Building Resilience to a Changing Climate:

A Technical Training in Water Sector
Utility Decision Support

WUCA
Water Utility Climate Alliance

One Water Management in the Delaware River Basin

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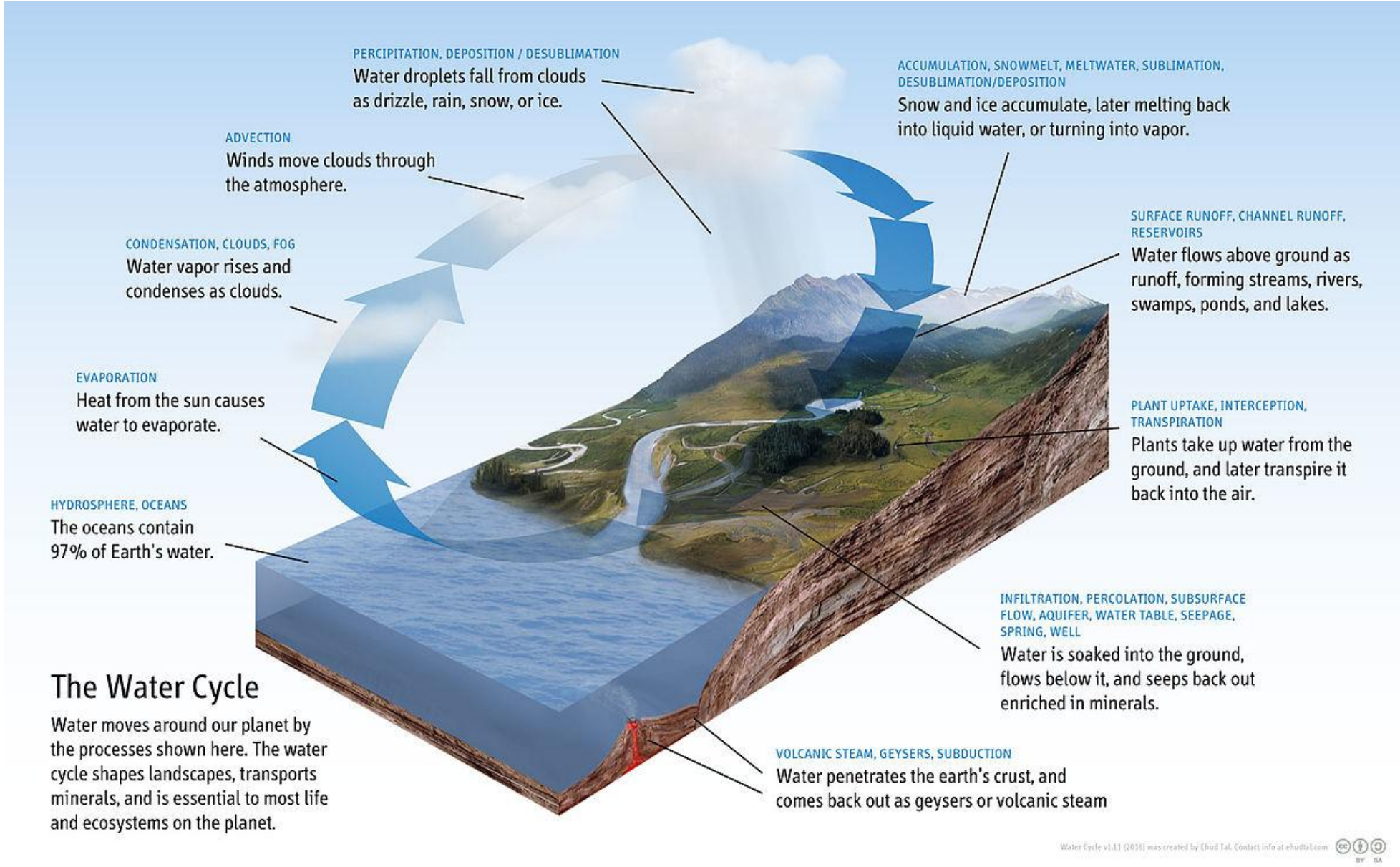
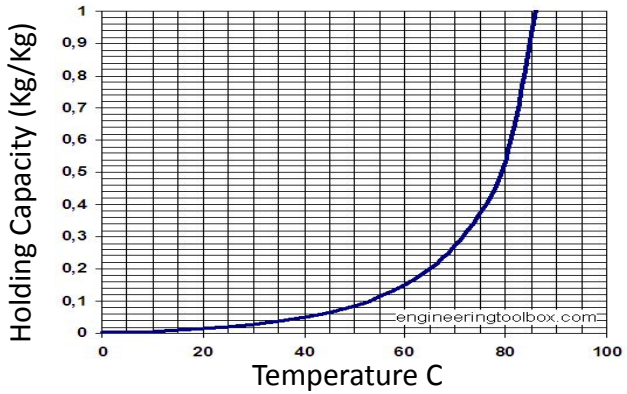
Climate Change is Water Change

A warming planet means a changing water cycle



Principle #1

Warm air holds more moisture than cold air.
"Atmospheric holding capacity"

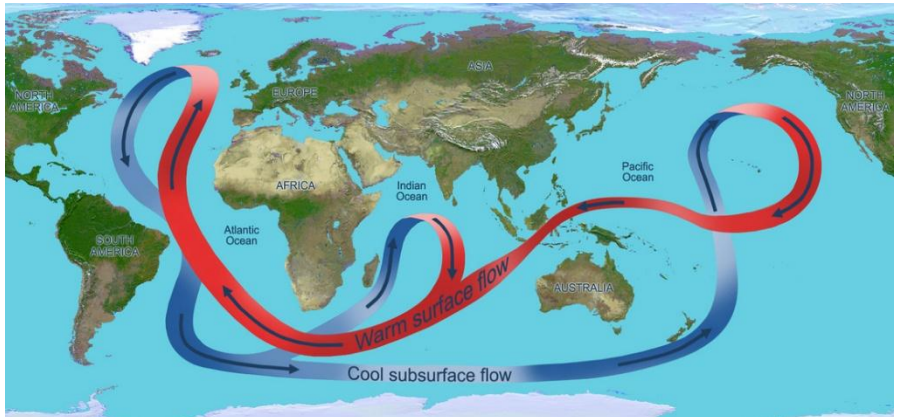


Principle #2

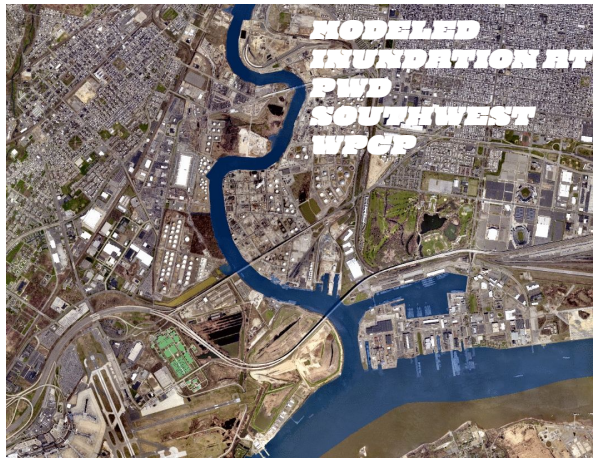
Warm air increases evaporation
and transpiration rates

