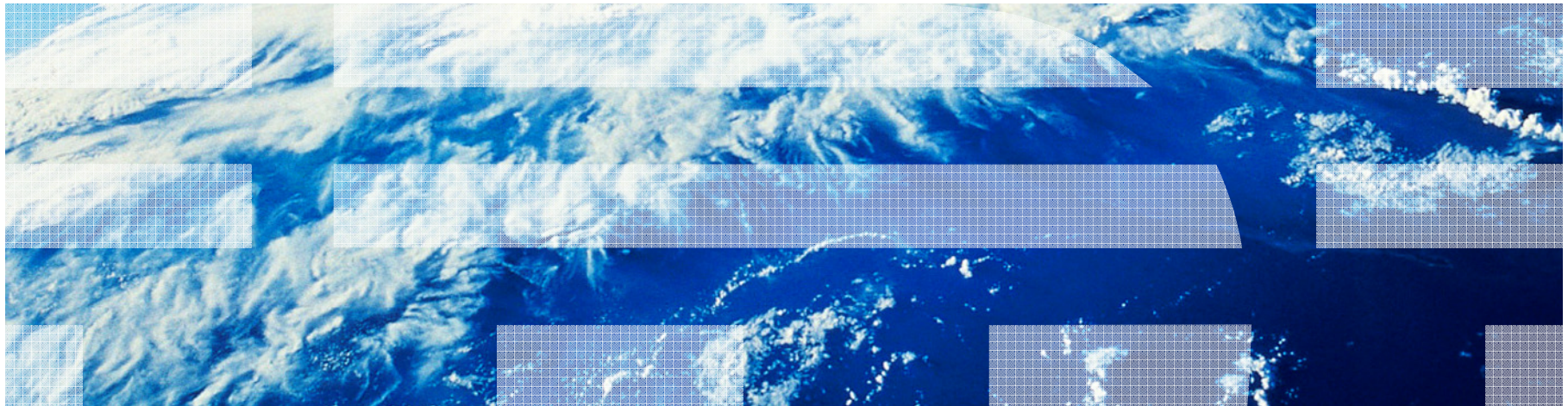


September 2012



Urban Systems Collaborative: Bay Area Water Challenges

Jurij Paraszczak for Peter Williams, September 11th 2012
IBM

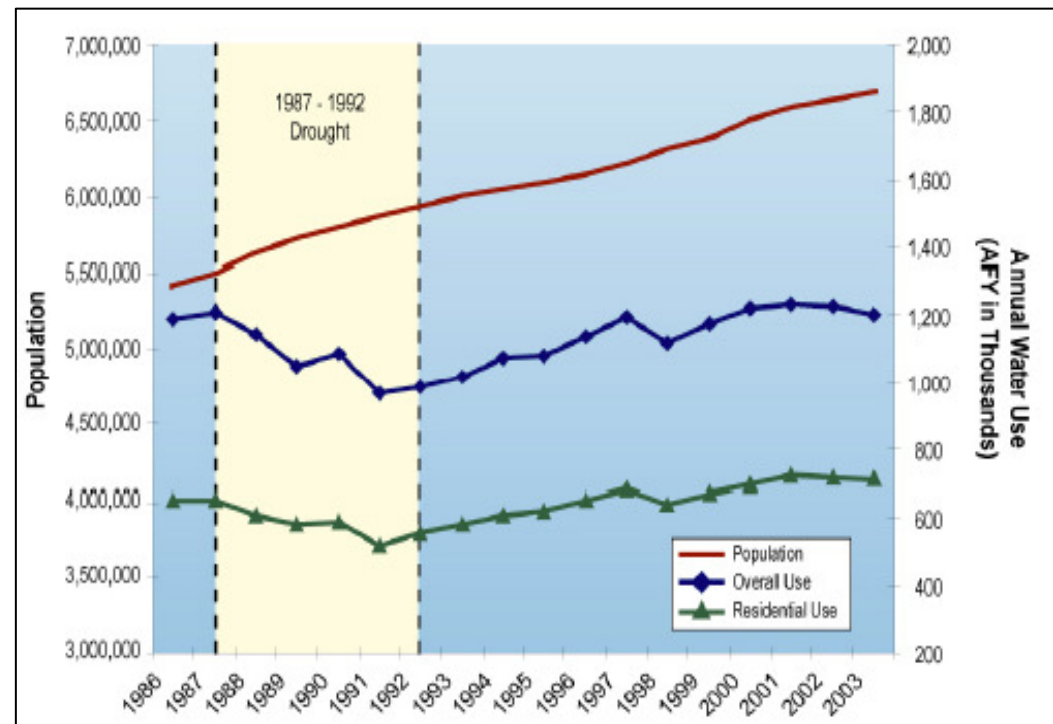


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Bay Area Water Demand

- Demand for water in the Bay Area has only increased by 1% since 1986, despite a 23% increase in population (to 7.1 million in 2006)
- This reflects a strong emphasis on conservation as well as economic trends (for example, off-shoring of semiconductor manufacturing, building on agricultural land).
- However, demand will continue to put pressure on supplies:
 - Bay Area population is projected to grow to 8.2 million by 2020.
 - Environmental water demand has to be balanced against this.
