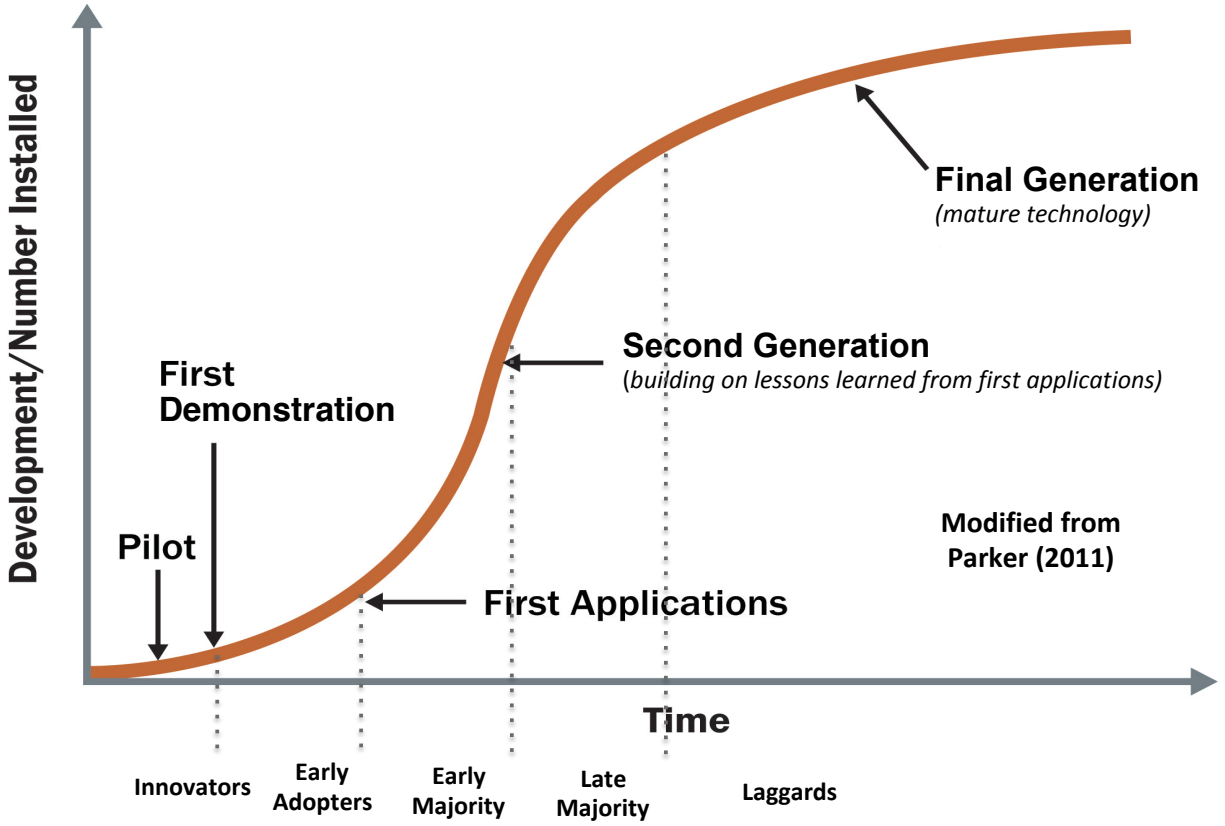
BlueTech Solutions for the Second Half of the Twenty-First Century

David L. Sedlak
Department of Civil & Environmental Engineering
University of California, Berkeley

BlueTech Forum
London, UK
June 6, 2019

S-Curve for Technology Diffusion



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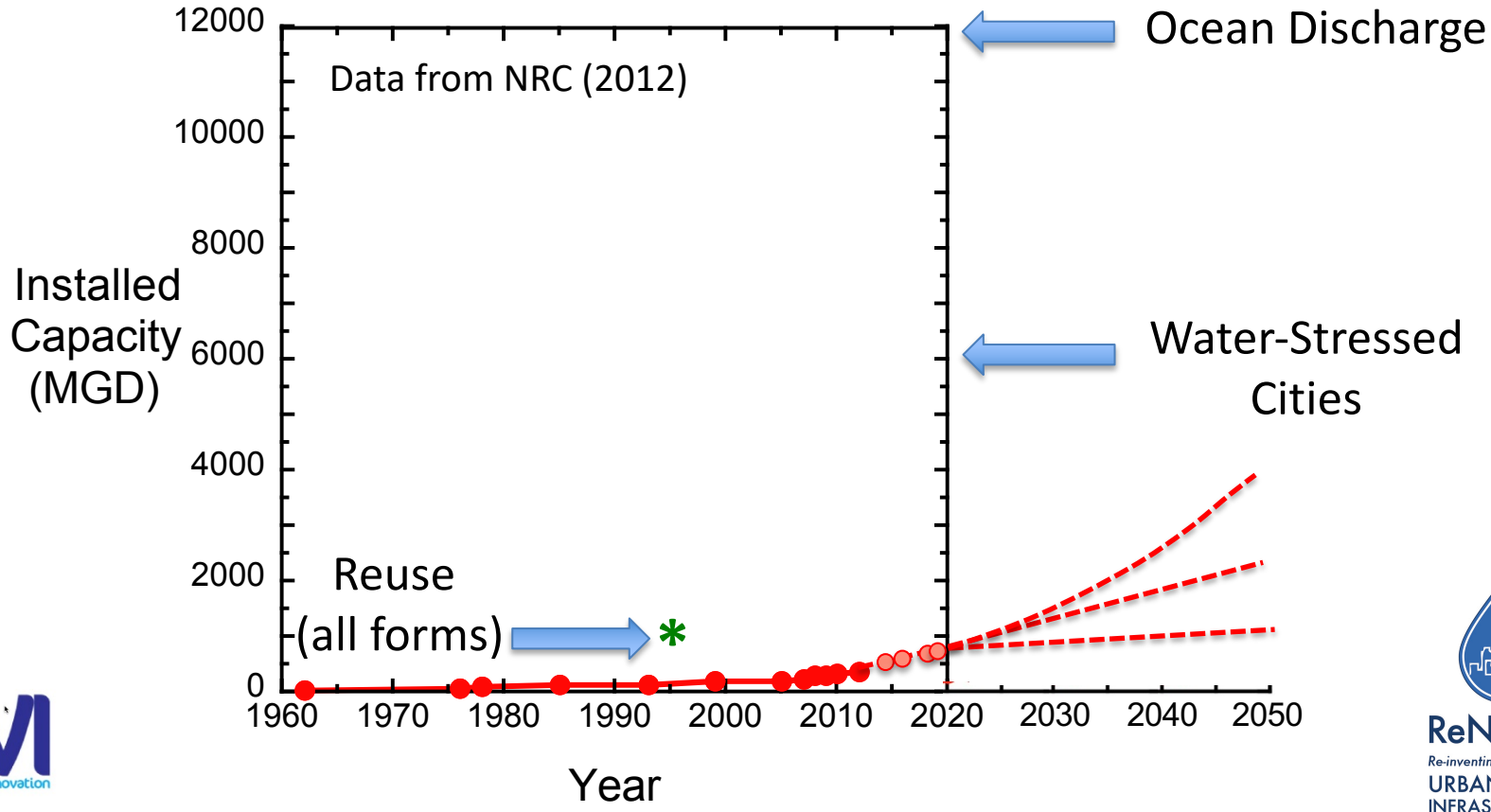
Municipal Wastewater Reuse in USA



