

INCORPORATING NATURAL ELEMENTS WITHIN BUILDINGS-CASES FROM DHAKA: LEARNING FROM TRADITIONAL PATTERNS

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ABSTRACT

Dhaka, one of the largest and densely populated megacities of the world faces lots of environmental problems due to the lack of open spaces and greeneries. Unplanned urban densification by grabbing the greeneries warningly deteriorates Dhaka's livable condition day by day. Within this dense urban condition some outstanding architectural examples in Dhaka shows some innovative and credible ways to incorporate open spaces, greeneries and water bodies within buildings by following some traditional rural patterns of Bangladesh. This paper tries to establish some solutions focusing on some selected architectural examples from Dhaka and looking into the traditional patterns of living with green. The recommended interesting approaches will definitely helpful to incorporate green environment with the lifeless architecture of urban Dhaka.

KEYWORDS: Dhaka City, Natural Elements, Traditional Architecture

INTRODUCTION

Dhaka is the nucleus city of Bangladesh and has come to be identified as one of the mega cities of the world. In 2001, the city had over 12 million people for the larger conurbation and 6 million people within the central city area¹. At the early 70's there were very few buildings in Dhaka that were more than two storied high. Almost all of the residential buildings were single storied and buildings on the plot had open spaces in and around them. Every house had conscious plantation in response to the climatic reason which created pleasing and healthy living environment. The dedicated open space in the building and planted trees surrounding the house allowed smooth, cool natural ventilation as well as lighting within the house. Air conditioning was a rare thing as it was not required at all.

With a rising population and increasing housing demand, apartment culture has grown up in Dhaka sharply. The horizontal expansion of the city is very limited as Dhaka is hemmed by a network of rivers that makes outward expansion difficult and only vertical expansion is possible to accommodate the growing numbers of residents. Apartments were first introduced by the formal private developers in early 80's to the housing history of Dhaka². At that period apartments were built on large plots that have open spaces at the ground level and have proper natural ventilation. During the 90's apartment buildings started to develop rapidly as the demand of accommodation was increasing piercingly. At the end of 90's, apartments are started to build even on small plots leaving almost no open space in and around them. As a result the problem of natural ventilation and lighting became an issue and that created dependency upon mechanical system for the required purpose and therefore increased the pressure on energy consumption.

¹ Islam, N (2005), Dhaka Now: Contemporary Urban Development. Dhaka:Bangladesh Geographical Society.

² Kamruzzaman & N. Ogura, Apartment Housing in Dhaka City: Past, Present and Characteristic Outlook Session A-1: Residential Building/Young Researchers Award, Department of Civil Engineering & Architecture, Faculty of Engineering, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 903-0213, Japan.

Though people are forced to live in these concrete boxes but still they have a strong thrust for nature. The Great Architect Louis I Kahn had created a superb example while designing the national assembly building at Sher-e-Bangla Nagar, Dhaka. He designed it upon water which is very rational with our vernacular pattern. His sensitivity to natural element is strongly depicts in his building where natural elements have been used from climatic reasons as well as aesthetic purpose. He invites sunlight into the building from roof and other openings whereas water creates a cooler environment around the building. But now in already overcrowded Dhaka, it is very difficult to manage large open spaces to make greeneries and water bodies within and around the buildings.



Photograph : Natural Light in the Interior Space of National Assembly Building in Sher-e-Bangla Nagar, Dhaka



Photograph : Buildings on Water. MP Hostels of National Assembly building in Sher-e-Bangla Nagar, Dhaka

Some practicing sensitive and nature responsive architects in Dhaka have very successfully accommodated natural elements like water, greeneries, air and sunlight within the buildings through their innovative and climate responsive design process. Moreover, traditional physical development in this region also offers the best and integrated solutions towards human needs, in their relation with the nature and living environment. This paper focuses on investigation the traditional living pattern within natural settings and some selected examples particularly in Dhaka where design ideas incorporated natural elements in buildings. Finally the paper tries to find out some innovative approaches to incorporate natural elements within the buildings.

