

Water Urbanism: A Prospective Study on Dhaka

Qazi Azizul Mowla

Department of Architecture, Bangladesh University of Engineering and Technology (BUET), Dhaka
Bangladesh

qamawla@arch.buet.ac.bd

Abstract: Bangladesh is located in the largest active delta in the world besides receiving high amount of rainfalls, mighty rivers flow through it. Still there is a water crisis. Dhaka, its capital, was once crisscrossed by numerous water channels draining the city as well as serving as a main source of service and communication line and naturally water bodies and Rivers had played an important role in the spatial development, life and liveability of Dhaka. The physiographic effect of water and land can be seen on the settlement pattern, which sited on available high ground or on artificial mounds created on the flood plains. The traditional system was of dig-elevate-dwell whereby ensuring water retention during floods and reservoir for lean period. Contemporary urban planning and design in Dhaka has its roots in the colonial period which ignored the traditional pattern of settlement planning resulting in the settlements to turn its back to the water bodies whereby causing health, sanitation and water logging problems.

This calls for an urgent attention to integrate the water bodies with the existing city fabric. The study is an attempt to explore the physiographic dynamics of Dhaka along with its socio spatial context and propose guide lines which would respond well to the water based context of Dhaka.

Key words: Geo-morphology; Water bodies; Historical Context; Dhaka; Urban Fabric.

Introduction

Dhaka metropolis, the capital city of Bangladesh, has developed on a strategic central place in the great 'Ganges-Brahmaputra' delta called Bengal. The geo-morphology of the place has always played a significant role in the formation and growth of this settlement. Almost whole of Bangladesh is formed by the alluvial deposits brought down by the mighty rivers – the Ganges, the Brahmaputra and their tributaries. One of the important hydrological aspects of the rivers of Bangladesh is that the rise and fall of the river stages are only very weakly dependent on the local rainfall, because 92% of the catchments of these rivers lie outside the country (IWM, 2003). Siltation process is simultaneously going on for ages in both water channels as well as in the flood plains thereby their relative depth remains almost constant and the shore line moves south ward with the accretion of new lands. Embankments and insensitive land fillings disrupts natural process of hydrological and geological dynamics resulting in the rise of the water channel beds above the surrounding land and make the local gravity drainage difficult.

Historically Dhaka's urban life and living was interwoven with the system of rivers, canals, lakes and ponds scattered and crisscrossing the city (Mowla,2008). In the earlier days, a network of natural canals within the city served as the means of drainage of the rain runoff and water during the events of flood, besides these canals served as a good means of transportation. Water bodies also offered highly valuable environmental and recreational asset for the area. But gradually in course of time this natural drainage system is being almost destroyed. Destruction of these water channels and depressions has resulted in the disruption and alteration of the natural process of land accretion, land formation and ecosystems. It is observed that, Traditional Architecture, Urban Design and planning in this region

offers the best and integrated solutions towards human needs, in their relation with the nature, ecosystems and the community but contemporary development ignored living with nature. Because of uncontrolled urbanization and lack of holistic planning, water logging is an inherent problem of most urban sites in Bangladesh.

Urbanization, without considering the geo-morphology of Dhaka during recent times has left a deep scar in the city's environment. Dhaka is now at crossroads. It needs some strategic decisions and quick actions to remain liveable. Water logging, pollution, changes in hydro-geological system, land subsidence and building collapse are some of the severe consequences of these environmental changes. In this paper, geo-morphological and hydrological features were explored to ascertain an appropriate role for them for their rejuvenation and integration into the city fabric. This paper takes a queue from a study conducted in the Department of Architecture, BUET (2009) to explore the physiographic dynamics of Dhaka along with its socio spatial context and propose design parameters following which spatial development could be achieved befitting the traditional system that was more sustainable. However, proposal for detailed urban design guidelines for Dhaka is not the intention of this paper.

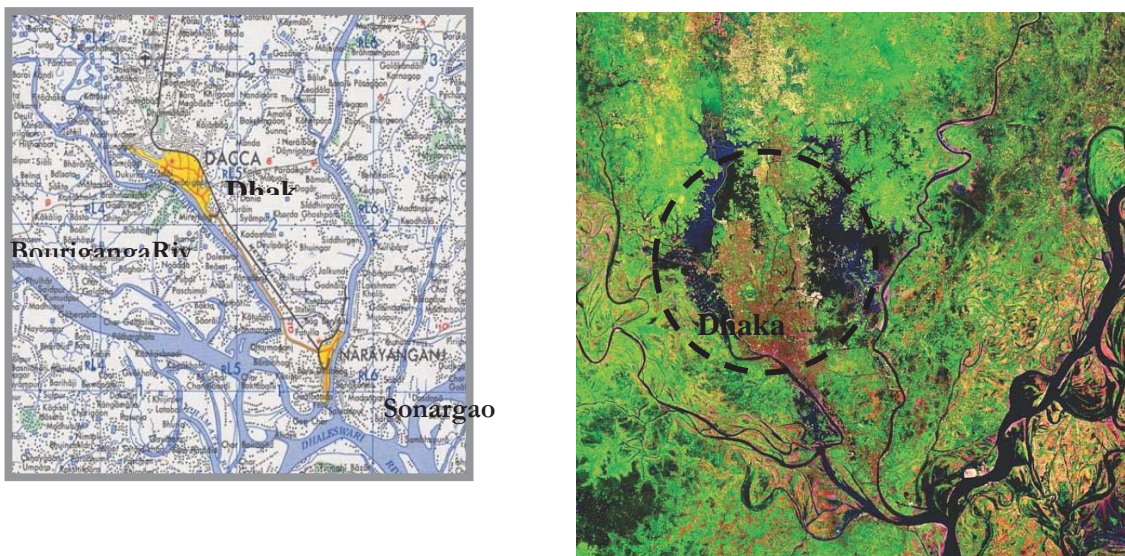


Figure 1. Physiographic Setting of Dhaka and its growth: Recent image show wetlands on its east and west.

