



**ISPRA**



# **The activities of the EU CIS WG on “Water Accounts”: implications on water balances**

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**Pilot Arno Water Accounts**

# Outline....

WFD & Water Quantity: WSD

Blueprint: “filling the gaps in particular as regards water quantity and efficiency”: CIS Water Account.

Implications on water balance estimation due to EU proposed approaches



# Why is water quantity a concern in EU?

- Balance between demand and availability has reached a critical level in many areas of Europe (water scarcity)
- More and more areas are affected by weather changes, in particular less rain (droughts)
- Climate change will almost certainly make the situation worse
- More frequent and severe droughts expected across Europe and the neighbouring countries
- Total water abstraction in EU 247 billion m<sup>3</sup>/year
  - 44% for energy production,
  - 24% for agriculture,
  - 17% for public water supply
  - 15% for industry

**Business as usual scenario:**

**Total abstraction will increase by 16% by 2030**



# What have we done about it so far?

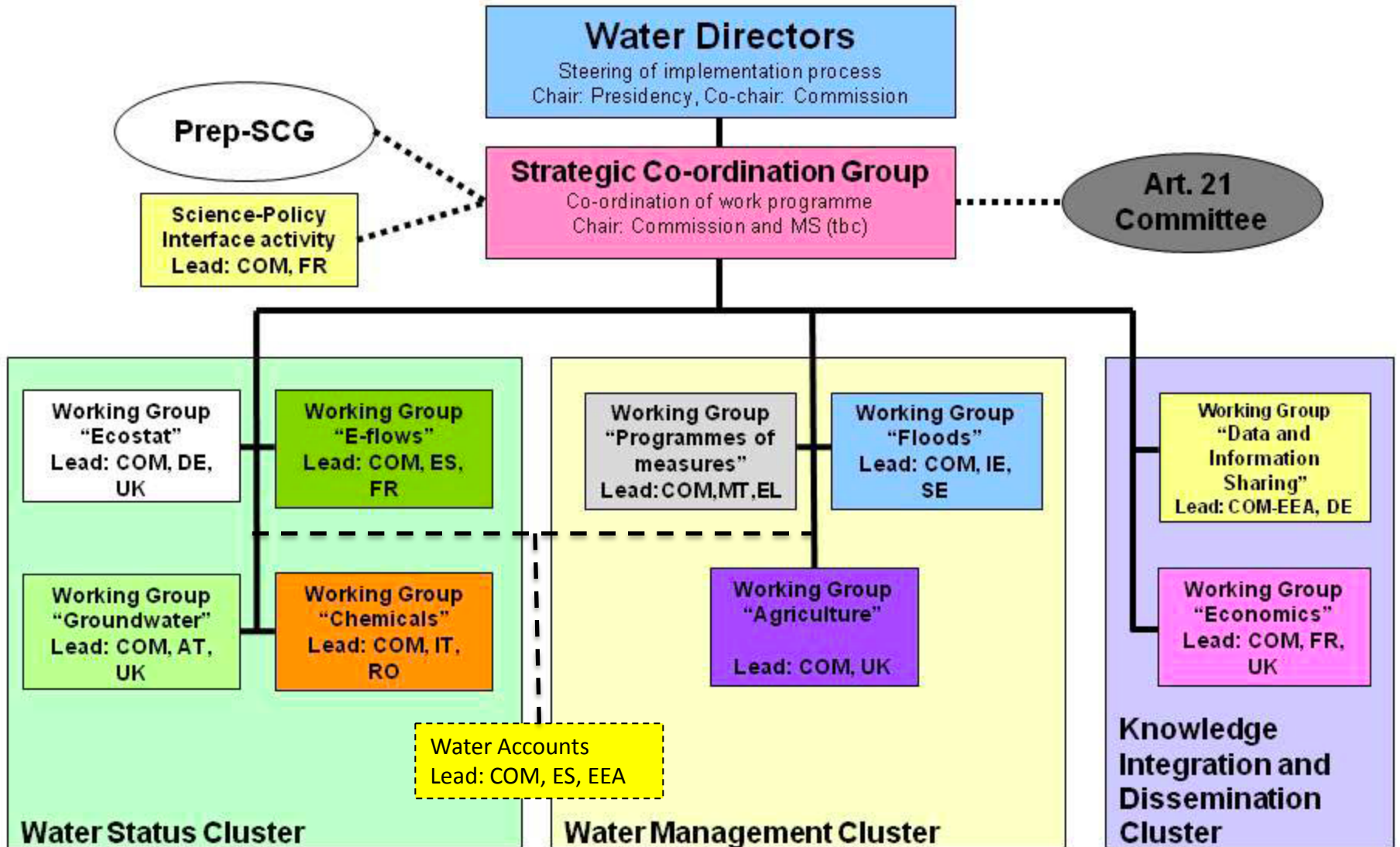
- Water Framework Directive – not so strong on SW quantity
- Commission Communication WS&D 2007 - 7 policy options
  - Putting the right price tag on water
  - Improving drought risk management
  - Fostering water efficient technologies and practices
  - Fostering the emergence of a water-saving culture
  - Allocating water & water-related funding efficiently
  - Considering additional water supply infrastructures
  - Improve knowledge and data collection
- Annual implementation reports
- Launch of Policy Review in 2010
- Blueprint in 2012
- CIS mandate



