

More is Sore: A Literature Review of the Urban Morphology

Characters of Depressing Living Conditions

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Abstract

Urbanization promises a better life in cities, drawing more individuals seeking space and opportunity. However, these aspirations often result in distressing and sore living conditions. Using literature review methods, this research seeks to achieve two primary objectives: firstly, to identify elements significantly impacting mental health and contributing to stress in urban settings; and secondly, to summarize strategies within the built environment to improve the quality of life. The limitations of this research is focusing on elements discerned from existing literature and filtered by the case for high density urban. The study focuses on urban morphology elements: buildings, streets, and plots. It highlights significant factors gathered from current literature. For example, the building element delves into features like windows and sky views factor, while the street element assesses their potential role in traffic congestion. Additionally, the plot element scrutinizes the influence of green and blue spaces within urban landscapes.

Keywords: *Blue Space, Depression, Green Space, Overcrowding, Urban Morphology, Urbanization*

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Introduction

The city has always been an attractive place. A place with high ambition and hope. For thousands of years, cities have sparked innovation and lifted many from poverty to the middle class through job opportunities (Glaeser 2020). Cities keep gathering people by offering better income, job opportunities, healthcare, and many other services. It gathers all the strangers agreeing to live side by side in high density, which creates more efficient collective use of infrastructure and concentrated development (Murphy, 2017). The data from the OECD show people in the city have higher life satisfaction than people in rural areas and semi-dense urban areas or towns (OECD, 2020). That is the ideal concept of urbanization, known as the process of reducing poverty (Sridhar, 2019). Done properly city should be the happiest place in the world.

Nowadays, urbanization has moved 56% of the world's population to cities (Ivers and Fleury, 2022). It makes cities denser and denser. Back in the 19th century, London city was in the industrial revolution and had an uncontrolled rising population. It created the worst living condition, slums that were called Victorian slums. The slums were characterized as a hellish environment. Because of that, Howard Ebenezer was motivated to write the idea of Garden city in the book entitled "Garden City of To-morrow." A Garden city is the image of a city with controlled density facilitated by green open space (Howard, 2016). According to a recent perspective by Monteiro et al. (2022), garden cities are perceived as a solution to reduce urban sprawl while promoting walkability and cycling through their design.

There seems like a density threshold where a city can turn into a depressing living condition. Recently, high migration to the city (urbanization) has created competition and challenges for occupying space and overloaded infrastructure. People who lives in the city are prone to the housing problem, traffic jam, air pollution, and loud noises (Moser, 1988; Iqbal and Ali, 2022). The reality has turned the hope of million souls for a better environment into an inescapable fate in depressing living conditions. But is it the built environment or the density of the citizen to blame? Layla McCay, Director of the Centre for Urban Design and Mental Health, said, "The villain isn't density itself; it's insensitive design" (Gardiner, 2017). McLennan (2009) believes that there is a "density sweet spot," a correct setting of density for the built environment in a city.

Similar to Howard Ebenezer's story, Le Corbusier was motivated by the chaotic planned medieval cities in Europe. In his book *The City of tomorrow and its planning*, Le Corbusier said density has to be controlled and centralized in a way for better housing solutions and to spare space for transportation and open space (Le Corbusier, 2013). On the contrary, Jane Jacobs distinguish density and overcrowding. Not all city solution is remake of a neighborhood into high-rise buildings. Jane Jacob said well design neighborhood (or city in this case) is a walkable and vibrant design. Even though both Le Corbusier and Jane Jacobs have different urbanism styles, both of them agree density is not the culprit of poor living conditions. Richard Rogers (2004) in *Urban Task Force* stated that density and intensity could create a condition of urban cramming where there are too many buildings and cramped living conditions. Density needs to be managed by urban design to create a quality of life (Rogers, 2004). In summary, we can agree that depressing living conditions are not created by density but by bad urban design.

Despite the bygone eras of Howard Ebenezer, Jane Jacobs, and Le Corbusier, recent research still observes a prevailing trend in contemporary development that emphasizes constructing new settlements primarily on untouched land or greenfield. The solution to improving living standards appears to be the creation of fresh residential areas. For instance, ongoing urban sprawl in Indonesia has resulted in the establishment of exclusive "private cities" targeting affluent segments (Permanasari et al., 2023). However, these developments foster segregated communities due to heavy security measures, gated structures, and surrounding walls. Given the concerning state of densely populated cities worldwide, this literature-based research aims to achieve two core objectives: firstly, identifying crucial elements influencing mental health and contributing to stress in high densified urban settings, and secondly, summarizing built environment strategies to enhance overall quality of life, particularly in crowded or strained environments.

More Is Sore by Urban Morphology

Since the end of the 19th, urban planning practices have seen a crowded area as a "vibrant" urban space or the best living in urban habitat (Cremaschi, 2014). Crowds bring more benefits and strengthen the community, like the crowd in the city square and the crowd in the shopping center. A successful public realm is where can attract people to come so people can see people doing an activity (Jacobs, 2007). However, the crowd can change into a negative stigma and related to congestion when rapid urbanization creates concentrated overpopulation in megacities. Crowds, density, and congestion are not new problems but growing problems. Since 1979, the crowd issue has grown into a depression problem (Schwab, Nadeau, and Warheit, 1979). If not properly controlled, the crowd can be chaos, an unorganized mass with the potential for disaster. Crowds can change the new urbanity image to become "more is sore."

Urban planners and designers have the knowledge, ability, and responsibility to manage the crowd in the city away from depressing living conditions. Seeing from that perspective, this study examines the element of the city related to urban planning and urban design scopes. Studied in those scopes, urban morphology is the study of the urban form or the physical form of the city (Oliveira, 2016). The main elements of urban form are streets, plots, and buildings (Oliveira, 2016). These elements also mention by Rogers (2004) as the element that occupy the space in the city, which is building, road, and open space (see Figure 1).

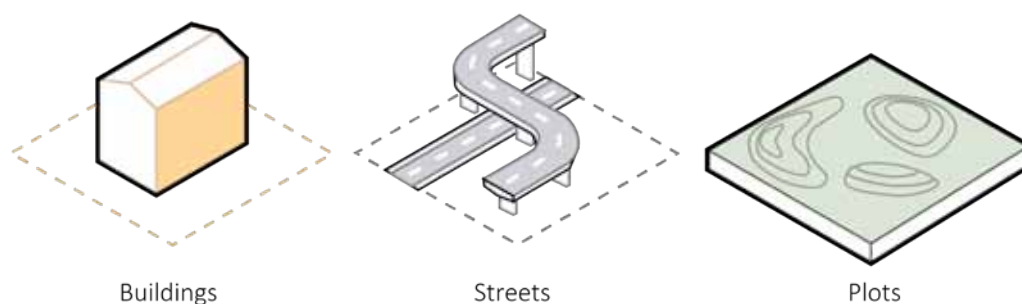


Figure 1. Illustration of main urban morphology elements. Source: illustration is created by Authors.

