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Impact Analysis of Urban Street Edges of Residential Area in Dhaka, Bangladesh

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ABSTRACT

Streets function both as circulation area for vehicles and vital public space for city people. Street edge is a crucial feature that create the character of the street. In urban residential area, usually boundary element creates the edge of its adjoining street. If the formation of boundary element integrates with its surroundings properly, it will establish coherence with public and private space, which can enhance one's urban experience. Dhaka, the bustling metropolis of Bangladesh, is undergoing rapid expansion in residential sector, which is mainly concentrating on individual architectural structures, instead of taking into account the entire urban region as an integrated entity. In most cases, it has been observed that individual buildings are ignoring the outer public environment by constructing solid boundary walls. This type of solid boundary element entirely separates the public and private space that creates negative impact on street environment. Hence, the primary purpose of this research is to investigate the present condition of street edges in Dhaka's urban residential areas, as well as to assess the influence of various forms of street edges on their adjacent spaces. Therefore, a small segment of Dhanmondi residential area in Dhaka has been selected as survey area. This study was mainly based on field survey and observation. Sources of secondary data were journals, books, information from websites and so on. It is found that, street edges which are physically and visually permeable make positive impact on dwellers and commuters.

INTRODUCTION

Streets play a crucial part in representing a city's visual image. The first thing that springs to mind when we think of a city is a street. A prosperous city not only stresses on distinct architectural features, but also makes positive contribution to their surroundings and urban street environment. Street has substantial influence on its surroundings. Well-developed street edge enhances the street's character by adding activity and visual appeal to the public domain.

Dhaka, the capital city of Bangladesh, is rapidly growing without of any careful planning. These growths are simply intended to address individual site and facing the problem to create well-developed outer environment. Because of rapid population growth over the last few decades, many housing developments have occurred in Dhaka city to provide shelter for this large population. Many real estate development entities are constructing and selling flats just like any other product. Majority of them are not aware of the outside environment, public areas and roads in front of their personal buildings. Building are sometimes treated as isolated objects in traditional residential development, contained by boundary walls that entirely divide the buildings from the nearby outside public space and streets. This results in unpleasant dead edges to the streets and unused spaces in front of buildings. An appropriate edge treatment of street has a considerable influence on the interface between the internal space and the outer public area, which can help to build an efficient city atmosphere.

The primary goal of this investigation is to investigate the present situation of street edges in urban residential

neighborhoods in Dhaka, as well as to assess the influence of different kind of street edge treatments on their surroundings.

LITERATURE VIEW

Indoor or outdoor interface spanning street and building that typically defines the character, spatial qualities, functions, and, ultimately, people's overall experience of the street is characterized as the urban street edge (Uttley, 2018). As stated by Kevin Lynch, edges are linear features that establish the borders between the public and private realms. Kevin Edge also stated that it can be act as barriers like permeable walls that separate one zone from another, or they can be seams, lines that connect two domains (Lynch, 1960).

The edge treatment of a street is one of the most important aspects in determining the quality of its adjacent area. If the edge nature responds to its surroundings, the urban environment of the street will produce extraordinary outcomes. The street's edge may function both as a barrier and a binder. When the boundary entirely divides private and public areas, it creates a barrier that adversely affects the entire region. On the other hand, if it connects public and private spaces, it works as a binder and helps to improve the entire environment. Hrishi Desai narrated the aforementioned attributes and features of street edge, and also described three fundamental characteristics of street edges on the basis of physical and visual permeableness (Desai, n.d.). Ian Bentley *et al.* stated that visual permeableness between private and public space can enhance public realm, whereas physical permeableness can enrich public space by stimulating

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activity along its limits (Bentley, 1985).

As said by Jane Jacobs, streets and sidewalks are important public spaces and vital parts of a city due to their three main characteristics: first, they end up serving as a demarcation between what is public and private space; second, they allow for natural surveillance; and finally, they have active pedestrians for users (Jacobs, 1961). The Project for Public Spaces identified four key features of a successful public space: accessibility, people's involvement in variety of activities, a pleasant ambiance, and a suitably lively space for large groups of individuals (Heffernan, 2014).