URBAN LIFE AT DHAKA

Dhaka is one of the most densely populated cities of the world rambling over more than 1530 square kilometers with population of more than 12 millions³. Dhaka is confronting the problem of huge population pressure on urban land shrinking its urban residential open spaces and deteriorating the quality of life and environment of the city. After independence in 1971, tremendous population pressure has put Dhaka's built environment in a crisis situation⁴. Unresponsive development in Dhaka is narrowing resident's access to open spaces, negating the enjoyment of civic life, mostly affecting children and young people⁵. Now it is trying to accommodate more people in less space like other mega cities of the world ignoring the inherent demand of living with nature of the local people. As a result it became very intricate to allocate green open spaces, water bodies and other natural elements to the inhabitants. Against the acceptable standard of about 25% urban greenery, the park greenery or tree-covered spaces in Dhaka constitute less than 15% of the city landscape. According to Dhaka Metropolitan Development Plan 1995, old Dhaka has only 5% and the new Dhaka about 12% open space⁶. This crisis in the built environment also visible in the residential blocks both in outdoor and indoor

³ S. Hossain, 2008, "Rapid Urban Growth and Poverty in Dhaka City", *Bangladesh e-Journal of Sociology*, Vol. 5, no. 1

⁴ Qazi Azizul Mowla, Proceedings of the Conference on Engineering Research, Innovation and Education 2011, CERIE 2011, 11-13 January 2011, Sylhet, Bangladesh

⁵ A. Siddiqua, 2011, Emergence of Open-spaces For Dense Dhaka: Searching for Solutions from Traditional Settings, *Nakhara*, Vol. 7, pp. 47-62

⁶ Qazi Azizul Mowla, Eco-design Concept in the Design and Management of Dhaka's Urban Open Spaces

environment where absence of natural touches degrading the healthy living condition day by day.



Figure 1: Dhaka Skyline
(Source: Author 2011)

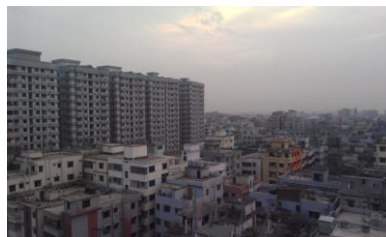


Figure 2: Dhaka Skyline
(Source: Masud ur Rashid' 2012)

IMPACT OF UNPLANNED DENSIFICATION IN DHAKA

Recent drift of unplanned urbanization in Dhaka is destroying the greeneries for the sake of new construction. Besides, this expansion is creating adverse impact on nature as well as energy consumption. This trend is deteriorating the quality of human life in densely populated Dhaka. Insensitive urbanization is also snatching away the enjoyment of people's life and therefore affects our future generations. Unfortunately, with the recent acceleration of development pressure in the urban areas and Euro-centric urban practice, the traditional sense of open space has been overlooked. Housing and other developments are overcrowded with towering living blocks without any open spaces left within them.⁷ People living in most of the apartment buildings in Dhaka have almost no relation with natural elements like sky, air movement, water-body, plants etc. Moreover in many apartments natural ventilation system is so poor that the inhabitants have no means rather to depend upon air conditioning system. The lack of sustainability in the new developments appears as a threat to environmental conditions.⁸ It is generally acknowledged that the quality of life in Dhaka has gradually deteriorated social and physical terms due to numerous factors.⁹

TRADITIONAL HOUSE IN RURAL BANGLADESH

In Bangladesh, a tropical country, open space carries an important functional and environmental purpose especially within the residential setting – both in rural and urban areas. Traditionally people of Bangladesh are also habituated to live in close connection to the nature. In most of the villages in Bangladesh people lives in huts. Culturally the houses are arranged around a courtyard that is the heart of the homestead. There are also lots of trees in and around the homestead. Usually each household behold one or two ponds that are the integral part of their day to day life. The excavated pond is also consciously positioned in the southern front of house so that the flowing hot summer breeze passes over the water, cool it down before to enter in the house.

