

The System of Environmental-Economic Accounts (SEEA)

Measurement Framework in Support of Sustainable Development and Green Economy Policy

"A first step towards the integration of sustainability into economic management is the establishment of better measurement of the crucial role of the environment as a source of natural capital and as a sink for by-products generated during the production of man-made capital and other human activities. As sustainable development encompasses social, economic and environmental dimensions, it is also important that national accounting procedures are not restricted to measuring the production of goods and services that are conventionally remunerated...A program to develop national systems of integrated environmental and economic accounting in all countries is proposed."

Chapter 8, Agenda 21

1 Introduction

Purpose of this briefing note...

The purpose of this briefing note is to inform how the SEEA can support sustainable development and green economy policy.

The SEEA in response to policy demands...

Policy-makers and managers benefit from consistent, comparable and comprehensive statistics and indicators when an integrated accounting approach is used. Importantly, the trade-offs of their decisions that affect natural resources and associated services are made explicit.

Relevant in a data poor environment ...

The SEEA is relevant in a data poor environment by identifying the data gaps and improving consistency. International agencies and donors need to contribute to the implementation of the framework.

The SEEA in response to Agenda 21...

Twenty years ago Agenda 21 identified the need for a systems approach to monitoring the transition to sustainable development and proposed a specific solution: the development of integrated environmental and economic accounts. Over the past two decades, the international official statistics and accounting communities have responded to this need through a rigorous and global process to develop a **System of Environmental-Economic Accounts (SEEA)** within the broader set of international statistical standards.

A critical lesson from Agenda 21 is that integrated policy decision-making is crucial. This requires greater integration of the statistical evidence that informs policy. Unfortunately, in many cases, the production and dissemination of statistics relevant to sustainable development has remained relatively disparate, following the traditional 'information silo' based organization rather than using a systems approach. Moreover, given that data collection often

involves many different agencies with different scopes of responsibility, there is usually limited collaboration in the collection, management and sharing of data across institutions, particularly on environmentally related topics.

The role of the SEEA ...

The SEEA provides the internationally moderated framework for reversing the historical 'information silo' approach to statistics and for providing indicators that directly respond to the demand of integrated policy-making. Indicators related to initiatives such as "beyond GDP", "Green Economy", "Green Growth", "measuring progress of societies", and "better life", all fit under the umbrella of sustainable development. Taking just a few examples, indicators derived from the accounts provide the measures for the following policy questions:

- Who benefits from natural resource use? What are the impacts on the state of the environment and on other sectors of the economy?
- How does depletion of natural resources affect measures of the real income of a nation? Are the depletion costs recovered by the government? What is the composition of the wealth of a nation?
- Are current trends in production and consumption of resources sustainable? What economic instruments are in place? And what is the impact of new instruments?

2 Accounting and integrated information systems

The importance of accounts for the environment...

The importance of the SEEA has long been recognized. Chapter 8 of Agenda 21 "Integrating Environment and Development in Decision-Making" called for "establishing the

Box 1: SEEA in practice: The Philippines

The Philippines has a decentralized statistical system consisting of a policy-making and coordinating body, a general purpose statistics producing agency, a statistical research and training center, and various government agencies engaged in the generation of statistical information. The National Statistical Coordination Board (NSCB) is the highest policy-making body on statistical matters, and plays a central role in coordinating statistical activities. For example, it is mandated to compile the System of National Accounts by integrating the information from various data producing agencies in the country.

The Philippines has established an Inter-Agency Committee on Environment and Natural Resource Statistics (IACENRS) with the objective of coordinating activities in the generation of environment statistics, the integration of statistics into the environmental-economic accounts, and the derivation of indicators. The Committee brings together the government agencies responsible for designing environmental policies and data production, including the geo-spatial agency and the business community. It agrees on priorities and data collection requirements, identifies data gaps and overlaps, determines timeliness and data quality expectations, outlines dissemination policies, and seeks ways to improve the efficiency and cost effectiveness of the data production process.

The Philippines has a long history in the implementation of the SEEA under the leadership of the NSCB. The Philippines started implementation of the SEEA in 1998 as a pilot project with the funding of UNDP and the technical assistance of the UN Statistics Division. The pilot compilation included the following accounts: forests, fish, water, mineral and energy, and land and soil.

