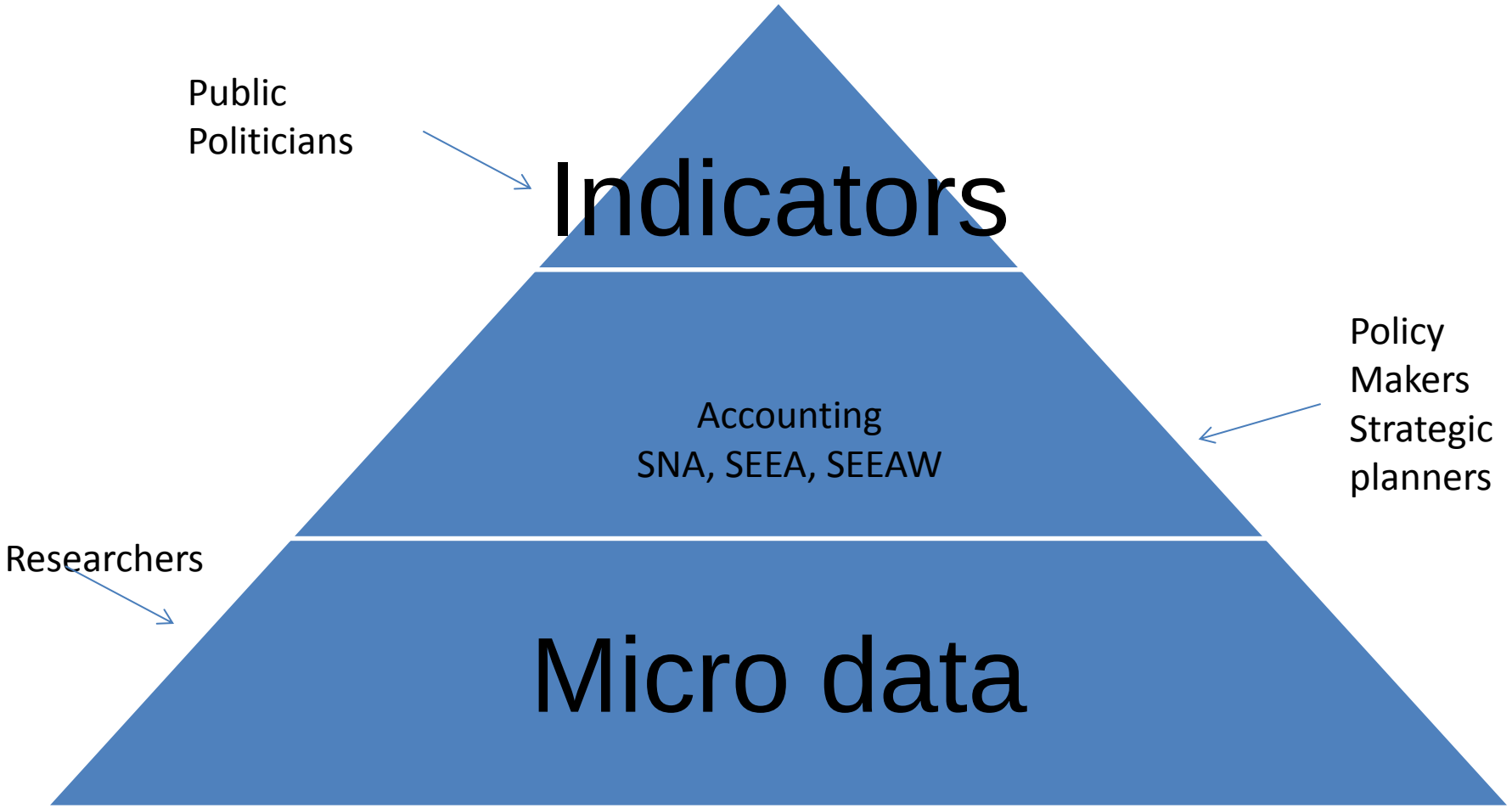
Water Account

Head of Environment Division

System of Environmental-Economic Accounting for Water (SEEAW)

- International statistical standard since 2007
- Is a module of environmental economic-accounting (SEEA)
- Covers the full water cycle (natural water cycle, water flows within the economy, flows of water from and to the economy)
- Water quality aspects are integrated
- Conceptually consistent with water statistics of UN, OECD and Eurostat
- Links physical and economic information
- Provides data for Integrated Water Resources Management
- Provides conceptual links to Water Footprint, Virtual Water etc.

Audiences for information

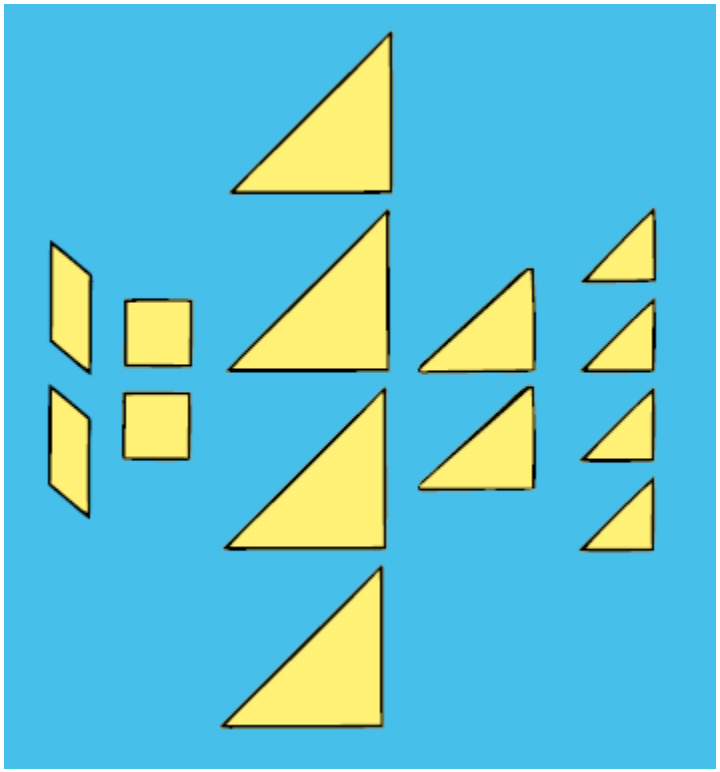


Strengths of the accounting approach

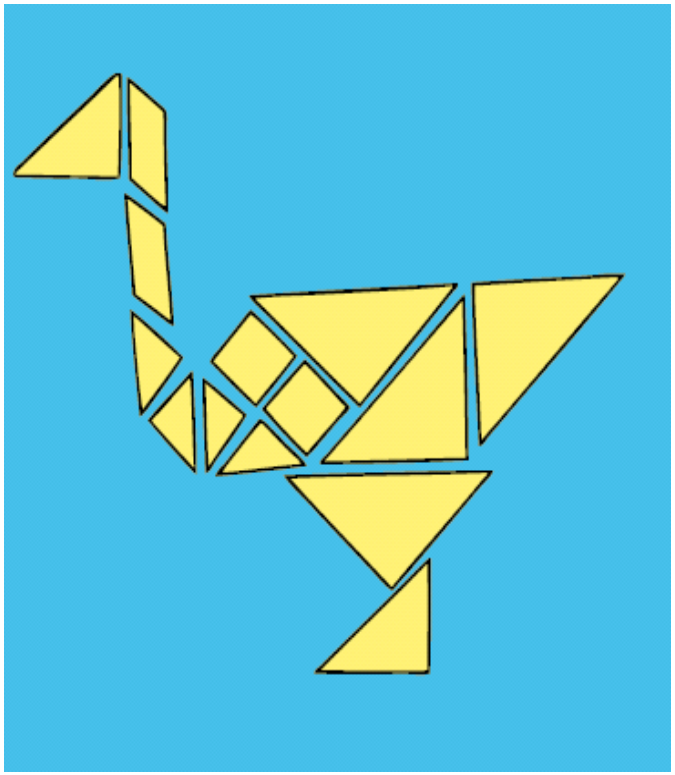
- Organised body of information facilitates integrated economic-environmental analysis (complements sustainable development indicators, modelling)
- Comprehensive and consistent, routinely produced
- Provides a system into which monetary valuations of environmental costs can be incorporated

Environmental-Economic Accounting and Environment Statistics

Environment statistics:



Environmental accounts:



Environmental-Economic Accounting and Environment Statistics

- Environment statistics:
- Often developed to answer one particular question or problem
- Difficult to figure out if all information is included
- Not always easy to see the whole picture, or how it relates to other things
- Typically not integrated with economic statistics

Environmental accounts:

- Help to make sense of the larger picture
- Help to identify pieces that are missing
- Can make connections to other statistics, especially to economic statistics

Keys concepts of SEEA

	Flows	Stocks
Volume (e.g. tonnes, m^3)		
Value (e.g. $, £, ¥, €)		

Terminology

Terminology is not always consistent among economists, environmental statisticians, scientists and policy makers

=> Need to use a clear, agreed terminology

One of the SEEA main contribution is the standardisation of terms and definitions

The role and value of Water Accounting

- “SEEAW provides the much-needed conceptual framework for monitoring and assessment”

Integrated Water Resources Management: core features

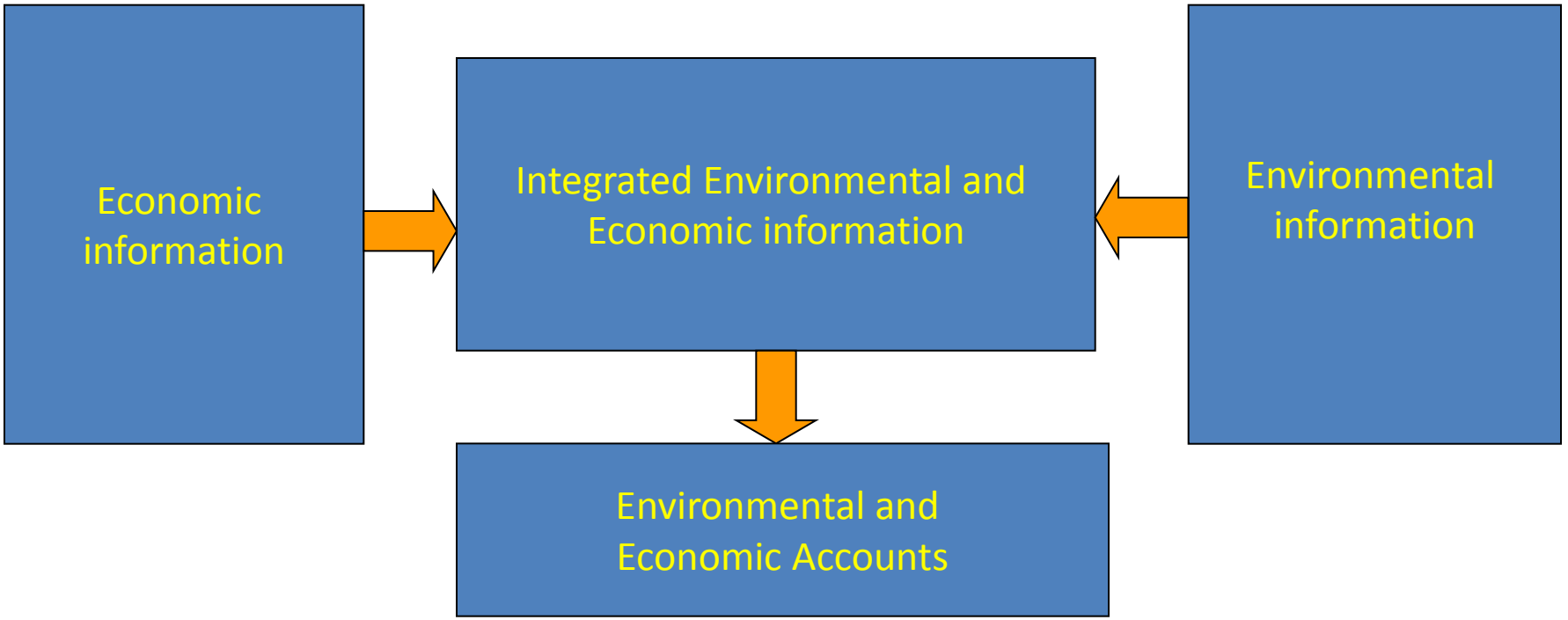
- Involves developing efficient, equitable and sustainable solutions to water and development problems
- Involves aligning interests and activities that are traditionally seen as unrelated or not well coordinated (horizontally and vertically)
- Needs knowledge from various disciplines as well as insights from diverse stakeholders
- Not just water: involves integrating water in overall sustainable development processes. Also requires coordinating the management of water with land and related resources

IRWM and its links to SEEAW

- Allocating water resources efficiently
- Improving water efficiency
- Understanding the impacts of water management on all users
- Getting the most value for money from investment in infrastructure
- Linking water availability and use
- Providing a standardized information system which harmonizes information from different sources, is accepted by the stakeholders and is used for the derivation of indicators

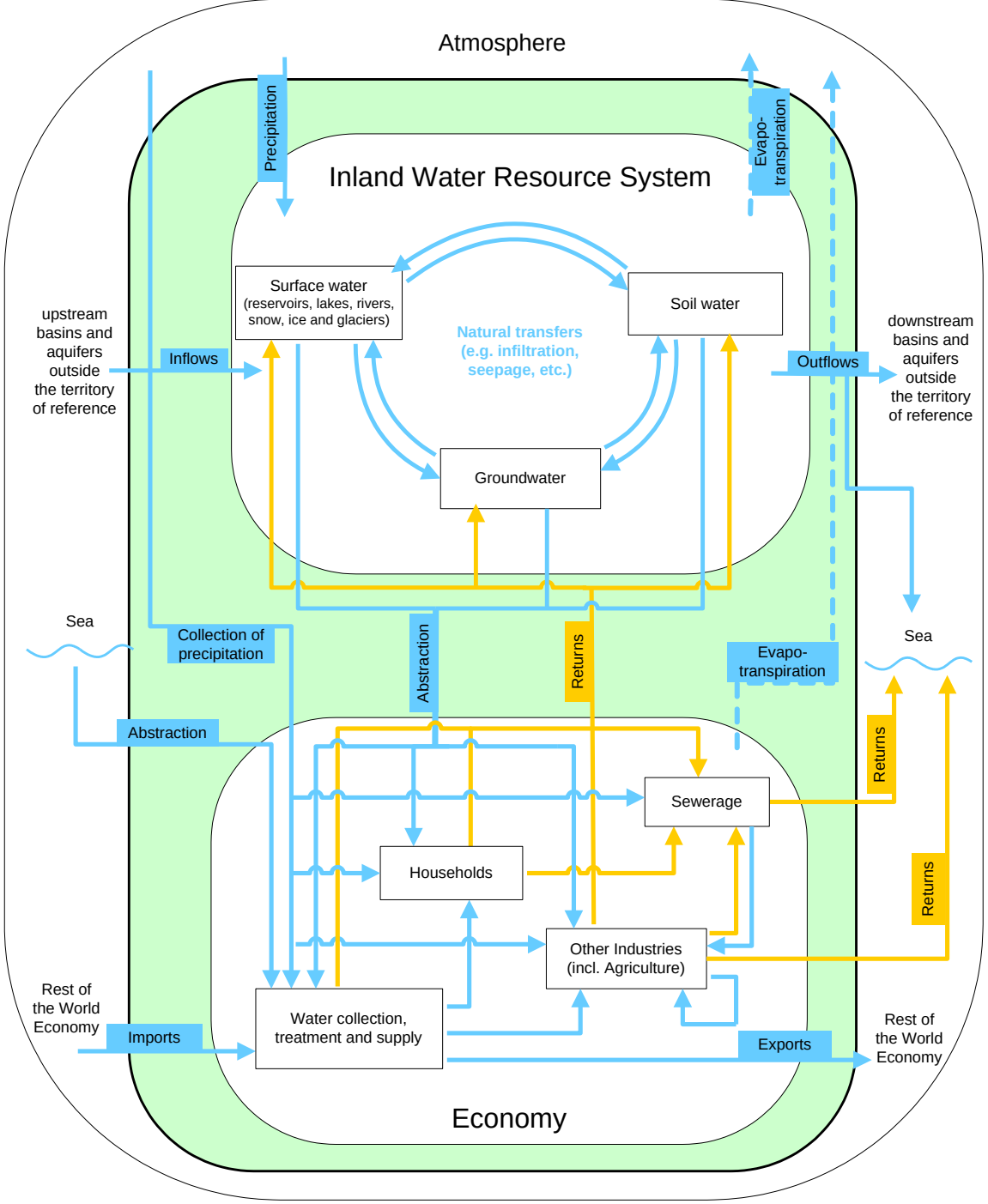
Environmental-economic accounting

- Brings together economic and environmental information



SEEAW

- Covers the full water cycle
- Stocks and flows
- Economy and environment



International Agencies and the System of Environmental-Economic Accounting for Water (SEEAW)

- UNSD has adopted the SEEAW and has fully harmonised their water questionnaire
- Eurostat and OECD have stated that they would begin harmonise their water questionnaire with SEEAW.
- Two UN regional commissions have adopted the SEEAW for data collection and presentation (ECLAC and ESCWA)
- The World Water Assessment Program Expert Group on Indicators, Monitoring and Databases is investigating the use of the SEEAW

Policy Key Questions (Examples)

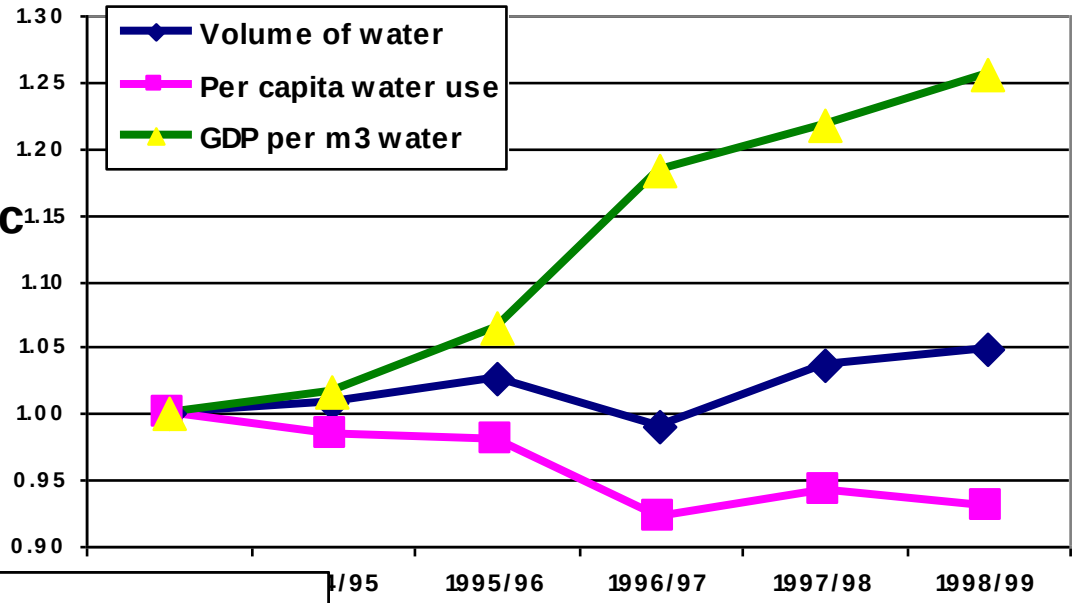
- Which industries are using the most water?
- How much water do households use?
- What are the main sources of nitrate emissions?
- Who pays the most for water?
- What's the relation between economic growth and use or pollution of water for the different industries (e.g. agriculture, tourism)
- Is water use sustainable?
- Is desalination of seawater a possible solution from the environmental and economic perspective?
- Is reuse of wastewater a possible solution?
- Have measures to improve water use efficiency been successful?

