

Public Value of Nature: Economics of Urban Trees, Parks and Open Space

Kathleen L. Wolf

*University of Washington,
College of Forest Resources*

Abstract

Urban parks, forests and open space systems provide many amenities for city dwellers. Yet perceptions of public value may not incorporate all of the scientifically confirmed public goods and services of urban green space. Theory and methods of economic valuation have been used to derive green space values – including direct use, environmental services, hedonic pricing and human health estimations. Green space administrators can use valuation data in strategic political management efforts on behalf of green space, to assure that adequate resources are allocated for planning and management of urban nature systems.

Keywords: Outdoor environments, city planning, aesthetics/meaning/assessment, health

Introduction

In recent decades the scientific understanding of how trees, parks and open space benefit people in cities has expanded substantially, to include social, environmental and economic domains. Despite mounting scientific evidence, there has been a lag in local government policy response to the data in many communities of the U.S. Local government policy, regulations and even departmental activities regarding trees and green space are often premised on design and planning traditions that address urban nature as the “parsley around the pig.” There are notable exceptions, but few local governments have developed a citywide, comprehensive framework of planning and management of urban green for specified purposes.

Not having a strategic framework for including adequate amounts of urban green throughout cities would be fine if municipal budgets were adequate to support parks development, tree plantings and natural areas management. Such activities, unfortunately, are often the first to experience cuts in times of budget constraints. In addition, governmental environmental expenditures are earmarked to respond to federal or state regulations regarding clean air and water, endangered species habitat, or wetlands conservation.

While costs can be directly tallied, benefits calculations are far less straightforward. Nonetheless, there are economic strategies and techniques for valuing nature and ecosystem services. Occasional publications have reviewed emerging knowledge about urban green benefits and their valuation (for instance, Dwyer et al. 1992, and Lerner and Poole 1999). This paper outlines current and prospective methods for economically valuing urban nature, and associated issues of social perception and public values of urban green space.

Creating Public Value

Moore (1995) writes of the role of public value in strategic public services management. Public value can be described as the widely held perceptions of the public regarding the function and service contributions of any public entity. The challenge for managers of municipal parks and natural systems is to expand the public value perceptions of urban citizens. While this expansion may increase the responsibility and accountability expected of the resource manager, it also increases the legitimacy of requests for adequate staff and fiscal resources.

Public value can be translated from the public goods values of urban green. Market dynamics of supply and demand establish prices and revenues for resource products, such as those derived from wildland timber. Urban parks and open space systems rarely generate harvestable goods. Multiple “owners” invest in a park's natural capital, generating “products” in the form

of intangible benefits for each visitor and user. The experience of these benefits by any single person does not exclude others from experiencing similar benefits, both immediately and indefinitely.

Although this situation seems complex from an economics perspective, economists have developed theory and methods for capturing an array of public goods values. Many such approaches were first developed to assess the economic value of wildland recreation. In addition, ecological economists have proposed ways to measure the environmental services that are provided by the world's forests, wetlands, oceans and other natural areas. Valuations of urban green public goods may integrate geographically extensive human and landscape systems, or focus on the response and behavior of individuals to be aggregated across time or space. The next section contains a framework and examples of valuation approaches.

Economic Valuation Approaches

Direct Use Values

The first, and most obvious, way to measure economic value is to tally all the expenses incurred by parks system visitors and users. Nearby, neighborhood users may spend little; others may travel some distance, and their spending on meals, fuel, and accommodations can be prorated depending on the importance of their park visit and the amount of time dedicated to the visit as part of a total trip. Travel cost method emerged to assess values associated with visits to wildland parks and open spaces.

Some users also make local purchases, from on-site gift shop purchases to equipment bought to participate in workshops, classes or programmed activities. Additional purchases may include plant and landscape equipment, acquired as a result of learning about trees, wildlife or horticulture while at a park. Food purchased for a picnic eaten on-site and other incidentals may be tallied.

Such values can only be calculated if detailed information is available about the characteristics of users and how their visit to a single park or an entire park system fits into their trip or lifestyle. User surveys at national parks and state recreation

areas have been used to collate such data for economic calculations.

Environmental Benefits and Costs

Ecological systems provide a myriad of services to human societies. Trees and green spaces are elements of the ecosystems that clean air and surface water, provide or renew potable water, and reduce energy consumption. American Forests has conducted 27 Urban Ecosystem Analyses in U.S. metropolitan areas, in an effort to capture the value of services that trees provide in cities. Using digital satellite imagery and aerial photographs, the degree of historic and current levels of urban forest canopy cover are calculated. Using summary mathematical models, annual values of urban forest services are estimated. For example, the Puget Sound basin study (American Forests, 1998) claimed that tree cover in the county's urban growth boundary area had reduced stormwater storage costs by \$910 million, and generated annual air quality savings of \$19.5 million. Fine-grained analysis can be done at the neighborhood level using the GIS software CityGreen, providing additional estimations of urban forest services.

