



Water Management – IT and Services Issues



CITRIS, January 27th 2010

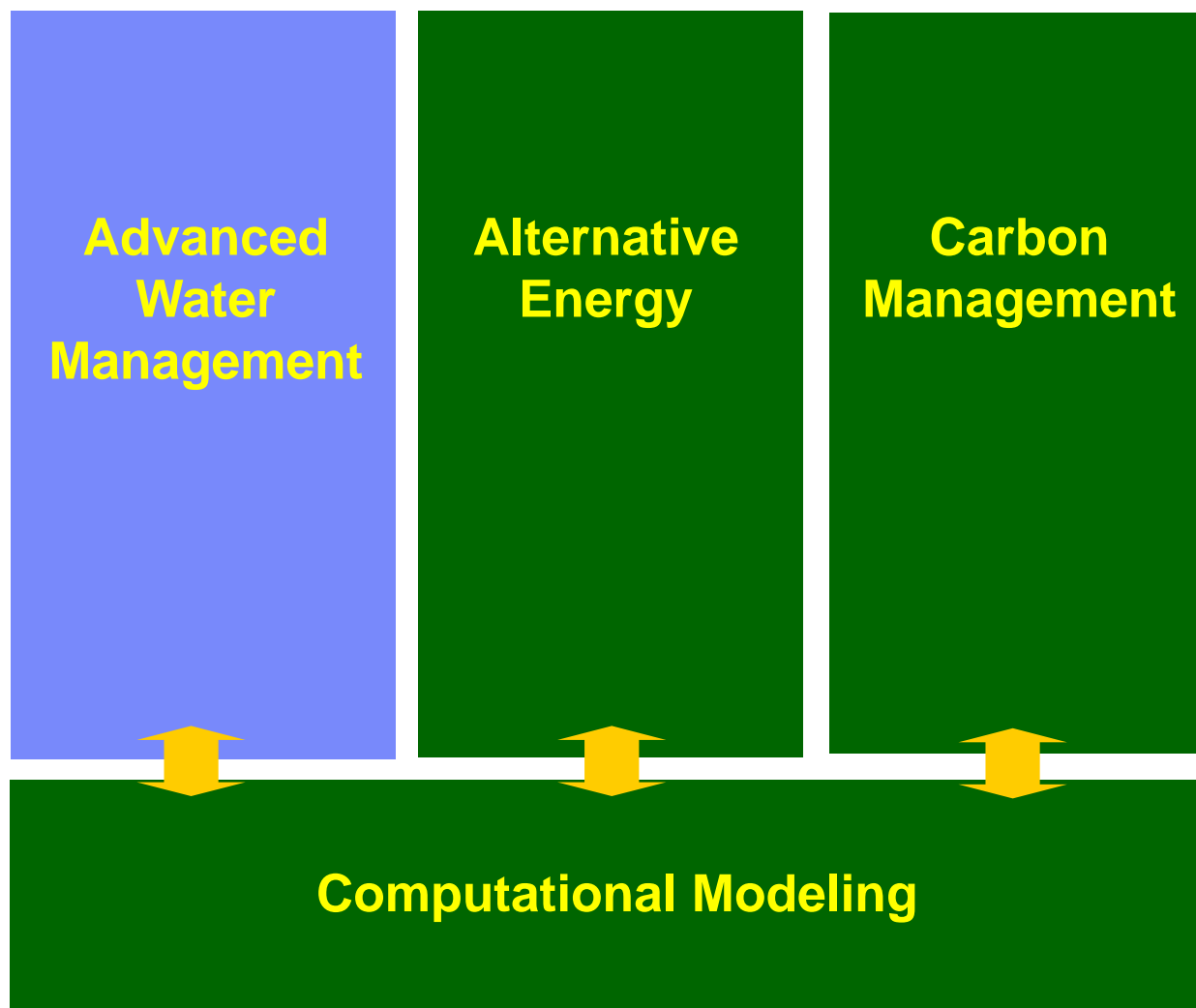


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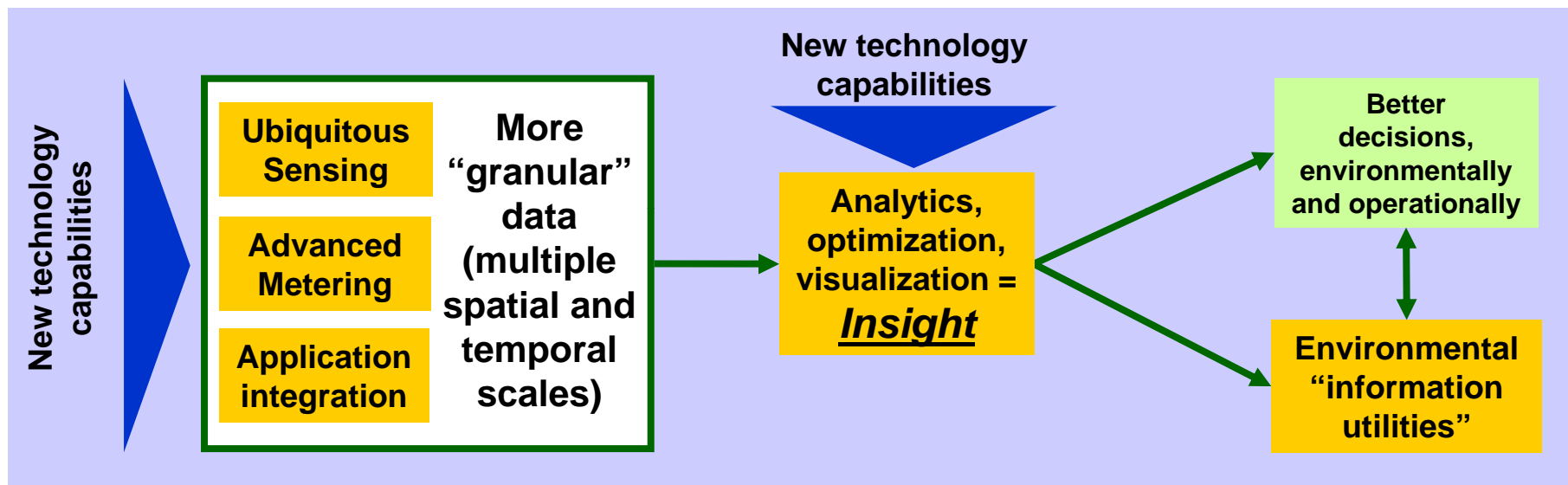
Big Green Innovations' portfolio - four core areas



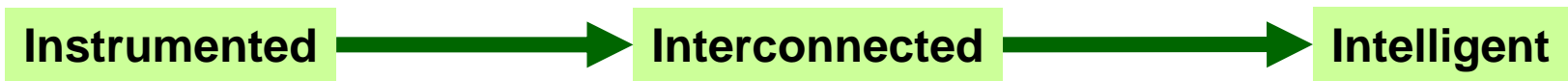


“Instrumenting the planet”...

- Much of Big Green Innovations is based on enhanced understanding of planetary & human systems, and their interactions



- Sensing and metering will be in ever greater detail and ever closer to real time/ continuous.
- Modeling & optimization will be “whole business, real-world, operational”, no longer “function-based, off-line, advisory”
- Result: better decisions and better optimization of operations within available resources





Much of water management is improving information flow & use

*“One barrier to better management of water resources is simply **lack of data** — where the water is, where it's going, how much is being used and for what purposes, how much might be saved by doing things differently. **The water problem is largely an information problem.** The information we can assemble has a huge bearing on how we cope with a world at peak water.”*

Source: Wired Magazine, “Peak Water: Aquifers and Rivers Are Running Dry. How Three Regions Are Coping”, Matthew Power, April 21st, 2008

*“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 individual[s], businesses and resource managers”*

Source: NSTC, “A Strategy For Federal Science And Technology To Support Water Availability And Quality In The United States, - Report Of The National Science And Technology Council Committee On Environment And Natural Resources Subcommittee on Water Availability and Quality”, September 2007



