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Perceived Urban Design Across Urban Typologies in Hanoi

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ABSTRACT



In light of the rapid global urbanization, urban design has been shown to contribute largely to promoting the health and well-being of urban citizens. However, studies of urban design are underrepresented in low- and middle-income countries in Asia, where urban forms are traditionally compact and complex with multiple layers. Hanoi, a typical city in low- and middle-income countries, exhibits five unique urban typologies generated through official planning, unregulated development, and historical fluctuations. This study examines the perceived urban design from a sample of 218 participants across five urban typologies in Hanoi using an established scale. The findings suggest that perceived urban design is significantly influenced by urban typologies. Old urban typologies tend to report higher scores of land use mix and access to services but lower scores of walking facilities and street connectivity than modern urban typologies. The study contributes to our understanding of urban design in Hanoi, providing policymakers and urban designers with essential insights for sustainable urban development.

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Highlights:

- Perceived urban design varies across urban typologies in Hanoi.
- The urban typologies in Hanoi, together with their characteristics, have significant impacts on perceived urban design in both a positive and negative direction.
- Despite having better infrastructure and facilities, New Urban Areas have a lower perceived urban design score than older urban typologies like Ancient Quarter or French Quarter

Contribution to the field statement:

- Enhances understanding of perceived urban design and its relation to urban typologies in Hanoi.
- Adapts the NEWS tool, originally designed for U.S. cities, to the unique urban context of Hanoi, thereby filling a knowledge gap in perceived urban design in mid- and low-income Asian countries that are underrepresented in existing literature.
- Provides valuable insights for policymakers, planners, and urban designers, aiding the development of sustainable urban design policies, strategies, and initiatives.

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1. Introduction

Studies on urban design have typically used two types of measures: objective measures and perceived measures. Despite their usefulness and popularity, objective measures such as those using D variables (e.g., density, diversity, design) are argued to be insufficient in depicting urban design in relation to its suitability for physical activities (Sallis et al., 2011). The gross characteristics of urban physical attributes collected from objective measures might not influence the overall encounter people have whilst on streets (Ewing et al., 2015). Another problem is that obtaining objective spatial data can be challenging and costly (Brownson et al., 2009) because they may be insufficient, inconsistent, not available, or administratively burdensome to use, especially in low- and middle-income countries (Porter et al., 2004; Salvo et al., 2014). Exploring residents' perceptions of the built environment through perceived measures is important as it complements data from objective measures and contributes to a better understanding of walking behaviour (Hoehner et al., 2005; McCormack et al., 2007; Parra et al., 2010). Importantly, there are numerous established tools that measure a resident's perception of the walking environment such as the Perceived Walking Environment Tool (Humpel et al., 2004), the Neighbourhood Walking Survey (Li et al., 2005), the Perceptions of Environmental Support Questionnaire (Kirtland et al., 2003). Among the tools, the Neighbourhood Environment Walkability Scale (NEWS) (Saelens et al., 2003) and its abbreviated version (NEWS-A) have been used most extensively (Cerin et al., 2008; Cerin et al., 2007; Oyeyemi et al., 2016). However, these tools have been developed in US and research using them comes from high-income countries such as the USA, Australia, and European countries, where cities are less dense in both population and destination compared to many low-income cities across the Asian continent (Cerin et al., 2007). Research in this field is still underrepresented in Asia where cities exhibit local walking-related characteristics (e.g., air pollution, crowdedness, diverse terrain, diverse destinations) that differ enormously to less dense locations (Cerin et al., 2007). Some studies have attempted to apply the tools like NEWS in the Asian context, but only from developed countries like Japan (Inoue et al., 2009), China (Cerin et al., 2007), and South Korea (Kim et al., 2016) where the urban design and urban and transport infrastructure are already well-developed. In most developing countries in Asia – like Vietnam, cities are only beginning to see rapid urban development (Chen et al., 2020). Such cities have high population density featuring a dynamic blend of functions that often arises from historical shifts and unregulated growth rather than deliberate governmental planning and where development is generally associated with underdeveloped urban infrastructure (Storch et al., 2008). Conducting research to comprehensively grasp the influence of these attributes on the perception of urban design is imperative for developing appropriate urban design policies and strategies. This study chooses Hanoi, a city in a developing Asian country as its research focus because it serves as a clear embodiment of the typical urban characteristics found in Asia and possesses a unique lifestyle and culture, which can be attributed to its intricate and extensive history of development. Furthermore, the present time in Hanoi is exceptionally opportune for conducting research aimed at improving urban design because the city finds itself at the turning point in urban development and has an opportunity to determine a sustainable pathway distinct from other developed or developing Asian cities which have embraced unsustainable patterns, such as urban sprawl, over-reliance on automobiles, and significant pollution.

