Towards the Integration of Statistical Information Systems to Monitor the Sustainable Use of Water Resources

Giorgio D'Amore

Pre-Accession Advisor, European Union PHARE 2001 Statistics Twinning Project between Romania and Italy

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1. Background

IN the E.U. Successive European Council have reaffirmed a commitment to integrate the environment into all Community policies and to ensure that these policies contribute to sustainable development.[1] A Commission Communication to the Council and the European Parliament, COM (2000) 20 “Indicators for the Integration of Environmental Concerns into the Common Agricultural Policy”, presented the context within which indicators are being developed to monitor the effectiveness of the strategy to integrate environmental concerns into agricultural and rural policies within the EU. The report emphasised the need for appropriate and reliable statistical information on which to base these indicators.

Detailed policy objectives have to be set and progress in reaching these objectives measured. Thus, according to the mentioned Communication, a solid set of indicators is needed:
– to help monitor and assess agri-environmental policies and programmes, and to provide contextual information for rural development in general;
– to identify environmental issues related to European agriculture;
– to help target programmes that address agri-environmental issues;
– to understand the linkages between agricultural practices and the environment.
The work of the Commission services is developed from that of the OECD, adapting and extending it to cover the European Agricultural system. The Commission's work goes further in trying to define not only the necessary indicators, but also methodologies to be applied, and possible data sources or data collection methods, so that indicators for EU Member States are harmonised and comparable.
The main criteria for choosing agri-environmental indicators are:

- *policy-relevance* – address the key environmental issues
- *responsiveness* – change sufficiently quickly in response to action
- *analytical soundness* – based on sound science
- *measurability* – feasible in terms of current or planned data availability
- *ease of interpretation* – communicate essential information in a way that is unambiguous and easy to understand;

[1] Communication from the Commission to the Council and the European Parliament. Statistical Information needed for Indicators to monitor the Integration of Environmental concerns into the Common Agricultural Policy, Brussels 20.03.2001

- . *cost effectiveness* – costs in proportion to the value of information derived

COM (2000) 20 presented an initial set of indicators and areas where indicators are needed. The level of development of these indicator areas varies and they can be divided into four groups.
(a) A first group contains indicators for which it is immediately clear what statistical data need to be collected.
(b) For the second group, statistics are not the appropriate source of information, though statisticians may make a contribution to the overall picture, by structuring and integrating data from different sources.
(c) In the third group the indicators have not yet been sufficiently well defined to identify the most appropriate data.
(d) For a fourth group, indicators are needed, but no indicator could yet be defined. Recommendations on data requirements cannot yet be made.

The challenge is to provide the inputs needed to calculate and maintain identified indicators, by finding and integrating data from statistical, administrative and environmental information sources within a sound analytic framework, define more clearly the indicators in the third and fourth groups.

At the United Nations level a Note by the Secretary-General on the Report of the Interagency Working Group on Environment Statistics, E/CN.3/2004/20, 5 January 2004, states among the other that:

"…The Statistical Commission at its thirty-fourth session agreed that the United Nations Statistics Division should set up an interagency working group on environment statistics, with a special focus on the development and harmonization of methods, concepts and standards, coordination of data collection and training.

It was recognized at the meeting that despite significant developments in international environment statistics, much work, both methodological and practical, remained to be done. Progress in work on environmental indicators, indicators of sustainable development as well as work on integrated environmental and economic accounting is still hindered by the lack of sufficient good-quality, relevant and timely basic environmental data.

Some of the major reasons behind this situation are the lack of harmonized and globally relevant methods, concepts, definitions and classifications; insufficient information and guidance on best practices; insufficient training and capacity building; and problems of coordination at both the national and the international level…."

2. The direct water survey in Romania

Pilot environmental surveys on waste and water were run in Romania during 2004 in the context of approaching Compliance with the European statistical system, and furthermore to support the negotiations in the chapter Environment. The surveys were run with financial support from the European Union PHARE project "Compliance of Romanian Statistics with European Statistical System".

The design of the **water** survey, and the methodological approach, started from the analysis of the European requirements, first of all from the EC Directive 2000/60 in the field of water policy (Water Framework Directive).