As stated in Auckland Design Manual, treatment of the site's front boundary sets the borders between private and public open spaces. The formation of boundary elements has crucial impact on the connection within the building and the roadway. The area between the building and the road is regarded as an important component for the overall design. Roger Trancik stated that, remaining unstructured area at the bottom of multistoried buildings, may function as wasted space, adding no positive impact, neither to the surroundings nor the users (Trancik, 1986). Walls are the most common edge treatment along residential streets. As described by Georgiou, walls commonly abut public space, thus their construction and design should be taken into consideration (Quaofo, 2018).

Datta defines pedestrian walkways as public spaces along the borders of roads and the area between buildings, where amenities like chairs, shaded trees, water features, lighting, and trash bins, can be placed to make the place more interactive for users and walkers" (Datta S., 2017). The aforementioned literatures have resulted in potential frontiers in the design of street edges and public spaces in urban regions such as Dhaka City, which has witnessed considerable changes in recent decades not just via territorial development but also through internal physical modifications (Ahmed, 2009). As a result of these changes in urban planning, residential development pattern has changed dramatically.

Due to rapid growth of population and higher demand for shelter, tradition of multi-storied building has remarkably emerged in the city areas of Dhaka. Most of these buildings are generally surrounded by solid walls

to offer security and keep away the unwanted observers. Furthermore, due to lack of effective laws and standards imposed by Bangladesh National Building Code, these boundaries contribute very little to the environment of urban streets.

METHODOLOGY

This is a generalized research, and it is believed that the results would be almost same in the similar circumstances in Dhaka. A small segment of residential neighborhood surrounding the 'Dhanmondi 4' playfield has been chosen for this research. This research is mostly an empirical investigation which is basically emphasized on the existing scenario of different types of street edges.

The investigation was carried out in multiple stages. At first, both primary and secondary data were gathered in order to establish the current state of the street edges in the given residential neighborhood. Visual observations, pictures, field surveys, drawings, and field notes were used to acquire primary data. Secondary data regarding street edges and associated factors were collected through a thorough literature review. Then, based on the GIS map and field survey; survey information and computer-aided drawings were generated, where the relevant information regarding plot and road layout, front setback, building orientation, and layout of walkway were provided. Later, certain types of street edges were categorized based on their physical characteristics and their relationship to surrounding private and public spaces. Lastly, analysis phase was intended to determine the influence of various forms of street edges on the walkways and frontage of buildings.

Background of the Study Area

Dhanmondi is one of the planned residential zone of Dhaka. After Dhaka was designated as the provincial capital of East Bengal in 1947, a new region of superior housing was created in Dhanmondi in the early 1950s to accommodate the rapidly expanding city's housing requirement (Roni, 2022). There were vast plots, spacious streets, and a pleasant atmosphere. The residences were primarily one or two storied with big front yards, and the land's construction coverage was quite low. Dhanmondi



Figure 1: Masterplan of Dhanmondi residential area

had no six-storied structures before to 1990. (Mahabub-Un-Nabi, 2007). However, these vast plots are now physically divided into 3 to 5 katha (1 katha = 67 m²). This land segmentation encourages to build multistoried buildings, while leaving little setback spaces around them. Furthermore, recent tendency is to use the lower level of a building for parking and the upper levels for residential purpose; that is why, the issue of privacy on the ground level of an apartment building is no longer a major concern. Despite that buildings are still enclosed by boundary walls that divide the front setback areas and the public walkways to ensure privacy and security. However, the relationship between public walkways and buildings has crucial role for enjoying greater urban aspects.

