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Urban Densification and Social Sustainability: A Case Study of Dhaka

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Abstract- Dhaka is regarded as a thriving megacity of South Asia. The key challenges that the bustling hub is confronted with are land scarcity and the growing population. With limited land supply, the city is copping to accommodate its ever-growing population through two development strategies, namely densification and vertical expansion. Densification is regarded as an effective tool in guiding the urbanization process, while vertical expansion can be considered as a complementary part of this strategy. When it comes to application in an urban environment as a strategy, the subjective attributes of density need to be taken into consideration along with its objective aspects. As the concept of crowdedness differs generally among people belonging to different cultures, statuses, ethnicity, and geographic location, the livable density standard is also supposed to vary accordingly. The concept of habitable density for any community is profoundly related to the various aspects of social sustainability. Since densification has been taking place in Dhaka without any guidelines, the livability conditions with regards to the social sustainability of the city dwellers are largely compromised. Therefore, there is an urgent need to assess the sustainability of the residential areas of Dhaka, which have been developing as a by-product of the unguided densification process taking place over the recent decades.

Keywords: *densification, social sustainability, megacity, density.*

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URBANDENSIFICATIONANDSOCIALSUSTAINABILITYACASESTUDYOFDHAKA

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Keywords: densification, social sustainability, megacity, density.

I. Introduction

Since the inception of Dhaka as a small trade center at the bank of river Buriganga, the city has undergone various stages of expansion under the different ruling regimes over the past 400 years. Reaching its spatial limits on the three sides due to topographical constraints, the city at present is left with the option of expanding northwards only. But the further expansion of the metropolis is not deemed feasible given the required infrastructure cost and loss of valuable agricultural land. Therefore, densification through vertical extension seemed to be a more practical solution to address the problem. Consequently, densification started in the mid-90s and gained momentum over the subsequent decades, eventually turning the residential areas into a jungle of high-rise buildings. Two distinctive land-use patterns govern the urban planning of Dhaka identified through the road network system. The land-use planning of Old Dhaka around the historic core was based on organically developed road network system comprising of an array of narrow lanes. In contrast, a regular grid iron pattern of road layout dominates in the planning of New Dhaka. Densification has not only resulted into a change in the urban fabric of these areas but also has a significant impact on the factors of social sustainability of these residential areas.

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II. Methodology

The paper examines the effects of the ongoing densification process on the social sustainability of the residential areas of Dhaka Megacity. Seven *wards* (municipal administrative units) were selected as study areas based on varied density profile, built form type and settlement age where ward, 77 and 78 (Luxmi Bazaar and Wari) house the oldest residential areas, ward no. 49, 19 and 18 (Dhanmondi, Banani and Gulshan) represents new residential areas and ward no. 1 and 6 (Pallabi, and Uttara) are among the more recently developed residential areas. This study attempts to assess the social sustainability of these residential areas by examining six selected aspects which include community facilities, amount of living space, health problems, community stability, social cohesion, and sense of safety. The analysis is carried out in two phases. The first phase contains the analysis of residents' perceptions about the prevailing density and the selected aspects pertinent to social sustainability through assessing the responses from the questionnaire survey and corroborating them with the informal qualitative interviews of the residents. The second phase examines the correlation between density attributes (physical and perceived) and sustainability aspects based on the residents' satisfaction level of the selected aspects of social sustainability. Depending on the limitation of availability of ready data Gross population density of study wards has been selected for assessing the physical density attributes. Perceived density is assessed from two levels which are perception about neighborhood density and perception about dwelling density. Extensive field survey, qualitive interviews with the residents and questionnaire survey provided the primary data for analysis while secondary data were accumulated from various published literature, government records, and archives. Base maps of the study areas and other spatial data were collected from RAJUK, PWD, Dhaka North and South

City Corporations. Since the research deals with many variables, only the most relevant ones were selected for the correlation analysis. These findings are then interpreted in detail with their theoretical underpinnings to provide an insight into the consequences of the ongoing densification process in the residential areas of Dhaka, that might serve as a guide for formulating contextualized density standards and effective policies of densification in the future.

III. Exploring the Aspects of Social Sustainability

The social sustainability of the study areas is evaluated through six selected aspects of social sustainability (community facilities, amount of living space, health problems, community stability and social cohesion, and sense of safety), and residents' perceptions regarding these issues are explored in the following:

a) *Accessibility to community facilities*

Ensuring access to community facilities is a key factor in the development of socially sustainable communities. Providing these facilities at a local level, in convenient locations, increases their accessibility for users and reduces the need to travel. These facilities further raise the quality of life by creating community cohesion, reducing isolation, reducing fear of crime, and creating opportunities for information sharing and participation in a community activity.

i. *Provision of community facilities*

The existing literature revealed that there has been a shortfall of community facilities in the residential areas from the beginning as the need assessment for social infrastructure was based on the anticipated population growth and did not take into account the flux of immigrating population who came after Independence in 1971. In the absence of proper community facility management and planning instruments, the authority tried to solve the rising crisis by allowing community services to develop with response to demand. Later the plots along both sides of the major thoroughfares were permitted for development as commercial strips. The standards for various community facilities provided in UAP and DAP state only the number and space requirement but do not suggest any guidelines regarding their appropriate locational criteria. Taking advantage of the loopholes in standards and also lax development control measures, the community facilities were not constrained within the commercial strips but started proliferating haphazardly within the residential area itself. This trend of sporadic proliferation of community facilities is taking place regardless of the optimum location, actual demand assessment, and compatibility of the built structure in terms of design and environmental concern. The consequences of such development trend are evident through the over-provision and under-provision of necessary community facilities in the planned and unplanned residential areas of Dhaka.

At present, the spontaneously developed planned residential areas of new Dhaka covers a diverse range of services and activities, including local corner shops, convenience stores, boutique shops, shopping malls, clinics, hospitals, diagnostic centers, GP chambers, schools, colleges, universities, banks, mosques, gymnasiums, community centers, etc. From the survey, it was found that the planned residential areas of new Dhaka (Dhanmondi, Banani, Gulshan, Pallabi, and Uttara) have more than the required number of some selected community facilities such as educational, shopping and healthcare facilities. The number of existing educational and healthcare facilities in the planned residential areas is multiple times greater than the actual requirement in compliance with planning standards. The situation is particularly alarming in the case of Dhanmondi and Banani, where there are 66 schools, 15 colleges, 16 universities, and 53 hospitals in Dhanmondi. At the same time, Banani houses nine universities and numerous primary and secondary schools (Field survey, 2016). Besides this, there are 192 other commercial uses like shopping centers, banks, offices of various organizations in Dhanmondi. DAP prescribes one primary school (1 acre) for a 15000 population and one secondary school (1 acre) for a 23000 population and other facilities on a ward basis requirement.

Except for the few public schools and colleges, most of the existing schools are of private ownership and accommodated in rental multi-storied residential buildings that were neither designed to serve the current purposes nor comply with the required space standards of the facility. Nevertheless, the vast number of educational, healthcare, and other commercial institutions of these residential areas is not only catering to the needs of the neighborhood itself but also the city as a whole (Nancy, 2004). A similar development pattern seems to be occurring in Uttara too. To meet the changing needs initiated by the incoming population, the number of private schools, colleges have increased noticeably within the last seven years in Uttara, that are at present serving mostly the neighborhood needs. Some of these private schools are newly designed buildings that comply with the space standards set for schools. But the universities located here are largely on rental accommodation with no campus and are catering to students from all over the city. The number of private and public schools in Pallabi has not still exceeded the demand of the residential area, but most of them are housed in multi-storied buildings not appropriate to work as educational institutions.

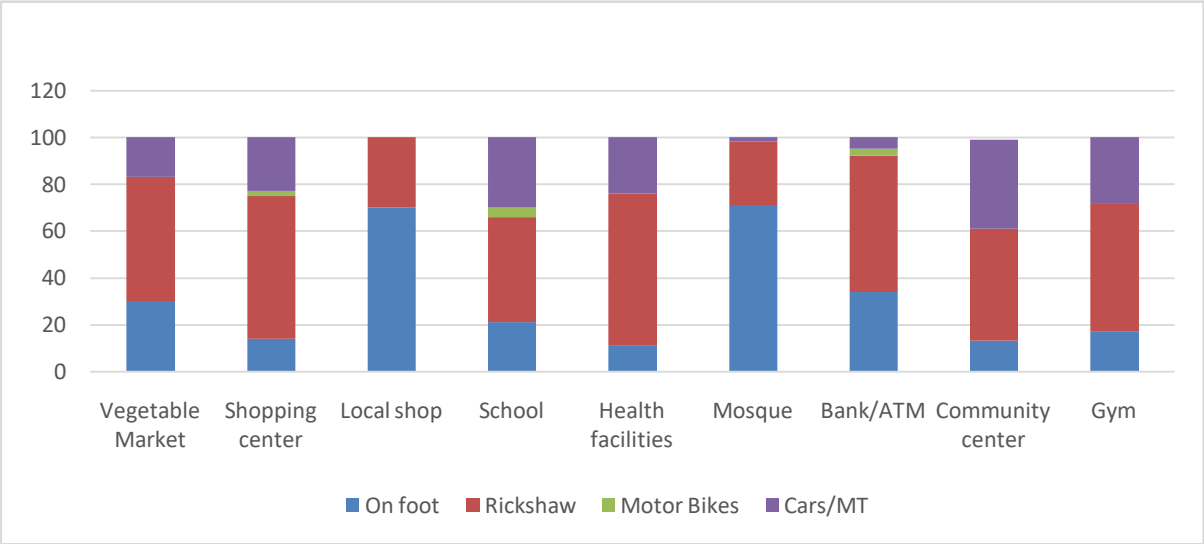
In the case of the old Dhaka, Luxmi Bazaar has more than 11 schools (primary and secondary) of a

