

Water statistics and water accounts

Information needs and important concepts

The presentation includes diagrams and examples prepared by UN-ESCAP and NSOs of Australia, Bahrain, Oman and Sweden

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What and why are we measuring

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What?

- Availability (stocks) and changes (flows) of water resources
- Supply and use of water within the economy

Why?

- Policies on water security, water resources management
- Links to economic accounts
- Basis for SEEA-WATER, SEEA-EEA
- Indicators, e.g.
 - Total water use (by source, purpose, etc.)
 - Water intensity/productivity
 - Variability in water resources, trends (droughts, floods)

Related SDG Indicators

Goal 6: Ensure availability and sustainable management of water and sanitation for all. For which ones is water statistics and accounts needed?



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- ✓ Indicator 6.1.1: Proportion of population using safely managed drinking water services
- ✓ Indicator 6.2.1: Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water
- ✓ Indicator 6.3.1: Proportion of wastewater safely treated
- ✓ Indicator 6.4.1: Change in water-use efficiency over time
- ✓ Indicator 6.4.2: Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
- Indicator 6.5.1: Degree of integrated water resources management implementation (0-100)
- Indicator 6.5.2: Proportion of transboundary basin area with an operational arrangement for water cooperation
- Indicator 6.6.1: Change in the extent of water-related ecosystems over time
- Indicator 6.a.1: Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
- Indicator 6.b.1: Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

What is important for producers of water statistics and water accounts?

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1. Knowing user needs
2. Conceptual understanding of water stocks and flows
3. Familiar with terms, definitions and classifications
4. Availability of basic water statistics and monetary data items
5. Understanding of main statistical and accounting principles
6. Understanding of structure of the water statistics and water accounting tables.

Terms, definitions and classifications

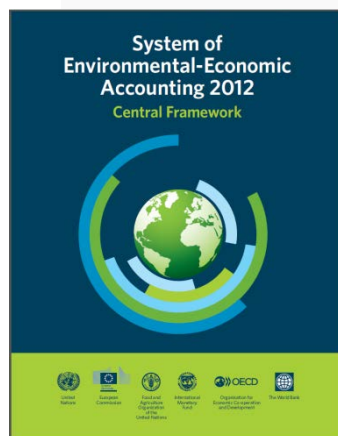
<https://seea.un.org> and [Data Collection Manual for the OECD/Eurostat JQ on Inland Waters](#)

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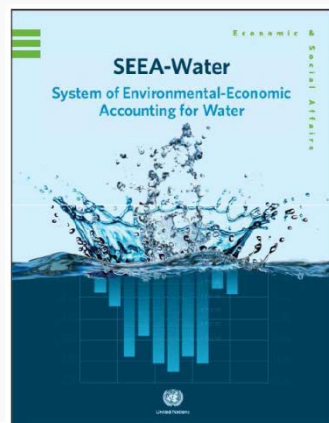


- **Classifications:**
 - Economic Activities: ISIC rev. 4.0
 - Products: CPC ver. 2
 - Environmental Assets
- **Terms, definitions, methodological guidance**

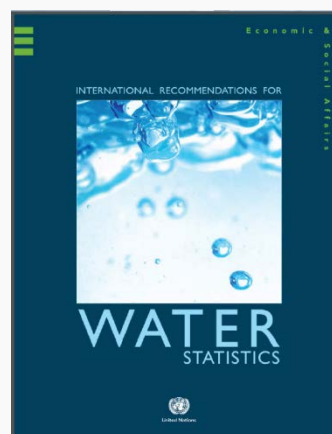
SEEA CF (2014)



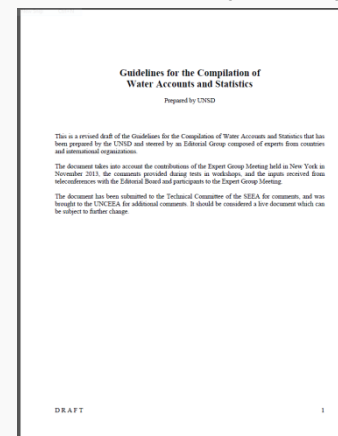
SEEA-Water (2007)



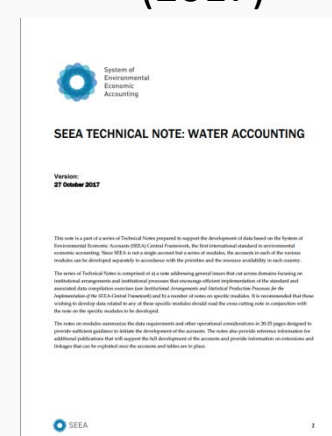
IRWS (2012)



Methodological
Guidelines (2014)



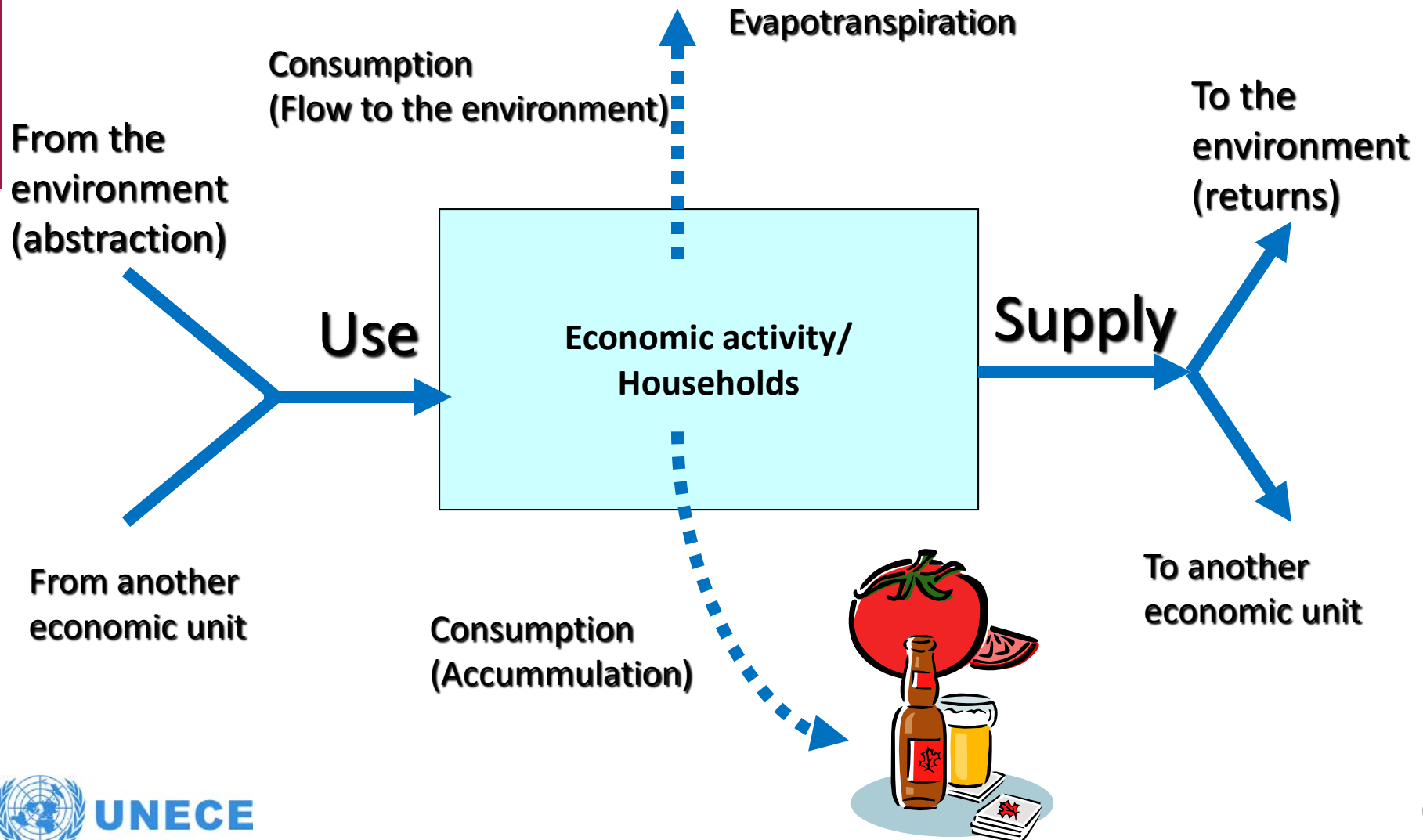
Technical Note
(2017)



Understanding of physical flows

Important concepts: be aware that the same terms may be used differently by others!

