



Water for All

Global Solutions for a
Changing Climate

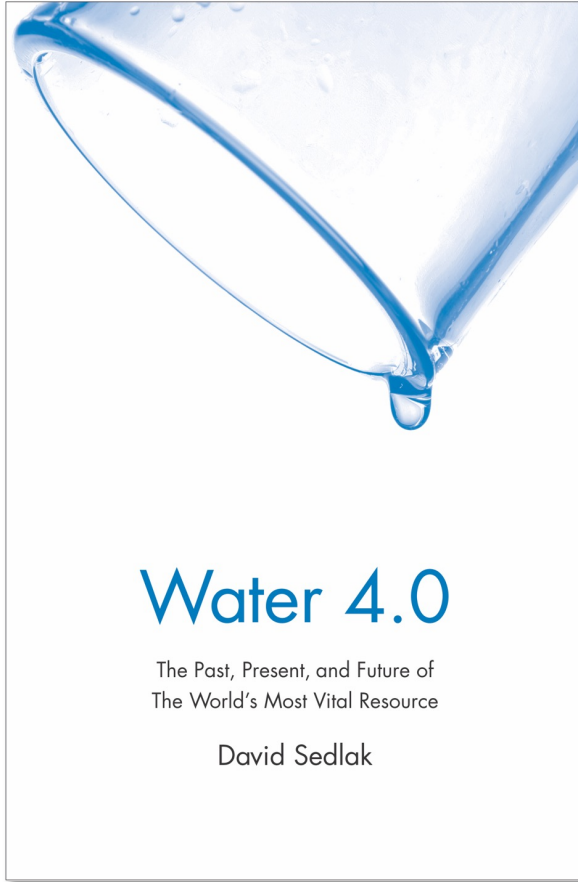
David Sedlak

Department of Civil & Environmental Engineering

University of California, Berkeley

University of Arizona Water Resources Research Center Webinar

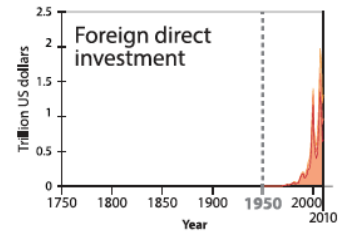
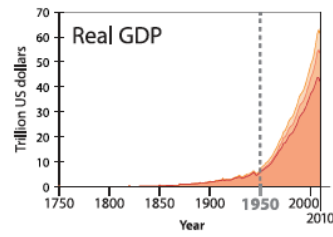
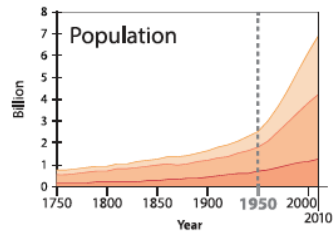
February 27, 2024



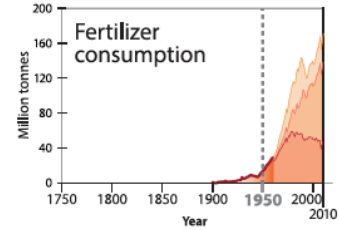
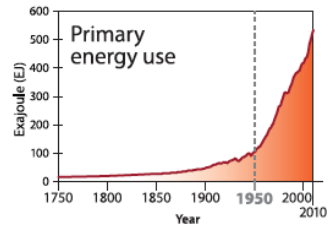
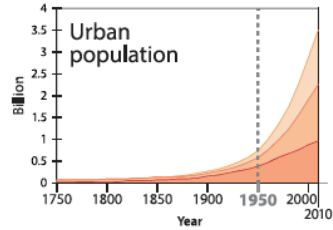
Water 4.0

The Past, Present, and Future of
The World's Most Vital Resource

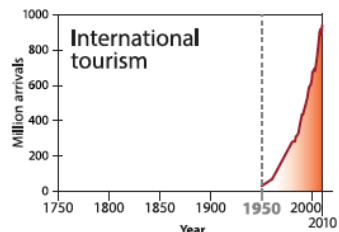
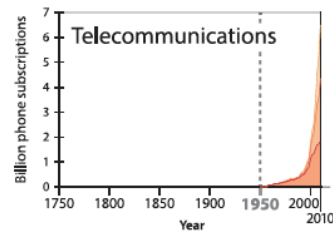
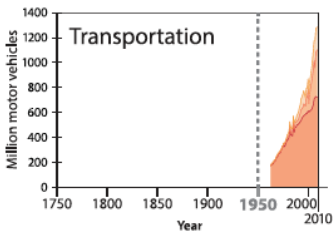
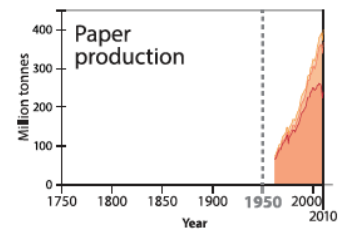
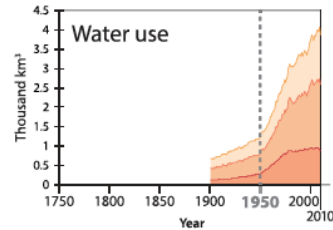
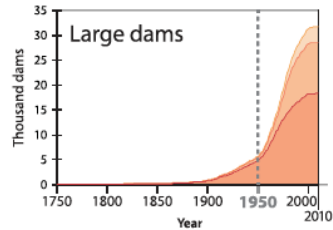
David Sedlak