reasonably good educational standard within the neighborhood along with colleges and a university located within a 1 km radius of the residential area. Around 70% of the school-going children of this ward travel on foot to reach school, which takes only 5-10 minutes, while the rest uses rickshaw. However, in the planned area of Wari, there is an insufficient provision of primary and secondary schools within the ward itself, and children of the affluent class of this area usually study in the English medium schools beyond their neighborhood precinct, particularly in Motijheel and Dhanmondi, which take about 10- 20 minutes to reach by car. The provision of educational institutions in Old Dhaka meets the standard prescribed in the Dhaka Metropolitan Development Plan (DMDP) in terms of number and space requirement except in Wari. The shopping facilities of the residential areas of Old Dhaka (Wari and Luxmi Bazaar) seems to be adequate in terms of number and scale appropriate to neighborhood requirement. The Luxmi Bazaar, which used to be the Mughal trade center since antiquity continues to function the same. However, the marketplace has evolved and adapted to the needs of the age by accommodating modern chain stores, fast food shops, and small-scale retail markets for clothes and electronic gadgets serving the surrounding middle-class residential areas. A similar transformation has also taken place in Wari, where continuous shopping strips mainly of retail shops, convenience, and chain superstores have formed along the main arterial road (*Rankin street*). In response to the ever-changing consumer trends and demands, the traditional neighborhood grocery and other retail shops of this area have been replaced by the market-driven retail chain stores offering a wide range of goods and services congenial to the modern lifestyle of the residents.

From the survey, it was found that there is a general shortage of authorized municipal *kutcha bazaars* (kitchen market) in both the planned and unplanned residential areas of Dhaka, which led to the set up of unauthorized kutcha bazaars in different locations of the study wards. For instance, due to the absence of authorized *kutcha bazaars* in Dhanmondi, a large portion of the residents has to rely on the roadside unauthorized kitchen markets and push-cart vendors while others travel to the nearby neighborhoods (Jigatola, Rayerbazaar, and Mohammapur) for their daily supply of grocery. The condition of the unauthorized make-shift *kutcha bazaars* is very poor in terms of lack of cleanliness, garbage disposal facilities, drainage provision, toilets, and parking facilities. Furthermore, they cause traffic congestion through illegal encroachment of the road. Currently, the nearest chain superstores have become popular alternative sources for meeting the daily grocery demand. In the case of Wari, there are two big kitchen markets (*Thathari Bazaar* and *Kaptan Bazaar*) within a 5-10 minute distance by rickshaw also with the chain superstores serving the area well. However, the provision of religious structures is adequate where all the study areas have at least one or two mosques within a radius of a quarter to a half-mile from any point within the residential area.

ii. *Accessibility to community facilities in terms of distance*

The intertwined network of roads and *chawks* (nodes) of the traditional neighborhoods attributed to the development of community facilities within the walking radius. According to the response of 52% of the old Dhaka residents, most of the basic facilities can be accessed within less than a 5-minute walk. The nearest available facilities are the local shops located within a walking distance of less than a 5-minutes. In the case of the residential areas of new Dhaka, most of the educational, health, and shopping facilities are located within 5-10 minutes, and facilities like community centers and gymnasiums are located far beyond 10 minutes walking distance, according to 55% of respondents. Similar conditions were observed in Wari with an exception in the provision of an adequate number of schools. Due to this inadequacy, most inhabitants have to send their children to the English Medium Schools of Dhanmondi by car (33%) and rickshaw. On the other hand, in Dhanmondi, Banani, and Gulshan, except for local shops and mosques, other community facilities are located beyond 10 minutes of walking distance. Uttara and Pallabi also have the majority of the community facilities within 11-20 minutes of walking distance. The survey findings indicate that most of the community facilities are located within 5-10 minutes and are availed by both rickshaws and on foot. Facilities like local shops and mosques, which are less than 5 minutes away, are accessed on foot. But schools and health facilities when located within 11-20 minutes distance then around 24-30% residents use cars. The usage of cars are for reaching the school is relatively higher in Dhanmondi, Banani, Gulshan, and Uttara, where most people drop their children at school on their way to work. On the other hand, nearly 40% of the residents of Luxmi Bazaar travel on foot to avail of these facilities while the rest 60% uses rickshaws or motorbikes. The 70% of residents of Wari find a rickshaw to be an easier and quicker mode of travel to reach destinations of 11-20 minutes and above 20 minutes while around 30% rely on their cars.



Source: Field Survey, 2015

Chart 1: Mode of travel used by the respondents to reach the community facilities

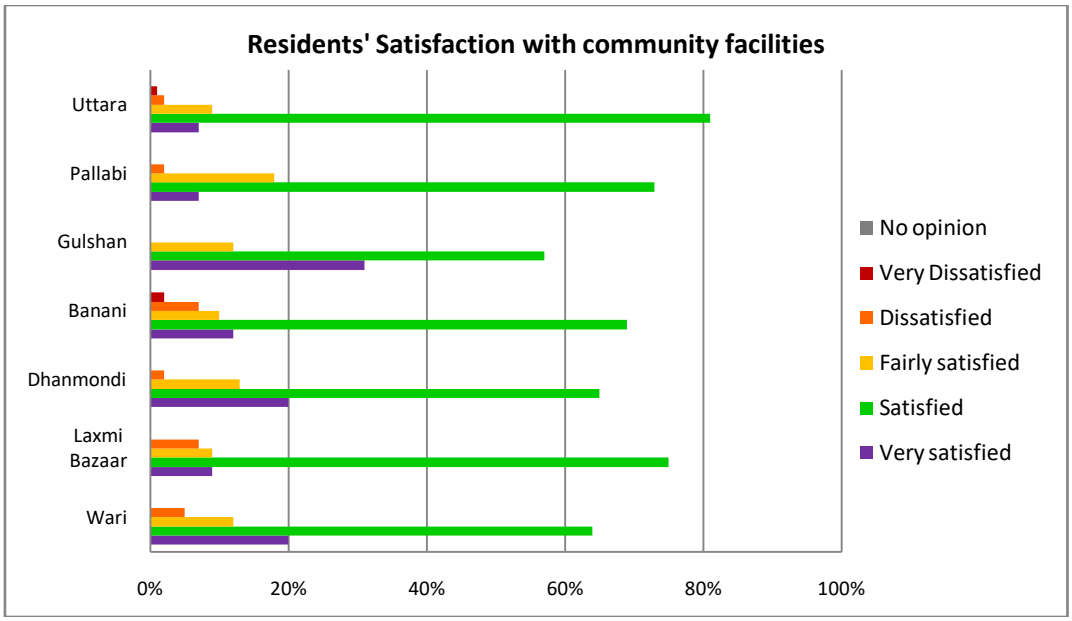
iii. *Residents' Satisfaction with community facilities*

As most of these planned residential areas were initially designed without consideration of proper community facility planning, the later provision of these supporting facilities sprang up from demand and helped to enhance the livability of these neighborhoods. This explains the residents' high satisfaction level regarding community facilities, but at the same time, residents have shown high discontent towards the resultant traffic situation as expressed by the residents -

"I have been living in Dhanmondi since 1981. Earlier, the area was more quiet and serene, but there was a lack of shops except for a handful of local grocery shops on some of the street corners. We used to do most of our shopping from Newmarket. The situation is quite different now where everything from daily food articles to luxurious commodities is available in the area and, is a privilege. But though there is a range of commercial facilities close around due to the traffic jam, which is almost always prevalent in the main roads it takes an unnecessarily long time to reach any of these shopping centers or restaurants even by rickshaw. The situation is even worse if I decide to go by car as the lack of parking is another problem with these shopping centers and restaurants. So even though I wish to go out with my family for recreation in the evening, I don't feel like going when I think of the traffic. This condition is very disgusting and unacceptable." (Interview with a female bank employee, October 2015)

"My house is in Dhanmondi, and I work in both Gulshan and Dhanmondi LabAid hospital in the morning and evening shift, respectively. From my house, any of these two destinations should not take more than 10 to 20 minutes to reach by car. But every day I have to spend at least two hours or sometimes even more in the traffic congestion during the morning and evening peak hours which is simply unacceptable for me. I wonder how people would be traveling in this city after five years from now! "(Interview with a senior doctor, December 2015)

These frequent expressions of discontent from the residents indicate that though the current livability standards of the residential areas have enhanced with the over-provision of community facilities, particularly in the residential areas of New Dhaka.