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Understanding of physical flows

Important conventions, terms and definitions

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- **Water abstracted by households for own consumption:** In water accounting it is recorded as part of ISIC 36 (water supply industry) – following the general treatment of households own-account activity in the SNA.
- **Urban runoff:** portion of precipitation on urban areas which does not naturally evaporate or percolate into the ground:
 - If collected by a sewer or a similar facility it is recorded as the abstraction of water from the environment by ISIC 37 (sewerage industry)
 - Otherwise not recorded in the PSUT
- **Losses during distribution:** evaporation, theft, leakages, water metering problems.
- **Evaporation, transpiration and water incorporated into products:**
 - Ideally recorded separately: evaporation and transpiration as return to the environment, incorporation into products as accumulation.
 - In practice often not possible, then recorded as a combined flow.
 - The sum is equal to “final water use”, also referred to as “water consumption” within water statistics.
- **Reused water:** wastewater supplied to another economic unit for use
- **Recycled water:** Recycling of water within economic units

Water Statistics and Indicators

UNECE Guidelines for the Application of Environmental Indicators

(<https://www.unece.org/env/indicators.html>)



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Aligned with
OECD/Eurostat JQ
on Inland Waters

Provides an
important basis
for:

- Water-related indicators
- Water accounting

Indicator	Description	Production	Glossary of terms
C. Water			
C1. Renewable freshwater resources (updated October 2014)	PDF	XLS	PDF
C2. Freshwater abstraction (updated October 2014)	PDF	XLS	PDF
C3. Total water use (updated October 2014)	PDF	XLS	PDF
C4. Household water use per capita (updated October 2014)	PDF	XLS	PDF
C5. Water supply industry and population connected to water supply industry (updated October 2014)	PDF	XLS	PDF
C6. Connection of population to public water supply	Integrated into C5		
C7. Water losses (updated October 2014)	PDF	XLS	PDF
C8. Reuse of freshwater (updated October 2014)	PDF	XLS	PDF
C9. Drinking water quality (updated October 2014)	PDF	XLS	PDF
C10. BOD and concentration of ammonium in rivers (updated October 2014)	PDF	XLS	PDF
C11. Nutrients in freshwater (updated October 2014)	PDF	XLS	PDF
C12. Nutrients in coastal seawaters (updated October 2014)	PDF	XLS	PDF
C13. Concentrations of pollutants in coastal seawater and sediments (except nutrients) (updated October 2014)	PDF	XLS	PDF
C14. Population connected to wastewater treatment (updated October 2014)	PDF	XLS	PDF
C15. Wastewater treatment facilities (updated October 2014)	PDF	XLS	PDF
C16. Polluted (non-treated) wastewaters (updated October 2014)	PDF	XLS	PDF



Water supply industry	Households	Agriculture, forestry, fishing	Manufacturing	Electricity	Other
Freshwater used					

Total freshwater available

Total freshwater use

Template C3

Exports of water

Losses during transport

Desalinated water

Reused water

Imports of water

Water supply industry	Households	Agriculture, forestry, fishing	Manufacturing	Electricity	Other
Freshwater abstracted					

Freshwater abstracted

Template C2

Fresh surface water abstracted

Fresh groundwater abstracted

Fresh surface water

Fresh groundwater

Template C-2: Freshwater abstraction

Time series data on the indicators for 1990-2013, Table C-2 Freshwater abstraction: (country name)

[illegible]

Template C-3: Total water use

Time series data on the indicators for 1990-2013, Table C-3 Total water use: (country name)

[illegible]



Time series data on the indicators for 1990-2013, Table C-1: Renewable freshwater resources: (CO

[illegible]

Why water accounting (when we have already water statistics)?

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It gives a completer picture of water flows and stocks, because:

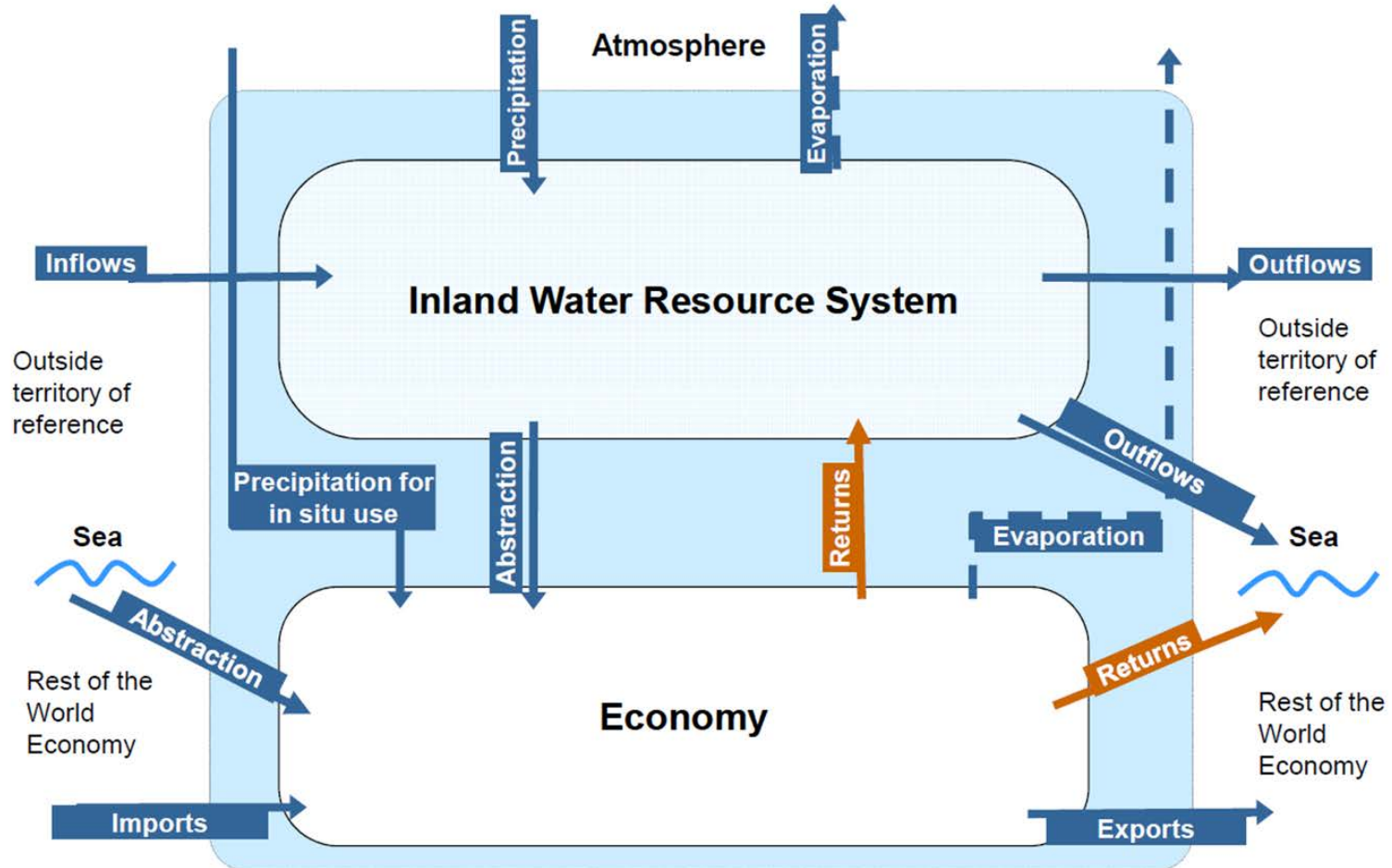
- It also includes soil water (next to surface and groundwater)
- Looks in more detail at flows of water within the economy
- Calculation of water stocks (compared to renewable water resources) considers also abstraction and returns of water by the economy
- Follows accounting principles, thus can be integrated with other economic data (economic statistics, SNA)
 - Includes monetary information, such as
 - monetary flows for water and wastewater
 - Taxes
 - Subsidies
 - Gross fixed capital formation
 - Etc.

→ Can serve more complex policy questions, planning and research

Water Accounting: Stock-Flow Model

Simplified model

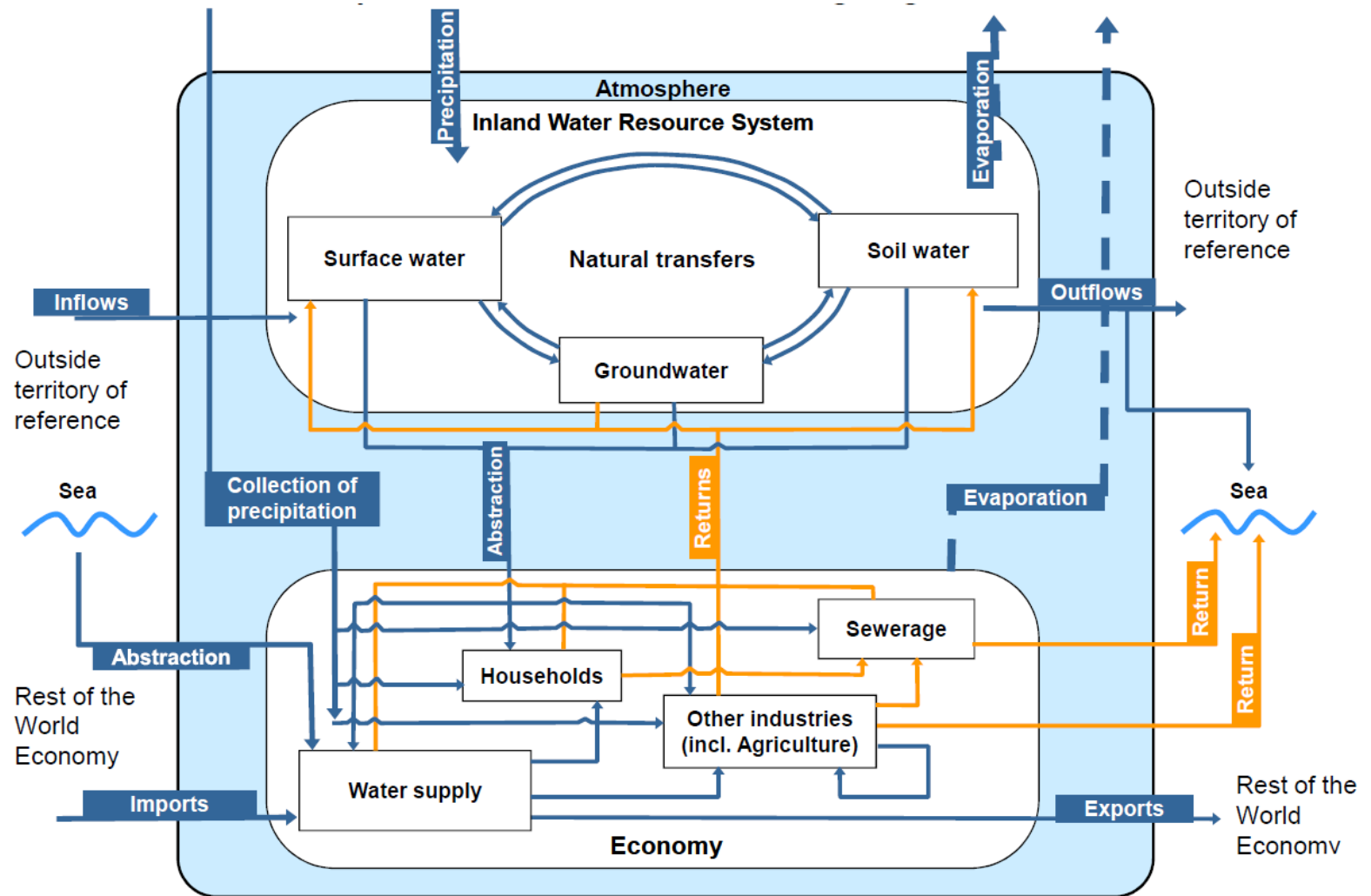
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Water Accounting: Stock-Flow Model

More detailed model

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Water Asset Accounts

What do we measure for each water asset?