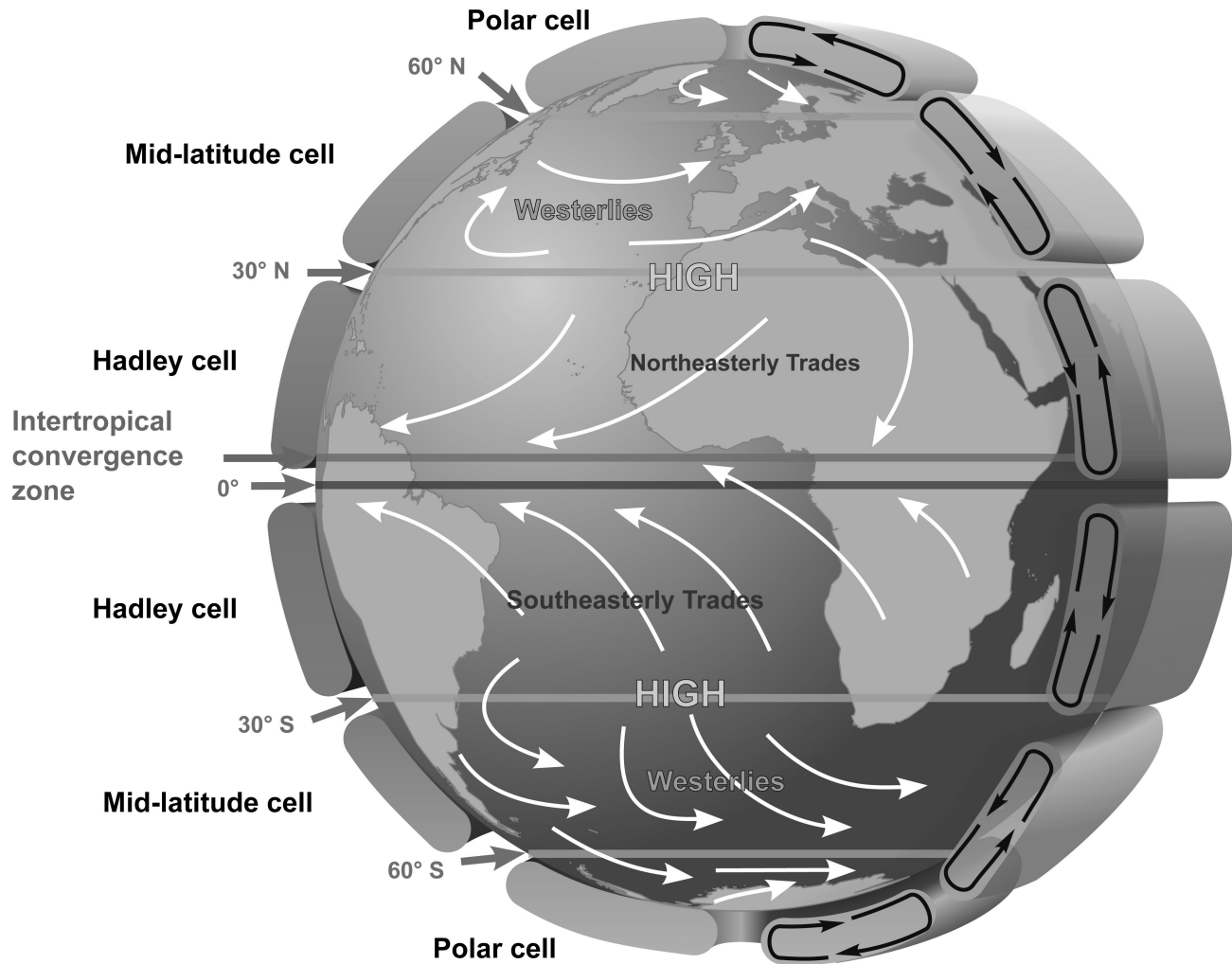


OECD BRICS Others



The Great Acceleration







Water for the Wealthy



Water for the Many

The Philippine Star



Water for the Poor

NY Times

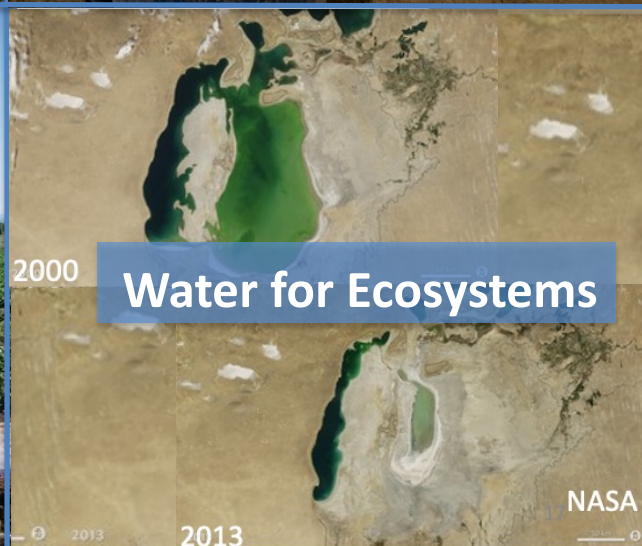


Water for Health

Wikipedia



Water for Food



Water for Ecosystems

2000

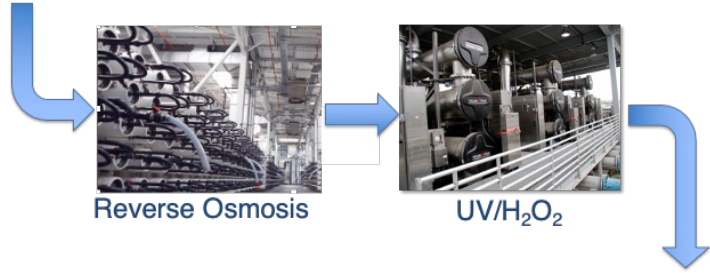
2013

NASA

A Water Reuse Revolution

Full Advanced Treatment (FAT)

Treated Wastewater



Physical/Chemical Treatment



Brown Bag Webinar: The Water Recycling Revolution: History and Lessons from Four Western States

Managed Aquifer Recharge



When

6:00 to 7:15 pm MST, October 13, 2022

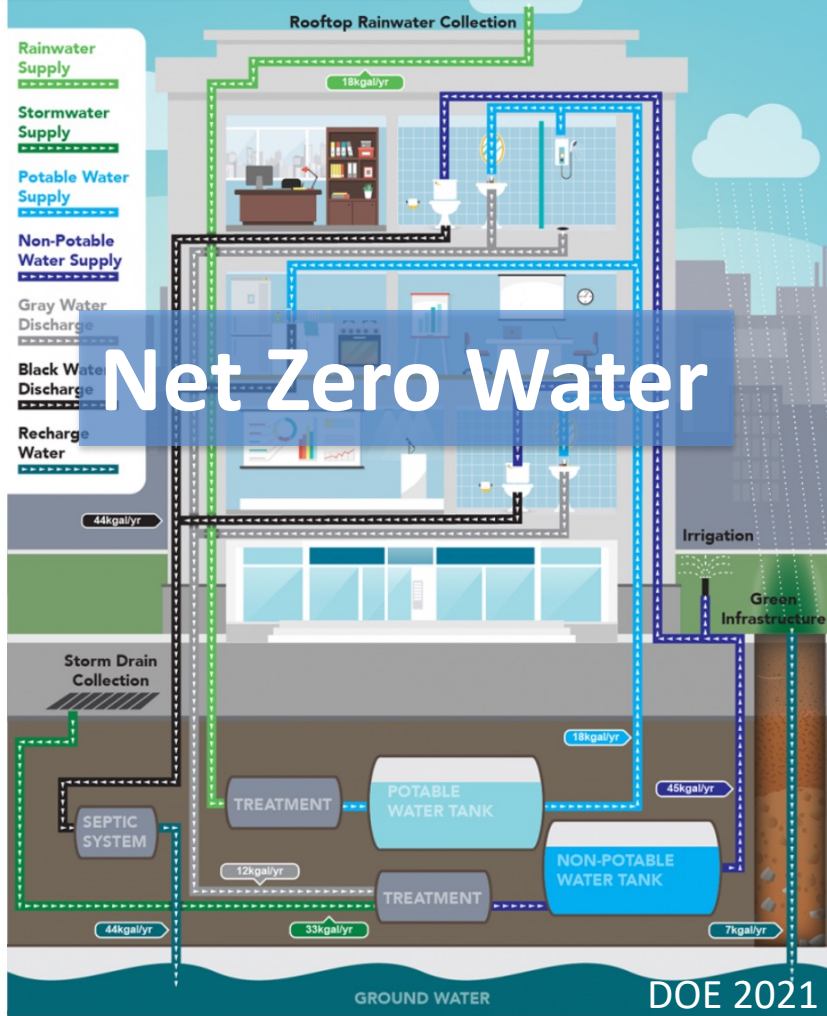
Where

Zoom

Speaker(s)

William M. Alley
Director, Science and Technology, National Ground Water Association

