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Water Policies Monitoring Framework: Draft Text for the UNSD-WWAP "Glossy" Publication

Paper prepared by UNSD

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WATER POLICIES
MONITORING FRAMEWORK

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Table of Contents

1. The quadrants of water policy objectives

1. Water is essential for achieving equitable and sustainable social and economic development. Water security, that is improving water resources development and management, is required for achieving most of the Millennium Development Goals (MDGs), such as eradicating extreme poverty and hunger, achieving universal primary education, promoting gender equality and women's empowerment, reducing child mortality, improving maternal health, combating major disease, and improving environmental sustainability.

2. Policies to achieve water security have different emphasis depending on the specific characteristics of each society. However, their objectives can usually be framed within the four broad groups of objectives illustrated in figure 1.

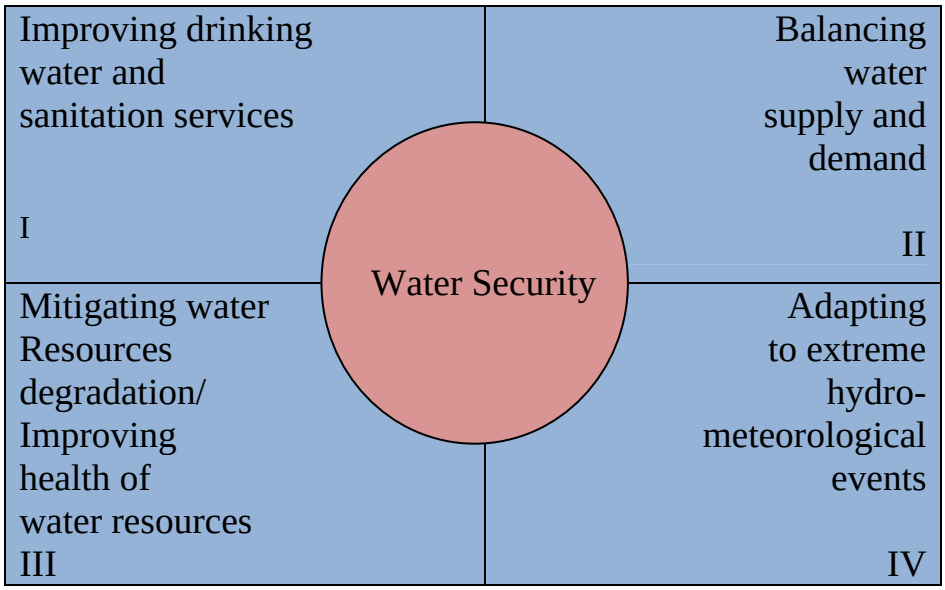

Figure 1.-Broad grouping of water policy objectives

3. The first quadrant, improving drinking water and sanitation services, refers to all the policies that aim at making sure that the population has access to safe water and also to means of disposing excreta. Water and sanitation services are provided to population centers through water supply and sewer networks operated by different types of water utilities, which can have private, public or mixed ownership.

4. For the issue of improving drinking water and sanitation services it is important to monitor progress towards assuring access to the services by all the population. It is also important to monitor the quality of the services being offered to the population. For all this it is important to monitor the costs associated to providing the services in a sustainable way, as well as the sources for funding them. Efficiency of the water utilities also needs to be monitored. Water utilities have to be able to provide a reliable service to the population and be able to collect the fees reducing unaccounted or non-revenue water (due to water losses, theft, lack of a good registry of users and failure to bill and receive the payment of the bills).

5. The second issue, balancing water supply and demand[1], refers to all the policies that aim at improving water allocation in order to properly satisfy all the needs of the society without compromising the needs of future generations and of the environment.

6. For this issue it is key to monitor the amounts of water that are being allocated to the different uses, including water allocated for environmental needs, and the different losses in conveying and distribution systems. It essential to have measurements of the trade offs involved in the allocation and re-allocation of water in order to satisfy the different demands with the limited water resources that can be used sustainably. It is key to account for the monetary flows necessary to maintain or increase the capacity to manage water: storage, conveying and reclamation systems.

