

1-Examples of Mega Trends

- Climate Change, extreme weather events and mega droughts
- Energy-water footprint/nexus
- Population change, urban growth and social impacts
- Land use – eco footprint



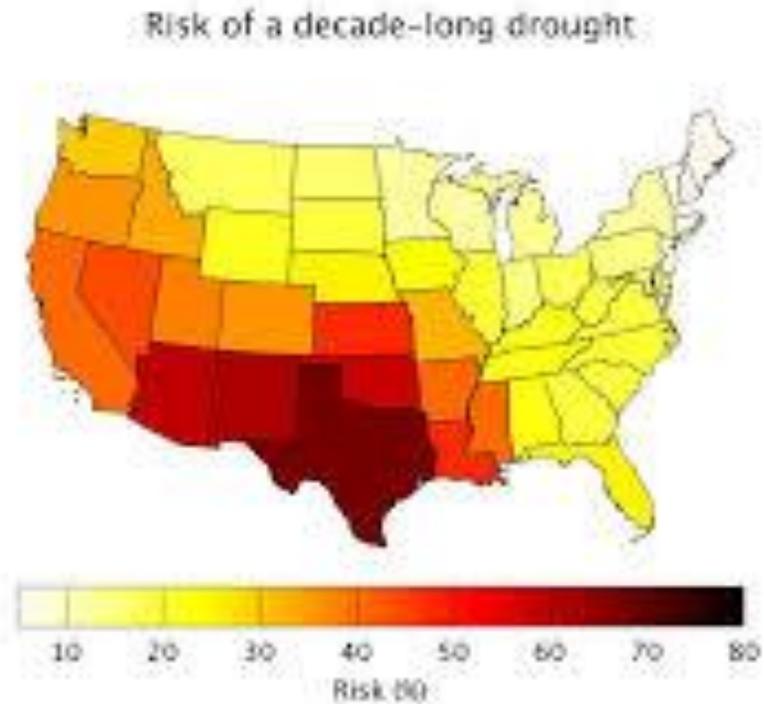
Elements of Water Resilience

Impacts from Climate Change, Population Growth Infrastructure needs and energy Use.

- Drought and watershed management
- Storm water and flood management
- Sea level rise and coastal erosion
- Drinking water and waste water management
- Water contamination
- Aging infrastructure