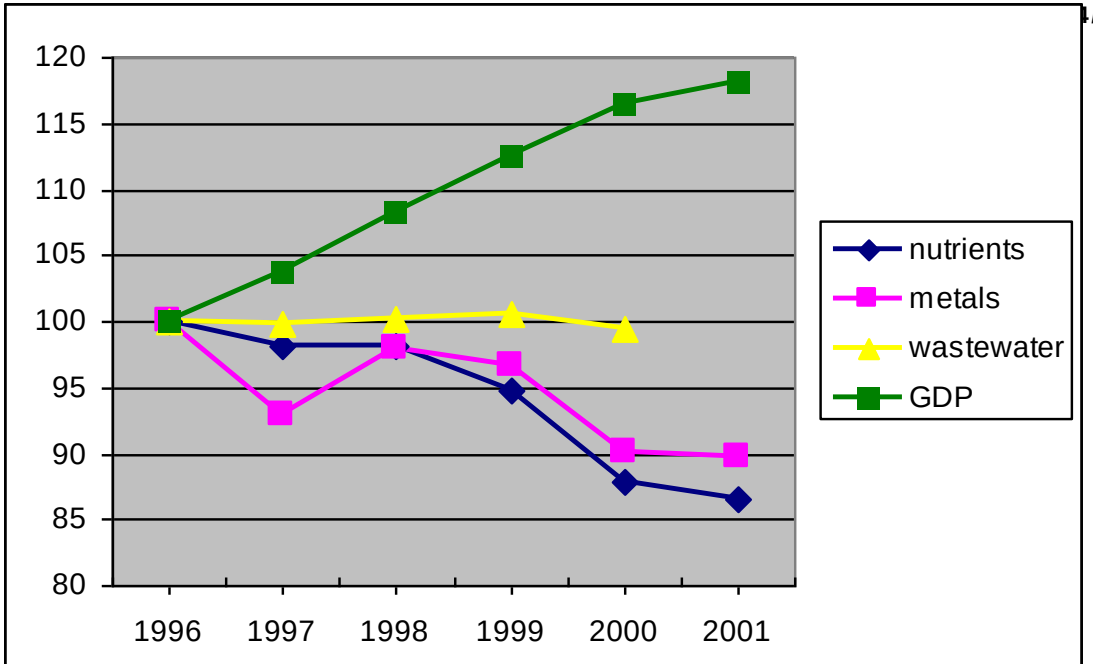
Examples for Indicators from SEEAW

- Macro trends in total water use
- Macro trends in water pollution
- Decoupling economic growth and water use
- Decoupling economic growth and water pollution
- Industry-level trends

National trends: economic growth and water pollution

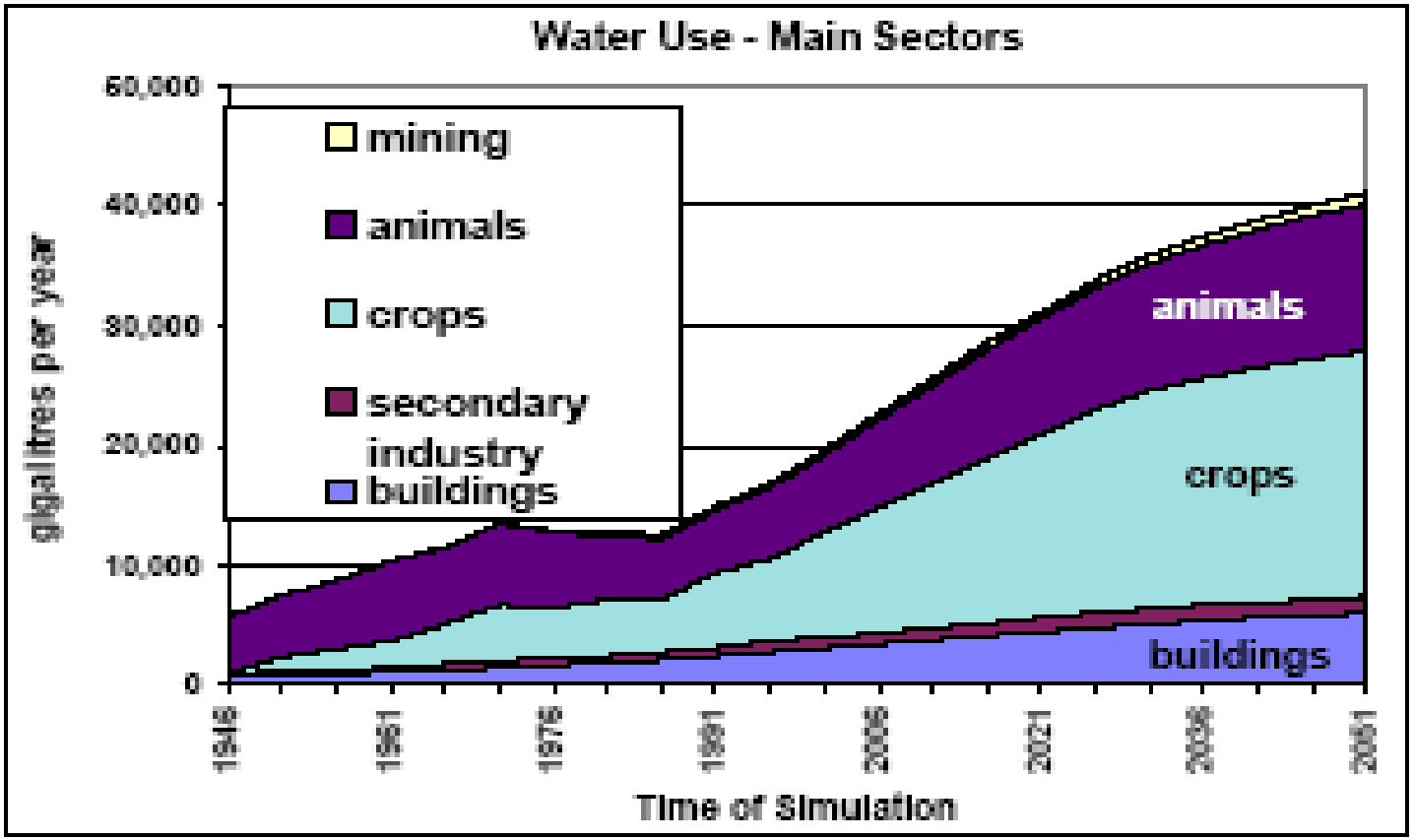
Botswana: water use and economic Growth, 1993-1998





Netherlands: water pollution and economic growth, 1999-2001

Projecting future water demands Australia 2050

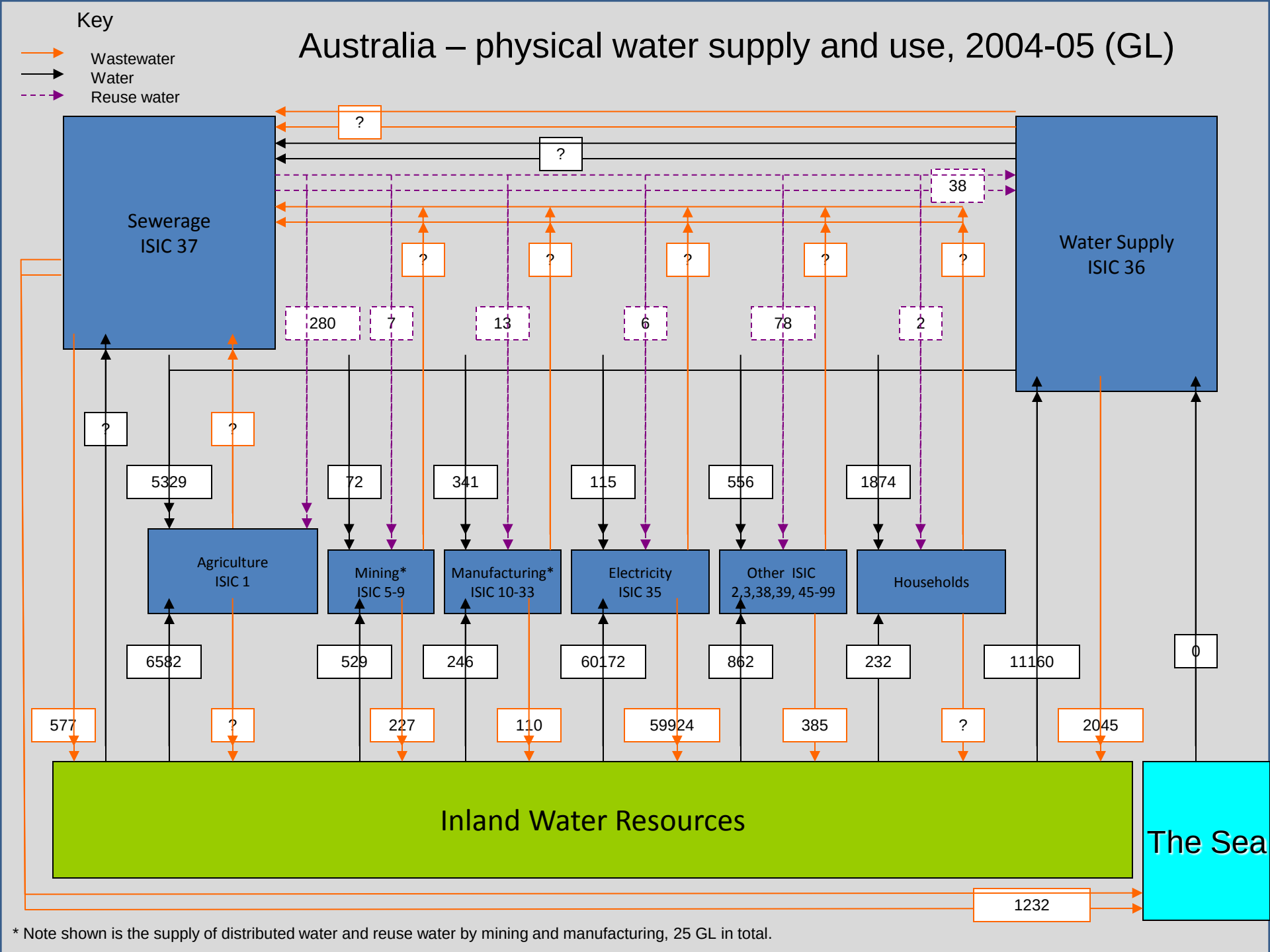


Modelling Effects of Price Changes: Murray-Darling River Basin Australia

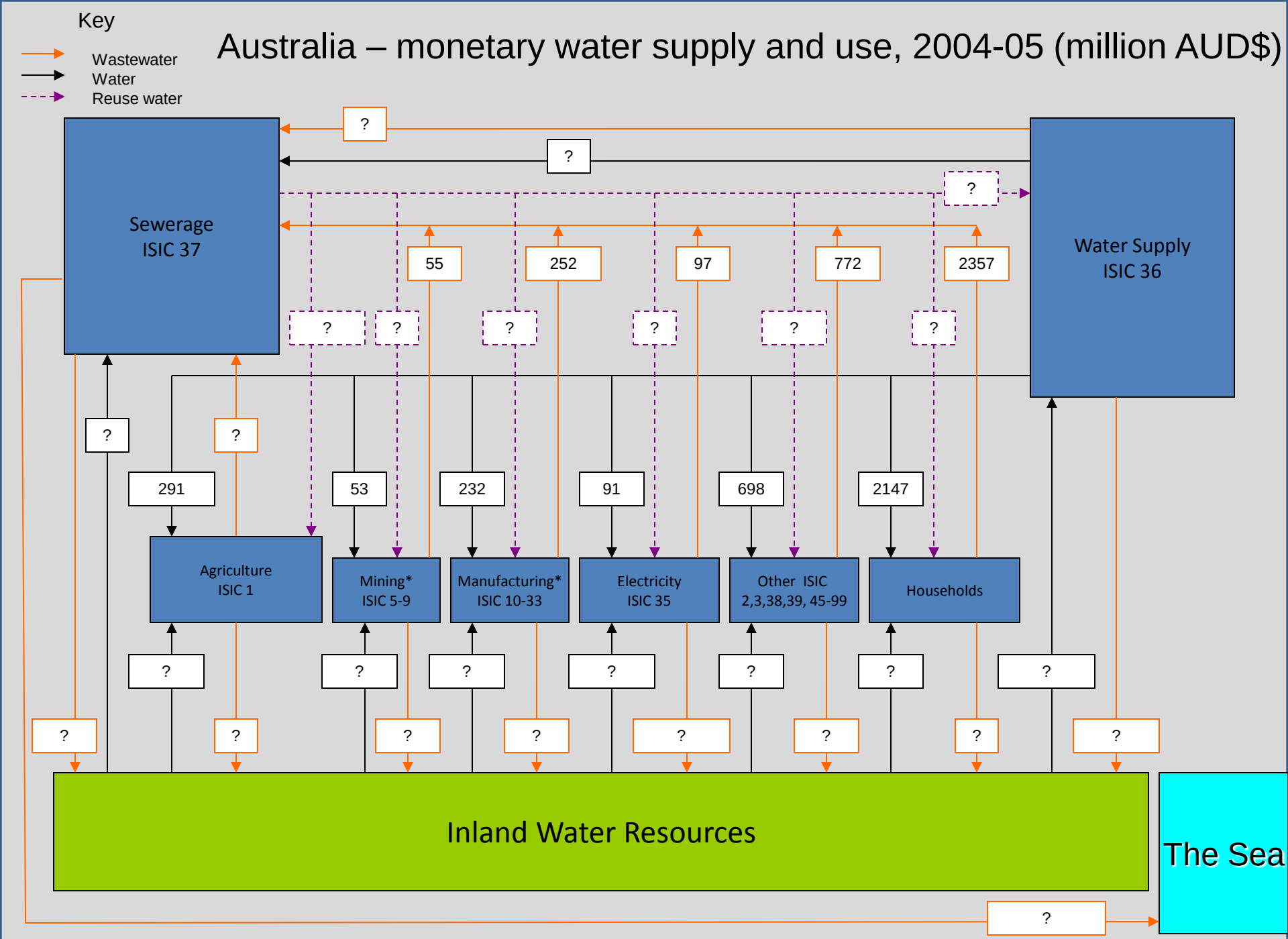
Based on historical water use & price data, simulated impact on GDP of doubling water prices and the expected increases in water use efficiency (WUE) of 1-2%

	Increase in GDP, A$million	
	1% increase WUE	2% increase WUE
Irrigated agriculture	-24	78
Dryland agriculture	-51	-112
Food and fibre processing	44	97
Other industries	262	410
Total impact on GDP	253	521

Australia – physical water supply and use, 2004-05 (GL)

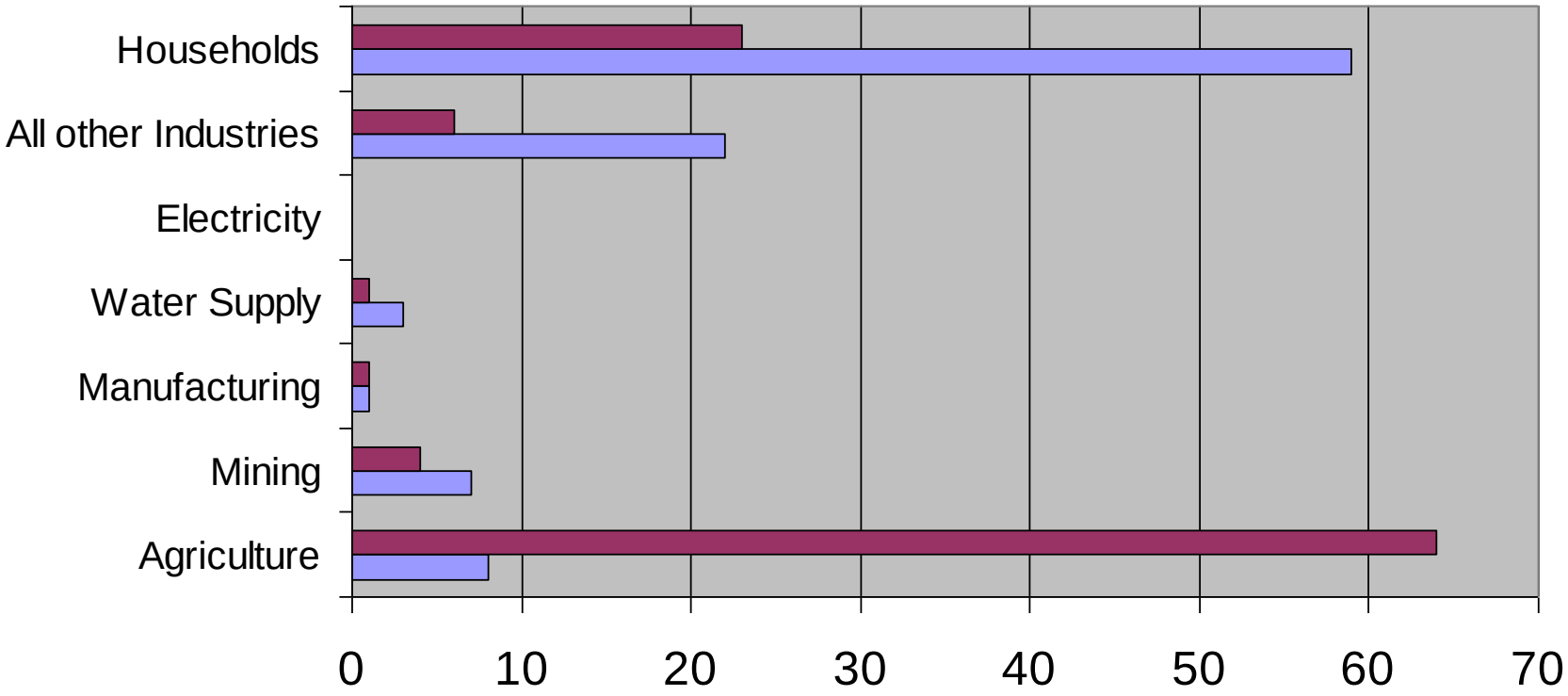


* Note shown is the supply of distributed water and reuse water by mining and manufacturing, 25 GL in total.



* Note shown is the supply of distributed water and reuse water by mining and manufacturing, 25 GL in total. No monetary available for these.

Monetary versus physical use of distributed water (Australia: % of total use)



Key lessons from countries implementing SEEAW

Build on existing knowledge

A phased approach is needed

- Start with issues of most importance:
  - In water scarce countries it has been water supply and use and asset accounts. In industrialized countries it has been pollution and emission accounts.

