



# Adaptation Planning and Clean Water Systems

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# Adaptation Planning

- *The planning or implementation of adaptation strategies can help publicly-owned utilities in their efforts to reduce vulnerability to climate change, especially for:*
  - *Wet weather events*
  - *Water shortage*



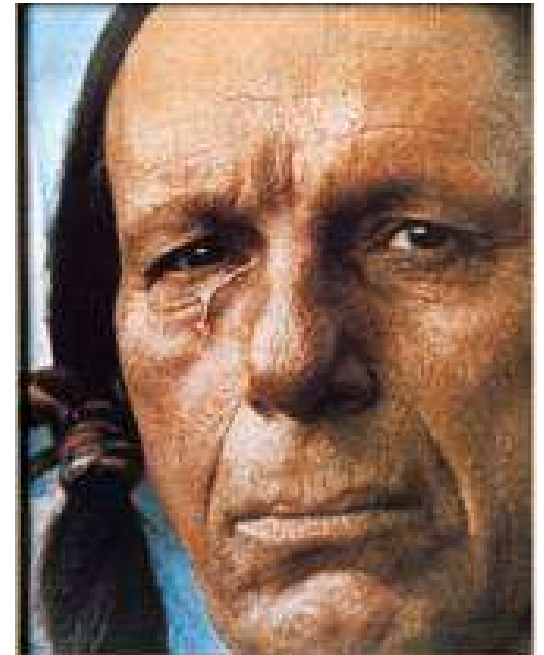






# Adaptation Planning

- The leveraging of indigenous knowledge in climate change mitigation and adaptation strategies.
  - The Indian, Pioneer, the River Captain
  - The Farmer, Operator, Sailor
  - The Environmentalist, Canoeist, Camper
- Today: The Engineer







# Why Adaptation Planning?

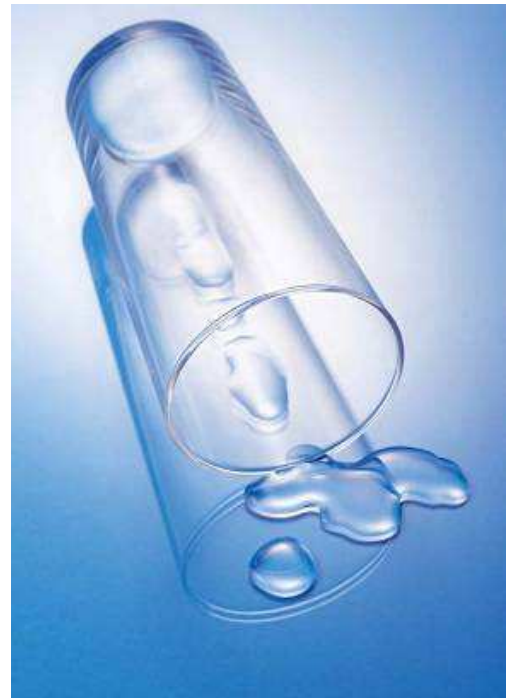
- 3% to 15% precipitation increases likely
- Heavy rain is more extreme in a warmer climate
  - Heavy rains can cause flooding and damage to storm & sewer systems
- Water scarcity due to Increased demand





# Why Adaptation Planning?

- Drought prone areas - rain will diminish further
  - Sensitive areas will need to increase water conservation
- Average **heat increases will decrease soil moisture**
  - enabling drought conditions to occur even in areas *with* rainfall

