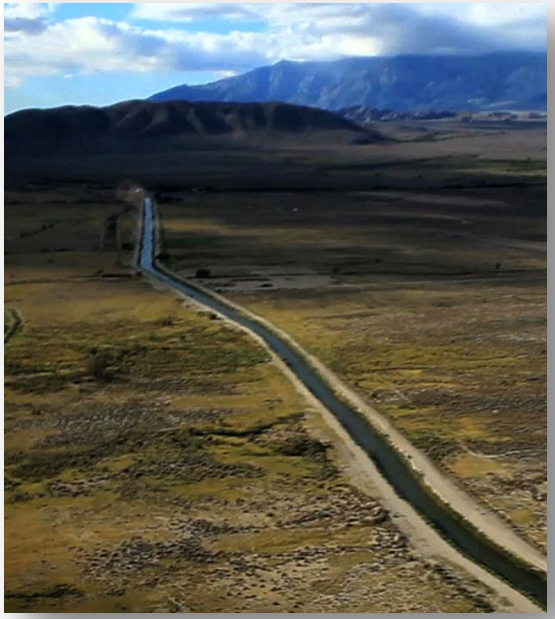
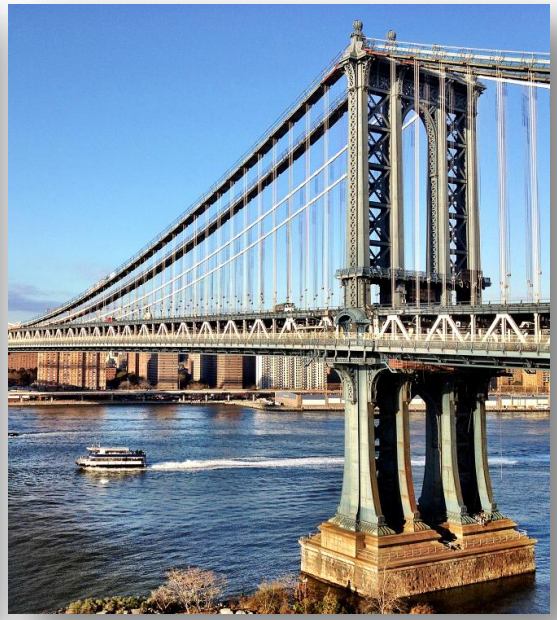


LA Aqueduct (1913)



Manhattan Bridge (1912)

Grand Central Terminal (1913)

ACHIEVING SUSTAINABLE WATER RESOURCES THROUGH TECHNOLOGY AND INNOVATION

JEFF LAPE
DEPUTY DIRECTOR
OFFICE OF SCIENCE AND TECHNOLOGY

SUSTAINABLE WATER RESOURCES ROUNDTABLE
December 15, 2016 | FGCU

Photo credits: LA Times, On the Real - New York City

Great Progress on Water Resources: Cuyahoga River

Fire on the Cuyahoga River
1969

Rowers on the Cuyahoga River
2015

EPA United States Environmental Protection Agency

Photo credits: Cleveland State University Library, AP Photo/Tony Dejak

Water Challenges of Today: Too Much; Too Little; Poor Quality; Wrong Place

Photo credits: Mashable, Justin Sullivan/Getty, Chuck Burton/Associated Press, @gregmoorewv/Twitter, National Geographic, WTEN-TV

Many Works Emphasize the Need for Change in the Water Sector

tion

The Business Case for Water Innovation

The Path to Water Innovation (Brookings & Stanford) – October 2014

- Change in the water sector has historically been reactive instead of proactive.
- Identifies numerous barriers to innovating in the water sector.
- Several key recommendations:
  - Price water to the full economic cost
  - Revised regulatory frameworks to make governance open and flexible
  - Financing and funding mechanisms (e.g., public benefit charge on water)

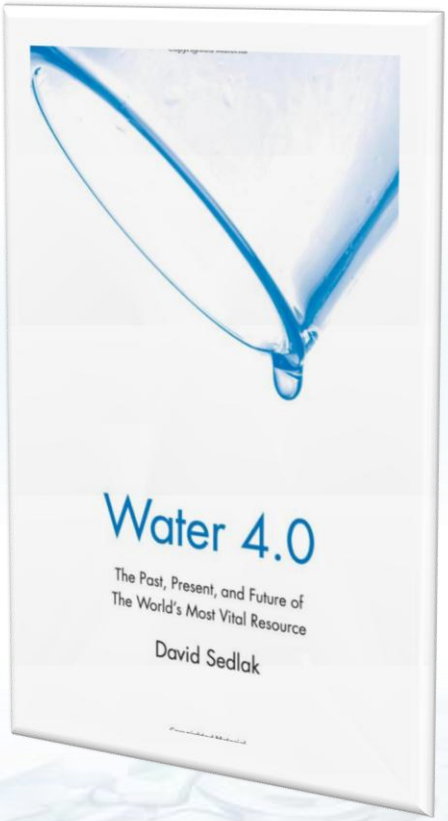
Source:
https://woods.stanford.edu/sites/default/files/files/path_to_water_innovation_thompson_paper_final.pdf