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What is measured?

- Stock of water at the beginning and end of an accounting period
- Flows of water:
 - Abstracted by the economy
 - Returned by the economy
 - Added through precipitation
 - Evaporated and evapo-transpired
 - Changes through flows between different water resources

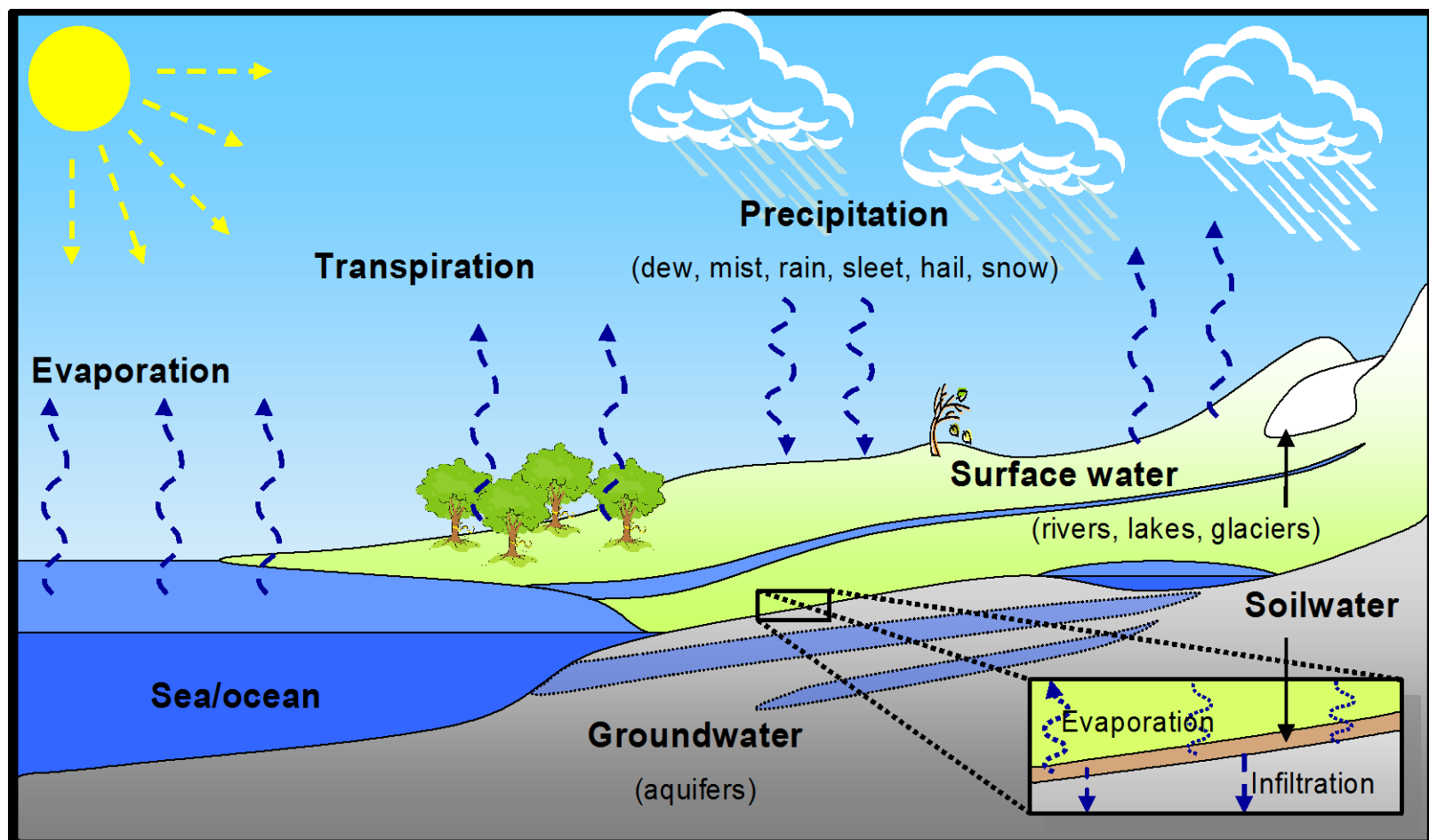
Water assets:

1. Surface water
 - 1.1 Artificial reservoirs
 - 1.2 Lakes
 - 1.3 Rivers and streams
 - 1.4 Glaciers, snow and ice
2. Groundwater
3. Soilwater

Understanding Water Asset Accounts

The Hydrological Cycle

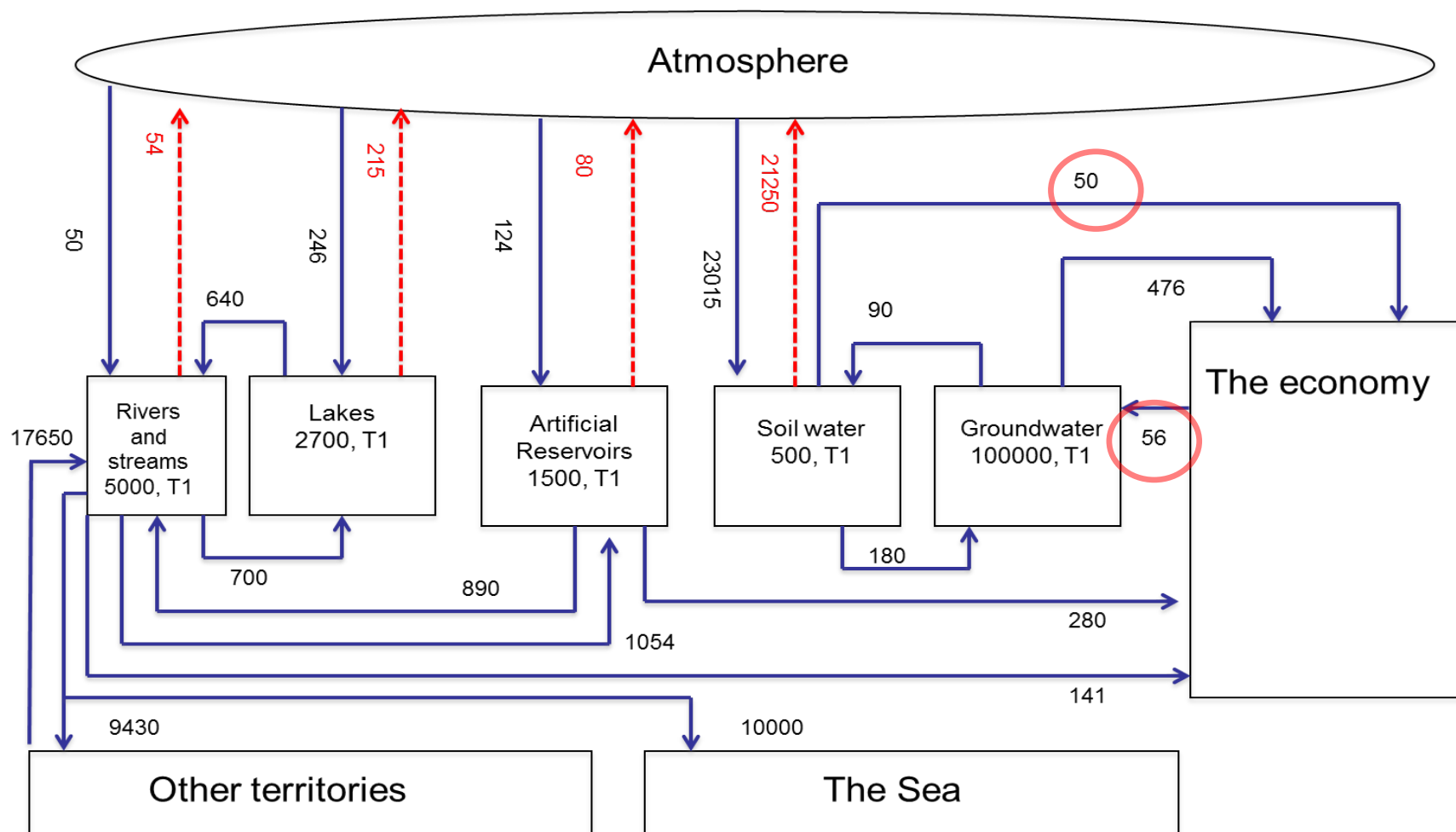
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Understanding Water Asset Accounts

Water asset account diagram

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Understanding Water Asset Accounts

Water asset account (from diagram)

