Water Technology and Sustainability For Southern California

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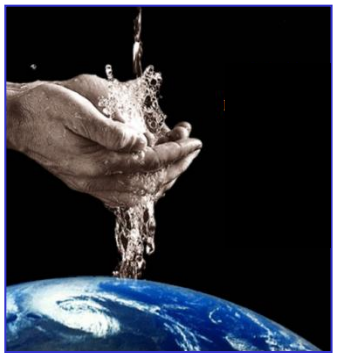

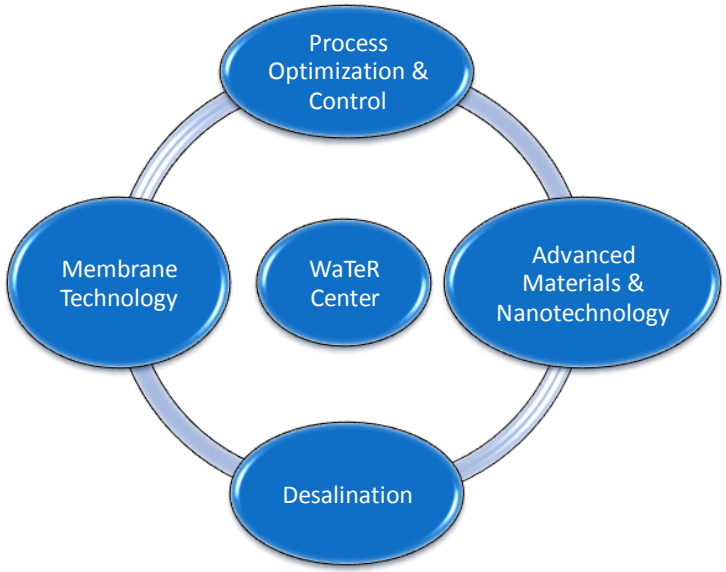

"The mission of the WaTeR Center is to advance technologies of water production in order to develop new and economical alternative sources of potable, irrigation, and consumptive water uses."

UCLA Engineering
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http://www.watercenter.ucla.edu

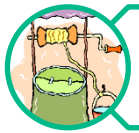
MWD Water Portfolio Responsibility

MWD Water Responsibility

- MWD customers demand water for human consumption, sanitation, fire protection, agriculture, landscaping, recreation, and industrial production.
- The volume of water needed to provide the needs of MWD customers could vary in the future with new technology, changing lifestyles, and new patterns of urban development.

Water Portfolio


Imported water


Groundwater


Water-use efficiency


Wastewater


Rainwater


Seawater

California Water Supply

Water Technology Research Center

Salinity: 3000-30,000 mg/L TDS

Southern California's population is projected to increase by 8 Million by Year 2020 (12 M increase for CA ; 35M →47 M)

San Francisco

SACRAMENTO

CLIFTON COURT

SACRAMENT RIVER

SAN JOAQUIN RIVER

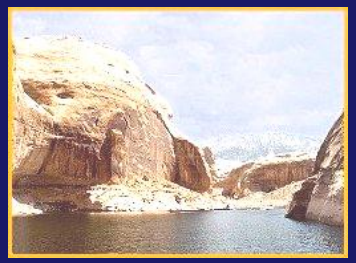
DELTA-MENDOTA CANAL

FRESNO

SAN LUIS RESERVOIR

California Aqueduct

LOS ANGELES AQUEDUCTS (2)



KERN RIVER

LAKE BUENA VISTA

EAST BRANCH

Colorado River Aqueduct

WEST BRANCH

SAN BERNARDINO

COLORADO RIVER

LOS ANGELES

MWD Service Area

SAN DIEGO

Imported Water

Groundwater

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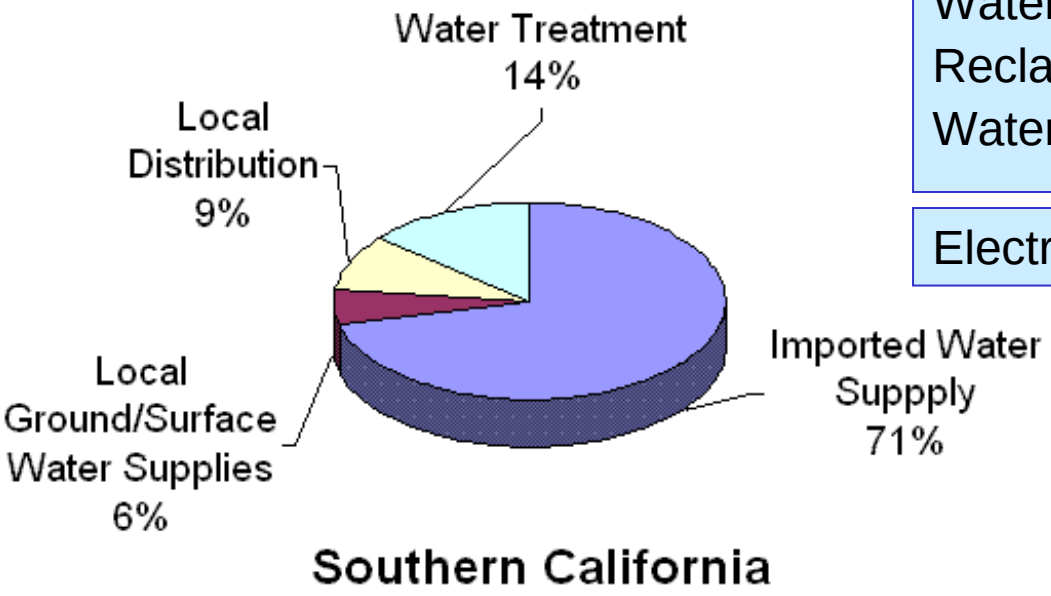
Water Energy Use for Water Production, Treatment & Distribution – The California Example

