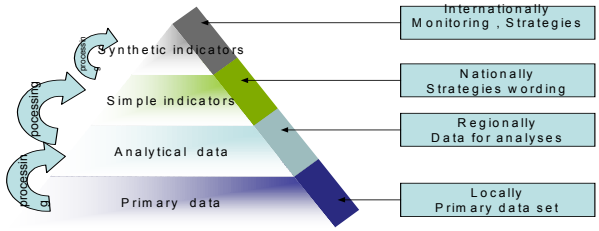
# The Information Pyramid for Environment Statistics

Assist. Giani GRĂDINARU
Statistics and Economic Forecast Department, A.S.E. Bucharest

*Abstract: The intricacy of environment Statistics is a constant challenge for specialists who want to put this domain in order. The first step is choosing the framework that organizes the statistic system according to data type aggregation level and environment specific aspects.*
***Keywords:*** *sustainable development, statistics indicators, environment data.*

Environment Statistics can be organized on more layers, like a very large base pyramid. The base of the pyramid consists of the primary data, and the top is represented by the strong aggregated indicators. Picture 1.1 illustrates a four different layers pyramid according to the aggregation level:




Picture 1.1. The information pyramid

The four layers of the pyramid correspond to the information need locally, regionally, nationally and internationally. The inferior level information of the pyramid are used to built the aggregated indicators , for national and international analyses .The primary data which form the pyramid base are as large as they are detailed . For example, the primary data referring to water may include daily measurements of pollutants concentration taken from a sample collecting station of some river. Other primary data referring to the river may include water flow, water temperature, suspension particles etc. Such information is relevant to the local officials, but relevance diminishes for hierarchy superior levels.

The second level of the pyramid consists of analytical data which are obtained by consolidation of the primary ones .The analytical data for the example we mentioned earlier, may include annual averages, variation measurement and the totals for each water parameter. The primary data may also be combined to obtain information about the pollutant charge of river water (for example, combining the data referring to pollutants concentration and water flow and volume). There are two elements met in this layer:

- data aggregation: obtaining environment parameters, the time and space variance analysis;
- Combining data (combining two or more parameters to create new measurement).

In the third and forth aggregation level, the simple and synthetic indicators are built based on primary and analytical data. For example, carbon dioxide emission from a single source, may be interesting for local authorities, but is almost useless for national authorities. Those who develop national strategies, may need, for example, an estimate of carbon dioxide emission for each unit of gross domestic product .In conclusion, primary and analytical data of the first two levels must be resorted to and aggregated, so it

can meet decisional needs of national authorities and international strategies wording.
Environment Statistics is a subject with huge potential. Establishing a framework is a justified preoccupation for at least two reasons:
- Attaining the objectives of a planned statistic program;
- A coherent data presentation through statistic publications.

In specialized literature are presented different types of approaches, many of them with commune elements.
The most viable proved to be:
- Environment elements based framework;
- Resource management based framework;
- The framework based on the pressure-status-response type of approach;
- The framework based on the ecological point of view

The United Nation Organization Statistic Bureau studied these attempts with of with the purpose of extracting commune characteristics which may be incorporated in an internationally applied framework. The study has showed that, in spite of adapting different methods to develop and organize environment statistics, the structure of the systems or frameworks and publications, they have many commune elements.

***The framework based on environment elements***

One of most simple available framework uses the notion of environment element .The data are gathered and organized with the purpose of describing each environment element (air, water, soil, biological diversity). This organization method is very common because is based on acknowledged scientific disciplines. Another advantage is that Statistician may use the existing data, which are recorded according to each element.
However, there some disadvantages. First, the framework only describes the existing problems and conditions for only one element and doesn't supply any information about the forces responsible for responsible for these conditions or how can we put the problem, and it cannot support a Statistics development which clears out the connection between environment elements (for example , air or soil pollution leads to water pollution). Most of the research is specialized on one environment element (they have the tendency to ignore the relationships between their domain and other domains).

