Chapter 2 The SEEAW framework

A. Introduction

2.1. The *System of Environmental and Economic Accounting for Water* (SEEAW) provides a systematic framework for the organization of water information to study the interaction between the economy and the environment. It is a further elaboration of the *Integrated Environmental and Economic Accounting 2003* (SEEA-2003) framework focusing exclusively on water resources. As the SEEA, the SEEAW expands the 1993 System of National Accounts (1993 SNA) (CEC et al. 1993) by separately identifying information related to water in the 1993 SNA and linking physical information on water with economic accounts. The purpose of this chapter is to describe the accounting framework for water.

2.2. Section B provides a description of the interactions between the hydrological system and the economy in a diagrammatic form. It describes, in a non-technical way, the hydrological system, the economic system (as measured by the 1993 SNA) and their interactions.

2.3. Section C introduces the SEEAW framework as a satellite system of the 1993 SNA and describes how the SEEAW expands the 1993 SNA in order to address water-related concerns. Section D presents the accounting framework in more detail: it describes the various accounts in the SEEAW framework, and presents the concepts, definitions and classifications that are used in the SEEAW. Section E introduces two cross-cutting issues in the compilation of water accounts: namely the identification of the temporal and spatial reference.

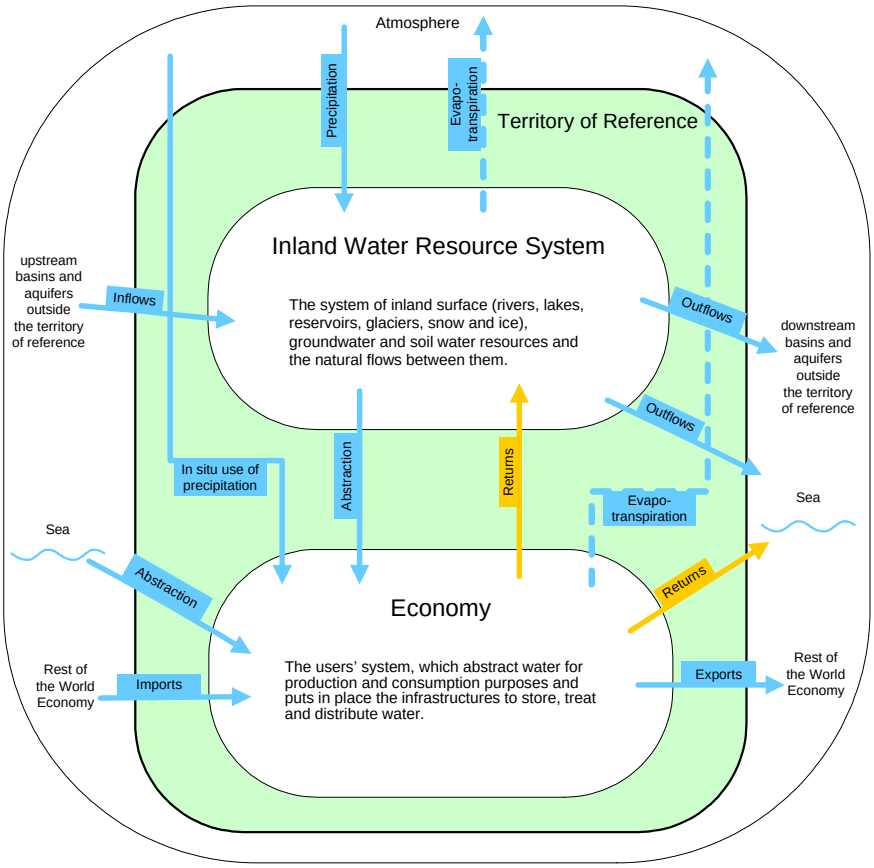
B. Water resource system and the economy

2.4. Water is needed in all aspects of life. It is essential for basic human needs, for socio-economic development and for the integrity and survival of ecosystems. Water resources provide material inputs and services to the economy, as well as to mankind outside of the economy and to other living beings. Water resources provide: (a) material input into production and consumption activities; (b) sink functions for waste material (such as wastewater discharged into water resources); and (c) habitat for all living beings including mankind. The SEEAW focuses on water as material input into production and consumption activities and as a 'sink' for waste. Accounts for water as a provider of ecosystem habitat are only discussed here in terms of the quality of water and its link to the various uses.

2.5. The SEEAW provides an integrated information system to study the interaction between the environment and the economy. At present, the integration with the social dimension, which is particularly important for the management of water resources, is not systematically included in the SEEAW framework. Information on some crucial social aspects of water, such as access to safe drinking water and sanitation, are included in supplementary tables to facilitate the analysis of water policies in their social impacts. Other social aspects of water can be made explicit in the SEEAW, for example, by disaggregating the household sector by specific characteristics (e.g., by income, rural versus urban etc.). Further methodological research and practical experience is needed to extend the framework to the social dimension.

2.6. The framework of the SEEAW is presented in the simplified diagrammatic form in Figure 2.1 which shows the economy, the system of water resources and their interactions. The economy and the inland water resource system of a territory – referred to as 'territory of reference' - are represented in the figure as two separate boxes. The inland water resource system of a territory is composed of all water resources in the territory (surface water, groundwater and soil water) and the natural flows between them. The economy of a territory consists of resident[5] water users who abstract water for production and consumption purposes and put in place the infrastructure to store, treat, distribute and discharge water. The inland water system and the economy are further elaborated in Figure 2.2 in order to describe the main flows within each system and the interactions between the two systems.

Figure 2.1: Flows between the economy and the environment



2.7. The inland water resource system and the economy of a given territory, which can be a country, an administrative region or river basin, can exchange water with those of other territories through imports/exports of water (exchanges of water between economies) and through inflows from upstream territories and outflows to downstream territories (exchanges of water between inland water systems). Figure 2.1 also shows exchanges with the sea and the atmosphere which are considered outside the inland water resource system. These flows are also captured in the SEEAW accounting framework.

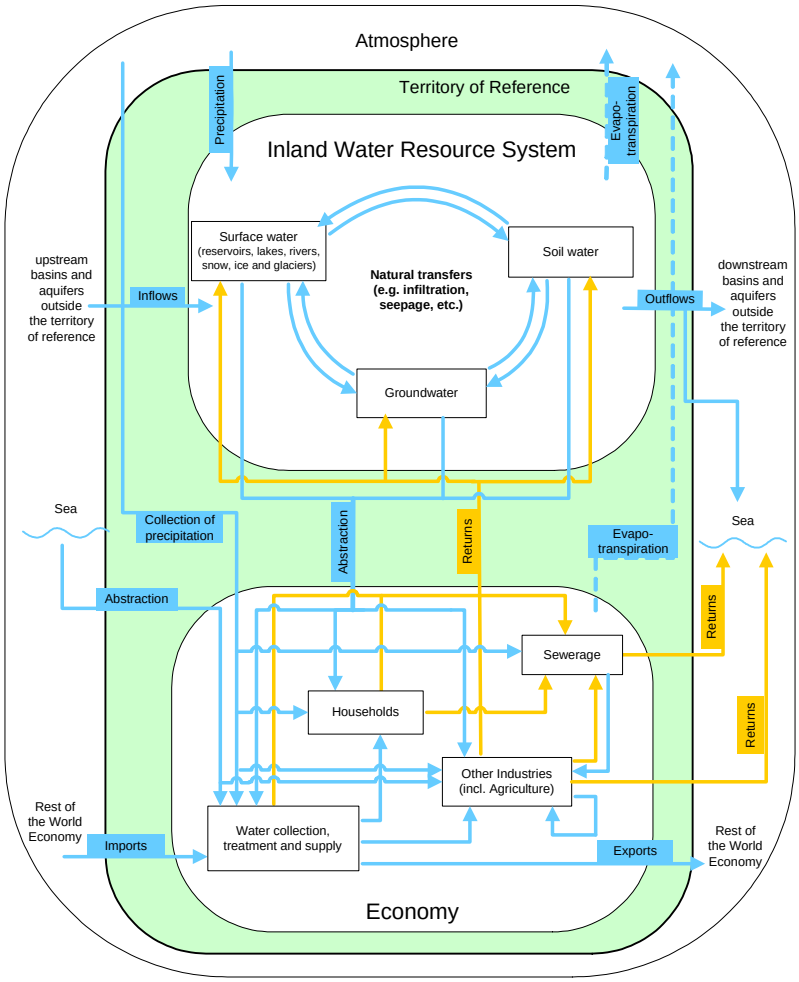
[5] The concept of residence follows that of the 1993 SNA according to which "an institutional unit is resident in a country when it has a centre of economic interest in the economic territory of that country" (1993 SNA para 4.15). This concept can be applied also to geographical boundaries other than the national ones.

