CRP 514

Term Project

Title

**Conservation of Heritage Sites Through Land Use Control using GIS –
a case study based on Chittagong Metropolitan Master Plan (CMMP) Area,
Bangladesh**

Final Submission

Submitted to:

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Table of Contents

II

Project Title
Conservation of Heritage Sites Through Geographic Information System (GIS) –
a case study based on Chittagong Metropolitan Master Plan (CMMP) Area,
Bangladesh

Abstract

Heritage is a part and parcel of every city's history all over the world. But over the years, it is being neglected and received very little attention from the city rulers. Lack of know how about Heritage conservation mechanism, tools, norms and rules, unplanned haphazard developments are being occurred in and around of Heritage Sites. Over the last few decades Geographic Information Systems (GIS) has been playing a key role in different planning applications ranging from daily administrative operations to Strategic Planning. Because of its various analytical capabilities, it is being treated as a decision making tools in the field of Urban and Regional Planning. Land Use Planning control mechanism linked with several policy, norms and regulations such as Master Plan, Building Construction Rules etc. Although GIS is a very important tool in the field of urban planning, its application in developing countries like Bangladesh is rarely found.

This project will highlight the application of different rules and regulations to conserve heritage sites by using GIS software – a case study based on Chittagong Metropolitan Master Plan Area, Bangladesh.
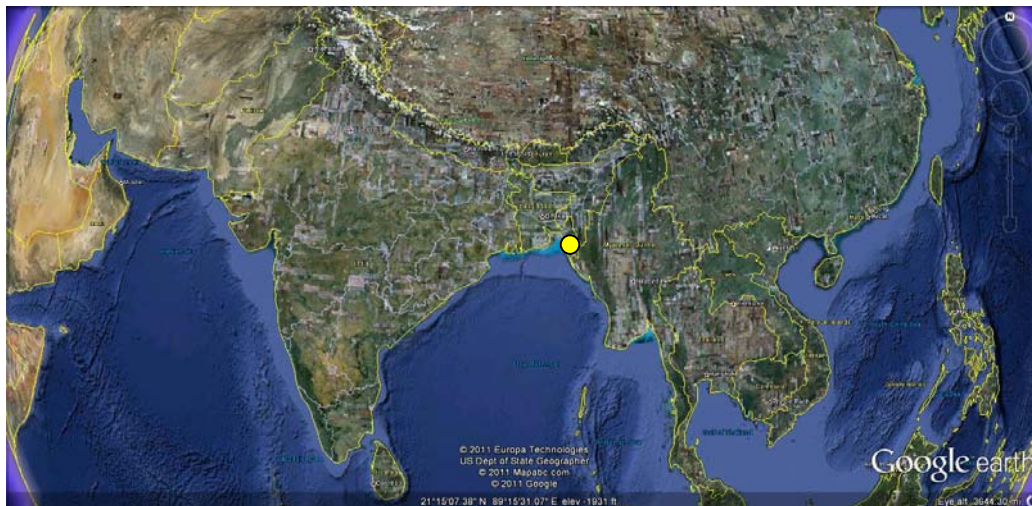
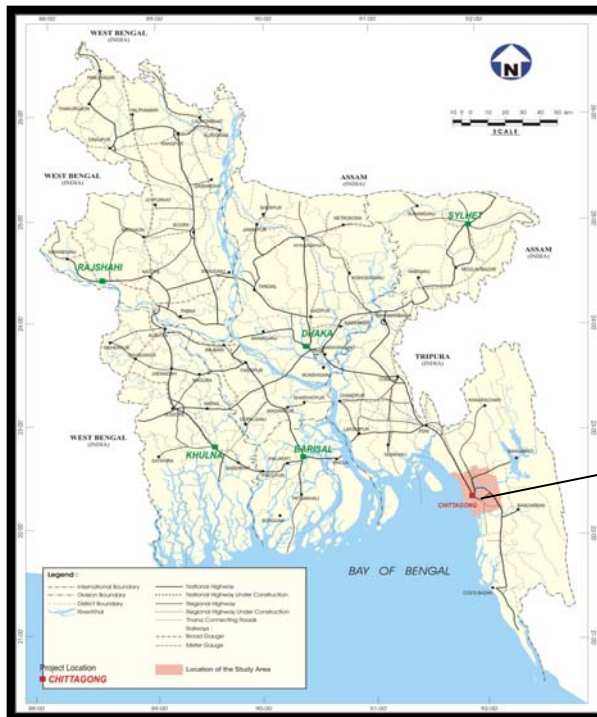*Keywords :* Heritage, Conservation, GIS

Introduction

Chittagong has a long and varied cultural past. Due to being a major maritime port, the heritage of Chittagong is enriched by contribution from diverse races and cultures. It flourished as a port of the Kingdom of "Harikela" (**Harikela** was a kingdom in *Ancient Bengal* encompassing much of the eastern regions of the *Indian Subcontinent*. Source : *Wikipedia*) from about the 14th century onward. The Arakans, Sultans from Bengal, Mughals (1670), Portuguese, and the British (1517) came here to trade and to rule. Greatest personalities and travelers visited this region several times. The city made notable contribution to the *Quit India Movement (1931-34)* and the *Independence movement*. It is the second largest and also the commercial capital of Bangladesh. The city is well known for its scenic beauty. Surrounding hills, river and sea make the city more attractive. With its unique natural beauty and services and facilities Chittagong has turned into an ideal tourism center of the country. Its green hills and forests, its broad sandy sea beaches and its fine cool climate always attract the holiday-makers. Described by the great Chinese traveler Huen Tsang (7th century AD) as "a sleeping beauty emerging from mists and water" and given the title of "Porto Grande" by the **Portuguese** traders.

