URP 4142: Environmental Planning and Management Studio

A Report on

Environmental Profiling in Khulna City (Ward 02)

Submitted by:

Anim Saha

Roll No: 1617040

Submitted to

Dr. Md. Mustafa Saroar

Professor, Dept. of Urban & Regional Planning, KUET

Md. Nazmul Haque

Lecturer, Dept. of Urban &Regional Planning

Department of Urban and Regional Planning

Khulna University of Engineering & Technology

Table of Contents

List of Figures

Chapter 01: Overview of the Study

This chapter contains the background of the project, objectives, scope and limitations of the project. It is the basic segment for the acknowledgement and working outline of the project.

1.1. Background of the Project

Environment profile is the characterization of environment where a system will be used that may include ambient lighting and noise, temperature, humidity, smoke, chemical substances, vibrations, any kinds of pollution, the visual environment etc. (labs, 2002-2015). That means it appraises environmental indicators which reflect impacts that occurs globally, regionally and locally in air, water and land as well as has a great impact upon humans and the environment (Inc, 2019). These impacts are assessed with the help of issued categories under certain range and then normalized. The weighted data will help to generate a measure of environmental impact which will act as a proportion of the annual impact of a city. An environmental profile provides a systematic overview of the development, environment and disaster setting, and institutional arrangements of an urban area, which is designed to highlight the environment-disaster interactions, the critical issues, and the sectors and stakeholders directly concerned with them (Srinivas, 2015). It is an important tool for the identification of the main environmental issues which is to be considered during the development of the national strategic paper (Fabien, 2006). A developing country like Bangladesh is going through a vast change in urbanization and civilization. Acres of agricultural land is turning into built area and thus the extension of city is expanding day by day. As a port city like Khulna is also not out of its influence. Industrialization and transportation etc. are increasing at the pressure of expanding population. As a planner it is very necessary to determine environmental profile for developing short and long term plans for land use in urban and rural areas while balancing considerations such as social, economic, and environmental issues. A planner also balances the economic demands of the city's growth with the environmental concerns associated with urban expansion regained which will help him to make more effective development plan that will also cover the maximum threshold values for meeting the demand. In this paper the environmental profile of ward no 2 of Khulna city is studied. Here multi criteria quantitative approach has been followed to find out the environmental profile.

1.2 Objective of the Project

To investigate existing environmental scenario of the area by profiling the elements and finding the problems in respect of environment as well as propose solution to those problem based on the existing situation.

1.3 Scope of the Project:

The study could be used as a further guideline for future work related to environment. Different short and long term plan can be developed by keeping in mind the existing condition of environment. The condition of the environment can be improved by minimizing the pollutions as well as taking measure for pollution source.

1.4 Limitation of the Project:

i. As environment profiling is a very long term process it is very hard to get all information within small amount of time.

ii. All the data used in the study are might be obsolete as environment is a continuous changing process.

iii. As some data are obsolete, the results of the study may have some inaccuracy with respect to present or future scenario.

iv. Insufficient information from the information holder.

Chapter 02: Literature Review

This chapter contains the definition of environment profile, and other key terminologies. It also contains a case study related to environmental profile. It is the basic segment for the acknowledgement and working outline of the project.

2.1 Environmental Profile

Environment is the total set of surrounding; the ecological complex of physical, chemical and biological factors that act upon an organism, population or an ecological community and ultimately determine its form, functions and survival. Environment is the product of a complex of variable factors which include (i) substances (soil, water), (ii) conditions (temperature, light), (iii) forces (wind, gravity), (iv) organisms (plants, animals and microbes) and (v) time, An environmental profile is a graphical presentation of environmental burdens. The concept may be used to present the results from a number of different stages (Edwards, 1997). It is the document one use to define the Natural Environmental Characteristics, Item Platform Characteristics, Platform Environments, and Design Requirements which will yield tailored Test Procedures.

2.2 Environment Profile Methodology

The Environmental Profiles Methodology is a standardized method of identifying and assessing the environmental effects associated with environmental materials over their life cycle - that is their extraction, processing, use and maintenance and their eventual disposal (Environmental Profiles Methodology, 2019).

2.3 Environmental Planning

Environment planning is the planning process for the environmental pillar of sustainable development (Ellis, 2010). It can also define as the theory and practice of making good, interrelated decisions about the natural environment (natural resources, wildlife, and natural hazards), working landscapes (farms, forests, and lands from which minerals are extracted), public health (air and water pollution, toxics and waste disposal) and the built environment. Environmental planning is done by different agencies mainly the key planning agencies (T.L.Daniel, 2009). Many environmental agencies also establish policies that guide future decision-making which can help in providing adequate environmental protection.

2.4 Environmental Management

Environmental management is the process which is related to the rational adjustment of people with nature that involves judicious exploitation and utilization of natural resources without disturbing the balance and equilibrium of ecosystem (Kumar, 2016). It can also refers as a goal or vision that attempts to direct a process, to the application of a set of appliances, to a philosophical exercise seeking to establish new perspectives towards the environment and human societies (C.J.Barrow, 2005).

2.5 Environmental Impact Assessment

Environmental Impact Assessment (EIA) is the process of assessing the likely environmental impacts of a proposal and identifying options to minimize environmental damage. The main purpose of EIA is to inform decision makers of the likely impacts of a proposal before a decision is made. EIA provides an opportunity to identify key issues and stakeholders early in the life of a proposal so that potentially adverse impacts can be addressed before final approval decisions are made (Bisset, 1996). EIA is a structured approach for obtaining and evaluating environmental information prior to its use in decision-making in the development process. This information consists, basically, of predictions of how the environment is expected to change if certain alternative actions are implemented and advice on how best to manage environmental changes if one alternative is selected and implemented.