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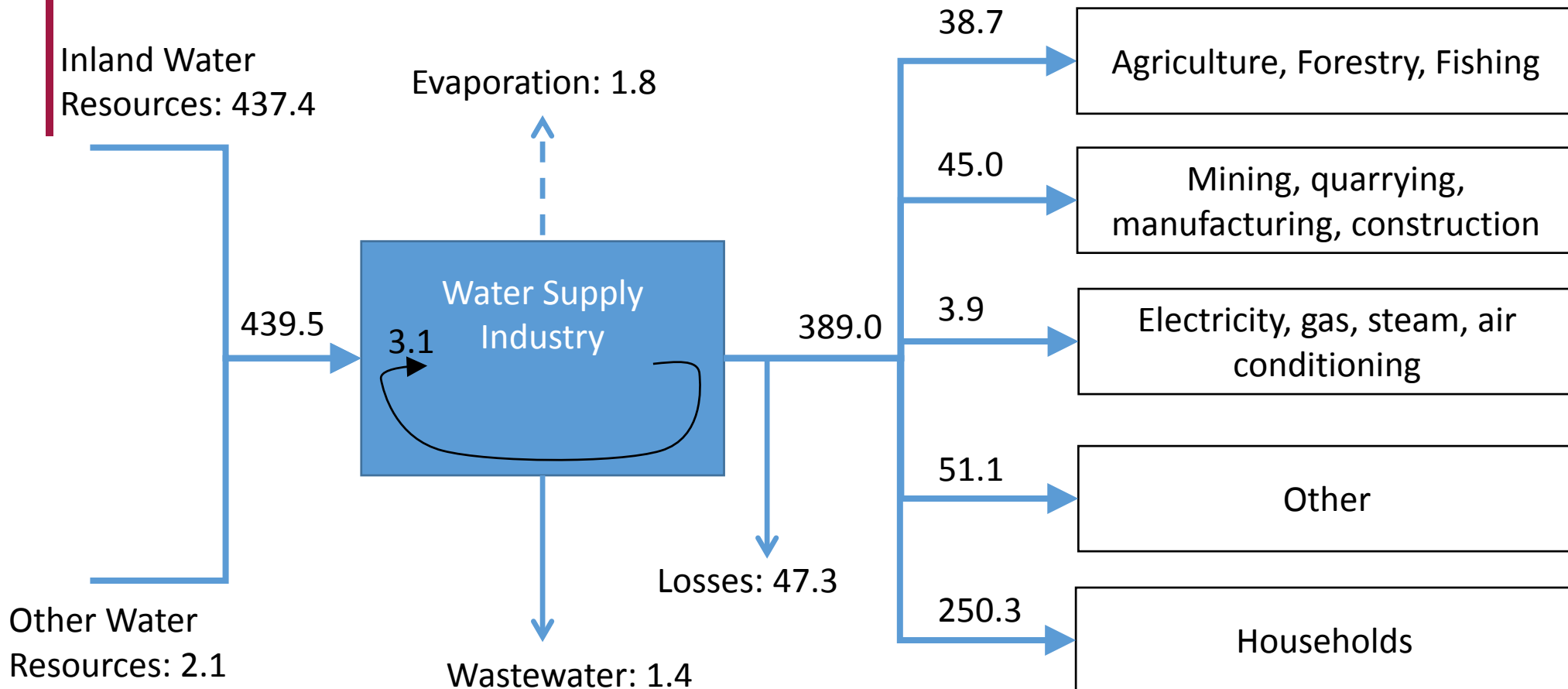


	Type of water resources						Total
	Surface water				Goundwater	Soil water	
	Artificial reservoirs	Lakes	Rivers and streams	Glaciers, snow and ice			
(A) Opening stock	1,500	2,700	5,000	-	100,000	500	109,700
Additions to stock							
(B) Returns (from Economy)	-	-	-	-	56	-	56
(C) Precipitation	124	246	50	-		23,015	23,435
(D) Inflows from other territories	-	-	17,650	-	-		17,650
(E) Inflows from other inland water	1,054	700	640	-	180	90	2,664
(F) Discoveries of water in aquifers					-		-
(G) Total additions to stock	1,178	946	18,340	-	236	23,105	43,805
Reductions in stock							
(H) Abstraction (to Economy)	280		141	-	476	50	947
(I) Evaporation and evapotranspiration	80	215	54	-		21,250	21,599
(J) Outflows to other territories			9,430	-	-		9,430
(K) Outflows to the sea			10,000	-	-		10,000
(L) Outflows to other inland water	890	640	1,754	-	90	180	3,554
(M) Total reductions in stock	1,250	855	21,379	-	566	21,480	45,530
Closing stock	1,428		1,961		99,670	2,125	107,975

Understanding of physical flow accounts

Water flow diagram

STATISTICS



Understanding of physical flow accounts

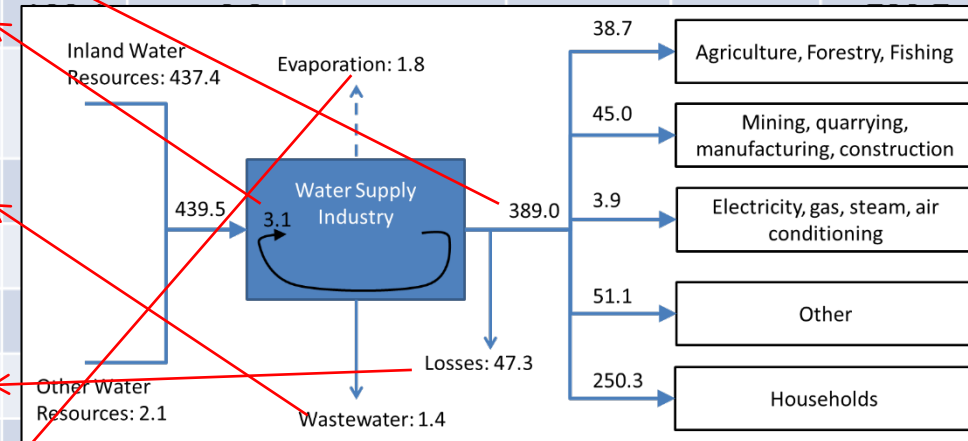
Physical supply table

	Abstraction of water; production of water; generation of return flows							RoW		
	01-03	05-33, 41-43	35	36	37	38, 39, 45-99	Households	Imports	Enviro nment	Total supply
(I) Sources of abstracted water										
Inland water resources									966.9	966.9
Other water resources									202.1	202.1
(II) Abstracted water										
For distribution				389.0						389.0
For own-use	108.4	114.6	404.2	3.1	100.1	2.3				732.7
(III) Wastewater and reused water										
Wastewater	17.9	117.6	5.6	1.4		49.1	235.5			427.1
Reused water produced		10			42.7					52.7
(IV) Return flows of water										
To inland water resources	65	23.5	300	47.3	227.5	0.7	4.6			668.6
To other sources		5.9	100		256.3		0.2			362.4
(V) Evaporation of abstracted water, transpiration and water incorporated into products	76.2	43.2	2.5	1.8	0.7	3.6	10			138.0
Total supply	267.5	314.8	812.3	442.6	627.3	55.7	250.3		1169.0	3939.5

Understanding of physical flow accounts

Physical supply table

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Understanding of physical flow accounts

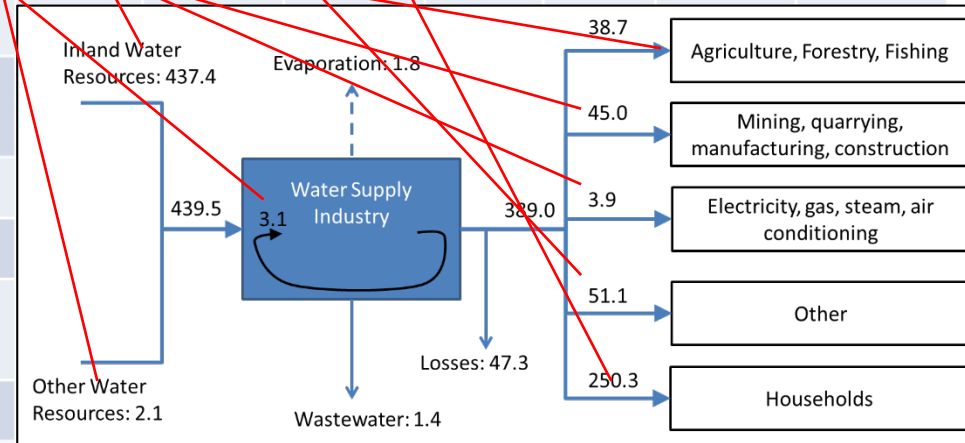
Physical use table

	Abstraction; intermediate consumption; return flows						F. cons.		RoW		
	01-03	05-33, 41-43	35	36	37	38, 39, 45-99	House holds	Accu m.	Expo rts	Enviro nment	Total use
(I) Sources of abstracted water											
Inland water resources	108.4	114.5	304.2	437.4	0.1	2.3					966.9
Other water resources			100.0	2.1	100.0						202.1
(II) Abstracted water											
Distributed water	38.7	45.0	3.9			51.1	250.3				389.0
Own-use	108.4	114.6	404.2	3.1	100.1	2.3					732.7
(III) Wastewater and reused water											
Wastewater received from other units					427.1						427.1
Reused water	12.0	40.7									52.7
(IV) Return flows of water											
To inland water resources										668.6	668.6
To other sources										362.4	362.4
(V) Evaporation of abstracted water, transpiration and water incorporated into products								10.2		127.8	138.0
Total use	267.5	314.8	812.3	442.6	627.3	55.7	250.3			1158.8	3939.5

Understanding of physical flow accounts

Physical use table

	Abstraction; intermediate consumption; return flows						F. cons.		RoW		
	01-03	05-33, 41-43	35	36	37	38, 39, 45-99	House holds	Accu m.	Expo rts	Enviro nment	Total use
(I) Sources of abstracted water											
Inland water resources	108.4	114.5	304.2	437.4	0.1	2.3					966.9
Other water resources			100.0	2.1	100.0						202.1
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Total use	267.5	314.8	812.3	442.6	627.3	55.7	250.3			1158.8	3939.5



