প্রতিবেশ Protibesh

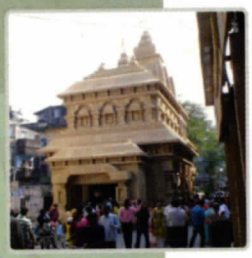
ENVIRONMENT

Journal of the Department of Architecture, BUET

JANUARY 2010

Volume 14 No. 1

Conservation



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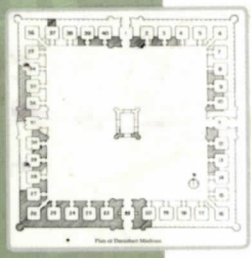

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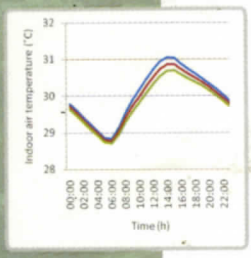

Environment

Bangladesh University of Engineering and Technology, Dhaka

Protibesh
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Protibesh is a peer-reviewed research journal published by Department of Architecture, Bangladesh University of Engineering and Technology, in January and July every year. Protibesh, meaning environment, aims to provide a forum for publication of original research and scholarship, for better understanding of the different aspects of and intervention for environment in urban and rural settlements. Protibesh is committed to act as a catalyst to bridge theory, research and practice in the broad field of Architecture of Bengal.

ISSN 1812-8068

Publisher The Publishing-cum-information wing
Directorate of Advisory, Extension and Research Services.
Bangladesh University of Engineering and Technology, Dhaka.
www.buet.ac.bd

Printer Baishakhi Mudrayan
49/6, R. K. Mission Road, Dhaka-1203
Phone : 7175832, 01911-040392

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Protibesh©BUET
January 2010, Volume 14 Issue 1
pp 3-4

Editorial

This issue of Protibesh, the journal of the Department of Architecture, Bangladesh University of Engineering and Technology, contains five papers. As always the attempt of the issue remains dedicated to presenting the latest developments in architectural studies and research. This peer-reviewed academic publication presents papers on the topical issues of architectural history, conservation and environmental simulation.

The first paper, written by … titled Darasbari Madrasah: analysis of Bengali Sultanate Madrasah in Gaur deals with the unique and intelligent architecture that prevails in the northland of the ancient city of Gaur. This is one of the two madrasas (religious schools) in Gaur and Pandua. The Darasbari Madrasah, identified by the discovery of its foundation plan after excavation of the site is an example of the Sultanate Architecture of Bengal. This Sultanate mosque, in its complex setting, is embedded with its own identity and stylistic integrity. The construction technique, building materials, local influence, formal expression is unique. The madrasah is a remarkable educational institute, near the Darasbari mosque, having a stimulating planning organization, axiality, spatial enactment and mediaeval structural solution. This paper, through a detailed field survey, has focused on analysing the form, spatial qualities and structural meaning of th Madrasah building to arrive at an understanding of missing parts of the structure, including the roofing outline. Detailed drawings have been prepared to execute the whole process of conjectural mapping and regeneration. The paper, in addition, addresses the philosophy behind the settings of the Darasbari Madrasah complex.

The second paper of this issue is titled Exploring Morphological Changes of the Oldest Core of Dhaka and is written by . . The paper, in the background of the built heritage of Dhaka city, discusses the problems that rapid urbanization is putting on its social, physical, cultural identity. There is transformation in the built forms due to shifting economic activities and changing land use patterns. The old historic structures of three major streets of the old city - Shirish Das road, Paridas road and Rupchand lane, forming a part of the oldest core of Bangla bazzar area are focused in this paper. The paper observes the present condition of these streets, attempting identification of find morphological changes, ultimately recommending some of the old structures of the area for conservation. The author bases his comments from physical survey, as well as from critical readings of publications, containing analysis of historic evidence on the identified buildings. As the area is undergoing major physical and environmental degradation, the paper advocates a rigorous programme for conservation of seven identified buildings, in order to preserve history for posterity.

The next paper shows that the same process of metamorphosis by globalization and urbanization **is taking place across the border in Kolkata, India. This paper, written by Dr. Bose titled A Report on Durga Puja Festival in Kolkata: Traditional Cultural Heritage with Art and Architecture discusses the** celebration of a traditional Hindu festival, the Durga Puja, in Kolkata which is a cultural expression of a particular Asian society that remains preserved and by dint of participation with vigour continues to thrive in India. As Asian cities are going through a phase in which old traditional and vernacular buildings are being replaced by modern standardized large buildings with universal look, thus erasing the 'Asian-ness' from the cityscapes, such festivals, it is argued can help to preserve the uniqueness of the context. The intricacies of the settings, the careful planning of the temporary Puja sites and the artistic craftsmanship and skills and architecture associated with it are described in this paper. The author goes on to list some of the problems that the practice of these celebrations inevitably brings to the forefront of civic life, often making safety difficult. The inherent conflict between global and local culture, can be neutralized with care so that this living cultural heritage may continue. This paper aims to present a report on this grand traditional religious and socio-cultural practice in Kolkata.

Back across the border to Bangladesh, the next paper addresses yet another religious rite and a pilgrimage spot on the Old Brahmaputra River. In this paper titled, To Conserve a Sacred Place: An Investigation on

Moha Tirtha Langalbandh, Mohataz Hussain proposes conservation of an ancient sacred place named Langalbandh. It is a well known pilgrimage area in Bangladesh which has a strong historical and religious significance. Thousands of Hindu pilgrims from around the world visit this region for ritualistic bathing. Historic bathing ghats (steps leading into the water), associated with several old temples and hermitages, were built in the past to facilitate the sacred activities of these devotees. Hossain brings to light the present condition of this holy place, which due to prolonged lack of maintenance is falling into disrepair. Recent Governmental decision to develop the place to facilitate the religious activities and to allow tourism, in recognition of its history, social and religious value has sparked new interest in conserving this two-kilometer long sacred site of Langalbandh. This paper investigates existing physical and social aspects of the site, focusing on a proposal for conservation-oriented development strategies, based on establishing cultural and historic significance of Langalbandh, while developing the sacred pilgrimage spot as a tourist spot, without hampering the religious context.

The fifth and final paper of this issue of Protibesh contains a different flavor from the other four. The paper titled Simulation determining passive cooling parameters for multi-storied residential buildings in Dhaka is written by .. This paper investigates the effect of passive cooling strategies of multi-storeyed residential buildings in achieving indoor thermal comfort in the context of Dhaka, Bangladesh. Two main passive cooling strategies for the warm-humid climate of Bangladesh is examined in the discussions. These strategies, thermal mass and clear floor to ceiling height are investigated by using the thermal simulation programme IES-VE to evaluate the isolated effect of each. The main findings of the simulations indicate that lowest internal temperatures are possible when thermal mass of 250mm brick wall is used for the walls and clear floor height is maintained at 3.35m. From the result of the simulations, the author suggests the adoption of these measures for residences.

It is hoped that through the five papers in this issue, Architects and practitioners of the building industry will get a notion of contemporary thoughts of researchers and academicians in their pursuit of architecture knowledge. As Editor, I would like to extend my thanks to the Authors of these papers for their painstaking efforts in writing these papers and disseminating their research for a wide audience. The process of review and modification after the post-review phase has also been sincerely done. Our Reviewers, through thorough reviews and intellectual input, have suggested modifications and corrections, following which the authors have modified their submissions, and thereby, added greater depth to the papers. Despite these various interventions at different phases, the final contents of the papers reflect the Authors' own thoughts and opinions, and the success, intellectual and academic value of their papers is their own achievement. The Editorial Board has merely served as instruments in their presentation.

Dr. Zebun Nasreen Ahmed
(Professor, Department of Architecture, Bangladesh University of Engineering and Technology) Editor, Protibesh, January 2010

Darasbari Madrasah: An Intelligent Structure of Bengali Sultanate Architecture

Sajid-Bin-Doza
Assistant Professor, Department of Architecture
BRAC University
Email: sajidbin@bracuniversity.ac.bd, sajid_bin_doza@yahoo.com

Abstract
Darasbari madrasah is the unique and intelligent architecture that prevails in the northland of the ancient city of GAUR. This is one of the two madrasas in Gaur and Pandua. The other Belbari madrasas is known to have been erected by Sultan Alauddin Husain Shah at Belbari on the Indian side of Gaur-Lakhnawti. The Darasbari one has been clearly identified by the discovery of the foundation plan after excavation of the site and the finding of the inscription within the debris recording its erection. The Sultanate Architecture of Bengal is filled and dotted with mosques. From the individual to the complex setting Sultanate mosque is embedded with its own identity and stylistic integrity. The construction technique, building materials, local influence, formal expression and lastly spatial meaning shows the royally and brilliances. It is however Darasbari madrasah is a remarkable educational institute just near at Darasbari mosque, the madrasah building is stimulating with the planning organization, axiality, spatial enactment and mediaeval structural solution. Analysis of form, space and structural meaning are the focused area in the research paper. A detailed field survey was incorporated to secure the construction and other parameters. The study paper will be analyzing the missing part of the structure including the roofing outline. Detailed drawings have been prepared to execute the whole process of conjectural mapping and regeneration.

Keywords: ancient city, individual and complex setting, course of action, local recourse and materials, Sultanate Architecture, mosque architecture, mediaeval structure, conjectural restoration, intelligent architecture.

1.0 Introduction:

In the mid-seventies Darasbari remove the confusion if there were one or two madrasash built by Sultan Alauddin Husayn Shah (1493-1519) in the city of Gaur-Lakhnawti or that if the mosque discovered by Sayyid Ilahi Baksh in 1876 A.D. was the same or a separate building from the madrasah. An inscription tablet now set upon the enclosure wall of a mosque to the north-west of English Bazaar police station , known to archaeologists and historians from the end years of the nineteenth century, led to the assumption that this inscription recording the erection of a madrasah by Alauddin Husayn Shah(1493-1519) in 907 A.H./1502 A.D. might refer to the vast ruins at Belbari to the northern end of the Chhota Sagar Dighi on the Indian side or that it could refer to the present madrasah, still unknown but current among thoughts that there must have been a madrasah at Darasbari as the name signifies a place-name with the existence of a 'lecture hall,' the meaning of the word Darasbari. The discovery clearly states that there were two madrasahs - one at Belbari and the other at Darasbari, the first one described in the inscription as an 'excellent madrasah' (al-madrasa -al-slmrifa) and the present one as a 'picturesque and magnificent' madrasah (al-madrasa -al-ltrtifn al-jamila) built after two years in 909 A.H. (1504 A.D.), and that the masjid and madrasah at Darasbari were two separate structures. The sighting of the two madrasas are significant from two points, it re-confirms the theory that Alauddin Husayn Shah(1493-1519) was a great patron of art and letters, and that he wanted an even development of the city in the north as well as in the south (fig : map of Gaur). The discovery of an enclosed area by moat to the south of the masjid and madrasah, locally known as Sawdagar Badshar Dhipi and the scattered ruins all around suggest that this part of the city was one of the most thickly populated areas, and certainly much developed. In the enclosed area it is likely that there was a separate residence of the Sultan besides the one at the main citadel now in the Indian side or that it was the palace of the new city built by the Ilyas Shahi Sultan Shamsuddin Yusuf Shah (1474-1481).

1 Husain, ABM. (ed), 1997. Gawr-Lakhnawti, Dhaka

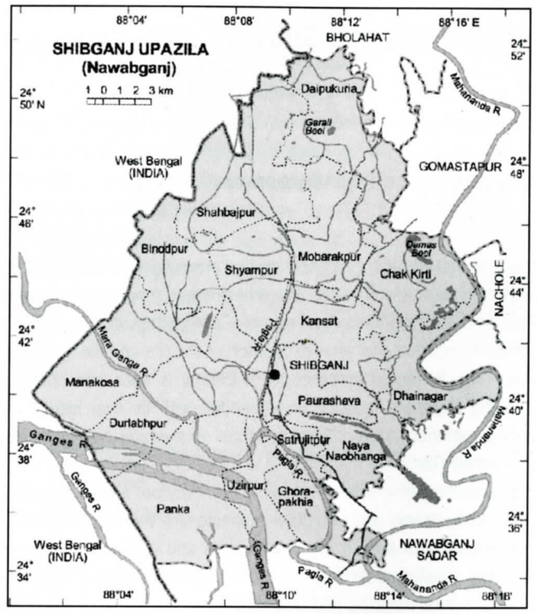


Fig 1: the map is showing the study area and Shibgonj

The Madrasah at Darasbari is situated in mauzalhoshpur, Union Shahbazpur, Thana Shibganj and District N'awabganj. It stands, as has been stated above while locating the Darasbari Masjid, about a kilometre to the south-west of the Kotwali Darwaza and about half a kilometre from the Chhota Sona-Kotwali Road. The Madrasah is situated between two tanks on its east and west, the latter is larger and separates the Madrasah from the Masjid which lies to its west. The discovery was made by the accidental find of the inscription tablet in 1973 A.D. during brick piracy by local men. On information the Department of Archaeology, Government of Director in charge of administration at Dhaka. According to the inscription the Madrasah Bangladesh, took its custody, and the inscription is now lying in the room of the Assistant was erected by Sultan Alauddin Husayn Shah in 909 A.M. (1504 A.D.).

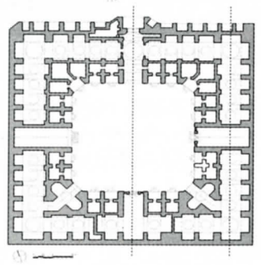


Fig 2: plan of a Khan or caravanserai

Primary data was collected from the site. Detail documentation of technical drawings prepared for the thorough study. A detail analysis and identification was formed to secure the architecture as the vernacular religious structure.

Extensive literature review conducted during the research. Photographs were taken and sketches were prepared to evaluate the formal expression and the spatial pattern and proportion.
There are references in historical literature and in inscriptions about the construction of madrasah by the conquerors and sultans, but the form it took remained uncertain. What we have in the present madrasah-is a number of living rooms around a courtyard -a sort of a Khan (caravanserai) , a slightly larger room in the qibla side for individual or group prayers and a central structure in the middle of the courtyard the purpose of which could only be conjectured. The variation might have been due to the architectural origins of the madrasah of different regions and for the climatic conditions. The earliest of the madrasah as separate institutions from mosques developed in Iran and Central Asia where the character is said to have been influenced by the local architecture with iwan as its ingredient elements and other accessories of Buddhist monastic establishments. Each of the known madrasah of this region either at Nishapur or later at Baghdad was furnished with these features which were almost inevitable as adjuncts.

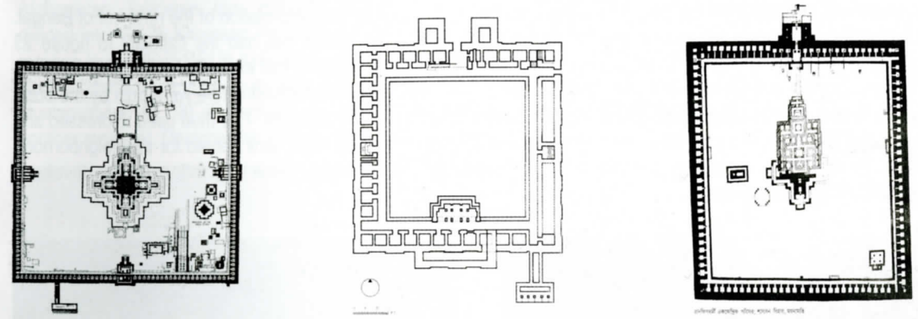


Fig 3: The diagram of Vihara and Paharpur, Sitakot Vihar & Moinamoti Vihara respectively

Instead of planning a single building, indications are that all were separated here in smaller buildings to perform their own individual functions. Hence was the necessity of a separate mosque, but nearby, and other adjuncts inn which because of their secular character lost the reason of existence. That the Bengal madrasah was influenced by local Buddhist monastery architecture as for example in Paharpur or Devaparvata (Mainamati) is perhaps without any doubt. The planning is almost the same - a row of rooms around a paved courtyard. The difference, the existence of the central shrine and other stupas within the courtyard of a monastery was unnecessary because of the existence of a congregational mosque nearby and the transformation of a west-side room for wakt prayer. But the place of the central shrine was filled up by a structure, whose purpose, although remains uncertain is perhaps in the case of the present madrasa was a lecture-room and library(fig 32). A madrasah besides being a dormitory must have lecture rooms and libraries within its structure. In the case of the madrasah at Darasbari the lecture rooms remaining absent in the planning of the side rooms, the central structure must have served the same purpose along with the keeping of books within it. This is a suggestion , and without the discovery of evidence against it, it should be reasonable to accept the building as such. The structure is however, regarded as an ornamental pavilion within the courtyard garden, as was also the case in former days, then the madrasah in question was no more than a lodging house or a caravansarai, one of the characteristics of earlier madrasah which formed a complex by the mosque, the lodging house and other accessories together were named as madrasa.

2.0 Influences in Madrasah:

2 Khanor caravanserai: most typically a caravanserai was a building with a square or rectangular walled exterior, with a single portal wide enough to permit large or heavily laden beasts such as camels to enter. The courtyard was almost always open to the sky, and the inside walls of the enclosure were outfitted with a number of identical stalls, bays, niches, or chambers to accommodate merchants and their servants, animals, and merchandise.

3 Husain, ABM. (ed), 1997. Gawr-Lakhnawti, Dhaka

Bengal's Sultanate madrasah was obviously influenced by the local climate. The monsoon shapes the whole built-form in such a shape. Courtyard is the strength of the Bengal's rural house. This analogy was adopted by the craftsman of the madrasah. Wide and open vast paved (stone or burnt brocks in square shapes) courtyard partially raised because of the rain and other water clogging, consciously surrounded by the cells or rooms to serve for the security and accommodation. The institution had the notion to keep the architecture in an introvert mode. This gives the uninterrupted environment to the pilgrims. Influence, context and desire fulfilled the madrasah structure in a context specified manner. On the other hand the rooms are directly opened to the paved courtyard mentioning stone door seal to prevent water and other moisture. During monsoon rain without the iwan or the verandah (cloister) diving rain was cut off by the thickness of the huge mason wall. Because the door (wooden) was set at the inner flash of the room so a deep clear cover is managed due to the mason wall's thickness, this is a proposition (fig 30). The roofing style is another phenomenon to justify the influence; the central tiny structure was roofed with curved chouchala (suggestion), as it talled on the central liwan of Choto Sona mosque. The four side was posted with turrets having four enhancing toped blind cupola with multi-face. Probably the façade had the bands of corbelling tires and the north-south façade was ornate with perforated jail opening. This curve reed hut roofing style is the interpretation of the rural hut of Bengal. this tiny structure used to function as the lecture hall cum library. The lecture hall had the capacity to house 23 persons/pilgrims. So all the students were not probably allowed to gather in the tiny hall except scheduling. The brick is the major construction material in this structure. The wall, dome, pave, and other infrastructure were built by the burnt brick. Huge tank used to excavate to collect mud as the row materials for the structure. This mud used to dressed and keenly burnt and brick was produced. The huge excavation transformed into dighi, tank served for the neighborhood facilities. So in terms of generating a structure Sultans supported the community like a way. Influence can develop a 'Purpose-Built Structure in Islam'.

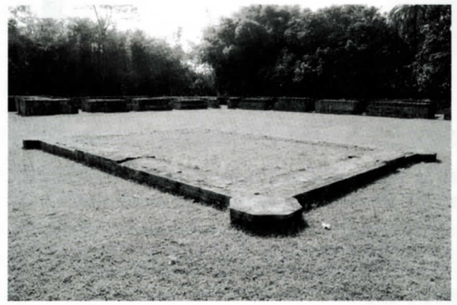


Fig 4: tiny lecture hall is in the middle of courtyard

Fig 5: the madrasah is associated with a waqt mosque

Fig 6: the entry pinnacle with polygonal side is embedded with cladding and ornamental floral motif

Fig 7: courtyard and rooms/cell

4 Chouchala: is the vernacular roofing system, this kind of chala roofing is usual practice in Bengal since delta evolved.

The functional criterion applied to a typology of mosques yields, in addition to separate structures for daily, congregational and community prayers, such other types as memorial, tomb, shrine and cemetery mosque as well as the monastic mosque, and one other type almost equal in importance to the jami the madrasah, or collegiate mosque. The problem in Islam is that nomenclature is never other than confused and different categories overlap. Not only did the madrasah plan ultimately furnish a model for the monastic mosque at an earlier stage of its development may have influenced the plan of the first madrasah. This was in Khurasan whence the new plan was to embark on a carrier of conquest, revolutionizing society and architecture alike.

3.0 Madrasah in the Islamic World:

Education was always closely connected with worship, and from the beginning mosques could be used for both prayer and instruction. The two functions eventually diverged, however, and the result was the collegiate mosque, or madrasa. Its plan, which seems to go back to the houses of Khurasan (fig 08), a historic region that covered parts of modern day Afghanistan, Tajikistan, Iran, Pakistan, Uzbekistan, and Turkmenistan, Khorasan Province of Iran, subsequently divided into: South Khorasan Province, North Khorasan Province, Razavi Khorasan Province, resembles the Iranian mosque layout illustrated in the plate , a rectangular courtyard with an iwan in the center of each side. Teaching takes place in the iwan, and students' lives in the cell arranged along the intermediate walls. For an example the restored Mustansiriyya (fig 10) in Baghdad, an archetypal madrasah without pulpit or minaret (the minaret here belong to another mosque). Designed as a university and not as a place of worship.

Fig 8: isometric view of the madrasah Mustansiriyya in Baghdad

Fig 9: view from the courtyard

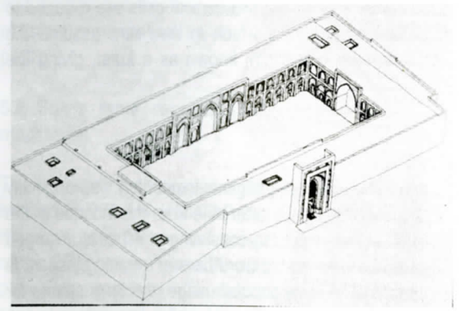


Fig 10: restored view shows the glory of the madrasah

Fig 11: A water channel running through the courtyard (fig 05) connects the madrasah with a caravanserai maintained in perpetuity by the religious endowment

5 Lorentz, J. Historical Dictionary of Iran. 1995 ISBN 0-8108-2994-0

The most sumptuous of Iranian madrasah is the Madrasah-i-Shah at Isfahan, a Royal Foundation dating from 1712-18. This view shows the corner of the larger courtyard devoted to students' accommodation. A water channel running through the courtyard (fig 11) connects the madrasah with a caravanserai maintained in perpetuity by the religious endowment.

A madrasah courtyard can be viewed as a scenario with the façade broken at intervals by the huge axial iwans in which the rhythm of the rows of small iwans culminates, since they describe the same outline but on contrasted scale. The relationship in which they exist to each other is also modified by the very different spatial relationship that obtains between them and such accents as minarets and domes. It is not surprising that the new invention soon eclipsed the less spectacular jami, even on its own ground, the liturgical.

The first madrasah were simply the houses of the teachers, where after the idea was reproduced on a monumental scale appropriate to the Seljuq Empire whose needs the new installation was intended to serve. The great vizier, Nazim-al-Mulk, who was the real ruler of the empire during he reign of Malik Shah. Khurasan witnessed the birth of a structure combining pragmatism and beauty to a degree seldom seen. The relationship in which they exist to each, other is also modified by the very different spatial relationship that obtains between them and such accents as minarets and domes. It is not surprising that the new invention soon eclipsed the less spectacular 'jami', even on its own ground, the liturgical.