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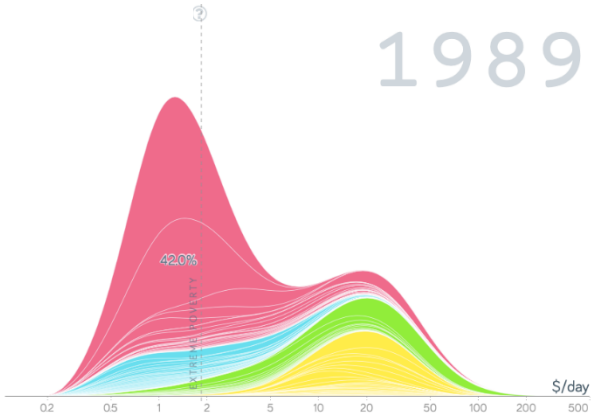
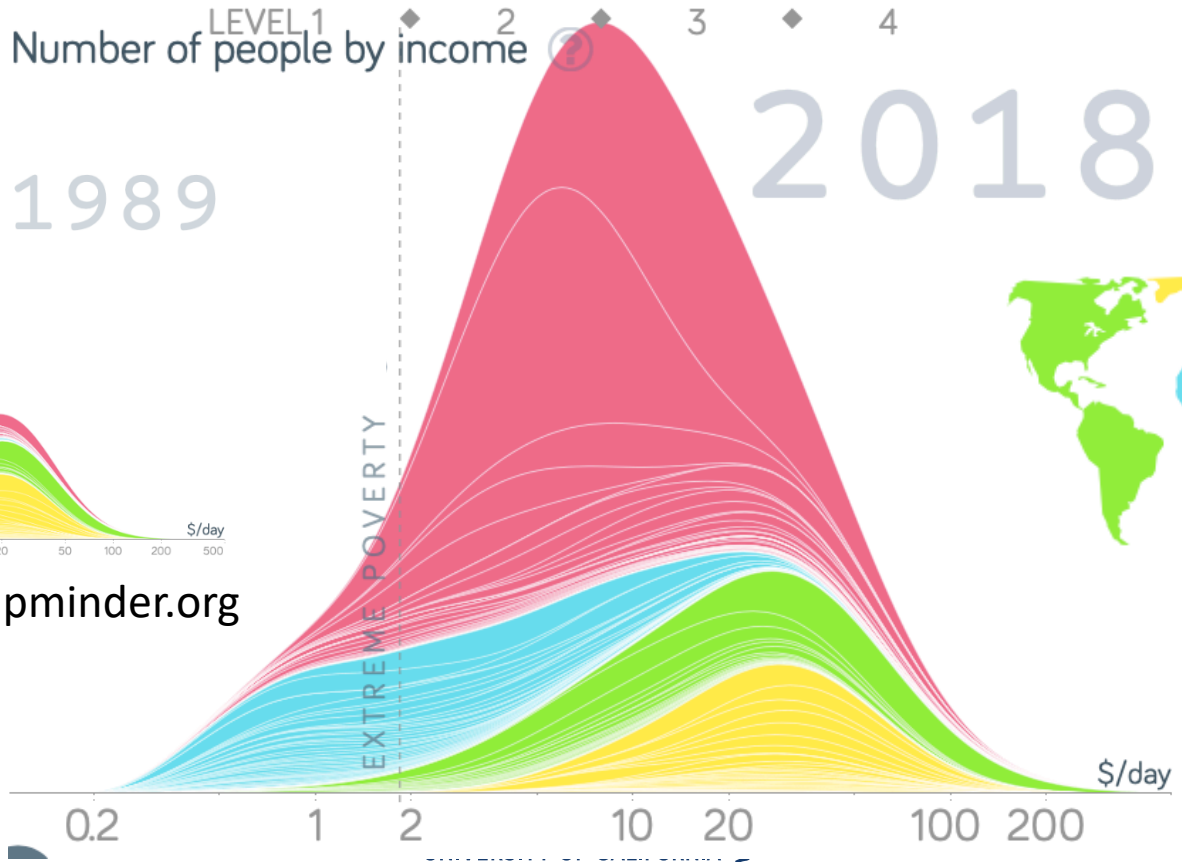
Global Income Distribution



gapminder.org



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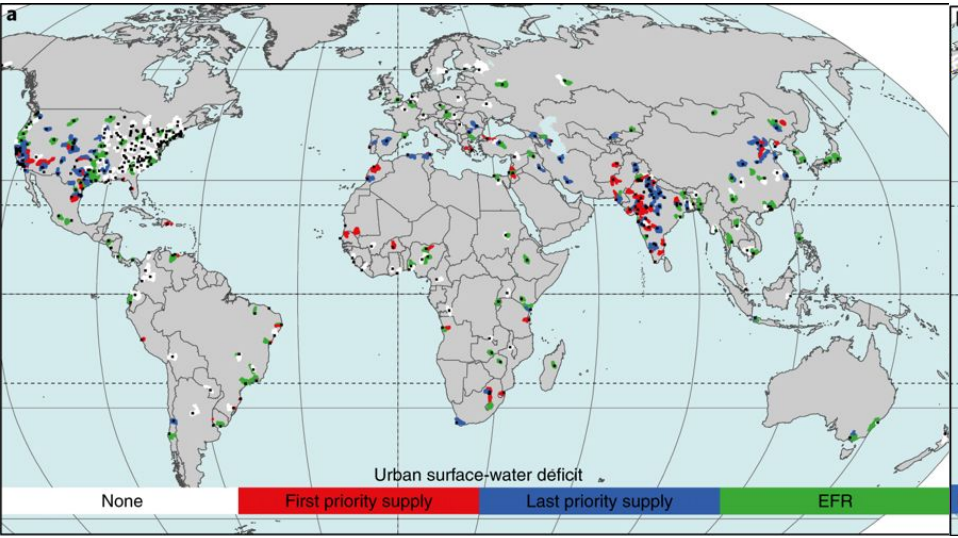
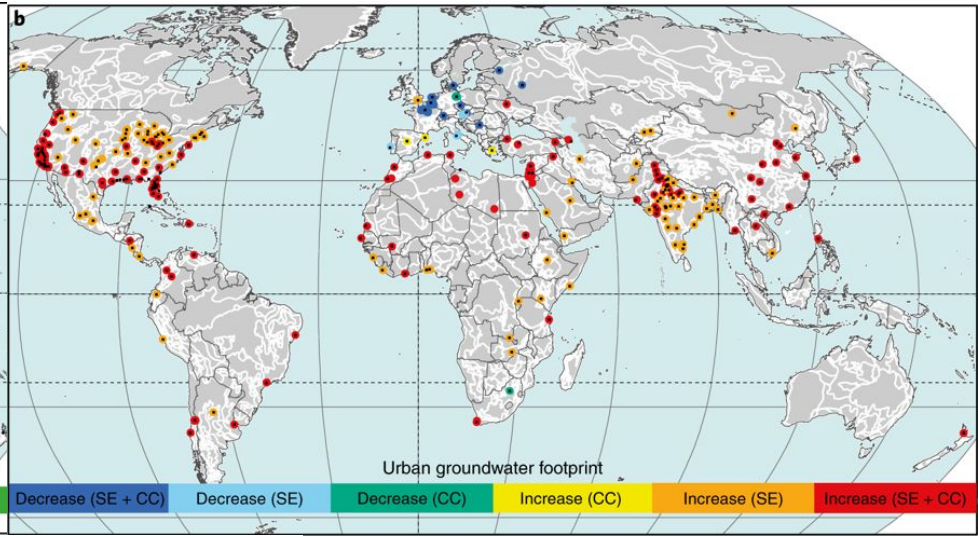
Urban Water Security Challenges

Surface Water Deficits (2041-2070)



27%

Unsustainable Groundwater (2041-2070)



46%

230/482 Cities

Flörke *et al.* (2018)

