Physical Supply and Use Tables in SEEAW: Main concepts and recording of flows

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Outline

- Policy relevance of the SEEAW
- Basic scheme of SEEAW
- What do Physical Supply-Use Tables (PSUT) measure?
- Concepts
- The standard tables of SEEA Water
- Supplementary tables
- Some data recording issues

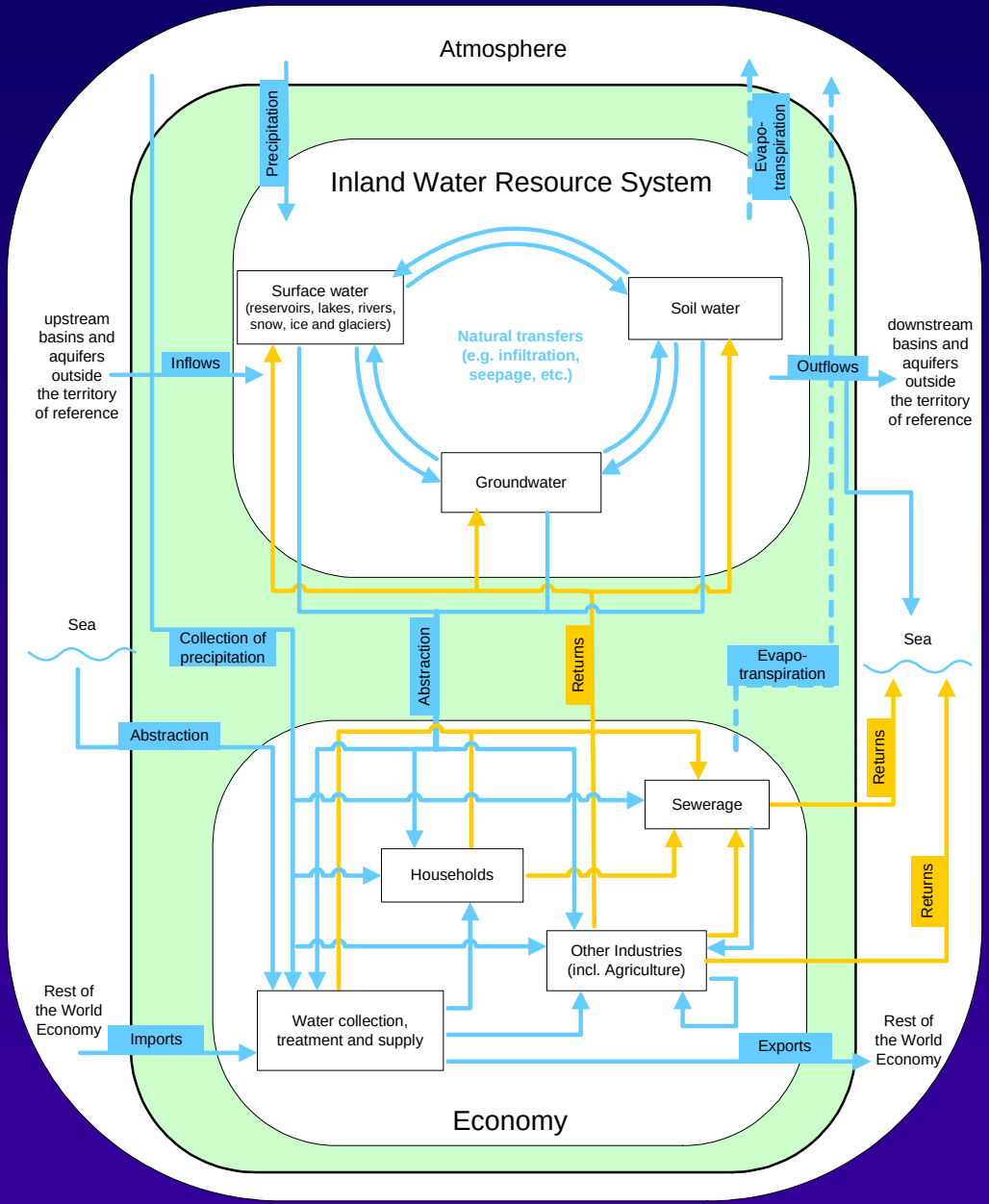
The need for SEEAW

- Supporting Integrated Water Resource Management (IWRM)
- Understanding the links between the economy and the environment
- Maximising/optimising the social, economic and environmental benefits of water use in the economy
- Managing water scarcity and competing demands for water, especially in the context of climate change
- Water as an economic good (e.g. water pricing, full cost recover, water rights)
- Identifying water intensive and water polluting industries for policy response (e.g. application of users pays and polluter pays principles)
- Bring together dispersed data into a multi purpose analytical framework

SEEAW

Overview

- Stocks and flows
- Economy and environment
- Monetary and physical



12 Standard Tables

1. Physical supply
2. Physical use
3. Gross and net emissions
4. Emissions by ISIC 37
5. Hybrid (Monetary and Physical) supply
6. Hybrid use
7. Hybrid supply and use
8. Hybrid water supply and sewerage for own use
9. Government accounts for water related collective consumption services (Monetary)
10. National expenditure for waste management (Monetary)
11. Financial accounts for waste water management (Monetary)
12. Asset account (Physical)

12 Supplementary tables

What do PSUT measure?

