The Transforming Economics of Green Infrastructure

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As cities and municipalities grapple with limited funds for management of existing public stormwater systems, expansion needs, flood control, and compliance with Clean Water Act requirements, there is a growing interest in implementing green infrastructure. A comprehensive, cost-effective approach to wet weather management, green infrastructure relies primarily on designs utilizing vegetation and soils and provides the distinct ability to incorporate multifunctional design elements that benefit multiple purposes. Case studies indicate a growing number of cities — including Philadelphia, Santa Monica, and Emeryville, California — list improvements in quality of life as a major priority in developing their green infrastructure policies.

Landscape architects are especially effective in providing green infrastructure designs benefitting the community because of their training, knowledge, and emphasis on relating the site to the human scale. This understanding enables landscape architects to design living places for people to inhabit…initiating vibrant centers of economic growth. These spaces may be as small as a pocket park or street, or as encompassing as a neighborhood or a city.

What is Green Infrastucture?

The purpose of green infrastructure is to preserve or mimic the natural hydrologic cycle by designing site techniques that infiltrate, store, evaporate, and detain stormwater runoff. This approach focuses on distributing many smaller integrated stormwater controls throughout the site, near the source of each impact, rather than collecting water and sending it offsite. Reducing water flow entering the stormwater drainage system reduces: runoff volumes, flooding, pollutant loadings to downstream waters, and the incidence of combined sewer overflows (CSO). For example, using green infrastructure, Chicago diverted over 70 million gallons of stormwater from its CSO in 2009.

Green infrastructure elements may include: bioretention areas, trees, green roofs, porous pavements, and rainwater harvesting for non-potable uses. Bioretention areas are vegetated depressions that collect and infiltrate stormwater, strategies easily incorporated into roadway systems and parking lots. They vary in design and include rain gardens, bio-swales, infiltration planters, and enhanced tree pits.

Green infrastructure stands in contrast to grey infrastructure, a combination of separate pipe networks for storm and sanitary flows, storage, and sewage treatment plants. In cities with combined sewer systems, both sanitary waste and stormwater flow together into wastewater treatment plants, where water quality is improved before being discharged. Heavy precipitation normally exceeds the combined system's capacity, causing CSOs, which then discharges both stormwater and untreated sanitary flow directly into local waterbodies. The untreated sewage poses health risks, threatens aquatic life, degrades local water quality, causes beach closures, and significantly reduces related economic activity.

Benefits of Green Infrastructure

Green infrastructure is well established as a cost-effective stormwater management policy based on hundreds of documented case studies published by a growing body of government and leading industry associations such as the Environmental Protection Agency (EPA), the Water Environment Federation, and ASLA, among others.

Photos: Aris Land Studio

Left: Rain garden storm event, Stepping Stones Museum for Children, Norwalk, CT. Right: The same rain garden in summer bloom.

Economic Benefits:

- Reduced sewer overflow events lower operation and maintenance costs. Philadelphia has reduced its CSO inputs by a quarter billion gallons, saving $170 million by requiring properties to retain the first inch of rain on site.
- Aging grey infrastructure systems are maintained longer when augmented by green infrastructure. Lenexa, Kansas discovered that green infrastructure on-site detention costs 25 percent less than retrofitting its existing system.
- Green and green-grey infrastructure combinations typically cost less than grey infrastructure. An August 2010 EPA report of 12 case studies reported capital cost savings ranging from 15 to 80 percent.
- Land values and economic activity increase in the vicinity of appropriate site amenities, which are often integral components of green infrastructure.
- Trees, green roofs, and other green infrastructure features shade and cool buildings, reducing cooling needs and energy consumption.
- Cost savings are realized through synergistic projects with other renovations that would cost more if constructed separately. Bridgeport and New Haven plan to incorporate bioretention features in enhanced tree pits, increasing stormwater management benefits along with future street tree plantings.

Environmental Benefits:

- Hydrological balance of watersheds are preserved by recharging groundwater through infiltration, rainwater harvesting, and evapotranspiration.
- Reduced sewer overflow events lower pollutant loads and improve water quality.
- Flood risk and stream bank erosion is mitigated by slowing and reducing stormwater flows.
- Trees, parks, and other green infrastructure features improve air quality by reducing atmospheric carbon dioxide (CO2) and reducing air temperatures that contribute to ground level ozone.
- Particulate pollution is reduced through absorption and filtered through vegetation.

Green roof, Stepping Stones Museum for Children, Norwalk, CT.

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Green Infrastructure, cont'd

- Urban heat islands are cooled through vegetative covers, including green roofs.
- Planting trees and vegetation increases wildlife habitat, especially when using plant species native to the region.

Social and Community Benefits:

- Areas for public recreational activities are expanded through green infrastructure features and improved water-body quality.
- The increase in green space and parks encourages outdoor physical activities leading to healthier lifestyles, with reductions in obesity and other chronic diseases.
- Trees and other plantings improve community livability and foster a stronger sense of community, along with increased economic activity. Seattle's SEAstreet design (Street Edge Alternative), a green infrastructure pilot program, saves $100,000 per block (330 lineal feet) in capital costs, and provides community benefits of improved neighborhood values, traffic calming, and bioremediation.

Landscape Architects Help Transform Cities

Throughout the country, cites such as Bridgeport, Philadelphia, New York, and Portland, Oregon recognize the financial relationship between functional, sustainable, and strategic design as a means to reduce costs, improve environmental health, and create more vibrant, economically strong communities. People repeatedly visit cities and towns, not for the functionality of their infrastructure, but rather for the vitality of their streets, neighborhoods, and parks. This is the realm of the landscape architect: creating livable spaces to benefit the health, safety, and welfare of the places we live.

Landscape architects experienced in designing sustainable green infrastructure can be found throughout Connecticut to provide solutions for land development, restoration, and planning. These landscape architecture firms routinely help to design stormwater management solutions that are cost-effective, sustainable, and destined to generate positive outcomes for our communities.

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