Scenario 1: The Ideal Net Zero Water Building

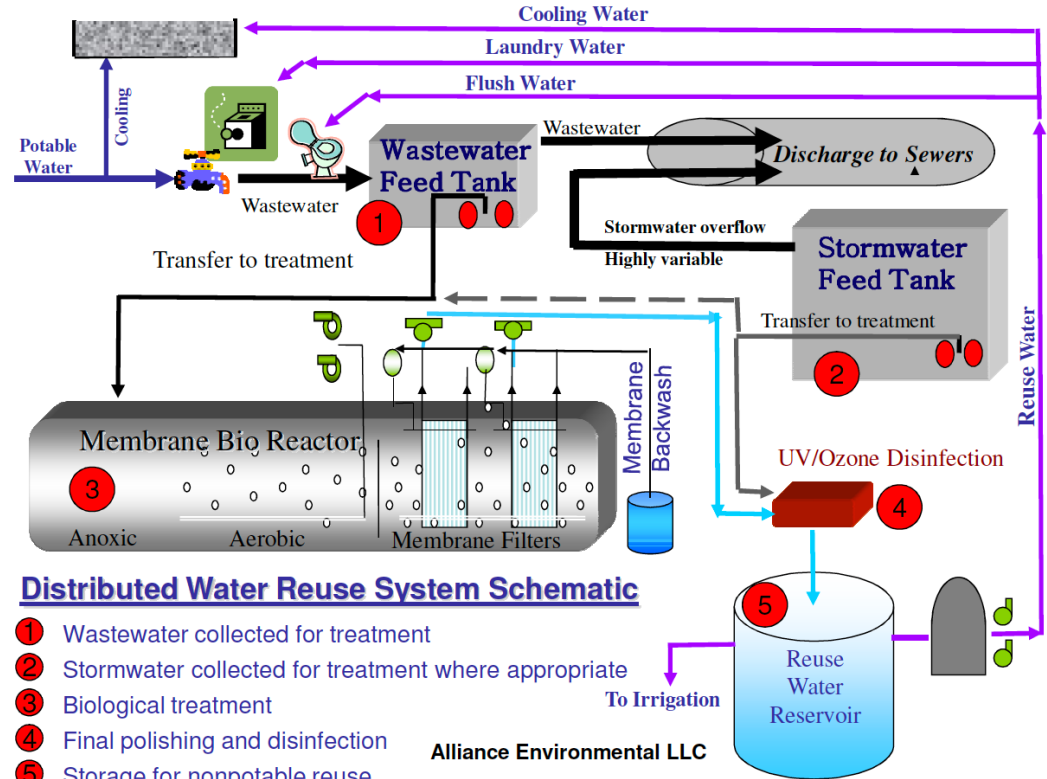


Net Zero Water

Halfway to Net Zero in New York



Battery Park City



Projects in Our Backyard

Uber Mission Bay at 1455 and 1515 Third Street –
San Francisco, CA



San Francisco Public Utilities Commission Headquarters –
525 Golden Gate Avenue



Salesforce Tower –
San Francisco, CA



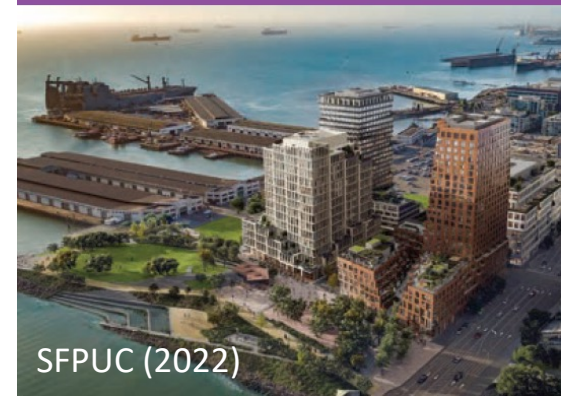
Chase Center –
San Francisco, CA



Fifteen-Fifty at 1550 Mission Street –
San Francisco, CA



Mission Rock at Third and Mission Rock Street –
San Francisco, CA

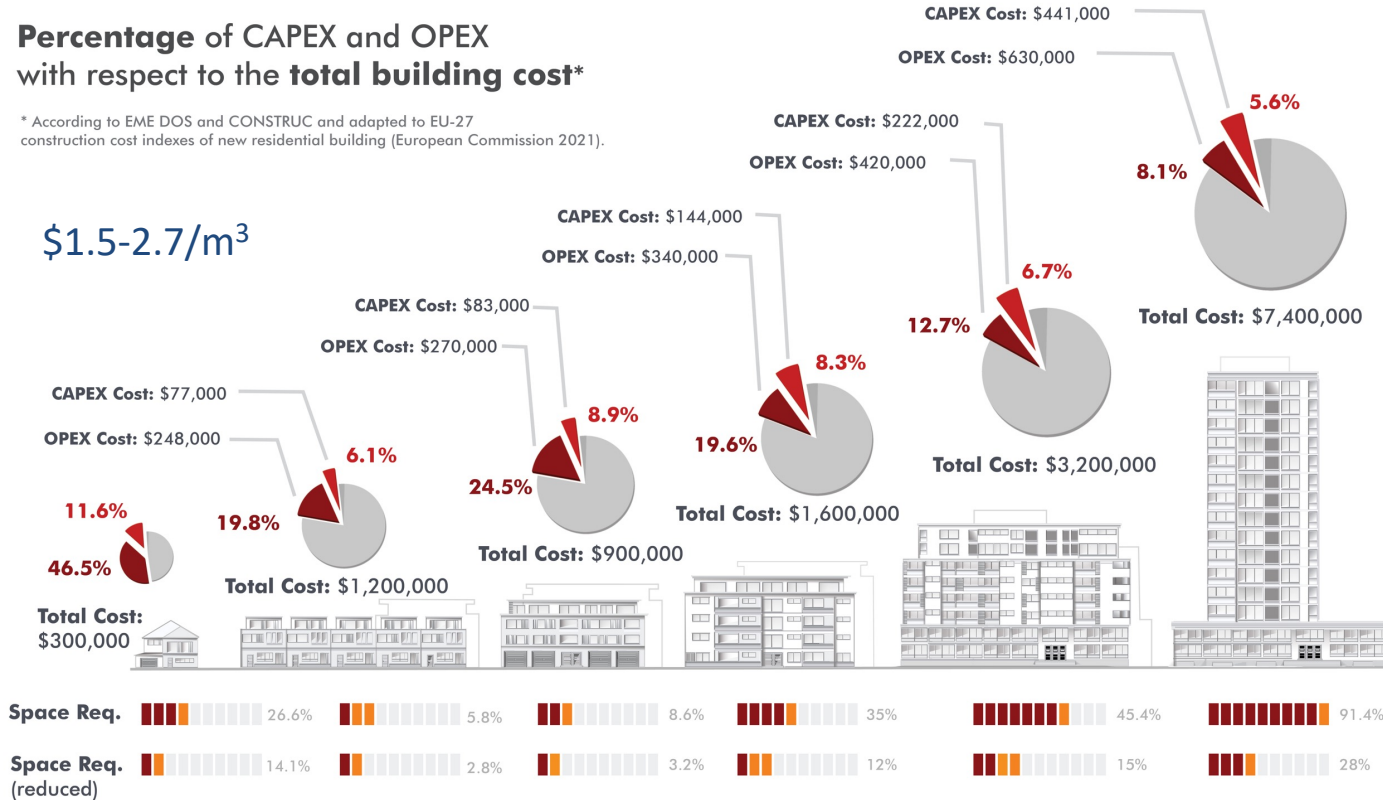


Costs: Techno-Economic Analysis

Percentage of CAPEX and OPEX with respect to the total building cost*

* According to EME DOS and CONSTRUC and adapted to EU-27 construction cost indexes of new residential building (European Commission 2021).