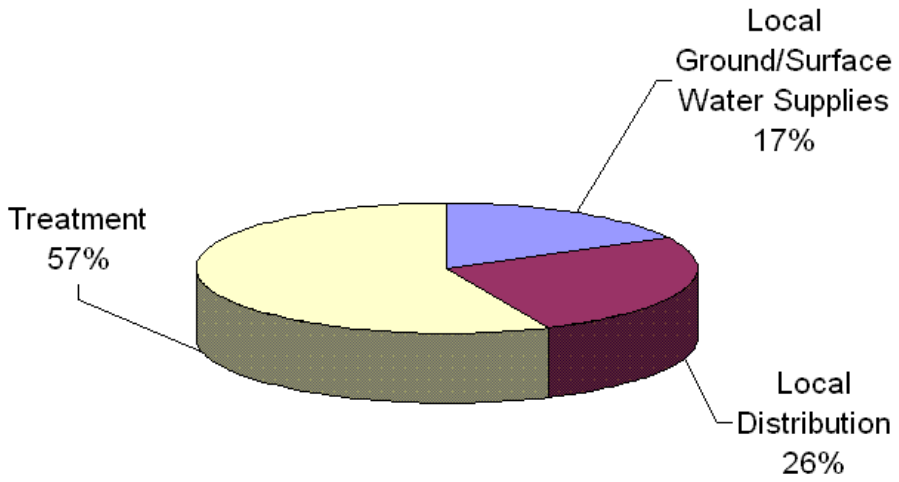


Southern California

Water conveyance cost	~2.5	kwh/m^3
Reclaimed water	~1	kwh/m^3
Water Desalination cost	~1–5	kwh/m^3