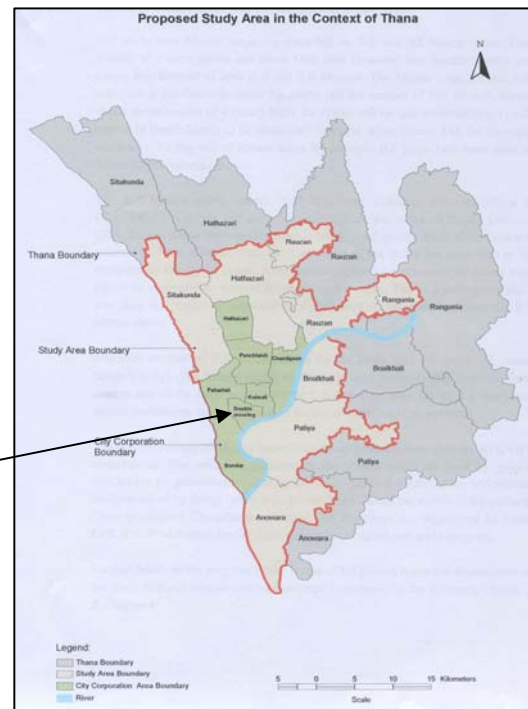**Location**

It is situated within 22°-14´ and 22°-24´-30´´ N Latitude and between 91°-46´ and 91°-53´ E Longitude and on the Right Bank of the river Karnafuli. The Bay of Bengal located on its east side.

Project Location in the context of World

Project Location in Bangladesh context

Background

Little traces to embody the eventful past, is evident in the city and its surroundings. Conservation of Chittagong's cultural and historic treasures or its old settlements with its trees and water bodies has not been in the planning and development agenda *(DAP, 2008)*. Heritage structures and sites have remained unrecognized and unrecorded. They have been neglected, disfigured, altered, encroached upon or demolished in the name of development.

Under the project titled "Preparation of Structure Plan, Master Plan and Detailed Area Plan, Metropolitan Development and Plan Preparation and Management in Chittagong" (BGD/88/052), the Chittagong Metropolitan Master Plan (CMMP) was prepared in the year 1992-95. The *Structure Plan* recognized the need for listing and conserving such buildings, monuments and enhancing their settings (DAP, 2008). Development of high profile projects for enhancing the prestige of the city had been advocated in the policy. In the *Detailed Area Plan for Chittagong Metropolitan Master Plan Area*, concluded in the year 2008, identified those historic sites and buildings and gave certain policies and guidelines to conserve them.

Based on those policies *Chittagong Metropolitan Building Construction Rules – 2008* introduced several specific rules to stop unplanned, unmatched and haphazard development in and around of Heritage sites and it also ensures design criteria for them.

Objectives

The proposed project will be carried out with a view to attain the following objectives:

- To identify heritage sites and building on Chittagong City Base Map using GIS
- To define a zone of influence and base line for each heritage site by using GIS
- To identify the development trend in and around of each heritage site
- To illustrate design criteria of all structures around each heritage site using GIS
- To prepare a digital database for all heritage sites as described in *Detailed Area Plan for Chittagong Metropolitan Master Plan Area*
- To prepare a Heritage Base Map for Chittagong by using GIS

Problem Statement:

- No database for heritage site – whether it is manual or digital
- Identification of Heritage Site in a congested area
- Less application of GIS in this field
- Lack of comprehensive guidelines for urban heritage conservation
- Vested groups interest
- General peoples' illiteracy about heritage values
- Illegal occupancy of the heritage buildings
- Lack of proper government intervention in heritage site conservation

Literature Review

What is GIS?

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. GIS allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. A GIS helps you answer questions and solve problems by looking at your data in a way that is quickly understood and easily shared *(Esri)*. GIS is a system of hardware and software used for storage,

retrieval, mapping, and analysis of geographic data. Practitioners also regard the total GIS as including the operating personnel and the data that go into the system. Spatial features are stored in a coordinate system (latitude/longitude, state plane, UTM, etc.), which references a particular place on the earth. Descriptive attributes in tabular form are associated with spatial features. Spatial data and associated attributes in the same coordinate system can then be layered together for mapping and analysis. GIS can be used for scientific investigations, resource management, and development planning *(nwgis)*. At the simplest level, GIS can be thought of as a high-tech equivalent of a map. The key word to this technology is Geography – this usually means that the data (or at least some proportion of the data) is spatial, in other words, data that is in some way referenced to locations on the earth. Coupled with this data is usually tabular data known as attribute data. Attribute data is generally defined as additional information about each of the features, which then can be tied to spatial data *(GIS Lounge)*.

