Statistics Netherlands
Division of Macro-economic Statistics and Dissemination
Development and support department

Accounting for Sustainable Development[1]

Peter Kee and Mark de Haan

1. Introduction

1. The Brundtland Commission defines sustainable development as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 8). The Brundtland report highlights three fundamental components to sustainable development: economic growth, environmental protection and social equity. The economic area, the environmental area and the social area are now widely recognised as dimensions that should be addressed by sustainable development policies.

2. It appears not straightforward, however, to translate the Brundlandt definition of sustainable development into manageable policy objectives. Economists tend to translate sustainable development into non-declining per capita wealth while ecologists tend to address the unavoidable biophysical constraints of human action. In addition, it is clear that social relationships play a fundamental role in sustainable development. However, this understanding has so far rarely been converted into explicit social sustainability objectives. Nevertheless, there is a general understanding that an important policy goal underlying sustainable development is to lengthen the time-horizon of policymakers. The concept typically refers to the long-term implications of current actions and addresses long-run policy objectives, while the time-horizon of decision-makers, on the other hand, is typically rather short. In addition, sustainable development urges the necessity of setting its three dimensions in such a relationship that they become mutually supporting. In current practice, however, it is difficult to formulate such 'win-win' policies, which promote simultaneously economic, environmental and social goals. Nonetheless, the concept of sustainable development should force policymakers to take into account the impact of policies beyond their own narrow area. Policy decisions then will involve considering trade-offs between the three dimensions. The concept of sustainable development thus serves as a way to co-ordinate policies (OECD, 2001a).

3. Significant statistical work on sustainable development is being carried out in many international and national settings, with a wide and growing body of experience in the measurement of sustainable development becoming available. This great effort is motivated by the fact that this subject dominates policy agendas. The recent World Summit on Sustainable Development strongly reaffirmed the fundamental principles (the Rio Principles) and the programme of action (Agenda 21) for achieving sustainable development. In its report "Policies to Enhance Sustainable Development", the OECD outlined a policy framework for better integrating economic, environmental and social objectives, and decoupling economic growth from a range of environmental pressures. It emphasises the need for sound analysis based on strong science that considers the full range of policy instruments and associated costs and benefits (OECD, 2001b). The OECD Council Ministerial Meeting in May 2001 recognised subsequently the three interdependent dimensions of sustainable development – enhancing economic growth, promoting human and social development, and protecting the environment – as an overarching goal of OECD governments and the Organisation (OECD, 2001c). Finally, the European Council has made its annual Spring Meetings the focal point for economic,

[1] Myriam Linster provided useful comments on earlier drafts.

social and environmental policy issues, in the light of the overall objective of ensuring sustainable development (Commission of the European Communities, 2002a, p. 2).

4. This paper addresses the development of frameworks, which are necessary to structure and integrate the sustainable development indicators on the different dimensions (Section 2). Its major focus is on frameworks that are linked to the national accounts (Section 3). The paper serves as background for the forthcoming workshop on accounting frameworks, organised by the OECD. The paper finally lists some discussion points that may be addressed in the workshop (Section 5).

2. Frameworks

5. Frameworks are important for linking information pertaining to different areas, and for relating indicators to analytical questions and policy issues. Different frameworks are currently used in the various areas of sustainable development, with the choice of framework varying according to the purpose of the measurement. According to recent OECD work (OECD, 2001a), frameworks for measuring sustainable development should:

- Integrate the economic, environmental and social dimensions of sustainable development.
- Have sound conceptual foundations.
- Capture key information needed to measure sustainable development by selecting indicators.
- Clarify relationships between different indicators and between indicators and policies.

6. OECD (2001a) considers two types of frameworks: analytical frameworks and accounting frameworks. One example of analytical frameworks is the Pressure – State – Response (PSR) model, originally developed in the context of OECD work on environmental policies and reporting, and variants of it such as the Driving Force – Pressure – State – Impact – Response (DPSIR) model used by the European Environment Agency (EEA) or the Driving Force – State – Response (DSR) framework used initially by the UNCSD in its work on sustainable development indicators. In these models cause-effect relationships are identified and corresponding indicators are monitored. PSR based models have proven particularly useful in highlighting relationships between the environment and the economy. Another example is the Resource – Outcome Indicator Approach developed in the context of OECD work on sustainable development (OECD, 2001a). The approach requires measures of both how well we are preserving our assets (resource indicators) and how well we are satisfying current needs (outcome indicators). An important element of this approach is its extension of the traditional economic balance sheet to consider a broader range of economic, environmental and social assets.