Recent studies found a relationship between those elements with depression. Chen et al. (2022) found that depression among the elderly is linked to environment characters like walkability, transportation, and types of greenness. Wang et al. (2020) have found the pa-

rameters of frontal area density (FAD), sky view factor (SVF), ground coverage ratio (GCR), and street coverage ratio (SCR) cause the suicide rate in Hong Kong case. Wei et al. (2016) found that sky view factor (SVF), floor area ratio (FAR), site coverage ratio (SCR), and building stories have an effect on urban microclimate in search of comfortable living condition design. Another study also found that spatial characters can detect the perceived urban stress in public areas (Knöll et al., 2018).

Methods

This study employs a literature review methodology to conduct an in-depth exploration of the relationship between urban morphology characteristics and their impact on mental health, particularly in the context of challenging living conditions. Utilizing a qualitative approach allows for a comprehensive understanding of this intricate phenomenon prevalent in high-density urban environments.

The study's content is delimited to scientific domains, focusing on various types of peer-reviewed journals, conference papers, online articles, and books. The search strategy involved systematically employing keywords related to 'depression,' 'stress,' 'mental health,' 'urbanization,' 'urban morphology,' and other related elements of the built environment. Literature was extensively sought through multiple academic databases, prioritizing studies that specifically addressed the interaction between urban morphology characteristics and mental health outcomes.

Building upon Oliveira's (2016) theoretical framework of urban morphology, this study examines elements such as buildings, streets, and plots as the variable. These exact three elements also mentioned by other urban expert such as M. R. G. Conzen (2004) and Stojanovski and Östen (2018). However, the analysis is limited to elements directly linked to depression and mental health, as supported by existing literature. Among all of elements found in the existing literature, this review highlights significant factors. For instance, the building element focuses on aspects such as windows and sky view factors, while the street element considers their potential contribution to traffic congestion. Additionally, the plot element concentrates on green and blue spaces within the urban environment.

Building Element

Building Element: Windows

A window is an opening of the building that connects the interior room to the outside environment. A window gives a view, natural light, and air circulation to the room. In the modern age, literature and research see windows as natural cooling and natural lighting to cut energy consumption. The window has a significant role in the thermal control, release of heat and indoor pollution in a room (Najafi et al., 2019). But windows are more than that. Windows are also stress coping instruments. When the covid-19 forced people to stay and work from home, suddenly, people realize the importance of windows to reduce stress. Homes with a lack of windows or openings makes the alternate workplace incomplete.

Natural light from windows is important for human health. It gives roles that cannot be replaced by artificial light. Natural light can help people sleep better and have a better mood. Natural light can be a biological clock for the human body by helping the body to produce melatonin hormone (Jordan, 2018). In contrast, artificial light decreases the production of this hormone and disturbs the sleep cycle. The interruption can have an impact

on the ability to sleep, think clearly, and regulate blood pressure. Research finds that person sleeping in a room with windows has better health qualities than a person sleeping in a windowless room (Boucher, 2015). Those measured qualities consist of sleep quality, sleep efficiency, sleep disturbances, and daytime dysfunction, which also impact productivity.

People will always choose a room with windows rather than a windowless one to stay or work. Views from the window have proven can reduce stress. A study case in china shows different view has a different level of impact. The best satisfaction view outside the windows is a waterscape view that generates great satisfaction, followed by green plant view, and lastly buildings view (Liu et al., 2019). Therefore, it is important to choose the best side for opening or placing the landscape that is visible from the building window. Optimizing the landscapes outside the window can help alleviate the anxiety of people and increase mental health (Liu et al., 2019). The anxiety is reduced greater on the natural landscape than on the human landscape.

As housing prices rose in the city center, windows and openings became rare in affordable housing. For example, Seoul is the capital city of South Korea and also a megacity with 9.77 million of population. House is very expensive in Seoul, forcing immigrants and low-income citizens to stay in low-cost house. One type of the low-cost housing is a semi-basement apartment (*banjiha*). *Banjiha's* floor level is lower than the street, while half of the wall above the street. It has only one side of the façade for windows and openings facing the street. Originally, *Banjiha* was buried two-thirds underground (see Figure 2). However, due to health considerations, in 1980, the newly built *Banjiha* was only half buried (see Figure 2). Nevertheless, a portion of *Banjiha*, one-third above ground, still exist.

The lifestyle of Koreans living in a *Banjiha* was portrayed in detail in the movie *Parasite* (2019). That movie shows how a family struggle to be rich while living in a semi-apartment. The family has difficulty getting good phone signals. Rich people describe them as having the same basement smell, which is characteristic of dirty and poor. In the movie also show how the semi-basement are vulnerable to the flood due to the high rainfall and underground level. In real life, the flood had happened several times and caused great damage to the *banjih*as, and some residents died during the disaster. *Banjih*as and the community of high-stress levels in Seoul is the combination of a depressing living conditions. The window in *banjiha* barely can catch natural light. With the half elevation under the street, it is almost impossible to get a view and totally impossible to aim the view at the city landscape.

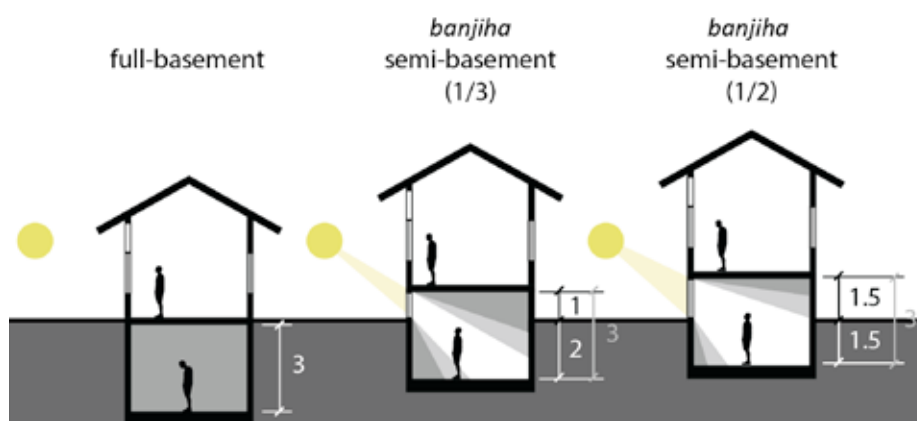


Figure 2. Illustration showing three type different type basement including full-basement and *Banjiha* (semi-basement apartment). Source: illustration is created by Authors.

Buildings Element: Sky View Factors

The sky view factor (SVF) is a fraction of the visible sky from the ground or outdoor view to the sky (Dirksen et al., 2019) (see Figure 4). High SVF means the sky is highly visible from the ground and not covered by any buildings. The equation to measure SVF is cos of arc tan of building height (H) after it is divided by half of the width between buildings (W) (see equation in Figure 3). This equation means that SVF is smaller when the building is taller and SVF is bigger when the space between buildings is wider. This fraction is first introduced as a measurement to count the fish eye lens on the digital camera (Khartwell, 2017). Nowadays, SVF is commonly used in urban studies to measure urban heat islands (UHI). SVF also reflects the plot ratio of an area. High SVF reflects low plot ratios and vice versa.

$$SVF = \cos\left(\arctan\left(\frac{H}{0.5W}\right)\right)$$

Figure 3. Equation of The Formula of Sky View Factor.