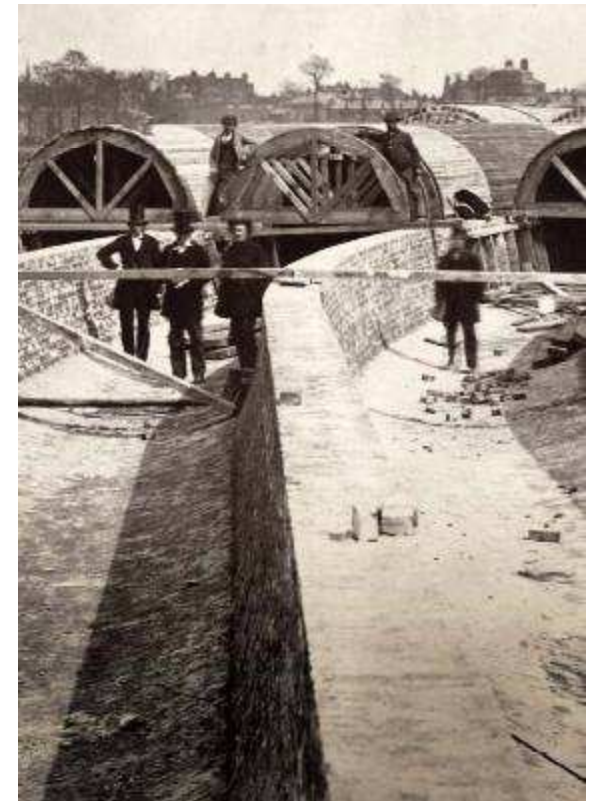






# Why do we need to adapt?

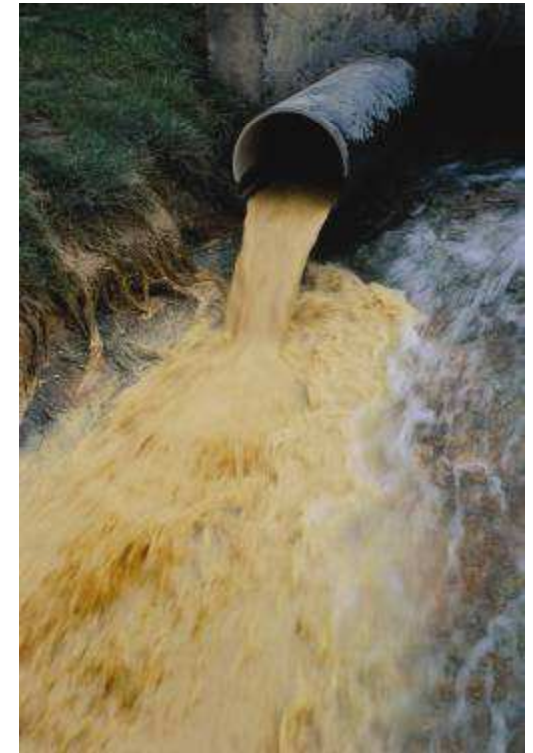
- Most infrastructure was put in the ground 50 to 100 years ago
- Failing infrastructure makes adaptation harder
- Needs to be rehabilitated before disaster occurs





## Adaptation planning for water/wastewater systems?

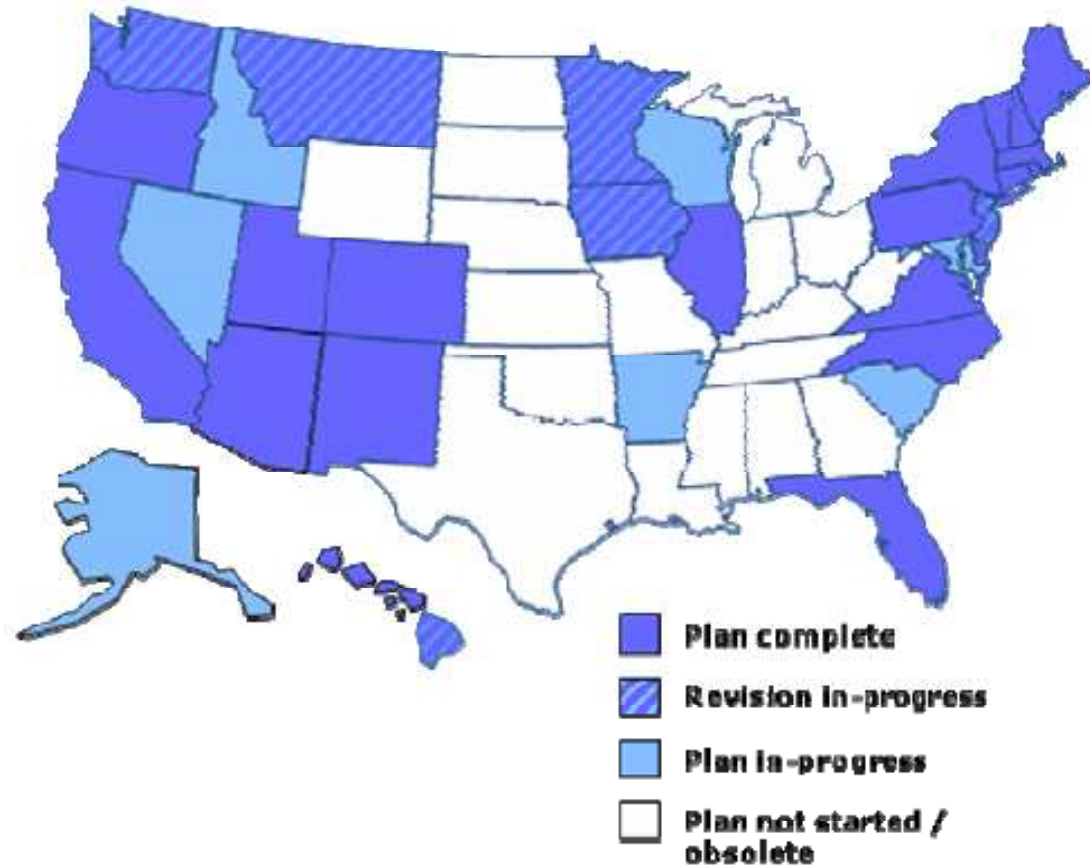
- Increased infiltration into cracked, ruptured systems, results in increased CSOs and SSOs
- Other infiltration problems: surging manholes, sewage backups, added stress on treatment plant capacity and flooding







