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Project 02: Potentials of Development in Proposed MRT Station Areas-A Study on Agargaon MRT Station

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ABSTRACT

A well-functioning transportation system promotes accessibility and quality of life. In terms of maintaining a transit-friendly city form and ensuring the urban poor have access to work, developing an appropriate Mass Rapid Transit (MRT) system is a critical factor. An efficient and accessible MRT system will help to reduce automobile dependency and traffic congestion. Transit oriented development around MRT station has gain popularity in global context due to its functionality. Dhaka MRT line-6 is under construction and after the completion of MRT, there will be an opportunity to implement the schemes for transit-oriented development. Agargaon MRT station is one of the transit stations of Dhaka MRT line 6. Our study area is confined within one kilometre's radius of Agargaon transit station. The objective of our study is to explore the land use pattern and socioeconomic context in surround areas of Agargaon MRT station and propose a land use plan compatible with the MRT station in the study area. To understand the socio-economic context of the study area and collect detailed land use information reconnaissance and questionnaire survey have been conducted. After the analysis of the collected data, strategic actions have been selected and land use proposals have been discussed in this study to achieve the vision for transit-oriented development around Agargaon MRT station.

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LIST OF ABBREVIATIONS

BNBC	Bangladesh National Building Code
BRT	Bus Rapid Transit
CBD	Central Business District
DAP	Detailed Area Plan
DMTCL	Dhaka Mass Transit Company Limited
DSP	Dhaka Structure Plan
DTCA	Dhaka Transport Coordination Authority
ITDP	Institute for Transportation and Development Policy
MRT	Mass Rapid Transit
NIDCD	National Institute of Deafness and Other Communication Disorders
NMT	Non-motorized Transport
RAJUK	Rajdhani Unnayan Kartripakkha
TOD	Transit Oriented Development

CHAPTER 01: INTRODUCTION

1.1 Background of the study

Many of the countries in the world are concerned with the problem of congestion, pollution, greenhouse gas emission, loss of open spaces, pressure on supply of oil, dependency on auto-mobile, sprawl development etc. (Azra, 2016). To remedy these problems the concept of smart growth can be implemented under sustainable development. TOD has become an important tool in this context. TOD encourages smart growth and compact development (Azra, 2016).

Peter Calthorpe codified the concept of Transit Oriented Development in 1980's (Carlton, 2009). According to Calthorpe, Transit Oriented Development (TOD) is a mixed-use community within a certain distance of a transit station that consist of a core commercial area. Transit Oriented Development (TOD) encourages pedestrian friendly, mixed-use, commercial and residential land use within a 15-minute walking distance of a transit stop with compact development, high density of population and promotion of the public open space and park facilities (Westwood, 2017).

Dhaka, the capital city of Bangladesh is going under rapid urbanization process with its ever-growing population and high-density settlement. As a result, for want of a dependable public transport system and incompetent traffic management practices, the present traffic and environment condition of the city has worsened.

The very first MRT project in Bangladesh was approved in 2012 by the Government's Executive Committee of National Economic Council (ECNEC) (DMTCL, 2022). MRT line from Uttara to Agargaon is expected to be publicly operational in December 2022. There is a great potential of Transit Oriented Development around the MRT stations in Dhaka. Sustainable development can be achieved by properly implementing Transit Oriented Development in Dhaka (Azra, 2016). The concept and application of TOD is relatively new in case of Dhaka and Bangladesh. Therefore, to identify the potential for development in the proposed MRT station, a study was conducted on surrounding areas of Agargaon MRT Station which is on MRT line 6. VBariation of land use is observed around the MRT station of agargaon including residential, commercial, institutional, educational, administrative etc. The land use pattern and socio-economic condition of the residents as well as commercial land users were studied and surveyed. Considering the elements of TOD

and the necessity of the local people, new land use of the surrounding one-kilometre buffer area of Agargaon MRT station was proposed in this report.

1.2 Objectives of the study

Setting objectives that are explicit, exact, relevant, and unambiguous is critical for any study. Three objectives have been formulated for our study as well.

1. To explore the land use pattern and socioeconomic context in surrounding areas of Agargaon MRT station.

2. To propose a land use plan compatible with the MRT station in the study area.

1.3 Rationale of the study

The transportation system of Dhaka has high level of operational disorder with increasing use of motorized vehicles and less non-motorized vehicles (Azra, 2016). Moreover, pedestrian walking environment is also very poor. This study proposed land use in TOD that encourage walkable pedestrian and bicycle friendly communities and lower the number of private cars in the study area. Development of TOD can be a great solution in a highly dense city like Dhaka. As more MRT stations are to be developed, planned TOD can make a great impact in solving many transportation problems of Dhaka.

1.4 Scope of the study

The proposals and findings from this study can guide the policy makers and planners to understand the impact and potential of TOD around MRT station and formulate future plan of action. Future detailed Transit Oriented Development plan may be implemented by the authorities ensuring the application of main components of TOD. There is a scope of taking opinion of many local residence and commercial land users by detailed survey and ensure participatory planning of the transit-oriented development.

1.5 Limitation of the study

T There were some limitations of the study specially, in data collection. The limitations were:

- A large part of the study area was restricted zone. It was not possible to conduct survey in those areas.
- Due to the unwillingness of many of the residents, the number of samples was relatively low
- The samples were not perfectly random.
- Time and travelling constraint were also a concern.
- Enough literatures about the study area was not found and up to date information and images of the study area were also not available in many cases.

CHAPTER 02: METHODOLOGY

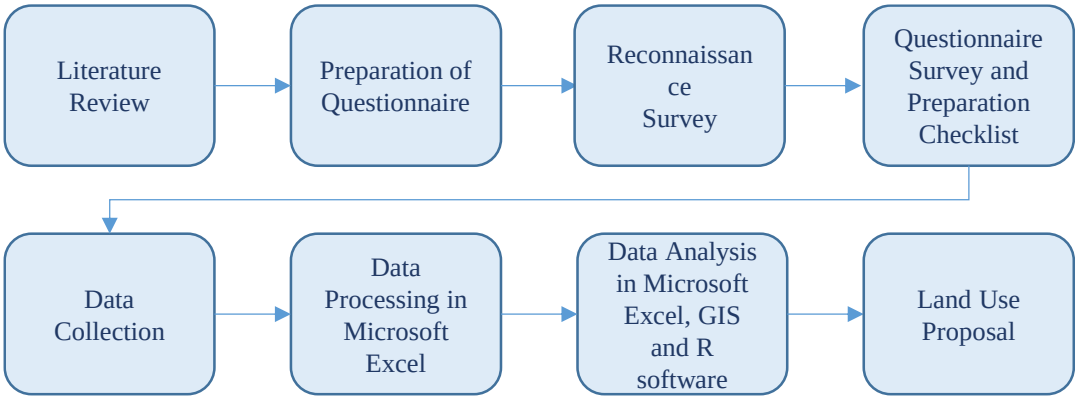


Figure 2.1 Methodological Framework Source: Author

The strategy of conducting a research project that outlines the way in which research is to be started, conducted, and conclude. For a successful research, methodology is one of the key issues. The following methodology has been adopted to fulfil the objectives of our study.

2.1 Literature Review

Relevant literatures related to the TOD and MRT station has been studied. Six other MRT stations were taken as case studies to understand the context of TOD better. To set the vision, mission, and the objectives to achieve them, several other literatures were also reviewed. Literatures about the social and demographic information about specifically Agargaon MRT station area were insufficient.

2.2 Formulation of Vision, Mission and Objectives

The vision for the Agargaon TOD was to create a functional, liveable and economically efficient 'Urban TOD'. Under this vision, several missions were fixed such as encourage efficient land use in the TOD area, enhance transportation network, design inclusive and affordable TOD etc. Some definite objectives and strategic actions were formed to achieve the missions, therefore the vision.

2.3 Preparation of Questionnaire and Checklist

Data were collected by primary data collection method: questionnaire survey. Two separate questionnaires were prepared for residential and commercial land use. At first, draft questionnaire was prepared. After some correction final questionnaire with relevant questions were prepared for

the local people of the study area to understand their socio-economic background, travel behavior of the respondents' family members and the expectation and recommendations from the respondents regarding the change after the establishment of MRT station. A checklist was also prepared.

2.4 Data Collection

Data were collected from both primary and secondary sources.

2.4.1 Primary Data Collection: Questionnaire Survey and Reconnaissance Survey

In primary data collection method reconnaissance and questionnaire survey of local people were conducted. Reconnaissance of the study area was done before data collection through questionnaire survey. Then questionnaire survey of the whole area was conducted in households and commercial establishments. Checklist was filled up by observation.

2.4.2 Secondary Data Collection

Many literatures were collected for the purpose of setting up vision, mission, objectives and design proposal. Shapefiles and images were also collected for the study area.

2.5 Data Processing and Analyzing

The collected data were cleaned as many datasets were blank and respondents didn't respond to several questions. Then data were analysed by analysis tools such as Microsoft excel and R software. ArcGIS was also used. Statistical analysis has been conducted by creating pivot tables, graphs/charts, etc. through Microsoft excel and multicriteria graphs were made using R.

2.6 Design Proposal

After understanding the respondents' expectation, necessity, problems of the area and recommendation and also the concept of Transit Oriented Development, draft design proposal were made. After several iterations, final land use design for the area was proposed.

2.7 Preparation of Report

All the analysed data and design proposals are organized in a report with major findings and recommendations for the study area.

CHAPTER 03: LITERATURE REVIEW

3.1 Introduction

Many research papers have been published on Transit Oriented Development around the world. Transit oriented development is being encouraged worldwide for sustainable development (Azra, 2016). TOD can be an important option for compact development, facilitating bicycle and use of public transport and help to reduce congestion (Azra, 2016). Mass Rapid Transit System or MRT can play a big role, if designed properly, to solve the transportation issues of large cities (Krishan, 2015). It can increase accessibility and act as a catalyst for change in land use pattern, land values and urban development (Krishan, 2015). According to Calthorpe (1993) and Newman and Kenworthy (1999), Transit Oriented Development can help to promote smart growth of a city (Azra, 2016). It can be very useful in context of Dhaka if it is to be established as a smart city.

Traffic congestion is a major issue of Dhaka city. It is a challenge for transportation professionals to build an urban transport system that is safe and has low level of congestion with basic mobility and accessibility (Azra, 2016). Transit Oriented Development around MRT station can increase the use of non-motorized vehicles and reduce travel distance (Cervero and Kockelman,1997). To

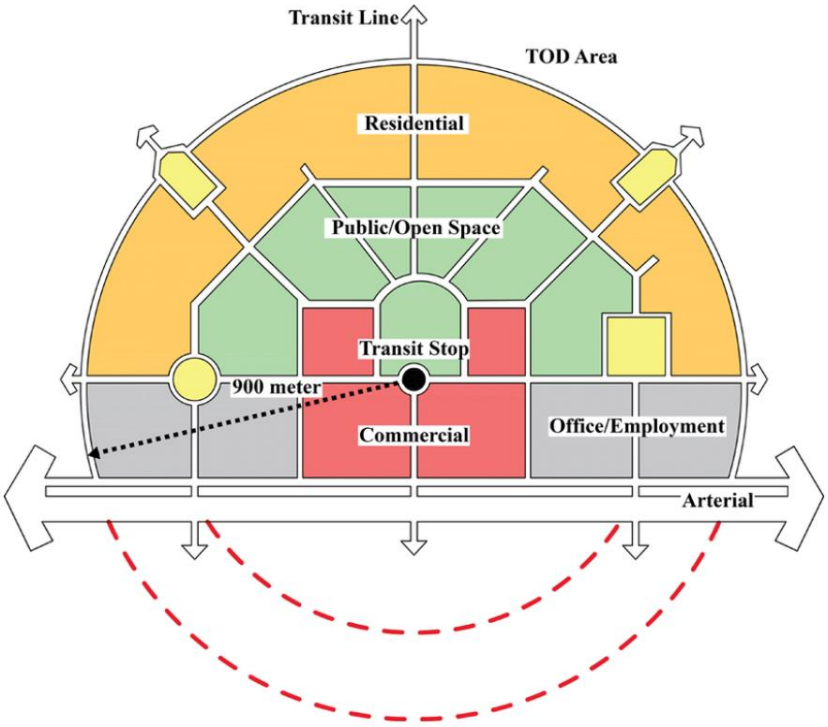


Figure 3.1: Transit Oriented Development *(Joshi et al; 2017)* Source: Joshi et al; 2017

determine the potential of development around MRT station, Budiati et al (2018) assessed the current condition of the TOD and established the strength and weakness of the development areas. But in case of this research, survey and data were collected when metro rail was yet to start its operation. Areas surrounding MRT station have a great potential for development if proper policies and strategies can be applied.

3.2 Basic Terminologies

1. Transit Oriented Development (TOD) Transit oriented development is a type of development that have mixed residential and commercial areas, compact, pedestrian and bicycle friendly neighborhoods (World Bank, 2022) Transit station (train station, metro rail station) is at the center of the TOD and areas close to the center have high density while density gets lower outward from the center. According to Calthorpe (1993), uses in areas close to the station are high story apartments and offices (Krishan, 2015).

2. Mass Rapid Transit System (MRTS)

Rapid transit public transports with a fixed separated lane and with a capacity of carrying 80 thousand passengers per hour per direction. New York subway is the biggest metro system in the world (Krishan, 2015).

3. Mixed Use Buildings

For buildings that have mainly residential land use and at least 30% commercial or other use were considered as mixed-use buildings for the study. It was also considered for mainly commercial buildings with minimum 30% of residential or other land use.

4. Compact Development

Compact city or compact development is an urban planning and urban design concept. It promotes relatively high density residential and mixed land uses (Williams 2000, cited in Dempsey 2010). In this development concept facilities are close in short distances, walking and bicycling is encouraged. It is a sustainable urban development concept (Williams 2000, cited in Dempsey 2010).

3.3 Case Study

For understanding MRT system better as well as a comparison of them with Agargaon MRT station areas, several case studies were done. They were Delhi (Lakshmi Nagar, Nirman Vihar, Preet Vihar and Karkardooma stations), Mumbai (DN Nagar Metro Station), Bengaluru (MG road metro station), Shanghai, Chennai (Guindy Nagar) and Singapore.

3.3.1 Delhi Mass Rapid Transit

The contest of Delhi is somewhat like Dhaka. "Impact Of Mrts On Urban Land: Case Study of Delhi" By Krishan, R. (2015) was studied. According to the author, the population of Delhi went through a phenomenal growth rate in last few decades and number of motor vehicles increased about 6.21% per year. This resulted in severe congestion and a disarray of bus, car, rickshaw, bike etc. To remedy this situation, government decided to form Delhi Metro Rail Corporation Ltd. To implement the project, Delhi Metro rail Corporation was established in 1995. Delhi MRTS consists of 245 kilometers network with 9 lines, and it was implemented in 4 phases (Krishan, 2015). Phase 1 consists of 58 stations and 65 kilometers of route length. It was completed on October 2006. In phases 2 and 3, 85 and 28(underground stations) stations were completed respectively (Krishan, 2015). The case study contains surrounding zones of three stations Lakshmi Nagar, Preet Vihar and Nirman Vihar.

Table 3.1: Land use change due to MRT station in Delhi metro station area

Land-use	2001 Area(sq.km.)	%age	2014 Area(sq.km.)	%age	± change of %age
Residential	1.73	66.43	1.57	60.32	-6.11
Commercial	0.30	12.38	0.43	16.38	4.00
Institutional	0.10	4.40	0.15	6.05	1.65
Mixed Use	0.13	5.26	0.21	8.17	2.91
Open	0.34	13.75	0.24	9.38	-4.37
TOTAL	2.60	100	2.60	100	

After the implementation of MRT station, Residential Land reduced by 6.11% and Open Space reduced by 4.37% while Construction of Commercial Buildings increased by 4% (Krishan, 2015). The density of the study area was almost same as Agargaon. Commercial land use was significantly higher for Delhi.

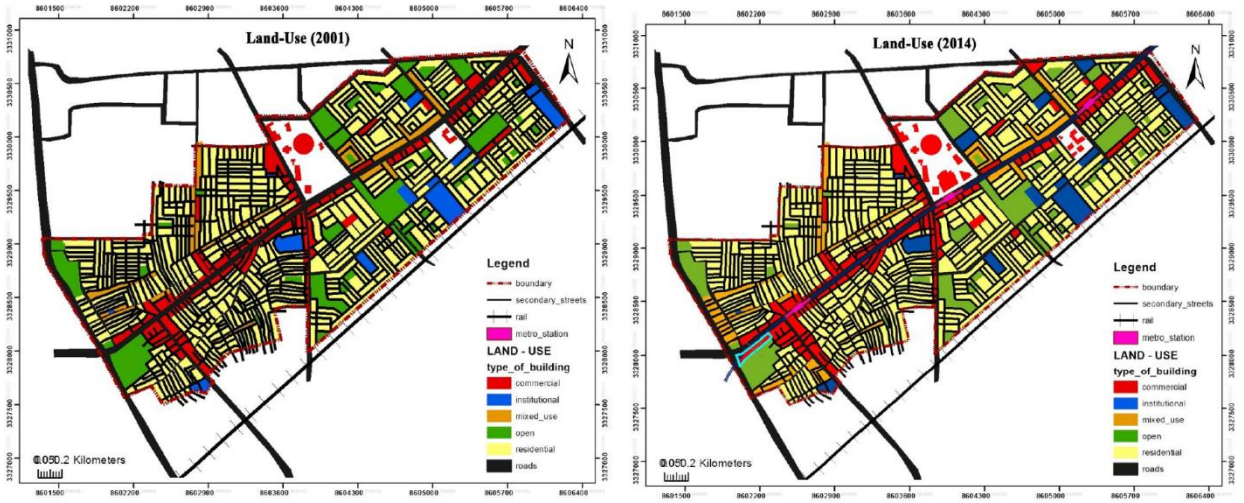


Figure 3.2: Land use change of Delhi metro area before and after Delhi MRT Source: Krishan, 2015

3.3.2 Mumbai Mass Rapid Transit

In a high-density city like Mumbai, lack of open space, heavy traffic in peak hours are common problems. A metro rail network of total 146 kilometers was proposed and it was planned to implement TOD in the new metro network (Shirke et al; 2017). Shirke et al (2017) worked on Transit Oriented Development along Mumbai metro line-I or Versova-Andheri-Ghatkopar (VAG) corridor. They proposed area within 500 meters to be developed as TOD. The authors proposed that ridership on metro rail will increase because of natural growth and future launching of new MRT lines. It can be relatable in case of Bangladesh as well. The MRT line runs through densely developed cities and areas around the MRT station have various characteristics. It was predicted that population will become double and employment opportunity will be nine times the existing condition by the year 2036 because of TOD (Shirke et al; 2017). DN Nagar Metro Station of MRT line-1 was also studied. It was opened in 2012 (Thakur, (2019). Before 2012, residential and industry were the dominated the land uses within the 500m buffer of the transit station. Vacant land was also present. The land use changed drastically after the operation of MRT line. No

industry was found in 2019 and 1/4th of total area was mixed use but commercial uses in these buildings were just 5 to 7 %. The remaining area was covered by residential land (Thakur, (2019).

3.3.3 Bengaluru Mass Rapid Transit Station

Bengaluru, being is the largest city in Karnataka and the fourth most populous city in India, have several transportation related problems. The Bangalore Metro Rail Corporation Limited (BMRCL) made Transit Oriented Development policy for the area (Anjanappa, 2021).

According to Dr Prashanth Reddy, Chairman of Real Estate Expert Committee, BCIC, TOD in Bengaluru can help to develop better urban eco system around transit stations and decentralization. Affordable housing, provision of open and green spaces can be ensured thus increasing the quality of life.

