

Indicadores urbanos de autosuficiencia ambiental para agua,  
residuos, energía y materiales.

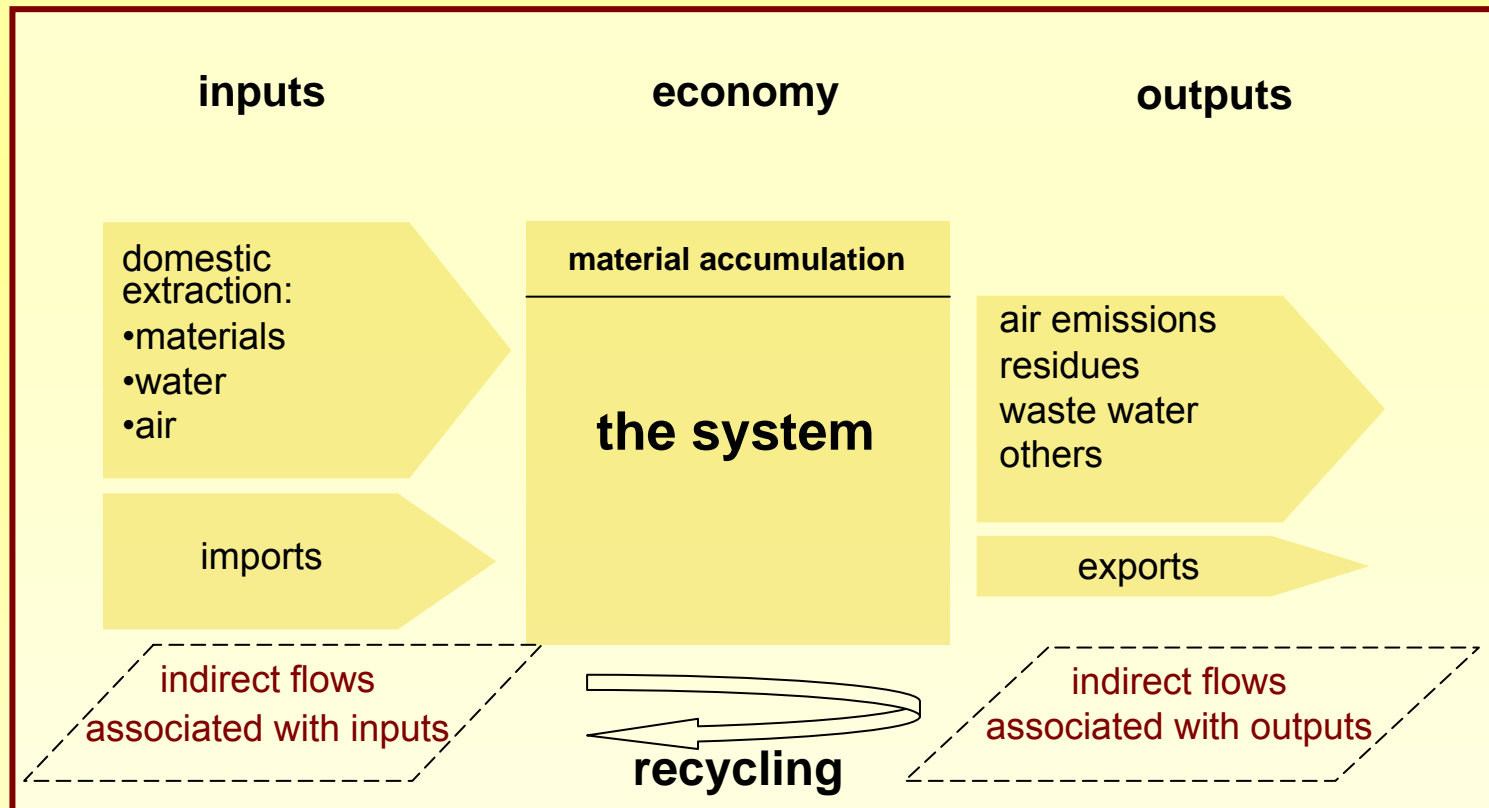


# Flujos artificiales de agua en áreas urbanas

Grup de Recerca Sostenibilitat i Prevenió Ambiental (SosteniPrA).  
Instituto de Ciencia y Tecnologías Ambientales (ICTA)  
Universitat Autònoma de Barcelona (UAB)

