Sustainable Water Resources Roundtable

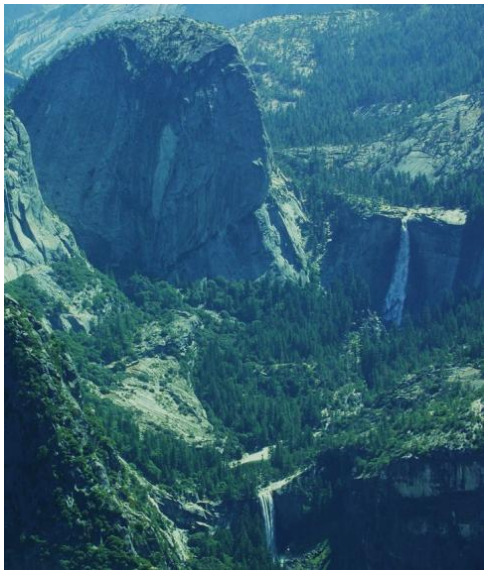
SAP

Executive Conference Center

Palo Alto, CA

April 27-28, 2010

Meeting Proceedings



Falls at Yosemite, David Berry

Day 1 Tuesday April 27

Opening Remarks:

SWRR Co-chair Bob Wilkinson of University of California, Santa Barbara chair welcomed the participants to the meeting which was held in the SAP Conference Center. There was a broad cross-section of participation from industry, academia and non-profit organizations. Bob thanked Jim Davis of SAP for providing the space for the meeting and acknowledged Jim, Mariana Grossman of Sustainable Silicon Valley and Bob Goldstein of EPRI for their work to bring the meeting into being. Jim Davis also welcomed the participants saying that SAP was committed to sustainability, happy to host the meeting, and interested in participating with SWRR moving forward.

Overview of SWRR

John Wells of the Minnesota Environmental Quality Board and SWRR Co-chair presented an overview of SWRR aimed at the many first time SWRR participants at the meeting. He described SWRR as a national collaboration of federal, state, local, corporate, non-profit and academic organizations that work or have interest in water resources.

Wells presented the SWRR mission: To promote sustainability of our nation's resources through

- Evaluation of information
- Development & use of indicators
- Targeting of research
- Engagement of people & partners

And he outlined the SWRR vision: A future in which our nation's water resources support the integrity of economic, social and ecological systems and enhance the capacity of these systems to benefit people and nature.

SWRR has about 500 active participants from federal, state and local governments; corporations; nonprofits and academia. Previous meetings have been held in California; Colorado; Maryland; Michigan; Minnesota; Virginia; Washington, D.C. Publications and conference presentations include the 2005 SWRR Preliminary Report http://acwi.gov/swrr/Rpt_Pubs/prelim_rpt/index.html and the 2010 SWRR Report http://acwi.gov/swrr

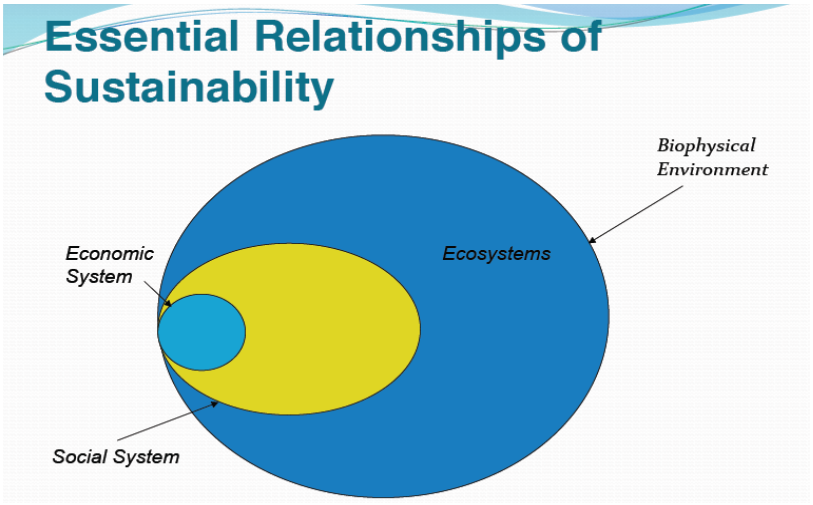
Wells then outlined the "SWRR Principles of Water Sustainability":

1. The value & limits of water: People need to understand the value and appreciate the limits of water resources and the risks to people and ecosystems of unbounded water and land use

2. Shared responsibility: Because water does not respect political boundaries, its management requires shared consideration of the needs of people and ecosystems up-and downstream and throughout the hydrologic cycle.

3. Equitable access: Sustainability suggests fair and equitable access to water, water dependent resources and related infrastructure.

4. Stewardship: Managing water to achieve sustainability challenges us while meeting today's needs to address the implications of our decisions on future generations and the ecosystems upon which they will rely.



Wells then proceeded to summarize the SWRR view of "capital and system capacities" and other elements of the SWRR framework for measurement and indicators. Capital is the capacity to produce value over time. Environmental, social and economic systems produce value through flows of services, experiences, or goods that meet human and ecosystem needs over time. We achieve sustainability by maintaining capital to meet needs.

Wells said SWRR attempts to maintain a focus on what's most relevant to sustainability including appropriate time horizons and scale, information integrity, and understandability. Indicators represent a way to measure progress.

The SWRR Indicator Framework

- **Water availability**
- **Water quality**
- **Human uses and health**
- **Environmental health**
- **Infrastructure and institutions**

Water Availability

- Renewable water (upper limit of water availability)
- Water in the environment (water remaining after human uses)
- Water use sustainability (degree to which water use meets current needs while protecting ecosystems and the interests of future generations

Water Quality

- Quality of water for human uses (drinking, recreation, industry and agriculture, etc.)
- Quality of water in the environment (flora and fauna and related ecosystem processes)
- Water quality sustainability (degree to which water quality satisfies human and ecosystem needs)

Human Uses and Health

- Withdrawal and use of water (amount of water withdrawn from the environment and the uses to which it is put)
- Human uses of water in the environment (extent to which people use water resources for waste assimilation, transportation and recreation)
- Water-dependant resource use (extent to which people use resources like fish and shellfish that depend on water resources)
- Human health (extent human health may be affected by the use of water and related resources)

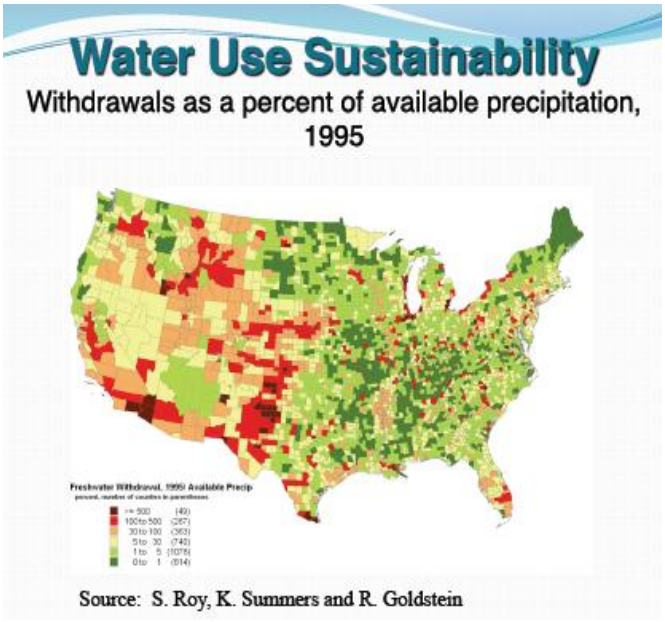
Environmental Health

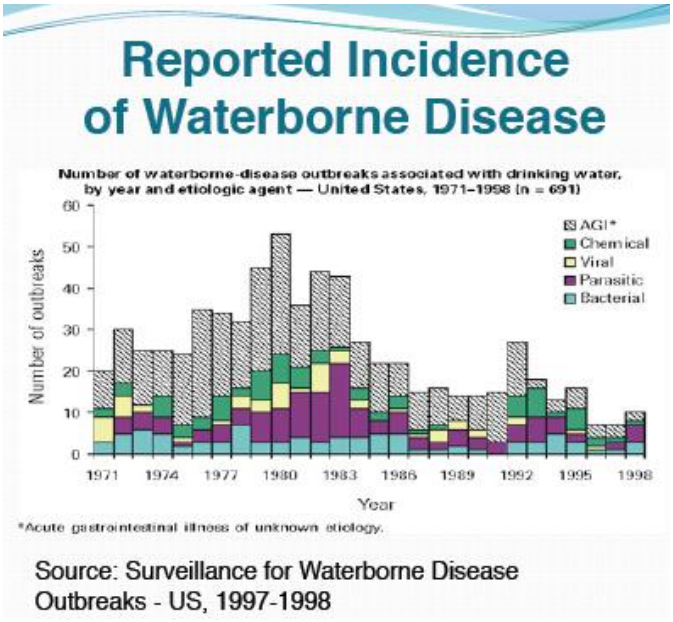
- Indices of biological condition (health of ecosystem)
- Amounts and quality of living resources (productivity of ecosystems)

Infrastructure and Institutions

- Capacity and reliability of infrastructure (capacity and reliability of infrastructure to meet human and ecosystem needs)
- Efficacy of institutions (efficacy of legal and institutional frameworks in managing water and related resources sustainably)

Sample Indicators





Next Steps for the SWRR

Wells concluded with an outline of possible next steps for SWRR including continuing roundtable outreach, building regional connections, and adding new private, nonprofit & public sector partners. He also suggested SWRR could refine the sample indicators to better address sustainability and scale, link to national and regional indicator sets, collaborate with the national environmental indicator efforts and the National Water Census program and assist agencies in describing the need for programs to collect indicators information

One minute round of brief self-introductions

David Berry opened the round of self introductions with the invitation to participants to share not only their name and organization but also what inspired their interest in water resources sufficiently to warrant taking two days to be part of a meeting on the sustainability of those resources.

During the hour and a half that followed, those at the meeting enjoyed a rich sharing of peoples interests and work in water resources and the experiences that led to their interest in or passion for water. As participants gave a brief description of their current work many opportunities for collaboration were quickly apparent and people used the breaks to exchange contact information.

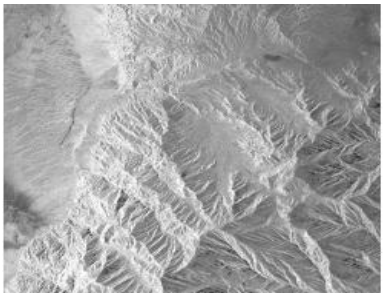
Federal Initiatives

Jet Propulsion Lab, Dean Wiberg JPL

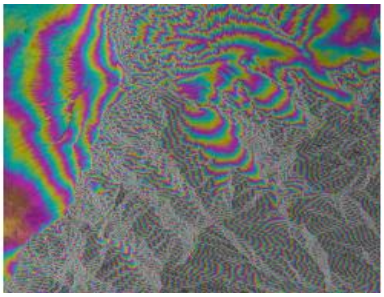
Tom Farr, Cathleen Jones and Dean Wiberg of JPL prepared a PowerPoint for the meeting presenting new strategies and uses of remote sensing and information for water management. Dean Wiberg made the presentation.