Madrasas built by the Seljuqs of Rum are both simple and multiple. A three-iwan version resulted in the T-plan mosque, which was standard for the early Ottoman period and was superseded only by the centralized, dome-dominated mosque that emerged in Edirne (the Serefeli Mosque) and then triumphed in Istanbul. A gradual evolution is discernible even at the Bursa stage. This sense of power is the first impression to be conveyed by a Seljuq building,
The standard Iranian mosque results from a fusion of the local 'kiosk' mosque, congregational in purpose, with the madrasah, collegiate in purpose; and to the product of this strange misalliance are added minarets and dome. The dome surmounts the kiosk, to which the qibla iwan now forms a vestibule, and its importance is further emphasized by the addition of minarets at the side. Whatever its functional drawbacks when adapted to congregational purposes (visibility of the imam in an Iranian mosque being practically nil), aesthetically the emended madrasa is a vast improvement on the hypostyle jami, which at best never had more articulation than that imparted to it by an axial aisle higher than the aisles to either side.

The Timurid development of this hybrid proved incomparable, producing in Transoxiana, Iran and India buildings that have no peer. The axially-planned Mughal mosque is derivative from the Iranian mosque but differs from it in details. Three, sometimes five, pyramidal arranged domes replace the single dome of Iran; the minarets return to the corners of the building to define the entire composition with an emphatic vertical accent; the two tiers of cells are reduced to single-storey porticoes whose low profiles throw into high relief the centre iwans, which in their turn assume the function of entrance gates; and finally the whole is elevated on a tremendous plinth, known as a kursi, giving the mosque a monumental character unsurpassed elsewhere.

4.0 Madrasah & Contextuality in Bengal: An Evolution

The name 'darasbari' literally is a place for learning which indicates that a madrasa (religious institution) was originally attached to this mosque. A low mound was discovered during excavations about a quarter mile from the mosque in the neighboring village of Ghoshpur. It revealed the foundations of a 169' square madrasa consisting of 40 cells arranged in four wings around a 123' square inner courtyard. Madrasah derived from an Arabic word darsun meaning lesson, is a Muslim educational institution, a centre for studies, teaching, research etc. In its popular usage, the term stands for an institution specializing in the teaching of the Arabic language and Islamic studies. The primarily stage of madrasah is called Maqtab or Nurani Madrasah or Furqania Madrasah ('Furqan' is derived from Al-Furqan). The primary education centres giving lessons on reading and reciting the Holy Quran is known as Darse Quran. Usually the local mosques serve as the centres for primary education for boys and girls of nearby families. The imams and muazzins of local mosques work as teachers.

In Islam, Madrasah education started from the first word of the divine revelation, iqra or 'read'. The first schooling of madrasah education started at the house of Zaid-ibn-Akram in the valley of the Safa Hills , where the Prophet (S.) himself worked as a teacher and some of his early followers became his students. After hijra, a madrasah, namely the Madrasah Ahle-Suffa was established on a site adjacent to the east of Prophet's mosque at Medina. Ubada-ibn-Samit was the teacher there. Abu Huraira Mu'az-ibn Jabal (R.) and Abu Zar Gifari (R.) were among the students. The syllabuses of early madrasahs included the Qur'an, hadith, farayez, primary healthcare, genetic science, and tajwid. In addition, horse riding, war skills, calligraphy and physical exercise were also included. The first phase of madrasah education continued for about 100 years from the day of nubuwat to the end of the rule of the Umayya dynasty.

So Bengali Sultanate madrasah perhaps evolve from the historical references of earlier establishment of Buddhist Vihara, with the alignment of the fresh growth of madrasah and collegiate mosque retaining in Persia. Previously known as the Khurasan style. The influence takes wing next to the Iranian mosque with rectangular courtyard where madrasah was served by the iwans and Cairo mosque with series dome appearance amalgamate the fresher meaning for the south-east Asian Muslim Sultanate madrasah. And finally the ancient Buddhist residential institute or Mahavihara and its sense turned into the traditional architecture for the residential Muslim institution or madrasah. So the combination of the North and South Khurasan madrasah complies a great role for evolving the Bengali Sultanate Madrasah obviously Buddhist rchitecture and the Mahaviharas became the iconic perception for the physical organization as well as for the morphological profile.

5.0 Some facts regarding the organization of the madrasah:

The Darasbari madrasa, according to the inscription , was erected in 909 AH (1504 AD) by Alauddin Husain Shah. However, its existence was revealed only in the seventies of the 20th century when the site was excavated and the plan fully exposed. Its discovery has removed the confusion between the location of the madrasa and that of the Belbari madrasah, erected two years earlier. Belbari is one of the two madrasas known to have been also erected by Sultan Alauddin Hussain Shah at Belbari on the Indian side of Gaur-Lakhnawti.

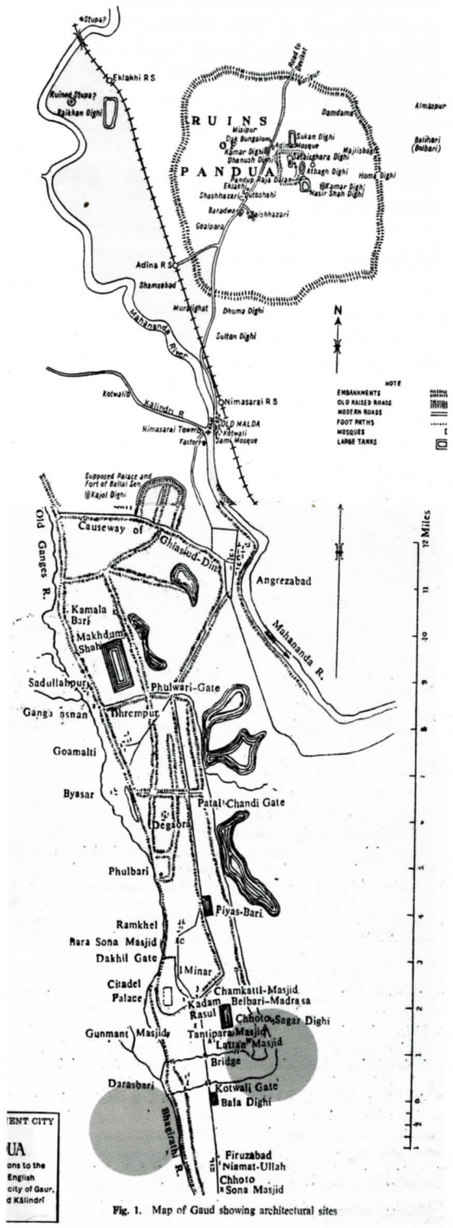


Fig. 1. Map of Gaud showing architectural sites

Fig 12: map of Ancient Hazrat Pandua and Gaur

6 Husain, ABM. (ed), 1997. Gawr-Lakhnawti, Dhaka
7 [ABM Husain]

The Darasbari one has been clearly identified by the discovery of the foundation plan after excavation of the site and the finding of the inscription within the debris recording its erection. But the Belbari madrasa (the origin of the name is uncertain) is yet to be discovered, although a vast quadrangular site at the north of the Chhota Sagar Dighi (fig12), generally known as 'Bhita of Chand Saudagar', has been identified by Cunninghum to be the actual spot of the Madrasa. The nature of the site, together with the inscription removed from the place but now 'set up on the enclosure wall of a mosque north-west of the English Bazar police station', testifies to its existence there. The inscription records the Madrasa as al-madrasa al-sharifa (excellent madrasa) to be distinguished from that at Darasbari which has been described as al-madrasa al-jamila (picturesque and magnificent madrasa). According to the inscription, the Belbari madrasa was erected in 907 AH (1502 AD). Although its site has not yet been cleared up, we can assume that it resembled in plan and construction the Darasbari madrasas the standard type of madrasas known to us from other examples in India and the Middle East.

6.0 Describtion of the Madrasah:

The Darasbari madrasa is square in plan, each side measuring 55.50m. It consists of forty rooms, each measuring 3m a side, constructed around an open courtyard measuring 41.5 m square. The mosque attached to this madrasa is in the middle of the west-side rooms which are a little larger than the others, measuring 4.9m a side enhancing Mehrab orientation. The mosque had three gateways, one each on the middle of the east, north and south sides. There are the ruins of a structure in the middle of the courtyard. Its identity is uncertain but it could be a library-cum-lecture hall or a

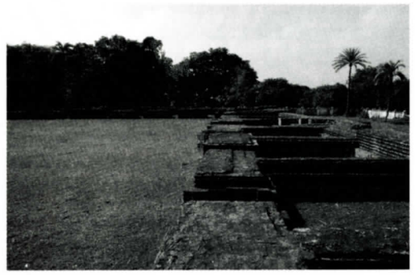


Fig 13: series of room alog with the courtyard

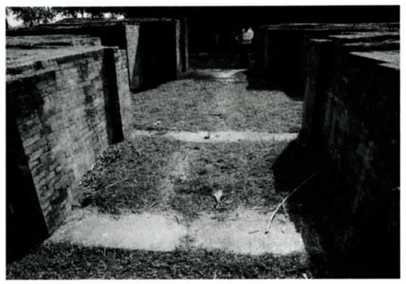


Fig 14: entrance hall area

Fig 15: construction technique and the cladding brick

8 In architecture, a quadrangle is a space or courtyard, usually rectangular (square or oblong) in plan, the sides of which are entirely or mainly occupied by parts of a large building. The word is probably most closely associated with college or university campus architecture, but quadrangles may be found in other buildings such as palaces. Most quadrangles are open air, while a few have been glazed over often to provide additional space for social meeting areas or coffee shops for students.

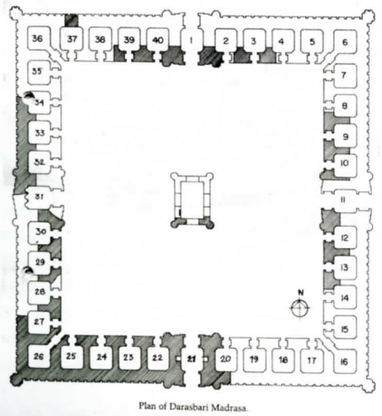
9 Gawr-Lakhnawati : A. B. M. Husain, Asiatic Society of Bangladesh, M. Harunur Rashid (Book, 1997)

(A huge collection of terracotta plaques found during excavation (1973-75) is now preserved in a room of the Guest House, Directorate of Archaeology, near the CHHOTA SONA MOSQUE.)

On the other hand Bengal was experienced in Gaur Darasbari Madrasah a unique structure. So it is obvious that ancient Bengal architecture primitively found a generic pattern for residential academic institutional generic type during the Buddhist period (Shompur vihara, Vasu vihara, Gokul medh, jogoddal, Shalbon vihara). The given examples have similarities to secure the characteristics of a vihara/monastery, such as courtyard, the shrine, ambulatory circulation, long verandah, cell, greater compartment with open terrace, services and entrance hall. So just after the Buddhist viharas in Bengal Sultanate Architecture refreshed with making of remarkable structures. The influence, context, materials, ornamentation, planning organization and most striking manners in the roofing treatment, which encompass the locality and its influences.

6.1 Planning organization of the madrasah

Buddhist people built their Mahavihara in a hidden part as well as in the remote side of the village/town. The intension of making this kind of architecture was to create the concentration on a point by the huge courtyard, introvert attitude and an academic-environment. The planning organization was bold square and coordinal axis diagramed, which compiles four coordinal center entrances, of which north was the main entrance complex. The madrasah has the character of introvert pattern. And observed before that it has the similarities with Buddhist monastery that reflects the residential institutional ground- figure. Same understanding has been done in the case of Darasbari madrasah, square plan configuring 182'X182' feet. The planning organization has the clear cordial axis orientation. Those end points created the three identical entrances including the in-house mosque. In the middle there is the evidence of having a



Plan of Darasbari Madrasa.

Fig 16: Plan of Darasbari Madrasah

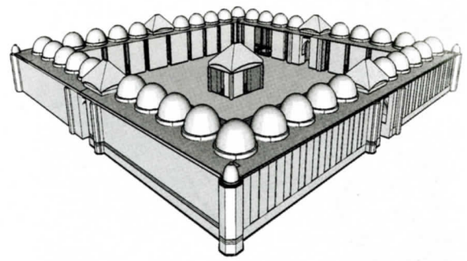


Fig 17: conjectural restoration of the Darasbari Madrasah

6.2 Three coordinal axial entrance and Gateway

It is however that the entire madeasah is associated with three projected gateway. The east side was the main entrance of the complex in a bigger shape. The entrance cubicle is paneled with alcoves. The stone bracketed plinth is

10 Definition of Mahavihara: mahavihara os the residential religious institution during the Buddhist period, mahabihara or the monastery is the identical architecture in Bengal as well as south east Asia.

stepped up from the ground. Especially the gateway has an elevation of having pinnacle on each side. A moderate pointed arch used for the entrance. All cells had a pointed arched opening towards the courtyard. The whole plan is matured with four corners polygonal turrets with terracotta ornamentation.

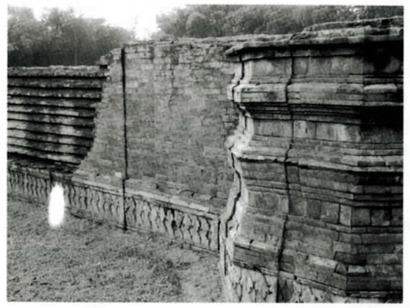


Fig 18: north entrance ruined façade of the madrasah

Fig19: façade is having recesses and offset

6.3 Facades

Today we can understand the structure by seeing, analyzing and compared to other contemporary structures; its plinth level is in a certain height. But it is obvious that the height of the façade of the madrasah was consisting of about 20'-0". The justification of the height could be analyzed from the bottom line of the structure. The plinth is recorded the height about 2'-0", respectively the façade at about 12'-0" and the domes are about 6'-0" height. The section shows the development of the ruin masdrasah. The entire façade is cladding with tiny thick and rectangular exposed brick. The plinth elevation is raised with floral terracotta decorative bands and having some equal plain bands embedded on the façade. The façade is exposed with terracotta brick and mouldings. The horizontal façade dominated with exposed bricks, it seems like once the whole facades were prominent with corner strong turrets, in middle the pinnacles and multi-domes for making roof.

Fig 20: gigantic turret with horizontal corbelling

6.4 Turrets and pinnacles

Sultanate architecture is associated with various elements and constituent. Turret and pinnacle is one of the two elements. Sultani mosque in Gaur is bracketed by turret, the turrets used in the other structure also; the Darasbari madrasah is containing polygonal gigantic turrets. These turrets are cladding with terracotta bricks. Simple tired corbelling are added like the horizontal bands makes each turret decorated. The detail corbelling was done through the linear facing bricks. The moulding was done by the special designed moulding bricks to secure better craftsmanship. Special type of motif of terracotta with floral designed was added at the bottom of the turret's base, the shaft of the turret is banded with horizontal mouldings and at the top probably cupola finial crowned on it, like chotosona mosque

and Bagha Mosque. The pinnacles are well decorated as the same manner as the turrets were finished. Exactly the same design in a miniature form to enhance the ceremonial gates of the three sides.

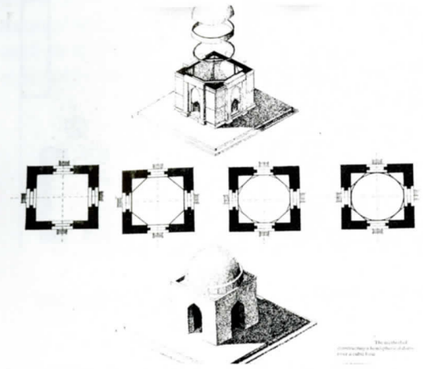


Fig 21: principle diagram showing the construction of dome in a single cube chamber

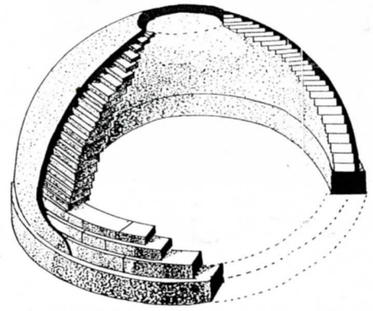


Fig 22: construction of domical roof

6.5 Roofing treatment Course of Construction and over all expression (with suggestion)

Particularly the madrasah's upper structure is completely destroyed. The organization of massive thick walls, the construction technique, climatic situation, craftsmanship, contemporary structures of the period reflect the roofing style in a multi-domed manner. The Sultanate architecture is enriched with its innovative roofing style; stating from the enormous Adina mosque to the other sultanate structure in Gaur (1375-1559 AD. structures in between this time span) the treatment of façade and roofing behavior remain same. However the wall cladding materials derived with innovative black-basalt stone (used in Choto Sona masjid, kushumba mosque) instead of terracotta brick works. The Darasbari madrasah erected on 909AH (1504 AD). The major construction technique of this time span reflects the structural 'outline'. An 'outline' by which we can understand and assume the character of the structure. The justification of the analysis is provided in the pictographic form. During the Sultanate period people of the land especially in Gaur built their rustic hut with curvilinear figural character for the physical reality. This physical reality exists for thousands of years in the Delta of Bengal. So dochala and chouchala became a 'presence in place', the roofing style of the sultanate architecture is bold to its own idiom. Dome construction was better-known to the local mason to carry out the whole construction, that is why in the roofing system of the mosque is dominated and combined with the chouchala/dochala with the association of hemispherical dome.

In the case of Darasbari madrasah hemispherical Multi-dome roofing (repetitive) with drums to be the outline of the roof. Perhaps this hemispherical dome construction is sophisticated and the basic 'structural theme of strength' is the compressive configuration, which always threatened by the seismic impact. In 1897 massive earthquake cause disappearance of the precious roofing. On the other hand, flat roof, shallow vaulted roofing and barrel shape vault were experienced on the massive or moderate mosques during the particular time span. Enormous number of examples were studied to identify the other roofing style prevailed in Bengal. Adina mosque, Gunmant mosque, Dakhil Darwaza and the tomb of Fath Khan are quite dissimilar in roofing.

Fig 23: a view of Qudam-e-rasul and Farah Khan mausoleum

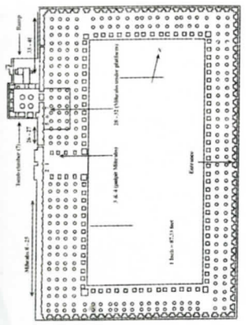


Fig 24: plan of Adina mosque

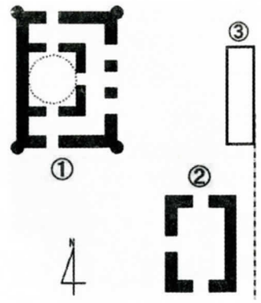


Fig 25: Qudam-e-rasul and premises

The central part of the Adina mosque's liwan was at one time a very impressive pointed vault over the 70' deep. It spanned over a distance of 34 ft and was supported at either end or walls perforated with five arches. The apex of the vault was at height of over 50ft above is now more in ruins to be of discernible architecture. The Gunmant mosque was consisted of a hall 140X60 ft. designed much like the Adina mosque sans the cloister and the central vault. In the case of Dakhil Darwaza the Saluting Gate the central space was topped with barrel vault or the dome. Lastly Fath Khan in Building his own tomb near the Qadam Rasul abandoned all the subtle techniques of his predecessors. Instead he erected an in Toto imitation of the Bengali Hut completed with the curvilinear thatch roof all built in the brick and plaster. His effort too proved to be not in vain. Another exception happened with the Masjidbari mosque (1465-74), in Patuakhali. The fore-room or the iwan was roofed with linear chouchala vault.

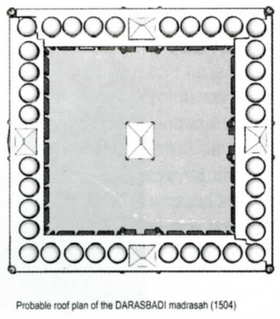


Fig 26: Probable roof plan of the DARASBADI madrasah (1504)

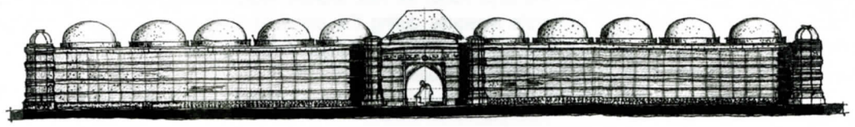


Fig 27: Suggestive Elevation of madrasah, showing the roofing treatment.

Now come up with the case of Darasbari madrasah overselling course of brick in the corners confirm that each wing had nine hemispherical domes supported Bengali corbelled pendentives. The central aisle was a single hall with three arched openings each on the north and south side. There were no oversailing courses of brick here; instead, there are traces of lateral arches, indicating that the central aisle was covered neither by hemisphere domes, nor by a long barrel vault as in the Adina mosque in Pandua of West Bengal. similar lateral arches are seen in the central aisle of chotosona masjid, nearby and similar vaults, with in an addition one to cover the central bay of the verandah.

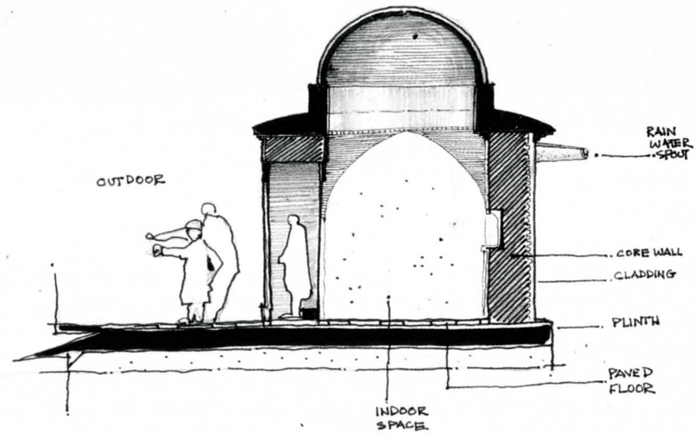


Fig 28: room opens to courtyard

Darasbari madrasah is no exception but having the series of hemispherical domes with drums underneath cubical chamber. A simple and bold constructional approach for the mass roofing.

6.6 Cell or chamber:

The Buddhist Monastery both in Paharpur and other viharas are having the same spatial manifestation, Darasbari madrasah is exception with only except the verandah or the cloisters. The cell or the rooms in Darasbari madrasah is about 144 sqft (approx) which is an average case found in the Buddhist Vihara. So some kind of standards used to implement making those rooms and cellas. The height of the room is a missing data in the madrasah. The highest wall retain, about the ground is 5'-0" (approx). But the study of roofing treatment is a strong reference to clarify the height of the rooms. The length and the width of the room is squarish (almost square), about 12'-0" so the height of the squarish room should have the same dimension as for the length and width. The entire room is having a cubic space volume integrated with the dome height. The dome has a circle at about 12'-0" and the radius is to upward is 6'-0". Then the entire height of the room comes at 18'-0". The room has the panel and recessed works in two walls. The corners are treated with corbelling. The structure does have the DPC course. The room has a single door way, which provided only a single arch way to come out to the courtyard (paved).