2.8. The economy uses water in different ways. It can physically remove water from the environment for production and consumption activities or use water without physically removing it from the environment. In the first case, the economy abstracts water from the inland water bodies or the sea, uses the precipitation (in-situ use of precipitation in Figure 2.1) through rain-fed agriculture or water harvesting, and uses water for hydroelectric power generation. In the second case, the economy uses water for recreational and navigational purposes, fishing and other uses, that rely on the physical presence of water (in-situ uses) and, often, also on the quality of water. Even though these uses may have a negative impact on the quality of the water bodies, they are not directly considered in the water accounts as they do not involve a displacement of water. It should be mentioned, however, that in the quality accounts their impacts on the quality of water resources could, in principle, be identified.

2.9. In addition to abstracting water, the economy returns water into the environment. As shown in Figure 2.1, returns can be either to the inland water system or directly into the sea. Usually, return flows have a negative impact on the environment in terms of quality, as the quality of this water is often lower than that of abstracted water. Although returns to the water resource system alter the quality of the receiving body, they represent an input in the water system as returned water becomes then available for other uses.

2.10. Figure 2.2 shows in more detail the flows of the inland water resource system and the economy to show in more detail the water flows captured by the accounts. It should be noted that, in order to keep the figure as simple as possible, only the main flows are depicted. For example, direct abstraction of sea water by industries is not explicitly shown even though it is recorded in the accounts.

Figure 2.2: Main flows within the inland water resource system and the economy



1. The inland water resource system

2.11. Water is in continuous movement. Solar radiation and gravity keep water moving from land and oceans to the atmosphere in the form of vapour (evapotranspiration) and falling back through precipitation. The inland water resource system is composed of: (a) all inland water resources from which water is, or can be, abstracted; (b) water exchanges between water resources within the territory of reference (e.g. infiltration, runoff, percolation); and (c) water exchanges with water resources of other territories (i.e. inflows, outflows). Exchanges of water between the water resources are also referred to as natural transfers.

2.12. The water resources considered in the inland water resource system are rivers, lakes, artificial reservoirs, snow, ice, glaciers, groundwater and soil-water within the territory of reference. These resources form the water asset classification presented in chapter 6. The main natural inputs of water for these resources are precipitation and inflows from other territories and from other resources within the territory. The main natural flows that decrease the stocks of water are evapotranspiration, outflows to other water resources within the territory and to other territories. Human activities decrease and increase the water stocks through abstraction and returns.

2.13. The asset accounts module of the SEEAW describes the inland water resource system in terms of stocks and flows: it provides information on the stocks of water resources at the beginning and end of the accounting period and changes therein. These changes are described in terms of flows brought about by the economy and by natural processes. Asset accounts can be thought of as a description in accounting terms of the hydrological water balance.

2. The economy

2.14. As mentioned in earlier paragraphs, water resources provide several functions not only to mankind which use water for survival, production and consumption activities, but also to other forms of life which are sustained by water. As such, the economy is one of many water users. The focus of water accounting is on the interactions between water resources and the economy, where the economy is thought of as the system which abstracts water for consumption and production activities, and puts in place the infrastructure to mobilize, store, treat, distribute and return water into the environment.

2.15. In Figure 2.2 the box representing the economy is expanded to show the main economic agents related to water. In particular, the following are identified:

- The industry primarily involved in the collection, treatment and supply of water to households, industries and the rest of the world;
- The industry primarily involved in the collection, treatment and discharge of sewage (sewerage);
- Other industries which use water as an input in their production processes;
- Households which use water to satisfy their needs or wants.

2.16. Note that households are separately identified only as final consumers of water. If water is used by households as an input in the production, for example, of agricultural products, water should be considered as an input in the production process and the activity should be classified according to the relevant category of the classification of economic activities.

2.17. The box representing the economy in Figure 2.2 describes, in a simplified format, the physical exchanges of water (represented by arrows) between economic units (represented by boxes). For the sake of simplicity, not all exchanges within the economy are represented in Figure 2.2. Additional information, which is an integral part of the SEEAW, includes:

- Monetary transactions related to water exchanges including: (a) costs of collection, treatment and supply of water and costs of sanitation services; (b) fees and taxes paid for water and sanitation services; (c) payments for access to the resource (e.g. water rights) as well as for discharging wastewater; and (d) the financing of these services (i.e. the sectors bearing the costs of services);
- Costs for environmental protection and resource management. They describe the economy's effort to prevent environmental degradation or eliminate part, or all, of the effects after degradation has taken place. They include actual expenses incurred (current and capital) by industries, households and the government as well as the financing of these expenditure;
- Investments in infrastructure. They describe (a) the costs of new investment; (b) the depreciation of old investment; (c) the costs of maintaining the water-related infrastructure; and (d) the financing of these investments;

- The emissions of pollutants into the environment. They allow for the identification of pressure on the environment by the various economic agents, namely industries, households and the government.

2.18. Sources of water for the whole economy of a given territory include: inland water resources in the environment of the territory of reference, precipitation which is either collected or used directly (e.g. rain-fed agriculture), sea water which can be either used directly (e.g. for cooling purposes), or after desalinization, and imports of water from other economies (the rest of the world). Once water enters the economy, it is used, returned back to the environment (to inland water resources and to the sea) or supplied to other economies (exports). In addition, during use or transportation, water can be lost through leakages or processes of evaporation and evapotranspiration.

2.19. Each economic unit either abstracts water directly from the environment or receives it from other industries. Once water is used, it can either be discharged directly into the environment, be supplied to other industries for further use (reused water), or be supplied to a treatment facility which in Figure 2.2 is denoted by the box "Sewerage".

2.20. During use, some water may be retained in the products produced by the industry or evapotranspired during use (note that most of the industrial activities lose water mainly due to evaporation as opposed to agriculture which consumes water mainly due to evaporation and transpiration by plants and crops). In these cases, water is considered "consumed" by the industry. The term consumption has often different meanings depending on the context. Here the term *consumption* refers to the quantity mentioned above that is water which after use is not returned back to the environment (inland and sea water). It is different from *water use* which denotes the water that is received by an industry or households from other industry or directly abstracted. The term "water consumption" is used in the hydrological sense and may create confusion among national accountants who tend to use the terms "consumption" and "use" as synonymous.