Cooperation essential

- Within Water Ministry
- Within Statistical Offices
- Between statistical offices, water departments, economic/planning departments and agricultural departments
- With the water supply industry
- With the scientific and research communities
- Between users and producers of information

Pilot or experimental accounts are very useful

Cook Book for Water Accounts

- Identify policy needs and national priorities
- Follow conceptually SEEAW approach → extend tables, if needed
- Concepts of different data producers have to fit to each other (reporting objects, classifications, terminology, etc.) and have to be SEEAW-compatible (alternatively conventions needed)
- Institutional roles/responsibilities to be clarified(Water Ministry, NSI, Environment Agency, Regional Water Authorities,…)
- Legal base or contractual agreements for data gathering and institutional cooperation needed (data exchange)
- Link to business register is useful
- Business processes and QA/QC-procedures to be determined
- Metadata to be included

Output of the UN Regional Meeting on Environment Statistics and Accounts (7-9 April 2010)

- **Work Plan for Environment Statistics, Indicators and Accounts for the ESCWA region (2010-2013)**
- Institutionalize and Coordinate National Statistical Information on Environment and Water for Integrated Resource Management and evidence-based Environmental Policy
- Develop a Strategy for Environment and Water Statistics, Indicators and Accounts Supported by Legislation in close consultation with National Statistical Offices and relevant stakeholders
- Develop Water Accounts as per the SEEAW in parallel
- Support and Training
- Disseminate and exchange experiences

Development of SEEA Water

- Sub-group on Water Accounting established at the 2003 meeting of the London Group (Rome)
- Sep 2004 SEEA Water discussed at London Group Meeting (Copenhagen)
- May 2005 1st draft SEEA Water discussed in by sub-group (New York)
- May 2006 2nd Draft discussed at the User-Producer Conference (Voorburg)
- Jun 2006 2nd Draft discussed by London Group and UNCEEA
- Jul-Dec 2006 SEEA Water finalised by electronic discussion
- More than 20 experts participated in the Sub-group
- UNSD coordinated the group and prepared the various manuscripts

SEEA Water

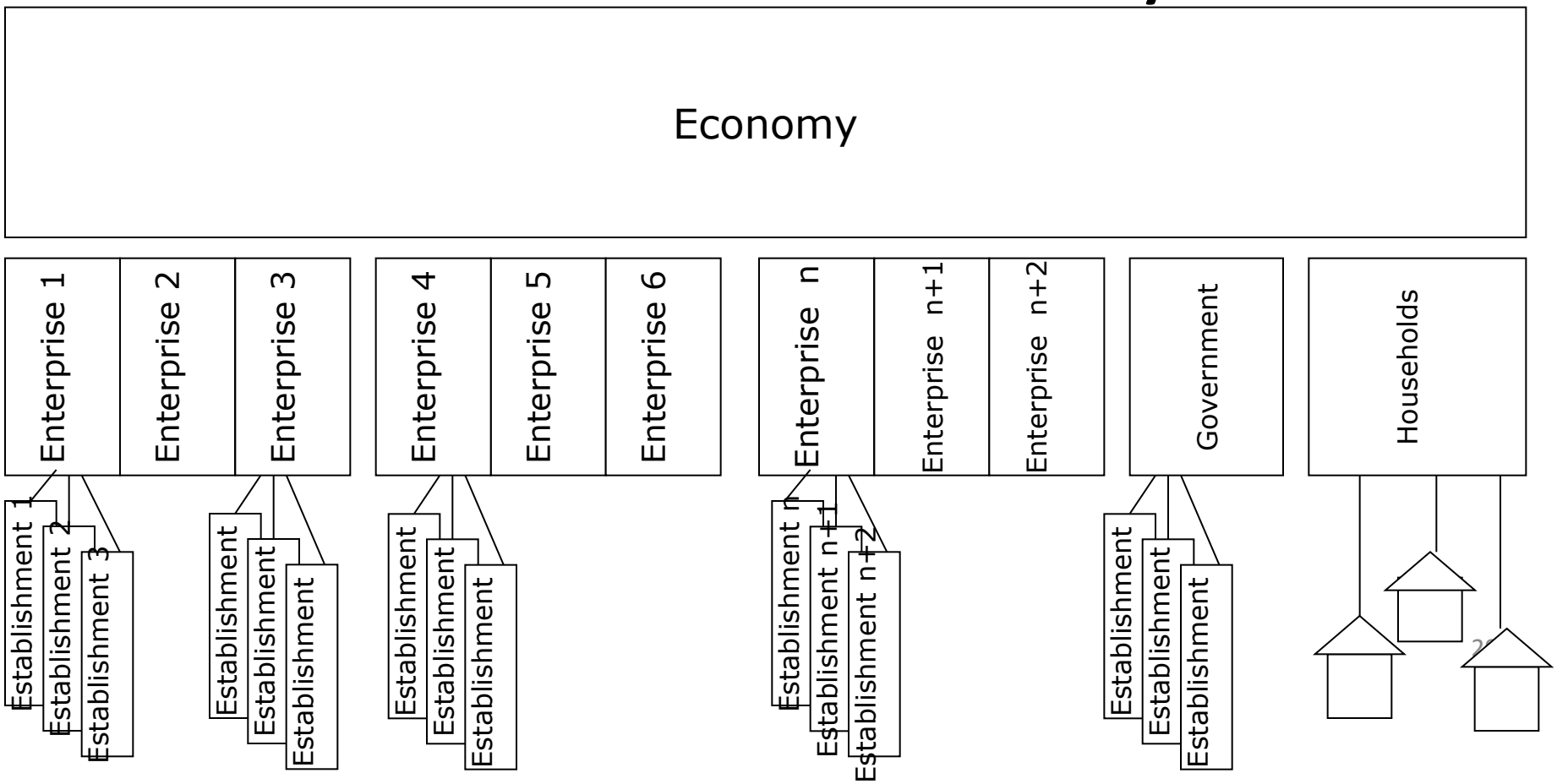
- Part 1 of SEEA Water was adopted by the United Nations Statistical Commission in March 2007 as an interim statistical standard
- Part 2 contains the elements of SEEA Water for which there is less country experience and there is still some debate
- SEEA Water has been recognized as useful by the users of information

Statistical Units

- A statistical unit is an entity about which information is sought and for which statistics are ultimately compiled. It is the unit at the basis of statistical aggregates to which tabulated data refer.

- These units can be divided into two categories:
  - (a) *observation units* – identifiable legal/organizational or physical entities which are able, actually or potentially, to report data about their activities;
  - (b) *analytical units* – entities created by statisticians (also referred to as *statistical constructs*), often by splitting or combining observation units in order to compile more detailed and more homogeneous statistics than it is possible by using data on observation units. Analytical units are not able to report data themselves about their activities, but there exist indirect methods of statistical estimation.
  - http://unstats.un.org/unsd/isdts/docs/StatisticalUnits.pdf

Units of the economy



Enterprises

- An institutional unit in its capacity as a producer of goods and services is known as an enterprise. An enterprise is an economic transactor with autonomy in respect of financial and investment decision-making, as well as authority and responsibility for allocating resources for the production of goods and services. It may be engaged in one or more economic activities at one or more locations. An enterprise may be a sole legal unit.

http://unstats.un.org/unsd/isdts/docs/StatisticalUnits.pdf

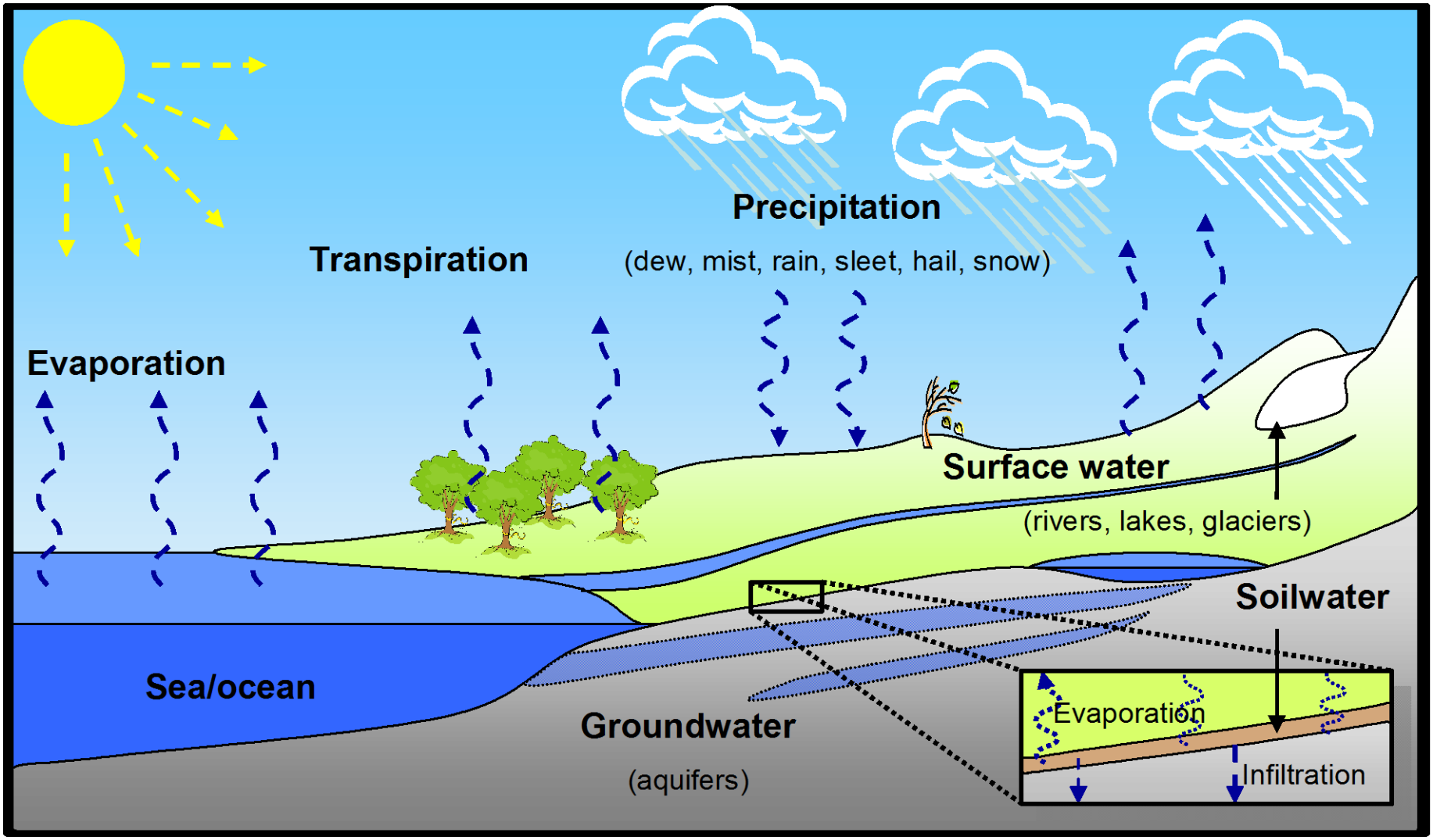
Establishments

- The establishment is defined as an enterprise or part of an enterprise that is situated in a single location and in which only a single productive activity is carried out or in which the principal productive activity accounts for most of the value added.
- In other words, an establishment can be defined, ideally, as an economic unit that engages, under a single ownership or control - that is, under a single legal entity – in one, or predominantly one, kind of economic activity at a single physical location - for example, a mine, factory or workshop.

The environment

- The environment has 4 components
  - Land
  - Atmosphere (Air)
  - Water
  - Life (biodiversity)
- Energy, and solar energy are also important in environment statistics
- The components of the environment interact with each other and with the economy

The Hydrological Cycle



SEEAW - Structure

9 Chapters, 2 parts:

- Part 1
  - Ch. 1 Introduction
  - Ch. 2 Water Accounting Framework
  - Ch. 3 Physical Supply and Use Tables
  - Ch. 4 Emission Accounts
  - Ch. 5 Hybrid and Economic Accounts
  - Ch. 6 Asset Account

- Part II
  - Ch. 7 Quality Account
  - Ch. 8 Valuation
  - Ch. 9 Policy use

12 Standard Tables

1. Physical use
2. Physical supply
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 wastewater management (Monetary)
11. Financial accounts for wastewater management (Monetary)
12. Asset account (Physical)

12 Supplementary tables

Physical water use: Standard Table I

Physical units

		Industries (by ISIC categories)							Households	Rest of the world	Total
		1	2-33, 41-43	35	36	37	38,39, 45-99	Total			
From the environment	U1 - Total abstraction (=a.1+a.2= b.1+b.2):										
	a.1- Abstraction for own use										
	a.2- Abstraction for distribution										
	b.1- From water resources:										
	Surface water										
	Groundwater										
	Soil water										
	b.2- From other sources										
	Collection of precipitation										
	Abstraction from the sea										
Within the economy	U2 - Use of water received from other economic units										
U=U1+U2 - **Total use of water**											

Physical water supply: Standard Table II

Physical units

		Industries (by ISIC categories)							Households	Rest of the world	Total
		1	2-33, 41-43	35	36	37	38,39, 45-99	Total			
Within the economy	S1 - Supply of water to other economic units										
	of which: Reused water										
	Wastewater to sewerage										
To the environment	S2 - Total returns (= d.1+d.2)										
	d.1- To water resources										
	Surface water										
	Groundwater										
	Soil water										
	d.2- To other sources (e.g. Sea water)										
S - **Total supply of water** (= S1+S2)											
Consumption (U - S)											

Gross and net emissions: Standard Table III

Physical units

Pollutant	Industries (by ISIC categories)						Households	Rest of the world	Total
	1	2-33, 41-43	35	36	38, 39, 45-99	Total			
Gross emissions (= a + b)									
a. Direct emissions to water (= a1 + a2 = b1 + b2)									
a1. Without treatment									
a2. After on-site treatment									
b1. To water resources									
b2. To the sea									
b. To Sewerage (ISIC 37)									
d. Reallocation of emission by ISIC 37									
e. Net emissions (= a. + d.)									

Emissions by ISIC 37: Standard Table IV

tonnes

Pollutant	ISIC 37
4. Emissions to water (=4.a+4.b)	
4.a After treatment	
To water resources	
To the sea	
4.b Without treatment	
To water resources	
To the sea	

Hybrid supply: Standard Table V

Physical and monetary units

	Output of industries (by ISIC categories)											
			35									
	1-3	5-33, 41-43	Total	*of which:* Hydro	36	37	38,39, 45-99	Total output, at basic prices	Imports	Taxes less Subsidies on products	Trade and transport margins	Total supply at purchaser's price
1. Total output and supply (Monetary units) *of which:* 1.a Natural water (CPC 1800) 1.b Sewerage services (CPC 941)												
2. Total supply of water (Physical units) 2.a Supply of water to other economic units *of which:* 2.a.1- Wastewater to Sewerage 2.b Total returns												
3. Total (gross) emissions (Physical units)												

Note: Grey cells indicate zero entries by definition.

Hybrid use: Standard Table VI

Physical and monetary units

	Intermediate consumption of industries (by ISIC							Actual final consumption						
			35					Households						
	1	2-33, 41-43	Total	*of which*: Hydro	36	37	38,39, 45-99	Total industry	Final consumption expenditures	Social transfers in kind from Government and NPISHs	Total	Government	Capital formation	Exports	Total uses at purchaser's price
1. Total intermediate consumption and use (monetary units)															
of which: Natural water (CPC 1800)															
Sewerage services (CPC 941)															
2. Total value added (monetary units)															
3. Total use of water (physical units)															
3.a Total Abstraction															
of which: 3. a.1- Abstraction for own use															
3.b Use of water received from other economic units															

Note: Grey cells indicate zero entries by definition.

Hybrid Supply and Use: Standard Table VII

	Intermediate consumption of industries (by ISIC categories)								Rest of the world	Taxes less subsidies on products, trade and	consumption	
			35									
	1	2-33, 41-43	Total	*of which* : Hydro	36	37	38,39, 45-99	Total industry			Households	Government
1. Total output and supply (Monetary units)												
of which :												
1.a Natural water (CPC 1800)												
1.b Sewerage services (CPC 941)												
2. Total intermediate consumption and use (Monetary units)												
of which :												
2.a Natural water (CPC 1800)												
2.b Sewerage services (CPC 941)												
3. Total value added (gross) (=1-2) (Monetary units)												
4. Gross fixed capital formation (Monetary units)												
of which :												
4.a For water supply												
4.b For water sanitation												
5. Closing stocks of fixed assets for water supply (Monetary units)												
6. Closing stocks of fixed assets for sanitation (Monetary units)												
7. Total use of water (Physical units)												
7.a Total Abstraction												
of which: 7. a.1- Abstraction for own use												
7.b Use of water received from other economic units												
8. Total supply of water (Physical units)												
8.a Supply of water to other economic units												
of which: 8. a.1- Wastewater to sewerage												
8.b Total returns												
9. Total (gross) emissions (Physical units)												
Pollutant 1												
Pollutant 2												

Hybrid water supply and sewerage for own use: Standard table VIII

Physical and monetary units

		Industries (by ISIC categories)								Households	Total industry
				35							
		1-3	5-33, 41-43	Total	*of which*: Hydro	36	37	38,39, 45-99	Total		
Water supply for own use	**1. Costs of production** (=1.a+1.b) (Monetary units)										
	1. a. Total intermediate consumption										
	1.b. Total value added (gross)										
	1.b.1 Compensation of employees										
	1.b.2 Other taxes less subsidies on production										
	1.b.3 Consumption of fixed capital										
	2. Gross fixed capital formation (Monetary units)										
	3. Stocks of fixed assets (Monetary units)										
	4. Abstraction for own use (Physical units)										
Sewerage for own use	**1. Costs of production** (=1.a+1.b) (Monetary units)										
	1.a. Total intermediate consumption (Monetary units)										
	1.b. Total value added (gross)										
	1.b.1 Compensation of employees										
	1.b.2 Other taxes less subsidies on production										
	1.b.3 Consumption of fixed capital										
	2. Gross fixed capital formation (Monetary units)										
	3. Stocks of fixed assets (Monetary units)										
	4. Return of treated water (Physical units)										

Note: Grey cells indicate zero entries by definition.

Government accounts for water related collective consumption services: Standard table IX

Monetary units

	Government (ISIC 84) (by COFOG categories)			
	05.2 Wastewater management	05.3 (part) Soil and groundwater protection	05.6 Environmental protection n.e.c.	06.3 Water supply
1. Costs of production (=1.a+1.b)				
1. a. Total intermediate consumption				
1.b. Total value added (gross)				
1.b.1 Compensation of employees				
1.b.2 Consumption of fixed capital				

National expenditure for wastewater management: Standard table X

Monetary units

	USERS/BENEFICIARIES					
	Producers		Final consumers			
	Specialised producers (ISIC 37)	Other producers	Households	Government	Rest of the world	Total
1. Use of Wastewater services (CPC 941 and CPC 91123)						
1.a Final consumption						
1.b Intermediate consumption						
1.c Capital formation	nr	Na				Na
2. Gross Capital Formation						
3. Use of connected and adapted products						
4. Specific transfers						
5. Total domestic uses (=1.+2.+3.+4.)						
6. Financed by the rest of the world						
7. National expenditures (=5.-6.)						

