



PARKS THAT PROTECT

LEVERAGING WATERFRONTS FOR RESILIENT COMMUNITIES

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ABOUT THIS REPORT

As cities around the globe grapple with the mounting impacts of climate change, local leaders are looking to waterfront parks as powerful tools with which to build resilience. This report features innovative waterfront park projects from around the world that are designed to withstand storms and rising waters and protect their neighborhoods from climate threats, all while improving residents' health and quality of life. These leading-edge case studies provide valuable insights for city officials, developers, and nonprofit partners working to create resilient waterfront parks in their own communities.

Cover photo: Meandering through a restored freshwater swamp, Rasau Walk in Jurong Lake Gardens, Singapore, offers visitors a unique viewpoint to admire more than 50 species of native plants. (National Parks Board, Singapore)

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Waterfront parks can help build resilience by protecting neighborhoods from climate threats and improving health and well-being for residents.

INTRODUCTION



NATIONAL PARKS BOARD, SINGAPORE

Cities worldwide are grappling with a range of climate change impacts and using waterfront parks to build resilience.

Waterfronts have long played pivotal roles in the development, adaptation, and success of cities. From being centers of industry to public spaces, arts and cultural hubs, and mixed-use districts, urban waterfronts have evolved to meet the challenges and opportunities of their times. Today, they are ground zero in the fight against climate change—and a key part of building resilient, healthy, and equitable cities for the future.

Cities worldwide are grappling with a range of climate change impacts, including more frequent and severe storms, flooding, drought, and extreme heat. Urban areas located on the ocean or rivers face the added threats of sea-level rise and heavy

precipitation events. All of these have significant implications for urban infrastructure, economies, health, and quality of life.

While urban waterfronts can heighten the climate change challenges that their communities face, they can also be important components of the solution. In cities around the globe, public- and private-sector leaders are redeveloping waterfront properties as parks and open space. Not only are these projects reconnecting residents to the water and providing substantial health and environmental benefits, but they are also increasing citywide resilience to the impacts of climate change. With thoughtful planning and design, waterfront parks can withstand flooding

and storms, recover quickly, and protect the neighborhoods around them from climate impacts.

This report describes innovative waterfront park projects from around the world that are built to outlast rising waters and severe weather and protect their neighborhoods from climate threats, all while improving residents' health and quality of life. The seven leading-edge case studies described herein offer valuable insights for city officials, developers, and nonprofit partners working to create resilient waterfront parks in their own communities.

Equity, Parks, and Climate Change

Everyone deserves a great park—but far too many people are living without access to one. It is well documented that parks tend to be inequitably distributed, with communities that are primarily home to people of color and those with low incomes having access to fewer, smaller, and lower-quality parks than more affluent communities with few people of color.

In many nations, this trend is rooted in longstanding patterns of residential segregation resulting from intentionally racist policies and uneven public and private investments. In the 100 most populated U.S. cities, neighborhoods where most residents identify as Black, Hispanic and Latino/a, American Indian and Alaska Native, or Asian American and Pacific Islander have access to an average of 44 percent less park acreage than majority-white neighborhoods, and similar inequities exist in neighborhoods with high proportions of low-income residents.¹ Parks in areas with many people of color and low-income people often contain aging amenities in need of repair and are designed and programmed in ways that do not align with residents' interests or that are intentionally discriminatory. In addition, experiences with racist and discriminatory behavior may keep people of color from using parks.

Compounding these disparities, people of color and low-income people are particularly vulnerable to the impacts of climate change. They are more likely to live in neighborhoods and buildings with the



Parks are an essential part of thriving, equitable cities.

greatest exposure to extreme weather, such as in flood-prone areas, near contaminated sites, and in housing without sufficient insulation or air conditioning. They have higher rates of many adverse health conditions, tend to have less access to resources and information, and are frequently left out of decision-making processes, making it harder

to prepare for and bounce back from natural disasters. Even climate adaptation efforts can exacerbate inequalities. Infrastructure improvements can lead to “green gentrification,” pushing up property values and displacing low-income residents.²

1. The Trust for Public Land (TPL), *Parks and an Equitable Recovery* (2021).

2. U.S. Environmental Protection Agency, *Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts* (2021).



Inclusive community engagement during all phases of park planning and development is essential for project success.

These intertwined challenges can be addressed only with deliberate and equitable planning, policymaking, and investment. Creating waterfront parks that support resilience, health, access to opportunity, and empowerment for all city residents is an important part of that. Strategies that accomplish this include the following:

- Using data to quantify hazard risk and how park access, quality, and investment vary across a city;
- Prioritizing investments in neighborhoods and sites with the greatest needs;
- Making planning and design processes inclusive, welcoming, and easily accessible to community members;
- Contracting with community-based organizations to provide park planning, maintenance and operations, and programming and activation services;
- Redesigning park spaces and programming to reflect the culture and interests of community members;
- Providing resources for leadership development, job training, home repair, and energy efficiency to community members; and
- Making park investments that provide multiple benefits, including racial justice, equitable economic opportunity, community health and well-being, and environmental quality.³

3. Urban Land Institute, *Five Characteristics of High-Quality Parks* (2021).

ON SAFER GROUND: Floodplain Buyouts and Community Resilience

Flooding is the most expensive and common natural disaster in the United States, and managing flood risk is critical to protecting homes, local and regional economies, and community well-being. *On Safer Ground: Floodplain Buyouts and Community Resilience*, a recent ULI report, highlights how local governments across the country are increasingly turning to buyouts as one strategy to cost-effectively reduce flood risk, offer relief to residents, and potentially improve access to open space in urban areas. The report explores best practices for equitable community resilience involving floodplain buyouts and models for partnerships with the private sector.



The Role of Parks in Resilient Cities

Parks are powerful tools for building urban resilience to climate change. They reduce the urban heat island effect, improve air quality, and absorb rainfall. They support local biodiversity and act as buffer zones for flooding and mudslides. They improve community health and well-being by creating spaces for physical activity, enjoyment of nature, mental respite, and social connection. Parks—as well as many other spaces where communities come together and build relationships—make up a city’s social infrastructure, which can help reduce an area’s vulnerability to climate change. More information about the role of social infrastructure in healthy, resilient communities can be found in ULI’s *Social Spaces, Resilient Communities* report.

In addition to these benefits, waterfront parks play the important role of mitigating the impacts of sea-level rise, storm surges, and extreme heat. Thoughtful, data-driven design and strategic use of green and gray infrastructure can reduce the urban heat island effect, manage floodwaters on site, and allow the park to continue serving the community as a gathering place post-disaster.

Park features that achieve this include the following:

- Green infrastructure—such as rain gardens, bioswales, permeable pavements, and tree canopies—that absorbs and filters stormwater;
- Restored wetlands and riparian areas that absorb excess water and buffer storm surge;
- Meandering streams to slow and spread floodwaters;



Parks—as well as many other spaces where communities come together and build relationships—make up a city’s social infrastructure.

- Native landscaping that can tolerate inundation and changing water levels;
- Tree canopy to provide shade and mitigate the urban heat island effect;
- Gradually sloping, vegetated banks and open spaces to facilitate the movement of stormwater into preferred areas;
- Buildings, mechanical and electrical elements, athletic fields, playgrounds, and other key amenities that are elevated out of the flood zone;
- Lower-lying structures and landscapes that are designed to withstand flooding or be moved to higher ground; and

- Recreation fields and courts, sculptural elements, and other features that double as stormwater retention areas.

Waterfront parks can build resilience well beyond their boundaries. Site grading and terracing, berms, and flood walls block storm surges and rising waters from entering surrounding neighborhoods, and prescribed flood pathways direct water into streams, rivers, oceans, or infiltration or retention zones and keep it away from community assets. Green infrastructure captures runoff from adjacent areas, reducing pressure on water and sewer systems. Gray infrastructure and other park features can be designed to be built upon, raised, or relocated as sea levels increase.⁴

4. Urban Land Institute, *Ten Principles for Building Resilience* (2018), <https://americas.uli.org/ten-principles-building-resilience/>.

LESSONS LEARNED



CAMDEN COMMUNITY PARTNERSHIP

Trails provide connectivity to urban waterfronts, many of which have been inaccessible to the public for decades.

Every waterfront park project is unique. This report profiles seven such projects from around the world, each with its own climate risks, city and neighborhood context, community needs, and opportunities to leverage. While the details vary, several overarching lessons learned can be gleaned from these innovative efforts. These lessons can be helpful to city officials, developers, and nonprofit partners working to create resilient waterfront parks in their own communities.

GROUND DECISIONS IN CLIMATE-SMART DATA

There is an inherent level of uncertainty in climate science—it is nearly impossible to know what future greenhouse gas emission scenario will emerge. Leveraging the best, most granular data and designing for a range of scenarios are both critical to successful waterfront park design. While obtaining area-specific climate data can sometimes be difficult, project partners can opt to conduct their own site analyses that consider climate change, as the San Francisco Recreation and Park Department and the Trust for Public Land did for India Basin Waterfront Park. City climate plans and studies, design standards,

or modeling tools also can supply the needed information, as Boston's climate-resilient design guidelines for flood barriers did for Langone Park and Puopolo Playground.

When documented, previous natural disasters can also provide useful data on potential impacts and vulnerabilities at the site, neighborhood, and city levels. Past experiences can demonstrate the resilience—or lack thereof—of building materials, landscaping, water and drainage systems, and electrical and mechanical elements, and can identify best practices for the design and siting of park features.

It is critical to view individual parks in the context of their neighborhoods and cities. Without this holistic lens, interventions meant to increase resilience in one park could cause problems elsewhere. For example, elevating a waterfront park could create a “bathtub effect” in which water is trapped in low-lying interior areas. Looking beyond the site, gaining a complete understanding of how water flows through the city, and coordinating investments in waterfront and interior neighborhoods enable decisions that strengthen the resilience of the entire community.

DESIGN FOR THE FUTURE

Waterfront parks should be designed to adapt to current and future climate threats. Project partners must define the time horizon they are planning for. This will vary across a city, depending on the site location and risks. Design decisions should strike a balance between meeting today’s needs and ensuring that the park is a functional space years from now. They should also consider the range of climate impacts

to the site and employ measures that will counter extreme events like 100-year storms⁵ as well as more incremental changes like sea-level rise and regular occurrences like heavy rains. This will often require a mix of green and gray infrastructure solutions. Other climate threats such as the urban heat island effect and drought also should be taken into account.

