Simple Supply and Demand Scenarios for Southern California

Rethinking Water Policy Opportunities in Southern California:
An Evaluation of Current Plans, Future Uncertainty, and
Local Resource Potential

Report available at:
www.bren.ucsb.edu/academics/WaterPolicyProgram.htm

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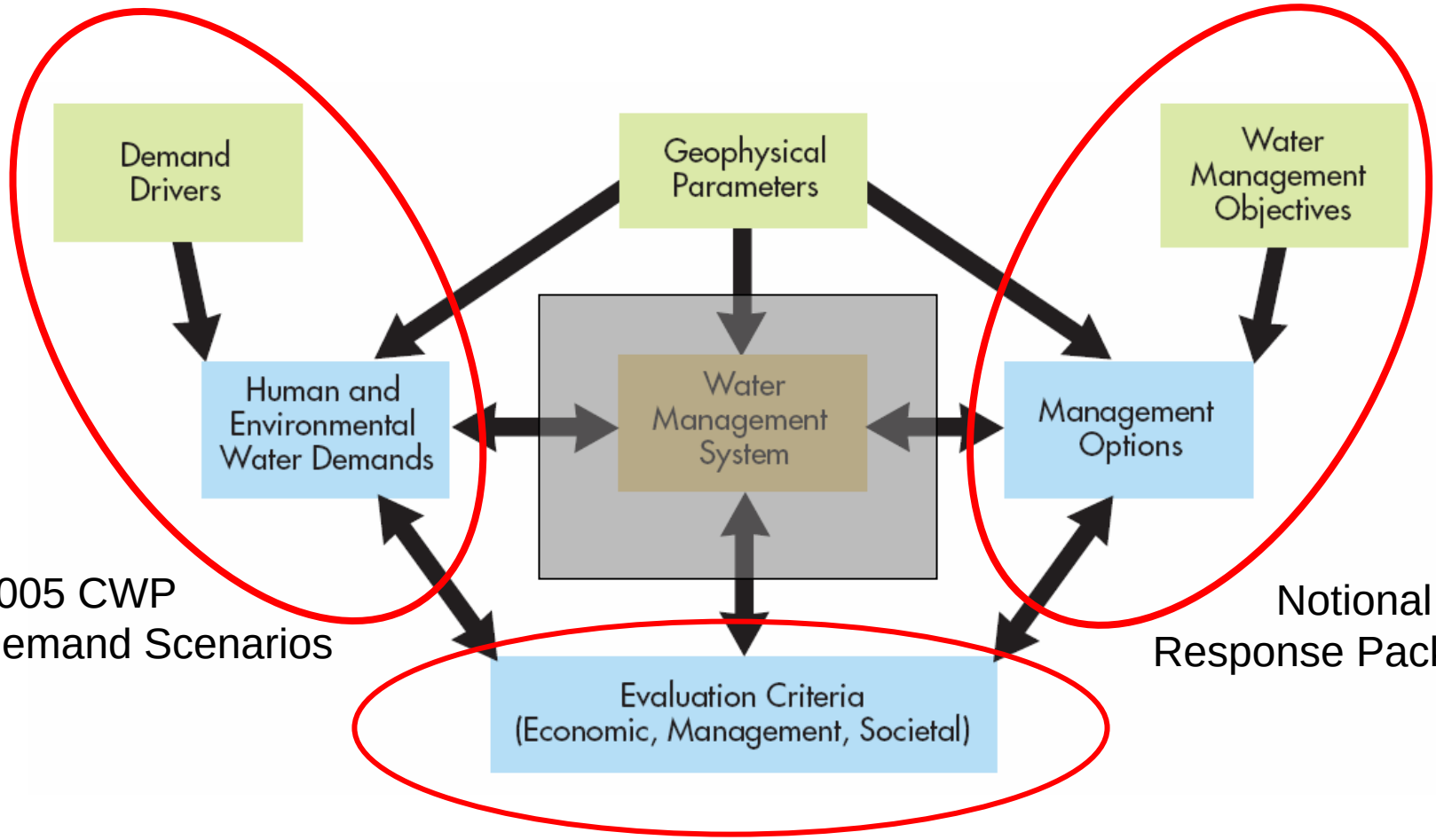
Southern California Faces Significant Water Management Challenges

