Water Reuse Europe

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Foreseeing the future of water resources management in the Costa Brava

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Where are we?

- Costa Brava is the name given to the coastal strip of Girona province, Catalonia, NE Spain.
- Length of coastline: 214 km, 22 coastal municipalities.
- Huge transformation of society, economy, landscape, land uses in the last 70 years
- Mediterranean climate: hot, dry summers; mild winters; rainy* autumns and springs
  - * Before climate change

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Who are we?

- Consorci d'Aigües Costa Brava Girona (formerly, Consorci Costa Brava) is a public organization created in 1971 and formed by 47 municipalities that provides the following services:
  - Drinking water production and supply to municipalities: 20 million m3/year
  - Wastewater treatment: 30 million m3/year
  - Reclaimed water production: 3.5 million m3/year
- Population
  - Resident population ≈ 300,000 inhabitants
  - Highly touristic area: estimation of peak seasonal occupation at ≈ 1,000,000 inhabitants
- New statutes (2021) indicate that the activity of CACBGI must be consistent with the UN Sustainable Development Goals (SDG).

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Where do we stand in water reclamation?

- Reclaimed water is produced and supplied for a variety of non-potable uses (irrigation, environmental, urban non-potable demands)
- The reclamation facilities developed 20-30 years ago have found their limits:
  - Installed technology does not allow to tackle more ambitious challenges (lack of quality).
  - Irrigation demand is seasonal, almost no need for reclaimed water production for six months/year (October to March).
  - Non-potable urban demands amount very small volumes and thus are seldom beneficial.
  - The cost of infrastructure for water conveyance is very high = water reuse has a limited geographical reach.

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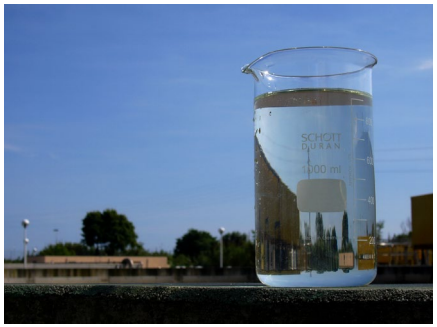
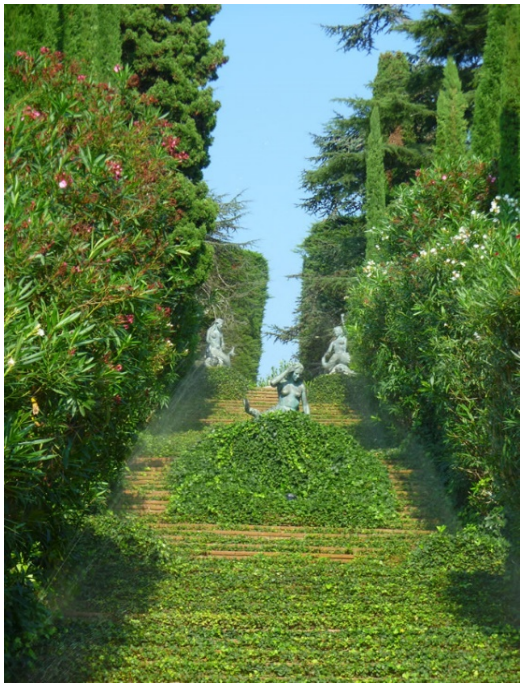
Benefits of water reclamation (so far)