To investigate the perceived urban design in Hanoi, this present study systematically customized the NEWS-A tool to the Hanoi context and employed it to assess various aspects of perceived urban design. Subsequently, the study compared ratings of perceived urban design among five typical urban typologies across Hanoi to highlight the influence of urban typologies on perceived urban design. The present research followed the theoretical framework as in Figure 1.

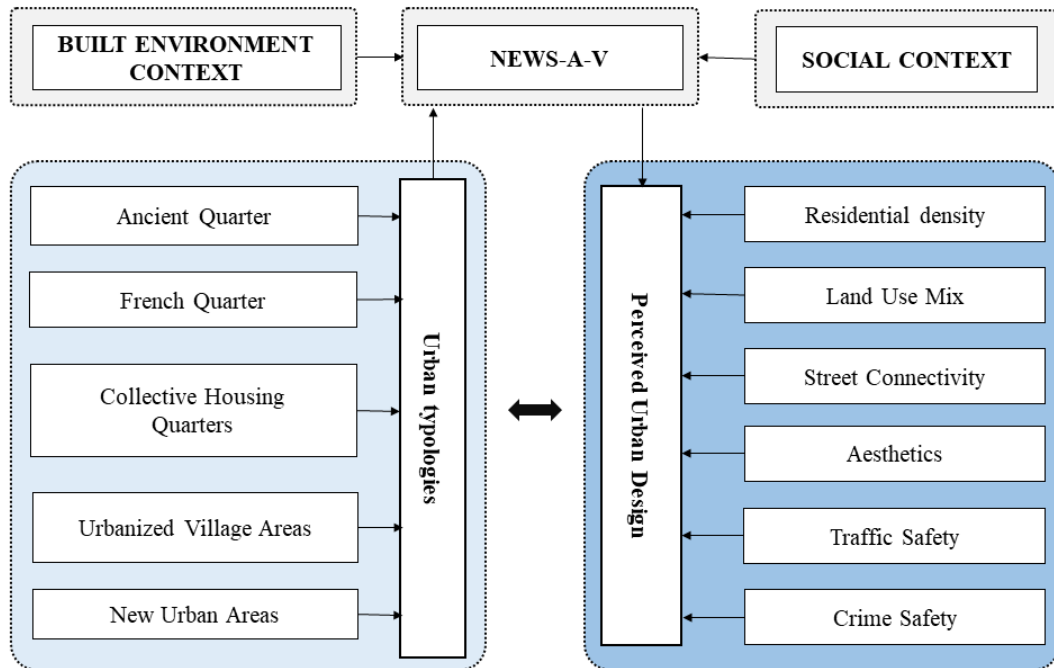


Figure 1. Research framework.

2. Material and Methods

2.1. Materials: the five urban typologies

Over the years, Hanoi has undergone several transformations in its urban design, with each era leaving its mark on the urban design. Originally made up of 36 merchant guild streets, the Ancient Quarter was a maze of narrow streets and alleys that date back to the 11th century and has since developed into the heart of Hanoi. The area is known for its traditional architecture, which includes narrow tube houses, temples, and pagodas. The Western foreign influence gained momentum through the French colonization that extended from the late 19th century to the mid-20th century, eventually resulting in the establishment of the French Quarter. (Geertman, 2007). During the French colonial period, Hanoi underwent a major transformation in its urban design. The French introduced wide boulevards, public parks, and other elements of European urban design to the city. Following its liberation from French colonization in 1957, Vietnam adopted a socialist model heavily influenced by the Soviet Union. (Geertman, 2007).