Water data and decision-making “pathologies” - and a prediction

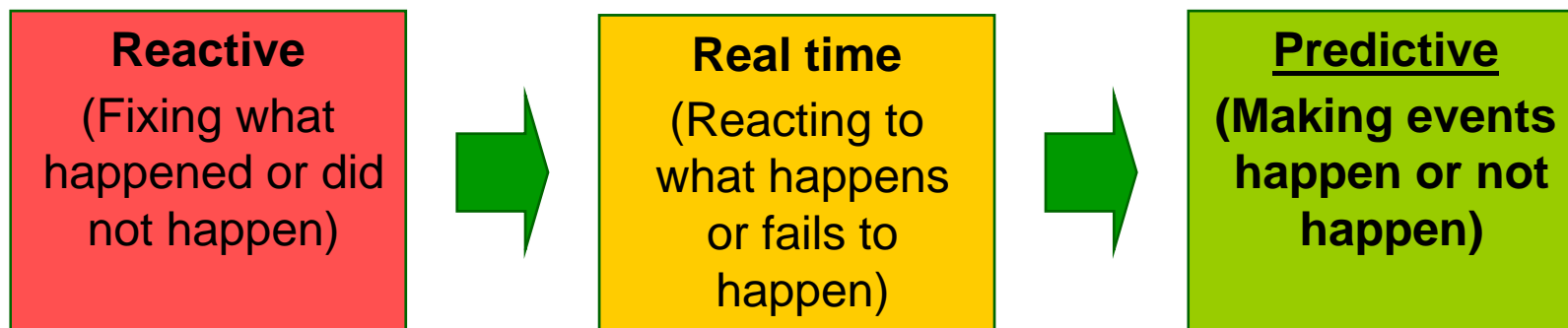
- **No data**
- Data is in the **wrong scale** (spatial or temporal) for the decision
- Data is **fragmented** between different stakeholders:
 - Different formats, scales, frequencies, standards
 - Re-capture of data many times
- **Too much data** to use