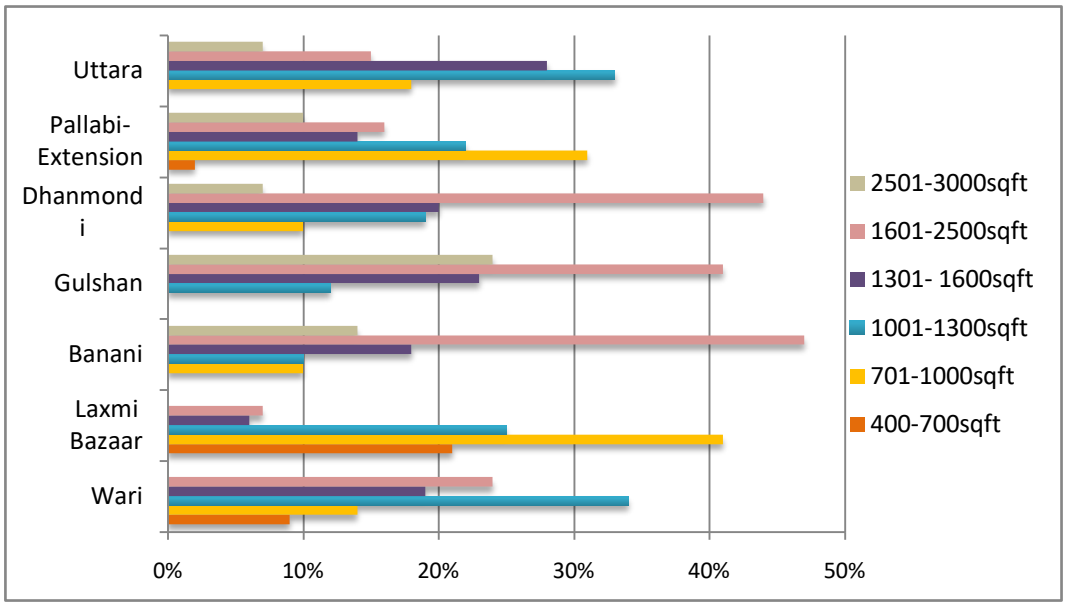


Source: Field Survey, 2015

Chart 2: Respondents' opinion about the satisfaction level of community facilities

b) Amount of living space

The amount of living space is assessed in terms of floor area per person and residents' satisfaction with the size of their dwelling. The former is a measure of the physical density and the latter one represents the residents' perception of density. The perceived density has been measured using three parameters, i.e. perceived neighborhood density, perceived density between building through setback space, and perceived density within the dwelling which provides an insight into the residents' perception of crowding. From the survey, it was found that the dwelling size of the old Dhaka are comparatively smaller than the ones of new Dhaka, where Luxmi Bazaar has the highest percentage (34%) of the lowest size dwellings (400-700 sq.ft.). These turn out to be the half-century-old 2-3 storied red brick buildings where the lower floors are mostly rented to the female college and university students. Maximum dwellings of Wari comprised newly constructed modern midrise (6–8 stories) buildings with apartments ranging between 1000-1600 sq.ft. The majority of the large size apartments (1601-2500 sq.ft. and 2500-3500 sq.ft.) are found in high-class residential areas of Banani (48% and 14%) and Gulshan (41% and 24%), respectively. The proportion of the largest apartments (2500-3500 sq.ft.) is highest in Gulshan. Dhanmondi and Uttara have a relatively high incidence of medium-sized flats (1000 – 1600 sq.ft.) while Pallabi has a moderate proportion of small, medium, and large size apartments with the highest number in the category of 701- 1000 sq.ft. This is because Pallabi is a middle and lower-middle-income residential area where smaller flats are in constant demand for affordable rent structure. Most of the landowners have redeveloped their original two-storied single houses into 6-10 storied houses for financial gain. Maximum plots of Dhanmondi, Uttara, and Pallabi range from 2340-3600 sq.ft. (3.25–5 *kathas*). Usually, the landowners occupy an entire floor for their own residency and subdivide the rest of the floors into economy-size apartments, which explain the existence of various sizes of apartments in these areas. The minimum floor area per person in old Dhaka, usually ranges from 80 sq.ft. to 140 sq.ft. while in new Dhaka the average floor area per person is 200–320 sq.ft.



Source: Field Survey, 2015

Chart 3: Size of flats of the respondents

The household income level also has a significant impact on the household densities as families with low income could only afford smaller dwellings in terms of rental or ownership purposes. A lack of affordability generally affects the amount of living space and results in less floor area per person and household crowding. In the case of Dhaka, less affordable housing and a smaller amount of living space are more an outcome of government policy and the highly active private sector, whose primary goal is to maximize profit rather than creating quality living spaces.

i. *Resident's perception of Density*

Though a large segment of residents of Luxmi Bazaar has the minimum floor space per person, their notion about crowdedness was not as anticipated. Nearly 91% of the inhabitants with an average family size of 1.5 members living in dwellings of 701-1000 sq. ft. find their dwelling size just adequate where only 5% feels it as a little bit crowded. This adaptation to lower floor space per person might be attributed partly to the years of residency of the inhabitants, where around 52% are the 3rd generation of the original inhabitants. The other 38 percentile are mainly the migrants of varied occupational groups (students, service holders) from all over the country who find this size of dwellings quite reasonable with their affordability. This could be a reason for a similar reaction towards dwelling size from this percentile. The average number of apartments in Wari is relatively larger than in Luxmi Bazaar, and around 65% of the inhabitants perceive their flats as fairly spacious. The majority of the residents from mid-density residential areas (Pallabi and Uttara) feel their dwelling size just adequate (49% and 67%) for their family, whereas a higher percentage of the inhabitants of low-density residential areas (Dhanmondi, Banani, and Gulshan) perceive their dwellings as fairly spacious as expected. As shown in the Table 2 there has been about 85% and 90% of the buildings violating the setback rules in Wari and Luxmi Bazaar respectively which contributes to the dense fabric of these residential areas even further. Despite the close juxtaposition of buildings, 46% of the residents of Wari feel that the setback space is okay, while 67% of inhabitants of Luxmi Bazaar have complained about lack of privacy. While there is a significant violation of setback rules in the study areas of New Dhaka too but on average, 52% of inhabitants feel that the setback space is okay.

Table 1: Respondents' perception about their dwelling size

Respondents' opinion about dwelling size				
Location	Fairly spacious	Just adequate	Little bit crowded	Too much crowded
Wari	**65**	31	4	-
Luxmi Bazaar	4	**91**	5	-
Dhanmondi	**56**	39	5	-
Banani	**58**	39	3	-
Gulshan	**77**	23	-	-
Pallabi	32	**51**	17	-
Uttara	31	**67**	2	-

The percentage is based on the number of responses.
Source: Field Survey, 2015

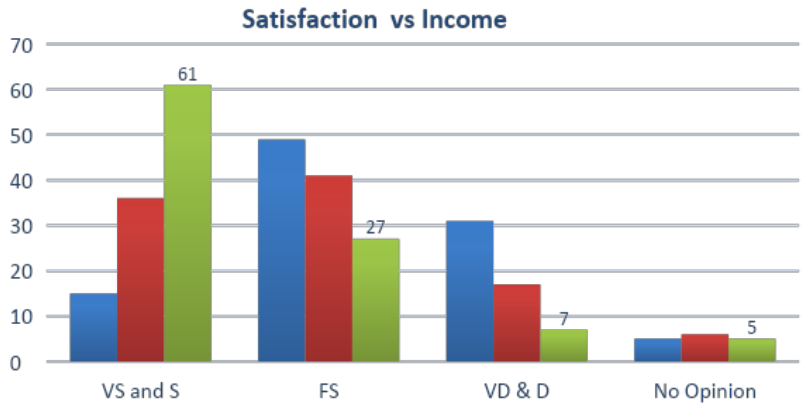


Chart 4: Satisfaction vs Income of the residents

Table 2: Violation of Rules

Sl No.	Thana	Violation of Rules		
		Building Height	Road Encroachment	Setback rules
1.	Luxmi Bazaar	68%	87%	90%
2.	Wari	65%	96%	85%
3.	Dhanmondi	12%	20%	31%
4.	Banani	14%	35%	42%
1.	Gulshan	16%	24%	33%
6.	Uttara	24%	56%	84%
7.	Pallabi	62%	98%	68%

Source: Field Survey 2015

Table 3: Respondents' opinion about setback space

(percentage)

Location	I feel it is okay	I have no problem with it	Hampers privacy	I do not like it at all	No opinion
Wari	46	22	26	4	2
Luxmi Bazaar	9	16	67	8	-
Dhanmondi	58	14	18	9	1
Banani	60	17	12	5	6
Gulshan	61	13	14	2	10
Pallabi	68	11	12	2	7
Uttara	61	18	12	4	5