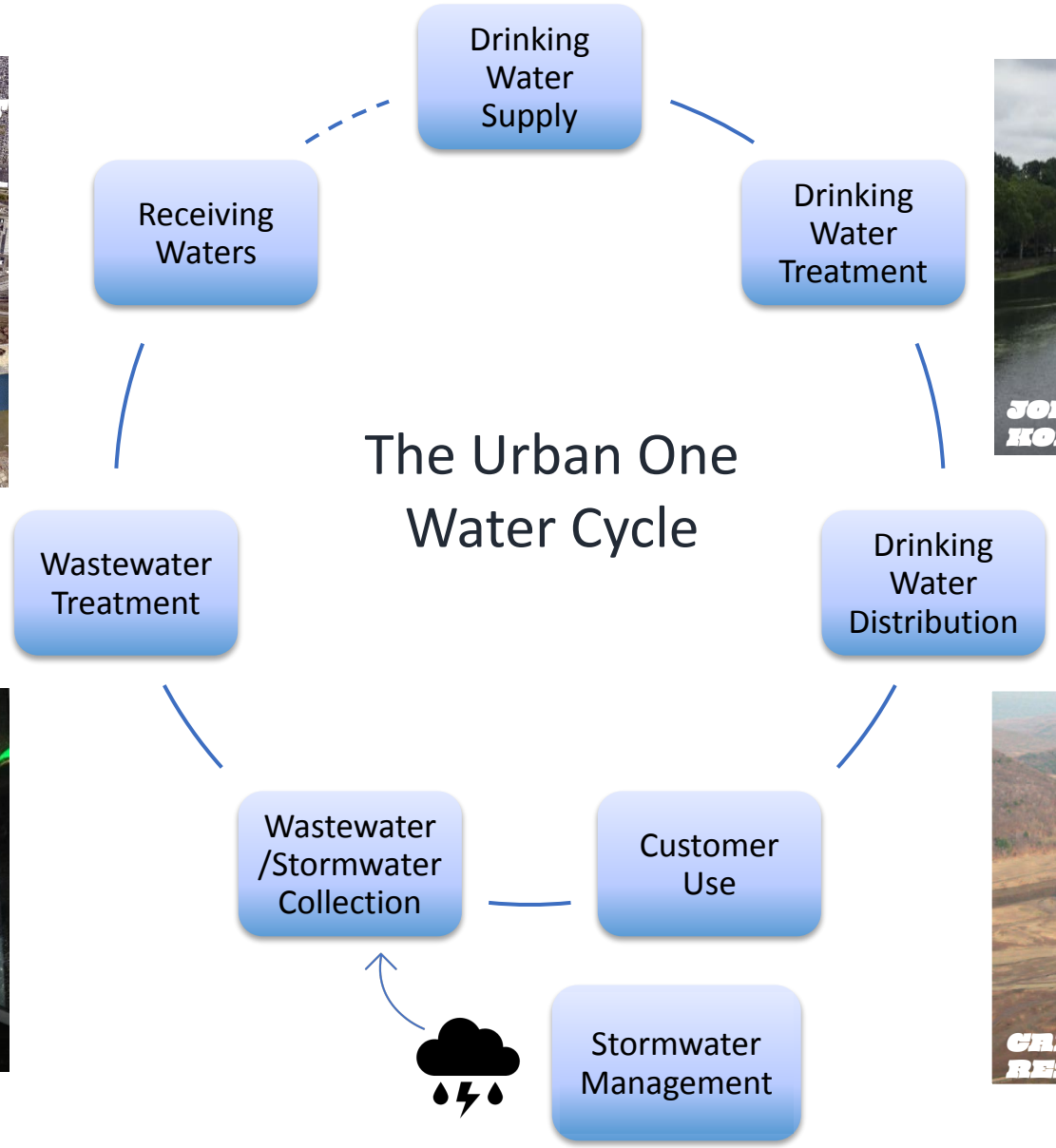
Principle #3

Temperature changes influence global circulation
patterns (atmosphere & ocean)