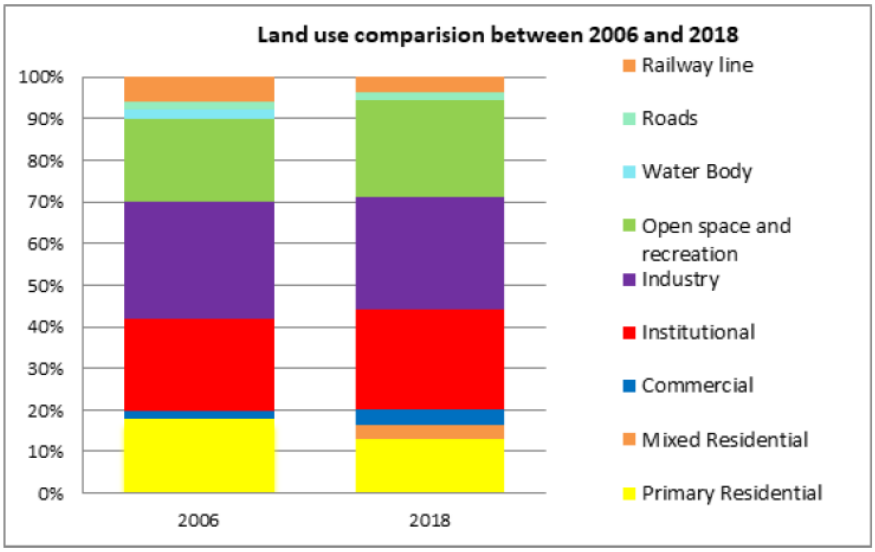
MG Road Metro Station of Bengaluru CBD was studied. Dominant Land use within 500m of the station was retail commercial area, shopping complex, military parade ground, hotels, offices, residential. Dominant land use in 1998 was commercial and defense. After establishment of MRT station, retail and office spaces demand have been increased and in 2014, overall land use within 1km buffer area is for commercial purposes.

3.3.4 Shanghai Mass Rapid Transit Station

Shanghai and Dhaka are similar in the context that both the city are commercial and financial center of their countries (Candido ,2020). Rural migration and social inequity of Shanghai can also be related to Dhaka (Li et al;2019). To integrate the transportation system with the land-use, the concept of Transit Oriented Development was introduced and adopted. There are four categories of TOD metro stations in Shanghai namely integrated TOD station, functionally place-developed TOD stations, morphologically node-developed TOD stations, dispersed TOD stations **(**Li et al;2019). In all types of stations, land use percentage of residential and transportation land use is high. Dominant Land use in 1 kilometer buffer was commercial. Some residential and administrative buildings are found in the outer portion of the TOD **(**Li et al;2019). Most of the land was privately owned and high FAR was implemented within 500 meters buffer (Li et al; 2022).

3.3.5 Chennai Mass Rapid Transit Station

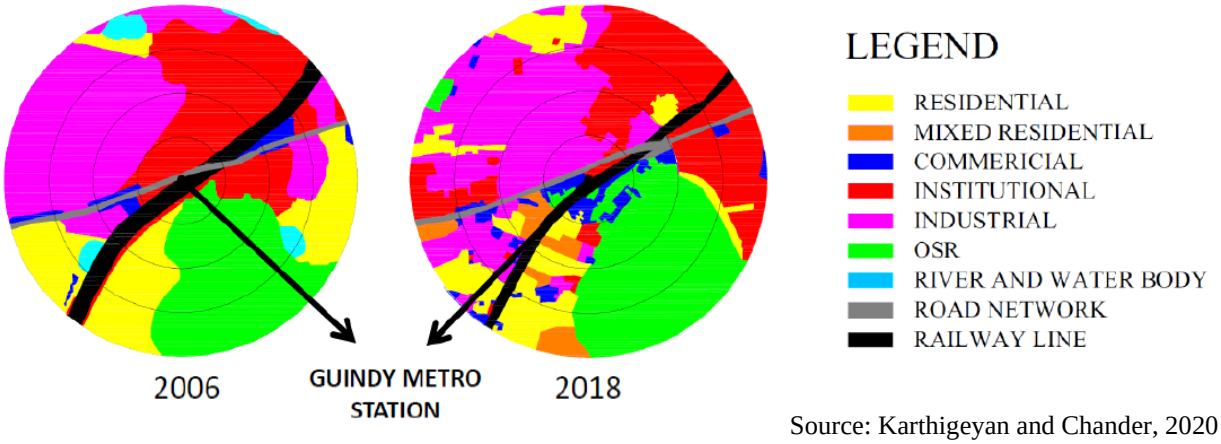
Guindy Metro station is situated in Anna Salai which connect the GST Road. The station connects Central Business District (CBD) and Airport outside the city limits (Karthigeyan and Chander, 2020). After the implementation of the MRT station, Residential land use reduced from 18 % to 13% and commercial land use have to 4 % from 2% (Karthigeyan and Chander, 2020).



Source: Karthigeyan and Chander, 2020

Figure 3.3: Guindy Metro station - Land use comparison before and after Guindy Nagar MRT station

Commercial land use decreases and residential land use increases as the distance from transit station increases. Due to the presence of the station commercial activity flourishes (Karthigeyan and Chander, 2020).



Source: Karthigeyan and Chander, 2020

Figure 3.4: Guindy Metro Station – TOD land use map before and after MRT station *Nagar MRT*

3.3.6 Singapore Mass Rapid Transit station

Tampines MRT station of Singapore was studied. It became operational on 16 December 1989 (Niu, et al; 2021). Dominant Land use within 500 meters buffer is commercial and trade and commerce expanded significantly after establishing of MRT station. Provision of public housing within 10 min walking distance was available (Niu, et al; 2021). Problems of multifunctionality, pedestrian accessibility were solved to some extent after operation of MRT station (Niu, et al; 2019).

3.4 Summary of the case studies and comparison with Agargaon MRT

Six individual case studies were done to find out the impact of MRT on the on the surrounding land use. Commercial land use was dominant for most of the case studies within 500 meters and 1 kilometer of the transit stations. At present, the land use around Agargaon MRT station is not dominantly commercial but it can be applicable after the metro rail operation starts. Land value also increased in case of Delhi MRT which can be also considered while proposing land use in Agargaon MRT station TOD. In Guindy Nagar and Delhi MRT station areas, residential land use decreased suggesting more business activities in the influence zone. Residential land use around Agargaon TOD is less than 50% at present. In most of the case studies percentage of open space was very low while in case of Agargaon, due to military parade ground, more than 40% land was vacant and restricted. It has good potential for development. For Bengaluru TOD there was also military land use around the station but not as prominent. CBD was present in Bengaluru MG Road metro station TOD unlike in Agargaon MRT station area. In case of Agargaon a majority of land use around 1 kilometer radius of the transit station was institutional and official such as passport office and other several government offices. Changes in land use, para transit and feeder service, area of impact and influence zones etc. could be inferred from the case studies and consider in proposing design of Agargaon Transit Oriented Development.

3.5 Implication of TOD in draft Detailed Area Plan (2016-35)

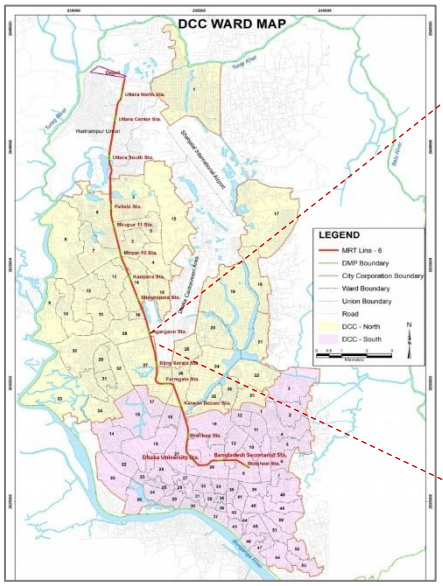
Transit Oriented Development zones were shown in draft Detailed Area Plan (2016-35). According to the plan, stations and terminals attract large number of people and activities surrounding the station increases. TOD zones were proposed in draft DAP (2016-35) keeping the station at central point. It was also proposed that TOD zone should be planned in a way to

encourage people to live there and use the service facilities. TOD should have High density land use and increase the use of public transport, decrease the use of private cars making the area pedestrian friendly (draft Detail Area Plan, 2016-35). It was proposed in draft DAP (2016-35) that TOD may have employment opportunity (commercial facilities, green, orange-a industries), high density residential buildings (apartment, bachelor quarters etc.), cultural facilities (open space, park, lake, playground). It also discourages parking and motorized transportation system. Following LEED building design, it was also implied.

CHAPTER 04: STUDY AREA PROFILE

4.1 Location of the Study Area

Agargaon MRT station is one of the 16th elevated stations of MRT Line-6 and the study has been conducted on the surrounding areas of this station. The station is located at 23°46’42” N and 90°22’48” E. The area is governed by Ward-28 of Dhaka North City Corporation. This neighborhood is home to several government and non-governmental institutions and some governmental, semi-governmental office and stuff quarters.



Source: DHAKA MASS TRANSIT COMPANY LIMITED (DMTCL), 2018

Figure 4.1 (a): MRT Line 6 Route Map

Source: Google Earth

Figure 4.1(b): Study Area (Agargaon MRT Station Map

To investigate the land use pattern and socioeconomic background, a buffer region of around 1 km from the station has been taken into consideration. About 66,000 people are currently living on and area of 3.1416km^2.

4.2 Existing Scenario

It was essential to look at the physical profile of the study area to comprehend the land use pattern and socioeconomic context. To develop this knowledge, existing land use, transportation, open space, community, and recreational amenities, as well as built up structures, have been characterized.

4.2.1 Land-Use

Table 4.1 Existing Land Use of the Study Area around Agargaon MRT Station

Land-use	**%**
Residential	16%
Commercial	1.4%
Open Space	46%
Park	0%
Institutional	19%
Education and Research	9%
Mixed use	2%
Water Body	6.6%

There are residential, commercial, institutional, educational, and research buildings in the area, as well as open space, water bodies, and mixed land uses. According to Table 4.1, open space is the predominant land use in this area. Even though almost half of the land is designated as open space, hardly any of it is used as a park. The location of the Old Airport is the explanation of the significant quantity of open space present in this area. Due to governmental and non-governmental organizations, institutional land use makes up 19% of this area's second maximum use.16% of the land is used for residential purposes in addition to open space and institutional uses. However, there is only a minimal provision for commercial property (1.4%) and mixed land use (2%).

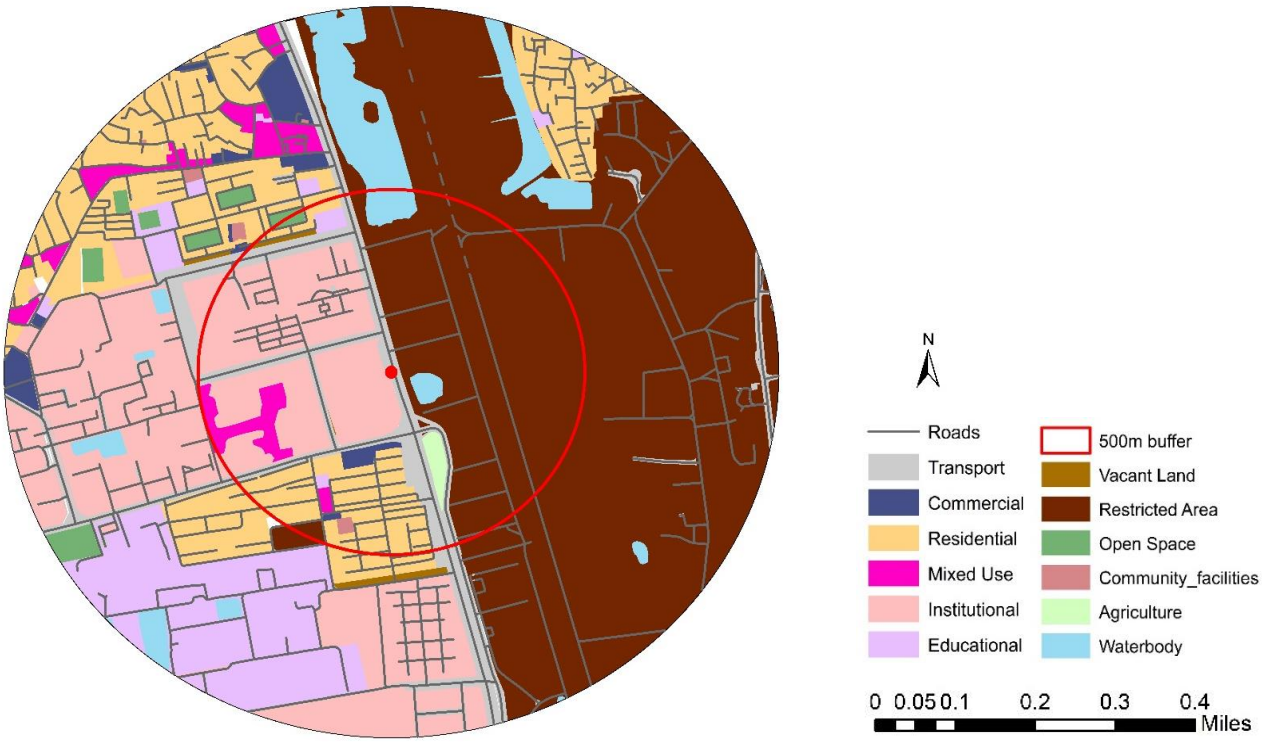


Figure 4.2: Existing Land Use Map of Agargaon TOD Area

4.2.2 Transportation

The transportation network of the study area is distinguished by three road typologies and multiple intersections. The prevailing road typologies are: Arterial Road, collector road and access road.

Station

Arterial Road

The arterial road carrying the most traffic within the study area is Begum Rokeya Sharani. This 100ft wide, with four lanes for both motorized and non-motorized traffic. One of the functions of this arterial road is to establish connection with the collector roads. Several intersections have been built at the convergence of this arterial and collector roads. There are sidewalks on both sides of the road and two on-site parking spaces in front of the IDB building. Because the road allows for high-volume traffic, there are multiple bus stops and a bus terminal near the transit station.

Collector Road

The three collector roads in the study area are Sayed Mahbub Morshed Road, Sthapatyacharjo Muzharul Islam Sarani, and Statistics Road. Both motorized and non-motorized vehicles can travel

on these collector routes, however there is less traffic on them than on the arterial road. Private cars and Rickshaws are found on these collector roads as a form of motorized and non-motorized transportation. Residential houses are not accessible via these collector roads, and the moving traffic on them moves more slowly than on the arterial route. Provision of sidewalks can be seen on this road. Only Sayed Mahbub Morshed Road has several bus stop accommodations among the collector roads.

Access Road

The access roads of the study area have created an interconnected network, providing access to residential houses and government quarters. These roads do not allow large automobile traffic and have a modest speed limit. Non-motorized vehicles (Rickshaw) are prevalent because residential users typically utilize them for commuting. Private automobiles predominate among motorized vehicles. These access roads are notably narrower than collector and arterial roads.

Table 4.2 Road Characteristics of the Study Area

Road Hierarchy	**Road Name**	**Onsite Parking**	**Traffic Mode**	
			Motorized	Non-motorized
Arterial	Begum Rokeya Sharani	Two parking spaces in front Of IDB Building	Private Car, CNG, Bus	Rickshaw
Collector	Sayed Mahbub Morshed Road	No provision of onsite parking	Private Car, CNG, Bus	Rickshaw
Collector	Sthapatyacharjo Muzharul Islam Sarani	No provision of onsite parking	Private Car CNG	Rickshaw
Collector	Statistics Road	No provision of onsite parking	Private Car CNG	Rickshaw

Collector	Sher-E-Bangle-Agricultural-University Road	No provision of onsite parking	Private Car CNG	Rickshaw

4.2.3 Open Space

When it comes to urban areas, the significance of open space is unbounded. Open space is necessary in urban settings for health, leisure, and ventilation concerns. It is clear from the station area's pattern of land uses that open space is the predominant land use there. Here, around half of the area has been retained as open space. Despite the availability of open space, a substantial percentage of it is restricted and off-limits to the public.

Additionally, the study area regrettably lacks provision of parks. There are no parks or playgrounds in Zone A or Zone B. Three playgrounds are in Zone C, and two more are in the staff quarters located at 500m from the transit station.

4.2.4 Community Facilities

People need a variety of openly accessible community facilities to maintain a neighbourhood. Libraries, hospitals, health facilities, community centres, schools, and places of worship are examples of communal amenities. There aren't many community facilities in the study area.

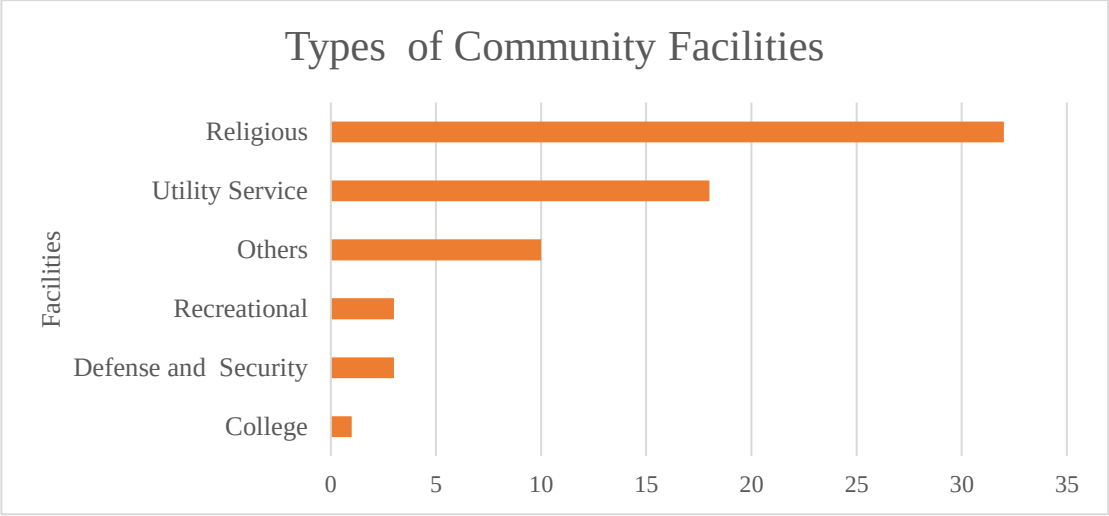


Figure 4.3: Types of Community Facilities

Community facilities are only present in about 2% of the structures. Schools, colleges, defence and security, places of worship, utility services, libraries, and political offices are common communal facilities. Figure 4.3 shows that the most prevalent types of community services in the area are religious and utility services.

4.2.5 Built-up Structures

The built environment has been created by integrating different types of structures to offer a setting for human activities. There are 3786 structures in the area, and they have been used for a variety of purposes. The use of structures, their types, heights, and other characteristics are discussed below.