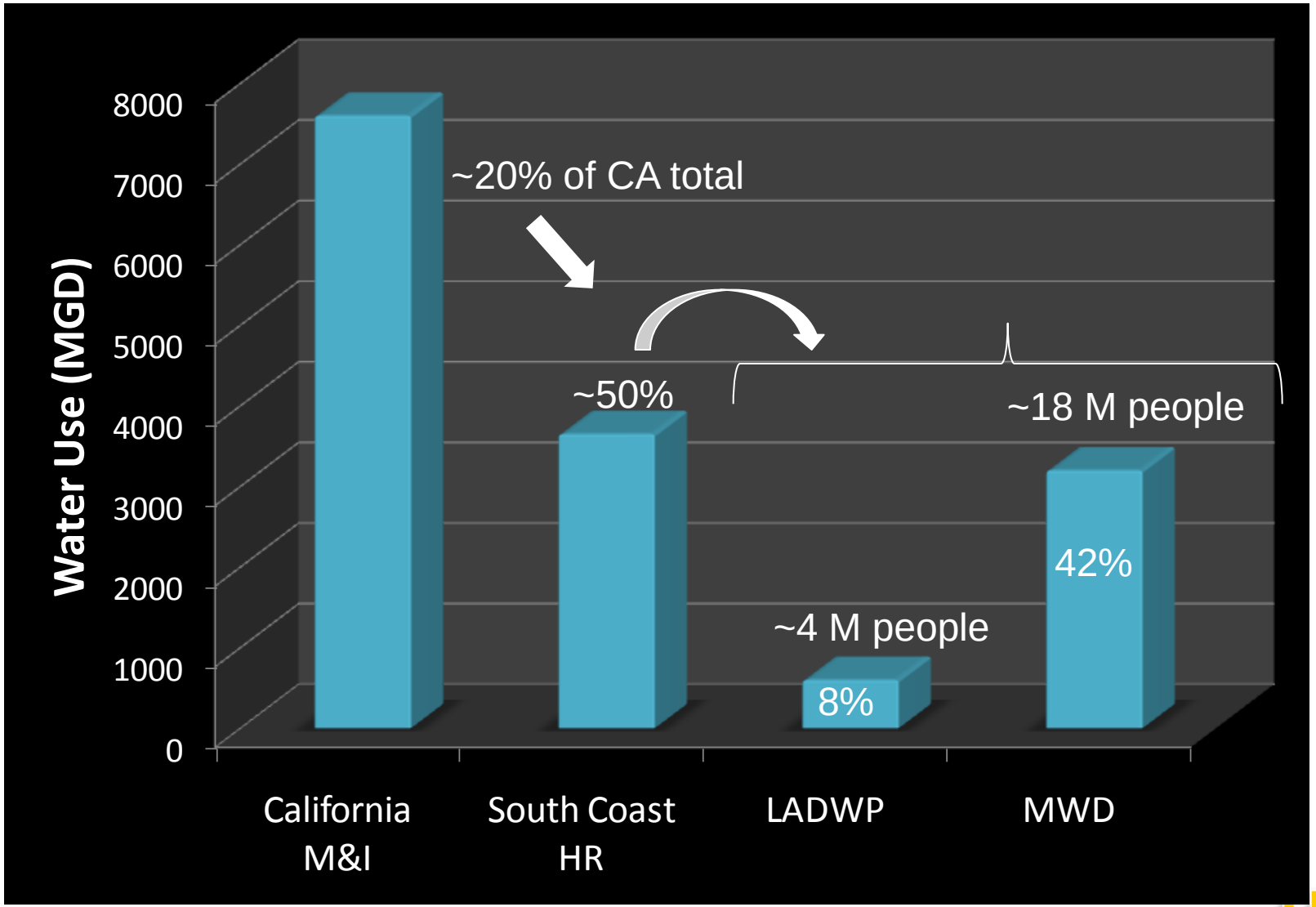
Electricity: 19% of State Use

Reduction in water conveyance will reduce energy consumption and the carbon footprint



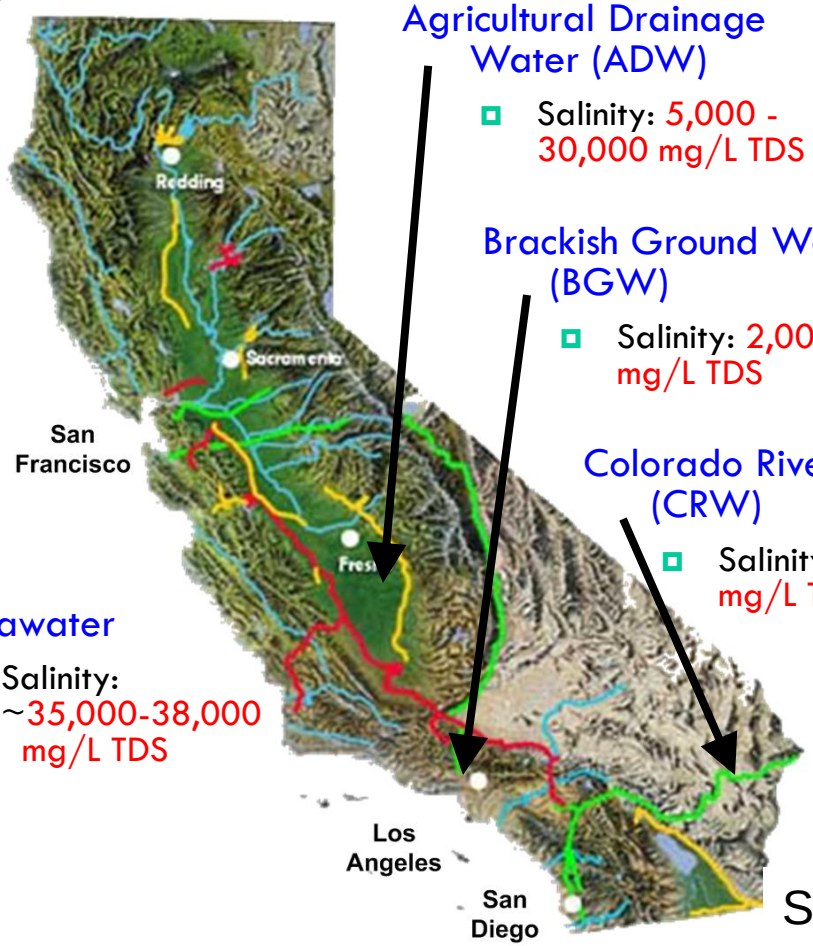
Northern California

Water Use in Southern California: The Case for Municipal and Industrial (M&I) Water Recycling