Fig 29: a spot section is elaborating the proportion, scale and other parameters of the room and indoor outdoor relationship

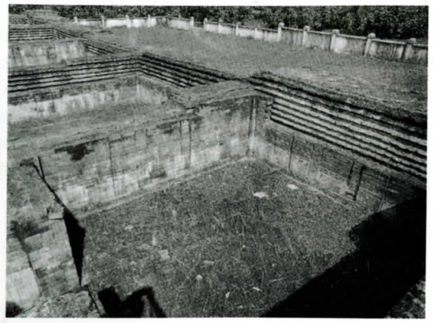


Fig 30: courtyard and the tiny structure

6.7 Courtyard :

Courtyard is the fundamental element and spirit of mind of the people of this region, starts from the domestic structure to the public and religious buildings in many ways courtyard was added and functioned as the space of livingness. Darasbari madrasah is aligned with the courtyard containing a tiny structure at the center. The courtyard (fig 32) is of a gentle proportion with façade surrounded. Probably the paved courtyard was surrounded with screened pointed arched opening. The courtyard is raised off from the ground, 2'-0" approximately was the raised dimension. The Madrasa was surrounded by a 3'-6". thick perimeter wall which ran round the site at a distance of 40'-0". From the structure wall. This boundary wall has been traced at two points in the east for a length of 9'-0" and 4'-0" respectively. Parts of the inner and outer courtyards were found paved with lime plaster finishing. It is likely that the entire courtyards were similarly paved. This is evident from the discovery of an arched tunnel 6.6" broad at bottom and 10" in height below the partition wall of the rooms between rooms 23 and 24. This tunnel in the body of the wall under the floor level must have served to drain out rain water from the courtyard area. The outer pavement was traced on the north, in front of the northern gateway for a length of 24'-0", and near the south-eastern corner tower of about the same length. It is likely that there were ancillary buildings within this outer courtyard. The gateways led to the middle of the west and east tanks.

Fig 31: Assumption and probable elevation of the tiny lecture hall

6.8 Central tiny pavilion -its settings and context

A lecture-room and library as suggested above, also bordered with octagonal turrets at the four corners and occupied the centre of the courtyard. It is completely destroyed and survives only in its scanty foundation courses.

The plan of the structure was rectangular measuring 25'-0" by 18'-0" externally, and its walls were 2'-6" thick. The structure probably had a chauchala roof.

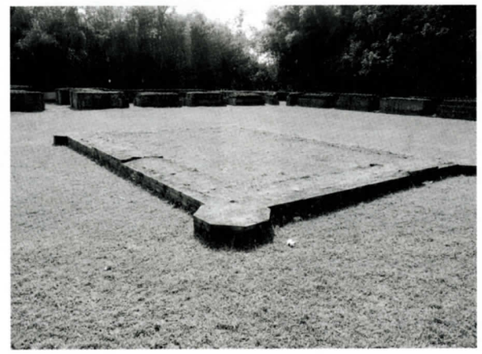


Fig 32: the hall was bracketed by turrets

The central structure must have served the same purpose along with the keeping of books within it. This is a suggestion, and without the discovery of evidence against it, it should be reasonable to accept the building as such. It the structure is, however, regarded as an ornamental pavilion within the courtyard garden. On the other hand another interpretation could be excelled. The vernacular house form is generally associated with courtyard. The courtyard is the place where inhabitants spend most of the time. This quad often seated with 'Dheki Ghor' or granary processing hut. A hut occupied by the women at the center of the courtyard. So the setting is more contexts specific for the elaboration of the tiny structure.

6.9 Spatial characteristics of the madrasah

Space was prolonged and shaped during the ancient time with specific philosophy. The Buddhist used to make their space dramatic with light and shadow. Sometimes they created a vast and grand scaled space through achieving height. Lights was so tracked and focused to the hypostyle hall to illuminate and result comes out with spiritual environment. So the central shrine of the Buddhist Vihara used to have this kind of environment. The hostel room or the cells were the cubic spatial profile with huge courtyard . so the central shrine is in the middle of the courtyard and providing message to the pilgrim.

The Hindu, the House of God is another spiritual house. Where people come to offer to the divinity. the language of the spatial environment partially accommodate the God's housing. Garva-Graha is a single chambered room or the vestibule. Which has a ornamental east side entrance. On which shikara or other stylistic element of architecture crowned. But the single chamber was darken and mysterious. So the devotees can concentrate on their offering. A temple's nucleus is the Garva-Griha and the other parts are engaged with public functions. The Christianity came out with light with colors. They usually gather in a nave space which is having an unusual height. At the same time the glazing used for lighting designed with stained or colored glass. So the spatial quality guide the pilgrims to step towards the God development.

Islam is filled with enlightened mind. So the mosque is associated with series of openings entitled pointed arch. Light is the focused meaning of presence of peace and prosperity of a Muslim. So the same thing happened in the case of the madrasah. The madrasah is filled with vast and frown of light. For the students of the madrasah which were actually meant find the Allah form the nature. So the spatial sequence was simple indeed to focus the learning process by learning the nature and the tiny structure always kept reminding to the musulli (pilgrims) for learn.

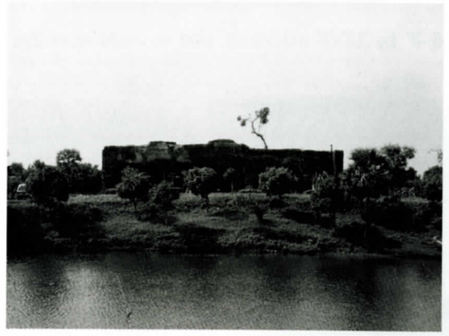


Fig 33: a view from the madrasah towards the Darasbari Mosque

Fig 34: huge Dighi

6.10 Large tanks and spatial sequence

It is obvious that the large tanks were excavated for the betterment of the neighbourhood, as well as for the village people. Purpose built structure has a sustainable meaning that we found during the time of the Sultanate Architecture. The lifted earth used for the construction of the mosque and madrasah. The mud brick was manufactured and then keenly burnt for the enveloping. So this kind of large tank has impact on the micro-climatic issue.

7.0 Bengali Sultanate Madrasah: an overview

The Deltaic region of Bengal is dotted with Buddhist stupa-vihara, Sultanate Mosque and other Local manner with different influence, which is a resourceful development to haul up the traditional and cultural legitimacy of Bengal. Different locality settled with various form of Architecture. The temple of Bengal has genuine and stylistic self-explanatory appearance. The form of the structure of temples mainly derived from the local manners. Individual temple settings in the remote end created the rural skyline identical. The same thing was happening with the mosque of the sultanate and mughal. Both the complex and individual development helped to secure the architecture site specific. Especially for the Sultanate mosque the complex manner was rare but sometime mosque was associated with the tomb or the madrasah (Darasbari). Though the madrasah function was occupied in the mosque but in the case of the Darasbari it is exception. A huge tank separates the mosque from the madeasah. This is the sole architecture that developed for the specialized function during the Sultanate period, Elaborated and dedicated for only academic and institunal aim. Darasbari madrasah is the example for the complex setting of pre-mughal era. The architectural meaning of the structure could be termed with massive public structure with series of domed roofing (specified before) and corner engaged turrets, the entry was once focused with projected façade and arched was with turrets development. The east entry door was little bigger than the other common domes. Entirely the madrasah structure is a shallow height development in respect to the mango garden, high density mango trees were the influential setting of the madrasah. It is noticeable that the bricks were built by the excavated earth of the large dighi or tank. Both the madrasah and the mosque eventually built by the excavated earth made bricks. Darassbari madrasah is the intelligent architecture in Gaur as well as in Bengal. The building could be named as the 'purpose-built structure'. May be the architecture was mandatory for the particular phrase of time. So its characteristics, notion, functional clarities, central tiny lecture cum library hall, coordinal approach, paved courtyard, climatic responsiveness and lastly the roofing treatment had an unparallel development during the particular period of span.

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January 2010, Volume 14 Issue 1
pp 22-23

Exploring morphological changes of the oldest core of Dhaka city for conservation

Wahida Iffat
Lecturer
Department of Architecture, The University of Asia Pacific, Dhanmondi 4/A, Dhaka.
E- mail: wahida_iffat@yahoo.com

Abstract:
The built heritage of Dhaka city is more than 400 years old. Its social, physical, cultural identity is transforming due to rapid urbanization, shifting economic activities and changing land use patterns. This paper focuses on some of the old historic structures of three major streets- Shirish Das road, Paridas/ Hemendra Das road and Rupchand lane which forms a part of the oldest core of Bangla- Bazzar area. The purpose of the study was to observe the present condition of those streets, try to find out any morphological changes, identify some of the old structures and form the basis for their conservation. The study considers identification of buildings from physical survey as well as critical reading of some books and analysis of historic evidences. The findings show that the area is going through major physical as well as environmental degradation and the situation is so worse that in few cases those buildings should be conserved immediately in order to preserving the history for future.

Keyword: Dhaka's oldest core, morphological changes, conservation.

1.0 Introduction:

The old core of Dhaka, once the glorious capital of the Mughal era is now on the verge of oblivion. During the Mughal period (1610- 1717) it was in its pinnacle of glory and a number of important monuments were constructed. However in the second quarter of the nineteenth century, under the initiative of the colonial administrators and the local elite, the decaying Mughal capital experienced renewal and rejuvenation. It started to grow again and this growth is still being continued. [Haque, 2002]
From Dhaka's current architectural and planning scenario, it would be difficult to answer that whether the growth is going in the proper direction or not. The land use patterns as incorporated in the city planning, has little scope for major changes as the core is densely built up. This high density is resulting into mixed use development in many residential areas like Dhanmondi, Gulshan, Bonani, Baridhara, Uttara etc which are forced to operate without legal prohibition and causing urban problems like pollution, traffic congestion and lack of urban open spaces for social and cultural activities.
If we focus on the older part of Dhaka it has a certain socio- cultural, architectural character which is completely different from the recent growing Dhaka. This growth is influencing the socio-cultural and historic heritage of the oldest core- Bangla-Bazzar area of the city, defacing the look and also changing the life style of the people. In this situation certain part of oldest core of Dhaka was studied to have an overall idea about the present state of the area, its morphological changes and existence of age old buildings which have architectural, cultural, historical, social, political or religious importance and should be brought into focus for the sustainability of the oldest core as a living city. This paper particularly focuses on the present status and morphological changes the area has gone through in the street, block and plot level and tries to form a basis for conservation of buildings on either side of three streets - Shirish Das road, Pari Das/ Hemendra Das road and Rupchand lane of Bangla-Bazzar area.

1.1 Aims and Objectives:

Main objective of this paper is to -
* Find out the morphological changes in street, block and plot level.
* Identify old structures which have some historic, social or architectural importance for conservation.

1.2 Methodology:

The methodology followed in this particular study focuses on the evolutionary phases of Dhaka, its historical background and morphological changes in street block and plot level through analysis of maps. The methodological frame work of this phase is concentrated on critical reading of books and journals. In the second part survey work of

the site is done to identify the old buildings that has been demolished, extended or redeveloped or exist in the same way focusing on their historical background, architectural styles or simply because of socio economic importance. Moreover observation, interview and photograph have also been adopted as part of the survey work.

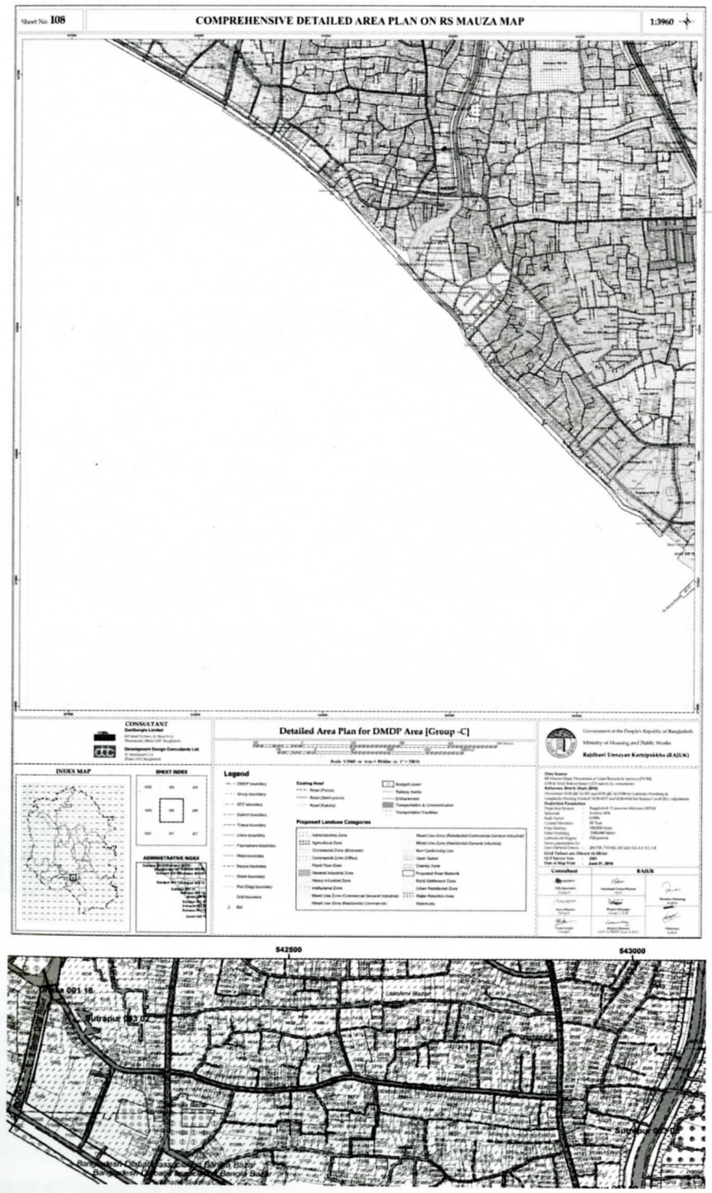


Figure 01: Comprehensive detail area plan on RS mauza map showing land use pattern of the area.

2.0 Historical Background:

According to some historians a city or town named Bangala either existed in the place of present Bangla-Bazzar close to the river Booriganga or somewhere in Shonargaon much before the time of the Mughals and from which the province derived the name Bangala. From records left by foreign travelers (in 1506 a Roman navigator Vartomannus visited the city of Bangala during the reign of King Hussain Shah) it is evident that a town named Bangala flourished during the last part of the 15th or first part of the 16th century and carried commerce in muslin, silk, sugar with foreign countries. The view that Bangala and Dhaka were identical places has further been confirmed by the fact that old writers never mentioned these place-names to indicate different places. Besides the following account of fortifications, mosq s and mausoleums existing in Dhaka from Turkish and Pathan times further established the fact that the city of Bangala, or Dhaka, by whatever name it was referred to, existed in this place long before the Mughals appeared in the picture. [Taifoor, 1984].

According to historians the once known "Bahanno Bazaar Teppanno Goli" old Bangala town or the city is the present day Bangla-Bazzar. In the beginning of the last decade the name Bangla-Bazzar was changed to "P.K. Roy road". Later it was again changed to "Shubhash Bosh road". None of these names were popular among the general people, and it continued to be known as Bangla-Bazzar. [Majumder, Kedarnath, etal, 2003]

2.1 Present Area Condition:

At present the Bangla-Bazzar area has evolved as a hybrid development as an amalgamation of multiple functions which is evident in the land use pattern of that area. [Fig 01] In spite of dominancy in book publication stores, press and storage spaces, this area still has the reflection of old structural styles found in the 400 years of history of the city. [Fig 02]

Figure 02, 03: Original street pattern of Pari Das/ Hemendra Das road

After independence the growth of the city has been phenomenal and brought changes of a greater magnitude than ever. This transformation is in both demographic and physical terms. The recent transformation has put this rich and varied architectural heritage under the threat of disappearance and disfiguration. Already many of Dhaka's historical buildings and areas have either totally disappeared, or are under the process of disappearing. Present demands and activities along with people's negligence, in preserving the old structures are the main reasons for such deterioration. Some of the old structures are being demolished and replaced with new ones. [Fig 04, 05, 06

Figure 04: Old structures are being replaced with new 6 storey buildings

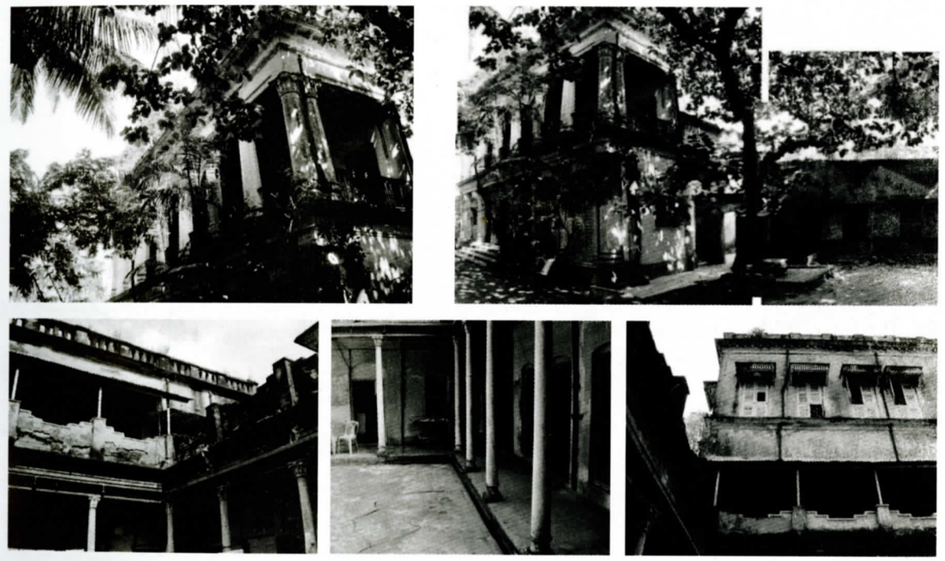


Figure 05: Early state - holding no 33, Paridas lane in 2009. [View- outer court and inner court]

Figure 06: Holding no 33, Paridas lane, currently [2011] in a vacant state, demolished for redevelopment.

4.0 Analytical Findings:

The preliminary stage of analysis was done considering the following steps:
4.1 Demarcation of the boundary of the area being surveyed.
4.2 Morphological transformation of the area.
4.3 Identification and listing of historical monuments and sites or other facilities in the area.
4.4 Classification of buildings in the area.
4.5 Data analysis.
4.6 Findings.

4.1 Demarcation of the Boundary of the study Area:

The survey area is bounded by Patla Khan Street in the north, part of Pari Das Lane and part of Rupchand lane in the South, North Brook Hall road in the west, Hrishikesh Das Road in the east. [Fig 07]

Figure 07: Boundary of survey area

4.2 Morphological Transformation of the Area:

Morphologically the area has gone through some changes. In the beginning of the capital city in the pre Mughal period, there is existence of places like Bangla -bazzar. The area started to develop with activity of different professional groups and started to grow both physically and in density. The study of the streets- Shirish Das lane, Paridas/ Hemendra Das road and Rupchand lane in CS map (1912-15) shows that the survey area had around 296 buildings, which grew to 578 numbers of buildings as found in the GIS map (2003). Around 163 new developments have been observed in the study of the GIS map.

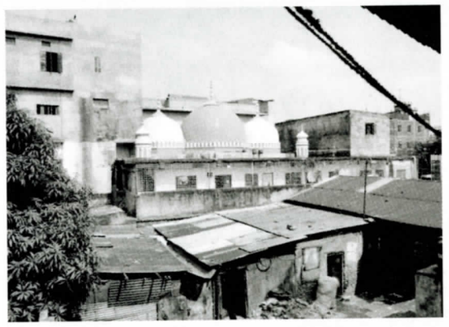
Fig 08: Ward no 79, survey area_ Bangla Bazzar_ street_ Shirish das, Pari Das and Rupchand in CS map

Fig 09: Survey area_ Bangla Bazzar_ street_ Shirish Das, Pari Das/Hemendra Das and Rupchand at present goggle image.

The new developments are more or less six storeys, or in some cases higher, which is destroying the overall scale of the road and the area.

Fig 10: Extension work is common feature

Fig11: Use is replaced - residence-turned into storage space



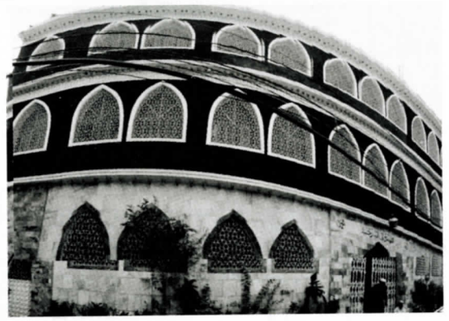


Fig 12: Singtola Mosque from late Mughal period being surrounded by new extension without leaving any trace of the original structure.

The architectural styles are different from the old existing buildings. Moreover, the owners, being unable to restore or conserve their property, are being forced to demolish, or rebuild, their properties. A large number of buildings have been extended both vertically or horizontally, sometimes even without leaving any trace of it. Again large plots are being divided into multiple plots, Thus the area, which was once a posh area with large buildings having courtyards and open spaces are getting destroyed. [Fig 10, 11, 12]

Transformation of Shirish Das road in map

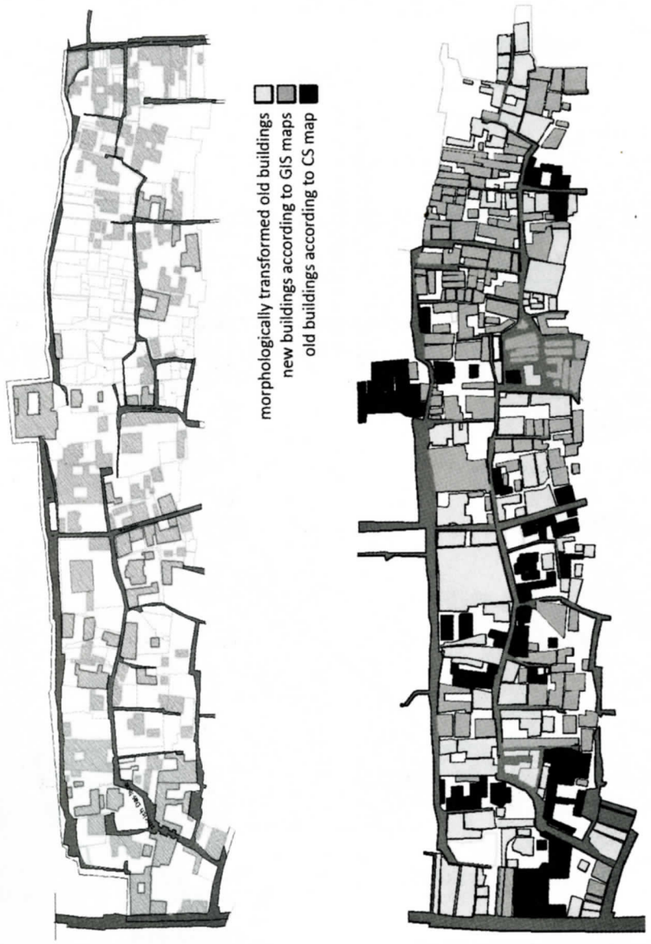
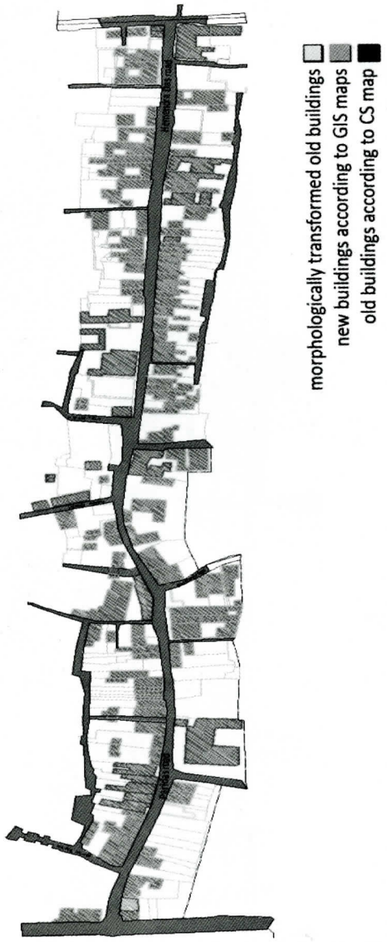


Fig 13: Shirish Das lane in CS maps 1912-15.

