Physical Water Flow Accounts (PWFA)

Manual (version 2014)

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Table of Content

Table of Content **2**

Preface **4**

Acknowledgement **4**

Important abbreviations **4**

1 Introduction ***6***

2 Conceptual foundations of PWFA ***7***

2.1 The SEEA physical flow accounting framework **7**

2.1.1 Definition of natural inputs, products, and residuals 7

2.1.2 The framework of physical supply and use tables (PSUT) 8

2.1.3 Accounting and balancing items 13

2.2 SEEA principles of physical flow accounting **14**

2.2.1 Definition of the economy – residence principle 14

2.2.2 Economic units 15

2.2.3 Production boundary – principal, secondary, and ancillary production activities 16

2.2.4 Production of goods for own account and intra-establishment production 17

2.2.5 Goods send for processing and repair 17

2.2.6 Units of measurement 17

2.2.7 International transport 17

2.2.8 Tourist activity 18

3 PWFA-questionnaire ***19***

3.1 Overview – set of five PWFA Tables **19**

3.2 Tables A and B – physical supply and use tables of water flows **21**

3.3 Tables C and D – physical supply and use tables of emissions to water **22**

3.4 Classification of rows **22**

3.4.1 Tables A and B 22

3.4.2 Tables C and D 25

3.5 Classification of columns (industries, households, etc.) **26**

3.6 Table E – Key PWFA indicators **28**

4 General compilation guidelines ***31***

4.1 Data sources **31**

4.1.1 National water statistics 31

4.1.2 International water statistics: OECD/Eurostat Joint Questionnaire on Inland Waters 31

4.1.3 International water statistics: Aquastat 33

4.1.4 Data sources related to industry detailing 33

4.1.5 Other data sources: E-PRTR 34

4.1.6 The use of modelled data 35

4.2 Compiling PWFA tables A and B **36**

4.2.1 Agriculture, forestry and fishing industry 36

4.2.2 Aquaculture 38

4.2.3 Hydroelectric power generation 38
4.2.4 Mining and construction sectors 38
4.2.5 Water collection, supply and treatment 39
4.2.6 Thermoelectric power production 40
4.2.7 Water incorporated into products 41

4.3 Compiling PWFA tables C and D 41
4.3.1 Net emissions 42
4.3.2 Measurement methods 42
4.3.3 Point and non-point (diffuse) sources 43
4.3.4 Thermal pollution 43

References 44

Annex 1: Joint data structure definitions (DSDs) for physical water accounts and JQ-IW 45

Data sets (modules) 45
Resources 45
Waterflows 46
Emissions 47
Infrastructures 48

Annex 2: Detailed definitions of rows of PWFA Tables A and B 50

Annex 3: Classification of columns in PWFA Tables A, B, C and D (industries, households, accumulation, rest of the word, environment) 53

Annex 4: Relations to other statistical frameworks 58

Relation to SEEA-W 58

Relation to IRWS 60

Preface

This *Manual for Physical Water Flow Accounts (version 2014)* documents the result of a development process which took place between 2010 and 2013. The European strategy on environmental accounts (ESEA) adopted in 2008 states that water accounts shall be developed by the European statistical system (ESS) in the longer run (i.e. until 2012-2013).

The Working Group on Environmental Accounts agreed to concentrate efforts and to develop first *Physical Water Flow Accounts (PWFA)*. PWFA comprise the flow of water from the environment to the economy, the water flows within the economy, and the water flowing from the economy to the environment. It also includes emissions of relevant substances to water.

A task force on water accounts was created and met three times (22-23 September 2010, 4 October 2011, and 13-14 June 2012) with the objective to develop a set of reporting tables (questionnaire) and a methodological manual describing conceptual foundations and general compilation guidelines for *physical water flow accounts (PWFA).*

Chapter 2 of this *Manual for Physical Water Flow Accounts (version 2014)* presents the conceptual foundations as discussed and agreed by the task force. The set of reporting tables, i.e. a draft PWFA-questionnaire, is presented in chapter 3. Finally chapter 4 gives general compilation guidance followed by several annexes useful for the practical compilation. Due to lack of resources this manual does not include a chapter on application of PWFA as initially indented.

This manual meets the conclusion of the Working Group on Environmental Accounts to bring the conceptual development of PWFA to a preliminary end.

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[to be completed]

Important abbreviations

SNA – International System of National Accounts

ESA - European System of National and Regional Accounts

SEEA-CF – System of Environmental Economic Accounting – Central Framework (2012)

SEEAW – System of Environmental Economic Accounting Water

NACE – Statistical classification of economic activities in the European Community

PSUT – Physical Supply and Use Tables

PWFA – Physical Water Flow Accounts

IRSW – International recommendations for water statistics

JQ-IW – Eurostat/OECD Joint Questionnaire on Inland Waters

IRWS – International Recommendations for Water Statistics

1 Introduction

1. This manual presents the theoretical and conceptual foundations of physical water flow accounts (PWFA) and provides some general compilation guidelines. It documents the results of the process to develop physical water flow accounts as initiated by the Working Group of Environmental Accounts.

2. Physical water flow accounts (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.

3. PWFA 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 back to the environment (water residuals). PWFA include also a pair of tables for recording emissions (pollutants) to water.

4. PWFA is a set of five tables which has been developed by a Eurostat task force: two physical supply and use tables for water flows, two physical supply and use tables for emissions to water plus a summary table deriving certain vectors of key water indicators from the previous four tables. The five tables are included in an electronic questionnaire.

5. PWFA are being developed very close to the System of Environmental-Economic Accounting Central Framework (SEEA-CF). In its chapter 3 (and parts of chapter 2) the SEEA-CF lays out a general physical flow accounting framework and a set of accounting principles and boundaries within which a consistent recording of all types of physical flows relating to economic activities can be made.

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

7. In this manual all references to NACE[1] relate to the most recent version NACE Rev.2.

[1] Statistical classification of economic activities in the European Community

2 Conceptual foundations of PWFA

8. Physical water flow accounts (PWFA) have been developed according to the accounting structures and principles of the System of Environmental-Economic Accounting – Central Framework (UN et al. 2012). The System of Environmental-Economic Accounting (SEEA-CF) contains the internationally agreed standard concepts, definitions, classifications, accounting rules, and tables for producing internationally comparable statistics on the environment and its relationship with the economy. The SEEA framework follows a similar accounting structure as the System of National Accounts (SNA) (UN et al. 2008) and uses concepts, definitions and classifications consistent with the SNA in order to facilitate the integration of environmental and economic statistics.

9. PWFA belong to the SEEA main area of physical flow accounts (see SEEA-CF chapter 3). As such they aim at describing the physical flows of water within the economy and between the natural environment and the economy. In its chapter 3 (and parts of chapter 2) the SEEA-CF lays out a general physical flow accounting framework and a set of accounting principles and boundaries within which a consistent recording of all types of physical flows relating to economic activities can be made.

2.1 The SEEA physical flow accounting framework

10. The accounting framework of physical supply and use tables (PSUT) form the conceptual fundament of SEEA physical flow accounts (SEEA-CF §21, section 2.5, and chapter 3). The PSUT framework has been based on the expansion of monetary supply and use tables used in the SNA by adding columns and rows specifically to accommodate physical flows between the economy and the environment. The same design approach has been used for all specific PSUT, such as those for flows of water and energy (SEEA-CF §21). PWFA Tables A and B constitute the specific PSUT for water flows.

11. Flows of water, materials and energy measured in physical units are the subject of measurement in SEEA physical flow accounts. These are termed physical flows. Three generic types of physical flows are distinguished: natural inputs, products, and residuals (see section 2.1.1). The recording of physical flows is arranged in physical supply and use tables (see section 2.1.2).

2.1.1 Definition of natural inputs, products, and residuals

12. Core to the measurement of physical flows in the SEEA-CF are the flows of natural inputs, products and residuals. The production boundary of the SNA (see also section 2.2.3) is used to distinguish between these types of physical flows. The definition of products aligns to the SNA definition being those goods and services created through a production process and having economic value (SEEA-CF §1.39).

13. There are three generic types of physical flows:
    (i) natural inputs,
    (ii) products, and
    (iii) residuals.
    Further classifications are needed detailing the three generic flow types (see section 3.4).

14. *Natural inputs* refer to physical flows from the environment into the economy. The SEEA-CF defines natural inputs as all physical inputs that are moved from their location in the environment as a part of economic production processes or are directly used in production. They may be (i) natural resource inputs, such as water, mineral and energy resources or timber resources, (ii) inputs from renewable energy sources, such as solar energy captured by economic units, or (iii) other natural inputs such as inputs from soil (e.g., soil nutrients) and inputs from air (e.g., oxygen absorbed in combustion processes) (SEEA-CF §2.89). It is important to not confuse natural inputs with products, e.g. in the case of mining activities[2].

15. *Products* are goods and services that result from a process of production in the economy. They are defined consistently with the definition of products in the SNA. Generally products are evidenced by a transaction of positive monetary value between two economic units (SEEA-CF §2.91). The scope of products flows included in physical flow accounts include also intra-establishment flows which are partly ignored in monetary flow accounts (see also section 2.2.4).

16. *Residuals* refer to flows of solid, liquid and gaseous materials, and energy, that are discarded, discharged or emitted to the environment (e.g., emission to water) by establishments and households through processes of production, consumption or accumulation but may also flow within the economy, as is the case when, for example, solid waste is collected as part of a waste collection scheme. (SEEA-CF §2.92).

2.1.2 The framework of physical supply and use tables (PSUT)

17. The PSUT provide an accounting framework enabling the complete and consistent recording of physical flows (water, materials and energy):
    (i) from the environment into the economy,
    (ii) within the economy, and
    (iii) from the economy to the environment.
    Physical flows within the environment, i.e. natural flows of water, materials and energy, are out of scope.

18. The accounting framework of supply and use tables (SUT) originates from national accounts (SNA, ESA[3]). There, the framework is used for the recording of monetary transaction related to production, consumption, and accumulation activities. For the recording of physical flows the SUT framework has been extended by additional rows and columns in order to accommodate environmental aspects. Whereas the monetary SUTs consider transaction flows only within the economy, the physical SUT comprises also

[2] *Natural inputs*, e.g. gross ore, are input flows to the mining industry. *Products*, e.g. processed ore and concentrates, are output by the mining industry.
[3] European Commission 2013.

physical flows between economy and environment.

19. The PSUT framework (see Figure 1) is basically a pair of tables which have the same format/structure.

    - 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 (i.e. production activities), households (i.e. consumption activities), accumulation (changes in stocks of produced assets and product inventories), rest of the world, and environment.

20. The physical *supply* table (top half of Figure 1) 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.

21. The physical *use* table (bottom half of Figure 1) 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".

22. The intersections or segments of the PSUT columns and rows denote sub-matrices. These have been labelled with capital letters from A to Q in the same way as in the SEEA-CF (chapter 3, Table 3.2.1). Each sub-matrix (cell labelled with capital letters) is explained in the following:

    - 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; i.e. the supply of products by the rest of the world.

23. Sub-matrices E, F, G, and H show how the products supplied (i.e. C and D) are used.

    - E. records the intermediate use of products by industries. Industries' intermediate use of products is for the production of other products (e.g. water to produce food products and beverages).
    - F. records the use of products, usually finished products, by private households.
    - G. records the net change of product inventories and the additions to produced assets (gross capital formation).
    - H. represents the export of products.

24. Sub-matrices I, J, K, L, and M show the generation, i.e. supply, of residuals from different origins (columns).

- I. records the residuals generated by industries.
- J. records the residuals generated by private households.
- K. records residuals provided from inventories (e.g. losses) or from produced assets.
- L. records the inflow of residual provided by rest of the world economies (e.g. non-value waste) – not much relevant for water.
- M. records the supply of residuals from the environment (e.g. collection of oil spills) – not much relevant for water.

25. Sub-matrices N, O, P, and Q record how residuals (provided by I, J, K, L, and M) are used.

- N. records the use of residuals by industries, e.g. the non-value waste collected by waste management industries.
- O. records the accumulation of residuals in the economy (e.g. landfills).
- P. record the use of residuals by the rest of the world economy – not much relevant for water.
- Q. records the use, i.e. reception, of residuals by the environment.

26. 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.

27. The second column covers the consumption of products by households (cell F. in the use table) and the generation of residuals from this consumption (cell 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.

28. Unlike the monetary supply and use table, no entries are made for government final consumption. In monetary accounts, government final consumption represents the purchase and consumption by governments of their own output which is services; it does not have an associated physical flow. All of the physical flows related to the intermediate consumption of governments, e.g. paper, electricity etc., are recorded in the first column under the relevant industry class, commonly public administration. In addition, the generation of residuals, e.g. emissions, dissipative heat, by governments in the production of their output is recorded in the first column (i.e. industries).

29. 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.). Note that according to SNA conventions changes in product inventories are recorded

net in the use table.

30. 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.

31. 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.

32. The general framework shown in Figure 1 may be articulated only partly. For the case of water flow accounts, the SEEA recommends the full articulation of the framework. Section 3.2 of this manual presents the PSUT scheme specifically adjusted to water flows.