Reality of Climate Change

Mega Droughts will grip U.S. in the coming decades

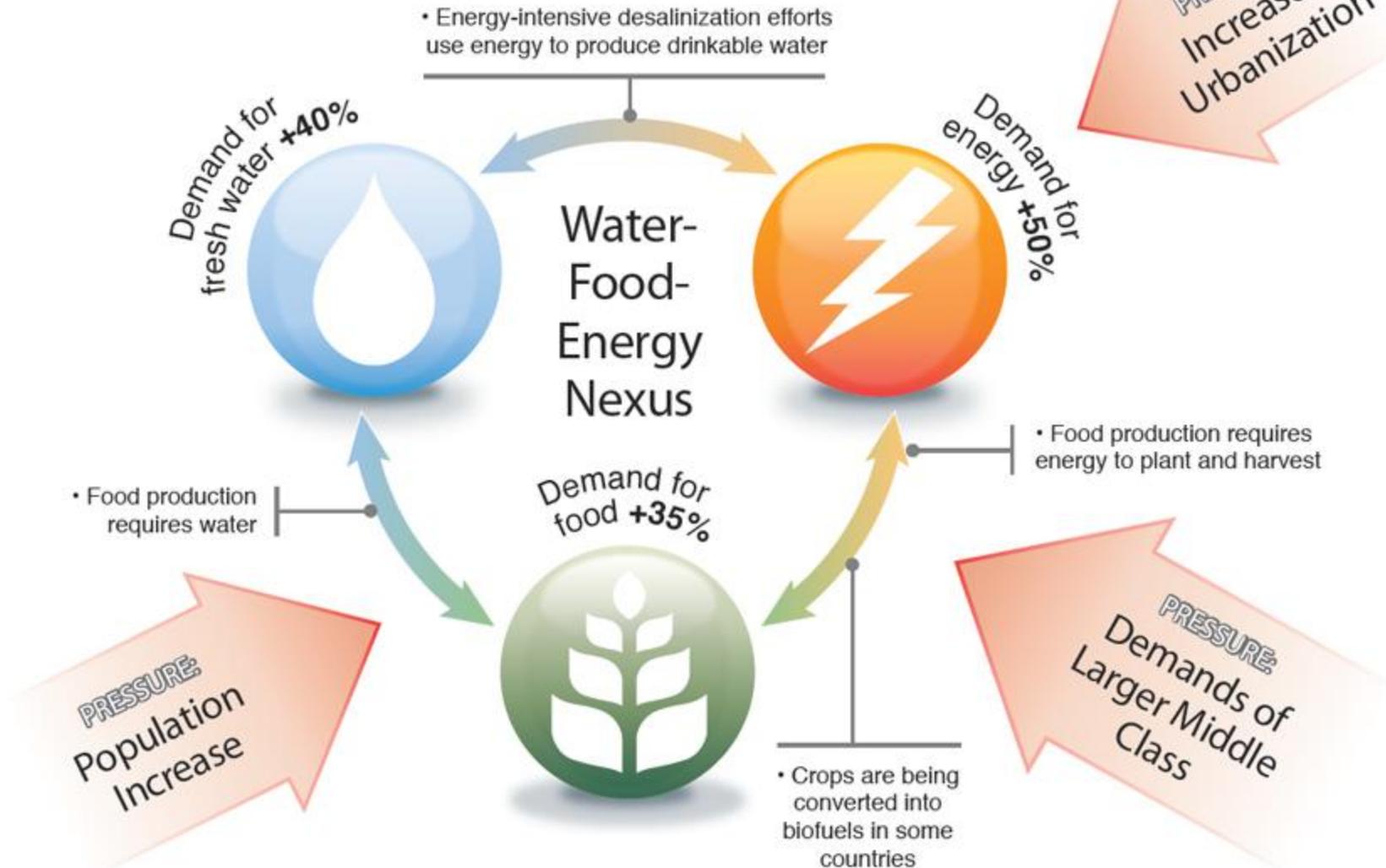


From: Kull et al., 2014. "Assessing the risk of persistent drought using climate model simulations and paleoclimatic data"

As population grows, pressures mount

And the relationships between food, water, and energy supplies become critical

Because of growth in global population and the consumption patterns of an expanding middle class, in less than two decades three key demands will sharply increase ...



Buried No Longer: Confronting America's Water Infrastructure Challenge

Investment needs for buried drinking water infrastructure total more than **\$1 trillion nationwide over the next 25 years**, assuming pipes are replaced at the end of their service lives and systems are expanded to serve growing populations:

America Water Works Association 2015



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2- Tools and Approaches for Innovation

- How to anticipate and respond to impacts of mega trends
- How to build resilient systems
- How to think in terms of system approach