M&I – municipal and industrial; HR – hydrologic region

We are Surrounded by Saline Water



Agricultural Drainage Water (ADW)
- Salinity: 5,000 - 30,000 mg/L TDS

Brackish Ground Water (BGW)
- Salinity: 2,000 - 15,000 mg/L TDS

Colorado River Water (CRW)
- Salinity: 700-1000 mg/L TDS

Seawater
- Salinity: ~35,000-38,000 mg/L TDS

- Drought conditions and increasing population necessitate smarter water production and reclamation
- Opportunity to produce/reclaim water from several sources
  - Agricultural drainage water
  - Brackish groundwater
  - Seawater
  - Wastewater
- CA is a net salt importer

Secondary/Tertiary treated municipal wastewater effluent: 500-1500 mg/L TDS

McCool et al., Desalination, 261 (2010) 240-250

Metropolitan's 2011 Business Model

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Incentives for advanced technology use/development

- Develop new imported supplies to meet growing demand
- Moderate demand through conservation programs and subsidies to members
- Enable members to take actions they could not take individually
- Subsidize local supply projects
- Lead regional integrated resource planning process
- Subsidize conservation and some local production

Major Challenges

- Local supply development
- Improved regional storage
- Delta restoration and conveyance
- Climate change
- Natural disaster and terrorism
- Rising energy costs

fostering a water service and technology innovative region

MWD and Water Technology

- Host prototype technology demonstration efforts.
- Partner with member agencies in their technology-adoption and demonstration efforts.
- Work with national trade associations to set
  - Performance standards to guide the water technology industry.
  - Standards and steps necessary for technology deployment & acceptability.
- Serve as a conveyer of, and venue for, meetings among entrepreneurs, innovators, researchers, investors, and water policy officials in the public, private, and academic communities.
- Participate in state-level and regional efforts aimed at developing regional technology clusters.

In acting as an active sponsor, convener, conduit for information, and possibly even technology vendor, MWD could affect not only its capacity to perform its own missions but also the very nature of the region it serves.

Water Conservation and New Water Sources

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- Public perception may be limiting the adoption of efficient conservation technologies
- For many water costs are a small fraction of living costs
- Cost-effectiveness of urban conservation methods often do not consider the "human factor"
- Water use efficiency and energy are linked but the detailed impact of specific water conservation approaches needs to be quantified
- Capital investment → return on investment
- Institutional constraints
- Cost of new water sources relative to the cost investment in water conservation and use efficiency
- Future projections should consider an future technological advances → incentive for technological advances

MWD and Future Technologies

Advances in technology are highly likely to reduce the costs of desalination, recycling, groundwater storage, and other options.

Major question: How quickly will technological advances occur and be commercialized, and at what cost will those options become more attractive relative to the purchase of imports?

- Smart meters
- Water quality monitoring
- Water use efficiency
  - Smart irrigation
  - Efficient water use in appliances
  - Efficient indoor water use
- Greywater reclamation/recycling/reuse
- Wastewater reuse
- Leak detection in water delivery systems
- Reduction of water evaporation in conveyance systems
- Seawater desalination
- Water supply storage & forecasting
- Renewable energy sources for water conveyance and treatment

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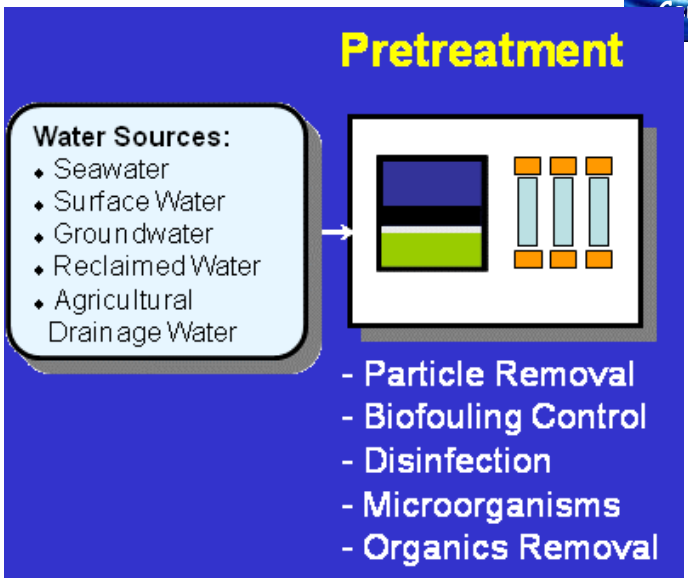
Technological Achievements and Opportunities

- Waste water can be treated to level of drinking water standard
- Brackish water desalination can be achieved up to 95% recovery in some cases
- Seawater can be desalted at reasonable cost (as low as ~$0.50-0.55 /$m^3$)
- Biological treatment can be carried out in small packed plants owing to developments in membrane bioreactors
- New generation of membranes enable significant reduction in the size of water treatment/ production plants
- The technology for compact distributed water treatment/reclamation and reuse is at our doorstep



High Recovery Desalting (RO integrated with chemical demineralization

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QUESTIONS?