Physical Asset Accounts and PSUT

They are linked with each other

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	Type of Water Resources						TOTAL
	Surface Water				Groundwater	Soil Water	
	Artificial Reservoirs	Lakes	Rivers and Streams	Glaciers, ice & snow			
1. Opening stock of water resources	1 500	2 700	5 000	0	100 000	500	109 700
2. Additions to stock:							
Returns	300	0	53	0	315	0	668
<i>of which: for hydro power and cooling</i>	100	0	0	0	0	0	100
Precipitation	124	246	50	0		23 015	23 435
Inflows from other territories	0	0	17 650	0	0		17 650
Inflows from other inland water resources	1 054	339	2 487	0	437	0	4 317
Discoveries of water in aquifers	0	0	0	0		0	0
TOTAL ADDITIONS TO STOCK	1 478	585	20 240	0	752	23 015	46 070
3. Reductions in Stock:							
Abstraction	280	20	141	0	476	50	967
<i>of which: for hydro power and cooling</i>	100	0	0	0	0	0	100
Evaporation & actual evapotranspiration	80	215	54	0		21 125	21 474
Outflows to other territories			9 430	0	0		9 430
Outflows to the sea			10 000	0	0		10 000
Outflows to other inland water resources	1 000	100	1 343	0	87	1 787	4 317
TOTAL REDUCTIONS IN STOCK	1 360	335	20 968	0	563	22 962	46 188
4. Closing stock of water resources	1 618	2 950	4 272	0	100 189	553	109 582

Example for a combined presentation for water

Combining physical and monetary data

Industries (by ISIC)										Rest of the World	Actual Final Consumption		TOTAL											
(ISIC A)	(ISIC B)	(ISIC C)	(ISIC D)	(ISIC 36)	(ISIC 37)	Agriculture, Forestry & Fishery	Mining and Quarrying	Manufacturing	Electricity, gas, steam & air conditioning supply		Water collection, treatment & supply	Sewerage		Other Industries	Total Industry	Households	Government							
MONETARY FLOWS	1. Intermediate Consumption and Final Use (currency):																							
	Natural Water (CPC 1800)	406	193	450	88	1 004	100	1 229	3 470	4	3 074	60	6 608											
	Sewerage Services (CPC 941)	3	69	160	1	13	1	1 406	1 653	3	3 316	66	5 038											
	Other Products	145 597	38 454	89 727	180 683	2 360	1 718	5842 990	6301 529	0	605 817	50 096	6957 442											
	2. Gross Value Added (currency)													24 731	42 327	98 763	14 997	3 193	3 217	632 663	819 891			819 891
3. Employment													371	663	1 548	61	41	43	8 204	10 931	0	0	0	10 931
PHYSICAL FLOWS	4. Supply of water (million m3):																							
	Distribution of abstracted water	0	0	0	0	378	0	0	378	0			378											
	Wastewater to treatment	18	35	82	6	1	0	49	192	0	236	0	427											
	Total return flows of water	65	9	21	400	47	484	1	1 026		5	0	1 031											
	5. Use of Water (million m3):																							
	Total abstraction of water	108	34	80	404	440	100	2	1 169				1 169											
	of which: Own use of abstracted water	108	34	80	404	3	100	2	733		11		744											
	Use of distributed water*	51	26	60	4	0	0	51	191	0	240		431											
	TOTAL USE OF WATER*	159	60	140	408	3	100	53	924		251		1 175											
	6. Water Consumption (million m3)													76	13	30	3	2	1	4	128		10	
7. Total Actual Renewable Water Resources (TARWR) (million m3)																		43367						
FIXED ASSETS FOR WATER	8. Gross fixed capital formation (currency):																							
	For water supply	582	3	13	819	2 872	0	0	4 289				4 289											
	For water sanitation	0	0	0	0	0	2 874	0	2 874				2 874											
	9. Closing stocks of fixed assets for water supply (currency)													6 112	13	71	9 871	25 347	0	17	41 431			41 431
	10. Closing stocks of fixed assets for water sanitation (currency)													0	0	0	0	0	37 457	0	37 457		10	

*Includes re-used water (distributed re-use) and excludes wastewater received (for treatment)

Water Aggregates

Three water aggregates suited to particular analytical and policy questions



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- **Gross water input:** Total water abstracted from the environment or imported
 - Provide indicators on the pressures placed through the supply of water to the economy
 - It may be useful to disaggregate by source and/or industry
 - Depending on the purpose, abstraction for hydropower and cooling may be shown separately
- **Net domestic water use:** Use of water by resident units. This excludes all flows of water between economic units and deducts exports of water. All return flows + evaporation + transpiration + water incorporated into products
- **Final water use:** Equal to evaporation + transpiration + water incorporated into products
 - Often referred to also as “water consumption”
 - Key indicator for environmental pressure as it reflects the quantity of water no longer available for use.

Some water accounting examples from around the world

Australia



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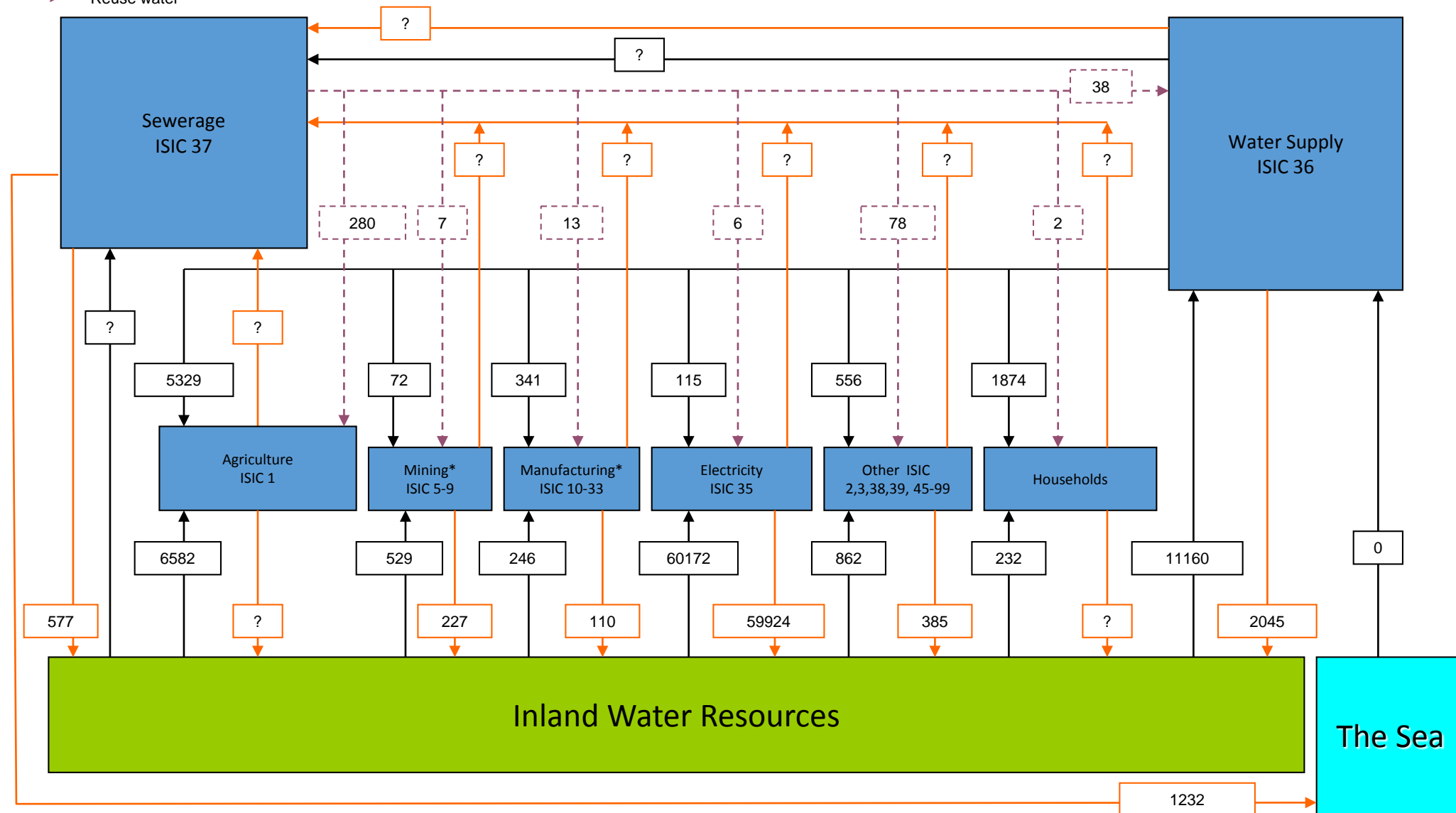




Example Australia – physical water supply and use, 2004-05 (GL)