2- Tools and Approaches

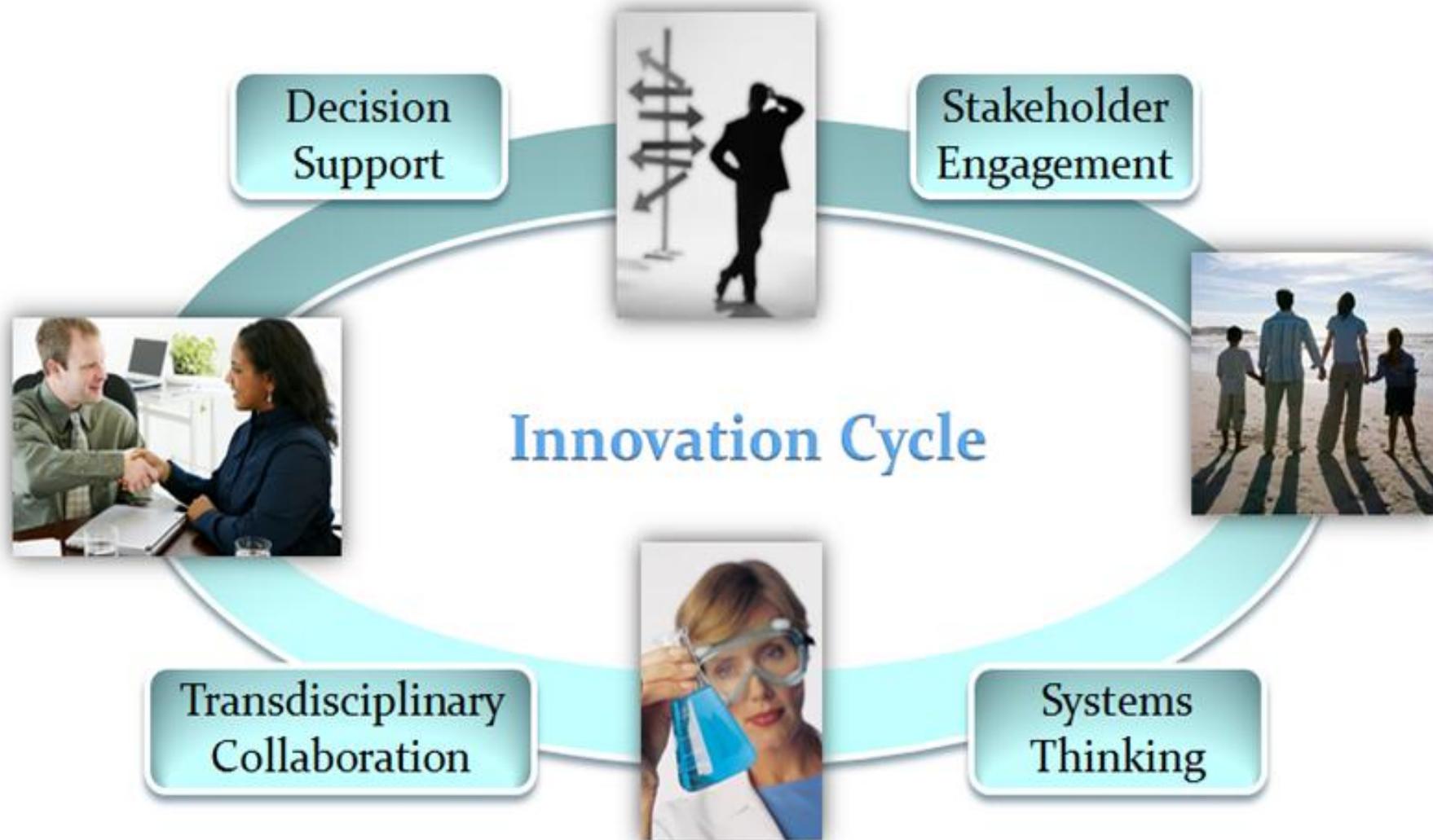
Resilience Tool	Purpose
My Environment	Integrates environmental and health data at the community level using maps based on a user's location
CANARY and TEVA-SPOT	Provides early warning & detection of harmful contaminants in drinking water distribution systems
Community-Based Water Resiliency Tool (CBWR)	Helps water utility personnel gauge current preparedness efforts and increase community awareness of including the water sector in emergency planning
Emergency Water Supply planning guidance	Provides guidance on how to plan for disruptions in drinking water services
Flood Resilience: A Basic Guide for Water and Wastewater Utilities	Aids water utility personnel understand flooding threats, identify vulnerable assets and evaluate mitigation options.
Water Resiliency Action Planner Kit	Meeting-in-a-box for hospitals, emergency services, major water users, public officials and stakeholders to discuss roles & responsibilities during interruptions in water service
Water Security Toolkit	Evaluates & designs rapid responses to water contamination incidents
Water/Wastewater Agency Response Networks (WARN)	Intra-state network of utilities for effective sharing of local water sector resources during disasters or service disruptions

Resilience Tool	Purpose
I-WASTE	Aids decision makers in estimating types of debris and selecting appropriate waste management following a disaster
Waste Estimation Support tool (WEST)	Estimates waste from a wide-area radiological incident as a function of selected decontamination approaches
Municipal Solid Waste Decision Support Tool (MSW-DST)	Aids solid waste planners in evaluating environmental aspects & cost of integrated waste management strategies
Climate Resilience Evaluation and Awareness Tool (CREAT)	Allows water utility stakeholders to explore long-term impacts of climate change & adaptation strategies
Urban Resilience to Climate Change Tool	Based on urban resilience indicators and their proximity to threshold values, stakeholders evaluate community resilience to gradual and extreme climate events.
Decontamination Selection Tool (Decon ST)	Provides decision support to select decontamination options for an incident involving <i>Bacillus anthracis</i>
Environmental Justice (EJ) View	Users create on-line maps to view factors affecting public & environmental health in Environmental Justice communities
Provisional Advisory Levels (PALs)	Informs decision-makers on health-based advisory levels for chemical exposure in air & water at different time periods & severity levels following a chemical incident

Examples of EPA Resilient-Water Tools

- **CANARY and TEVA-SPOT:** Provides early warning & detection of harmful contaminants in drinking water distribution systems
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3-Innovative and Resilient Solutions