# Water Quantity in WFD implementation

- Previous CIS phase – water scarcity & droughts EG:
- Agreeing definitions of WS & D + Starting up work on e-flows
- Development of WS & D indicators
  - SPI,
  - fAPAR,
  - Soil Moisture,
  - SRI,
  - Snowpack,
  - WEI+
- This CIS phase: activities related to quantity in several groups
  - e-flows
  - PoM: Leakage reduction, Water re-use
  - Water accounts

# CIS Organisation 2013-2015



# Water Accounts

2 meetings: April + October 2014

Focus & Mandate:

- Physical Water Balance: glossary, scales, goals
- Support development and use of WB in MS at the RB scale for WRs management + achievement of WFD obs
- Provide input to Pan EU work (EEA, Eurostat, JRC)

Deliverable: WB guidance (first draft)

# Other initiatives on WQ/WA

- EEA indicators on WQ + application of SEEA model; results to be checked by MS;
- DG ENV PRB initiative: 2 sets of grants (e.g. PAWA);
- Nuclear/Thermal Power Plant and Industrial Cooling work promoted by EC
- Hydroeconomic model at JRC
- EUROSTAT



# Water Accounts: first steps

- Agree on the structure of WB guidance + definitions, scales and components of water balance
- Ensure consistency among different reporting requirements on water quantity: WFD, EEA, Eurostat.....

# EUROPEAN COMMISSION

## Guidance document on water balances (2014)

### Key components of the hydrological cycle

$$\text{IN} = \text{OUT} \pm \Delta\text{S}$$

IN = input of water to the catchment;  
OUT = output from the catchment  
 $\Delta\text{S}$  = change in storage

In a system with no external inflows, the water is entering the system via precipitation (**P**), converted into evaporation (**E**) and surface runoff and groundwater (**R**) and associated storage (**S**) or change in storage ( $\Delta\text{S}$ ) during the time period investigated:

$$\text{P} = \text{R} + \text{E} \pm \Delta\text{S}$$

$$P = R_s + R_u + R_{gw} + E_s + E_i + E_t + \sum \frac{ds}{dt} + \text{Export} + \text{Import}$$

*R:* runoff  
*E:* evaporation  
*dS/dt:* Storage variation

*i:* interception  
*s:* surface  
*u:* unsaturated zone  
*gw:* Ground Water

# ITALIAN MINISTRY OF ENVIRONMENT

## National guidance on water balances (*D.M. 28 luglio 2004*)

Hydrological balance based on water available for annual abstraction:

$$R_{ut} > \sum F_i + R_{riu} + V_{rest}$$

$$R_{ut} \leq R_{pot} - V_{DMV}$$

$R_{ut}$  = **Groundwater and surface water available for annual abstraction**

$R_{pot}$  = Resources available (**Recharge into the aquifer** and surface water)

$F_i$  = Consumptive water use;

$R_{riu}$  = Reused water;

$V_{rest}$  = Returned water

$V_{DMV}$  = Rate of flow required to achieve ecological quality objectives  
for associated surface water

# OECD/EUROSTAT Joint Questionnaire on Inland Waters

$$P + Q_i - ET_a - Q_o - R - C = 0$$

where

$P$  areal precipitation (item 1)

$Q_i$  external inflow (item 4)

$ET_a$  actual evapotranspiration (item 2)

$Q_o$  total outflow from the territory ( $Q_o = Q_{o,s} + Q_{o,n}$ ) (items 5 (6,7))

