



Revitalising Open Spaces in the Densely Populated City of Chittagong

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Revitalising Open Spaces in the Densely Populated City of Chittagong

by

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BArch, MURbDes

Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

Deakin University

December, 2023



**DEAKIN UNIVERSITY
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Acknowledgements

A substantial amount of individuals and organizations have helped with this study. first and foremost, my sincere appreciation goes to principal supervisor Associate Professor Dr. Beau Beza for his passion, vast expertise, altruistic effort, and genuine concern, all of which have greatly aided me in completing my PhD thesis. I am also thankful to my co-supervisor Dr Angela Kreutz for guidance in research and careful revision of my writing of this thesis.

I am also thankful to Professor David Jones who gave me the opportunity to pursue this research in the School of Architecture and Build Environment, Deakin University and supported me during the initial phase of my research. The supporting material from both Beau Beza and David Jones helped me a lot to develop my research in an appropriate direction.

I want to express my deep admiration to the Late Professor Shamsul Hossain, Member Secretary of Chittagong Centre for Advanced Studies (CAAS) for giving me support by sharing literature and his knowledge on history of Chittagong.

I am obliged of accredited professional editor Mary-Jo O'Rourke AE for providing copyediting and proofreading services for Chapters 1, 7 and 8 according to the national university endorsed *Guidelines* for editing research theses (Institute of Professional Editors, 2019).

I am grateful to Vahede Nosrati, a Deakin University Language and Learning Advisor, for her assistance with copyediting and proofreading Chapter 2.

My gratitude to the Chief Town Planner Ar. Shahinul Islam Khan and the Planning Department of Chittagong Development Authority for proving me with the necessary maps and data for my research.

Also, I would like to express my gratitude to my father late M A Mannan and my daughter Yushraa Manha for their support and encouragement all the way towards completing this research.

Above all, I am thankful to Almighty Allah to give me the opportunity and courage to conduct research on a problem in my own country.

Deakin University Protocols

This research is subject to a Human Ethics approved application and confirmation of Candidature, and the candidate has passed Deakin University's Human Ethics protocol.

This candidature commenced following June 2017 so is subject to Deakin University's PhD Xtra track and the candidate has passed the required SSC900 Academic Writing and Communication unit in T2/2017.

The candidate has passed Deakin University's Research Integrity protocol.

List of Publications and paper presentation:

1. Article: Developing an Open Space Standard in a Densely Populated City: A Case Study of Chittagong City (Accepted) By Maharina Jafrin and Beau B Beza

Publisher: MDPI, Special issue: Infrastructures, Vol. 3, no. 3, 40., Year: September 2018

Authorship statement 1- Appendix 16. <https://www.mdpi.com/341436>

2. Book Chapter: Conservation of historic open space urban landscapes of Chittagong, Bangladesh (Chapter 11) (Accepted)

Book: The Routledge Handbook on Historic Urban Landscapes in the Asia-Pacific, by Maharina Jafrin and Shamsul Hossain, Edited By Kapila D. Silva Edition:1st Edition.

1st Published 2020, eBook Published: 29 January 2020

Publication Location: London, Imprint: Routledge, Pages 199-215

Authorship statement 2- Appendix 17. DOI: <https://doi.org/10.4324/9780429486470>

3. Article: Developing a Data Driven Strategy and Guideline to Increase Per Capita Open Space and Relative Accessibility in Chittagong City (Accepted) by Maharina Jafrin

Publisher: MDPI, Special issue: Sustainability, Vol.14, no.16, 9828, Year: August 2022

<https://www.mdpi.com/1767618>

4. Conference paper: Waterways of Chittagong and Dhaka: socio-cultural influences on the development of cities open space (Panel presentation) (Accepted).

Seminar title: 8th SSEASR Conference on Rivers and Religion: Connecting Cultures of South and Southeast Asia,

Location: Dhaka, Bangladesh, Held on June 13-16, 2019, Academic Session 21.

Organiser: South and Southeast Asian Association for the Study of Culture and Religion

Panel presentation on

Panel Chair: Beau Beza

Presenter 1: Maharina Jafrin,

Presentation title: Influence of waterways on open space in Chittagong (Appendix 15)

Presenter 2: Shahinul Islam Khan

Presentation title: Development Planning Proposals and their Influence on the Karnaphuli River and the Canals in Chittagong

Presenter 3: Professor Shamsul Hossain

Presentation title: Historic values of the Karnaphuli River in Chittagong

Presenter 4: Dr. Fahmid Ahmed,

Presentation title: Transforming Landscape of Dhaka with its Plan Making Culture of Urban Development in Managing Water.

Please note that the data and reflections used to produce these publications stem from the research presented in this thesis. The work in these publications is written different from that presented in this thesis but supports its research approach, findings and insights as many of these publications have been peer reviewed and/or edited through reputable publishers (e.g. Routledge).

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List of Abbreviations

BAF	Bangladesh Air Force
BB	Bangladesh Betar
BBS	Bangladesh Bureau of Statistics
BGMEA	Bangladesh Garment Manufacturers & Exporters Association
BN	Bangladesh Navy
BPDB	Bangladesh Power Development Board
BR	Bangladesh Railway
CBD	Central Business District
CCC	Chittagong City Corporation
CDA	Chittagong Development Authority
CMMP	Chittagong Metropolitan Master Plan
CRB	Chittagong Railway Building
CWASA	Chittagong Water Supply and Drainage Authority
DAP	Detailed Area Plan
DC	Deputy Commissioner
DPZ	Detailed Planning Zone
DMDP	Dhaka Metropolitan Development Plan
EPZ	Export Processing Zone
GIS	Geographic Information System
JICA	Japan International Cooperation Agency
MHPW	Ministry of Housing and Public Works
NHA	National Housing Authority
NRPA	National Recreation and Park Association
PWD	Public Works Department
RAJUK	Rajdhani Unnayan Kartipakkha (Capital City Development Authority)
UDP	Urban Development Plan
UNDP	United Nation Development Program
UNEP	United Nation Environment Program
WHO	World Health Organization

Chapter 01: Introduction

1.1 Background

Among the physical components that facilitate urban development, public open space is singularly responsible for improving urban quality (Rao, 2016). Every year, seven million people in the world die due to air pollution (Rao, 2016) and more than five million people die due to lack of physical activity (Kohl 3rd et al., 2012). It has been argued that open space plays a significant role in maintaining public health by acting as a “green lung” in the urban environment (Cranz, 1982; Woolley, 2003). In recognition of these public health issues, World Health Organization (WHO) recommended an accessibility index of a green space (0.5 ha, or 1.0 ha or 1.2 acre to 2.4 acre) within 300-m distance (WHO, 2016). There is also consistent evidence that access to public open space is associated with physical activity across different age groups (Frumkin, 2018).

Historically, the 19th century witnessed the creation of open space in Western cities (Alhajaj, 2014). This was brought about by the recognition of their important role in providing fresh air to urban areas, which at the time suffered from air pollution produced by factories and unhealthy odours emanating from waste such as sewage. For example, the Arboretum Public Park was established in 1839 in Derby in England to provide the city with fresh air and to address the drainage problem of the town (Simo, 1988). The importance of open space continued to evolve and has provided opportunities for active recreation areas and significant ecological services such as the managing of flood water, the filtering of air and creation of wildlife habitats in the 20th century (Benedict & McMahon, 2006).

1.2 Nature of the problem

In a densely populated setting like Chittagong City, Bangladeshi cities facing rapid urbanisation and economic growth are challenged to provide the necessary open space for its citizens. The densely populated Chittagong City centre of Chittagong district (5283 square kilometre¹) is home to the commercial hub. Chittagong City being a port city and the commercial capital of Bangladesh is facing environmental pollution from industrialisation and urbanisation (Rahman, 2011). Due to environmental pollution, alarming public health issues and disasters such as floods and landslides, providing open space for city residents in Chittagong has become an important issue (Ashraf & Chowdhury, 2009). Numerous research stated that the WHO recommends 9 square metres² of open space per person (Emmanuel, 2009; Singh et al., 2010; Thundiyl, 2003). However, there is a challenge

¹ Source: Bangladesh National portal, chittagong.gov.bd/en/site/page/jQWu-এক-নজরে-চট্টগ্রাম

² The WHO official document cited in this citation could not be located; only pertinent publications made reference to this standard.

in achieving the open space standards established in Western countries and attempting to realise them in developing settings.

Cities in Western countries, for example, are able to provide more open space because of their realisation of the need for open space has been a consideration in city development since the beginning of the 19th century (Alhajaj, 2014). As an example, in London consideration of open space began in 1833, when city officials realised that the increase in the city's population left little to no provision for open space (Turner, 1992). As a result, open space considerations such as needs assessment, management plans, policy etc were established to support development of these spaces. Being a pioneer in developing open space settings, cities such as London have achieved more (Jafrin & Beza, 2018).

The WHO was established in the middle of the 20th century to ensure public health across the globe (Alhajaj, 2014). This organisation's open space matrix was developed for the betterment of public health. In this sense, the WHO (2016, pp.14) recommended that "[a]ll urban green space should be physically accessible within a short distance of local residences" and determined that the allowable distance to an open area is 300 metre or a 5-minute walk. Yet, the WHO (2016, pp.11) recommended further research in this field to determine the minimum amount of open space per person required. Unfortunately, cities in eastern countries can hardly manage to provide the minimum amount of open space required; this is because their awareness of the open space issue was only raised in the late 19th and early 20th centuries and they are still developing their open space agenda(s). As a result, eastern city thought on the subject is relatively recent and has not had much time to mature or be effectively woven into the consideration of city development by decision-makers and community members. For example, in Tokyo an infrastructural boom happened at the beginning of the 19th century (Huang, 2004) while the city's open space awareness in planning was 1st taken in consideration in the late 19th century (Xu, 2013). But after the Second World War, the city lost a few parks due to rapid postwar economic development with chaotic construction. In consequence, the Urban Park Preservation Act was enacted in the late 20th century and resulted in creating and preserving parks (Clark, 1973). Tokyo's late consideration of this topic and postwar development, however, have resulted in an open space ratio of 3 square metres per person. So, while London, New York, Madrid, Toronto and Paris have more open space compared to other developed city settings like Hong Kong, Tokyo, Shanghai etc, while densely populated Singapore preserves more (Kabisch & Haase, 2013).

Some of the reasons for the low amounts of open spaces in some of these developed cities are, as mentioned before, the late realisation by city officials to consider these spaces in the planning of their cities and also the failure to preserve these spaces from development. Conversely, developing cities like Buenos Aires, Mumbai and Delhi have comparatively less open space than the WHO Standard. It has been observed that the open space of these cities is around 1 square metre of open space per person. But in other developing city settings such as Chittagong, the total open space achieved in the city is only 0.243 square metre per person (0.059 acres per 1000 people) (Hasan, 2008). This number was obtained from the official CCC-controlled open space records. When the city's existing unique natural open space system is not added to the city's reserved open space network. However, in Dhaka, the capital city of Bangladesh, the minimum open space requirement has been set by city officials in the Dhaka Structural Plan and is 3.5 square metres per person. Unfortunately, an open space requirement in Chittagong has yet to be established.

1.3 Open space in Chittagong

Chittagong has only 132.72 acres of accessible open space in 168.1 square kilometres of land which serves 3.8 million city residents (Hassan, 2008). This is due to the reducing amount of open space which over the years has been built upon to service the city's industrialisation, housing and commercial development needs by the government and private sector.³ An early response to the city's open space loss came in 1961, when the 1st Master Plan of Chittagong was formulated. This document noted for the 1st time the lack of public parks, playgrounds and children's play areas. The city's 1965 Master Plan made 26 proposals for new parks and other open spaces to meet the needs of the city's population. In regard to these land uses, in the city the open space recommendations have changed over the years in 11 different proposals, all of which have resulted in a failure to preserve open space in the city. The land use change from open spaces, vegetated areas and waterbodies to built-up areas (e.g. housing, industries etc) increased over the 1989–2001 period by 76% and over 2001–2013 increased by 72% (Chisty, 2014). In response to this open space loss, Hossain (2002, p. 2) stated, “[w]e currently have an open space average of 0.066 acres per 1000 population, we have failed miserably to promote the development of parks, playfields and other amenity open spaces”. This situation has become worse as the city's population has increased extremely fast. For example, from 1991 to 2015 the estimated average annual population increase in the city area was 77,625 (CDA, 2011). As a result of this increase, the existing open space in the city only covers 0.33% of the CCC area (Hassan, 2008).

³ The impact on open space by the private sector is discussed more in the section “critical urban issues”.

Therefore, to meet the city's suggested open space aspirations it will need an additional 9 acres of parks and 6 acres of playgrounds according to the requirement of the Ministry of Housing and Public Works (MHPW, 2012). Additionally, resulting from this growth in population, increases in built-up areas and the decreasing open space situation, the accumulated effect creates environmental and public health issues for the city.

These environmental and public health issues in Chittagong manifest in many ways. For example, the city lacks open space that is ecologically designed to address the city's environmental issues such as the management of floods and the retention and draining of stormwater (Ashraf & Chowdhury, 2009). In terms of the latter, this overflow of stormwater brings the city to a halt during the rainy season as every year during this season Chittagong becomes flooded and many of the city's homes become submerged under the accumulated rainwater which results from the encroachment of buildings over waterways and the siltation of the creeks (Ashraf & Chowdhury, 2009).

Regarding public health, the shortage of parks, pedestrian walking networks and playgrounds, green networks and verges along street sides minimises the opportunities for residents to engage in physical activity, which can lead to increases in cardiovascular disease and obesity (Beza, 2015) in Chittagong City. Cardiovascular disease is the single most important contributor to ill health in Bangladesh, responsible for 17% of total mortality, and diabetes has become a national health concern in the country (WHO, 2015). In terms of obesity in Chittagong, women are more affected than in the other parts or cities of the country. Alarmingly, to support this claim, according to Ali et al. (2022), Residents of Chittagong had a significant prevalence of abdominal obesity (37.3%). To counter these ill health effects impacting city residents in Chittagong, physical exercises like jogging and walking are activities people can participate in to reduce these emerging health issues, which is supported by physicians recommending the planning and construction of, for example, playgrounds to combat the obesity issue in children (Jabbar, 2016; Staff Reporter, 2015).

1.4 A conceptual frame of open space

The term "open space" has a range of meanings brought about by various discipline perspectives. For example, from a geographical point of view Kimbly (1939) described open space as the empty land on Earth unoccupied by inhabitants, while from an urban planning perspective Gold (1980) framed open space as undeveloped land in an urban context covered by neither buildings nor cars. From a recreational point of view, Payne (2002) described open space as green areas organised in a linear or batch form which can accommodate a variety of outdoor recreational activities or works on protecting natural resources.

However, for the purposes of this research the most appropriate framing of open space would be that of Cranz (1982). His conception of open space evolved from the practicality and vision that was introduced into park planning after the mid-1960s. Firstly, this revolved around the conception that open spaces are wide-open areas with the connotation that this is a setting where anything goes and where a new permissiveness about the range of possible park activities was appropriate. Secondly, they are not built-up areas but rather left open, as open space. They are “bits and pieces” of the city saved from the usual fate of urban land; that is, being built upon. Thirdly, open spaces are fluid and at their perimetres the park flows into the city and the city into the park (Cranz, 1982).

Hence, this thesis uses the above conceptual framework of Cranz (1982) to examine a range of open spaces accessible to the public in Chittagong, Bangladesh. It excludes amusement parks, hotel gardens, open cafés and restaurant green spaces. It also excludes semi-public spaces like hospital gardens. In addition, the study also excludes unusable open spaces on road traffic islands created for beautification purposes.

1.5 Research gap

It was previously stated that the WHO (2016) recommends that a minimum size of green space (i.e. 0.5 ha, or 1.0 ha which is 1.2 acre or 2.4 acre) be within a 5 minute walk or 300-metre distance from someone's residence. Unfortunately, Chittagong's Master Plan does not focus on this recommendation. Again, in the capital city of Bangladesh, according to the Dhaka Structural Plan (2016–2035), this plan recommends that a minimum size of park and playground is 0.5 acre and the minimum requirement of open space per person is 3.5 square metre (RAJUK 2015). To explore disconnect between the desired open space recommendations from Western-derived standards and the availability of resources and considered thought on open space standards in developing city settings, this research studies the development of a relative open space standard based on the availability of local resources in a developing city setting. The city used in this examination is Chittagong, where the city's existing unique natural open space system is considered an appropriate setting for this thesis study.

1.6 Aims and objectives

Hence, the aim of the thesis is to understand how open space planning is practised around the world and to use this knowledge to develop a theoretical framework and criteria to achieve a minimum per capita open space in Chittagong. In order to achieve the aim, the research questions are focused upon three objectives. The research objectives are follows:

Objective 1: To examine and document the evolution of existing open space in Chittagong.

Objective 2: To establish a relative open space benchmark and standard that Chittagong can reference in its open space developments.

Objective 3: To investigate approaches to realising open spaces in Chittagong City.

Objective 4: To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations.

1.7 Research questions

Each objective is supported by a series of research questions, which guided this study. The research questions structured with the objectives are explained as follows:

Objective 1: To examine and document the evolution of existing open space in Chittagong.

1.1. What types of open spaces have existed in Chittagong? This question investigates and documents the variety of open spaces that have come to be since Chittagong's conception. Addressing this question includes developing an understanding of the evolution of open space as it relates to the city's more than 700 years of evolution of open space and its different periods of religious and/or political associations. Documentation of this evolution is used as a means to provide insight into the mechanism(s) that have influenced the expansion and contraction of the city's open spaces.

1.2. What types of open spaces currently exist in Chittagong and to what extent are these accessible to the city's residents? This question seeks to develop an understanding of the city's current open space situation related to the quantity and accessibility of these spaces for Chittagong's residents. Answering this question (and in partnership with question 1) allows a picture to be developed that is used to elaborate on the current stock of open space in the city. This also highlights the specific shortage of open space types. It was also envisioned that insight from both questions 1 and 2 would be used as a means to provide a context-specific understanding of Chittagong's open space development which can be used in the development of an open space framework that can be applied in the city to meet the open space demands of Chittagong's growing population.

Objective 2: To establish a relative open space benchmark and standard that Chittagong can reference in its open space developments.

2.1. What open space benchmarks and standards exist around the world and to what extent are these applicable to Chittagong? Answering this question allows the researcher to evaluate the world's existing open space benchmarks and standards to ascertain the extent to which they are applicable (or not) to Chittagong. In addition, answering this question provides data that can be used to shed light on the open space standards in Bangladeshi cities, with a focus on Chittagong. Ultimately, these

questions identify, for example, the extent to which Anglo-Western standards and the Dhaka Metropolitan Development Plan (DMDP)⁴ standards are achievable (or not) in Chittagong.

2.2 What open space guidelines currently exist in Chittagong and to what extent do they influence open space in the city? This question seeks to investigate the city's current open space direction and to identify the opportunities of this direction relative to international measures and aspirations. Additionally, this question seeks to understand the extent to which the city's open space guidelines relate to the open space benchmarks and standards identified in question 2.1.

Objective 3: To investigate approaches to realising open spaces in Chittagong City.

3.2. What are the city's open space aspirations and how do these achieve the urban growth plan of Chittagong? Answering this question allows the researcher to investigate the city's open space typology. Answering this question also allows for an analysis of how these open spaces may be distributed in the city. In addition, answering this question seeks to define the types of open space absent or lacking in Chittagong City, which guides the distribution plans generated in this thesis of open space for the city.

3.2 What city-specific open space considerations best support the open space aspirations of Chittagong?

This question seeks to develop measures to achieve open space aspirations in Chittagong (supported by data established under objective 2).

Objective 4: To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations.

4.1 What open space approaches derived from other work and fieldwork analysis may best be applied in the city? This question seeks to propose an approach to establish measures for establishment of new open spaces in Chittagong.

4.2 How should open space best be distributed to meet the city's growth and residents' open space aspirations? This question seeks to discuss the distribution possibilities of open space in Chittagong.

1.8 Contribution to knowledge

Western-derived open space standards are used as benchmarks for other developing nations to aspire to. These open space standards, however, are not necessarily appropriate for use in developing nations due to the local city context and the inherent "baggage" that accompanies an idea developed in one national setting and then applied in another (Beza, 2016). Hence, locally derived

⁴ The DMDP was a future planning proposal for the Dhaka City Corporation area prepared by the Capital Development Authority (RAJUK) for the time period 1995–2015.

open space recommendations based on local conditions and the availability of local resources need to be developed in Chittagong and for Chittagong to provide an achievable and realistic standard that other developing settings can strive for. To do this, the thesis investigates open space standards from around the world to develop a Chittagong-specific open space standard that can be used as an example for other developing settings to aspire to. The research contributes to the creation of appropriate and context-specific measures for increasing open space in Chittagong which can be used as a guide by other developing cities striving for open space increases. In addition, the creation of an open space approach does not only potentially provide Chittagong's residents with enough open space for recreation, but also play a role in addressing an important issue that affects people's quality of life, health and safety.

1.9 Research challenges

There were several challenges in the research. As the open space concept is new in Chittagong, the main challenge of the research was to establish a benchmark for an open space standard for Chittagong and to establish a comprehensive typology of open spaces in Chittagong. Due to a dearth of such material, the research encountered difficulties integrating the documentation regarding open spaces in "historically divergent Chittagong." However, to contextualise the types of open space, the research considers other similar national and international examples as precedents. This research attempts to describe the history of open space in Chittagong. However, the history of the city is rich and spans a period of more than hundreds of years started from 7th Century BC (Hossain, 2008), while documentation like maps and drawings of the city are a challenge to locate and many are missing. These potential gaps in material hindered the process of contextualising the historical open spaces in Chittagong. Hence, the effect on determining precisely the historical open spaces in the city was a challenge. Note that the quality of open space is not focused on in this research as it has been examined in previous literature such as in the book *Open space: People space* (2007) edited by Catherine Word Thompson and Penny Travlou.

1.10 Structure of the thesis

Chapter 1 comprises the introduction to the thesis by providing a briefing background to the research. Chapter 2 gives an overview of Chittagong in relation to the city's open space situation and clarifies the urban and environmental issues generated in Chittagong due to the reduced open space. Chapter 3 presents the research methodology describing how the research strategy was designed to achieve the thesis study. It also presents the questions arising to reach these objectives and explains how the research found answers to each question to achieve these objectives. Then, following the 1st

objective of the thesis, a description of the evolution of open space in Chittagong is presented in the fourth chapter. To accomplish the 2nd objective, the open space norms, typology and area allocation for each form of open space practise around the world are illustrated in Chapter 5 based on Chapter 2, which also provides an overview of Chittagong. The sixth chapter explains and analyses the survey data and interview reports using the software SPSS and NVivo, and concludes with the findings of the survey and interview analysis. Next, the seventh chapter synthesises the findings of the research by using objectives 1, 2 and 3 as a foundation to discuss approaches to improving and implying the findings in a case study area. Chapter 8 concludes the thesis by presenting the statements of significance stemming from this research project.

Chapter 02: An Overview of Chittagong

2.1 Introduction:

In this chapter, critical urban and environmental issues related to the shortness of open space in Chittagong City are discussed. The 1st section contextualises Chittagong's location and topography, providing an overview of the city's growth and population in the 20th and early 21st centuries. The next section of this chapter provides an overview of Chittagong's climate and the environmental issues related to open space resulting from its location and climatic conditions. The 3rd section highlights the major urban issues in the context of open space in Chittagong. Finally, the chapter concludes by analysing the factors responsible for susceptibility of open space.

2.2. Location and Topography

Chittagong is the second-largest city of Bangladesh (Mia et al, 2015) and serves as country's one of the major seaport (Monir, 2016). It is situated in the southeastern region of Bangladesh (latitude 22°22' North and 91°48' East) (Vacik, 2014). (Figure 1) and it is located approximately 280 kilometres to the south of the capital city, Dhaka (Islam, R. et.al., 2020). Therefore, its access to Dhaka has contributed to its growth in a north-western direction along the highway (Chowdhury P., 2014). Additionally, the longest beach, Cox's Bazar, is located 190 kilometres to the south of Chittagong (Europa Publications, 2002). This connection, coupled with the railline connection to Hathajari, has further extended its growth to the north-east. The presence of a hilly range to the north, situated between the east and west, serves as a scenic constraint on its growth in that direction. The topography of Chittagong is distinct from most other cities in Bangladesh because it features both hills and a coastline. The city is surrounded by a combination of a lake, canal, hills, rivers, and the sea, all of which work together to provide natural open spaces within the city. In terms of the Chaktai canal and the Karnaphully River, they have historically served as significant modes of transportation for goods. The city has a rich history dating back to the 7th century where it emerged as seaport that has evolved over time. The growth and development of the city evolved primarily along the Chaktai canal and Karnaphuli river, which are located to the southeast of the city. So, the historic city, associated with the 7th century growth, and densely populated urban areas are located along these regions. In contrast, its northern part is largely covered by a hill known as the Northern Hills. The hilly terrain in the city's north upholds its natural beauty of the city but also limits further expansion. To the west of the city, there is the Bay of Bengal, which

converges with the Karnaphuli River to the south (as shown in Figure 2), effectively forming a boundary for the city. Patenga Beach, the official seafront of Chittagong City, is situated to its west.



Figure 1: Location of Chittagong city in context of Bangladesh.

Source: Edited by author



Figure 2: Arial view of Chittagong, Source: Google earth image.

2.3 Urban Growth and Population

The population in Chittagong increased significantly from 2.4 million to 4.09 million over a span of two decades, from 1991 to 2011 (Mia et al., 2015). To manage such rapid growth, the Chittagong Municipal Corporation (CMC) was established in 1982 and later renamed as the Chittagong City Corporation (CCC) in 1990 (Karim, 2006). The city expanded in two directions, towards the north-east and north-west (figure 3), and in the south on the west bank of the Karnaphuli River by creating an industrial area. From 2010 to 2011, the urban population growth rate was recorded at 2.25% (CDA, 2015). Chittagong City's growth since 1948 and the corresponding expansion throughout time are depicted in Figure 3.

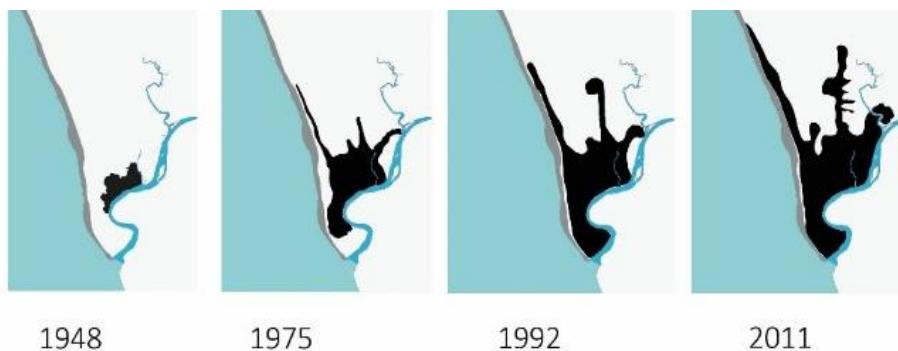


Figure 3: Growth of Chittagong,
Prepared by author, Source: Chittagong City Corporation.

2.4 Climate

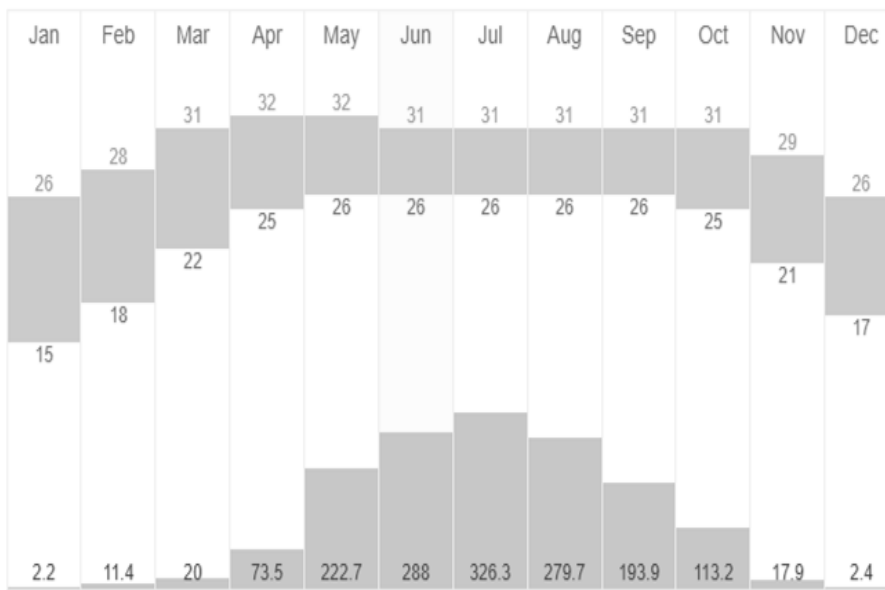


Figure 4: Average Temperature and rainfall in Chittagong during 2005-2015.

Source: <https://www.timeanddate.com/weather/bangladesh/chittagong/climate>

Chittagong features a tropical Monsoon Climate characterised by warmth and ample rainfall, which is suitable for green and vegetation. May stands out as the warmest month with an average temperature of 28.5°C, while January is the coldest, with an average temperature of 19.9°C. The region has significant rainfall throughout most months, with a short dry season. Figure 4 shows that, Chittagong receives heavy rainfall in the months of June, July and August, about 2794 mm of precipitation falls annually. The heavy rain in short period of time results in flooding and landslides in the exposed (hills are subjected to cutting and losing their top soil and ground coverage) mountainous areas of Chittagong (Ahmed 2020).

2.5 Environmental issues:

The geographical location and climatic conditions place Chittagong in a vulnerable state prone to natural environmental disasters such as flooding, landslides, cyclones and earthquakes. The adverse effect of these natural disasters causes harm to its residents, property loss and sometimes even homelessness. Encroachments along riverbanks and canal sides, as well as constructions in protected hilly areas of the city, can cause flooding and landslides. Consequently, the city faces a number of environmental issues that continuously impact its development. The primary environmental issues affecting the city are landslides, earthquakes and cyclones. Each of these is discussed in greater detail below.

Landslides: In Chittagong, approximately 28% of the total area of the city consists of hilly terrain. There are a total of 88 hills within the study area, covering an area of 18,304.11 acres in the Chittagong City Corporation region (Chisty, 2014). The soil in the foot hill areas is soft silty clay or medium stiff to stiff silty clay, with depths ranging from two metres to eight metres (CDA, 2008). The soil strata in these areas are notably thin and loose. During rainfall, water dissolves the minerals of the soil of the hills that loosen its compaction. This loosening of the soil poses a significant risk to the slums located at the base of these hills, making them vulnerable to landslides. The steep slopes of the hills are unable to support the mass weight of the wet soil or mud, leading to landslides (Chisty, 2014). In the north-west part of the city, which is also hilly, the city centre still contains several hills that are subject to hill cutting, causing



Figure 5: Devastation landslide on 19 July 2015 in Chittagong Metropolitan Area.

Source: Rahman (2017)

landslides during heavy rainfall (Islam et al., 2017). In 2007, the death toll for landslide was reported as 133 (Ahmed, 2017). Figure 5 shows the devastating impact of a landslide in 2015.

Earthquake: Chittagong is situated in an area considered to be highly prone to earthquakes. A seismic zoning map published in the Bangladesh National Building Code (BNBC, 1993) designates Chittagong district as part of seismic zone 2 (as shown in Figure 6), signifying it as an extremely high earthquake-prone area. The city's rapid urban growth further exacerbates the vulnerability of human lives, the economy, and infrastructure to seismic activity (Masud, 2007). While it may not be possible to completely eliminate damage to infrastructure, a well-balanced Open Space System that is easily

accessible can aid in adapting to and coping with the unforeseen changes that occur following a catastrophe (Villagra et al., 2014).

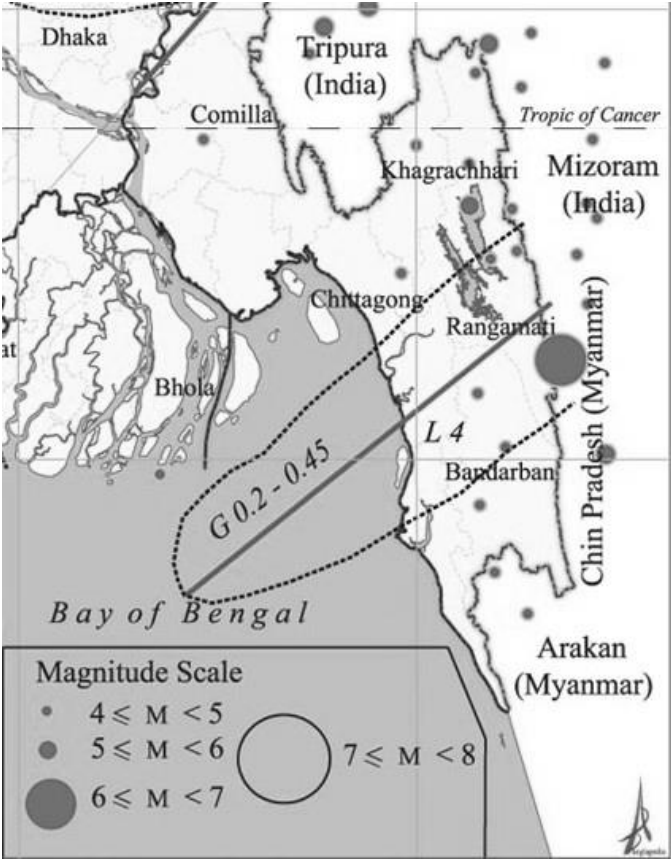


Figure 6: Map Seismic Zone in Bangladesh where Chittagong is placed in zone 2. ` Source: Banglapedia, [Earthquake - Banglapedia](#)

As an illustrative example, the 1997 Chittagong earthquake, also known as the Bandarban earthquake, took place on November 21 at 11:23 UTC in the Bangladesh-India-Myanmar border region. It registered a magnitude of Mw 6.1 and did not result in any reported fatalities within that localised zone. However, fatalities did occur, and houses were damaged in the Chittagong Regional areas during various time periods from 1830 to 2011 (Kausar MRH, 2017).

Cyclone: The city is also highly susceptible to storm surges due to its location in a cyclone-prone



Figure 7: Picture showing the tragic incident of cyclone on April 29 in 1991 in Chittagong.

Source: Hall & Day (2009)

coastal region in South Asia (Rahman, 2011). For example, a cyclone in 1991 killed at least 138,000 people and left as many as 10 million homeless (NOAA, 2012). Interestingly, open space and green infrastructure can serve as protective measures for both people and cities from cyclones (Erickson, 2018). Green infrastructure, which includes elements like trees, parks, and green roofs, plays a vital role in mitigating the urban heat island effect and acts as a response to safety concerns related to open spaces. In recognition of these safety considerations, the 1995 Master Plan for the city designated a cyclone-prone zone as a no-development zone. This measure was put in place to help mitigate or minimise the potential effects of a cyclone in the area. Additionally, parts of this zone areas act as open spaces for residents in Chittagong. Hence, one effective solution to defend and strengthen shorelines against cyclones is to build more green spaces along the city's shores. Parks designed with natural landscapes such as hills, native plant life, and salt marshes are better equipped to respond to a storm surge by slowing down and redirecting water, rather than channelling it through roads into the neighbourhoods and beyond. The latter scenario often necessitates extensive reconstruction once the water has receded (Erickson, 2018). Figure 7 provides a visual representation of the impact of cyclone on Chittagong city coastal area.

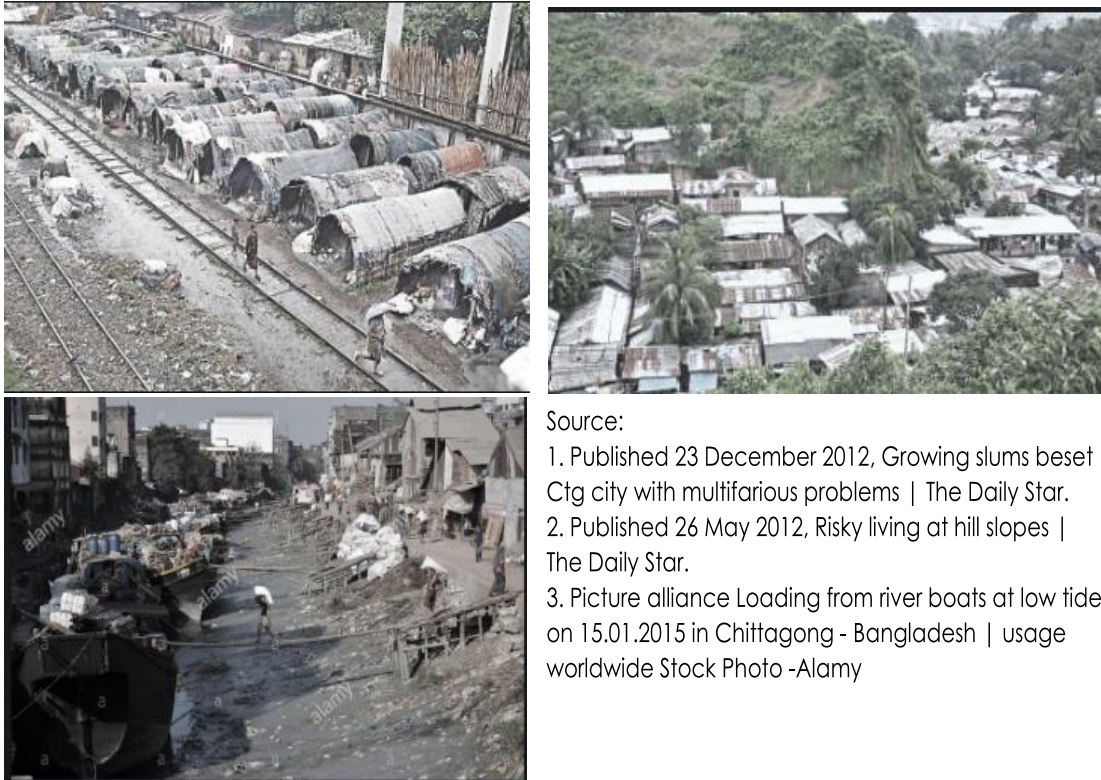
Flooding: Chittagong has experienced heavy rainfalls attributed to deep convection over the North Bay and adjoining coastal areas of Bangladesh (Habib et al., 2023). The coastal area faces the imminent threat of flooding primarily due to rising sea levels and the influence of high tidal waters.

Certain parts of the city are particularly susceptible to flooding as a result. Additionally, Chittagong city experiences annual flooding during the rainy season and many of the city homes submerge under accumulated rainwater. The creeks and canals of Chittagong function as sewerage system (Ashraf & Chowdhury, 2009), making them unsuitable for use as open spaces for city residents. Additionally, due to the encroachment and siltation over the creeks, waterlogging⁵ occurs. Many residential areas in the city lack access to water bodies. For example, both side of the creeks being occupied and encroached by buildings. The mandatory open space, stated by City planning authority known as CDA, specifies a width of 12' or 3 metres on each side of the creeks. These designated open spaces are currently occupied by informal settlements, which could also contribute to the city's open space. It's worth noting that the shoulders of the creeks are acting as a leftover space and no-man zone because of their inaccessibility. The 1995 Storm Water Drainage Plan proposed the widening and creation of new creeks with designated siltation area by dividing the city into 12 drainage areas. However, this plan has largely proven to be ineffective. Figure 8 shows the flash flood in Chittagong in 2017.



Figure 8: Photo showing a Flush Flood caused by 32millimetre rainfall during the monsoon season in Chittagong, which is a regular occurrence, published in a daily newspaper on 2 April 2017 (source: <http://en.prothomalo.com/environment/news/145947/Heavy-rain-floods-Chittagong-city>)

⁵ When an area becomes inundated with water due to tidal effects, high rainfall, or poor drainage and it is difficult for groundwater to move anywhere, this condition is referred to as waterlogging.



Source:
 1. Published 23 December 2012, Growing slums beset Ctg city with multifarious problems | The Daily Star.
 2. Published 26 May 2012, Risky living at hill slopes | The Daily Star.
 3. Picture alliance Loading from river boats at low tide on 15.01.2015 in Chittagong - Bangladesh | usage worldwide Stock Photo -Alamy

Figure 9: Urban slum in Chittagong clockwise in the railway corridor, in the foothill and on the side of the creek.

2.6 Urban Issues

Being a densely populated city with arguably having poor management and planning of the city (Werna, 1996), Chittagong city faces numerous urban issues that significantly impact its social and environmental conditions. The city contains 5.74 square kilometres of unplanned settlements that lack basic infrastructures such as water and sewerage systems (Angeles et al., 2009). These unplanned settlements are home to approximately 1.4 million people, which accounts for about one-third of Chittagong's total population (CCC, 2005). The majority of these slums are situated in embankment areas of the city, along its railway lines, on the side of creeks and in the foothill areas. Figure 9 shows the urban slum conditions of Chittagong described as above.



Figure 10: Hawkers occupy Chittagong footpaths (collected from “thedailystar.net” published 28 April 2012)

Chittagong also has a lack of footpaths within the city. Data from the Detailed Area Plan (2015) and the GIS database of footpath reveal that only 39% of the roads in Chittagong has footpaths. This is

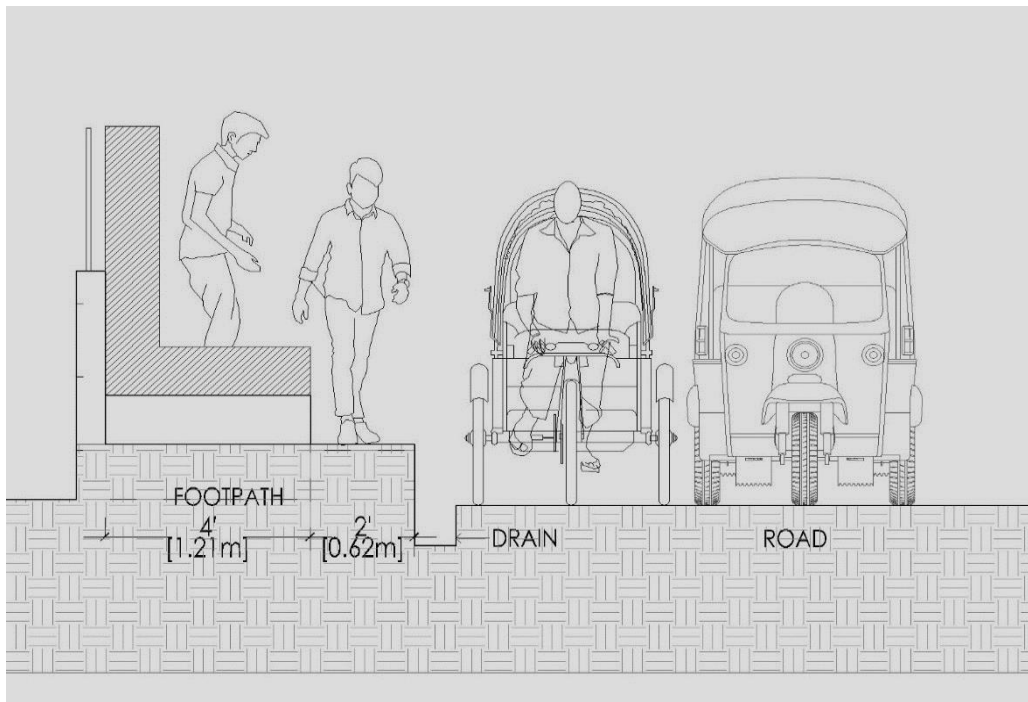


Figure 11: Typical Road and footpath Section of Chittagong city.

Source: Prepared by author

largely due to footpaths being occupied by vendors and shop keepers (figure 10), and in most cases, they are not continuous. The width of these footpaths varies in shape from one metre to two metres. As a result, approximately two-thirds of the existing footpaths are currently occupied (as calculated from the section shown in Figure 11). The city's primary and secondary roads, covering a total distance of 609.39 kilometre in Chittagong, have the potential to provide footpaths free of vendors. Achieving this goal would effectively transform these ribbon or linear areas into valuable contributors to the city's overall open space.

In addition, the city has an inadequate public transportation system that only serves a limited number of streets (Fattah et al., 2022). For example, considering the industrialisation and booming garments industry, Chittagong employs a 52.1 million labour force (Ullah, 2018), there is a pressing need for reliable public transportation for the city's low- and middle-income residents who depend on it for commuting to and from work.

In terms of urban environmental issues, there are several sources of air pollutions in Chittagong, among them unfit vehicles and industries are notable (Kitada & Azad, 1998). The city's urban settings are made up of congested buildings set close to each other in middle- and higher-income residential areas, which suffer from poor ventilation (Rahman, 2010). These ventilation issues are also evident in

the congested one-room slum houses found in the lower income residential areas of the city (Rahman, 2011).

The urban growth in Bangladesh is having a detrimental impact on biodiversity, leading to the loss of vital ecosystems in protected areas within the city. This, in turn, results in the degradation of forests and wetlands, as well as infrastructure development, and perpetuates an unsustainable and /or illegal exploitation of land resources and pollution (Foster-Turley et al., 2016).

2.8 Public Health

People in Bangladesh suffer from a range of public health problems due to the lack of open space infrastructure (Labib et al., 2020). Notably, diabetes has become a national health concern in Bangladesh, primarily attributable to a lack of physical activity. Additionally, cardiovascular diseases is the single-most important contributor to the overall ill health of the city's residents, accounting for 17% of total mortality. According to the International Diabetes Federation assumption in 2010, the explosion in diabetes prevalence is expected to rank Bangladesh among the top 7 countries with the highest number of people living with diabetes by 2030. The Bangladesh Demographic Health Survey (BDHS, 2011) showed that the overall age-standardised prevalence of diabetes and pre-diabetes was 9.7% and 22.4%, respectively. These figures are largely attributed to the predominantly sedentary lifestyle, while emphasising the importance of physical exercise in mitigating these rising health concerns (WHO, 2015).

The health discussion above highlights that Bangladesh is currently undergoing a socioeconomic transition, leading to significant lifestyle changes among its residents. For example, people living in areas with limited outdoor recreation facilities were found to have a higher likelihood of being overweight (Catlin et al., 2003). Increasing prevalence of obesity, tobacco use, and less physical activity is accompanied by this transition (Islam et al., 2016). The obesity rate of Bangladesh is rising to the point where nearly 1 in 5 adults are overweight. This concerning trend is not limited to adults; it also affects Bangladeshi city children, particularly among certain groups. Alarming levels of childhood obesity are observed, especially among urban children from affluent households (Rahman et al., 2014). In contrast, research indicates that children who walk to school tend to be more physically active throughout the rest of the day than those who are driven (Cooper et al., 2003). While car dependency is common in upper-middle-class society in Chittagong city, it is worth noting that this could be attributed to the lack of walking facilities such as footpaths. As a result, there is limited walking to school among these individuals. This situation suggests a potential connection between poor urban planning, inadequate provision of open spaces, and adverse public health outcomes.

2.8 Critical issues for reducing open space:

The preceding discussion leads to a consideration that the city's open spaces are suggested by Hassan (2008) to be reducing alarmingly and is affecting city residents. To develop deeper into this issue, the researcher explored the consequences of this diminishing open space in the following section.

I. Encroachment of Public open space: The primary threat to the stock of open space stems from the encroachment by both public and private bodies, such as developers (Rahman, 2021). For example, government agencies themselves have fully or partially built industrial areas or housing in parks and open spaces in Chittagong. A notable example of such land-use changes by the government can be reflected in the Export Processing Zone (EPZ) in Chittagong, which was established in an open space area (i.e., a racecourse) and the associated square has been turned into a parking lot for Chittagong railway station. Additionally, allowing private landowners to build residential housing in, for example, Alpine Park land by the city's planning authority is an involvement of private and government bodies (Master Plan, 1995). Furthermore, slum development and squatters are also involved in the encroachment of the sides of creeks, canals, hills and unused railway corridors. Additionally, street-side shops and vendors are often involved in encroaching on footpaths and public plazas, as exemplified by the situation in Chittagong New market. Furthermore, the seaside has been occupied by ship dismantling industries, which take up adjacent unused land (i.e., open space) (Hossain et al., 2016).

II. Ignoring the Chittagong Metropolitan Master Plan (CMMP): Large open spaces in Chittagong have been undergoing development by the government and semi-government bodies, despite clear planning direction set 4th in CMMP and DAP to retain these spaces for recreational use. Despite this designated purpose, the city's zoning of this land for recreation has been changed to industrial use. As an example, the racecourse was directed to be kept as open space in the city's 1961 Master Plan (Jafrin & Beza, 2018), but in 1983 it was converted to Export Processing Zone (EPZ) by the Bangladesh Government. Furthermore, Exhibition Park, originally designated as open space in the 1995 Master Plan and located in Haliashahar, has undergone transformation into a commercial development and residential area by the city's Housing Society (Jafrin & Beza, 2018). Consequently, substantial portions of the city's open spaces are being developed, leading to a net loss of green space for the city's residents.

III. Incompatible standard and absence of classification:

Different government agencies in Bangladesh have established varying standards of open space required as community facilities by the city. However, there appears to be no standard that is

maintained in classifying different types of open spaces in the city. In addition, the proposed open space ratio set by the government is believed to be significantly greater than a benchmark when examining the city's existing urban fabric. Furthermore, it appears to be comparatively high in comparison to similar countries like Bangladesh, which is discussed in the next section. For example, Private Residential Land Development Rules 2012 set a Standard of Park and Playground (0.2 acres/1,000 populations) (MHPW, 2012). Dhaka Metropolitan Development Plan (DMDP) (1995-2015) set standard (0.16 acre/1,000 populations) (RAJUK, 2016). Thus, different set of standards among government bodies and agencies have been visualised in Bangladesh. This example situation is similar for Chittagong as the same national rules applies to the city.

IV. Poor management of formal open space:

The physical quality of open space is notably poor in Chittagong. The existing parks and playgrounds are not properly maintained by authorities (Hassan, 2008). The parks and playgrounds that fall within the organization's jurisdiction are managed by Chittagong City Corporation (CCC). There are inadequate public utility facilities, security systems, lighting, and waste management. Additionally, there are in short of landscaping elements such as seatings, shelters and playground equipment, etc. Despite the country's natural greenery, most of the open spaces are found barren and repulsive due to poor quality and limited accessibility (Hassan, 2008).

V. Scattered unconnected blue and green resource:

The presence of the Bay of Bengal Sea to the west of the city, the Karnaphuli River to the east and the hills situated in the north of the city, calas distributed throughout the city, all separated by localities and highways, has led to a situation where their contributions to environmental quality and ecological balance are minimal. For example, buildings that have encroached on the seashore have cut off residents from the Chaktai Canal. The container terminal mostly blocks the view of the Karnaphuli River. By use of a highway or outer city ring road, the sea is separated from the city. Hills are occupied by slums.

VI. Lack of preservation effort for historic sites and buildings:

The directives provided by the Development Area Plan (DAP) regarding the preservation of historical sites and buildings in Chittagong have unfortunately been largely disregarded and violated in the city's development process. One notable example is the historic site 'Gandhi Maidan,' which has been repurposed as a hospital (for a more detailed explanation, please refer to Chapter 5). Many historical sites suffer from neglect and deteriorate without proper care, exemplified by the city's 1st court

building, Madrasa Pahar (Uddin, 2013). Additionally, several historic sites face the threat of commercial expansion, as observed with the Anderkillah Shahi Jam-e-mosque and Bayzid Bostami mosque, where the inclusion of commercial buildings within their premises is imminent.

In summary, this discussion reinforces the notion that the city's open spaces are indeed diminishing, as suggested by Hassan (2008), and underscores the importance of this research project, which aims to make recommendations for the improvement of open spaces in the city.

2.9 Conclusion

This chapter aims to establish an evidence base by detailing how Chittagong city suffers from major urban and environmental issues. The analysis and data presented suggest that the reduction of protected areas such as rivers, hills and canals contributes to environmental damage and may result in a decline in the overall health of the city's residents. In addition, decreasing open spaces leading to environmental issues, including flooding and waterlogging. Furthermore, the lack of an efficient mass transit system, such as metro, contributes to traffic congestion and a greater reliance on roads and cars. Moreover, inadequate footpaths discourage people from walking. The chapter also highlights the poor management of existing open spaces. Furthermore, hill cuttings within protected areas increase the risk of landslides, while developments in low-lying areas contribute to waterlogging. The lack of open space reduces physical activity levels, leading to public health issues. These problems can be attributed to the city's poor planning and the significant shortage of open space. Hence, it is crucial to emphasise that Chittagong needs to prioritise the creation of open spaces to enhance residents' health and mitigate the city's urban problems.

Chapter 03: Research design

3.1 Introduction

The population density in the Chittagong City Corporation (CCC) area was 242.28 per square metre (Bajracharya, 2020, p 20) in 2019, and Bulmer (1993) suggests that, due to the high birth rate in Asia, cities such as the CCC can be considered high in density. Contextually this 'high-density' element is a determining factor that potentially allows one to address the city's open space standard as open space "should compensate and complement the physical and social context of the [urban] surrounding environment" (City of Monash, 2017, p 27). The research area of this thesis is focused in the urban area, defined as the CCC area which is 168 square kilometres. Unfortunately, due to increasing urbanism and unplanned growth, Chittagong is losing its open space and recreation areas. For example, its per capita officially recorded open space is 0.243 square metre per person (Hassan, 2008). For example, its per capita open space is far lower than open space standards practiced around the world's cities⁶.

The purpose of this thesis is to create a substantiated recommendation that provides a framework for increasing the amount of open space per person in Chittagong City. In order to realise an increase in the relative open space ratio of the city and to recommend the best approaches to distributing open space in the city, the thesis aims to establish a theoretical framework from an examination of literary work and fieldwork. To achieve this, the following research objectives and associated questions have been developed. Figure 12 illustrates the conceptual structure of the research design developed in this thesis, which is based on Beza (2006), with permission.

Objective 1: To examine and document the evolution of existing open space in Chittagong.

- 1.1 What types of open spaces have existed in Chittagong?
- 1.2 What types of open space currently exists in Chittagong and to what extent are these accessible to the city's residents?

Objective 2: To establish a relative open space benchmark and standard that Chittagong can reference in its open space developments.

- 2.1 What open space benchmarks and standards exist around the world and to what extent are these applicable to Chittagong City?
- 2.2 What open space guidelines currently exist in Chittagong and to what extent do they influence open space in the city?

⁶ Refer to Chapter 5: Contemporary open space standard for details.

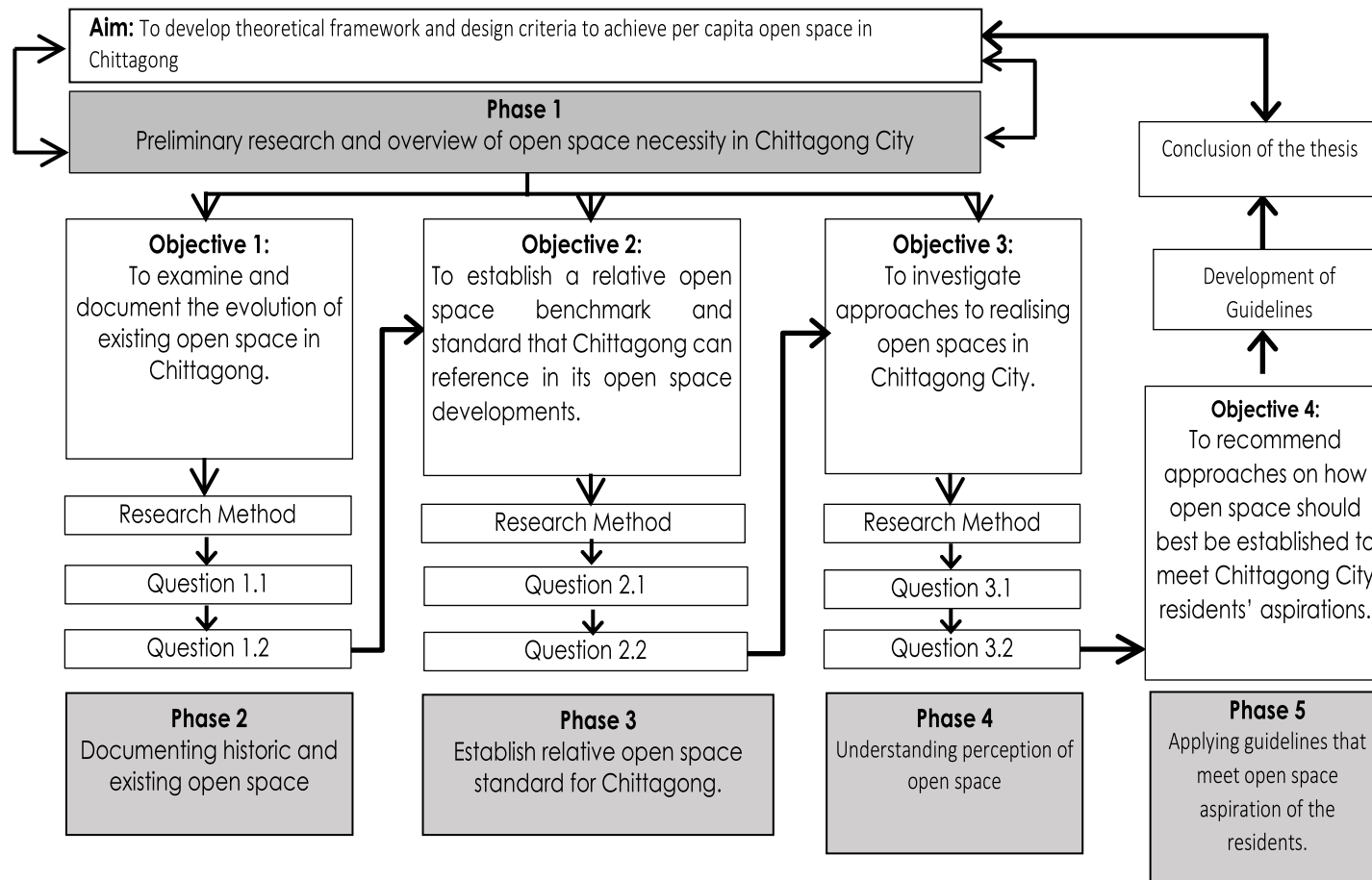


Figure 12: Research design: research aim, objective, and questions.

Objective 3: To investigate approaches of realising open spaces in Chittagong City.

3.1. What are the city's open space aspirations and how do these meet the urban growth plan of Chittagong?

3.2 What city specific open space considerations best support the open space aspirations of Chittagong?

Objective 4: To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations.

4.1 What open space approaches derived from other work and fieldwork analysis may best be applied in the city?

4.2 How should open space best be distributed to meet the city's growth and residents' open space aspirations?

To explore the specific psychological, cultural and technical challenge or difference in demand of open space in Chittagong relative to this thesis, both quantitative and qualitative methods have been implemented in this research. In terms of the quantitative dimension, the research strategy "incorporate[s] the practise and norms [of groups and] embodies a view of social reality as an external" (Bryman 2004, p19). Whereas an influencing variable using a qualitative research strategy "[...] rejects the practise and norms [and] embodies a view of social reality as a constantly shifting emergent property of the individual" (Bryman 2004, p 20).

This brief discussion highlights an opinion that, "[w]e are left with not one single method as being the answer [...] of social research" (May, 1997, p 155). The researcher supports this opinion due to years of experience embedded within the culture of Chittagong and engaging with the city's residents as a public official working in urban space design. In practise, the PhD candidate has developed a hybrid system of social engagement that combines with the case study specific survey methods studied as part of this thesis (e.g., Carine Lai's approach used for open space opinion survey in Hong Kong in 2018).

The following sections outline the approach used to address the research objectives, questions and, ultimately, the aim of this thesis. Following this outline is a detailed description and analysis of the research techniques used in this thesis. Each objective is associated with phases of research that present a step-by-step guide leading towards achievement of the aim of the research. Therefore, following the four objectives of the research, the thesis is designed in to five phases. These phases are individually described below:

3.2Phase 1: Preliminary research and overview of open space necessity in Chittagong City

This section describes the 1st in a series of phases developed to achieve the aim of this thesis (Figure 13). This preliminary research design phase involves setting the aim and objective of the research, articulating the nature of the problem, developing a conceptual framework of open space, providing a brief overview of Chittagong relative to its declining open space and establishing a research methodology. This section includes the development of a research strategy and associated techniques to achieve the aim.

This research strategy primarily depends on a case study design approach explained by Yin (2003) and is described below to present an understanding of case study considerations. To commence this description, the case study method suggests that a complete research design requires the development of a theoretical framework that "state[s] a condition under which a particular phenomenon is likely to be found" (Steenhuis & Bruijn, 2006, p.4). Adhering to this advice in the 1st phase of this research, a cast study framework needs to be established. Hence, using case studies aids in defining the appropriate research design and data collection observed in following phases.

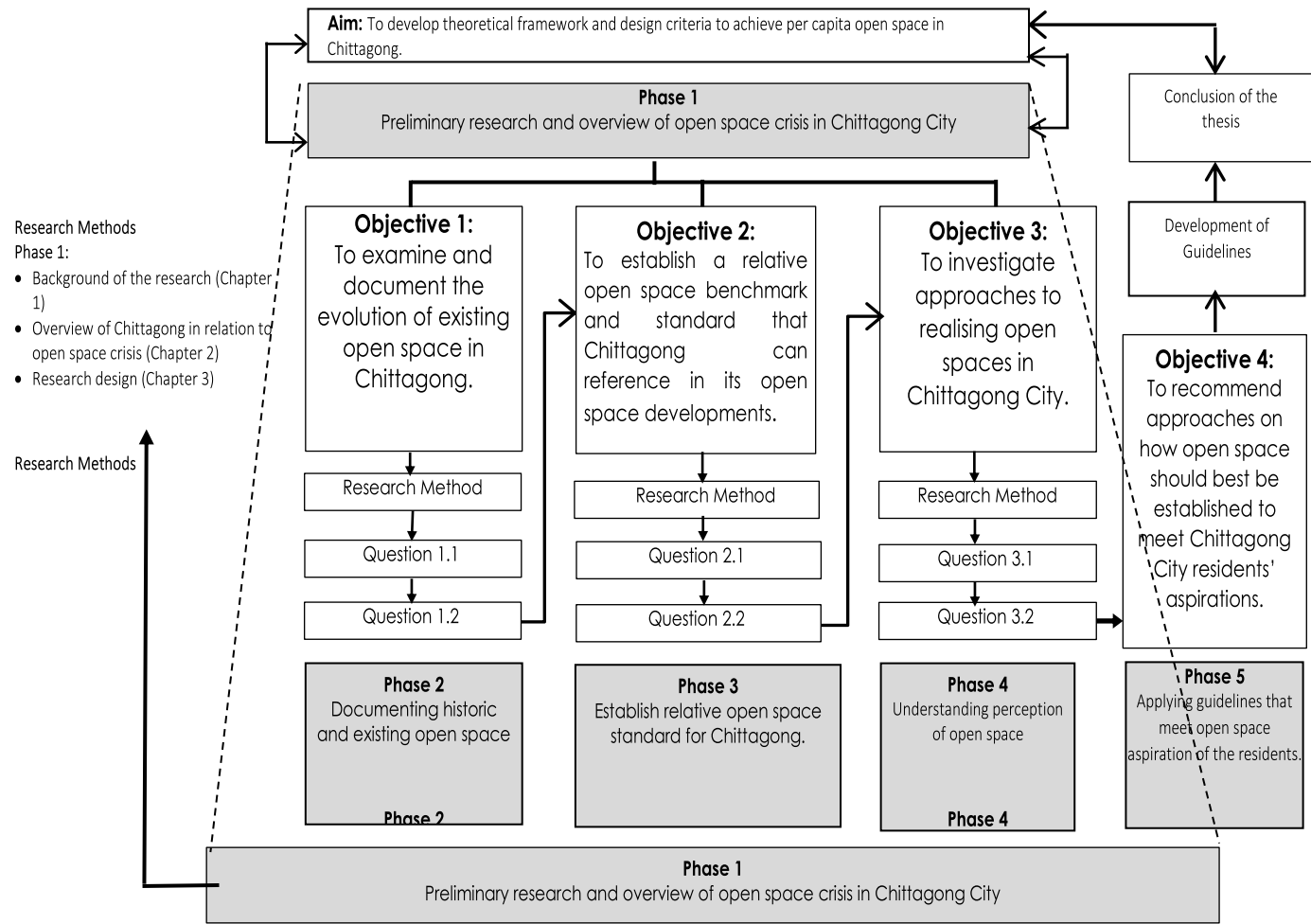


Figure 13: Research method in Phase 1.

In judging the quality of a research design, as suggested by Yin (2003), the theory considered to construct validity and reliability. In this research, achievement of the research aim is supported by using multiple sources of evidence acquired and described in the respective phases of this research (see fig. 3.2) and are summarised here as:

- i) Providing insight into the open space scenario in Chittagong (phase 2),**
- ii) Establishing internal validity by selecting contextual cities to compare (phase 3),**
- iii) Establishing external validity by using theory of different open space typologies (phase 3), and**
- iv) Demonstrating reliability by developing an open space database that can be used to link open space findings for potential use in Chittagong (phase 4).**

The case study design principles, above, described by Yin (2003) are shadowed in this research by the following three steps:

- i. To collect case study evidence,**
- ii. To analyse the case study evidence, and**
- iii. To compile a case study report.**

In contrast, George and Bennett (2005) suggested three phases, as opposed to Yin's (2003) four, to conduct case study research. Their phases are, i) designing case study research, ii) carrying out case studies, and iii) drawing the implications of case findings for theory (George and Bennett, 2005). To maximise the benefit to this research project from these two case study sources, the researcher preferred Yin's (2003) principles and applied them to Chittagong as the researcher considers them most relevant to the sources of evidence in the city and when used properly, can help to deal with the problems of establishing validity and reliability of case study evidence (Yin 2003).

Additionally, when considering a case study approach to address a research problem the 1st principle is to use multiple sources of evidence, which can be drawn from the other cities open space strategies examined as part of this 1st phase of this thesis. The next principle is to create a case study database followed by comparing the open space strategy in the respective cities and preparing a contextual database relative to the open space findings from the examination. The last principal is to maintain a chain of evidence (i.e. a link) projected by using this open space strategy data as evidence for Chittagong. These principles are accompanied by a series of steps and are described as below:

i. To collect case study evidence:

There are six commonly used sources of case study evidence that can be potentially used in research projects suggested by Yin (2003). They are documentation, archival records, interviews, direct observation, participant's observation and physical artefacts. Not all these six sources for data

generation are relevant to this research project. The case study approaches will be used in this study are documentation of the existing and historic open spaces in Chittagong by collecting data from planning authority and archives, relevant historic books respectively illustrated in phase 2 when applying a case study approach. A final source of evidence is a physical or cultural artefact of which this may be a technological device, a tool or instrument, a work of art or some other physical evidence (Yin 2003). In this research, the historical background of open space in Chittagong is relevant to the study and an important component to the overall research. This is because the physical evidence of the city is an important component when observing and analysing the historical landscape of Chittagong. Phase 3 (see Fig. 12) helps to achieve this artefact related step as it supports examination of the city's planning proposals to understand the scope of potentially increasing the open space ratio in Chittagong. In order to gain a better knowledge of open space issues in Chittagong from the viewpoint of its citizens, phase four involved conducting a field study. The information gathered from this study was then used to create an open space framework that adhered to WHO standards.

As part of this case study step, participant's observation was be considered in the research in phase 4 (see Fig. 12). This is to be conducted as a field study to develop an understanding of open space issues in Chittagong, from the perspective of its residents, where the data was be used for the realization of an open space framework in relation to the WHO standard. The field study was also involved interviewing professionals, such as architects and planners working in Chittagong, which addressed the qualitative dimension of this research. Please note that, the main preoccupation and considerations of qualitative research, in this thesis, are to see the 'problem' through the eyes of affected residents; describe and emphasise the context of the problem; and to develop an investigative field study process that has clear boundaries while remains flexible in its application (Bryman, 2004).

ii. To analyse case study evidence:

Atkinson J (2002) suggest four steps to analysis data using case study methods for novice researcher, whereas Yin (2003) extended that this analysis revolve around the researcher's theoretical proposition, accounting for rival explanations of data, or evaluating other descriptive frameworks. Given a general strategy, several specific analytic techniques are relevant and are described by Yin (2003) as, contextualising, explanation building, historical context analysis and cross-case synthesis effectively has been laid in the groundwork for obtaining the quality of this research. Yin's (2003) methodology recommends beginning with a simple and straight forward case study. As experience gained in completing such studies leads to the ability to tackle more difficult topics in subsequent case studies (Yin, 2003).

iii. To compile case study report

Regardless of the form of the report, this thesis followed the three steps suggested by Yin (2003) to develop a document. These steps are identifying the audience for the report, developing its compositional structure and having draft review of others by attending seminars and conferences related to the research. For this purpose, the researcher attended a conference named "8th SSEASR Conference on Rivers and Religion: Connecting Cultures of South and Southeast Asia" in 2019 and presented a paper written in phase 1 in a panel submission as "The Waterways of Chittagong and Dhaka: Socio-Cultural Influences on the development of cities open space". In addition, the researcher presented her paper on "Influence of waterways on open space in Chittagong" written in phase 2 (see Fig.3). in two seminars organised by the Leading University in Sylhet, Bangladesh and Institute of Architects, Bangladesh (IAB). The paper was presented on influence of waterways on open space in Chittagong. The conference paper and the seminar presentations are attached in the Appendix 16 and 17 and demonstrate a considered approach to the focus of this thesis (i.e. open space in Chittagong) which have been openly debated and defended. Demonstrating an appreciation and understanding of Yin's (2003) case study approach.

Yin (2003) suggests that a case study must be significant, complete, consider alternative perspectives, display sufficient evidence and composed in an engaging manner to be exemplary. In summary, the case study approach presented here is similar to the experimental isolation paradigm, in which each case must be specified (Yin, 2018). The degree of certainty or consensus that, in outdoor social science, a given community's ability to attain will typically be reduced due to a lower degree of plausibility-reduction of competing hypotheses that is likely to be realised. (Yin, 2018).

3.3 Phase 2: Documenting historic and existing open space

This section illustrates the 2nd phase among the series of phases developed to achieve the aim of this thesis. In this instance, it relates to the research method used to achieve the 1st objective.

Objective 1: To examine and document the evolution of existing open space in Chittagong.

Two questions were asked to achieve the 1st objective:

- 1.1. What types of open spaces have existed in Chittagong?
- 1.2. What types of open spaces currently exist in Chittagong and to what extent are these accessible to the city's residents?

This phase documented how open spaces were historically and culturally adopted in Chittagong by reviewing literature and historical records. Yin's (2003) theory suggested four ways to perform case study research. Among the four ways, this research is conducted with single case embedded design. In this

thesis, the open space of Chittagong is being studied and is the primary unit of analysis. This "unit" is divided into sub-units based on typology, with each sub-unit's evaluation area accommodating different types of open space. The resulting evaluation is embedded in each type of open space. This approach is used in this stage to investigate the contextual conditions defined by Yin (2003) by examining a single and extreme case that critically tests the existing theory and practise. In addition, George and Bennett (2005) suggested that the researcher should identify a single case or a group of cases to be studied. For example, declining open space in Chittagong City fits into an extreme and single case scenario which can be used to compare the context of city's open space. Another component of Yin's (2003) & Gerring (2006) research design process is "analysis of unit". The single case can represent a significant contribution to knowledge and theory building. Therefore, existing and existed open space in Chittagong is analysed in phase 2. That phase develops an understanding typology of historical open space and the cultural values that used to be practised in Chittagong and how they are fading. By analysing the four major historic periods in response to their corresponding open space typology and accommodation projected in this phase (i.e. chapter 4) presents a landscape history of Chittagong, migration of growth centres and transformation of landscape in Chittagong in terms of Heritage Management and Conservation guidelines in master plans. This analysis of historic landscape of Chittagong was published by this thesis' author in collaboration with Shamsul Hossain by "Routledge" as a chapter (Appendix 18) in a book named "The Routledge Handbook on Historic Urban Landscapes in the Asia-Pacific", chapter 11: Conservation of historic open space urban landscapes of Chittagong, Bangladesh.

The 2nd segment of this phase illustrated an existing open space scenario in Chittagong. Yin (2003) suggested that the potential analytic difficulties are reduced by a general strategy for analysing the data. Therefore, the researcher explored the amount of existing open space, available typology and their relative area distribution throughout the city, Identifying the existing amount of open space clarified the open space ratio in Chittagong to achieve the 2nd objective of the research. The existing open space provision and the historic open space in Chittagong related to this phase, is presented in chapter 4 and 5 respectively. Figure 14 illustrates the methodology used in phase 2.

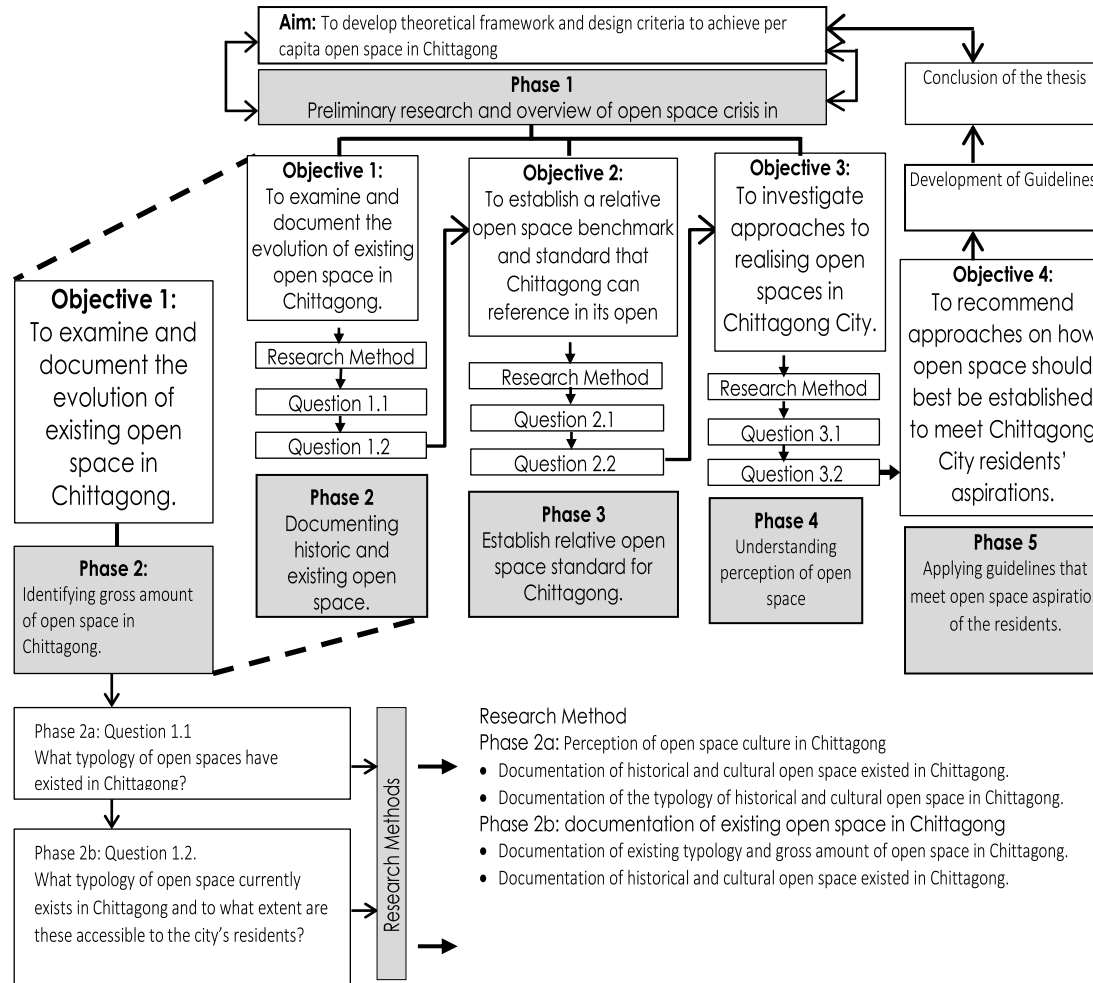


Figure 14: Research method in Phase 2.