Analysis and Outcomes

The Study area is situated around the playground area near 'Dhanmondi-4' where various types of boundary elements along the streets were found. The playground is surrounded by 12 residential plots that are organized in an orthogonal pattern. Three of the twelve buildings are two storied, one of them is under construction, and rest of them are six storied. Generally, ground levels are utilized for non-residential use, whereas upper levels are utilized for residential use. Ground level of each of the seven buildings is utilized for parking area, security room, and other service spaces. Only two ancient buildings have residential flats on ground level. Others include offices, markets, coaching center and parking areatwo ancient

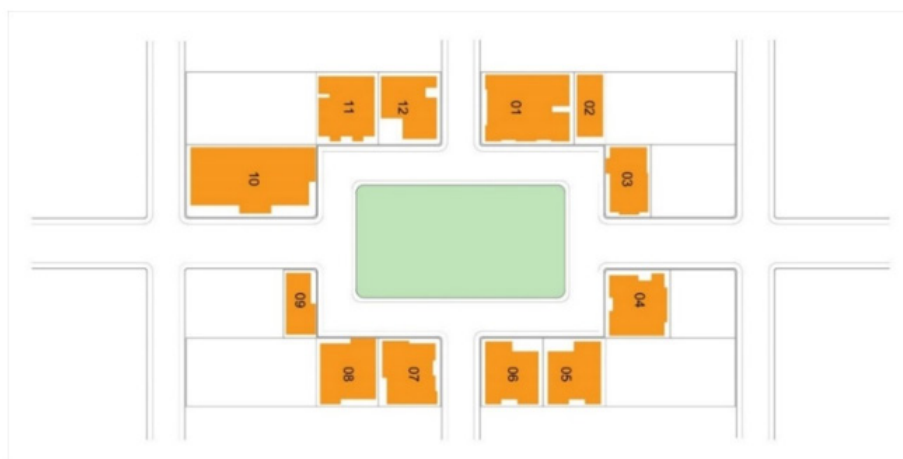


Figure 2: Building block, road pattern & plot division of selected site around the playfield of Dhanmondi 4

buildings have residential flats on ground level. Others include offices, markets, coaching centers, and parking area.

Front Setback & Configuration of Pedestrian Walkway

Among the twelve buildings, only eight were constructed in accordance with the former laws and regulations of the Bangladesh National Building Code (BNBC) - 1996, with a front setback width of 1.5 meters. Plot 12 was built in accordance with the latest version of the Bangladesh National Building Code (BNBC)-2008, with a front

setback space of at least 1.5 meters. Only three of the twelve buildings violated the BNBC setback guideline, which lack sufficient front setback space. The following plan depicts the existing layout of pedestrian walkway and front setback space of buildings at selected site, where red line represents pedestrian walkway and green represents front setback area

Categorization of Street Edges and their Influence on Surroundings

Among the twelve buildings, only four are enclosed by

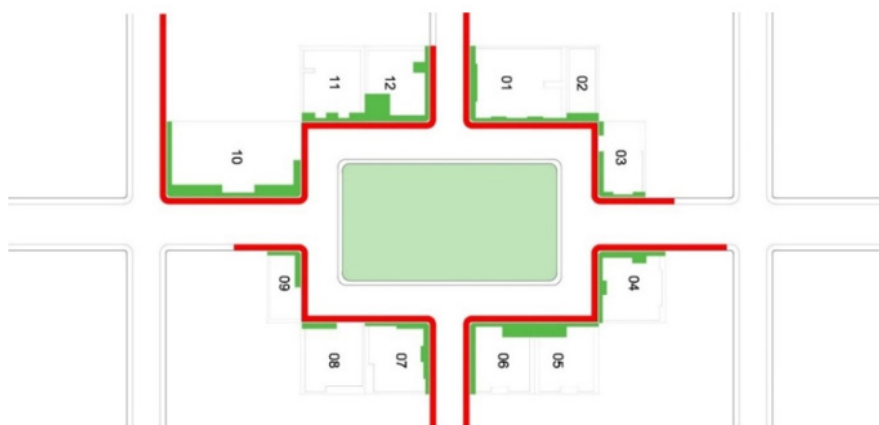


Figure 3: Front setback area of existing buildings and pedestrian walkway of selected site around the playfield of Dhanmondi 4