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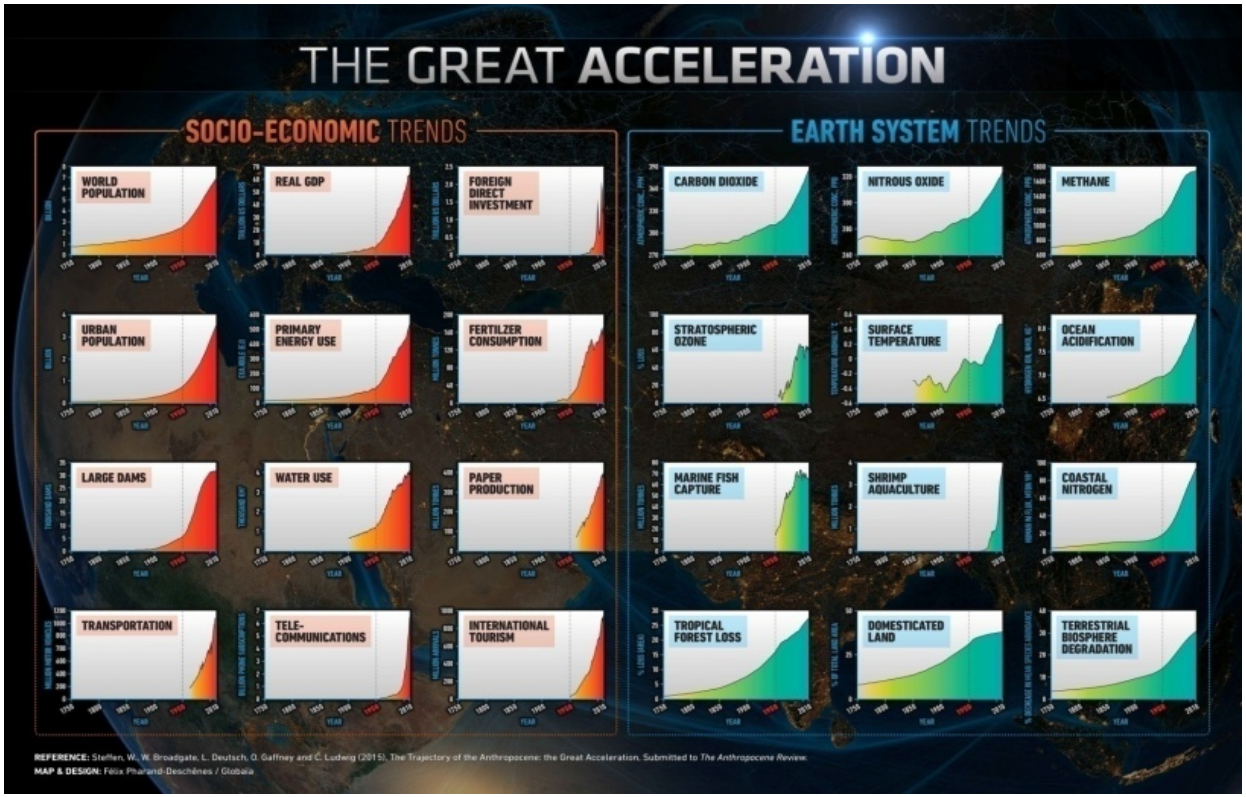
Global context: Living in the Anthropocene



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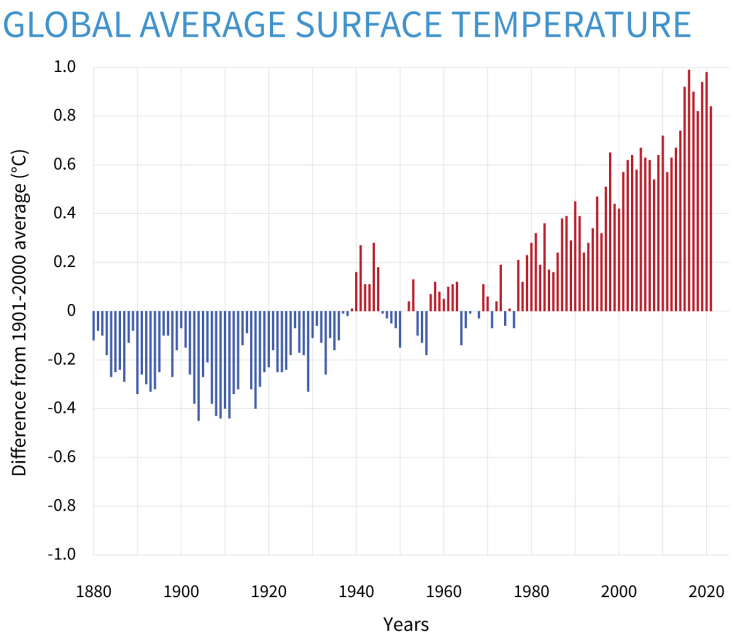
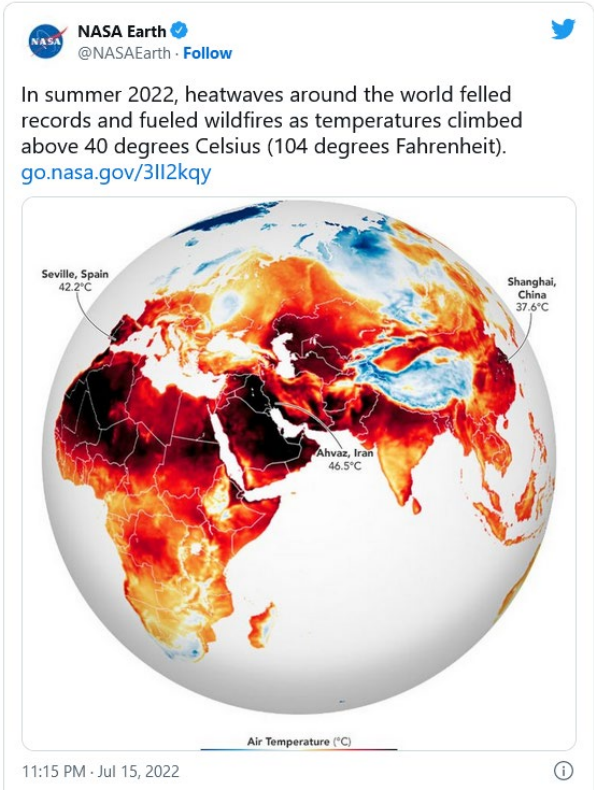
Climate change: The future has already arrived

