American Journal of Art and Design
2024, Vol. 9, No. 2, pp. 24-30
https://doi.org/10.11648/j.ajad.20240902.11

Research Article

Evaluation of the Literature on the Use of Space Underneath Elevated Highways in Urban Leftover Space Renewal

Yang Tian[1, 2, *]

[1]School of Fine Arts, Nanjing Normal University, Nanjing, China
[2]Faculty of Engineering and Built Environment, The National University of Malaysia, Bangi, Malaysia

Abstract

The construction of urban highways within and around the city has resulted in a significant amount of residual spaces, which are rarely incorporated into official planning and design efforts. This literature review paper provides an overview of space underneath elevated highways delivered by urban leftover space: What types of leftover space have been discussed? Which underneath elevated highways have been identified in leftover space? 112 scientific papers were analyzed for their 1) leftover space terms applied, 2) space underneath elevated highways studied, 3) current or potential underneath elevated highways discussed. Through the review, we found that although different types of space have been identified in leftover space, most studies did not consider underneath elevated highways synergies and trade-offs. The literature review highlights two knowledge gaps for future research: Firstly, the existing research on residual space under urban viaducts has been exhaustive in terms of connecting with environmental attributes. Secondly, the content of the social interaction and use of the remaining space under the viaducts can be connected to the content of the environmental attributes. The existing gaps in the research indicate the importance of exploring the potential impacts aimed at utilizing leftover spaces. By highlighting the value of the environmental attributes of under-bridge spaces, the literature study promotes the recognition of the association of social interactions with the environmental attributes of under-bridge spaces and further outlines future research directions for the remaining under-bridge spaces in the urban design process.

Keywords

Leftover Space, Underneath Elevated Highways, Literature Review

1. Introduction

Urban design and development attempts generally overlook the underutilized zones underneath elevated highways. However, these places have a special ability to promote neighborhood activities and social contact. This review of the literature looks at the literature on leftover urban spaces and identifies some of the processes that go into making and naming these spaces as well as the key elements that are needed to comprehend how these spaces relate to one another in an urban setting and investigate their possible uses in the city. Meanwhile, looks at the complex relationships between

[*]Corresponding author: yangtiantian1212@qq.com (Yang Tian)

Received: 27 February 2024; **Accepted:** 18 March 2024; **Published:** 2 April 2024

social dynamics and the spatial arrangements beneath elevated roadways.

2. Definition and Concept

2.1. Urban Design and People

The multifaceted field of urban design plans the physical environment of cities where people live. It covers the planning and design of infrastructure, including public areas, buildings, transportation, services, and amenities. Jacobs and Whyte have long asserted the importance of urban design in shaping the interactions that occur within public spaces, highlighting how design influences behavior and social life [23, 45].

a. Public Place

The concept of the public space is essential to both social interaction and urban design. According to Carr (1992), a public place is an area that is open to the public and is used for shared purposes, like common ground [8]. Gehl's focus on the importance of public spaces in cities and how these spaces can enhance the quality of life for their inhabitants. He advocates for city planning that takes human behavior into account, emphasizing walkability, and the use of urban spaces for social interaction. He contends that excellent urban planning fosters "life between buildings" and that the social life of a community is strongly impacted by the quality of public spaces [15].

Public spaces ought to accommodate a range of usage, including unplanned and scheduled events as well as casual or spontaneous ones. According to Whyte's (1980) research on the social life of small urban spaces, effective public spaces frequently include adaptable designs that can accommodate a variety of activities [45]. These features can draw in a wide spectrum of patrons and promote social interaction.

b. Place and Social Life

Place and social life have a complex and reciprocal interaction. "Place" refers to more than just a physical location devoid of significance; rather, it refers to a significant location with emotional connections [35]. Tuan delves further into the notion of "place" in his work, contending that our attitudes and sentiments towards a place have the power to elevate it from a simple location to one that has both community and personal value [44].

Public spaces' social lives are a dance between the activities that take place there and their physical surroundings. According to Oldenburg, "third places" are unofficial meeting spots like parks, cafés, and markets that fall between first and second place classifications—home or workplace [32]. The social fabric of communal life is woven together by these environments of daily public life. Skjaeveland and Garling provides an insight into the significance of "neighboring places"—those areas that are in between public and private spaces, such as front porches and yards, that encourage casual social contact [39].