The percentage is based on the number of responses.
Source: Field Survey, 2015

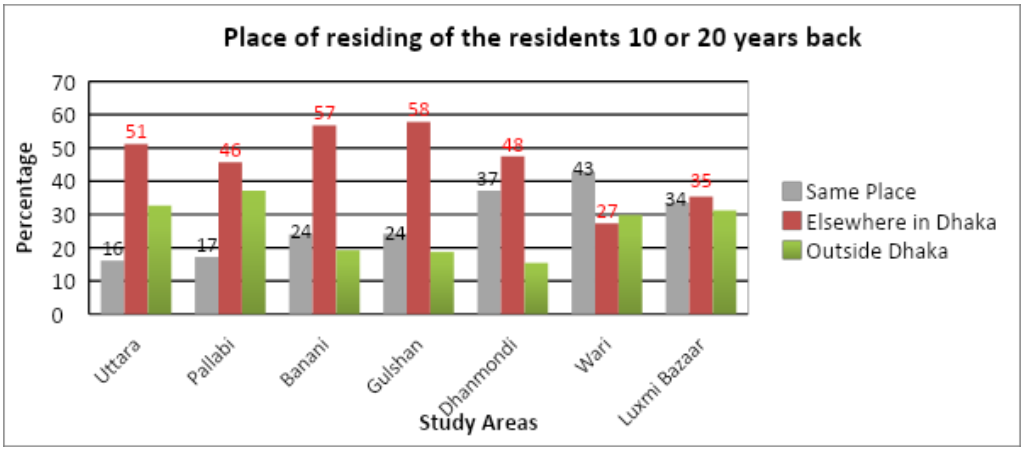
Around 46% of the inhabitants of Luxmi Bazaar do not like the neighborhood density, while 54% of the residents have expressed positive notions about the density. In Dhanmondi, Banani, Gulshan, Pallabi, and Uttara, around 36%, 31%, 44%, 57%, and 56% of inhabitants find the neighborhood density tolerable. Empirical observations found that most of the residents of the new residential areas are living in these areas for less than ten years except Luxmi Bazaar and Wari, where a significantly higher percentage of the residents are original inhabitants of the area (shown in Chart 5). The longer residency period of the inhabitants of old Dhaka could be a reason for higher acceptance of the neighborhood density as satisfactory. On the other hand, most of the newcomers of old Dhaka were found to be belonging to the migrating population from remote district towns and villages who took the transition from rural to urban settings as an up-gradation of lifestyle. This mindset might be partially responsible for the overall higher percentage of satisfaction level of the respondents. The observation also shows around 46–58 percent (Chart 5) of the residents of new residential areas have migrated from elsewhere in Dhaka in pursuit of better living standards, facilities, and social status. Therefore, an enhancement in the type and nature of their new habitat also seems somehow to meet their optimum level of expectation. This progress might be keeping their satisfaction level high despite the various problems associated with the built environment of the new residential areas.

Table 4: Respondents' opinion about the perception of neighborhood density

(percentage)

Location	I am fine with it	It is tolerable	I like it	I have no problem with it	I do not like it	It is intolerable	No opinion
Wari	38	49	-	9	-	-	4
Luxmi Bazaar	-	36	6	12	46	-	-
Dhanmondi	19	36	29	11	3	-	2
Banani	15	31	27	7	20	-	-
Gulshan	18	44	28	8	2	-	-
Pallabi	21	57	10	5	-	-	7
Uttara	27	56	11	6	-	-	-

The percentage is based on the number of responses.
Source: Field Survey, 2015



Source: Field Survey, 2015

Chart 5: Respondents' whereabouts 10 or 20 years back

c) Health of the Residents

According to the self-reported health problems of the survey, a significant number of household inhabitants from all the study areas have complained of at least one family member suffering from stress or pollution-related diseases. In the case of Wari, there is a higher incidence of asthama patients, while in Luxmi Bazaar, people have complained more about stress-related problems, particularly blood pressure. Among the stress-related problems patients, suffering from blood pressure (avg. 50%) and diabetes (avg. 18%) are significantly common in most of the households of the study areas. The majority of the stress-related patients belong to the age group of 20-45, comprising of primarily male and female earning members, housewives, and students. Although most households did not report obesity, the general observation suggested a different picture where a significant percentage of the young generation, especially the children, were found to be obese. The negative response is perhaps due to the unacceptability or reluctance of the parents to perceive their children as obese. Most of the parents of the obese children, when asked, acknowledged their children as healthy. However, obesity is more likely to be associated with the non-physical activities of children. Due to the lack of open space or playgrounds for physical activities, most of the children tend to spend their leisure time playing computer games or watching TV. The indulgence in virtual games rather than physical sports not only affects the physical health but also impedes the mental growth of the children by making them hypersensitive and self-centered. The second highest occurring disease to be reported is asthama, caused by air pollution from the emission of automobiles. Headache is the second most reported pollution-related health disorder among the inhabitants.

The catalyst of blood pressure is stress and anxiety. People of this city, in general, are undergoing an urban lifestyle that is very demanding and competitive, where stress and anxiety disorder has become inevitable. Within this context, if the built environment fails to provide a variety of ample open spaces that work as an antidote to stress, then that community becomes more prone to a stressful psychological state. The lack of sufficient breathing spaces, however, might explain the high incidence of blood pressure in the most unlikely age group (25 – 40 years) of the study areas. The high-

income group is more devoted to sedentary jobs and automobile-dependancy, contributing to more physical idleness, which is reflected by the increased number of heart disease and blood pressure patients in the high-income but low-density residential areas of Gulshan, Banani, and Dhanmondi, respectively. In Wari and Luxmi Bazaar, where inhabitants reported dissatisfaction towards the size of their dwelling, it can be said that perceived density, the crowding within the house seems to have some degree of a positive relationship with the stress-related health problems of the residents.

Table 5: Self-reported health-related problems of the residents

Location	Health-Related Problems						
	Stress-related diseases				Pollution related diseases		
	Heart disease %	Blood pressure %	Diabetes %	Obesity %	Headache %	Asthma %	Nausea %
Wari	5	55	38	2	12	72	16
Luxmi Bazaar	17	52	27	4	37	41	21
Dhanmondi	6	67	23	5	3	69	28
Banani	4	64	30	2	14	73	14
Gulshan	30	48	21	2	53	32	13
Pallabi	5	42	40	13	13	62	25
Uttara	29	36	18	4	63	24	13

The percentage is based on the number of responses.
Source: Field Survey, 2015

d) Community Stability and Social Cohesion

Community spirit and social cohesion is the fundamental building block of social sustainability. Globalization seems to play a defining role in the current lifestyle of the urbanites by making people increasingly technology-dependent and too much absorbed in the virtual world of digital media-based communication. The frequent and casual visits to relatives and neighbors are being replaced by pre-scheduled visits arranged by cell phone or text messaging. Nowadays, people are more eager to make new social contacts and maintain the established ones through social communication platforms like Facebook, Twitter, and Viber rather than relying on unplanned spontaneous informal meetings in public spaces. Their communication pattern has increasingly become more globally oriented rather than locally focused. This diversion of attention from the immediate neighbors and the neighborhood is the main barrier in forming social cohesion among modern urbanites. The virtual mode of contact speeds up communication but it cannot necessarily develop the social ties that used to be strengthened by the traditional form of informal chats frequently taking place in public places. Nevertheless, the design and accessibility to public spaces also play a crucial role in inviting people towards a more rewarding way of socializing and therefore assist in establishing community sustainability. The survey findings provide an insight into the communication pattern and the type of social cohesion existing in the study areas, which is shown in the Table below:

Table 6: Residents' opinion about the number of social contacts

Location	1- 5 neighbours	6 - 10 neighbours	11- 15 neighbours	Above 15 neighbours
Wari	8	44	31	17
Luxmi Bazaar	3	6	49	42
Dhanmondi	30	29	22	19
Banani	56	31	11	2
Gulshan	69	21	7	3
Pallabi	20	54	21	5
Uttara	65	18	10	7

The percentage is based on the number of responses.
Source: Field Survey, 2015

From Tables 5 and 6, it can be seen that residents of Old Dhaka, in general, maintains a high number of social acquaintances with their neighbors. In Luxmi Bazaar, around 80% of the inhabitants, reported the neighborhood to be very friendly, with 42% of the residents knowing more than 15 neighbors. This higher degree of social cohesion of the area still prevailing today may be attributed to the social and spatial configuration of its past legacy. As Luxmi Bazaar does not have any open space. The neighborhood streets, tea stalls, as well as street corners, traditionally served as places of socializing for the male. The traditional low-

height buildings with shop frontage created a continuous band of vibrant commercial activities flanking the narrow roads on both sides. This type of urbanization pattern contributed to forming the street façade and scale attractive for social gatherings. Women used to socialize with their neighbors from rooftops of their houses as the conservative Muslim and Hindu society of those days did not allow females to spend time outdoors. The close spacing of buildings with almost no setback rather aided in the communication of the women folks between households and nurture close ties with neighbors. This scenario is better expressed from the interview of a senior citizen –

"I have been living in Wari for over 48 years. When I was a girl, we used to play in the inner courtyard of our house with our neighbors' children. The houses were usually two-storied then. My mother and grandmother used to spend leisure time in this courtyard during the afternoon. Often the women folks of the adjacent household would go to their rooftop, and my mother used to converse with them from our courtyard. It was a nice friendly environment for the females. So the female folks did not essentially feel the need for any public open space for informal social interaction. But now, as my family has expanded, we have built this 8-storied building tearing down our anchestral home. The high-rise apartments do not offer that type of space or opportunity for social interaction. I feel pity for my grandchildren who cannot find suitable outdoor spaces for playing and, hence, have to spend most of their time in the confinement of home. "(Interview with a senior resident of Wari, November 2015)

It also somehow fostered a sense of security in the neighborhood through natural surveillance from the immediate neighbors of each household. The long-term residency of the inhabitants in Luxmi Baazar also helped in developing and maintaining this social capital. The respondents of Wari reported the neighborhood to be (57%) moderately friendly, with 44% of residents having 6-10 social contacts within the neighborhood. Despite being a locality of old Dhaka, there is a reduction in the number of social contacts in comparison with Luxmi Bazaar and, the neighborhood is also perceived as moderately friendly by the inhabitants. This anomaly could be partly to the fact that most of the lowrise structures of this posh neighborhood of the past are replaced by high-rise buildings attracting a huge inflow of migrants from all walks of life. The self-contained apartment culture is not conducive to fostering social contact between the new migrants and the native dwellers as it was before in the lowrise dwellings with few inhabitants. On the other hand, there is a class distinction and feeling of overcrowding which acts as a barrier in developing social contacts between the migrants and original dwellers, as pointed out by a resident of Wari -