2.21. Note that Figure 2.1 and Figure 2.2 aim at showing in a simple way situations that are more complex in reality, and therefore they do not contain all the flows that occur in reality and are recorded in the accounts. For example, in Figure 2.2 flows of water lost during distribution are not explicitly shown, but they often occur, at times in significant quantities. Although not explicitly shown in the figures, these losses are recorded in the SEEAW.

C. The SEEAW and SNA frameworks

2.22. The SEEAW has been designed to link the economic information with hydrological information in order to provide the users with a tool for integrated analysis. The SEEAW takes the perspective of the economy and looks at the interaction of the economy with the hydrological system. It has been developed as a satellite account of the SNA in the sense that it expands the analytical capacity of national accounts by addressing water-related concerns without overburdening or disrupting the central system. As a satellite accounts of the 1993 SNA, the SEEAW has a similar structure to the 1993 SNA as it uses concepts, definitions and classifications consistent with the 1993 SNA while not violating the fundamental concepts and laws of hydrology. The SEEAW expands the central accounting framework by:

- Expanding the 1993 SNA asset boundary to include all water assets and their quality and explicitly identifying produced assets used for mobilizing water resources.

  The 1993 SNA includes only "aquifers and groundwater resources to the extent that their scarcity leads to the enforcement of ownership and/or use rights, market valuation and some measure of economic control" (1993 SNA, Annex of Chapter XIII). The SEEAW expands the

1993 SNA asset boundary by including all water resources, namely surface, groundwater and soil water, found in the territory. The water asset accounts in physical terms are an elaboration of the hydrological water balance, and they describe the changes in stocks due to natural causes and human activities.

Water resources are also described in the SEEAW in terms of their quality as often the degradation of the quality of water resources is a limiting factor in the use of water. Quality accounts describe the quality of the stocks of water at the beginning and end of the accounting period. Quality can be defined in terms of one pollutant, a combination of them, or in terms of physical characteristics (e.g. salinity level) of water.

Asset accounts for infrastructure (e.g. pumps, dams, etc.) related to water and sanitation are already included in the 1993 SNA, however, they are often not separately identified from other produced assets. The SEEAW allows for the explicit identification of those assets related to water and sanitation. This type of information has great analytical value as it provides an indication of the ability of a country to mobilize water.

- Expanding the 1993 SNA by juxtaposing physical information to the monetary accounts.

In the 1993 SNA the stocks or assets used in the production process and the flows of products are measured only in monetary terms, even if underlying physical information may be used in the compilation of monetary accounts. The SEEAW allows for the compilation of the accounts in physical terms. In the case of water, physical flows include the quantity of water used for production and consumption activities and the quantity of water reused within the economy and returned to the environment (treated or untreated). Monetary flows include the current and capital expenditures for abstraction, transportation, treatment and distribution of water resources as well as water-related and wastewater-related taxes paid and subsidies received by industries and households.

- Introducing information on the relationship between the economy and the environment in terms of abstractions, returns and emissions thus allowing for the analysis of the impact on natural assets caused by production and consumption activities of industries, households and government.

Production and consumption activities affect both the quality and quantity of water resources. By introducing information on abstraction and discharge of water by industry, households and government as well as information on the emission of pollutants into water resources, the SEEAW allows for the study of the impacts of these activities both in terms of quantity and quality of water resources.

- Separately identifying expenditures for the protection and management of water resources.

The 1993 SNA already includes implicitly expenditures for environmental protection and resources management. The SEEAW reorganizes this information in order to make it more explicit, thus allowing for the separate identification of the expenditures for the protection and management of water as well as the identification of taxes, subsidises and the financing mechanisms.

2.23. The strengths of using the national accounting framework to describe the interactions between the environment and the economy are manifold. First, the 1993 SNA is an international standard for compiling economic statistics. It provides a set of internationally agreed concepts, definitions and classifications which ensures the quality of the statistics produced. The 1993 SNA is the main source of

information for internationally comparable economic indicators and for economic analysis and modelling. The integration of environmental information into this framework requires using concepts, definitions and classifications consistent with those of the SNA. This ensures the consistency of environmental and economic statistics and facilitates and improves the analysis of the interrelations between the environment and economy.

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

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

2.26. In short, the existence of an underlying integrated data system is essential for integrated economic and environmental analyses: it allows for cost-effectiveness, scenario modelling, economic and environmental forecast and evaluation of trade-offs by no longer viewing sectoral policies in isolation but in a comprehensive economic and environmental context.

D. The SEEAW framework

2.27. The SEEAW consists of two parts. The first part describes the accounts for which there has been considerable practical experience in countries and an agreement on how to compile the accounts has been reached. This part presents a set of standard tables which constitutes the minimum data set that countries are encouraged to compile. It also presents supplementary tables which are a further disaggregation of the standard tables and which consist of items that should be considered by countries in which information would, in their particular cases, be of interest to analysts and policy makers. Part I of the SEEAW expands what is presented in the SEEA-2003 by (a) presenting agreed concepts, definitions and classifications related to water, and (b) providing standard compilation tables. Part II describes modules that are more experimental and for which not enough country experience exists and examples of applications of the water accounts. Part II includes: quality accounts, valuation of water and examples of applications of the accounts which are discussed in Chapters 7, 8 and 9 respectively. Chapters 7 and 8 discuss issues in the compilation of those accounts illustrating them by presenting country experiences and presents supplementary tables for which compilation is still experimental or not directly linked with the 1993 SNA. In Part II, there is no recommendation on how to compile those modules of the accounts. The SEEAW framework consists of the accounts described below.

Flow accounts

2.28. The central framework of the 1993 SNA contains detailed supply and use tables (SUT) in the form of matrices that record how supplies of goods and services originate from domestic industries and imports, and how these supplies are allocated between intermediate and final uses and exports. The SEEAW flow accounts provide information on the contribution of water to the economy and the pressure exerted by the economy on the environment in terms of abstraction and emissions.

Physical supply and use tables

2.29. The physical supply table is divided into two parts: one which describes the flows of water within the economy (e.g. distribution of water from one industry to another or to households, and with

the rest of the world), the other which describes flows from the economy to the environment (e.g. discharges of water in the environment).

2.30. The physical use table is also divided into two parts: one which describes flows from the environment to the economy (e.g. water abstraction by industries and households); and the other which describes flows within the economy (e.g. water received from other industries, households and the rest of the world). Physical supply and use tables are presented in Chapter 3.

Emission accounts

2.31. Emission accounts provide information by industry, households and government on the amount of pollutants added to wastewater which is either discharged into the environment (with or without treatment) or discharged into a sewage network. Emission accounts are presented in Chapter 4.

Hybrid and economic accounts

2.32. Hybrid accounts present, in a consistent manner, physical and monetary information on the supply and use of water by juxtaposing the standard (monetary) 1993 SNA supply and use tables with the corresponding physical tables. The monetary part of the hybrid supply and use tables explicitly identifies water-related products and industries. These accounts are a useful tool for obtaining a comprehensive picture of the economics of water and for deriving consistent sets of indicator such as intensity and productivity indicators.

2.33. For analytical purposes, it is useful to identify the government expenditures related to water such as on the management of water supply and sanitation. Further, it is also interesting to assess the contribution of water-related activities to the economy, linked to the physical flows of water, in particular to understand the financing of these activities and products. Monetary accounts for government expenditure on water-related activities as well as hybrid accounts for the *Collection, treatment and supply of water* as well as *Sewerage* carried out as principal and secondary activity or for own use provide this kind of information which is useful for compiling resource management and environmental protection expenditure.