PSUT describe in physical units

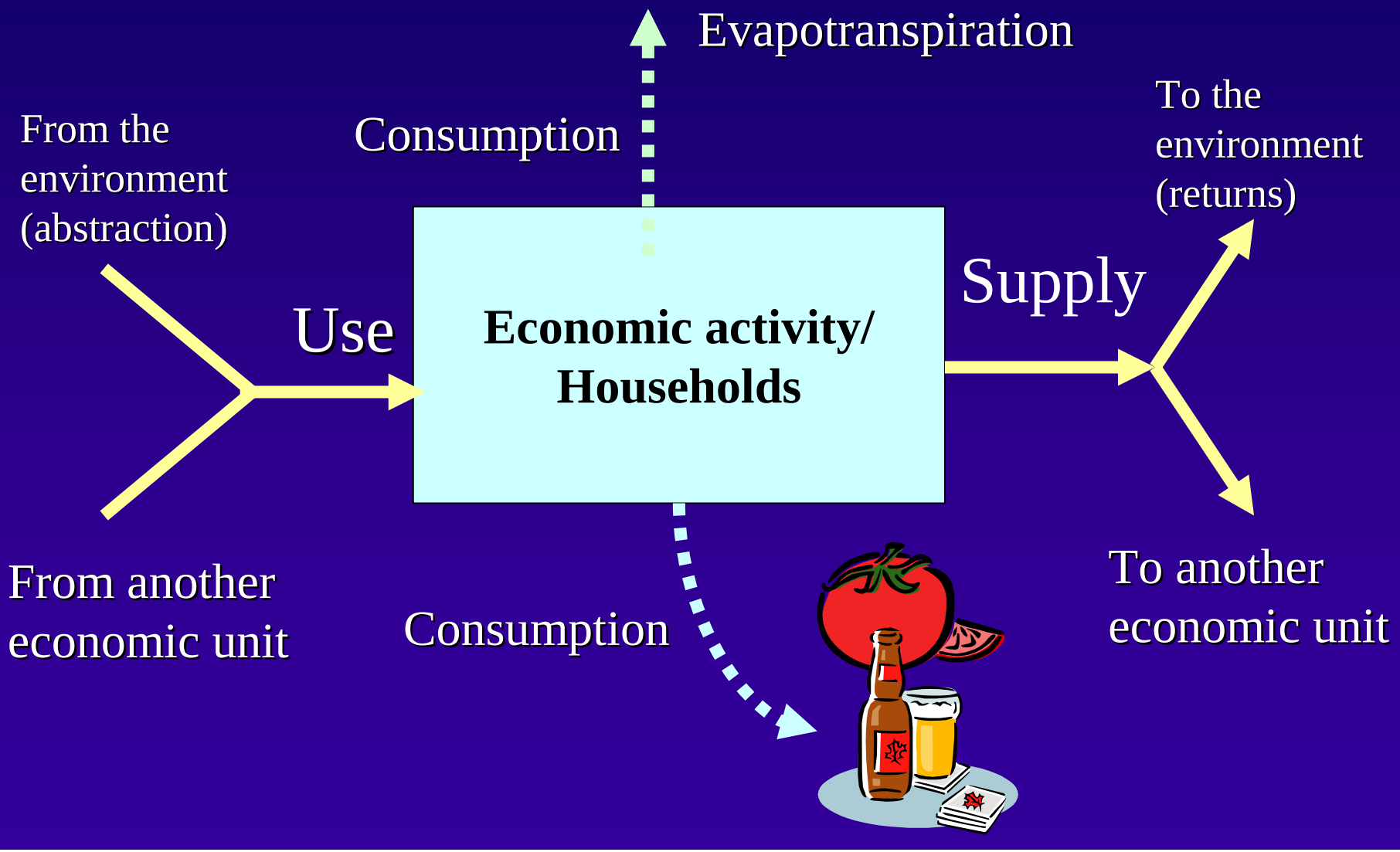
- The exchanges of water between the environment and the economy (abstraction and returns)
- The exchanges of water within the economy (supply and use within the economy)

Why compiling physical supply and use tables?

They are important because

- They allow for the identification of the industries/sectors which put pressure on the environment via extraction and use
- They indicate the industries/sectors consuming the most water
- Together with monetary data (e.g. from the hybrid accounts), they provide information on water use efficiency and other information useful for water allocation policies

Basic concepts and definitions



Water Use

Water use: water intake of industries and households for production and consumption activities. Water Use is the sum of *water use within the economy* and *water use from the environment*.

Water use within the economy: water intake for production and consumption activities, which is distributed by industries or households and by the Rest of the World (Imports).

Water use from the environment: water abstracted from water resources, seas and oceans, and precipitation collected by industries and households for production and consumption activities, including rainfed agriculture.

