

THE BUSINESS CASE

Many communities are looking for ways to build resilience that yield the most benefit for the least cost. This section builds the business case for nature-based solutions by summarizing their non-monetary benefits and potential cost savings. Thoughtfully planned nature-based solutions can contribute to a community's triple bottom line, providing social, environmental, and financial value.

HAZARD MITIGATION BENEFITS

Nature-based solutions can help reduce the loss of life and property resulting from some of our nation's most common natural hazards. These include flooding, storm surge, drought, and landslides. As future conditions, like climate change, amplify these hazards, nature-based solutions can help communities adapt and thrive.

Riverine Flooding

Communities can mitigate riverine flooding by investing in watershed-scale practices. Land conservation, floodplain restoration, and waterfront parks can keep development out of harm's way. They also store and slow floodwaters.

The GreenSeams program in greater Milwaukee, Wisconsin permanently keeps floodprone lands in high-growth areas from being developed. Since 2001, the GreenSeams program has preserved more than 3,000 acres of land that can store 1.3 billion gallons of water.

Urban Drainage Flooding

When the amount of stormwater flowing into a community's storm sewer system exceeds the system's capacity, water can back up and flood streets, basements, and homes. This type of flooding is most common where new development and changing rainfall patterns produce more runoff than the system was designed to handle. While urban drainage flooding is often less damaging than riverine flooding, it also tends to be more frequent. Over time, repeated minor floods can cost a community more than the extreme floods. They can also decrease real estate values and drive businesses away. Communities can mitigate this type of flooding by encouraging or requiring neighborhood- and site-scale nature-based solutions like bioretention systems. Bioretention systems include practices such as rain gardens, rainwater harvesting, green roofs, and more. These practices soak up runoff from hard surfaces and reduce the amount of stormwater flowing into the storm sewer system.

In Huntington, West Virginia, many neighborhoods experience flooding after heavy rainfalls. The city's comprehensive plan recommends using nature-based solutions that manage stormwater onsite to reduce the burden to the storm sewer system and reduce flooding.

Coastal Flooding and Storm Surge

Coastal flooding can be caused by unusually high tides, strong winds, or storm surge. As future conditions lead to more intense storms and rising sea levels, coastal flooding is becoming more frequent and storm surges are becoming more severe. Communities can mitigate coastal flooding by investing in nature-based shoreline stabilization. Living shorelines, reefs, and dunes can slow waves, reduce wave height, and reduce erosion. At the same time, these practices benefit the ecosystem by filtering and cleaning water and providing habitat.

According to a 2014 journal article in *Ocean & Coastal Management*, North Carolina properties with natural shoreline protection measures withstood wind and storm surge during Hurricane Irene (2011) better than properties with seawalls or bulkheads. The storm damaged 76 percent of bulkheads surveyed, while there was no detected damage to other shoreline types.

Drought

Droughts are also expected to be amplified by future conditions. As precipitation patterns become more unpredictable, communities can increase their resilience. Two options are conservation and rainwater harvesting. Conservation is a watershed-scale approach. It preserves or restores rainwater infiltration to increase groundwater. At the site scale, rainwater harvesting can help. It offsets some of the demand for non-potable water. This demand can be further reduced by xeriscaping, or drought-tolerant landscaping.

In Tucson, Arizona, almost 45 percent of the city's water is used for outdoor (non-potable) purposes. The City of Tucson's Commercial Rainwater Harvesting Ordinance aims to reduce this demand. It requires commercial property developers to harvest rainwater for at least 50 percent of their landscaping needs.

Landslides

Landslide hazards tend to be highest in steeply sloped areas. They are particularly high when soils are saturated and vegetation has decreased, or as a result of fires and droughts. At the watershed scale, communities can reduce landslide threats through conservation aimed at steeply sloped land. At the neighborhood and site scale, communities can invest in green stormwater infrastructure and bioretention systems. This includes trees, rain gardens, bioswales, infiltration basins, and pervious pavement. These stabilize slopes by keeping them drier and adding vegetation and root structures.

The Minnesota Department of Natural Resources lists stabilizing slopes using native vegetation and drainage improvements as one way to mitigate landslide hazards.



Mud slide with rock, boulders, and debris

COMMUNITY CO-BENEFITS

The biggest selling points for nature-based solutions are their many benefits beyond mitigating the effects of natural hazards. Nature-based solutions can provide short- and long-term environmental, economic, and social advantages that improve a community's quality of life and make it more attractive to new residents and businesses. Unlike gray infrastructure, a single nature-based project can yield a variety of community benefits that fulfill many departments' goals. Local leaders can highlight these co-benefits to encourage collaboration and make nature-based solutions standard practice. The bottom line is that collaboration on nature-based solutions can help communities survive in the long-term and thrive day-to-day.

