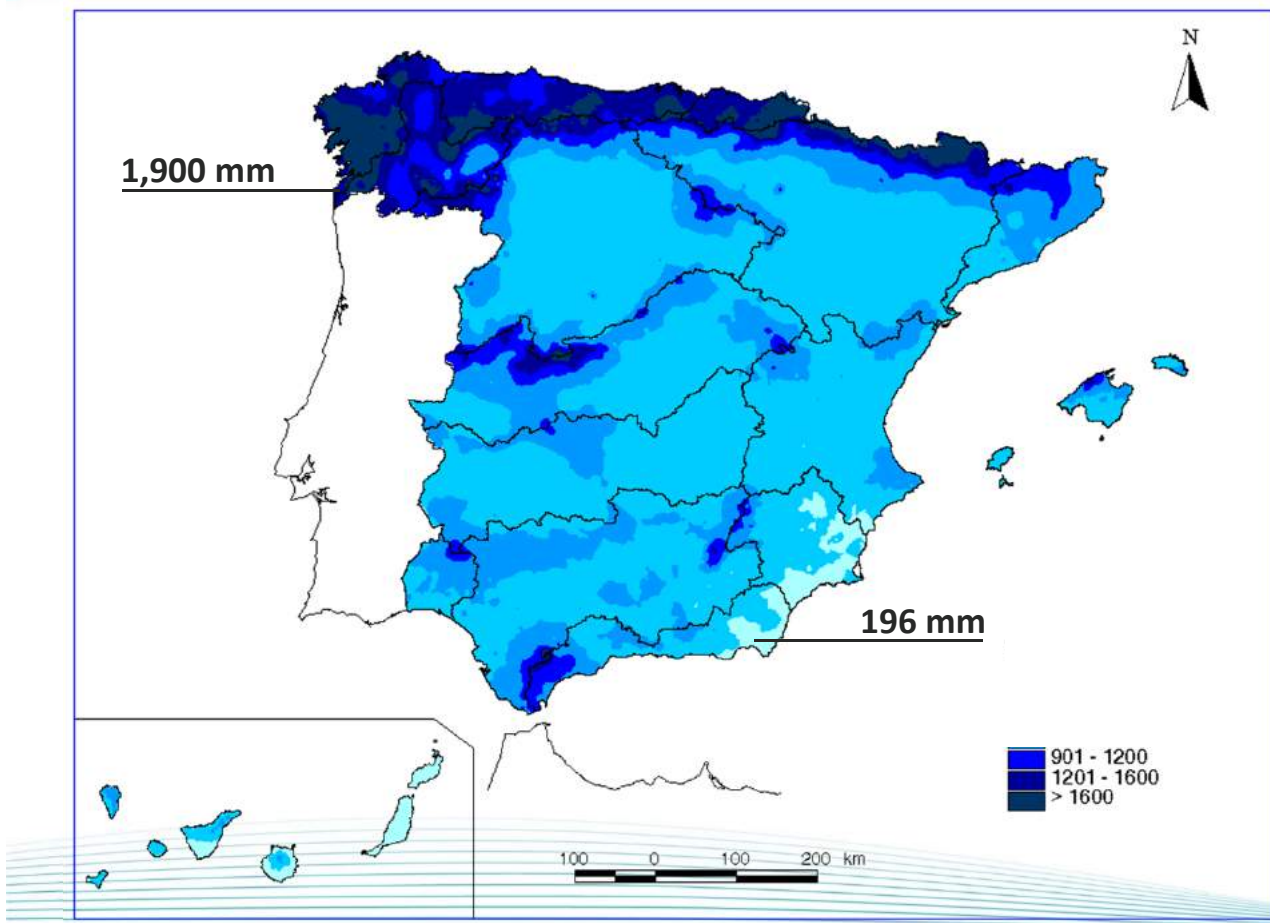


DESALINATION IN SPAIN

Ignacio Glez.-Castelao Mtnez.-Peñuela
Deputy to CEO



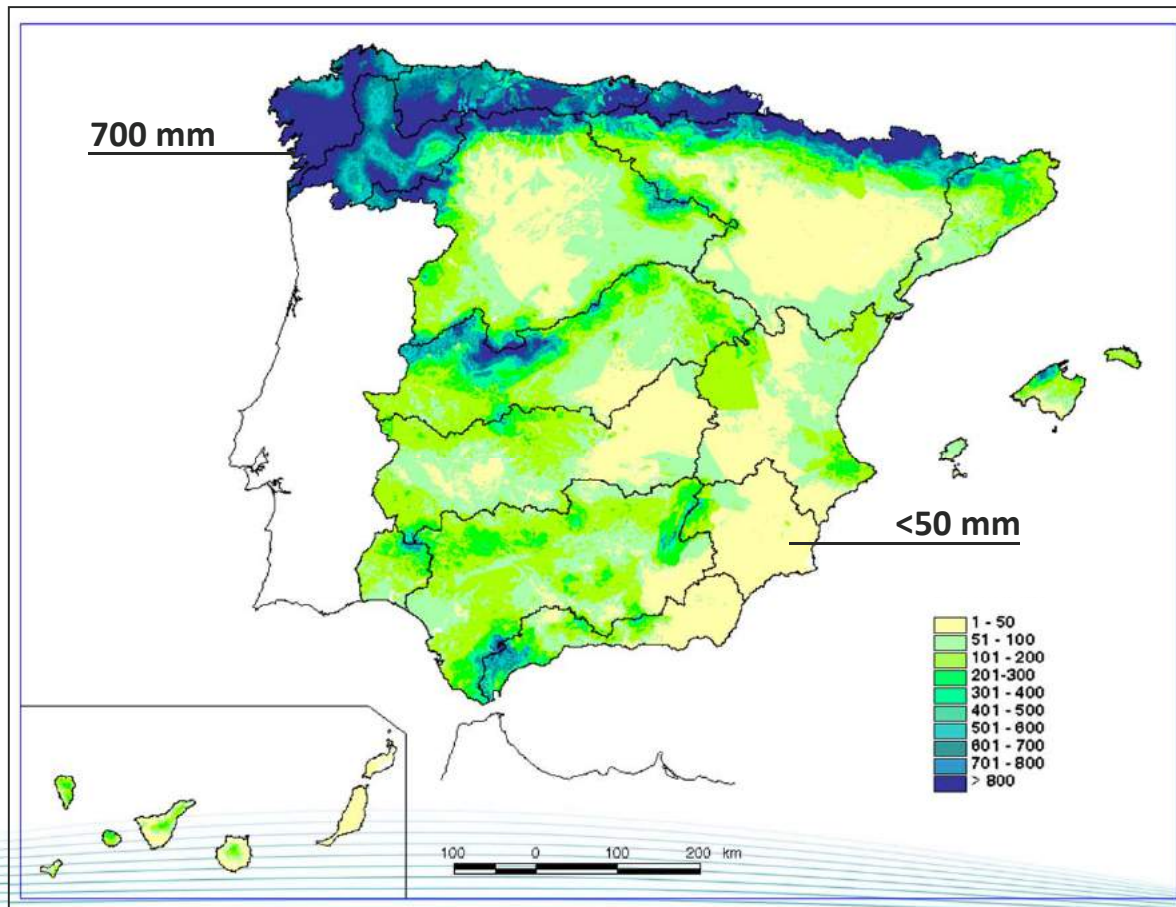
SPAIN | Physical framework



Average annual precipitaton
650 mm

SPAIN | Physical framework

Average annual runoff
220 mm

