

SPATIAL INTERVENTION FOR REGENERATION OF URBAN WATER BODIES – A CASE STUDY OF DHAKA CITY

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ABSTRACT

This paper will present a new approach to the sustainable solutions for the Regeneration of Urban water bodies through limited physical intervention. It will only focus on the issues and some possibilities against the recent condition of Dhaka. As the lakes, canals and water bodies in the city have been grabbed by unauthorized occupiers, with impunity, the outlets for stagnant waters have been closed. For canal grabbed the sewerage clearing has been blocked. A committed member requesting anonymity said the committee has sat once only in the last one month and still its activities are limited to paper works. Therefore, the wetlands should be utilized for welfare of the people by protecting those from ruination and preserving biodiversity through proper and time-befitting work plans.

KEYWORDS: Sustainable Solutions, Regeneration, Wetlands

INTRODUCTION

Wetlands in the Context of Dhaka

Definition of wetland has been set by Ramsar Convention. It was the first attempt towards intergovernmental treaties conservation and wise use of natural resources. According to Ramsar Convention wet lands are defined as follows: Wet lands include a wide variety of habitats such as marshes, peat lands, floodplains, rivers and lakes and coastal areas such as salt-marshes, mangroves and sea grass beds but also coral reefs and other marine areas no deeper than 6m at low tide, as well as human made wetlands such as waste-water treatment ponds and reservoirs(Ramsar Convention Bureau,2000). According to the permanency and depth of water Dhaka has different categories of wetland. This research primarily focused on the impact of filling wetlands of Dhaka.

Magnitude of Wetland Loss and its Impact

Several studies have documented to determine the loss of wetland in Dhaka over the period 1989-1999-2003 (ESCAP, 2005).The findings of the study shows that the annual rate of loss of wetland in Dhaka during the period 1999-2003 was 5.67%, whereas the annual rate of loss was 1.23% over the period 1989-1999.The land filling activity became irresistible since the later half of 90s due to high profitable prospect of the business. The current development activities are taking place without considering such geomorphological, hydrological and environmental aspects of the site. Conversion of wetland into urban uses has following major implications:

- I. Adverse impact on flooding situation of Dhaka city due to loss of retention area and increase of impervious surface.
- II. Decrease of ground water recharge area and ground water level
- III. Destruction of natural drainage system
- IV. Disturbance of local ecology and biodiversity

- V. Destruction of aesthetically pleasant recreational sites.

Polices and Acts regarding Wetland

DMDP (1995-2015) in its “structure Plan” and “Urban Area Plan” demarcated “Flood Flow Zones” and also indicated locations of flood retention ponds for the purpose of water storage at the time of flooding. Any kind of development is prohibited in those areas DMDP(1997). National environment policy, National land use regulation also stated polices on wetlands. Water body conservation act 2000 stated that natural water bodies means the places which are demarcated in the master plan as river canal, depression areas, lake, stream or wetland or places which are declared as flood flow zones by the local government notification and such places should also include the land which retains storm water. This law covers a wide range of wetlands restricted any sort of land development (Bangladesh gazette, 2000).

Objectives and Research Framework

The goal is to develop innovative integrated and implementable approach to the complex environmental, social and economic issues facing cities today in both developing and post-industrial nations. It needs to develop integrated strategies for water management, housing, jobs and urban land-use aimed at alleviating social, environmental, and economic and public health issues associated with flooding, continuing population growth and widespread poverty.

The central approach is to use of water as infrastructure, where hydrological issues serve as starting point and framework for future urban planning and design efforts.

Both within the existing city and in anticipation of future development, the proposal is to build a more expansive and better functioning water containment and transfer system that:

- gives more land to flood water detention
- manages siltation
- aids in metropolitan wastewater treatment strategies
- preserves excess water for the dry season
- provides a livelihood, a residential zone with decent housing and legal land tenure for the urban poor
- Offers Park and recreational land and an overall improvement in the quality of urban life to all of Dhaka's inhabitants.

HISTORY

Changes in Regional Drainage System Surrounding Dhaka from 1778 to 1974

Among the city canals the Dholai Khal which once used to be the artery of an important navigational route for country boats to and from destinations within the metropolis, has almost disappeared due to four decades of wrong policies of the city administration to construct roads by closing the canal. The canals had their outlets to the Buriganga, the Sitalakya, the Balu and the Turag rivers, which were inter-connected. This ancient canal used to encircle the old town joining the Buriganga by the Mitford Hospital and the Mill Barracks. The closing of the Khal has had far-reaching impact on the drainage system of the city.