In the early 1960s, Hanoi witnessed the construction of Soviet-style apartment complexes throughout the city. These districts, sometimes referred to as Collective Housing Quarters or "KTT" in Vietnamese, were designed to accommodate sizable populations, ranging from 7,000 to 12,000 residents. They typically featured a central four- to five-story building surrounded by public amenities like parks, community courtyards, schools, kindergartens, and markets. Between 1965 and 1975, a significant portion of Hanoi was devastated by the war but was subsequently rebuilt. While the process of transitioning villages, particularly those near the city center, into urban areas had been ongoing for decades, Hanoi's rapid urbanization truly began following the economic reforms of 1986, known as Doi Moi. Despite the absence of official planning and infrastructure development, numerous villages underwent swift urbanization to meet the housing demands of the growing economy, giving rise to an urban typology known as Urbanized Village Areas. These areas were characterized by a prevalence of self-constructed houses and an intricate network of narrow, lengthy, and winding lanes that were informally arranged and interconnected to mimic the layouts of former villages. Starting in the 1990s, many traditional neighbourhoods were demolished to make way for modern buildings and infrastructure, leading to the creation of various New Urban Areas. These zones featured contemporary housing styles, including high-rise apartments and spacious single-family homes, along with improved public services and amenities

(JICA, 2007). The characteristics and the location of these five urban typologies are illustrated in Figure 2.

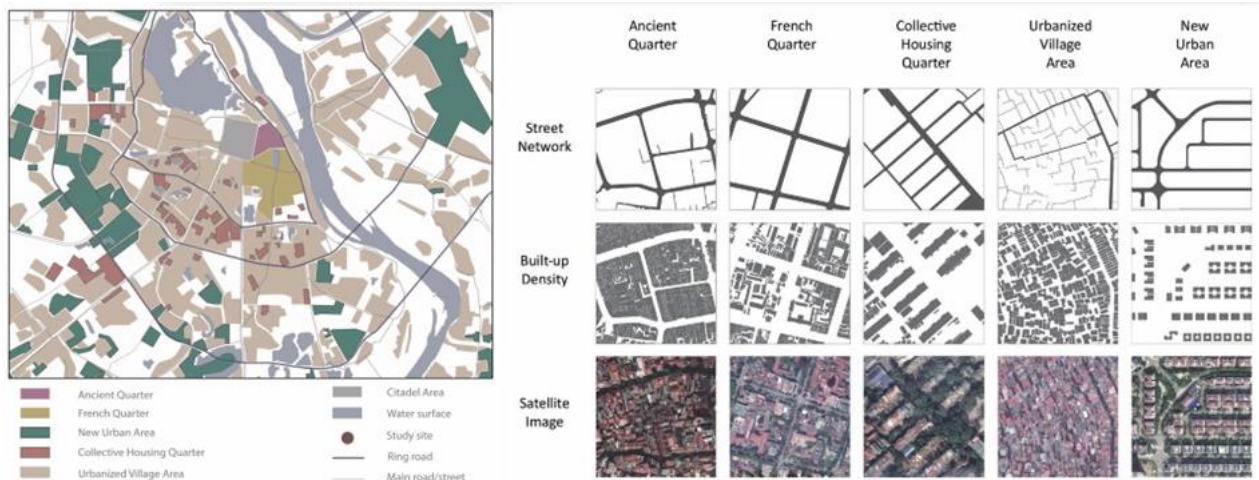


Figure 2. Characteristics and distribution of five urban typologies in Hanoi.

2.2. Methods

2.2.1. Site Selection and Sampling

The sampling uses both stratified sampling and multi-stage cluster sampling to ensure randomness and enhance the representativeness of the sample. Excluding all rural communes, all urban wards in Hanoi were stratified into 5 groups based on their urban typologies: (i) Ancient Quarters; (ii) French Quarters; (iii) Collective Living Quarters; (iv) Urbanized Villages; (f) New Urban Areas. Figure 1 illustrates the characteristics of those urban typologies. In the second stage, two wards were randomly selected in each group to have 10 wards (See Figure 1). After creating the list of streets in these 10 wards, four streets were randomly selected in each ward to make a total of 40 streets. Finally, houses that share the same selected street were numbered and 6 numbers were randomly selected. The research team then approached the selected houses and one member of the household living in the house was invited to participate in the research. If all the household members of selected houses refused to participate, other houses on the street would be randomly selected and approached until there were 5 to 6 consented participants on each street. Eligibility criteria for choosing participants included: (i) being current residents of Hanoi; (ii) being residents of the Hanoi area for at least 6 months; (iii) being able and willing to answer questions in Vietnamese, which is the official language in the study region; (v) not having any disability that prevented independent walking; (vi) no visible signs of cognitive impairment; (vii) must be 18 years of age or older. A total of 218 participants were recruited, and the response rate was 100% due to the sampling strategy discussed above.