 - Droughts happen about 1 year in 10.

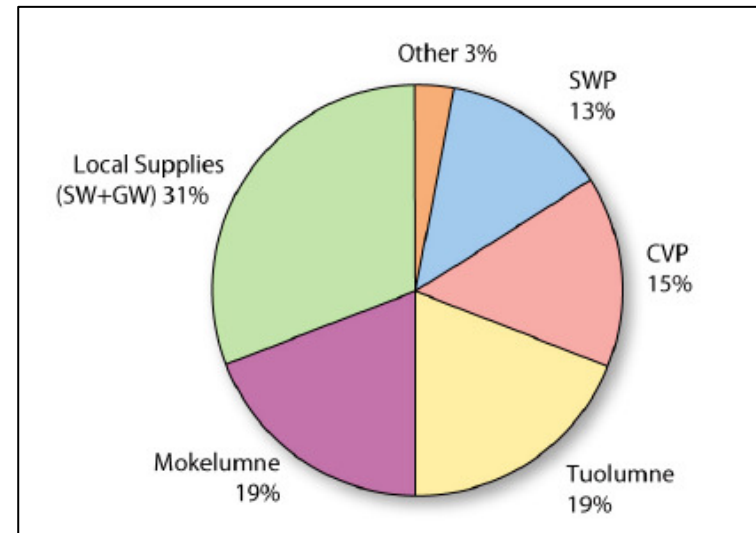


Source: Bay Area Integrated Regional Water Management Plan, 2006, available from <http://bairwmp.org/>.

The IRWMP is being updated for 2013.

Bay Area Water Supplies

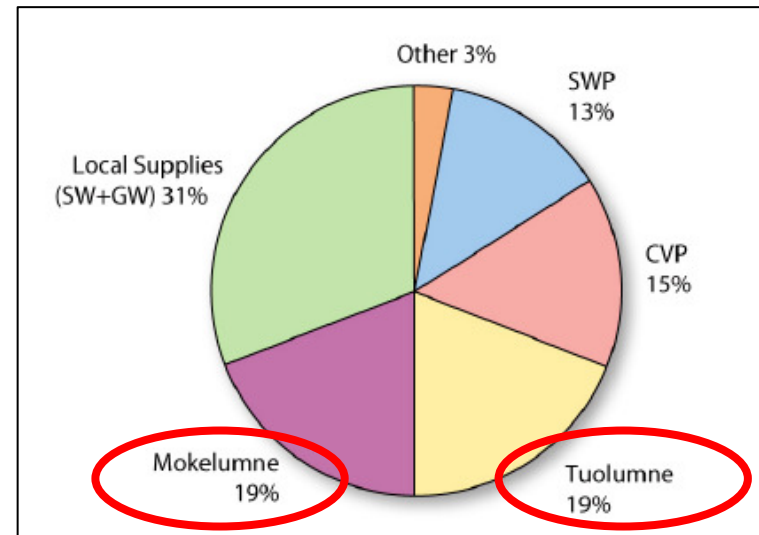
- Water in the Bay Area comes from a mix of sources:
 - Sierra Nevada (mainly via the Mokelumne and Tuolumne Rivers)
 - The State Water Project (SWP) and Central Valley Projects (CVP) – which take their water mainly from the SF Bay Delta.
 - Local ground and surface water.
 - A small amount of desalination, recycling etc.
- These sources are vulnerable to a number of issues....



Source: Bay Area Integrated Regional Water Management Plan, 2006, available from <http://bairwmp.org/>.