Ecosystem Services

- **Improved water quality:** Nature-based solutions can be used to filter pollutants from stormwater runoff and to reduce the volume of polluted water flowing into rivers, lakes, and coastal waters. In older cities with combined sewer systems, they can also reduce the untreated sewage going into community waterways. Combined sewer systems send all stormwater and sewage to a wastewater treatment plant before releasing the treated wastewater into waterways. When it rains, these systems sometimes carry more water than the treatment plant can handle. As a result, some of the mixed stormwater and sewage will be released untreated into waterways. These events are called combined sewer overflows (CSOs). By lowering the volume of rainwater flowing into a combined sewer system, Nature-based solutions can reduce CSOs and improve water quality.

The City of Lenexa, Kansas focuses on nature-based solutions to prevent stormwater pollution and reduce stormwater runoff.

- **Cleaner water supplies:** Nature-based solutions that protect the land around drinking water reservoirs can keep polluted runoff away from a community's water supply. New York City has high-quality tap water because the city invested in nature-based solutions around its 19 reservoirs. The city's \$600 million investment to conserve and restore the land keeps the water draining into the reservoirs clean. It provided the same level of service as the \$6 billion water filtration plant that the city would have needed otherwise.

- **Improved air quality:** Trees, parks, and other plant-based, nature-based solutions can absorb and filter pollutants and reduce air temperatures. Doing so reduces smog and improves air quality.
- **Healthier wildlife habitats:** Watershed and shoreline nature-based solutions preserve open space and natural environments. If thoughtfully designed, they can also connect habitats to give plants and animals more space to move across the landscape. Both types of nature-based solutions protect aquatic and wildlife habitats by improving water quality.

Economic Benefits

- **Increased property values:** If a property is near a park or has more landscaping, it generally has a higher value. A study of 193 public parks in Portland, Oregon found that parks had a significant, positive impact on nearby property values. A park within 1,500 feet of a home increased its sale price by \$1,290 to \$3,455 (adjusted to 2020 dollars). As parks increased in size, their impact on property value grew.
- **Improved property tax base:** Nature-based solutions can improve the tax base in both high-growth and low-growth communities. In high-growth areas, nature-based features translate into a higher property tax base. In low-growth communities, nature-based solutions can stabilize property values in areas with high vacancies.

In Philadelphia, Pennsylvania, vacant lots were found to deflate neighborhood property values by as much as 20 percent. The Pennsylvania Horticultural Society initiated a program to green and maintain vacant lots. This program now maintains about 7,000 parcels totaling 8 million square feet. A 2012 study of the program found that homes within a quarter mile of a greened lot increased in value by 2 to 5 percent annually – generating \$100 million in additional annual property taxes.

- **Green jobs:** Green stormwater infrastructure creates new job opportunities in sectors like landscape design, paving, and construction. It also opens new job opportunities in emerging industries.

Los Angeles, California saw an increase of more than 2,000 jobs from its \$166 million investment in nature-based solutions from 2012-2014. The best part about this job growth is that many of these jobs are local, providing an extra boost to the local economy.

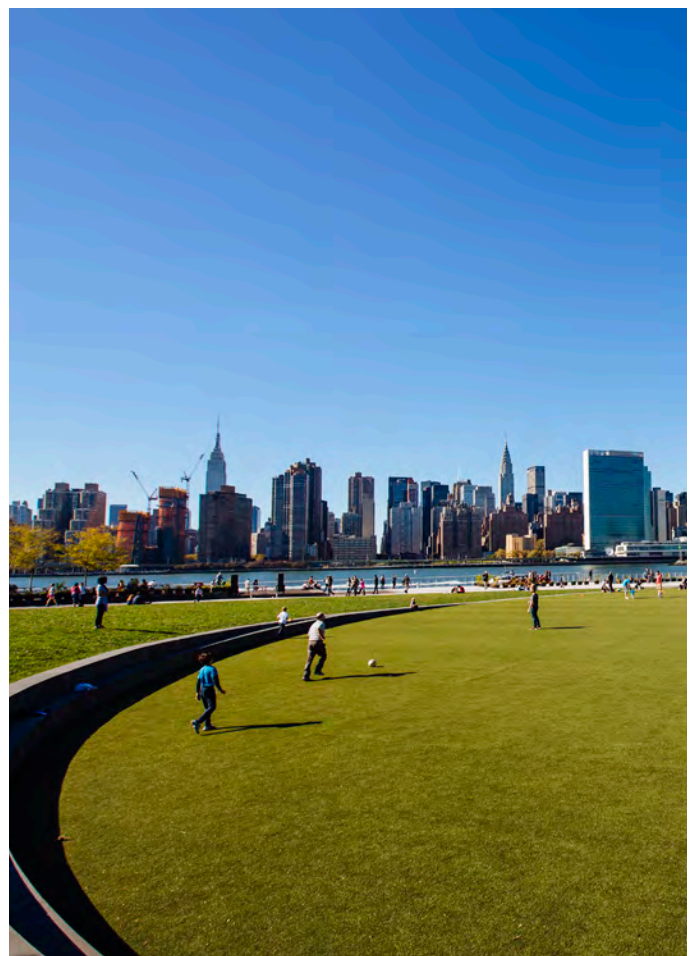
- **Improved triple bottom line:** The triple bottom line is an accounting framework that measures the value of social and environmental benefits, as well as financial benefits. Nature-based solutions provide more triple bottom line benefits than traditional, gray infrastructure. As a result, they increase a community's return on investment.

