

Public Health and the Need for Comprehensive Urban Greening in Cities

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Urbanization and Sustainability

Early America was an agrarian culture, with small towns and farms interspersed across the landscape. Industrialization promoted both expansion of settlements across the continent and ever greater population concentration in cities. Today more than 80 percent of the U.S. population lives in cities and urbanized areas.

Given the evolution of both national population growth and urban systems achievements (such as transportation and utility systems) cities are now the most viable option for sustainable human settlement.¹ Cities magnify human strengths, as urban centers enable important social and economic exchanges.² Innovation is facilitated by face-to-face interaction, talent is drawn to cities, entrepreneurship is supported, and there is extensive opportunity for social and economic mobility. Compact, higher density central cities are the places where such interactions occur at high rates, and again, despite long held assumptions about the environmental impact of cities, these are also the places where the per capita environmental footprint may be the smallest. People who live in more dense cities generally use less energy and generate significantly less carbon emissions than people who live in suburban areas. Urban homes are smaller and less materials intensive, often using less energy for heating and cooling. Urban residents drive less, as they walk and use transit more often.³

Metro Nature Services

Metro nature is interspersed within the places where people live, work, learn and play in cities, providing green backdrops for the daily routines of millions of people. It includes naturalistic patches, such as urban forests, greenbelts, conserved open spaces, and riparian corridors. Metro nature also includes constructed nature such as parks, streetscapes, community gardens, pocket parks, and recreation paths.

In recent decades scientific research has expanded public knowledge of the environmental services of urban forests and other natural systems, including air quality, reduced heat island effect, and stormwater management. Social scientists have also expanded the scope and characterization of nature's functions in cities. We now know that metro nature directly contributes to quality human habitat,⁴ and is profoundly important for the health of mind and body.

Evidence of Nature Benefits

Scientific evidence should be the basis of future efforts to make cities more sustainable, and sustaining. A surprisingly rich literature exists about the relationships of urban nature and human health and well-being. The USDA Forest Service has sponsored a project to provide access to this knowledge base. The website *Green Cities: Good Health* represents a collection of more than 2,100 scholarly works (most are peer reviewed) that have been sorted into key themes, each represented by a summary essay with citations. The site link is: www.greenhealth.washington.edu. A sampling of findings follows.

Active Living

There has been a dramatic rise in recent years in the percentage of people who are overweight or obese, and these conditions contribute (over the life of the average person) to increases in chronic disease, such as diabetes, and traumatic diseases, such as cancer and heart disease.⁵ The U.S. Centers for Disease Control provides recommendations for weekly rates of moderate-level physical activity to reduce health risks.⁶ Living close to parks and other recreation facilities is related to higher physical activity levels for both adults and youth.⁷ People who use parks are three times more likely to achieve recommended levels of physical activity than nonusers.⁸ Access to safe parks or other activity supporting places is one of a set of neighborhood characteristics that has an important effect on whether teens meet recommendations for physical activity.⁹ Childhood obesity has more than tripled in the past 30 years. Improving the walkability of neighborhoods and increasing recreation access can help promote healthy childhood weight status.¹⁰ Older people also benefit; a study found that seniors that had nearby parks, tree-lined streets, and walkable spaces showed higher longevity over a 5-year study period.¹¹

Reduced Stress Response

Stress is a major contributor to ill-health in modern times. When experiencing stress one's muscle tension increases, blood pressure rises, the pulse quickens, respiration increases, and the body produces more adrenaline. Unresolved, long-term stress can lead to secondary symptoms and illnesses. The experience of nature is one antidote to stress, and the body's positive response is remarkably fast. In one experiment people who viewed a video of a natural setting, after viewing a visual stressor, displayed faster and more complete physiological recovery than those seeing nature-less built environments.¹² Visual exposure to nature in the form of trees, grass, and flowers can effectively reduce stress, particularly if initial stress levels are high.¹³ Mental restoration is also gained from spending time in an urban green space, and increased length of stay (up to 1.5 hours) increases the restorative effect.¹⁴ Studies in Japan of *Shinrin-yoku*, or forest walking and breathing, have found effects of improved immune system response, lowered stress indicators, reduced depression, and lower glucose levels in diabetics.¹⁵