7. The third issue, mitigating water degradation and/or improving the health of water resources, refers to all the policies that aim at preserving the quality of water resources and the aquatic ecosystems.

8. In this quadrant it is essential to measure emissions discharged to water resources by the different users, the emissions collected and removed by wastewater treatment facilities, and the carrying capacity of the different water bodies. It is also key to account for the monetary flows necessary to maintain or increase the capacity to mitigate waterborne emissions.

9. The fourth issue, adapting to extreme hydro-meteorological events, refers to all the policies that aim at reducing the negative effects of droughts and floods on people and productive areas.

10. In this quadrant it is important to identify the inter-seasonal variations in water flows that give rise to droughts and also the peak flows that cause floods. It is essential to measure the creation or preservation of the assets (natural or produced) that will aid in providing regulation to these seasonal and inter-seasonal variations.

11. Different targets are set for the objectives in each of the four quadrants described above. In order to measure progress towards the achievement of the goals set, information systems are required to aid in collecting data and converting it into information for monitoring progress.

12. Hydrological data is only part of the data required to understand today's water problems. Data from many other fields of expertise is necessary to understand the complex interrelationships of water with all the other aspects of human life. Data has to be brought together, it has to be analyzed and converted into useful information for policy makers, for the general public, for managers and also for researchers[2]. 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.

[1] The terms demand and use have different meanings depending on the context. In National Accounts the term "supply and use" is commonplace, with a slightly different meaning to "supply and demand".
[2] World Water Development Report 2

13. It is therefore necessary to have a comprehensive conceptual framework to guide the process of data acquisition and its transformation into policy relevant information. The System of Environmental-Economic Accounts for Water (SEEA-Water) is the conceptual framework adopted by the United Nations for this purpose. SEEA-Water is based on years of experience for monitoring economic policies.

2. Building on the established policy monitoring frameworks

14. Economic policies are monitored using indicators which are widely accepted and comparable between countries and through time. Most of these indicators, such as the gross domestic product (GDP) are derived from the standard concepts and definitions prescribed in the System of National Accounts (SNA). The SNA is an internationally agreed standard adopted through a rigorous process in the United Nations. Its first version was adopted in 1953 and the latest version in 2008. Today it is the main source of information for internationally comparable economic indicators and for economic analysis and modeling. Countries around the world have developed capacity to systematically compile the accounts in their National Statistics Offices and/or Central Banks.

15. Based on a process similar to the one that led to the adoption of SNA, the United Nations Statistics Division in collaboration with Eurostat, IMF, OECD and the World Bank, as well as experts from different countries, developed the System of Environmental-Economic Accounts (SEEA). SEEA provides internationally agreed standards for the compilation of measures about the environment and its interactions with the economy.

16. A subsystem of SEEA is the System of Environmental-Economic Accounting for Water (SEEA-Water), which was developed with the purpose of providing an integrated conceptual framework to support water policy design and evaluation. It includes physical and monetary data that describe the natural water cycle and its interaction with the economy. Being a subsystem of SEEA, the framework will facilitate the evaluation of the interactions between water resources and other natural resources, as well as ecosystem services.

17. SEEA-Water builds upon the existing SNA and SEEA frameworks. It ensures the coherence of environmental and economic statistics and facilitates and improves the analysis of the interrelations between the environment and the economy. The framework contains a series of identities (for example, those involving supply and use), which can be used to check the consistency of data, with the advantage of improving basic statistics.

18. The framework allows for the calculation of coherent sets of indicators which are precisely defined, consistent and interlinked with each other because they are derived from a fully consistent data system, instead of loose sets of independently calculated indicators.

19. The following figure illustrates the transition from environmental statistics to environmental accounts. While statistics provide different sets of data from different

sources (i.e. administrative or survey data), 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.