Most fresh water on Earth not frozen in ice caps and glaciers is in the form of groundwater but, Wiberg said, knowledge of the groundwater level is not uniformly available. Wells provide some monitoring capability, but there are political and practical difficulties in assembling data.

Use of imaging radar from space to detect groundwater withdrawal and recharge is increasing.



Standard Radar Image



Interference fringes follow topography

Imaging radar interferometry can provide information on groundwater levels by measuring surface deformation caused by withdrawal and recharge of aquifers. This can be done from space, now, and the US is planning to orbit a satellite that will provide even better information. Key Attributes of Synthetic Aperture Radar (SAR) Data are that repeatable multitemporal data is independent of weather or sun illumination and the physical information is provided about surfaces and volumes. When two observations are made from the same location in space but at different times, the interferometric phase is proportional to any change in the range of a surface feature directly.

NASA Funded Project: Monitoring Levees and Subsidence in the Sacramento-San Joaquin Delta using UAVSAR

PARTNERS: Jet Propulsion Laboratory *(P.I. Cathleen Jones, Scott Hensley),* ***California Department of Water Resources*** (Joel Dudas), ***USGS*** *(Gerald Bawden),* ***HydroFocus*** *(Steve Deverel)*

1. **Risk Assessment & Disaster Management (Levees)**
   Assess changes in the condition and integrity of the levees on a monthly basis by measuring small-scale changes in the levee positions using DifInSAR.
   Support emergency response to levee threats and failures.
   Provide data to inform Delta Emergency Response Plan for a major earthquake in the San Francisco area.
2. **Water Resource Management (Subsidence/Levees)**
   Short Term: Support decisions on the allocation of funds for levee repairs and upgrades by monitoring levee conditions across the entire Sacramento-San Joaquin Delta in a comprehensive and consistent manner.
   - independent and verifiable source of information with the spatial extent needed to cover the 1100 miles of levees within the Delta
   - temporal frequency required to detect changes indicative of potential levee failure
   Long Term: Provide critical subsidence rate measurements needed to inform a viable long term solution to water management in the area.

CHALLENGE: Requires high resolution to resolve levees and sub-centimeter change detection capability.

An Emerging Future for Remote Sensing

A trend in science data requirements for California Water is higher spatial and temporal resolution for system monitoring and process control (e.g. Bay Delta and Owens Lake).

Emerging availability and regulatory allowance of UAV platforms in the Civil Air Space will provide increased remote sensing spatial and temporal resolution at reduced cost

1) Application of Moore's law will continue to reduce instrument size (MEMS and nanotech systems are emerging routinely)

2) **"Things tend to cost what they weigh"**
(Ivan Sutherland, Fellow Sun Microsystems, Chairman Computer Science, Caltech)

3) United States has 42 manufacturers of UAV's offering 142 models
(Aerospace America (AIAA), Apr 2009)

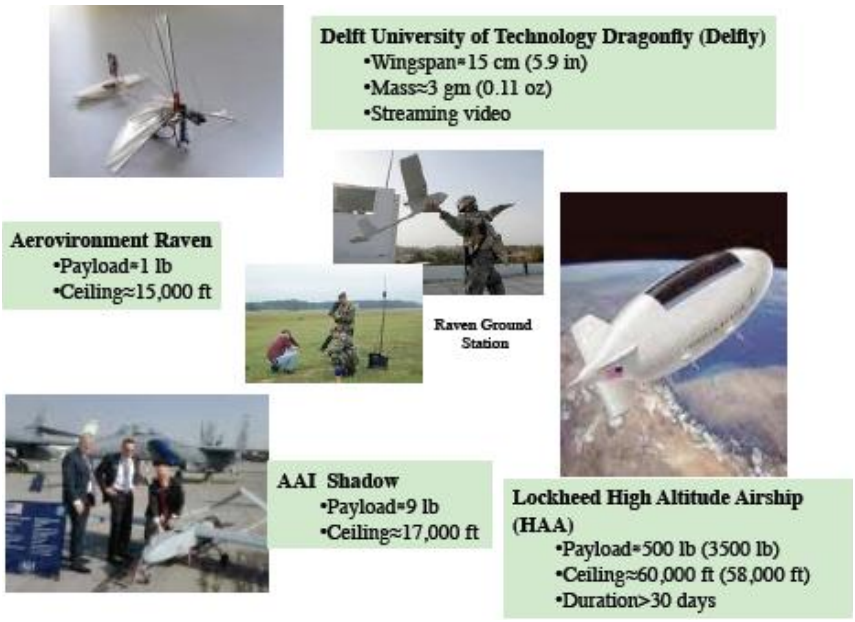
4) "…roughly twice as many unmanned as manned aircraft" are deployed in the Middle East (Iraq, Afghanistan, etc)
(Aerospace America (AIAA), Apr 2009)

5) As the conflicts in the Middle East are resolved, many surplus systems and operators are going to be available

6) Use of UAV's in the US airspace will essentially become like any other civil flight by about 2014.
(Jerry Lockenour, Director of Technology Development for Aerospace systems, Northrop Grumman)

Ivan Sutherland

Wiberg presented images of new remote monitoring devices commercially available. Viewing from low earth orbit (LEO) is from 100 to 1240 miles. The Space Shuttle altitude is about 210 miles. The relationship for pixel size (resolution) to altitude is 1:1: an instrument with a resolution of 30 meters at 210 miles has a resolution of 1.3 meters at 50,000 feet and 0.54 meters at 20,000 feet. Some of the devices shown would fly a much lower altitudes and have much better resolution.



US Water Census/Water SMART update, Eric Evenson, US Geological Survey

The objective of the Water Census is to place technical information and tools in the hands of stakeholders, allowing them to answer two primary questions about water availability:

- Does the Nation have an enough freshwater to meet both human and ecological needs?
- Will this water be present to meet future needs?

The National Water Census is part of the US Geological Survey's Science Strategy for an ongoing assessment of the Nation's water resources. Water Smart is a Department of Interior initiative on water conservation that includes activities in the Bureau of Reclamation, the USGS and the Office of the Assistant Secretary for Water and Science. The Water Availability and Use Assessment proposed in the 2011 budget is part of WaterSMART and the Water Census.

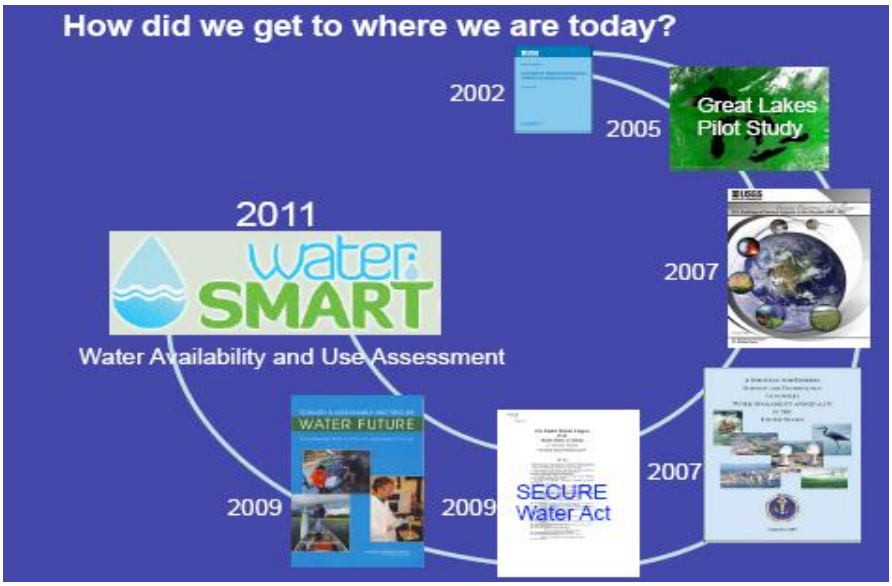
Evenson gave a detailed summary of what the USGS doing on SECURE Water today:

- Subcommittee on Groundwater: Part of the Advisory Committee on Water Information (ACWI) is working with a broad group of stakeholders to design a National Groundwater Monitoring Network
- Stream gaging – $4.75 M invested in stream gages and funds applied to update telemetry
- Brackish Groundwater Assessment – Three pilot studies began in 2010
    - Southern Midcontinent
    - Southeastern US
    - Geochemical, Geophysical, and Geostatistical Methods
- Water Use
    - Thermoelectric Cooling Water
- GAO Report 10-23 recommendations
- Account for alternative sources of cooling water
    - Consumptive use estimates

- Irrigation

• Improving methods for estimating irrigation use

Under the Water Census, these efforts will be doubled in 2011.



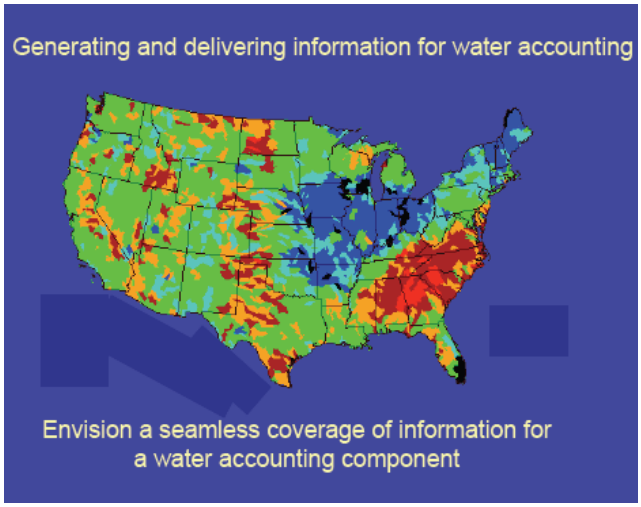
USGS organized an Implementation Team which began with short "concept papers". After receiving the input of an ad hoc committee of stakeholders working through the SWRR, the team will refine the concepts and products to meet stakeholders' goals in draft implementation plan. The ad hoc committee of stakeholders includes:

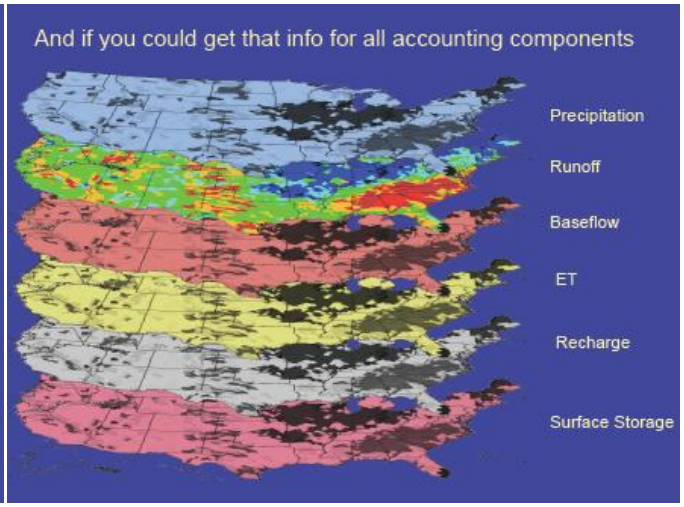
Association of Fish and Wildlife Agencies AFWA
Association of Metropolitan Water Agencies AMWA
Association of State Drinking Water Administrators ASDWA
American Water Resources Association AWRA
American Water Works Association AWWA
Interstate Council on Water Policy ICWP
National Ground Water Association NGWA
The Nature Conservancy TNC
Western States Water Council WSWC
Bureau of Reclamation BOR
US Fish and Wildlife Service USFWS
US Dept. of Energy - Energy Information Administration DOE - EIA
NOAA National Weather Service NOAA-NWS
US Army Corps of Engineers USACE
US Dept. of Agriculture - Economic Research Service USDA - ERS
US Dept. of Agriculture - NASS USDA - NASS
US Dept. of Agriculture - NRCS USDA - NRCS
US Dept. of Agriculture - Forest Service - USFS
US Environmental Protection Agency USEPA

Evenson said that the goal of the Water Census is to create a nationwide system to deliver water accounting information addressing:

- Precipitation
- Evapotranspiration
- Storage in Reservoirs, Lakes, Snow and Ice
- Surface Water
- Ecological Needs
- Water Withdrawals
- Groundwater
  - Recharge rates
  - Water level in aquifers
- Return Flows

- Consumptive Uses
- Run-of-the-River Uses



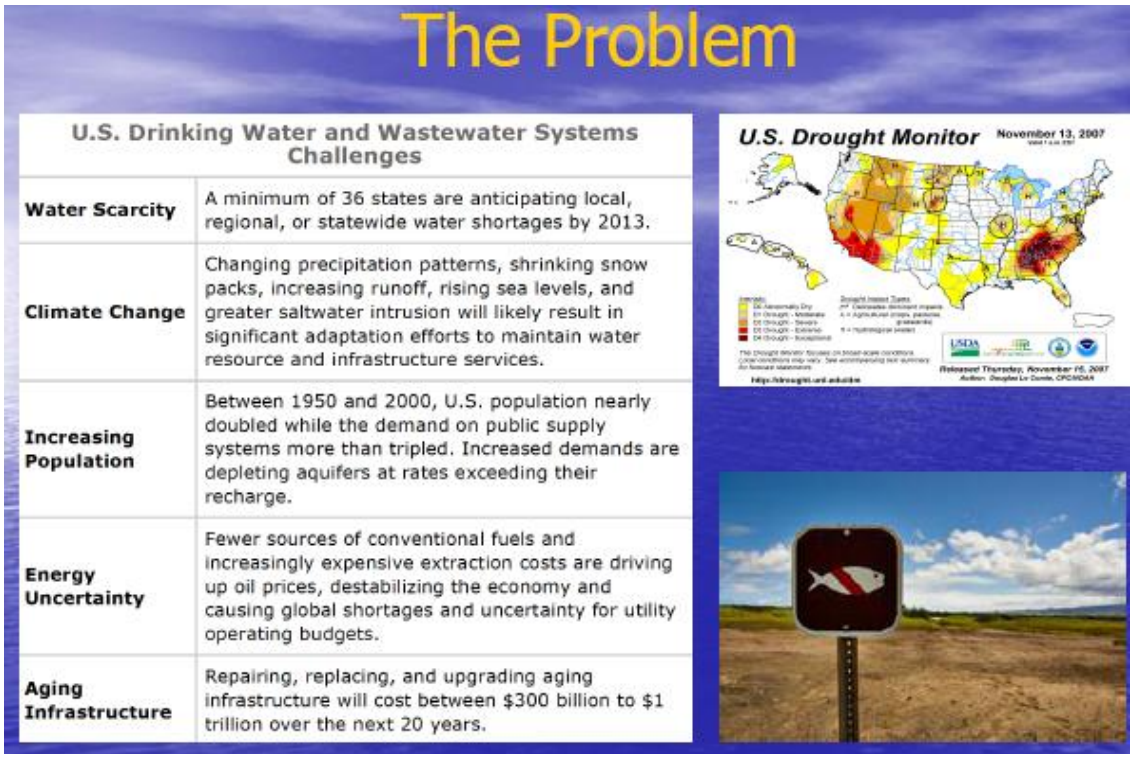


Evenson said enhancing the nation's water use information will involve using new methods to estimate water use such as stratified random sampling and regression models of water use based on land use. Eventually the Water Census will give the ability to track water from point of withdrawal thru to return of flow.

New authority will be given through Water Use Grants to States and a broadened science vision will expand our use of remote-sensing in water use science. USGS plans to re-map inter-basin transfers at a watershed scale and integrate water use with streamflow and groundwater information.

Finally, Evenson said the Water Census will undertake three studies focused on selected watersheds: the Colorado River, the Delaware River, and the Apalachicola/Chattahoochee/Flint River Basin - where there is significant competition over water resources. The USGS will work collaboratively with stakeholders in those regions to comprehensively assess the technical aspects of water availability. The work will also contribute to improving future regional studies.

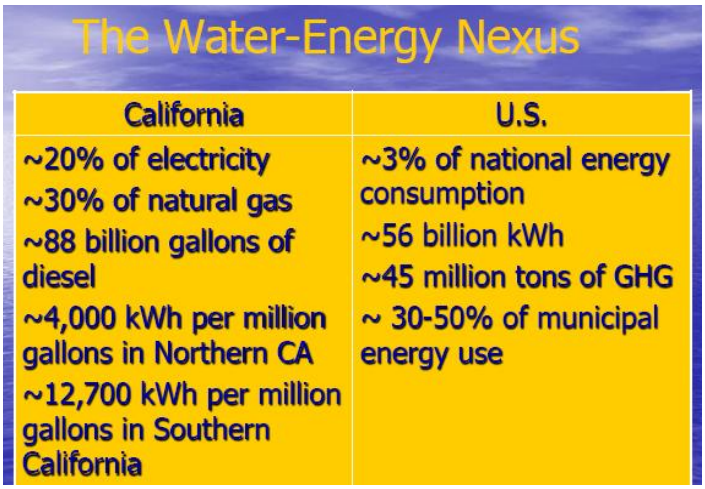
EPA Region 9 Sustainable Water Infrastructure and Climate Change Initiative, Eric Byous, EPA Region 9, Sustainable Infrastructure Office,



Eric told the participants that the EPA Region 9 Water Division formed the Sustainable Infrastructure Office in February 2008. This Office houses the major water infrastructure programs and has greatly improved coordination between them...matched funding sources with priorities. Programs include: State Revolving Fund, Sustainable Infrastructure, U.S./Mexico Border Infrastructure, and Congressional Earmark Programs.

The priorities of the Sustainable Infrastructure and Climate Change Office are:

- Energy and Water Efficiency
- Renewable Energy Production
- Low Impact Development
- Green Jobs
- Coordination with state and federal agencies to identify sources of SI funding



Byous showed the close relationships between water and energy use then outlined EPA's "Four Steps to Sustainability Process":

1. Benchmark with the ENERGY STAR Portfolio Manager
2. Audit (State Revolving Fund project, electricity provider, DOE, contractors)
3. Implement Audit Recommendations (State Revolving Fund projects, Energy Management Programs, capital and operational improvements, renewable energy projects)
4. Repeat

Byous described the State Revolving Fund Programs saying they can fund nearly all aspects of energy and water efficiency improvements for a water or wastewater utility. The fund constitutes $3.5B of US EPA's entire $10.5B budget for 2010…the largest single agency investment. Between 2009 and 2010 California's share of the programs have been provided with nearly $830M, and substantial programmatic changes have occurred.

The types of sustainable infrastructure projects eligible for funding include energy and water use audits, development and/or implementation of EMS and energy management programs, renewable energy production such as combined heat and power, leak detection, energy efficiency improvements or upgrades, water efficiency upgrades or rebate programs, water metering/tiered rate development projects and low impact development and green infrastructure.

EPA is actively developing partnerships with other state and federal agencies based on the thinking that since they are funding the same kind of projects, why not simplify sources of funding for potential recipients? They are also working to effectively add value to city and county sustainability efforts.

Byous concluded by talking about Water Sense which he called a national brand for water efficiency. WaterSense offers a simple solution for communities implementing water efficiency

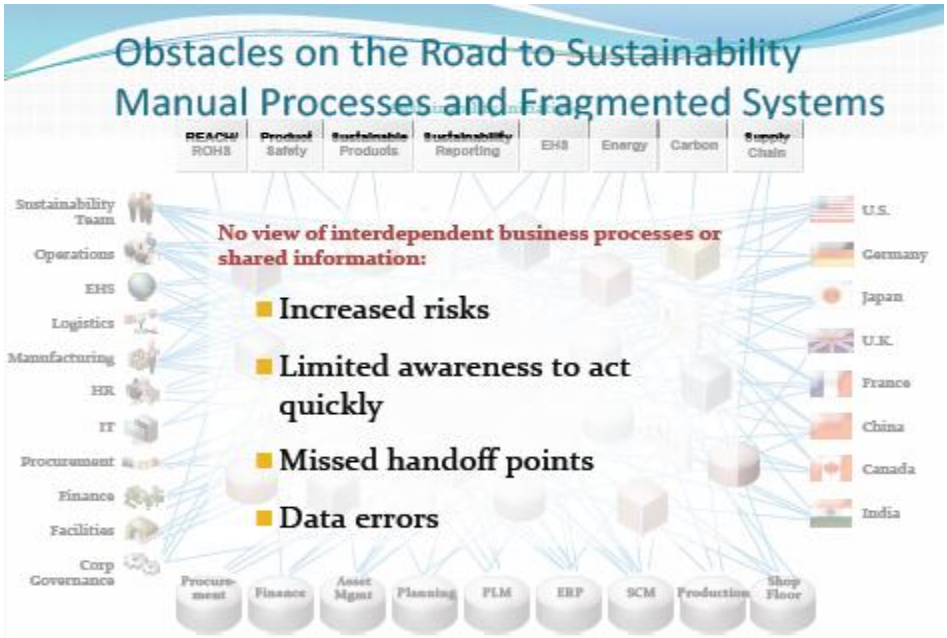
by being a National, consistent brand with an easy-to-recognize label. Products are being certified for performance and efficiency. So far 280 toilets and 820 faucets have earned the label. There are also landscape designer and home certification programs.

Sustainable Silicon Valley: Moderator: Marianna Grossman, Executive Director, Sustainable Silicon Valley

Mariana Grossman moderated the session and led off with a summary of the Sustainable Silicon Valley Water Initiative. The purpose of the Initiative is to increase understanding of regional water resources challenges and some current solutions. Marianna introduced various members' presentations on practical issues on the ground and on policy and economic issues.