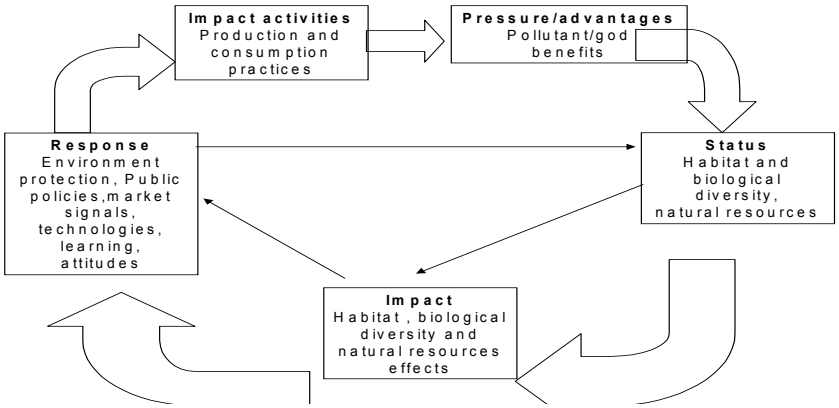
***The framework based on resource management***

This approach is based on the method of managing resources by looking after the life cycle of a resource. Data are organized we may monitor the stocks and flows of a certain resource, the goods in which they are transformed, the leftovers resulted from the resource-good conversion, any recycling procedure that can be used and residue disposal. So, a resource management framework must allow analysts to determine the optimal resource use, so environment degradation will be minimum. Such a framework is useful, but requires a large volume of data, obtained from many sources.

***The framework based on the pressure – status –response type of approach***

This framework can be used to describe different stages of the "cause-effect" connection of the economy-environment circuit and the processes that take place in the in nature: the pressure of impact activities, the quality of the environment and the response of the society (environment protection). This type of approach allows a description of the economy – environment relations, and in the same time, has great relevance in what concerns policies wording in solving environment problems. Picture 1.2 suggests a representation which highlights the flows imposed by the economy- environment circuit.
The first stage in describing **impact activities** (for example, production and consumption activities) which lead to a certain **pressure** (for example pollutants disposal). This stage identifies the pressure which develops from economic activities and generate unwanted change or environment benefits. The two aspects have either, a negative or positive environment impact. This stage also settles the connection between pressures and

processes which are directly influenced by the economic policies. To highlight the environment pressures (for example, quality air change), we approach the second stage: **Status** (for example, changes in the resource supply).




Picture 1.2. "Pressure-Status-Response" approach

A change in the status of the environment may have consequences on people's wellbeing or on the economy, so it causes an **impact** (for example, effects on human health or natural productivity). The last stage, **response**, covers a description of undertaken activities to prevent or remedy environmental effects (environment protection activities) as a response to a certain form of impact.

***The framework based on the ecological approach***

The forth type of approach, the ecological one. Discusses different subjects such as: evolution of biological diversity and population dynamics, productivity, stability and resilience of ecosystems etc.

No other framework can describe more adequately the complicated and continuously changing net of relations that exists in the environment. Each version, implicitly, brings new simplifications, which means some aspects are not as the real one.

A framework is definitely useful in the designation process of different environmental problems. The multitude of problems differs from one country to another, and choosing a framework must help statisticians in identifying more important problems. For example, pollution, is very common problem, is a priority in wealthier countries, rather than in poor ones. In countries with agriculture based or increased natural resources consumption economy , we more often come upon problems like land conservation and resource exhaustion .In countries with very limited water reserve , the quality and access to water are the most common problems .In time the significance of environment problems changes.

A framework may be useful in the decision making process to a series of organizational problems such as:

- The settlement on the general process of data collecting, estimation and interpretation;
- Determining logical ways of organizing data around key problems and subjects;
- The lack of problem identification for each type of data;
- Making clear the responsibility to collect and report certain subjects (the agreement between the National Statistic Institute and other data providers).

Over the years there were outlined two directions regarding the environment statistic system:

- The Organization For Economic Cooperation and Development (OECD)

Framework

- The United Nations-Framework for Development of Environment Statistic (the UN-FDES).

***The OECD framework***

OECD developed a framework based on the pressure-status- response approach. This approach is used in all countries member of OECD, but also eastern European and Central Asian Countries. The OECD framework

is based on two key hypotheses .The first one refers to the fact that there a direct lining of causes, starting with environment pressure, to its status and then to the response of society. And second, there is a one-to-one relationship which connects every pressure on the environment to a certain change in its status and then to an answer from the society.

