

Spatial Analysis and Environmental Impacts of Decentralized Water Reuse Systems

Olga Kavvada

Civil and Environmental Engineering
University of California, Berkeley

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ReNUWIt

Re-Inventing the Nation's Urban Water Infrastructure



13th IWA

Specialized Conference on
Small Water and Wastewater
Systems

5th IWA

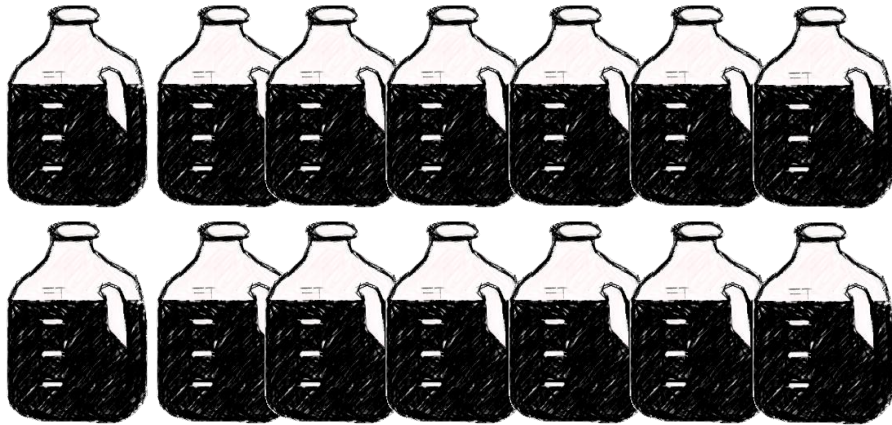
Specialized Conference on
Resources-Oriented Sanitation

Motivation

Lost Water:

Unrecoverable discharged water per day

In the U.S.:



45 billion Liters

Water demand per day

San Francisco:



200 million Liters
(0.8 million people - 2013)

Athens:



400 million Liters
(3.4 million people - 2011)

Lost Energy:

- In California, 8% of electricity is related to treatment and conveyance of water
- Electricity consumption is associated with greenhouse gas (GHG) emissions

Data: National Research Council, 2011; California Public Utilities Commission, 2010; EYDAP, 2005