7. Most frameworks choose indicators for the three dimensions by applying general selection criteria, like the Bellagio Principles (Hardi and Zdan, 1997) or those put forward by the OECD in its work on environmental indicators (OECD, 2002b, p. 21) or for the Economic and Development Review Committee (EDRC) peer reviews (OECD, 2002a, p. 5). In general, indicators should be flexible, transparent, meaningful, policy relevant and easy to interpret.

8. Different selections have resulted in a large number of indicator sets giving information on developments in the economic, environmental and social areas. Hass *et al*. (2002) provide a detailed overview of sets of sustainable development indicators used by national and international agencies. One example is the set of 58 core indicators developed by the *United Nations Commission on Sustainable Development (UNCSD)*; the set originates from a list of about 130 indicators and is structured in a framework focusing on themes and sub-themes of sustainable development (United Nations, 1996 and 2001). The indicators fall into four categories (social, environmental, economic and institutional) and several themes/sub-themes. They are intended for use at the national level by countries in their decision-making processes, and for reporting internationally on sustainable development. Another example is the *EU List of Structural Indicators*. The role of the structural indicators is to allow for an objective assessment of the progress made towards the Lisbon European Council objectives, expanded at Gothenburg and refined at Stockholm and Barcelona. The 42

indicators (seven for each domain) cover six areas: general economic background, employment, innovation and research, economic reform, social cohesion and the environment (see Commission of the European Communities, 2002b). One final example is the *UN/World Bank/OECD Indicator Set*, which emerged from the 1996 policy initiative *Shaping the 21st Century* (see OECD, 2000a). The 31 indicators in the core include indicators, which directly measure each of the seven development goals (reducing extreme poverty, universal primary education, gender equality, infant & child mortality, maternal mortality, reproductive health, environment). The aim is to raise public awareness in donor countries and to focus national efforts on a few, key development goals for 2015, which if realised would contribute to "a stable, sustainable future for this planet".

9. Most of the indicators in the above sets have not been linked together in a common system. This seems not quite compatible with the important requirement of analytical soundness. This requirement, however, is an explicit part of the prevailing selection criteria. The Bellagio Principles point to the necessity of an organizing framework that considers the interaction between the various component parts. OECD (2002b) stresses that an (environmental) indicator should lend itself to being linked to economic models, forecasting and information systems. And OECD (2002a) addresses the need for analytical tractability: policy items under review should be limited to those that are amenable to analyses based on solid data. Looking at the *EU List of Structural Indicators*, De Haan *et al.* (2002) get the impression of a fairly incoherent shopping list of numbers without underlying structure. They argue that a meaningful policy evaluation is possible only when indicators are presented in their economic, social or demographic context. This might be accomplished by embedding indicators in an underlying accounting system. Such an integrated system enhances the mutual consistency, reliability and comparability of indicators and reduces the risk of different indicators measuring the same phenomena. An underlying statistical information system allows studying the interdependencies between indicators. Understanding these interrelationships is essential for meaningful policy evaluations in the context of sustainable development goals.

3. Accounting Frameworks

10. The core System of National Accounts (SNA; United Nations *et al*., 1993) is a unifying framework for economic statistics. It is broadly accepted, credible, internally consistent, and has a long established theoretical structure. The accounting structure imposes a more systematic discipline to the organisation of statistics. This provides opportunities for modelling and for an assessment of the impact of particular policies. Also, comparisons across countries are facilitated by this internationally recognised standard.

11. However, for the purpose of measuring sustainable development the conventional system of national accounts is inadequate. For example, it does not deal with the priceless environmental and social externalities, which are important in a sustainable development context. Accounting for sustainability thus requires an extension of the standard framework. Environmental accounts that are linked to the SNA are extensively described in the draft handbook System of Environmental and Economic Accounts, SEEA 2000 (United Nations *et al*., forthcoming). The SEEA explores the interrelationship between the environment and the economy by compiling sets of statistical accounts. Broadly speaking, the handbook offers two main extensions that are relevant in the context of measuring sustainable development. Firstly, SEEA extends the representation of production and consumption activities in the SNA by including environmental interactions such as natural resource inputs and residual outputs, usually expressed in physical units. These physical flow accounts are useful in measuring environmental-economic performance. Secondly, the SEEA contains an extended representation of balance sheets by including a wider range of environmental assets than presently included in the SNA. These balance sheets may be compiled in physical or monetary units and are useful in measuring environmental wealth, or the environmental state, and changes therein. Both accounting approaches and their contribution to measuring sustainable development are discussed below.

