Accounting for Water in Dry Regions:
A Comparative Review

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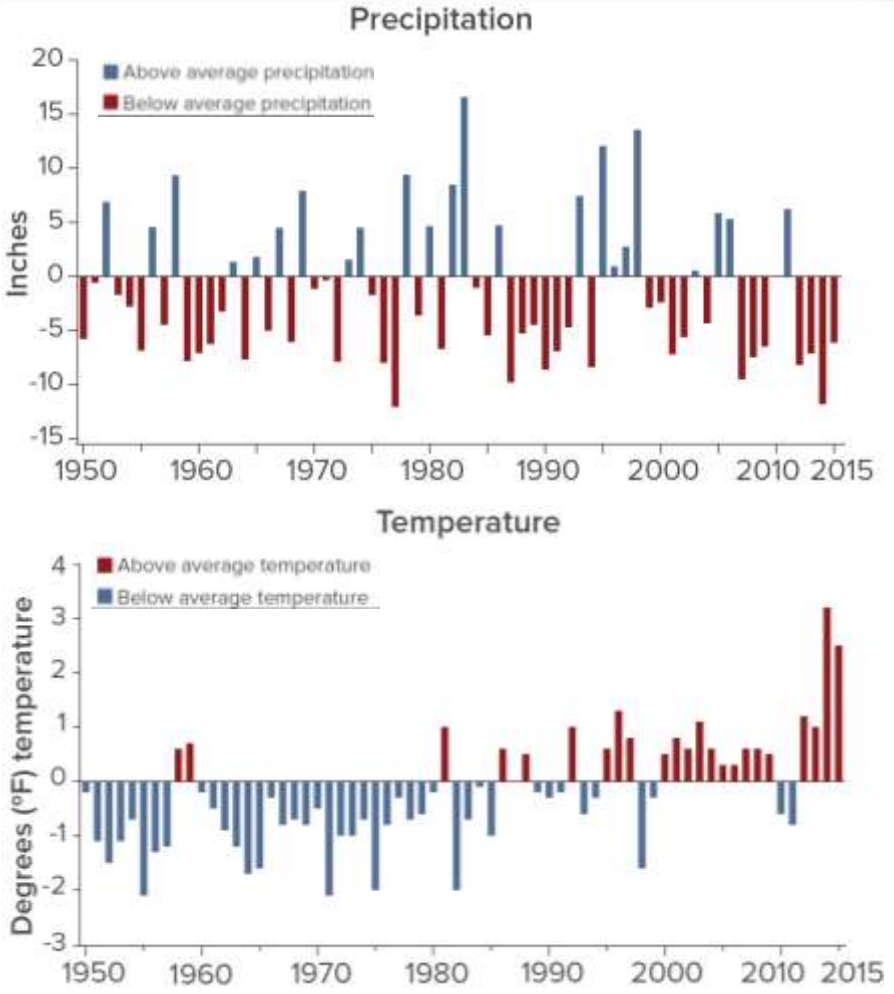
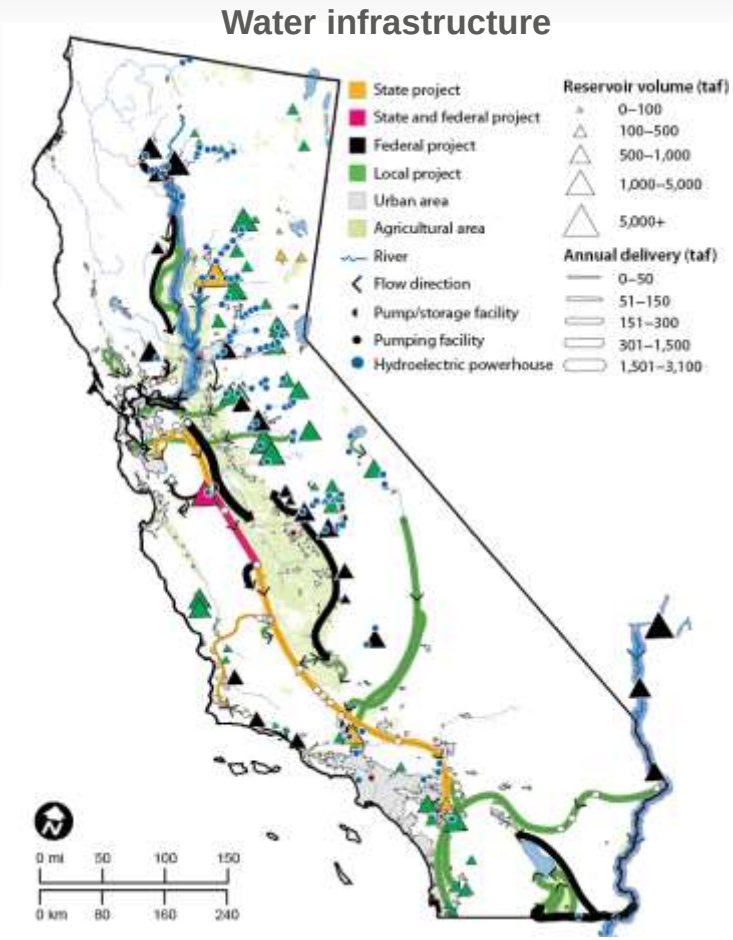
CA's latest drought is a "drought of the future" (high temps, reduced snowpack, low flows)

- 2012 – 2015 was the driest 4-year period since record keeping began in 1885
- 2014, 2015 and 2016 were the hottest years in records



California's water supply is physically interconnected, but institutionally fragmented



Source: Hanak et al. (2011), *Managing California's Water: From Conflict to Reconciliation*

- Several federal and state agencies manage water
- Over 1,000 irrigation districts
- Over 400 urban agencies
- Nearly 200 priority groundwater basins
- Over 1,400 large dams

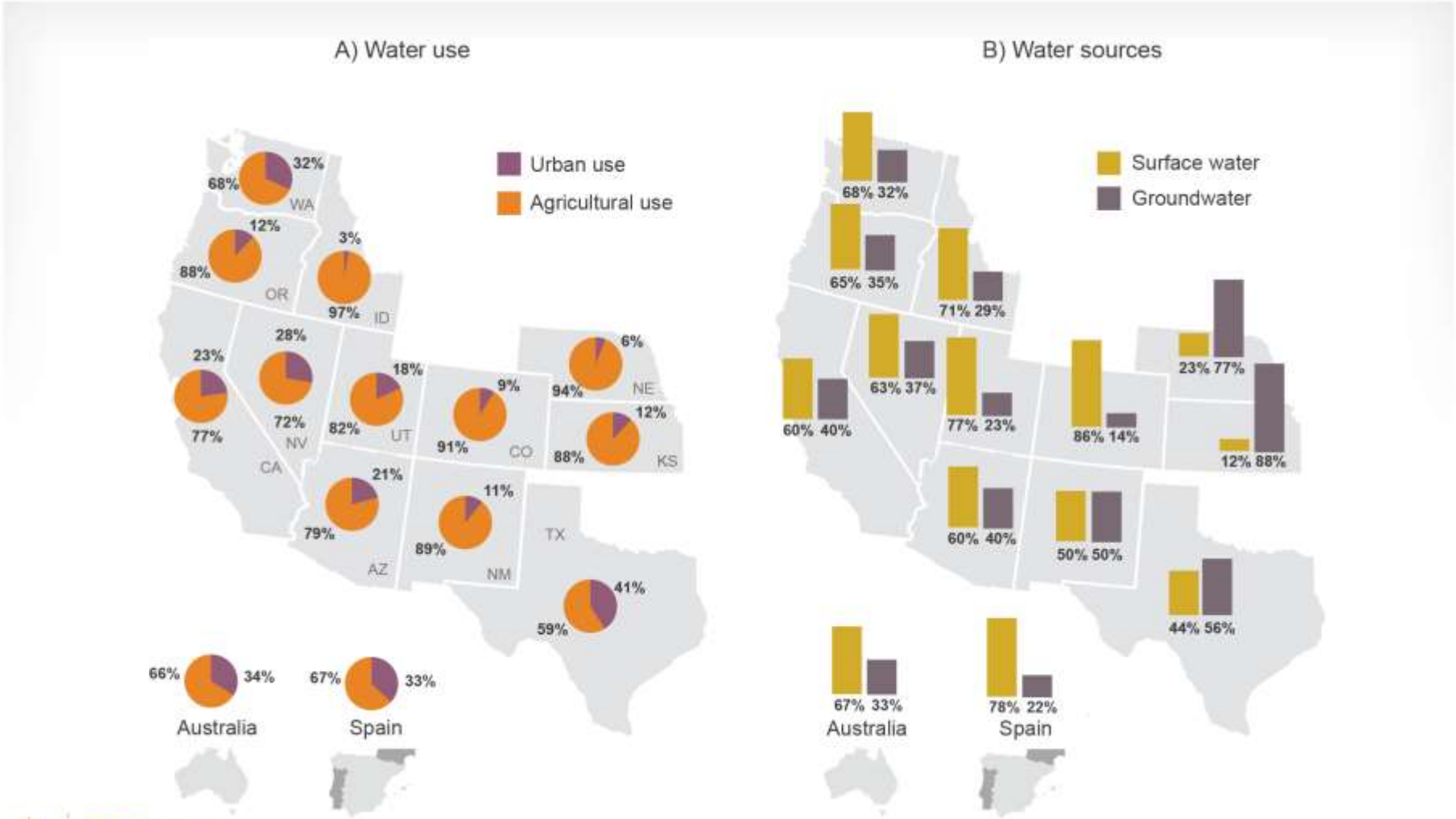
The drought spotlighted weaknesses in California's water accounting

- Surface water allocations and curtailments
- Long-term depletion of aquifers
- Water for the environment
- Water trading

There is a need to improve water information and accounting

- Analyzing information needs
- Reviewing practices in other comparable regions
- Identifying best management practices
- Proposing policy changes for California's water management

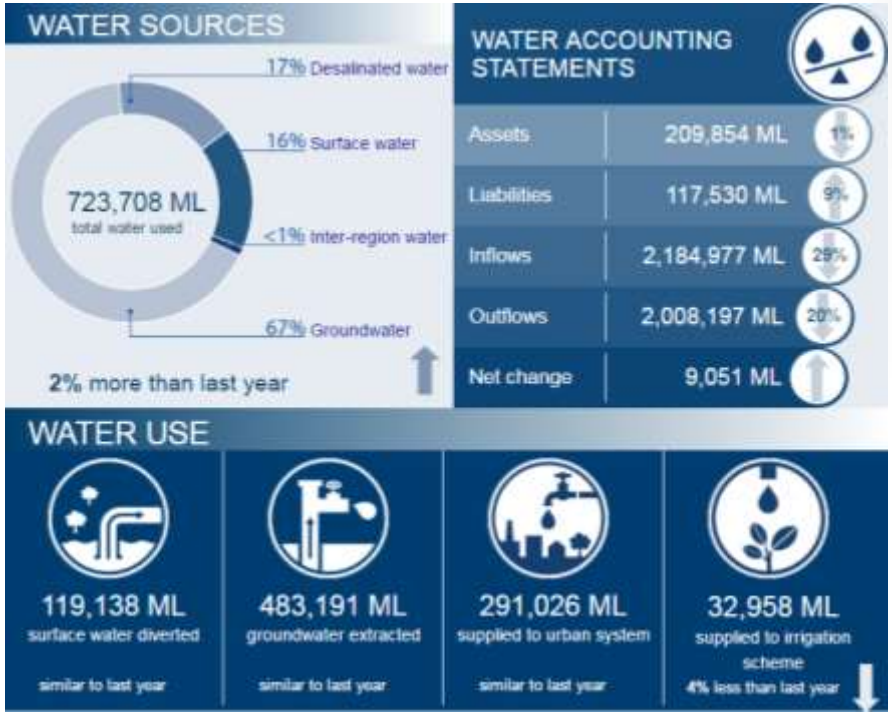
Other dry regions teach valuable lessons



What do we understand by water accounting?

- Understanding the balance sheet:
  - How much is there?
  - Who has claims to use it?
  - What is actually used?
- Managing and sharing information

Water information dashboard



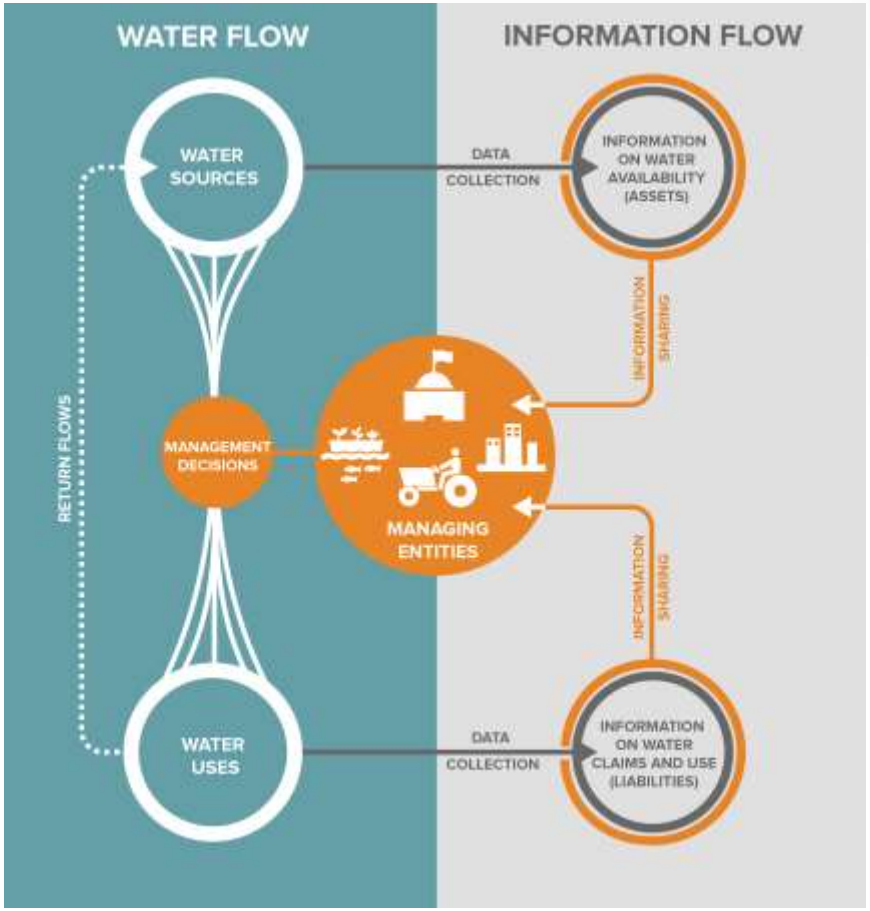
Source: Bureau of Meteorology of the Australian Government

¿Who are the users of water accounting?

- Oversight agencies
- Operational agencies
- Water users (water right holders, irrigation districts, cities…)
- Policy makers and the general public

¿What are the basic elements of water accounting?

- Assets
  - Water availability
- Liabilities
  - Water rights
  - Actual water use
- Information management
  - Standards and compatibility
  - Information availability
- Cost



Accounting for water assets: Water availability

- Surface water
- Groundwater
- Surface-groundwater interactions

- Best practices:
  - Integrated information systems (Colorado and Spain)
  - State-funded standard models to reduce costs: Texas, Colorado, Idaho…

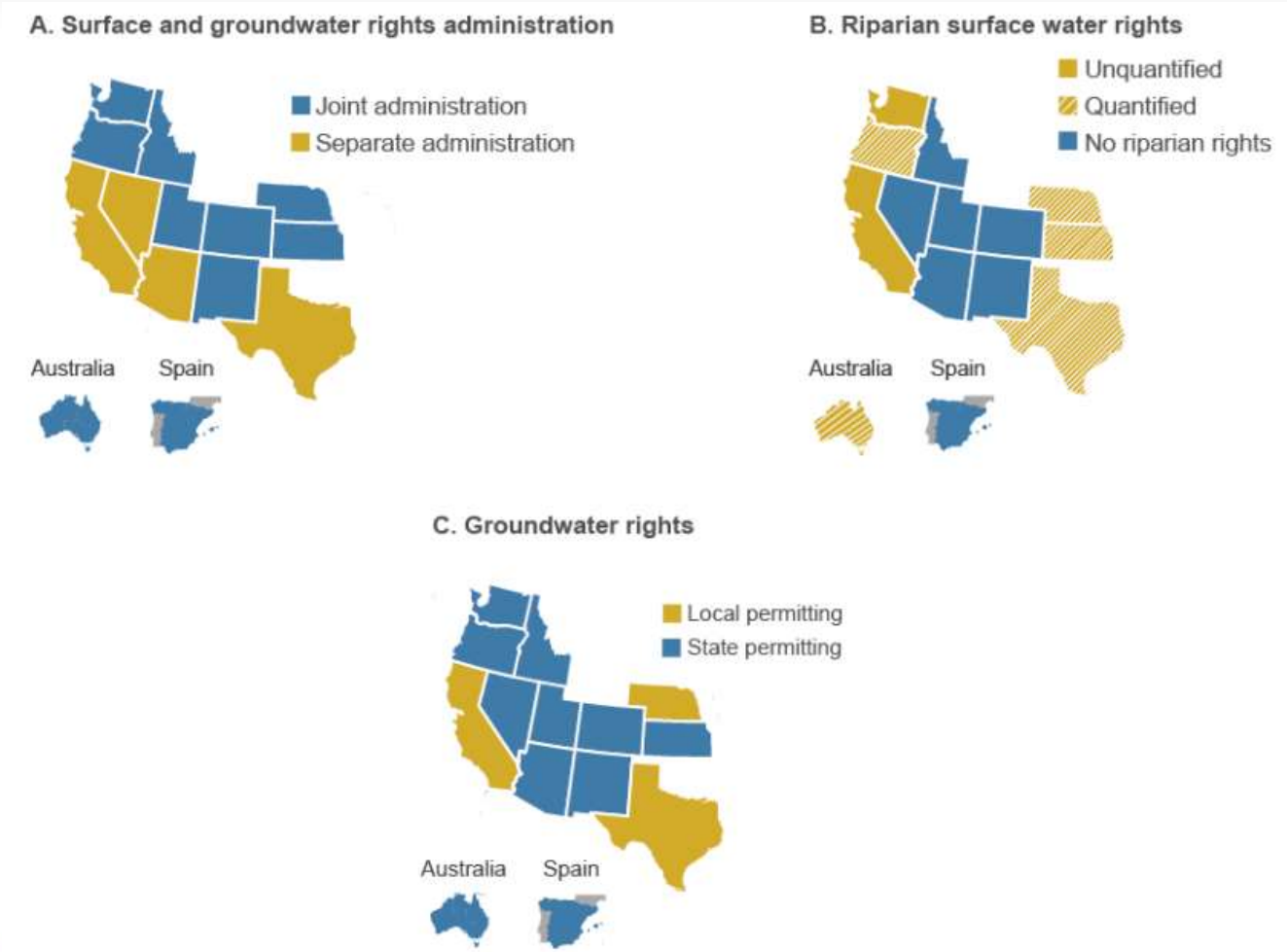
Automatic water information system in the Ebro Water Basin Authority (Spain)