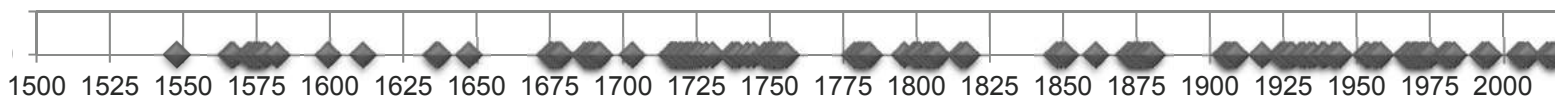


SPAIN | Physical framework



Droughts

Drought Intensity

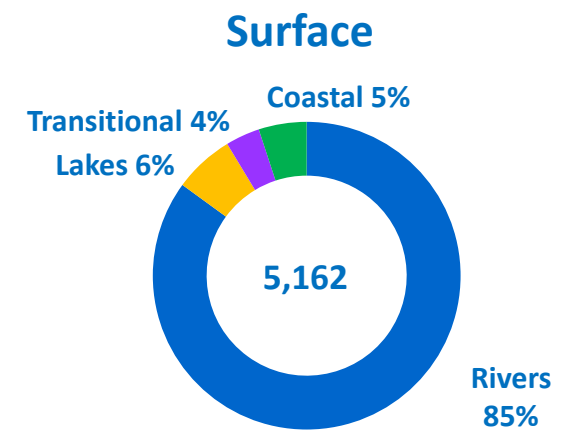


Drought years in Spain

SPAIN | Water Resources



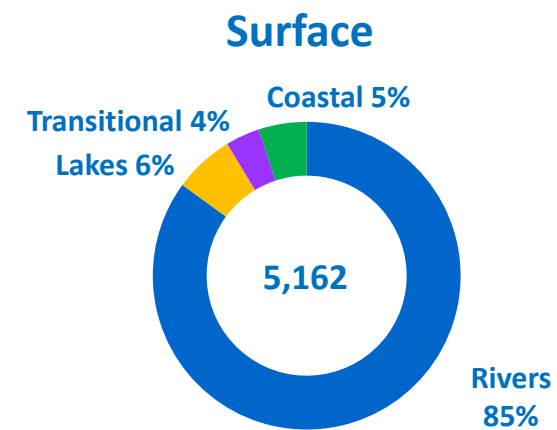
Water bodies



SPAIN | Water Resources



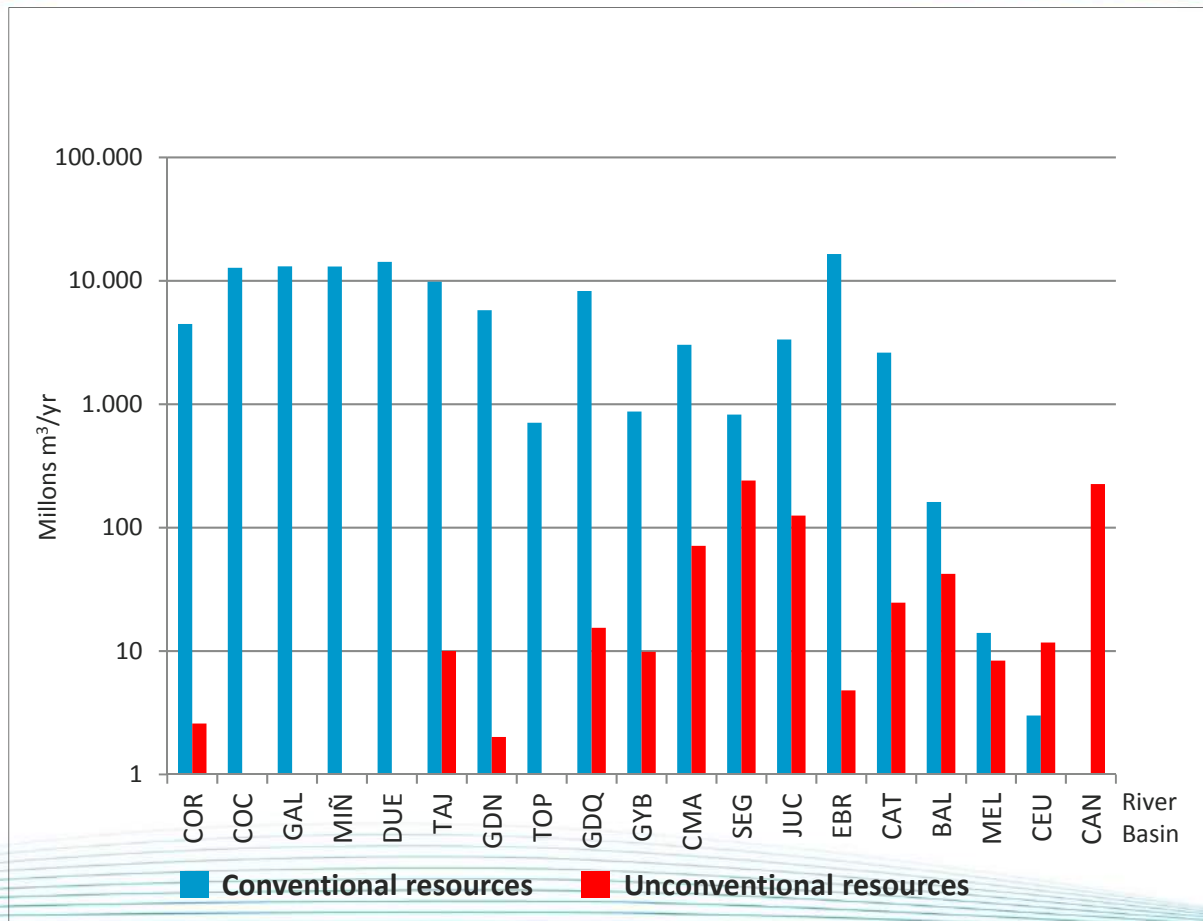