# States with Climate Action Plans



Pew Center on Global Climate Change



# How does planning work?

- Successes with adaptation programs
  - Fort Collins, CO Utilities Planning Program
  - Climate Change Task Force, global/regional climate change models to aid in planning and investment in sewer and wastewater treatment systems affected by storm surge
  - NYC, evaluated tide gates and dam infrastructure along with collection systems and treatment plants to develop plans for wet weather events







# How do we begin?

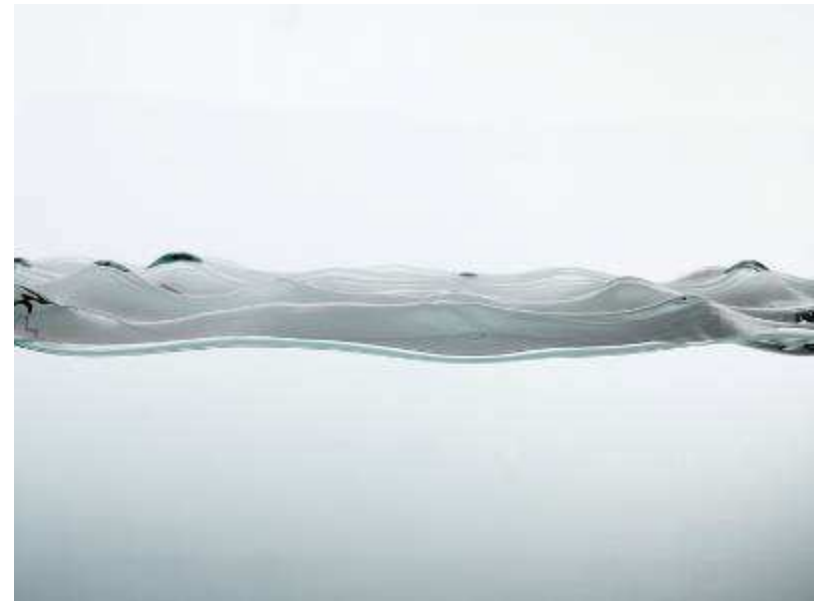
- Steps to the Water and Wastewater Infrastructure Adaptation Planning Process
  - Identify hydraulic impacts
  - Apply future climate change scenarios
  - Characterizing options
  - Conducting initial screening
  - Linking to capital cycle
  - Evaluating options
  - Creating implementation plans
  - Monitoring and reassessing (Major, D., Rosenzweig, C., Demong, K. & C. Stanton. 2005.)





