Sustainable Landscapes

Dhaka, an Urban and Architectural Strategy for High-Density City

Supervisor: Michele Roda

Co-Suervisor: Filippo Orsini

By

Imran Ebne Amin

Index

Introduction:

Dhaka, the Mega city is the capital of Bangladesh. According to Forbes's magazine, Dhaka is the most densely populated, making its way to number one in the world. In 2013, its population reached to 14.399 million with the density of 115200 per square mile (45000/km2). (http://www.forbes.com/pictures/edgl45fdlj/no-1-dhaka-bangladesh/)

The most important development that has taken place in the city's recent history is the overwhelming growth of its population, chiefly through migration. In 1872, at the time of the first census, Dhaka had a population of 69,212; in 1881, 79,076; in 1911, 1,25,000; and in 1941, 2,39,000. After the Partition of 1947 the increase in population showed a steady rise with the arrival of migrants from India and in 1951 the population jumped to 3,36,000. According to the census of 1961, the city had a population of 556,000, a growth of some 44.63% during a decade. This growth rose dramatically after 1971. By 1974, the population increased to 1,680,000; in 1981 it reached 3,440,000; and in 1991, 6,150,000 (Chowdhury, AM ….). Moreover, in last half a decade the situation has worsened. In 2008, population was 12.8 million (BBS 2008) whereas now in these five years it rose to around more one and half-million.

The discussion here is, "Is Dhaka capable of accepting this population in the conventional way of the design system?" Satellite views of different parts of Dhaka show both planned and unplanned developments of this city that clearly answers this question.

0102

03 04

05

06

Dhaka is basically being built/killed in two ways: by developers and builders whose only concern is maximum economic profit and who could care less about spearheading an environmental and social degradation; and by designated policy-makers whose myopic and miserly visions do not go beyond making regulations and land divisions, and hold no answer to the complexity of the urban landscape.(Ashraf et al 2009)

However, thanks to those initiators who forced the Government to introduce the new building construction rules in 2008. The most significant part of this rule is to construct a building, maintaining its Floor Area ratio (FAR).

Moreover in my research, I aimed to analyze this system (FAR) and its application in the city. The results have been included bellow(see Page 27 to 38).

Project:

It is a crucial moment for architects to find out how to adapt this population by utilizing the best of the new construction regulations, updated in 2008 and recover Dhaka from its form of a dead concrete city. Also, this thesis project aims to find and develop an approach for designing a sustainable building for optimum living in future Dhaka; this approach will be a prototype, and thus can be applied where necessary.

The Site:

The availability of land in Dhaka is highly competitive and thus the battle is ruthless. Consequently, the land value is sky rocketing and each vacant square feet becomes a subject prior to discussion:"Is it possible, in these circumstances to recover Dhaka from the certain death?"

The answer to this question is hard to find until now. However, through last few years of observation, I realized the great possibility for the execution of this vision near Hatirjheel Lake. Hatirjheel (also known as Hatirjheel-Begunbari Lake) is a significant lake situated at the heart of the city beside Tejgaon Industrial area. Both the lake and the industrial area create a wide opportunity to start the recovery of Dhaka from its certain death.

Moreover, during the last decade, there have been some inappropriate constructions around the lake by some influential people**(see page 13 pic 7)**, against the regulations. For a deeper enquiry, a research and analysis have been developed regarding DMDP (Dhaka Metropolitan Development plan) and DAP (Detail area plan). The outcome showed the lake was converted into a wetland by multiple owners; who began to develop their properties on the converted wetland according to themselves, within and around the lake.

Yet now one can find the plot divisions within and around the lake in DAP. However, this incident was then protested by some architects and the wetland in hatirjheel was acquired by the Government for redeveloping the lake. This lake now serves as the heart and a major breathing space for the whole city.

In addition, this created a wide opportunity for Dhaka city to rethink the future. The lake was then further developed with a new a permanent boundary.(People started to build new building **see page 14 pic 11 and Page 21)**More interestingly, This fixed boundary of the lake created an unknown opportunity for the future development of Dhaka, as the land around the lake was not predefined or zoned into any specific type of area.

Moreover, according to DAP theses lands have the different owners who are legal to build.

A satellite view of this area has been illustrated below from the year 2001 till now to explain the scenario.

2001


Badda Lake
Tejgaon Industrial Area
Hatir Jheel Lake
Rafiq Lake

2003


Badda Lake
Tejgaon Industrial Area
Hatir Jheel Lake
Rafiq Lake

2006


Badda Lake
Tejgaon Industrial Area
Hatir Jheel Lake
Rafiq Lake


Badda Lake
Tejgaon Industrial Area
Hatir Jheel Lake
Rafiq Lake

2008

2012

2013

2014

It is the ideal time for a visionary approach for the whole area. Whole area includes the land beside the lake as well as the Tejgaon Industial Area itself.

Development of Tejgaon Industrial Area and Hatirjheel Lake:

Ibegan to research the importance of the area. Find out an answer,"why an industrial area grew in the heart of the city?" As a result, I produced these maps considering the Tejgaon Industrial area in relation to the growth of the Dhaka City.

17th Century (The City was developed from East to West. Dhaka attracted by European Traders)They established their

Pre Mughal (16th century**)**

18th Century (Shrinking of Dhaka after British East India Company took over the country)

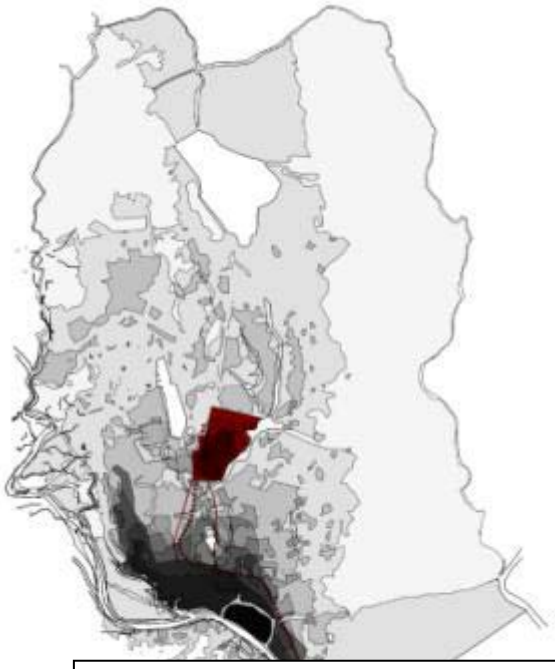
1859 (introducing a rail line from Tongi trough Tejgaon)

1
u
B
c
t
b

1980 (Dhaka Started to develop towards Further in the North)

2014 (Tejgaon became in the middle of the city)

Future projection of the City

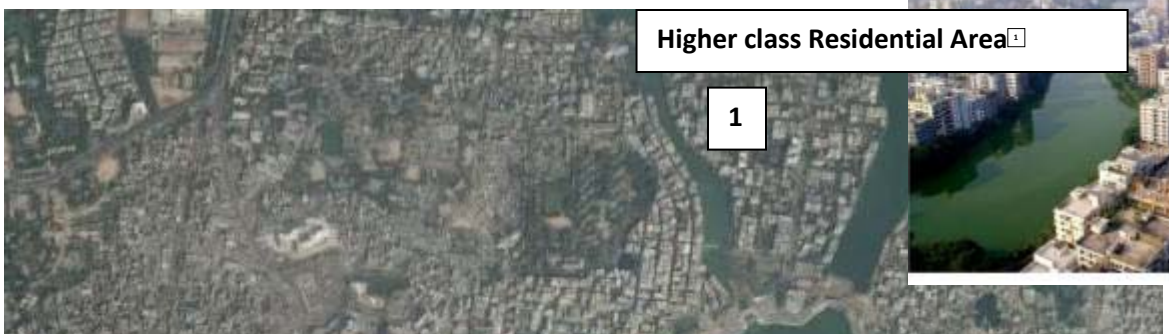


All together

From the above analysis, it is clear, tejgaon in the Mughal period started far away from the city. After British ruler took over the country, they started to develop the city towards North direction. It also influenced the East Pakistan government (1950) to develop the city more towards North by selecting different part of the land to develop mostly middle-income housing. It is noticeable that in selecting

these sites the method of picking the highlands along the transportation system was followed. (Chowdhury, AM ….)

Introduction to the lake and surrounding:



1

11

5

2

9 & 10

3

4

6

8

Residential Area[1]

7

2

3

5

4

6

7

8

10

Pic 01: View through Higher class residential area towards the Banani Lake. The lake is ignored. Public are not familiar to this place. Became the back of the Apartments.

Pic 02: View through Industrial building to the Hatir Jheel Lake.

Pic 03: Night view of newly developed Landscape beside hatir Jheel Lake.

Pic 04: Spontaneous development of a residential area to adapt the huge population.

Pic 05: Industrial Building

Pic 06: Hatir Jheel Lake from the newly constructed road.

Pic 07: Example of Building built inside the lake. This one still exists

Pic 08: panoramic view of Hatir Jheel lake and surroundings.

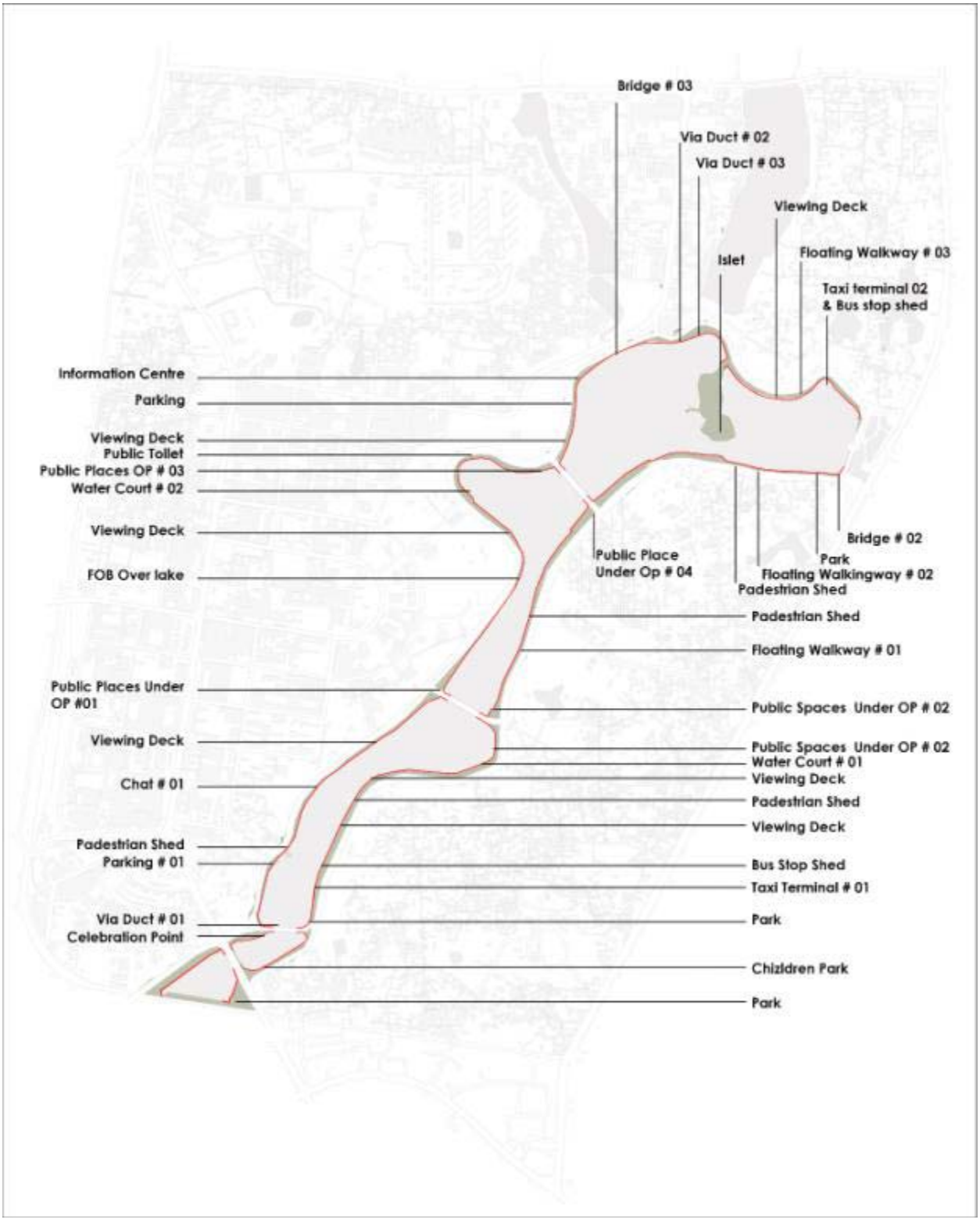
Pic 09: temporary Building** during construction of the Road.