Marianna defined an EcoCloud as a virtual industrial eco-system following key concepts:

- Industrial Metabolism (material & energy flow)
- Industrial Ecology (linking energy and material flows across adjacent facilities)
- Industrial Symbiosis (integrated design)
  - Material exchanges and integrated waste treatment to reduce environmental impact
  - Design facilities & processes to maximize energy efficiency & conserve material use



The companies participating in Sustainable Silicon Valley are exploring many potential opportunities including material exchange, energy cascading, water cascading, shared transportation, information and best practices, shared services and other possibilities.

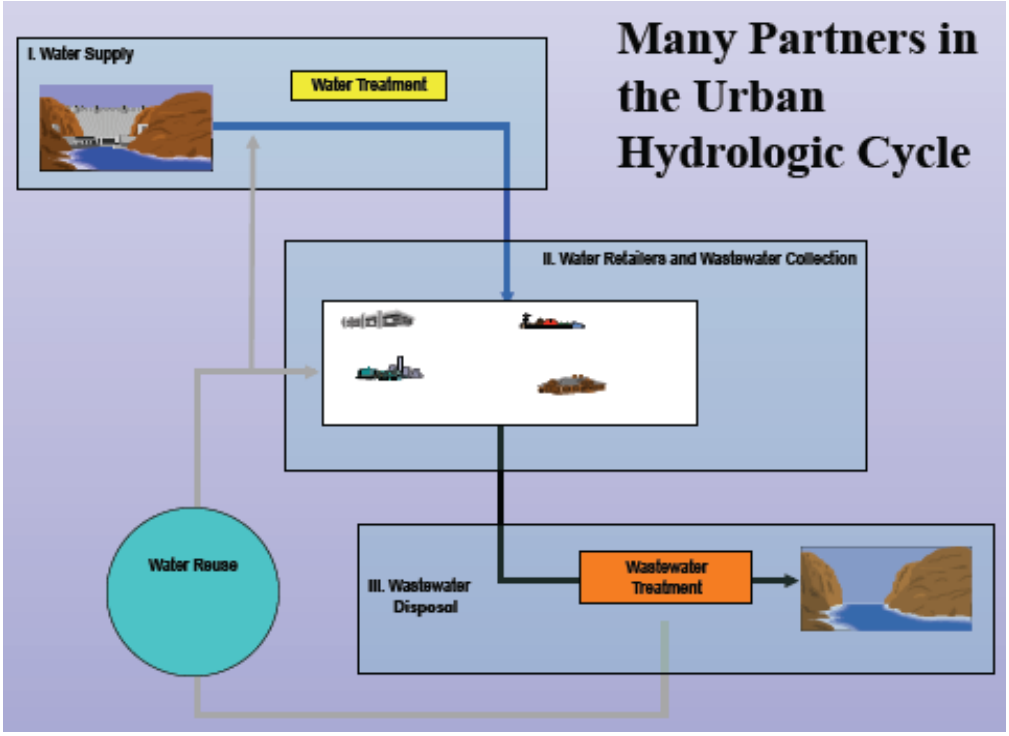
Practical Issues on the Ground

An Opportunity for Collaboration: South Bay Water Recycling Cooling Tower Initiative and SSV "EcoCloud" Eric Rosenblum, South Bay Water Recycling, City of San Jose

Rosenblum presented the accomplishments of the water recycling efforts of the City of San Jose. 97% of recycled water customers use 68% of the water for irrigation including golf courses, landscape, street medians, cemeteries, parks, and gardens while the remaining 3% of customers use 32% of the water for industrial purposes including cooling towers, dual plumbing, boiler feed, decorative water features, dust control, industrial process water and equipment washing. For this reason the City of San Jose is now focusing on developing industrial use of recycled water.

The benefits of recycling include:

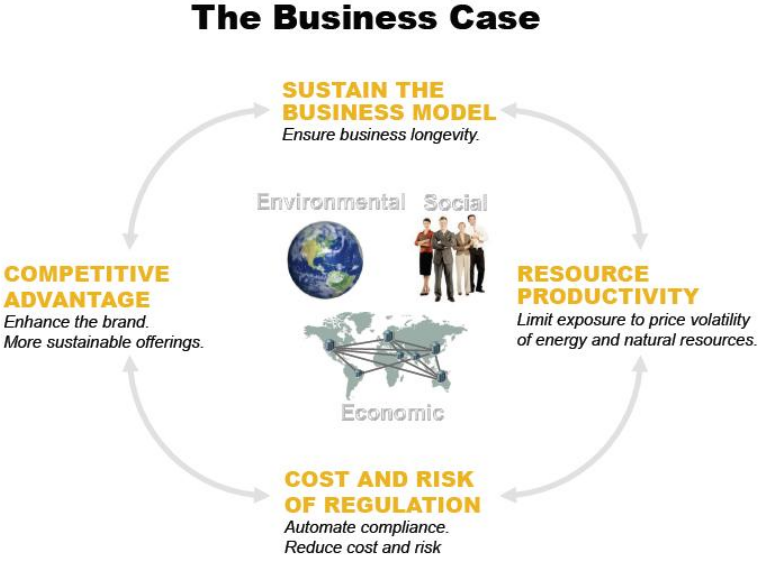
- Lower water rates
- Consistent water quality
- Drought proof water supply
- Creates redundant supply when potable water is available as backup
- Points for LEED certification



Sustainability@SAP The Next Generation for Business Process Excellence

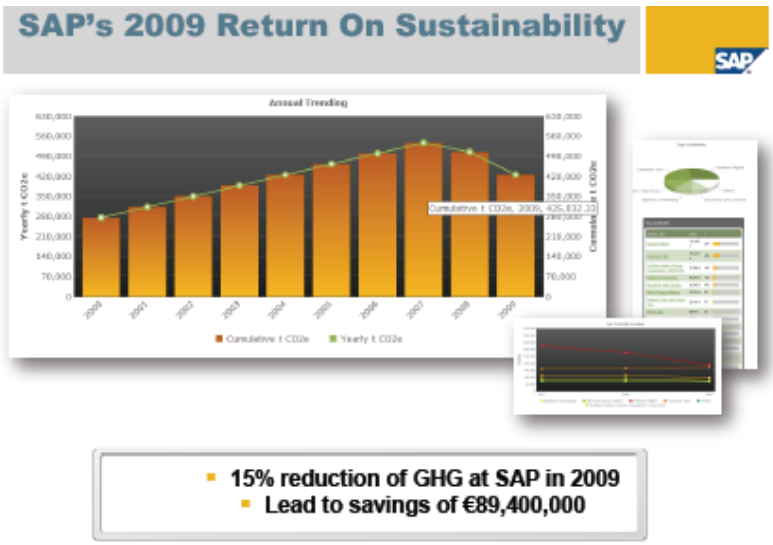
Jim Davis, Executive Director, Sustainability

Jim Davis again welcomed the SWRR participants to the SAP Conference Center saying that SAP's participation reflected its commitment to sustainability as a core business practice. SAP's business approach to sustainability is "to increase short and long-term profitability by holistically managing economic, social and environmental risks and opportunities." An increasing number of businesses are seeing that becoming more sustainable is in line with their business objectives.



SAP has a dual strategy with respect to sustainability:

- SAP as exemplar with world class sustainability reporting and a three time leader in the software category of the Dow Jones Sustainability Index,
- SAP as enabler to support its customers in sustainability since for example the CO_2 footprint of SAP's customer base is about 10,000 times larger than that of SAP.



Davis concluded by presenting some of the business challenges in water sustainability:

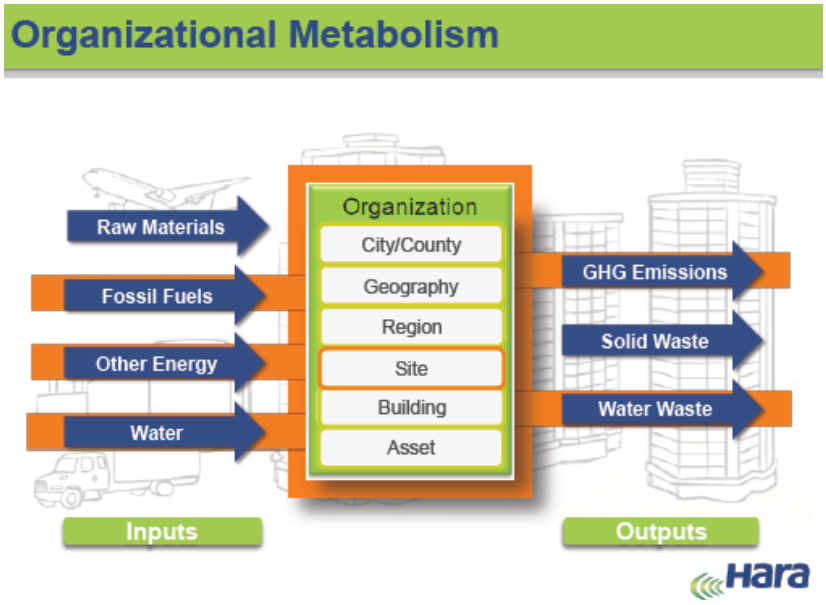
- Operations Footprint – transparent disclosure of water consumption and discharge (quantity and quality)
- Sustainable Water Supply Chain – quantify embedded energy, carbon, other resources and waste in water supply options
- Product Footprinting – credible life cycle analysis and disclosure for water in products
- Monetization – pricing and valuation to include water externalities
- Portfolio Optimization – evaluate reduction/efficiency options to create marginal cost abatement curve for supply/use options
- Business Integration – embed water in core asset, investment and operating decisions

Know Your Impact, Change Your World,

Michel Gelobter, Chief Green Officer, Hara Software

Michel Gelobter introduced Hara as a new company headquartered in Redwood City California, founded in late 2007 with a $20MM investment from KPCB, JAFCO, and Nth Power and formally unveiled in June 2009.

The Hara mission is to help enable a post-carbon economy in which organizations grow and profit while optimizing natural resource consumption and minimizing environmental impact. The business model is Software as a Service Subscriptions offering value-added services. In less than a year customers include a wide range of large organizations including: Coca-Cola, News Corporation, The City of San Jose, The City of Palo Alto, Safeway, Aerojet, and Intuit.



