

Urban Planning Impacts on Comfort and Quality of Indoor and Outdoor Spaces of Dhaka: An Analysis of Urban Planning and Design (A Case Study on Rampura, Banasree and Dhanmondi Area)

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Abstract - Urban planning vastly affects the local microclimate and have an immense influence on the comfort level of the city dwellers and also the quality of spatial environment of a city. That means, responsive and proficient planning can fabricate spaces where users experience nominal abrasion concerning comfort, quality and adoption of spaces. Architecturally well designed buildings can provide comfortable living spaces within the building envelopes under the general framework of urban planning. The errors of planning and architectural design are more visible in Dhaka, the capital city of Bangladesh, that's why it is taken up as a study. This research scrutinizes three housing zones of Dhaka City to show how current urban planning and design has fabricated different quality of space within the same city and its impact on people's comfort.

Key Words: Urban Planning, Design, Indoor Space, Outdoor Space, Comfort, Quality of Space

1. INTRODUCTION

"Cities are what we make them. Urban landscape with a combination of structures, communication channels, open-space, vegetation, etc. make up the city and illustrates a standard of urban development with increasingly detached relation between human beings and the urban environment. Traditionally outdoor spaces are regarded as important as indoor spaces, because they are intensively used year round in Bangladesh. Outdoor spaces are used, by the housewives to cook and perform other household chores, by children to play, by adults to stroll or interact with their neighbors. But present urban planning and design tend to ignore these facts and the sense of belonging to the community is gradually being lost." [1][Hafiz 2004]

Dhaka is the capital city of Bangladesh. Set beside the Buriganga River. The city has been experiencing rapid growth in the recent years. In 1971, eve of Independence, Dhaka had a population of 1.2 million increasing to about 21 million by 2020[2].

To improve the features of indoor outdoor space and living environment should be the basic objective of Urban Planning. Healthy Indoor outdoor relationships don't develop between the city dwellers and the urban settings at the current urban planning and design. People are being

more introvert now a days. In this rapidly increasing city it has become very difficult for the planners, architects and policy makers to ensure standard, comfortable indoor and outdoor spaces.

"In order to provide space for housing, commerce, industry, transportation, etc. planners and designers sought the easy way of developing flood plains and green areas in Dhaka. Progressive degradation of the physical environment is the most visible effect of rapid and unplanned urbanization." [1][Hafiz 2004]

After surveys, questionnaire and study this paper shows the necessity of proper planning and designs to create comfortable spaces for the users in an urban area and negligence for it creates chaos and discomfort. Rampura, Banasree and Dhanmondi; three vital housing areas of Dhaka city are taken as case studies. A survey was conducted among 55 people from the above mentioned communities (18 from Rampura, 22 from Banasree and 15 from Dhanmondi) and their opinion were analyzed. The study involves systematic analysis using both primary and secondary data. The paper will give the reader some ideas about indoor-outdoor space comfort, the climatic conditions of Bangladesh, basic notions and space quality of the above mentioned housing communities along with some analysis of planning, design and conditions also the dwellers opinion about their respective areas.

2. Literature Study

2.1 Open Outdoor Space and comfort:

Open public space is a space available for all people [3] and "the vital ingredient of successful cities" [3]. In addition, these places are crucial in creating the sense of community, culture and social capital. Open public space is a place where people can perform various activities (movement, recreation, cultural activities, shopping, meeting new people, etc.) [4] and represents a gathering space, which includes squares, parks, streets and sidewalks [5]. They are an integral part of the urban landscape, which depends on buildings and structures in their immediate vicinity. Overall, open public spaces reflect the character and identity of a city, giving it meaning in an aesthetic, ecological and functional sense [6](Milena, 2019). So open outdoor space is really needed to

ensure a healthy, vibrant, comfortable city life physically and psychologically.

2.2 Indoor Space and comfort:

The building design aims to provide a healthier and more comfortable environment for people. People stay indoors for more than 90% of the time [7], so most countries believe that the indoor environment has a major impact on human health and well-being [8][9]. Studies have shown that healthier buildings can reduce occupants' stress [10], increase productivity, and reduce health care costs by 1-5% [11]. Therefore, to determine the relationship between building environment and comfort is conducive to the design and operation of healthy buildings. [12](Qi Zhen, 2014)

In the indoor environment, the literature review examining the comfort of building occupants mainly focuses on the impact of physical environmental conditions on overall IEQ satisfaction, such as noise, light, and temperature [13][14][15]. The influence of architectural design on the indoor environment is mainly reflected in the space characteristics, and the building space factors can interact with occupants [16]. Studies have shown that the architectural decoration and light color have little effect on thermal comfort [17][18], but the building space factors exert a significant influence on overall IEQ* satisfaction [19].