Utilization of shade and shadow by using the building elements are incredible which are very much relational with the local climate and comfortable living environment. Large extended overhang above the opening prevent solar radiation penetrate into indoor area during hot season and at the same time restrict driving rain during monsoon. Moreover, the projected overhang also allows wind flow through the indoor space due to pressure difference.

An extensive landscaping is done to define the house in the surrounding environment. Trees plantation around the house are done in such consideration so the shadow of trees are on the outdoor working areas and house façades which allow comfortable working environment and reduce heat gain from solar radiation respectively. Inclined pitched roof and vegetation on the thatched roof reduce heat gain.

⁷ Ayasha Siddiqua, Emergence of open space for dense Dhaka: Searching from traditional settings, Nakhara Journal

⁸ Ayasha Siddiqua, Emergence of open space for dense Dhaka: Searching from traditional settings, Nakhara Journal

⁹ Ayasha Siddiqua, Emergence of open space for dense Dhaka: Searching from traditional settings, Nakhara Journal

The planning layout also suggests environmental consideration regarding climatic condition. The rectangular shaped north-south elongated shape of house allows regional ventilation coming from south-east direction and minimizes heat absorption from east and west importantly. The internal functional arrangement considering the directional climatic benefits accommodation mostly used living areas in the comfortable zone.

Traditional approach of planning and design of living environment with nature is still valid without sacrificing contemporary needs¹⁰. By investigating the cultural and environmental aspects of vernacular settlement, it is possible to formulate credible approaches to integrate green within dense urban residential environments.



Figure 3: Traditional Rural Homestead of Bangladesh
Arranged Around a Courtyard (Source: D M Hasan, 1985)

CASE STUDIES OF SOME SELECTED BUILDINGS IN DHAKA

The mindful thought of a number of Bangladeshi architects guided us through experiments in the direction of greater awareness where they value their unique resources of land and tradition. In this practice they continuously take the advantage of the character of the local climate by introducing natural elements in the urban context. In the realm of complex urban society life became more complicated and challenging. So people sometimes eagerly expect simplicity and practicality of the traditional rural architecture of Bangladesh. This paper discusses some cases where traditional simplicity established in modern living. These architectures are motivated with the natural elements believing that these natural elements are also desirable into buildings in urban areas whereas introduction of natural elements like water, stone, plants, sunlight in traditional way can greatly enhance the beauty and comfort with impressive color and texture. In this paper some architectural projects from different locations of Dhaka are presented as representative of this practice.

RESIDENCE OF ARCHITECT BASHIRUL HAQ AT INDIRA ROAD, DHAKA

Architect Bashirul haq designed his own residence at Indira Road near Farmgate at Dhaka in 1983. It is a very good example for using greeneries at the outer walls and also in the interior parts of the building. In his residential building he uses creepers at exterior walls. It also helps to reduce the heat from sunlight and makes the building interior cool. In the same house he uses greeneries at the living room and brings sunlight upon the trees. In this project the buildings blocks are arranged around courtyards.



Figure 4: Architect Bashirul Haq's Residence
(Source: Kazi Khaled Ashraf 1987)

¹⁰ Qazi Azizul Mowla, Proceedings of the Conference on Engineering Research, Innovation and Education 2011, CERIE 2011, 11-13 January 2011, Sylhet, Bangladesh.

KALINDI APARTMENTS AT INDIRA ROAD, FARMGATE, DHAKA

Kalindi Apartments is one of the pioneer apartment buildings of Dhaka at Indira Road of Farmgate area. It is designed by Architect Bashirul Haq where he tries to create open spaces around and in between the building. There open spaces are used as a base of different types of trees around the building creating proper ventilation within this apartment. The boundary wall of this apartment is also used as a base for creepers.