Water Supply

Water supply: water leaving/flowing-out from an economic unit (Industries, Households and rest of the world). Water supply is the sum of *water supply to other economic units* and *water supply to the environment*.

Water supply to the environment (also Water returns): water returned into the environment during a given period of time after use. Returns can be classified according to the receiving media (i.e. water resources and sea water) and to the type of water (e.g. treated water, cooling water, etc.).

Water supply within the economy: water distributed to households and industries (including agriculture) and to the rest of the world (exports). Water supply within the economy is net of losses in distribution.

Organisation of the Physical Supply-Use Tables

- By columns, industries (ISIC Rev.4), households and the Rest of the world
- By rows, types of flows

Within the economy the SNA identity “Supply is equal to the Use” holds

They consist of three parts:

- Abstraction (in-flow) of water from the environment to the economy
- Flows within the economy
- Returns (or out-flows) of water from the economy to the environment

Flows from the environment to the economy

Millions m^3

		Industries (by ISIC categories)							Households	Rest of the World	Total
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
From the environment	**1. Total abstraction** (=1a+1b=1i+1ii)										
	1a. Abstraction for own use										
	1b. Abstraction for distribution										
	1i. From water resources:										
	1i.1Surface water										
	1i.2 Groundwater										
	1i.3 Soil water										
	1ii. From other sources										
	1ii.1Collection of precipitation										
	1ii.2 Abstraction from the sea										

Flows within the economy

Millions m3

		Industries (by ISIC categories)									
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
Within the economy	**2. Use of water received from other economic units**										
	4. Supply of water to other economic units										
	of which:										
	4.a. Reused water										
	4.b. Wastewater to sewerage										

Flows from the economy to the environment

Millions m^3

		Industries (by ISIC categories)							Households	Rest of the world	Total
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
To the environment	**5. Total returns** (=5.a+5.b)										
	5.a. To water resources										
	5.a.1 Surface water										
	5.a.2. Groundwater										
	5.a.3. Soil water										
	5.b. To other sources (e.g. sea water)										

Standard PSUT

Physical use table

Millions m^3

		Industries (by ISIC categories)									
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
From the environment	**1. Total abstraction** (=1a+1b=1i+1ii)										
	1a. Abstraction for own use										
	1b. Abstraction for distribution										
	1i. From water resources:										
	1i.1Surface water										
	1i.2 Groundwater										
	1i.3 Soil water										
	1ii. From other sources										
	1ii.1Collection of precipitation										
	1ii.2 Abstraction from the sea										
Within the economy	**2. Use of water received from other economic units**										
3. Total use of water (=1+2)											

Physical supply table

Millions m^3

		Industries (by ISIC categories)									
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
Within the economy	**4. Supply of water to other economic units**										
	of which:										
	4.a. Reused water										
	4.b. Wastewater to sewerage										
To the environment	**5. Total returns** (=5.a+5.b)										
	5.a. To water resources										
	5.a.1 Surface water										
	5.a.2. Groundwater										
	5.a.3. Soil water										
	5.b. To other sources (e.g. sea water)										
6.Total supply of water (=4+5)											
7. Consumption (=3-6)											

Water consumption

Water consumption: part of water use which is not distributed to other economic units and does not return to the environment (to water resources, sea and ocean) because during use it has been incorporated into products, consumed by households or livestock.

It is calculated as a difference between total use and total supply, thus it may include losses due to evaporation occurring in distribution and apparent losses due to illegal tapping and malfunctioning metering

Supplementary tables and information

- The standard tables are the minimum required to meet agreed international standards
- Countries can disaggregate the industries and line items to suite individual needs
- In many case it is useful to have these data separately identified in the data collection, estimation and compilation processes
- If the data are available and of sufficient quality then making it available will enhance it usefulness to decision makers and others

Supplementary information: Abstraction for own use

Line item 1.a. abstraction for own use:

- *Hydroelectric power generation*
- *Irrigation water*
- *Mine water*
- *Urban runoff*
- *Cooling water*
- *Other*

Supplementary information: Use of water received from other economic units

Line item 2. Use of water received from other economic units. This can be disaggregated to show:

- *Water abstracted from the environment for distribution (Distributed water)*
- *Reused water*
- *Wastewater to sewerage*
- *Note that reuse water and wastewater are shown in the standard supply table in line items 4.a and 4.b, respectively.*

Supplementary information: Supply of water to other economic units

Line item 4. Supply of water to other economic units. This can be disaggregated to show:

- *Water abstracted from the environment for distribution (Distributed water)*
- *Reused water (already shown, item 4.a)*
- *Wastewater to sewerage (already shown, item 4.b)*
- *Desalinated water*
- *Note: Desalinated is included in the use table (line item 1.ii.2) as an abstraction from the environment.*

Additional information: further disaggregation industries

ISIC Rev.4, 1-3

- Agriculture (ISIC Rev.4, 1)
- Forestry (ISIC Rev.4, 2)
- Fishing (ISIC Rev.4, 3)

ISIC Rev.4, 5-33 and 41-43

- Mining (ISIC Rev.4, 5-9)
- Manufacturing (ISIC Rev.4, 10-32)

ISIC Rev.4, 38,39 and 45-99

- Accommodation (ISIC Rev.4, 55)
- Food service (ISIC Rev.4, 56)
- Public Administration (ISIC Rev.4, 84)
- Etc…

Matrix of transfers within economy

- This table is symmetrical.
- Is done to match line items 2 and 4 of the supply and use tables
- Can be done for each of the components of line items 2 and 4 (i.e. distributed water, reuse water and wastewater to sewerage)
- Its construction allows you to check that supply = use within the economy.