San Francisco – Case Study

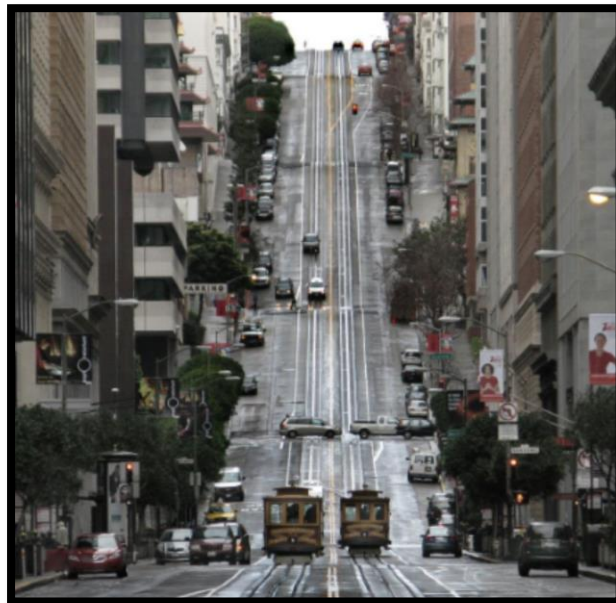
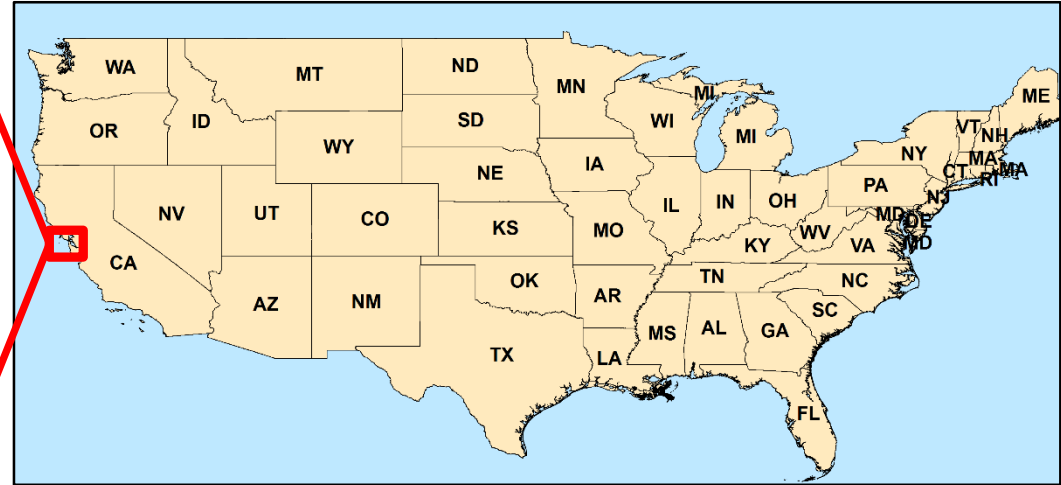
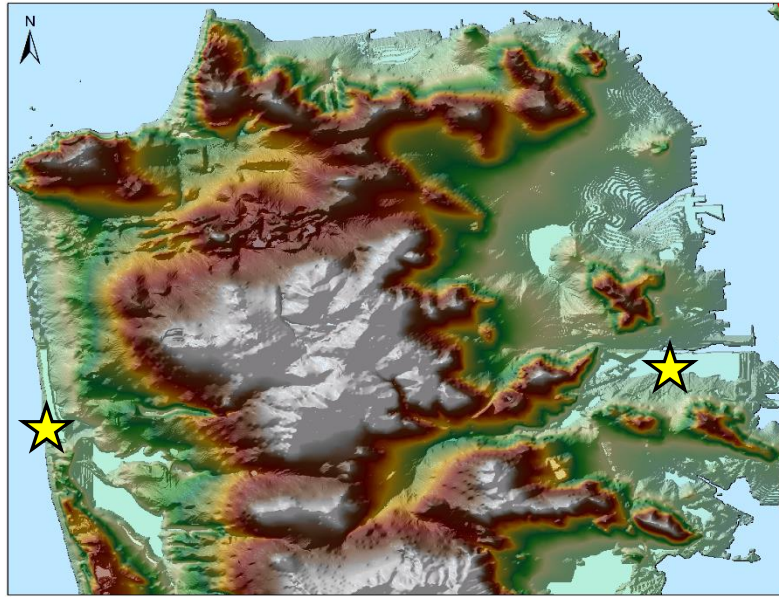
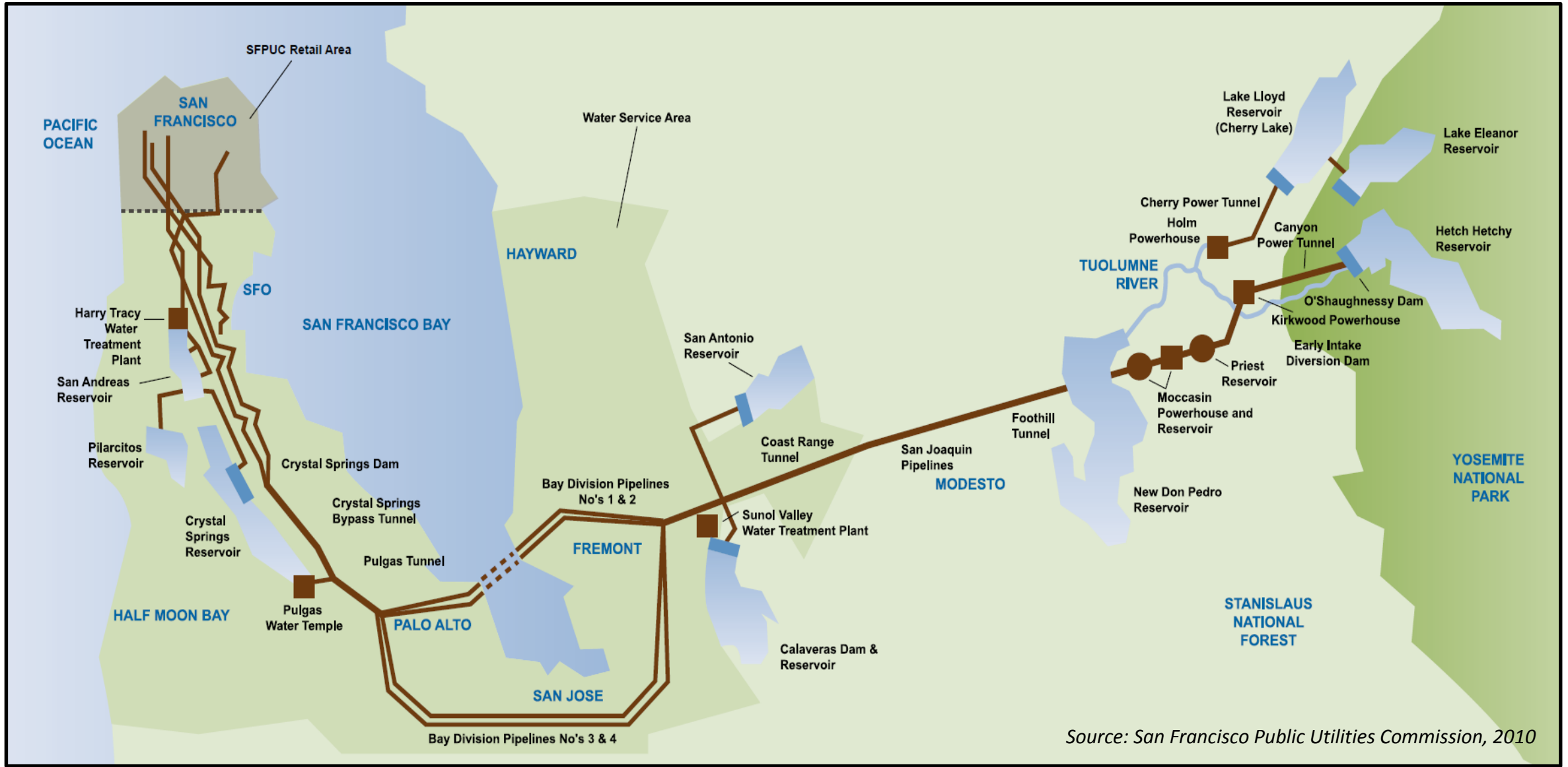