Figure 5: Kalindi Apartments, Inner Courtyard and Boundary Wall with Trees (Source: Author)

MEGHNA RESIDENCE, DHANMONDI, DHAKA

Meghna Residence designed by Architect Rafiq Azam is situated in the Dhanmondi residential area near Sultana Kamal Mohila Complex. In this residential building project our climate, context and typology is very successfully incorporated within its own boundary wall by introducing natural elements like creepers and water. Internally it has its own courtyard covered with grasses and trees around. Courtyards and ponds of traditional living are reproduced in this project with certain typological inclusions like sitting beside the pond with untamed green and greenish water. Environmentally it creates cool breeze at roof level. It also reduces the scorching heat of the tropical sun of this region. In all the terraces there are creepers and trees. Actually the architect composes the building not only with glass, bricks and concrete but also with green and water¹¹.

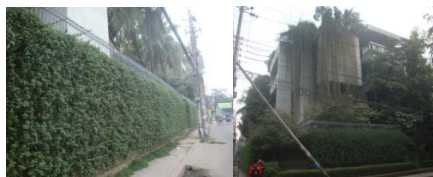


Figure 6: Meghna Residence at Dhanmondi Dhaka Showing Creepers at Boundary wall and the Building Facades and Terraces Covered with Greeneries (Source: Author)



1)View of the Pool at the Roof Top 2) Fountain at Upper Terrace 3) Green Lawn at Ground Level at Meghna Residence, 4) Top view of Meghna Residence Showing the Water Pool at Roof and the Greeneries and Creepers, (Photos by: Hassan Saifuddin Chandan, **Source:** Shatotto Architects)

¹¹ Meghna Residence by Shatotto Architects, Home Design: Interior Design And Inspirational Homes, Viewed 30 September, 2012 (<http://www.homedsgn.com/2011/10/06/meghna-residence-by-shatotto-architects/>)

CHAYANAUT BHABAN, DHANMONDI

Chayanaut Bhaban designed by architect Bashirul Haq is another building which incorporates greeneries and natural sun light through open courtyard at the central part of the building providing natural air and light to all rooms. The road side fencing made up with green bushes provides a soothing look to the passersby. At the ground level the set back space and also a covered space is allocated for greeneries.

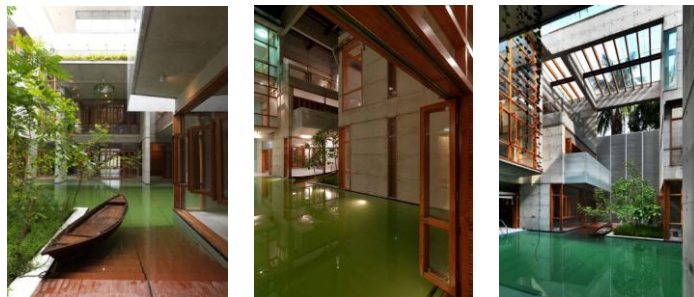


Figure 7: Inner Courtyard and Greeneries at Ground Level and at Boundary of Chayanut Bhaban (Source: Author'2012)

SA RESIDENCE, GULSHAN, DHAKA

SA Residence is a single ownership residential building at Gulshan area designed by Architect Rafiq Azam. Traditional space quality has achieved through simple architectural vocabulary by combining urban and rural typology into one. This building reflects the traditional way of living by combining courtyard connected with adjacent water body at the ground level symbolizing the pond adjacent to the courtyard of our village.

To catch the summer winds most of the openings of this building is oriented towards the south while by providing open courtyard lets light, wind, and rain through - create an ever changing environmental reservoir with comfortable indoor space. Architect Rafiq Azam claims this one an introspective building, in which every view, every glimpse one room from another is designed to encourage observation of space and contemplation of the natural elements present in the patio garden on each level.