Water bodies



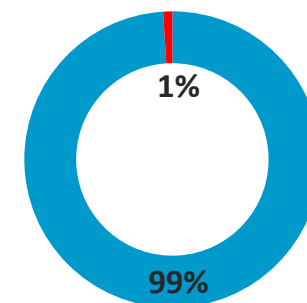
Groundwater

762

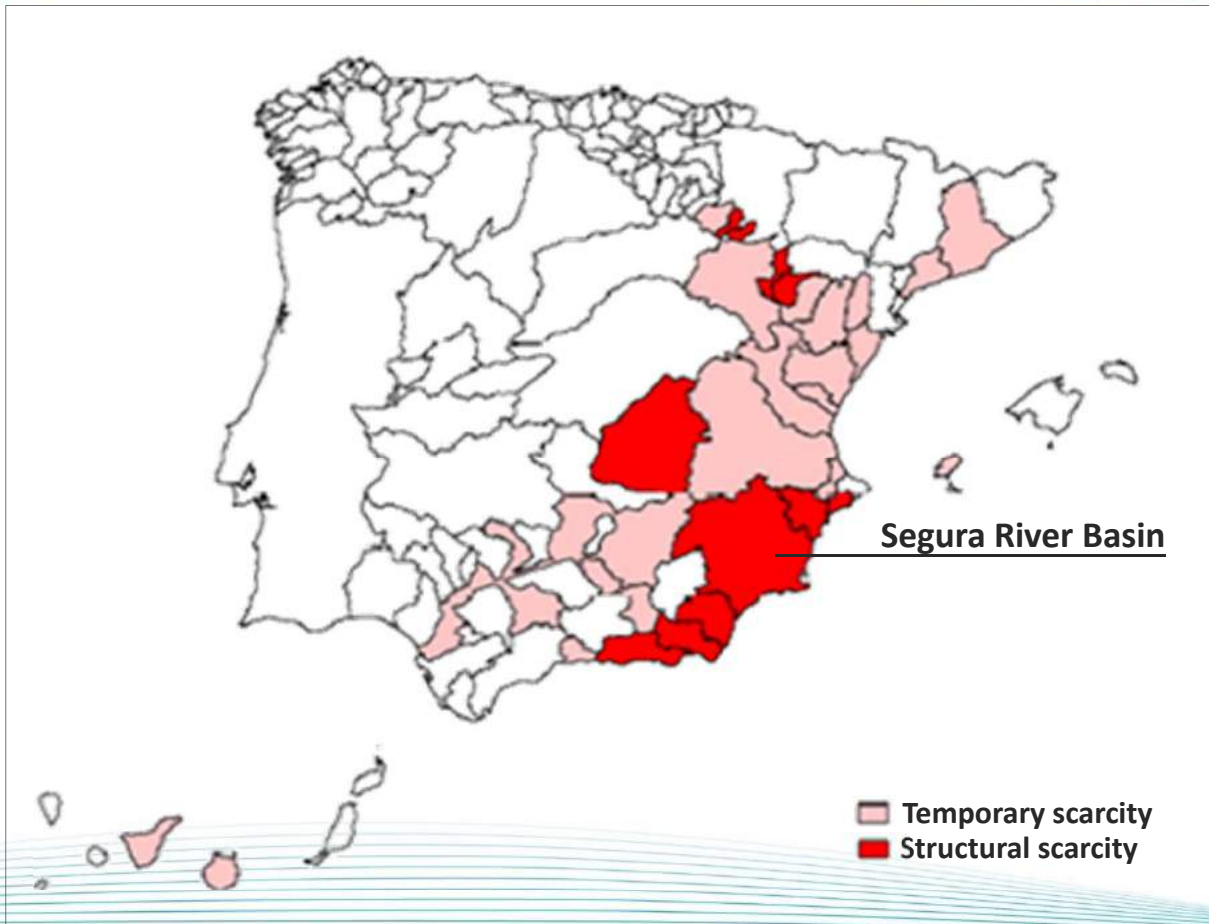
SPAIN | Water Resources



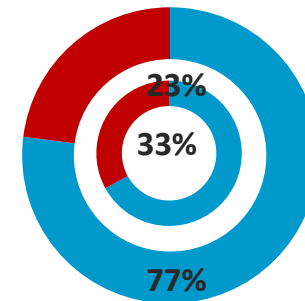
Contribution of water resources under natural regime
~110,000 Million m³/yr
(35% underground path)