Regardless of the planning horizon or the specific design choices, making waterfront parks flexible and adaptable to changing conditions maximizes their benefits. Flood protection infrastructure can be engineered to be built upon if flood projections change and stormwater management systems can be set up to connect to future systems on neighboring properties, as they are in Langone Park. Flexible spaces that are not designed for single uses and park amenities that are mobile or temporary increase adaptability. For example, picnic tables, lighting, plants, and even restrooms on trailers in the lower section of Cincinnati’s Smale Riverfront Park can easily be relocated to higher ground.

INVEST EQUITABLY ACROSS CITIES AND NEIGHBORHOODS

Climate impact data should be overlaid with other site- and community-level information to equitably distribute investments. Waterfront park projects should be prioritized in the neighborhoods with the greatest need. This includes vulnerability to climate change as well as other health, environmental, and economic disparities that stem from decades of underinvestment.

Park professionals are looking at site-level indicators such as historic investment, physical condition, maintenance outcomes, and park size, and placing them in the context of the vulnerabilities and needs of the surrounding community. Common metrics include the percentages of the population that are of color, with low incomes, or overweight or obese; population density; projected population growth; and housing vacancy rates. Practitioners are also examining environmental factors such as tree canopy, heat island effects, flood risk, distance to



India Basin Waterfront Park, San Francisco, California.



Detroit Riverfront Park, Detroit, Michigan.

⁵ The terms *100-year storm* or *100-year flood* refer to storms and floods that have a 1 percent chance of occurring in a given year, not that they occur every 100 years.

the nearest park, and the existence of bicycle and pedestrian infrastructure. India Basin Waterfront Park's Equitable Development Plan places the project in the context of demographic and health data and the legacy of environmental racism and disinvestment in the neighborhood, in an intentional effort to improve economic opportunity and health for its residents, particularly Black residents.

Conducting these data-driven, systemwide evaluations and applying them to inform capital and operations spending can support waterfront park projects that help address the enormous inequities faced by communities of color and low-income communities.

TAP INTO THE COMMUNITY AS PARK CO-CREATORS AND OPERATORS

Like any park planning or management effort, the development and operation of waterfront parks should be rooted in inclusive community engagement and partnership. The more community members see their interests and identities reflected in the space itself, the activities it hosts, and how it is run, the more successful the park will be.

Engagement is most effective when it begins well before decisions are made so that input can shape plans and designs. The first phase of Singapore's Jurong Lake Gardens redevelopment was informed by a multiyear outreach campaign that produced 17,000 suggestions and directly influenced the process and ultimate outcome. Project partners should seek out the perspectives of park users and nonusers as well as people who are often left out of decision-making processes, including people of color, people who have low incomes, people who speak nondominant languages, youth, seniors, and disabled individuals.



Langone Park and Puopolo Playground, Boston, Massachusetts.

It can be helpful to work with neighborhood associations, community development corporations, youth organizations, workforce training providers, churches, scout troops, local businesses, arts organizations, and friends-of-the-park groups that have established relationships with residents. Some projects, such as the Detroit Riverfront and India Basin Waterfront Park, have created dedicated advisory committees that were intimately involved throughout the process and supported broader outreach. Compensation can facilitate more inclusive engagement.

Early outreach should be approached as a step in a longer process of relationship-building, which can extend to park maintenance, operations, programming, and activation. Community-based organizations can play active roles, often through contracts or other paid arrangements.

Co-creation might require the testing of new approaches. Project partners might want to support the development of citizen-initiated ideas, run an iterative and transparent design process, or hire a middleman to manage and maximize community engagement as was done for Rotterdam's Heliport Square.

Two-way learning and sharing between project partners and community members can be helpful to create a shared understanding of the climate risks and adaptation opportunities at the site. Though the public may not have the expertise to weigh in on technical questions, communities experiencing climate change can help design teams understand the small and large ways that various hazards negatively affect their everyday life. These ongoing communications about the design process can facilitate long-term trust and mutual benefit for the community and project partners.



Langone Park, Boston, Massachusetts.

EMBRACE NATURE

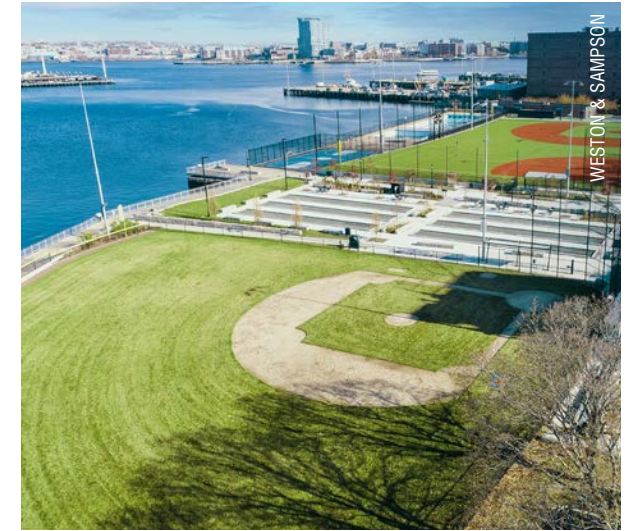
By fully embracing nature in their design, waterfront parks can boost their resilience while strengthening the other environmental and health benefits they provide. This principle holds true both along the shore and inland. Many waterfront parks have transformed concrete walls and stone-encased banks to softer-edged living shorelines, such as in Nassauhaven in Rotterdam. These typically have gently sloping banks that provide habitat for native plants, nooks in which fish can rest and spawn, and migratory pathways for birds. They also buffer storms, slow down and filter stormwater, and reduce erosion.

In the upland sections of waterfront parks, adding green infrastructure such as rain gardens, bioswales, and lush tree canopies can capture rainwater where it falls, reducing runoff and recharging groundwater aquifers. These features also cool temperatures and improve air quality.

One of the greatest benefits of waterfront parks is their ability to reconnect people to the water. Visual and physical connections are both important. Shoreline trails, observation areas, and clear sight lines through the park can renew the water's presence in community life and invite people to explore. Waterfront parks should also provide access points for fishing, boating, swimming, and playing that are safe and usable by all. Jurong Lake Gardens features a shoreline boardwalk, a water play area, and a series of naturalized meandering streams—once a concrete drain—that both entice people to explore and mitigate flood risk.

MAKE EVERY DOLLAR MULTITASK

Every feature of a waterfront park should provide multiple benefits to the community. Potential benefits include climate resilience, health and well-being, social equity, racial and environmental justice, and



Langone Park and Puopolo Playground, Boston, Massachusetts.

water and air quality. Making every investment multitask will create usable, attractive spaces that provide first-rate recreational experiences while advancing bigger-picture resilience and environmental goals.

Resilience-building elements should blend seamlessly into the park and perhaps not even be noticeable to users. Langone Park's seawall does double duty as terraced seating and an overlook with harbor views. Smale Park's Great Lawn is a concert amphitheater and event space designed for stormwater infiltration, and the steps that connect its series of terraces create a stunning procession from downtown to the water's edge. Flood protection infrastructure that is not well integrated can stand in the way of the other goals of a high-quality park.

CONVENE DIVERSE PUBLIC AND PRIVATE PARTNERS TO PLAN, FUND, AND MANAGE PARKS

Resilient waterfront parks can be complicated projects. Successful development efforts engage potential public and private partners early in the planning phases. These can include entities with funding resources, technical expertise, staff capacity, strong networks, regulatory authority, and land or infrastructure ownership and management roles. The New Jersey Department of Environmental Protection was deeply involved in Camden's Cramer Hill Waterfront Park project years before shovels hit the ground, contributing significant staff, technical, and financial resources over the course of two decades.

Waterfront park projects often bring in government agencies at the national, state, provincial, and local levels. Municipal parks and recreation, environment, and planning departments tend to be closely involved. Public works and transportation agencies and water utilities get engaged when projects include water and sewer infrastructure and streets, sometimes



Jurong Lake Gardens, Singapore.

coordinating efforts to increase efficiency and save money. State-, provincial-, and national-level agencies can support brownfield remediation and infrastructure investment. In the United States, the U.S. Army Corps of Engineers may be undertaking related construction, and the Federal Emergency Management Agency (FEMA) is involved in the development and maintenance of flood protection infrastructure.

On the private-sector side, planning and designing waterfront parks is a collaborative effort among engineers, scientists, and landscape architects. Project teams frequently engage owners of surrounding properties, which may include ports and other current or former industrial entities, as well as the real estate developers of new mixed-use projects taking shape along the waterfront.

Partnerships with developers can marry the resources and skills of the public and private sectors to produce greater community benefits. For example, developers can ensure connectivity between their projects and waterfront parks and even incorporate public open space into their developments, increasing overall acreage. They may be able to act more quickly and flexibly than parks departments, experiment with innovative park designs and programs, and provide funding, equipment, and personnel for park maintenance.

Local and regional environmental organizations also tend to be at the table. Given the costly nature of resilient waterfront parks, foundations and corporate funders can be catalysts for redevelopment.

Ongoing park operation also should be a joint effort. Friends-of-the-park groups, conservancies, and other community-based organizations often take active roles. Interagency cooperation can be necessary; for

example, parks and recreation and environmental departments may need to share equipment and labor responsibilities for clearing and cleaning green infrastructure features.

Having a dedicated organization like the Detroit Riverfront Conservancy or the Camden Community Partnership leading waterfront park development and operations can help manage these complex projects. These organizations can be effective conveners, fundraisers, providers of staff and technical capacity, and coordinators of community engagement. Their long-term involvement builds trust and supports successful projects with enduring, equitable impact.

LEARN FROM PAST EXPERIENCES TO BUDGET ACCURATELY

Resilient waterfront parks can be expensive, especially if they include significant flood protection infrastructure expected to function on a neighborhood scale. Repeatedly revising cost estimates and requesting additional funds can be time-consuming, create resistance among decision-makers and the public, and delay project implementation. With more examples of resilient waterfront parks available worldwide, project teams can learn from these previous experiences to budget accurately upfront, and to set expectations that parks providing multiple benefits to the community—including climate resilience benefits—may require greater initial investment than more conventional parks have in the past.

In addition, project partners should develop a strategy to fund ongoing park maintenance and allocate resources for that purpose as early as possible. Providing sustainable operations and maintenance funding will ensure that waterfront parks live up to their potential over the long term.

CRAMER HILL WATERFRONT PARK

CAMDEN, NEW JERSEY

QUICK FACTS

OWNERS/OPERATORS:

[City of Camden](#), [Camden County](#)

DESIGNERS:

[CDM Smith](#), [JPC Group](#)

DEVELOPER:

[New Jersey Department of Environmental Protection](#)

SIZE:

62 acres (25 ha)

COST:

\$48 million

STATUS:

The park opened in 2021. As of 2023, local partners are developing a plan for park operations, maintenance, and programming.

