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Assessing The Impact of Highrise Building as Landmark on Adjoining Urban Fabric in Oxygen Area

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Abstract

Tall buildings can be complex in architectural, structural, or facade systems and in interrelations with the urban fabric. With rapid urbanization and technological innovation, tall buildings are being placed relentlessly as a solution to the scarcity of land and resources to cope with the persisting urban development. Tall Building is the most eagerly debated building typology as People have divided opinions on their contribution to the urban plan. The urban area having a skyscraper is not like those areas where most of the buildings are low-rise. Newly built high-rise buildings can wield an unneglectable impact on the surrounding context. This paper outlines how a landmark high-rise if built in Oxygen circle, Chattogram will impact that area's urban fabric. In this study qualitative method is used and it starts with the analysis of the urban context of Oxygen area, then shows some case studies to illustrate the need, context, and interdependence of cities and tall buildings. After that, several aspects such as environmental, cultural, and socioeconomic factors are shown related to tall building in that urban context. Finally, a conclusion is summed up by analyzing the probable impacts of the tall building if it is built in that area.

Keywords: Highrise; Urban Design; Urban Fabric; Oxygen area.

1 Introduction

Chattogram, the commercial metropolis of Bangladesh, remains less developed than Dhaka, despite its rapid growth and expansion because of the current construction boom. The current urbanization rate in Bangladesh is between 5 to 6 percent per year and it is projected that by 2025 and 34 percent of the population will reside in urban areas, up from the current 28 percent. (Bony and Rahman,2014). With rapid population growth in developing nations, it has become difficult to house many people in metropolitan regions where they can live and work. The growing global urban population demands High-rises in increasing locations, requiring efficient construction, urban service growth, and careful planning. As many developed nations are urbanizing, one or two towns can grow enormously unless limitations are put in place (Ali et al. 2008). In a rapidly growing city like Chattogram, where land is scarce and property value is high, the only evident alternative is the construction of enormous towers. The city contains numerous high-rise buildings, which are the second highest in Bangladesh. Intermediate urban centers that have been identified by Planning Commission based on socio-economic and administrative criteria for making development investments are growth centers in the context of Bangladesh. (LGED,1995). Growth centers are typically targeted for investment and development to stimulate economic growth and regional development. The industrial area of Bayezid Bostami Thana in Chattogram, Bangladesh, has recently undergone residential development. Oxygen Circle is a prominent node in this region. Numerous commercial and residential structures as well as a high population density indicate the region's growth and development potential. In addition, the adjacent Bayezid Bostami Industrial Area and Chattogram Export Processing Zone have been designated as an industrial zone to foster economic growth and development. Due to the proximity of these industrial zones, it is possible that Oxygen Circle may experience expansion and development. Given the region's scarcity of land and the rising demand for additional space, it appears that high-rise construction is a viable option for meeting the demand. Moreover, if regional authorities and other relevant parties view high-rises as a strategy to stimulate economic development and nurture a distinctive character for the area, it could be deemed essential.

The choice between high-rise and low-rise buildings shapes an expanding city. High-rise structures depend on the availability of land; the balance between public and private transportation; population pressures; the strength

of planning and development standards; urban service accessibility; existing infrastructure; and future plans. It must be assessed in relation to the city block, street, pedestrian, user, and inner space (Ali et al. 2008).