A. Measuring environmental-economic-social interrelationships

12. A clear understanding of the interrelationships between the natural environment and the economy is not possible without understanding their physical representation. This proposition equally holds for the economic analysis of these interrelationships. Material and energy exchanges between the environment and the economic system are elementary in the operation of an economy. All production and consumption processes as well as commodity transactions one way or another coincide with the use of materials, energy and space. At the same time, material and energy consumption are important (but not the only) determinants of environmental quality and the concomitant availability of environmental use functions. Prior to any environmental damage assessment in terms of money, the causes, the damages as well as the concomitant cause-effect interactions have to be observed and understood in physical terms.

13. Physical flow accounts are helpful in showing the physical characteristics of production and consumption activities. The SEEA presents a range of compatible physical flow accounts. Some accounts provide a physical representation of all material flows within the economic system. Others specifically focus on the physical exchanges between the economic system and the natural environment, i.e. on natural resource inputs and residual outputs. The latter approach is specifically useful in extending the scope of national accounting and is followed in the National Accounting Matrix including Environmental Accounts (NAMEA; cf. De Haan and Keuning, 1996). The SEEA characterises these types of accounts as the hybrid accounting approach. The NAMEA maintains a strict borderline between monetary accounts on the one hand and accounts denominated in the most relevant physical units on the other. The environmental accounts contain the material inputs and outputs from and to the natural environment that are not considered economic transactions and for that reason ignored in the SNA. All European Union member states participate now in the European Commission's NAMEA project. Air emission accounts are the most far advanced: in several member states the publication of these NAMEAs has become an annual exercise (see European Commission–Eurostat, 2001).

14. The primary goal of such a hybrid accounting approach is to provide consistent monetary and physical data in the Leontief tradition, allowing for corresponding analytical advantages. These accounts link economic and environmental indicators and allow for comparisons across different industries and household activities. This information can be used to examine decoupling environmental pressures from economic growth. Within the context of national accounting, decoupling could be defined as decreasing levels of pollution per money unit of either value added (industries) or consumption (households). Decoupling indicators do not answer the question of whether or not the economy is sustainable. But they do provide a good measure of whether or not progress is made on the way to sustainability, especially when pressure indicators directly refer to policy targets (e.g. Kyoto agreements). Decoupling indicators derived from hybrid accounting structures are systematically decomposable according to various economic causes: efficiency changes, structural changes in the composition of industries (e.g. transitions towards a knowledge based services economy), changes in consumption patterns and consumption volume (see, e.g., De Haan, 2001; Jacobsen, 2000; Wier, 1998). Decomposition analyses can also be carried out at the industry level.

15. The transformation towards services (or knowledge) based economies has often been considered a strategy to increase simultaneously social (employment) and environmental performance. However, it is not straightforward to what extent this transformation will genuinely result in dematerialization of economies. Sustainability on a worldwide scale is not improved when the specialisation in services of some countries implies an increasing reliance on foreign supply of products with relatively high environmental requirements. Physical flow accounting is typically very helpful in analysing the indirect environmental requirements of economies or specific activities. Indirect environmental requirements refer to the environmental consequences attributed to the intermediate inputs of particular production processes or to the imports of an economy as a whole. The

measurement of indirect environmental requirements is indispensable when evaluating the environmental performance of industries or countries. The same holds when policy objectives are directed towards realising more sustainable consumption patterns or lifestyles. In assessing these patterns or lifestyles, for example not only the environmental direct effects of using household appliances should be taken into account, but also the indirect effects of producing these appliances.
Besides the NAMEA, another relevant national accounting module is the Social Accounting Matrix (SAM, see United Nations *et al*., 1993, pp. 461-88). SAMs elaborate on the interrelationships between economic and social statistics by incorporating information on labour and households in the system of national accounts. More specifically, SAMs add detailed information on the generation of income in an economy by differentiating labour inputs according to sex, level of education, and type of profession. In addition, a SAM includes a sub-division of the household sector, for example according to household composition or main income source of the household. In principal, SAMs allow for the integrated analysis of social issues within one statistical framework. For example, imposing environmental constraints on production or consumption will inevitably have consequences for employment and the income distribution. Expanding the national accounts with modules like NAMEA and SAM may yield a consistent and linked set of indicators that are relevant for analysing interactions between the different dimensions of sustainability. The different consumption patterns found for different groups of households in SAM may further contribute to sustainability analyses of households. However, at this moment little experience has been gained with the use of SAMs in such integrated analyses, and their relevance in the context of sustainability issues needs further investigation.