Key

- Wastewater
- Water
- Reuse water



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

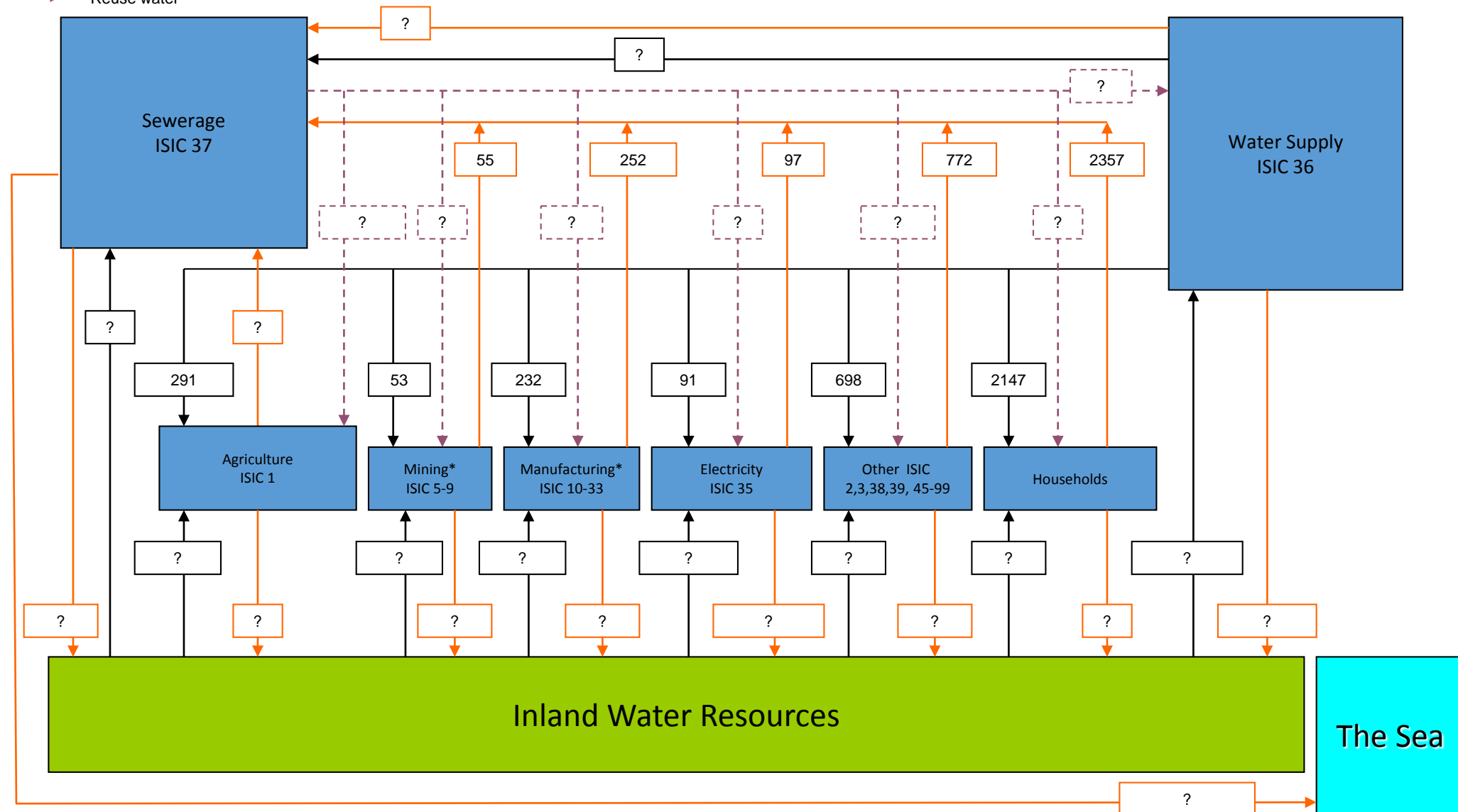


Example Australia – monetary water supply and use, 2004-05 (million AUD\$)



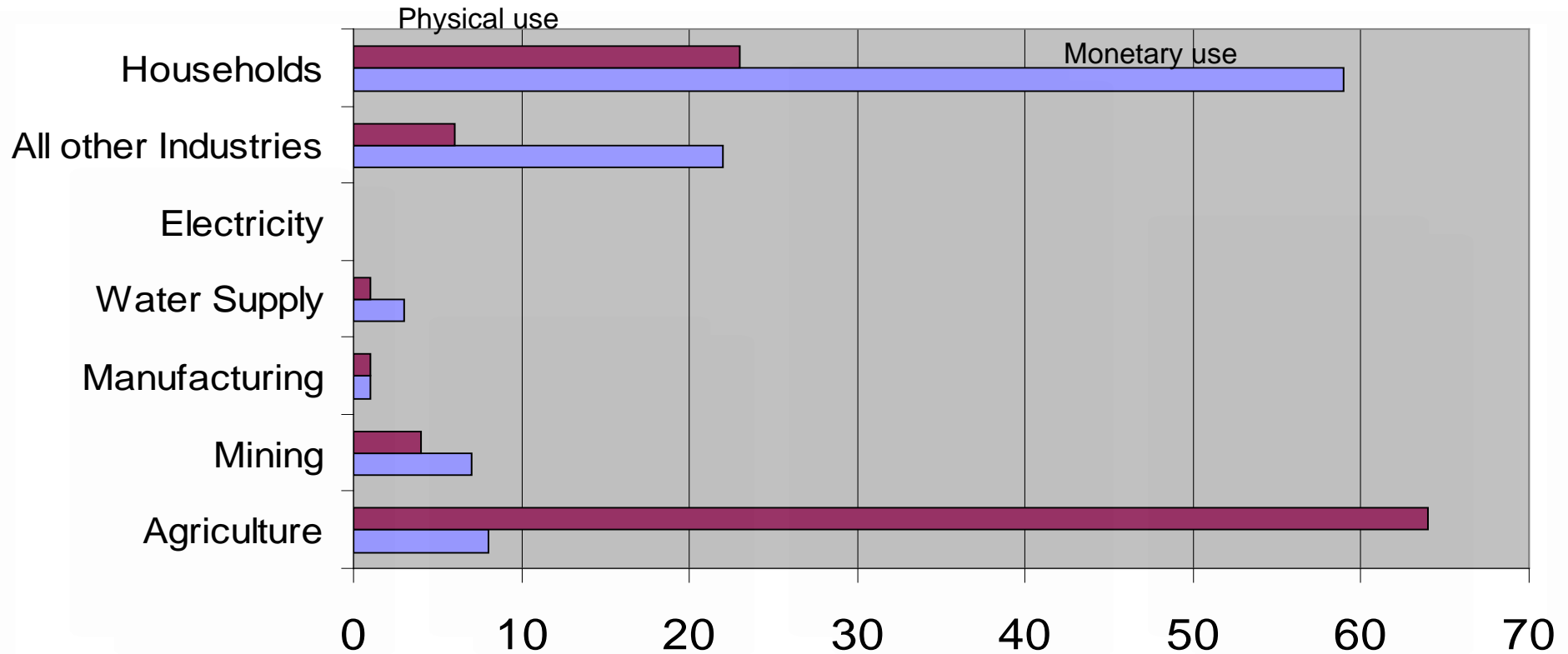
Key

- Wastewater
- Water
- Reuse water



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

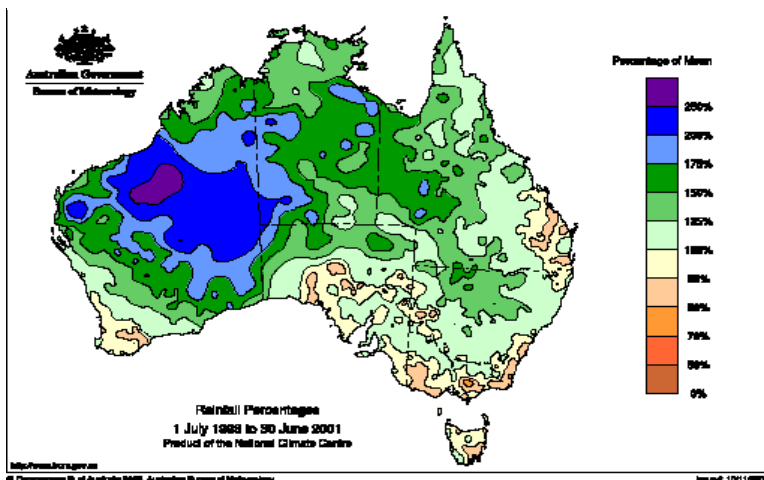
Example Australia: Monetary versus physical use of distributed water (% of total use)



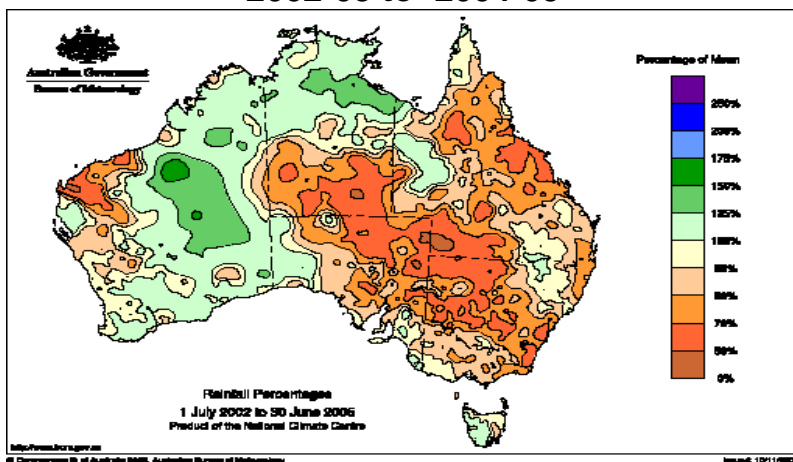


Australia: Analysing changes over time

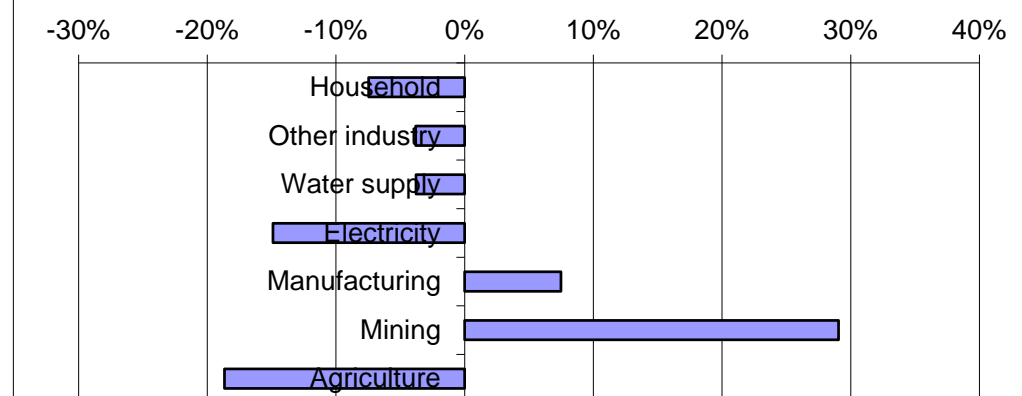
Percentage of mean annual rainfall
1998-99 to -2000-01