Since the 1998 pilot project, the Philippines has formally institutionalized the SEEA and IACENRS has adopted the SEEA as the supporting framework for integrated policies on the economy and the environment. The NSCB has been given the task to integrate the basic data produced by the different agencies in the SEEA accounts and tables. In the new 2012-2017 Philippines Statistical Development Programme a separate chapter on the environment has been devoted to the adoption of the revised SEEA as one of the activities under this program.

Source: National Statistical Coordination Board

SEEA (1993) in all member countries” to obtain a “better measurement of the crucial role of the environment as a source of natural capital and as a sink of by-products generated during the production of man-made capital and other human activities”. It also requested the “UN Statistical Division in collaboration with other relevant international organizations to further develop, test refine and standardize the provisional concepts and methods proposed” in the 1993 SEEA.

Elevation to an international statistical standard...

In recent years there has been an extensive effort to revise the SEEA and elevate it to an international statistical standard, taking into account new thinking in the measurement of environmental issues as well as established country experiences in implementation. The revised SEEA has undergone a wide consultation process led by the UN Committee of Experts of Environmental-Economic Accounting (UNCEEAA), an intergovernmental body under the auspices of the UN Statistical Commission. The global consultation involved countries at different stages of development from all regions, as well as international partners including multiple UN agencies, World Bank, IMF, OECD and the European Commission.

The SEEA utilizes the principles of economic accounting, building on the existing System of National Accounts (SNA). The SEEA accounts bring into direct focus the relationship between the environment and well-being not revealed through traditional measures of economic activity, such as GDP and national income.

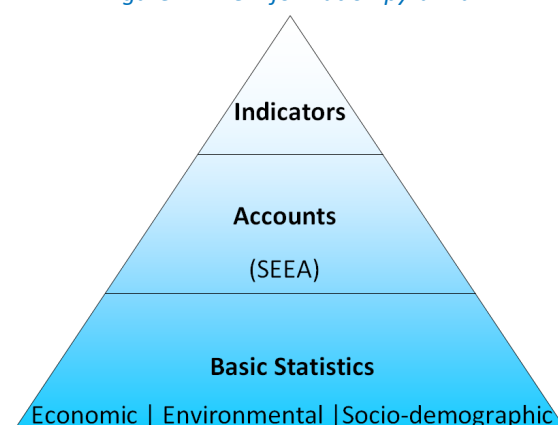
The SEEA does not propose or recommend any single indicator or basket of indicators for use in developing and assessing policy. Indeed some of its major strengths are in its approach to integrating statistics to allow for multiple purposes

and multiple scales of analysis. However, there are several key aggregates and indicators that are directly derived from the accounting tables and are of interest to policy analysis and goal-setting.

Consistent, comparable, coherent statistics and indicators...

Figure 1 below illustrates the role of the SEEA in the statistical system. Starting from the basic economic, environmental and socio-demographic statistics, the SEEA organizes and reconciles them using accounting concepts and structure to obtain time series of consistent, comparable and coherent statistics and indicators and to facilitate the linkages with official statistics. While the indicators can be derived from basic statistics, the use of the accounts ensures that the indicators are consistent because their component data are derived from a common framework. As a result the signals of the statistics and indicators are coherent.

Figure 1: The information pyramid



Box 2: SEEA in practice: European Union

The countries of the European Union (EU) have been working for many years developing environmental accounts of the kind included in the SEEA.

A number of manuals have been produced relating to key parts of SEEA such as air emissions, material flows, environmental protection expenditure, environmental goods and services sector, forest accounts, etc. These are practical guides aimed mainly at compilers which reflect and embody the experience of the most advanced EU countries.