EPA Advancing Critical Goals for 2014-2018

EPA has identified 50 communities for assistance as part of the Making a Visible Difference in Communities

<http://www2.epa.gov/smart-growth/making-visible-difference-communities>

- Sustainable Future
- Visible Difference in Communities
- New Era of Partnerships
- High-Performing Organization

Addressing Climate Change and Improving Air Quality

Protecting America's Waters

Cleaning Up Communities and Advancing Sustainable Development

Ensuring the Safety of Chemicals and Preventing Pollution

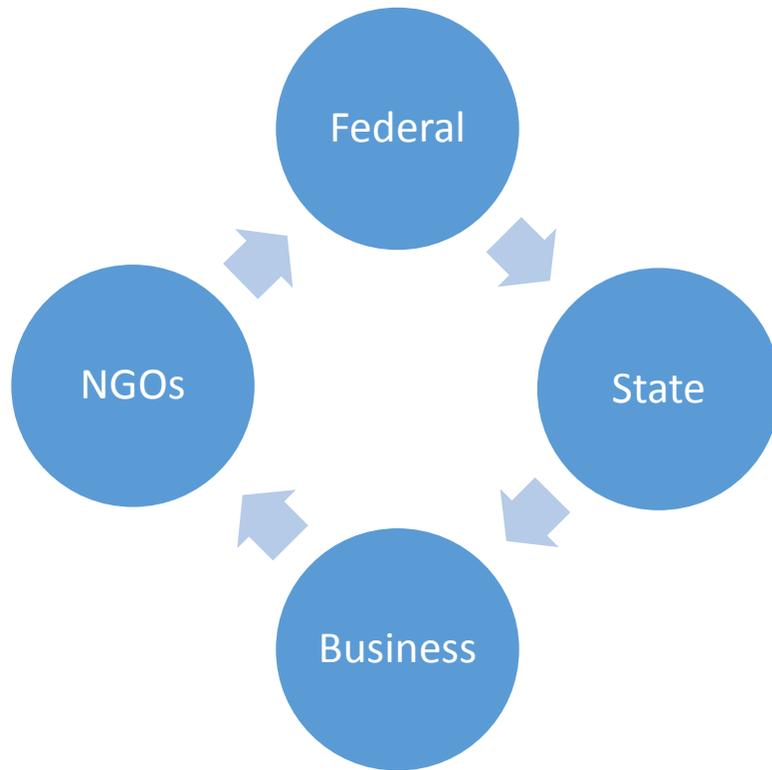
Enforcing Laws, Ensuring Compliance

“Our struggle for sustainability will be won or lost in cities.” —Ban Ki-Moon

EPA Research aims for Integrated and Systems Approach for Addressing Next Generation Problems



4- Collaboration and Applications



Executive Order 13653: Preparing the United States for the Impacts of Climate Change Sec. 4. Providing Information, Data, and Tools for Climate Change Preparedness and Resilience(a) In support of Federal, regional, State, local, tribal, private-sector and nonprofit-sector efforts to prepare for the impacts of climate change

Presidential Directive 21: Critical Infrastructure Security and Resilience 2013. This directive identifies 16 critical infrastructure sectors including Water and Wastewater Systems

EPA-Rockefeller Resilient Cities; UN-R!SE

EPA: Water Infrastructure and Resiliency Finance Center: help communities across the country improve their wastewater, drinking water and stormwater systems, particularly through innovative financing and by building resilience to climate change.

The Water Infrastructure Finance Challenge

Failing Infrastructure

Dependable, available drinking water and sanitation in communities depends on working, modern infrastructure, but leaking water collection and distribution systems and inadequate wastewater treatment continue to plague municipalities.

Community Financial Gap

Some communities lack financial capacity and resources, face multiple demands and are experiencing affordability concerns.

Infrastructure financing and resiliency are key components to help communities address economic and environmental needs.

100 Years +
The age of some U.S.
water infrastructure

\$600 Billion
In water sector needs over
the next 20 years

Trillions of Gallons
Of potable water lost yearly from
broken & leaking pipes

Billions of Gallons
Of raw sewage discharged
to local waters

Community Concerns
Impacts include limited financial
expertise, frequent storms, droughts,
and floods

5- Summary -Achieving Sustainable Outcome

- Anticipate and respond to future trends
- Promote effective infrastructure development (America 2050)
- Create effective business-government-public collaborations
- Promote innovation in science and technology and application of decision support tools
- Promote access and use of decision support tools
- Enhance public understanding and support.



Are We There Yet?