solid peripheral walls, which serve the edge of their adjoining street. Two buildings are partly surrounded by perforated barriers, while the remaining five have low height sitting walls or variation in levels to separate the public and private areas. Plot 4 is a corner plot where perforated fence are found in one side and other sides has no additional barriers other than some variations in levels. Buildings on Plots 8 and 9 have uncommon edge treatment along the roadway. Small part of the front facade of both buildings have formed border element.

Almost half of the front setback in plot 9 has no peripheral wall, whereas few portion of the front setback in plot 8 has solid peripheral wall. The following layout depicts existing forms of street edge treatments of the selected area, where red, blue, and green lines represent a perforated fence, solid boundary wall, and no peripheral wall or variation in levels, respectively.

Only five buildings have boundary elements that do not divide front setback spaces and pedestrian walkways completely, rather allow connection between public space

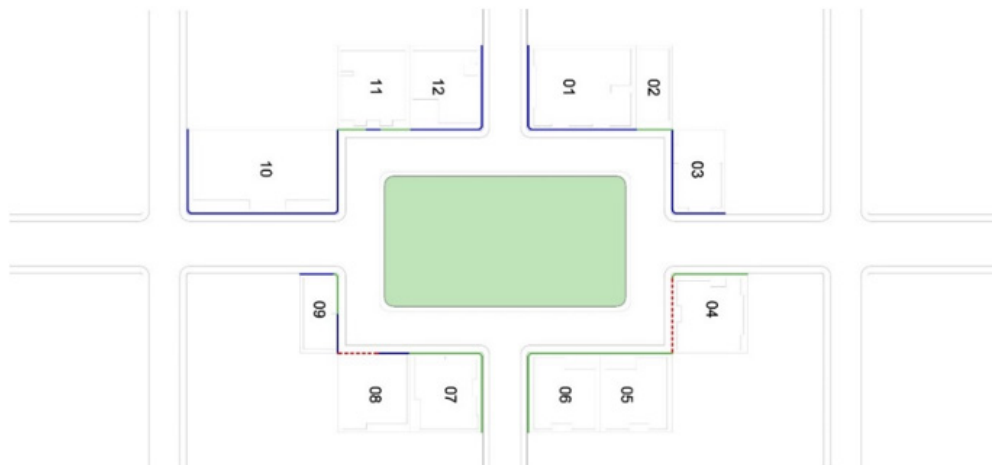


Figure 4: Various types of street edges

and private space by creating functional spaces, both for pedestrians and dwellers. The following layout shows the current configuration of accessible setback spaces and non-accessible setback spaces for general people along with pedestrian walkways of selected area, where red

color symbolizes accessible zone and grey symbolizes non-accessible zone.

According to the aforementioned observation, street edge of the selected area might be classified into three fundamental typologies based on visual and physical connectivity

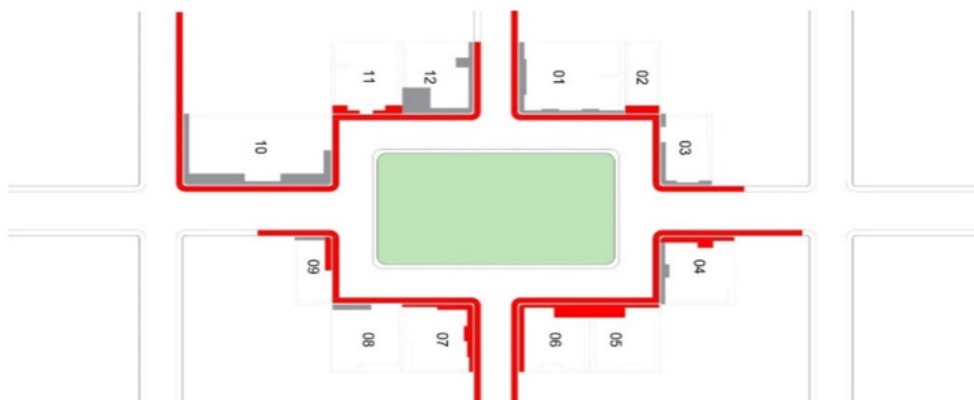


Figure 5: Public non-accessible area & accessible area

Table 1: Existing situation of each building plot of selected site around the playfield of Dhanmondi 4