Contextual Brief

Geo-Morphology of Dhaka: Dhaka has grown from a small settlement within the confines of River Bouriganga and the Dholai *Khal* (canal) to a sprawling metropolis of about thirteen million people. The spatial development followed the prong of flood free terrace originating from the old nucleus along Bouriganga River towards north as a part of Madhupur terrace of pre-ostacian age (Fig.1 & 2). This terrace was also crisscrossed by numerous water channels that drained the city as well as served as a main source of service and communication line (Figs. 3 & 4). The Madhupur terrace, on which Dhaka has developed, slopes towards eastern and western flood plains, marshes and Rivers. The physiographic effect of water and land can be seen on the settlement pattern, which sited on available ground or on artificial mounds created on the flood plains (Mowla,2005).

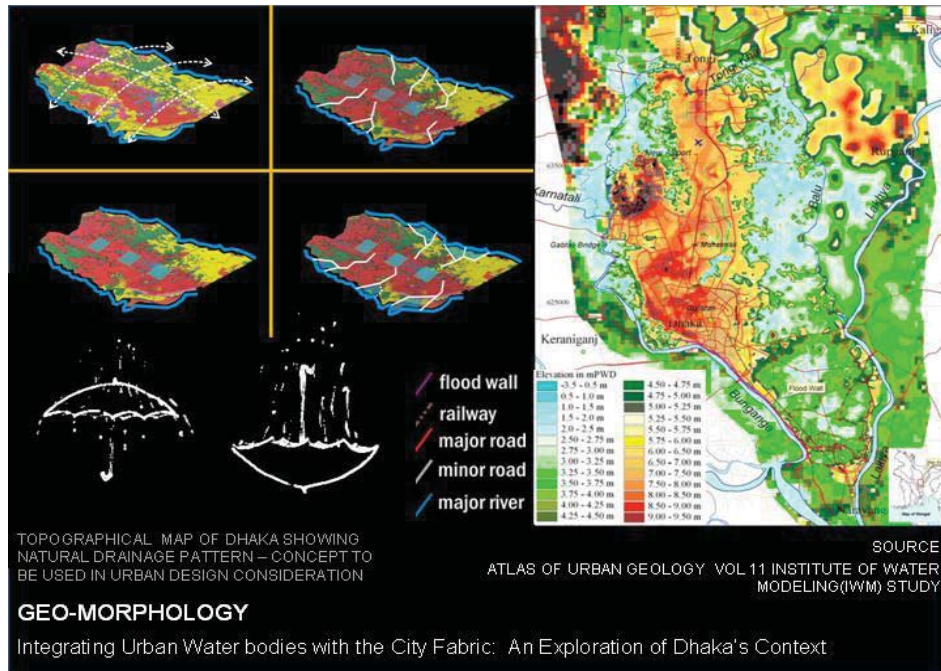


Figure 2. Geomorphology Context of Dhaka – showing natural drainage pattern based on IWM,2003.

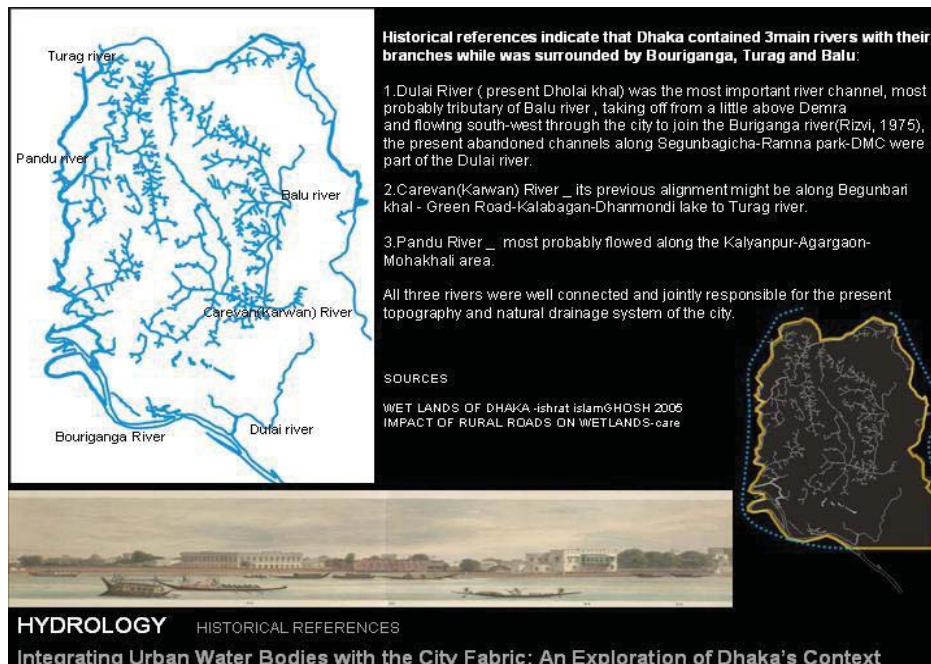


Figure 3. Historic Water body system in Dhaka (Source: Mr Emaduddin, IWM,2003).

