

Perceiving Liveability through the Diverse Aspects of Walkability

Amir Hossein Sirjani^{1*}, Árpád Szabó¹

¹ Department of Urban Planning and Design, Faculty of Architecture, Budapest University of Technology and Economics, H-1111 Budapest, P.O.B. 91, Hungary

* Corresponding author, e-mail: amir.sirjani@gmail.com

Received: 13 May 2020, Accepted: 12 April 2021, Published online: 06 May 2021

Abstract

A city's walkability is a measure of how friendly, safe and attractive a city is for walking within it. Moreover, a well-designed walkable environment can become a place where many social, political, and other important urban activities occur. Following the appearance of motorised vehicles, cars have occupied urban spaces, with many city structures changing according to motor vehicles' requirements rather than pedestrians. Regardless of the many benefits that cars bring to people's lives, the overuse of cars has had many social, physical, and economic consequences. Based on the reviewed literature, this research analyses the relationship between the built environment and walking, behavioural factors and travel mode choices, walking as a means of socialisation and as a transportation mode. In addition to these factors, four main groups of criteria contributing to increased walking rate are identified: lifestyle, urban design factors, personal and locational factors. Each of these groups has comprehensive sub-categories that can evaluate the walkability of a street or an urban space. This research mainly examines the relationship between the built environment's physical properties and the walkability of urban space.

Keywords

walkability, walking, livability, sustainable, urban design

1 Introduction

Walking is the most primitive and obvious way of moving in space and on an urban scale. It has numerous social and individual benefits with positive health improvements and social equity and reduces greenhouse gas emissions. Moreover, it has been reduced to use as a general type of travel mode for different purposes such as day-to-day travelling or leisure. The promotion of vehicular traffic is due to the spatial spread of cities. The expansion of cities and growing urban sprawl leads to more vehicle use, which in turn increases car dependency and vehicle transportation leading ultimately to a degraded space.

On the other hand, liveability is the quality of living in a city and is determined by many elements. One of these is to create a walkable environment in order to achieve liveability in an urban environment. The examination of the built environment for the appropriateness and attractiveness of walking has been significant for many decades in various scientific fields such as urban planning, psychology, geography and public health (Brownson et al., 2009). In each field, walking is introduced by individual definitions.

For instance, according to Ewing and Handy (2009), urban planners defined walking as a factor in decreasing vehicle travel, urban sprawl and greenhouse gas emissions. Moreover, public health researchers are interested in walking as an essential factor in reducing obesity, cancer and chronic diseases as a result of daily exercise.

One of the main research questions of this study is how to assess the liveable environment and walking behaviour to find the relationship between them and walking. To investigate walkability's influence on liveability, we need to understand the meaning of walking and the walkability concept, the relationship between urban environments and walking behaviour, and describe the environmental features influencing walkability.

2 Definition and aims of walking

Walkability is defined as the extent to which a safe and convenient environment encouraging walking is provided for pedestrians (Southworth, 2005). A walkable environment provides a variety of destinations that are

accessible within a logical amount of time and effort and offers visual interest in walking throughout the network. Walking is one of the natural and fundamental human features. People walk for transportation, entertainment and even sports. Walking leads to more social interaction and maintains physical and mental health. The society in which most people walk instead of using cars is more sustainable in terms of natural resources and economically. Medical practitioners have continuously argued that walking can play a positive role in human health. Reducing crime, other societal problems and improving social cohesion are other benefits of walking (Duffy, 2009).

A walkable society can have various benefits like community liveability, improved fitness and public health, basic mobility, efficient land use, consumer cost savings, external cost savings (road and parking facilities, traffic congestion, crash risk, and environmental damage), and economic development. The advantages of a more walkable society are also essential for vulnerable groups, including the elderly, disabled people, children and those with low incomes (Litman, 2011).

2.1 Social roles of walking

Walking is the keystone of the community. One of the most significant ways to enhance the liveability of a society is to increase walkable streets. Streets are the main places providing people with the opportunity to meet each other and socialise. Walking improves community liveability, including security and public health, safety, local environmental quality, social cohesion and entertainment. In this way, streets are a major part of the public realm. They are places where people interact with their community. Therefore, more attractive, safe and walkable streets increase community liveability (Litman, 2010).