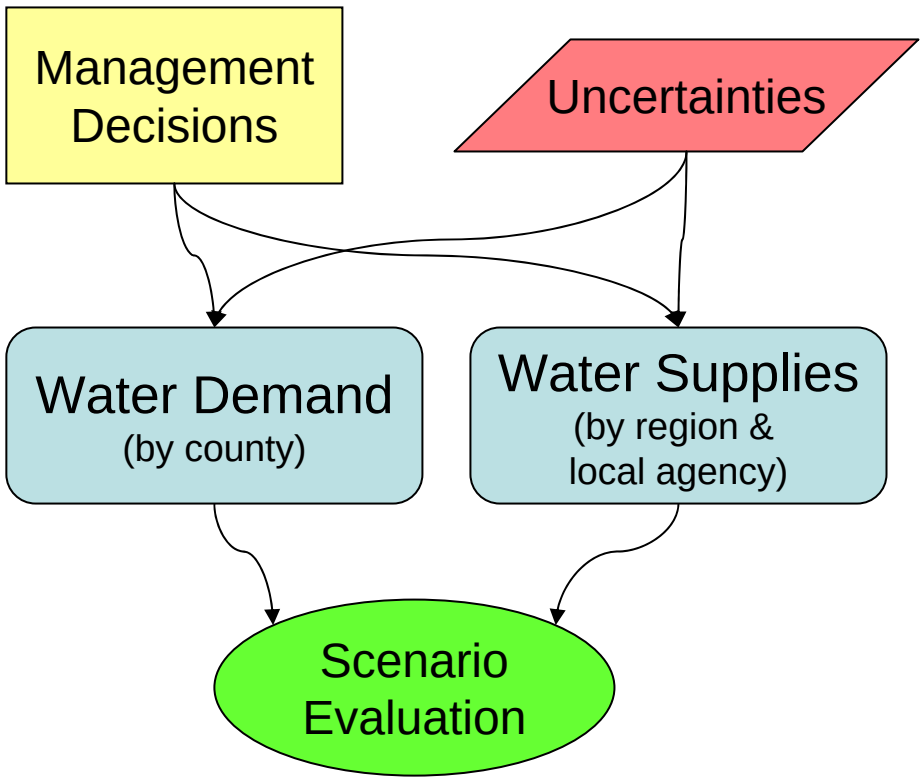
- Increasing uncertainty about future reliability of imported supplies and local conditions
- Growing recognition of potential for local resource development

How Can Local Resources Strategies Help Address These Water Management Challenges?

Study Builds on 2005 CWP Scenarios and Evaluates Management Options for Southern California



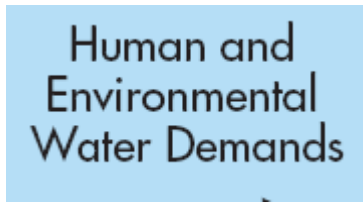
Study uses simple Analytica model to generate scenarios of water demand and supply in the Southland



Annual time-step from 2005 → 2030

Model forecasts demand using similar methodology to Urban Water Management Plans

- Urban demand based on projections of
  - Households, employees, population
  - Per unit water demand changes
    - demographics
    - income
  - Conservation at various levels of efficiency implementation
- Based on demand model used to quantify 2005 California Water Plan demand scenarios



Regional and local supplies based on specified goals for different sources

- Local supplies
  - Groundwater (including desalted brackish water)
  - Local rivers and streams
  - Recycled urban water
  - Desalinated sea water
- Imported supplies
  - State Water Project
  - Colorado River
  - Owens Valley

