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Chapter 1 DEVELOPING AN INTEGRATED MONITORING FRAMEWORK FOR WATER

This chapter discusses the different water policy needs and how official statistics respond to them by the integration of sectoral statistics into a comprehensive framework, the System of Environmental-Economic Accounts (SEEA), which allows consistency checks, and produces comparable information. The SEEA-Water, a subsystem of the SEEA, and the International Recommendations for Water Statistics (IRWS) are presented as additional tools to specifically respond to the needs of water management and policy design and evaluation.

The chapter shows how the information can be organized using a structure of quadrants covering the wide variety of policy objectives, and how these quadrants translate into official statistics processes.

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.I. Water policy needs of information and official statistics

The integral role of water in development is widely recognized, and water issues are very high in the national and international development agendas, with several international agreements specifying targets for water supply and sanitation.

The importance of reliable information for development purposes is also well established. Policy makers, citizens, and the international community are well aware of the role of information in supporting result-based management, better governance, and greater aid effectiveness. However, "the absence of systematic data collection in most countries impedes regular reporting on water resources and water-use trends." (WWDR4, page 158).

Informing about water policies requires a great variety of data. Hydrometeorological data is only a subset of the data required to understand today's water issues. Data from many other fields of expertise are necessary to understand the complex interrelationships of water with aspects of human well-being. Data must be integrated, analyzed and converted into useful information for policy-makers, the general public, managers and researchers[1]. Due to the nature of water, a wide variety of measures are necessary in order to understand the various ramifications of the decisions that are made. It is therefore necessary to have a comprehensive conceptual framework to guide the process of data integration and its transformation into policy relevant information.

Official statistics provide the answer to this need of systematic water data collection and processing.

Official statistics in support of water policy needs of information

Countries collect, process and disseminate official statistics on behalf of national governments through the ensemble of statistical organizations and units which form their national statistical system (NSS). The organization of the NSS varies from country to country, but most countries have set up statistical systems.

The United Nations Statistical Commission (UNSC) has adopted a set of fundamental principles of official statistics, which guide the work of many NSS around the world. Several standards and classifications have been agreed to assist NSS in the development of comparable statistics.

The fundamental principles of official statistics have been adopted by the United Nations Statistical Commission since 1994. The principles have been reaffirmed in subsequent sessions of the commission. At its forty-fourth session in 2013, the Statistical Commission adopted a revised preamble, as follows:

"Recalling recent resolutions of the General Assembly and the Economic and Social Council highlighting the fundamental importance of official statistics for the national and global development agenda. Bearing in mind the critical role of high-quality official statistical information in analysis

[1] World Water Development Report 2

and informed policy decision making in support of sustainable development, peace and security, as well as for mutual knowledge and trade among the States and peoples of an increasingly connected world, demanding openness and transparency. Bearing in mind also that the essential trust of the public in the integrity of official statistical systems and confidence in statistics depend to a large extent on respect for the fundamental values and principles that are the basis of any society seeking to understand itself and respect the rights of its members, and in this context that professional independence and accountability of statistical agencies are crucial, Stressing that, in order to be effective, the fundamental values and principles that govern statistical work have to be guaranteed by legal and institutional frameworks and be respected at all political levels and by all stakeholders in national statistical systems."

The experience with the System of National Accounts

Many countries around the world have built on decades of experience in the integration of economic information through the System of National Accounts (SNA), which is an internationally agreed standard adopted through the United Nations Statistical Commission through a rigorous process. From the SNA one of the best known indicators can be calculated, the Gross Domestic Product (GDP), as well as many other economic indicators, which are widely accepted and comparable between countries and through time.

The SNA provides standards to compile measures of economic activity in accordance with strict accounting conventions based on economic principles. The accounting framework of the SNA allows economic data to be compiled and presented in a format that is designed for purposes of economic analysis, decision-taking and policymaking. The accounts themselves present in a condensed way a great mass of detailed information about the working of an economy. The SNA conceptual framework is the basis for producing comprehensive, consistent and comparable economic information.[2]

The first standard for the SNA was published in 1953. It was then reviewed in 1968, then in 1993, and recently in 2008. Throughout all these years the system has been widely used and improved to guide countries in the design of their economic information systems, which provide an information pyramid that suits the needs of researchers, managers and policy makers. The data that supports the pyramid of information is continuously collected in order to provide the information required at the different levels. A clear linkage between data (which has costs) and information (which offers value) is established.