3.4 Phase 3: Establish relative open space standard for Chittagong:

This section describes the 3rd phase in the series of objectives developed to achieve the aim of the thesis. In this instance, it relates to the research method used to achieve the 2nd objective.

Objective 2: To establish a relative open space benchmark and standard that Chittagong can reference in its open space developments.

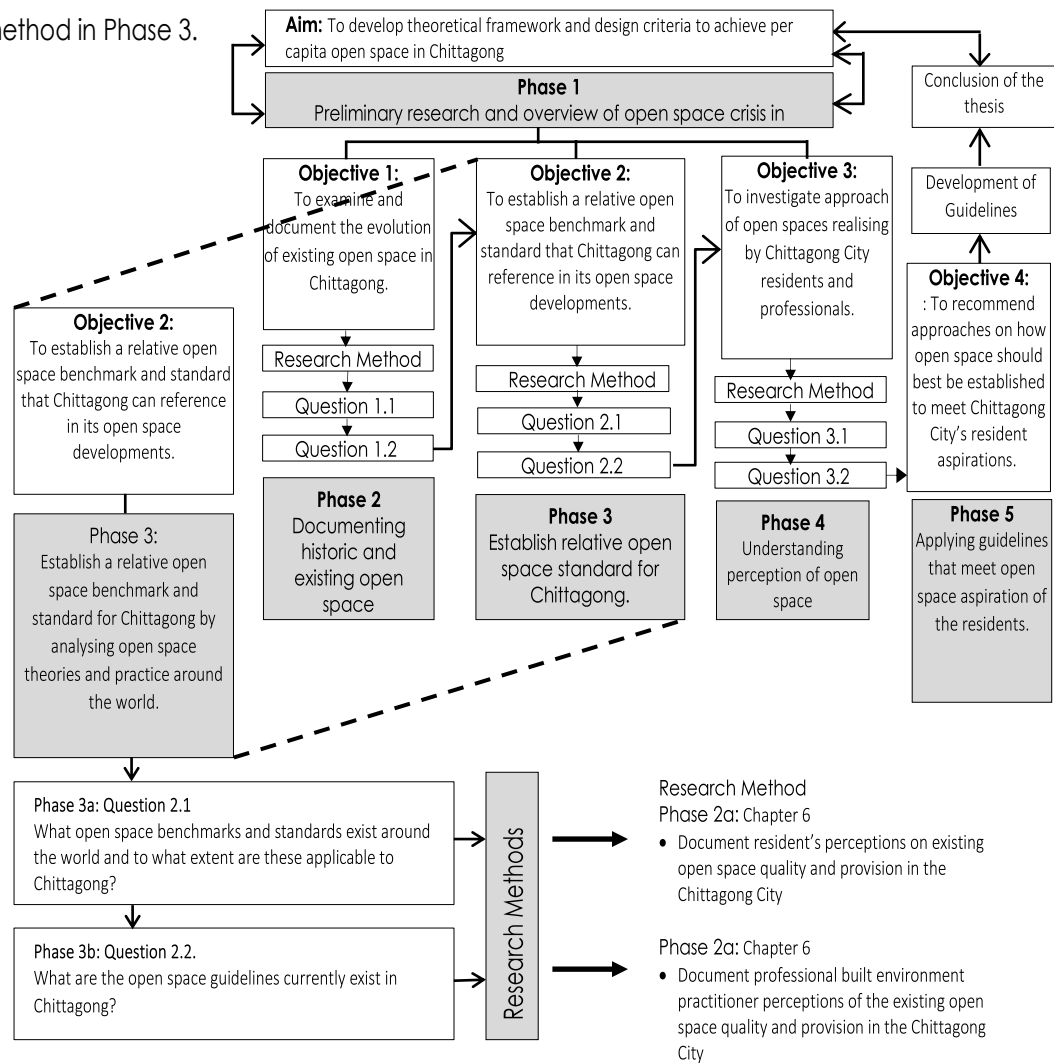
Two questions were asked to achieve this objective:

2.1. What open space benchmarks and standards exist around the world and to what extent are these applicable to Chittagong?

2.2 What open space guidelines currently exist in Chittagong and to what extent do they influence open space in the city?

These two questions correspond to phase 2, as gross open space in Chittagong needed to be correlated with open space provisions practise around the world. Following George and Bennett (2005) process, the information related to open space guidelines in Chittagong is collected and several such cases in cities around the world are examined in phase 3, where these objective's research questions help to identify the relevant information to be collected about the respective case.

Figure 15: Research method in Phase 3.



The intent of the phase 3 is to review literature on the definition, typology, benefits and ratios of open space practise around the world and to compare this material to the existing open space provision in Chittagong, which allowed in depth investigations of the research questions. To establish a relative standard this phase includes examination of open space planning standards and guidelines for Bangladesh practised in Chittagong, reviewing of planning proposals, description of sites proposed in planning proposals, implementation and maintenance of open space in Chittagong. It also describes the approach to collect preliminary data on the open space guidelines practised in cities and a brief overview of Chittagong in the context of open space. This research involved the evaluation of the relevant scholarly literature and other materials and the development of a research design and associated techniques to achieve the aim of this thesis. Phase 3 also intends to document the open space guidelines in the city by analyzing data collected from organizations such as Chittagong Development Authority (CDA) and CCC as illustrated in an article (Appendix 15) published by Multidisciplinary Digital Publishing Institute (MDPI) in volume 3 of 'Infrastructure', Special Issue Expanding Cities, Diminishing Space, 2018, Volume 3(3), 40 on 19 September 2018 and written by Maharina Jafrin and Beau B. Beza.

The literature review conducted in this thesis involves a scholarly inspection of open space standards practised around the world in correspondence to recommendations from the WHO. This literature review approach is based on a systematic review of material (Transfield et al., 2003) and was used to canvas a range of material specifically related to the thesis topic. This component of the literature review is presented in Chapter 6. This chapter expands upon the thesis by establishing that per capita open spaces in Chittagong City is far lower than the standards practised in cities. Finally, this chapter tries to establish a relative benchmark in Chittagong by analysing open space ratios practised in Western and Asian cities. Figure 15 illustrate the research method in phase 3.

3.5Phase 4: Document perception and thoughts on open space in Chittagong

The previous section presented the research method to achieve objective 2. This section describes the 3rd phase of the thesis which correlates to the 3rd objective.

Objective 3: To investigate approaches to realising open spaces in Chittagong City.

Two questions were asked to achieve this objective:

3.1. What are the city's open space aspirations and how do these achieve the urban growth plan of Chittagong?

3.2 What city-specific open space considerations best support the open space aspirations of Chittagong?

These two questions correspond to phase 3 and are used to explore residents' perceptions and professional's thoughts on open space in Chittagong (identified in the 1st phase of this thesis). In response to the 3rd objective to this thesis' research question, surveys on parks, playgrounds and open space in Chittagong City and interviews of professional is conducted.

According to Yin (2003, p xiv), such research is usually accompanied by “an intolerance of the ambiguities of non-laboratory settings”, which distinguish the case study from alternative research methods in social science. Whereas ambiguity tolerance is the ability to respond to perceived uncertainty with varying degrees of intensity (McLain et al., 2015). This phase analysed the gap between perception and reality in realising open space in the Chittagong City in phase 4.

In summary, and in relation to this thesis, the intent of the surveys and interviews are to:

- Document resident's perceptions on existing open space quality and provision in Chittagong City.
- Document professional built environment practitioner perceptions of the existing open space quality and provision in Chittagong City.

Towards developing an approach realising open spaces in Chittagong City, the survey and interview methodology were conceptually developed to portray peoples' aspiration on the demand of open space in Chittagong and to consolidate feedback on the city's existing planning strategy. The survey and interview analysis was published by “Multidisciplinary Digital Publishing Institute (MDPI)” as an article (Appendix 19) in 'Sustainability', Special Issue Advances and New Approaches in Smart Sustainable Urbanism, 2022, Volume 14(6), 9828 on 24 July 2022 and written by thesis's author.

The methodologies followed by the researcher allowed her to conduct surveys and interviews as shown in figure 16:

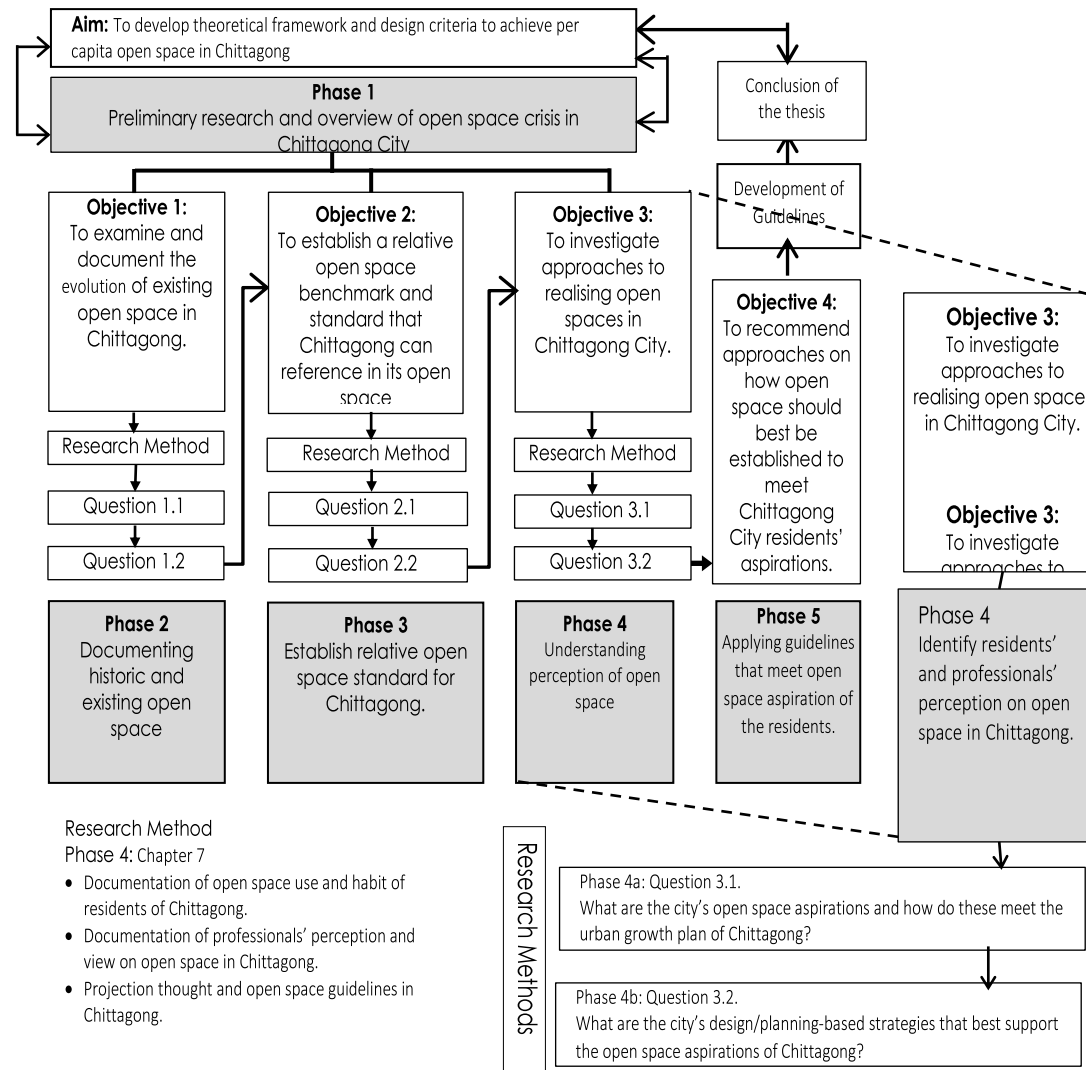


Figure 16: Research method in Phase 4.

- Research Method
Phase 4: Chapter 7
- Documentation of open space use and habit of residents of Chittagong.
 - Documentation of professionals' perception and view on open space in Chittagong.
 - Projection thought and open space guidelines in Chittagong.

Survey methodology: "Surveys [in studies described as above] are used to estimate the characteristics, behaviours, or opinions of particular populations" (Salant & Dillman, 1994, p.2). To understand and then address resident's need and aspirations related to Chittagong's open spaces, the survey questions in this thesis are designed to evaluate people's attitude towards three types of open space. The survey method reported by Lal (2018) is considered to be appropriate for use in this thesis (with amendment) as it also revolves around a case specific social survey. The sample survey was conducted in Hong Kong in 2018 by the Civic Exchange group and aimed to evaluate public opinion on existing open space quality. The sample size consisted of 3,604 Hong Kong permanent residents (Lal, 2018). The objective of the Hong Kong survey was to examine "how public open space meets residents' need" (Lal, 2018, p 11). The Hong Kong open space survey targeted "around 200 respondents in each district in order to ensure broad geographical coverage" (Lal, 2018, p. 12). The survey questions were both open and closed ended.

The researcher of this thesis engaged students from Chittagong University of Engineering and Technology (CUET) to assist her in conducting the survey. The students were 1st given the questionnaire (Appendix 7) as an example to engage with and test it on each other. Low non-response rates and insignificant misinterpretations of the questions were discovered by the researcher. Therefore, minor modifications were made to the documents based on their understanding of the material.

All respondents who participated in the survey were informed that these questions were intended to collect preliminary data according to the respective research question.

Surveys can also be used to assess needs, evaluate demand, and examine impacts (Salant & Dillman, 1994, p. 2). Hence, the survey in this thesis aimed to identify Chittagong's residents' pattern of open space use, their satisfaction/dissatisfaction in response to the contemporary design and implementation of the parks, open spaces and playground's use. The development of the survey was organised into the following elements (sample size, identification of sample sites, and survey questions and documenting respondents' responses) and are used to describe and present the researcher's understanding of how to develop and apply a quantitative survey.

I. **Sample size:** In this research, "sample is a set of respondents selected from a large population for the purpose of the survey" (Salant & Dillman, 1994, p. 53). Please note that as "[t]he decision about sample size, is not a straightforward one [...] and it depends on a number of considerations" (Bryman 2004, p. 97), the regular number of users of the sample sites are formed by daily users of a setting. As mentioned in the previous chapter (chapter2), the Chittagong City population was 5 million in 2021 and 19% of its residents live in a 400-metre catchment area of open spaces (see chapter 4). Therefore,

only 95,000 people are those who live in proximity to open spaces. The target group of this research is park, playground and open space users. The researcher applied a "convenience sampling" technique as directed by Young (2015). It involves the researcher selecting participants simply for reasons, such as, ease of access, in terms of physical proximity and accessibility (Young, 2015). Again Bryman (2004 p. 97), suggested that "[a]s the sample size increase, sampling error decrease". To decrease sampling error, a minimum size of sample has been selected from a daily user's ratio. The average daily user in CRB, Jamboree Park and Parade Ground are 1421, 2570 and 1285 person respectively (see Appendix 13). Therefore, the number of survey respondents has been selected from daily users is a minimum of 100 in each site. In total 279 respondents were addressed for the questionnaire survey.





II. Identify sample site to investigate:

To plan and develop a survey, sampling is needed "to save time and money" (Salant & Dillman, 1994, p 53) where "[t]he power of sample surveys is their ability to obtain information from a relatively few respondents to describe the characteristics of an entire population" (Salant & Dillman, 1994, p 53). Salant & Dillman, (1994, p 58) suggested that the 1st step in this process is "to identify the target population as precisely as possible". The issue predominantly under examination in this thesis is to understand residents' open space aspirations. To address this issue, park, playground and open space users are targeted for the survey due to their catchment area in Chittagong City. Among the seven types of open space in Chittagong illustrated in chapter four in this thesis, the survey has been conducted in three types defined as publicly accessible open spaces (see detailed description in the 1st chapter of the theses).

Each sample site selected, distinctively exemplifies a respective type of open space selected for survey due to their recent design and changes in upgrading, which attracts more users. These open space, park and playground developments are remarkable in Chittagong, because preservation and development of existing open space did not come into practise until 2001. In 2001, the CDA initiated the development of DC (District Commissioner) Hill Park, a city park. Following that 2014 saw the development of Parade Ground. However, two city park, one playground and one open space have been developed since 2001. However, CCC developed Biplob Udayan and Jatiangha Park (year of development unknown). There are numerous other private open space and amusement parks in Chittagong that have been developed or transformed to ticketed entry which are not considered in this thesis. The three sample sites in this thesis are selected as they are solely developed as public open space, accessible to the city's residents free of charge and have increased in size with the number of

regular users. The researcher therefore has selected these open spaces for their contemporary importance to the city's residents. In this research, selected sites are known as the Parade Ground, Jamboree Park and Chittagong Railway Building (CRB) area and are considered by the researcher a representative sample of the city's playground, City Park and open spaces, respectively. Table 1 presents photographic view of three sites before and after development, where Jamboree Park was once a playfield, but due to development, it turned in to a city park. CRB and Parade Ground updated with new amenities while maintaining the same purpose.

Table 1: Pre and post development phases of three sites.

	Pre-development phase	Post-development phase
Jamboree Park (2018)		
CRB (2015)		
Parade Ground (2014)		

III. Survey questions:

In response to the 1st question of 3rd objective, "What are the city's open space aspirations and how do these meet the urban growth plan of Chittagong?" a survey was designed to determine resident's open space aspiration following the considerations of:

- Identify the characteristics of users (i.e. age, gender, profession) that visit the open space.
- Inspecting how frequently they visit the spaces.

- Understanding user's attitudes and responses towards the development of open space.
- Investigating residents' demand for open space.
- Exploring the availability of formal open space in neighborhoods.
- Exploring the availability and accessibility of natural open space in proximity to neighborhoods.
- Examining park, playground and open space populations.

At the start of each survey the researcher began by reading the "Project Description/Protocol" and the "Plain Language Statement- Type A" (Appendix 4) The objective of the survey questionnaire was

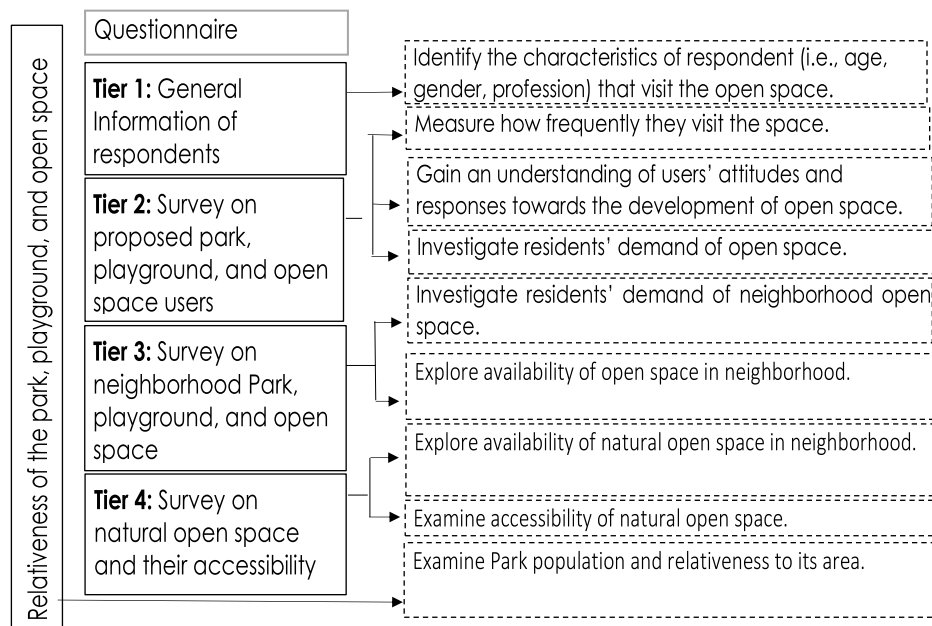


Figure 17 Relation between the considerations of each tier of survey question attached in Appendix 6.

to gather data on the open space visiting habits of residents. In particular, to measure whether they can avail open space and, how frequently they use it before and after development. To achieve the goal of the survey, four tiers of questionnaires presented in figure 17 were established to assist in organizing information and establishing a survey structure. Each tier resembles user specific information, such as demography, reflections on the development, availability of neighbourhood open space and the relationship of natural open space available in proximity of the resident. The survey questions are presented in Appendix 6. These were linked to the above seven considerations. The 5th tier is a relative observation of these three sites.

The researcher investigated user experience, their thoughts, level of satisfaction and demand of open spaces by identifying the users of the different types of open spaces available for city residents. Note, that as a consideration of a site selections in this study, the three sites also become variables due their different location, frequency of use and level of development presented in Table 2. Therefore, the structure of the questionnaire in these three sites has common elements although respondent's

outcomes have varied due to heterogeneity of the users interviewed (Bryman, 2004). The survey questions are comprised of a series of open and close-ended questions.

Table 2: List of open space development in Chittagong City.

Type of open space	Name of the place	Owner	Year of development	Open time	Area	Daily Visitors (approx.)	Landscape features added
Park	Jamboree Park	Ministry of Housing and Public Works	2018	4 pm to 10 pm (6 hours)	8.55 acres/ 35,550 sq. m.	3200-4750	Water body Fountain Sitting Lighting Walking trail Boundary wall
Open space (City park)	CRB Area	Bangladesh Railway	2017	24 hours	110 acres /445,315.98 sq. m.	600-2300	Sitting Stage Informal gallery Walkway
Playground	Parade Ground	Chittagong College	2014	5 am -9 am 4 pm -7 pm (7 hours)	6.11 acres/ 25,000 sq. m.	1200-1400	Walking trail Badminton court Volleyball court Gymnasium Boundary wall

Source: Prepared by author

The 1st tier of the questionnaire (part A) revolved around gathering general demographic data to explore the user's age, gender, educational background and working status. This data benefitted the researcher by suggesting the type of open space that is most likely to be required according to user's preference. The section also examines which type of users are mostly visiting the sites and helps the researcher to relate the type of open space depending on the type of user.

The 2nd tier of the questionnaire (part B) is focused on the respective park, open space or playground users' aspirations while they were visiting. This tier is structured to identify the change of respondent's use habits resulting from the change carried out on the respective open space. This part is distinctive among park/open space users and playground users. This is because, in order to maximise the use of the limited resources that are presently available, park planners and managers would greatly benefit from understanding more about utilisation trends and their changes (NRPA, 2016). As an illustration, Hornback & Eagles (1999) carried out survey to determine how people use parks and other protected areas. This section is intended to identify user preference and accessibility to a neighbourhood park, a playground and open space. This part revolves around the following identities:

- open space visiting frequency,
- proximity and accessibility to the open space,
- reflections on the development (whether the development fascinated them to visit more frequently or not),
- level of satisfaction regarding the development,
- their mode of transportation and travelling distance to the place.
- compatibility of the places, and
- How the transformation is related to their frequency of use.

In the 3rd tier of the survey question (part C), the respondents were asked whether they have experienced a neighbourhood park or playground, how they use it or not and whether want more etc. If they have the facility but they are not regular users, they were asked why they did not visit the space frequently. Furthermore, this section is designed to raise the open space situation with residents in Chittagong. The purpose of this part of the questionnaire is to identify:

- The user's distance from his/her residence or workplace to the open space facility to understand accessibility potential.
- Their requirements regarding open space.
- User's demand of the park and playground.

- Pedestrian connectivity along the street.

The 4th tier of the questionnaire (part D) is constructed to determine user proximity to natural open space in the city such as a lake, river, hill, pond, canal and the sea. This part is designed to realize residents' responses, whether they are living close to these open spaces or not. The intent was to explore whether a place attracts them more or not. If responses were in the negative (i.e. did not attract them) the question also allowed for data to be generated on why they were not attracted to the space. This section was also used to explore accessibility issues of the natural open spaces and to understand their state of condition and accessibility. In summary, a series of questions have been formed to identify:

- Residents' accessibility (physical and visual) to natural open space.
- Limitation (if people do not visit space, then why not).
- Residents' preference.

At the end of the survey, the data is compiled on residents' interest in using existing open spaces. In this study, the results from the survey are analyzed by creating a weighted rank, whereas a weighted rank is a representation of the rank of a specific observation inside a dataset that has been weighted by many variables (Costa, 2015) and establishes the priority of open space according to user's needs. The weighted rank was determined using:

- Recording the frequency: Open space transformation that pleased the user is rated as "very good" and as the 1st option, with a numeric value of 3, to the final option, which is rated as "not good," with a numeric value of -1.
- Recording the frequency: Assigning the frequency of visits as "more" by giving it a numerical value of +1, "same as before" by giving it a value of 0, and "less" by giving the last option a value of -1.

A tabulation (i.e. table 3) summarising the nature of the questionnaire is as follows:

Table 3: Participant type and questionnaire type.

Participants type	Types of Questions					Total questions
	Part A: 5 questions (General Information)	Part B: 14 questions (redeveloped park visitors)	Part C: 15 questions (redeveloped playground users)	Part D: 15 questions (Neighbourhood park and playground users)	Part E: 13 questions (Neighbourhoods in natural environment)	

Ai. Park/open space Visitors	√	√		√	√	47
Aii. Playground users	√		√	√	√	48

Furthermore, the number of survey questions are set to gather data in respective sections such as to gather data on perceived demand of open space. Followed by park and open space authority in cities who conducts survey with the goal of learning the needs of a cross section of the public, such as the Boston open space survey by Boston park and open space department, Hence, questions set as, “If you don't have a park in your neighbourhood, do you think you need a park in 10 minutes or in 1 kilometre walking distance from your place?” enabled the researcher to learn how much users want a park in their neighbourhood. As most people can walk 800 metre in about 10 minutes (Field in Trust, 2023), the question helps the researcher to understand residents desire to have open space in their neighbourhood. A few questions attempt to determine user's thoughts on existing open space. There are number of examples of this type of survey specifically on user's thoughts or perception of perception of open space survey. Such as Huang et al (2022) conducted a survey on Park management on Chicago and Parker (2017). An example of this type of question is, “Do you think this/these park/playground is sufficient for your neighbourhood?” In addition, this section set questions to frame user's satisfaction on existing open spaces. Such as, “How do you rate the redevelopment of this playground?” Respondents were also asked about their frequency of visit to different types of open spaces.

IV. Survey respondents: Two types of participants, shown in table 3, addressed the survey questionnaires and all respondents were above 18 years of age. This age benchmark was set to capture the decision of adults who visit these sites on their own. Because the thesis addresses both park and playground users, the respondents are divided into two categories.

1. Park/open space Users: This related questionnaire is set up with a number of sections as general demographic information, questions for visitors to a park/open space, questions about existing neighbourhood park and playground user patterns and requirements and questions about visitor associations to natural environments. The intent with this set of questions is to gather data about visitors with respect to their age to identify 'who' mostly visits these spaces and to gather data on how many times a month they walked to each type of open space adjacent to their homes.

2. Playground Users: In accordance with Curtis's (1914) recommendations, the purpose of this survey is to ascertain the quantity, age, and nature of playground activities. Furthermore, the purpose of this survey is to gather data regarding user's needs. The identical question that was asked of park and

open space users in the survey was repeated in order to determine whether there were any natural open spaces nearby for residents. In order to identify user patterns, the survey began with the primary gathering of data on general demographic information. The questions for playground user have been developed to help determine the future direction for playground provision and standards (City of Monash, 2019).

A. Interview method analysis:

In addition to providing insight, the interviews offer advantage in generation of research data (Salant & Dillman, 1994). To answer the 2nd question of 3rd objective, "What are the city's design/planning-based strategies that best support the open space aspirations of Chittagong?", the professionals involved in development of Chittagong were interviewed. And with respect to this method, "[q]ualitative interviewing, especially the in-depth interview, is now used extensively as a keyway of exploring social meaning within social science research" (Walter 2006, p 85). Using Walter (2006) as inspiration for this section of the interview it was organised into the following elements (Interview process, Interview question development process and Interview respondents) are described below to present the researcher's understanding in how to develop and apply a qualitative interview.

1. Interview process:

To assist in developing interview questions, Bryman (2004, p. 268) outlined six major steps and an approach when using this technique as part of a qualitative research method. The steps are to develop general research questions, select relevant sites and subjects, collect relevant data, interpret the data, outline conceptual and theoretical work, and write up findings/conclusion (Bryman, 2004). Once the interview questionnaire was organised into a research ready format and approved by Deakin University's ethics committee, the interview process commenced with presenting the "project description/protocol" to respondents to engage them in addressing the thesis' research aim and objectives. Following this step, the 2nd step as suggested by Bryman (2004), the professionals selected for the interviews are either directly or indirectly involved in the open space redevelopments or the critics who could best describe the pros or cons of these issue. Mainly 'face-to-face' interviews have been conducted with open ended questions (Gillham, 2001). This type of interview style was deemed suitable by the researcher due to the respondent's occupational and organizational background as a public official. A key element of why face-to-face interviews were employed, was this mode of data gathering allowed for frank and honest discussions to take place regarding the city's parks. While interviewing respondents' relevant data like maps, master plans and proposals were collected as part of Bryan's (2004) 3rd step as mentioned above. During this process "[t]he interviewer [...] ask[ed]

additional questions, express[ed] [...] her opinions where appropriate and explore[d] issues as the interviewee raise[s] them" (Walter 2006, p 86). Therefore, the interview method used here may be considered in between an in-depth method and structured method, which according to May (1997) can be suggested to be a semi-structured interview. This interview style also allowed for respondents from different organizations to freely offer solutions to address the city's open space issue (Salant & Dillman, 1994). However, due to a respondent's schedule, availability or location within the city, a couple of telephone interviews were conducted and to avoid the cost of travelling long distance (Bryman, 2004). Both the surveys and interviews were started in October 2019 ensuring the approval of the ethics committee. Whereas the surveys and interviews were conducted in between October and December 2019, but the telephone interviews, where the interviewer contacted respondents from Australia continued up to 2021. The interview protocol is as follows:

At the start of each interview the researcher began by reading the "Project Description/Protocol" and the "Plain Language Statement- Type B" (Appendix 5). Respondents were also given the opportunity to read the document in English and/or in the Bengali language, which was produced by the researcher and approved by Deakin University Human Research Ethics Committee ⁷ before giving their consent to participate.

In context of South Asian countries, Bulmer (1993), suggested that the following two influencing factors should be considered in context of a social survey. Due to language and cultural difference, the factors influencing the survey are contextualised in this research as follows:

a. Language: Bulmer (1993) stated that, "[l]anguage is most obvious a problem" when developing and conducting a survey. The survey and interviews of this research were conducted in a non-English country, where the researcher and students who assisted the researcher in conducting the survey are residents in Bangladesh and are bilingual. Both the survey and interview questions were constructed in English and Bengali for ease of communication in between the respondents and the students assisting in the survey. Furthermore, Bulmer (1993) suggested two methods to operationalize linguistic equivalence. In this research, the 1st of Bulmer's methods has been used where "different respondents answer the same question constantly in their respective language" (Bulmer 1993, p. 175). This suggestion was interpreted by the researcher giving instructions to students on how to administer the questionnaire in both English and Bengali. Although the Bengali language was offered, the majority of respondents completed the survey and conducted the interview in English. Using a questionnaire

⁷ Approval number 2019-243.

(Appendix 10) created in Bengali, the researcher conducted survey with participants who indicated during the process that they preferred to communicate in Bengali. In addition, the interviews conducted by the researcher were both in English and Bengali. The participants who prefer the Bengali language during the interview, were interviewed by the researcher with the questionnaire written in the Bengali language (Appendix 10). When conducting an interview in the Bengali language, the researcher documented it in Bengali and later translated it into English. Please note that, out of thirteen interviews with the professionals, only two were conducted in Bengali due to participants' preference.

b. Cultural distinction: Like other south Asian cities described by Bulmer (1993), Chittagong is a male dominant culture and conservative society. When working in places where these cultural characteristics are prevalent Bulmer (1993, p. 265) suggested that during administration of a survey “complications arose because of [...] precise personal information (on age for example), religiosity and fear concerning disclosure of some opinions or items of information”. Considering this conservatism in Chittagong and to address Emily & Macaulay's (1993) and Huddy et al. (1997) concern for response effects arising from interviewer gender, the researcher engaged male and female students in the field to address men and women, respectively visiting the open spaces.

2. Interview question development process:

The interview questions are both open and close ended to address the 3rd research question planned to address the 3rd objective of this thesis as stated above. Therefore, the interview questions are structured to identify the thoughts and experience of practitioners. The interviews are guided by a set of questions that acts as a theme, which allows them to develop personalised responses that provide the researcher with data revolving around the 3rd objective. The questions were constructed to gain knowledge and opinions from the technical and specialized practitioner in the area of this research investigation. For example, their responses provided data on relevant guidelines, policies and frameworks within their respective department to address open space in Chittagong. Following advice from Walter (2006, p 65), these questions are constructed as a “guide that covers all the key areas of the interview”. Additionally, the interview questions (Appendix 7) are open-ended and were asked by the interviewer to individual professionals in their workspace (except as described above). Bryman (2004) suggested that “the kind of questions asked in qualitative interviews are highly variable” and to address this Kvale (1996) suggested nine types of interview questions, such as introductory questions, follow-up questions, probing questions, specifying questions, direct questions, indirect

questions⁸, structuring questions, silence, and interpreting questions. Among these types of interview possibilities, the researcher incorporated the following question approaches into her research:

- I. **Introducing a question:** What guidelines/policies/framework do you and/or your Department/Practise have in place to address open space in Chittagong?
- II. **Follow-up questions:** Please tell me the issues, as you see them, relevant to existing and planned open space in Chittagong?
- III. **Specifying questions:** Please explain to me what you/your organization is doing or plan to do to address the issue of open space in Chittagong?
- IV. **Direct questions:** Please explain to me why you/your department doesn't consider open space as an issue in Chittagong?

3. Interview respondents:

As May (1997, p 129) suggested that an "Interview [is] used as [a] resource of understanding [of] how individuals make sense of their social world and act within it", hence, respondents identified for interviews were selected if they were professional Built Environment Practitioners. To develop and recommend an approach to realising open spaces in Chittagong City (i.e. the aim of this thesis), it is fundamental to explore the challenge in planning and development proposals recommended by these professionals. Furthermore, as mentioned previously to gain qualitative insight and perspective as stated by Bryman (2004), 13 professionals engaged in the development and planning of parks and playgrounds in Chittagong were interviewed. The interviewees include professionals from private foundations, corporations, government and public sector organizations, individuals and academia.

3.6 Phase 5: Applying guidelines that meet open space aspiration of the residents:

The previous section presented the research method to achieve objective 3. This section describes the 5th phase of the thesis which correlates to the 4th objective. Two questions were asked to achieve 4th objective:

Objective 4: To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations.

4.1 What open space approaches derived from other work and fieldwork analysis may best be applied in the city?

⁸ Indirect question is a projective method in which participants are asked to react to prepared questions from the viewpoint of a different individual or group.

Answering this question allowed the researcher to review the possible approaches derived from the literature review and fieldwork analysis that fit in context of Chittagong.

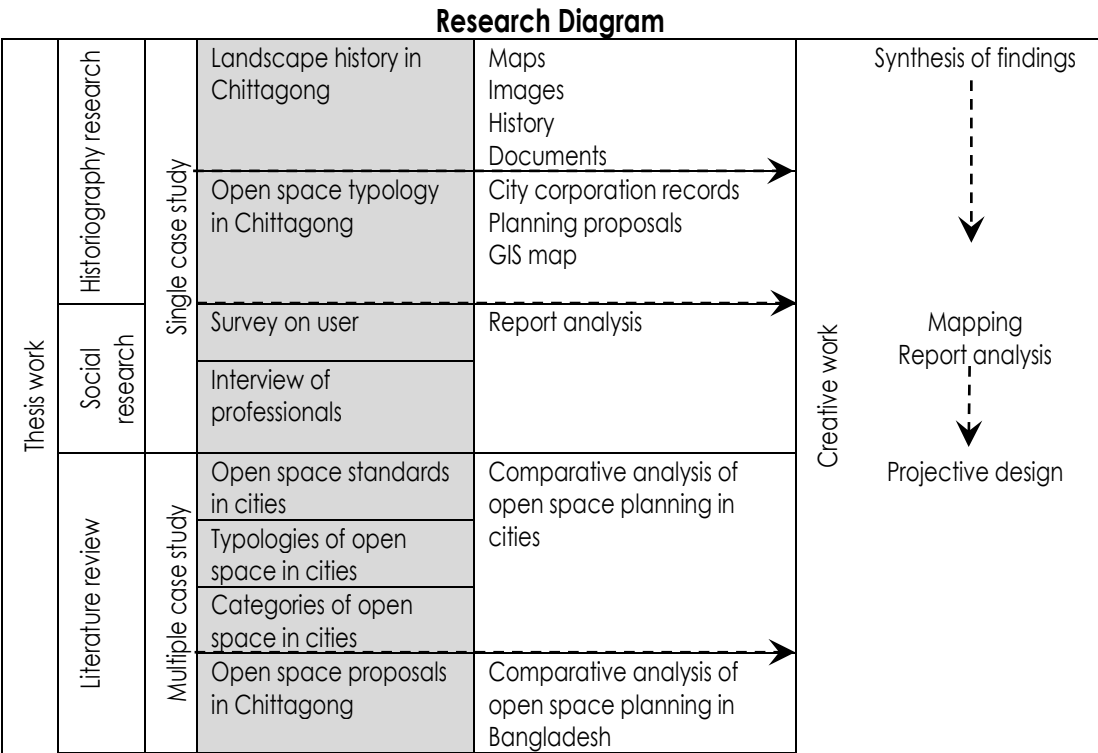


Figure 18: The research Framework and strategies, Source: Prepared by Author.

4.2 How should open space best be distributed to meet the city's growth and residents' open space aspirations?

The researcher was able to synthesize methodologies and their implication policies by providing an answer to the query. In addition, suggestions for the distribution of these open spaces throughout the city were made possible by the response to this query. Furthermore, providing an answer to this question indicated specific kinds of open space that Chittagong City needs in order to be revitalized and to guide the optimal distribution of open space. This phase extended to creative work stage to achieve objective 4 shown in figure 18 followed in chapter 7. As a result, chapter 7 covered the findings of objectives 1, 2, and 3. Researchers can establish open space standards and typology in Chittagong by combining existing open space data analysis with a literature review from various case studies and the historiographical research of a particular case study, such as Chittagong. Once more, by combining the results of objectives 2 and 3, the researcher able to create instructions for expanding open space. In the end, both of them assisted the researcher in projecting design options for Chittagong's open space network.

The following presents the creative work stage associated with this research project, which was conducted to develop and present an approach to improving Chittagong's open space ratio.

The Creative Work Stage (development of an open space approach)

The creative work stage of this thesis is used to develop a process/approach that leads to the establishment of an open space standard in Chittagong (presented in chapter 7); which can then be used by other developing city settings in their realisation of an open space standard. In this sense, the approach is to be a distinct agent for researching outcomes in landscape architecture (Deming and Swaffied, 2011 p.205). Since designing is the primary practise of landscape architecture, research methodology includes combinations of research and designing (Creswell & Plano Clark, 2011, p. 47) , where an investigation into the development of an open space standards is positioned in this thesis by implementing the findings. For example, Deming and Swaffied (2011, p 206) stated that a “design only becomes an autonomous research strategy when it produces new generalizable knowledge about the world through its purpose, protocols and outcomes”. They suggested eight fields need to be addressed in research design, which was followed in the framing of an open space standard and establishing an open space strategy in Chittagong. These eight fields are: truth value, applicability, consistency, transparency, significance, efficiency, organization and originality (Deming and Swaffied, 2011).

The useful indicator of ‘truth value’ in design research (i.e. in this thesis) relates to the internal validity of the process and its outcomes that may be achieved in inductive strategies, such as description, classification or action research. The next field, applicability is the generalised or transferable application of the finding of the respective research that, other designers can apply, whereas consistency is the reliability of knowledge created through design research. Bowring & Swaffied (2010) also suggest that the research should be free of hidden bias which is referred to as transparency. To meet this objective, it is recommended to document the graphical representation of the research by diagramming the work (Bowring & Swaffield, 2010). The next field is “significance” and to achieve this objective, it is necessary to ground the research within a wider theoretical context. The field “efficiency” is achieved by carefully planning the goal and process and the research needs to be well structured and disciplined to achieve the field “organization”. In this research, truth value was achieved by the findings of the literature review and local context analysis of classification, accessibility and visibility of open space in Chittagong to generalise the application that another city can apply where the reliability of the knowledge was achieved by analysis with design research and a diagram of the document that was created to gain transparency of the research. While planning upheld the goal of establishing standards through effective research this research intends to be well structured for better organisation and deployment of ideas by other cities wishing to improve their

open space situation. The last field “originality” was achieved by adding guidelines, idea, paradigm or theory in the development of the open space approach.

Specifically, the projective design strategy has three procedures: design operations, design interpretations and design reflections (Deming and Swaffield, 2011). In this thesis, design operation procedures were used to generate a standard and distribution of open space in Chittagong by creating a conceptual approach for designing urban open space in the city through examining certain principles of open space strategies that has been practised in other cities. According to Deming & Swaffield (2011), design operations, of this nature, are a characteristic of design experiments emerging at the intersection of landscape architecture and urban planning. Design operations include three common phases: inventory, analysis and synthesis (Deming & Swaffield, 2011). Each of these phases may be utilised as a research procedure, if it is arranged as part of a broader strategy and design. The Information is gathered and organised through the classification process known as the inventory phase. The process of dividing the gathered data or information into component variables or pieces is known as the analysis step. In this research, the data collected from the literature review and the information gathered from the analyse of existing local settings in Chittagong was divided into sections according to typology, area and accessibility requirements. The last phase is synthesis, which is a reciprocal process to put the pieces back together into a logical whole while also significantly altering it in the process Deming & Swaffield (2011).

Richard Weller's "Landscape (Sub) Urbanism in Theory and Practise" (Weller, 2008, p. 247–267 and "Planning by Design Landscape Architectural Scenarios for a Rapidly Growing City" (Weller, 2008, p.18-29) are examples which adopted design operation procedure of projective design strategy. In the former, Weller (2008) used a range of representation and mapping techniques to generate and communicate an alternative scenario for a single site. While, in his later work, he applied a combination of McHarg's analysis (presented in his book "Designing with Nature") of landscape capability and theoretical predictions about the types of landscape. Alternative urban areas to create a number of potential landscape scenarios for an area. These design interpretations are adopted, in this thesis, as discursive rather than an instrumental approach based on reading and writing the historical layering and accumulation of site narratives (Deming and Swaffield, 2011, p.215). In this research, the layering of historical open space analysis and the existing open space in Chittagong was used to understand the capability to increase open space and the theoretical projection of an open space standard and typology to create a number of potential open spaces in Chittagong. Another example of this type of design is "honouring the Stolen Generation" by Ware

(1999). In Ware's critical analysis, imagery is used as a means of investigation as well as a means of communicating research findings. In an effort to honor the "Stolen Generation," her research looked into how memorial design is understood, related to one another, and expressed formally in Australia (Ware, 1999) and was organized into several stages, similar to a studio design project. Beza et al., (2022) classify this approach to design research or in their case to thesis production as a Doctor of Philosophy by Creative Practise, where a creative component is included as a major element in one's work. In terms of Ware's (1999) work, Her steps included creating a typology for memorial designs, analyzing previous designs, speaking with members of the Stolen Generation, and conducting a number of design exercises that investigated the connections between various memorial conceptions, their formal expressions, and various contexts (Deming & Swaffield, 2011). Similar research by design, which applied the principal of projective design, is the Para-Scape thesis (Alhajaj, 2014). This aimed to test the possibility to practise the landscape urbanism theory in Dubai. This process involved a survey of a range of landscape architectural projects leading to identification of the dominant landscape architectural typologies that underlie and illuminate the ways in which culture and nature are perceived in Dubai. This process was achieved after using a descriptive strategy to serve and classify existing Public Open Space (POS) (Bolleter, 2009).

Whereas urban open space design, rather than pure research, is a complex challenge and balances a broad range of factors including ecological, cultural, economics, aesthetic, and human behavioural considerations (Masters, 2014). This type of research is known as Environmental Design Research (EDR). According to the Environmental Design Research Association (EDRA), the field is concerned with the "social aspects of the environment" and involves "improving understanding of the interrelationships between people, their built and natural surroundings and helping to create environments responsive to human needs" (Environmental Design Research Association, 2012, NPN). The EDR can be done by behaviour mapping and aesthetic design guidelines. Guidelines appear to be the most comprehensive and in-depth, least coercive, most reliant on logic and inspiration, and most customised to the design process of all the potential ways that EDR might inform the design process. (Chapin & Cooper, 1993). In this stage of this research project, the open space approach is predicted to include the creation of urban open space scenarios for the city. Hence, the creative work stage is a design stage that suggested design proposals to overcome the situation of a lack of open space in Chittagong. The framework of this stage was also influenced by critical reviews and recommendations in the preliminary study in the thesis stage. In this stage, the design solution is proposed in different urban scenarios to mitigate the crisis of open space in micro and macro level.

The 5th part (chapter 5) includes a critical review of literature and recommendations for increasing an open space ratio by suggesting an open space network following the outcome of that thesis' section. The projective design section illustrated in Chapter 7 presenting elaborately the recommendation on open space in Chittagong.

3.7 Conclusion:

This chapter delineates the research design applied to achieve the aim of this thesis. It has provided detailed descriptions of the five phases engaged to meet the four objectives and accompanying questions in this research project. Diagrams portraying the major research activities in each phase were used to structure the discussion of the research design with a series of appendices displaying the data collected during survey and interviews. The next four chapters report the results of the research questions undertaken on each of the four objectives while a final chapter synthesizes these findings into projective design.

Chapter 04: Evolution of open space in Chittagong

4.1 Introduction

Natural systems shape landscapes, which are also influenced by history and culture. (Brown, 2007). Habib (2010) suggests that the landscapes found within a setting may initially appear to be "left over" places but in fact they may be charged with significant meaning if one is unaware of the historical significance of the location. In Chittagong, Bangladesh, its rapid urbanisation and economic growth present challenges to the preservation of the city's historic open spaces; the challenges being similar to Habib's (2010) description above. Currently Chittagong is facing a shortage of open space not only due to lack of forward- looking planning and implementation, but also due to failings in the preservation of the city's historic open spaces. In terms of urban planning, while the first Master Plan of 1961 proposed 26 different forms of open space, which also included historic places, it failed to preserve them and to implement more open space for the city.

The focus of this chapter is to present an understanding in how the city's open spaces were developed in Chittagong's journey from a small port settlement to a contemporary urban setting and the significance of their preservation for the management of its urban heritage. This discussion on the evolution of open space revolves around their creation and development from the seventh century to the twenty-first century through three major periods – pre-medieval, medieval and colonial. The discussion is focused on the city's geography, cultural, economic and political influences, and historical transformations. This section is aimed to achieve the 1st objective of this thesis which is "To examine and document the evolution of existing open space in Chittagong. This objective is supported by following questions:

1.1. What types of open spaces have existed in Chittagong?

1.2. What types of open spaces currently exist in Chittagong and to what extent are these accessible to the city's residents?

This chapter therefore addresses the 1st question of objective 1. The next chapter will address the 2nd question of the 1st objective.

Despite the city's unsupportive stance on heritage spaces, a few traces of the city's past are evident in Chittagong and its surroundings (CDA, 2011). Additionally, UNESCO (2011) recommends the preservation of historic landscapes for their important role in modern societies. They recommended that certain specific dangers to the preservation of historic urban districts be identified, and that broad principles, policies, and guidelines be provided to address these issues (UNESCO, 2011). In addition to being a vital resource for improving the livability of urban places, urban heritage—both tangible and intangible—also promotes social cohesion and economic growth in a changing global context. Since

the future of humanity depends on wise resource management and planning, conservation has emerged as a tactic for striking a sustainable balance between urban growth and quality of life (UNESCO, 2011). Hence, in Chittagong, the city's historic landscapes need to be preserved to promote their cultural and historical value, to help save the historic buildings in their midst from threat of development, and to contribute to the overall open space aggregate of Chittagong for the health and wellbeing of its people.

Chittagong is one of the oldest seaports in the world and thus possesses a rich urban heritage. Geospatially, the city is cradled by hills, the sea, rivers and lakes and was referred to as 'the queen of the east' (Karim, 2006; Mohammad Khan, 2017). Its natural features also provided a flat plane suitable for cultivation, trade and industrialization (Jafrin & Hossain, 2020). The landscape has been described by many travelers, such as Captain Pogson (1831), a soldier with the East India Company in the mid-1800s, referring to the city as, "a romantic beautiful place; the houses are on separate contiguous hills, about a hundred feet above the level of the sea; the glens and valleys are beautifully crowded with Betel, Mango, and Negesar trees; the air was cold, pure and serene: sensibly different to the atmosphere of the water" (Hossain S., 2012b: xiv). Pogson's writings of Chittagong reveal that he was as much fascinated by the physical scenery as the natural resources of the area (Mamoon, 2015).

Chittagong has long been a center of cross-cultural interaction, and the cultural and religious origins of the city's rulers have shaped its physical features (Jafrin & Hossain, 2020). The city was governed by several sovereign 'foreign' powers (Hossain 2012b), eventually developing into a vibrant multicultural society. The rulers came from a variety of socio-religious backgrounds, carried their own customs of construction practice, spatial shape, and considerations for open space in the city. The major traits of rich cultural diversity of Chittagong are noticeable in its architecture, sculpture, coins and other metal products dating from the seventh century (Hossain 2012b). The folk art, costumes, foods and punthi (manuscript) literature, various dialects, folklore, rituals, customs and ceremonies of Chittagong constitute and support the city's precious intangible cultural heritage. The hills in Chittagong and its peripheries also boast an interesting prehistory.

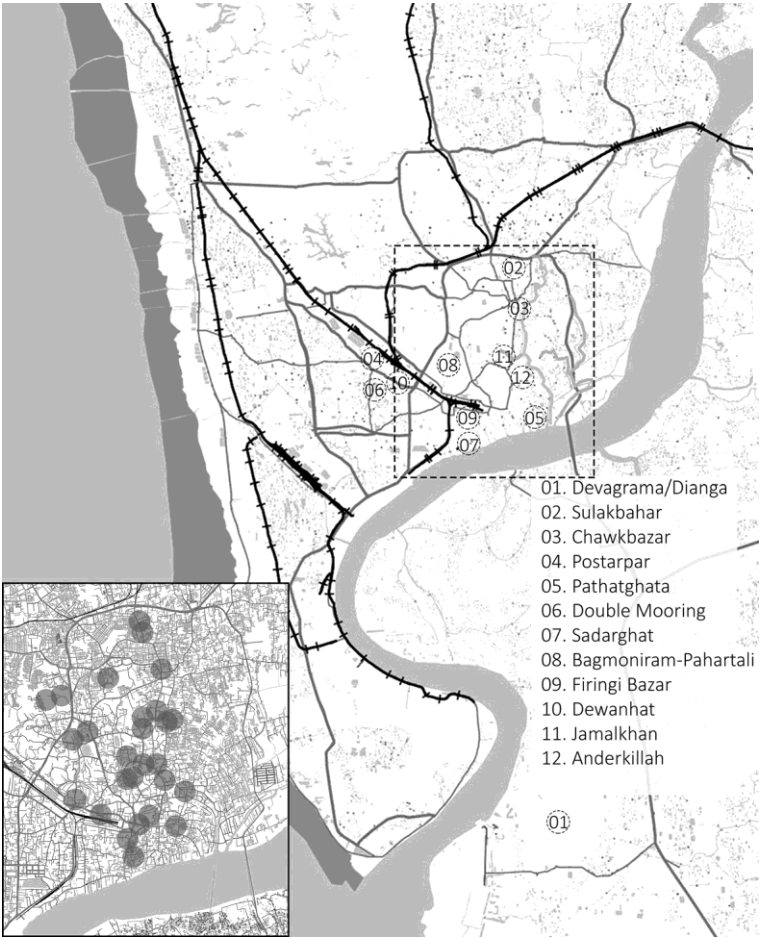
Harikela, the pre-medieval name for Chittagong, was mentioned by Chinese traveler Yi Jing as India's eastern border in the seventh century (Eaton, 1993). With Harikela at its centre, the bustling seaport of Harikela had long been a significant stop on the Bay of Bengal and South Asian trade routes. In the past, the port was also connected to a vast hinterland that was renowned for its prosperity. Due to its strategic geopolitical location, Harikela's economic importance as a major port city, as well as its

contribution to trade and commerce, attracted "Arab Geographers" from the eighth to the twelfth centuries, who referred to the nearby Bay of Bengal as the "Sea of Harikela." During the Sultanate (1340-1538), Arakanese (1575-1666), and Mughal administration (1666-1760) of the area, Harikela produced sophisticated currency system and remained a mint-town. Throughout the Colonial era (1760–1947), the city also maintained its status as a major transit and economic hub in the eastern Indian region (Khan 1990). In order to meet the import and export needs of the eastern region of the newly formed state of Pakistan, the seaport was further built and enlarged after 1947. The state's planning authority was originally established in 1959, and the city's 1st master plan was created in 1961. In 1971, Chittagong, an important port city, and other areas of East Pakistan joined the newly formed Bangladesh (Jafrin & Hossain, 2020).

4.2 Chittagong's historic growth centres and urban landscape

In contrast to other regions of Bangladesh, Chittagong's urban expansion was unique due to the city's steep geography, port, and water-based trade. The city's natural and urban landscape in Chittagong was influenced by the civilizations (of the separate eras) that inhabited the area in the past. Chittagong is an urban environment with a V-shaped form. While Chittagong's canals serve as a bridge between the city and the river and the sea, the western 'arm' is an edge to the sea (Bay of Bengal), while the eastern 'arm' is an edge running parallel to the Karnaphuli River. Hills rise in the heart of the city between these two arms, spreading out to the north and niching down to the south. The sea, river, hills, and adjacent flat land connected to the canals are the four main natural open areas that dominate Chittagong's geography and have a significant impact on the city's development. The distance between the Karnaphuli River and the Bay of Bengal's confluence and Chittagong's current city centre is approximately 15 miles (CDA, 1995). Transportation and manner of trade have an impact on the city's growth hubs. The majority of the growth hubs were close to the Chaktai Canal, which joins the Karnaphuli River. As a result, these growth hubs are undoubtedly the busiest and most populated business regions.

The ancient town and growth hubs are shown on a map of Chittagong that also shows the location of the city's historic structures (Figure 19). The Pandit Vihara was located during the Harikela period



Gray dots denote to the historical growth centres in present city centre. Source: Prepared by Author/Map from Chittagong Development Authority.

Figure 19: Historical growth centre of Chittagong.

(seventh century CE to 1340) on the east bank of the Karnaphuli River, now known as Deang. There were a few Buddhist temples and viharas during this time (Qanungo, 1988). A vihara is a monastery that serves as a monks' home, a place for religious study, meditation, and practise. A vihara normally featured an enclosed courtyard in the center. Due to unfavourable climate conditions and the devastating Canon War against the Portuguese utilizing Canon, these locations have been lost (Ray, 2017). Consequently, because to the extensive change that has taken place, it is challenging to determine the actual impact of monasteries on the current landscape.

According to Qanungo (1988), the Sultanate period (1340–1538) saw the development of a new port location at Sulk-ul-Bahar and the emergence of the 1st Arabic place names in Chittagong. Postarpar, also known as Pust Par in Persian, was another growth center during this time period. It is situated close to Dewan Hat and to the west of the Karnaphuli River. Due to their commercial activity and use for water-based transportation, these places have grown into dense urban centers. (i.e. being located next to the river and the creek) (Jafrin & Hossain, 2020). Muslim urban planning and architecture also

affected building and landscape design when Sultans invaded this area. For instance, the Badar-Aulya tomb in Boxir Hat was a combination of a tomb construction, mosque, and courtyard named for the saint who travelled to Chittagong to preach Islam with his eleven saints (Banglapedia, 2021).

Later, the Portuguese built a town called Dianga close to the shore about 20 miles south of the current Chittagong, south of the mouth of the Karnaphuli River (Phayre, 1883). During the Arakanese era, Portuguese activity increased (Qanungo, 1988). According to Ray (2017), the Portuguese referred to Chittagong as "Porto Grando," and the location is currently a hub for port-related activity and home to administrative structures. The Portuguese also had their own port facility at Bundel, which is now a very busy commercial centre and a significant religious hub in Chittagong. It was located in the Patharghata region on the Karnaphuli River. On the Jamal Khan Hill, they also constructed churches. At Jahanpur, Hathazari, Kathirhat, and Fateabad, the Arakanese built their "mud forts," or Kotterpaar (Banglapedia, 2014). Despite existing at the same time, the Arakanese and Portuguese reigned over different parts of the city (Qanungo 1988), and their respective open spaces developed in different ways.

The Mughals built a fort called Anderkillah (inner fort) on Rangmahal Hill during their administration of Chittagong (1666–1760). This strategic location, with its clear vistas, offered a military advantage. A mosque named Anderkillah Shahi-Jam-e Mosque was built close to the fort to commemorate the Arakanese defeat by the Mughals. The right bank of the Karnaphuli River is dotted with a variety of ghats (quays) and bazaars (open markets), which were constructed as Mughal control expanded. Today, both inside and beyond the municipality, these open space settings are significant locations (Banglapedia 2014). The city began to establish what may be considered its 1st town parks during the Mughal era (Nilufar, 2011). The general timeline associated with historic landscape developments of the city is shown in Table 4, which is based Hossain (2008) and figure 19 presented the growth center in grey dots on Chittagong city map.

Table 4: Chronological historical periods of Chittagong and their landscape characteristics

Name	Pre-medieval Harikela	Sultanate age	Arakanese age	Mughal Age	Colonial age	
Time period	7th c. BC to 1340	1340–1538	1575–1666	1666–1760	1760–1947	
Establishments	Monasteries	Mosque Tomb	Fort	Fort Mosque Tomb Garden Water ways Chawk/Chauk	Playground Railway setup Club Judicial settlement Resident's Garden Church Racecourse	
Landscape	Boundary	Yes	Yes	Yes	Yes	No
Characteristics Shape	Geometrical	Geometrical	Geometrical	Geometrical	Geometrical	Free shape
Location	High flat land	High flat land and close to river	High flat land and close to river	High flat land and close to river	Hills	
Function	Religious/ Educational	Administrative Residential Religious	Administrative Residential	Administrative residential Commercial Religious	Administrative residential Commercial Recreational	
Accessibility	Fully restricted	Fully and Partially restricted	Fully and Partially restricted	Fully and Partially restricted	Free	

(Source: Prepared by Maharina Jafrin and adapted from Hossain (2008).

The transfer of the city's Christ Church, which was originally built west of Lal Deghi in 1839, serves as an illustration of this change in the growing center. However, during the Colonial era, in 1929, the church was relocated to the colonial port city's new core, which also housed the Assam-Bengal Railway's headquarters (Hossain 2012b; Mia et al., 2015). The establishment of the Headquarters in Chittagong at the end of the 19th century permitted the administrative building and the railway station to continue to exist as open spaces, generously surrounded by the hilly environment (Muzzini and Aparicio, 2013). In this age and in this steep environment, the establishment of a commercial tea plantation sparked the growth of another rail line to the north-east of Chittagong. This linear corridor has the effect of giving Chittagong an open area that is still a feature of the city's urban landscape today.

The development of a lovely visual aesthetic in the city is a result of the city's multi-layered evolution and development. An observer of the town in the 19th century described it as having "a succession of small round hills, planted with coffee, pepper, vines, and bamboo and surrounded by the villas of the English residents, give to the surrounding country an interesting and romantic appearance" (Qanungo, 2010, p84). The planned Racecourse, which the city's 1961 Master Plan had earmarked as a future open area, was replaced in 1983 after Bangladesh's independence with an Export Processing Zone (EPZ).

As a result of the historical growth centers, a dense urban environment has been developed against a backdrop of sizable historical open spaces. Chittagong's urban area was on the left side of Chaktai Creek and connected to the Karnaphuli River before the Colonial era. The city was built in such a way as a result of the use of water-based transportation that the main road had to turn around and avoid the crowded area of the ancient town. This region has the majority of the old open areas. The city grew in both the north-west and north-east throughout the Colonial era. The Karnaphuli River, which had previously flowed alongside Fairy Hill (as can be seen on old maps), changed its course and produced a new type of environment between the locations of the water-based trade and commerce. Following the construction of railways, commercial activity on waterways diminished. As a result, the old town's traditional open space began to decrease.

4.3 Historical landscape typology of Chittagong

The Historic Urban Landscape of Chittagong could be analyzed in terms of open space types that would reflect the historical development of the city. The heritage landscape typology of Chittagong, given below, is based on their setting characteristics, function, associated historical events, and impact on the growth of the city (including an account of the respective dominant development

influences) (see City of Melbourne, 2012; DSR, 2012). Ten heritage open space types are identified. They include informal (unplanned) and formal open spaces. Within these spaces, there are historical buildings, public spaces, and natural settings with hardscape and softscape features. The analysis of the urban form of the city in such landscape types helps to overcome limitations of monument-centric and bifurcated (nature/culture; tangible/intangible) approaches to conservation of urban heritage and to develop an approach that is place-specific and that highlights Chittagong's landscape setting and historical development. Hence, this section addresses the 1st question addressing objective 1 which is "What types of open spaces have existed in Chittagong?"

a. Cultural open spaces

Cultural open spaces are related to significant events that contributed to the open space's importance to the heritage of the city. For example, maidan (ground) commonly refers to a large plain, open field, a vast ground or a public square (Habib, 2010). In Chittagong, there are a few maidans, but several of them, such as the Gandhi Maidan and the Municipality Maidan, have been lost to development (Qanungo, 2010). The Gandhi Maidan was in the north of the city's Rangmahal Hill. The maidan was historically significant since Mahatma Gandhi presented a memorable speech there as part of the Non-Co-Operative Khilafat Movement (i.e. the revolution against British colonial rule attempted in 1919–1922). The Chittagong General Hospital is situated in this place.

The Municipality Maidan was an open space setting extending between the foothills of the Fairy Hill and the Laldighi (a pond adjacent to this maidan). The place was bifurcated by a road (Qanungo, 2010), and the segment east of the road was renamed Laldighi Maidan. The western part of the maidan is now built on and occupied by commercial activities. This maidan has an association with Jobbarer Boli Khela, a traditional form of self-defense closely aligned with wrestling in Bangladesh. In the early part of the twentieth century, Abdul Jabbar Saodagor, a merchant of Chittagong, arranged a Boli Khela event with the desire to develop an activity preparing the city's youth to challenge British occupation. The 'training' started in 1907 and still occurs to this day annually in the first month of the Bengali New Year in this location (Banglapedia, 2014).

There are other cultural open spaces associated with sports that were developed during the colonial period. Four noticeable play-fields that helped shape the city (Qanungo, 2010) include:

- i) Nizamat Paltan Ground (situated in the foothills of Railway Hospital Hill);
- ii) a Parade Ground, which was important for inspection of troops and was significant for patriotic meetings, political and social assemblies;

- iii) a polo ground (which was a favourite site for Europeans to use for horse racing and polo games. This is now used as a playground and a place for hosting fairs in Chittagong; and,
- iv) a cricket ground (that mostly Europeans used to play cricket on) which is now encircled by a stadium.

Another type of cultural open space is the ghat – a quay/landing place that runs along the city's waterways and acts as an interface between the land and water (Ahmed, 2017). The oldest of these waterfronts are Sadar Ghat (the main-quay, created during the colonial period), part of it has been transformed to recreational open space named as Abhay Mitro ghat, Ghat Forhad Beg (established in the Mughal period), Fishery Ghat (year of development unknown), Patharghata (Portuguese settlement), and Firingji-Bazaar Ghat (foreign-market-quay; year of development unknown). The Ghats provide bathing, recreation, worship, domestic activity, trading and transport, and thus are important for city residents (Ahmed, 2017). The ghats are extremely busy places that are key features of the city's urban form and public realm.

b. Open spaces associated with waterbodies:

This open space type is associated with bodies of water in the city, such as beaches, reservoirs (dighi), and canals (khal). According to Qanungo (2010), in the colonial period, seaside resorts were established near the town (Qanungo, 2010), such as the seaside resorts at Minamutee and Parkee. He suggested that these two beaches were much liked by the Europeans and there were riverside walkways. These two sites are in outskirts of the city. The shore of the river Karnaphuli from Sadar Ghat to Patenga was once noted for walking, while boat racing on the Karnaphuli was a favourite game since the Swadeshi period (from late 19th to twentieth century) (Qanungo, 2010).

Another aquatic-based open space is the Lal Dighi, which is a natural reservoir of fresh water. During the Arakanese period, it was the principal source of water used by the garrisoning army; while in the Mughal period, it retained its importance for similar purposes and in mid-nineteenth century Lal Dighi was given a beautiful shape by adding two ghats on both sides of the dighi (Qanungo, 2010). The Mughals created Ashker Dighi in the mid-seventeenth century to ensure the water supply to the soldiers of the Mughal second commandant (Tourin, 2016). The British built Foy's Lake in 1924 to provide water to the railway workers' residences (Banglapedia, 2014). This lake and its surrounding hilly area still serve as the largest open space feature in the city. Pahartali Lake (known as Jorr Deba or a 'pair of ponds'), was also excavated and converted to an artificial lake during the Colonial period

(Qanungo, 2010). Agrabad deba (pond) was created when vast land was excavated to collect soil for laying the Erstwhile Assam-Bengal Railway (1892-1942) track.

UNESCO's Operational Guidelines for World Heritage Sites state that "[a] canal is a human-engineered waterway" and that "[it] may be of outstanding universal value from the point of view of history or technology, either intrinsically or as an exceptional example [...]" (UNESCO, 2017, p84). In this sense, the canals of Chittagong represent a unique form of cultural heritage in that they identify a monumental achievement and work to define the features of a continuing cultural landscape. These historic canals continue to contribute to the city and thus need to be preserved according to ICOMOS (1996) guidelines. Heritage canals and waterways in Chittagong are related to traditional riverine settlements concentrated with water-based trade and life along the Karnaphuli River and the Chaktai Canal. During the Arakanese, Sultan and Mughal periods, Maheshkhali Khal was prominent among those canals providing a necessary water-based communication network in the city promoting human settlements. The area in Khatunganj along the Canal was once Bangladesh's largest wholesale market for essential commodities and was known as the 'Wall Street of Bangladesh' (Chowdhury, 2011; Dastider, 2016, p64). During the colonial period, there was an extensive expansion of the canal system. For example, the Mahesh Khal was excavated to facilitate water transport in the port area and the Arakan Khal was expanded from Karnaphuli to the Pahartali-Bagmaniram area of the city (Talukdar, 2014). The creeks were used less and started to shrink due to encroachment (BIGD, 2014). Construction of retaining walls along the canals also reduced the width of creeks. Siltation causes the reduction of the depth of canals, however, they are occasionally excavated to avoid flash flooding (Ashraf and Chowdhury, 2009).

c. Gardens and parks

These include designed and/or formal parks and gardens that are of two types: royal gardens and residential gardens. The Royal Garden at Ander-killah evolved from the development of the city's fortified installations (Figure 20). There are two aspects to this type of space: an inner open space and outer open space. The inner garden relates to the open space in and around the hill of the Anderkillah (inner fort) area in Chittagong (Hossain, 2012a). The landscape inside the Anderkillah reflected a formal arrangement of gardens, including a compound of the tomb of Badr Aulyia (the saint of seamen), a mosque (named Kadam Mubarak), a formal pond (Lal Dighi) and an open field area (called 'Lal Dighi Maidan') that included a moat and rampart on its periphery. The fort had two springs inside its inner walled area (Ray, 2017). Built features positioned in and around this open space were religious and administrative buildings and housing for the monarchs of this period. The open space

outside of the forts was used for informal and passive public recreation and consisted of tree groves and flower gardens. These places were aptly named 'Bagh'; which is a Persian word that translates

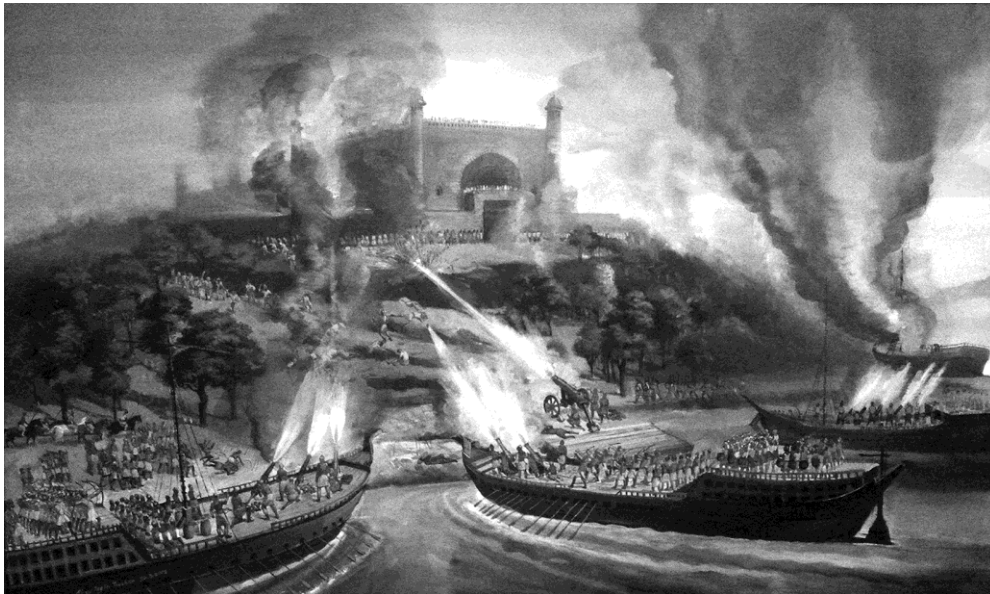


Figure 20: Mughal-Arakanese battle on the Karnaphuli River in 1666 in front of Chittagong.

Source: Chittagong University Museum.

as garden. Usually, a Bagh refers to an enclosed area with many different types of trees, shrubs, and flowering plants (Nilufar, 2011). The first use of the Bagh design occurred during the Mughal period. There was a similar fort known as 'the outer fort' at the mouth of the Karnaphuli River (Ray, 2017), and was lost due to the war between different rulers.

The garden spaces, such as those contained in the fort, need to be preserved not only due to their cultural and historical value, but also due to the city's existing shortage of open space. For example, without the open spaces abutting the Fort's buildings (areas surrounding Anderkillah Shahi-Jam-E Mosque), the designed relationship between built form and function (i.e. military fortification and defense) would be lost, providing only half of the story of the city's urban development.

Residential gardens, as open spaces, accompanied the houses of the officers during the Colonial rule. People of high rank, such as European officials, merchants and agents, built their houses on the top of the hills of the city (Qanungo, 2010). These houses were known as bungalows. Examples for such houses include the bungalows of Captain's Fog, M. M. Rae, Captain Compbell, Lieut. Lomas, M. Boifongs, and Bydanaw. Paintings, maps and other documents from this period depict a calm and soothing environment of meticulously planned open spaces that complemented the built environment. These gardens form a distinctive feature of the residential landscape of the Colonial period and need to be preserved where they exist. Good examples of this type of open space are the gardens of the Circuit House and the DC Hill Park. The Circuit House was the residence of the high

officials of the British administration. Its meticulously planned open space is now used for the New Circuit House and an amusement park (Hossain, 2012b). The old Circuit House, now converted into a museum, is significant to Chittagong because it memorializes those who were tortured and killed by Pakistani troops before the country's independence in 1971 and later it marked the assassination of a president of Bangladesh. Before the construction of the amusement park, this open space served as a vibrant public gathering space and provides a clear illustration of Chittagong's national importance. The DC Hill Park still serves as a public space and for cultural programs to mark the Bengali New Year. During the Colonial period, two other public parks were realized: the Hands Park (located to the north of the Muslim Institute and now occupied by a commercial building) and the Victorian Garden (in the foothills of Fairy Hill (Qanungo, 2010) is currently being used as a fueling station).

d. Social and community open spaces

These open spaces revolve around social and community activities. In the Mughal and British periods, it was customary to have community houses surrounded by open spaces. The Nachghar (dance hall) in the Mughal period and the Town Hall in the Colonial period had open spaces around them. These spaces have been reduced in size but are still used for public gatherings or ceremonies. The former tea plantation in Pioneer Hill accommodates the bungalows and clubhouse for the European officers. In 1875, a tea planter started a club for interaction and entertainment of British officials, which was taken over by the Chittagong Club in 1878 (Figure 21) (now Chittagong Club Limited, listed as a heritage structure) to accommodate and provide facilities for an increasing number of European residents coming to the city (Figure 21). In the early 1890s, work began on the railway, which resulted in a large influx of Europeans. Houses sprang up on all hilltops and the general tempo of life at Chittagong increased. To overcome this 'peace of life' issue, a new club-house was erected at the present site of the Chittagong Club. Another club named Pahartali European Club, an association of Europeans travelling to the city for pleasure and co-operation, was established in the open hilly terrain of Ambagan. It was later transformed into a museum to commemorate warrior Pritilata who was a

martyr involved in raiding the club. These buildings and the open spaces around these need to be taken care of for preservation.