KEY INSIGHT:

Close collaboration among community members and partners from across sectors and levels of government, including funders, produces waterfront parks that realize residents' visions.



Cramer Hill Waterfront Park has transformed an 86-acre (35 ha) municipal landfill into an urban oasis containing abundant green space and direct access to two rivers.

Overcoming Camden's history of economic and environmental justice challenges, [Cramer Hill Waterfront Park](#) has turned an 86-acre (35 ha) municipal landfill into an urban oasis containing abundant green space and direct access to two rivers. With the community's vision, nonprofit organization support, and effective intergovernmental collaboration, Cramer Hill was able to reclaim its riverfront for recreation, education, and the enjoyment of nature.

“This park represents equity and justice in the city. Residents are no longer exposed to a space where crime thrived, where illegal dumping took place daily, and where parents had to keep their kids away from this landfill. Today, this green space rivals any park in the state and represents the kind of investment and change that Camden deserves.”

—Commissioner Jeff Nash (from [this article](#))

Park Overview

Today, visitors to Cramer Hill Waterfront Park would never guess that it was once a landfill. Opened in 2021, the park has reconnected neighborhood residents with their waterfront and become a vital community asset. The city of Camden's largest park, it provides plentiful green space dotted with an array of recreational amenities, from walking and biking trails and a picnic area to a playground and exercise stations. The site takes full advantage of its position at the confluence of the Cooper and Delaware rivers. A fishing plaza and kayak launch entice people to the water, and shoreline observation areas show off the stunning views of the Philadelphia skyline, downtown Camden, and the restored wetlands and woods along the river's edge.

Turning the Harrison Avenue landfill into a waterfront park took years of planning and partnerships. The idea gained traction with the 2009 Cramer Hill NOW! Plan, developed by local organizations and community members. The landfill had never been capped or officially closed since it stopped operating in 1971, and it harbored crime and unauthorized dumping. Neighbors were eager to see it cleaned up and transformed into a park, and to have their rivers brought out from behind contaminated property and fencing.

Around the same time, the Salvation Army was constructing the Kroc Community Center on 24 acres (9.7 ha) of the landfill, funded by \$59 million from the estate of Ray and Joan Kroc. That started a conversation with the city, Camden County, the New Jersey Department of Environmental Protection



As the most significant neighborhood investment in years, Cramer Hill Waterfront Park was designed to withstand flooding and reduce its impacts to the surrounding area.

(NJDEP), and the community about reusing the rest of the site in a resilient and sustainable way. These discussions led to the NJDEP providing \$74 million to fund the remaining landfill's closure and cleanup, shoreline protection, natural resource restoration, and park construction.

The development of Cramer Hill Waterfront Park spurred improvements to surrounding streets, which were high-speed and dangerous. The street grid is being reconnected, roads are being extended into the park, and sidewalks, bike lanes, and lighting are being added. In addition, the park will connect to the Circuit Trails, Greater Philadelphia's regional trail network.

Social Equity and Community Engagement

Close, sustained partnerships and active nonprofit organizations have meant that Camden residents were at the table throughout the planning and development of the waterfront park. The Camden Community Partnership was a key convener, facilitator, and fundraiser. For example, their Camden Collaboration Initiative, which brought together dozens of public and private entities to focus on environmental impact and sustainability in communities of color, seeded many of the relationships that brought the waterfront park to fruition and put environmental justice front and center. In addition, the NJDEP invested significant staff and technical resources over the course of two decades to ensure that residents were meaningful contributors throughout the environmental remediation, design, permitting, and construction phases of the process.

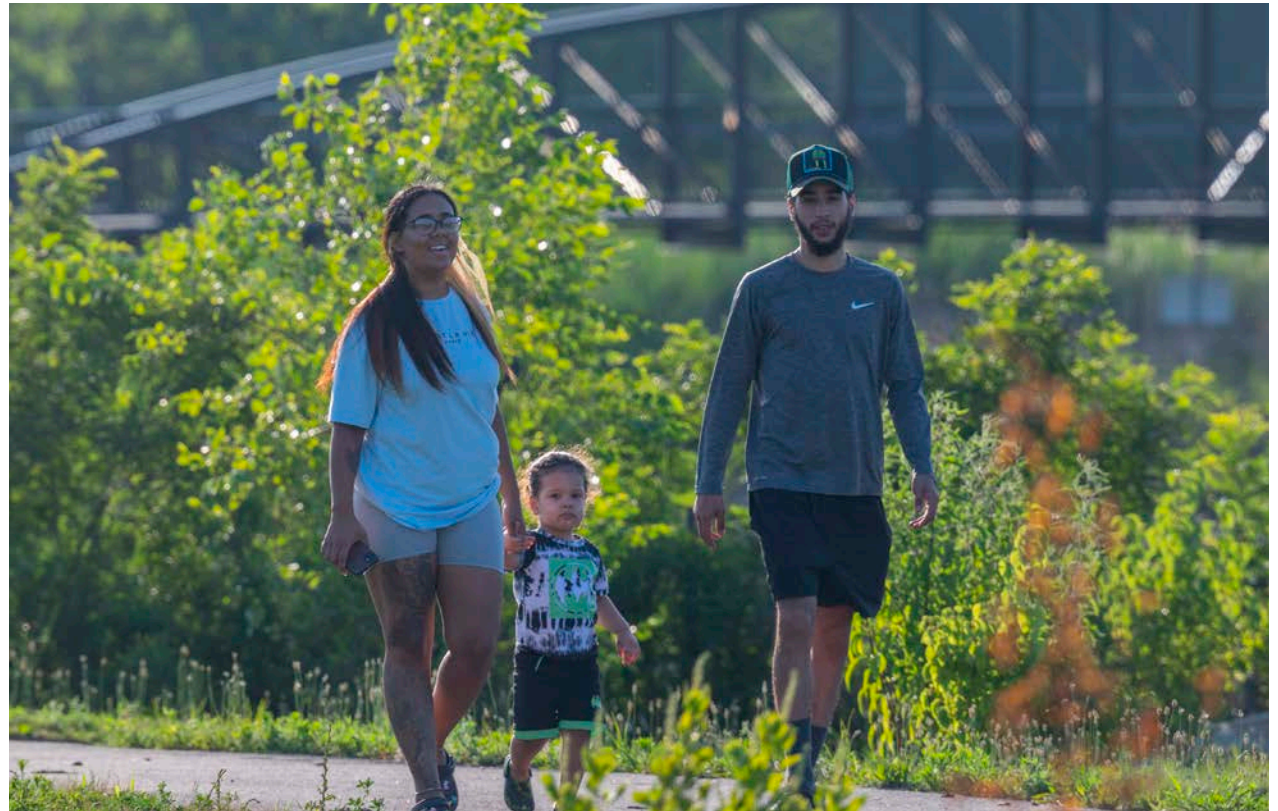
The Cramer Hill Community Development Corporation (CDC) facilitated much of the community engagement in the park planning. Over many years, they proactively sought out community leaders and hosted open houses at churches, schools, and public housing developments. The CDC organized a regular monthly meeting on the project, where community members sat together with staff from the NJDEP, city, county, Camden Redevelopment Agency, police department, Salvation Army, design firms, and others.

This strong engagement helped reject a large-scale development proposal in the early 2000s that did not align with the community's priorities and

heightened concerns about gentrification and displacement. This event further mobilized the neighborhood and seeded new partnerships, ultimately resulting in the resident-driven Cramer Hill NOW! Plan. The plan includes anti-displacement strategies such as expanding financial assistance to homeowners for home improvement projects, creating a housing resource center, and developing existing infill sites.

After a 2019 ULI national study visit, local partners are exploring how to maintain, operate, and program the park in ways that are cost-effective,

leverage partnership opportunities, and maximize the community benefits of the new space. The panel of experts recommended establishing a nonprofit entity to manage the park, hiring park rangers from the community, and expanding community-led programming, including by allocating small grants to neighborhood organizations. The city has committed to using American Rescue Plan Act money to create a youth ambassador program, and various community organizations are providing park programming and activation, ranging from monthly kayaking events to kite competitions to yoga and Zumba classes.



The park's walking and biking paths will connect to the Circuit Trails, Greater Philadelphia's regional trail network.

Resilience

Flooding is a major problem in Cramer Hill, one of the lowest points in Camden. During storms, rainfall overwhelms the city's outdated water infrastructure, causing costly and disruptive flooding in homes, businesses, and streets. These floods are becoming all too frequent as the climate changes. And since Camden has a combined sewer system, with wastewater and sewage using the same pipes, the floodwaters are contaminated with human waste, posing risks to human health.

As the most significant neighborhood investment in years, Cramer Hill Waterfront Park was designed to withstand flooding and reduce its impacts to the surrounding area. Over 3,000 feet (914 m) of shoreline were regraded and stabilized, and almost 400,000 cubic yards (306,000 cu m) of soil were moved to the center of the site. This created an elevated buffer against riverine flooding, as well as a scenic summit vista.

The project also involved the creation of seven acres (2.8 ha) of new freshwater wetlands on both the Cooper and Delaware rivers, which further

protect the shoreline and provide habitat for plants and animals. The park's wetlands, extensive green space, rain gardens, and swales absorb and filter stormwater, reducing flooding and pollution flowing into waterways.

In addition, the park supports the resilience of ecosystems and species along the river. Existing trees were preserved as forage habitat for bald eagles and other wildlife, and 375,000 more were planted. The park's fishing pond contains habitat structures for fish and turtles. Moreover, the project capped solid waste and contaminated soil that was exposed on the surface of the landfill and polluting the water.

Building on the park's success, local partners are undertaking additional projects to mitigate flooding in Cramer Hill. The city and utility are working on preliminary designs to convert Harrison Avenue into a green street, and Drexel University is using sensors in storm outlets to collect data on flood events.



Over 3,000 feet (914 m) of shoreline was regraded and stabilized to create a buffer against riverine flooding.

DETROIT RIVERFRONT

DETROIT, MICHIGAN

QUICK FACTS

OWNER/OPERATOR:

[Detroit Riverfront Conservancy](#)

DESIGNERS:

[Skidmore, Owings & Merrill](#), [SmithGroup](#)

DEVELOPERS:

[Detroit Riverfront Conservancy](#), [Hines](#),
[Jones Lang LaSalle](#)

SIZE:

5.5 miles (8.8 km)

COST:

\$300 million

STATUS:

The 3.5-mile (5.6 km) East Riverfront is almost complete; there is still work to be done on the two miles (3.2 km) of the West Riverfront. Construction is underway at Ralph C. Wilson Jr. Centennial Park, a key site on the western portion.