The Segunbagicha Khal that extended from Shahbagh to the Jirani Khal via the Manda Bridge used to from the main drainage channel of central Dhaka. A major part of it is under illegal encroachment by influential people in the

Segunbagicha, Purana Paltan and Naya Paltan areas. The box culvert has been turned into a road to prevent future encroachment. At the center there was the mighty Hatirjheel. The Gulshan lake system directly drained south-west into Hatirjheel and into east through the Rampura Khal to the Balu River. The Gulshan lake system was connected to Dhanmondi lake system via the Begunbari khal which then drained through the Katasur Khal into Turag. In the west the Katasur canal also drained Rayerbazar and Mohammadpur areas. Ramchandrapur and the Dholai Khal drained old Dhaka. Within the current Dhaka business hub at Motijheel was its namesake Motijheel and the Segunbagicha Khal draining all of south central Dhaka. The Hatirjheel, which once ran from the backside of the present Sonargaon Hotel to Gulshan-1, is now being illegally occupied by BIAM, BRAC, Aarong, Capital Housing, Nirman International and other local land grabbers. Other important canals of the city, such as the Begunbari Khal extending from the Dhanmondi Lake to Trimuhani via Rampura before emptying into the Balu River, the Ibrahimpur canal, the Khathalbagan-Rajarbagh canal and the Gopibagh canal together with other minor canals of the city were all victims of either illegal encroachment or acquisition for construction of either roads, box culvert or underground drain. All these projects have changed the original purpose which the old network of canals was meant to serve.

Hydrology (Flooding and Drainage)

Flood is a serious hydrologic event which may cause inundation of geographical areas of a region. Present greater Dhaka city experiences high magnitude flood almost in every ten years 2007, 1997 and 1988 floods for example submerged about 40 to 70 percent defined greater Dhaka city areas of 260 square km (64832 acres) of which 136 square km in west and 124 square km in east. In terms of description of study area in Bid document for preparation of detailed area plan for DMDP area, greater Dhaka having 260 km² (64832 acres) allocated for planning purpose to Group-C (51277 acres), Group-E (6000 acres), Group-B (1805 acres). During 1988 flood of 70 years return period vast areas of Bangladesh including Dhaka city was flooded by flood waters of Tongi khal, Balu, Turag, Buriganga and Sitalakkhya Rivers. These rivers are distributaries of the Brahmaputra, Jamuna, Ganges and Meghna rivers carrying water from India, Nepal, Bhutan and other neighbouring countries. The depth of this flood was higher than the normal flood by 1.5 m and its duration was more than 4 weeks. As a result many posh areas of Dhaka city including diplomatic zones in Gulshan and Baridhara; Mirpur, Mohammadpur, Banani, Tejgaon and Dhanmondi etc. were submerged to depths ranging from 0.3 m to over 4.5 m and about 2.5 million people of the city were directly affected by the flood



Fig: 1 Hazardous Conditions after Water Bodies Filling (Source: The Daily Star-21June, 2007)

Drainage is also a very important aspect for keeping the urban environment free from pollution and health hazards. Drainage in the built up areas can be provided by network of drains. Rainfall in Dhaka on the average 2000 mm per annum and 70 percent of this rain comes from April to September. The old Dhaka city area, Dhanmondi, Kalabagan, Mohammadpur, Mirpur etc. have pucca household and Mohalla drains. These drains are connected to natural khals of adjacent areas. Also new Dhaka city area, Magbazar, Kalabagun, Dhanmondi, Mohammadpur, Mirpur, Banani, Gulshan suffer from drainage congestion during and soon after heavy rainfall. West Dhanmondi, Hazaribag, Katasur, Bakshibazar,

and Rayer bazar area are drained by Hazaribag, Katasur, and Ramchandrapur khals. All these khals finally deliver their discharges to mainly Buriganga river. Kallyanpur khal removes storm water from Adabar, Kafrul, Pirerbag, Shamoli, Kallyanpur and Gabtali areas, Ibrahimpur, Kachuket, Cantonment, Baunia, Mirpur etc. areas receive drainage service by Ibrahimpur, Mirpur and Baunia khals and their branches. Further to north, Baunia and Digun areas are drained by Baunia and Digun khal.



