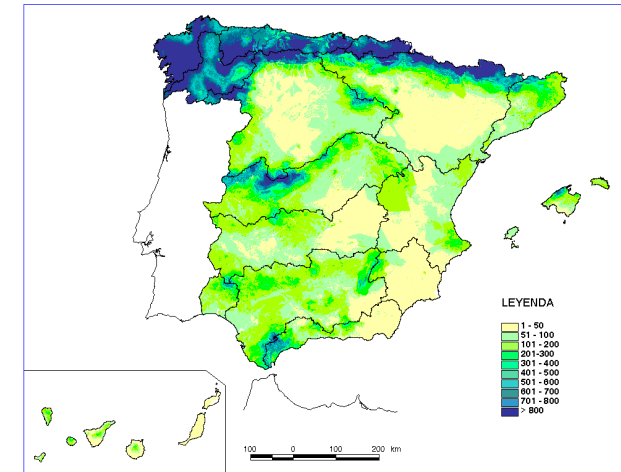

Water reuse in Spain

Solutions and role of the River Basin Management Plans

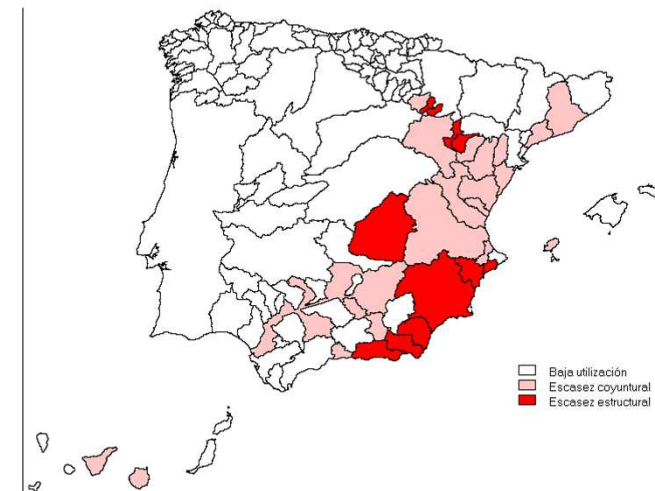
Teodoro Estrela Monreal
Confederación Hidrográfica del Júcar, Spain
Vice-President World Council of Civil Engineers
Permanent Secretary of MENBO

Water resources and vulnerability

- A significant increase in conventional resources in water scarcity areas is not foreseen for the future.
- In those areas, the use of non-conventional resources, such as desalination or treated waste water reuse, is extremely important.



Mean annual runoff (mm)



Water exploitation index (WEI) in Spanish Water Resources systems

Role of Water Reuse

Water reuse allows:

- an increase of the available resources.
- to overcome drought situations.
- to improve compliance of water quality directives.

The main use of reclaimed water is agricultural:

- alternative resource in GWB not achieving the good quantitative status.
- improvement of guarantee in water resources systems.

Determining factors in water reuse for irrigation

Favourable

- Fragile balance between water resources and demands.
- Geographical coincidence in the coast of population/waste water reuse plants and irrigation.

Unfavourable

- Irrigation susceptible of reusing water has priority rights with quality water.
- Need of temporal adaptation between treated volumes and agricultural demand.
- High conductivity in coastal collectors.