Plot	Building information	Use of the ground floor	Condition of Front setback area	Treatment of street's edge	Condition of pedestrian walkway
1	• 6 storied building • Built in accordance with BNBC 1996 standards	• Guard room • Parking	• Used as parking • Width 1m	• 2.1m high solid plastered brick wall with perforated metal fence at top up to first floor	• Small plants at the edge of walkway • There is no street furniture area or trees • Effective Width around 2.1m

2	• 6 storied building • Built in accordance with BNBC 1996 standards.	• Guard room • Parking	• Used for plantation • Width 1m • Green area (Soak-Able)	• Height .3m • No provision for sitting and taking rest • Low height brick wall	• There is no street furniture or trees • Small plants at the edge of footpath • Effective Width around 2.1m
3	• 2 storied housing building • Violated building rules	• Residential purpose • Parking	• Remained as unused space • Width 1m-2m • Soak able green area • Have big trees	• 1.8-meter-high solid boundary wall of brick with 3-meter-high perforated metal railing on top	• Presence of big trees that provide shade for pedestrians • Sometimes used for parking against solid wall • Small plants at the edge of pedestrian walkway • Effective Width around 2.1m • Absence of street furniture area
4	• 6 storied building • Built in accordance with BNBC 1996 standards.	• Guard room • Parking	• Soak able green area • Width 1m • Presence of plantation	• One side has perforated metal fence; made of bar and mesh • Other side has low-rise wall (.5m-1m). Partly utilized as a public sitting area.	• Existence of large tree • Absence of street furniture • Effective Width around 2.1m
5	• 6 storied building • Built in accordance with BNBC 1996 standards	• Guard room • Parking	• Soak able green area • Using as garden with shaded tree, fountain • Width 1.5m-2.5m	• Used as public seating area • Variations in levels (max 150mm per level)	• Absence of trees and street furniture zone • Effective Width around 1.8 m
6	• 6 storied apartment • Built in accordance with BNBC 1996 standards.	• Guard room • Parking	• Soak able green area • Using as garden with fountain and shaded tree, • Width 1.5m-2.5m	• Used as public seating area • Variations in levels (max 150mm per level)	• Absence of street furniture • Effective Width around 1.8 m • Existence of some trees
7	• 6 storied building • Built in accordance with BNBC 1996 standards.	• Guard room • Parking	• Soakable green area • Width 1m • Presence of plantation	• Height .6m • low height brick wall used as seating area	• Presence of big tree • Absence of street furniture • Effective Width around 1.8 m
8	• Mixed-use building, 2 storied • Violated building rules	• Market • Residential purpose	• Using as parking area • Width of half front setback area 1.5 m • Almost half of the site has no front setback.	• Front facade of building itself has formed edge of the street on other part • Other Half part is low (.5m) height perforated fence	• Presence of big tree • Effective Width around 1.8 m • Absence of street furniture