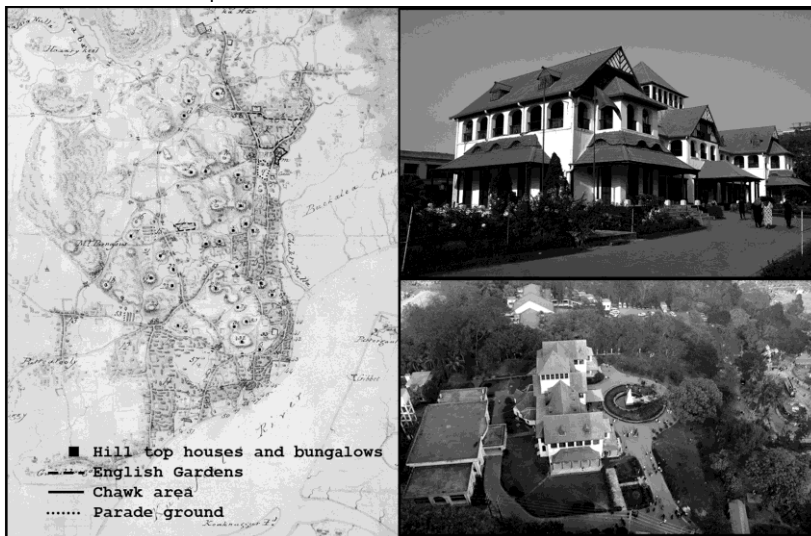


Figure 21: Chittagong Club. A clubhouse for European residents in Chittagong and circuit house.
Source: Map from British Library; Images by Mohammad Faqur Islam.

e. Open spaces associated with tea cultivation

This type of open space was associated with tea plantations. The first initiative for the development of a tea plantation was taken on the bank of the Karnaphuli River in 1824. Later in 1840, tea plantations started in an area adjacent to the existing Chittagong Club which was named Pioneer Hill (BTB 2018). During the 1870s, the tea industry started to grow at a rapid pace and the Chittagong Hill Tracts (an extensively hilly area outside the city, known as Bandarban, Khagrachari and Rangamati) were opened for tea cultivation. Though tea plantation has shifted from the city to the Hill Tracts, the activities related to tea procurement, packaging and distribution still exist in the city. Due to its association with the history of tea plantations in Chittagong and for historic buildings such as the Chittagong Club located in it, the Pioneer Hill and surrounding hills of tea Board Guest House at Chatteshawri is an important open space to be conserved.

f. Transport oriented open spaces:

A single authority managed Chittagong's port and railway throughout the British rule. During the 1953–1958, in the period of Pakistan era (1947–1971), Chittagong Port acquired 920 acres of land through the Railway. After separation of the unified Port and Railway Authority in 1960, the Railway Authority handed over land to the Port Authority. The rail line connected to the port has been unused since 2013. The Detail Area Plan (DAP) prepared by the Chittagong Development Authority proposed to conserve the unused rail land as open space (Figure 22). This proposal follows an ICOMOS (1999)

concept that railways deemed significant for economic and social development could be considered heritage sites (Coulls, 1999).



Figure 22: Railway land and administrative buildings.

Source: Map from Bangladesh Railway Authority, Source: map prepared by author and Images by Mohammad Faqurul Islam.

g. Open spaces associated with religious places

These open spaces provide a setting for worship and/or homage to a religion as well as for educational pursuits. These spaces are associated with diverse religious influences – Buddhist, Hindu, Islam, and Christian faiths – that guided the rulers of Chittagong during specific periods of the city's development. They are markers of significant historical and cultural moments of Chittagong and are, therefore, worthy of conservation.

Spaces associated with the Islamic faith include mosques, tombs or shrines. A mosque is not only a place for prayer, but also a centre for educational, political and judicial activities (Al-hajaj, 2014). A mosque provides court-like open space within its premise to include structures for such activities. Typically, there is also a big tank of water in mosques to avail water for ablution before prayer. Breeze flowing over this body of water also helps to sweep hot air out from the prayer hall. Mughal granted 150 mosques, 63 Muslim shrines and 26 temples to build in Chittagong by clearing jungles (Eaton, 1993).

The Badr Auliya Tomb is an excellent example of this type of open space with both a tomb and a mosque within it. The Bayazid Bostami Shrine, another such example, also consists of a tomb and a mosque built in the Mughal period; it sits on the top of a hill with a large pond in front of it. The Shahi Jam-e Mosque, erected at the top of the hill at Anderkillah, is another example; its courtyard is widely used for praying during the Eid festival. However, the foothill is currently occupied by a market and the new extension of the mosque blocks the view of the historical mosque.

Vihara or monasteries are public open spaces associated with the development of the first Buddhist Monasteries in Chittagong. The monasteries were established throughout Bengal during the sixth to eighth centuries (Rashid, 2009). Residential quarters of the Buddhist monks are termed as *vihara* (Qanungo, 1988) and there usually is an open space – a courtyard area – that allows conference, consultation, discussion, and interchange of opinion to take place. Rajanagar Buddhist Vihara, Sudharmadhara Vihara, Salbaria Vihara, Pahartali Mahananda Vihara, Kartala Belkhain Saddarmalankara Vihara, and Pandit Vihara (in Chittagong) (Ahmed 1986) are notable examples with extensive open space (Qanungo, 1988). Generally, the locations of monasteries and associated open spaces were by the banks of the River Ganga's delta (Ahmed, 2013). The planning of Buddhist monastery complexes references the vernacular architecture of Bengal, particularly the traditional courtyard house (Rashid, 2009). The courtyard provided natural light and ventilation to the building complex and was suitable for the introvert nature of monastic life. Furthermore, the center of the courtyard was emphasized by the placement of the most sacred structure (either a temple or a statue of Buddha) of the complex (Rashid, 2009). In this sense, the courtyard is a significant spatial element that is central to both monastery and ordinary house design in the region (Rashid, 2009). This open courtyard space typology has been repeatedly followed in both single and grouped residential developments in Chittagong. The surrounding of Chittagong Buddhist Monastery needs to be preserved as religious open space.

Church complexes with associated open space were built in the apex of the hills scattered around the city or close to the river on flat lands. The Portuguese built the Church of Our Lady of the Rosary in 1601 in the Paterghatta area near the Mughal period's Sadar Ghat. This Paterghatta area remains a place for Christians. The landscape of the church includes an open space for social interaction with a garden and graveyard around it. There also are a number of shrines for the worship of Hindu deities and missionary work along with open space to hold gatherings of devotees (Qanungo, 2010). Some of these are on the tops of hills, such as the Chandranath Temple positioned on Chandranath Hill, Prabortak Shangha at Prabortak Hill and Chatteshawry Temple and Kaibalya Dham Asram on top of

Kaibalyadham Hill. These places are threatened by development and need to be preserved for their unique location in the city and for the safeguarding of the ratio of open space in Chittagong.

h. Commercial public open spaces

Commercial open space is referred to as a chowk or chawk (derived from Persian word "chok" which refers to a daily market place) (Steingass, 1996) and can be translated as 'town square' or 'market square'. In traditional Bengali cities, chawk refers to a street intersection in the urban core (Pacione, 2001). A chawk was an open marketplace and a public place commonly found in the heart of a



Figure 23: The old Chawk area,

Source: Prepared by author from GIS Map collected from Chittagong Development Authority.

traditional town. They were the traditional outdoor civic spaces and were the generator of many events and human activities (Nilufar, 2011). There were officials appointed to supervise the running of the market and to regulate the prices of articles during the Mughal period (Qanungo, 2010). Like many South Asian cities, Chittagong grew from a place of exchange of agricultural products, developed as a transport node, and later as an administrative centre. In Chittagong, the Chawks (figure 23) are in proximity to the Chaktai Creek to allow transport of goods to and from these bazaars. In this bazaar-based traditional city, there are linear bazaar streets as well as wider Chawks, both types are surrounded by the houses of merchants, who often live above or behind their shops and warehouses. There also are intermediate and smaller scale chawks in the mohallahs (neighbourhoods) at the nodal points of winding streets off the main Chawk Bazaar of the city. This main Chawk Bazaar is still a vibrant and busy meeting place (Figure 23). These chawks are important cultural and civic spaces of the city and provide a contextual illustration of the city's urban development and the cultural thinking on urban public life in historical times.

i. Administrative open spaces

These open spaces are associated with administrative buildings created during the Colonial period. Prominent among them is the Assam Bengal Railway headquarters that was established in 1892, with a railway, workshop, administrative buildings, hospitals, housing for staff, a playground and a clubhouse. The open spaces were mostly in hilly areas associated with the Central Railway Building (CRB) and the Batali Hill. The predominant feature of these administrative open spaces is the lack of a boundary wall, allowing people to access these places unrestricted and enjoy the panoramic views of the city below from the hills. The existing rail station adjacent to this administrative area holds the rail line corridor through the city. This corridor is a prominent landscape in the dense fabric of the city; it hosts the cultural program of Bengali New Year in every year. The administrative grounds of the CRB and the rail corridor provide opportunities for various uses for the city's residents, which is not possible in the adjacent dense surroundings.

The Judicial Building (named Darul Adalat) was established in the mid-sixteenth century during the colonial Period, at the apex of Madrasa Hill in Chittagong, to resolve social disputes. This hill and space surrounding the building still serve as open space for the public due to its secured location. However, the building is in a derelict state and no longer in use. At the end of the 19th century, the Chittagong Court Building was established on the Fairy Hill near the Karnaphuli River which is in operation today. The open spaces around the building were beautifully laid out as a park and the northern valley included two large reservoirs (Hossain, 2012b). The area is now developed with buildings, such as an extension to the court building and offices for attorneys. These places are important for conservation due to their historical significance and for their contribution to the amount of open space in the city.

j. Commemorative open spaces

These open spaces include the places reserved for commemorating the victims of war in Bangladesh. For example, 'Chittagong suffered most in the Second World War and [as a result] was declared as a "non-family area" (Qanungo, 2010, p103). The latter is a designation suggested by Qanungo (2010) to be a setting that is unfit for human habitation. To commemorate the soldiers who died on the Eastern Front of the Second World War, the resting place of 400 military personnel was converted to a cemetery by the army along with other cemeteries in Assam. It is located at the foot of a horseshoe shaped hill lying east and south (Hossain, 2012b) in Chatteshawri and still serves as an open space for the city. To commemorate the devotees in the war for Bangladesh's Independence (in 1971), the Chittagong Shaheed Minar (tower) was built with an open space area in front of it, which

can hold a range of public gathering events every year on, for example, the Independence Day and Victory Day of Bangladesh.

In conclusion, ten classifications can be used to categorize the historic landscape of Chittagong. Table 5 provides a summary of these categories as well as some of the previously shown examples.

4.4 Conservation and Management of the Historic Urban Landscape of Chittagong

These ten types present a range of open space scenarios developed in Chittagong throughout its various stages of the history. The existence of this unique Historic Urban Landscape is hidden in today's city. Many are in various states of disrepair and/or in need of conservation, refurbishment, and management. The 1961 Master Plan first recognized conserving heritage buildings and improving their surrounds. However, little has improved, and buildings largely remain in a neglected state.

Table 5: List of historic open space

Historic open space type	Example	
a. Cultural open spaces	Gandhi Maidan Municipality Maidan Parade Ground Polo ground Cricket ground	Sadar Ghat Ghat Forhad Beg Fishery Ghat Patharghata Firingi-Bazaar Ghat
b. Open spaces associated with waterbodies	Karnaphuli River - Sadar Ghat area Chaktai Canal Maheshkhali Canal	Ashker Dighi (pond) Jorr Deba or a 'pair of ponds' Agrabad Deba (pond)
c. Gardens and parks	Ander-killah (inner fort and outer fort) Kadam Mubarak mosque garden	Mouth of the Karnaphuli River Bungalows Circuit House DC Hill Park.
d. Social and community open spaces	Nachghar (Dance hall)	Pahartali European Club
e. Open spaces associated with tea cultivation.	Pioneer hill- Chittagong club	
f. Transportation related open spaces	Rail way land and port land	
g. Open spaces associated with religious structure	Bayazid Bostami Shrine, Badr Auliya Tomb Anderkillah mosque Pandit Vihara (doesn't exist) Paterghatta church	Chandranath Temple Prabortak Shangha Kaibalya Dham Asram Chatteshwari Kali Temple Buddhist Monastery
h. Commercial public open spaces	Chawk bazar	
i. Administrative open spaces	Central Railway Building (CRB) Batali Hill	Chittagong Court Building
j. Commemorative open spaces	War cemetery	Shahid minar (Martyr tower)

Source: prepared by author

The Detail Area Plan (DAP) prepared by the Chittagong Development Authority in 2015 led to the preparation of a preliminary listing of historic buildings to be preserved and conserved for historical, architectural, environmental or ecological importance. DAP has designated 54 locations as historic sites yet failed to include all heritage open spaces. In consequence, a number of heritage open spaces have been lost with the approval of the Authority for new development. In addition, DAP notes that cultural conservation is a component of planning and urges the Chittagong City Corporation (CCC), Bangladesh Parjatan (Tourism) Corporation, and other relevant government departments to acquire and preserve archaeological and historical resources and sites as heritage (DAP 2015). For example, a "No Objection Certificate" (NOC) is required for the construction of any structure within a 250-meter radius of any archeological, historical, architectural, or aesthetically pleasing place in Chittagong, according to the Building Construction Rule of 2008. Nevertheless, DAP appears to have overlooked the fact that this clause appears to have arbitrarily delineated the land uses surrounding heritage monuments in accordance with the pre-existing land use patterns and local transportation networks. Therefore, while approving permits near historic places, neither cultural nor historic land use is taken into account. Such decision-making ought to be reoriented toward the preservation of historical sites (Talukdar, 2014).

The DAP oversaw the land usage and development for the entire city, but it disregarded the guidelines for the preservation of Chittagong's historical sites. Because of this, heritage sites are struggling to survive. From a land use planning perspective, Talukdar (2014) suggested plans for immediate and long-term action for heritage conservation in Chittagong. Fixating on the criteria of heritage sites, updating the DAP (concerning the conservation of heritage sites), cooperating with various concerned institutions and organizations, forming a conservation committee every historical site, and creating a strategy for conservation management and heritage impact assessment were all noted as part of the immediate action plan. The long-term action plan was denoted as a national movement (Talukdar, 2014), consisting of creating a historic section under the department of national planning, as well as in- depth research, site inventories and the publication of heritage educational material.

To conserve heritage open spaces, it is important first to itemise open spaces associated with the city's historic buildings. Hence, preparing a heritage inventory and developing a historical background of heritage landscapes is a necessary step in the process. Such historical records need to be examined and supported by an experienced heritage management team made up of both scholars and practitioners. As part of this team's examination, they may prescribe land uses that complement the respective heritage sites that can be used in the development of conservation/preservation open

space guidelines. It is also recommended that in terms of evaluating permits for building construction, that a special committee needs to be established and supplied with the 'guidelines' so that they too can appropriately evaluate proposed development in and/or around a respective heritage site, which is a recommendation of DAP.

Secondly, city officials need to restrict development near heritage buildings and their associated landscapes. Prior to this, the periphery of these open spaces needs to be demarcated and appropriate land use(s) for open space heritage sites should be declared by authorities in the city's planning documents (e.g. DAP). Simultaneously, the open spaces need to be reclaimed where possible. Place-specific conservation strategies need to be implemented in each of the different open space types that conserve their respective architectural and historical value and peripheral landscape, along with any heritage structures within their landscape. In general, urban heritage is understood at the scale of city-level, where the conservation area comprises broad landscapes and not just individual sites (Brown, 2007). Due to its ten types of heritage landscapes, considering the city of Chittagong as a macro cultural landscape with varying degrees of sites is quite effective.

The use of contemporary technology for mapping the urban landscape was useful in the case of Chittagong. Anshary (2012) recommended that an application of a Geographical Information System (GIS) would be a very effective tool for identification and preservation of heritage structures. For example, in the UK, since 1994, "[...] English Heritage [...] has been carrying out a programme of Historic Landscape Characterisation (HLC) throughout England in partnership with individual county councils" (Brown, 2007, p37). The goal of the GIS map-based HLC technique is to generate a broad understanding of the historical and archaeological component of the current environment (Brown, 2007). HLC, as conceived in the UK, expects a multidisciplinary project team involving professionals from a wide range of disciplines that work collectively towards the mapping and realization of the vernacular characteristics and traditions of the landscape under study (Fairclough and Wigley, 2006).

4.5 Recommendation

Historical sites listed in this thesis need to be demarcated by its boundary and records need to be examined and supported by an experienced heritage management team made up of both scholars and practitioners. As part of this team's examination, they may prescribe land uses that complement the respective heritage sites that can be used in the development of conservation/preservation open space guidelines. In terms of evaluating permits for building construction near heritage sites, recommendation from "special project permit committee" prevails. Where the special committee

needs to be supplied with the above 'guidelines' so that they too can appropriately evaluate proposed development in and/or around a respective heritage site.

4.5 Conclusion

This chapter covered the first purpose, which is to "examine and document the evolution of existing open space in Chittagong," as well as the previously mentioned related questions. The exploration of the various kinds of historic open spaces that Chittagong had is an attempt to reflect upon characteristic of the city's existing physical state and the issues surrounding those areas. The diverse social, economic and political forces in Chittagong's past shaped the creation and planning of the city's open spaces, while it is absent in today's or in future planning proposals. Among these diverse political systems, the Mughal contribution to the open space landscape in Chittagong is remarkable in terms of their formal planning and design. The colonial rule by the British had a notable impact on the city's open spaces, which led to gradual erasure of other spaces created before the colonial period.

Today, most of the open spaces are lost due to lack of conservation guidelines and efforts. The heritage list prepared by the planning authority of Chittagong contains only historic landmarks and ignores the significance of the city's historic urban landscape. The city's contemporary preservation and conservation proposals are not adequate for effective conservation of this urban heritage. Though the conservation of this expansive urban landscape is an ambitious task to undertake, it is initially recommended to revisit the historic land use patterns associated with the city and its historic buildings, so that future growth could be managed in a manner that appropriately conserves the city's historic urban landscapes and heritage buildings amid them.

Chapter 05: Literature Review

5.1. Introduction

The intent of this chapter is to review the importance, benefits, typology and standard of open space practised in cities. By analysing the importance and benefit of open space, this chapter emphasize how landscape architecture has been interpreted to overcome the crisis of open space arose due to civilization. In the next section of the chapter evaluates the world's existing open space benchmarks and standards to ascertain the extent to which they are applicable (or not) to Chittagong. In addition, this provides data that can be used to shed light on the open space standards in Bangladeshi cities. This section then continues to investigate the city's current open space "direction" and to identify the opportunities of this direction relative to international measures and aspirations by analysing planning proposals in Chittagong. In addition, Finding specific types of open space that are inadequate or absent in Chittagong City can be done by analysing the various kinds of open space that serve a purpose in cities. which guides the development of an approach for open space development in the city. Doing this addresses objective 2 and its associated questions as follows:

Objective 2: To establish a relative open space benchmark and standard that Chittagong can reference in its open space developments.

2.1. What open space benchmarks and standards exist around the world and to what extent are these applicable to Chittagong?

2.2 What open space guidelines currently exist in Chittagong and to what extent do they influence open space in the city?

5.2 Open Space definition

Open space is any open piece of land that is undeveloped (has no buildings or other built structures) and is accessible to the public (EPA, 2017). The Town and Country Planning Act 1976 of Malaysia defines open spaces as: "any land whether enclosed or not which is laid out or reserved for laying out wholly or partially as a public garden, park, sports and recreation ground, walk or as a public place" (Government of Malaysia 2014, p.14). The word "open space" refers to any open area that is held by an agency or organisation that is committed to conservation, including conservation land, recreation and agricultural land, forest land, corridor parks, and amenities like tiny parks and green buffers along roads (City of Gardner, 2005). The London Plan definition of all open space is as follows. "All land use in London that is predominantly undeveloped other than by buildings or structures that are ancillary to the open space use (The London Plan 2016, p. 418).

This thesis frames open space based on these definitions addressing public open space in Chittagong, Bangladesh. Furthermore, in contrast to the EPA's 1st definition from 2017, the thesis also takes into account inaccessible open places.

5.3 Importance of Open space:

Open space is very useful in terms of environmental, economic, health and from social point of view (Gruber, 1986 and MacArthur, 2002). This chapter discussed strategies from the point of view of the Landscape Architecture discipline to improve green open space in settings. As population density increases and private recreation space (courtyard, backyards for example) decreases, the demand for public recreation spaces, especially those close to dwelling units increase (Lancaster R. A., 1983). The advantages of open spaces are mentioned below from a scholarly perspective:

a. Environmental Benefit:

Green spaces as open spaces are a great benefit to our environment. The environmental benefits of open space contribute to the way we live our lives now and for future generations. The environmental benefits of green space are discussed below:

I. Resilience:

In conjunction with vegetated areas, open space provides storm protection, erosion buffering and flood control (Victoria State Government, 2018). Unpaved ground absorbs, and stores rainwater, reduces surface runoff and flooding. Concrete drainage ditches and pipes are significantly more costly and inefficient ways to manage storm water than trees and grass. (Casasndra, 2016). For example, a mangrove plantation may be used for the protection from cyclone a surge in the coastal area directed by DAP is guidance of environmental resilience. In Chittagong, development in flood plain areas and encroachment of creeks cause flooding and development in coastal areas need to be controlled and preserved for the probability of sea level rise which is predicted to negatively affect coastal infrastructure and coastal cities like Chittagong (World Bank, 2009).

II. Reduce soil erosion:

Ground covers with plants, bark, woodchips, leaves, gravel and groundcovers hold soil in place, resist sedimentation in lakes, streams, storm drains and roads; and reduces flooding, mudslides and dust storms (Morgan R. P. C., 1995). For example, the hills of Chittagong are of thin and loose soil, which makes them susceptible to erosion needs protection like ground covers. Cutting these hills remove the ground covers and makes the hills vulnerable and causes landslide in time of heavy rainfall. Furthermore, in Chittagong 28% of the total area of the city is hilly land. Eighty-eight hills in the study

area which cover 18304.11 acres of total city corporation area (Chisty, 2014). The slums at the foot of the city's hills are threatened by landslide as well and the steep slope of these hills cannot bear the weight of the wet soil or mud on top of them and may result in a landslide (Chisty, 2014). For example, in 2007, the city's death toll due to landslide was reported as 133 people (Ahmed, 2017).

III. **Biodiversity**

Although it is commonly believed that the urban environment is incompatible with nature, more and more research indicates that this is not always the case. (Nicol & Blake, 2000). Elkin et al. (1991) cite research done by Leicester City Council to evaluate the city's animal habitats. In that study, the area percentage of each subtype deemed to have 'high ecological value' for undeveloped land within the city limit was expressed. This shows that the total ecological value of formal open space was approximately fifty percent of unmanaged "land left to nature" and almost identical to that of cultivated grassland. What this suggests for Chittagong, and as discussed in chapters 2, 3 and 4, the city has a unique geographic location and is well placed for the conservation of biodiversity, but this is diminishing due to rapid and haphazard urbanisation (Uddin et al., 2015).

b. Health benefit

A multitude of health advantages are derived from open spaces, which foster psychological and physical well-being by connecting people with the natural and fostering community involvement. The following is a brief explanation of these advantages:

Physical benefit: Access to green areas encourage exercise and, as a result, lead to behavioural changes (Gladwell et. al, 2013). Report shows that a rise in physical activity levels directly affect many health metrics. A report (HHS 1996) by the Surgeon General stated that, people who engage in regular physical activity benefit from a reduced risk of premature death, coronary heart disease, hypertension, colon cancer and non-insulin-dependent diabetes (Johnson J. M. & Ballin S. D., 1996). Physical activity also helps people maintain their muscle strength, joint structure, and function, lose weight, redistribute their body fat favourably, improve their physical functioning, and have healthier endocrine, respiratory, and cardiovascular systems (American Heart Association 2018). This is an important set of findings because it was highlighted that, in chapter 2, Chittagong's residents are experiencing higher degrees of health-related illnesses brought about through a lack of physical activity. Hence, open space can provide a general location for recreation (i.e. physical activity), vary from walking dogs to team activities like football that require more physical exertion. Therefore, having open space helps boost cardiac activity (Nicol & Blake, 2000).

In addition, Paul et al. (2020) conducted a study on the relationship between public open spaces and well-being in Chattogram City and discovered that roughly 70% of the city's residents thought that green spaces and other public open spaces could support an active lifestyle and improve their capacity for thought and confidence. In conclusion, establishing open space in Chittagong will help the locals' quality of life and health.

I. **Psychological health:** It is evident that a location where individuals may socialize, make new acquaintances, and engage in leisure activities is beneficial to the mental health of the community (Casasndra, 2016). Being in close proximity to nature has its own advantages for mental health, lowering stress and elevating happiness, and these benefits happen almost instantly (Weir K., 2020). For example, spending just ten minutes in a park or urban forest can significantly lower stress levels (Willams F., 2023). In addition, after spending time in the urban woodland, individuals felt the most restored. (Casasndra, 2016).

c. Economic benefit:

Urban green spaces offer a multitude of distinct economic advantages (Mickan, S 2019). The economic benefits of open spaces include the following categories:

I. **Increase property value:** Open spaces, including parks, tend to enhance an area's socioeconomic desirability. As well as enhancing property values (More et al., 1988; Neal, 1994). A Kim et al. (2018) study found that decreasing the amount of surrounding green open space considerably lowers the values of the neighbouring properties and vice versa.

II. **Attract tourists:** Urban forests, parks, and tree-lined boulevards can all be crucial components of a city's marketing strategy. They can project an inviting and appealing image while serving as venues for a variety of events and activities that can stimulate the local economy (City of Melbourne, 2011). For example, Whitehead (2005) investigated how economic activity in Manchester, England, was affected by broad improvements in urban quality, such as walkable areas. Before and after "walkability" evolves, the researchers examined people's willingness to purchase, do business, or work in such regions. Additionally, previous research on "Green cities: good health" (UW, 2018) presented economic value of urban nature such as urban forests, parks, and greenbelts. It added that rent in pedestrianized retail zones increases by 22% for every 20%–40% increase in foot traffic. They discovered that increasing pedestrian activity through urban quality enhancements had a minor but noteworthy positive impact on employees and companies.

III. **Commercial vitality:** A number of studies such as doctorate of philosophy thesis by Gulsrud (2015), investigated the role of 'greening' in enhancing the 'commercial vitality' of specific business

precincts. The study shows that towns with high-quality green spaces frequently utilised this resource in marketing tactics aimed at tourists and visitors. A 2003 study that looked at how landscaping and trees affected the rental prices of 85 office buildings in Cleveland, Ohio, discovered that the most visually pleasing landscaping increased average rental rates by about 7%, while landscaping that created shade for the building increased rates by an additional 7% (Laverne and Winson-Geidman, 2003).

IV. **Business Resilience:** The Nature Conservancy, a resiliency expert, and experts from a chemical company worked together in 2013 to assess multiple business case studies and produce a white paper that suggested green and hybrid infrastructure alternatives be added to modern engineers' standard toolkits (Hawkins' & Prickett, 2014). The research team also evaluated the idea that green infrastructure can provide more opportunities than grey infrastructure to increase the industrial business operations' resilience against disruptive events like power outages, mechanical failure, rising raw material costs, and floods. According to the research, hybrid systems that combine green and grey infrastructure may offer the best response to several shocks and increase businesses sustainability (The Nature Conservancy, 2013).

d. Social benefit:

Urban green spaces have the ability to strengthen and influence the social fabric of urban communities in a number of ways (Jennings, V., 2019). Urban green spaces and social interactions may be related by the following factors:

I. **Reduction in crime:** Numerous studies have shown that greenery can lessen antisocial behavior and the dread of crime (Taylor, Kuo, & Sullivan, 2002) (Kuo & Sullivan, 2001). While in contrast, according to Kaplan (1987), stress may be the driving force for violent, major crimes. Additionally, scientific data suggests that the presence of trees may reduce stress, which in turn may reduce the likelihood of crimes committed by stressed-out offenders (Donovan & Prestemon, 2010). In and around Baltimore, a team of researchers examined the relationship between tree canopy and crime and came to this conclusion that trees were found to reduce crime by 12 percent for every 10 percent increase in trees. (Benfield, 2017). Moreover, maintenance tasks and tree planting contribute to reduced crime rates and stronger community ties (Rij, Dekkers, & Koomen, 2008). Surprisingly, according to other academics, there is a greater fear of crime in areas with natural flora (Nasar, Fisher, & Grannis, 1993; Nasar & Fisher, 1993).

II. **Pursue recreational activities:** Various types of individuals use open green spaces according to their requirements, preferences, availability, and physical capabilities for a variety of recreational and

amenity purposes (Dahmann, et. al., 2010). This implies that there are two types of recreational uses for urban open green spaces: passive use and active use (Woolley, 2006; Woolley, 2008; Schaefer-McDaniel, 2007; Mäkinen & Tyrväinen, 2008). While passive recreation includes things like taking in the scenery, reading, unwinding, or chatting with friends, active recreation typically involves places like skateboarding parks, sports, tennis courts, swimming pools, and even rock climbing and other games (Woolley, 2003).

III. Enhance social Interaction: Recent research by scholars such as Woolley (2003) has expressed the value of open green spaces as a place where people can gather and interact, whether formally and informally, or as a focal point for the community (Woolley, 2003). Additionally, they offer a forum for cultural expression, political discussion, and social interaction (Li, 2014). The presence of grass and trees, together with their shade, in public spaces might encourage people to spend more time outside, enhancing community life and social interaction (Coley, Sullivan, & Kuo, 1997). Compared to other urban areas, open green spaces are easier to access, which means that there is a greater chance of social interaction there. Additionally, those who engage in leisure activities that bring them together, such as planning public ceremonies, track and field, or cycling, may have stronger social relationships (Konijnendijk, Annerstedt, Nielsen, & Maruthaveeran, 2013).

IV. Increase Social Cohesion: Over the past few decades, the degree of mitigation has increased, partly due to globalization (CES, 2021). Therefore, traditional homogeneous societies are becoming increasingly multi-cultural, which may reduce interaction and reduce social cohesion (Kærgård, 2010). In order to combat this, urban open green spaces integrate social and ecological aspects (Borgström, 2009; Olsson, 2012), enabling individuals to come together, engage in conversation, and forge bonds with others in their local communities (Völker et al., 2007). Moreover, urban open green spaces have been seen as an important component of community and urban development that can be utilized to erase social division, in addition to being a place for leisure and enjoyment (Coley et al., 1997; Van Herzele & Wiedemann, 2003; Parr, 2007; Maas, Van Dillen, Verheij, & Groenewegen, 2009). They contribute to social justice by creating opportunities for all people to participate in close interaction between social layers of diverse ethnic and racial backgrounds. By giving everyone the chance to engage in close social interaction between groups of different racial and ethnic backgrounds, they promote social fairness (Lofland, 1998; Fainstein, 2005). They are specifically utilized for a variety of purposes that foster a stronger feeling of community, greater leisure time activities, and social support (Elmqvist et al., 2004; Chu et al., 2010; Chen & Jim, 2008; Maas et al., 2009; Seeland,

Dübendorfer, & Hansmann, 2009; S; Rakowski et al., 2012; Ahmad, Maulan, Mariapan, & Habib, 2011; Arnberger, 2012; Arnberger & Eder, 2011).

V. Reduce probability of road accidents: Due to their vertical walls, street trees serve as a movement guide for pedestrians and provide streets a defined boundary, which can significantly affect automobiles' speed. (Burden, 1906). Street trees can improve pedestrian safety because they prevent drivers from mistakenly taking human lives in the event of driving errors (Naderi, 2003; Wolf, 2003). Burden (2008) asserts that roads with trees have fewer run-off-the-road collisions and generally less severe crashes than similar streets without trees.

VI. Aesthetic perception: Affective underpinning for environmental preference that is both universally shared and powerful is aesthetic perception (Parsons & Daniel, 2002) supports a connection with nature. In this sense, psychological connection to exquisite natural objects—like peaceful, aesthetically attractive vegetation—is a natural human trait (Jim, 2004). Green open spaces are important because they add aesthetic value to the public realm, but because this value is difficult to measure, its importance is typically minimised (Enger, 2005). Additionally, people who use open green spaces show different aesthetic preferences and values for elements such as water, a variety of vegetation and trees, different terrain, and topography (Yuen, 1996; T. Zhang & Gobster, 1998; Byrne & Sipe, 2010).

VII. Create regional identity: A typical town square fosters the growth of the local identity by acting as a hub for interaction amongst the neighboring towns (Calthorpe, 1993). Its local character is further enhanced by the wide green spaces' preservation of the distinctive and natural scenery. A network of connected open green spaces can strengthen a city's sense of identity by defining its unique character and fostering a sense of community (Enger, 2005). In addition to providing chances for carefree, unstructured outdoor and pedestrian activities, they also make a welcome contrast to the rigidly planned urban fabric and promote peaceful contemplation of the natural world. Additionally, they can provide a haven of peace and relaxation in contrast to the frequently hectic pace of city life (Enger 2005). Put another way, carefully planned and kept open green spaces help to define the character of towns and cities by providing a variety of land uses and opportunities for a wide range of activities, which enhances their appeal to people looking to live, work, invest, and visit (Tüzin Baycan-Levent & Nijkamp, 2009; Tuzin Baycan-Levent & van Leeuwen, 2002).

In conclusion, open spaces are beneficial for social connections, preserving one's physical and mental health, and recreational activities. Its presence prevents crime and car accidents and enriches the quality of life in the community by encouraging a connection with nature.

5.5 Categorization of open space

In reviewing the above, this information can be summarized as follows: "Typology" and "Classification," which are the two general open space categorization methods. Typology is the study of open spaces and their internal features. Actually, by employing the typology method, we primarily concentrate on specific types of spaces, including "streets," "parks," "markets," "squares," "plazas," "atrium/indoor/marketplaces," and so on (Nicol & Blake 2000). Open space character then may be influenced by a range of factors such as its location, level of development, primary function, and interface with adjoining land use and urban form (City of Melbourne, 2012).

Classification is used when the characteristics of spaces need to be included for, potentially, operational categorization by departments, which the general public may not 'see'. In addition, open space has different characteristics, and this influences the way in which open space is used and valued by residents (Nochian et al., 2015). Three methods are typically used in the classification process for open spaces: i) function (the role of the open space), ii) the catchment hierarchy (who will use the open space) and iii) landscape/environmental character (what the open space looks like) (Rutherford et al., 2013). These are discussed below.

I. Function

Every open space has a functional classification assigned to it that corresponds with its principal usage. It is employed to specify the intended usage of a space. A functional classification takes into account the open space's primary application or purpose inside the network (Tahir & Roe, 2006). Primary use and expected activities identify three primary functions of open spaces (DSR, 2012). These are:

Recreation spaces- Recreational areas offer a venue for informal play, exercise, relaxation, and social contact. Recreational areas improve physical and mental health through leisure, entertainment, or stimulation activities (DSR, 2012).

Sport spaces- Sport venues offer a setting for formally organized athletic events. Sport facilities offer a setting for formally structured sporting activities such team tournaments, the development of physical skills, and training. (DSR, 2012).

Nature spaces- In addition to protecting the local biodiversity and natural area assets, nature spaces offer an environment where people can appreciate adjacent nature. Activities like strolling, riding, picnicking, playing, viewing, or investigating natural features are probable in nature places. (DSR, 2012).

II. Catchment Hierarchy

This term in some sources is simply called hierarchy. The size, intensity of use, and relevance of the geographical area being served (the catchment) essentially determine hierarchy. Rutherford (2013) established four categories of catchment hierarchy. These are:

Local open space- Local open space often consists of small parklands that cater to the recreational needs of the surrounding residential neighbourhood (WA, 2023).

Neighbourhood open space- Neighbourhood open space (NOS) serves as the recreational and social focus of a community. Residents are attracted by the variety of features and facilities and opportunities to socialise.

District open space- District open space (DOS) is principally designed to provide for organised formal sport. DOS will vary and likely include substantial recreation space and some nature space. DOS design and function should consider biodiversity principles and environmental management goals. It also serves several neighbourhoods with players and visitors travelling from surrounding districts.

Regional open space- Assist to preserve local biodiversity and natural area values.

III. Landscape / Environmental Setting

Each open space assigned with a landscape/environmental classification reflects its primary physical setting (Delgado, 2006). A landscape setting type classification is proposed to assist with the differentiation of sites, which offer different types of experiences for potential users and for planning, management and marketing purposes. These are used where the setting type may not be evident from the functional classification. Hence, landscape character is used to define the desirable landscape and/or vegetation type of a space (Nochian et al., 2015).

In conclusion, these three classifications must be used in conjunction with a "Precinct Objective," "Site Analysis," and "Context Assessment" (Jafrin & Beza, 2018). The theory behind this is that the precinct objectives, context assessment, and site analysis will have determined which aspects of a site and its surroundings should be strengthened and which would present challenges. All of which can be addressed when planning for and/or redeveloping an open space element.

To demonstrate an example of this approach to open space classification/typology development, DSR (2012), included the purpose, description and possible sub-type of each open space function in Western Australia, as presented in the following table 7. Additionally, the following tables also illustrate the varied approaches to open space classification/typology development:

Description of space according to hierarchy typology:

The study discovered that there are three categorizable perimeters in the open space framework. These are its size and the size of the neighbouring locality to which it contributes, as well as its access

or catchment area (distance from neighbourhood). Open spaces are categorised as either local, neighbouring, district and regional based on their perimeter characteristics. Table 8 displays these groups together with their corresponding perimeters.

Table 6: Open space typology practised in Australia (based on Hierarchy)

Type	Catchment area	Typical size
Local Open Space	Within 400 metres or 5-minute walk.	1 acre to 2.5 acre (approx.)
Neighbourhood open space	Within 800 metres or 10-minute walk	2.5 to 12.5 acre (approx.)
District open space	Within 2 kilometre or 5-minute drive. In regional WA, DOS may provide sporting facilities for the wider district and surrounding communities.	12.5 acre to 37 acre (approx.)
Regional Open Space (ROS)	ROS serves one or more geographical or social regions and is likely to attract visitors from outside any one local government area. Users not living within close proximity will use either private vehicles or public transport systems.	Size is variable and dependant on function. When sporting space is identified as a necessary regional function, allocations for playing fields and sports facilities should be 20+ha in area.

Source: DSR (2012)

Whereas, in South Australia, the City of Marion (2006, p.vi) set Landscape/ Environmental classification as bellows:

Table 7: Open space typology in Australia (based on landscape element)

Formal/landscaped	Includes garden beds, turf, trees that provide a more formal landscaped appearance
Turf / lawn	Well maintained turf areas for the purpose of a sporting surface
Watercourse	Natural waterway, corridors for animals and birds to traverse, and biodiversity
Natural area	Land that features significant amounts of native vegetation or indigenous vegetation that may include provenance plantings
Undeveloped area	Land that features minimal or no vegetation
Wetland	Areas that are seasonally or permanently waterlogged and feature an abundance of vegetation that is adapted to life in saturated soil conditions
Drainage / stormwater	Land which controls stormwater run-off
Buffer	Land of recreational or environmental value that provides visual relief that is a buffer between incompatible land uses
Hard surface	Land that is predominantly surfaced for sport use such as tennis courts
Coastal	Land located between the coastline and the sea

Unclassified	Open space which does not have any significant current or potential value within the categories above
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London:

Open space typologies are set out in Table below and are contained in the City of London Open Spaces Audit 2013.

Table 8: Open space typology in London based on purpose of use.

Typology	Primary Purpose
Parks and Gardens	Accessible, high-quality opportunities for informal recreation and community events.
Natural and semi-natural greenspaces	Wildlife conservation, biodiversity and environmental education and activities
Local Green corridors	Walking, cycling or horse riding, whether for leisure purposes or travel and opportunities for wildlife migration
Outdoor Sports Facilities	Participation in outdoor sports, such as pitch sports, tennis, bowls, athletics or countryside or water sports
Amenity Greenspace	Opportunities for informal activities close to home or work or enhancement of the appearance of residential or other areas.
Provision for children and young people	Areas designated primarily for play and social interaction involving children and young people, such as equipped play areas, ball courts, skateboard areas and teenage shelters.
Cemeteries and churchyards	Quiet contemplation and burial of the dead often linked to the promotion of wildlife conservation and biodiversity
Primary civic spaces	Provides open space amenity. Includes civic and market squares and other hard surfaces designed for pedestrians
Secondary civic spaces	Provides both open space amenity and facilitates pedestrian movement.
Sites awaiting development	Awaiting development

Table 9: Open space classification by size and expected walking distances.

Open space classification	Size Guideline	Distances from home
Regional parks: large areas, corridors or networks of open space, the majority of which will be publicly accessible and provide a range of facilities and features offering recreational, ecological, landscape, cultural or green infrastructure benefits. Offer a combination of facilities and features that are unique within London, are readily accessible by public transport and are managed to meet best practise quality standards	Over 1000 acre (approx.)	3.2 to 8 km

Metropolitan parks: large areas of open space that provide a similar range of benefits to Regional Parks and offer a combination of facilities at a sub-regional level, are readily accessible by public transport and are managed to meet best practise quality standards	150 to 1000 acre (approx.)	3.2 km
District/major parks: large areas of open space that provide a landscape setting with a variety of natural features providing a wide range of activities, including outdoor sports facilities and playing fields, children's play for different age groups and informal recreation pursuits.	50 to 150 acres (approx.)	1.2 km
Local parks and open spaces: Providing for court games, children's play, sitting out areas and nature conservation areas.	5 to 50 acres (approx.)	400m
Small open spaces Gardens: sitting out areas, children's play spaces or other areas of a specialist nature, including nature conservation areas.	1 to 5 acres (approx.)	Less than 400m
Pocket parks: small areas of open space that provide natural surfaces and shaded areas for informal play and passive recreation that sometimes have seating and play equipment.	Under 1 acre (approx.)	Less than 400m
Linear open spaces: Open spaces and towpaths alongside the Thames, canals and other waterways; paths, disused railways; nature conservation areas; and other routes that provide opportunities for informal recreation. Often characterised by features or attractive areas which are not fully accessible to the public but contribute to the enjoyment of the space.	Variable	Wherever feasible

Source: Local hierarchy based on "the London Plan 2016"

The above tables demonstrate a typology and classification-based on understanding of open space in a national setting. To demonstrate an understanding of this typology and classification approach in this research project the following has been prepared by using the city of Dhaka, Bangladesh open space types and characteristics. Based on primary use characteristics, the variety of open spaces in the Structural Plan of Dhaka Metropolitan Master Plan (2016) classified open space under following characteristics:

Table 10: Open space type & characteristics proposed by Dhaka Structural Plan

Type	Definition	Categories
a. Park	Within urbanized areas, Used purely for the recreational purposes	city level parks
		Local parks
b. Playgrounds and Sports Facilities	These are open spaces that are assigned for	Metropolitan level (stadiums, swimming pools and tennis complexes),

		more or less organized out-door sports facilities	Community level (play fields in residential areas, usually 2-9 acres).
c.	Urban Development Open Space	Urban plazas/parks of various sizes in commercial and institutional areas. not purely recreational areas by nature	intermediate to small sized green areas with pavements Areas have historic, cultural or political importance.
d.	Functional Open Space	functional in nature	settings such as a nursery, car park, a graveyard and cemetery
e.	Streetscapes, Trails and Buffers	Scattered and sporadic open spaces within the city boundary, beyond the functional spaces. Open spaces and plantation along the streets, sidewalks, interchanges street medians contribute to green streetscape trails are open space corridors for conservation.	recreation and alternative forms of transportation Mostly linear in shape that may occur by the rivers, lakes, canals, storm water corridors/drainage channels, utility corridors, abandoned rail lines, right off ways along major roads, the green belts around ponds, water retention areas or the outline of swamps and lowlands.
f.	Urban Forests /Natural Park	Forest areas include national park, botanical garden, urban forest, roadside forestry and orchard garden, etc.	Picnic spots or naturally pleasant sites in the form of natural parks are developed for recreational purpose at out-skirt of the city
g.	Protected Area	Special areas of scenic and other natural values, like riverbanks,	usually facilitate recreational use of public

Source: Structural Plan of Dhaka Metropolitan Master Plan 2016 (RAJUK, 2016)

The above material demonstrates the researcher's understanding of open spaces based on its respective characterises, in a setting similar to Chittagong. The below material is intended to demonstrate an understanding of the typology classification system used in open space planning and how it can be applied in a developing setting. In this example Dhaka, Bangladesh is used. The following typology classifications of open space are derived from Rajuk (2016):

Table 11: Open space typology in Dhaka based on area and optimum number of users

Hierarchy of Open Space	Facility	Size (minimum)	Distance from home (optimum)
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Metropolitan Park	General amenity area or woodlands with facilities	150 + acres	3200-4800m (approx.)
District Park	Children's play, court games, some special facilities	50-75 acres	1200 m (approx.)
Local Park	Children's play areas, informal games, quiet areas	5-10 acres	400 m (approx.)
'Mini' Park	Sitting area, flower garden, children's play areas	under 2 acres	less than 400 m (approx.)

In terms of understanding and applying the above open space classification systems to Chittagong's situation the following open space classification outline has been developed by the researcher. This outline is based on information obtained from the DAP (2015) for the Chittagong Metropolitan Master Plan (CMMP). In essence the outline divides the city's open spaces into two groups according to their use and size. The classification is:

A. According to Use:

- a. Urban Park
 - I. Neighbourhood Park
 - II. Community Park
 - III. City Park
 - IV. Playgrounds
- b. Regional and special purpose park

B. According to size:

- a. Small parks (2.5 to 10 acre) for one neighbourhood
- b. Medium Parks (25 to 30 acre) for one or more neighbourhood
- c. Large Park (more than 100 acre) for whole city.

Furthermore, from the analysis of open space typologies by different scholars and agencies (presented above), the following typologies of open space are derived for Chittagong.

Table 12: Comprehensive open space typology proposed by author.

Green open space	Blue open space
Protected area	Sea front
Hilly area	Riverfront
Urban forest	Lake
Parks	Ponds/Tanks
City parks	Creeks
Neighbourhood/Local Parks	
Playgrounds and sports fields	Functional open space
Playgrounds	Market square and plaza
Stadium complex	
Religious open space	Cultural open space
Mosque yard	Memorials

Cemeteries
Tomb and adjacent open space

Streetscapes

Road siding/paths
Civic Boulevard

Source: prepared by author

By presenting this information on Chittagong's open space characteristics and associated typologies (based on the above open space discussion and benchmarks) these can be used to help support the researcher's achievement of objective 4 of this thesis. Presented later in this document. That is, this information can be used to help structure an approach for the improvement of an open space ratio for Chittagong.

Criteria for developing standard:

The preparation of park and open space standards is by no means an arbitrary activity. Cities' open spaces need to be identified and structured for their purpose of use (function), catchment hierarchy and landscape setting as described above. Firstly, the criteria of developing three types of standards such as accessibility standard, quality standard and quantity standard has been discussed. This chapter primarily focuses on the quantity standard criterion derived from accessibility standard. As previously discussed, open spaces in cities must be designated and administered according to their intended of use, catchment hierarchy, and landscape context. In addition, it can help mapping existing open spaces, this classification can aid with planning and creating standards for open space in an urban area. Therefore, the following criteria should guide standard development of a community:

- I. They must reflect the needs of the people in the specific service area.
- II. They must be realistic and attainable.
- III. They must be acceptable and useful to both the practitioner and policymaker.
- IV. They must be based on sound analysis of the best available information.

Based on the discussion above, it can be concluded that Chittagong City's open space standards will be determined by factors such as availability, quantity, category, accessibility and function. To set the local open space standard in Chittagong in context of Bangladesh, it is essential to understand the planning standards practised in cities of Bangladesh, which are discussed below.

5.6 Open Space Planning Standards for Bangladesh

In the 1961 Master Plan for Chittagong the following open space standard was recommended and received negligible attention by the City's officials (CDA) 1995). Later, in 2004, guidelines and a planning standard for parks and playgrounds were established for the City's Private Housing Projects

by the Ministry of Housing and Public Works, Bangladesh (MoHPW, 2004). The following standards are adopted for open spaces from Land development Rules for Private Housing (table 15), and these suggest that the city's natural greens like City Park, Botanical Garden or water bodies are excluded from this structure. Chittagong also follows these standards for developing private housing projects under the supervision of Chittagong Development Authority (CDA). However, this standard relates to and provides for open space in private residential areas. The requirements are:

Table 13: Open space standard for Private residential areas in Bangladesh

Local Park	0.12 acre/1000 people	0.48 square metre/capita
Playground	0.08 acre/1000 people	0.32 square metre/capita
Total	0.20 acre/1000 people	0.80 square metre/capita

Source: Ministry of housing and Public Works (MoHPW), Bangladesh.

In terms of these figures, Hassan (2008) suggests that an open space standard in Chittagong of as 1.8 acre/1000 population or 7.28 square metres per capita would be hard to achieve when the city's existing open space is currently 0.243 square metre per capita according to CCC controlled open space record.

Additionally, table 15 shows that the proposed standard of open space in four cities of Bangladesh each fall below the recommended WHO (Emmanuel, 2009; Singh et al. 2010; Thundiyl 2003) standard. Furthermore, the existing open space ratios identified in these cities is also below the recommended standard for open space in Bangladesh. As an example, open space in Dhaka is at a level of 0.16 square metre per person, which is well below the standard recommended in the city's master plan.

Table 14: Open Space Standards recommended in planning proposals of metropolitan cities of Bangladesh.

Unit	Khulna City Master Plan, 2001-2010	Dhaka Metropolitan Development Plan, 1995-2015 [18]	Rajshahi Urban Area/Functional Master Plan, 2004-24	Barishal Master Plan 2010-30
Per 1000 population	2 acres	0.86 acre	1.5 acre	1 acre
Per capita	8 square metres	3.5 square metre	6 square metres	4 square metres

Source: (Khan, 2014)

The different types of standards above show that the different cities are maintaining standards according to their local analysis. According to NRPA (1983), "Park and recreation planning in any

community, large or small, occurs at three levels. The 1st, the policy plan, is sometimes referred to as the masterplan for parks, recreation and open space. The second level of planning is physical or concept plan. Usually prepared in a series, concept plans are site specific and serve as the basic documents for the layout, facility mix, landscaping, and construction details for a park or recreation facility. The 3rd level addresses the operation and maintenance plan for parks, open space and recreation facilities" (NRPA, 1983, p.37). Again, NRPA stated that a "[p]lanner should avoid setting a high standard. Establishing appropriate local standards requires the planner's commitment to gathering valid and reliable data and using them in a development process" (NRPA, 1983, p 41).

To help establish a relative open space benchmark in Chittagong, it is important to review the types of open space found in the city and their association in this setting's urban catchment areas. Hence, the availability of open space needs to be revisited as this potentially influences the recommendation of open standards and approaches for Chittagong. The open space concept included in the city's master plans is examined in the section. Taking into account, next section will discuss their current state and implementation status.

5.7 Review of planning proposals in Chittagong

What the above discussion on approaches to opens space suggests is that a coordinated effort and strategy for the improvement of the city's open space is needed. Hence, a series of planning proposal for Chittagong were prepared by the CDA. As briefly mentioned above, the authority was established in 1959 with the intent to ensure the planned and systematic development, improvement and expansion of the city and certain areas of its vicinity (Master plan, 1995). Its main objective was to ensure the planned and systematic growth of the Chittagong. The CDA's main effort in this regard was the 1961 preparation of the City's Master Plan, which was redone in 1995. In 2015, the CDA prepared the Detailed Area Plan for the City, which now governs development and open space requirements for Chittagong. A main feature of this document are the planning proposals embedded within it that are related to a series of open space issues the City has been facing for decades; these are discussed in detail below. Before analysing planning proposals, a brief discussion on the DAP and associated open space policies will take place, which is then followed by a review of the city's planning proposals. Please note that the structure of these planning proposals is as follows:

- Master Plan 1961
- Master Plan 1995
 - Structure Plan (1995-2015)
 - Urban Development Plan (1995-2005)

- Long Term Development Strategy for Traffic and Transportation in Chittagong (1995-2015)
- Chittagong Stormwater Drainage and Flood Control Master Plan (1995-2015)
- Detailed Area Plan (upto 2015)

In contrast to the planning related documents supporting the potential development of open space in Chittagong, generally in Bangladesh and at national level there is no open space, leisure or recreation policy that establishes a legislative leaning set of documents supporting open space development in the nation⁹. In Chittagong City, as discussed above, very few parks have been created and maintained by the CDA and CCC and the DAP tried to follow the 1961 Master Plan of Chittagong to implement the open space proposal. Yet, according to the city's Structural Plan Policy, PRS.03 (CDA 1995), it is designed to protect and enhance significant areas of Open Space within the City. In creating this city based policy it set the basis of the DAP for protecting of Open Space in Chittagong. In DAP for Chittagong, among the seven categories of proposed land use (discussed below), the open space is defined as Recreation Leisure and Open space.

The DAP also recommended to create a group named as the 'Chittagong Parks and Recreation Department' who will be incorporated in with the City Corporation and maintain liaison with the Planning Authority for acquiring, designing and maintaining Parks and Open Spaces. It is also proposed to make a 20-year plan for implementation of a park and open space system within the city. The DAP 2015 suggests that this system be referred to as the Chittagong Green Space Programme. It also recommended that suitable open space in the city with all government organizations (including all government) shall be designed and maintained as public open space.

In support of this department creation, the DAP proposed a number of policies and guidelines for open space planning proposal under section 2.6 which is mentioned as Recreation Leisure and Open Spaces.

According to the DAP and related to Chittagong, the government need to aim to create a wide range of indoor and outdoor leisure and recreational facilities and urban amenity areas to achieve a good quality of life for its residents and environmental sustainability. It also suggests that these spaces need to be accessible by public transport.

The policy RO 3.2, which stated that the Authority and the Local government should purchase open space areas, especially those that have a substantial chance of losing their conservation value, is

⁹ Policy and planning document refers to open space guidelines and strategy investigating open space structure, typology and fixing local standards.

encouraging in reporting this statement and, additionally (CDA 2011), this research Innovative tactics may be employed to benefit from such land.

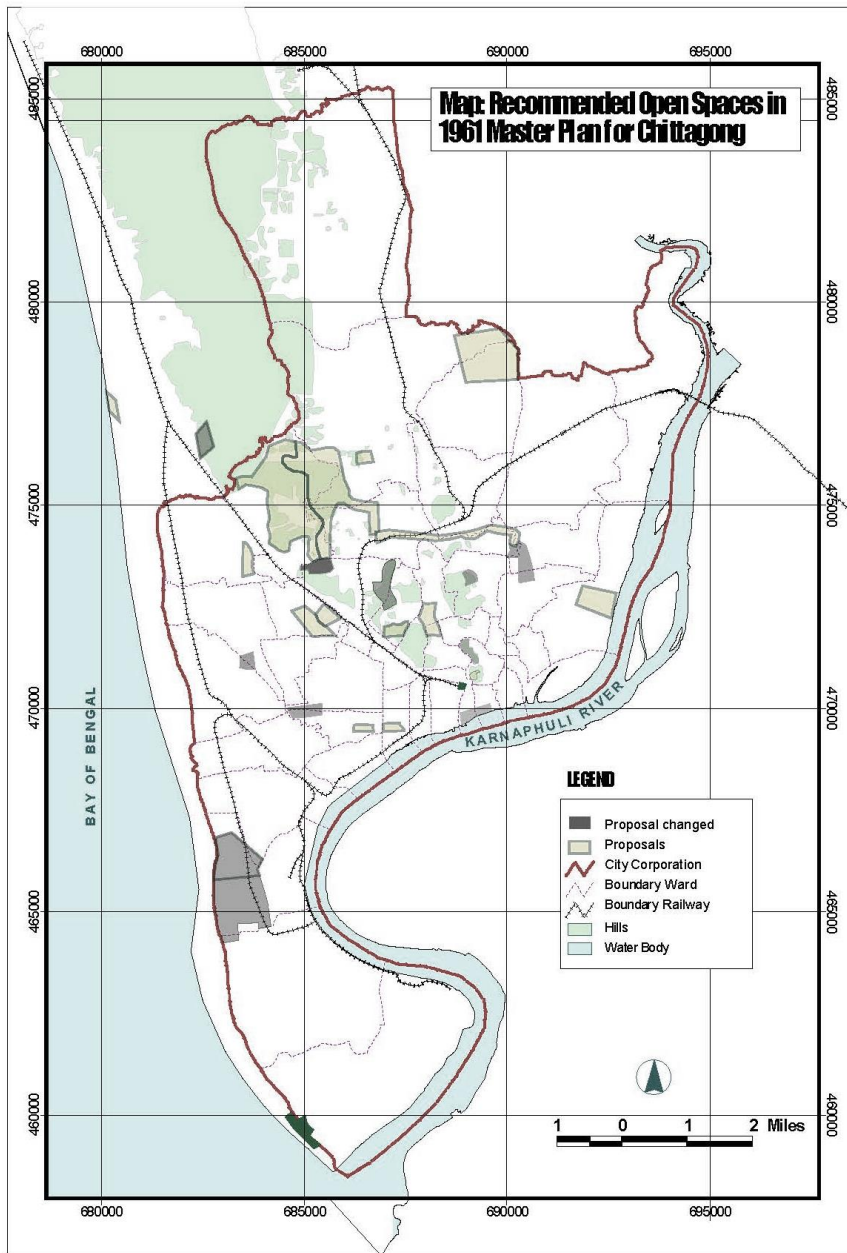


Figure 24: Proposals of open space 1961 Master Plan

Source: Hassa (2008), Updated by author.

The following is a review of the city's planning proposals and is undertaken to demonstrate an understanding of the planning related literature from which this research project engages with.

I. Master Plan 1961

The 1961 Master Plan prepared by the CDA covered 550 square kilometres (CDA 1995). The plan stated that the open space problem is due to a lack of public parks, play fields and small children's play areas, which, unfortunately, greatly simplified the issue. According to the plan it identified a

“grave deficiency of open space, particularly public parks and small areas suitable for use by children” as a major problem for Chittagong's residents (Hassan, 2008, P 60). And in this sense, the master plan found that only 88 acres of land were in the City's total area and were dedicated to parks and playgrounds. Hence, it recommended 26 different proposals as shown in figure 24 to create 2935 acres of land for new park and open space areas in the city. In Table 17¹⁰, it can be viewed that only four proposals recommended in the Master Plan were partially implemented. Among these four, three proposals have been also partially turned into an amusement park. The major problem for implementing the proposals or changed in land use proposal is that the majority of proposed lands are owned by other government and private organizations and private landowners.

Table 15: Open space proposal in 1961 Master Plan and implementation status

Proposals and Implementation status		Area (Acre)
Land use changed: 12		998 (Total)
Partially implemented: 04		867.37 (Total)
1	Circuit House and Chittagong Stadium	84
2	Agrabad	29
3	Foy's lake Regional Park	736
4	Patenga Sea beach	18.37
Not implemented: 10		935 (Total)
1	Riverside Tank (Agrabad)	25
2	Stadium and Central Eidgah Pahartali	92
3	Railway Tank, Pahartali	43
4	Botanical and zoological Gardens	354
5	Batali hill	53
6	Bayazid Bostami Shrine Nasirabad	17
7	Regional Park, East of Hathazari road	99
8	Park way along Chaktai Khal	115
9	Park near Kalurghat Industrial Area	107
10	Foujderhat Sea Beach (outside city corporation area)	50 (estimated) ¹¹

II. Master Plan 1995 and Detailed Area Plan 2015

The second Master plan was prepared in 1995 and includes three tiers related to the City's development: A Structural Plan, Urban Development Plan and Detailed Area Plan. The later Detailed Area Plan was prepared in 2015 and relates to the City's existing open space in context of Urban Development Plan, a Storm Water Drainage Master Plan and Transportation Master Plan. Each of these is supported by a number of proposed guidelines and policies that lead to the creation of open

¹⁰ Refer to Appendix 1 for details.

¹¹ The beach area is estimated from the GIS map and Google Earth.

space in the City. These guidelines are discussed below and individually they contribute to the City's total open space. The Detailed Area Plan for Chittagong, in 2015, recommended policies based on the 1995 Master Plan. Which, in terms of the 1995 plan, recommended to create a department named the "Chittagong Parks and Recreation Department" (CDA 2015), who's intention is to work with the Chittagong City Corporation and liaison with the Planning Authority to acquire, design and maintain the City's parks and open space areas. The 1995 plan also proposed to develop a twenty-year plan for the implementation of a park and open space system; which the DAP refers to as the 'Chittagong Green Space Programme' (CDA, 2015). The DAP 2015 also recommended that all government organizations with suitable land enclosed and/or that accompany their related facilities should be designed and maintained as public open space. Recommendations such as these can be taken into consideration when attempting to overcome the potential issue of land ownership or expropriation of land within the City's boundary. The ordinance, related to this expropriation of land, also suggests that the CCC may provide and maintain, within Chittagong, open space as necessary for the convenience of the public and such spaces shall be grassed, hedged, planted and designed to include amenities (CCC, 1982). A number of additional proposals related to improving the City's open space situation are discussed below in Table 18.

Table 16: The 1995 Master Plan proposal and implementation status

Proposals	Existing status	Area (acre)
Structure Plan		
Creation of a landscape adjacent to Jumiatul Falah Mosque	A field area for stockpiling construction material for ongoing development road works. Area is connected by footpaths on the adjacent roads	7.6
Further development of the zoological and botanical garden at Foy's Lake	A zoo and amusement park. Most of the park remains unused due to inaccessibility	736
CRB (Central Railway Building) Area	Public open space but is currently in a degraded condition and, after dusk, turns into a place for anti-social activities	10
Structure Plan and Urban Development Plan		
Batali Hill	In very poor condition, weak connection to the City and, particularly, its surrounding areas. Insufficient Landscape elements.	53
Urban Development Plan		
Northern Hills	Hilly area which is not accessible. Excavation of the hill occurs in this area. The area is close to the City's industrial zone which are occupied by informal settlements.	200
Detailed Area Plan		
Debar par Lake front development	Flooded by tidal water and occupied by informal settlements.	22

Karnaphuli River Front Development project	This is submerged land that is not connected to the surrounding areas. (Western bank of the river stretches from Kalurghat bridge to Shah Amanat bridge)	30
--------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------	----

Source: Prepared by author (refer to appendix 1)

5.8 Description of sites proposed in planning proposals:

The previous section addressed types of Master Plans and their overall guidelines. The following section will investigate specific guidelines of open space in areas addressed by master plans.

Hills:

a. Northern Hills (Bhatary)

The contents in the above discussion suggest a range of considerations that, if acted upon, may help alleviate some of Chittagong's decreasing and lack of open space areas for the City's residents. In particular, the Urban Development Plan recommends that the northern part of Foy's Lake needs to be designated as a regional open space. This recommendation is made because of the hills, forest and central lake it poses easily can attract visitors (CDA, 2011). Additionally, passive relaxation (e.g. sitting) and fishing facilities are provided in this space; which help to allow for a range of uses in this setting. The site is ideal as a large recreational area as it has an estimated area of 200 acres. Part of the site is inside the boundary of the CCC area. However, the development pressure on this land is high, it is only 20 kilometres away from the city. Yet, the area is considered 'safe' due to its proximity to a military installation and the need for this camp to maintain a buffer around its facility.

b. Batali Hill

Batali hill is the second largest open space in Chittagong and spreads over 53 acres of land. The hill is about 90 metres in height and faces threats of erosion and landslides due to illegal excavation of the hill. This excavation is done to collect soil for the brick industry and to perform development works like housing (BUET, 2014). Unfortunately, due to the hill's slope, most of the area is not accessible to the City's residents. The hill is connected with a vehicular road and two series of stairs that provide access to the hill. In the 1961 Master Plan, this hill is marked as special planning zone which is to be preserved as botanical garden for Chittagong, as the city does not currently have such a garden. The site is partially restricted by the private residence of Government officials (e.g., Bangladesh Police and Public Works Department).

i. Intangible open spaces or Water bodies:

Chittagong is geographically bounded by the ocean and river and composed with lakes which provide visual and psychological aspect as open space and may be considered as intangible open

space (Jafrin & Beza, 2018). An intangible open space element in this thesis is considered as open space that are not physically accessible. These open space areas do not contribute to per capita open space. These intangible open spaces in the city are the sea, rivers & canals. But, in Chittagong, these places are not fully open to the residents. This is due to a lack of accessibility and visual obstruction, depending on one's view of this setting. The Master plans for the city provide some guidelines adjacent to these open spaces which are mostly to promote transportation in the city. There are only two recreational open space proposals which have been made for the riverside and the seaside. The lake side proposals have been discussed under the hill section of the document due to their geographical location. These intangible open spaces are discussed below:

a. Sea: According to the Transportation Master Plan of Chittagong (CDA, 1995), it proposed an outer ring road with an embankment on the seaside section of this road. Though the proposal was made to bypass the traffic from the inner city, it can potentially increase the visibility and accessibility to this intangible open space element (i.e. the sea). Hence, more information addressing this type of intangible open space in the city's plans could help address the lack of open space the city faces.

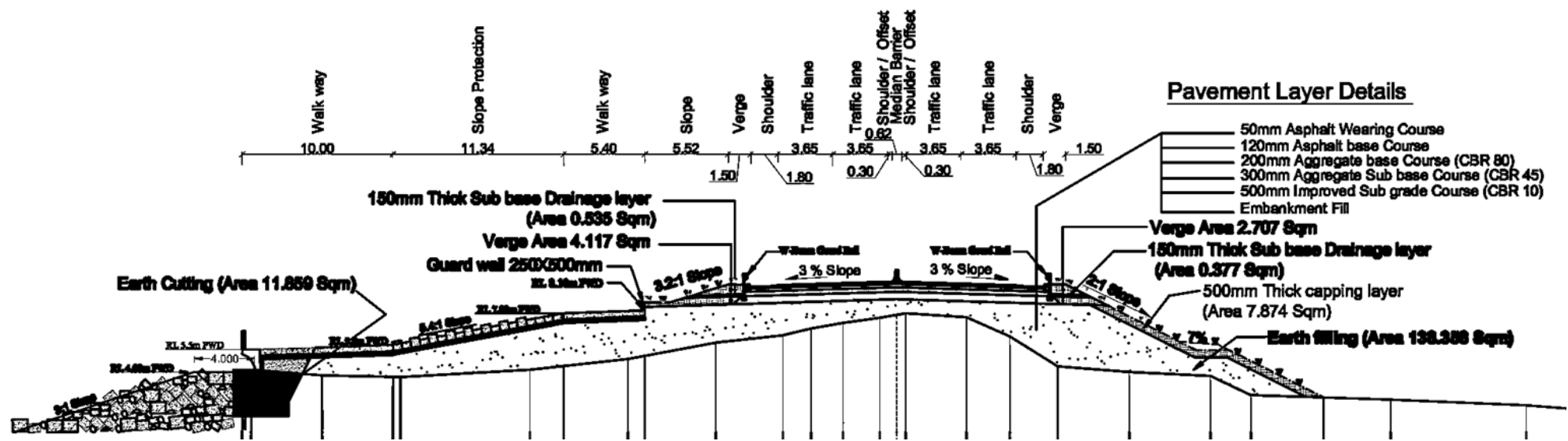


Figure 25: A typical cross-section of the outer ring road proposed by Japan International Cooperation Agency (JICA) CDA.

Source: Chittagong Development Authority (CDA)

Additionally, the 1995 Master plan proposed outer ring road along the sea shore and river bank to reduce traffic in internal road. The proposal for the outer ring road extends from the river junction to the boundary of the city at Fouzderhat (i.e. the Patenga sea beach to Dhaka Trank Road). The embankment associated with this road has the potential to provide an opportunity to create a pedestrian friendly walkway adjacent to embankment (10 metre or more width), A projected road segment of the outer Ring Road by the JICA (Japan International Cooperation Agency) that offers a possibility of public open space is depicted in figure 25. Furthermore, this ring road is proposed to be connected to the city by feeder roads that will open views to the sea by the city dwellers. Whereas, in addition to existing beaches in Patenga, an additional beach is proposed to be created in an area twenty kilometres away from the existing beach in the Fouzdarhat area, which was proposed in 1961 Master Plan open space proposal and is currently used as a ship dismantling area. Though the seaside is proposed for the conservation of mangrove areas and, as discussed above, can serve to minimise storm surges, a detailed consideration of how open space of this nature can serve city residents needs to be considered.

b. River: Another prominent intangible open space in Chittagong is the river, where the next phase of the outer ring road proposal has been made. In this proposal it is suggested to build an embankment on the west bank (city side) of the Karnaphuli River. In regards to this proposal, the 1961 Master Plan mentions that waterfront parks should be a part of every riverside town, preferably in close proximity to the town centre where they can serve as a green lung and are easily accessible to the public; in the Indian subcontinent, such parks are a common feature of many towns. East of Sadarghat Road, on the bank of a shallow stretch of the river, is a good location for such a park. that might be designed as an extremely luxuriant place. In relation to Marinar's Park in Avoymitro Ghat, this park might be noted. Along with these pieces of art, the opportunity to develop the neighbouring riverside for the creation of a blue open space presents itself.

Furthermore, and according to the DAP, a riverfront project is suggested to be developed on the west bank of the river which is located from the Shah Amanat Bridge to the Karnaphuli Bridge. This area, however, as mentioned in the DAP, needs to be protected from urban development. Again, the proximity of the area to city residents has not been considered. To reduce the distance for accessibility to this open space area, the importance of the Chaktai creek area as a heritage canal mentioned in the fourth chapter also needs to be included in this proposed development measure. The old City area has been extended its development on both sides of Chaktai Creek, forming the river frontage. The southern portion of the city's riverside area is being used for Navy and ports related activities.

Consequently, these limit public accessibility to riverbank. The situation involving the riverbank and military activity is the same as that of the embankment road at the river-sea confluence.

The situation involving the riverbank and military activity is the same as that of the embankment road at the river-sea confluence. In the event that this area is developed as an open space, people might visit spend time in the serene environment of the Karnaphuli River, where they can observe ships entering and leaving and have a clear view of the opposite bank of the river. Yet to achieve this transition to open space the existing vehicular road needs to be considered. Currently it is narrow (20' or 6 m), designated for two-way traffic and does not have any pedestrian facilities like a footpath for walking or seating. However, it does have a working viewing deck. This space also has temporary restaurants that provide seating for the viewer while they have their food and enjoying the scenery. Total length of this area is 1.66-kilometres, which is half of the length of Mumbai Marine Drive and includes a 50' wide track for jogging and walking.

c. Lakes: Foy's Lake and Bhatiary Lake are two of Chittagong's notable lakes. Both of these intangible open space have been discussed in previous section and it was argued that those open spaces need more accessibility. The Bangladesh Railway colony encircles the Foy's Lake, which is situated close to the city center. The lake area is more than 200 acre of land. Bhatiary Lake is located in the city's northern region. These two lakes can serve as intangible open space. Of these two, Foy's Lake has been the subject of prior discussion because it was suggested as a regional open space in the Detailed Area Plan of 2015 and the Master Plan of 1995. This lake's dense surroundings could make it an intangible open space because of its unhindered perspective and easy access to nearby neighbourhoods. Unlike Foy's Lake, Bhatiary Lake is situated on the outskirts of the city and serves as a refuge for the surrounding hilly landscape and foliage in addition to being an intangible open space.

Ponds: There are several sizable ponds in Chittagong, and the city's shantytowns are along their edges. These shantytowns impede not only the view of the surrounding ponds but also the ease of access to the nearby water's edge. The Agrabad Tank and the Pahartali Railway Tank (Bhelor Deghi and Jorr Deghi) were suggested to be kept as open space in the 1961 Master Plan. More recently, the DAP suggested developing these ponds as both open space and flood storage ponds. DAP also suggested that, in order to conserve the environment, existing ponds larger than 0.5 acres be preserved. The following ponds (table 19) in Chittagong City are all greater than 0.5 acres, according to the study.

Table 17: List of ponds more than 0.5 acres in size.

Agrabad deba	16.80 acre	Jorr Deghi	20 acre
Beluar Deghi	1.25 acre	Rani Deghi	1.90 acre
Asker Deghi	7.40 acre	Bhelor Deghi	11.20 acre
Lal Deghi	1.48 acre	Hajrat Shah Sufi Amanat Khan	0.60 acre
Agrabad pond	1.23 acre	Bayzid Bostami pond	1.67 acre
Damua pond	1.18 acre	Bashir Shah Tomb pond	2.37 acre
Total	65.41 acre		

Source: Prepared by author

Canals and Creeks: The DAP for Chittagong recommended the creation of a network of linear open spaces by linking together and making better use of the City's canals and natural creeks (e.g., Chaktai creek). In support of these recommendations the greening of the edge of the creeks also need to be considered. This open space recommendation may also act as a linear green space and walkway that can connect the open spaces scattered around the city (Zaitzevsky, 1983).

ii. Cultural hub:

The Chittagong Shaheed Minar is a built feature of national importance and is located in the cultural enclave area proposed in 1961 Master Plan (figure 26). The 0.12-acre complex is intended to honor the nation's activists who gave their lives to keep Bengali as the official language of the nation¹². This area is located adjacent to the City's secondary major road; which has a



Figure 26: Cultural Enclave site, Source: Google Earth
Source: Google map

¹² In 1947 the West Pakistani-dominated government decided to remove Bangla on official currency and stamps and in schools. Politicians, community organizations, and leaders of Bengali student organizations criticized these language rules. The Pakistani leadership's repeated insistence that Urdu would be the only official language of Pakistan in 1952 marked the height of the Language Movement. This announcement created a movement in East Bengal and prompted numerous student organizations to call for large-scale protests on February 21. Many of the activists died from gunshot wounds. The Shaheed Minar memorial in Dhaka was built in their honour and Chittagong Shaheed Minar memorial was built after that following the same purpose.

small space in front of it this memorial to accommodate a number of people that come here on a variety of important national and local celebratory days, such as Independence Day. Individual people with or without family, government, the private and social organizations come here to pay their respect to the people that have contributed to the development of the Chittagong and Nation.

iii. Footpaths: Footpaths are the most important and a driving force of open space. Without effective footpaths, the researcher considers, existing open spaces fail to be connected with neighbourhoods and lack links to these spaces for residents. According to DAP (2015), effort to make the public open space system interconnected through the use of footpaths is important to connect the open spaces. Unfortunately, upon analysis this appears to be nearly achieved. For example, the primary road and secondary roads data in the DAP 2015 (CDA 2015) and GIS database of footpaths shows that only 39% of Chittagong's roads have footpaths. Yet those that do, most of them are occupied by vendors and shopkeepers, and most of them are not continuous and vary in width from below one metre to two metres. To put this footpath dimension into perspective, two-thirds of the city's existing footpaths are occupied (refer to figure 11 in chapter 2). So, if 100% of the city's roads (i.e. 609.39 kilometres) can be redesigned to provide footpaths this could go some way to support the connectivity of the open spaces with the residents.

iv. Rail-Line Corridor: A prominent feature of Chittagong City is its green corridor, shown in figure 27; which can be found running along the sides of the rail line. To improve the city's open space ratio the DAP (2015) recommended greening and creating usable recreational space on the sides of this unused railway track. The DAP also has the intention that this linear space can act as a green corridor for the city, potentially linking the City's various urban areas together. As a result, if implemented, this green corridor can connect the City's other open space areas such as the CRB,



Figure 27: Rail-line Corridor.
Source: Created by author, Map collected from CDA.