The impact of high-rises on urban fabric has been studied by several researchers (Czynska, 2019; Al-Kodmany, 2013; Ali, 2010; Ali et al., 2008; Wood, 2004; Pank et al., 2002). Tall buildings can be considered landmarks as they dominate the city space. Moreover, it creates an impact on the urban order when a landmark is in a prominent location. In addition to the urban composition, the impression of high-rise buildings is influenced by their scale (spread) and the development of their immediate surroundings. Besides, there is a common belief that a tall structure expands the area around it. Additionally, tall structures located at terminating vistas take on a prominent position and are significant in the urban landscape (Czynska, 2019). The skyline of a city is frequently seen as its "urban signature," molded by its cultural and economic development and serving as a symbol of the city's identity, development, and way of life (Al-Kodmany, 2013). Urban planners and designers have reconsidered their views on including buildings in cities because of current globalization, technological advancements, and sustainability trends (Ali, 2010). Tall structures have physical, socio-cultural, and historical consequences for urban environments. Their placement and design must be favorable. They can enhance the skyline and cityscape when correctly built. Tall buildings congest traffic, strain city infrastructure, utilities, and transportation; significantly impact roads and other public infrastructure. Therefore, changes must be anticipated and managed to maintain the city's transport networks and other services. Cities must integrate land use and transportation plans (Ali et al. 2008). A tall building cannot be expected to "fit in" with its surroundings. It will inevitably soar above and take control of its surroundings. However, that does not imply that it can't contribute positively to the urban landscape (Wood, 2004). High-rise structures' commitment to sustainability is frequently questioned. On one side, some groups think tall structures are fundamentally sustainable and good for the environment since they can house a lot of functions people in a small space, which prevents urban sprawl and encroachment on green space and other negative effects (Pank et al., 2002).

All the aforementioned studies concentrated on the effects of high-rise structures on the urban environment in a generalized manner. It is crucial to consider the specific urban context of a particular area to determine more accurately how a high-rise will impact that area. Therefore, taking into account the positive and negative effects, the current study concentrated on analyzing the impacts of a landmark high-rise building constructed on vacant land near the Oxygen node on the adjacent urban fabric.

2 Contextual Analysis of Oxygen Area

2.1 Built Form and Uses

There are a variety of residential and commercial structures surrounding Oxygen Circle, including stores, markets, and eateries. To the north of Oxygen Circle is a small park known as Bayezid Bostami Park, which provides recreational green space. The area appears densely populated, with a blend of old and new structures and multistory buildings. The Bayezid Bostami Shrine, the Bayezid Bostami Industrial Area, and the Chattogram Export Processing Zone are in close proximity to Oxygen Circle. These landmarks are intended to encourage economic growth and development in the region, which may contribute to the future development of the surrounding area. The vacant land adjacent to the node is significant for the Oxygen region because the name "Oxygen" was derived from this leased land, which was previously leased by Linde Corporation and used as an oxygen factory. According to the Detail Area Plan, this abandoned Land can be used for commercial purposes.

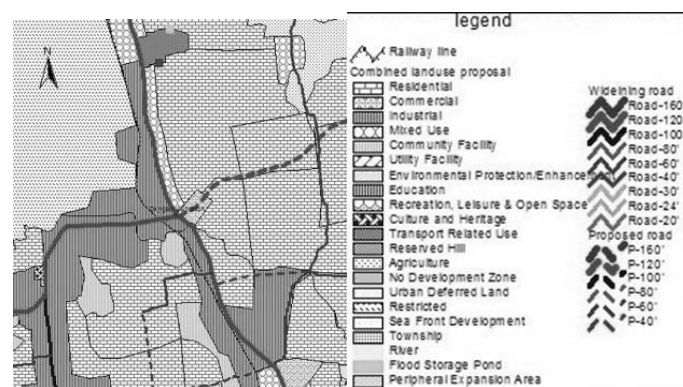


Figure 1: Detailed area plan of the oxygen node marking the site for mixed-use purposes.

Table 1. Amenities surrounding Oxygen node within 1km radius.