# Material Flow Analysis (MFA)

- A methodology that allows the quantification of material flows of a system with the aim to obtain some indicators



# Urban water flows



- Can be distinguished into:

- Natural water flows

- Surface water

- Groundwater

- Precipitation

- Evaporation

- Artificial water flows

- Piped water

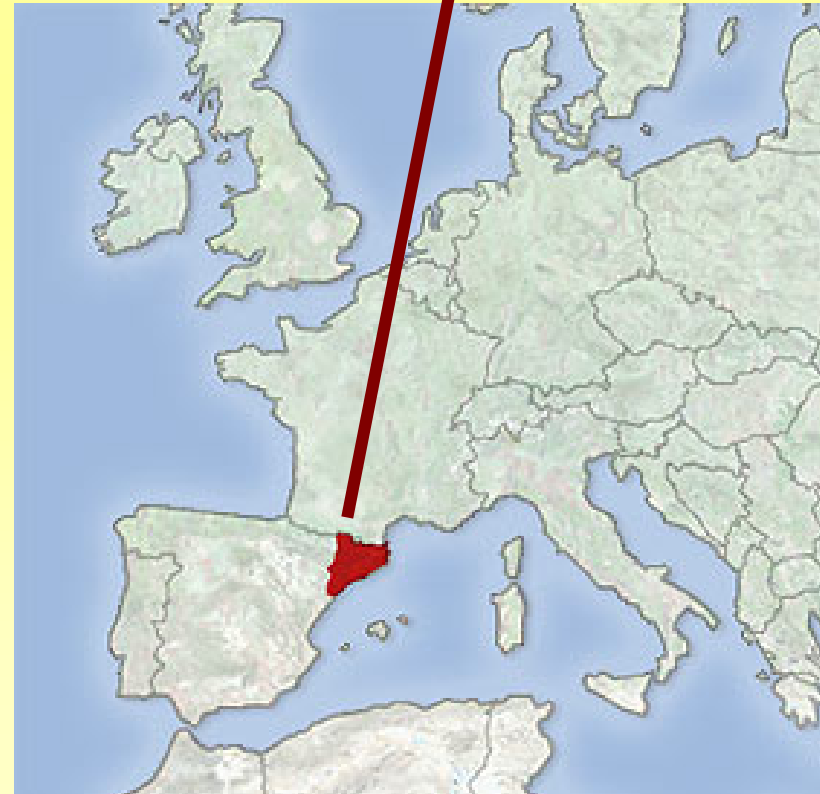
- Drained water

# The selected coastal system

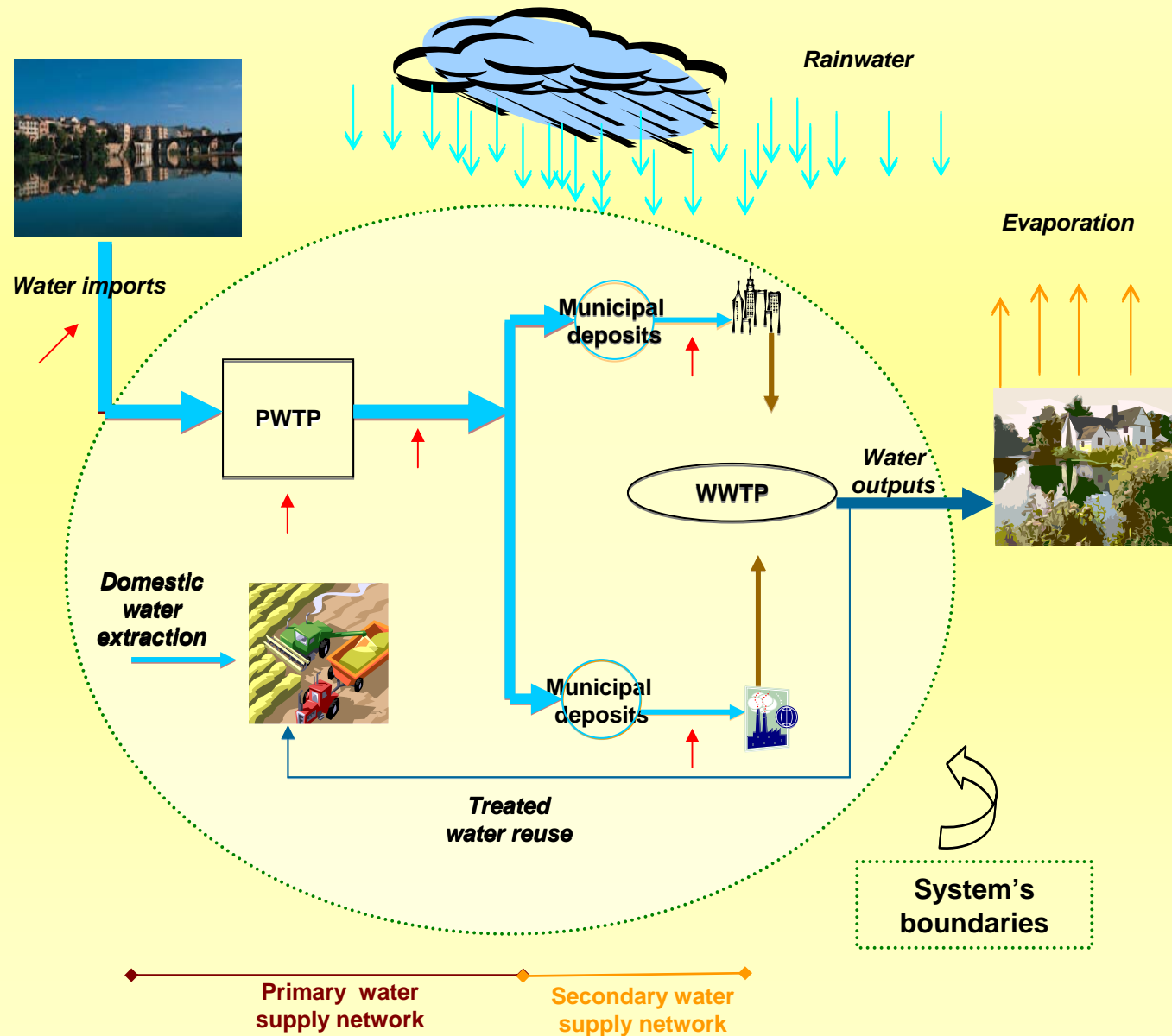
- 27 coastal municipalities of the Barcelona Metropolitan Region

- Population density > 5000 persons/km<sup>2</sup>  
EU average  $\approx$  115 persons/km<sup>2</sup>