Photo credit: priceconomics.com, twistedifter.com

SFPUC Water System



Source: San Francisco Public Utilities Commission, 2010

San Francisco Chronicle

California Drought

Running Dry

California's record-breaking drought, now in its fourth year, is altering the state — perhaps forever. From what we eat to where we live to what our homes look like, a shrinking water supply affects everyone. Throughout the crisis, The Chronicle has had a team of reporters and photographers tracking California's environmental, economic and social transformation. In 2015, The Chronicle extended its resources to cover the changing landscape.

SFGATE NEWS

California drought bummer: Sierra water runoff coming up short

By Kurtis Alexander Updated 12:23 pm, Tuesday, June 28, 2016

Dwindling snowmelt

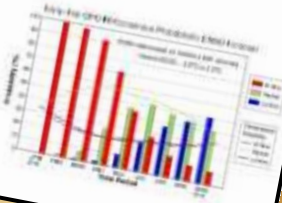
This year's water runoff from the Sierra Nevada snowpack was significantly lower than last year's, according to a report released Tuesday. Heavy rain in the period of April through July is expected to help offset the deficit for June 13. (Permalink)

LATEST

Waning El Niño could signal state's water woes not over

By Kale Williams

El Niño, as all things must, will be coming to an end over the next couple months, possibly to be replaced by its opposite, La Niña, which could spell a drier winter.



How the drought boosts your utility bills, and global warming

By David R. Baker

By starving California's hydroelectric dams of water, the state's four-year drought has cost consumers an extra \$2 billion in utility bills and pushed up greenhouse gas emissions from power plants by ...



Obama proposes new approaches to Western water shortages

By Carolyn Lochhead

WASHINGTON — Spurning dams for research in water technology, President Obama laid out a striking contrast Tuesday to the strategies adopted by California lawmakers in both parties on how to remedy ...



Without water, work or homes: Farm laborers displaced by drought

Story by Marissa Lang Photography by Leah Millis

MENDOTA, Fresno County — In bare feet, stepping carefully over jagged rocks and broken glass, Martin Hernandez Mena set out for the irrigation canal on the other side of the dirt road. It was late on ...