Water Retention and Drainage: Due to the urban development pressure in Dhaka there is a tendency of filling of water bodies and flood plains resulting in the reduction of water retention capacity, diminishing public spaces

and increasing water logging or flooding. Manmade drainage systems are not sufficient enough for this growing metropolis. Flood visits the city almost every year victimizing millions of people in and around. In this respect the localities situated inside the city suffers most, especially the inhabitants of old town. Degradation, obstruction and demolition of natural drainage systems are causes of floods severity in some parts of the city (Fig.4).

Given the fact that Dhaka is subject to frequent flooding, an appropriate plan for flood control is needed. Such a plan is not evident in Detailed Area Plan (DAP, 2007), which rather than setting aside adequate space for water retention ponds and for permeable surfaces (including parks and other unpaved surfaces), focuses instead on roads and buildings, embankment and pump oriented flood control approach which will further intensify the suffering of Dhaka residents due to flooding. Interestingly, water retention / detention areas in the DAP are not being located in the natural depressions. Considering the geo-morphology of Dhaka, contrary to the embankment- and pump-oriented flood control and drainage management approach of DAP, flood management and a detention reservoir-based gravity drainage system is expected to be more reliable and appropriate for storm water drainage system in a floodplain landscape like Dhaka with rivers encircling the city.

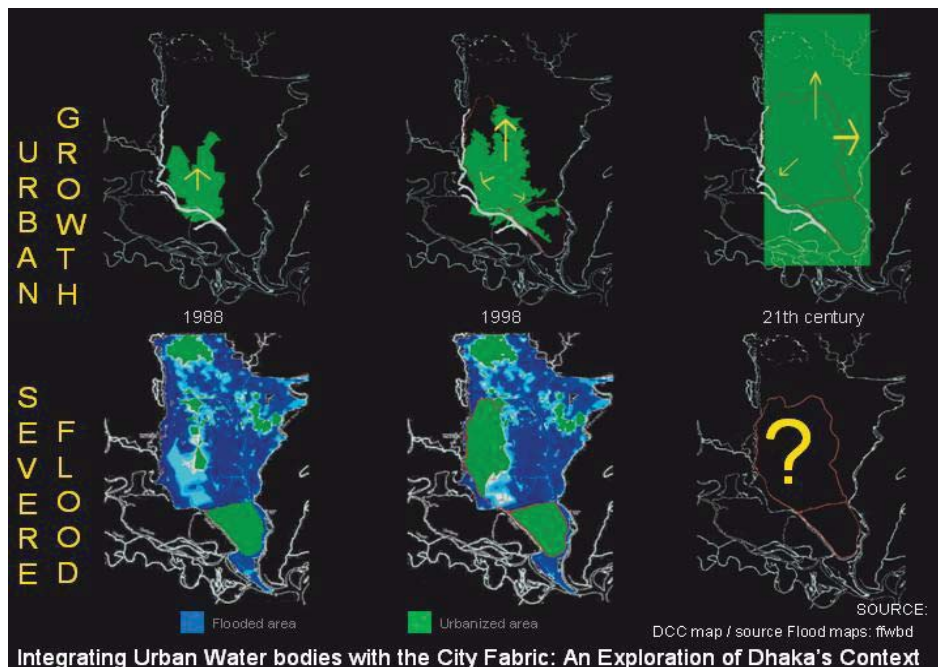
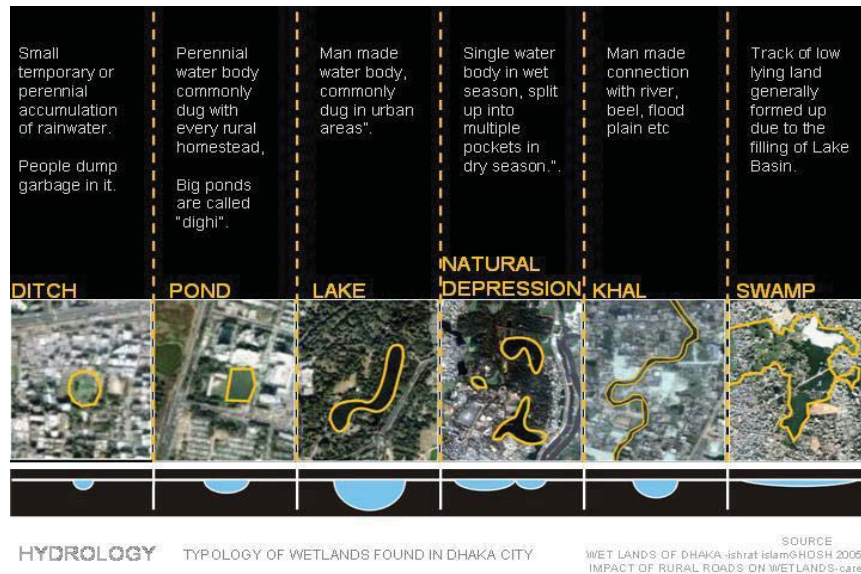


Figure 4. Dhaka’s Urbanization Trend and Flooding Propensity (BUET,2009)

Ground water extraction: Due to over extraction and reduced percolation, water table in Dhaka has currently dropped to below 1200 feet, which was about 10 to 20 feet. Being one of the largest mega cities in the world and without any hydrological planning and remaining surface water being excessively polluted or destroyed, Dhaka is facing continues potable water-related problems over the last few decades. Many ponds that worked as runoff reservoir and meeting the domestic water needs are filled up to create land for housing and roads. Ground water extraction poses a great threat to the sustainability of the city itself. Dhaka Water and Sewerage Authority (WASA) mainly depend on ground water extraction to continue its supply to increasing number of inhabitants in the city. Due to increasing population and industrial growth the demand for fresh drinking water is rising rapidly. There is no strategy for planned replenishment of ground water, and that is in a place that receives one of the highest rates of rain fall in the world. Considering this context, development and integration of surface water sources into the settlement fabric seems a logical planning imperative.