Financial accounts for wastewater management : Standard table XI

Monetary units

FINANCING SECTORS:	USERS/BENEFICIARIES					
	Producers		Final Consumers		Rest of the world	Total
	Specialised producers (ISIC 37)	Other producers	Households	Government		
1. General government 2. NPISHs 3. Corporations 3.a Specialised producers 3.b Other producers 4. Households						
5. National expenditure						
6. Rest of the world						
7. Domestic uses						

Note: Grey cells indicate non relevant or zero entries by definition.

Physical water assets: Standard Table XII

physical units

	EA.131 Surface water						
	EA.1311 Reservoirs	EA.1312 Lakes	EA.1313 Rivers	EA.1314 Snow, Ice and Glaciers	EA.132 Groundwater	EA.133 Soil water	Total
Opening Stocks							
Increases in stocks							
Returns from the economy							
Precipitation							
Inflows							
from upstream territories							
from other resources in the territory							
Decreases in stocks							
Abstraction							
of which Sustainable use							
Evaporation/Actual evapotranspiration							
Outflows							
to downstream territories							
to the sea							
to other resources in the territory							
Other changes in volume							
Closing Stocks							

Outline

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

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

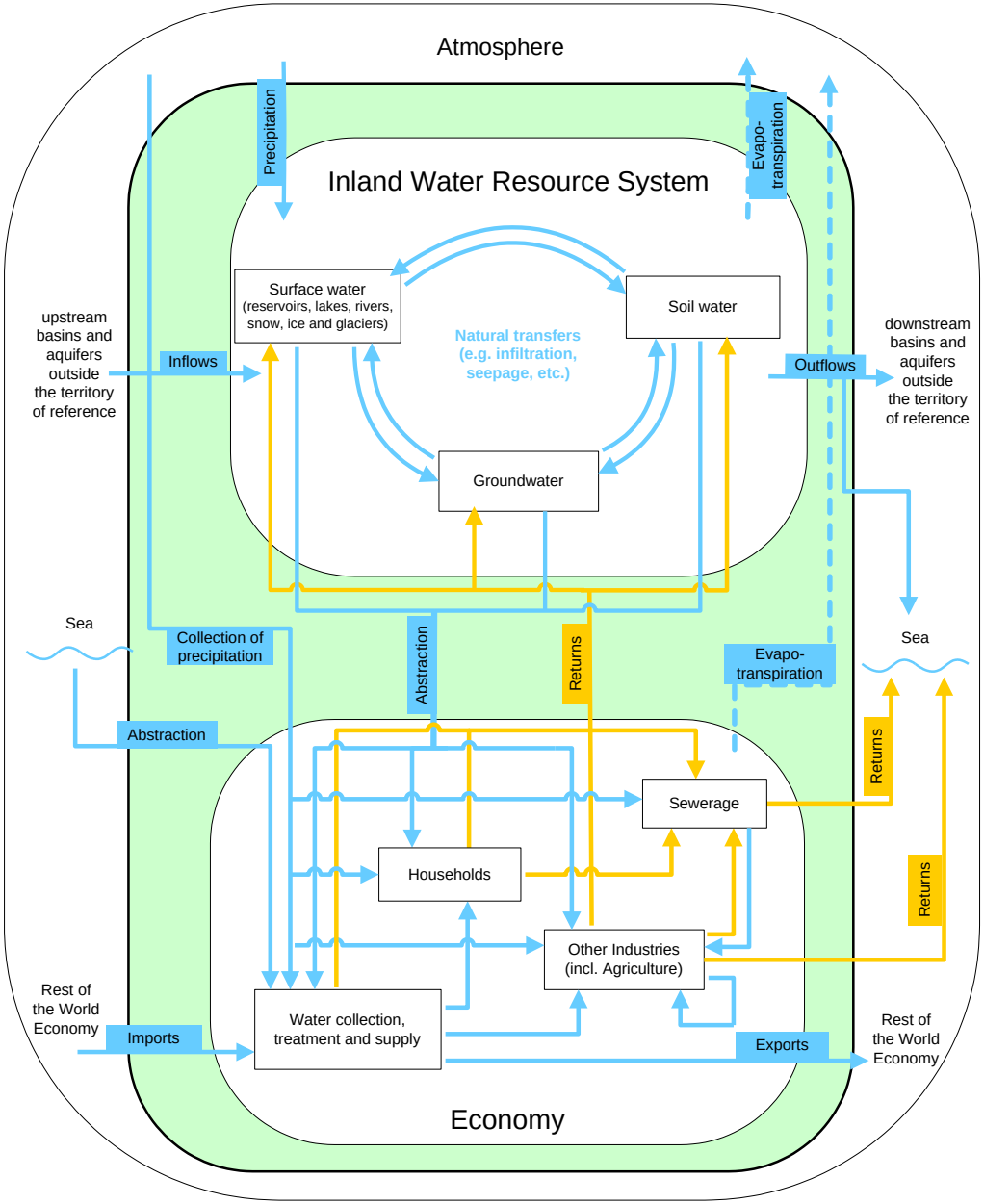
- They allow for the identification of the industries/sectors which put pressure on the environment via extraction and use
- They indicate the industries/sectors consuming the most water
- Together with monetary data (e.g. from the hybrid accounts), they provide information on water use efficiency and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

SEEA Water

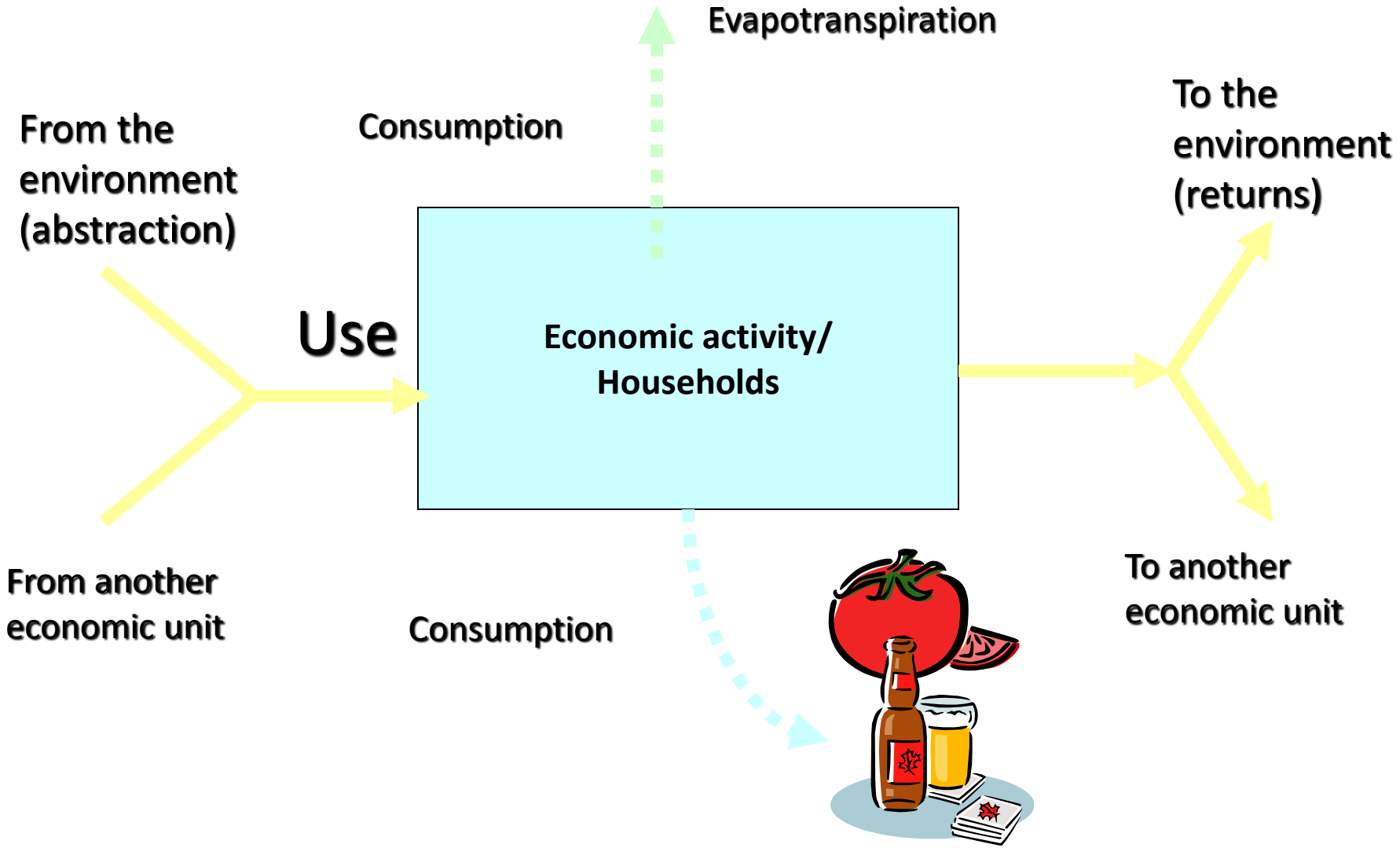
Overview

- Stocks and flows
- Economy and environment

This is a complex system, so it is useful to simplify it



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)							Households	Rest of the world	Total
	1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
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)							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.1 Surface water										
	1i.2 Groundwater										
	1i.3 Soil water										
	1ii. From other sources										
	1ii.1 Collection 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)							Households	Rest of the world	Total
		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)

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)
- It 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**
- **The are not explicitly identified**

Supplementary information: Losses in distribution

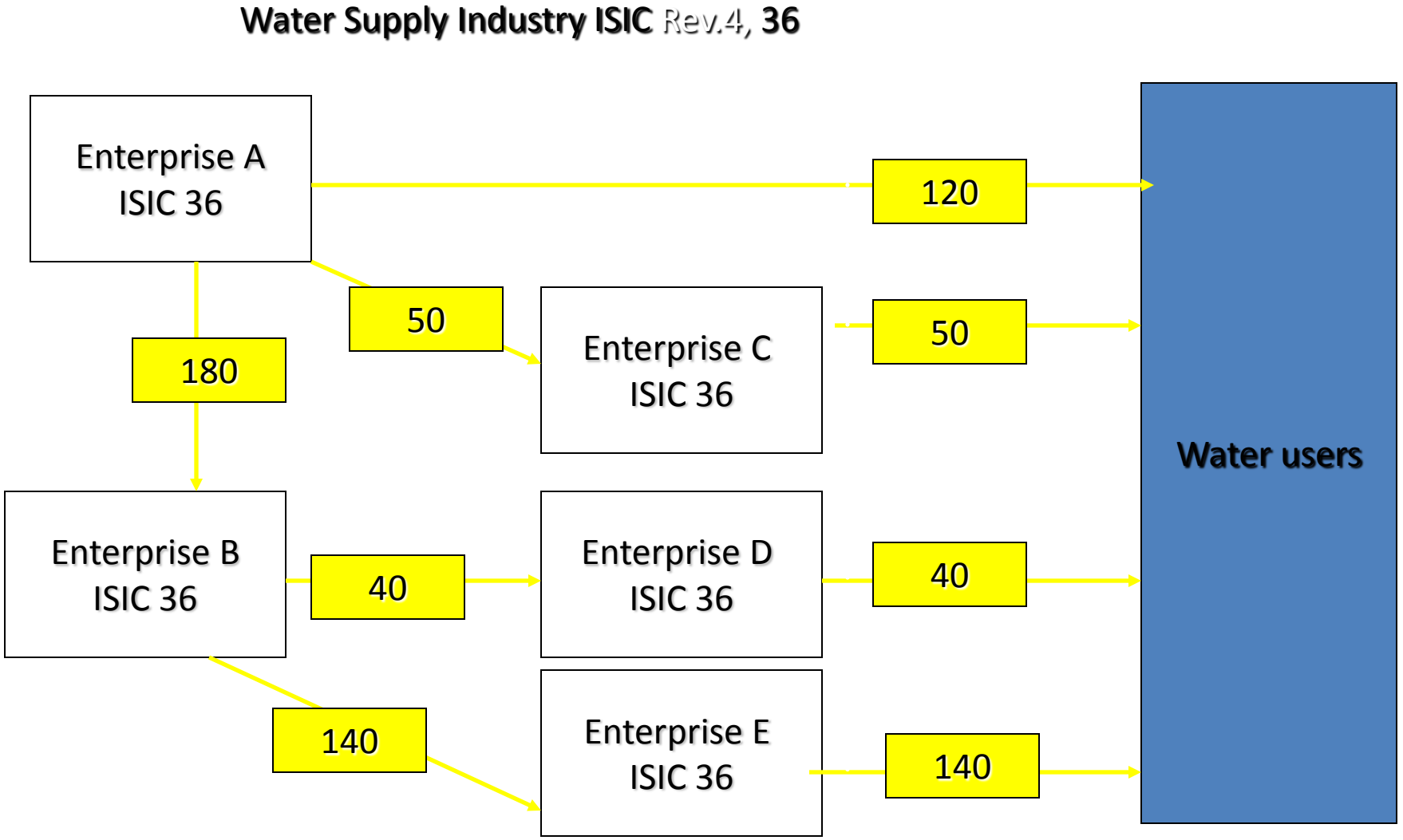
Millions m3

	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 transfers 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) – 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**

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
  - The groundwater is usually discharge 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-wa

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 ru

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 is 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

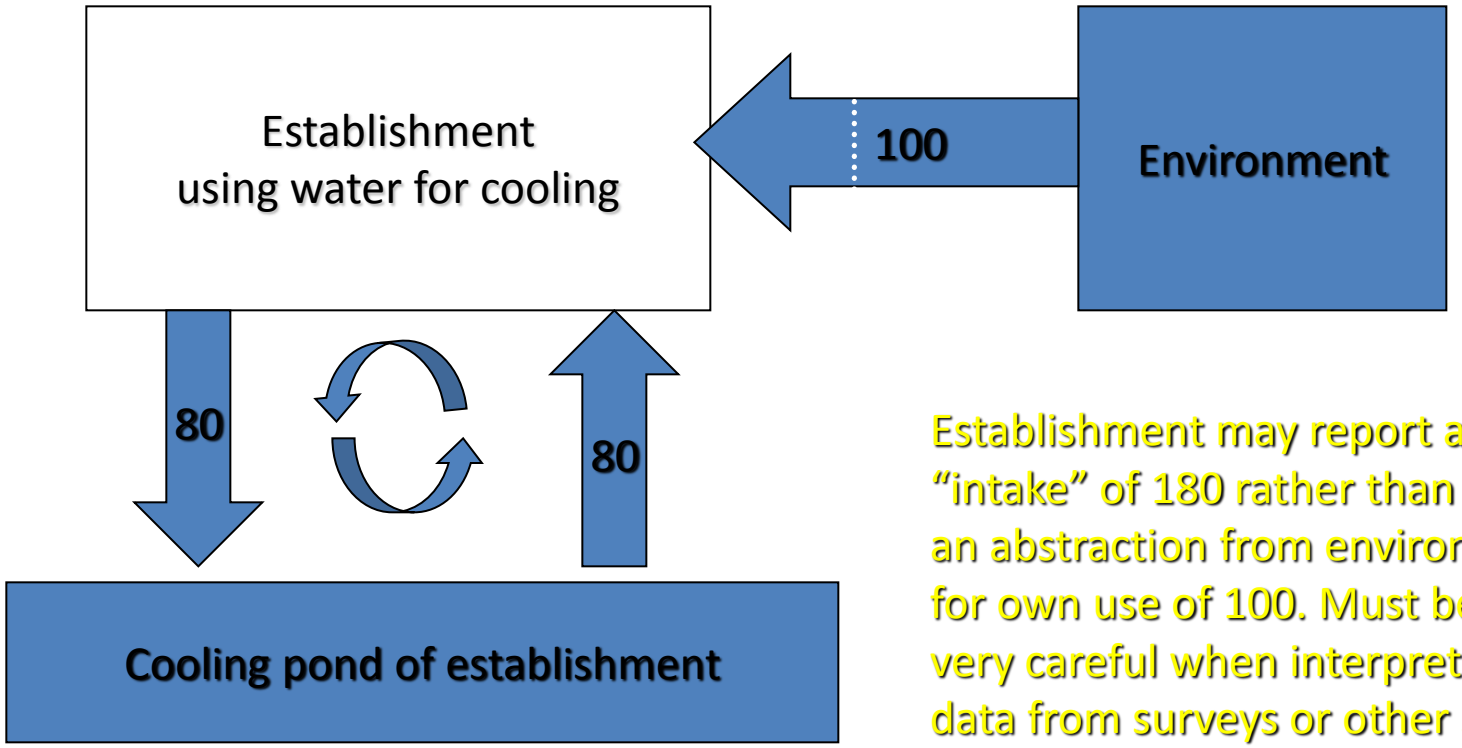
Cooling water

- Cooling water is defined as water which is used to absorb and remove heat
- When discharge is 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

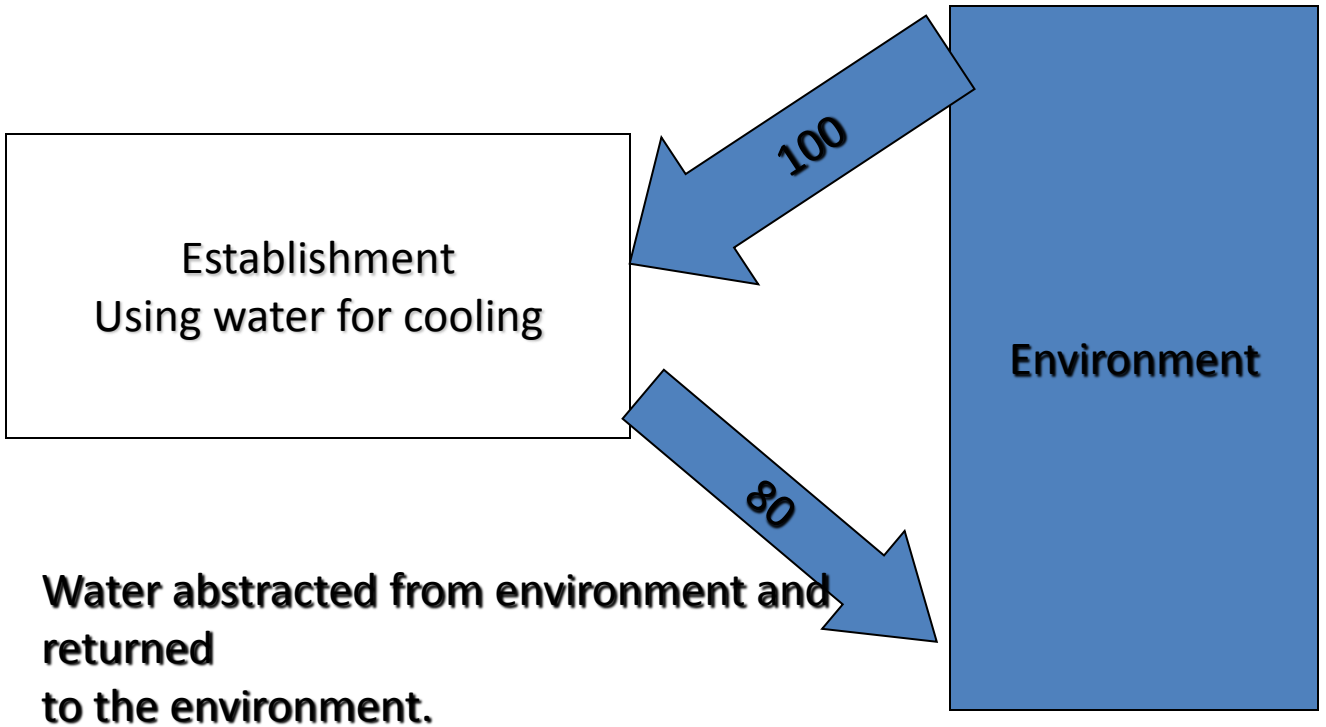
Boundary of establishment



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

Water discharged to pond and then extracted from pond.