Fig. 2: Existing Canals in Dhaka City and DMDP Area(Source: Dhaka Wasa –Drainage circle(June,2008)

Reasons of Water Stagnancy at Dhaka City

- Unplanned urbanization
- Illegal occupancy of khals
- Building roads at the bank of the khals by narrowing their ways.
- Internal filling of retention reservoir, flood plain of the city
- Direct entry of the wastage from surface drain to drainage line
- Different organizations' drains are being connected to the main drain of Dhaka Wasa by neglecting the rules of connection.

Existing Drainage System (1964 to 2008)

Table 1: Source: Dhaka Wasa -Drainage Circle (June,2008)

From storm water line(450mdia to 3000mm)	265mm
Box culvert	8.5mm
Open khal development	65mm
Water drawing out pumping station	2nos
Kallyanpur	10.00cm
Dholikhal	22.00cm
Water drawing out underdevelopment area	160km

Besides these to solve the city's water stagnancy problem, transient pumps are arranged at some point during rainy season.

Comparative Description of Renowned Water Stagnancy Area of Dhaka City

Table 2: Source: Dhaka Wasa -Drainage Circle (June,2008)

Serial no.	Area	Time period (hr)for Water logging due to heavy rainfall,2005	Recent condition,2008
1	Santinagar	10-12 hr	3-4 hr
2	Mouchak / mailbag	10-12 hr	4-6 hr
3	Rajarbag	8-12 hr	3-4 hr
4	Secretariat	4-5 hr	--
5	Motijheel	6-8 hr	1-2 hr
6	Gulistan	6-8 hr	1-2 hr
7	Polashi	6-10 hr	--
8	Azimpur	4-6 hr	--
9	Dept of fisheries	6-8 hr	--
10	Mirpur-10/13/Pallabi	8-12 hr	1-2 hr
11	Bijoy shoroni/Monipuripara	6-8 hr	2-3 hr
12	Shawrapara/Pirerbag	8-12 hr	3-4 hr
13	Kazipara/Monipur	8-12 hr	4-6 hr
14	Paikpara	12-16 hr	2-3 hr
15	Mirpur road/Mohammadpur	6-8 hr	1-2 hr
16	Hosseni dalan	6-8 hr	2-3 hr
17	Nazimuddin road	8-10 hr	3-4 hr
18	Jigatola	6-8 hr	4-5 hr
19	Fakirapul	6-7 hr	2-3 hr
20	Khilgaon/Meradia	3-4 hr	1-2 hr
21	Bashabo	3-4 hr	1-2 hr
22	Mugda	6-8 hr	--
23	Newmarket	6-7 hr	--
24	Shahajadpur	6-8 hr	--
25	Islambag	6-7 hr	--

Space Syntax Analysis - Understanding the Spatial Realities

This part of the study attempts to investigate the actual spatial characteristics of the canals of Dhaka city. The study uses Space Syntax methods to identify the spatial sustainability of the proposal in two levels; First, the locational

significance of the canals in the context of the city; Second, the spatial logic for the regeneration of some canals as an integrated urban system when embedded within its surrounded neighborhood.

The following axial map of Dhaka city including the existing and previous water bodies represents the potential decisions - ensuring syntactically strategic locations for regenerating water bodies. In the global context of Dhaka city (Fig 4) water bodies are remain one of the highest integrated part. The analysis shows that, throughout the study period the peripheral roads gain the maximum local ($R=4$) and global integration ($R=n$) within the spatial structure of Dhaka. Among the peripheral roads, three highly integrated roads of the area constitute 2 percent global integration core of the city. This indicates a significant morphological character of Dhaka city. When analyzed as an independent system, the spatial structures of the neighborhood remain unchanged. However, as an independent local area and when embedded in the larger urban grid of the city – the internally distributed spaces throughout the area remain segregated in all level of the analysis.