Geophysical Parameters

Local resource potential drawn from recent studies

- **Urban water use efficiency**
  - CBDA “Comprehensive Review” (2005)
  - Pacific Institute’s “Waste Not, Want Not” report (2003)
- **Groundwater**
  - Association of Ground Water Agencies (AGWA) conjunctive use assessment (2000)
- **Recycled municipal water**
  - USBR’s Southern California Comprehensive Water Reclamation and Reuse Study (2002)

We Developed 3 Demand scenarios and 6 Supply scenarios

Demand

Scenario component	Population growth
Reference	+21% (2005 → 2030)
High population growth	+31% (previous forecast)
Low population growth	+14% (another equivalent downward revision)

Supply

Scenario component	Supply parameter
Reference	As forecast in RUWMP
Reduced Imports	SWP: -25% LAA: -30%
Wet Socal	GW recharge: +20% Surface runoff: +20%
Dry Socal	GW replenishment & recharge: -20% Surface runoff: -20%

Long-term Supply and Demand Balance Under Current Plan

Scenarios	Reference Demand	High Pop	Low Pop
Reference Supply	1.08		
Reduced Imports			
Wet Socal			
Wet Socal / Reduced Imports			
Dry Socal			
Dry Socal / Reduced Imports			
Dry Socal / Increased Imports			

Evaluation Metric: 2030 Supply / Demand ratio

Locally Cost Effective Conservation (CBDA P2)

Scenarios	Reference Demand	High Pop	Low Pop
Reference Supply	1.12	1.03	1.19
Reduced Imports	1.02	0.93	1.08
Wet Socal	1.18	1.08	1.25
Wet Socal / Reduced Imports	1.09	0.99	1.15
Dry Socal	1.06	0.97	1.13
Dry Socal / Reduced Imports	0.95	0.87	1.01
Dry Socal / Increased Imports	1.13	1.04	1.20

Evaluation Metric: 2030 Supply / Demand ratio

Locally Cost Effective Conservation and 50% Local Resource Potential

Scenarios	Reference Demand	High Pop	Low Pop
Reference Supply	1.16	1.06	1.23
Reduced Imports	1.05	0.96	1.12
Wet Socal	1.21	1.11	1.29
Wet Socal / Reduced Imports	1.12	1.03	1.19
Dry Socal	1.10	1.00	1.16
Dry Socal / Reduced Imports	0.99	0.91	1.05
Dry Socal / Increased Imports	1.17	1.07	1.24

Evaluation Metric: 2030 Supply / Demand ratio

Study Provides Additional Insight to the 2005 CWP Scenario Analysis

- Scenarios articulate some key water management challenges facing Southern California
- Linking demand, supply, and management responses suggest that local resource development may mitigate against some adverse conditions

BUT → Lack of geophysically-based model limits ability to address more detailed management questions….

Questions??

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50% Local Resource Potential