Batali Hill, A K (Abul Kashem) Khan Hill, Jorr Deghi and Belaur Deghi. Thus, an interconnected network of green spaces can also be achieved that can connect all existing major parks, nodes and open space areas. Additionally, installing this interconnected network can link together the City's road reserves, utility reserves, ponds and drainage reserves, railway reserves, scenic roads, and scenic easements (Nilufar, 2015). However, the continuation of linking the existing green space is hindered by the railway's workshop and the City's slums that occupy the sides of the rail line. In terms of these slum areas, it must be noted that one must treat these with the utmost consideration and care when/if planning any new open space proposal that would affect these people.

Summary of open space proposals:

From the above analysis of the city's actions regarding planned open space for Chittagong, the following table can be drawn to summarize the open space proposals evident in the master plans. The table 20 shows that the cumulative amount of open space would be 1700 acres, which, if acted on, could increase the ratio of open space in Chittagong. Yet, as the discussion above also suggested many of these planned open spaces are being encroached upon by development, which lowers the possibility of increasing open space for the city.

Table 18: Combined list of existing open space and recommended open spaces in master plan.

	Name	Source/Details	Area (acre)
Regional Park: Botanical and Zoological Garden	Northern Hill	Urban Development Park	200
	Batali Hill	Master plan 1961 and Detailed Area Plan 2015	53
	Foy's Lake (without amusement park area)	Structure plan 1995 and Detailed Area Plan 2015	646
	Butterfly Park	Existing open space	3.89
	Zoo	Existing open space	2.59
City Park	CRB	Structure plan 1995	10
	Batali Hill	Master Plan 1961	53
	DC Hill Park	Existing open space	17.92
Waterfront	Marine drive and beach	CDA project	50
	Patenga Beach	1.5 km X 7m	2.6
	Karnaphuli river front	Detail Area Plan	25
	Foujderhat Beach	Master Plan 1961	3.1
Cemetery and Memorial	Central Shaheed Minar	Proposal of extension in existing area	1
	War Cemetery	Existing open space	5.24
Religious	Jumiatal Falah	Structure Plan 1995	7.6 (excluding mosque)
	Mosque field		

Ponds	Bayazid Bostami Shrine	Master Plan 1961	17
	Agrabad Deba	Master Plan 1961 Detailed area Plan 2015	25
	Jorr Dighi and Bhelaur Dighi	Master Plan 1961	43
Park way along creeks	Chaktai Khal (5.1 kmX3mX2)	Master Plan 1961 and DAP	7.56
	Moheshkhali Khal (4.9 kmX3mX2)	DAP	7.26
Railway Corridor	Greening on both side of unused rail line	DAP	200
Playground	Total 64 Playgrounds	Existing open space	106
Stadium	Stadium 02		35.5
Total			1700.16

Source: prepared by author

5.9 Conclusion:

This chapter has achieved objective 2 of this thesis (To establish a relative open space benchmark and standard that Chittagong can reference in its open space developments). It did this by examining a range of open spaces definitions and frameworks practised in cities and their classification typologies and characteristics of open spaces were used as reference points. It also achieved this by presenting Chittagong specific open space information and typologies that could as well be used as reference points.

In summary, this chapter highlights that the open space scenario in Chittagong may be improved by simply implementing the City's open space master plan proposals. However, by only implementing the City's existing open space plans it may only result in a quantitative delivery of land. The desired outcome of achieving net gains needed to be assisted by also preserving the open spaces demarcated in the master plan that are under threat by development.

The chapter also found that by simply adhering to the proposed implementation guidelines included in the City's various Master Plans, the open space per capita in Chittagong can be increased from 0.243 square metre to 1.67 square metre. It is understood that this standard is far below the requirement. However, as Chittagong is bounded by the sea and river to its west and east, respectively, the city can potentially develop more riverfront open space by increasing accessibility, connectivity and visibility of the waterfront for its city dwellers. Hence, more open space can be found

and realized by also simply looking at the potential of spaces with and adjacent to the city. Lastly, it is suggested that, although the master plan suggestions will increase the ratio of open space in Chittagong, it is still important to develop distinct approaches related to open space conservation, land acquisition and government funding of such open space works. Otherwise, the open space proposals found in the City's various master plans will continue to fail to meet Chittagong's open space needs and aspirations of its residents.

Chapter 06: Survey and interview analysis

6.1 Introduction:

The population density in the CCC area was, mentioned previously to be, 242.28 per square metre in 2019 (Bajracharya 2020), and Bulmer (1993) suggests that, due to the high birth rate in Asia, cities such as the CCC can be considered high in density. Contextually this 'high-density' element is a determining factor that potentially allows one to address the city's open space standard as open space, "should compensate and complement the physical and social context of the [urban] surrounding environment" (City of Monash, 2017, p. 27). This research is focused on the urban setting, defined as the CCC area of 168 square kilometres. The literature review and case study analysis found that per capita open space in Chittagong is far lower than the WHO (2003) recommendation. Additionally, the UN stated that within 400 metres of open public places, 47% of [the city's] residents live. Whereas, according to this thesis, in Chittagong City only 19% of residents live within this distance to open space, the intent of this chapter is to investigate guidelines to mitigate the ratio and to explore users demand of open space. The projected approaches and the user's requirements helped to address the crisis by helping to identify means to increase the per capita open space in the Chittagong City.

Therefore, research objective 3 is examined in this chapter, which is to investigate approaches of realising open spaces in Chittagong City. and its intent is to investigate a process to increase open space in Chittagong City. To achieve this objective, the following two research questions were formulated:

- I. What are the city's open space aspirations and how do these achieve the urban growth plan of Chittagong?
- II. What city-specific open space considerations best support the open space aspirations of Chittagong?

After a careful literature review on open space typology, strategy, and standards in chapter 4, the researcher intends to now investigate the open space situation locally. Therefore, to address these questions, the researcher conducted a survey and interviewed residents and professionals in Chittagong, respectively. This paper presents the analyses of survey and interview data through the use of SPSS and NVivo. The analysis of the associated results then influences the researcher's consideration of creating open space as well as indicating types and user's aspiration with also suggesting probable approaches to increase these spaces in Chittagong.

6.2 Interview analysis with NVivo

The researcher interviewed 13 professionals engaged in Chittagong City. To translate the interview data into findings for discussion, the researcher implemented an inductive content analysis and thematic analysis of interview data. Thematic analysis refers to the “method of identifying, analysing and reporting patterns (or themes) within data” (Braun and Clarke 2006, p 79). In addition to conventional paper-based approach to analysis interview data, the researcher adopted the use of the NVivo 12 software as a qualitative data analysis tool to aid in the thematic analysis of data. Following the framework of analysis stated by Braun and Clarke (2006), data collected from the interviews is examined in 6 phases. These are:

I. Phase 1: Familiarization with data

The 1st step is to familiarize oneself with data through listening and taking notes (Mortensen, 2021). Therefore, in this step, to facilitate the analysis, the researcher transcribed the recorded audio conversation of 13 interviews into electronic text, attached in Appendix 15. The interview files consist of four to 14 pages. The researcher read and then after a couple of months reread these transcripts to develop an initial view of the potential themes. In addition, for the reader's review, two interviews documented in the Bengali language have been translated into English and are presented in Appendix 15.

II. Phase 2: Generating initial codes

In the 2nd phase, for analysing the interviews, the researcher set to generate codes from the interview data. It is the researcher's consideration that “[a] code in qualitative inquiry is most often a word or short phrase that symbolically assign a summative, salient, essence-capturing, and/or evocating attribute for a portion of language-based or visual data” (Saldana, 2016, p.3). To implement this consideration the researcher prepared a coding table based on the 1st impression of the transcriptions, developed in phase I. To generate a code with NVivo, the researcher imported the 13 interview files in to “NVivo”. Following these, the NVivo software generated 34 codes from the 980 text references of the 13 different interview files. Accommodating processing of this large data set in this analysis chapter has been included as part of the phases' explained in this section of the thesis.

III. Phase 3: Searching for themes

Coding of respondent's data occurred in the 1st two phases, which are preliminary steps that lead to the positioning of these into groups of thematic coherence. In this sense, “[a] theme captures something important about the data in relation to the research question” (Braun and Clarke, 2006, p 82) and, in this step, the researcher established the themes based on the four interview questions

developed to achieve the 3rd objective. Furthermore, themes were identified based on whether thematic coherence was considered, by the researcher, as to have a semantic or latent association. That is, semantic codes and themes identify the explicit and surface meanings of the data and latent codes capture underlying ideas, patterns, and assumptions (Bree and Gallagher, 2016). Additionally, codes can lead to identification of interesting information in data. Themes, however, are broader and involve active interpretation of the codes and the data (Mortensen D H, 2021).

For a better understanding, the relationship between files, themes, codes (also known as nodes), and references these can be simplified as in a diagram presented in Figure 28. In short, 980 code extracts from 13 files are sorted into three themes.

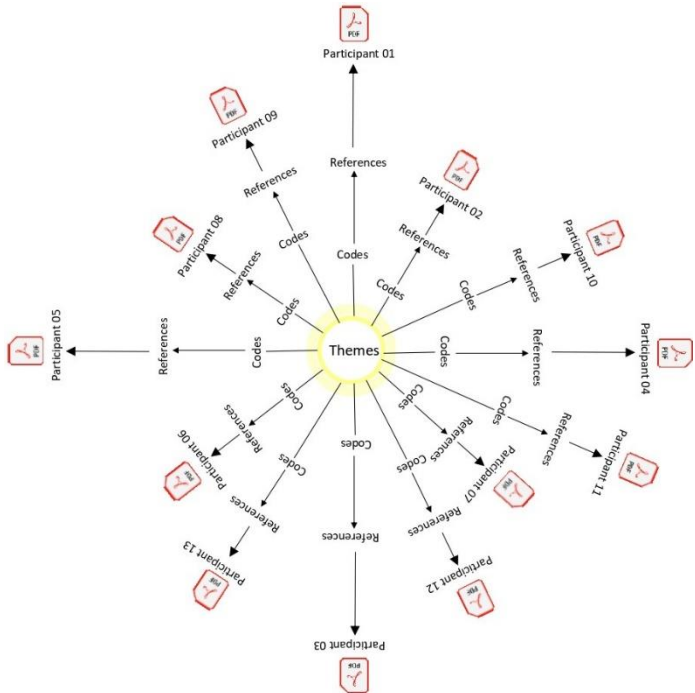


Figure 28: Structure of elements in thematic analysis associated with interview files.
Source: NVivo.

IV. Phase 4: Reviewing themes

In this step, the researcher verified that “if the themes work in relation to the coded extracts and the entire data set [they then can be used to] generate a thematic ‘map’ of the analysis” (Braun and Clarke 2006, p 87). Note, as a preliminary step, the researcher was initially guided by a traditional paper-based approach where comments from each interview transcripts were cut out and thematically arranged by code. The researcher reviewed and refined the themes identified in phase 3 by reading the references of each code to explore whether they support, contradict, and overlap with a respective theme (Mortensen D H, 2021). The NVivo-generated references were categorized into three topics by the researcher during this phase. NVivo used the quotes from interview files as references and coded the number of references. Positive and negative emotion can also be

extracted from the interview files using NVivo. In this context, "positive sentiment" denotes the likelihood of more open space in Chittagong, whereas "negative sentiment" denotes the opposite (Jafrin, 2022). For example, a quote from an interview file reads as, "It will carry water to the river Karnaphuli, the main river and it will have beautiful, lush green banks where people can sit. It will have trees and bushes and shrubs". Hence, when analysed by NVivo this sentiment is interpreted as positive. The relationship between themes and sentiments derived from NVivo is shown in the Figure 29.

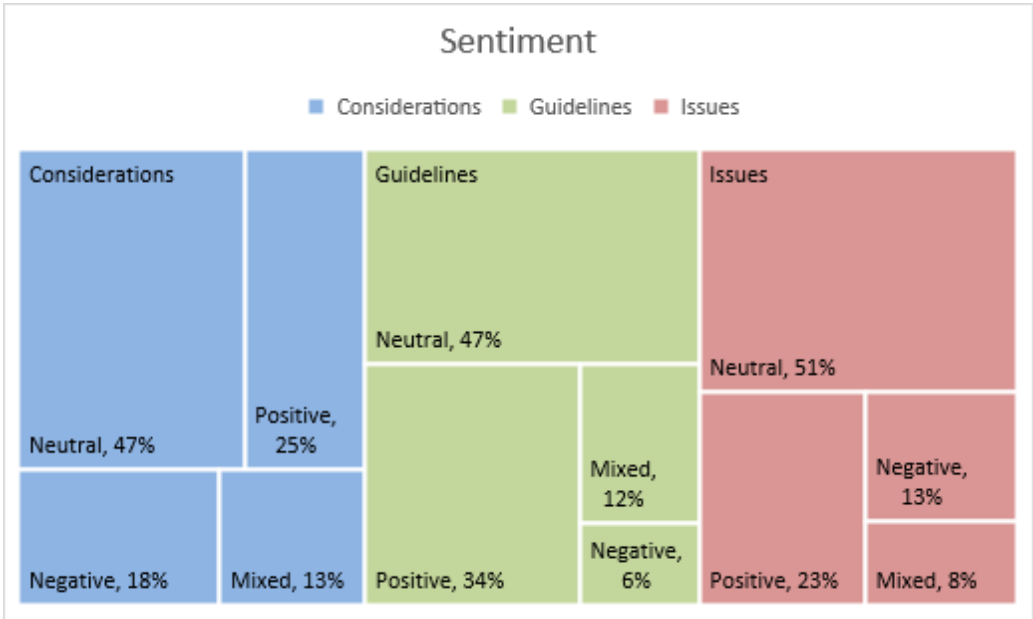
V. Phase 5: Defining and naming themes

As a complementary step to phases III and IV, this phase revolves around an analysis which enhances the data placed under each theme. Hence, to generate clear titles of the themes in this step each theme was named by analysing the overall data supporting it (Braun and Clarke 2006, p 87) and this naming validation continued until production of the final report (Bree and Gallagher, 2016). Following this line of theming the data, the researcher refined the codes and their associated extracts, collated and combined the categories into broader themes. This process was proceeded by the researcher, removing repetitions and irrelevant themes by reorganising codes and splitting differences. In addition to NVivo result, the researcher has to add the missing nodes or rename the codes according to the findings of traditional approached analysis.

VI. Phase 6: Producing the interview report

This phase relates the analysis of data respective to the research question and literature to produce an analysis of the interview data (Andreotta et al. 2019). It is also the final opportunity for the researchers to select an intense and persuasive set of extracts and or illustrations to support the

Figure 29: Relationship between themes and sentiments derived from NVivo.



analysis (Andreotta et al., 2019). When focusing on the research question, the researcher classified the codes under themes and summarised them. After careful assessment the researcher finalized 30 nodes with 584 references. As discussed above, the two parent sentiment nodes (Positive and Negative) have four child nodes: neutral, positive, negative and mixed. Where Figure 29 shows the ratio of positive and negative sentiment with child nodes in each theme according to NVivo. This helps the researcher to understand the sentiments in each theme. Again, the sentiment ratio of positive, mixed, neutral and negative are derived from NVivo to support the probability of increasing the open space ratio in Chittagong, shown in figure 29. This figure shows that each theme has a majority of neutral sentiment and positive sentiment is next to it where negative and mixed sentiments are less prioritised. This means that majority of the participants are neutral regarding open space in Chittagong, but their positive thoughts on open space in Chittagong is stronger than negative.

Interview report:

NVivo shows that 13 interview files have 217, 208 words and 185 references for regarding the sentiments of considerations, or identified issues, and guidelines, respectively (figure 30). Additionally, according to NVivo, 12 people interviewed resulted in 467 positive sentiments and 12 people leaned towards 292 negative sentiments regarding open space in Chittagong. These helped the researcher with her considerations related to the development of open space approaches while the sentiment identified to the researcher the willingness that may be present to improve open space in Chittagong. The researcher sorted 30 nodes with 584 references derived from NVivo into three themes. The themes are more positive leaning in terms of sentiment which supports a respondent's willingness to create or act on the improvement of open space in Chittagong. Figure 30 presents the relationship between files and reference data derived from NVivo.

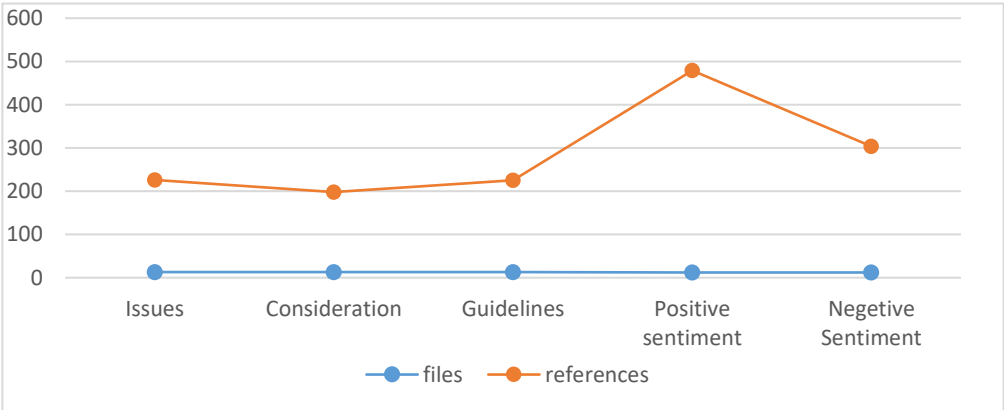


Figure 30: Relationship between files and reference derived from NVivo.

Hence, in this analysis of subject matter a theme was developed to best position the thoughts and conceptual orientation of professionals interviewed. The themes identified from the 1st three questions of the interview are:

A. **Issues:** The theme "Issue" was formulated from the 2nd interview question, which was "Please tell me the issues, as you see them, relevant to existing and planned open space in Chittagong?"

B. **Guidelines:** In response to the 1st interview question, "what guidelines/policies/frameworks do you and/or your Department/Practise have in place to address open space in Chittagong?" The researcher formulates "Guidelines" as one of the themes of the interview files.

C. **Considerations:** This theme was derived from the 3rd interview question, "Please explain to me what you/your organization is doing or plan to do to address the issue of open space in Chittagong?" This theme relates to the respondents' consideration for creating or providing open space and related facilities in Chittagong.

The following sections present a more detailed data analysis of the themes and further sub-divides them into more discrete sub-themes for discussion.

A. **Issues:** The interview responses presented a series of open space issues related to planning recreational open space in Chittagong City. Issues are further delineated into sub-themes where discussions on open space challenges in Chittagong are presented. These sub-themed issues are incompatible land use, professional body, calamities, land availability, planning initiative, urbanisation, incoordination and relocation. The graphical relationship (or positioning) of a sub-issue (i.e., file) respective to its frequency of mention (i.e., reference) is presented in the figure 31. The graph in this figure shows that, incompatible land use is mostly referred to by interviewees. In addition, Urbanisation and Concurrent Development is referred to by 5 interviewees and represents more than one-third of the respondents. The following section discusses the findings of the issues by elaborating on the responses used to establish their thematic framing (referred to as nodes) and the lateral references used by respondents to describe the nodes.

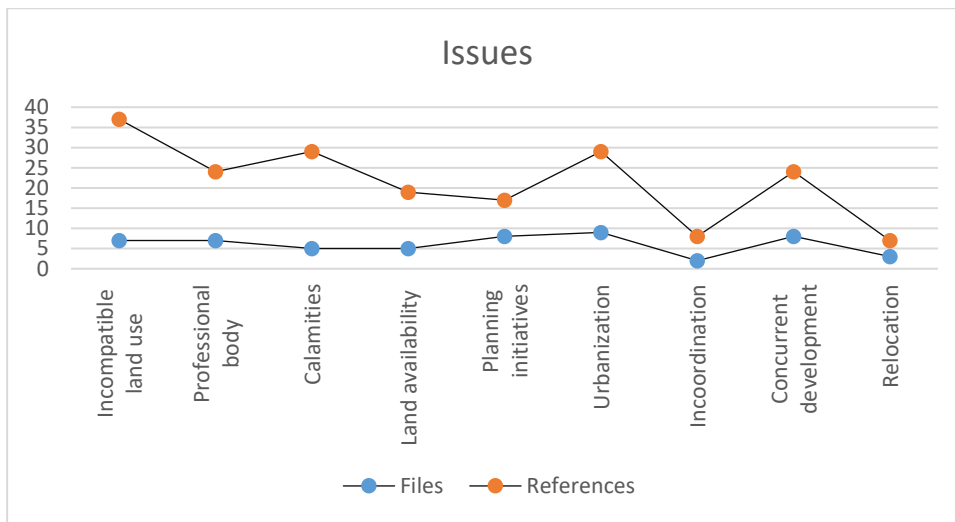


Figure 31: Relationship of file and references considering issue.

1. Urbanisation: Among the 13 respondents interviewed, urbanisation is the mostly mentioned issue effecting the city's open space. Nodes embedded in this issue are density, rapid growth, and environment. Seven respondents provided 11 different references, Figure 32 suggest that density and migration are considered to also lead to a decrease of open space in Chittagong. Additionally, they refer to port activity

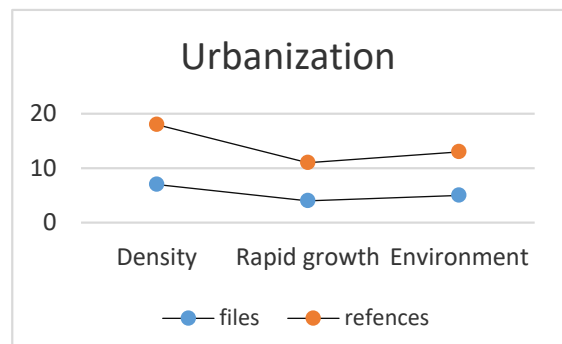


Figure 32: Relationship among nodes in Urbanization.

and industrialization for attracting workers to the city, which simultaneously increases density and reduces open space by creating industrial and residential areas. Referring to Chittagong as port city, where 90% of the country's export and import activities are involved (ADB, 2018), the respondents suggest that migration is taking place and open spaces prescribed in the city's master Plan are declining and being replaced with increasing residential and commercial uses. For residential use, when respondents exemplified "Parir Pahar"- (Fairy hill) which is a local hill, this refers to claims that high rise buildings permitted to be developed in current city open spaces demarcate its hilly areas. The respondent also exemplified that the new EPZ in Chittagong was established in an open space area demarcated in the 1961 Master plan. Respondents also addressed rapid and unplanned city growth for reducing open space in the city. Furthermore, the respondents suggest that for its current population density, Chittagong may not be able to provide the standard quantity of open space practised around the western cities, but it needs to provide open space for the betterment of its residents' health, as recommended by the WHO (2016) that there is safe and accessible open space within 5 minutes walk of 300 meter distance from someone's residence. In addition, "environmental"

nodes supporting the issue of urbanisation mentioned by respondents are hill cutting, air pollution, water pollution, sound pollution, and anti-social activities.

2. Incompatible land use: The interviews recommended incompatible land use as the 2nd highest issue related to open space in Chittagong. For example, in regard to a percentage of open land converted to residential and commercial use, the participants stated the irony of the situation of land transformation from open space to housing, such as the Agrabad R/A¹³, Hallishahar R/A and Bakalia R/A developments decreasing open space. A total of 6 files noted 29 references to changing open space to an amusement park and commercial areas, further reducing the number of public open spaces in the Chittagong City. This type of land use change was also identified in the city's Master plan (Jafrin & Beza, 2018), suggesting that as physical transformation of land occurs in the city it reduces open space in Chittagong. The files highlight that the amusement Park in Agrabad, building in front of Jamatul Falah mosque, building the swimming pool in the outer stadium and Lal Deghi, and the new commercial building in Biplob Uddayan as predominant land use changes in Chittagong negatively impacting open space. The files also suggest a number of dedicated open spaces in residential areas converted to plots, such as Agrabad, Halishahar and Sugandha Residential Area, also have reduced open space in the city.

3. Natural Disaster: Natural disaster is the 3rd highest recommended issue referenced in the interviews. The interviewees suggested that Chittagong experiencing natural calamities like an earthquake, flooding, cyclones, and landslides need open space to protect the city, to reduce the probability of disaster and to promote shelter from these elements. The relationship of a cyclone, earthquake, flood and landslide in terms of reference to this sub-theme are presented in figure 33. Among the calamities, flooding was predominantly referred. Two types of flooding occur in Chittagong: flooding with rainwater (frequently occurs during the monsoon) and flooding with tidal water (occurs regularly due to high tide). The low laying areas demarcated by CWASA (Chittagong Water Supply and Sewage Authority) (CDA 2011) as flood storage ponds can serve as open space and are highly recommended to mitigate flooding and waterlogging in Chittagong. As these low-laying areas are converted to residential plots, flooding occurs frequently in Chittagong in these areas. Next to flooding,

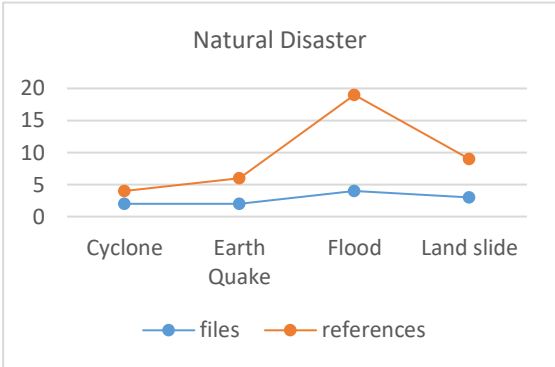


Figure 33: relationship of files and references with Disaster.

¹³ R/A is abbreviation of Residential Area

"landslide" is second the highest suggested calamity that effects Chittagong City. The interviewees denote that, landslides frequently occur in Chittagong, due to the sand dunes being washed out in rainy season after hill excavation for residential development. The interview files lean towards preserving hills as open space to avoid the probability of disaster. Additionally, Chittagong is prone to cyclonic surges and the sea sides are affected by it. To protect from cyclonic surges, the files suggest that Chittagong City needs to keep open space along its seaside embankments. The interviewees also add that, Chittagong also needs open space for immediate shelter for residents to gather during an earthquake in highly urbanized areas.

4. Professional body: Considering the professional body as the 4th highly prioritized issue for open space, 7 interviewees provide 17 references indicating a lack of organization and coordination by these bodies for creating recreational open space in the city, which also supports a failure by these bodies in conserving and protecting open space in Chittagong. The respondents strongly recommend setting an independent park and open space department as it is suggested to benefit the city with effective planning and can initiate development of open space following the city's Master Plan guidelines. According to the respondents, this apex body can implement the master plan, reserve the stated open spaces, control open space by implementing policy, and execute and play an important role in land acquisition and preservation. The interviewees suggested this institute should hold a number of professionals such as planner, sociologist, economist etc to execute the master plan and to resolve problems created by jurisdictional conflicts in open space. The interviewees think that this institute can also engage professionals by outsourcing where they do not have the inhouse expertise. In addition, the respondents who are engaged with professional bodies such as the Institute of Architects of Bangladesh (IAB) and social organizations such as Forum for Planned Chittagong (FPC) are intent on working, investigating, surveying and publishing newsletters and articles on open space, which is suggested by the professional respondents.

5. Concurrent development: Concurrent development is the 5th highly prioritised recommendation for open space. According to the respondents, recently established recreational land use in Chittagong is detrimental, as seen by the city's beachfront developments at Patenga, Lal Deghi, and Jamboree Park. While showing negative sentiment in NVivo, these public open spaces were highly criticised for not respecting site, climate and the existing land use of the areas. For example, the respondents exemplify Jamboree Park as a cosmetic development that transformed provides ornamental decoration, Foy's Lake has restricted entry (i.e. there is a fee to enter into the lake area), Lal Deghi transformed its existing pond into swimming pool and Patenga beach for its dramatical

design style being influenced by western aesthetic consideration which ignore the sites native aspects. The most remarkable and promising development supported by respondents was Parade Ground, DC Hill and CRB area for their distinctive, aesthetically pleasing and recreationally significant aspects.

6. Land availability: For 6 million people Chittagong is a quite dense setting and the respondents suggest that the opportunity for acquiring additional open space is limited. The interviewees indicate that Chittagong needs mandatory open spaces to act as silt traps, flood storage ponds, and rainwater reservoirs, which are currently unavailable in the vicinity because of its highly urbanised setting. Therefore, 5 interview files with 13 references state

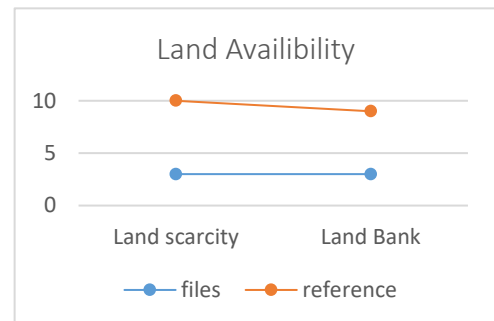


Figure 34: Relationship of land scarcity and land bank in terms of files and references.

that adequate land for recreational open space does not exist in such a densely populated area and they recommended to use the city's waterfront, ponds, canals, riverbanks, seashores, and hills as open space in Chittagong City to address the lack of open space. The respondents also suggested to create a land bank for future expansion proposals of the city. Figure 34 shows the relationship of land scarcity and land bank possibilities in terms of interview files and references from respondents.

7. Planning initiatives: The respondents denoted a lack of planning initiatives as an issue related to the open space crisis in Chittagong. Eight interview files with nine references signify that proper open space planning is necessary, which also may suggest wrong planning practises are currently being applied in the city. The respondents signified that conscious and skilful planning can make proper utilization of resources in creating open spaces. For example, the respondents suggested, open space policy that establishes a hierarchy in open space development should be 1st initiated in the city's smallest areas up to its larger administrative zones. In this sense, a "ward" is the smallest administrative unit in the City Corporation area. Hence respondents, proposed preparation of an open space development hierarchy from the ward and then up to the police station district and finally the larger city. In this sense, Chittagong City has 13 Police Station areas and 41 smaller wards within them. For a further understanding the structure of a Ward, Police Station in Chittagong City is presented in Appendix 13. Lastly, respondents also suggest developing open space standards for Chittagong City that can be used to improve the open space situation.

8. Incoordination: Chittagong has 23 organizations working in its territory, such as the Chittagong Development Authority (CDA), Chittagong City Corporation (CCC), Chittagong Water Supply and Drainage Authority (CWASA), Bangladesh Railway (BR), Chittagong Port Authority (CPA), Bangladesh Power Development Board (BPDB) etc. The interviewees indicate that a lack of co-ordination between organizations is a fundamental problem in acquisition and maintenance of open space in Chittagong. The respondents signified that land use demarcation, management, maintenance, jurisdiction of natural recourses such as canals and hills conflict in terms of priorities and consideration between organizations. Such as canals are managed by the CWASA and maintained by the CCC, which make it hard to determine who will potentially act on the informal settlements encroaching on the sides of the canals. Furthermore, the CRB area is owned by the BR and the CDA demarcated it as public open space. All of this is quite confusing as the CWASA and BR are not responsible for providing public open space in the city.

9. Relocation: Another challenge for open space in Chittagong is the emergence of informal communities along hillsides, canal sides, and riverbanks. According to the respondents, settlements have partially encroached over hills, riverbanks, and half of the canal side; therefore, they need to be shifted. The interview added that they understand the relocation of settlements (i.e. people) is a difficult issue to address and is hard. Interview findings pointed on how challenging it is to deal with the relocation of communities, or groups of people. Once more, interview indicated that open space development in Chittagong City is hindered by a lack of land acquisition program in accordance with the city's master plan, which called for the relocation of settlements.

A. Considerations

The interviews presented a series of considerations for open space in Chittagong. The theme 'Consideration' delineates their thoughts reflecting on how to overcome the challenges of open space. The thoughts within this theme are: landscape, accessibility, historic landscape, O & M (Operation & Management), Biodiversity, climate, master plan, tradition, budget and hydrology. Hydrology is also a significantly prioritised as consideration for open space which includes the sub-considerations of sewage system, rainwater and tidal water management and water supply. The graphical relationship of considerations among the files and references are presented in figure 35 shows that hydrology is referred to 80 times by the interviewees.

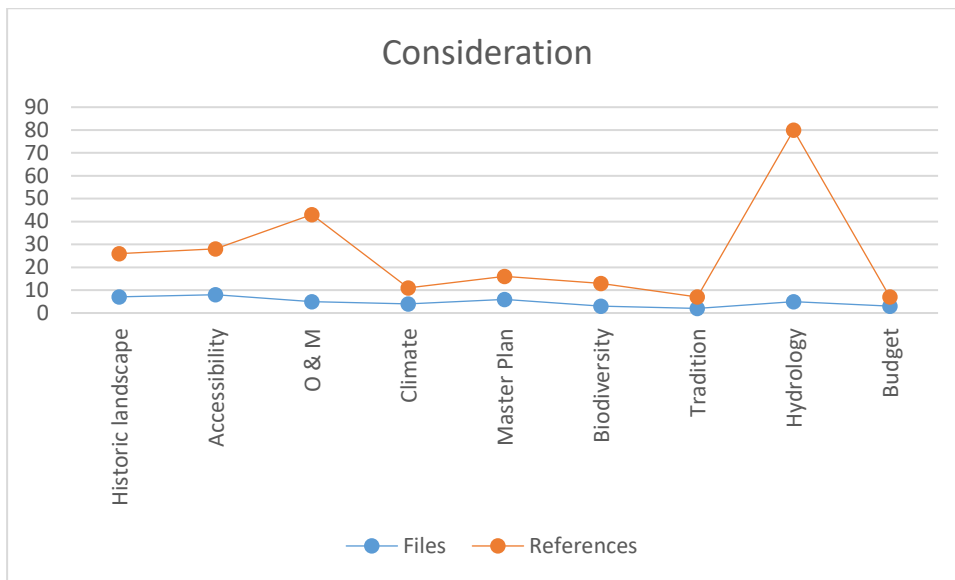


Figure 35: Relationship between files and reference in terms of consideration.

I. Hydrology: In the interview files, hydrology is distinctly recommended to be a consideration for open space. According to the literature (Ashraf & Chowdhury 2005), Chittagong is inundated by rainwater and tidal water, and the efficiency of the city's drainage system is reduced. Mainly three types of hydrological system, such as ground water, surface water and drainage system are prioritised by respondents and interlinked with

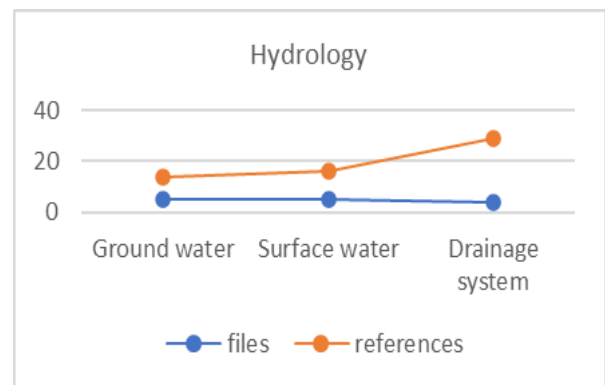


Figure 36: Correlation of considerations in terms of hydrology.

open space considerations. Figure 36 shows the percentage of interview files and references in terms of a hydrological system. The nodes under hydrology are explained as follows:

a. Ground water: According to JICA (Japan International Cooperation Agency (JICA, 2023)), only 50% of the city's supply water demand is served by the Chittagong City Corporation area and ground water is the only source of supply water by (Chowdhury, 2019). JICA proposed water treatment plan on top of Batali hill, which coincides with the findings of the thesis (JICA, 2023). The interviewees stated that Chittagong is in crisis in terms of ground water, as groundwater only recharges when surface runoff water is collected and absorbed by a land surface (e.g. a collection pond). This is suggested to be due to a lack of open space reducing the total amount of ground water recharge areas and the interviewees' suggestion that demand for water will increase due to new industrial zones being built in the city. The respondents, also, suggested that as open space

decreases preserving low laying areas as rainwater catchment zones can be used to increase ground water recharge.

b. Surface water: Chittagong City is in a high rainfall zone of Bangladesh (Ahmed, 2015). Significant rainfall in the rainy season causes flooding in Chittagong. In addition, due to the city's low elevation, tidal water can cause waterlogging in low laying areas. Mainly low laying areas such as in Agrabad and Bakalia areas can become flooded with this tidal water. Again, encroachment on the canal areas by informal development and siltation reduce its water flow efficiency by 60% (CWASA). Therefore, waterlogging (i.e. flooding) occurs in the rainy season when the drainage system fails to carry excess surface water to the river. Furthermore, the respondents suggest developing flood storage ponds in low laying areas and dams in hills to increase rainwater catchment and reduce flooding. Additionally, they suggested embankments can stop the tidal overflow and that Chittagong City needs to harvest rainwater to increase the supply of water. Lastly, they also suggested to clear water channels like canals and rivers by relocating the encroaching settlements to avoid surface water flooding.

c. Drainage system: Canals of Chittagong are part of the city's drainage system and connected to it through drains and subdrains acting as open sewers. As a separate dedicated sewage system of Chittagong is not available, natural streams/canals are used and as a result become polluted and environmentally degraded. Addressing the sewerage system, 4 respondents recommended 25 different suggestions regarding the concern for canals in Chittagong. Referring to the city's 200 miles of canals, the interview files recommended separating the sewerage system from canal to create environment friendly open space corridors throughout the city.

II. O & M (Operation and Management): In terms of operation and management, the respondents recommended that three considerations should be made for open space improvements in Chittagong. These are management, maintenance and security. The relationship of these considerations is presented in figure 37. The files refer that in terms of maintenance, quality

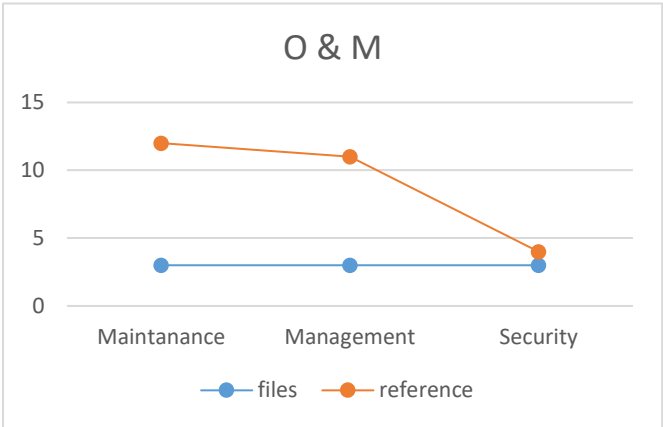


Figure 37: Correlation of consideration in terms of O & M

control such as cleaning, lighting system and watering is an important consideration to be taken care of. Additionally, the interviewees highlighted that the cost of Jamboree Park's maintenance for

cleaning and running its fountain is an issue. Management is another consideration suggested by the files (i.e. respondents), as the appearance of the parks and open space needs to be consistent. For example, respondents cite the administration and maintenance of parks and playgrounds in Dhaka such as Rasulbagh Park and Shahid Haji Abdul Alim playground as being intimately tied to economic issues. They suggest that including stakeholders who intend benefits by supervising, managing regulations, and repairing damages. Additionally, the respondents recommended that people should feel safe utilizing the city's parks and open areas. To achieve this, it is suggested to keep open spaces open to increased surveillance by users which in turn can minimise the risk of anti-social activity. The interviewees also suggested discouraging the restrictive park's open hours, recommending free accessibility to the park and its environment setting.

III. Accessibility: The interview files referred to accessibility as a consideration in Chittagong's open space settings. For example, the files emphasize natural open spaces in Chittagong such as its hills, waterbodies and waterfronts are inaccessible. In addition, to access the hills, they suggested encouraging recreational development in the city's hills. To connect neighbourhoods with open space, respondents recommended increasing the connectivity and accessibility of these settings. Here accessibility refers to improving the city's walkways, removing obstructed canals (i.e. relocating settlements encroaching on the sides of canals) and establishing a mass communication system that brings attention to the connected city's open spaces. This series of recommendations is stated because according to the respondents, waterfronts, waterbodies, creeks, hills and canals are inaccessible.

IV. Historic landscape: An historic landscape is moderately referred to for consideration by the respondents due to the existing and significant historic open space settings in Chittagong. According to them, the historic playgrounds, open fields, and waterbodies in Chittagong need to be preserved and can be used to contribute to an improved open space situation in Chittagong. A total of 7 interviewees with 19 references, indicate that, landscapes created in the historic periods of Chittagong are vibrantly contributing to open space. To protect these spaces, they suggested demarcating the boundaries of historic open spaces and exemplified in their arguments the polo ground, CRB, Batali Hill, Ashker Deghi, Lal Deghi and Foy's Lake for this type of landscape preservation.

V. Master plan: The interviewees suggested acting on the proposals, actions, executing and following up the Master Plan's recommendations for Chittagong. Positive sentiments on the proposals of 1995 Master plan were identified in the interview files. In contrast, the Detailed Area Plan (DAP) in

Chittagong was highly criticized by respondents, which was identified in NVivo through a negative sentiment correlation. In addition, failure to execute the city's 1961 and 1995 Master Plans were highly noticed by respondents. Additionally, the interviewees highlighted that the Master Plan's 1995 direction is to conserve the city's hills, riverbanks and seashore as open space. What this suggests is that a major concern regarding the 1961 Master Plan was that it identified 26 open space proposals as well as the CDA 2011 suggesting creating an open space conservation and regulatory committee but none of these have been realised to improve the city's open space situation.

VI. Biodiversity: In creating open space, the respondents strongly recommend considering biodiversity and ecology. Exemplifying the park development in Dhaka city, they suggested planting trees for seasonal fruits and trees for habitats and hatching of butterflies to promote biodiversity.

VII. Climate: The interviewees recommended to consider the local climate when creating open space. For example, Chittagong has a tropical monsoon climate and they suggested that in the city the open spaces need more shading and shelter, which will benefit the users from the hot climate and heavy rainfall.

VIII. Tradition: The interviewees suggested to consider traditional uses and the riverine culture of Chittagong in open space planning. For example, they suggest considering the city's traditional festivals held in the winter which celebrates harvesting of crops or organising a local fair with event of the traditional "Boli Khela" (wrestling). In a more ambition suggestion the interview finding link tradition of celebrating "Pohela Boishakh" (Bengali newyear) which requires a large open space and can only be accommodated in the CRB and DC Hill. Another strong open space suggestion is to also link with the "Eidgah", a traditional religious event held twice a year. The respondents highlighted that these outdoor open space events have been lost due to the building of prayer halls and/or their inclusion in commercial developments. Lastly, they strongly recommend to keep open space in front of the city's Mosques and to preserve the specific open space for Eid prayer in front of Jamatul Flah Mosque and other specific open spaces such as "Laldighi Maidan"¹⁴ for "Boli Khela"¹⁵.

IX. Budget: The interviewees recommended that the government needs to finance open spaces for recreational activity. Their references to this finance dimension highlights that the government's allocation to this type of open space development is considered proportionally small or insignificant to them. They also suggested to allocate adequate government funding to recreational open spaces and to find new sources of revenue for open space development.

¹⁴ Maidan is a large open ground to hold meeting such as public meeting.

¹⁵ A traditional form of wrestling that happens once a year.

B.Guidelines: Guidelines (or approaches) describe the respective measures that may be used to overcome the challenge of providing open space in Chittagong. Under this theme, mostly guidelines are framed to address the city's existing natural reserves. Among these respondents suggest developing approaches that support open space development of Chittagong's canals, hills, rivers, ponds and seaside areas. In addition, guidelines regarding civic engagement with open spaces, establishing more typologies and improving the city's mass transit to open spaces are

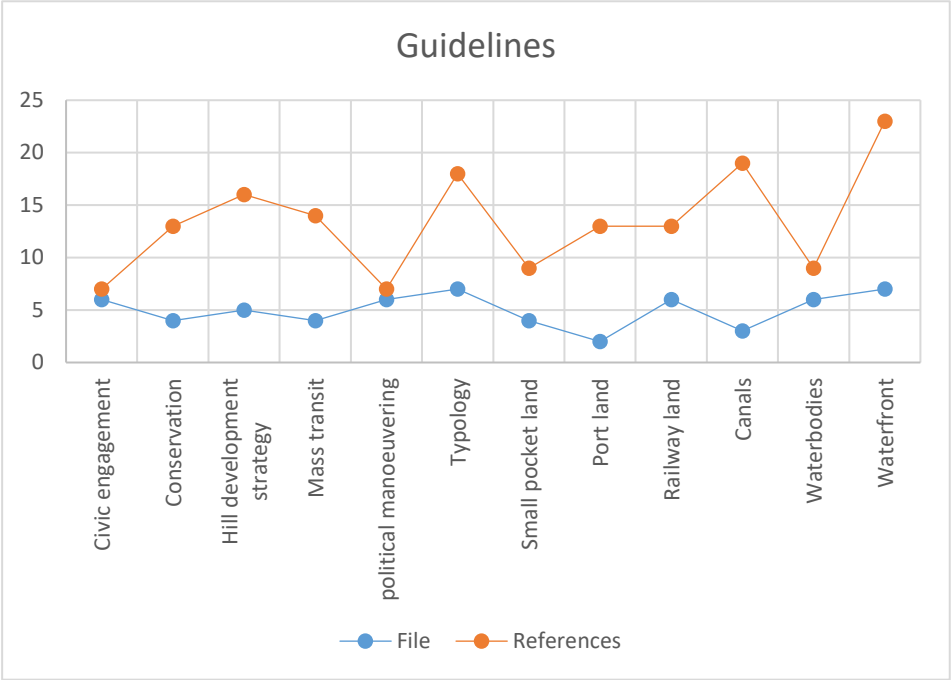


Figure 38: Relationship of guidelines in terms of interview files and references.

notable. Figure 38 shows the relationship of developing guidelines (or approaches) with respect to the files and references representing the hills, waterfronts and canals that were mentioned by respondents to be developed as open space. Under this theme are sub-themes of Typology, Waterfronts, Canals, Hill development Strategy, Mass transit, Railway land, Port Area, Conservation, Small Pocket Land, Water bodies, Political Manoeuvring and civic engagement. Respondents' comments and suggestions related to these sub-themes are reported and discussed below.

1. Typology: The interview files developed from the respondent data focused here on the type of open space recommendations for Chittagong. Hence, the interviewees suggested to 1st investigate the city's quality and quantity of open space in Chittagong. According to the files, open space in Chittagong is suggested by respondents to differ from western cities because of its native culture and tropical climate. What they suggested for establishing new open spaces developments mainly revolved around implementing mix use open spaces for the city. However, the majority of respondents referred to both a park and playground arrangement as a form of mixed use. In terms of a qualitative arrangement, the files point to providing multiple uses or opportunities in new open

spaces and emphasize that new open spaces should incorporate vibrant uses during the day and night-time. Additionally, the respondents insisted that mixed use can incorporate parks with small playgrounds and walking or jogging tracks for city residents. Hence, they suggested to create open spaces for all types of potential city users and age groups, such as a playground for the young and walking trails for the elderly. The respondents think that Chittagong City currently lacks pedestrian facilities (i.e. park land/green space) and claimed that 80% of the city's roads do not have footpaths and/or the footpaths are occupied either by vendors or shops, which make it hard-to-find a space for people to walk. Additionally, and according to the respondents, the existing footpaths are either too narrow or occupied. Therefore, the files under this theme also suggest the creation of more footpaths in this City.

2. Waterfront: Guidelines (or approaches) regarding the city's waterfronts holds the highest number of files (figure 39) with the highest number of references.

Chittagong City is next to the Bay of Bengal on its Southwest and by the Karnaphuly River on its Southeast. Interestingly, the Transportation Master Plan of Chittagong (CDA, 1995) proposed a ring road along its riverbank and seashore, and the respondents understood this. Therefore, development of the sea front and the river front were prominently supported by respondents, in the interview files, to also be used

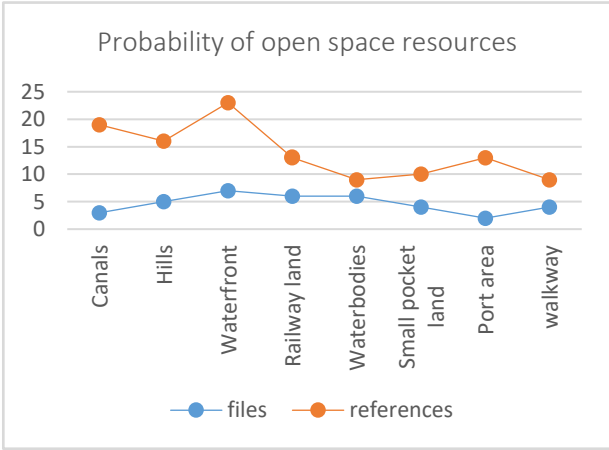


Figure 39: relation of references in terms of natural open space.

as open space. And in considering the road direction of this Master Plan, they also recommended that Chittagong needs to create an open space along the proposed development of Marine Drive, which is near the ring road. Thus, throughout its 15 miles in length along the Karnaphuly River and approximately 11 miles length along the Bay of Bengal, a linear open space was proposed, by respondents, on the edge of the river and sea in between the ring road and waterfront. They also suggested to set up multiple types of open spaces within this green space, either with free access or with ticket entry to attract an income group for its maintenance. They also strictly discouraged any other type of developments (such as residential or commercial) from occurring in this area. According to the interviewees, this proposed open space and associated embankment can potentially save the city from cyclone surges.

3. Canals: The professionals think that canals can contribute to open space in Chittagong if they are stopped from being used as part of the city's sewage system. In addition, the respondents suggested that the Chittagong City Corporation, Chittagong WASA and Chittagong Development Authority are working together to reclaim the canals. The respondents denoted that there are 57 canals in Chittagong that can contribute to open space as linear parks and be used for transportation, which has decreased due to railway connection. Along the 200 miles of the canals' sides they are also suggested to be used as open space, but 1st the building encroachments on the canals' sides need to be relocated. The interviewees also suggested to establish walkways, sitting spaces and greeneries to promote biodiversity and ecology along these canal spaces. In addition, they suggested to install silt traps, developed by the CWASA, to reduce sedimentation in the canal system and to increase its water flow, which can help contribute to an improved open space scenario. The respondents strongly suggested that these creeks should only be used as open space when the sewerage system is separated from it.

4. Hill development strategy: The respondents strongly suggested that the hills of Chittagong can contribute to the city's open space issues and hence an approach supporting their open space development should be established. For example, Chittagong has a range of hills on its North. According to the files, established in NVivo, hills can contribute to open space with the creation of accompanying sustainable development strategies focusing on the environment. They also emphasized that the continual hill range to the north of Foy's Lake to Sitakunda is proposed to be developed. These hills allow for 10% development (CDA 2011), including a meandering road to increase accessibility to the site and other developments such as limited residential, health or educational facilities. The respondents focused on the multiple benefits of this potential hill development as it could also establish a water treatment plant (desalinization of the adjacent sea water) and a rainwater harvesting system with dam that could be used to service adjacent residents, and to mitigate the city's water supply crisis.

5. Mass Transit/Rail land: Developing mass transit as a means to open space creation is another suggestion by respondents. For example, they suggested to use the city's existing abandoned railway corridors and railway lands for a new mass transit system. According to them, installing mass transit and building in accompanying green spaces can serve the poor who are deprived of outdoor recreational facilities close to their home. They also note that both sides of the existing rail line could be used to contribute to a new landscape of open space. The interviewees suggested that these long linear railway lands could be preserved for the city's future use and can be used as open space

by future residents. These linear spaces could also include bazars (informal shops) at its stops/stations and connect the city while transporting goods and passengers.

6. Port area: Chittagong port is another major land shareholder in Chittagong. The interviewees claimed that open spaces of Chittagong port area can hardly serve the city's residents due to its restricted accessibility. People who reside inside the port area, only can use this open spaces. The respondents suggested that proposals to develop new ports in other parts of Bangladesh (Mather Bari port) can be used as a reference or example to potential open up Chittagong port's area in the future for public use. The respondents, also, noted that Chittagong ports authority holds the largest area of land on the bank of the Karnaphuli River, which currently holds container terminals, and if redeveloped or even rethought can contribute to open space in the city by relocating these containers, which act as visual obstructions to the edge of the river.

7. Conservation: The files associated with this sub-theme suggest that existing open space in Chittagong should be demarcated, delineated, and conserved. The files (i.e. residents) criticized the conservation techniques employed by the city regarding its hills, seashores and riverbanks presented in the 1995 Master Plan. Hence, they suggest the conservation of the remaining available suitable open space land in the city and its scenic zones and historic landmarks.

8. Small pocket of land: Indicating a shortage of land in Chittagong, the files associated with this sub-theme refer to locating small pockets of land in Chittagong. This type of land could, as suggested by respondents to be, located along the city's roadways, with or without public access to them. The interviewees revealed that this type of land could be cost effective and serve as open space in the city's dense setting. By addressing small pockets of land available in the city, the respondents suggested that the government can acquire these lands by paying compensation to the respective owner, if not owned by the city, to create parks for neighbourhoods. This suggestion points to the idea that these small open space in some cases can accumulatively work together to create large chunks of open space land that the city and its residents can benefit from.

9. Waterbodies: The respondents referred to number of waterbodies that exist in Chittagong. According to the files, these waterbodies such as ponds and lakes are identified to be preserved as open space and accessibility can be provided to them. The files (i.e. respondents) proposed that Chittagong has five beautiful waterbodies, these waterbodies need to be demarcated and protected as open space. For example, they mention Debar Par, Jorr Deghi, Ashker Deghi, Foy's Lake and Bhelur Deghi, as places the respondents strongly recommend access should be provided to and that by doing this these settings can contribute to open space in Chittagong.

10. Political manoeuvring: The respondents suggested that open space development should be a policy maker's or government initiative. They exemplify the Jamboree Park and DC hill development as open spaces that could be a focus on to demonstrate political commitment and willingness.

11. Civic engagement: The files identified that it is necessary to create and/or develop positive perception's in people when promoting open space in Chittagong. The respondents suggested that citizens need to be made aware of the open space standard and crisis in Chittagong. For example, a survey on the city's residents was suggested to be conducted with the intent of the city to develop an understanding of its citizens open space aspirations, requirements and types of open space they may like in the city. They suggested that a focus of the survey could also help to make users aware of the open spaces' requirements for cleanliness and to engage them in the management and maintenance of these spaces. For example, local parks in Dhaka appear to achieve this (Yousuf, 2020), where neighbours, social workers, politician and historians are engaged in maintenance and management of these open space settings. Hence, the respondents strongly recommend their involvement in the management of the city's open spaces.

Findings:

Barth (2020, p 35) stated that, “[c]areful and thoughtful planning is critical to identifying opportunities to generate greater resiliency and sustainability benefits for the community”. The interview files reported above uncover thoughts on planning and opportunities of open space in Chittagong City and in doing so question 1 of objective 3 is addressed. The results of the interviews indicated that three variables should be taken into account when planning open space in Chittagong City. In order to foster open space in Chittagong, the variables have been used to list the conclusions from the interview files. These can be used to guide the city's future open space developments and act as a guide for further research on open space in Chittagong City. These findings have been organised under the themes of organisation / government responsibility, small interventions, historic/ cultural place, Mass transit / accessibility and Biodiversity to aid in their presentation and discussed below (Jafrin, 2022):

Organisation / government responsibility

- a. To set up an individual or sole organisation like a “Parks and open space department”.
- b. To plan open space development according to priority actions over 1 year, 5 year and 10-year time frames.
- c. To establish co-ordination between departments.
- d. To set open space standards for the Chittagong City corporation Area.

- e. To allocate sufficient budgeting to open space developments through government initiative.
- f. To formally define the types of open space in the city and demarcate open space according to their respective typology.
- g. To separate the sewage system from the city's canals to promote an environment friendly open space corridor along both side of its 200 miles length.
- h. Open spaces including parks and playground to have proper management and maintenance.
- i. To provide shelter, resting points and seating, walking or bicycle tracks, shading in the open spaces.
- j. To promote informal and passive surveillance in the city's open space and to create public awareness and engagement in these settings.
- k. To support the multi-functional use of open space with both park and playground facility developments to encourage the engagement of all types of users.
- l. To understand the hydrological system of the city and take initiatives accordingly.

Small Interventions

- m. To adopt the planning of open space in small scale like "Wards" up to the larger sized spaces such as the city's "Thanas" in City Corporation area.
- n. To develop small pockets of land in the city as open space.

Historic / cultural places

- o. To preserve historic and prominent waterbodies like Ashker Deghi, Jorr Deghi, Bhelor Deghi and Debar Par as open space by promoting accessibility.
- p. To preserve historic places like the CRB, Batali Hill and Parir Pahar as open space.
- q. To preserve open spaces for traditional cultural activities such as "Boli Khela" in the periphery of "Lal Deghi" and DC Hill for "Pohela Booishakh".

Mass transit / accessibility

- r. To promote accessibility to the hills, create a desalination plant, rainwater catchment area with dam to promote electricity and water supply to the city.
- s. To make accessible the city's natural reserves and resources such as its hills, rivers, seas and other water bodies.
- t. To use the riverbank and seashore associated with new developments (e.g. the ring road) as open space.

u. To install mass transit and to use both sides of the existing rail line corridor as open space.

Biodiversity

v. To promote biodiversity and ecology by planting local fruits, and flowering plants and trees.

The interview files were carefully analysed both manually and with the automated software “NVivo” to arrive at the above points. This analysis of the interview files creates a platform to further address the open space situation in Chittagong City. The findings suggest that there exists, for example, an opportunity to create an open space network in Chittagong but the probability of this to increase the city's per capita ratio needs further observation. The next chapter will discuss the findings in terms of supporting development of an approach to realising an improved open space situation in Chittagong City.

5.4 Contemporary Open Space Planning Standards

In the context of planning for a city's open space agenda, the term standard in reference to open space requirements is referred to, in this research, as a mechanism to help address change in the city for the betterment of its residents. However, before this reference can be applied it must 1st be noted that the open space standards used throughout the world, are determined by a number of indicators and their use for open space planning has a long history, dating back to the 19th century (Spencer et al., 2015). Throughout the 20th century, formal national standards for open space planning were developed, notably, in Britain and in the United States (Theobald, 1984). In Britain the National Playing Fields Association (NPFA, now Fields in Trust, 2015) standard of 6 acres of open space per 1000 population (24 square metre per capita) has been , in existence since the 1920s, while in the USA the National Recreation Association (now National Recreation and Parks Association, NRPA 2016) standard of 10 acres of open space per 1000 population (40 square metre per capita) dated from early in the twentieth century (Theobald, 1984).

This brief "list" of nations and open space instances suggests that the standards of each represent a variety of particular country-related variables, and these vary in relation to their cities. They also reflect the priorities and agendas of local planning bodies. Yet, the most commonly used indicator, in these settings, is a Quantity Standard; which is derived from examination, by city officials, of their open spaces related to a population of 1000 or square metre per capita (Jafrin & Beza, 2018) The other standard, quality, is largely overlooked as a mechanism to achieve open space aspirations and

addresses safety and user satisfaction. Accessibility is another open space related standard and is discussed in the next stage of this chapter, the planning and designing of open space.

The following table (Table 6) is a conceptual attempt to organize the open space standards used in the countries of America, Australia, Europe and Asia. This table should not be viewed as a comprehensive piece nor for the purposes of criticizing country specific standards. Rather it should be viewed as an illustration suggesting an abstract weighting of a respective country’s standards that affect the realization of open space aspirations in a setting.

Table 19: Indicators of open space standards in American, Australian, European and Asian countries

Organization: National Recreation and Park Association (NRPA), USA			
Guidelines: NRPA Park Metrics			
Quantity	Quality	Accessibility	Neighborhood/locality
Greenspace Scotland and Scottish Natural Heritage (2013)			
Quantity	Quality	Accessibility	A series of settlement or neighborhood descriptions
Fields in Trust (fit) UK			
Guidance for Outdoor Sport and Play: Beyond the Six Acre Standard			
1.Quantity	Quality	Accessibility	Buffer zones
2.Spatial Requirements			
Parks and Leisure Australia (PLA) (2013), Open space planning standards in Australia			
1. Population-ratio	Facility specification	Catchment Area	X
2.Area-percentage			
Hong Kong, Planning Department, Principals of Recreation and open space planning			
Population standard	X	Greening standards	X
Federal Territory of Kuala Lumpur, Department of Statistics, Malaysia			
Quantity ¹⁶	X	Accessibility	X
Town and Country Planning Organization (GO) in India			
Urban and Regional Development Plans Formulation & Implementation (URDPFI) Guidelines			
Quantity			
Ministry of Housing and Public works, Government of Bangladesh			
Quantity			

Asia

Source: Prepared by author

Table 6 shows that in the USA and UK, countries measure open space standards by four indicators. These are quantity, quality, accessibility and neighbour hood or locality. Whereas in Australian state and territories they only use the 1st three indicators. In comparison, Asian countries like India use only the quantity indicator to measure open space standard. As the table suggests there are a range of standards and open space priorities in each of the respective country settings. Each set of standards also appears to follow and is prescribed along a specific cultural context. From the above table, the

¹⁶ Refer to Appendix 2 for more detail

classification of open space standard is taken in as different categories. The amount of open space required is determined by the open space to population ratio, which varies by country and city. According to the above table, the following three standards are commonly practised and are discussed below:

- I. Accessibility standard
- II. Quality Standard
- III. Quantity standard

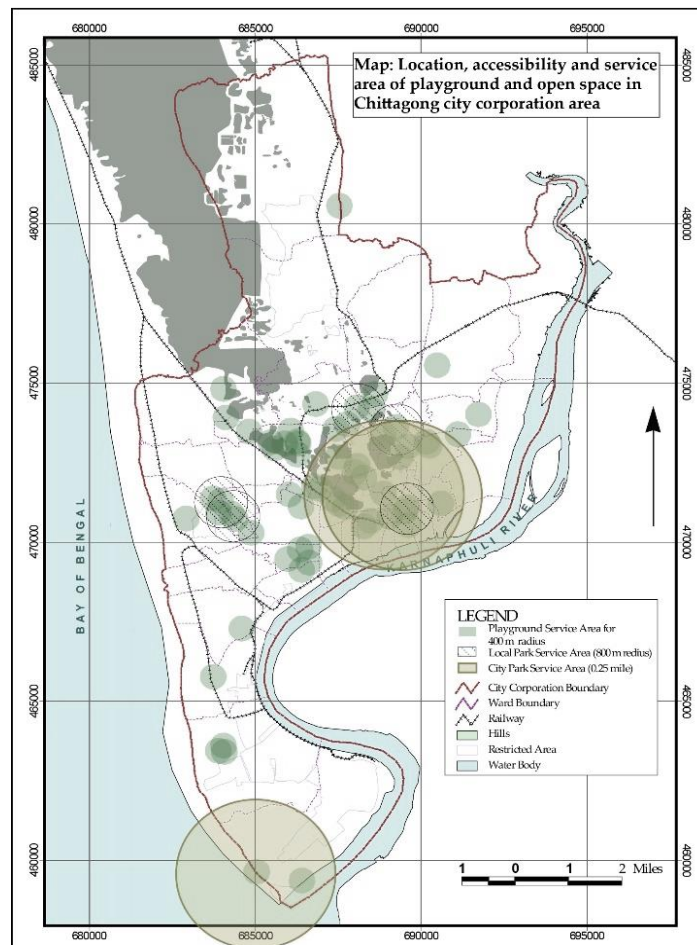


Figure 40: Existing open space accessibility scenario according to accessibility and catchment area. Source: updated by author.

I. **Accessibility standard:** The accessibility standard refers to how close people should be to their nearest publicly usable open space (SNH, 2013). So, accessible green spaces are defined as places available free of cost for the people and mainly utilized by target users living in the catchment area (England, 2010). International research into the impacts of greenspace on health and on wider quality of life shows that having greenspace within a 5-minute walk of home is a strong indicator for health and quality of life benefits (Greenspace scotland, 2008). There are several methods developed to measure accessibility.

Bangladesh do not have any accessibility standard that Chittagong can follow. But according to a walkability measure of 400 metres, the accessibility scenario of open space in the city is as shown in the map (figure 40). The map shows the open spaces in the city are mostly concentrated in the old town but it is a necessity if they are accessible in terms of connectivity to surroundings by walkways. Note that Hassan (2008) suggested that to have a catchment area within this 400m distance throughout the city, Chittagong city needs a total 69 local parks and playgrounds. In total, the open spaces associated with this 400m walkability measure equates to a total catchment area of 34.68 sq. km of land which is only 19% of the whole city (Hassan, 2008).

II. **Quality Standard:** The quality standard is a matrix that determines which landscape elements or infrastructure are most suitable and appropriate for public places in order to meet user needs PLA (2013). To apply this standard, all publicly usable open spaces will score 'good' or better on the locally used quality assessment. To contextualise this measure, a report by Hassan (2008) on the quality of 7 parks and 13 playgrounds, shows the satisfaction levels of park users are relatively better than playground user in Chittagong.

III. **Quantity Standard:** Local differences in quantity standards also exist. For instance, the amount depends on the amount of open space already present in the locality. As a result, each community or settlement should have X hectares (or Y square metres) of publicly accessible open space for every 1000 residents, where X or Y is a locally generated number. Quantity benchmarks related to the above standards vary in different cities. For example, the majority of councils in Australia apply the open space standard of 7 acres/1000 population or 28 m² per capita (Veal, A.J., 2013). In Chittagong this type of ratio is beyond the consideration of planners because Australian cities (such as Sydney) are suggested to be not as densely populated when compared to European and Asian Cities (Spencer, A, 2015). While density is an issue in fixing the open space standard as a physical feature, a comparison of Chittagong and, say, Melbourne may revolve around the respective city's approximate size (i.e., area), population, and relative density along with clearly stating how/where metropolitan borders are framed and what is included (or not) as open space.

To aid in the discussion of Chittagong's open space development this chapter now focuses on examining the accessibility and quantity standard of the city's existing open spaces. This is done in an attempt to understand the extent to which a shortage of open space is currently occurring in the city. These two indicators (i.e. accessibility and quality) need to be reviewed and focused on as these are dimensions of the existing open space shortage currently being addressed in the city's planning

proposals and little material is found on these. Other data, however, exists on the level of satisfaction of safety and security of park and playgrounds in Chittagong (Hassan, 2008).

In terms of quantity benchmarks related to the above standards these vary in cities. For example, the majority of councils in Australia apply the open space standard of 7 acre/ 1000 population or 28 square metre per capita (Veal, 2013). In Chittagong this type of ratio is beyond the consideration of planners because Australian cities (such as Sydney) are suggested to be not as densely populated when compared to European and Asian Cities (Spencer et al., 2015). While density is a factor influence addressing open space standard. Since, a comparison of Chittagong and, say, Melbourne may best then revolve around cities approximate size (i.e. area), population and relative density along with clearly stating how/where metropolitan borders are framed and what is included (or not) as open space.

However, cities like Tokyo, Hong Kong, and Buenos Aires still strive to meet standard (or other open space benchmarks) (Gungor & Ozanguc, 2017). Hence, standard practicing in Australian cities may not be appropriate in setting like Chittagong. Table 7, below, identifies the relative open space per capita ratio in cities considered densely populated. The cities considered developing and fast growing according to UN habitat are taken for this comparison (UN-Habitat, 2016). UN habitat (2016) suggests that Mexico, Buenos Aires in Latin America, Dhaka and Mumbai in South Asia are developing cities. Whereas Istanbul and Kuala Lumpur are taken into consideration as Turkey and Malaysia are the fastest growing rapid urbanized countries (UN-Habitat, 2016). Though China is also a fastest growing country, the mega cities of China like Beijing and Shanghai has moderate open space compared to its density. The table below presents the cities that pose a comparative open space ratio. Hence, the park planning systems in western countries and Eastern countries have differences in their names, contexts, criterion, documentation of open spaces and their respective outputs. Yet, they have four key factors in common: quantity, type, facility and service (Jia, 2011). In order to compare and deepen an understanding of public perceptions of open space in two differing systems Jia (2011) examined residents' use and perceptions of open space in Shanghai, China, Waterloo, Canada and Kokomo, USA, which possess very different social, economic and cultural attributes. Jia (2011) found that service radius, acreage, and level of service make up the bulk of the open space hierarchy.

In terms of quantity, the realization of open space shortage and the idea of addressing an open space standard had been taken into consideration in western cities in the beginning of 19th century (Veal, 2013). Whereas the eastern cities started to conceive it in late 19th century when there was little scope to increase open space (Xu, 2013). As an example, London has 27 square metre per person

when Tokyo has 3 square metre per person (Bagherian, 2018). Though it is suggested that open spaces decrease with urban compactness (Fuller & Gaston, 2009), the contrary does not necessarily occur. That is, decreases in density does not necessarily provide more open space in cities (Kabisch & Haase, 2013). For example, Singapore having a higher density still provides 66square metre/person of open space (Bagherian, 2018). In the table below, Chittagong and Buenos Aires share a comparable area, population density, and open space per capita, but Buenos Aires has more open space overall. Again, Mumbai and Hong Kong are densely populated compared to Chittagong but hold more open space per person. In Bangladesh, Dhaka city has set its open space target as 3.5 square metre per person (RAJUK, 2016), depending on typologies and resident's accessibility to open space.

Table 20: Open space standard in densely populated cities.

	City and country	Total population (Million)	Urban Population (Million)	City Area (Sq.km)	Density / Sq. Km	Open Space/capita (sq. m.)
Europe	Istanbul, Turkey	15.02	14.79 ¹⁷	1539 ¹⁷	2,813 ¹⁷	6.4 ¹⁸
	Barcelona, Spain	5.47	1.6 ¹⁹	101.9 ¹⁹	16,000 ¹⁹	5.6 ²⁰
America	Colima, Mexico	7.11	1.7 ²¹	5627 ²¹	130 ²¹	6.2 ²⁰
	Mexico City	20.9	8.91 ²²	1485 ²²	6,000 ²²	3.5 ²⁰
	Buenos Aires	13.59	2.89 ²³	203 ²³	14,237 ²³	1.90 ¹⁸
Asia	Tokyo	38.30	13.61 ²⁴	2188 ²⁴	6,224 ²⁴	3.00 ²
	Kuala Lumpur	7.2	1.79 ²⁵	243 ²⁵	6,890 ²⁵	6.5 ²⁶
	Mumbai	20.74	12.3 ²⁷	603 ²⁷	21,000 ²⁷	1.1 ²⁸
	Shanghai	24.1 ²⁹	22.2 ¹⁸	4000 ³⁰	3,800 ¹⁸	6.1 ³¹
	Hong Kong	-	7.40 ³²	2754 ³²	6,777 ³²	2.7 ³³

17 Turkish Statistical Institute - Turkish demographics and statistics

18 (Bagherian 2018)

19 Department of Statistics of Catalonia - Population, household and homes statistics

20 (Vazquez 2011)

21 <http://www.citypopulation.de/Mexico-Colima.html>

22 Mexico Demographics Profile 2018

23 Censo 2010. Resultados provisionales : cuadros y gráficos

24 Tokyo Metropolitan Government.

25 "Federal Territory of Kuala Lumpur". Department of Statistics, Malaysia.

26 Appendix 2.

27 "Maharashtra (India): Districts, Cities, Towns and Outgrowth Wards – Population Statistics in Maps and Charts".

28 <https://timesofindia.indiatimes.com/city/mumbai/You-have-just-1-1-square-metres-of-open-space/articleshow/13585198.cms>

29 The operation of the national economy in Shanghai in 2017] (in Chinese). Shanghai Bureau of Statistics. 2018-01-19. Retrieved 2018-8-10.

30 "Land Area". Basic Facts. Shanghai Municipal People's Government. Retrieved 10 August 2018.

31 (Jia, 2011)

32 Monthly Statistics for June 2018, p. 4

33 (Lai 2017)

Bangladesh	Dhaka	18.89	14.39 ³⁴	306.38	28,410	3.5 ³⁵
	Chittagong	5.2	4.1	168.1	14,200	?

Source: Prepared by author

6.3 Survey analysis with SPSS

A survey of the city's open spaces is an appropriate tool to address the 2nd question of Objective 3, because it can lead to estimates on population characteristics (Salant & Dillman, 1994) and potential demand of the city's open spaces. To focus the candidate's research efforts a survey of three types of open space named Parade ground, Jamboree Park and CRB in Chittagong has been conducted to develop an understanding of user's open space perceptions and their demand for open space. These recently developed three sites were investigated as a representative of the city's playground, city park and open spaces, respectively (refer to chapter 3). The three sites investigated are: The Parade Ground, Jamboree Park and A total of 279 descriptions of participants responded in the survey. The survey data is analyzed with SPSS (Statistical Package for the Social Sciences) as below. The analysis is described following the structure of the questionnaire.

I.1st Tier: General information

Data presented in this section is derived from the 1st level of respondent data identified as level "A" in the questionnaire and is designed to provide an overall understanding of the demographics of open spaces users. That is, data on gender, age group, education, and occupation of the participants respective to each study site. This questionnaire is presented in Appendix 6. The overall graph on the general demographic information of the respondents presented in the series of questions A1 to A5 (see Appendix 13 for detailed graphs). The data shows that among 279 respondents, 73% were male and 27% were female. This male dominated response rate represents the overall requirement of the national setting in which this research was conducted. Efforts were made to develop a more balanced representation of respondents, but this was unable to be achieved. Hence, the data presented below must be treated with caution and further research is therefore suggested and, importantly, suggested to focus on female open space users. The data shows that, among the respondents, the age group is between 18-25 (47%), 25-35 (18%) and between 35-45 (18%). This age group distribution highlights that most respondents are young. Calculating the education level of the participants, the survey identified that 40% of participants are graduates of university and 40% have completed their education up to a higher secondary level. In terms of respondent occupation 36% of

³⁴ "Population & Housing Census-2011" (PDF). Bangladesh Bureau of Statistics. p. 4

³⁵ Dhaka Structure plan 2016-2035 Chapter 10 Preserving open space for recreation, livability and identity, p 213,

respondents were students, 28% were housewives or dependents, 12% participants are in business and the rest were engaged in other profession.

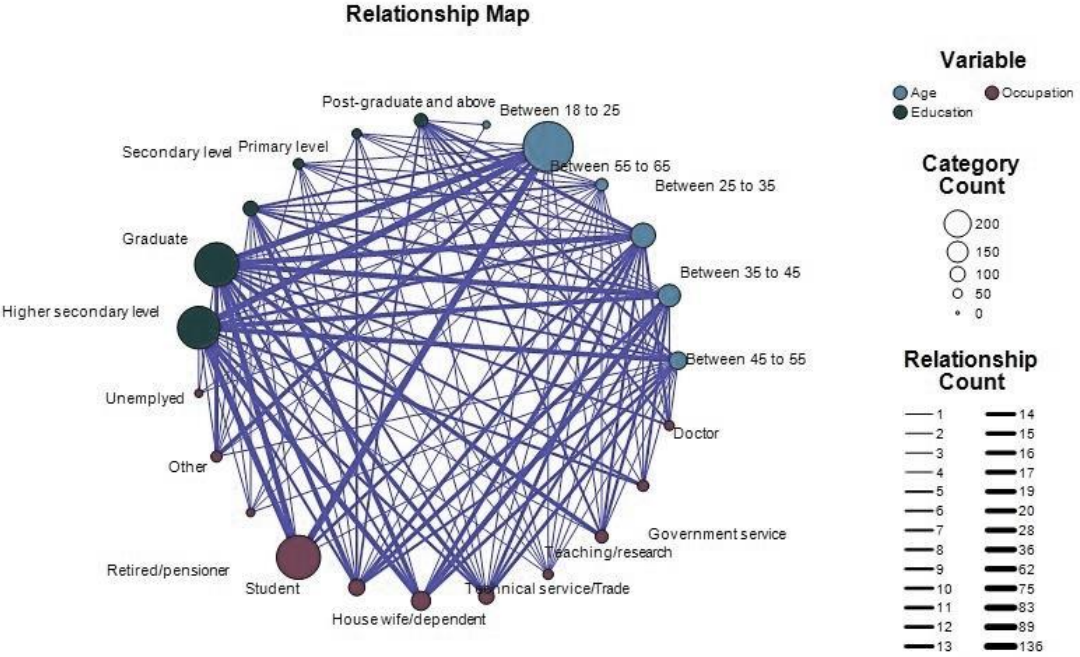


Figure 41: Correlation of Age, occupation, and education status in three sites derived from SPSS.