Pic 10: temporary Building and its convertion to Permanent structure after construction of the Road.

Pic 11: Showing construction beside the lake after settle down the boundary of the lake.

** **Temporary Building**: Temporary building" means any building or structure constructed of short-lived materials or permitted to be used by the competent authority or Commissioner of Building Control for a period not exceeding 36 months or such other period as may be prescribed.

Functions designed in this landscape lake front:



Analyzing Hatijheel Lake and its surrounding:

To understand in detail and to identify the gap where the future development can be possible, I started with a morphological analysis. All these analyses led me to come up with a proposal.

A. Morphology around the Site (by fixing a boundary depending on the road around**)**

Permanet Buildings
Temporary Buildings
hafiz Jheel Lake

Permanent and Temporary Building

Permanent Building

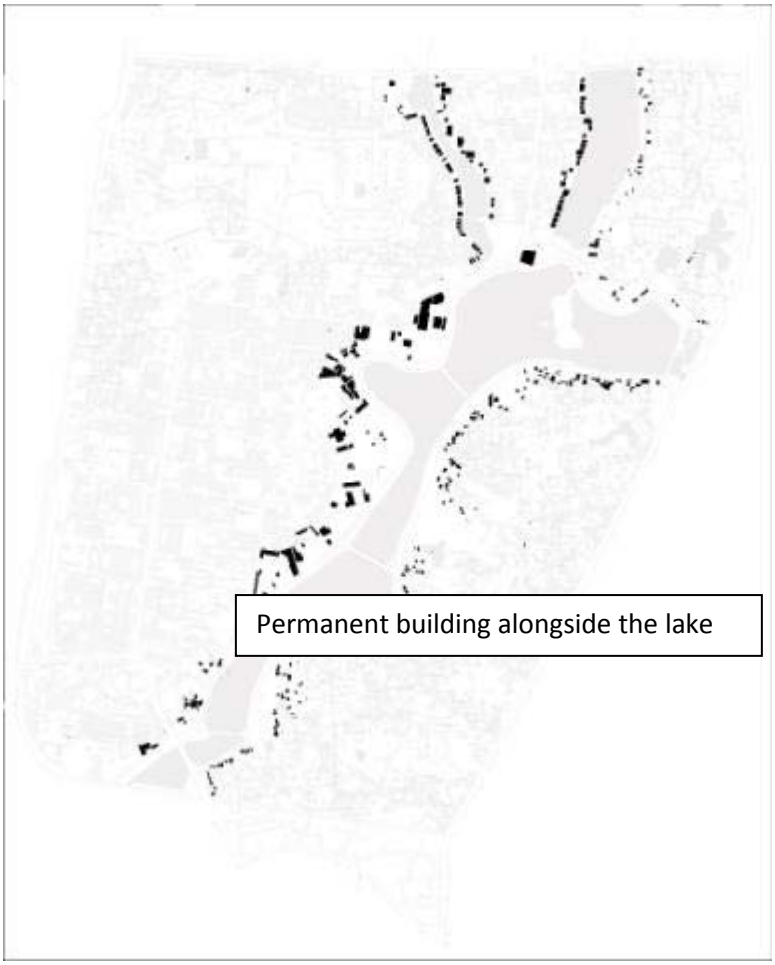
Only Temporary Building (darker one Temporary structure in the industrial area using as industrial purposes)

What is happening here?

Identifying through This analysis:

- A gap beside the lake and the industrial area.
- Uncertain future of the Area
- Spontaneous development started (this change is more visible in next analysis).

