Connecting Energy, Water, Food, Ecosystems, and Climate Change

-the Regional Implication for Sustainable Policy &Development

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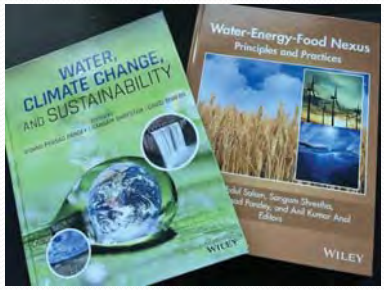
Note: this presentation is from my personal view as an Interdisciplinary scientist and artist



Highlight

- Overview: why connecting the dots with climate change
- Conceptual model framework for water, energy, food, and ecosystems with climate change
- Implication in integrated regional resource policy and management in CA
- - Examples of CA water plans -South coast region: Assess regional water-energy intensity
- Opportunities and Challenges
- Thought with my footprint art map in Europe trip

Acknowledgement

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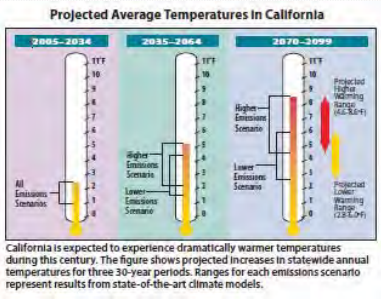
Peer reviews

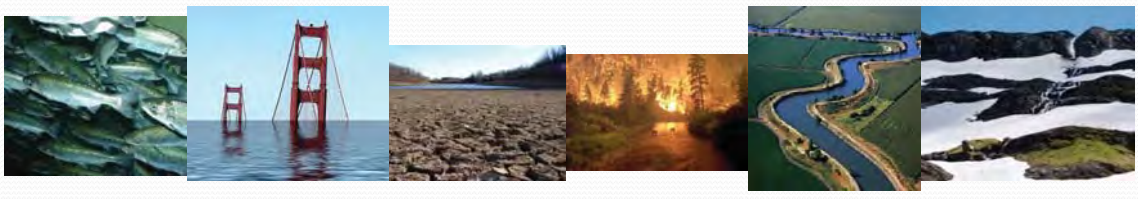
-Technical experts from academic institutions, CEC, CPUC, UC, Pacific Institute, SMUT, MWD, EBMUT, local agencies, and water and energy utilities.

Climate Change Effects on Ecosystem services on water, energy, food, transportation systems



California is expected to experience dramatically warmer temperatures during this century. The figure shows projected increases in statewide annual temperatures for three 30-year periods. Ranges for each emissions scenario represent results from state-of-the-art climate models.

- Increased temperatures
  - Projected temperature increase in CA (4.1 to 8.6 °F by 2100)
- Loss of snowpack
- Fire and air quality
- Extreme events with flood and drought,
- Rising sea levels
- Changes in species & habitats



Green House Gas Emissions Related To Each Sector

(about 37% in transportation, 21 % in energy, 8% in agriculture)

