

Accounting for Water in Dry Regions: A Comparative Review

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Alvar Escriva-Bou, Research Fellow (escriva@ppic.org)
Henry McCann, Ellen Hanak, Jay Lund, Brian Gray

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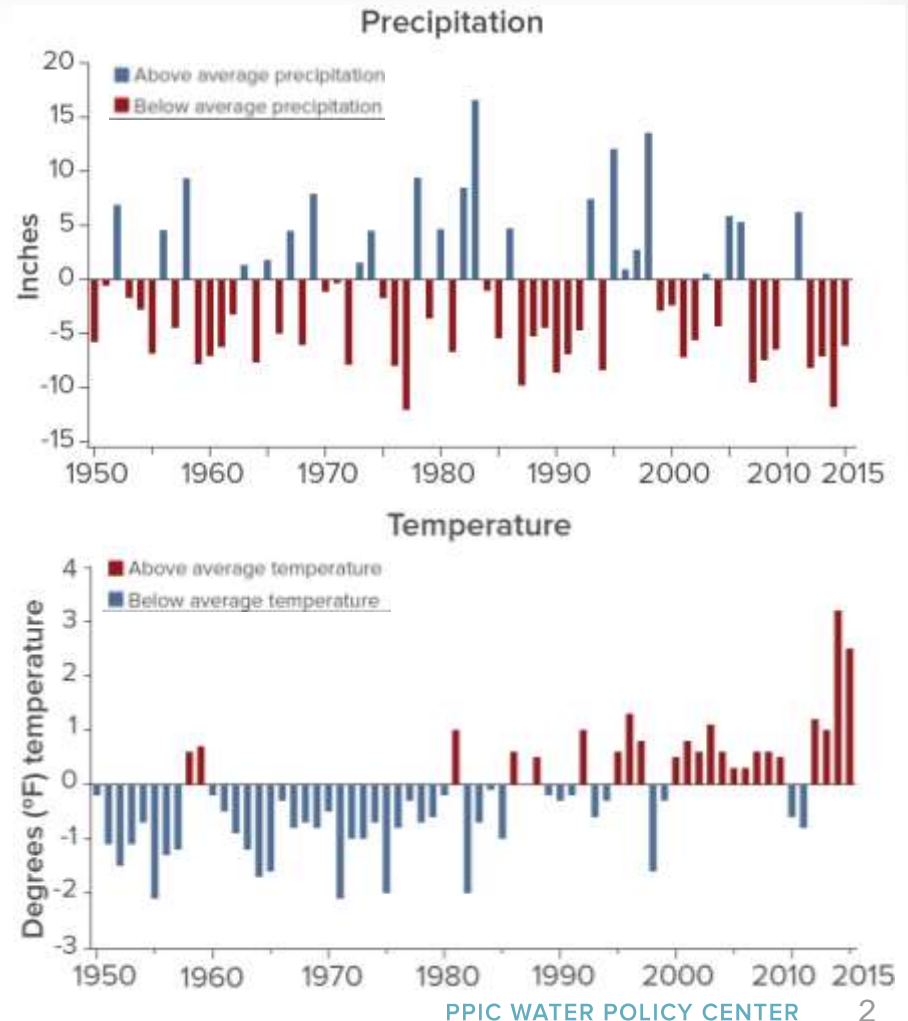
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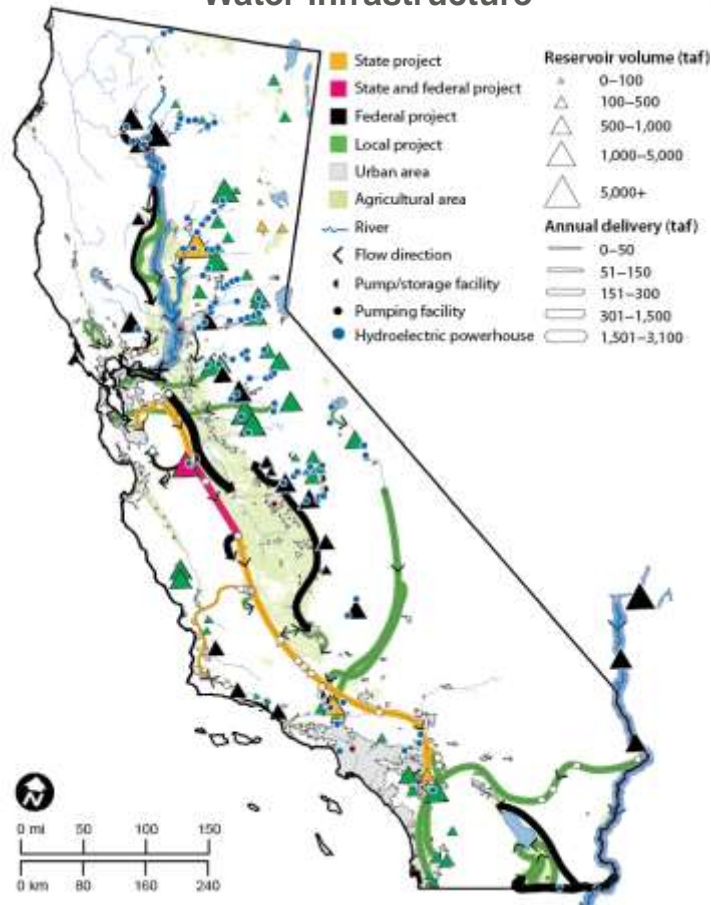
CA's latest drought is a “drought of the future” (high temps, reduced snowpack, low flows)

- 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

Water infrastructure



- 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

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

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



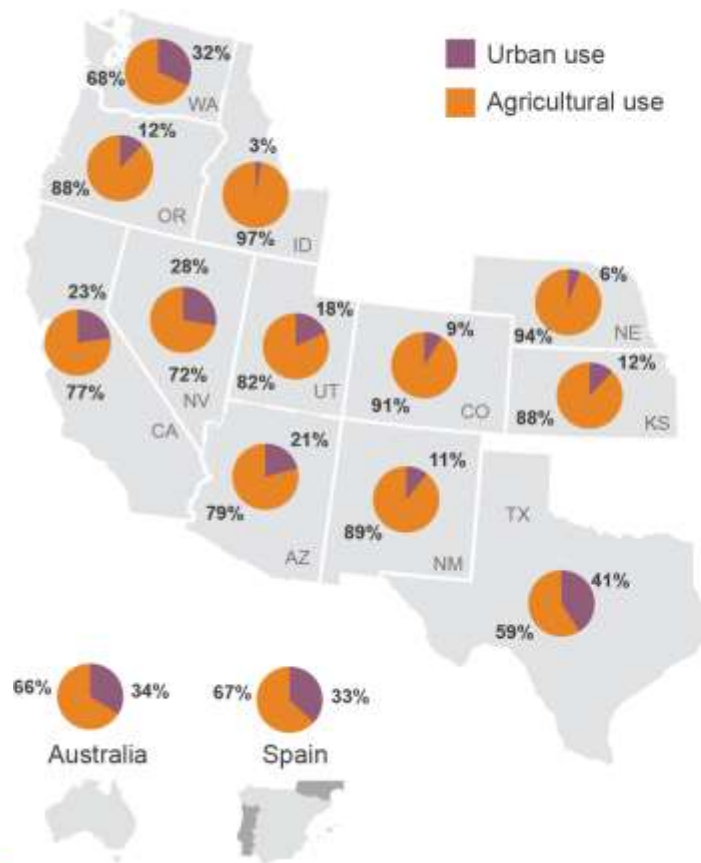
There is a need to improve water information and accounting

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

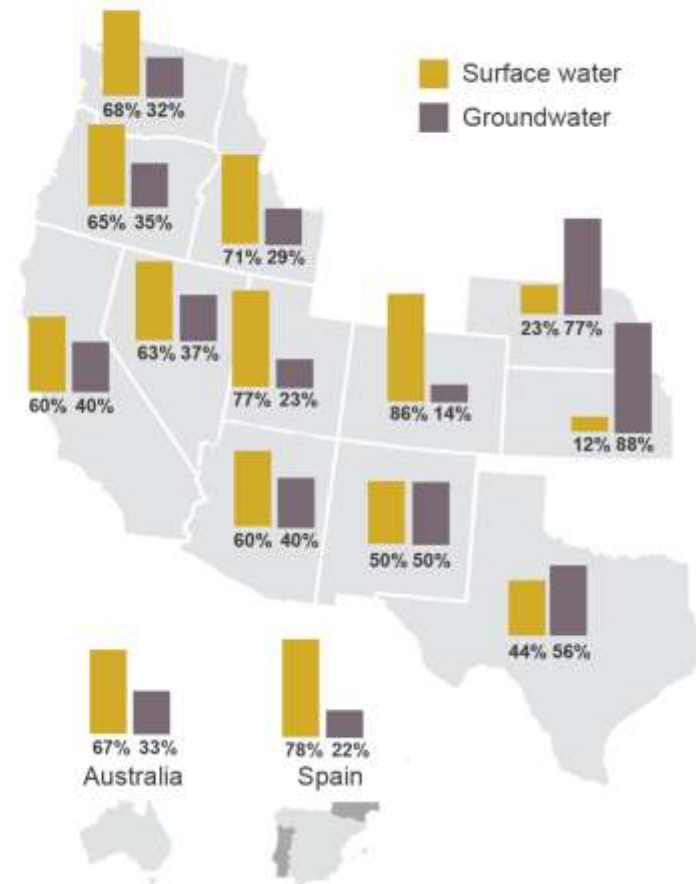


Other dry regions teach valuable lessons

A) Water use

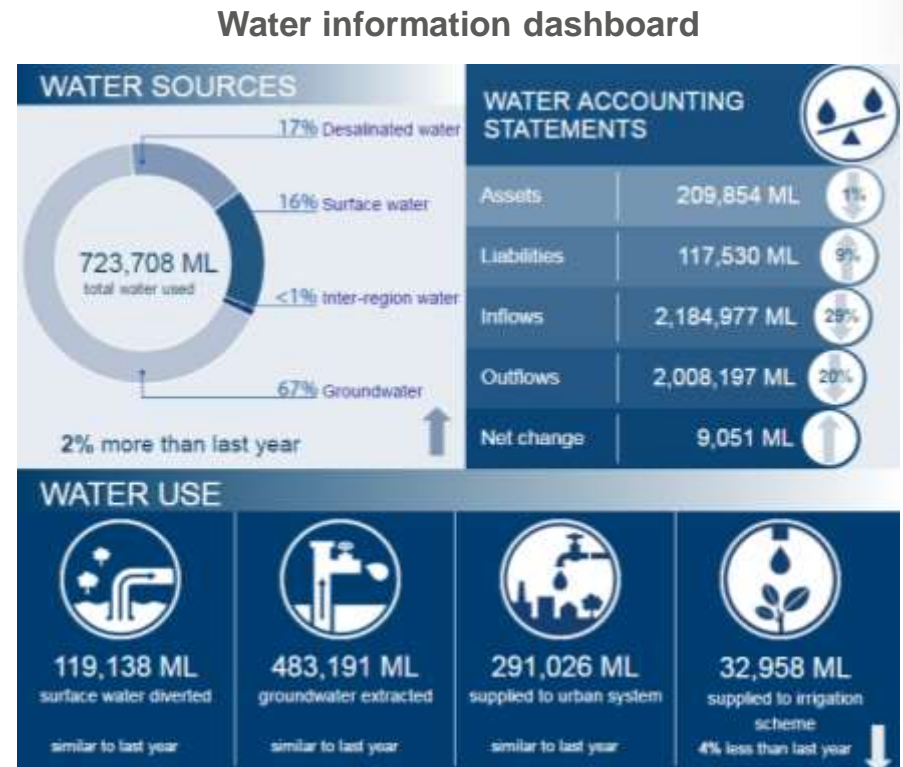


B) Water sources



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



Source: Bureau of Meteorology of the Australian Government

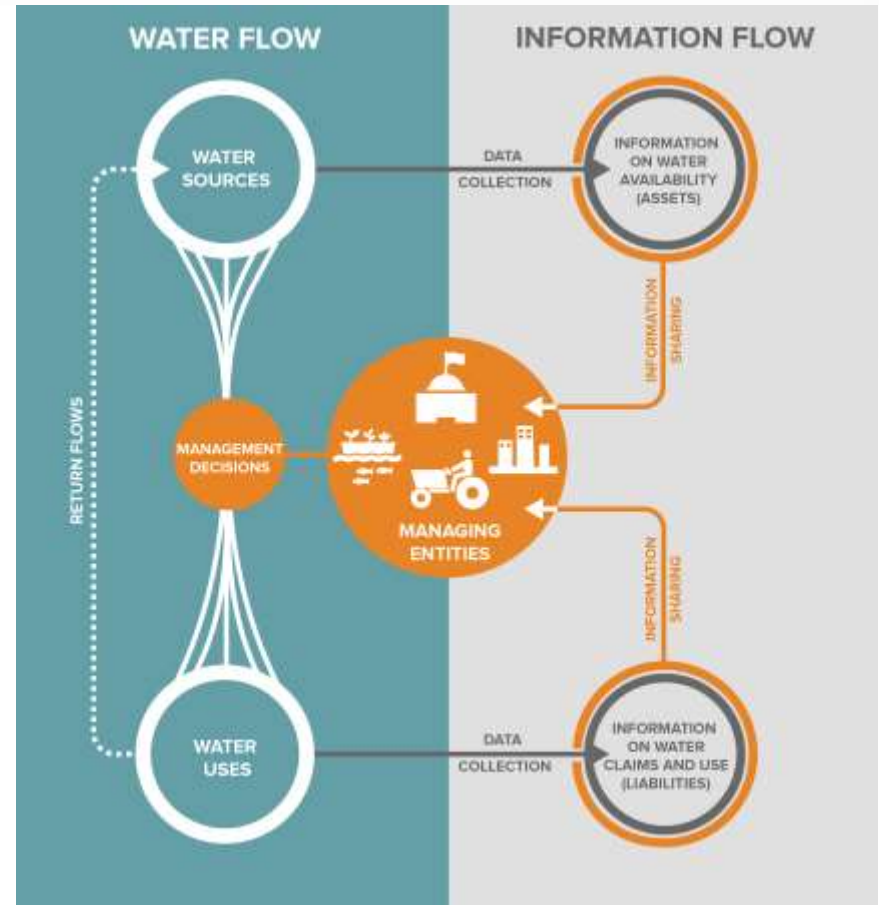
¿Who are the users of water accounting?