According to urban planners, one of the most crucial benefits of walking and walkability is increasing social interactions. Walking through the streets of a city allows people to get to know their neighbourhood and develop a closer relationship with other people on the street. Jane Jacobs defines it as 'eyes on the street'; she believes that the more people on the streets, the greater the neighbourhood's well-being and safety (Jacobs, 1961).

People walk on streets based on their needs (transportation or recreation); in doing so, it provides an active and lively street, leading to a positive public sense of society. Due to these significant social impacts, many urban designers have recently been drawn to designing compact and walkable neighbourhoods. New transportation and

land use policies are being implemented for pedestrians, claiming that street-connected communities can increase spontaneous meetings and provide better and more enjoyable travel in higher quality areas (Duffy, 2009).

2.2 Walking as a transportation mode

Walking is the most basic means of transportation, whether we go from one room to another or a far destination. Even for those with cars, walking is essential. Whatever form of transportation, we use walking as a component of our transportation as every journey begins and ends with a walk. Whether we walk to most of our destinations, walk to a public transport point, or walk to our car, we still rely on our feet to get us where we want to go (Duffy, 2009).

Walking is also the cheapest form of transportation. Moreover, creating a walkable community can provide a more affordable transportation system. Since 5–10 % of car trips are unnecessary, they can be replaced by non-motorised transportation, including walking, as the most important mode of non-motorised travel (Mackett, 2000). Alongside its various benefits, driving has many disincentives in today's cities. Traffic congestion, air pollution, parking problems and environmental damage are some of the disadvantages of vehicle overuse.

2.3 Impacts of car-dependency

The accessibility of vehicles after World War II revolutionised cities and changed the role of walking in human life. Following the widespread use of private cars, cities were formed according to the requirements of car access. During the post-World War II reconstruction process, cities were designed for cars. The automobile has been considered as one of the most significant inventions of the 19th century and influenced urban design due to the various perceived advantages that it presented. At the time, it created less noise and pollution than the rail system. It also occupied less space than carts and was considered a suitable solution for reducing the chaos that existed in many cities.

Cars provided access to places that seemed impossible before, and their affordability resulted in ready access to any location around the city, resulting in the sprawl of urban spaces (Newman and Kenworthy, 1999). The decentralisation of cities was one of the consequences of automobile use since the connection between land use and transportation in cities had been broken, and car dependency became an important phenomenon.

In general, walking and cycling allow people to experience the places they cross. As cities began to develop

according to car access, a strong disconnect between pedestrians and motorised vehicles occurred. Excessive use of automobiles has turned places into destinations or movement corridors. It has been forgotten that transportation can be more than just a means of getting to a place; it can be the experience of the place itself (Engwicht, 1993).

3 Diverse aspects of walking and walkability

In recent decades, many researchers have addressed the issue of increasing walking and in urban areas. Walkability literature deals with various aspects of sustainability and the factors contributing to it from diverse perspectives.

In this part of the research, walkability in literature is grouped according to their domains to effectively understand the factors and criteria of walkability suggested by various researchers over recent decades. Environmental and behavioural issues are the most influential factors affecting walking, whether as a means of transportation or socialising and communicating.

3.1 Behavioural factors affecting walking

A recent urban design study attempted to provide researchers with the subjective quality of urban street environments to provide operational definitions to measure street environments and test key relationships with walking behaviour (Fig. 1; Ewing and Handy, 2009).

There is no easy solution as many areas were established prior to policymaking, and it has become attractive for architects, planners and the government to plan new areas and enhance the existing areas. However, the real problem is the lack of awareness among the public, which is strengthened by the lack of government support to encourage citizens to walk within city centres. Stricter measures are needed to change attitudes and may only be modified by the design of the city centre environment itself. Further research is suggested to assess the effectiveness of policies in encouraging

people to walk in city centres as this may influence why there is still a lack of interest among citizens to walk.