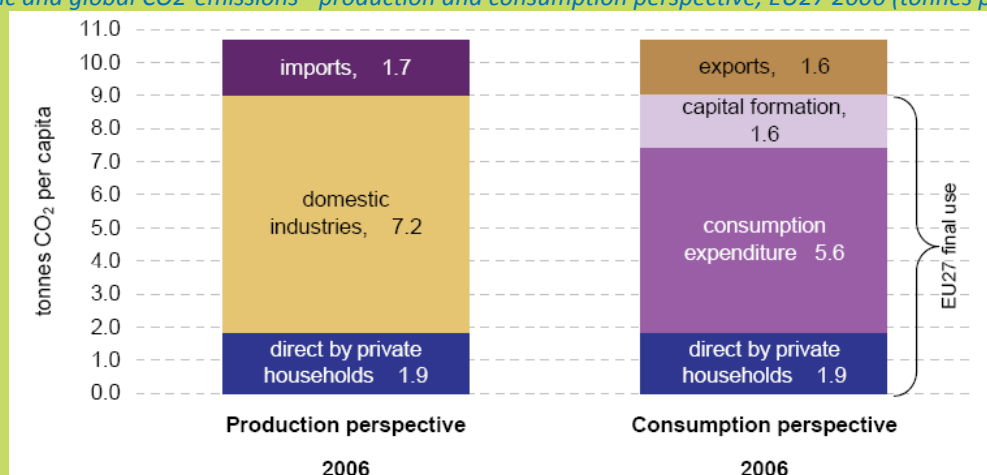
In July 2011 the European Parliament and Council adopted the first EU Regulation (an EU law) on environmental accounts which requires all Member States to compile annual data for three modules in a first stage:

- Environmental taxes
- Emissions to air of 14 substances by industries (ISIC 2-digit) and households
- Economy-wide material flow accounts showing domestic extraction, imports and exports of some 40 materials

The data is to be collected according to a standard form and timetable, with first data delivery at the end of 2013. In fact much of this data is already being collected on a voluntary basis and is published on Eurostat's web site http://epp.eurostat.ec.europa.eu/portal/page/portal/environmental_accounts/introduction

A second set of modules is being prepared by Eurostat for a future update of the Regulation, including environmental protection expenditure, environmental goods and services and energy supply and use by industries and households. One recent example illustrates the analytical possibilities of integrated environmental-economic accounting. Starting from the air emissions recorded against the industries and activities that generated them and passing through an input-output table, it is possible to reallocate the emissions to the final use categories that indirectly caused them ("consumption perspective"). The results interestingly show that the EU induces emissions in other parts of the world through imports, but only for about the same amount as the EU export.

Domestic and global CO₂-emissions - production and consumption perspective, EU27 2006 (tonnes per capita)



Source: Eurostat

From statistics to accounts...

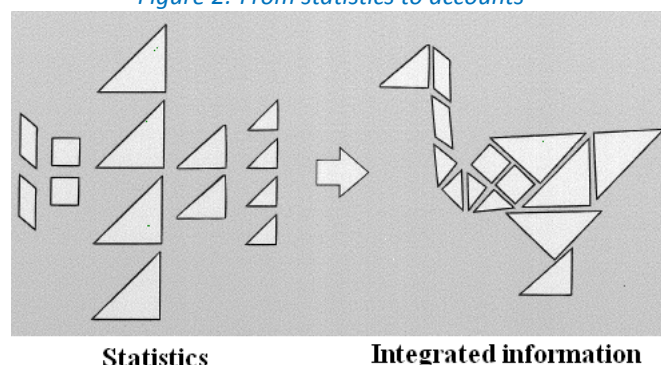
The UN Framework for the Development of Environment Statistics (FDES, currently under revision) provides the conceptual foundation and structure for organizing environment statistics.

The SEEA provides a comprehensive conceptual accounting framework which brings together the blocks representing basic economic, environment and socio-demographic statistics and describes the relationship between them as illustrated in Figure 2. In addition to economic and socio-demographic statistics, the SEEA relies on basic environment statistics such as statistics on natural resources such as water, energy, forest, flows of materials and pollutants which are usually collected for specific purposes.

The SEEA adds value to individual information components by bringing them together to inform integrated policies,

evaluate trade-offs between different policies and evaluate their impacts across domains of the economy, the environment and society.

Figure 2: From statistics to accounts



Box 3: SEEA in practice: South Africa

South Africa is committed to implement the SEEA with Statistics South Africa, the agency mandated by law to produce statistics and declare statistics as official, coordinating the implementation. Several accounts have already been compiled on an experimental basis and South Africa plans to institutionalize the SEEA on an incremental basis, starting from the mineral and energy accounts.

Traditionally, statistics in South Africa related to environmental issues such as water, minerals, energy, climate change and biodiversity have been fragmented. To fulfill its mandate, Statistics South Africa embarked on a process to strengthen institutional arrangements with other line Ministries in order to systematically develop a series of environmental-economic accounts guided by the SEEA-framework. This led to the formation of inter-departmental working groups to address the data and quality gaps between basic statistics, environmental indicators and the accounts. In recent years environmental-economic accounts have been developed in four areas of focus, namely Water (2000), Minerals (1980 – 2008), Energy (2002 – 2006) and Fisheries (1990 – 2008).

