(GREEN) INFRASTRUCTURE TODAY, FOR RESILIENCE TOMORROW

HUNTS POINT, NEW YORK

The City of New York and the Hunts Point community have an important opportunity to build RESILIENCE and COMMUNITY while conserving precious tax dollars in the process. A long-standing focus on heavily engineered infrastructure for water management, transportation, power, coastal resiliency and other services has left Hunts Point with only scant traces of the rich wetland, shoreline, and forest ecosystems that thrived here historically. Today, though Hunts Point is a vital commerce hub for New York City, community members not only struggle with loss of nature and greenspace, but also many related effects like persistent flooding, air pollution, and noise.

THE OPPORTUNITY

The Hunts Point community is proactively looking to reintroduce nature-based solutions to help reduce pressing environmental challenges, like persistent flooding, while also providing broad community benefits like access to parks and recreation, better air quality, and protection from extreme heat. Nature-based solutions have proven to be cost-effective for many resilience challenges throughout the world, often providing a high return-on-investment as measured through public and private benefits. Though the benefits are clear, progress in Hunts Point – and in many communities around the country – has been painfully slow. Natural infrastructure should be considered a fundamental feature of a healthy resilient communities rather than an afterthought. Reintroduction of nature requires collaboration, creativity, and a new way of thinking about our communities and about nature's role in our future.

A PROMISING START, BUT ONLY A START

Following the devastation of Hurricane Sandy, the Rebuild-by-Design competition was launched to award federal funding for resilience-building projects. The Hunts Point residents eagerly engaged and produced the Hunts Point Lifelines proposal, which ultimately received a total of $45M in combined federal and local matching funds. These dollars have been invested in an energy pilot project that will increase the resiliency of critical facilities through a local tri-generation microgrid for the Hunts Point Food Distribution Center, and rooftop solar and energy storage for two public schools. While this project will benefit the commercial hub and community at large, the severe flood risk remains, as do many other challenges within the community.

A TREE IS NOT JUST A TREE

Trees are just one of many types of natural infrastructure that can address community challenges while building quality of life. This table highlights the value of trees in Hunts Point, based on information from The New York City Street Tree Map.

The Annual Value of Trees in Hunts Point

BENEFIT	VALUE PER TREE	VALUE IN HUNTS POINT
STORMWATER INTERCEPTION	$9	$29,676
REDUCED BUILDING COOLING COSTS	$84	$286,096
REMOVAL OF AIR POLLUTION	$6	$21,824
CARBON SEQUESTRATION	$2	$6,778
TOTAL	**$103**	**$351,152**

"RESILIENT DESIGN SHOULD NOT EXIST IN A SILO, BUT RATHER BE A WELL-INTEGRATED PART OF EXISTING PROCESSES AND ADDRESS OTHER GOALS OF THE CITY."

NYC MAYOR'S OFFICE OF RECOVERY AND RESILIENCY, CLIMATE RESILIENCY DESIGN GUIDELINES, 2018

HOLISTIC PLANNING IS PRICELESS

Most big planning decisions are considered in economic terms when allocating city budgets, calculating benefit-cost ratios, or determining return-on-investment. Until natural infrastructure is valued in these same terms, it will always be at a big disadvantage to traditional, engineered approaches. With recent advances in economic methods, the economic value of natural infrastructure to residents and communities can now be estimated in dollars – including the value reduced flood damage, improved resident health, heat mitigation, industrial retention, or new green jobs. Estimating the full value of green infrastructure helps to ensure that nature has a seat at the decision-making table.

Early in 2018, New York City took an important step forward by updating their Climate Resiliency Design Guidelines, laying out standard practice methods for incorporating climate change and resulting impacts into project analysis. The guidelines highlight opportunities to consider environmental, social, and economic benefits of natural infrastructure, clarifying benefit categories as well as tiers of analysis.[1]

Time will tell whether planners and community members will fully embrace these valuation approaches and make a concerted effort to incorporate the broad environmental and social benefits of all resilience projects. Residents can encourage the City to take a holistic view when analyzing projects by taking the following steps:

1. Ensure that all flood modeling uses the best forecasts for climate and sea-level and not depend on recent or historical events. These errors will likely underestimate future flood risk.

2. Prioritize nature-based solutions, including living shorelines and coastal wetlands, as design interventions for flood prone areas that incorporate co-benefits for the community and overall ecosystem.

3. Seek opportunities to manage rainfall locally by reducing impervious surfaces and incorporating natural water capture features like bioswales, green roofs, and street trees.

4. Always estimate the benefits of access to nature and recreation such as reduced medical cost for stress or anxiety, reduced demand for emergency services, and fewer lost work days.

DID YOU KNOW... A WATERFRONT PARK CAN HELP TO BOTH MANAGE COASTAL FLOODING AND SERVE AS A HABITAT FOR BIRDS?

TAKING A HOLISTIC, COMMUNITY-FOCUSED VIEW

Too often project planning by cities and utilities takes a narrow, discipline-specific view of a problem or opportunity e.g. "streets move cars" or "stormwater infrastructure moves water to the river or ocean". These narrow solutions miss opportunities to provide other benefits, and all-too-often create unintended problems or exacerbate existing ones. Pursuing a more holistic, systems-oriented approach to planning and community resilience helps to identify and implement innovative solutions to long-standing problems. Community members know the most about how shocks (e.g. flooding) and stressors (e.g. poor air quality) affect daily life. Elevating community expertise coupled with bottom-up planning helps design solutions to the most pressing concerns.