Social Benefits

- **Added recreational space:** Nature-based solutions that preserve and enhance open space provide more areas for recreation. In addition, nature-based solutions such as greenways and green streets can increase opportunities for active transportation, such as biking and walking. These spaces can also provide aesthetic benefits that contribute to improved mental health and physical well-being.

Hunter's Point South Park in Queens, New York City gives residents a new space to play and relax outdoors, while also mitigating flood risk along the East River. Nature-based features include bioswales and street-side stormwater planters to slowly absorb and release stormwater, and 1.5 acres of new wetlands to shield upland areas from storm surge.

- **Cooler summer temperatures:** Built-up areas tend to be hotter than nearby rural areas, particularly on summer nights. The "urban heat island effect" can lead to higher rates of heat-related illness. Adding trees and vegetation can help reduce these effects by providing shade and cooling through evapotranspiration.
- **Improved public health:** Many of the environmental and social benefits of nature-based solutions also benefit public health, including mental health. Improved air and water quality reduce exposure to harmful pollutants. Cooler summer temperatures reduce the risk of heat-related illness. Additional recreation spaces increase opportunities for physical activity and social engagement.



Hunter's Point South Park, a part of Gantry Plaza State Park, NY

COMMUNITY COST SAVINGS

The final piece of the business case for nature-based solutions is the potential for cost savings. Savings may come when nature-based solutions cost less than alternative investments, avoid the need for certain infrastructure altogether, reduce the cost of rebuilding and repairs after a disaster, and help mitigate the impacts of future conditions like climate change. It is important to emphasize that it is often, *but not* always, possible to identify nature-based approaches that are cheaper than gray infrastructure alternatives.

Reduced Stormwater Management Costs

Using nature-based infrastructure can reduce the cost of stormwater management for new development because material costs are lower. Nature-based solutions can reduce the need for expensive below-ground infrastructure. They can also reduce the number of curbs, catch basins, and outlet control structures required. Nature-based solutions can save money on site preparation because they require less land disturbance.

In older cities with combined sewer systems, using both green and gray infrastructure can reduce combined sewer overflows (CSOs) at a lower cost. The traditional, gray infrastructure approach is to install below-ground tanks and tunnels and expand existing facilities. This process has extremely high capital costs. It also delays water quality improvements until the end of a decades-long design and construction process. Many nature-based solutions practices have lower capital costs and begin to provide benefits in a few years. New York City developed a plan to reduce CSOs using both green and gray infrastructure. The nature-based solutions component will eventually capture runoff from 10 percent of the impervious areas of the combined sewer watersheds. While the gray infrastructure option would cost about \$3.9 billion in public funds, the nature-based alternative will cost about \$1.5 billion.

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Reduced Drinking Water Treatment Costs

Watershed-scale conservation practices can keep drinking water clean. They are often more cost-effective than building filtration plants to treat polluted water.

The Quabbin and Wachusett Reservoirs serve 2.5 million people in central Massachusetts and the Boston area. Over 20 years, the Massachusetts Water Resources Authority spent \$130 million on nature-based solutions. The nature-based solutions protect 22,000 acres of the watershed that drains into these reservoirs. A water filtration plant would have cost \$250 million to build and \$4 million annually to operate and maintain.

Avoided Flood Losses

Nature-based solutions can also help communities save money by reducing losses from future floods and other natural disasters. The U.S. Environmental Protection Agency (EPA) studied this issue in a landmark 2015 study. The study estimated the flood losses that would be avoided nationwide by adding requirements to manage stormwater onsite. It found that, over time, using nature-based solutions in new development and redevelopment could save hundreds of millions of dollars in flood losses.