SPAIN | Water Resources

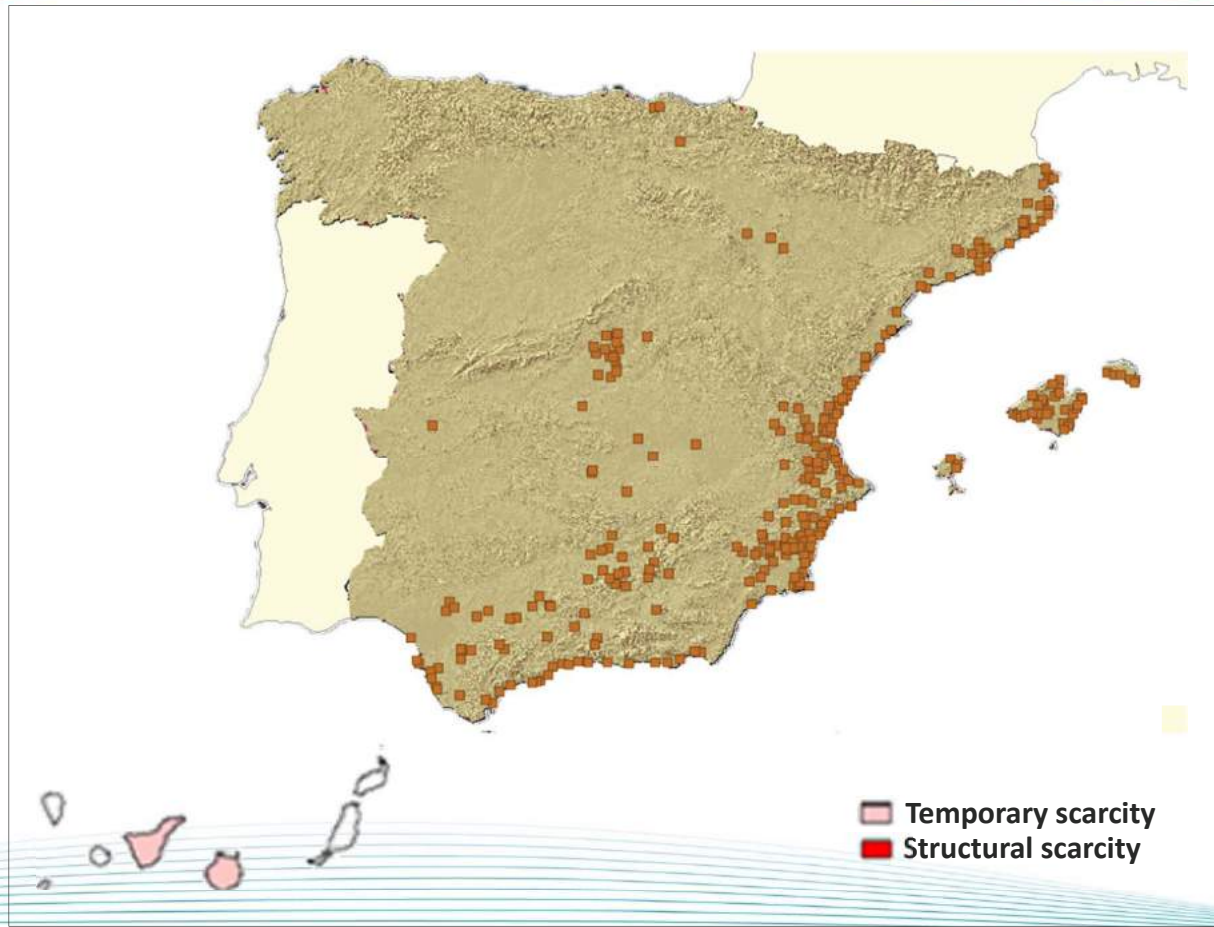


Water Scarcity Unconventional resources



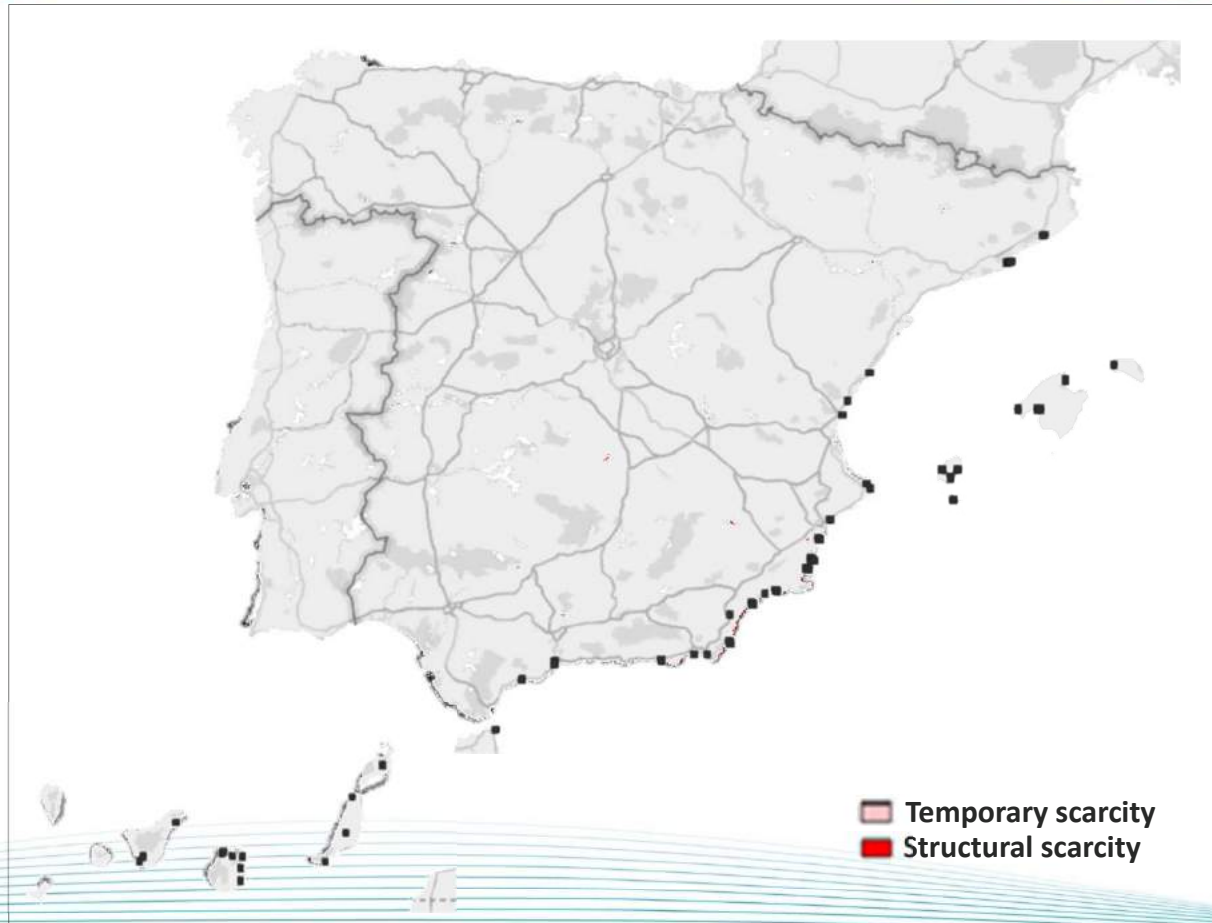
SPAIN | Water Resources

Unconventional Water Resources Reuse



SPAIN | Water Resources

Unconventional Water Resources Desalination



SPAIN | IWRM Desalination & Reuse

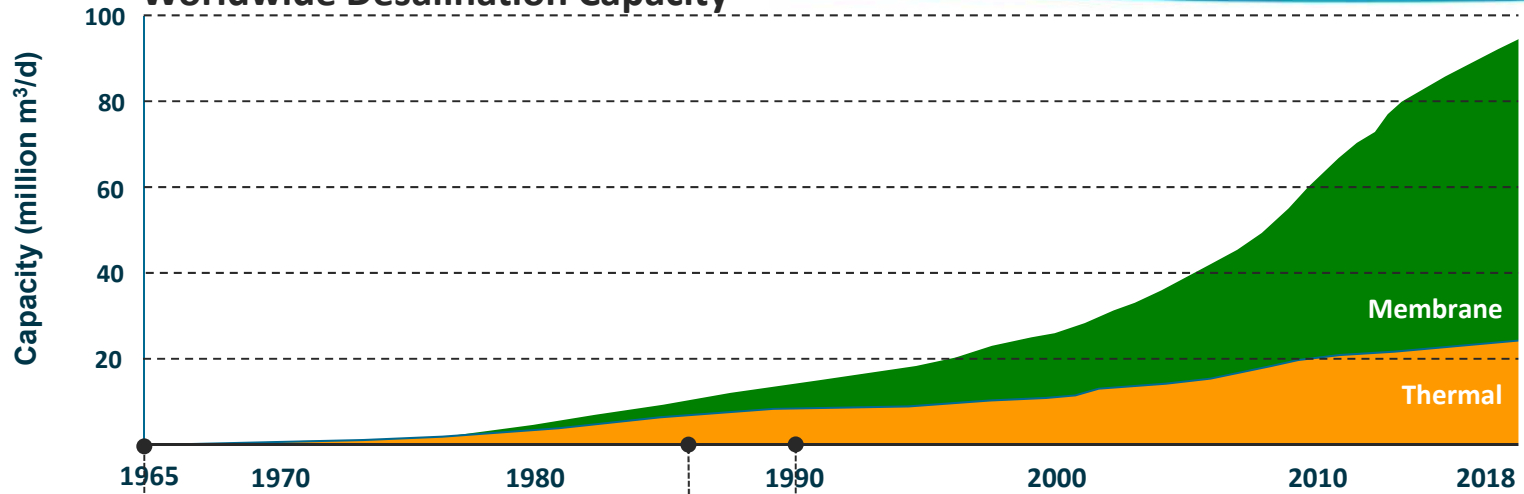


- Legal and regulatory framework
- Treated as an additional source to traditional ones