Water reuse legal framework

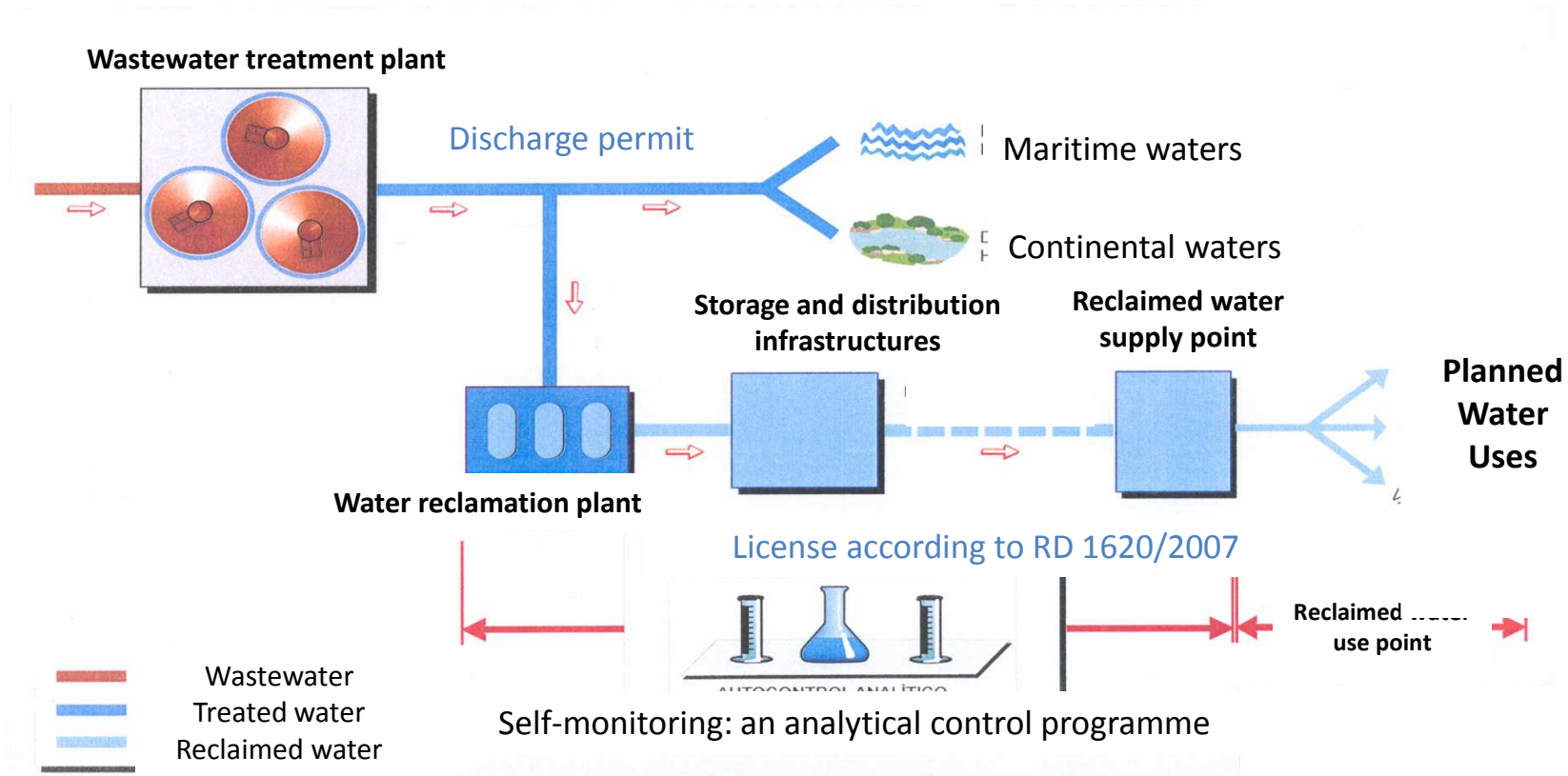
- The RBMP include in the PoM those measures to promote an efficient and sustainable water use.
- This includes the conditions for the reuse of treated water for irrigation of parks and gardens, for agricultural and industrial uses (art 47 of RD 907/2007-Water Planning Regulation).

Water reuse legal framework

Water reuse must comply with the Royal Decree 1620/2007 of December 7th, which establishes the legal regime for the reuse of treated wastewater:

- Determines the necessary requirements to carry out reclaimed water use.
- Establishes the procedures to obtain the licences.
- Compiles the compulsory minimum quality criteria needed for reclaimed water use, depending on the uses.

Water Reuse System in Spain



The role of Water Reuse in RBMP

- Water Reuse is addressed in all RBMPs.
- Areas with the greatest volumes reused are located in Júcar and Segura RBDs.



The role of Water Reuse in Júcar RBMP

- 120 Hm³/yr are directly reused mainly in lower basins, especially in Valencia and in the Vinalopó-Alacantí area.
- The Júcar RBMP makes WR allocations (115 Hm³/yr) for future water uses to solve environmental problems - overexploited groundwater bodies- and to improve guarantee of irrigated areas, mainly in Mijares-Plana de Castellón, Turia, Júcar and Vinalopó-Alacantí.
- 108 M€ in 19 measures.

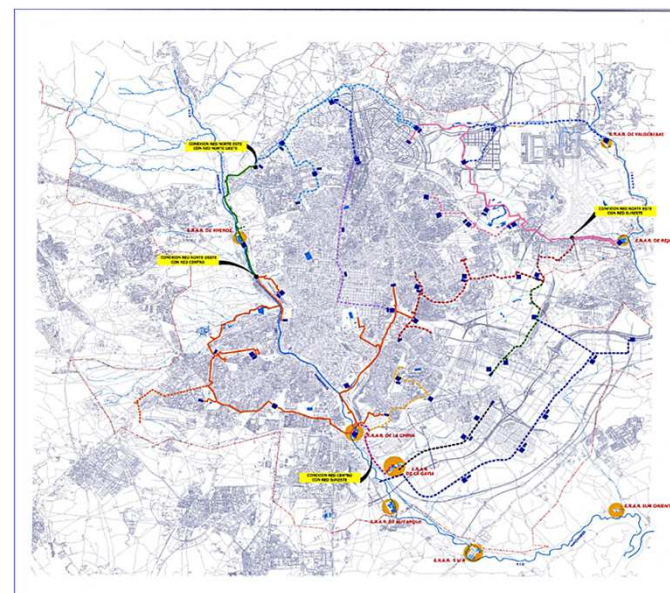
The role of Water Reuse in Segura RBMP

- 86 Hm³/yr are allocated for irrigation from direct reuse. Golf courses have 5 Hm³/yr allocated from direct reuse.
- 50 Hm³/yr from indirect reuse (as a consequence of a regional Reuse Plan, which has promoted tertiary treatment in almost all WWTPs).
- 71 M€ in 10 measures.