Cultural Heritage - Definition

Cultural Heritage can be defined as follows irrespective of origin and ownership:

"Movable or immovable property of great importance to the cultural heritage of every people, such as monuments of architecture, art or history, whether religious or secular; archaeological sites; groups of buildings which, as a whole, are of historical or artistic interest; works of art; manuscripts, books and other objects of artistic, historical or archaeological interest; as well as scientific collections and important collections of books or archives or of reproductions of the property defined above;

buildings whose main and effective purpose is to preserve or exhibit the movable cultural property defined in sub-paragraph (a) such as museums, large libraries and depositories of archives, and refuges intended to shelter, in the event of armed conflict, the movable cultural property defined in sub-paragraph (a); centres containing a large amount of cultural property as defined in sub-paragraphs (a) and (b), to be known as 'centres containing monuments'." *(UNESCO, 1954).*

Cultural Heritage can farther be defined as follows:

*"**Monuments:** architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of

features, which are of outstanding universal value from the point of view of history, art or science;

Groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science;

Sites: works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view." *(UNESCO, 1972)*

UNESCO has further defined 'cultural heritage' in its Draft Medium Term Plan 1990-1995 (UNESCO, 25 C/4, 1989, p.57), which has been reproduced below:

"The cultural heritage may be defined as the entire corpus of material signs - either artistic or symbolic - handed on by the past to each culture and, therefore, to the whole of humankind. As a constituent part of the affirmation and enrichment of cultural identities, as a legacy belonging to all humankind, the cultural heritage gives each particular place its recognizable features and is the storehouse of human experience. The preservation and the presentation of the cultural heritage are therefore a corner-stone of any cultural policy.

This is one of the fields where UNESCO's action has been particularly appreciated and noted, as regards both its standard-setting aspects and the major preservation and safeguarding campaigns. In this way it has helped to gain worldwide recognition of the very idea of the heritage, which, at the same time, has been broadened and extended. The cultural heritage should be considered both in time and in space. First, it no longer stops at the dawn of the nineteenth century but now also embraces the records left behind by the twentieth century. Second, the aim is not only to preserve increasingly numerous items of cultural property but also to safeguard complexes which go far beyond single large monuments or individual buildings. The idea of the heritage has now been broadened to include both the human and the natural environment, both architectural complexes and archaeological sites, not only the rural heritage and the countryside but also the urban, technical or industrial heritage, industrial design and street furniture."

Heritage Conservation Acts and Rules

Antique Act

Heritage conservation was put into effect in 1968 by Antique Act, 1968 for the Government of the former Pakistan. After liberation of Bangladesh, this act was modified in 1976 without fundamental changes (Talukdar, 2010). In the former Antiquities Act' 1968, it was depicted that ancient product or object would be meant belonging or relating to any period prior to May 1857. After liberation of Bangladesh, the definition of ancient products or objects was replaced by "the preceding hundred years" in lieu of "any period prior to May 1857".

In this Act, antiquity was meant:

- Any ancient product of human activity, movable or immovable, illustrative of art, architecture, craft, custom, literature, morals, politics, religion, warfare, science or of any aspect of civilization or culture.
- Any ancient object or site of historical, ethnographical, anthropological, military or scientific interest, and
- Any other ancient object or class of such objects declared by the central government, by notification of the official gazette, to be an antiquity for the purpose of this act.

Bangladesh National Building Code (BNBC), 2006

BNBC depicted the following guidelines for Historic and architecturally valuable buildings:

"A building or structure which has been designated by official action as having special historical or archaeological interest, or a building or structure identified by a legally constituted authority as being architecturally valuable, may be undertaken for repairs, alterations and additions necessary for its preservation, restoration, rehabilitation or continued use provided."

Architectural and Environmental Control

Besides enforcing the provisions of this code for normal buildings and structures, the building official shall, for special structures such as those listed in below, also examine the aesthetics and environmental issues vis-a-vis the existing structures and the characteristics of the area, and exercise architectural and environmental control in accordance with the provision of this section *(Talukdar, 2010).* Special structures for which architectural and environmental control shall be exercised by the building official shall include:

(a) major public building complexes,

(b) building in the vicinity of monuments and major sculptures,

(c) building and structures near existing structures identified to be architecturally valuable

(d) building and structures near historic buildings or in an area of historical of archaeological significance,

(e) buildings near any structure that represents the special characteristics of an area,

(f) any proposed building or structure that represents the special characteristics or forms part of a larger master plan of an area, and

(g) any development that may have an effect on or mar the environment or characteristics of an area,