The customers face drivers such as:

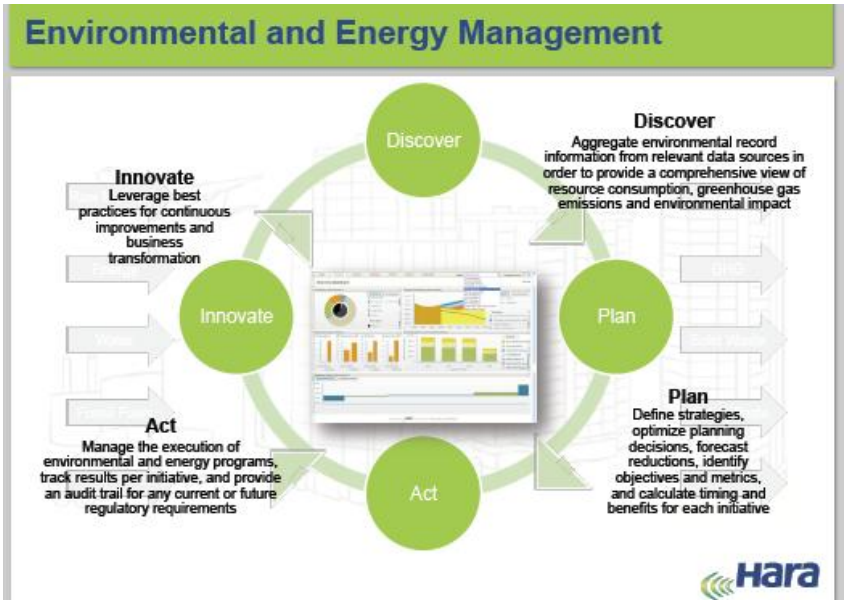
- Environmental challenges & constraints
- Increased population
- Increased energy and resource costs

• Limited budgets

The upsides include:

• Risk management

• Cost savings e.g. by taking action Santa Clara cumulative to 2006 saved $183 Million and the energy use of 206,000 households' annual energy use



Water Conservation: Drivers and Challenges in Commercial Building

Chris Brown, Webcor Builders

Chris Brown told the participants that buildings consume 13.6% of potable water in the United States according to the US Geological Survey. Low impact development strategies in urban areas of the California have the potential to increase water supplies by 405,000 acre-feet of water per year by 2030. California's Commercial, Industrial and Institutional Sector consume 2.5 million acre-feet per year or approximately 1/3 of total water use in urban areas. Estimates for cost-effective strategies suggest that potential for water savings is 710,000 to 1.3 million acre feet per year according to Natural Resources Defense Council. Landscape irrigation practices in the United States consume large quantities of potable water. Outdoor uses, primarily landscaping, account for 30% of the 26 billion gallons of water consumed daily in the United States.

Efficient use of water, capture of rain water and minimizing waste water have become part of Environmental Certification of buildings in systems such as:

- LEED
- BREEAM
- Green Globes

California applies legislative initiatives such as Cal Green and the Clean Water Act. Cost factors that need to be considered are both first cost at the time of construction and the costs of continued maintenance and operation. More efficient buildings are very cost effective when costs over time are factored in.

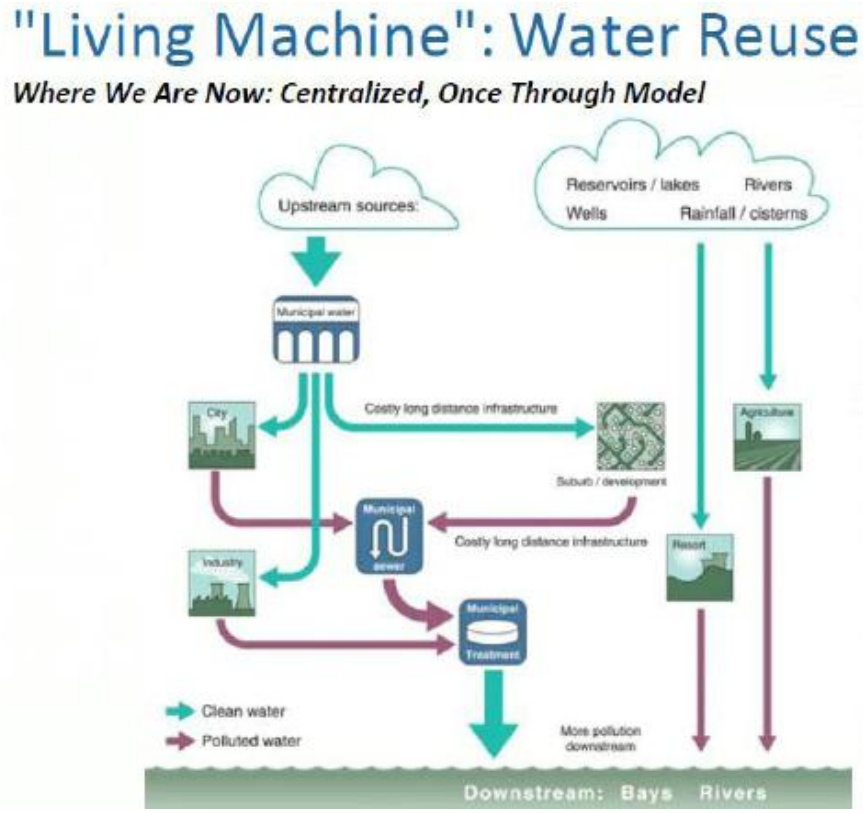
Brown described the features of the San Francisco Public Utilities Commission Building that led to its LEED Platinum level certification for sustainability:

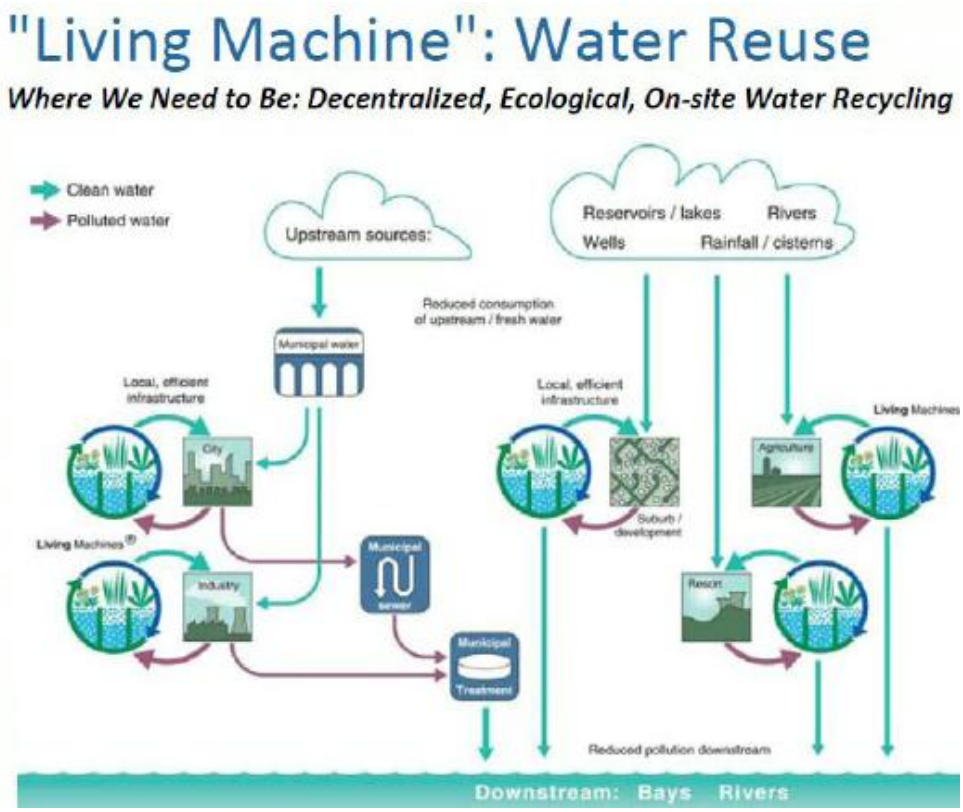
- Wind Turbines
- Photovoltaics
- Maximized Glazing
- Green Roof
- Efficient HVAC
- Raised Floors
- Light Shelves
- Operable Windows
- Thermal Shaft

Water Use and Reuse

- Waterless Urinals
- Low Flow Fixtures

Brown concluded by introducing the "Living Machine"® concept of waste water treatment. Webcor Builders applies such tools to building sustainably.





WiFi Meter Reading: Dave Serge, City of Mountain View

Dave Serge described the new WiFi metering system which was to become operational in June 2010. It is owned and operated by Google and covers 16 square miles of the City of Mountain View. The system is designed as a learning network to observe both the content and the user experience. The collection network provides transport for metering data to water department servers to avoid driving to collect data and improves leak detection capability.

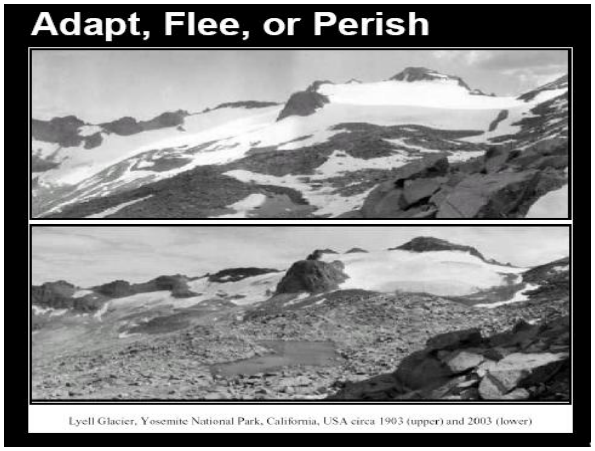
The system can use existing metering or a new AMR 900 MHz water or gas metering system. The Orion Information System was introduced into the water market in 2002. There are three types of "interrogators": the Drive-by, the Walk-by and the Wi-Fi Mesh Network.


Pit transmitter

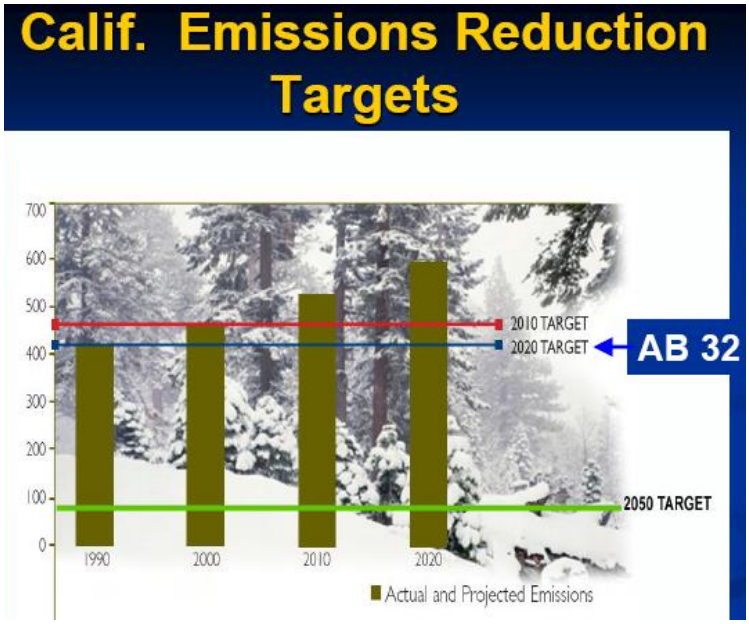
Water Meter Monitor

California Strategies Toward Sustainability in a Changing Climate: John Andrew, California Department of Water Resources

John Andrew began his presentation with dramatic images of the Lyell Glacier taken in 1903 and 2003 showing how far the glacier has receded in a century.