*IEQ-Indoor Environment Quality

A healthy building should provide a comfortable indoor environment for occupants, which makes them healthy, both physically and psychologically [20]. The importance of indoor environment has reached a consensus among many researchers. Comfort perceived by human is disrupted by many (individual, social, and architectural) factors. Jaakola believes that different determinants simultaneously affect both human health and comfort, and sometimes the effects may be synergistic [21].

2.3 Comfort and Quality of Space

Comfort of a space is totally a relative term. It not only depends on the ambience, temperature, humidity, lighting and ventilation, vegetation etc. but also on the indoor outdoor environment, spatial quality and infrastructure and provided services. When people are not in static state physical and psychological problems arises and tends to discomfort, friction and tension and an unstable state of mind.

"Indoor spaces were judged on the basis of privacy, quality of view, degree of satisfaction of living in that particular community, natural ventilation, natural light, intensity of use of artificial ventilation systems (such as, ceiling fan/ AC/ exhaust fan) during summer, and intensity of use of artificial lighting for use of spaces during daytime. To judge comfortable outdoor spaces criteria that were taken into

account were ambient temperature, precipitation/ humidity, airflow, planning and landscape of the total community and design of built structures and their visual impacts. Neighborhood livability, street life, social interactions between neighbors and level of outdoor activities were also taken into account. Urban services and residential functions were also considered important in both types of spaces." [1]

So while planning a city and designing individual building urban planners and Architects have to be very sensible about the comfort and quality of indoor and outdoor spaces and environment.

2.4 Impact of Urban Planning and Landscape Design on climate change

Urban and landscape design can have a major impact on climate change. Being a special element of urban and landscape design, urban open public spaces play an important role in reducing high temperatures, but also in overcoming the impacts of climate change [22]. One of the actions is seen in "boosting green infrastructure, that does not only lead to increased resilience of the urban area, but is likely to also have numerous co-benefits, such as improved air quality, better health, improved biodiversity and enhanced overall quality of life for citizens" [23]. Such interventions in open public space could also be considered as the improvement of its comfort [24], seen as a "positive emotional reaction to external surroundings in different situations, including physical, social and psychological reactions", while "the feeling and degree of comfort is dependent on the surroundings, the situation and the individual" [25]. To improve space comfort it is important for architects to elevate optimistic building design.

2.5 Climate and Weather in Bangladesh

"Bangladesh is not so much a land on water as water on a land". One-third of Bangladesh's physical space is comprised of water in the dry season. In the rainy season almost 20 percent of the land is normally submerged. Bangladesh has the largest delta system and the largest flow of water to the sea of any country on earth making flood a common phenomenon in this region. The delta is also one of the most fertile lands in the world and support a population on a land area of 143,999 square kilometer where density equals to about 4000 to 5000 persons per hectare [26](Hafiz, 1998). Geographically Bangladesh is a great alluvial floodplain formed by some of the world's great rivers – the Padma (Ganges), the Jamuna (Brahmaputra) and the Meghna. Bangladesh is also characterized by its very low elevation. Except for some hilly areas nearly 50 per cent of the elevation of land surface of Bangladesh is below 25 feet (8.3 meters). Moderate to heavy rainfall characterizes Bangladesh, which is on average 80-100 inches (2000- 2500 mm) per year. High temperatures also characterize Bangladesh in the summer (June-August) ranging from 35-42 degree Celsius. Humidity ranges from 45-65 percent in the dry winter season

(November-January) and 85-100 percent in the summer and monsoon [27](Islam, 1996).