$R$  net recharge into the aquifers

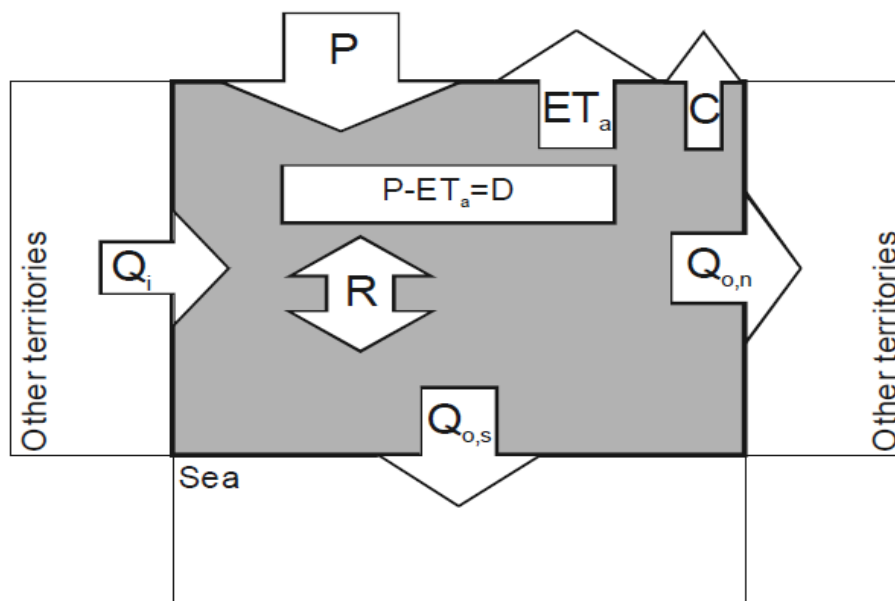
$C$  consumptive water use

$P - ET_a = D$  internal flow (often also referred to as internally generated depth of runoff) (item 3)

**annual water balance of  
the national territory**

$$P = R + E \pm \Delta S$$

$$P = R + Q_o + E_{ta} - Q_i + C$$



Fonte:

OECD-Eurostat Joint Questionnaire on Inland Waters (vers. 2010) [http://ec.europa.eu/eurostat/ramon/coded\\_files/OECD\\_ESTAT\\_JQ\\_Manual\\_version\\_2\\_21.pdf](http://ec.europa.eu/eurostat/ramon/coded_files/OECD_ESTAT_JQ_Manual_version_2_21.pdf)

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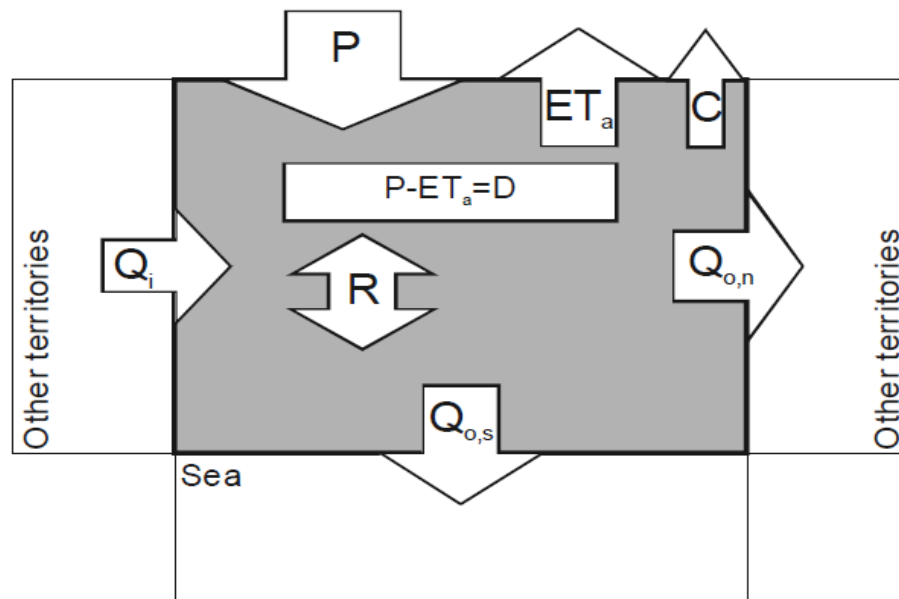
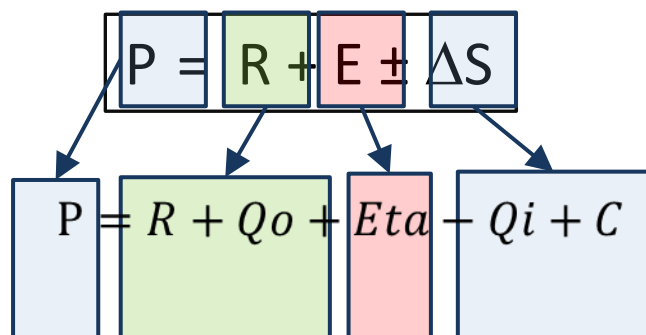
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# OECD/EUROSTAT