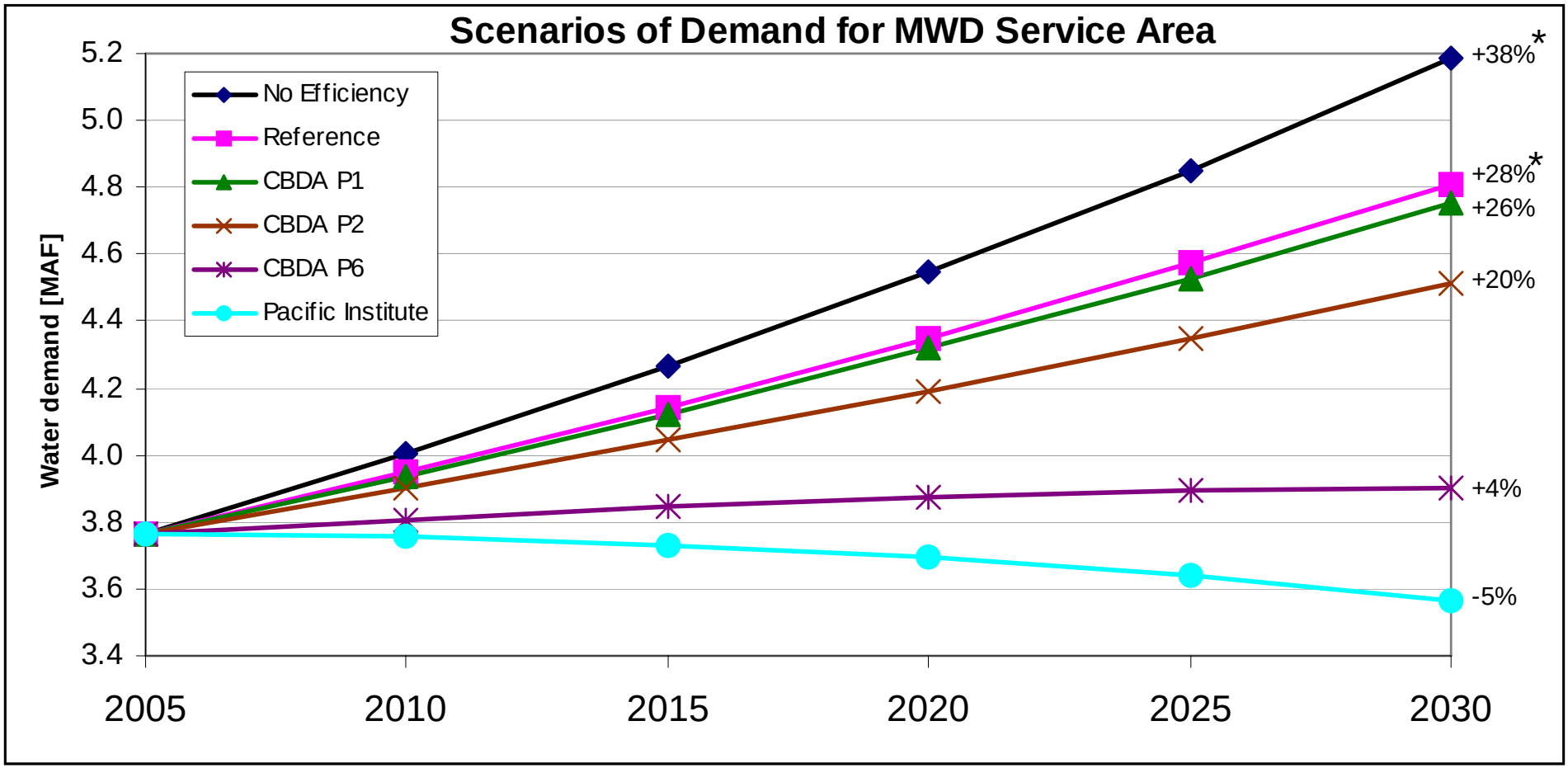
Scenarios	Reference Demand	High Pop	Low Pop
Reference Supply	1.11	1.02	1.18
Reduced Imports	1.01	0.92	1.07
Wet Socal	1.16	1.06	1.23
Wet Socal / Reduced Imports	1.08	0.98	1.14
Dry Socal	1.05	0.96	1.12
Dry Socal / Reduced Imports	0.95	0.87	1.01
Dry Socal / Increased Imports	1.12	1.02	1.19