As many other economic analyses, these presumptions simplify a lot the real life conditions. The one-to-one simple relations between cause and effect are rare. A certain pressure on the environment may affect the quality of many elements (air , water or soil quality) in this case we deal with one-to-many relations .Also a group of causes may generate a cumulated effect on the environment , and in this case we deal with many-to-one relations. These relations are often met in the responses of the society. For example, a number of strategies and/or settlements may be necessary to solve certain environmental problems, while in other cases; a simple strategy can provide a quick answer to many pressures. The list of examples may continue ,but the basic ides is clear .Often , the cause-effect relationships recorded in the real world are not of one-to-one type , but many-to-many , and sometimes are too complicated to be described.

The economic activities use environment resources (air, water, and other natural resources) and generate environment pressure, which can be observed in different sectors of the economy .The responses may come from economic agents, households and administration. The connection between the 3 stages depends on the information flow. The society receives information about the types of pressures and environment status, and then it words answers which are addressed to a certain economic sector or the environment.

***The UN-FDES framework***

UN-FDES doesn't require specific set of statistics parameters or indicators. Also, it's not conditioned by a sum of classifications or a particular method of data collecting. The framework is projected in such a manner that is flexible enough to allow statisticians to monitor all environmental characteristics. But, flexibility granting is not for free. There is for example precision loss in specifying the connection between pressure, status and response, in the ability to aggregate primary data and in the fundamental evidence of bookkeeping. UN-FDES is based on the block approach. Table 1.1 presents the global structure of the framework.

**Table 1.1: The structure of UN-FDES framework**

| Environment element | Economic and social activities | The impact of activities on the environment | Response | Supply and records |
|---|---|---|---|---|
| 1. Flora | Agriculture | Proliferation and diminishing effective, endangered species | Protection of endangered species | Species recording and genetic resources |
| | Forestry and forests exploitation | Shortage/growth of forest surface and fields | Forests management, including forestation | The record of vegetation areas |
| | Harmful emission for the flora | The impact of pollution on the vegetation (for example , acid rain) | Monitoring and pollution control | Recording harmful emission on the flora |
| 2. Fauna | Animal breeding and hunting | Habitat/ecosystem changes | Habitat protection | Habitat distribution and characteristics records |
| | Harmful fauna emission | Health and wellbeing impact | Pollution monitoring and control | Recording harmful fauna emission |
| 3. Atmosphere | Land use activities which affect climate | Biological and ecological impact | Promoting ecological ways to use land and alternative production processes | Recording emission (types and sources of air polluting) |
| | Mobile and Immobile air polluting emissions | Health and wellbeing impact | Preventing being taken ill , monitoring and control | Social and economic factors which affect air quality |

| Environment element | Economic and social activities | The impact of activities on the environment | Response | Supply and records |
|---|---|---|---|---|
| 4. Water<br>a. Fresh water | Collecting water | The quantity and level of water , the volume and water reserves | Conservation, discovering new sources of water | Ware reserve evidence |
| | Water use in industry , agriculture and households | The quality of water | Water treatment | Recording the water consumption |
| | Residual water management | Biological and ecological impact | Pollution monitoring and water quality control | The evidence of evacuation (types, sources of disposal , pollutants) |
| b. Salt Water | Water collecting and use (desalinization, consumption) | The biological and ecological impact | Pollution monitoring and control, conservation | The record of marine ecosystems |
| | Coast pollution | Impact on human health and wellbeing | Human health and aquatic ecosystems protection | Records of the use of coasts |
| 5. Land<br>a. Surface | The use of land for agriculture, forestry, mining and human settlement | Wasted or gained soil, loss of agriculture land , erosion | The regulation of land use , dividing territory | Land use and land property records, topographic characteristics |
| | Residue disposal and residual waters | The impact on human health and wellbeing | Monitoring and pollution control | Solid and liquid waste evacuation records |
| b. Subsoil | Mining and minerals processing | Resource stock diminish , open wells , residue disposal | Land rehabilitation | Mineral resources evidence |
| 6. Human settlements | Constructions | Disfavored households, poor establishments | Reorganizing and development of the community | Building and outbuilding records |
| | Residue and residue disposal | Pollutants and waste concentration | Preserving water and energy | Emission evidence (pollutants types and sources) |

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