The authority shall, for the purpose of existing the architectural and environmental control and for identifying existing structures having architectural value, appoint a standing committee comprising noted experts from the fields of Architecture, Planning, Engineering, History, Art, Literature or any other discipline which may be deemed relevant. The committee shall examine the aesthetic quality of the proposed building, structure or development and the effect it may have on the characteristics and environment of the area in order to ensure aesthetic blending of the new structure with the existing ones and continuance of the new structures with the existing surroundings. The committee may require additional drawings and information to those specified for a detailed study of the proposed work. The committee, for the purpose of arriving at their decision, may at their direction depending on the magnitude of the project and the impact it may have on public life, hear the architect of the proposed work who may wish to explain the various features of the project, note comments of other experts in the relevant disciplines, or in exceptional circumstances, institute a public hearing to assess public reaction to the project. The committee may approve the proposed work, recommend changes in the scheme, or disapprove the scheme, for reasons of aesthetics and environmental control. The building official shall not issue permit for undertaking the proposed work until obtaining a report from the standing committee stating that the intended work is acceptable in respect of its effect on the environment, landscape, architectural characteristics, historical feature or any other aesthetic quality of the locality, area or landscape concerned.

Constitution of Peoples' Republic of Bangladesh

The provision of heritage conservation is considered as national sense of duty evoked by the Government in article 24 of the Constitution of the Peoples' Republic of Bangladesh as *The State shall adopt measures for the protection against disfigurement, damage or removal of all monuments, objects or places of special artistic or historic importance or interest*".

Structure Plan of Chittagong Metropolitan Master Plan (CMMP)

The structure Plan set out a long term strategy covering twenty years from 1995-2015 for urban development and use of land in the metropolitan area of Chittagong as a whole. This document sets a series of policies to be pursued. This document had identified 8 (eight) development objectives for Chittagong Metropolitan City. To carry out the broad objectives for the development of Chittagong, policies were sorted in 12 sectors. A total of 76 Strategies and guidelines in the following sectors were described here. In Prestige Projects sector, it was depicted as "**PRS. 02:** Conserve buildings and monuments of cultural, architectural and historic interest" *(CMMP, 1995).*

Detailed Area Plan of Chittagong Metropolitan Master Plan (CMMP)

The Structure Plan recognizes the need for listing and conserving such buildings, monuments and enhancing their settings. Development of high profile projects for enhancing the prestige of the city had been advocated in the policy.

Chittagong Metropolitan Building Construction Rules 2008

Building Construction Rule' 2008 has replaced the former Building Construction Rule, 1996 to promote the development trends adjusted with modern city structure. In this rule, it has made compulsory take No Objection Certificate (NOC) from Special Project Permission Committee to build any structure within 200 meter buffer of any archaeological, historical, architectural and natural aesthetical beautiful area.

Methodology

Identification of Heritage Sites

In Detailed Area Plan, it has been stated that a preliminary schedule of areas and buildings requiring preservation and conservation for historical, architectural environmental or ecological point of view. It has arbitrarily marked 32 sites as heritage sites. The list is as follows:

Sl No.	Name	Period	Present Use	Location
1	Badar Awlia Tomb	Sultani	Mosque & Shrine	Boxirhat, Anderkillah
2	Shah Qatal Tomb	Sultani	Mosque	Katalgonj, Shulakbahar
3	Anderkillah Shahi-Jam-e-Mosque	Mughal	Mosque	Anderkilla
4	Hamza Khan Mosque and Tomb	Mughal	Mosque & Shrine	Panchlaish
5	Miskin Shah Mosque	Mughal	Mosque & Shrine	Slope of Chittagong Mohsin College Hill
6	Wali Beg Khan Mosque	Mughal	Mosque	Chawkbazar
7	Kadam Mubarak Mosque	Mughal	Mosque & Education	Jamal Khan
8	Darul Adalat	Colonial (British)	Now Ruin	Top of Chittagong Mohsin College Hill
9	Court Building	Colonial (British)	Court & Govt Office	Court Hill, Anderkillah
10	General Hospital	Colonial (British)	Hospital & Research	Anderkillah
11	Nach Ghar (Dancing Hall)	Colonial (British)	Fire Brigade	Siraj-ud-Dowla Road, Chandanpura
12	Central Railway Station	Colonial (British)	Renovated Railway Office	Kotwali
13	Wooden Bungalow	Colonial (British)	Museum	Ambagan Road, Pahartoli
14	DC's Bungalow	Colonial (British)	Govt Officer's Residence	Buddhist Temple Road
15	Mirza Pool (Mirza Bridge)	Colonial (British)	Now Ruin	Hathazari Road, Shulakbahar
16	Battali Railway Station	Colonial (British)	Now Ruin	Kadamtoli, Kotwali
17	Karnafuli Railway Bridge	Colonial (British)	Rail Bridge ove river	Kalurghat