Fig 14: Shirish Das lane in GIS maps 2003.

- Structures that changed morphologically
  - Addition, extension, divided.
- Structures that remained more or less unchanged
- Vacant plots

Transformation of Pari Das/ Hemendra Das road in map:



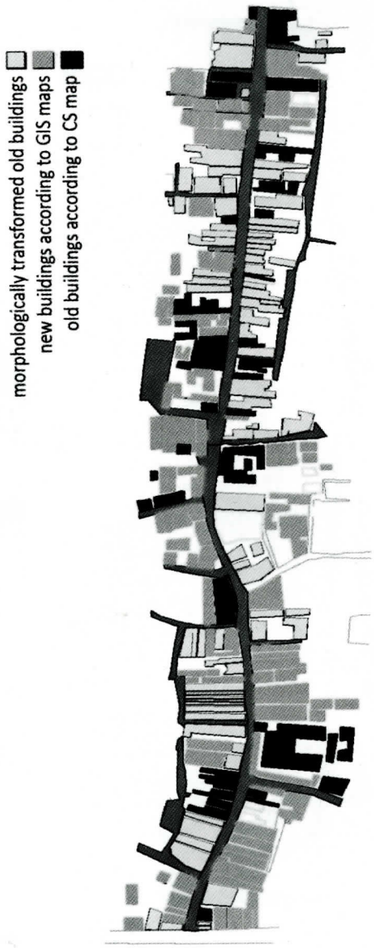
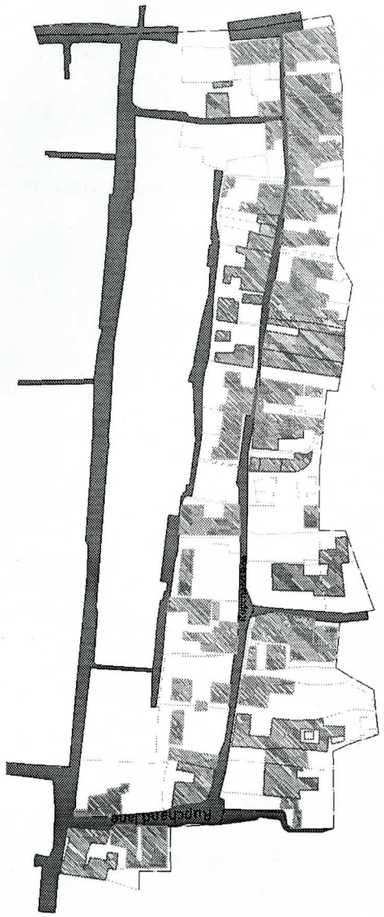


Fig15: Paridas lane in CS map 1912-15

Fig 16: Paridas lane in GIS map 2003

- Structures that changed morphologically
  - Addition, extension, divided.
- Structures that remained more or less unchanged
- Vacant plots

Transformation of Rupchand lane in map:



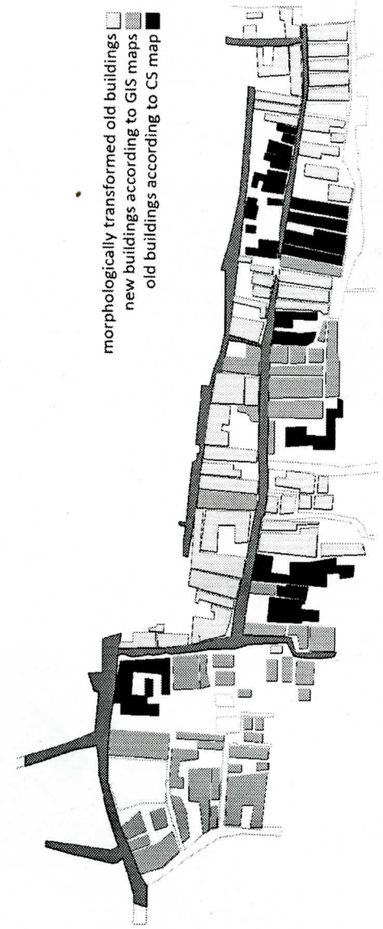


Fig 17: Rupchand lane in CS map 1912-15

Fig18: Rupchand lane in GIS map 2003

- **Structures that changed morphologically**
  - **Addition, extension, divided.**
- **Structures that remained more or less unchanged**
- **Vacant plots**

4.3 Identification and listing of historic monuments and sites in the area:

Identification of historic monuments are based on the following considerations -
" Architectural excellence or style of any particular period.
" Socio-economic or cultural history.
" Proximity to any historically significant structure.
" Potentiality and suitability for adaptive re-use [Hussain, M.Arch,1997]

4.4 Classification of listed monuments in the area:

The aim of the following classification is to identify and categorize different structures in the area. These are -
" Religious buildings.
" Landmarks
" Secular buildings
" Isolated individual buildings, relatively small buildings and detached structures.
" Buildings in rows, road side linear structures forming an integrated pattern of development.
" Palatial large building complexes. [Imamuddin,1993]

4.5 Data analysis: 4.5.1Shirish Das road:

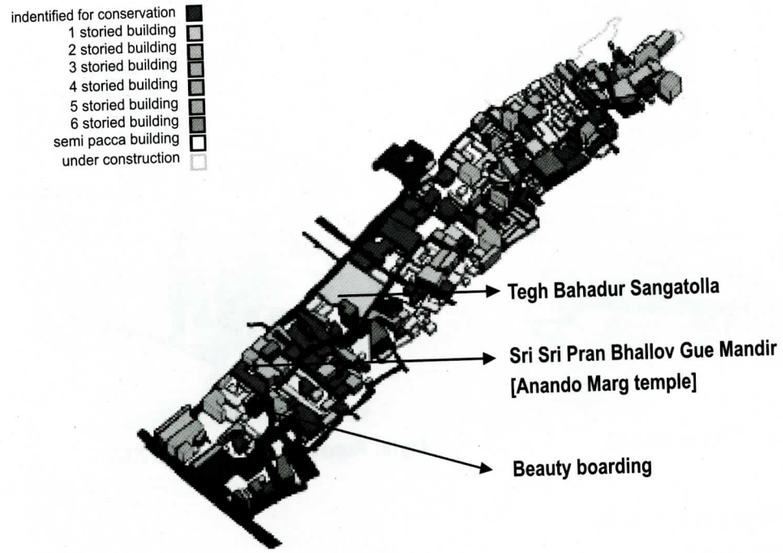


Fig19: Identified structures for conservation in Shirish Das road

Old buildings in Shirish Das lane:

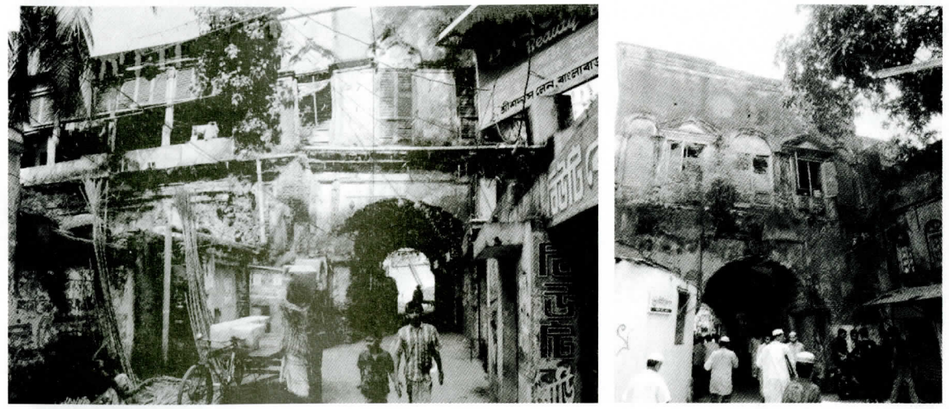


Fig 20: 1, 2_Shirish Das Lane_ arched approach acts as a gateway.

Holding no: 1, 2 Jamindar Bari [residence of Shirish Babu], Beauty Boarding. The residence continues from North Brook Hall road to Shirish Babu Lane and stretches over the lane in the form of a gate way.

Historical background: This was the house of Shudhir Babu, Father of Shirish Chandra Das. The house is known as Chadchi Bari. They were landlords, having lots of property in that area. According to the people most of the buildings in this road were their family property. The street was named after him.

Use: Originally a residential building, part of which was later converted to Shonar Bangla press and existed till 1948. After that from 1950s the press was converted to a Boarding named Beauty Boarding. At present the main part of the building is used as Farida Bag police station and residence at the same time.

Figure 21: View of the police station and residence from the Shirish Babu lane.

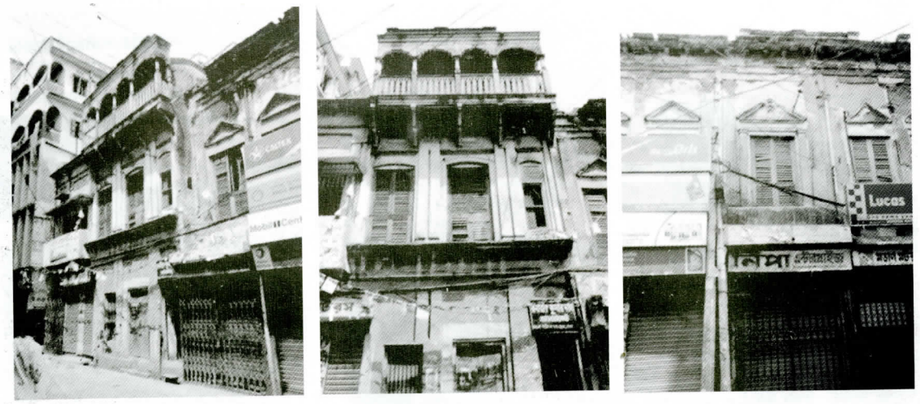


Figure 22: view of residence from the North Brook Hall road.

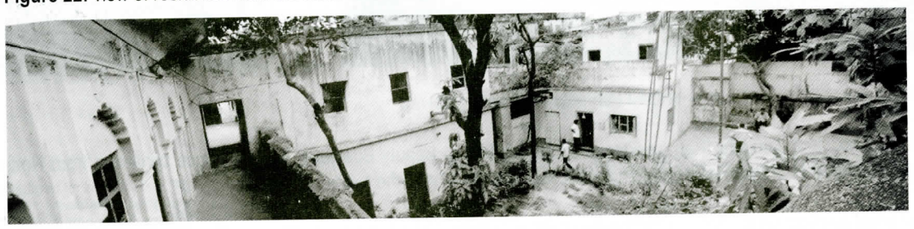


Fig 23: Front court of boarding house.

Fig 24: Press currently used as boarding

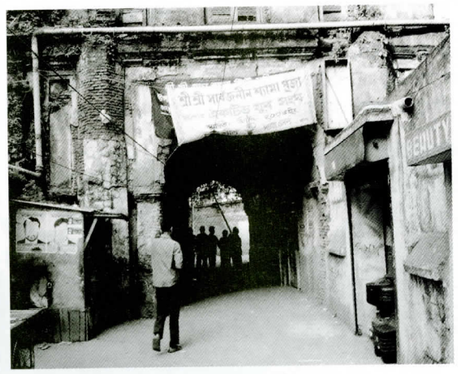


Fig 25: Arched approach acts as a gateway stretching over Shirish Babu Lane

Period of construction: Constructed in around (1850 -1900) approximately as it exists in the CS map of 1912.

Architectural style: The building's arched entry/ gate way towards the Shirish Das lane gives the building a kind of land mark effect. It is assumed that it was built in the late 17th century or in the early 18th century containing certain elements of colonial style, such as the use of Corinthian/ ionic columns, wooden sun breakers, steel beams (kari barga), cast iron railing and arches. Different types of arches have been used in the different facades. The construction material suggests that the time period of construction may be in Mughal period, and it appears to be an amalgamation of different architectural styles of different period.

Consideration for conservation: Beauty boarding has historic, cultural as well as some political importance. The place had been used by film makers, journalists, writers, movie makers as place of congregation. The front court yard is still used as space for people to gather, as well as an entry to the boarding house. Though both holdings no. 1 and 2 have been identified as risky buildings in the City Corporation data base, 2004, they should be conserved as landmarks, due to the social and cultural influences in the area, as well as their distinct architectural features.

Fig 26, 27: 33_Shirish Das lane_ Sri Sri Pran Bhallov Gue Mandir [Anando Marg Temple]

Holding no: 33, Sree Sree Pran Bollov Gue Mandir [Anando Marg Temple]

Use: *Mandir* (temple), religious purpose. There is a school within the Mandir property.

Period of construction: Constructed in the early 18th century.

Fig 28, 29: Cast iron grills and use of stained glass in the doors

Architectural style: The Arched entry and Corinthian columns suggest that the time period of construction may be in the Colonial period. There are two balconies on both sides which are very intricately designed with wooden lattice work. The cast iron grills and stained glass in the doors and diagonally tiled marble floor represents its excellent architectural features.

Fig 30: Wooden lattice work in the balcony

Fig 31: Diagonally tiled marble flooring.

Consideration for conservation: As a religious building the structure serves both social and cultural needs of the area. Moreover, due to its excellent architectural features and style, the temple should be preserved.

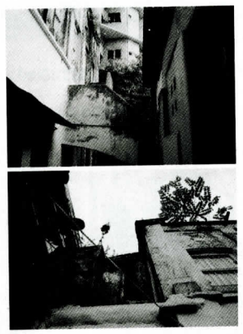


Fig 32: 14_ Shirish Das lane_ Shikh temple- Tegh Bahadur Sangatolla.

Holding no: 14, Tegh Bahadur Sangath Hall.

Historical background: Tradition says that the ninth Shikh guru, Tegh Bahadur (1) visited Dhaka during the reign of Aurangazeb and built a Sangat hall in moholla Sangattola in Bangla-bazzar of Dhaka. The original building does not exist now, but on the old site a comparatively new building exists, though it has been listed under risky buildings, by the City Corporation data base, 2004. [Taifoor, 1984]

Use: Used for religious purpose, congregation space.

Period of construction: early 18th century.

Architectural style: The arched entry, steel columns, suggests that the time period of construction may be in the Colonial period.
Consideration for conservation: As a religious building and for distinct architectural features it should be preserved.

4.5.2 Data analysis _ Pari Das/ Hemendra Das road

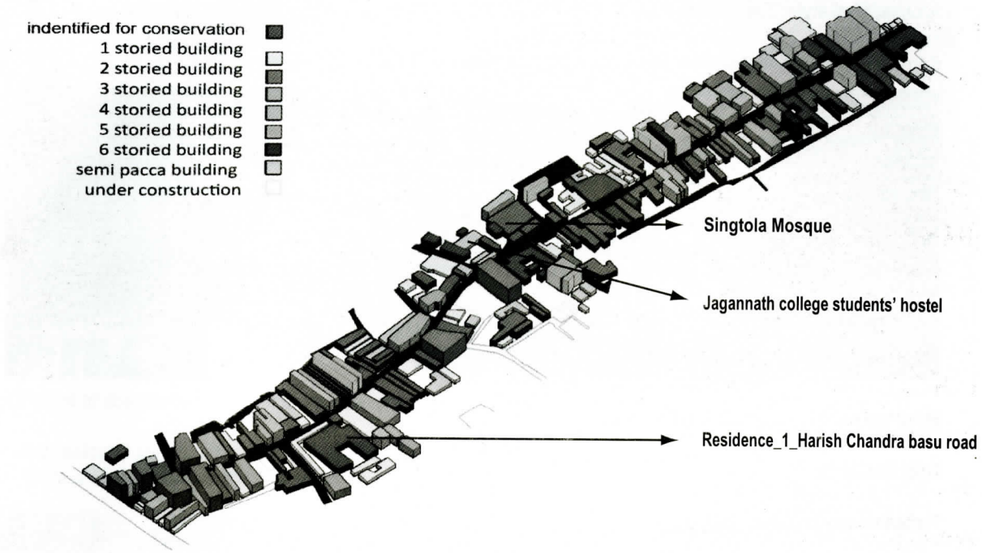


Fig 33: Identified structure for conservation in Pari Das/ Hemendra Das road

Old Buildings in Pari Das/Hemendra Das road:

Fig 34: Arched entrance at 1_ Harish Chandra Bashu road

Fig 35: View from Pari Das road side

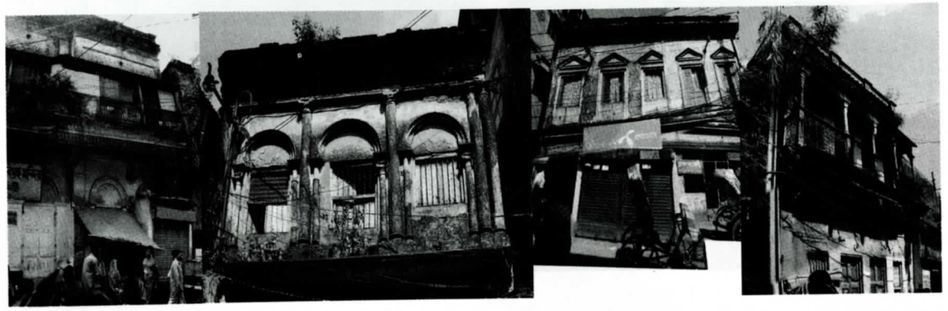
Holding no: 1_Harish Chandra Bashu road.

Use: Originally residence, presently used as press and storage.

Period of construction: Colonial period after 1890.

Architectural style: The building is constructed in the Colonial style and is grand in scale and well-maintained.

Consideration for conservation: Due to its architectural features it should be preserved.



Holdings no: 32, 61, 54, 63 Pari Das road.

Use: Residence

Period of construction: 1910-12.

Classification of buildings: Religious building+ residential buildings.

Architectural style/ features: Colonial with temple architectural style. Chun Shurki (lime concrete) and Jafri brick (brick designed for screens) is used in construction work. Steel column, cast iron railing suggests Colonial style.
Consideration for conservation: Religious structures as well as buildings in rows, forming an integrated pattern of linear development and historic properties behold the ambience of the whole area, which should also be considered for conservation.

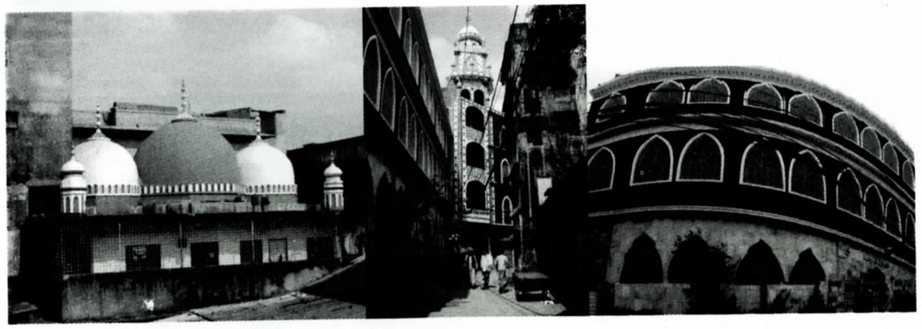


Fig 37: Singtola Mosque- view from rear side **Fig 38:** View from- Protab Das lane_entry side

Similarly there are few other structures which are worth mentioning, like-holding no. 5_ Protab Das lane_Singtola Mosque or Sitara Begum's Mosque in Singtola which was constructed on a raised platform in late Mughal period (1814). The original part of the mosque is surrounded by a new structure leaving no trace of the original part.

Fig 39: 1_Ishwar Chandra Das Lane, Paridas road- Students' Hostel

Holding no: 1 _ Ishwar Chandra Lane.

Use: Students' hostel, currently used as Jagannath University employees' residence.

Period of construction: In the late 17th century to early 18th century approximately.

Architectural style: Certain features of the building followed the Colonial style, like the arches, cast iron railings, etc. There is a small temple in the inner court.

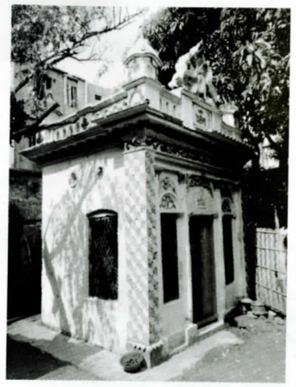


Fig 40: Temple in the inner court

Fig 41: Entrance to hostel

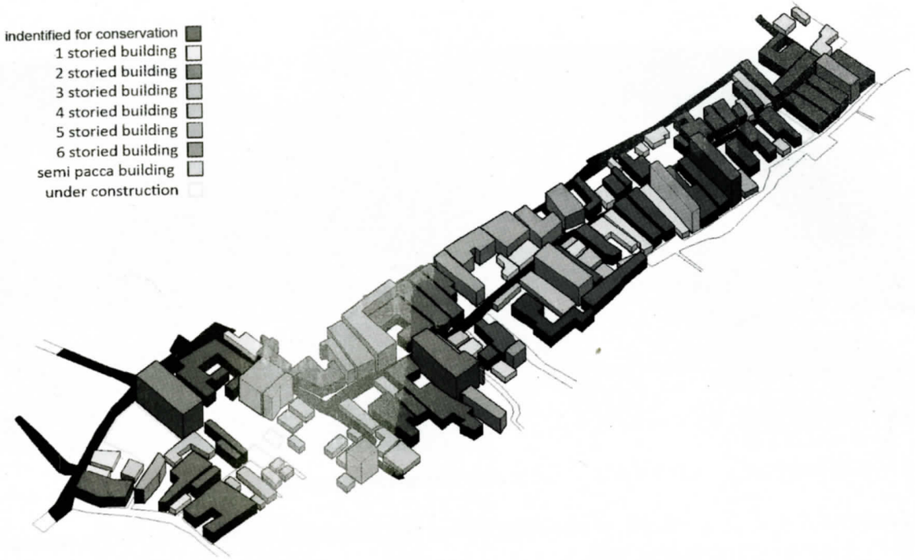


Fig 42: Identified structures for conservation in Rupchand lane

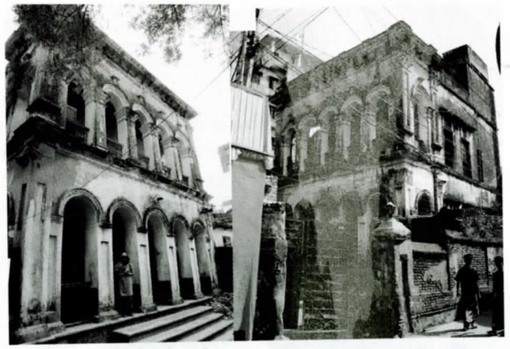


Fig 43: 41, 42_ Rupchand lane_ arched entrance_ residence.