"We have been living in Wari since our childhood. In those days, the area was remarkably clean, and we used to play in the streets and nearby vacant plots with the neighbours' children. Most of the people living here belonged to an elite social class, and there was a healthy relationship between the neighbors. But now most of the elders of those families have passed away, and most of their children have settled abroad or in other parts of the city giving their plots to the developer for constructing high-rise buildings which they have given on rent. As a result, the area is now crammed with too many people from different social backgrounds with whom you cannot easily mix. Moreover, there is no open space left where we can let our children play, which is depriving the new generation of developing the kind of bonding we used to share with our neighborhood children." (Interview with a resident of Wari, November 2015)

Table 7: Residents' responses regarding the frequency of social interaction

Location	Less than 5	5-10 times	10-15 times	15-20 times
Uttara	63	19	12	6
Mirpur	48	37	10	5
Dhanmondi	59	25	13	3
Banani	67	18	11	4
Gulshan	72	17	8	3
Wari	6	48	37	9
Luxmi Bazaar	-	43	41	16

The percentage is based on the number of responses.
Source: Field Survey, 2015

Though high density has a positive association with social interaction but the findings from Wari indicate that if people somehow feel crowded by the concentration, they tend to establish fewer social contacts (Table 6). On the other hand, the residential areas of new Dhaka with lower density show relatively smaller number of social connections. Most of the inhabitants have Dhanmondi, Banani, Gulshan, and Uttara seem to be known to 1-5 neighbors and perceives the neighborhood as moderately friendly. However, the number of social contacts, which is about 6-10 persons in Pallabi, is higher (64%) than the other study sample wards of Dhaka. Pallabi was designed as a middle-class residential area, and the new migrants of this area also predominantly belong to the middle or lower-middle-income class. People from similar income groups usually share the same values and social status and find it easier to interact with each other. The concentration of similar demographic trait is most likely a reason for developing of a comparatively higher

degree of social interaction in Pallabi than in other residential areas of new Dhaka.

Table 8: Perceived friendliness of the residential areas

Friendliness of the neighborhood			
Location	Not Friendly %	Moderately Friendly %	Very Friendly %
Wari	3	57	37
Luxmi Bazaar	3	17	80
Dhanmondi	4	79	17
Banani	12	69	19
Gulshan	11	81	8
Pallabi	5	64	31
Uttara	9	72	19

The percentage is based on the number of responses.
Source: Field Survey, 2015

Overall, the survey reveals that social capital is more prevalent in the high-density residential areas rather than the low-density residential areas of Dhaka. People living in older neighborhoods with higher site coverage (90% - 100%), such as Wari and Luxmi Bazaar, have a higher number of social contacts within the neighborhoods. On the other hand, in new neighborhoods in residential areas like Dhanmondi, Gulshan, Banani, Pallabi, and Uttara, the number of social interactions is comparatively fewer. Although the result from the correlation test between density and social cohesion indicated positive relation, in reality, it would not be appropriate to attribute the development of social capital to density alone. Built form, design, and provision of public spaces have a strong association with this aspect, as it was found that there was less informal chatting with neighbors in high-rise apartments than in lowrise dwellings. Again, it was also found that despite having high density, there is a considerable reduction in the possibility of a desirable amount of social interaction when the neighborhood is perceived as crowded by its inhabitants. The perception of crowding, therefore, leads to reduced community spirit and social cohesion. This scenario was evident in the blocks with a relatively higher number of high-rise buildings (10-14 storied). Moreover, the notion of class distinction and social status has also been found to be a factor impeding the development of social cohesion in the apartment culture.

Socio-demographic variables such as the number of years of residing in the same neighborhood were found to have a strong positive correlation with the number of social contacts and the amount of informal chatting that residents had within the neighborhood, as evident in Luxmi Bazaar. The research had similar findings with the studies of Bonnes et al. (1991), who observed that the length of time residing in a place has a greater effect on the resident's perception of spatial density than physical density. They also found that with the increase in the duration of residence, the inhabitants become more satisfied with the physic-static spatial density aspects of their residential area. This research found similar observations.

It is worthy to note that among the families living in the residential area for more than 20 years, only the senior-most member claimed to have known more than 15 neighbors. The younger members of these families are mostly acquainted with 6-10 neighbors. Due to the frequent arrival and departure of many new migrants, even the families with 20 years of residency is not able to maintain as many contacts as they used to in the past, as expressed by a senior resident of Dhanmondi –

> *"I came to live in Dhanmondi in 1974 after my marriage. Since then, I have been living here with my family. We were familiar to most of the neighbors along our street at that time as there were only a handful of 1-2 storied houses with few families in our street block. Now, most of those old houses are replaced with high-rise buildings with many new families, new faces. Most of our earlier neighbors had either shifted with their adult children to other places or had passed away. So now, after being in this place for around 41 years, I do not know most of our new neighbors". (Interview with a senior resident of Dhanmondi, December 2015)*

It was also found that family income plays a crucial role in social interaction and community cohesion. Households with lower family incomes had fewer social contacts within the neighborhood. In comparison, while families with higher incomes and living in high-rise apartments had less informal chatting and were perceived as less friendly.

Participation in community events

Community events in the study areas mainly included various religious, national, and seasonal festivals like Milad Mehfils, Handicraft fairs, Durga Puja, Pohela Boishak, Pohela Falgun, Choitro Shronkanti, Ekhushey February (Language Martyrs' Day), Bijoy Dibosh (Victory Day), and local fairs of handicrafts, etc. Besides this, sports tournaments are organized periodically by the local sports clubs, but access and participation in these events are exclusively limited to the members. According to the self-reported statistics of the respondents' involvement in the community events was

found moderate in the study areas. The key reasons for the less engagement in community events were reported to be lack of time and the improper organization of these events. The lack of suitable open and community spaces was also another vital reason. For instance, in Dhanmondi, other than the Rabindra Shorobor and lakeside park, there is no designed open space for community activities in the locality. Most of the existing playfields are illegally occupied by influential sports clubs and, therefore, not available for the residents. Apart from the national and religious festivals, there is a lack of social activities focusing on leisure and craft-related activities, which also positively affects the participation of the residents.

e) *Sense of safety*

The findings of this research illustrated that the residential areas with high gross population density had a positive relationship with the sense of safety, which indicating a low incidence of crime. In contrast, perceived densities are found to have significant negative associations with indicators of the sense of safety. The high level of safety was also affirmed by the interview of the residents of the dense settlement of Luxmi Bazaar and Wari –

> *"We do not usually have any incident of mugging or theft because the thief or mugger is certain to get caught while he tries to run away through the alleys of our neighborhood. There is a substantial presence of people in the alleys most of the time, and the local shopkeepers of the neighborhood grocery and corner shops also keep a good eye on the strangers." (interview with a resident senior government official of Luxmi Bazaar, January 2016)*

> *"I cannot recall any incident of mugging or theft in my neighborhood since I am living here. We feel very safe in that regard. Moreover, there is the "Muchi Potti"* (cobblers' lane) *just beside my house where the cobblers' families have been living. Though they have their single-storied houses along the lane, they use the lane for cooking, gossiping, playing, and usually, the male members sleep in the open alley at night. For their constant presence, we feel extra safe both at night and daytime because no thief or mugger can get past them without being caught." (interview with a housewife of Wari, January 2016)*

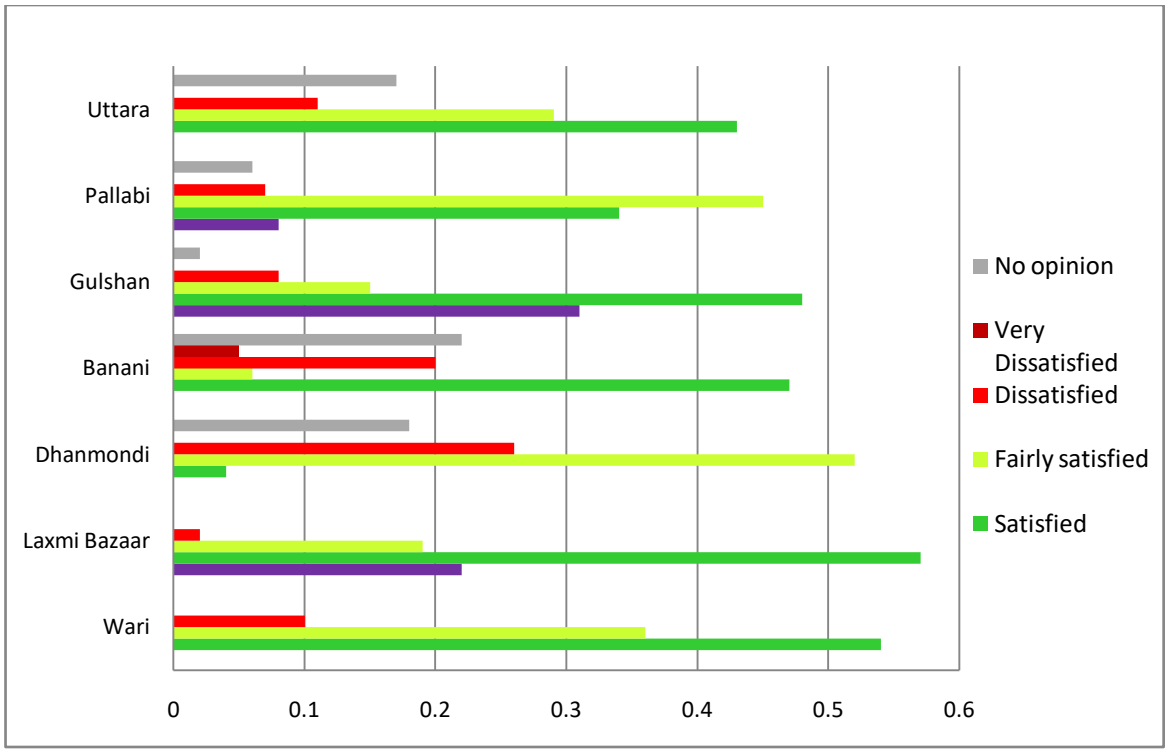
Table 9: Perception of safety by respondents during day and night-time

