White Paper

on

Valuing the Benefits of Public Space Systems

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17 March 2019

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EXECUTIVE SUMMARY

Recent research has provided a clearer picture of the importance of adequate quantity and quality of interconnected public spaces in cities – that is, the connected systems of streets, plazas and parks, and the private-space systems that adjoin them. Following are key conclusions of the research:

1. ***Economic benefits.*** The economic interactions of a city are dependent, to a surprising degree, on a well-connected, well-functioning public space system. To the extent this system is degraded or nonexistent, the city's economy will under-perform.

2. ***Transport benefits.*** Well-designed streetscapes can increase walking and public transit use, and help to reduce vehicular traffic congestion (and the cost of building and maintaining expensive vehicular infrastructure). The corollary is that a degraded streetscape system will contribute to induced demand for automobile travel, resulting in greater congestion, infrastructure cost and other negative impacts.

3. ***Social benefits.*** A comfortable, attractive public realm promotes social interaction and formation of social capital, which in turn promotes social resilience.

4. ***Health benefits.*** A walkable public space system promotes activity, exercise and stress reduction.

5. ***Environmental benefits.*** Cities with well-connected, quality public space systems reduce dependence on automobiles, and increase the ability to exploit compact, resource-efficient neighbourhood types that further reduce environmental impacts.

6. ***Benefits for the elderly, children and vulnerable populations.*** A well-connected, safe public space system provides choice of mobility for those who are unable to drive automobiles, and also affords opportunity for exercise, recreation and social interaction.

7. ***Benefits from tourism, and from company/employee relocation.*** A walkable public realm is more attractive to tourists who will more likely return, and are more likely to share their positive experiences with others. Walkable streets with shops provide the number one most popular activity for tourists – shopping – which in turn further benefits the local economy. In addition, companies considering relocation of offices are increasingly responding to preferences of employees who seek (among other amenities) attractive, walkable neighbourhoods to live and work.

Many of these benefits are systemic, that is, they are fully achieved only when these systems function well as a whole. In addition, there are other factors that contribute to each of these benefits, and it is often difficult to tease out the causative role of the different factors for a given locale.

For both reasons, it is often difficult to quantitatively measure the direct effects of specific local changes. Nonetheless it is possible to measure indicators of public space benefits, as we will discuss in the second part of this document.

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1 *Portions of this paper include material first prepared for Strelka KB, whose support is gratefully acknowledged.*

Introduction

In the last few decades, research findings have accumulated demonstrating the significant benefits of the public space systems of cities. When these systems perform well, the benefits include higher rates of economic productivity, social interaction, public health and well-being, equity and justice, environmental benefits, and other related outcomes. The converse is that cities with poorly functioning public space systems under-perform in these areas relative to their competitors.

As the research shows, these public space systems typically include a number of consistent attributes:

1. They are ***pervasively and intricately connected***, that is, they have many connections between them, well-distributed at large and small scales, and across the extent of the city.
2. They are ***scaled to human beings***, and to the dimensions across which a human being can reasonably walk, featuring frequent intersections, pedestrian crossings and adjacent destinations.
3. They are ***multi-modal and integrated***, with transport by car and taxi, public systems, bicycles and pedestrians all coordinated into a well-spaced nodal system.
4. They are ***safe***, protected from high-speed traffic and other hazards, and structured to promote observation and deter crime.
5. They are aesthetically ***attractive***, so that they invite walking, bicycling, rest and interaction with others. This means among other things that they possess some combination of greenery, human-scaled architecture, ability to see activities in buildings, places to gather, and focal points of art or other features. They must also be clean and well-maintained.
6. They ***afford choices*** to increase comfort, well-being, social contact, economic interaction, and other "affordances" over time. This means they offer complementary and overlapping amenities (for example, seating that is in active places as well as quiet ones) and they can be altered by users to some degree (for example, seating can be moved in the short term, or adjacent buildings can be modified by various owners in the long term).
7. They are ***intimately connected to private spaces***, which in turn provide active, supportive, and mixed-use edges.

Following is an overview of each of the benefits, together with some notable research on each.

1. Economic Benefits

It has long been recognised that cities are engines of creative development and exchange. This dynamic creativity helps to explain the great attraction of cities, and in particular, the rapid urbanisation that is under way today. Clearly, cities offer important economic opportunities to their residents, including jobs in growing sectors and companies.

But this observation begs the question: why are these companies located in cities in the first place – and why does this location help them to grow?