Sierra Nevada Water - Challenges

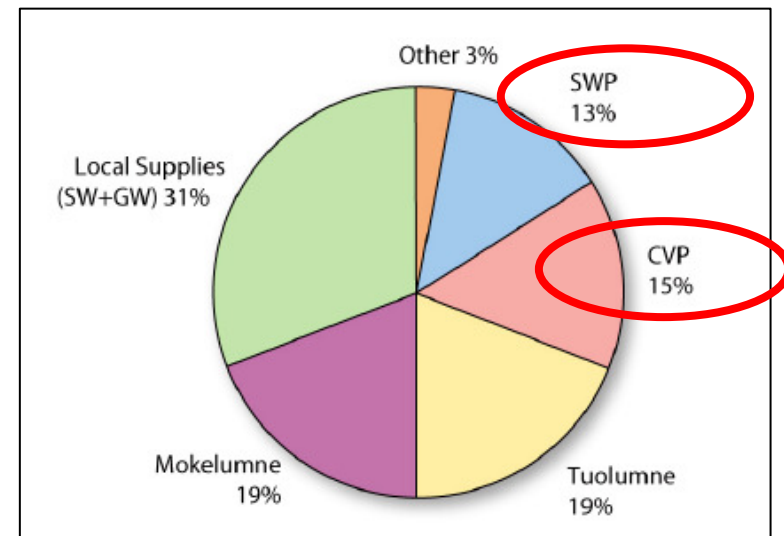
- Growing variability in seasonal snow levels due to climate change.
 - 30-40% supply reductions in drought years (about 1 year in 10).
 - More precipitation will fall as rain and run off much faster, instead of slowly melting through the year – the state’s water systems are not designed to catch rapid runoff.
- Transmission pipelines (and storage reservoirs such as Hetch Hetchy and Don Pedro) are seismically vulnerable.
- Growing movement advocating for removal of Hetch Hetchy dam (supplies most of San Francisco’s water and much of its energy).
 - If this happens it will necessitate development of entirely new supplies.
- (Very low pollution levels – extremely high quality water).



Source: Bay Area Integrated Regional Water Management Plan, 2006, available from <http://bairwmp.org/>.

Delta Water - Challenges

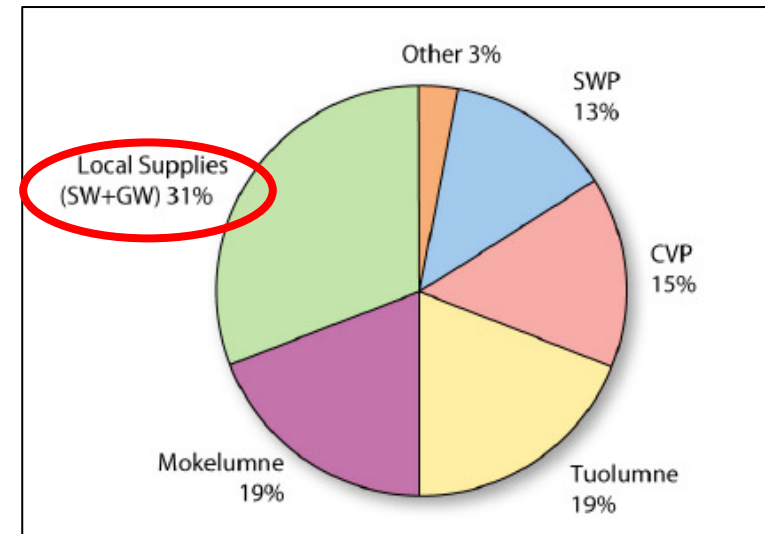
- Tremendous contention for Delta water from Central Valley agricultural interests and also Southern California.
 - Droughts increase contention: up to 60% supply reductions in SWP and 25% in CVP.
- Delta will be more prone to salination as sea levels rise and as usage grows:
 - Plan to extract water for SoCal upstream from the Delta via tunnel.
- Delta levees are old and prone to flood- and seismically-induced collapse.
- Delta contains several endangered species.
- Delta water is prone to concentrations of pollution in low flow periods (chloride, bromide, nitrate, total organic carbon):
 - Sometime so severe that treatment plants have to close or mix in other supplies.



Source: Bay Area Integrated Regional Water Management Plan, 2006, available from <http://bairwmp.org/>.