3.2 Environmental factors affecting walking

The connection between the built environment and human travel behaviour (especially walking and cycling) has been an exciting and challenging issue for urban planners. The built environment includes the following fields:

- The design of a city and the arrangement of its physical elements (urban design)
- Distribution of various activities in an urban space (land use)
- Transportation system including streets, sidewalks, and bicycle paths.
- The built environment also includes diverse human activities within the physical environment (Handy et al., 2002).

Changes in the physical environment affect the cost of travel and utility. The design features and physical element of a walkable urban space proposed by New Urbanists and many other urban researchers, such as high-density mixed land-uses, well-connected streets and improved sidewalks, aim to reduce the distance and time of trips and the travel cost. The travel experience must be improved to increase walking and cycling by enhancing understanding of convenience, aesthetic qualities, and safety (Handy and Clifton, 2001). There are approximately 50 perceptual qualities of the urban environment in literature reviews (Handy et al., 2002). Of these, six (Imageability, Legibility, Enclosure, Human scale, Transparency and Complexity) were selected for further study based on their importance in the literature.

3.3 Walking as a mode of transportation

Providing a suitable environment for walking has become a fundamental challenge in urban design and transportation. Walking and cycling, previously accepted as recreational activities, have attracted planners and designers' attention in recent decades as a means of transportation. Southworth (2005) considers pedestrian requirements in urban and suburban areas with respect to maintaining essential criteria for a walkable city. He defines walkability to the extent to which a safe and convenient environment encouraging walking is provided for pedestrians. A walkable environment provides a variety of destinations that are accessible within a logical amount of time and effort and offers visual interest in walking throughout the network. The walkability criteria for an urban environment are:

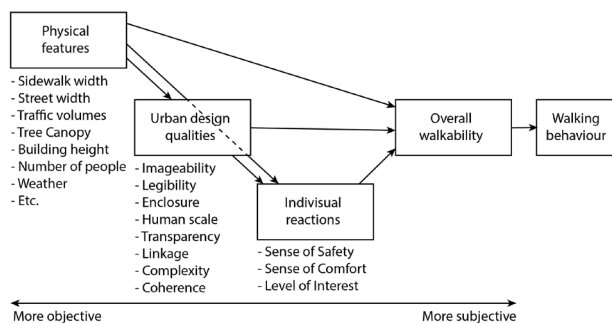


Fig. 1 Conceptual framework for the influences on walking behaviour (Ewing and Handy, 2009).

1. Connectivity of a path network, both locally and in the larger urban setting
2. Linkage with other transportation modes such as bus and subway
3. Fine-grained and varied land use patterns, particularly for serving local uses
4. Safety from traffic and criminal activities
5. Path quality, including the width of paths, paving, landscape, signing, and lighting
6. Path context, including visual interest of the built environment, landscape, street design, transparency, spatial definition, and general "explore-ability" (Southworth, 2005).

3.4 Walking for socialisation

Social interactions and social conflict have a positive effect on the physical and mental health of individuals. Leyden (2003) explored the impacts of mixed and pedestrian-oriented neighbourhoods on the level of social interaction. To this end, he examined the relationship between neighbourhood design and individual level of social capital. Social capital refers to "social networks and interactions that inspire trusted reciprocity in citizens". A high level of social capital in society encourages members to participate in voluntary activities and be more willing to gather with other people. In his studies, Leyden indicates that walkable neighbourhoods have a high level of social capital compared to car-oriented suburban neighbourhoods. This study shows that those living in walkable neighbourhoods have more social relationships with others and have a greater sense of trust and participation in political and social activities. Accordingly, a high level of neighbourhood walkability and mixed-use design create more social capital and improve people's physical and mental health (Leyden, 2003).

4 Liveability

Liveability is the social and environmental quality of the area perceived by residents, employees, customers and visitors (Lambert, 2005). The main features of liveability can be considered from different aspects, including environmental conditions such as air and water quality, cleanliness, dust and noise levels. Other factors include personal security, public health and traffic safety, and refers to the quality of social interactions such as neighbourhood, fairness and respect, and community identity. Finally, aesthetics, recreational opportunities, and environmental elements such as historic structures and the preservation of traditional local architectural styles are other aspects of liveability in an urban space (VTPI, 2014).