\$1.5-2.7/m³



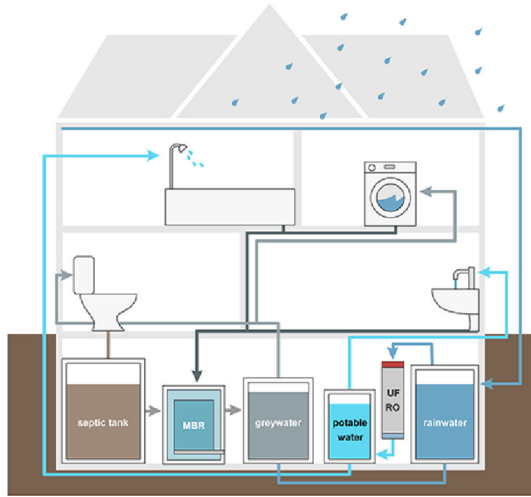
Garrido-Baserba et al. (2022)

Percentage of occupied space with respect to one entire floor plant or basement (%)

Calculation details in supplementary information

Beyond Big Projects in Wealthy Cities

Single Family Dwellings



Rabaey et al. (2020)

Rural Communities

THE CALIFORNIA REPORT MAGAZINE
Racism Robbed This Historically Black California Town of Its Water. Now, They're Developing Water of Their Own



By Teresa Cotairilos
Food and Environment Reporting Network Sep 9, 2022 Save Article



Sherry Hunter, president of the Allensworth Community Services District in rural Tulare County, stands near a swing set at the town's community center on Friday, Aug. 29, 2022. (Craig Kohlross/FERN)

Emerging Megacities

How Africa can leapfrog the world's stagnant water paradigm

August 12, 2019

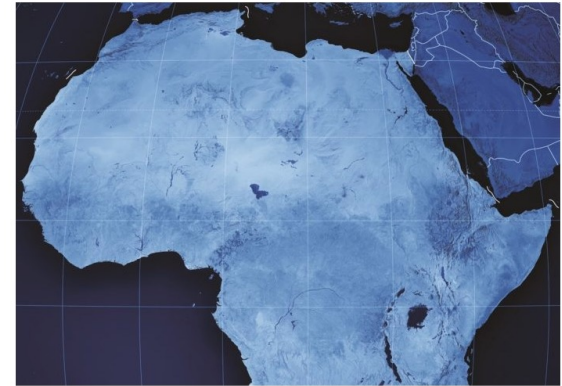


Photo credit: FrankRamspott/iStock

*Africa has an unprecedented opportunity to embrace widespread water innovation. IWA is poised to help catalyse this, and to share the lessons globally in a two-way exchange with its African partners, writes **Kala Valravamoorthy**.*

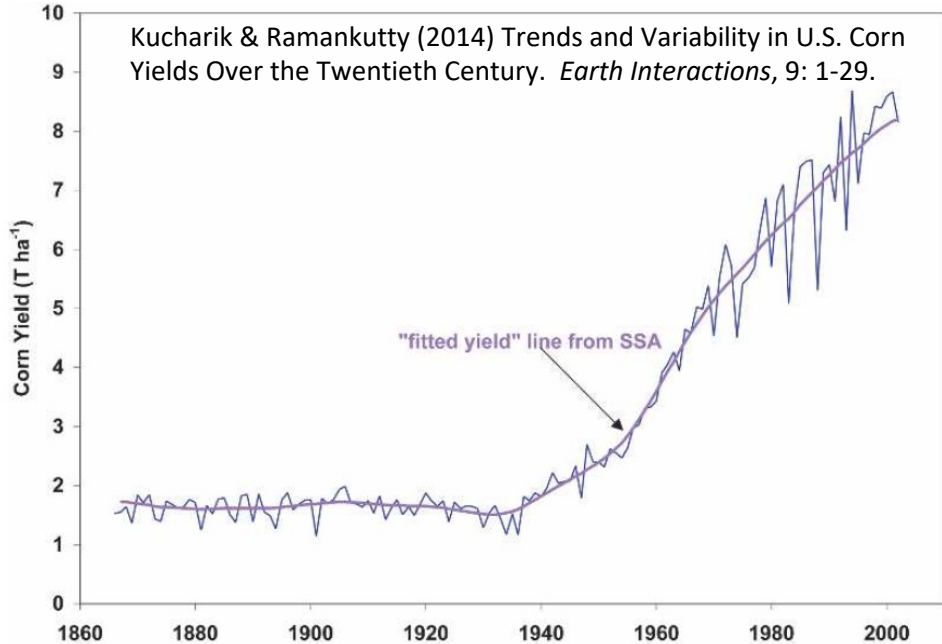
Water for Food

An aerial photograph of a center-pivot irrigation system in Kansas, USA. The image shows a vast expanse of agricultural land divided into numerous circular and rectangular plots. The colors range from vibrant green, indicating healthy crops, to various shades of brown and tan, representing bare soil or harvested fields. The circular patterns are characteristic of the center-pivot irrigation method, where water is distributed from a central point to the perimeter. The overall scene is a complex mosaic of different agricultural zones.