- **Incompatible or incomplete models** mean that data is not leveraged
- **Poor visualization** of information impedes effective decision-making
 - “So what’s this telling us?” syndrome

- *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”.*



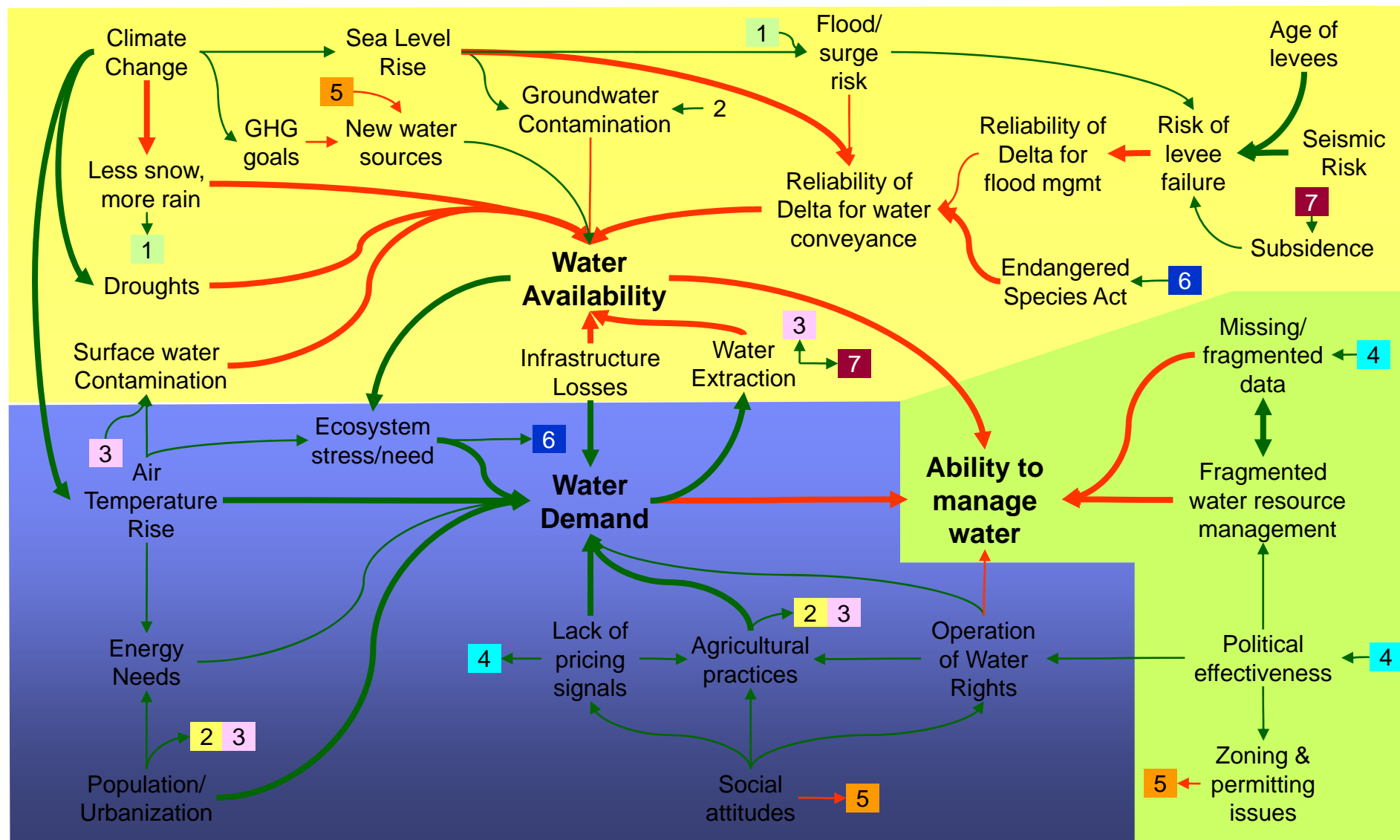
Also, water management today is in the wrong tense