2.34. One outcome of the compilation of economic accounts for water is the construction of the financing table, which allows for the identification of the units which bear the costs of production of water supply and sanitation services and of those which receive transfers from other economic units, government or other countries.

2.35. These accounts are presented in Chapter 5 together with other economic transactions related to water, namely taxes/subsidies and water rights.

Asset accounts

2.36. Asset accounts measure stocks at the beginning and end of the accounting period and record the changes in stocks that occur during the period. Two types of assets are related to water: produced assets which are used for the abstraction, mobilization and treatment of water; and water resources.

Produced assets

2.37. Produced assets related to water include infrastructure put in place to abstract, distribute, treat and discharge water. They are included in the 1993 SNA asset boundary as fixed assets; hence they are implicitly included as part of the core SNA accounts compiled in monetary terms. This information, however, is generally available in conventional national accounts in an aggregated manner and special surveys may be necessary to separately identify those produced assets related to water. A large part of these assets are owned either by water companies or water authorities, but can be owned also by other

industries or households that collect and treat water or wastewater as a secondary activity or for own use. Changes in the value of these stocks during the accounting period are explained by changes due to transactions in the item in question (acquisitions or disposals of non-financial assets; consumption of fixed capital, etc.), changes in the volume of the asset that are not due to transactions (e.g. discoveries of assets or recognition of their value; the unanticipated destruction or disappearance of assets; changes in classification etc.), and changes in prices (based on para. 13.92, 1993 SNA). Asset accounts for produced assets related to water provide information on the ability of an economy to mobilise and treat water including information on investments on infrastructure and its depreciation. Accounts for these assets are not dealt with explicitly in the SEEAW as these accounts follow the structure of the conventional accounts. Interested readers should refer to chapters X, XII and XIII of the 1993 SNA.

Water resources

2.38. The asset accounts describe the volume of water resources, in the various asset categories, at the beginning and end of the accounting period and all the changes therein due to natural causes (precipitation, evapotranspiration, inflows, outflows etc.) and human activities (i.e. abstraction and returns).

2.39. The SEEAW asset boundary of water resources is very broad and includes, in principle, all inland water bodies, namely surface water (rivers, lakes, artificial reservoirs, glaciers, snow and ice), groundwater and soil water. In practice, it is very difficult to compile asset accounts for all water resources in the SEEAW asset boundary. Nevertheless, they are included in the asset classification for the sake of completeness and are important when measuring exchanges between water resources (flows within the environment).

2.40. A small part of water resources is already included in the 1993 SNA asset boundary: the category AN.214, Water Resources, includes aquifers and groundwater resources to the extent that their scarcity leads to the enforcement of ownership and/or use rights, market valuation and some measure of economic control. The updating of the 1993 SNA is likely to further expand the asset boundary to include lakes and rivers for which ownership rights are enforced.

2.41. Asset accounts for water resources could also be compiled in monetary terms, but in practice, it is more common to compile them only in physical units: very rarely water has a positive resource rent as it is often provided free of charge or at prices that do not reflect the costs of providing the services. Physical assets accounts are presented in chapter 6.

Quality accounts

2.42. Asset accounts can also be compiled on the basis of water quality. They describe stocks of water at the beginning and end of an accounting period according to their quality. Since it is generally difficult to link changes in quality to the causes that affect it, quality accounts describe only the total change in quality in an accounting period without further specifying the causes. Quality accounts are presented in chapter 7.

Valuation of non-market flows

2.43. This component presents economic valuation techniques of water beyond the market prices and their applicability in answering specific policy questions. The valuation of water resources and consequently their depletion remain controversial because of the fundamental importance of the resource for basic human needs and the lack of a real market for water. As such the SEEAW does not discuss the calculation of macroeconomic aggregates adjusted for depletion and degradation costs, which are nevertheless discussed in the SEEA-2003. Chapter 8 of the SEEAW presents a review of the

valuation techniques that are used for water resources and discusses their consistency with the SNA valuation.

1. Classifications of economic activities and products

2.44. The economy is comprised of five sectors: the non-financial corporation sector, the financial corporation sector, the general government sector, the non-profit institutions serving households sectors, and the households sector. These sectors are themselves comprised of resident institutional units which are economic entities that are capable, in their own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities (1993 SNA, para. 4.2).

2.45. Institutional units in their capacity as producers are referred to as enterprises. They can be involved in a various range of productive activities which may be very different from each other with respect to the type of production processes carried out, and also the goods and services produced. Therefore to study production, it is more useful to work with groups of producers who are engaged in essentially the same kind of production. These are called establishments and are institutional units disaggregated into smaller and more homogeneous units. Industries are groups of establishments. The production accounts and generation of income accounts are compiled for industries as well as sectors.

2.46. The classification of industrial economic activities used in the SEEAW is the same as that used in the SNA, namely the International Standard Industrial Classification of All Economic Activities (ISIC).

2.47. ISIC is a classification according to the kind of economic activity (and not a classification of industries, goods and services). The activity carried out by a unit is the type of production in which it engages. This is the characteristics of the unit according to which it is grouped with other units to form industries. An industry is defined as the set of all production units engaged primarily in the same or similar kinds of productive economic activity (para. 5.41, 1993 SNA).

2.48. ISIC does not draw distinction according to kind of ownership, type of legal organization or mode of operation because such criteria do not relate to the characteristics of the activity itself. Units engaged in the same kind of economic activity are classified in the same category of ISIC irrespective of whether they are (part of) incorporated enterprises, individual proprietors or government, and whether or not the parent enterprise consists of more than one establishment. Also ISIC does not distinguish between formal and informal, legal and illegal production or market and non-market activity.

2.49. Since an establishment, the statistical unit for industrial or production statistics, may often engage in a number of activities, it is useful to distinguish between principal and secondary activities. The output of principal and secondary activities, respectively principal and secondary products, is produced for sale on the market, for provision free of charge or for other uses that are not prescribed in advance. For example, they may be stocked for future sale or further processing. The principal activity of an economic entity is the activity that contributes the most to the value of the entity, or the activity for which the value added exceeds that of any other activity of the entity. A secondary activity is each separate activity that produces products eventually for third parties and that is not a principal activity of the entity in question.

2.50. In the 1993 SNA, the activity classification of each unit (establishment) is determined by the ISIC class in which the principal activity, or range of activities, of the unit is included. There are, however, cases in which the production of secondary activities within an establishment is as important, or nearly as important, as the production of the principal activity. In these cases, the establishment should be subdivided so that the secondary activity is treated as taking place within an establishment

separate from that in which the principal activity takes place and classified accordingly. The SEEAW follows the same principle.

2.51. Box 2.1 provides a summary of the economic activities, classified according to ISIC Rev. 4 (United Nations, 2006), which are primarily related to water in the sense that they either provide water or water-related services. Even though the simplified standard tables of the SEEAW present only two of the activities in Box 2.1 (i.e. ISIC 36, *Collection, treatment and supply of water*, and ISIC 37, *Sewerage*), for analytical purposes it is useful to explicitly identify in the accounting tables all the water related activities.

2.52. Note that structural changes were introduced in ISIC Rev.4 since its previous version, ISIC Rev. 3.1 (United Nations, 2004). In particular, for activities related to water, two major changes were introduced in ISIC Rev. 4:

(i) In order to reflect the fact that often activities of abstraction, purification and distribution of water are carried out in the same enterprise as activities of wastewater treatment and disposal, ISIC Rev. 4 combines under the same section (Section E, ISIC Rev.4) activities of 'Collection, purification and distribution of water' and 'Sewerage' which were previously classified under different sections in ISIC Rev. 3.1.

