Water: The Big Picture

The 30,000 Foot View in a Flat World

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Water

I think it can be said that water lies at the intersection of most of the major issues that we, the "Blue Planet Earth," will face in the 21st Century

Water sector – What is it?

- Industrial/Ultrapure water
- Drinking water
- Domestic and Industrial Wastewater
- Water Reuse
- Residuals (sludge-biosolids) handling
- Reject streams – treatment – RO reject
- Produced Water – associated with energy
- Contaminated ground water
- AND – much more as we will see

Overview

- Water availability/sustainability
  - Water reuse – central theme in sustainability
- Water treatment through the CO_2 lens – game changer since 2005
  - Developing the carbon footprint of all unit processes
- Considerations
  - Economic models for assessing options in water
  - Biosolids/sludge treatment
  - Salinity and agricultural practices
  - RO reject water Treatment
  - Destruction *vs.* phase transfer
  - Pharmaceuticals and other emerging chemicals of concern
  - Engineered nanoparticles in water
  - Infrastructure
  - Smart Water Systems
  - Reinvestigation of innovative water treatment processes

Water Scarcity and Quality

WATER!!

- We are not living sustainably!!
  - Biggest problem facing water – globally – uncontrolled population growth
    - to say the least, a very contentious issue!
  - Biggest unknown in water - climate change!

The question that personally drives me is simple:

What kind of a world do I want to leave to my children and grandchildren?

Population

- 1 billion people do not have access to WATER
- 2.5 billion people do not have access to adequate SANITATION
- Two Iraq months would have funded over 50 % of the solution to this problem!

Can you imagine

- In this day and age that…….

Can you imagine -

That translates to -

- **5,760** children – die every day as a result of water borne disease!
- We must act, individually, collectively BUT act!!! And NOW

Population - Food

- Food Production will have to increase 70 % by 2050 to feed the growing population

- Yet Agriculture as we know it in the US depends on ‘cheap’ oil – so now we have the food – water – oil nexus

Regulatory World

- Water is one of the most essential "..... essentials of life"
- Regulatory framework was developed in the 1970's
- Worldwide – the biggest enemy of water is uncontrolled population growth
  - **Population Clocks**

U.S.	179,323,175	- 1960
	203,302,031	- 1970
	226,542,199	- 1980
	248,709,873	- 1990
	281,421,906	- 2000
	306,259,018	- 2009
World	6,774,701,760	April 21, 2009

Do we have a problem?

- We do! And it is as much a historical one as a real one – we just don’t want to believe that “times they are a changing!”

Climate Change

- Worldwide – the biggest unknown in water is climate change

- We can not continue – in the light of the overwhelming evidence that climate change is us – our dependence upon fossil fuels!

    - Let me remind you it took 200 – 300 million years to sequester all that CO_2 and we're burning it up in 200 years – or 10^6 faster than mother nature can help us recapture/sequester it!

Climate Change

- Water resources – the way that we have studied, allocated and predicted water – in its' broadest sense – has been to look at the historical record and project

- Climate change – now changes all of the rules as the weather patterns are going to change, precipitation patterns will change and added with population increases – what we saw in the past is not a predictor of what we will see in the future

Lake Mead

- Lake Mead is the largest reservoir in the United States
- Located on the Colorado River about 30 miles (48 km) southeast of Las Vegas
- Formed by Hoover Dam
- Lake Mead extends 112 miles (180 km) behind the dam
- Holding approximately 28.5 million acre feet (35 km^3) of water

October 31, 2007

Lake Mead's elevation is 15 feet lower than last year at this time!

Lake Mead is 118 feet below maximum elevation!