B. Wealth-based approaches

16. One approach to sustainability is that of preserving a stock of wealth. Sustainability is then viewed in terms of maintaining the capital base of a country, and could be potentially measured on the basis of the national accounts. The SNA contains a balance sheet and records all changes in that balance sheet during an accounting period in the capital and financial accounts (changes due to transactions) and in the other changes in assets account (changes not due to transactions). A number of important environmental assets are included in the SNA. However, assets over which ownership rights cannot be established or that are not capable of bringing economic benefits to their owners are excluded. These criteria imply that various environmental assets, such as the environmental media of air and water, sub-soil deposits whose economic viability is in doubt, and ecosystems fall outside the asset boundary of the SNA. Capital measures for the social dimension are completely absent.

17. The SEEA expands the asset boundary of the SNA to cover all environmental entities that are of interest and measurable. They are grouped in the following broad categories: natural resources, land and associated surface water, and ecosystems. Each of these assets can be measured in different physical units and can be monitored statistically on an asset by asset basis. Whether or not this is sufficient depends on how environmental sustainability is viewed. Strong sustainability requires that all separate asset types do not decline. In this case, the different assets do not have to be valued in monetary terms. However, it is clear that the use of non-renewable resource inputs such as mineral deposits implies that the goal of strong sustainability becomes out of reach. The weak version of sustainability, on the other hand, requires that changes in the total amount of capital are not negative. Then monetary valuation becomes necessary to aggregate the various asset types. In the real world, not all declining assets can be replaced. Capital for which there is no alternative, is sometimes labelled "critical capital". Such critical capital should be monitored separately in physical units. For example, the ozone layer provides critical functions for which substitutes do not exist.

18. The SNA records assets only in monetary terms, but the SEEA asset accounts register both quantities and values. When market prices of the assets are not available, valuation is based on the present discounted value of expected future rents. For some assets, however, only physical accounts are possible. For example, biodiversity is an asset that is fundamentally difficult to value. It should be noted that sustainability in value terms is quite a different concept than sustainability in quantity terms.

Stock values change by price movements. In perfectly competitive markets, these price changes reflect changes in expected future income streams from the assets. Hence, sustainability in the sense of non-decreasing stock values over time addresses the issue of maintaining a constant income generating capacity of the asset stocks.

19. Based on a capital model, Smith *et al*. (2001) propose a potential set of indicators of economic sustainability. By economic sustainability they mean creating the conditions that are necessary to allow economic production to continue into the indefinite future. The model tracks stocks of key types of capital – produced, natural and human – that will be needed by future generations. Produced capital refers to inputs in production such as factory buildings and machinery that last over time. Natural capital is divided into three principal categories: natural resource stocks, land, and environmental systems or ecosystems. Individuals' stock of human capital consists of acquired education and experience; health components are included as well. They do not, however, take social capital into account. Social capital is defined in OECD (2001d, p. 41) as: networks together with shared norms, values and understandings that facilitate co-operation within or among groups.

20. Estimates of the wealth of nations are developed by the World Bank. They represent an attempt to establish national balance sheets for a broad range of assets and for countries around the globe. The World Bank's work resulted in the publication since 1999 of the genuine saving measure (Kunte *et al*., 1998, Hamilton, 2000). Genuine saving is a national accounting aggregate designed to measure the net change in assets in a national balance sheet that includes natural and human capital. The definition of the published indicator is as follows.