Supplementary information:
Matrix of flows within the economy

to: from:	Industries (by ISIC categories)							Households	Rest of the world	Total supply
	1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
1										
2-33, 41-43										
35										
36										
37										
38,39, 45-99										
Total										
Households										
Rest of the world										
Total use										

Some data recording issues

- Water supply and sewerage services are provided by the same enterprise
- Losses in distribution
- Water supply industry (ISIC Rev.4, 36): intra-industry transfers
- Hydro-electric power (classification enterprises and recording)
- Mine ‘de-watering’
- Urban run-off
- Cooling water

Enterprises supplying both water and sewerage services

- In many countries it is common for one enterprise to provide both natural water (CPC v.2, 1800) and sewerage services (CPC v.2, 941)
- In national accounts they will coded according to which product generates the highest value output.
  - If it is natural water (CPC v.2, 1800) then it will be Water Supply (ISIC Rev.4, 36).
  - If it is sewerage services (CPC v.2, 941) then it will be Sewerage (ISIC Rev.4, 37)
- In practice many countries do not separate these industries in the national accounts

Enterprises supplying both water and sewerage services

- In SEEAW these enterprises should be split into two establishments
  - One supplying natural water (CPC v.2, 1800) and coded to Water Supply (ISIC Rev.4, 36).
  - The other supplying sewerage services (CPC v.2, 941) and coded to Sewerage (ISIC Rev.4, 37)
- If they are not split then the flows to and from these industries and to other industries becomes less clear
- If they cannot be split then the line items 2 (Use of water from other economic units) and 4 (supply of water to other economic units) should be subdivided to show wastewater to sewerage, reuse water and distributed water (as shown earlier in the presentation)

Losses in distribution

- This is an important policy area and because they are not shown explicitly in the standard supply and use table countries should consider preparing the SEEAW supplementary table on losses in distribution

Losses in distribution: treatment in standard tables

- **Water losses in distribution** is the volume of water lost during transport through leakages, theft and evaporation between a point of abstraction and a point of use, and between points of use and reuse.
- Water supply within the economy is recorded **net of water losses in distribution**
- Losses **are recorded in water abstractions** from the environment, **leakages are recorded in water returns** and **may be separately recorded under water consumption**
- **They are not explicitly identified**

Supplementary information: Losses in distribution

Millions m3

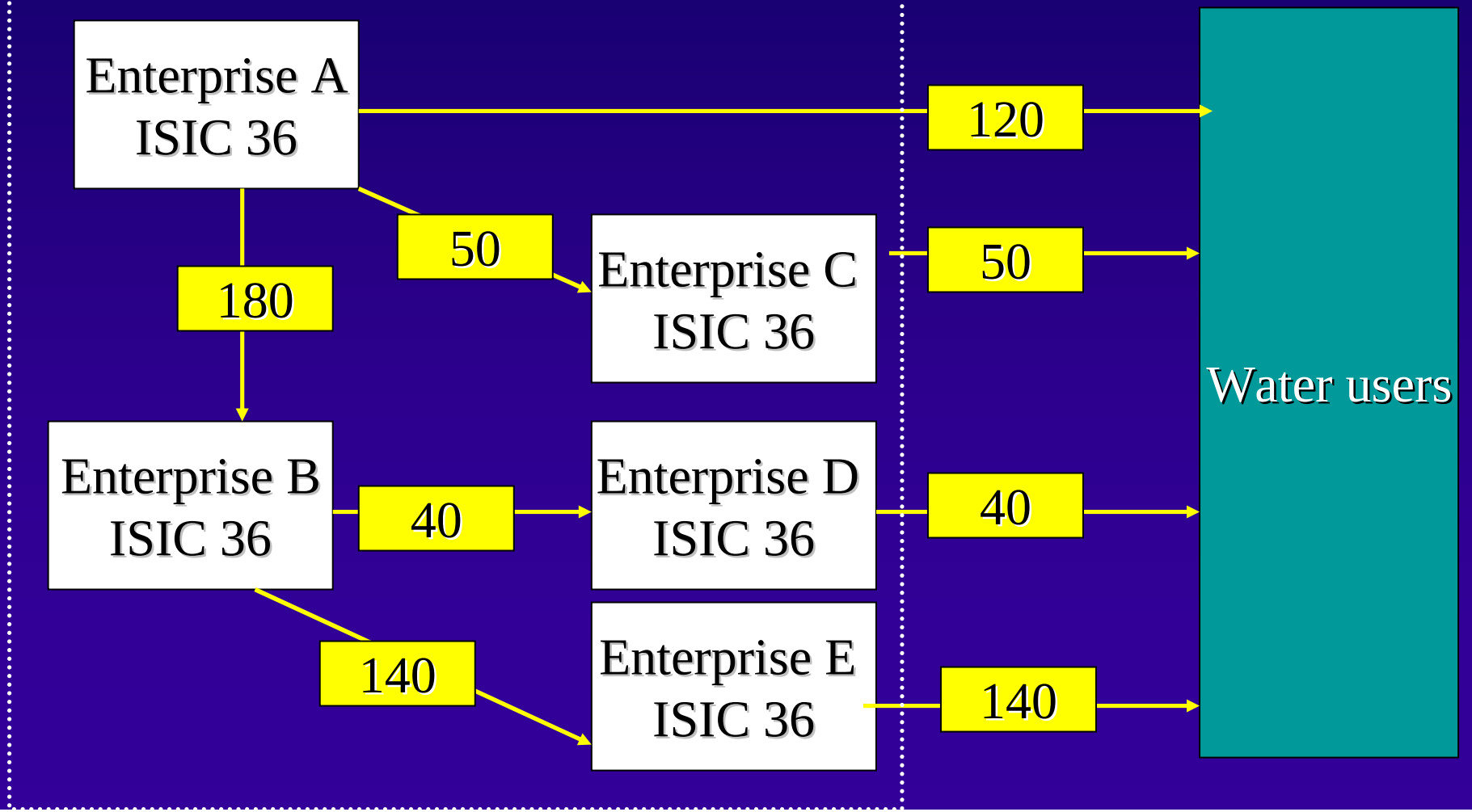
	Industries (by ISIC categories)							Households	Rest of the world	Total
	1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
1. (Net) Supply of water to other economic units										
2. Losses in distribution (=2.a+2.b)										
2.a Leakages										
2.b Other (e.g. evaporation, apparent losses)										
3. Gross supply within the economy (=1.+2.)										