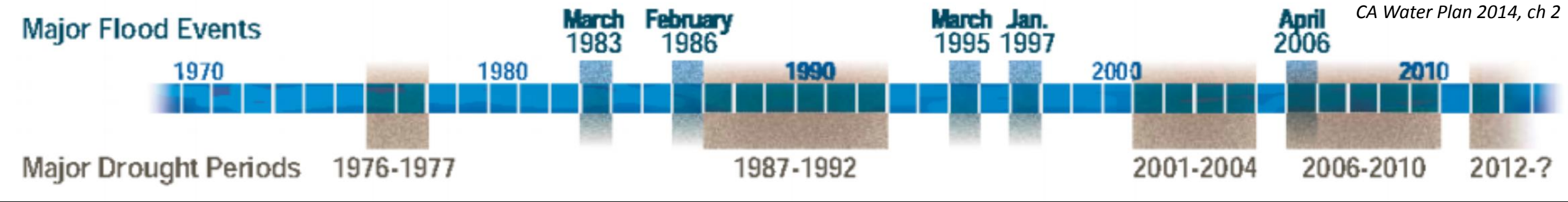


Amid El Niño, a push to save California's drought-drained aquifers

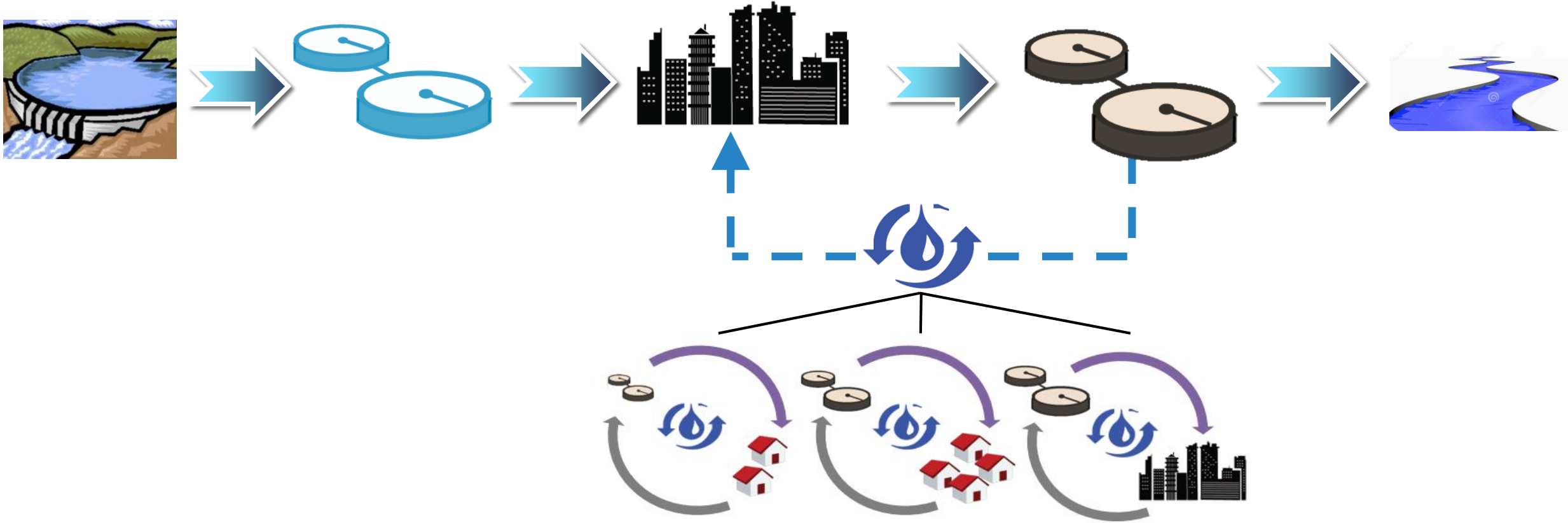
By Kurtis Alexander

SANGER, Fresno County — The clouds over the Sierra foothills were a welcome sight for Phil Desatoff. As general manager of the Consolidated Irrigation District, which serves parts of Fresno, Tulare