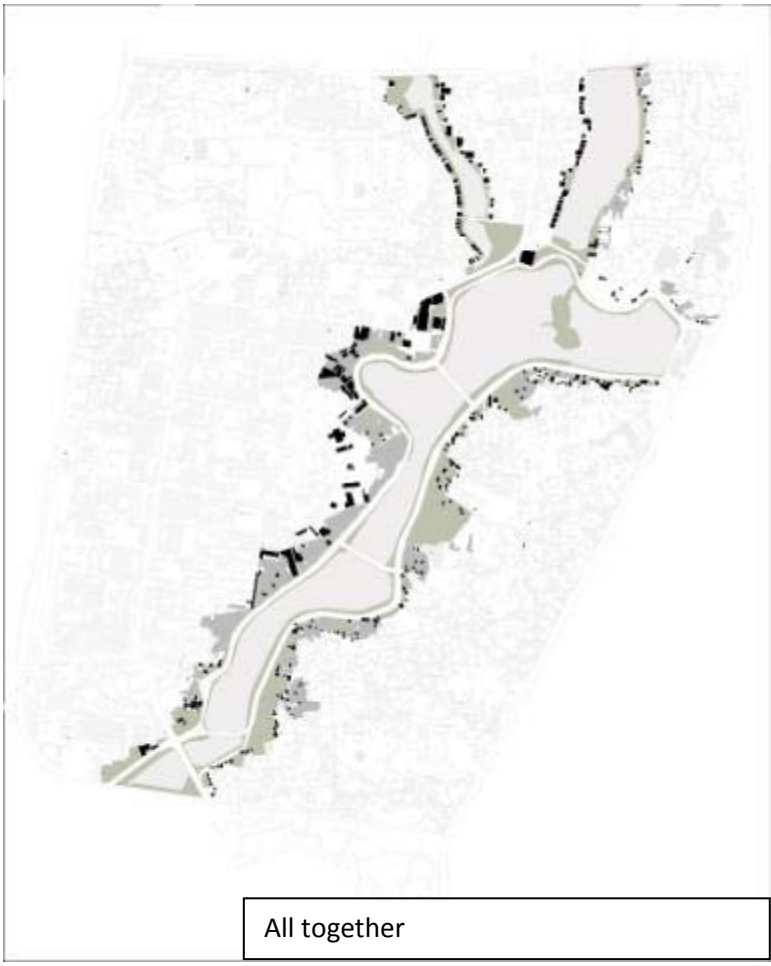
B. **Morphology alongside Lake:**



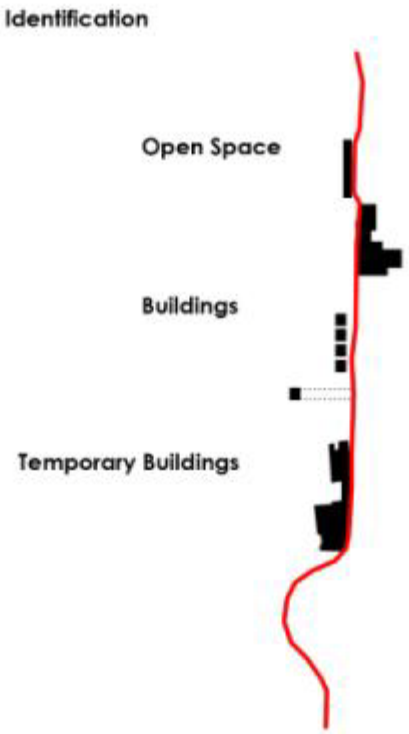
Permanent building alongside the lake

Temporary building alongside the lake

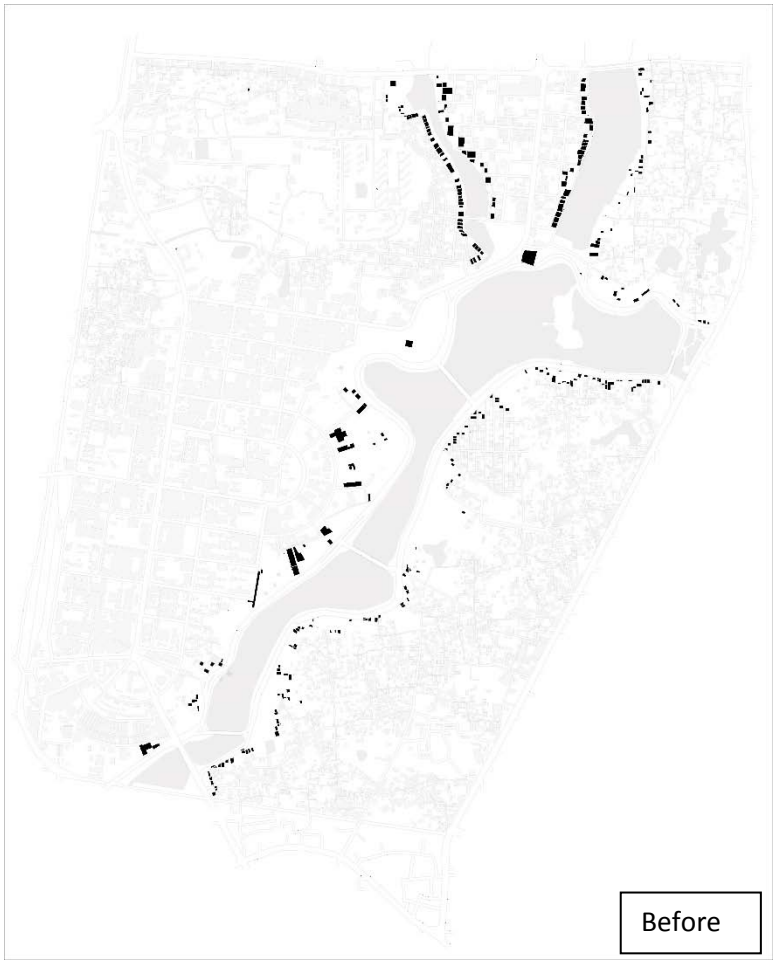
Open Space alongside the lake

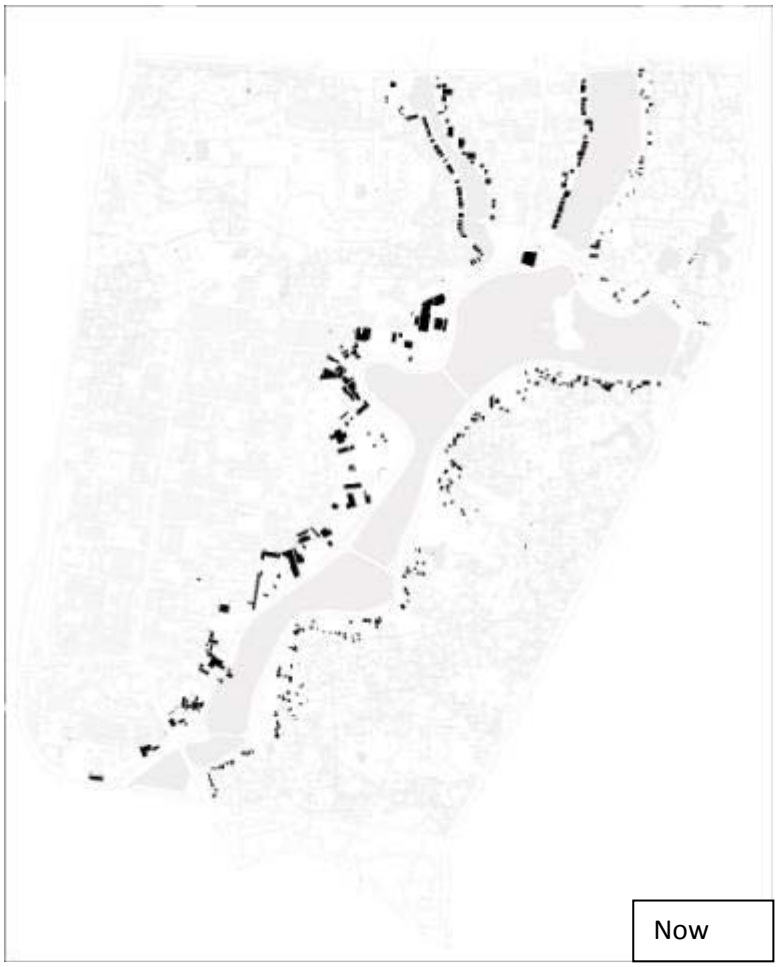


All together



However, More interesting finding came out after analyzing lake side development during last few years.



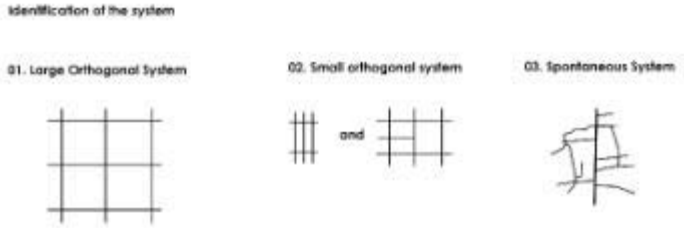


C. Analyzing Urban System:

The analysis is done to understand the urban system exist around the site.

- Identifying Industrial area has a large Orthogonal of Urban system.

- This identification made me to



develop the strategy for developing future sustainablewith a healthy environment Dhaka.

D. Analyzing the connection between the lake and the Industrial Area.

Identifying the urban system led me to analyze the connection between the industrial area and the hatir Jheel Lake. The result is, there are missing connections. To merge the “gap” the connection must be continue.

Accessibility

Accessibility and connections

E. Urban Section:

Understanding the skyline

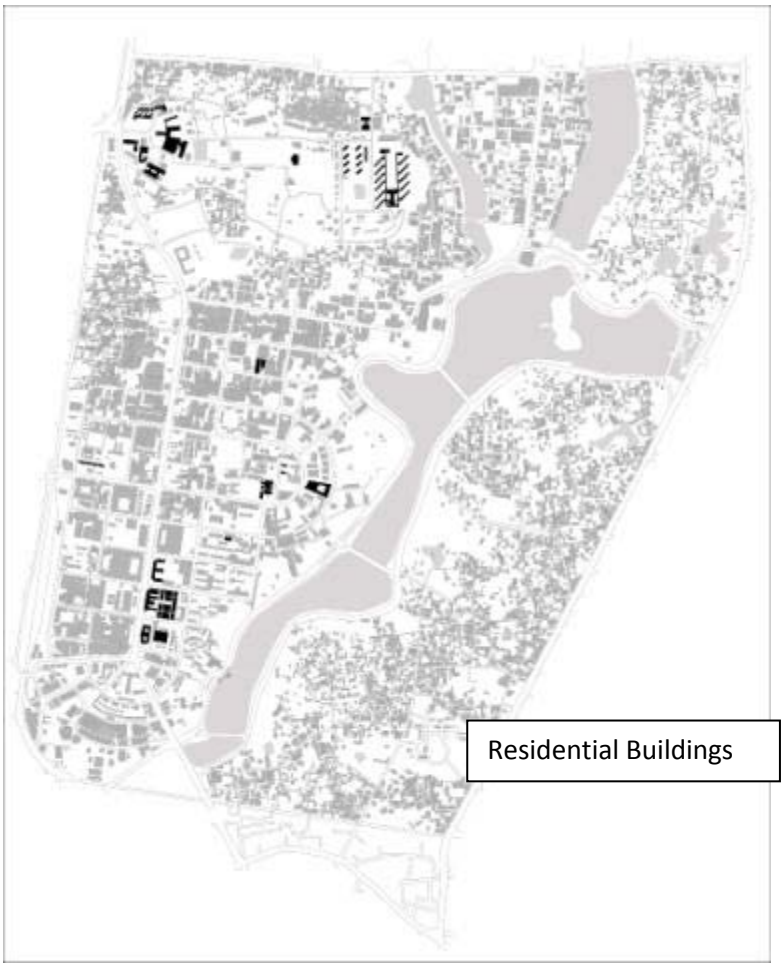
Industrial Area

Site

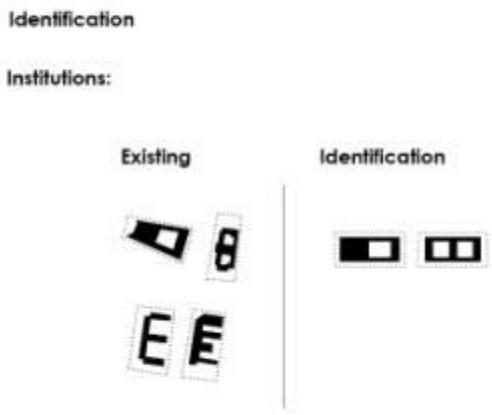
F. Typology of the Building:

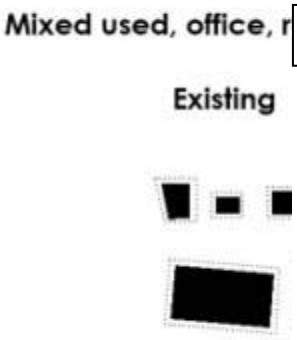
This analysis finally led me to finish with an analysisof the typology of the building. What is the building typology around?

Institutional Buildings



Residential Buildings





Mixed Used Buildings

The identification shows the building constructiontook almost all the land around except a few setbacks.

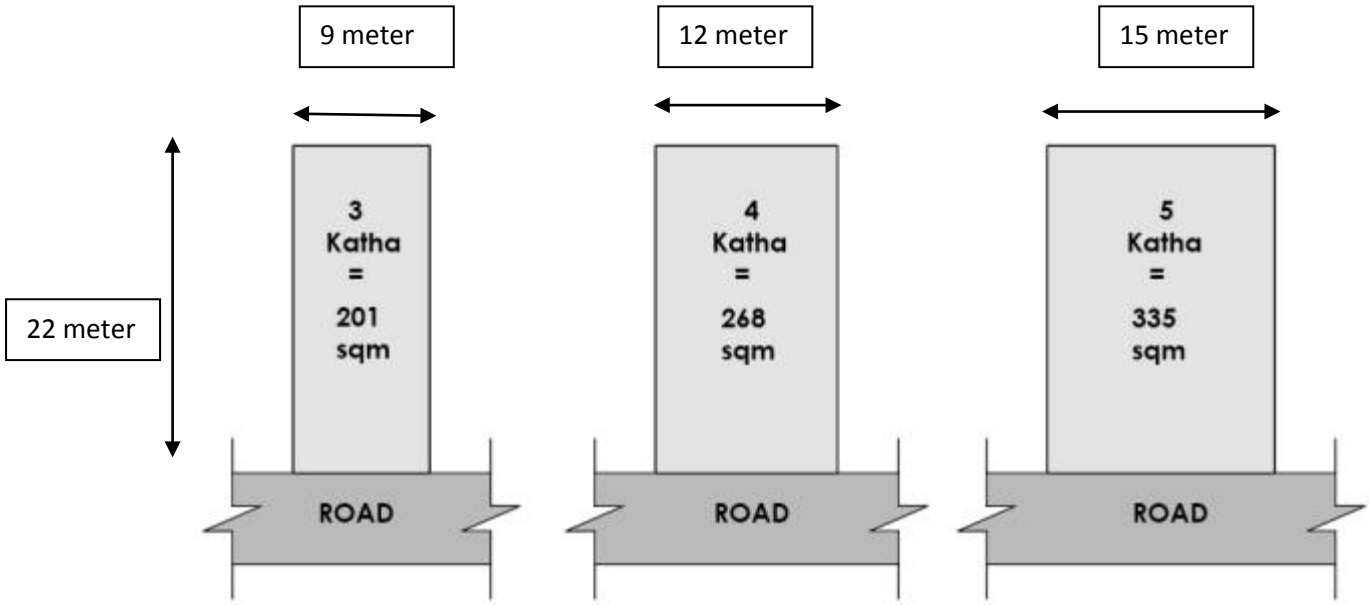
I mentioned before from 2008 government introduced new rules for the building construction. This identification started myself to think to analyze the rules and regulation for the building construction, both old and new one.

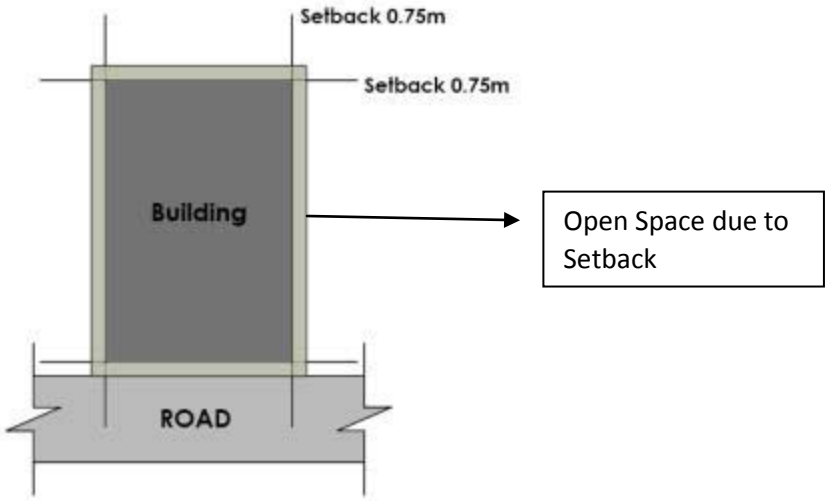
Old one to understand the mistakes. However, the new one to understand how it works.