2.2. Leftover Space

a. Leftover Space of Modern Cities

A crucial challenge in urban planning and architecture is the leftover space in contemporary cities. These are places that are discontinued in use, were disregarded during development, or have become outdated because of several urban processes. About thirty years ago, Roger Trancik began analytical study on residual spaces. He looked into the idea of leftover spaces, which he referred to as "lost spaces" in the book's title since they didn't appear to have much of a good effect on the surrounding area. Trancik offers a thorough analysis of these urban gaps [43]. And talks about how these areas came to be, from failed urban redevelopment initiatives to the detrimental effects of car-oriented design that priorities highways over public areas. He makes the case for a reintegration plan that sees these areas as chances for creative urban renewal rather than as issues. Trancik highlights the significance of incorporating historical background, regional customs, and current urban layouts when devising a plan for effectively reclaiming abandoned areas [43].

Unused land parcels in expensive inner-city areas have become more numerous and varied in size and form since the 1990s, when property prices in city centers skyrocketed. These deserted areas were classified as Temporarily Obsolete Abandoned Derelict Sites (TOADS) by Greenberg [16].

Karen A. Franck's work on "loose space" provides an enlightening perspective on the potential of leftover spaces in urban settings [14]. Franck investigates the notion that certain urban areas are "loose" in the sense that they are amenable to a variety of uses and interpretations by different individuals. These "loose spaces" are often the result of residual, interstitial urban regions that have evaded stringent planning and have a certain uncertainty in use and ownership, in contrast to highly controlled and planned places. According to Franck, "loose space" can be separated into two categories: one is specific uses, which is planned public open space. Another is space without assigned functions, which refers to leftover and abandoned spaces.

Piccinno and Lega considers that leftovers allude to the empty voids and gaps between every solid of the urban fabric (i.e., buildings, infrastructures, etc.) [33]. This is consistent with Thomas Fundneider's view, they are the edges and leftover spaces, which are ever-present in urban and architectural design, and which tend to unintentionally collide or create unfortunate divisions. The spaces of absence, voids, and gaps between the forms of objects, Thomas called it "in-between spaces." [42]. Azhar, Gjerde and Vale emphasizing the value and variety of between-ness from a spatial and temporal perspective, being in-between becomes a spatial category [2].

Combining the previous discussion of space models, the remaining space can be further explained by the fact that as

cities grow and change, this kind of space gradually becomes inconsistent with urban development. As a result, people's social and behavioral patterns may temporarily stagnate or cease due to the demand for this kind of space. Furthermore, the ability to communicate with the outside world is sometimes disregarded since involvement is reduced to nothing.

b. Type of Leftover Space

Typologies of urban space can provide a way of analysing existing, and designing new, urban forms. Researchers have explored the topic using different interpretations and terms such as loose, liminal, lost, vacant, transitional, indeterminate, neglected, in-between and derelict [43]. In most cases, by adding slight semantic differences, these definitions have only contributed to increased confusion about the subject and have focused on one type of space rather than their broader connections [26]. However, typologies may help scholars think in novel ways. Leftover spaces come in various shapes and sizes, and their potential for reuse varies significantly. According to Trancik, Lost space is the leftover unstructured landscape at the base of high-rise towers, the unused sunken plaza away from the flow of pedestrian activity in the city, surface parking lots that ring the urban core of almost all American cities, no-man's-lands along the edges of freeways, the abandoned waterfronts, train yards, vacated military sites, and industrial complexes, the residual areas between districts and loosely composed commercial strips, deteriorated parks, and marginal public housing projects [43].

Doron divided leftover into disused harbours and train yards, abandoned barracks, closed mining sites or industrial areas, abandoned neighbourhoods, empty lots, spaces at the edge of highways and under bridges etc [11]. Azhar et al. thought it has six types of leftover spaces at a micro level located in the front, at the sides, and at the rear of buildings, at the edges and corners of roadways, around and between buildings, on rooftops [2].

In short, places that look empty, and appear as ones which do not have any use any more [11], which is an empty, shapeless, solitary space that lacks any spatial interaction with its surroundings and is incapable of creating a state of transition [3].