- The summer of 2022, as terrible as it has been, may still be one of the freshest of the rest of our lives.





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Which challenges do we face?

- **Lack of local freshwater resources**: Most of the drinking water supplied in the coastal area is managed by CACBGI and imported from nearby richer basins, which can't sustain further growth of demand.
- Threats posed by the trends of **climate change**: increase of temperature, decrease of number of rainy days, slight reduction of total rainfall, likelihood of an increased frequency of natural disasters (flooding / drought).
- **Aging facilities**: Facilities built in the 80's and 90's are almost 40-year-old and investments for deep renovation / upgrade / enlargement are needed.
- **Growth of inland demand**: infrastructure initially built for water supply for coastal municipalities is increasingly used by non-coastal municipalities. Potential lack of capacity in periods of peak demand.
- **Tightening of regulations**: need for improving performance, intensification of existing treatments / addition of new processes, increased energy consumption and overall costs.
- **Sustainability**: all this must be planned and developed in the frame of the SDGs.

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Diagnosis of the future – *if business as usual*

- All the **freshwater resources** in the nearby area have been tapped and **fully exploited** – no real chance for importing new freshwater
- Long-term **guarantee of supply** / resilience for the municipal supply is **compromised**
- Social, economic and environmental **impacts expected** on the mid to long term
  - How could economic activity and community welfare could be sustained without adequate water supply, in quantity and quality?
  - How could aquatic ecosystems be preserved ("*good ecological status*", according to the EU Water Framework Directive) if they are overexploited?
- As Peter Gleick (Pacific Institute, California) stated "*water facilities were designed and planned for a situation deemed as normal. But the predictions for the remaining 21st century look far away from being normal, or comfortable*".

Future alternatives for municipal water supply

- To secure municipal water supply on the long run, **new / alternative / decentralized** water resources are needed:
  - Located as near as possible of the urban areas.
  - Predictable, reliable and usable volumes, even during drought periods.
  - Production has a moderate / acceptable consumption of energy.
- Alternatives:
  - **Seawater desalination**: Widely accepted and without public health implications, but with high energy consumption; no experience within our organization.
  - **Purification of reclaimed water and aquifer recharge**: Technically challenging, public health issues need to be addressed, but lower energy impact and more SDG-oriented. CACBGI has a 30-year background of managing water reclamation systems.