Traditional Response to Water Based Urbanization

As mentioned before Dhaka grew on a wedge shaped land mass crisscrossed by numerous water channels connected to the surrounding river system (Fig.-01). Fringe areas were generally low, flood plains, depressions etc. Water bodies developed generally on tectonic faults. Filling up of those water bodies poses two prong problem of unsuitability of construction and reduced water retention capacity. Other than surrounding river system, depending upon the nature of filling, excavation, natural status etc Dhaka's water bodies can be categorized into six types – ditch, pond, lake, natural depression / lowland, Khal/canal, swamp/wetland. (Fig. 5).



Integrating Urban Water bodies with City Fabric: An Exploration of Dhaka's Context
Figure 5. Categorization of in land water bodies in Dhaka (BUET,2009).

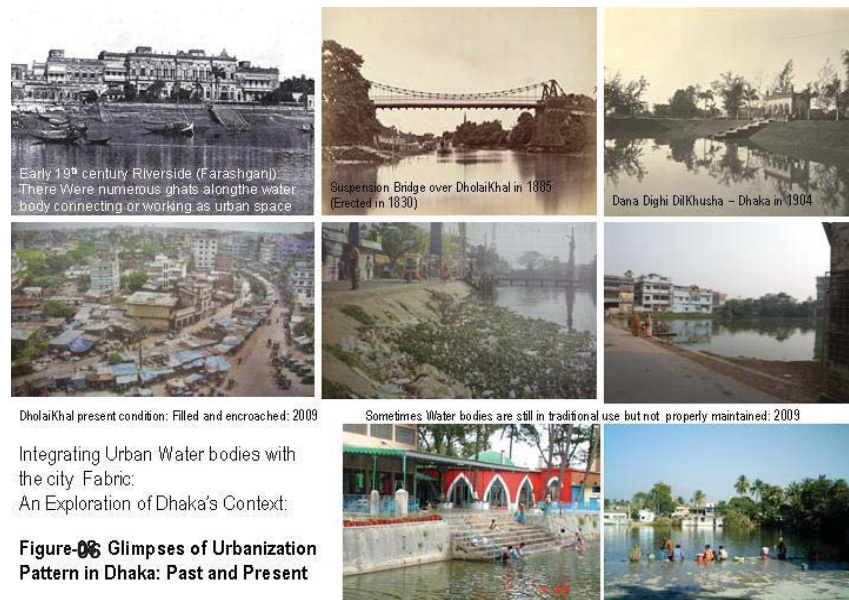


Figure 6. Glimpses of Water Urbanization: Pasr and Present.



Contemporary Scenario over Traditional

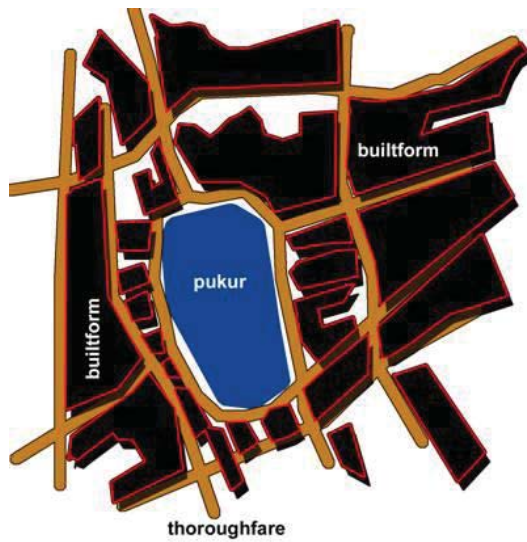


Figure 7. Settlement Pattern Evolving out of traditional needs in response to water bodies.