- 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
- It hasn't really happened yet in water management...





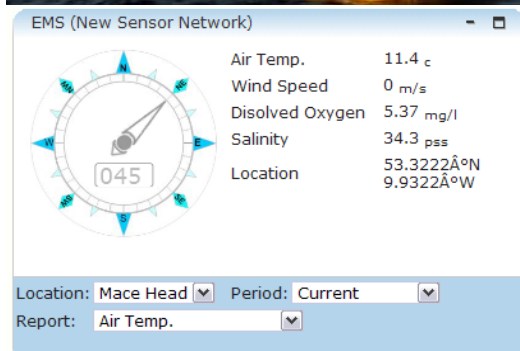
California's water – it's complicated...!!



This is at best a partial view of the issues and their linkages!



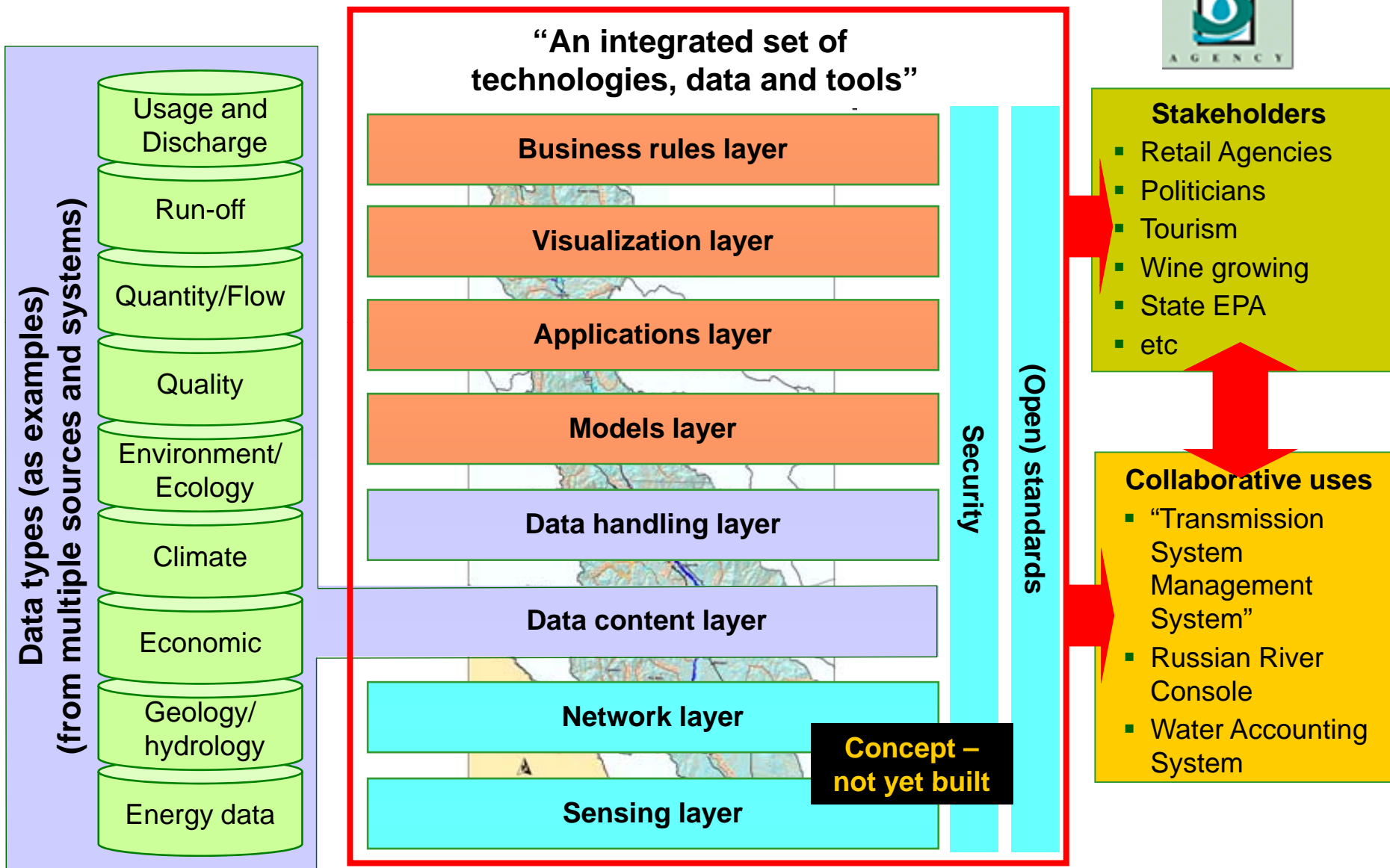
Collaboration platform: Smart Bay (Galway Bay, Ireland)



- Sensor network monitors multiple dimensions of water quality in Galway Bay
 - Data is streamed and processed in real time
- Integration with other data feeds (weather, shipping etc)
- Innovative user interface and advanced visualization supporting multidisciplinary users
- Benefits:
 - Collaboration platform for multiple stakeholders (coastguard, shipping, fish-farming, tourism, agriculture, etc)
 - Enables rapid response to water quality events etc
 - Enables system-wide response to climate change, economic development etc
 - Helping to identify sustainable business models

