

## Healthy Benefits of Green Infrastructure in Communities



Rain Garden



Bioswales



Planter Box



Urban Trees



Natural Areas



Permeable Pavement

### What is Green Infrastructure?

When rain falls on our roofs, streets, and parking lots, the water cannot soak into the ground as it should. If not managed well, it can lead to flooding, sewer overflows, and water pollution. Unlike conventional gray infrastructure, which uses pipes, storm drains, and treatment facilities to manage stormwater, green infrastructure uses vegetation, soils, and other natural landscape features to manage wet weather impacts, reduce and treat stormwater at its source, and create sustainable and healthy communities.

Green infrastructure can include features such as rain gardens, bioswales, planter boxes and planting strips, urban tree canopies, natural areas (such as parks and wetlands), and permeable pavement, as well as techniques to redirect, capture, and store rainwater for irrigation and other uses, such as downspout disconnection and the use of rain barrels and cisterns

### Green Infrastructure & Health

By weaving natural features into the built environment, green infrastructure can not only provide stormwater management, but also a number of other environmental, social, and economic benefits not typically provided by gray infrastructure [1-4]. Green infrastructure increases exposure

to the natural environment, reduces exposure to harmful substances and conditions, provides opportunity for recreation and physical activity, improves safety, promotes community identity and a sense of well-being, and provides economic benefits at both the community and household level.

These benefits are all known to directly or indirectly benefit public health. The degree to which the environmental, social, economic, and public health benefits of green infrastructure are realized is dependent on a number of factors, including the design, installation, and maintenance of the green infrastructure features.

The City of Philadelphia Triple Bottom Line Assessment [5] found that increased tree canopy can reduce ozone and particulate pollution enough to significantly reduce hospital admissions, lost work days, and mortality.

### Environmental Impacts

By design, green infrastructure installments typically impact the physical environment by decreasing impervious surfaces and creating natural habitat and permeable surfaces. Open soil and permeable pavements increase stormwater infiltration and storage capacity; thereby, slowing and reducing stormwater runoff and

discharges associated with pollutant loading, flooding, combined sewer overflow (CSO) events, and erosion.

Reducing these stormwater-related impacts also reduces a person's exposure to water pollution and flooding-related health hazards and their associated health outcomes, such as waterborne illness, respiratory disease and asthma associated with mold and bacteria, vector-borne disease, stress, injury, and death. Trees, bushes, and greenery have the ability to absorb air pollutants and trap airborne particulates on their leaves, reduce surface and air temperatures through shading and evapotranspiration, and provide a physical barrier to traffic and street noise pollution. Exposure to air pollutants and particulates can exacerbate asthma conditions and cause respiratory disease, cardiovascular disease, stroke, cancer, and even premature death. Extreme heat events can lead to heat-related illnesses and fatalities, while noise pollution has been linked to hearing and cognitive impairment, hypertension, stress, and sleep disturbance. These are all health impacts that are especially detrimental for children, the elderly, and those with pre-existing health conditions.

Green infrastructure installments also provide natural habitat for birds and wildlife and increase

greenspace, which has been linked to reduced anxiety and stress, and improved mental health, cognitive function, healing and recovery, and overall health and well-being.

**Social Impacts**

Green infrastructure can also have positive impacts on social determinants of health, such as recreation and physical activity, social capital, and crime. The natural habitat and greenspace provided by green infrastructure creates places for recreation (e.g., bird and wildlife viewing and physical activity) and improves social capital.

Physical activity has been shown to reduce stress and the risk of obesity, cardiovascular disease, hypertension, diabetes, stroke, and certain kinds of cancer, and lead to improvements in mental health and overall health and well-being. Attractive, accessible greenspace can improve community identity and sense of place, improve aesthetics, and provide a place for gathering and social interaction. Improved social capital has been linked to reduced stress and improvements in mental health and overall health and well-being.

Greenspace and improved aesthetics also have the potential to reduce crime and violence in a community, although design and maintenance of the natural elements are critical to realizing those benefits and the reduced risk of crime-related injury and stress. Crime Prevention through

Environmental Design is a crime management strategy that utilizes natural elements.

A Health Impact Assessment <sup>[1]</sup> conducted on a proposed green street project in Atlanta, Georgia led the City of Atlanta to extend the length of the green street to maximize the public health benefits.