A warming planet also means a changing *urban* water cycle





Adapted from 'The Urban Water Cycle' by Robert B. Sowby

Philadelphia Water Department

Combined Utility for 1.7M Customers

PHILADELPHIA WATER DEPARTMENT

Protecting Water Resources

Stormwater
Storage & Management
60% Combined, 40% Separate

Drinking Water
Treatment & Delivery
300+ MGD

Wastewater
Collection & Treatment
522+ MGD

Philadelphia Water Department

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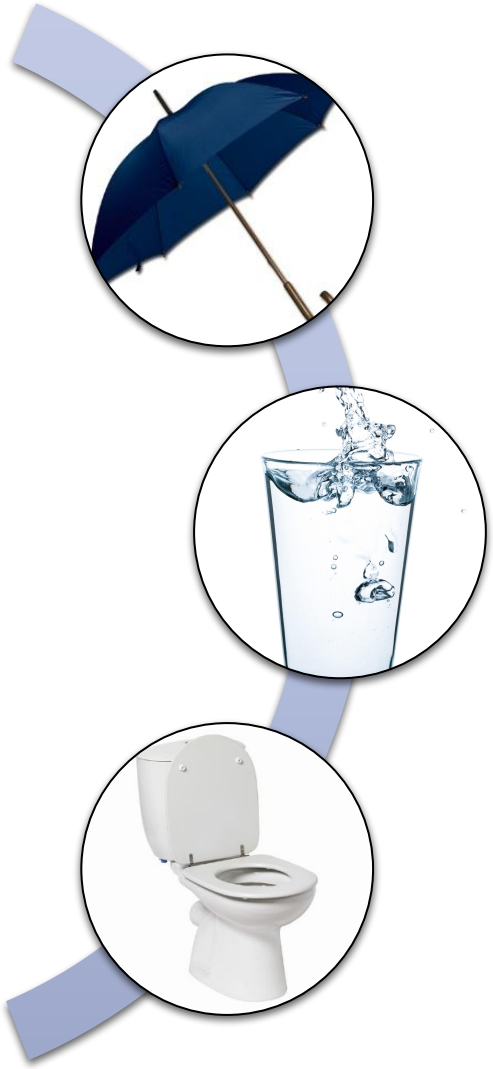
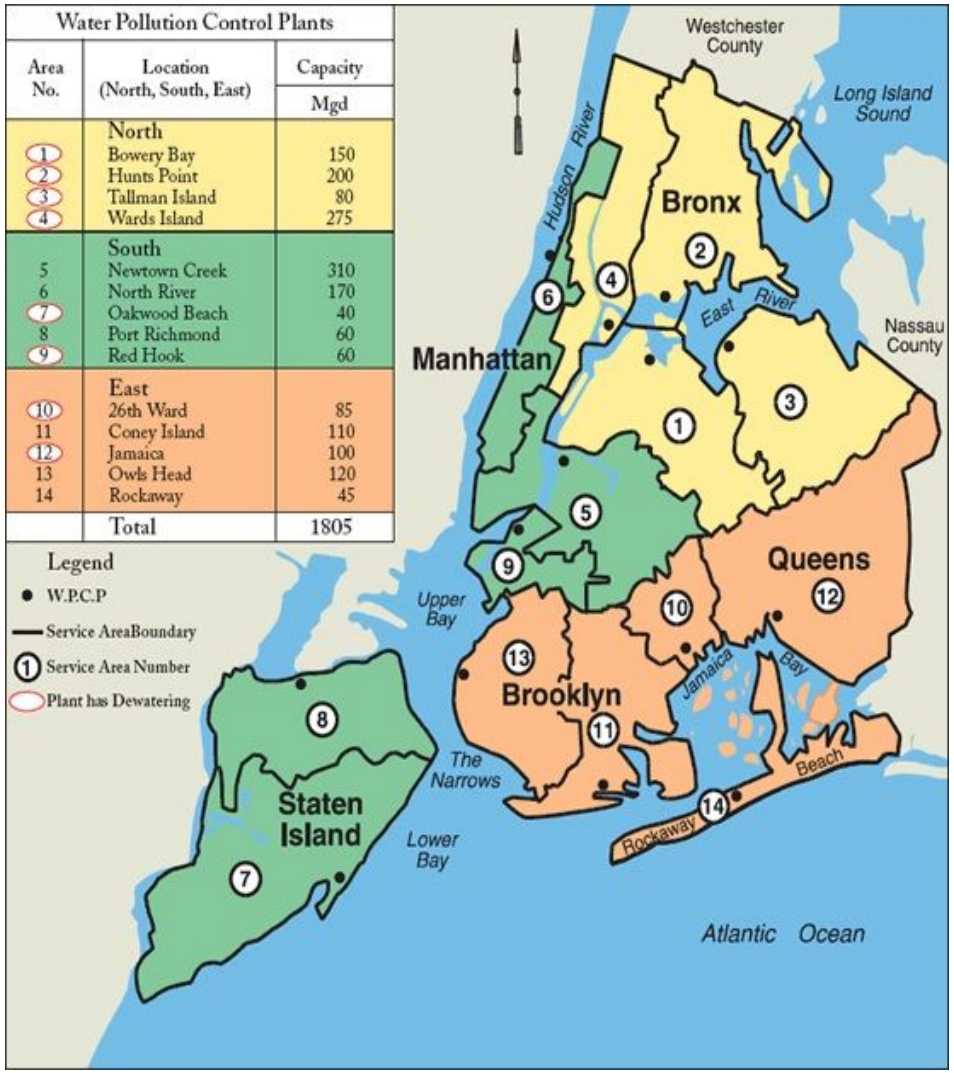
PHILADELPHIA WATER DEPARTMENT

Protecting Water Resources



About the NYC Department of Environmental Protection (DEP)

DEP is the largest combined water and wastewater utility in the United States, delivering over 1 billion gallons per day to over 9 million customers.



The Water Utility Context

Regulatory Compliance

The primary driver for water/wastewater/stormwater infrastructure investments

- **Safe Drinking Water Act**
  - Source water quality
  - Drinking water quality
- **Clean Water Act**
  - Pollutant reduction/Discharge permits
  - Surface water quality
  - Stormwater management
- **Inter-basin Management**
  - Water quantity and quality

Maintaining High Levels of Service

Challenges include:

- Aging infrastructure
- Land use changes / development
- Changing environmental conditions

Resilient infrastructure considerations:

- Use service life (long)
- Criticality (high)
- Adaptive capacity (varies)

Because of climate and other uncertainties, **we need solutions that increase our adaptive capacity.** Both structural (e.g infrastructure-based) and non-structural (e.g. policy-based) solutions are needed.

Equitable Service Delivery

- ***Water equity*** *occurs when all communities have access to safe, clean, and affordable drinking water and wastewater services; are resilient in the face of floods, drought, and other climate risks; have a role in decision-making processes for water management in their communities; and share in the economic, social, and environmental benefits of water systems.* – US Water Alliance

Goals and Objectives

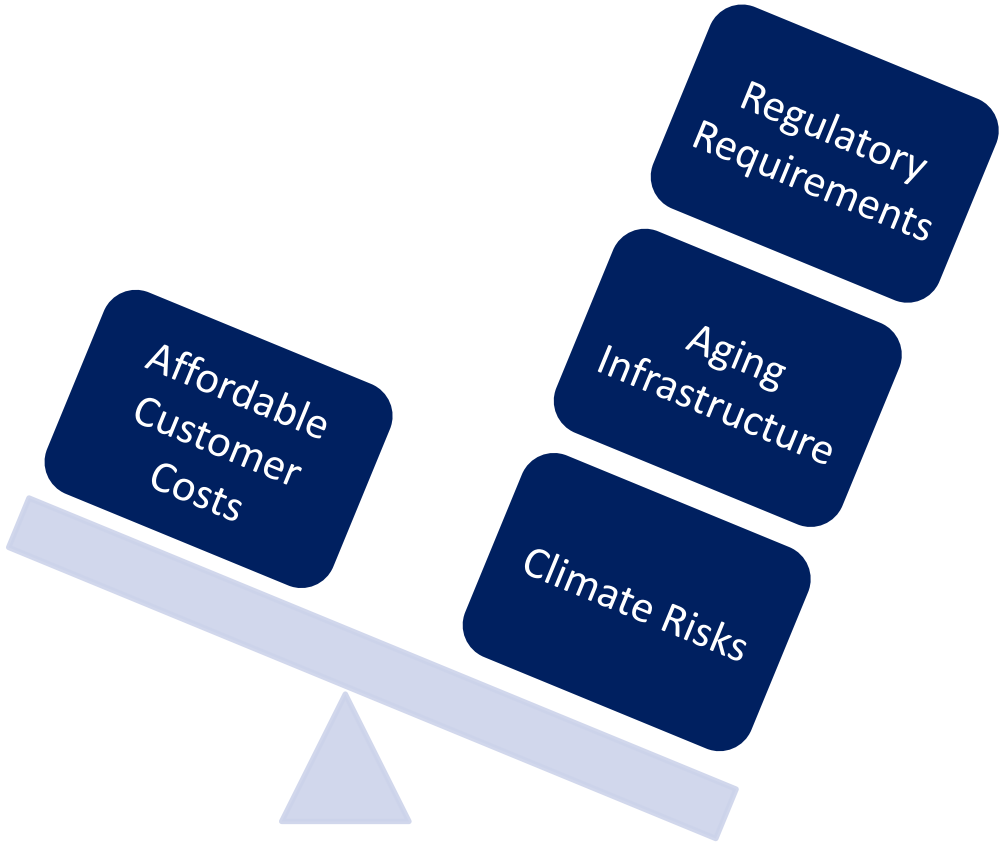
INNOVATE AND LEAD: Leverage our collective experiences to develop leading practices in climate change adaptation and mitigation that are actionable, equitable, and serve as a model for others.

