Wolf, K.L. 2017. The sanitary to sustainable city: Place, health, and trees. Arborist News 26, 4, 40–43.

The Sanitary to Sustainable City: Place, Health, and Trees

By Kathleen L. Wolf

Many cities are in the midst of dynamic re-inventions of major systems, such as water management, housing, and transportation. Cities' functional relationship to urban nature is also in transition. The fairly universal standards and performance expectations of gray infrastructure are giving way to innovations that align with local needs and ecologies. Within these emergent systems are opportunities to generate co-benefits. Urban forestry, and urban greening more generally, contribute to city systems that move from sanitary to sustainable.

The Sanitary City

Infrastructure networks are intended to meet the constant, fundamental demands of cities. City systems that provide potable water and electricity, remove refuse, and process wastewater are essential. When these systems function well, they are below the consciousness of most people. If they aren't working well, everyday life is filled with challenges and expensive workarounds.

In the mid-19th century, the "sanitary idea," proposed by Edwin Chadwick in England, stressed the importance of the physical environment and the role of decaying organic matter as the source of disease. Sanitary engineering solutions emerged, focusing on rapid and efficient disposal of urban wastes, and providing clean air and water.

KATHY WOLF

Sanitary city solutions often rely on gray infrastructure that is built and placed underground. Photo taken at Baltimore Public Works Museum.

Best practices and infrastructure systems of the sanitary city provide the most basic conditions necessary for good health for all city residents. The degree to which a city has achieved sanitary goals has enormous implications for the health and quality of life of its residents. Innovations continue, often in ways that enable economic growth.

The Sustainable City

Applying historic infrastructure technologies to urban problems has sometimes produced contradictory outcomes. Citywide sewer systems alleviated sanitation problems of the inner city, but waste was redirected to nearby rivers, lakes, and bays, thus creating new health and pollution hazards. Electrical power reduced household dependence on wood and coal, but increased the use of polluting fuels at centralized power plants.

In many instances, unintended consequences do not prompt wholesale revisions of an infrastructure system, but launch another layer of problem-solving technology. Greater demands on a system are often met with expensive sizing-up construction, such as larger pipe and pump systems.

The historic escalation of engineering fixes to provide potable water, process trash, and cleanse wastewater are now being revisited as part of sustainability initiatives. Decades old, engineered systems are faltering, and public officials are considering alternative technologies.

Green Infrastructure as Sustainability Strategy

The notion of the sustainable city offers new goals and practices. Described as the triple-bottom-line or the three pillars, sustainability includes environmental, social, and economic goals. Green infrastructure is a practical integration of built and natural systems that addresses all three goals.

Green infrastructure describes the networks of natural, semi-natural, and constructed ecological systems within, around, and between urban areas. The contributing land units range in scale from small parcels to large parks or greenbelts. New nature-based facilities may have a primary purpose, such as rainwater removal or waste

disposal. Having more of a systems outlook encourages green infrastructure that has multiple secondary functions and benefits.

Parks and open spaces can be upgraded into a coherent, functional landscape network. Urban forestry is another comprehensive sustainability strategy. Historic tree plantings might be conducted for community beautification. Research now shows how trees address many important urban challenges. Combined with built technologies, trees help reduce stormwater runoff, remove the particulates from the air that cause respiratory illness, reduce heat-island effects, and reduce energy consumption. The benefit–cost implications of a smartly managed urban forestry strategy can be substantial—it's the whole point of i-Tree tools.

Social Determinants of Health

Sanitary practices include goals of improved human health. Advocates of the sustainable city are also concerned about social conditions and human wellness. And for good reason. Health care costs in the U.S. are about USD $3 trillion per year, representing about 17 percent of the gross domestic product. Other nations have similar health care cost burdens. Due to these expenses, and the quality-of-life implications, public health officials are now considering more than just clinical care; the notion of social determinants of health has also come into play.

The World Health Organization defined health (in 1946) as "A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." While individual choices, such as food and exercise, play a role in determining one's health, the community where one lives is crucial. It is said that your zip code may be more important for health than your genetic code. Social-determinants policies address the full spectrum of human health influences.