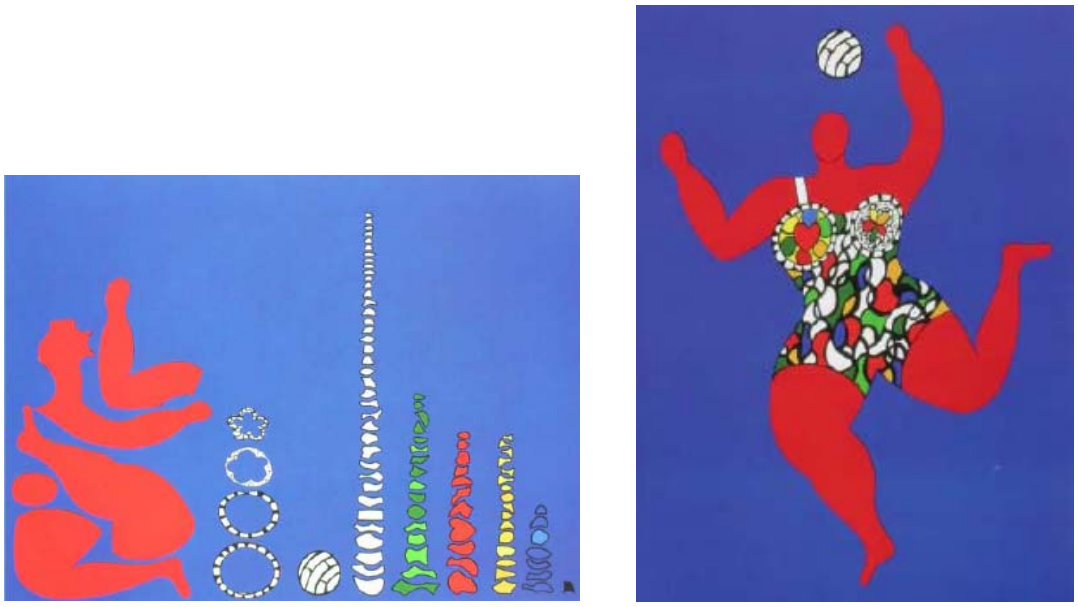

Figure 2. From statistics to accounts: environmental statistics are depicted on the left and their transformation into a complete "picture," on the right.

20. Specific frameworks are being developed for other topics as well, such as, energy and fisheries.

21. SEEA-Water was adopted by the United Nations Statistical Commission (UNSC) in 2007. The UNSC brings together the Chief statisticians from the Member States and is the highest decision making body for international statistical activities, especially the setting of statistical standards, the development of concepts and methods and their implementation at the national and international level. UNSC is a functional commission of the UN Economic and Social Council (ECOSOC).

22. As part of the implementation of the framework, 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 to support the collection, compilation and dissemination of water statistics, as well as their integration in water accounts. IRWS was adopted by the UNSC in February 2010.

23. SEEA-Water and IRWS can be implemented in countries at different stages of development. They offer a statistical organizational framework for deriving coherent set of macro aggregates from basic source data, without creating an additional burden for the existing water and statistics departments. They also offer a way of adding value to resources allocated to the collection of data related to water.

3. Water accounts and statistics in detail

24. SEEA-Water provides a set of recommendations to create integrated information systems to study the policy-relevant impacts of the use and development of water resources. It offers a conceptual framework based on a systemic or integrated perspective of water resources management. Two subsystems are identified in the framework: the economy and the inland water resources. The water cycle in its liquid phase takes place within these two main systems, which have interactions with the larger atmospheric and oceanic systems.

25. The economy system of a given territory is composed of all the industries, and households, which make use of water. The economy uses water in different ways. It can physically remove water from the environment for economic production and consumption activities or use water without physically removing it from the environment.

26. The inland water resource system of a given territory, which can be a country, an administrative region or a river basin, is composed of three main media: 1) surface waters, which include rivers, lakes, reservoirs, snow and ice 2) groundwater, which refers to the aquifers, and 3) soil water, which is a transient state between surface and groundwater (useful when accounting for water used in rain-fed agriculture, "green water".

27. The economy is described in terms of industries, classified according to the International Standard Industrial Classification of All Economic Activities (ISIC), which is used, since 1948, to classify data according to kind of economic activity in the fields of economic statistics, such as production or national income, employment, population and others.