2.6 Environment Pollution

Environmental pollution is defined as the contamination of the physical and biological components of the earth/atmosphere system to such an extent that normal environmental processes are adversely affected (Iyyanki V. Muralikrishna, 2017). Pollutants can be naturally occurring substances or energies, but they are considered contaminants when in excess of natural levels. Any use of natural resources at a rate higher than nature's capacity to restore itself can result in pollution of air, water, and land. It is the unfavorable alteration of our surroundings, wholly or largely as a byproduct of man's actions, through direct or indirect effects of the changes in the energy pattern, radiation levels, and chemical and physical constitution and abundance of organisms (Rai, 2016).

2.7 Ecosystem

Ecosystem is a biological system which is composed of all the organisms that are found in a particular physical environment. The organisms are interacting with it and each other (Tsujimoto, Kajikawa, Tomita, & Matsumoto, 30 June 2017). It can be seen as the complex interactions among biotic and abiotic elements of ecosystems which encompasses as broad terms material cycles and flow of energy (Lyon & Brigham, 2005). Natural and semi-natural ecosystems provide benefits to human society, which are of great economic, ecological and socio-cultural value (Hermann, Schleifer, & Wrbka, 26 March 2011).

2.8 Ecological Profile

An Ecological Profile can be defined as more comprehensive replacement of the usual socioeconomic profile that gives equal coverage to the physical, biological, socioeconomic, cultural and built environments. It is a document that contains information of a certain environment. It contains data about the present flora and fauna (plants and animals) and the problems that arises because of these living things, the present and past state of the area's environment and other things.

Case Study 01

The study was conducted in Sundarban the largest mangrove forest which is situated in South-eastern most point of Bangladesh which is about 8km west of the Myanmar coast that covers 5.9 km2 and has five physiographic areas plus an extensive marine zone. It is heavily influenced by the subtropical monsoonal climate that prevails over Bangladesh although it lies within the tropical belt, the climate of the Island. The whole project is done under Coastal and wetlands Biodiversity Management Project which was done by a partnership between Department of Environment Ministry of Environment and Forest and UNDP Bangladesh.

In the profile some physical features like (geology, geomorphology, sea water, fresh water), ecosystem (ecosystem diversity, rocky habitat, sand dunes and beach, lagoons, wetlands, marine habitat, vegetation, species of conservation significance), people etc. are included. It is clear that the rapidly increasing population of island create a growing pressure upon land and resources due to expanding need for housing, food and income. Besides unregulated tourism has a great effect upon the health of this unique system. Unless tourists visiting, this island quickly adopt

ecologically responsible behavior though the unique flora and fauna of the island has experienced tragic changes over the last two decades which will continue to be degraded. So, initiative should be taken to conserve biodiversity resources which must address both population and poverty.

Some management policies and strategies are given to improve the situation that are policy harmonization and enhancement, awareness, knowledge management, monitoring and evaluation, Natural Resources Accounting, Leveraging national and international partnerships, activating a marine protected area system, enhancing institutional capacity. Besides the whole study area is divided into some important zone like Managed Resource Zone, Sustainable Use Zone and Restricted Access Zone so that development can done easily according to the specialty of the zone. Concern should be given to the development of ecotourism so that it can bring greater benefits to local people as well as has a great effect upon country's GDP.

Case Study 02

The project country environment analysis was conducted in Islamic Republic of Pakistan which is positioned mainly in the Middle East and is situated in both the northern and eastern hemispheres. It is bordered by the countries Afghanistan, China, India, Iran as well as Arabian Sea.

The main objective of the project was to make an informed assessment of the environmental needs, opportunities, and challenges that Pakistan faces. From the study it is seen that Pakistan's environment and natural resources are increasingly polluted and under stress because of poverty declination. It faces problem to manage scarce natural resources, pollution and waste management and the issues that pertain potential vulnerabilities to natural hazards and climate change. Renewable fresh water resources are fast depleting because fresh water flows are substantially by water diversion which is used by agricultural irrigation that results salinization because of low levels of efficiency. Besides an excessive and improper use of pesticides is destroying the natural biotic balance. The traditional breeding grounds for commercially important sea life named Mangrove have also declined. Air quality has declined drastically due to increasing vehicle numbers and their hazardous emissions which causes different health problems. Industrials toxic discharges are contaminating some of the country's best soils and water resources. Besides there occurs some natural hazards like flood, earthquake, drought and cyclones that destroy the standing crops several hundred kilometers inland.

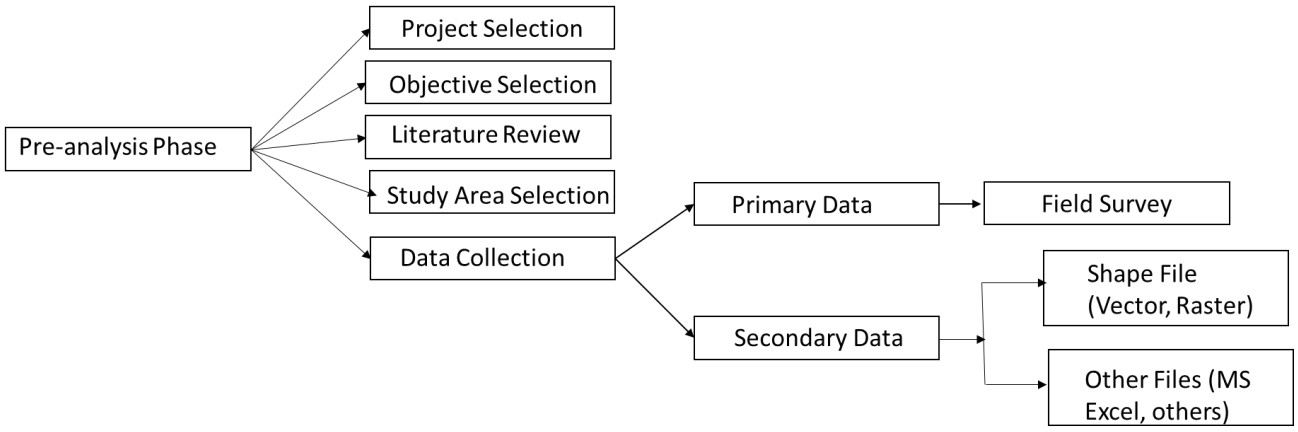
To minimize the problems some macro policy framework are considered that takes into account environmental considerations by setting targets as well as allocating resources for environmental programs and foresee major investments in large infrastructure projects including the priority areas of urban development, energy, power, roads, water and irrigation. Focuses should be given upon "improving energy efficiency" and "improving the reliability of energy services". Emphasis should be given upon developing the capacities of EMS consultants to help industries attain ISO 14001-2004 certification and improve their export competitiveness and upgrade the local environment as well as developing the capacity required to conduct environmental monitoring, analysis and communicating the results clearly. To reduce the vulnerability of the poor and protecting key infrastructure in the water resources and agriculture sectors as well as ability to adopt climate change. Finally Pakistan Resident Mission's in house capacity for environmental analysis needs to be upgraded in view of the challenges of environmental sustainability associated with policy and program level support and for the programmatic support of ADB this project must be sufficiently equipped.

