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Criteria for a Conceptual Framework for Developing Environment Statistics

Robert Smith and Michael Bordt

Statistics Canada

Abstract

This paper outlines some aspects of a conceptual framework as a contribution to the international process of collaborating on the development of a new conceptual framework for environment statistics.

1. KEY WORDS

Environment statistics, conceptual framework, FDES, pressure-state-response, natural capital, ecosystem services

2. INTRODUCTION

Concern over environmental issues is no longer confined to the scientific community. Today, environmental challenges such as pollution, resource limitations, climate change and sustainable development are areas of great interest for ordinary citizens and decision-makers alike. These horizontal issues are beyond the scope of any one department to address. Governments at all levels are expected to collaborate to address these challenges.

Evidence-based approaches to informing policy emphasize the need for high-quality statistics. Unlike economic or social statistics, however, environment statistics have largely been collected in an *ad hoc* fashion. Data collection and reporting have been often conducted to suit the needs of individual policy initiatives. The approach has rarely involved the National Statistical Office (NSO) and has resulted in a patchwork of environment statistics. Existing statistics, therefore, do not adequately support the current horizontal policy needs.

NSOs are ideally placed to participate in the development of coherent bodies of high quality information and have done so in the areas of economic and social statistics.

The situation in terms of environment statistics underlines the need for a conceptual framework—a basic organizing structure together with principles to guide their development.

The objective of the current exercise, together with the United Nations[1], several NSOs and other stakeholders, is to collaborate on the development of a new framework that will:

- Define the scope and boundaries of "environment statistics"
- Lay out the important dimensions (for example: What are the components of the environment? Which aspects are to be measured?)
- Guide collection, organization and communication among various data producers and users by providing consistent concepts and definitions
- Provide consistent statistical quality guidelines and classification standards
- Define the links with other conceptual and statistical frameworks (such as the SNA and SEEA) and analytical models, and thereby

[1] United Nations Statistics Division. Nd. Framework for the Development of Environment Statistics http://unstats.un.org/unsd/environment/fdes.htm (accessed May 10, 2010).

- Support the identification of gaps in existing statistics.

A conceptual framework ***does not*** provide guidance on ***how*** to measure these aspects. That is the role of a ***statistical framework.***

3. LESSONS FROM ECONOMIC STATISTICS

The Great Depression of the 1930s and the threat of the Second World War stimulated efforts to develop sound economic statistics. The pressing need to maintain economic stability and promote growth in the post-war years provided motivation for economists, politicians and statisticians to work towards more robust economic statistics. Progress in macro-economic theory refined the understanding of growth and provided the conceptual framework for economic statistics. This, in turn, stimulated the creation of a statistical framework—the System of National Accounts (SNA), which integrates economic statistics collected from hundreds of sources via an elaborate process of estimation and aggregation into the core economic indicators, such as GDP, which are used to assess the state of the economy.

Given clearly defined conceptual and statistical frameworks, economic statistics evolved from a patchwork of *ad hoc* measures to the highly accurate, complete and coherent system we enjoy today. Policy needs drove the creation of the SNA and, in turn, the SNA improved the process of economic policy making. With the appropriate mechanisms in place, the same progress could be made with environment statistics.

4. EXISTING ENVIRONMENTAL FRAMEWORKS

The term "framework" has been used to refer to a number of approaches to conceptualizing and organizing information. It sometimes refers to a set of principles or goals (such as the Millennium Development Goals[2]). For the purposes of this paper, three common, comprehensive frameworks are assessed in terms of the degree to which they address the objectives set forth in the introduction:

- **Pressure-State-Response** (PSR and derivatives such as DPSIR, Drivers-Pressure-State-Impact-Response) have been used since the 1970s, largely to classify and report existing data. Such a framework does not clearly define the scope and boundaries of environment statistics and therefore is not appropriate for identifying data gaps. Furthermore, the framework makes no attempt at linking with other existing conceptual frameworks such as economic statistics.
- **Natural capital** is a means of identifying and quantifying natural resources and ecosystem goods and services. The approach follows the economic notion of capital, which is a stock of assets used to produce goods and services. Natural capital consists of the stock of natural resources, land and ecosystems upon which the economy depends. The framework defines the environment largely in terms of its ability to provide goods and services to people. As such, it is well placed to provide the linkage between environment and economic statistics. The UN

[2] UN. 2000. Millennium Development Goals. www.un.org/millenniumgoals.

System of integrated Environment and Economic Accounts[3] (SEEA) provides a useful statistical framework to measure natural capital.