Building Construction rules and regulation:

Again I would like to mention the quotation from Ashrat et al (2009), Dhaka is basically being built/killed in two ways: by developers and builders whose only concern is maximum economic profit and who could care less about spearheading an environmental and social degradation; and by designated policy-makers whose myopic and miserly visions do not go beyond making regulations and land divisions, and hold no answer to the complexity of the urban landscape.

Usually in Dhaka popular land division by both developers and the government are as bellow:

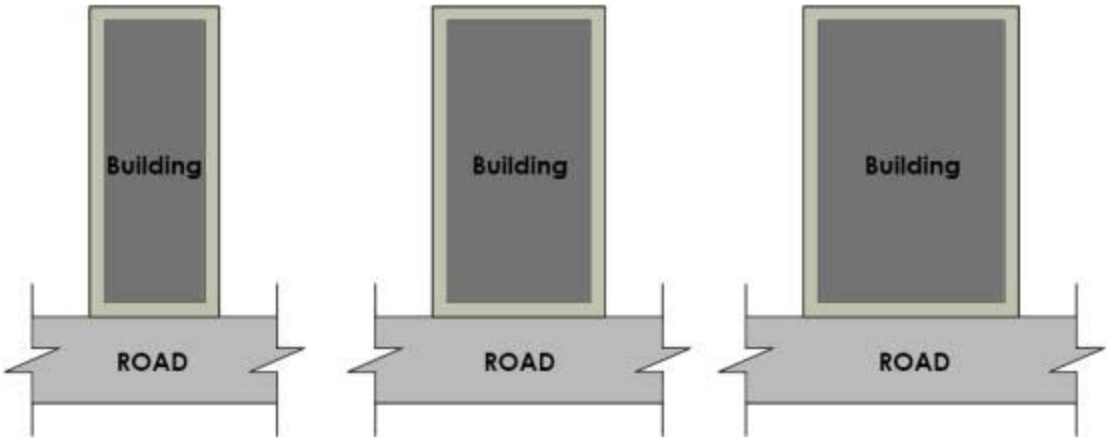


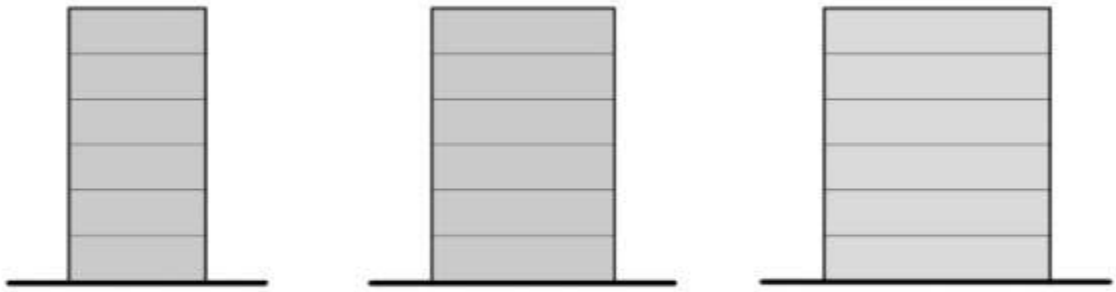


Let's see what was happening before:

After constructing the building in all those land divisions the situation created asbellow:

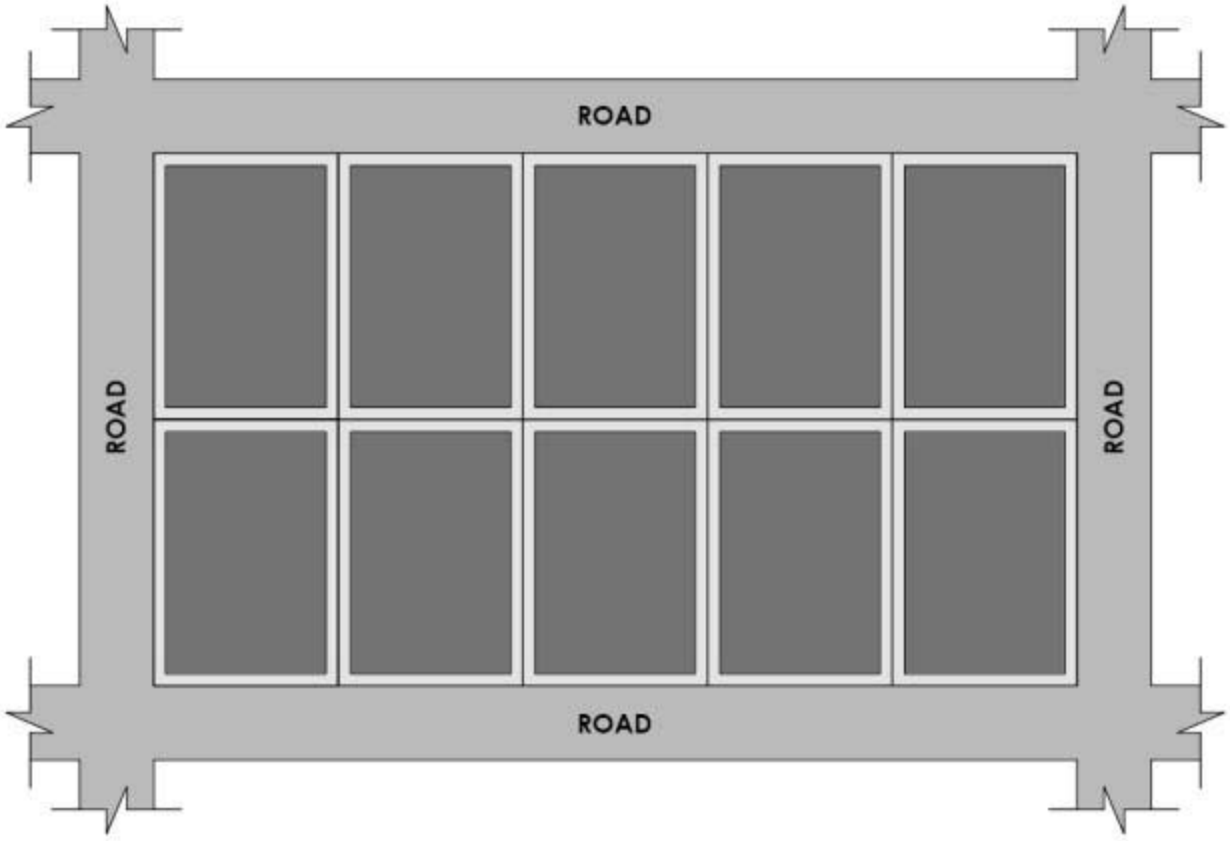
The height was fixed and maximum 6 storied.

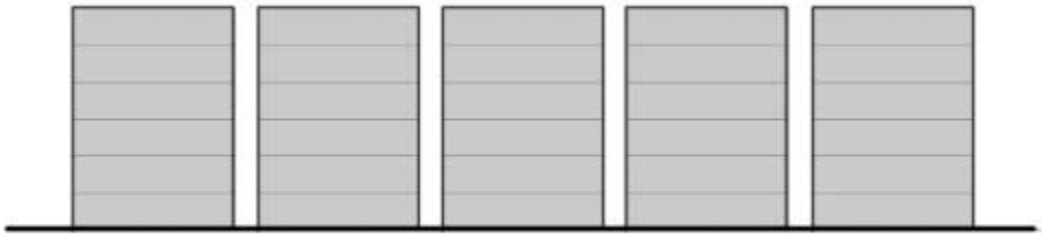




Building could built upto 6 storied

As a result when the building was built in a site:

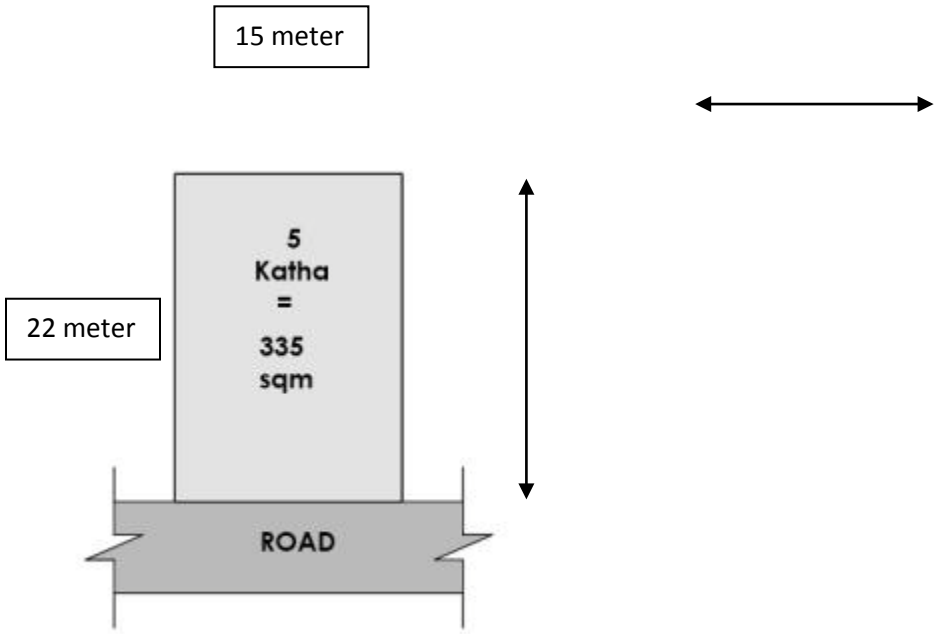




Now let's jump to the new rules and regulation introduced in 2008. It introduced Floor Area Ratio (FAR). Which mean the building can be constructed with a relation to the site area. The new rules for building construction trends to appear as an opportunity for the healthy and livable environment for Dhaka city in the future.

I have attached a chart where it mentioned how much one can construct a building in respect to his land area.(I have to translate the chart later or explain you at next revision)

I choose 335 square metre land area to illustrate the rules and its implementation. This is the most favored land area in Dhaka. Later, I interpreted picking one part from the proposed site to prove how it serve.