Findings:

The survey finds that more male participants use playground and female participants are attracted to parks rather than playground. But the male and female user's ratio is not consistent in three sites. Interestingly, it shows gradual decrease of female participants from Jamboree Park to CRB and Parade Ground (Table 21). In three sites, cumulatively, age 18-25 are predominant and most participants are graduated. Figure 41 presents the findings of comparative analysis of participant's characteristics in three sites.

The demographic survey summarised in following table presents that according to open space type, user's demographic characteristics are different. The table present the gradual decrease of female participant from the Jamboree Park to CRB and Parade Ground, the next tier will derive the reason for this difference from further survey questions. The figure 41 presents that, young students are dominant

participants in Parade Ground compared to rest two sites. This leads the researcher that mostly students use the playground.

Table 21: Findings of comparative analysis of demographic survey in three sites

	Jamboree Park	CRB	Parade Ground
Gender	Male participants are slightly higher than female participants, ratio is 56:44	Male participants are moderately higher than female participants, ratio is 69:21	Male participants are dramatically higher than female participants, ratio is 87:13
Age group	Highest number of participants are in age group 25-35	Highest number of participants are in age group 35-45	Highest number of participants are in age group 18-25
Education	Most of the participants are graduates from university.	Most of the participants are graduates from university.	Most of the participants are educated up to the higher secondary level.
Profession	Participants are mostly university students, works in business sector and housewife/dependents.	Most of the participants are housewives/dependents.	Most of the participants are students.

II. 2nd tier: Park, playground and open space users' aspirations

This tier is linked with data gathered in the 2nd section of the questionnaire to investigate the user's interest to use open space and whether their demands are mitigated by these settings. The 2nd section of the questionnaire is considered as level "B" (Appendix 6b) in the questionnaire set, is targeted at examining demand, accessibility, use of the formal open space setting and how the open space's development has influenced their use.

For better understanding the findings under this tier they have been grouped for discussion and are divided into 4 sections. The 1st section assessed frequency of visits before and after an open space (re)development to understand residents' demand for open space. The next section of the discussion is focused on gathering and presenting data on users' accessibility to the open spaces. It concentrates on the users travelling distance, mode of transportation and pedestrian accessibility. The 3rd part of this section concentrates on the type of use in the open space, respondent attitudes and aspirations for activities in open spaces and their purpose of the open space visit. At the end of this section, the (re)development of the open space setting is considered as a means to measure whether user's aspiration are being meet by the (re)developed open space. The following material presents and discusses the findings associated with these four sections. They have been assigned the

themes Demand for open space, Travelling Distance, Influence of transformation and Purpose of visit, and presented in this order below.

a. Demand for open space: This section discusses the visiting frequency of users in the three sites to examine the demand for open space in the city. Figure 42 shows that cumulatively user's daily and weekly visiting rates are 30% and 35%, respectively. The survey identifies that Jamboree Park and Parade Ground has the highest visiting frequency and no substantial differences in daily and weekly users' ratio, but CRB has more weekly visitors compared to daily visitors. This survey data also shows more than 80% of visitors surveyed stated that they cannot make time to visit more frequently. In addition, more weekly visitors in CRB shows that this place serves as a city park attracting visitors from a range of settings across the city, while more daily visitors in Jamboree Park and the Parade Ground suggest these serve as a local park and playground, respectively. According to the survey, 52% of

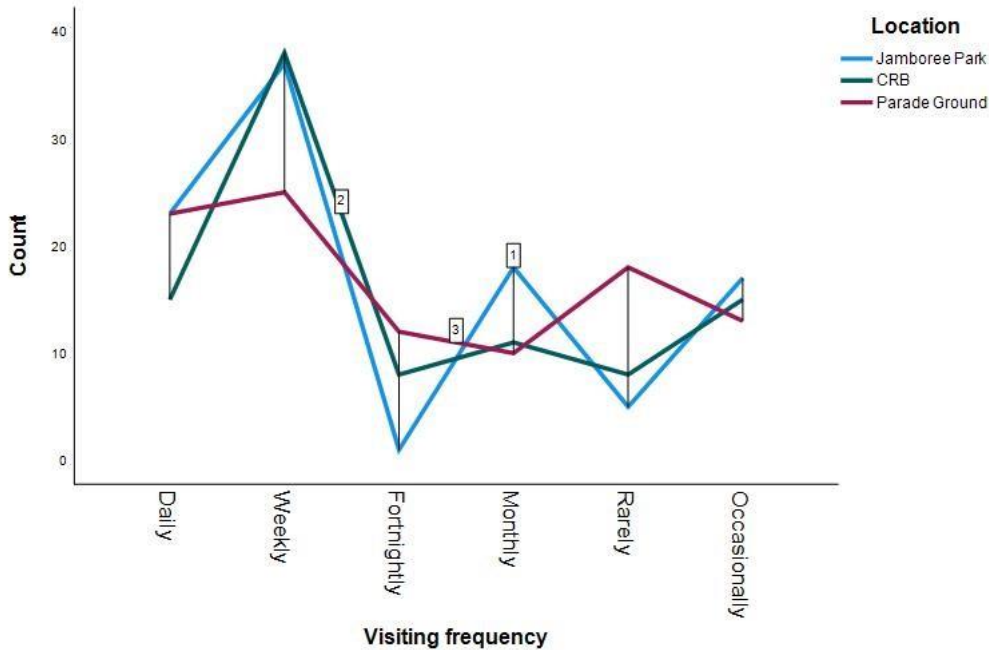


Figure 42: User's visiting frequency.

Parade Ground users think that the space is not enough for them and would like more similar open spaces in their area. For example, the users stated that to use the playground, they have to come 1st before it becomes occupied by others. The users waiting to play in the playground illustrates that they need more playgrounds in the area. Additionally, 32% of Parade Ground users do not have walkways along the street connecting their home to the playground, which suggests an accessibility issue in getting to this open space facility.

b. Travelling distance: The cumulative analyses of the three open space sites conducted with SPSS

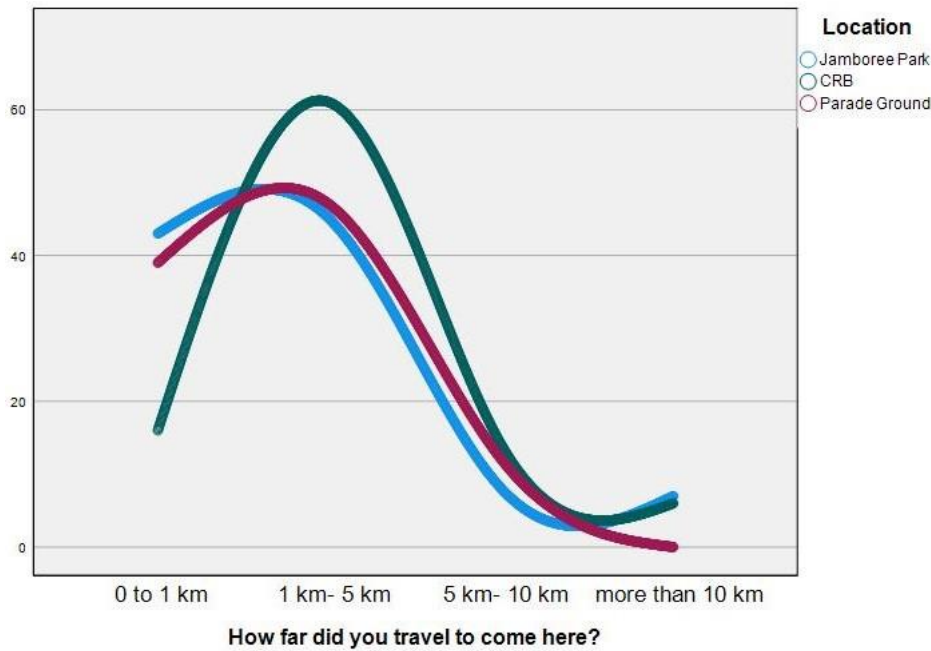


Figure 43: Travelling distance.

shows that 32% of users commute less than one kilometre distance to the respective open space settings, 51% of users commute from 1 km - 5 km distance away from their home to these places (figure 43), 11% of users travel 5 km - 10 km distance and only 0.08% of visitors come more than 10-kilometre distance away to get to these open space settings. This data indicates that a majority of users travel 1 km- 5 km distance to get to the open spaces. For example, CRB has 16% of users who come from 0 km- 1 km distance away from their home, 61% of users come from a 1 km- 5 km distance and 14% of users from a 5 km to 10 km distance. This data indicates that CRB has more distant visitors compared to neighbourhood visitors to this open space setting. On the other hand, Jamboree Park has 43% of users traveling from a 0 km- 1 km distance to this setting and 45% of users coming from 1 km- 5 km distance away. The Parade Ground has 39% of users coming from a 0 km- 1 km distance away from this setting and 47% of users travel from a 1 km- 5 km distance and 12% of users come from a 5 km to 10 km distance to this parkland. Therefore, both the Parade Ground and Jamboree Park have mostly visitors coming from a 0-1 km distance and 1- 5 km distance, which suggests these open spaces service a local residential population. However, the CRB visitors mostly come from a 1 to 5 km distance away and suggests this setting may service a wider population base.

c. Mode of transportation: To get to Jamboree Park and the Parade Ground, 56% and 57% of visitors, respectively, walk to these open spaces. While to get to the CRB, only 16% of users walk to this setting. Most of the CRB visitors ride either the bus or a rickshaw (a light two-wheeled passenger vehicle manually pulled by one person but can carry two passengers at a time) to get into the place.

This data supports the travelling distance discussion related to CRB's users discussed above. Figure 44 shows the comparative analysis of mode of transportation in the three sites.

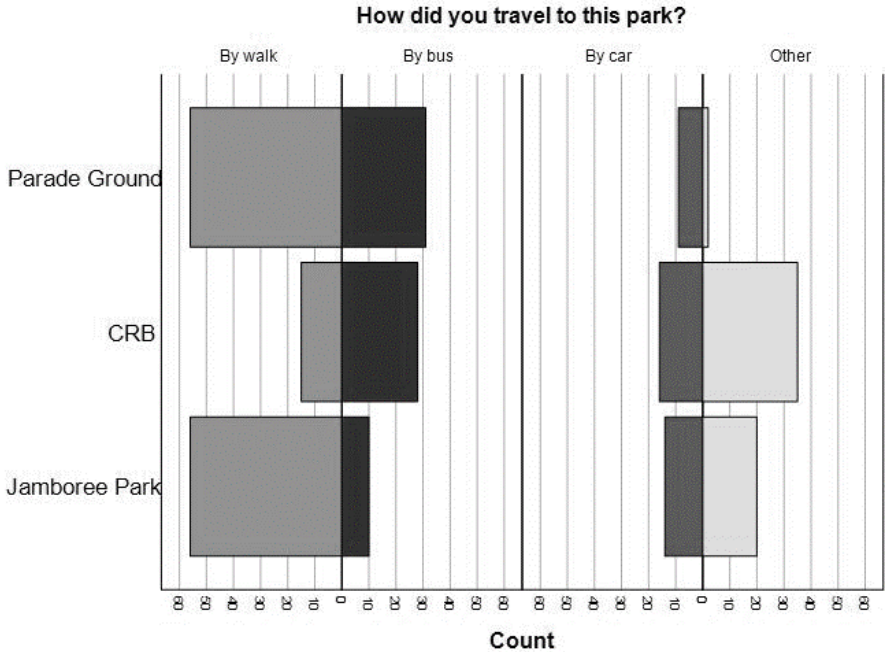


Figure 44: Mode of Transportation.

In summary, Jamboree Park and Parade Ground has more neighbourhood visitors compared to distant visitors. The survey did not find any visitors in Parade Ground that commute more than a 10 km distance to this open space setting.

The data presented above suggests walking as the main mode of transportation to these open spaces as most of the visitors' survey in Jamboree Park and the Parade Ground live up to a 5-kilometre distance away and said that they generally walk to these settings. While the more distant CRB users indicated they ride buses, drive and take a rickshaw to get to this place.

d. Influence of transformation: This section reports on whether or not development of an open space setting influences the user's visiting frequency. The survey suggests that the development of Jamboree Park, CRB and the Parade Ground did influence the regular users to increase their visiting frequency by 90%, 48% and 38% respectively (figure 45) to these settings. For example, 72% of Jamboree Park visitors, 41% of CRB visitors and 33% of Parade Ground visitors started to visit these open space settings after their development. The results therefore suggest that the developments

associated with open spaces have persuaded the users to visit them more frequently or to start to visit them.

Furthermore, 15% of CRB's users and 19% of the Parade Ground users were not satisfied with these open space development. These percentages lean towards the consideration that most of the users appreciate the new developments in these sites. Table 22 represents the comparative analysis of the influence on development of the open spaces to the users. Interestingly, and in a potentially contrasting result, this table indicates that 4% of Jamboree Park users, 48% of CRB users and 55% of the Parade Ground users' visiting frequency after development remained unchanged. In addition, the visitors were asked the reason for their increase and decrease of visits to the open space settings. It was an open-ended question, and the answers are presented in the following table. In response to this question, the survey found that 40% of users of the Parade Ground claimed the sports field is not sufficient and cannot accommodate all users. In addition to this, the accessibility restriction (only college students can use it) in the Parade Ground was also identified as an issue restricting use and access to this field. Lastly, when speaking with these visitors they highlighted that the Parade Ground cannot accommodate all the users wanting to access this field and that they need to wait a long time for their turn to play on it. Please note that while analysing the data, the previously discussed landscape elements introduced to these open spaces—which are shown in table 2 of chapter 3 is juxtaposed with the findings of both an increase and a decrease in open space visits.

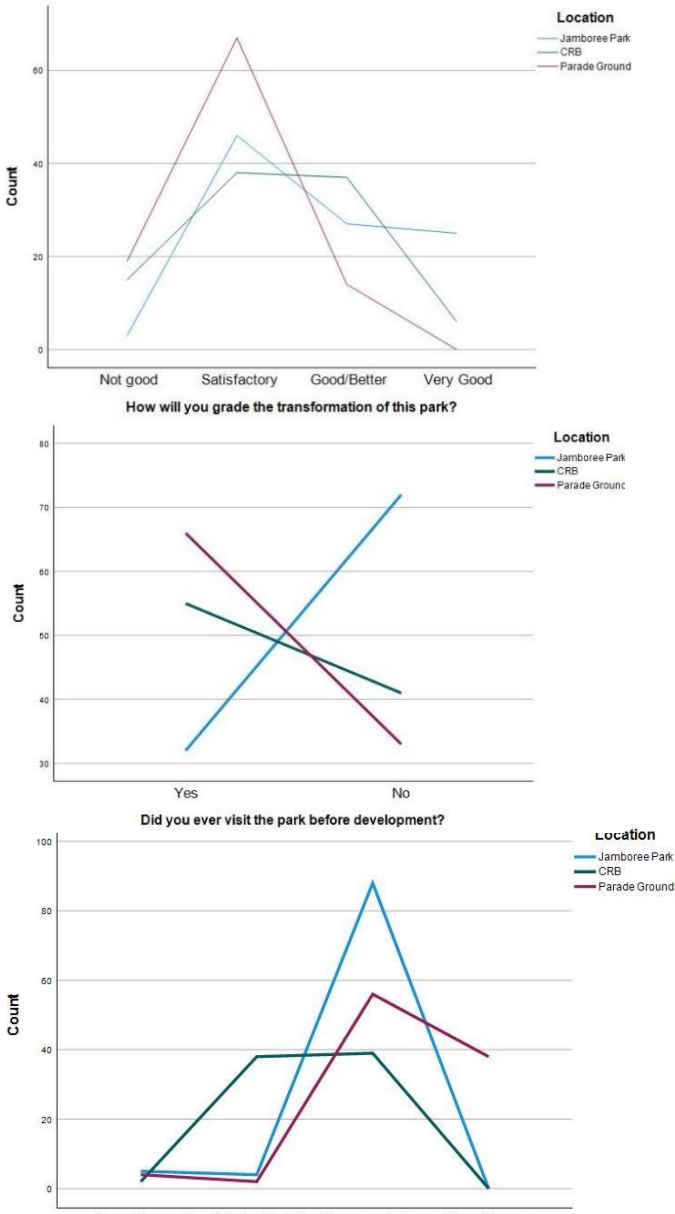


Figure 45: Comparative analysis of transformation grade, visiting frequency before and after development.

Table 22: Findings of a comparative analysis conducted in the three survey sites. These 'reasons' have been themed for ease of presentation.

Reason for increase visits to open space	JP	CRB	PG	Reason for decrease visits to open space	JP	CRB	PG
Good environment	√			Lack of maintenance		√	√
Better weather protection	√			Not enough space			√
Green space		√		Flooding			√
Calm/quiete/peaceful		√		Bad environment			√
Park development	√			Restricted accessibility			√
Safety and security	√						
Evening lighting	√						
Openness		√					

*JP- Jamboree Park, CRB- Central Railway Building, PG- Parade Ground

In summary, the survey finds that the developments in these open spaces support an increase in the user's visits to these settings and is of a satisfactory standard to them most. Among the three sites, the Jamboree Park development increased user's visitation frequency more when compared to CRB and the Parade Ground. For example, the survey and the data in table 22 suggests that safety and security in Jamboree Park influences users to increase their visiting to the park.

e. Purpose of visit: To answer the survey question related to purpose of visit, respondents were asked to choose the activities they are most likely to do in the open space settings. Approximately, 33% stated that they visit open spaces to enjoy them with their family and friends, 10% visit for sightseeing and 15% for walking. The remaining users selected "other" as their purpose of visit. For example, in the Parade Ground, more than 56% visit this open space for playing and 16% visit for watching sports matches (such as Cricket). But 70% of female users surveyed in the Parade Ground declared that they use the field area for walking and jogging, 20% watch matches and 10% use it to play. Additionally, Jamboree Park and CRB users are kin to visit for more recreation and socializing activities.

III.3rd tier: Neighborhood Park, playground, and open space

The above section presented and discussed four aspects of the data related to the users' interest to use open space and whether their demands are mitigated by the three open spaces examined in the city. This section is designed to gather data on the availability and demand of open space in Chittagong. To investigate this focus, the visitors of each open space examined were asked whether

they have an available formal open space in their neighborhood or not, whether they think it is sufficient or not, and with respect to a park and playground preference, which one of these might they prefer most. The survey question developed and used in this section of the thesis is presented in Appendix 6. The following material presents and discusses the findings associated with this 3rd tier examination of data related to the availability and demand of open space in Chittagong. For ease of presenting and discussing the data material has been assigned the themes availability of Neighborhood Park, playground and open space; Purpose of open space; Park and playground arrangement preference; and open space availability for kids. These are presented below. Please note that some of this data may be considered similar to the above section's material. This was purposely done to triangulate data.

a. Availability of Neighborhood Park, playground This section is designed to gather data on user's availability and demand of a neighborhood park, playground and open space. The responses identify that 16% of users have a park within their ward area, 33% of users have a playground and less than 2% of users have both a park and playground in their neighborhood (figure 46). This result indicates that 51% of users have access to some form of open space near them. However, 49%,

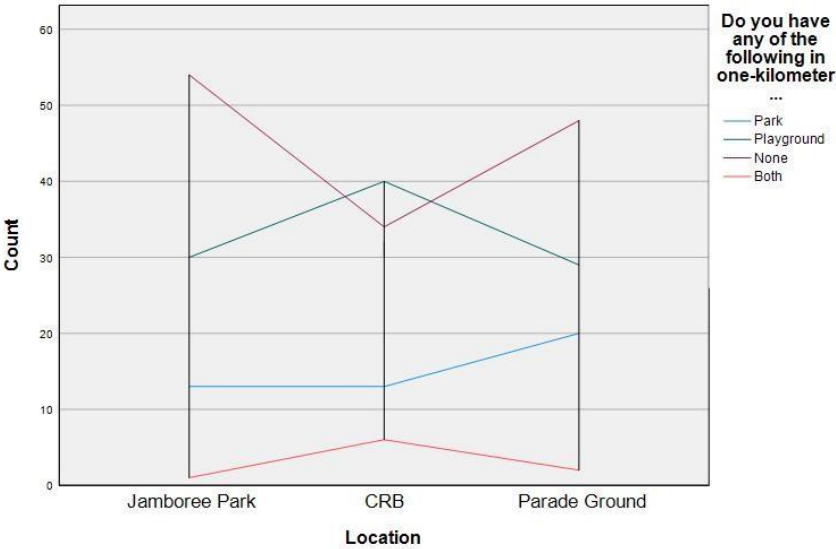


Figure 46: Availability of park, playground and open space in neighbourhood.

which is essentially half, do not have an open space facility in their neighborhood. Therefore, this finding supports the necessity of creating more open space in this ward/neighborhood. In addition, over 11% of people desire a park within their ward, over 10% desire a playground inside their neighborhood, and 79% would prefer both (park and playground).

b. Purpose of open space: To answer the question related to the purpose of the open space, the respondents were asked to identify the reasons as to why they would like to visit a park and open space. Nearly one-quarter of the respondents said that they want to visit an open space area for

recreation, 20% of respondents want to visit it for its openness (please remember Chittagong is a very dense and highly urbanized setting), more than 20% prefer to visit it for social interaction and 15% specifically said that they visit it for exercising.

c. Park and playground arrangement preference:

When respondents were asked to select a park or playground, most of the respondents picked a combined arrangement of both a park and playground to be developed in their neighbourhood. In the spirit of objectivity related to this data, one may argue that when asked about theoretical options such as this, respondents will 'of course' prefer to have both types of open spaces developed in their setting. Hence, this data is simply attempting to establish a preference base

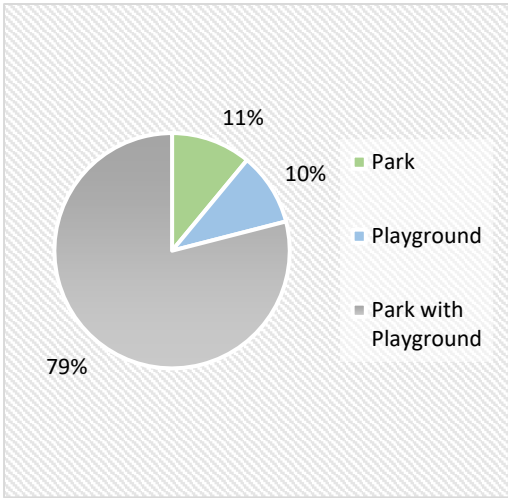


Figure 47: Demand of park and playground.

from residents for the development of open space in the city. In doing so, this preference approach follows an established line of enquiry to data gathering found in contingent valuation research (Markandya and Ortiz 2011). In particular, Figure 47 shows that 11% of users believe their community should have a park, 10% believe their neighborhood should have a playground, and 79% believe their neighborhood should have both a park and a playground. Regarding the Parade Ground, for instance, 86% of users believe that their area should have a playground for children up to the age of fifteen. Additionally, based on the poll results, 95% of Jamboree Park visitors believe that their neighborhood needs more playgrounds and parks. According to the results, the users desire more parks and playgrounds in their neighbourhood settings in Chittagong City.

d. Open space availability for kids: Most of the parents visiting the open spaces stated that their kids stay at home and do not play outdoors because there is no open space facility near them to walk to. The survey shows that less than 32% of parents can send their kids to a nearby playground and more than 65% parents cannot send their kids to a playground because there is not one available in their neighborhood. The question helps to also identify the lack of playgrounds (i.e. open spaces) for kids in Chittagong City, and in summary, most of the residents surveyed do not have a park or playground arrangement in their neighbourhood.

IV.4th tier: Natural open space and its accessibility

This section of the survey was created to gather information about whether or not residents have access to natural open spaces around their homes, given the variety of natural open spaces found in Chittagong City, including hills, creeks, oceans, and rivers (Appendix 6d presents the survey question). In this context, accessibility is defined as having unhindered access to natural open space regions via roads or paths that aren't walled or otherwise restricted. According to Figure 48, 61% of users live near a natural open area (i.e., at or within a 1km radius). Of these, 27% have a canal or creek adjacent to their home, 11% have ponds, 9% have hills, 8% have sea beaches, and 6% have a river. On the other hand, 39% of people stated that there is not any natural open space near their

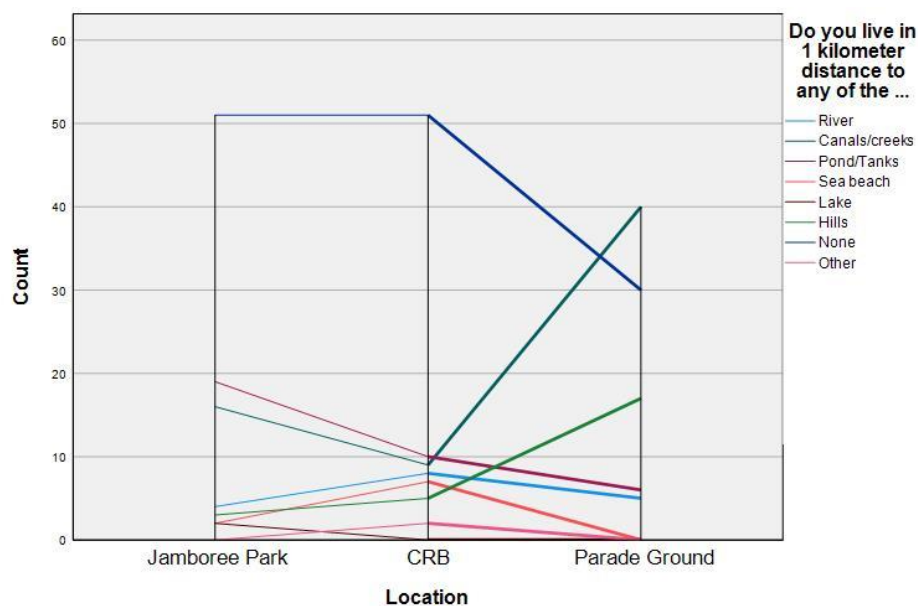


Figure 48: Availability of natural open space in neighbourhood.

neighborhood. Additionally, of the 61% of users who report having natural open space in their neighborhood, 55% do not have access to it due to a variety of barriers or, for instance, the absence of walkways (access as it relates to physical connectivity is covered in the previous chapter). When given access to natural open space features nearby, 73% of users who do not already have access to such locations said they would be willing to visit them. In addition, 44% of respondents said that they dislike going to nearby natural open spaces because they are unclean and unsafe.

In conclusion, around 60% of users could visit the nearby natural open spaces provided those areas were made safe, hygienic, and easily accessible. Because natural open spaces are already present in Chittagong City, the survey results indicate that they are more likely to contribute to the city's open space status.

V.5th tier: Relativeness of the park, playground and open space: To gather as much data as possible respective to residents and the open space setting, the study sites were surveyed on

weekdays and weekends over the period of August 2019 to September 2019. Following completion of the survey, a relative evaluation of these open spaces settings was undertaken among these three sites. This was conducted to identify the ratio of open space to users, the variance of users to a setting and its relation to the area. This examination and reporting of data are organized under the headings of Number of users, Male and female users and Open space proximity to one's workplace/study facility. These are presented below.

Number of users: To examine the number of users among these open spaces to the Jamboree park, the CRB and the Parade Ground users per square metre of park land is considered. From the demographic survey (figure 49), this shows that among the two city parks, Jamboree Park is the most populous (i.e used). In Jamboree Park, 3000 users visited the park on one weekend day from 5pm-6pm and in relation to the parks size of 8.55 acres (i.e. 35,550 sqm), this equates to 11. 85 square metres open space was occupied by a person at this time (Appendix 13). To put this into perspective,

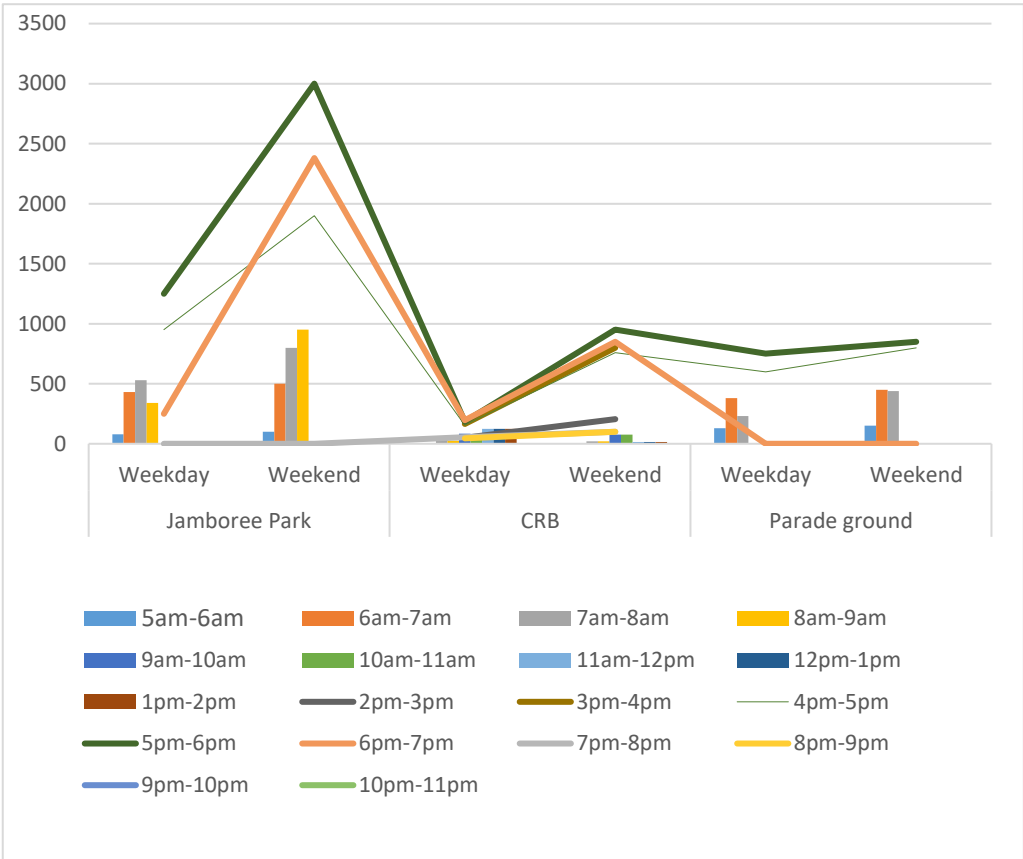


Figure 49: Comparative analysis of number of users.

according to Lancaster (1983, p. 70), a neighborhood playground the size of 3-5 acres (i.e. 121401-20234sq metres) has a 264-person capacity, and a community recreation center (10-15 acre) (i.e., 40469- 60703 sq metres) has a 420-820-person capacity at peak periods. This data suggests that Jamboree Park receives four times as many visitors as the range of benchmarks proposed by Lancaster (1983). While calculating current user of surveyed open spaces, table 23 presents the areas

associated with the three open space areas and associated visitor numbers. Additionally, and in summary, the Parade Ground holds 850 users at its peak time (5-6 pm) and CRB has the least number of visitors compared to its designated open space areas because it is only partially open to visitors. Appendix 13 presents the demographic survey on users and summarized in table 23.

Lastly, the survey data shows and as suggested in figure 49 that on the weekend (from 4 pm to 7 pm) this is the peak time in these open space settings use and the time they hold the highest visitor numbers.

Table 23: Visitor numbers in the Jamboree Park, CRB and the Parade Ground and area of associated open space

Open space	Area	Day	Total Visitors	Opening hours	Average visitors/h	Visitors in pick hour (5-6 pm)
Jamboree Park	8.55 acres/ 35,550 sqm	Weekday	3140	9	348	1250
		Weekend	4750	9	527	3000
CRB	12 acres/ 50,000 sqm	Weekday	573	12	31	185
		Weekend	2270	12	126	950
Parade Ground	6.11 acres/ 25,000 sqm	Weekday	1180	7	131	750
		Weekend	1390	7	154	850

a. Male and female open space users':

Please note that as described in the opening to this chapter the male to female respondent ratio in the survey heavily leans to inclusion of male respondents. Hence, the presentation and discussion of data here must be treated with caution. This section is designed to examine data on open space and user's visiting the three sites surveyed in this research. The survey data shows that during the weekdays, female user visits to the three open spaces decrease, and male users increase (figure 50). To help explain this phenomenon, women appear to be more likely to visit these settings on the weekend because their children are home and they wish to 'do' something with them. In contrast, male user's visiting these open spaces appears to increase during the weekday. This is an interesting observation and although this cannot be explained it suggests further research into this differing aspect of open space use. Additionally, when women are asked the reason why they use an open space setting, for example like Jamboree Park, more and less they explain that they feel more secure and safe here. This finding suggests further research into the aspect of security and safety in Chittagong's open spaces is needed. Furthermore, when female users of the Parade Ground visit this setting they stated that they like to visit its playground to walk around it. Lastly, and in recognition of the male leaning to female ratio of surveyed respondents, according to the discussed open space

standards the number of visitors per square metre to these setting generally suggests that these open spaces are overcrowded. Hence, this result suggests that the demand for open space in Chittagong City is greater than the capacity of the city's existing open spaces can accommodate.

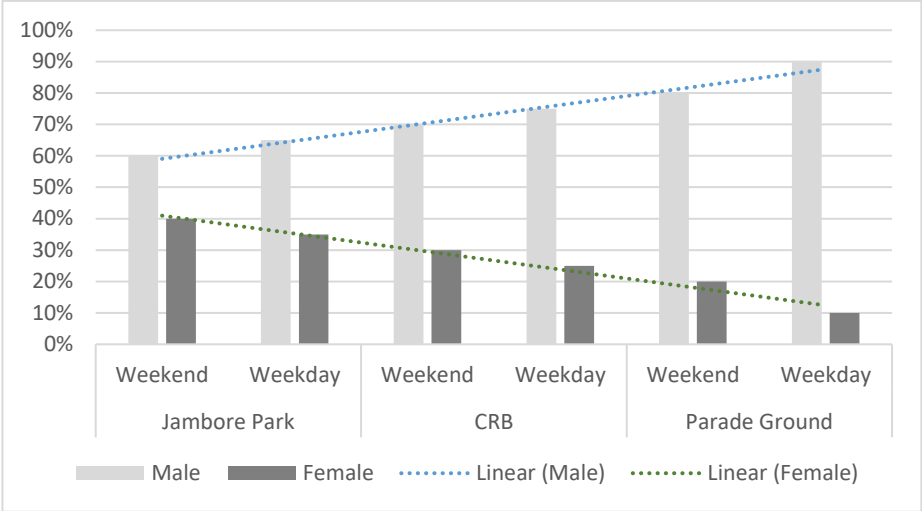


Figure 50: Male and female user ratio.

Key findings:

The objective of this section was to understand residents' open space aspirations. By identifying, presenting and discussing the data above they provide material that addresses question 2 of objective 3. From user patterns and a travelling distance perspective, the three open spaces surveyed can be defined as follows:

- a. For its size, CRB serves as a city park for distant visitors.
- b. Jamboree Park serves as both a city park and local park for both distant and neighbouring visitors.
- c. The Parade ground serves as a sports field for both distant and neighbouring visitors.

The key findings of the survey are:

- 1. The Parade Ground is insufficient for the total number of daily users.
- 2. Most of the users commute 1 to 5 kilometer distance to get to the park.
- 3. The development of Jamboree Park, CRB and the Parade Ground influenced the regular users to increase their visiting frequency and attract new visitors.
- 4. CRB users do not feel safe because of inadequate lighting and 1poor environmental conditions.
- 5. The users prefer mostly leisure activities, walking and playing in these open spaces.
- 6. Neighbouring users do not have pedestrian infrastructure connected to the open spaces.
- 7. The users prefer a combined arrangement of park and playground.

8. Kids playgrounds are unavailable for residents' neighbourhood in an open space setting.
9. Most of the users have natural open space close to their neighbourhood which are inaccessible, unsafe and unclean.
10. Jamboree Park and the Parade Ground are overcrowded.

The results stated in survey analysis provide an overview of how locals interact with existing open space environments. The results demonstrate that the upgrading of the Parade Ground, CRB, and Jamboree Park increase number of user and visiting frequency. It, also, illustrated how the open space settings of Chittagong have brought the park and playground users' desires to life and which will be helpful in formulating policies for Chittagong's public open space. The survey data presented above suggests a range of considerations that can be used to address the city's open space situation. From an open space, park and playground users' aspiration perspective the following findings can be used for the future development of open space in Chittagong. The recommendations from the findings are:

1. Any park and playground should have a sidewalk/ footpath connecting to the neighbourhood for a catchment area up to 1 to 5 kilometer distance.
2. Park and playground setting need to have walking trail for adults and playing equipment for kid's activity.
3. Chittagong City needs more local parks and playground settings.
4. Local Parks need to be combined with playground settings.
5. An open space setting should have adequate arrangements for leisure activities, such as sitting, shading, picnic spots (in city park).
6. A setting needs to be safe and secure both in the nighttime and daytime.
7. A setting needs to promote cleanliness, accessibility and safety in natural resources close to neighbourhoods.

These outcomes suggest that Chittagong City needs more park and playground settings with infrastructure facilities for activities. However, potentially an excessive amount of planned and designed public areas raises the possibility that the green spaces may become overly "structured," anticipating and restricting their functional usage while leaving little room for leisure activity (WHO 2016). The data also suggests safety and security are important, which can be attained via community involvement, nighttime events, and proper lighting for the evening. The survey concluded that pedestrian infrastructure, such as bike lanes and walkways, is necessary to link the

open space networks. Ultimately, it demonstrates the locals' wish to have greater connections to surrounding open space environments, such as parks, canals, hills, ponds, rivers, and the sea.

6.4 Discussion of Interview and Survey data:

The findings of the interview and the survey (summarised in table 24) are individual data sets but support each other. For example, the survey highlights residents' interest to use open space and how the development of park and playground inspire them to be more active. The survey indicates that local natural open spaces are unsafe and not entirely accessible. The situation is consistent with UNEP (2023, Goal 11.7) to "Provide access to safe and inclusive green and public spaces."

It also emphasized the limitation of these spaces in the case of security and cleanliness. On the other hand, the interview specifies the potentiality of existing open spaces. It suggested to use the city's railway land, hills, and riversides and canals by introducing mixed use development that not only provide communication, power and initiate drainage systems for the city but also promote the implementation of potential open space in the dense setting. Thus, these spaces will also benefit the city environmentally and physically. The thought on waterlogging (i.e. flooding) presented in the interview data coincides with survey results, in that both sets of respondents suggest a user's limitation to use the park occurs during the monsoon. Furthermore, the proposal of a hill's development arises in the interview and coincide with the security problem of open space found in the survey. The proposal of mass transit to development and the ancillary opens spaces may be used to increase distant users to use open spaces by providing access to, for example, the CRB.

Table 24: Feedback from interview reflecting on the survey.

Supporting question		Feedback from interview	Feedback to survey
How to create new open space?	Canals	<ul style="list-style-type: none"> • Removing settlement from both sides of canals, • Separating the canal system from wastewater, and • Preserving as required open space. 	<ul style="list-style-type: none"> • Boost biodiversity, • Create walking tracks, and • Improve access to natural waterways.
	Low laying areas	<ul style="list-style-type: none"> • Preserve low laying areas 	<ul style="list-style-type: none"> • Increase the area where ground water is caught; and • Reduce flooding.
	Hills	Create dams, resorts, and trails within a 10% ground covering restriction in hills.	Although there has been a lot of concern about preventing landslide during development, it is advised to

			foster connectedness and provide security.
	Railway land	<ul style="list-style-type: none"> • Discourage dependency on motor vehicle. • Develop mass transit. 	Promote the day-and night-time multipurpose use of the surrounding areas of train stations.
	Pocket of land	Find and transform pockets of land into parks or playground.	Increase visibility, accessibility, maintain environmental quality.
How to develop existing open space?	Quality	Ensure security, connectivity, visibility and accessibility.	Encourage more users. Promote direct and indirect use of open space.
	Public engagement	Engage more users and create awareness among residents.	Ensure peoples participation to maintain the space.
	Hydrology	Ensure proper drainage system and rainwater collection during monsoon.	Supply excessive water to neighbourhood.
	Multi-function	Encourage shared use of playgrounds and parks facilities.	Will engage both park and playground users simultaneously.

Lastly, the survey reflects the users' interest to use open space and their aspirations regarding open space in the city. In contrast, the interview reflects professional's thought to support the user needs. It also broadens the limitations and prospects to create open space in the city.

6.5 Conclusion:

To promote planned open space developments in Chittagong, in addition to the literature review, the interview data points to the probability of creating open space in the city, with its limitations and the survey extends the necessity to create open space. The analysis of the interview and survey data with NVivo and SPSS, helped the researcher to reach the findings and to create a platform to address the open space issue in Chittagong City. Furthermore, the findings of the survey explore the demand for park and playground development in the city. In this regard, the interviews explored the potential natural open spaces and their limitations for use. Hence, the findings from the interview data and discussion is used to address open space guidelines in Chittagong and the survey data helps to sketch out an approach that can be used to meet the open space aspiration derived from user's preference. Both findings helped in propose of an increase of public open space in the Chittagong City. These findings will apply with associated principles and guidelines explained in chapter 7.

Chapter 07: Discussion

7.1 Introduction

The thesis study was carried out in four stages, each of which addressed one of the four objectives. These steps are mentioned in the research design chapter (Chapter 3). The fourth objective of this thesis, which is built upon the results of the prior three objectives, is what this chapter aims to accomplish. The 1st three objectives are summarised in the previous chapters, together with the results for each. The 1st objective of the thesis is "to examine and document the evolution of existing open space in Chittagong" (1st stage of the research). To accomplish this objective, a history of Chittagong's public areas was compiled along with the dwindling historic and cultural open places that ought to be preserved for the city's future use- presented in chapter 4. The 2nd objective of the thesis is "to establish a relative open space benchmark and standard that Chittagong can reference in its open space developments". In order to achieve this goal, chapter 5 presented the open space standards practised around the world (2nd stage) and identified the varied types of open spaces that exist in Chittagong City. Analysing the existing open spaces and guidelines assisted the researcher to determine a local open space standard. The 3rd objective of the thesis is "to investigate approaches to realising open spaces in Chittagong City". To achieve this objective, a survey of three open spaces and interviews with thirteen professionals were conducted. Analyses of the survey data and interview data was presented in the 6th chapter (3rd stage). The data presented in that chapter helped the researcher to discover users' open space aspirations and demand for open spaces in the city. Following the 1st three objectives, the fourth objective is presented as below:

Fourth objective:

The fourth objective of this research project is "to recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations". To accomplish this goal, the findings from the 1st three objective through historiographic analysis, literature review, survey and interview analysis are discussed in this chapter. As stated in the research design chapter, two questions were adopted in this step to help attain this goal. These are:

- What open space approaches derived from literary work and fieldwork analysis may best be applied in the city?
- How should open space best be distributed to meet the city's growth and residents' open space aspirations?

To respond to the 1st question, this chapter identifies the methods from an analysis of literary work and fieldwork that ultimately guided development of the optimal approach(es) to distributing open space in the city. The primary findings of the 1st three objectives are briefly summarised in the

following section of this chapter. By doing so, a foundation is created from which objective 4 can be addressed.

1st objective findings:

The 1st objective of the thesis is "to examine and document the evolution of existing open space in Chittagong". To achieve the objective, the research found 12 historical growth centres (Chapter 4, figure 19) in ancient Chittagong and described their respective historical landscapes characteristics (Chapter 4, Table 4). The chapter discussed the existing fabric of the city's historical growth centres and highlighted the applicable landscape characteristics that could be proposed for use in Chittagong's open space planning. Ten categories of historical open spaces that resulted from the historiographic research were listed in this chapter (Chapter 4, Table 5). These are open space cultural open spaces, related to religious places, open space associated with waterbodies, garden and parks, social and community open space, transport oriented open space, open space associated with tea cultivation, commercial public open space, administrative open space and commemorative open space. The author discussed that these once-urban open places have either been completely lost or partially preserved. Therefore, the management of historical open spaces and conservation policy were addressed in this chapter.

2nd objective findings:

The 2nd objective of the thesis is to establish a relative open space benchmark and standard that Chittagong can reference in its open space developments. To reach this objective, the thesis enlisted seven types of existing open spaces (Chapter 5, Table 12) in Chittagong City. These seven types of open space are green open space, blue open space, playgrounds and sports fields, functional open space, religious open space, cultural open space and streetscape. The chapter presented recommendations from the city's 1995 Master Plan and policies derived from the Detailed Area Plan (DAP) 2015, which was intended to preserve the open spaces in the city. It also described implementation status of the proposals and the limitations of the Master Plan. The findings in that chapter showed that only four proposals in the Master Plan were partially implemented. What was also identified was that in terms of the land uses presented in the plan 12 proposals have changed and ten other open space proposals remain unimplemented. The findings also suggested that the DAP 2015 for the Chittagong Master Plan has 12 Detailed Planning Zones (DPZ) guidelines. Additionally, in an international context, the literature review identified that the guidelines and standards practised around the world with respect to such zones may not be applicable for use in the Chittagong City. Hence, the literature review recommended that the categorisation and

development of open space in the city should be based on local conditions and not international standards. The research stated that city parks, district parks and regional parks need to be defined and planned for larger areas. Local parks, or neighborhood parks can be smaller, sometimes measuring less than an acre. After reviewing the Master Plans and existing open spaces, the researcher came to the conclusion that Chittagong has 1.67 square metres of open space for every resident (Chapter 5, Table 18).

In the literature review, the city's local parks and playgrounds were suggested to be structured around the catchment area they serve (Chapter 5). For example, from a walkability point of view, in a local park catchment area a minimum 5 minutes to maximum 8 minutes distance relates to 300 to 500 metres, respectively (Chapter 5, Table 6 & Table 9). Hence, this type of park should be located within this walking zone to serve city residents. Yet, according to survey finding 3, more than 50% of park users commute 1 to 5 kilometres to access open space, which is well beyond this walking zone suggestion. Putting this local park walkability dimension from the perspectives of residents' need or service, Chittagong City requires at least 80 local parks or playgrounds for the maximum accessibility distance (500 metres) (Chapter 5, Section 5.4). Furthermore, RAJUK, recommended the minimum size of a local open space in Dhaka, the capital city of Bangladesh, is five acre (Chapter 5, Table 11), a recommendation that might not be appropriate to apply in Chittagong City. This is because 45% of local parks in Chittagong City are 0.5 acre to 1 acre in size (Hasan, 2008).

3rd objective findings summary:

The 3rd thesis objective is to investigate approaches to realising open spaces in Chittagong City. To achieve the objective, the thesis study collected survey and interview data. In doing this, the survey explored users' preferences regarding three local parks and playgrounds in the city and the interview analysis outlined how open space may best be distributed in the city, as discussed below. The results show that 29 suggestions from the interviews and seven recommendations from the 10 findings of the park, playground, and open space study. These suggestions allowed the researcher to portray potential open space planning strategies that could be used in Chittagong with the anticipated per capita open space ratio.

The 2nd part of this chapter was a report on the findings for the 1st three objectives that applied these principles in a comparatively dense setting in Chittagong City. This section of the chapter described the planning principles for open space settings in Chittagong.

7.2 Synthesis of findings

The above summary of findings relates to the respective objectives that are now synthesised below

into discussion items that lead to demonstration of the achievement of objective 4 (To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations). The findings from objectives 1, 2 and 3 are incorporated in two steps:

- I. Step 1: Synthesis of findings for objectives 2 & 3
- II. Step 2: Synthesis of findings for objectives 1 & 3

The steps are discussed below.

7.2.1 Step 1: Synthesis of findings for objectives 2 and 3

The outcome of objective 2 was a comparative study of open space standard practices in cities and the current open environment setting in Chittagong. There are 1700 acres of existing open space in Chittagong city presented in Table 20. According to these existing setting, the amount of open space per person will rise from 0.243 to 1.67 square meters (Chapter 5, Table 18). Nevertheless, more investigation on these settings reveals in chapter 5 that not all these spaces are neither included officially nor accessible to city residents. For instance, including the inaccessible environments of hills and canals will increase the amount of open space per person from 0.243 square meters (Hasan, 2008). This may be far less than the WHO recommendation. But implementing findings from objective 3 to allow access to these settings will improve the bar. This section will address how the researcher include different types of existing open spaces based on the findings from the survey and interview. Following steps from the findings the recommendations are explained below:

a. Organizational setup and scope of work:

The findings from objective 2 indicated that the DAP 2015 for the city's 1995 Master Plan advised creating an organization to be named the "Chittagong Parks and Recreation Department" in order to carry out the recommendations made for open areas in the Master Plan. This coincide with the 1st suggestion resulting from interview finding 'a' is to "establish a solitary, independent organisation such as a parks and open space department". The interview findings suggested that in order to achieve rollout of open space setting in the Chittagong City, there should be a series of steps as follows:

- Prepare an open space strategy and guidelines.
- Split the proposals into stages as one-year, two-year, five-year aspirations etc.
- Prepare a budget for the proposed open space development.
- Set in motion and monitor the approvals of the proposals.
- Monitor the open space development.
- Create public awareness.

- Maintain and manage open space quality.
- Identify historical open spaces and prepare guidelines for their conservation.
- Establish coordination between departments where necessary.
- Establish open space standards for the CCC area.
- Identify the various kinds of open spaces and their respective sizes.

The interview data advised that this team will be formed by a historian, planner, psychologist, urban designer, sociologist, ecological, economist, biologist and landscape architect. In doing this a range of perspectives and strategies could be structured, which may lead to the achievement of establishing an appropriate open space ratio or standard in the city.

b. Establish open space structure and strategies:

The open area that now exists in Chittagong City needs to be categorized and developed strategically. For instance, the outcomes of objective 2 categorized Chittagong City's open space into seven distinct categories (Table 12). The open space paradigm discussed in Chapter 5 must be applied to classify these locations. Table 6 and Table 9 (Chapter 5) is an illustration of how different types of open space could be classified according to their size and catchment area. These are Local, neighborhood, district and regional open space. The open space in Chittagong must then be categorized into four different categories of open areas. It will be difficult to implement in Chittagong the standard size that is shown in Table 6 and that Australia is adopting. As a result, local strategies like the Dhaka Structural Plan can be taken into consideration while defining the standard size. Following the completion of objective 2, these results are shown in Table 18, where Chittagong's open space was first classified. Furthermore, additional study is required to enumerate the categories, such as ponds larger than 0.5 acres and religious open space. In addition, open space of Chittagong can also be classified by landscape elements and purpose of use following Table 7 and Table 8. As an example, Table 24: Feedback from interview reflecting on the survey, presents an overview of survey and interview results, highlighting that four categories of open space could improve the current open space setting in the Chittagong City. These are canals, hills, low laying areas and pockets of land (findings of objective 2). These natural open spaces can be classified as linear open space, district open space, local parks and small playground (Table 9) and contribute to cumulative open space in Chittagong. Finally, table 24 shows how to improve these areas with guidelines, strategy, and policy. Improving environment quality with strategies will also promote biodiversity in the city.

Next, objective 2 finds Chittagong is in shortage of local parks and playgrounds in 5 minutes walking

distance guided by WHO (2016) (figure 40). Therefore, catchment area planning is required for neighborhood parks and playgrounds. A 5- to 10-minute walk or 300 to 500 meter distance might be carefully considered in a densely populated area like Chittagong City, since the survey finds that most park and open space users travel more than one kilometer to enter these areas (Chapter 5:2b: Travelling distance). According to a review of literature, Chittagong requires 69 local parks and playgrounds for a catchment area of 400 meters (Hassan, 2008) (Chapter: 5, 5.4: I). These may not be available in Chittagong City. In this instance, the interview suggests that small areas of land could

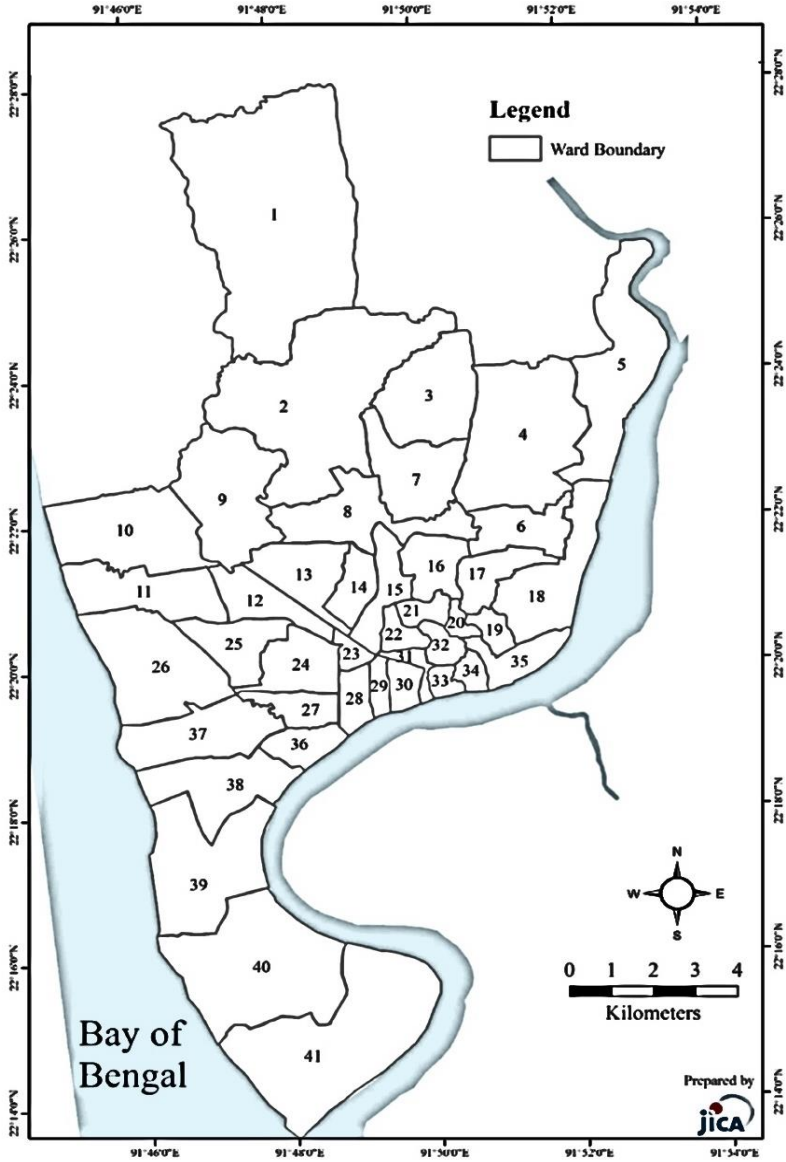


Figure 51: Ward boundary map of Chittagong City Corporation.

Source: Waste report (2019–2020), CCC.

be developed and used as a park or playground to make up for the lack of open space.

Table 25: Chittagong Ward and its open space scenario.

Ward no.	Area (acre)	Population	Density/ sq. km.	Playground		Park		Natural and other features							
				Count	Area (acre)	Count	Area (acre)	Hill	Lake	Canal /creek	River	Larg e pond	Sea	Railway land	
1	2650	96,084	8959	1	0.61			√	√	√					
2	3344	82,266	6079					√		√					
3	1425	71,260	13627	1	0.74					√					
4	2283	88,419	9698							√					
5	2227	89,041	9935							√	√				
6	627	38,534	14713	1	0.69					√					
7	1004	113,655	26267	2	2.02					√					
8	1236	129,388	25371	4	5.31	1	1.26			√					
9	1357	70,673	11076	3	1.79			√	√						
10	696	44,922	9729							√				√	
11	813	63,183	16300	3	5.98	1	1.03			√				√	
12	659	80,374	35372							√		√			√
13	561	77,845	25643	10	13.03					√					√
14	304	98,754	68036	2	3.91			√		√					√
15	536	74,688	36142	5	14.84			√							√
16	435	59,488	29567	3	9.67	1	2.30	√		√					
17	598	78,880	38400	3	3.45					√					
18	1613	67,761	10104							√	√				
19	312	88,844	113,691	1	0.52					√					
20	96	71,858	163,398	1	0.4					√		√			
21	186	61,283	78630							√		√			
22	212	60,489	75559	1	2.98			√				√			

23	189	47,594	17027									√	√
24	511	77,237	43233	3	4.11								
25	476	50,053	10834	2	2.41	1	1.46			√			
26	1695	60,446	8978	2	5.00						√		√
27	364	104,730	80265	4	12.42					√			
28	299	70,227	52347								√	√	√
29	262	72,714	81907							√			√
30	270	69,481	63055	2	4.79					√	√		
31	226	73,346	93,806								√		√
32	263	76,724	97,580	2	2.21	2	11.18	√				√	
33	204	43,673	72220	1	0.88					√	√		
34	226	69,377	94143	1	1.38					√	√		
35	733	37,802	14535							√	√		
36	333	55,707	28032	2	1.42					√	√(NA)		
37	931	68,966	20,053										√
38	1336	78,142	16,079	1	1.17						√		√
39	2068	99,037	16,840	1	2.21						√		√
40	2368	94,366	8414	3	2.48						√		√
41	2496	68,331	16,485				1	18.37			√		√
Total	42416	3,025,715	17032		106.01	5	35.6						

Source: Population survey 2011, CCC & Hassan (2008, pp. 46-47); see Appendix 12. Prepared by author.

*NA – Not Accessible.

b. Small-scale planning

According to the findings related to section 'b' of the interviews, the data suggested adopting the planning of open spaces at multiple scales, such as from small areas like the city's Wards (Figure 51) through to the larger areas like its 'Thana zone' or police station-controlled areas in Chittagong City. Note that the 'Ward' is the smallest administrative urban geographical unit in the city comprising neighbourhoods and having a Ward council (BBS, 2015). In this thesis, the interview findings stated that open spaces, neighbourhood parks and playgrounds need to be structured in accordance with the Chittagong City's jurisdictional subdivisions. Furthermore, as previously stated, in order to achieve the maximum number of open spaces for a smallest administrative setting that is a 'Ward', it is necessary to correlate the Wards' open spaces with neighboring Wards. In the following section, will explore the synthesis of the findings from the survey, interviews, and literature review to offer guidelines for such context. By doing this, it became possible to achieve a cumulative effect whereby the total of these Ward parks supports a higher ratio of open space in city's police station area, also known as the 'Thana zone'. To illustrate this concept for increasing city's open space ratio, 41 Wards and 11 police stations of CCC has been presented in Appendix 12. The name, area and population in relation to existing local parks and playgrounds and natural features in the 41 Wards (a synthesis of the findings from objectives 2 and 3 presented in Chapters 5 and 6) are given in table 25. According to this table, 13 Wards neither have parks nor playgrounds, 15 Wards do not have any playgrounds and 35 Wards do not have any parks.

The table identifies that Chittagong City needs more local parks and playgrounds. Note that this situation coincides with survey finding 10 (Chapter 6) that 47% of users had neither a park nor a playground in their neighbourhood. Therefore, a cumulative impact would occur and the city's stance on open space would improve by potentially increasing the number of open spaces in each Ward.

The table shows that Ward 20 (Dewan Bazar) is one of the most densely populated areas in the city and lacks any neighbourhood parks. This Ward, as an illustration, will be used as a case study to implement the research's findings.

In order to apply same guidelines, the Wards needs to be defined by landscape typology. According to table 25, most of the Wards are connected to creeks or canals and, in certain cases, have hills, lakes, big ponds (greater than half an acre in size), sea frontage and railway lands. To determine the specific situation of open space presents in the city and how this may be enhanced by using a theoretical framework and design criteria, it is necessary to evaluate of each Ward's geography. To

improve open space in these Wards, a thorough understanding of the entire Ward morphology in relation to the available natural open space has been provided to fulfill the purpose of the thesis study. Therefore, in terms of natural resources, 41 Wards of Chittagong can be categorised into four distinct types. These are:

- Type 1: Ward adjacent to the sea and/or rivers
- Type 2: Ward adjacent to railway land
- Type 3: Ward adjacent to hills and/or creeks
- Type 4: Ward adjacent to canals

These types are described below.

- **Type 1: Ward adjacent to the sea and/or rivers**

The city has 18 Wards in proximity to a river or the sea. On average, the Wards in the west and east are shaped by the Bay of Bengal Sea and Karnaphuli River. Among these Wards, the seaside of Ward 39 is considered as an industrial settlement

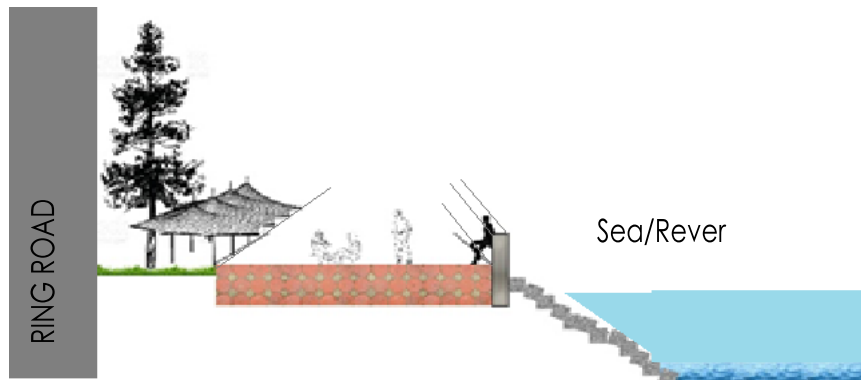


Figure 52: Open space proposal on Ring Road.

Source: Prepared by author

and riverside port settlement. Wards 36, 38 and 39 are not connected to the river due to a restricted access to port operating area along the river. Hence, the only possible open space access in these Wards is open space via the water transportation area containing jetties (i.e. the river). Rainfall induce 'urban storm water-logging' (USWL) in these Wards (Akter 2017). Chapter 5 identified these low-laying areas as blue open spaces and, hence, these Wards can be classified as sea and river connected Wards. The DAP 2015 suggested building an outer city ring road along the river and coastline. In order to control floods, this road would feature an embankment with a sluice gate (Chapter 5, Section 5.8, figure 25). The proposal of landscaping that increases the likelihood of an improved open space ratio is seen in the projected outer ring road construction in figure 52. This ring road has been partially constructed along the coast. Among the Wards adjacent to the sea, Ward 10 is disconnected from the sea because of a ship decommissioning zone located next to it. The residents' only access to the blue space will be through the embankment-centred ring road, which needs to be established in this

Ward . The author suggests a typical section along othe embankments depicted from in (Chapter 5, section 5.8), might feature an open space connecting the locality through the feeder road, as illustrated in Figure 52.

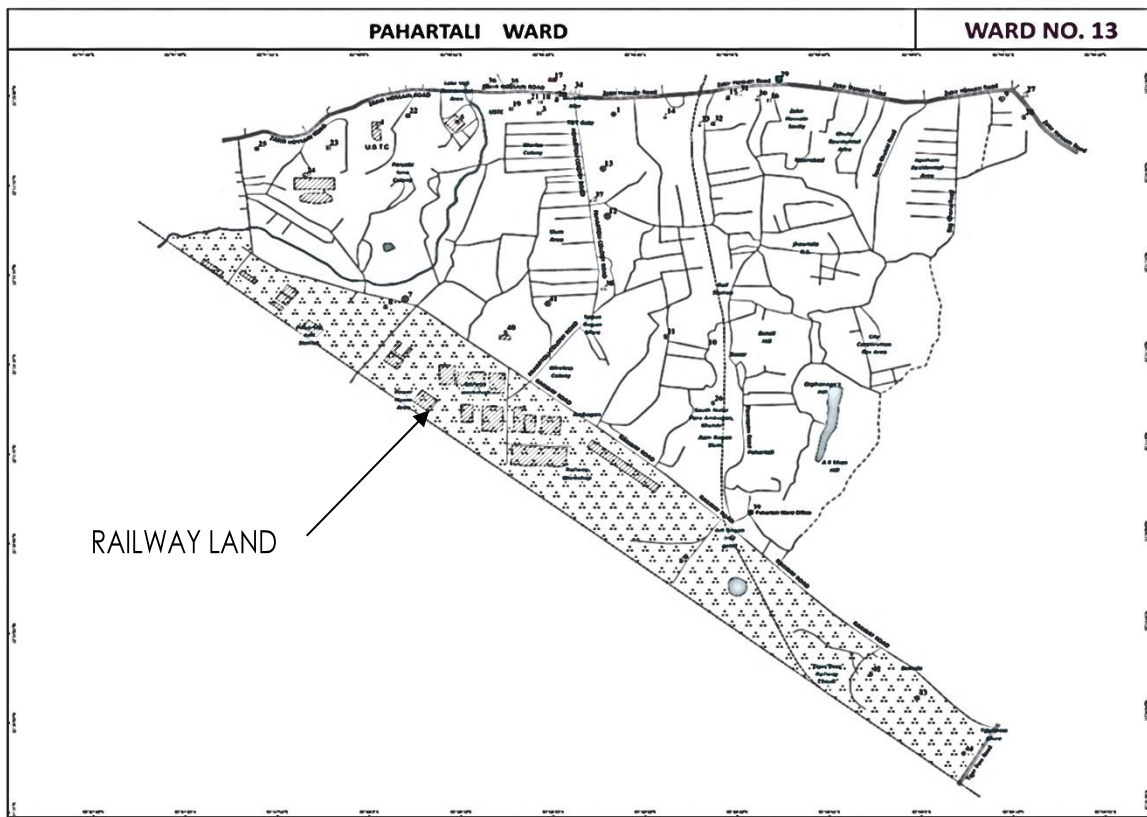


Figure 53: Ward type 1: adjacent to railway land. (Ward 13) Source: CDA (2015)

- **Type 2: Ward adjacent to railway land**

Eight of the total Wards are close to railway lands. As an illustration, figure 53 shows that Ward 13 (Pahartali Ward) containing railway land. Two of the 18 Wards, as discussed in Chapter 5, have railway corridors passing through them. In the interview findings, it was suggested that these railway properties can be used as transportation-related open spaces with multipurpose activities such as night markets. The open spaces associated with mobility in urban centres are based on traffic organisation, as opposed to the railway lines. In other words, the design of roadways for mobility creates settings for open spaces and these areas aid in developing in people an appreciation of the environment and landscape (Yang et al., 2018).

- **Type 3: Wards adjacent to hills and creeks**

There are three Wards adjacent to the city's hilly areas. These Wards have reserved hills prominently presented in their geography. These Wards also contain creeks carrying water from the hills down into the city. Among these Wards, the hills of Ward 13 are partially accessible due to a military

settlement. These hilly areas can potentially contribute to the open space of the Chittagong City. Interview finding "h" (Chapter 6) suggested encouraging access to hills and establishing a rainwater collection area (a blue open space) with a dam that could supply the city with water and electricity. Figure 54 shows map of the Ward-1 containing hilly areas. For instance, Foy's Lake in Ward 9 was built to store water from the hills and was once used to supply water to the nearby railway community.

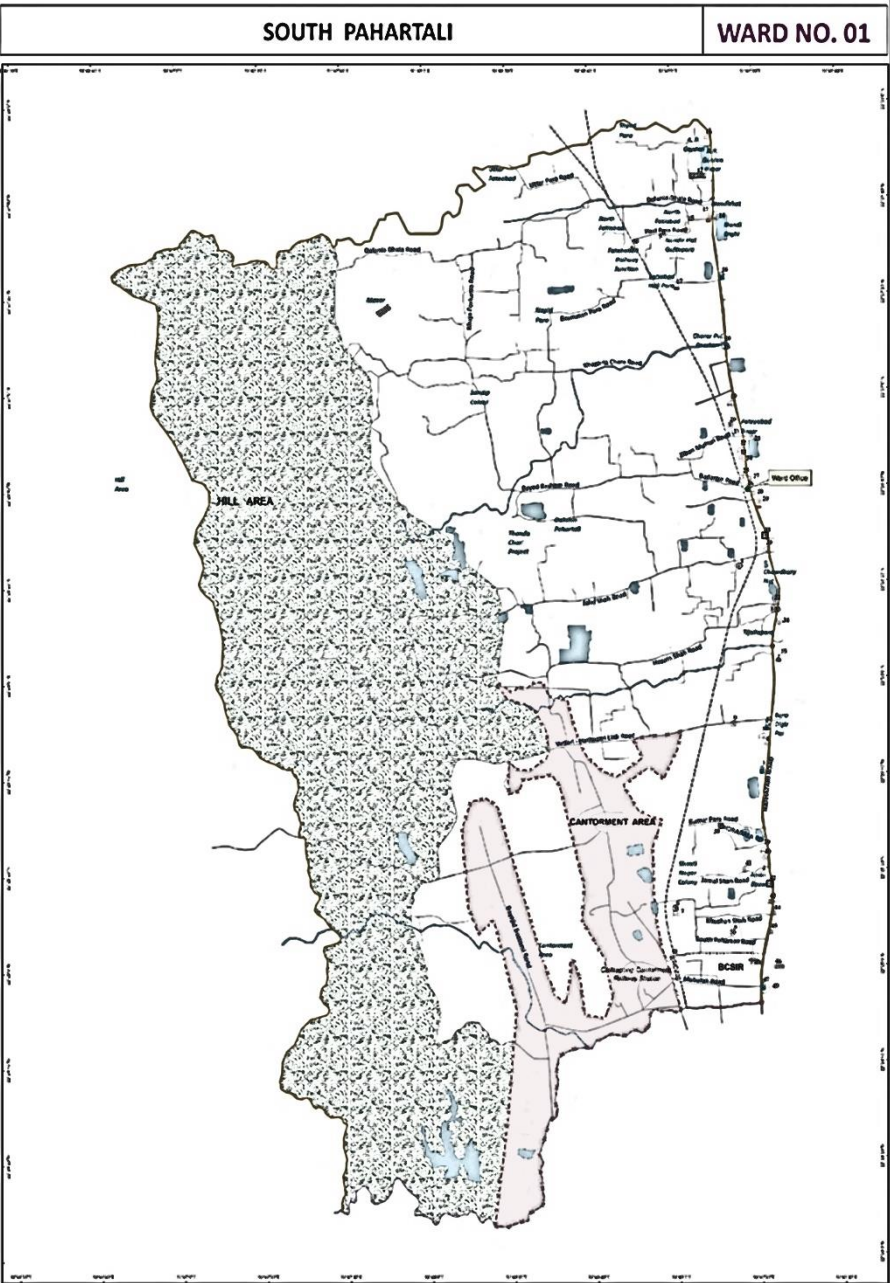
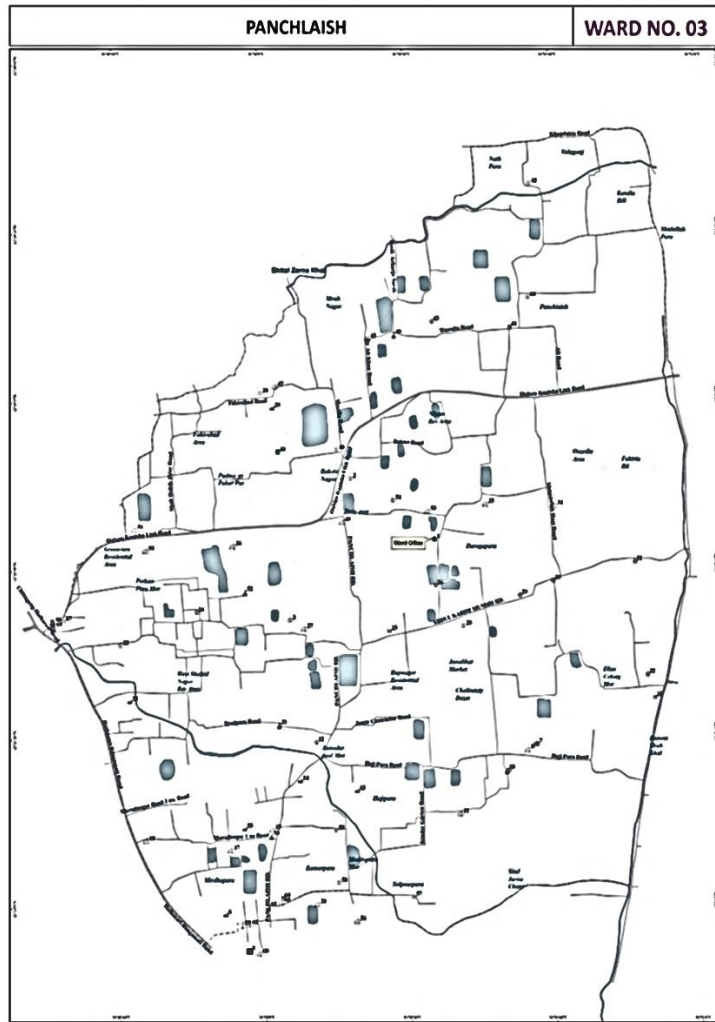


Figure 54: Ward type 2: adjacent to hills and creeks (Ward -1).

The area is partially accessible, as discussed in Chapter 5. According to the city's Detailed Area Plan (CDA 2015), the hills are a reserved area that was recommended to be developed by 10% to 15% with recreational amenities including hotels or vacation resorts. By doing this, it is intended to give visitors potential access to artificially created lake or dam, perhaps increasing the amount of open

space. The planning aims to give inhabitants access to recreation and open space as well as a supply of water, which the city desperately needs. Whereas 1st objective of 'Strategic Plan 2015-2020' of CWASA was to 'supply adequate, safe, clean, reliable, and sustainable water'. For example, according to the interview findings, the supply water of Chittagong's is collected from underground aquifers. The water level of underground aquifer has dropped five times in the last five years (Akter et al. 2017) and Chittagong is facing water supply crisis. CWASA (2015, p. 11) stated that "(t)he city is therefore water stressed with most customers receiving intermittent water supply service". The interview results "r" indicated that the creation of an artificial lake and a dam in the city's hills may potentially supply water from the hills, produce electricity and expand open space. Hence, if the CWASA can act on this suggestion, an increase in both water supply and open space for the city can be achieved. An example of this type of open space is 'Kaptai dam' located outside the Chittagong City area.