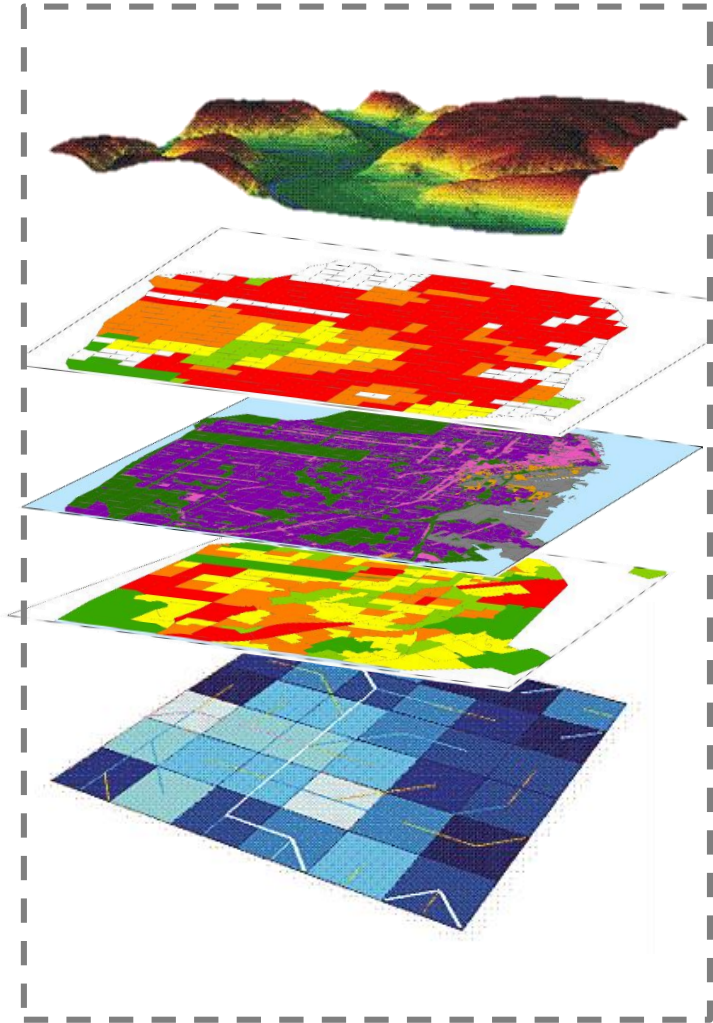


Non-Potable Water Reuse

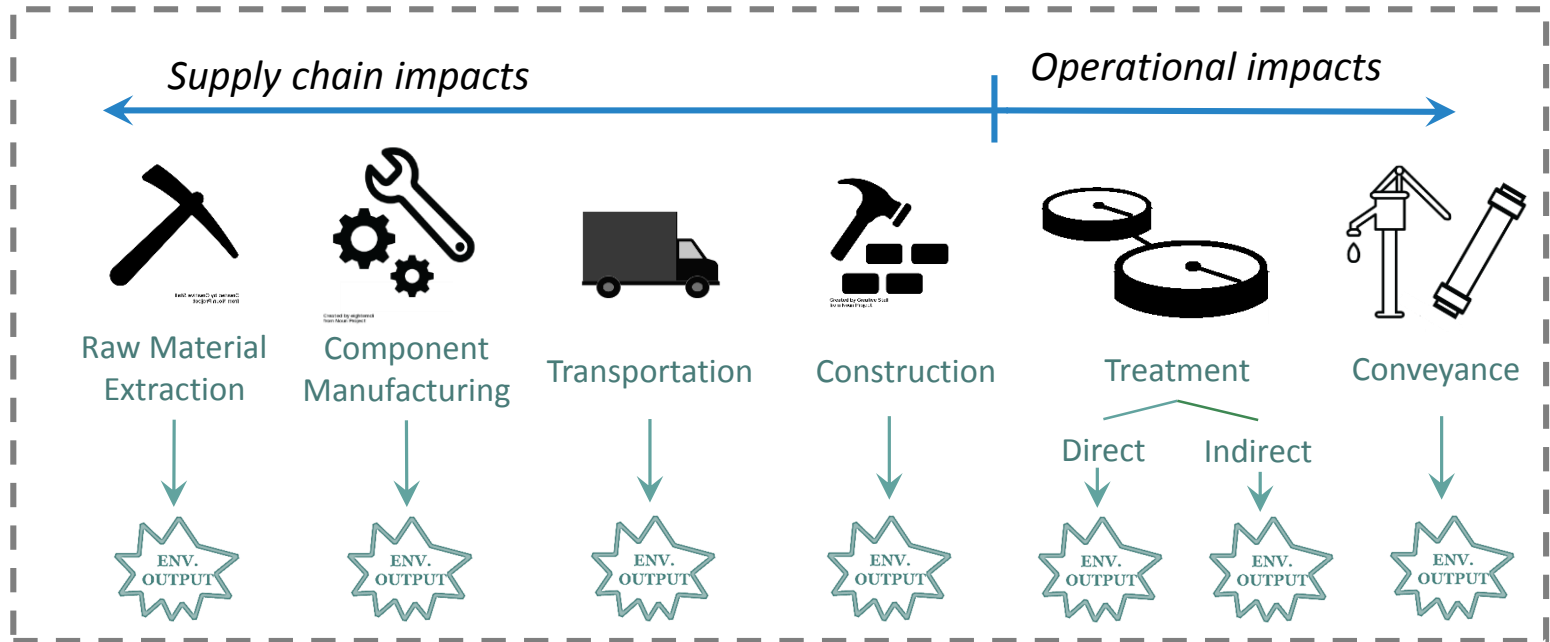