2.2.2. Research instrument adaptation

The perception of urban design for physical activity such as walking was assessed using the NEWS-A instrument. NEWS (also called the San Diego instrument) is a 98-question instrument developed by Saelens et al. (2003) to assess the perception of neighbourhood design features believed to be related to physical activity. The NEWS questionnaire has an abbreviated version (NEWS-A) with 54 items which achieves the same as the extended NEWS. They have been adapted and translated into various languages and found to be reliable and valid in many countries (Arvidsson et al., 2012; Cerin et al., 2008; Cerin et al., 2010; Hallal et al., 2010; Sheu-jen et al., 2010; Stopher et al., 2007). The NEWS-A questionnaire assessed several environmental characteristics grouped into 8 main subscales and 4 single items as follows:

1. Residential density
2. Land use mix (Land use diversity)
3. Access to services



4. Street connectivity
5. Walking facilities
6. Aesthetics
7. Pedestrian traffic safety
8. Crime Safety

Four single items:

- Lack of parking
- Absence of cul-de-sacs
- Hilliness
- Physical barriers

All items, except for the residential density and land use mix subscales, are assessed using a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). Residential density items are assessed on a 5-point Likert scale and weighted relative to the proportion of various types of residences, from single-family detached homes to high-rise apartments with a numerical response ranging from 1 (none) to 5 (all). Land use mix is rated by the walking distance in minutes (from 1-5 minutes to more than 30 minutes) to various types of businesses or facilities such as stores, restaurants, and post offices. In most items, a higher score suggests a better environment for walking. However, for some items, like those in traffic safety and crime safety, the subscales have inversed scores, which means a higher score means a reduced likelihood of walking in the environment. The overall score of each subscale is the means of scores of items belonging to this subscale.

As mentioned above, since the tool was developed in the US, an adaption process is required to apply it to the context of Hanoi. The adapted version was named NEWS-A Vietnamese (NEWS-A-V). A multi-disciplinary panel of experts from the fields of urban design (n = 2), urban planning (n = 1), and transportation (n=1) reviewed the original English version to discuss how to adapt them to reflect the built environment of Hanoi. Criteria used for selecting the multi-disciplinary expert panel include: (i) senior researchers/lecturers on the field; (ii) currently doing research and have publications about Hanoi in the last 10 years; (iii) fluently in English. After review, a number of original items were modified or removed while new items that were relevant to the study setting and target population were added.

Table 1. Adaptation of NEWS – A – V.

Modified items	Reason
Changed ‘townhouses or row houses of 1-3 stories’ to ‘townhouses or row houses’	The number of stories of townhouses and row houses varies greatly in Hanoi
Changed destination ‘supermarket’ to ‘supermarket/big market’ and ‘vegetable market’ to ‘vegetable market/small market’	To specify the destination because markets/small markets are common destinations in Hanoi
Changed destination ‘video store’ was changed to ‘Internet/gaming cafe’.	Video stores have no longer existed while internet/gaming cafes are popular entertainment destinations in Hanoi
Changed destination ‘recreation centre’ to ‘Sports centre/Football fields/swimming pools.	To specify the destination because playing football and swimming are popular recreational activities in Hanoi
Change item ‘Sidewalks are separated from the road/traffic in my neighbourhood by parked cars’ to ‘There is a painted line that separates the sidewalks from parking spaces’	The painted line to mark the parking area is common on sidewalks in Hanoi
Change ‘30 Mph’ to ‘50 Kph’ and ‘100 yards’ to ‘100 metres’	The Metric system is used in Vietnam
Changed items ‘The streets in my neighbourhood do not have many cul-de-sacs (dead-end streets)’ to ‘My	Cul-de-sacs is uncommon in Hanoi