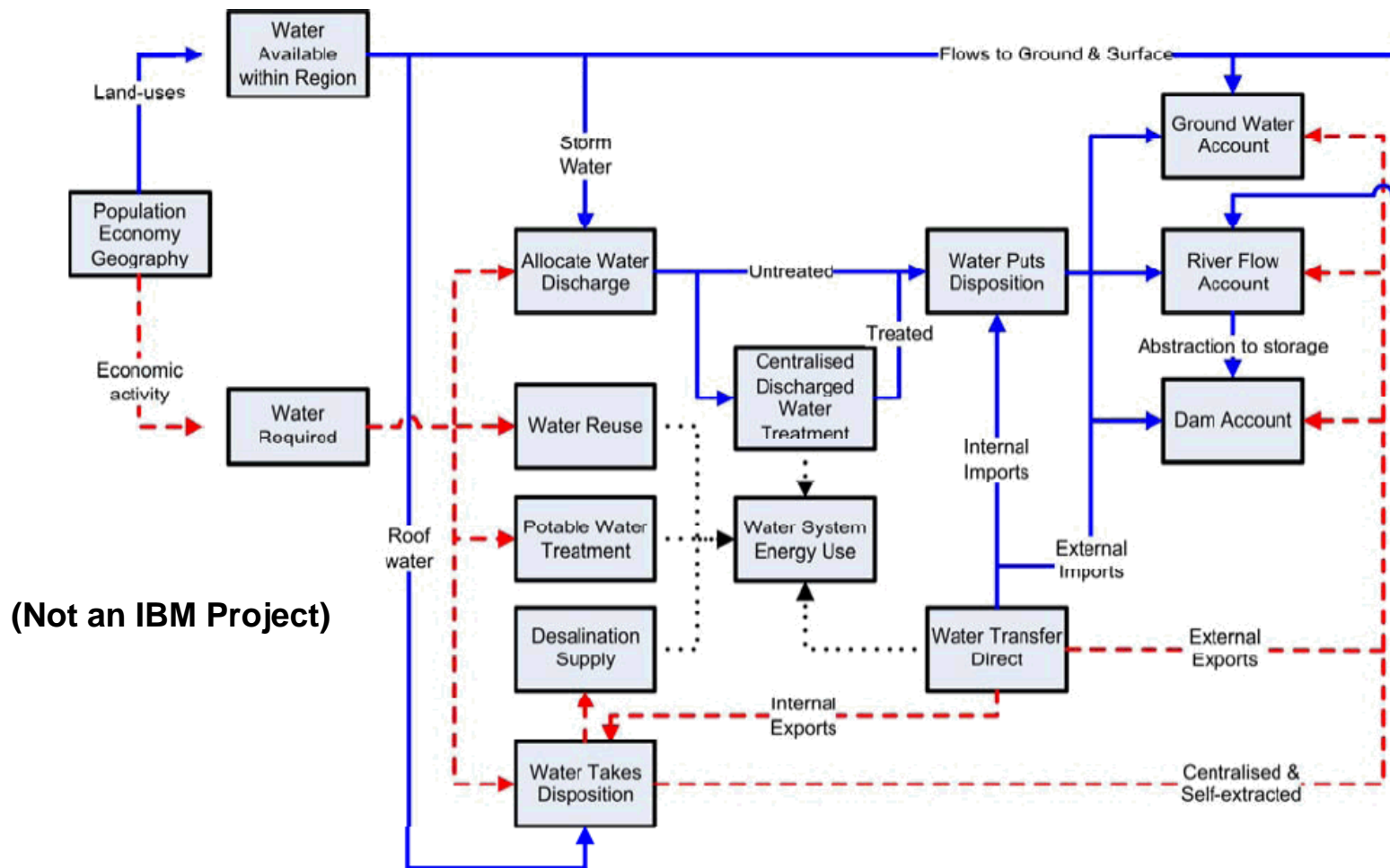


Collaboration platform – Sonoma CWA





Water accounting system: example from Australia



(Not an IBM Project)

"A Water Accounting System for Strategic Water Management": GM Turner, TM Baynes, BC MacInnis, Socio-economics and the environment in discussion, CSIRO Working Papers, 2008-14



Land use tools: Water For Tomorrow

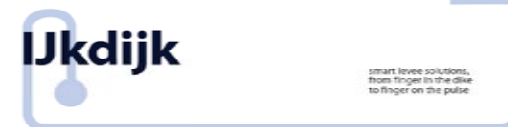


- Combines science-driven conservation with I/T expertise and computing power
- Build a novel modeling framework to simulate the behavior of river basins
- Inform policy and management decisions benefitting the natural environment and people who rely on these resources
- Sample questions:
 - What impact will development have on water availability for wetlands and farming downstream?
 - Will clear-cutting a forest in the upper part of a river's watershed imperil fish stocks local people depend on?
- Software:
 - Scenario forecasting tools
 - Integrative modeling framework
 - 3-D visualization





Smart Levees: Ijkdijk (“Calibration Levee”)