> *Genuine saving = gross domestic saving minus consumption of fixed capital plus education expenditure minus energy depletion minus mineral depletion minus net forest depletion minus carbon dioxide damage.*

21. The savings indicator highlights the need to consider a range of assets and their relative significance: sustainable development as portfolio management. The policy implications of genuine saving follow both from its level and composition. If saving rates are low or negative, then the sustainability of the development path is marginal or doubtful under the current policy regime. Hamilton (2001) stresses that what the World Bank does publish is limited by internationally available data. Current gaps in the coverage of the savings measure include depreciation of human capital, soil degradation, depletion of fisheries and subsoil water, and damage to assets (including human health) from unsafe water and indoor and urban air pollution. Critical natural capital is absent from the savings indicator as well.

4. Conclusions

22. Measuring sustainable development is necessary for addressing the long-term future of our societies. Without an integrated information set on long-term sustainability problems, public awareness of these issues will be limited and the formulation and monitoring of policy responses will be difficult (OECD, 2001a).

23. Progress to sustainability is currently being measured mainly by sets of indicators covering a wide range of economic, environmental and social issues, and often structured according to analytical and theme-based frameworks. This paper points to the advantages of using a national accounting framework to derive sustainability indicators. The integration into this framework would facilitate linkages between data sets covering different dimensions of sustainable development and establish stronger links between the individual indicators. Hence, opportunities are enhanced for making, evaluating, and analysing sustainable development policy decisions in a more integrated fashion. The standard system of national accounts, however, provides only limited possibilities for measuring sustainability.

24. This paper discusses two different approaches to measuring sustainability issues within an extended accounting framework. The first approach extends the core system with modules or satellite accounts, which are specifically developed to gain more insight into the existing economic, environmental and social interrelationships. For example, relevant indicators and trade-offs in the economic-environmental-social field may be derived from the NAMEA and SAM. The second approach broadens the asset boundary of the system by including more assets that are of interest in a sustainable development context. Monitoring sustainability then means tracking stocks of assets over time.

25. Both approaches should be considered as complementary rather than competing. The capital approach provides indicators that show the periodic changes in assets taken into consideration and follows as such a 'cost-borne' concept. The NAMEA approach focuses on the eco-performance of an economy such as developments in eco-efficiency and economic structures, and follows as such a 'cost-caused' concept, although the costs are not (directly) expressed in terms of money. In other words, both approaches partly try to answer different kinds of questions and have a somewhat different scope with respect to the kind of environmental issues that they can incorporate. Comparing stocks in time inform us whether sustainability has increased or decreased. Flows, on the other hand, highlight the underlying dynamics.

5. Issues for discussion

The workshop addresses the usefulness of national accounting frameworks in measuring some aspects of sustainable development. The discussion will address conceptual, measurement and policy issues, with a focus on the following questions:

I. Conceptual issues

1. What are the advantages of accounting approaches for the measurement of sustainability? Should they focus on the absolute size of sustainability (gaps), or on the specific characteristics of society that are particularly relevant from a sustainable development perspective?
2. What are the most important goals that accounting frameworks should pursue? Are they useful in effectively dealing with the policy trade-offs that arise in discussions about sustainability? What are the main priorities in order to implement the two accounting frameworks presented in the paper?
3. Sustainable development is defined in various ways. How these definitions are translated into accounting approaches is therefore important. One general goal of accounting frameworks is to provide objective information to support policy decisions, without imposing subjective sustainability perspectives. To what extent are accounting frameworks capable of fulfilling this function?

II. Measurement issues

1. What are the strengths and weaknesses of physical flow accounting? What are the most relevant indicators that these accounts can produce? Which specific environmental concerns cannot be captured through these accounts? Can they be extended to cover social issues and concerns?
2. What are the strengths and weaknesses of balance sheets? What are the most relevant indicators that these accounts can produce? What are their strengths and weaknesses for describing environment concerns? Are they suitable to cover social issues and concerns?
3. What are the strengths and weaknesses of accounting aggregates and valuation methods? To what extent are monetary measures useful when evaluating ecosystem functions (e.g. climate change, biodiversity), in particular those that are relevant to meet the needs of future generations? What about resource values that are socially or morally motivated?

III. Statistical policy issues

1. What is the degree of involvement of national statistical agencies in initiatives to measure the sustainability of development patterns? Are they taking part in the activities of dedicated bodies (such as round-tables, advisory boards, etc.)? If yes, how do these bodies work and what is the role of statistical experts?
2. What should be the role of international organisations in general, and of the OECD in particular, in pushing ahead the statistical agenda for sustainable development? What are the problems for effectively co-ordinating the various international organisations active in this field?

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