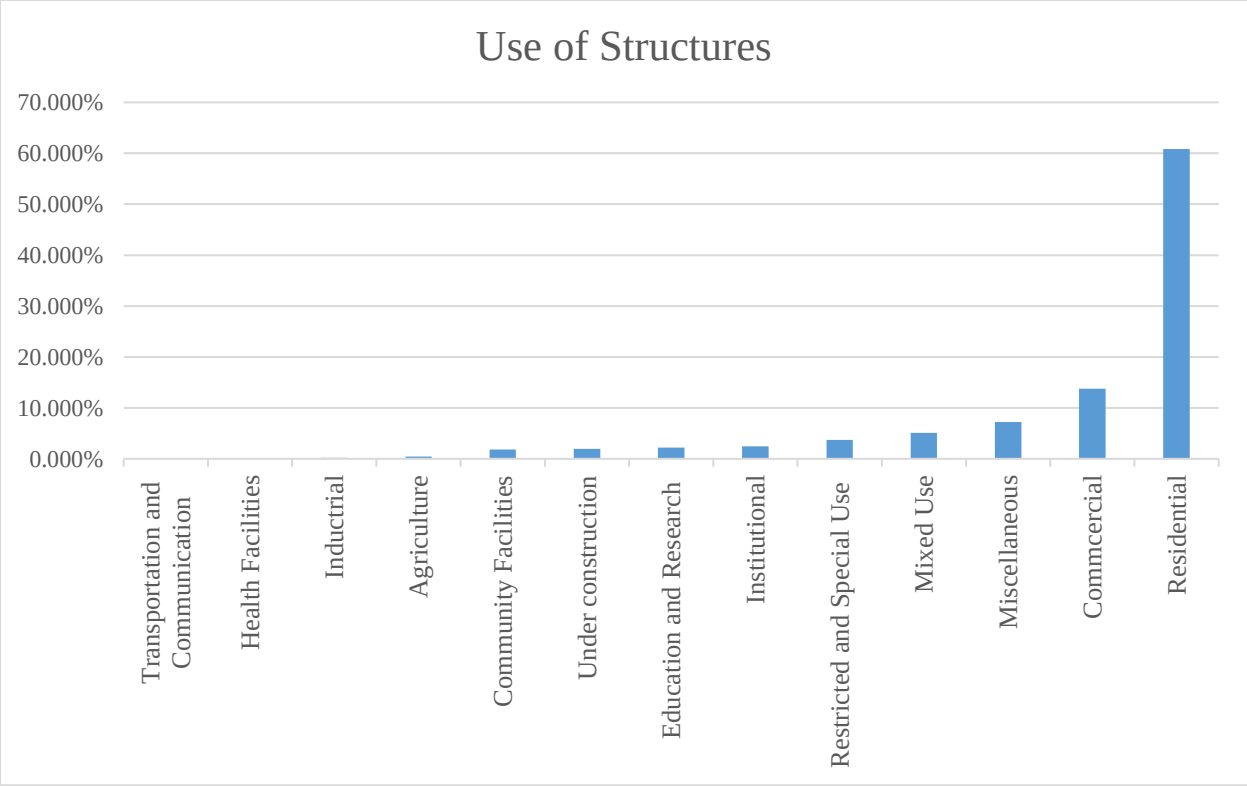


Figure 4.4: Use of Structures

The primary land uses of the area are open space and institutional. Although just 16% of the land is used for residential purposes, more than 60% of the structures are used for this purpose only. Commercial buildings are the second most common use of structures; however, their percentage is substantially smaller than that of residential structures. Less than 20% of structures are utilized

for commercial reasons, while 5% are mixed-use structures. The graph shows that the least common uses of buildings are for industrial and agricultural purposes.

Type of Structure

Prevalent structures are classified into four types: Katcha, Pacca, Semi-pacca, and under construction. Semi-pacca structures account for 36.5% of the structures, while pacca and

katcha structures account for 32.09% and 31.27%, respectively. However, only.13% of the structures are under construction.

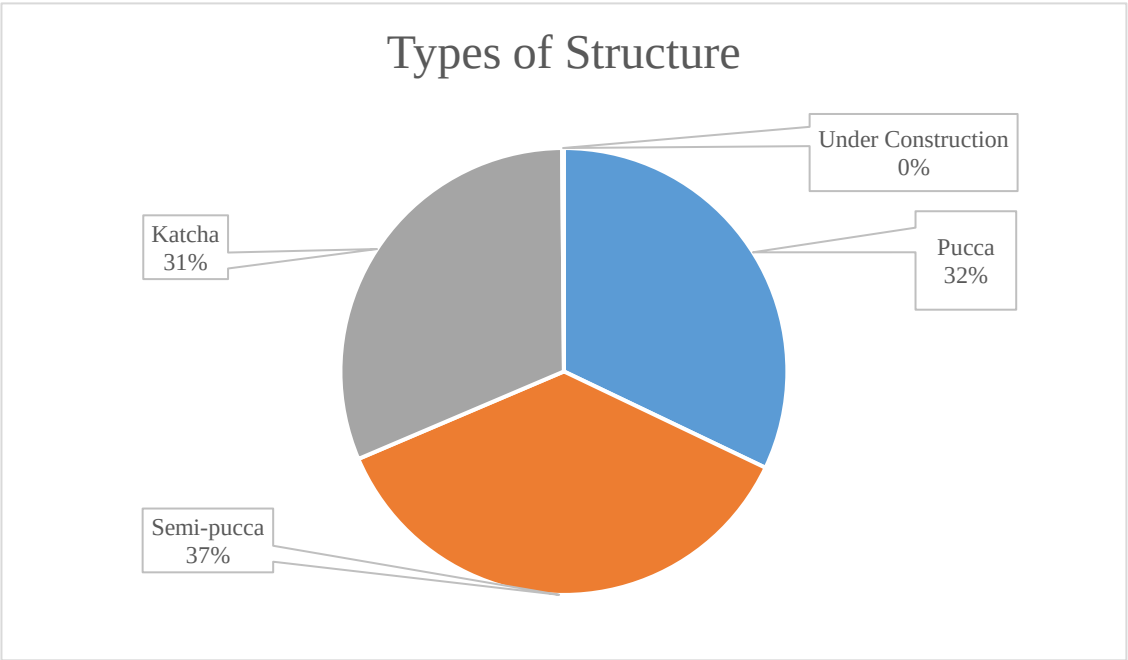


Figure 4.5: Types of Structures

Area of the structures

The existing structures have taken up spaces between 2 m^2 to 16633 m^2. The buildings have occupied 142.27 m^2 on average. The graph clearly shows that 90% of the structures are under 300 m^2, which explains why the average area of structures is so small.

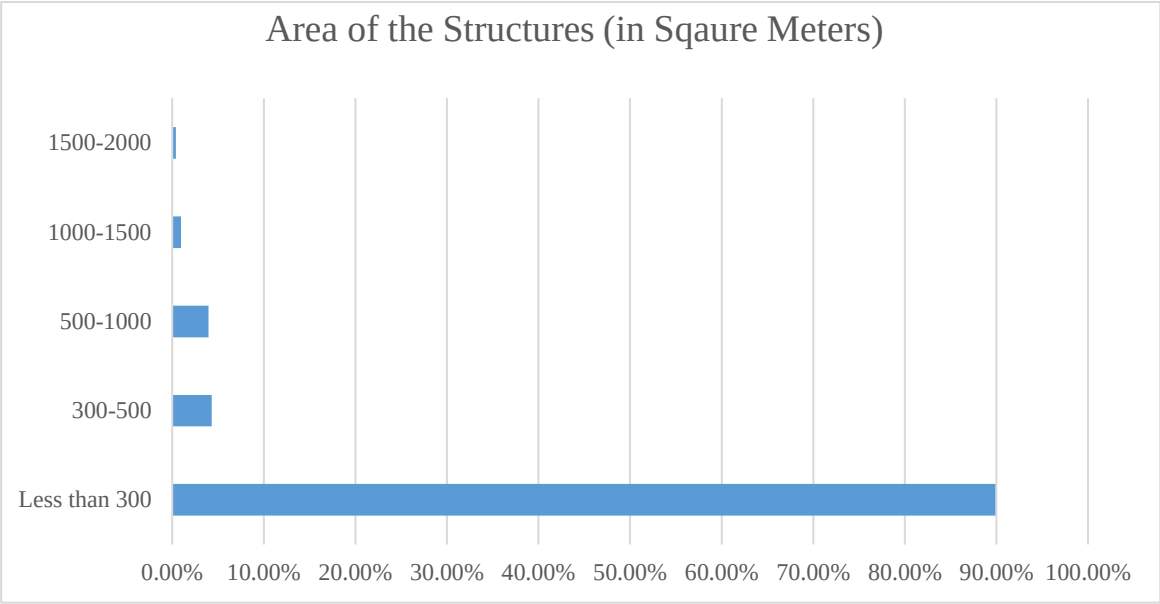


Figure 4.6: Area of Structures

Years of Construction of Structures

Most of the structures in this region (about 80%) were built between 21 and 30 years ago, with only 10% built between 11 and 20 years ago.

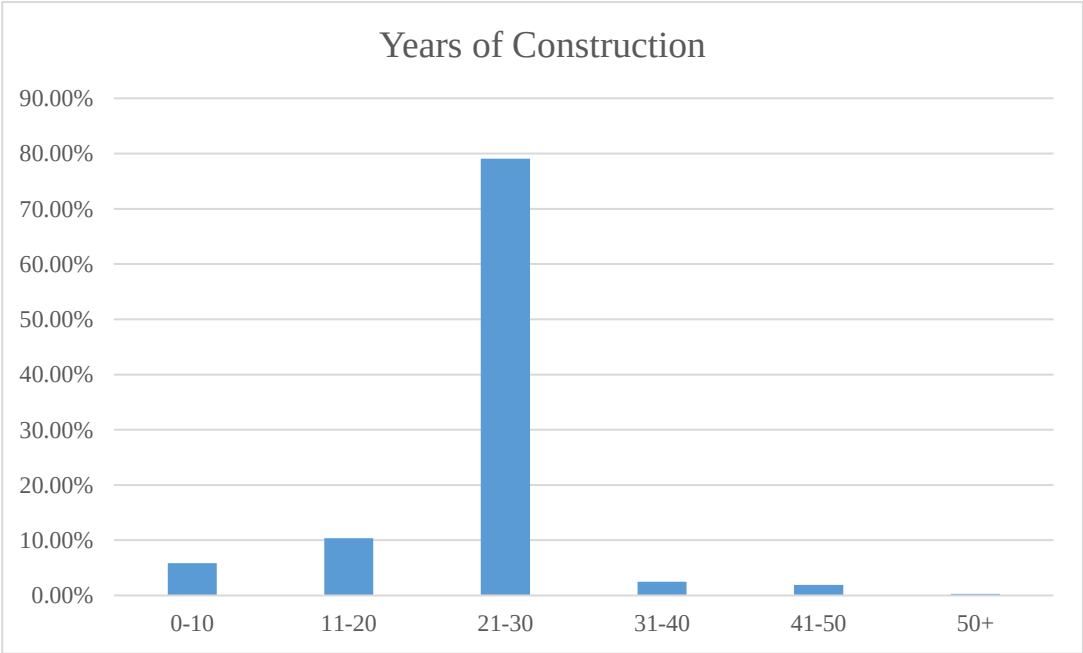


Figure 4.7: Years of Construction

Number of Floors of the Structures

The existing structures are two storeyed (1.78) on an average and around 80% of the structures are one storeyed building. Among this one storied building, around 60% are used for residentials and only 16% for commercial. Buildings which are more than 9 storeyed are mostly used for commercial and institutional purposes.

To conclude, open space and institutional usage prevail in the study area. Although it appears beneficial that the area contains open areas, it is not accessible to everyone. Furthermore, there are few parks and playgrounds in the residential neighbourhood.

The transportation system has a wide network and carries low to medium volume traffic. Although arterial and collector roads are broad, access roads are narrow in some locations, and sidewalks are in poor shape.

The study area profile also shows that existing structures that have been constructed over 21 to 30 years and are generally one-story with floor areas of less than 150 square meters. These constructions are largely semi-pacca and pacca, with some still being constructed. It's worth noting that there aren't many high-rise structures in the region. Some high-rise structures have recently been constructed; however, they are largely for institutional purposes.

CHAPTER 05: ANALYSIS AND DISCUSSION

The people that live there make up a society. Every society has an own culture, belief system, tradition, and way of life. Studying the local populace is the greatest approach to learn about a society's lifestyle, demands, issues, and expectations. Every planning choice must start with a thorough study of the society's population. So, 147 residential inhabitants and 94 commercial inhabitants of the Agargaon area were polled to create an interactive land use plan that is consistent with the MRT station. During the survey, socioeconomic information was gathered about the respondents, including their issues, their expectations, their worries about the MRT station, etc. The examination of the data from the survey is the subject of this chapter.

5.1 Socio-economic Profile

5.1.1 Residential Communities

Age and Gender of the Residents

There are 487 residents among our 138 family survey respondents. 3.53 people on average make up each household. Residents are grouped into five age groups based on their chronological age: children (0–14 years), early workers (15–24 years), prime workers (25–54 years), mature workers (55–64 years), and seniors (65+). (elderly). 231 (48.3%) of them are in the prime working age group. The proportion of old individuals is the smallest, with only 6.2%. There are around 54% male residents overall according to our survey.

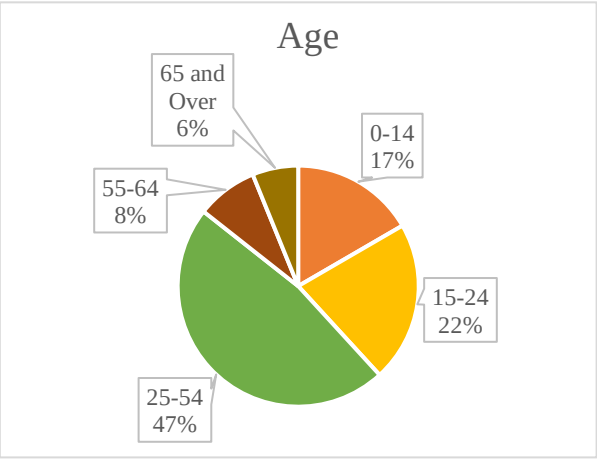


Figure-5.1: Age of the residents

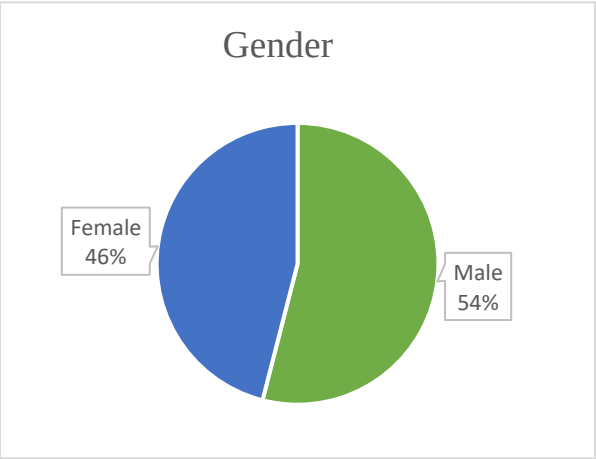


Figure-5.2: Gender of the residents

Duration of Living

There are five categories for duration of living: "Less than 10 years," "10-20 years," "20 to 30 years," and "More than 30 years."

Most responders (45, or 32.9%) had been residents for less than 10 years. The fewest respondents (20.43%) are those who have been residents for more than 30 years.

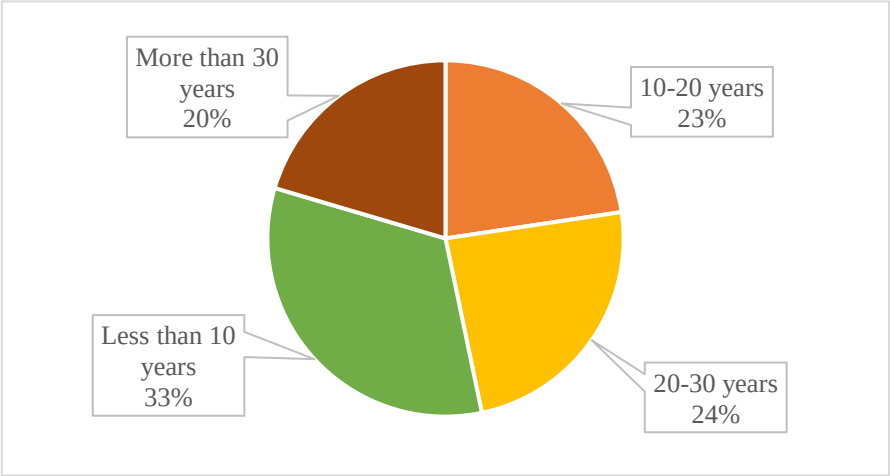


Figure-5.3: Respondent's Duration of living

Educational Background

The neighbourhood has a high level of education. 25% of residents are undergraduates, while 22.42% are graduate students. About 69.84% of the population has a S.S.C. or higher degree.

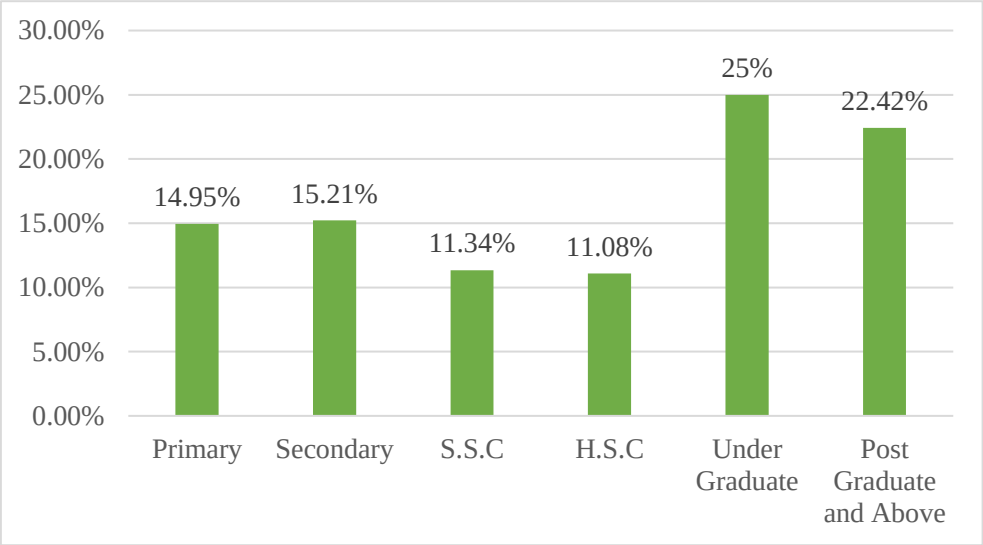


Figure-5.4: Educational Background

Residential Status and Floor area

Approximately 124, or 89.6%, of the 138 respondents live with their family. Just 8.4% of persons are single. Since most respondents live with their families, the floor space of 1000–1500 square feet have the largest percentage (26.72%). 5 respondents' floors total more than 2000 square feet. Most of them are owners. The apartment size should satisfy the requirements of the residence pattern in terms of any land use design.

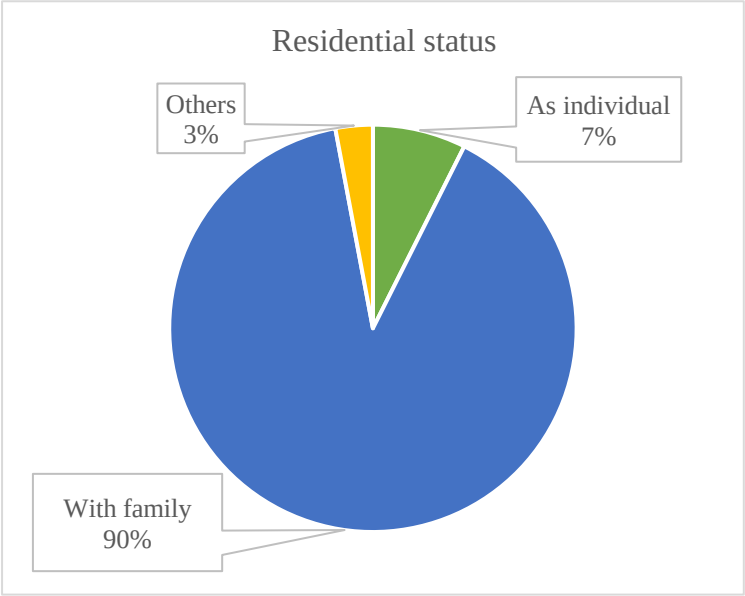


Figure-5.5: Residential status of the respondents

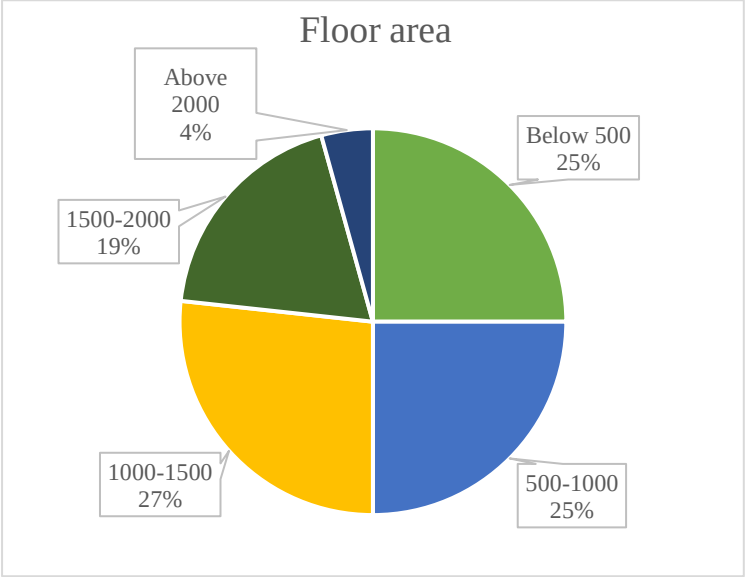


Figure-5.6: Floor area of the house

Monthly Household Income

According to the data, the majority of the population in the study region belongs to the Middle Class. There are 7 categories used to group respondents. The range of 30,000 to 50,000 BDT represents the majority of the respondent's (30.8%) monthly gross household income. A small percentage of people make less than 10,000 BDT.