International cooperation has provided the impetus and guidance for the development of the accounts in South Africa. Given the rich datasets that are required to produce detailed accounts, the South African environmental-economic accounts are not comprehensive, but the work achieved thus far paves the way for future refinement of statistics and indicators and for improved collaboration between the agencies that are involved.

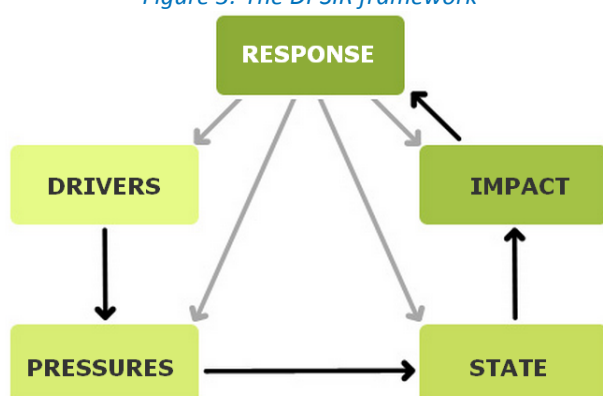
Source: Statistics South Africa

The SEEA conceptual accounting framework is equally applicable for data rich and data poor environments. While in a data rich environment the SEEA confronts and reconciles the basic component data, in a data poor environment it identifies data gaps and provides the structure for the imputation of missing data.

Connection to DPSIR...

Statistics and indicators derived from the SEEA can be communicated through the DPSIR framework. The Driving forces, Pressure, State, Response framework describes a step-wise causal chain between economic activity and impacts on ecosystems¹.

Figure 3: The DPSIR framework



Responses are management responses to address environmental problems, such as environmental protection and resource management expenditures and environmental taxes. Driving forces are anthropogenic activities that cause pressure on ecosystems. Pressures are direct stresses from anthropogenic activities to ecosystems such as emissions to air, water and waste, release of excessive nutrients. State refers to the state of ecosystems in terms of its capacity

to provide services to humanity and the conditions of the environment. Impacts are the measures of changes in the ecosystem conditions such as depletion of natural resources and degradation of ecosystems conditions.

The monitoring framework, the SEEA, informs the policy framework (see Figure 4) through statistics and indicators that may be communicated through the DPSIR framework.

3 Sustainable development policy and information requirements

Informing different policy perspectives...

Figure 4 presents sustainable development policy areas according to four simple quadrants related to how information is derived from the SEEA. The first quadrant, Improving access to services and resources, refers to policies that aim to ensure that households have access to appropriate, reliable and affordable resources and services. Scarcity, as experienced by individuals, is not only about absolute volumes of resources in a country, but also accessibility. The SEEA can provide a range of measures to guide policymakers in assessing and managing performance of providers of critical services such as water and energy. They include the following indicators:

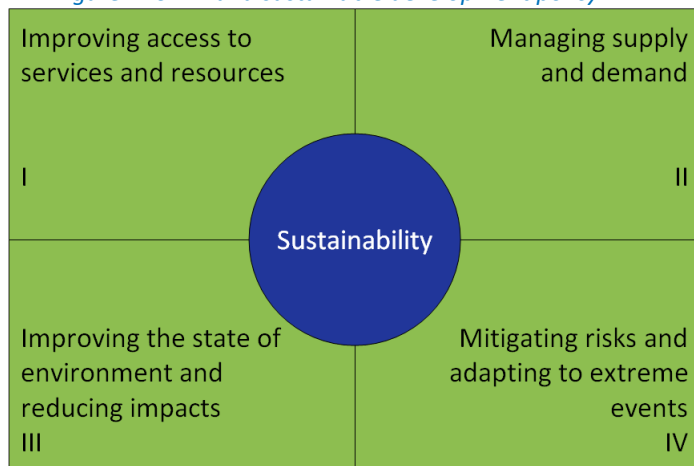
- Current and capital costs associated with the provision of the services and their financing;
- Losses in distribution;
- Quantity of resource used.

The second quadrant, Managing supply and demand, refers to the allocation of natural resources for meeting the needs of current and future generations in relation to the available endowments. Relevant measures derived from the SEEA include the following key aggregates and indicators:

- Resource use of production and consumption;
- Generation of emissions and waste by economic activity and households.