- Replace other resources when: **Groundwater bodies are in poor condition**
Water scarcity regions
- Management for temporary scarcity situations and prolonged drought
- Supportive measures and incentives



SPAIN | Desalination

Worldwide Desalination Capacity



1964

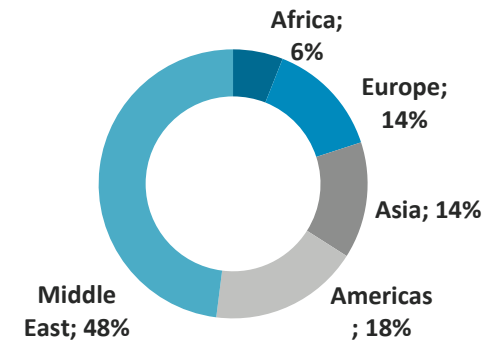
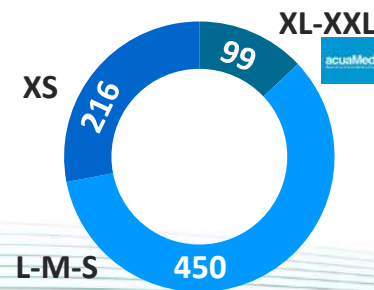
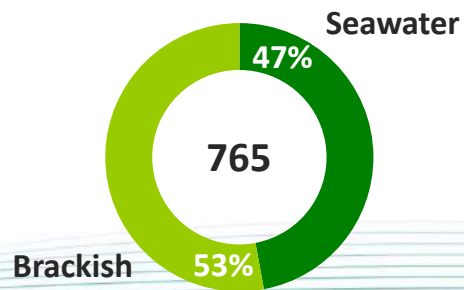
1986 1990