Other standards have been developed to complement the SNA, such as the International Standard Industrial Classification of All Economic Activities (ISIC) and the Central Product Classification (CPC), providing harmonized methodological bases for National Statistical Systems.

[2] United Nations.- System of National Accounts.- 2008

An agreed system for the environment

More than twenty years ago, when Agenda 21 identified the need for a systems approach to monitoring the transition to sustainable development and proposed a specific solution: the development of integrated environmental and economic accounts. Over the past two decades, the international official statistic community has responded to this need through the development of the System of Environmental-Economic Accounts (SEEA).

In 2012, the United Nations Statistical Commission (UNSC) adopted the Central Framework of the SEEA as a standard for environmental-economic accounts. The SEEA Central Framework is a multipurpose conceptual framework for understanding the interactions between the economy and the environment, and for describing the stocks and changes in stocks of environmental assets. The SEEA brings statistics on the environment and its relationship to the economy into the core of official statistics[3]. provides internationally agreed standards for the compilation of measures that describe the environment and its interactions with the economy.

The SEEA was developed through a process similar to the one that led to the adoption of the SNA. It was a collaborative effort of the United Nations Statistics Division (UNSD), FAO, Eurostat, IMF, OECD and the World Bank, as well as experts from different countries. In February 2012, the Central Framework of the SEEA was adopted by the United Nations Statistical Commission.

The accounting framework of the SEEA allows for different data about the environment and its interactions with the economy, to be compiled and presented in a format that is designed for purposes of environmental-economic analysis, decision-taking and policymaking. The accounts themselves present in a condensed way a great mass of detailed information about the environment, the economy and their interactions.

The strengths of using the national accounting framework to describe the interactions between the environment and the economy are manifold. First, the SNA is an international standard for compiling economic statistics. It provides a set of internationally agreed concepts, definitions and classifications which ensures the quality of the statistics produced. The SEEA builds up on the infrastructure created around the SNA for integration of environmental information, using concepts, definitions and classifications coherent with those of the SNA. This ensures the consistency and comparability of environmental and economic statistics and facilitates and improves the analysis of the interrelations between the environment and the economy.[4]

Second, the accounting framework contains a series of identities (for example, those involving supply and use), which can be used to check the consistency of data. Organizing environmental and economic information into an accounting framework has the advantage of improving basic statistics[5].

[3] System of Environmental-Economic Accounting, Central Framework. White cover publication. 2012