¹Report of the Issue Management Group on Green Economy "Working towards a balanced and inclusive green economy – A United Nations System-wide Perspective"(UN Environmental Management Group (EMG 2011)

Figure 4: SEEA and sustainable development policy



- Resource efficiency;
- Decoupling indicators for emissions and resource use;
- Carbon and energy embedded into products;
- Environmental goods and services;
- Green jobs;
- Environmentally-adjusted aggregates for depletion (e.g. net savings or environmentally-adjusted value added);
- Resource rent;
- Investment in infrastructure.

The third quadrant, Improving the state of the environment and reducing impacts, recognizes the potential for economic activities to cause harm and the potential to protect or restore natural capital for future benefit. The SEEA provides an agreed approach for internationally comparable measures such as:

- Stocks of natural resources;
- Emissions into water, air and soil and waste generation;
- Environmental protection expenditures and resource management;
- Land use and land cover;
- Conditions and health of ecosystems;

- Regulatory services provided by ecosystems;
- Economic instruments to reduce impacts.

The SEEA is also developing best practices on measures such as:

- Conditions and health of ecosystems;
- Regulatory services provided by ecosystems ;

Finally, the fourth quadrant, Mitigating risks and adapting to extreme events, refers to policies that aim to reduce human, economic and ecological harm created by extreme natural events and changing environmental patterns. Measures that inform this quadrant include:

- Greenhouse gas emissions by type of economic activity;
- Expenditures on mitigation (e.g. technologies);
- Expenditures for adaptation to extreme events (e.g. dykes, etc.).

4 Implementation of the SEEA

Countries adopting the framework...

Although the SEEA is a relatively new approach in the development of integrated national accounts for the environment, more and more countries are compiling or planning to compile environmental accounts. Environmental accounts do not necessarily require a large amount of data. On the contrary, the SEEA provides the organizational structure to bring all the available data together to improve understanding of their interrelationships and verify consistency. This facilitates the identification of data gaps and overlaps as well as the improvement the quality of the data.

Also developing countries adopting the SEEA...

The SEEA can be implemented in countries which are at various stages of development. The implementation of the framework can be incremental starting from very aggregated tables and accounts that can be disaggregated based on policy needs and data development. Increased use of the framework should lead to improvements in the availability and quality of the data and the information base that

Box 5: SEEA in practice: China

China's rapid economic expansion over the past three decades has delivered a measured annual growth rate in GDP of around 10 per cent per annum. There are increasing concerns among policymakers and the public in China about environmental issues such as natural resource depletion and environmental degradation.

In response to an increasing demand for integrated environmental and development policies, the National Bureau of Statistics of China (NBS) has adopted the SEEA as the statistical framework for measuring inter-relationships between the economy and the environment. Over an extended period of time, the NBS has cooperated with a range of government agencies including the Ministry of Land and Minerals, Ministry of Environment Protection, State Forestry Administration, and the Ministry of Water Resources to develop SEEA accounts.

The NBS, working together with Statistics Canada, Statistics Norway and the United Nations Statistics Division, has compiled (on a pilot basis) the following physical and monetary accounts for China with the goal of institutionalizing the SEEA: timber resources, energy flow and stock accounts, water accounts (including accounting for emissions to water), mineral accounts, and air emission accounts.

Source: National Bureau of Statistics of China

Box 4: SEEA in practice: Australia

Australia is an industrialized nation with a range of environmental resources and unique flora and fauna. The country's climate varies widely with a tropical north, temperate south, and a semi-arid center. Annual rainfall varies substantially across the Australian continent, with large seasonal variations. Like most countries, Australia faces significant environmental challenges, particularly with regard to climate, water and energy.

Australia's population is concentrated in the south-east, where water is often a relatively scarce resource. An increasing population and growing economic demands compete with nationally significant environmental assets for use of the water, and its management is therefore crucial and attracts considerable public attention. The Australian Bureau of Statistics (ABS) production of SEEA accounts for water have provided a consistent and enduring framework to manage this water, and are a good example of how integrated information can effectively guide complex decision-making processes.

The ABS commenced the production of environmental-economic accounts in the mid-1990s, with the release of a natural resource account presenting energy resources; production, conversion and consumption; as well as emissions discharged into the natural environment. Since then, the ABS has produced a range of other environmental-economic accounts, including accounts for water, energy, land and environmental protection expenditure (EPE). The ABS now produces water and energy accounts annually, and is continuing to expand its suite of regular environmental-economic accounts to meet policy demands.