Holdings no: 41, 42_ Rupchand lane.
Use: originally residence, presently storage space and residence.
Period of construction: 1910-15 approximately.
Architectural style: The building is grand in scale, and is constructed in the Colonial style, as suggested by the use of Corinthian columns and arches.
Consideration for conservation: Example of architectural excellence.

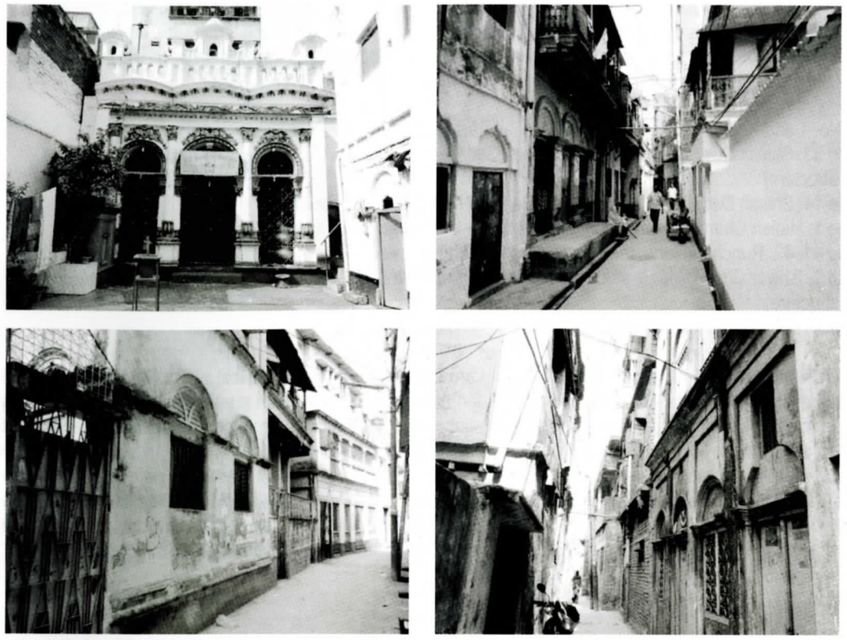


Fig 44, 45, 46, 47: Rupchand lane_ overall street pattern.

Street pattern: The road is narrow and pedestrian. On both side of the road the buildings are more or less two to three storeys high, and haven't changed structurally. Furthermore the presence of few religious structures and the styles and conditions of the buildings reflects glimpses of old days.

Fig 48:8/2_ Sree Sree Krishna Chandra jue Bigraha temple

Fig 49: 16_ Hazrat Baba Shah (R :) mazzar.

Rupchand lane is one of those few streets which haven't changed much morphologically, so it is possible to bring this road under area conservation because this road is very important in the matter of heritage integrity and preserving ambience of the whole area.

4.6 Findings:

The survey result identified a number of old structures which have existed from the early 18th century. There was another category of structures, which in spite of their existence in the CS map 1912-15, has gone through some

morphological changes. Further categories were constituted of demolished structures and of those newly developed. In this critical situation, it was very difficult to actually identify the old structures which are to be conserved. Seven structures have been identified which need to be conserved because of their architectural style, religious importance, or simply because of their socio- cultural value. These seven buildings are listed below:

Holdings No. 1 and 2, Shirish Das lane, Jamindar bari, [Architectural feature and Land mark]
Holding No 33, Shirish Das Lane, Sri Sri Pran Bollov Geo Mandir - Anando Marg Temple, [Architectural features, Religious structure]
Holding No 14, Shirish Das Lane, Tegh Bahadur Sangath hall. [Religious structure]
Holding No 1, Harish Chandra bashu road, paper storage and press. [Architectural features]
Holding No 41, 42, Rupchand lane, residence. [Architectural features]
Holding No 1, Ishwar Chandra lane, students' hostel along with the small temple inside. , [Architectural features, Religious structure]
Holding No. 5, Singtola mosque, Protab Das lane. [Religious structure]

Recently RAJUK has brought a number of buildings and area under conservation, amidst which Shutrapur area and one of the surveyed roads, Pari Das/ Hemendra Das Road has been brought under area conservation. Regulations have also restricted any removal, reconstruction, modification, extension, addition, from/on any old structures without the permission of RAJUK in the Gazette published in February 12, 2009. Despite this, on 19 August, 2009, a historic building at 33_ Paridas Road was pulled down to redevelop the site. The building was most definitely one of the important structures of the Shutrapur area and the historic road, yet it was demolished violating the rule. In this situation, the study along with the seven structures, also identifies Rupchand Lane as another street which should be taken under area conservation due to its overall integrity of heritage, historic and religious elements.

5.0 Conclusion:

The study and survey suggests that the area has a number of old structures which still retain their traditional character. But the way the area is getting reconstructed in the name of development is actually destroying the whole socio-economic and cultural aspects, as well as architectural features, that exemplify the excellence in development in the past. So it has become our moral duty to help restore the environment, by bringing the whole area under area conservation or at least by conserving the buildings. If area conservation is not possible, it should at least be ensured that existing historic buildings are not destroyed due to development and other needs. For example, the empty plot of holding No. 33, Pari Das road could be used or developed as a public open space, instead of redeveloping it with a high rise building, since the area lacks open spaces. For this if necessary, rules and regulations should be set out by the Government, restricting new constructions under certain guidelines and control, within the purview of area conservation. At the same time, people should be motivated, by making the general people conscious of their heritage through the historic built environment and by awakening an active interest in its cultural, social and economic importance. Moreover, the public should be made aware of their responsibilities in the process of conservation, preservation and maintenance.

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Protibesh©BUET
January 2010, Volume 14 Issue 1
pp 44-50

A Report on Durga Puja Festival in Kolkata: Traditional Cultural Heritage with Art and Architecture

Dr. Shivashish Bose
Architect, Urban Designer, Conservationist
Reader, Department of Architecture
Jadavpur University, Kolkata - 700032, India
E-Mail: shivashishbose@yahoo.co.in

Abstract:
Asian cities are going through a phase of metamorphosis by globalization and urbanization in which, old traditional and vernacular buildings are being replaced by modern standardized large buildings with universal look, thus stated as having started to erase the 'Asian-ness' from the cityscapes. Amongst conflict between global and local culture, there are certain cultural expressions in Asian societies that remain preserved and continuing by people's participation with vigour. Celebration of Durga Puja festival in Kolkata is one such case where artistic craftsmanship and skills and architecture associated with it are continuing and more demonstrative through this living cultural heritage. This paper aims to present a report on this grand traditional religious and socio-cultural practice in Kolkata.

Keywords: Cultural heritage, Celebration, Durga Puja festival, Kolkata, Temporary architecture, Tradition

Introduction

Every Asian city has a particular local cultural characteristic. With growing influence of western culture, there is a concern about the impact of globalization upon local cultural heritage and identity in Asia. An apparent loss of traditional craft and artistic skills and decline in value/sense/feeling of community-attachment with reference to the society has been observed in many parts of Asia. The force of market-economy presently dictates the expressive forms of traditional cultural forces within the society. Tremendous population increment in Asian cities has created a growing competition and frustration in the lives of people. Loss of cultural properties from war, terrorism and natural disaster has also raised manifold. There is growing concern about poverty, scarcity of drinking water, lack of proper sanitation system, provision for education for all, creation of job opportunity, environmental crisis, and how to manage with limited resources. The need for development overpowers the need for conservation. However, within such a complex situation in a transforming city, some traditional socio-cultural and religious rituals mostly intangible cultural heritage are still preserved and celebrated. In the celebration of Durga Puja festival in Kolkata, the religious and cultural expression is traditionally tangible as well as intangible form of cultural heritage. Architecture in temporary form with great artistic craftsmanship is the base of this cultural celebration in Kolkata.

Kolkata

Kolkata (historically known as 'Calcutta') is a linear city grown along the river Ganges (Hugli) in West Bengal state in eastern India. Job Charnock, a British merchant, on August 24, 1690 bought and amalgamated three villages named Sutanuti, Kalikata and Govindapur which constituted respectively the north, central and south of Kolkata then. The British, however, could start planning and development of the city since 1758 after obtaining the territorial right of Kolkata for development from the then King (Nawab) of Bengal. Kolkata became the capital city of British India in 1774 and quickly emerged as the most powerful port city of Asia. However, since the shifting of the capital of India from Kolkata to Delhi in 1911 and the partition of India through Independence in 1947 with sudden influx of population from Bangladesh into the city and its environs, the city's glamour and grandeur were gradually replaced by squalor and decay. Gradually, population increment and rural-urban migrants put pressure on the infrastructural capacity and facilities of the city. The Kolkata Municipal Corporation (KMC) area of the present day consists of 141 wards covering 185 sq. km. area with population of around five million, and population density 24760 per sq. km. as per Census of India, 2001 (Census, 2001). Tremendous rate of urbanization has taken place in Kolkata and its fringe areas since 1990s with construction of high rise buildings and mega structures gradually erasing the historic cultural patinas in the city as commonly observed to be happening in most of the Asian mega cities. Though majority of population in the city

Durga Puja Festival

Durga Puja festival of Bengal being celebrated commonly in October every year is the greatest religious festival of the Hindus for worshipping Goddess Durga symbolizing 'power' who destroys 'evil' called Asur. An ensemble of clay images of the Goddess, her children-two sons and two daughters, Asur, a lion and a slain buffalo is made on a structure of Saal wood (Shorea robusta) logs and bamboos, and the images are made with bamboo, straw, a top layer of clay and are dressed with ornaments (Fig. 10, 11). The image is traditionally made at 'Kumartuli' (meaning - the potters' town) at historic district 'Chitpur' of northern Kolkata.

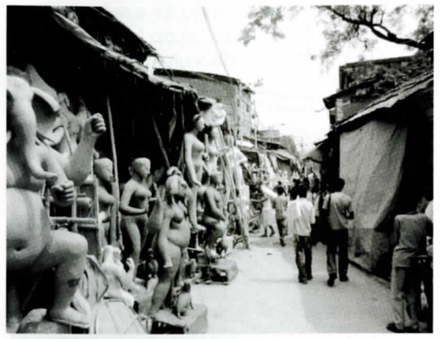

Fig. 1 Streetscape at Kumartuli

Fig. 2 Interior of clay-modelers' studio

Fig. 3 Durga being prepared

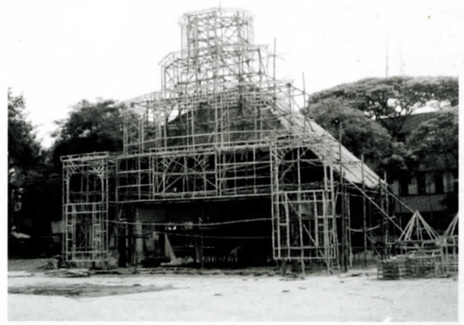

Fig. 4 Pavilion under construction

Kumartuli

Chitpur area at the north of Kolkata was always the designated residential area for the native Indians, mostly Bengali, before and during British rule. Many traditional craft-oriented industries like image-making industry at Kumartuli (Fig. 1), various small scale industries and commercial activities related to the establishment and growth of economic, technological, educational, recreational, religious and socio-cultural aspects of Kolkata were developed along Chitpur Road, the central spine connecting northern part of the city with the southern part and presently named as Rabindra Sarani. In Hindu religion, worshiping of images of Gods and Goddesses are common. Kolkata has a long historical tradition of celebrating religious festivals and rituals in which worshiping of images are part of this socio-cultural form. Terracotta images of deities have been among the oldest archaeological finds in and around metropolitan Kolkata (Bose, 2009). Clay images of various deities made in Kumartuli are supplied in the city and the state, in New Delhi, Mumbai, parts of south India, and are regularly exported to USA, UK, Australia and other countries where Bengali population live.

The studios/workshops (estimated to be about 400 numbers) of the clay-modelers at Kumartuli (spread over 3.8 acres of land) (KMDA, 2010) are mostly single-storied temporary structures with either thin brick walls or partition walls made up of bamboo-twigs with earthen floor and no plinth height at all thus being vulnerable to rainwater invasion into the interior. Three sides of the single-room studio are closed and the front is open. The room height is about 4.5m, and the roof is mostly of tin. As rainwater is dangerous for clay image, polythene sheet is often spread under the ceiling to protect the images from rainwater penetration. The modelers stay at the studios during the day and they sleep at other buildings within the area at night, though during critical hours they sleep at the studios. There is no attached-toilet system; a very shabby and unhealthy common toilet serves many workers of the area. However, the Kolkata Metropolitan Development Authority (KMDA) of the government of West Bengal has proposed for a redevelopment programme of Kumartuli's heritage site to provide for new and good condition of housing and studio for the potters of Kumartuli. This project has been under negotiation between KMDA and the beneficiaries (through Kumartuli Mritshilpi Samiti) for some years and there is problem from failure to identify a suitable site for the temporary settlement of the artisans in nearby area. It would be funded partly under the Jawaharlal Nehru Nationaı Urban Renewal Mission (JNNURM) of the central government, partly by the state government, and the remaining amount would be borne by KMDA and the beneficiaries (Dam, 2008; Akansha, 2010; KMDA website, 2010).

Fig. 5 Detail of bamboo structure

Fig. 6 Pavilion in a park

Fig. 7 Pavilion like Hawa-mahal of Rajasthan

Fig. 8 Pavilion on a road

Image-Making Process

The clay-modelers of Kumartuli (Fig. 2) use mostly their hands and seldom use any tool. They first make a structural framework along with the skeleton of the targeted image of god with small wooden planks, Saal wood logs, split bamboos and straw (shaping the figure of the deity). The proposed deity stands on a pedestal. They apply clay mixed with rice-husk and jute fiber reinforcement on the straw-skeleton to create the basic form of the image. That form is then kept outside on the road for drying under the sunlight for a couple of days. The image appears to have developed

cracks due to shrinkage after drying under the sunlight. Then the modelers apply a fine layer of sandy clay-paste with jute fiber over the cracks for filling up and later smooth the surface of the images with wet cloth. The head and fingers both made with clay from terracotta moulds earlier are then fixed to the neck and hands respectively with clay paste. The joints of limbs of the images are wrapped with cloth-pieces soaked in clay solution. Then they paint the dry figures with chalk-solution two-three times to make them appear white. Afterwards, paints of various colors according to preference are applied on all over the body. The modelers take special care to paint the face, especially the eyes (Fig. 3), the eyebrows, lips and other delineations, and finally they apply a vegetable oil over the face to make it look glistening. Then they fix hair on the head and put gorgeous dress and ornaments on the figure (Bose, 2009). The process is more like preparing a female model for a fashion show. The backdrop or chali of image is also delineated. Then the image is ready for transportation to the designated pavilion commonly referred as pandal, to other parts of India and for export to foreign countries. .

The Temple as Pavilion or Pandal

A temporary temple is constructed for housing the deities for worshipping. This temple is pavilion or pandal and is the architectural product of the greatest range of variety in design, material, construction and 'theme'. Kolkata does neither have plazas that we can see in European cities, nor does it have adequate open spaces. The city has some parks which are more gathering and recreational spaces than green areas. So, the pavilion is built either in a park (Fig. 6) or on the road (Fig. 8) literally blocking vehicular access across it for some days. Permission for erection of pavilion is to be taken beforehand from the department of police and fire-fighting satisfying their rules and norms. Local clubs organize neighborhood-wise the process of fund-raising, erection of pavilion, installation of deities purchasing from Kumartuli, and worshipping for about five days. The fund is raised by the donation from people of the particular neighborhood and through sponsorship from advertisement by Indian and multinational companies like Coca-Cola and Pepsi for example. Globalization has resulted in financial support for this festival in one hand, and introduction of new varieties of associated programs somewhat away from core religious contexts on the other hand. The puja is also traditionally organized by some wealthy families in their residences in Kolkata and presently, residents of the modern housing complexes at their premises.

Fig. 9 Interior of a pavilion

Fig. 10 Images of Durga and others

The structural skeleton of the pavilion is erected entirely at site (Fig. 4) with bamboos tied with ropes made from coconut fibers (Fig. 5) and has tarpaulin sheet roofing. The decorative elements can be crafted elsewhere or at site and fixed on the frames as per preconception. The whole process may take a few days to more than a month depending on the scale, quality and grandeur of the pavilion. The blueprint of design of the pavilion is made beforehand and sometimes even a year before the festival. The design is inspired either from historical architecture of India and abroad, or with the reflection of rural India. Sometimes, the pavilion is of an indigenous quality - a specimen of its own kind. Hence, the pavilion may look like 'Sacre Cour' of Paris, 'White House' of Washington D.C., Pyramid of Egypt, Alhambra of Spain, heritage buildings of India (Fig. 7) and abroad, or an indigenous temple reflecting a 'theme' which none has seen before (Bose, 2008). The basic bamboo structure is traditionally covered with cotton or jute cloth of suitable color or painted to give the look as per design. In recent times, tharmocol is seen to be added as the top cladding material of the pavilion which is painted to look like different building façade materials as brick or stone.

Sometimes, processed earth is applied on the cloth to make it look like an adobe hut. A variety of unconventional materials like earthen pot, terracotta tiles, bangle, oceanic conch, ice-cream sticks, spoons, colored threads, glass-pieces, skins of bamboo, kites, etc., are applied on the façade and in the interior to give a unique look as per the chosen theme. The interior is richly ornamented with patterns on the walls and ceiling coupled with decorated lighting and chandelier. The interior of a pavilion (Fig. 9) is basically a rectangular shape three-dimensional space with one end having a raised platform designated for the ensemble of deities and for performing religious rituals called 'puja' meaning 'worship'. The opposite end is kept for the crowd of population to enter, observe the deities from inside the pavilion and then to exit. For safety and security reasons, the famous pavilions provide for separate exit for people. Lighting is a major part of quality of illumination as well as decoration by it both on exterior and in interior, and a centrally hung large chandelier is a must in use in large pavilions (Fig. 12).

Fig. 11 Detail of bamboo structure

Fig. 12 Pavilion in a park

Between Tangible and Intangible Cultural Form

The festival is primarily religious but has socio-cultural tag more dominantly associated with it. Though it is a Hindu festival, but all sections of population irrespective of caste, creed and religion participate with equal vigor in this event. People buy new garments, jewellery, household appliances, furnishing materials and other things to celebrate this festival. Pleasantries and gifts are also exchanged amongst people, especially for kids. The worshiping is actually for five designated days (from Sasthi to Dashami tithi - the sixth to tenth lunar day from new moon) in October, but the ensemble of images is brought at the pavilion two-three days prior to those five days. For five days, these pavilions become urban architecture and tangible cultural forms in the city, and along with participation of all sections of population, the festival becomes the greatest celebration of "Architecture and Life in the City". It is as if, Domenico Fontana's Rome emerges; all attractions are centered on 'centers' the places of the pavilions, and they are connected by 'spines' the roads; and all pilgrims follow the roads to fall into the centers, enlivening Fontana's urban design idea. Usually fairs are organized by the concerned 'puja committees' to add to the festivity to the pujas held at parks. Various food stalls, as well as public facilities are erected and provided to cater to the enormous crowd. The pavilion is inaugurated by distinguished persons from cinema, art and media, sports or from political parties in the country. Huge crowd of thousands of population per hour visiting pavilions from evening to midnight (Fig. 12) and early hours of the next day are managed by local volunteers and police. Traffic flow gets disrupted and slowed during those days. All local government institutions except for emergency divisions, academic institutions and other organizations remain closed for this festival. People, mostly in the housing complexes and of some neighbourhood, get together during these festive days and organize to take common and simple lunch together at the pavilions (Fig. 13), and they organize cultural programmes like song and dance presentations in the pavilions or beside them in the evenings. After five days, the puja ends and the images are immersed traditionally in the river Ganges (Fig. 14) (Bose, 2009). The pavilions are dismantled within about five days after puja ends and the vernacular materials are reused elsewhere. So, after five days there is no sign of any pavilion which housed the festival on the streets or in the parks. Only documents in photography and images in memory are left with people who would wait for the next year to come for celebration again. This cultural expression of the society of Kolkata and the state of West Bengal is a unique form between tangible and intangible and a class of its own in the world.

Fig. 13 Interior of a pavilion

Fig. 14 Images of Durga and others

Some Quotable Problems and Remedial Measures

i) Colours (especially lead-based) and accessories used to decorate the images lead to pollution in the river water;
ii) Immersion of hundreds of images in river Hugli has resulted in silt deposition in the river channel;
iii) Dumping of accessories, flowers and other garbage materials related to images at the riverbank at the time of emersion is polluting the area and the water of the river;
iv) Use of non-biodegradable materials in decorating the pavilions is growing according to the latest fashion. This leads to increase of quantity of non-degradable waste in the local environment;
v) Many pavilions do not have security-checking mechanism or surveillance system;
vi) Marketing-oriented aggressive displays or modern cultural performances by the multinational companies distract and spoil the essence of traditional religious and cultural ethos;

New kind of vegetable-based colours are being prescribed for use in the delineation of the images. The Kolkata Municipal Corporation (KMC) has been taking measures to collect the garbage and clear them from the riverbank within a short time. The saal wood and bamboo skeletons of the images are taken out of the water and taken away for reuse of them. Organizers have been instructed by the police to be alert during the festival days and have sufficient arrangements for fire-fighting and accidents. Thousands of police patrol the sites of festivals and transportation systems with their own surveillance network and disaster-preparedness arrangements. The organizers and designers of pandals should refrain themselves from using non-degradable items in the pandals. Multinational companies should respect the cultural ethos of this festival and design their programmes accordingly.

Culture, Tradition, Economy, Modernity and Sustainability

This traditional socio-cultural religious celebration in Kolkata has attracted huge economic investment and exchange. This event also promotes tourism in the city from various parts of the world and especially Europe. Tremendous urbanization, physical and technological modernization and metamorphosis in the city have not been able to produce any negative effect on this event. This cultural heritage between tangible and intangible forms is rather strengthened by the introduction of globalization, economic liberalization and culture-mix. Bamboo, straw, jute, coconut-ropes, etc. are common agricultural products and are recycled until their physical qualities deteriorate. Clay used in deities returns to mother earth. The river in the city is closely related physically, religiously, spiritually and emotionally with this festival. The construction of pavilion creates minimum impact on environment. Almost all the decorative elements are recycled. Hence, this pavilion and associated materials are in sustainable form.

Conclusion

Every full moon is followed by a new moon. So, all is not well in this event unless protected from hazards and recent threat - terrorism. Recent terrorist-attacks in many cities in India exemplify that crowd is where terrorists like to operate. Though the administration and police of Kolkata are alert and work hard for providing safety and security during the festival days, it should be the highest priority for civic administration to monitor law and order situation not

only during the festive days but long before that time. The force of traditional culture in the society and people's spontaneous participation would carry forward the continuity of this festival, which is one of the greatest cultural shows on earth in South Asia repeated every year irrespective of any impact from political, economic and natural disaster in the society.

