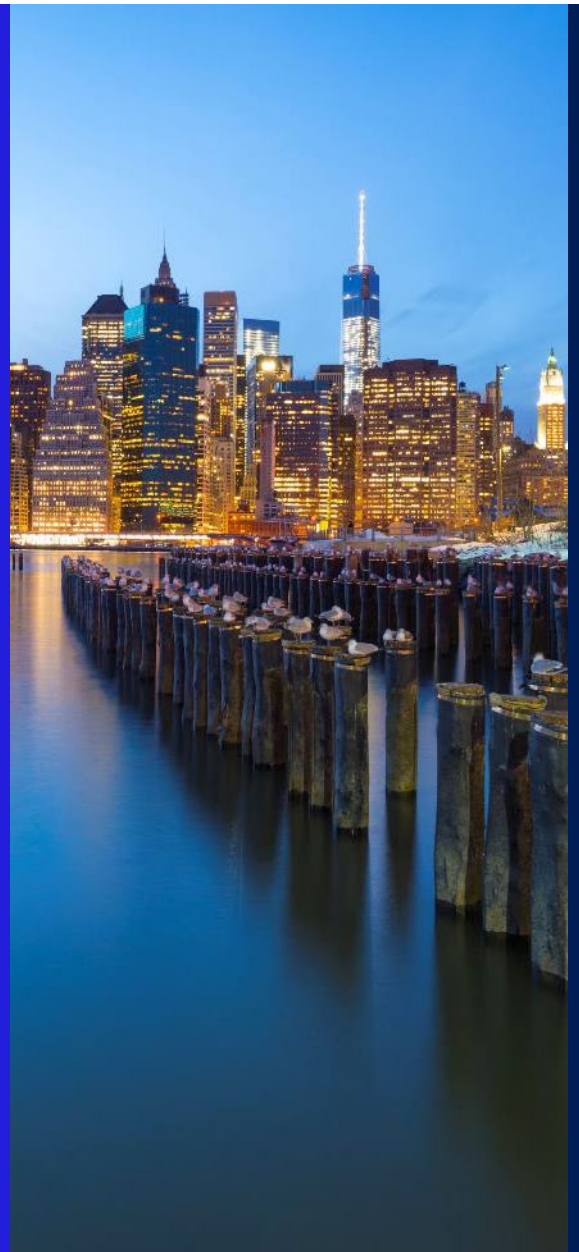
Jacobs Challenging today. Reinventing tomorrow.

Leveraging Water Infrastructure Projects as a Catalyst for Urban Revitalization



In the kNOW Webinar Series

June 24, 2021

Drowning awareness

National Drowning Prevention Alliance

10 per day

In the U.S. drowning takes an average of 3.500 – 4.000 lives per year. That is an average of 10 fatal drownings per day.

Top 5

Drowning is the leading cause of unintentional injury related death for children ages 1-4. Drowning remains in the top 5 causes of unintentional injury related death from birth to 54 years old.

Twenty - Three Percent

23% of child drownings happen during a family gathering near a pool.

Learn to Swim

Learning to swim can reduce the risk of drowning by 88% for 1-4 year olds who take formal swim lessons.

Education

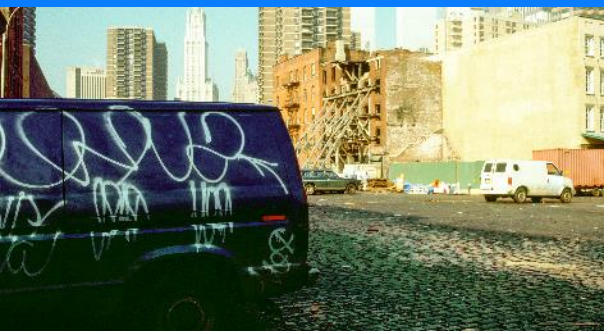
Water Quality

Transportation

Parks & Open Space

Challenges facing today's urban areas

Urban Blight



Flooding

Public Services

Employment

Grade A

"Exceptional, Fit for the Future"

PORTS B-

Grade B

"Good, Adequate for Now"

DRINKING WATER C-

Grade C

"Mediocre, Requires Attention"

DAMS D

LEVEES D

INLAND WATERWAYS D+

STORMWATER D

WASTEWATER D+

Grade D

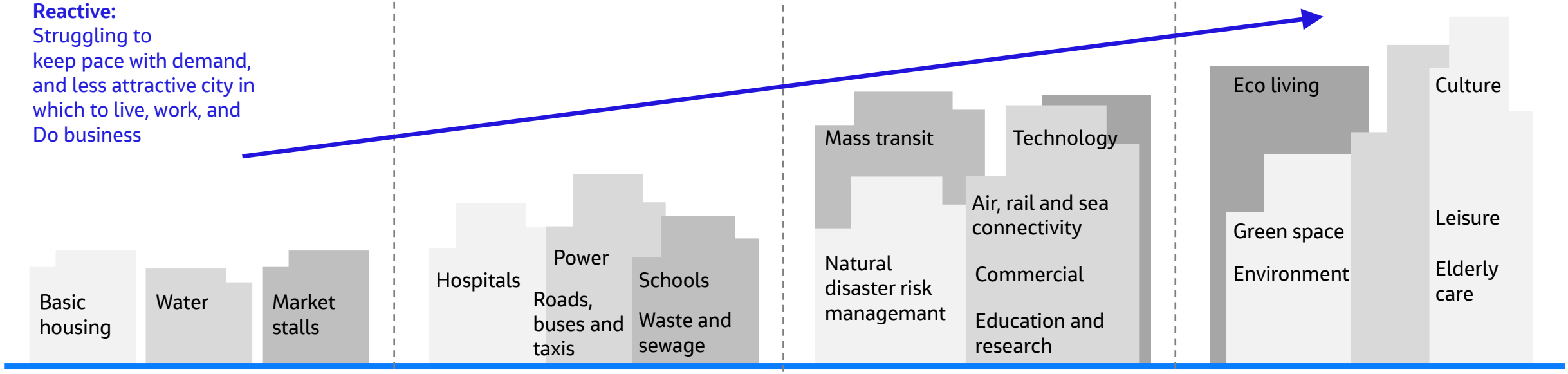
"Poor, At Risk"

Source: https://infrastructurereportcard.org/

The Evolving Role of Infrastructure

Proactive:
Setting the pace, ahead of the demand curve, and more attractive city in which to live, work, and do business

Reactive:
Struggling to keep pace with demand, and less attractive city in which to live, work, and Do business



Survival

Minimal urban Infrastructure to meet basic human survival needs such as running water and shelter

Basic

Infrastructure to ensure more basic needs are met in terms of healthcare, primary and secondary education, transport connectivity within a city and surrounding areas, and access to power for households and business

Advanced

Infrastructure geared more toward improving economic growth and productivity, competitiveness, and economic efficiency, including mass transit, commercial property, technology, global connectivity, advances university education and research, and enhanced natural-disaster risk management , such as flood defenses, to prevent human suffering

Quality of life

Infrastructure targeting more advanced human needs to improve all aspects of quality of life and sustainability, including elderly care, green space, leisure and cultural assets, and environmental infrastructure.

Source: PWC

Agenda

- The Transformational Role of Infrastructure in the Built Environment
  Gary Lapera | Global Solutions Director – Architecture, Jacobs
- Producing Multiple Benefits: AlexRenew's Commitment to Water and Community
  Karen Pallansch | CEO and General Manager, Alexandria Renew Enterprises
- Embracing Wastewater Resource Recovery in NYC
  Pam Elardo | Deputy Commissioner for Bureau of Wastewater Treatment , New York City Department of Environmental Protection
- Social Value in Urban Revitalization
  Emily King | Global Technology Leader – Social Value Advisory, Jacobs
  Victoria Johnson | Practice Leader, Americas – Social Value/Equity, Jacobs

Jacobs

The Transformational Role of Infrastructure in the Built Environment

Gary Lapera, Jacobs Architecture Global Solutions Director

Infrastructure is more than just a series of assets.

It is a **system of systems** that links the built environment, the natural world and the human experience.

Done right, infrastructure investment has the potential to help us build a more **sustainable**, **equitable** and **prosperous** world.

World Economic Forum

Infrastructure 4.0

May 2021

Infrastructure as Catalyst

$9 trillion

Worldwide, capital project and infrastructure spending is expected to total more than $9 trillion by 2025, up from $4 trillion in 2012

5-25%

Economic return generated for every dollar spent on a capital project

It Begins with a Clear Vision

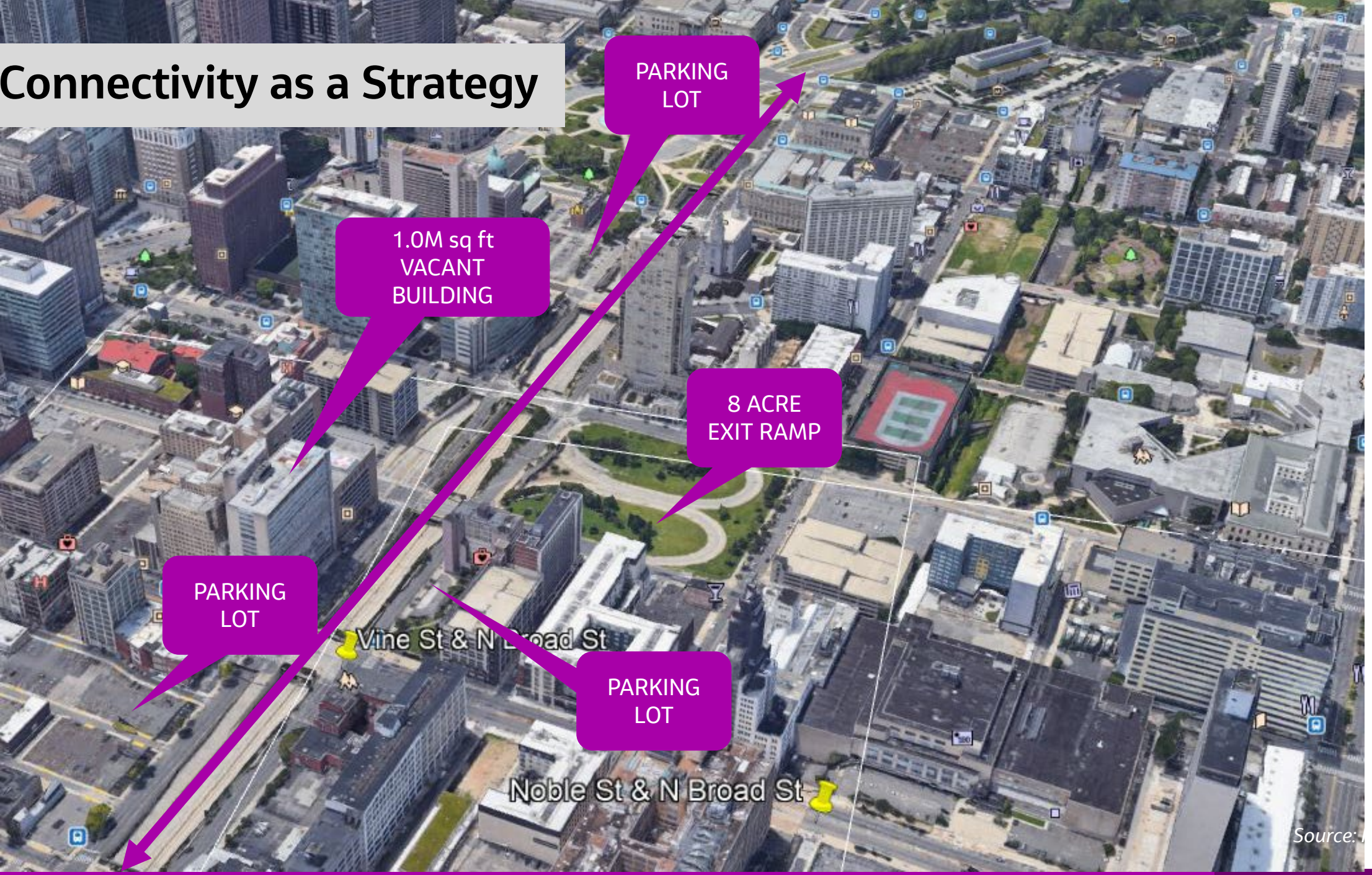
"**Metrolinx** will have a sustainable transportation system that is **aligned with land use** and complete communities. The system supports healthy, safe, convenient and reliable connections, **a high quality of life, a prosperous economy, and a protected environment**"

Residents and Jobs within Walking Distance of Frequent Rapid Transit[1]

		within Walking Distance of Frequent Rapid Transit[1]	
2011	6.8 million people	91%	9%
	3.3 million jobs	79%	21%
2041	10.1 million people	62%	38%
	4.8 million jobs	51%	49%