Source: Australian Bureau of Statistics

supports the development and assessment of policies that have an impact on the environment.

Countries will have to make changes to their national economic accounts in order to have more detailed information about the natural resource asset accounts, material flow and pollution accounts

As the framework is implemented at national and sub-national levels it will become increasingly easier to share and compare information over time and space.

5 Subsystems of the SEEA

The SEEA-Water and the SEEA-Energy are two subsystems of the SEEA. They elaborate and build on the concepts of the SEEA while maintaining close links with the concepts and terminology of the specific subject areas.

SEEA-Water...

The SEEA-Water, a subsystem of the SEEA, provides a conceptual framework to support water policy design and evaluation. The SEEA-Water was adopted by the United Nations Statistical Commission (UNSC) in 2007. As part of the implementation of the framework the International Recommendations for Water Statistics (IRWS) were also developed and adopted by the UNSC in 2010. IRWS provides the list of data items and methods of collection for water statistics.

The SEEA-Water framework sets the basis for compiling a full spectrum of information to answer a wide variety of policy questions, such as:

- What are the investments in water supply and sanitation services? How are the costs being recovered? Are the services affordable to the population?
- Are water resources being used sustainably? Who benefits in the allocation of scarce water resources? What are the trade-offs of water re-allocations?
- Are the levels of pollutants emitted to water acceptable? Are they decreasing? What investments are made for the purpose of reducing pollutant emissions?

- What are the economic losses associated to floods and droughts? What investments are associated with reducing flood and drought risks?

SEEA-Energy...

Work is currently underway to finalize SEEA-Energy. SEEA-Energy can inform on progress across the full spectrum of energy related matters. For example, for those concerned with an environmentally sustainable energy supply that addresses socioeconomic needs, it informs the following policy questions:

- Do we have an affordable, economically sustainable and environmentally sustainable energy supply?
- What is the mix of energy products used - and who are the various users of these products? What are the emissions generated by this energy mix? How does this supply and use of energy impact on the full range of related economic measures, for example, energy prices paid, energy expenditures as a proportion of household income or business income, profits earned and so on?
- What is the expected (and actual) impact of various policies on the environment; and on household and business expenditure, business income, taxes and so on? Or, for example, how would incentives to invest in renewable energy impact on industry emissions? Furthermore what types of incentives are being used (subsidies, grants etc), what is their size, and who is financing them? What are the changes in the contribution of renewable energy to total energy use over time?

Sustainability goals..

Water and energy are essential for achieving equitable and sustainable social and economic development. Water and energy security require improving the management of water and energy resources. These are necessary conditions for achieving many Millennium Development Goals (MDGs), such as eradicating extreme poverty and hunger, achieving universal primary education, promoting gender equality and

Box 6: SEEA in practice: The Netherlands

Statistics Netherlands has a long history in environmental accounting. During the initial phase in the early 1990s, accounts were developed for air emissions, water emissions, waste, energy, water and environmental expenditure. Recently Statistics Netherlands has gradually extended the Dutch System of Environmental-Economic Accounting by compiling new accounts on material flows, the environmental goods and service sector, emission permits, etc. The Dutch environmental accounts are compiled following the general concepts, definitions and classifications as described in SEEA.

One important new application of the Dutch environmental accounts is the compilation of indicators for green growth / green economy (Statistics Netherlands, 2011). "Green growth" fosters economic growth and development while ensuring that natural resources can continue to provide the ecosystem services on which our well-being relies. Both on a national and international level there is much interest in monitoring the transition towards green growth. Following the approach of the OECD (2011), indicators were compiled for four themes: indicators reflecting the environmental efficiency of production, indicators of the natural asset base, indicators monitoring the environmental quality of life, and indicators describing policy responses and economic opportunities. The majority of the indicators could directly be derived from the Dutch System of Environmental-Economic Accounting which provides a good measurement framework for green growth, as it integrates economic and environment statistics.