18	Old Circuit House	Colonial (British)	Museum	Lalkhan Bazar
19	Pahartoli Railway Staion	Colonial (British)	Rail Maintenance Workshop	Ambagan Road, Pahartoli
20	Chittagong Police Hospital	Colonial (British)	Renovated	Lalkhan Bazar
21	Police Armory	Colonial (British)	Renovated	Bagmoniram, Lalkhan Bazar
22	The European Club	Colonial (British)	Railway Office	Ambagan Road, Pahartoli
23	Chittagong Club Building	Colonial (British)	Club House for Elites	Lalkhan Bazar
24	J M Sen Hall (Town Hall)	Colonial (British)	Community Hall	Bangla College Road, Anderkillah
25	Kamala Kanta Theatre Hall	Colonial (British)	Recently Demolished	Sadarghat Road, New Market
26	Chin Lun Chinese Restaurant	Colonial (British)	Restaurant (Dilapidated)	Shahid Sohrawardi Road, Kotwali
27	P K Sen House	Colonial (British)	Residential	Sadarght
28	N N Paul Building	Colonial (British)	Education	Buddhist Temple Road
29	Chandanpura Jam-e-Mosque	Colonial (British)	Mosque	Siraj-ud-Dowla Road, Chandanpura
30	St. Mary's Church	Colonial (British)	Religious & Education	S S Khaled Road, Jamal Khan
31	Patharghata Church	Colonial (British)	Religious & Education	Bundle Road, Kotwali
32	War Cemetery	Colonial (British)	2nd World War Martyrs' Tomb	Sarson Road, Mehedibag, Kotwali

Source : DAP, 2005, Annex - 4

In this regard DAP also proposed a committee namely '*Heritage Committee*' composed of officials from Chittagong Development Authority (CDA), Chittagong City Corporation (CCC), Bangladesh Parjatan (Tourism) Corporation, Department of Archeology and other concern Government departments, for farther listing of heritage and architecturally important sites.

Description of some historical buildings is given below:

Zia Museum (formerly Circuit House)

On the 30th may, 1981 the president of Bangladesh General Ziaur Rahman was killed in the room on 4 of Chittagong Circuit House was built by the British ruler in India in residential building of Govt. high officials. Most of Zia's activities including his household goods are preserved in this museum. This house was also used by Pakistani army as a torturing center during the liberation war of Bangladesh.

Court Building

Situated on the Fairy Hill, this building commands a magnificent bird's eye view of Chittagong city, particularly at night. This gigantic Judge Court building was built immediately after the East India Company conquered and declared Chittagong as a separate administrative area in 1773. The building is huge, over 250 thousand square feet and has hundreds of rooms.

War Cemetery

The War Cemetery on Badshah Mia Road is another place of historic interest. It contains the graves of 755 soldiers of the Allied Forces who laid down their lives on the Indo-Burmese front during World War II. Most of the soldiers buried there were from Australia, Britain, Canada, East

and West Africa, British India and New Zealand. The total area of the cemetery is eight acres and it is protected and maintained by the Commonwealth War Graves Commission.

Kadam Mubarak Mosque

Kadam Mubarak Mosque is located at Jamalkhan ward of Chittagong City Corporation. The locality adjacent to this mosque is known as Kadam Mubarak, deriving the appellation from the two holy footprints on stone preserved in a room contiguous to the prayer chamber of the mosque. From an inscription it is known that Muhammad Yasin, a local faujdar, built this mosque in AH 1156 (AD 1723) during the reign of Mughal emperor Muhammad Shah.

Wali Khan Mosque (Chittagong)

It is situated at Chawk Bazar, city centre of Mughal Chittagong. Wali Beg Khan, a Mughal Faujdar at Chittagong, built the six-domed masonry mosque in between AD 1713-1716. He also made a gift of 120 *drona*s of land in Kadalpur, Nizampur and Sandwip for the upkeepment of the mosque. Wali Khan founded Chawk Bazar and built his residence with a kutchery near by. He also dug a big tank near his residence known as *Kamaldaha*.

Heritage Site Conservation Methodology

As per Chittagong Metropolitan Building Construction Rule' 2008 a high profile special project permission committee was formation to give permission or conservation within or around 200m buffer from each heritage site.

The said committee will be formed as follows:

1.	Chief Town Planner, CDA	Chairman
2.	Superintendent Engineer, PWD, Cicle-1, Chittagong	Member
3.	Town Planner, CDA	Member
4.	Executive Engineer, CDA	Member
5.	General Secretary, IAB, Chittagong Branch	Member
6.	General Secretary, IEB, Chittagong Branch	Member
7.	General Secretary, BIP, Chittagong Branch	Member
8.	Senior Architect, CDA	Member Secretary

In Article No. 61 (concerning conservation and preservation) of this rule, it is stated that, to protect historical building and important places authority can enact the following regulations:

a) Authority will preserve a list of buildings to be conserved.

b) To prepare this list, authority may consult with Archaeological Department, IAB or experts on historic, scenic, scientific, social, spiritual buildings.

c) After preparation the list of building, Authority has to notify the concern owners of the buildings.

d) After preparation of the list of buildings, Authority has to demonstrate the list for general public.

e) For any change, extension, addition, destruction of this buildings, one has to obtain written permission from Nagor Unnayan Committee *(City Development Committee).*

f) Authority can permit (fully or partially) applications to change, extent, adjoin or destruct the listed buildings and can impose reasonable condition also.

g) The permission from the authority will be valid up to 3 (three) years.

h) If any person do change, extent, adjoin or destruct of the listed buildings, authority will order the occupier or owner to impede the tasks.

i) If it seems that there is lack of superintending of the listed buildings, authority can acquire the listed buildings.

j) Authority can list special scenic, historic, scientific, social, spiritual or naturally remarkable area as conservation site.

k) Authority will take steps to upgrade and conserve the areas from time to time.