1. Leverage memberships (e.g., AMWA, WUWC) to influence national policy and funding for climate change adaptation, mitigation, and related infrastructure investments.
2. Build strategic partnerships with and convene professional associations, research organizations and foundations to innovate, address emerging issues and amplify WUCA's voice in climate action.
3. Incorporate consideration of equity into all WUCA's work.

WUC
Water Utility Climate A

US Water Alliance

Affordability & Financial Stability



Climate adaptation planning can:

- **Reduce costs and help maintain affordability.** Make sound investments that address high priority risks and result in long-term cost savings (i.e. maximize avoided costs).

- **Help ensure fiscal stability.** Demonstrate to ratepayers, credit rating agencies and investors that we are addressing and reducing climate-related risks.

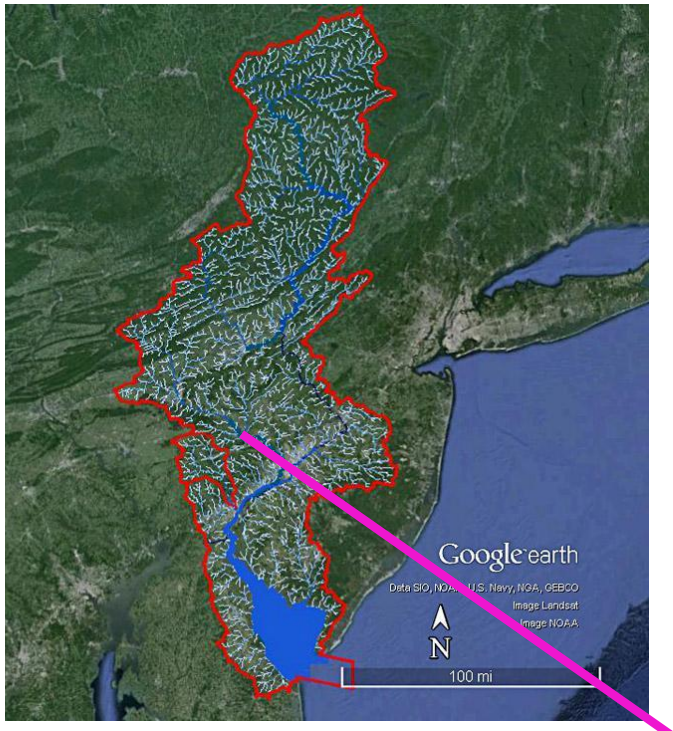
Climate Change Adaptation Planning

- Essential to reduce risks and ensure utilities can:
  - Continue meeting evolving and more stringent regulatory requirements
  - Maintain high levels of service under changing conditions
  - Provide equitable service delivery
  - Maintain affordability and financial stability

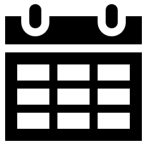
NYCDEP & PWD Adaptation Examples

Climate-Informed Water Resources Management Across Scales

Basin Scale

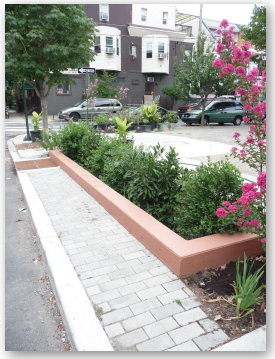


Annual, seasonal

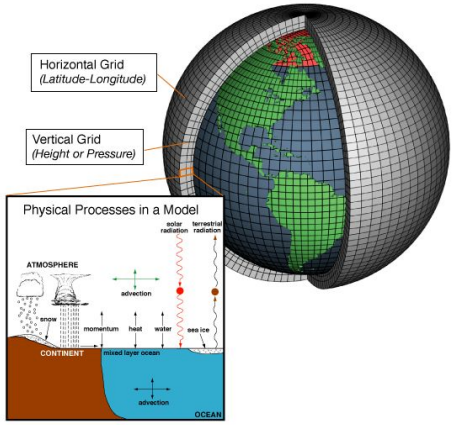


15 minutes

Project Scale



Informed by climate science and projections generated from Global Climate Models (GCMs)



Data| Modeling | Tools

Hydrologic & Hydraulic (H&H) Models

- Watershed runoff (SWMM)
- Drainage system performance (SWMM)

Hydrodynamic and Water Quality Models

- Delaware River and tidal tributaries (EFDC)
- Non-tidal tributaries (EFDC)

Reservoir Optimization Model

- Source water supply (OASIS)

Water Pollution Control Plant (WPCP) Modeling

- Hydraulic models (MS Excel, Infoworks)
- Computational Fluid Dynamics (CFD)
- Treatment process (BioWin)

Warning System Tools

- Early Warning System (drinking water supply)
- Surveillance and Response System (distribution system)
- CSOcast (combined sewer collection system)

Actionable Science Needed

- High resolution precipitation projections
- Localized sea level rise and storm tide projections
- Air and water temperature projections