Jacobs (1969) argued that cities are capable of generating "new work" through the exchange and diversification of knowledge, which becomes possible when different residents and industries are located within one urban "agglomeration". This knowledge transfer, or "knowledge spillover" as it is now termed, relies to an important degree upon casual encounters that occur partially within the public space system, and partly within adjacent (and connected) private spaces.

It seems that the information that people exchange in person within private spaces (like offices and

conference centres) is controlled and fairly limited, whereas the information that is exchanged in public settings is more random and interactive. Of course there is an important place for the private information exchanges – and also of course for other forms of knowledge exchange, including scientific literature. But the research is revealing that there is also a crucial role for public space systems to serve as a kind of "spine" for informal knowledge transfer. For example, persons A and B may meet in a private cafe, but they might step outside and bump into A's friend C on the street, to whom A introduces B; the friend C might mention a new company being formed, and B's expertise might be just what C is looking for. They may even begin a discussion of how this creative enterprise might develop.

Jacobs (1961, 1969) first described this phenomenon in New York City – a city that was clearly capable of taking penniless immigrants from, say, Ireland, Italy or Russia, and giving them access to the means to become middle-class shop owners and professionals. Much of this access is surprisingly informal and even incidental (e.g. someone who knows someone with an opportunity – often perhaps someone they met in a public space).

Jacobs described in more detail the example of Detroit, a former shipbuilding city that had specialised knowledge of making pump engines, rubber coatings, wheels and other useful technologies related to that industry. These separate skills were integrated creatively into a new industry, automobiles – not only through formal knowledge networks, but through informal and casual interactions that occurred in part within the public space system of the city.

Later work confirmed Jacobs' early insights, notably by Glaeser (2009), Bettencourt (2012, 2013) and his colleagues (Bettencourt, Lobo, Helbing, Kuhnert and West (2007). Recent work by Batty (2008) has also confirmed the view of a city as an interactive network that is built upon – or alternatively, under-performs without good access to – its public space network. As Batty said with his co-author Peter Ferguson:

"What is required is a new definition of the city, as a contact system, as a set of interactions and flows that define the kinds of network that enable creativity and innovation to thrive and grow. This is a challenge that now defines the way we must think about all cities."

This echoes Jacobs' earlier observation: "Lowly, unpurposeful and random as they may appear, sidewalk contacts are the small change from which a city's wealth of public life may grow." As we now know, this "wealth of public life" includes literal financial wealth, as well as other kinds of wealth as discussed below.

There is a related and crucial insight from network science, as Bettencourt (2013) and others have shown. As Bettencourt put it, ***cities perform best economically when they feature pervasive human-scale connectivity.*** Like any network, cities benefit geometrically from their number of functional interconnections. To the extent that some urban populations are excluded or isolated, a city will under-perform economically and environmentally. Similarly, to the extent that the city's urban fabric is fragmented, car-dependent or otherwise restrictive of casual encounters and spillovers, that city will under-perform—or require an unsustainable injection of costly resources to compensate.

Other researchers have provided more direct empirical research for cities with well-connected, walkable public space systems. Litman (2011) surveyed research on the economic value of walkable neighbourhoods and found significant benefits from reduced transport externality costs, improved (and therefore lower-cost) functioning of public transport systems, and improved health (leading to overall reductions in public healthcare costs). He also found increased income for retail properties, when other factors were held equal.

Cortright (2009) showed a statistically strong correlation between walkable streets and increased property values in the USA. Residential properties in walkable neighbourhoods commanded a premium of between $4,000 and $34,000 per residence based on walkability factors, when other factors were held equal.

Similar results were found by Rauterkus and Miller (2011) although the authors also found that, when car dependency rose, the premium in home prices was negated – possibly as a result of market valuations of increased household costs of transport by car, as well as loss of a functional amenity that the market had valued more highly.

Others have shown benefits of neighbourhood walkability for reduced crime and economic distress. An example is Gilderbloom, Riggs and Meares (2014), who showed that neighbourhood walkability as measured by a popular rating system known as "Walkscore," is independently correlated with lower rates of crime and foreclosure, as well as higher property values.

The following table from Litman (2011) lists potential economic impacts of walkable neighbourhoods, and a suggested rationale for assessing them with indicators. (In Part II of this report, we propose a number of similar indicators.)