Figure 1: Basic scheme of a physical supply and use table (PSUT)

Supply table

	Production; generation of residuals		Accumulation			
	Production; generation of residuals by industries (including household production on own account), classified by ISIC	Generation of residuals by households	Industries — classified by ISIC	Flows from the rest of the world	Flows from the environment	Total
Natural inputs					A. Flows from the environment (including natural resource residuals)	Total supply of natural inputs (TSNI)
Products	C. Output (including sale of recycled and reused products)			D. Imports of products		Total supply of products (TSP)
Residuals	I1. Residuals generated by industry (including natural resource residuals) I2. Residuals generated following treatment	J. Residuals generated by household final consumption	K1. Residuals from scrapping and demolition of produced assets K2. Emissions from controlled landfill sites	L. Residuals received from rest of the world	M. Residuals recovered from the environment	Total supply of residuals (TSR)
Total supply						

Use table

	Intermediate consumption of products; use of natural inputs; collection of residuals	Final consumption[a]	Accumulation			
	Industries—classified by ISIC	Households	Industries — classified by ISIC	Flows to the rest of the world	Flows to the environment	Total
Natural inputs	B. Extraction of natural inputs B1. Extraction used in production B2. Natural resource residuals					Total use of natural inputs (TUNI)
Products	E. Intermediate consumption (including purchase of recycled and reused products)	F. Household final consumption (including purchase of recycled and reused products)	G. Gross capital formation (including fixed assets and inventories)	H. Exports of products		Total use of products (TUP)
Residuals	N. Collection and treatment of residuals (excluding accumulation in controlled landfill sites)		O. Accumulation of waste in controlled landfill sites	P. Residuals sent to the rest of the word	Q. Residual flows to the environment Q1. Direct from industry and households (including natural resource residuals and landfill emissions) Q2. Following treatment	Total use of residuals (TUR)
Total use						

[a] No entries for government final consumption are recorded in physical terms. All government intermediate consumption, production and generation of residuals is recorded against the relevant industry in the first column of the PSUT.

Source: SEEA-CF, section 3.2.1, table 3.1, p. 41)

2.1.3 Accounting and balancing items

33. The general PSUT framework as presented in Figure 1 contains a range of important accounting and balancing identities. One important feature of PSUT is the supply-use-identity (see SEEA-CF §2.44), i.e. the row sums in both tables have to be balanced: the total supply of a given flow type needs equalling the total use of the very same flow type.

34. For products the supply-use-identity implies that within the economy the amount of products supplied must be used within the economy or exported. Thus (using references to the cell-letters in Figure 1)

- Total Supply of Products (TSP) = Domestic production (C) + Imports (D)

is identical to

- Total Use of Products (TUP) = Intermediate consumption (E) + Household Final Consumption (F) + Net inventory changes of products and additions to produced assets (gross capital formation) (G) + Exports (H)

35. This supply-use identity for products also applies in the monetary supply and use table. In the PSUT the supply-use identity is extended to the other types of physical flows, namely natural inputs and residuals. Total supply of natural inputs must equal the total use of natural inputs (TSNI = TUNI):

- Total Supply of Natural Inputs (TSNI) = Flows from environment (A)

is identical to

- Total Use of Natural Inputs (TUNI) = Extraction of natural inputs (B)

36. Thirdly, the supply-use-identity is valid for residuals. The total supply of residuals must equal the total use of residuals (TSR = TUR):

- Total Supply of Residuals (TSR) = Residuals generated by industry (I) + Residuals generated by households (J) + Residuals from inventories and produced assets (K) + Residuals from rest of the world (L) + Residuals recovered from environment (M)

is identical to

- Total Use of Residuals (TUR) = Residuals received by industries (N) + Accumulation of residuals within economy (O) + Residuals to the rest of the world (P) + Residual flows to the environment

37. When applied to all three types of physical flows these equalities also relate to the fundamental physical identities underpinning the PSUT concerning the conservation of mass and the conservation of energy. These physical identities imply the existence of material and energy balances for all individual physical flows within the system.

38. Another balancing principle is the input-output-identity. Over an accounting period, flows of materials into an economy must equal the flows of materials out of an economy plus any net additions to stock in the economy. Thus the input-output-identity describing the physical flows between an economy and the environment is as follows (using references to the cell-letters in Figure 1):

- Physical flows into the economy = Natural inputs (A) + Imports of products (D) + Residuals from the rest of the world (L) + Residuals recovered from the environment (M)

is identical to

- Physical flows out of the economy = Residuals flows to the environment (Q) + Exports of products (H) + Residuals to the rest of the world (P)

plus

- Net additions to stock in the economy = Net inventory changes and gross capital formation (G) + Accumulation of residuals within economy (O) – Residuals from inventories and produced assets (K)

39. This input-output-identity is applied both at the level of the entire economy (as described) and also for the industry column. For industries the input-output identity is:

- Physical input into industries = Extraction of natural inputs (B) + Intermediate consumption of products (E) + Residuals received (e.g. waste) (N)

is identical to

- Physical output out of industries = Domestic production of products (C) + Residuals generated by industry (I)

40. Particular note is made regarding the flows of residuals. For these flows a number of stages need to be recognised. In the first stage residuals are generated or enter the economy as reflected in cells (I), (J), (K), (L), and (M) in Figure 1. These residuals are received by other units in the economy (N and O), sent to other countries (P), or returned to the environment (Q). The residuals received by other units (N) may be treated or processed and then either sold as recycled or reused products (for example reused water) or returned to the environment. If sold as recycled or reused products the production is recorded in (C) and the purchase in (E), (F), or (H).

2.2 SEEA principles of physical flow accounting

41. The following sections present various important principles and accounting rules/conventions as derived from SEEA-CF (and often implicitly from SNA) which are also valid for PWFA.

2.2.1 Definition of the economy – residence principle

42. In short, PWFA record all water flows associated with activities of resident units – regardless where these activities actually take place geographically.

43. In National Accounts the economy of a country is the outcome of the activity of a very large

number of units carrying out economic activities such comprising a variety of transactions of various kinds for purposes of production, consumption, accumulation, redistribution, finance etc. (ESA 2010 paragraph 2.01).

44. The units constitute the economy of a country. The units have to be resident; i.e. their centre of economic interest has to be on the economic territory of that country. These units are termed resident units (ESA 2010, paragraph 2.04). Thus, the national economy is defined as the total of all resident units' activities. The national accounts system records all flows and stocks related to the resident units of a national economy.

45. Resident units engage in transactions with non-resident units (i.e. units which are resident in other economies). These transactions are referred to as transactions between national economy and the economy of the rest of the world.

46. It is important to note that PWFA – as in general national and environmental accounts – follow the residence principle. Water statistics and the underpinning basic water data follow rather a territory principle. Where water statistics are used to build up PWFA, adjustments might be needed to account for differences between territory and resident principle.

47. Water flows accounted for in PWFA have to be associated with resident unit's activities and not with activities of units acting on the territory. This implies that water flows associated with resident unit's activities abroad have to be taken into account. Conversely, water flows associated with non-resident's activities on the territory have to be excluded.

48. Also, since PWFA encompass only water flows associated to economic units' activities, water flows within the environment are not recorded.

49. Natural inputs denote flows from the environment to the economy, i.e. to resident units. The natural resources from which the natural inputs derive are considered to be owned by residents of the country in which the resources are located. By convention, natural resources that are legally owned by non-residents are considered to be owned by a notional resident unit and the non-resident legal owner is shown as the financial owner of the notional resident unit. Consequently, in general, the extraction of natural resource inputs must take place within a country's economic territory by economic units that are resident in the country.

2.2.2 Economic units

50. The relevant economic units are those that interact with each other and that are able to make decisions about the production, consumption, and accumulation of goods and services. They are classified in different ways depending on the type of analysis being undertaken (ESA 2010 paragraphs 2.01 – 2.03).

51. *Industries* are the most homogenous grouping of economic unit's activities. Ideally, an industry is composed of elementary units that undertake the same activity and only that activity. Industries cover, in broad categories, agriculture, mining, manufacturing, construction, and services.

52. The elementary units – which are further grouped to industries – are termed *establishments* (2008 SNA paragraphs 5.11ff.) or *local kind-of-activity units* (ESA 2001 paragraphs 2.144ff.). They are situated in a single location and in which ideally only a single production activity is carried out. These elementary units (establishments, local KAU) are hence most homogenous with regards to their activity. I.e. industries should consist of a group of establishments (SNA) or local KAUs (ESA) engaged in the same, or similar, kind-of-activity.

53. In Europe, the classification used for grouping elementary units to industries is the Statistical Classification of Economic Activities in the European Community (NACE).

2.2.3 Production boundary – principal, secondary, and ancillary production activities

54. The national account's definition of the production boundary is important to delineate products from natural inputs and residuals. The SNA defines production as processes or activities carried out under the control and responsibility of institutional units that use inputs of labour, capital, goods and services to produce outputs of goods and services (SNA 2008 §§5.5ff., see also ESA 2010 paragraphs 3.10ff.) whereby three types are distinguished: (i) principal activity, (ii) secondary activity, and (iii) ancillary activities.

55. The *principal activity* of a producer unit is the activity whose value added exceeds that of any other activity carried out within the same unit.

56. *Secondary activity* is an activity carried out within a single producer unit in addition to the principal activity and whose output, like that of the principal activity, must be suitable for delivery outside the producer unit. The value added of a secondary activity must be less than that of the principal activity, by definition of the latter. The output of the secondary activity is a secondary product.

57. An *ancillary activity* is incidental to the main activity of a producing unit. It facilitates the efficient running of the producing unit but does not normally result in goods and services that can be marketed. For producing units that are relatively small and have only a single location (i.e. enterprises), ancillary activities are not separately identified. For larger producing units it may be useful to treat ancillary activities in the same way as a secondary or even a principal product.

58. As discussed in the previous section 2.2.2 the producing units as recorded in PWFA are industries which should be as homogenous as possible as regards their production activity. This implies that production output from secondary activities should be rather small.

59. In addition to the three aforementioned types the production process and its output is de-composed along another criterion: market production, non-market production, and production for own final use (SNA 2008 § 1.42 (§ 2.40; § 5.47), see also ESA 2010 paragraphs 3.24ff.).

2.2.4 Production of goods for own account and intra-establishment production

60. The SEEA-CF applies one important variation in the recording of physical product flows compared to the SNA recording or monetary product flows (SEEA-CF §1.41-1.44). In SEEA-CF physical flow accounts all intra-enterprise flows are recorded, i.e. the production and use of goods and services on own-account within enterprises. In the monetary SNA the recording of these is limited to the production of goods for own final use (i.e. excluding intermediate use) and intra-enterprise flows related to ancillary activities. Thus for example the recording of the production of drinkable water (e.g. through groundwater abstraction) for own intermediate consumption (for example for producing beverages) is recommended in SEEA-CF.

61. The SEEA-CF also encourages the recording of own-account production and final consumption by households. For such own-account production, the production boundary used is the same as that described in SNA.

2.2.5 Goods send for processing and repair

62. There is a second case where the recording of physical product flows deviates from the SNA recording of monetary product flows (SEEA-CF §1.45). Goods send to other countries for processing and repair, or in cases of merchanting, the SEEA-CF recommends recording the actual physical flows of goods in those cases where the ownership of those goods does not change but remains with a resident of the originating country. This variation is e.g. applied when recording physical flows associated with processing of raw materials (e.g. oil refining) where the physical flow may be largely invariant to the nature of the contractual relationships which are the focus of the recording of monetary flows in the SNA and the Balance of Payments. This variation is not much relevant for water.

2.2.6 Units of measurement

63. Physical flows are recorded in physical measurement units. The water flows recorded in PWFA are measured by their volume (m^3).

2.2.7 International transport

64. International transport refers to the movement of people, animals, and goods from one location to another thereby crossing country borders. The appropriate recording of international transport activity is centred on the residence of the operator of the transport equipment. It is important particularly for information concerning the use of fuels and the associated release of emissions; while it is not much relevant for water.

2.2.8 Tourist activity

65. The recording of tourist activity is consistent with the recording of international transport activity in that the concept of residence is central. Tourist activities include travelling outside their country of residence including the stay of short term students (i.e. less than 12 months), people travelling for medical reasons and those travelling for business or pleasure. The consumption activity of a tourist travelling abroad is attributed to the tourist's country of residence and not to the location the tourist visited. Thus purchases by the tourist in other countries are recorded as an export of the country visited and as an import of the country of residence of the tourist.

66. Residuals (wastewater) generated by tourists will generally be attributed to local enterprises (e.g. hotels and restaurants).

3 PWFA-questionnaire

3.1 Overview – set of five PWFA Tables

67. Eurostat's electronic questionnaire for Physical Water Flow Accounts (PWFA-questionnaire) is a MS EXCEL workbook and designed in a way that it accommodates data only for one reporting year. This implies that a series of EXCEL workbook files is required to transmit time series.

