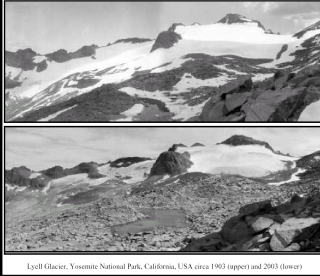


Adapt, Flee, or Perish



Left photo: Yosemite National Park, California, USA since 1993 (upper) and 2003 (lower)

T. Andrew
 Calif. Department of Water Resources
 Public Health Working Group
 September 14, 2009
 Sacramento, California

Today's Topics

- Projected impacts of water resources from climate change
- Climate change mitigation in the water sector
- Adaptation of climate change in the water sector
- Climate change and water quality

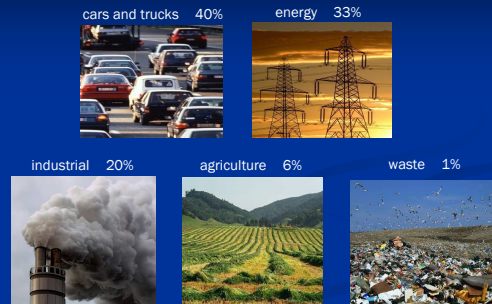


Climate Change Impacts on California's Water Resources



- Reduced snowpack, impacting water supply and hydropower
- Earlier snowmelt results in increased flood control demand on reservoir space
- Higher water temperatures impacts ecosystem
- Sea level rise impacts the Delta, threatens levees and increases salinity
- Increased demand in all sectors

California's GHG Emissions



Water, Energy and Climate Change

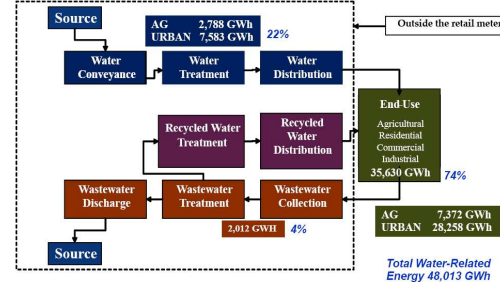


Future water management activities must carefully consider strategies to reduce greenhouse gas emissions.

Framework The Water Use Cycle



Estimates adjusted Oct 2006



Where are the greatest near-term opportunities for significant energy benefits?

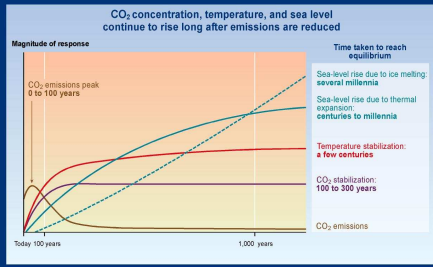
**Governor's Climate Action Team
Water Energy Subgroup**



- Water conservation
- Water recycling
- Energy intensity of water systems
- Urban runoff and stormwater reuse
- Renewable energy production

O'Shaughnessy Dam

Adaptation is a Necessity



IPCC | INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



Climate Change Water Adaptation White Paper
www.climatechange.water.ca.gov



Comprehensive Strategy for Adaptation

■ **Regional Strategies**

- Fully implement Integrated Regional Water Management (IRWM)
- Aggressively increase water use efficiency



Comprehensive Strategy for Adaptation

■ **Statewide Strategies**


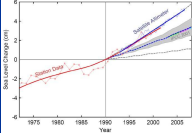
- Practice and promote integrated flood management
- Enhance and sustain ecosystems
- Advance and expand conjunctive management of surface and groundwater resources
- Fix the Delta



DEPARTMENT OF WATER RESOURCES

Comprehensive Strategy for Adaptation

- Improving Management and Decision-Making Capacity
 - Preserve, upgrade, and increase monitoring and data analysis and management
 - Plan for and adapt to sea level rise
 - Identify and fund focused climate change impacts and adaptation research and analysis

DEPARTMENT OF WATER RESOURCES


Comprehensive Strategy for Adaptation

- Investment Strategies
 - Provide sustainable funding for statewide and integrated regional water management



California **Water Plan Highlights**

INTEGRATED WATER MANAGEMENT




UPDATE 2009 - DEPARTMENT OF WATER RESOURCES

Public Review Draft
January 26, 2009


www.waterplan.water.ca.gov

EXECUTIVE SUMMARY
2009 CALIFORNIA CLIMATE ADAPTATION STRATEGY
DISCUSSION DRAFT

A Report to the Governor of the State of California
in Response to Executive Order S-13-08-09



Public Review Draft



www.climatechange.gov/adaptation

Climate Change & Water Quality Direct Effects

- Watershed responses
 - Changes in vegetation, soil moisture, groundwater infiltration, erosion
- Runoff timing
 - Less dilution during the dry season, droughts
 - More (and more polluted) runoff during flood season
 - Infrastructure damage from flooding
- Influent water quality
 - Changes in temperature, pH, turbidity, dissolved oxygen, nutrients
 - Impacts to treatment processes
- Sea level rise/salinity
 - Sacramento-San Joaquin Delta
 - Coastal aquifers


Climate Change & Water Quality Indirect Effects

- Water system operations
 - Flood control
 - Fisheries/ecosystem needs
 - Recreation
 - Ambient water quality
- Alternative water supplies
 - Groundwater
 - Recycled water
 - Desalination
- Energy use
 - Advanced water treatment technologies
 - Treatment plant operations

California Water Management and Climate Change

- Climate change presents significant challenges for the management of California's water resources.
- California water managers must focus on mitigation and especially adaptation.
- Climate change responses must be thoughtfully integrated with water supply reliability, environmental protection, public safety, and public health actions.
- We must embrace a entirely new way of thinking about water resources planning and management.

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 andrew@water.ca.gov



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Common Energy-Water Tradeoffs


Energy Use	More	Seawater desalting Wastewater reuse Conjunctive use Wastewater treatment Large dam removal Drip irrigation-SW Fish screens	Water treatment Pumping
	Less	Water conservation Crop yield improvements Solar generation agriculture substitution?	Shade trees Evaporative cooling Reforestation Biofuels Production? Shale oil Production?
		Less 0 More	

Water Use or Environmental Impact Jay Lund, UCD

California Environmental Protection Agency
 Air Resources Board


DRAFT

EXPANDED LIST OF EARLY ACTION MEASURES TO REDUCE GREENHOUSE GAS EMISSIONS IN CALIFORNIA RECOMMENDED FOR BOARD CONSIDERATION



Lipit-Gillette, Yosemite National Park, California, USA circa 1903 (top) and 2003 (bottom)

SEPTEMBER 2007



CLIMATE ADAPTATION STRATEGY

- Executive Order S 13-08
- Statewide adaptation plan covering seven sectors:
 - Water
 - Transportation and Energy Infrastructure
 - Forestry
 - Oceans and Coastal Resources
 - Agriculture
 - Biodiversity and Habitat
 - Public Health
- NAS & Level Readily
- Transportation systems vulnerability assessment