Around node	Pachlaish Road	Bayezid Bostami Road	Oxygen-Kuwaish Road	Chattogram-Rangamati-Khagrachari highway
Bank	Jute mill	Garments	Schools	Filling station
Filling station	Motor parts	Industries	Hotels	Bank
Police station	Workshop	Fire-brigade office	Restaurant	Mosques
Paper mill	Bank	Cantonment	Community center	Graveyard
Bakeries	Garment	School	Residential areas	Schools
Food court	Shopping complex	Tea board	Kachabazar	Colleges
Kachabazar		Engineering workshops	Coaching center	Tannery
Public toilet		Mosque	Mosque	Diagnostic center
				Community center

2.2 Environmental Analysis

2.2.1 Microclimate

Tropical monsoon climate makes Oxygen area hot and humid throughout the entire year. This region experiences two distinct seasons: wet from May to October and dry from November to April. In low-lying areas, excessive rainfall during the monsoon season can cause flooding and waterlogging. Roads and structures absorb and retain heat, causing an increase in temperature. The moderating effect of vegetation reduces temperatures in vegetation-covered regions. During the dry season, the region's temperature may rise due to the region's built-up surfaces and lack of foliage. Localized heat islands caused by land use patterns also may be detrimental to the region.

2.2.2 Topography

The Oxygen area is situated in a comparatively low-lying coastal region of Bangladesh, approximately 5 meters above sea level on average. The territory is bordered to the west by the Karnaphuli River and is located close to Chattogram Port and Chattogram Railway Station. Transportation, land use, and flood risk may be affected by the topography of the Oxygen region. For instance, the region's low terrain may make it simpler to construct transport infrastructure, such as roads and railways. However, the area's low elevation also makes it more susceptible to inundation during intense rainfall or storm surges.

2.3 Movement Patterns and Infrastructures

2.3.1 Urban Street and Road Network

Four primary roads meet at Oxygen circle within two roundabouts- 1. Bayezid road (on west); 2. Hathazari Road (on north); 3. Kuwaish Road (on east); and 4. Pachlaish Road (on south). The Hathazari-Pachlaish road (on north-south) is national highway N106 (Chittagong-Rangamati highway). Several secondary and tertiary roads connect various built forms and create smooth accessibility.

2.4.2 Traffic Congestion

Chattogram Railway Station, the city's primary transportation center, is located close to Oxygen. The suburb is close to a number of main roadways, including CDA Avenue, which links it to the city. However, rush hour and heavy traffic may create congestion on the region's roads. Additionally, cargo lorries and other large vehicles that use the Chattogram Port to import and export products may contribute to traffic congestion. This could lead to traffic congestion and safety concerns for large, small, and foot traffic.

Table 2. Amount of vehicle on roads on pick hours and off pic hours.

Road	Pick Hour (%)	Off-pic Hour (%)
1. Bayezid Road to Panchlaish road	75	25
2. Panchlaish road to Kuwaish road	64	36
3. Bayezid road to Hathazari road	72	28
4. Bayezid road to Hathazari road	62	38
5. Bayezid road to Kuwaish road	68	32
6. hathazari road to Kuwaish road	60	40

3 Case Study

3.1 Dhaka: A Developing City with Skyscrapers

Dhaka is one of the major developing cities in the world, with a population of 22.4 million. In the past few decades, the rapidly changing urban scenario has seen the vertical growth of Dhaka with a good number of tall buildings. The scarcity of land, high land value, accommodation for the growing population, and commercial and administrative facilities have initiated the rapid growth of tall buildings. Since the early 80s, with the increase in economic activities and scarcity of high-quality land, the construction of Highrise buildings accelerated for commercial and housing purposes. Alongside the government, private and real estate companies also started investing in this sector through hotels, residential, mixed-use and commercial buildings. Though tall buildings have been a solution to the scarcity of land and rapid urban growth issues, the urban landscape, environment, and socio-economic aspects have been affected by the unplanned growth of these buildings. Social connectivity is lost as only a few tall buildings have community spaces. Social segregation, lack of structural safety, inadequate infrastructure and transportation system cannot keep pace with these growing high-rises. (Iqbal, 2005)