For the topography of the region every year storm, cyclones intensities funnels up. During the monsoon water and silt flow over the lands that makes the lands of Bangladesh one of the most fertile lands in the world. "Every year the outflow carries about 2.5 billion tons of silt and 2.4 billion cusecs of water." [1](Hafiz 2004)

Dhaka Is located at the center of Bangladesh. In the early time the climatic conditions were almost same like the other cities of the country. But during the urbanization process the micro climate has changed vastly. The change in the surrounding environment is notable. As Bangladesh experience high temperature, high precipitation level, flooding, water clogging etc. the Designers, Planners and Architects must need to keep this in mind while planning a city, community or deigning an individual building. The spaces both indoor and outdoor need to be designed very carefully

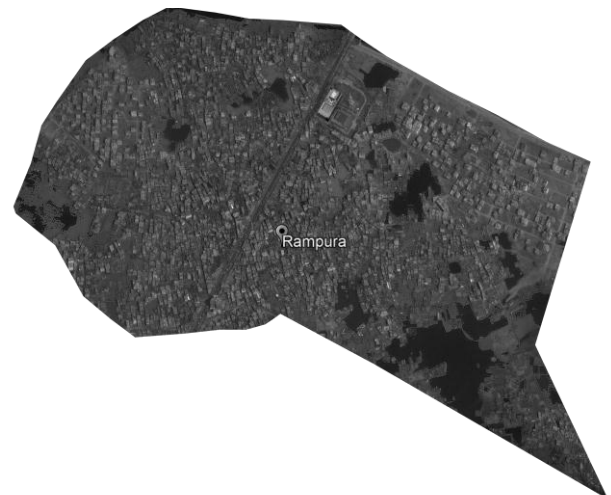
3. CASE STUDY 1

Rampura:

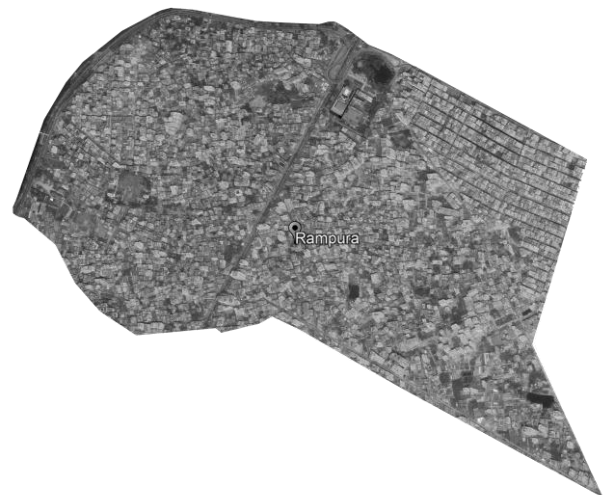
In the mid-70s or 80s in Dhaka, Rampura had been considered a focal point of cultural amalgamation for the people living in the town. At the early time there were extended water body around the area and called as Rampura Khal. Now that are almost filled and new housing area are developed there. The Hatir Jheel Area and Rampura khal were connected in an unplanned way.

Rampura was originally a low-density residential area with single detached houses with spacious compounds. These houses compounds had gardens with plants and fruit trees. The trees used to give shade and had tremendous effect on the micro climate. There were fields to play. Most of the residents were higher middle and middle income families.

Initial lower density and large individual plots are mainly subjected to the unplanned nature of the Rampura. Proper urban services also lacked then. Over time it came to be positioned near the Centre. After the Liberation war of Bangladesh this area faced rapid population growth and the unplanned progress of this area continued. From the post-independence period till mid 80s most of the residences were Low-rise, mostly tin shaded. The rapid growing density of population caused development of frequent low rise and midrise building that changed into high-rises in a very short period. There were satisfactory vegetation and water bodies. There were large water bodies surrounding the area. Gradually the new housing projects were constructed and gradually the natural equilibrium were almost ruined.



Map 1.1: Satellite image of Rampura (2001)



Map 1.2: Satellite image of Rampura (2020)

Because of its closeness to center and also for lower house rent the Lands in Rampura is being extensively used. Here most of the people are low and middle income that's why the standard of living is quite different. Nearly 90% of the buildings are medium and high-rises that developed ignoring the set-back rules totally or partially propagated by the concerned authority. Numerous building façades are placed on the site line and dominating the streetscape. In recent times some buildings are constructed maintaining the proper rules but they could not ensure much changes for the previously unplanned nature of the area. There is no public access in the houses as high walls and hooked fences are made to protect the buildings. This shell like apartment buildings may stronger the dweller's security but all sorts of social and community interactions has been minimized. The sense of community belonging and community interactions has almost been lost in recent time due congestion of the streets and high, opaque boundary walls.

Privacy between the buildings are not sufficient in most cases due to existing narrow street width and spaces among buildings. The neighbors can see or listen anything happening to other neighbor's apartment. In a conservative society this creates conflicts and rigidity which affect psychologically. The

all-time kept curtains may maintain privacy but that disputes the natural lighting and ventilation issues. Creating chaos and risk of accidents pedestrian and vehicular traffic intermingle due to lack of footpaths.