Plan Approval Process

There are two types of Plan approval process

- One is Simple Type Approval Process
- Another is Special Project Approval Process

Here we are dealing with Special Project Approval Process

My project will be a helping tool for the special Project Permission Committee as well as other Town Planning Officers who usually dispose simple planning applications.

How GIS can be helpful in this Process?

- Since the Inception, GIS is being used in various field of Planning, Engineering and so on
- Regarding my project work, I have used GIS to store data of historic sites in a systematic manner.
- I created buffer zones in three layers (50m, 100m and 200m) around each heritage sites
- I also included surrounding structures and other features within the buffers.
- I made it convenient for the decision makers to know about each of the historical sites and its surroundings by joining attribute table into a single table.
- The project will be helpful for the decision makers to differentiate among planning applications whether they are special type or simple type.
- It will be helpful for Special Project Permission Committee to prepare separate guidelines for each individual structure within the buffer.
- Monitoring of illegal encroachments will be much more easier

Data Collection and Methodology

▸ All primary data are taken from existing physical feature survey of Chittagong Metropolitan Master Plan Area, conducted under the project "Preparation of Detailed Area Plan for CMMP"

▸ ArcGIS 9.3 Software used in this project

▸ Base Map for Chittagong City Area was prepared

▸ Heritage Sites have been identified on this base map

▸ Three buffer areas have been created around each heritage site-

      Red Buffer (50m) : Highly sophisticated area for heritage

      Yellow Buffer (100m) : Moderately sophisticated

    Green Buffer (200m) : Out of danger zone but needs   supervision

▸ Clipping Structures within each heritage site

▸ Used the Intersect Tool of ArcTool Box to share the buffer data and structure data in same table

▸ Then data of intersected table and heritage site attribute table are spatially joint by using Overlay Tool to get all the information in a single table.

▸ Finally I prepared the Heritage Base Map

Attribute Table

The attribute table for heritage sites consists of following fields:
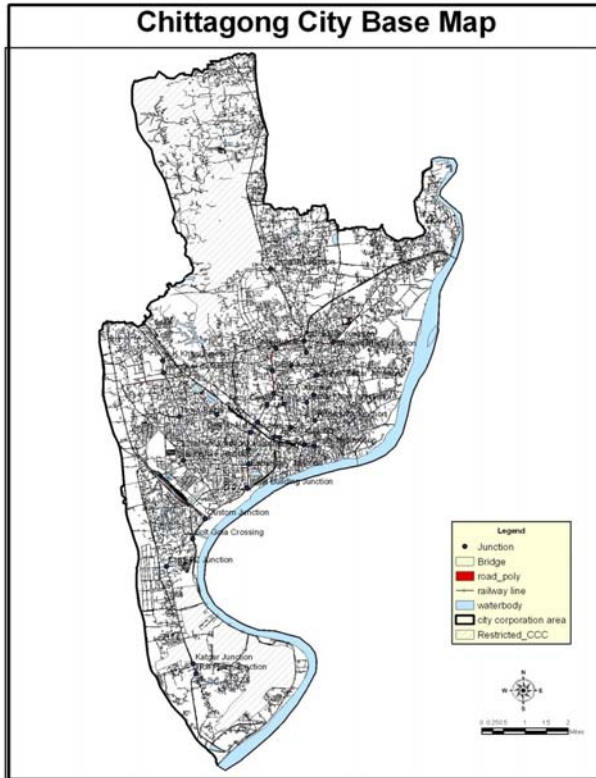
- ID number
- Name of the Site
- Period of construction
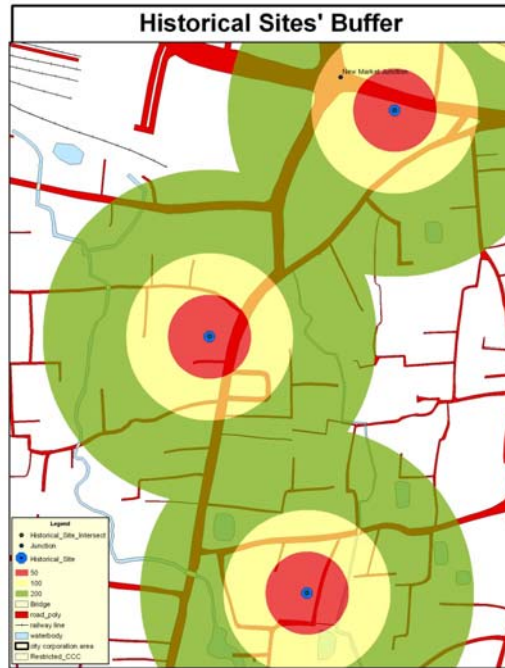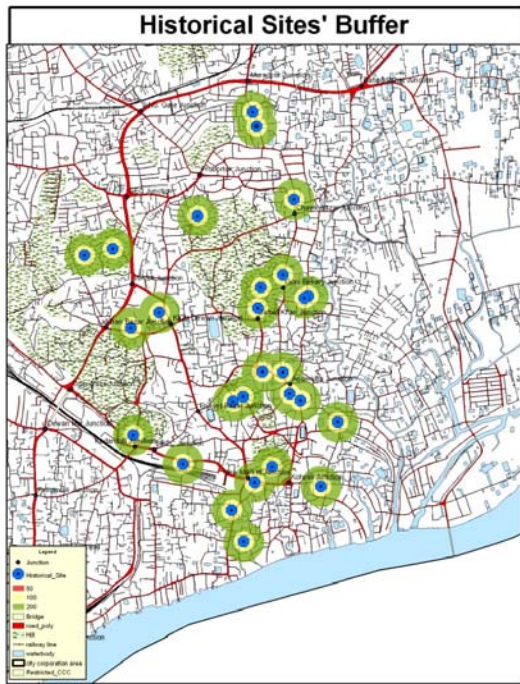- Present Use of the Structure
- Location