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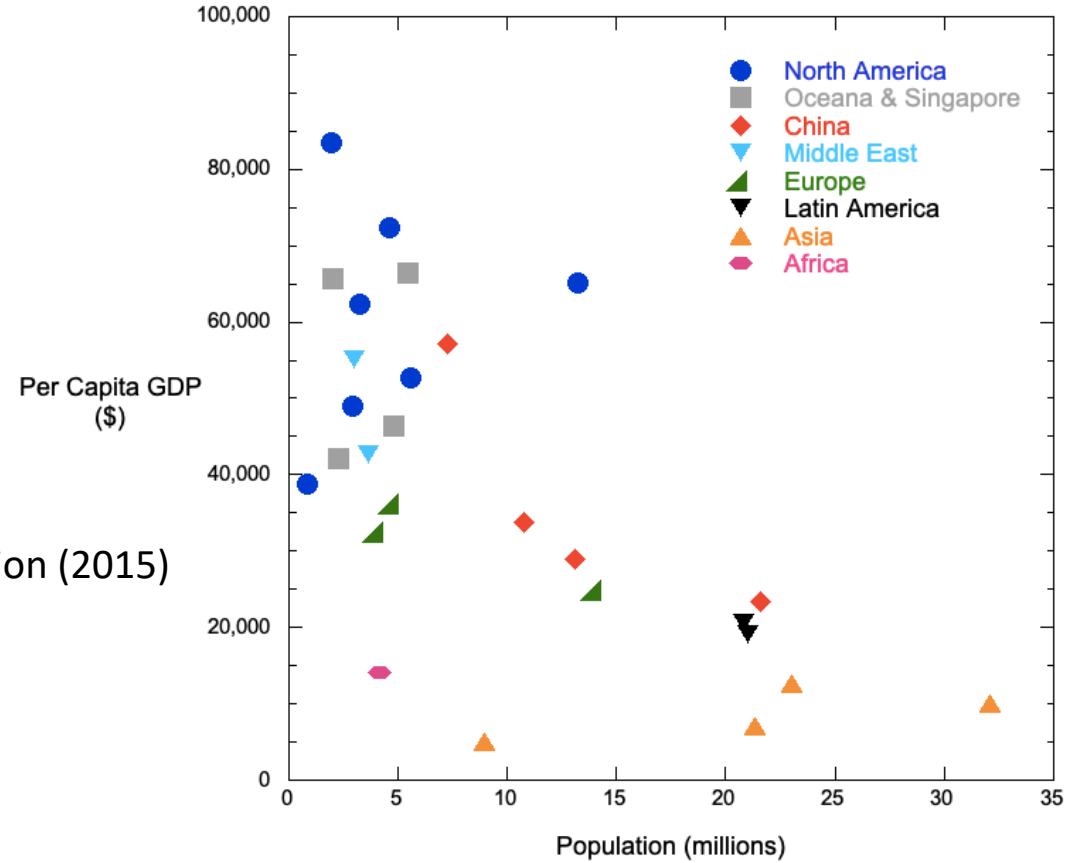
Wealthy City Solutions



Data source:
The Brookings Institution (2015)

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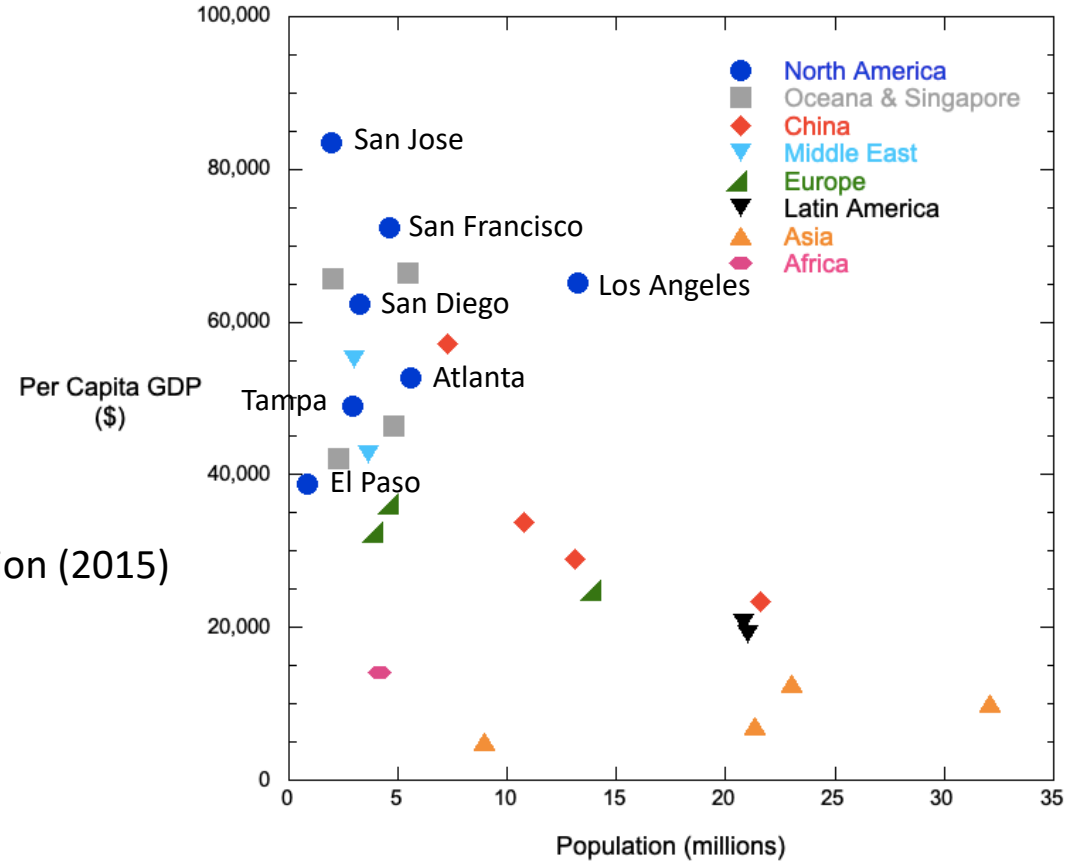

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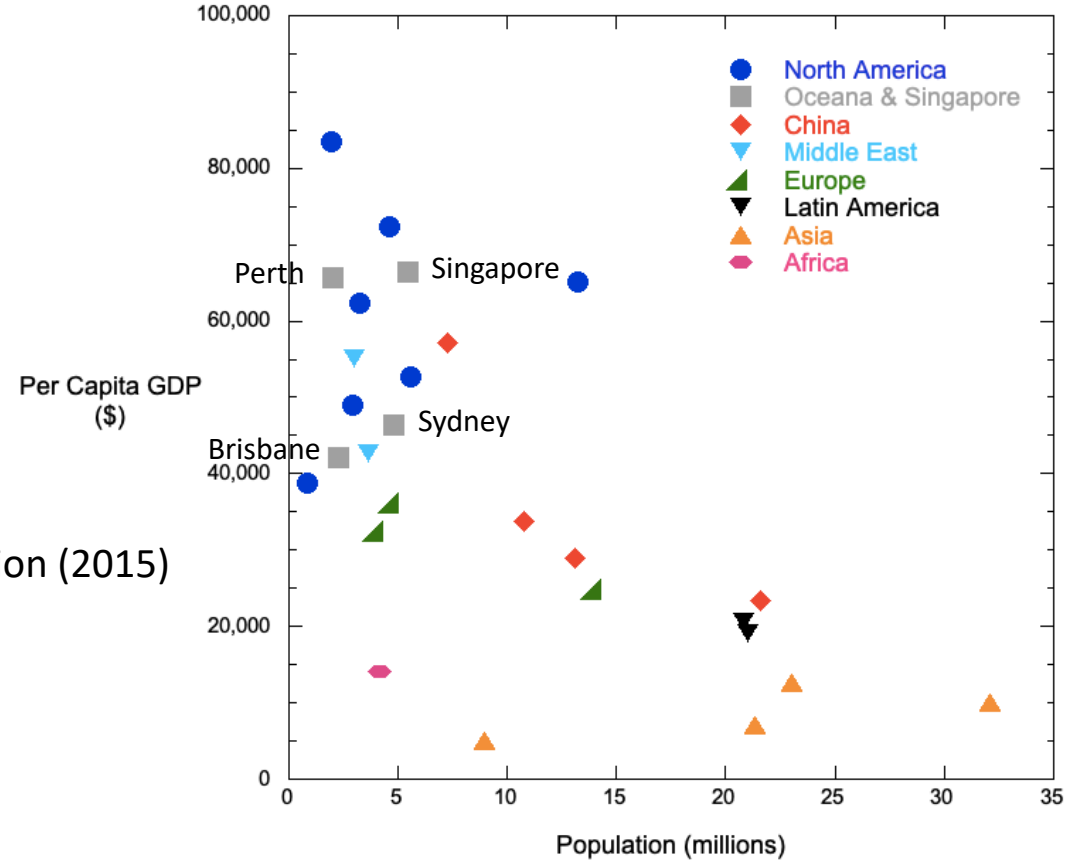