2.3. Underneath Elevated Highway

Without exception, most scholars have noted that the space underneath the elevated highway is a great feature in the leftover space. The spaces under the bridge, although sometimes portrayed as wasteland, are regarded as having a specific role to play in the city [28]. In recent years, many papers have studied the "grey space" under overpasses to explore new possibilities for land usages and spatial forms [36]. Elevated circulation structures have not been entirely overlooked in the past. They have been praised for their importance as visual elements working as urban edges, defining district limits, or identifying directions while leaving the ground level free for the city to flow [20].

Mohamed Anuar & Abdullah, guided by a systematic framework established by Malterre-Barthes, and was carried out in the framework, which divided the space underneath elevated highways into two categories: Typology 1 is for easily accessible spaces, which revolve around public spaces, public spaces with service functions, and transit space hubs. Typology 2 is for hard-to-access. This can be further divided into transit space circulation and inaccessible space [29, 30]. The specific framework was chosen as the main data gathering tool that was supported by Biesecker (2015) who indicated that it allowed the documentation of the typologies of the studies site to be systematic. Under the flyovers, is an existence of a space that might differ from the rush of the above, a loose space with uncertainties and endless possibilities [34].

Though academics' assessments of leftover space have changed recently, it still functions as a buffer to allow for potential growth. However, the author thinks that when the time dimension and general urban planning are considered, the positive potential will greatly outweigh the present drawbacks.

3. The Urban Impact of the Overpass Space

A lot of research has been done in the last few years on how living near a road affects people's health. For example, Samuel and Poole look at the effects of under highways in cities in six terms and six categories:

(1) increasing mobility and accessibility;
(2) dominant structure in the urban fabric;
(3) community segregation because of physical and psychological barriers, and visual intrusion;
(4) undefined spaces, which are often misused;
(5) low natural lighting and ventilation under the elevated structure; and
(6) generation of negative or lost spaces [37].

3.1. Spaces and Typology of Toleration

Chiodelli and Moroni talk about different types of spaces and how much people are willing to tolerate them. This is very useful for looking at spaces under elevated roads because they aren't clearly defined, which makes it hard to keep track of who owns them. Chiodelli and Mornoni put places into groups, but they didn't just say which ones were public or private. The places that the government owned were put into three groups: strict sense public spaces, special public spaces, and privately run public spaces. In strict sense spaces, all kinds of access and behavior are usually okay. In special public spaces, though, access and behavior that goes against the space's purpose are limited. In privately run public spaces, the law of the space controls who can go there [7].

There is a lot of writing about the idea of public and private

places, but it rarely talks about who owns and runs these spaces. A new way to talk about spaces is to think of them as properties that have complicated relationships between their structure, role, function, and nature. Chiodelli and Mornoni said that space is made up of three main parts: a boundary, a claim, and power. The claim talks about the right to own the space, the limit talks about the shape of the space that is owned, and the control talks about the right to make decisions about space [4]. There is a constant fight for ownership and control in places like those under elevated highways. The fact that these places aren't clearly defined makes ownership and control rights even more tense and unclear. When talking about and studying these kinds of places, it is important to keep in mind their limits, who owns them, and who controls them.

The four ideas we've talked about so far show how having an elevated structure go through any part of an urban fabric can affect more than just the structure itself. They all have to do with lost spaces, control, ownership, and different kinds of public spaces. These kinds of things need to be thought about whenever a raised highway is used in a city. The highway cuts through a neighborhood and has many effects on it. It also makes new places and changes how people think about ownership and control.

3.2. Aspect of Safety

Trancik comes up with the idea of "lost space" to describe public areas that are "anti-spaces"—they don't add anything good to the environment or the people who use them—and would benefit from being redesigned in some way. He says that lost places happen because of the modern movement, the dominance of cars, and the separation of functions in cities [43]. Over-managed and under-managed public places were the two main types of public spaces that Carmona found [9]. Spaces that aren't handled well are being ignored, taken over by transport needs, used in ways that keep some people out, and separating different groups of people who use space. As Carmona says, the areas under urban bridges are not well controlled as types of urban space. So, policymakers should work to improve the state of the environment in areas under bridges [9].

In the same way, Tibbalds says that ignored areas are often strewn with trash, covered in graffiti, polluted, crowded, and suffocated by traffic. Also, they can be dangerous because homeless people live in cardboard boxes, alleys, and subways at night, and many of the same people beg on the streets during the day [41]. It was said by Hajer and Reijndorp that these transitional spaces need a lot more attention. Hauck et al. have tried to design and plan how empty spaces have been turned into lively places.