3.2 Mumbai, The Commercial Capital of India

Mumbai is India's commercial, financial, and entertainment center located on the western coast. The city's naturally deep harbor handles 50% of the nation's freight and passengers. Mumbai has 23 million people, 16% of the world's population, and covers 600 square kilometers. This area is also one of the top ten global financial centers and contributes 6.16% to India's GDP. The city's strong economy attracts people from throughout the nation seeking better opportunities. The lack of adequate housing for low-income people has caused urban poverty and homelessness. Most modern urban projects are vertically spread on restricted lands without considering infrastructure due to spatial restrictions. Poverty, poor public health, and land shortages are causing an urbanization issue in the metropolis. Thus, the city struggles to house its newcomers. Skyscrapers are now mitigating these issues to some extent. Thus, high-rise buildings in Mumbai have boosted trade and business too. In today's world of sophisticated technology and architecture, skyscrapers symbolize authority and development, driving the construction of tall buildings. (Jambhekar et. al., 2008)

4 Methodology

The process is initiated by the context and site analysis with the objectives of designing a Highrise building in the Oxygen area and a literature study about high-rise buildings in different megacities. The literature review gives a clear view of the increasing construction and uses of the high rise in urban fabrics as well as the influences of such vertical expansion. The effects of a high rise in social, ecological, economic, and environmental aspects can be noted. Considering the facts following is a suggested design solution for the landmark high-rise to be built on the vacant land adjacent to the oxygen node.

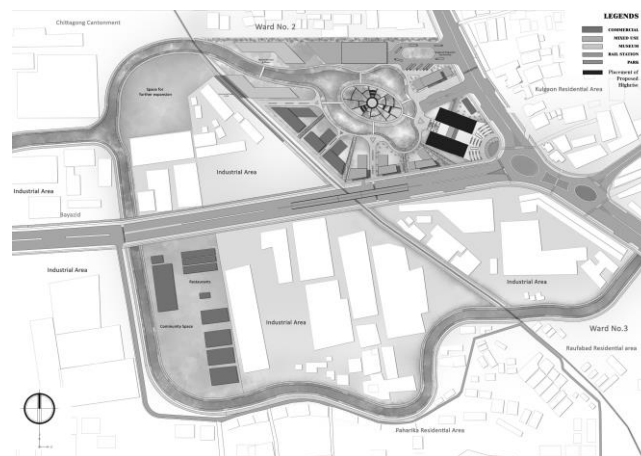


Figure 2: Probable urban solution for Oxygen area denoting placement of proposed high-rise.

Analyzing the facts from the literature review, contextual analysis and case studies, influences are discussed in respect to the proposed probable urban solution. Finally, design considerations for constructing high-rise structure in Oxygen area are incorporated with the conclusion.

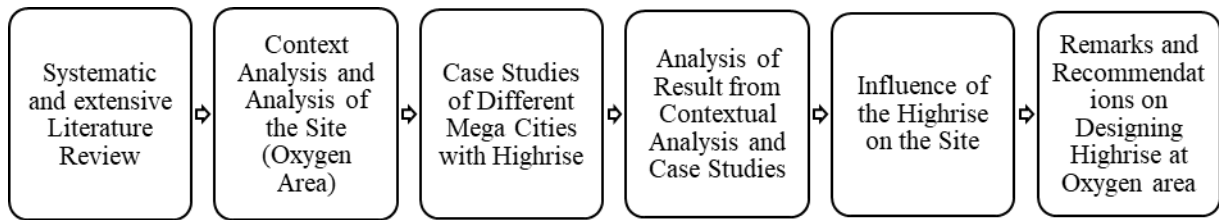


Figure 3. Methodology flowchart.