(ii) Given the importance of activities aimed at the decontamination of water resources and wastewater management, a division is introduced in ISIC Rev. 4 (Division 39) to explicitly identify these activities.

2.53. The correspondence of codes of ISIC Rev. 4 and Rev. 3.1 is presented in this chapter together with a detailed description of the classes relevant to water accounting. In the rest of the chapters, reference to a particular class is made according to ISIC Rev. 4. The main activities related to water are described below.

2.54. Activities of **operation of agricultural irrigation systems** in support of crop production include, among various support activities for crop production, all water mobilisation activities corresponding to agricultural uses including groundwater abstraction, construction of dams, catchments for surface flows, etc., and the operation of irrigation equipment. The operation of irrigation systems is recorded under class **0161** of ISIC Rev. 4 and it corresponds to the class 0140 of ISIC Rev. 3.1. This class does not include the provision of water in ISIC 36 Rev. 4 or any construction involved in the provision of this service. Note, however, that special surveys are often necessary to disaggregate information on class 0161, ISIC Rev. 4 in order to explicitly identify activities for the operation on irrigation system.

2.55. Activities for the **collection, treatment and supply of water** (ISIC Rev. 4 class 3600), include: collection of water from various sources (abstraction from rivers, lakes, wells etc. and collection of rain water); purification of water for supply purposes; and distribution of water through mains, by trucks or other means for domestic and industrial needs. This class also includes activities of desalting of sea or groundwater in order to produce water. The operation of irrigation canals is also included; however, the provision of irrigation services through sprinklers, and similar agricultural support services, are classified under the class 0161 of ISIC Rev 4. ISIC Rev. 4 class 3600 corresponds to ISIC Rev. 3.1 class 4100.

2.56. Activities of **sewerage** (ISIC Rev. 4 class 3700) include: the operation of sewer systems or sewer treatment facilities; the collection and transportation of (human and industrial) wastewater from one or several users, as well as urban runoff by means of sewerage networks, collectors, tanks and other means of transport (sewage vehicles etc.); the treatment of wastewater by means of physical, chemical

and biological processes like dilution, screening, filtering, sedimentation etc.; the emptying and cleaning of cesspools and septic tanks, sinks and pits from sewage; and servicing of chemical toilets. This class also includes activities of maintenance and cleaning of sewers and drains. Note that an economic unit engaged in the collection and treatment of wastewater, ISIC 3700 Rev. 4, can also re-distribute (waste)water to specific users for further use.

2.57. Class 3700 of ISIC Rev. 4 corresponds to part of the activities classified in class 9000 of ISIC Rev. 3. The rest of the activities classified in class 9000 of ISIC Rev. 3 relate to remediation activities and are explicitly identified in ISIC Rev. 4 in class 3800 and 3900. ISIC rev. 4 class 3800 is 'Waste collection, treatment and disposal activities and materials recovery'. Since these activities refer to solid waste, they are not discussed further in the SEEAW.

2.58. **Remediation activities and other waste management services**. These activities are coded under class 3900 of ISIC Rev. 4 and they include the provision of remediation services, i.e. the cleanup of contaminated buildings and sites, soil, surface or ground water. Only part of these activities is related to water. They include: (a) decontamination of soils and groundwater at the place of pollution, either in situ or ex situ, using e.g. mechanical, chemical or biological methods; (b) decontamination and cleaning up of surface water following accidental pollution, e.g. through collection of pollutants or through application of chemicals; and (c) cleaning up of oil spills and other pollutions on land, in surface water, in ocean and seas, including coastal areas.

2.59. These activities are particularly useful in assessing environmental protection expenditures. Class 3900 of ISIC Rev. 4 corresponds to part of class 9000 of ISIC Rev. 3.1.

2.60. Activities for the **transport of water** are identified in the ISIC classes 4923 and 4930 depending on whether the transport is by road (e.g. tanker trucks) or via pipeline. These activities are related to the long-distance transport of water as opposed to the distribution of water which is classified under ISIC class 3600.

2.61. Activities aimed at the **administration and regulation of programmes related to water** such as potable water supply programmes, waste collection and disposal operations and environmental protection programmes (part of ISIC Rev. 4 class 8412) are classified together with the administration of a number of other programmes in health, education, sport etc. Thus when compiling water accounts, the interest is only in the information on the part of class 8412, ISIC Rev. 4, which is relevant to water which has to be identified through special surveys. Class 8412, ISIC Rev. 4 corresponds to class 7512 of ISIC Rev. 3.1.

2.62. Note that division 84 of ISIC Rev. 4 includes activities normally carried out by the public administration. However, the legal or institutional status is not, in itself, the determining factor as ISIC does not make any distinction regarding the institutional sector to which a statistical unit belongs. Activities carried out by government units that are specifically attributable to other divisions of ISIC should be classified in the appropriate division of ISIC and not in division 84, ISIC Rev. 4. Often there is the tendency of allocating to class 8412 of ISIC Rev. 4 activities for collection, purification and distribution of water (class 3600 of ISIC Rev. 4) and for the sewage, refuse disposal and sanitation (class 3700 of ISIC Rev. 4) when they are owned by the government. This can occur, for example, when the local government accounts are not detailed enough to separate water supply or sewage collection from other activities. Division 84 of ISIC Rev. 4 includes the administration of programmes related to a variety of services, enabling the community to function properly, but it does not include the actual operation of facilities, such as water works. Some activities in this division may be carried out by non-government units.

Box 2.1: Main activities related to water in the economy

ISIC 0161 **Support activities for crop production** [corresponds to class 0140, ISIC Rev. 3.1]
This class includes among various support activities for crop production:
- operation of agricultural irrigation equipment.

ISIC 3600 **Water collection, treatment and supply** [corresponds to class 4100, ISIC Rev. 3.1]
This class includes water collection, treatment and distribution activities for domestic and industrial needs. 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. This class 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
- operation of irrigation canals

This class excludes: operation of irrigation equipment for agricultural purposes, see 0161; treatment of waste water in order to prevent pollution, see 3700; (long-distance) transport of water via pipelines, see 4930.

ISIC 3700 **Sewerage** [part of class 9000, ISIC Rev. 3]
This class include:
- the operation of sewer systems or sewer treatment facilities
- collecting and transporting of human waste water from one or several users, as well as rain water by means of sewerage networks, collectors, tanks and other means of transport (sewage vehicles etc.)
- emptying and cleaning of cesspools and septic tanks, sinks and pits from sewage; servicing of chemical toilets
- treatment of waste water by means of physical, chemical and biological processes like dilution, screening, filtering, sedimentation etc.
- treatment of waste water in order to prevent pollution, e.g. from swimming pools, industry
- maintenance and cleaning of sewers and drains
- sewer cleaning and rodding.

ISIC 3900 **Remediation activities and other waste management services** [part of class 9000, ISIC Rev. 3]
This class includes:
- decontamination of soils and groundwater at the place of pollution, either in situ or ex situ, using e.g. mechanical, chemical or biological methods
- decontamination of industrial plants or sites, including nuclear plants and sites
- decontamination and cleaning up of surface water following accidental pollution, e.g. through collection of pollutants or through application of chemicals
- cleaning up of oil spills and other pollutions on land, in surface water, in ocean and seas, including coastal areas
- asbestos, lead paint, and other toxic material abatement
- other specialized pollution-control activities

This class excludes: treatment and disposal of non-hazardous waste, see 3821; treatment and disposal of hazardous waste, see 3822; outdoor sweeping and watering of streets etc., see 8129.