Evaluation Metric: 2030 Supply / Demand ratio

We consider several levels of urban water use efficiency implementation

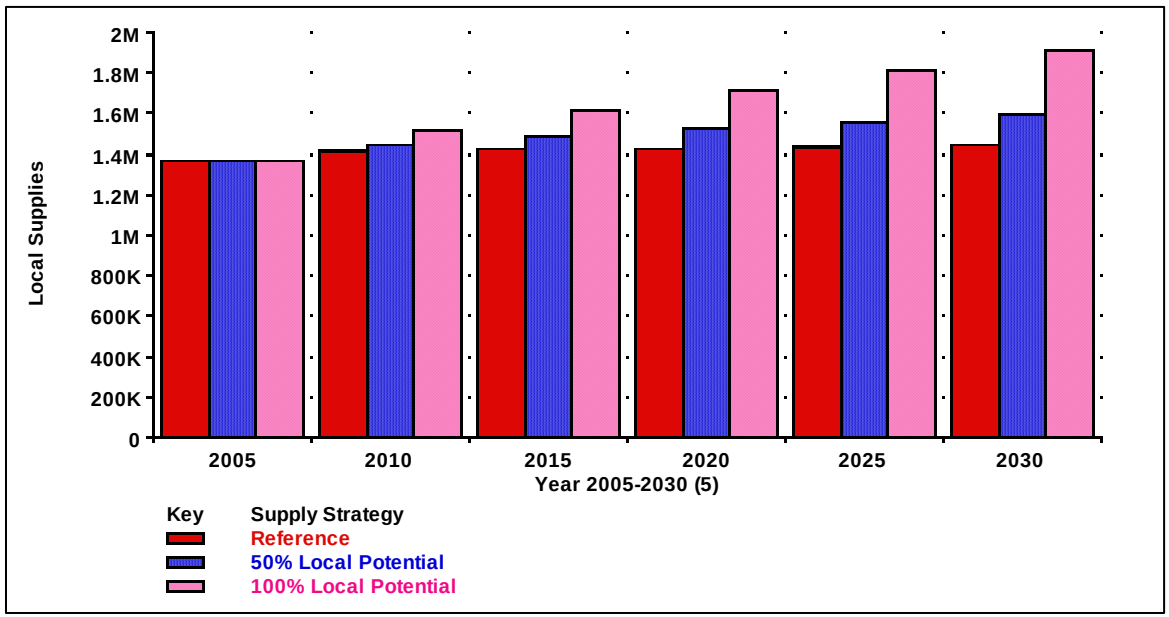
Efficiency Level	Interior household	Exterior household	CII sectors
Reference (RUWMP)	9% (SF) / 11.5% (MF)		6.5%
CBDA P1 (Reasonably Foreseeable)	14%	0%	4.9%
CBDA P2 (Locally Cost Effective)	13.2%	5.1%	20.4%
CBDA P6 (Technical potential)	28.3%	23.3%	18.6%
Pacific Institute (Cost effective, technically feasible)	32.5%	27.5%	32.5%

Application of feasible levels of efficiency leads to divergent demand projections



We consider two levels of groundwater use and urban water reuse

Resource	Reference Strategy	50% local potential	Full local potential
Groundwater supply	147 taf	300 taf	617 taf *
Recycled municipal water	199 taf	225 taf	452 taf **
Total	346 taf	525 taf	1,069 taf