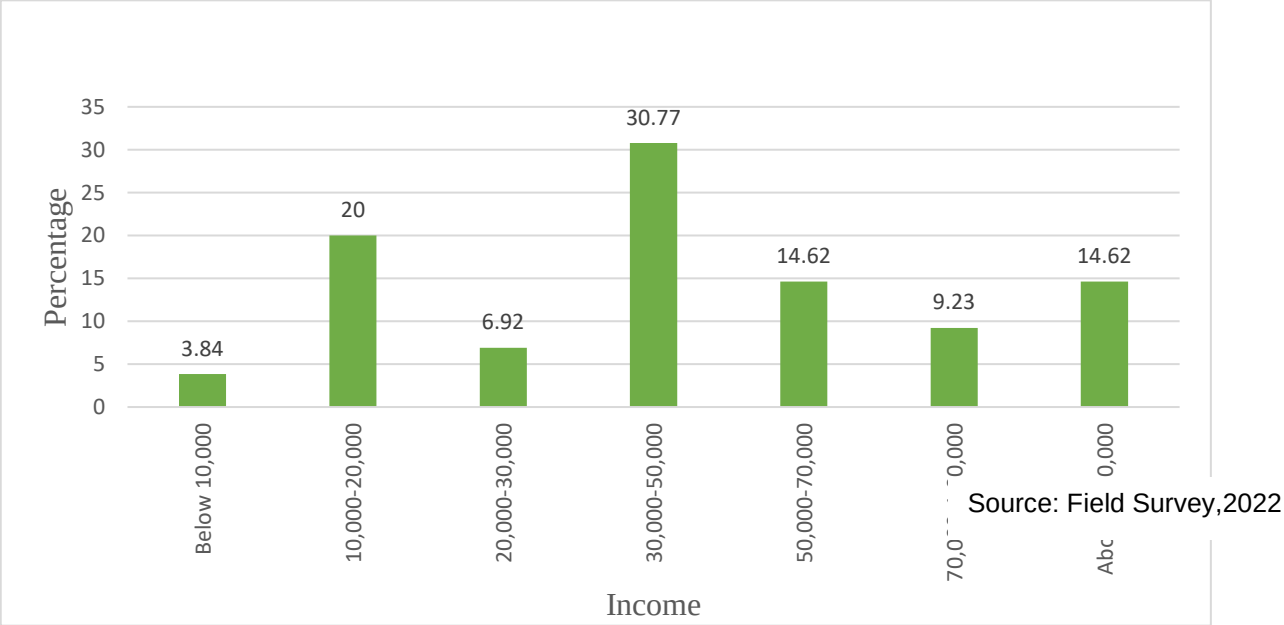


Figure-5.7: Monthly household income of the respondents

Tenancy Type

44 (33.33%) of the 132 respondents were owners, while 87 (66%) were tenants. Additionally, about 78.3% (36) of families had individual ownership in terms of the kind of residence (according to ownership). The remaining 21.7%, however, had several owners.Residence Type

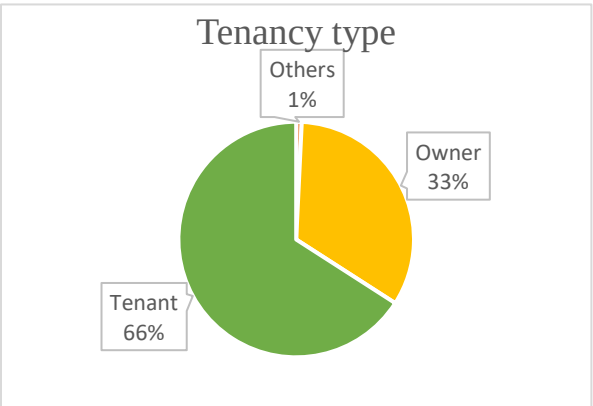


Figure-5.8: Tenancy type of the respondents

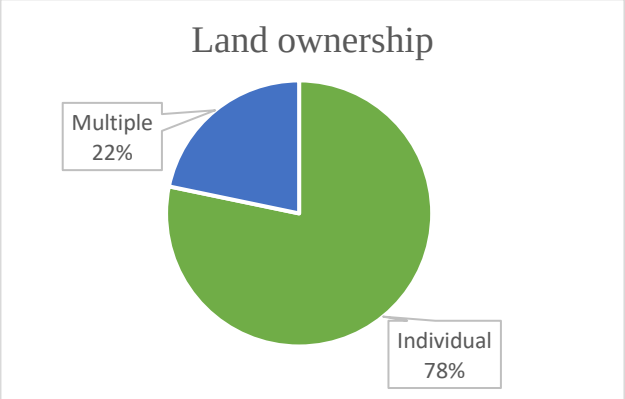


Figure-5.9: Ownership of land

Most respondents (39.5%) reside in multi-story apartments. In addition, a significant share (31%) resides in apartment complexes. Additionally, around 26% of residents live in single-family homes.

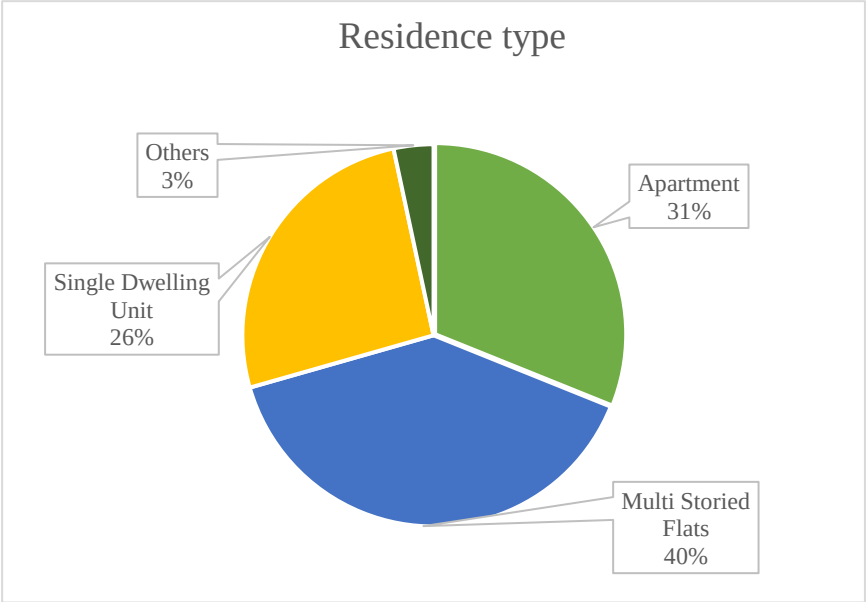


Figure-5.10: Types of residence

Vehicle Ownership and Major Mode of Transportation

A little over 120 respondents (87%) reported having no vehicle. And 23 (16.67%) of the respondents have their own car.

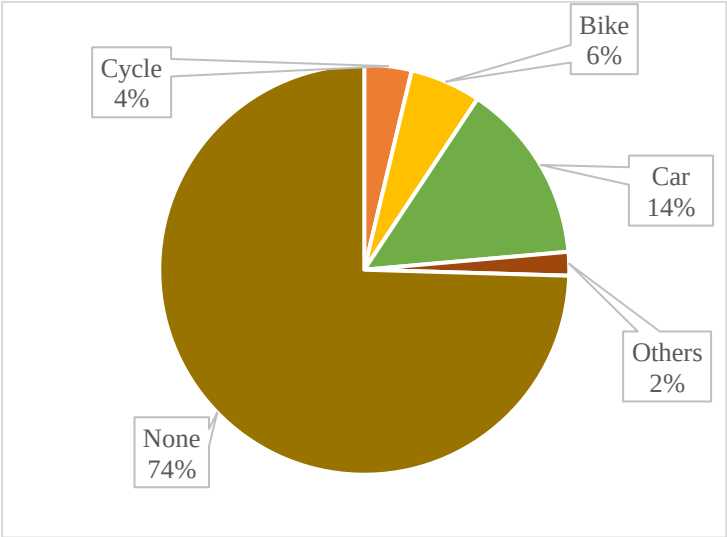


Figure-5.11: Ownership of vehicles

Based on replies in six categories, the most popular modes of transportation are the bus (29.4%) and the rickshaw (26.9%). Additionally, a sizable percentage (26%) of people just walk to meet their daily needs.

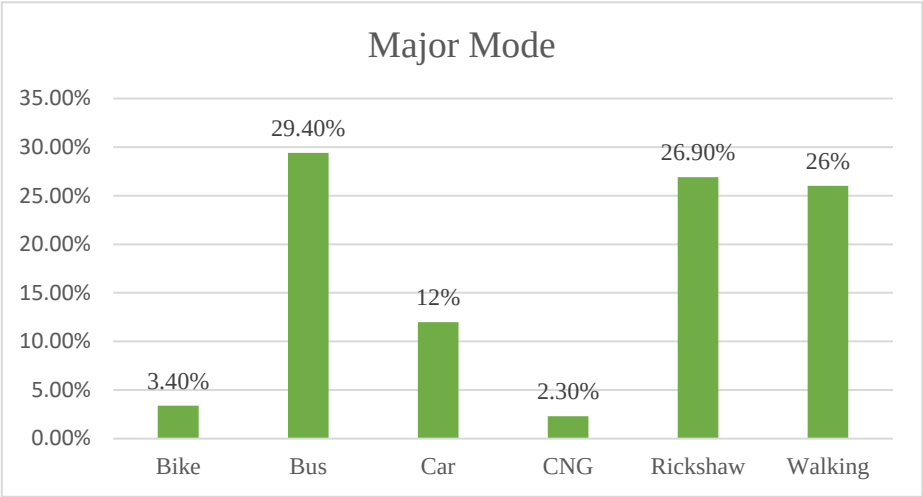


Figure-5.12: Major travel mode

Using MRT as an Alternative Mode:

When asked if they preferred using MRT over other options, 86% of the respondents that provided an answer were highly optimistic about the project, while the remaining respondents (14%) did not favour MRT as a substitute means of transportation.

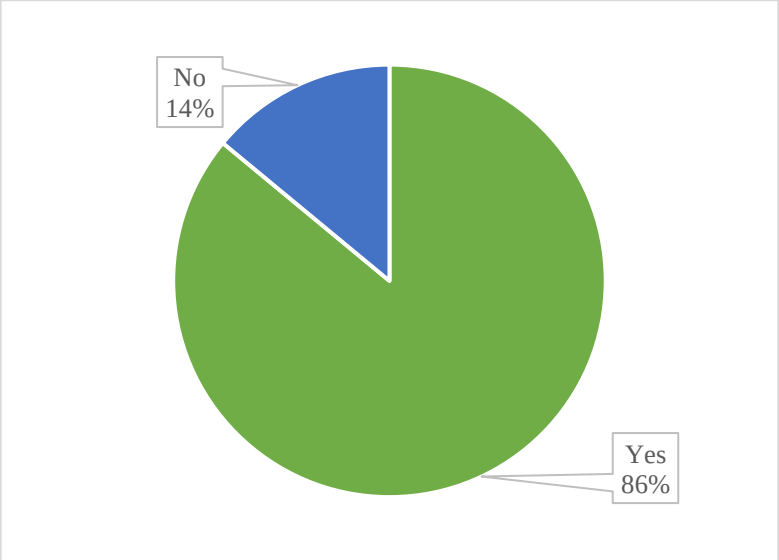


Figure-5.13: Preference of MRT as alternative mode

Reasons for Living in Agargaon

The advantages of residing in our study region are displayed in the graph below. The area's strong connectivity is the major factor (71 responses). Second greatest importance has been given to the utility's satisfactory level (water, gas, and electricity) (60 responses). Along with the other factors listed below, people choose to reside in this area for the following reasons: Good Security, Excellent Community Amenities, Landowner and Birthplace, Low Pollution, Affordable House Rent, etc.

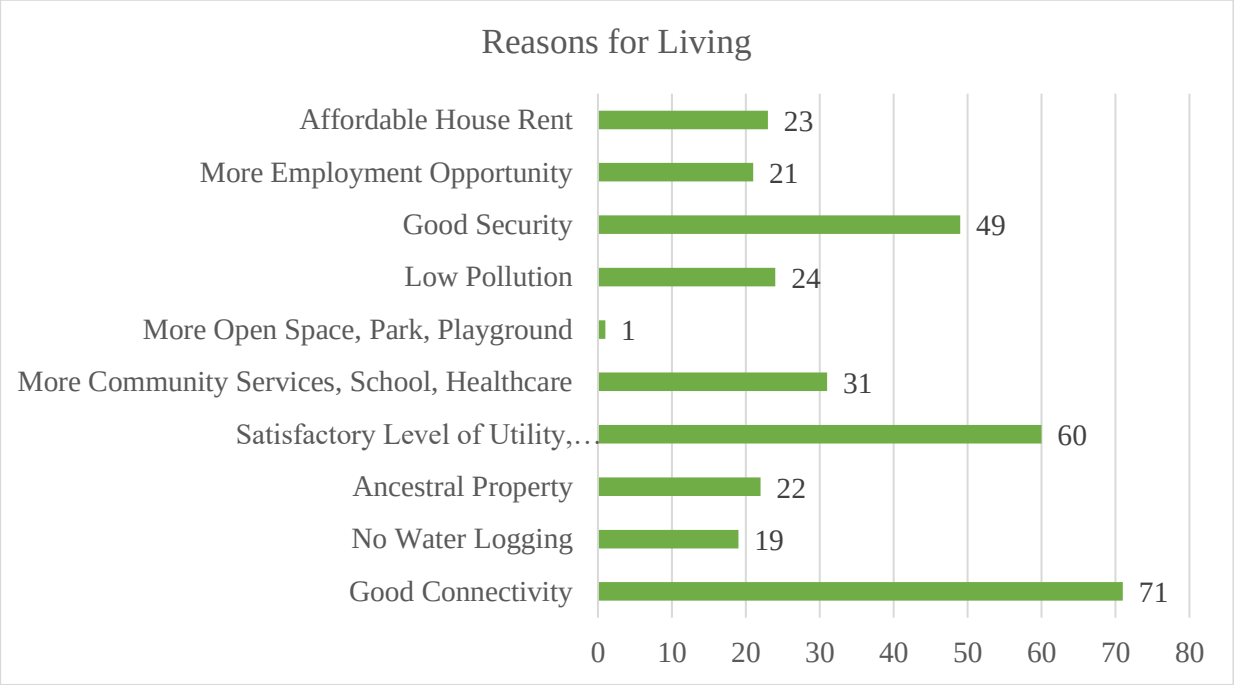


Figure-5.14: Reasons for which residents want to live

Problems of the Study Area

The issues locals encounter is depicted in this graph. Lack of appropriate open space, parks, and playgrounds is the main issue. This issue is faced by 68 responders. A significant number of respondents claimed that the research region lacked utility services (45 responses). Within the research region, water logging is a significant problem (22 responses). Only a small fraction is plagued by issues like inadequate security and expensive housing costs.

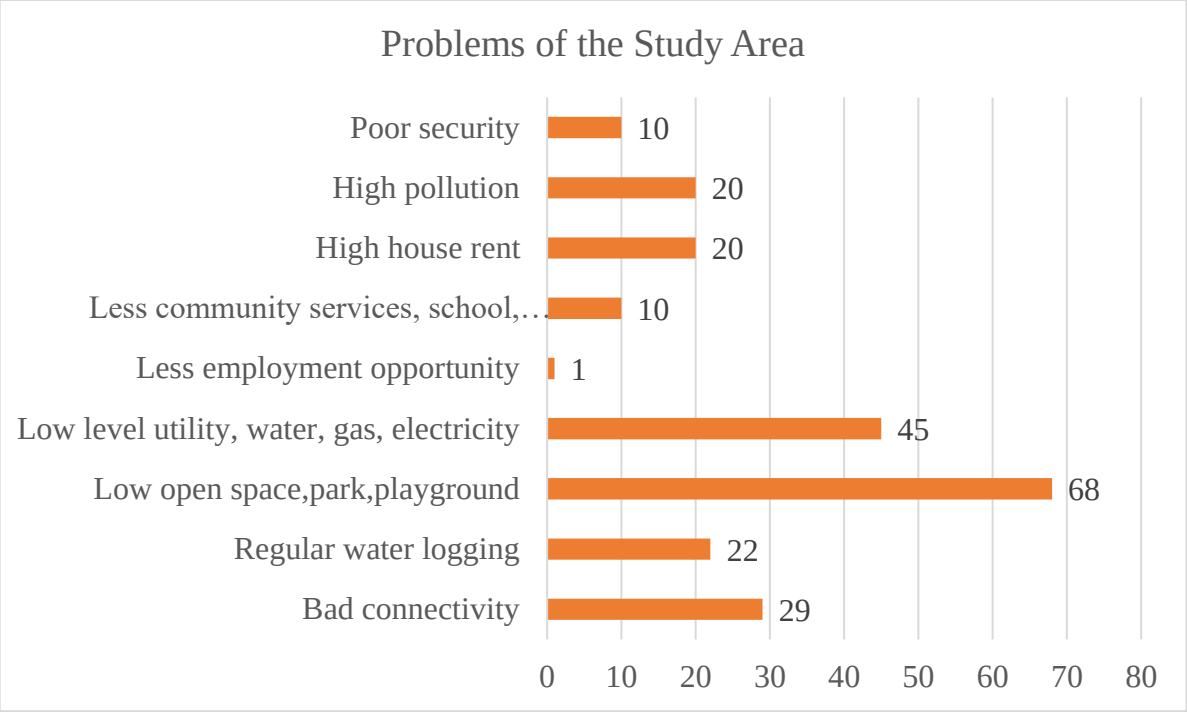


Figure-5.15: Problems of living in Agargaon

Expected Benefits after Opening MRT Station

48 of the respondents expressed expectations for a stronger pedestrian network and 47 for more developed infrastructural facilities. In addition, they anticipate that following the MRT station

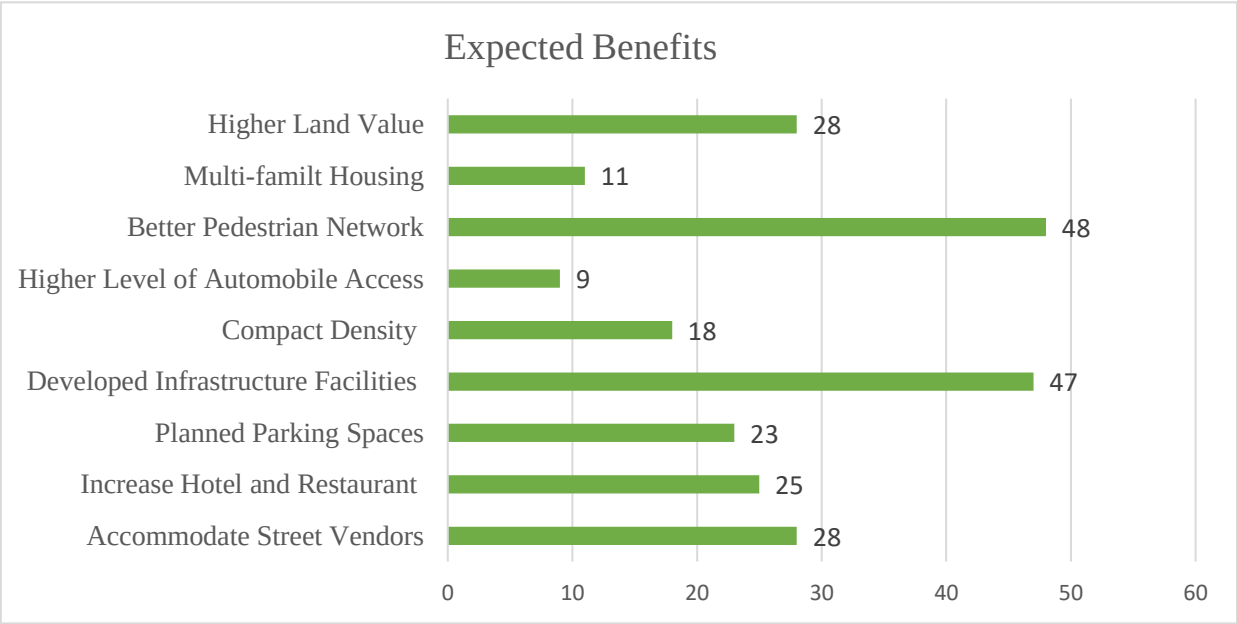


Figure-5.16: Expected Benefits

competition, there will be more hotels and restaurants, and accommodations for street sellers (28 respondents). Additionally, they anticipate that increased land value brought on by compact density.