ISIC 4923 **Freight transport by road** [corresponds to class 6023, ISIC Rev. 3.1]
This class includes:
- all freight transport operations by road (e.g. logging haulage, bulk haulage, including haulage in tanker trucks, etc.)

This class excludes, among other things, distribution of water by trucks, see 3600

ISIC 4930 **Transport via pipeline** [corresponds to class 6023, ISIC Rev. 3.1]
This class includes:
- transport of gases, liquids, water, slurry and other commodities via pipelines
- operation of pump stations

This class excludes: - distribution of natural or manufactured gas, water or steam, see 3520, 3530, 3600; - transport of water, liquids etc. by trucks, see 4923.

ISIC 8412 **Regulation of the activities of providing health care, education, cultural services and other social services, excluding social security** [corresponds to class 7512, ISIC Rev. 3.1]
This class also includes:
- administration of potable water supply programmes
- administration of waste collection and disposal operations
- administration of environmental protection programmes.

Source: UN (2006b).

2.63. Monetary supply and use tables are constructed for the products associated with the industries in Box 2.1 and provide information on the value of the output produced (supplied) and its uses as intermediate, final consumption and exports. In national accounts, products are classified according to the Central Product Classification (CPC) Ver. 2.0 (United Nations, 2006). The CPC constitutes a comprehensive classification of all goods and services and classifies products based on the physical properties and the intrinsic nature of the products as well as on the principle of industrial origin. The CPC and the ISIC are both general-purpose classifications, with the ISIC representing the activity side and the CPC the product side of these two interrelated classifications. Note, however, that a one to one correspondence between the CPC and the ISIC is not always possible as the output of an industry, no matter how narrowly defined, will tend to include more than a single product. Similarly, a product can be produced by industries classified in different classes. In general, however, each subclass of the CPC consists of goods or services that are predominantly produced in a specific class or classes of the ISIC, Rev. 4.

2.64. The main products related to water which are identified in the CPC Ver. 2.0 are described in Box 2.2 together with the reference to the ISIC Rev. 4 class in which most of the goods or services in question are generally produced. It should be noted that bottled water is not explicitly included in the list of water-related products as it is treated in the same way as other beverages such as beer, soft drinks and wines. While the SEEAW standard tables do not explicitly record the physical and monetary exchanges of these products within the economy, they can be easily expanded to add this information. They do, however, record information on the volumes of water used and discharged during the production of these beverages.

2.65. The simplified standard tables explicitly identify only two of the products related to water which constitute the most important water-related products: CPC 18, *Natural water*, and CPC 941, *Sewerage, sewage treatment and septic tank cleaning services*. It is, however, highly recommended to also explicitly include the other water-related products.

2.66. Although the term natural water seems to describe water in the natural environment, the CPC class “Natural water” is very broad and covers all types of water: water in the environment, water supplied and used within the economy and also water discharged back into the environment. The exact boundaries of this class are usually determined by the statistical framework that uses the CPC. To reflect these different types of water flows, water accounts disaggregate the CPC class of natural water firstly in terms of the type of flow (from the economy to the environment, within the economy and from the economy to the environment), secondly in terms of the type of water: for example, water supplied to other economic units is further disaggregated to identify, for example, if it consist of wastewater supplied for further use. This is particularly important for water conservation policies which encourage the reuse of water. Examples of relevant categories of water in the physical supply and use tables are presented in Chapter 3.

2.67. Physical supply and use tables record the amount of water that is exchanged between an economic unit and the environment (abstraction and return flow) and between economic units. However, monetary supply and use tables may report the value of the service associated with the water exchange as well as the value of the water exchanged. This is because the output of the supplying industry is generally a service (and the monetary SUT records the value of the service). For example, the water supply industry, which collects, treats and supply water, generally charges only for the service of collection, treatment and supply and not for water as a good.

Box 2.2: Main products related to water according to CPC Version 2.0

Product code	ISIC reference
Natural water - CPC 18000	ISIC 3600 – Collection, treatment and supply of water
Transport services which includes the following subclasses CPC 65112 *Road transport services of freight by tank trucks or semi-trailers* CPC 65122 *Railway transport services of freight by tanker cars* CPC 65139 *Transport services via pipeline of other goods*	ISIC 4923 - Freight transport by road and ISIC 4630 - Transport via pipeline
Water distribution services which include the following subclasses: CPC 69210 *Water distribution services through mains, except steam and hot water* CPC 69230 *Water distribution services, except through mains* CPC 86330 *Water distribution services through mains (on a fee or contract basis)* CPC 86350 *Water distribution services, except through mains (on a fee or contract basis)*	ISIC 3600 - Collection, treatment and supply of water
Operation of irrigation systems for agricultural purposes which is part of CPC 86110 - Services incidental to crop production. The class CPC 86110 includes a number of activities necessary for agricultural production ranging from the preparation of fields to harvesting. The supply and use table only report the part of this class that is relevant for water.	ISIC 0161 - Support activities for crop production
Water-related administrative services which are part of CPC 91123 - Administrative housing and community amenity services. The class CPC 91123 covers a number of services, the part that is relevant for water include: (i) public administrative services for water supply, (iii) services provided by offices, bureaux, departments and programme units involved in developing and administering regulations concerning water supply; and (iii) public administrative services related to refuse collection and disposal, sewage system operation and street cleaning.	ISIC 8412 - Regulation of the activities of providing health care, education, cultural services and other social services, excluding social security
Sewerage, sewage treatment and septic tank cleaning services - CPC 941. This group includes: (i) Sewerage and sewage treatment services (CPC 9411) and (ii) Septic tank emptying and cleaning services (CPC 9412).	ISIC 37 – Sewerage
Site remediation and clean-up services, surface water – CPC 94412. This subclass includes services involved in implementing approved plans for the remediation of surface water on a contaminated site, that meet requirements specified by legislation or regulation *Site remediation and clean-up services, soil and groundwater* – CPC 94413. This subclass includes: (i) services involved in implementing approved plans for the remediation of soil and groundwater on a contaminated site, that meet requirements specified by legislation or regulation, (ii) maintenance and closure of landfills and other disposal sites; and (iii) operation, maintenance, closure of hazardous waste disposal facilities.	ISIC 3900 - Remediation activities and other waste management services

Note: main products related to water as identified in the CPC Ver. 2.0 are presented together with the reference to the industry, ISIC Rev. 4, in which most of the goods or services in question are generally produced.

Source: UN (2006a).

2. Main identities of the SNA accounting framework

2.68. The conventional economic accounts consist of an integrated sequence of accounts which describe the behaviour of the economy from the production of goods and services, generation of income, to how this income is made available to various units in the economy and how it is used by these units. The 1993 SNA has identities within each account and between accounts that ensure the consistency and the integration of the system. The identities that are used in the SEEAW more frequently are described below.

2.69. A particularly useful identity for the SEEA involves the total supply and total use of products. In a given economy a product can be the result of domestic production (output) or production in another territory (imports). Hence

Total Supply = Output + Imports.

2.70. On the other side (use), the good and services produced can be used in various ways. They can be used by: (a) industries to produce other goods and services (intermediate consumption); (b) households and government to satisfy their needs or wants (final consumption); (c) they can be acquired by industries for future use in the production of other goods and services (capital formation); and finally they can be used by the economy of another territory (exports). Therefore

Total Use = Intermediate Consumption + Final Consumption +

+ Gross Capital Formation + Exports.

Total supply and total use as defined above have to be equal. In the SNA this identity is expressed only in monetary terms, but in the SEEA it holds also when the accounts are compiled in physical terms.