**Governance
+
Innovation
+
Technology**

Source: GWI DesalData / IDAO

SPAIN | Desalination



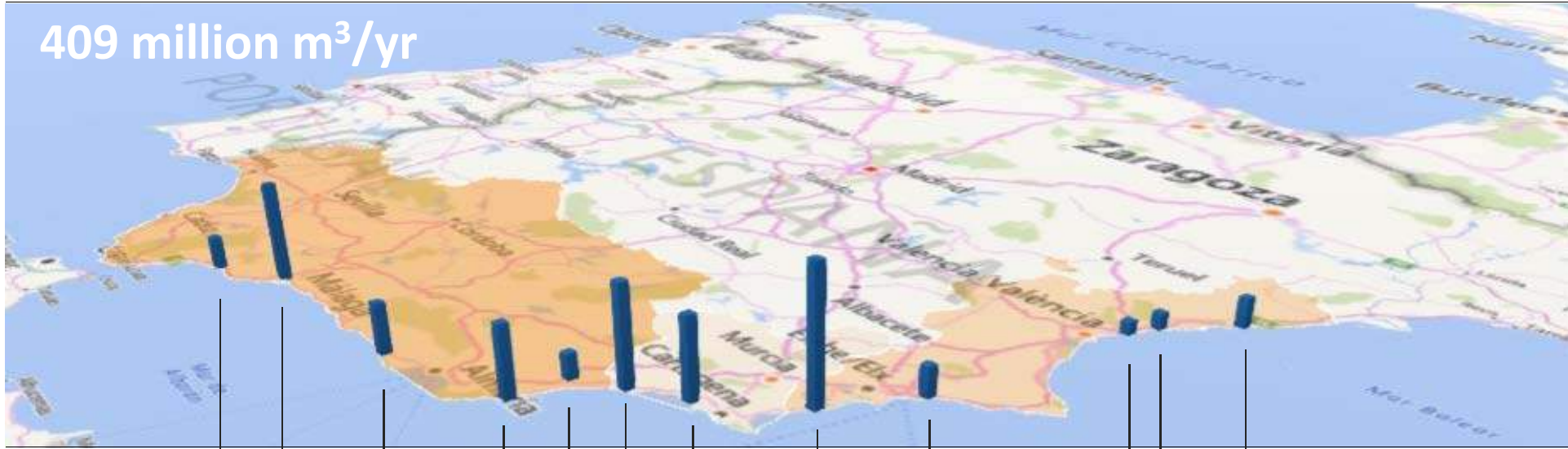
SPAIN



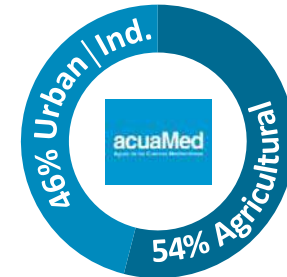
Desalination



409 million m³/yr



| | | | | | | | | | | | |
|---------------|----------------|-------------------|-----------------|------------------|--------------|--------------------|------------------|---------------|-------------|---------------|--------------|
| Marbella (20) | El Atabal (60) | Camp. Dalías (30) | Carboneras (42) | Bajo Alman. (15) | Águilas (60) | Valdeleñtisco (48) | Torre vieja (80) | Mutxamel (18) | Sagunto (8) | Moncófar (10) | Oropesa (18) |
|---------------|----------------|-------------------|-----------------|------------------|--------------|--------------------|------------------|---------------|-------------|---------------|--------------|



SPAIN



Desalination



Investment Costs:
~1,100 € per m³/d



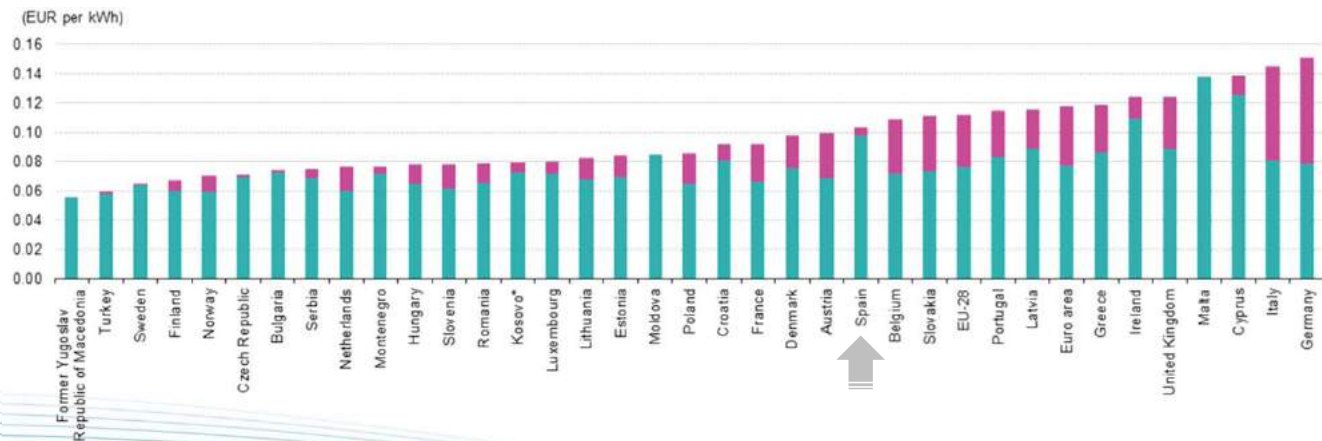
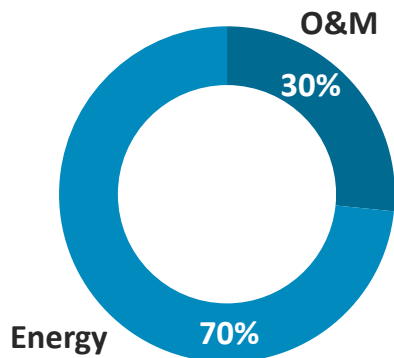
Financial sources