Chapter 03: Methodology

This chapter reflects a detailed methodology to determine environment profile. The procedure began with selecting ward no-02 as the study area. The overall detailed methodology has been described in this chapter that includes collecting and analyzing of data. All analysis were done using ArcGIS software. Thus after some specified key findings through analysis several measures are recommended for future development of environment profile.

3.1 Pre-analysis Phase

Pre-analysis includes from the project selection to data collection. It also includes data source which means the place from which secondary data were collected.



3.1.1 Project Selection

The project was selected to determine the environmental profiling of an area that will help to determine future environment condition of an area. The environment condition can be improved by minimizing pollution and proper management of pollution source of that area. This project is also important to know the need and requirement of the people of that area**.**

3.1.2 Objective Selection

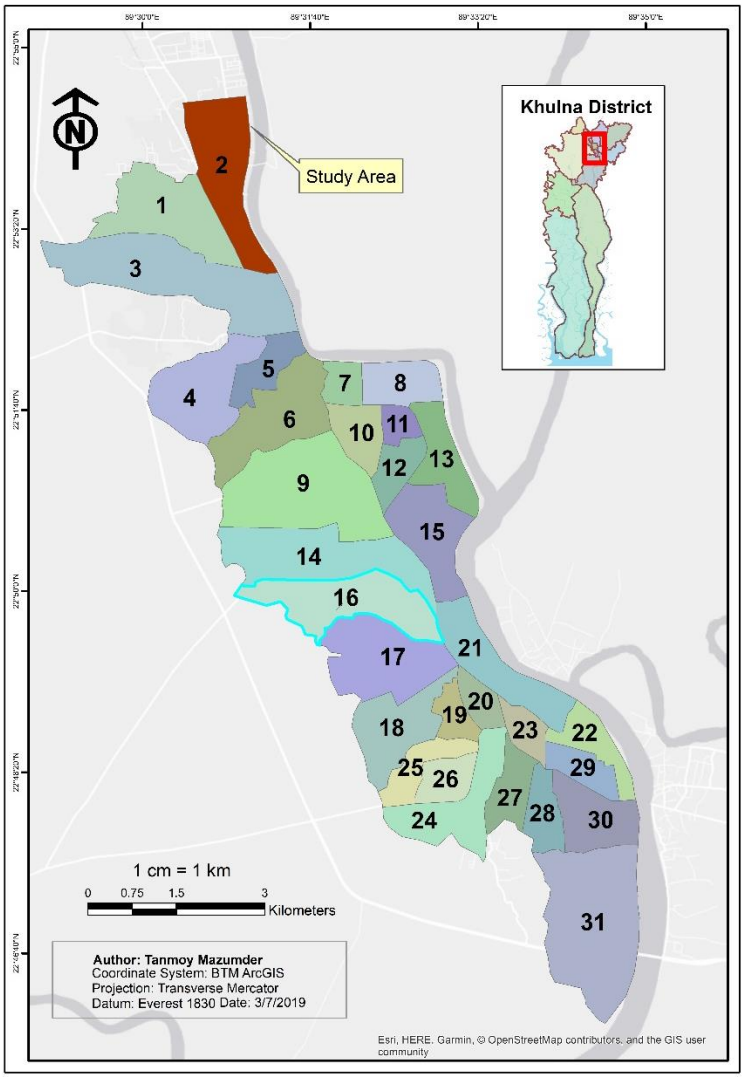
To determine the main goal of the project an objective is selected which will defined the future scope, rationale and limitations of the project.

3.1.3 Literature Review

Some research paper relating environment profile and other related topics have been reviewed for the proper understanding of the project. Different factors relating environment profile that are considered in those papers helped to find the output results of this project.

3.1.4 Study Area Selection

Ward 02 among 31 ward of Khulna City Corporation is selected as a study area in this project that is located in between 24°45' and 24°54' north latitudes and in between 89°28' and 89°35' east longitudes. It includes Mirerdanga, Senpara and some parts of Religate.



Map 1: Study Area

3.1.5 Data Collection

- ✓ **Primary Data:** Data was collected primarily with help of field survey. By interrogating the people of the ward primary data has been collected. By visiting the place, the information about water supply and sanitation can be known.
- ✓ **Secondary Data:** The secondary data has been collected from past research, thesis papers published by NGO's or researchers related with Khulna city water and sanitation condition. The existing water supply datum are collected from the KWASA (Khulna Water and Sewerage Authority), Municipality Office and KDA. The format of data was shape file (.shp) which were collected from secondary sources like Diva-GIS, Mapcryzin, WARPO, BMD, Osmic Online, BMD etc.

3.2 Analysis Phase

Analysis phase includes data analysis. The data that found from the data collection phase should be analyzed in appropriate way. In this project data are analyzed with the help of GIS.

3.3 Post-analysis Phase

3.3.1 Findings

Using the appropriate analysis, that help us to find out the problem and some appropriate solution. The finding will be helped to make the present environmental profile.

