Institutionalization of environment statistics

Khamis Raddad

UNSD and ECOWAS

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Legislation

The importance of law is to recruit experienced statisticians, environmental specialists and enumerators as well as the long-term allocation of financial resources and to keep a sustainability of the work, so the adjustments in the statistical law to consider environment statistics is essential to allow the sustained establishment of environmental program with experienced statisticians, so Jordan base their activities on a general statistical law. It includes by indirect way the environment statistics.

Based on the statistical law number 24 in 1950 and it is amendments, the department of statistics (DOS) in Jordan is the responsible agency that conducts and publishes all types of statistics, and any other institution cannot engage in this type of work without the prior agreement from DOS.

In 2004 a new statistical law was released. This law includes in clear statement the environment statistics and the responsibility of DOS in this work.

The first step of the work

Due to increase of attention on environment in Jordan the government requested in 1994 that the DOS initiate a new unit for environment statistics. Since then this unit has become a section and it has the same the rights as any other statistical section. The section conducts its activities under the umbrella of statistical law.

Preparatory team

A team of two DOS employees was located to start in the preparatory stage to initiate the work in this field. The DOS facilitate the team with all requirements and direct support of director general to show the importance of the work.

The agencies deal with environment

The DOS team specifies the main agencies that deal with environmental information and environment statistics, to specify the partners for future work. There are three type of agencies deal with environment: governmental agencies, privet agencies and NGO's and regional and inter national agencies.

About 45 agencies were specified such as Ministry of Municipality Affairs and Environment, Ministry of Agriculture, Ministry of Health: Environmental Health Directorate, Meteorological Department, Directorate of Forestation And Range, Ministry of water, and Royal Society For The Conservation Of Nature.

The DOS team visit all agencies to specify there needs in environment statistics and to study there activity and available data in environment statistics, after that the DOS mad complete set of all data available in the agencies to make use of this data, and the DOS team keep contact with a key person in each agency.

Workshop

The DOS received assistance form international expert in this field to review all activities done in DOS and to make suggestion for next step. The DOS conducted a workshop and invite a representative from each agency to discus the importance of environment statistics, the available data and information, the suggested activities for environment statistics.

After the workshop the objectives of environment and main elements of environment to be covered were specified (land and soil, water, air, and pollution). After that the work on data collection and data processing take place.

Sources of environmental data and statistics

The team suggested three sources of data to achieve the objectives as followed:

1. administrative records:

- Governmental agencies: such as Ministry of Water and Irrigation, Ministry of Agriculture, Ministry of Health … etc.
- Available data in different directorate in DOS such as agriculture statistics, industrial statistics and transportation statistics.
- Data available in international and regional agencies like FAO, Plane Blue.

2. If the data doesn't included in the first source. The data was collected through questionnaires, which are attached to other surveys such as economic surveys for industrial activities where the environment questionnaire contains questions about water use, sewage water disposal, quantity of waste produced and the methods of energy generation and consumption by type.

3. For special studies like hazardous waste. The surveys are conducted by the environmental section; some data not available from any source and therefore the environment statistical section designs and conducts the survey to collect the necessary data An example for this type of survey is the survey on artesian wells, agricultural wastes and the Medical hazardous waste survey. These types of surveys are comprehensive, special solely for the production of environment statistics.

Available data

The table below shows some data collected in the environment statistics section and their sources. All data are published on an annual base.

Institution	Data
Meteorological Department	Amount of Annual Rainfall by Station, Annual Temperatures (Lowest, Highest, Mean) (C°) by Station,
Ministry of Agriculture **Laboratory of Residual Pesticides**	Local and imported food samples analyzed in the laboratory, Number of local and imported samples that contain acceptable and non-acceptable pesticides residuals.
Ministry of Health: Environmental Health.	The General Monthly Rate of TSP, Pb, Relative Humidity and Wind Speed in Downtown & Shmeisani Stations, Monthly Distribution of The General Average for The Total Suspended Particles TSP) and Lead Concentration (Pb) in Air of Down Town, Shmesani, Abu-Nsair and Marka Stations, Detailed and Specialized Results of Microbial and Parasites Tests for Treated Water by Treatment plant, Status of Cleaning Plants by Design and Operating Capacities to Hydraulic and Organic Load in Jordan, Results of Chemical