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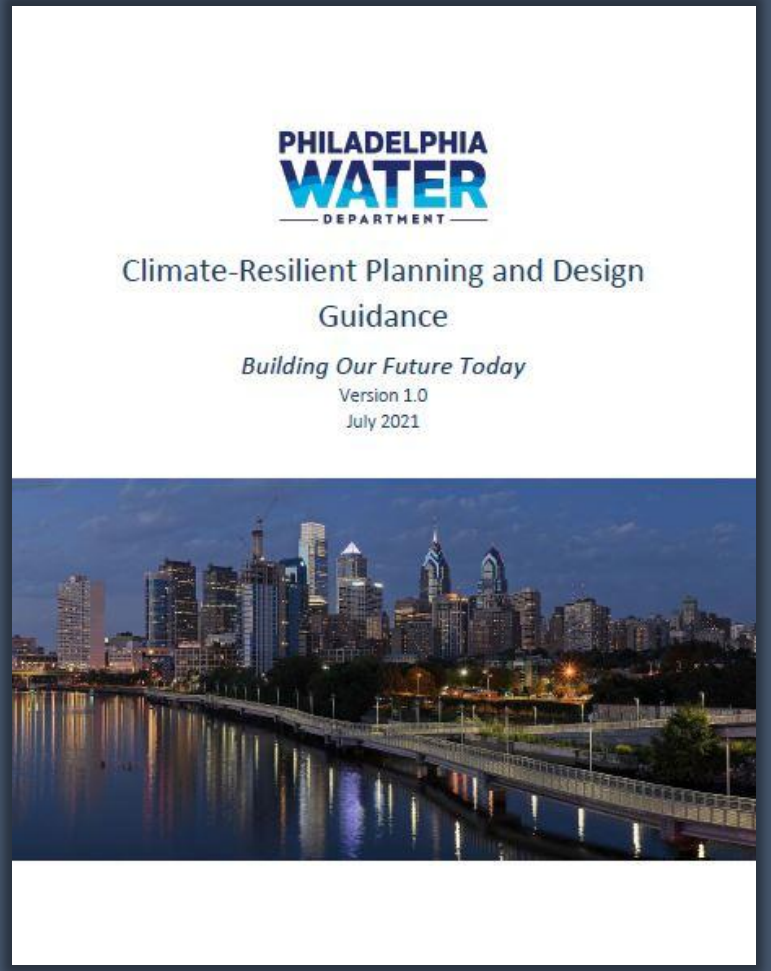
Schuylkill Action Network

Watershed-scale Stakeholder Coordination

- Established in 2003 □ 18 years and counting
- EPA grant award to PDE & PWD of $1.15M
- Millions leveraged for on-the-ground watershed implementation projects
- SAN encompasses water suppliers, agencies, conservation districts, nonprofit organizations, and other stakeholders
- Targeted workgroups to address specific watershed issues and initiatives:
    - Abandoned Mine Drainage
    - Agriculture
    - Education and Outreach
    - Pathogens and Point Sources
        - Recreation
        - Stormwater
        - Watershed Land Collaborative

PWD Climate-Resilient Planning & Design Guidance

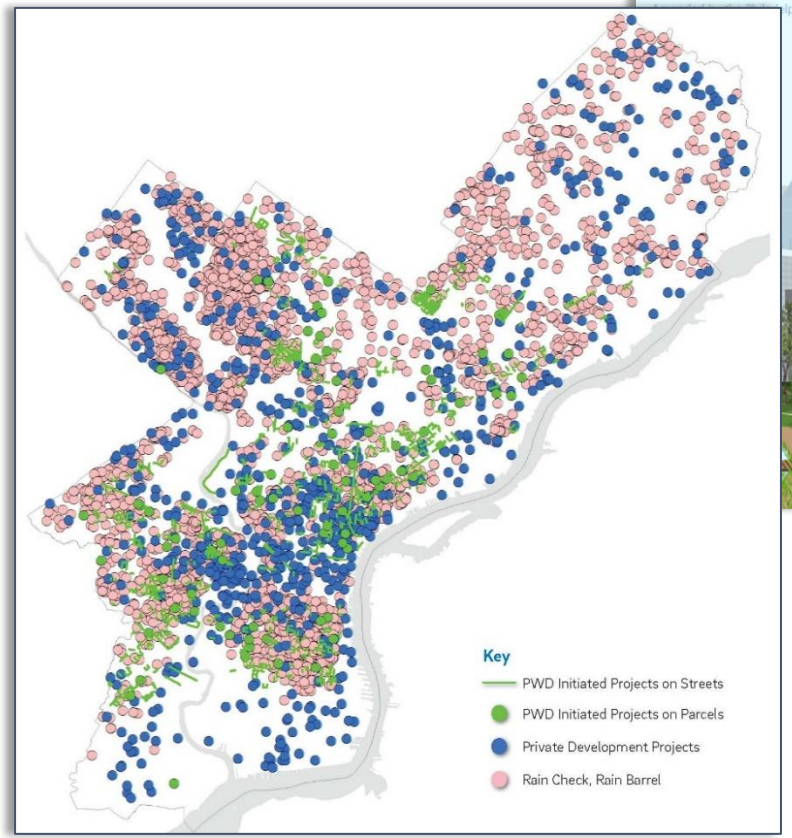
- PWD's fundamental reference document for **mainstreaming** the use of climate change information at PWD
- Provides guidance on what climate change projections PWD staff and consultants should use in infrastructure planning and design processes
- Department-wide policy requiring use of the Guidance document was established in January 2022