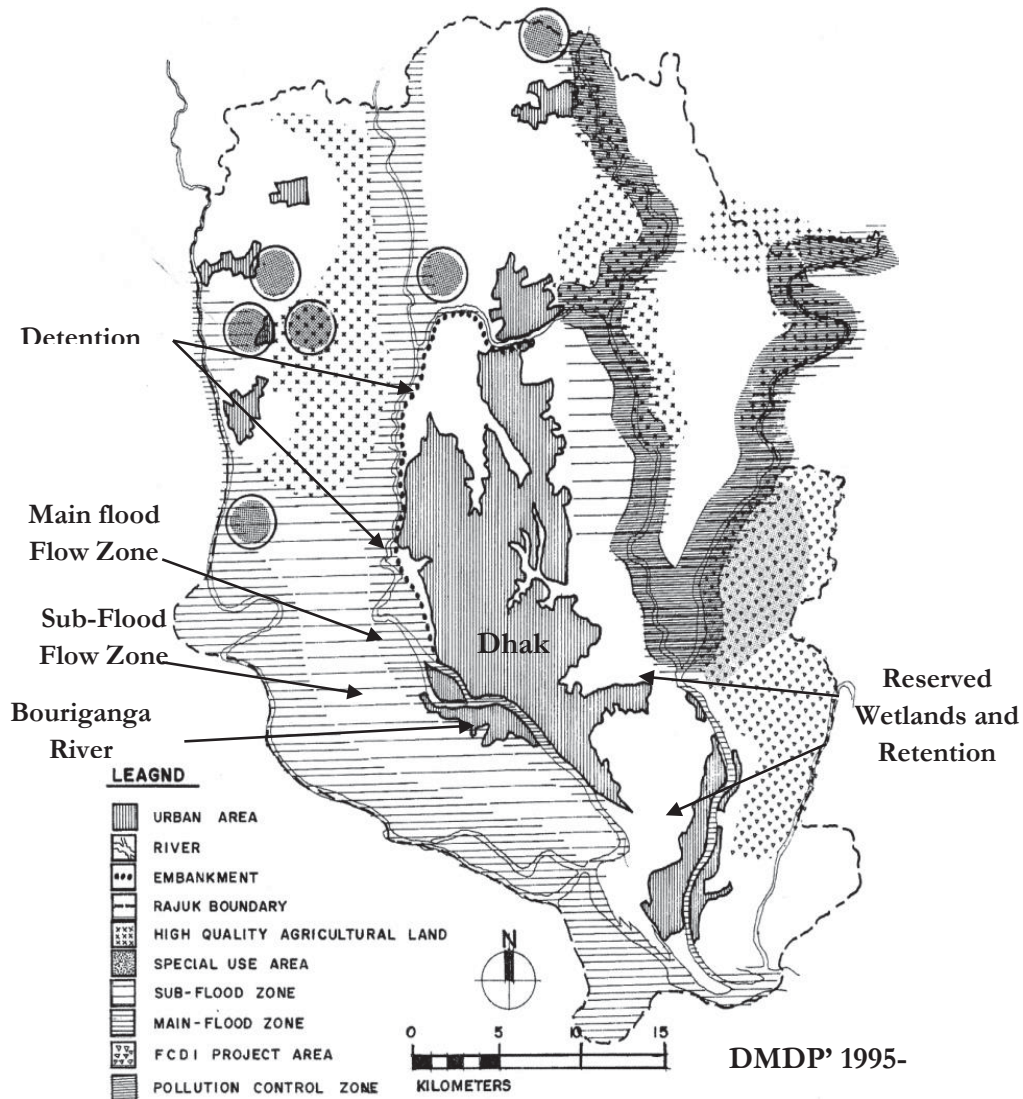


Figure 8. DMDP’ 95 - Proposed Plan Policy Areas i.e. built and natural areas for Dhaka.

Traditional Response Water Bodies in Dhaka; The settlement pattern of the earlier period in comparison to the contemporary one presents a richly woven urban fabric at the human scale. The rivers spilling over the flood plains and into canals / khals or connecting inland depressions or lakes together provided a hierarchy and network of water bodies and navigation routes giving rise to settlements alongside. There were flights of steps, locally known as ghats at intervals rising up to the lanes or community spaces. The ghats on the bigger water bodies or rivers were major community spaces where the daily activities took place such as bathing, washing or religious or commercial activities. Historic pattern reveal that the relationship of urbanization and water bodies was positive and for the people. Ghats were community spaces as well and provided a hydraulic character to the settlements in the area (Figs. 6, 7 & 8).

The traditional system was of dig-elevate-dwell whereby ensuring water retention during floods and reservoir for lean period. The system protecting the homesteads above flood levels with crop fields around helped create adequate biomass was a time tested approach of the settlement pattern for sustainability in the area (Mowla,2005 & 2008). In Dhaka traditionally the settlement structure evolved in consonance with water bodies. The water bodies were

the main transport corridors, streets being secondary to it. Planning deep inland together with European planning principles changed the development pattern giving emphasis on automobiles. Contemporary urban planning and design in Dhaka has its roots in the colonial period which ignored the traditional pattern resulting in the settlements to turn its back to the water bodies.

Prospects of Water Urbanism in Dhaka

Bangladesh is a deltaic country and has abundant rainfall, but due to the absence of clear policy-guidelines, useable water quantity is declining fast. Most countries have water policy and regulatory laws for water use. Wetland Protection Act, 2000 in Bangladesh restricts change in the wetland areas but doesn't regulate the use of water. Neither the building construction rules, or building code or any planning regulation nor wetland act calls for integrating natural water bodies or channels into the urban planning and design frame work.

In Dhaka, for example, as Dhanmondi is located on a higher ground and developed around a water basin, it is much less prone to flooding and water logging. Being located in original depressions, the Amlapara area or BUET campus and Siddheswari area are affected by moderate to severe flood and water logging during the monsoon (September- November) seasons. Siddheswari, was initially part of a floodplain and had numerous drainage channels and water bodies within the site. Now the excess runoff and floodwater cannot be drained out as the channels have been filled up without arranging for adequate alternate way for discharge. The topography or the problem of flooding and water logging has not been taken into account in the planning of either BUET or Siddheswari or elsewhere – and is the main cause of flooding.