Lake Mead has fallen to 46% of capacity! (Dr. Ken Dewey)

June 2010

- Lake Mead

- Oct 1998 – 1216 feet above sea level

- Jun 2010 - 1089

-127 below maximum

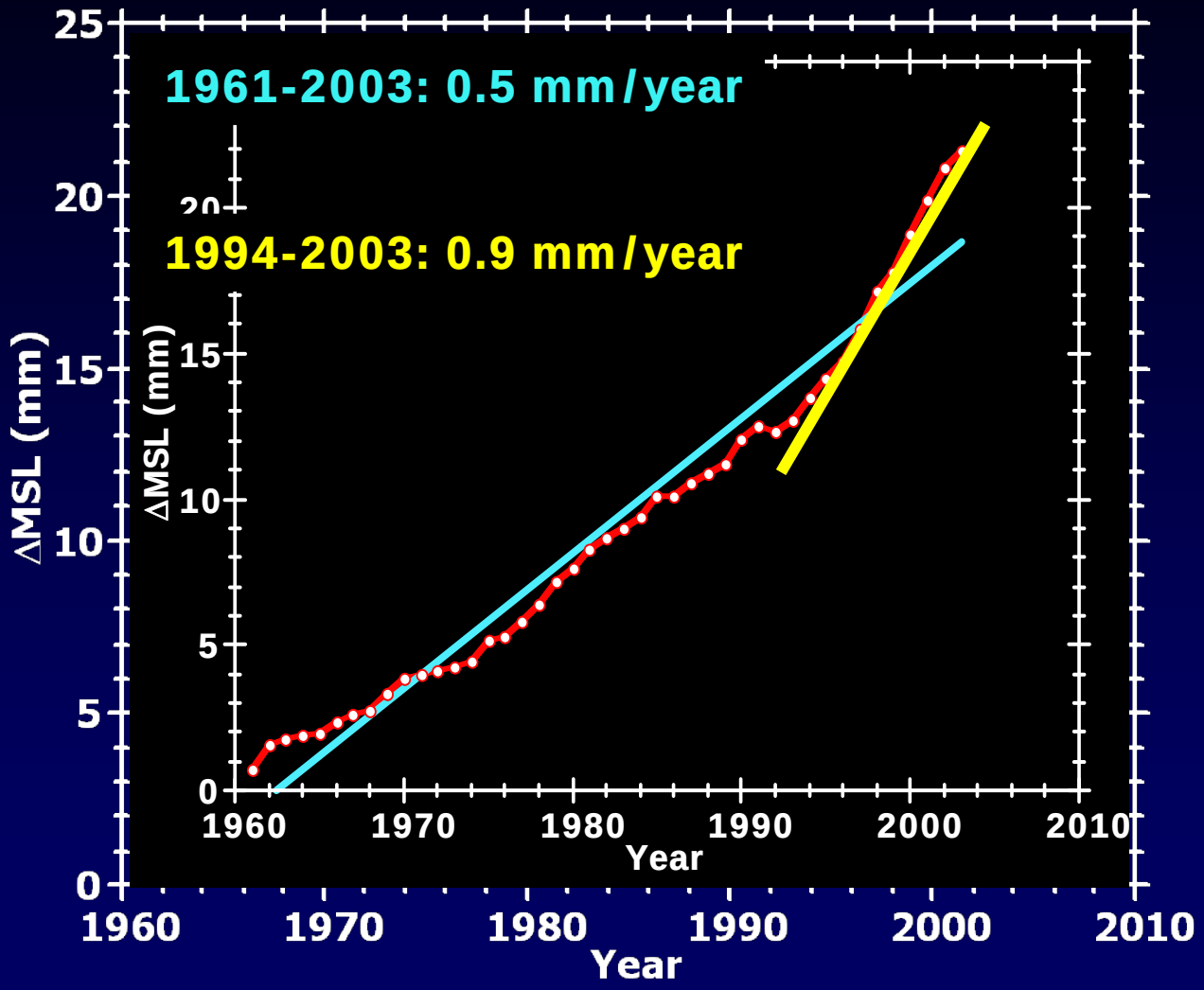
Lowest level in 40 years – boaters be ware!

Drought in Southwestern US

- Is this a drought OR is it the norm?
  - GCMs predict it to be the norm
  - El Niño – last year we got 2” above normal rain
  - La Niña – now – will be drier than normal

- Water allocations were made in ‘wet’ years the River is approximately 10 % over subscribed!
- Headlines in 2076 – “Seven States in the southeastern US are at war over water, and Mexico is threatening to get involved”

Sea Level – Coastal Communities?