Walkability is considered a sub-heading of the notion of liveability. Therefore, theories of liveability would help to understand walkability and its importance better.

Liveability became important in the 1960s when the adverse effects of motorised cities and urban sprawl were recognised as a significant problem in urban areas. These problems have reduced the vitality of cities (Engelke et al., 2003).

5 Walkability and factors contributing to walkability

Walkability has become one of the most controversial and fast-growing concepts in urban planning and urban design. Walkability is such that the environment created with people's presence for shopping, visiting, enjoying or spending leisure time is more friendly. Walkability, which can be considered a relatively new phenomenon in urban design, has many social, economic and health benefits. One of the best ways to determine whether a block, corridor or neighbourhood is walkable is to "count the number of people walking, lingering and engaging in optional activities within a space" (Gehl, 1998). The presence of people, especially children, the elderly and the disabled, in an urban space, is a good indicator of walkability (Zehner, 2012). Based on the literature criteria, this research has developed four groups of factors that effectively increase the walking rate and the walkability in urban space.

5.1 Lifestyle factors

According to Saelens et al. (2003) studies, the lifestyle circumstances influencing the walkability of urban space is divided into three different groups (see also in Table 1):

- *Individual issues*: Individual lifestyles that influence walking behaviour in an area are mainly related to "ecologic models of behaviour". Self-efficacy, a positive perspective about walking as a significant physical activity and social support are the main features influencing individuals' desires for walking.
- *Group issues*: A high degree of social connections positively affects both physical and mental health. People with high social engagement with others live longer and have higher levels of health. People with high social capital also exhibit more kindness and trust towards other people.
- *Regional and environmental issues*: Proximity and connectivity are two significant factors that directly impact urban design, discourage people from driving, and encourage them to walk to short-distance destinations. Proximity refers to closeness between activity points and optimum distance of travel routinely accepted by people. Connectivity refers to directness

Table 1 The factor of lifestyle circumstances influencing walkability of urban space (Saelens et al., 2003)

Individual factors	Psychological or cognitive factors	Subjective norms
		Perceived behavioural control
		Level of behavioural intention
		Habitual behaviour
		Self-efficacy
		Physical activity enjoyment levels
		Attitudes and Awareness
Demographic factors		Age / Gender
		Education
		Marital status
Biological factors		Weight
Group factors	Sociological factors	Levels of social support
		Social reinforcement
		Social modelling
		Sport membership, recreational activities, and outdoor clubs
Regional factors	Cultural factors	Informal "culture" of neighbourhoods
	Climate Topography	Coastal neighbourhoods

or ease of travel between two activity points that is causally related to the characteristics of street design.

5.2 Locational factors

5.2.1 Mixed land-use and neighbourhood public spaces

Mixed land use refers to the proper integration of the various types of physical space uses in each urban area. The most important and essential uses required for a qualified mixed-use urban area are official, residential, retail and commercial uses, with a variety of public spaces. Walkable streets or neighbourhoods should have high access to various urban activities, especially those needed for everyday life, including shops, grocery stores, banks, schools, and cafes within 10 to 20 minutes on foot. A mixed land-use neighbourhood can encourage students to walk to schools and to the neighbourhood parks to play, provided that high-speed vehicles are highly restricted and a high level of safety from both traffic and criminal danger is retained in the neighbourhood.

5.2.2 Pathway characteristics, continuity and connectivity

A well-designed pedestrian path provides all pedestrians, including children, the elderly and the disabled, with an ideal level of safety and comfort. A walkable pathway should have a standard width that two or three people can

walk easily beside each other without interrupting others. A well-designed path should also have a relatively smooth surface; the continuity of a pathway and its connectivity are also significant factors in increasing walkability. Moreover, topography is a crucial factor affecting path quality and level of walkability. For instance, steep pathways, particularly in regions with snowy climates where the surface is covered by ice during several months of the year, can decrease pedestrians' safety and restrict their mobility. With steep pathways, utilising steps or railings can help make walking easier.