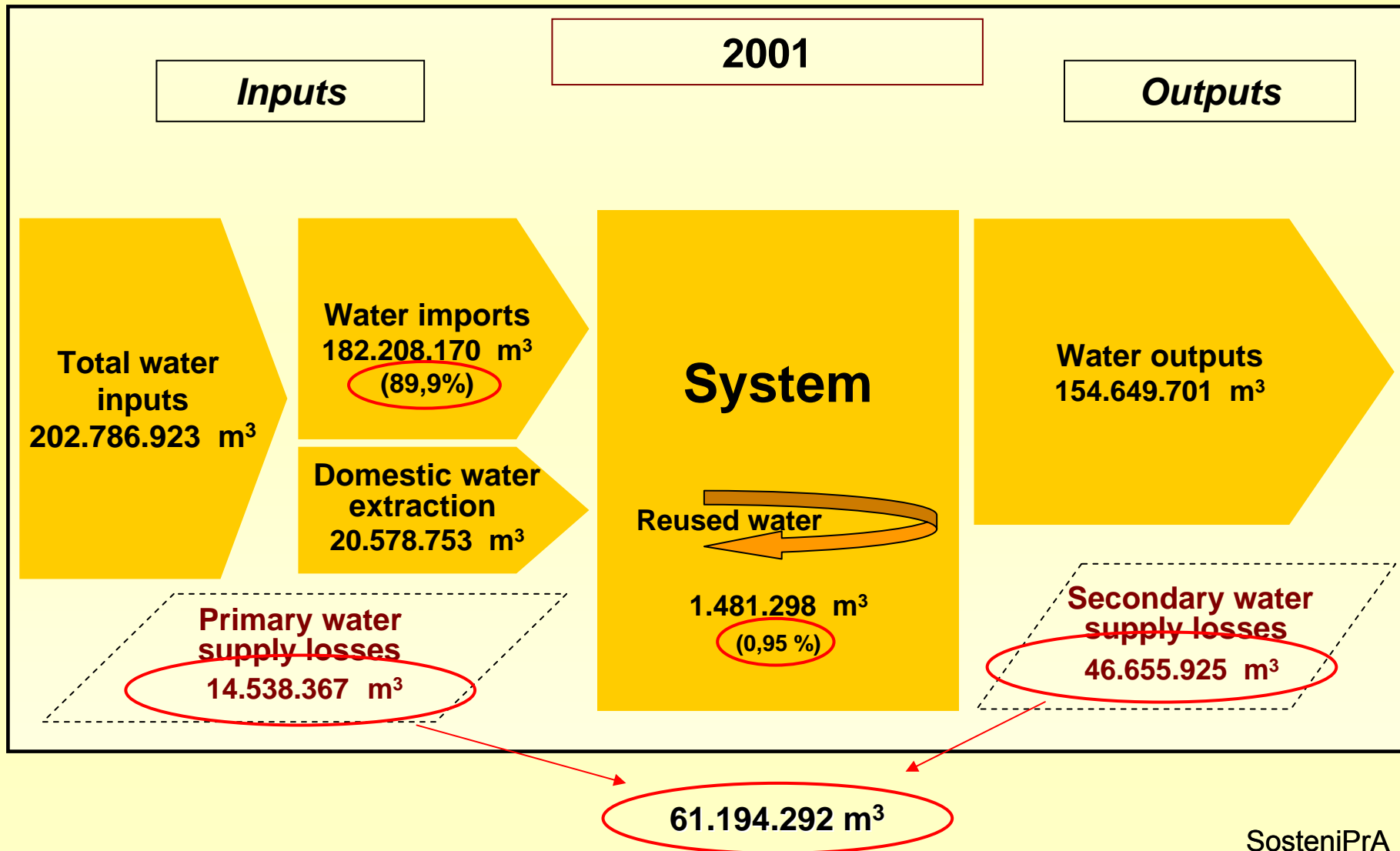
- Intense activities
  - Industrial
  - Comercial
  - Touristic