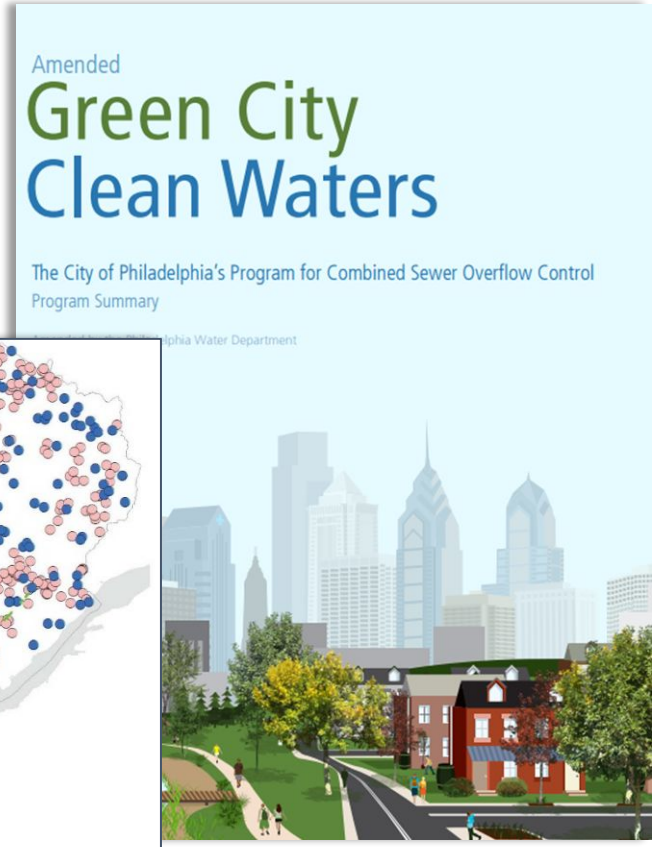


Green City, Clean Waters Program

Adaptive Stormwater Management

Columbus Square Planter Trench





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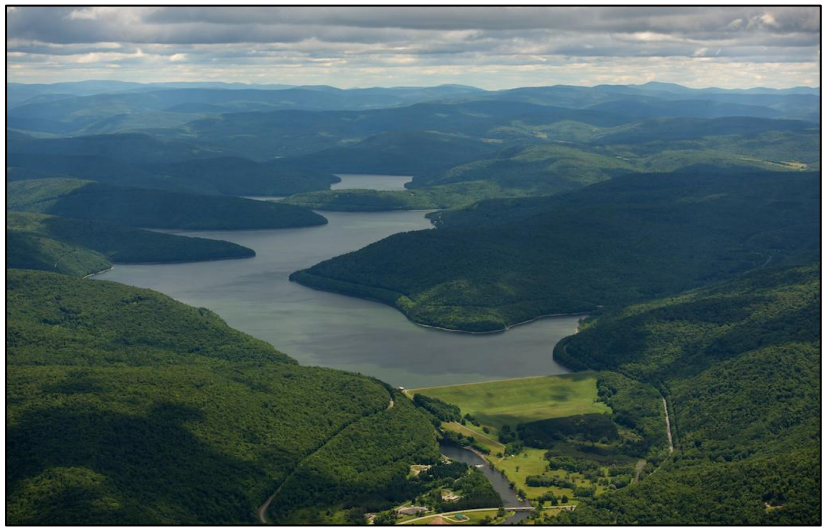
Watershed protection is the first line of defense



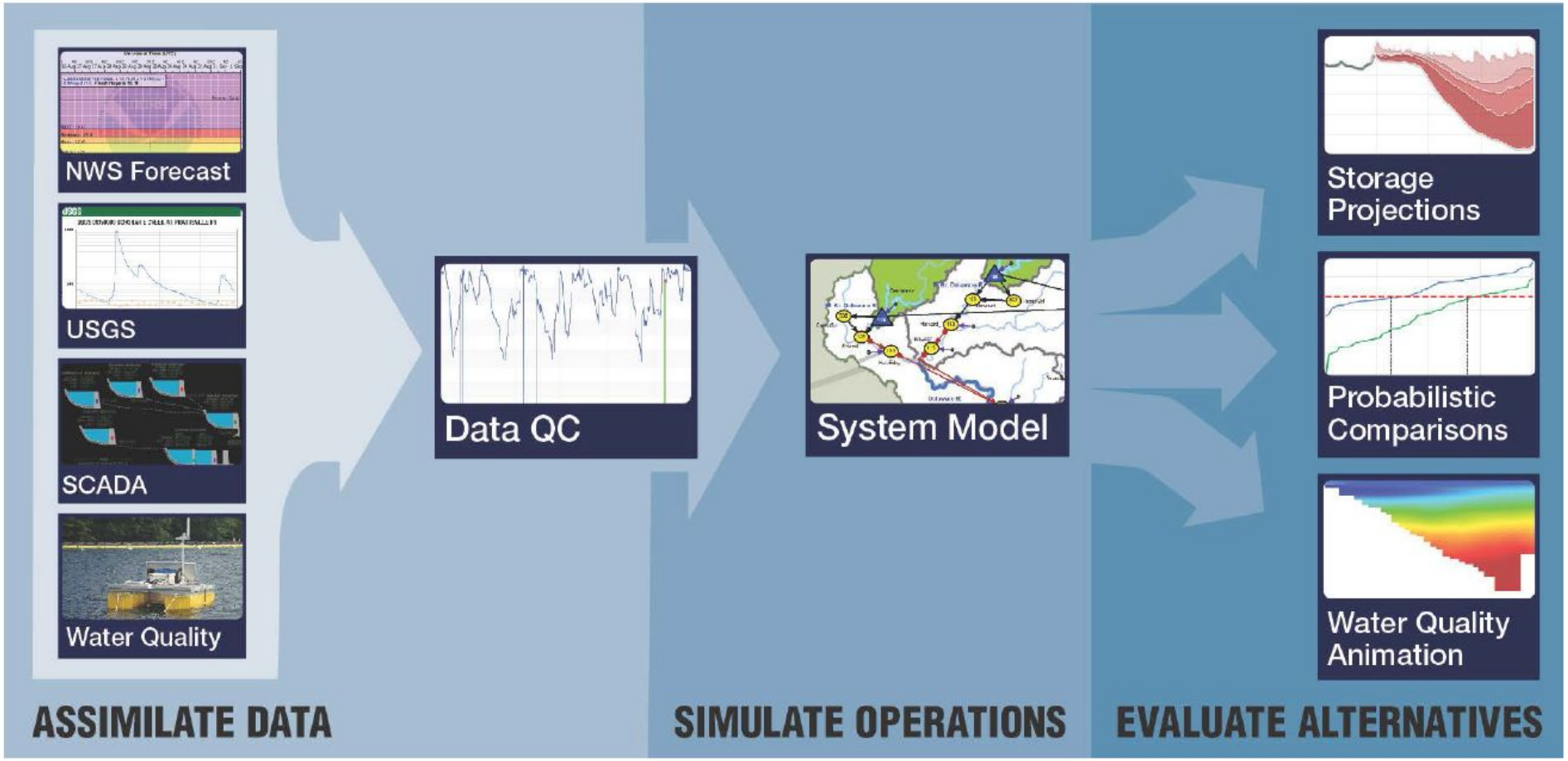
- New York City received its first Filtration Avoidance Determination (FAD) in 1993
- Catskill and Delaware systems have remained unfiltered since then
- 2017 FAD is for 10 years and raised the total program commitments to $2.7 billion

- Key FAD programs include:
  - Land Acquisition Program
  - Septic Repair & Replacement
  - Wastewater Upgrade Program
  - Farm Program
  - Stream Management Program
  - Forestry Program

Tapping into the highest quality water

A new connection between the Catskill and Delaware Aqueducts, known as the Shaft 4 Connection, will allow DEP to divert Delaware System water into the Catskill Aqueduct.

