Twinning Project
"Strengthening of the National Statistical System of Armenia – Phase II"

Activity 6.1
Assessment of the current status on water statistics and water accounts

An overview of Water Accounts

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Yerevan, 1-4 February 2016

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Plan of presentation (1)

- Brief remarks on Eurostat water statistics
  - main topics
  - OECD/Eurostat JQ-IW and REQ Questionnaires
  - recent developments to simplify water data reporting
- Water accounts within the European Statistical System
  - the new European Strategy for Environmental Accounts ESEA 2014-2018
  - EU statistical law
  - action plan for implementing ESEA 2014-2018
  - activities of the Eurostat Working Group on Environmental Accounts
- International framework of Economic and Environmental Accounting Systems
  - System of National Accounts
  - System of Environmental-Economic Accounting (SEEA)
  - System of Environmental-Economic Accounting Central Framework (SEEA-CF)
  - System of Environmental-Economic Accounting for Water (SEEA-Water)
- The development of Physical Water Flow Accounts (PWFA)
  - accounting principles drawn from SEEA-CF
  - PWFA conceptual foundation and contents

Plan of presentation (2)

- the Physical Water Flow Accounts (PWFA) set of reporting tables
  - the physical supply and use tables and the summary table
  - SNA supply-use tables vs PWFA tables
  - basic scheme of the physical supply and use tables for water
  - sub-matrices contents

- scheme providing an overview on the set of tables in the PWFA electronic questionnaire
  - table A the water supply table
  - table B the water use table
  - table C the emissions to water supply table
  - table D the emissions to water use table
  - table E key PWFA Indicators

- strengths and properties of water accounts

Water accounts within the European Statistical System

❑ Activities of the Eurostat Working Group on Environmental Accounts

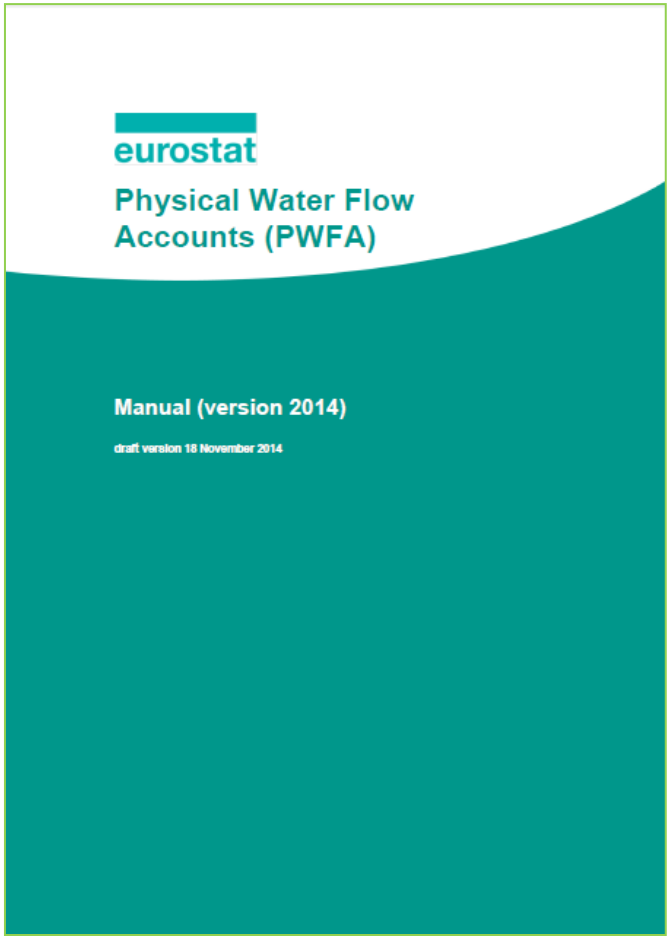
WG developed a system of **water accounts** allowing a more systematic approach to analyse water data, e.g. by way of double bookkeeping of *flows* (supply and use) and consistent with the **System of National Accounts (SNA, United Nations 2008)** and with its concept of *stocks and flows*

Water accounts encompass:

- **Asset Accounts** (on water resources)
- **Physical Water Flow Accounts PWFA** (supply and use tables) between environment and economy as well as within the economy
- **Monetary Water Accounts** necessary to calculate water use efficiency and contribution to gross value added by industry. These have increasing relevance in water-economic considerations related to environmental policies

Physical and monetary water accounts could be compiled with some legal cover in the coming years, to ensure compliance by all countries. The natural candidate is a module in **Regulation (EU) 691/2011** and **Reg. N. 534/2014 on 16 June 2014** devoted to water accounts

Focus on PWFA



The development of Physical Water Flow Accounts (PWFA)

❑ PWFA conceptual foundation and contents (1)

PWFA present data on the physical flows of water expressed in m^3, in a way that is fully compatible with the concepts, principles, and data reported under the International System of National Accounts (SNA) and European System of National and Regional Accounts (ESA).

PWFA record water flow data in relation to the economic activities of resident units of national economies. Economic activities comprise production, consumption, and accumulation. The idea is to align water information closer to National Accounts enabling the integration of water related concerns into macro-economic monitoring, analyses, modelling.

PWFA comprise the flows of water from the environment to the economy and describe the abstraction of water resources (water as natural inputs) from the environment into the economy, the water **flows within the economy** in the form of supply and use by industries and households (of water products) and finally **flows of water from economy back to the environment** (water residuals). PWFA also includes emissions of relevant substances (pollutants) to water.

The development of Physical Water Flow Accounts (PWFA)

❑ PWFA conceptual foundation and contents (2)

PWFA are supposed to complement water statistics. The idea is to align water information closer to National Accounts enabling the integration of water related concerns into macro-economic monitoring, analyses, modelling, and theory building

PWFA are complemented by Asset Accounts for Water Resources and focus on "*the availability of water to meet demands from the economy and to assess whether those demands are consistent with the longer-term sustainability of water supply*" (SEEA-CF, 2014, § 5.470)

Asset Accounts for water resources (tables directly from SEEA 2014, p. 214) see **Mapping Eurostat fig. 1-2**)

- give information on **the stock of water** at the beginning and end of an accounting period
- record different types as well as **origins and destinations of water inflows and outflows**

Water statistics, PWFA and Asset Accounts are very relevant under the **"EU Blueprint to Safeguard Europe's Water Resources 2012 strategy "** that outlines actions on better implementation of current water legislation, integration of water policy objectives into other policies and filling gaps regarding water quantity and efficiency. **Blueprint objective is to ensure a sufficient quantity of good quality water available for people needs, economy and environment throughout the EU**

The Physical Water Flow Accounts set of reporting tables

❑ the physical supply and use tables and the summary table

Eurostat Task Force developed a set of five reporting tables

- two physical supply and use tables for water flows
- two physical supply and use tables for emissions to water
- one summary table deriving key water indicators from the previous four tables

The five tables are included in an electronic questionnaire

Most of the data needed to fill in the five tables come from **water statistics (OECD/Eurostat Joint Questionnaire on Inland Waters)** that constitute an established source of water information serving European water policies.

Eurostat is in the process of reviewing (streamlining, simplifying) its water statistics and setting up water accounts. The goal is to have a **Joint Reporting Vehicle** covering the needs of both water statistics and water accounts. A technical proposal could be completed in 2015-2016 and could see work in two areas:

1) **to set up a voluntary, test data collection**
2) **to launch legal work for a new module devoted to water resources in Regulation 691/2011**

The Physical Water Flow Accounts set of reporting tables

SNA supply-use tables vs PWFA tables

The accounting framework of supply and use tables (SUT) originates from the System of National Accounts (SNA 1995). There, the framework is used for the recording of monetary transaction flows only within the economy related to production, consumption, and accumulation activities

For the recording of physical flows between economy and environment the SUT framework has been extended by additional rows and columns to accommodate **environmental physical aspects (Physical SUT => PSUT)**

Flows of water measured in physical units are the subject of measurement in **SEEA-Water physical flow accounts**. Three generic types of physical flows are distinguished:

- **natural inputs**, referring to physical flows from the environment into the economy
- **products**, goods and services that result from a process of production
- **residuals**, refer to flows of solid, liquid and gaseous materials, and energy, that are discarded, discharged or emitted to the environment (emission to water) by establishments and households through processes of production, consumption or accumulation

The Physical Water Flow Accounts set of reporting tables

❑ Basic scheme of the physical supply and use tables for water

- **row-wise**, the two matrices show the various physical flow types (namely *natural inputs*, *products*, and *residuals*)

- **column-wise,** they show the various origins and destinations supplying and using the flow items, namely *industries* (production activities), households (consumption activities), *accumulation* (changes in stocks of produced assets and product inventories), *rest of the world* and *environment*

The ***physical supply table*** shows which flow items are provided by which supplier (industries, households, accumulation, rest of the world and environment); in other words it shows the flows by origin

The ***physical use table*** shows who (i.e. production, consumption, accumulation activity etc.) is using or receiving the respective physical flow. In other words, it shows the flows by its destination. Like this, each flow is recorded twice: first at its origin, secondly at its destination. This way of recording is also referred to as "double-entry-bookkeeping"

The Physical Water Flow Accounts set of reporting tables

❑ Sub-matrices contents

The intersections of the PSUT columns/rows denote submatrices. Similarly in the PWFA supply-use tables, submatrices are labelled with capital letters from A to Q in the same way as in the SEEA-CF (chapter 3, Table 3.2.1)

- **A** records the supply of natural inputs from the environment
- **B** records the very same natural inputs, however by the receiving, i.e. extracting, industries
- **C** shows the supply of products by the producing industries
- **D** shows the imports of products (the supply of products by the rest of the world)
- Sub-matrices **E, F, G,** and **H** show how the products supplied (C and D) are used
- Sub-matrices **I, J, K, L**, and **M** show the generation, i.e. supply of residuals from different origins (columns)
- Sub-matrices **N, O, P**, and **Q** record how residuals (provided by I, J, K, L, and M) are used

Table A: Physical Supply Table for Water

	industries	households	accumulation	rest of world	environment	Total
water inputs					A	TSWNI
water products	C		D	D		TSWP
water residuals	I	J	K	L		TSWR

Table B: Physical Use Table for Water

	industries	households	accumulation	rest of world	environment	Total
water inputs	B					TUWNI
water products	E	F	G	H		TUWP
water residuals	N		O	P	Q	TUWR

Table C: Phisical Supply Table for Water Emissions

	industries	households	accumulation	rest of world	environment	Total
emissions by type						TSE

Table D: Phisical Use Table for Water Emissions

	industries	households	accumulation	rest of world	environment	Total
emissions by type						TUE

Table E: vectors of key water indicators

	industries	households	accumulation	rest of world	environment	Total
water key indicator 1						
....						
water key indicator n						

Legend:

logical impossible cases for PWFA

white cells: contain a number or symbol ':' (not available)

R capital letters denote sub-matrices in accordance with SEEA-CF

Scheme providing an overview on the set of tables in the PWFA electronic questionnaire (Figure 1)

- The **first column** in the supply table presents the production of products (C.) and the generation of residuals (I.) by industries. In the use table it covers the use of natural inputs (B.), the intermediate consumption of products (E.), and the receipt of residuals by industries (N.). The first column is further broken down using NACE classification
- The **second column** covers the consumption of products by households (F. in the use table) and the generation of residuals from this consumption (J. in the supply table). The activity of households in extracting natural inputs from the environment for their own consumption (e.g. water abstraction for own use) is considered a productive activity and hence this activity should be recorded in the first column of the use table against the relevant industry class
- The **third column**, labelled accumulation, concerns changes in the stock of water, materials and energy within the economy. From a supply perspective, this column records reductions in the physical stock of produced assets through, for example, demolition or scrapping (K.). From a use perspective, the accumulation column records additions to the physical stock of produced assets (gross capital formation) and the net changes of inventories of products (G.). It also includes accumulation of residuals stocked within the economy, e.g. in landfills (O.)
- The **fourth column** 'rest of the world' recognises the exchanges between national economies in terms of imports (D.) and exports (H.) of products and flows of residuals. Residuals received from the rest of the world (L.) and sent to the rest of the world (P.) primarily concern the movement of solid waste between different economies
- The **fifth column** 'environment' is the significant addition to the monetary supply and use table structure. In this column natural input flows from the environment (A.) and residual flows to the environment (Q.) are recorded. The incorporation of the environmental column allows a full balancing for all physical flows that would otherwise not be possible