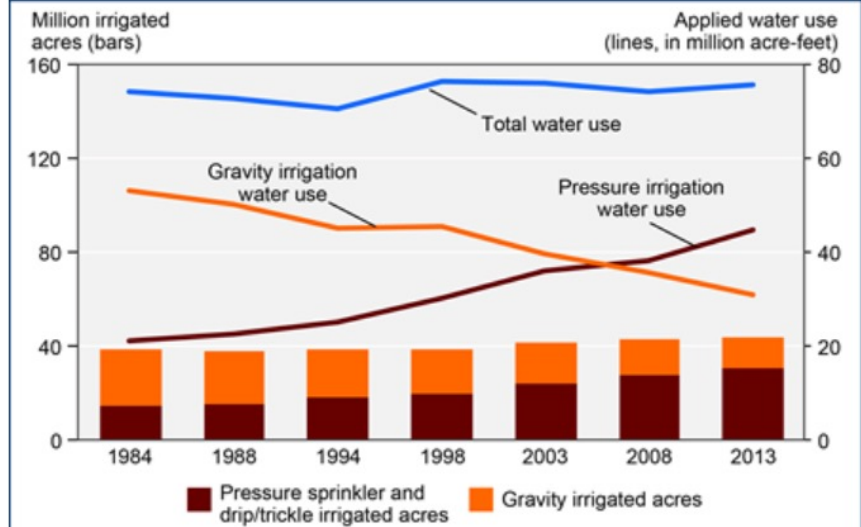
Center-Pivot
Irrigation in Kansas
USA

Wikipedia

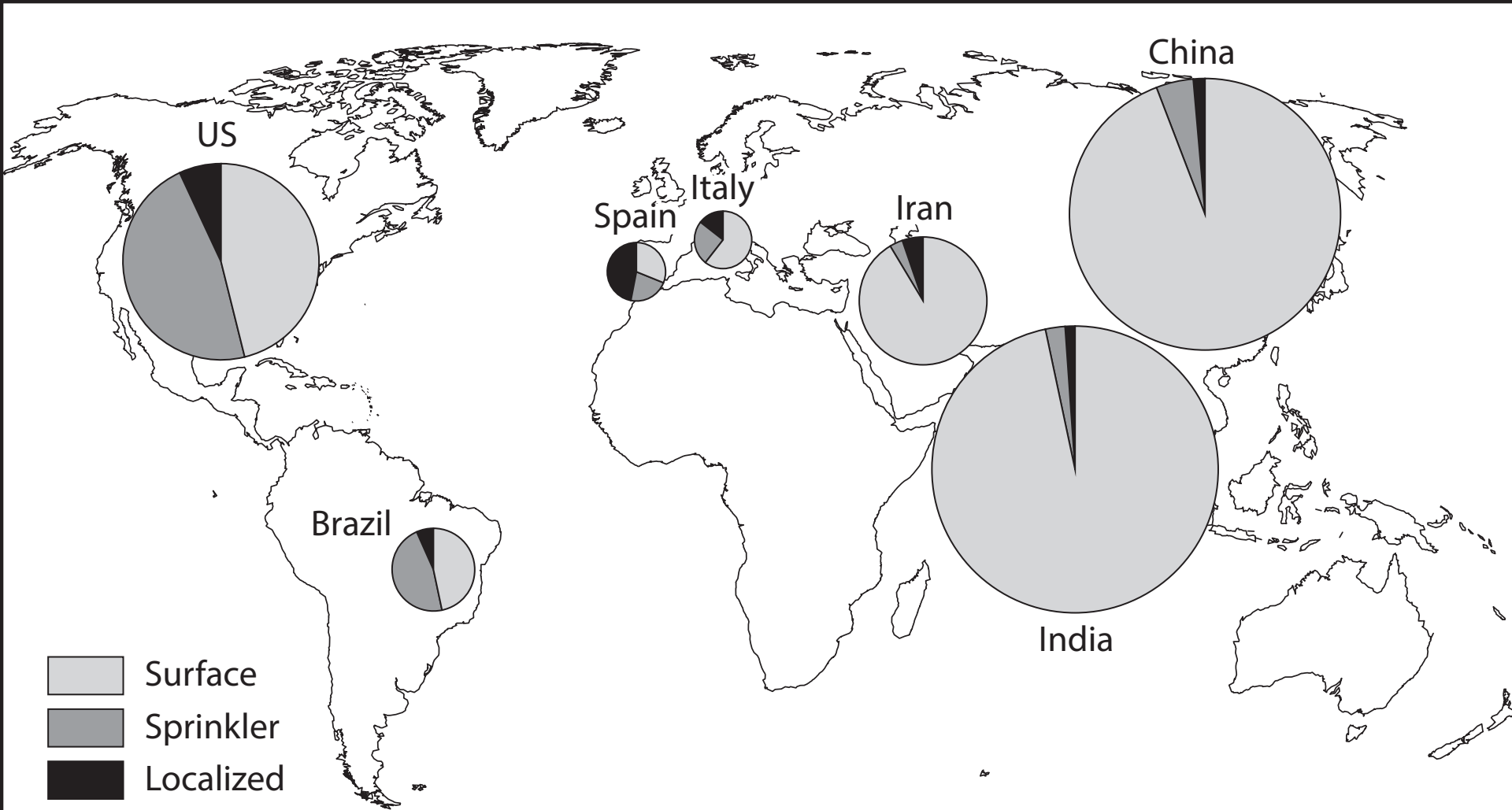
The First Green Revolution



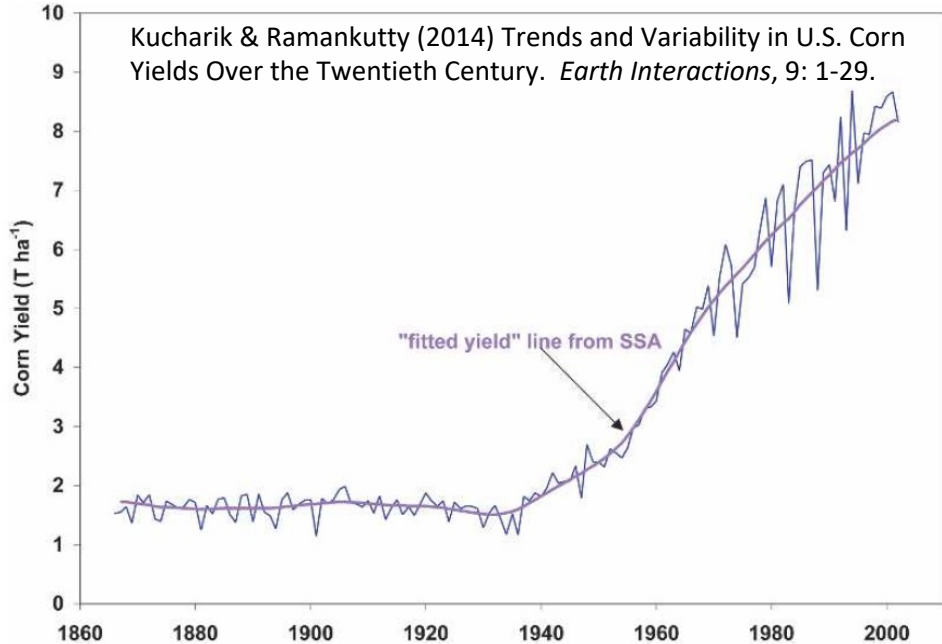
Irrigated acres and applied water use, 17 Western States, 1984-2013



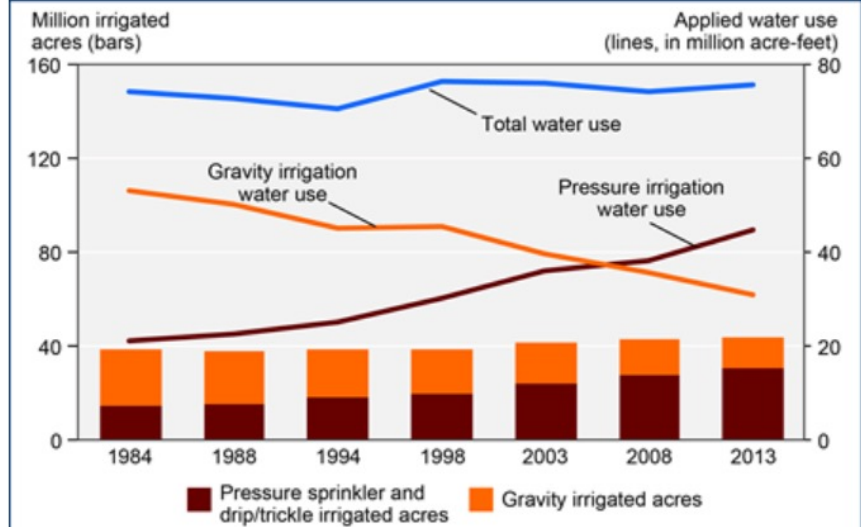
Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service, Farm and Ranch Irrigation Survey (FRIS) data. Note that FRIS reports onfarm water applied, not withdrawn; this chart excludes irrigated horticulture crops under protection.



The First Green Revolution



Irrigated acres and applied water use, 17 Western States, 1984-2013



Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service, Farm and Ranch Irrigation Survey (FRIS) data. Note that FRIS reports onfarm water applied, not withdrawn; this chart excludes irrigated horticulture crops under protection.