Accounting for the liabilities (I): Water rights

- Water rights (above and below ground)
- Environmental flows (and other environmental requirements)

- Best practices:
  - Joint administration of Surface and groundwater rights
  - Systematic definition of environmental requirements

Accounting for the liabilities (I): Water rights

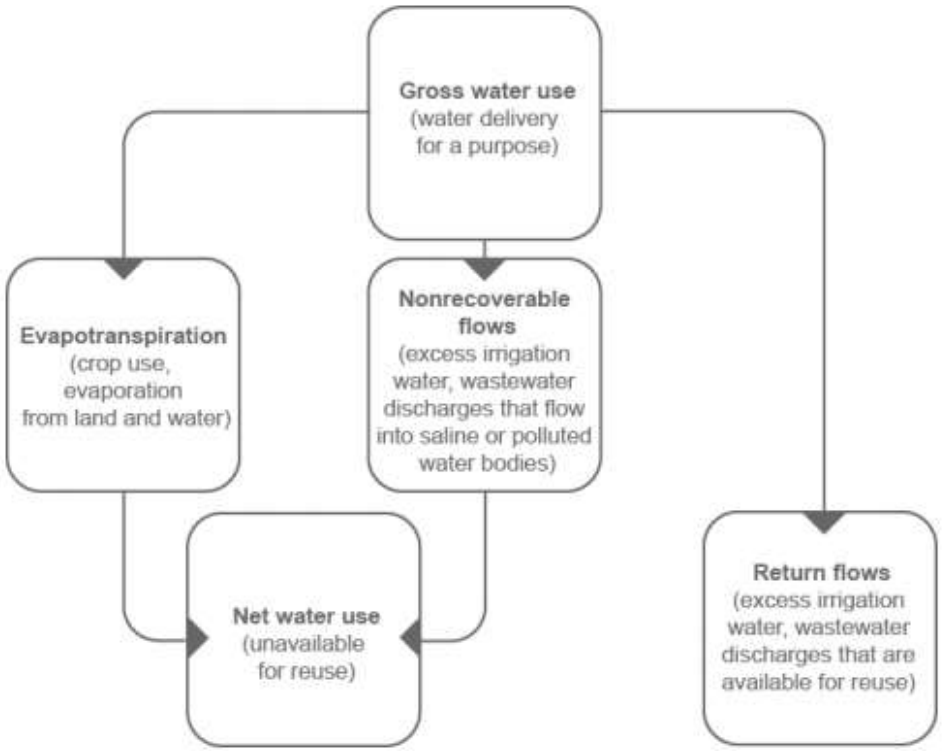


Accounting for the liabilities (II): Water use

- Surface diversions
- Groundwater pumping
- Return flows
- Environmental uses

- Best practices:
  - Telemetry-based measurements
  - Mandatory measurement (when needed) of groundwater pumping
  - Measurement (or estimation) of return flows

Applied and consumptive water use, and return flows



Managing water information

- Water standards
- Authoritative and transparent models
- Useful information (time and access are key)

- Best practices:
  - Australian accounting standards
  - State groundwater models in Texas
  - Online platforms for water trading

Seven best practices in water accounting

- Water availability
  1. Develop centralized monitoring for river basins
- Water rights and environmental requirements
  2. Quantify all major water rights
  3. Clarify environmental water claims
- Water use
  4. Measure and monitor strategic water uses
  5. Improve estimates of net use and return flows
- Managing information
  6. Develop standards for data and models
  7. Organize information

Modernizing water accounting provides more resilience in a changing climate

- Provide more accurate assessments:
  - How much water is there?
  - Who has claims to use it?
  - What is actually used?
- Fill accounting gaps, consolidate information, and make data useful
- Make the most of available water

More information:

- www.ppic.org
- Accounting for California's Water (2016). A. Escriva-Bou, H. McCann, E. Hanak, B. Gray and J. Lund
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