Methods

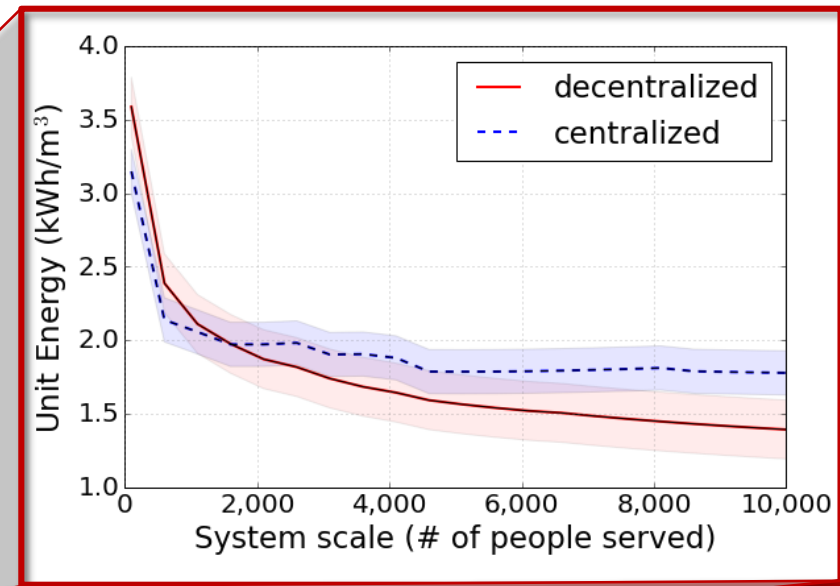
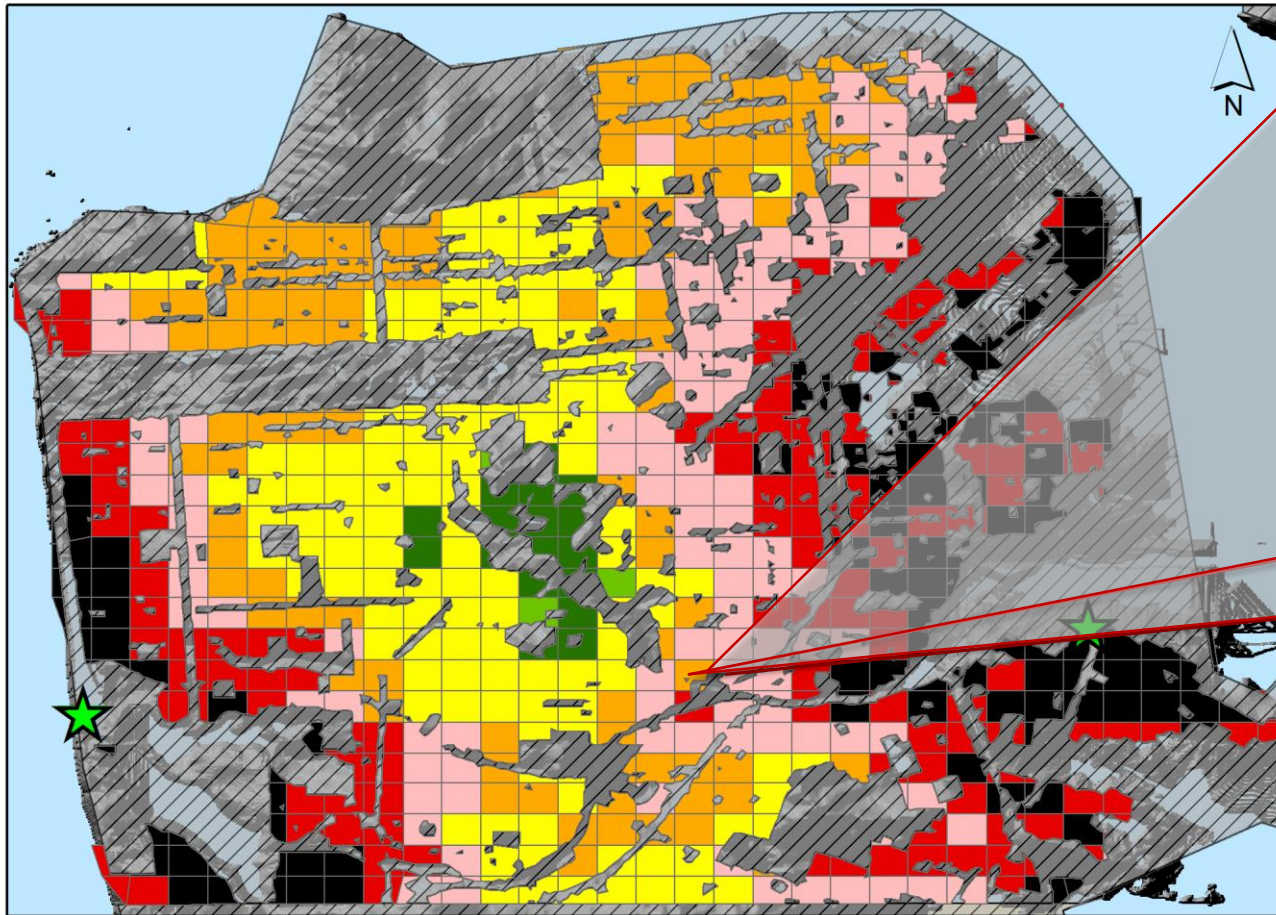
Spatial Analysis