9	• 6 storied building • Built in accordance with BNBC 1996 standards	• Coaching Center • Parking	• Paved area • Remained as unused space • Almost half area of site has no front setback. • Width of half front setback area 1 m	• Half portion is 2m solid boundary wall with .5m perforated barbed wire on top. • Front facade of building itself has formed edge of the street on other part	• Susceptible to turn into dumping area • Absence of tress and street furniture • Often unsocial behavior occurred • Small plants at the edge of walkway • Effective Width around 1.5m
10	• Mixed-use building, 2 storied • Violated building rules	• Official purpose	• Paved area • Remained as unused space • Width 1m-4m	• 1.5m solid boundary fence with a 1m perforated fence on top.	• Often road side parking can be found • Effective width of roughly 1.5m • Lack of street furniture • Existence of Few trees • Susceptible to turn into dumping area • Occasionally used for parking against the solid wall
11	• 6 storied building • Built in accordance with BNBC 1996 standards.	• Guard room • Parking	• Used as plantation area • Soak able green area • Width 1m	• No provision for taking rest and sitting • Variations in levels (max .3m per level)	• Lack of street furniture and trees • Effective Width around 2.1m
12	• Under construction • Built in accordance with BNBC 2008 standards.		• 1.5m width	• Temporary solid wall (2.1m) by metal sheet	• lack of street furniture and trees • Effective Width around 2.1m

Type 01

This type of street edge is both physically and visually impermeable. It can be solid walls of the building or solid peripheral wall along the street's edge, which are usually constructed for extreme security and privacy. Unfortunately, it has been noticed that, this creates hindrance for social interaction and does not assure security and safety for dwellers and pedestrians. Besides, it's one of the causes of street crimes and unsocial

behaviors as it visually separates the pedestrians from the people of the private buildings. Sometimes, space besides boundary wall is very susceptible to turn into dumping zone. It has been observed that *street along* the inactive edges is often used as parking space, that worsen the condition of road. In addition, this type of street edge changes the front setback space of building into an unused space and creates negative effect to the inside private area.



Figure 6: Solid peripheral wall that encloses building. (Source: Author)

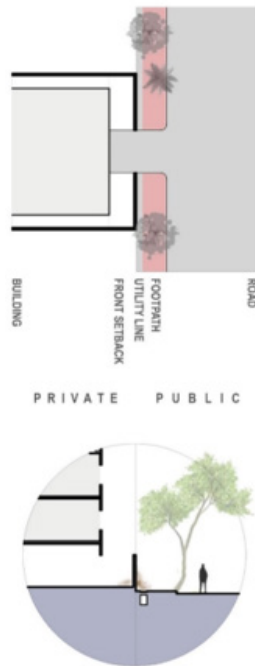


Figure 7: Type 1A - Solid boundary wall

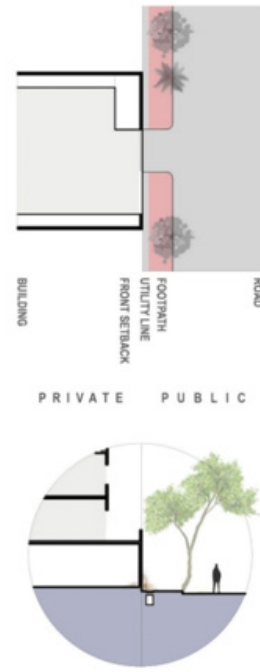


Figure 8: Type 1B - Boundary wall is created by the building itself

Type 02

This sort of street edge is permeable visually but physically it is not permeable. Generally, fences, perforated screens, etc. form this sort of street edge. Most of the cases, this sort of street edge provides safety and security by

natural surveillance, that decreases crimes and unsocial behaviors. It has been observed that, front setback space behind this street edge is used for landscape gardening to provide certain amount of privacy.



Figure 9: Boundary elements with perforations. (Source: Google street view & Author)

Type 03

This type of street edge allows both physical and visual access between outer public space and inner open private space. Generally, this type of street edge is formed by low height sitting walls or by variation in levels. Now-a-days, in most cases, ground level of a building is used for parking space, so privacy on ground floor is not a major issue. In such situation, security of buildings is obtained by designing front facade of each building properly. Here, the front setback spaces are sometimes used for plantation and seating spaces for pedestrians. This enhances pedestrian experience by expanding the scope of activities along its edges that makes the street

secured and safe. However, it is also noticed that there are lack of additional amenities and large trees on the front setback space which can provide shadow and comfort for pedestrians.