- Netherlands project to understand what this instrumented levee will “look and feel like” as it breaks
- Multiple sensor types create a reference real-time “signature” from inside the levee, as hydraulic pressure builds up. Also tests:
 - Effectiveness of different sensor types
 - Applicability of numerical models
- IBM is undertaking integration task, working with TNO (NL Government scientific research organization)**



“A more accurate and more continuous insight into the functional quality of water management infrastructures will become increasingly important...occasional measurement and manual data processing procedures will no longer be sufficient...” Source: *“The Ijkdijk” (Ijkdijk brochure)*



Services science implications

- Managing water as a combined natural and human system:
 - What modeling, simulation and optimization tools will add real value?
 - How would they be used politically and operationally?
- Impact of information on decision possibilities:
 - What behaviors do we want to encourage?
 - How well will existing service systems work in real time?
 - What new decisions become possible – what new policy options?
 - What new business processes become possible?
 - How will it better connect the scientific and operational communities?
- Impact of information on politics and decision making:
 - Negotiating behavior?
- Business case:
 - How do you value ecosystem services?
 - How do you value preservation of economic potential?
- Business models:
 - What are the information utility possibilities?



Thank you!

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Examples of smarter water management innovation from IBM



Smarter River and Estuary Protection:

Working with the Beacon Institute, IBM is helping enable minute-to-minute monitoring of New York's Hudson River via an integrated sensor network, robotics, and computational technology throughout the 315-mile river to better understand and predict the effects of global warming, the movements of migrating fish, and transport of pollutants.



Smarter Levee Management and Flood Control:

In the Netherlands, IBM is working with partners to build smarter levees and flood management solutions that enable authorities to monitor infrastructure and changing flood conditions and utilize advanced decision tools to help prevent avoidable flooding incidents as well as enable better emergency response to unavoidable flooding events.



Smarter Bay Management:

Paving the way for smarter environmental management and development of Galway Bay, IBM and the Marine Institute of Ireland have deployed a real-time advanced analytics platform to monitor wave conditions, marine life, and pollution levels in and around Galway Bay.



Smarter Water Use and Energy Efficiency:

IBM itself has realized dramatic economic and sustainability benefits implementing advanced water management systems. Using Green Sigma™ methodologies, IBM has implemented a smarter water management solution in IBM Burlington's Semiconductor Fab that allowed us to realize \$3 million in cost savings and reduce water consumption by 27% while increasing production.



More examples of smarter water management innovation



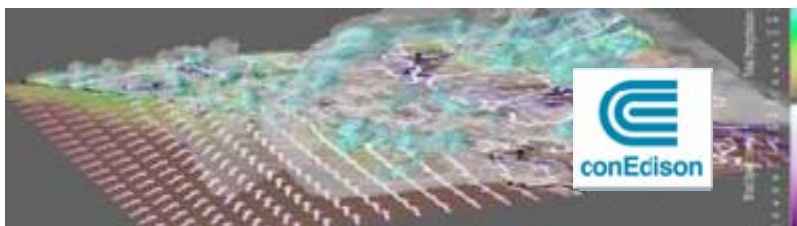
Smarter River Basin Management:

Working with The Nature Conservancy, IBM is helping build an innovative computer-modeling framework that will allow users to simulate the behavior of river basins around the world thereby helping inform policy and management decisions.



Smarter Water and Energy Metering:

Working with Enemalta, IBM is developing a new smart grid with 250,000 meters for Malta that integrates both water and power systems. Malta will be able to identify water leaks and electricity losses in the grid allowing the utilities to more intelligently plan their investments in the network, increase operational efficiency, and reward customers who consume less energy and water.



Smarter Weather Management:

As part of Con Edison's emergency management program, IBM is applying high-resolution weather forecasting capability called Deep Thunder to predict damage ahead of time and optimize processes so that they can better mobilize resources, reduce restoration time, communicate more accurately, and reduce emergency management costs.



Smarter Water Infrastructure Asset Management:

The San Francisco Public Utilities Commission (SFPUC), is using IBM software to help reduce pollution in the water surrounding San Francisco. SFPUC has improved visibility into their maintenance operations and physical infrastructure, with near real-time status of equipment and maintenance history, allowing them now to respond to and solve problems within 24 hours.