Advanced Water Technology for Agriculture

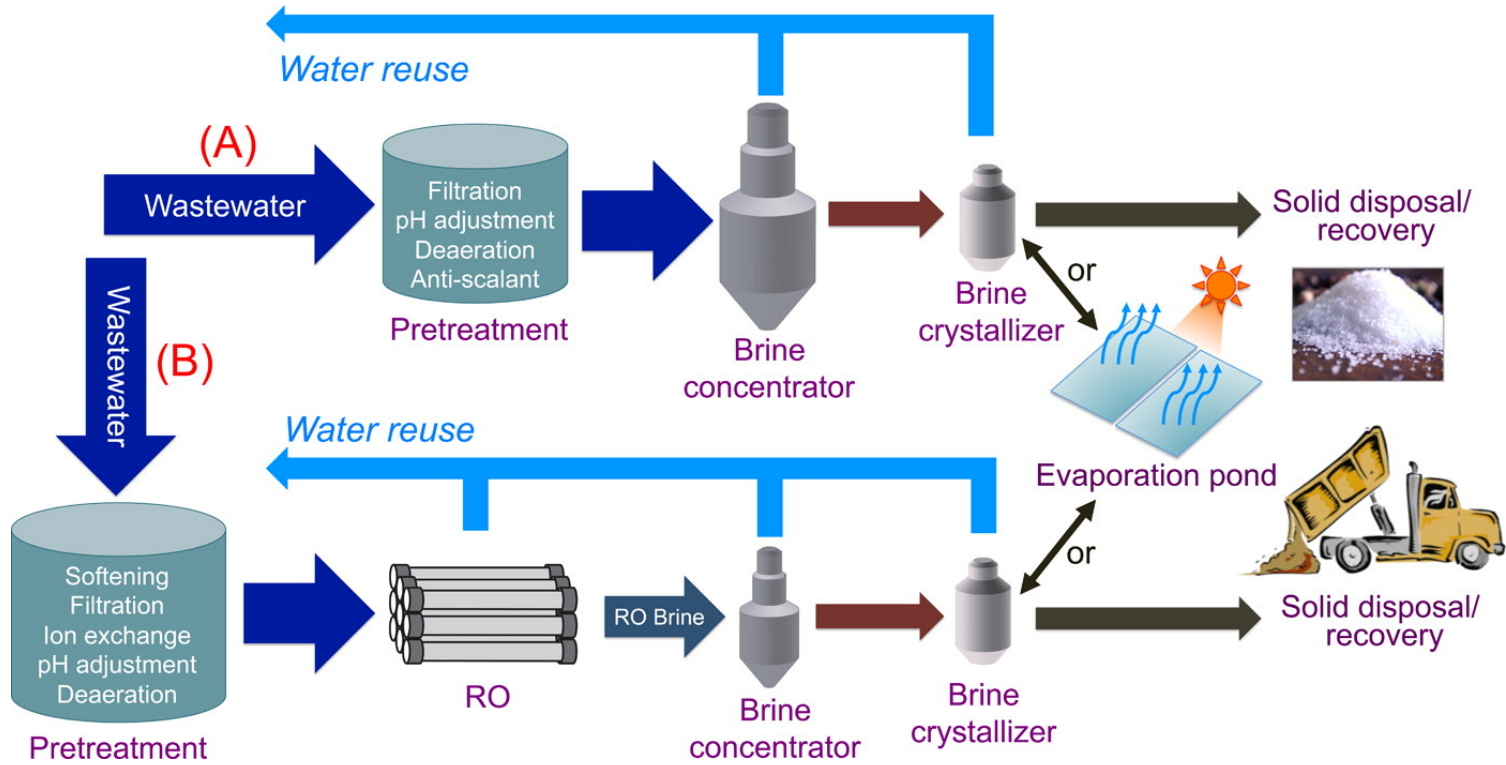
Brackish Water Desalination



Modular Small-Scale Treatment

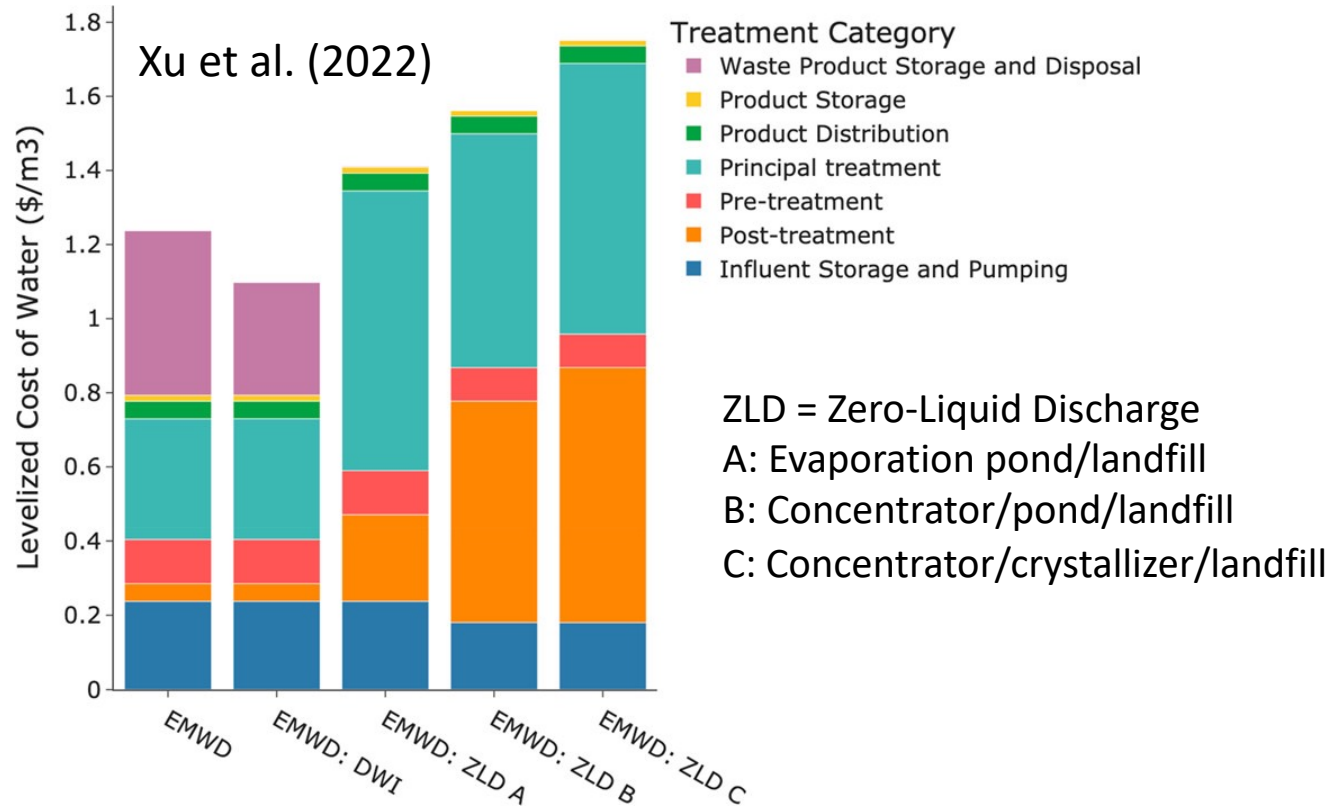


Zero Liquid Discharge (ZLD) or near ZLD



Tong and Elimelech (2016)