Green infrastructure, including city trees, plays an important role in disease prevention and health promotion. Literally thousands of articles point to the important link between metro nature (a term that includes parks, gardens, trees, and green infrastructure) and well-being. Of course, people don't single out views of trees from other vegetation in their mental and physical responses. Yet trees are often the nature scaffold or framework in a community, a key component of a physical environment that promotes good health. (Check out the Green Cities; Good Health website for a summarized review: www.greenhealth.washington.edu)

City Nature and Health Response

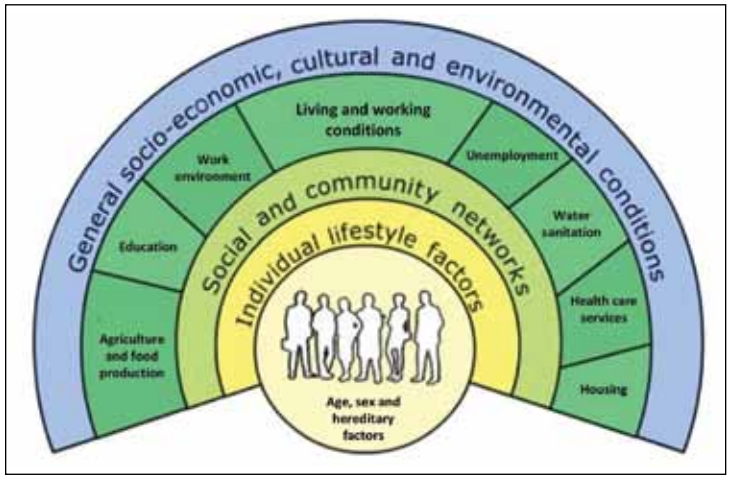
Distribution of metro nature in cities, for better or worse, reflects local land availability, real-estate costs, and historic planning practices. Considering both scarcity and sustainability, every bit of nature should be co-designed for co-benefits to optimize functions and return on investment. Health-oriented co-design can reduce costs and engage residents more directly in sustainable city

KATHY WOLF

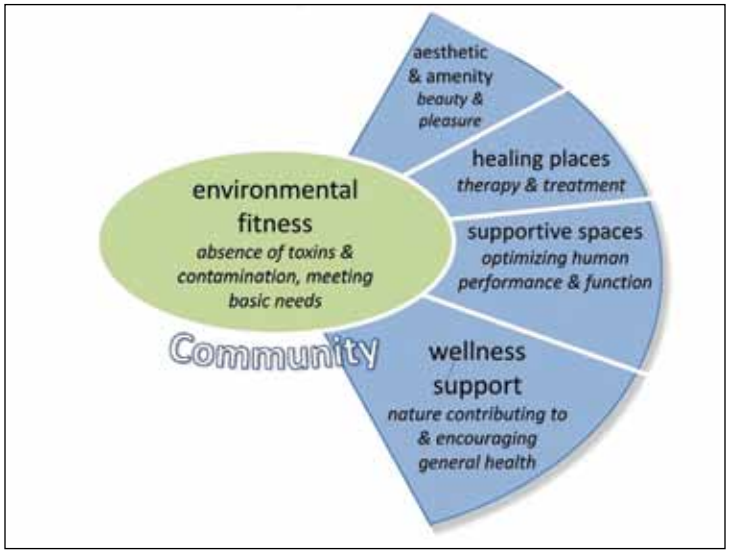
Green infrastructure manages stormwater, and becomes part of the everyday experience of the city.

agendas. The graphic on the following page shows a framework of nature-based health outcomes that can guide green infrastructure planning, including urban forestry.

This is the baseline of nature support for human health. Infrastructure and environmental services facilities provide the fundamental conditions necessary for good health for all city residents, such as clean air and water, and the absence of toxins. Environmental protection agencies monitor and regulate potential harmful impacts from pollutant emissions, harmful materials dumping,



Good health is the result of a broad set of determinants, including the presence of trees and nature. Reprinted from Dalhgren and Whitehead (1991).



A framework of city nature and human health benefits.

and industrial by-products. Trees are increasingly utilized as prevention or mitigation strategies to comply with environmental protection regulations.

Wellness Support

Being scientifically linked to wellness, convenient and pervasive nature access should include views of nature from homes and vehicles, greenspaces within walkable distances, and active encounters with nature (such as gardening and tree planting). Benefits include increased physical activity, reduced incidence of chronic diseases, less stress, and improved mental health. These benefits span the entire human life cycle. For example, urban forest canopy proximate to households has been associated with higher infant birth weight, and reduced elder mortality is seen in green urban neighborhoods.