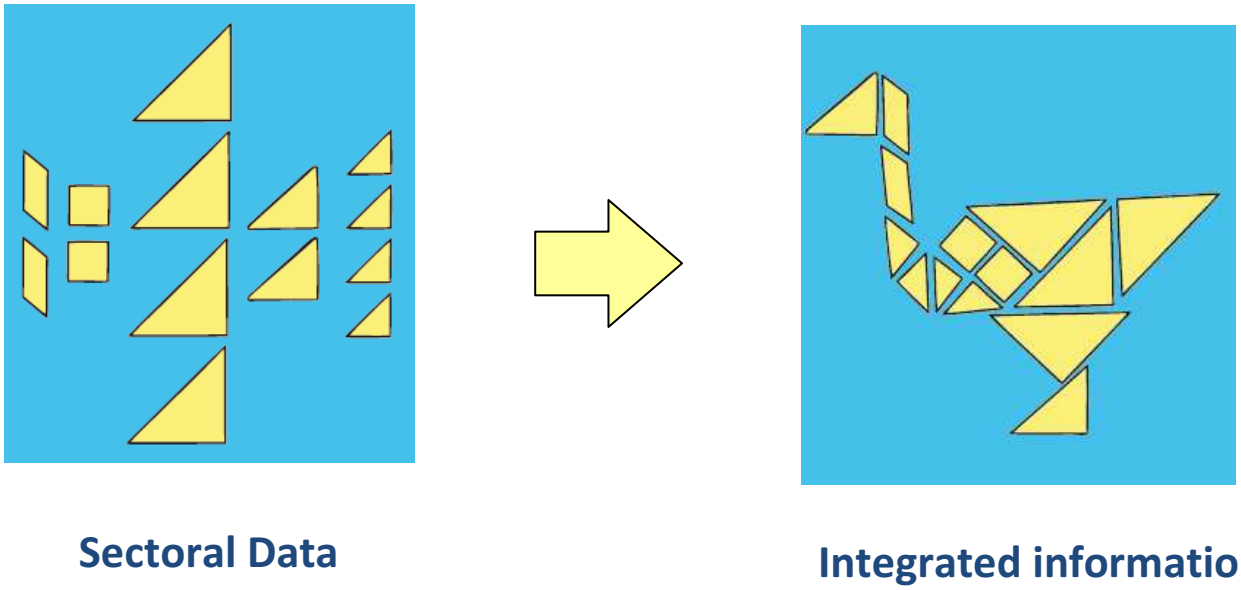
[4] SEEA-Water 2.24

[5] SEEA-Water 2.25

Third, the accounting structure also allows for the calculation of indicators which are precisely defined, consistent and interlinked with each other because they are derived from a fully consistent data system. Compared to the use of loose sets of independently calculated indicators, using indicators that are derived from the accounts has the advantage of enabling further analyses of interlinkages and of causes for changes, complemented by scenarios and prognoses on the basis of scientific macro-economic models.[6]

The following figure illustrates the transition from environmental statistics to environmental accounts. While statistics provide different sets of data for different specific purposes, accounts provide a coherent "image", that emphasizes the relationships between the different elements of a complex system. Moreover, data gaps can be identified and the remedies put in place.

Figure 1.1 From sectoral to integrated information



The SEEA-Water has been developed as a subsystem of the SEEA to provide the information framework linking the hydrological cycle with the economy. It includes physical and monetary data that describe the natural water cycle as well the water cycle through the economy. This conceptual framework is intended to support decisions that have an impact on water resources, their use and their development. Being a subsystem of the SEEA, the framework will facilitate the evaluation of the interactions between water resources and other natural resources, as well as ecosystem services.

As part of the implementation for the SEEA-Water, the International Recommendations for Water Statistics (IRWS) was developed as an agreed set of recommendations for compiling internationally comparable information related to water. The recommendations provide an agreed list of data items

[6] SEEA-Water 2.26

to support the collection, compilation and dissemination of water statistics, as well as their integration in water accounts.

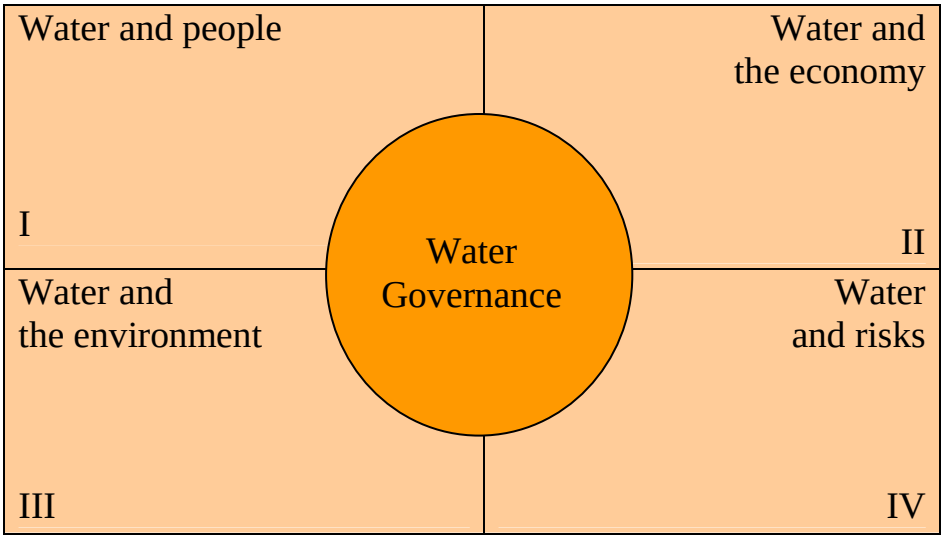
.II. Water policy information and its organization in quadrants