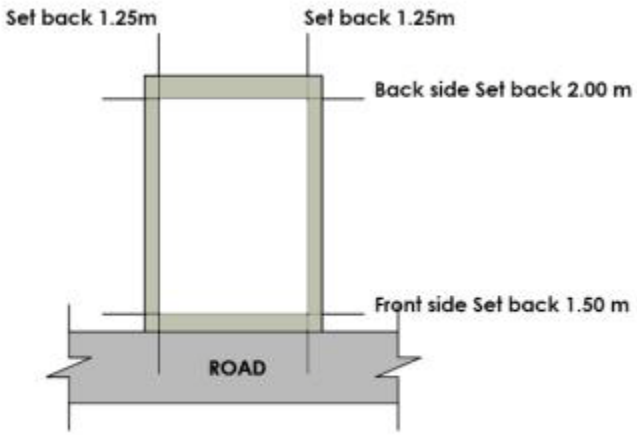
c-‡Ui cwigvY		Bgvi‡Zi †kªYxt (A1 - A4) [1] (AvevwmK evox)			Bgvi‡Zi †kªYxt (A5)[2] (AvevwmK †nv‡Uj)		
eM©wgUvi	KvVv	iv¯—vi cÖ¯’ (wgUvi)	FAR	MGC (%)	iv¯—vi cÖ¯’ (wgUvi)	FAR	MGC (%)
134 etwgt ev Bnvi bx‡P	2 KvVv ev bx‡P	6.0	3.15	67.5	6.0	2.50	67.5
134 etwgt Gi DaŸ©nB‡Z201 etwgt ch©š—	2 KvVvi DaŸ©nB‡Z 3 KvVv	6.0	3.35	65.0	6.0	2.75	65.0
201 etwgt Gi DaŸ©nB‡Z268 etwgt ch©š—	3 KvVvi DaŸ©nB‡Z 4 KvVv	6.0	3.50	62.5	6.0	3.00	62.5
268 etwgt Gi DaŸ©nB‡Z 335 etwgt ch©š—	4 KvVvi DaŸ©nB‡Z 5 KvVv	6.0	3.50	62.5	6.0	3.25	62.5
335 etwgt Gi DaŸ©nB‡Z 402 etwgt ch©š—	5 KvVvi DaŸ©nB‡Z 6 KvVv	6.0	3.75	60.0	6.0	3.50	60.0
402 etwgt Gi DaŸ©nB‡Z469 etwgt ch©š—	6 KvVvi DaŸ©nB‡Z 7 KvVv	6.0	3.75	60.0	6.0	3.75	60.0
469 etwgt Gi DaŸ©nB‡Z536 etwgt ch©š—	7 KvVvi DaŸ©nB‡Z 8 KvVv	6.0	4.00	60.0	6.0	4.50	57.5
536 etwgt Gi DaŸ©nB‡Z603 etwgt ch©š—	8 KvVvi DaŸ©nB‡Z 9 KvVv	6.0	4.00	60.0	9.0	5.50	57.5
603 etwgt Gi DaŸ©nB‡Z670 etwgt ch©š—	9 KvVvi DaŸ©nB‡Z 10 KvVv	6.0	4.25	57.5	9.0	6.00	55.0
670 etwgt Gi DaŸ©nB‡Z 804 etwgt ch©š—	10 KvVvi DaŸ©nB‡Z 12 KvVv	9.0	4.50	57.5	9.0	6.50	55.0
804 etwgt Gi DaŸ©nB‡Z938 etwgt ch©š—	12 KvVvi DaŸ©nB‡Z 14 KvVv	9.0	4.75	55.0	9.0	7.00	52.5
938 etwgt Gi DaŸ©nB‡Z1072 etwgt ch©š—	14 KvVvi DaŸ©nB‡Z 16 KvVv	9.0	5.00	52.5	9.0	7.50	52.5

1072 etwgt Gi DaŸ©nB‡Z1206 etwgt ch©š—	16 KvVvi DaŸ©nB‡Z 18 KvVv	9.0	5.25	52.5	9.0	8.00	50.0
1206 etwgt Gi DaŸ©nB‡Z1340 etwgt ch©š—	18 KvVvi DaŸ©nB‡Z 20 KvVv	9.0	5.25	50.0	9.0	8.50	50.0
1340 etwgt Gi D‡aŸ©	20 KvVvi D‡aŸ©	12.0	5.50	50.0	12.0	9.50	50.0[2]
†h †Kvb cwigvY	†h †Kvb cwigvY	18.0	6.00	50.0	18.0	NR*	50.0[2]
†h †Kvb cwigvY	†h †Kvb cwigvY	24.0	6.50	50.0	24.0	NR*	50.0[2]

[1] Uªvwdk, cvwK©s Ges Ab¨vb¨ Pvwn`v c~iY mv‡c‡¶ AcwiKwíZ AvevwmK GjvKvq wb‡gœ ewY©Z e¨envi Pwj‡Z cvwi‡e: (K) WiwgUwi I †nv‡÷j; (L) wkï wbevm, GwZg Lvbv Ges e„×wbevm; (M) me©vwaK 20 K¶ wewkó †nv‡Uj ev jR; (N) Ab~a© 100 eM©wgUv‡ii †i÷y‡i›U; (O) Ab~aŸ©200 eM©wgUv‡ii agx©q Dcvmbvi ¯'vb; (P) AvevwmK fe‡bi bxPZjvq †ckvRxex‡`i Awdm, ÷zwWI ev †P¤^vi hvnv 100 eM©wgUv‡ii †ekx bq Ges †hLv‡b †gvU Rbej Ab~aŸ©15 Rb; Ges (Q) ïaygvÎ Kb©vi c-‡Ui Rb¨ Ab~aŸ©25 eM©wgUv‡ii †mjyb, weDwU cvjv©i, Jl‡ai †`vKvb, gyw` †`vKvb, `w¾©i †`vKvb|

[2] A5 (AvevwmK †nv‡Uj) Bgvi‡Zi †¶‡Î, 20 KvVvi D‡aŸ© Rwg ev 18 wgUvi ev Z`~aŸ© cÖk¯— iv¯—vicv‡k© †h †Kvb cwigv‡ci Rwgi †ejvq bxP Zjvq cÖ‡hvR¨ Avewk¨K †mUe¨vK †¯úm e¨ZxZ msjMœ iv¯—vi DcwiZj nB‡Z m‡e©v"P 12 wgUvi D"PZvi (c¨viv‡cU mn) †cvwWqvg wbg©vb Kiv hvB‡e| *NR (Non restricted)–FAR Gi eva¨evaKZv bvB|

Min Setback:



FAR applied for this plot according to the chart is 3.5

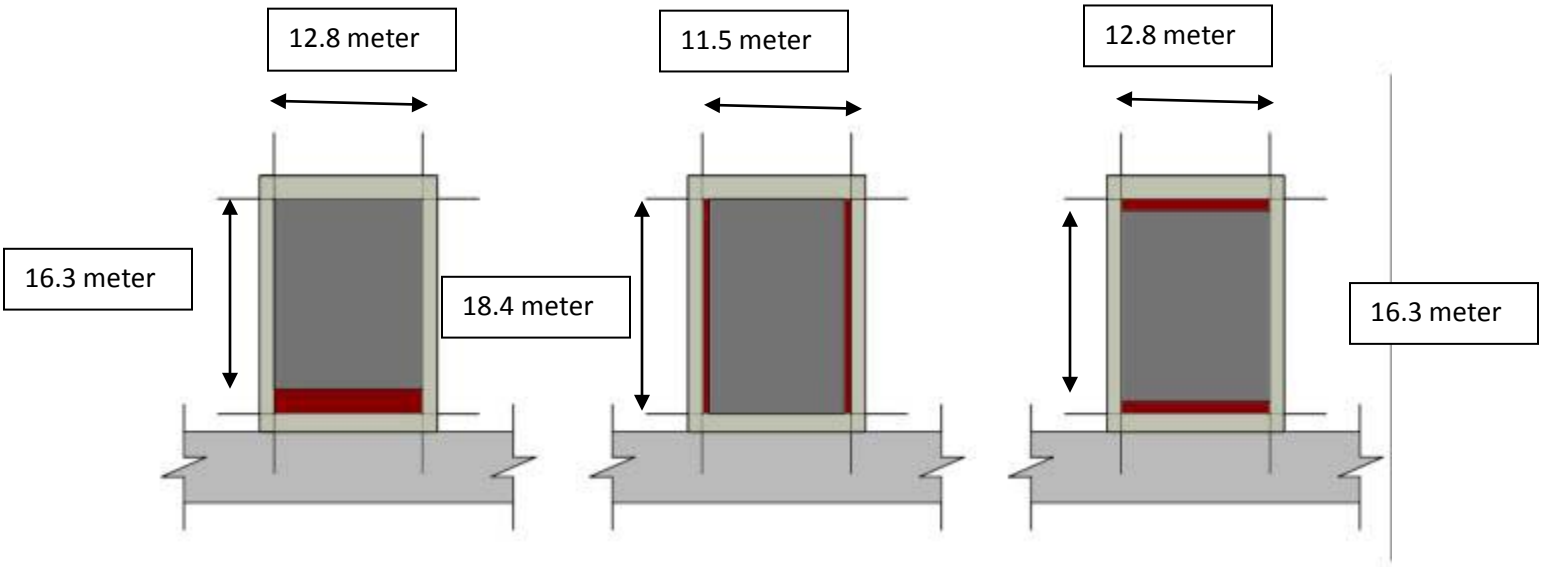
Maximum Ground Coverage is 62.5% for this land area

Total floor area is then FAR x floor area= 335 x 3.5 = 1172.5 sqm

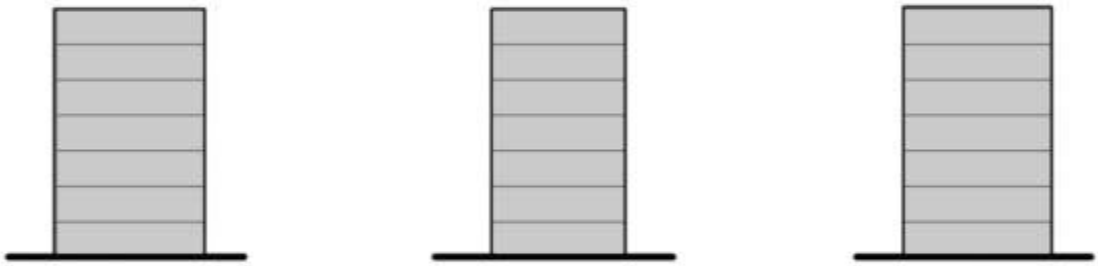
So maximum ground coverage is 209.37 sqm

Building height is 6 Storey + Parking

Taking the ground coverage the maximum 62.5%



Gained Open Space



7 storied building including parking area

The building now can be placed in many ways. Above I showed possible three ways.

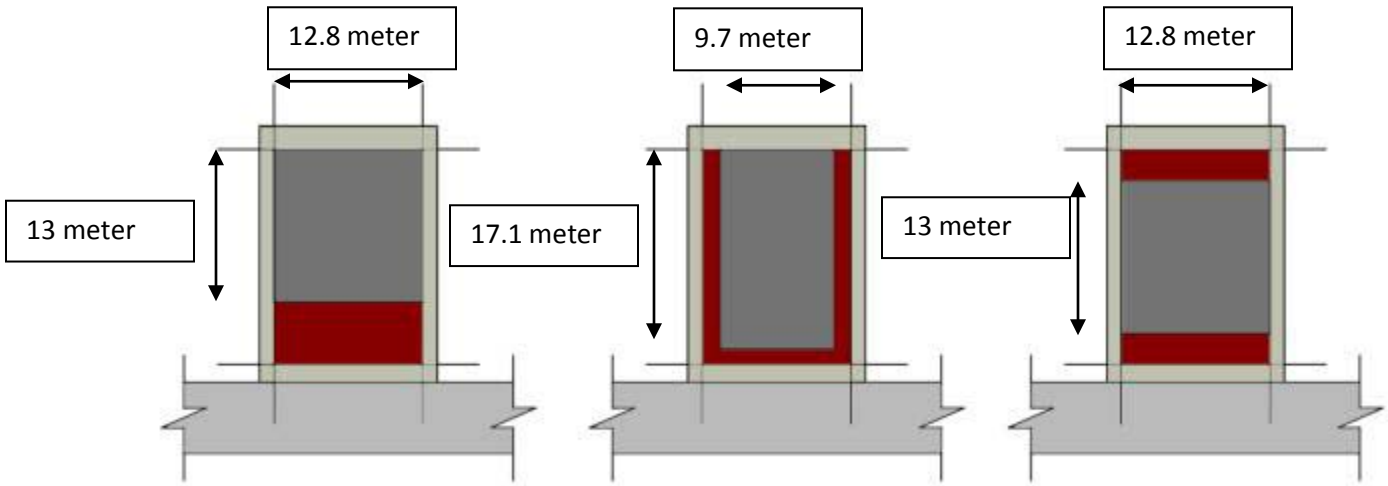
The red color indicates the gained green/open spaces one's getting from the application of the FAR.