## Joint Questionnaire on Inland Waters

### OECD/Eurostat Water balance indicators

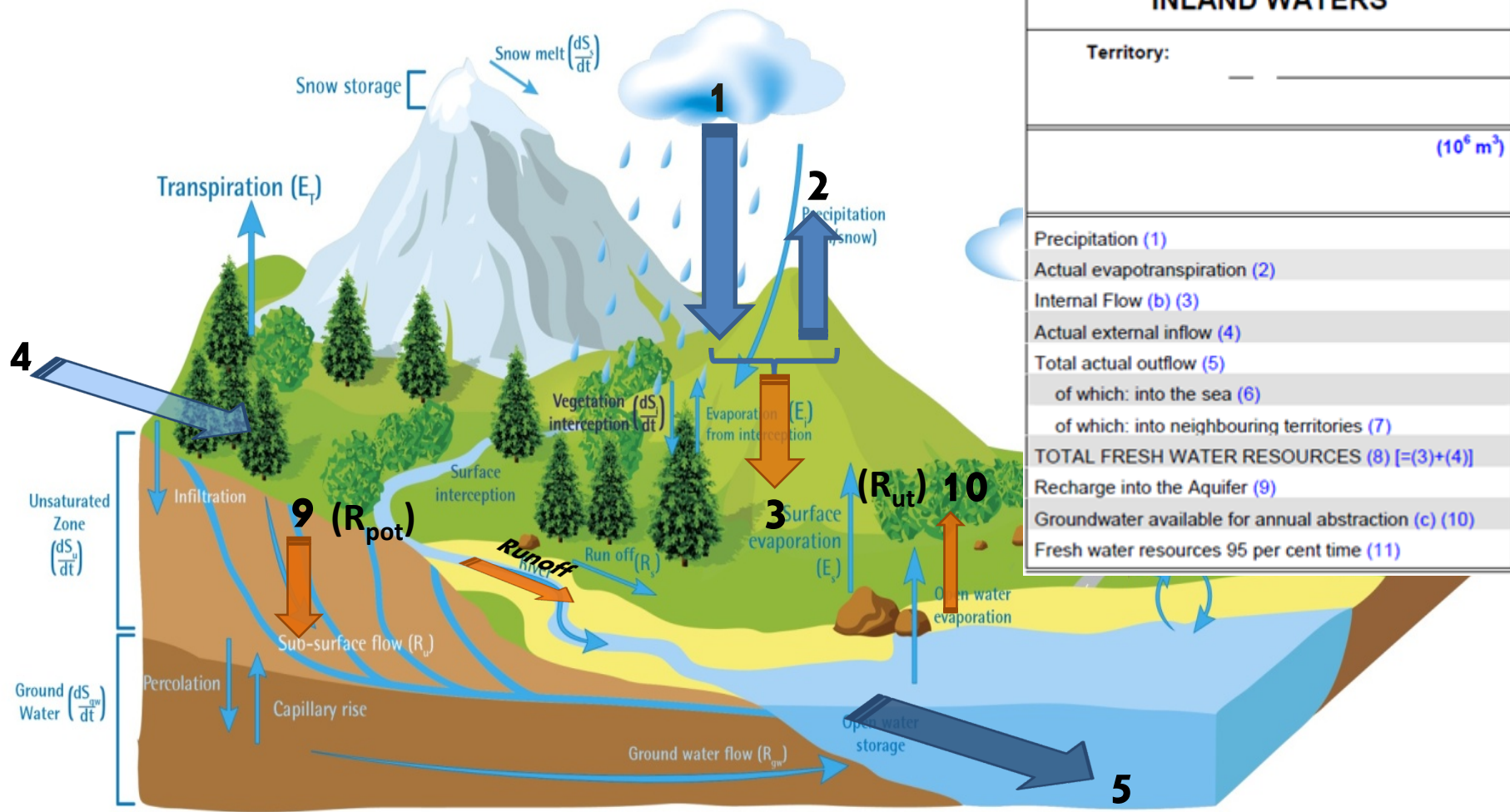
| INLAND WATERS   | TABLE 1: Fresh water resources (a) |                           |                            |
|---|------------------------------------|---------------------------|----------------------------|
| Territory: _____                                      | Contact: _____                     |                           |                            |
| (10 <sup>6</sup> m <sup>3</sup> )                     | Definition<br>DCM page             | Decision tree<br>DCM page | Best practices<br>DCM page |
| Precipitation (1)                                     | 30                                 | 34                        | 35                         |
| Actual evapotranspiration (2)                         | 30                                 | 34                        | 35                         |
| Internal Flow (b) (3)                                 | 30                                 | 34                        | 35                         |
| Actual external inflow (4)                            | 30                                 | 34                        | 35                         |
| Total actual outflow (5)                              | 31                                 | 34                        | 35                         |
| of which: into the sea (6)                            | 31                                 | 34                        | 35                         |
| of which: into neighbouring territories (7)           | 31                                 | 34                        | 35                         |
| TOTAL FRESH WATER RESOURCES (8) [(3)+(4)]             | 31                                 | 34                        | 35                         |
| Recharge into the Aquifer (9)                         | 31                                 | 34                        | 36                         |
| Groundwater available for annual abstraction (c) (10) | 32                                 | 34                        | 37                         |
| Fresh water resources 95 per cent time (11)           | 32                                 | 34                        | 37                         |

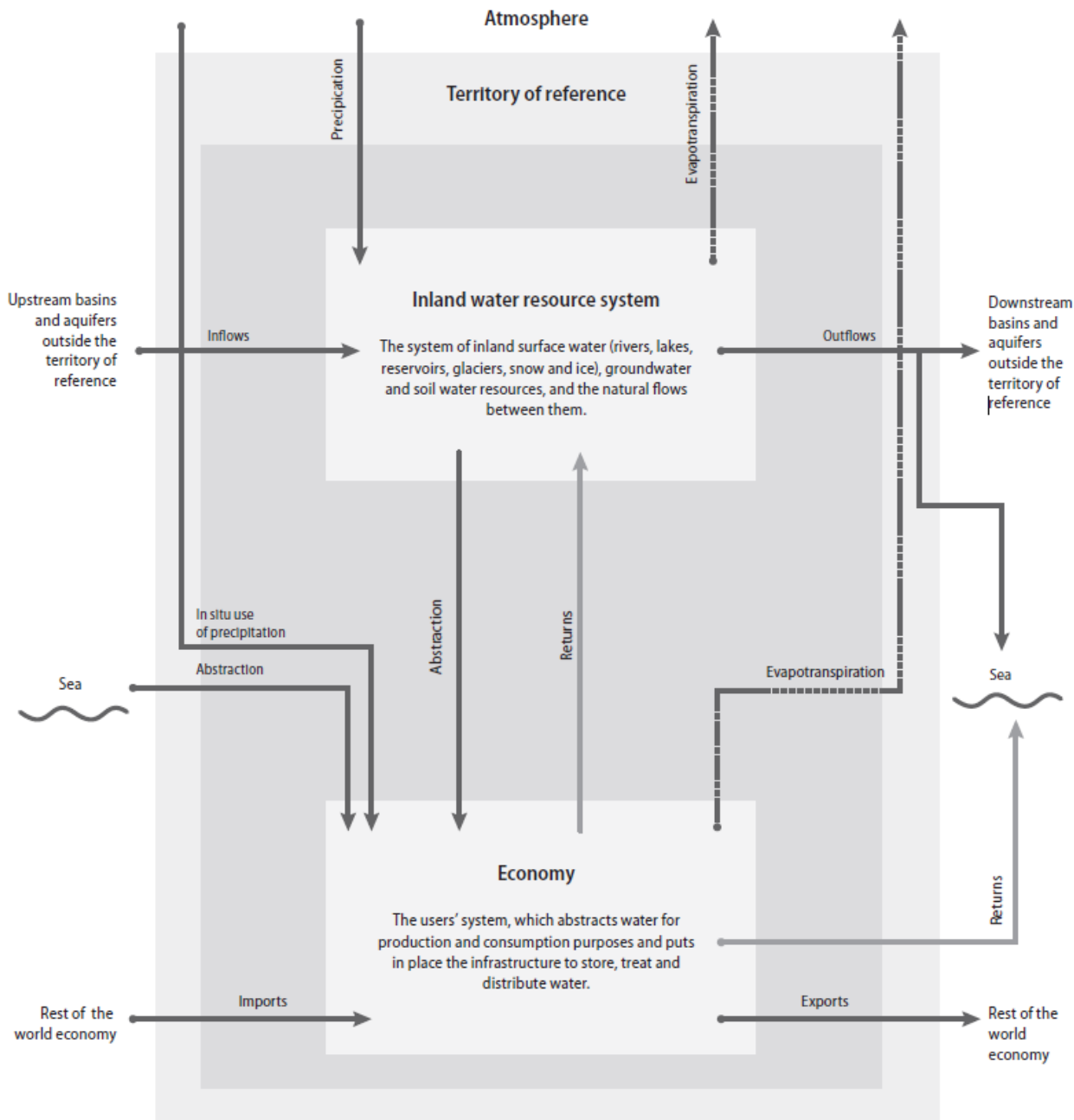
**P - Actual Evapotr. = Internal Flow (surface runoff + Recharge into the aquifer)**

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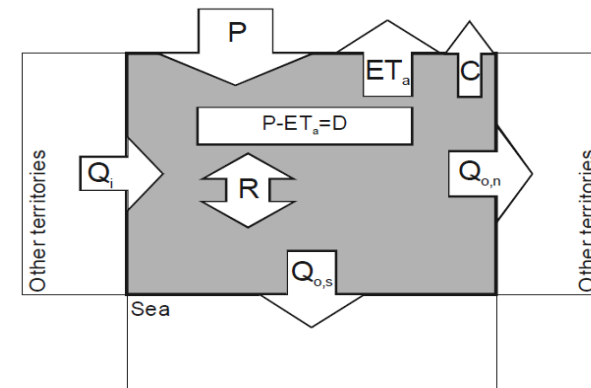
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# **SEEA-Water - System of Environmental-Economic Accounting for Water**

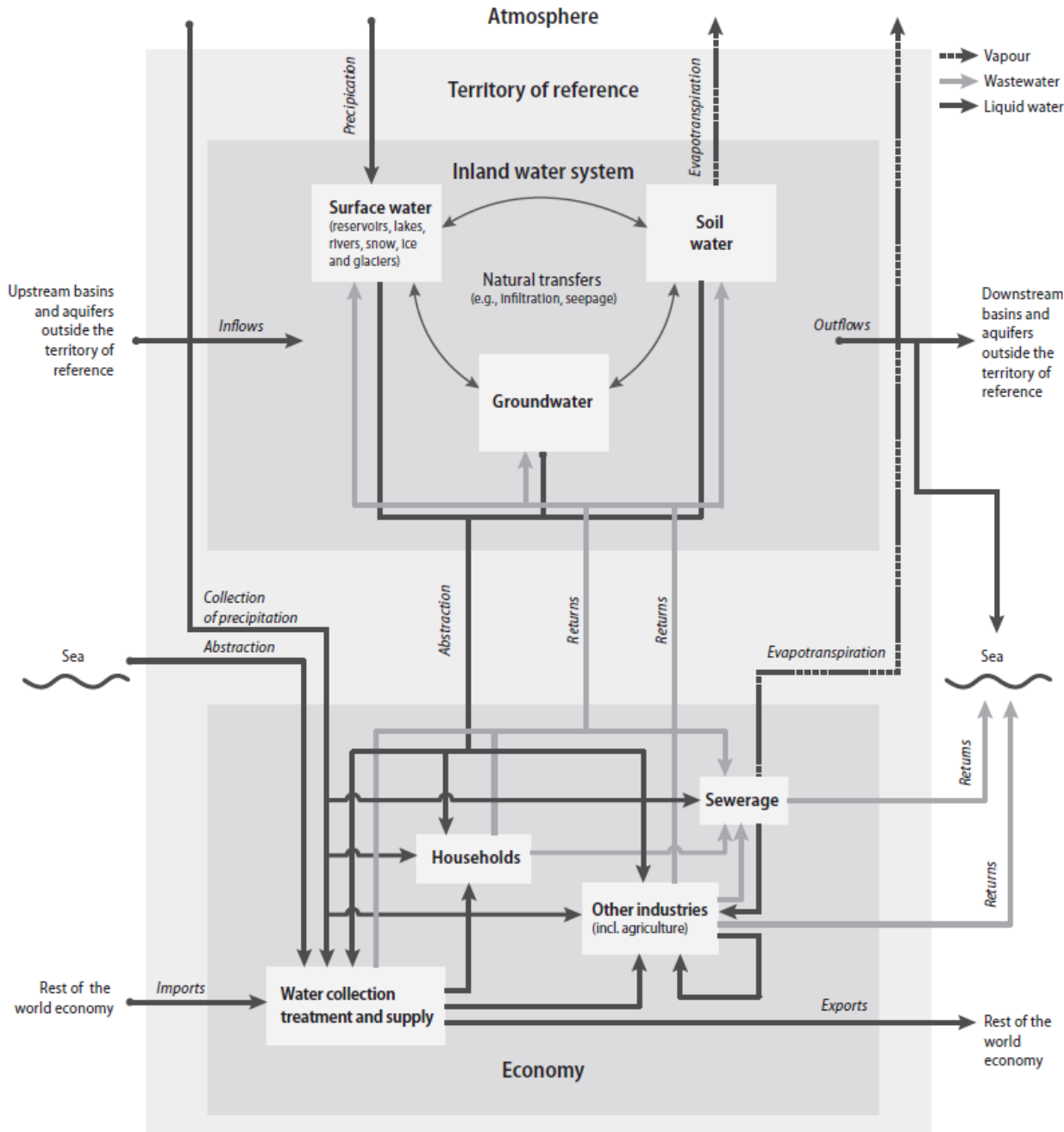
## **Flows between the economy and the environment**