Expected Problems after Opening MRT Station

MRT has advantages, but it may also have drawbacks. About 50 respondents believe that this will result in higher rent. 30 of the respondents believe that when the region transitions to a TOD area, population density will rise.

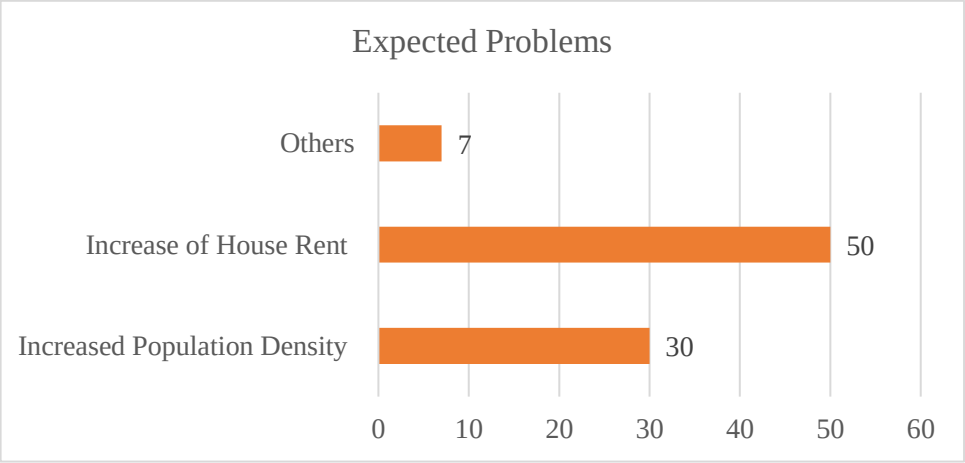


Figure-5.17: Expected problems after opening MRT

Preferable Land Use

"Highly Prefer," "Prefer," "Neutral", "Don't Prefer," and "Must Avoid" are the five land use preference selections. According to the graph, respondents primarily choose open space and

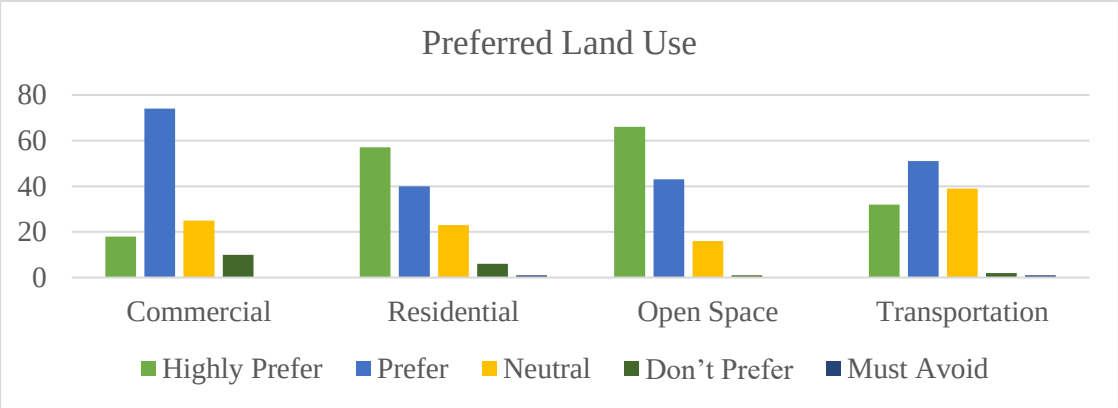


Figure-5.18: Preferred Land Use by Residents

residential land use. Most respondents prefer commercial land use. According to respondents' preferences, transportation is another significant land use.

5.1.2 Commercial Activities

Age of Respondent

Respondents are grouped into five age groups based on their chronological age: children (0–14 years), early workers (15–24 years), prime workers (25–54 years), mature workers (55–64 years), and elderly (65+). Among the 92 respondents, most of them are in the prime working age group 71(78.1%). The proportion of old individuals is the smallest, with only 2.2%.

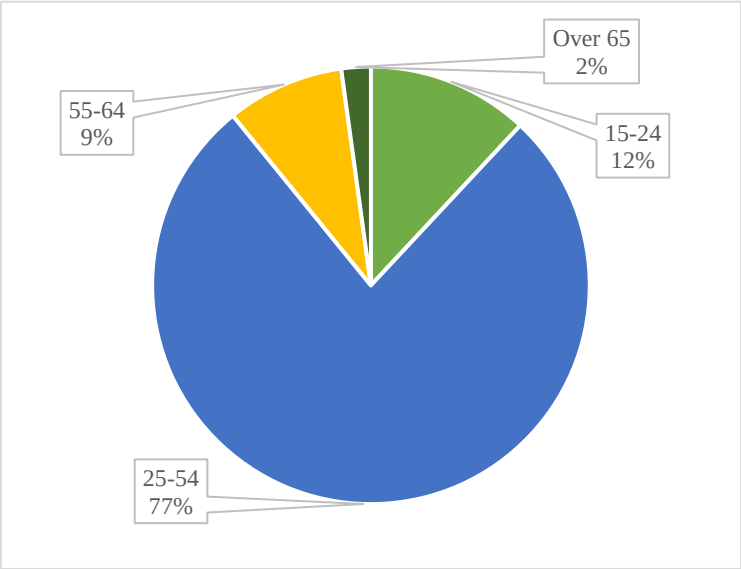


Figure-5.19: Age of the respondents

Duration of Working

From 92 shops, 35 (38%) had respondents who have been there for under five years. About 19% of businesses have been around for five to ten years. Only 8.7% of businessmen have more than 20 years of experience.

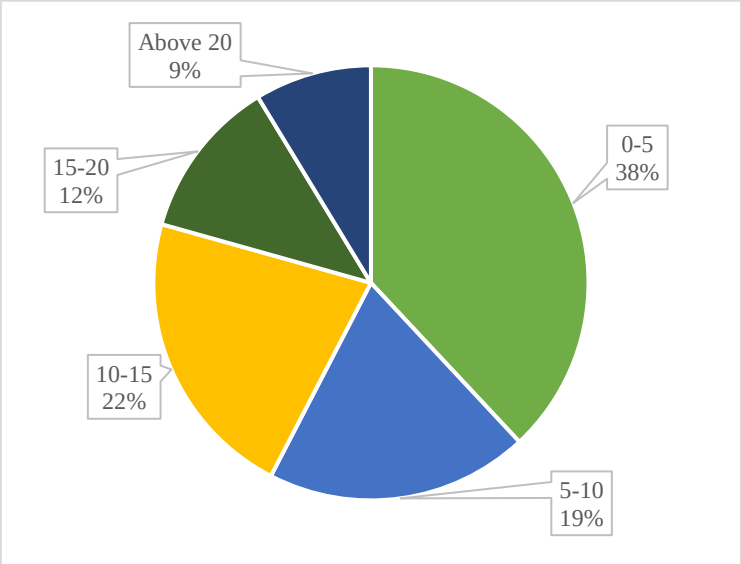


Figure-5.20: Duration of working

Tenancy Type and Floor Area

Out of 92 shops examined, 54 (59%) were tenant shops and the remaining 82 were owned. Because tenants predominate in Agargaon, it is important to keep retail rent as low as possible. The floor space of 46 (53.48%) of the establishments is between 0-100 and Above 500 square feet. However, just 12.8% of retail space is between 300 and 500 square feet. Instead of a department store with a high floor area that would be calculable and effective for the area, a low floor area depicts a tiny business.

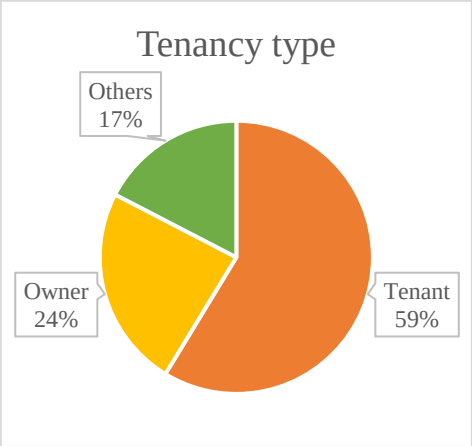


Figure-5.21: Type of tenancy

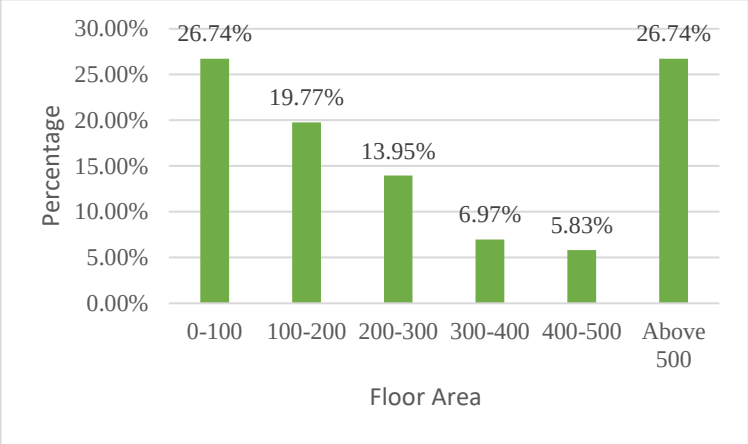


Figure-5.22: Floor area of shop

Ownership Type and Employee Number

A little over 88% (65) of the company's operations are individual entrepreneurs. About (48.83%) of the shop's had employee number between 1 and 2. Six of them (6.52%) have more than 10 employees.

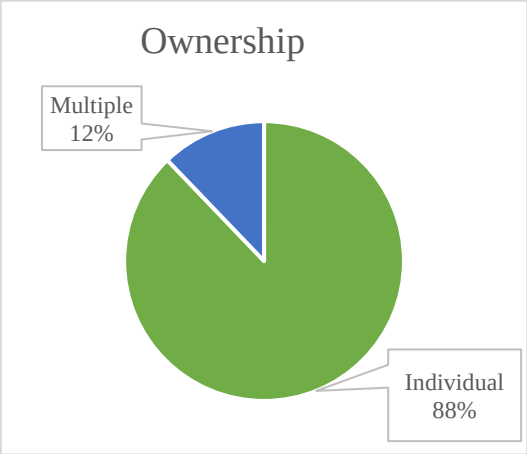


Figure-5.23: Ownership type

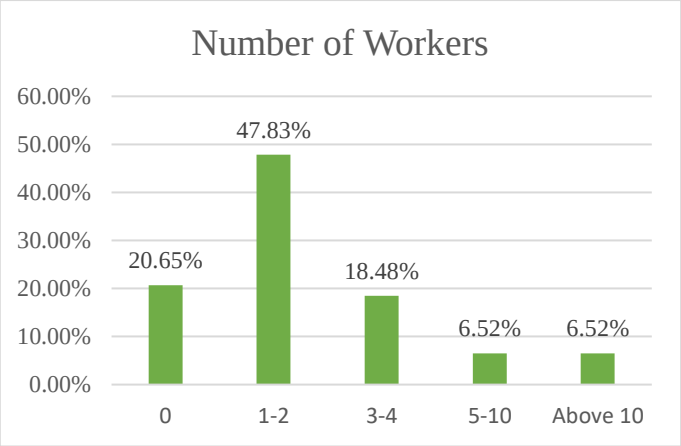


Figure-5.24: Number of workers

Types of Shop

Our study area is home to a variety of stores. We divided them into 8 categories for easier understanding, with the "other" category including the stores with the smallest number. The most significant of these are "Grocery, Stationary, Super Shop," "Restaurant and Food Shop," "Pharmacy," "Clothes," and Leather" since they are essential for our everyday needs. The "Grocery, Stationery, Super Shop" category includes about 25.29% of the stores. Restaurants and other food retailers make up 21.84%.

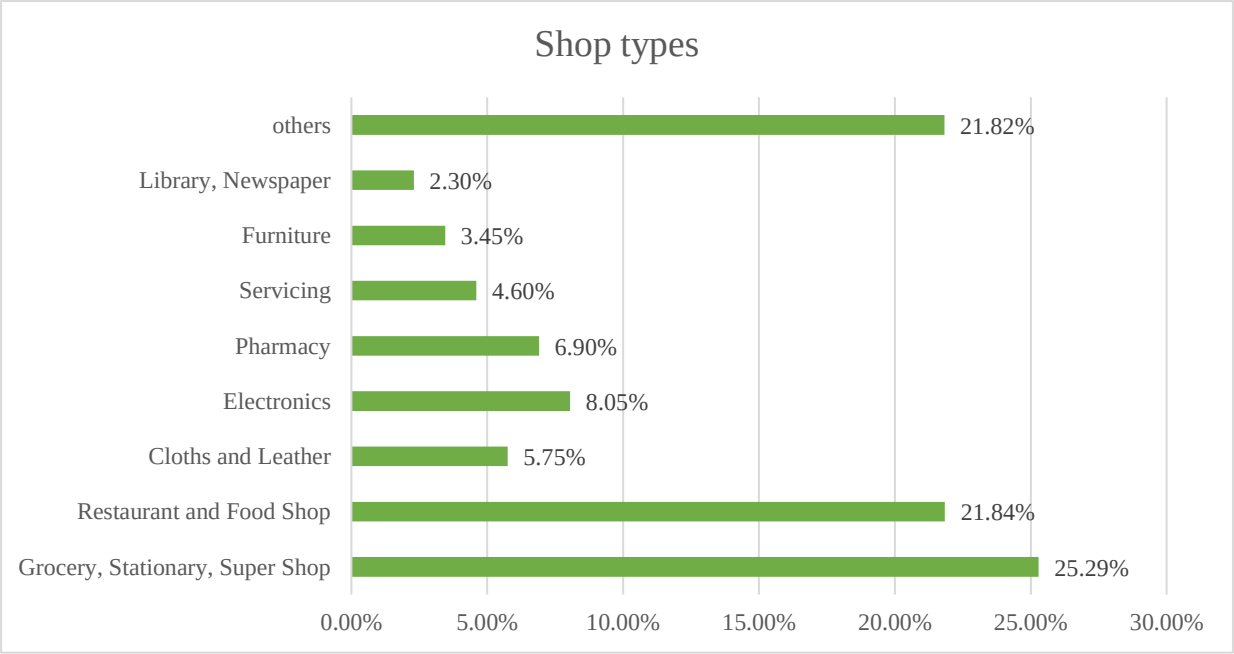


Figure-5.25: Types of different shops

Age of the Structures

The data shows that most of the stores are between 10 and 20 years old (30%) and 0 to 5 years old (29%), respectively. Only 20% of structures are older than 20 years.

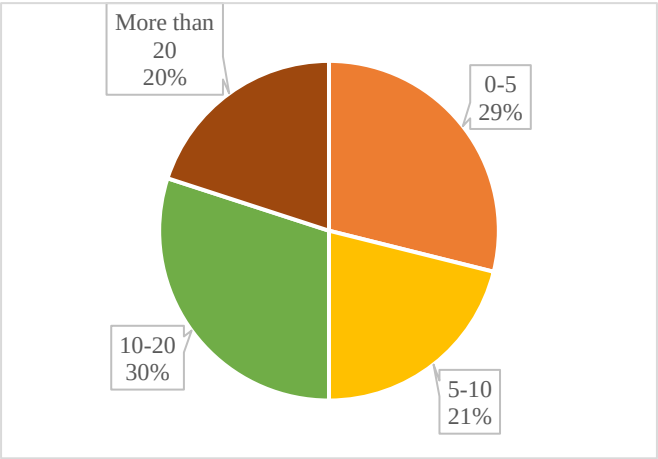


Figure-5.26: Structure's age

Monthly Gross Income and Shop Rent

For monthly gross income, there are 8 categories. The majority of them, or 35.29 percent of all of them, had income levels between 10,000 BDT and 30,000 BDT, according to the statistics. Their revenue is hence not particularly high. A monthly income of 21.18% is found in the next-highest range, which is between 30,000 and 50,000 BDT. A low percentage of people—5.88%—earn less than 10,000BDT. Shop rent isn't all that expensive in comparison. Between 5,000 and 10,000 BDT is the rent for 36% of the shops. In essence, the monthly home rent for 76% of the shop's ranges from 0 to 20,000 BDT. There is a group of people (16.47%) whose monthly income is over 1,50,000 BDT. Additionally, we see that 14.68% of the total must pay more than 60,000 BDT. There are parallels between monthly gross revenue and shop rent.

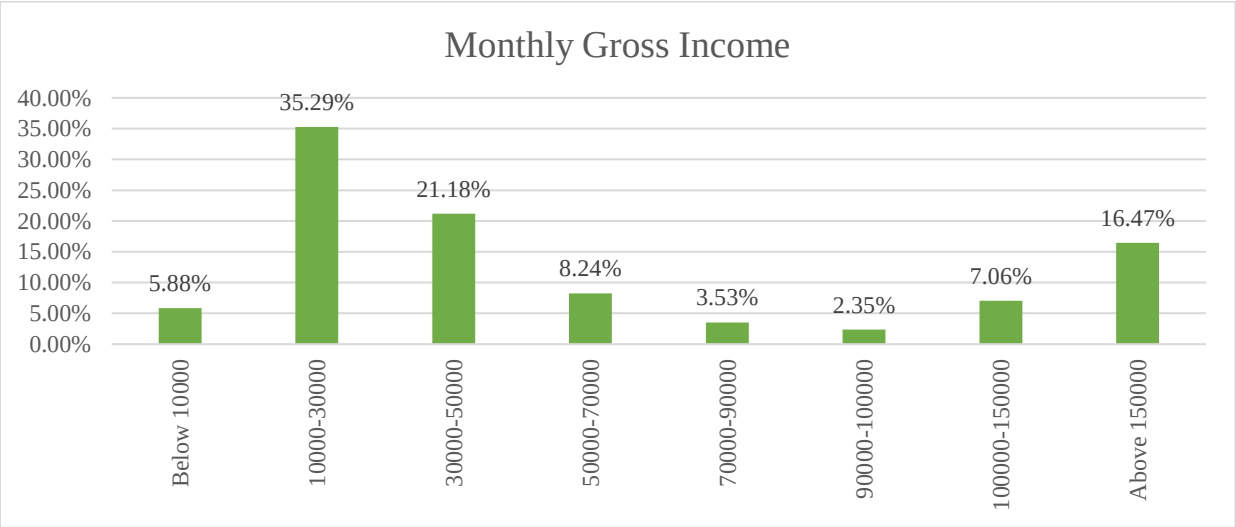


Figure-5.27: Monthly gross income

Figure-5.28: Rent of shop

MRT as an Alternative Mode

When asked if they would prefer using MRT over other choices, 66 respondents who gave an opinion were very positive about the project, while 6 respondents did not think MRT would be a good alternative form of transportation.