neighbourhood does not have many dead-end streets’ and moved to the ‘Street Connectivity’ subscale	
Moved two single items ‘Parking is difficult in local shopping areas’ and ‘There are major barriers to walking in my local area that make it hard to get from place to place’ to the ‘Access to Services’ subscale	As suggested by the expert panel and to match the original NEWS
Removed items	Reason
Removed item ‘There is a grass/dirt strip that separates the streets from the sidewalks in my neighbourhood	Grass/dirt strip is uncommon in Hanoi
Removed single items ‘The streets in my neighbourhood are hilly, making my neighbourhood difficult to walk in.’	Hanoi has a relatively flat terrain
Added items	Reason
Added destination ‘Religious places’	Religious places such as pagodas or churches are common destinations in Hanoi
Added item ‘The sidewalks in my neighbourhood are well maintained’ to ‘Walking Facilities’ subscale	The poorly maintained sidewalk is a common issue in Hanoi
Added item ‘Sidewalks in my neighbourhood are often encroached or obstructed by parked vehicles, sidewalk businesses, vendors, or physical obstructions’ to ‘Walking facilities’ subscale	Sidewalk encroachment is common in Hanoi

2.2.3. Analysis

Perceived urban design scores were compared between the five typical urban design typologies of Hanoi namely the Ancient Quarter, French Quarter, Collective Housing Quarter, Urbanised Village Area, and New Urban Area. The mean combined scores of eight subscales for five urban typologies were also Z-scored and then visualised in a box plot chart for comparison. Multiple linear regressions were applied to determine the relationship between the participants’ perceived urban design and the five urban typologies. The five urban typologies were dummy-coded and entered the regression analyses with the New Urban Area as the reference category. All analyses were conducted by using SPSS version 28.0 for Windows with the R-essential add-in.

3. Results.

Table 2 reported the perceived urban design by demographics and urban typologies, while Figure 3 compares the Z-score of perceived urban design between the five urban typologies. Overall, Hanoi has high scores (over 2) for all perceived urban design sub-scales, especially for land use mix and density. People in the youngest age group (18-24) had the highest mean score of Residential Density while the oldest group (60+) perceived the highest mean score of Street Connectivity. Males and females shared similar perceptions of urban design except for Traffic Safety where males rated the traffic of Hanoi higher than females. Among five urban typologies Ancient Quarter and French Quarter have a higher perceived land use mix, while New Urban Areas have better walking facilities. Crime safety and traffic safety are almost the same across urban typologies. All the typologies have a higher score for street connectivity than Urbanised Village Areas.

Table 2 Perceived urban design by age, gender and urban typology.

	Residential Density		Land Use Mix		Access to services		Street Connectivity		Walking Facilities		Aesthetics		Traffic Safety		Crime Safety	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age																
18-24	314.83	90.69	3.89	0.52	2.72	0.36	2.86	0.55	2.80	0.40	2.50	0.34	2.57	0.28	3.07	0.22
25-44	309.40	78.70	3.97	0.52	2.71	0.38	2.98	0.61	2.79	0.45	2.55	0.32	2.67	0.27	3.07	0.27
45-59	296.35	88.80	3.75	0.67	2.76	0.42	3.13	0.58	2.93	0.52	2.44	0.46	2.68	0.38	3.18	0.32
60+	303.72	77.78	3.90	0.67	2.73	0.32	3.17	0.75	2.71	0.69	2.35	0.50	2.52	0.59	3.18	0.44
Gender																
Male	307.25	82.80	3.92	0.51	2.75	0.34	2.96	0.62	2.81	0.45	2.53	0.36	2.66	0.29	3.04	0.23
Female	309.60	83.35	3.90	0.60	2.69	0.40	3.02	0.60	2.80	0.50	2.48	0.37	2.60	0.36	3.14	0.33
Urban typology																
Ancient Quarter	254.60	67.03	4.06	0.34	2.93	0.24	3.40	0.52	2.77	0.32	2.71	0.26	2.80	0.24	3.13	0.25
Collective Housing Quarter	280.00	57.78	3.72	0.35	2.81	0.20	3.05	0.55	3.11	0.34	2.79	0.20	2.70	0.35	3.20	0.27
French Quarter	275.21	84.99	4.44	0.49	2.83	0.24	3.12	0.66	2.43	0.51	2.38	0.35	2.64	0.17	3.05	0.24
Urbanised Village Area	307.21	78.73	3.90	0.62	2.82	0.28	2.46	0.32	2.51	0.30	2.22	0.38	2.51	0.43	3.02	0.33
New Urban Area	325.02	71.46	3.45	0.40	2.22	0.37	2.91	0.54	3.21	0.28	2.44	0.30	2.51	0.31	3.07	0.30

Note: boldface font indicates the maximum values, and italic font indicates minimum values.