KEY INSIGHT:

Having a dedicated organization responsible for the development and management of a waterfront park is vital to inclusive planning, effective fundraising, implementation of a complicated project, and long-term impact.



STEPHEN MCGEE

DETROIT RIVERFRONT

The renewed riverfront will eventually extend 5.5 miles (8.8 km) and provide plazas, play areas, and green spaces—all connected by the riverwalk.

With tremendous vision, support from public and private partners, and close community collaboration, the [Detroit Riverfront](#) is transforming a string of abandoned factory sites along the city's international waterfront into a landmark destination for residents and visitors alike. The leadership of the nonprofit Detroit Riverfront Conservancy, charged with the parks'

improvement, operations, security, maintenance, and programming, has supplied the capacity for intensive public engagement and the implementation of this complex, 5.5-mile-long (8.8 km) project.

Park Overview

Today's Detroit Riverfront is the result of a remarkable transformation. Though the city's downtown riverfront has been home to iconic destinations like the GM Renaissance Center and the Joe Louis Arena in recent decades, it was otherwise dominated by empty warehouses and parking lots, and the water was inaccessible and out of sight.

City visionaries had long dreamt of a riverfront park and promenade, and the turning point came in the early 2000s when General Motors purchased the Renaissance Center and developed plans to open its waterfront to the public. The Kresge Foundation made a \$50 million capital challenge grant—the largest grant in its history—and invited other funders to match this commitment. That partnership brought seven more property owners to the table and inspired an additional \$117 million to launch the riverfront's revitalization.



The continuous greenway provides ample opportunity for walking, biking, and rolling.



ALANNA ST. LAURENT

Public, private, and philanthropic dollars came together to revitalize the riverfront.

The renewed riverfront will eventually extend 5.5 miles (8.8 km) from the MacArthur Bridge to the Ambassador Bridge. With the remediation and groundbreaking of the former Uniroyal tire factory site, the eastern portion is almost complete. The Detroit Riverfront is made up of parks, plazas, pavilions, and green spaces, all connected by the riverwalk. Highlights include the Cullen Family Carousel, featuring animals native to the Detroit River; a universally accessible interactive water feature at Mt. Elliott Park; several play areas; and educational butterfly gardens at Gabriel Richard Park. The riverfront parks use art, ornamental paving, and native landscaping to tell the story of the Detroit River and how it shaped the

city. The West Riverfront will have a water garden, an iconic sports pavilion, a hill for viewing films and musical performances, and a world-class playground.

The Riverwalk connects to the Dequindre Cut, the first leg of an emerging greenway system called the Joe Louis Greenway. The Dequindre Cut heads north to the Eastern Market commercial district. The Dennis Archer Greenway connects East Side residents to the riverfront, and the Southwest Greenway, which opened in fall 2022, link neighborhoods throughout southwest Detroit and Corktown with the West Riverfront. These paths take advantage of vacant rail tunnels to pass underneath busy thoroughfares, providing cyclists and pedestrians with safe and uninterrupted connections to the river.

Social Equity and Community Engagement

From the outset, the Detroit Riverfront Conservancy (DRFC) has been committed to fostering open dialogue with the community and making decisions based on that engagement. The conservancy hosted over 100 community meetings before putting a shovel in the ground, and its approach went beyond traditional tactics. Recognizing that many past planning efforts have not benefited Detroiters or come to fruition, the DRFC understood that it needed to build relationships and trust.

A key strategy for the development of Ralph C. Wilson Jr. Centennial Park was creating an advisory committee made up of 21 community members. These advisers—residents of nearby neighborhoods who are active in their communities and have strong networks—were intimately familiar with the project details. They participated in educational trips, tours of the riverfront, and stakeholder interviews. Their ideas formed the basis of the request for proposals (RFP), and they were the first to hear about design updates. The committee was given a clear scope of responsibilities and a high degree of respect, and the in-depth input they provided was critical to creating a park that delivered on community needs.

The broader public had ample opportunity to engage in park planning as well. For example, the interviews for the design team were open to the public, and sessions were well attended in person and on Facebook Live. At every step of the design process, the DRFC was intentional about listening, responding, and following up. The members of the DRFC continuously reported back what they heard, shared how they changed the plans, and asked for more feedback.

Before the DRFC started work on the design for Ralph Wilson Park, the programming team wove interim activation into their suite of engagement tools. By programming spaces with light-touch events like concerts, outdoor movies, food truck rallies, and interactive activities such as touch-a-trucks, they attracted people to the waterfront and sparked ideas about what is possible in the longer term.

These approaches have nurtured trusting relationships with the community and a public space that reflects their aspirations. The carousel, butterfly garden, sandy beach, barbecue area, splash pad, and basketball courts all came about because of suggestions from the community. Ongoing programming is also responsive to resident requests. Examples include a literacy program, a walking program for seniors, and tai chi classes.



The Detroit Riverfront Conservancy hosted more than 100 public meetings to understand community needs and collect input on the project.

Resilience

Parts of Detroit, including the East Side, are susceptible to flooding during heavy rains due to their low elevations and outdated water infrastructure. With climate change, the severity and frequency of these storms are increasing, causing serious damage to residents' homes. What's more, as mentioned previously, Detroit has a combined sewer system, with wastewater and sewage moving through the

same pipes. When rainfall overwhelms the system, the water overflowing into basements is often contaminated with human waste, endangering the health of the people who live there.

While major investment in the city's infrastructure is needed to address these challenges, and they primarily affect neighborhoods several miles from the river, the Detroit Riverfront is helping capture stormwater and mitigate flooding. For instance,

Milliken State Park, a 31-acre (12.5 ha) former brownfield site, includes a restored riparian wetland that absorbs and cleanses stormwater runoff from 12 acres (5 ha) of adjacent land. The remediation of industrial sites is also reducing the risk of contaminated soils spreading during flood events and the associated health concerns.

In addition, the riverfront redevelopment is supporting the resilience of ecosystems and species along the shoreline. The seawall has been transformed into a softer-edged living shoreline made of rock and other natural materials, providing nooks in which fish can rest and spawn. This technique also creates habitats for native plants, provides migratory pathways for birds, slows down and filters stormwater, and reduces shoreline erosion. At Maheras Gentry Park, for example, 1,640 feet (500 m) of shoreline were restored, an oxbow wetland was created, and native aquatic plants were installed to improve fish habitat.

The Detroit Riverfront has increased community resilience in other ways. The city was hit hard by the COVID-19 pandemic and, like people everywhere, residents felt anxious and lonely. The riverfront's usage tracking systems picked up a 20 percent increase in 2020, and the Dequindre Cut saw 25 percent growth in use. Community members have come to rely on these green spaces as places where they can gather, socialize, exercise, and recreate, reaping great physical and mental health benefits.



Cullen Plaza is home to many of the riverfront's most well-loved highlights, including the Cullen Family Carousel, which features animals native to the Detroit River.

INDIA BASIN WATERFRONT PARK

SAN FRANCISCO, CALIFORNIA

QUICK FACTS

OWNERS/OPERATORS:

City and County of San Francisco Recreation and Park Department, Port of San Francisco, Pacific Gas and Electric Company (PG&E)

DESIGNERS:

Many, including [Gustafson Guthrie Nichol](#), [Jensen Architects](#), [Sherwood Design Engineers](#), [JBSE Inc.](#), and [Moffat & Nichol](#)

DEVELOPERS:

Many, including [BUILD SF](#)

SIZE:

64 acres (26 ha)

STATUS:

Renovations of three city-owned sites—900 Innes Avenue, India Basin Open Space, and Shoreline Park—are underway and slated for completion in 2026. As of 2022, brownfield remediation at 900 Innes is complete and park construction has begun; the outdated Shoreline Park's makeover is next. These parcels will connect to Heron's Head Park and Hunters Point Shoreline, owned by the Port and PG&E, respectively. Developers are building the Big Green and Northside Park; the Big Green will be transferred to the city/county.

KEY INSIGHT:

For waterfront park projects to meet community needs and avoid negative impacts such as displacement, park planning needs to extend beyond site boundaries and consider interrelated issues such as housing, jobs, transportation, and environmental health.



Once complete, India Basin Waterfront Park will unite seven waterfront parcels into 1.7 miles (2.7 km) of contiguous public open space.

Guided by San Francisco's first Equitable Development Plan, [India Basin Waterfront Park](#) is a catalyst for environmental remediation, economic opportunity, and public health in the underserved neighborhood of Bayview-Hunters Point. The project, which is underway, is revitalizing and uniting seven waterfront parcels into 1.7 miles (2.7 km) of contiguous public open space, while actively working to preserve neighborhood identity and prevent the displacement of the Black community living and working in Bayview-Hunters Point.

“The unequivocal goal for the project is to deliver a park designed by and for the Bayview-Hunters Point neighborhood while improving the economic opportunity and environmental health of its residents, particularly its Black residents.”

—India Basin Waterfront Park Project Equitable Development Plan

Park Overview

The Bayview-Hunters Point neighborhood has long been excluded from San Francisco's economic progress, and its waterfront has been contaminated and inaccessible due to a concentration of industrial sites. However, members of the India Basin Neighborhood Association (IBNA) see far more potential in their shoreline, which sits along a cove in San Francisco Bay. The 2014 acquisition by the San Francisco Recreation and Park Department (RPD) of the former shipyard at 900 Innes Avenue—the last missing link in the open-space network ringing the basin—added new fuel to a community conversation that began with the park and extended far beyond its boundaries.

India Basin Waterfront Park will knit together and transform seven publicly and privately owned former industrial spaces and underperforming parks to create a single unified park. The park will restore public access to the shoreline with a gravel beach, piers, and a dock for fishing and kayaking. It will offer art installations and gathering spaces, such as picnic areas and multipurpose buildings for concessions and programming. A robust interpretive program highlighting the site's important history will be based out of the restored Shipwright's Cottage at 900 Innes Avenue, one of the oldest known residences in India Basin. There will be basketball courts, children's play areas, and adult fitness stations, and trails will connect users to wetland habitat and close a critical gap in the San Francisco Bay Trail.

Project partners are working to overcome longstanding physical and psychological barriers to access by improving street crossings and stairways to the park, creating bike lanes and bikeshare stations in and around it, and exploring alternative public-safety approaches such as providing lighting, streaming music aloud, hiring community ambassadors, and dispatching social workers to provide needed services.

Two mixed-use developments are contributing open space to the park. At one of them, BUILD SF is funding the design and construction of the Big Green and subsequently transferring it to the city/county. A community facilities district will support maintenance costs. The project also includes a proposed 1,575 residential units and 200,000 square feet (18,600 sq m) of commercial space. With the IBNA, the developer is exploring possible community benefits such as affordable housing, business incubation spaces, and a stewardship program to provide maintenance, programming, and community resilience capacity-building.