The Business Case for Water Innovation

Water 4.0 – The Past, Present and Future of the World's Most Vital Resource (David Sedlak) – January 2014

- **Water Supply**—Upgraded, centralized systems with imported water will be supplemented or replaced by desalination and potable water recycling along with array of water conservation incentives.
- **Waste Treatment**—Centralized sewage treatment will evolve to systems that recover water, energy, and nutrients from sewage.
- **Integration of water systems**.

Available at: http://www.water4point0.com/



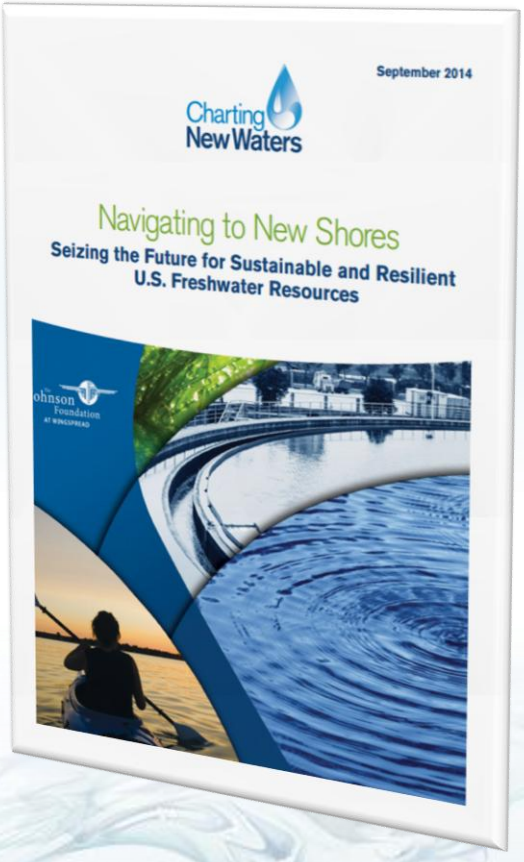
"To make informed decisions about the future, we need to understand the three revolutions in urban water systems that have occurred over the past 2,500 years and the technologies that will remake the system."

The Business Case for Water Innovation

Navigating to New Shores – Seizing the Future for Sustainable and Resilient U.S. Freshwater Resources (Johnson Foundation) – September 2014

- Elevate the profile and community involvement of utility managers.
- Researchers and their advocates cannot let up on new innovations.
- Policymakers need to prioritize flexibility to make room for innovative solutions.
- Elected leaders must champion the cause.

Source: http://www.johnsonfdn.org/sites/default/files/reports_publications/CNW_NavigatingToNewShoresFullReport.pdf

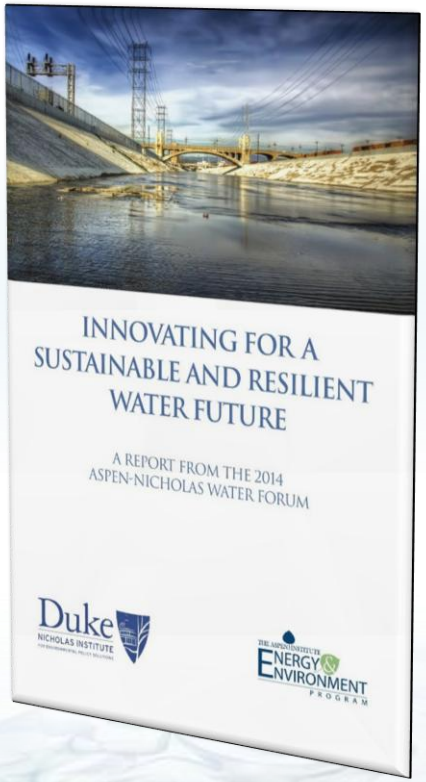


"Across the nation, we are poised to adopt and scale up the most innovative technologies, management practices, policy incentives and financing strategies."

The Business Case for Water Innovation

Innovating for a Sustainable and Resilient Water Future (Aspen-Nicholas Water Forum) – May 2014

- Identifies challenges and near-term actions to address them.
- Discusses innovations in water finance and water technologies.
- Outlines priorities for the U.S water sector:
  - Disseminate and scale innovative practices
  - Focus on resilience as framework
  - Generate awareness of the value of water
  - Define & monitor the country's water budget
  - Help address federal-state-local water tensions.