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Protibesh©BUET
January 2010, Volume 14 Issue 1
pp 51-65

To Conserve a Sacred Place: An Investigation on Moha Tirtha Langalbandh

Md. Mohataz Hossain
Lecturer, Department of Architecture,
Bangladesh University of Engineering and Technology (BUET), Dhaka-1000, Bangladesh
E-mail: mohataz@arch.buet.ac.bd, tofa_4300@yahoo.com

Abstract:
This paper proposes conservation of an ancient sacred place named Langalbandh. It is a well known pilgrimage area in Bangladesh which has a strong historical and religious significance. Every year, thousands of Hindu pilgrims from all over the world come here to take their holy bath at the Old Brahmaputra River with other ritual activities. To facilitate bathing for the devotees a number of bathing ghats have been built and several old temples and hermitages are established in this holy place. But this place has been in poor condition with lack of maintenance for a long time. In accordance with the minutes of some inter-ministerial meetings, this sacred place has been initiated to be developed as a tourist spot for its history, social and religious value. Comparing with other significant pilgrimage areas in and around this country, this 2-kilometer long sacred site of Langalbandh requires conservation with pursuing sensitive and analytic approaches. This paper aims to investigate existing physical and social aspects and focuses on establishing cultural and historic significance of Langalbandh. This paper also proposes some conservation oriented development strategies which could be helpful to develop a master plan for the total area so that the whole area could be developed as a sacred pilgrimage place as well as tourist spot while conserving the religious context.

Key words: Conservation, sacred place, historical and religious significance, physical and social aspects, development strategies.

1.0 Preamble:

According to the Hindu mythology, the word 'Langalbandh' refers to the place where a plough was stopped. It is a 2-kilometer long sacred place where pilgrims ('tirtha-yatri') come to take their holy bath since the ancient times (Acharjee, T. 2004: 91). Pilgrims, special tourists whose purpose is to visit place of religious significance (Alecu, I.C., 2010), come to this 'moha tirthai Langalbandh' situated at Bandar Thana (near Sonargaon) in Narayanganj district beside the Old Brahmaputra river (Figure 1), 20 km south-east of Dhaka on Dhaka-Chittagong highway (Bangladesh Parjatan Corporation, 2006: 45). They come from all over Bengal and the adjacent regions (India, Sri Lanka, Nepal etc.) to congregate on the banks of the Brahmaputra river at Langalbandh for religious activities including "Holy Bath" at various 'ghats' during the established festival of 'Mahashtami Tithi' on the 8th day of lunar month falls in the Bengali month of Chaitra (Bangladesh Parjatan Corporation, 2006: 45). The river on which Langalbandh is situated is called Brahmaputra, because, according to Hindu mythology, it is the son ('Putra') of Lord Brahma (Dev, P.R., 2005; Acharjee, T. 2004: 17). This paper initially investigates the existing physical contexts as well as the traditional ritual activities which are the main part of heritage of Langalbandh. As this type of heritage places can be used as a cultural resource to revitalize the economic base through promoting tourism (Bischoff, A., 2008), this sacred place is also proposed to be developed as a tourist spot. But, the development strategy of this place should differ from other developments and the natural sacred profile is needed to be considered as an important issue.

The objectives of the study are to investigate the existing ritual structures, social and cultural activities, infrastructures and other issues; to analyze the effects of the current proposals and to suggest the some necessary development strategies to develop the place as a tourist spot with conserving the sacred context. The paper may serve as a useful initial report to develop the site with conserving the existing structures and 'ghats'ii and suggested development strategies may act as useful guidelines to restore sacred profile of the place.

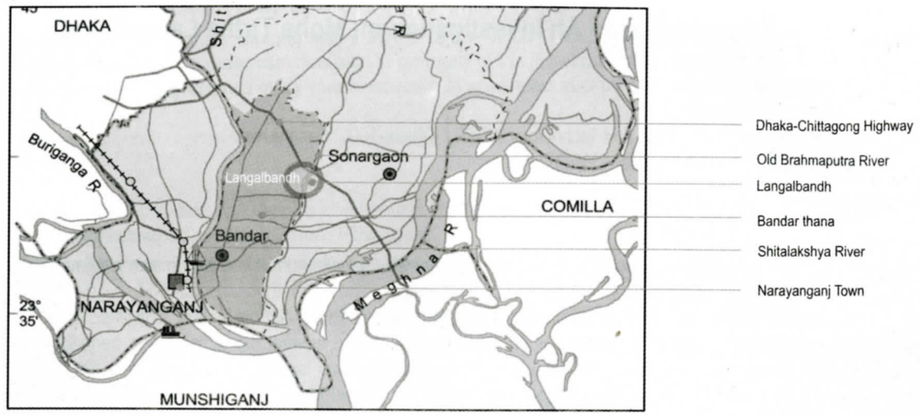

Figure 1: Map showing the location of Langalbandh
Source: http://www.banglapedia.org/httpdocs/Maps (edited by author)

Relevant literatures about the history of Langalbandh, conservation, mythology, other sacred place developments have been reviewed. Field survey, including photographic and observational study, unstructured interviews on local inhabitants, writers and experts, has been conducted to know the existing condition of Langalbandh in 2007 and 2008.

2.0 Physical context

The Ghat area or the main land-water interface has always been a strong and significant component of settlement morphology (Kumar, M., 2009: 30). Langalbandh has a rural settlement with a 12 feet wide pitched road beside the river which acts as an embankment for the site (Figure 2). Some significant temples, ghats, moths co-exist with this semi-commercial road. Langalbandh village is under the Bandar Thana where approximately 17219 people live and among them about 9897 people are of Hindu religion. (Biswas, P. K., 2006: 278). The local Hindus had donated large area of land on the river bank declaring them as religious or 'Debottar Property' for the benefit of Hindu pilgrims. But after 1947, those Properties were usurped gradually for other constructions, residential and industrial units. As an effect, a certain percentage of land is already encroached and many unplanned stalls and other structures exist beside the river.

Figure 2: Existing river side road with the encroachments
Source: Author's photograph, 2007

Due to the changes of weather in different seasons in Bangladesh, the water level of the river varies. The maximum water level is observed in the June to August as precipitation rate is high. But during the main festival (March ~April) the water level decreases to the minimum level. Also due to excessive natural siltation and other reason the depth of the river decreases with time and it causes interruptions for aqua transportation during this period. Water pollution of the river and poor embankment with soil erosion are also important considerable issues for this sacred site.

The ghat area or the main land-water interface has always been strong and significant component of settlement morphology, deriving from a complex spiritual interpretation of the ghat system itself (Ray, R., 1989). The ritual focus of the place is the ancient sacred ghats, temples, ashramsiv, moths etc. To facilitate bathing for the devotees, philanthropic persons built a number of bathing ghats. There are now 13 such ghatsii (Figure 3) and these are: Premtala ghat, Annapurna ghat, Raj ghat, Bhadreshwari ghat, Gandhi ghat, Joykali ghat, Pathankali ghat, Srirampur ghat, Kalibari ghat, Kalidah ghat, Shankar ghat, Shikhri ghat and Rakshyakali ghat (Acharjee,T., 2004: 84-87). Most of the ghats are at the west side of the river as these ghats were built considering the Sun god which rises in the east.

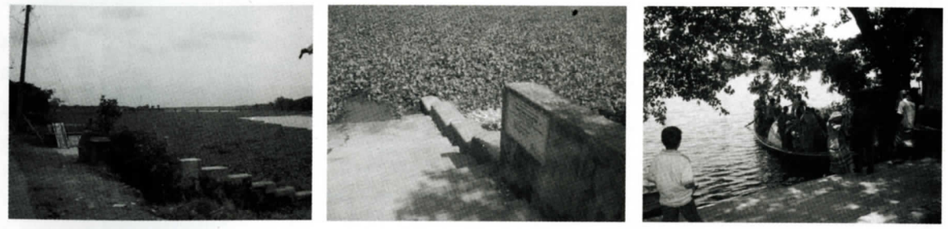

Figure 3: Picture showing the Annapurna Ghat, Raj Ghat and Gandhi Ghat respectively.
Source: Author's photograph, 2007.

At Langalbandh, there are 10 Temples in this pilgrimageiii area. Among them 3 temple-complexes are operating properly all the time with its related activities. These three temples are: Shashan Kali Temple attached with 'Gandhi ghat', Durga Temple attached with 'Raj ghat', Mandir and ashram at Premtola (Figure 4).

Figure 4: Temple attached with 'Raj ghat', Shashan Kali Temple attached with 'Gandhi ghat' and temple at Premtola respectively.
Source: Author's photograph, 2007.

Other Temples are (Figure 5): Annapurna mandir, Jaykali mandir, Raksha kali mandir, PashanKali mandir, Gauranga mahaprabhu mandir, Bhadreshwari Shib mandir, Dhakshineshwari kali mandir, Shib Parbati moth, Rakshakali mandir-North (Acharjee,T., 2004: 84-87). These temples are partly encroached and the vehicular road goes through between the Temples and its adjacent Ghats. This road creates interruption to perform the ritual activities in these temples as vehicles such as rickshaws, vans, trucks and small buses always go through this road (Figure 6). Sometimes, heavy traffics also use this road for bypassing the other roads. As a result, the temples and 'ghats' which are the main structures to be considered for conservation are threatened.

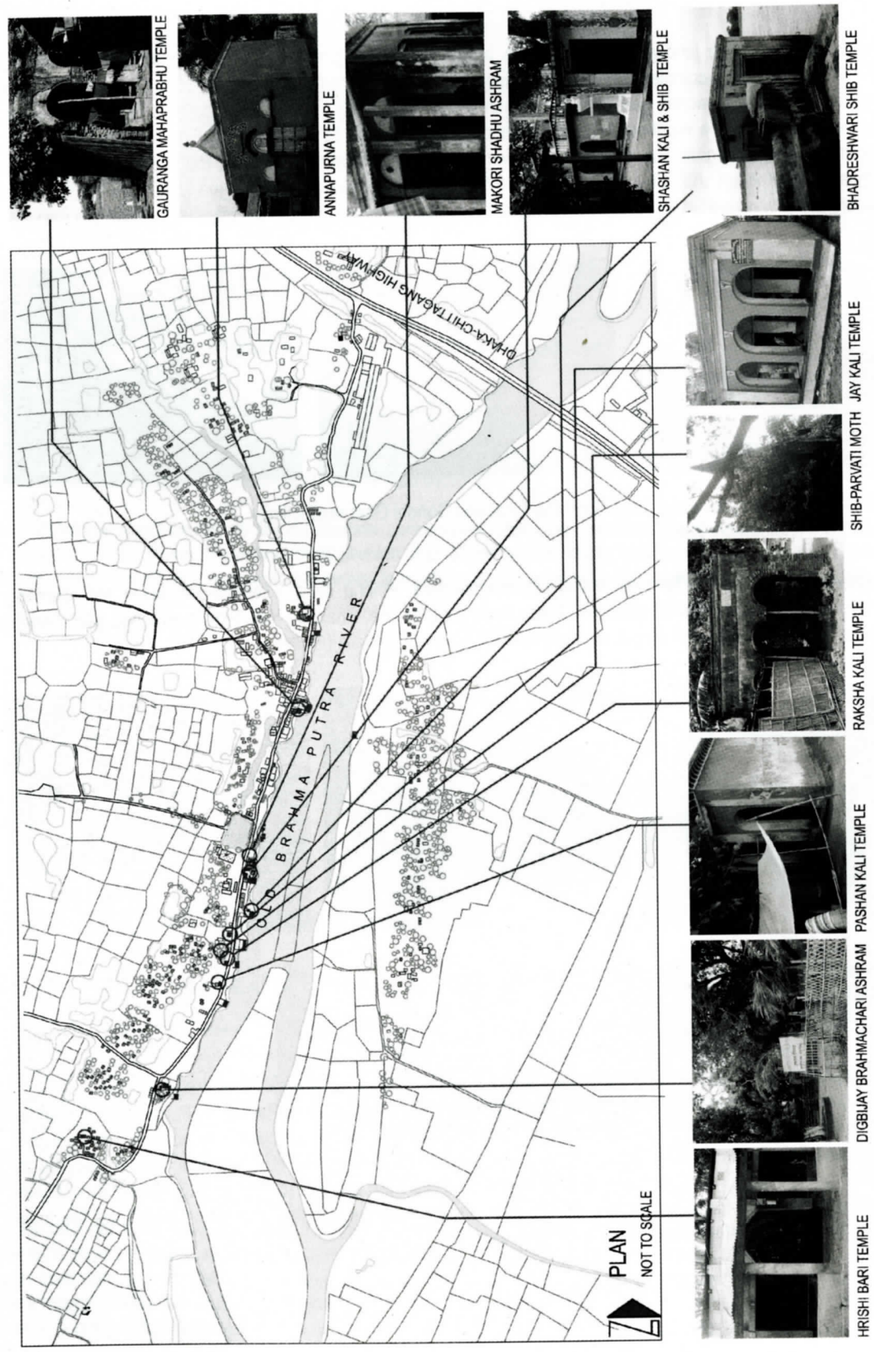

Figure 5: Map showing the location of the main temples and Ashrams
Source: Author's photograph and self-drawn map, 2007.

Figure 6: Vehicles creates interruption in ritual activities Source: Author's photograph, 2007.

Figure 7: Lalit shadhu and other Ashrams
Source: Author's photograph, 2007.

There are several Asrams (hermitages) for pilgrims (Figure 7). Many of them are of temporary structure. They are: Lalit Shadhu Ashram, Benimadhab Brahmachari Ashram, Makori Shadhu Shanti Ashram, Digwijay Brahmachari Ashram, Paresh Brahmachari Ashram (Acharjee,T., 2004: 89). During the festivals as well as on other occasions a few pilgrims take shelter and serve the god and people. A few pilgrims can take shelter at the main festival time in a rectangular permanent structure named "Tilak Yatri Nibash" (Figure 8). But the structure remains unused in the rest of the year. During the main festival, many temporary structures made of bamboo and cotton fabric are built by the various welfare organizations to provide the pilgrims with shelter beside the road. Some inhabitants also like to sublet rooms of their cottage for the same reason and it is also a source of income for the inhabitants.

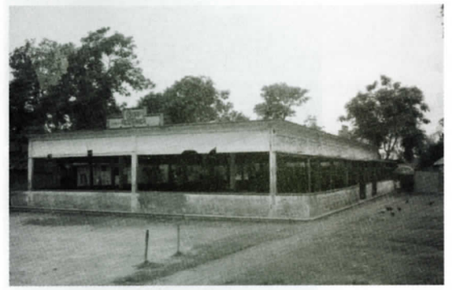

Figure 8: 'Tilak Yatri Nibash', a permanent shelter for pilgrims
Source: Author's photograph, 2007.

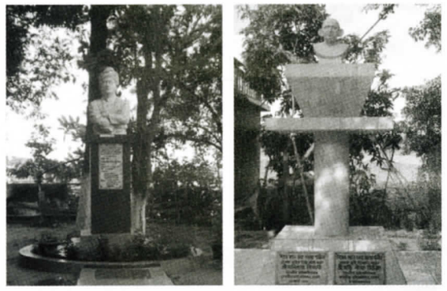

Figure 9: Statue of Swami Vivekananda and Mahatma Gandhi
Source: Author's photograph, 2007.

Figure 10: shades for displaying Hindu Goddess
Source: Author's photograph, 2007.

Figure 11: Old sacred Trees at Raj Ghat and Premtola
Source: Author's photograph, 2007.

Some benevolent persons also built statues of 'Mahatma Gandhi' at Gandhi Ghat and 'Swami Vivekananda' at Premtola Ghat (Figure 9). According to the article "Mahatma Gandhir Chitabhosmo", published in the daily newspaper 'The Dainik Azaad', (issue no. 101, 14 February, 1948), the ashes of the Mahatma Gandhi were immersed here signifying how the great leader honoured this place and the ghat where the ashes immersed was named as 'Gandhi Ghat' (Acharjee, T., 2004: 88). The Raj Ghat is also significant for Swami Vivekananda as he took his holy bath here with his family (Acharjee,T., 2004: 85). Many temporary structures can be observed where many Hindu god and goddess of different names are placed for display and ritual purpose and earning money as offering from the pilgrims and visitors (Figure 10). These Hindu figures have no fixed place and these are covered all the time to protect from the natural calamities. These are uncovered when tourists or pilgrims come to visit the place especially during festival. There are many old trees (approx. 100 years old) which are important for Hindu community, as these are considered as sacred trees (Figure 11).

Various options of transportation toward Langalbandh can be noted. One can travel to this place by bus. In festival period, the huge numbers of pilgrims are provided with special Bus services (Figure 12). Transportation by boat is another option to come to this sacred place. During the main festival period the road is covered with temporary stalls and crowds. As a result, circulation of pilgrims becomes troublesome. During the festival period, the road acts as a pedestrian road. Among the community facilities there are a government primary school, mosques, a Kacha bazar, Musapur union office, Grameen bank, Kindergarten school with a small library, post office etc. at Langalbandh. Tube-well is the main source of water-supply here. All drainages are sloped towards the river or adjacent ditches. It is also a main reason of water pollution.

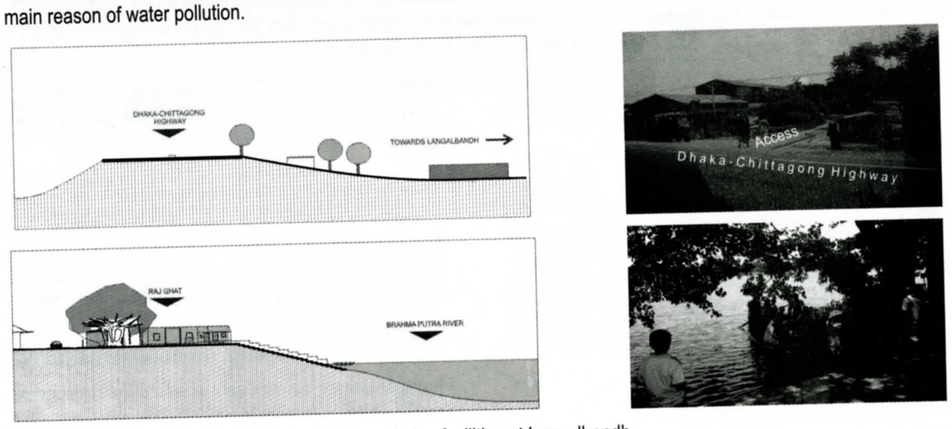

Figure 12: Existing Vehicular and Aqua transportation facilities at Langalbandh
Source: Author's photograph and drawing, 2007.

3.0 Rituals and social dimensions

Ritual is an expression of cultural and social continuity. It serves to revive and express the memory of myth associated with an event, person and place (Kanekar, A.K. 1992: 12). According to the Hindu mythology, here Parshuram, son of the saint Jamadagni, is the person for whom the place became significant. He had found the holy water (the son of Brahma) in a cave at the bottom of the Himalayas (Acharjee,T., 2004: 60). He had brought the holy water from Himalayas by his plough for the welfare of the common people and stopped his plough here at Langalbandh. For this reason, the river is named as 'Brahmaputra' and the place as 'Langalbandh' (Acharjee,T., 2004: 60). Here the main event for the Hindu religion is the 'Maha Ashtami Snan' which held on the auspicious day of Chaitra (usually in the month of April). Thus, myth and rituals are very closely related. As there is a myth like: the holy river washes the place unceasingly, unending streams of people visit the place along the river at this time of the year in seeking blessings of Brahma. The prosaic life of riverside area is totally transformed to an unrecognizable degree during this main festival. This 'Maha Ashtami Snan' involves the entire settlement as well as places around them. Economy is one of the main reasons behind the fairs. Like other ritual of the pilgrimage events, this event also involves a journey of special

significance from one spot to another. Thousands of pilgrims take their holy bath at ghats (Bangladesh Parjatan Corporation, 2006: 45) in a prescribe sequence like visiting temple, taking bath at ghats, visiting goddess at the temple again, receiving 'proshad', listening the ritual songs etc. (Figure 13).

Figure 13: Ritual activities during the main festival
Source: Author's photograph, 2008 and Asad's photograph, 2006.

Figure 14: Langalbandh fair during the main festival
Source: Author's photograph, 2008

On this occasion, a three-day long fair takes place. The main attractions of the fair are exhibits like pottery, products made of bamboo-cane and thread like hand fans (Figure 14). These exhibits are very popular among the devotees. There are also some arrangements to entertain the children like puppet shows, circus, and merry-go-round (Bangladesh Parjatan Corporation, 2006: 47). Sweetmeat stalls do brisk business during the fair. Tourists also come to that fair to buy articles, arts and crafts.

During the "Ashtami Snan" festival, many welfare and charity-organizations and committees organize welfare programs for the pilgrims such as catering, health care, 'Proshad' making etc. But in various occasions all the year round, many of the organizations also arrange welfare program like free medical treatment, training, relief supply etc. (Figure 15).

Figure 15: Activities of the charity-organizations
Source: Author's photograph, 2007 & 2008

In every purnima and in various Puja festivals (Ashare purnima, durga puja, lakshi puja etc) various people as well as pilgrims gather here in the temple complexes. The devotees also take the ritual bath on the occation of Chaitra Baruni (Bangladesh Parjatan Corporation, 2006: 47). Small temporary stall, cultural performance, 'kirtan', puja, 'vogh' etc

various types of activities are main attractions here. Shanshan Ghat which defines cycle of life to death also becomes the source of event all the year round.

Figure 16: Friday 'Haat'
Source: Author's photograph, 2007

Figure 17: Daily activities: pottery and boat making
Source: Author's photograph, 2007

The scenario at the festival time and the ordinary time is completely different. The rural inhabitants of Langalbandh culturally do many activities which attracts the tourist all over the year. Among the daily activities 'Proshad' making, pottery, boat making, wood and bamboo work, fishing etc. are significant ones (Figure16). On every Friday, a large 'haat' is held with various kinds of activities in Langalbandh (Figure 17). Various types of daily necessary accessories and bamboo, grocery things, handmade crafts, clothes are also available here.

4.0 Old structures, Decorations and Damages

In Langalbandh, most of the structures are of brick masonry constructed with the design techniques of the mughal period. Special modules of bricks from local clay with lime mortar which are usually used in mughal buildings can be noticed in those structures. Some of the old structures have been refurbished with new finish materials such as cement mortars and neat cement finishes in course of time. The original load-bearing structures can be still observed. Among the ritual structures of Langalbandh area, many old structures carry some significant histories. Gauranga Mahaprabhu Temple, constructed by Sri Nandakumar Poddar 108 years ago (bengali year: 1308); Annapurna Temple, renovated about 70 years ago (bengali year: 1346) with the funding of Jitendra Nath Chakrabarti; Makuri Shadhu, established on Bengali year 1346 are the notable structures that need restoration (Acharjee,T., 2004: p. 84-90). Many of them renovated without paying attention to the appropriate techniques of restoration.

Figure 18: Rich decorations in moth and damages observed in temples and 'ghats'
Source: photograph taken by T. Alim, 2009 and Achaejee, T., 2004, p. 36

Rich floral decorative elements embellish the moths of Lalit shadhu's ashram in the north and the Dakshineshwari moth in the south (figure 18) of Langalbandh. Majority of the temples consist of 'mughal' Arch of various proportions with minimum decorative elements where ceiling of the temples are of 'kori-borga' structure. There was also an old temple beside the Raksha kali ghat which was demolished in the near past. The old ghats and temples are damaged (figure 18) with prominent cracks in the ceiling and walls, external and internal walls and ghats, being destroyed pernicious vegetal growth. The main reasons behind these damages are excessive dampness, dust, natural disasters, vegetal growth and termites, vibration caused by traffic, encroachments, vandalism and lack of maintenance. There is no

previous record of architectural drawings of the existing structures. Some of the drawings was done during the field survey within the scope of the study (figure 19). But, Damage survey as well as more extensive documentation of existing old structures such as ancient temples, ashams, ghats, moths with detailed drawings, structural analysis, preservation and consolidation are urgently needed.