Funding sources have included the John Pritzker Family Fund, the U.S. Environmental Protection Agency (EPA), the state of California, the San Francisco Bay Restoration Authority, and the city and county of San Francisco. Fundraising is underway to complete park construction and make complementary neighborhood investments.



Renovations of three city-owned sites—900 Innes Avenue, India Basin Open Space, and Shoreline Park—are underway and slated for completion in 2026.

Social Equity and Community Engagement

Neighbors view India Basin as much more than a park. It is an opportunity to create a cultural anchor for equitable economic growth and development, particularly for Black residents. In 2019, the RPD, the A. Philip Randolph Institute San Francisco, the San Francisco Parks Alliance, and the Trust for Public Land initiated an equitable development planning process to deliver a park designed by and for the Bayview-Hunters Point neighborhood while improving the economic prosperity and environmental health of its residents.

An Equitable Development Plan Leadership Committee was formed to guide the process, build a strong relationship with the community, and support broad engagement in planning and events. The community has been deeply involved in many aspects of the park project, ranging from serving on juries for design competitions to identifying programming needs to engaging city-county agencies to fundraising for implementation.

The Equitable Development Plan, released in 2022 after two years of work, is a playbook for strengthening the stability and resilience of the greater community. It emphasizes preserving Black cultural identity and preventing the displacement of Black residents. The plan identifies six areas of focus: arts, culture, and identity; workforce and business development; transportation, access, and connectivity; healthy communities and ecology; youth opportunities; and housing security.



The park development is guided by San Francisco's first Equitable Development Plan, a playbook for strengthening the stability and resilience of the greater community.

Sample strategies and initiatives include forming a programming committee to plan a diverse mix of events and coordinate with community-based organizations; developing a communications strategy to ensure that local Black-owned construction firms receive timely notice of contracting opportunities; extending urban nature to surrounding neighborhoods by planting trees and expanding community

gardens; and using the park to connect residents with resources regarding housing trends, financing options, tax services, credit education, and homeownership opportunities in the neighborhood.

The Leadership Committee is in the process of transitioning from planning to implementation and determining how to sustain its capacity going forward.



The project is restoring the tidal marsh that once ringed San Francisco Bay, renewing the ecosystem that supports plant and animal species.

Resilience

Recognizing the vulnerability of India Basin Waterfront Park and the adjacent neighborhoods to sea-level rise, project partners rooted their work in existing studies, such as [an assessment by the San Francisco Bay Conservation and Development Commission](#) and the city and county of San Francisco's [Guidance for Incorporating Sea Level Rise into Capital Planning](#). They also conducted their own [site analysis](#) that explicitly accounted for sea-level rise.

In this project, design elements are used to accommodate and build resilience to sea-level rise. It is restoring the tidal marsh that once ringed San Francisco Bay, renewing this valuable ecosystem that supports a wealth of plant and animal species, including migratory birds. The project is also softening the shoreline by grading the site, creating a much more gradual slope into the bay. This grading will form protected terraces that will provide habitats for a variety of flora and fauna and allow for those habitat zones to shift over time as sea levels rise. Both design elements will allow the site to adapt to the rising seas while buffering it—and its neighbors—from the power of waves and storms.

Other climate-resilient features will include on-site stormwater management, drought-tolerant native plantings, and the location of the trail and other key amenities outside the floodplain.

Since part of the site was contaminated, the RPD evaluated possible cleanup approaches with an eye toward how well they would stand up to sea-level rise and flooding. The RPD used an [EPA checklist](#) to identify the potential spreading of contaminated soil as a concern, and selected soil excavation as the preferred site cleanup method, since it would reduce the risk of remobilizing soil contaminants due to sea-level rise or flooding versus the method of installing a barrier around contaminated soil.

JURONG LAKE GARDENS

SINGAPORE

QUICK FACTS

OWNER/OPERATOR:

[National Parks Board, Singapore](#)

DESIGNERS:

[CPG Consultants Pte. Ltd.](#), [Ramboll Studio Dreiseitl](#)

DEVELOPER:

[National Parks Board, Singapore](#)

SIZE:

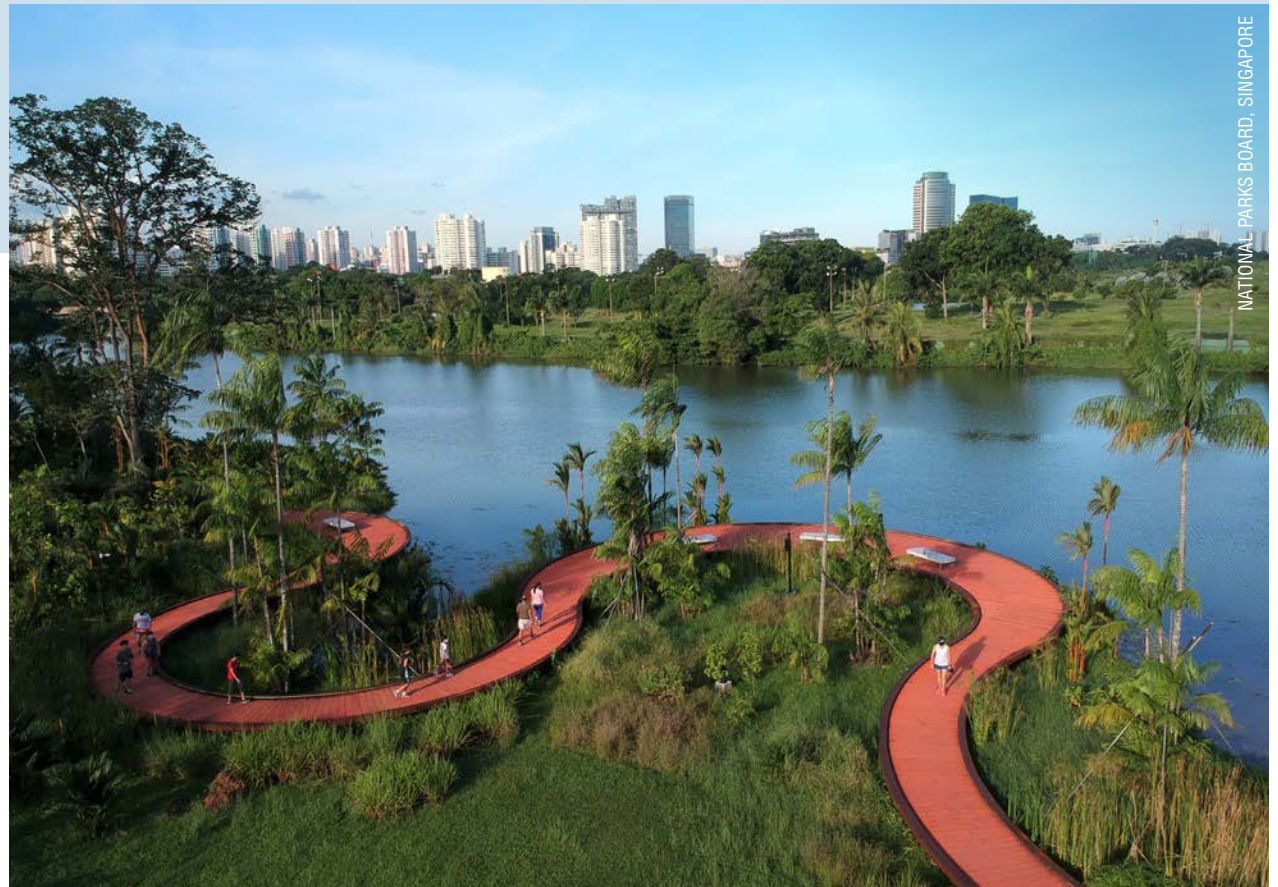
222 acres (90 ha)

STATUS:

Planning began in 2014, and the park's first phase, Lakeside Garden, opened in 2019. The other parts of Jurong Lake Gardens, including the Chinese and Japanese Gardens, are undergoing redevelopment.

KEY INSIGHT:

Intentionally connecting waterfront park redevelopment projects with citywide climate and green infrastructure strategies produces parks that make visible contributions to those goals.



NATIONAL PARKS BOARD, SINGAPORE

JURONG LAKE GARDENS

Jurong Lake Gardens exemplifies Singapore's vision to become a "city in nature" by restoring the native freshwater swamp forest that once stood on the site.

Jurong Lake Gardens is Singapore's first national gardens in the residential areas outside the city center. Exemplifying Singapore's vision to become a "city in nature" and inspired by the ideas of thousands of the city-state's citizens, the lakeside park restores the site's original freshwater swamp forest as a powerful tool to enhance climate resilience and biodiversity, reconnect people to their island's rich flora and fauna, and provide more nature-based recreational opportunities.

"Engagement has played a critical role in the transformation of Jurong Lake Gardens. My advice for other park project developers would be to take the time to really understand what people want and need from the space. The outcome will be so much more meaningful with community buy-in, involvement, and support."

—Kartini Omar, Group Director, Parks Development & Jurong Lake Gardens, National Parks Board, Singapore

Park Overview

Although Jurong Lake Gardens has existed since the 1970s, it is being redeveloped as a national garden and anchor of Singapore's second business district. The park, which brings back the freshwater swamp forest that once stood on the site, has emerged as a model for urban habitat restoration and a key component of the city-state's "City in Nature" vision. Its wealth of active and passive recreation opportunities has drawn millions of visitors annually since its opening in 2019.

The site's original freshwater swamp forest was cleared to make way for industrial development in the 1960s. Public housing was built, along with lakeside gardens that became very beloved. More recently, the nation's commitment to rejuvenating and expanding its natural capital has become the guiding principle for the redevelopment of Jurong Lake Gardens.

Today's Jurong Lake Gardens features a shoreline boardwalk that brings people through a restored freshwater swamp forest and a series of naturalized meandering streams. A newly created grassland habitat offers refuge for migratory and indigenous birds. The park offers several play areas, including Clusia Cove, an interactive water feature that mimics tidal patterns, and the Forest Ramble, with adventure stations inviting kids to emulate the movement of animals that inhabit freshwater swamps. The park also offers a therapeutic garden with a butterfly maze that caters to seniors and children with special needs, as well as an outdoor swimming pool and gym.



The park and its programming are designed to be accessible and welcoming to people of all ages, races, ethnicities, genders, and abilities.

Jurong Lake Gardens provides plentiful space for community-based organizations and activities. Three hundred garden plots allow the community to grow their own food, and there are classroom facilities and event halls. The arts council, nursing homes, schools, and other partners hold and participate in the many events held in the park, ranging from the Horticulture Show of the Singapore Garden Festival to Sustainable Fest to the Mid-Autumn Festival lantern displays. The People's Association, a government agency that oversees grassroots and volunteer organizations, is located on site and offers programming there, such as water sports and wellness courses.