Fonte: **OECD-Eurostat** Joint Questionnaire on Inland Waters

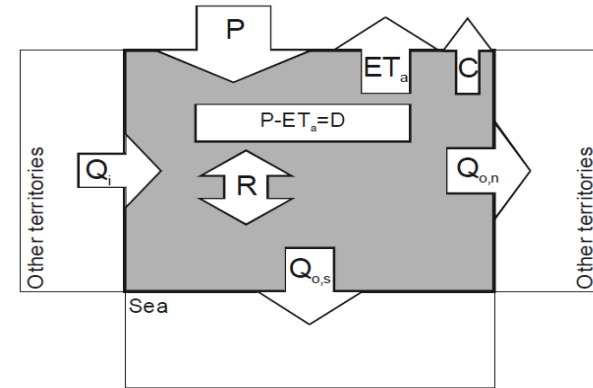
Fonte:  
 System of Environmental-Economic Accounting for Water  
 ST/ESA/STAT/SER.F/100  
**United Nations publication**





# SEEA-Water - System of Environmental-Economic Accounting for Water

## Flows between the economy and the environment



Fonte: OECD-Eurostat Joint Questionnaire on Inland Waters

Fonte:  
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**United Nations publication**

# ***SEEA-Water - System of Environmental-Economic Accounting for Water***

## Physical use table (*physical units*)

|  |   | Industries (by ISIC category)  |             |    |    |    |               | Households | Rest of the world | Total |
|--|---|--|-------------|----|----|----|---------------|------------|-------------------|-------|
|  |   | 1-3  | 5-33, 41-43 | 35 | 36 | 37 | 38, 39, 45-99 |            |                   |       |
| <b>A. Physical use table (<i>physical units</i>)</b> |   |  |             |    |    |    |               |            |                   |       |
| 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<br><i>of which:</i> |             |    |    |    |               |            |                   |       |
| 2.a. Reused water                                    |   |  |             |    |    |    |               |            |                   |       |
| 2.b. Wastewater to sewerage                          |   |  |             |    |    |    |               |            |                   |       |
| 3. Total use of water (= 1 + 2)                      |   |  |             |    |    |    |               |            |                   |       |

*Fonte:*

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# SEEA-Water - System of Environmental-Economic Accounting for Water

## OECD/Eurostat Joint Questionnaire on Inland Waters

Physical use table (*physical units*)