Another example I am showing by taking the ground coverage 50%.

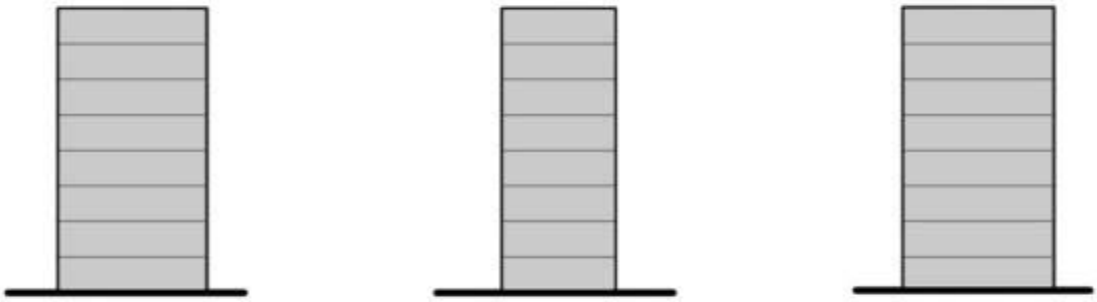
Maximum Ground Coverage 50%

So maximum ground coverage will be 167.5 sqm

Building height 7 storey + Parking

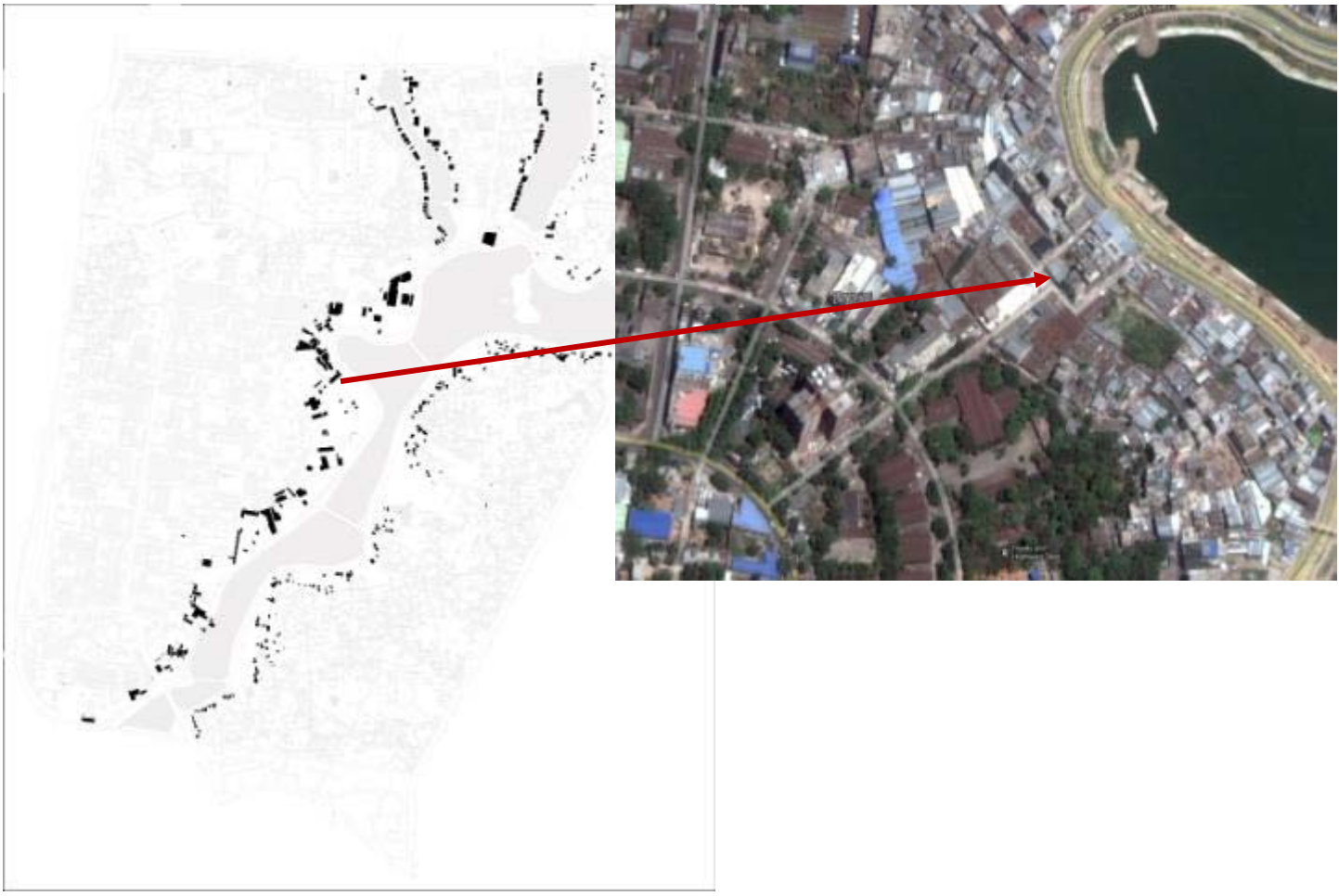


8 storied building including parking area

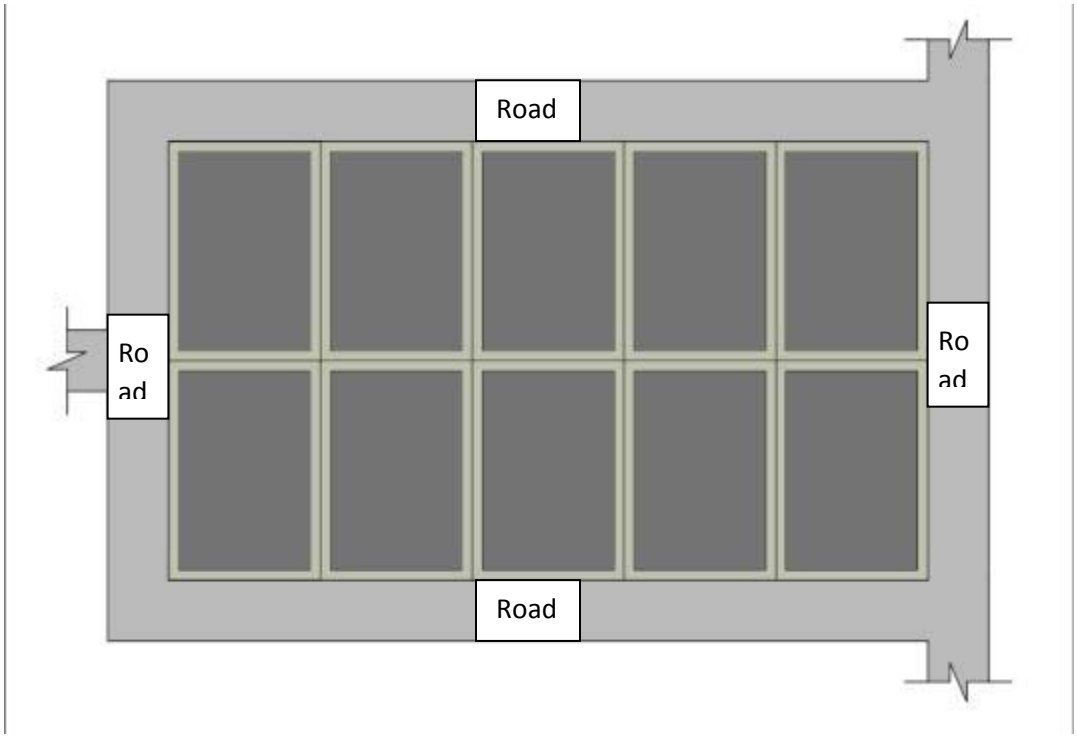


In the site, there is an example of some conventional way of creating buildings. In DAP (Detail Area Plan) we can find these plots wereowned by only three owners. However, studying current situation from the google map it seems, the owner divided it into 10 regular conventional plots to sell it in the market.

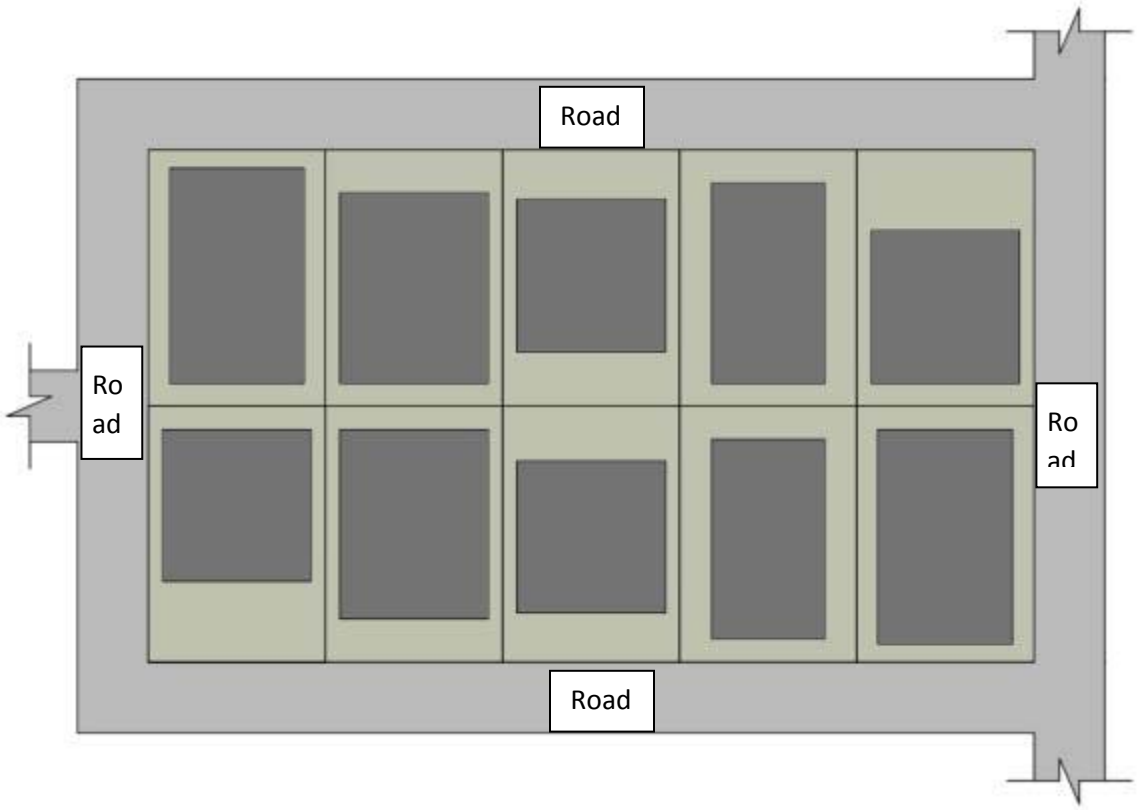
I am choosing this area to compare with the new building construction rule.