The indicators were assigned two scores: one with respect to the trend in greening growth, and one for identified policy targets (see Table). The scores for environmental efficiency indicators are based on decoupling. Decoupling occurs when the growth rate of an indicator of environmental pressure is lower than the rate of economic growth in a given period. Decoupling can be either absolute or relative. With regard to green growth, the ultimate goal is absolute decoupling, as only this will reduce the absolute burden for the environment. Indicators that cannot be linked to economic growth are assigned a score based on the evaluation of their trends. The presented indicator scores for policy targets were obtained from the Netherlands Environmental Assessment Agency. It was not possible to identify policy targets for all indicators. The policy targets are primarily included to provide background information to the presented trends.

Preliminary Scores of Green Growth Indicators

Group	Indicator	Time series	Trend	Policy targets
Environmental efficiency	Production-based greenhouse gas intensity	1990–2009	Relative decoupling	Likely to be met
	Consumption-based greenhouse gas emissions	1996–2009	Relative decoupling	-
	Energy efficiency	1990–2009	Relative decoupling	-
	Renewable energy	1990–2009	Improvement	Unlikely to be met
	Nutrient surpluses	1990–2009	Absolute decoupling	Likely to be met
	Material intensity	1996–2008	Relative decoupling	-
	Water use intensity	1990–2009	Absolute decoupling	-
	Water treatment	1985–2008	Improvement	Likely to be met
Natural asset base	Stocks of standing timber	1990–2005	Improvement	Unlikely to be met
	Fish inputs	1996–2008	Deterioration	-
	Natural gas reserves	1996–2010	Deterioration	-
	Land conversion into built-up land	1900–2006	-	-
Quality of life	Threat to biodiversity	1994–2005	Deterioration	Unlikely to be met
	Pollution induced health problems	1980–2000	Improvement	-
Policy responses	Green patents	2000–2006	Increase	-
	Share of green taxes	1990–2009	Increase	-
	Energy prices	1990–2009	-	-
	Carbon trade	2005–2009	-	-
	Environmental investments	1990–2007	Stable	-
	Green jobs	1995–2008	Increase	-

-not possible to score, no policy target identified or inconclusive trend

The main conclusion of the first Dutch green growth report is that the environmental efficiency of production in the Netherlands has improved. Although greenhouse gas emissions and consumption of materials for production have increased, they have done so at a slower rate than economic growth. The indicators on stocks of natural resources, policy responses and economic opportunities paint a mixed picture. On the one hand, stocks of natural gas have declined, but on the other the volume of standing timber has increased. Furthermore while green jobs and green patents account for a larger share of the labour market and innovations respectively, investments in green capital goods are below mid-1990s level.

Sources: Statistics Netherlands (2011). Green growth in the Netherlands. The Hague/Heerlen: Statistics Netherlands; OECD (2011). Green Growth Strategy Synthesis Report. C(2011)29. Paris: OECD.

women's empowerment, reducing child mortality, improving maternal health, combating major diseases, and ensuring environmental sustainability.

Also developing countries adopt water and energy accounts...

The SEEA-Water and SEEA-Energy can be implemented in countries which are at various stages of development. The implementation of the frameworks can be incremental starting from very aggregated tables and accounts that can be disaggregated based on policy needs and data development.

Increased use of the frameworks should lead to improvements in the availability and quality of the data and the information base that supports the development and assessment of policies that have an impact on water and energy.

As the frameworks are implemented at national and sub-national levels it will become increasingly easier to share and compare information over time and space.

6 Conclusions and recommendations

The examples above provide a preliminary and limited preview of the possibilities of the SEEA in relation to sustainable development policy. The SEEA is a multi-purpose tool that can serve a variety of monitoring purposes related to sustainability.

Donors need to contribute to implementation...

The advantage of implementing the SEEA comes from the

benefits of integrating environmental and economic information in an internationally agreed framework, using common definitions, classifications, and accounting rules.

In order to realize the full potential of the SEEA, cooperation and commitment at the national and international level is required.

International agencies and donors need to contribute to the implementation of the SEEA, including through programmatic support to institutions in developing economies to improve their capacity to collect, organize, interpret, and communicate the relevant data.

Building a commitment in countries...

At the national level, considering the many institutions that either produce or use environmental information, it is important to create appropriate institutional arrangements for coordination purposes. Usually the national statistical offices or other agencies that compile national economic accounts are important coordinators in the compilation of the SEEA.

Implementation of the SEEA can take a step-wise approach and each individual country will need to establish its own priorities for measurement. But the first step is to build a commitment in countries in support of the SEEA implementation to help meet their sustainable development monitoring needs.

For further information on this briefing note, contact seea@un.org.