3.3.2 Recommendation

Based on the findings, some solution can be recommended to solve the existing problem of environmental profile. The recommendation must be sustainable so that it may help to solve the present problem as well as can work as a guideline for future environmental profile.

3.3.3 Conclusion

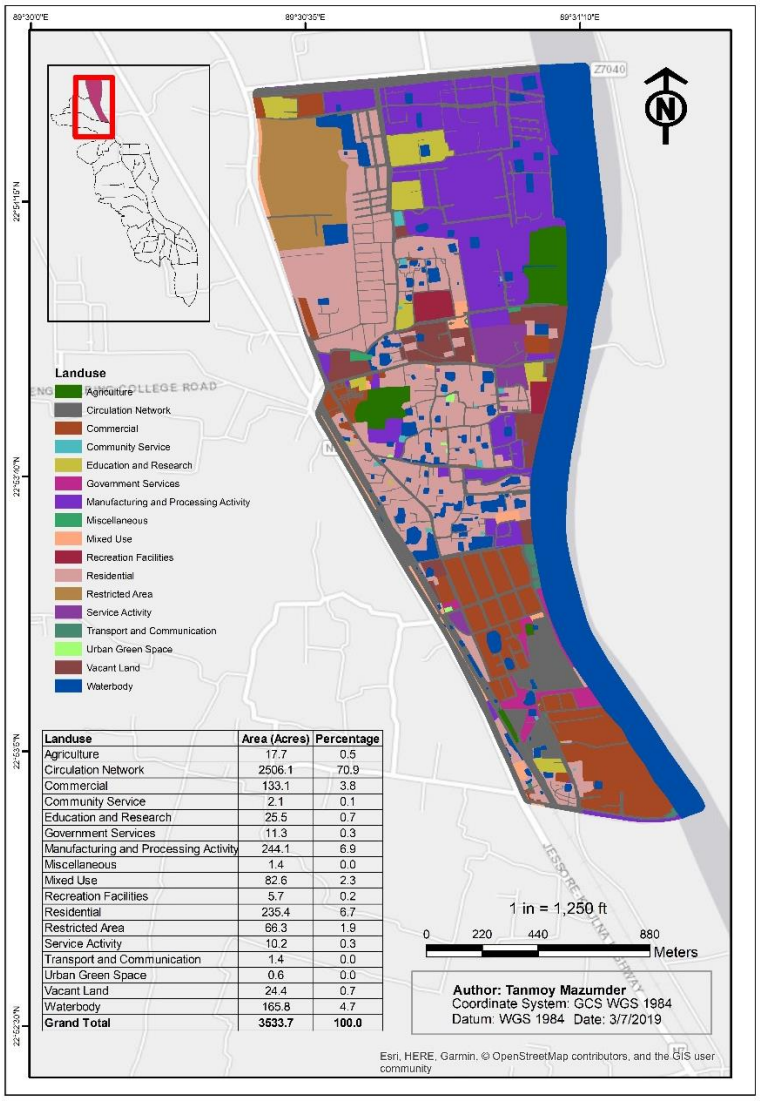
The conclusion consists of some suggestion that helpful for solving the problem of the area. It gives us a summary of all the problem and working process that need to solve this existing scenario.

Chapter 04: Findings and Discussion

In this chapter, the results by following the methods are shown. There is also analyzation of the results, both theoretically and statistically. ArcGIS software is mainly used for analysis.

4.1 Existing Land use

About 7% of total land area of ward 2 is used as industrial area. Residential area is about 7%. As different industries like Sonali Jute Mill, Agax Jute Mill, United Jute press, Daulatpur Jute press etc. are situated in ward 2, the internal connectivity is very good. The details of existing landuse is shown on the map 2.