68. The PWFA questionnaire EXCEL workbook has five reporting tables where actually data are filled in. Figure 2 provides an overview. This section explains briefly the five tables:

69. Table A – Physical water supply table

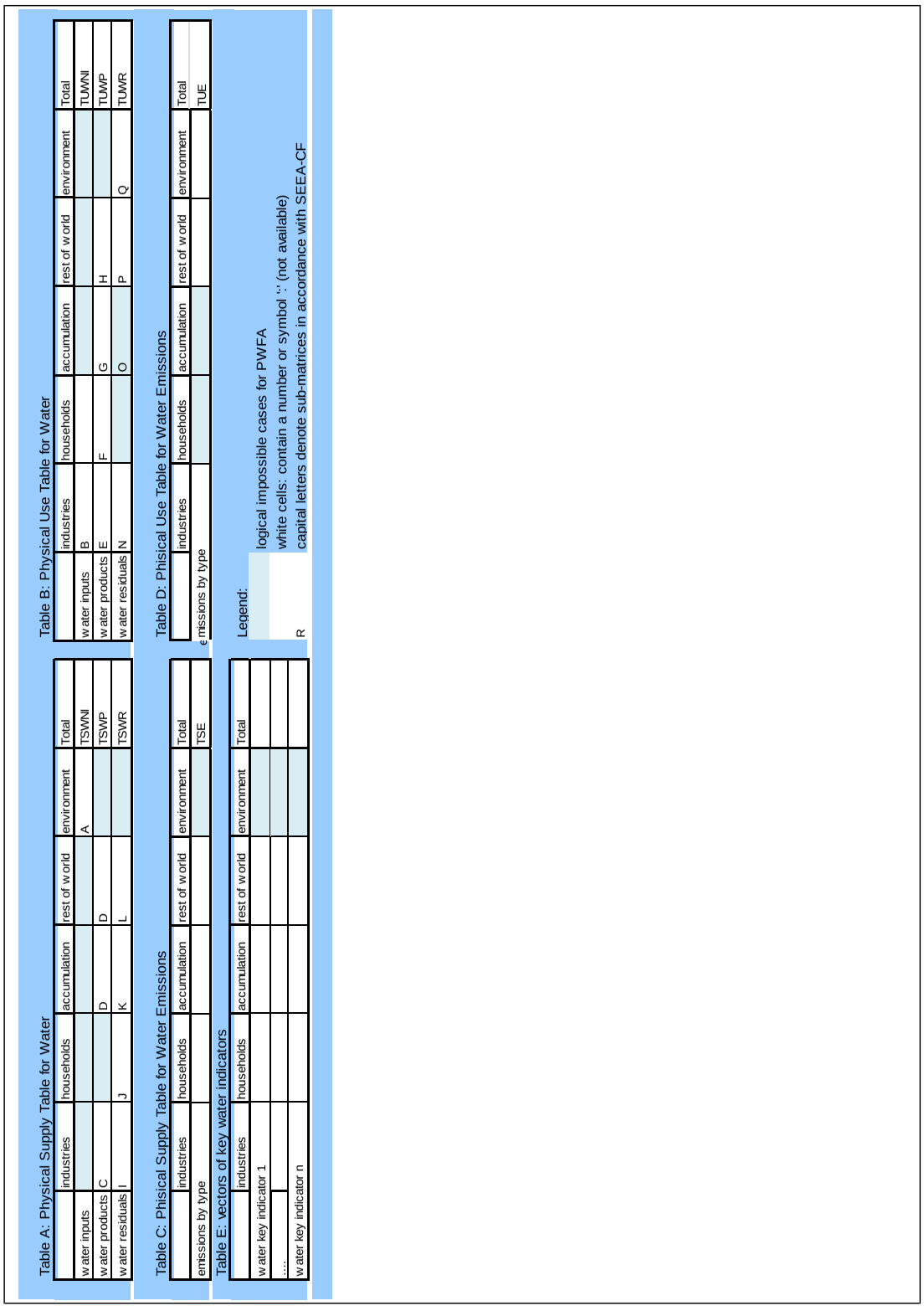
70. Table B – Physical water use table

71. Table C – Physical supply table for emissions to water

72. Table D – Physical use table for emissions to water

73. Table E – Key water indicators

Figure 2: Scheme providing an overview on the set of tables in the PWFA electronic questionnaire



3.2 Tables A and B – physical supply and use tables of water flows

74. Tables A and B constitute full-fledged physical supply and use tables (PSUT) for water flows as introduced in SEEA-CF chapter 3.5 (see also Figure 1 in this manual). Emissions to water are recorded in a separate PSUT (Table C and D) discussed below in section 3.3.

75. Tables A and B in principle have the same column and row structures/formats. Row-wise they distinguish three broad types of flows, namely water as natural input, water products, and water residuals which corresponds respectively to the abstraction of water, the distribution and use of abstracted water and the flows of wastewater and reused water. Column-wise they show the origin and the destination respectively of the various flows. The classifications used for the three physical flow types are described and further explained in section 3.4. Section 3.5 describes the columns and their classification.

76. As shown in Figure 2 the two basic physical supply and use tables (Tables A and B) can be decomposed into various sub-matrices in order to explain better their content. Capital letters in the scheme provided in Figure 2 denote these sub-matrices (or cells). These capital letters are the same as used in SEEA-CF (chapter 3, Table 3.1, see also Figure 1 in this manual).

77. Table A is a physical supply table. It records the supply of water (row-wise) by origin, i.e. 'supplier' (column-wise):

- Cell A in Table A shows water as provided (supplied) by the environment as natural input. Water as natural input can originate from artificial reservoirs, rivers, lakes, groundwater bodies, soil, and the atmosphere (precipitation). Precipitation is only recorded in the PSUT when it enters the economy, i.e. is captured by human activities (e.g. capture of water from the roof or urban runoff channelled in sewers).

- Further Table A shows the supply of water products. Water as a product originates mainly from the water supply industry as a primary production output (cell C). Water as a product can also be imported (cell D). Theoretically water products could also be taken from stocks (cell D).

- Finally Table A presents the supply of water residuals (wastewater and reused water). Water residual flows may originate from various sources: Industries (cell I) and households (cell J) produce water residuals mainly through transformation and end use of water products. Wastewater could also be imported for treatment (cell L). Notably they include evapotranspiration.

78. Table B is a physical use table and records the use of natural water inputs, water products, and water residuals (row-wise) by destination, i.e. 'user' (column-wise).

- Table B shows how natural water inputs are used (abstracted) by industries (cell B) in their production processes.

- Further Table B presents how water products are used by industries (cell E) and households (cell F). Water products may go on and off product inventories (e.g. water

products produced in one period and sold in the following period). These inventory changes in water products are recorded net in the accumulation column of the physical use table (cell G) whereby negative signs imply a net supply from inventories. The rest of the world column records the export of water products (cell H).

- Thirdly, Table B records the use of water residuals. Water residuals may be used by industries (cell N) e.g. for water re-use or waste water treatment. Eventually water residuals will flow into the natural environment (cell Q) i.e. be 'used' by the natural environment. Note that water residuals also include evapotranspiration of water to the atmosphere. It happens that water residuals are sent to the rest of the world (cell P) e.g. treatment plants in a neighbouring country. Theoretically water residuals may also go on stock (cell O).

3.3 Tables C and D – physical supply and use tables of emissions to water

79. Tables C and D constitute full-fledged physical supply and use tables (PSUT) for flows of emissions to water as introduced in SEEA-CF chapter 3.6 (see also Figure 1 in this manual) and further developed in the IRWS chapter 4 (§§ 4.84 to 4.98).

80. Tables C and D in principle have the same column and row structures/formats. Row-wise they distinguish emission flows by type of substance. Column-wise they show the origin and the destination respectively of the various flows of emissions. The classifications used for the flows types are described and further explained in section 3.4. Section 3.5 describes the columns and their classification.

81. The structure of Table C and D is a reduced version of that of the general PSUT as shown in Figure 2. The supply table shows the emissions by industries and households by type of substance. Notably the supply table also shows the supply of emissions from treated waste water by the sewerage industry. The accumulation column describes emissions of relevant substances from fixed assets (e.g. vessels operating within a country's water resources). Water emissions do not include the flows of substances through natural flows of water resources. The use table shows the collection of releases to wastewater for treatment by the sewerage industry and the emissions to the environment (see also SEEA-CF § 3.263).

3.4 Classification of rows

3.4.1 Tables A and B

82. PWFA Tables A and B present row-wise the flows of water as natural inputs, water products, and water residuals. The three generic types of physical flows are explained in section 2.1.

83. For the purpose of the PWFA questionnaire Eurostat developed in close consultation with

experts from national statistical institutes (NSIs) a classification of water as natural inputs, water products and water residuals which is presented in Table 1. It comprises in total 45 items. Natural water input flows are classified according to their origin. Water products are classified on the basis of the Statistical Classification of Products by Activity in the European Economic Community (CPA). Natural water has the CPA product code 36 and can be further decomposed into drinkable and non-drinkable water. A second water product group includes CPA codes 35.30.11 and 35.30.21 (steam hot water and ice). A third water product group comprises all remaining CPA products which may incorporate water (e.g. beverages). Water residuals are classified according to their state and quality. Evapotranspiration refers to the gaseous state of water. Wastewater refers to the fluid state and is further distinguished into treated and un-treated (i.e. a kind of quality criteria).

Table 1: PWFA questionnaire – classification of water as natural inputs, water products, and water residuals (PWFA rows of tables A and B)

level	code	label
		WATER AS NATURAL INPUTS
1	A.1	Inland Water Resources (excl. soil water), total
2	A.1.1	Surface Water
2	A.1.2	Groundwater
2	A.1.3	Soil Water
1	A.2	Precipitation
1	A.3	Sea Water
		WATER PRODUCTS
1	CPA 35	Electricity, gas, steam and air conditioning
2	CPA 35.30.11	Steam and hot water
2	CPA 35.30.12	Steam and hot water supply services through mains
1	CPA 36	Natural water; water treatment and supply services
2	CPA 36.00.11	Drinking water
2	CPA 36.00.11	Non-drinking water
1	CPA X	Water incorporated in products [related to all remaining CPA divisions]
		WATER RESIDUALS within the economy
1	B.1	Wastewater treated
1	B.2	Wastewater untreated
		WATER RESIDUALS from the economy to the environment
1	C.1	Water to surface water bodies
2	C.1.1	Hydroelectric power generation
2	C.1.2	Irrigation water

level	code	label
2	C.1.3	Mine water
2	C.1.4	Urban runoff
2	C.1.5	Cooling water
2	C.1.6	Treated wastewater
2	C.1.7	Other
1	C.2	Water to groundwater bodies
2	C.2.1	Irrigation water
2	C.2.2	Mine water
2	C.2.3	Urban runoff
2	C.2.4	Losses in distribution because of leakages
2	C.2.5	Other
1	C.3	Water to sea
2	C.3.1	Irrigation water
2	C.3.2	Mine water
2	C.3.3	Urban runoff
2	C.3.4	Cooling water
2	C.3.5	Treated wastewater
2	C.3.6	Other
1	C.4	Water to land
2	C.4.1	Irrigation water
2	C.4.2	Mine water
2	C.4.3	Urban runoff
2	C.4.4	Cooling water
2	C.4.5	Losses in distribution because of leakages
2	C.4.6	Treated wastewater
2	C.4.7	Other
1	C.5	Evapotranspiration

84. Annex 2 presents exact definitions of each PWFA row class. The classes are based on international definitions, namely from:

- International Recommendations for Water Statistics (IRWS[4])

[4] UN 2012.

- OECD/Eurostat Joint Questionnaire on Inland Waters (JQ-IW)

85. Annex 2 presents the exact correspondences between the PWFA row classes shown in Table 1 and the various international classifications.

3.4.2 Tables C and D

86. PWFA Tables C and D present row-wise the flows of emission to water by substance and/or chemical parameter respectively.

87. For the purpose of the PWFA questionnaire Eurostat developed in close consultation with experts from NSIs a classification which is presented in Table 2.

Table 2: PWFA questionnaire – classification of emissions to water (PWFA rows of tables C and D)

level	code	label
1	E.1	BOD
1	E.2	COD
1	E.3	Suspended Solids (SS)
1	E.4	N-total
1	E.5	P-total
1	E.6	Cd
1	E.7	Cr
1	E.8	Cu
1	E.9	Pb
1	E.10	Ni
1	E.11	Zn

88. Tables C and D distinguish 11 different substances and/or chemical parameters – BOD, COD, suspended soils, N, P, Cd, Cr, Cu, Pb, Ni, and Zn. The supply table (Table C) shows the emissions of these substances by origin. Note that the supply of so-called non-point source emissions from urban runoff and agriculture are assigned to the sewage industry (NACE 37) and agriculture (NACE 01) respectively. In the use table (Table D) the physical flows of these substances can be subdivided into "direct emissions to water" and "to sewerage (NACE 37)". The former are all flows of emissions which are taken up ('used' by) the environment (surface water, groundwater, the sea). The latter are all flows of emissions taken up by the sewerage industry.

3.5 Classification of columns (industries, households, etc.)

89. The columns of the physical supply and use tables (i.e. PWFA Tables A, B, C and D) show the origins and destinations of the respective flows (specified row-wise). The columns of the supply Tables A and C constitute the origins whereas the columns in the use Tables B and D denote the destinations of the respective water and emissions flows (see also section 2.1). Annex 3 presents the full hierarchical classification of columns employed in the PWFA questionnaire.

90. In accordance with SEEA-CF the columns are broken down by five generic types of activities:

- Production activities (i.e. industries),
- Consumption activities (i.e. households),
- Accumulation (changes in stocks of produced assets and product inventories),
- Rest of the world (imports and exports), and
- Environment (supply of natural water inputs and absorption of residuals).

91. The first generic column type relates to production activities by industries. Industries are homogenous groupings of resident units producing the same output (see also section 2.2). A production activity is defined as the process of transforming certain inputs (products, labour, capital) into outputs (products, i.e. goods and services).

92. NACE is the European classification for production activities. In PWFA Tables the industries are broken down using the NACE classification. The basic breakdown level chosen in the PWFA questionnaire is A*64 (divisions). In addition some groupings on one-letter-level (A*21) are inserted so that the column classification is a nested hierarchical one. This is consistent with monetary supply and use tables.

93. Some industries are of special relevance to water flows in the PSUTs because they use large quantities of water, discharge large quantities of sewage to other economic units or the environment, or are major sources of waterborne emissions. These industries include:

- Agriculture (NACE Rev.2, division 01): Agriculture may use water products for irrigation and water as a natural input in rain-fed agriculture. It is also a significant non-point source of emissions, in particular of nitrogen and phosphorus.
- Mining and quarrying (NACE Rev.2, divisions 05-09): Significant quantities of water as natural input and residual are moved as part of mine dewatering operations. Mining may also be a significant source of emissions to water.
- Manufacturing (NACE Rev.2, divisions 10 to 33): Significant quantities of water are used in production processes and for cooling. The major manufacturing industries that use large amounts of water are food and beverage, textile, leather, paper, petroleum and chemicals industries. In addition, these industries are the source of large amounts of wastewater discharge.