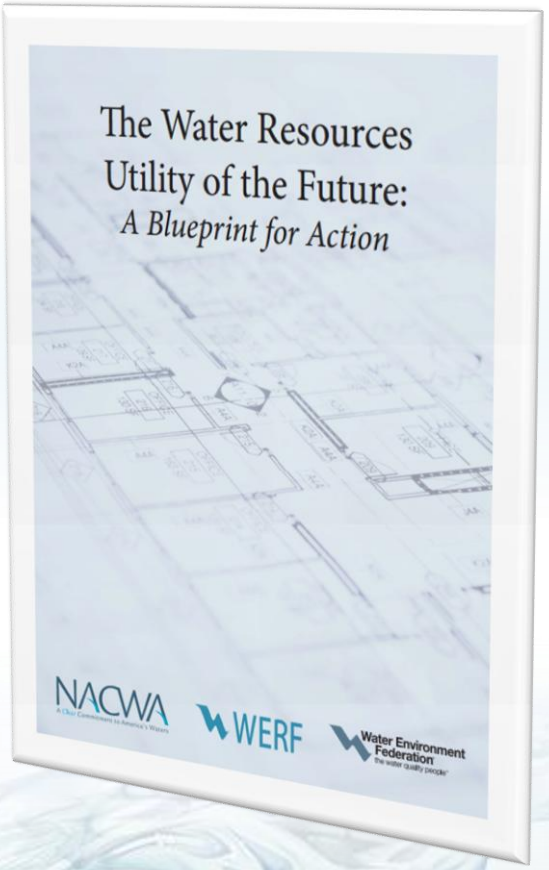


Source: https://nicholasinstitute.duke.edu/sites/default/files/publications/2014_water_forum_report.pdf

"State and federal authorities need to find a way to 'say yes' to new opportunities and then to help disseminate, translate, and scale the effective and efficient ideas."

The Business Case for Water Innovation

The Water Resources Utility of the Future: A Blueprint for Action (NACWA, WEF, WERF) – January 2013



- Makes the business case for innovation.
- Comprehensive discussion of how to create an environment that encourages innovation.
- Identifies tangible steps:
  - Regulatory environment
  - Financial support and investment mechanisms
  - Utility-led initiatives

Source:
http://www.nacwa.org/images/stories/public/2013-01-31waterresourcesutilityofthefuture-final.pdf

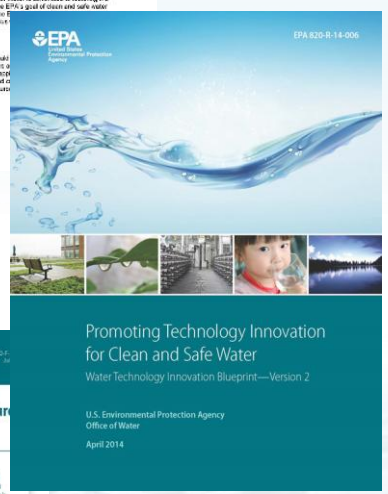
White House Water Summit – Working Together for a Sustainable Water Future – March 22, 2016

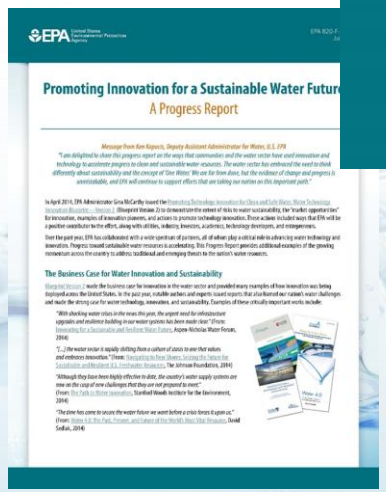
Archived Recording: https://www.youtube.com/watch?v=fSu2xUSXLag

EPA's "Blueprints" and "Progress Report"

- **Version 1.0 - March 2013**
  - Highlighted the EPA Office of Water's initial ideas and plans for advancing technology innovation across various water programs
  - Introduced the "10 Market Opportunities"
  - Framed early EPA actions
- **Version 2 – April 2014**
  - Makes the business case for water technology innovation
  - Expanded the vision and business case for the "10 market opportunities"
  - Provided 13 examples of emerging innovation pioneers
  - Outlined a more robust set of EPA actions (32)
- **Progress Report – July 2015**
  - Highlights external reports on water innovation
  - Provides 17 additional examples of pioneers of innovation
  - Updates on EPA actions


BLUEPRINT FOR INTEGRATING TECHNOLOGY INNOVATION INTO THE NATIONAL WATER PROGRAM





Market Opportunities for Water Technology and Innovation

tion

1. Conserving and Recovering Energy

- **Challenge:** Approximately 1-2% of the nation's total electricity consumption is used for drinking water and wastewater treatment services

- **Aspirational Goal:** Imagine a future when water, wastewater and agricultural activities can cost-effectively generate as much energy as they consume!