There is no proper space for outdoor activities. The children lives in the slums or colonies play in the roads that is very risky. The children living in the apartments mostly play in the apartment parking or roof that is also prohibited in most of the situations. The lack of play fields or parks are turning the children into video games or social media that is very injurious to their psychology and health. The extreme heat during daytime is caused by the congested building structures and absence of proper open space and vegetation.

Artificial ventilation and cooling system is required that results wastage of valuable energy. The residents said they need to use ceiling fans and AC even in the early winter. The excessive heat takes long time to cool. In the winter time light cotton quilt or katha get sufficient at night. The narrow spaces within buildings do not allow enough light and air flow. Around the year the lower floors units barely get adequate sunlight. Due to high level of precipitation and humidity that allows quick growth of fungus and dampness in the wall turning the indoor space very unhealthy and exhaustive.

The unplanned narrow street and the roadside shops and markets, number of schools, college and offices draw unnecessary traffic and noise pollution. That's a serious negative point of Rampura.

4. CASE STUDY 2

Banasree:

Though Banasree area is built recently and planned. But it is not planned in a proper way in the sense of open space, park and playing facilities. As a residential area Banasree is growing very fast. Though most of the buildings are designed and built in keeping proper set back rules but still there is rules violation. That's why the apartments facing roadside gets some natural light but the others lack of proper sunlight throughout the day. For that people living in that apartments need to keep the light on. Same thing about the ventilation.

As a promising community there are a notable number of schools, colleges, medical centers, restaurants, food and shops outlets, etc. in Banasree. People from the surrounding communities come here frequently and that creates traffic congestion. Though the internal roads are quite spacious and road network is satisfactory but the traffic abrasion and lack of walkways create risks of accidents.



Map 2.1: Satellite image of Banasree (2001)



Map 2.2: Satellite image of Banasree (2020)

In this total area there is no designed open outdoor gathering space like play field, park or any other open space. Previously there were vacant residential plots so children used to play there and they worked also as social gathering space for people for that the lack of open space were not prominent in the early time. But in recent time the population density is growing rapidly in Banasree. Just 20 year back almost all the plots were vacant and now in 2020 rarely there is any vacant plot. The children has no place to play except the garage or the play zones in the restaurant. Some play in the roads but that is very risky. There is no space for a walk for the senior citizens, no open space to stroll and interact. It has totally become a concrete jungle. Now the need for open outdoor space has become acute.

The waste and water disposal system is quite well. There are good community services. But the lack of open space turned the area fictitious.

In recent time the plot owners more concern about getting highest room of usable space than a good quality comfortable space. So the houses are growing without keeping in mind about the environment and indoor interaction spaces. That turns the area into discomfort and chaos in the long run. Same thing happened in Banasree. Though it is a planned area but it fulfill only the basic living criteria. But living with comfort is very important that depends on the sensitive community and city planning.

5. CASE STUDY 3

Dhanmondi:

“Dhanmondi was initially designed as a low-density posh residential area for high-income and higher-middle income groups in the early 1950s. Dhanmondi, with an area of 473 acres and having about 1000 highly serviced plots, is located 5 km. away from the city center. It was one of the first planned residential communities in Dhaka. Dhanmondi is basically laid out on a gridiron pattern and consists of rectangular plots (144,000 sft.). Three types of streets (30 meter, 15 meter and 10-15 meter), having sidewalks, are provided in Dhanmondi.” [Hafiz 2004]

“An existing lake breaks the monotonous layout of Dhanmondi, gives it a character. Initially the need for community facilities was totally ignored. There was only one school and one mosque within Dhanmondi. Gradual invasion of non-residential uses has drastically affected the quality and changed the character of Dhanmondi” [Hafiz 2004]



Map 2.1: Satellite image of Dhanmondi (2001)



Map 2.1: Satellite image of Dhanmondi (2001)

Dhanmondi as an elegant location has always attracted the prosperous residents in the race of rapid urbanization and high demand for housing. The problems seen in Rampura because of haphazard development are also apparent in Dhanmondi. Because of the concentrated development it has reformed into a compact phenomenon and explosion of built structures from a planned low-density, low-rise residential area