**Economic Impacts**

Green infrastructure costs less than conventional gray infrastructure, provides green jobs and reduces municipal water usage and cooling costs.

At the household level, this can result in increases in available income for preventative healthcare, healthy foods, and adequate housing, all of which have proven health benefits contribute to overall health and well-being. At the community level, this can reduce unemployment and promote economic growth.

Green infrastructure has also been shown to increase nearby property values, which can be of benefit to

businesses and homeowners, but can also increase the cost of living in a community, which has the potential for negative impacts on household economics and can even lead to displacement of residents, especially if the green infrastructure signals revitalization in the area.

[1] EPA. 2015. Proctor Creek’s Boone Boulevard Green Street Project Health Impact Assessment (HIA). EPA/600/R-14/400. U.S. Environmental Protection Agency, Office of Research and Development and Region 4, Washington, D.C.

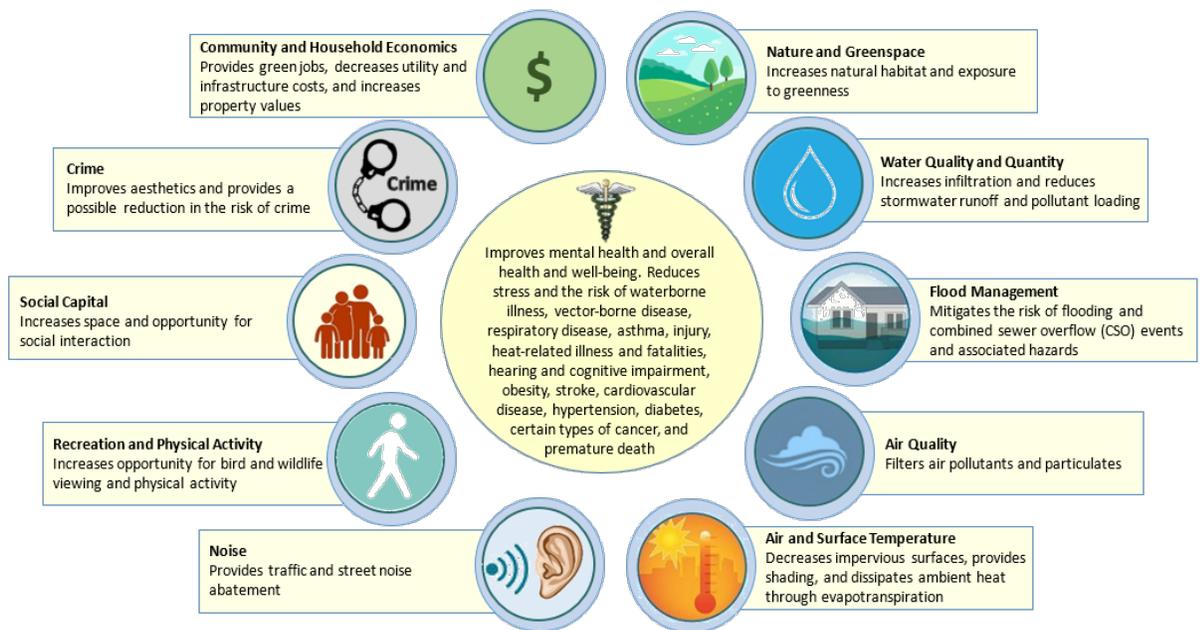
[2] EPA. 2017. Green Infrastructure [Internet]. Available at: <https://www.epa.gov/green-infrastructure>, accessed August 2017.

[3] EPA. 2014. Enhancing Sustainable Communities with Green Infrastructure: A Guide to Help Communities Better Manage Stormwater while Achieving Other Environmental, Public Health, Social and Economic Benefits. EPA/100/R-14/006. U.S. Environmental Protection Agency, Washington, D.C.

[4] CNT. 2010. The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental and Social Benefits. Center for Neighborhood Technology, Chicago, IL.

[5] Stratus Consulting Inc. 2009. A Triple Bottom Line Assessment of Traditional and Green Infrastructure Options for Controlling CSO Events in Philadelphia’s Watersheds. Boulder, CO

August 2017



*Environmental, social, economic, and public health benefits of green infrastructure*