Walkability Economic Impacts

Name	Description	Measuring Techniques
Accessibility	Degree that walking provides mobility options, particularly for people who are transportation disadvantaged.	Travel modeling, analysis of travel options.
Consumer cost savings	Degree to which walking provides consumer transportation cost savings.	Consumer expenditure surveys
Public cost savings (reduced external costs)	Degree that walking substitutes for vehicle travel and reduces negative impacts.	Determine to what degree walking reduces motor vehicle travel, and the economic savings that result.
Efficient land use	Degree that walking helps reduce the amount of land used for roadway and parking facilities, and helps create more accessible, clustered land use.	Identify the full economic, social and environmental benefits of more pedestrian-oriented land use.
Livability	Degree that walking improves the local environment.	Property values, business activities, consumer preference surveys.
Public fitness and health	Degree that walking provides physical exercise to people who are otherwise sedentary.	Travel and health surveys to determine the number of people who benefit from walking exercise.
Economic development	Degree to which walking makes commercial areas more attractive and shifts consumer expenditures to goods that provide more regional economic activity and employment.	Market surveys and property assessments. Input-output table analysis.
Equity	Degree that walkability helps achieve various equity objectives.	Various indicators of horizontal and vertical equity.

Table of walkability economic impacts and potential indicators (Litman, 2011).

2. Transport Benefits

There is abundant research that walkable streets and public spaces encourage the use of complementary modes to automobiles, thereby reducing dependence on automobiles, and on the expensive infrastructure and space allocations that they require.

The point here is not that pedestrian modes, or other modes like public transport and bicycle, should entirely replace the automobile. The point is that the car must not entirely replace the other modes, but that (as research shows) cities perform best when they feature multiple and complementary transport modes, providing a viable choice of other modes, and reducing dependence on the automobile.

Research by Berrigan, Pickle and Dill (2010) has demonstrated that greater rates of walking are associated with a well-connected, fine-grained street pattern.

Saelens, Sallis and Frank (2003) surveyed the literature and found that an attractive streescape with vegetation and interesting, human-scale detail at pedestrian scales encouraged walking and cycling. Cerin, Sallis and Frank (2006) also found a correlation between the presence of vegetation and greater rates of walking.

Another key conclusion is that the clustering of inter-modal exchanges, connected by walkable segments, promotes the use of transit. This research has been demonstrated by Audirac and Higgins (2004) and by Zhao et al. (2003).

Cao, Mokhtarian and Handy (2007) showed that increasing the presence of safe and well-designed pedestrian pavements and bike lanes led to changes in travel behaviour – specifically, increases of walking, bicycling and public transport.

Cervero and Radisch (1996) showed a significant association between pedestrian-oriented neighbourhoods and reduced automobile use.

Zhao et al. (2003) showed that improved walkability also improved transport usage, by providing crucial connectivity between destinations and the transport stops – what has been termed "the last mile" (or "last kilometre").

Jane Jacobs (1961) argued for "attrition of automobiles" - emphatically not to replace automobiles but to place them within a mix of viable transport modes. Empirical studies of cities that embraced her recommendations, like Vancouver, British Columbia (Canada) and Portland, Oregon (USA), show that their transport systems are far less costly per capita, and paradoxically far less congested, than cities that tried to "build their way out of congestion" (e.g. Perth (Australia) and Atlanta, Georgia (USA).

3. Social Benefits

Important work on the social benefits of public space systems has been done by the sociologist Robert Putnam (1995, 2001). Putnam is best known as the developer of the concept of "social capital" - a working relationship. He advanced the concept that social ties needed to be "multi-stranded" and include casual encounters within the public space system.

A classic study by Appleyard (1980) showed that the number of social connections formed when street volumes do not interrupt public space is higher than where street volumes are so high as to interrupt the connectivity of the public space system.

Leyden (2003) showed that walkable neighbourhoods were an important variable in the formation of social capital.

Freeman (2001) showed that sprawling (i.e. unwalkable), automobile-dependent neighbourhoods were associated with reduced numbers of social ties between residents.

4. Health Benefits

Some of the most detailed research on the connection between public space and public health comes from the US Centers for Disease Control, and their work on obesity, heart disease, cancer, and other diseases in relation to rates of neighbourhood walking. Much of this work was summarised by Dannenberg et al. (2003).

Tomalty and Haider (2009) showed a statistically significant relationship between improved walkability and lower body mass index (BMI), and lower hypertension. They also showed that residents of more walkable neighbourhoods are more likely to walk for at least 10 minutes per day and have lower rates of obesity than those in less walkable areas, independent of age, income or gender.

Pucher and Dijkstra (2003) demonstrated that safe, attractive infrastructure for walking and cycling can improve health outcomes, with case studies from the Netherlands.

Cold (1998) surveyed the literature and found a strong link between improved health and well-being (specifically, stress reduction and greater exercise) and the presence of nature and natural elements, and a combination of coherence and complexity.