Time	Uttara	Pallabi	Dhanmondi	Banani	Gulshan	Wari	Luxmi Bazaar
Day time	83	79	87	86	85	91.7	98.1
Night	78	64	72	77	79	92	94.7

The percentage is based on the number of responses.
Source: Field Survey, 2015

The inhabitants of new Dhaka feel relatively less safe both during the day and night-time than the residents of old Dhaka. The existence of gated communities was found more predominant in the study residential areas of new Dhaka (Uttara and Pallabi), where the gates of each neighborhood remain closed during late night. In the residential areas of new Dhaka, the level of street crimes is higher due to the various characteristics of the residential areas. For instance, in Banani and Gulshan, the presence of many banks and posh shopping malls ensures more money transactions which makes these places much targeted for hijacking and mugging. On the other, hand the lack of convenient stores and street activities makes them vulnerable to street crime. Inhabitants refrain from using the parks during the night for the presence of drug abusers. While Uttara and Pallabi both are gated communities, the security of Banani, Gulshan and Dhanmondi largely owes to the presence of security guards in each house and police check posts. However, the crime data indicate a higher incidence of homicides in the new residential areas usually occurring indoors. This intensity of crimes might be attributed to the design of the high-rise apartment buildings generally lacking visual connectivity. The incidence of crime in high-rise buildings often has to do with a lack of connection with the surrounding outdoor spaces and with the residents of the building. Some studies show that the higher the building, the less likely for the residents to reconnect with the surrounding public spaces, and therefore, feel a lack of safety due to this disconnect (Gifford, 2007). The findings of Newman (1982) also asserted that high-rise buildings offer fewer settings where the residents can be relatively free to respond to cues to increase social interaction and therefore reduces the opportunity for natural surveillance. The positive association of duration of tenure in the residential area with the sense of safety has also been asserted by the residents of other study areas as expressed by a resident of Pallabi -

> *"I have been living in this area since my birth. Though the area does not feel as peaceful as before because of all the new people coming here to live but, I stilll feel no lack of safety because we have been familiar to most of the people of the neighborhood from our childhood." (Interview with a resident teacher of Pallabi, December 2015)*



Source: Field Survey, 2015

Chart 6: Residents' satisfaction with neighbhourhood safety and security

On the other hand, in Wari, 18% of the inhabitants have shown dissatisfaction regarding safety while the rest have no complaints. The perceived crowding of the neighborhood could be the cause for the negative responses as expressed by one of the residents –

"There are too many high-rise apartments along our street with too many new unknown faces around. The place is not as it used to be before when there were a handful of families, all familiar to each other in some way. In our childhood, we used to play in these neighborhood streets and our parents did not worry about us because they knew that the children are always under the watchful eyes of neighbors. But now, as I am not able to keep an eye on my children from my flat, and not also familiar with most of the new inhabitants of my neighborhood, I do not feel that safe to let them play alone outside in the street." (Interview with a resident of Wari, November 2015)

Table 10: Regularity of children going out to play in the study areas

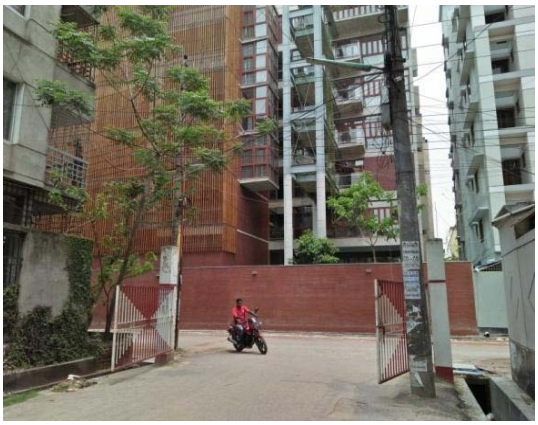
(Percentage)

Location	Every day	2 – 3 days/wk	Rarely	Never
Wari	-	8	11	81
Luxmi Bazaar	3	15	13	67
Dhanmondi	5	10	9	76
Banani	-	7	15	78
Gulshan	-	6	21	73
Pallabi	5	12	15	68
Uttara	2	10	17	71

Source: Field Survey, 2015

This sense of insecurity implies that neighborhoods perceived as crowded have more negative associations with perceived safety during daytime within the locality. High-rise buildings with multi-dwelling units contribute to a higher perception of density. Existing literature reports that the frequency of crime accelerated in the less visible streets from neighboring houses (G. Brown et al., 2004; Perkins et al., 1993), indicating the importance of a surveillance system provided by the residents. Windows facing the road, balconies, or front porches where people can sit and provide eyes on the street does not only give residents opportunities to have informal contacts with neighbors and helps in building local ties but also in the formation of natural surveillance (B. Brown et al., 1998; MacDonald & Gifford, 1989; Perkins et al., 1992, 1993).

Generally, all the apartments of high-rise buildings cannot have street-facing windows and balconies, and thereby the dwellers of high-rise do not have the opportunity of building natural surveillance as the low-rise dwellers have. This disadvantage contributes to a reduced sense of safety suggestive from the expressions of the inhabitants of the study areas. The research also found that on average only 3.75% of children from the study areas go out to play regularly while 9.7% frequently and 14% rarely play outdoors, and on an average, not more than 7% of the parents can watch their children from their apartment while they are playing in the nearby open space (street, park, playground, inside the building premise).



Apart from the lower social cohesion of these neighborhoods, another probable reason could be the lifestyle of the occupants, where a significant percentile of the high-rise residential buildings of area remains vacant during the daytime because of the higher incidents of working couples residing there. The lower rate of occupancy during the daytime attributes to a reduced sense of safety for the inhabitants. The reported robbery cases mainly took place during the daytime when the occupancy rate of the apartments was lower. As mentioned in the previous section, high-rise apartment culture has a lower degree of social cohesion where residents, in general, are not much concerned or feel any responsibility towards what is happening to the neighbors next door. This xenophobic attitude makes the community more prone to bystander effect or "Genovese syndrome", that works as a catalyst for such vicious crimes.

Furthermore, the residents of high-rise apartment culture tend to form social groups according to their income and status leading to centrifugal fragmentation of the society, which in turn impede the development of social capital within the neighborhood as a whole. This attitude increases the opportunity of crimes and thereby lowers the sense of neighborhood safety and security of New Dhaka, where a lower degree of social cohesion is prevalent. This notion of insecurity is reflected from the survey findings of Dhanmondi, Banani, and Uttara, where residents have shown a relatively lower degree of satisfaction regarding the sense of safety. The perceived crowding of people displayed a negative association with perceived safety after dark within the neighborhood, especially where there is inadequate street lighting. This situation was more common in Pallabi, Dhanmondi, and Banani, where people feel unsafe and vulnerable due to vandalism after dark due to the lack of streetlights. This claim is also reflected through the high dissatisfaction level of the residents of these areas, as shown in Chart 6. Income level also influences the sense of safety and security. Neighborhoods with higher floor area per person and with higher family income reported feeling safer and less vandalized, as evident from the residents' responses in Gulshan. Despite the vandalism record is pretty high, which takes place mainly in the commercial strips along the primary road in Gulshan, the neighborhoods of the area have a higher reputation of being safe. Overall, the survey finding suggests that though density is not the sole predictor of safety but high density if not perceived crowded has a positive influence in developing social capital and therefore helps to safeguard the overall security condition of the neighborhood.

IV. Relationship between Density and Sustainability Aspects

The aim of the analysis carried out in this research was to explore the relationship between density and the selected aspects of social sustainability of the study areas. The analysis process used simple correlations (Pearson's correlation) to examine the basic relations among the two sets of key variables of density and aspects of social sustainability. The correlation between the variables of density (physical and perceived) and the indicators of each selected aspect of social sustainability was examined individually and then the overall impact of density was determined from the average values of the indicators of each aspect. The results of the correlation analysis are presented in Table 11 and followed by the interpretation of the findings.