- Electricity, gas, steam and air conditioning supply (NACE Rev.2, Section D, division 35): Large amounts of water are used for cooling activities and source of thermal pollution especially in thermoelectric and hydroelectric electricity production.
- Water collection, treatment and supply (NACE division 36).
- Sewerage (NACE division 37).

94. For Crop and animal production, hunting and related service activities (NACE division 01) and Electricity, gas, steam and air conditioning supply (NACE division 35) PWFA Tables include also a more detailed breakdown of production activities at the third and fourth level of NACE (NACE's groups and classes respectively).

95. For some economic sectors, the breakdown of the NACE system does not discern specific sectors separately but groups them in more aggregated classes. Hydroelectric power generation and thermoelectric sectors are two important sectors in terms of significant water abstraction and return flows that are not represented separately in NACE classification. Therefore, a further disaggregation of electricity, gas, steam and air conditioning supply (NACE 35) can be used in the PWFA as follows:

- Electricity, gas, steam and air conditioning supply (NACE division 35)
    - Electric power generation, transmission and distribution (NACE group 35.1)
        - Production of electricity (NACE class 35.11)
            - Thermoelectric (new code – 35.11a)
            - Hydroelectric (new code – 35.11b)
            - Nuclear (new code – 35.11c)

96. The second generic column type relates to the consumption activities of households. Households are resident units consuming products and generating residuals from this consumption. Note that in monetary national accounts households' consumption activity is the final use of products, i.e. the recording ends at this stage. Physical accounts also record the corresponding output from consumption activities in form of residual flows.

97. The household column in PWFA Tables A, B, C, and D relates solely to the consumption activity of households (see SEEA-CF §2.41, §§3.27ff.). Should households engage in the abstraction of water and transform it to water products (e.g. abstraction of water for own use) then this is to be considered as a production activity. The production is recorded in the first generic column (e.g. under the column hosting the water supply industry). In a second step the produced water is consumed by households; recorded under the household column.

98. Government consumption activities are not considered in the classification of columns. In monetary accounts government final consumption records the acquisition and consumption of their own output because the final user cannot be specified as it is the entire society (see SEEA-CF §§3.27ff). This convention of booking has no equivalent in physical flow accounts. The water flows related to production activities of government are entirely recorded in the first generic column (industries).

99. The fourth generic column is entitled accumulation. Broadly it relates to the stock of water in the economy. The PWFA questionnaire does not further detail the accumulation column, i.e. it remains one single column. Changes in inventories are not much relevant for the PWFA, since these are usually negligible given that water is a bulky commodity.

100. Note that a column entitled 'statistical discrepancies' aside the accumulation column could be added to the PWFA questionnaire's Tables whenever the need might arise. The 'statistical discrepancies' column hosts possible discrepancies in the primary data. E.g. the statistic on the supply of a given water product may originate from production statistics whereas the statistic on the use of the same product may have another source (e.g. consumer surveys). The various sources may lead to a mismatch of the total supply and the total use of a product which is then booked in the column 'statistical differences'.

101. The fifth generic column is the environment. It hosts the supply of water as natural inputs and the absorption of water residuals. It is a single column in the PWFA questionnaire, i.e. not further broken down.

102. Annex 3 presents the full and detailed classification of PWFA columns.

3.6 Table E – Key PWFA indicators

103. Table E presents vectors of certain key indicators derivable from Tables A, B, C and D.

104. This table does not have the matrix format as the previous tables. This table shows row-wise vectors of key water indicators. Column-wise it 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.

105. Three key indicators have been identified following the SEEA-CF (§ 3.5.4):

- 'Water consumption' (K.1) is equal to evapotranspiration, water incorporated into products, and water to sea..
- 'Water use' (K.4) is the total water abstracted from the environment and imported.
- 'Net emissions' (K.9) is the sum of the direct and indirect release of pollutants into water resources.

106. 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. They are defined by making reference to the cells as illustrated in Figure 2. These indicators can be combined with monetary information (gross value added and production) in order to give efficiency measures.

107. 'Water consumption' (K.1) gives an indication of the amount of water that is lost by the economy during use in the sense that it has entered the economy but it has not returned to inland water resources (surface, ground, and soil water bodies). This happens because during use part of the water is incorporated into products, evaporated, transpired by plants or simply consumed by households or livestock. Discharges of water into the sea is also

considered as water consumption since this water, once in the sea, is not directly available for further use as it would be in the case, for example, of discharges into a river, where discharged water becomes a resources for downstream uses. Water consumption is then the sum of evapotranspiration, water incorporated into products and discharges of water into the sea. Combining physical and monetary information one can derive water consumption per gross value added (K.2) and water consumption per unit of production output (K.3).

108. 'Water use' (K.4) refers to use of water by agriculture, industry, energy production and households, excluding in-stream uses such as fishing, recreation, transportation and waste disposal. It is the sum of water abstraction from the environment and water received from other economic units. Combining physical and monetary information one can derive water use per gross value added (K.5) and water use per unit of production output (K.6). This information can be disaggregated by type of source and can also be measured by industry.

109. 'Net emissions' (K.9) corresponds to pollutants discharged into water resources. When wastewater is discharged directly into a water body gross and net emissions coincide. In practice, however, an economic activity may discharge part of its wastewater directly into water resources (thus releasing the pollutants directly), and supply the rest to a wastewater treatment plant which, after treatment, discharges the 'treated' wastewater into the environment. Since the 'treated wastewater' may still contain traces of the pollutant generated by the economic activity, the net emission of the economic unit would correspond to the sum of the direct release of pollutants into water resources and the indirect release through wastewater treatment plants.

110. For the whole economy, the difference between gross and net emissions totals would correspond to the pollution removed by treatment plants. The distinction between gross and net emissions is not applicable for non-point pollution (e.g. resulting from agriculture).

111. In the calculation of the net emissions, the release of pollutants by the sewerage industry, (NACE 37) is reallocated to the economic unit responsible for the discharge in the first place. This is often difficult to calculate as the sewerage industry treats aggregated flows of wastewater coming from diverse users of the sewage system. In general, the allocation of emissions in the return flow of NACE 37 to the original economic unit responsible for generating that pollution is obtained by applying abatement rates of the treatment plant to every emission collected by the treatment plant.

112. Combining physical and monetary information one can derive net emissions per gross value added (K.10) and net emissions per unit of production output (K.11). This information can be disaggregated by industry and presented in absolute figures and as a share of total net emissions.

113. Two other indicators are included in Table E: the ratio of water consumption to water use by industries (K.7), and the ratio of losses in distribution to total water use (K.8).

Table 3: PWFA questionnaire – Indicators

level	code	Label [unit of measure]
1	K.1	Water consumption [m3]

level	code	Label [unit of measure]
1	K.2	Water consumption per GVA (gross value added) [m3 per currency unit]
1	K.3	Water consumption per Production Output [m3 per currency unit]
1	K.4	Water use [m3]
2	K.4.1	of which: natural inputs (i.e. direct abstraction) [m3 and/or %]
3	K.4.1.1	of which from surface and groundwater [m3 and/or %]
1	K.5	Water use per GVA (gross value added) [m3 per currency unit]
1	K.6	Water use per Production Output [m3 per currency unit]
1	K.7	Water consumption / water use
1	K.8	Losses in distribution / total water use
1	K.9	Net Emissions [kg]
1	K.10	Net Emissions per GVA [kg per currency unit]
1	K.11	Net Emissions per Production Output [kg per currency unit]

114. The electronic PWFA questionnaire populates Table E automatically from Tables A, B, C and D. The formulas for calculating indicators according to the items included in Tables A, B, C and D are given in the sheet CAL.

4 General compilation guidelines

115. Like in the case of classical monetary national accounts the compilation of PWFA is based on a wide range of information and potential data sources. As common to all accounts PWFA is not depending on surveys but exploiting existing data sources.

4.1 Data sources

4.1.1 National water statistics

116. It is assumed that national water statistics constitute the primary data source for compilers of PWFA. Depending on the scope and level of detail provided in national water databases the compiler will need additional auxiliary data sources such as e.g. national accounts, waste and wastewater statistics, balance of payments, employment statistics, foreign trade statistics etc.

117. On national level the basic data underpinning national water statistics may be organised in various ways. Internationally the collection of water statistics has been standardised though. Eurostat and the OECD jointly collect statistics through the Joint Questionnaire on Inland Waters (JQ-IW), a questionnaire sent out to European countries and OECD members biennially. This manual can only make reference to the data format of the JQ-IW because the format and structures of national water statistics vary considerably across countries and unknown to the authors of this manual.

4.1.2 International water statistics: OECD/Eurostat Joint Questionnaire on Inland Waters

118. The main source of harmonised water related statistics for European countries is the OECD/Eurostat Joint Questionnaire on Inland Waters (JQ-IW).

119. It should be noted that the JQ aggregates some NACE categories where the water PSUT does not.

120. The definitions and boundaries of the JQ-IW are very close but not completely aligned to the SEEA-CF. In some cases the differences are simply a matter of terminology and are of minor importance. For example the JQ-IW aggregates some NACE categories where the PWFA does not. Another example is the variable self-supply in the JQ-IW (abstraction of water by the user for own final use). The water accounting does not consider abstraction for own use a supply but a use.

121. In some cases the differences are more important. For example the JQ-IW variable "Reused water" is defined as water that has undergone wastewater treatment and is delivered to a user as reclaimed wastewater. The SEEA-CF includes in its definition of reused water also wastewater that is delivered without treatment to a user. The PWFA however, has dealt with

this issue through the separation of the variable wastewater into treated and untreated wastewater. A full list of differences between the JQ-IW and water accounts is available on request from the UNSD.

122. Below follows some guidance on what tables in the JQ can be of use when filling the water PSUTs with regards to the water flows (PWFA Tables A and B). With regards to the emission tables the JQ table 7 is the table of interest.

Table 4: PWFA Tables A and B: links to the JQ-IW Tables

Flow	Code	Label	A Agriculture, forestry and fishing	B Mining and quarrying	C Manufacturing	D Electricity, gas, steam and air conditioning supply	E Water supply; sewerage, waste management and remediation activities	36 Water collection, treatment and supply	37 Sewerage	F Construction	G-H-I-J-K-L-M-N-O-P-Q-R-S-T-U Services	Final consumption by households	Changes in inventories	RoW	Environment
	Industries (NACE)		1	36	42	67	72	73	74	77	81	130	134	137	138
From Environment to Economy	A.1	Inland water resources													JQ tab. 2.1
	A.1.1	Surface water													JQ tab. 2.1
	A.1.2	Groundwater													JQ tab. 2.1
	A.1.3	Soil water													
	A.2	Precipitation													
	A.3	Sea water													JQ tab. 2.1
Within the Economy	CPA 35	Electricity, gas, steam and air conditioning													
	CPA 36	Natural water; water treatment and supply services						JQ tab 3.1							
	B.1	Wastewater - treated	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1									
	B.2	Wastewater - untreated	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1								
From Economy to Environment	C.1	Water to surface water bodies	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ table 7							
	C.2	Water to groundwater bodies	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1								
	C.3	Water to sea	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1								
	C.4	Water to land	JQ tab. 2.1	JQ tab. 2.1											
	C.5	Evapotranspiration	JQ tab. 2.1	JQ tab. 2.1											

Flow	Code	Label	A Agriculture, forestry and fishing	B Mining and quarrying	C Manufacturing	D Electricity, gas, steam and air conditioning supply	E Water supply; sewerage, waste management and remediation activities	36 Water collection, treatment and supply	F Construction	G-H-I-J-K-L-M-N-O-P-Q-R-S-T-U Services	Final consumption by households	Changes in inventories	RoW	Environment
	Industries (NACE)		1	36	42	67	72	73	77	81	130	134	137	138
From Environment to Economy	A.1	Inland water resources												
	A.1.1	Surface water		JQ tab. 2.1	JQ tab. 2.1	JQ tab. 2.1		JQ tab. 2.1						
	A.1.2	Groundwater		JQ tab. 2.1	JQ tab. 2.1			JQ tab. 2.1			JQ tab. 2.1			
	A.1.3	Soil water												
	A.2	Precipitation												
	A.3	Sea water			JQ tab. 2.1	JQ tab. 2.2								
Within the Economy	CPA 35	Electricity, gas, steam and air conditioning												
	CPA 36	Natural water; water treatment and supply services		JQ tab. 3.2	JQ tab. 2.1					JQ tab. 3.1	JQ tab. 3.1			
	B.1	Wastewater - treated												
	B.2	Wastewater - untreated												
From Economy to Environment	C.1	Water to surface water bodies												
	C.2	Water to groundwater bodies												
	C.3	Water to sea												
	C.4	Water to land												
	C.5	Evapotranspiration												

123. The data contained in the JQ-IW cover a majority of what is needed to compile PWFA. Since both water accounts and the JQ-IW are based on the same water statistics framework (terms, definitions, classifications) and the JQ-IW follows the most relevant accounting principle by using NACE-activities, Eurostat developed a data structure definition (DSD) which accommodates both PWFA and the JQ-IW (see Annex 1).

124. The data structure definition (DSD) describes basically the dimensions of a multidimensional data cube. There are three modules for which joint DSDs for PWFA and JQ-IW have been developed: 'resources', 'waterflows', and 'emissions'. A fourth DSD for 'infrastructures' serves the JQ-IW only.

4.1.3 International water statistics: Aquastat

125. Aquastat is FAO's global water information system, which collects analyses and disseminates information on water resources, water uses, and agricultural water management. Aquastat is organised in six different databases that contain information on water resources, water uses, and agricultural water management. These databases are hosted by the Food and Agriculture Organisation of the United Nations (FAO).