Life – Cycle Assessment (LCA)



Decentralized facility size for energy efficiency gains



Minimum decentralized facility size (# of people served) for energy efficiency gains over centralized reuse

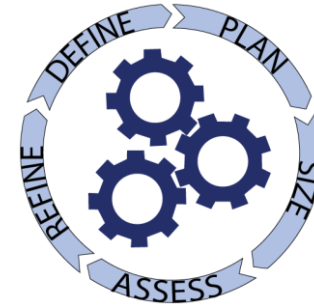
- 100 - 500 people
- 500 - 1000 people
- 1000 - 3000 people
- 3,000 - 5,000 people
- 5,000 - 7,000 people
- 7,000 - 10,000 people
- over 10,000 people
- Not residential areas

★ Centralized Wastewater Treatment Plant

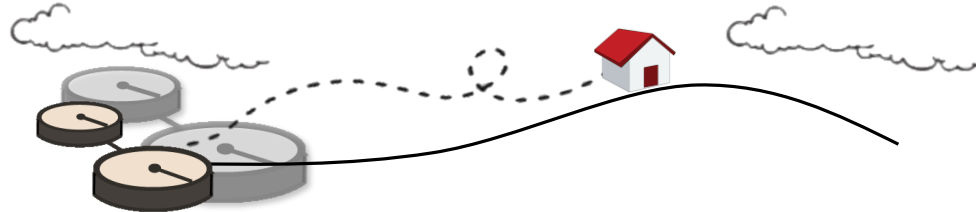
DO NOT CITE OR REDISTRIBUTE

Re-cap

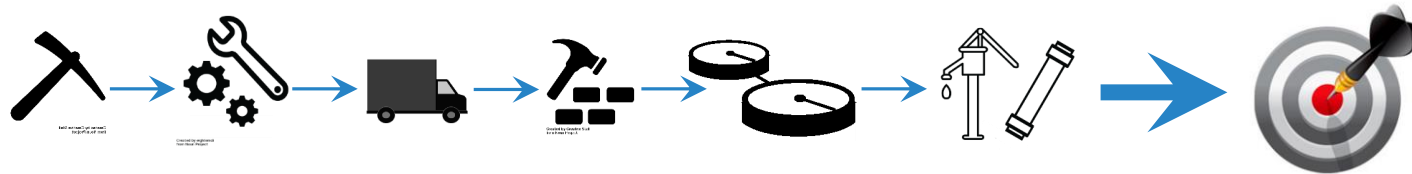
- Framework for assessing decentralized water/wastewater systems.



- Identify the effect of spatial & design parameters on the system performance.



- Generate modeling & planning support tools for optimal solutions with respect to energy and GHG emissions.



- Systems approach for integrated and sustainable infrastructure.



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