Ward 3 (residential)



Ward 4 (residential)

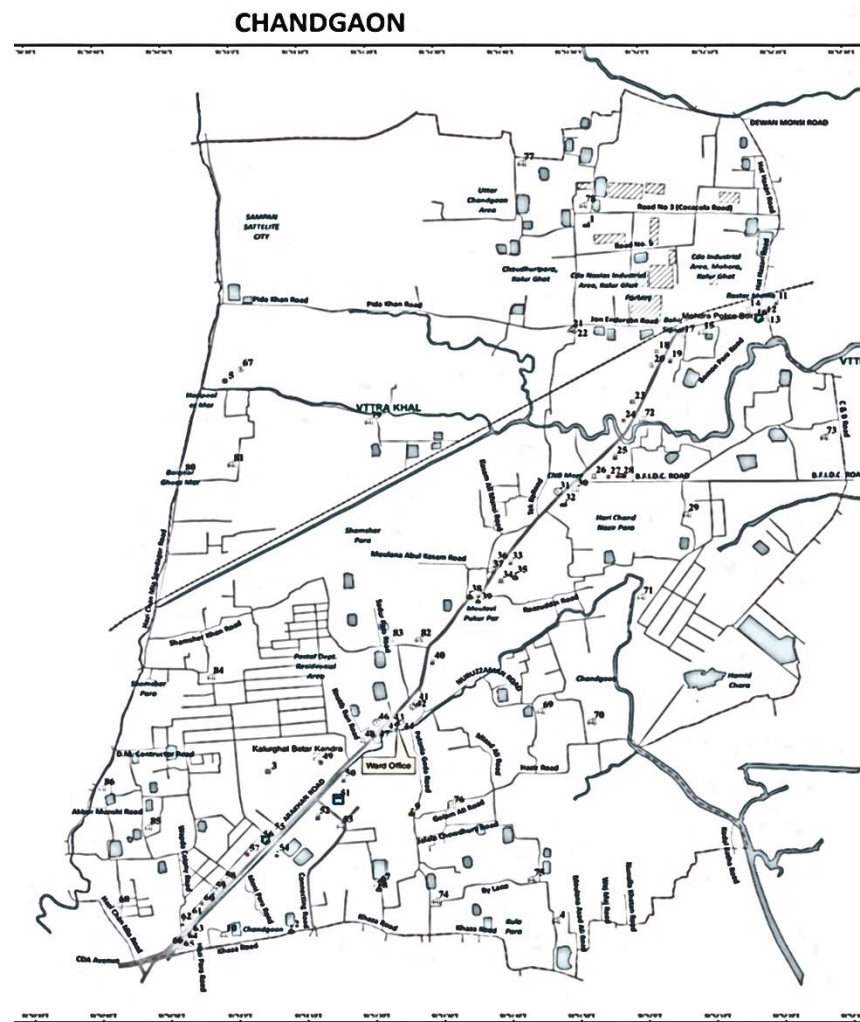


Figure 55: Ward type 3 - adjacent to canal (Ward 3 and Ward 4).

- **Type 4: Wards adjacent to canals**

There are 21 canal-dividing wards in Chittagong City (Figure 55). Within the boundaries of these Wards, there are no hills, rivers, or seashores. Compared to other Wards, these Wards are denser since they are predominantly residential areas. The only natural resources in these Wards are ponds and canals. These canals function as a sewerage system and are inaccessible. The majority of the amenities, including homes, are 500–1000 meters distant from the canals. The canals vary in width from 2 to 4 meters. Evidence from the interviews findings suggests that these canals, which are in total about 200 miles or 320 kilometers long, may support a 400-kilometer walking trail and bike track on both sides of the canal. To contribute to any future urban green space, the canals need to be preserved and isolated from the sewerage system.

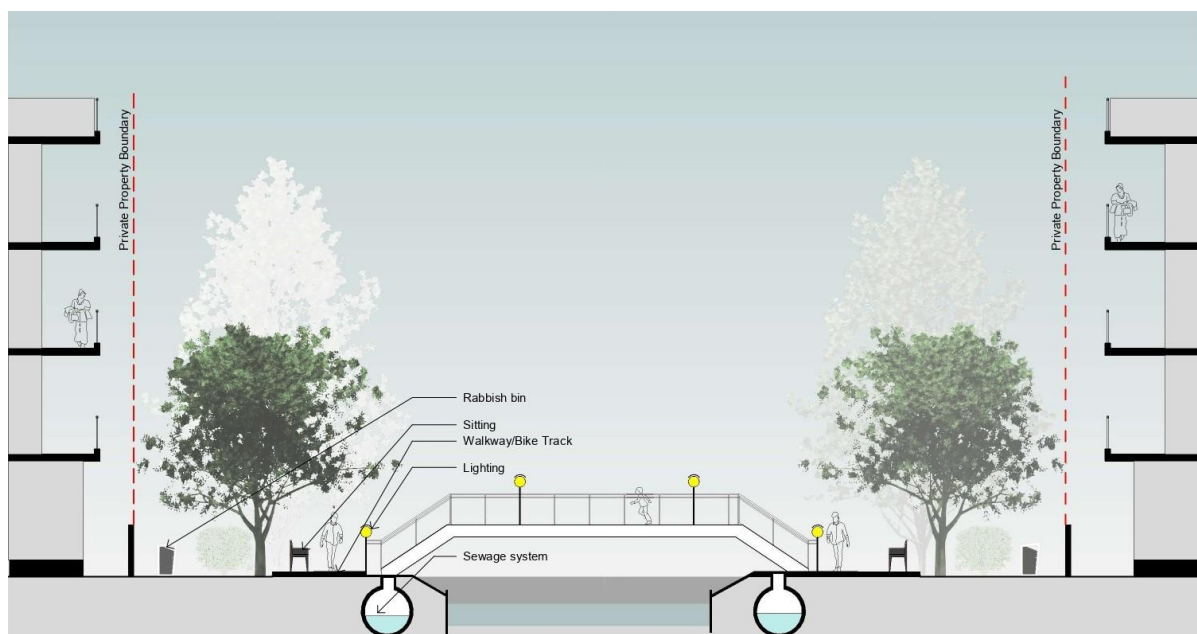


Figure 56: Proposed canal section.

Additionally, in accordance with finding "c" from the interview data (Chapter 6, Section 6.4), a supporting planning procedure that includes one-year, three-year and five-year proposal time frames needs to be developed in order to transform these canals into useable parts of the city that increase open space. This could coincide with "Chittagong Water Supply Improvement and Sanitation Project (CWSISP)" proposed by CWASA and funded by World Bank (World Bank 2017). The project aims to improve city environment and sewage network. Along with this recommendation, the city's Drainage Master Plan (CDA 1995) suggested widening and excavating the canals to prevent floods. Sanitation and drainage Master Plan by CWASA (Strategic Plan 2015-2020) also suggest to improve sewage system. Accordingly, using an existing city proposal that is also supported by the interview data in this study, it is possible to increase the amount of open space per person in

the city. Furthermore, and according to interview finding “k” (Chapter 6, section 6.4), separating the city's sewerage system from the canals could promote environmentally friendly open space corridors along both sides of these canals, effectively creating 400 linear miles or 640 kilometre of linear open space for the city and its residents. Yet, in the spirit of scholarship, it must be stated that the canals are not fully accessible and a finding from this research project's survey (i.e. Section 6.4: iv) stated that 55% of users did not have accessibility to natural open spaces such as these canals. So, redeveloping these canals into an open space system that supports the city does face realistic challenges. Figure 56 shows a proposal of canal cross-section prepared by the author that is derived from the above Ward adjacent to canal discussion.

Furthermore, and in relation to resident health and safety, survey finding (see Section 6: iv) identified that 44% of users did not like to visit natural open spaces close to their neighborhood associated with canals as these places are not clean or safe. Therefore, these canals need to be separated from the sewerage system and it is suggested here for them to be designed with proper landscape design techniques and approaches such as erosion-control techniques and resident-friendly/attracting concepts (e.g. seating, tree planting – see Figure 56) to protect the canals from soil erosion.

The above discussion has presented in step 1, a synthesis of the findings of objective 2 and 3. The findings from objective 2 established a relative benchmark by comparing open space standards practicing in cities and analysing local guidelines in context of Chittagong city. The third objective determined the residents' desire for open space and the city-specific strategies that might address that need. By synthesizing findings from objective 2 and objective 3, this stage provided a broad overview of how people' needs can be met by enhancing accessibility a natural open space.

Step 2, which summarizes the results for objectives 1 and 3 presented in chapters 4 and 6, is discussed in next section. The final section, Step 2, summarizes the findings from the historiography analysis, fieldwork, and literary studies. Results concerning steps 1 and 2 will provide credence to the claim that objective 4 (To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations) has been accomplished.

7.2.2. Step 2: Synthesis of findings for objectives 1 and 3

Based on the results of objective 1, chapter 4 has identified the historical open space that might be added to the city's open space. The ten different forms of historical open spaces presented in the chapter 4 has been laid in Wards are highlighted in Table 26. To aid in the planning of open space for conservation, the table indicates their placement within the Wards. In addition, chapter 5 presents 12

growth centres of four historical periods in Chittagong. Five of these growth centres are located near the Chaktai Canal. These are Patharghata, Anderkillah, Jamalkhan, Chawkbazar and Sholakbahar. shows that these 5 Wards are densely populated. While further research needs to be done to define the perimeter of historical open spaces that can be preserved and can help to add to the cumulative open space scenario. Therefore, can also help to contribute to the amount of city's per capita open space. It is recommended to note that the landscape features of these old open spaces offer case studies and suggest future directions for creating new public places in the city.

Table 26: Historical open spaces in Chittagong.

	Name	Location (Ward no.)	Area	Name	Location (Ward no.)
1.	Gandhi Maidan	20		Sadar Ghat	34
	Municipality Maidan	32		Ghat Forhad Beg	Unknown
	Nizammat Paltan Ground	22		Fishery Ghat	34
	Parade Ground	16		Patharghata	34
	Polo ground	23		Firingji-Bazaar Ghat	33
	Cricket ground	22			
2.	Minamutee beach	Outside		Chaktai Canal	16, 17, 20, 34, 35
	Parkee beach	Outside		Maheshkhali Canal	27, 37, 38, 39
	Asker Dighi (pond)	21		Deba degghi (pond)	28
	Jor Dighi (pair of ponds)	12			
	Foy's Lake	9			
3.	Ander-killah fort area	32		Karnaphuli River mouth	41
	Hands Park	32		Bungalows	Unknown
	Circuit House area	15		DC Hill Park	32
4.	Nachghar (dance hall)	20		Pahartali European Club	13
5.	Chittagong Club	15			15
6.	Railway land	8,13, 23, 26, 31, 37, 38		Port land	36
7.	Bayazid Bostami shrine	2		Chandranath temple	15
	Badr Auliya tomb	16		Prabortak Shangha	8
	Pandit Vihara	Unknown		Kaibalya Dham Asram	9
	Paterghatta church	34		Chatteshwari Kali temple	Outside
	Buddhist monastery	Unknown			
	Chawk bazar	16			
8.	Central Railway Building	22		Chittagong Court Building	32
9.	Batali Hill	14			
10.	War cemetery	16		Shahid Minar (martyr tower)	32

7.3 Principles from the findings

The above discussion material can be positioned in terms of a number of principles to improve the open space ratio in the city. These are:

- An open space development authority needs to be established.
- Small-scale areas like Wards need to be planned with local parks, playground and open space.
- Hills can contribute to open space by providing meandering paths and waterbodies.
- Canals must be created with suitable landscaping features and need to be separate from sewerage connections.
- Historical open space needs to be listed and their periphery needs to be demarcated for reservation.
- Open space developments must be coordinated between the city's responsible authorities.
- Local open spaces might be in 300- 500 metres walk in distance from neighbourhoods.
- Open space needs to be developed to promote biodiversity. This includes native planting of trees and shrubs.
- Open space should be multifunctional.
- Parks and playgrounds located within open spaces should be connected by walkways and footpaths.
- Small and leftover pocket lands can be used for open spaces.

The above synthesis of findings and summary of open space principles conducted through a discussion and elaboration of steps 1 and 2 support the achievement of objective 4 (To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations). The following section specifically applies these principles to a site in the city. This is done to apply findings that demonstrate a micro-level application of open space knowledge and its relevance to the city.

7.4 Applying the principles

Following the findings from objectives, each Ward need to be examined to establish potential locations for open space, local parks and playgrounds, connectivity and accessibility to natural resources, demarcation of historical landscape periphery and searching of pocket lands as well as the viability of these locations . This will enforce small-scale planning, which is in line with the WHO suggestions to "make green spaces available on a local level" (WHO, 2016, p. 41). Again Table 25 shows the density of each Ward and that each varies from 4757 to 163,398 people per square

A Map of Ward 20 (Dewan Bazar) has been presented in Figure 57, The jurisdiction area of the Ward Dewan Bazar is 96 acres and its' density is 163,398 person per square kilometer. In addition, Dewan Bazar is located in DPZ-2 of the DAP (CDA 2015) Chittagong. For instance, contrasts a park and playground measuring one acre in area with a Ward boundary to graphically visualise the minimum requirement (figure 57). The 300–500 metre walkability distance from the park is also displayed in the figure. Additionally, the material presented in this figure does not lend itself to determining how much open space each Ward needs for its density. Yet, as this cautionary note states, the material in this figure is used as a guideline to structure the possible locations of local parks and playgrounds in the respective Wards. Ward 20 has historical open space as mentioned in chapter 4 shown in figure 59. As the density of each Ward varies, the per capita open space of each Ward will also vary accordingly. Hence, any new planning of open space should lean to Wards being distributed according to density. A survey of the Ward's historical open space, current parks and playgrounds, and pocket lands is necessary in order to support the setting up of neighbourhood open space. The following section discusses on these landscape elements for Ward 20.

7.3.1 Walkability distance

The Ward 20 has only one playground located in the housing of the Public Works Department (PWD) area which is 0.4 acres in size. As a first step, and as mentioned above, the Ward's walkability distance needed to be calculated. The area surrounding this playground roughly 300 metres to 500 metres in size will benefit the locals and this space could potentially serve as a local park and playground if it is accessible to neighbouring residents (figure 57). This open space facility can be permeable for the neighbourhood, survey finding 6 suggested that the development of open space increases the frequency of users accessing park facilities. In addition to this existing setting, the Ward needs to set up another park and playground for its residents in walkability catchment area. For dense setting like this Ward, a small pocket land can turn into a local park and playground. The interview finding "m" (Chapter 6) suggested that small pocket-sized pieces of land within Wards could be potentially turned into playgrounds and parks needs further discussion as stated below.

7.3.2 Small pocket of lands:

To realistically support the creation of open space in Ward Dewan Bazar, it is suggested to identify pocket-sized pieces of land that are leftover city spaces, such as the spaces created by oddly shaped road intersections or land developments, which in themselves are usually small in size. To support this suggestion, pocket-sized pieces of land in this Ward which are scattered through it and can be found adjacent to the canal marked green in figure 57. This suggestion, however, and in terms of returning

to the city's planning framework, does need to be supported by the parks and open space department (see finding "a"), which in turn needs to preserve and develop these open spaces. In addition, the department needs to prepare a budget that would support the planning and development of these pocket parks.

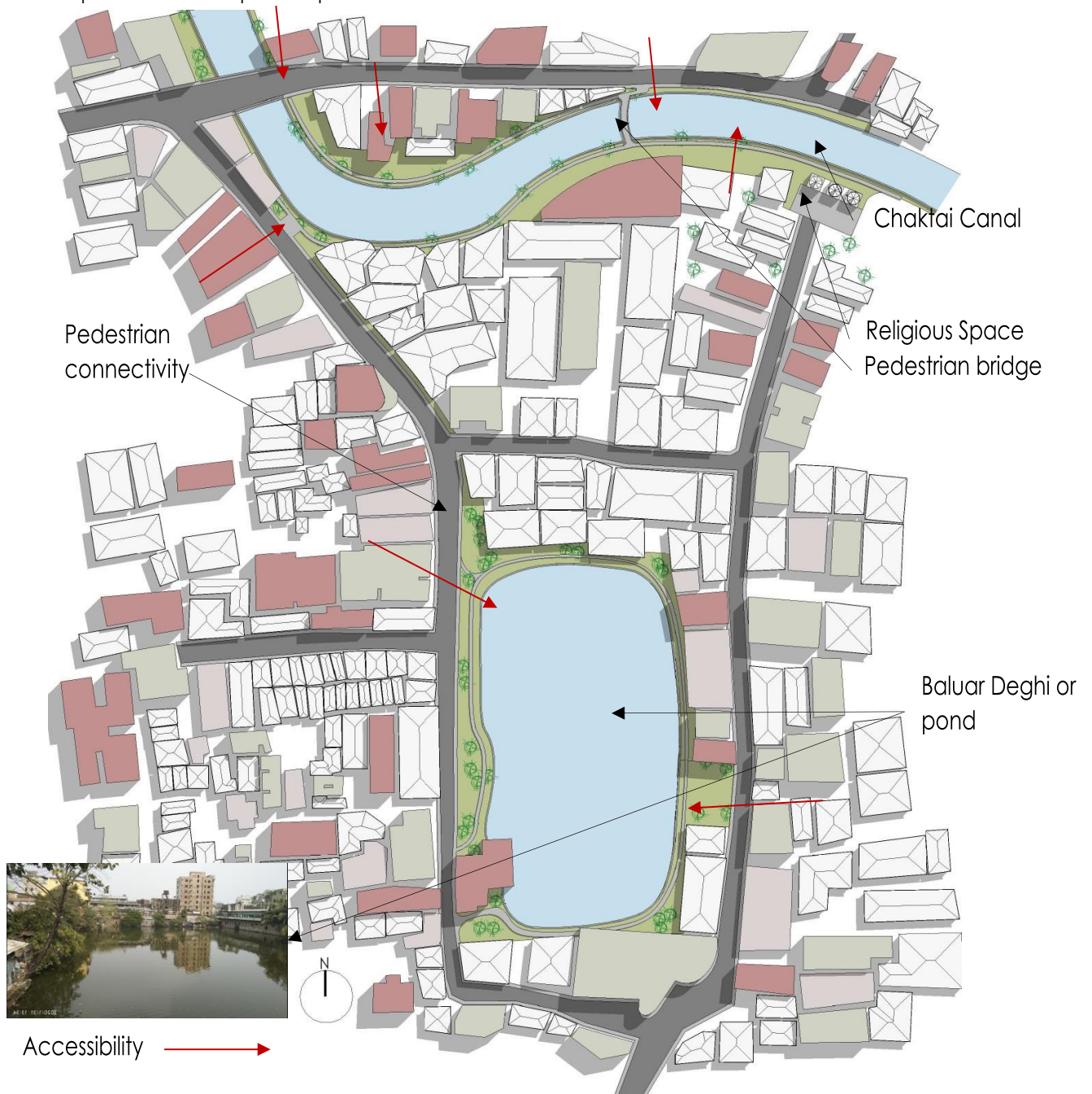


Figure 58: Relationship of blue open space to neighborhood

Source: Prepared by author from GIS map collected from CDA and Google earth.

7.3.3 Streetscape

Additionally, any new parks and playgrounds for this Ward need to be connected by walkways and/or footpaths. Moreover survey found that 50% of users would walk to a park and playground in their Ward area, if they had one, which supports the survey's claim that 32% of playground users do not have

sidewalks along the streets to get to a playground. Furthermore, a survey of the literature reveals that vendors occupy the majority of Chittagong City's sidewalks (figure 11). The Chittagong Building Construction Rule 2006 (CDA 2006) recommend minimum 6-meter-wide road, was evaluated in Chapter 5. In order to enable a 1.5-meter-wide walkway on both side of a 6-meter-wide road, the street in this ward need to be kept at a width of 9 meters, and sidewalks must be cleared to allow for pedestrian mobility facilities. Hence, to make the playground accessible to the neighbourhood outside the Ward boundary, it needs to be connected to the locality (i.e. established footpaths).

7.3.4 Blue open space

In the creation of a better open space ratio for the city and its residents, any new open space facility needs to be developed in line with the abovementioned water catchment principles or a hydrological system (e.g. canal system) that can also be used to promote biodiversity and the multi-functionality of the park and playground.

The existing natural pond Boluar Deghi in Ward Dewan Bazar could contribute as open space (Figure 58) and its edges could serve as open space for the residents, where the edges of the pond are now occupied by unofficial settlements and shops. In total this potential blue space area and its surrounding area is approximately 2 acres in size. This is supported by DAP (CDA 2015) guideline and interview findings to preserve ponds more than half acre in size³⁶. These ponds, which were listed in Chapter 5 (Table 17), can add 65.41 acres of open space in total to the city's open space setting if they are protected and maintained with guidelines. Hence, the existing natural pond (Boluar Deghi) needs to be retained in this Ward to serve as blue open space. Due to Boluar Deghi's proximity (100 meter) to the Chaktai Canal, both of these blue open places have the potential to be integrated and create an environmentally friendly open space if provided accessibility to neighborhoods (figure 58). The Chaktai Canal is situated on the edge of this Ward. The inhabitants of the Ward live approximately 300–700 meters away from the Ward boundary, where residents can walk with comfort to reach the Chaktai Canal. Given the densely populated surroundings, many residents might benefit from even a modest connection to these open spaces.

The Ward is also bifurcated by a secondary canal crossing Nabab Siraj-Ud-Daula Road and terminating at the Chaktai Canal (Figure 57). Although this canal suggests more open space for the Ward, it is unusable. This is because despite this canal having at its narrowest point a width of 3 to 4 metres, the side of the canal is occupied by informal settlements on its edges.

³⁶ The DAP recommended to preserve existing ponds, a minimum size of 0.5 acres (Chapter 5).

The pond and canal are existing natural open spaces that currently are unusable by residents because of environmental condition. When this pollution element is examined more closely, the survey data identified that 90% of residents living close to a canal do not access to the canal, with pollution being a major negative factor barring use. Hence, those who does not have access to open space features, according to recommendation "l" (see Chapter 6), the respondents suggested to initiate accessibility to natural reserves and resources like canals or other potential open space features such as hills, rivers, the sea and other water bodies.

Understandably, cleaning up the Ward's canal areas involves budgeting for these types of works. But the sentiment of cleaning up canals such as this was supported by respondents. For example, interview finding "g" (see Chapter 6) suggested that canals need to be separated from sewerage systems to promote environment friendly open space corridors for city residents. The existing canals in Chittagong City are blocked by garbage and waste disposal. In support of the city in relation to this discussion point, the CCC and CDA have started to clean and reclaim canals throughout the city area. Note that blockage of canals is creating flooding during the rainy season in the city. Yet, the CWASA and CCC maintain and are responsible for the canals in Chittagong. Interestingly, city residents are aware of this responsibility and according to interview finding "c" (see Section 6), the city's open space department need to coordinate with the CWASA and CCC in their proposals for development and maintenance of canals. The point is that, to improve the open space ratio for this Ward's residents, and the city, coordinated efforts between the city's responsible authorities need to occur.

However, as a word of caution, to convert this space into a recreation area, the cost of land is a factor that would need to be considered if, for example, the abovementioned parks and open space department find it feasible to proceed with this course of action. The canal is listed as a historical open space element for the city and is identified by the city to be reclaimed and used as open space in chapter 4.

7.3.5 Historic landscape:

Dewan Bazar has three historical sites, as listed above in Table 26, that used to serve the Ward's residents as open space and potentially could be regained and turned into public open space. These are Gandhi Maidan (32 acres), Nach Ghar (550 sq. m) and Chaktai Canal. Among these, Ghandhi Maidan has been lost to development but has most promise to converted back into accessible open space for the Ward. It is located at the foot of Rangmahal Hill (figure 59). Rangmahal Hill itself was the previous name of the hill that contains the Anderkillah mosque (Hossain, 2012b) and part of the Ward

Dewan Bazar is adjacent to the hill. Chittagong General Hospital is located in this area (Jafrin & Hossain 2020). Therefore, to commemorate the historical speech of Mahatma Gandhi, the hill of Chittagong General Hospital needs to be a public open space. Its restricted access also prevents people from walking through the green lung of the Ward (Figure 59). This historic landscape surrounded by highly dense commercial and residential area needs accessibility for the residents.

The example above shows how to plan open space in the smallest jurisdictional region in Chittagong, the Ward, by considering local parks, pocket of lands, the area's historical landscape, and natural reservoirs. The elements that must be considered when creating these open spaces will be covered in the section that follows. The neighborhood or local park is one of these spaces that will be covered first.

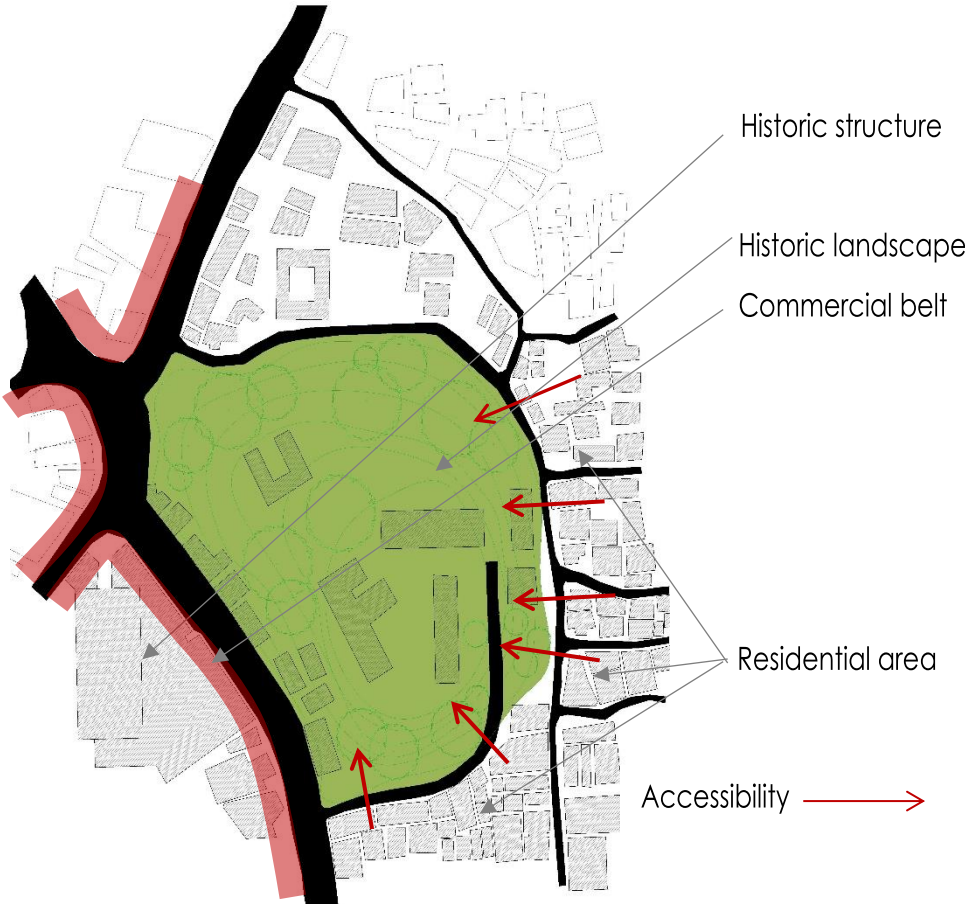


Figure 59: Historic landscape and accessibility

Source: Prepared by Author.

Local park design

In the context of Chittagong City, local parks and playgrounds are required to be guided by the city's planning guidelines and proposals. The detailed guidelines regarding this open space can be related to the findings from the literature review, survey and interview data analysis.

Local park catchment area and size in Australia and Dhaka were presented in Table 8 and Table 13 in Chapter 5, where the recommended range for a local park's size is 1 to 2.5 acres and 5 to 10 acres consecutively. In a dense setting like Dewan Bazar, local park sizes can be carefully negotiated to serve the residents. For example, it could be less than 1 acre in size. This size concept is supported by findings that the existing park size available in Chittagong city is less than 1 acre (finding from objective 2). An example of this size can be found in Dhaka where 0.66-acre size park which serves 40,000 people living in half kilometre distance (Archasia 2023) which is created and built with local considerations.

In order to proceed with the establishment of neighborhood parks and playgrounds within the city, it is crucial to take note of Table 22 in Chapter 6, which examines the factors that contribute to both an increase and decrease in park and playground visits. In terms of local park development, landscape elements added to surveyed open spaces presented in Table 2 of chapter 3 need be taken into consideration. Table 2 concentrated on landscape aspects including benches, trees, playground equipment, and walking trails that should be adhered to in future development, while interview added multi-function, biodiversity and shelters for climatic consideration.

According to the survey analysis in this thesis, 70% of female playground users used the walkway for their evening walks. This is an interesting survey finding because in Chittagong, the literature suggests that female users are less involved in outdoor activities (Chapter 6, Table 21). Therefore, a suggestion stemming from this discussion is that by promoting walking trails in parks may increase the number of female users of this type of open space element.

Furthermore, 86% of playground users thought that they should have a playground in their neighbourhood for children up to 15 years of age and the female park users stated that their children need play equipment in parks. This suggestion is also important because 65% of parents could not send their kids to playgrounds as they were unavailable in their neighbourhoods. Therefore, both walking trails and playing facilities may increase the numbers of both women and children using these types of open space facilities.

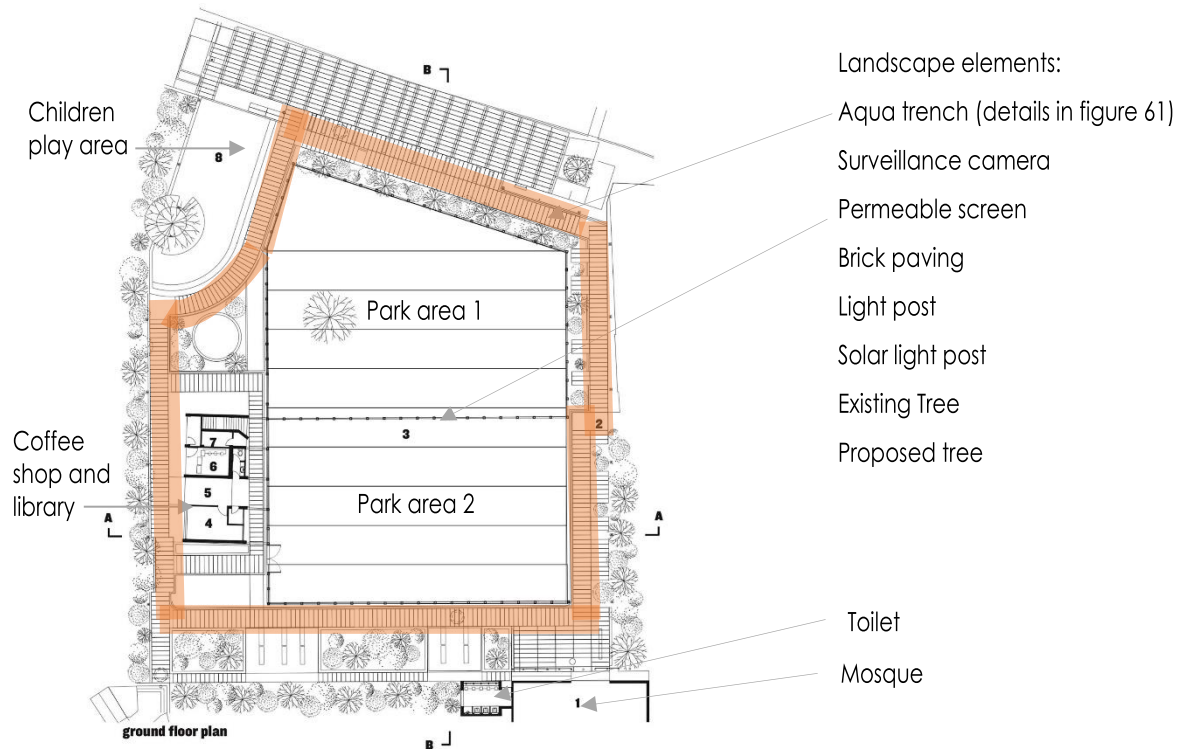


Figure 60: Local Park design.

Source: Chowdhury (2022), Archasia (2022)

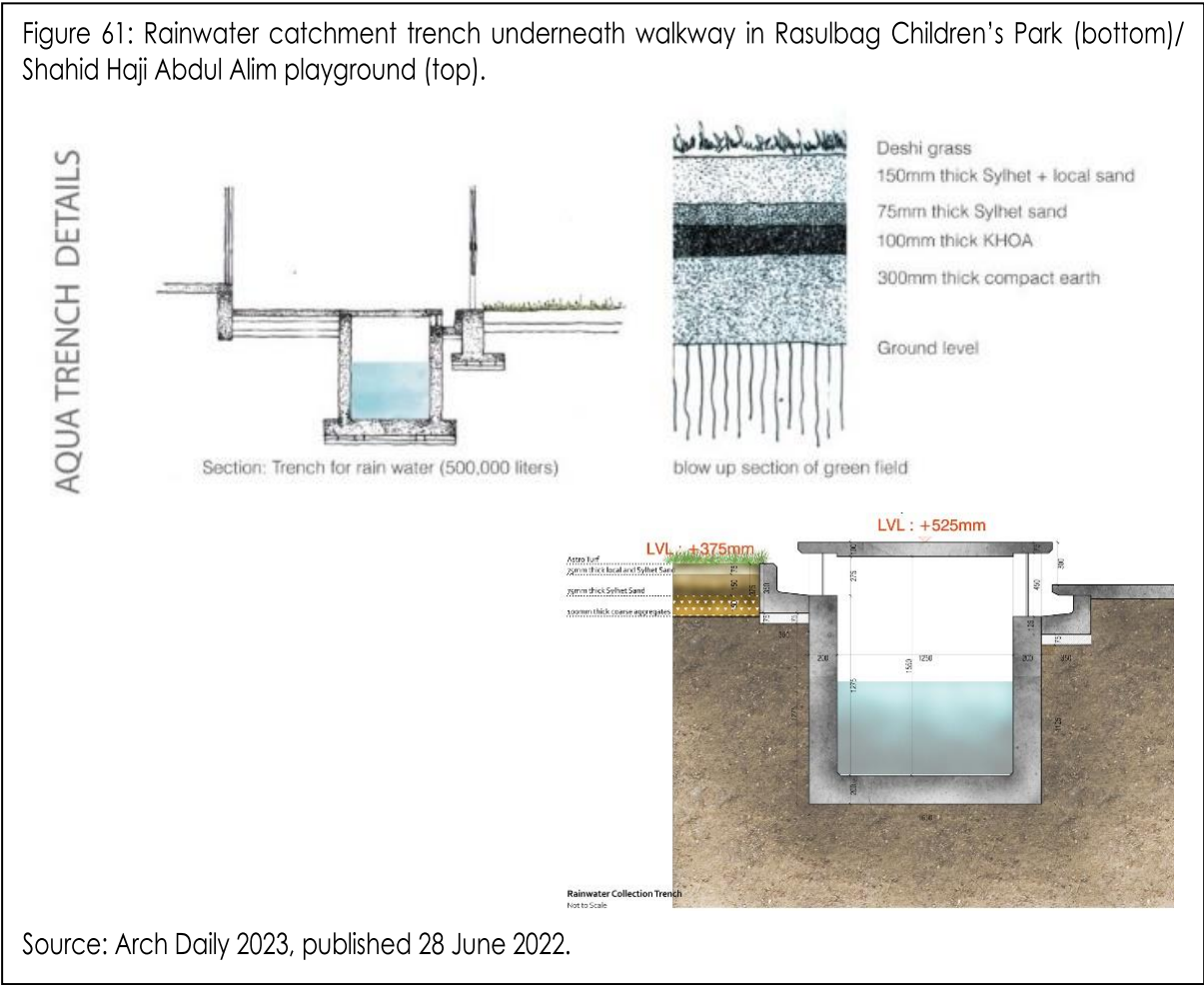
The interview finding “k” (Chapter 6) suggested that multifunctional use of open space is important to residents and, according to survey finding 11, 79% of users wanted to have both park and playground arrangements. This can be projected to Wards creating a multifunctional park and playground setting that may include features such as play equipment in the playground, a coffee shop, bookstores, walking trail, a night market and other elements.

Additionally, and in partnership with this water accommodation approach to open space creation, according to interview finding “p” (see Chapter 6) it was suggested to promote biodiversity and ecology. This could be achieved by planting local fruit-bearing plants and flowers, and trees that respect local habitats. Lastly, any newly created open spaces in the city need to have management and maintenance of them conducted on a regular basis. This could be achieved by neighbourhood residents, as directed in the interview data.

Interestingly, interview finding “i” (see Chapter 6) also suggested that hydrology must be taken care of in low-laying areas while establishing of open areas to avoid flooding. Therefore, small, local open spaces could also act as water-catchment areas or rainwater harvesting areas, which could reduce flooding in city areas and serve the community with emergency water systems for firefighting. An example of this type of park can also be found in the Rasulbagh Children’s Park and Shahid Haji Abdul Alim playground project developed by the Dhaka South City Corporation in 2018 (Chowdhury, 2022).

Here, an underground peripheral water trench of one metre in width and two meters in depth serves as a drainage system to collect overflowing water and aid with park irrigation during the dry season (Figure 60). This water channel located beneath the park's walkways as deep trench collects and store rainwater runoff from the adjacent parkland.

Reducing floods could be achieved by removing runoff water from city streets through the above-suggested drainage systems. Furthermore, studies on the Chittagong City have shown that



Chittagong's low-lying regions get flooded during the monsoon season because of inadequate drainage systems (Islam & Debasish, 2021). Therefore, in order to reduce overflow of water during rainy season, a trench needs to be created around the perimeter of any new parks and playgrounds. This suggestion is particularly relevant to the following Urban Storm Waterlogging (USWL) areas in Chittagong: Nasirabad, Prabartak, Sholoshahar, Muradpur, Bahadderhat, Chawkbazar, Badurtala, Bakalia, Kapasgola, Chaktai, Agrabad, Halihsahar and Patenga (Akter, 2017).

Again, Table 22 concentrated on safety, security and maintenance to enhance park visits. Table 9 provides a range of landscape setting in open space of London depending on classification provides a brief how landscape elements can categorise open spaces. For playground design, Wortham et al.

(1990) suggestion for equipment, environment, safety measures and maintenance need to follow. For instance, landscape elements used in a recently developed park located in Dhaka city named as Rasulbag Children's Park (Figure 61) was noted in the interviews.

Canal restoration:



The synthesis of the first step's conclusions included a discussion of the literature study, survey, and interview analysis, which recommended developing the 200 miles of canal system in Chittagong by disconnecting the sewage system from the existing canal and creating linear open space on both sides. A typical canal cross section was also suggested for development as open space in Step 1 of synthesis of findings. A reflection of the abovementioned canal restoration can be found in Dhaka City known as "Hatirjheel- Begunbari integrated development project" (figure 62), where the Begunbari canal has been reclaimed and in doing this has created 302 acres of new city open space (Ahmed, 2017). Hatirjheel, the largest reservoir in Dhaka, has a crowded environment surrounding it and was in high demand for local accessibility to the lake (Sanne P., 2015). The first phase of the wetland restoration project started in 2007, and the second phase started in 2013 (Ahmed 2017). This project also provides water-based transportation system. It needs to be noted that Chittagong City's Chakai Canal has water-based transport system that might be strengthened with canal restoration project. To extend this redevelopment concept to Chittagong, the city has 200 linear miles of canals that could potentially be transformed in a similar manner and used to contribute to a per capita gain in open space in the city. To achieve such potential, however, does need planning and any transition would need to be conducted in stages under, as mentioned in finding "c" (Chapter 6), short-term and long-term budget time frames prepared by the CWASA and city's parks

and open space department.

Summary

Dewan Bazar is used as an example to illustrate how a specific Ward may increase its open space. However, each Ward in the city varies in terms of its size and physical characteristics, which include, for example, its streetscapes, historical spaces and land uses. These characteristics need to be accounted for applying the respective principles mentioned above, which in themselves have been derived from the literature review, survey data and interview findings. Furthermore, with respect to the Wards' different land uses and residential makeup, the open space function varies. Such as local open space in commercial area may not include playground. This notion, however, an increase in open space can be positioned around the various Wards identified in this chapter. That is:

- Type 1: Wards adjacent to the sea and/or rivers – could be used to enhance accessibility and contribute to the city's total open space.
- Type 2: Ward adjacent to railway land – could be used to serve transportation corridors with multi-functional use such as night market.
- Type 3: Wards adjacent to hills and/or creeks – could be used to supplement the regional open space dimension of the city could include dam and accessibility should be preserved as forests or reserves.
- Type 4: Wards adjacent to canals – could be used to establish a canal based open space network throughout the city and each Ward they run through.

The above-discussed synthesis of facts provides strategies for improving open spaces to meet the expectations of locals. The concept, which came about as a result of study, has been applied to demonstrate how the rules should be implemented in a dense settlement of the city.

7.5 Conclusion

This chapter has discussed a number of points that could be used to improve the open space ratio of the city. It did this by expanding upon the findings related to objectives 1, 2 and 3, which were used as a foundation to address objective 4 (To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations). This foundation was set by establishing a two-part discussion process that started with a series of steps to achieve a rollout of open space to improve the open space standard in the city. This discussion was followed by a description of the Wards contained within the city and their respective characteristics. Ultimately, the discussion led to a considered application of the steps and use of a series of principles designed to improve the city's open space ratio, generally in the Wards and in the specific example of Dewan

Bazar. In doing all this, objective 4 of this thesis is achieved. The following chapter concludes this thesis by presenting statements of significance related to this research project.

Chapter 08: Conclusion

8.1 Introduction

This thesis focuses on the declining amount of public open space in Chittagong City. This port metropolis, which had an estimated 3.56 million population in 2011, is rapidly becoming more populated (CCC, 2011). Currently Chittagong City has 0.243 square metres of official open space per capita (Hasan 2008). This number was obtained from CCC-controlled open space records. Consequently, negative environmental impacts due to this lack and reduction of open space in the city are increasing, such as flooding. Hence, it is a concern for this researcher (and other city officials) that the city's development control authority has not established a per capita open space requirement for Chittagong. Therefore, and accompanying urbanisation, the city's open spaces are reducing due to a lack of planning guidelines, proposals and government initiatives. The conceptual structure of this chapter as developed is based on Beza (2006), with permission.

The aim of this study was to understand how open space planning is practised around the world and to use this knowledge to develop a theoretical framework and design criteria to achieve a per capita standard for open space in Chittagong. To achieve this aim, the thesis focused on four objectives, each supported by a series of questions. Hence, the thesis is divided into five phases; the 1st phase was to introduce the background of the thesis and to develop the research structure of the thesis. The 2nd, 3rd, 4th and 5th phases investigated the respective questions associated with the four objectives, which themselves were designed to support achievement of the aim of the research. The investigation associated with each thesis objective concluded by synthesising the findings. This synthesis resulted in the development principles and guidelines for open space development in Chittagong City. Furthermore, these data-derived principles were applied in Dewan Bazar, which is a dense setting of Chittagong City. This was done so that a relative open space standard could be developed specifically for this (developing) city and, hence, achieve the aim of this thesis.

The remainder of this chapter provides a summary of the findings for each of the research questions under their respective objectives and concludes with a presentation of the implications of this study that establish recommendations for academics, open space professionals (e.g. urban planners) and local residents for future research.

8.1 Summary

The research questions under the four objectives of this thesis are the foundation for the summary of the findings in Chapters 4, 5, 6, and 7. These objectives were:

Objective 1: To examine and document the evolution of existing open space in Chittagong.

Objective 2: To establish a relative open space benchmark and standard that Chittagong can reference in its open space developments.

Objective 3: To investigate approaches to realising open spaces in Chittagong City.

Objective 4: To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations.

To professionals, researchers, local residents and development control authorities, the materials associated with these objectives provide new strategy based on which the open space in Chittagong City can be structured and addressed with respect to the city. Thus, this synopsis describes the phases of the study's work as outlined in the research design chapter, and it discusses the potential applications of the findings from Chapters 4, 5, and 6 that are synthesized in Chapter 7. The research conducted in five phases. These phases are discussed as below:

8.1.1 1st phase: Preliminary research and fieldwork

In order to aid the exploration of the research questions, the 1st phase of the study, which served as a prelude to the main body of the study, employed a variety of research approaches to gather information about open space. This phase comprised outlining the objectives of the study, characterizing the problem, developing a conceptual framework for open space, providing a synopsis of Chittagong in light of its declining open space, and developing a research methodology. To facilitate investigations of the research questions, the preliminary research techniques involved examining related resources and research materials and evolving a research plan and associated procedures to accomplish the thesis objectives.

The research strategy was largely based on Yin's (2003) explanation of the case study design approach. In phase 2 of the study, the case study approach was employed to document the current and past open spaces in Chittagong by gathering information from the city's planning authority, archives and pertinent historical documents, and then using that information to describe each place (i.e. each open space). Critical to the 2nd phase of the study was to understand the evolution of open space in Chittagong and its current state to achieve the 1st objective. Conducting literature review, this phase investigated the open space standards and guidelines practised around the world. Hence, the study in this phase was used to investigate the local guidelines for Chittagong and the associated strategies presented in Chittagong master plans and the city's development control rules.

Phase 3 of this research focused on analysis of the city's development initiatives to comprehend the potential for addressing the open space standard in Chittagong, which was done to meet the study's 2nd objective. Quantitative approaches were utilised to enable the researcher to compare how open

space is used in various cities throughout the world. This phase included analysing open space practises in other cities by contrasting the open space usage in Chittagong City with those of other cities. This included investigating open space typologies or classifications, reviewing area allocations in each typology, examining planning guidelines, and identifying hierarchies. In next phase, qualitative methods were used to broaden the study's focus through social research. Following phase 3, participants' observations and professional's thought were taken into account to accomplish the goal. This was done as a field study to learn more about open space concerns in Chittagong from the viewpoints of city residents. Since Bangladesh is a non-English-speaking nation and language is the most evident barrier to organising and conducting surveys (Bulmer, 1993), both the survey and interview questions were constructed in Bengali and English (Appendix 8 and 9) for ease of communication between the respondents and the interviewer.

The researcher surveyed 279 city residents' perception regarding their experiences of visiting Chittagong's open spaces. To do this, the researcher selected three recently developed open spaces (approximate year of development: 2014 to 2019) regarding their importance to the city's residents. The three different open spaces selected for the survey were Chittagong Railway Building (CRB) open space, Jamboree Park and the Parade Ground. Among them, CRB open space is a city park, Jamboree Park serves as a neighbourhood park and the Parade Ground serves as a playground. Together these settings represent the general range of the city's current open spaces that residents can access.

The surveyed users were given information on this study and subsequently completed the questionnaire. All respondents were informed that they could contact the Human Research Ethics Committee at the address provided if they had any concerns or issues regarding this research. Deakin University, where this experiment was carried out, granted ethics approval (Appendix 3) for this study to conduct the survey and interview. The survey questions (presented in Appendix 6) themselves were prepared to examine users' satisfaction and experiences with the city's parks and playgrounds. The three sites' questionnaire designs were identical, but the responses given by respondents differed due to the diversity of the persons who were questioned (Bryman, 2004), which was intended. An interesting fact regarding the survey interviews with Chittagong professionals was that they mostly preferred to conduct the interview in English rather than Bengali. Hence, both Bengali and English version of the questionnaire were used. They preferred English in order to communicate effectively using common terminologies.

Additionally, the survey was comprised of a series of open and close-ended questions. However, some parts of the questions were not answered by the users because they lacked experience or familiarity with the respective question or the material was unrelated to their knowledge/experience base. The questions in the survey revolved around four sections. Gathering general demographic information on the user's age, gender, educational history and employment status was the focus of the 1st section (part A) of the inquiry. The 2nd section of the questionnaire (part B) was centred on the specific park, open space or playground that they visited in this study and was designed to track changes in respondents' usage patterns as a result of (re)development work done on the specific open space setting under investigation. Furthermore, respondents were asked about their experiences with neighbourhood parks and playgrounds in the 3rd section (part C) of the survey. Lastly, users' proximity to natural open spaces in the city, such as lakes, rivers, hills, ponds, canals and the sea, was assessed using the fourth section of the questionnaire (part D). Since the intended audience for the study was residents who frequently visited parks, playgrounds and other public spaces, the questionnaires were addressed by two different participant groups and all respondents were over the age of 18. These groups were titled playground visitors and park visitors. The researcher was able to examine user experience, their aspirations regarding the city's open spaces and their level of satisfaction with accessible open spaces within the city.

The interview method used to gather data from 13 professionals working in Chittagong, such as environmentalists, historians, city officials, architects and planners, The process began by conveying the project description/protocol to respondents in order to involve them in addressing the thesis research aim and objectives. The interview questionnaire for this respondent group was structured into a research-ready format and also received ethics approval (Appendix 3) from Deakin University. Therefore, this study employed both qualitative and quantitative methods based on Braun et al. (2006) by conducting literature review, survey and interview.

In this study, the results from the survey were analysed by creating a weighted ranking, where the rank of a particular observation in a dataset was weighted by several variables. This weighted analysis technique was based on Costa (2015). The researcher also projected the survey data using SPSS and NVivo software to facilitate the analysis.

In phase 5 of this thesis project, the researcher continued by synthesizing findings of the objectives in two steps. The 1st step synthesized findings of objective 2 and 3. While the 2nd step synthesized the findings of objective 1 and 3. These provide the researcher with guidelines for meeting the aspirations of the locals in Chittagong by achieving open space standard for the city. The above material

presents a summary of the entire thesis process and the following presents specific data relative to the respective thesis objectives.

8.1.2 2nd phase: The 1st objective and data to be discussed is 2nd phase, which is

Objective 1: To examine and document the evolution of existing open space in Chittagong.

To address this objective, the researcher examined and documented the evolution of existing open space in Chittagong. This examination found that historical open spaces in Chittagong are diminishing. Hence, to identify the city's open spaces that have evolved over time, it was important to itemise the open spaces associated with the city's historical significance. Thus, preparing an open space inventory and developing a historical background of the city's landscapes was a necessary step in the process to meet this objective. Therefore, the 1st question under objective 1 was:

a. What types of open spaces have existed in Chittagong?

To answer this question, the transformation of Chittagong from a minor port town into a modern city was traced back from the 7th century, where the city's 1st major open spaces can start to be visualised (Jafrin & Hossain, 2020). Furthermore, to trace the city's open space developments, five significant periods representing the city's historical growth centres and their influence on the city's fabric were examined. These are the Harikela period (7th century BC to 1340), the Sultani period (1340–1538), the Arakanese period (1575–1666), the Mughal period (1666–1760) and the British period (1760–1947) (Hossain 2008). In Chapter 4, in response to the landscape history of Chittagong, their corresponding open space typologies, the migration of growth centers, and the modification of the landscape in Chittagong during five main historical periods were discussed.

The results of this investigation revealed that the city contained the following types of open spaces: administrative, commercial, commemorative, transportation-related, open spaces linked to religious locations, social and community open spaces, open spaces connected to waterbodies, gardens, and parks, and cultural open spaces. Important structures from these periods associated with open spaces were Buddhist temples and viharas, forts, mosques, tombs, commercial hubs and social clubs. These historical forms were planned with significant open areas revolving around them. These helped identify the lost open spaces that had to be revived and aided the researcher in identifying the factors that impact on declining open space.

The study found that Chittagong's canals are part of the city's heritage since their momentous accomplishments and help to define the characteristics of an ongoing cultural landscape. The study's conclusion addressed the current state of Chittagong's historical open spaces in order to fulfill its 1st goal.

The open areas associated with the city's historic sites were enumerated in chapter 4. As a result, historical context for heritage landscapes was established, and the creation of a heritage inventory was recommended as a necessary step in the procedure. Such historical documents require the scrutiny and backing of a knowledgeable heritage management team composed of academics and professionals. During their investigation, this team may recommend land uses that enhance the corresponding heritage sites and can be applied to the creation of open space conservation and preservation policies. Additionally, it advised that a special committee needs to be formed and equipped with the authority to evaluate any development in these sites.

In addition to examining the historical open space typologies in Chittagong, the researcher recorded their landscape characteristics and elements used to enhance the open spaces. Next, to develop and support an understanding of the city's current open spaces, the 2nd question under objective 1 was:

1.2 What types of open space currently exist in Chittagong and to what extent are these accessible to the city's residents?

This question was answered by mapping the present-day open spaces available in the city. This mapping exercise involved the researcher exploring the amounts of existing open space, available typologies and their relative area distributions throughout the city. The distribution allowed the researcher to identify typologies that require special consideration to improve open space settings. As a result, the study assisted the researcher in determining the kinds of open spaces that are either absent or exist but need special consideration before they can be improved or established throughout the city. Material related to this objective and respective questions was presented in Chapter 5.

8.1.2 3rd phase: The 2nd objective and data to be discussed is 3rd phase, which is:

Objective 2: To establish a relative open space benchmark and standard that Chittagong can reference in its open space developments.

To address this objective, for the researcher to set an open space benchmark for Chittagong City, it was necessary to understand the open space practises around the globe. Therefore, the 1st question under this objective was to investigate differences in open space practises among cities around the world:

2.1 What open space benchmarks and standards exist around the world and to what extent are these applicable to Chittagong City?

To answer this question, contemporary open space planning standards with four matrix practises found in terms of open space were presented. These were quality, quantity, accessibility and

neighbourhood or locality. Among these, the researcher focused on the quantity matrix to apply in Chittagong City. According to Hassan (2008), Chittagong presently has an open space ratio of 0.243 square meters per resident. Nonetheless, it is advised that the minimum open area per person be established in accordance with WHO (2016, pp. 11) guidelines, which ask, "What is the minimum amount per person required?" These guidelines fluctuate significantly in urban areas and have not yet been established for Chittagong. The examples of varying standards highlight the fact that there is no "one size fits all" approach to set appropriate open space standards in a dense setting like Chittagong. Therefore, the researcher investigated a relative per capita open space ratio in cities considered to be in a developing setting and that are densely populated. To find an appropriate standard for open space in Chittagong, the researcher extended her investigation by revising the Master Plan guidelines and planning controls available in Chittagong City. Thus, the next question investigated the guidelines projected for existing open spaces in Chittagong City:

2.2 What open space guidelines currently exist in Chittagong City?

Guidelines from the Master Plan and the DAP were examined to provide an approach. This emphasised that Chittagong's current open space situation could be improved by merely putting the city's open space master plan recommendations into practise. Therefore, the chapter concluded with a proposal of 1.67 square metres of open space per inhabitant following the suggested implementation proposals provided in the city's different master plans. This discussion is presented in chapter 5.

The thesis aimed to look into the methods for realising open space in Chittagong City, following the guidelines for per capita open space with current open space suggestions in the Master Plan. As a result, the 3rd objective was as follows:

8.1.4 4th phase: The 3rd objective and data to be discussed is 4th phase, which is:

Objective 3: To investigate approaches to realising open spaces in Chittagong City.

In order to accomplish this goal, the researcher investigated users' preferences and expert opinions in realising open space aspirations in Chittagong. As a result, the questions included under this purpose were as follows:

3.1. What are the city's open space aspirations and how do these meet the urban growth plan of Chittagong? and

3.2 What city-specific open space considerations best support the open space aspirations of Chittagong?

To answer these two questions, the researcher conducted survey of users' preferences in a park, a playground and an open space setting in Chittagong and interviewed professionals to document environment practitioner perceptions of the existing open space setting and provision in Chittagong City. The survey and interview questions are presented in Appendix 7. A research approach was developed and presented in Chapter 6 to analyse the survey and interview material. Hence, the survey responses were counted with a weighted ranking and analysed through the software known as SPSS (Statistical Package for the Social Sciences) and the interview materials were examined with qualitative data analysis software known as NVivo. The survey and interview responses were recorded in either Bengali or English where language was a barrier to overcome. The researcher translated the data from Bengali into English and prepared transcripts of the interviews (Appendix 15). NVivo helped the researcher to analyse the interview data where thematic coherence of material was developed and used to support a discussion of this data.

The researcher analysed 13 interviews and 279 survey materials. Although the results for the survey and the interviews are separate datasets, they complement one another. The findings from the survey and interview data were presented in Chapter 6. The chapter concluded with a comparative analysis of the findings from the survey and interview data (Table 24). Therefore, the researcher was able to establish a platform to handle the open space settings in Chittagong City through the interview and survey analysis. The survey results also suggested the need for more parks and playgrounds in the city and to upgrade accessibility to natural open spaces. The interviews covered both the potential of natural open spaces and their prospective uses in this regard. As a result, the discussions and insights from the interviews were supportive in addressing Chittagong's open space setting. Hence, the survey results were worthwhile and enabled the researcher to outline a strategy for achieving users' preferences for open space in the city. Therefore, the next objective was:

8.1.5 5th phase: The 4th objective and data to be discussed is 5th phase. The objective is:

Objective 4: To recommend approaches on how open space should best be established to meet Chittagong City residents' aspirations.

To achieve this objective, the researcher organised the findings from the 1st three objectives. The researcher synthesised the findings from objectives 1, 2 and 3 in two steps. In first step, the findings for objectives 2 and 3 were integrated to accomplish the best possible application drawn from the fieldwork and literary work. In second step, the results for objectives 1 and 3 were used to identify historical open spaces that needs to be preserved. Therefore, the findings from the research questions led to the understanding that open space aspirations in the Chittagong City are formed by two key aspects:

4.1 What are the approaches derived from literary work and fieldwork analysis that may best be applied in the city?

4.2 How should open space best be distributed to meet the city's growth and residents' open space aspirations?

To answer the 1st question, the findings for objectives 1 and 3 led the researcher to identify historical open spaces in each Wards. By doing this, the researcher proposed open areas with historical significance that could contribute to city's open space. To answer the 2nd question, the findings for objectives 2 and 3 led the researcher to propose principles that best suited the approaches open space standard to meet residents' aspirations. Data collection on comparative open space standards and practises throughout world cities were the findings for the 2nd objective. The researcher had to look into the significance of open spaces for environmental and public health issues. This enabled the researcher to comprehend the advantages of open areas. The 3rd objective's findings assisted the researcher in determining residents' perceptions and professional's thought on open space. By combining the results of goals 2 and 3, the researcher determines appropriate strategies to extend open space setting to meet the desires of locals.

8.2 Implications

Understanding how open space in Chittagong City may fulfil residents' aspirations leads to a number of suggestions. These suggestions are discussed in terms of organisation/government responsibility, open space structure, Ward-wise planning, small Interventions, local park design, canal conservation, mass transit/accessibility, historic/cultural places and biodiversity.

1st of all, it is recommended to set up a city organisation work as 'parks and open space department'. This is recommended in order to execute the planning suggestions and to follow up on them. Following establishment of this city organisation, the next suggested step is to prepare an open space strategy to structure the seven types of open space as presented in Chapter 5. Among the seven types of open spaces that exist in Chittagong, the quantity (in terms of number and area) provided for neighbourhood parks and playgrounds needs to be increased to meet the open space aspiration of city residents. According to the results described in Chapter 6, Chittagong requires at least 80 neighbourhood parks and playgrounds to serve a 500-metre catchment area. While more research is required for the remaining 200 meters³⁷ of additional distance (WHO 2016). The research also recommended to start with small-scale planning to establish local park and playgrounds that residents

³⁷ WHO (2016) recommended 300-metre travel distance to an open space. There is not a consensus on the minimum distance.

can walk to. Additionally, and as mentioned in Chapter 7, a Ward-wise distribution of open space needs to be considered for the city's residents which can identify small pockets of land to serve as parks or playgrounds. Secondly, a water catchment system in Chittagong needs to be incorporated into all open space planning efforts. This is suggested because Chittagong needs to have a rainwater catchment system in parks and playgrounds that can be used to reduce flooding in adjacent city areas. This hydrological system could also be proposed to serve the neighbourhood for firefighting, gardening etc.

Thirdly, the findings in this thesis suggest that the city's current canal system needs to be revitalised and sewage system needs to be removed from these water bodies. Hence, an independent sewerage system should be installed throughout the city to make the canals environmentally friendly and usable as open spaces for city residents.

Fourthly, the city's hills should be developed with dams to harvest water for this type of open space area and to serve the city with drinking water. This is recommended because, if constructions were allowed to take up no more than 10% of the total space, this could help create natural reserves with protected dam to enhance open space setting which additionally serve supply water for city dwellers. In addition to these suggestions, the city's outer ring roads and railway corridors need to be reflected on by city officials and, hopefully, reconsidered as means to contribute to open space for the city. This could also potentially be supported by the help of the city's transportation experts, who in their planning of mass transit can design metro stations that connect to the city's (informal) open spaces and that can be used by both vendors and travellers by promoting multifunction such as night market. Lastly, there should be established guidelines for large ponds (more than 0.5 acre in size) and historical open spaces, as described in Chapters 4, 5 and 7. It is advised to build large ponds with walkways and appropriate landscaping around them. This would not only help provide open space in a crowded environment, but also collect rainfall to lessen flooding. The open areas that surround the historically significant buildings on the DAP list needs to be preserved. In addition, for conservation purposes, historical sites proposed in this study must be recognised and preserved as open space.

In summary, this section has presented suggestions supporting the creation and management of open space in the city. In presenting this summary, the research demonstrates that Chittagong's canals are an important feature of the environment and can be regarded as linear parks when they are separated from the city's sewerage system. It also sheds light on the need for the city to take into account the flooding that may occur in its open space areas when planning neighbourhood parks and playgrounds. Furthermore, this water dimension could be turned into a positive that can be

harvested for use in creating nature areas for plants and wildlife. Lastly, the planning of the city's outer ring road and linear railway corridors can be positioned to provide open spaces for city residents which can also provide open spaces for travellers and neighbourhood residents.

8.3 Recommendations for future research and limitations

The following presents recommendations for future research and limitations, and they are discussed in terms of their general applicability to academics, professionals, local government officials and residents.

The thesis has looked into what open space standards ought to be established to satisfy local inhabitants' aspirations. It advised detailed research, such as Ward-wise planning, for future studies. Due to time restrictions, the thesis study only covered one Ward as a case study. Since each Ward differs in terms of terrain, use and density, this analysis needs to be expanded. For instance, hilly Wards require distinct guidelines compared to those for lowlands. Compared to residential Wards, commercial Wards should contain a different type of open space. One limitation of this study is that it did not fully investigate the factors that need to be considered to apply the guidelines and principles that have been established in the city's Master plans and later on in this thesis. Budget concerns and authorities' late realisation that they have not safeguarded the city's open spaces or adhered to the Master Plan's recommendations are two examples of these factors. Hence, if factors such as these are not accounted for, it is probable that the thesis findings and suggestions may not be applied in the future open space planning of the city. In order to assist the application of the conclusions and recommendations of this research, further research is proposed in order to ascertain the best way to apply the findings of this thesis and to take into account elements like these. One possible suggestion that could boost the application of the results of this thesis is to form a park and open space body. However, this suggestion, made in the above section, needs to be investigated further to ascertain how city officials may establish and fund this organisation, how it may operate, what will be the organisational structure and what will be the roles and responsibilities of its employees. Hence, future research addressing these issues could support the government to take initiative to establish a park and open space body for the development of open spaces in Chittagong City.

8.4 Conclusion

This chapter contains an overview of the thesis study. This has been accomplished by restating the issues that led to the development of this thesis project and outlining the findings in light of the study's preliminary findings and the objectives outlined in Chapters 4, 5, 6 and 7. The implications that resulted from this investigation were then discussed. The thesis comes to conclusion with suggestions for

additional studies that could benefit open space development in Chittagong and could be used to inform the development of open space in other highly populated cities across the globe.

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Appendix 1: 1961 Master plan open space proposal and implementation status

Proposal no	Location of proposal	Area (Acre)	Implementation Status
1	Central Area	52	Partially kept and the remaining has been used as administrative and commercial purpose.
2	Circuit House and Chittagong Stadium	84	Partially developed as amusement park
3	Station Square	10	Not implemented
4	Riverside Town Park	37	Other use
5	Riverside Tank (Agrabad)	25	Not implemented- occupied by slums
6			
7	Camping/Recreation Area Halishahar	111	Rezoned into industrial use-CPEZ
8	Racecourse	204	
9	Exhibition Park, Halishahar	62	Partially vacant and remain subdivided into commercial plots and residential plots
10	Regional Park, Halishahar	60	Not implemented/ unplanned development
11	Stadium and Central Eidgah Pahartali	92	Not implemented
12	Railway Tank, Pahartali	43	Exist in poor environmental condition
13	Green Buffer between Fouzderhat Industrial Area	108	Sub-divided into industrial area
14	Foy's lake Regional Park	736	Partially developed as zoo and amusement park
15	Botanical and zoological Gardens	354	Not implemented
16	Khulshi Road	25	Allocated for Industrial development
17	Alpine Park, Khulshi road	127	Private Housing development
18	Battali hill	53	Preserved as open space
19	Viewpoint, Chatteshwari road	13	Private housing development and government guest house
20	Bayazid Bostami Shrine Nasirabad	17	Reserved but threaten by extension of tomb related commercial use
21	Regional Park, East of Hathazari road	99	Not implemented
22	Park way along Chaktai Khal	115	Not implemented
23	Regional Park east of Chawk Bazar	189	Other development
24	Park near Kalurghat Industrial Area	107	Not implemented
25	Fouzderhat Sea Beach		The site is threatened and partially occupied by ship breaking industries
26	Patenga Sea Beach		Partially developed

Source: Updated by author from Hassan (2008)

Appendix 2: Area for different types of park base on population distribution:

Type	No of unit per 10,000 population	Land Area per 10,000 population (Hectare)	Minimum Land Area per unit (Hectare)	Standard Area (Hectare) per population	Standard Area per person
District Park	0.05	2.00	40.00	40.0 ha/20,000	2 sq. m.
Neighbourhood Park	0.20	2.00	10.0	10.0 ha/50,000	2 sq. m.
Local Park	0.50	1.00	2.00	2.00 ha/20,000	1 sq. m.
Local Play Area	2.00	1.00	0.50	0.50 ha/5,000	1 sq. m.
Sports Complex	0.20	0.50	2.50	2.50 ha/50,000	0.5 sq. m
Total					6.5 sq. m.

Source : Kuala Lumpur Structural Plan 2020 (http://www.dbkl.gov.my/pskl2020/english/community_facilities/index.htm)

Appendix 3: Ethics Approval letter

Human Research Ethics

Deakin Research Integrity
Burwood Campus
Postal: 221 Burwood Highway
Burwood Victoria 3125 Australia
Telephone 03 9251 7123
research-ethics@deakin.edu.au



Memorandum

To: Dr Beau Beza
School of Architecture and Built Environment
F
cc: Ms Maharina Jafrin

From: Deakin University Human Research Ethics Committee (DUHREC)

Date: 08 October, 2019

Subject: 2019-243
Revitalizing of open space in a densely populated city: A case study of Chittagong City (x-ref 2019-153)
Please quote this project number in all future communications

DUHREC considered the application for this project at its meeting held on 22/07/2019 and found it to comply with the National Statement on Ethical Conduct in Human Research 2007 (Updated 2018).

DUHREC has granted approval for Dr Beau Beza, School of Architecture and Built Environment, to undertake this project from 8/10/2019 to 8/10/2023.

The approval given by the Deakin University Human Research Ethics Committee is given only for the project and for the period as stated in the approval. It is your responsibility to contact the Human Research Ethics Unit immediately should any of the following occur:

- Serious or unexpected adverse effects on the participants
- Any proposed changes in the protocol, including extensions of time.
- Any events which might affect the continuing ethical acceptability of the project.
- The project is discontinued before the expected date of completion.
- Modifications are requested by other HRECs.
- Any complaints are received by the research team, an external HREC or, in the event of overseas research, an external complaints contact.

In addition you will be required to report on the progress of your project at least once every year and at the conclusion of the project. Failure to report as required will result in suspension of your approval to proceed with the project.

DUHREC may need to audit this project as part of the requirements for monitoring set out in the National Statement on Ethical Conduct in Human Research 2007 (Updated 2018).

Human Research Ethics Unit
research-ethics@deakin.edu.au
Telephone: 03 9251 7123

Appendix 4: Plain Language Statement- Type A



PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO: Participants

Plain Language Statement – Residents of the City of Chittagong

Date:	TBA
Full Project Title:	Revitalizing of open space in a densely populated city: A case study of Chittagong City
Principal Researcher:	Dr. Beau B. Beza
Student Researcher:	Ms. Maharina Jafrin
Associate Researcher(s):	Professor David Jones
Associate Researcher(s):	Professor Shamsul Hossain, Secretary of the Chittagong Centre for Advanced Studies (CCAS), Chittagong.
Reference number:	2019-243

1. Your Consent

You are invited to take part in this research project. This Plain Language Statement contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all procedures involved in this project so that you can make a fully informed decision whether you are going to participate.

Please read the Plain Language Statement carefully. Feel free to ask questions about any information in the document.

Once you understand what this project is about and if you agree to take part in it, you can continue with the study. Please take this document being the Plain Language Statement about the project to keep as a record.

2. Purpose and background

The purpose of the study is to examine how Chittagong city residents experience parks, playgrounds and open spaces in the city. Being a resident of this city and formerly working in the planning department of Chittagong Development Authority (CDA), I have witnessed first-hand changes to the city open space structure where development of built features (e.g. buildings) has been realised on these settings; which I, and the CDA, suggest greatly diminishes opportunities for city residents to experience these settings for their active/passive needs.

This is not a project funded by the CDA or the Chittagong City Corporation (CCC), and is not being undertaken upon their request or via a consultancy project.

Hence, the research project aims to collect resident and professionals' perceptions towards these open space, park and playground settings to better understand residents' open space needs and to develop data and design models that can assist decision makers better plan the city to match their needs.

You are invited to participate in this research because we are interested in hearing from a large number of users and professionals about their perceptions and thoughts on these settings in the City of Chittagong. The result of this research may be used to help the investigators in understanding the demand and supply of necessary open space where the positive and negative issues are engaged in this setting of the City.

3. Research question and method:



The research questions are formed to achieve the objective of the study. The questions in the survey questionnaire revolve around a series of open ended and/or closed ended queries related to the city's open space.

About 40 questions are in the questionnaire and may take approximately 25-30 minutes to answer.

You are being asked to participate in his study because you are using this open space setting.

All the answers you give will be treated as confidential and your name will not be used in any of the research. Your answers will be re-coded to de-identify your information. This is done to protect your anonymity and for you to feel comfortable in speaking freely about open space in the city.

A sample question is:

C1	How do you rate the redevelopment of this playground?			
	<input type="checkbox"/> worse	<input type="checkbox"/> Not Satisfactory	<input type="checkbox"/> Satisfactory	<input type="checkbox"/> Better

4. Funding

The project is self-funded by the student researcher.

5. Procedures

You will be asked to complete a series of close and open-ended questions on the associated survey form. At any time, you may ask me to clarify any question. Once you answer the survey your responses will be allocated a code to protect your identity.

6. Possible risk and potential benefit:

It is not expected that you will be exposed to any physical risk or psychological distress by participating in this project. If you feel discomfort in answering any question or towards the project, you can withdraw from participating in the project at any time. Respondents will not incur any risk from withdrawing from the study.

The research offers an indirect benefit to the participant by creating a platform for the development of a city where urban open space is academically presented as an issue for city planning. The outcome of the research will benefit planners, city residents, consultants and other authorities by offering a platform to comprehend the complexities of open space development in Chittagong.

7. Privacy, confidentiality, and disclosure of information

Data collected as part of the project will not be associated with any identifying information.

All information gathered from participants will be kept securely in a locked file at the student researcher's home and then upon return to Australia the material will be placed in a locked file at Deakin University's School of Architecture & Built Environment. Electronic data will be password protected and stored on a secure server within the School of Architecture & Built Environment at Deakin University. None of the electronic files will include any identifying information. Only the research staff directly linked with the project will have access to the data. After the completion of the project, the data collected will be securely stored for five years at Deakin University, as set out in the University regulations, after which all data will be destroyed.

In any publication, information will be provided in such a way that you cannot be identified. Only group data will be disseminated. As a result, no one person's data will be presented, nor will any identifiable information be relevant or disclosed in the reporting of results.



8. Results of the Project

Upon completion of this research, the data will be assembled into a PhD thesis for examination.

If you would like to receive a copy of the post-examined PhD thesis, please email the Principal Investigator on beau.beza@deakin.edu.au or the Associate/Student Investigator on mjafrin@deakin.edu.au.

9. Participation is Voluntary

Participation in this research project is voluntary.

IF YOU DO NOT WISH TO TAKE PART YOU ARE NOT OBLIGED TO.

If you decide to take part and later change your mind, you are free to withdraw from the project at any stage during the on-site interview phase only.

10. Ethical Guidelines

This project is being carried out in accordance with Australia’s *National Statement on Ethical Conduct in Human Research* (2007) – updated 2019 (NS) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies. Deakin University’s Human Research Ethics Committee has approved this research project.

11. Complaints

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

- The Manager, Deakin Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3215, Australia, Telephone: +61 3 9251 7123, Facsimile: +61 3 92446581; email: research-ethics@deakin.edu.au

Please quote project number: 2019-243

12. Further information, Queries, or Any Problems.

If you require further information or have any problem, please contact one of the below mentioned Research Team involved:

<p>Dr Beau Beza School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 522 78554 Email: beau.beza@deakin.edu.au</p>	<p>Ms Maharina Jafrin School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 5227 1100 Email : mjafrin@deakin.edu.au</p>
<p>Professor David Jones School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 52278763 Email: david.jones@deakin.edu.au</p>	<p>Professor Shamsul Hossain Director, Chittagong Centre for Advanced Studies, Email: shossain.chati@gmail.com</p>

Appendix 5: Plain Language Statement- Type B and consent form



PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO: Participants

Plain Language Statement – Built Environment Practitioners in Chittagong

Date:	TBA
Full Project Title:	Revitalizing of open space in a densely populated city: A case study of Chittagong City
Principal Researcher:	Dr. Beau B. Beza
Student Researcher:	Ms. Maharina Jafrin
Associate Researcher(s):	Professor David Jones
Associate Researcher(s):	Professor Shamsul Hossain, Secretary of the Chittagong Centre for Advanced Studies (CCAS), Chittagong.
Reference number:	2019-243

1. Your Consent

You are invited to take part in this research project. This Plain Language Statement contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all procedures involved in this project so that you can make a fully informed decision whether you are going to participate.

Please read the Plain Language Statement carefully. Feel free to ask questions about any information in the document.

Attached to this Plain Language Statement, is a

- Consent Form and a
- Withdrawal of Consent Form,

for your use:

You are invited to sign the Consent Form and to return it to the Student Research Investigator – Ms Maharina Jafrin -- , once you have read this Plain Language Statement, to commence the survey interview.

Once you understand what this project is about and if you agree to take part in it, you can continue with the study. Please take this document being the Plain Language Statement about the project to keep as a record.