Moreover, providing high connectivity and linking walking paths to other modes of public transportation, including subway and bus, is very significant in their contribution to high walkability. Sufficient public transport stations are required to permit pedestrian access between residential and commercial areas, usually within 10 to 20 minutes walking distance.

5.2.3 Quality of built environment and architecture

The built environment is another influential factor in urban space walkability because of its important role in increasing legibility, aesthetics, convenience, and many other accepted features of a city. The form and placement of various urban elements should be precisely chosen, and their particular qualities should be considered both in design and implementation processes. Successful urban design and an appropriate combination of urban elements encourage people to walk. The architectural style of buildings and urban design styles define a particular identity for a given street and create a sense of place and belongingness in pedestrians. Qualified architecture and urban design are mainly concerned with attractiveness, comfort, legibility, green space and a sense of place.

5.3 Urban design factors

The third group of walkability attributes are urban design factors. Although design factors affecting walkability can encompass a wide range of criteria, this research concentrates on the following design factors:

- *Imageability* is the quality of a place that makes it distinct, recognisable and memorable. A place has high imageability when specific physical elements and their arrangement capture attention, evoke feelings and create an impression.
- *Legibility* is defined as the ease with which a city's parts can be recognised and organised into a coherent pattern. There are five essential components for a legible city: paths (routes along which people move

throughout the city), nodes (unforgettable places or strategic points that are majorly significant for orientation), edges (elements that separate two regions), districts (distinguished by homogeneity, functionality and repetition of physical images) and landmarks (defined physical object such as a particular building, sign, symbol or even a hill or mountain, which is observable from various distances). (Lynch, 1960)

- *Enclosure* refers to the degree to which streets and other public spaces are visually defined by buildings, walls, trees and other vertical elements. Spaces where the height of vertical elements are in proportion and related to the width of the space between them; having a room-like quality.
- *Human scale* refers to the size, texture and articulation of physical elements that match the size and proportions of humans and, equally important, correspond to the speed at which humans walk. Building details, pavement texture, street trees, and furniture are physical elements contributing to human scale.
- *Transparency* refers to how people can see or perceive what lies beyond the edge of a street. Physical elements that influence transparency include walls, windows, doors, fences, landscaping and openings into mid-block spaces.
- *Complexity* refers to the visual richness of a place. The complexity of a place depends on the variety of the physical environment, specifically the numbers and types of buildings, architectural diversity, landscape elements, street furniture, and human activity. It is one perceptual quality that has been measured in visual assessment studies and is related to changes in texture, width, height and setback of buildings.

5.4 Personal factors

5.4.1 Sense of safety

The safety of urban space has two aspects: actual safety and perceived safety. Actual safety means a safety that can be achieved through physical properties in urban spaces. As a street is a three-dimensional entity including various elements such as sidewalks, vehicular path, buildings and street furniture, actual safety in an urban space should be achieved in different ways.

Perceived safety refers to maintaining pedestrians' security from the perception or negative feelings of criminal activities or dangers from traffic in an urban area. Controlling excessive traffic noise, which generates anxiety in people, is also a concern of perceptual safety. Moreover,

proper arrangement of buildings that minimises dark and hidden spaces between buildings can be considered one of the factors that enhance perceived safety (Jaskiewicz, 2000).

Jane Jacobs (1961), in his book "The Death and Life of Great American Cities", defined three important qualities for perceptual safety:

1. A clear delimit between public and private space
2. Buildings oriented towards the street to provide "eyes on the street."
3. Common use facilities to add more "eyes on the street."

5.4.2 Level of interest

Level of interest analyses the aesthetic level that attracts people to an urban space using Gestalt principles (shape, form, pattern or configuration). Despite that discussion about aesthetic or attraction is a debatable and complicated issue, these principles can help us to evaluate whether an urban space is attractive or not.

According to Gestalt psychology, we perceive the environment through four steps:

- Detection of simple features such as colours, curvatures and end of lines.
- Parsing of the scene in a way that shapes can be recognised from the background. This step of visual perception is called 'perceptual segregation'. In this step, the mind separates the objects from their background; therefore, the object is observed as a coherent whole, distinct from its background. This is called the 'figure-ground' relation in Gestalt.
- Perceptual organisation in which the mind groups the parts into one single object.
- Pattern recognition that determines what the object is (McWilliams, 2015).