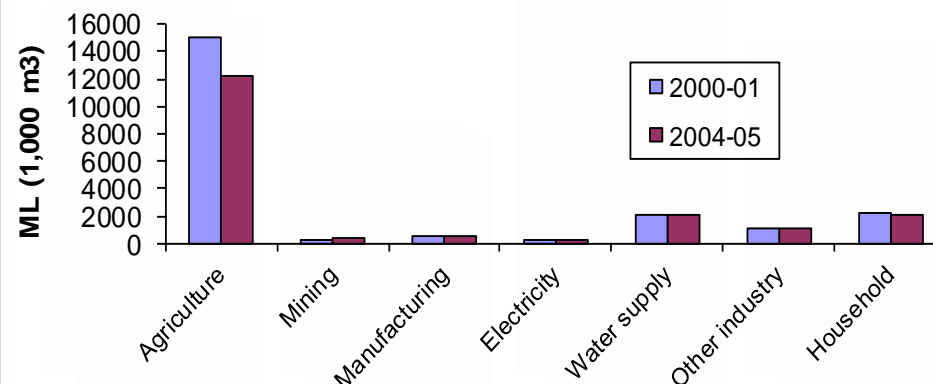
Percentage of mean annual rainfall
2002-03 to -2004-05



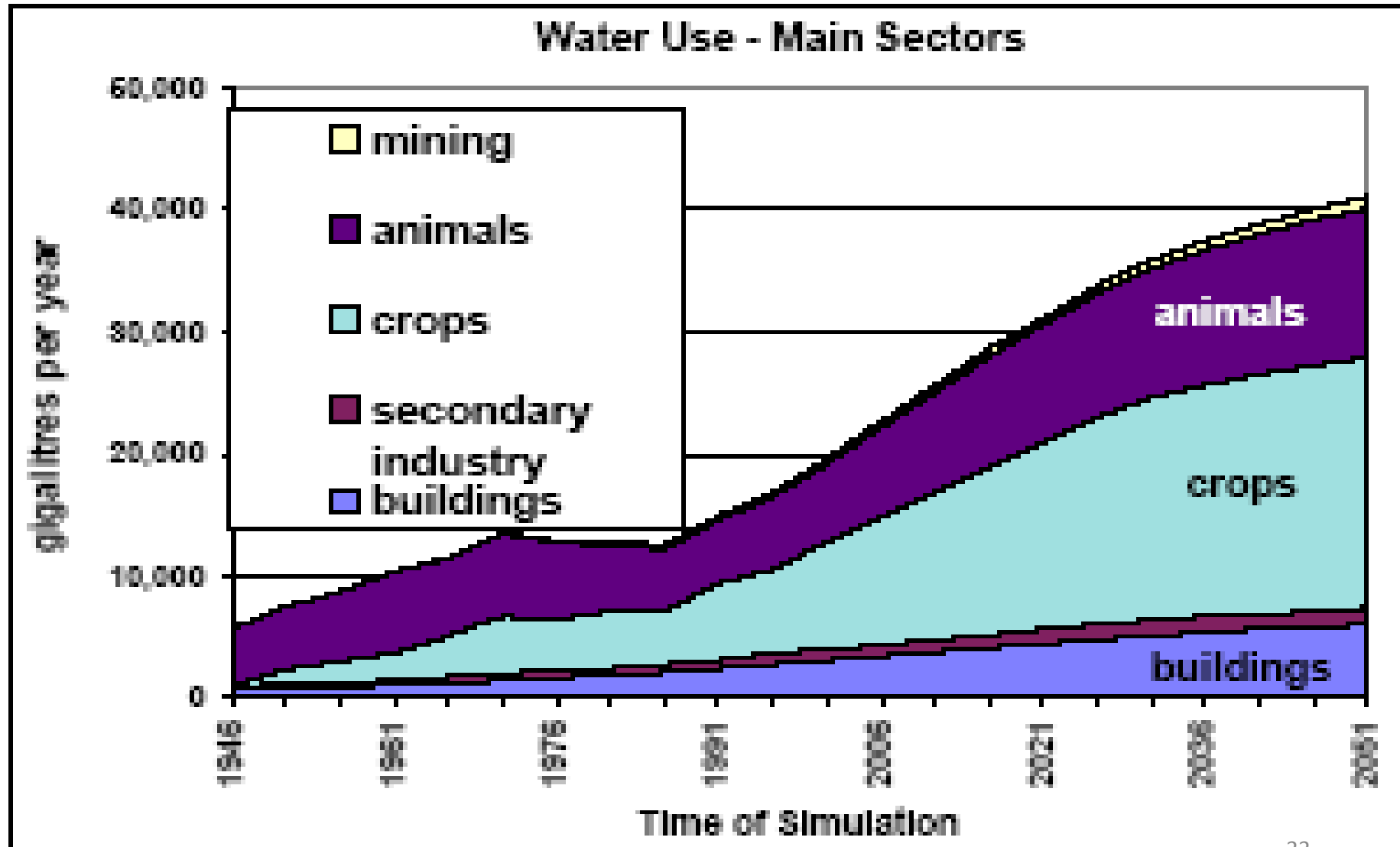
Water use
Percentage change 2000-01 to 2004-05



Water use



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%

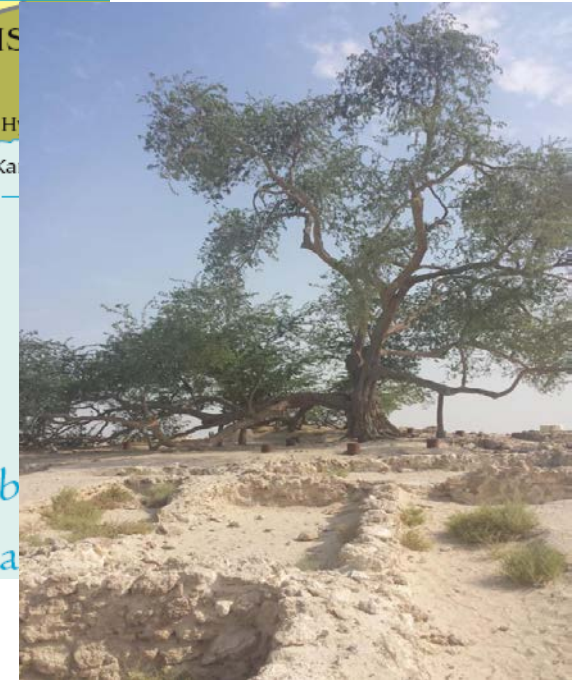
	Increase in GDP, A\$million	
	1%increase WUE	2%increase WUE
Irrigated agriculture	-24	78
Dryland agriculture	-51	-112
Food and fibre processing	44	97
Other industries	262	410
Total impact on GDP	253	521

Some water accounting examples from around the world

Pilot water accounts for Oman and Bahrain



STATISTICS

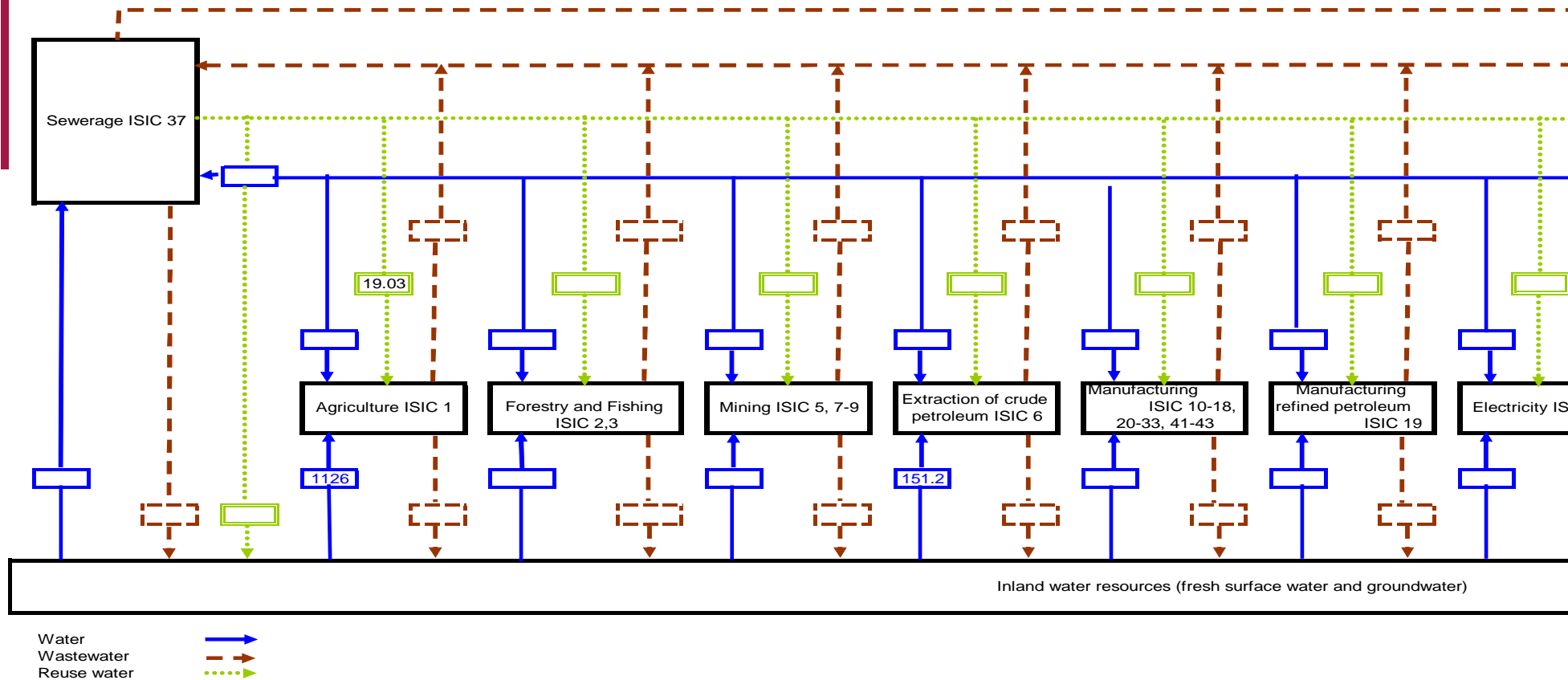


Some water accounting examples from around the world



Oman: Trial population of physical supply and use diagram

STATISTICS



Water Account Diagram for Bahrain, 2005

The diagram illustrates the flow of water from the Desalination plant to various sectors, including Industrial, Water Supply Industry, Domestic, Ground water, Sewerage Treatment, and Agriculture. The flows are quantified in million cubic meters (mcm).