Water Supply Industry (ISIC Rev.4, 36) – Intra-industry transfers

- In some countries different enterprises within the water industry transfer water between themselves
- It is important to understand these transfers:
  - To avoid double counting
  - For policy analysis and decision makers, especially where the price of water varies (for example between regions and between water “wholesalers” and water “retailer”)

Intra industry supply

Water Supply Industry ISIC Rev.4, 36



Water Supply Industry (ISIC Rev.4, 36) – Intra-industry transfers

- The standard physical supply and use tables do not record these within industry transfers
- In countries where this occurs a table showing these should be developed to assist the compilation process and could also be presented as supplementary information
- SEEAW does not have a standard table for intra-industry transfer this but one has been developed by UNSD

Water Supply Industry (ISIC Rev.4, 36) – intra-industry transfers

Supplied to	Supply from: Enterprises in ISIC 36 A	B	C	D	E	ISIC 36 Total
Enterprises in ISIC 36 A						
B	180					
C	50					
D		40				
E		140				
All other ISICs	120	0	50	40	140	350
Gross supply of ISIC 36	350	180	50	40	140	760
Net supply of ISIC 36	**120**	**0**	**50**	**40**	**140**	**350**

Hydro-electric power

- Hydro-electric power can be a very large water user in countries. While the water is used it is not consumed
- Even though the water is not consumed it is important to record these flows because:
  - The water is an essential input to the output of hydro-electricity (and hence an important consideration in decision making and policy analysis)
  - This use may take place at the expense of other uses
  - The water made available by the infrastructure that supports hydro-electric power and the water available after use are important water sources for industry

Hydro-electric power: classification of enterprises
Is it the Electricity Supply or Water Supply Industry?

- The enterprise engaged in the production of hydro-electricity often produces two products
  - Electricity (CPC v.2, 171)
  - Natural water (CPC v.2, 1800)
- In most cases the value of the output of energy exceeds the value of the output of water.
- As such hydro-electric enterprises are mostly classified to the Electricity Supply Industry (ISIC Rev. 4, 35) in the national accounts of countries
- This creates a problem for recording flows in the physical supply and use tables (and hybrid tables)

The solution to the hydro-electric classification problem

- Split the hydro-electricity enterprise into two establishments
  - One produces Electricity (CPC v.2, 171) and is classified to Electricity Supply (ISIC Rev. 4, 35)
  - The other producers Natural water (CPC v.2, 1800) and is classified to Water Supply (ISIC Rev. 4, 36)
- For the establishment classified to ISIC 35 water is recorded as an abstraction for own use, with the volume of water returned equal to the amount abstracted. This results in zero (0) consumption
- For the establishment classified to ISIC Rev.4, 36 the water is recorded as an abstraction for distribution

Recording of water use for Electricity Supply (ISIC Rev.4, 35)

SEEAW Standard Table I: Physical use tabl

		Industries (		
		1	2-33, 41-43	**35**
From the environment	**1 - Total abstraction** (=1.a+1.b = 1.i+1.ii)			
	1.a Abstraction for own use			
	1.b Abstraction for distribution			
	1.i From water resources:			
	1.i.1 Surface water			
	1.i.2 Groundwater			
	1.i.3 Soil water			
	1.ii From other sources			
	1.ii.1 Collection of precipitation			
	1.ii.2 Abstraction from the sea			
Within the economy	**2. Use of water received from other economic units**			
3. **Total use of water** (=1+2)				
Note: grey cells indicate zero entries by definition.				