- 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

A. Surface and groundwater rights administration



B. Riparian surface water rights



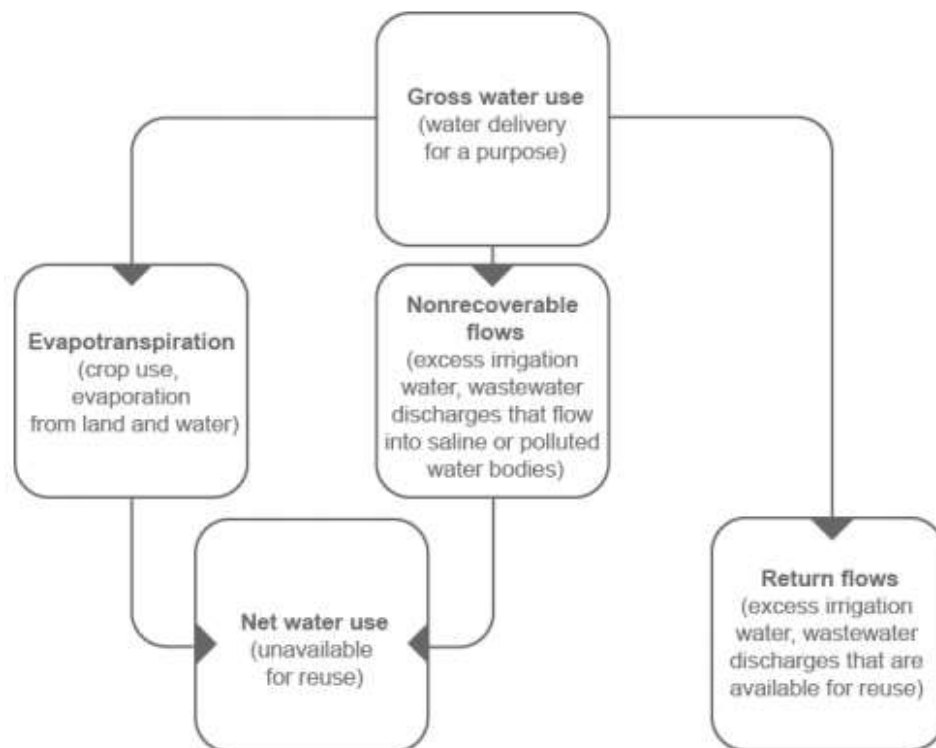
C. Groundwater rights



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
- Alvar Escriva-Bou (escriva@ppic.org; +1-916-440-1125)

The screenshot displays the PPIC website interface. At the top left is the PPIC logo with the text 'PUBLIC POLICY INSTITUTE OF CALIFORNIA' and the tagline 'Informing and improving public policy through independent, objective, nonpartisan research.' To the right are social media icons and a search bar. A navigation menu includes 'ABOUT PPIC', 'PUBLICATIONS', 'TOPICS', 'NEWS & EVENTS', and 'SUPPORT PPIC'. The main content area features a sidebar with 'RSS FEED' links for 'NEW PUBLICATIONS' and 'STATEWIDE SURVEY', and a list of filters: 'VIEW ALL PUBLICATIONS', 'By Author', 'By Title', 'By Publication Date', 'By Publication Type', and 'By Topic'. The main article is titled 'Accounting for California's Water' by Alvar Escriva-Bou, Henry McCann, Ellen Hanak, Jay Lund, and Brian Gray, dated July 2016. It includes a thumbnail image of people in a field and links to the 'Full Report' (PDF, 1627K) and 'Technical Appendix' (PDF, 2012K). The text describes the report's focus on California's water balance sheet and compares accounting systems with other western states, Australia, and Spain. A 'RELATED EVENT' section lists 'Improving California's Water Accounting', and an 'OTHER PUBLICATIONS' section lists 'Allocating California's Water: Directions for Reform', 'California's Water', and 'Water Stress and a Changing San Joaquin Valley'. A 'RELATED TOPICS' section lists 'Water'.