28. ISIC includes all kinds of economic activities, from agriculture to retail sales, with a precise definition. It includes water collection, treatment and supply, as well as sewerage and wastewater treatment services. The following table shows a breakdown of industries, which is of interest to water resources management and its relationship with ISIC. Different countries will seek different levels of disaggregation of data according to their own water policy emphases.

Table 1. Minimum breakdown of economic activities and households, which are of main interest for water management.

ISIC codes	Description of the economic activity	Relevance for water policy and management
1-3	Agriculture, forestry and fishing.	The largest amounts of water abstracted ("consumptive" or "off-stream") from inland water resources, are for these economic activities. It is important to

		distinguish water abstracted from surface and groundwater sources ("blue water"), and water abstracted from the "soil water" ("green water")
5-33, 41-43 38, 39, 45-99	Manufacturing, mining and quarrying and other industrial activities. Service activities.	These economic activities abstract water directly from inland water resources, or more often, through municipal water networks (classified as ISIC-36). They are also important contributors to waterborne emissions.
351	Electric power generation, transmission and distribution. It is useful to identify the following division: a). hydroelectricity, where potential energy of water is used to move turbines ("non-consumptive" or "on-stream" use). b). Other types of generation, where water is used for cooling ("consumptive" or "off-stream" use).	Hydroelectricity uses a large amount of water, even though it is returned immediately after use without alterations. Large amounts of water are also used for cooling thermoelectric generators, including nuclear power plants.
36	Water collection, treatment and supply	This economic activity refers to the water supplied through mains to industries and households. They can be owned and/or managed by public or private entities.
37	Sewerage, including treatment of wastewater.	This activity is often done together with ISIC 36. Sewage is collected through municipal networks, which may or may not treat the water in wastewater treatment facilities before returning it to the environment.
No code	Households as consumers	Households usually receive water from water utilities (ISIC-36) and return wastewater through sewerage utilities (ISIC 37).

29. Based on the classifications described above for the inland water and economy subsystems, the framework provides specific guidelines on the data that is desirable to have, such as, water abstractions by industry and from specific media (i.e. surface or groundwater), water returns, gross and net emissions of pollutants, different types of monetary payments, etc. The specific information about water can then be combined with the information in the SNA in order to generate hybrid accounts in which information, such as, fixed capital formation for the water sector and value added by each industry is contrasted with water abstractions, water consumption and pollutant emissions.

30. All kinds of indicators can be derived from the framework, from the common physical indicators, such as, total renewable water resources and water stress, to combined physical and monetary indicators, such as, water productivity and pollutivity. The indicators derived have very precise definitions and are therefore comparable through time and space. Depending on data availability more or less detailed indicators can be calculated.

4. Linking water accounts and statistics with policy objectives

31. The main purpose of compiling water accounts and statistics is to identify areas of social, economic or environmental stress and to monitoring policies. The four quadrants described above provide guidance in the organization of the targets to achieve water security in a broad sense. For each of the quadrants it is possible to identify indicators derived from water accounts and statistics. SEEA-Water and IRWS provide the concepts and definitions for constructing the indicators. The following table shows some examples.

Table 2. Examples of indicators for each of the four water policy groups of objectives

Group of water policy objectives	Examples of policy relevant information
I. Improving drinking water and sanitation services	• Population using improved water sources (IRWS data item). • Population using improved sanitation facilities (IRWS data item). • Fixed capital formation for ISIC 36 and 37 (from SEEA-Water national expenditure tables).
II. Balancing water supply and use	• Relative water stress calculated as the sum of abstractions for "consumptive" uses divided by net precipitation (from SEEA-Water physical supply and use tables and asset accounts). • Value added per unit of water used by industry (from SEEA-Water hybrid table). • Percentage of losses in the different supply systems.
III. Mitigating water degradation/ improving quality of water resources	• Ratio of treated wastewater returns to total wastewater returns to the environment (from SEEA-Water physical supply table). • Ratio of net emissions to gross emissions by type of industry, measured by weight units of BOD and COD (from SEEA-Water gross and net emissions tables). • Value added per unit of BOD or COD discharged.