Center for Urban Forest Research scientists have also conducted micro-scale studies, focusing on street tree costs and benefits. Costs include tree planting, irrigation, pruning and other maintenance. Calculated benefits include energy savings, reduced atmospheric carbon dioxide, improved air quality, and reduced stormwater runoff. This economic data is mathematically combined to generate a per tree net benefits figure. For instance, a 2002 analysis of data from Washington state cities suggests that per tree average annual net benefits are \$1 to \$8 for a small tree, \$19 to \$25 for a medium tree, and \$48 to \$53 for a large tree (McPherson et al.). The range of value reflects whether trees are on public or private property and their placement with respect to building heating and cooling devices.

Environmental benefits modeling is often based on the economic principle of deferred costs, that is, if trees are not present, homeowners or municipal government would have to invest in additional engineered infrastructure or equipment

to remedy environmental problems. For instance, tree canopies intercept rainwater, thereby reducing the amount of water falling to the ground and running off into stormwater collection systems, thus potentially saving a community the materials and construction costs of a stormwater system built for greater runoff capacity.

Hedonic Pricing

A local public good can have an economic ripple effect on nearby properties and commerce. The concept of hedonic or amenity pricing acknowledges that both property values and people's spending behaviors can be affected by the presence of parks and green spaces.

Measurement of the effect of parks and open space on adjacent property values has become an accepted value measurement. Numerous studies have shown that appraised property values of homes that are adjacent to parks and open spaces are typically about 8 percent to 20 percent more than comparable properties elsewhere (Crompton, 2000). These values are capitalized when property taxes are assessed or when taxes are paid on a property sale.

Hedonic valuation can also be applied to commercial and retail situations. Wolf (2003) investigated the role of trees on shoppers' behavior in retail business districts using contingent valuation method, finding that people claim they are willing-to-pay about 10 percent more for products in a shopping area with trees, as compared to a comparable district without trees. Another study found that rental rates of commercial office properties were about 7 percent higher on sites having a quality landscape, including trees (Laverne & Winson-Geideman, 2003). While nearby parks have not been factored into the consumer response studies, it is possible that the observed ripple effect on residential properties may also apply to retail and commercial sites.

Human Health

There are at least two ways human health might be assessed for economic value. First, there has been a dramatic rise in recent years in the percentage of U. S. citizens 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.

The national Centers for Disease Control (CDC) are conducting baseline studies on human physical activity levels, and how to motivate people to do basic physical activities, such as walking, on a routine basis. CDC is collaborating with urban planners to explore how urban form (such as street layout, the presence of sidewalks and parks proximity) can encourage walking and biking. The CDC is also considering how community outdoor volunteer and stewardship programs can boost activity levels.

The positive economic consequences of routine, mild exercise are enormous, when aggregated across entire cities or the nation. Again, deferred costs are possible, as medical expenses are lower for people who do routine physical activities and exercise. For instance, a 2002 CDC study estimates that obesity-associated annual hospital costs for youths aged 6 to 17 were about \$35 million between 1979 and 1981, and nearly tripled to \$127 million during 1997-1999 (Wang & Dietz 2002). Weight related medical expense trends for adults are equally alarming; studies suggest that when inactive adults increase their participation in regular moderate physical activity, annual mean medical costs are reduced by \$865 per person (in 2000 dollars) (Pratt, Macera and Wang 2000).

Mental Health

Mental health is a second arena of health benefits with economic consequences. Recent studies have established that the presence of trees and "nearby nature" in human communities generates numerous psychosocial benefits. A series of studies (Kuo 2003) has determined that 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. School-related studies show that children with ADHD show fewer symptoms and girls show more self-discipline in academics if they have access to natural settings. Other studies confirm that hospital patients recover more quickly and require fewer pain-killing medications when

having a view of nature. Finally, studies suggest that office workers with a view of nature are more productive, report fewer illnesses, and have higher job satisfaction.

These studies, in combination, suggest extensive economic consequences for urban people who have views of trees and nature in the course of their normal, everyday activities and experiences. The next important step is to translate the psychosocial benefits to economic terms – a difficult but not impossible exercise.

Nature Valuation and Public Value

The economics of renewable resources and ecological systems has gained greater attention in recent years. Valuation of the services of regional and even global ecosystems (Daily 1997) has expanded social perceptions of nature, and how the production capacity of ecosystems far exceeds the traditional market commodities that may be associated with them. Fewer comprehensive studies have been done regarding the public goods of urban resource systems. While theory and valuation approaches may be similar, city settings can be more complex landscapes, making it more difficult to isolate the specific economic contributions of nature. Some valuation approaches focus on the accrued benefits at the street or neighborhood level, then results are aggregated across an entire city or region. Others construct or access a city, state or national database, then extrapolate economic returns.