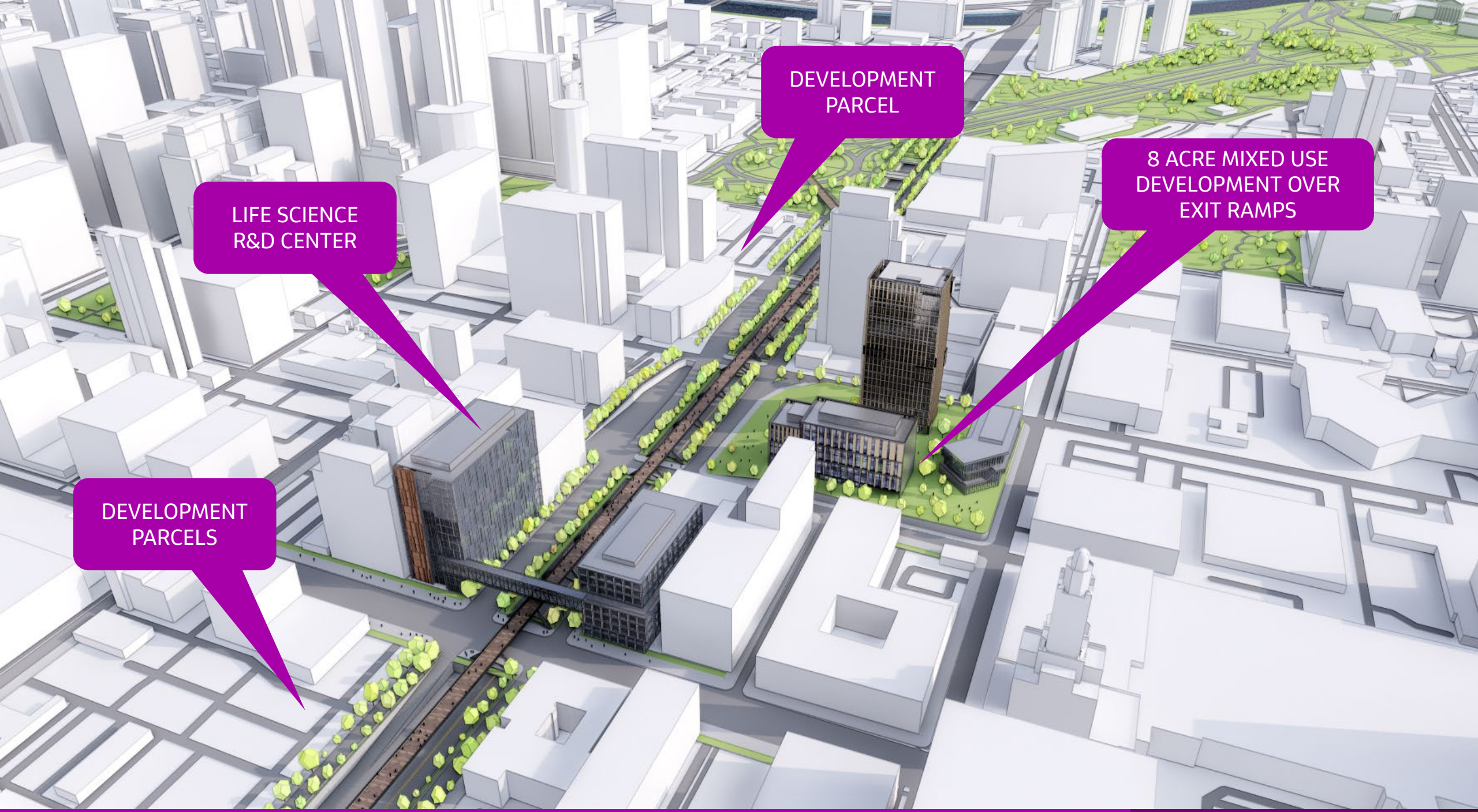
1 Walking Distance is 400m from Priority Bus, BRT and LRT lines, and 800m from subway and 15-minute GO stations

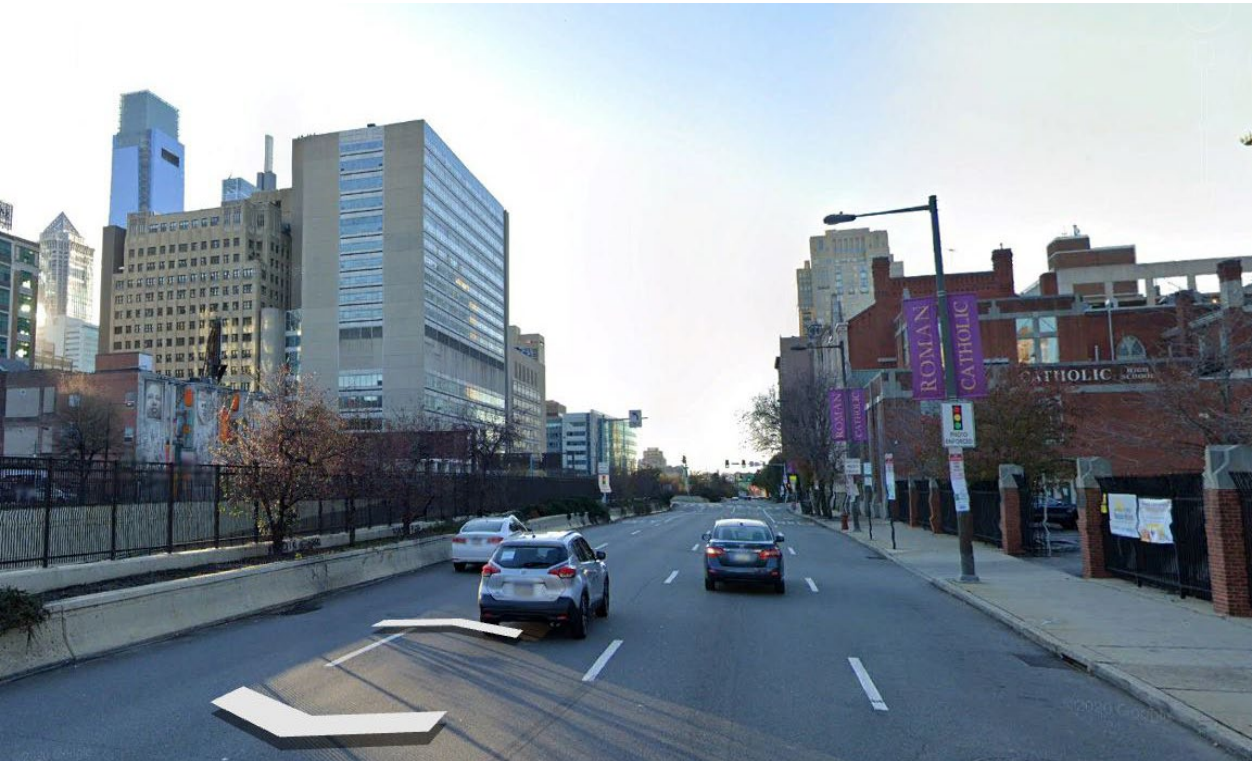
Connectivity as a Strategy



Source:

Source: Rogers, Stirk, Harbour


DEVELOPMENT PARCEL
LIFE SCIENCE R&D CENTER
8 ACRE MIXED USE DEVELOPMENT OVER EXIT RAMPS
DEVELOPMENT PARCELS



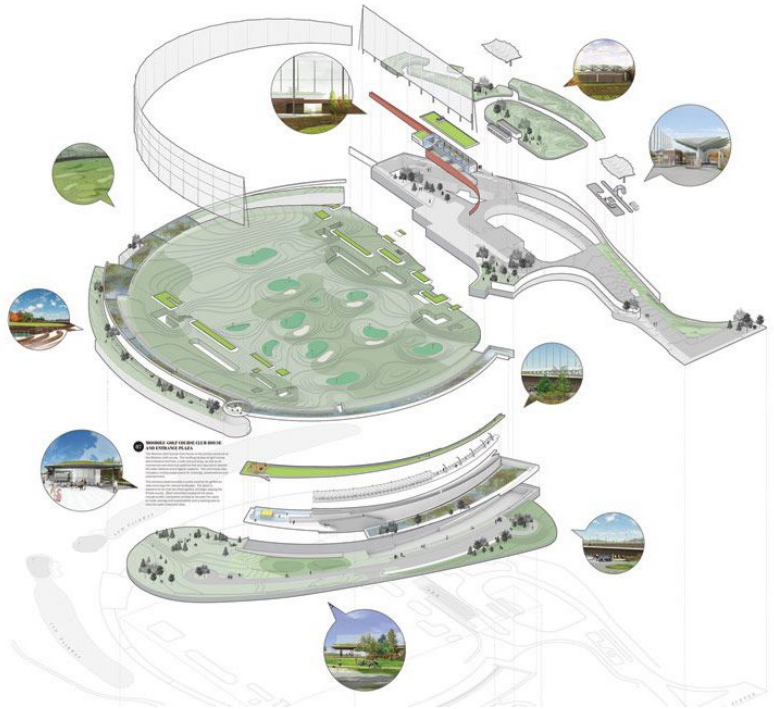
“A world without oil is possible; a world without water is not”

Scott Wolf, FAIA – Miller Hull

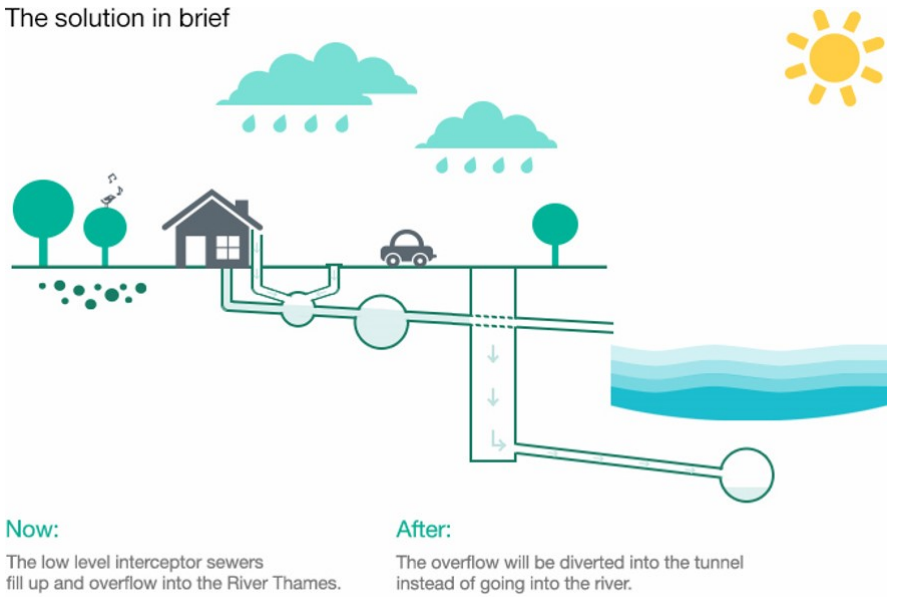
WILAMETTE RIVER TREATMENT PLANT PARK
9.9 ACRES
ARCHITECT: MILLER HULL

CROTON WATER TREATMENT PLANT
11 ACRES
ARCHITECT: GRIMSHAW


NINTH FAIRWAY
DEP PARKING LOT
SECURE ENTRANCE
CELL 1
CELL 2
CELL 3
CELL 4
CELL 5
CELL 6
CELL 7
TEE BOXES
PUTTING GREENS
CLUBHOUSE
DPR PARKING LOT
EXISTING PARKING LOT
BAINBRIDGE AVE.
NINTH GREEN
FIRST FAIRWAY
FIRST GREEN
FIRST TEE
DPR ENTRANCE
213 STREET
DEKALB AVE.