In the literature, natural surveillance is seen as an important idea for designing public places. For example, the presence of people who can naturally watch over the area can help lower the crime rate. Natural surveillance is helped by putting up or improving street lighting, taking things out of convenience store windows that block views of the store, and cutting back or getting rid of bushes in front of homes so people can see what's outside. A popular idea by Jacobs called "eyes on the street" informed this idea [23]. She said that the safest place in a city is one that is always being watched by people. Oscar Newman's safe space study from 1995 builds on this idea. In his observational study of American housing projects, he found that crimes were more likely to happen in areas that residents couldn't see. He also found that criminal activities can happen in areas that are empty and not being watched.

These ideas are linked and form the basis of standard crime prevention through environmental design (CPTED) methods. According to CPTED (2018), it is a multidisciplinary way to lower crime through urban and environmental planning, as well as the management and use of built environments. CPTED (2018) strategies try to lower the number of victims, stop criminals from making choices that lead to crimes, and bring people together so that they can take control of their neighbourhoods and lower crime and fear of crime.

3.3. Aspect of Comfort

When it comes to roads, people who care a lot about their health and want to live in clean, safe places may see changes in livability as a bigger problem. Previous research has shown that people who are easily annoyed by things like noise generally have a negative view of roads because they are so noisy [30]. Studies show that living close to highways can lower property values, but the good things about them, like how easy they are to get to, can make up for it. This means that some people are willing to live near highways [25]. When it comes to social problems, new transport facilities can make communities less connected with each other.

According to Irger, highways have various impacts on the urban areas they pass through, encompassing the physical, social and psychological aspects, as well as the visual surroundings, land use, economic conditions, displacements, and safety. In the end, he thought about identity, land use, architecture, and landscape when he redesigned these lost places [21]. Some important design strategies were looked at in another study for areas under highways. These included access, safety, lighting, management, physical connections to nearby communities, visual complexity, nature, noise and air pollution, use of the structure, and the openness of sites [4]. Also, in New York City, a project called "under the elevated" made a creative programmed to improve and manage the space under elevated highways [5]. Adding activities to these areas can raise property values, make it easier to get to stores and stores, stop people from using them informally, make them safer, and give communities long-term benefits [7].

4. The Working Definition

4.1. The Term of Spatial Configurations

Spatial configurations in urban areas refer to how the built environment is physically arranged and organized and how this affects the social and economic activities that take place there. Understanding the urban environment requires the ability to characterize space based on form and function, which is why the idea of spatial signatures has been introduced. Because it encodes many characteristics of the phenomena that formed them, such as historical, cultural, and economic reasons, the spatial structure of a city's components is important [25]. It is also crucial for assessing neighborhood sustainability since it affects the way that communities engage with their surroundings [19]. Additionally, the socio-economic dynamics of urban streets can be better understood by utilizing metrics like average width, secondary interfaces, and opening length to quantify the spatial configuration of these areas [40].

Areas below elevated highways are often characterized by their in-between state, being neither entirely apart from the metropolitan environment nor fully integrated. Hillier makes the case that a space's physical arrangement and relationship to its surroundings have a direct impact on its potential and usefulness [18]. Through the perspective of Hillier's ideas, we may evaluate these under-highway places' strategic potential for urban connectedness and shared usage.

4.2. The Term of Social Interaction

Urban development is directly influenced by interaction with others, which is a basic component of urban life. Urban green spaces, for instance, have been demonstrated to promote social interactions that are constructive and cohesive, hence improving health and well-being [25]. The "spatial turn" ideas postulate urban social spaces, emphasizing how time, location, and the time-space continuum interact and impact social dynamics. These ideas aid in our comprehension of the many and varied relationships that exist in urban environments, particularly with regard to social interactions [41]. This is expanded upon in more recent theoretical viewpoints that use a flat ontology approach to try and comprehend the complex relationships seen in metropolitan social areas [22].

The design and accessibility of urban environments have an impact on social interactions. Whyte explores how urban space design may promote or inhibit social interaction and public usage. Whyte's observations of how people behave in public areas provide insightful ideas for repurposing under-highway areas to promote social interaction. This research is essential to comprehending how social activities and place design interact [45].