5.4.3 Lighting and visibility

The quality of lighting along a street has a considerable influence on pedestrians and drivers. Appropriate lighting systems enhance visibility. Although the lighting system of a street is a factor being handled in the design process, the impact of light on the feelings of safety and comfort depends on pedestrians' perceptions and attitudes regarding lighting levels and fear of darkness.

6 Conclusion

The origin of the walking behaviour harks back to the basic human behaviours where walking is the most primitive and obvious way of moving in space, also on an urban scale. During the recent century, with the advent of advanced

technology, walking has been replaced by motorisation, which has generated several livability problems, such as increased air pollution and human dependence on cars. To achieve a sustainable environment, scientists (urban planners, designers, environmentalists, health care.) started to explore the relationship between walking behaviour and liveability by transforming cities into more walkable communities. The results show that walking and the social life generated through pedestrian space usage and liveability are directly correlated. Previously, scientists have focused more on physical factors of sustainability that have a significant impact on walking behaviour and walkability.

Various sorts of influential factors in increasing walkability and encouraging people to walk through urban spaces are proposed in a wide range of research concerning this issue. The scope and suggested walkability factors were collected in this study, and these factors were selected and categorised into four main groups: lifestyle factors,

locational factors, urban design factors and personal factors. To fully understand the value of the statistical studies on walkability and to understand why there are differences in the results and the factors that are considered important in urban design literature, we need to consider the context of the different studies and what aspects they are capturing within the complex mechanism of walkability. Most correlational studies on walkability have been conducted in highly car-dependent, problematic (from the perspective of walkability) contexts (e.g., residential neighbourhoods in the USA, Canada, or Australia). These studies often deal with situations that do not allow or prevent the transformation of environmental conditions. They are capturing the effect, or rather the absence, of the route and its destination and providing an aspect of walkability; its unliveability. Although walkability research is often referred to as walking encouragement, these studies deal with the condition where the environment prohibits walking.