The way it way constructing:



Let replace it with the new way of creating the buildings. From the dimension measured from the google earth each of the plots is about 335 sqm plot the same we assumed.



The green/open space increased from the conventional way.

However, the spaces are not practically developed as it could be or should be developed as a green living environment.

To understand this hypothesis in detail let assume the owner of these plots haven't divided the plots as we find in the google map, conversely they added the plot together and made a bigger plot. So, as it happened rather to create it in 10 small plots, they made it in only one big plot. In such a way according to the new rule, the FAR at present can apply 5.5 or 6 (according to the road adjacent with the site) for the whole area. And the maximum ground coverage is now 50%, which mean the increase of the open space.

In detail,

Plot Size 3350 sqm

FAR applied for this plot according to the chart is 6

Maximum Ground Coverage is 50%

Total floor area is FAR x floor area= 3350 x 6 = 20100 sqm

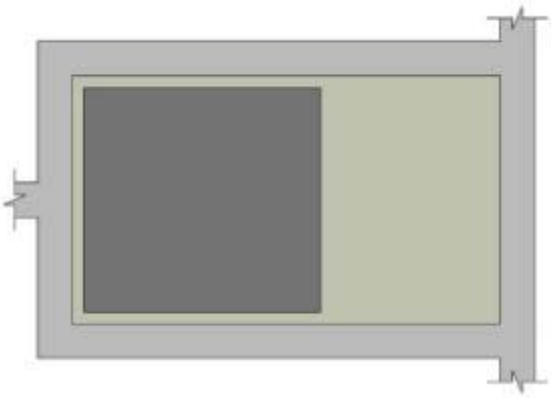
(In the previous way of developing if we add the amount of total floor area all together we can find it is (**1172.5 sqm x 10) 11725 less than this one.)** Almost double. It means in this way we gain both buildable area as well as green area.

So maximum ground coverage is 1675 sqm

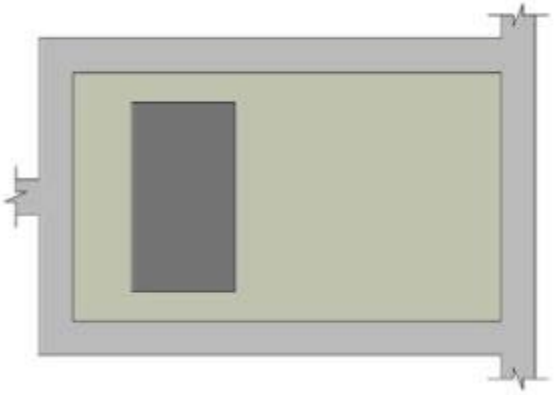
Building height min is 12 Storey + Parking

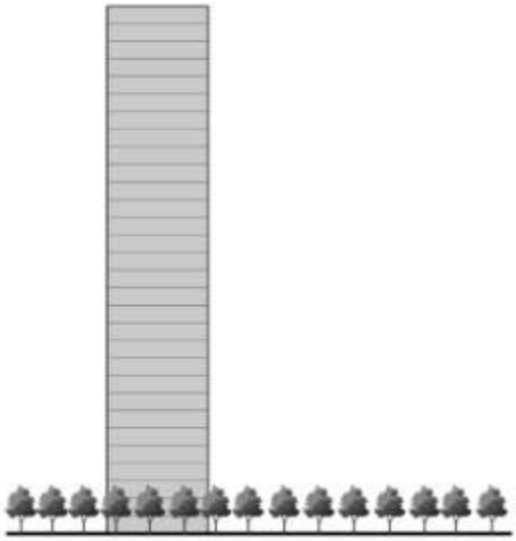
The height is variable in relation to the Ground coverage. And the option for building are more. Bellow has given few examples of this:

Option 01

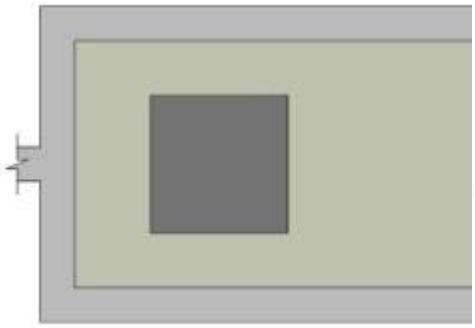


Option 02

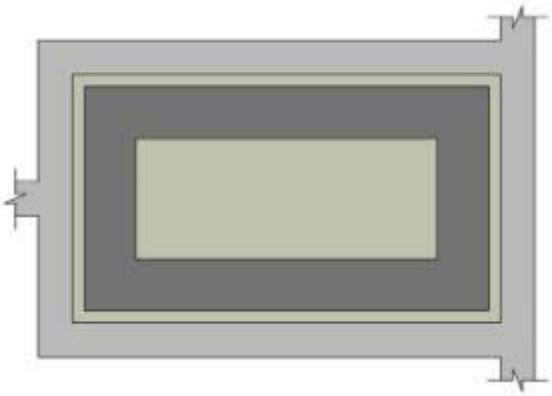


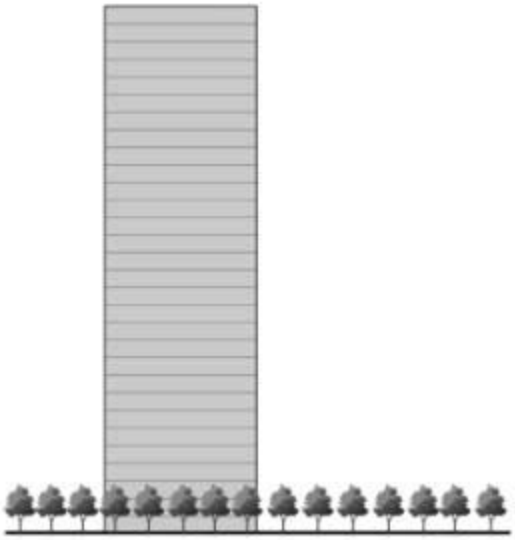


Option 03

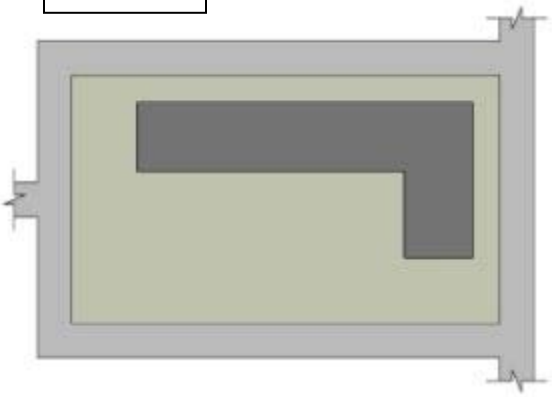


Option 04

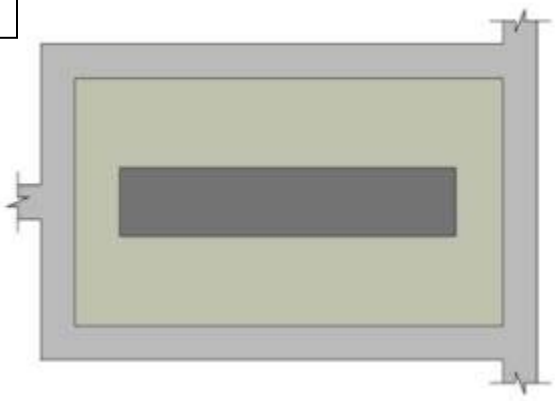


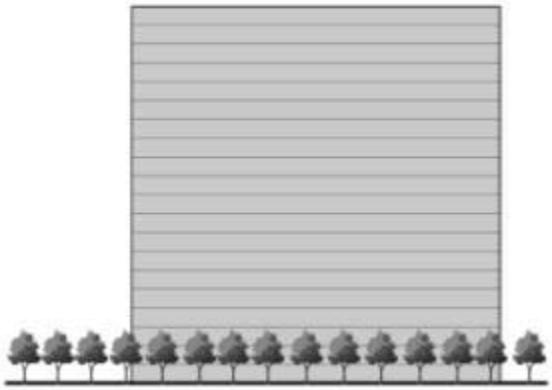


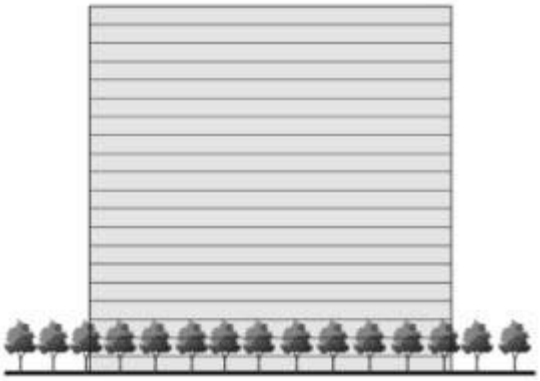
Option 05



Option 06







Part of my research project will include how to develop the small plots in a comparatively bigger plot to find the best benefit from the buildable area as well as for the open spaces. Moreover, in the strategic plan to come up a master plan design to guide for developing this area.

Vision:

At the moment, when I started to think about the strategic master plan, I started to visualize some visions for the future Dhaka. This vision includes the Tejgaon Industrial area what I am proposing in the future it can be developed as heart of the city. The maps that show the development of Dhaka city (page 8 to 10) strengthen this visionary idea. All the analysis represents the potentiality of this proposal.The visions can be as follows:

From a nonfunctional area in the heart of the city

TO

a multifunctional and variety in the heart of the city

From a car priority city

TO

People Priority City

From a traffic barrier

TO

Rather a connected city

From rather neglecting connection to the lake front with the surroundings

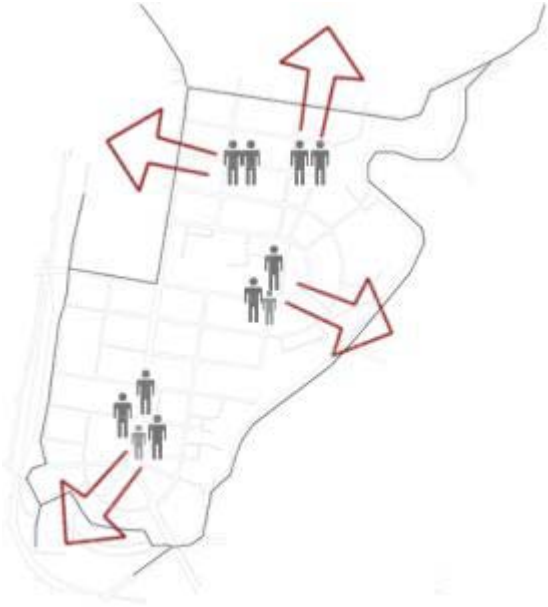
TO

a greater connection with the surroundings city

From a poor links to surrounding amenities city

TO

a strong link to surrounding amenities and to Strengthen the waterfront as people's place



From a very low priority bicycle friendly streets

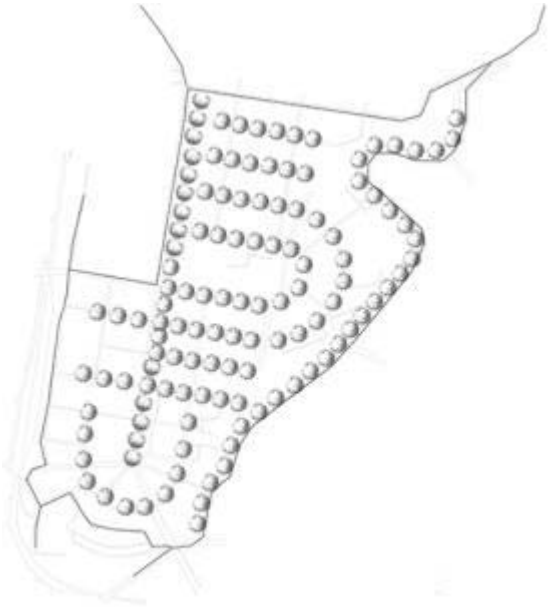
TO

a bicycle friendly streets

From a city with scattered trees

TO

an organized and green city



From Lack of visual pleasure in the street environment

TO

a street with beautiful and surprising environment with high quality streetscape

Developing Strategy:

From the visions above I started to think to develop the strategy by merging the gap between the proposed site and the industrial area. It led me to analyze the function having in the industrial area.