- European funds
- Own Funds
- External finance

Investment recovery ⁽¹⁾ 0.12 €/m³

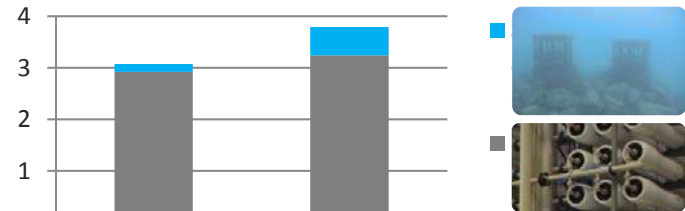
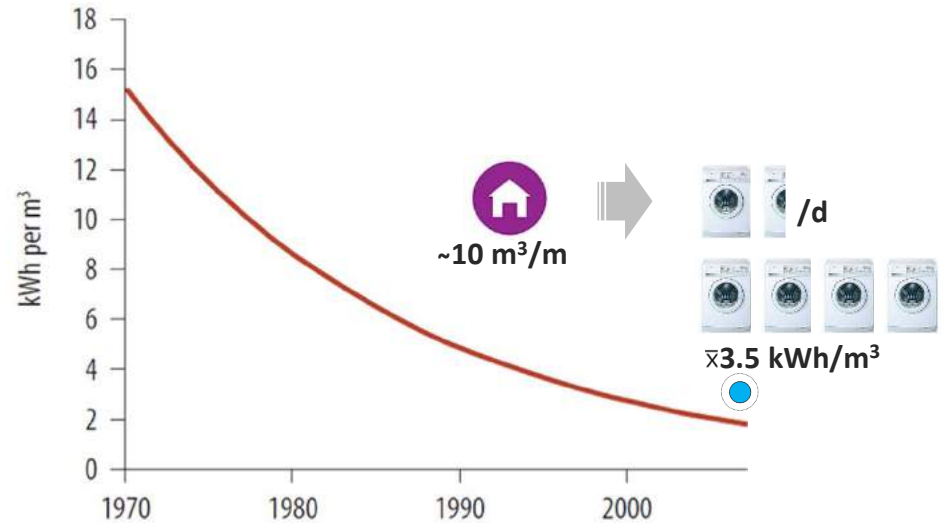
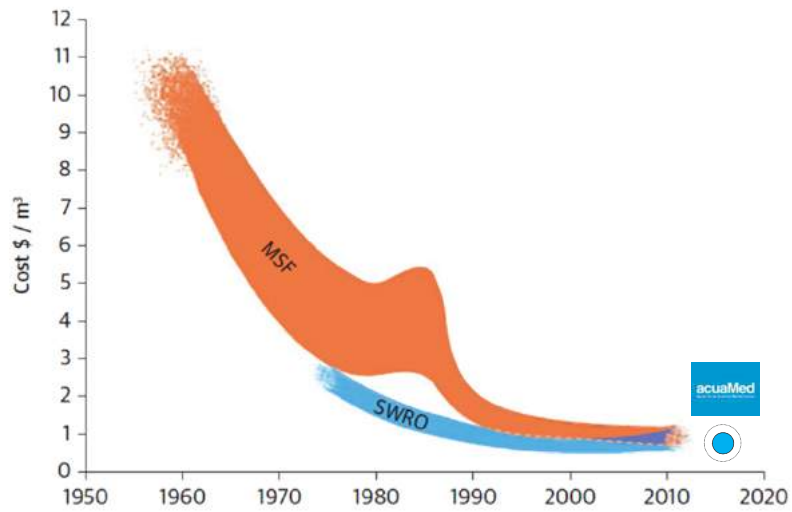
Operational Costs:
0.40 €/m³



⁽¹⁾ E.F. 20% | O.F. 40% | E.F. 40% | 25 years | For production equal to the maximum capacity of the desalination plant. Water distribution Costs are not included in the Op. Costs.

Source: Esutostat

SPAIN | Desalination



Sources: World Bank. 2019. "The Role of Desalination in an Increasingly Water-Scarce World." World Bank, Washington, DC. | Elimelech and Philip

SPAIN |



Desalination



Open filters



Pressurized filters

- Low-speed pre-treatment with open and pressurized filters system



SPAIN |



Desalination



- **Low-speed pre-treatment with open and pressurized filters system**
- **High-pressure and energy recovery systems**
- **Semipermeable high-performance membranes**
- **Boron removal**

SPAIN |



Desalination



Seawater intake



Brine disposal (diffusers)

- **Low-speed pre-treatment with open and pressurized filters system**
- **High-pressure and energy recovery systems**
- **Semipermeable high-performance membranes**
- **Boron removal**
- **Intake and discharge systems.**