Different views of the water court with a traditional boat lited with natural lightings at the ground level of SA residence, Photos by: Daniele Domenicali, Rafiq Azam, Source: Shatotto Architects



Circular holes on the cement slab on the roof to create 'rain-room', Photos by: Daniele Domenicali, Rafiq Azam, Source: Shatotto Architects, Dhaka.



Figure 8: The ground Floor Plan of SA Residence Showing Greeneries and Water Consequentlt with Green and Blue Color Source: Architect Rafiq Azam, Shatto Architects, Dhaka

POSSIBILITIES AND SCOPE

Contemporary trend of urban is to learn from the traditional city morphology and to apply them in a contemporary development context.¹² A building with proper light, air, green and water bodies not only create pleasing environment but also reduces the pressure on energy consumption by minimizing the air conditioning and artificial lighting. Traditional biases along with the inspiring case studies, some design ideas have been suggested here to incorporate greeneries and water bodies for healthy living environment.

APPLICATION OF GREEN IN THE EXTERIOR FACADES AND BOUNDARY WALLS

Trees, shrubs and other plants play a significant role in moderating the built environment by providing shade to building and spaces, intercept solar radiation and cool the air by “evapotranspiration” (Mowla 1999B). Total biomass has a significant soothing effect on the built-environment. Deciduous trees shading the south and west sides of building or roads or spaces blocks the summer sun thereby reducing the cooling energy by as much as 30% while allowing sun during winter when altitude of sun is thereby reducing heating cost (Mowla, 1985 B). Trees help filter out up to 75% of particulate air pollutants such as dust, pollen, smoke, odor. And fumes, making the air healthful for the outdoor space users (Rubenstein, 1992). Some of the trees which have the ability to endure air pollution are suitable where heavy traffic congestion occurs. Moreover, green climbing plants in the boundary wall and external facades could curb the noise level which is intolerable day by day in the urban life.

INTRODUCING GREEN IN THE INTERIOR SPACES

Greeneries can be used in the interior spaces of buildings including terraces and verandas. By reducing the indoor temperature successfully designed plantation also can reduce the heat gain to the building as whole. Terraces and verandas in the south allow desired ventilation from south but at the same time receive solar radiation from sun as it inclines bit south in this latitude. Green plantation and small water bodies in these areas could act as heat absorber and less effects in inside environment. Additionally, greeneries in the interior spaces provide contextual touch in the living atmosphere as well as keep indoor temperature in tolerable level. Open court yard of open atrium at the inner part of the house is very useful for providing natural light and air to pass through the building

GREEN AND WATER IN THE LAWN OF THE BUILDING

Almost all apartment buildings left the ground floor for parking and other common facilities. Including the covered and open-to-sky spaces in the ground floor could be designed by green and water bodies At the ground level it is very helpful to create water bodies to bring the nature within the constructed environment. In a large plot open courtyards

¹² Towards a paradigm of liveable city-The case of Dhaka.Qazi azizul Mowla, Tha jahangirnagar review, Part II, Social Science, Vol. XXVII june 2004

can be provided that can be used as green spaces and also provides ventilation. Innovative use of greeneries, water bodies and inviting sun and rain can be interesting ideas to allow nature in the robotic urban life. Children playing in the lawn can have the touch of nature which is helpful for their upbringing.

WATER AND GREEN IN THE ROOF AND TERRACES

Most of the roof in the apartment complex and residential blocks left unutilized rather only some community spaces. But incorporating the green and water along these community facilities might have multi –dimensional scopes. Vegetated roofs have the potentials to combat urban heat island effect, alleviate storm water pressure on the sewerage system, reduce energy consumption and purify the air.¹³ Green roofs alleviate storm water system, reduce combined sewer overflows rates by retaining 50-95% of rainwater on site, cool down and reduce runoff flow, and absorb and filter heavy metals and pollutants. The cooling effect of rooftop plants was confirmed by different studies and the maximum temperature difference of 4.2 deg C was detected.¹⁴ Additionally, vegetated roof could be a good source urban agriculture.