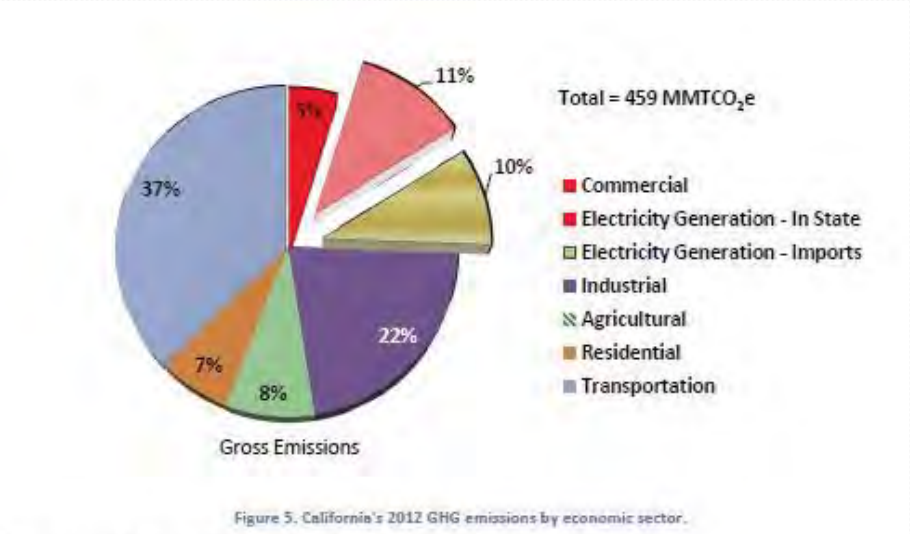
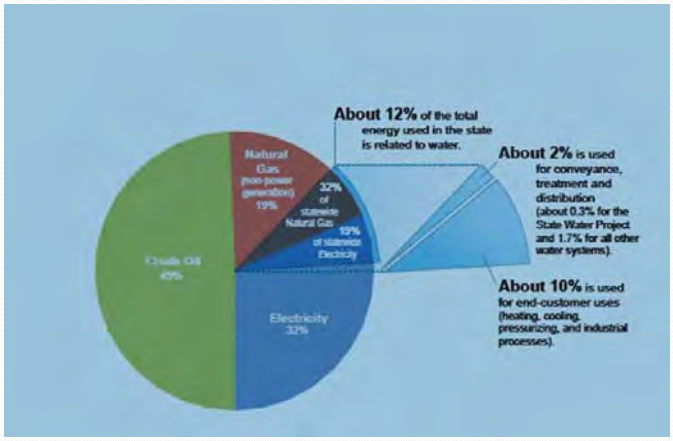


Figure 5. California's 2012 GHG emissions by economic sector.

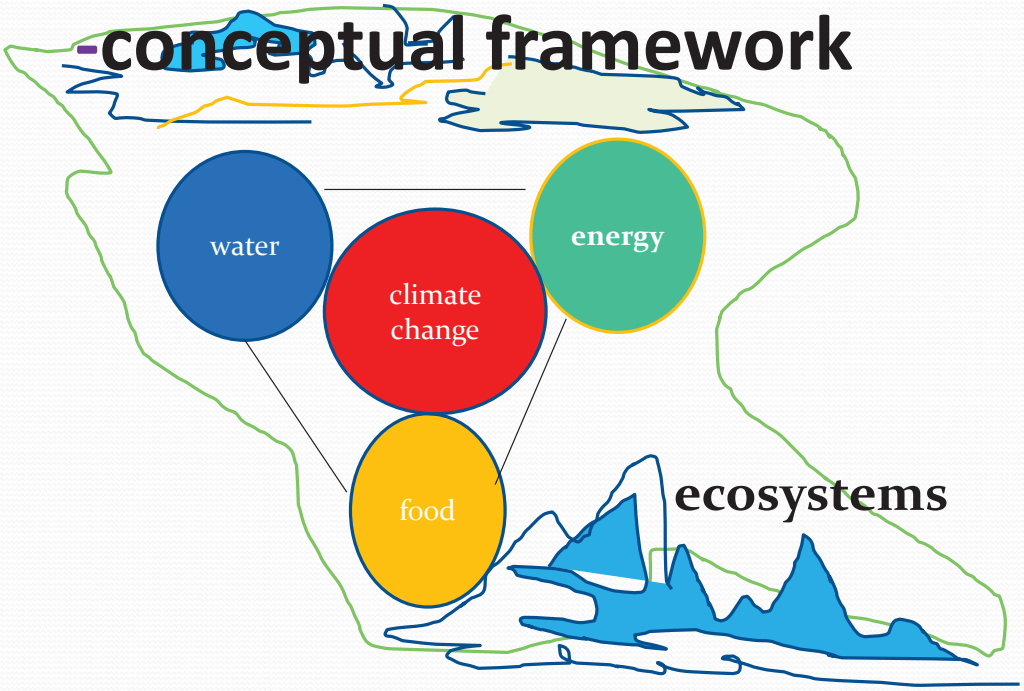
Data source: California Air Resources Board 2012 GHG Inventory.[17]