Cooling water
Case two: Abstraction and return

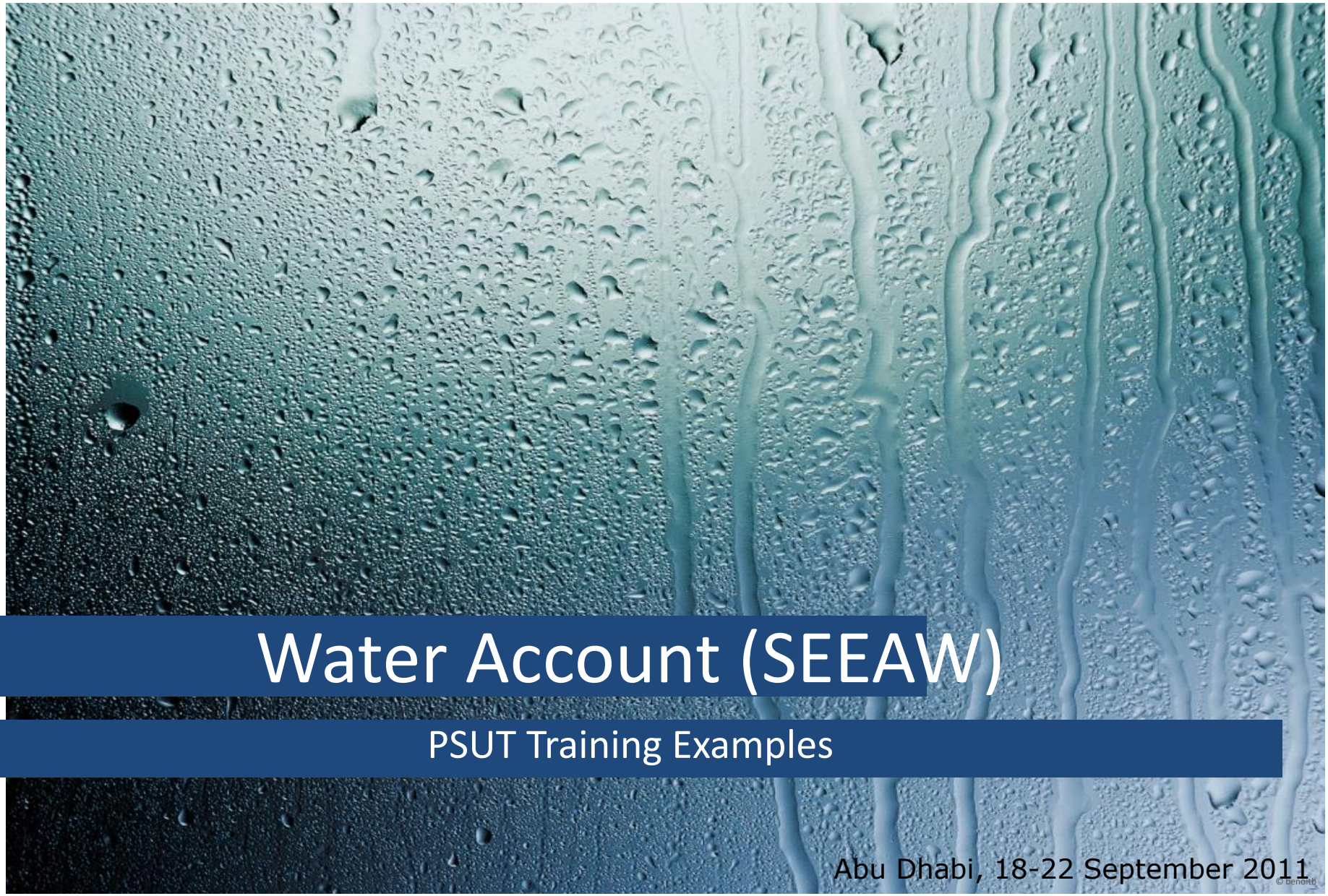


Water abstracted from environment and returned
to the environment.

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

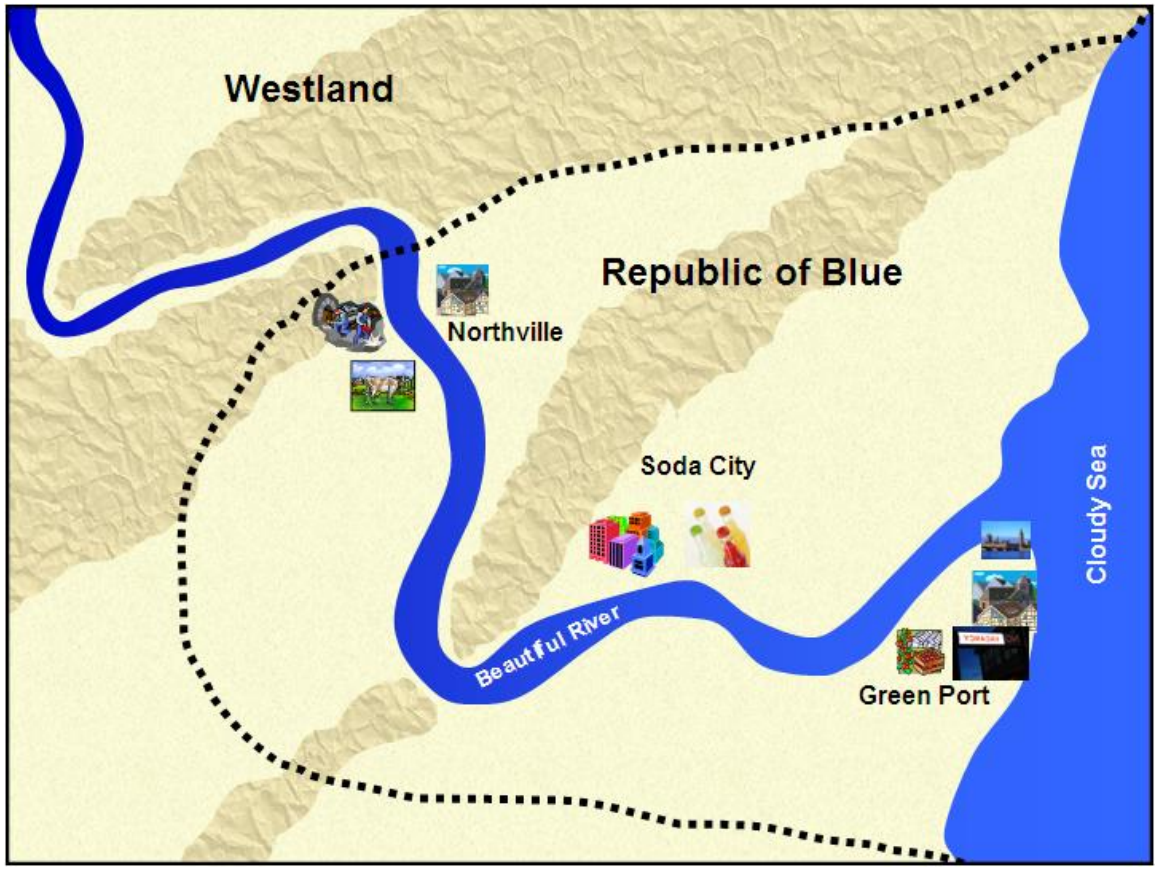


Water Account (SEEAW)

PSUT Training Examples

Abu Dhabi, 18-22 September 2011

“Republic of Blue”



Area: 67.000 km²
Population: 1,656,000
GDP: RBD$59,819 million

Soda City

Households

Sewerage
ISIC 37

12

4

36

Other industries ISIC 38, 39, 45-99
(Including transport ISIC 49)

5

16

8
Losses

2
Losses

Manufacturing ISIC 10-33
(including soft drink ISIC 11)

5

20

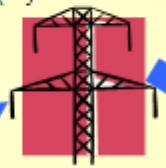
7 Losses

Water Supply Industry
ISIC 36

59

Electricity ISIC 35
(Hydro-electric plant)

8



1

144

322

321

5

Beautiful River

Soda City: Physical Use Table

Physical use table

1,000,000 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	**Industry total**			
From the environment	**1 - Total abstraction (=1.a+1.b = 1.i+1.ii)**	**0**	**0**	**322**	**144**	**0**	**0**	**466**	**4**		**470**
	1.a Abstraction for own use	0	0	322	0	0	0	322	4		326
	1.b Abstraction for distribution	0	0	0	144	0	0	144	0		144
	1.i From inland water resources:	0	0	322	144	0	0	466	4		470
	1.i.1 Surface water	0	0	322	144	0	0	466	4		470
	1.i.2 Groundwater	0	0	0	0	0	0	0	0		0
	1.i.3 Soil water	0	0	0	0	0	0	0	0		0
	1.ii Collection of precipitation	0	0	0	0	0	0	0	0		0
	1.iii Abstraction from the sea	0	0	0	0	0	0	0	0		0
Within the economy	**2. Use of water received from other economic units**	**0**	**59**	**8**	**0**	**22**	**16**	**105**	**36**	**0**	**141**
	of which:										
	2.a Reused water	0	0	0	0	0	0	0	0	0	0
	2.b Wastewater to sewerage	0	0	0	0	22	0	22	0	0	22
	2.c Distributed water	0	59	8	0	0	16	83	36	0	119
3. Total use of water (=1+2)		**0**	**59**	**330**	**144**	**22**	**16**	**571**	**40**	**0**	**611**

Note: grey cells indicate zero entries by definition.

Soda City: Physical Supply Table

Physical supply table

1,000,000 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	**Industry total**			
Within the economy	**4. Supply of water to other economic units**	**0**	**5**	**0**	**119**	**0**	**5**	**129**	**12**	**0**	**141**
	of which:										
	4.a Reused water	0	0	0	0	0	0	0	0	0	0
	4.b Wastewater to sewerage	0	5	0	0	0	5	10	12	0	22
	4.c Distributed water	0	0	0	119	0	0	119	0	0	119
To the environment	**5. Total returns (= 5.a+5.b)**	**0**	**5**	**321**	**18**	**20**	**0**	**364**	**0**		**364**
	5.a To inland water resources	0	5	321	18	20	0	364	0		364
	5.a.1 Surface water	0	5	321	1	20	0	347	0		347
	5.a.2 Groundwater	0	0	0	17	0	0	17	0		17
	5.a.3 Soil water	0	0	0	0	0	0	0	0		0
	5.b To other sources (e.g. sea water)	0	0	0	0	0	0	0	0		0
6. Total supply of water (= 4+5)		**0**	**10**	**321**	**137**	**20**	**5**	**493**	**12**	**0**	**505**
7. Consumption (3-6)		**0**	**49**	**9**	**7**	**2**	**11**	**78**	**28**	**0**	**106**

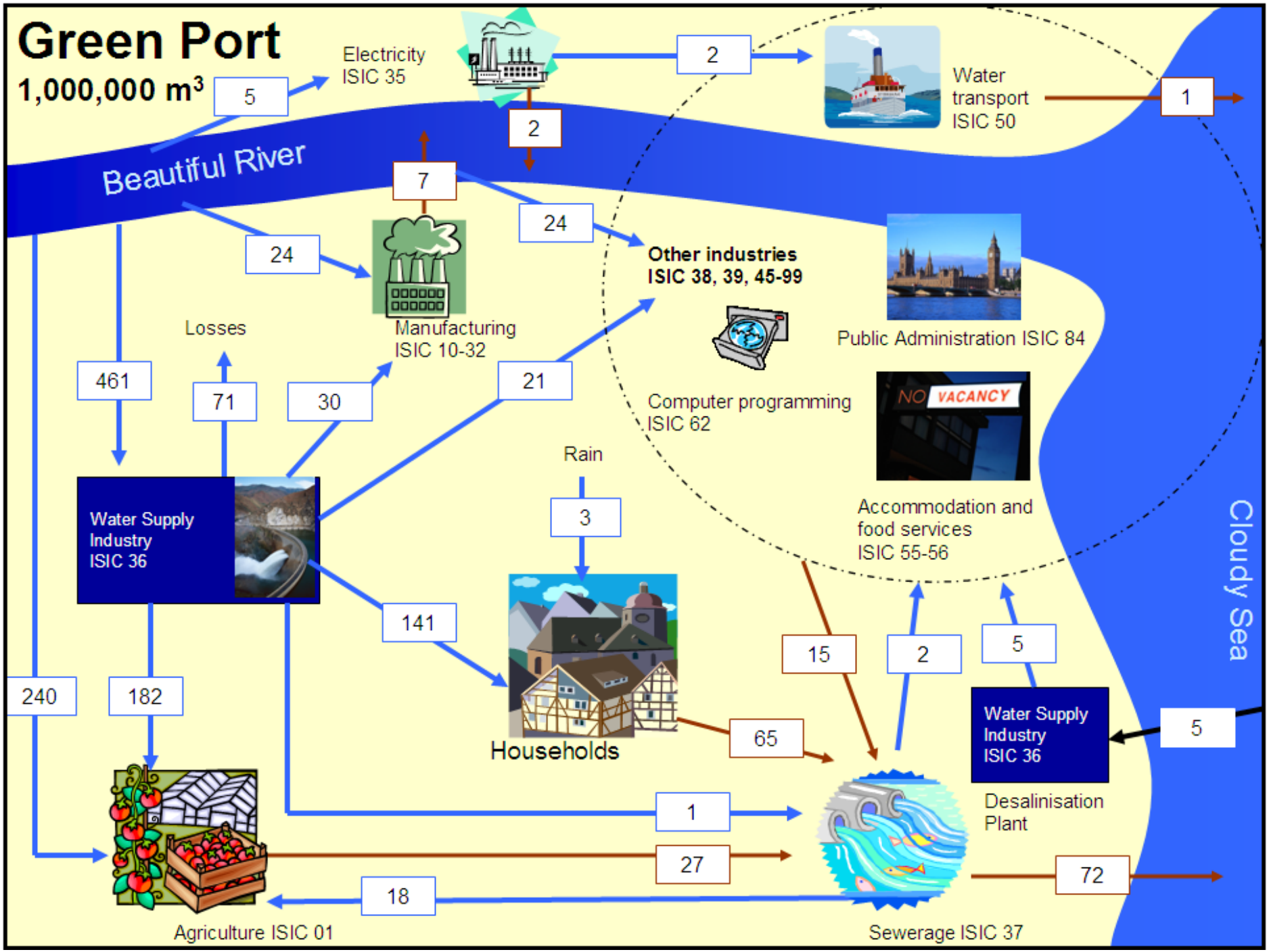
Note: grey cells indicate zero entries by definition.

Questions on Soda City

- How much water does the electricity industry (ISIC 35) abstract from the environment?
- How much water do households receive from other economic units?
- How much water does the water supply industry (ISIC 36) distribute to users?
- How much water do the “other” industries (ISIC 38, 39, 45-99) return to the environment?

Questions on Soda City

- Which industry **uses** the 2nd greatest amount of water?
- Which group of industries **consumes** the 2nd greatest amount of water?
- If some households installed rainwater tanks and collected 2,000,000 m3 of water, in what line and column would you record this abstraction?
- If a water supply pipe burst and an additional 1,000,000 m3 of water was discharged to the surface and it eventually flowed back into the Beautiful River, in what line and column would record this flow?


Green Port
1,000,000 m3
Electricity
ISIC 35
5
2
2
Water
transport
ISIC 50
1
Beautiful River
7
24
24
Other industries
ISIC 38, 39, 45-99
Losses
Manufacturing
ISIC 10-32
461
71
30
21
Computer programming
ISIC 62
Public Administration ISIC 84
NO VACANCY
Accommodation and
food services
ISIC 55-56
Rain
3
Water Supply
Industry
ISIC 36
141
Households
65
15
2
5
Water Supply
Industry
ISIC 36
5
Desalinisation
Plant
240
182
1
27
18
72
Agriculture ISIC 01
Sewerage ISIC 37
Cloudy Sea

Please complete Physical Use Table for „Green Port“

Physical use table

Gigalitres (=1,000,000 m3)

		Industries (by ISIC categories)							Households	Rest of the world	**Total**
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	**Industry total**			
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 inland water resources:										
	1.i.1 Surface water										
	1.i.2 Groundwater										
	1.i.3 Soil water										
	1.ii Collection of precipitation										
	1.iii Abstraction from the sea										
Within the economy	**2. Use of water received from other economic units**										
	of which:										
	2.a Reused water										
	2.b Wastewater to sewerage										
	2.c Distributed water										
3. Total use of water (=1+2)											

Note: grey cells indicate zero entries by definition.

Please complete Physical Supply Table for „Green Port“

Physical supply table

Gigalitres (=1,000,000 m3)

		Industries (by ISIC categories)							Households	Rest of the world	**Total**
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	**Industry total**			
Within the economy	**4. Supply of water to other economic units**										
	of which:										
	4.a Reused water										
	4.b Wastewater to sewerage										
	4.c Distributed water										
To the environment	**5. Total returns (= 5.a+5.b)**										
	5.a To inland 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)											

Note: grey cells indicate zero entries by definition.

Answers Green Port: Physical Use Table

Physical use table

Gigalitres (=1,000,000 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	**Industry total**			
From the environment	**1 - Total abstraction (=1.a+1.b = 1.i+1.ii)**	**240**	**24**	**5**	**466**	**0**	**24**	**759**	**3**		**762**
	1.a Abstraction for own use	240	24	3	0	0	24	291	3		294
	1.b Abstraction for distribution	0	0	2	466	0	0	468	0		468
	1.i From inland water resources:	240	24	5	461	0	24	754	0		754
	1.i.1 Surface water	240	24	5	461	0	24	754	0		754
	1.i.2 Groundwater	0	0	0	0	0	0	0	0		0
	1.i.3 Soil water	0	0	0	0	0	0	0	0		0
	1.ii Collection of precipitation	0	0	0	0	0	0	0	3		3
	1.iii Abstraction from the sea	0	0	0	5	0	0	5	0		5
Within the economy	**2. Use of water received from other economic units**	**200**	**30**	**0**	**0**	**108**	**30**	**368**	**141**	**0**	**509**
	of which:							0			
	2.a Reused water	18	0	0	0	0	2	20	0	0	20
	2.b Wastewater to sewerage	0	0	0	0	107	0	107	0	0	107
	2.c Distributed water	182	30	0	0	1	28	241	141	0	382
3. Total use of water (=1+2)		**440**	**54**	**5**	**466**	**108**	**54**	1127	**144**	**0**	**1271**

Note: grey cells indicate zero entries by definition.