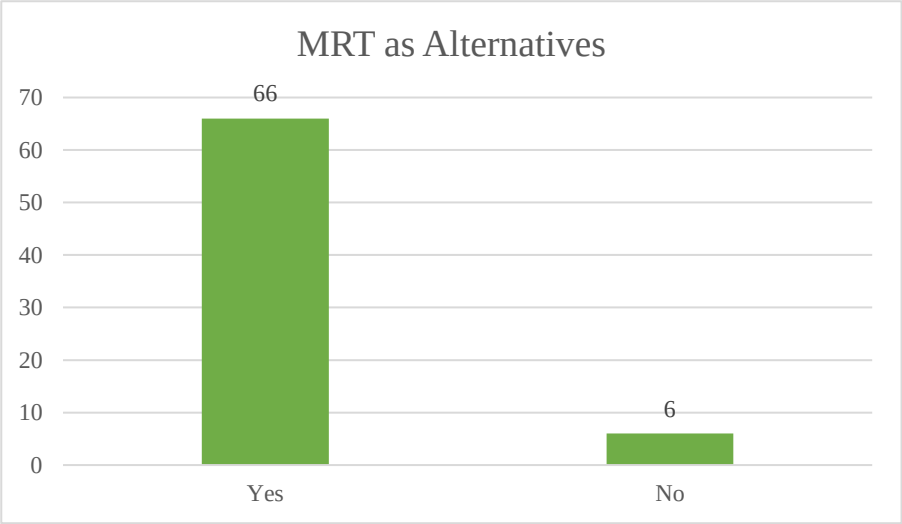


Figure-5.29: Preference of MRT as an alternative mode

Reasons for Choosing to Do Business in Agargaon

The graph below shows the benefits of conducting business in Agargaon. The primary cause is the area's good connectivity (56 responses). The location draws many customers, which is a secondary

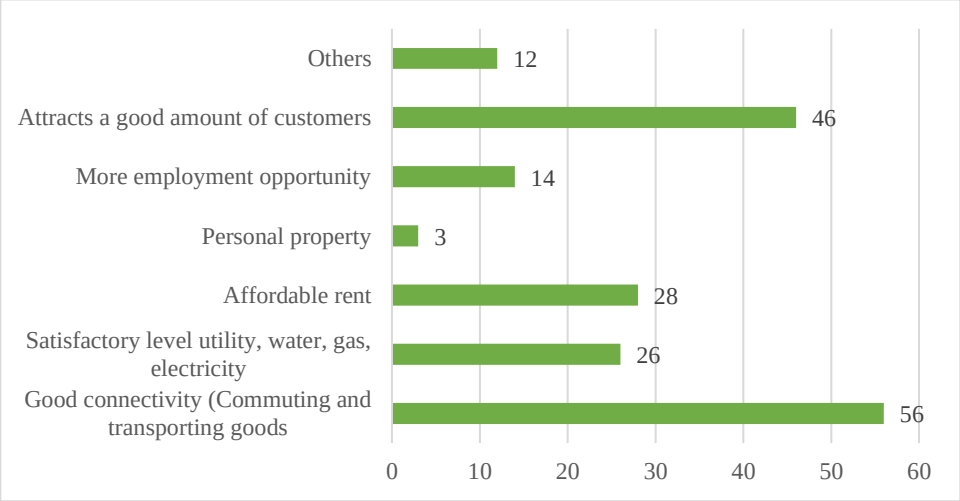


Figure-5.30: Reasons for doing business

factor (46 responses). According to respondents, low rent is the third primary justification. The utilities' good level (water, gas, and electricity) has also been given priority (26 responses). People prefer to live in this location for the following reasons: Personal belongings, employment opportunity etc.

Problems of Doing Business in Agargaon

The issues local's businessman is depicted in this graph. High rent is the is the main issue (32 responses). A significant number of respondents claimed that the research region lacked utility services (20 responses). Also, 13 responders have problem with the bad connectivity. Only a small fraction is plagued by issues like water logging and pollution.

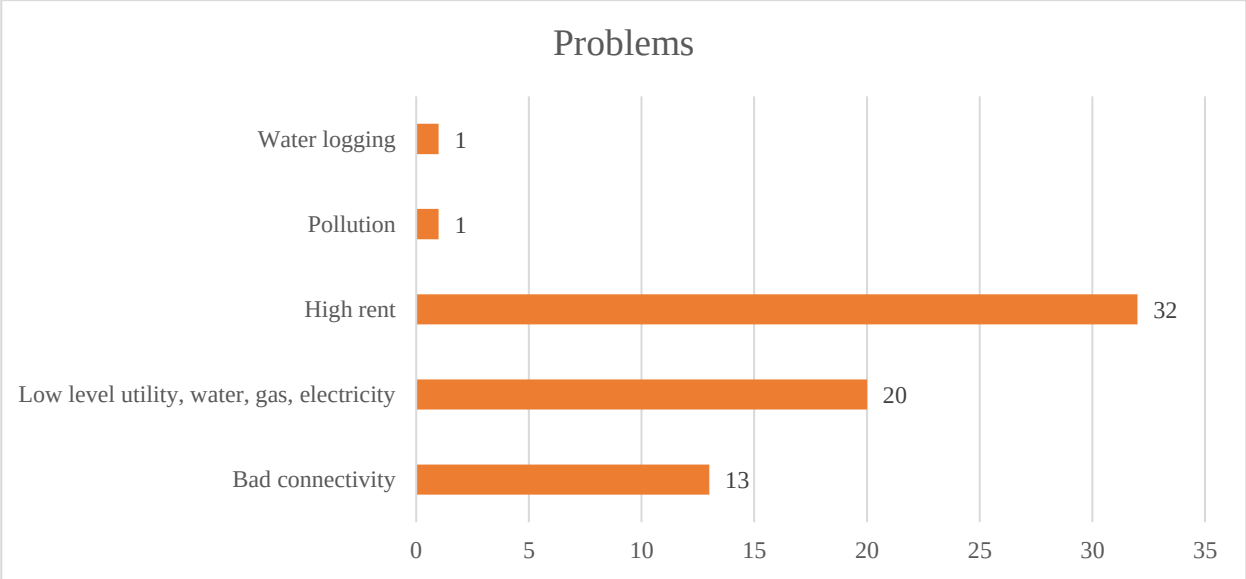


Figure-5.31: problems of doing business

Expected Changes to Happen in Commercial Activities after Opening MRT Station

The graphic shows that the majority of respondents (44) prioritize a better pedestrian network. On their list of expectations are things like planned parking spaces (22), greater property value (22), more hotels and restaurants (22), accommodations for street vendors (19), etc. 18 of them also desire compact density.

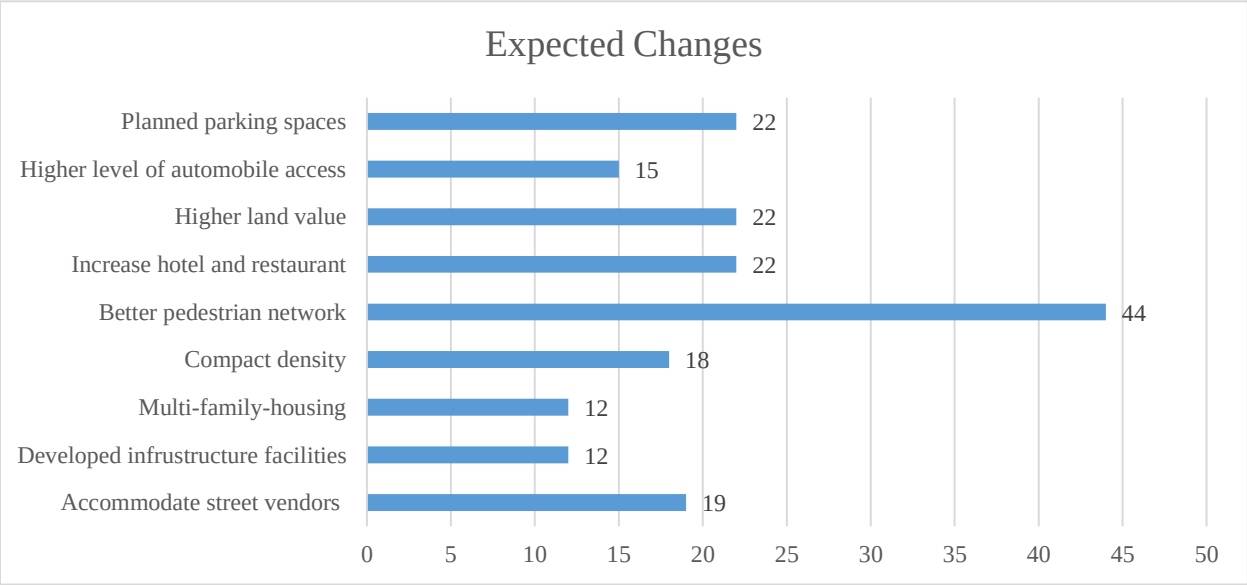


Figure-5.32: Expected change after opening MRT

Preferable Land Use

The five land use choice options are "Highly Prefer," "Prefer," "Neutral," "Don't Prefer," and "Must Avoid." The graph shows that 50 respondents selected Commercial as their top choice. Most of them (46) chose Residential as their second option. A sizeable percentage of respondents said they dislike open space.

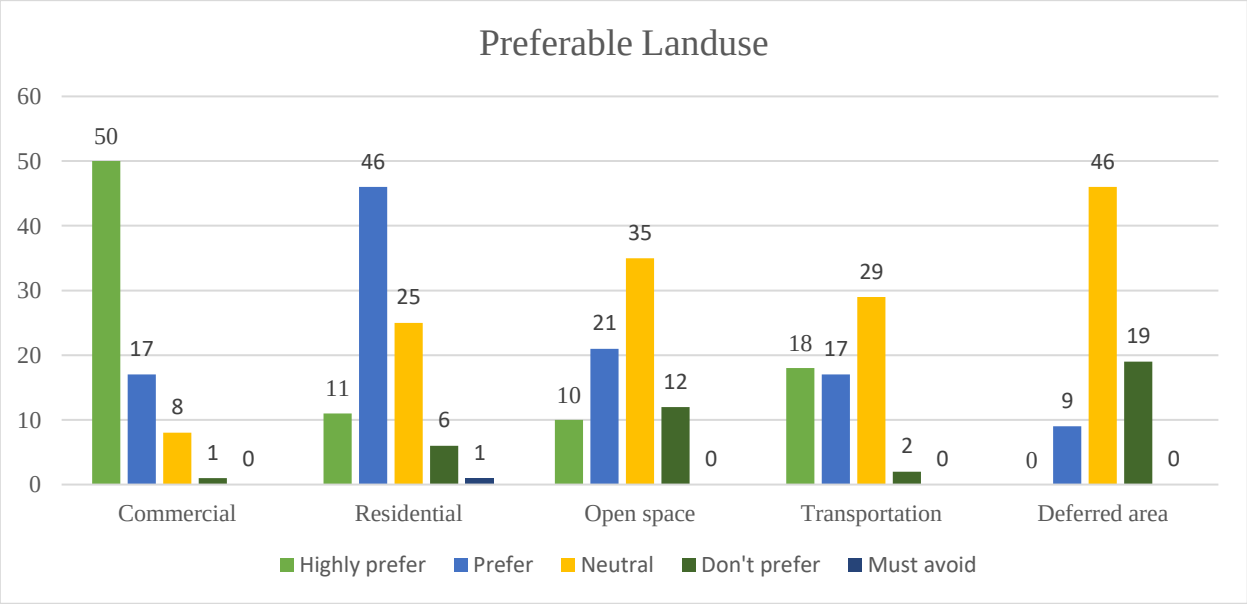


Figure-5.33: Land use preference

A Suggestion or Comment on the MRT Project

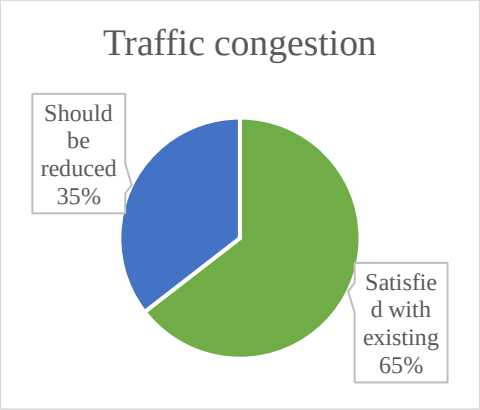


Figure-5.34: Satisfaction level with traffic congestion

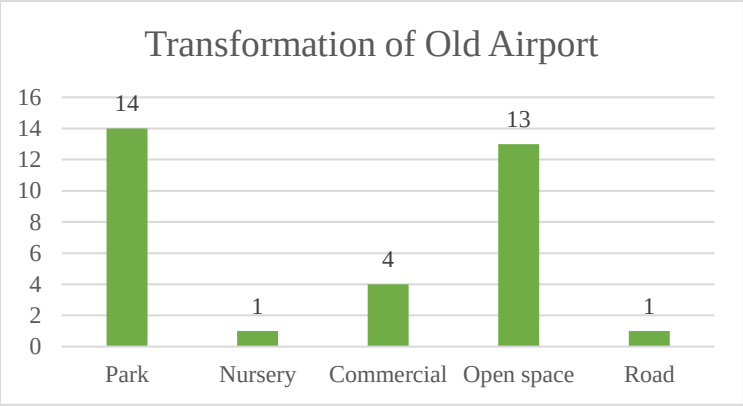


Figure-5.35: Recommendation on transformation of old airport

1. Increasing Accessibility to Transit Station

One of our objective is to make transit stations more accessible in order to develop a useful transportation network. The survey findings will be analysed, and strategic actions will be determined accordingly.

Analysis with Residential Survey Data

Only those inhabitants who often go outside the Agargaon TOD region will be examined for analytical purposes since these individuals mainly require easier access to transport stations. The figure shows that the majority of respondents (84) use buses. MRT usage as a substitute mode is desired by about 89% of the selected population. Additionally, the figure shows that 35% of individuals prefer to walk to TOD from the origin while 65% choose rickshaws.

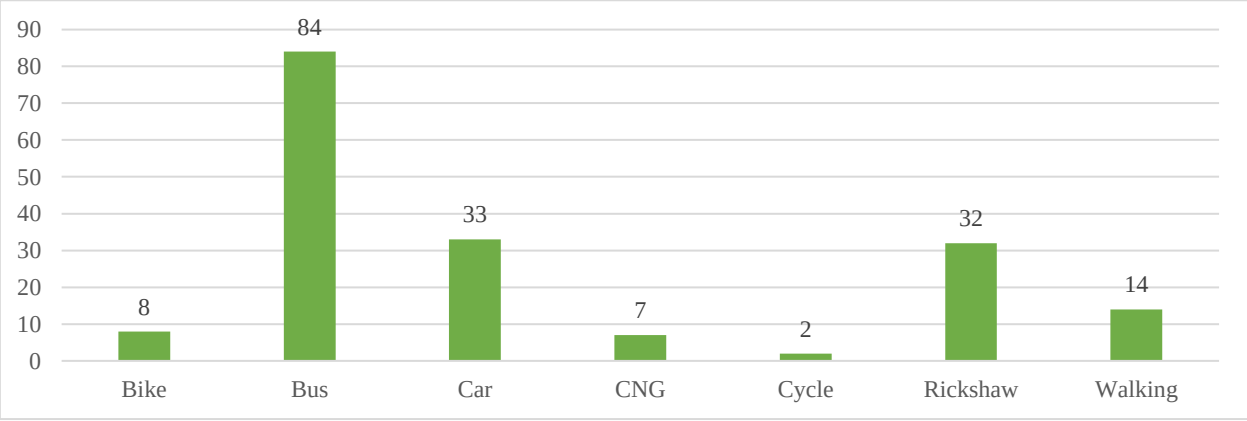


Figure-5.36: Major mode of residents

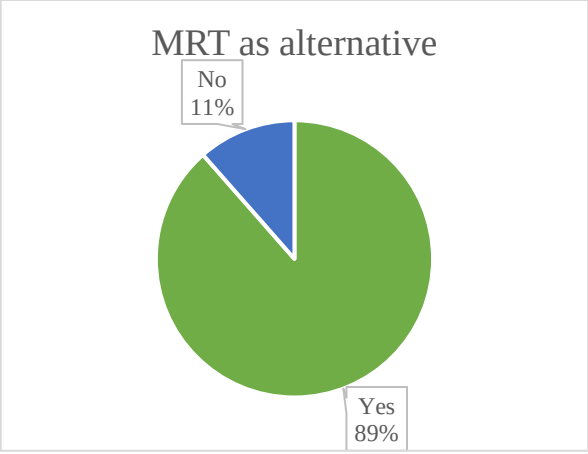


Figure-5.37: MRT as alternative mode

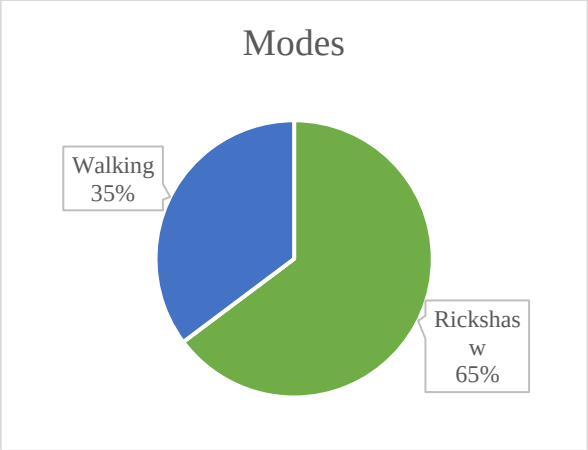


Figure-5.38: Modes to access TOD

Analysis with Commercial Survey Data

For analytical reasons, only employees who come from beyond the Agargaon TOD zone will be looked at because they primarily need easier access to transportation hubs. The graph demonstrates that 35 out of the respondents utilize buses. About 93% of the chosen population wants to use the MRT as an alternative method. Additionally, the data reveals that 67% of people prefer to walk from their starting point to TOD whereas 22% choose for rickshaws.