4.3. Social Interaction in Underneath Elevated Highway

Within the context of areas beneath elevated freeways, "spatial configurations" refers to the ways in which the physical structures—such as underpasses and pillars—are positioned and used, influencing the possibilities for social interaction, business ventures, and community involvement. "Social Interaction" in these contexts refers to how people and groups use these spaces for social interactions; examples include unofficial marketplaces, get-togethers, or transit zones that promote social interaction. Comprehending the dynamic relationship among these concepts is essential for urban design and for improving the standard of living in such specially designed urban areas.

Elevated highway undercrofts may provide a distinct setting for social interactions that are different from those in traditional metropolitan areas. The specific context of social interactions occurring underneath elevated highways is less frequently addressed in literature. Jane Jacobs' groundbreaking work offers a crucial critique of urban planning practices that resonate with the challenges of activating these underused areas, even though it is not specifically focused on the spaces beneath highway [23]. To improve safety and social liveliness in the areas underneath elevated highways, Jacobs supports mixed-use construction that promotes natural surveillance and "eyes on the street," two ideas that could be creatively applied [23]. Cairns, studies how residual urban places, such as those under highways, can serve as hubs for shared identity and memory. According to Cairns, even though these spaces are frequently overlooked or neglected, they have hidden potential for promoting social cohesiveness and a sense of place through shared histories and experiences [7]. Furthermore, Borden discusses the phenomenon of skating and other urban sports in abandoned places. In his research, skateboarders frequently transform the areas underneath elevated highways into bustling hotspots of youth culture and social interaction [5]. This repurposing reflects a wider movement in which unused urban areas are reclaimed and transformed by local groups.

These varied perspectives contribute to a deeper understanding of the complex layers of social interaction that can flourish underneath elevated highways, challenging the notion that these are merely dormant areas to be ignored or bypassed.

5. Conclusion

One interesting thing about residual study is that different words are used to describe residuals, which makes it hard to get a sense of all the papers that have been written on the subject. In this literature review, we used a number of different words to look for "excess space," such as "brownfield," "wasteland," "open space," "vacant land," "moorland," "wilderness," "barren," "gap," and "informal green space."

But there are other fields of study that look at empty and neglected urban open places. These mostly come from architecture and human geography, and they are not as well covered in our study. Architect Ignasi de Solà-Morales used the term "ambiguous topography" [21], while landscape geographer Matthew Gandy used the term "unintentional landscapes" [29], Landscape architect Gilles Clément used the term "third landscapes" [17] There is a chance that we might miss studies that could change our conclusions because this review can't include all the terms used to describe residual spaces. This is especially true for studies that look at the temporary and transgressive cultural practices of residual spaces that are talked about by architecture and urban design scholars. As a result, we think that more research should be done on the environmental economy of residual space systems. This research should focus on the environmental economy of culture and the topic in the fields of architecture and human geography.

Abbreviations

TOADS: Temporarily Obsolete Abandoned Derelict Sites
CPTED: Crime Prevention Through Environmental Design

Author Contributions

Yang Tian is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Ahmed, H., Malik, A. M., Mujahid, S., & Khan, R. (2020). Study of Utilizing Residual Spaces under Flyovers in Lahore, Pakistan. *Journal of Art Architecture and Built Environment*, *3*(1), 84–98. https://doi.org/10.32350/jaabe.31.05

[2] Azhar, J., Gjerde, M., & Vale, B. (2020). Re-imagining Urban Leftover Spaces. In R. Roggema & A. Roggema (Eds.), *Smart and Sustainable Cities and Buildings* (pp. 307–318). Springer International Publishing. https://doi.org/10.1007/978-3-030-37635-2_21

[3] Azhar, J., Gjerde, M., Vale, B., & Asif, M. (2022). Perception of Urban Leftover Spaces: A Comparative Study of Built Environment and Non-Built Environment Participants. *Architecture*, *2*(2), 231–244. https://doi.org/10.3390/architecture2020013

[4] Biesecker, C. (n.d.). *DESIGNING URBAN UNDERHIGHWAY SPACES*.

[5] Borden, I. (2006). *Skateboarding, space and the city: Architecture and the body* (Paperback reprint). Berg. http://www.gbv.de/dms/bowker/toc/9781859734933.pdf

[6] Bradley, R. (1981). Review of The Urban Question: A Marxist Approach. [Review of *Review of The Urban Question: A Marxist Approach.*, by M. Castells & A. Sheridan]. *Social Forces*, *59*(3), 845–847. https://doi.org/10.2307/2578202

[7] Cairns, S. (2016). *Citizens and Denizens: Managing Loose Space in Singapore*. Cities and Citizenship Conference. https://www.research-collection.ethz.ch/handle/20.500.11850/119091

[8] Carr, S. (1992). *Public Space*. Cambridge University Press.