Mental Health and Functioning

In addition to physical well-being nearby nature contributes to better mental health and improves one's capacity to be productive. Modern life often demands sustained focus on tasks, and this effort can lead to cognitive overload, bringing on irritability, inability to function effectively, and physical symptoms. Views or brief experiences of nearby nature help to restore the mind from mental fatigue, as natural settings provide respite from the highly focused attention needed for most tasks in school or in the workplace.^{16 17} This psychological response may contribute to higher productivity in the workplace as office workers with a view of nature are better able to attend to tasks, report fewer illnesses, and have higher job satisfaction.¹⁸ Green spaces and parks provide opportunities for physical activity; exercise improves cognitive function, learning, and memory.^{19 20} Outdoor activities can help alleviate symptoms of Alzheimers, dementia, stress, and depression and improve cognitive function in those recently diagnosed with breast cancer.^{21 22 23} Symptoms of ADD in children can be reduced through activity in green settings, thus "green time" can act as

an effective supplement to standard traditional pharmaceutical and behavioral treatments.²⁴

Healing and Therapy

From ancient to modern times plants have been the sources of medicines. The experience of plants and nature is also associated with healing and treatment of emotional and physical disabilities. Hospital patients having plants in their room display less fatigue and pain, shorter hospitalization, less anxiety, and higher hospital and room satisfaction.^{25 26} Horticultural therapy engages patients in gardening activities to achieve specific treatment goals. Participation in gardening activities can slow the deterioration of the physical and mental conditions of the elderly.²⁷ Dementia patients who have access to gardens are less likely to have negative reactions and fits of anger,²⁸ as well as improved sleep patterns and decreased agitation.²⁹ Nature can also be used in rehabilitation programs. A group of prisoners in a horticulture program had a recidivism rate of 25%, compared to the 65% rate of the general prison population.³⁰

Social Capital

Social capital is formed from the interpersonal relationships of people, and resulting supportive networks. Social capital is a critical condition for a host of community benefits,³¹ and contributes to development of social resilience in communities.³² The mere presence of landscape or trees appears to promote community connections. Views of green space from homes are linked to greater perceptions of well-being and neighborhood satisfaction.³³ Public housing residents reported feeling a greater sense of safety in their development if it had well-maintained landscaping including trees and grass.³⁴ Greener public housing neighborhoods tend to be safer, with fewer incivilities and reported crimes.³⁵ Having trees in public housing neighborhoods lowers levels of fear, contributes to less violent and aggressive behavior, encourages better neighbor relationships and better coping skills.³⁶ Active involvement in community greening and nature restoration projects also produces a range of social benefits from healthy food production to strengthening intergenerational ties, and organizational empowerment.³⁷

Community Economics

Most economic valuations of metro nature have addressed residential property values. The *proximate principle* calls out that homes adjacent to naturalistic parks and open spaces are valued from 8 percent to 20 percent higher than comparable properties.³⁸ Having adjacent street trees positively affects home values and time on market for sales,³⁹ while yard trees are associated with both higher property values and rental rates.^{40 41 42}

There are many more opportunities to express benefits in the economic terms. Increased worker productivity and school performance have implications for local industry and work force development. Nature-based healing and therapy may be reasonably priced supplements in human services programs. Perhaps the most promising valuation opportunity is the relationship of outdoor space and active living, given the high costs of treating the chronic diseases associated with obesity (such as diabetes, heart disease, and stroke). The potential economic consequences of routine, mild physical activity are enormous, when aggregated across regions, entire cities or the nation. Deferred costs are

possible, as medical expenses are lower for people who do routine physical activity and exercise. Parks prescription programs integrate open space with the medical benefits of activity.

Collected Works

Recent books have synthesized the knowledge about the need for nearby nature in everyday built environments. The *Restorative Commons*,⁴³ presents eighteen essays about the health and function roles of urban landscapes. The edited *Forests, Trees and Human Health*⁴⁴ represents the work of scientists from 25 countries, including the U.S. *Healing Spaces: The Science of Place and Well-Being*⁴⁵ describes the role of nature experience in the complicated working relationship between the senses, the emotions, and the immune system. The linkages between human behavior and conservation goals are explained in *Conservation Psychology*.⁴⁶

