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The Relationship between FDES and the Main Ways to Obtain Environmental Statistics

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Introduction

This work has as its guiding principle to support the Group of Experts to Review the Framework for Development of Environmental Statistics coordinated by the United Nations Statistics Division under the United Nations Statistics Commission delegation.

So, it searches to help the Official Statistical Offices in its basic mission, in providing countries with the necessary information to this knowledge in an organized, systematic and updated manner. Regarding environmental statistics, it identifies as its main functions in this process: 1) the promotion of information flows necessary for this purpose, 2) harmonization and standardization of concepts and methods, 3) the dissemination of its results.

The organization, systematization, and continued production of environmental statistics serves, firstly, the interest, the right and the need to know and inform the general public and, consequently, the discussion and conduction of political activities related to the theme. Of course, these statistics serve specifically to the public and private planning activities and monitoring of the institutions involved with environmental issues. However, here we also of understand that this production is an specialized activity that can be best conducted when performed in independent and major manner, articulating different sources and informants, as the Official Statistical Offices can do.

The term Environmental Statistics covers a wide and heterogeneous collection of statistics. A good part of the Environmental Statistics consists of sets of data that expresses stocks or flows of natural resources and / or energy, allowing the environmental characterization of a region. Another important set of environmental statistics is composed of information concerning the "quality" of natural resources. This quality is understood as the suitability of the resource for use and consumption by humans or by the activities carried out by them. In this case is included the majority of statistics dealing with the pollution. Also associated with the concept of environmental quality are the statistics that measure the sense of well being and environmental comfort of human populations, as in the case of noise and visual pollution.

Thus, environmental statistics can be understood as a way to measure the availability and quality of natural resources (water, soil, air, vegetation / biomass, etc.) and of the energy existent in a place and its suitability to the needs and comfort of human populations.

This information can be obtained either by direct measurement or by indirect data

As we see, the environmental statistics include a diversified range of subjects and require a complex system that covers different methods of data acquisition and the establishment of a network of institutional cooperation, as well as the observation and recording of environmental phenomena. The production of environmental statistics involves a series of other activities as the processing and data analysis.

A project to establish a system like this must provide answers to the questions on "*which are the statistics to be produced"*, its content and form of dissemination, over short, medium and long term, identify *"how to produce*" including a general formulation of the necessary means to do it and develop a strategy of how to implement it. The following topics are dedicated to exposing some of the initial responses to these questions: What are the main ways of obtaining environmental information and their

relationship with the development of a production system of environmental statistics, in a regular and organized way.

How the environmental information is obtained

The presentations of environmental statistics are usually organized by subject area (statistics of water, air, biodiversity, land use, urban environment, etc.). However, there are a variety of methods for obtaining basic data that will compose a set of environmental statistics (e.g. image interpretation, instrumental measurement, administrative records, survey, scientific research, indirect estimates) and the specialization required for each of these activities recommends recognition of the fact that each one of them corresponds to similar institutions producing information with similar goals, language, procedures and apparatus. It is believed that these similarities facilitate the convergence of interests and establishment of work teams with more homogeneous expertise and language.

The following are segments that compose the possibilities of generating environmental information.

- Remote sensing and mapping
- Surveys and Censuses
- Administrative records / recompilation
- Statistics of monitoring systems
- Statistics derived or indirect estimates

Further is presented a brief diagnosis of each of them and the statistics associated with each one as well as the type of institutions involved in its production.

Remote sensing and mapping statistics

This kind of data is related to the information from thematic maps of environmental resources (physical, biological, land cover and land use) obtained through remote sensing and GIS. In some cases it also has the purpose of monitoring environmental conditions in relation to the theme. A map is a visual information, and to become a statistic you need the features mapped to be associated with qualitative information and / or quantitative determinations directly observed in the field (e.g. biomass / carbon) or measurements made on the map itself (number of areas and points, for example).
Several public and private institutions are engaged in mapping activities of environmental resources, in several territorial scales (regions, states, river basins, municipalities, etc.) generating a significant amount of data, but also constitutes a challenge the dispersal, access, time series, different methodologies, which are constraints on its transformation into statistical information. Despite this there are immense possibilities of turning the maps in lists, i.e., turn thematic mapped information in statistics.

Surveys and Censuses

Surveys and censuses are the most common way of obtaining data in Official Statistical Offices. These include private or public agents who have environmental information, which are taken as informants, then questionnaires and other data collection instruments co are designed, teams of interviewers are trained, information is collected, checked, aggregated, analyzed and disseminated.
It can also be classified as information obtained by survey these data collected for other purposes, not environmental, but that gain new meaning when (re) interpreted as statistics of the environment through further analysis, or new meanings attributed to them. In this case is included a large amount of information regularly gathered and worked by the Official Statistical Offices in their traditional survey, such as the information relating to sanitation and water supply arising, for example, from the demographic censuses, the use of forestry and agricultural data originated from the agricultural censuses.
There are numerous possibilities for obtaining environmental statistics with the proper tools of survey, not only in studies specifically designed for this purpose but also with the introduction of specific questions in existing surveys, for example, the industrial survey, in which can be collected, for example, the amount of investment in environmental protection, energy and water consumption, etc..