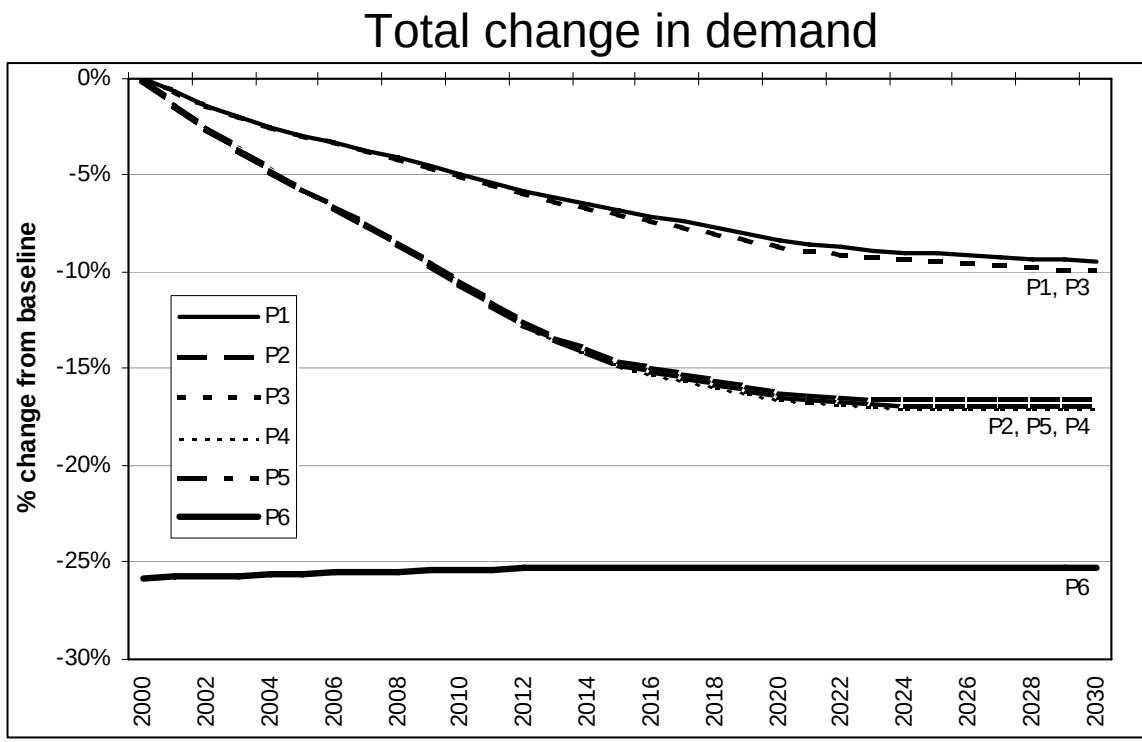


* AGWA short-term yield increase potential

** SCCWRRS 2010 recycled potential supply

Example: CBDA "Comprehensive Review" Conservation Projections

- CBDA South Coast demand projections
  - population growth
  - 6 levels of conservation implementation
- Convert to rates of WU intensity change for WASEM



P1: Reasonably Foreseeable
P2: Locally cost-effective
P3: P1 w/ moderate CALFED funding
P4: P2 w/ moderate CALFED funding
P5: P2 w/ ROD funding levels
P6: Technical potential

Groundwater Potential

Table 1: Current and potential conjunctive use water supply benefits for Southern California groundwater basins within the MWD service area, in TAF. Source: AGWA (2000)

Groundwater Basin	Existing increase in basin yield	Potential Dry Year (or long-term) groundwater storage	Potential short-term yield increase
Ventura	0	500	88
San Fernando	44	150	27
Raymond	0	144	0
Main San Gabriel	76	400	187
Los Angeles Coastal Plain	54	1089	54
Orange County Coastal Plan	150	300	130
Six Basins	0	30	30
Upper Santa Ana River	43	1854	49
Upper Santa Margarita River Watershed	10	200	10
San Diego County	0	271	42
Total	**377**	**4938**	**617**

Reclamation and Reuse Potential

Table 1: Potential regional water demand satisfied by short-term and long-term reclamation and reuse projects as identified by the SCCWRSS (USBR 2002).

Region	Demand Satisfied by 2010 (AFY)	Additional Demand Satisfied by 2040 (AFY)	Total Demand Satisfied (AFY)
Los Angeles Basin	128,100	96,400	224,500
Orange County	114,600	52,500	167,100
San Diego	50,300	65,200	115,500
Inland Empire	158,500	82,200	240,700
Total	**451,500**	**296,300**	**747,800**

Table 1: Urban Conservation Projections Projection State/Federal Funding Assumption. Table from (CBDA 2005).

Projection	State/Federal Funding Assumption
1. Reasonably Foreseeable: Regulatory code-induced conservation plus continuation of historic rate of investment in Urban BMPs; continuation of investment trend in locally cost-effective conservation; state/federal investment in projects that are not locally cost-effective but do have statewide positive net benefits.	Limited to remaining Proposition 50 funds. Analysis assumes funds fully awarded by 2006.
2. Locally Cost-Effective Practices: Regulatory code-induced conservation plus full implementation of locally cost-effective practices; state/federal investment in projects that are not locally cost-effective but do have statewide positive net benefits.	Limited to remaining Proposition 50 funds. Analysis assumes funds fully awarded by 2006.
3. Moderate CALFED Investment: Same as Reasonably Foreseeable but state/federal funding increased and extended to 2030.	$15 million/yr through 2030.
4. Locally Cost-Effective Practices w/ Moderate CALFED Investment: Same as Locally Cost-Effective but state/federal funding increased and extended to 2030.	$15 million/yr through 2030.
5. Locally Cost-Effective Practices w/ ROD Funding Levels: Same as Locally Cost-Effective but state/federal funding increased and extended to 2030.	$40 million/yr for first 10 years; $10 million/yr thereafter.
6. Technical Potential: 100% adoption of urban conservation measures included in analysis. Funding is not a constraint.	Not Applicable