# Suggested Methodology



# Balance 2001



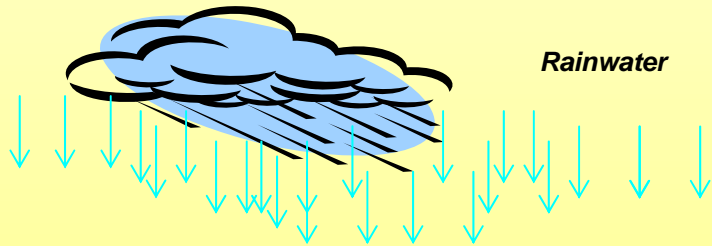
# The importance of water flows

160 million tonnes of total inputs in entire Catalunya



> 200 million tonnes of water inputs in the coastal region

# Water use sustainability – year 2001

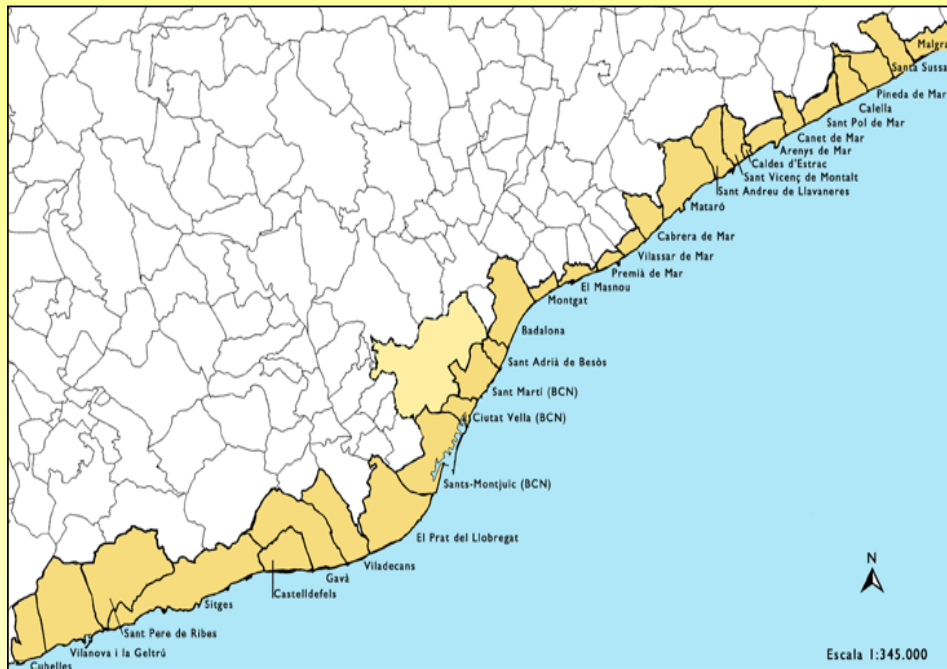


**Precipitation  
(m<sup>3</sup>/year)**

**Precipitation  
(m<sup>3</sup>/hab/year)**

**248 052 680**

**100.7**



**Water inputs  
(m<sup>3</sup>/year)**

**Registered water  
(m<sup>3</sup>/hab/year)**

**202 786 923**

**70.9**



# Water self-sufficiency indicator

- examines a system's self-sufficiency in terms of water consumption
- the system's renewable resources inputs are used as a sustainability metric
- defined as:


$$WSS = V_{cx} / V_{rrx}$$

Where:

$V_{cx}$  is the volume of water consumed in the system for year  $x$

$V_{rrx}$  is the volume of renewable water received by the system in year  $x$

# Interpretation of the wss indicator



$0 < wss \leq 0.5$  Sustainable system in terms of water use

$0.5 < wss \leq 1$  Moderately sustainable system in terms of water use, but on alert

$wss > 1$  Unsustainable water use and dependence on water imports and/or domestic extraction

# Precipitation calculations in the studied system for the year 2002

Surface covered by studied municipalities (km <sup>2</sup> )	478.2
Urbanized surface in the system (km <sup>2</sup> )	363.9
Total Precipitation (m <sup>3</sup> year <sup>-1</sup> )	433 743 600
Precipitation on urbanised areas (m <sup>3</sup> year <sup>-1</sup> )	330 453 219
Precipitation on urbanised areas (m <sup>3</sup> hab <sup>-1</sup> year <sup>-1</sup> )	148.8
Precipitation on urbanised areas (l hab <sup>-1</sup> day <sup>-1</sup> )	407
WSS	0.62

# Indicator values and basic statistical data on 5 selected municipalities of the studied system for 2002

Municipality	Surface covered (km <sup>2</sup> )	Total Precipitation (m <sup>3</sup> year <sup>-1</sup> )	Precipitation on urbanized areas (m <sup>3</sup> year <sup>-1</sup> )	Total water inputs (m <sup>3</sup> )	wss
Sitges	43.8	38 989 446	20 865 585	1.934.379	0.09
Viladecans	20.4	17 008 296	13 206 442	4.870.384	0.37
Badalona	21.2	21 187 280	19 568 252	15.487.246	0.79
Barcelona	100.4	94 094 880	84 301 140	148.354.404	1.75
Mataró	3.0	2 565 000	2 248 650	9.001.825	4.00