Answers Green Port: Physical Supply Table

Physical supply table

Gigalitres (=1,000,000 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	**Industry total**			
Within the economy	**4. Supply of water to other economic units**	**27**	**0**	**2**	**380**	**20**	**15**	**444**	**65**	**0**	**509**
	of which:										
	4.a Reused water	0	0	0	0	20	0	20	0	0	20
	4.b Wastewater to sewerage	27	0	0	0	0	15	42	65	0	107
	4.c Distributed water	0	0	2	380	0	0	382	0	0	382
To the environment	**5. Total returns (= 5.a+5.b)**	**0**	**7**	**2**	**71**	**72**	**1**	**153**	**0**		**153**
	5.a To inland water resources	0	7	2	71	0	0	80	0		80
	5.a.1 Surface water	0	7	2	0	0	0	9	0		9
	5.a.2 Groundwater	0	0	0	71	0	0	71	0		71
	5.a.3 Soil water	0	0	0	0	0	0	0	0		0
	5.b To other sources (e.g. sea water)	0	0	0	0	72	1	73	0		73
6. Total supply of water (= 4+5)		**27**	**7**	**4**	**451**	**92**	**16**	**597**	**65**	**0**	**662**
7. Consumption (3-6)		**413**	**47**	**1**	**15**	**16**	**38**	**530**	**79**	**0**	**609**

Note: grey cells indicate zero entries by definition.

The Hybrid and Economic Accounts of SEEAW

Outline

- What are the hybrid accounts
- What do hybrid accounts measure
- Why compile them?
- The seven hybrid and economic standard tables of SEEAW
- The hybrid tables and accounts
- Example from Australia

What do hybrid accounts measure?

- Physical flows of
  - Water and emissions (pollutants)
- Monetary flows of
  - Water and sewerage services
- Value of fixed assets (and fixed capital formation) for
  - Water supply and sewerage industries

Why compile hybrid accounts for water?

To identify

- The costs associated with production of water-related products and income generated by the production
- The investment in water-related infrastructure
- Costs of maintaining the infrastructure
- Fees paid by users for water-related services and subsidies received

The seven hybrid tables

- Hybrid supply table
- Hybrid use table
- Hybrid account for supply and use of water
- Hybrid account for water supply and sewerage for own use
- Government accounts for water-related collective consumption services
- National expenditure accounts for wastewater management
- Financing accounts for wastewater management

Hybrid use - scope

- Monetary flows of water within the economy
  - e.g. supply of water by the water supply industry (ISIC 36) to other industries
  - Equivalent to output in the SNA
- Monetary flows of water from the environment to the economy
  - e.g. abstraction of water for own use by agriculture ISIC 1
  - This goes beyond the SNA
- These flows are recorded in separate tables (5.3 and 5.4)

Hybrid supply

Hybrid Supply table (Table 5.1, page 66 of SEEAW) consist of 3 parts:

1) Monetary supply (in monetary units) (Output + imports);
2) Physical supply: water supplied to other units and discharged to the environment (in physical units);
3) Emission of pollutants (gross): pollutants added to water as a result of production and consumption.

Columns: Industries classified by ISIC

ISIC 36 main supplier of water, other industries also may supply water as secondary activity

Rows: Products classified by CPC ver. 2

Natural water + distribution services

Sewerage

CPC Version 2

- Natural water (CPC 1800)
  - Excludes bottled water (CPC 2441 - Waters (including mineral waters and aerated waters), not sweetened nor flavoured
- Sewerage services (CPC 941)
  - 9411 - Sewerage and sewage treatment services
  - 9412 - Septic tank emptying and cleaning services

Hybrid sup

For water the greatest value should be here

	Output of industries (by ISIC cat s)												
			35										
	1	2-33, 41-43	Total	*of which*: Hydro	36	37	38,39, 45-99	Total output, at basic prices	Imports	Taxes on products	Subsidies on products	Trade and transport margins	Total supply at purchaser's price
1. Total output and supply (monetary units)													
of which:													
1.a Natural water (CPC 1800)													
1.b Sewerage services (CPC 941)													
2. Total supply of water (physical units)													
2.a - Supply of water to other economic													
2.b - Total returns													
3. Total (gross) emissions (physical units)													
Pollutants													
Note: Grey cells indicate zero entries by definition.													

Note: use of basic price and purchase's price in table

For water the greatest value should be here

SNA Term: Basic price

- The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, on that unit as a consequence of its production or sale; it excludes any transport charges invoiced separately by the producer.

- **Relevant SNA Paragraphs** 6.205. 15.28. [3.82.]

From UNSD – Glossary of SNA
http://unstats.un.org/unsd/sna1993/glossary.asp?letter=B

SNA Term: Output

- Output consists of those goods or services that are produced within an establishment that become available for use outside that establishment, plus any goods and services produced for own final use.
- Relevant SNA Paragraph 6.38

But not intermediate consumption

From UNSD – Glossary of SNA Terms

http://unstats.un.org/unsd/sna1993/glossform.asp?getitem=423

SNA Term: Purchaser's price

- Purchaser's price is the amount paid by the purchaser, excluding any deductible VAT or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser; the purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place.
- **Relevant Paragraphs** 6.215. 15.28. [2.73.] [3.83.]

From UNSD – Glossary of SNA
http://unstats.un.org/unsd/sna1993/glossary.asp?letter=P

Hybrid use table

Table 5.2 (page 70 of SEEAW) consists of two parts:

1. Monetary use table

   Shows the destination of produce in terms of:

   - Intermediate consumption
   - Actual final consumption of households and government
   - Gross capital formation
   - Exports

2. Total use of water

Hybrid use table

Physical and monetary units

	Intermediate consumption of industries (by ISIC								Actual final consumption					
			35						Households					
	1	2-33, 41-43	Total	*of which*: Hydro	36	37	38,39, 45-99	Total industry	Final consumption expenditures	Social transfers in kind from Government and NPISHs	Total	Government	Capital formation	Exports	Total uses at purchaser's price
1. Total intermediate consumption and use (monetary units)															
of which: Natural water (CPC 1800)															
Sewerage services (CPC 941)															
2. Total value added (monetary units)															
3. Total use of water (physical units)															
3.a Total Abstraction															
of which: 3. a.1- Abstraction for own use															
3.b Use of water received from other economic units															

Note: Grey cells indicate zero entries by definition.

Note: purchase's price is recorded in this table

Final consumption

- In SEEAW final consumption for household is the actual final consumption of households not the final consumption expenditure by households
- This is a departure from SNA (which records the final consumption expenditure)
- It is done because in many countries household do not directly purchase water rather it is provide free or almost free by government

Final consumption expenditure and actual final consumption

- Total final consumption may be calculated as:
  - Final consumption expenditure

    = Total value of expenditures on individual and collective goods and services of households, not for profit Institutions supporting households (NPISH) and government
  - Actual consumption expenditure

  = Value of individual goods and services acquired by households plus the value of collective services provided by the government

(See box on page 68 of SEEAW)

Final consumption expenditure and actual final consumption

	Final consumption expenditure				
	Households (a)	NPSHIs individual (b)	Government		Total (a)+(b)+(c)+(d)
			Collective (c)	Individual (d)	
Total use of products	**43**	**5**	**2**	**50**	**100**

Actual Consumption			
Households		Government (c)	Total (a)+(b)+(c)+(d)
Final consumption expenditures (a)	Social transfers in kind from Government and NPISHs (b)+(d)		
43	**5+50 = 55**	**2**	**100**

Individual and collective goods and services

- Individual goods and services of government and NPISHs are those incurred for the benefit of individual households (e.g. supply of water to households by government, etc.)
- Collective goods and services of government are those incurred for the benefit of the community (e.g. water management, legislation and regulation)

The hybrid accounts

- Combine the physical and monetary supply and use tables for water in a single table for deriving hydrologic-economic indicators
- Table 5.3 (page 71) consists of 2 parts:
  - Monetary SUT [items 1-6]
    - Supply, use, value added and gross capital formation – total and water-related [1-4]
  - Stocks of water-related fixed assets [5, 6]
  - Physical SUT [items 7-9]
    - Use of water [7]
    - Supply of water [8]
    - Gross emissions [9]

Hybrid account for supply and use of water

	Intermediate consumption of industries (by ISIC categories)								Rest of the world	Taxes less subsidies on products, trade and	consumption	
			35									
	1	2-33, 41-43	Total	*of which* : Hydro	36	37	38,39, 45-99	Total industry			Households	Government
1. Total output and supply (Monetary units)												
of which :												
1.a Natural water (CPC 1800)												
1.b Sewerage services (CPC 941)												
2. Total intermediate consumption and use (Monetary units)												
of which :												
2.a Natural water (CPC 1800)												
2.b Sewerage services (CPC 941)												
3. Total value added (gross) (=1-2) (Monetary units)												
4. Gross fixed capital formation (Monetary units)												
of which :												
4.a For water supply												
4.b For water sanitation												
5. Closing stocks of fixed assets for water supply (Monetary units)												
6. Closing stocks of fixed assets for sanitation (Monetary units)												
7. Total use of water (Physical units)												
7.a Total Abstraction												
of which: 7. a.1- Abstraction for own use												
7.b Use of water received from other economic units												
8. Total supply of water (Physical units)												
8.a Supply of water to other economic units												
of which: 8. a.1- Wastewater to sewerage												
8.b Total returns												
9. Total (gross) emissions (Physical units)												
Pollutant 1												
Pollutant 2												

Hybrid account for supply and use of water

	Intermediate consu		
			3
	1	2-33, 41-43	Total
1. Total output and supply (Monetary units)			
of which :			
1.a Natural water (CPC 1800)			
1.b Sewerage services (CPC 941)			
2. Total intermediate consumption and use (Monetary units)			
of which :			
2.a Natural water (CPC 1800)			
2.b Sewerage services (CPC 941)			
3. Total value added (gross) (=1-2) (Monetary units)			
4. Gross fixed capital formation (Monetary units)			
of which :			
4.a For water supply			
4.b For water sanitation			
5. Closing stocks of fixed assets for water supply (Monetary units)			
6. Closing stocks of fixed assets for sanitation (Monetary units)			
7. Total use of water (Physical units)			
7.a Total Abstraction			
of which: 7. a.1- Abstraction for own use			
7.b Use of water received from other economic units			
8. Total supply of water (Physical units)			
8.a Supply of water to other economic units			
of which: 8. a.1- Wastewater to sewerage			
8.b Total returns			
9. Total (gross) emissions (Physical units)			
Pollutant 1			
Pollutant 2			
Pollutant ….n			

Hybrid accounts for water-related activities for own use

- Objective is to separately identify the cost and of providing water and sewerage services for own use in industries and households
- This is because the cost of providing these is incorporated into the value of the other outputs of the industries or is bourn by households
  - For example, in agriculture the cost of providing water for own use is incorporated into the output of crops (e.g. rice, wheat, cattle, etc)
- This goes beyond the output covered by SNA

Hybrid accounts for water-related activities for own use

- Hybrid accounts for own use are carried out for:
  - Water supply
  - Sewerage services
- For each the following is needed
  - Total intermediate consumption (rents, electricity)
  - Total gross value added
    - Wages
    - Taxes less subsidies
    - Consumption of fixed capital
  - Fixed capital formation
  - Stocks of fixed assets

Hybrid accounts for water-related activities for own use

- This is one of the most data intensive tables to produce
- Comprehensive data can probably only be collected from specially designed surveys
- Alternatively a variety of other information sources may be used to estimated data

Hybrid accounts for water supply and sewerage for own use

Physical and monetary units

		Industries (by ISIC categories)								Households	Total industry
		1-3	5-33, 41-43	35 Total	35 *of*	36	37	38,39, 45-99	Total		
Water supply for own use	**1. Costs of production** (=1.a+1.b) (Monetary units)										
	1. a. Total intermediate consumption										
	1.b. Total value added (gross)										
	1.b.1 Compensation of employees										
	1.b.2 Other taxes less subsidies on production										
	1.b.3 Consumption of fixed capital										
	2. Gross fixed capital formation (Monetary units)										
	3. Stocks of fixed assets (Monetary units)										
	4. Abstraction for own use (Physical units)										
Sewerage for own use	**1. Costs of production** (=1.a+1.b) (Monetary units)										
	units)										
	1.b. Total value added (gross)										
	1.b.1 Compensation of employees										
	1.b.2 Other taxes less subsidies on production										
	1.b.3 Consumption of fixed capital										
	2. Gross fixed capital formation (Monetary units)										
	3. Stocks of fixed assets (Monetary units)										
	4. Return of treated water (Physical units)										

Largest numbers for water supply are typically for agriculture and hydro-electricity.

Largest numbers for sewerage may be expected for manufacturing and mining.

Data sources

- National accounts
- Businesses reports
  - Annual reports, environmental reports, websites
- Government
  - Agency reporting and websites
  - Administrative data bases (especially tax)
- Surveys
  - Business surveys
  - Agricultural surveys
  - Household surveys
- Estimation based on case studies, other research and assumptions

Country experiences

Australia – Experimental monetary accounts

2003-04 http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4610.0.55.0042003-04?OpenDocument

2004-05 http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4610.0.55.0052004-05?OpenDocument

Water use in Australia and scope of the monetary account

	Self-extracted (GL)	Distributed Water (GL)	Reuse Water (GL)	In-Stream (GL)	Water Consumption (GL)
Agriculture	6,582	5,329	280		12,191
Mining	529	72	7	183	413
Manufacturing	246	341	13		589
Water Supply	11,160	2,045	39		2,083
Electricity and Gas	60,172	115	6	59,867	271
All other industries	862	1,561	78	386	1,021
Households	232	1,874	2		2,108
Total	79,783	11,337	425	60,436	18,676

Classification of products and assets

Four water products were identified:

1. Urban distributed water
2. Rural distributed water
3. Bulk water
4. Wastewater/sewerage services

Three assets selected for asset values:

1. Urban water supply infrastructure assets;
2. Urban sewerage infrastructure assets; and
3. Irrigation and drainage infrastructure assets

Primary data sources and reference year

Supply side:

- ABS Economic Activity Survey
- State government, industry association and company annual reports

Use Side:

- Households: State government reports, WSAA facts
- Agriculture: Water Use on Australian Farms
- Other industries: Economic Activity Survey
- Sewerage services: Environmental Protection Expenditure Account 1996-97

Reference year: 2003-04

Results – economic output

- Total output of water & sewerage services in was AUD$7.3 billion, of which;
  - sewerage services generated AUD$3.4 billion;
  - urban water sales generated AUD$3.3 billion;
  - bulk water sales AUD$0.5 billion; and
- sales of rural water were worth AUD$0.3 billion
- water supply industry supplied 8,296 GL of water

Results – expenditure on water

- Households highest expenditure AUD$2,046 million (59% of total), used 1,874 GL of water (23%)
- Agriculture spent AUD$293 million (8%) for 5,329 GL of water (64%)
- Victoria lowest annual consumption per household (204 KL) and lowest expenditure per household (AUD$205)
- Northern Territory highest annual consumption per household (453 KL) and highest expenditure per household (AUD$507)

Results – total value of infrastructure

- Total assets AUD$73.0 billion
- wastewater & sewerage assets - AUD$35.0 billion
- Urban water infrastructure assets - AUD$ 32.0 billion
- Irrigation and drainage assets - AUD$6.0 billion

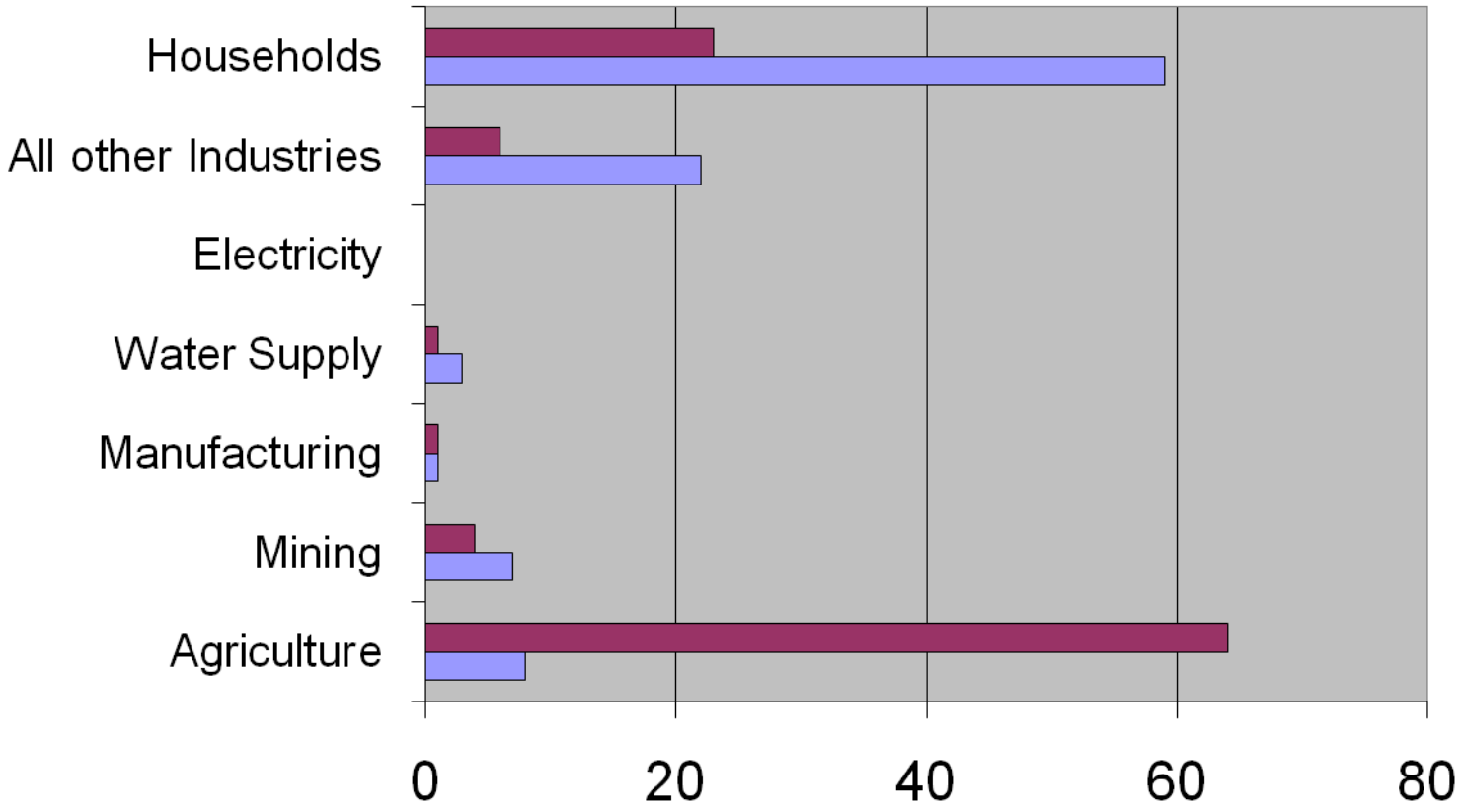
Simple hybrid use table from ABS

Note different reference years for monetary and physical

	Expenditure on water, 2003–04		*Physical use of water, 2004–05*	
	Distributed water $m	*Percent of total %*	*Distributed water GL*	*Percent of total %*
Intermediate consumption				
Agriculture, forestry & fishing	293	8	5,354	64
Manufacturing	235	7	341	4
Mining	51	1	72	1
Electricity & gas supply	92	3	115	1
Water supply, sewerage & drainage	2	0	23	0
Other Industries	746	22	531	6
Total intermediate consumption	1,419	41	6,436	77
Final consumption by households	2,047	59	1,874	23
Total use	3,466	100	8,310	100

Note: Monetary data in this table are considered experimental.