TREATMENT OF OPENING WITH GREEN

Windows integrating with the plantation and facing the windward direction can be very useful to pass the cool air through the interior spaces. Deep recesses of opening with shading device will cut the unwanted solar radiation and same time controlled sunlight can be introduced into buildings to create dreamy light and shadows in the spaces.

LANDSCAPE IN THE COLLECTED SETBACK SPACES

Before 2008 almost all the apartment type residential buildings were constructed just by leaving a narrow strip of land at the periphery that was not enough for proper ventilation. In the new building construction rules published in May 2008, it is mandatory to provide a minimum percentage of land as open space.

Depending on the building height this mandatory open spaces could be vary from 37.5% to 50%. Intelligent utilization of this set back space with green and water will definitely good example of open spaces for urban habitants.

Furthermore, collected setback spaces of adjacent plots will also a good example to allow large open space with greeneries for group of inhabitants. These innovative uses of spaces with green will also affect the micro climate with desired air flow, sun light penetration, and solar radiation absorption in this dense, concreted urban life.

CONCLUDING REMARKS

Development is a continuous process. This process is composed of effort and achievement. Perhaps we are giving our effort in such a way which needs alteration so that we can use our natural resources with the own responsibility. May be in present time we cannot build our residence in lush green, but we can bring nature into our buildings to assure our keenness for nature. Through our architecture we can attain our aspiration, reflect our feelings for nature and can respect our environment. Even working on single building can play a great role to this comprehension.

REFERENCE

1. Islam, N (2005), Dhaka Now: Contemporary Urban Development. Dhaka:Bangladesh Geographical Society.
2. Kamruzzaman & N. Ogura, Apartment Housing in Dhaka City: Past, Present and Characteristic Outlook Session A-1: Residential Building/Young Researchers Award, Department of Civil Engineering & Architecture, Faculty

¹³ Qazi Azizul Mowla, Eco-design Concept in the Design and Management of Dhaka's Urban Open Spaces

¹⁴ Qazi Azizul Mowla, Eco-design Concept in the Design and Management of Dhaka's Urban Open Spaces

- of Engineering, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 903-0213, Japan.
3. S. Hossain, 2008, "Rapid Urban Growth and Poverty in Dhaka City", *Bangladesh e-Journal of Sociology*, Vol. 5, no. 1
 4. Qazi Azizul Mowla, Proceedings of the Conference on Engineering Research, Innovation and Education 2011, CERIE 2011, 11-13 January 2011, Sylhet, Bangladesh
 5. A. Siddiqua, 2011, Emergence of Open-spaces For Dense Dhaka: Searching for Solutions from Traditional Settings, *Nakhara*, Vol. 7, pp. 47-62
 6. Qazi Azizul Mowla, Eco-design Concept in the Design and Management of Dhaka's Urban Open Spaces
 7. Ayasha Siddiqua, Emergence of open space for dense Dhaka: Searching from traditional settings, *Nakhara Journal*
 8. Qazi Azizul Mowla, Proceedings of the Conference on Engineering Research, Innovation and Education 2011, CERIE 2011, 11-13 January 2011, Sylhet, Bangladesh.
 9. Meghna Residence by Shatotto Architects, Home Design: Interior Design And Inspirational Homes, Viewed 30 September, 2012 (<http://www.homedsgn.com/2011/10/06/meghna-residence-by-shatotto-architects/>)
 10. Towards a paradigm of liveable city-The case of Dhaka. Qazi azizul Mowla, *Tha jahangirnagar review*, Part II, *Social Science*, Vol. XXVII June 2004
 11. Qazi Azizul Mowla, Eco-design Concept in the Design and Management of Dhaka's Urban Open Spaces