Figure 3. Z-score of perceived urban design for five urban typologies (developed by Authors).

Table 3 shows the associations between perceived urban design and urban typologies. In terms of perceived Residential Density, the Ancient Quarter and French Quarter had significantly lower scores while Collective Housing Quarter had a significantly higher score compared with the Urban New Areas (the reference urban typology). Urban New Areas had a significantly lower perceived Lan Use Mix than all other urban typologies.

Table 3. Associations between perceived urban design and urban typologies.

Urban typologies	Residential Density	Land Use mix	Access to Services	Street Connectivity	Walking facilities	Aesthetics	Traffic Safety	Crime Safety	Total Score
Ancient Quarter	-70.419 <.001	.616 <.001	.707 <.001	.488 <.001	-.444 <.001	.266 <.001	.289 <.001	.058 .337	-68.439 <.001
French Quarter	-45.023 .004	.271 .006	.586 <.001	.148 .197	-.097 .210	.349 <.001	.188 .006	.134 .028	-43.445 .006
Collective Housing Quarter	50.186 .002	.993 <.001	.605 <.001	.209 .068	-.778 <.001	-.060 .357	.134 .047	-.023 .700	51.265 .001
Urbanised Village Area	-17.814 .257	.458 <.001	.600 <.001	-.451 <.001	-.698 <.001	-.213 .001	.002 .978	-.052 .387	-18.168 .249

Note: New Urban Areas is the reference urban typology, boldface font indicates that the coefficient is statistically significant.

4. Discussion

4.1. Residential density

Although, Hanoi has a high level of residential density, townhouses or row houses are the dominant residential typology while apartments with over 13 stories are the least popular typology. The townhouses (rowhouses), often called ‘tube house’ in Vietnam, has been the most dominant dwelling typology in Hanoi for centuries (Kien, 2008). The limited presence of high-rise apartments can be traced back to the planning regulations in Hanoi, which impose height restrictions on buildings across most areas of the city, with the exception of new urban zones where high-rise apartment complexes remain permissible. Within the inner city, residential buildings commonly attain heights ranging from 10 to 13 meters, while in the Ancient Quarter, their elevation is restricted to a mere 6 to 8 meters (Anh et al., 2018). Five-stories Soviet-style apartment block is the main dwelling typology in the Collective Housing Quarters but is infrequent in other urban typologies.

4.2. Land use mix

Among destinations, the participants agreed that coffee places are the most popular destination which tended to always be present within a 5-minute walk from their homes. This result is reasonable when Vietnam is famous for its rich coffee history and culture. In 2019 the country exported \$2.39B in coffee, making it the 2nd largest exporter of coffee in the world. The domestic market is also very active, especially in large cities like Hanoi. Coffee shops, coffee stands, and beer shops can be found everywhere in Hanoi. They are places for not only enjoying coffee but also working, chatting and meeting others for personal or business purposes. The convenience of coffee shops makes them an unsubstituted part of Vietnamese daily life (Ta, 2016). Other destinations within walkable distance include convenience/small grocery stores, clothing stores or restaurants. Most participants’ workplaces and schools seemed to be far from their homes (more than a 15-minute walk). Hoylyoak and Bray (2015) and Nguyen (2021) found that an average routine work trip in Hanoi has an average distance of about 7.2 km, which is equivalent to about a 1-hour walk.

4.3. Access to services

Most participants reported that transit stops (bus stops or metro stations) are easy to access in Hanoi. However, public transport only accounts for 4% of total trips in the present research and below 10% in other studies from Hanoi (JICA, 2007; Pham, 2017). The problem of public transport may not lie only in

the availability of the network. A study of 800 students in Hanoi revealed that motorcycle ownership, part-time employment, and fear of sexual harassment (among women only) are some of the reasons that led students to quit riding buses (Nguyen & Pojani, 2022). Participants agreed that stores are within walking distance from home in most neighbourhoods, reflecting the vibrant commercial activities along streets in Hanoi. Participants also reported that it's not difficult to park their vehicles in Hanoi, which seems to be an unexpected result in a high-density city like Hanoi. However, it should be noted that illegal parking is very popular in Hanoi (see Figure 5), especially in the CBD area (Thanh Truong & Ngoc, 2020; Vu, 2017). A study by Vu (2017) pointed out many reasons for this behaviour including the shortage of parking spaces, low level of enforcement, and high parking charges of legal parking.