The System of National Accounts (SNA) is the methodological basis to produce all kinds of economic indicators, such as the well known Gross Domestic Product (GDP), the Gross Fixed Capital Formation (GFCF), and many others, which are useful for policy design and evaluation. All these indicators are comparable, consistent, and provide a comprehensive view of the economy. The sequence of national accounts generates several balancing items, which are indicators themselves, or used with other data, such as population, yield additional indicators.

In the same way, the System of Environmental-Economic Accounts (SEEA) provides the basis for developing all kinds of policy relevant indicators to guide policy design and evaluation, including environmental aspects. The indicators provided by the SEEA include many other aspects not included in the SNA. Moreover, the indicators calculated with the SEEA are coherent with those calculated with the SNA. The combination of indicators based on the SNA and the SEEA provides a great variety of indicators about the economy and the environment to inform policy makers. Likewise, several indicators specific about water can be derived from the SEEA-Water. They also assists, in combination with other statistical standards, with the integration of social data, such as demographic and labor statistics.

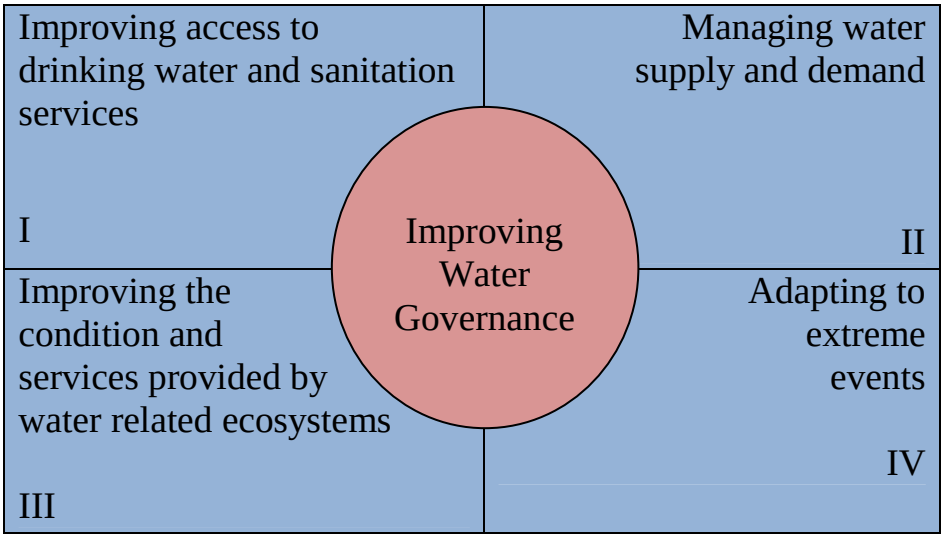
The figure below shows a way of organizing the information into groups. While the groupings are chosen mainly for statistical considerations, they also clearly relate to different aspects of water related policies. At the center of these policies is water governance.

Figure 1.2 Grouping of information about water



The information is directly linked to each of the five broad areas of water policy objectives, as shown in the figure below.

Figure 1.3 Broad grouping of water policy objectives



Depending on country priorities and water management issues, as well as the statistical development and resources, each country can decide the level of detail for the data collection and compilation process for each of the five groups. Depending on the level of detail and type of information to be collected, countries may decide to implement different sections of the SEEA, usually starting with those in the standard, the Central Framework (CF), and then moving to the SEEA Ecosystem Experimental Accounts, as explained below for each group or quadrant.

Quadrant I, improving access to drinking water and sanitation services

The first quadrant refers to all the information related to the provision of drinking water and sanitation services to households, including health centers and schools, which also serve households. It includes physical and monetary data about the production and consumption of drinking water and sewerage, products classified as CPC 18000 and CPC 94110, produced by the activities of water supply and sewerage, classified as ISIC 36 and ISIC 37.