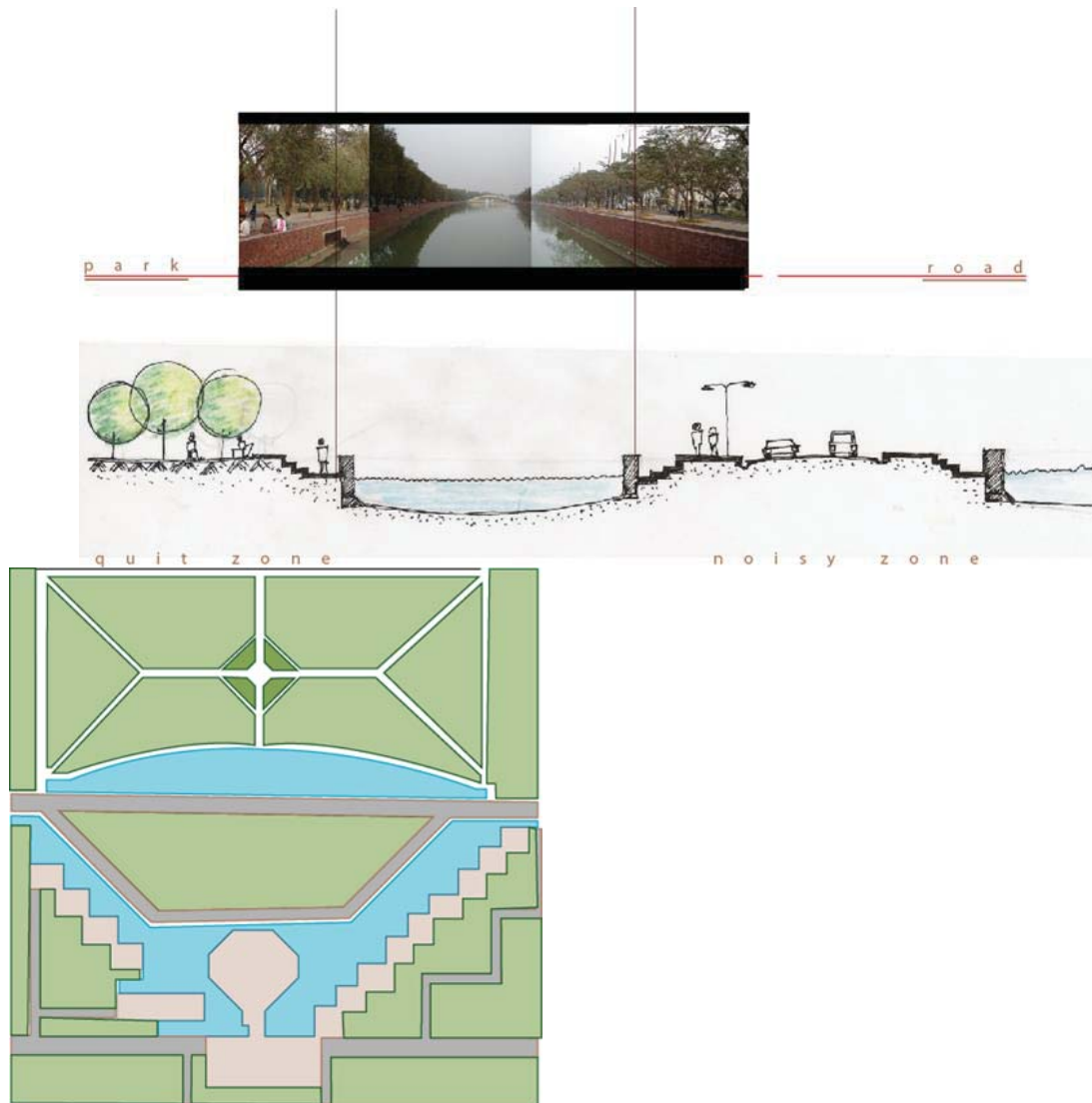


Figure 9. Shangshad Bhaban Precinct design considering water bodies as its integral part.

Some sporadic attempts to integrate water bodies with the settlement pattern are observed in Dhaka without any link with upper and lower level planning and design framework (Fig.08-10). Considering the geo-morphology of Dhaka, it seems essential that if and when needed the earth cutting to fill / raise lands must be judiciously planned and invariably done on the channel ward side that would get rapidly filled up by the natural process of siltation / accretion. The western embankment of Dhaka is a response to the floods of 1988. The attitude of zero tolerance for floods amounts to demanding equal protection from floods along different stretches of rivers irrespective of the geographical difference found there, which in practice is not possible.

Learning from the past wisdom and taking lessons from contemporary failures, an exercise was carried in the studio (BUET, 2009), many proposals submitted by the students (Fig.11) suggest that traditional approach of planning and design of living with nature is still valid without sacrificing contemporary needs and that natural areas should be strictly controlled by regulations (Mowla, 2010).