Local Supplies - Challenges

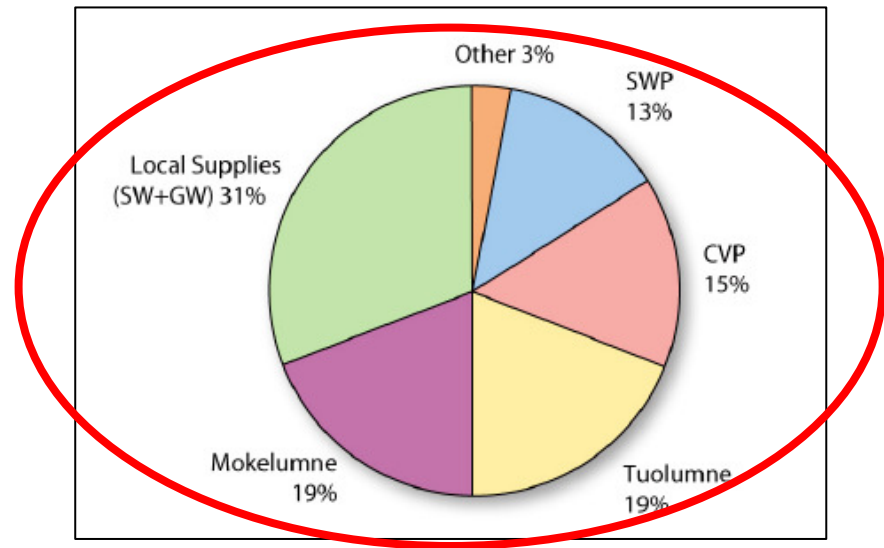
- Ground water:
 - Becoming overdrawn in places.
 - Sometimes polluted with nitrate, MTBE (gasoline additive) and other harmful substances.
 - Saltwater incursion in coastal aquifers.
- Surface water :
 - Over 160 rivers impaired by pollution (nitrate, pathogens, mercury...).
 - Seismic concerns (for example, the Calaveras dam is right ON the Calaveras fault).
 - Sedimentation of reservoirs.
 - Over 100 protected wildlife species.
- Both are vulnerable to drought - ~50% reduction in supplies.



Source: Bay Area Integrated Regional Water Management Plan, 2006, available from <http://bairwmp.org/>.

General Challenges

- Economic impact of droughts – a 20% supply deficiency costs about \$8bn per year.
 - (Bay Area is world's 24th largest economy).
- Ageing and fragile infrastructure is seismically vulnerable.
- Storm drainage systems are often poor – localized flooding issues.
- Organizational fragmentation – MANY agencies have some say in Bay Area's water.
 - Mishmash of water rights arrangements.
 - Cooperation needs are acute.



Source: Bay Area Integrated Regional Water Management Plan, 2006, available from <http://bairwmp.org/>.

Bay Area Water Challenges - Possible IT Responses (1 of 2).

Challenge	IT Response
Continued conservation	<ul style="list-style-type: none"> ▪ Continued implementation of advanced meter infrastructures (AMI) to enable granular measurement and data for consumers. ▪ Industrial process control (for major water-using industries). ▪ Precision irrigation systems.
Aging infrastructure	<ul style="list-style-type: none"> ▪ Continuous, analytics-based leak detection and pressure management, to reduce non revenue water, and wear and tear. <ul style="list-style-type: none"> – (May require enhanced instrumentation on water systems) ▪ Failure prediction linked to capital budgeting, to ensure effective resource prioritization.
Seismic fragility	<ul style="list-style-type: none"> ▪ Scenario modeling, to understand risk. ▪ Redundant instrumentation (also includes AMI) for rapid damage assessment and triage. ▪ Asset inventory ▪ Emergency management systems, integrated with other agencies.

Bay Area Water Challenges - Possible IT Responses (2 of 2).

Challenge	IT Response
Pollution	<ul style="list-style-type: none"> ▪ Water quality sensing networks with public data read-outs. ▪ Support for pollution trading (especially nutrient pollution). ▪ Citizen sensing (eg Creek Watch).
Drought	<ul style="list-style-type: none"> ▪ Scenario modeling to understand risks and responses– drought events and source optimization. ▪ (Conservation – see above).
Organizational Fragmentation	<ul style="list-style-type: none"> ▪ Data integration – even if organizations are fragmented, ensure a “single version of the truth” from common data. ▪ Collaboration tools (for example, to enable sharing of data on implementation of IRWMPs). Significant scope for a standard app.
Water resource management	<ul style="list-style-type: none"> ▪ Integrated monitoring system for the Delta – quality, flow, withdrawals - with data shared by all key stakeholders. ▪ Groundwater monitoring ▪ Enhanced surface water level monitoring (stream flows, depths etc) ▪ Ecosystem indicator monitoring (extents, key species counts etc)