126. The main database contains country specific information, and it is possible to extract country fact sheets that contain general information about e.g. country area or population, but also its water resource and water withdrawal by a few aggregate sectors such as agriculture, municipal and industrial sector. It also presents information regarding irrigation and drainage.

127. The usefulness of Aquastat in directly applying the information in the PWFA is limited. Perhaps only one or two variables can be directly linked. These would be water withdrawal from the agriculture sector and information based on the modelled data that will be described later in this chapter. Nevertheless the information in the fact sheets can also be used as known totals to be reallocated to the NACE activities using other economic statistics.

128. In order to use the information of the Aquastat database to fill the PWFA some caution is required. The database does not reveal its specific sources and the data are sometimes estimated based on for example the data available through the JQ-IW. The information is also highly aggregated which would require further work in order to fill the PWFA. It is however easily possible to contact the FAO in order to receive more information about specific country data.

4.1.4 Data sources related to industry detailing

129. The detail of industries in PWFA (classification of columns in PWFA Tables A, B, C and D) is NACE aggregation level A*64 (see section 3.5). In many national water statistics this level of detail may not be available.

130. There are various sources which can be used as auxiliary data to estimate/derive distribution keys. The general idea is to derive shares allowing to distribute a given water use figure over a number of NACE divisions. The most challenging is probably finding good distribution keys for the service industries. The NACE aggregation level A*64 distinguishes more than 30 service industries.

131. **Monetary supply and use tables**[5] form one possible auxiliary data source. The monetary use structures may be used to derive a distribution key in particular in the service industry. The annual use table presents the use of three groupings relevant for water products by 64 NACE industries in purchaser prices (distinguished by domestic produced versus imported):

- Natural water; water treatment and supply services (CPA E36)

[5] http://epp.eurostat.ec.europa.eu/portal/page/portal/esa95_supply_use_input_tables/introduction

- Electricity, gas, steam and air-conditioning (CPA D35)

132. CPA 35 can be further disaggregated into CPA 35.30.11 (Steam and hot water) and CPA 35.30.12 (Steam and hot water supply services through mains). CPA 36 can be also disaggregated into CPA 36.00.11 (drinking water) and CPA 36.00.12 (non-drinking water).

133. **Structural business statistics** (SBS)[6] may constitute another auxiliary data source. SBS includes e.g. expenditure for wastewater treatment (in monetary value) by a very detailed NACE class level for manufacturing industries and construction.

4.1.5 Other data sources: E-PRTR

134. The E-PRTR stands for: European pollutant release and transfer register. It is based on an EC regulation[7] that is intended to improve public access to information about the environment.

135. The E-PRTR contains data on the main pollutant releases to air, water and land of about 28,000 industrial facilities across the European Union and EFTA countries. It also contains data on off-site transfers of waste water and waste from these facilities.

136. Reporting to E-PRTR is carried out based on measurement, calculation or estimation of releases and off-site transfers. The European Environment Agency is hosting the database.

137. The database, available through the web-site of the EEA[8] can be useful when compiling tables C and D. The EEA have made the information publicly available and even summarised the results for further use. The information is linked through several tables where identification keys are available connecting the different tables. Each row shows a specific enterprise (though not necessarily as seen in statistical registers), its NACE class, a range of pollutants emitted to water and what method has been used to show the pollutant levels.

138. However, the E-PRTR is an administrative register used for regulatory follow up. This means that reporting is obligatory for a specific number of facilities that meet a number of criteria through certain thresholds. The primary use of the information is not to produce statistics but to ensure that regulations are followed and applied appropriately.

139. Some of the issues related to the use of an administrative register or regulatory information are that statistical theory does not apply. This means that a national total with accompanied quality calculations (mean standard error or variances) cannot be fully accounted for. If enterprises, units or variables are missing these cannot be assumed to be random and therefore representative for the sample. This is because there is no sample (thresholds apply) even though one could consider the statistical population to be all economic units.

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[6] http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/introduction

[7] Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC.

[8] http://www.eea.europa.eu/data-and-maps/data/member-states-reporting-art-7-under-the-european-pollutant-release-and-transfer-register-e-prtr-regulation-9

140. Another issue with the information in the database relates to the units that have the obligation to report data. The E-PRTR uses the unit facility, which does not coincide with statistical units such as for example enterprises.

141. Something that might also represent a problem linking different types of statistical information to that available in the E-PRTR is the NACE classification of facilities. In some countries the facility itself is reporting to the E-PRTR also the NACE category in which it considers itself belonging to. This means that some might not report the correct NACE code, or at least the one that is used in statistical registers.

142. A third issue relates to the control of the data transmitted. The reporting country has to validate its own data and even if there are assisting tools for doing so, errors are still likely to appear.

4.1.6 The use of modelled data

Estimation of evapotranspiration in agriculture and forestry industry

143. Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation and transpiration. Accurate estimates of ET are needed for recording soil water abstraction and return flows from agriculture industry. Precipitation and irrigation are the two primary sources of water that plants use. Plant leaves and soil surfaces temporarily retain some part of the water applied to the field. This part is readily available for evaporation. The remaining part infiltrates into the soil. Plants extract the infiltrated water through their roots and transport it up to their leaves for photosynthesis.

144. Many factors affect ET including: weather parameters such as solar radiation, air temperature, relative humidity, and wind speed; soil factors such as soil texture, structure, density, and chemistry; and plant factors such as plant type, root depth and foliar density, height, and stage of growth. Although ET can be measured using such devices as lysimeters, estimating ET using analytical and empirical equations is a common practice because measurement methods are expensive and time consuming.

145. One of the models frequently used for the estimation of ET is the EPIC model[9] (Williams et al., 1990; Williams, 1995), also available in grid-based form (Liu et al., 2007). Another model is the CROPWAT model[10] developed by the Food and Agriculture Organization (FAO) of the United Nations (FAO, 2009), which is based on the method described in Allen et al. (1998). Without the intention to exclude good alternative models, Eurostat recommends to use the CROPWAT model because of its wide application, online availability, good documentation and embedding in FAO practice.

[9] The Erosion Productivity Impact Calculator (EPIC) is a model to support assessments of soil erosion impacts on soil productivity for soil, climate, and cropping conditions.
[10] CROPWAT is a model for the calculation of crop water requirements and irrigation requirements based on soil, climate and crop data: http://www.fao.org/nr/water/infores_databases_cropwat.html

4.2 Compiling PWFA tables A and B

146. PWFA Tables A and B describe the flow of water from the environment to the economy, its supply and use within the economy, as well as to its final discharge back to the environment. PWFA Tables A and B do not account for flows within the environment (for example between inland water resources and the atmosphere, between the sea and inland water resources, as well as the flows between the different inland water resources such as surface water, groundwater and soil water) which are recorded in the asset accounts (see SEEA-CF, chapter 5).

147. The functional system boundary between economy and environment in the PWFA refers to the system which abstracts water for consumption and production activities, or puts in place the infrastructure to mobilize, store, treat, distribute and return water into the environment. This boundary definition restricts the abstraction by the economy to the purpose for consumption and production activities. For example, only the part of soil water that is evapotranspirated by the crops is considered as abstraction from soil water by the agricultural sector and is recorded in the PWFA. Similarly, only the part of soil water that is evapotranspirated by the trees is considered as abstraction from the soil water by the forestry sector and is recorded in the PWFA.

148. The unit of measurement for the physical data items is cubic metres. For the collection of primary data other units of measure may also be used, such as units typically used by farmers to measure abstraction (e.g. gallons, litres etc.), but for the purposes of presenting data and for comparison, it is important to convert data into standard scientific measurement units (i.e. the metric system). Notably the water evapotranspirated needs to be converted into cubic metres.

149. Data items can be collected with reference to a number of different spatial and temporal levels. For PWFA data items are compiled at the national level. Compilation of data for a river basin or other hydrological relevant area may be appropriate. However, corresponding economic data will only be available only for administrative regions and thus will not align to water flows related data.

150. It is generally recommended that water accounts are developed for the time period used in the SNA, which is the calendar year. This allows direct temporal comparability between economic and environmental aspects of water statistics and facilitates the integration of the PWFA with monetary PSUTs and other environmental accounts.

4.2.1 Agriculture, forestry and fishing industry

151. Agriculture, forestry and fishing industry (NACE Section A) includes establishments engaged in the exploitation of plant and animal natural resources, comprising the activities of growing of crops, raising and breeding of animals, harvesting of timber and other plants, animals or animal products from a farm or their natural habitats. Crop and animal production is a very large water user in most countries. For example, irrigators abstract water from surface water or groundwater or receive it from water suppliers, while rain-fed agriculture is a large direct user of soil water.

152. Agriculture includes the class support activities for crop production (NACE 01.6). This class includes the operation of agricultural irrigation systems but does not include the provision of water (which belongs to NACE 36) or any construction activity involved in the provision of this service. Therefore, the losses and evaporation from distribution systems of irrigation water are not recorded under this industry.

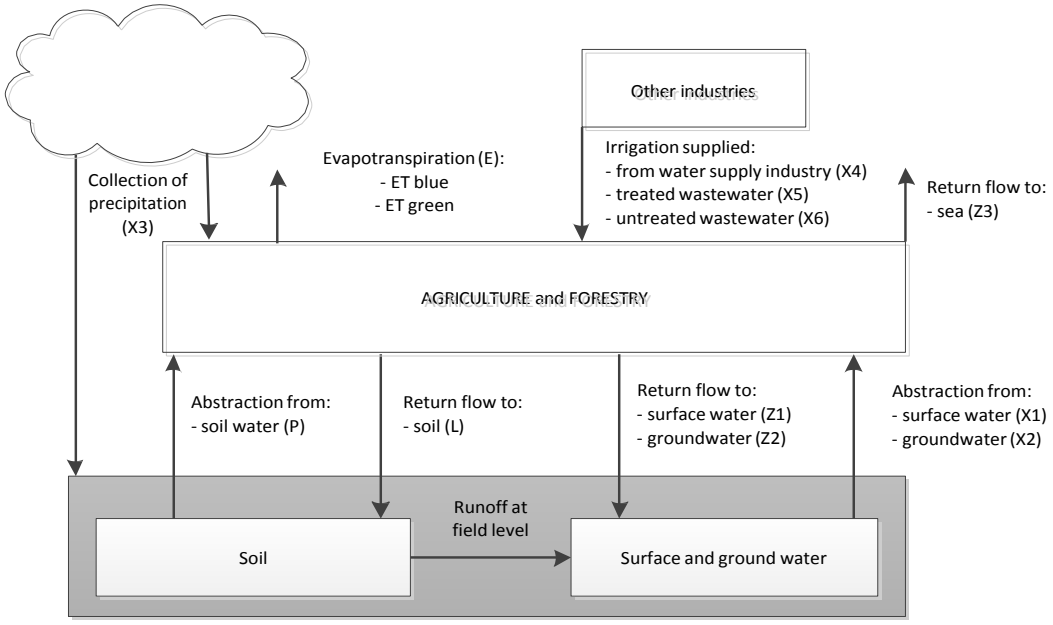
153. Identification and quantification of the input and output components of water to the plant root zone are very important for determining where to record the inflows and outflows. Water inputs to the plant root zone include rainfall, irrigation water, and capillary rise from ground water. The outputs include runoff, evapotranspiration, and deep percolation.

154. As shown in Figure 3, agriculture industry has two main type of water use: irrigation water and soil water. The sources of irrigation water are: abstraction from surface water and groundwater, collection of rainwater, water supplied from water supply industry, treated wastewater supplied from other industries and untreated wastewater from other industries. Soil water abstraction by agriculture industry is the volume of precipitation that falls onto agricultural fields and is then transpired or incorporated in crops.

155. The outflows from agriculture industry include flows to the atmosphere in terms of evapotranspiration, return flows to soil, as well as drainage water. Drainage water can be discharged into surface water, into groundwater and to the sea.

156. Evapotranspiration includes evaporation from the soil and soil surface where crops are grown, and includes the transpiration of water that actually passes crops. It has two components: evapotranspiration of soil water by plants and evapotranspiration of irrigation water by plants. Measuring evapotranspiration from a field is a laborious task. And even when total evapotranspiration was measured, one would need to estimate which part of the total is irrigated water. Therefore one will generally rely on water balance models that use data on climate, soil, crop characteristics and actual irrigation as input.

Figure 3: Scheme providing an overview of inflows and outflows from agriculture industry



4.2.2 Aquaculture

157. Aquaculture water use is associated with raising organisms that live in water — such as finfish and shellfish — for food, restoration, conservation, or sport. Aquaculture production occurs under controlled feeding, sanitation, and harvesting procedures primarily in ponds, flow-through raceways, and, to a lesser extent, cages, net pens, and tanks. Aquaculture ponds, raceways, and tanks usually require the withdrawal or diversion of water from a ground or surface source. Cages and pens for finfish and shellfish generally are placed in a water body, such as a lake, stream, or ocean that does not require withdrawal or diversion of water; however, cages and pens for alligators generally require withdrawals of water. Most water withdrawn for aquaculture production is used to maintain pond levels and/or water quality. Water typically is added for maintenance of levels, oxygenation, temperature control, and flushing of wastes. Abstraction and diversion of water for aquaculture is recorded in the PSUTs under NACE 03.

4.2.3 Hydroelectric power generation

158. Water used for hydroelectric power generation is a typical example of temporarily displacements in which water is directly abstracted by the economy and returned immediately to the environment. In the PSUTs, this abstracted and returned water is recorded as a flow from the environment to the economy, and from the economy to the environment respectively.

