

Research Brief

natural
capital
PROJECT

Stanford
WOODS
INSTITUTE for the
ENVIRONMENT

JUNE 2019

Valuing Urban Nature – Implications for Water Quantity and Quality Policy

ISSUE OVERVIEW

Sufficient clean water is essential to life, making the policies that govern water availability and quality extremely high stakes. Cities are faced with multiple challenges in managing stormwater runoff and wastewater while providing safe and reliable drinking water. The integration of nature-based solutions like urban parks, green roofs, and raingardens has proven to be effective at improving water quality and restoring the natural infiltration capacity of a watershed, increasing the water supply. However, tradeoffs between grey and green infrastructure exist and must be considered.

In a new study, scientists at the Natural Capital Project developed a framework for valuing urban nature and examined different factors cities must consider when making infrastructure and other investment choices. This brief is part of a series based on that research which examines the efficacy of nature-based solutions to the issues of water quantity and water quality.

RECOMMENDATIONS AND POINTS FOR DECISION-MAKERS – URBAN WATER SUPPLY

Nature-based solutions that protect or restore the natural infiltration capacity of a watershed will increase the water supply service: these solutions include, street trees, parks and open space, community gardens, and engineered devices such as raingardens, bioswales or retention ponds that are designed to increase stormwater infiltration. To maximize urban water supply, practitioners should:

- Continue to use nature-based solutions as alternatives to traditional stormwater management techniques, where possible, since these solutions can promote groundwater recharge. Stormwater harvesting, which is not necessarily “nature-based,” also represents a significant urban water source.
- Prioritize the use of raingardens, wetlands, or engineered infiltration ponds or bioswales over street trees as nature-based solutions most likely to promote recharge and reduce evapotranspiration.



Photo Credit: Center for Neighborhood Technology



Photo Credit: Center for Neighborhood Technology

- Avoid activities or interventions that increase soil compaction and reduce infiltration.
- Select vegetation with low water requirements.

RECOMMENDATIONS AND POINTS FOR DECISION-MAKERS – STORMWATER AND WASTEWATER

Urban parks and open spaces, wetlands, green roofs and other engineered stormwater treatment devices such as raingardens help manage stormwater by reducing the volume and contamination of stormwater runoff. With regards to wastewater, urban nature can help ease the burden on grey infrastructure by removing water and associated pollutants, allowing for more efficient functioning of wastewater treatment plants and additional treatment of the effluents. For improved storm and wastewater management, practitioners should:

- Couple nature-based solutions with grey infrastructure to reduce stormwater volumes because of the limitations of grey infrastructure; nature-based solutions may be particularly useful in helping reduce flooding and combined sewer overflows (CSO).
- Deploy nature-based solutions to reduce heavy metal and particulate pollutants in stormwater.
- Consider maintenance costs and space requirements of nature-based solutions.
- Consider adverse effects of nature-based solutions that may act as sources of nutrient pollution to stormwater in some instances, especially in the absence of appropriate maintenance or management.

BACKGROUND

According to the World Health Organization, half of the world's population will be living in water-stressed areas by 2025. United Nations Sustainable Development Goal target 6.1 calls for



Photo Credit: Center for Neighborhood Technology

universal and equitable access to safe and affordable drinking water. However, as climate change exacerbates extreme weather events, it makes phenomena such as droughts, hurricanes, and high-tide flooding even more dangerous. These factors have significant ramifications for urban water supply as well as stormwater and wastewater. Management of all water resources will need to be improved to ensure sufficient water quantity and quality is available to future populations. Nature-based solutions can be integrated to help mitigate these issues, while providing a range of co-benefits.

Urbanization generates wastewater from residential and commercial uses and stormwater runoff from large impervious surface area. Both can have detrimental effects on the water systems into which the waste and runoff flows and on the health and wellbeing of local populations. Water quality near urban areas is affected by organics, heavy metal, and salt pollutants, as well as nutrient enrichment, leading to eutrophication (excessive richness of nutrients) and algal blooms. In developing countries lacking adequate wastewater treatment, urbanization also concentrates raw sewage in surface waters, increasing the risk of contamination of drinking water supplies. For many decades, engineers have dealt with these issues by building grey infrastructure (stormwater and wastewater sewer networks, wastewater treatment plants), which have high capital costs and often fail to mitigate urbanization effects on stream health. There is growing interest in finding alternative ways to treat urban stormwater and wastewater with nature-based solutions.

ABOUT THE STANFORD NATURAL CAPITAL PROJECT AUTHORS

Katie Arkema is a lead scientist; **Anne Guerry** is the chief strategy officer and a lead scientist; and **Perrine Hamel** is an ecosystem services scientist with the Stanford Natural Capital Project.

This research brief is based on the study, *Social-ecological and technological factors moderate the value of urban nature* published in the journal *Nature Sustainability*.