Table 11: Relationship between density and aspects of social sustainability

	List of indicators	Physical density relationship (ward wise - gross population density	Perceived density relationship		The overall impact of density
			Perceived neighborhood density	Perceived density within the dwelling	
Social sustainability					
Accessibility to community facilities	Average distance to nearest daily use shopping center, vegetable/grocery market, health facilities, primary school, mosque, bank, community center, Gymnasium	positive			positive relationship – higher density residential areas have better accessibility
	An average number of shopping centers, vegetable/grocery markets, health facilities, primary schools, mosques, banks, community centers, Gymnasiums per 1000 people.	positive			
Amount of living space	Floor area per person	negative	negative		Negative relationship- higher density residential areas have less amount of living space
	Perceived level of satisfaction with the size of home	negative	negative		
The health of the inhabitants	Number of family members having a stress-related health problem	positive	no impact	positive	Positive relationship – higher density residential areas have more stress or pollution-related health problem
	Number of family members having a pollution-related health problem	positive			
	Number of family members having no health problem	negative	no impact	no impact	
Community stability and social cohesion	Perceived number of social contacts (knowing people) within the last 12 months within the residential area	positive	negative	negative	positive relationship – higher density residential areas have a higher number of social interaction but when the building or neighborhood was perceived as crowded then the number of social contacts are fewer.
	Perceived friendliness of the neighborhood.	positive	positive	no impact	
	Perceived no. of informal chats with neighbors	positive	positive	no impact	
	Self-reported participation in various community events in the last 12 months	no impact	positive		

Sense of safety	Perceived safety within the residential area during daytime	positive	negative	no impact	Positive relationship-higher density residential areas have a higher degree of safety but when perceived as crowded by people the perceived safety was less during both day and night time, perceived
	Perceived safety within the residential area during the night	positive	negative	no impact	
	Perceived vandalism in the neighborhood	no impact	positive	no impact	

Source: Questionnaire survey 2015

From the analysis of the findings displayed in Table 11, it can be seen that most of the selected aspects of social sustainability are positively correlated with density. The aspects of having positive relationships are accessibility to community facilities, the health of the inhabitants, community stability and social cohesion, and a sense of safety. Accessibility of community facilities is found to be positively related to the physical density of the residential areas, which indicates that higher density areas have better access to community facilities in terms of provision and distance.

The aspect of the health of the inhabitants involves three indicators, namely stress-related health problems, pollution-related health problems, and no health problems. The relation between individuals suffering from health problems and density was positive, that signifies that high-density residential areas have more health problems. However, only stress-related health problems exhibit a significant relationship with the perceived density within the dwelling which indicates that if the house is perceived as crowded it tends to add to the stress of the inhabitants. This view is also supported by the literature. The aspect of community stability and social cohesion, in general, demonstrates a significant positive association with physical density where the inhabitants of higher density residential areas displayed a higher number of social contacts and interactions. But contrarily, when the higher density areas are perceived as crowded by the residents the number of social contacts and interactions was significantly decreased. Although the relationship between the participation of the inhabitants in community activities and the perceived density was positive, it was not statistically significant.

One of the reasons for the lower involvement rate was commonly pointed out by the respondents as lack of time, while others held the mismanagement of these events responsible. The sense of safety is strongly associated with physical density indicating that high-density residential areas have a higher degree of protection both during the day and after dark. But when the neighborhood was perceived as crowded, people seemed not to be feeling safe. The perceived vandalism was also found to be increased with the perceived crowdedness of the neighborhood during peak hours. Among the selected aspects of social sustainability, only the amount of living space displays a negative association with both physical and perceived density of the residential areas, which means, the higher the density, the lesser the amount of living space available for individuals as well as less floor area per person. This observation also supports the literature, which suggested that areas with higher net residential densities or population densities are likely to have a lower amount of living space per person.

The relationship of density was examined against four aspects of environmental sustainability, which are accessibility to open space, access to daylight, sense of privacy, and satisfaction with the living condition of the neighborhoods. The accessibility to open space and satisfaction with the living condition of the neighborhoods was found negatively related with density, while the other aspects had a positive relationship. The negative relationships imply that higher density residential areas have less open space. In addition, the higher density areas show less preferrence in terms of attractiveness, cleanliness, architectural character, and privacy. The positive relationship between access to daylight and density signifies that dense residential areas need more artificial lights to be put on during daytime and are subjected to a higher degree of visual obstruction. The measured intensity of noise is positively associated with physical density, but no significant correlation was found between the perceived level of noise and both physical and perceived density.

Among the aspects of economic sustainability, only satisfaction of public transport exhibits a negative association with physical density, which implies that higher density areas are not well served with public transport. In contrast, no significant association was found between density and infrastructure indicating that the provision of utility services (gas, electricity, and water) in the residential areas has not yet gone beyond the threshold. However, higher density is found to be negatively associated with the services like sewerage and garbage disposal of the residential areas of Dhaka.

V. Summary Findings

While summarizing the findings of this research, it is important to point out that though the statistical method has many advantages, the results cannot always portray the real impact as it cannot visualize people's feelings, experience and perception towards a

situation in the practical context which is more subjective by nature. To investigate the consequences of the densification process, it is, therefore, critical to recognize that the findings from the statistical analysis alone are not enough to produce conclusive results in understanding the impacts of such phenomenon on sustainability as it has been confronted by several contradictions reported by the respondents of the study areas. So to get the real picture of the impacts of densification, statistical results from the correlation analysis (Tabel 11) were compared with the contradictions associated with each selected aspect of sustainability which is presented below:

a) Accessibility to Community Facilities

It was evident from the statistical findings that higher gross residential densities had positive impacts on access to facilities and amenities at the neighborhood level, which supposedly enhances the livability as widely supported by the literature. Various theories have recommended that minimum level of densities is important to support local services and facilities (Gharpure, 1995; Burdett et al., 2004). But a closer examination of the study areas suggests that despite the adequacy of community facilities in the study areas their number, distribution and scale is not pertinent to the neighborhood scale rather more in conformity to the city scale. From the field, it was observed that the city scale provision of these facilities is, therefore, inviting the city traffic into the neighborhood regularly. As reported by the respondents' severe traffic congestion due to this unwanted traffic is commonplace in these residential areas hindering the accessibility of the local residents to these facilities and amenities in terms of travel time and thereby hampering the quality of life. Most of the inhabitants usually avail these facilities through rickshaw which takes about 10-15 minutes. But due to the frequent traffic congestion, these short trips take exhaustingly more time which is totally unacceptable. So even though having adequate and sometimes over the provision of these community facilities the local residents cannot accrue the full benefit from them. A standard for the provision of community facility is provided in DAP 2010 but no directives have been suggested to implement it. However, it is usually ensured through government land-use policy with community facility planning and their managerial and financial capacity to distribute social infrastructure evenly among various parts of the city. But in absence of such policy, the provision of social infrastructures through private initiatives tends to cross or sometimes overlook the demand of the residential areas. So although the statistical analysis of this research shows a positive relation of density with this sustainability aspect the planning considerations associated with the accessibility of the existing community facilities portray a picture quite contrary to the sustainability requisites.

b) Community Stability and Social Cohesion

The statistical findings indicate that higher density residential areas have a higher number of social interactions but when the building or neighborhood was perceived as crowded then the number of social contacts are fewer. Social cohesion in the community helps to build social capital which helps to resolve most of the community problems by themselves and creates a social safety net for the community. Social cohesion is developed through frequent informal social interaction which helps to cultivate trust and nurtures bonding among the neighbors. The research findings also revealed that the form of traditional bonding is still prevalent in the high-density neighborhoods of Old Dhaka but not very prominent in the neighborhoods of new Dhaka. The cause of this diminishing status of the social capital in the new neighborhoods may not be attributed to the density alone as indicated in the results of correlation analysis. The design of the built environment, as well as the lifestyle of the residents, is identified as important predictors hampering the formation of social capital in contemporary neighborhoods. In the pursuit of an urban lifestyle, city dwellers have to spend a major portion of the day at work and traffic congestion which spares very little time for them to stay at home and socialize with neighbors.

On the contrary, people happen to spend more time with their colleagues rather than their neighbors. This facilitates the formation of social capital through *bridging* is increasingly replacing the *bonding* exercise which used to be a common practice previously in the traditional neighborhoods. Even Globalization can be seen as a *bridging* exercise of social capital. However, some argue that the expansion of social capital in globalization has been done at the expense of traditional *bonding* of social capital, which is based on shared norms, values, and cooperation among in-group members for common ends and this could be partly true in this case. *Bonding* and *bridging* in social capital can co-exist as long as they are in harmony and well-balanced (Putnam, 1998). But as revealed from the field survey results mentioned in Section 3.4 the inhabitants of the residential areas of new Dhaka are found to be more interested in the bridging exercise which tends to form various groups based on similar occupation and shared interests thereby results in a reduced level of social cohesion among their immediate neighbors. Apart from the lifestyle demands the urban design elements such as lack of open space, the design features of the multi-dwelling buildings as well as the street designs do not provide the opportunity for social bonding. Under the circumstances, the bonding exercise is found to be gradually diminishing and being increasingly replaced by bridging and linking exercises. The future consequences of this type of social capital are likely to lead towards centrifugal fragmentation in the

society which is a major threat in developing social sustainability.