The purpose of the Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. Even if in the Directive the statistical activities for the data collection are not specified, the topics of interest for the data collection are indicated. In particular, the Water Framework Directive establishes that:
a) each Member State shall ensure for each river basin district (or for the portion of an international river basin district falling within its territory) (Article 5):
- an analysis of its characteristics;
- a review of the impact of human activity on the status of surface waters and on groundwater;
- an economic analysis of water use.

b) each Member States shall identify, within each river basin district (Article 7):
- all bodies of water used for the abstraction of water intended for human consumption providing more than 10 m3 a day as an average or serving more than 50 persons;
- those bodies of water intended for such future use. Member States shall monitor, in accordance with Annex V of the Directive, those bodies of water which, according to Annex V, provide more than 100 m3 a day as an average.

c) each Member States shall ensure the establishment of programmes for the monitoring of water status in order to establish a coherent and comprehensive overview of water status within each river basin district (Article 8):
- for surface waters such programmes shall cover: (i) the volume and level or rate of flow to the extent relevant for ecological and chemical status and ecological potential; (ii) the ecological and chemical status and ecological potential;
- for groundwaters such programmes shall cover monitoring of the chemical and quantitative status;
- for protected areas the above programmes shall be supplemented by those specifications contained in Community legislation under which the individual protected areas have been established.

d) each Member State shall ensure the establishment for each river basin district (or for the part of an international river basin district within its territory), of a programme of measures (Article 11), taking account of the results of the analyses required under Article 5.

The main specifically statistical requirements reference was the **OECD/Eurostat Joint Questionnaire** on inland waters. Parts of interest of the JQ questionnaire to be included in the Romanian water survey were so identified:
- Annual water abstraction by source and by sector (table 2)
- Water consumption by supply category and by sector (table 3)

- National population connected to waste treatment plants (table 4)
- Treatment capacity of waste water treatment plants, in terms of volume (table 5)
- Generation and discharge of waste water,
  - in terms of volume (table 7.1)
  - in terms of BOD, biochemical oxygen demand (table 7.2)

Some initial outcome of the Romanian water survey, from the methodological point of view, were presented in a National Conference on the "Development of the Environmental Statistical System in Romania" held in Tulcea (site of the Danube Delta Biosphere Reserve) in May 2004 and the related acts are published on the web site of the Romanian INS (National Statistical Institute http://www.insse.ro/indexe.htm) *

The main objective of the direct survey on **water**, whose pilot was conducted for the Mures river basin, reference year 2003, and whose result are going to be published before the end of the current year, was to achieve unitary and coherent data collection on water flow (abstraction, supply, discharge and processing system) from specialized units, industrial units and the agriculture sector.

This was done by means of three different direct surveys:

- Specialized Units performing Water Abstraction and Use & Urban Wastewater Collection, Treatment and Discharge, for public purposes were investigated in an exhaustive manner, using a questionnaire named "AS-A-SER" (Ancheta Statistica – Apa – Servicii)
- Industries involved in Water Use and Supply (by means of source) & Wastewater Generation, Collection and Discharge were weighed through stratified sampling; the questionnaire use was named "AS-A-IND" (Ancheta Statistica – Apa – Industrie)
- Agricultural enterprises performing irrigation were observed on sampling base (but exhaustively for irrigated surface of over 100 hectares) and related questionnaire named "AS-A-IRR" (Ancheta Statistica – Apa – Irrigatii)

The survey on Specialized Units and Industries was so implemented using both census (exhaustive) and sampling (stratified sampling on activity code - NACE classification- and employees size class) manner using as a frame the Business Register (REGIS).

The sub population surveyed on a census base included all local units matching at least one of the following two characteristics:

- Units of all the economic activity (industry and service) with more than 500 employees;
- Units of the categories of economic activity, according to the NACE economic activity classification, particularly relevant in terms of water abstraction, water consumption or wastewater generation.

The sub population surveyed by means of a stratified sample included:

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* the methodological first and main input was given by Prof. Giorgio Alleva, member of the Italian COMSTAT; the actual implementation of the survey has been realized by a consortium led by LDK Environmental Consultants SA. The coordination and monitoring role has been ensured by Romanian environmental statistics working group at the INS (National Statistical Institute of Romania), leaded by the environment PHARE project component manager Mr. Constantin Mindricelu.

- all local units of the survey frame that are not included in the aforementioned sub population investigated on a census base.

Enterprises of less than 5 employees were excluded from the population, to reduce response burdens and costs.

The frame for the specific survey on agricultural enterprises performing irrigation was deducted from the agricultural census applying a threshold of minimum 1 hectare of irrigated surface.

To enlarge the coverage of the water use in agriculture, specifically in the zoo-technical sector, an exercise of estimating the water consumption by different kind of animals was performed applying to the stocks of animal available from the data of the agricultural census and its further updates, coefficients derived by international standards provided by sources such as FAO and ILRI (International Livestock Research Institute).

3. Further Developments

The publication of the Romanian water survey results, as anticipated, is expected before the end of the 2004 and will include a more detailed description of the methodology used. The discussions held in the analysis team led to some interesting different perspectives; some of them are beyond the initial objectives and may not be all necessarily part of the publication.