Andrew's first topic was climate change mitigation in the water sector. California's green house gas emissions are 40% from cars and trucks, 33% from energy generation and distribution, 20% from industry, 6% from agriculture and 1% from waste disposal. The Global Warming Solutions Act (AB 32) .sets in statute the Governor's target (1990 levels by 2020) which equals approximately 169 million tons emission reduction or 30% below projected business-as-usual levels. The legislation puts the California Air Quality Board in the lead with the California EPA and other State agencies participating. The statute contains a mix of regulatory and market approaches and a detailed, aggressive schedule.



With regard to water resources, the Governor's Climate Action Team Water-Energy Subgroup known as "WETCAT" is focused on water conservation, recycling, energy intensity of water

systems, urban runoff and stormwater, reuse and renewable energy production. The climate change impacts on California's water resources include reduced snowpack impacting water supply and hydropower, earlier snowmelt resulting in increased flood control demand on reservoir space, higher water temperatures impacting the ecosystem, sea level rise impacting the Delta, threatening levees and increasing salinity, and increased demand for water in all sectors.

California has developed a comprehensive strategy for adaptation to climate change. Executive Order S-13-08 is a statewide adaptation plan covering seven sectors:

- Water
- Transportation and Energy Infrastructure
- Forestry
- Oceans and Coastal Resources
- Agriculture
- Biodiversity and Habitat
- Public Health

Investment Strategies

- Sustainable funding for statewide and integrated regional water management

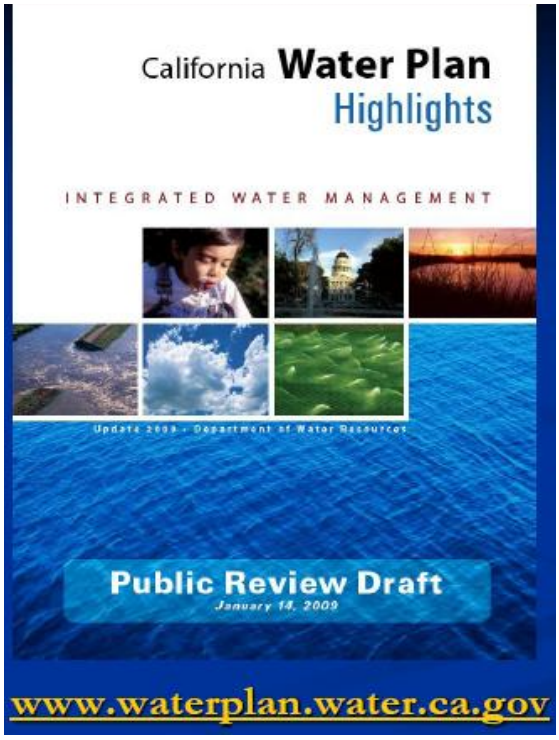
Regional Strategies

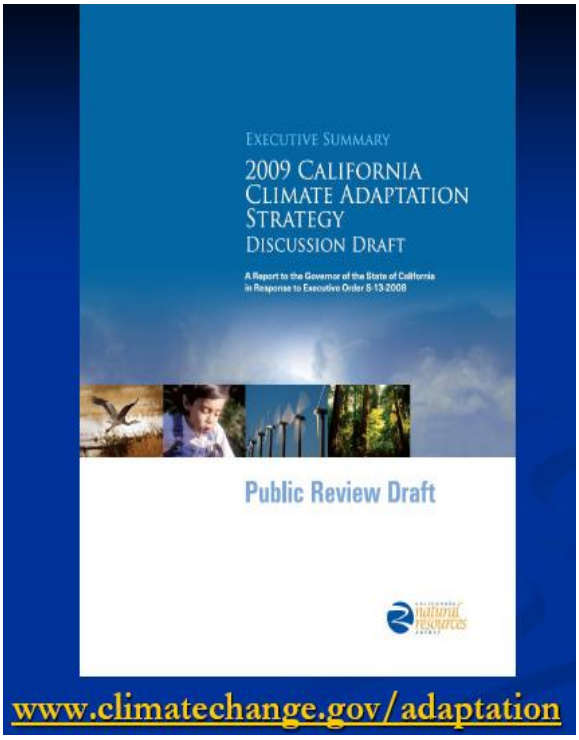
- Fully implement Integrated Regional Water Management
- Aggressively increase water use efficiency

Statewide Strategies

- Practice and promote integrated flood management
- Enhance and sustain ecosystems
- Advance and expand conjunctive management of surface and groundwater resources
- Fix the Delta

John Andrew invited comment on two public review drafts: The California Water Plan and the 2009 Climate Adaptation Strategy.



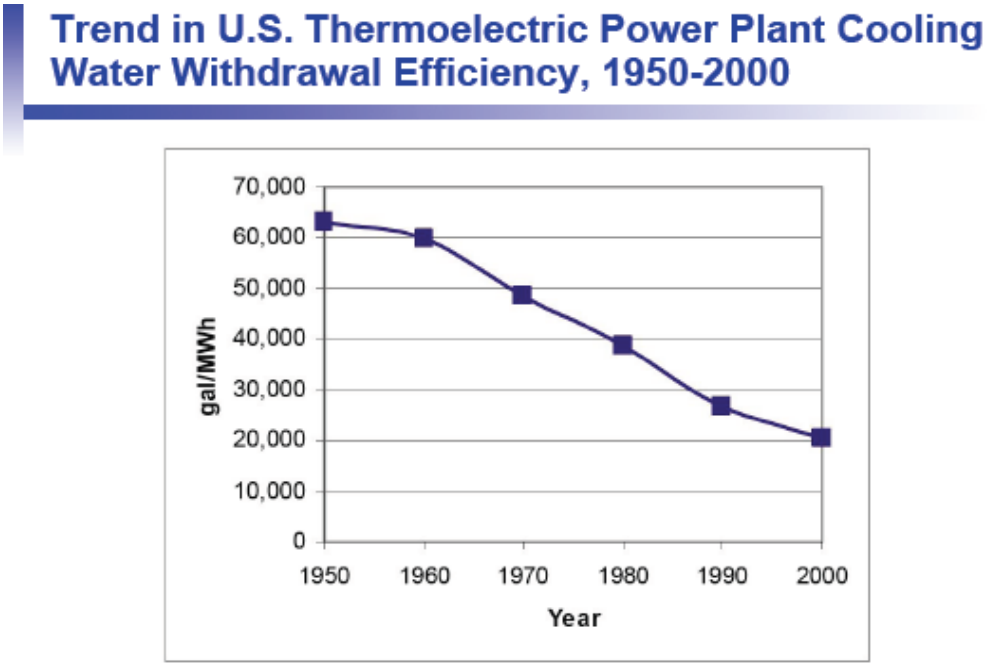


Sustainability at EPRI, Todd Maki, Project Manager, Sustainability

Todd Maki opened his presentation with an overview of the history and role of EPRI and listed some of the companies that are part of the EPRI Sustainability Interest Group. Maki said that in the big picture, water is a shared community resource so water resource management requires broad stakeholder consensus. Community social and economic vitality depend on water and electricity availability and demand for both are increasing and interrelated. Therefore energy and water sustainability are real and high priority issues for the U.S.

The consequences of growing water/energy demands include pressure to reduce water use, more intensive water resource management, greater integration of water and energy planning and emphasis on watershed and regional planning

There is a demand for new science and technology to support planning and management needs and the electric industry has made gains in efficiency of water use over the past half century.



Maki said that there are "top down" approaches to reaching sustainability such as watershed-based planning, that consider all stakeholder demands and matching aggregate water demands to water supply. Bottom up approaches are facility-based with objectives that include increased water use efficiency and conservation. Different large electric utilities differ in their strategies.

More information on the strategies of each of the company examples Maki included in his PowerPoint can be found on the SWRR web site at http://acwi.gov/swrr

California's Water-Energy Relationship: A Policy Perspective,

Laurie Park, Navigant; Robert Wilkinson, Bren School, University of California Santa Barbara

Laurie Park said the water-energy nexus occurs at the intersection of water and energy resources and infrastructure. The increasing role of seawater desalination in California's water resource portfolio serves as a reminder of the importance of an integrated approach to optimizing water and energy decisions. California has a broad scope of water energy activities undertaken by the agencies in the state government, the Public Utilities Commission, the Governor's Climate Action Team Water-Energy Subgroup nicknamed "WETCAT" and industry associations; energy, water & wastewater agencies; NGOs and others are conducting separate studies.

On January 19, 2007, the CPUC opened a water-energy proceeding to consider whether/how energy "embedded in water" should be recognized as an energy efficiency resource

Decision 12-07-050:

- Authorized the IOUs to conduct water-energy pilots
- Directed that three studies be conducted:
  - Study 1 - Statewide and Regional Water Energy Relationship Study
  - Study 2 - Water Agency and Function Component Study and Embedded Energy -Water Load Profiles
  - Study 3 - End-Use Water Demand Profile Study

Current Status & Timeline:

- Water-Energy Pilots
  - Completed December 2009
  - EM&V fieldwork complete March 2010
  - Embedded Energy Profiles complete April 2010
  - EM&V final report July 2010
- Studies 1 & 2:
  - Study Drafts & Models released March 2010
  - Public Workshop tentatively scheduled April 2010
  - Final Report end April or early May 2010
- Study 3
  - Final Report expected October 2010

Park outlined some of the areas of work for improved performance at the energy water nexus:

1 - Reduce water sector impacts on energy resources & infrastructure:

Energy Efficiency	•Save energy by saving water (aka, "embedded energy") •Improve energy efficiency
Demand Response	Build flexibility into water systems (e.g., storage, redundancy)
Renewable Energy	Maximize water-related renewable energy: •By-products of water & wastewater operations (in-conduit hydropower, digester gas cogeneration) •Untapped renewable resource potential on public lands

2 - Reduce energy sector impacts on water resources & infrastructure:

Cooling	•Use non-potable water sources •Use non-water technologies
Hydropower	•Mitigate long-term impacts of climate change that could reduce hydropower production (presently ~20% of California's energy supplies)

3 NAVIGANT CONSULTING

Laurie Park said that on behalf of the California Sustainability Alliance, Navigant Consulting conducted a study on the role of recycled water in energy efficiency and greenhouse gas reduction which had significant findings:

- Low energy intensity resource available now in substantial quantities
- Significant energy and carbon benefits over other options such as seawater desalination

Park concluded by saying the solutions to the water-energy topics are cross-cutting, sensible and economic, but as in any emerging area of thought, barriers and hurdles will need to be overcome.

- Economic – substantial investments are needed

- Knowledge & experience – new ground is being paved
- Data, methods & metrics – more data & new methods are needed to effectively evaluate tradeoffs and rank options
- Traditional single entity perspectives – decisions made by all agencies and utilities, whether water or energy, currently focus on optimizing their own systems and resources

To truly optimize the state's water and energy resources, a statewide perspective is needed. This will require new policies, decision making frameworks, tools and techniques.