# Identify impacts

- How will our systems be impacted?
  - Rise in sea levels
  - Higher temperature
  - Increase in extreme events
  - Changing precipitation patterns

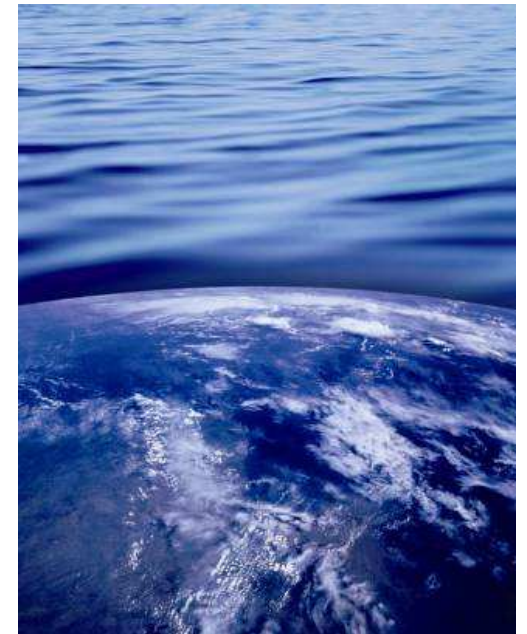






# Apply future climate change scenarios

- Utilize scenarios to analyze possible impacts for which adaptations are needed
  - Climate change models
  - Estimate system effects based on present indigenous knowledge





# Characterizing options

- What are our options?
  - Change operations (ex: find ways to reduce use of water and energy)
  - Make capital investments to improve systems
  - Change policy to address environmental shifts







# How do we *adapt* our sewer systems?

- Renewal of sewer/stormwater pipeline infrastructure using low-impact sustainable methods can:
  - Reduce infiltration/mitigate CSOs, SSOs
  - Decrease flows to pump stations and treatment plants (lowers energy & wear and tear)
  - Trenchless methods (CIPP, others) for the rehab of sanitary and storm sewers minimizes impact





# How do we *adapt* our water systems?

- Renewal of water pipeline infrastructure using sustainable methods can:
  - Prevent leakage (and waste) of clean, treated, drinking water from pipelines
  - Mitigate water main breaks (can lose thousands of gallons in a single break and can cost up to \$65,000)
  - Improve water quality (keep treated water clean)







# Conducting initial screening



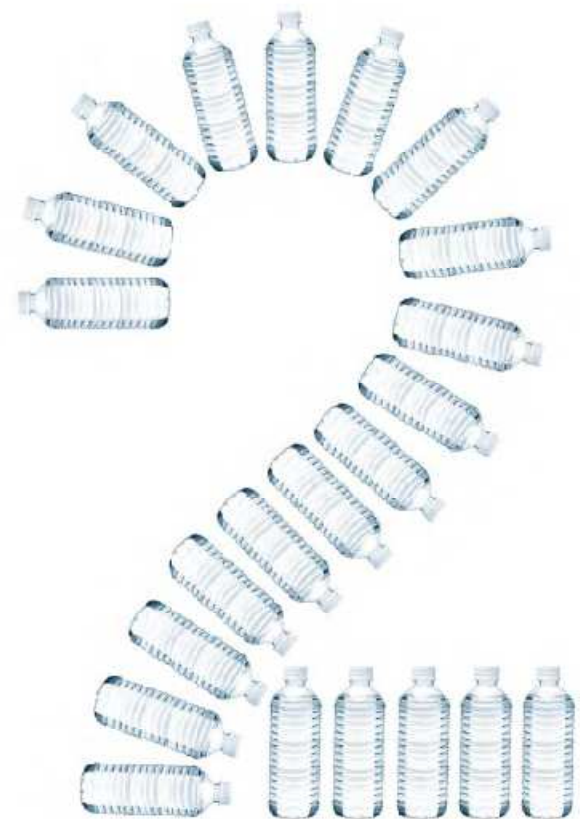
- What is feasible to do?
  - Political and institutional obstacles
  - Engineering hurdles (what can we do with our technical ingenuity?)
  - Regulations





# Linking to capital cycle

- Paying for adaptation planning?
  - Develop asset management plan to enable sustainable improvement
  - Don't wait until failure occurs to make repairs
  - Invest with the future in mind