2. Purpose and background

The purpose of the study is to examine how Chittagong city residents experience parks, playgrounds and open spaces in the city. Being a resident of this city and formerly working in the planning department of Chittagong Development Authority (CDA), I have witnessed first-hand changes to the city open space structure where development of built features (e.g. buildings) has been realised on these settings; which I, and the CDA, suggest greatly diminishes opportunities for city residents to experience these settings for their active/passive needs.

This is not a project funded by the CDA or the Chittagong City Corporation (CCC), and is not being undertaken upon their request or via a consultancy project.



Hence, the research project aims to collect resident and professionals' perceptions towards these open space, park and playground settings to better understand residents' open space needs and to develop data that can assist decision makers better plan the city to match their needs.

You are invited to participate in this research because we are interested in hearing from a large number of users and professionals about their perceptions and thoughts on these settings in the City of Chittagong. The result of this research may be used to help the investigators in understanding the demand and supply of necessary open space where the positive and negative issues are engaged in this setting of the City.

3. Research question and method:

The research questions are formed to achieve the objective of the study. The questions in the survey questionnaire revolve around a series of open ended and/or closed ended queries related to the city's open space.

About five interview questions are in the questionnaire and may take approximately 60 minutes to answer.

You are being asked to participate in this study because you make decisions regarding the open space settings in Chittagong.

All the answers you give will be treated as confidential and your name will not be used in any of the research. Your answers will be re-coded to de-identify your information. This is done to protect your anonymity and for you to feel comfortable in speaking freely about open space in the city.

A sample question is:

C1	How do you rate the redevelopment of this playground?			
	<input type="checkbox"/> worse	<input type="checkbox"/> Not Satisfactory	<input type="checkbox"/> Satisfactory	<input type="checkbox"/> Better

4. Funding

The project is self-funded by the student researcher.

5. Procedures

You will be asked a series of close and open-ended questions. You may either complete the survey questionnaire yourself by hand or speaking. Or, if you wish the Student/Associate Investigator, after you answer each question, can write down your answer. At any time, you may ask the Student/Associate Investigator to clarify any question. Once you answer the interview your responses will be allocated a code to protect your identity.

6. Possible risk and potential benefit:

It is not expected that you will be exposed to any physical risk or psychological distress by participating in this project. If you feel discomfort in answering any question or towards the project, you can withdraw from participating in the project at any time. Respondents will not incur any risk from withdrawing from the study.

The research offers an indirect benefit to the participant by creating a platform for the development of a city where urban open space is academically presented as an issue for city planning. The outcome of the research will benefit planners, city residents, consultants and other authorities by offering a platform to comprehend the complexities of open space development in Chittagong.

7. Privacy, confidentiality, and disclosure of information

Plain Language Statement & Consent Form to Participants
[project ID]: version n: 10.04.2019



Data collected as part of the project will not be associated with any identifying information.

All information gathered from participants will be kept securely in a locked file at the student researcher's home and then upon return to Australia the material will be placed in a locked file at Deakin University's School of Architecture & Built Environment. Electronic data will be password protected and stored on a secure server within the School of Architecture & Built Environment at Deakin University. None of the electronic files will include any identifying information. Only the research staff directly linked with the project will have access to the data. After the completion of the project, the data collected will be securely stored for five years at Deakin University, as set out in the University regulations, after which all data will be destroyed.

In any publication, information will be provided in such a way that you cannot be identified. Only group data will be disseminated. As a result, no one person's data will be presented, nor will any identifiable information be relevant or disclosed in the reporting of results.

8. Results of the Project

Upon completion of this research, the data will be assembled into a PhD thesis for examination.

As offered in the Consent Form, if you would like to receive a copy of the post-examined PhD thesis, please include your email address.

Additionally, if you would like to receive additional information about this project and/or a copy of the post-examined PhD thesis, please email the Principal Investigator on beau.beza@deakin.edu.au or the Associate/Student Investigator on mjafrin@deakin.edu.au.

9. Participation is Voluntary

Participation in this research project is voluntary.

IF YOU DO NOT WISH TO TAKE PART YOU ARE NOT OBLIGED TO.

If you decide to take part and later change your mind, you are free to withdraw from the project at any stage during the survey/interview stage using the attached Withdrawal Form. You are not able to withdraw this data once the thesis is submitted for examination which is projected to be in 2020.

10. Ethical Guidelines

This project is being carried out in accordance with Australia's *National Statement on Ethical Conduct in Human Research* (2007) – updated 2019 (NS) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies. Deakin University's Human Research Ethics Committee has approved this research project.

11. Complaints

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

- The Manager, Deakin Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3215, Australia, Telephone: +61 3 9251 7123, Facsimile: +61 3 92446581; email: research-ethics@deakin.edu.au



Please quote project number: 2019-243

12. Further information, Queries, or Any Problems.

If you require further information or have any problem with this research, please contact one of the below mentioned Research Team involved:

Dr Beau Beza School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 522 78554 Email: beau.beza@deakin.edu.au	Ms Maharina Jafrin School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 5227 1100 Email : mjafrin@deakin.edu.au
Professor David Jones School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 52278763 Email: david.jones@deakin.edu.au	Professor Shamsul Hossain Director, Chittagong Centre for Advanced Studies, Email: shossain.chati@gmail.com



Individual Participant Consent Form

Date: TBA
Full Project Title: Revitalizing of open space in a densely populated city: A case study of Chittagong city
Principal Researcher: Dr. Beau B. Beza
Student Researcher: Ms. Maharina Jafrin
Associate Researcher(s): Dr. David Jones
Reference number: 2018-243

I understand the attached Plain Language Statement.

I freely agree to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of the Plain Language Statement and Consent Form to keep.

I acknowledge that the research team have agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form, unless specific consent is given below:

I wish to obtain a copy of the final post-examined PhD Thesis arising from this research, and disclose my email address below for this purpose.

Participant's Name:

Participant's Email Address:

Signature Date

Please return this completed and signed form to the Student Research Investigator – Ms Maharina Jafrin.

If you require further information or have any problem with this research, please contact one of the below mentioned Research Team involved:

<p>Dr Beau Beza School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 522 78554 Email: beau.beza@deakin.edu.au</p>	<p>Ms Maharina Jafrin School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 5227 1100 Email : mjafrin@deakin.edu.au</p>
<p>Professor David Jones School of Architecture and Built Environment Faculty of Science, Engineering & Built Environment, Deakin University, 1 Gheringhap Street Geelong Victoria 3220, Australia Ph : +61 3 52278763 Email: david.jones@deakin.edu.au</p>	<p>Professor Shamsul Hossain Director, Chittagong Centre for Advanced Studies, Email: shossain.chati@gmail.com</p>



WITHDRAWAL OF CONSENT FORM

TO:

Withdrawal of Consent Form

Table with 2 columns: Field Name and Value. Fields include Date, Full Project Title, Principal Researcher, Student Researcher, Associate Researcher(s), and Reference number.

I hereby wish to WITHDRAW my consent

As to participate in the above research project and understand that such withdrawal WILL NOT jeopardise my relationship with Deakin University.

Participant's Name (printed)

.....

Signature

Date

Please return (email/post) this completed and signed form to any of the people on the Research Team listed below.

If you require further information or have any problem with this research, please contact one of the below mentioned Research Team involved:

Table with 2 columns and 2 rows. Each cell contains contact information for a specific research team member, including name, school, faculty, address, phone, and email.



Appendix 6: Survey Question

Appendix 6: Part a: General information

A1	Name			
A2	Gender	Male	Female	Other
A3	Age	Between 18-25	Between 25-35	Between 35-45
		Between 45-55	Between 55-65	65 and over
A4	Education	None	Primary Level	Secondary Level
		Higher Secondary Level	Graduate	Post-Graduate and above
A5	Profession	Student	Government Service	Business
		Unemployed	Teaching/research	
		Private service	Retired/pensioners	Technocrats

Appendix 6: Part B: Survey on proposed park, playground and open space

B1	Location of the Park/open space:					
	Jamboree Park					
B2	How far did you travelled to come here?					
	0-1 km	1 km-5km	5km-10km	More than 10 km		
B3	If you live close to the park, how long it takes, if walk to the park?					
	Less than 10 minutes	Less than 20 minutes	Less than 30 minutes	Not applicable		
B4	How did you travel to this park?					
	By walk	By bus	By car	By rickshaw		
B5	Whom did you come with?					
	With family	With friends	With a group	Alone		
B6	How often do you visit the park?					
	Daily	Weekly	Fortnightly	Monthly	Rarely	Occasionally
B7	If you don't visit frequently than what is the reason?					
	I am not interested	I can't make time	It's far from me	Other		
B8	For which of the following reason, do you visit this park?					
	All	Park facility	Sightseeing	To enjoy with family and friends	Walking	Other
B9	Is there any other reason to you for visiting the park? Please explain:					
	1.					
	2.					
	3.					
B10	Do you ever visit the park before development?					
	Yes			No		
B11	How do you grade the transformation of the park?					
	Not good	Satisfactory	Good	Very good		
B12	How do you define your visit to the park after development?					
	More frequent	Less frequent	Same as before			
B13	What is the reason behind your decrease and increase of visit of the park?					
	Decrease			Increase		

B14	Do you live in Chittagong?	
	Yes (Please answer part C and D)	No

Appendix 6: Part c: Survey on Neighborhood Park, playground, and open space:

C1	Where do you live in Chittagong?			
	Street/road/avenue:		Ward:	
	Area:			
C2	Do you have any of the following in one-kilometre distance of your place which takes maximum 10-minute walk?			
	Park	Playground	None	Both
C3	If yes, please provide details:			
	Park:			
	Playground			
C4	How often do you visit this place/ these places?			
	Park		Playground	
	Daily	Weekly	Daily	Weekly
	Monthly	Occasionally	Monthly	Occasionally
	Rarely	Not Applicable	Rarely	Not Applicable
C5	Do you walk to the park or playground?			
	Park	Yes	No	Not applicable
	Playground	Yes	No	Not application
C6	If you walk, how long it takes?			
	Park			
	Less than 5 minutes	5-10 minutes	10-15 minutes	Not applicable
	Playground			
	Less than 5 minutes	5-10 minutes	10-15 minutes	Not applicable
C7	If you don't walk, why?			
	I don't want to walk	I don't have a walkway	I can't walk	Not applicable
C8	If you don't visit frequently, then what is the reason?			
	I am not interested	I can't make time	It is far from me	Not applicable
	I don't have walkway		Not in good condition	
C9	Do you think this park/ playground is sufficient for your neighborhood?			
	Park	Yes	No	Not Applicable
	Playground	Yes	No	Not Applicable
C10	If you think it is not sufficient, then please explain why?			
	Park:			
	Playground: less space			

C11	If you don't have a park in your neighbourhood, do you think you need a park in 10 minutes or in 1 kilo metre walking distance from your place?			
	Yes	No	Don't know	Not applicable
C12	If yes, why do you think you will need this?			
	For recreation	For openness	For Social interaction	For exercising
C13	If you have kids, where do they play?			
	At playground	At home	Other	Not applicable
C14	If you don't have playground close to your area, do you think you will need this?			
	Yes	No	Don't know	Not applicable
	Please name some of the park you know and visit in Chittagong?			
	Name		Distance from the place you live in	
C16	Please name some of the playgrounds you know and visit in Chittagong?			
	Name		Distance from the place you live in	
C17	If you think that it is necessary to have an open space close to your house, then which arrangement do you think will be more preferable to you?			
	Park	Playground	Park with playground	

Appendix 6: Part d: Survey on natural open space close neighborhood

D1	Do you live in 1-kilometre distance of any of the following area?			
	River	Canal/creeks	Pond/Tanks	Seabeach
	Lake	Hills	None	Other
D2	Please provide details of the place/places:			
D3	Do you have access to this area?			
	Yes	No	Not applicable	
D4	If you don't have access to this area, do you think it would be better if you have access?			
	Yes	No	I don't know	Not applicable
D5	If you would have access to the place, do you think you would visit the place?			
	Yes	No	I don't know	Not applicable
D6	If you are not interested to visit this area, then why?			
	It is not clean	It is not a safe place	It is not scenic	Other
D7	Where do you work/study?			
	Location		Ward	

D8	Do you have park or open space near to your workplace/institution?			
	Yes	No	I don't know	Not applicable
D9	If yes, please provide details:			
D10	Do you know any public Open space in Chittagong close to shopping center or market? If so, please explain.			
	1.			
	2.			
	3.			
	4.			

Appendix 7: interview questions

1. What guidelines/policies/framework do you and/or your Department/Practise has in place to address open space in Chittagong?

2. Please tell me the issues, as you see them, relevant to existing and planned open space in Chittagong?

3. Please explain to me what you/your organization is doing or plan to do to address the issue of open space in Chittagong?

4. Can you please explain to me why you/your department doesn't consider open space as an issue in Chittagong?

Appendix 8: Survey question (Bengali Language)



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

উদ্যান/উন্মুক্ত স্থান ব্যবহারকারীদের জন্যে ভূমিকামূলক বর্ণনা - শ্রেণী A1

শুভ সকাল/ শুভ অপরাহ্ন,

আমার নাম মাহারিনা জাফরিন।

আমি ডেকিন বিশ্ববিদ্যালয়ের স্নাকোত্তর গবেষণা শিক্ষাত্রী হয়ে চট্টগ্রাম শহরের উন্মুক্ত স্থান, উদ্যান ও খেলার জায়গাগুলোর ব্যবহার এবং বৈশিষ্ট্য যাচাই এর জন্যে একটি প্রকল্প পরিচালনা করছি।

এই গবেষণার উদ্দেশ্য হলো চট্টগ্রামের উন্মুক্ত স্থান, উদ্যান ও খেলার মাঠ এর উপর ব্যবহারকারীদের ধারণাকে তুলে ধরা অর্থাৎ পরিস্থিতি অনুসন্ধান করে চট্টগ্রামের উন্মুক্ত পরিসরের সংরক্ষণ, উন্নয়ন ও সংস্থান করা, যা আমার পি এইচ ডি প্রকল্প গঠনে সাহায্য করবে।

আপনাকে এই অনুশীলনে অংশগ্রহণে আমন্ত্রণ জানানো হয়েছে কারণ আপনি এই উন্মুক্ত পরিসর ব্যবহার করছেন বা আপনি শহরের উন্মুক্ত পরিসর উন্নয়নে একজন বিশেষজ্ঞ।

আপনার ধারণা এবং আগ্রহকে বিবেচনা করে জরিপের প্রশ্ন তৈরী করা হয়েছে।

আপনি ধারাবাহিকভাবে কতগুলো ব্যাখ্যামূলক ও নির্বাচনী প্রশ্নের উত্তর দিবেন এবং আমি তা লিপিবদ্ধ করবো।

যার নমুনা প্রশ্ন হলো :

গ-১	আপনি এই খেলারমাঠের উন্নয়নকে কিভাবে দেখেন?			
	<input type="checkbox"/> ভালো নয়	<input type="checkbox"/> সন্তোষজনক নয়	<input type="checkbox"/> সন্তোষজনক	<input type="checkbox"/> উন্নত

আপনি যদি এই প্রকল্পে অংশগ্রহণ করতে চান, তবে চারটি সেটের নির্বাচনী ও ব্যাখ্যামূলক প্রশ্নের উত্তর দিতে আপনার সর্বোচ্চ ২৫-৩০ মিনিট সময় লাগবে।

শুধুমাত্র মৌখিক সম্মতির মাধ্যমে আপনি স্বপ্রনোদিতভাবে এই জরিপে অংশগ্রহণ করতে পারেন। আপনি চাইলে, আপনার নাম ও পরিচয় এর ক্ষেত্রে গোপনীয়তা বজায় রাখা হবে এবং আপনার উত্তর ও প্রশ্নের উপর প্রতিক্রিয়া নামবিহীন থাকবে।

কারণ, এই জরিপটি ডেকিন বিশ্ববিদ্যালয়ের হিউম্যান রিসার্চ ইনিক্স কমিটি দ্বারা অনুমোদিত। সংযোজনকৃত স্পষ্ট ভাষা বিবৃতি পত্রটির একটি অনুলিপি আপনার কাছে রাখবেন, যা গবেষণা প্রকল্পটির আনুসঙ্গিক তথ্য বহন করে এবং কোনো অতিরিক্ত অনুসন্ধানের জন্যে যোগাযোগের ঠিকানা সম্মিলিত।

ধন্যবাদ।



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

খেলার মাঠ ব্যবহারকারীদের জন্যে ভূমিকামূলক বর্ণনা - শ্রেণী Aii

শুভ সকাল/ শুভ অপরাহ্ন,

আমার নাম মাহারিনা জাফরিন।

আমি ডেকিন বিশ্ববিদ্যালয়ের স্নাকোত্তর গবেষণা শিক্ষার্থী হয়ে চট্টগ্রাম শহরের উন্মুক্ত স্থান, উদ্যান ও খেলার জায়গাগুলোর ব্যবহার এবং বৈশিষ্ট্য যাচাই এর জন্যে একটি প্রকল্প পরিচালনা করছি।

এই গবেষণার উদ্দেশ্য হলো চট্টগ্রামের উন্মুক্ত স্থান, উদ্যান ও খেলার মাঠ এর উপর ব্যবহারকারীদের ধারণাকে তুলে ধরা অর্থাৎ পরিস্থিতি অনুসন্ধান করে চট্টগ্রামের উন্মুক্ত পরিসরের সংরক্ষণ, উন্নয়ন ও সংস্থান করা, যা আমার পি এইচ ডি প্রকল্প গঠনে সাহায্য করবে।

আপনাকে এই অনুশীলনে অংশগ্রহণে আমন্ত্রণ জানানো হয়েছে কারণ আপনি এই উন্মুক্ত পরিসর ব্যবহার করছেন বা আপনি শহরের উন্মুক্ত পরিসর উন্নয়নে একজন বিশেষজ্ঞ।

আপনার ধারণা এবং আগ্রহকে বিবেচনা করে জরিপের প্রশ্ন তৈরী করা হয়েছে।

আপনি ধারাবাহিকভাবে কতগুলো ব্যাখ্যামূলক ও নির্বাচনী প্রশ্নের উত্তর দিবেন এবং আমি তা লিপিবদ্ধ করবো।

যার নমুনা প্রশ্ন হলো :

গ-১	আপনি এই খেলারমাঠের উন্নয়নকে কিভাবে দেখেন?			
	<input type="checkbox"/> ভালো নয়	<input type="checkbox"/> সন্তোষজনক নয়	<input type="checkbox"/> সন্তোষজনক	<input type="checkbox"/> উন্নত

আপনি যদি এই প্রকল্পে অংশগ্রহণ করতে চান, তবে চারটি সেটের নির্বাচনী ও ব্যাখ্যামূলক প্রশ্নের উত্তর দিতে আপনার সর্বোচ্চ ২৫-৩০ মিনিট সময় লাগবে।

শুধুমাত্র মৌখিক সম্মতির মাধ্যমে আপনি স্বপ্রনোদিতভাবে এই জরিপে অংশগ্রহণ করতে পারেন। আপনি চাইলে, আপনার নাম ও পরিচয় এর ক্ষেত্রে গোপনীয়তা বজায় রাখা হবে এবং আপনার উত্তর ও প্রশ্নের উপর প্রতিক্রিয়া নামবিহীন থাকবে।

কারণ, এই জরিপটি ডেকিন বিশ্ববিদ্যালয়ের হিউম্যান রিসার্চ ইথিক্স কমিটি দ্বারা অনুমোদিত। সংযোজনকৃত স্পষ্ট ভাষা বিবৃতি পত্রটির একটি অনুলিপি আপনার কাছে রাখবেন, যা গবেষণা প্রকল্পটির আনুসঙ্গিক তথ্য বহন করে এবং কোনো অতিরিক্ত অনুসন্ধানের জন্যে যোগাযোগের ঠিকানা সম্মিলিত।

ধন্যবাদ।



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

পরিবেশগতনে অনুশীলনবত পেশাদার অংশগ্রহণকারীগণের জন্যে ভূমিকামূলক বর্ণনা

শুভ সকাল/ শুভ অপরাহ্ন,

আমার নাম মাহারিনা জাফরিন।

আমি ডেকিন বিশ্ববিদ্যালয়ের স্নাকোত্তর গবেষণা শিক্ষার্থী হয়ে চট্টগ্রাম শহরের উন্মুক্ত স্থান, উদ্যান ও খেলার জায়গাগুলোর ব্যবহার এবং বৈশিষ্ট্য যাচাই এর জন্যে একটি প্রকল্প পরিচালনা করছি।

এই গবেষণার উদ্দেশ্য হলো চট্টগ্রামের উন্মুক্ত স্থান, উদ্যান ও খেলার মাঠ এর উপর ব্যবহারকারীদের ধারণাকে তুলে ধরা অর্থাৎ পরিস্থিতি অনুসন্ধান করে চট্টগ্রামের উন্মুক্ত পরিসরের সংরক্ষণ, উন্নয়ন ও সংস্থান করা, যা আমার পি এইচ ডি প্রকল্প গঠনে সাহায্য করবে।

আপনাকে এই অনুশীলনে অংশগ্রহণে আমন্ত্রণ জানানো হয়েছে কারণ আপনি এই উন্মুক্ত পরিসর ব্যবহার করছেন বা আপনি শহরের উন্মুক্ত পরিসর উন্নয়নে একজন বিশেষজ্ঞ।

আপনার ধারণা এবং আগ্রহকে বিবেচনা করে জরিপের প্রশ্ন তৈরী করা হয়েছে।

আপনি ধারাবাহিকভাবে কতগুলো ব্যাখ্যামূলক ও নির্বাচনী প্রশ্নের উত্তর দিবেন এবং আমি তা লিপিবদ্ধ করবো।

যার নমুনা প্রশ্ন হলো :

গ-১	আপনি এই খেলারমাঠের উন্নয়নকে কিভাবে দেখেন?			
	<input type="checkbox"/> ভালো নয়	<input type="checkbox"/> সন্তোষজনক নয়	<input type="checkbox"/> সন্তোষজনক	<input type="checkbox"/> উন্নত

আপনি যদি এই প্রকল্পে অংশগ্রহণ করতে চান, তবে চারটি সেটের নির্বাচনী ও ব্যাখ্যামূলক প্রশ্নের উত্তর দিতে আপনার সর্বোচ্চ ২৫-৩০ মিনিট সময় লাগবে।

শুধুমাত্র মৌখিক সম্মতির মাধ্যমে আপনি স্বপ্রনোদিতভাবে এই জরিপে অংশগ্রহণ করতে পারেন। আপনি চাইলে, আপনার নাম ও পরিচয় এর ক্ষেত্রে গোপনীয়তা বজায় রাখা হবে এবং আপনার উত্তর ও প্রশ্নের উপর প্রতিক্রিয়া নামবিহীন থাকবে।

কারণ, এই জরিপটি ডেকিন বিশ্ববিদ্যালয়ের হিউম্যান রিসার্চ ইথিক্স কমিটি দ্বারা অনুমোদিত। সংযোজনকৃত স্পষ্ট ভাষা বিবৃতি পত্রটির একটি অনুলিপি আপনার কাছে রাখবেন, যা গবেষণা প্রকল্পটির আনুসঙ্গিক তথ্য বহন করে এবং কোনো অতিরিক্ত অনুসন্ধানের জন্যে যোগাযোগের ঠিকানা সম্মিলিত।

ধন্যবাদ।



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

জরিপ Ai : উদ্যান ও উন্মুক্ত স্থান ব্যবহারকারীদের জন্যে প্রশ্ন

অংশগ্রহণকারী : সকল শ্রেণী				
ক ১	নাম :			
ক ২	লিঙ্গ :	<input type="checkbox"/> পুরুষ	<input type="checkbox"/> মহিলা	<input type="checkbox"/> অন্যান্য
ক ৩	বয়স :	<input type="checkbox"/> ১৮ হতে ২৫ এর মধ্যে	<input type="checkbox"/> ২৫ হতে ৩৫ এর মধ্যে	<input type="checkbox"/> ৩৫ হতে ৪৫ এর মধ্যে
		<input type="checkbox"/> ৪৫ হতে ৫৫ এর মধ্যে	<input type="checkbox"/> ৫৫ হতে ৬৫ এর মধ্যে	<input type="checkbox"/> ৬৫ এর উর্ধ্ব
ক ৪	শিক্ষাগত যোগ্যতা :	<input type="checkbox"/> নেই	<input type="checkbox"/> প্রাথমিক পর্যায়	<input type="checkbox"/> মাধ্যমিক পর্যায়
		<input type="checkbox"/> উচ্চ মাধ্যমিক পর্যায়	<input type="checkbox"/> সন্থান	<input type="checkbox"/> মাস্টার্স বা উর্ধ্ব
ক ৫	পেশা :	<input type="checkbox"/> ছাত্র	<input type="checkbox"/> সরকারী চাকুরী জীবী	<input type="checkbox"/> ব্যবসায়ী
	<input type="checkbox"/> বেকার	<input type="checkbox"/> চিকিৎসক	<input type="checkbox"/> প্রযুক্তিবিদ	<input type="checkbox"/> শিক্ষক/গবেষক
	<input type="checkbox"/> বেসরকারী চাকুরীজীবী	<input type="checkbox"/> অনানুষ্ঠানিক খাতে কর্মরত	<input type="checkbox"/> গৃহিনী/নির্ভরশীল	<input type="checkbox"/> অবসরপ্রাপ্ত
	<input type="checkbox"/> টেকনোক্রোট	<input type="checkbox"/> অন্যান্য		

অংশগ্রহণকারীর শ্রেণী : উদ্যান/উন্মুক্ত পরিসর পরিদর্শক				
খ ১	উদ্যানের / উন্মুক্ত পরিসরের নাম :	<input type="checkbox"/> জামুরী পার্ক	<input type="checkbox"/> সি.আর.বি এরিয়া	
খ ২	আপনি কতদূর থেকে এসেছেন ?			
	<input type="checkbox"/> ০-১ কিঃমিঃ	<input type="checkbox"/> ১ - ৫ কিঃমিঃ	<input type="checkbox"/> ৫ - ১০ কিঃমিঃ	<input type="checkbox"/> ১০ কিঃমিঃ এর অধিক
খ ৩	আপনি যদি উদ্যান/উন্মুক্ত পরিসর কাছে বসবাস করেন, তাহলে হেটে আসতে আপনার কতক্ষন লাগে ?			
	<input type="checkbox"/> ১০ মিনিটের কম	<input type="checkbox"/> ২০ মিনিটের কম	<input type="checkbox"/> ৩০ মিনিটের কম	<input type="checkbox"/> প্রযোজ্য নহে
খ ৪	আপনি কিভাবে উদ্যানে এসেছেন ?			
	<input type="checkbox"/> হেটে	<input type="checkbox"/> বাসে	<input type="checkbox"/> গাড়িতে	<input type="checkbox"/> রিকশায়
খ ৫	আপনি কার সাথে এসেছেন ?			
	<input type="checkbox"/> পরিবারের সাথে	<input type="checkbox"/> বন্ধুর সাথে	<input type="checkbox"/> একটি দলের সাথে	<input type="checkbox"/> একা
খ ৬	আপনি সাধারণত কতদিন পরপর উদ্যানে আসেন ?			
	<input type="checkbox"/> প্রতিদিন	<input type="checkbox"/> সপ্তাহে একবার	<input type="checkbox"/> দুই সপ্তাহে একবার	<input type="checkbox"/> মাসে একবার
	<input type="checkbox"/> বছরে একবার	<input type="checkbox"/> বছরে কয়েকবার	<input type="checkbox"/> কদাচিৎ	<input type="checkbox"/> কখনোই নয়
খ ৭	আপনি যদি ঘন ঘন (প্রতি মাসে অন্ততঃ একবার) উদ্যানে না আসেন তবে তার কারন কি ?			
	<input type="checkbox"/> আমি আগ্রহী নই	<input type="checkbox"/> সময় পাই না	<input type="checkbox"/> দুরে থাকি	<input type="checkbox"/> উদ্যানের পরিবেশ ভালো না
	<input type="checkbox"/> অন্যান্যঃ			
খ ৮	নিম্নের কোন কারনে আপনি উদ্যানে আসেন ?			
	<input type="checkbox"/> উদ্যানের সুবিধা সমূহ	<input type="checkbox"/> দর্শনের জন্য	<input type="checkbox"/> পরিবার ও বন্ধুদের সাথে সময় কাটানোর জন্য	<input type="checkbox"/> হাটের জন্য
	<input type="checkbox"/> সবগুলো সঠিক	<input type="checkbox"/> কোনটিই নয়	<input type="checkbox"/> অন্যান্য	
খ ৯	অন্যান্য কি কি কারনে আপনি উদ্যান আসেন, বর্ণনা করুন :			
	১.			



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

	২.
	৩.
খ ১০	আপনি কি উন্ময়নের আগে ও উদ্যানে আসতেন ? <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> না
খ ১১	উদ্যানের উন্ময়নকে আপনি কিভাবে দেখবেন ? <input type="checkbox"/> ভালো না <input type="checkbox"/> সন্তোষজনক <input type="checkbox"/> ভালো <input type="checkbox"/> খুব ভালো
খ ১২	উদ্যানের উন্ময়নের পর আপনার উদ্যান, দর্শন কিভাবে বর্ণনা করবেন ? <input type="checkbox"/> বৃদ্ধি পেয়েছে <input type="checkbox"/> কমে গেছে <input type="checkbox"/> একইরকম
খ ১৩	আপনার উদ্যান ভ্রমণ বৃদ্ধির/কমে যাওয়ার কারণ কি ? ১. ২. ৩. ৪.
খ ১৪	আপনি কি চট্টগ্রামে বসবাস করেন ? <input type="checkbox"/> হ্যাঁ (অনুগ্রহ করে অধ্যায় ঘ উত্তর করুন) <input type="checkbox"/> না

অংশগ্রহণকারীর শ্রেণী : উদ্যান পরিদর্শক, খেলারমাঠ ব্যবহারকারী এবং চট্টগ্রামের পেশাদারগণ			
ঘ-১	আপনি চট্টগ্রামের কোথায় বসবাস করেন ? সড়ক : <input type="checkbox"/> ওয়ার্ডঃ <input type="checkbox"/> মহল্লা : <input type="checkbox"/>		
ঘ-২	আপনার বাড়ির এক কিলোমিটারের মধ্যে নিম্নের কোনটি আছে ? <input type="checkbox"/> উদ্যান <input type="checkbox"/> খেলার মাঠ <input type="checkbox"/> কোনটিই নয় <input type="checkbox"/> দুটোই		
ঘ-৩	যদি থাকে, তবে বর্ণনা করুন ? <input type="checkbox"/> উদ্যান : <input type="checkbox"/> <input type="checkbox"/> খেলার মাঠ : <input type="checkbox"/>		
ঘ-৪	আপনি সাধারণত কতদিন পরপর এই উদ্যানে/খেলার মাঠে যান ? <input type="checkbox"/> প্রতিদিন <input type="checkbox"/> সপ্তাহে একবার <input type="checkbox"/> প্রতিদিন <input type="checkbox"/> সপ্তাহে একবার <input type="checkbox"/> মাসে একবার <input type="checkbox"/> মাঝে মধ্যে <input type="checkbox"/> মাসে একবার <input type="checkbox"/> মাঝে মধ্যে		
ঘ-৫	আপনি কি হেটে উদ্যান বা খেলার মাঠে যান ? উদ্যান <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> না <input type="checkbox"/> প্রযোজ্য নয় খেলার মাঠ <input type="checkbox"/> হ্যাঁ <input type="checkbox"/> না <input type="checkbox"/> প্রযোজ্য নয়		
ঘ-৬	আপনি হেটে গেলে কতক্ষণ লাগে ? উদ্যান <input type="checkbox"/> ৫ মিনিটের কম <input type="checkbox"/> ৫-১০ মিনিট <input type="checkbox"/> ১০-১৫ মিনিট <input type="checkbox"/> প্রযোজ্য নয় খেলার মাঠ <input type="checkbox"/> ৫ মিনিটের কম <input type="checkbox"/> ৫-১০ মিনিট <input type="checkbox"/> ১০-১৫ মিনিট <input type="checkbox"/> প্রযোজ্য নয়		
ঘ-৭	আপনি যদি না হাটেন, তবে কেন ? <input type="checkbox"/> আমি হাটতে পছন্দ করি না <input type="checkbox"/> আমি হাটতে পারি না <input type="checkbox"/> আমার হেটে আসার ফুটপাথ নেই <input type="checkbox"/> প্রযোজ্য নয়		
ঘ-৮	আপনি যদি ঘন ঘন উদ্যান বা খেলার মাঠে না যান তবে তার কারণ কি ?		



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

	<input type="checkbox"/> আমি আগ্রহী নই	<input type="checkbox"/> আমি সময় করতে পারিনা	<input type="checkbox"/> দূরে	<input type="checkbox"/> প্রয়োজ্য নয়
	<input type="checkbox"/> আমার হেটে যাবার ফুটপাথ নেই		<input type="checkbox"/> উদ্যান বা খেলার মাঠের পরিবেশ ভালো না	
ঘ-৯	আপনি কি মনে করেন উদ্যানটি বা খেলার মাঠটি আপনার এলাকার জন্য যথেষ্ট ?			
	<input type="checkbox"/> উদ্যান	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> প্রয়োজ্য নয়
	<input type="checkbox"/> খেলার মাঠ	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-১০	আপনি যদি মনে করেন, যথেষ্ট নয় তাহলে কি কারণে মনে করেন তা বর্ণনা করুন ?			
	উদ্যান :			
	খেলার মাঠ :			
ঘ-১১	আপনার আশে পাশে যদি উদ্যান না থাকে, তাহলে কি আপনি মনে করেন আপনার এলাকার বাসার ১০ মিনিট বা ১কিঃমিঃ দূরত্বের মধ্যে একটি উদ্যান দরকার ?			
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-১২	যদি মনে করেন প্রয়োজ্য আছে, তবে কেন বর্ণনা করুন ?			
	<input type="checkbox"/> মনোরঞ্জন এর জন্য	<input type="checkbox"/> খোলামেলা পরিবেশের জন্য	<input type="checkbox"/> সামাজিক যোগাযোগের জন্য	<input type="checkbox"/> ব্যায়াম অনুশীলনের জন্য
ঘ-১৩	আপনার যদি শিশু সন্তান থাকে তবে তারা কোথায় খেলে ?			
	<input type="checkbox"/> খেলার মাঠে	<input type="checkbox"/> বাড়িতে	<input type="checkbox"/> অন্যান্য	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-১৪	আপনার বাসার আশে পাশে যদি খেলার মাঠ না থাকে, তবে কি আপনি তার প্রয়োজন আছে মনে করেন ?			
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-১৫	চট্টগ্রামে কোন উদ্যানে আপনি যান ?			
	নাম :		দূরত্ব :	
ঘ-১৬	চট্টগ্রামে কোন খেলার মাঠে আপনি যান ?			
	নাম :		দূরত্ব :	
ঘ-১৭	আপনি যদি মনে করেন, আপনার এলাকায় উন্মুক্ত পরিসরের এর প্রয়োজন আছে, তবে নিম্নের কোনটিকে আপনি অধিক প্রাধান্য দিবেন ?			
	<input type="checkbox"/> উদ্যান	<input type="checkbox"/> খেলার মাঠ	<input type="checkbox"/> উদ্যান ও খেলার জায়গা	<input type="checkbox"/> অন্যান্যঃ

অংশগ্রহণকারীর শ্রেণী : উদ্যান পরিদর্শক, খেলারমাঠ, উন্মুক্ত পরিসরের ব্যবহারকারী এবং চট্টগ্রামের পেশাদারগণ				
ঙ-১	আপনি কি নিম্নের কোন প্রাকৃতিক পরিবেশের ১ কিঃমিঃ দূরত্বের মধ্যে বসবাস করেন ? থাকলে চিহ্নিত করুনঃ			
	<input type="checkbox"/> নদী	<input type="checkbox"/> খাল	<input type="checkbox"/> পুকুর	<input type="checkbox"/> সমুদ্র
	<input type="checkbox"/> লেক	<input type="checkbox"/> পাহাড়	<input type="checkbox"/> কোনটিই নয়	<input type="checkbox"/> অন্যান্য
ঙ-২	জায়গাটির বর্ণনা :			
	নাম :			
	স্থান :			



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

ঙ-৩	আপনার কি উক্ত স্থানে যাতায়াতের কোন ব্যবস্থা আছে ? <input type="checkbox"/> হ্যা <input type="checkbox"/> না <input type="checkbox"/> প্রযোজ্য নয়
ঙ-৪	যদি না থাকে, তাহলে আপনি কি মনে করেন আপনার যাতায়াতের ব্যবস্থা থাকলে ভালো হত ? <input type="checkbox"/> হ্যা <input type="checkbox"/> না <input type="checkbox"/> উত্তর জানা নেই <input type="checkbox"/> প্রযোজ্য নয়
ঙ-৫	আপনার যদি যাতায়াতের ব্যবস্থা থাকতো, তাহলে কি আপনি যেতেন ? <input type="checkbox"/> হ্যা <input type="checkbox"/> না <input type="checkbox"/> উত্তর জানা নেই <input type="checkbox"/> প্রযোজ্য নয়
ঙ-৬	আপনি যদি জায়গাটিতে যেতে পছন্দ না করেন, তবে কেন ? <input type="checkbox"/> পরিষ্কার পরিছন্ন নয় <input type="checkbox"/> নিরাপদ নয় <input type="checkbox"/> সুন্দর নয় <input type="checkbox"/> অন্যান্য
ঙ-৭	আপনি কোন এলাকায় কাজ/লেখাপড়া করেন ? স্থান : <input type="text"/> ওয়ার্ড : <input type="text"/>
ঙ-৮	আপনার কর্ম স্থলের/বিশ্ববিদ্যালয়ের আশে পাশে কোন উদ্যান বা উন্মুক্ত পরিসর আছে কি ? <input type="checkbox"/> হ্যা <input type="checkbox"/> না <input type="checkbox"/> উত্তর জানা নেই <input type="checkbox"/> প্রযোজ্য নয়
ঙ-৯	যদি থাকে তবে বর্ণনা করুন ? স্থান : <input type="text"/> ওয়ার্ড : <input type="text"/>
ঙ-১০	আপনি কি চট্টগ্রামে শহরের শপিং সেন্টার বা বাজার সংলগ্ন কোন সর্বজনীন উন্মুক্ত স্থানের সাথে পরিচিত? যদি থাকে, তবে অনুগ্রহ করে বর্ণনা করুন ? ১. নাম : <input type="text"/> স্থানের নাম : <input type="text"/> ২. নাম : <input type="text"/> স্থানের নাম : <input type="text"/> ৩. নাম : <input type="text"/> স্থানের নাম : <input type="text"/>

প্রয়োজনীয় সময় নিয়ে উত্তর দেবার জন্যে ধন্যবাদ।



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

জরিপ Ai : খেলার মাঠ ব্যবহারকারীদের জন্যে প্রশ্ন

অংশগ্রহণকারী : সকল শ্রেণী				
ক ১	নাম :			
ক ২	লিঙ্গ :	<input type="checkbox"/> পুরুষ	<input type="checkbox"/> মহিলা	<input type="checkbox"/> অন্যান্য
ক ৩	বয়স :	<input type="checkbox"/> ১৮ হতে ২৫ এর মধ্যে	<input type="checkbox"/> ২৫ হতে ৩৫ এর মধ্যে	<input type="checkbox"/> ৩৫ হতে ৪৫ এর মধ্যে
		<input type="checkbox"/> ৪৫ হতে ৫৫ এর মধ্যে	<input type="checkbox"/> ৫৫ হতে ৬৫ এর মধ্যে	<input type="checkbox"/> ৬৫ এর উর্ধ্ব
ক ৪	শিক্ষাগত যোগ্যতা :	<input type="checkbox"/> নেই	<input type="checkbox"/> প্রাথমিক পর্যায়	<input type="checkbox"/> মাধ্যমিক পর্যায়
		<input type="checkbox"/> উচ্চ মাধ্যমিক পর্যায়	<input type="checkbox"/> সন্থান	<input type="checkbox"/> মাস্টার্স বা উর্ধ্ব
ক ৫	পেশা :	<input type="checkbox"/> ছাত্র	<input type="checkbox"/> সরকারী চাকুরী জীবী	<input type="checkbox"/> ব্যবসায়ী
	<input type="checkbox"/> বেকার	<input type="checkbox"/> চিকিৎসক	<input type="checkbox"/> প্রযুক্তিবিদ	<input type="checkbox"/> শিক্ষক/গবেষক
	<input type="checkbox"/> বেসরকারী চাকুরীজীবী	<input type="checkbox"/> অনানুষ্ঠানিক খাতে কর্মরত	<input type="checkbox"/> গৃহিনী/নির্ভরশীল	<input type="checkbox"/> অবসরপ্রাপ্ত
	<input type="checkbox"/> টেকনোক্রোট	<input type="checkbox"/> অন্যান্য		

অংশগ্রহণকারীর শ্রেণী : খেলার মাঠ ব্যবহারকারী				
স্থান : প্যারেড গ্রাউন্ড				
গ ১	আপনি এই খেলার মাঠের উন্নয়নকে কি ধরনের নির্ধারন করবেন ?			
	<input type="checkbox"/> মন্দ	<input type="checkbox"/> সন্তোষজনক নয়	<input type="checkbox"/> সন্তোষজনক	<input type="checkbox"/> উত্তম
গ ২	আপনি সাধারণত কতদিন পরপর এই খেলার মাঠে আসেন ?			
	<input type="checkbox"/> প্রতিদিন	<input type="checkbox"/> সপ্তাহে একবার	<input type="checkbox"/> দুই সপ্তাহে একবার	<input type="checkbox"/> মাসে একবার
	<input type="checkbox"/> বছরে কয়েকবার	<input type="checkbox"/> বছরে একবার	<input type="checkbox"/> কদাচিৎ	<input type="checkbox"/> নির্ধারিত নয়
গ ৩	আপনি কি ধরনের কর্ম কান্ড করেন ?			
	<input type="checkbox"/> হাটেন	<input type="checkbox"/> দৌড়ান	<input type="checkbox"/> খেলাধুলা করেন	<input type="checkbox"/> খেলা পর্যবেক্ষন করেন
গ ৪	আপনি খেলার মাঠ হতে কত দুরে থাকেন ?			
	<input type="checkbox"/> ০-১ কিঃমিঃ	<input type="checkbox"/> ১-৫ কিঃমিঃ	<input type="checkbox"/> ৫ -১০ কিঃমিঃ	<input type="checkbox"/> ১০ কিঃমিঃ এর অধিক
গ ৫	আপনি কিভাবে খেলার মাঠে যাতায়াত আসেন ?			
	<input type="checkbox"/> হেটে	<input type="checkbox"/> নিজস্ব গাড়িতে	<input type="checkbox"/> রিকসায়	<input type="checkbox"/> বাসে
গ ৬	আপনি যদি কাছে থাকেন এবং হেটে না আসেন তবে তার কারণ কি ?			
	<input type="checkbox"/> আমি হাটতে পছন্দ করি না	<input type="checkbox"/> আমি হাটতে পারি না	<input type="checkbox"/> আমার হেটে আসার ফুটপাথ নেই	<input type="checkbox"/> প্রযোজ্য নয়
গ ৭	আপনি কি মনে করেন, খেলার মাঠটি এই এলাকার মানুষের জন্য যথেষ্ট ?			
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	
গ ৮	আপনি কি উন্নয়নের পূর্বেও এই খেলার মাঠে আসতেন?			



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না
গ ৯	আপনি কি মনে করেন, এই খেলার মাঠটি যথেষ্ট নয় তাহলে তার কারণ কি ?	
	১.	
	২.	
	৩.	
গ ১০	আপনি কি মনে করেন, আমাদের এ ধরনের আরো খেলার মাঠের প্রয়োজন ?	
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না
গ ১১	যদি প্রয়োজন মনে করেন, তবে তার কি কারণে?	
	<input type="checkbox"/> মনোরঞ্জন এর জন্য	<input type="checkbox"/> খোলামেলা পরিবেশের জন্য
গ ১২	<input type="checkbox"/> সামাজিক মেলামেশার জন্য	<input type="checkbox"/> ব্যায়াম অনুশীলনের জন্য
	উন্নয়নের পর আপনার খেলার মাঠ ব্যবহারকে কিভাবে বর্ণনা করবেন ?	
গ ১৩	<input type="checkbox"/> অধিক	<input type="checkbox"/> কম
	<input type="checkbox"/> একই	<input type="checkbox"/> প্রয়োজ্য নয়
	কোন বয়সের জন্য আপনি খেলার মাঠটিকে প্রয়োজ্য মনে করবেন ?	
গ ১৩	<input type="checkbox"/> ৩ বছর-১০ বছর	<input type="checkbox"/> ১১ বছর-১৫ বছর
	<input type="checkbox"/> ১৬ বছর-২৫ বছর	<input type="checkbox"/> ২৬ বছর-৩৫ বছর
গ ১৩	<input type="checkbox"/> ৩৬ বছর-৪৫ বছর	<input type="checkbox"/> উর্ধ্ব
	<input type="checkbox"/> সব বয়সের জন্য	<input type="checkbox"/> কোনটিই নয়
গ ১৩	খেলার মাঠটি যদি অনূর্ধ্ব ১৫ বছর বয়সী শিশুদের জন্য প্রয়োজ্য না হয় তবে আপনি কি মনে করেন, আপনার এলাকায় এধরনের একটি খেলার মাঠের প্রয়োজন আছে?	
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না
	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রয়োজ্য নহে

অংশগ্রহণকারীর শ্রেণী : উদ্যান পরিদর্শক, খেলারমাঠ ব্যবহারকারী এবং চট্টগ্রামের পেশাদারগন			
ঘ-১	আপনি চট্টগ্রামের কোথায় বসবাস করেন ?		
	সড়ক :	ওয়ার্ডঃ	
	মহল্লা :		
ঘ-২	আপনার বাড়ির এক কিলোমিটারের মধ্যে নিম্নের কোনটি আছে ?		
	<input type="checkbox"/> উদ্যান	<input type="checkbox"/> খেলার মাঠ	<input type="checkbox"/> কোনটিই নয়
ঘ-৩	<input type="checkbox"/> দুটেই	যদি থাকে, তবে বর্ণনা করুন ?	
	<input type="checkbox"/> উদ্যান :	<input type="checkbox"/> খেলার মাঠ :	
ঘ-৪	আপনি সাধারণত কতদিন পরপর এই উদ্যানে/খেলার মাঠে যান ?		
	<input type="checkbox"/> প্রতিদিন	<input type="checkbox"/> সপ্তাহে একবার	<input type="checkbox"/> প্রতিদিন
	<input type="checkbox"/> সপ্তাহে একবার	<input type="checkbox"/> মাসে একবার	<input type="checkbox"/> মাঝে মধ্যে
ঘ-৫	আপনি কি হেটে উদ্যান বা খেলার মাঠে যান ?		
	উদ্যান	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না
	খেলার মাঠ	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না
ঘ-৬	আপনি হেটে গেলে কতক্ষন লাগে ?		
	উদ্যান	<input type="checkbox"/> ৫ মিনিটের কম	
	খেলার মাঠ	<input type="checkbox"/> ৫-১০ মিনিট	<input type="checkbox"/> ১০-১৫ মিনিট
	<input type="checkbox"/> ৫ মিনিটের কম	<input type="checkbox"/> ৫-১০মিনিট	<input type="checkbox"/> ১০-১৫ মিনিট
	<input type="checkbox"/> প্রয়োজ্য নয়	<input type="checkbox"/> প্রয়োজ্য নয়	<input type="checkbox"/> প্রয়োজ্য নয়



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

ঘ-৭	আপনি যদি না হাটেন, তবে কেন ?			
	<input type="checkbox"/> আমি হাটতে পছন্দ করি না	<input type="checkbox"/> আমি হাটতে পারি না	<input type="checkbox"/> আমার হেটে আসার ফুটপাথ নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-৮	আপনি যদি ঘন ঘন উদ্যান বা খেলার মাঠে না যান তবে তার কারণ কি ?			
	<input type="checkbox"/> আমি আগ্রহী নই	<input type="checkbox"/> আমি সময় করতে পারি না	<input type="checkbox"/> দূরে	<input type="checkbox"/> প্রয়োজ্য নয়
	<input type="checkbox"/> আমার হেটে যাবার ফুটপাথ নেই		<input type="checkbox"/> উদ্যান বা খেলার মাঠের পরিবেশ ভালো না	
ঘ-৯	আপনি কি মনে করেন উদ্যানটি বা খেলার মাঠটি আপনার এলাকার জন্য যথেষ্ট ?			
	<input type="checkbox"/> উদ্যান	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> প্রয়োজ্য নয়
	<input type="checkbox"/> খেলার মাঠ	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-১০	আপনি যদি মনে করেন, যথেষ্ট নয় তাহলে কি কারণে মনে করেন তা বর্ণনা করুন ?			
	উদ্যান :			
	খেলার মাঠ :			
ঘ-১১	আপনার আশে পাশে যদি উদ্যান না থাকে, তাহলে কি আপনি মনে করেন আপনার এলাকার বাসার ১০ মিনিট বা ১কিঃমিঃ দূরত্বের মধ্যে একটি উদ্যান দরকার ?			
	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-১২	যদি মনে করেন প্রয়োজ্য আছে, তবে কেন বর্ণনা করুন ?			
	<input type="checkbox"/> মনোরঞ্জন এর জন্য	<input type="checkbox"/> খোলামেলা পরিবেশের জন্য	<input type="checkbox"/> সামাজিক যোগাযোগের জন্য	<input type="checkbox"/> ব্যায়াম অনুশীলনের জন্য
ঘ-১৩	আপনার যদি শিশু সন্তান থাকে তবে তারা কোথায় খেলে ?			
	<input type="checkbox"/> খেলার মাঠে	<input type="checkbox"/> বাড়িতে	<input type="checkbox"/> অন্যান্য	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-১৪	আপনার বাসার আশে পাশে যদি খেলার মাঠ না থাকে, তবে কি আপনি তার প্রয়োজন আছে মনে করেন ?			
	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-১৫	চট্টগ্রামে কোন উদ্যানে আপনি যান ?			
	নাম :		দূরত্ব :	
ঘ-১৬	চট্টগ্রামে কোন খেলার মাঠে আপনি যান ?			
	নাম :		দূরত্ব :	
ঘ-১৭	আপনি যদি মনে করেন, আপনার এলাকায় উন্মুক্ত পরিসরের এর প্রয়োজন আছে, তবে নিম্নের কোনটিকে আপনি অধিক প্রাধান্য দিবেন ?			
	<input type="checkbox"/> উদ্যান	<input type="checkbox"/> খেলার মাঠ	<input type="checkbox"/> উদ্যান ও খেলার জায়গা	<input type="checkbox"/> অন্যান্যঃ

অংশগ্রহণকারী র শ্রেণী : উদ্যান পরিদর্শক, খেলারমাঠ, উন্মুক্ত পরিসরের ব্যবহারকারী এবং চট্টগ্রামের পেশাদারগন

ঙ-১	আপনি কি নিম্নের কোন প্রাকৃতিক পরিবেশের ১ কিঃমিঃ দূরত্বের মধ্যে বসবাস করেন ? থাকলে চিহ্নিত করুনঃ			
	<input type="checkbox"/> নদী	<input type="checkbox"/> খাল	<input type="checkbox"/> পুকুর	<input type="checkbox"/> সমুদ্র
	<input type="checkbox"/> লেক	<input type="checkbox"/> পাহাড়	<input type="checkbox"/> কোনটিই নয়	<input type="checkbox"/> অন্যান্য



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

ঙ-২	জায়গাটির বর্ণনা :			
	নাম :			
	স্থান :			
ঙ-৩	আপনার কি উক্ত স্থানে যাতায়াতের কোন ব্যবস্থা আছে ?			
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> প্রযোজ্য নয়	
ঙ-৪	যদি না থাকে, তাহলে আপনি কি মনে করেন আপনার যাতায়াতের ব্যবস্থা থাকলে ভালো হত ?			
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রযোজ্য নয়
ঙ-৫	আপনার যদি যাতায়াতের ব্যবস্থা থাকতো, তাহলে কি আপনি যেতেন ?			
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রযোজ্য নয়
ঙ-৬	আপনি যদি জায়গাটিতে যেতে পছন্দ না করেন, তবে কেন ?			
	<input type="checkbox"/> পরিষ্কার পরিচ্ছন্ন নয়	<input type="checkbox"/> নিরাপদ নয়	<input type="checkbox"/> সুন্দর নয়	<input type="checkbox"/> অন্যান্য
ঙ-৭	আপনি কোন এলাকায় কাজ/লেখাপড়া করেন ?			
	স্থান :		ওয়ার্ড :	
ঙ-৮	আপনার কর্ম স্থলের/বিশ্ববিদ্যালয়ের আশে পাশে কোন উদ্যান বা উন্মুক্ত পরিসর আছে কি ?			
	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রযোজ্য নয়
ঙ-৯	যদি থাকে তবে বর্ণনা করুন ?			
	স্থান :			
	ওয়ার্ড :			
ঙ-১০	আপনি কি চট্টগ্রামে শহরের শপিং সেন্টার বা বাজার সংলগ্ন কোন সর্বজনীন উন্মুক্ত স্থানের সাথে পরিচিত? যদি থাকে, তবে অনুগ্রহ করে বর্ণনা করুন ?			
	১. নাম :		স্থানের নাম :	
	২. নাম :		স্থানের নাম :	
	৩. নাম :		স্থানের নাম :	

প্রয়োজনীয় সময় নিয়ে উত্তর দেবার জন্যে ধন্যবাদ।



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

জরিপ Bi : পরিবেশগঠনে অনুশীলনরত পেশাদার অংশগ্রহণকারীগণের জন্যে প্রশ্ন

অংশগ্রহণকারী : সকল শ্রেণী				
ক ১	নাম :			
ক ২	লিঙ্গ :	<input type="checkbox"/> পুরুষ	<input type="checkbox"/> মহিলা	<input type="checkbox"/> অন্যান্য
ক ৩	বয়স :	<input type="checkbox"/> ১৮ হতে ২৫ এর মধ্যে	<input type="checkbox"/> ২৫ হতে ৩৫ এর মধ্যে	<input type="checkbox"/> ৩৫ হতে ৪৫ এর মধ্যে
		<input type="checkbox"/> ৪৫ হতে ৫৫ এর মধ্যে	<input type="checkbox"/> ৫৫ হতে ৬৫ এর মধ্যে	<input type="checkbox"/> ৬৫ এর উর্ধ্ব
ক ৪	শিক্ষাগত যোগ্যতা :	<input type="checkbox"/> নেই	<input type="checkbox"/> প্রাথমিক পর্যায়	<input type="checkbox"/> মাধ্যমিক পর্যায়
		<input type="checkbox"/> উচ্চ মাধ্যমিক পর্যায়	<input type="checkbox"/> সন্মান	<input type="checkbox"/> মাস্টার্স বা উর্ধ্ব
ক ৫	পেশা :	<input type="checkbox"/> ছাত্র	<input type="checkbox"/> সরকারী চাকুরী জীবী	<input type="checkbox"/> ব্যবসায়ী
	<input type="checkbox"/> বেকার	<input type="checkbox"/> চিকিৎসক	<input type="checkbox"/> প্রযুক্তিবিদ	<input type="checkbox"/> শিক্ষক/গবেষক
	<input type="checkbox"/> বেসরকারী চাকুরীজীবী	<input type="checkbox"/> অনানুষ্ঠানিক খাতে কর্মরত	<input type="checkbox"/> গৃহিনী/নির্ভরশীল	<input type="checkbox"/> অবসরপ্রাপ্ত
	<input type="checkbox"/> টেকনোলজি	<input type="checkbox"/> অন্যান্য		

অংশগ্রহণকারী র শ্রেণী : উদ্যান পরিদর্শক, খেলারমাঠ ব্যবহারকারী এবং চট্টগ্রামের পেশাদারগন				
ঘ-১	আপনি চট্টগ্রামের কোথায় বসবাস করেন ?			
	সড়ক :		ওয়ার্ডঃ	
	মহল্লা :			
ঘ-২	আপনার বাড়ির এক কিলোমিটারের মধ্যে নিম্নের কোনটি আছে ?			
	<input type="checkbox"/> উদ্যান	<input type="checkbox"/> খেলার মাঠ	<input type="checkbox"/> কোনটিই নয়	<input type="checkbox"/> দুটোই
ঘ-৩	যদি থাকে, তবে বর্ণনা করুন ?			
	<input type="checkbox"/> উদ্যান : <input type="checkbox"/> খেলার মাঠ :			
ঘ-৪	আপনি সাধারণত কতদিন পরপর এই উদ্যানে/খেলার মাঠে যান ?			
	<input type="checkbox"/> প্রতিদিন	<input type="checkbox"/> সপ্তাহে একবার	<input type="checkbox"/> প্রতিদিন	<input type="checkbox"/> সপ্তাহে একবার
	<input type="checkbox"/> মাসে একবার	<input type="checkbox"/> মাঝে মধ্যে	<input type="checkbox"/> মাসে একবার	<input type="checkbox"/> মাঝে মধ্যে
ঘ-৫	আপনি কি হেটে উদ্যান বা খেলার মাঠে যান ?			
	উদ্যান	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> প্রযোজ্য নয়
	খেলার মাঠ	<input type="checkbox"/> হ্যা	<input type="checkbox"/> না	<input type="checkbox"/> প্রযোজ্য নয়
ঘ-৬	আপনি হেটে গেলে কতক্ষন লাগে ?			
	উদ্যান			
	<input type="checkbox"/> ৫ মিনিটের কম	<input type="checkbox"/> ৫-১০ মিনিট	<input type="checkbox"/> ১০-১৫ মিনিট	<input type="checkbox"/> প্রযোজ্য নয়
	খেলার মাঠ			
	<input type="checkbox"/> ৫ মিনিটের কম	<input type="checkbox"/> ৫-১০মিনিট	<input type="checkbox"/> ১০-১৫ মিনিট	<input type="checkbox"/> প্রযোজ্য নয়



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

ঘ-৭	আপনি যদি না হাটেন, তবে কেন ?			
	<input type="checkbox"/> আমি হাটতে পছন্দ করি না	<input type="checkbox"/> আমি হাটতে পারি না	<input type="checkbox"/> আমার হেটে আসার ফুটপাথ নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঘ-৮	আপনি যদি ঘন ঘন উদ্যান বা খেলার মাঠে না যান তবে তার কারণ কি ?			
	<input type="checkbox"/> আমি আগ্রহী নই	<input type="checkbox"/> আমি সময় করতে পারিনা	<input type="checkbox"/> দূরে	<input type="checkbox"/> প্রয়োজ্য নয়
	<input type="checkbox"/> আমার হেটে যাবার ফুটপাথ নেই		<input type="checkbox"/> উদ্যান বা খেলার মাঠের পরিবেশ ভালো না	
ঘ-৯	আপনি কি মনে করেন উদ্যানটি বা খেলার মাঠটি আপনার এলাকার জন্য যথেষ্ট ?			

অংশগ্রহণকারী র শ্রেণী : উদ্যান পরিদর্শক, খেলারমাঠ, উন্মুক্ত পরিসরের ব্যবহারকারী এবং চট্টগ্রামের পেশাদারগণ				
ঙ-১	আপনি কি নিম্নের কোন প্রাকৃতিক পরিবেশের ১ কিঃমিঃ দূরত্বের মধ্যে বসবাস করেন ? থাকলে চিহ্নিত করুনঃ			
	<input type="checkbox"/> নদী	<input type="checkbox"/> খাল	<input type="checkbox"/> পুকুর	<input type="checkbox"/> সমুদ্র
	<input type="checkbox"/> লেক	<input type="checkbox"/> পাহাড়	<input type="checkbox"/> কোনটিই নয়	<input type="checkbox"/> অন্যান্য
ঙ-২	জায়গাটির বর্ণনা :			
	নাম :			
	স্থান :			
ঙ-৩	আপনার কি উক্ত স্থানে যাতায়াতের কোন ব্যবস্থা আছে ?			
	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> প্রয়োজ্য নয়	
ঙ-৪	যদি না থাকে, তাহলে আপনি কি মনে করেন আপনার যাতায়াতের ব্যবস্থা থাকলে ভালো হত ?			
	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঙ-৫	আপনার যদি যাতায়াতের ব্যবস্থা থাকতো, তাহলে কি আপনি যেতেন ?			
	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঙ-৬	আপনি যদি জায়গাটিতে যেতে পছন্দ না করেন, তবে কেন ?			
	<input type="checkbox"/> পরিষ্কার পরিছন্ন নয়	<input type="checkbox"/> নিরাপদ নয়	<input type="checkbox"/> সুন্দর নয়	<input type="checkbox"/> অন্যান্য
ঙ-৭	আপনি কোন এলাকায় কাজ/লেখাপড়া করেন ?			
	স্থান :		ওয়ার্ড :	
ঙ-৮	আপনার কর্ম স্থলের/বিশ্ববিদ্যালয়ের আশে পাশে কোন উদ্যান বা উন্মুক্ত পরিসর আছে কি ?			
	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই	<input type="checkbox"/> প্রয়োজ্য নয়
ঙ-৯	যদি থাকে তবে বর্ণনা করুন ?			
	স্থান :			
	ওয়ার্ড :			
ঙ-১০	আপনি কি চট্টগ্রামে শহরের শপিং সেন্টার বা বাজার সংলগ্ন কোন সর্বজনীন উন্মুক্ত স্থানের সাথে পরিচিত? যদি থাকে, তবে অনুগ্রহ করে বর্ণনা করুন ?			
	১. নাম :		স্থানের নাম :	
	২. নাম :		স্থানের নাম :	
	৩. নাম :		স্থানের নাম :	



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

অংশগ্রহণকারী : চট্টগ্রামের পেশাদারগণ (স্থপতি, পরিকল্পনাবিদ ও পরিবেশবাদী)			
চ-১	অনুগ্রহ করে আপনার পেশা সনাক্ত করুন:		
	<input type="checkbox"/> শিক্ষাব্রী	<input type="checkbox"/> স্থপতি	<input type="checkbox"/> পরিকল্পনাবিদ
	<input type="checkbox"/> গবেষক/বিশেষজ্ঞ	<input type="checkbox"/> অন্যান্য:	
চ-২	আপনি কি মনে করেন, পৃথিবীর অন্যান্য উন্নয়নশীল শহরের তুলনায় চট্টগ্রাম শহরের উন্মুক্ত স্থান অপরিপূর্ণ?		
	<input type="checkbox"/> হ্যাঁ	<input type="checkbox"/> না	<input type="checkbox"/> উত্তর জানা নেই
চ-৩	যদি আছে বা নেই মনে করেন, তবে তার কারণ বর্ণনা করুন :		
চ-৪	চট্টগ্রামে কোন কোন ধরনের উন্মুক্ত স্থান রয়েছে আপনি মনে করেন ?		
	<input type="checkbox"/> এমিউজমেন্ট পার্ক	<input type="checkbox"/> চিড়িয়াখানা/প্রাণী উদ্যান	<input type="checkbox"/> উদ্ভিদ উদ্যান
	<input type="checkbox"/> স্থানীয় উদ্যান	<input type="checkbox"/> খেলার মাঠ	<input type="checkbox"/> স্টেডিয়াম
	<input type="checkbox"/> বাণিজ্যিক এলাকায় উন্মুক্ত স্থান	<input type="checkbox"/> বাজার বা শপিং সেন্টার সংলগ্ন উন্মুক্ত স্থান	<input type="checkbox"/> নদীর পাড়
	<input type="checkbox"/> হ্রদ	<input type="checkbox"/> পুকুর	<input type="checkbox"/> খাল/জলপথ
চ-৫	আপনি কি মনে করেন উপস্থাপক সব গুলো উন্মুক্ত স্থান উল্লেখ করছেন? যদি না করে থাকেন তবে চট্টগ্রামের কোন কোন উন্মুক্ত স্থান উল্লেখ করা হয়নি বলে আপনি মনে করেন ?		
চ-৬	চট্টগ্রামে কোন ধরনের উন্মুক্ত স্থানের প্রয়োজন সবচেয়ে বেশি বলে মনে করেন? (অনুগ্রহ করে ধারাবাহিক ভাবে প্রয়োজনীয়তা উল্লেখ করবেন)		
	১.	৪.	
	২.	৫.	
	৩.	৬.	
চ-৭	চট্টগ্রামের কোন কোন উন্মুক্ত স্থান আপনি সবচেয়ে বেশি যান ?		
চ-৮	অনুগ্রহ করে চট্টগ্রামের প্রতিটি উন্মুক্ত স্থানের উদাহরণ দিন:		
	চিড়িয়াখানা		
	প্রাণী উদ্যান		
	উদ্ভিদ উদ্যান		
	শহরের উদ্যান		
	স্থানীয় উদ্যান		
	খেলার মাঠ		
	স্টেডিয়াম		
	অন্যান্য (অনুগ্রহ করে উল্লেখ করবেন)		
চ-৯	পৃথিবীর অন্যান্য শহরের উন্মুক্ত স্থানসমূহের প্রকারভেদে নিম্ন লিখিত উন্মুক্ত স্থান গুলোর উদাহরণ হিসেবে চট্টগ্রাম শহরের আপনি কোন কোন স্থানকে		



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

উল্লেখ করবেন?			
উন্মুক্ত স্থানের প্রকারভেদে	নাম	অবস্থান	বর্ণনা
সবুজ উন্মুক্ত স্থান			
<input type="checkbox"/> সংরক্ষিত এলাকা			
<input type="checkbox"/> পাহাড়ি এলাকা			
<input type="checkbox"/> বন			
নীল উন্মুক্ত স্থান			
<input type="checkbox"/> সমুদ্র সৈকত			
<input type="checkbox"/> নদীর পাড়			
<input type="checkbox"/> হ্রদ			
<input type="checkbox"/> পুকুর			
<input type="checkbox"/> খাল/জলপথ			
খেলার মাঠ ও ক্রীয়ামূলক উন্মুক্ত স্থান			
<input type="checkbox"/> খেলার মাঠ			
<input type="checkbox"/> স্টেডিয়াম কমপ্লেক্স			
ব্যবহারিক বা কার্জকারিতাভিত্তিক উন্মুক্ত স্থান			
<input type="checkbox"/> মার্কেট স্কোয়ার			
<input type="checkbox"/> প্লাজা			
ধর্মীয় উন্মুক্ত স্থান			
<input type="checkbox"/> মসজিদ/সমাধি ও উন্মুক্ত স্থান			
<input type="checkbox"/> মন্দির ও উন্মুক্ত স্থান			
<input type="checkbox"/> চার্চ ও উন্মুক্ত স্থান			
সাংস্কৃতিক ও ঐতিহাসিক উন্মুক্ত স্থান			
<input type="checkbox"/> স্মৃতি সংক্রান্ত			
<input type="checkbox"/> সমাধিক্ষেত্র			
রাস্তা সংলগ্ন উন্মুক্ত স্থান			
<input type="checkbox"/> ফুটপাথ			
<input type="checkbox"/> স্থানীয়/এলাকার রাস্তা			
<input type="checkbox"/> বৃক্ষ শোভিত সড়ক			
অন্যান্য			

Appendix 9: Interview question (Bengali Language)



ঘনবসতি পূর্ণ শহরে উন্মুক্ত পরিসরের পুনঃগঠন: চট্টগ্রাম শহরের পরিপ্রেক্ষিতে পর্যবেক্ষণ

১. চট্টগ্রামে উন্মুক্ত স্থান মোকাবেলা করার জন্য আপনি এবং/অথবা আপনার বিভাগ/অভ্যাসের কোন নির্দেশিকা/নীতি/ফ্রেমওয়ার্ক রয়েছে?

২. চট্টগ্রামে বিদ্যমান ও পরিকল্পিত উন্মুক্ত স্থানের সাথে প্রাসঙ্গিক সমস্যাগুলো আপনি যেভাবে দেখছেন দয়া করে আমাকে বলুন?

৩. দয়া করে আমাকে ব্যাখ্যা করুন আপনি/আপনার সংস্থা চট্টগ্রামে খোলা জায়গার সমস্যা সমাধানের জন্য কী করছেন বা করার পরিকল্পনা করছেন?

৪. আপনি কি দয়া করে আমাকে ব্যাখ্যা করতে পারেন কেন আপনি/আপনার বিভাগ চট্টগ্রামে খোলা জায়গাকে একটি সমস্যা হিসাবে বিবেচনা করেন না?

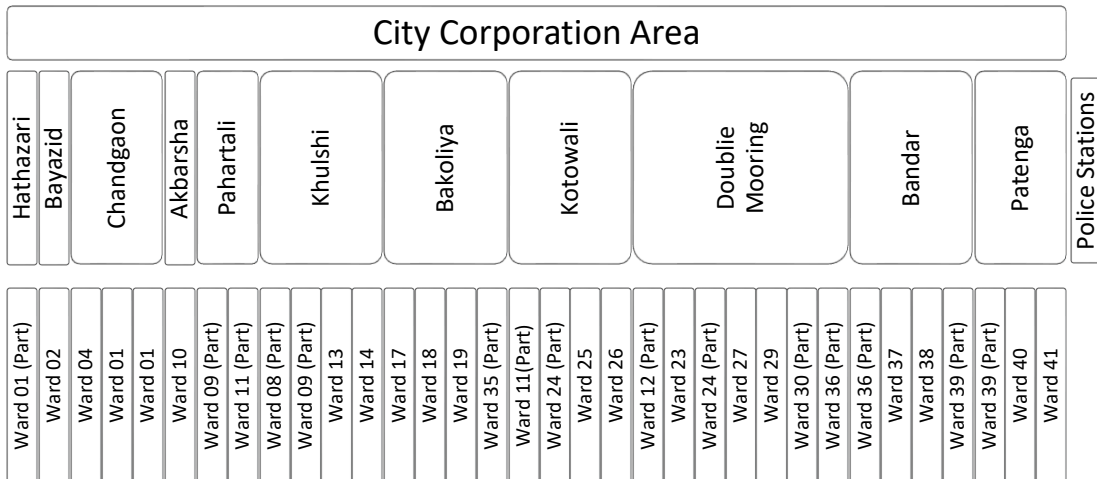
Appendix 10: Daily visitors

Parade Ground										Jamboree Park										CRB			Name of open									
Weekend					Weekday					Weekend					Weekday					Weekend			Weekday			Day visited						
Stay	Exit	Entry	Stay	Time	Stay	Exit	Entry	Time	Stay	Exit	Entry	Stay	Exit	Entry	Time	Stay	Exit	Entry	Stay	Exit	Entry	Time	Stay	Exit	Entry	Time	Total Number of visitors	Male (%)	Female (%)			
150	0	150	130	0	130	0	130	5 am -6 am	100	0	100	80	0	80	5am -6am	0	0	0	0	0	0	0	0	0	0	0	5am-7am					
450	0	300	380	0	250	0	250	6 am -7 am	500	0	400	430	0	350	6am -7am	40	0	40	60	0	60	0	60	0	60	0	7am-9am					
440	100	90	230	200	50	0	300	7am -8 am	800	0	300	530	100	200	7am - 8am	150	0	110	159	0	99	0	99	0	99	0	9am-1am					
0	440	0	0	230	0	0	400	8 am -9 pm	950	250	400	340	250	60	8am - 9pm	30	120	0	248	0	89	0	89	0	89	0	11am-1pm					
Closed					9 am -10 pm					0					70					9am -10pm					410			50			1pm-3pm	
CLOSED (11pm-3 pm)																																
800	0	800	600	0	600	0	1900	4 pm -5 pm	1900	0	1900	950	0	950	4pm-5 pm	1560	200	1350	340	0	235	0	235	0	235	0	3pm-5pm					
850	0	50	750	0	150	0	3000	5 pm -6 pm	3000	200	1300	2000	200	1250	5pm-6 pm	1800	100	340	380	0	40	0	40	0	40	0	5pm-7pm					
0	850	0	0	750	0	0	2380	6 pm -7 pm	2380	900	280	1600	650	250	6pm -7pm	200	1600	0	100	280	0	0	0	0	0	0	7pm-9pm					
Closed					7 pm -8 pm					0					1600					7 pm -8 pm					10			200			9pm-11pm	
1390					1180					4750					3140					2270					573			Total Number of visitors				
Avg. daily users =1285					Avg. daily users =3945					Avg. daily users =1421					75			Male (%)														
80					60					65					70			75			Male (%)											
20					40					35					30			25			Female (%)											

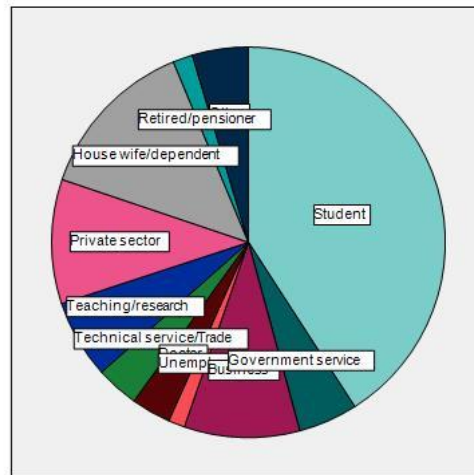
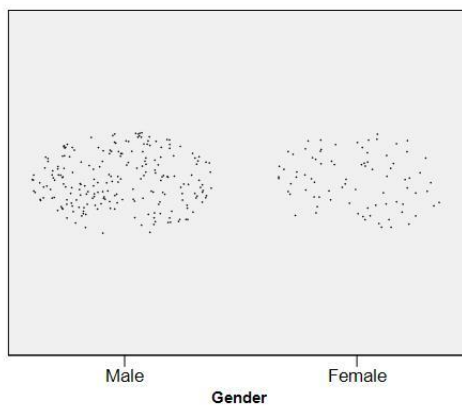
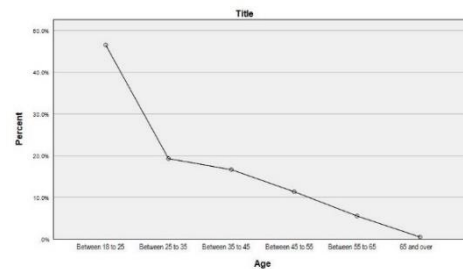
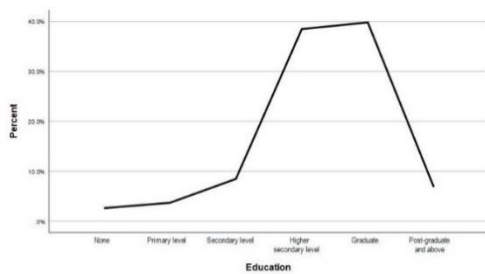
Appendix 11: Ward name, area and population

Ward	Name	Area (sq mile)	Total population
1	South Pahartali	4.141	96,084
2	Jalalabad	5.225	82,266
3	Panchlaish	2.227	71,260
4	Chandgoan	3.567	88,419
5	Mohra	3.480	89,041
6	East Sholokbahar	0.940	38,534
7	West Sholokbahar	1.569	113,65
8	Sholokbahar	1.931	129,38
9	North Pahartali	2.121	70,673
10	North Kattali	1.087	44,922
11	South Kattali	1.271	63,183
12	Saraipara	1.029	80,374
13	Pahartali	0.876	77,845
14	Lalkhan Bazar	0.475	98,754
15	Bagmaniram	0.837	74,688
16	Chawkbazar	0.680	59,488
17	West Bakalia	0.935	78,880
18	East Bakalia	2.520	67,761
19	South Bakalia	0.488	88,844
20	Dewan Bazar	0.150	71,858
21	Jamal khan	0.290	61,283
22	Enayet Bazar	0.331	60,489
23	North Pathantuli	0.296	47,594
24	North Agrabad	0.799	77,237
25	Rampur	0.744	50,053
26	North Haliashahar	2.649	60,446
27	South Agrabad	0.569	104,70
28	Pathantuli	0.467	70,227
29	West Madarbari	0.410	72,714
30	East Madarbari	0.422	69,481
31	Alkaran	0.353	73,346
32	Anderkill	0.411	76,724
33	Firinghee Bazar	0.319	43,673
34	Patharghata	0.353	69,377
35	Boxirhat	1.145	37,802
36	Gosaildanga	0.521	55,707
37	North middle Haliashahar	1.454	68,966
38	South middle Haliashahar	2.087	78,142
39	South Haliashahar	3.231	99,037
40	North Patenga	3.700	94,366
41	South Patenga	3.900	68,331
Total		60 sq km	35,64,580

Appendix 12: Ward and Police station physical boundary distribution in Chittagong City Corporation.