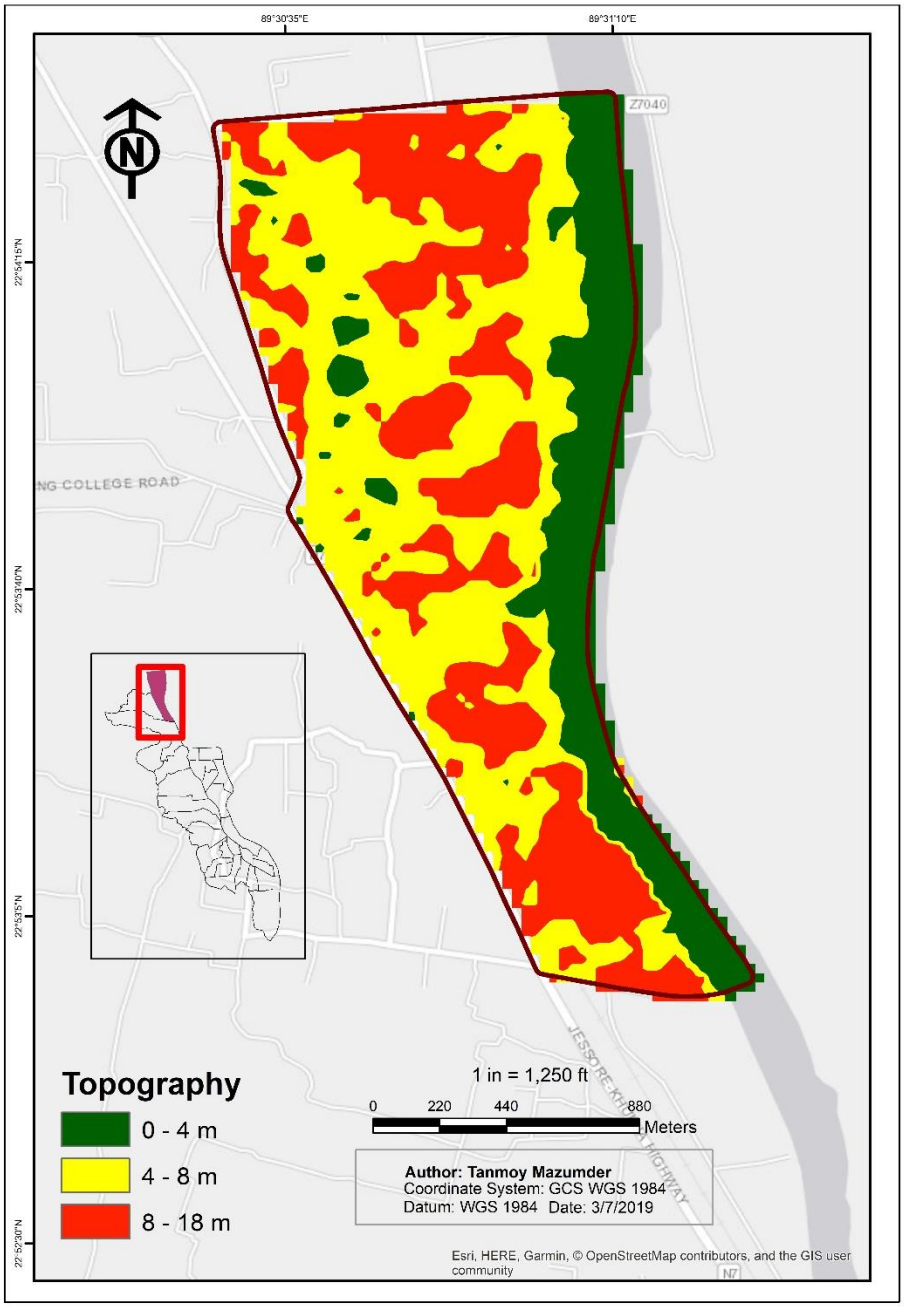


Landuse	Area (Acres)	Percentage
Agriculture	17.7	0.5
Circulation Network	2506.1	70.9
Commercial	133.1	3.8
Community Service	2.1	0.1
Education and Research	25.5	0.7
Government Services	11.3	0.3
Manufacturing and Processing Activity	244.1	6.9
Miscellaneous	1.4	0.0
Mixed Use	82.6	2.3
Recreation Facilities	5.7	0.2
Residential	235.4	6.7
Restricted Area	66.3	1.9
Service Activity	10.2	0.3
Transport and Communication	1.4	0.0
Urban Green Space	0.6	0.0
Vacant Land	24.4	0.7
Waterbody	165.8	4.7
Grand Total	**3533.7**	**100.0**

Map 2: Existing Land use of ward 02

4.2 Topographic condition

This ward is less vulnerable in terms flooding. The slope of land is higher than other words. The average height from mean sea level is about 15m. The slope of land in ward 2 is shown on the below map.



Map 3: Topographic condition of ward 2

4.3 Temperature and sun path

The climate data for Khulna shows us that Khulna is in a temperate area. Khulna is humid during summer and pleasant in winter. Khulna has an annual average temperature of 26.3 °C (79.3 °F) and monthly means varying between 12.4 °C (54.3 °F) in January and 34.3 °C (93.7 °F) in May. Its average high temperature is recorded in April and May which is respectively 34.6 and 34.3 degree centigrade (according to the Bangladesh Meteorological department [2010, 2011, 2012, 2013, 2014]

Climate data for Khulna [hide]													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	25.6 (78.1)	28.5 (83.3)	33.1 (91.6)	34.6 (94.3)	34.3 (93.7)	32.9 (91.2)	31.8 (89.2)	31.8 (89.2)	32.1 (89.8)	32.1 (89.8)	29.9 (85.8)	26.5 (79.7)	31.1 (88)
Average low °C (°F)	12.4 (54.3)	15.4 (59.7)	20.5 (68.9)	23.9 (75)	25.2 (77.4)	26.1 (79)	26.0 (78.8)	26.2 (79.2)	25.8 (78.4)	24.1 (75.4)	19.6 (67.3)	13.9 (57)	21.6 (70.9)

Figures shown in degrees from vertical

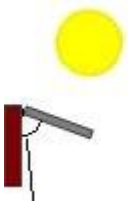
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
51°	59°	67°	75°	83°	90°	83°	75°	67°	59°	51°	44°

On the other hand average lowest temperature is recorded in January which is 12.4 degree centigrade.