Examples of Water Reuse Schemes in Spain

Water Reuse in the Region of Madrid

- City of Madrid and 21 municipalities.
- Reclaimed water capacity: 70 M³/year.
- Distribution network for reclaimed water 493 Km.
- Green areas and parks: 619,9 ha in Madrid city and 592,6 ha in other municipalities.
- Golf courses: 10 (Irrigated area 698 m²)



Water Reuse in Catalonia



E-flow Llobregat river	63,0 hm ³ /yr
Irrigation	23,7 hm ³ /yr
Wetlands maintenance	12,6 hm ³ /yr
Seawater intrusion barrier	0,7 hm ³ /yr

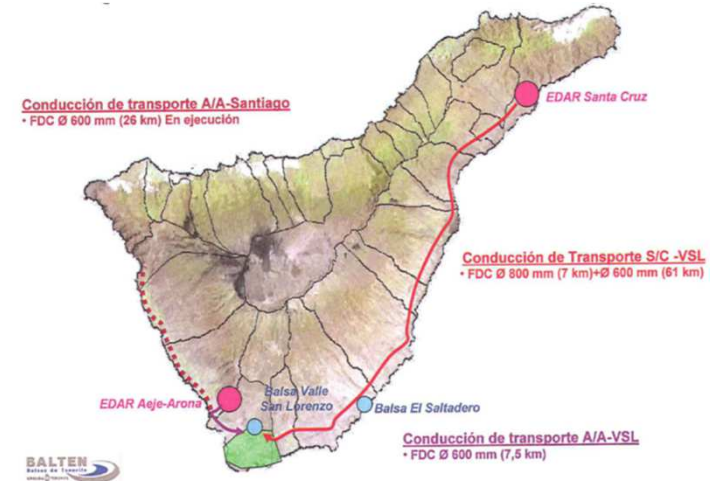
Baix del Llobregat, Plant Capacity 102 hm³/year

Water Reuse in Canary Island

Type of resource	1993	1997	2004	2012
Water reuse	1,0	17,5	35,0	95,0
Desalination	37,0	76,0	130,0	188,0
Goundwater	262,4	326,0	273,0	40,0
Surface water	21,1	24,1	50,0	24,1

Canary islands sources, Miom³/year

Operational cost: 0,25-0,30 €/m³
 Storage and transport: 0,10-0,15 €/m³
 Management: 0,10 €/m³
 Price of reclaimed water : 0,45-0,55 €/m³

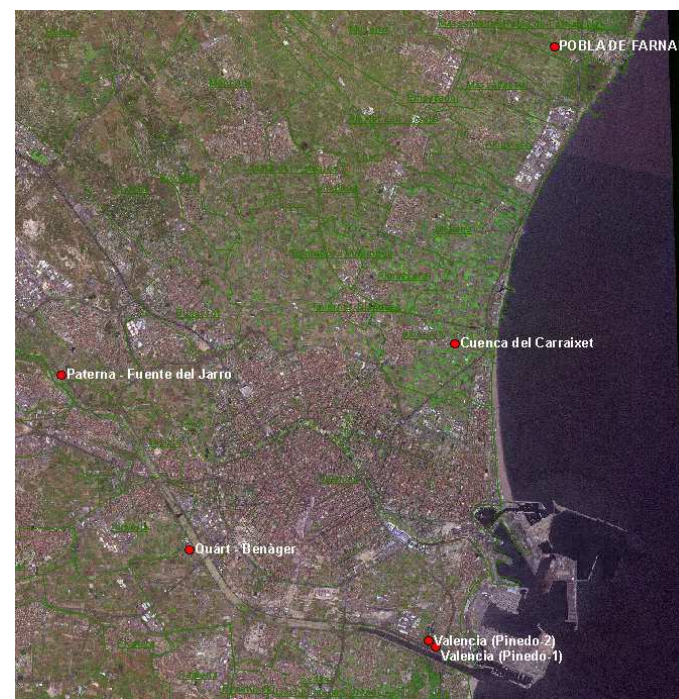


Water reuse in Valencia and its metropolitan area

Waste Water Reuse Plant	Treated volume (Hm ³ /year)	Reused volume (Hm ³ /year)
Pinedo (I y II)	116,65	29,16
Cuenca del Carraixet	13,08	3,74
Paterna-Fuente del Jarro	3,7	3,35
Quart-Benàger	11,00	11,00
Puebla de Farnals	9,29	5,06
TOTAL	153,72	52,31

Source: EPSAR (Public Entity of Waste Water Sanitation,2015)

- Users: Traditional irrigation.
- EPSAR (Public Entity of Waste Water sanitation) finances tertiary treatment.
- Discharge holders have a reduction in their Discharge Control Fee.



Water reuse in Valencia and its metropolitan area

Future challenges and action lines

Technical aspects:

- seasonal gap between offer (continuous) and demand for irrigation (summer).
- important pumping to meet demand in some areas.
- high conductivity in coastal collectors.

Economic-financial aspects:

- investment in tertiary and disinfection and in distribution networks and pumping. Need of distributing costs for all beneficiary users of each water resource system.
- water reuse licence involves reduction of discharge to public water domain and consequently the discharge control fee.