- **Ecosystems and ecosystem services** is an approach that takes a more comprehensive *view* to defining the environment in terms of its component ecosystems and the services they provide to people and other ecosystems. Ecosystems are collections of living organisms, their interactions and the non-living components (soil, water, rocks, gases) on which they depend. While the ecosystem approach provides a broad definition of the environment, implementing it requires substantial scientific knowledge and therefore a high degree of collaboration between data producers (largely scientists), the NSO and users.

The proposed approach borrows from all three frameworks. The ecosystem framework provides a very broad definition of environment, natural capital provides the linkages with the economic system and PSR thinking is useful for understanding the interactions between human activities and environmental quality.

5. PROPOSED CRITERIA FOR AN ENVIRONMENT STATISTICS FRAMEWORK

The shape and structure of the ideal framework for environment statistics will be determined through an international process. This section outlines some proposed criteria developed by Statistics Canada as input to this process:

- **The primary purpose:** Since virtually all environmental legislation is concerned about maintaining the quality of the environment, it is suggested that this framework define as its high level objective: **the measurement and monitoring of environmental quality**
- **The scope of environment statistics:** To incorporate economic and non-economic aspects, the suggested scope of environment statistics is very broad: **to incorporate all statistics on the biophysical aspects of the world that may directly or indirectly affect the quality of the environment.**
- **The dimensions of the framework:** although more dimensions may be specified in the future, it is suggested that the dimensions include (see Table 1):
    - **An augmented classification of the environment into ecosystems**: aquatic ecosystems, terrestrial ecosystems, the atmosphere and subsoil assets. These can be further broken down into sub-components and the important interactions between components. Human activities could be considered external to the framework but interacting with the components.
    - **Aspects of environmental quality**: their extent and pattern, stability, diversity and productivity. As well, each of these can be further broken

[3] United Nations Statistics Division, Handbook of National Accounting: Integrated Environmental and Economic Accounting, 2003, http://unstats.un.org/unsd/envaccounting/seea.asp, accessed October 26, 2009

down into specific concepts. For example, productivity refers to natural growth as well as economic value.

- **To guide the collection, organization and communication among various data producers and users**, it is important to provide consistent concepts and definitions. Beyond this, it is also critical to ensure a central role of the NSO in the national environmental statistical system.
- **Defining links with existing conceptual systems:** the economic aspects of the "productivity" quality dimension provide one link with economic statistics, that is, the direct economic use of natural resources. Similarly, links with social concepts can be taken into account in terms of the ecosystems providing amenities and their quality influencing human health.
- **Identifying gaps in existing statistics:** The two suggested dimensions can be used as an initial checklist to assess the availability of statistics to address a given issue. For example, in the case of climate change:
    - **Which component is the main focus?** Atmosphere (temperature, weather)
    - **Which quality dimension is of concern?** Stability
    - **Which components are affected by a change in quality?** (for example) forests, lakes/rivers
    - Which quality dimensions of the components are affected? (for example) extent and pattern of forest, stability of lakes/rivers, etc.
    - What statistics are required to monitor the impacts? (for example) forest species by age, type, and location; freshwater yield by location
    - Are these statistics available? Yes but they are incomplete and not timely.

Table 1 Two proposed dimensions of the ecosystem framework

Ecosystem - **Component** o **Sub-component**	**Quality dimension**			
	Extent and pattern	**Stability**	**Diversity**	**Productivity (goods and services)**
Aquatic				
- Marine				
o Open ocean				
o Coastal				
o Estuaries				
o Seagrass/algae beds				
o Coral reefs				
o Shelf				
- Wetlands				
- Tidal marsh/mangroves				
- Swamps/floodplains				
- Lakes/rivers				
- Groundwater				
Terrestrial				
- Forest				
o Tropical				
o Temperate/boreal				
- Grass/rangelands				
- Desert				
- Tundra				
- Ice/rock				
- Cropland				
- Settled				
Atmosphere				
Subsoil assets				

6. CONCLUSIONS

This paper has presented some of the important criteria for a comprehensive framework for environment statistics. The two main dimensions described: augmented ecosystems and environmental quality, show promise in satisfying the objectives stated in the introduction. As well, explicitly considering the aspects of statistical quality and organizational context will ensure that the framework will provide practical as well as theoretical guidance on environment statistics.

This is a work in progress and will benefit from collaboration with national and international experts. Statistics Canada is participating in the UNSD's revision of the FDES and that collaboration will provide useful input into Canada's framework.