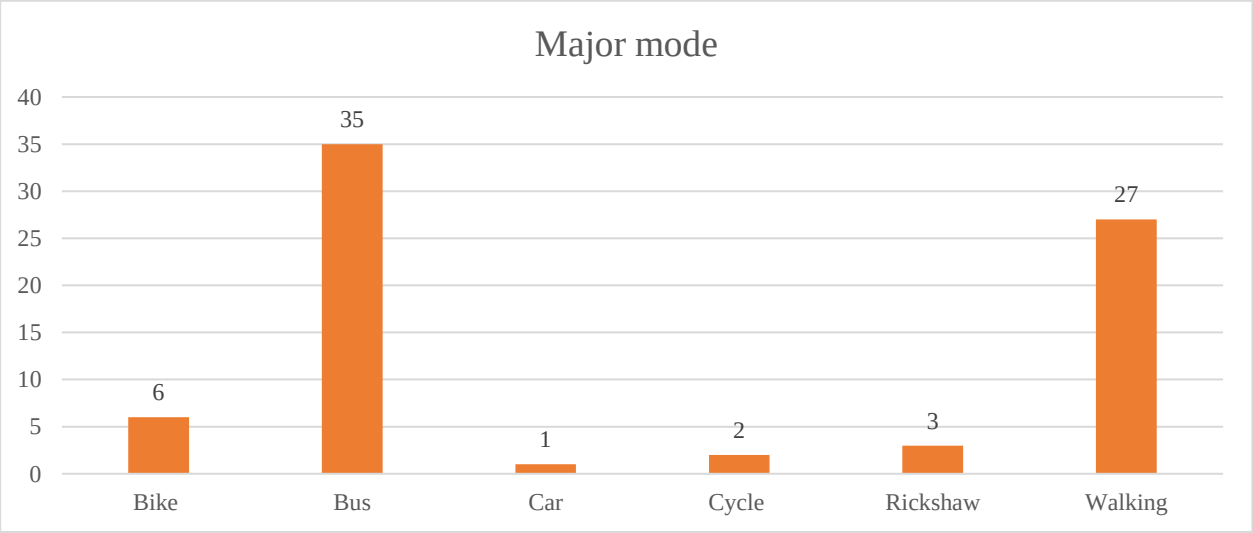


Figure-5.39: Major modes used by tenants

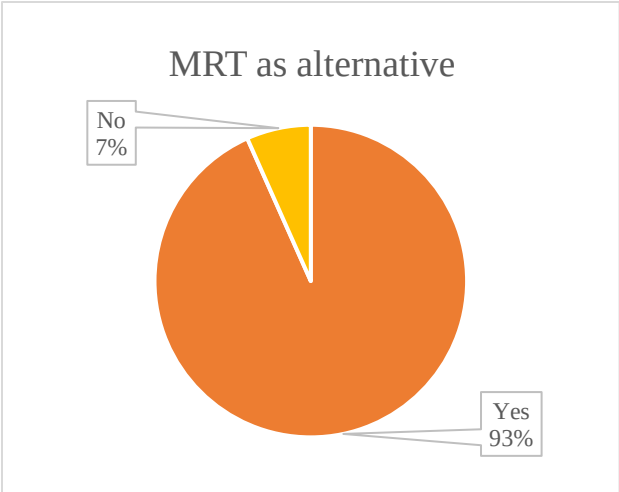


Figure-5.40: MRT as alternative mode

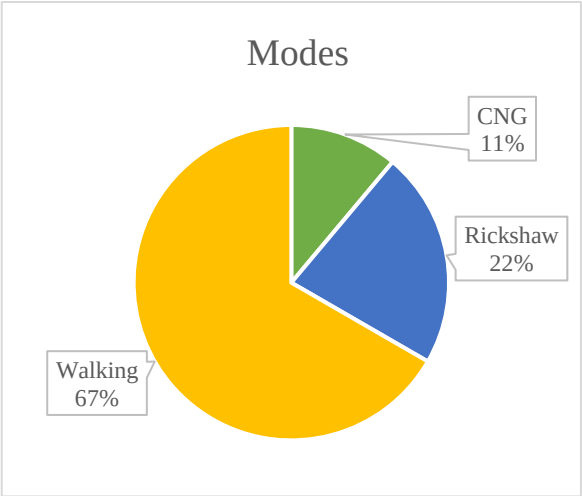


Figure-5.41: Modes to access TOD

Consideration in Design Proposals to Increase Accessibility to Transit Station

According to the data, the major modes of transportation used by passengers to get to the MRT station are rickshaws and walking. Therefore, it will be a good idea to offer bicycle facilities so that locals and employees can conveniently access MRT stations.

2. Creating Pedestrian and Non-motorized Transport Friendly Environment

To ensure a pedestrian-friendly environment, only those residents who used to regularly travel inside TODs are selected for analysis purposes. They are the most important group for this analysis.

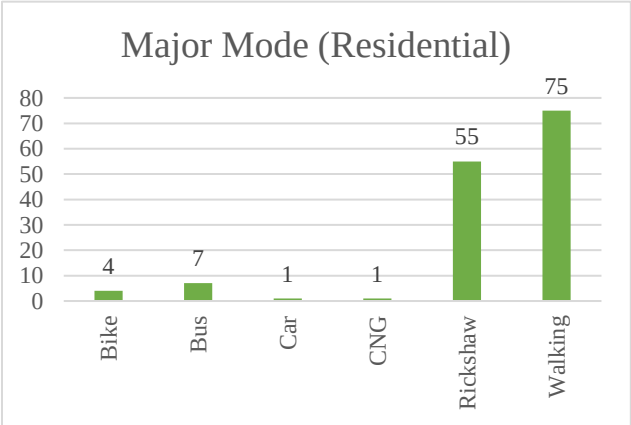


Figure-5.42: Major mode used by residentials

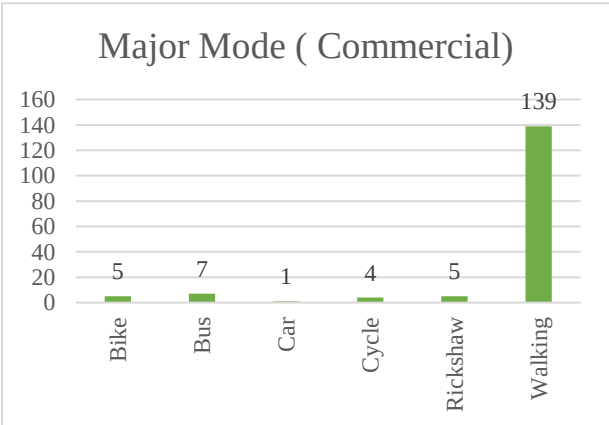


Figure-5.43: Major mode used by residentials

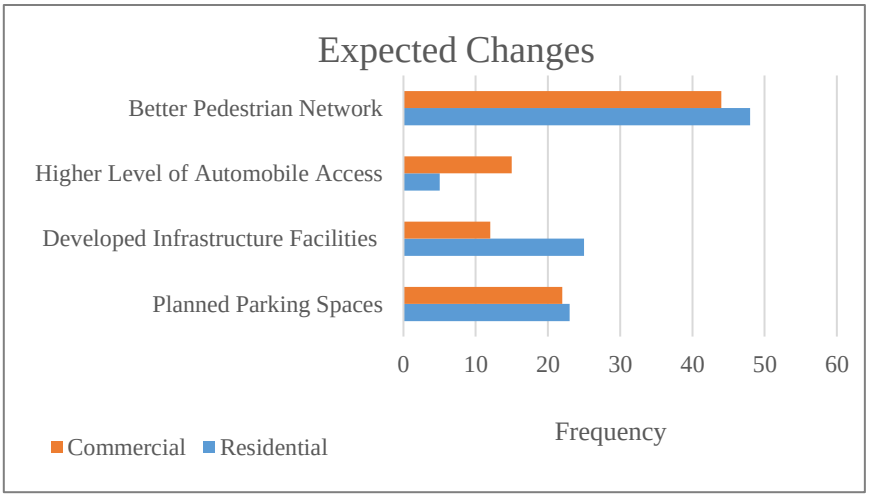


Figure-5.44: Expected changes after the completion of MRT

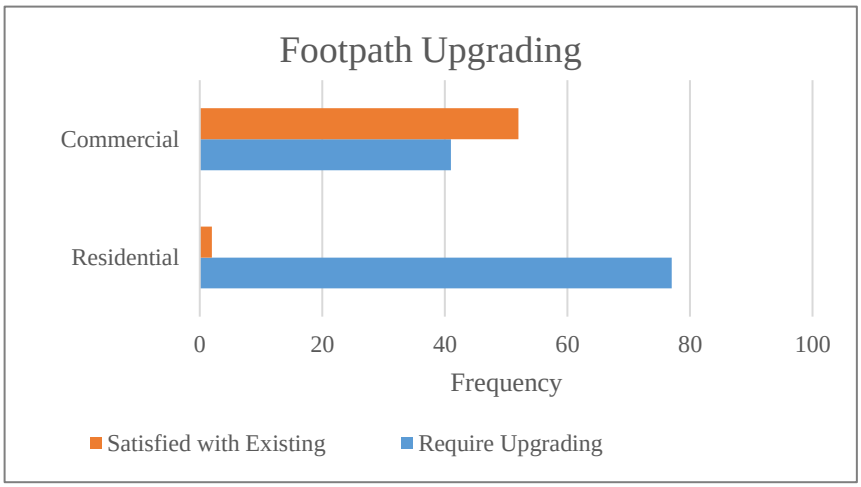


Figure-5.45: Satisfaction with footpath condition

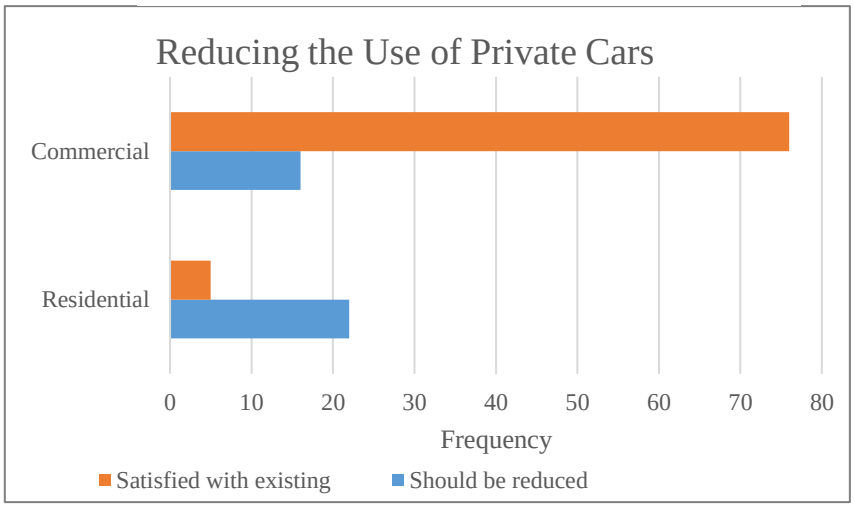


Figure-5.46: Opinion about reduction of private car

In the TOD region, walking is the preferred form of transportation for both the residential responders (75) and the commercial employees (139). Another popular mode of transportation for the majority of people is the rickshaw (55). But just a small percentage of individuals use bicycles (Total 4).

After the MRT is completed, both residential and business respondents expect an improved pedestrian network. Figure shows that the majority of residential respondents are dissatisfied with the current state of the pathway. And a substantial number of locals favour limiting private vehicles to foster an atmosphere that is favourable to non-motorized transportation.

Consideration in Design Proposals to Pedestrian and Non-motorized Transport Friendly Environment

In order to establish a pedestrian- and non-motorized-transportation-friendly environment, bicycle infrastructure must be secure and well-maintained. Accessibility for rickshaws is also necessary. It is essential to have sidewalks and pedestrian crossings that are secure, safe, and welcoming to pedestrians.

3. Provide affordable housing for low and middle-income groups

Our objective is to provide housing that is affordable for all income categories, but especially for those who are low income. One of the main benefits of residing in the studied region is the low cost of housing (23 respondents mentioned it). The responders were questioned about potential issues since TOD will raise the area's land value. The issue of "Increase in House Rent" was

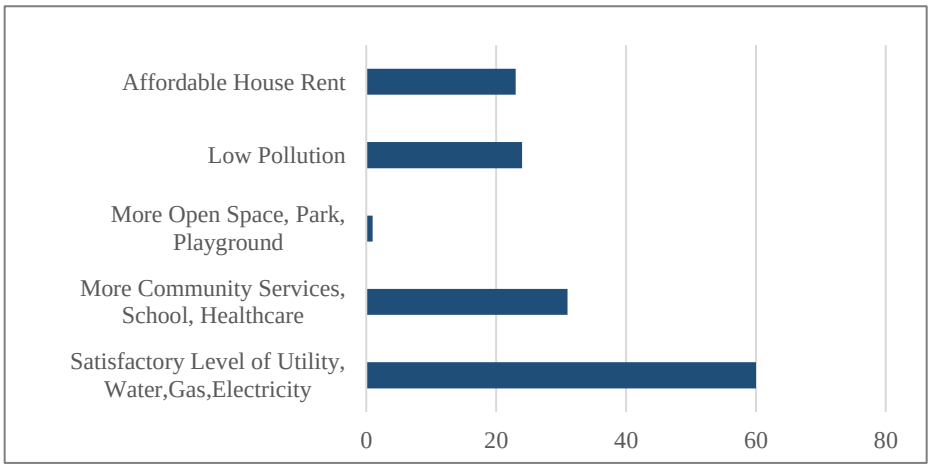


Figure-5.47: reasons for living in Agargaon

highlighted by more than 30 respondents. Currently, the majority of households pay between 10,000 and 25,000 BDT per month in rent, indicating that most individuals can handle an increase of 0 to 10%.

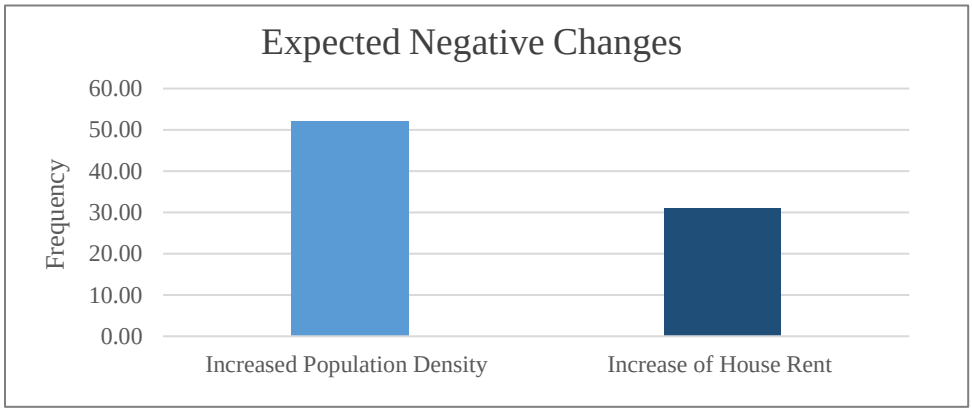


Figure-5.48: Expected changes after MRT station

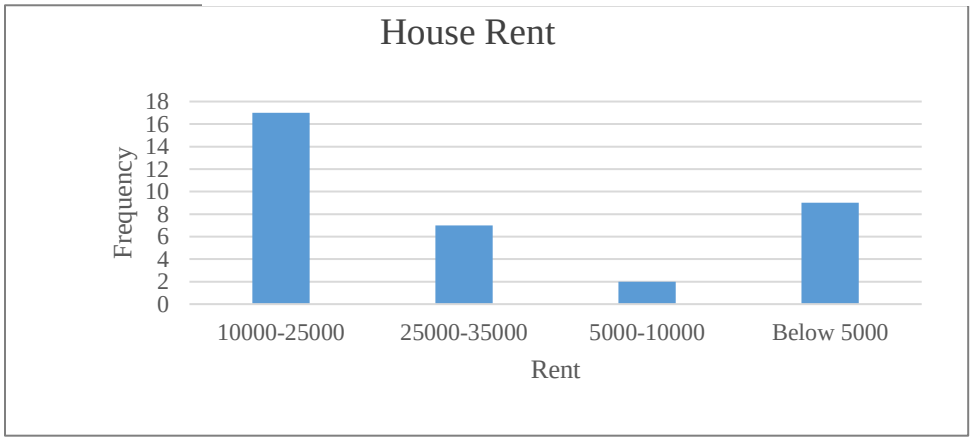


Figure-5.49: Resident's monthly house rent

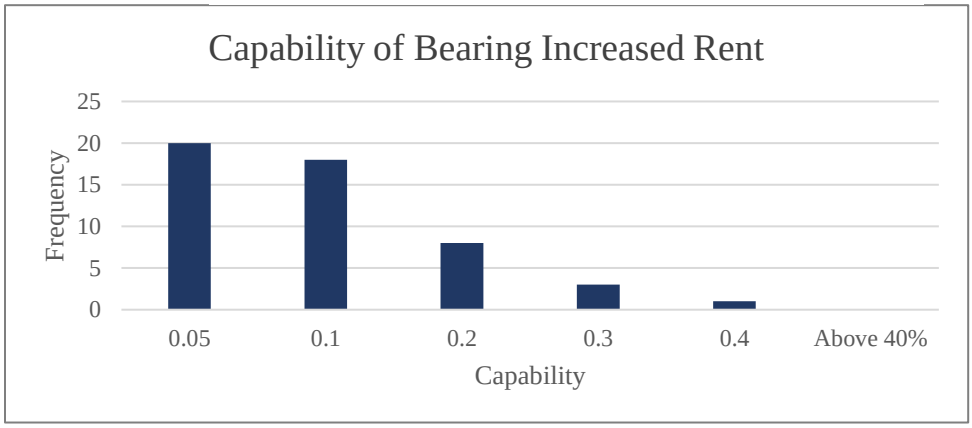


Figure-5.50: Capability of bearing increased house rent

4. Promote Green Environment

The major problem that Agargaon residents are facing is the lack of parks and open space. Statistics show that 68 communities are struggling with this problem. The majority of Agargaon citizens prefer open areas. Even they prefer uninhabited areas to population. The current open space is unsatisfactory to almost all Residents. The same circumstance is evident from the index table. Open space comes at high on the list of desires.