Two highways run through this residential area that creates unwanted traffic into the community. In 2004, there were about 89 schools, colleges and universities, 88 medical centers and hospitals and about 108 offices within Dhanmondi. The number is increasing day by day. Dhanmondi Lake is now one of the utmost community interaction space for the city dwellers. There are also a huge number of restaurants, medical centers, community centers, beauty parlors, etc. People from the whole city of Dhaka gather to enjoy all these facilities creating unwanted crowd. The expansion of heavy vehicles and threat of accidents within the area has destroyed the calmness and peace of Dhanmondi. Within a larger housing area the high-rises have become small islands of group housing. Without taking into account the consequences of the problems the concerned authority allowed tall commercial building in this residential areas. That results various problems in the area. Along with the traffic congestion the tall building besides the roadsides also creates other problems to other buildings. The smaller buildings don't get enough sunlight due to the shadow created by the tall buildings, natural light and air flow also obstructed and privacy is hampered as well. Lack of quality open spaces and indoor outdoor quality spaces in residential area results low-interaction or non-interaction of the residents with their neighbors.

Students of different institutions and young generation chitchat on the streets or stairs of different shopping malls now a days. A lots of road side food carts also stand in many places. Though that is a lively medium of interaction but that creates chaos for the pedestrian. If it was well planned the street life could be very vibrant.

6. Comparison and Analysis:

This segment shows a comparative study and investigation of the quality of different spaces in the three housing communities and the level of comfort appreciated by the inhabitants of respective communities (see Table 1 and Table 2).

Table -1: A Comparison of Three Communities

Community Indicators	Rampura (18 respondents)		Dhanmondi (16 respondents)		Banasree (22 respondents)	
	Previous	Present	Previous	Present	Previous	Present
Basic Area Planning and Site	Unplanned + Satisfactory* (94.4%)	Unplanned + Unsatisfactory (98%)	Well-planned + Satisfactory (100%)	Well-planned + Moderately Satisfactory (45%)	Moderately planned + Satisfactory* (72.7%)	Moderately planned + Unsatisfactory (72.7%)
Individual Building Design	Bad Design (88%)	Moderate Design (97.5%)	Moderate Design (86.5%)	Good Design (95%)	Bad Design (63.6%)	Moderate Design (63.6%)
Set-back rules	Ignored (94.4%)	Ignored (over 50%)	Taken care of (53 %)	Taken care of (83 %)	Ignored (over 81%)	Taken care of (54.5%)
Population Density	Low	Extremely High	Low	High	Low	High
Road Network	Unsatisfactory	Moderately Unsatisfactory	Moderately Satisfactory	Moderately Satisfactory	Moderately Satisfactory	Satisfactory
Temperature in Summer (Outdoor)	Comfortable (61%)	Uncomfortable (100%)	Comfortable (95%)	Uncomfortable (100%)	Comfortable (63.6%)	Uncomfortable (88%)
Water Features (ponds, lakes, etc.)	Present	Present	Present	Present	Present	Present
Drainage System	Severe water logging	Moderate water logging	Moderate water logging	Severe water logging	Moderate water logging	No water logging

Source: Community Survey, September 2020

Table -2: Quality of Spaces Studying and analyzing in the Three Communities

Community	Rampura (18 respondents)		Dhanmondi (16 respondents)		Banasree (22 respondents)	
	Previous	Present	Previous	Present	Previous	Present
Internal Space availability and design	Moderately-planned + Satisfactory* (61%)	Unplanned + Unsatisfactory (77%)	Well-planned + Satisfactory (96.5%)	Moderately-planned + Satisfactory (70%)	Unplanned + Satisfactory* (100%)	Unplanned + Unsatisfactory (88%)
Need of Artificial Lighting	Only at night (98%)	Only at night (77%)	Only at night (+90%)	Throughout the day (+ 60%)	Only at night (+85%)	Throughout the day (60%)
Need of artificial Ventilation System	Ceiling fan in summer (77%)	Ceiling fan, Air cooler, Exhaust in summer (83.3%)	Ceiling fan in summer (93.3%)	Ceiling fan, Air cooler, Exhaust in summer (+96.6%)	Ceiling fan in summer (50%)	Ceiling fan, Air cooler, Exhaust in summer (+68%)
Privacy and Comfort	Satisfactory (67%)	Highly unsatisfactory (38.8%)	Satisfactory (75%)	Unsatisfactory (+48%)	Moderately satisfactory (38.8%)	Unsatisfactory (+63%)
Interactions with Neighbors	Satisfactory (95%)	Non-existent (+80%)	Satisfactory (85%)	Moderately Satisfactory (50%)	Satisfactory (50%)	Moderately Satisfactory (50%)
Social Interactions	Satisfactory (95%)	Moderately Satisfactory (61%)	Satisfactory (85%)	Moderately Satisfactory (48.8%)	Satisfactory (83%)	Moderately Satisfactory (45%)
Services:						
Water supply	Unsatisfactory (77%)	Satisfactory (77%)	Satisfactory (87.5%)	Satisfactory (75%)	Satisfactory (59.5%)	Satisfactory (77%)
Electricity	Satisfactory (66.6%)	Satisfactory (88.8%)	Satisfactory (75%)	Satisfactory (100%)	Satisfactory (54.5%)	Satisfactory (81.88%)
Waste disposal	Unsatisfactory (83.3%)	Satisfactory (61.1%)	Satisfactory (56.25%)	Satisfactory (68.75%)	Satisfactory (59.5%)	Satisfactory (72.3%)