A widely read book, *The Last Child in the Woods - Saving Our Children From Nature-Deficit Disorder*⁴⁷ included the latest studies of the impact of nearby nature on child development. A follow up, *The Nature Principle*,⁴⁸ proposes that tapping into the restorative powers of the natural world can promote health and wellness, and build smarter and more sustainable businesses, communities, and economies. The question of why people create natural spaces in extreme or difficult conditions is explored in *Defiant Gardens*.⁴⁹ Just published, *Greening in the Red Zone: Disaster, Resilience and Community Greening* explores how access to and stewardship of green space can promote community stability and recovery.⁵⁰

Planning for Urban Greening

The prevailing approach to U.S. planning in the last century was Euclidian zoning, the practice of spatially separating land uses by mapped zones. So residential was separated from commercial, and each was held at a distance from industrial. In recent decades mixed use zoning has become more common so that buildings and developments are multi-functional, such as buildings having retail on the first floor and residential above.

In addition, zoning and land use regulation maps draped residential, commercial, and industrial developments across landscapes with little acknowledgement of underlying conditions. The result was places that experienced disturbance episodes ranging from human discomfort (high temperature microclimate) to catastrophe (such as major flooding) due to inattention to the biophysical basis of built places.

Two changes are needed in future metro nature planning, building on innovations that are underway in some cities. First, parks, open space and other urban natural elements must be designed and managed as citywide systems. Second, the parcels within such systems must be multi-functional to achieve the broadest array of social and environmental co-benefits.

Comprehensive Citywide Planning for Nature

The term infrastructure brings to mind roads, pipes, and power lines. Infrastructure systems are systematically planned to source and deliver crucial services or products, such as road or water systems. *Green infrastructure* is a practical integration of built and

ecological systems,⁵¹ that incorporates all natural, semi-natural and constructed green spaces within, around, and between built areas.⁵² Green infrastructure upgrades parks and open space to a coherent system of landscape units having functional linkages.⁵³ Successful implementation includes not only construction of new green spaces, but also strategic designation and conservation of existing parcels that provide high levels of services.

Mixed Use Nature

Urban planners and designers are increasingly pursuing land uses that incorporate ecosystem functions and processes. Built and developed lands are mutable, and any development approach can achieve multiple functions. Lands or facilities that are constructed to serve a primary function can, with a little extra design effort, offer co-benefits. Performance goals that typically guide environmental improvements should simultaneously specify how nature settings can be designed to welcome, restore, and heal those who have visual and physical access.⁵⁴ Equitable access to nature for all of a city's residents is an environmental justice concern.

A multi-tasking approach to green planning generates efficiencies and expands the functionality of any bit of nature. In the past most nature parcels were discrete land units (such as parks) that were separated from built land uses either in function or by legal boundaries.⁵⁵ In many cities natural elements or parcels are no longer simply set aside for recreation or aesthetics. Parks, open space, the urban forest and other urban greening features are now multi-tasking. Local governments promote innovative integrations of nature in engineered systems that serve multiple purposes.⁵⁶ For instance green roofs are installed to manage on-site stormwater and reduce building energy use, but also serve as small parks and offer wildlife habitat.⁵⁷ Urban farms address concerns of food security and children's nutrition, can aid stormwater management, and can provide green industry job training.

Closing Comments

Landscapes around many metropolitan areas will continue to be developed and suburbanize, but more cost-effective urban form can be achieved by doing so at higher densities and by consuming less land. Comprehensive approaches for integrating nearby nature in new development. Visionary planning, such as Frederick Law Olmsted's parks systems, and the Garden City and City Beautiful movements, used layouts of parks and open spaces, to redevelop and beautify urban areas. Each of these landmark integrations of built and green space systems pursued both aesthetic and social reform goals. Advocates claimed that the experience of refined nature would encourage moral and civic virtues in the urban masses. Early city beautification programs aimed to increase quality of life and generate a more harmonious social order within the crowded housing that emerged during industrialization. The expression of these ideals is now supported by research.^{58 59} The *biophilic city* includes strategies that integrate nearby nature in order to satisfy the essential human need for frequent contact with nature, reduce environmental risks, and generate ecosystem services. These are the foundations of the *humane metropolis* strategies that improve the habitability of cities and suburbs, including regional greenspaces, urban ecological restoration, public health, social equity, and quality of place.⁶⁰

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