2.71. Another identity of the SNA involves the generation of value added. Gross value added is the value of output less the value of the goods and services, excluding fixed assets, consumed as inputs by a process of production, (intermediate consumption); and is a measure of the contribution to Gross Domestic Product (GDP) made by an individual producer, industry or sector. When we take into account also the reduction in the value of the fixed assets used in production during the accounting period resulting from physical deterioration, normal obsolescence or normal accidental damage (consumption of fixed capital), we then obtain net value added:

Gross Value Added = Output – Intermediate Consumption

Net Value Added = Output – Intermediate Consumption – Consumption of Fixed Capital.

2.72. Once the value added is generated, it is decomposed in the primary generation of income accounts in compensation of employees, taxes and subsidies on production and operating surplus:

(Gross) Value added = (Gross) Operating Surplus + Compensation of Employees + Taxes – Subsidies

2.73. Another identity of the SNA particularly useful in the SEEA involves assets and links them with flows. This identity describes the stocks of assets at the beginning and end of an accounting period and their changes. Changes are the result of transactions on the asset (gross fixed capital formation), consumption of fixed capital, changes in the volume of the asset that are not due to transactions (e.g. changes in classification, discoveries, natural disasters etc.), changes in their prices (holding gains/losses on assets):

Closing Stocks = Opening Stocks + Gross Fixed Capital Formation – Consumption of Fixed Capital

+ Other Changes in Volume of Asset + Holding gains/losses on assets.

3. The water accounting framework

2.74. Figure 2.3 gives a simplified representation of the SEEAW accounting framework and links supply and use tables (SUT) with the asset accounts. The framework of the SEEAW is the same as the one of the SEEA-2003, but it focuses specifically on water. The unshaded boxes represent monetary accounts that are already part, explicitly or implicitly, of the SNA. The grey boxes represent accounts that are introduced in the SEEAW and are not covered in the SNA. They are measured in physical and monetary units.

2.75. The monetary SUT are shown in Figure 2.3 with unshaded boxes. While the 1993 SNA supply table in monetary terms remains unchanged in the SEEAW framework, the use table in the SEEAW contains a more detailed breakdown of the costs for water use, which are not usually explicitly available in the SNA. Monetary supply and use tables for water are presented in chapter 5.

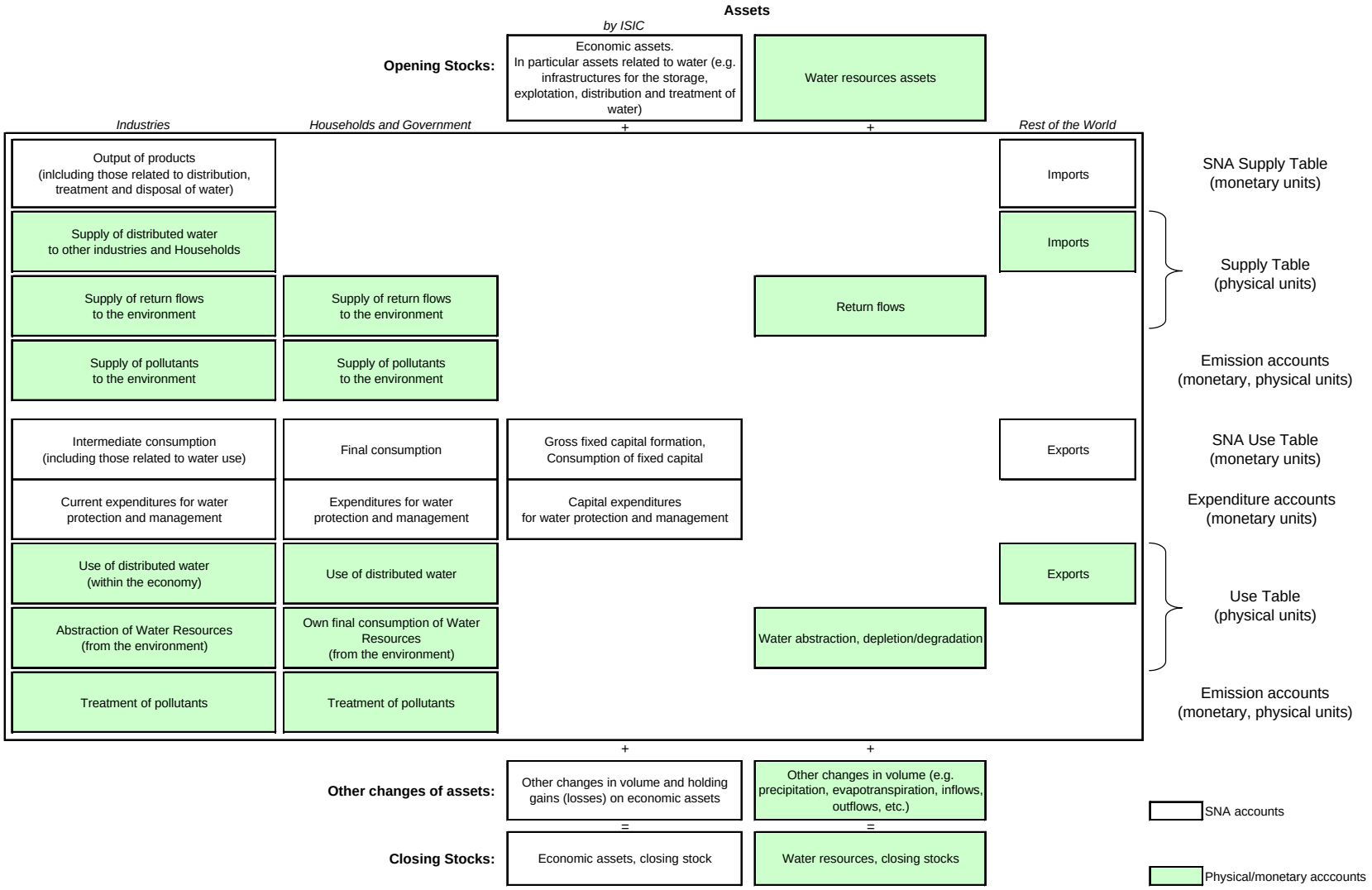
2.76. Expenditure accounts are also shown in the figure with unshaded boxes. This is because the information on expenditures for water protection and management are also part of the conventional accounts even though the information is generally aggregated and special surveys are necessary to separately identify these expenditures. Water protection and management accounts are also presented in chapter 5.

2.77. Physical SUT describe the water flows from abstraction, use and supply within the economy and returns into the environment and are shown in the figure with shaded boxes as they are not part of the core national accounts. The SEEAW also introduces SUT for pollutants (emission accounts) which describe the flow of pollutants, in physical and possibly in monetary terms, generated by the economy and supplied to the environment.

2.78. The asset accounts are obtained in Figure 2.3 by combining the opening and closing stocks of assets with the part of the SUT which affects the stocks. In particular, Figure 2.3 distinguishes assets related to water which are within the asset boundary (unshaded box) which includes infrastructures for the storage, mobilization and use of water, as well as assets of water which include mainly water in the environment. Note that part of the assets of water is already included in the SNA (e.g. groundwater) but they are not shown separately for two reasons. Firstly, these assets represent a minimal part of all water assets; secondly, the valuation of those assets, even though theoretically possible, remains in practice a difficult exercise and it is often embedded in the value of land.