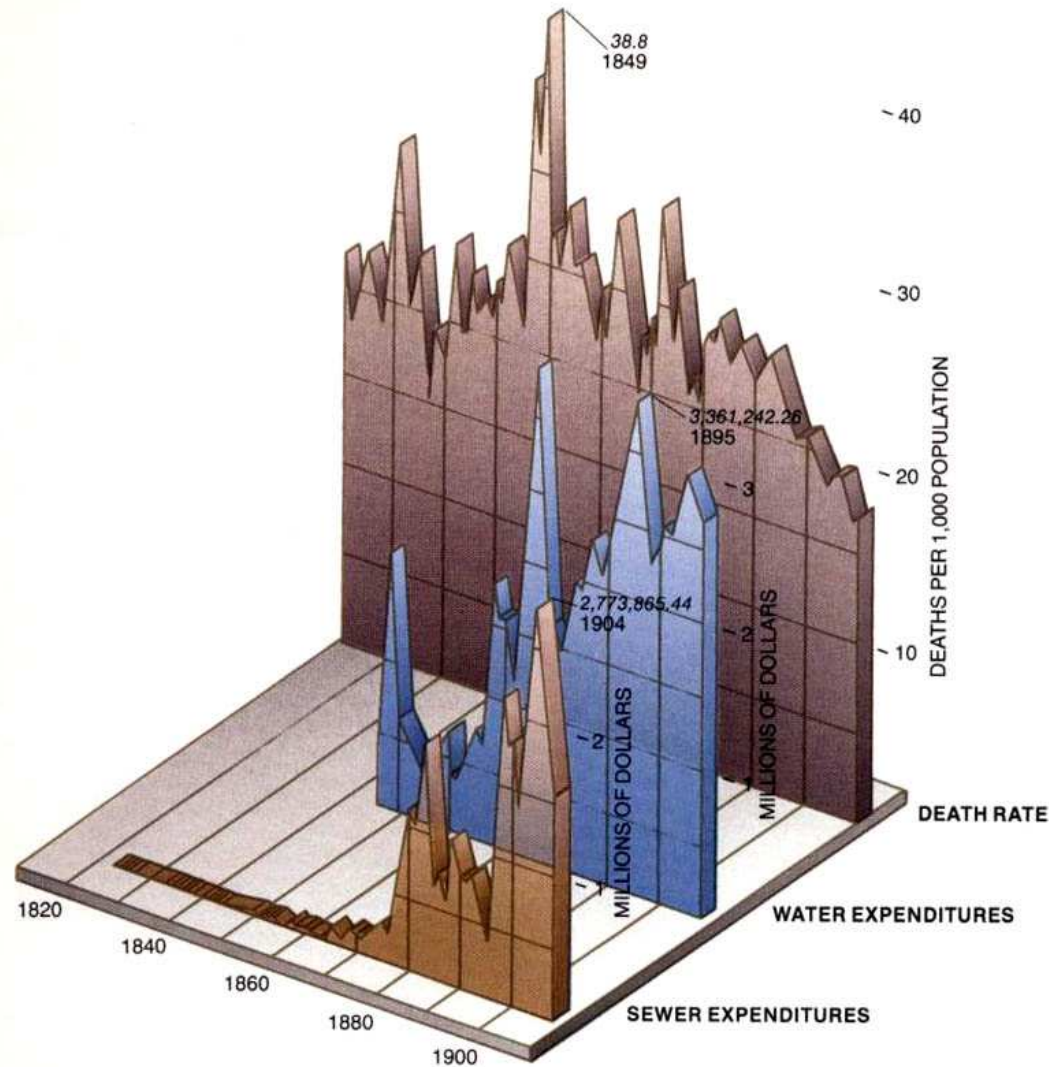


# Evaluating options

- Compare your options:
  - Adaptation costs
  - Adaptation benefits
  - What are the social costs and benefits if we fail to adapt?







## Water route to health

Death rates in Boston declined with increased spending for sanitation. Measles led the killers in 1821, cholera in 1849, smallpox in 1872. The death rate was lower in the late 1800s, partly because the water and the city itself were cleaner, from docks and curbs to hospital wards and homes.

By 1851 water from distant Lake Cochituate, an improvement over local wells and cisterns, ran to 80 percent of the city's dwellings. The gravity sewer system was revamped in the 1880s, reducing the stench of wastes that backed into streets and cellars at high tide and smeared mud flats at low tide.





# Creating implementation plans

- Organize plans
- Set priorities
- Time-scales:
  - Short-term planning
  - Medium-term planning
  - Long-term planning





# Monitoring and reassessing

- Indicators to measure improvement/change due to adaptation planning activities
- Develop feedback loop to refine adaptation strategies - evolve







Questions?