[9] Cerreta, M., & La Rocca, L. (2021). Urban Regeneration Processes and Social Impact: A Literature Review to Explore the Role of Evaluation. In O. Gervasi, B. Murgante, S. Misra, C. Garau, I. Blečić, D. Taniar, B. O. Apduhan, A. M. A. C. Rocha, E. Tarantino, & C. M. Torre (Eds.), *Computational Science and Its Applications – ICCSA 2021*(pp. 167–182). Springer International Publishing. https://doi.org/10.1007/978-3-030-86979-3_13

[10] Delgado-Viñas, C., & Gómez-Moreno, M.-L. (2022). The Interaction between Urban and Rural Areas: An Updated Paradigmatic, Methodological and Bibliographic Review. *Land*, *11*(8), Article 8. https://doi.org/10.3390/land11081298

[11] Doron, G. M. (2000). The Dead Zone and the Architecture of Transgression. *City*, *4*(2), 247–263. https://doi.org/10.1080/13604810050147857

[12] Erfani, G. (2022). Reconceptualising Sense of Place: Towards a Conceptual Framework for Investigating Individual-Community-Place Interrelationships. *Journal of Planning Literature*, *37*(3), 452–466. https://doi.org/10.1177/08854122221081109

[13] Foroughmand Araabi, H. (2016). A typology of Urban Design theories and its application to the shared body of knowledge. *URBAN DESIGN International*, *21*(1), 11–24. https://doi.org/10.1057/udi.2015.6

[14] Franck, K., & Stevens, Q. (2006). *Loose Space: Possibility and Diversity in Urban Life*. Routledge.

[15] Gehl, J. (2011). *Life Between Buildings: Using Public Space*. Island Press.

[16] Greenberg, M. R., Popper, F. J., & West, B. M. (1990). The TOADS: A New American Urban Epidemic. *Urban Affairs Quarterly*, *25*(3), 435–454. https://doi.org/10.1177/004208169002500306

[17] Guo, X., Yang, Y., Cheng, Z., Wu, Q., Li, C., Lo, T., & Chen, F. (2022). Spatial social interaction: An explanatory framework of urban space vitality and its preliminary verification. *Cities*, *121*, 103487. https://doi.org/10.1016/j.cities.2021.103487

[18] Hillier, B. (2007). Space is the machine: A configurational theory of architecture. In *Space Syntax: London, UK. (2007)*. Space Syntax. https://discovery.ucl.ac.uk/id/eprint/3881/

[19] Hong, S., Hui, E. C., & Lin, Y. (2022). Relationship between urban spatial structure and carbon emissions: A literature review. *Ecological Indicators*, *144*, 109456. https://doi.org/10.1016/j.ecolind.2022.109456

[20] Hormigo, P., & Morita, T. (2004). Urban *Gapscapes*: Problems and Opportunities in Urban Design Analysis of *Gapspaces* Originated by Elevated Railways. *Journal of Asian Architecture and Building Engineering*, *3*(1), 181–188. https://doi.org/10.3130/jaabe.3.181

[21] Irger, M. (2014). *The Effect of Urban Form on Urban Microclimate* [Thesis, UNSW Sydney]. https://doi.org/10.26190/unsworks/16956

[22] Jabareen, Y., & Eizenberg, E. (2021). Theorizing urban social spaces and their interrelations: New perspectives on urban sociology, politics, and planning. *Planning Theory*, *20*(3), 211–230. https://doi.org/10.1177/1473095220976942

[23] Jacobs, J. (n.d.). *Death and Life of Great American Cities*.

[24] Jennings, V., & Bamkole, O. (2019). The Relationship between Social Cohesion and Urban Green Space: An Avenue for Health Promotion. *International Journal of Environmental Research and Public Health*, *16*(3), 452. https://doi.org/10.3390/ijerph16030452

[25] Khatibi, M., Khaidzir, K. A. M., Syed Mahdzar, S. S., & Sharifi, A. (2023). Measuring spatial configurations for spatial neighborhood sustainability assessment. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-023-03463-y

[26] Li, J., Md. Dali, M., & Nordin, N. A. (2023). Connectedness among Urban Parks from the Users' Perspective: A Systematic Literature Review. *International Journal of Environmental Research and Public Health*, *20*(4), 3652. https://doi.org/10.3390/ijerph20043652

[27] Lynch, K. (n.d.). Wasting away. Retrieved 10 December 2023, from https://cir.nii.ac.jp/crid/1130000794125273472

[28] Lynch, K. (2008). *The image of the city* (33. print). M. I. T. Press.