Administrative records / recompilation

Important sources of environmental statistics are administrative records kept by public and private institutions. Among the environmental statistics of this kind can be mentioned, for example, those relating to fisheries, conservation units, derived from records kept by the environmental agencies, the use of pesticides and fertilizers, the trafficking of wild animals, the radioactive waste. This kind of environmental statistics makes use of raw data collected by various institutions, almost always obtained for control and supervision of an activity. In this case, before being "processed" as environmental statistics, raw data need to be investigated, evaluated and analyzed in more detail than in other situations. It is common, for example, the occurrence of changes in the methodologies of data collection along the time and the information is not always properly documented. Also there can be gaps in time series and change in the institution responsible for collecting and storing data. All these possibilities need to be properly treated. They may introduce flaws and biases in the statistics being released.
A method for obtaining environmental statistics very close to the administrative records is here classified as recompiling. What differentiates the two methods is the direct use of raw data in the case of administrative records and in the case of recompilations the use of statistics generated directly for other purposes, with little or no rework.
This category includes, for example, the energy statistics coming from the Energy Balance, from which is extracted information about renewable and non-renewable energy sources, energy intensity. Other examples are the statistics of the usage of recycled raw materials in industries, produced by business associations, the consumption of minerals quantified by the agency of geology or mining and information about threatened species compiled from lists prepared by environmental agencies.

Statistics of monitoring systems

One source of data used in the production of systematic and periodic environmental statistics is the monitoring of environmental parameters. These statistics come from the periodic collection of information related to the quality of natural resources, conducted mainly by national or local environmental agencies. Almost all of this information has a defined spatial extent and limited (spatially restricted), describing the neighborhood of the collection points, or linear small patches but, in general, restricted areas (small river basins, for example).

The collection of this information is often structured on the political necessity to know and control the quality of some natural resources fundamental to human comfort and survival, such as air, water and soil. Almost always, associated with monitoring, there is a set of laws and instruments of action that allows the government to intervene to maintain or improve the quality of the monitored resource. The dissemination of results is done through newsletters and reports (not always with clear periodicity) and by the Web.

Among the statistics that can be framed in this category are air quality (smell, toxic substances, content of suspended particulates, gaseous pollutants, etc.), The quality of inland waters (pH, turbidity, BOD, nutrient content, pollutant content, etc.), the quality for bath in beaches (sea and inland waters, etc.).

It can be highlighted among the difficulties encountered in obtaining and processing such information for the production of comprehensive environmental statistics for the national level: the spread of data, disclosure of information, gaps in time series, changes in methodologies used, changes in the collection points, limited spatial coverage, different scales and methods of measurement and bias towards areas with the worst records.

In many cases, data are scattered in their institutions, making it difficult to obtain and interpret them. The use of different methodologies by various environmental agencies and changes in methodology over time complicate the comparative analysis of results. Logistic and financial support (personnel, equipment) to the institutions that produce the primary data often are needed to improve the quality and to use these data as official statistics.

Moreover, the information is not always readily available either on paper (publications) or virtual environment (reports on the Web). A schedule of disclosure of information must be negotiated with environmental agencies. Another important issue is the tendency to monitor, primarily, the areas with the worst environmental conditions (lower environmental quality). Therefore, the results reflect the extreme, not the average condition of the quality of a resource in a territory.

Strictly speaking, these figures could be categorized as administrative records, but the problems listed above confer such specificity that is recommended special attention in the use of this type of information. On the other hand, often these are the unique existing information about some environmental issues.

Statistics derived or indirect estimates

Environmental statistics can also be built on or derived from indirect estimates. In this case, the environmental information is not derived from the direct measurement of an

environmental parameter or characteristic, but rather inferred from other data sources. The main environmental statistics currently produced in this manner is the estimate of the greenhouse effect gases emissions. Data from industrial air pollution, water and soil obtained from information on industrial production or the number of people employed in industry are other examples of environmental statistics obtained indirectly.
In the case of indirect statistics, it is (almost) always relevant environmental information, but difficult to obtain in operational terms and / or of very high cost. Because of this, inferences, using conversion factors, are made between information that we have and that which is desired. Conversion factors can be obtained as generic averages, such as values of experiments in controlled conditions or as a result of the knowledge of experts or scientific research. The derived statistics are therefore dependent on the factors used in converting the information, and this is the biggest criticism to the use of this method. It is not easy to know the degree of approximation between the actual and the inferred values, and so the measurement accuracy. Thus, the derived statistics are considered preliminary estimates from reality, used in the absence of directly measured values, with more importance in relative terms than absolute. However, its use is crucial in situations where there is no prospect of direct statistics on the short or medium term, or where only partial data or point (in space and time) are available. The indirect statistics are good proxies in exploratory studies, very important in identifying areas and critical processes that demand larger investment in a deeper study. Moreover, indirect statistics, by using a simple and standardized methodology, are a good practice for comparative studies on a large scale, being widely used by international organizations.
The role that Official Statistical Offices can play in the case of indirect statistics is to produce estimates or orientate production techniques and methodologies, conducting critical evaluation of the results, especially considering that the basic data upon which apply the conversion factors, in much of the time, are produced in the Official Statistical Offices, for example, the estimate of industrial production or the area of certain crops.

Conclusion

Given the diversity and dispersion of environmental issue in terms of statistics, we reaffirm the finding that Official Statistical Offices can not be solely responsible for its production, requiring the cooperation of many institutions and, fundamentally, agencies or environmental ministries.
It is known that the articulation and convergence of many institutions is not trivial. However, this function of cooperation between various actors is key to achieving the goals of creating an efficient system of environmental statistics.
The establishment of a wide system as suggested is a difficult and lengthy process. A good strategy to fit many different interests would be to adopt a mode of “learning while doing”, creating a product oriented system. It is a good experience to determine a first product, whose production process has a structuring function to consolidate the system.