Supportive Spaces

Nature can improve human function or productivity in a targeted way. Trees and gardens can be placed in direct proximity to certain facilities or buildings to encourage specific outcomes. For instance, studies show that having trees and gardens support human performance, including improved workplace satisfaction and high-school success.

Healing Places

In some settings, nature is an intentional element for healing, therapy, and rehabilitation. Both passive experiences of nature and prescribed nature-based therapies can aid people in physical, psychological, and emotional healing. Facilities include healing gardens, horticulture therapy gardens, and sacred spaces (e.g., memorials).

Amenity and Aesthetics

Beauty and improved emotions are common public responses about why trees are good. Marketing research in Seattle, Washington, U.S., aimed at more homeowner planting to boost canopy cover, found that beauty, wonder, and a spiritual connection to trees were more common responses than appreciation of ecological services. Research shows that positive response to nature occurs subconsciously, and even after just a few minutes, which may be why people call out aesthetics so readily.

Community

All of these experiences and benefits are embedded within the contexts of human relationships, built places, and change. Most cities have limited resources for planting programs, so residents are being welcomed as partners in metro nature planning, implementation, and management. Local programs of stewardship engage in community care, and nurture relationships that lead to better social cohesion. Recent research observes that garden-creating and tree-planting programs within neighborhoods can help reduce crime, and set up paths to resilience for individuals.

Health, History, and Sustainability

An absolute definition of sustainability is elusive. Across decades of use, the term has raised lengthy debates about theory, practice, and measurement. Yet, the ambiguity of sustainability may be what promotes experimentation and innovation, improving on the standards of the sanitary city. Human health is rising in prominence as a policy and economic concern in cities. City trees and the urban forest, while often emphasized as the source of environmental and ecological services, play an important role in human health, from individuals to households to entire communities. Arborists and urban foresters usually focus on tree care, but their most important professional activity may actually be people care.

Additional Reading

Chen, W.Y., and C.Y. Jim. 2008. Assessment and valuation of the ecosystem services provided by urban forests. In: M.M. Carreiro, Y.C. Song, and J. Wu (Eds.). *Ecology, Planning, and Management of Urban Forests*. pp. 53–83. Springer, New York, New York, U.S.

Cooper Marcus, C., and N.A. Sachs. 2013. *Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces*. John Wiley & Sons, Hoboken, New Jersey, U.S.

Dahlgren, G., and M. Whitehead. 1991. *Policies and Strategies to Promote Social Equity in Health*. Institute for Future Studies, Stockholm, Sweden.

Hartig, T., R. Mitchell, S. de Vries, and H. Frumkin. 2014. Nature and health. *Annual Review of Public Health* 35(1):207–228.

Lindland, E., M. Fond, et al. 2015. "Nature Doesn't Pay My Bills": Mapping the Gaps Between Expert and Public Understandings of Urban Nature and Health. FrameWorks Institute, Washington, D.C., U.S.

Melosi, M.V. 2008. *The Sanitary City: Environmental Services in Urban America From Colonial Times to the*

Trees are important for infrastructure functions, and contribute to human health benefits.

GUY KRAMER

Present. University of Pittsburgh Press, Pittsburgh, Pennsylvania, U.S.

Nowak, D.J., S.M. Stein, et al. 2010. Sustaining America's Urban Trees and Forests: A Forests on the Edge Report. U.S.D.A. Forest Service, Northern Research Station, Newtown Square, Pennsylvania, U.S.

Pincetl, S. 2010. From the sanitary city to the sustainable city: Challenges to institutionalizing biogenic (nature's services) infrastructure. *Local Environment* 15:43–58.

Rouse, D.C., and I.F. Bunster-Ossa. 2013. *Green Infrastructure: A Landscape Approach*. American Planning Association, Chicago, Illinois, U.S.

Tzoulas, K., K. Korpela, et al. 2007. Promoting ecosystem and human health in urban areas using green infrastructure: A literature review. *Landscape and Urban Planning* 81(3):167–178.

Wolf, K.L., and A.S.T. Robbins. 2015. Metro nature, environmental health, and economic value. *Environmental Health Perspectives* 23(5):390–398.

Kathleen L. Wolf, Ph.D. is a research social scientist with the School of Environmental and Forest Sciences, University of Washington (Seattle, Washington, U.S.).

Acknowledgments. Writing support was provided by the USDA Forest Service, Pacific Northwest Research Station and the Nature Sacred Project of the TKF Foundation.