Figure 5. Parking violations on sidewalks.

4.4. Street connectivity

The majority of participants agreed that there are many alternative routes to go from one place to another place in their neighbourhood. They also believed that the distance between intersections is usually under 100 metres. The main street network of Hanoi is considered to be insufficient for the transport demand (Pham, 2017), but it is supported by the secondary networks of small streets and alleys. Although these dense and complex “narrow-alley” networks are often inaccessible by cars and buses, they provide many alternative routes, significantly reducing the travel times for small vehicles and pedestrians (Nguyen et al., 2020). However, the alley network often does not have many intersections and it does have many dead-ends.

4.5. Walking facilities

Participants reported that sidewalks are present and well-lit at night in most streets in their neighbourhood. However, they shared the concern that sidewalks are not well maintained and are often obstructed (see Figure 6). Sidewalks are usually poorly maintained with uneven surfaces and cracks and gaps (JICA, 2007). In Hanoi, sidewalks are considered a semi-public semi-private space (To, 2011) and are commonly taken over by local people for all kinds of private use, from social meetings to working, playing, or cooking (Labbé, 2021). Besides, there are also numerous facility-related obstructions on the sidewalk such as electric posts, cables, and electrical cabinets and temporary obstructions such as dumped garbage or construction materials. While local authorities periodically conduct “sidewalk clean-up campaigns,” these campaigns are often imposed without much flexibility and consideration for the real needs of local people. Hence, the desired level of efficiency is not achieved, and the sidewalks consistently remain disorderly. (Han et al., 2019). Participants also reported the common presence of the sidewalk painted line that divides the sidewalk width into two parts: one side permits businesses and their parking, while the opposite side is designated for pedestrians. This line visually reminds people of space for pedestrians, but it is usually violated (Han et al., 2019).



Figure 6. The sidewalk is occupied by parked vehicles and personal activities.

4.5. Aesthetics

The most remarkable point stated by the participants about the aesthetics in Hanoi is the presence of trees along the streets in most areas, especially in the French Quarter, the Ancient Quarter and the New Urban Areas (see Figure 4). However, due to the construction of urban transport infrastructure, thousands of trees were cut down and removed from many streets such as Kim Ma, Nguyen Trai and Pham Van Dong, raising concern about pollution and urban heat consequences (Liou et al., 2021). Participants also highlighted that Hanoi has interesting buildings to look at along its streets. The high density of activities and highly mixed architecture make streets and sidewalks in Hanoi diverse, vibrant, and attractive (Ho et al., 2021). The participants rated Hanoi's urban design as very low because of the lack of natural sight along the streets. Due to rapid urbanisation, it becomes more and more difficult to see natural sights such as rivers, lakes, or large green spaces in most neighbourhoods.

4.6. Traffic and crime safety.

The worst traffic hazard in the minds of participants was the heavy traffic along their nearby streets. The high volume of traffic often results in serious congestion as well as an increasing level of air and noise pollution, negatively influencing the walking experience. It also increases the risk of collision for pedestrians. However, the heavy traffic also contributed to the slow speed of traffic in the neighbourhood. Participants agreed that exceeding the speed limit was not a problem in their neighbourhoods.

The majority of participants had no concern in relation to crime in Hanoi. They agreed that walking is safe throughout Hanoi during the day and at night, which is also supported by the fact that streets are often well-lit at night as confirmed in the result for Walking Facilities. Participants also perceived that the crime rate is low, and it does not discourage them from walking. The heavy traffic and the large number of pedestrians on sidewalks in Hanoi also help to improve crime safety as per the classic concept “eyes on the street” by Jane Jacobs (1961)

4.7. Perceived urban design and urban typologies.

As seen in Table 1, people in all urban typologies perceived a significantly higher land use mix in their neighbourhood than those in New Urban Areas. With the dominance of identical villa and apartment buildings, New Urban Areas have low-mix land use and long distances to different land-use destinations. Although having lower built-up density and more open spaces, New Urban Areas have more high-rise buildings which were given a higher weight index than houses in the computational process, leading to a high score of perceived residential density. Similarly, Collective Housing Quarter, thanks to the dominance of five-stories Soviet-style apartments and the encroached houses also got a very high score of perceived residential density from people living there. Despite the high built-up density, residential density is hindered by limited building height in other urban typologies. However, the ongoing urban renewal process, characterized by the transformation of existing areas into new residential developments

with higher floor area ratios to maximize profits, is gradually increasing residential density in many parts of Hanoi (Tung, 2018).