The physical information includes the amount of water supplied by the utilities[7] to households, as well as to other users which provide water to households (which can be classified by income), the

[7] The term utility is used for both private and public enterprises that perform the activities of drinking water supply and sewage collection and treatment.

amount of wastewater generated and either collected by wastewater utilities or discharged directly to the environment. The monetary information includes the price of the services, as well as all the financial flows of the water and wastewater utilities, including fixed capital formation, consumption of fixed capital, and compensation of employees. All this monetary information is part of the Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS) project undertaken by the World Health Organisation in partnership with others.

Quadrant II, managing water supply and demand

The second quadrant, managing water supply and demand, refers to the information related to the water cycle in nature and in the economy. It includes the abstraction, use, reuse, and return of water resources by the different economic activities and households, as well as hydrologic information to estimate the total renewable water resources.

The physical information includes amounts of water abstracted by the different economic activities, water supplied to the different users, wastewater generated by the different users, wastewater treated and sent for reuse or discharged to the environment. The monetary information includes gross value added, as well as intermediate consumption, especially of water (CPC 18000) and sewerage (CPC 94110). Also the gross fixed capital formation and consumption of fixed capital is important to understand the needs for water supply, not only for drinking water as mentioned in quadrant I, but also water supply for agriculture.

The data required for this quadrant is also found in the SEEA core table 1 shown above. For quadrant I the emphasis is on the highlighted rows and columns. For quadrant II the whole table is used to inform about water in the economy and water flowing to and from the environment. It is also important to understand the effects on the abstractions on the environment.

Quadrant III, improving the condition and services provided by water related ecosystems

The third quadrant, improving the condition and services provided by water related ecosystems, refers to all the biophysical information necessary for tracking changes in extent and condition of water-related ecosystems, as well as for measuring the ecosystem services provided. The measurements include statistical data as well as cartography about the conditions and provisioning services of the related ecosystems.

The information includes different the different characteristics of conditions of water bodies (rivers, lakes, wetlands, aquifers), such as, amount of pollutants in the water and water beds, quantity and diversity of aquatic life living in the water bodies, disturbances to the natural path of water, etc. It also includes flow analyses to determine flow patterns and quantify required environmental flows.

A wide variety of indicators related to quadrant III can be calculated from the data integrated in the SEEA Experimental Ecosystem Accounts. The following type of indicators can be generated:

- Water quality indicators

- Actual renewable water resources based on the ecosystem carrying capacity and regulating services.
- Ecosystem carrying capacity to absorb the different type of pollutants.
- River fragmentation indicators.
- Wetland extent.
- Environmental flows.
- Mean species abundance.

Quadrant IV, adapting to extreme events

The fourth quadrant, adapting to extreme events, refers to the information related to extreme events having an impact on water ecosystems, such as floods and droughts. It includes information about the frequency and magnitude of the events and their effects on the population and economy. It includes all the expenditures related to mitigation, adaptation, as well as remediation.

The information includes magnitude and return periods of precipitation, storms, as well as hydrologic droughts. Also, cartographic information about areas prone to flooding, housing and economic activities in those areas, artificial reservoir storage capacity for flood control.

A wide variety of indicators related to quadrant III can be calculated from the data integrated in the various accounts. The following type of indicators can be generated:

- Economic losses due to hydro-meteorological events.
- Actual renewable water resources based on the ecosystem carrying capacity and regulatory services.
- Ecosystem carrying capacity to absorb the different type of pollutants.
- Environmental flows

Water governance related information

The information in the different quadrants described above will be useful for assessing water governance aspects. For example, all the financial information, the information about human resources required for the water sector and for water resources management provide the basis for informing about water governance. The SEEA provides a framework for coordinated work among the different institutions participating in water management activities.

.III. Incorporating water monitoring in National Statistics Systems (NSS)

The NSS must be able to respond in a precise, effective, and sustainable manner to the changes under way in the societies and economies and to the new information requirements. This response

entails a co-ordinated national effort aimed at improving the mechanisms and processes needed to produce relevant statistics.