SEEAW Standard Table II: Physical supply ta

		Industries (		
		1	2-33, 41-43	**35**
Within the economy	**4. Supply of water to other economic units**			
	of which:			
	4.a Reused water			
	4.b Wastewater to sewerage			
To the environment	**5. Total returns** (= 5.a+5.b)			
	5.a To water resources			
	5.a.1 Surface water			
	5.a.2 Groundwater			
	5.a.3 Soil water			
	5.b To other sources (e.g. sea water)			
6. Total supply of water (= 4+5)				
7. Consumption (3-6)				

Amount of water abstracted is recorded as an abstraction for own use of surface water in the use table

Amount of water returned is recorded is the supply table, as return to surface water

If the amount returned is equal to the amount abstracted then the consumption is zero. If pollution has been added then this would be recorded in the emission account

Alternative solution to the hydro-electric classification problem

If it is impossible to split the hydro-electricity enterprise into two establishments then:

- In the use table the water should be recorded in line item 1 as an abstraction form the environment, however you will not be able to fill in either line item 1.a or 1.b as it is both an abstraction for distribution and an abstraction for own use
- In the supply table it will be recorded in line item as a supply to other economic units
- It IS NOT recorded in line item 5 as a Total return as it is the first treatment.

Alternative recording of water use and supply by Electricity Supply (ISIC Rev.4, 35)

SEEAW Standard Table I: Physical use tabl

		Industries (		
		1	2-33, 41-43	**35**
From the environment	**1 - Total abstraction** (=1.a+1.b = 1.i+1.ii)			
	1.a Abstraction for own use			
	1.b Abstraction for distribution			
	1.i From water resources:			
	1.i.1 Surface water			
	1.i.2 Groundwater			
	1.i.3 Soil water			
	1.ii From other sources			
	1.ii.1 Collection of precipitation			
	1.ii.2 Abstraction from the sea			
Within the economy	**2. Use of water received from other economic units**			
3. **Total use of water** (=1+2)				
Note: grey cells indicate zero entries by definition.				

SEEAW Standard Table II: Physical supply ta

		Industries (		
		1	2-33, 41-43	**35**
Within the economy	**4. Supply of water to other economic units**			
	of which:			
	4.a Reused water			
	4.b Wastewater to sewerage			
To the environment	**5. Total returns** (= 5.a+5.b)			
	5.a To water resources			
	5.a.1 Surface water			
	5.a.2 Groundwater			
	5.a.3 Soil water			
	5.b To other sources (e.g. sea water)			
6. Total supply of water (= 4+5)				
7. Consumption (3-6)				

Amount of water abstracted is recorded in use table in Total abstraction (item 1) but not in items 1.a or 1.b

Amount of water supplied to other economic units is recorded is the supply table.

No return to the environment is recorded.

If the amount supplied is equal to the amount abstracted then the consumption is zero.

Mine de-watering

- In underground mining water is often pumped out of the mine
- It is important to record these flows as
  - This may prevent others from using the groundwater
  - Groundwater is usually discharged into surface water and may be of a different quality due to natural processes or because of pollutants added
  - In arid areas this may disrupt the ecology of the environment
  - Once on the surface it can be used by others

Recording mine de-watering

SEEAW Standard Table I: Physical use tabl

		Industries (		
		1	2-33, 41-43	35
From the environment	**1 - Total abstraction** (=1.a+1.b = 1.i+1.ii)			
	1.a Abstraction for own use			
	1.b Abstraction for distribution			
	1.i From water resources:			
	1.i.1 Surface water			
	1.i.2 Groundwater			
	1.i.3 Soil water			
	1.ii From other sources			
	1.ii.1 Collection of precipitation			
	1.ii.2 Abstraction from the sea			
Within the economy	**2. Use of water received from other economic units**			
3. **Total use of water** (=1+2)				

Note: grey cells indicate zero entries by definition.

SEEAW Standard Table II: Physical supply ta

		Industries (		
		1	2-33, 41-43	35
Within the economy	**4. Supply of water to other economic units**			
	of which :			
	4.a Reused water			
	4.b Wastewater to sewerage			
To the environment	**5. Total returns** (= 5.a+5.b)			
	5.a To water resources			
	5.a.1 Surface water			
	5.a.2 Groundwater			
	5.a.3 Soil water			
	5.b To other sources (e.g. sea water)			
6. Total supply of water (= 4+5)				
7. Consumption (3-6)				

Amount of water abstracted is recorded as an abstraction for own use of groundwater in the use table

Amount of water returned is recorded is the supply table, as return to surface water

If the amount returned is equal to the amount abstracted then the consumption is zero. If pollution has been added then this would be recorded in the emission account