Participants from French Quarter rated their neighbourhoods have the best land use mix. The French Quarter has many public buildings such as government offices, hospitals, theatres, cinemas, representative offices, libraries, and post offices. Simultaneously, it hosts many commercial establishments, such as hotels, restaurants, coffee shops, stores, and malls, owing to its location in the city center. High land use mix is also prevalent in other urban typologies, except for New Urban Areas where residential land use dominates. The same pattern repeated with 'Access to services' where New Urban Areas have a significantly lower score than other urban typologies. Participants in New Urban Areas reported they did not have adequate services within a proximity distance. In New Urban Areas, traditional shops are frequently supplanted by shopping malls, which can offer pollution-free indoor shopping settings for neighbourhoods. However, in doing so, they diminish both the accessibility to essential services and the social vibrancy of the streets in those areas (Bäckman & Rundqvist, 2005).

On the other hand, New Urban Areas exhibited significantly higher perceived 'Walking Facilities' and 'Street connectivity' compared to all other urban typologies, thanks to their well-designed infrastructure featuring a grid-like network of main roads and spacious, attractive sidewalks. However, the robust transport infrastructure seemed to encourage drivers to exceed speed limits in most streets, resulting in lower 'Traffic Safety' ratings from residents in New Urban Areas compared to those in the Ancient Quarter, French Quarter, and Collective Housing Quarters. This finding aligns with a previous study by Thi et al. (2011) which found that new urban areas contribute, on average, to higher traffic accidents and fatalities compared to old areas.

5. Conclusion

The research's findings showed that people in Hanoi perceive urban design features differently. Residential density and land use mix are generally perceived as positive in most parts of Hanoi, while walking facilities, traffic safety, and aesthetics are not as favorable. The urban typologies in Hanoi, together with their characteristics, have significant impacts on perceived urban design in both a positive and negative direction. Despite having better infrastructure and facilities, New Urban Areas have a lower perceived urban design score than older urban typologies like Ancient Quarter or French Quarter. This discovery implies that Hanoi should reevaluate its approach to city development. Instead of simply embracing modern Western-style planning and urban design, it is crucial to thoroughly examine the local urban forms and typologies already present and use this knowledge to achieve the most effective urban design. Moreover, there is valuable insight to be gained from documented experiences of urbanization in Western countries.

The research also demonstrated the effective adaptation of the NEWS tool, originally designed for U.S. cities, to the significantly different urban context and design of Hanoi. This study contributes to bridging the knowledge gap regarding perceived urban design, particularly in the region of mid- and low-income Asian countries, which have been inadequately represented in existing literature. We expect that the NEW-S-V scale can be used in future studies as an appropriate method to collect perceived urban design data in other cities in Vietnam, providing useful findings for policies and strategies as well as implementing interventions in urban development and planning. Nonetheless, it is imperative to make modifications to account for the impacts of the local context. For instance, in the context of densely populated urban areas like Asian cities, adjustments should be made to measures of residential density that depend on building typologies. Furthermore, it is necessary to incorporate additional criteria for evaluating the informal components frequently found in developing nations, such as street markets or sidewalk businesses, which can significantly influence accessibility to services and pedestrian facilities. We recognize several limitations in this study. The primary limitation is the relatively small sample size ($n = 218$), which could have been expanded to yield more substantial data for analysis. Additional limitations stem from the distinctiveness of Hanoi as Vietnam's capital and a major tourism hub. This distinctiveness can introduce greater variability in the data. For instance, the concentration of tourism-related facilities in the Ancient Quarter might substantially influence the perception of urban design in



this urban typology. The exceptional nature of Hanoi also makes it challenging to extrapolate the results to other cities in Vietnam. To sum up, this research enhances our comprehension of how urban design is perceived in various urban typologies in Hanoi. It offers valuable insights to inform the decisions of policymakers, planners, and urban designers, enabling them to formulate sustainable urban design policies, strategies, and initiatives that enhance the city's quality of life and ultimately foster the well-being of its inhabitants.

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Conflicts of Interest

The author(s) declare(s) no conflicts of interest.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

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