While national statistical offices are usually responsible for compiling and disseminating official statistics, statistical units in line ministries are also responsible for collecting and providing sector specific data which are key to monitoring development progress. It is, therefore, imperative that sectoral requirements are integrated into the design of the NSS.

- development policies require comprehensive data from a variety of sectors to be effective;
- it is necessary to make data collected by sectors and national statistical offices more widely available to meet the results-based development agenda; and

An NSS brings together key stakeholders and institutions involved in producing, supplying and using official statistics, and training centres.

Typically, the NSO has a legal mandate to coordinate activities so that data collected, compiled and disseminated by different sectors and agencies are consistent and comparable and can be used with confidence. Sectoral statistics are produced through the statistical system of each sector which may be functionally centralized or decentralized within the NSS.

Mainstreaming of sectoral statistical systems requires that stakeholders involved in producing, supplying and using sectoral statistics are more involved in the functioning of the NSS and that they work with each other and with the NSO to develop shared goals and cross-cutting strategies and to streamline institutional and coordination arrangements. The intended outcome is an NSS capable of efficiently and effectively monitoring development progress, which can be brought about by the following objectives and strategies:

- Make more efficient use of resources: by creating coordination mechanisms, agreeing common legal and institutional frameworks, developing NSS-wide financing strategies and human resource policies, and sharing physical, information technology, and communication infrastructures.
- Improve the productivity of data management: by streamlining management processes, for example by creating a data warehouse.
- Increase the availability of quality data: by developing a common data dictionary and standards of data quality, and agreeing comprehensive data production and dissemination policies.
- Raise the public profile for statistics: by developing a coherent NSS-wide advocacy strategy.

National Strategy for the Development of Statistics

Many countries around the world have developed a strategic planning process known as the "National Strategy for the Development of Statistics (NSDS)". An NSDS enables countries to build a reliable statistical system that produces the data necessary to design, implement, and monitor national development policies and programmes. Water being a priority for many countries, should be incorporated in their NSDS.

An NSDS is expected to provide a country with a framework for strengthening statistical capacity across the entire NSS. The NSDS provides a vision for where the NSS should be in five to ten years, sets priorities and identifies milestones for getting there. It presents a comprehensive and unified framework for continual assessment of user needs and priorities for statistics and for building the capacity needed to meet these in a more coordinated, synergistic and efficient manner. It also provides a framework for mobilising, harnessing and leveraging resources (both national and international) and a basis for effective and results-oriented strategic management of the NSS. The key principles are that an NSDS should:

- be nationally led and owned, with high level political support and champions;
- be demand-focused and integrated into national development policy processes, taking account of countries' regional and international commitments;
- be developed in an inclusive and consultative way;
- assess all statistical sectors and user needs and provide a vision and strategic plan for national statistics;
- set out a comprehensive statistical development programme, which is prioritised and timetabled, to build capacity to deliver results, incorporating plans for implementation, monitoring, and evaluation, but also flexible enough to cope with change;
- address institutional and organisational constraints and processes, including resources, for the sustainable development of statistical systems and outputs;
- build quality "fit for purpose", drawing on best international practices and standards;
- build on what exists and is being developed and continue to satisfy immediate needs for statistics during the NSDS process;
- respond to user needs but be realistic about resources;
- serve as a coherent framework both for international support for statistical development and statistics programmes across the NSS.

Institutional arrangements for an integrated monitoring system for water

The practices to achieve an integrated monitoring system for water may vary depending on the degree of centralization or decentralization of the national statistical system (NSS). NSS that are less advanced and complex should take at an early stage the principles of integration of environmental statistics into the design of their statistical production process. More advanced statistical systems should incorporate the principles of integration in the re-engineering of their statistical production process and institutional arrangements.

It should be recognized that one single and detailed implementation approach towards an integrated monitoring system for water is neither possible nor desirable, because national statistical systems are different. There are, however, general guiding principles and good practices that are presented in these Guidelines. Integration requires a broad and comprehensive system-wide approach encompassing:

a) the adoption of an integrated conceptual framework as the umbrella framework for organizing water information, this is provided by the SEEA in general and the SEEA-Water in particular,
b) the creation of institutional arrangements for integrating the information, and
c) the establishment of an integrated production of information process.