5 Result and Discussion

5.1 Result

After analyzing the literature review, case studies, and contextual aspects of the Oxygen area; it shows that this area is a potential growth center. This area is densely populated for residential, commercial, and industrial purposes. The neighborhood is characterized by narrow roads, few parks, and intense traffic. According to the research evaluation, tall buildings can either enhance or diminish urban fabric. High-rise has both positive and negative effects on the urban fabric, depending on its location, design, and surrounding environment. Planned urban design can facilitate the integration of high-rise structures and reduce their negative effects on the surrounding neighborhood. High-rise structures can create wind tunnels and shade the local environment. The development can result in traffic congestion and may impact property values. The data analysis and literature review yield recommendations for incorporating high-rise buildings into the Oxygen area's urban fabric in the aspects of socio-economic and commercial development. Also, it may enhance the image of the Oxygen area as a landmark if the design is incorporated with the cultural and historical setting of that area. These recommendations include harmonizing the high rise with the urban fabric of that area, enhancing the street-level experience, and employing sustainable architecture.

5.2 Discussion

Cultural, socio-economic, environmental, historical, and demographic factors affect the design of a high-rise building and on the other hand, a high-rise building has such kind of influences on a built environment as well as the surrounding context and site. Some possible influences of a high-rise building, if built in Oxygen area, are discussed below:

Table 3. Influences of High-rise in the surrounding context

Influences	Aspects
Contextual	As Oxygen node area is a commercial and industrial area of Chattogram, a tall building can serve as- <ul style="list-style-type: none"> • a Landmark in that region imposing a new identical influence. • representation of the technological development of that region. • a mixed-use commercial tower with multiple public functions.
Environmental	The local environment, microclimate, and topography of the site are always major concerns for the design of a tall building. Some environmental aspects to be considered are- <ul style="list-style-type: none"> • Low-lying flat land exposed to rainwater clogging during the monsoon period. • Local temperature and wind flow from the southeast in case of building orientation • Wind, shadow, and effects in the case of the surrounding buildings. • Indoor environment quality, ventilation, acoustics, energy efficiency, waste management, and rainwater management. • could also alter the area's physical landscape. • The excavation required for the foundation of the building could lead to soil erosion, destabilization of surrounding structures, and alterations to the natural drainage patterns of the area. So, these issues should be considered.
Socioeconomic	<ul style="list-style-type: none"> • Draw attention and promote the perception of the city as a major business hub. • Can provide amenities and economic advantages for the neighborhood. • Can provide employment and training opportunities for local worker's community in the construction of the building. • The whole building may act as a community gathering space enhancing the social bonding.
Cultural and	<ul style="list-style-type: none"> • The iconic tall building and public square with a monument or memorial can

Historical	commemorate the sacrifice of Masterda Surja Sen. <ul style="list-style-type: none">• This Vertical hub can be a center of cultural and intellectual practice for the community where library, memorial, and cultural centers can be located.
Urban Infrastructures	<ul style="list-style-type: none">• Traffic problems may occur due to public accessibility in the vertical hub• Pedestrian walkways and public breathing spaces, green spaces should be provided considering the public accessibility and activity
Psychological	<ul style="list-style-type: none">• High-rise may demonstrate a sense of grandeur and attract the attention of the public.• Public participation may reduce antisocial conduct and offenses.• This vertical junction will attract developers and other government and non-government groups as a cultural and commercial landmark. This will enable regional growth.

6. Conclusion

The primary objectives of this study are to assess the impacts of landmark high-rise buildings in Oxygen area with respect to the specific urban context. A systematic and extensive literature review along with context and case studies are analyzed to discuss influences.

It is concluded that high-rise buildings can have both positive and negative impacts on the surrounding urban fabric in Oxygen area. A high-rise has the potential to contribute to the particularity of Oxygen area, stimulate economic growth, and offer communal spaces. This may result in shade, wind, and visual dominance. Therefore, to enhance the urban environment, a high-rise must employ integrating and cohesive urban design principles. Collaboration between developers, urban planners, and local communities is essential in designing and constructing a high-rise to promote viability and sustainability. Future judgments regarding the selection of high-rise construction projects can be made considering this region's distinct geographical characteristics and the presence of residents, businesses, and government officials. With meticulous planning and design, A high-rise in Oxygen area of Chattogram has the potential to serve as a prominent landmark and foster a cohesive and vibrant urban atmosphere.

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