Winter

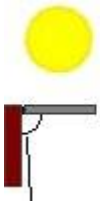
44° angle

Spring/Autumn



67° angle

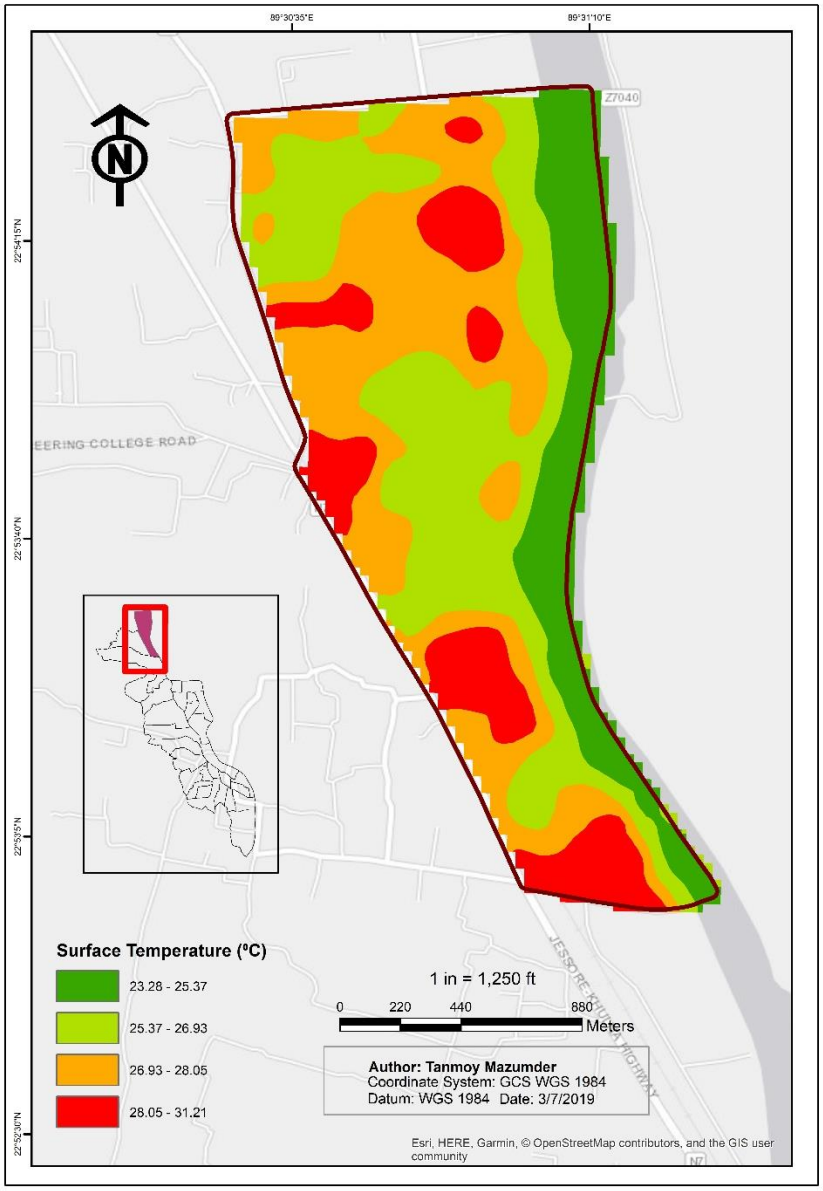
Summer



90° angle

On the 21st December, the sun will rise 80° east of due south and set 80° west of due south. On the 21st March/21st September, the sun will rise 91° east of due south and set 91° west of due south. On the 21st June, the sun will rise 102° east of due south and set 102° west of due south. So it is clear that the site gets maximum heat in the summer season (May-August). Especially in the afternoon the heat comes from the west side as it gets maximum day light in the Jun.

4.4 Heat Island effect



Map 4: Heat Island effect in ward 2

The term heat island describes built up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with 1 million people or more can be 1.8–5.4°F (1–3°C) warmer than its surroundings. In the evening, the difference can be as high as 22°F (12°C). Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality. If we compare the landuse map to map 4, then it is seen that areas with bare soil and built-up areas show a higher temperature while other categories, such as water bodies, agriculture and vegetation, have lower temperature values.

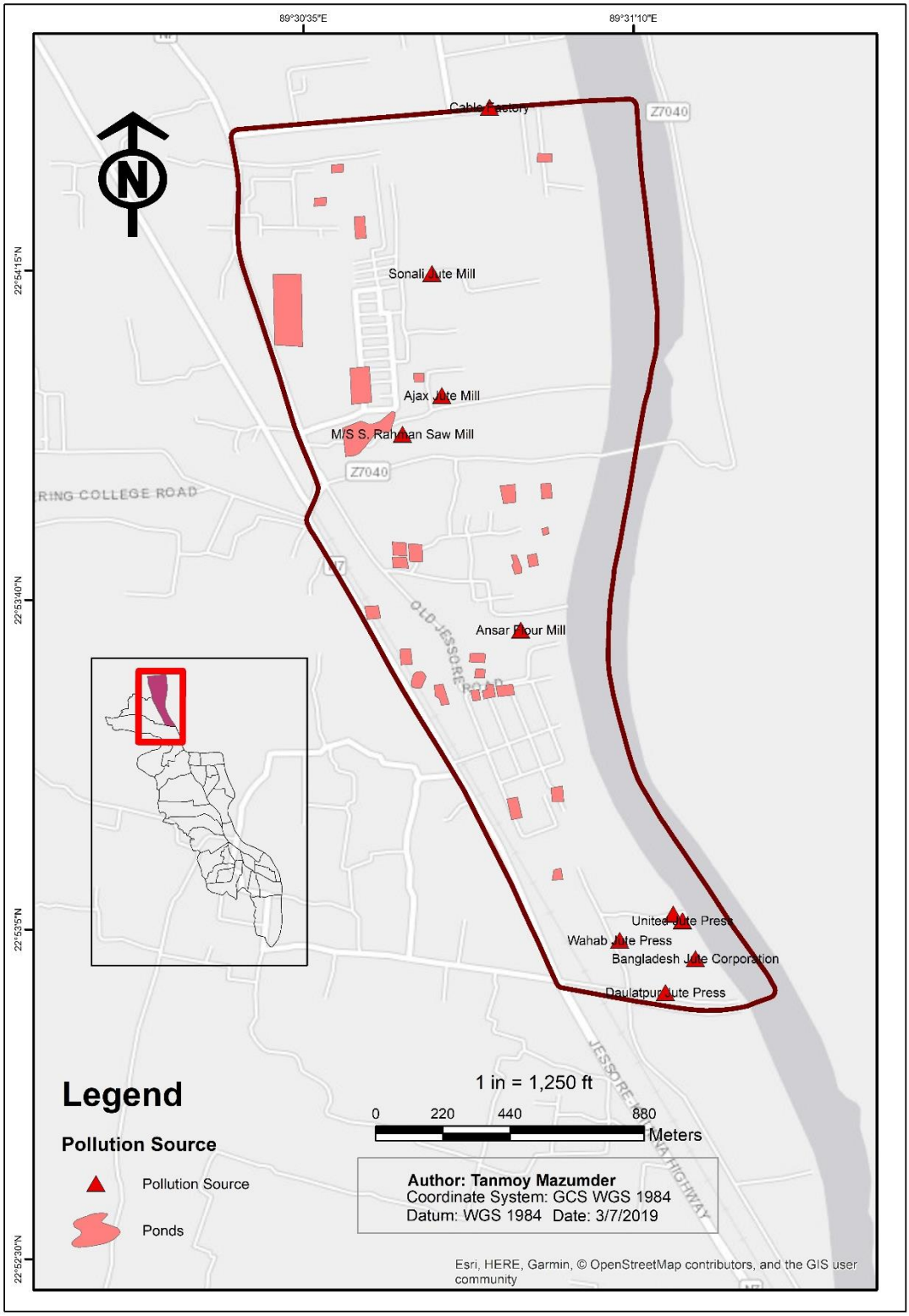
4.5 Pollution sources

Ward 2 is mainly an industrial area. So, the main pollution sources lie within the industries. Besides, dumping of household wastage here and there specially in ponds, beside roads causes environmental pollution. The main pollution sources in ward 2 are given below:

- Industry, waste disposal site, latrine beside roads
- Poor maintenance of drainage system and sanitation.
- Dumping household wastages by the community people here and there.