These and other researchers have demonstrated that ***public spaces perform best when they adapt to human psychological dynamics and patterns of activity.*** Urban residents have a basic need to make sense of their environments, and to find meaning and value in them. But this issue is not as straightforward as it may appear. Research in environmental psychology, public health and other fields suggests that some common attributes promote the capacity to meet these human requirements—among them green vegetation, layering, and coherent grouping. Wayfinding and identity are also promoted by iconic structures, and meaning is enriched by art. But for most people most of the time, evolutionary psychology is a more immediate factor to be accommodated.

A related finding is that ***cities perform best when they offer a range of choice and some control of spatial structure.*** We all need varying degrees of public and private space, and we need to control those variations at different times of the day, and over the span of our lives, in order to secure our own comfort and well-being. In the shortest time frames, we can open or close windows and doors, draw blinds, come out onto porches and informally colonize public spaces, or retreat inside the privacy of our homes. Over longer time frames, we can remodel our spaces, open businesses, build buildings, and make other alterations that gradually form the complex growth of cities. This is good for our health – and, evidence suggests, good for the economic health of the neighbourhood and the city too.

5. Environmental Benefits

It has long been known that cities have dramatically lower energy and resource consumption as well as greenhouse gas emissions per capita, relative to other kinds of settlements. Only some of this efficiency can be explained by more efficient transportation. It now appears that a similar network dynamic provides a synergistic effect for resource use and emissions – a network that is formed in part by the system of public spaces in the city.

In actual measurements the effect is dramatic. On an equal basis, removing extraneous factors like climate, economy and political system, it appears that well-formed, compact urban settlements, built on the "spine" of their public space systems, can outperform their sprawling, auto-dependent comparisons by a factor of two or more – possibly up to a factor of six (Mehaffy, 2015).

Krizek (2003) analysed the changing travel habits of residents who relocated to neighbourhoods with greater or lesser presence of walkable streetscapes, and found that these aspects of neighbourhood form did have a significant effect on travel modes and on emissions impacts.

Polimeni (2008) demonstrated empirical evidence for the "Jevons Paradox" stating that increased efficiency of the transport system can paradoxically increase its usage through lower cost and ease of use, creating "induced demand." This explains why many cities have been unable to

Mehaffy (2015) has surveyed the literature and shown a major "green dividend" from cities with a functional public space system, including significantly reduced greenhouse gas emissions as well as significantly greater efficiencies in resource consumption.

6. Benefits for the Elderly, Children, and other Vulnerable Populations

A safe, walkable public space system offers important benefits to the elderly, children and other populations, by providing mobility without the need for automobiles (which are often unavailable). In addition, they provide the same benefits discussed previously, in this case to vulnerable populations for whom these benefits are all the more important – health, social contact, economic opportunity and so on.

Leyden (2003) showed that walkable neighbourhoods provided significant benefits for the elderly and children, including the formation of stronger social ties and social capital.

Southworth (2005) surveyed the literature and found that the poor, children, and elderly suffer disproportionately from living in auto-dependent neighbourhoods, in relation to walkable neighbourhoods.

King et al. (2011) showed that walkability was positively correlated with lower incidences of obesity and improved health out comes for older residents.

Similar results have been found for children. Indeed there are findings that suggest an "obesity epidemic" among children in many developed countries (WHO, 2000; Kosti and Panagiotakos, 2006), closely correlated with lower rates of walking and biking, and declining infrastructure for both (Sallis and Glanz, 2011). Furthermore, neighbourhood environment does not only influence rates of physical activity, but can also influence diet. Surveying the literature, Mehaffy (2015) showed a correlation between fast-food diets and the "choice architecture" of neighbourhoods, including their degree of walkability or car dependence.

De Guzman and Kulaks (2012) showed a similar connection between the built environment and the health of vulnerable populations, including rates of obesity, heart disease, mental illness and other factors.

7. Tourism and Relocation/Recruitment Benefits

Tourists have an increasing selection of options for travel, and the previous emphasis on resort environments and historic cores has been supplemented with tourism of offbeat, distinctive neighbourhoods with vibrant arts and culture. In almost all cases these neighbourhoods feature high quality of walkable public space system design.

Jansen-Verbeke (1998) found evidence for a "synergism" between shopping and tourism, wherein attractive shopping feeds tourism, and vice versa. These shopping amenities are almost always located in highly walkable streets and public space areas.

A number of specific studies have shown strong correlations between walkability and positive tourism development, including Falkirk and Perić (2013) for the city of Novo Sad, and Ujang and Muslim (2014) for the city of Kuala Lumpur. Litman (2004) also found survey research that correlated walkability with positive tourism development.