IV. Adapting to extreme hydro-meteorological events	• Time series showing precipitation and evapotranspiration patterns (from SEEA-Water asset accounts). • Stocks of water at different points in time. • Capital formation for managing water resources.

32. A full collection of indicators is presented in the annexes of the SEEA-Water and the IRWS, as well as the formulas to calculate them from the standard tables or data items.

33. Since SEEA-Water and IRWS were designed in perfect alignment with the System of National Accounts, it is also possible to monitor the contribution of water to policies that go beyond the four quadrants of water security. Water accounts and statistics are a means of linking the decisions that are within the "water box"[3] to decisions that are "outside the box".

5. Implementation in countries and internationally

34. Although SEEA-Water and IRWS are relatively new, more than 50 countries around the world are compiling or planning to compile water accounts. Countries, such as, Australia and the Netherlands have institutionalized water accounting. Other countries, such as Brazil, China, Dominican Republic, Egypt, Guatemala, Jordan, Mexico and South Africa, have done preliminary work, which can allow them to fully implement the accounts.

35. Water accounts compiled according to SEEA-Water and IRWS usually do not require large amounts of additional data. They simply aid in setting all the data together to improve understanding and facilitate the exchange of information. Part of the data may have to be estimated based on known parameters. As water accounts become a systematic way of organizing information, it is expected that more data becomes available, even though, given the complexities of the water cycle, for some data, even in the long term, some low precision estimates will be acceptable.

36. The real value of water accounts will become more apparent through years of usage. Communication between national accountants and water experts is essential, since the economic information available will require further breakdown in order to show specific information regarding industries that are of special interest for water policy, such as the water supply and sanitation industries (ISIC 36 and 37), agriculture (ISIC 1-3) and electricity (ISIC 351).

37. Water accounts require, and therefore promote, institutional arrangements for the collaboration of the different producers and users of information. It usually requires the involvement of the National Statistics Office and/or the Central Bank, as well as the ministry or agency in charge of water resources or the environment, and the different agencies with tasks related to water management. Data providers also include water

[3] The concept of "water box" is used in the World Water Development Report 3 to describe the specific sphere in which water managers and water leaders make their decisions.

utilities, irrigation companies or farmer associations, electricity companies, etc. SEEA-Water provides the framework necessary to make the collaboration successful, by identifying the key data and providing common terminology, concepts and definitions.

38. Increased use of the framework should lead to improvements in the availability and quality of the data and the information base that supports the development and assessment of policies that have an impact on water. Countries will have to make changes to their national accounts in order to have more detailed information about water (e.g. separating the water industries from those of electricity and gas, which are often aggregated in the accounts).

39. As the framework is implemented at national and subnational levels it will become increasingly easier to share and compare information through time and space. It will also increase the information that will be incorporated to the national accounts, so that better estimations of green growth can be made.

BOXES TO ILLUSTRATE THE TEXT WITH EXAMPLES FROM COUNTRIES

BOX 1: The water and sanitation quadrant

--Show time series of investments in water and sanitation infrastructure and percentage of people connected to the services. (from IRWS and modified SEEA-Water 5.6 table on national expenditure accounts for wastewater management).
--Show indicators of performance of water utilities.

BOX 2: The water supply and demand quadrant

--Show decoupling of economic growth and water abstraction and water consumption (from SEEA-Water hybrid tables).
--Show time series of value added versus abstraction, consumption and emissions (from SEEA-Water hybrid tables).

BOX 3: The water quality and water health quadrant

--Show decoupling of economic growth and emissions to water (from SEEA-Water hybrid tables).
--Show time series of emission of BOD_5, COD and TSS (from SEEA-Water table 4.2)

--Show standard river units of water courses polluted (from SEEA-Water table 7.4)

BOX 4: The floods and droughts quadrant

--Time series of precipitation and evapotranspiration (from SEEA-Water asset accounts).
--Time series of levels in reservoirs (from SEEA-Water asset accounts).