4.2.4 Mining and construction sectors

159. Dewatering processes in mining and construction sectors are examples of relocation and

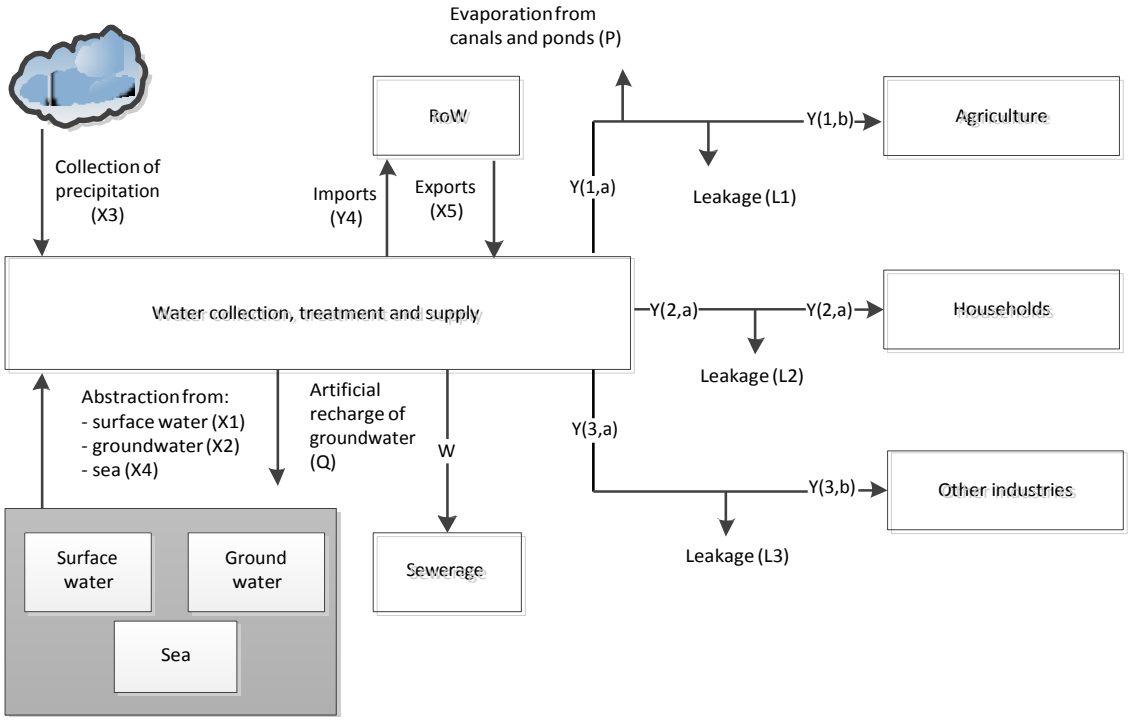
displacement of water resources. Mine water use generally involves a removal and displacement of water in the environment when the mine extends below the water table. In construction activities, it is a common practise to displace water or to change the course of any water body. All these kinds of water displacements/relocation are considered as water abstraction in PSUTs and should be recorded as flows from the environment to the economy, and back to the environment respectively.

4.2.5 Water collection, supply and treatment

160. This industry includes water collection, treatment and distribution activities for domestic and industrial needs. The product produced by this industry is natural water (CPA code 36). Collection of water from various sources, as well as distribution by various means is included. The operation of irrigation canals is also included; however the provision of irrigation services through sprinklers, and similar agricultural support services, is not included. It also includes: collection of water from rivers, lakes, wells etc.; collection of rain water; purification of water for water supply purposes ; desalting of sea or ground water to produce water as the principal product of interest; distribution of water through mains, by trucks or other means; and operation of irrigation canals. The operation of irrigation equipment for agricultural purposes; treatment of waste water in order to prevent pollution; (long-distance) transport of water via pipelines are excluded from this industry.

161. Figure 4 shows the inflows and outflows from water supply industry. Inflows to this industry are: abstraction from surface water, groundwater, and sea/ocean; collection of precipitation, water imports from the rest of the world and intra-sector water transfers, which are excluded in the PSUTs. Outflows from water supply industry are: supply to agriculture, to households, and to other industries; artificial recharge of groundwater; evaporation from canals and ponds; leakages, wastewater supply to sewerage industry and supply to the RoW.

Figure 4: Scheme providing an overview of inflows and outflows from water collection, treatment and supply industry.

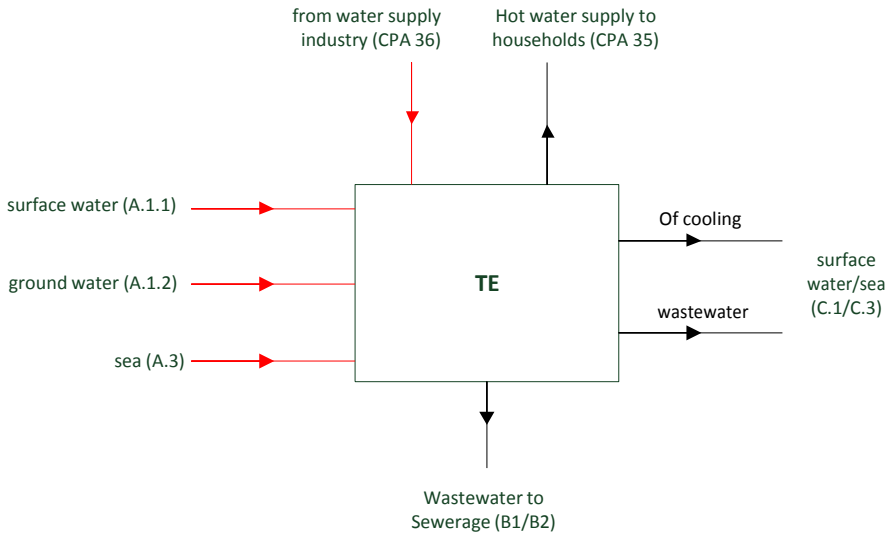


4.2.6 *Thermoelectric power production*

162. Most water for thermoelectric use is self-supplied from freshwater or saline surface-water sources. Smaller quantities are derived from ground-water sources or provided by public suppliers.

163. Water use and discharge data are usually collected by surveys or questionnaires. If such data is not available, power-generation data can be used to estimate thermoelectric power water withdrawals. A coefficient to estimate cubic metres of water used per unit-hour of electricity generated is calculated using information on water withdrawals and power generation from plants of similar age, design, and cooling methods. This coefficient then can be multiplied by the amount of electricity generated during a specified time period by the plant for which withdrawals are being estimated.

Figure 5: Scheme providing an overview of inflows and outflows from thermoelectric power production.



4.2.7 Water incorporated into products

164. To fully account for the balance of flows of water entering the economy through abstraction and returning to the environment as return flows of water, it is necessary to record three additional physical flows: evaporation of abstracted water, transpiration and water incorporated into products (SEEA § 3.215). Evaporation and transpiration are included in one item in the flows from the economy to the environment (Tables A and B, code C.5)

165. Amounts of water incorporated into products (e.g., water used in the manufacture of beverages) are shown among the flows within the economy (Tables A and B, code CPA X) as supplied by the relevant industry, commonly a manufacturing industry.

166. Conceptually, all water incorporated into products is relevant and should be recorded. In practice, only for certain products (beverages) recording is feasible.

167. A simple compilation approach to water incorporated into beverages is to simply calculate the difference between water input and output of the beverage industry (assuming that evapotranspiration is approximately zero).

4.3 Compiling PWFA tables C and D

168. Table C and D record the amount of pollutants or their measured properties emitted to water by production and consumption processes and are expressed in terms of mass (kilograms or tonnes, depending on the pollutant under consideration).

169. The main source of data for Tables C and D is table 7 of the JQ-IW.

170. Data on emissions from diffuse sources are scarce and in general have to be estimated with

the help of models.

4.3.1 Net emissions

171. The wastewater and associated pollutants are either discharged directly into the environment with or without self-treatment, or supplied to a wastewater treatment plant. Two types of emissions can be calculated from emission supply and use tables: gross emissions and net emissions.

172. Gross emissions are the pollutants added to the water by an activity, assessed at the point where the wastewater leaves the activity's site (or the dwelling, in the case of households). Net emissions correspond to the pollutants discharged into water resources. When wastewater is discharged directly into a water body gross and net emissions coincide. In practice, however, an economic activity may discharge part of its wastewater directly into water resources (thus releasing the pollutants directly), and supply the rest to a wastewater treatment plant which, after treatment, discharges the 'treated' wastewater into the environment. Since the 'treated wastewater' may still contain traces of the pollutant generated by the economic activity, the net emission of the economic unit would correspond to the sum of the direct release of pollutants into water resources and the indirect release through wastewater treatment plants.

173. For the whole economy, the difference between gross and net emissions totals would correspond to the pollution removed by treatment plants. The distinction between gross and net emissions is not applicable for non-point pollution (e.g. resulting from agriculture).

174. In the calculation of the net emissions, the release of pollutants by the sewerage industry, NACE 37, is reallocated to the economic unit responsible for the discharge in the first place. This is often difficult to calculate as the sewerage industry treats aggregated flows of wastewater coming from diverse users of the sewage system. In general, the allocation of emissions in the return flow of NACE 37 to the original economic unit responsible for generating that pollution is obtained by applying abatement rates of the treatment plant to every emission collected by the treatment plant.

4.3.2 Measurement methods

175. For chemical oxygen demand (COD) and biochemical oxygen demand (BOD), it is recommended to use the following measurement methods. Only in exceptional cases substitute parameters should be used and this should be clearly indicated.

176. BOD measures the amount of oxygen required or consumed for the microbiological decomposition (oxidation) of organic material in water. BOD is an index of the degree of organic pollution in water. It should be measured as the oxygen consumed in 5 days at a constant temperature of 20°C in the dark, which is commonly referred to as BOD5.

177. COD measures the quantity of oxygen used in biological and non-biological oxidation of materials in water. It provides a measure of organic compounds in water. It should be calculated using the dichromate COD test which measures the oxygen equivalent of the

amount of organic matter oxidizable by potassium dichromate in a 50% sulphuric acid solution.

4.3.3 Point and non-point (diffuse) sources

178. Emissions from non-point (diffuse) sources to the environment are emissions into a receiving water body without a single point of origin or a specific outlet. This kind of emissions include emissions that are the result of individual and small-scale polluting activities, which for practical reasons cannot be treated as individual point sources of pollution. An example is the run-off from urban areas or agricultural land. Urban run-off emissions occur when pollutants are washed away after being deposited in urban areas. Agricultural non-point (diffuse) emissions of nutrients and hazardous chemicals occur when nutrients and hazardous chemicals from fertilizers and pesticides that have been spread over the soil and crops dissolve into water, which infiltrates into groundwater or runs off into surface water.

179. Although for certain substances (e.g. pesticides, pharmaceuticals etc.) diffuse emissions from households could also be significant, agriculture and urban runoff are the two most important diffuse sources for emissions to water from non-point sources. The IRWS recommends including diffuse emissions from these two sectors.

180. Theoretically, emissions should be always attributed to original source. In practice, usually due to lack of data, some assumptions may have to be made. Non-point (diffuse) emissions to water from agriculture should be assigned to agriculture industry (NACE 01) and run-off from urban areas to the sewerage industry (NACE 37). However, in order to allow countries which have available data to assign these emissions to diffuse sources, the possibility for reporting has been created, by including "of which non-point (diffuse) sources" in table C for agricultural and urban non-point (diffuse) emissions.

4.3.4 Thermal pollution

181. Thermal pollution is in general brought about by the release of cooling water from the electricity generating sector to the environment. During the cooling process this water has augmented in temperature which is often significantly higher than the temperature of the receiving water. This type of pollution is especially threatening flora and fauna not adapted to high temperatures.

182. However, as pointed out earlier, the emission tables only cover physical pollutants directly released to a water body (surface water, groundwater, the sea) as well as the indirect release by transfer to an off-site wastewater treatment plant. Thermal pollution – not being a 'physical pollutant' is not accounted for in the physical emission supply and use tables.

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Annex 1: Joint data structure definitions (DSDs) for physical water accounts and JQ-IW

Eurostat developed data structure definitions (DSDs) accommodating both the JQ-IW and physical water accounts.

Data Structure Definition (DSD) is a scheme for organizing related pieces of information. Basically, a DSD defines the dimensions of a multidimensional data cube and the value-lists for each dimension.

Eurostat's Joint Task Force on Water Statistics and Accounts developed data base structures (DSDs) for four modules which are suited to accommodate the data reported with the current JQ-IW as well as the data which potentially would populate physical water accounts (physical supply and use tables for volume flows and emissions to water, as well as asset accounts).

The table below illustrates the different dimensions for each of the data sets (modules).

Dimensions	Datasets (modules)			
	Resources	Waterflows	Emissions	Infrastructure
ITEM	X			
ASSET	X			
ORIGIN		X	X	X
DESTINATION		X	X	
PURPOSE		X		X
TYPE		X		
SOURCE_TYPE			X	
SUBSTANCE			X	
TREATMENT_PLANT_TYPE			X	X
MEASURE				X
GEO	X	X	X	X
TIME	X	X	X	X
UNIT	X	X	X	X
UNIT_MULT	X	X	X	X

In the next sections the data sets (modules) as well as dimensions for each data set are described.

Data sets (modules)

Resources

The module on RESOURCES covers the natural flows of water between different water resources as well as the water flows between water resources and the economy.

The conceptual foundations for the RESOURCES module are the physical water asset accounts (SEEA-W Table 6.1) and the relevant parts of the 2012 version of the OECD/Eurostat Joint Questionnaire on Inland Waters (table 1: Renewable Freshwater Resources).