Innovative Technology in Action:
East Bay Municipal Utility District in Oakland, CA, and City of Gresham OR became the first two water resource recovery facilities in North America to produce more renewable energy on site than needed to run the facility.

2. Recovering Nutrients

- **Challenge:** Nitrogen and phosphorus pollution affect over 14,000 water bodies across the nation

- **Aspirational Goal:** Imagine if we could recover nutrients from human and animal wastes and convert them into marketable commodities before they impact surface and ground water!

Innovative Technology in Action: Hampton Roads Sanitation District in Virginia Beach, VA, and Clean Water Services in Hillsboro OR, are recovering phosphorous and nitrogen to create a fertilizer, turning waste into a profitable resource.

3. Improving and Greening of the Water Infrastructure

- **Challenge:** Rehabilitation of water and sewer infrastructure estimated to cost over $655 billion dollars

- **Aspirational Goal:** Imagine if we could expand the use of green and natural infrastructure to improve the nation's water infrastructure while achieving a broad array of environmental, social, and economic benefits!

Innovative Technology in Action: The 25 -year Green City, Clean Waters project in Philadelphia, PA, is redefining green infrastructure to include not only combating storm water runoff, but also improving biodiversity, air pollution and aesthetics.

4. Conserving and Eventually Reusing Water

- **Challenge:**
  - Nation's 15,000 municipal wastewater facilities discharge approximately 32 billion gallons of water every day
  - U.S. reuses an estimated 5% of our water
    - Israel reuses an estimated 70%; Singapore 90%

- **Aspirational Goal:** Imagine if we could increase water reuse to support the water needs of our burgeoning population!

Innovative Technology in Action: The Orange County Water District in California recycles treated wastewater to produce 100 million gallons of water per day—providing clean water to about 600,000 residents!

Potable Reuse in the United States

United States Environmental Protection Agency

Graphic from WEFTEC 2015 presentation by CDM-Smith

5. Reducing Costs and Improving Techniques for Water Monitoring

- **Challenge:**
  - Less than 30% of nation's surface water's have site specific assessments
  - Traditional monitoring techniques are not cost-effective
- **Aspirational Goal:** Imagine collaborative monitoring efforts that provide low-cost, watershed-scale, real-time data on water quality and quantity that facilitate protection and wise use of our water resources!

Innovative Technology in Action: The River and Estuary Observatory Network (REON) deploys real-time monitoring systems that collect data on the Hudson River to more cost-effectively inform scientists and research analysts regarding the health and status of the watershed.

Market Opportunities for Water Technology Innovation

1. Conserving and Recovering Energy
2. Recovering Nutrients
3. Improving and Greening of the Water Infrastructure
4. Conserving and Eventually Reusing Water
5. Reducing Costs and Improving Techniques for Water Monitoring
6. Improving Performance of Small Drinking Water Systems
7. Reducing Impacts from Energy Production
8. Improving Resiliency of Water Infrastructure to the Impacts of Climate Change
9. Improving Access to Safe Drinking Water and Sanitation
10. Improving Water Quality of Our Oceans, Estuaries and Watersheds
11. **Putting It All Together – Achieving Water Sustainability!**

Water Challenges Are Actually Opportunities

a blog by Administrator Gina McCarthy (12/8/16 Excerpts)

Our nation needs to talk more about the future of water, which I believe is one of the top public health and economic challenges now facing our country.

We need to accelerate the move to a 21st century view – where we see water as a finite and valuable asset, as a major economic driver, as essential to urban revitalization, as a centerpiece for innovative technology, and as a key focus of our efforts to build resilience.

We need to drive innovation across all dimensions of the water sector: in technology, finance, management, and regulation.

We all see how science, technology, and innovation are opening new frontiers, fueling the economy, and changing our world. We must incubate this change in the water sector as well because both the challenges and the opportunities are vast.

As our nation heads into a time of transition, we need to remember that water is a nonpartisan issue. We all depend on clean and reliable water – our families, our communities, our businesses, our society.

https://blog.epa.gov/blog/2016/12/water-challenges-are-actually-opportunities/

Thank you

Key Discussion Questions

- How do we accelerate progress to a “sustainable water future”
- What role can EPA play to make progress?

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