[29] Malterre-Barthes, C. (2011). The Highway's Shadow: Zurich's Hardbrücke. *Infrastructural Urbanism: Addressing the In-Between*, *13*, 93–108.

[30] Mohamed Anuar, M. I. N., & Abdullah, S. A. (2020). RE-APPROPRIATION OF ELEVATED HIGHWAY RESIDUAL SPACE THROUGH GREEN INFRASTRUCTURE PLANNING. *PLANNING MALAYSIA*, *18*. https://doi.org/10.21837/pm.v18i14.827

[31] Mohamed Anuar, M. I. N., & Ahmad, R. (2018). EXPLORING POSSIBLE USAGE FOR ELEVATED HIGHWAY INTERSTITIAL SPACES: A CASE STUDY OF DUKE AND AKLEH, KUALA LUMPUR. *PLANNING MALAYSIA JOURNAL*, *16*(7). https://doi.org/10.21837/pmjournal.v16.i7.512

[32] Oldenburg, R. (1989). *The Great Good Place: Cafés, Coffee Shops, Community Centers, Beauty Parlors, General Stores, Bars, Hangouts, and how They Get You Through the Day*. Paragon House.

[33] Piccinno, G., & Lega, E. (2013). Spatial Design for New Typologies of Places: In-Between Urban Spaces. In *Space and Place: Diversity in Reality, Imagination, and Representation* (pp. 41–49). Brill. https://doi.org/10.1163/9781848881266_005

[34] Qamaruz-Zaman, N., Samadi, Z., & Azhari, N. F. N. (2012). Opportunity in Leftover Spaces: Activities Under the Flyovers of Kuala Lumpur. *Procedia - Social and Behavioral Sciences*, *68*, 451–463. https://doi.org/10.1016/j.sbspro.2012.12.241

[35] Relph, E. C. (1976). *Place and Placelessness*. Pion.

[36] Sheng, J., Xu, H., Zheng, J., Luo, M., & Zhou, X. (2018). Commercial Value Assessment of "Grey Space" under Overpasses: Analytic Hierarchy Process. *Advances in Civil Engineering*, *2018*, 1–12. https://doi.org/10.1155/2018/4970697

[37] Simões Aelbrecht, P. (2016). 'Fourth places': The contemporary public settings for informal social interaction among strangers. *Journal of Urban Design*, *21*(1), 124–152. https://doi.org/10.1080/13574809.2015.1106920

[38] Simões Aelbrecht, P. (2019). Introducing body-language methods into urban design to research the social and interactional potential of public space. *Journal of Urban Design*, *24*(3), 443–468. https://doi.org/10.1080/13574809.2018.1537712

[39] Skjaeveland, O., & Garling, T. (1997). EFFECTS OF INTERACTIONAL SPACE ON NEIGHBOURING. *Journal of Environmental Psychology*, *17*(3), 181–198. https://doi.org/10.1006/jevp.1997.0054

[40] *Spatial_Configuration_and_Bid_Rent_Theor.pdf*. (n.d.).

[41] *Theorizing urban social spaces and their interrelations: New perspectives on urban sociology, politics, and planning—Yosef Jabareen, Efrat Eizenberg, 2021*. (n.d.). Retrieved 3 January 2024, from https://journals.sagepub.com/doi/full/10.1177/1473095220976942

[42] Thomas Fundneider. (2021, March 2). *Venetian Letter - In-between Spaces: Living Cities Need Voids and Edges*. Venetian Letter. https://www.venetianletter.com/2021/03/02/in-between-spaces-living-cities-need-voids-and-edges/

[43] Trancik, R. (1986). *Finding lost space: Theories of urban design*. Van Nostrand Reinhold.

[44] Tuan, Y.-F. (1977). *Space and Place: The Perspective of Experience*. E. Arnold.

[45] Whyte, W. H. (2001). *The Social Life of Small Urban Spaces*. Project for Public Spaces.