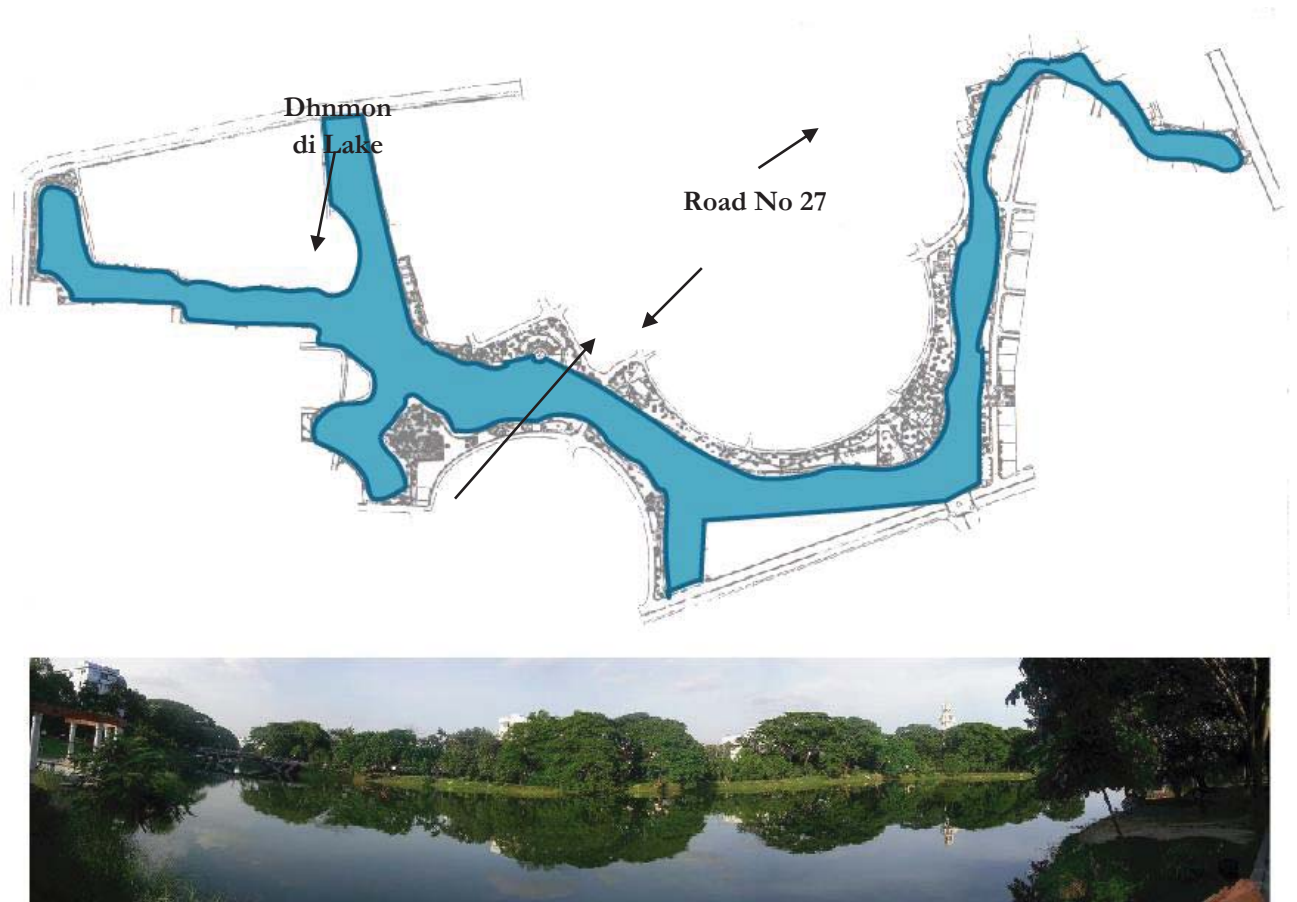
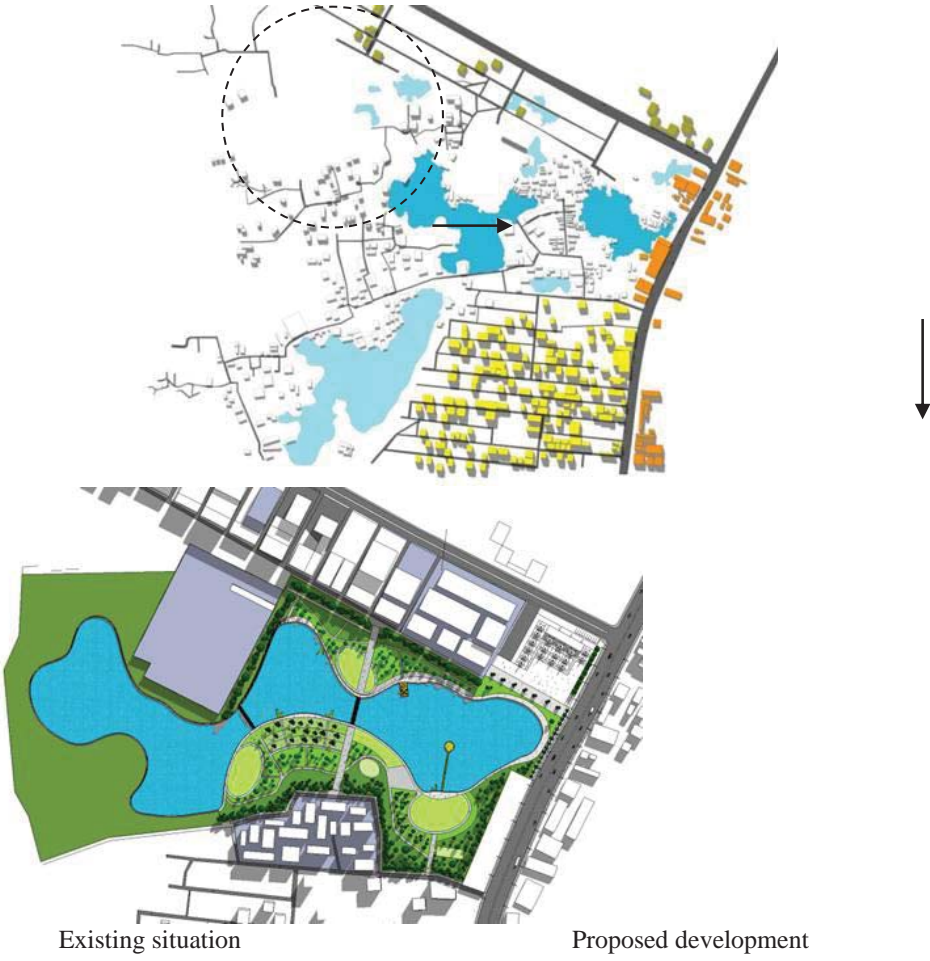


Figure 10. Dhanmondi R/A Designed with water-bodies but not integrated.