Jurong Lake Gardens also functions as a living laboratory for sustainability and technology. Sustainable solutions include mass-engineered timber buildings as well as the use of recycled materials in the construction of footpaths and play areas. Technologies such as autonomous vehicles, concierge robots, and integrated garden management systems are being tested and implemented at the site.

Designated cycling paths wind through the park, and it is part of the Round Island Route, a recreational trail connecting green spaces and neighborhoods across the city. Bus and subway stops adjoin the site.

Social Equity and Community Engagement

With Jurong Lake Gardens designated as a national garden, the National Parks Board (NParks) sought to involve people from across Singapore in the enhancement. Planners conducted a multiyear engagement exercise for phase one, the redevelopment of Lakeside Garden, which included roving exhibitions, town hall meetings, focus group discussions, and online engagement. These efforts generated 17,000 suggestions, which NParks carefully reviewed and categorized. Many of them were incorporated into the process and designs, which were shared with the public before construction began.

For example, community members wanted to be able to continue using the park during redevelopment, so planners split the project into phases, keeping the Chinese and Japanese Gardens open while Lakeside Garden was redeveloped. Singaporeans asked for the preservation of familiar landmarks and events, such as the aforementioned Mid-Autumn Festival. They also requested amenities that were not in the original master plan but were later added, including a dog run, barbecue pits, and cycling paths. Planners received many suggestions for both passive and active recreation opportunities, so they designed the northern section of the park as the more active zone and the southern one as a more tranquil area. For phase two, the ongoing revitalization of the Chinese and Japanese Gardens, NParks received more than 14,000 suggestions.

The space and its programming are designed to be accessible and welcoming to people of all ages, races and ethnicities, genders, and abilities. There are no admission fees. A range of activities are available, from birding and sketching to hiking and paddle boating, and workshops and trainings empower new users. Inclusive playground elements allow children with different abilities to play together, and the therapeutic garden has sections that cater to children with special needs like mild autism and

attention deficit/hyperactivity disorder, as well as seniors with dementia. Wheelchairs are available upon request and the barrier-free park enables all visitors to enjoy and immerse themselves in nature.

The park also has a vibrant volunteer program that offers opportunities for individuals and corporations to help run its community programs on edible gardening, horticulture, composting, guided walks, and more.



Planners conducted a multiyear public engagement process that generated more than 17,000 suggestions for the park and garden.



Children enjoy the pond and sand beds at Clusia Cove, where water is drawn from the lake and recycled through a closed-loop circulation system that treats and cleans water naturally.

Resilience

Jurong Lake Gardens is an important part of Singapore's nature-based approach to addressing the climate change impacts it faces, which include sea-level rise, intense rainfall, flooding, drought, the heat island effect, and threats to biodiversity.

A 984-foot (300 m) concrete stormwater drain was demolished and transformed into a series of naturalized meandering streams totaling 4,265 feet (1,300 m) in length. During dry weather, people can interact with these shallow streams, and when it rains the area acts as a floodplain, capturing and slowing down

stormwater runoff from the rest of the site and cleansing it before it flows into Jurong Lake. Aquatic plants native to freshwater swamp forests create habitat for dragonflies and other wildlife and function as natural mosquito control.

The water in Clusia Cove is drawn from the lake and recycled through a closed-loop circulation system that treats and cleans water naturally. Play is infused with learning as children discover the sand beds, semi-aquatic plants, eco-ponds, and other features that filter out particulate matter, absorb excess nutrients, reduce algae growth, and encourage beneficial bacteria.

The grassland provides food and shelter for many small native and migratory bird species. Three bird hides allow visitors to observe the birds without disturbing them.

In addition, sustainable building materials were used, including concrete injected with recycled carbon dioxide and mass-engineered timber that reduces on-site construction time and material waste.

LANGONE PARK AND PUOPOLO PLAYGROUND

BOSTON, MASSACHUSETTS

QUICK FACTS

OWNER/OPERATOR:

[City of Boston Parks and Recreation Department](#)

DESIGNER:

[Weston & Sampson](#)

DEVELOPER:

[WES Construction](#)

SIZE:

4.5 acres (1.8 ha)

COST:

\$15 million

STATUS:

Planning began in 2017 and design plans were modified to incorporate climate resilience in 2018. The park opened in 2021.

KEY INSIGHT:

Evaluating every waterfront park element on its effectiveness at increasing resilience and its recreational value provides multiple community benefits while maximizing every dollar spent.



After being struck by a strong Nor'easter in March 2018, Langone Park became the first park in Boston to integrate the city's resilient design standards.

The renovation of Langone Park and Puopolo Playground leveraged a prime harborfront site in Boston's dense North End to defend the neighborhood against sea-level rise and storm surge. The first to implement the city's climate-resilient design standards, the groundbreaking project seamlessly integrates a new seawall and other flood-adaptive features with recreational and athletic amenities that are heavily used by the community.

“When we started the project in 2017, we thought we'd be looking at renovating the playground and improving the lighting, which was really antiquated. Then those storms in 2018 hit and we realized [sea-level rise] was an urgent problem that needed to be addressed.”

—Cathy Baker-Eclipse, Boston Parks and Recreation

Park Overview

Along Boston Harbor in the famous North End, Langone Park and Puopolo Playground has a storied history as one of the city's oldest parks, and now is the first park to incorporate Boston's climate-resilient design standards. The small park packs a punch, providing a dense mix of recreational facilities that are otherwise lacking in the neighborhood, connecting people to the water, and protecting homes and businesses from the flooding brought about by sea-level rise.

The park was slated for routine renovations when a Nor'easter hit in March 2018. High tides breached the park's seawalls and many other areas of downtown Boston, cresting nearly four feet (1.2 m) above the lowest elevations of the park. After this storm and a similar one two months before, the city and design team quickly shifted their plans.

Fortunately, the Boston Public Works Department had recently released its Climate Resilient Design Standards & Guidelines for Protection of Public Rights-of-Way, a document that provides design guidelines and operations and maintenance procedures for flood barriers that will withstand sea-level rise and storm surges. Langone Park became the first project in the city to integrate these standards and test a new design approach that incorporates coastal resilience strategies.

The designers' goal was to protect the community from rising tides while preserving access to the water and providing a first-rate recreational experience. In today's Langone Park, the Boston Harborwalk, which follows the edge of the site, has been rebuilt and raised four feet (1.2 m). A second seawall was constructed behind the existing one, greatly



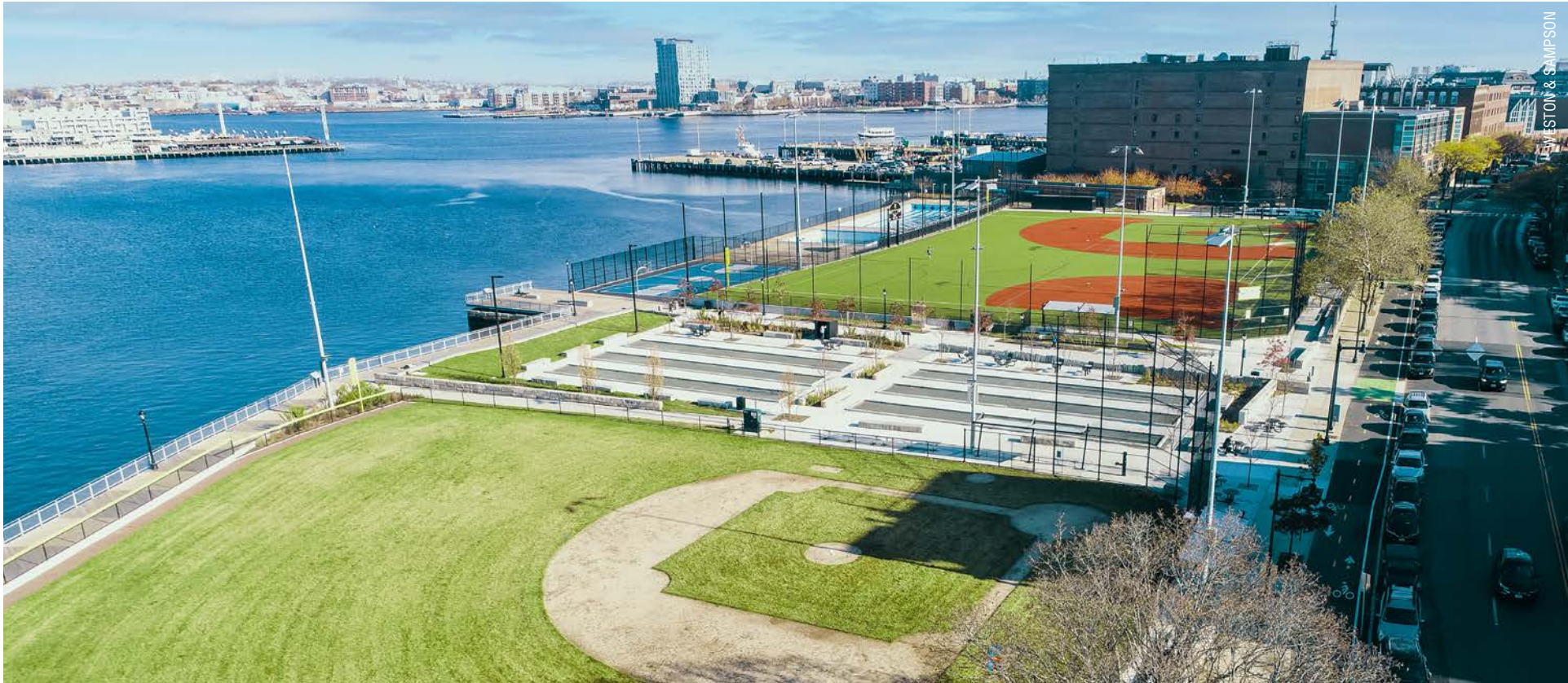
Park designers carefully blended resilience-building features and inclusive recreational facilities into the design of Langone Park.

reducing permitting and construction complexities and adding protection to playing fields and bocce courts that were elevated above the flood zone. A low-lying basketball court is designed to flood and drain quickly.

The resilience-building features blend seamlessly into the park. The secondary seawall offers overlooks and seating with expansive harbor views. The project expands recreational opportunities for a diverse, multigenerational population, with a grass baseball field, a multisport synthetic turf field, the

universal-access Puopolo Playground, a memorial garden, and the aforementioned bocce and basketball courts. The direct physical and visual connections from the neighborhood to the water invite neighbors to come and explore.