	Tests from Out Door of Sewage Water by Treatment Plant, Results of Chemical &Physical Analysis for Drinking Water in Jordan,
Ministry of Agriculture: Directorate of Forestation And Range	Distribution Of Forests Area By Type And Tenure (this work was done with the help of USAID using the FAO Classification and the scientific name for each plant). Number of Forests Fires, Number of Damaged Trees and Area Damaged in Donum (.1 hectare), Area of Reforested, Replanted and Length of Planted Roads.
Water Authority	Comparison of Surface Water Budget 1998/ 1999 Season with Long-Term Average 1937-1999
Annual Report of National Electric Power Company	Distribution of Quantity & Percentage of Electrical Energy (GWh) by Consumption Sector 1993-1999
Report of Ministry of Energy and Natural Resources.	Production of Potash (Metric Ton) and Distribution (Domestic and Export).
Annual Report of the Jordanian Phosphate Mining Company	Geological Reservation of Raw Phosphate and Oil Shale in Jordan, Produced Dried Phosphate (Thousand Ton) by Mine
Ministry of Agriculture	Quantity of Imported, Locally Produced and Exports of Recorded Pesticides by Kind (L - Kg), Quantity of Imported, Locally Produced and Exported Pesticides by Group (L - Kg).
Department of Statistics	Quantity of Solid & Liquid Wastes in Medical Services and Industrial Sector by Category and Method of Disposal (the WHO classification was applied). Quantity of water used and Sewage Water by Economic Activity for Services Sector and Industrial Sector, Quantity of Solid Wastes Resulted From Services Sector Distributed by Method of Disposing of Solid Wastes and Economic Activity.
The Jordan Cement Factories.	Produced Cement and Klencer (Ton) by Factory
National Cancer Registry	Number of cancer cases by site, geder, and governorate.
Ministry of health-disease control directorate	Number of Meningococcal Meningitis, Ttyphoid, Para typhoid, measles, German Maeasles, Mumps, Brucellosispulmonart TB, Cut leshmaniasis, diarrhea, and no. Of infection disease
Traffic Department	Number of vehicles

Royal Society For The Conservation Of Nature.	Number of wild and marine organisms by kind

Human resources

As mentioned before the DOS allocated two employees for the preparatory stage, after that the Environment statistics Section at DOS employs six staff members with training in different scientific fields such as water science, geology, chemistry, biology, and other agricultural fields.

At the beginning of the work, DOS hired only temporary employees and then the DOS recruited permanent staff during 2001. That means the new employees need training and time is required to substitute the temporary employees who have built up a lot of experience during last few years.

Other agencies and governmental bodies such as the Ministry of Municipality and Environment and the Ministry of Heath do not have statisticians but instead employ technical experts in environmental science. Therefore, a close cooperation between DOS and the Ministries take place.

Furthermore, training of the staff of the Ministries in the basic concepts and principles of environment statistics was applied.

Activities in environment statistics

The DOS adopted the following methods for data collection:

1. Collects the available data from different governmental agencies, e.g. the Ministry of Water and Irrigation. These data are then classified by subject, processed, and used to produce useful and comparable statistics. The DOS also collects some raw data and laboratory sheet data, which are tabulated at DOS.

2. Data are also collected by adding a page to surveys already conducted by DOS, e.g. economic enterprise surveys. The page added to this survey includes questions on water consumption, sewage water production and method of disposal, quantity of solid waste produced and method of disposal.

3. The environmental section conducts a survey on hazardous waste that covers the chemical manufacturers and health services activities generating hazardous waste. This survey is carried out annually since 1996 and it covers all enterprises except the clinics and small enterprises, which are covered through sampling.

The environment section also conduct a survey on water production and water use of artesian wells:

the survey was conducted for two years, this survey covered the use of water from artesian wells, in order to provide data on the quantity of water pumped, and to calculate the average consumption of water for each type of crop and for other uses of water.