2.79. The framework in Figure 2.3 can also be presented in a matrix form. The matrix presentation is commonly referred to as National Accounting Matrix including Water Accounts (NAMWA). NAMWA and more in general National Accounting Matrix including Environmental Accounts (NAMEA) have been developed by Statistics Netherlands (CBS) and adopted by Eurostat. It should be noted that NAMWA is not a different framework rather an alternative presentation of the information contained in the supply and use tables presented in Figure 2.3.

Figure 2.3: SEEAW framework



E. Spatial and temporal issues in water accounting

2.80. Water resources are not evenly distributed in time and space. Major spatial variability at the global level can be seen in the difference between arid regions where almost no precipitation falls and humid regions where several metres of rain can fall yearly. Even at smaller spatial scales, there can be great variability in the availability of water: within the same river basin there can be areas subject to water scarcity, while others are subject to flooding. The temporal distribution of water resources depends on the characteristics of the water cycle. Periods of high rainfall alternate with dry periods; for example, on a yearly basis, dry summer months are followed by wet winter months. The frequency of the water cycle varies with climatic regions and the inter-annual and year-to-year variability can be significant.

2.81. Economic information that is compiled according to the SNA and uses as spatial references the country or administrative regions, and as a temporal reference the accounting year and in some cases smaller temporal references (such as quarterly accounts). Since water accounts consist of integrating hydrological information with economic information, some issues in the reconciliation of the temporal and spatial reference of the two sets of data arise.

2.82. Considerations on the choice of the spatial and temporal reference for the compilation of water accounts are presented next. In general, priority should be given to the spatial and temporal reference of the conventional economic accounts. The main reason being that it is easier to adapt the reference of hydrologic information to that of the conventional economic accounts, as hydrological data are often available at a more disaggregated spatial and temporal level than economic data. As a second principle, in order to allow for meaningful comparisons through time, the spatial and temporal references of the accounts should not be changed.

Spatial dimension

2.83. The choice of the spatial reference for the compilation of the accounts ultimately depends on the objectives of the analysis. As mentioned above, the compilation of national water accounts is important for designing and evaluating macro-economic water policy. However, to reflect better spatial differences in the water use, supply, pressure on water resources and to make decisions on water allocation between different users, it is often more appropriate to use a finer spatial reference.

2.84. The water accounting framework can in principle be compiled at any level of geographical disaggregation of a territory. At sub-national level, the options are usually to compile the accounts either at the level of administrative regions, river basins or accounting catchments.

2.85. An **administrative region** is a geographic area designated by the provincial government for administrative purposes. Administrative regions are usually responsible for certain economic policies within their jurisdiction and regional economic accounts are usually compiled for administrative regions.

2.86. A **river basin** is a naturally defined region which is drained by a river or stream. It is internationally recognized that the river basin is the most appropriate unit of reference for Integrated Water Resource Management (see, for example, Agenda 21 (United Nations, 1992) and the EU Water Framework Directive (WFD)). In particular, the WFD requires Member States to formulate a river

basin management plan for each river basin district[6] within their territory, and, in the case of an international river basin district, Member States shall ensure coordination with other Member States or third countries with the aim of producing a single international river basin plan. Water management can in fact be more effectively pursued at the river basin level since all water resources within a river basin are inextricably linked to each others both in terms of quantity and quality. In this way, managers are able to gain a more complete understanding of overall conditions in an area and the factors which affect those conditions. For example, emissions from a sewage treatment plant might be reduced significantly, and yet the local river and groundwater may still suffer if other factors in the river basin, such as polluted runoff from upstream emissions, go unaddressed.

2.87. As there are often large spatial differences in terms of availability and use of water resources between different river basins of a country, especially in "water stressed" countries, the use of national averages is not always sufficient for sound policy decisions at the local level. Policy analyses for each main national "basin area" (a homogeneous basin area formed by the association of contiguous river-basins) are generally required. In addition, the compilation of the accounts by local basin data providers for their water management needs is generally essential to sustain their involvement in the water accounting process.

2.88. River basin agencies have been increasingly established in countries. They are usually government bodies endowed with their own resources and entrusted with all issues (economic, hydrological and social) related to water. They are often responsible - within a clear legal and participatory framework - to collect taxes and fees on water abstraction and discharges and to make decisions on water allocation. To support their decision, they often collect physical and monetary data related to water resources. The WFD, for instance, requires the establishment of competent authorities in the river basin districts to be responsible for the implementation of the Directive.

2.89. While the compilation of physical water accounts at river basin can be easily undertaken (as river basin agencies generally collect physical data at river basin level), the compilation of monetary water accounts at the river basin level requires extra work to reconcile the spatial reference of economic information (such as output, value added etc.) which is only available at administrative region. Often techniques to allocate economic data to river basin involve the allocation of economic accounts at the administrative region level to the river basin on the basis of other socio-economic data.

2.90. Depending on the characteristics of the administrative regions and river basins in a country, it may be useful to define regions for the compilation of water accounts for which both economic and physical data are more easily available. Such regions, that we refer to here as **accounting catchments**, would be composed by river basins or sub-basins and would be large enough so that economic information is available. An accounting catchment could consist, for example, of an administrative region and be composed by several river basins or it could be composed by several administrative regions to cover a whole river basin.

Temporal dimension

2.91. The temporal reference of economic data generally differs from that of hydrological data: hydrological data generally refer to the hydrological year (which is a 12-month period such that the overall changes in storage are minimal and carryover is reduced to a minimum[7]); economic data, and in

[6] In the WFD, "River basin district" means the area of land and sea, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters, which is identified under Article 3(1) as the main unit for management of river basins. It may include several river basins and their sub-basins.
[7] UNESCO/WMO International Glossary of Hydrology, 2nd edition, 1992

particular accounting data, refer to the accounting year. It is imperative that the hydrological and economic data used in the accounts refer to the same temporal reference. Moreover, it is recommended that the reference period for the compilation of the accounts is the 12-month accounting period of the national accounts.

2.92. Yearly accounts often hide potential seasonal variability of water use and supply as well as of availability of water resources in the environment. Ideally, quarterly water accounts would be useful in the analysis of intra-annual variations. They are, however, very data demanding and thus are often not considered a feasible option.

2.93. The choice of the frequency of the compilation of the accounts depends on the availability of data and the type of analysis. Annual accounts provide detailed information on water resources and their use, and allow for a detailed time series analysis. However, there may be cases where compiling annual accounts on water use may not provide significant information: the inter-annual variability may not be greater than the variability of the estimation procedure. Moreover, an increase of those water uses which depend heavily on the climatic variations (such as agriculture) may be interpreted as a structural change of water use while in reality it may just be a short term increase in response to a climatic change. An alternative could be the compilation of accounts on water use every three or five years which would allow for a sufficiently complete analysis of the water use trend (Margat, 1996).

2.94. To reflect the long-term hydrological cycle (longer than a year), "budgetary" accounts could be compiled. These accounts combine average data on water resources (budgetary asset accounts) with actual annual information on water use. Budgetary asset accounts refer to an average year in a series of years long enough to be stable (20 or 30 years) and provide information on the average annual water availability in the environment. These accounts could be also supplemented with accounts for a particular year, e.g. the dry year, which would describe the worst condition of the natural water system. Annual water use accounts describe the water use of the economy in a particular year. Combining hydrological information on annual averages with economic information on water use for a specific year can be justified by the fact that while the variability of water resources is pseudo-cyclical and their average is relatively stable in the long term and in a given climatic situation (and it is often the reference for the assessment of water resources), water use tends to change over the years (due, for example, to increasing population and changes in the structure of the economy). Therefore the combination of these two types of information would allow for the analysis of the natural water supply in relation to the evolution of human water demand (Margat, 1996).