Discussions and Recommendations

Studies show that much greater environmental as well as socio-economic success can be achieved through design with ecological principles in mind than without it. Settlement design and planning in Dhaka revolving around geomorphology and hydrological behaviour of the place would result in water responsive urban design (Mowla,2000). Considering Dhaka's geomorphology and hydrological profile, finger shaped open ended dykes may be constructed for settlements, particularly in the fringe areas to allow free flow of flood water in and out of the urban areas. Lower plains may be used as vegetation areas (parks or open spaces) during lean seasons. Restoration of natural (gravity) drainage system and creation of adequate water bodies is needed for a sustainable ecosystem in Dhaka. Urban drainage system that take care of water quality, water quantity, amenities and environment, may be called sustainable drainage system.



3-D



Figure 11. Badda retention pond development area students' vision of development without sacrificing density or contemporary needs but integrating nature with the development.

Houses with elevated floors built on earth mounds created by adjacent excavation thus having similar storage capacity and evacuation boats kept available for emergency were the traditional concept of settlements in the flood plains. It is considered a highly developed form of culture born out of necessity to live with hydraulic dynamics. The concept of sustainable architecture, urban design and planning successfully reconciling hydrological laws, geological profile and economic interest while providing additional benefits like the inclusion of water bodies (rivers, flood plains, canals, ponds etc.) into the city's footprint and enhanced landscape aesthetics.

Planning and design, sympathetic to many forces of nature and human activity pattern, result in a sustainable development. Therefore, Water bodies of the city must be recognized as a valuable natural resource requiring protection, conservation and recycling and the water resources of the city needs to be incorporated in the physical planning process, the early the better. In nutshell, the major ingredient for sustainable development in a city like Dhaka is sensitivity, flexibility and adaptability of development approach and process encompassing Clean, Green, connected, open, accessible, useable practice to suit local conditions and that planning must be holistic in nature.

Conclusions

Historically Dhaka's development responded well with the hydro-geological realities of the place. Traditional Architecture, Urban Design and planning in this region offered the best and integrated solutions towards human needs, in their relation with the nature, ecosystems and the community but contemporary development ignored living with nature. After abusing urban water bodies through the years of hard use and neglect, when it has retaliated with

unthinkable magnitude, there is a realization on the stake holders that they are valuable natural assets / resource for the community. The fact is that the contemporary planning process never took water systems as the driving force in any physical planning in this delta.

Urban development with water bodies as focus was never given a trial during the rapid urbanization over the last 100 years. Review of Dhaka's geomorphology reveals that for the sake of ecological, hydrological integrity and development sustainability, natural systems must be protected and can be protected. DAP,2007, though quite conservative, if strictly followed is expected to improve this situation. Fragmented approach of planning must be avoided. Studies show that much greater environmental as well as socio-economic success or advantages can be achieved through design with ecological principles in mind than without it.

References

- BUET (2009). *Integrating the Urban Water Bodies in Dhaka's Fabric: An Imperative Issue of Sustainable City*, Workshop organized in BUET, 29 October, 2009, Dhaka. (Workshop conducted by the author).
- DAP (2007). *Detailed Area Plan for Dhaka Metropolitan Development Plan (Draft Final Plan)*, GOB/MoH&PW/RAJUK, Sept, 2007.
- DMDP (1995). *Dhaka Metropolitan Development Plan 1995-2015*, GOB / RAJUK, Dhaka.
- IWM, (2003). *Atlas of Urban Geology*, Volume-II, Institute of Water Modelling (IWM), Dhaka
- Mowla, Q.A. (1999). Contemporary Urban Morphology of Dhaka – Lessons from the Context, *Oriental Geographer*, 1999: Vol.43(1), pp.52-65.
- Mowla, Q.A. (2000). Human Settlements in the Coastal Areas and the Offshore islands of Bangladesh: The Urir Char Experience, Matin, Bhuyan & Datta (Eds.) '*Coastal Environment and Energy Resources in Bangladesh*' Published Jointly by Khulna University, UGC-Bangladesh & USIS-Bangladesh, 2000, pp.66-74.
- Mowla, Q.A.(2005). Eco-systems and Sustainable Urban Design Nexus – A Borderless Concept, in the Global IIT 2005 Alumni Conference On *Beyond ii Technology*, with the theme "*Technology without Borders*" May 20-22, 2005, Bethesda, Washington DC, USA.
- Mowla, Q.A.(2008). Eco-Sustainability of Urban Environment – the Case of Dhaka, presented in the International Continuing Education Meet on *Sustainable Communities – Bridging the Gap between Research and Action*, jointly organized by TKK-Finland, AIT-Thailand, UN-HABITAT and UNEP, 11-22 August 2008, AIT Bangkok.
- Mowla, Q.A.(2010). Role of Water Bodies in Dhaka for Sustainable Urban Design, *Jahangirnagar Planning Review*, 2010: Vol.08, pp.13-30.