Monetary v physical use of distributed water (% of total use)



Government accounts for water-related activities

- Government expenditure on collective consumption services on water related activities are classified by Classifications of Functions of Government – COFOG
- It includes the following categories:
  - Wastewater management
  - Soil and groundwater protection
  - Environmental protection n.e. c.
  - Water supply

Government accounts for water-related activities

monetary units

	Government (ISIC 84) (by COFOG categories)			
	05.2 Wastewater management	05.3 (part) Soil and groundwater protection	05.6 Environmental protection n.e.c.	06.3 Water supply
1. Total output				
2. Intermediate consumption				
3. Value added (gross) (= 1-2)				

National expenditure accounts

- Aim at recording the expenditure of resident units and financed by resident units for environmental protection
- CEPA-2000 (Classification of Environmental Protection Activities) is the classification for EP It classifies:
  - EP activities (Activities whose primary purpose is the protection of the environment)
  - EP products (e.g. septic tanks)
  - Expenditures for EP (investment grants, taxes, subsidies, acquisition of land for EP, etc.)

Environmental Protection Expenditure related to water

- CEPA-2000 related to water include:
  - Wastewater management
    - Activities of sewerage, administration, use of specific products (e.g septic tanks) and specific transfers
  - Water management and exploitation
    - Activities for the collection, treatment and supply of water, legislation, administration and specific transfers

National expenditure accounts for wastewater management

- Table 5.6 (page 82 of SEEAW) includes, by row:
  - Use of wastewater services [Item 1]
  - Gross capital formation for producing EP services including acquisition of land [2]
  - Use of connected and adapted products (septic tanks and collecting sludge) [3]
  - Specific transfers (current and capital transfers, earmarked taxes, subsidies, etc.) [4]
  - National expenditure = Total domestic uses [5= 1+2+3+4] – the part financed by the ROW [6]

National expenditure accounts for wastewater management

	USERS/BENEFICIARIES					
	Producers		Final consumers		Rest of the world	Total
	Specialised producers (ISIC 37)	Other producers	Households	Government		
1. Use of Wastewater services (CPC 941and CPC 91123)						
1a Final consumption						
1b Intermediate consumption						
1c Capital formation						
2. Gross Capital Formation						
3. Use of connected and adapted products.						
4. Specific transfers						
5. Total domestic uses (=1+2+3+4)						
6. Financed by the rest of the world						
7. National expenditures (=5-6)						
Note: Grey cells indicate non relevant or zero entries by definition; nr not recorded to avoid double counting;						
Na not applicable in the case of wastewater management						

National expenditure for wastewater management

- Table 5.6 by column:
  - Specialized producers (ISIC 37 is the principal activity)
  - Other producers
  - Final consumers
  - ROW

Financing accounts

Purpose:

- To identify the financing sector of water related products and the beneficiaries
- It analyzes transfers (e.g. subsidies, investment grants, taxes) from whom to whom

Financing accounts

- Table 5.7 (page 83 of SEEAW) shows how wastewater is financed:
  - By row: Financing sectors – institutional sectors in the SNA
  - By column the Beneficiaries (same as table 5.6)

Financing accounts for wastewater management

monetary units

FINANCING SECTORS:	USERS/BENEFICIARIES					
	Producers		Final Consumers (Actual consumption)		Rest of the world	Total
	Specialised producers (ISIC 37)	Other producers	Households	Government		
1. General government						
2. NPISHs						
3. Corporations						
3.a Specialised producers						
3.b Other producers						
4. Households						
5. National expenditure						
6. Rest of the world						
7. Domestic uses						

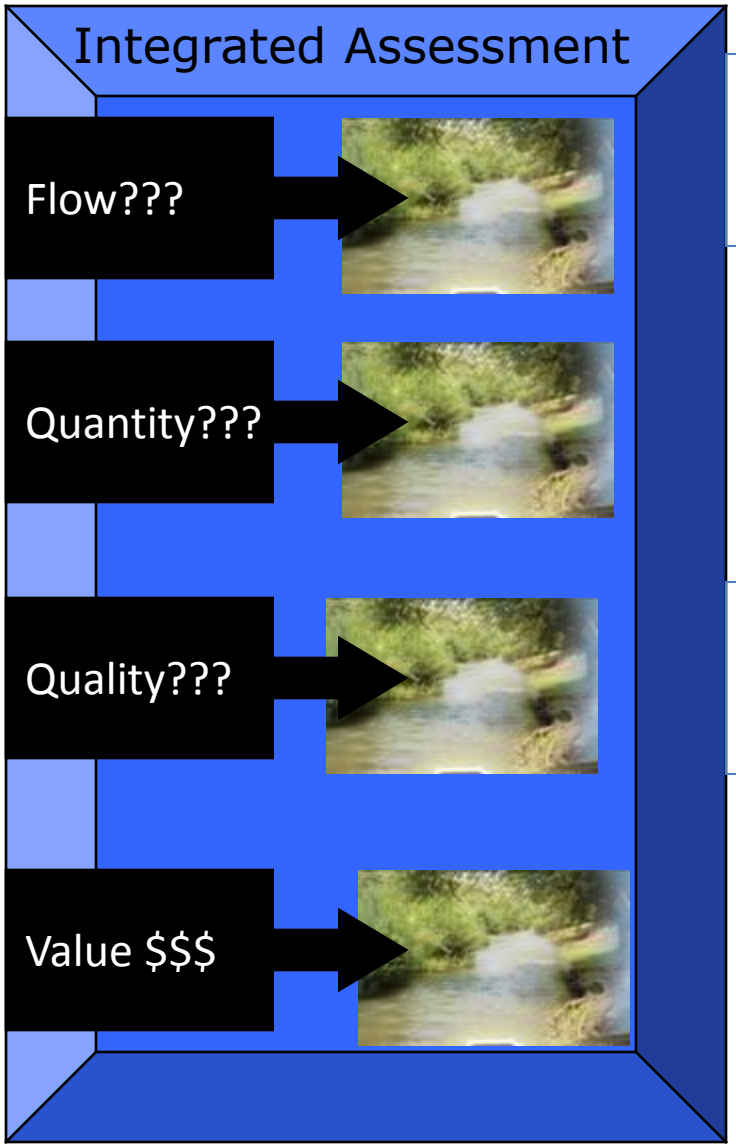
ASSET ACCOUNT

Outline

1. Water asset accounts in SEEAW
2. Assets versus Flows
3. *Spatial Information System (SIS) for Natural Resources*
4. Importance of Water Assets in the SEEAW
5. What is in Water Asset Accounts Chapter
6. The Water Cycle - Water Balance
7. Water Assets: Definitions and Classifications
8. Special Considerations
9. Types of Water Resources
10. Asset accounts vs physical supply & use tables
11. SEEAW Standard and Supplementary tables
    1. National
    2. Trans-national
    3. Matrix of flows within the environment
12. Example of Water Assets from Philippine
13. Relation to UNSD Water Questionnaires
14. Policy Relevance

Water asset accounts in SEEAW

Chapter 6 and relation to other Chapters



- **The Flow is in chapter 3 in SUT Tables**

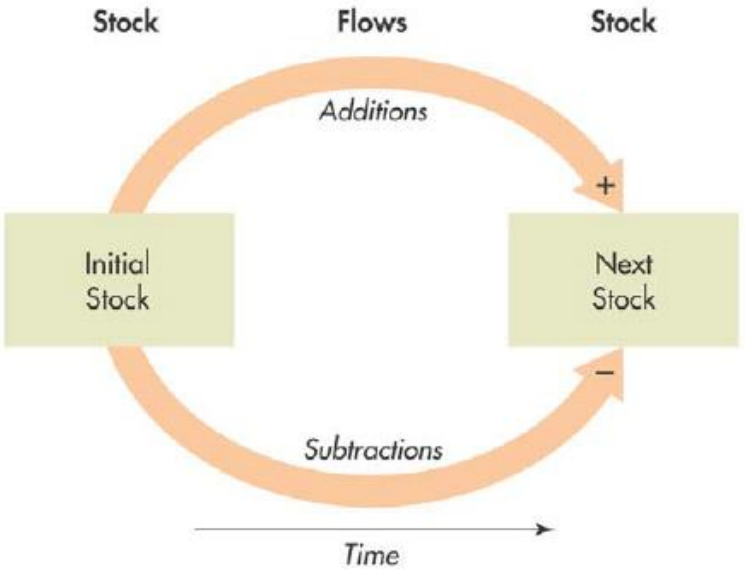
- Chapter 6 focuses on Assets: the quantitative assessment of the stocks and the changes in stocks which occur during the accounting period.

- Qualitative characteristics of the stocks are dealt with in the Quality accounts (chapter 7).

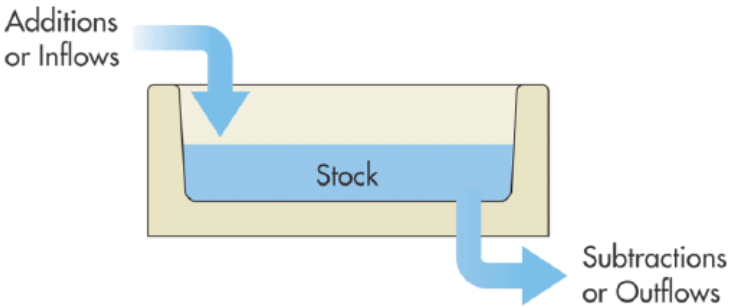
- **Monetary description of the assets of water resources no standard techniques to assess the economic and non-economic values of water (Chapter 8).**

Assets versus Flows

A "stock“ exists *at a point* of time, (may have been accumulated in the past)
It would be measured in units (such as dollars or tons).
For example, the amount of water in a bathtub.



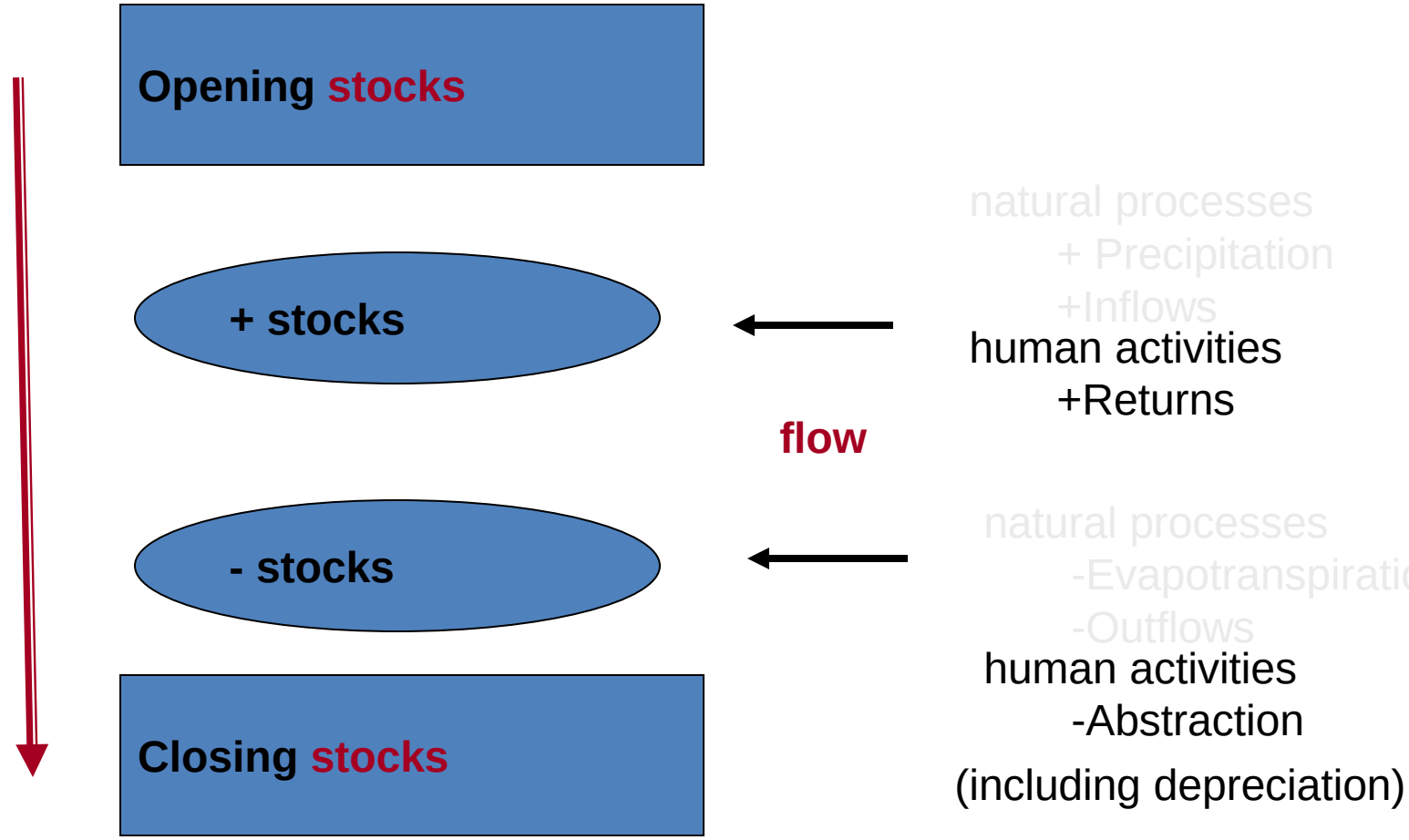
A"flow“ occurs *over time*
It would be measured *per unit of time* (dollars or tons per month, year, …).
For example, the water that goes into a bathtub from a faucet is a flow;



The Global Development And Environment Institute, Tufts University (GDAE),

Ref.:George W. Harrison (1987). "stocks and flows," *The New Palgrave: A Dictionary of Economics*, v. 4, pp. 506-09. Retrieved from "http://en.wikipedia.org/wiki/Stock_vs._flow"

Linking flows with stocks



How current levels of abstraction & discharges affect the stocks of water?

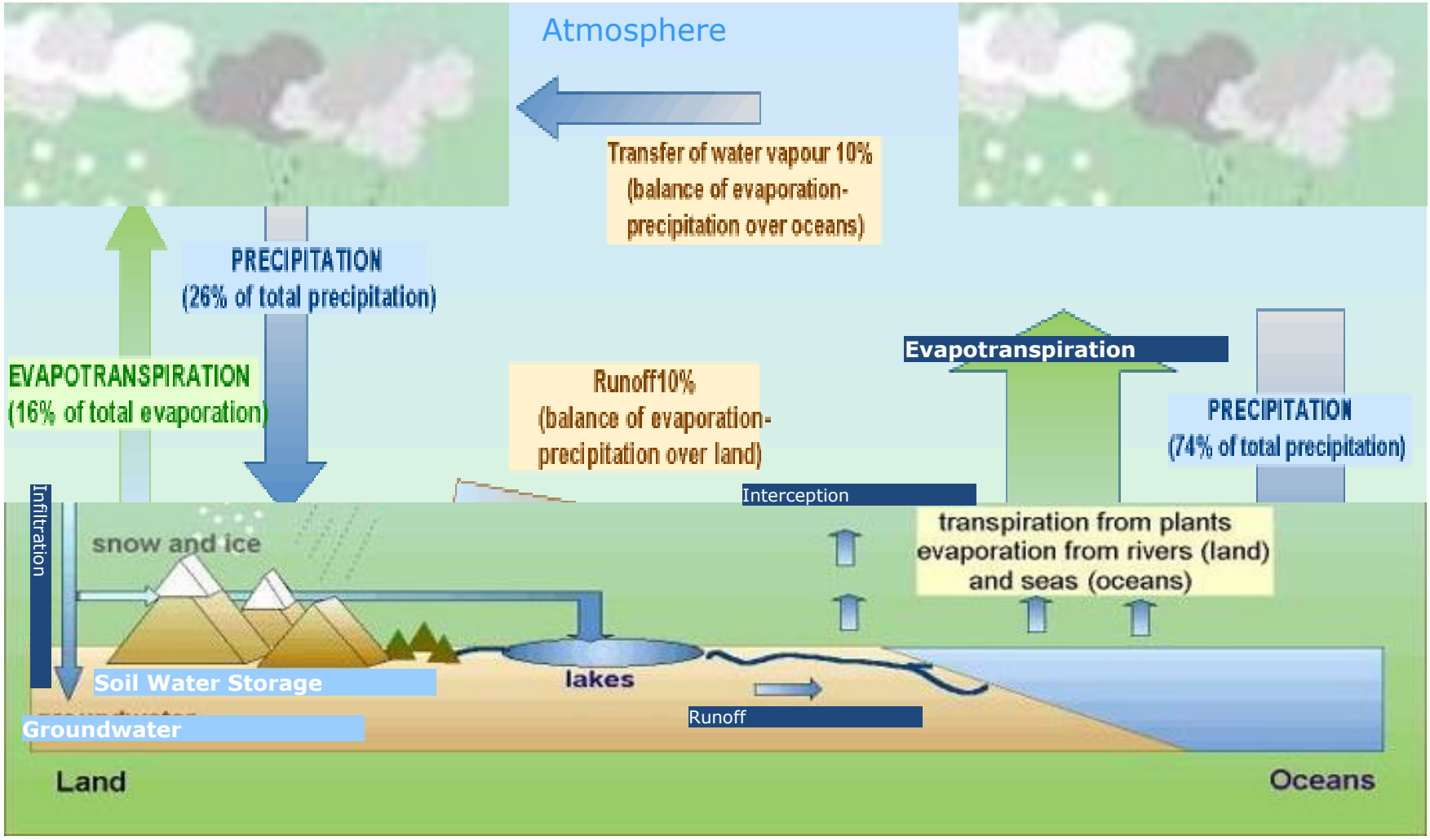
Importance of Water Assets in the SEEAW

- links the information on the abstraction and discharge of water with information on the stocks of water resources in the environment in order to assess how current levels of abstraction and discharges affect the stocks of water.
- useful in balancing the use of water and the available resource in its different compartments: aquifers, soil, rivers, canals, lakes, reservoirs,…

What is in Water Asset Accounts Chapter

- Water asset accounts describe water in the environment
- The hydrological cycle and how it is represented in the asset accounts
- The principles behind physical asset accounts; from opening stock levels to closing stock levels
- The classification of water resources
- Standard tables for compilation
- The compilation of asset accounts for transboundary waters.