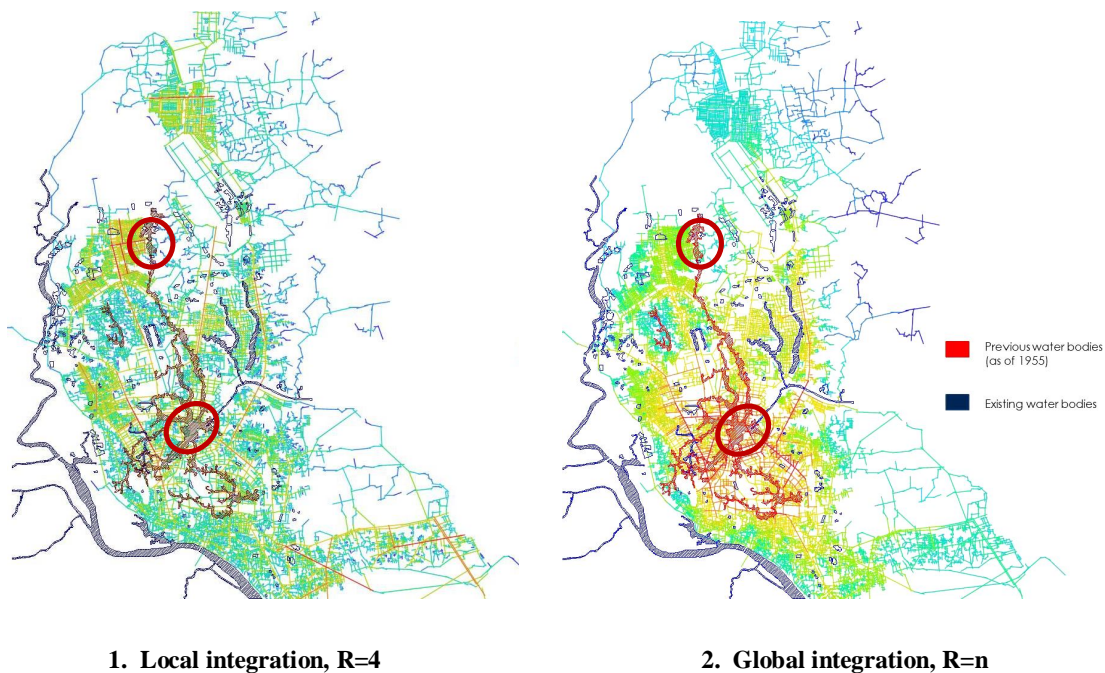


Fig. 4: Syntactic analysis of Dhaka City Showing the Change in “Integration core “Integrating the Water Bodies with its Surrounding

By zoom in the whole scenario, it can be a probable solution that two areas can be having potential decisions - ensuring syntactically strategic locations for locating different activities in space. The segregated internal streets within Dhaka city became highly integrated by their spatial integrity with these integrated activity zones (Table 3). However, the locally segregated space of Dhaka city has been intentionally made accessible by integrating them with the water bodies (Fig 4).

It can be suggested that the Northern part of the city, Mirpur/Pallabi khal can regenerate their identities within some special considerations. Through Space syntax analysis, Pallabi (Mirpur road), Kachukhet road shows less integration (Table:03) according to the city. So it's been possible to make a step to regenerate these khals.

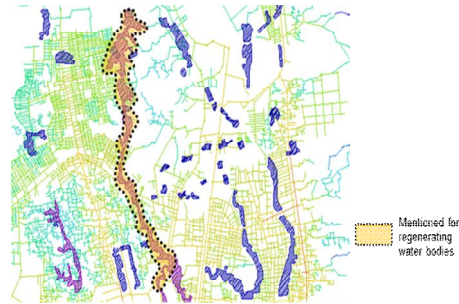


Fig. 5: Syntactic Analysis of Blow up Part of Dhaka City Showing the New Possibilities for Mirpur/Pallabi khal

Begunbari Khal which was once connecting Hatirjheel to Dhanmondi lake system can join together within a new approach. Through Space syntax analysis related roads within these areas like Panthapath, Green road, Shonargaon road show good integration (Table:03) according to the city, so for this case some design approach (Bridge connection, Water Taxi-hub, Biking path) can make a new dimension for the city.