### A. Physical use table (*physical units*)

|                                 |  |
|---------------------------------|--|
| From the environment            | 1. Total abstraction (= 1.a + 1.b = 1.i) |
|                                 | 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                       |
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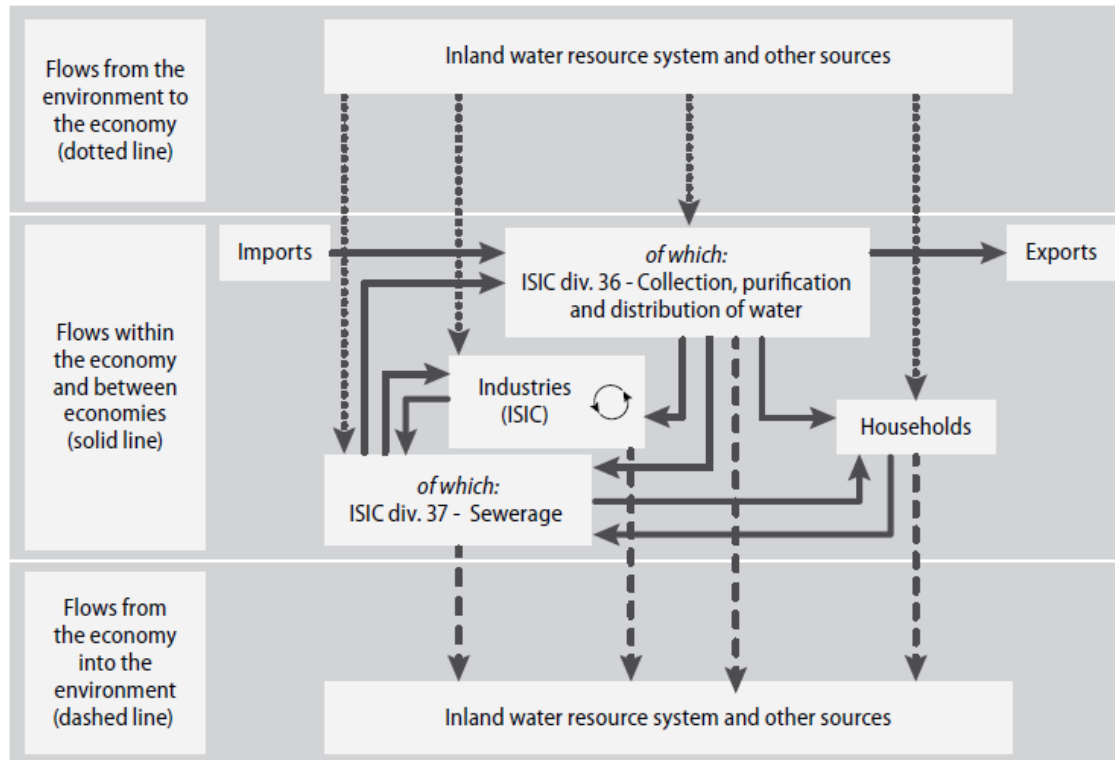
| INLAND WATERS   |           | TABLE 2.1: Annual fresh water abstraction by source |                           |                            |
|---|-----------|---|---------------------------|----------------------------|
| Territory: _____<br>(10 <sup>6</sup> m <sup>3</sup> ) |           | Contact: _____                                      |                           |                            |
|   | ISIC/NACE | Definition<br>DCM page                              | Decision tree<br>DCM page | Best practices<br>DCM page |
| <b>Fresh surface water (13)</b>                       |           | 39  | 44                        |                            |
| Total gross abstraction (15)                          |           | 40  | 44                        |                            |
| of which: (a)   |           |   |                           |                            |
| * Public water supply (16) (41)                       |           | 40  | 44                        | 45 - 48                    |
| * Agriculture, forestry, fishing (01-05)              |           |   | 44                        | 49 - 51                    |
| of which: Irrigation (17)                             |           | 40  | 44                        | 49 - 51                    |
| * Mining and quarrying (10-14)                        |           |   |                           |                            |
| * Manufacturing industry (15-37)                      |           |   | 44                        | 52 - 55                    |
| of which: industry-cooling (18)                       |           | 41  | 44                        | 52 - 55                    |
| * Production of electricity (cooling) (18) (40.1)     |           | 41  | 44                        | 55                         |
| * Services (b) (50-93)                                |           |   | 44                        | 57                         |
| * any other economic activity (e.g. construction)     |           |   |                           |                            |
| * Private households (c)                              |           |   | 44                        | 57                         |
| <b>Fresh groundwater (14)</b>                         |           | 39  | 44                        |                            |
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Fonte:

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ST/ESA/STAT/SER.F/100  
United Nations publication

# SEEA-Water - System of Environmental-Economic Accounting for Water

Detailed description of physical water flows within the economy



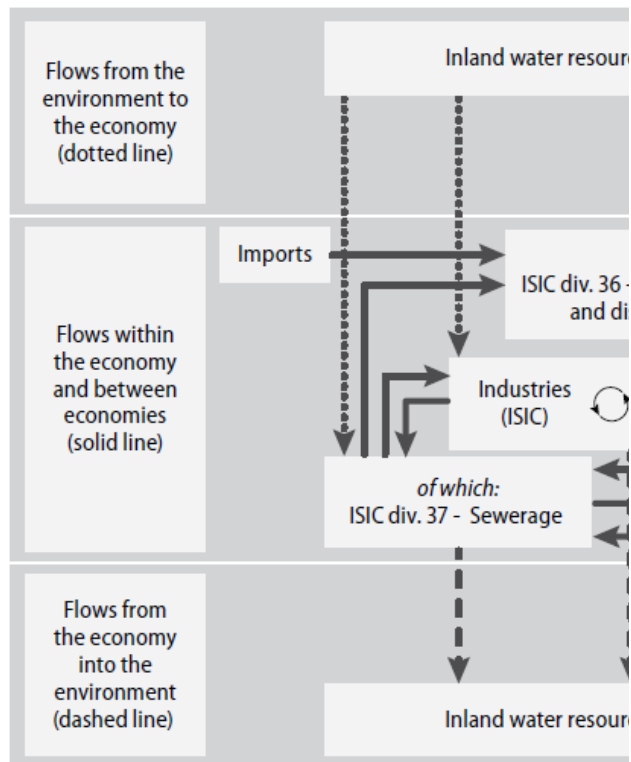
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# SEEA-Water - System of Environmental-Economic Accounting for Water

## OECD/Eurostat Joint Questionnaire on Inland Waters

Detailed description of physical water



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