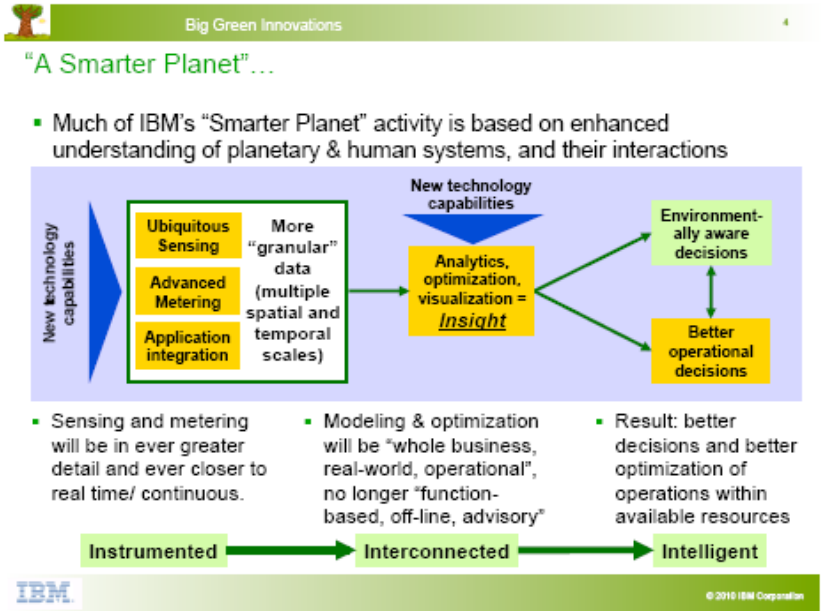
Day 2: Wednesday April 28

The second day of the meeting began with a brief recap and review of goals for the day.

Sonoma County Water Agency – "Collaboration Platform"

Grant Davis, General Manager Sonoma County Water Agency and Peter Williams CTO, Big Green Innovations, IBM

Williams began the presentation with a discussion of the Smarter Planets program of IBM's Big Green Innovations.



Williams said much of water management is improving information flow and use. Quoting from "A Strategy For Federal Science And Technology To Support Water Availability And Quality In The United States", a 2007 report of the National Science and Technology Council, he said: "Today's decisions and policies will shape our water future. The effectiveness of those decisions depends on the quality of information. In addition to improved water data the United States should develop and expand forecasting and predictive models and systems to educate and influence water use behavior of individuals, businesses and resource managers."

Water management today is in the wrong "tense" (i.e. past tense rather than current useful information). With process management in general there is a trend from reactive to predictive management using real time data about the preconditions of events to enhance or prevent those events before they happen. This hasn't really happened yet in water management which still tends to be reactive (fixing what happened or did not happen). Real time management involves reacting to what is happening or is failing to happen. Predictive management is working in advance to make events happen or not happen.

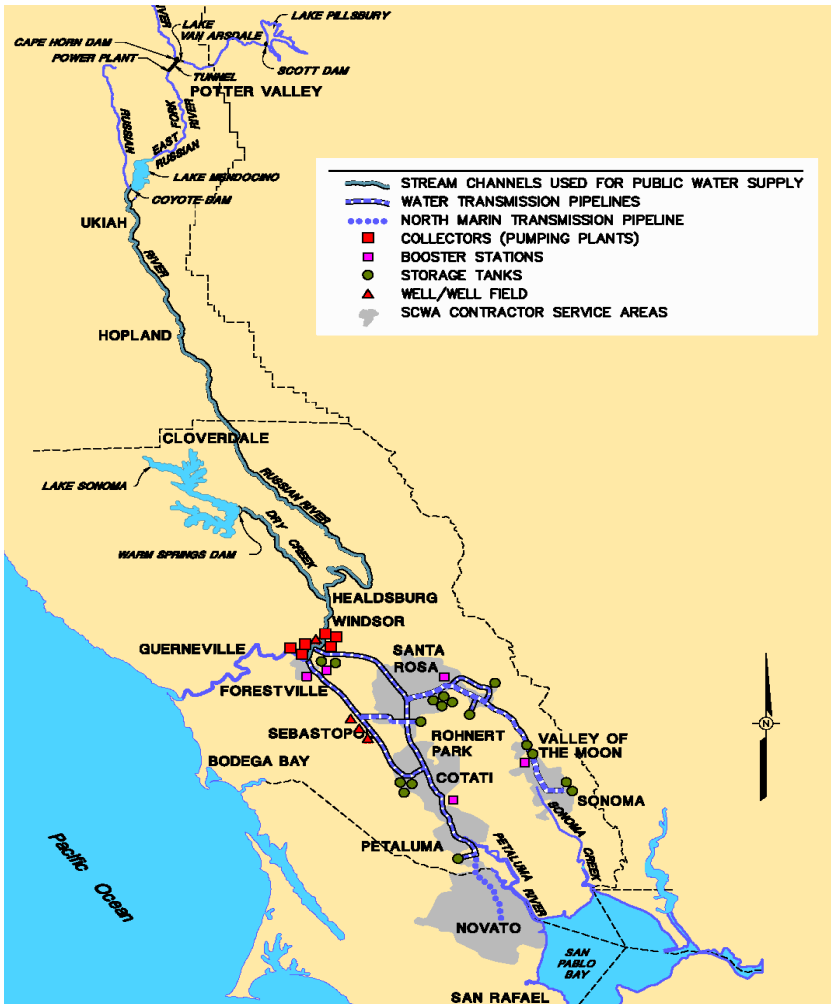
Williams said water data "pathologies" include a lack of data, data in the wrong scale (spatial or temporal) for the decision maker, and data fragmented among different stakeholders with different formats, scales, frequencies, and standards. In spite of the lack of data, some data is re-captured many times and sometimes there is too much data to use. Models using the data can be incompatible or incomplete. He continued to say the poor visualization of information impedes effective decision-making creating a "So what's this telling us?" syndrome.

Williams made a prediction: "Unless we solve these data problems, some percentage of whatever we invest in water management (let's say, 30-50%) will be wasted. But we won't know which 30-50% until something major breaks."

Williams and Davis provided background on Sonoma County and its county water authority. Sonoma is a microcosm of California. The county is a wholesale water supplier to over 600,000 people with nine retail water contractors. The primary water source is the Russian River with supplemental groundwater supply. Water is moved from source to users via the Russian River and transmission pipelines that form one single integrated system. The county has the world's largest river-bank filtration system.

The main issues facing the Sonoma County Water Authority are:

- Increased demand
  - Population growth
  - Wine and other industries
- Environmental regulations
  - Flow management
    - Vine spraying, reduced summer flows
  - Endangered species protection
- Drought
- Climate change
  - Rainfall/river flows
  - Seasonality, summer temperature
- Flood protection

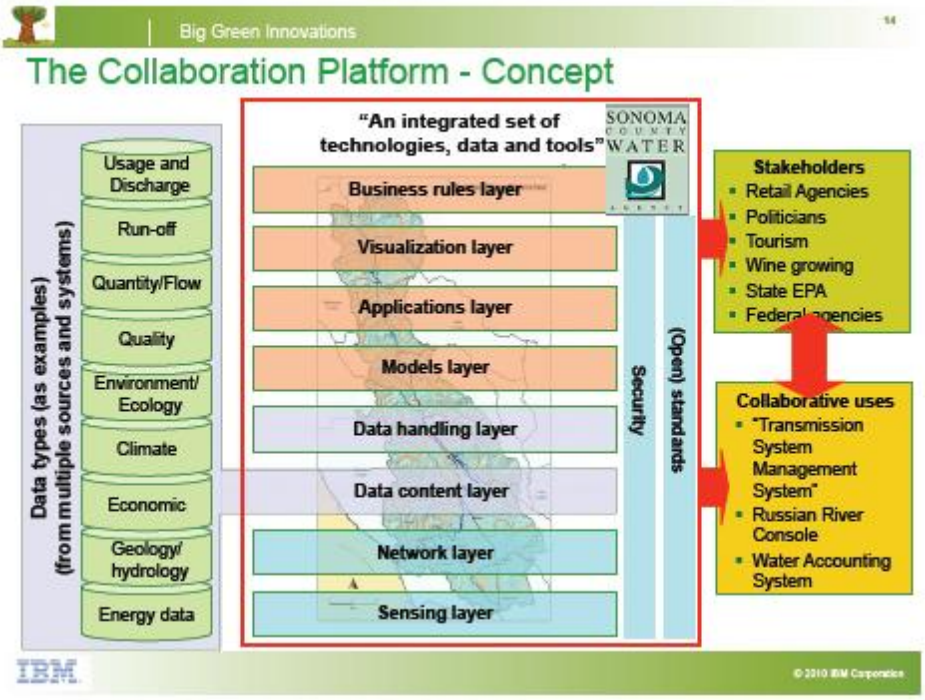


The project objectives to move Sonoma County toward real time water monitoring are to

- Create a "collaboration platform" for the water authority and its retail contractors, including:
  - A common operating picture of the Russian River and district Transmission System
  - Integration of SCADA systems
  - Collaboration and data sharing tools for operators in each agency

- Use information sharing and transparency to:
  - Enable greater levels of trust
  - Elevate the quality of the debate

- Provide a platform for future data gathering



The presentation concluded with a discussion of future developments:

- Add remaining retail contractors
- Add higher resolution weather forecasting, frost warnings etc
- Integrate NOAA/ACE/USGS pilot on precipitation modeling
  - Create an emergency management support tool
- Additional sensors and data sources
- Support pumping optimization and leak detection
- Better integration with asset management
- Collect ecosystem data
  - Round out to create "Russian River Console"
- Integrate with groundwater models etc to create "Water Accounting System"

- Enable truly integrated water resource management

MWD 2060: Planning for Sustainability 50 Years Ahead, Robert Wilkinson, Bren School, UC Santa Barbara, reporting for the Metropolitan Water District of Southern California

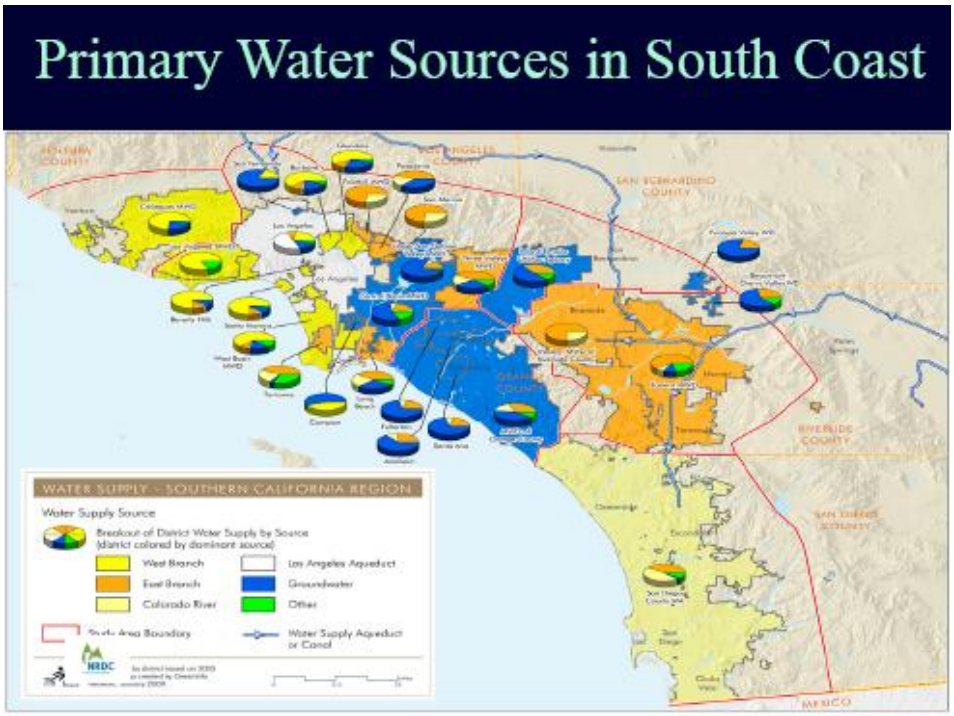
Bob Wilkinson began by sharing a vision of what the Metropolitan Water District of Southern California would report in 2060. He said that as in the 50 years prior to 2009, the water district is providing reliable, high-quality water to its member agencies in communities throughout Southern California. It is now a regional water and energy service providing "value added" to a wide range of local solutions. By 2060 the district will be providing "net carbon negative" water and energy through its renewable energy generation facilities and robust water portfolio.

