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Expert Group Meeting on the Framework for the Development of Environment Statistics

Session 3

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A Framework for Developing Environment Statistics

Overview

- How was the work initiated
- Canadian context and main stakeholder comments
- Summary of the Canadian Framework proposal to date
  - Development of the Framework
  - Review of alternative frameworks
  - Environmental statistics and quality standards
  - Proposed development of an ecosystems-based framework
  - From concepts to measurement
  - Linking the framework to policy

Background

- Project motivated by Canadian Chief Statistician's observation that environment statistics are *ad hoc*
- Summary of activities to date
  - Produced a "think piece" to introduce the idea and to start initial discussions
  - Solicited feedback on the framework from key stakeholders, especially relevant policy departments
  - If successful in obtaining buy-in, we will proceed with further development of the framework

Canadian context

- Existing environmental statistics in Canada are *ad hoc* and have varying degrees of quality:
  - "The government cannot answer whether, taken together, federal programs are contributing to the protection of Canada's major ecosystems from the kind of degradation reported globally through the Millennium Ecosystem Report. Instead, we continue to examine *piecemeal monitoring and other data systems that are not connected strategically*."

    Scott Vaughan, Commissioner of the Environment and Sustainable Development of Canada, November 2009 (*emphasis added*)

- Collection and reporting is largely conducted for individual policy initiatives
  - This negatively affects statistical quality in a variety of ways

Environment statistics and quality

- **Accuracy** may be compromised through a lack of methodological rigour, reporting error and scientific uncertainty
  - For example, industries are allowed to choose for themselves how they report toxic emissions and they are free to change methods from one period to the next
- Environment statistics are often not as **timely** as economic and social statistics
  - "Good" timeliness for environmental data is one year following the reference period – five years behind is not uncommon
    - Compare this with economic statistics, which are often reported monthly or quarterly

Environment statistics and quality

- **Accessing** environmental data can be difficult
  - Users must go to several sources that will have different reporting standards
- **Relevance** and **comprehensiveness** are a concern
  - Important variables may not be captured
  - Some variables are captured that are not relevant
- Frequently, the **coherence** of environment statistics is compromised
  - Pollution statistics in Canada cannot be easily combined with each other or with economic statistics

Lessons from economic statistics

- Great depression of the 1930s and threat of Second World War stimulated the development of macroeconomic theory
- This, in turn, simulated the development of a statistical framework – the System of National Accounts
- This clear, widely-accepted framework, guided the development of accurate, complete and coherent economic statistics

Lessons from economic statistics

- Policy drove the creation of the SNA, in turn, the SNA improved policy
- The same benefits can be realized with environment statistics
- As with the lengthy process to develop the SNA, improving environment statistics will require a long-term commitment

Past experiences with frameworks

- Pressure-state-response frameworks
  - Stress Response Environment Statistics System
  - Driving Force-Pressure-State-Response
    - Early development at Statistics Canada
    - Carried on by UNSD, UNEP, OECD, EEA and others
  - All share similar approaches, structures and weaknesses
    - Difficult to distinguish natural from human stressors
      - Even more difficult to link particular stressor with a specific response
    - Not always clear how to classify a given variable
      - Is acid rain a “response”, a “state” or a “pressure”?
    - Bias toward harmful aspects of human-ecosystem relationship
  - Users may misinterpret the statistics as a result of these weaknesses

Past experiences with frameworks

- Natural capital
  - Ecological adaptation of the economic concept of capital
  - Recognizes that the environment comprises a series of assets that render essential services for human activity
  - Emphasises the need to measure assets and ensure their continued functioning
  - Closely related to the concept of ecosystem goods and services
  - Criticized by some for being too “economic” and placing too much emphasis on monetary valuation
  - Welcomed by others as a means of bridging the gap between conservationists and those who emphasize the value of nature to humans

Defining a new framework

- Before choosing a conceptual foundation, we first asked ourselves what high-level policy objective the framework would have to support
  - This was done to ensure relevance of the framework to our users
  - A lesson from the development of economic statistics is that this first step is crucial to long-term success
- We wanted an objective that could be defined in very general terms while being tightly focussed
- We also wanted one that would have broad social and political acceptance

Choosing a high-level objective for environmental statistics

- After reviewing Canadian environmental legislation, one policy objective clearly stood out
  - Maintaining environmental quality
- Given this, we chose *measuring and monitoring environmental quality* as the high-level objective for the framework
- We believe this focus should stand the test of time just as maintaining economic stability has stood the test of time as the goal of economic policy
- Of the available conceptual foundations for such a framework, we choose that based on the science of ecosystems
  - Ecosystems are today understood to be the basis of environmental quality and they lend themselves well to measurement

Specifying key target variables

- The next step was to identify key the target variables of the framework
  - These would become the focus of measurement, just as the elements of income and production are the focus of measurement in the SNA
- Ecologists have identified two main classes of ecosystems
  - Aquatic ecosystems
  - Terrestrial ecosystems
- Because of its importance, a third must be added here
  - The atmosphere
- The quality of these three systems become the key target variables in the environment statistics framework

Identifying the sub-component variables

- The framework must reflect the fact that ecosystems are dynamic, not static
  - There is constant exchange of material and energy between ecosystems and from ecosystems to the human sphere
- Therefore, both *stock* (or state) and *flow* variables must be measured in the framework
  - These we call sub-component variables and they are the main points of measurement in the framework

Examples of sub-component variables

- The paper presents a number of examples of sub-component variables
  - These are subject to further discussion with scientists and other experts
  - Your comments on them are welcome
- What the paper does yet do is discuss the dimensions of environmental quality
  - These are needed to more precisely define the scope of the framework and to provide guidance for organizing sub-component variables
  - They will also make framework more valuable as a tool for informing real ecosystem-based management decisions

Dimensions of environmental quality – preliminary thoughts

- Environmental quality cannot be measured in and of itself
  - Rather, it is characterized by the condition of ecosystems across several key dimensions
  - Taken together, these conditions provide a measure of ecosystem quality
- Key dimensions include the extent and pattern, stability, diversity and productivity of ecosystems along with the flow variables that cause changes in these dimensions
  - Further discussions needed with ecologists to confirm these dimensions

A graphical view

Ecosystem/ Quality dimension	Extent and pattern	Stability	Diversity	Productivity (goods and services)
Terrestrial - Forests - Prairie - Farmland - Etc.				
Aquatic - Marine - Surface Freshwater - Groundwater				
Atmosphere				

Conclusions

- Ecosystem science offers the best foundation for a conceptual framework
  - But more thinking/expert engagement needed
- The framework must be simple and relevant to the public and decision makers
- It should be flexible enough to produce data useful for a wide variety of reporting efforts (indicators, PSR reports, etc.)
- Once the conceptual foundation is agreed, the next step is to craft the statistical system (concepts, principles, methods, standards, etc.) necessary to operationalize it
- This must not take too long and we must focus on early, relevant practical results