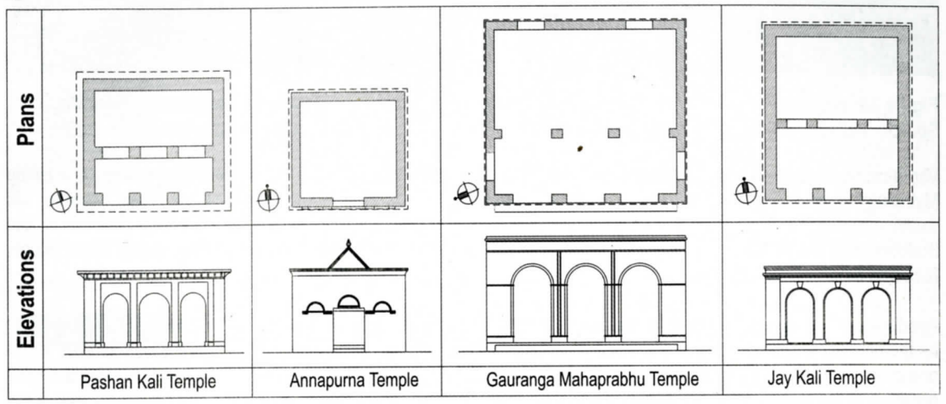

Figure 19: Plans and front elevations of some notable temples
Source: Drawn by the author from field survey, 2008

5.0 Comparison with other pilgrimage places:

In Bangladesh, there is another pilgrimage place called "Chandranathdham" at Shitakunda 37 kilometer away from Chittagong (Figure 20) where the context is entirely different from Langalbandh. Here the pilgrimage pathway is in a hilly area between two main temples "Virupaksha Mandir" and "Chandranath Mandir" (Biswas, P. K., 2005: 115). A thousand-year-old Shiva temple stands at the top of the Chandranath hill. There are many other old temples situated at various parts of the 500m high hill. Thousands of devotees gather in the temple at night on 14th Falgun (Bangladesh Parjatan Corporation, 2006: 25). In India there are many river side sacred places. Among them Varanasi (Kashi), Gaya, Mathura and Vrindavan Ghats, Haridwar, Ayodhya Ghats are noteworthy ones. In these important riparian towns the complex cycle of activities and interventions at the ghats, have given rise to an extremely beautiful and impressive array of structures that have become architectural assets in their own right.

Figure 20: Shitakunda, Chittagong
Source: Biswas, P. K, 2007: 113

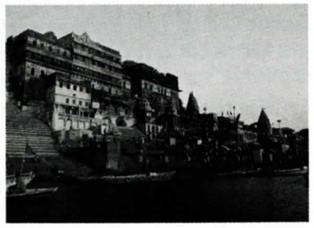

Figure 21: Varanasi, India
Source: en.wikipedia.org/wiki/Varanasi

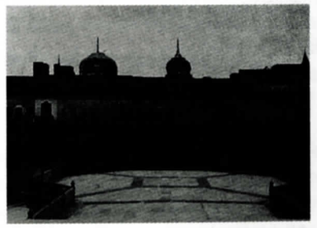

Figure 22: Ayodhya ghats, India
Source: Ray, R., 1996.

Figure 23: Haridwar, India
Source: IndiaLine, 2006

Figure 24: Mathura ghats, India
Source: Ray, R, 1989.

Figure 25: Langalbandh, Narayanganj
Source: Asad's photograph, 2006

Varanasi, or Benaras (Kashi), is one of the oldest living cities in the world (Figure 21). Varanasi's prominence in Hindu Mythology is virtually unrivalled. This is a city of spiritual light. It is also renowned for its art, music heritage, silk weaving and crafts. Again, Gaya is situated on the bank of Falgu River. This place is significant for both Hindu and Buddhist religions. It is surrounded by small rocky hills. Ghats and temples line the banks of the sacred River (Singh, R.S. and Singh, R.P.B., 2007).

Ayodhya is a city of temples which is situated on the right bank of the mythical river Sarayu (Figure 22). It is believed to be the birthplace of Lord Rama, the seventh incarnation of Lord Vishnu. It is known for its many famous temples and is one of the location for Kumbha Mela like Langalbandh mela. But scale of the 'Kumbha' fair is vast. This Hindu sacred occasion is the largest religious gathering on Earth (Ray, R., 1996). Haridwar is an ancient city on the Gangas River (Figure 23), located between the Gangetic Plain and the Himalayan foothills. It's a city located in northern India, in Uttaranchal state (Microsoft Corporation, 2007). It is one of the seven holy cities of Hindus, and its name means "door of Hari". According to the researchers the oldest fair started about 2,000 years ago in Haridwar (Bangladesh Parjatan Corporation, 2006: 01).

The context of Mathura 'ghats' (Figure 24) is similar to the area of Langalbandh. But, again Mathura's degree of development is larger and more developed. A special group had worked to conserve and revitalize a part of the area of Mathura named Sati Burj area (Ray, Rajat, 1989: p. 61). Their conceptual base was restoring the structure, developing land-river interface, infra structures, urban furniture and above all maintaining a self-sustaining nature. Another sacred place is the Vrindaban ghats. The ghat-edge is almost three kilometers long and convexly bends toward the river (Ray, Rajat, 1989: p. 65).

Analysing the all pilgrimage areas mentioned above, with extensive literature review, it can be noted that the context of Langalbandh (Figure 25) is very unique from historical and physical point of view. All of the above places had been started to develop from long time ago. So many developments were phased by the government as well as other organizations while continuing architectural conservation processes there. But Langalbandh is in initial developing phase. It is the appropriate time to take proper initiative to conserve this holy place so that it could be maintained as a sacred place in future.

6.0 Current Proposals and the effects:

Langalbandh will be developed as a pilgrimage place as well as a tourist spot (Acharjee, T. 2004: 92). The decision came from an inter-ministerial meeting with Religious Affairs Adviser in the 07 May 2007 (2007, Meeting minutes, Ministry of Religious Affairs). The Deputy Commissioner of the district had been asked to submit a project plan on land requisition mentioning the quantity of khas and vested property to the ministry concerned. The meeting also decided that an 8-km area along the Brahmaputra River would be re-excavated and 14 ghats would be reconstructed by Water Ministry under the supervision of Religious Affairs Ministry as part of the proposed project.

Besides, the Architecture Department would formulate a master plan following which the ministries concerned would reconstruct the temples, set up shades, guide-walls, roads and other necessary infrastructures. The Ministry of Forest and Environment would set up tree-shadows, a tourist corporation and a restaurant as a part of the project. A police station would also be set up to ensure public security in the area.

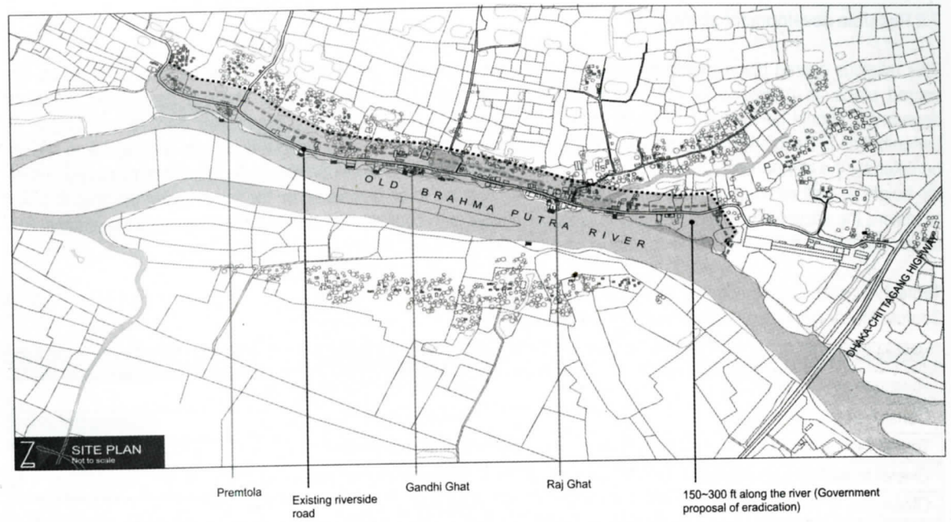

Figure 26: Map showing the approximate area of government's proposal of development
Source: Author's self-drawing

The current proposal for this sacred place is encouraging and appreciable. But more sensitive and analytic approaches which are related to restoration of the historic sacred place (Cartwrite, R.M., 1980: 127) and development of the total master plan are required to be adopted. The initial proposal is to relocate the illegal as well as legal inhabitants which covers approximately 150~300 ft along the edge of the river to setup a clean area for development (Figure 26). But it may be an incorrect approach to conserve the area. The decision of eradicating the rural settlement along the river may take off the traditional life of Langalbandh. From the observations, it is found that some of Hindu families that use to serve the temples and ashrams for a long time are the part of this rural area. Some stalls and small factories which act as threats for conservation could be relocated. But total context of this sacred place which consists of riverside natural landscape, rural settlement, ancient temples, ashrams, ghats, daily activities of people should be restored to retain the traditions.

In reference to the current proposal, the existing riverside vehicular road would be widened with new designed landscaping. But for this approach, the natural profile would be totally changed into an artificial context. The existing 12 feet wide road with heavy traffics acts as a stumbling block for ritual activities of some temples and adjacent ghats, as the road goes through between them. The sustainability of the ancient temple structures is in threat for noise of the vehicles. Though the road is the only way to access to the place, widening the road with vehicular access would rather increase the problem.

A tourist complex, recreational facilities, children amusement parks etc. are also going to be developed here in future. But these features should not be located in the pilgrimage area as it may change whole definition of the sacred place and the place of worship would be changed into a recreational tourist place. The major negative effects of the current proposal can be mentioned as follows:

- Eradicating the existing rural settlement along the river may disrupt the traditional life of Langalbandh.
- Widening the existing vehicular road would rather increase vehicular traffic and heighten the problem of obstructing the ritual activity and conservation of old structure.
- Tourist recreational facilities within this site would destroy the sacred profile of this place of worship.

7.0 Possible development strategies

This religious sacred place should be developed with some sensitive approaches which will be help to conserve the sacred place. In reference to various sacred places that are being developed in India, a designated group or department should be formed for proper analysis of this sacred place to develop the master plan. As the context of Langalbandh in Bangladesh is completely unique from other pilgrimage places, special decisions and regulation should be taken by the government for restoring of the place. Besides the new development works, government should restrict the height as well as other aspects of the buildings that is going to be developed in the future within the area in order to restore the sacred profile and the rural landscape. Master plan could be developed and implemented in phases. But all the concerned authorities (Table 1) should co-ordinate properly to achieve that goal.

Table 1: Concerned authorities of the action plans
Source: Meeting minute, 2007, Ministry of Religious Affairs.

Works to be done	Concerned authority
Riverside development	Ministry of Water Resource
Conservation of temples	Ministry of Religious Affairs
Tourist facilities	Tourist Corporation
Overall master plan and details	Department of Architecture, PWD
Others	Ministry of Culture

The master plan should have many layers considering architectural conservation as well as other technical aspects. The possible layers of developments could be:

a. Consideration of Transportation: (Pedestrian, vehicular and aqua transportation)
b. Access and circulation (pedestrian and Vehicular road network and nodes)
c. Parking system for tourist and pilgrims during the festival and at other times
d. River side development to conserve the place of worship (river-land interface)
e. Conservation of Individual ancient temple complex with adjacent ghats
f. Tourist complex (tourist facilities)
g. Allocation of space for fair, camping and other temporary facilities for the festival.
h. Spaces for supporting community and welfare facilities
i. Development of services (toilet and dressing facilities during festival, water supply, drainage and others)
j. Safety-security system of the area

The master plan should have a conceptual base which would guide the whole process (Ray, R., 1989: 65). Following the conceptual base some action plans can be developed consulting with all special groups to implement systematically. For facilitating the tourist and pilgrims and to keep the sacred profile of the Langalbandh site, it should be developed with a conservation oriented master plan. The master plan can be developed and implemented through 2~3 phases. The development strategies with possible design ideas of these phases could be as follows:

7.1 Phase one

The first work should be repairing and restoring the existing ancient temples, ashrams, moths and Ghats with proper analysis of the structural system, materials, color etc. Documentation of all the old structures should be carried out with the support of special archeological and conservation team. By relocating minimum illegal houses, stalls, small factories, these sacred structures could be kept secured with participatory surveillance approaches. The depth of Brahmaputra River rationally designed and the main connecting point from the highway should be widen to enhance the transportation. At certain point of the riverside some new and separate landing platform should be provided for aqua transportation (Figure 27) to restore the existing 'ghats' for only ritual purpose. The existing infra structures should be analyzed with the support of technical department and make some action plans in order to develop drainage system, prevent the water pollution and other services.

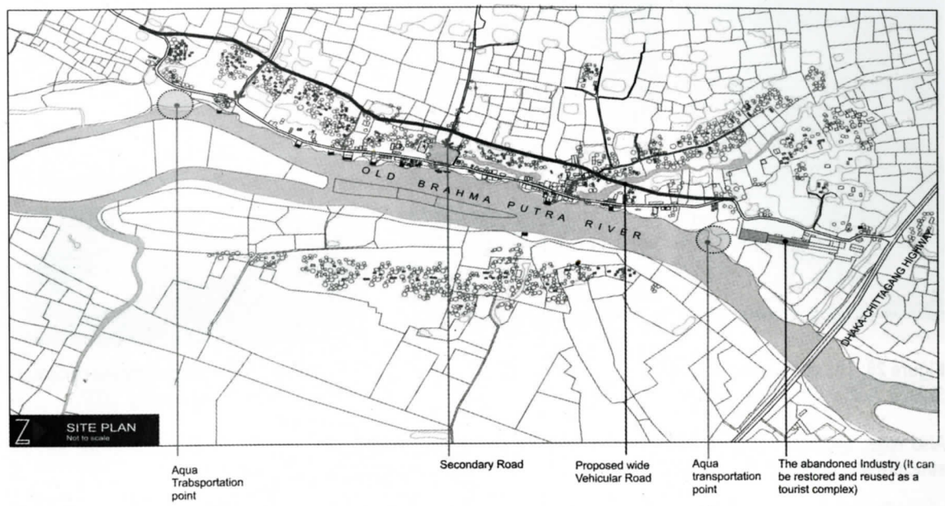

Figure 27: Map showing the proposed road network, transportation and existing abandoned industry.
Source: Author's self-drawing

7.2 Phase two

A wide peripheral vehicular road could be proposed parallel to the existing riverside-road, outside the rural area, without eradicating the rural settlements (Figure 27). This road would be the main road for vehicular access towards the sacred site and existing secondary roads could be connected with it and stopped before the river-side to restrict the vehicular circulation. It could be an option to restore temples as well as to revitalize the temple activities with the adjacent ghats without disturbance of the vehicles. The existing riverside road could be developed as a wide pilgrimage pedestrian pathway for performing all ritual activities uninterruptedly. Restoring all the existing old sacred trees, some new trees could be proposed for enhancing the landscape. These could be some holy trees like Krishnachura and Radhachura trees to make the pathway colourful during the main festival in April. Also at this phase, the embankment is an important issue. To maintain the natural contour and landscape of the riverside new technologies like use of geo-textile can be implemented here. It may also decrease the soil erosion of riverside land which is now a serious issue. Every temple complex consists of a temple, adjacent ghat, common activity space etc. Justifying the public, ritual and contemplation zones, individual temple complexes like Arnapurna temple, Jaykali temples, Pashan kali temples etc. with their adjacent ghats should be developed to define activities of the individual temple-complexes (Figure29). Toilet, dressing and other services should be provided according to the need analysis.

7.3 Phase three

After conserving the total sacred place, Tourist complex with entertaining facilities could be developed at this phase. But it should be constructed outside of the sacred profile. At Langalbandh there is an old industrial structure which has been abandoned for more than 10 years (Figure 27 and 28). It is located at the entry point of Langalbandh near the Dhaka-Chittagong highway (Figure 27). As the government is trying to procure this site from the owner, the tourist complex with its necessary functions like restaurants, library, multipurpose space, boating club, tourist guide and residential accommodations could be retrofitted here without demolishing the structure of the industry. Some structures for community facilities and welfare facilities could be developed. At this phase, new continuous ghats could be constructed with all facilities, as the limited number of ghats cannot facilitate the large number of pilgrims to take holy bath during the festival.

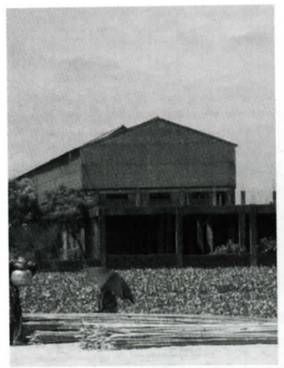

Figure 28: The abandoned Industry
Source: Author's photograph, 2007

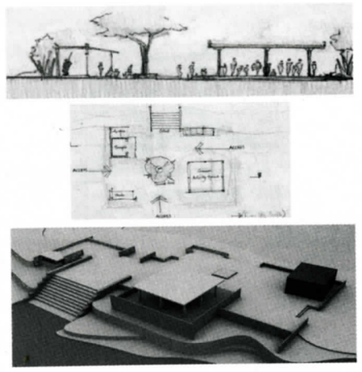

Figure 29: revitalization of temple complex
Source: Author's self drawing, 2007

Also other alternative phases could be proposed for sustainable development with the conservation of the sacred structure and places in an integrated master plan of Maha Tirtha Langalbandh.

8.0 Epilogue

Every year innumerable pilgrims come to Langalbandh. This holy place occupies an important part in the heritage of Bangladesh. As the place has the religious as well as historical significance, sustainable development of this place of worship involving conservation as well as a detail master plan design is a dire necessity. Considering the unique nature of the project proper procedures and analysis should be followed to develop this sacred place. If the development in the considered phases is accomplished successfully, more pilgrims as well as tourists will visit the historical holy place all the year round and it will be a powerful impetus to develop the economy of the place and the country.

Acknowledgements

Special Thanks to Professor Dr. Khandaker Shabbir Ahmed and Farhan Shirajul Karim, Department of Architecture, BUET, for their inspiration and supervisions. Thanks to Tarapodoa Acharjee - author of the book "Mohatirtho Langgolbond", Proshanto Kumar Biswas, Shankar Shaha, photographer Asad Abdullah for providing with support and necessary information.

Notes

i. A ***Tirtha*** is a holy place where there is a well, pond, lake, river or sea, the waters of which are considered to be holy. The Sanskrit word Tirtha, meaning 'water' has come to connote, by religious tradition, any place of pilgrimage on the banks of sacred streams of water. (http://en.wikipedia.org/wiki/Tirtha_and_Kshetra).
ii. As used in many parts of South Asia, the term ***ghat*** refers to a series of steps leading down to a body of water. In Bengali-speaking regions, this set of stairs can lead down to something as small as a pond or as large as a major river (Source: http://en.wikipedia.org/wiki/Ghats).
iii. In religion and spirituality, a ***pilgrimage*** is a long journey or search of great moral significance. Sometimes, it is a journey to a shrine of importance to a person's beliefs and faith. Members of many major religions participate in pilgrimages. A person who makes such a journey is called a pilgrim. (Source: http://en.wikipedia.org/wiki/Pilgrimage).
iv. Traditionally, an ***ashram*** is a religious hermitage. It would typically, but not always, be located far from human habitation, in forests or mountainous regions, amidst refreshing natural surroundings conducive to spiritual instruction and meditation (Source: http://en.wikipedia.org/wiki/Ashram)

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Protibesh©BUET
January 2010, Volume 14 Issue 1
pp 66-77

Simulation determining passive cooling parameters for multi-storied residential buildings in Dhaka

Adnan Hossain
Lecturer, North South University, Dhaka, Bangladesh
Email: arto_adnan@yahoo.com

Abstract
The paper investigates the effect of passive cooling strategies of multi-storeyed residential buildings in achieving indoor thermal comfort in the context of Dhaka, Bangladesh. It examines two main passive cooling strategies for warm-humid climate - thermal mass and clear floor to ceiling height. The mentioned passive means are investigated by using the thermal simulation programme IES-VE to evaluate the isolated effect of each. Finally, an overview of conclusions with design guideline from the investigated data is cited. The main findings of this paper indicate best temperature results when thermal mass is 250mm brick wall and clear floor height is 3.35m.

Key words

Passive cooling, Simulation, Thermal mass, Clear floor to ceiling height

1.0 General introduction

This Paper is concerned with the environmental aspect of design. It particularly focuses on multi-storied residential buildings of the Dhaka city. It aims to identify design approaches that rely on natural systems in order to develop a comfortable indoor environment.
Dhaka, the capital of Bangladesh, lies between longitudes 90?20' E and 90?30' E and between latitudes 23?40' N and 23?55' N, with three sides bounded by rivers Buriganga in the south, the Tongi Khal (canal) in the north and the Turag river in the west. The climate of Bangladesh, based on the widely used classification by Atkinson (Koenigsberger et al, 1973), is categorised as warm-humid for much of the year.
The most practical problem of Dhaka is its population. Dhaka is the 11th largest city in the world with 12 million residents and has the highest growth rate of 3.2% (South Asia Population). To cope with this huge population mid-rise and high-rise apartments are growing up rapidly in the city. Most of these are developing without considering passive design methods for cooling. Residents have to use ceiling fans and air conditioner even in early winter, contributing to wastage of valuable energy. (Hafiz, 2002)

In the context of Bangladesh, where there is a burning energy crisis, it is wasteful to use energy for thermal comfort in buildings. So for the sustainable development of Dhaka the only way is the adoption of more effective and widely used methods for passively cooling buildings. Thus the paper tries to develop design guidelines in the context of Dhaka, for thermal mass and clear ceiling to floor height as passive design elements for multi-storied residential buildings.

Fig 1: Residential development of the city of Dhaka

1.2 Objectives:

The main objectives of the paper are:

To evaluate the physical properties of, thermal mass, and clear floor height as passive design means used in multi-storied residential buildings.
To investigate the primary factors that influences the design and performance of the mentioned design strategies and to provide design guideline for these.

1.3 Methodology

To achieve the above objectives the Paper first discusses passive design strategies for warm humid climates, especially thermal mass and clear floor height from literature review. Then thermal simulation, carried out to investigate thermal performance of these passive cooling systems, has been discussed, with analysis leading to design guidelines, as established upon synthesis of the findings.