The vision is that the Metropolitan Water District will be widely credited for its leading role in restoring ecosystems and species throughout California. Notwithstanding serious perturbations to infrastructure systems over the past half century, the district will have demonstrated the value of integrated systems and robust and resilient technology and management strategies.

Wilkinson then showed how different the world is than what we envisioned in the 1950s and discussed how a new vision could be achieved. Water policy has been straightforward: when people want water, agencies like the district go get it for them – at low cost, high quality, and high reliability." This is the concept enshrined in the district's "Laguna Declaration" in 1952.

But now, every major water supply system in California (and many other places) is over-allocated. Roger Revelle and Paul Waggoner said as long ago as 1990: "Governments at all

levels should reevaluate legal, technical, and economic procedures for managing water resources in the light of climate changes that are highly likely."



Energy Water Nexus, Martha Davis, IEUA and Chair of the Energy Committee of the Association of California Water Agencies

Martha Davis told the participants that Association of California Water Agencies was discussing energy because water and wastewater sectors are major users of energy – and their load is growing. Nineteen percent of electricity consumption in California is related to water use. Roughly half is used by water management agencies and the remainder by end-users. To the water and wastewater agencies, energy represents the largest controllable cost – and these costs are rising.

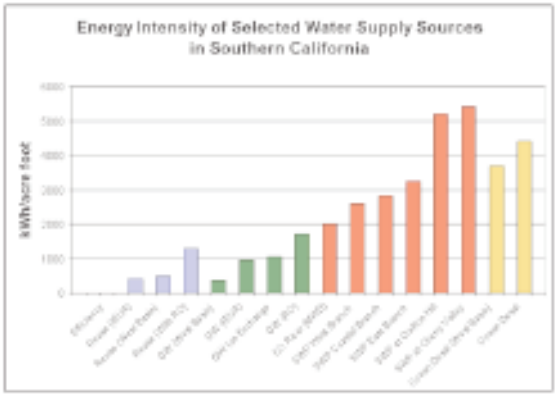
Energy generation used in the water sector (coal, natural gas, and diesel) emits large amounts of greenhouse gases. Overall, electricity generation is the third highest emitter of greenhouse gases in California.

Climate Change is having a major impact on water and wastewater agencies. The reliability of the California State Water Project and the Central Valley Project and of local surface supplies are expected to be reduced as will hydroelectric power generation as water flows drop. Actions

by water and wastewater agencies to be more efficient and to generate renewable energy are simultaneous climate change "mitigation" and "adaptation" strategies

Water Agency Opportunities

- Water and Energy Efficiency Programs
  - Production Efficiency (Pumps, process energy savings)
  - End User Efficiency (Sonoma County Program)
- Development and use of less-energy intensive water supplies
  - Conservation
  - Recycled Water
  - Groundwater/Conjunctive Management
  - Stormwater Capture



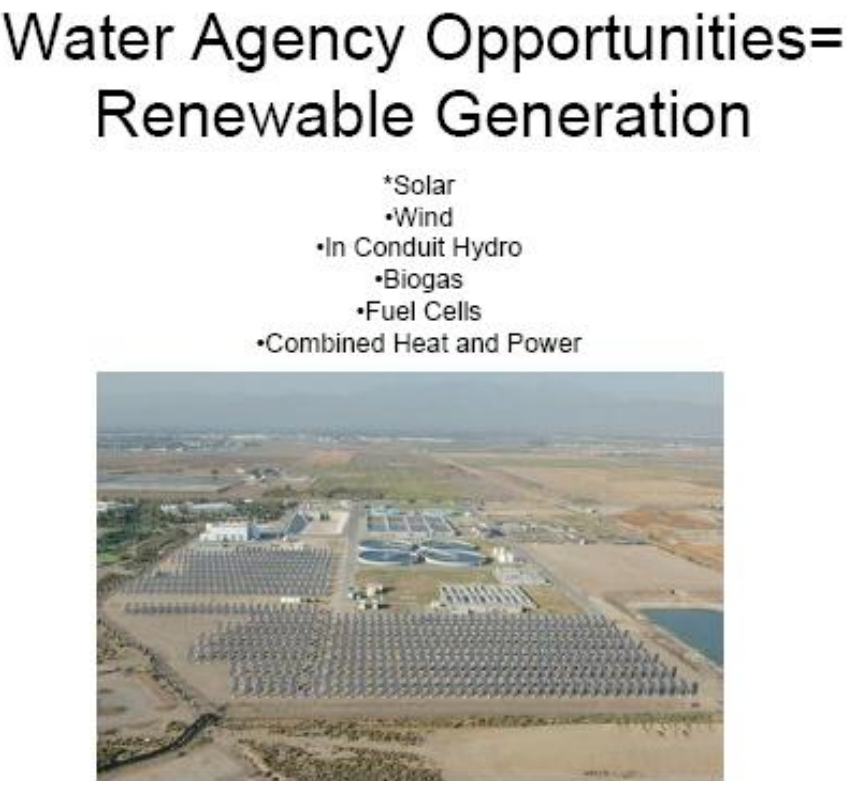
Obstacles and challenges faced by the water agencies include:

• Funding – Tipping point
  - SGIP, California Solar Initiative Rebates
  - Green Infrastructure Grants/State Revolving Fund
  - Tax Credits
  - Emerging RPS/Greenhouse gas emission reduction credits

• Value of Generation = Opportunity to oversize or install projects that feed power into grid
  - Net metering (various)
  - Feed in tariff (1-3 MW, possibly up to 20 MW)
  - Market referent price vs. reverse auction
  - ?? Reduced transmission costs
  - Value of using less intensive water supplies?

• "Market Entry Issues"
  - Rules of the game for developing projects/accessing credits
  - Interconnection
  - Cross media regulatory conflicts

Martha Davis said that what is needed is an understanding of potential value of engaging the water/wastewater sector in efficiency/generation with regard to efficiency, generation and climate change mitigation/adaptation potential. New energy-related infrastructure needs can be reduced through timing and shared investments in infrastructure development. Jobs, economic development and national energy independence would all benefit. Demonstration projects and investment funding are needed for the Water/Wastewater Renewable Generation Initiative.



Inland Empire Utilities Agency actions include:

- Completed assessment by RAND of impacts of climate change on Inland Empire's water supplies
- Developing local water supplies to reduce overall energy footprint
    - Expect to save 225,000 MWh/Yr by 2020
    - Case studies underway to evaluate energy savings in recycled water use
- Developing Renewable Energy
    - 3 MW biogas on line
    - 3 MW of solar installed
    - Wind, fuel cell projects under development
    - Goal to "go gridless" by 2020
- Constructed Platinum-rated LEED Headquarters – first public agency in nation to achieve Platinum level

- Completed carbon footprint assessment
- Participating in REC and carbon markets

Open Discussion, and Next Steps for SWRR

During the open discussion at the end of the meeting many useful comments and suggestions were made:

- Consider conducting a webinar for the next SWRR meeting
- SWRR should look into the issue of externalities associated with water management such as energy costs, ecosystem services and valuation of water flows and wetlands.
- How can SWRR and business groups be a mechanism for a collective voice to help validate the value of data collection budgets such as through letters of support?
- How can SWRR provide credibility to magnitude of water conservation benefits?
- What can SWRR do on the issue of value of water vs. cost of water? The field of social marketing may help get the public to understand the value of water. The price of water is out of whack so we optimize the wrong thing. Government subsidies of water skew the price seen by consumers. There's also the issue of how we align divergent public and private timeframes. They lack a sensitive business model. Water conservation advocates need to sell return on investment.
- Why is it necessary to provide added incentives to conserve energy and water? Answer: It's a lot like the incentives we provide for fluorescent light bulbs. There is a savings in the avoided cost of additional infrastructure. How to value the avoided marginal cost of added water supply is a good question. In some areas, the cost of providing salt water desalination may be the appropriate measure.
- SWRR should include story telling as part of the description of sustainability – what are the risks of losing water? We have the wrong paradigm in mind when we're still thinking we have an abundance of water.
- How can SWRR support companies' sustainability efforts through communication efforts without being an advocacy or lobby group?
- The SEC has mandated all companies to report on environmental risk. Understanding the aggregate sources of environmental risk should be part of this. We need to identify the risks to companies bottom line due to inadequate water/water quality
- Look at quality of life issues related to water supply and quality
- Need to include participation by agriculture in water sustainability efforts
- How can USDA agriculture statistics be improved?
- It is important to build bridges with other sustainability initiatives beyond water.

- Cal Water will be developing water sustainability indicators and strategizing how to go about it. Rich invited people to provide advice with this.

- SWRR should look at both big picture policy issues and small scale projects. We need collaborative water efforts at both big and small scales. Change is difficult to sell on a grand scale and no one wants to be the first bird off the wire. We need smaller test cases to get an understanding of the broad policy value of a measure.

- Build a compilation of success stories to identify the most important issues and develop a tool box that lays out procedures and examples of how to develop indicators. We need to work with community members to get the word out.

- Identify issues of water resources sustainability

- Develop a toolbox for developing the 14 SWRR indicators with methods and data requirements

- Some states have decoupled the energy-cost connection. How to do this with water?

- SWRR should make use of social media. SWRR could use the Web to invite submission and collect case studies of sustainability. Leslie Joslin of Cisco volunteered to help with this! Jim Davis also suggested that SAP has the facilities for this.

- A meeting of people interested in sustainability is sometimes called "preaching to the choir." Preaching to the choir isn't necessarily a bad thing when it's really a lot like going to choir practice, which people have long seen as valuable and necessary to empower the individual members and improve coordination.