Source: Community Survey, September 2020

7. Planning and Design

Dhanmondi and Banasree are quite well planned residential communities and at early times they were comfortable for the residents. After rapid growth in population density the comfort almost disappeared. In Dhanmondi the difference between the lake side area and other area is highly notable in the sense of comfort and activity. There are some buildings in Dhanmondi with good indoor spaces and other criteria. They show how design and planning impact on people's comfort. But in overall Dhanmondi this disappeared. Banasree is a bad example of planned community. It shows how a completely planned area can fail becoming a good space to live. That's totally planning failure. Mere good services and infrastructure cannot be successful without good quality designed space. The unplanned nature of Rampura is almost impossible to be repaired through restructure or redevelopment. Complications of indoor outdoor space relationship, social interaction, privacy, thermal comfort etc. have worsened with increasing number of people coming in to live there.

Spaces for social interactions and outdoor activities whereas has disappeared in these areas. Sense of belonging is almost not evident in majority of the residents of Rampura and Banasree because of the invasion of outsiders to these communities. The old "Para", "Mahalla" matters, the social interaction is diminished almost. "The very name of Dhanmondi still conjures the image of a posh residential that is why outsiders are still attracted to it."(Rahman 93)

In between these three communities the few areas and buildings that are architecturally well-designed and well organized have been able to solve some of the physical, social and cultural problem but these types are not prominent. All three communities have rather separate residents from their natural environment and segregated them from interacting with their neighbors. Ceiling fans, air-conditioners, and other devices need to take care of the high temperature, precipitation and humidity. If there were enough vegetation and open spaces these problems would be solved numerously. Bansree and Rampura has tended to produce trapped heated spaces among the buildings. It is tended to

overlook the factors of thermal comfort, privacy in designing and locating new buildings.

8. CONCLUSIONS

If urban planning and design aim at improving the quality of space in order to improve the living environment of the people, then urban planning as such do not exist in Bangladesh or anywhere in Dhaka (Hafiz, 2000).

Our analysis and finding several problems in the communities also proves above statement. Plot division and design for that individual plots has become now the main concern of urban planning without taking care of the surroundings, environment, micro climate not even thinking of the comfort and necessity of the dwellers. To be more specific, the main problems are rapid increase in density, scorching heat in summer, lack of open space and vegetation, lack of privacy even proper service facilities etc. but while planning for broader aspect concerned individuals should be more careful about these. From the above study it can be stated that the decision and policy makers' planner and architects need to think more deeply about- Basic planning of total area, individual plot and building design for making better indoor space, proper set back and planning rules and Floor Area Ratio (FAR), other rules attributed by concerned authority; preserving existing natural heritage, open space, water bodies, vegetation and designing more open spaces for contributing to the microclimate also for creating more vibrant social interaction space; energy and environmental issues, climate change, natural calamity risk factors and plan according to the need and proper implementation afterwards. The each and every factor is very important for creating a comfortable, dweller friendly city. While designing a single plot relationship with the surrounded plots is needed along with the community and the city as well. And a particular community need to unite with other communities. In one hand the city should be designed in way that creates a sense of belongingness to its dwellers and on the other hand it's the dwellers duty to have a close connection and interaction with the community they belong. The total process is vice versa. In Bangladesh different rules have been attributed but the proper implementation is needed. When the planning will be considering the comfort of the users and improving the quality of indoor outdoor spaces along with other important factors the city will be more inhabitable.

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