According to the study it is found that, "Type 03" street edge has a positive impact on its surrounding environment. As the front setback area adjacent to this type of boundary element is both physically and visually permeable, it does not used as leftover space. Moreover, pedestrians may utilize this area for relaxation purpose and sitting space.

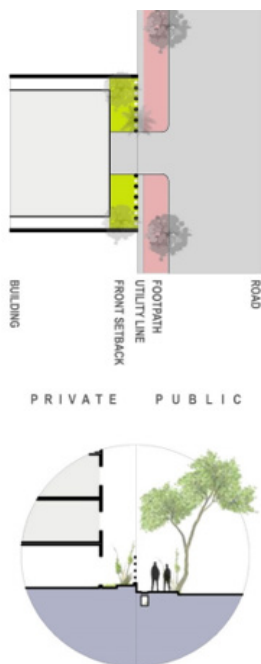


Figure 10: Type 02-formation pattern of boundary elements

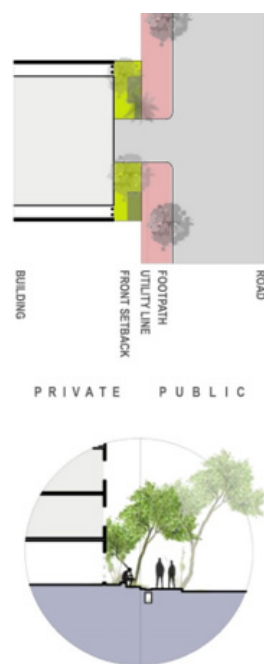


Figure 11: Type 03-formation pattern of boundary elements

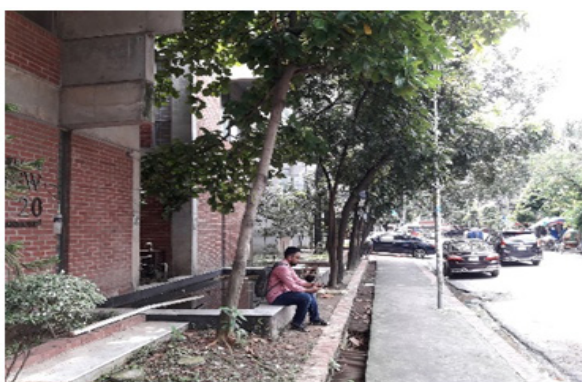


Figure 12: Variation in levels and low-height boundary elements . (Source: Google street view & Author)

Recommendation and Opportunities for Future Research

Among all types of street edge treatment, physically and visually permeable street edge performs better than others, but it also has some limitations. By analyzing the previous literature, it has been evident that some facilities including street lighting, street furniture, trash bins and drinking facilities can be implemented along the street edge to enhance the overall experience of pedestrians. There are enough potential for future research on front setback area of buildings as an effective way of streetscape plantation to protect the natural environment. Addition of shaded trees and seating areas along the street edge for pedestrians might broaden the scope of this study.

CONCLUSION

Street edge represents a vital portion of individual building, at the same time it characterizes a significant portion of overall urban area. All the buildings, streets, even edge of the streets must be considered as a holistic part of entire design process. A well-used and safe street

environment results from an active street edge that connects the public and private domain. Physically and visually permeable boundary elements encourage creating well-used and active street edge. In the past, it was a common practice in Dhaka to construct solid boundary walls in front of buildings for the purpose of security and privacy. Unfortunately, it creates inactive street border that causes street crime and anti-social behavior. However, the practice of incorporating non-residential usage and parking space on ground level in residence is increasing these days. In this situation, physically and visually permeable boundary can help to enhance the public environment outside the buildings while securing the safety issue by designing building's front facade appropriately. Moreover, this allows the strollers to admire the architectural design of the building and improve the urban environment and streetscape.

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