THAMES TIDEWAY
CHELSEA EMBANKMENT FORESHORE
ARCHITECT: HAWKINS BROWN



NextGEN Waste Water Catalysts are:

- Scalable
- Driven by operational ingenuity
- Fundable
- Comprehensive and equitable solutions
- The sustainable path forward

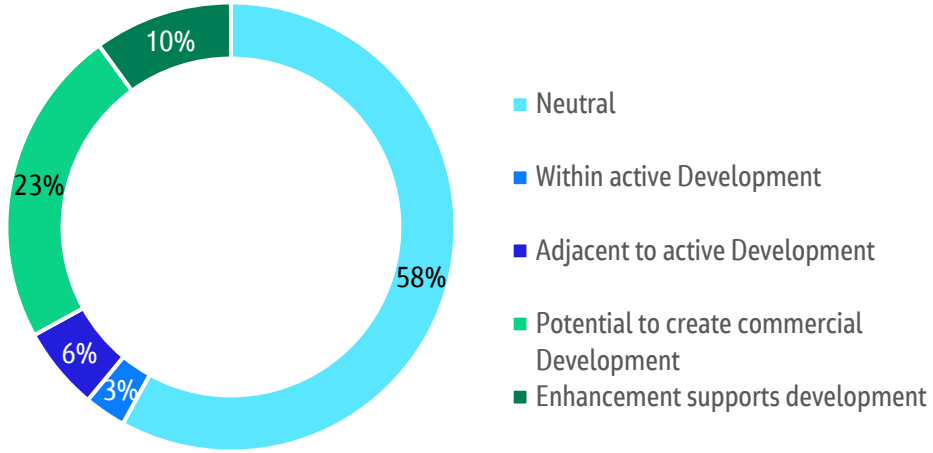
Public Markets: Drive a more **effective** capital spend with greater **collateral** benefit to constituencies

- develop a high impact / low investment strategy
- enhance regional connectivity to the three rivers
- define strategic partnerships
- create betterments that would drive socio - economic growth

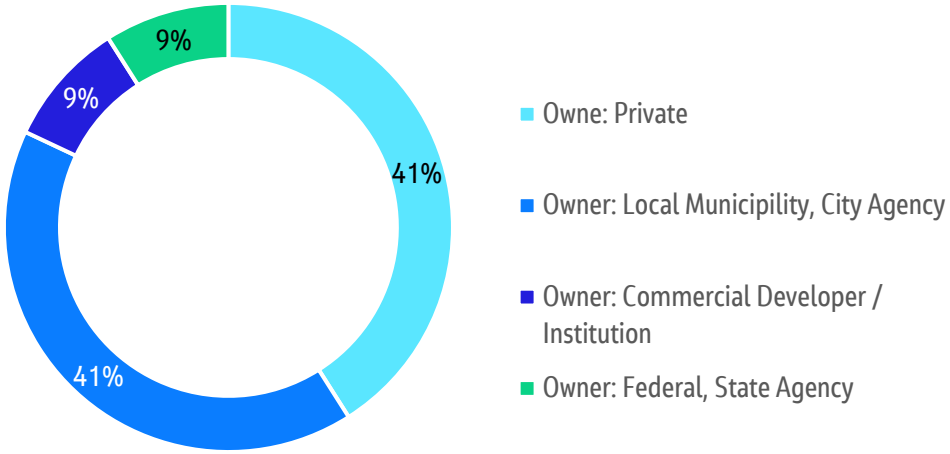
SITE METRICS

- Identifying strategies for allocating capital
- Defining key program drivers
- Setting expectations for potential partners and the ALCOSAN community
- Providing a rationale for site development, affordability, and highest / best use of resources.

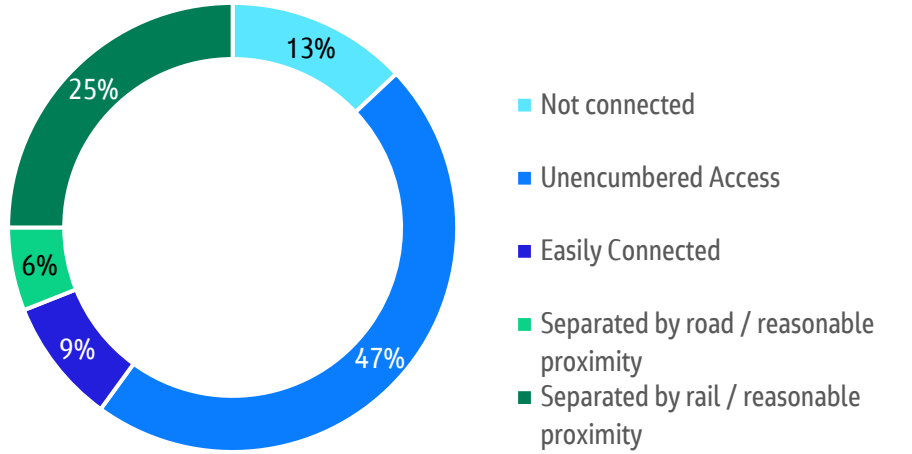
Commercial Funding / Development Opportunities Score



Commercial Funding / Development Opportunities Score



Commercial Funding / Development Opportunities Score



“We cannot solve our problems with the same thinking we used when we created them”

Albert Einstein

Producing Multiple Benefits: AlexRenew's Commitment to Water and Community

Karen Pallansch, Alexandria Renew Enterprises,
CEO and General Manager

AlexRenew At-A-Glance

- Serves over 300,000 customers in Alexandria and Fairfax County
- Independent political subdivision created under the Virginia Water and Wastes Authorities Act in 1952
- Led by an appointed five-member citizen Board of Directors
- AlexRenew is primarily funded through sewer fees on 26,000 accounts

4 pumping stations throughout Alexandria

4 combined sewer outfalls

20 miles of sewer interceptors

35 million gallons of wastewater treated every day at our wastewater treatment plant

Defining Multiple Benefits

AlexRenew Uses a Decision Model to Ensure Multiple Benefits are Derived in Each Project

Focused On Our Board's Vision and Outcomes:

- Adaptive Culture
- Watershed Stewardship
- Public Trust
- Operational Excellence
- Effective Financial Stewardship

And Water Sector Best Practices:

AlexRenew Invests in Multiple Benefits to Sustain Our Urban Community

AlexRenew's Nitrogen Management Facility was Constructed in 2016 as part of the Award Winning State-of-the-art Nitrogen Upgrade Program to Meet Limit of Technology Nutrient Standards for Our Bay

- Effectively uses limited land to meet limit of technology nitrogen removal
- Replaced 143,000 square feet of existing asphalt with new soccer field
- Project awarded Envision Platinum certification, first in Virginia

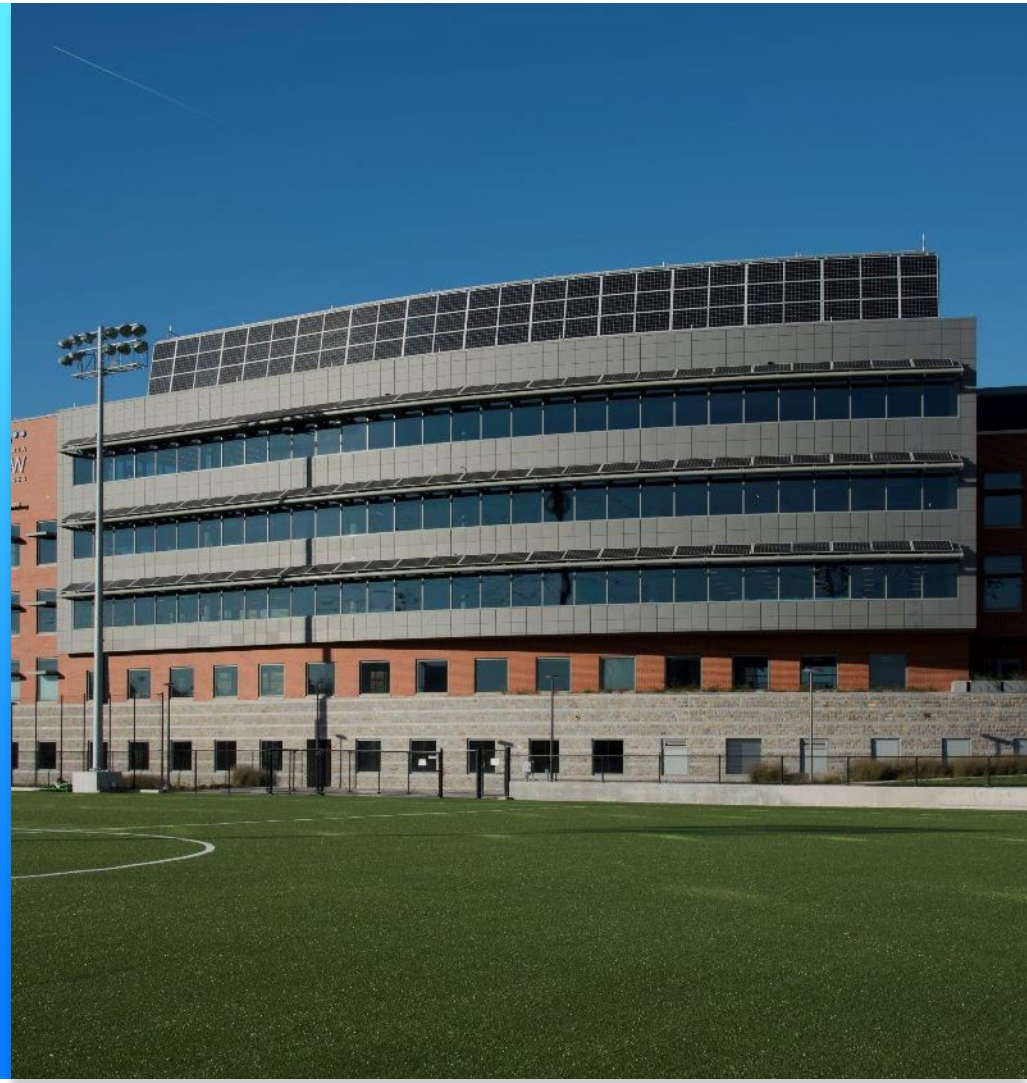
AlexRenew's Environmental Center Leadership in Energy and Environmental Design (LEED) Platinum Certification Supported City Environmental Goals for Building Environmental Certification

- Houses AlexRenew's Support Teams
- Incorporates Educational Lobby
- 6th Floor Community Meeting Space
- Platinum status was requested by our community, to serve as an educational tool for developers and others

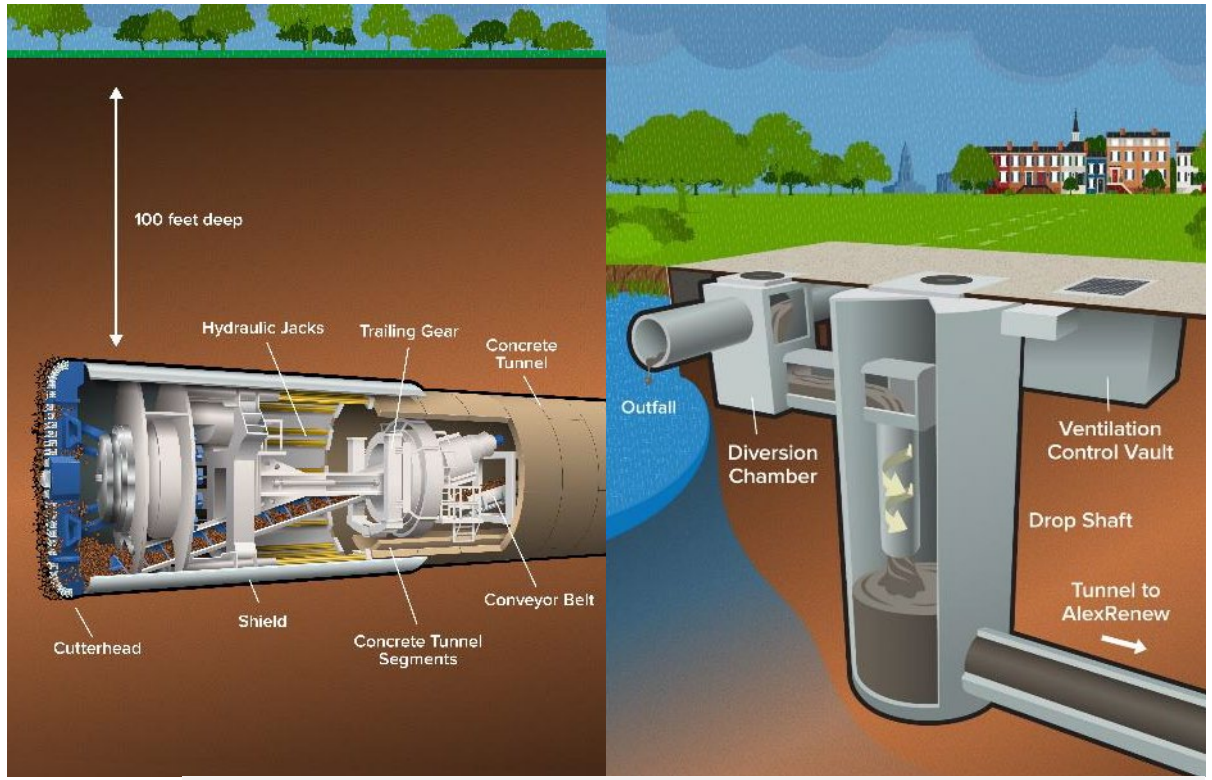
13 percent of total energy comes from renewable energy sources

36 percent reduction in potable water

450 solar panels



AlexRenew has Incorporated Sustainability Rating Systems into the Design of the RiverRenew Program, Integrating Mandates with Community Desires



ENVISION

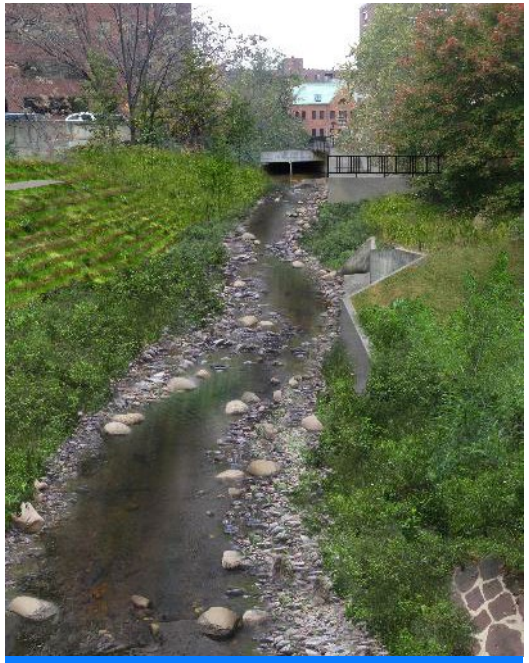
The Tunnel Project will seek Envision Certification

U.S. GREEN BUILDING COUNCIL LEED SILVER USGBC

Superstructure will seek LEED Certification

RiverRenew will Instill a Water Culture into our Community through Healthier Waterways, by Making Our Community's Investments in Water Visible

Oronoco Bay Promenade at Outfall 001



Hooffs Run Riparian Buffer Enhancements and Reclaimed Water Line extension

Jones Point Park Native Plantings

AlexRenew Uses Decision Modeling to Integrate Water Protection Needs and Community Ideals into Our Planning and Outcomes

Operational Excellence

Best Use of Water Resources

- Compliance
- Creativity in Use of Raw Materials
- Flexibility

Public Engagement and Trust

Personally Connect with Local Waterways

- Allow Community to See/Benefit from Water Investment
- Increase connection to Value of Water

Watershed Stewardship

Create a Healthy Local Environment

- Support Eco- City Charter
- Support National/UN Sustainability Goals

Adaptive Culture

Improved Employee Experience

- Increase Efficiency and Reliability
- Enable continuous safety culture
- Provide exciting work environment

Effective Financial Stewardship

Sustainable Financial Investments

- Best Value Proposition
- Minimize Use of Constrainted Resources

Adaptive Outreach and Education Anchors Us in Our Community

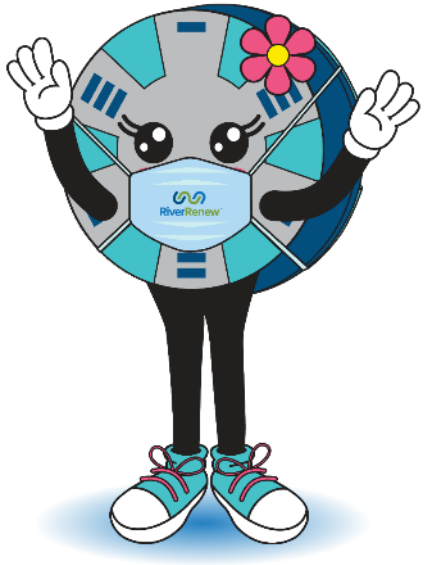
AlexRenew Leverages Our Existing Infrastructure to Benefit and Educate Our Community

Moxie the Water Cleaning Nitrogen Eating Superhero

Interactive Educational Lobby that Serves as City Polling Location

Interactive Educational Exhibits at AlexRenew's Four Mile Run Pump Station

Lobby Green Wall



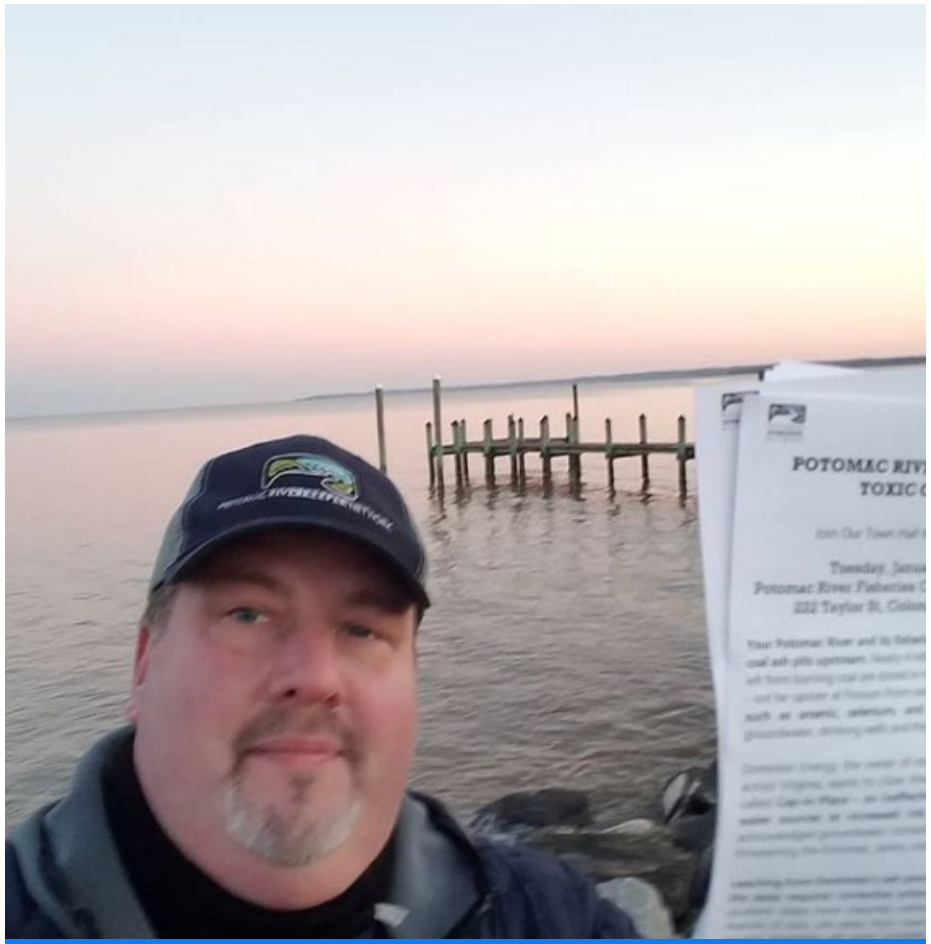
Cloe the Tunnel Boring Machine

AlexRenew and Lost Boy Cider Recently Hosted a Series of Blood Drives as Part of a Continued Partnership – Apple Tree Planting in the Planning Stages

AlexRenew Partners with NGOs and Others to Promote Healthier Waterways

Water Sampling

Stream Cleanups



Advocacy and Outreach

Photo credits: Potomac Riverkeeper Network Instagram: https://www.instagram.com/potomac_riverkeeper_network/?hl=en

AlexRenew Instills our Water Passion through Active Involvement

URBAN ALLIANCE
Employing Youth. Inspiring Excellence.

EISENHOWER PARTNERSHIP

FirstNight ALEXANDRIA

THE CHAMBER ALX

Urban Alliance

Apprentice Programs

Engaging Locally

Thank You

Karen Pallansch, General Manager
Karen.Pallansch@alexrenew.com

Jacobs

ALEXANDRIA renew ENTERPRISES®

Embracing Wastewater Resource Recovery in NYC

Pam Elardo, New York City Department of Environmental Protection, Deputy Commissioner for Bureau of Wastewater Treatment

The Outline

Outline:

- DEP/BWT Basics
- The Path Forward
- Energy Strategies
- Wastewater Resource Recovery: Local/regional/global solutions
- Final Message

DEP/BWT Basics

NYC Environmental Protection

Largest combined water and wastewater utility in the United States

- **Potable water supply:** 1.1 billion gallons of water per day

- **Water delivery and wastewater conveyance:** ~7,000 miles of water mains & ~7000 miles wastewater conveyance

- **WRRFs: … more to come…**

- **Sustainability:** response to climate change; Green Infrastructure

- **Multimedia environmental protection:** Air, hazardous waste, noise pollution

DEP Bureau of Wastewater Treatment (BWT)

- 14 Wastewater Resource Recovery Facilities (WRRFs)
- 6 Dewatering Facilities
- 96 Pump Stations
- 497 Regulators
- 4 CSO Storage Facilities
- 2 In-stream Aeration Facilities
- 6 Laboratories
- 17 Inner Harbor Vessels

Solar Panels at Port Richmond WRRF

Sludge Vessel

Paerdegat Basin CSO Facility

Newtown Creek Digester Eggs

The Path Forward

NYCDEP Bureau of Wastewater Treatment Mission & Vision

First step on the PATH FORWARD: What we do and where do we need to go…

Mission

We safely convey and treat wastewater, manage stormwater, and recover valuable resources to protect public health and enhance the environment to sustain the economy and the quality of life for all who live, work and play in New York City.

Vision

Advance a ***state of good repair*** through engaged employees and responsible asset management, and become a leader in Wastewater Resource Recovery.

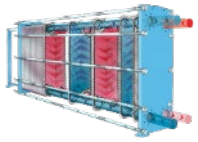
Resource Recovery Vision

Residential & Commercial Wastewater

Industrial Wastewater

Stormwater

Food Waste



HEAT

Process Water Reuse

ELECTRICITY
CoGen & Di-Gas Reuse

CLEAN Water

Fit-for-Purpose Water

Biosolids Products

Renewable Energy

Next Generation Products

Inputs Raw Materials → Processing Manufacturing → Outputs Products

Energy Strategies

Some External Drivers

80% reduction in GHG emissions, and achieve carbon neutrality by 2050

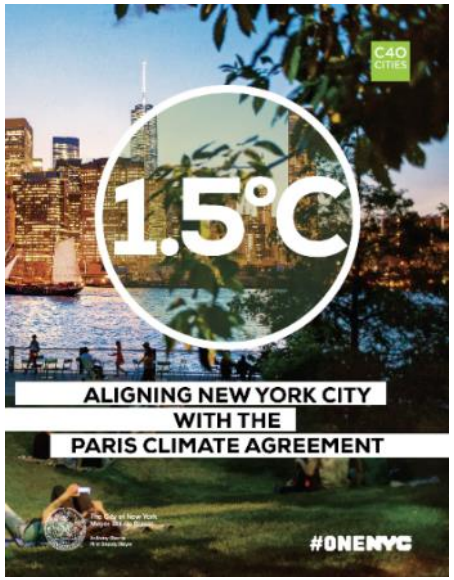
- 40% reduction in GHG emissions by 2025 & 50% by 2030
- 20% reduction in energy usage by 2025

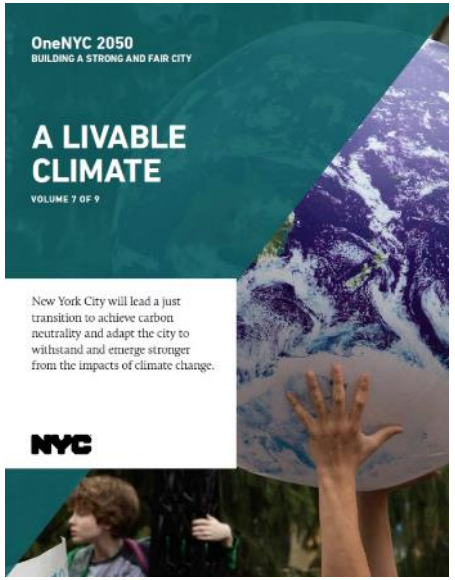
Achieve energy-neutral wastewater treatment plants by 2050

- Increase energy efficiency, biogas & renewables production
- maximize beneficial use
- eliminate fugitive biogas

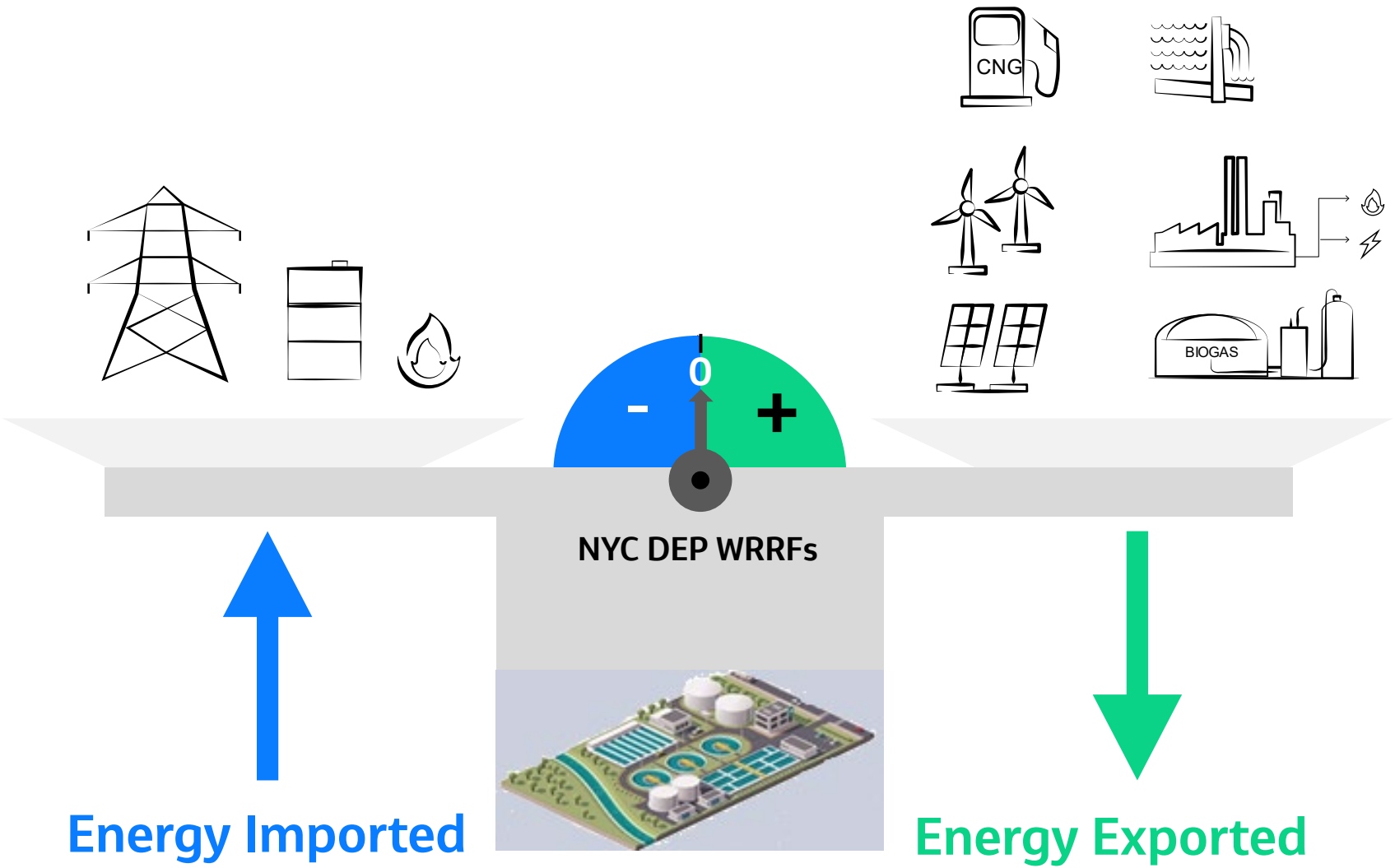
Send zero waste to landfills by 2030

- 100% biosolids beneficial use
- Food waste to digesters

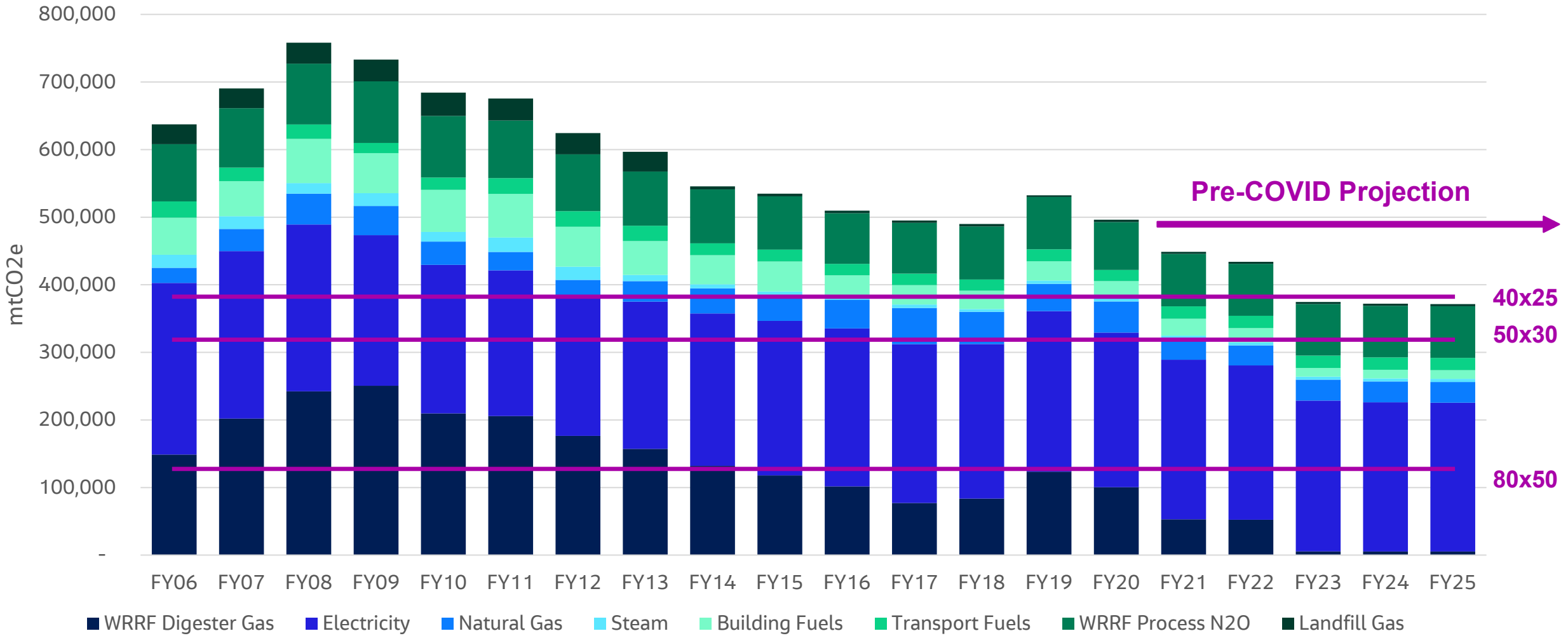




Net Energy-Neutral WRRFs



DEP GHG Emissions

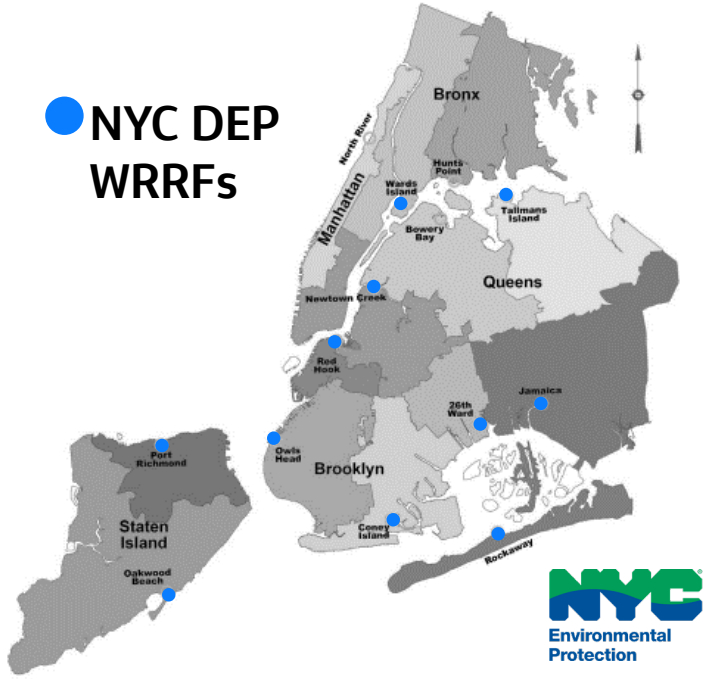


Strategies for Energy-Neutral WRRFs

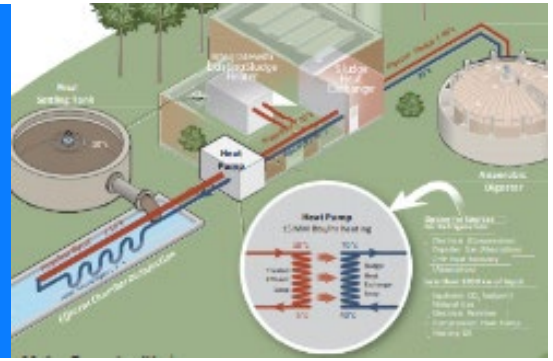
12 MW Cogen at NR

1.2 MW Solar PV at PR
5 MW Solar PV at WI

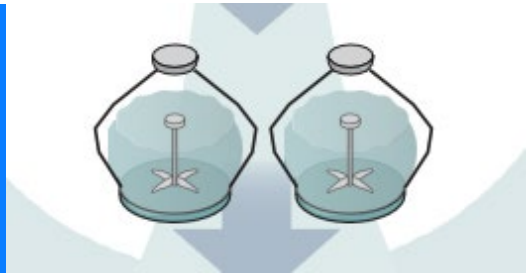
Energy Efficient Processes and equipment



Innovative Renewables



Biogas Production at 14 WRRF for beneficial use



Gas to Grid

Food Waste Codigestion

Traditional Renewables

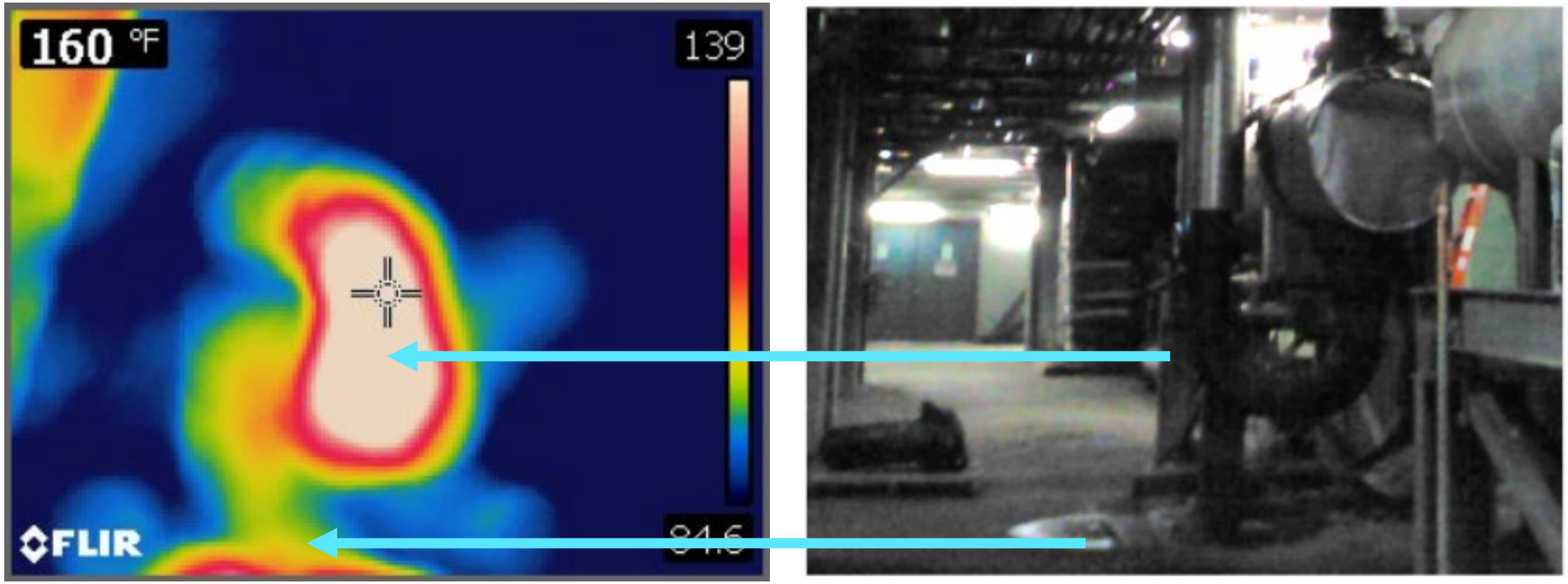
Port Richmond WRRF: 1.2 MW system, online since 2015, provides 5% of energy needs at PR

Wards Island WRRF:
10 MW under design, installation 2022-2023
(over tanks, open land, parking canopies, and rooftops)

Owls Head, Rockaway, and Oakwood Beach WRRFs:
DEP is investigating the potential for as much as
400 kW of micro wind-turbines at coastal locations

Exploratory analysis for “waste” heat

recovering heat from condensate



Gas-to-Grid

- DEP-National Grid to inject excess biogas from Newtown Creek WRRF into the local natural gas distribution grid
- ~200 million cubic feet of pipeline-quality renewable natural gas (RNG)
  - Directly offsets fossil-based gas
  - Capacity to heat ~4,000 homes

Food Waste Co-Digestion

- Source-separated organics are pre-processed into a slurry off-site
- Slurry is delivered to DEP's digesters at a feed-in station

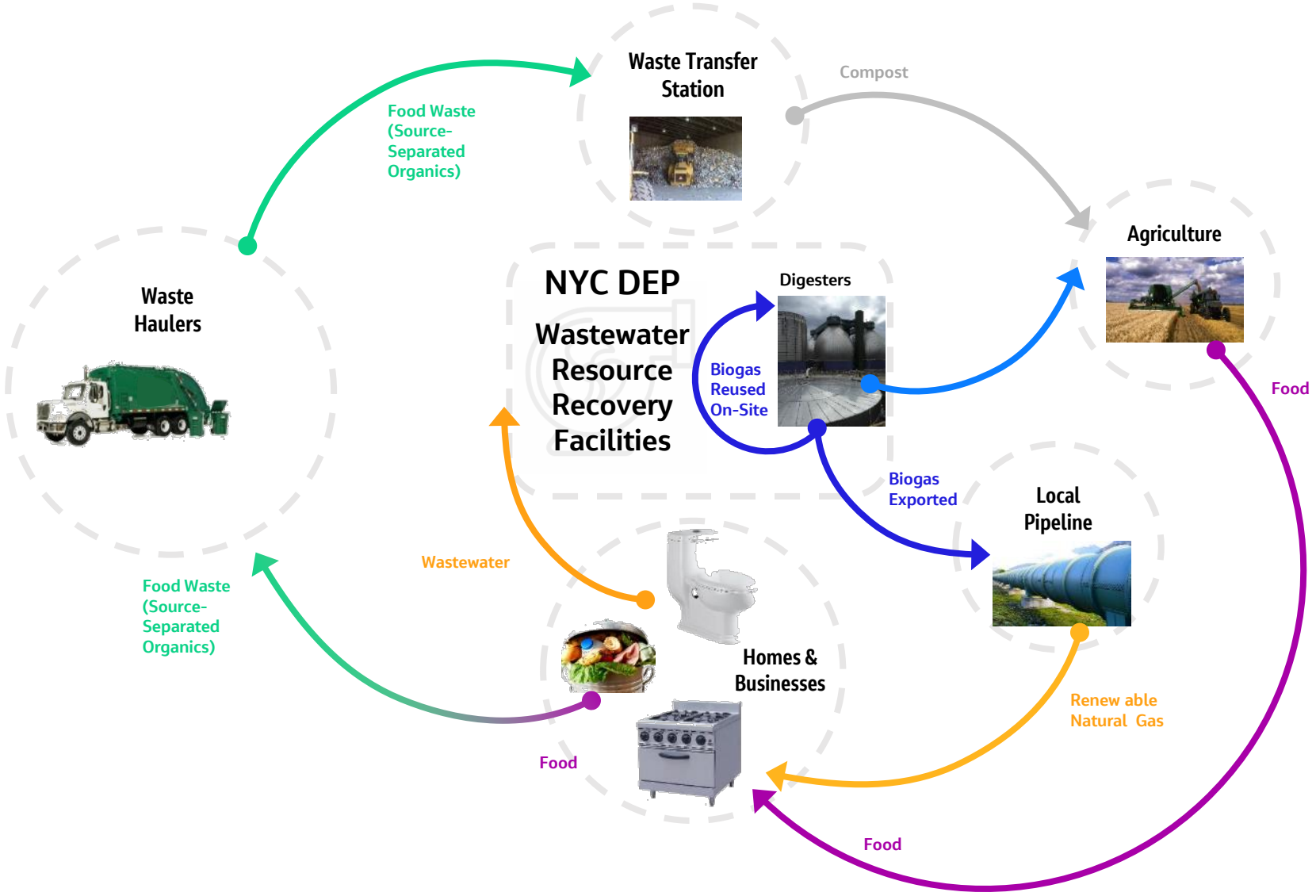
Source Separation + Collection

Off-Site Pre-Processing

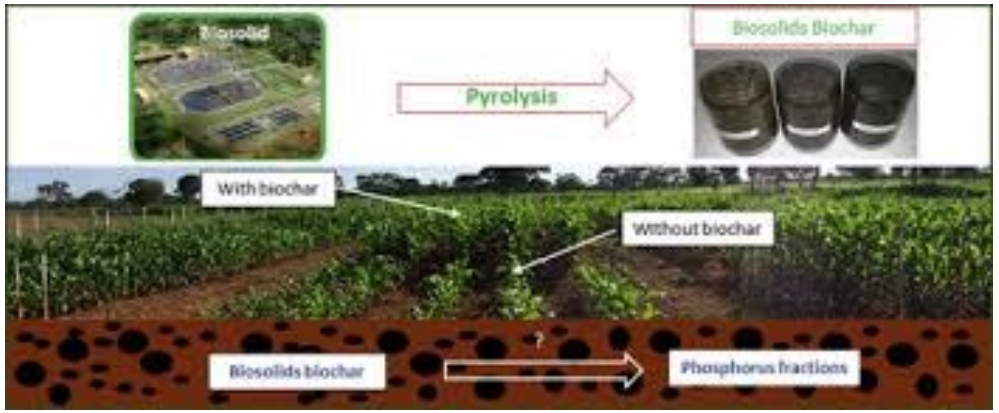
Transport + Storage + Co-digestion

Wastewater Resource Recovery
Local/regional/global solutions

WRRFs and the Circular Economy

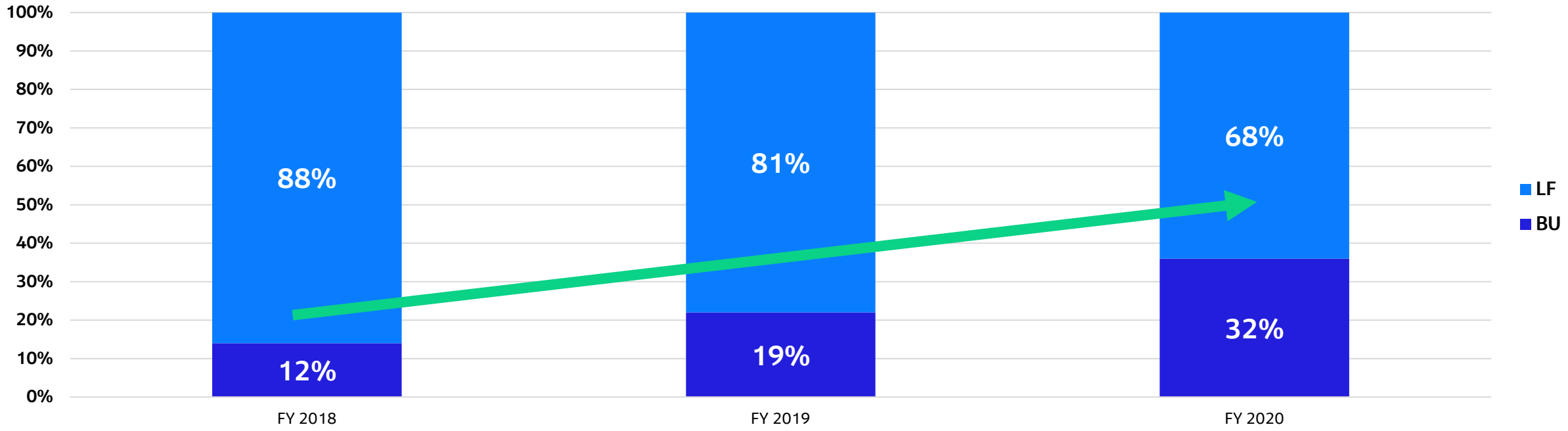


Biosolids for Carbon Neutrality



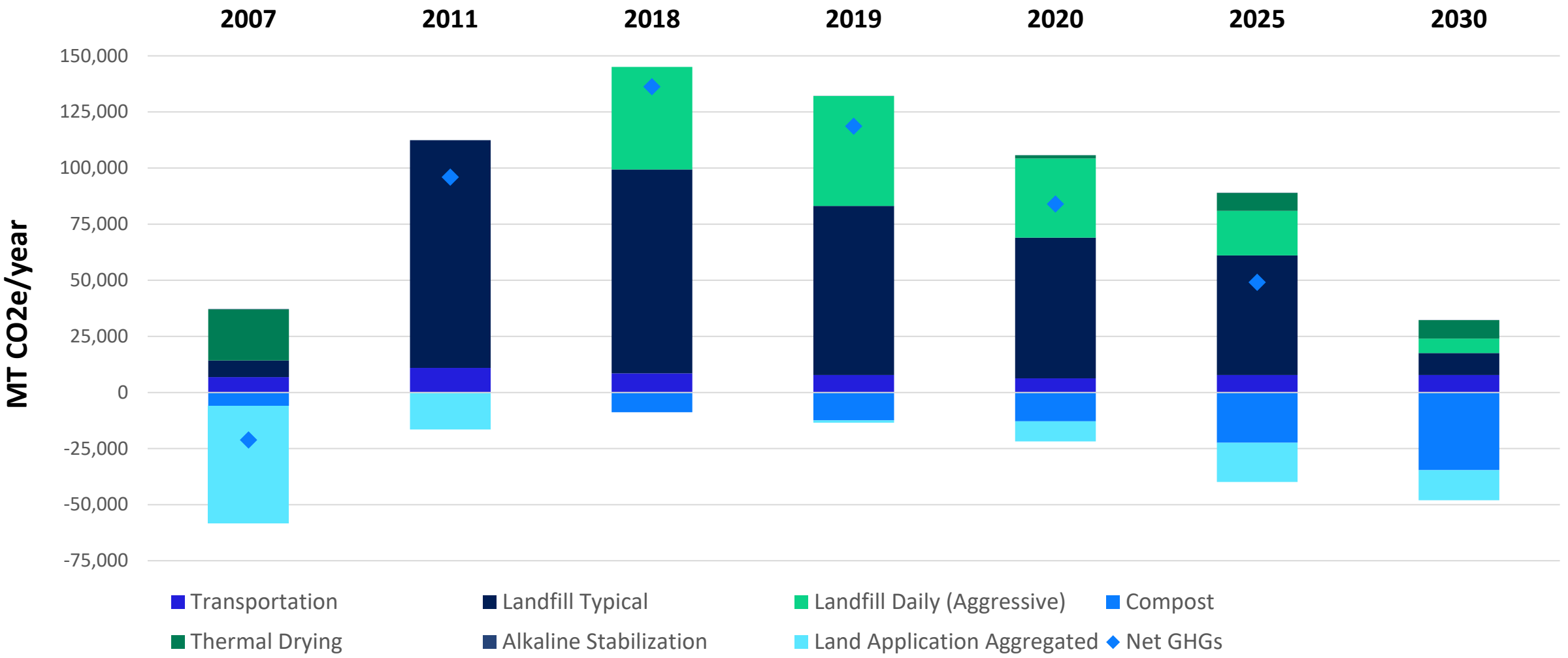
Overview of Biosolids Production

Yearly Biosolids Breakdown of Disposition Sites



- Production of biosolids at NYC DEP is 550,000 average wet tons per year with ~ 14% transshipped to NJ PVSC
- Due to production volumes, effective disposition of biosolids is a resource to meet agency goals
  - Zero waste to landfill goals by 2050
  - Energy and Carbon Neutrality goals

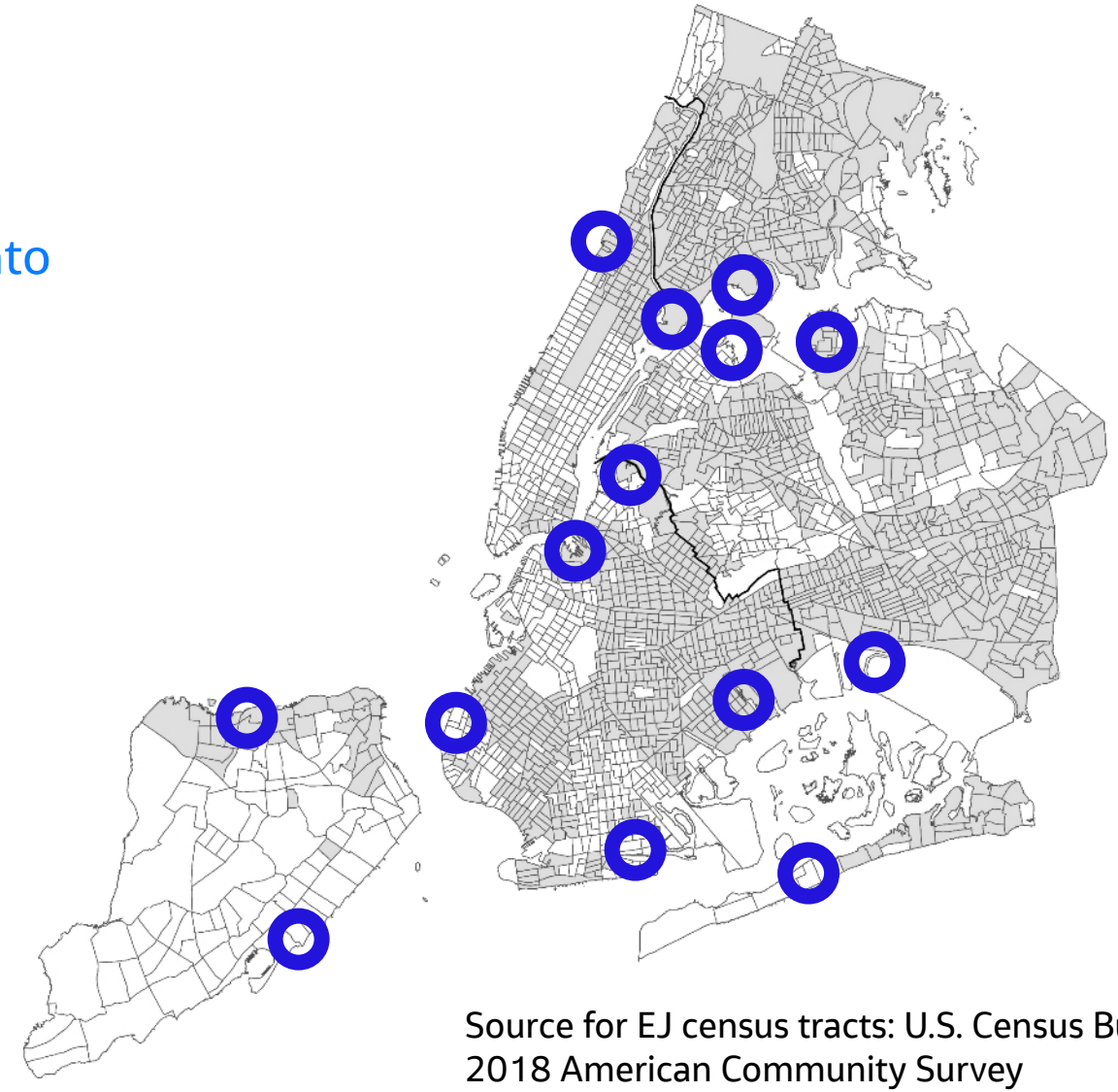
BWT Biosolids GHG Emissions



Environmental Justice

WRRFs often located in or adjacent to environmental justice communities, which positions them to be transformed into distributed community assets.

Riverbank State Park above the North River WRRF



Source for EJ census tracts: U.S. Census Bureau, 2014-2018 American Community Survey

WRRFs as Community Assets

WRRFs as a steward of resources for the local community

- Green energy generation, heat recovery, valuable products from the influent waste streams
- Provide a local recycling option for food waste and other high strength waste (Fats, Oils, Grease, etc)
- Good neighbor fostering education, career development, community participation/gardens; location sensitivity and process improvement (odor, landscaping, etc.)
- Respect the ratepayers dollar- build sustainable economics through strategic asset management principles, best utility practices for capital replacement and cost effective innovation

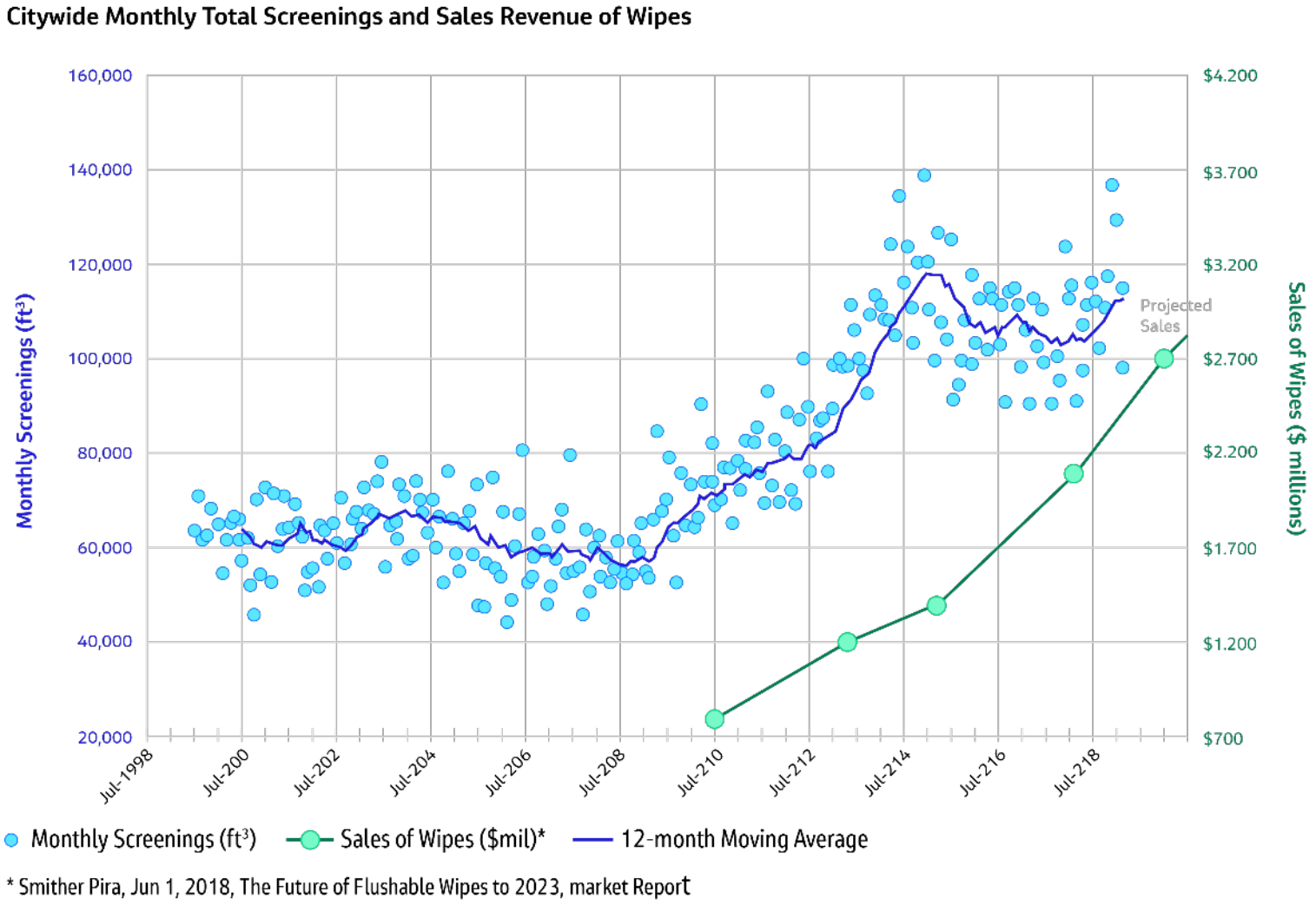
More equitable outcomes for the communities served

Opportunities

- Provide a foundation for economic sustainability and growth by preserving public health and creating clean harbor waters
- Invest in resource recovery and circular economy opportunities
- Embrace today's technologies for more effective operations
- Optimize new opportunities to really bring our utility into this century:
  - Support feasibility study for Wastewater Resource Recovery and Green Energy projects on Rikers Island
  - Examine consolidation of existing aging plants based on best economic, environmental, and social outcomes (for example, Jamaica Bay)
- Transform WRRFs to community assets; become education and environmental centers, foster entry level green jobs, target community engagement and development

Final Message

Growth of the Wipes Industry and Screenings



We are in this together

Continuing our crusade against “flushable” wipes!

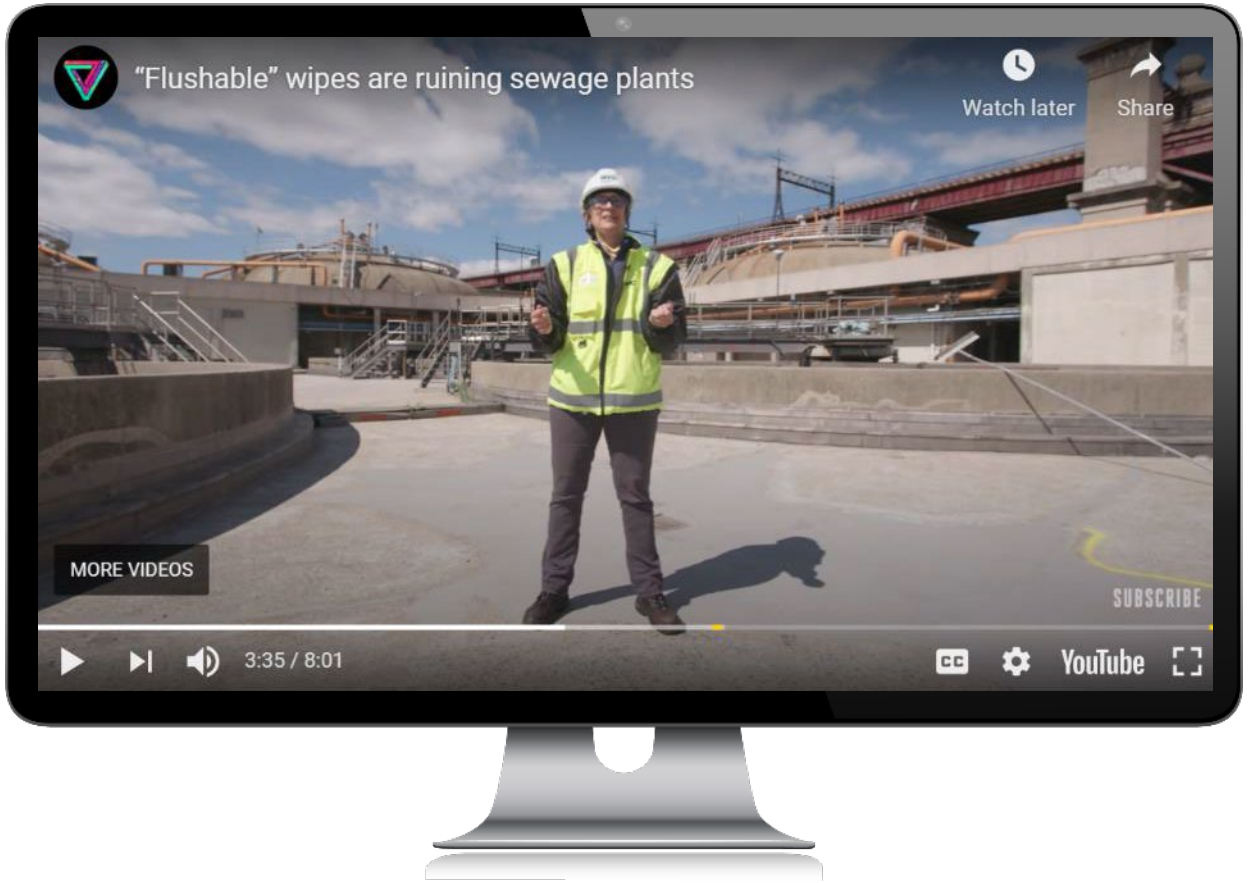
https://

What actually makes something ‘flushable’?

These products cost New York City millions of dollars per year

By Nicole Wetsman | May 13, 2021, 10:00am EDT

SHARE



Thank You

Deputy Commissioner Pam Elardo, P.E.
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Jacobs

NYC Environmental Protection

Social Value in Urban Revitalization

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June 24, 2021

Jacobs Challenging today. Reinventing tomorrow.

Social Value:

Social value is the analysis and measurement of the social, economic and environmental impacts of infrastructure on individuals, communities and society.