Scheme providing an overview on the set of tables in the PWFA electronic questionnaire: focus on Table E

❑ Table E – Key PWFA indicators

- It presents vectors of **key indicators** derivable from tables A, B, C and D.
- This table does not have the matrix format as the previous tables and shows row-wise vectors of key water indicators. Column-wise shows a breakdown by the three generic activity types: production (i.e. industries), household consumption and accumulation (i.e. in principle a similar column-structure as presented in Tables A, B, C and D).
- Three key indicators have been identified following the SEEA-CF (§ 3.5.4):
  1. **'Water consumption' (K.1)** is equal to evapotranspiration, water incorporated into products, and water to sea
  2. **'Water use' (K.4)** is the total water abstracted from the environment and imported
  3. **'Net emissions' (K.9)** is the sum of the direct and indirect release of pollutants into water resources
- The above key indicators are widely self-explaining as they derive from tables A, B, C and D which are explained in section 3.2. These indicators can be combined with monetary information (gross value added and production) in order to give efficiency measures.

Table 3 - PWFA questionnaire key Indicators

- **The electronic PWFA questionnaire populates Table E automatically from Tables A, B, C and D**

code	Label	[unit of measure]
K.1	Water consumption [m^3]	
K.2	Water consumption per GVA (gross value added) [m^3 per currency unit]	
K.3	Water consumption per Production Output [m^3 per currency unit]	
K.4	Water use [m^3]	
K.4.1	of which: natural inputs (i.e. direct abstraction) [m^3 and/or %]	
K.4.1.1	of which from surface and groundwater [m^3 and/or %]	
K.5	Water use per GVA (gross value added) [m^3 per currency unit]	
K.6	Water use per Production Output [m^3 per currency unit]	
K.7	Water consumption / water use	
K.8	Losses in distribution / total water use	
K.9	Net Emissions [kg]	
K.10	Net Emissions per GVA [kg per currency unit]	
K.11	Net Emissions per Production Output [kg per currency unit]	

properties and strengths of water accounts

❑ properties

Granularity

- resolution of economic activities, e.g. full resolution of 2-digit-NACE, or groups of NACE classes
- purpose of water use (e.g. cooling, irrigation, hydropower)

Level of spatial aggregation

- country, statistical/administrative region (NUTS2), WFD-RBD, RBD

Time resolution

- normally the calendar year, while sub-yearly accounts or the hydrological year display seasonality for asset accounts

properties and strengths of water accounts

❑ strengths

- focus on the economic angle (environment-economy flows; economic activities of resident units, like production, consumption and accumulation) rather than the ecological perspective. They are ideal for schemes like "GDP and beyond" which link to national accounts
- internal consistency between the accounts physical and monetary, stocks and flows, etc.
- integration or consistency with other SEEA accounts developed in Europe (in particular physical flow accounts: material flow accounts, physical energy flow accounts). This means they have the same accounting structure and concepts, definitions and classifications. They can be integrated as part of an overarching system of accounts for natural resources, encompassing material flow accounts, energy, water, forests, waste and beyond (carbon emissions and absorption, ecosystems, etc.)
- in the line of the statistical work developed by Eurostat in the last decades.

properties and strengths of water accounts

❑ some drawbacks

- normally accounts are annual, hence seasonal effects are masked
- typically accounts are elaborated for national territories, so regional/basin effects are invisible
- regional accounts (NUTS2 or RBD) are not standard and would be a huge effort to implement because of the structure of the accounting tables
- environment-to-environment flows are not taken into account, only environment-to-economy and economy-to-environment normally are. This represent a limit!

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