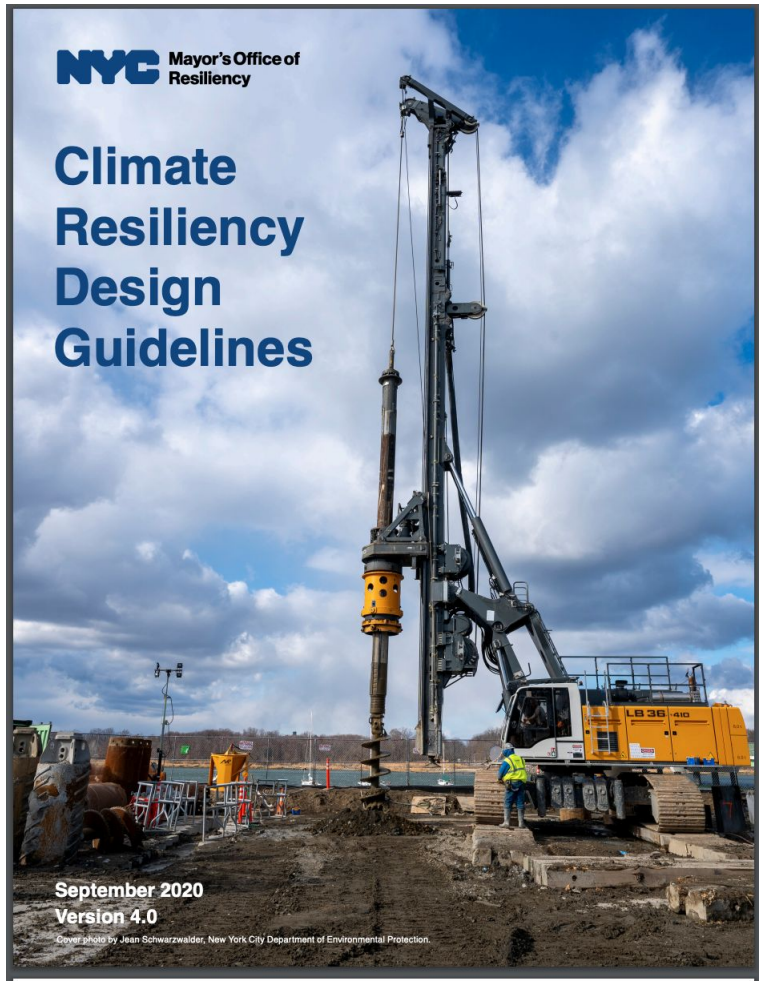
Data help optimize which water to use and when

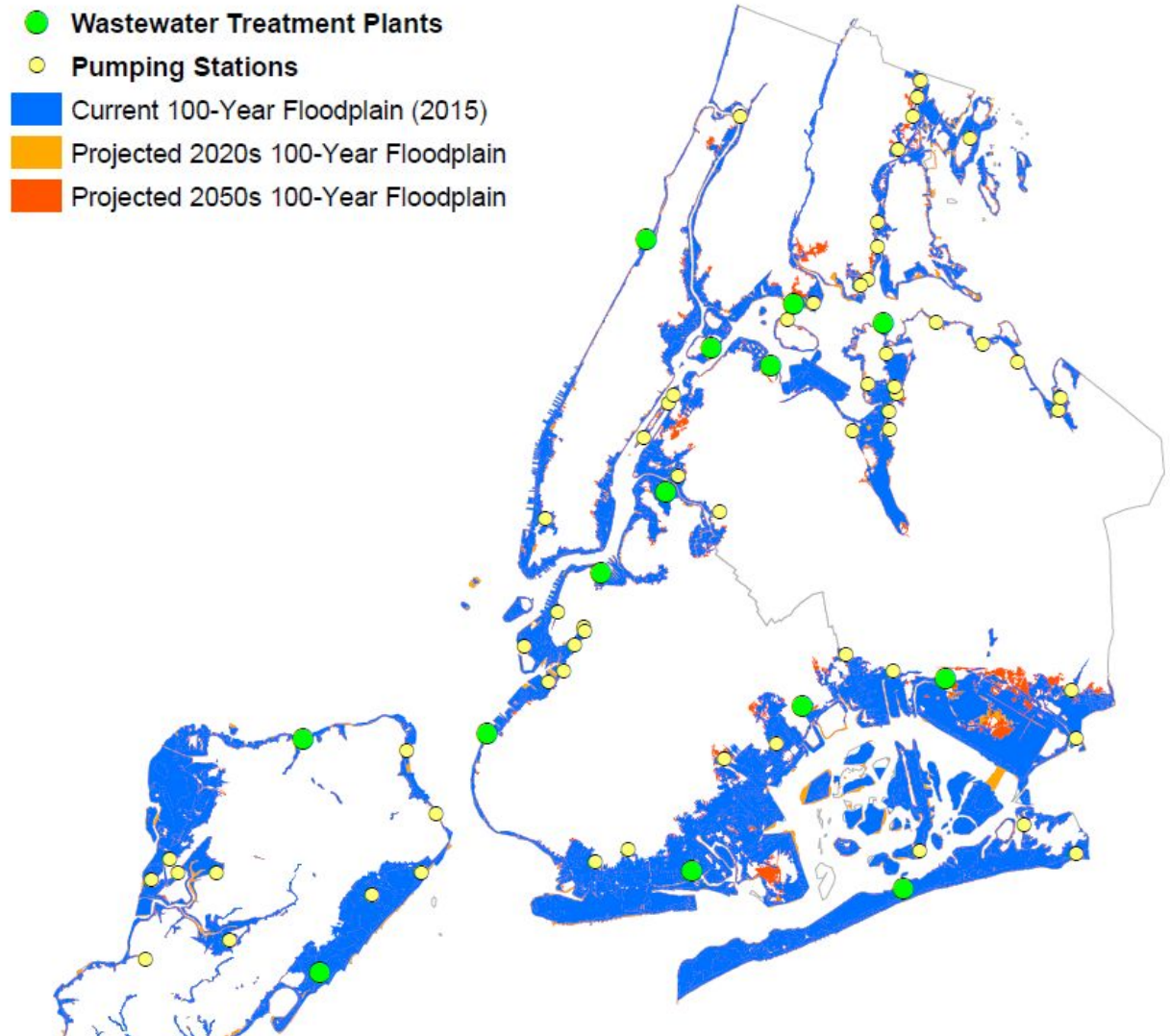


The Operations Support Tool's look-ahead capability provides system analysts, operators, and managers with information to support decisions concerning reservoir diversions and releases.