The RESOURCES module is to serve the following data needs:

1) Water Accounting: Physical Water Asset Accounts

2) OECD/Eurostat Joint Questionnaire on Inland Water (Version 2012): Table 1 Renewable Freshwater Resources

The DSD for RESOURCES consists of the following dimensions:

a) ITEM: The list of combined data items from JQ-IW 2012 and physical water asset accounts (SEEA-W Table 6.1). It takes into consideration some specific issues of the two frameworks (e.g. the different definition of inflows or outflows).

b) ASSET: The physical asset according to water accounts (e.g. groundwater, soil water, freshwater) and its hierarchies. It also includes "total" which is needed for the total columns of the water asset accounts and for JQ table 1.

c) GEO: Regional disaggregation (e.g. NUTS2, River Basin Districts - RBD, etc.).

d) TIME: Temporal disaggregation (e.g. month, season, annual).

e) UNIT: unit of measurement (in this case only M3 -1,000,0000 m3).

f) UNIT_MULT: Unit of measurement multiplier (e.g. 6 in combination with m3 stands for 1,000,000 m3).

Waterflows

The DSD for WATERFLOWS covers the flows of water from the environment to the economy, within the economy and from the economy to the environment.

This module is capable to serve the following data needs:

1) Water Accounting:
   a) Flows of water from the environment to the economy
   b) Flows of water within the economy
   c) Flows of water from the economy to the environment
2) OECD/Eurostat Joint Questionnaire on Inland Water (Version 2012) :
   a) Table 2 dealing with data on annual freshwater abstractions by source (flows from the environment to the economy).
   b) Table 3 dealing with water use by supply category (flows from the environment to the economy and within the economy).
   c) Water balance table.
   d) Table 8 dealing with wastewater volumes (generation and discharges) including the flows from the economy to the environment.

The DSD for WATERFLOWS consists of the following dimensions:

a) ORIGIN: this dimension includes all NACE activities (entire hierarchy included), Total Economy and Rest of the World. The ORIGIN dimension includes further the environment as a source for natural water inputs (flows from environment to the economy).

b) DESTINATION: it includes the same items as ORIGIN and additionally surface water, groundwater, soil water, atmosphere and sea (for the flows from the economy to the environment).
c) PURPOSE: this dimension includes the main purposes of a given water flow - cooling, irrigation, desalination, mine water, urban runoff, direct use, hydropower or losses in distribution because of leakage. Some of these items are similar to the ones under "type of water" (see below), but have been included in the dimension "purpose" in order to enable the combination with other types.
d) TYPE: this dimension covers the main types of water: fresh/non-fresh (brackish) water, natural water/vapour/steam, water incorporated into products, and un/treated wastewater.
e) GEO: this dimension is to address regional aggregates (e.g. NUTS2, RBD, NATIONAL)
f) TIME: this dimension is to address seasonal aggregates (e.g. month, quarter, annual)
UNIT: Unit of measurement (e.g. kg, m^3)
g) UNIT_MULT: Multiplier of unit of measurement (e.g. 6 in combination with m^3 stands for 1,000,000 m^3)

Emissions

The DSD EMISSIONS covers the flows of wastewater within the economy and from the economy to the environment for both wastewater volumes and annual loads of pollutants.

Currently the DSD is designed for the following pollutants : Five Day Biochemical Oxygen Demand (BOD_5), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), nutrients (N-total, P-total) and heavy metals (Cd, Cr, Cu, Pb, Ni, Zn, As and Hg). It also includes population equivalents (p.e. - required for JQ-IW Table 8) and can be expanded at a later stage with more pollutants if needed.

This module is capable to serve the following data needs:

1) Water Accounting:
   a) Flows of wastewater within the economy
   b) Flows of wastewater from the economy to the environment
   c) Emission accounts
2) OECD/Eurostat Joint Questionnaire on Inland Water (Version 2012)
   a) Table 3, data items related to "reused water" (corresponding to flow of wastewater within the economy in the water accounting framework)
   b) Table 6
      i) Incoming load BOD_5 (to wastewater treatment plants, corresponding to flow of BOD_5 loads from the economy to sewerage for treatment)
      ii) Effluent BOD_5 (corresponding to flow of BOD_5 loads from sewerage (for treatment) to any other destination).
   c) Balance Table:
      i) Reused water (corresponding to flow of wastewater within the economy in the water accounting framework)
      ii) Wastewater discharged to inland waters and marine waters (corresponding to flow of wastewater from the economy to the environment)
   d) Table 8

The structure of the DSD furthermore contains some extra dimensions which are needed for specific levels of aggregation or disaggregation which can differ from the pure NACE structure (e.g. point sources / diffuse sources, urban/industrial wastewater, urban wastewater treatment/industrial treatment/independent treatment, primary/secondary/tertiary treatment).

The DSD consists of the following dimensions:

a) SOURCE_TYPE: It specifies whether a source is a point source, non-point source or it is not further specified
b) TREATMENT_PLANT_TYPE: It specifies the type of wastewater treatment (if any) and distinguishes between urban, independent and other treatment. It furthermore addresses primary, secondary and tertiary treatment levels.
c) SUBSTANCE: It specifies whether the data item refers to wastewater volume, physical pollution (in terms of tonnes or kg/day) or p.e.
d) ORIGIN: Sources are all NACE activities (entire hierarchy included), Total Economy and Rest of the World. Further sources are the specific aggregates of the JQ 2012: "domestic" and "industrial".
e) DESTINATION: it includes the same items as ORIGIN additionally surface water, groundwater, soil inland water, and sea (for flows from the economy to the environment) as well as not specified (e.g. needed for "generation of wastewater" when the origin is clear, but not the destination).
f) GEO: this dimension is to address regional aggregates (e.g. NUTS2, RBD, NATIONAL)
g) TIME: this dimension is to address seasonal aggregates (e.g. month, quarter, annual)
h) UNIT: Unit of measurement (e.g. kg, m^3)
i) UNIT_MULT: Multiplier of unit of measurement (e.g. 6 in combination with m^3 stands for 1,000,000 m^3)

Infrastructures

Next to the coverage of water resources and the flows of water and substances carried within (nutrients, pollutants), the JQ-Water also comprises a section (tables 5 to 7) that does not primarily ask for flows of water or pollutants but rather asks different questions, namely :

- Table 5: which percentage of the population is connected to wastewater collection and treatment by level? (service indicator);
- Table 6 – is the wastewater treatment infrastructure (number and capacity of plants) adequate for the amount of wastewater generated? (WWTP capacity, load and effluent (BOD_5) by type and level of treatment);
- Table 7 – how much sewage sludge is generated, and what happens to it? (sewage sludge production and disposal).

The content of tables 5, 6 and 7 of the JQ-IW generally is not needed for water accounting; therefore no specific alignment is necessary. The only exception may be the incoming load and affluent of WWTPs in terms of BOD_5, which characterizes whether the design of the WWTPs overall matches the needs, but it can as well be used in emissions accounting.

The DSD consists of the following dimensions:

a) TREATMENT_PLANT_TYPE: It specifies the type of wastewater treatment (if any) and distinguishes between urban, independent and other treatment. It furthermore addresses primary, secondary and tertiary treatment levels.
b) ORIGIN: Sources are all NACE activities (entire hierarchy included), Total Economy and Rest of the World. Further sources are the specific aggregates of the JQ 2012: “domestic” and “industrial”.
c) DESTINATION it includes the same items as ORIGIN additionally surface water, groundwater, soil inland water, and sea (for flows from the economy to the environment) as well as not specified (e.g. needed for “generation of wastewater” when the origin is clear, but not the destination).
d) PURPOSE: it is used to describe the destination of the sewage sludge.
e) MEASURE: describes properties of wastewater treatment plants and is used as well to host some items that do not fit into other dimensions and do not justify a separate one (population connected, resident population,..).
f) GEO: Regional disaggregation (e.g. NUTS2, RBD, national)
g) TIME: Temporal disaggregation (e.g. month, season, annual)
h) UNIT: unit of measurement (in this case only M^3)
i) UNIT_MULT: Unit of measurement multiplier

Annex 2: Detailed definitions of rows of PWFA Tables A and B

This classification of water inputs, water products, and water residuals (short: PWFA classification of rows) has been developed for the PWFA questionnaire. It is built upon and hence fully consistent with more detailed international definitions (JQ-IW, SEEA-W, IRWS).

PWFA label	ESTAT code	Definition
From Environment to Economy		
Inland water resources	A.1	The volume of water that is removed by resident economic units from surface water, groundwater and soil water within the territory of reference, per year. This includes the abstraction of inland waters that are fresh, brackish, saline or polluted. This excludes abstraction of water from the sea or ocean, as these are not inland water resources.
Surface water	A.1.1	The volume of water removed by resident economic units from artificial reservoirs, lakes, rivers, wetlands, and snow, ice and glaciers within the territory of reference, per year.
Groundwater	A.1.2	The volume of water removed by resident economic units from aquifers and springs, within the territory of reference, per year.
Soil water	A.1.3	The volume of water used by resident economic units in rainfed or non-irrigated agriculture and forestry within the territory of reference, per year. This is the volume of precipitation that falls onto agricultural fields and is transpired by the crops, plantations, orchards, etc.
Precipitation	A.2	The volume of water collected by resident economic units directly from falling rain, snow, sleet and hail or collected by contact with dew and mist within the territory of reference, per year. A typical example of collection of precipitation is roof rain harvesting by households. The collection of precipitation includes urban runoff.
Sea water	A.3	The volume of saline water removed by resident economic units from the sea and ocean within the territory of reference, per year.
Within the economy		
Electricity, gas, steam and air conditioning	CPA 35	The volume of hot water and steam produced by resident economic units and supplied to the rest of world or to other resident economic units for heating, power and other purposes, per year.
Steam and hot water	CPA 35.30.11	The volume of hot water and steam produced by resident economic units and supplied to the rest of the world or to other resident economic units for heating, power and other purposes, per year.
Steam and hot water supply services through mains	CPA 35.30.12	The volume of hot water and steam produced by resident economic units and supplied through mains to the rest of the world or to other resident economic units for heating, power and other purposes, per year.
Natural water; water treatment and supply services	CPA 36	The volume of natural water produced by resident economic units and supplied to the rest of the word or to other resident economic units for drinking and non-drinking purposes, per year.
Drinking water	CPA	The volume of natural drinking water produced by resident economic units and supplied to

PWFA label	ESTAT code	Definition
	36.00.11	the rest of the word or to other resident economic units for drinking purposes, per year.
Non-drinking water	CPA 36.00.11	The volume of natural drinking water produced by resident economic units and supplied to the rest of the word or to other resident economic units for non-drinking purposes (e.g. irrigation), per year.
Water incorporated in products	CPA X	The volume of water incorporated in products produced by resident economic units and supplied to the rest of the world or other resident economic units, per year.
Wastewater - treated	B.1	The volumes of waste water supplied by resident economic units to other resident economic units or the environment after some pollutants have been removed, per year.
Wastewater - untreated	B.2	The volume of waste water discharged by resident economic units into drains or sewers for treatment or disposal by other resident (or rest of the world) economic units, and water supplied by resident economic units to other resident economic units which have to treat this water before it can be used (by the same units), per year. All water discharged into drains or sewers is considered untreated wastewater regardless of the quality of water discharged.
From Economy to Environment		
Surface water	C.1	The volume of water that flows from resident economic units directly into artificial reservoirs, lakes, and rivers and wetlands, per year. Discharges of water to surface water include discharges of cooling water, urban runoff (including storm water), or run-off from agricultural land. It may also include the discharges of water used for hydro-electricity power generation.
Water to surface water bodies	C.2	The volume of water that flows from resident economic units directly into aquifers, per year. Discharges of water to groundwater include, the artificial recharge of aquifers, urban runoff (and storm water) that is collected and allowed to infiltrate into groundwater, and water from agricultural that infiltrates into groundwater.
Water to sea	C.3	The volume of water that flows from resident economic units directly into the sea or ocean, per year. These discharges may occur near the coast or further offshore.
Water to land	C.4	The volume of water that flows from resident economic units directly to land, per year. Discharge to soil water is water discharged from resident economic units onto land surfaces, where the water seeps rapidly into soil.
Evapotranspiration	C.5	The volume of water that flows from resident economic units directly to atmosphere, per year. It refers to the quantity of water transferred from the soil to the atmosphere by evaporation and plant transpiration.
From hydroelectric power generation	C.1.1	The volume of water discharged into the environment by resident economic units after being used to drive turbines to generate electricity, per year.
Of irrigation water	C.1.2 C.2.1 C.3.1 C.4.1	The volume of water supplied by resident economic units that infiltrated into groundwater, or ran off into surface water, after being artificially applied to soil for purposes of growing plants, per year.
From mining	C.1.3 C.2.2 C.3.2 C.4.2	The volume of water discharged into the environment by resident economic units after being abstracted as a part of mineral extraction and milling operations, per year.
From urban runoff	C.1.4	The volume of water discharged from urban areas on the economic territory because it

PWFA label	ESTAT code	Definition
	C.2.3 C.3.3 C.4.3	does not naturally percolate into the ground or evaporate, but flows via overland flow, underflow, or channels, or in pipes, to a defined surface water channel or a constructed infiltration facility, per year. Urban runoff is commonly referred to as urban storm water.
Of cooling water	C.1.5 C.3.4 C.4.4	The volume of water discharged into the environment by resident economic units after being used to absorb and remove heat, per year.
Of losses in distribution because of leakages	C.2.4 C.4.5	The volume of water (including wastewater) slowly escaping from mains, artificial open channels, trucks, through infiltration, small cracks, holes or gaps operated by resident economic units, between the point of abstraction and the point of use, or between the points of use and reuse, per year.
Of treated wastewater	C.1.6 C.3.5 C.4.6	The volume of water discharged into the environment by resident economic units after some pollutants have been removed, per year. This includes wastewater discharged by the sewerage industry (NACE 37) and other industries after undergoing on-site treatment.
After being used for other purposes	C.1.7 C.2.5 C.3.6 C.4.7	The volume of water discharged into the environment by resident economic units after being used for purposes other than those listed above (includes water unintentionally discharged into the environment), per year.