References

- Brownson, R. C., Hoehner, C. M., Day, K., Forsyth, A., Sallis, J. F. (2009) "Measuring the Built Environment for Physical Activity: State of the Science", *American Journal of Preventive Medicine*, 36(4), pp. S99–S123.E12.
<https://doi.org/10.1016/j.amepre.2009.01.005>
- Duffy, C. (2009) "Indoor Recreational Walking in Semi-Public Spaces: Assessing Demand and Design Standards", Academic Thesis, Massachusetts Institute of Technology.
- Engelke, P. O., Schmid, T. L., Frank, L. D. (2003) "Health and Community Design: The Impact of The Built Environment on Physical Activity", Island Press, Washington, DC, USA.
- Engwicht, D. (1993) "Reclaiming Our Cities and Towns: Better Living with Less Traffic", New Society Publishing, Philadelphia, PA, USA.
- Ewing, R., Handy, S. (2009) "Measuring the Unmeasurable: Urban Design Qualities Related to Walkability", *Journal of Urban Design*, 14(1), pp. 65–84.
<https://doi.org/10.1080/13574800802451155>
- Gehl, J. (1998) "Public Spaces, Public Life submitted by Royal Danish Academy of Fine Arts", *Places*, 12(1), pp. 27–28. [online] Available at: <http://escholarship.org/uc/item/17q591xt> [Accessed 14 May 2020]
- Handy, S. L., Boarnet, M. G., Ewing, R., Killingsworth, R. E. (2002) "How the built environment affects physical activity: Views from urban planning", *American Journal of Preventive Medicine*, 23(2), pp. 64–73.
[https://doi.org/10.1016/S0749-3797\(02\)00475-0](https://doi.org/10.1016/S0749-3797(02)00475-0)
- Handy, S. L., Clifton, K. J. (2001) "Local shopping as a strategy for reducing automobile travel", *Transportation*, 28(4), pp. 317–346.
<https://doi.org/10.1023/A:1011850618753>
- Jacobs, J. (1961) "The Death and Life of Great American Cities", Random House, New York, NY, USA.
- Jaskiewicz, F. (2000) "Pedestrian Level of Service Based on Trip Quality", In: TRB Circular E-C019: Urban Street Symposium, Dallas, TX, USA, pp. G-1/1–G-1/14. [online] Available at: http://onlinepubs.trb.org/onlinepubs/circulars/ec019/Ec019_g1.pdf [Accessed: 14 May 2020]
- Lambert, K. (2005) "A critical evaluation of liveability in Garrison Woods", Unpublished Master's Thesis, University of Calgary.
<https://doi.org/10.11575/PRISM/1238>
- Leyden, K. M. (2003) "Social Capital and the Built Environment: The Importance of Walkable Neighbourhoods", *American Journal of Public Health (AJPH)*, 93(9), pp. 1546–1551.
<https://doi.org/10.2105/AJPH.93.9.1546>
- Litman, T. (2010) "Quantifying the Benefits of Nonmotorized Transportation, For Achieving Mobility Management Objectives", [pdf] Victoria Transport Policy Institute, Victoria, Canada. Available at: <http://www.indiaenvironmentportal.org.in/files/nmt-tdm.pdf> [Accessed 14 May 2020]
- Litman, T. (2011) "Economic Value of Walkability", [pdf] Victoria Transport Policy Institute, Victoria, Canada. Available at: <http://www.vtpi.org/walkability.pdf> [Accessed 14 May 2020]
- Litman, T., Victoria Transport Policy Institute (2012) "Non-Motorized Transportation Planning: Identifying Ways to Improve Pedestrian and Bicycle Transport", [online] Available at: <https://www.vtpi.org/tdm/tdm25.htm> [Accessed 14 May 2020]
- Litman, T., Victoria Transport Policy Institute (2014) "Evaluating Active (Non-Motorised) Transport: Techniques for Measuring Walking and Cycling Activity and Conditions", [online] Available at: <https://www.vtpi.org/tdm/tdm63.htm> [Accessed 14 May 2020]
- Lynch, K. (1960) "The Image of the City", The M. I. T. Press, Massachusetts Institute of Technology, Cambridge, MA, USA.

- Mackett, R. L. (2000) "Reducing the Number of Short Trips by Car", presented at AET European Transport Conference (ETC), 1999, Cambridge, UK, September 27 1999. [online] Available at: https://www.researchgate.net/publication/330554508_Reducing_the_Number_of_Short_Trips_by_Car [Accessed: 14 May 2020]
- McWilliams, S. A. (2015) "Psychology, History of (Twentieth Century)", In: Wright, J. D. (ed.) *International Encyclopedia of the Social & Behavioral Sciences*, Elsevier, Amsterdam, The Netherlands, pp. 412–417.
<https://doi.org/10.1016/B978-0-08-097086-8.03046-4>
- Newman, P., Kenworthy, J. R. (1999) "Sustainability and Cities, Overcoming Automobile Dependence", Island Press, Washington, DC, USA.
- Southworth, M. (2005) "Designing the Walkable City", *Journal of Urban Planning and Development*, 131(4), pp. 246–257.
[https://doi.org/10.1061/\(ASCE\)0733-9488\(2005\)131:4\(246\)](https://doi.org/10.1061/(ASCE)0733-9488(2005)131:4(246))
- Saelens, B. E., Sallis, J. F., Frank, L. D. (2003) "Environmental correlates of walking and cycling: Findings from the transportation, urban design, and planning literatures", *Annals of Behavioral Medicine*, 25(2), pp. 80–91.
https://doi.org/10.1207/S15324796ABM2502_03
- Victoria Transport Policy Institute (VTPI) (2014) "Community Liveability: Helping to Create Attractive, Safe, Cohesive Communities", [online] Available at: <http://www.vtpi.org/tdm/tdm97.htm> [Accessed 14 May 2020]
- Zehner, O. (2012) "Green Illusions: The Dirty Secrets of Clean Energy and the Future of Environmentalism", University of Nebraska Press, Lincoln City, OR, USA.
<https://doi.org/10.2307/j.ctt1d9nqbc>