Result:

 = 56%

 = 13%

 = 10.3%

 = 5.8%

 = 2.9%

 = 2.9%

 = 2.9%

 = 1.4%

Others = 4.8%

Which made my analysis to go further to analyze to identify what happen to this area at night.

According to Detail Area Plan, the proposed site is mostly dedicated for mixed used development, Commercial Office and Business.

However, all these analyses led me to propose residential functions within this mixed used building. So the area won't be a dead or dangerous place after certain time. Moreover, general people can take the best advantages of the newly developed landscape design along the lake.

A city where is very few options for getting natural light and air in each dwelling, proposing residential functions can be a good step to adapt this. The location of the proposed site is excellent for catching the wind as well as for the natural light.

It is rare to find a place such as this in Dhaka, where there is a huge void of open space. This opportunity made me to propose the new buildings with a technology of sustainable architecture. Get the best advantages of the wind and Sun to adapt in the building system.

Furthermore, I am proposing to build low-income housing in some part of the industrial area to Marge the gap. This low-income housing will be mostly reserved for the workers of the industrial area who basically lives now in the temporary structure where I am going to propose my building.

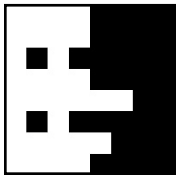
These analysis led me to develop my strategic plan in two period of time.

1. **In 2020 (which I am going to design)**
2. **In 2050 Future city center for Dhaka.**

In 2050, the industrial functions can be replaced and a new city center with multifunctional activities can be introduced.

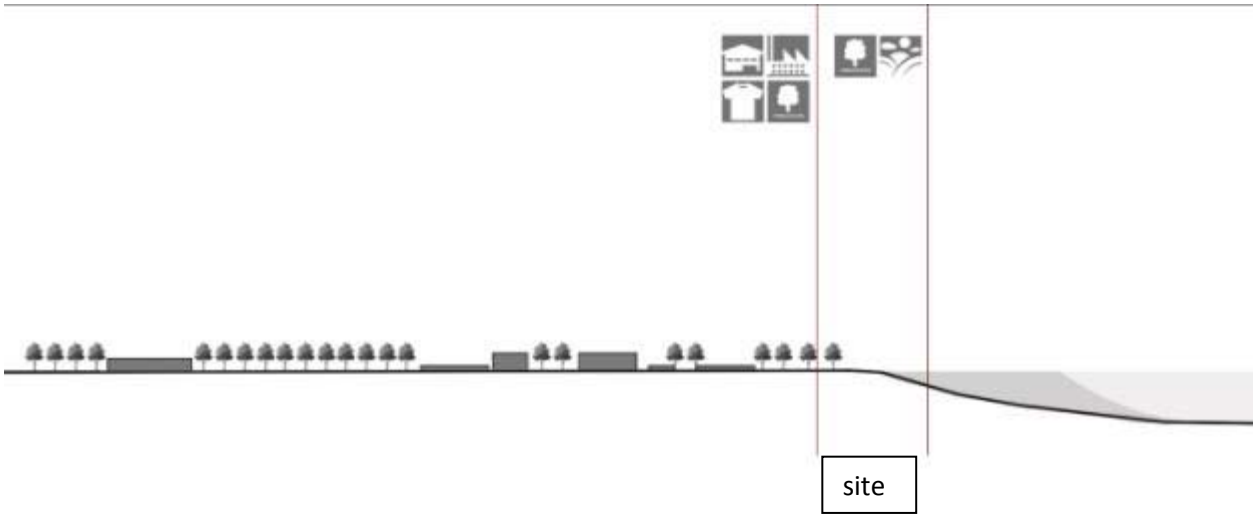
Strategy:

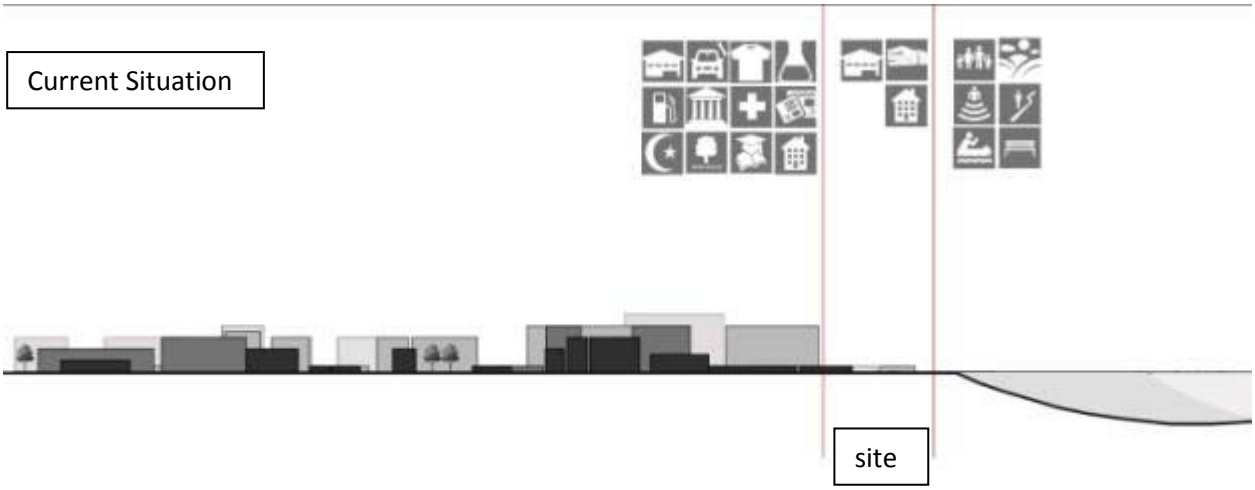
Strategy is Marge the Gap.



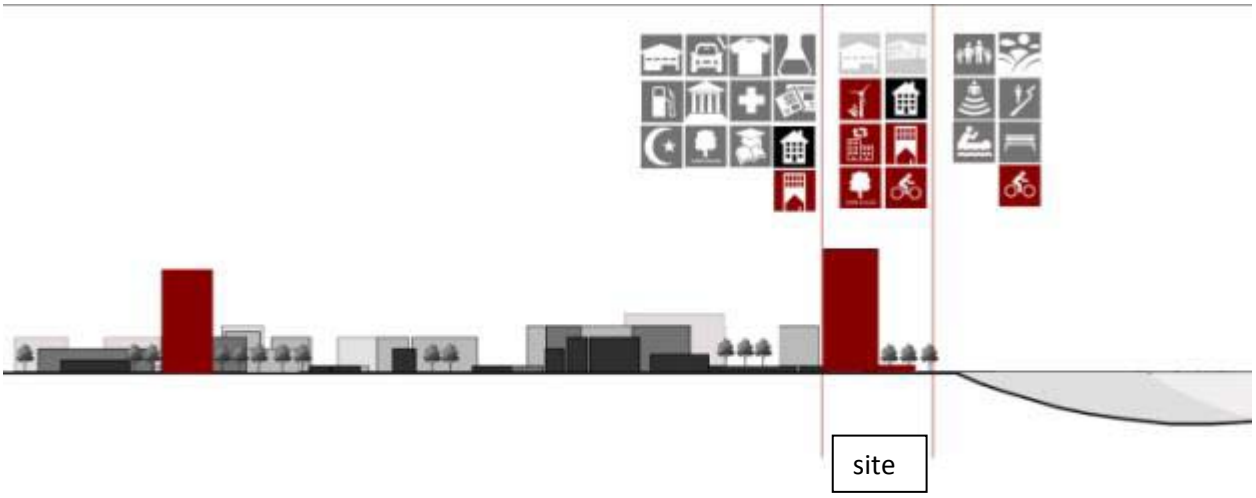
In section:

In PAST:





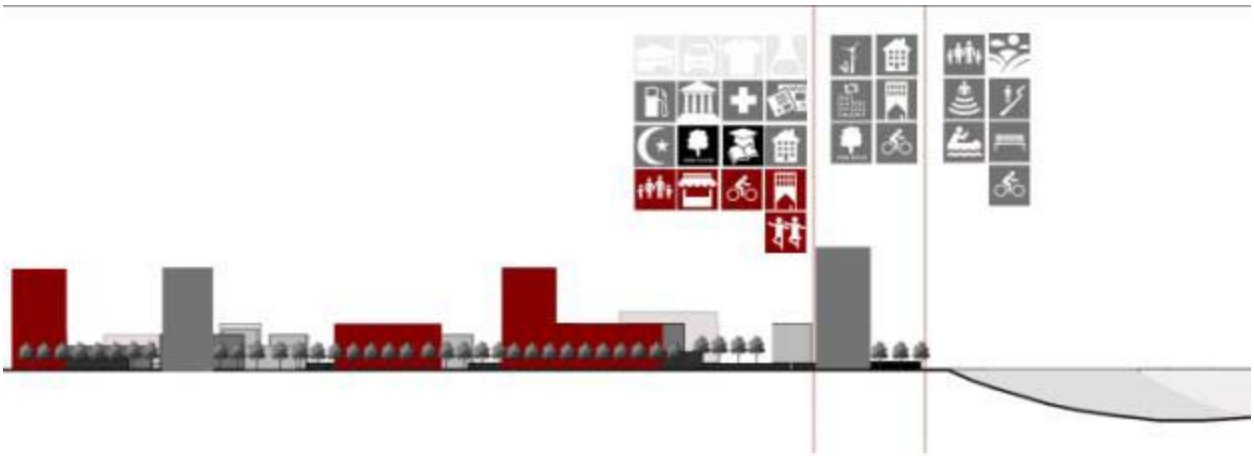
Strategy for 2020



site

Strategy for 2050

site



Detail Area Plan of the Site: