AECOM

WORKING SUSTAINABLY AND TACKLING THE CLIMATE EMERGENCY

WATER HAS NO BOUNDARIES

It can be easy to take water for granted. When water infrastructure is working well, we expect clean water to flow from our taps, sewage to be treated out of sight, and heavy rain to drain from our streets and away from our homes.

Our expectations of water infrastructure are starting to change due to a confluence of two factors. Firstly, infrastructure constructed more than a hundred years ago is showing signs of age at a time when the true scale of the challenges presented by climate change are being realized. Secondly, demand for water is also increasing. Cities are racing to keep up with increasing urban populations, address social inequities, attract new businesses, and compete globally for economic investment.

To avoid stretching water-related infrastructure to breaking point, new thinking is required.

> **WE NEED TO CONSTANTLY UPDATE OUR APPROACH AND REINVEST IN OUR WATER INFRASTRUCTURE, WHETHER IN OUR FLOOD PROTECTION SYSTEMS OR IN OUR CLEAN WATER SUPPLY.**

FOUR AREAS ARE RIPE FOR CHANGE

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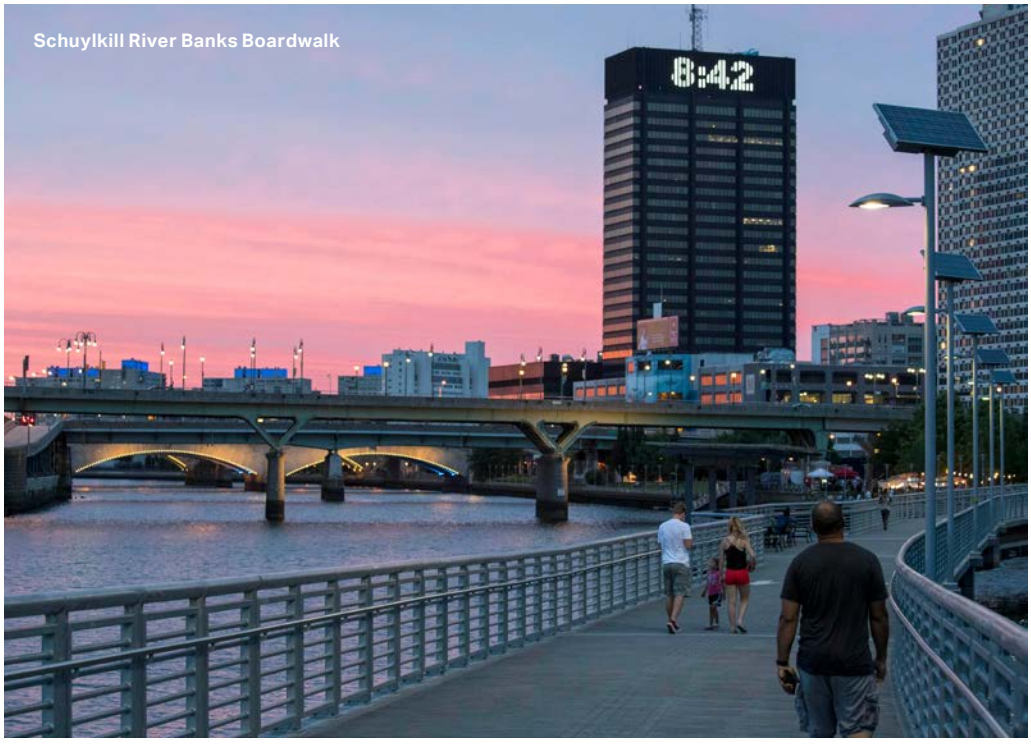
We must plan for the need for ongoing investment in water infrastructure. While considerable uncertainty surrounds the exact extent and timing of sea level rise impacts and flooding from future storms, the question is not if but when.

> THE BUSINESS CASE FOR INFRASTRUCTURE PROJECTS SHOULD TAKE INTO ACCOUNT SOCIAL AND ENVIRONMENTAL BENEFITS.


Schuylkill River Banks Boardwalk

Generally, as the models improve, they are showing that impacts are occurring more quickly than previously predicted (in line with current observations). This means we need to constantly update our approach and reinvest in our water infrastructure, whether in our flood protection systems or in our clean water supply.

2/

Individual municipal budgets are stretched, so cities must collaborate across jurisdictions and agencies. Joint powers authorities and other cross-jurisdictional forms of governance can take the lead in solving water infrastructure problems that affect multiple cities and communities at once. After all, flooding does not respect physical, political, or socio-economic boundaries.

3/

New financing methods are needed. Traditionally, infrastructure projects have been funded by raising taxes or through insurance premiums as well as utility fees. These sources are insufficient given the scale of investment needed. Initiatives like the Milken Institute's Financial Innovations Labs series brings together key experts and decision makers to identify new ideas and develop proposed solutions for raising money and tapping into new combinations of financial sources to tackle our most pressing economic development challenges.

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kilometer-long, Thames Tideway Tunnel to be built beneath London to prevent sewage overflows from reaching the Thames

4/

The business case for infrastructure projects should take into account social and environmental benefits. Rallying support for these projects is easier if the community understands not only the dangers that these projects seek to prevent, but also the additional benefits from combining infrastructure enhancements with other benefits they can enjoy.

In this article, we provide examples of best practices in each of these areas.

Be vigilant and keep investing

Many of our major cities are located on the coast or on the banks of rivers, where the need to invest in infrastructure is acute. In 1982, London completed the Thames Barrier, steel gates that can close to protect most of Greater London's floodplain from high tides and stormwater surges. However, rising sea levels and more powerful storms combined with population growth means the Thames Barrier cannot cope alone. The city's combined sewer system, constructed in the mid-1800s, has reached capacity. On average, sewage overflows[1] into the river 50 times a year. Further investment is needed to manage overland flooding.

Part of the solution is the Thames Tideway Tunnel[2], a £4.2 billion (US$6.4 billion) project to build a 25-kilometer-long tunnel beneath London to prevent sewage overflows from reaching the Thames. It is slated for completion by 2024. The UK government recognized that the project was nationally significant, highlighting the government's need to be constantly engaged in new efforts to mitigate and adapt to an unpredictable and changing climate.

Cooperate across administrative borders

Municipal agencies have traditionally operated with siloed budgets with narrow performance indicators. They rarely have the mandate to work across agencies to solve present and looming challenges. However, when cross-departmental collaboration occurs successfully, tangible benefits can be realized, as the Resilient Corridor project in Chicago shows.

Apply innovative financing models

Even when there are technical solutions to known water infrastructure challenges, financing can still be a challenge. Innovative approaches to pay for these essential projects are still needed, and many communities, such as New York, have embarked on initiatives that can inspire and inform other cities and regions. →

MANAGING CHICAGO'S STORMWATER FLOODING WITH RESILIENT CORRIDORS

After a severe rainstorm in 2013, City staff from the Departments of Planning, Water Management, Transportation, Office of Emergency Management and Communications, the Mayor's Office, and staff from the Metropolitan Water Reclamation District convened to consider strategies to protect the city against stormwater damage. As a result of this collaboration[3], the city secured a Housing and Urban Development Block Grant for their Resilient Corridor Project, which develops landscapes to conserve water and lower runoff rates on city-owned land that is maintained by community volunteers. Work began in 2017, and now instead of floods, communities have new green and amenity space, enhanced public realm, and improved neighborhood resilience.

CHICAGO'S HUMBOLDT PARK BEACH'S SWIMMING AREA REBORN

Chicago's Park District and Department of Streets and Sanitation have also successfully collaborated to improve the efficiency of public spending and create attractive and safe community spaces at Humboldt Park Beach in Chicago's West Side.

The Park District created the beach[4] in 1973 by altering part of an existing lagoon, providing a popular swimming area for local residents. However, the swimming area depended on the municipal drinking supply for its water, an expensive way to operate a public amenity like this. Water quality issues often forced temporary closures, which finally caused the city to close the beach. The Park District and the Department of Streets and Sanitation came together to review their capital programs and their key performance indicators. Instead of creating new sewers at the park, they realized that if they both invested in a wetland treatment landscape, they could clean stormwater locally and use it to supply the swimming facility. This solution had the added benefit of decreasing the burden on the wastewater treatment network being built by the Chicago Department of Streets and Sanitation in the area. As a result of these joint efforts, the beach reopened in August 2016.

THE RESILIENT BY DESIGN CHALLENGE'S RESILIENT EQUITY HUBS IN OAKLAND

San Leandro Bay touches the Oakland Coliseum area, the main island of the City of Alameda, Bay Farm Island, Oakland International Airport, and the San Leandro watershed. Cross-jurisdictional coordination is therefore essential.

In 2017, the Resilient By Design Bay Area Challenge[5] was launched, bringing together nine design teams to collaborate with communities and municipalities to improve resilience in the face of rising sea levels, storms, and flooding. AECOM led one of these design teams, the All Bay Collective[6], focusing on the San Leandro Bay Estuary to tackle sea level rise, groundwater flooding, and social equity.

After extensive interaction with various community groups and other stakeholders, the All Bay Collective developed several long-range proposals; among them a governance idea for Resilient Equity Hubs[7]—alliances among agencies, community advocates, and residents who commit to share resources across jurisdictions and boundaries.

Shared governance arrangements such as a joint powers authority and combined special districts, dedicated to topics such as geological hazard abatement or community benefits, can help communities implement their visions of resilience across city borders. These arrangements elevate acute social equity challenges, currently thought of as one community's problem, to regional importance and enable issues like neighborhood flood protection to be addressed and integrated as part of large critical infrastructure improvements. Many of the lessons learned are now informing SPUR's regional strategy[8] and also work with the San Francisco Planning for the Islais Creek Resilience Plan[9].

NEW YORK'S RESPONSE TO HURRICANE SANDY

In 2012, when Hurricane Sandy hit the East Coast, it resulted in more than 40 deaths and cost the city $19 billion in both damages and lost economic activity. As climate change continues to supercharge storms and raise sea levels, the next storm could be even more damaging. The city's own climate resilience master plan[10] estimates that properly protecting the Lower Manhattan Financial District from both sea level rise and inland flooding by expanding the East River shoreline could cost as much as $10 billion—far more than the city's current capital plan budget. Possible federal funding can only provide so much support.

To identify possibilities for funding resiliency initiatives along the coast of Lower Manhattan, the Milken Institute, a nonprofit economic think tank, held a Financial Innovations Lab[11] in April 2019. The lab workshop assembled municipal officials, academics and advocates, insurance industry representatives, investors and financial institutions, and nongovernmental organizations to discuss potential innovative models for funding climate resilience.

The result was a series of recommendations that could close the funding gap for the Lower Manhattan Coastal Resiliency program by improving data collection and risk quantification, expanding municipal bond options, creating an insurance surcharge that would feed into a state or regional trust fund, and exploring the possibility of raising funds by working with private developers, including perhaps selling air rights or development rights to newly created land or setting up tax increment financing.

Also discussed in the Financial Innovations Lab was Goldman Sach's finding that in the state of New York, there were $47 billion worth of property, casualty, and title insurance premiums in 2017, and that applying a 2 percent surcharge to these policies could accelerate funding for the much-needed programs for Lower Manhattan as well as other resilience programs across the state.

SAN FRANCISCO PUBLIC UTILITIES COMMISSION REALIZES RESILIENCE THROUGH INFRASTRUCTURE AND COMMUNITY BENEFITS

The San Francisco Public Utilities Commission (SFPUC) launched a 20-year program to invest in upgrading the city's aging combined sewer system, parts of which are more than 100 years old. Dubbed the Sewer System Improvement Program (SSIP)[12], it will improve not only the gray infrastructure, which manages wastewater, but also green infrastructure, which manages stormwater. To convince the public, who must bear the impacts of such a massive construction effort in their neighborhoods, authorities are keen to communicate how this will improve residents' lives. The SFPUC developed a Triple Bottom Line calculator with AECOM to help articulate the economic, environmental, and equity performance of design alternatives to allow the public to decide which project to support.

One of the SSIP's green infrastructure projects, the Mission Valencia Green Gateway[13], improved stormwater management by creating rain gardens and installing permeable pavements. Rainwater can percolate through the soil before entering the sewer system, avoiding sudden surges that can lead to overflows. As part of the work, the SFPUC created a new corner plaza and improved the streetscape to enhance access for pedestrians, bicyclists, and transit riders.

Address inequity

In many of our cities, low-income neighborhoods and regional critical infrastructure are often co-located in lower-lying areas that are more vulnerable to flooding. As the Federal Emergency Management Agency redraws its flood maps, many of the most economically challenged populations are finding their home insurance rates skyrocketing, destabilizing many of our communities. At the same time, adjacent large-scale infrastructure critical to our regional mobility and economic development must be rebuilt to withstand climate challenges. If the economic benefits of stabilizing these challenged communities are considered when planning large-scale infrastructure programs, it could unlock new funding streams — enabling projects that might otherwise go unfunded.

Large catastrophes like hurricanes and flooding command media attention, but the day-to-day impacts from seasonal rains and high tides affect regional infrastructure and hurt mostly low-income communities by flooding basements, giving rise to mold problems, and backing up sewers. These everyday challenges of groundwater flooding should be given as much consideration as the long-term threats from storm events or sea level rise.

The analysis can also lead to opportunities to create new open spaces—sorely needed in many urban communities—to improve air quality and build affordable housing.

By demonstrating that well-made investments can have multiple benefits, cities can increase investment opportunities. Multiple-benefit approaches can guide infrastructure design, rally support from a broader range of community members, and widen the range of potential funding sources. WL