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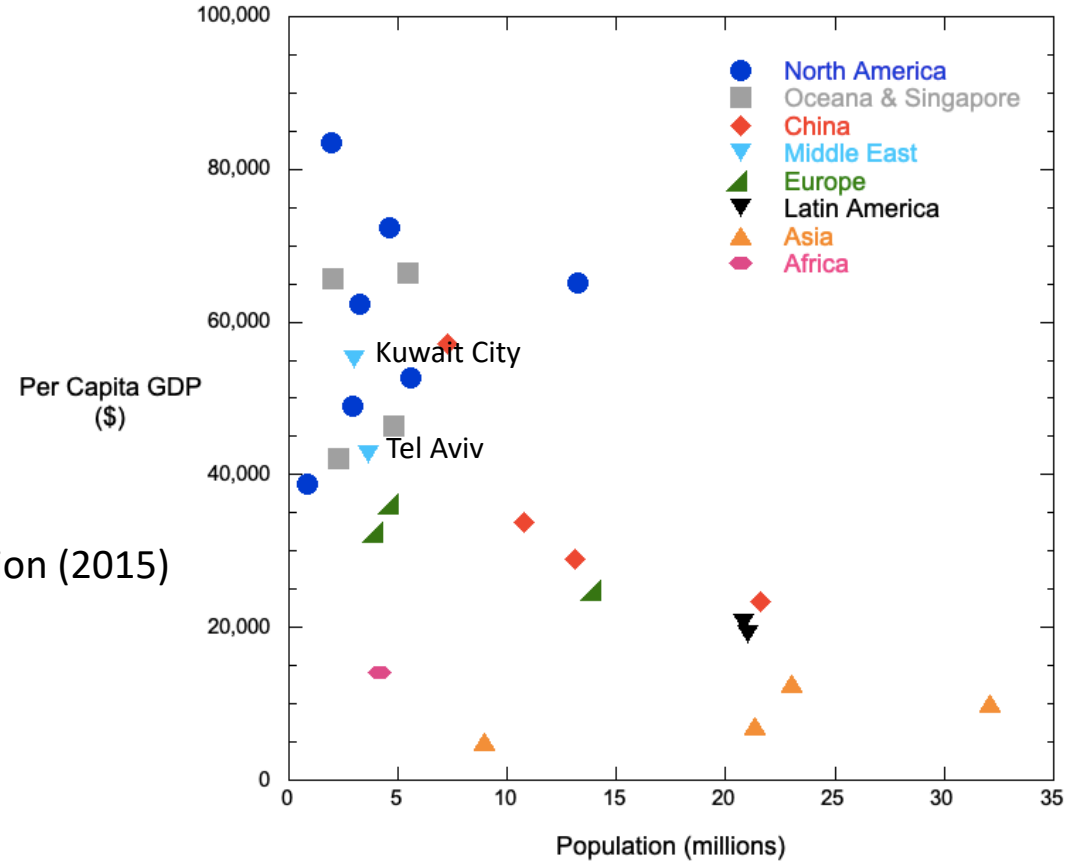

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The Brookings Institution (2015)

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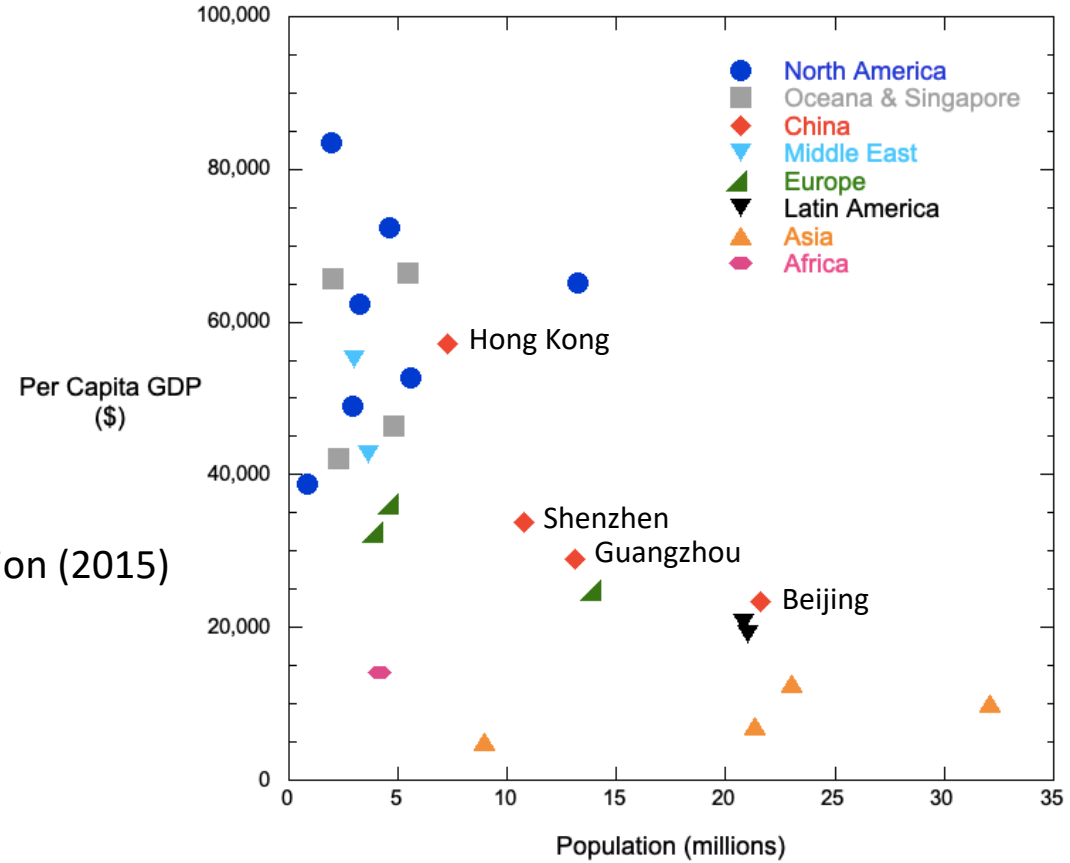
Water Stress in China



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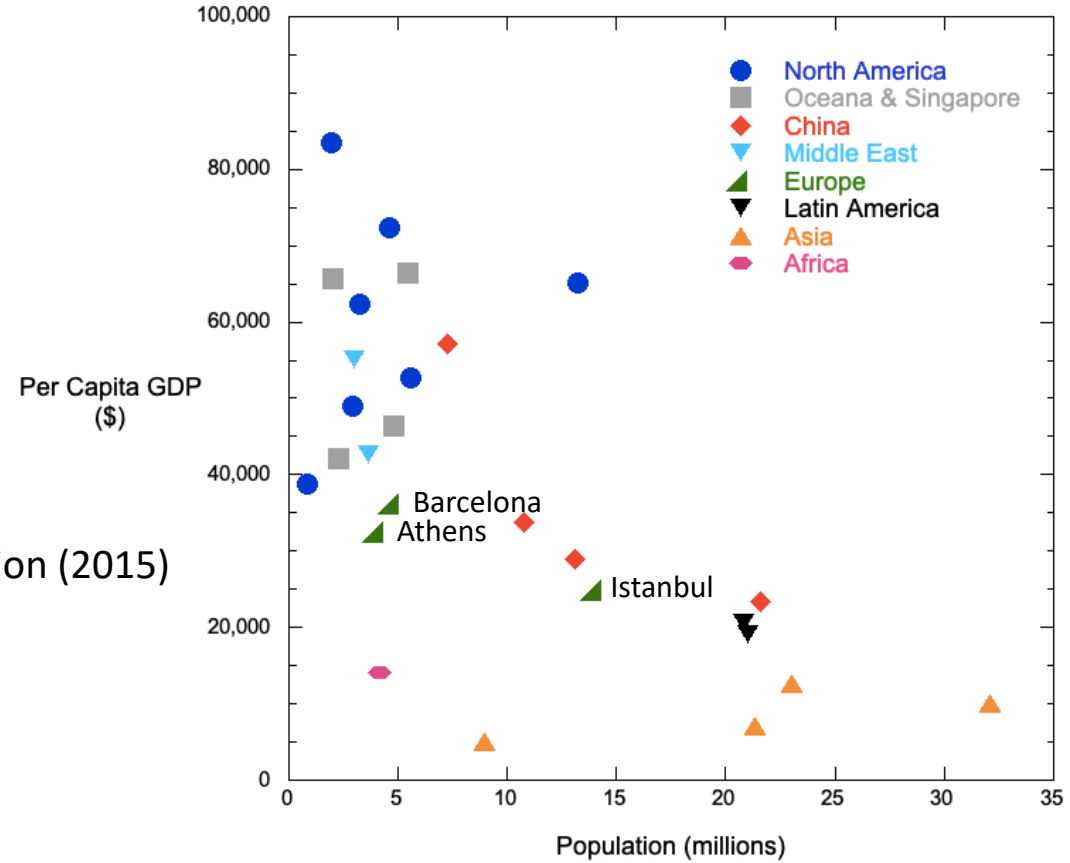
Water Stress in Europe