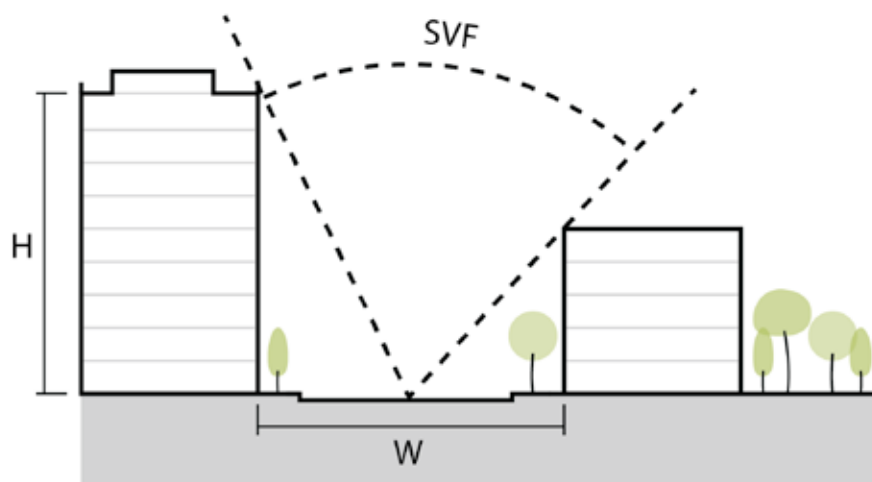


Figure 4. Sky view factor Illustration. Source: illustration is created by Authors.

The sky is a space of plenty of natural phenomena that is always characterized as beautiful. The clear sky in the day gives a peaceful and calm feeling through the azure color. A starry sky and a yellow moon at night can relieve stress (Brock, 1988). While cloud in the sky, just like the beautification of flying white cotton that usually appears in our device's wallpaper. Since ancient times, people have developed many activities of visualizing the sky, namely: stargazing, cloud watching, sunset or sunrise hunting, etc. People can see meteor showers, comet crossings, auroras, and solar eclipses on special occasions and locations.

The sky is a free feature that anyone can enjoy as long there is nothing blocking the view. It has been a natural coping mechanism since ancient times. But what happens when the city cannot provide a sky view? Several Hollywood movies had helped put a picture of how it would look like a city without the sky. The fictional city called Gotham city is a city with many high rises and a small gap between buildings, providing a little sunlight direct sunlight on the ground. Many movies with futuristic cyberpunk themes have pictured the future city with a lot of skyscrapers and some kind of bridge structure covering the upper layer, almost leaving no sky to see from the ground. For examples: the Bay City (fictional city) in the TV series *Altered Carbon*; the futuristic Los Angeles in the movie of *Blade Run-*

ner 2019; and New Port City in the live-action movie of *Ghost in the Shell*. All of these three movies often use gloomy color set to picture the environment on the city as full of crime, low life expectancy, and social degradation.

Meanwhile, the city of low sky view factor also appears in real life. The increasing population and urbanization have led several cities to be cramped space with a housing problem. Urban village in Shenzhen, China, is very popular due to the gentrification turning a lot of rural plots into a dense housing areas. This urban village took international attention due to the eyesore environmental condition (Wang, 2013). Because the distance between buildings is very tight, it leaves only one crack of space to see the sky (see Figure 5). They call it “one-line sky” (一线天 - yi xian tian).



Figure 5. The low Sky View Factor (SVF) in Shenzhen Urban Village. Source: Illustration is created by Authors, the aerial view photo from “Urban Mountains,” (2018) photographer Li Zhenxing, and the eye view photo from Zhang (2019) photographer Phoebe Zhang.

On another discussion, high SVF might cause problems because it brings direct sun radiation that heats up the city. The heat can make people feel uncomfortable and depressed. Urban heat island (UHI) is the phenomenon of rising temperature as the location is closer to the city center because of the dense population and high establishment of the built environment. Some studies found that SVF has a positive relation to UHI. High SVF can contribute to high UHI. However, when the SVF was extremely low, it created major implications for the health condition because it received higher terrestrial radiation and no heat mitigation space. In conclusion, providing high SVF in the city is a good thing to make the city less depressing. Venhari, Tenpierik, and Taleghani (2019) suggest covering half of the sky with vegetation for effective urban heat mitigation. The discussion about how green space and vegetation in the city can reduce stress will be discussed in the next section (Green space).

Street Element and Traffic Congestion

Traffic congestion is a common urban phenomenon that happens in all over the world. In our perception, traffic congestion is pictured as being stuck in the road of vehicles crowding, and creating delays in daily activities. By theory, the road has a physical capacity, a normal volume for standard commuting flow and speed. Traffic can be categorized as congested when the traffic volume is above the physical capacity (Rodrigue, 2020). The possibility of traffic congestion occurring in the city is high because of the high population and agglomerated economic activities (Sheffi, 1984). Cities as a magnet for more traffic have created sore travel.

Humans do not like being controlled. Feeling under control can raise anxiety and cause depression. Traffic congestion puts humans under the control of idly moving traffic. In Toronto, Canada, traffic congestion raises thrice anxiety rate, increases 50% of depression risk and 50% percent more likely to divorced (Kwame McKenzie, 2015). While in India, Samal et al. (2020) found that 81% percent of people suffered due to traffic congestion (see Figure 6). Because of traffic congestion, 20% percent of people has the difficulty of breathing, 18% has a headache, 16% get mental stress, 10% feel tiredness, 8 percent feel uncomfortable sounds, and many other symptoms (Samal et al., 2020).

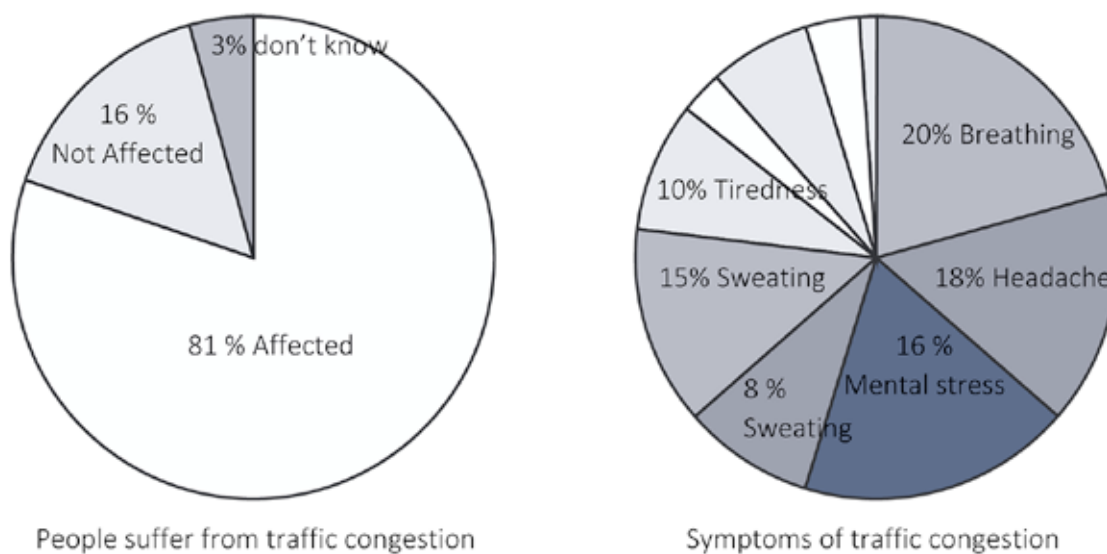


Figure 6. Diagram of the impact of traffic congestion in India. Source: Illustrated by Authors, Data from Samal et al. (2020).

The relationship between traffic congestion and stress has been carefully explained in the previous passage. But yet, the cause and solution seem vague. There is no way to live in the city without tolerating traffic jams. The title of this section seems to justify and blame the traffic jam on the morphology of the street network. The shape of the street network does have an impact on traffic congestion, but there are many other factors causing the traffic jam. Traffic jams can be reduced by providing more connectivity. Many studies suggest grid patterns like cities in America as the best street connectivity. The grid creates 90 degrees turns dan rectangular land parcels. It helps people in terms of wayfinding because they are

familiar with 4-direction orientations like in the compass (Turner, 2007). Grid pattern gives more alternative routes. It can change travel decisions and divert traffic to the road with lower volume.

Providing more connectivity, and constructing new streets, only can solve the traffic jam as the short-term solution. Sooner or later, people will be encouraged to use private vehicles, create more traffic volume and then bring back the traffic congestion. Traffic congestion cannot be solved by only fixing the road network. Encouraged by it, this study explores more the aspect of urban form.

Congestion can be easily created by uncontrolled urban form growth. When the land price in the city center and nearby is high, people will build a house in the outskirt areas, leaving the area adjacent to the city center empty. This is called leapfrog development, where the citizen jumps to the cheaper land for housing development (Corner, Ongee, and Dewan, 2014). It can greatly expand the size of the city area and create more demand for long-distance transport. Related to leapfrog development, suburbanization creates urban sprawl creating a new center settlement that depends on the city central for amenities, infrastructure, and economic activities (Abeyrathna, 2015). A research has been conducted by Mohd Noor and colleagues (2018) measuring the urban sprawl within Kuala Lumpur city, as result it found out a lot of sprawl was initiated by leapfrog urban sprawl (see Figure 7). Urban sprawl gives additional traffic volume to the city center. To solve both issue, polycentric development is the development of creating a new center settlement that has basic amenities and mixed-land use to reduce the travel to the city center. Polycentric development also can help absorb the overpopulation in the city center.

Besides leapfrog development, another scenario of urban form growth involves the 'extension' of built-up areas (see Figure 7). Since longer distances contribute to increased traffic, there is a suggestion to create compact spaces and densify areas or 'extending' the current built up area (Aras, 2022). However, densification can lead to overpopulation, causing traffic volumes to exceed the streets' physical capacity and resulting in traffic congestion within the inner-city network. This situation has occurred in Jakarta, where citizens from the entire archipelago predominantly favor one central city. Jakarta has a concentrated population that continues to expand outward from this nucleus (Abidin et al., 2009). The city's streets are primarily occupied by private motorcycles and cars, utilizing all modes of transportation, including the railway and bus systems, alongside an odd and even plate number regulation. Traffic congestion arises due to overcapacity. Transit-oriented development offers a solution by encouraging a shift from private vehicles to public transportation. This approach changes people's habits from owning cars to paying for travel. Moreover, transit-oriented development facilitates connectivity to various city nodes through mass transit systems and very effective for city with urban sprawl case (Liu et al. 2022). In Jakarta's case, prioritizing mass transportation and establishing new city nodes are crucial to distribute the population. This emphasis on public transportation has been a governmental focus over the last decade.

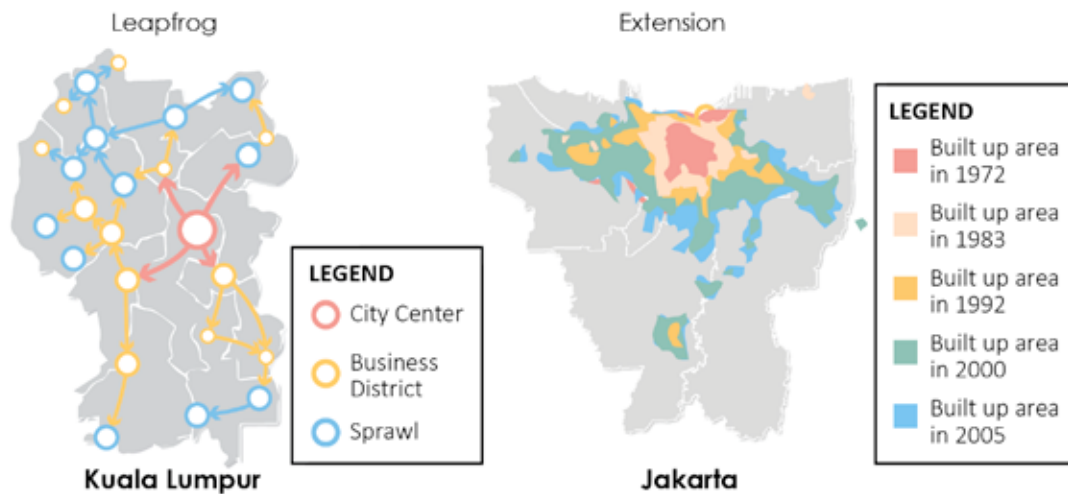


Figure 7. Two types of urban growth, leapfrog development example in Kuala Lumpur and built area extension example in Jakarta. Source: The illustration is created by the Authors, the data for leapfrog development in Kuala Lumpur is retrieved from Mohd Noor et al. (2018) and data for extension development in Jakarta is retrieved from Abidin et al. (2009).

Plot Element in Natural Context

In this section, we explore the relationship between nature and health in urban settings. Several previous studies have identified a connection between natural elements and depression. Dijkstra, Pieterse, and Pruyn (2008) measure patients' stress levels to assess the impact of natural elements in the built environment and found a significant reduction in stress levels due to the presence of natural elements. They concluded that natural elements can enhance the attractiveness of a space, leading to stress reduction. In comparison to man-made structures in urban settings, Ulrich et al. (1991) discovered that natural elements are more effective in helping patients recover from stress. Grinde and Patil (2009) found that incorporating natural elements into urban spaces can promote positive cognition and emotions, improve well-being, and reduce stress levels. It can be inferred that humans are genetically predisposed to seek out natural elements; an environment devoid of plants can evoke feelings of unease. Hunter, Gillespie, and Chen (2019) conducted a study using saliva biomarkers and found that citizens with access to urban parks for outdoor activities experience lower stress levels than those without such access. These health and medical research findings underscore the significance of natural elements in urban settings.

Within urban infrastructure, natural elements are categorized as soft spaces, comprising green spaces and blue spaces (Gledhill and James, 2008). Green spaces encompass recreational parks, forest reserves, and open green areas predominantly featuring trees and vegetation as natural elements. On the other hand, blue spaces encompass water elements such as rivers, wetlands, beaches, and canals. A current global issue is the expansion of urban areas, which leads to competition for land within cities. This often results in citizens prioritizing housing and commercial areas at the expense of open green spaces or blue

spaces. For example, the United States lost 1.4 million hectares of open space due to urban expansion between 1990 and 2000 (McDonald, Forman, and Kareiva, 2010). Similarly, in Chittagong, high population density has made it challenging to provide open spaces (Jafrin and Beza, 2018). The following section delves into the utilization of green and blue spaces in urban settings to reduce stress, as well as strategies for cities with high population density.

Green Spaces

Green spaces in urban contexts encompass areas such as gardens, parks, playgrounds, residential greenery, and other spaces adorned with grass, trees, and shrubs (Jennings and Bamkole, 2019). A common strategy involves integrating green spaces into natural and mix natural-manmade areas within cities (Gledhill and James, 2008). Beyond the environmental advantages, green spaces contribute to mental and physical well-being by offering psychological relaxation and stress relief, while also fostering social cohesion (World Health Organization. Regional Office for Europe, 2016). Urban green spaces not only facilitate positive social interactions that enhance psychology and well-being (Jennings and Bamkole, 2019), but well-designed public spaces can also encourage outdoor activities and subsequently promote social cohesion, as suggested by Gehl (2007). However, green spaces can hinder social cohesion due to concerns such as crime, inaccessibility, and physical conditions such as lack of maintenance (Clarke et al., 2023).

In response to the constraints posed by urbanization and the resulting scarcity of land, many cities have experienced a reduction in green space. Hong Kong, for instance, suffers from a shortage of open spaces due to its densely populated living environment (Thilakarathne, 2019). The World Health Organization recommends a minimum of 9 m² of green space per person as the ideal standard for cities, promoting compact city design and planning to enhance community health and well-being (Russo and Cirella, 2018). This standard underscores the need for balanced and sustainable planning in the future development of public green spaces (Almohamad and Knaack, 2018).

However, achieving this standard is often impossible for overpopulated cities. For example, in Chittagong, the existing cumulative open space is a mere 0.18 square meters per person (Jafrin and Beza, 2018). In such cases, the World Health Organization suggests considering factors such as availability, accessibility, quality, and security of public green spaces as indicators of a healthy city when the minimum area standard cannot be met (Jafrin and Beza, 2018). Wen, Kenworthy, and Marinova (2020) propose that streets can be repurposed as green open spaces in densely populated urban areas with limited space, necessitating design strategies that incorporate green elements into streetscape design. This is actually a great idea since the road transport infrastructure usually take 10 percent to 25 percent of the land in the city.

The biophilic design approach offers a valuable recommendation for greening compact cities for example cities in Singapore. The concept of a biophilic city involves designing and planning cities to embrace nature extensively, enabling deep connections between urban residents and the natural world (Milliken et al., 2023). The core of this concept lies in biophilia, the idea that humans possess a natural tendency to establish connections with nature, encompassing plants and living entities (Grinde and Patil, 2009). The current

research focus on biophilic cities positions them as strategies for resilient and sustainable urban development, however there are more to look at on the benefits for mental and physical health.

Blue Spaces

Urban blue space encompasses all natural and man-made water surfaces within urban environments, such as seas, beaches, rivers, lakes, canals, ponds, and water fountains (Gledhill and James, 2008). The fact that over half of the global population lives within 3 km of water bodies - rivers, lakes, and seas - (Kummu et al., 2011) underscores the significance of blue spaces and their potential for future urban development. However, water sources can pose dangers, serving as drowning hazards and disease vectors. Often, they suffer from inadequate maintenance, rendering them unattractive and unsanitary. Moreover, rivers have a dual nature; they offer aesthetic charm but also harbor risks such as flooding and inundation. Despite these challenges, human communities persist in residing near water bodies, driven not only by survival needs but also by the river's aesthetic appeal.

The highlighted facts prompt a question: Is the appeal of blue spaces due to their mental health benefits or simply for practical reasons? A study by Vitaly Komar and Alex Melamid revealed people's preference for a green environment alongside a river or lake, emphasizing the attraction of water bodies. A recent study by Poulsen et al. (2022) on the benefits of visiting blue spaces found that the frequency of visits correlates with reduced perceived stress rather than directly impacting mental health. Developing accessible blue spaces may provide restorative benefits, as water bodies hold significant potential for relaxation and social activities (Rybka and Mazur, 2018), eliciting positive emotions in humans. A comprehensive review focusing on blue spaces and mental health consistently demonstrates a positive correlation between increased exposure to outdoor blue spaces and enhanced mental well-being (White et al., 2020).

Blue spaces play a crucial role in establishing sustainable urban environments that prioritize human health, particularly focusing on psychosocial well-being (Britton et al., 2020). Amid challenges posed by expanding urban populations, blue spaces offer potential solutions to public health concerns. Worldwide regulations increasingly protect water bodies from development, emphasizing their significance. Overcoming challenges associated with construction on water bodies positions them as an ideal choice for preserving open spaces amidst urban expansion. The role of blue spaces in promoting mental well-being, especially in densely populated urban areas characterized by stress due to compact living conditions and limited open spaces, is noteworthy. As cities grapple with scarce land for traditional open spaces, embracing blue spaces emerges as a promising strategy to address the psychological well-being of citizens while maximizing available resources

Conclusion

"More is sore" is a statement to depict how bad the living condition of overcrowded environments. All urban theorists agree that the crowd is not the culprit. Urbanization is not a crime for decreasing the life quality in the city. However, it is the bad planning and bad design that has missed the density sweet spot. The study cases show that the depressing living condition is created by collective greed to maximize land utilization. In Shenzhen, China, they maximize the plot ratio leaving a small gap between buildings. In Seoul, South

Korea, they maximize the whole building floor use for low-cost apartments. While in Jakarta, people compete to have their own rights on the street.

Building, street, and plot are the three elements in urban design and planning to create a density sweet spot. Through the element of building, having natural light, a view from indoors to outside, and a view from land to the sky are important to reduce stress. In comparison, the street element is a complex matter that needs careful planning, not just the shape but also the activity and the demand. However, in simple words, the grid shape creates better connectivity. TOD and polycentric development are highly recommended to reduce traffic congestion.

On the scope of the plot, natural context is vital to generate positive emotions. Green and blue spaces such as urban recreation parks, street plantings and water features are the element that commonly been used in any development to bring nature into the urban space. Not only do they appeal to our sense of fascination and need for relaxation, but they also provide us with places for social cohesion, to get together with friends and meet our neighbour. It turns out that several studies have shown that green and blue spaces play an important role in addition to having a positive effect on our physical and mental health. There are plenty strategies to maximize the design of open space in compact cities such as green space on streetscape, biophilic cities concept, and water bodies as open spaces.

The research has identified a limitation concerning the exploration of depression within densely populated urban areas. This study primarily focuses on phenomena and strategies associated with cities experiencing high population densities, even reaching superdensification. It is imperative to acknowledge that future endeavors should concentrate on innovation and novel approaches aimed at enhancing the comfort and well-being within highly densified cities. Presently, research efforts and practical applications predominantly emphasize the creation of new developments and the integration of 'greenfield' concepts. However, the pressing global crisis urges a shift away from exploiting natural resources, presenting a significant opportunity for concentrated research on 'brownfield' areas, especially within highly densified regions. The lack of focus on these areas presents a gap in current research and practice, warranting attention to revitalize and improve the living conditions within these densely populated zones.

References

- Abeyrathna, Khmwk. "An Evaluation of the Planning Implications Driven by Urban Sprawl with Special Reference to the Suburbs of Kandy City." Thesis, University of Moratuwa, 21 February 2015. <http://dl.lib.mrt.ac.lk/handle/123/10673>.
- Abidin, Hasanuddin Z., Heri Andreas, Irwan Gumilar, and Mohammad GAMAL. "Land Subsidence and Urban Development in Jakarta (Indonesia)." Presented at *7th FIG Regional Conference, Spatial Data Serving People: Land Governance and the Environment – Building the Capacity* Hanoi, Vietnam Oct, 2009.
- Almohamad, Hussein & Anna Lisa Knaack. "Assessing Spatial Equity and Accessibility of Public Green Spaces in Aleppo City, Syria." *Forests* 9 (14 November 2018). <https://doi.org/10.3390/f9110706> (accessed August 23, 2023).
- Aras, Nagesh. "Explainer: Urban Planning Measures That Can Reduce Traffic and Ease Commute." *Citizen Matters*. 22 September 2022. <https://citizenmatters.in/urban-planning-measures-for-mobility-commute-roads-parking-land-use-30901> (accessed January 29, 2023).

- Boucher, Bernice. "How Biophilia Reduces Workplace Stress and Drives Productivity." *Work Design Magazine*. May 14, 2015. <https://www.workdesign.com/2015/05/how-biophilia-reduces-workplace-stress-and-drives-productivity/> (accessed January 29, 2023).
- Britton, Easkey, Gesche Kindermann, Christine Domegan & Caitriona Carlin. "Blue Care: A Systematic Review of Blue Space Interventions for Health and Wellbeing." *Health Promotion International* 35, no. 1 (February 1, 2020): 50–69. <https://doi.org/10.1093/heapro/day103> (accessed August 26, 2023).
- Brock, Barbara. "The Natural Discovery: For Family Enrichment and Relief of Stress." *Visions in Leisure and Business* 7, no. 3 (January 1, 1988). <https://scholarworks.bgsu.edu/visions/vol7/iss3/12> (accessed December 22, 2022).
- Chen, Yu-Ru, Masamichi Hanazato, Chie Koga, Kazushige Ide & Katsunori Kondo. "The Association Between Street Connectivity and Depression Among Older Japanese Adults: The JAGES Longitudinal Study." *Scientific Reports* 12, no. 1 (August 8, 2022): 13533. <https://doi.org/10.1038/s41598-022-17650-w> (accessed January 6, 2023).
- Clarke, Mysha, Stephanie Cadaval, Charles Wallace, Elsa Anderson, Monika Egerer, Lillian Dinkins & Ricardo Platero. "Factors That Enhance or Hinder Social Cohesion in Urban Greenspaces: A Literature Review." *Urban Forestry & Urban Greening* 84 (June 1, 2023): 127936. <https://doi.org/10.1016/j.ufug.2023.127936> (accessed August 26, 2023).
- Conzen, M. R. G. *Thinking about Urban Form: Papers on Urban Morphology, 1932-1998*. Berlin, Germany: Peter Lang, 2004.
- Corner, Robert J., Emmanuel T. Ongee & Ashraf M. Dewan. "Spatiotemporal Patterns of Population Distribution." In *Dhaka Megacity*. Edited by Ashraf Dewan & Robert Corner, 45–60. Dordrecht: Springer Netherlands, 2014. https://doi.org/10.1007/978-94-007-6735-5_3.
- Cremschi, Marco. "Unmaking and Remaking Urban Crowds." *Lo Squaderno 33 Crowded Spaces* 33, no. 1 (September 2014): 27–30. <http://www.losquaderno.net/wp-content/uploads/2014/09/losquaderno33.pdf> (accessed December 5, 2022).
- Dijkstra, K., M. E. Pieterse & A. Pruyn. "Stress-Reducing Effects of Indoor Plants in the Built Healthcare Environment: The Mediating Role of Perceived Attractiveness." *Preventive Medicine* 47, no. 3 (September 1, 2008): 279–83. <https://doi.org/10.1016/j.ypmed.2008.01.013> (accessed August 22, 2023).
- Dirksen, M., R. J. Ronda, N. E. Theeuwes & G. A. Pagani. "Sky View Factor Calculations and Its Application in Urban Heat Island Studies." *Urban Climate* 30 (December 1, 2019): 100498. <https://doi.org/10.1016/j.uclim.2019.100498> (accessed November 17, 2022).
- Gardiner, Joey. "City-Dwellers Are Prone to Depression – Are High-Rises to Blame?" *The Guardian*. March 16, 2017. sec. Guardian Sustainable Business. <https://www.theguardian.com/sustainable-business/2017/mar/16/cities-depression-stress-mental-health-high-rises-urban-design-london-toronto> (accessed January 6, 2023).
- Gehl, Jan. "Three Types of Outdoor Activities: Life Between Buildings, and Outdoor Activities and the Quality of Outdoor Space." In *Urban Design Reader*. Edited by Matthew Carmona and Tiesdell Steve. Oxford: Elsevier, 2007.
- Glaeser, Edward L. 'Urbanization and Its Discontents.' *Eastern Economic Journal* 46 (2020):191–218. <https://doi.org/10.1057/s41302-020-00167-3>.

- Gledhill, David, and Philip James. "Rethinking Urban Blue Spaces from a Landscape Perspective: Species, Scale and the Human Element." *Band 42* (January 1, 2008): 151–64.
- Grinde, Bjørn & Grete Grindal Patil. "Biophilia: Does Visual Contact with Nature Impact on Health and Well-Being?" *International Journal of Environmental Research and Public Health* 6, no. 9 (September 2009): 2332–43. <https://doi.org/10.3390/ijerph6092332> (accessed August 22, 2023).
- Hossain, Syed Zakir. "Officials Have No Answers for Dhaka's Traffic Troubles." October 7, 2022. <https://www.dhakatribune.com/bangladesh/2022/10/07/officials-have-no-answers-for-dhakas-traffic-troubles> (accessed January 29, 2023).
- Howard, Ebenezer. *Garden Cities of To-Morrow: Urban Planning*. n.p.: CreateSpace Independent Publishing Platform, 2016.
- Hunter, MaryCarol R., Brenda W. Gillespie & Sophie Yu-Pu Chen. "Urban Nature Experiences Reduce Stress in the Context of Daily Life Based on Salivary Biomarkers." *Frontiers in Psychology* 10 (2019). <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00722> (accessed August 22, 2023).
- Iqbal, Javed & Kashif Ali. "Examining the Impact of Urbanization on Human Health." *Cosmic Journal of Linguistics* 2, No. 1 (2023): 46–59.
- Ivers, Laura & Melina Fleury. "Urban Development." Text/HTML. World Bank. October 6, 2022. <https://www.worldbank.org/en/topic/urbandevelopment/overview> (accessed January 9, 2023).
- Jacobs, Jane. "The Uses of Sidewalks: Safety." In *Urban Design Reader*. Edited by Matthew Carmona and Steve Tiesdell, 1st ed. Oxford: Architectural Press, 2007.
- Jafrin, Maharina & Beau B. Beza. "Developing an Open Space Standard in a Densely Populated City: A Case Study of Chittagong City." *Infrastructures* 3, no. 3 (September 2018): 40. <https://doi.org/10.3390/infrastructures3030040> (accessed August 23, 2023).
- Jennings, Viniece & Omoshalewa Bamkole. "The Relationship between Social Cohesion and Urban Green Space: An Avenue for Health Promotion." *International Journal of Environmental Research and Public Health* 16, no. 3 (January 2019): 452. <https://doi.org/10.3390/ijerph16030452> (accessed August 22, 2023).
- Jordan, Jade. "Natural Light and Mental Health." July 26, 2018. <https://www.rtor.org/2018/07/26/how-light-improves-mental-health/> (accessed January 29, 2023).
- Khartwell, Par. "Understanding the Sky View Factor." Billet. *Métrologie des Ambiances Urbaines* (blog). May 23, 2017. <https://mau.hypotheses.org/271> (accessed January 2, 2023).
- Knöll, Martin, Katrin Neuheuser, Thomas Cleff & Annette Rudolph-Cleff. "A Tool to Predict Perceived Urban Stress in Open Public Spaces." *Environment and Planning B: Urban Analytics and City Science* 45, no. 4 (1 July 2018): 797–813. <https://doi.org/10.1177/0265813516686971> (accessed November 29, 2023).
- Kummu, Matti, Hans de Moel, Philip J. Ward & Olli Varis. "How Close Do We Live to Water? A Global Analysis of Population Distance to Freshwater Bodies." Edited by Matjaz Perc. *PLoS ONE* 6, no. 6 (8 June 2011): e20578. <https://doi.org/10.1371/journal.pone.0020578> (accessed April 7, 2023).

Le Corbusier. *City of Tomorrow and Its Planning*. London: Dover Publications, 2013.

Liu, Y., T. Pei, C. Song, H. Shu, S. Guo & X. Wang. "Indoor Mobility Interaction Model: Insights into the Customer Flow in Shopping Malls." *IEEE Access* 7 (2019): 138353–63. <https://doi.org/10.1109/ACCESS.2019.2942428> (accessed November 9, 2023).

Liu, Yudi, Nabamita Nath, Akito Murayama & Rikutarō Manabe. "Transit-Oriented Development with Urban Sprawl? Four Phases of Urban Growth and Policy Intervention in Tokyo." *Land Use Policy* 112 (January 2022): 105854. <https://doi.org/10.1016/j.landusepol.2021.105854>.

McDonald, Robert I., Richard T. T. Forman & Peter Kareiva. "Open Space Loss and Land Inequality in United States" Cities, 1990–2000." *PLoS ONE* 5, no. 3 (March 3, 2010): e9509. <https://doi.org/10.1371/journal.pone.0009509> (accessed August 23, 2023).

McLennan, Jason F. "Transformational Thought: Density and Sustainability: A Radical Perspective." *Trim Tab: Cascadia's Magazine for Transformative People + Design*, no. 2 (2009): 26–34.

Mental Health In The News: Traffic and Congestion Stress. 2015. <https://www.youtube.com/watch?v=3O-FKKNOZoc> (accessed January 29, 2023).

Milliken, Sarah, Benz Kotzen, Sonali Walimbe, Christopher Coutts & Timothy Beatley. "Biophilic Cities and Health." *Cities & Health* 7, no. 2 (March 4, 2023): 175–88. <https://doi.org/10.1080/23748834.2023.2176200> (accessed August 25, 2023).

Mohd Noor, Norzailawati, Nur Aulia Rosni, Mazlan Hashim & Alias Abdullah. "Developing Land Use Geospatial Indices (LUGI) for Sprawl Measurement in Alpha Cities: Case Study of Kuala Lumpur, Malaysia." *Cities* 82 (December 2018): 127–40. <https://doi.org/10.1016/j.cities.2018.05.012> (accessed December 8, 2023).

Monteiro, João, Nuno Sousa, Eduardo Natividade-Jesus & João Coutinho-Rodrigues. "Benchmarking City Layouts – A Methodological Approach and an Accessibility Comparison Between a Real City and the Garden City." *Sustainability* 14, no. 9 (2022): 5029. <https://doi.org/10.3390/su14095029>

Moser, Gabriel. "Urban Stress and Helping Behavior: Effects of Environmental Overload and Noise on Behavior." *Journal of Environmental Psychology* 8, no. 4 (December 1, 1988): 287–98. [https://doi.org/10.1016/S0272-4944\(88\)80035-5](https://doi.org/10.1016/S0272-4944(88)80035-5) (accessed November 29, 2022).

Murphy, Douglas. "Where Is the World's Densest City?" *The Guardian*. May 11, 2017, sec. Cities. <https://www.theguardian.com/cities/2017/may/11/where-world-most-densely-populated-city> (accessed August 23, 2023).

Najafi, Najmeh, Khosro Movahed, Zahra Barzegar & Siamak Samani. "The Effect of Ventilation by Window Opening on Stress, Anxiety, and Depression of Female High School Students." *International Journal of School Health In Press*, no. In Press (April 8, 2019). <https://doi.org/10.5812/intjsh.87038> (accessed January 29, 2023).

OECD. *Cities in the World: A New Perspective on Urbanisation*. Paris: Organisation for Economic Co-operation and Development, 2020. https://www.oecd-ilibrary.org/urban-rural-and-regional-development/cities-in-the-world_d0efcbda-en.

- Oliveira, Vítor. *Urban Morphology*. The Urban Book Series. Cham: Springer International Publishing, 2016. <https://doi.org/10.1007/978-3-319-32083-0>.
- Permanasari, Eka, Feby Hendola, Surya Tarigan, Issa Tafriidj & Fitria Aurora. "Urban Expansion in South Tangerang: Analyzing Bintaro Jaya as a Private City." *Cities* 144 (January, 2023): 104665. <https://doi.org/10.1016/j.cities.2023.104665>.
- Poulsen, Melissa N., Cara M. Nordberg, Allison Fiedler, Joseph DeWalle, Dione Mercer & Brian S. Schwartz. "Factors Associated with Visiting Freshwater Blue Space: The Role of Restoration and Relations with Mental Health and Well-Being." *Landscape and Urban Planning* 217 (January 2022): 104282. <https://doi.org/10.1016/j.landurbplan.2021.104282> (accessed December 8, 2023).
- Rodrigue, Jean-Paul. *The Geography of Transport Systems*. Fifth edition. Abingdon, Oxon ; New York, NY: Routledge/Taylor & Francis Group, 2020.
- Rogers, Richard George. *Towards an Urban Renaissance*. London: Taylor & Francis e-Library, 2004.
- Russo, Alessio & Giuseppe T. Cirella. "Modern Compact Cities: How Much Greenery Do We Need?" *International Journal of Environmental Research and Public Health* 15, no. 10 (October 2018): 2180. <https://doi.org/10.3390/ijerph15102180> (accessed August 23, 2023).
- Rybka, Adam & Rafał Mazur. "The River as an Element of Urban Composition." Edited by D. Słysz and J. Dziopk. *E3S Web of Conferences* 45 (2018): 00077. <https://doi.org/10.1051/e3sconf/20184500077> (accessed April 4, 2022).
- Samal, S. R., P. Gireesh Kumar, J. Cyril Santhosh & M. Santhakumar. "Analysis of Traffic Congestion Impacts of Urban Road Network under Indian Condition." Paper presented at the *IOP Conference Series: Materials Science and Engineering* 1006, no. 1 (December 2020): 012002. <https://doi.org/10.1088/1757-899X/1006/1/012002> (accessed January 10, 2023).
- Schwab, John J., Stephen E. Nadeau & George J. Warheit. "Crowding and Mental Health." *The Pavlovian Journal of Biological Science : Official Journal of the Pavlovian* 14, no. 4 (October 1, 1979): 226–33. <https://doi.org/10.1007/BF03003004> (accessed December 5, 2022).
- Sheffi, Yosef. *Urban Transportation Networks: Equilibrium Analysis with Mathematical Programming Methods*. Englewood Cliffs: Prentice-Hall, 1984.
- Sridhar, Kala S. "Costs and Benefits of Urbanization: The Indian Case." In *Cities of Dragons and Elephants: Urbanization and Urban Development in China and India*. Edited by Guanghua Wan and Ming Lu, 0. Oxford University Press, 2019. <https://doi.org/10.1093/oso/9780198829225.003.0003>.
- Stojanovski, Todor & Axelsson Östen. "Typo-Morphology and Environmental Perception of Urban Space." In *Urban Form and Social Context: From Traditions to Newest Demands*, 2018. 822–34. Krasnoyarsk: Siberian Federal University. <https://elib.sfu-kras.ru/handle/2311/111758> (accessed December 5, 2023).
- "Urban Mountains: Shenzhen's Green Rooftop Project – in Pictures." *The Guardian*. November 7, 2018. sec. Cities. <http://www.theguardian.com/cities/gallery/2018/nov/07/urban-mountains-shenzhens-green-rooftop-project-in-pictures> (accessed January 29, 2023).

- Thilakaratne, R. "Designing Liveable Urban Open Spaces in High Density Cities." Paper presented at the IOP Conference Series: Earth and Environmental Science 297, no. 1 (August 2019): 012049. <https://doi.org/10.1088/1755-1315/297/1/012049> (accessed August 23, 2023).
- Turner, Alasdair. "From Axial to Road-Centre Lines: A New Representation for Space Syntax and a New Model of Route Choice for Transport Network Analysis." *Environment and Planning B: Planning and Design* 34, no. 3 (June 1, 2007): 539–55. <https://doi.org/10.1068/b32067> (accessed October 30, 2022).
- Ulrich, Roger S., Robert F. Simons, Barbara D. Losito, Evelyn Fiorito, Mark A. Miles & Michael Zelson. "Stress Recovery during Exposure to Natural and Urban Environments." *Journal of Environmental Psychology* 11, no. 3 (September 1, 1991): 201–30. [https://doi.org/10.1016/S0272-4944\(05\)80184-7](https://doi.org/10.1016/S0272-4944(05)80184-7) (accessed August 22, 2023).
- Venhari, Armaghan Ahmadi, Martin Tenpierik & Mohammad Taleghani. "The Role of Sky View Factor and Urban Street Greenery in Human Thermal Comfort and Heat Stress in a Desert Climate." *Journal of Arid Environments* 166 (1 July 2019): 68–76. <https://doi.org/10.1016/j.jaridenv.2019.04.009> (accessed September 14, 2023).
- Wang, David. "Shenzhen's Urban Villages: Surviving Three Decades of Economic Reform and Urban Expansion." Doctoral Thesis, San Diego State University, 2013.
- Wang, Pin, William B. Goggins, Xuyi Zhang, Chao Ren & Kevin Ka-Lun Lau. "Association of Urban Built Environment and Socioeconomic Factors with Suicide Mortality in High-Density Cities: A Case Study of Hong Kong." *Science of The Total Environment* 739 (October 15, 2020): 139877. <https://doi.org/10.1016/j.scitotenv.2020.139877> (accessed November 14, 2022).
- Wei, Ruihan, Dexuan Song, Nyuk Hien Wong, and Miguel Martin. "Impact of Urban Morphology Parameters on Microclimate." Paper presented at the Procedia Engineering 169 (2016): 142–49. <https://doi.org/10.1016/j.proeng.2016.10.017> (accessed December 4, 2022).
- Wen, Liang, Jeffrey Kenworthy & Dora Marinova. "Higher Density Environments and the Critical Role of City Streets as Public Open Spaces." *Sustainability* 12, no. 21 (January 2020): 8896. <https://doi.org/10.3390/su12218896> (accessed August 23 2023).
- White, Mathew P., Lewis R. Elliott, Mireia Gascon, Bethany Roberts & Lora E. Fleming. "Blue Space, Health and Well-Being: A Narrative Overview and Synthesis of Potential Benefits." *Environmental Research* 191 (1 December 2020): 110169. <https://doi.org/10.1016/j.envres.2020.110169> (accessed August 25, 2023).
- World Health Organization. Regional Office for Europe. "Urban Green Spaces and Health." World Health Organization. Regional Office for Europe. 2016. <https://apps.who.int/iris/handle/10665/345751> (accessed August 22, 2023).
- Zhang, Phoebe. "Migrant Workers Forced out as 'Urban Village' Faces Wrecking Ball." *South China Morning Post*. July 22, 2019. <https://www.scmp.com/news/china/society/article/3019506/migrant-workers-forced-out-one-shenzhens-last-urban-villages> (accessed January 29, 2023).