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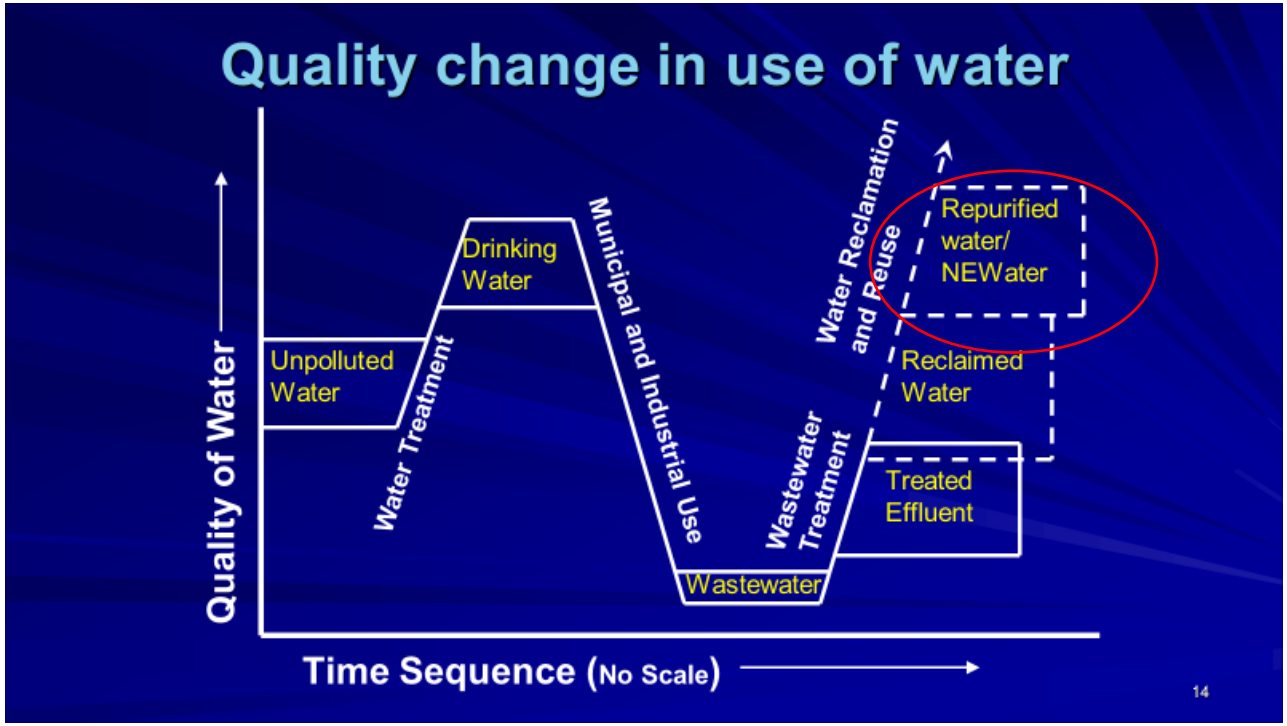
Our vision

- We must learn **new ways to produce drinking water** other than importing it from increasing distances.
- So, we want to draw on successful experiences worldwide (Torreele, Belgium; Orange County, USA and others) in order to **purify reclaimed water up to drinking quality** and store it in the aquifers along the Costa Brava, to improve supply guarantee and increase groundwater quality.
- **Precious freshwater** contained in effluents should not be lost by being discharged into the sea, unless no beneficial use for it.
- Construction and maintenance of **distribution networks for reclaimed water** in municipalities as a standard practice is seen as **unrealistic:** cost; impact on citizen's life; mostly, little added value.
- **Investment efforts made on the treatment / resource side** –water purification to restore drinking water quality and aquifer storage- benefit from the use of the existing network for drinking water supply.

Conceptual scheme



From Takashi Asano's presentation "Milestones in Water Reuse"

Relationship with SDG

- Water purification can be related to the following SDG:
  - SDG 6.3: By 2030, **improve water quality** by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and **substantially increasing recycling and safe reuse.** Globally
  - SDG 6.4: By 2030, **substantially increase water-use efficiency** across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
  - SDG 6.6: By 2020, **protect and restore** water-related ecosystems, including mountains, forests, wetlands, rivers, **aquifers** and lakes

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Next steps

- CACBGI has received a **grant** from the Catalan Water Agency to **build and test a pilot water purification plant** to determine its requirements (technical, OPEX, CAPEX) prior to any full-scale later development.
- Capacity: 6 m3/h
- Location: Roses WWTP, in northern Costa Brava
- Treatment processes:
  - Chloramination; ultrafiltration; reverse osmosis; advanced oxidation; activated carbon filtration and remineralization.
  - Performance will be assessed under different conditions of bypass of RO, to establish those that produce water of drinking quality with the minimum RO treatment.
- CACBGI will promote **the creation of an independent review / advisory panel** in search of a sound technical and scientific progress, aimed at converting water purification into an applicable water resource generation strategy for the future.