In this conference the author is presenting some of them hoping they can give a contribution to the debate and eventually help other countries in their approach to water statistics.

A first result from preliminary data analysis is that the integration and the cross-checking of data from different sources should conveniently be pursued. We advise to give priority to “mirror statistics” having in mind the dimension of coherence as defined in Eurostat guidelines on quality; but the integration should help also to give a more complete coverage of the phenomenon.

During the analysis of the preliminary results in Romania, for instance, having noticed that some significant areas were not served by Specialized Units (mainly in the rural areas), also the household water consumption and waste water generated not-covered by specialized units were estimated with coefficients.

This added a new source to the water survey: while population served information (water consumption and waste water generated) was derived from direct environment questionnaire answers of specialized units, the same information for population not served (mainly rural areas) was estimated applying coefficients to population census and its further updates.

So from the methodological point of view we can assert that all the three main pillars of the statistical data administered by a national statistical institute were used: population, business register, and agricultural-territorial data.

Integration of the tree databases in a single information system and possibly into a corporate-wide database, as suggested by the Conference of European Statisticians

debating on Information Systems Architecture for National and International Statistical Offices, and the possible subsequent representation over a geographical information system (GIS) can also help the production of statistics at finer NUTS level and a more effective representativeness of territorial and environmental information.

Few practical example: the amount of emission in the air of a given gas in a country may be irrelevant if there is a wide dispersion but lethal if concentrated; the exact localization of each waste landfills or water reservoirs (possibly through Global Positioning System, GPS) give an additional very effective information not included in the total amounts of stocks at regional or basin level.

This approach is followed by the *European Environment Agency* (EEA) that, through its specialised European Topic Centres, collects environmental information on topics such as air emissions, land cover, water, and nature/biodiversity. In particular, the CORINE landcover inventories provide a basis for representing statistics on a more detailed spatial level as well as being a source of basic data needed to compile indicators on changes in the landscape.

The Romanian pilot project was an interesting laboratory and possible future developments, already matter of discussion, are also the integration with other important sources towards a more extended coverage of the phenomenon including:

- Water precipitation (quantity and rain days)
- Number, localization, storage potential and actual stock (beginning and end of year) of water *reservoire*
- Estimate of water loss (leakage, evaporations …)

Cross analyses with other domain are under investigation such as GDP evolution (and specifically agriculture contribution) against rainfall and variation of stock in the reservoire.

Impact of water scarcity also on the energy sector is investigated; as a matter of fact the only nuclear power plant in Romania, at Cernavoda, was closed at the end of summer 2003 for about one month due to the low level of water in the Danube river.

Preliminary evidences suggest as a key indicator, under human management, the total “capacity" of the *reservoire* and the efficiency of the Specialized Unit in the water distribution and delivery (rate of water lost). Cost-benefit analyses may show the convenience of how much the stocks of the reservoire should be increased to avoid negative impact on agricultural and energetic output in dry years and what is the maximum affordable rate of water lost in the distribution (before intervening in the improvement of the water- pipe networks) .

4. Sharable outcome and proposed Indicators

The specific pilot environmental direct water survey run in Romania can be considered a very interesting experience to which other transition or developing countries can refer in their own approach to water statistic surveys.

To support countries having financial and human constraints in developing targeted environmental surveys the interagency working group on environment statistics may

consider the opportunity to advance researches on indirect coefficients in topic groups at core level.

Specific water questions can also be suggested for addition to current household, business and agricultural surveys at a low cost.

We like to conclude this short paper proposing for debate some sustainable water indicators apologizing if some of them are obvious or already considered:

Water precipitations:
Quantity and rain days (total, basins, different NUTS level)

Water retainement efficiency:
Quantity of rainfall retained for subsequent human management (increase in stocks, net of consumption) over rainfall

Water use by sector:
Total m3 and % distribution by sector over the total

Water use intensity:
total agricultural and by crop (*Use of water per €1000 output)*
total industry and by economic activity (NACE code) (*Use of water per €1000 output)*
total population (with further details like urban/rural or finer NUTS levels) (*Use of water per 1000 people)*

Surface Water levels:
River, lakes water level beginning and end of year in m3

Ground Water levels:
Level beginning and end of year in m3

Water Reservoire potential and levels:
Full potential and actual level beginning and end of year in m3

Water distribution and delivery efficiency:
Water consumption at the served clients (households, industries and farms) over water effectively put in the water pipe network by Specialized Units (*a rate far from 1 denotes high water leakages in the distribution network)*