Flows and Losses:

- Desalination plant: 104.5 mcm
- Losses: 0.5 mcm
- Water Supply Industry (ISIC 36): 104 mcm
- Losses: 1 mcm
- Industrial (ISIC 5-33, 41-43): 4 mcm
- Ground water: 5 mcm
- Losses: 0.5 mcm
- Domestic: 7 mcm
- Losses: 28 mcm
- Water Supply Industry (ISIC 36): 148.5 mcm
- Water Supply Industry (ISIC 36): 120.5 mcm
- Ground water: 49.5 mcm
- Losses: 50 mcm
- Sewerage Treatment (ISIC 37): 80 mcm
- Ground water: 128 mcm
- Agriculture (ISIC 01): 21 mcm

Table: Annual Water Consumption for All Uses (million cubic meters)

Year	Grand total			Treated Water			Desalinated Water			Groundwater		
	Total	Industrial	Domestic	Total	Industrial	Domestic	Total	Industrial	Domestic	Total	Industrial	Domestic
1982	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1983	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1984	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1985	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1986	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1987	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1988	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1989	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1990	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1991	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1992	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1993	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1994	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1995	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1996	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1997	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1998	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
1999	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
2000	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
2001	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
2002	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
2003	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
2004	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3
2005	1000	86	0	42	1.8	0.4	61.0	148	0	1000	44	0.3

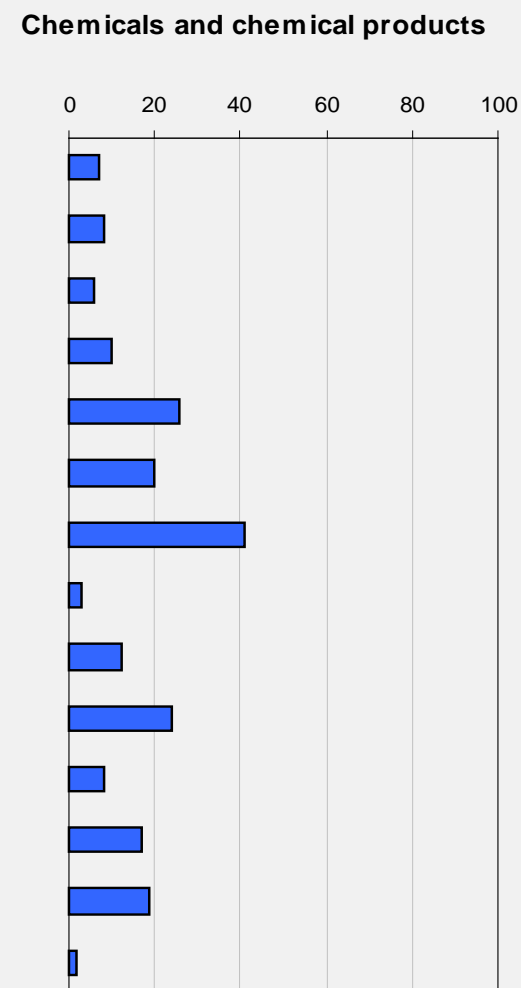
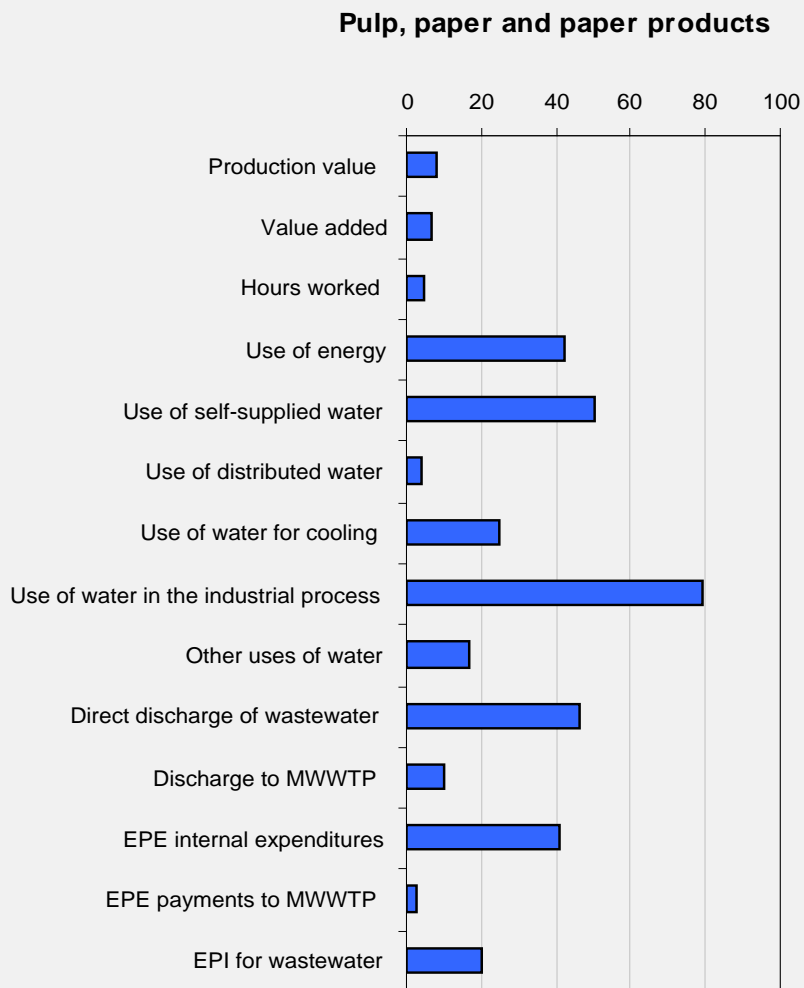
Some water accounting examples from around the world



Sweden: Environmental Economic Profiles (1995)



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Some water accounting examples from around the world

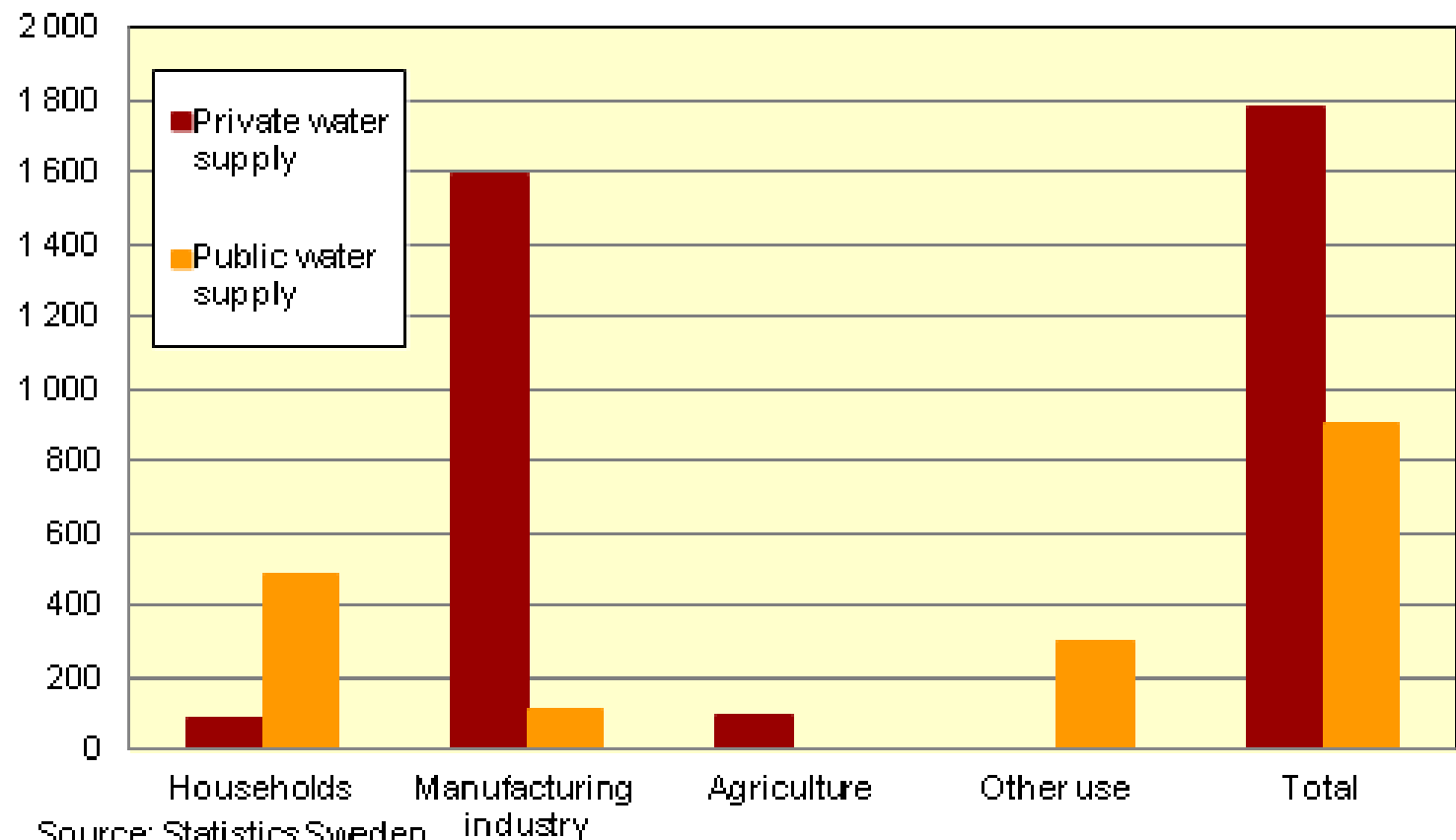


Sweden: Water use by sectors (2010)



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Water use by sectors, 2010





Thank you!

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