Energy uses in CA water sector

12% of the total energy use is related to water
(10% is related to end users; 2% other water cycle)
-CA water plan update

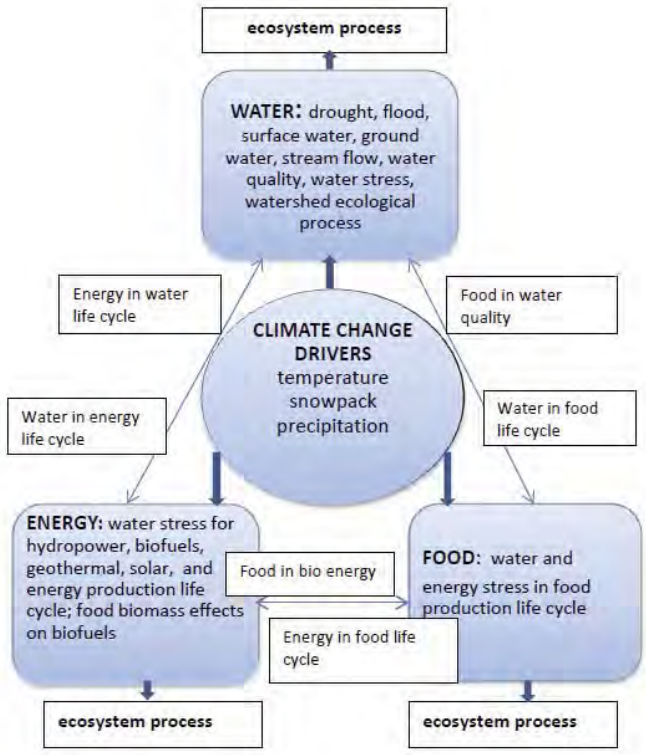


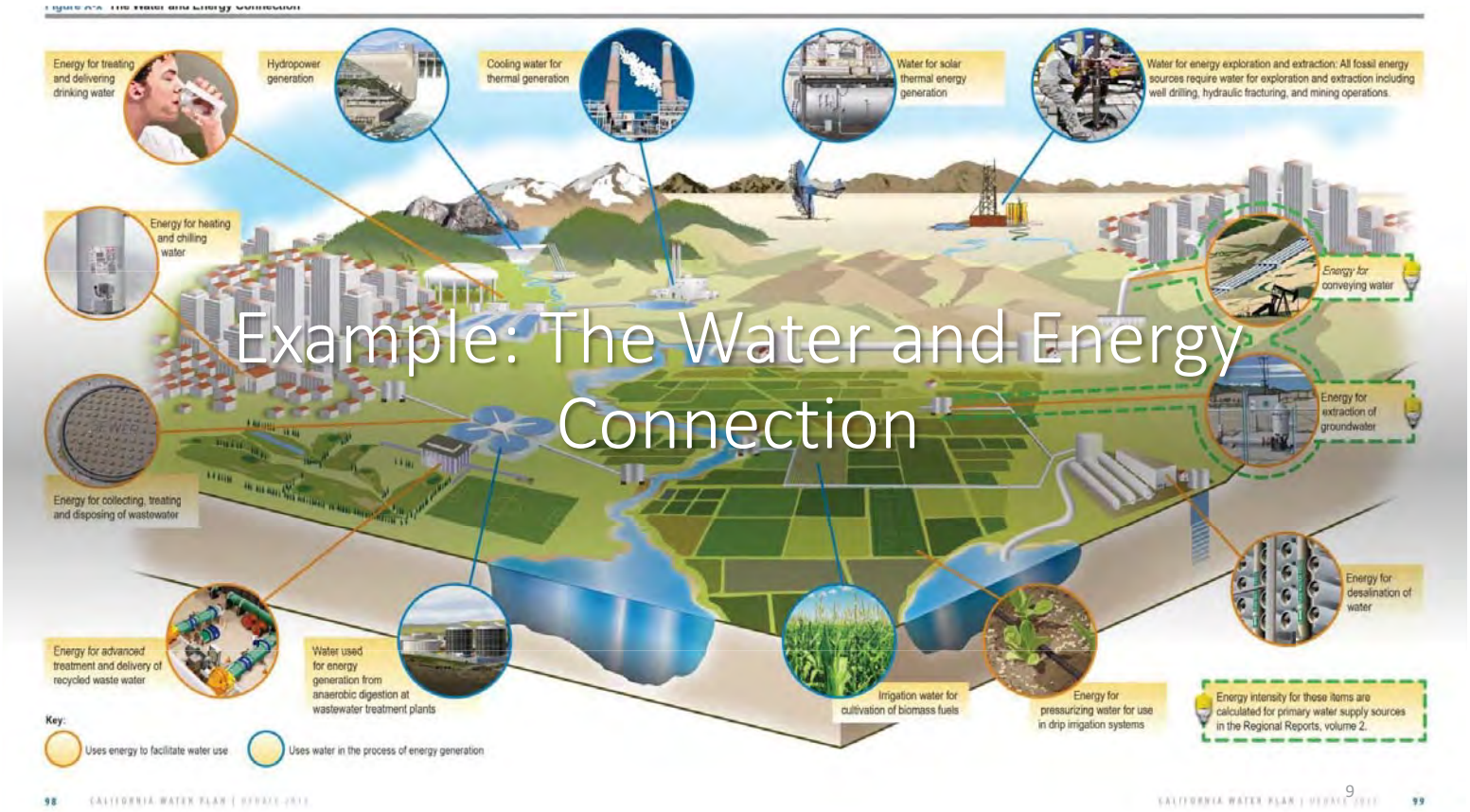
Connecting dots -conceptual framework