Funding sources were the city's Community Preservation Fund, a city trust fund dedicated to improving North End recreational facilities, and the city's Capital Improvement Plan, 10 percent of which is dedicated to climate resilience annually.



The city and design team met with neighborhood residents, business owners, and associations, including the North End Athletic Association, to understand the historic importance of Langone Park and aspirations for the future.

Social Equity and Community Engagement

Before renovations began, the city and design team met with neighborhood residents and community-based organizations, including the North End Athletic Association, to solicit feedback and listen to concerns. Dating back to the days of the Big Dig, the North End community is very organized and engaged, and the project team worked closely with residents and business owners to understand the historic importance of Langone Park, how it has been used, and aspirations for its future. The team sought out the opinions

of generational residents as well as new ones and gathered a robust set of perspectives about the park's evolution.

As part of the city's Climate Ready Boston framework, planners and designers are encouraged to take a holistic approach to infrastructure projects and consider community needs and social equity. The city has developed a set of evaluation criteria, outlined in a plan for East Boston and Charlestown but applicable citywide, to help compare the benefits and tradeoffs between design alternatives and select a preferred option that blends into the neighborhood context and enables accessibility, livability, and

connectivity for all. The criteria assess whether design options include benefits that promote social equity, racial and environmental justice, community health and well-being, and water and air quality.

These conversations and planning efforts resulted in a vibrant park that is actively used by a diverse population from the North End, across Boston, and beyond. The space is bustling day and night, with baseball, softball, soccer, bocce, spikeball, organized league play, pickup games, commuters on the Harborwalk, community events, and more.

Resilience

Boston is increasingly affected by extreme heat, rain, snow, and flooding, a trend that will only continue as climate change intensifies. Scientists expect Boston to see nine inches (23 cm) of sea-level rise over 2013 levels by the 2030s and 40 inches (102 cm) by the 2070s. Langone Park's prime position on Boston Harbor gives it a critical role to play in protecting the public and private assets behind it from the rising waters.

Using flood data from [Climate Ready Boston](#) and an interdisciplinary approach, [designers employed solutions](#) that adapt to incremental sea-level rise, exceptionally high “king tides,” increased storm events and intensities, and urban heat island

effects. The results reflect an innovative combination of climate mitigation and flood protection with high design value for recreation. Every element was created for functionality and resilience now and in 50 years.

The renovation started from the ground up, stabilizing the soil, adding lightweight fills, and installing micro piles. This allowed the park to be elevated up to seven feet (2.1 m) without affecting adjacent structures, properties, and the existing seawall. Due to the difficulty of removing that seawall, engineers designed a secondary one behind it that serves as a wave action barrier. Breaks in the wall allow people to get down to the harbor and some water to enter and leave the site. Its foundation is designed to

hold additional weight so that it can be built upon if flood projections change. The Harborwalk is cantilevered over the water on deep-drilled micro piles.

The site was carefully graded to preserve water access, views, and areas suitable for athletic facilities. This grading creates a high point that floodwaters will not surpass, providing an additional layer of defense to the neighborhood and allowing stormwater to run into the harbor. Utilities and lighting were placed at a high elevation to maintain electricity during floods.

Subsurface retention chambers were built to store stormwater until it can gradually flow out along prescribed flood pathways and away from infrastructure that could be damaged. This keeps stormwater from overwhelming the city's water and sewer pipes and becoming contaminated. The chambers can be connected to future off-property stormwater systems, further reducing flooding pressures in the city.

Langone Park is serving as a model for waterfront projects across Boston—not only as an example of innovative design, but also as an example of budgeting for climate-resilient investments. Experience with Langone has provided valuable lessons learned on the costs of waterfront parks with neighborhood-scale flood protection built in, as well as the money saved on future repairs.



During the Nor'easter in March 2018, high tides breached the park's seawalls and many other areas of downtown Boston.

NASSAUHAVEN AND HELIPORT

ROTTERDAM, THE NETHERLANDS

QUICK FACTS

OWNER/OPERATOR:
[City of Rotterdam](#)

DESIGNERS:
[City of Rotterdam \(Nassauhaven\)](#), [Tussentuin Foundation \(Heliport\)](#)

DEVELOPER:
[City of Rotterdam](#)

SIZE:
4.5 acres (1.8 ha)

COST:
Nassauhaven: €1.5 million (US\$1.6 million);
Heliport: €750,000 (US\$819,000)

STATUS:
Construction of Nassauhaven started in 2017, the park opened in 2019, and the floating houses were completed in 2020. Work on Heliport started in 2018 and the renovated courtyard opened in 2020.

KEY INSIGHT:
Testing new approaches to planning, engagement, and design can accommodate the unique nature of each climate adaptation project.



Nassauhaven is a formerly unused harbor that has been transformed into a riverfront park with a natural bank and a row of floating houses.

A leader in climate adaptation, Rotterdam is using a European Union (EU) funding program to carry out a series of cutting-edge pilot projects to mitigate flooding, extreme heat, and threats to biodiversity. In the Nassauhaven project, one of the city's many unused harbors was converted into a natural riverbank that has brought people back to the water, including to live in state-of-the-art floating houses. Driven by a citizen-led design process, Heliport was transformed from an uninviting gray courtyard into a living green square that absorbs floodwater and moderates temperatures.

“It started out as a New Year’s resolution. Two years later, we received an EU subsidy and one year later, it is there. Quite remarkable. And it is still our project!”

—Resident who initiated the Heliport project

Park Overview

Sitting in large part below sea level, the Netherlands faces grave threats from climate change. As an international port city in the middle of the Rhine-Meuse delta, Rotterdam is no stranger to these risks. The city is a forerunner in the field of climate adaptation and is using the European Union LIFE program to undertake a series of innovative demonstration projects known as Urban Adapt that will help the city adjust to climate impacts.

These projects belong to two categories: riverfront and inner city. Along the river, Nassauhaven is a former unused harbor basin that has been transformed into a waterfront park with a natural bank and floating houses. Through the first Urban Adapt project, the stone walls of the harbor were replaced by a gently sloping bank, allowing the tides to ebb and flow naturally. Not only does the natural bank allow people to access the water and experience tidal cycles—something that is all too rare in Rotterdam—it provides feeding and resting grounds for birds and fish and greens the urban environment.

The 18 floating houses are another first for the city. The homes, which move with the tide, have solar panels, biomass heating, and internal water purification systems, so they do not have to be connected to the sewer. They were developed by Public Domain Architects, a firm specializing in floating projects.

Nassauhaven is providing valuable insights to inform other efforts around and beyond Rotterdam. It brought together a coalition of new partners excited about the opportunities the river presents, including the city, the provincial government, the World Wildlife Fund, ARK Nature, the Dutch Ministry of Infrastructure and Water Management, and the Port. They pioneered



Tired of dealing with urban flooding, a group of residents approached the city with an idea to transform their apartment courtyard into a resilient oasis.

a fresh approach to infrastructure projects, brainstorming together for a couple of years before creating a collaborative solution. In addition, the lessons learned about floating construction are being applied elsewhere to address the city's enormous need for housing.

Though not on the waterfront, the Heliport project highlights a solution to a common inner-city climate challenge—during heavy rain events, stormwater overwhelms aging urban infrastructure and floods homes, businesses, and streets. Tired of dealing with this, a group of Rotterdam residents approached the city with an idea to make the courtyard in the midst of their apartment complex climate-proof and more attractive, and the Urban Adapt project was born. The pavement was replaced with greenery,

flowers, and a permeable paving material that absorbs water. The city bumped up its planned sewer replacement, installing a separated sewer system that deposits stormwater directly into the canal flowing through the neighborhood. The redesigned courtyard provides new wooden playground equipment and a “worm hotel” where worms turn organic waste into compost that is used for greenery maintenance.

Heliport shows the impact that a smaller initiative can have and the efficiencies that can be created when projects are combined. The square, which is public space, has been transformed into a greener and more inviting spot, flooding has been reduced, and social connections among the neighbors are much stronger.

Social Equity and Community Engagement

Heliport tested and proved a new way of co-creating infrastructure projects with the community. Unlike the traditional city-initiated design and public engagement approach, the residents living around the square came up with the idea to renovate it and brought a preliminary proposal to the city. City engineers found that the proposal needed to be more technical, so they used a municipal fund for citizen initiatives to contract with the Tussentuin Foundation, an independent design foundation, to collaborate



The Nassauhaven project is one of the first of its kind in Rotterdam.

with the residents and refine the plan. The Tussentuin Foundation acted as an intermediary, ensuring that all stakeholders were heard and had equitable opportunities to provide input.

The community used its regular resident meetings to gather feedback on the project, including from children. Other partners included neighborhood councils, homeowners associations, and the regional water authority. Outreach was also conducted via email, a Facebook group, door-to-door canvassing, and voting in person and through social media. The layout and design of the courtyard evolved iteratively until all parties were satisfied with the result. This



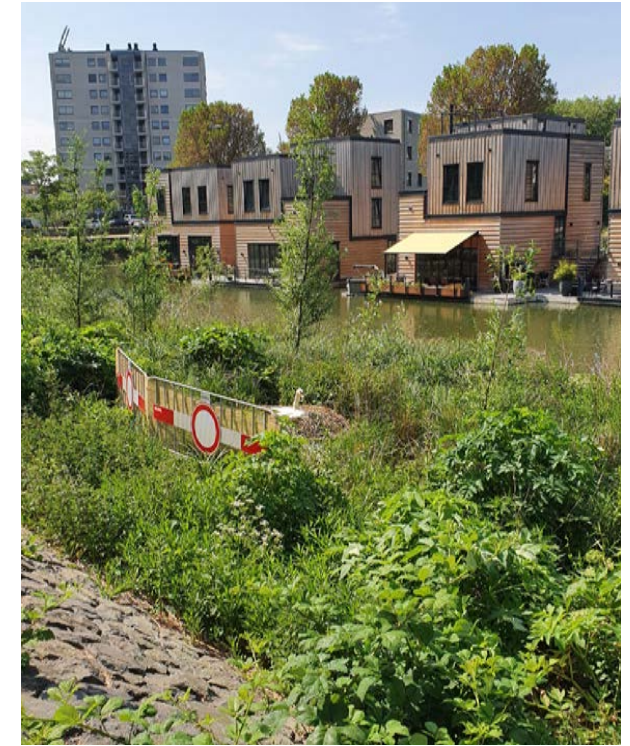
Unlike the traditional city-initiated design and public engagement approach, the residents living around Heliport came up with the idea to renovate the central plaza and brought a preliminary proposal to the city.

process worked so well that the scope and funding for the project were increased by the city over time. The effective coordination among the partners led to the discovery of the Urban Adapt program, which proved to be a good fit for the ultimate implementation.