c) Sense of safety

The findings of the research found gross population density to be positively associated with the sense of safety which indicates that the higher the density contributes to a higher sense of safety as it was found very prominent in the dense residential areas of old Dhaka with a relatively good degree of social cohesion. While in the new residential areas though people were found satisfied with the sense of safety their security was achieved through the practice of gated communities rather than natural vigilance system provided by the neighbors like old Dhaka. Various researches have recognized the positive impact of social capital on safety issues of the neighborhood. The results from new residential areas indicate though the sense of safety is increased with high density this is not helping in nurturing social bonding where vigilance is formed by the presence of people alone rather than any physical aid. The design of the apartment buildings which does not encourage informal social interaction in their narrow corridors and small balconies could be another reason for this kind of social isolation. This again suggests that built form characteristics, design, and layout associated with lower social capital also contribute to the prevalence of reduced sense of safety and vice versa evident from the findings of the study areas. Thus, it was found that generally higher density had a positive association with a sense of safety but if the area is perceived crowded then the relationship becomes negative. However, crowding within the dwelling was found to have no relationship with indicators of safety.

d) The Health of the Inhabitants

Despite the residents' overall higher satisfaction level regarding the living condition at differing densities, the self-reported health statistics indicate an unfavorable result which questions the livability as well as the sustainability of these residential areas. Besides the overall positive association of high density with health problems the findings also revealed that a higher incidence of stress-related health problems was found common in all the study areas while pollution-related problems were relatively higher in some of the new residential areas. As discussed earlier in section 3.3 the cause of the stress and pollution-related health complications can be traced to the design features of the built environment (amount of living space, lifestyle, lack of outdoor recreation spaces, dwelling design, vehicular emission, etc.) of the residential areas. A growing body of literature indicates that sedentary lifestyles have been increasing in recent decades leading to increased risk of Type II diabetes, cardiovascular disease, obesity, and various cancers. The use of open spaces to promote physical activity is an important part of addressing these conditions in an urban setting. But from the survey, it was found that old Dhaka residential areas are devoid of open spaces while the new residential areas have open spaces but still far below the actual requirement. The shortage of adequate open spaces and especially green spaces, which promote a healthy active lifestyle by providing an accessible, affordable, and enjoyable place to be physically active could be one of the prime causes of higher incidence of stress-related problems in the study areas. Furthermore, the prolonged exposure to the vehicular emission caused by the daily traffic in the neighborhoods can also be responsible for the increased pollution-related health problems of the new Dhaka study areas. Since the built environment features and overall design show a lack of consideration in promoting good health to the inhabitants the sustainability of the community as well as the residential area seems vulnerable.

e) Privacy

Although the observations revealed that the measured intensity of noise was above the residential threshold but the majority of the residents did not recognize it a as problem. Similar responses were also found towards the degree of visual obstruction and loss of privacy caused by closely placed adjacent buildings which were quite high in the study areas. The reason for people's insensitivity towards visual and acoustic privacy could be the lack of awareness regarding the hidden ill effects of these factors on health. Needless to say, if people are left exposed to such unacceptable environmental conditions for a prolonged period then this would certainly impart serious physical and psychological impairment in the future generations putting the overall sustainability of the community at stake.

f) Amount of Living Space

The respondent's amount of living space was also considered in the supplementary measures of urban form. Although the research found that higher density is negatively associated with the amount of living space and affordability of houses, the respondents' attitude towards their dwelling space implied that this variable had only limited significance towards the sustainability of the community. However, the satisfaction level regarding dwelling space does not always rely on its size but the length of stay and the community cohesion which had a significant role to play. Perhaps due to these two factors, the residents of old Dhaka despite living in small dwellings have displayed greater satisfaction in comparison to their counterparts in new Dhaka.

However, in reality, it would be inappropriate to attribute the production of smaller living spaces to high

population density alone. In the context of Dhaka, the Floor Area Ratio (FAR) restrictions, which allows extra height bonus for less ground coverage is one such factor. Due to the application of FAR there is less available built space which naturally reduces the per capita living space. This results in the construction of smaller size apartments which has to compromise with the amount of living space. The application of FAR cannot be beneficial enough unless the occupancy density and amount of living space per person is considered. Besides, the lack of sufficient open space in the neighborhood promotes people to spend more time indoors. Therefore, the indoor space needs to be more spacious to compromise the shortage of open space to some degree. But the private developers' concern is making a profit rather than creating standard living space for the community.

VI. Conclusion

The findings discussed in this study show the consequences of densification based on the empirical study conducted in seven sample wards of Dhaka. On the basis, of results from the analysis, it is evident that there is a wide range of consequences found in the residential study areas of differing densities. The findings reflect that traffic congestion, lack of public transport, lack of open spaces, thus the improper allocation of social infrastructure are the major visible consequences while health problems, social cohesion, and people's lack of awareness regarding social and environmental problems are apparently the silent consequences of densification. The contradictions presented by the arguments in Section 5 signal an emerging urban crisis that questions the sustainability of the residential areas of Dhaka. Marx defines crisis as the manifestation of underlying problems. The emergence of this crisis can be identified through the residents' growing dissent stemming from a host of urban problems both obvious and imperceptible like, lack of open space, lower sense of safety, health complexities, diminishing state of social cohesion in the densifying residential areas of Dhaka. Given the summary findings, it can be said that the underlying problems of this crisis seemed to be deeply rooted in the current process of densification which is posing a threat to the overall social sustainability of the residential areas of Dhaka. Though the current livability condition of the residential areas seems to be passing through more or less a tolerant phase but considering the growing intensity of the urban problems embedded in the very system of the development process itself, the sustainability of these residential areas, in the long run, becomes quite questionable and uncertain. The magnitude of most of these explicit and hidden problems of the dense residential areas seemed to be within the tolerable limit at present which makes them more or less livable for the time being but if this trend of development keeps on continuing then the aggregate outcome of these growing complications will multiply and produce an unbearable situation for the residents in near future. Under such circumstances, the livability of these residential areas will further decline. Overall the studies of this research are suggestive that despite the statistical data showing a more positive result the consequences of densification is likely to have far-reaching negative implications on the sustainablilty of the residential areas in the long run. Hence, from the sustainability perspective, the ongoing trend of densification of the residential areas of Dhaka does not appear to be sustainable at all.

References Références Referencias

1. Bonnes M, Bonaiuto M, Ercolani AP. (1991). Crowding and residential satisfaction in the urban environment: a approach, Environment and Behaviour 23(5): pp. 531 – 552.
2. Burdett R, Travers T, Czischke D, Rode P, Moser B. (2004). Density and Urban Neighbourhoods in London: Summary Report, London School of Economics: London; 64.
3. Brown, B.B. and Bentley, D.L. (1993). Residential Burglars Judge Risk: The Role of Territoriality. Journal of Environmental Psychology. Volume 13, pp 51-61
4. Brown, G., Perkins, D. D., & Brown, B. B. (2004). Incivilities, place attachment and crime: Block and individual effects, Journal of Environmental Psychology 24, pp. 359–371.
5. DAP (2010). Final report of Preparation of Detailed Area Plan (DAP) for DMDP Area: Group C. Dhaka: RAJUK, The Capital Development Authority of Dhaka.
6. Dhaka City Corporation, 2010, Dhaka City Corporation Official Website, Retrieved from URL: http://www.dhakacity.org/, Accessed on 28th May, 2010.
7. DMDP (1997a). Dhaka Metropolitan Development Plan (1997-2015) Volume I *Structure Plan (1995-2005).* Dhaka, Bangladesh: Rajdhani Unnayan Kartripakkha (RAJUK), Government of the People's Republic of Bangladesh.
8. DMDP (1997b). Dhaka Metropolitan Development Plan (1997-2015) Volume II *Dhaka Urban Area Plan (1995-2005).* Dhaka, Bangladesh: Rajdhani Unnayan Kartripakkha (RAJUK), Government of the People's Republic of Bangladesh.
9. DMDP (1996). *Dhaka Metropolitan Development Plan*, vol. 2, RAJUK, Dhaka, pp.6.
10. Gharpure PC. (1995). Density, Costs and Built form: Case Study of Nagpur, MS thesis, School of Planning, Centre for Environmental Planning and Technology (CEPT); Ahmedabad.

11. Gifford, R. (2007). *Environmental psychology: Principles and practice* (4th edition). Colville, WA: Optimal Books.
12. Haq, A. S. (2009), "Estimation of Vehicle Induced Emissions of Selected Urban Areas in Dhaka City', Proceedings of the International Conference on Mechanical Engineering 2009 (ICME2009), December 26-28, Dhaka, Bangladesh.
13. Nancy, S. J. (2004). *"Effects of Commercialization on the Adjoining Residential Areas; A Study of Dhanmondi and Banani"*, Unpublished MURP Thesis, Department of Urban and Regional Planning, Bangladesh University of Engineering (BUET), Bangladesh.
14. Newman, Oscar, and Karen A. Franck., (1982)."The effects of building size on personal crime and fear of crime." *Population and Environment* 5.4, pp 203-220.
15. McDonald, J. E. and Gifford, R. (1989). *Territorial cues and defensible space theory: The burglar's point of view*, Journal of Environmental Psychology 9(3):193205.
16. Perkins, D.D., Wandersman, A., Rich, R.C. & Taylor, R.B. (1993). The physical environment of streetcrime: Defensible space, territoriality and in civilities .Journal of Environmental Psychology,13, pp 29-49.
17. Putnam, R. D. (1998). Foreword to Social Capital: Its Importance to Housing and Community Development. Housing Policy Debate9 (1): v-viii.
18. World Health Organization. (2009). *Global Health Risks - Mortality and burden of disease attributable to selected major risks* (Text), World Health Organization. Retrieved from URL: http://reliefweb.int/report/world/global-health-risks-mortality-and-burden-disease-attributableselectedmajor-risks, Accessed on Feb 27, 2012.