The same attractions appear to operate for companies considering where to relocate their businesses, or for employees considering where to relocate for work. In recent years, the shift to a "knowledge economy" with growing sectors of software, systems engineering, design and other knowledge professions, has also brought with it an increasing competition to recruit both companies and employees who are increasingly mobile in a global economy. Those companies and employees are increasingly seeking out neighbourhoods with appealing walkable characteristics, more compact, and offering more diversity of "urban-style" amenities.

Salvesen and Rensky (2003) surveyed the literature and found increasing importance for neighbourhood quality of life (including walkability) on new-economy firms in making relocaiton decisions. As discussed previously, Cortright (2009) and Litman (2011) showed strong correlations between property values and walkability, and Litman specifically addressed the appeal of these neighbourhoods to new residents and businesses.

Summary

The recent findings from the sciences show that cities are complex adaptive systems with their own characteristic dynamics, and – if they are going to perform well from a human point of view – they need to be dealt with as such. At their very cores are the public space systems that connect human beings to all their other parts, and ultimately, to one another.

If these public space systems are well-structured and connected, then, as the research demonstrates, the city outperforms relative to baseline. If these public space systems are fragmented, sprawling, privatised, or in poor condition, then the city will under-perform.

This implies that we must place greater value on walkable public space systems, and greater priority on their creation improvement. Among other things, it means we must replace older models of car-dominated planning with newer models of well-connected, multi-modal, pedestrian-centred cities. Indeed, that is a key agenda item for the upcoming Habitat III United Nations conference, for which this author has consulted.

However, to improve these public space systems, we must do more than change our ideas of design. We must re-assess our current systems of planning, building and managing cities—the laws, codes, standards, models, incentives, and disincentives that effectively make up the modern "operating system" for urban growth. To make better cities, we need to shift to an evidence-based approach, able to draw on the best lessons of science and history about the making of well-functioning, good cities, from a human point of view.

The stakes for reform could not be higher. Over the next five decades, if present trends do not reverse dramatically, humanity is set to create more sheer volume of urban settlement than it has in the *entire previous history* of human settlement. The implications are nothing short of alarming for the viability of future economies, and for the future quality of human life.

It seems that humanity now faces a watershed challenge: to find a new basis to generate creative economies and quality of life, without destroying the resources on which life ultimately depends. If we do not do so, it seems we are likely to enter an era of unprecedented human misery. In this challenge, it is now clear that cities will play an outsized role. Sprawling, resource-inefficient, poorly functioning cities could make all our challenges far worse. Or, if we understand the lessons from the emerging science of cities about cities' dynamic capacity to promote creative growth while reducing resource destruction—and perhaps even offering the promise of regeneration—they can be enormous contributors to the solution.

In this challenge, understanding and enhancing the key capacity of public space systems within cities – the spine of cities, in a real sense – could not be more important.

Part II: Economic Benefit Indicators of Public Space Systems

The literature previously cited does suggest some metrics that may be useful to assess the beneficial impacts of a well-structured public space system, or alternatively, indicators of issues possibly needing remediation.

It s important to note again, however, that indicators are not deterministic: they do not determine exactly what must be corrected, or what portion might be attributable to the public space environment. Rather, they should be regarded more as clues that suggest other follow-up investigations needed (e.g. specific area assessments, etc).

Following are some suggested indicator metrics:

1. ***Economic benefits***
   a) Volume of walk-in retail traffic
   b) Volume of sales from walk-ins
   c) Property values, adjusted for other comparable factors

2. ***Transport benefits***
   a) Traffic counts (by type)
   b) Modal split measurements
   c) "Vehicle kilometres travelled" (per person or household)

3. ***Social benefits***
   a) Audits of public space usage rates and activities
   b) Measurement of social capital formation from resident surveys (interaction with neighbours, etc)

4. ***Health benefits***
   a) Neighbourhood rates of obesity and heart disease
   b) Resident surveys of walking and health

5. ***Environmental benefits***
   a) Audits of environmental impacts from public space systems
   b) Neighbourhood rates of walking and biking vs. driving and long transport commutes

6. ***Benefits for the elderly, children and vulnerable populations***
   a) Social surveys of vulnerable populations and their well-being

7. ***Tourism and relocation/recruitment benefits***
   a) Economic data on tourism
   b) Social surveys of tourist behaviour and preferences
   c) Economic data on relocations
   d) Social surveys of relocating firms, relocated employees

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