Figure : Pollution sources in ward 2 (Source: Field survey, 2019)

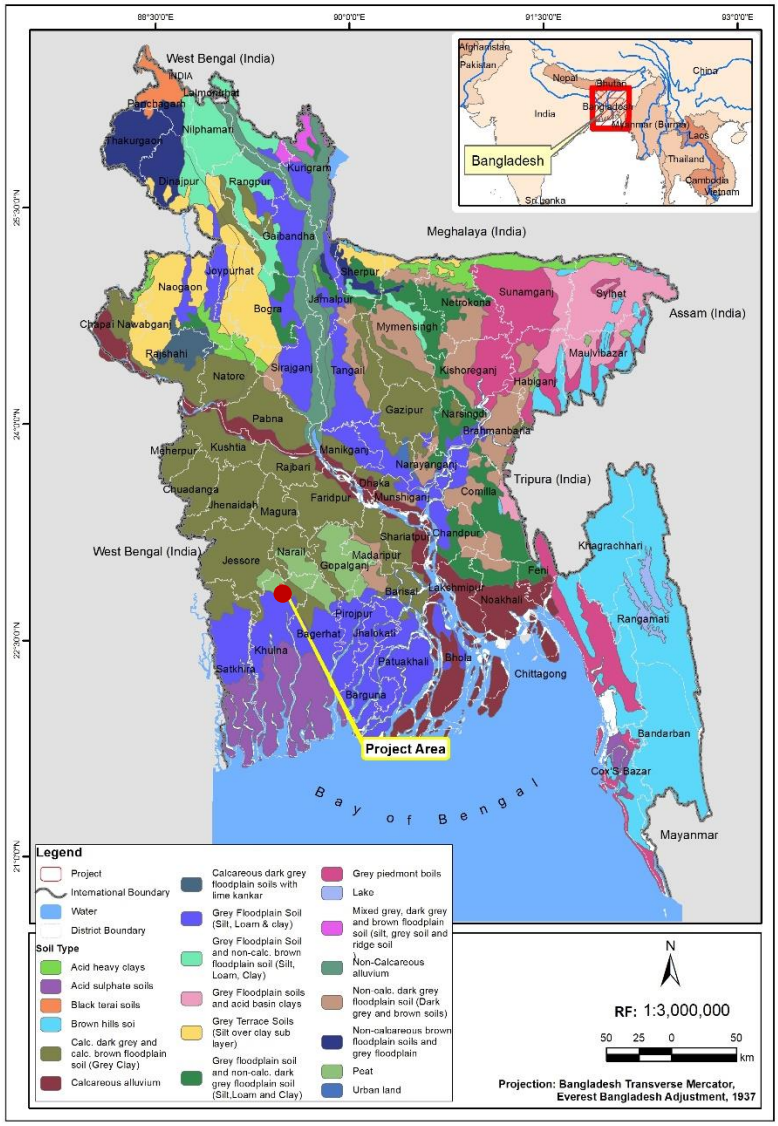
The below map shows the major pollution sources in ward 2.