ADVANCING NATURE-BASED SOLUTIONS IN HUNTS POINT

Nature-based solutions can help the City meet its service targets for stormwater control, flood protection, air quality, water quality, heat mitigation, and coastal resiliency, while providing a range of co-benefits and improving quality of life for the Hunts Point community. Here are a few examples of common natural infrastructure assets and their benefits:

- **COASTAL GREEN INFRASTRUCTURE** describes a spectrum of practices that integrate both natural and manmade infrastructure to reduce cost and improve resilience to sea level rise, storm surge, heavy surf, and intense precipitation events.[2]
  - **LIVING SHORELINES.** A variety of practices to stabilize shorelines, integrating green infrastructure, such as plantings, with structural techniques, such as seawalls.[3]
  - **COASTAL WETLANDS AND SALT MARSHES** can help to protect shorelines by absorbing storm energy and reducing storm surge. A study by Costanza et al. in 2008 estimated the hurricane buffering value of coastal wetlands based on data from 34 hurricanes that have hit the US since 1980. The study found that in New York, each acre of wetlands provides more than $24,000 in value per year (in 2017 dollars).[4]
  - **REEFS.** Ridges of material submerged at or below ocean, estuarine, or river surfaces.
  - **SEAGRASS BEDS.** Submerged aquatic vegetation that grows in shallow marine and estuarine habitats.
  - **SAND BEACHES AND DUNES.** Deposits of sand and gravel shaped by oceanic waves, wind, and coastal vegetation.
- **RAIN GARDENS AND BIOSWALES** are vegetated sections of permeable ground, often strategically placed in low points, surrounded by impermeable surfaces such as roads. These features are designed to capture stormwater runoff, and can reduce pollutant loads by 25-100%, depending on the pollutant,[5] on par with many conventional treatment methods.[6]
- **PERMEABLE PAVERS AND CONCRETE** allow water to penetrate and be retained by the ground rather than runoff into the city stormwater system and waterways, saving significant cost for grey stormwater infrastructure capacity.[7]
- **URBAN TREES**, whether as a component of a larger green infrastructure installation or a standalone feature, provide many benefits.[8] The heat reduction function of trees not only supports public health by reducing heat stress, but also reduces the energy costs associated with building cooling. Unlike traditional infrastructure assets, urban trees appreciate in value over time as the trees grow and mature.[9] The New York City Street Tree Map has mapped approximately 3,400 trees in Hunts Point and estimated the annual value of the benefits provided by these trees. Table 1 indicates that, based on only the four benefits valued, the average tree in Hunts Point provides an annual value of $103.[10] These benefits easily outweigh the typical maintenance costs associated with each tree, as reported in cities across the US.[11, 12]
- **GREEN ROOFS** are vegetated roofs for homes and business with a layer of soil atop a drainage layer to retain stormwater, lower energy bills, reduce heat island effects, and improve air quality.[13]
- **GREEN STREETS** is the practice of integrating vegetated areas into street design to facilitate storage, infiltration, and evapotranspiration of stormwater while enhancing livability.[14] It is acknowledged by the City that urban vegetation will play an important role in reducing heat-related illness and mortality in Hunts Point and NYC as a whole,[15] and this is backed up by the existing science. For example, the shading and evapotranspiration provided by urban vegetation can reduce peak summer temperatures by 2–9°F.[16, 17] A 2015 study looked at heat-related mortality in NYC for the period 2000-2011, and found that "...individuals living in 'greener' areas of the city were less likely to die during and immediately after heat waves."

While the above green infrastructure examples provide value as stand-alone features, their benefit is amplified when deployed together with a scale and density equal to the community's challenges. Implementation of these features in the community requires a combination of vision and opportunism. While it is critical to understand the assets already in place and to establish a long-term natural infrastructure vision with municipal leaders, progress often comes through an unexpected opportunity to acquire a piece of property, create an incentive program, or secure funds from non-traditional sources (e.g. transportation department, FEMA, healthcare systems).

A SYSTEMS THINKING APPROACH

System thinkers thrive on complexity, taking a distinctly non-linear approach to problem solving. Applying systems thinking can highlight barriers, draw out dependencies, and expose opportunities for action, with a focus on the power of feedback loops and leverage points. Nature-based solutions can serve as a catalyst for positive feedback loops – where one action sparks a cycle that increases over time. For example, a living multipurpose shoreline incorporating a recreation path creates new space for walking, biking, and running alongside opportunity for local businesses to grow in response to increased activity. The resulting benefits of improved individual and community health continue to grow, as more activity builds community and encourages even more local residents to participate. Following the cascading impacts of investments can help to highlight which may be leverage points for further change.

SUPPORTING PUBLIC HEALTH WITH GREEN INFRASTRUCTURE

- According to the NYC Heat Vulnerability Index, developed by the NYC Department of Health and Mental Hygiene, Hunts Point is one of the most heat-vulnerable neighborhoods in NYC, and has among the highest rates of heat-related death and illness.[18, 19, 20] Trees can help to mitigate heatwaves in urban areas,[21] but tree canopy cover in Hunts Point hovers around 8%, compared to a borough-wide average of 23% for the Bronx.[22, 23]

- Hunts Point ranks 56th out of 59 NYC community districts for physical activity participation. 30% of residents did not report any physical activity in the last 30 days according to a recent community health survey.[24] Research shows that open space within and near cities can encourage higher levels of physical activity among residents, contributing to lasting physical and mental health with lower rates of obesity and diabetes, reduced stress, and increased productivity at the workplace.

- Avoidable hospitalizations for asthma are 2.5x the NYC average and 10x higher than the healthiest neighborhoods in the state.[25] One study found that an increase in street tree density was associated with a lower prevalence of early childhood asthma in New York City, but noted that further analysis is required.[26]

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