Table 1: Year 2030 savings potential (from 2000) for the South Coast for each of the Comprehensive Review projections. Source: Table 1.16 (CBDA 2005).

Projection	Savings potential	
	TAF	% reduction
1: Reasonably Foreseeable	510	9.4%
2: Locally Cost-Effective Practices	896	16.6%
3: Moderate CALFED Investment	536	9.9%
4: Locally cost-Effective Practices w/ Moderate CALFED Investment	921	17.1%
5: Locally cost-Effective Practices w/ ROD Funding Levels	915	17.0%
6: Technical Potential	1,363	25.3%

2005 CWP Adopts a Scenario Approach to Consider Future Uncertainty

California Water 2030

In the future, water management challenges will be more complex as population increases, demand patterns shift, environmental needs are better understood, and global climate change and other effects on the state's water resources and systems become more evident.

To acknowledge that we don't know with great certainty what will happen in the distant future, Update 2005 includes three plausible yet very different scenarios for 2030, rather than a single "likely future" condition.

Scenarios are possible pictures of the future, not predictions, and depend on many assumptions. The scenarios in Update 2005 offer three different water demand conditions for 2030, but do not include climate change or other effects on water supplies. Each scenario describes a different base condition for 2030, to which the water community would need to respond by implementing various management strategies.

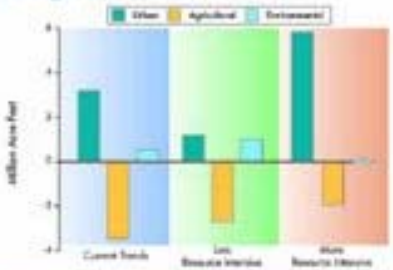
With so much variation possible in future water demand from region to region and sector to sector, no single water management strategy will work statewide. California needs to ensure that each region of the state can tailor responses to local conditions by implementing integrated regional water management supported by strong statewide water management systems.

2030 Water Demand Changes by Scenario

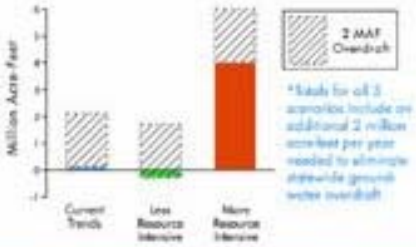
Changes by Region

These charts show how water demands could change between 2000 and 2030 for three scenarios by region (left); statewide by sector (immediate right); and statewide plus groundwater overdraft (far right).

Changes by Sector



Changes Plus Groundwater Overdraft*



*Totals for all 3 scenarios include an additional 2 million acre-feet per year needed to eliminate statewide groundwater overdraft

Scenarios

These three scenarios include two kinds of water use efficiency actions: those that water users take on their own (called naturally occurring conservation), and those encouraged by water agency programs. Only naturally occurring conservation was varied among the scenarios; and all scenarios include the same continued implementation of cost-effective actions by water agencies.

Current Trends:
Recent trends continue for the following: population growth and development patterns, agricultural and industrial production, environmental water dedication, and naturally occurring conservation (like plumbing code changes, natural replacement, actions water users implement on their own, etc.).

Less Resource Intensive:
Recent trends for population growth, higher agricultural and industrial production, more environmental water dedication, and higher naturally occurring conservation than Current Trends (but less than full implementation of all cost-effective conservation measures currently available).

More Resource Intensive:
Higher population growth rate, higher agricultural and industrial production, no additional environmental water dedication (year 2000 level), and lower naturally occurring conservation than Current Trends.