Map 5: Major pollution sources in ward 2

4.6 Soil condition

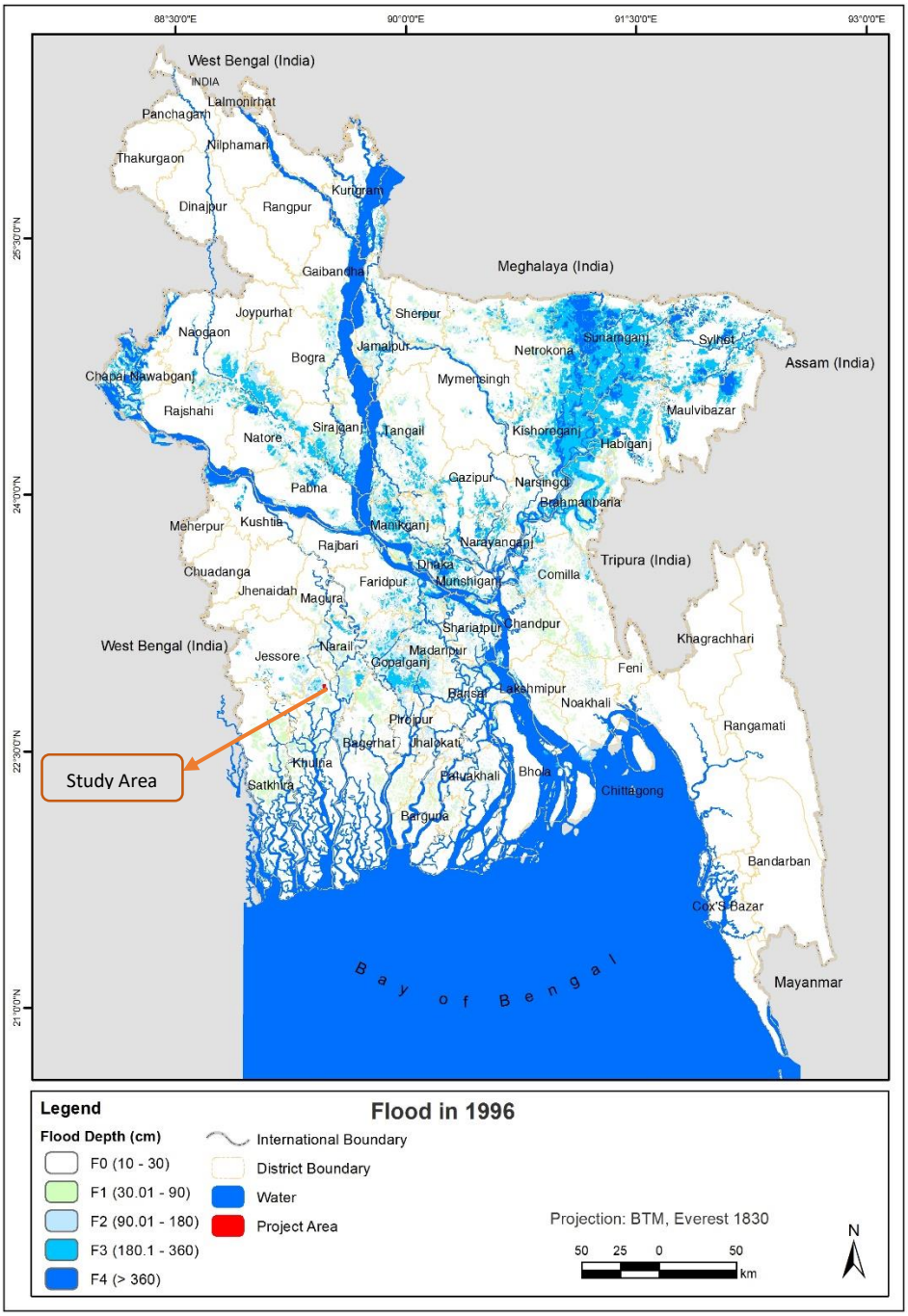
Khulna City, situated in the south east of Bangladesh, is generally underlain by soft recent swamp deposits. The soft soil areas of Bangladesh showing the location of Khulna area are of bearing layer at moderate depths poses problems for construction of buildings between 4 and 6 stories, which are the more desired types in this area. Buildings above 6 stories are founded on piles whose length often exceed 30 m. In ward 2, non-calcareous Grey Flood Plain soils seasonally flooded soils developed to below 25 cm, dominantly grey in sub-soils, not very strongly acidic throughout the upper 50 cm and not calcareous within 125 cm from surface.



Map 6: Soil type map of Bangladesh

4.7 Flood level

Khulna is in F1 flood level area denoted by the Flood map. It is in normal flood level area which is in average 30 to 90 high from the danger level of flood. As ward 2 has higher slope than other wards, flood risk is not as severe as other wards.



Map 7: Flood depth map of Bangladesh

Chapter 05: Conclusion

Environmental profile is very important to identify the main environmental issues of present situation. Among the 31 wards of Khulna City Corporation slope of ward 02 is high than that of other. For this it is not so vulnerable for flood and water logging than other ward. As most part of the ward contain industries, the percentage of pollution as well as pollution source is comparatively more than other ward of the Khulna City Corporation which has a great impact upon human and environment of that ward. So some short and long term plan should be introduced to minimize these problem as well as to find an alternative for these problem which can work as a great solution for the present problems and can work for the future improvement of the environment profile of the regions as well as the whole country.

References

Bisset, R. (1996). *Environmental Impact Assessment: Issues, Trends and Practice.* United Nations Environment Programme (UNEP).

C.J.Barrow. (2005). *Environmental Management and Developing Countries.* Routledge, London.

Edwards, S. (1997). *ENVIRONMENTAL PROFILES OF CONSTRUCTION.* Paris: Building Research Establishment.

Ellis, M. (2010). A Methodology for Evaluating Environmental Planning Systems: A case study of Canada. *Journal of Environmental Management, 91(6)*, 1268-1277.

Environmental Profiles Methodology. (2019). Retrieved 2 24, 2019, from BRE: https://www.bregroup.com/greenguide/page.jsp?id=2106

Fabien, D. (2006). *ENVIRONMENTAL PROFILE OF.* Kigali: European Commission.

Hermann, A., Schleifer, S., & Wrbka, T. (26 March 2011). *The Concept of Ecosystem Services Regarding Landscape.* Austria: Austrian Academy of Science.

Inc, B. R. (2019, 2 23). *BRE Global Certified Environmental Profile*. Retrieved 2019, from ECOLABEL INDEX: http://www.ecolabelindex.com/ecolabel/bre-environmental-profile

Iyyanki V. Muralikrishna, V. M. (2017). *Environmental Management chapter one-introduction.* Elsevier Inc.

Kumar. (2016, August 13). *Environmental Management: Concept, Scope and Aspects of Environmental Management*. Retrieved March 05, 2019, from Environmental Pollution: http://www.environmentalpollution.in/environmental-management/environmental-management-concept-scope-and-aspects-of-environmental-management/361

labs, F. (2002-2015). *Meaning environmental profile*. Retrieved 2 23, 2019, from Dictonary.university: http://dictionary.university/environmental%20profile

Lyon, K. G., & Brigham, C. A. (2005). *Rare species and ecosystem.* Conservation Biology.

Rai, P. K. (2016). *Biomagnetic Monitoring of Particulate Matter In the Indo-Burma Hotspot Region.* Elsevier Inc.

Srinivas, H. (2015, April). *GDRC*. Retrieved 2 23, 2019, from http://www.gdrc.org: http://www.gdrc.org/uem/disasters/disenvi/tools/index.html

T.L.Daniel. (2009). A Trail Across Time: American environmental planning from City Beautiful to sustainability. *Journal of the American Planning Association, 75(2)*, 178-192.

Tsujimoto, M., Kajikawa, Y., Tomita, J., & Matsumoto, Y. (30 June 2017). *A review of the ecosystem concept — Towards coherent ecosystem design.* Japan: Elsevier Inc.