This participatory approach took longer than the standard one, but it produced results that solve pressing problems and have stronger buy-in from the community. Today, Heliport residents are so happy with their revitalized square that they share maintenance duties with the municipality. The Urban Adapt project also led to a blueprint for tackling future projects differently.



At Heliport, native plants capture and filter stormwater while a series of cascading steps direct runoff to a central storm drain.



In Nassauhaven, designers sought to reintroduce nature to the riverbank with fertile soil and native plants.

Resilience

Climate change is bringing sea-level rise, increased river discharges, intense storms, extreme heat, and drought to Rotterdam. The city's built environment can exacerbate these threats. The outdated water and sewer system is easily overwhelmed by heavy rains, causing floodwaters—which can be contaminated—to enter buildings and streets. In addition, 70 percent of Rotterdam's riverbanks are encased in concrete, limiting opportunities for urban greening, cooling, and biodiversity.

In Nassauhaven, designers sought to reintroduce nature to the riverbank. They added fertile soil and native plants that thrive in brackish water and changing water levels, which can vary by up to 6.5 feet (2 m). Urban ecologists took a gradual approach, planting in phases and starting the plants in pots to keep them from being eaten by water birds. The vegetation filled in and is now greening and cooling the area. The sloping bank supports biodiversity by providing habitats for a range of migratory fish, birds, and other species moving between freshwater and saltwater. Researchers are monitoring fish, aquatic and

shore plants, and insect-like aquatic animals to test whether habitat conditions are optimal. Their observations will inform future projects; for instance, the lack of juvenile fish suggests that the water depth should be modified.

The Heliport project helps retain rainwater for longer and allow it to drain gradually to prevent sewer overflow and flooding. Collecting water in barrels and separating the sewer systems enables residents to reuse it in the garden. The greenery reduces the average temperature, making the area more resistant to extreme heat as well as heavy rain.

SMALE RIVERFRONT PARK

CINCINNATI, OHIO

QUICK FACTS

OWNERS/OPERATORS:

Cincinnati Park Board, [The Banks Public Partnership](#)

DESIGNER:

[Sasaki Associates](#)

DEVELOPER:

[Universal Contracting Corporation](#)

SIZE:

45 acres (18.2 ha)

COST:

\$120 million

STATUS:

Planning started in 1997, ground was broken in 2008, and the first phase of the park opened in 2012. Additional features continued to be constructed through 2015.

KEY INSIGHT:

Innovative design and engineering approaches can make it possible to create waterfront parks in flood-prone areas that are major attractions for residents and visitors, renew connections to the water, and offer protection from flood events.



Smale Park serves millions of visitors and generates over \$1.2 billion in economic impact annually.

Smale Riverfront Park has accomplished the difficult task of safely creating a world-class waterfront destination on the banks of the increasingly unpredictable Ohio River. Its cutting-edge terraced design has endured multiple record-breaking floods, allowing the park to quickly reopen and continue welcoming visitors from far and wide to enjoy its unique attractions.

“Smale is about connecting the city and community to the river—literally. That is what we heard when we researched the city’s colorful history and talked to the people here. People want to physically reconnect to that heritage.”

—Principal designer Mark Dawson, Sasaki Associates

Park Overview

Located along Cincinnati's downtown riverfront, John G. and Phyllis W. Smale Riverfront Park has reconnected the community with the Ohio River and completed a necklace of public open spaces along its banks. The project transformed a brownfield into a bustling front lawn for landmarks including the Paul Brown Stadium, the Great American Ball Park, and the National Underground Railroad Freedom Center. Just as impressive, its innovative terraced design was created to withstand flooding along the river's edge, a test that it has already passed multiple times.

Smale Riverfront Park's story spans several decades. In the 1990s, the site was covered by parking lots and vacant industrial parcels. It flooded regularly, and a four-lane highway cut it—and downtown—off from the river. A 2000 district master plan set redevelopment and fundraising in motion and commenced a multiphase park development process, beginning with moving the highway.

Following the Smale family's donation of \$20 million, the Cincinnati Parks Foundation led private fundraising efforts, matching John Smale's commitment for a total of \$40 million. The Cincinnati Park Board, the city of Cincinnati, Hamilton County, and the Cincinnati Parks Foundation also worked together to leverage funds from sources including the U.S. Army Corps of Engineers and the Federal Emergency Management Agency's Homeland Security Grant Program.

Today, Smale Park serves millions of visitors and generates over \$1.2 billion in economic impact annually. Its terraces create a striking procession to the river while lifting key areas out of the floodplain and providing direct access to the water.

The park's diverse amenities include water play areas, the PNC and Heekin Family Grow Up Great Adventure Playground, a riverfront promenade, a Great Lawn and stage, the Moerlein Lager House, Carol Ann's Carousel depicting Cincinnati-centric characters, and a soon-to-be boat dock. Shading structures and seating areas, such as giant swings, offer respite for visitors, and lighted pathways make the space functional at night. The P&G go Vibrantscape contains exercise equipment, a giant foot piano, and other interactive features encouraging movement. Public works of art include the Black Brigade Monument and the Marian Spencer Statue.

Smale Park is crisscrossed by walking and biking trails and connected to the Ohio River Trail. It is adjacent to The Banks, a mixed-use development envisioned in the same 1999 master plan. The Banks, which lies at the southern terminus of the streetcar system, will eventually include 1,800 residential units, 400 hotel rooms, 1 million square feet (93,000 sq m) of office space, and 400,000 square feet (37,000 sq m) of retail uses. A partnership among the city, Hamilton County, and developer Carter/Dawson manages the public infrastructure of The Banks, including Smale Park, and additional private entities own and manage individual components.



Carol Ann's Carousel depicts Cincinnati-centric characters.

Social Equity and Community Engagement

Given the park's potential to transform the city and create new connections among major attractions, the community's engagement in the project was critical. A 16-member Riverfront Advisors Commission was appointed by the city and county and worked intensively over the course of one year to develop a report making recommendations on land use, parking, financing, developer selection, and phasing for the redevelopment of the central riverfront. Drawing on community forums and interviews, the commission's recommendations included connecting the riverfront development with the central business district; creating a vibrant, mixed-use, pedestrian-friendly neighborhood; funding infrastructure through public/private partnerships; and stimulating economic opportunity among people of all ages, races, and genders. The commission also worked closely with the Cincinnati Park Board and consultants to integrate the planning for Smale Riverfront Park into the overall district master plan. Urban Design Associates and Economic Research Associates were assigned to support them with designs, drawings, market analyses, and financial pro formas.

Along with a series of public meetings to obtain broader community feedback, the project team conducted interviews and focus groups with over 150 elected officials, Over-the-Rhine neighborhood representatives, downtown organizations, business and athletic team owners, recreational groups, and other stakeholders. A weeklong design charrette



The park features a variety of play and entertainment facilities, including splash pads, a carousel, exercise equipment, and public art.

was held at the Cincinnati Convention Center, which culminated with a public presentation attended by 300 citizens. Small group discussions provided venues for more detailed input.

Universally accessible design emerged as an important priority for Smale Riverfront Park. Design features include paved stair landings with a special texture between the end of each railing and the start of the

next so that visually impaired visitors can more easily find them, an extra-large elevator to accommodate a variety of needs, water features such as cascades and fountains that generate distinctive sounds to help orient people within the park, an extra-wide pathway through the labyrinth, and accessible features on the park's playgrounds.



The park's terraced design has endured record-breaking floods, allowing the park to quickly reopen and continue welcoming visitors.

Resilience

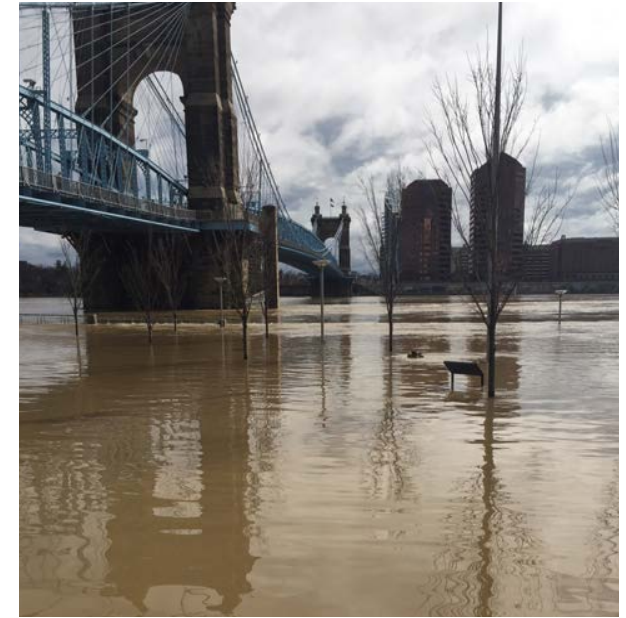
Renewing Cincinnati's connection to the historic Ohio River was a guiding design principle for Smale Park. However, the river is more volatile than it once was. Climate change is bringing more frequent and intense rain events, surging river levels, and flooding, and the city's aging infrastructure is easily overwhelmed.

Balancing the call to reconnect people to the river with the need to provide protection from it, the park is designed as a series of terraces with two primary levels. The upper level lies above the 100-year floodplain and contains features that cannot be flooded. The elements in the lower level, which lies within the floodplain, can withstand floodwaters or be moved to higher ground.

Throughout the design process, the team worked with the parks department to determine how to activate the entire park site, including the floodplain, while limiting the labor needed to protect and remove features.

When the water rises, the lower restrooms, which are on trailers, can be rolled away. The picnic tables, bollard lighting, and even special specimen roses can easily be relocated. Wherever possible, mechanical and electrical systems were located on higher ground or designed to be removed. Systems too large to be removed are enclosed in reinforced, sealed rooms.

Every surface of the adventure playground was constructed from durable materials that can survive flooding and the subsequent power-washing and sanitization needed after potentially contaminated



In February 2018, the Ohio River crested above 60 feet (18 m) and Smale Park faced its first true test.

waters recede. The carousel building was located far outside the floodplain and made with flood-resistant materials.

The Great Lawn was left open not only to provide a large event space, but also to slow floodwaters. The low-maintenance lawn sits atop sand-based and reinforced soils that absorb water and resist compaction.

In February 2018, Smale Park faced its first true test. The Ohio River crested above 60 feet (18 m), causing the area's worst flood in two decades. Park employees had five days to prepare. Thanks to the site's thoughtful design and its flood response plan, damage was minimal, and the park was cleaned and reopened within a week of waters receding. In 2019, when record flooding occurred again, the results were similar.

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