[*Dyurgerov and Meier*, 2005]

Sea Level Rise and Water

- 1 meter – we loose approx. 20 nations
- Greenland – ice melts – worlds oceans rise 7 meters
- Antarctica – ice melts – worlds oceans rise 55 meters
    - Lake Ontario is 200 feet above sea level
    - The lower Everglades are 1 meter at it highest point
- Recent indications are that both are loosing ice mass much faster than predicted by IPCC

Economic Models

Have to globalize models in light of climate change

- We are unable to put a price on one human!
- How do we value – thinking about sea level rise – an entire Nation – or 20?
- When people say that it is ‘too expensive’ – I ask, for what? your own self interests?
  - A sub-set here is GREED – a nasty word

The Problem

- Is where to begin with this complex issue
- The issues are so interrelated that we can not JUST think about one nexus – but we have to think, plan, move forward thinking about all of them
- environment – energy – food - WATER - law – economic models

The Value of Water

- We don't value water relative to it's essentiality to life! OURS
- We talk about the $250 – 450 B to rebuild and modernize our water/wastewater infrastructure
- Population – 300,000,000 – that translates to $1,000 per person over 10 – 15 years

Cost of Commodities

Clean Gravel	Sand	Beach Rock
$0.14	$0.097	$0.37

Water in Southern California

$0.00023

The BIG question that keeps me awake at night is ---

- Do we have the political will to do what is right for the country and the world
  - OR
- Are we going to do business as usual and only follow individual needs
  - – individual/corporate/states/nations –
- And our grandchildren will ask – why did you do that – what were you thinking?

www.Waterunifies.com

WIN – Water Innovation Now

My hope is in an engaged younger generation!

- We challenge the K – 12 students to:

- "Think about a world without water – think up innovative water conservation (and other water solutions) and WIN neat stuff"

www.waterWINnow.com

- We are looking for partners to go Nationally and then internationally

WIN CONTEST 2008

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Prizes for teachers and students:
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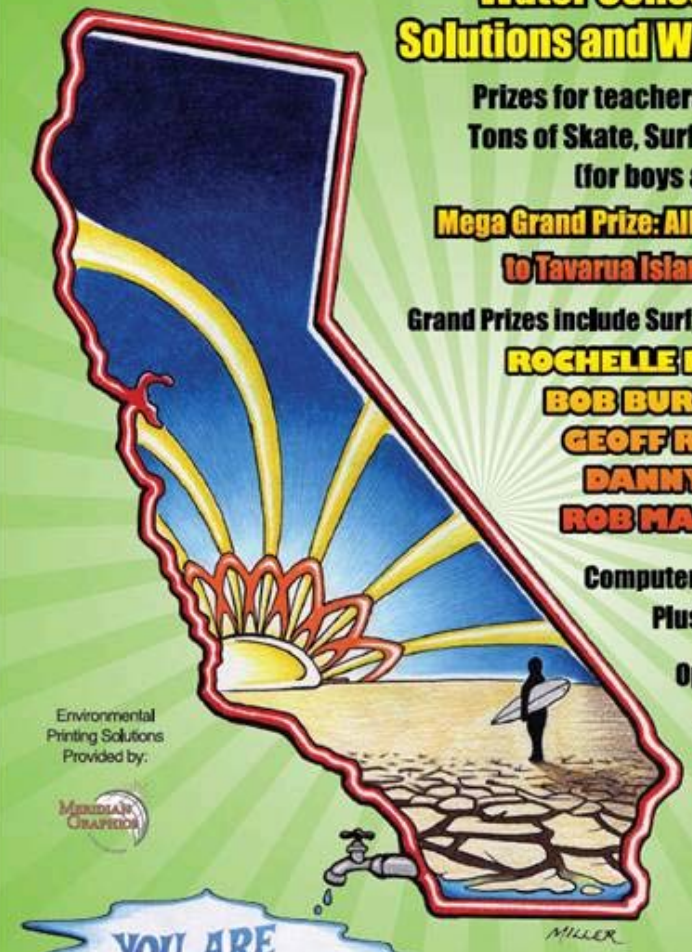

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IMAGINE LIFE WITHOUT WATER

Thank you for your attention

We may have time for questions