Conceptual Model Framework

Based on the Life cycle in water, energy, and food from supply to end use





Example: The Water and Energy Connection

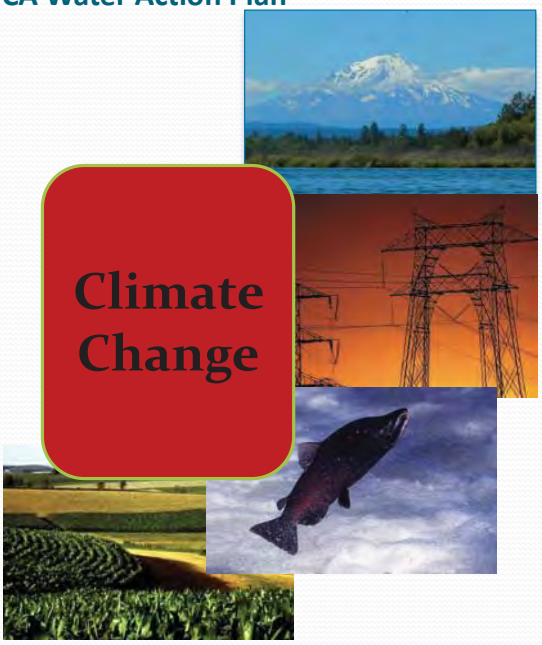
Example: Connecting The Dots by Integrated Water Management