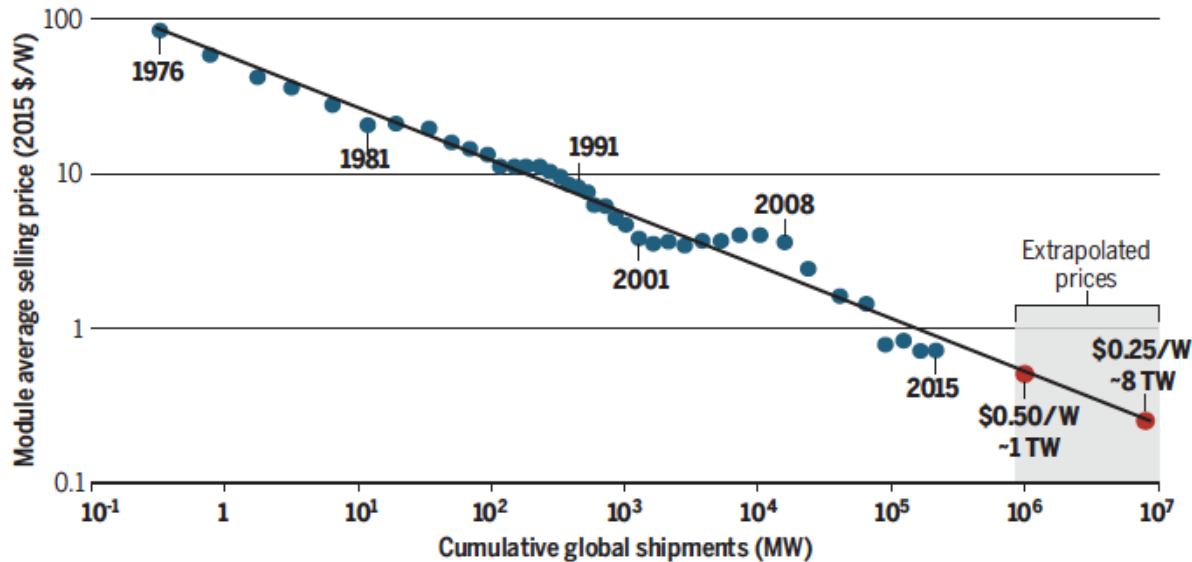
Alternatives to Brine Lines



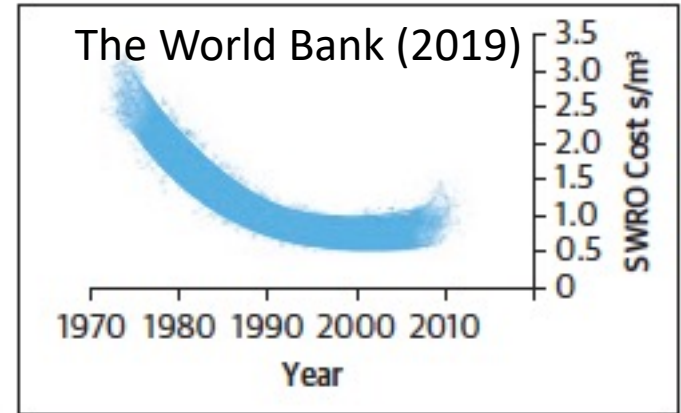
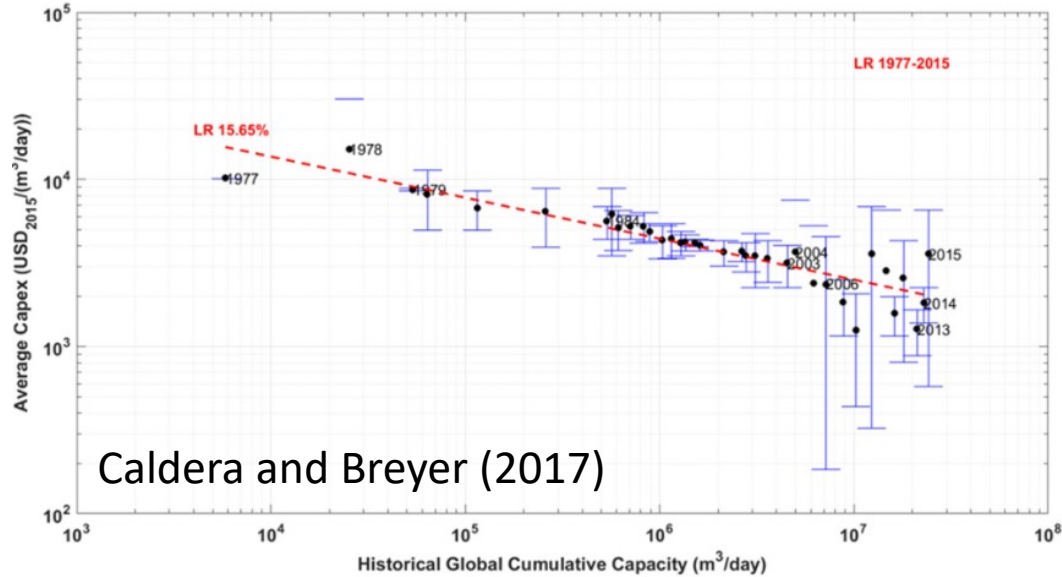
Technology Diffusion: Solar PV

PV module experience curve

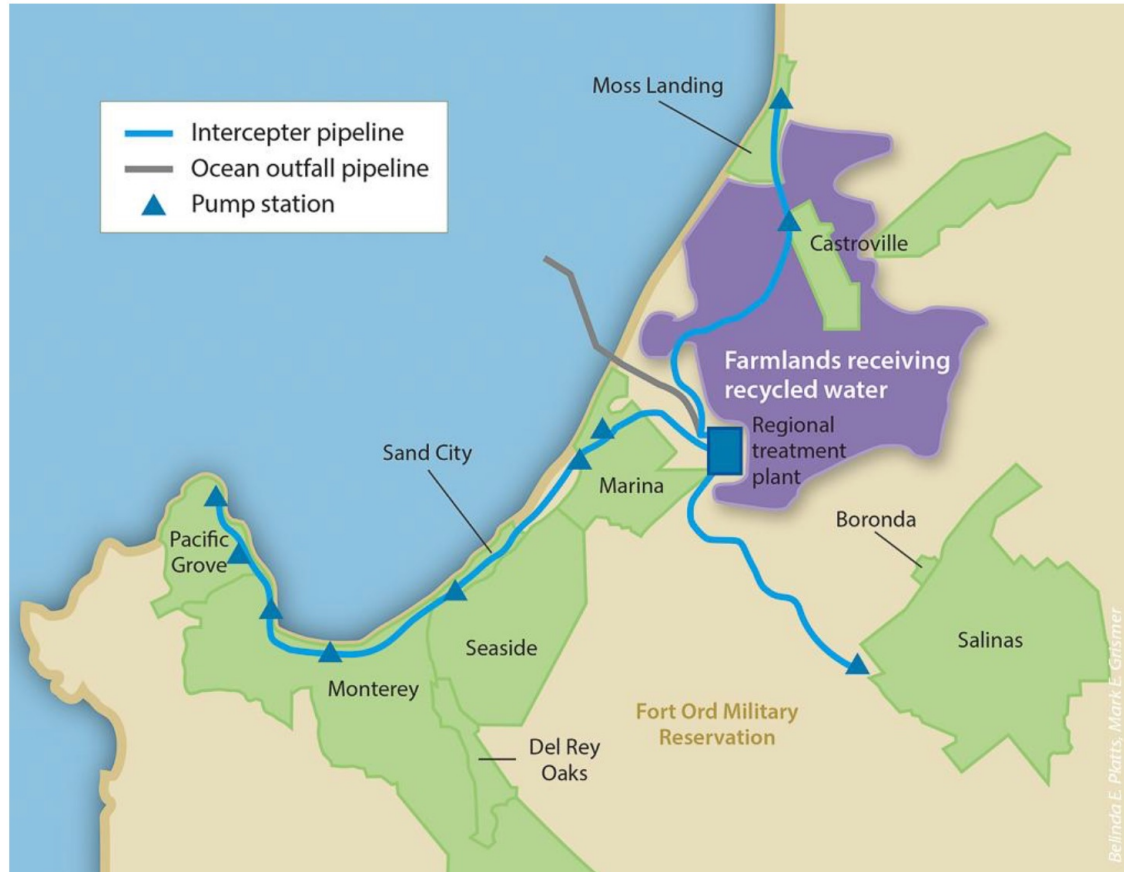
Historically, module prices have decreased as a function of cumulative global shipments (blue dots reflect historical data, red dots reflect extrapolated prices for 1 TW and 8 TW based on the historical trend line). See supplementary materials for data sources.