Floodproofing critical infrastructure

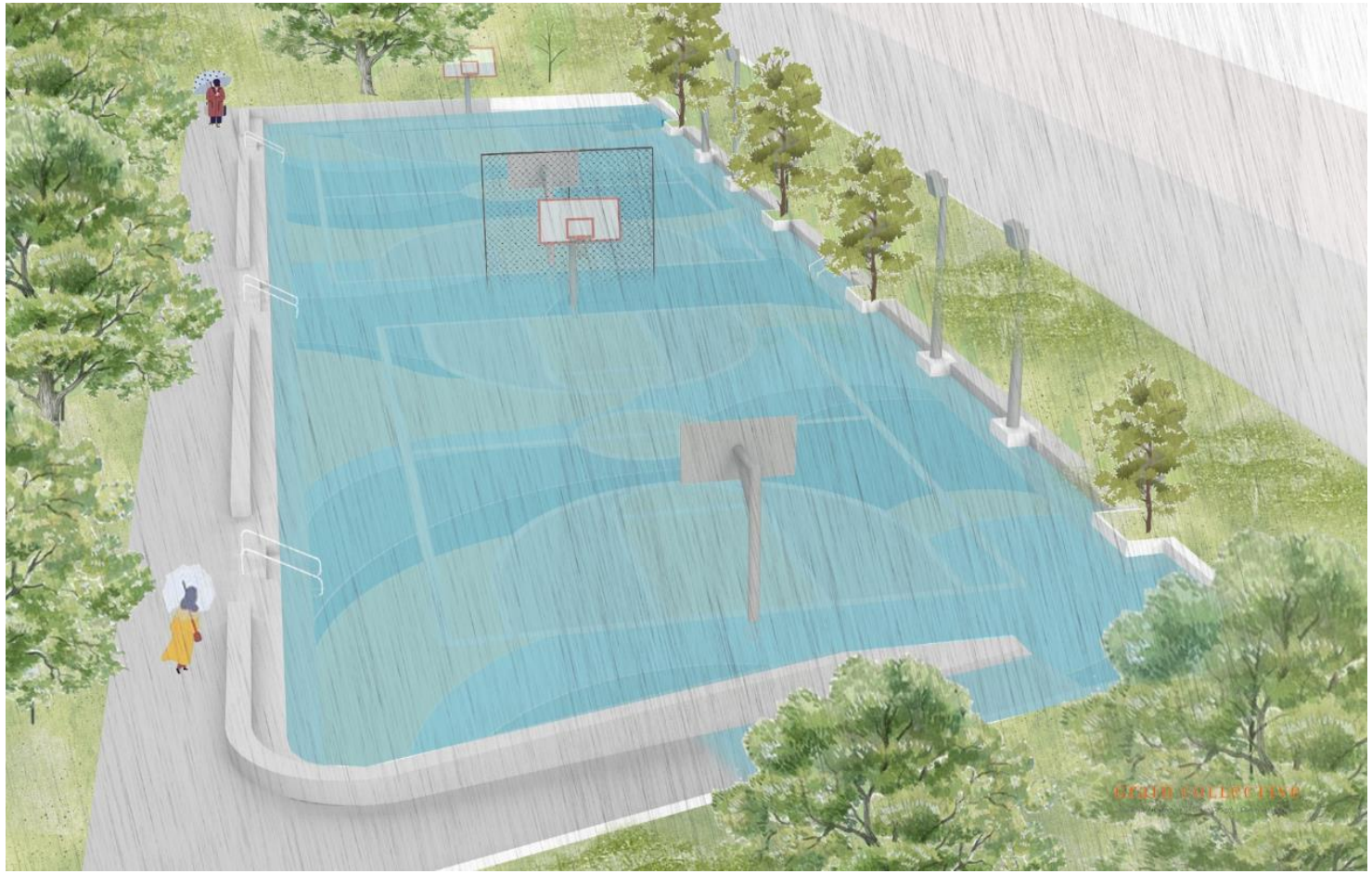
Critical equipment is being designed and retrofitted for climate change per NYC's Climate Resiliency Design Guidelines.





Designing open spaces for managing rainwater

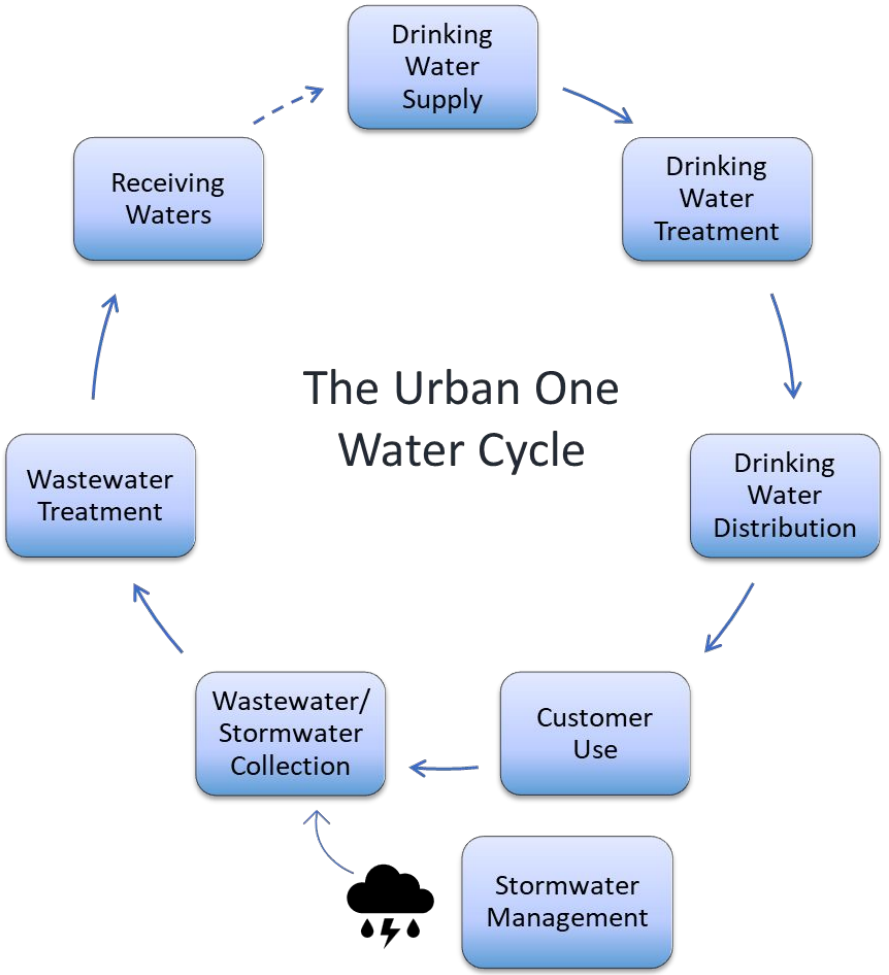
In addition to absorbing runoff through green stormwater infrastructure, streets and recreational areas can be used to safely store water during heavy rain events.



Rendering of Sunken Basketball Court at South Jamaica Houses, Queens, NY

Key Questions

- We can't wait for "perfect" information—how can we make decisions with the information we have available?
- How can we better work with climate scientists to co-create actionable science at local and basin scales?
- How do we develop flexible/adaptable processes and solutions?



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Thank you!

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