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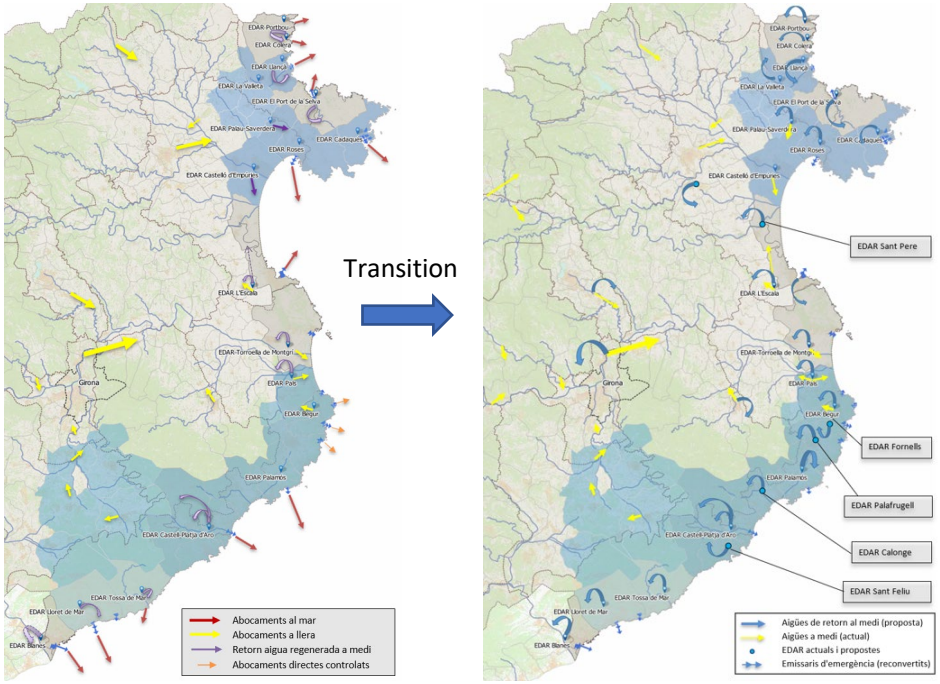
If we are successful…

- By mid 21st century….
  - No coastal aquifer in Costa Brava should be affected by seawater intrusion.
  - Coastal aquifers should have enough water of drinking quality to contribute to municipal supply.
  - Municipalities belonging to CACBGI should have an increase of guarantee of drinking water supply and be more resilient in situations of drought.
  - Circular economy fully developed in the water sector



Credit: Agustí López, CACBGI.

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Summary

- CACBGI, as a provider of drinking water supply, wastewater treatment and water reclamation to 47 municipalities in the coastal strip of Girona's province, is currently undergoing a strategic line of thinking in order to identify the challenges of water management for the forthcoming decades.
- All the freshwater resources in the area are tapped and fully used. No untapped resources to increase supply or improve its guarantee. Climate change is expected to play a major role, affecting the availability of freshwater resources over larger periods of time.
- To secure municipal water supply on the long run, new / alternative / decentralized water resources are needed.
- In compliance with the statutes of the CACBGI and SDG 6.3, 6.4 and 6.6, purification of reclaimed water until drinking quality and storage into the aquifer is thought to be a promising option to be deeply analyzed and tested.
- CACBGI has received a grant from the Catalan Water Agency in order to built and test a purification pilot plant including chloramination, ultrafiltration, reverse osmosis, advanced oxidation, activated carbon filtration and remineralization in order to produce water suitable for aquifer recharge.
- If successful, by mid 21st century we expect to have reverted the way water resources are managed, transitioning from linear to circular. This should be instrumental in improving the condition of coastal aquifers, which in turn would lead to a greater guarantee of supply to our municipalities.

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