2. Passive cooling

Thermal comfort can be achieved by active or passive means. By active methods comfort it is achieved by energy-consuming mechanical devices, whereas passive strategies provide the same, naturally. However, in extreme climates it is sometimes impossible to rely only on passive means for indoor comfort. Hence the objective is to ensure the best possible indoor thermal conditions by passive means to reduce the use of active means.
Passive cooling strategies try to make the indoor cool, where the outdoor is hot. The principle objectives that outline the strategy for passive cooling are:

1. Prevention of heat gain
2. Protection from effects of heat gain
3. Promotion of cooling through heat loss

(Commission of the European Communities, 1992)

Fig 3: Influence of the height of the room on air change hour. (Ghiaus and Allard, 2005)

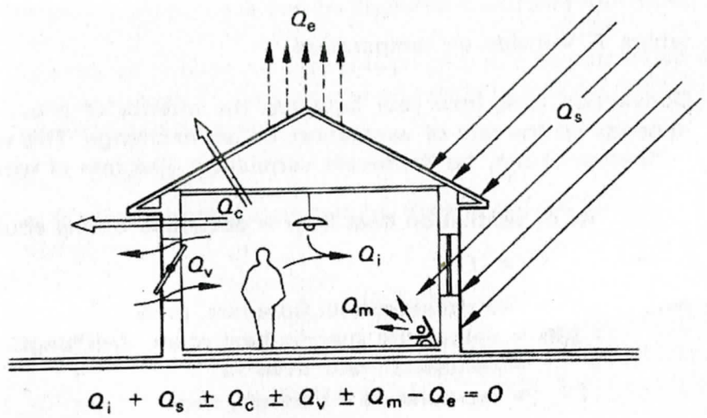


Fig 2: Heat exchange of Buildings (Koenigsberger et al., 2004).
(Qi - internal heat gains, Qs - radiation, Qc - convection, Qv - ventilation Qm - mechanical equipment, Qe - evaporation)

2.1 Thermal mass

The effect of outdoor heat can be moderated by using the heat storage capacity of building materials to create comfortable and cooler indoor spaces. The thermal resistance and the heat capacity are the most important properties of the materials, which should be considered in design. (Givoni, 1981). The resistance moderates the heat flow external to internal surfaces, and the thermal capacity of a material stores heat and controls the fluctuation of indoor temperatures.
Heavy thermal mass is very effective in regions, where both external temperatures and diurnal temperature difference are high. In Bangladesh, the hot dry season between March and May are the most appropriate for the use of thermal mass. Passive cooling in such situation can be farther enhanced by removal of heat accumulated during the day by night ventilation (Givoni, 1981). The use of thermal mass has different effects in warm-humid season, where diurnal temperature range is low and the use of material having high thermal capacity may increase night time indoor temperature. In the winter the use of thermal mass may have advantages to make the indoors warm at night (Koenigshofer, 1981).

Using high thermal mass in buildings in warm humid areas should have insulation to increase resistance to heat gains. The proper location of the insulating layer is to the outside of the building envelop (Baker, 1987).
Brick and concrete are the most common materials of building construction in Bangladesh. The walls are built brick by brick manually and concrete is cast on site. This allows variation in thickness of the wall and roof elements easily and causes variation in thermal mass.

2.2 Clear floor height

The height between the floor and the ceiling affects the internal air flow as well as the feeling of comfort of the occupants. A sufficient value of clear floor height gives provision of enough space for warm air to rise above the occupant's level. On the other hand, too much height has a negative effect on the air change hours (ACH) of a room. Fig 3 shows the effect of floor height on the ACH (Ghiaus and Allard, 2005). These results are obtained from a simulation study carried out for a summer time outdoor temperature between 26-41?C and wind velocity between 0-10m/s. Hence, care should be taken while specifying floor height of a building.

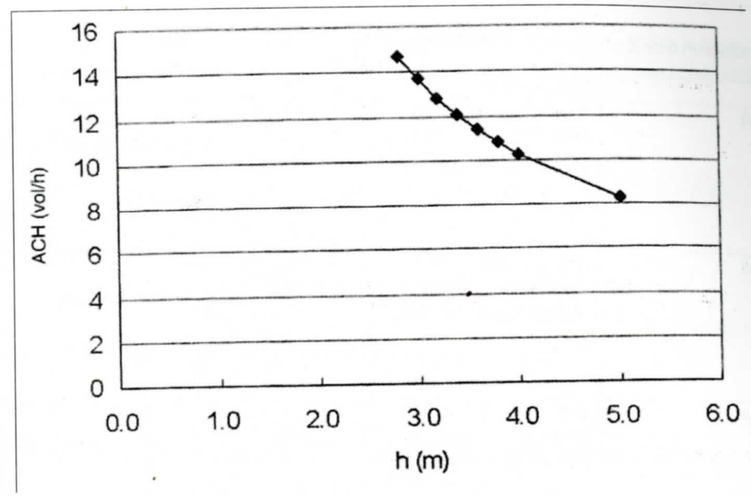


Fig 3: Influence of the height of the room on air change hour. (Ghiaus and Allard, 2005)

Table 1 presents the recommended values of ceiling height in Bangladesh by the Bangladesh National Building Code (1993). Surprisingly they do not have any recommendation for residential buildings.

Table 1: Minimum ceiling height for building

Occupancy	Minimum ceiling height (m)	
	Non-air conditioned buildings	Air conditioned buildings
Education, Institutional, Health care, Assembly	3.0m	2.6m
Industrial, Storage, Hazardus	3.5m	3.0m

(Source: Bangladesh National Building Code, 1993)

3. Simulation studies

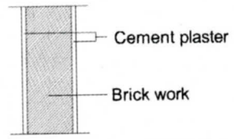
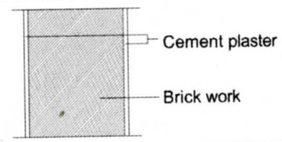
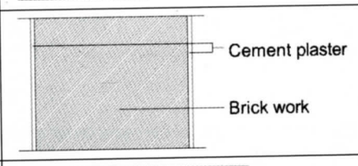
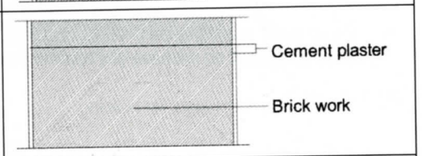
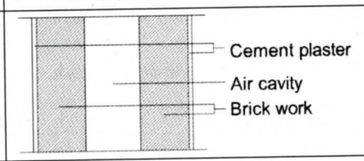
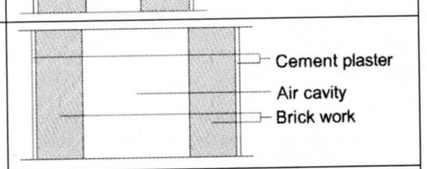
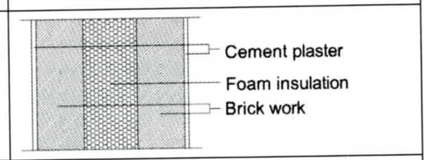
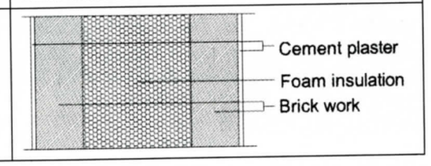
This section investigates the effect of the changes in thermal mass and clear floor height in indoor environment through simulation. For this simulation study a dynamic computer simulation program named 'Integrated Environmental Solutions - Virtual Environment' (IES-VE, version 5.8) has been used.

3.1 Parameters investigated

3.1.1 Thermal mass

The effect of thermal inertia was simulated as changes in wall thickness. Wall thickness varies as a multiple of 125mm, the width of a single brick. The effect of wall with air cavity and insulation was also simulated. Only external walls are subjected to changes as would happen in the commonly used column beam structural system. The constructional details of the investigated wall are shown in the Table 2.

Table 2: Construction details of different wall used in simulation

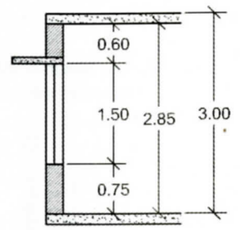
Name	Construction	
125mm wall	Cement plaster 10mm Brick work 110mm Cement plaster 10mm	
250mm wall	Cement plaster 10mm Brick work 230mm Cement plaster 10mm	
375mm wall	Cement plaster 10mm Brick work 355mm Cement plaster 10mm	
500mm wall	Cement plaster 10mm Brick work 480mm Cement plaster 10mm	
With 125mm air cavity	Cement plaster 10mm Brick work 110mm Air cavity 125mm Brick work 110mm Cement plaster 10mm	
With 250mm air cavity	Cement plaster 10mm Brick work 110mm Air cavity 250mm Brick work 110mm Cement plaster 10mm	
With 125mm foam insulation	Cement plaster 10mm Brick work 110mm Foam insulation 125mm Brick work 110mm Cement plaster 10mm	
With 250mm foam insulation	Cement plaster 10mm Brick work 110mm Foam insulation 250mm Brick work 110mm Cement plaster 10mm	

3.1.2 Clear floor height

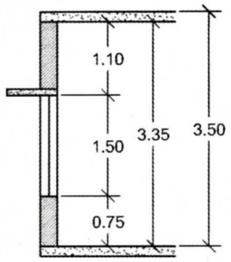
The effect of clear floor height on indoor air temperature was investigated with three different clear floor heights. These are chosen from the commonly used floor to floor height (Table 3).

Table 3: Different floor height used in simulation

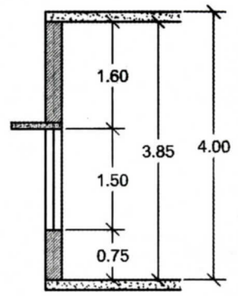
Name	Clear floor height	Floor to floor height
2.85m clear height	2.85m	3m
3.35m clear height	3.35m	3.5m
3.85m clear height	3.85m	4m



2.85m clear height



3.35m clear height



3.85m clear height

Fig 4. Detail of different floor height

3.2 The building model

A real apartment building; **Wari Tower,** 1 Hayer street road, Wari, Dhaka 1203; was chosen as the model for thermal simulation (Fig 5). This building was chosen to have simulations results as real as possible. The simulation was carried out for the corner rooms of the sixth floor. The reason behind choosing corners rooms, is that these are the practical situations of rooms with two exterior facades. For the simulations, the rooms were assumed to have no supplementary heating or cooling.

Fig 5: Wari tower and the Building model for simulation

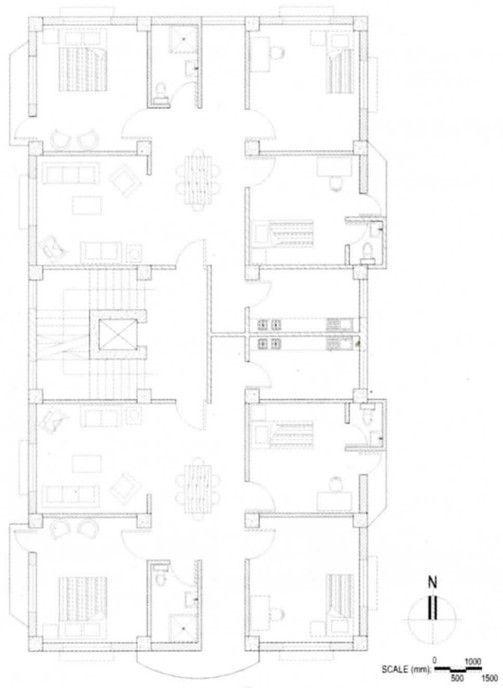


Fig 6.: Typical floor plan

3.3 Results and discussion

The indoor air temperatures generated for varying conditions of the parameters mentioned were analysed. The hourly indoor air temperatures for each condition were obtained from simulation for one year. The mean hourly temperatures are compared to each other for the four different seasons separately. Moreover, the total number of hours having air temperature in comfort air temperature range (26.3?C - 29.6?C) (Hossain, 2008). are also compared to each other for each different situation to find out the most suitable one.

3.3.1 Effect of thermal mass

The indoor air temperatures obtained for different external wall construction for 6th floor south-east corner room during the hot-dry season (March-May) are shown in the Fig 7. The Figure shows that the 125mm wall has a much different effect on indoor temperature than the others. It creates a diurnal temperature variation of almost 4?C with almost 34.8?C mean maximum temperature at 3:00 pm, which is 0.8?C higher than the others. All the other constructions have almost similar effect on indoor air temperature. The figures for other seasons show that the 250mm wall creates a bit lower day temperature compare to most of the other options, especially during the long warm-humid season.

South-east room

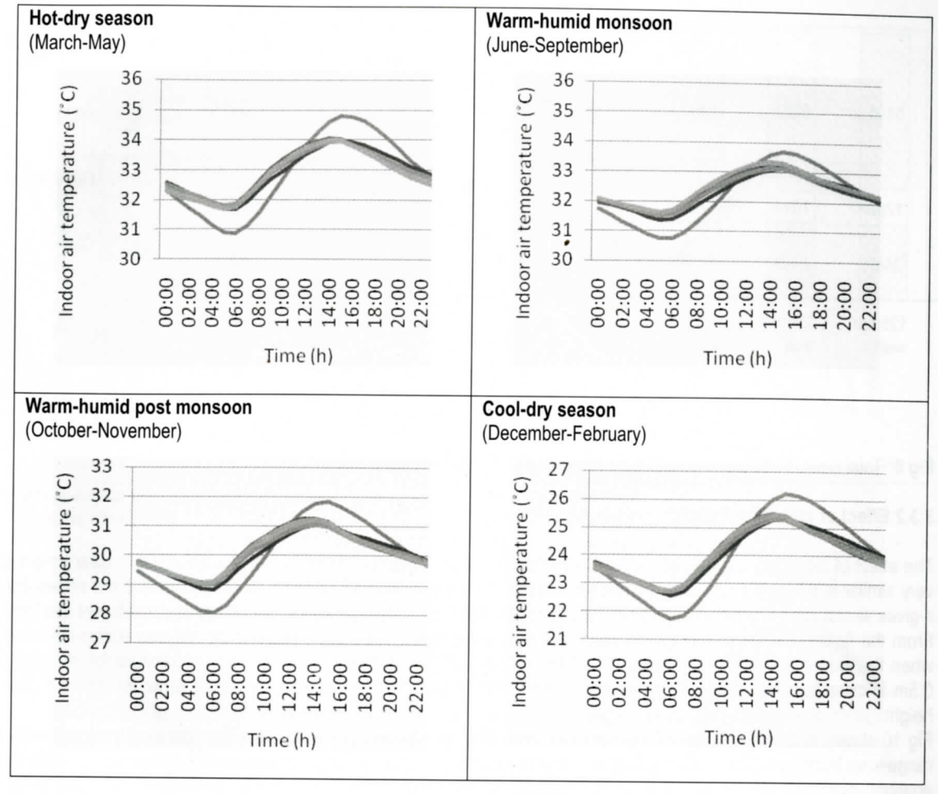


Fig 7.: Mean hourly indoor air temperature for different wall construction in south-east room.

The total hours with comfortable temperatures for each wall are shown in the Fig 8. The figure shows that the 125mm wall has the highest number of hours with temperatures in comfortable range and the 250mm wall has the second height. Though, the 125mm wall has the maximum number, but the hourly temperature results shows that it creates a much higher indoor air temperatures in the warm hours range compared to the others. The analysis of the simulation results suggests that the 250mm wall is the most suitable as external wall in creating comfortable indoor air temperature. It is also economical compared to the other six options, except for the 125 mm walls.

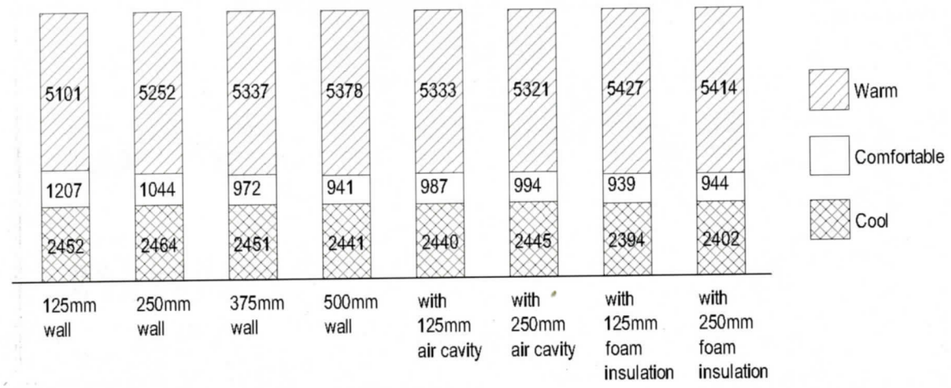


Fig 8: Total hours in different temperature range regarding comfort temperature.

3.3.2 Effect of clear floor height

The effect of clear floor height upon indoor temperature was analysed in the same way. As the effect of clear height is very similar in different room, only the results obtained from the south-east room are discussed here. Fig 9 shows that it gives similar results when compared to the others, though they have different air temperatures for different seasons. From the figure, it is clear that as the clear floor height increases, the indoor temperature reduces during day time, when the indoor environment is warm. It creates about 0.25?C less mean maximum air temperature for increasing 0.5m in clear floor height. On the other hand, during cool night hours the effects are almost same for different clear height.

Fig 10 shows that as the height of the floor increases the total number of hours with air temperatures within comfort range also increases. The 3.85m clear floor height room has the highest hours of comfortable temperature. Both the analysis, diurnal air temperature and total comfortable hours, suggests that it is better to have higher clear floor height for a more comfortable indoor environment. But in the real world increasing floor height adversely affects construction cost, particularly in multi-storied buildings, increasing the overall building height significantly. So in practical design a balance should be created, and the floor height should be as high as possible considering the economic side. The clear floor height should be at least 3.35m rather than the most commonly used 2.85m.

South-east room

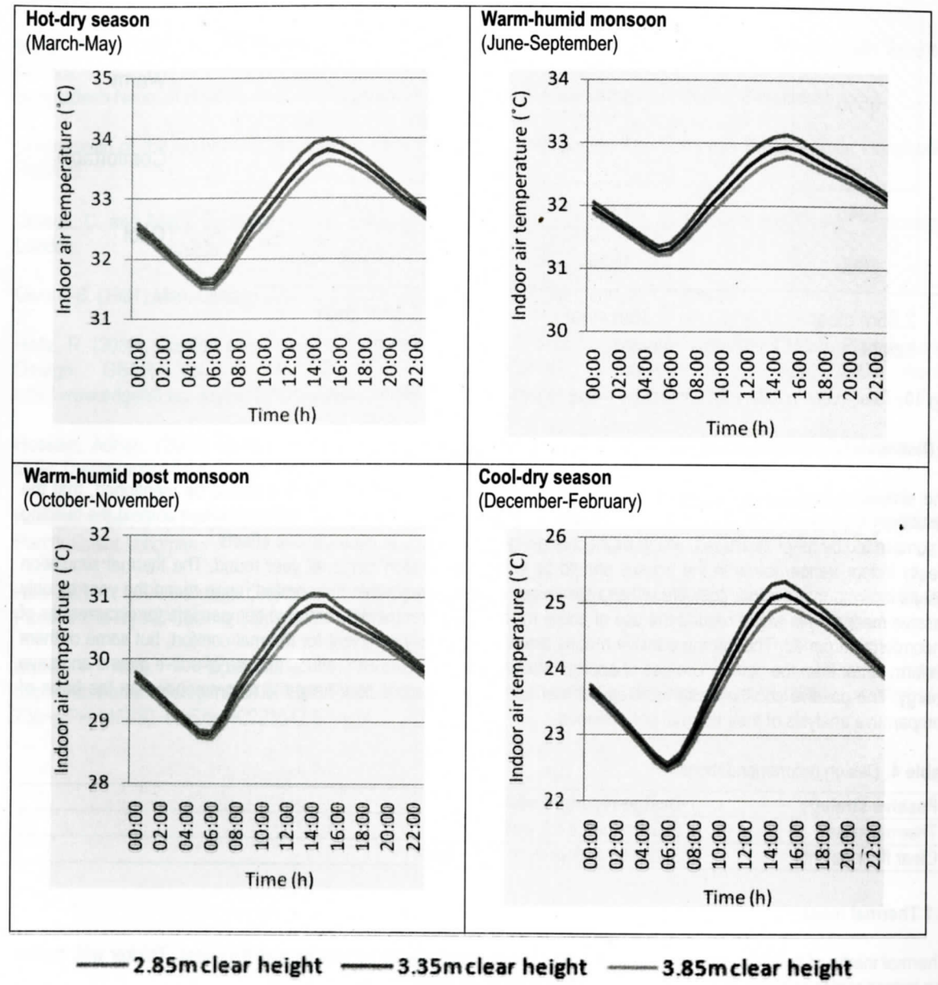


Fig 9: Mean hourly indoor air temperature for different clear floor height in south-east room.

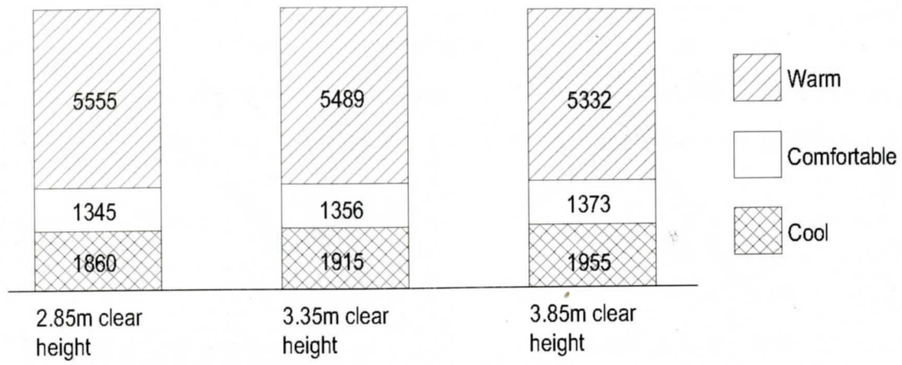


Fig 10: Total hours in different temperature range regarding comfort temperature.

4. Discussions and conclusions

The simulation results are discussed with a view to derive design guidelines. Here it should be mentioned, that the simulation was carried out with a condition, having open surroundings. But in the real world urban context the building is surrounded by other structures, which might change the results, due to microclimatic effects.
Ideally indoor temperatures in the houses should be within the comfort range all year round. The thermal simulation results indicate that it is not possible to keep the indoor temperatures within the comfort range round the year by only passive means. This would require the use of active means of environmental control to compensate for occurrences of uncomfortable period. Though the passive means are not completely sufficient for thermal comfort, but some of them perform better than the others. The use of appropriate passive strategies can reduce the use of active means and save energy. The passive cooling design strategy of thermal mass and clear floor height is recommended on the basis of comparative analysis of their thermal performance.

Table 4: Design recommendations

Passive strategy	Design recommendations
Thermal mass	250mm thick brick wall
Clear floor height	3.35m clear floor to ceiling height

4.1 Thermal mass

Thermal inertia of building fabric can be manipulated most conveniently by varying wall thickness. Thicker wall makes the indoor cooler and also reduces the diurnal temperature variation.
The simulation studies for multi-storeyed buildings show that a wall of 500mm thickness has a better performance than wall of 250mm thickness. But there is almost no better effect for increasing the wall thickness more than 250mm or introducing air cavity or thermal insulation to it for upper levels. Hence, the 250 mm thick wall construction is the best option for external walls of multi-storeyed residential buildings.

4.2 Clear floor height

The floor to ceiling height is an important issue regarding indoor thermal comfort. Particularly for high rise construction as it is a normal trend to keep floor height as low as possible in high-rises to reduce construction cost.
All the findings from thermal simulation present that it has a positive effect of increasing floor height to cool down indoor air temperature. So regarding indoor air temperature and construction cost, the clear floor height may be 3.35m.

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Sub Heading 11 Arial narrow bold

Body text 10 Arial narrow

End note 9 Arial narrow

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Department of Architecture
Bangladesh University of Engineering and Technology
Dhaka-1000, Bangladesh.
Fax: +880 2 8613046
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ISSN 1812-8068