Technology Diffusion: Desalination



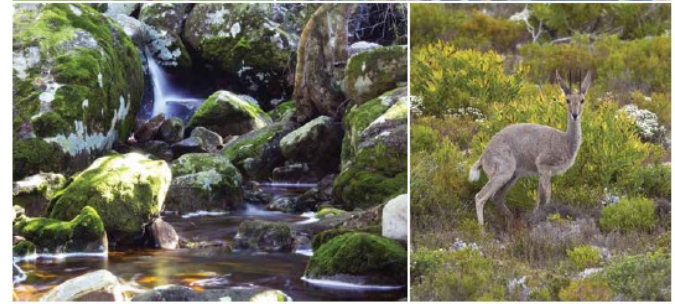
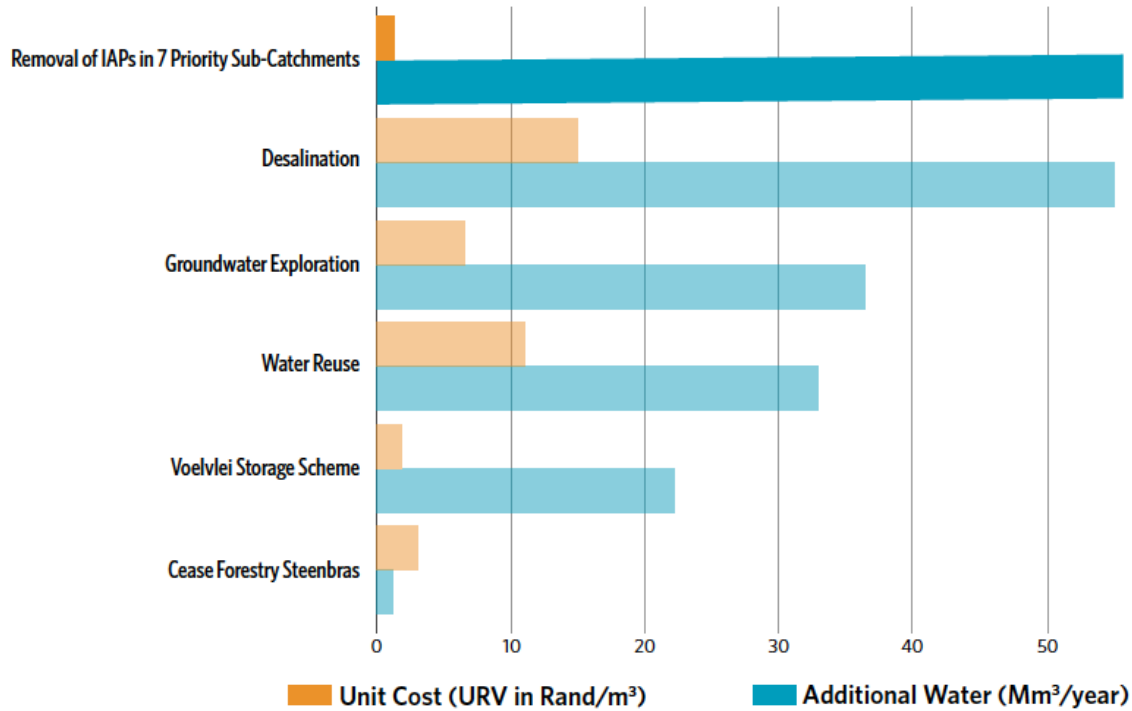
Reuse/Desalination Pairing in Agriculture





Running the Rivers

CATCHMENT RESTORATION INCREASES WATER SUPPLY AT THE LOWEST UNIT COST

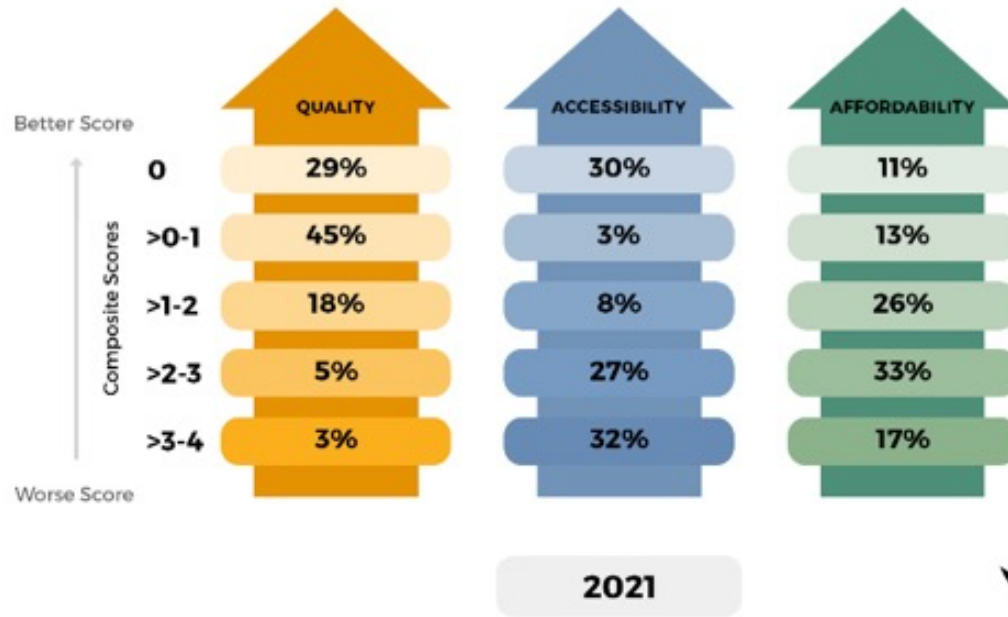


Greater Capetown Water Fund (2019)





The Right Things to Do



Achieving the Human Right to Water in California, OEHHA 2021

Takeaways

The six global water crises are likely to be more prominent in coming decades.

No single solution will solve the world's water crises.

Experience gained in local water crises can be adapted to new locations.

The costs of technological solutions is likely to decrease.

Shared stewardship of water is the only viable path to Water for All.

Water for All

Global Solutions for a

Changing Climate

DAVID SEDLAK