These building blocks are interlinked and mutually reinforcing structures for setting up integrated statistical systems.

The integrated conceptual framework provided by the SEEA-Water is perfectly aligned with other internationally accepted standards and international recommendations. The framework is also comprehensive, including all the flows and stocks at the base of the behavior of all inland water systems.

The institutional setting has an important role to play in the building blocks of the integrated statistical production process. The functions and responsibilities of the lead statistical agency in the country can be carried out more efficiently if it is supported in this role by institutional arrangements such as advisory committees, relationship meetings, memorandums of understanding, service level agreements, technical cooperation, and a legal framework that protects the confidentiality and integrity of the data while allowing for the sharing of data between partner statistical agencies.

It is crucial for integration to apply uniform concepts, definitions and classifications based on internationally accepted standards and classifications, for which the SEEA-Water functions as the umbrella framework. The use of harmonized terminology, concepts, definitions, and classifications is necessary in a national statistical system so that the various data collections are comparable and can be related to each other.

In all phases of the integrated statistical production process, common concepts are recommended. To ensure the use of consistent terminology and definitions, statistical agencies should establish a terminology management strategy to reduce in the different areas in the organization the use of inconsistent terminology applied in questionnaires and in dissemination. For this purpose, the appropriate tools, including thesaurus, glossary of concepts should be developed and adopted across the organization. The glossaries, as a minimum, should contain a concept label, definition, detailed source information and related terms.

Integrated statistics obtained through the use of harmonized classification devices are more powerful than statistics collected without harmonization. Harmonization has been achieved, for example, through the implementation of standards such as the International Standard Industrial Classification of All Economic Activities (ISIC) (United Nations (2008a). It should be noted that integration is a broader concept than harmonization as it goes beyond harmonizing concepts, definitions, classifications or standards. The harmonization of standards is only one dimension of integration.

Examples in countries

Recent reforms to Mexico's National Statistical Systems

In 2006 article 26 of the Federal Constitution of Mexico was modified in order to include the creation of a National Statistical and Geographical Information System (SNIEG). A new law was enacted in 2008 to regulate the system.

The new law states that the purpose of the SNIEG is to produce Information of National Interest, which is necessary for the design and evaluation of public policies in Mexico. The information produced by the SNIEG is considered official and of mandatory use to the Federal Government, the States and the Municipalities.

The legislative changes make INEGI, the National Institute of Statistical and Geographical Information, an entity with full technical and operational autonomy. INEGI is no longer part of the Mexican Executive Branch, but an autonomous entity similar to other bodies, such as the Federal Elections Institute and the Central Bank. INEGI is ruled by a Board of Governors consisting of 5 members appointed by the President of Mexico and ratified by Congress. INEGI becomes the coordinator of the SNIEG. It changes its role of mainly an information producer to the coordinator of the production of Information of National Interest.

The Information of National Interest has to support the design and evaluation of public policies. It has to be produced periodically according to scientifically based methodologies. The law requires the integration of Specialized Technical Committees for the different topics in which the Information of National Interest is grouped. The committees are formed by the different line ministries that produce or use the information included in the committee's domain, as well as different agencies and organizations that provide technical inputs to the process.

A specialized technical committee of information about water (CETAGUA) was created in 2010. This committee is responsible for determining the information that will be classified as of national interest, as well as establishing the priorities of INEGI and the relevant Ministries in the different projects related to Information of National Interest.

The CETAGUA is presided over by the National Water Commission of Mexico (CONAGUA), which is the entity in charge of water policy design and implementation in Mexico. INEGI is the permanent secretariat. The CETAGUA was formed based on the experience of inter-organizational cooperation for water information that started in 2005 with the creation of a group of mainly federal government agencies with the purpose of sharing water policy relevant information.

The different information projects are shared among the members of the committee and synergies are sought among the agencies. The SEEA-Water is used as the methodological basis for guiding the priorities of information collection and dissemination.

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