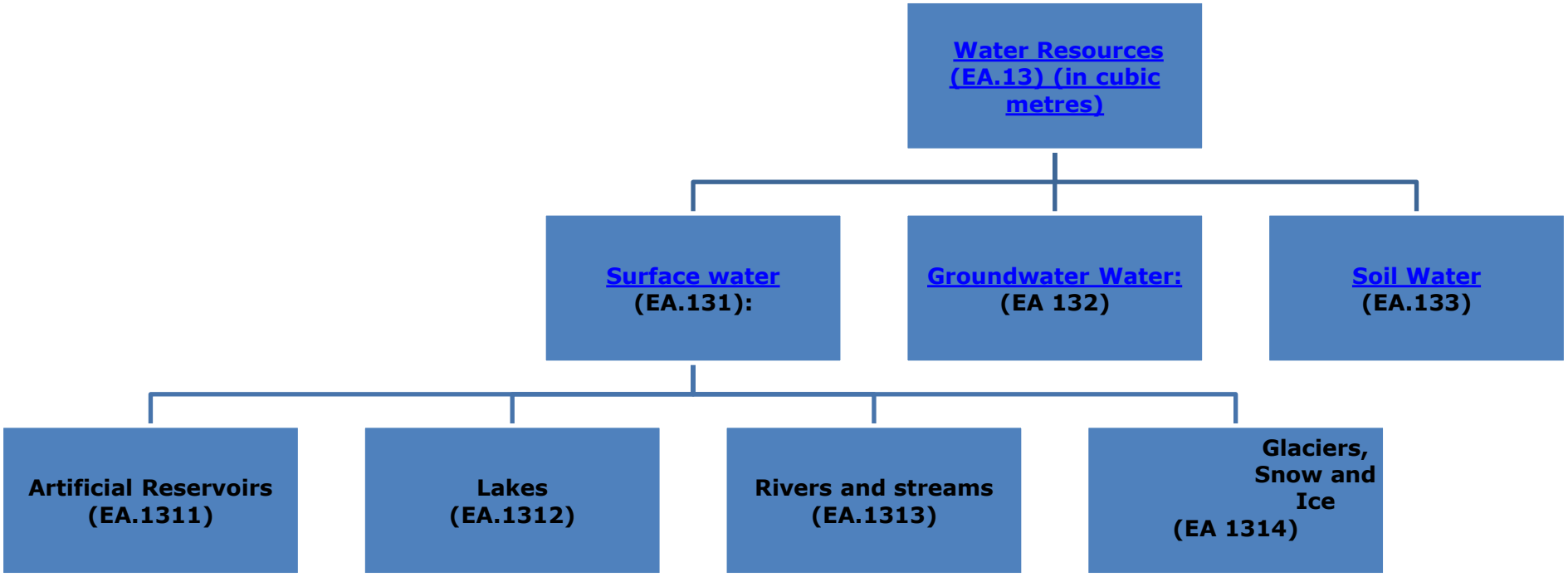
The Water cycle



With permission from The Chemistry Information Centre, CIC , 2007

Precipitation = runoff + evapotranspiration + infiltration + interception +/- change in storage (in soil or the bedrock)

Water Assets: Definition and Classification



Water Resource assets: Definition

Water Resources : Water found in fresh and brackish surface and groundwater bodies within the national territory that provide direct use benefits now or in the future (option benefits) through the provision of raw material and may be subject to quantitative depletion through human use.

Surface water (EA.131):	Groundwater Water: (EA 132)	Soil Water (EA.133)
Water which flows over, or is stored on the ground surface	It collects in porous layers of underground formations known as aquifers	Water suspended in the uppermost belt of soil, or in the zone of aeration near the ground surface, that can be discharged in to the atmosphere by evapotranspiration

Special Considerations

- Spatial Variability (at the river basin or catchment levels)
- Seasonal Variability
- The stock of a river:
  - the average volume held in the riverbed.
  - alternative that is proposed in SEEA, i.e. that of the mean annual run-off [SEEA, 2003, 8.112], equivalent to the “accumulated flow” concept proposed by Margat [1986; 1996].
- Groundwater assets could alternatively be measured as the sustainable yield rather than as the volume in storage

Special Considerations

- Boundaries between categories may not always be precise
- Data availability
- Country priorities

  E.g., Disaggregate the classifications: artificial lakes for household, agricultural, hydroelectric power generation & mixed use

Type of water resources: Salinity level

- **Fresh water**
  - naturally occurring water having a low concentration of salts. It is generally accepted as suitable for abstraction and treatment to produce potable water.

    - It is often the major source of water supply.

    - It is an important renewable resource.
- **Brackish water**

    - water containing salts at a concentration significantly lower than that of sea water. The concentration of total dissolved salts is usually in the range of 1,000-10,000 (mg/l).

    - It can be used with or without treatment for some industrial uses or for irrigation purposes for some specific crops or aquaculture.

The salinity level that distinguishes fresh and brackish water varies among countries.

http://unstats.un.org/unsd/ENVIRONMENTGL/

Accounting for transboundary water

- Quota indicated in the international agreement opening/closing stocks
- Without agreement equal share

  (e.g., if the river borders 2 countries, amount of inflows: 50/50)

Asset accounts vs physical supply & use tables

	Asset accounts	Physical supply & use tables
Sea	Water flowing into oceans and sea (outflows from rivers)	Water abstracted from & returned into the sea (e.g., cooling, desalination)
Evaporation & evapo-transpiration	Water vaporised and evapo-transpired from water resources	Which occurs within the economic sphere (e.g., part of water consumption)
Precipitation	Precipitation into water resources (flow from atmosphere to inland water resources)	Precipitation directly used by the economy (e.g., rain harvest)

SEEAW
Asset Accounts
Standard Tables and Supplementary Tables

Table 6.1 Asset Accounts

Opening Stocks and Increases in Stocks

Asset accounts

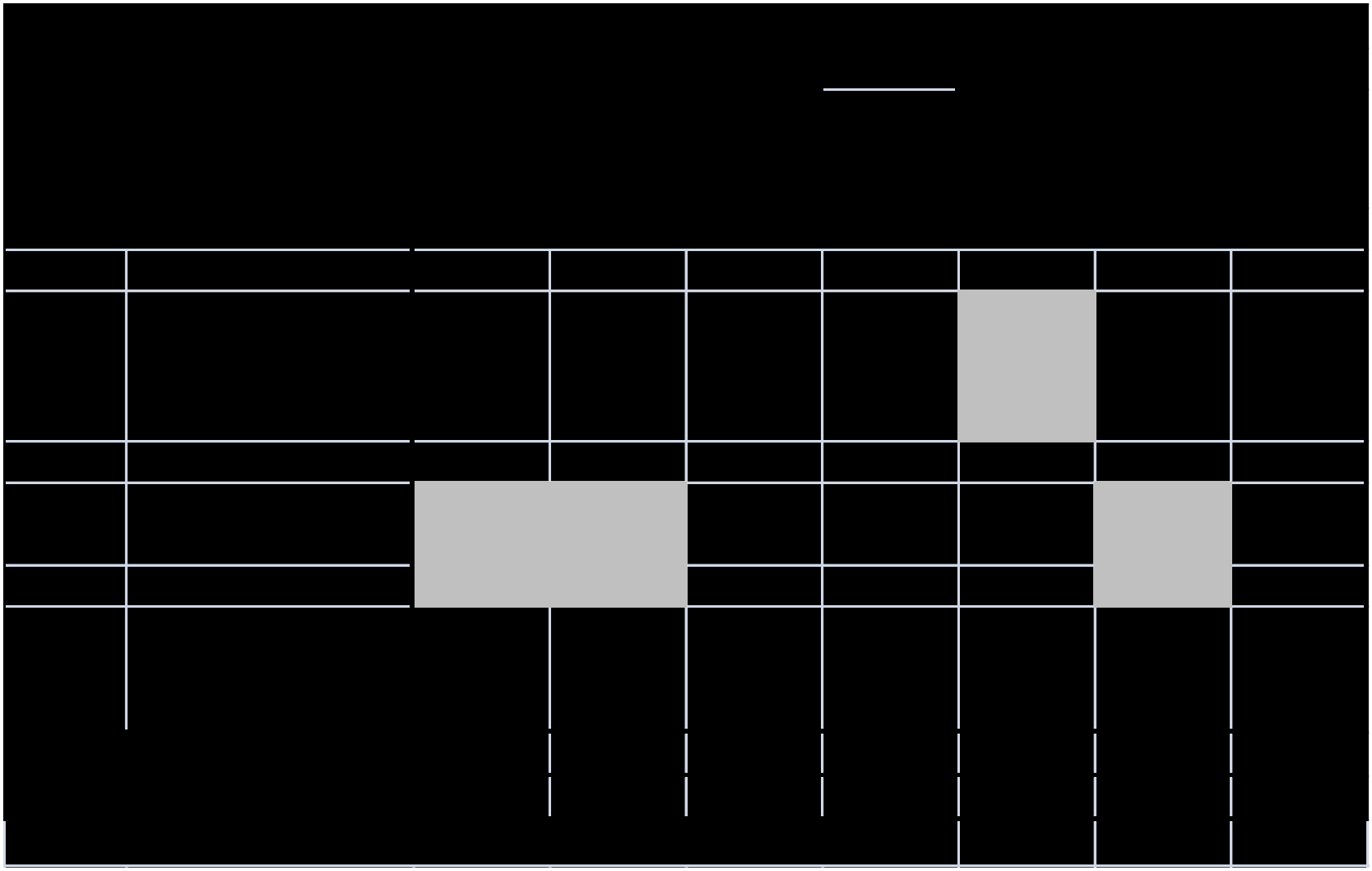
Physical units (Million Cubic Meters)

	EA.131 Surface water				EA.132 Groundwater	EA.133 Soil water	Total
	EA.1311 Artificial Reservoirs	EA.1312 Lakes	EA.1313 Rivers	EA.1314 Snow, Ice and Glaciers			
1. Opening Stocks							
Increases in stocks							
2. Returns from the economy							
3. Precipitation							
4. Inflows							
4.a. from upstream territories							
4.b. from other resources in the territory							

Source: SEEAW-Land

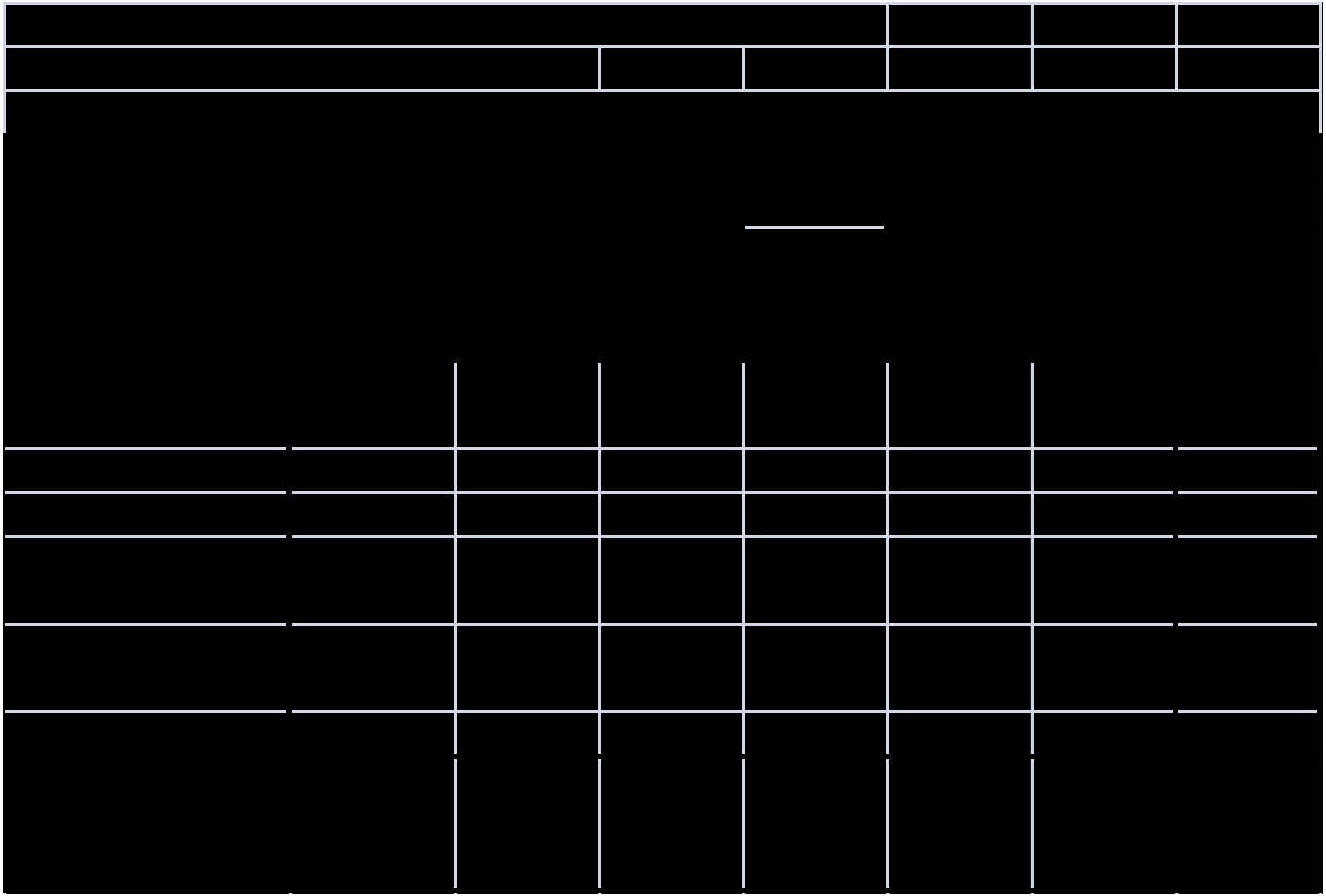
Table 6.1 Asset Accounts

Decreases in Stocks and Closing Stocks



Source: SEEAW-Land

Table 6.2 Matrix of Flows between Water Resources



Source: SEEAW-Land

Example of Water Assets from Philippine

APPENDIX TABLE 5. PHYSICAL ACCOUNTS OF GROUNDWATER, BY REGION, 1988-1994
IN MILLION CUBIC METERS

ACCOUNT	1988	1989	1990	1991	1992	1993	1994
NCR							
Opening Stock	6,185.14	5,871.76	5,499.42	5,154.17	4,721.80	4,283.50	3,838.74
Changes in Quantity (Withdrawal)	(519.54)	(549.71)	(580.73)	(610.04)	(623.05)	(641.08)	(670.69)
Other Accumulation (Recharge)	206.16	177.37	235.48	177.67	184.75	196.32	212.41
Closing Stock	5,871.76	5,499.42	5,154.17	4,721.80	4,283.50	3,838.74	3,380.46
Changes in Quality	103.08	88.69	117.74	88.84	92.38	98.16	106.21
REGION I							
Opening Stock	4,620.00	4,472.31	4,377.64	4,242.93	4,096.09	4,003.73	3,869.82
Changes in Quantity (Withdrawal)	(251.29)	(267.27)	(297.01)	(287.40)	(249.69)	(247.73)	(274.78)
Other Accumulation (Recharge)	103.60	172.60	162.30	140.56	157.33	113.82	103.97
Closing Stock	4,472.31	4,377.64	4,242.93	4,096.09	4,003.73	3,869.82	3,699.01
Changes in Quality	103.60	172.60	162.30	140.56	157.33	113.82	103.97
REGION II							
Opening Stock	11,850.00	11,938.25	12,035.31	12,215.36	12,340.87	12,430.74	12,482.76
Changes in Quantity (Withdrawal)	(91.40)	(92.95)	(95.15)	(97.14)	(98.65)	(100.48)	(102.52)
Other Accumulation (Recharge)	179.65	190.01	275.21	222.65	188.51	152.51	139.94
Closing Stock	11,938.25	12,035.31	12,215.36	12,340.87	12,430.74	12,482.76	12,520.19
Changes in Quality	179.65	190.01	275.21	222.65	188.51	152.51	139.94
REGION III							
Opening Stock	54,700.00	54,618.27	54,499.92	54,421.20	54,280.08	54,157.35	54,061.46
Changes in Quantity (Withdrawal)	(261.38)	(263.42)	(269.04)	(270.01)	(278.00)	(285.82)	(294.45)
Other Accumulation (Recharge)	179.65	145.07	190.32	128.89	155.27	189.93	125.84
Closing Stock	54,618.27	54,499.92	54,421.20	54,280.08	54,157.35	54,061.46	53,892.85
Changes in Quality	179.65	145.07	190.32	128.89	155.27	189.93	125.84
REGION IV							
Opening Stock	37,000.00	35,901.79	34,723.95	33,426.30	32,008.17	30,418.75	28,684.27
Changes in Quantity (Withdrawal)	(1,301.64)	(1,393.00)	(1,533.33)	(1,619.01)	(1,753.11)	(1,953.55)	(2,258.61)
Other Accumulation (Recharge)	203.43	215.16	235.68	200.88	163.69	219.07	170.94
Closing Stock	35,901.79	34,723.95	33,426.30	32,008.17	30,418.75	28,684.27	26,596.61
Changes in Quality	203.43	215.16	235.68	200.88	163.69	219.07	170.94

Example of Water Assets from Canada

An asset account fo inland fresh water (km^3)

Row number			EA.131 Surface Water			EA.132 Groundwater		Total	EA.nc	Total
			EA.1311 Reservoirs	EA.1312 Lakes	EA.1313 Rivers	EA.nc Shallow aquifers	EA.nc Deep aquifers		Glaciers	
1	Opening Stock		880	17398	3315	.	.	21593	35000	56593
2	Abstraction		41			1		42	.	.
3	Residuals	Return from irrigation	.	.	.	.	.	.	.	.
		Wastewater	31			1702		1733		
		Lost in transport	...	...	...	2	...	2	.	.
		Others	.	.	.	.	.	.	.	.
4	net precipitation (1)		3200			.	.	3200	.	.
5	Inflows		52					52	.	.
6	Net natural transfers		.	.	.	.	.	.	.	.
7	Evaporation from water bodies		403			...	...	403		
8	Outflows	To other countries	192			.	.	192	.	
		To the sea	3123			.	.	3123	.	
9	Other Volume Changes	Due to natural disaster	.	.	.	.	.	.	.	.
		Discovery	.	.	.	.	.	.	.	.
		Others	.	.	.	.	.	.	.	.
10	Closing Stock		.	.	.	.	.	.		

Notes:

The stock in reservoirs refers to operational capacity of large dams; data excludes dams smaller then 15 meters in height.

The stock of lakes refers to Great Lakes, Canadian portion only.

Stock in rivers refers to annual accumulated flows, based on the long term average.

(1) This row should be replaced by four rows: precipitation, evapotranspiration, evaporation, and their balance, net precipitation

. Not available

... Not applicable

Policy Relevance

Sustainability Assessment: The volume of water use must be compared to the availability of water in the environment based on the assessment of stocks.

However, few countries compile comprehensive water asset accounts as their water SUT.

Integrated water resource management (IWRM) : Analysis of water allocations, future water demands.