Existing knowledge and emergent science can enable green space administrators and managers to justify ongoing strategic investment in urban green space. Economic data becomes an asset, useful for creating and defining public value. Interpretation and public presentation of valuations, within a local political context, can aid a manager's efforts to reframe how local elected officials and the public perceive urban green (Bolman and Deal 2003). Valuation data can be shared at multiple scales, ranging from the economics of a single park to cost/benefit estimations of entire cities or regions. For instance, Florida (2002) describes how green space is part of a portfolio of urban amenities that can attract "creative class" workers and the

businesses that hire them.

Political management is needed to augment or supplement the influence of a manager or agency on behalf of green space (Moore 1995). Political institutions grant public managers the resources needed to accomplish long-range goals. Asserting a claim of greater need or legitimacy on behalf of green space is a process of engaging and influencing people within the political realm, beyond the immediate authority of a manager. A manager must strategically identify and reach out to specific players who can wield broader influence. Once the dialog about a program takes on added dimension, more comprehensive, expanded mandates begin to emerge.

Achieving expanded public value requires political management of both internal and external situations (Moore 1995). External political management involves strategies and actions that encourage key community stakeholders, as well as the general citizenry, to tacitly expand their expectations for and perceptions of a program or department, gradually lending assistance and support to a new vision. These expectations may crystallize to become new mandates for action. Internal political management entails additional strategies and actions to shift the activities of staff and supervisors, and to induce key decision-makers within the agency, to reorient then adopt an evolving mandate. Existing authority can be used to leverage the change of outlook through accumulation of small actions and communications that demonstrate a new direction.

Nature benefits metrics can serve two purposes in a political feedback loop. Generalized knowledge about the benefits and services of urban green can be used in the political management process to engage non-traditional constituencies through social learning, expanding the number of voices endorsing greater allocation of resources. Economics estimations can be used to communicate about foregone benefits if green spaces are not adequately supported. In response to political support and assignment of more resources, managers become more accountable. Valuation metrics of specific sites and situations can be used, as outcomes evidence, to

demonstrate the returns from granted resources.

Arguably, most Americans' attention to nature has focused on pristine, wilderness areas. The trees and parks of urban nature, while appreciated for amenity values, have been historically overlooked as sources of environmental and human health services that rival those of wildland areas (Harmon and Putney 2003). A variety of studies, conducted by investigators representing multiple disciplines and geographic areas have disclosed the subtle, essential contributions of green space to local and regional urban economies. New public values can materialize to promote resources for open space planning and management, when political management actions make both the needs and economic returns visible.

References

- American Forests. 1998. Regional Ecosystem Analysis-Puget Sound Metropolitan Area: Calculating the Value of Nature. Washington D. C.: author.
- Bolman, L. G., and Deal, T. E. 2003. Reframing Organizations: Artistry, Choice and Leadership, 3rd edition. San Francisco, CA: Jossey-Bass.
- Crompton, J. L. 2001. The Impact of Parks and Open Space On Property Values and the Property Tax Base. Ashburn, VA: National Recreation and Park Association.
- Dailey, G. C. (Ed.). 1997. Nature's Services: Societal Dependence on Natural Ecosystems. Washington D.C.: Island Press.
- Dwyer, J.F., E. G. McPherson, H. W. Schroeder, and R. A. Rowntree. 1992. Assessing the benefits and costs of the urban forest. *Journal of Arboriculture*, 18,5,227-234.
- Florida, R. 2002. The Rise of the Creative Class. New York, NY: Basic Books.
- Harmon, D., and Putney, A. D. 2003. The Full Value of Parks: From Economics to the Intangible. New York, NY: Rowman and Littlefield.
- Kuo, F. E. 2003. The role of arboriculture in a healthy social ecology. *Journal of Arboriculture*, 29,3, 148-155.
- Moore, M. H. 1995. Creating Public Value: Strategic Management in Government. Cambridge, MA: Harvard University Press.
- Laverne, R. J., and Winson-Geideman, K. 2003. The influence of trees and landscaping on rental rates at office buildings. *Journal of Arboriculture*, 29,5,281-290.
- Lerner, S., and Poole, W. 1999. The Economic Benefits of Parks and Open Spaces: How Land Conservation Helps Communities Grow Smart and Protect the Bottom Line. San Francisco, CA: The Trust for Public Lands.
- McPherson, E.G., Maco, S. E., Simpson J.R., Peper, P.J., Xiao, Q., VanDerZanden, A.M., and Bell, N. 2002. Western Washington and Oregon Community Tree Guide: Benefits, Costs, and Strategic Planting. Silverton, OR: International Society of Arboriculture, Pacific Northwest Chapter.
- Pratt, M., Macera, C. A., and Wang, G. 2000. Higher direct medical costs associated with physical inactivity. *Physician and Sportsmedicine*, 28,10,63-70.
- Wang, G., and Dietz, W. H. 2002. Economic burden of obesity in youths aged 6 to 17 years: 1979-1999. *Pediatrics*, 109,5.
- Wolf, K. L. 2003. Public response to the urban forest in inner-city business districts. *Journal of Arboriculture*, 29,3,117-126.