Data source:
The Brookings Institution (2015)

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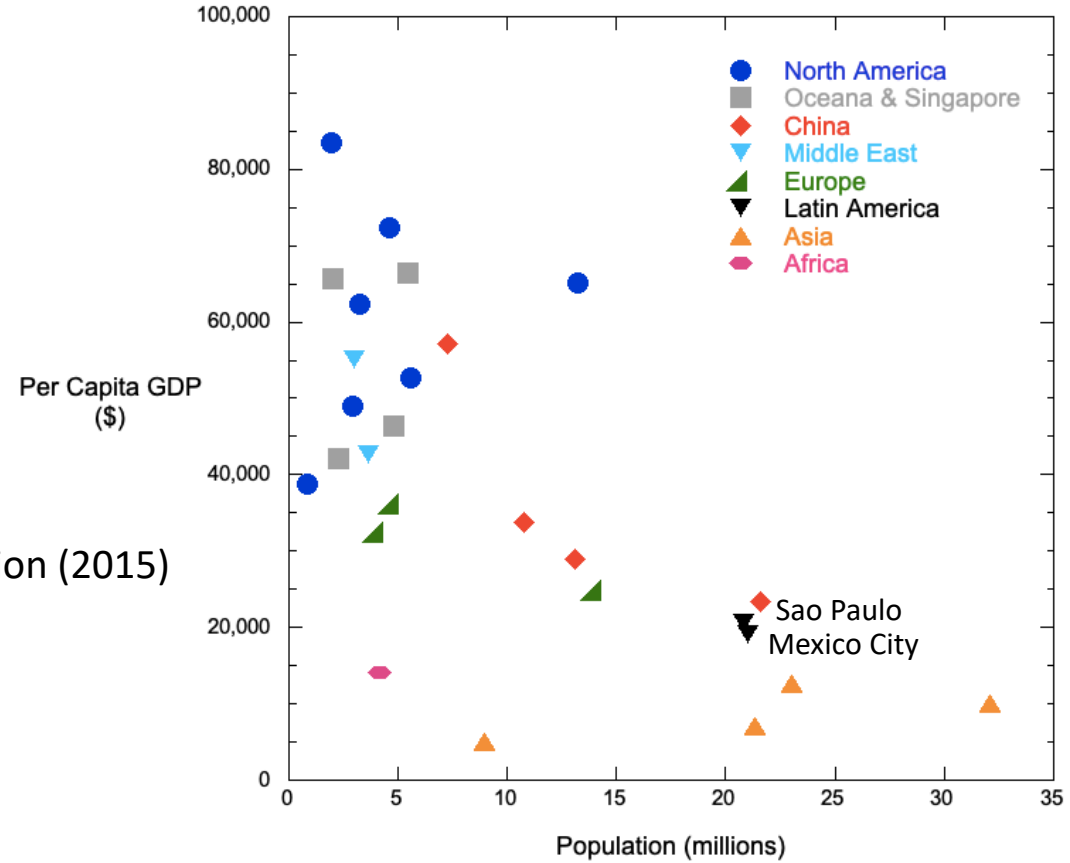
Water Stress in the Americas



Data source:
The Brookings Institution (2015)

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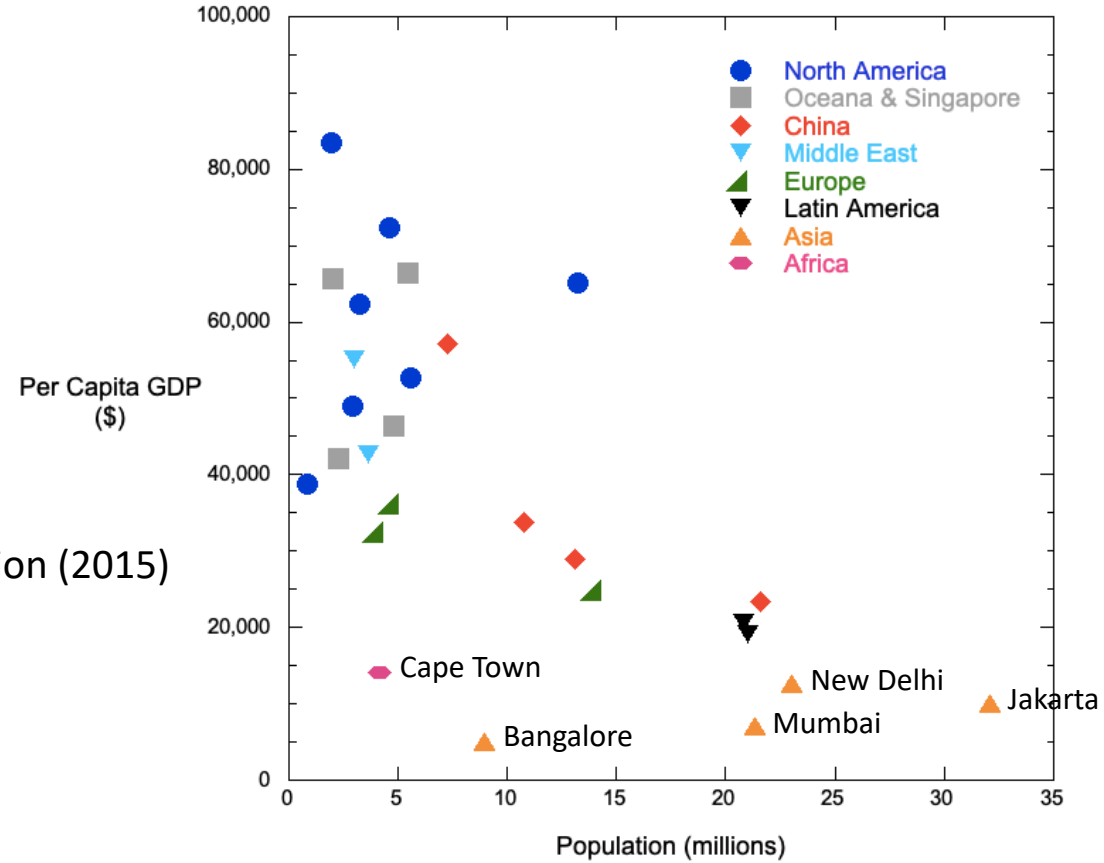
Water Stress in Asia & Africa



Data source:
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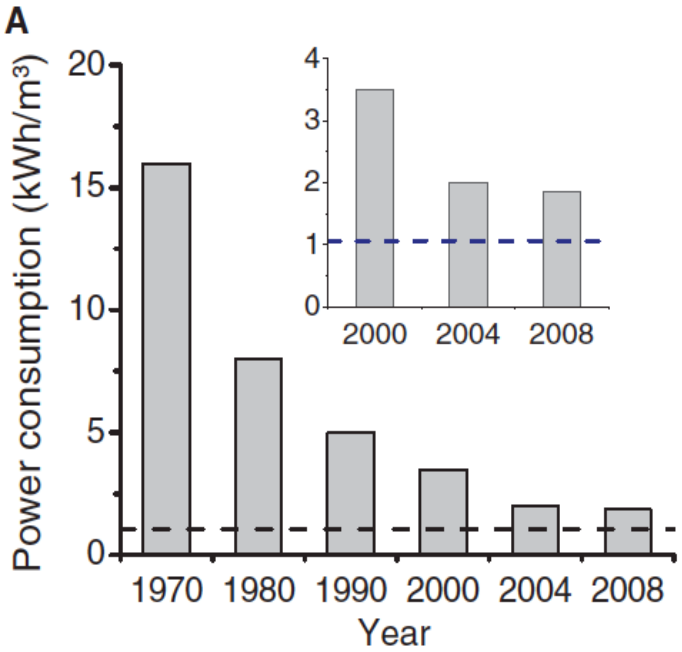
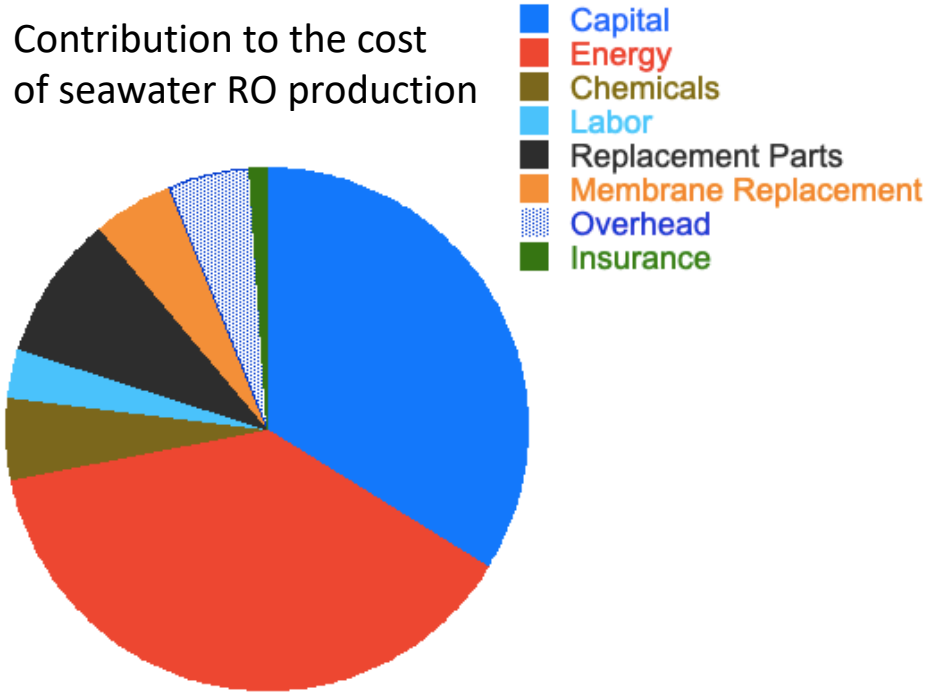
Reverse Osmosis Energy Intensity



Elimelech and Phillip (2011)

Contribution to the cost of seawater RO production



Cohen et al. (2017)

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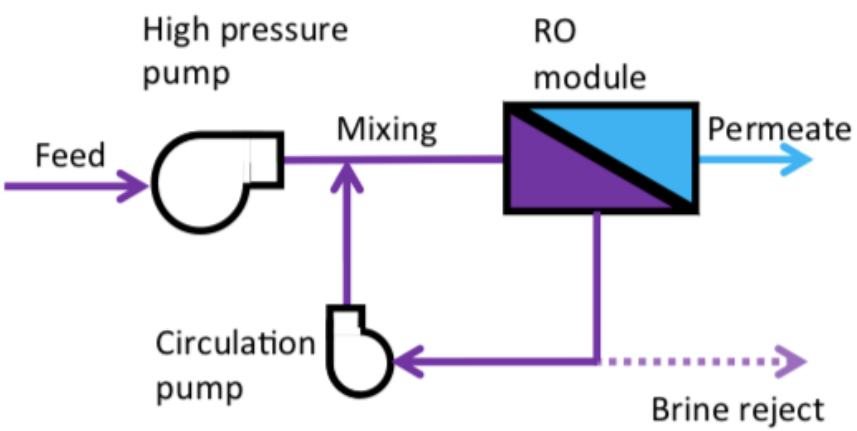
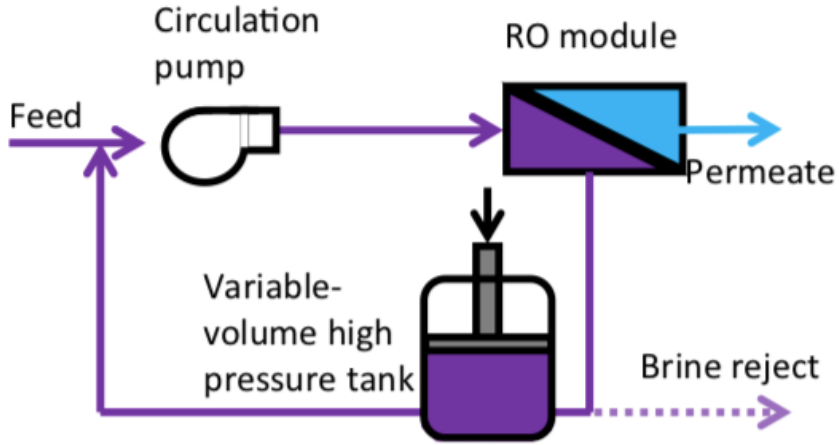
Innovations in Reverse Osmosis

Closed Circuit RO (CCRO)



37% energy savings

Batch RO



64% energy savings

Warsinger et al. (2016)

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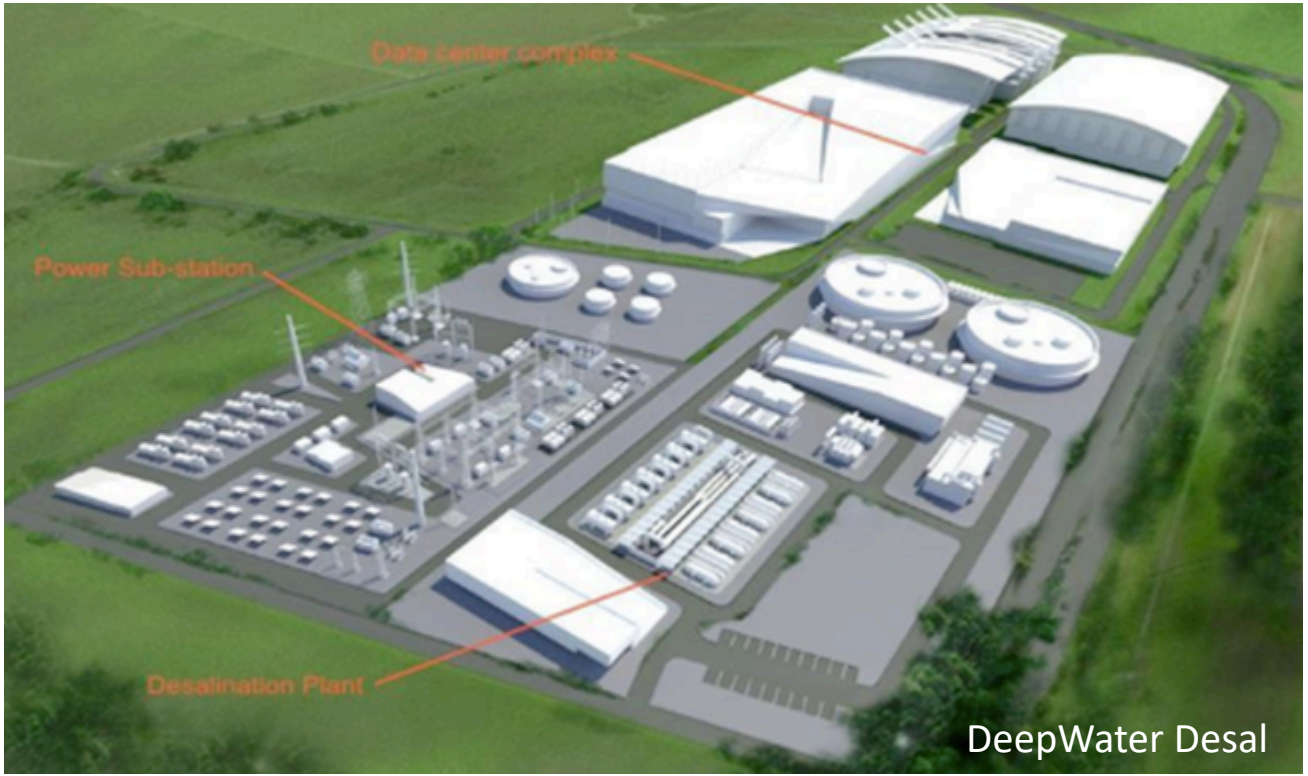
Innovations in Desalination Design



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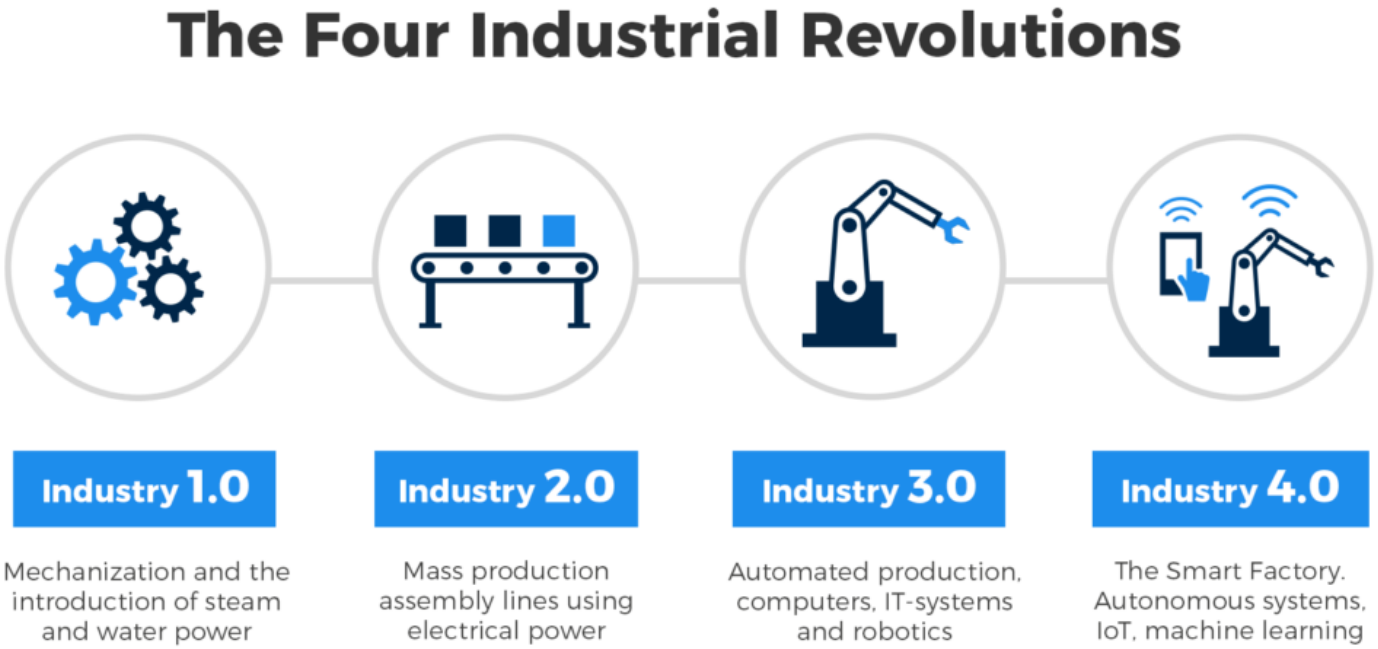
Innovations in Manufacturing



spectralengines.com

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Water for the World's Poor

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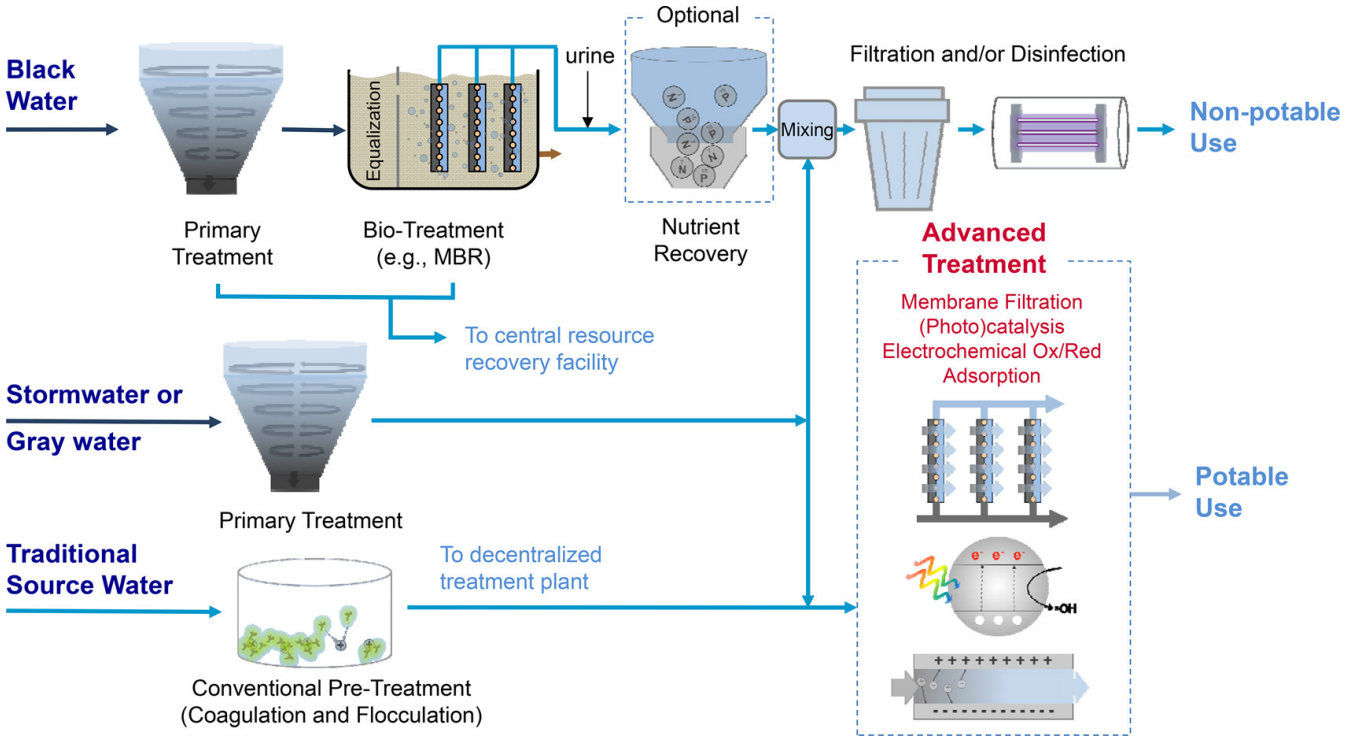
Distributed Water Treatment



Zodrow et al. (2017)

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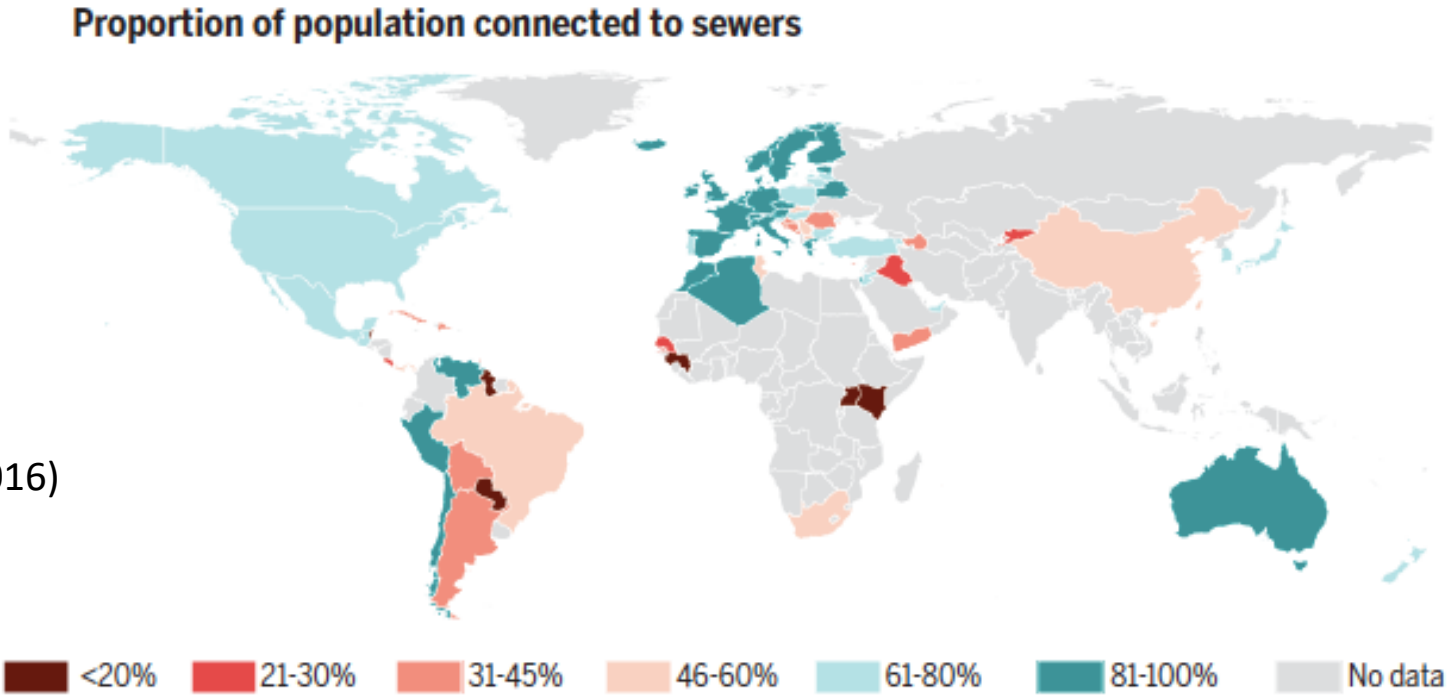
Sanitation Solutions



Larsen et al. (2016)

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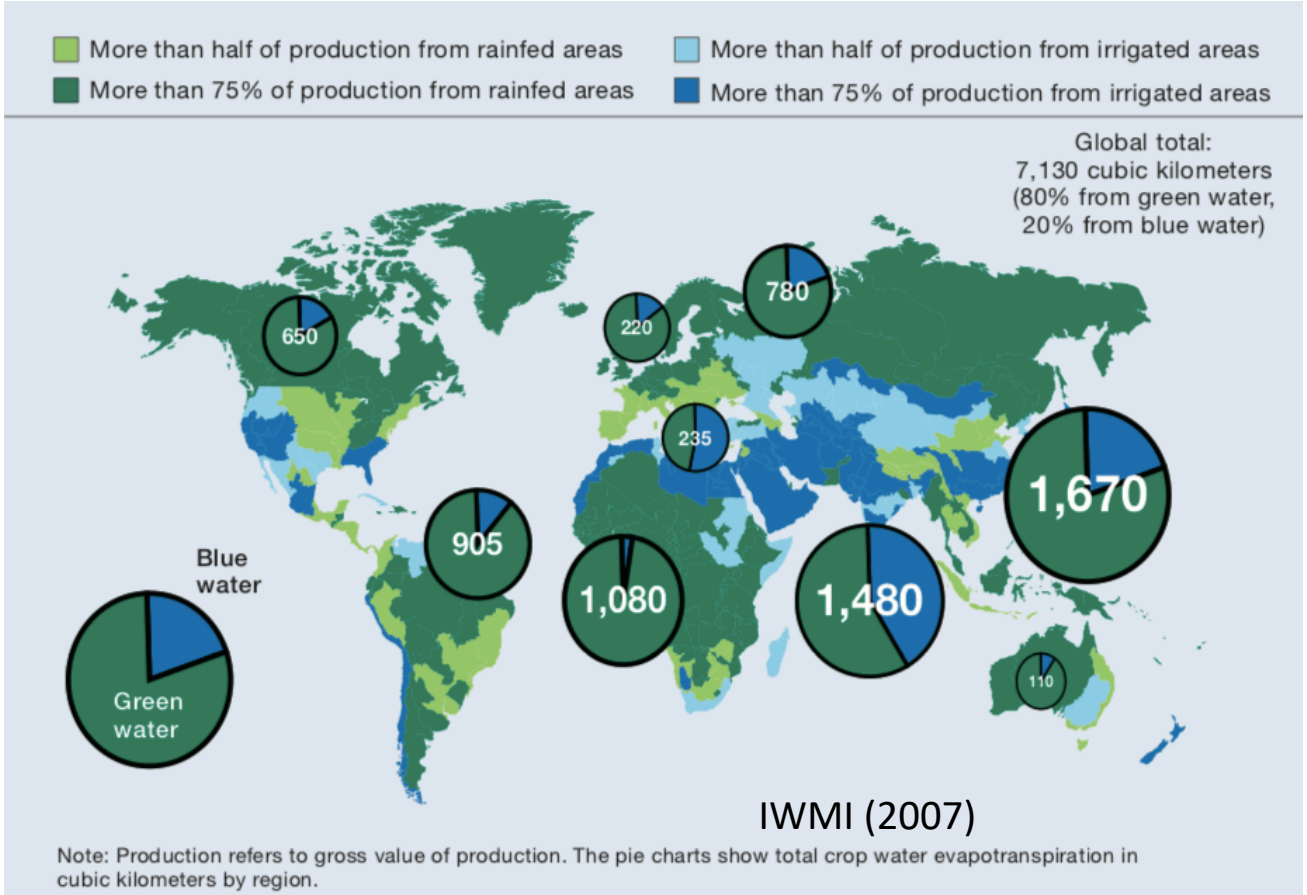
Water for Food



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Wasted Water in Agriculture

Wastewater

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Agricultural Wastewater Treatment

Wastewater Treatment

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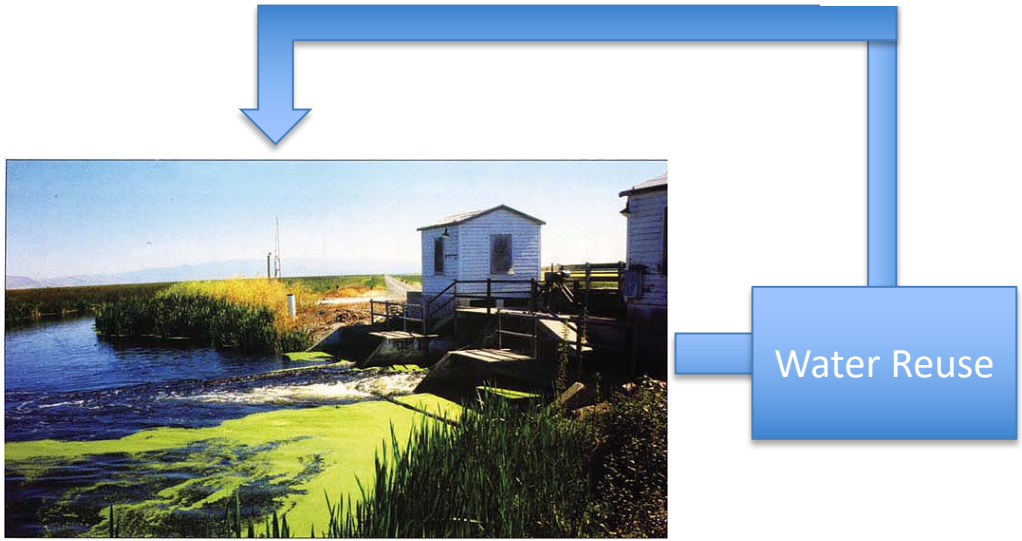
Agricultural Water Reuse



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An Early Ag Wastewater Prototype

The new plant will eventually be capable of producing up to 1.6 billion gallons (5,000 acre-feet) of freshwater per year. HydroRevolution's source of impaired water comes from a 7,000-acre drainage area that serves farmers in Panoche as well as several nearby Water Districts.

The plant will be capable of water treatment with zero-liquid discharge, turning the excess salt and minerals into usable by-products that have industrial applications.

All the water generated by HydroRevolution will be made available to the Panoche Water and Drainage District.

WaterFX

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Final Thoughts

- BlueTech solutions are enabling water solutions in wealthy places.

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- Key concepts:
  -modularity
  -systems-level thinking
  -communicating success and vision

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