Urban run-off

- Urban run-off (or storm water) is the precipitation that falls on urban areas that does not evaporate or percolate into the ground but flows via overland flow, underflow or channels or is piped into a water cannel or constructed infiltration facility.
- When urban run-off is collected by the sewerage or storm water system the supply and use of this water is recorded against the Sewerage Industry (ISIC Rev. 4, 37)

Recording of urban run-off

SEEAW Standard Table I: Physical use table

		35	36	37
From the environment	**1 - Total abstraction** (=1.a+1.b = 1.i+1.ii)			
	1.a Abstraction for own use			
	1.b Abstraction for distribution			
	1.i From water resources:			
	1.i.1 Surface water			
	1.i.2 Groundwater			
	1.i.3 Soil water			
	1.ii From other sources			
	1.ii.1 Collection of precipitation			
	1.ii.2 Abstraction from the sea			
Within the economy	**2. Use of water received from other economic units**			
3. **Total use of water** (=1+2)				
Note: grey cells indicate zero entries by definition.				

SEEAW Standard Table II: Physical supply table

		35	36	37
Within the economy	**4. Supply of water to other economic units**			
	of which:			
	4.a Reused water			
	4.b Wastewater to sewerage			
To the environment	**5. Total returns** (= 5.a+5.b)			
	5.a To water resources			
	5.a.1 Surface water			
	5.a.2 Groundwater			
	5.a.3 Soil water			
	5.b To other sources (e.g. sea water)			
6. Total supply of water (= 4+5)				
7. Consumption (3-6)				

Amount of water abstracted is recorded as an abstraction from other sources in the use table

Amount of water returned is recorded in the supply table, as return to surface water or to sea

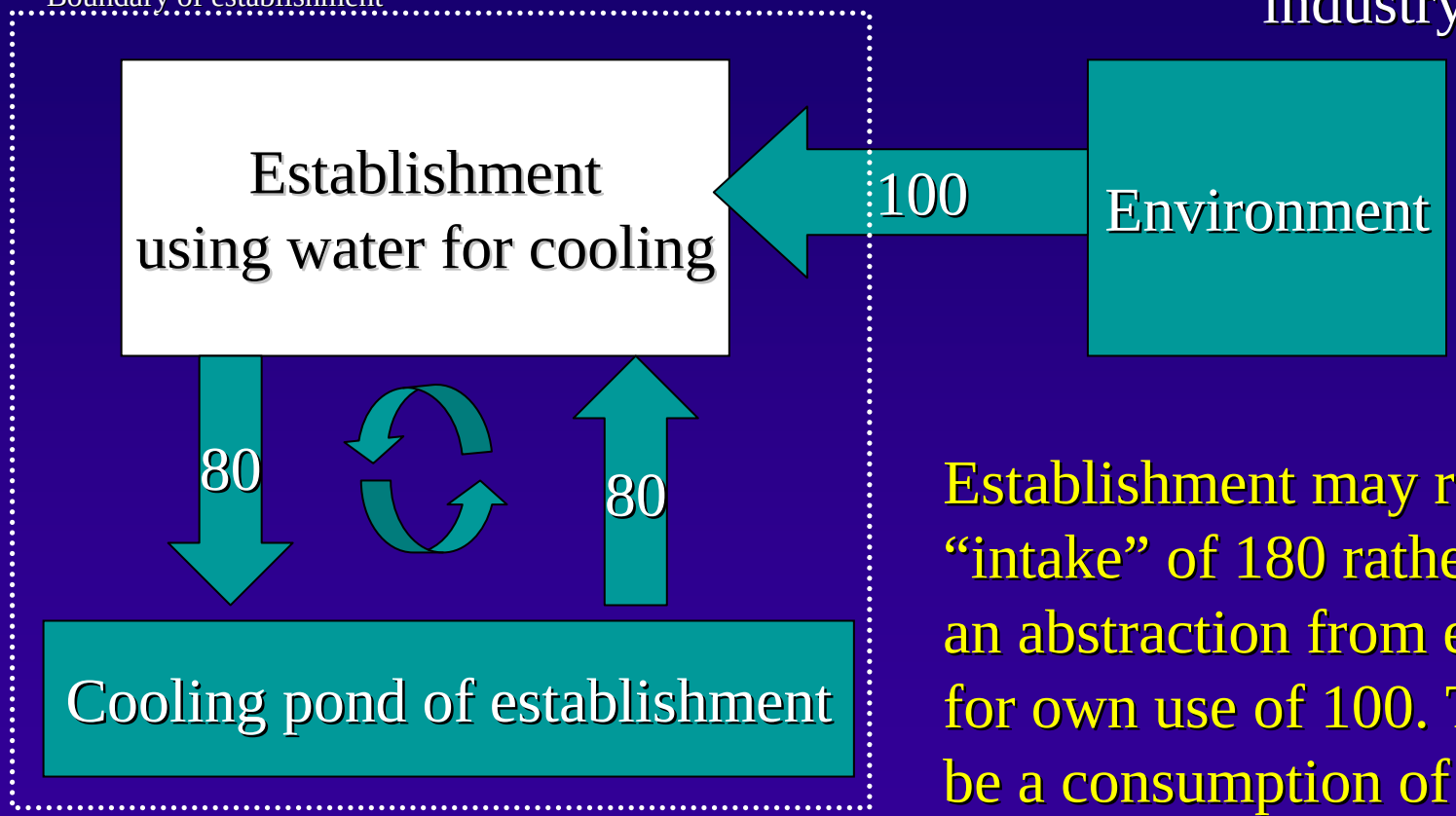
If the amount returned is equal to the amount abstracted then the consumption is zero. If pollution has been added then this would be recorded in the emission account