Annex 3: Classification of columns in PWFA Tables A, B, C and D (industries, households, accumulation, rest of the word, environment)

PWFA Tables are physical supply and use tables. In accordance with SEEA-CF their columns are classified into five broad kind of activity categories (level 0): production, consumption, accumulation, rest of the word, and environment (see sections 2.1 and 3.5). PWFA Table E includes a set of 11 row-vectors (key indicators) and has the same column structure plus a column "Total".

Production activities are further broken down by NACE sections (one letter, level 1) and divisions (mainly 2 digits, level 2). The PWFA questionnaire employs a 2-level hierarchical nested classification for the production activities. On the lowest level – mainly divisions – 64 groupings of industries are distinguished. This A*64 aggregation level is also employed in ESA supply, use and input-output tables. The higher level corresponds to the 21 one-letter-sections (A*21).

The consumption activities consider only private household consumption Government consumption activities are not considered in the classification of columns. In monetary accounts government final consumption records the acquisition and consumption of their own output because the final user cannot be specified as it is the entire society (see SEEA-CF §§3.27ff). This convention of booking has no equivalent in physical flow accounts. The water flows related to production activities of government are entirely recorded in the first generic column, i.e. production activities.

Accumulation, rest of the word, and environment constitute three single columns which are not further broken down.

level	code	label
0	A_U 01-99	Total NACE industries
1	A	Agriculture, forestry and fishing
2	A01	Crop and animal production, hunting and related service activities
3	A01.1	Growing of non-perennial crops
4	A01.11	Growing of cereals (except rice), leguminous crops and oil seeds
4	A01.12	Growing of rice
4	A01.13	Growing of vegetables and melons, roots and tubers
4	A01.14	Growing of sugar cane
4	A01.15	Growing of tobacco
4	A01.16	Growing of fibre crops
4	A01.19	Growing of other non-perennial crops
3	A01.2	Growing of perennial crops
4	A01.21	Growing of grapes
4	A01.22	Growing of tropical and subtropical fruits
4	A01.23	Growing of citrus fruits
4	A01.24	Growing of pome fruits and stone fruits

level	code	label
4	A01.25	Growing of other tree and bush fruits and nuts
4	A01.26	Growing of oleaginous fruits
4	A01.27	Growing of beverage crops
4	A01.28	Growing of spices, aromatic, drug and pharmaceutical crops
4	A01.29	Growing of other perennial crops
3	A01.3	Plant propagation
3	A01.4	Animal Production
4	A01.41	Raising of dairy cattle
4	A01.42	Raising of other cattle and buffaloes
4	A01.43	Raising of horses and other equines
4	A01.44	Raising of camels and camelids
4	A01.45	Raising of sheep and goats
4	A01.46	Raising of swine/pigs
4	A01.47	Raising of poultry
4	A01.49	Raising of other animals
3	A01.5	Mixed Farming
3	A01.6	Support activities to agriculture and post-harvest crop activities
3	A01.7	Hunting, trapping and related service activities
2	A02	Forestry and logging
2	A03	Fishing and aquaculture
1	B	Mining and quarrying
2	B05	Mining of coal and lignite
2	B06	Extraction of crude petroleum and natural gas
2	B07	Mining of metal ores
2	B08	Other mining and quarrying
2	B09	Mining support service activities
1	C	Manufacturing
2	C10	Manufacture of food products
2	C11	Manufacture of beverages
2	C12	Manufacture of tobacco products
2	C13	Manufacture of textiles
2	C14	Manufacture of wearing apparel
2	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
2	C17	Manufacture of paper and paper products
2	C18	Printing and reproduction of recorded media
2	C19	Manufacture of coke and refined petroleum products
2	C20	Manufacture of chemicals and chemical products
2	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations

level	code	label
2	C22	Manufacture of rubber and plastic products
2	C23	Manufacture of other non-metallic mineral products
2	C24	Manufacture of basic metals
2	C25	Manufacture of fabricated metal products, except machinery and equipment
2	C26	Manufacture of computer, electronic and optical products
2	C27	Manufacture of electrical equipment
2	C28	Manufacture of machinery and equipment n.e.c.
2	C29	Manufacture of motor vehicles, trailers and semi-trailers
2	C30	Manufacture of other transport equipment
2	C31	Manufacture of furniture
2	C32	Other manufacturing
2	C33	Repair and installation of machinery and equipment
1	D	Electricity, gas, steam and air conditioning supply
2	D35	Electricity, gas, steam and air conditioning supply
3	D35.1	Electric power generation, transmission and distribution
4	D35.11	Production of electricity
5	D35.11a	Thermoelectric
5	D35.11b	Hydroelectric
5	D35.11c	Nuclear
3	D35.2	Manufacture of gas; distribution of gaseous fuels through mains
3	D35.3	Steam and air conditioning supply
1	E	Water supply; sewerage, waste management and remediation activities
2	E36	Water collection, treatment and supply
2	E37	Sewerage
2	E38	Waste collection, treatment and disposal activities; materials recovery
2	E39	Remediation activities and other waste management services
1	F	Construction
2	F41	Construction of buildings
2	F42	Civil engineering
2	F43	Specialised construction activities
1	G-H-I-J-K-L-M-N-O-P-Q-R-S-T-U	Services
2	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles
2	G46	Wholesale trade, except of motor vehicles and motorcycles
2	G47	Retail trade, except of motor vehicles and motorcycles
2	H49	Land transport and transport via pipelines
2	H50	Water transport
2	H51	Air transport

level	code	label
2	H52	Warehousing and support activities for transportation
2	H53	Postal and courier activities
2	I55	Accommodation
1	I56	Food and beverages services activities
2	J58	Publishing activities
2	J59	Motion picture, video and television programme production, sound recording and music publishing activities
2	J60	Programming and broadcasting activities
2	J61	Telecommunications
2	J62	Computer programming, consultancy and related activities
2	J63	Information service activities
2	K64	Financial service activities, except insurance and pension funding
2	K65	Insurance, reinsurance and pension funding, except compulsory social security
2	K66	Activities auxiliary to financial services and insurance activities
2	L68	Real estate activities
2	M69	Legal and accounting activities
2	M70	Activities of head offices; management consultancy activities
2	M71	Architectural and engineering activities; technical testing and analysis
2	M72	Scientific research and development
2	M73	Advertising and market research
2	M74	Other professional, scientific and technical activities
2	M75	Veterinary activities
2	N77	Rental and leasing activities
2	N78	Employment activities
2	N79	Travel agency, tour operator reservation service and related activities
2	N80	Security and investigation activities
2	N81	Services to buildings and landscape activities
2	N82	Office administrative, office support and other business support activities
2	O84	Public administration and defence; compulsory social security
2	P85	Education
2	Q86	Human health activities
2	Q87	Residential care activities
2	Q88	Social work activities without accommodation
2	R90	Creative, arts and entertainment activities
2	R91	Libraries, archives, museums and other cultural activities
2	R92	Gambling and betting activities
2	R93	Sports activities and amusement and recreation activities
2	S94	Activities of membership organisations
2	S95	Repair of computers and personal and household goods

level	code	label
2	S96	Other personal service activities
2	T97	Activities of households as employers;
2	T98	Undifferentiated goods- and services-producing activities of households for own use
2	U99	Activities of extraterritorial organisations and bodies
0	HH	Consumption activities by households
0	CHINV_PA	Changes in inventories and produced assets
0	STADIF	Statistical Differences
0	ROW_ACT	Rest of the World - economic activities
0	ENV	Environment

Annex 4: Relations to other statistical frameworks

Relation to SEEA-CF

The SEEA-CF contains internationally agreed standard concepts, definitions, classifications, accounting rules for producing physical flow accounts. For water the SEEA-CF includes also the tables for producing internationally comparable statistics, which are described in detail in chapter 3.5 (physical supply and use table for water) and chapter 3.6 (water emissions account).

Eurostat's physical water flow accounts (PWFA) have been developed according to the accounting structures and principles of the SEEA-CF and thus Tables A and B correspond largely to SEEA-CF physical supply and use tables for water (Table 3.6) and Tables C and D correspond to physical supply and use tables for gross releases of substances to water (Table 3.8). Nevertheless few minor differences between SEEA-CF's tables and PWFA's tables exist.

Physical water flow account

The columns of the two sets of tables which describe the origins and destinations supplying and using the water flows items are broadly the same. Differences exist in the breakdown of production activities and the column "accumulation (changes in stocks of produced assets and product inventories)" is not present in SEEA-CF supply table. The explanation provided in the SEEA-CF insists on the fact that volumes of water stored in one period for use in the next accounting period are not relevant and thus accumulation is assumed to be zero (SEEA-CF § 3.199).

The rows of the two sets of tables which describe the various water flow types, namely natural inputs, products, and residuals, are very much the same but are organized in a different way (see the table below, which gives an overview of the differences between the rows of SEEA-CF's table 3.6 and PWFA's tables A and B).

Table: Overview of the differences between the rows of SEEA-CF's table 3.6 and PWFA's tables A and B.

SEEA CF	PWFA	Comments
(I) Sources of abstracted water	Flows from environment to economy	
(II) Abstracted water	Flows within the economy	Differentiated by type of product in the PWFA vs "for own use" and "for distribution" in the SEEA-CF
(III) Wastewater and reused water		Wastewater treated in the PWFA correspond to "reused water" in the SEEA-CF. Wastewater untreated in the PWFA correspond to "wastewater" in the SEEA-CF
(IV) Return flows of water	Flows from economy to environment	Return flows of water are more detailed in PWFA
(V) Evaporation of abstracted water, transpiration and water		

SEEA CF	PWFA	Comments
incorporated into products		
Evaporation	Flows from economy to environment: evapotranspiration	
Transpiration		
Water incorporated into products	Flows within the economy	

Water emissions account

Water emissions account are described in detail in the SEEA CF (Chapter 3.6.4, § 3.257 to 3.267).

The columns of the two sets of tables largely correspond. With regards to rows, the SEEA CF's tables distinguish between emissions to the environment and releases to economic units, which is not the case of PWFA's tables. The numbers of substances is also less detailed in the SEEA CF's tables than in the PWFA's tables.

Relation to SEEA-W

The SEEA-Water (SEEA-W) is a SEEA sub-system implementing the environmental-economic accounts for water. It provides agreed concepts, definitions, classifications, tables and accounts for water and water related emissions.

The SEEA-W was developed as a response to increasing policy interest in the area of sustainable water use, methodological advances and growing experience on the level of national statistical institutes.

SEEA-W was adopted as an interim international statistical standard by the United Nations Statistical Commission (UNSC) at its 38th session in 2007. Given the recent revision of the SEEA it will be subject to re-evaluation.

The scope of the SEEA-W is very wide including monetary and asset accounts. Physical water supply and use tables and water emission accounts are dealt with in chapters II and IV respectively.

When setting up the new Eurostat water PSUTs the clear objective was to use existing tables and approaches, or ensure compatibility. The new Eurostat PSUTs distinguish similar economic sector categories as origins/destinies (columns) of water flows as in the PSUTs of the SEEA-W (see table III.1, p. 47). However, the disaggregation of the economic and final use categories is higher in the Eurostat tables, and the SEEA-W PSUTs do not distinguish the environment as separate origin/destination in the PSUTs which, from Eurostat's point of view, is essential to completely reproduce the hydrological cycle within the PSUTs framework.

In both sets of water supply and use tables the water flows (rows) are divided into the same categories (from the economy to the environment, within the economy, from the economy to the environment). However, the Eurostat tables distinguish more flows; most importantly (and in contrast to the SEEA-W tables), following the logic of the PSUT framework, Eurostat's supply and the use table have exactly the same structure. However, Eurostat's water PSUTs can be bridged towards SEEA-W's.

With regards to emissions, differences are more important. The SEEA-W (Table IV.2, p. 63)

provides two tables – on gross and net emissions by different sector and emissions by ISIC 37. In contrast, the Eurostat emission tables follow again the PSUT structure – two equal tables containing the supply and use of different types of contaminants by different economic sectors and final users.

Relation to IRWS

The International Recommendations for Water Statistics (IRWS)[11] are a set of guidelines for the collection, compilation and dissemination of internationally comparable water statistics and water accounts in line with SEEA-W. The drafting of IRWS was undertaken as part of the United Nations Statistics Division work programme on environment statistics and the implementation strategy for SEEA-W. They were developed to help strengthen national information systems for water in support of design and evaluation of Integrated Water Resources Management policies.

IRWS provides a comprehensive list of "recommended data items" for the collection, compilation and reporting of basic water statistics. The recommended data items cover the stocks of water in the environment and the economy, the flows of water in and between the environment and the economy, and the social-demographic data needed for the monitoring of MDG target 7.C. Additional data items that complement the recommended data items to meet specific requirements are listed as "supplementary data items".

The data items are fully consistent with the concepts and definitions of SEEA-Water and are, to the greatest extent possible, consistent with other information sources, including the OECD/Eurostat joint questionnaire on the state of the environment.

The data items in IRWS can be used for many purposes, including the populating of SEEA-W standard tables and compilation of SEEA-W indicators. IRWS's annex tables AIV.1 to AIV.9 shows the links between the recommended data items of IRWS and SEEA-W standard tables.

[11] IRWS was adopted by the United Nations Statistical Commission (UNSC) at its 41st session in 2010 https://unstats.un.org/unsd/envaccounting/irws/