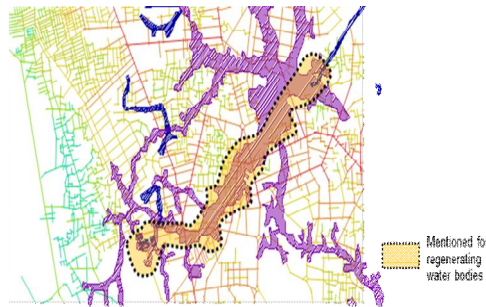


Fig: 6 Syntactic Analysis of Blow up Part of Dhaka City Showing the New Possibilities for Begunbari Khal

Through this part, Space syntax method will identify the spatial sustainability of the urban water bodies with its-

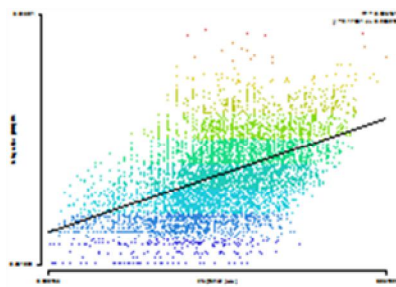
- Locational significance
- Spatial nature of accessibility and
- Integration with urban system

Table 3: Syntactic Measures of Surrounded Roads for Parts of Water Bodies to be Regenerated

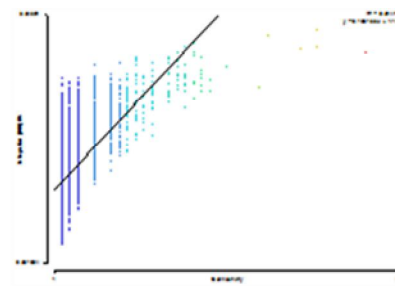
Road name	Connectivity	Control	Integration(HH)	Integration (P-value)R4	
Sonargaon road	13	5.527	2.292	2.292	
Kazi Nazrul Islam Avenue	9	2.589	0.795	2.380	
Panthapath	5	1.182	0.731	1.789	
Green Road	23	7.974	0.776	2.763	
Shah Tazuddin avenue	9	2.893	0.781	2.167	■ Better
Mirpur Road	21	6.151	2.961	2.961	■ Moderate
Pallabi(mirpur road)	9	1.592	0.635	2.466	■ Less moderate
Kachukhet road	5	1.277	2.037	2.0375	

In the global context of Dhaka city, water bodies as of 1990 to 2006, shows that the peripheral roads gain the maximum global integration ($R=n$) within the spatial structure of Dhaka city. Though most of the peripheral roads are highly integrated to the city, but Panthapath and Pallabi road are found (Table 3) less integrated with the city. So it's been quite possible to intervene the extinguished water bodies which were undergone because of filling these roads on it. But it will need more concern to intervene these water bodies to its previous place, whether through design support (bridge connection) or suggestion for some other supportive road.

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Comparative analysis of Global and Local integration of Dhaka city



Comparative analysis of Connectivity & integration value of Dhaka city

CONCLUSIONS

The systematic destruction of Dhaka's vital canals took an institutional shape during Ershad's Road building fiesta. He filled up the very important Begunbari Khal east of Sonargaon to build Panthapath. The process of turning the Dholai Khal into a road was also started during his regime. Most of the vital wetlands of Dhaka are almost nonexistent now. Panthapath landfill destroyed the whole eastern portion of the Begunbari Khal connecting Hatirjheel to Dhanmondi lake system. The 30-meter wide Dholai Khal is now a 2.5X2.5 meter box culvert. Among the city canals the Dholai Khal which once used to be the artery of an important navigational route for country boats to and from destinations within the metropolis, has almost disappeared due to four decades of wrong policies of the city administration to construct roads by closing the canal. The canals had their outlets to the Buriganga, the Sitalakya, the Balu and the Turag rivers, which were inter-connected. This ancient canal used to encircle the old town joining the Buriganga by the Mitford Hospital and the Mill Barracks. The closing of the Khal has had far-reaching impact on the drainage system of the city.

Water storage and drainage capacities of urban catchments are to be increased by recovering encroached wetlands and khals. Making provision for water transport within Dhaka will usher in great benefit for the city dwellers. It is to be ensured in the eastern part of Dhaka City that road alignment and culvert locations are consistent with the storm water runoff process in the floodplain landscape.

This paper, on the basis of space syntax analysis of the spatial patterns of development in

Dhaka city, has revealed the fact that; in its present condition, increased integration between the spatial order of the waterbody development and the surrounding urban system of the neighborhood is about the principles of continuous connections among different grid morphology. This phenomenon is further emphasized by locating different activities at strategic and integrated locations through the water body. This spatial integration in turn, restores the khal from

encroachment and environmental degradation.. By taking into consideration the effects of proposed land developments on floodplain water regime, appropriate plinth level and road level for every zone also should be set in the urban area plan.

NOTES

Khal is a Bengali word, meaning small channel.

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