



Workshop Summary

Regional and Statewide Water Management Responses to an Uncertain Future

October 8, 2009

The California Department of Water Resources held a workshop of the Statewide Water Analysis Network to solicit feedback on recent studies exploring the effectiveness of regional and statewide water management responses to uncertainties facing California water managers. Studies were presented that offer different perspectives on how climate change, population growth, droughts and other uncertainties may impact regional water management systems, and operations of the Central Valley Project and State Water Project. The studies presented were selected to highlight our current technical capabilities and limitations for describing future uncertainties and to provide decision makers with some insight into the challenges facing water managers. The following studies were presented:

- **Water Management Lessons for California from Statewide Hydro-economic Modeling using the CALVIN Model**, (Jay R. Lund, University of California, Davis)
- **CalSim-II Modeling Efforts on Water Resources Challenges and Potential Management Responses and Uncertainties Facing Management of the CVP and SWP** (Francis Chung and Ray Hoagland, California Department of Water Resources)
- **Regional Water Management Responses using IRPSIM** (Jennifer Nevills, Metropolitan Water District of Southern California)

Workshop findings about capabilities, limitations, and policy implications

General capabilities and limitations – Water management models are intended to provide insight into dynamics of the water management system and provide direction to decision makers. No model exists to capture all the complexity of the real world, particularly when looking at different spatial and temporal scales. Studies must effectively link statewide and local/regional water management responses while considering planning horizons that range from real-time predictive assessments to projections out to the year 2100.

Climate change – Within the water management models, progress has been made over the last 5 years to represent climate change impacts on future supply and reservoir operations. There is uncertainty remaining related how well information from global circulation models is downscaled to produce regional information, particularly for determination of future snow pack associated with climate change. Planning environment has changed. We are no longer planning for average conditions.

Water management system operation and re-operation – There is a need to study re-operation of the existing water management system in order to more fully evaluate impacts from climate change, drought, and new environmental requirements. Studies must include an integrated hydrologic representation of water supplies and water demands and an explicit representation of water management costs, benefits, and tradeoffs for the entire water management system. The Delta is the weakest link in the system from a water supply reliability, flood management, and environmental sustainability perspective.

20X2020 water conservation targets – Modeling efforts must be clear about assumptions related to 20X2020 water conservation targets. There are policy concerns about the purpose and need for these targets on a statewide basis. Water conservation is not always the economically efficient response from a local water supply perspective. Studies must clearly define baseline water use and how additional water conservation affects regional self sufficiency and area of origin water rights.

Providing decision support – Currently there is poor communication between technical analysis and decision makers. It is difficult to bring together technical analysis from many different analytical tools into a single number for decision makers. There is a need to include a collaborative approach between the technical analysis and decision makers. There are not always “no-regrets” solutions. Must consider that new infrastructure takes time.

Agricultural water use – Modeling studies often do not capture the observed variability in crop planting decisions, particularly in relation to supply availability and crop markets. There is a need to study the policy implications of market based shifts to permanent crops away from “lower value” crops that have a greater diversity of field crop rotations. There is a need to study water quality impacts on crop production and consider how energy costs impact planting decisions as groundwater levels continue to decline and pumping costs increase.

Data availability and management - There is a lack of reliable data for agricultural practices, hydrology, water diversions, and ground water use. Data is available in some areas of the state, but not others. There is a need to develop a collaborative framework for data collection to effectively integrate information between local, regional, statewide, and federal planning efforts. Better documentation of data sources used in models is needed to support data integration. The California Water Plan can assist with data integration by providing a framework and tools for regions to do their own planning.

Other areas of needed improvement

- Representation and consideration of water quality particularly in the Delta.
- Include more explicit modeling of water rights.
- Need better representation of groundwater system
- Include more direct connection between land use and water use
- Look at how models work together (large scale vs small scale)
- Quantifying the biological /ecological systems.
- Describing sustainability of water management.

Model Specific Questions

CALSIM / LCPSIM

1. Explain why studies with the LCPSIM model suggest that Integrated Regional Water Management actions on the South Coast don't have significant effect on Delta Exports.
 - a. Answer: Because South Coast always takes as much SWP deliveries as possible to meet local uses or fill local storage.
2. Need to more closely look at assumptions behind the 5 MAF south of Delta groundwater storage. 5 MAF South of Delta groundwater banking is in addition to existing groundwater projects. There may be 9-10 MAF of storage capacity, but it is not realistic to move that much water. Need to look at how often groundwater storage will be used against cost of developing it.
3. Is water going to south of Delta groundwater storage taking surplus Delta water?
 - a. Answer: It depends on how the Bay Delta Conservation Plan is implemented.
4. Previous CALSIM surface storage studies for CALFED need to be updated to consider climate change.
5. Does the CALSIM hydrology reflect that 1 degree warming under climate change will result in 500 feet lower snow line?
 - a. Answer: Yes. This is reflected in the pattern shift in peak flows.
6. Need to explain effect of losing natural snow pack storage and that flood operation rules were not adjusted.
7. How is uncertainty handled in CALISM
 - a. Answer: possible future approaches: For climate change uncertainty, use 12 scenarios give a range of numbers, but need to condense information for decision makers. Can use sensitivity analysis to look at changes to assumptions. Can also derive probabilities from 82 year sequence.
8. CALSIM does not use perfect foresight. Some form of perfect foresights resides in CALSIM as there is some knowledge of conditions at all locations within a time-step. Operating rules are adapted by the modeler in occasions for a particular hydrologic sequence iteratively. This entails knowing in advance what it will happen in the next period.
9. CALSIM shows 1.5 MAF of impacts with Wanger and climate change. Must use every tool to restore system to D1641.
10. CALSIM gives relative impacts of different factors, but what is the range from seal level rise?

- a. Answer: Should compare range of impacts under climate change to single number under Wanger decision

IRPSIM

1. Does IRPSIM modeling confirm that Integrated Regional Water Management actions on the South Coast don't have significant effect on Delta Exports.
 - a. Answer: IRPSIM does not do cost optimization, so SWP deliveries are utilized whenever possible.
2. Does IRPSIM modeling propose additional south of Delta storage.
 - a. Answer: No. IRPSIM studies look at getting back to Delta supplies under D1641.
3. How is uncertainty handled in IRPSIM?
 - a. Answer: IRPSIM uses a probabilistic approach. IRPSIM approach doesn't select one scenario for climate change. It looks for no regrets options across different climate change scenarios. Look for decisions that are robust over many scenarios.

CALVIN / SWAP

1. CALVIN studies show there is more value in expanding the most limited conveyance than expanding storage capacity in most locations, even considering climate-related increased winter flow events.
2. Concern that CALVIN undervalues storage because it has perfect foresight of the system while water managers use storage to manage risk.
 - a. Answer: Research with CALVIN (Draper 2003 <http://cee.engr.ucdavis.edu/calvin>) has shown that the potential bias introduced by perfect foresight relative to storage is small as storage capacity in the system expands relative to demands and inflows. The estimated factor ranges from 2-5 for the small shadow value on expanding surface storage. California has access to large groundwater basins and existing surface reservoirs for taking advantage of seasonal storage.
3. Regarding SWAP: Many crop Kc values need updating. Model uses old ET numbers/production functions not always appropriate for current knowledge/practice (e.g. almonds & processing tomatoes in SJV using 20 to 30% more water with 2x the average yield of 20 years ago). Some corrections were made to SWAP.