Output

First task was to prepare a city base map.

City's core area, where most of the heritage buildings are located

Identification of heritage sites on the base map and creation of buffer around each heritage site
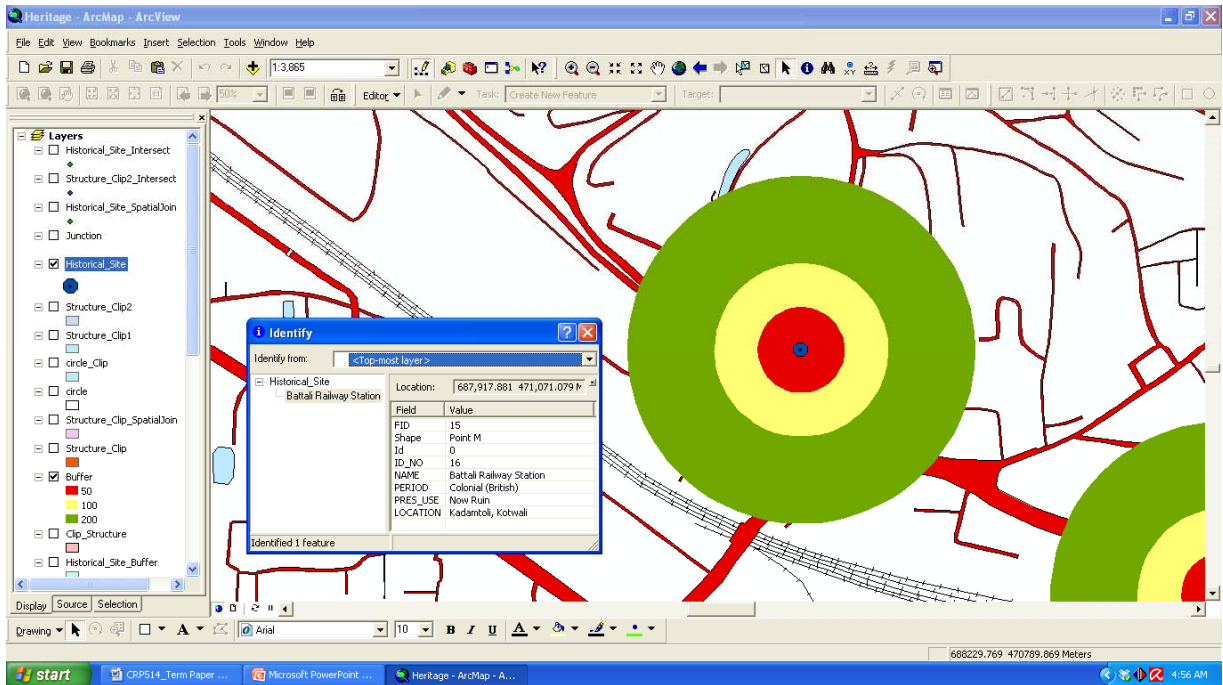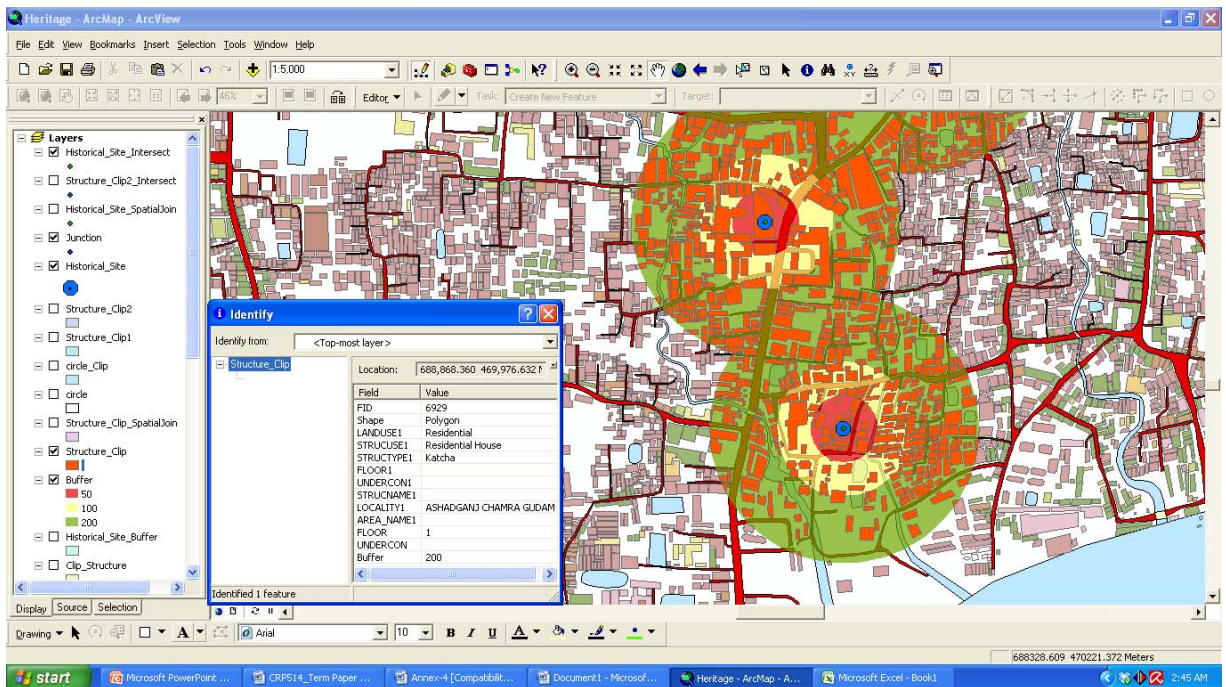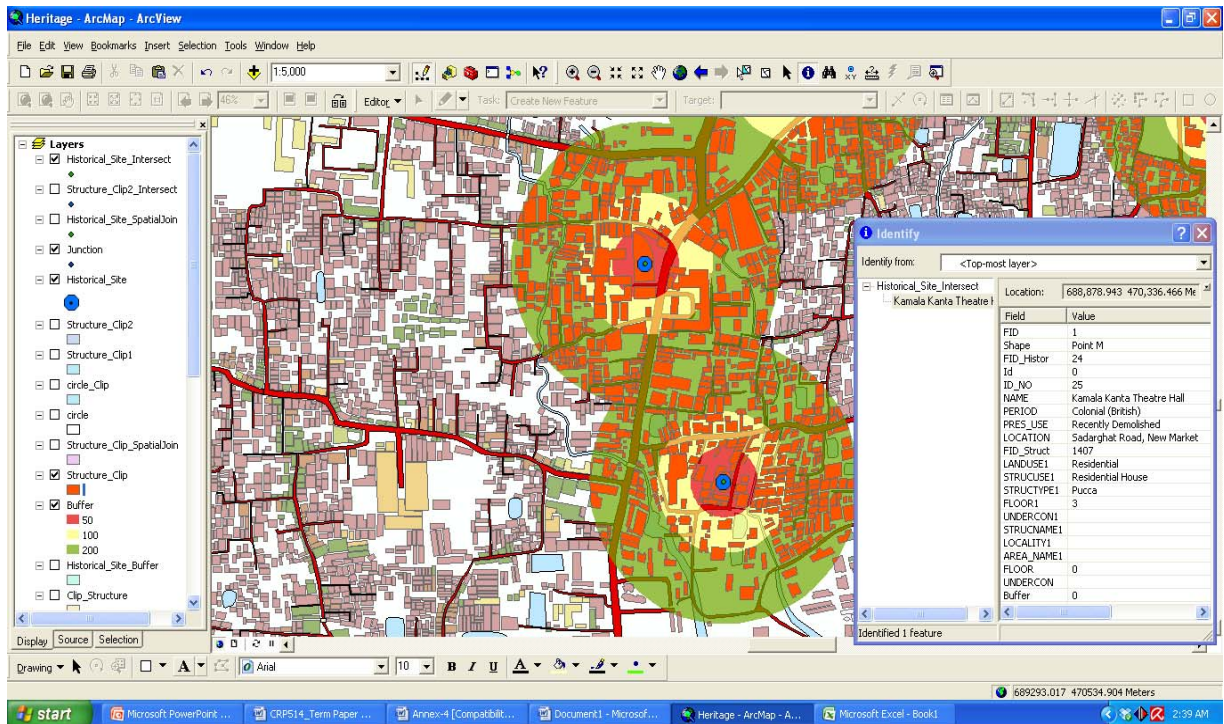

Table showing primary information of a heritage site

Clipping Structure within the Buffer

After Intersection, the attribute table showing that the pointed structure is within 200m buffer zone

After spatially joining several tables the final table shows all the information of the heritage site

Conclusion

The application areas of GIS are increasing very rapidly. Planning sector is one of the most potential sectors to apply GIS. Lack of actual identification and proper monitoring, invaluable heritage sites located all over Chittagong are ruining day by day. With application of this project, my project output will be a very important tool for the decision makers.

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