

CALVIN

Model Uses CALVIN is an economic-engineering optimization model for the entire water system of California. The model operates facilities and allocates water so as to maximize statewide agricultural and urban economic value from water use.

Major Categories Climate; Decision Support; Hydrology and Water Use

Subject Knowledge Level
Advanced

Minor Categories Climate Change; Desired Future Conditions; Scenario Development; Management; Surface Water; Ground Water

Technical Difficulty Level
Advanced

Model Type Physical Model

Geographic in Nature?
Semi

Abstract

CALVIN is a model of the entire California water system including surface and groundwater systems, and supply and demands. It is an economic-engineering optimization model taking into account economic values for agricultural, urban and hydropower uses, and flow constraints for environmental uses. The model, unless otherwise constrained, operates, facilities and allocates water so as to maximize statewide agricultural and urban economic value from water use. CALVIN prescribes monthly system operation over a 72-year representative hydrology. CALVIN modeling will indicate the ability of California's water system to adapt to the predicted climate changes of wetter winters and drier summers over the next century.

Future Developments

Current development is around applications to climate change problems and long-term planning for California's inter-tied water system.

The creators of CALVIN believe that it needs a new institutional home (outside of the University) such as the California Department of Water Resources.

Model Limitations

1. Data Limitations:
Base hydrology, Tulare Basin and San Joaquin Valley have frequent problems, monthly agricultural demands, etc.
2. Network flow formulation:
Simplified costs, water quality, environmental requirements, hydraulics, hydrologic foresight and coordination
3. Limited range of benefits:
No flood control or recreation

Model Features

- Covers 92% of California's population and 88% of its irrigated acreage
- Contains roughly 1200 spatial elements including:
 - 51 surface reservoirs
 - 28 groundwater basins
 - 18 urban economic demand areas
 - 24 agricultural economic demand areas
 - 39 environmental flow locations
 - 113 surface and groundwater inflows
 - Numerous conveyance and other links representing the majority of California's water management infrastructure

Required Data Types

- Surface and Ground Water Hydrology
- Physical facilities and capacities
- Environmental flow constraints
- Urban values of water (elasticities)
- Agricultural values of water

Model Outputs

- Delivery, Scarcity, and Cost Performance
- Economic benefits of Alternatives
- Conjunctive use and cooperative operations
- Willingness-to-pay for additional water and reliability

- Operating costs
- Policy Constraints

- Water operations and deliver reliabilities
- Value of more flexible operations
- Values of increased facility capacities
- Costs of Environmental Flows

Source

UC Davis, Civil and Environmental Engineering, and Agricultural and Resource Economics Departments
 Principal Investigators: Jay R. Lund, Richard E. Howitt, and Marion W. Jenkins

Source (URL)

<http://cee.engr.ucdavis.edu/faculty/lund/CALVIN/>
<http://cwemf.org/workshops/ClimateChgWrkshp/LundCAClimate.pdf>

Hardware Requirements

unknown

		Supported Platforms	
DOS	<input type="checkbox"/>	UNIX	<input type="checkbox"/>
Windows	<input checked="" type="checkbox"/>	Macintosh	<input type="checkbox"/>

Software Requirements

Windows 98 or XP

Cost, Licensing and Availability

Model available at <http://cee.engr.ucdavis.edu/faculty/lund/CALVIN/>