-CA Water Plan & CA Water Action Plan

Department water resource climate change program's efforts

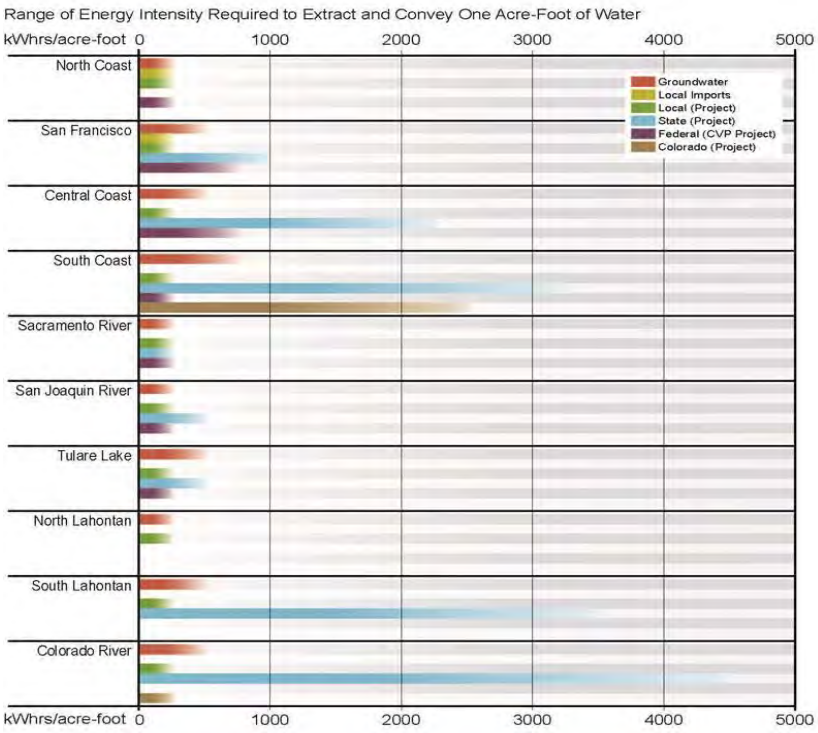
- Assessing water and energy related to climate change, agriculture, and ecosystems;
- Developing water-energy framework for integrated water management;
- Estimating energy intensity for regional water planning and management.

-see CA water plan update Vol. I, II, & III in climate change sections.



Regional water-energy difference

- management and policy implication



Q Liu at Water-Energy-Food Nexus-Principles and practices, AGU and Wiley, 2017, pp158.

-data resources: DWR CA water plan update &climate change program white paper, 2017.

- DWR CA water plan update, and climate change program white paper-2017

SC 25: South Coast Energy Intensity per Acre-Foot of Water

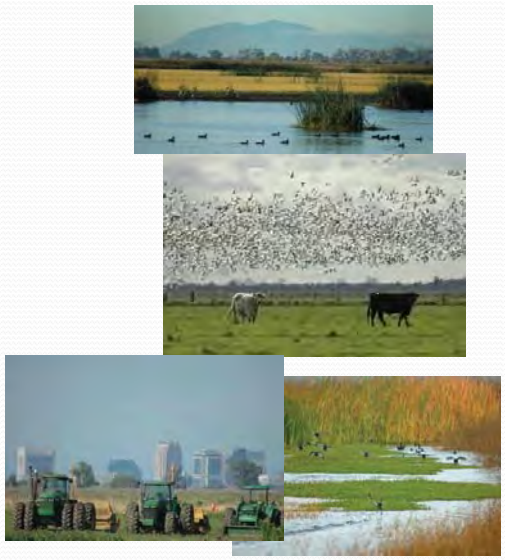
Type of Water	Energy Intensity (= 1-250 kWh/AF, = 251-500 kWh/AF)	Percent of Regional Water Supply*
Colorado (Project)	2,500	21%
Federal (Project)	<250 kWh/AF	<1%
State (Project)	3,214	27%
Local (Project)	<250 kWh/AF	4%
Local Imports	0*	5%
Groundwater		33%

* Los Angeles Aqueduct is a net energy provider

Challenges and Opportunities
In Climate Actions with Mitigation and Adaptation

Multi-sectors coordination for a sustainable future with resilience:

- Multiple benefits, trade-offs, and conflicts
- Water and energy efficiency systems
- Water, agricultural food production, fish & wildlife
- Wetland, carbon farming, carbon offset & GHG reduction
- Soil carbon storage and renewable energy from agricultural food production



Personal Story of transportation footprint in Europe Trip

Paris- Orange

Amsterdam-blue

London-Orange blue

Dublin & Galway-Irish Green

-Most by walking, buses, and trains with energy-water-food infrastructure and transportation support

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- What can we learn from this story for our regional climate action & planning???

Questions

-Decision of Climate Actions for future choice???

Thanks!!!