These three sources of data were used to provide information on a low cost basis but there are many problems such as a lack of continuity in data availability as well as the format and units of measurement used in the data collection.

With respect to questionnaires attached to other surveys the problem of non-sampling error is eminent because administrative persons in each enterprise usually fill out the main questionnaire, whereas the environmental questions require a technical expert. Thus, the DOS has decided to apply the environmental surveys independently starting in 2002.

The third method creates some problems such as an increase in non-response due to the repeated visits of enterprises every year.

Basic principles to apply environment survey

1 – specify the objectives of the survey

First you need to raise the question that are we really need to conduct a survey, if the answer yes, you can specify the data needed by this items:

- What's the data needed in pressing and has priority relate to other data?
- Who own the study?
- What's the budget deposit for this study?
- What's the availability of human resources to conduct the study?
- What's the level of accuracy for study results?
- What's the dead line to issue the results?

2-Dummy tables

3-Questionnaire design

-Preparation of questions

-Questions order

-Questions words

-Questionnaire length

4- concepts and definitions

5- survey population

-Frame and sampling units

The frame defined as a list or a map contains all sampling units. The frame should be:

- Comprehensive covered all sampling units at the target population.
- Up to date.
- Homogenous, all sampling units from the same type; like enterprises or farms or households.

- Avoided from duplication or missing of some sampling units.

The sampling units are all parts of the population and could be natural like families or artificial like farms. These sampling units should be defined and free from any interaction. Each sampling unit should have chance to drawn in the sample.

6-Sampling design

- The technical capability of the working team and the software available for this purpose. When every thing available you can apply complex sample design with high efficiency but if some thing not available you need to change the policy.
- The availability of finance and materials.
- The domains for information release; if the results will be published at governorate level it needs more sampling units than when it will be published at national level.
- The required time to issue the results.
- The level of accuracy.
- The objectives of the study.
- The expected size of non-response rate.
- Periodically of the survey.

7-Methods of data collection

- Telephone.
- Normal mail.
- E-mail.
- Interviewing the response.
- Actual measurement.

8-training of enumerators and other field workers:

9-The time reference.

10-Pilot survey

11-Field work

12-Data processing and data entry

Questionnaire editing and data cleaning.

Data tabulation

Data entry and computer editing

Extraction of the survey results

13-Preparation of tabulation report

14-Analysis of results

Classifications, methodologies, standards and coding systems

The DOS uses international classifications such as ISIC for economic activities, CPC for commodities and FAO for land use. The methodologies applied by DOS were already mentioned above, that is the combination of data collected from secondary sources with those collected through field survey.

The Jordan Institution for Standards and Methodology (it is web site is www.jism.gov.jo) is the responsible agency to produce standards for all commodities in Jordan including water quality and food and other standards relevant for the environment. The standards are brought before the standard committee, which has a special committee for each field. The standards set forth for environment statistics are used. In some case where the Jordanian standard is not available, international standards are applied.

For the coding system of chemical hazardous wastes the DOS adopted a classification using ISIC and documents on hazardous waste available from the Basel Convention on the Trans boundary Movement of Hazardous Wastes.

Data collection estimation compilation methods applied in data collection

The data are collected from governmental agencies, other institutions and from annual reports and surveys. The data are collected in different formats and types such as:

1. Laboratory data sheet, which are tabulated and from which the results are extracted, e.g. drinking water quality.
2. Annual reports such as forest reports. The data aggregated from the available information in these reports.
3. Monthly reports like pesticide residual.
4. Some information is collected by questionnaire attached to the economic enterprise survey.
5. The data also collected through special questionnaires such as the hazardous waste survey.

Some indicators are calculated from the available information in different reports.

Frequency of data production

Some data are collected on a monthly basis, for example, meteorological data and drinking water quality whereas other data are collected yearly. In general all data are published yearly.

Publications and databases

The DOS produces an annual environment statistics report since 1995. The most current report was published in 2003 and contains about 15 main topics, among which are natural condition, population indicators, economic indicators, pesticide residuals, agricultural indicators, air quality, biodiversity, water statistics, energy and minerals, and solid and liquid wastes including hazardous waste.