Appendix 13: Demographic survey of Education, age, gender, and profession.



Appendix 14: Conference Paper

Title: Influence of waterways on open space in Chittagong.

Authors: Maharina Jafrin and Dr. Beau B. Beza

Abstract: Chittagong has flourished for centuries on the edge of the Karnaphuly River. This city is one of the oldest seaports in the world and was once referred to as 'the queen of the east' (Karim 2006; Mohammad Khan 2017). Today it is still considered an ideal spot for cultural and religious confluence. Historically the port city was connected to a vast hinterland that contributed to the city's prosperity. Geospatially, the city is cradled by hills, the sea, rivers and lakes; with the city's flat plane providing suitable land for cultivation. Over Chittagong's long history it has been governed by several sovereign 'foreign' powers and over time has assisted the city's residents develop into a vibrant multicultural society. The various rulers of the city came from diverse socio-religious backgrounds and brought with them their own culture and religion; which was initially imposed on the city's residents. For instance, the Mughal invaded the city in 1667 and established a mosque on the top of the hill (once close to the River Karnaphuli) to signify their rule of Chittagong, while the British established a number of Churches in the Patharghata area (near the Karnaphuli river) to signify their religious and cultural setup in the city.

In terms of the Karnaphuli river, it is a place for Hindu devotees to pray, immerse deities and dip themselves into the river for purification. In time, the river has shifted in direction and has acted as a magnet attracting the city's development towards this water body. Quiet unintentionally this constantly shifting water course has now influenced the removal of the City's historical and cultural spaces and resulted in a disconnect with the city's original fortification. Hence, the aim of this paper is to analyse and discuss the waterway's influence on Chittagong and to critically appraise the cultural, religious and historical value the River Karnaphulli has on the city.

1. Introduction:

Chittagong is an ancient sea port and was noted as one of the largest eastern sea ports. It has a rich urban history dating back from the 7th century B. C. The city is situated on the left bank of the Karnaphuly River and the Bay of Bengal is its west. In times, the Karnaphuli River significantly change in its course, from Kalurghat (a place on the left bank of the river) downwards (Banglapedia 2014). As the reiver receded left, it revealed vast and extensive alluvial lands along its right bank, where villages developed and eventually turned into cities - now known as Char Bakalia, Chandgaon, Char Chaktai. Also, the ghats (a flight of steps leading down to a river) and bazars (open market places) that once dotted the left bank of the Karnaphuli, located along the eastern limits of the town, are still important city focal points in and outside the municipality despite now being quite a distance from the present course of the river (Banglapedia 2014).

Another significant influence on Chittagong's development is that, for centuries it has been invaded and then ruled by several foreign powers; which over time has produced a city rich in socio-cultural life and turned it into a vibrant religious centre. The natural landscape of Chittagong was also influenced depending on who ruled and revolved around the specific ruler's cultural and religious background. Accompanying them in their, respective, journey to the city they brought with them their

own tradition of building practice, spatial form and considerations for open space. As a result, today the city's rich cultural diversity is still noticeable in its architecture, sculpture, coins and other metal products dating from the 7th century. The folk art, costumes, foods and punthi (manuscript) literature, various dialects, folklore, rituals, customs and ceremonies of Chittagong also constitute and support the city's precious intangible cultural heritage. All of these material and intangible elements of the city primarily resulted from the influence of the river and effected the creation of the city's urban fabric and open spaces. This paper aims to analyse and discuss the influence of the Karnaphulli River on the city and to critically appraise the cultural, religious and historical value of this water body on these socio-cultural aspects of the city.

2. Historical Background of Chittagong:

Chinese traveller Yi Jing, in the 7th century, described Harikela (the pre-medieval name of Chittagong) as the eastern limit of India. The vibrant seaport of Harikela had been a major destination in the Bay of Bengal and South Asian trade routes with the port being located at its apex. Chittagong port itself was regarded as the front and face of Bangle (Banglapedia 2014a), where Bengal was a region of south asia that included part of India and Bangladesh. The port was also historically connected to a vast hinterland known for its prosperity and the economic importance of Harikela, as a major port city, was because of its strategic geo-political location together with its contribution to trade and commerce. These factors worked together to attract 'Arab Geographers' during the 8th to 20th centuries and, at this time, they referred to the adjoining the Bay of Bengal as 'Bahr-i-Harkandh' (Sea of Harikela).

Harikela produced a very sophisticated currency system and remained a mint-town during the Sultanate (1340-1538), Arakanese (1575-1666) and Mughal rule (1666-1760) of the region. The city also continued to occupy the position of an economic and transit hub in the geographic and economic landscape of eastern India during the Colonial period (1760-1947). After 1947, the seaport was developed and expanded further to cater to the needs of the import and export businesses of the eastern part of the newly formed state of Pakistan. In 1959, the state's planning authority was first formed, and in 1961 the first master plan for the city was prepared. Chittagong as a city along with other parts of East Pakistan became a part of independent Bangladesh in 1971. The general time-line associated with the landscape developments of the city are shown in Table 1.

Table 1: The Chronological Historical periods in Chittagong

Source: Prepare by Maharina Jafrin

Period	Influencing features
Pre-medieval Harikela (7 th B C to 1340)	Harikela, as a major port city The historical settlement of Harikela was on both side of the river
Sultante age (1340-1527)	Sultans established road connection to Chittagong and to avoid crossing the river they leaned towards west side of the river.
Arakanese age (1527-1665)	Created fort on both side of the river.
Mughal age (1666-1792)	Invaded Chittagong through the Karnaphuli River. Created of Bagh (Garden), mosque, tomb, waterbodies and residential open space
Colonial age (1793-1942)	Creation public open space and shifted the growth center away from the river by establishing and focusing development on the rail and reducing the city's dependency on the river.

3. Geographical location and influence:

Geospatially, the city is cradled by hills, the sea, rivers and lakes; which help contribute to it also being referred to as 'the queen of the east' (Karim 2006; Mohammad Khan 2017). In terms of the city's morphology, Chittagong is a V-shaped urban setting. The western 'arm' of this V-shape is considered an edge to the sea (Bay of Bengal) and the eastern 'arm' runs parallel to the Karnaphuli River, while Chittagong's canals work as connectors from the city to the river and the sea. In between these two arms, hills rise in the middle of the city, spreading out northward and then narrowing down to the south. The existing city core of Chittagong is about 15 km upstream of the river's mouth where the Karnaphuli meets the Bay of Bengal (CDA 1995).

Figure 1 shows the location of Chittagong in context of Bangladesh and its shape controlled by the Bay of Bengal and the Karnaphully River. Therefore, geographically, Chittagong has four prominent types of blue/green natural open space that influenced the city's development: the sea, the river, the hills and the adjoining flat land associated with the river and canals.

4. The Karnaphuli River and its name:

The Karnaphuli River is the largest and most important river in Chittagong and the Chittagong Hill Tracts (an area within the Chittagong division bordering India and Myanmar), it originates in the Lushai hills in the mizoram state of India. The river travels through 180 km of mountain wilderness where a narrow section of it creates a loop that has been converted into an earth-filled reservoir. The river is navigable throughout the year by sea-going vessels up to Chittagong Port, along with shallow draughts and varieties of freighters and launches transporting goods up to the Kaptai river in the Hill Tracts.

Culturally, there is a legend regarding the naming of the Karnaphuli river. Stories are told of an Arakanese princess who fell in love with a tribal prince of Chittagong. They were once enjoying a moonlit boat ride on the river and while the princess was admiring the reflection of the moon dancing on the rippled water surface, she leant forward and a flower (given to her by the prince and) tucked

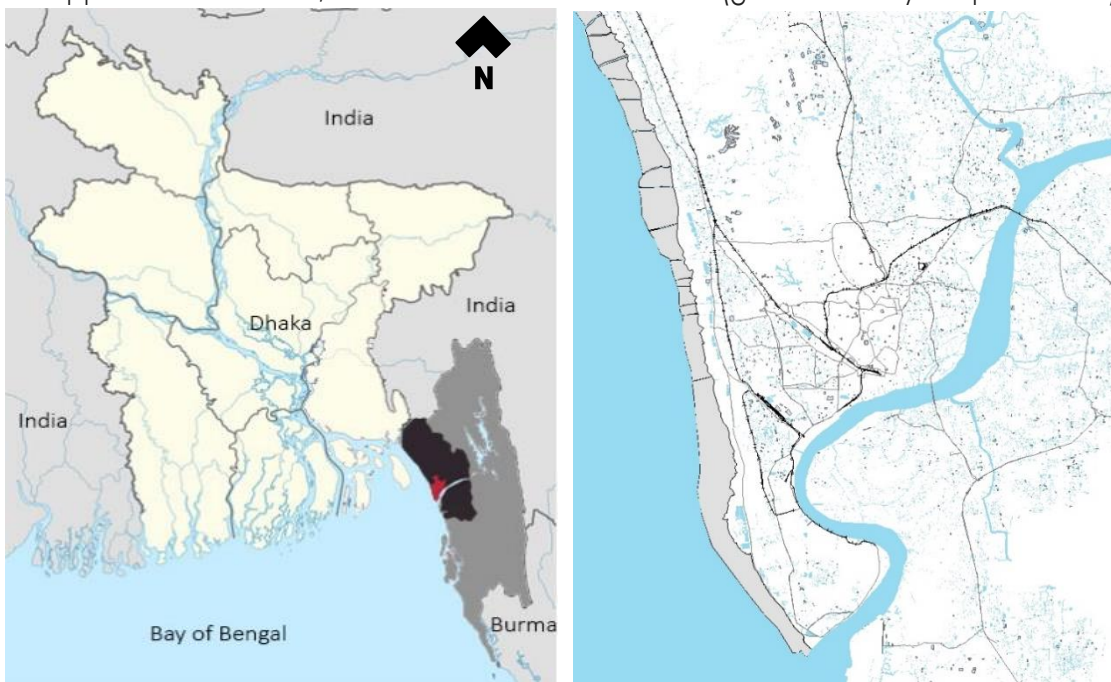


Figure 1: Location of Chittagong city (red dot), Chittagong district (black area) and Chittagong division (dark grey). Prepared by: Maharina Jafrin
behind her ear suddenly fell into the river. Grief-stricken at losing the flower she jumped into the river

to retrieve it but instead was carried away by the fast-flowing current and vanished. The prince dived into the river to rescue her but in vain. Where out of sorrow he drowned himself in the river in the hopes of being united with the princess. This tragedy and legend gave rise to the river's name, Karnaphuli; derived from the word 'karnaful' meaning 'flower adorning the ear' (Banglapedia 2014b).

5. Influence of the waterways on Chittagong:

Chittagong's development has been influenced by three different waterways, these are the Karnaphuli River, the Bay of Bangle and the Chaktai Khal (canal). The sea-side of the city is vulnerable to cyclones and flooding while the river-side is congested with a dense urban fabric and rarely accessible to residents due to location of the port and military base. Historically the city's early urban development centered around the fort, and religious and administrative center; which were all established in close proximity to the river.

The western bounds of the Karnaphuli River present a link and identify where places developed, such as the fort, administrative center and commercial hub, during the Mughal and early British period (Banglapedia 2014). Prior to the Colonial period, the urbanization of Chittagong was primarily realised on the west side of the Chaktai Canal and connected to Karnaphuli River (Banglapedia 2014b). The water-based transportation of goods for the city shaped Chittagong in a manner that pushed the main road of the city outward from the river resulting in a loop that bypasses the dense urban setting of the old town. Most of the City's historical open spaces are in this section of the town. During the Colonial period, the city expanded to the north-west and north-east directions while it is bifurcated by a range of hills in its middle. The Karnaphuli River, which previously ran by the side of the Fairy Hill (this can be seen in historic maps) changed its course and created a new dense urban landscape. However, the commercial activities that took place by these waterways (i.e. the river and canal) decreased after the establishment of the railway during the Colonial period of the City's development. As a consequence of this reduction the open space in relation to the historically and commercially significant structures in the old town began to reduce.

6. Influence of river on growth centres and urban landscape:

Due to the port and water-based trade, Chittagong's urban growth was different in comparison to other parts of Bangladesh. For example, the city's growth centres were influenced by water-based trade and transportation until the introduction of rail in the City. Most of the growth centres were also in proximity to the Chaktai Canal that branches from the the Karnaphuli River. As a consequence, these growth centres are arguably the most vibrant and dense commercial areas in the present-day city. Importantly, these areas were also able to respond to the shift from water-based transport to rail transport and not 'fade away' because of its established and dense make up of residents. Figure 2 presents a map of Chittagong and the city's historic buildings. It also identifies the location of the old town and growth centres positioned around the city.

During the Harikela period (7th century BCE to 1340), the port was situated on the south bank of the Karnaphuli River, almost at the mouth of Karnaphuli, now known as Deang. In this period, there were a few Buddhist temples and viharas located in the City (Qanungo 1988). A vihara generally refers to a monastery as a residence for monks, a centre for religious work, meditation, and Buddhist learning. It typically was designed with a central courtyard surrounded by built features (e.g. Pandit Vihara which was known to be located on the east bank on the river). These places have been lost due to changes in the environment, climate, the influence of Islam over Buddhism. Unfortunately, the physical

influence of monasteries on the city's existing open space landscape is difficult to trace since so much change has occurred.

The Sultanate period (1340-1527) visualized the growth of a new port site on the west of Chaktai Canal, known as Alkaran and Sulk-ul-Bahar (Qanungo 1988); which represents the first Arabic place names used in Chittagong. Another growth centre in this period was in Postarpar (pronounced Pust Par in Persian), near Dewan Hat, and is located on the west of Karnaphuli River. These places are now dense urban settings having evolved into their current state. They present mostly as a commercial hub due to their trade and transport activities (i.e. being located next to the river and the canal). When the Sultans conquered this region, Muslim architecture and the urban patterning associated with their layout of towns also influenced building and landscape design. For example, the Badar-Aulyia tomb (named after the saint who came to preach Islam in Chittagong along with his eleven holy persons) was a combination of a tomb structure, mosque and courtyard located in Boxir Hat. This place does not exist in its original state today because its open spaces was built upon to absorb the City's development.

Later, a settlement named Dianga was established by the Portuguese near the sea-coast, south of the mouth of Karnaphuli and about 20 miles south of present day Chittagong (Phayre 1883). Activities of the Portuguese intensified in the Arakanese period (1528-1665) (Qanungo 1988) and they used to call the city 'Porto Grando' (Ray 2017). The Portuguese also had their own specific port establishment at Bundel, in the Patharghata area on the Karnaphuli; which is now a highly dense commercial area and a Christian religious centre in Chittagong. To practice their religion and culture, they built a church on the Jamal Khan Hill. Interestingly, the Arakanese and Portuguese existed in same period of the city's development but they ruled in different areas (Qanungo 1988) of the Chittagong and their respective open spaces evolved differently.

The Mughal invaded Chittagong through the Karnaphuli River and during their rule (1666-1792), the fort Ander-killah (which means inner fort) was established at the Rangmahal Hill near the river. They built this because the hill provided a natural vantage point where the military had unobstructed views of the surrounding area. Scholars suggest that the fort was built in the peripheral grounds that surrounded the existing Ander-killah Shahi-Jam-e Mosque; which itself was established to express the Mughal victory over the Portuguese. As the Mughal rule intensified, a range of ghats and bazaars were established, which dot the west bank of Karnaphuli River. These primarily commercial open space settings are now important localities in and outside the municipality (Banglapedia 2014).

During Colonial rule, the city further expanded south with the development of a railway and was established to connect with Assam (north-west India). The Sadar Ghat (main-quay) was established in association with the city's port administration building, along with officers' bungalows, staff housing and a custom-house within the vicinity of the bank of Karnaphuli River. In this period, Chittagong's open spaces were preserved mostly as a part of the administrative and social functions of the Assam-Bengal Railway Headquarter and European's club. These areas predominantly remained open/unbuilt on, in contrast to land in the city's other growth centres. An example of this shift in growth centres, from the old town, can be seen through the relocation of the city's Church to the new extension and 'centre' of the colonial port city (Mia et al. 2015).

Additionally, the industrial sector moved inland, south of the City by establishing another railway corridor for transporting goods to and from other parts of the country. And as the city's rail grew in

importance the river's role slightly diminished. For example, the relocation of a commercial tea plantation in the city's central hills to the north instigated the development of another rail line to the north-east of Chittagong to transport tea rather than use the river for transport. The effect on the city of this linear corridor is that it provided open space for Chittagong's residents that is still a part of today's urban fabric.

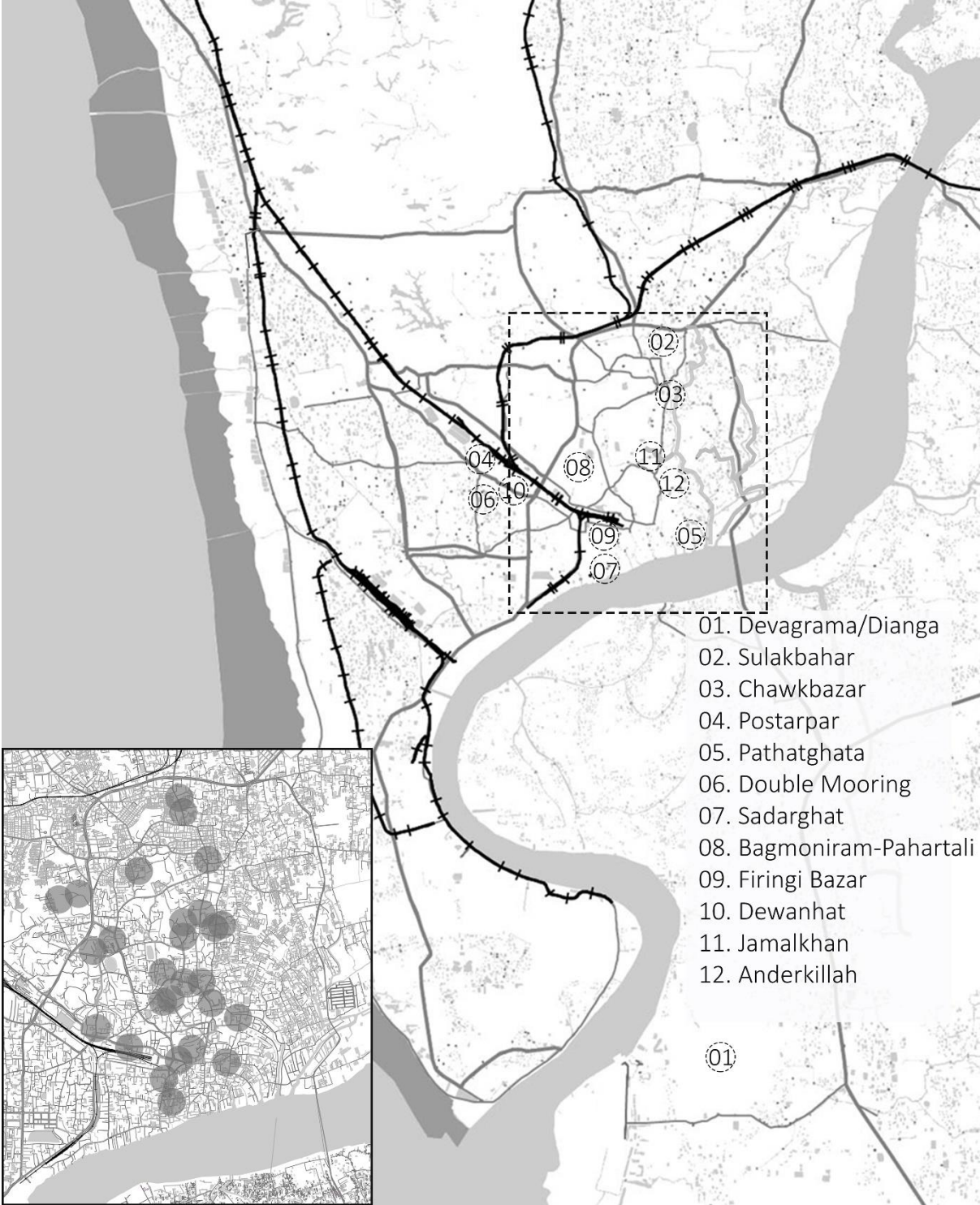


Figure 2: Historic buildings and historic growth centers in Chittagong
 Prepared by: Maharina Jafrin

In summary, the historical growth centres were developed in close proximity to the river because of the city's water-based transportation and their development helped spatially to influence the layout

of Chittagong. This development, prior to the Colonial period, was mostly on the west side of the Chaktai Canal and connected to Karnaphuli River. Most of the historical open spaces that accompanied the city's growth centre development are in this western area of the city. Yet, during the Colonial period, rail was introduced into the city and partially severed Chittagong's reliance and relationship with the river. The result was a north-west and north-east expansion of the city away from the river. The Karnaphuli River, however, was not a static player in this city development and it shifted too. The river changed course and influenced the creation of a new landscape, that came about in between the growth centres and river.

7. Influence of the river on Chittagong's open space

The growth centres and resulting urban landscape can be analysed in terms of open space types that parallel the historical development of Chittagong. The city's open spaces, described in detail below, are based on a setting's characteristics, function and associated use. They include informal (unplanned) and formal blue/green open spaces. Surrounding and within these spaces, there are historical buildings, public spaces, and natural settings with hardscape (e.g. buildings) and softscape features. The analysis of the city's urban form in relation to the water influenced landscape types helps to overcome the limitations associated with monument-centric and bifurcated (nature/culture; tangible/intangible) approaches to conservation of urban heritage. That is, the water/open space relationship help develop an approach to urban conservation that is place-specific rather than monument focused.

i. Cultural open spaces

Cultural open spaces are related to significant events that contributed to the heritage of the city. For example, *maidan* (ground) commonly refers to a large plain, open field, a vast ground or a public square (Habib 2010). In the old town of Chittagong, there were a few *maidans* in proximity to the Karnaphuli River, but several of them, such as the Gandhi Maidan and the Municipality Maidan, have been lost due to development (Qanungo 2010). The Gandhi Maidan was in the north of the city's Rangmahal Hill, which is now the present site for Chittagong General Hospital. This *maidan* was historically significant as Mahatma Gandhi delivered a memorable speech there as a part of the Non-Co-Operative Khilafat Movement (i.e. the revolution against British colonial rule, attempted in 1919-1922).

The Municipality Maidan was an open space setting extending between the foothills of the Fairy Hill and the Laldighi (a pond adjacent to this *maidan*). The place was bifurcated by a road (Qanungo 2010), and the segment east of the road was renamed as Laldighi Maidan. The western part of the *maidan* is now built on and occupied by commercial activities. This *maidan* has an association with Jobbarer Boli Khela, a traditional form of self-defence closely aligned with wrestling in Bangladesh; where in the early part of twentieth century, Abdul Jabbar Saodagor, a merchant of Chittagong, arranged Boli Khela events with the desire to cultivate a sport that would prepare the youth to fight against British rule. The 'training' started in 1907 and still occurs to this day annually in the first month of the Bengali New Year supported by a Bangla fair in this location (Banglapedia 2014).

There are other cultural open spaces associated with sports that were developed during the colonial period. Four noticeable play-fields that helped to shape the city (Qanungo 2010) include:

- i) Nizamat Paltan Ground (situated in the foothills of the Railway Hospital Hill);

- ii) The Parade Ground, which was important for the inspection of troops and was significant for patriotic meetings, and political and social assemblies;
- iii) The polo ground which was a favourite site of Europeans to use for horse racing and polo games. Currently, it is used as a playground and a place for hosting a fair in Chittagong; and
- iv) A cricket ground (that mostly Europeans used to play cricket on); which is now encircled by a stadium.

Another type of cultural open space are ghats - a quay/landing place that run along the city's waterways and act as an interface between land and water (Ahmed 2017). The ghats are extremely busy places that are key features of the city's urban form and public realm. The oldest of these are Sadar Ghat (the main-quay, created during the colonial period), Ghat Forhad Beg (established in the Mughal period), Fishery Ghat (year of development unknown), and Firingi-Bazaar Ghat (foreign-market-quay; year of development unknown). These provide space for bathing, recreation, worship, domestic activity, trading and transport, and thus are important for city residents (Ahmed 2017).

ii. Open spaces associated with water bodies

This open space type is associated with bodies of water in the city, such as beaches, reservoirs (dighi), and canals (khal). In the colonial period, seaside resorts were established near the Chittagong (Qunungo 2010), such as the seaside resorts at Minamutee and at Parkee (at the mouth of Karnaphuli River). These two beaches were much-liked by the Europeans (Qunungo 2010) and there was a riverside walkway (on the left bank of Karnaphully River) in the colonial period that the Europeans regularly used. The shore of the Karnaphuli River, from Sadar Ghat to Patenga, was once noted for walking (Qanungo 2010), while boat racing on the Karnaphuli River was a favourite game since the Swadesh period (started from late 19th century and is continued to till now) (Qunungo 2010).

Another aquatic-based open space is the Lal Dighi, which is a natural reservoir of fresh water. During the Arakanese period, it was the principal source of water used by the garrison army (Qanungo 2010). In the Mughal period, it retained its importance as a principal source of water and in the mid-nineteenth century Lal Dighi was given a more aesthetic shape by adding two ghats on both sides of the dighi (Qanungo 2010). The Mughals created Asker Dighi in mid-17th century to ensure a water supply to the soldiers of the Mughal second commandant (Tourin 2016). The British built Foy's Lake in 1924 to provide water to the railway workers' residences (Banglapedia 2014). This lake and its surrounding hilly area still serve as the largest blue and green open space feature in the city. Pahartali Lake (known as Jorr Dighi or a 'pair of ponds'), was originally a marshy land that was excavated and converted to an artificial lake during the Colonial period (Qanungo 2010). Agrabad Deba was dug for the Railway and Port employees as well as for city residents during the British period to carry out their daily chores and other activities.

Heritage canals/waterways in Chittagong are related to traditional riverine settlements associated to water-based trade and life along the Karnaphuli River as well as the Chaktai Canal. During the Arakanese, Sultan and Mughal periods, the Chaktai Canal dominated the city by providing a place for water-based commerce. The area in Khatunganj along the Canal was once Bangladesh's largest wholesale market for essential commodities and was known as 'Wall Street of Bangladesh' (Chowdhury 2011; Dastider 2016: 64). During the colonial period, there was an extensive expansion of the canal system. For example, the Mahesh Khal was excavated to facilitate water based transport

in the port area and the Arakan Khal was expanded from the Karnaphuli River to the Paharttali-Bagmaniram area of the city (Talukdar 2014). The creeks were used less and started to shrink due to encroachment (BIGD 2014). Construction of retaining walls along the canals also reduced the width of creeks.

In support of the canals importance to the city, UNESCO's Operational Guidelines for World Heritage Sites state that a canal is a human-engineered waterway and that it may be of Outstanding Universal Value from the point of view of history or technology, either intrinsically or as an exceptional example (UNESCO 2017). In this sense, the canals of Chittagong represent a unique form of cultural heritage in that they identify a monumental achievement and work to establish the foundations of a linear cultural landscape, or an integral component of a complex cultural landscape.

iii. Creation of Gardens, parks and fort

There were two forts in Chittagong that had open space associated with them. One was on the right side of the Karnaphuli River known as the outer fort and another was on the left side of the river known as the inner fort. The inner fort was constructed between the hills next to the Karnaphuli River and there were two springs inside the fort whose water used to fall into the Karnaphuli River (Ray 2017). The inner fort included designed and/or formal parks and

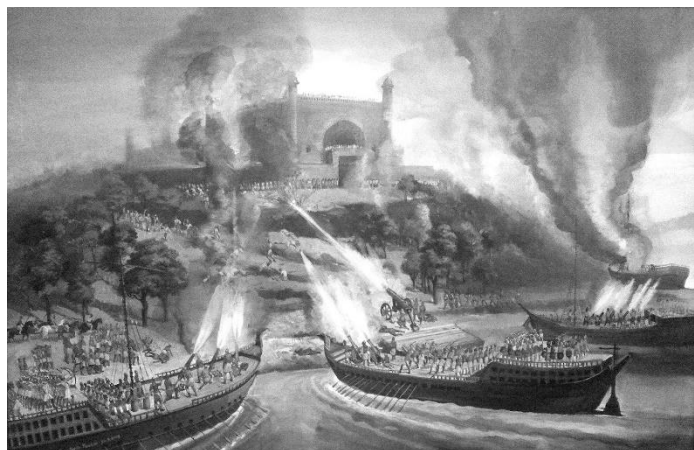


Figure 3: Chittagong fort and Karnaphuli River

gardens that are of two types: royal gardens and residential gardens. The Royal Garden at Ander-killah (the inner fort) evolved from the development of the city's fortified installations (Roy 2017). There are two aspects to this type of space: an inner open space and outer open space. The inner garden relates to the open space in and around the hill of the Ander-killah area in Chittagong (Hossain 2012a). The landscape inside the Ander-killah reflected a formal arrangement of gardens, including a compound of the tomb of Badr Aulyia (the saint of seamen), a mosque (named Kadam Mubarak), a formal pond (Lal Dighi) and an open field area (called 'Lal Dighi Maat') that included a moat and rampart on its periphery. The fort also contained two springs inside its inner walled area. Built features positioned in and around this open space were religious and administrative buildings and housing for the monarchs of this period. The open space outside the forts was used for informal/passive public recreation and consisted of tree groves and flower gardens. These places were aptly named 'Bagh'; which is a Persian word that translates as garden. Usually, a Bagh refers to an enclosed area with many different types of trees, shrubs, and flowering plants (Nilufar 2011). The first use of the Bagh design type of layout occurred during the Mughal period. The outer fort was similar to the inner fort's layout and was located at the mouth of the Karnaphuli River (Ray 2017).

iv. Open spaces associated with Tea plantations

This type of open space is associated with tea plantations. The first installation of tea plantation was on the bank of Karnaphuli River in 1824. Later in 1840, another tea plantation started in an area adjacent to the existing Chittagong Club; which was named Pioneer Hill (Bangladesh Tea Board 2018).

During the 1870s, the tea industry started to grow at a rapid pace and the Chittagong Hill Tracts (an extensively hilly area outside the city, known as Bandarban, Khagrachari and Rangamati) were opened for tea cultivation. Although now, the tea plantations have shifted from the city to the Hill Tracts, yet the activities related to tea procurement, packaging and distribution still exist in the city.

v. Transportation related open spaces

A single authority managed Chittagong's port and railway throughout the British rule. During the 1953-58, in the period of Pakistan era (1947-1971), Chittagong Port acquired 920 acres of land through the Railway. After separation of the unified Port and Railway Authority in 1960, the Railway Authority handed over land to the Port Authority. Unfortunately, the rail line connecting the port with the Karnaphuli River became unused since 2013; which, fortunately the Chittagong Development Authority saw as an opportunity to prepare a Detail Area Plan (DAP) that proposed the conservation of this unused rail land as open space (Figure 4). This development proposal follows the ICOMOS concept that railways deemed significant for economic and social development could be considered heritage sites (Coulls 1999).



Figure 4: Rail line corridor and open space. Prepared by: Maharina Jafrin

vi. Influence on open spaces associated with religious places

These open spaces provide a setting for worship and/or homage to a religious setting as well as for educational pursuits. These spaces are associated with diverse religious influences on the city such as Buddhism, Hinduism, Islam, and Christian faiths - that influenced the rulers of Chittagong during specific periods of the city's development. Importantly, these places are markers of significant historical and cultural moments in Chittagong's history.

For example, folklore speaks of many of the Islamic saints coming to Chittagong, from the Middle East, by sea (Ray 2017). These saints established sites within the city associated with the Islamic faith, including mosques, tombs and/or shrines. It can be noted that a mosque is not only a place for prayer, but also a centre for educational, political and judicial activities (Al-hajaj 2014). A mosque provides court-like open space within its premise to include structures for such activities. Typically, there is also a large pool of water in mosques to avail water for ablution before prayer and the breeze flowing over this body of water also helps to cool the air in the prayer hall. In Chittagong the Badr Auliya Tomb is an excellent example of this type of open space with both a tomb and a mosque enclosed within its space. The Bayzid Bostami Shrine, another such example, also consists of a tomb and a mosque built in the Mughal period; it sits on top of a hill with a large pond situated in front of it. The Shahi Jam-e Mosque, erected at the top of the hill



Figure 5: Painting of Mosque in Chittagong with open space and waterbody before 1828. Source: <http://www.bonhams.com/auctions/13803/lot/67/>

at Ander-killah, is another example; its courtyard is widely used for praying during the *Eid* festival. However, the foothill is currently occupied by a market and the new extension of the mosque blocks the view of the historical mosque.

Another example of this type of open space is associated with a monastery or *Vihara* (the residential quarters of the Buddhist monks (Qanungo 1988) in Chittagong, the monasteries were built throughout Bengal during the 6th to 8th centuries (Rashid 2009). The residential quarters of the monks are usually provided with a courtyard area that allows for conference, consultation and discussion to take place. Some notable examples of these quarters with extensive open space areas are the Rajanagar Buddhist Vihara, Sudharmadhara Vihara, Salbaria Vihara, Pahartali Mahananda Vihara, Kartala Belkhain Saddarmalankara Vihara, and Pandit Vihara (Qanungo 1988).

Generally, the locations of the monasteries and associated open spaces were by the banks of the Ganga's delta (Ahmed 2013). In Chittagong, Pandit Vihara was located close to the Karnaphuli River at Debang Hill and the planning of the Buddhist monastery complexes referenced the vernacular architecture of Bengal, particularly the traditional courtyard house (Rashid 2009). As a reference element, the courtyard itself provided natural light and ventilation to the building complex and was suitable for the nature of the monastic life. Furthermore, the centre of the courtyard was emphasized by the placement of the most sacred structure (either a temple or a statue of Buddha) of the complex (Rashid 2009).

vii. Commercial public open spaces

A commercial open space is referred to as a *chowk* or *chawk* and can be translated as 'town square' or 'market square'. In traditional Bengali cities, *chawk* refers to a street intersection in the urban core (Pacione 2001); which was used as an open market place and a public place commonly found in the heart of a traditional town. They were the traditional outdoor civic spaces and were the generator of many events and human activities (Nilufar 2011). There were officials appointed to supervise the running of the market and to regulate the prices of articles during the Mughal period (Qanungo 2010). Like many South Asian cities, Chittagong grew from a place of exchange of agricultural products,

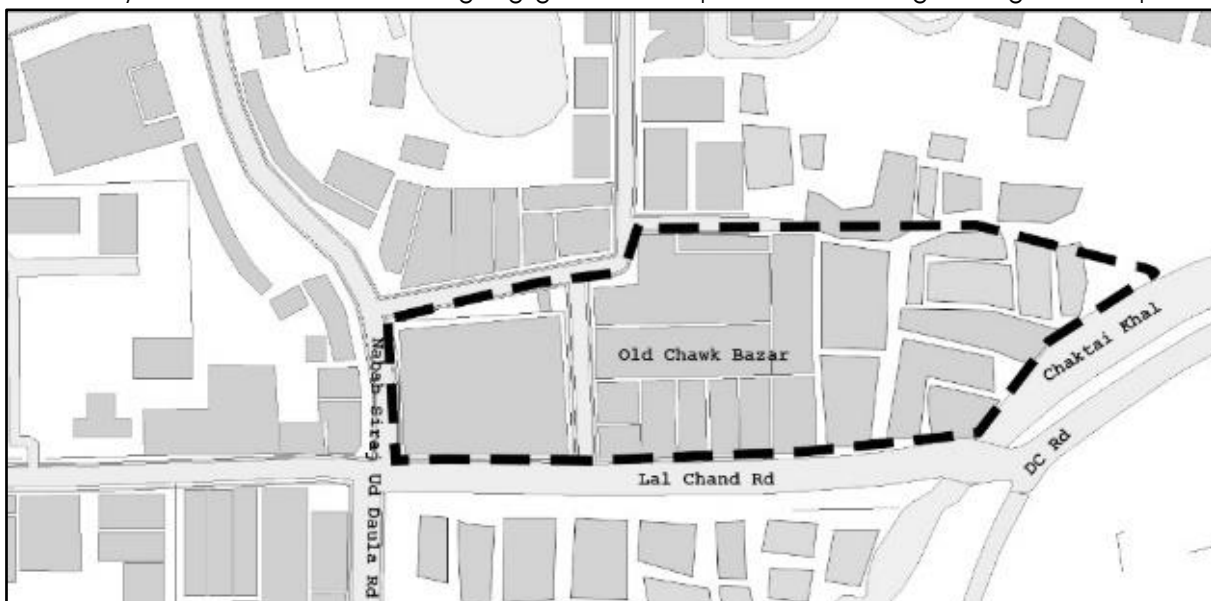


Figure 6. The old Chawk area which was an open market shown in the centre with dashed line depicting its original boundary (The existing Chawkbazar area is expanded from this area). Source: Amended from GIS map of CDA.

developed as a transport node, and later as an administrative centre. In Chittagong, the *chawks* are in proximity to the Chaktai Canal to allow transport of goods to and from these bazaars. In this bazaar-based traditional city, there are linear bazaar streets as well as wider *chawks*, both types are surrounded by the houses of merchants, who often live above or behind their shops and warehouses. There also are intermediate and smaller scale *chawks* in the *mohallahs* (neighbourhoods) at the nodal points of winding streets off the main Chawk Bazaar of the city. This main Chawk Bazaar is still a vibrant and busy meeting place. These *chawks* are important cultural and civic spaces of the city and provide a contextual illustration of the city's urban development and the cultural thinking on urban public life in the historical times.

viii. Administrative open spaces

These open spaces are associated with administrative buildings created during the Colonial period. Prominent among them is the Assam Bengal Railway headquarters that was established in 1892, with a railway, workshop, administrative buildings, hospitals, housing for staff, a playground and a clubhouse. The open spaces were mostly in hilly areas associated with the Central Railway Building (CRB) and the Batali Hill. The predominant feature of these administrative open spaces is the lack of a boundary wall, allowing people to access these places unrestricted and enjoy the panoramic views of the city below from the hills. The existing rail station adjacent to this administrative area holds the rail line corridor through the city. This corridor is a prominent landscape in the dense fabric of the city; it hosts the annual cultural program associated with the Bengali New Year. The administrative grounds of CRB and the rail corridor provide opportunities for various uses for the city's residents; which is not possible in the adjacent densely urban surroundings.

Another example of this type of open space is the Judicial Building named Darul Adalat, established in the mid-6th century during the Mughal Period, at the apex of Madrasa Hill in Chittagong. This hill and space surrounding the building still serve as open space for the public due to its secured location. However, the building is in a derelict state and no longer in use. At the end of the 19th century, the Chittagong Court Building was established on the Fairy Hill near the Karnaphuli River; which is still in operation today. The open spaces around the building were beautifully laid out as a park and the northern valley included two large reservoirs (Hossain 2012b). The area is now slowly developing with buildings, such as an extension to the court building and offices for attorneys.

8. Conclusion:

The discussion of different types of open spaces that existed in Chittagong is an attempt to reflect upon the defining factors of the physical condition of the city as well as the social construct of those spaces. The diverse social, economic and political forces in Chittagong's past shaped the creation and planning of the city's open spaces; while this type of open space thinking is largely absent in contemporary planning proposal. Among the diverse political systems that shaped the city, the Mughal's legacy to open space development in Chittagong is remarkable in terms of their formal planning and design. The colonial rule by the British also had a notable impact on the city's open spaces; which led to a gradual erasure of other spaces created before the colonial period. This range of open space scenarios developed in the old town close proximity to the Karnaphuli River, but evidence of this relationship is mostly hidden in today's city. Many open space areas are in various states of disrepair and/or in need of conservation, refurbishment, and management. The guidance

regarding the conservation of these spaces will be seen in various stages of planning proposals as the City understands the need of providing open space for its residents.

Today, most of the open spaces are being lost due to a lack of conservation guidelines and political will. Hence, contemporary city preservation proposals are not adequate for the effective conservation of this type of urban heritage. Though the conservation of this expansive urban landscape is an ambitious task to undertake, it is initially recommended that a revisiting the historic land use patterns associated with city and its historic buildings take place, so that they can be documented in a way that potentially influences the future growth of the city in a manner that appropriately conserves the city's historic urban landscapes and heritage buildings amidst them.

Acknowledgement

Material in this conference paper originally appears in the book titled *Routledge Handbook on Historic Urban Landscapes in the Asia-Pacific*, in the chapter "The historic landscape of Chittagong, Bangladesh: Urban Growth and Managing Conservation". (The book is available through Routledge in November 2019.) Content from that chapter has been substantially rewritten here to present a focus on the Karnaphuly River's influence on Chittagong's open space development through five periods of rule.

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Appendix 15: Interview Transcript

Interview of Ali Ashraf

Maharina Jafrin: Good afternoon. This is Maharina Jafrin. I am a Ph.D student from Deakin University. My research topic is "Revitalization of open space in a densely populated city: a case study of Chittagong City". Today I am going to take an interview of Dr. Ali Ashraf, he is a pro VC of southern university. In addition to this, he is an active engineer, researcher and scholar in Chittagong who is working on Chittagong water system, drainage system and also transportation system in Chittagong. In accordance to this, Professor Ali Ashraf is related to planning of Chittagong city master plan. He was involved in preparing master plan of Chittagong City. So, now I am going to ask Professor Ali Ashraf, what do you think about the development of a planning process or how are we going addressing our open space in Chittagong city. What do you or do you have any thoughts or any ideas on this? thank you.

Ali Ashraf: Thank you, Maharina for your interesting question, well Chittagong City has a population of around 60 lakhs that mean, we can tell 6 million people. 6 million people are residing in Chittagong and for that many people the amount of open space that we supposed to have, in fact we don't have that amount of open space and Parks, playgrounds and open space like water bodies are sometimes are not available to that extent. So, in that case I was thinking on this particular issue for a pretty long time, and I have thought of the Khals, the natural streams that is available itself within the city. So, in Chittagong, we have 70 streams within the city. A city of having an area of about 60 square miles within that city record about 70 natural streams and of course some of those systems are not available now but on recorded it is there. Say 50% of the streams are still available that means around 35 to 36. Now, those 70 streams, I've got a study research report by American consultant John Arsmel incorporated. They did it in 1969. They produced a drainage master plan of Chittagong, as early as 1969.

In that master plan they have recorded 70 Khals within the city and they had physical surveyed those Khals to approximate length of about 100 miles. That means the estuary of the Khals and the beginning of the Khal, up to that they had measured and they had measured the depth and they had measured the width and it is reported in that consultancy report. So, the calculation that I remember the length that they found out, they had measured or surveyed 100 miles of stream, natural stream meandering within the city. So, there are around 100 miles of Khals, if I consider one way. If I consider the banks of the streams in that case it'll be around 200 miles. So, now think of the situation, now the natural streams in Chittagong, these streams are used as sort of open sewer, that means all the sewerage water through local drains and sub-drains, it is coming through the drains, it is coming to this natural streams and ultimately natural systems becomes polluted and the water if you go there to see those Khals in the bank of the streams, what you'll see? You will find the water is black and it is stinging, smells are there, bad smells are there all the time. So, people are not using these banks because the environment is not congenial for people to go and sit on the bank or by the side of them, relaxed sitting by the side of the bank, people are not doing it. So, in that case if we can change the direction of our sewer lines, domestic sewer drains in those drains and we can have reticulated sewer line underground, in that case for example, from one building drainage line is there, septic tanks and all those things are linked to the Khals and natural streams, and natural streams is linked through a drain,

Now if I can intervene that drain by another underground sewer line, in that case by all this line for solid water and sewer water and all these things water, it goes to the underground sewer line then this sewer water will not go to the natural stream. Ultimately what will happen the water will be clear. It may not be crystal clear immediately, because we have hills and all these hills are sandy hills, so natural sands during a downpour, during monsoon when water flows it will be muddy. Water will be evadilish, because it will be carrying silt. But it will not sting, it will not smell, and the atmosphere will not be that bad as it is now. In that case, if the sewer water is diverted from the Khals and that Khals will be free from being polluted and

water will be clear. At least, not in those 12 months. At least in four to six months, it will be very clear, and they remain in my little bit muddy, because it will be carrying silt. Specially during the monsoon. So, in that case we will be getting 200 miles of open space and if we can develop the banks of these Khals, say throughout the walkways, especially in the west, riverfront development are practised. Now, in this 200 miles, if we can develop the practice, if people can sit there, if there are sitting arrangement, if there can be tree cover, if we have got this different varieties of trees, flower bearing trees at their, hardwoods are there, where lot of these birds will have their nest, so, if we can create that kind of atmosphere in that case imagine a situation, where you are having bushes, and trees, and all these on the bank, there will be having chipping sound of all these birds, you know having there evening meeting there, under the trees and bushes and shrubs and then you have got grasses on the bank and there are people chit chatting, hanging out there....

Maharina Jafrin: Like Hatirjheel in Dhaka.

Ali Ashraf: Right, Like Hatirjheel in Dhaka. I am just dreaming of that kind of things and Chittagong has got that avenues available. Only thing is that, if you have got imagination, we've got little bit of money now in our pocket and at the same time if you have got intention and political will to do that, in that case, we can change the whole scenario. Now, forget about having open yard, huge yard. We don't have that space,

Maharina Jafrin: We cannot create now.

Ali Ashraf: We cannot create now. So, whatever you have got through these open channels and if that channel utilised for this purpose, in that case, it will be multipurpose kind of development. it will carry water to River Karnaphuli, main River and it will have beautiful lush green banks where people can sit, it will have trees and plans bushes and shrubs. You will find birds coming in all the time. So, it will give a wonderful kind of scenario. So, the natural streams, the natural channels, it will become a source of open space.

And if that can be judiciously utilised, consciously utilised, and if someone designs it someone with this aesthetical knowledge, in that case, I think something like wonderful and essential for the city. So, that can be one of the... and then still in Chittagong City, withing the city there are a few large ponds, Lake water bodies, those water bodies can utilised as open space and people are abusing those water bodies now, misusing those water bodies, and seeing Chittagong with one well utilised waterbodies, Foy's Lake but there are other waterbodies say Asker Dighi, Jorr Deba, so there are different water bodies with in the city.

Maharina Jafrin: They also have historical values.

Ali Ashraf: They have got historical values.

Maharina Jafrin: Yeah, Ashker Deghi, I think it's from Mughal period, and Lal Deghi is from Arakanese period, and Debar Par and Jorr Deghi are from colonial period,

Ali Ashraf: Right. Now Lal Deghi is more or less developed, it looks very good and people feel like going there. Now, Ashker Deghi and Jorr Deghi, these are to be developed, people are using it, it's a recreation or amusement centre, people go there and there is a zoo by the side of the Foy's Lake. So, this is OK, we just avenues for people to go there. So, that is one thing and another thing is in our transportation master plan in Chittagong, we have talked about this ring road surrounding the city basically, CDA (Chittagong Development Authority) has built the ring road now from Fouzderhat to Naval avenue. And then from Sadarghat near the Bay of Bengal, just it is separation the Bay with the mainland. So, it's a sort of in between Bay of Bengal and mainland, and then following the riverbank, Karnaphuli River, from Naval Avenue to Kalurghat bridge, so this whole length can be developed like a marine drive road, so, in that case, if the marine drive road is created, now, in our country the problem is sometimes, say, people are always

interested in using the water body, the water front. So, if there's a road there, adjacent to the waterfront, touching the water, people sometimes build structures.

Maharina Jafrin: There will be a boundary, so people cannot go encroach the bank..

Ali Ashraf: Not that. The tendency is in most of our rivers, what they have done, just on the bank itself, just touching the water they're having structures. So, in that case, people some 20' away, or 50' away, they cannot see the river.

Maharina Jafrin: no, there are obstacle.

Ali Ashraf: obstacle, there are obstructions are there. In that case, what we will have to do? That can be a riverfront road, but touching the water, there should not be any development. Development will be on one side of the road. Away from the water. So, that means, people will have access to water. So, there should be other development, where, specially Karnaphuli is a huge river. It garlands a part of the city. In the eastern side, it is garlanded by the Karnaphuli, in the southern side, it is garlanded by the Bay of Bengal itself. So, this part, the eastern part of the Chittagong City, there can be riverfront development. In that case, we will have to ensure that this road will be used by people is fine, it can be used for regular traffics, but, in the front, that is touching the water, that area, there should not be any development. It should be always available for people to access it, and there can be some kind of recreational development, people can go there, there can be park like structures, people can go there. Or if there may be some little bit intervention there and there. But throughout that length, whole length, the length is not less than 15 miles, so that land can be utilized for recreational purpose. In that case, it will serve the purpose of open space, and Karnaphuli is not as polluted as Chaktai Khal, in Chaktai Khal people will not feel like sitting on the side of the bank, but Karnaphuli, still is not in that shape, Like Buriganga in Dhaka. So, by the side of Karnaphuli river, if we have riverfront development, and if we can have facilities for recreation, a place for where people can hanging on, there can be eateries there, there can be park like atmosphere there, there an be playground there. If that kind of developments are encouraged there, in that case it will serve the purpose of open space. So, Bay front development and riverfront development, these two areas will be utilized as open space and waterfront, then waterbodies, historic water bodies within the city, that can be utilized as open space and another alternative way we have got that is, Chittagong still have a lot of range of hills, though lot of hills are demolished, lot of hills are normally as a word of killed by the people, those who are levelling it for, I mean plot or all these side of some hills, so, still there are some hills. That standing from there from Foy's lake to up to Sitakunda, Mirersharai, it's a continual chain of hills, on the top of the hills, if we look at google map, we will find contours of ups and downs, so, there can be some dams, water can be preserved, rain water can be harvested, and those man made lakes by creating small dams, that can be utilized for producing electricity, by using small scale hydraulic power, small scale, little bit of electricity will be produced, but that is good enough for say powering and recreational area. There can be resorts in that areas. So, that hills, now, hills are beautiful, provided we can go there. Say, we have got a good type of example of that kind of development, that is Batali Hill. There is a meandering road to the top, if you drive by the meandering road, it's a pleasure, when you reach the top, and you will look at the surroundings, you will address the half of Chittagong. So, there are huge land from Foy's lake to Sitakunda, you cannot go there on the top, because there are no road linkage, So, if you can develop that kind of things, If you can have residential sorry resorts like structure there, if you can have residential school there, where people can stay and study natural environment, those kind of development can be patronised there, in that case, people access the peak, people can go through the meandering road, but in that case, there should be certain parameters, certain insistence or rules, for example, say footprints should not be more than 10%. If we develop the hill, it should not be more than 10%. That means, on the top of the hill, just on the top, we can have low-rise development, say two to three stories building or that kind of things, but to reach there, we have to follow a meandering path and that meandering path will be lengthy. If we level it up, in

that case number of plots will more development can be done but hill will be destroyed. Now that kind of development we are not going to encourage. So, in that case, now if I sum up, for open space, you have these Khals, natural streams, and if you can free the natural stream from encroachment, you will have two hundred miles of bank areas. Now, we have got 50 to 60 miles of Bay front, we have got 50 to 60 miles of Karnaphuli River front, these two areas will be developed, we have open space there, then, we have got some historic waterbodies within the city itself, those water bodies can be developed, We should have access to those things, there can be recreational development surrounding that waterbodies. So, there you get some open space, then the fourth is developing the hills, hill tops, from Foy's Lake to Sitakunda. It's a hill range, continuous hill range, on the top of that, if we can have this upper dam, for preserving water, in that case it will give us multipurpose benefit. Water can be used, because Chittagong, specially, Sitakunda, Mirersharai area, having a problem of water, because Bay water is saline, and because of industries, in that area, there are lot of industries and they are using water, underground water for running the industries, but with the increase of number of industries in that area, now government is building a new economic zone, Mirersharai economic zone, it will be having around 30 thousand acres of land, if that area is filled with industries, in that case, all of them, they will be demanding water. And that water will not come from river, because river is not there, it will not come from the sea, because the water is saline, for all of them, they will go for ground water. Now, ground water, initially, may be there will be some water, but with increase of industries, they will not get any water, because it will become dry, in that case we will have to think of some alternatives, the alternative is costly, but still there is alternative, that is desalination. Desalinating sea water. By desalinating say, in Mumbai, there is desalinating plant, and Mumbai plant is supplying water to the city. Now so far still we can have ground water or sweet water from the ground, but after some ten fifteen years, we are not going to get that water. In that case, from now on we will have to think of desalinating sea water, and water harvesting on the hill tops, if can store water, during rain and during monsoon, the water can be stored on the hill tops, that water can be utilized for feeding the city industry and then this can be used as recreational open space and recreational open space is our requirement and if all this thing can be done, in that case, Chittagong will be one of the most beautiful cities of the world. Because no other city can give you all these amenities and avenues together in one place. Because it has got a sea, it has got a lake, within the city Foy's lake, it has got a riverfront, the Karnaphuli River, it has got a range of hills, all these things are in one place. If you can develop it by following a professional plan, by following a conscious plan, in that case, it will be one of the most beautiful cities of the world.

Maharina Jafrin: Sir, as you talked about like, Foy's lake, what do you think, like Foy's Lake is 736 acre of land, it is the most biggest open space in Chittagong, but as it is owned by like now it's working like amusement park. Like they are, like there is no accessibility for public. So, we cannot say it like an open in space now and what if the amusement park will work, but in the other spaces, people can go. In that case, we can

Ali Ashraf: In that case, OK, in that case what I am telling, say, Foy's Lake, initially it was done by railway. And railway, you know a dam was created, because of that dam, we got that lake. That dam was built by Foy. An engineer named Foy.

Maharina Jafrin: Hmm. Chief engineer.

Ali Ashraf: So, he built that dam to supply water to the railway officials, employees, now, because Chittagong is getting water from Chittagong Water and Sewerage Authority (CWASA), that particular lake is not using for supplying water to the railway people. Because railway is now getting water from Chittagong WASA. Now, avenues are available for using that waterbody for recreational purposes. Now, for recreation purposes, some investments are necessary. So, government has invited to invest money. So, concord came in to invest money for the development of that area. And they are charging some entry money. Because,

otherwise they will not develop, and economically beneficial. So, now, people are entering there, some people who can afford, and most of the people, say forgetting these street kids and people those do not have any money in their pocket, the rest of the people they can go there reasonably.

Maharina Jafrin: Yeah, I know, if it is restricted, it cannot be defined as open space.

Ali Ashraf: But, if you say, access is not there by all the defaults, in west, there are areas, you don't have to pay money, but there are area, where you might have to pay money. So, in that case, now riverfront development, where you will not have to pay money, bay front development, where you don't have to pay money, but there are some private spaces, where you have to pay money. But we must encourage private people also to develop things, because government alone cannot develop everything. Even in Bay area, some pockets can be given for exclusive development. Say, foreigners can go there, say, Patenga, in one of my writings, I have suggested that Sandeep Channel, it's a huge channel. We can reclaim some land there, or create an island like Burj Dubai, we can create an island there and, in that island, we can have all the amenities available for the foreigners. Because Chittagong can be tourist centre. And we can do that by creating an island in the Sandeep Channel. If you create an island in Sandeep Channel, it is not going to create any problems for the marine traffic. Because it's a huge channel. And by the side of the bank, it is shallow, in that shallow areas, we can have an island. And islands are 10 acre/ 20 acre area of island, is not huge something. But it can be a small town there within the 20 acres piece of land. And that can be developed catering to the requirement of the foreign people, say the type of atmosphere they want. There can be casinos, there can be all that kind of things that foreign people are interested. So, foreigners can go there.

In Chittagong, only in Chittagong, there are no guideline, so we have to go for two different type of things, one is, you will have to invite investors to invest money and there should be opportunities for them to take the money back and then as part of social responsibility, government will have to do something for the common people who cannot buy ticket, but still they need to go to those places. They need those open spaces, for them the city can have small parks, children's park, an open area, so, when specially by the side of this natural channels that can open spaces, say, out of this 200 miles, there can be 50 miles, there can return money, where you pay. Remaining 150 miles you don't have to pay. Now people most who want exclusive development, they are prepared to pay, so, they will go to that 50 miles, you can go to that 50 miles. There should be facilities for all these things, because it's not 100% socialized country. Everything should not be free, if everything is free, in that case, who will develop it? You need money for that. So, in that case, there should be happy marriage between these two things. There should be a combination of thinking. We should use our possibilities for investment, at the same time we should have opportunities for common people, where they will not pay any money for visiting at some basis.

Maharina Jafrin: Thank you, I think that's a thoughtful idea. I think, in some respect, may be in our country, in our condition, may be it's like that, but the thing is, if the private company is using 20% or 15% of Foy's Lake, then what about the other open spaces, I am not talking about the amusement things, If people don't want to use those amusement thing, they want to walk around, then what about them? I think, yes that's very surprising, we don't have small pocket land, pocket park, in 400 meter, or 500 meter, even not in a distance, we can go and walk there. Ok, thank you for everything that you mentioned today, like the canals, the river front and Bay front, one more question I have.

Ali Ashraf: Before you ask me the 2nd question, for small land, see government can acquire that, in some of my writings, I have mentioned, within the city, there are several pockets available. Somewhere, in new land development, by the side of the road, you will find development. But, they have their road, there are some pockets, where you don't have any access.

Maharina Jafrin: Right, that's what I think about accessibility.

Ali Ashraf: Government can do, they can buy some land, so under the government rule, they can acquire everything. Providing government pay just compensation. So, identify those plots, If you search through google, you can find those pockets. So, those pockets government can acquire by paying money. Then they can create an open space there. It can be a children's park. There are pockets available in the city. Chittagong is not as dense as in Dhaka, if you follow the Sheikh Mujib Road or CDA Avenue, go up stair, go to the top most floor of a ten stories building, you will find lot of pockets available, where you don't have an access. You can't go. Government can buy, because it is just the not developed, cost will be less. And it will be within the capability and capacity of the government. Government can buy and develop it.

Maharina Jafrin: Develop it, right.

Ali Ashraf: and then, by the side of the road, say there are 10' strip, or 20' strip, which is densely developed, costly structures are there, government can buy only 40' width land, so that 40', say 10/20 decimal, if the cost is abnormal, see you can open acres of land through that space, still little bit of money, you will have to buy, a think, additional money, very costly price will be there but by buying that you are opening up some 20 times and 40 time space. So, now, that bigger space can be open space for people for use and access you are providing by buying this chunk of land and that cost for chunk of land is small portion.

Maharina Jafrin: Compare to whole space. Yeah.

Ali Ashraf: Options are there. Only you need, you will have to be creatively thinking. Identify that, identify to produce a DPP (Development Project Profile) and submit it to relevant ministry. You will have to go through that processes, ultimately it will be accepted. Government will allocate money. Only thing is, we will have to ask for it.

Maharina Jafrin: yeah, as you have mentioned about the currently how we are addressing the issues, though we are not addressing that we need open space, but the river front and Bay front, both are like to create out ring road. The main purpose is to create outer ring road. What I have seen, in the Bay front, they have created almost a railing, that is detaching people from the sea beach. So, people now, like in Patenga beach they have 30' or 35' opening, that can take them to the beach, Otherwise, whole Bay front is railed, people cannot go to the beach. So, what do you think? Isn't it like, do you think it is more than what you want to do?

Ali Ashraf: Chittagong Patenga Beach compare to Cox's Bazar is little bit different. Cox's Bazar is a sandy beach. In Chittagong all beach areas are not sandy.

Maharina Jafrin: Wave is strong.

Ali Ashraf: not only wave, they found mud. Say, in Cox's Bazar, if you walk down, you can walk, say, may be 500 yards, and all those are sand, and people will feel comfortable in walking through the sand. So, sand is there to bit of walk and relax, no problem. But in Patenga, the whole beach is not sandy. There are little bit of sandy beaches in here and there, but most of the beaches are muddy. And then another thing is in some areas, it is deep. In Cox's Bazar, it is shallow. You can walk even miles, beside the water, but here you cannot do that. There are pockets, which is shallow, there are pockets which is very deep. So, without having this railing, if you allow people to go there, ultimately, there will be fatalities. Lot of people will die. So, they have identified few places, which is more or less secure, so, those places, they have allowed them to touch water, the remaining, places, possibly the have created railings and all those things just to deter people from going to water. Now there you cannot touch water. But, you can at least see water. You can face it. Even in Karnaphuli, you cannot allow them to go to the water. Because it's risky, depths are there, currents are there. If you are, swimming there, going down there, its not a lake. It's a continuous river, under current

and over current. Both are currents are there. It is risky. Even in the Bay, there may be under current, but Foy's lake, no question of current. If you create lakes on the top of hill, no question of current.

Maharina Jafrin: Salient water.

Ali Ashraf: Right, and if you use this Ashker Desghi and Jorr Deba, no question of current. So, in that case people can do anything but river? you'll have to handle it with care, Bay, you'll have to handle it with care, you cannot allow everything to be done there.

Maharina Jafrin: In that case, actually the riverfront is it still open space, obviously blue open space or aquatic open space. Whatever it is. In that case, in case of Chittagong, the Karnaphuli and the Bay of Bengal, both the drives are like marine drive.

Ali Ashraf: Right. but only difference is, say in most of the countries the marine drive has a purpose, specific purposes, OK, you just go and for recreational purposes there are driving is a pleasure. For our cases, our roads are always multipurpose. Say, the Patenga Marine drive road, basically it's an embankment come road. It's not an embankment alone, not a road alone. Because Cyclonic surges. See in Patenga area, we have got a lot of investment. EPZ is there, Export Processing Zone, our airport is there. And you remember in 1991, when there are cyclonic surges were there, lot of our small aircrafts, own by Bangladesh Airforce were damaged. So, now to protect the airport, protect the industries, will need an embankment. Again, to consider that global warming issue that height of the embankment was raised. Initially there was an embankment, but now height is raised much about that. So, that is done. Then we wanted to make it multipurpose. Just having an embankment, protecting the area from cyclonic surges is not enough. We need access, because accessing Patenga, we have only one road now. That road is, if it is crowded, people cannot avail flight and if in EPZ area, the labours go for strikes and that kind of thing, in that case, you cannot reach the airport. People see only one access, only one road, go to the southern part of the city and if you have another road, in that case you are now in less risky situation. So, if we can increase another, if their can be a third road, that can be more advantageous. So, this is going to be a road, that will give us some advantage and at the same time this is going to be embankment which will protect us from cyclonic surges. And then if you remember in 1995 Master Plan, that area, was said, this area will be free from development. Because just beyond the embankment, it is risky. So, if the settlements are there, existing old settlements, there can be development. But it will be restricted to one or two stories. Because we do not want to take the risk and it will be environmentally protected area we can go for cultivation, fishing and that kind of thing nothing more than that. But now CDA you can tell, you can go for development because now the whole area is protected. By protecting through this embankment, you are opening. Initially, it was used for fish cultivation only. Now, those area, CDA is thinking of having a smart city there, a new city, land for recreation there. You can think of it now because you have got protection. So, that road cum embankment is costly structure, costly thing and government, by knowing it, it is not done unconsciously, consciously government has invested money there and that money is funded by JICA (Japan International Cooperation Agency). And they did it consciously, it is for all purposes, it is opening up areas, it is protecting the existing industries, it is giving a road access and it is completing outer ring road. In the last transportation Master Plan, we have talked about some ring road. People those who are not willing to come to the city, they can use outer ring road. And now Karnaphuli tunnel is being made. In the case, people coming from Dhaka from Fouzderhat, and other part, they will go to Cox's Bazar without coming inside the city. So, that is an advantage. So, all these things put together has created these facilities. Now, if you have some recreational thing, that is extra and that's why created those avenues for them. That is it.

Maharina Jafrin: OK, I think today, we have got lots of ideas about the open space and your thoughts are really very helpful for us. I'm going to, we have covered almost all of the questions in today's interview. So, now I will thank you and thank you for giving consent for and participating in our interview and giving time

for this research and I'm going to finish this session. Thank you, engineer Ali Ashraf, thank you for giving time.

Ali Ashraf: Thank you very much. Thank you for visiting me and giving me the opportunity to talk about the subject very close to my work.

Maharina Jafrin: You are welcome.

Appendix 16: Authorship statement-1

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1. Details of publication and executive author

Title of Publication		Publication details
Developing an Open Space Standard in a Densely Populated City: A Case Study of Chittagong City		MDPI, Special issue: Infrastructures, Vol. 3, no. 3, 40., Year: September 2018
Name of executive author	School/Institute/Division if based at Deakin; Organisation and address if non-Deakin	Email or phone
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2. Inclusion of publication in a thesis

Is it intended to include this publication in a higher degree by research (HDR) thesis?	Yes	If Yes, please complete Section 3 If No, go straight to Section 4.
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3. HDR thesis author's declaration

Name of HDR thesis author if different from above. (If the same, write "as above")	School/Institute/Division if based at Deakin	Thesis title
As above	School of Architecture and Build Environment	Revitalising Open Spaces in the Densely Populated City of Chittagong
If there are multiple authors, give a full description of HDR thesis author's contribution to the publication (for example, how much did you contribute to the conception of the project, the design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)		
The Author wrote the article with the support of the Co-author, who oversaw her work.		
<i>I declare that the above is an accurate description of my contribution to this paper, and the contributions of other authors are as described below.</i>	Signature and date	Signature Redacted by Library 13.12.23

4. Description of all author contributions

Name and affiliation of author	Contribution(s) (for example, conception of the project, design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)
Maharina Jafrin	Write the draft. Please note that, some written content in this thesis and appearing in chapter 5 derives from my original thesis related research, which was published as stated in this Authorship Statement.
Dr. Beau B Beza	Supervised the structure of the article, editing and proof-reading.

5. Author Declarations

I agree to be named as one of the authors of this work, and confirm:

- i. that I have met the authorship criteria set out in the Deakin University Research Conduct Policy,
- ii. that there are no other authors according to these criteria,
- iii. that the description in Section 4 of my contribution(s) to this publication is accurate,
- iv. that the data on which these findings are based are stored as set out in Section 7 below.

If this work is to form part of an HDR thesis as described in Sections 2 and 3, I further

- v. consent to the incorporation of the publication into the candidate's HDR thesis submitted to Deakin University and, if the higher degree is awarded, the subsequent publication of the thesis by the university (subject to relevant Copyright provisions).

Name of author	Signature*	Date
Maharina Jafrin		13.12.2023
Dr. Beau B Beza		12.12.23

Signatures Redacted
by Library

6. Other contributor declarations

I agree to be named as a non-author contributor to this work.

Name and affiliation of contributor	Contribution	Signature* and date
Dr. Beau B Beza	See above.	
		12/12/23

Signature Redacted by Library

* If an author or contributor is unavailable or otherwise unable to sign the statement of authorship, the Head of Academic Unit may sign on their behalf, noting the reason for their unavailability, provided there is no evidence to suggest that the person would object to being named as author

7. Data storage

The original data for this project are stored in the following locations. (The locations must be within an appropriate institutional setting. If the executive author is a Deakin staff member and data are stored outside Deakin University, permission for this must be given by the Head of Academic Unit within which the executive author is based.)

Data format	Storage Location	Date lodged	Name of custodian if other than the executive author

This form must be retained by the executive author, within the school or institute in which they are based.

If the publication is to be included as part of an HDR thesis, a copy of this form must be included in the thesis with the publication.

Appendix 17: Authorship statement-2

Appendix 17: Authorship Statement- 2

Details of publication and executive author

Title of Publication		Publication details
Conservation of historic open space urban landscapes of Chittagong, Bangladesh		Book chapter-The Routledge Handbook on Historic Urban Landscapes in the Asia-Pacific, Chapter 11.
Name of executive author	School/Institute/Division if based at Deakin; Organisation and address if non-Deakin	Email or phone
Maharina Jafrin	Deakin University	mjafrin@deakin.edu.au
Shamsul Hossain	Chittagong Research Resources Centre	shossain.chati@gmail.com

2. Inclusion of publication in a thesis

Is it intended to include this publication in a higher degree by research (HDR) thesis?	Yes	If Yes, please complete Section 3 If No, go straight to Section 4.
-----------------------------------------------------------------------------------------	-----	---------------------------------------------------------------------------

3. HDR thesis author's declaration

Name of HDR thesis author if different from above. (If the same, write "as above")	School/Institute/Division if based at Deakin	Thesis title
As above	School of Architecture and Build Environment	Revitalising Open Spaces in the Densely Populated City of Chittagong
If there are multiple authors, give a full description of HDR thesis author's contribution to the publication (for example, how much did you contribute to the conception of the project, the design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)		
The Author wrote the article with the help of Co-author, who supervised her work with all supports.		
<i>I declare that the above is an accurate description of my contribution to this paper, and the contributions of other authors are as described below.</i>	Signature and date	Signature Redacted by Library 13.12.2023

4. Description of all author contributions

Name and affiliation of author	Contribution(s) (for example, conception of the project, design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)
Maharina Jafrin	Write the chapter. Please note that, some written content in this thesis and appearing in chapter 4 derives from my original thesis related research, which was published as stated in this Authorship Statement.

Shamsul Hossain	Help with historic background of Chittagong and materials.
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5. Author Declarations

I agree to be named as one of the authors of this work, and confirm:

- i. that I have met the authorship criteria set out in the Deakin University Research Conduct Policy,*
- ii. that there are no other authors according to these criteria,*
- iii. that the description in Section 4 of my contribution(s) to this publication is accurate,*
- iv. that the data on which these findings are based are stored as set out in Section 7 below.*

If this work is to form part of an HDR thesis as described in Sections 2 and 3, I further

- v. consent to the incorporation of the publication into the candidate's HDR thesis submitted to Deakin University and, if the higher degree is awarded, the subsequent publication of the thesis by the university (subject to relevant Copyright provisions).*

Name of author	Signature*	Date
Maharina Jafrin	Signature Redacted by Library	13.12.2023
Shamsul Hossain	Deceased	

6. Other contributor declarations

I agree to be named as a non-author contributor to this work.

Name and affiliation of contributor	Contribution	Signature* and date
Shamsul Hossain	Deceased	

* If an author or contributor is unavailable or otherwise unable to sign the statement of authorship, the Head of Academic Unit may sign on their behalf, noting the reason for their unavailability, provided there is no evidence to suggest that the person would object to being named as author

7. Data storage

The original data for this project are stored in the following locations. (The locations must be within an appropriate institutional setting. If the executive author is a Deakin staff member and data are stored outside Deakin University, permission for this must be given by the Head of Academic Unit within which the executive author is based.)

Data format	Storage Location	Date lodged	Name of custodian if other than the executive author

This form must be retained by the executive author, within the school or institute in which they are based.

If the publication is to be included as part of an HDR thesis, a copy of this form must be included in the thesis with the publication.

Appendix 18: Authorship Statement-3

Appendix 18: Authorship Statement- 3

Details of publication and executive author

Title of Publication		Publication details
Developing a Data Driven Strategy and Guideline to Increase Per Capita Open Space and Relative Accessibility in Chittagong City		Publisher: MDPI, Special issue: Sustainability, Vol.14, no.16, 9828, Year: August 2022 https://doi.org/10.3390/su14169828
Name of executive author	School/Institute/Division if based at Deakin; Organisation and address if non-Deakin	Email or phone
Maharina Jafrin	Deakin University	mjafrin@deakin.edu.au

2. Inclusion of publication in a thesis

Is it intended to include this publication in a higher degree by research (HDR) thesis?	Yes	If Yes, please complete Section 3 If No, go straight to Section 4.
-----------------------------------------------------------------------------------------	-----	---------------------------------------------------------------------------

3. HDR thesis author's declaration

Name of HDR thesis author if different from above. (If the same, write "as above")	School/Institute/Division if based at Deakin	Thesis title
As above	School of Architecture and Build Environment	Revitalising Open Spaces in the Densely Populated City of Chittagong
If there are multiple authors, give a full description of HDR thesis author's contribution to the publication (for example, how much did you contribute to the conception of the project, the design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)		
The Author wrote the article with the help of Co-author, who supervised her work with all supports.		
<i>I declare that the above is an accurate description of my contribution to this paper, and the contributions of other authors are as described below.</i>	Signature and date	Signature Redacted by Library 13.12.2023

4. Description of all author contributions

Name and affiliation of author	Contribution(s) (for example, conception of the project, design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)
Maharina Jafrin	Write the chapter. Please note that, some written content in this thesis and appearing in chapter 6 derives from my original thesis related research, which was published as stated in this Authorship Statement.

5. Author Declarations

I agree to be named as one of the authors of this work, and confirm:

- i. that I have met the authorship criteria set out in the Deakin University Research Conduct Policy,
- ii. that there are no other authors according to these criteria,
- iii. that the description in Section 4 of my contribution(s) to this publication is accurate,
- iv. that the data on which these findings are based are stored as set out in Section 7 below.

If this work is to form part of an HDR thesis as described in Sections 2 and 3, I further

- v. consent to the incorporation of the publication into the candidate's HDR thesis submitted to Deakin University and, if the higher degree is awarded, the subsequent publication of the thesis by the university (subject to relevant Copyright provisions).

Name of author	Signature*	Date
Maharina Jafrin	Signature Redacted by Library	13.12.2023

6. Other contributor declarations

I agree to be named as a non-author contributor to this work.

Name and affiliation of contributor	Contribution	Signature* and date

* If an author or contributor is unavailable or otherwise unable to sign the statement of authorship, the Head of Academic Unit may sign on their behalf, noting the reason for their unavailability, provided there is no evidence to suggest that the person would object to being named as author

7. Data storage

The original data for this project are stored in the following locations. (The locations must be within an appropriate institutional setting. If the executive author is a Deakin staff member and data are stored outside Deakin University, permission for this must be given by the Head of Academic Unit within which the executive author is based.)

Data format	Storage Location	Date lodged	Name of custodian if other than the executive author

This form must be retained by the executive author, within the school or institute in which they are based.

If the publication is to be included as part of an HDR thesis, a copy of this form must be included in the thesis with the publication.