Cooling water

- Cooling water is defined as water which is used to absorb and remove heat
- When discharged it may cause thermal pollution or have collected pollutants during use (e.g. if used in metal manufacture)
- In some cases industries using water for cooling recycle it “on site”. In other cases it is abstracted and returned to the environment
- You need to carefully distinguish which situation is occurring, particularly for large users of cooling water (for example coal fired electricity generators)

Cooling water
Case one: Recycling

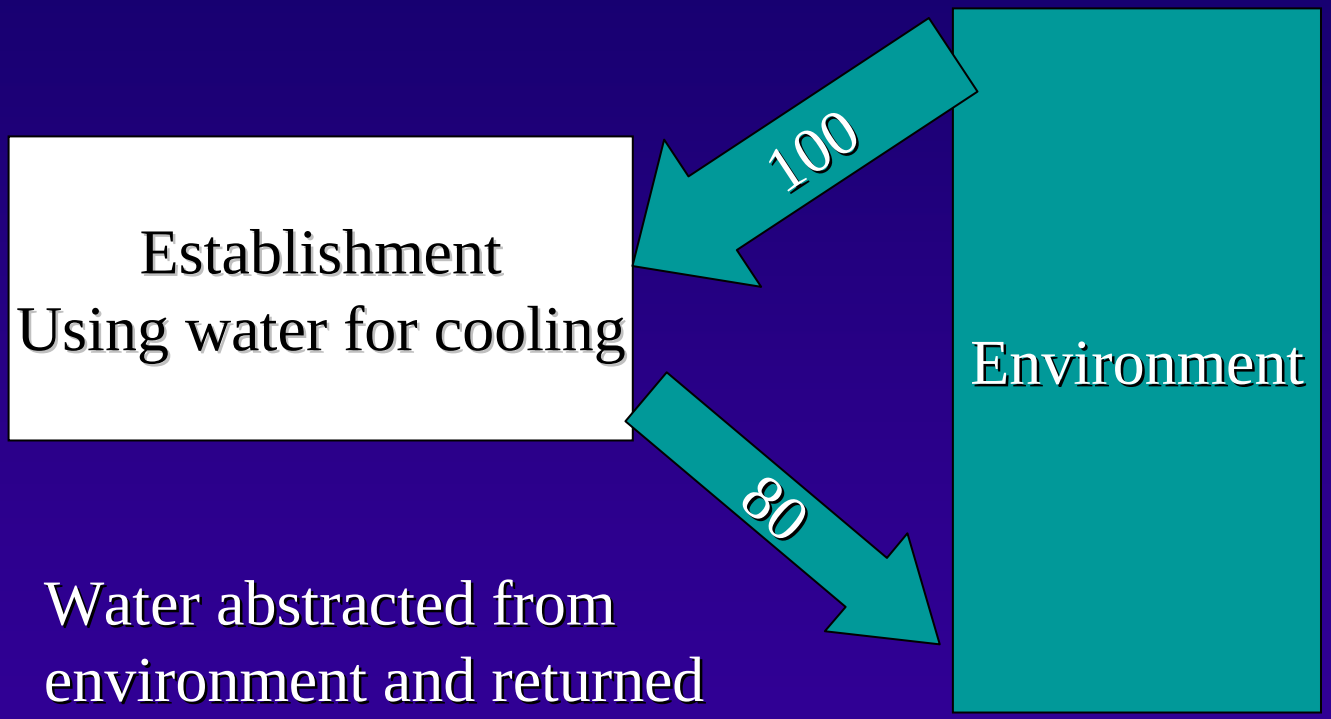
Water abstract from environment only to replace the water consumed by the industry



Water discharged to pond and then extracted from pond.

Establishment may report an "intake" of 180 rather than an abstraction from environment for own use of 100. This would be a consumption of 100.Must be Very careful when interpreting data from surveys or other sources

Cooling water
Case two: Abstraction and return



Water abstracted from environment and returned to the environment.

Difference is the consumption.
100 abstracted for own use – 80 returned = 20 consumption

Cooling water – be careful!

- If you misinterpret the situation you may over or under estimate to volume of water consumed
- Contact directly the large water users (e.g. coal fired electricity generators to be sure what the situation is)

Conclusion

- SEEAW uses existing international classifications (CPC and ISIC) a categorization of water flows to describing the flows of water within the environment, and economy as well as between the environment and economy.
- Most flows are easily identified and recorded in the standard tables.
- The categorization of the enterprises in the economy is important, particularly for enterprises hydro-electric power plants and water and sewerage service suppliers