In addition the DOS conducted a survey called urban agriculture survey and living condition survey, this surveys covered the indoor environment and the demographic characteristics of households. It included some opinions of families on the environmental situation.

The data relating to environment statistics available on the Internet website of the DOS under www.dos.gov.jo. Most of the annual report tables can be found on this page. The database of environment statistics is also available from the Internet site of the National Information Center under www.nic.gov.jo. This site has a focal point for environmental information and it has links to the main sources of environmental information in Jordan.

Frequency, characterization of databases, compatibility

Despite the relative early start of the environmental protection activities in Jordan, environment statistics still has many data gaps and some fields are not covered yet.

Hence the priorities specified by the decision-makers are as follows and they depend on the demands from Agenda 21 and sustainable development indicators:

1. To cover water statistics in more detail, e.g. water import and irrigation and the quality of treated water.
2. Land cover and a more detailed survey on land use and changes in land use.
3. Improvement of the work on waste statistics, which includes municipal waste, is required.
4. Initiation of a GIS database including the position of main point sources such as chemical manufactories and sewage water treatment plants.
5. It is very important to start environmental accounting to meet the demand of national accounting in DOS, the SNA 1993 (System of National Account 1993) includes a part for environmental accounting.
6. It is also suggested to conduct some data analysis at least a descriptive analysis for the main environmental topics.
7. Improve the environmental indicators.

Case study

Sample design for wastes of manufacture activity

1-The frame

The economic enterprises census was conducted in 1999 and covered all economic enterprises in Jordan. It provides good benchmark and frame for this activity. It includes information about paid capital, total revenue, and total number of employees for each enterprise besides the identification data like the detail activity (isic6digit) and other information needed to make the sample design.

2 – stratification

All enterprises stratified by total revenue into 3 classes, it classified by paid capital, total employee, and it classified by activity 4 digit at the region level.

3 – sample design

All enterprises classified as big enterprises were surveyed by complete coverage. (Revenue 200000 JD and above, or paid capital 200000JD and above, or number of employees 20 person or more).

All enterprises with small number (less than 10 enterprises in the frame) at the same stratum also were surveyed by complete coverage.

The enterprises remained were divided into middle and small size (middle when revenue between 60 thousands to less than 200 thousands, and small when revenue less than 60 thousands J.D.). After that in each stratum and in each size of enterprises the sampling units were selected.

4-Sample allocation

The Nyman allocation was applied to allocate sampling units between stratums after calculating the sample size depending on 1999 results, the coefficient of variation (C.V.) is around 5% at region level for each activity isic 4 digits.

5-Method of drawing sample

The systematic method was applied after ordering all sampling units in each stratum ascending by total revenue, to provide implicit stratification to increase the efficiency of the design. Main difficulties

1. Environment statistics is more sensitive than any other type of statistics and it is thus difficult to collect reliable data from the field.
2. Environment statistics is more expensive than most other types of statistics.
3. Environment statistics is a complex field and covers all human activities. It is therefore difficult to meet the demand for data or to specify the priorities.
4. The manuals and tools used for this type of statistics are still incomplete and not adapted to the characteristics of the ESCWA region.
5. This type of statistics needs experience and expertise in many fields, e.g. agriculture and statistics.

Recommendations

1. It is recommended to improve the environment statistics system through the creation of a committee and to foster teamwork including NGOs that are active in this field.
2. It is recommended to build a complete environmental statistical system including manuals, classifications, and guidelines for standardization, methodology and case studies in ESCWA region.
3. The financial support for this type of statistics like other type of statistics is very important because it is new subject and many points need to be clarified**.**
4. The cooperation of the countries in the region is required in order to transfer the experiences and knowledge from one country to another.

The activities in Jordan with respect to environment statistics are rather advanced but still a lot of work remains to be completed. Many data gaps need to be filled and an improvement in data quality is also required. Also, in some areas the work has not yet begun and should be initiated.