Community wellbeing
Connectedness, cohesion and safety

Equality and equity
Including justice and fairness

Housing
Affordability and choice

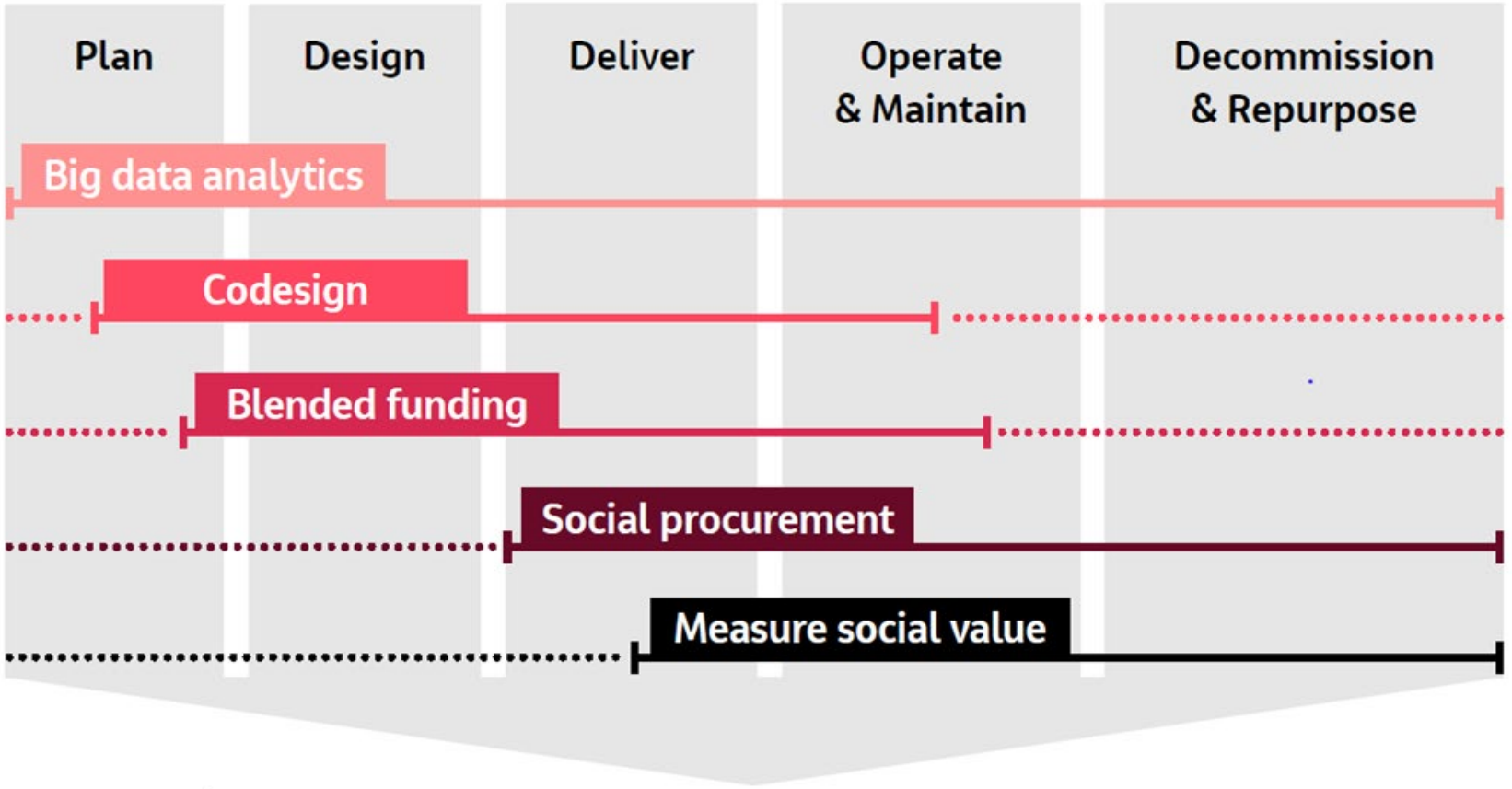
Physical and mental health

Work
Security, availability and meaning

Mobility
Accessibility and choice

Access to vital services
Food, water, energy and health

A Blueprint for Creating Social Value Across the Project Lifecycle



Measuring Social Value

GLOBAL PURSUITS AND CASE STUDIES

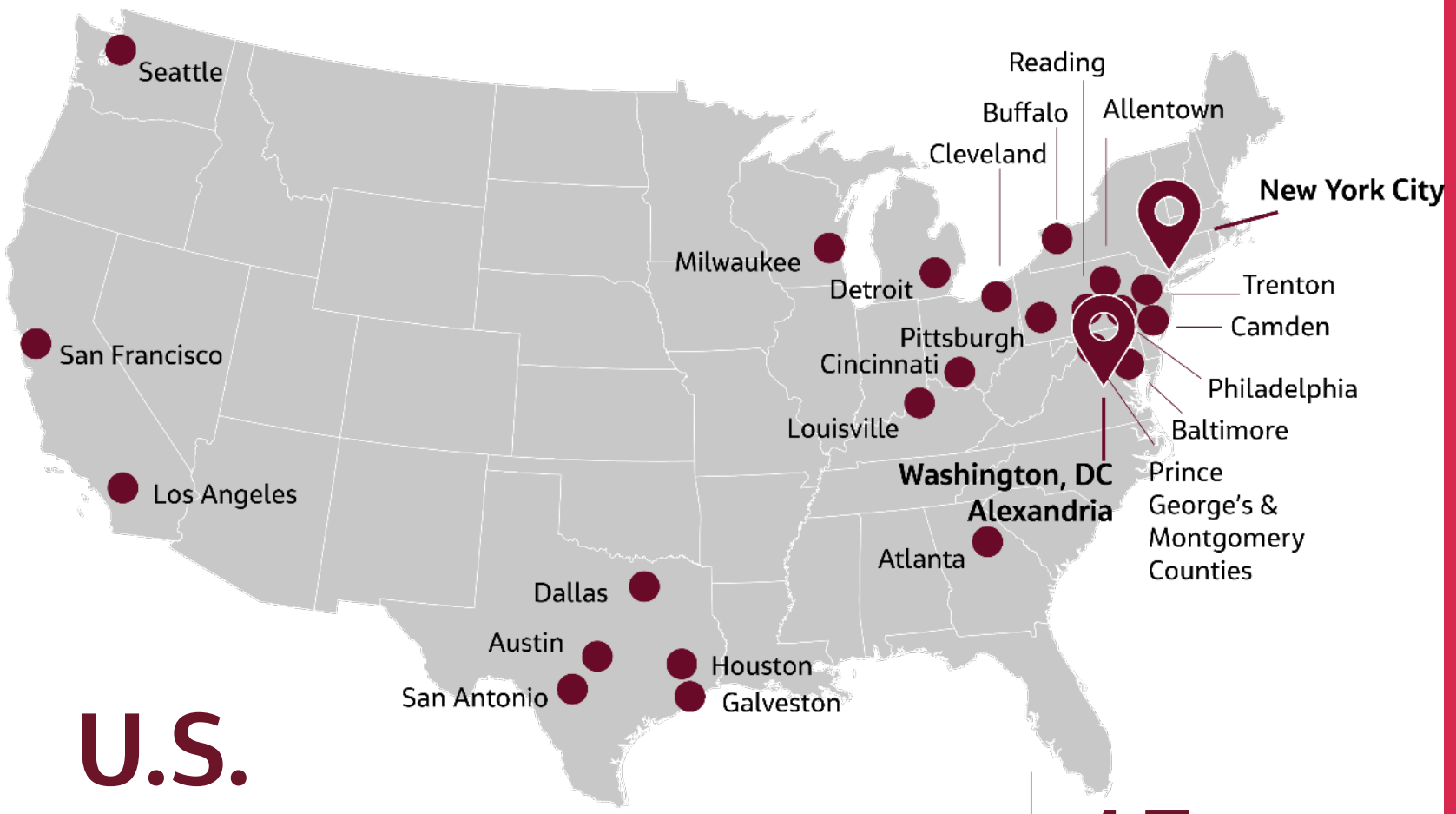
Case Study: Edinburgh City Centre Transformation

£420M
Total Measured Benefit

- Increase in Economic Activity **+£60M**
- Accident Prevention **+£25M**
- Active Travel Increase **+£25M**
- Increased Accessibility **+£70M**
- Air Pollution Reduction **+£140M**
- Enhanced Public Spaces **+£80M**

Utilities and Urban Revitalization

A U.S. Water Perspective

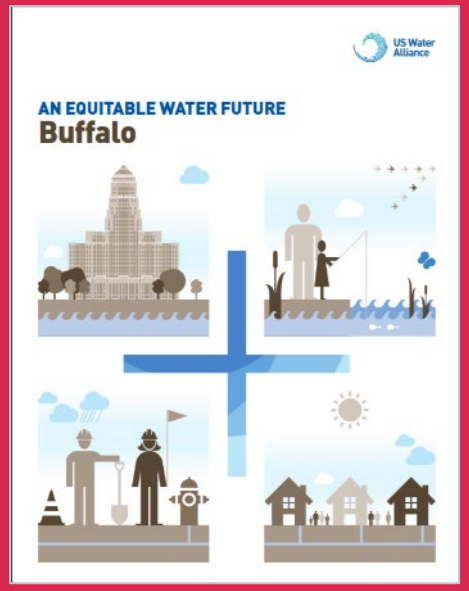


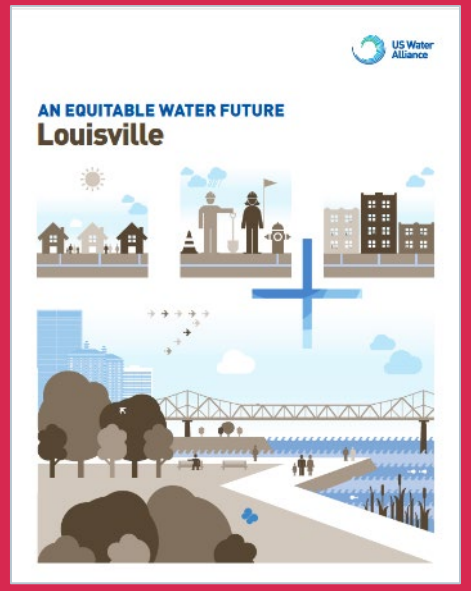
U.S. Water Utilities

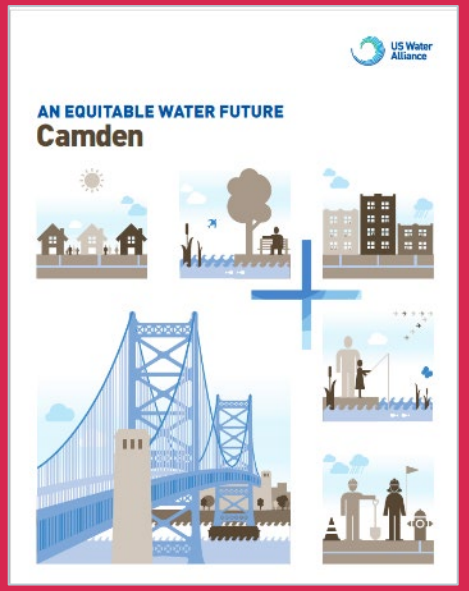
50K Water Utilities | **15K** Wastewater Utilities

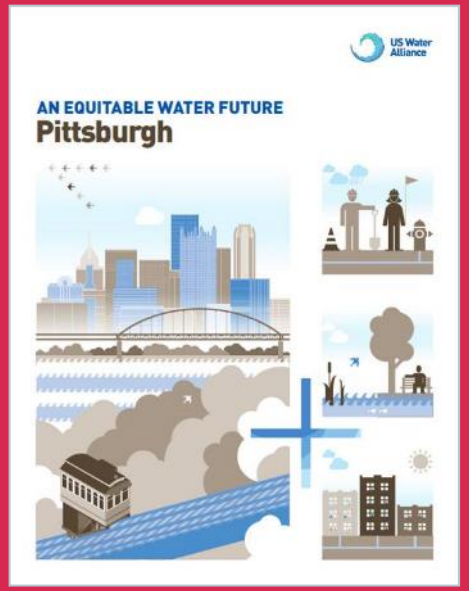
65,000 Water Utilities

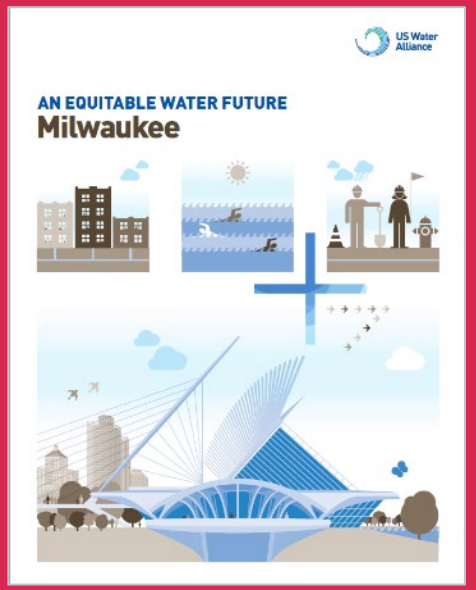
Water Utilities Nationwide Committed to Social Value

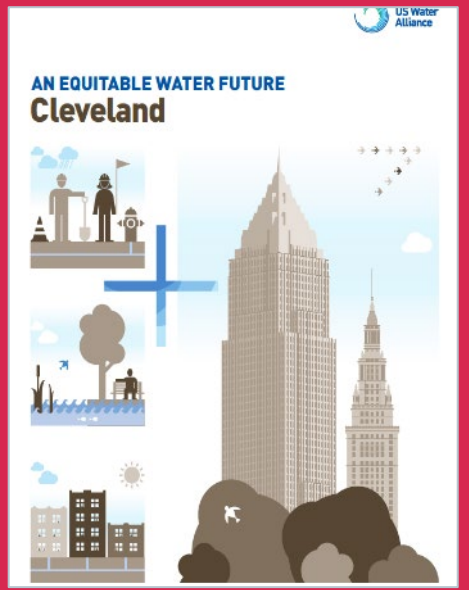












Social Value in New York City

WORKFORCE DEVELOPMENT

SECOND CHANCE EMPLOYMENT

STAKEHOLDER ENGAGEMENT

NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION

8.6M
Residents Served

Social Value in Greater Washington, D.C.

WATER EQUITY

ENVIRONMENTAL JUSTICE

INFRASTRUCTURE POLICY

AlexRenew Enterprises

300K
Residents Served

Future of Social Value

- Federal, state, municipal and agency-led priorities re: justice, equity, diversity and inclusion
- Compliance with policies and regulation
  - President Biden's Build Back Better and American Jobs Plans
  - $111B allocated to the Water Sector
  - $100B for Workforce Development
  - EPA Environmental Justice Priorities

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Challenging today.
Reinventing tomorrow.

Q & A

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Thank You

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