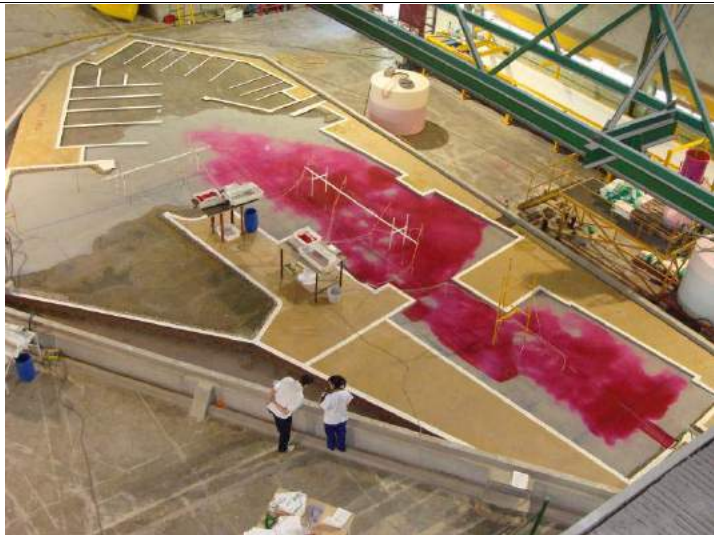
SPAIN |



Desalination



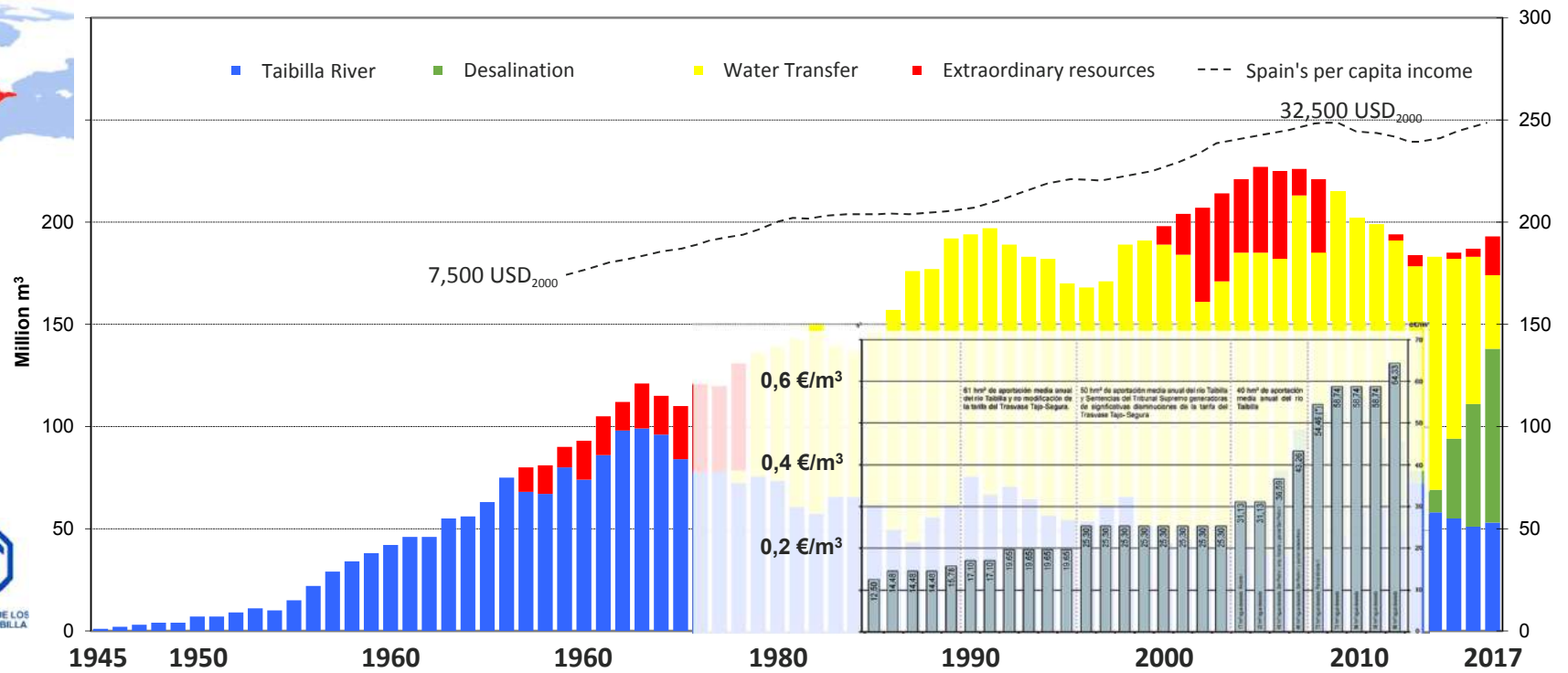
VICEPRESIDENCIA
CUARTA DEL GOBIERNO
MINISTERIO
PARA LA TRANSICIÓN ECOLÓGICA
Y EL RETO DEMOGRÁFICO



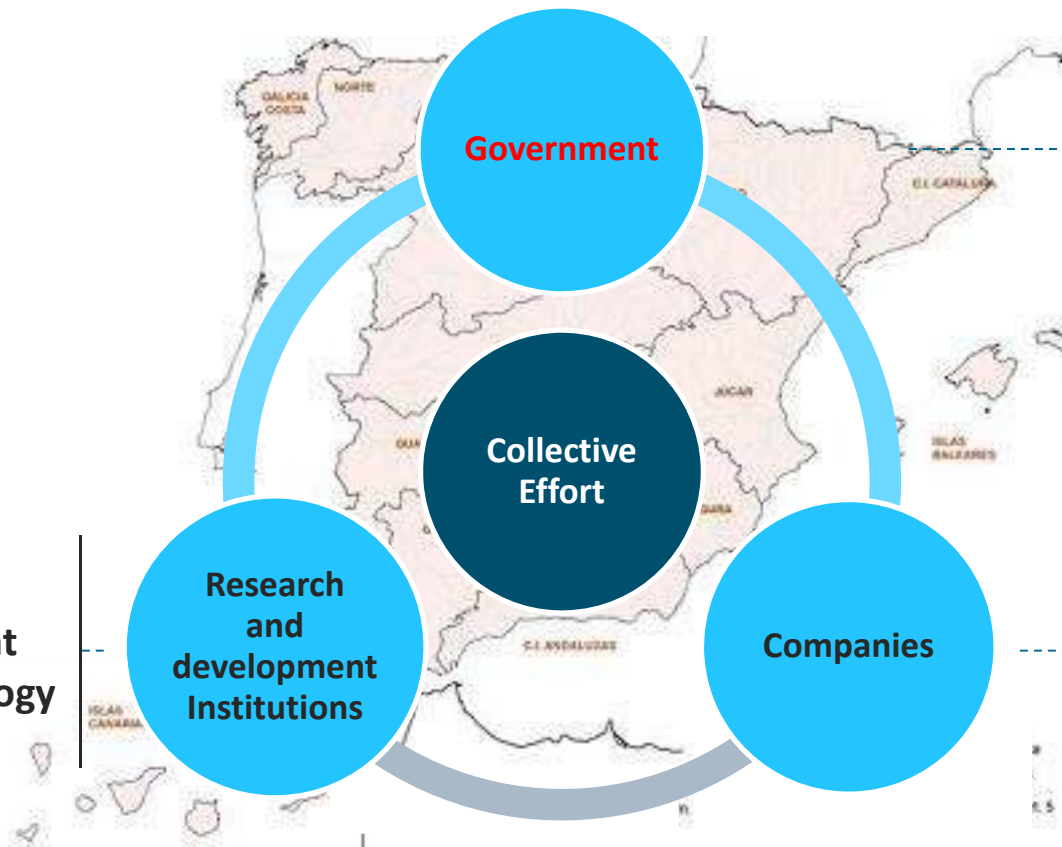
Monitoring of the marine environment

1. Preoperational phase. Definition of situation zero.
2. Construction phase.
3. Operation phase.

SPAIN | IWRM



SPAIN | Desalination



- Research, development and technology transfer

- Promotion and implementation of appropriate policies in water management

- Design, construction and operation
- Technological innovation

SPAIN | Desalination

- IWRM
- Water supply guarantee
- Better risk management
- 1.7 billion people by 2050



140 countries with coastlines
Over 2,000 cities with more than 100,000 inhabitants (1.5 billion people)



Torrevieja – 240,000 m³/day

Ignacio Glez.-Castelao, Deputy to CEO
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