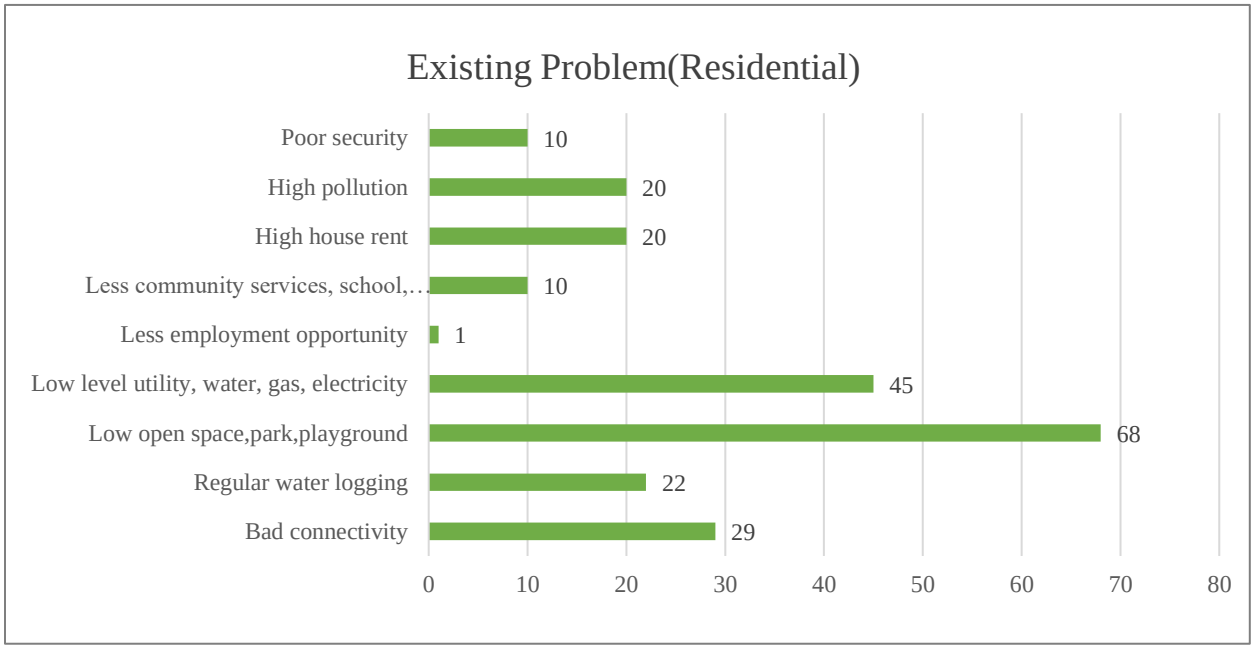


Figure-5.51: Existing problems in Agargaon

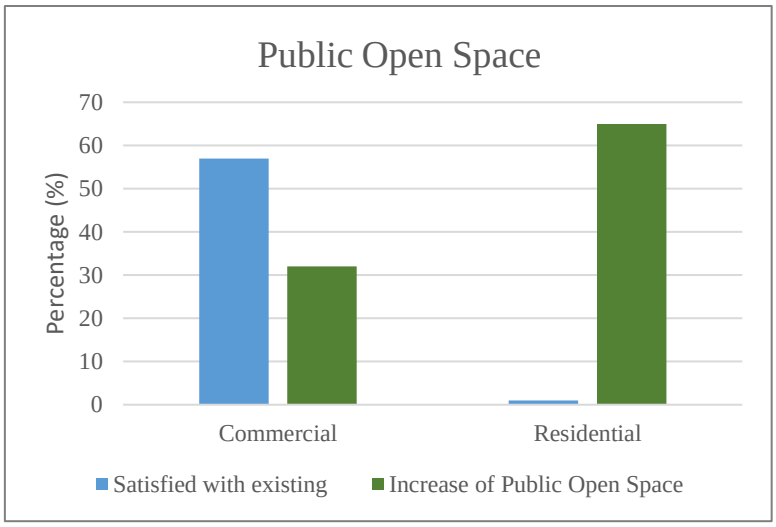


Figure-5.52 Satisfaction with public open space

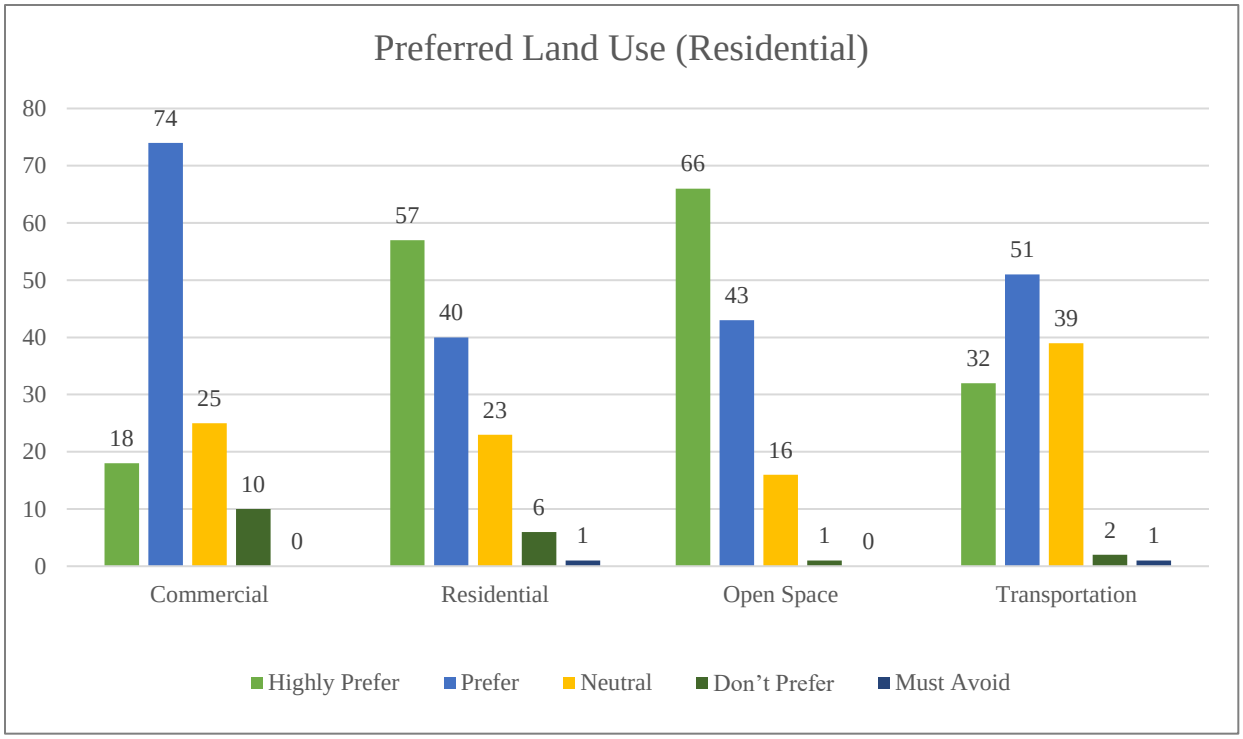


Figure-5.53: Land use preference of residents

Table 5.1: Land Use Preference Index (Residential)

Land-use	**Index Value**	**Rank of Order according to Preference Index**
Commercial	0.7	4
Residential	1.15	2
Open Space	1.38	1
Transportation	0.9	3

Both the residential and commercial respondents mostly prefer transformation of Old Airport as open space and park. Almost all of them want this transformation. So, there is a high potential to develop this restricted area as public open space and park.

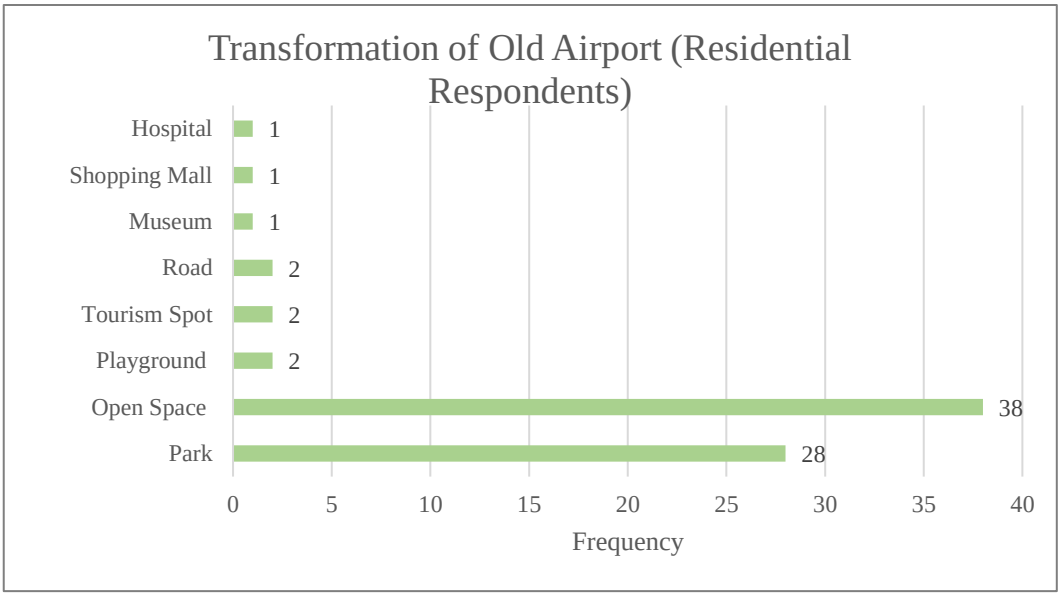


Figure-5.54: Transformation of Old Airport (Residential Respondents)

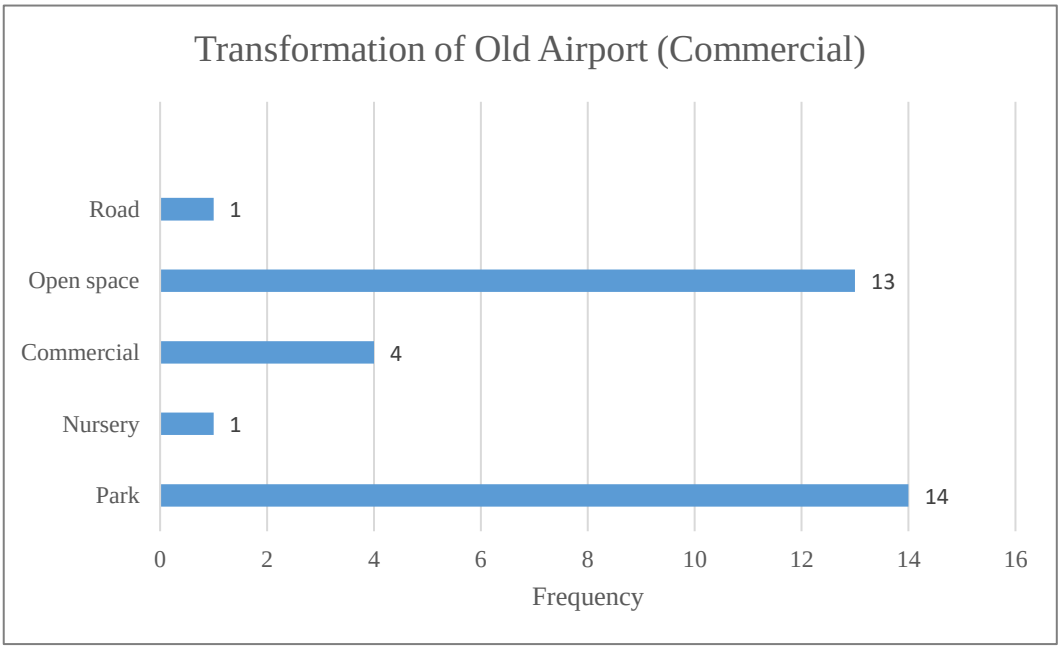


Figure-5.55: Transformation of Old Airport (Commercial)

5. Ensure access to employment opportunity

From the Commercial survey data, we have found that, one of the main reasons for which businessman doing business in this area is profitable sale. For this reason, though 32 respondents have said that shop rent is high, but for profitable sale they want to do business here. Most of the shop owner want to expand their business after competition of MRT. Fig shows the people's expectation about the changes in commercial activities. Most of them want changes into commercial. Most of them expect that land value will increase because of MRT project.

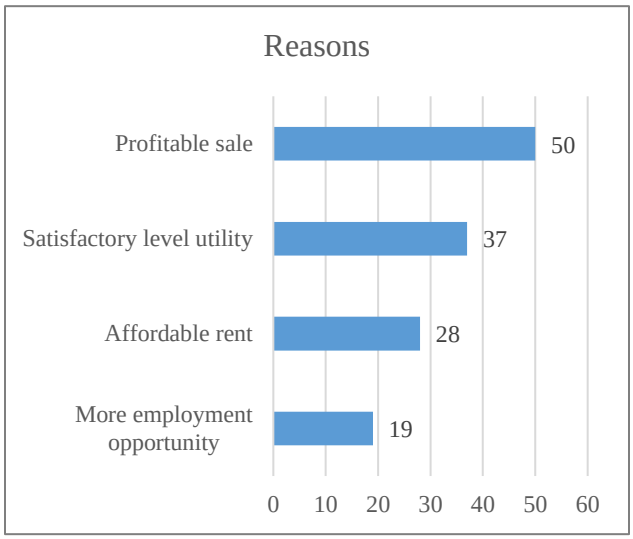


Figure-5.56: Reasons for doing Business in this Area

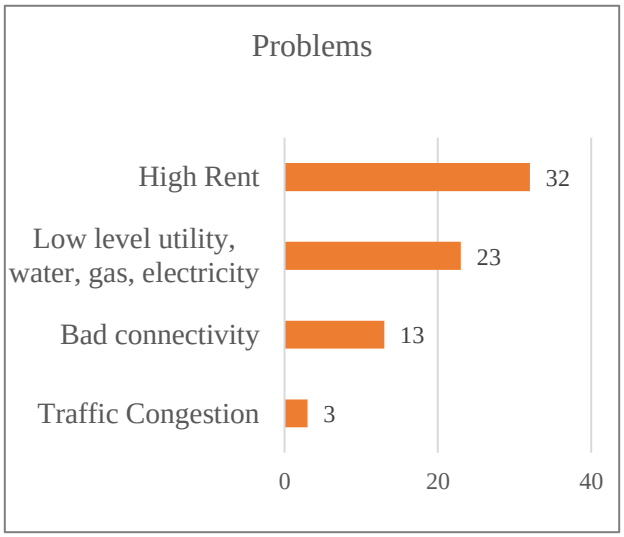


Figure-5.57: Problems faced while doing Business

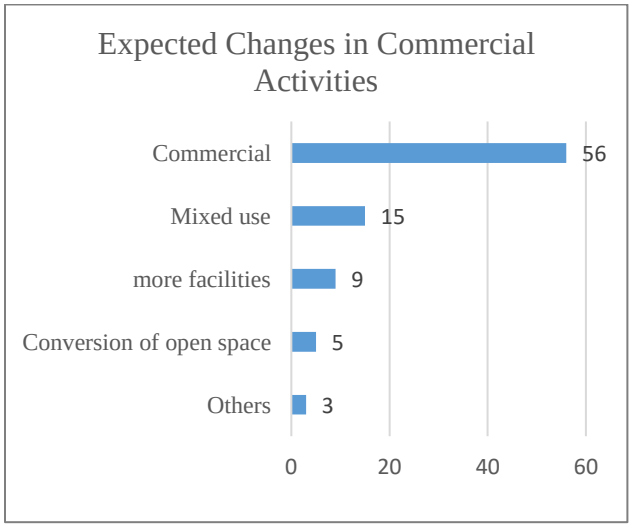


Figure-5.58: Expected Changes in Commercial Activities

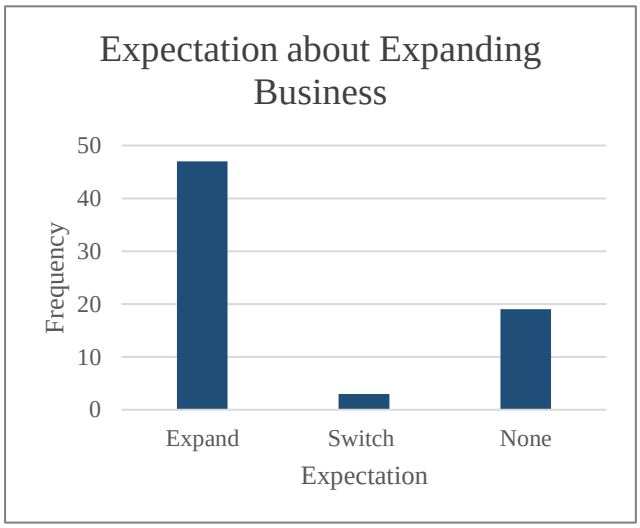


Figure-5.59: Expectation regarding changing business

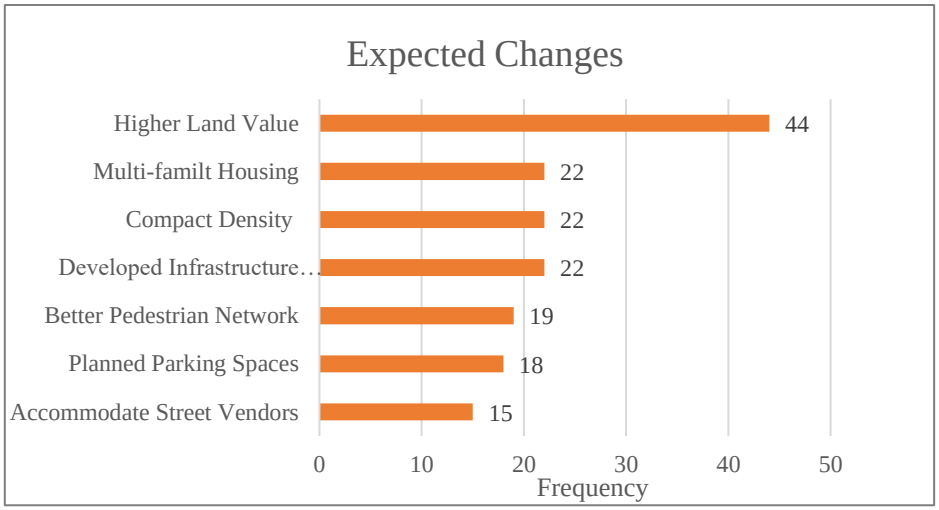


Figure-5.60: Expected Changes in the Area after Opening MRT Station

After taking everything into account, it can be concluded that there is a strong possibility for the creation of new employment opportunities around TOD precinct that will meet respondents' expectations and help low-income groups which will create a vibrant business environment.

Table 5.2: Land Use Preference Index (Commercial)

Land-use	**Index Value**	**Rank of Order according to Preference Index**
Commercial	1.53	1
Residential	0.67	3
Open Space	0.37	4
Transportation	0.8	2

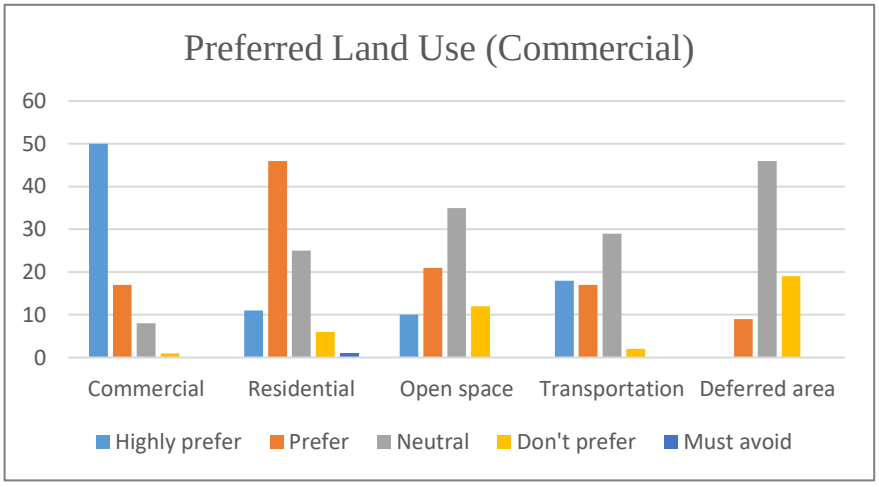


Figure-5.61: Preferred Land Use (Commercial)

CHAPTER 06: DEVELOPMENT POTENTIAL

Because our study intends to explore the possibilities of transit-oriented development near Agargaon stations, it was critical to first determine whether the existing land use had the potential for redevelopment. Likewise, it was necessary to determine whether the present stakeholders of the area (commercial and residential populations) support any growth inside the area.

To understand the development potential of the study area, the entire region has been characterized into 4 zones

Table 6.1 Average Building Height (Floor No) and Structure age(in years) of the Preferred Locations

Location	**Average Building Height (Floor No)**	**Average Age of Building Structure (in Years)**
500m from transit station	1.19	30
Zone-A	1.97	30
Zone-B	2.25	30
Zone-C	5	30

The average building height in the studied zones ranged from one to five stories, with a construction time of 30 years. The Draft Density Zoning 2018 includes a provision that allows for 12 floors of housing in the TOD precinct. As a result, it is clear that each zone has the potential to be redeveloped as high-rise structures that support high-density residential and mixed-use development. Vertical growth allows the development to be compacted, allowing people to have access to service facilities in a timely manner.

However, the perception of the residential and commercial communities was equally vital to consider.

6.1 Residential Land Use

Reasons for living in this area

Figure 5.2 indicates that residents have chosen to live in this area mostly because of its good connectivity, sufficient utility services, and security systems. People who live in this neighborhood opted to live here since their workplaces are near by and there is decent transportation access between workplaces and residences. In addition to the existing community facilities, the provision of utility service is good, which attracts residents. Residents want to feel protected in their homes, which is why effective security has also been used to attract residents. One of the reasons people choose to live in Agargaon is the availability of community amenities like as schools and hospitals.

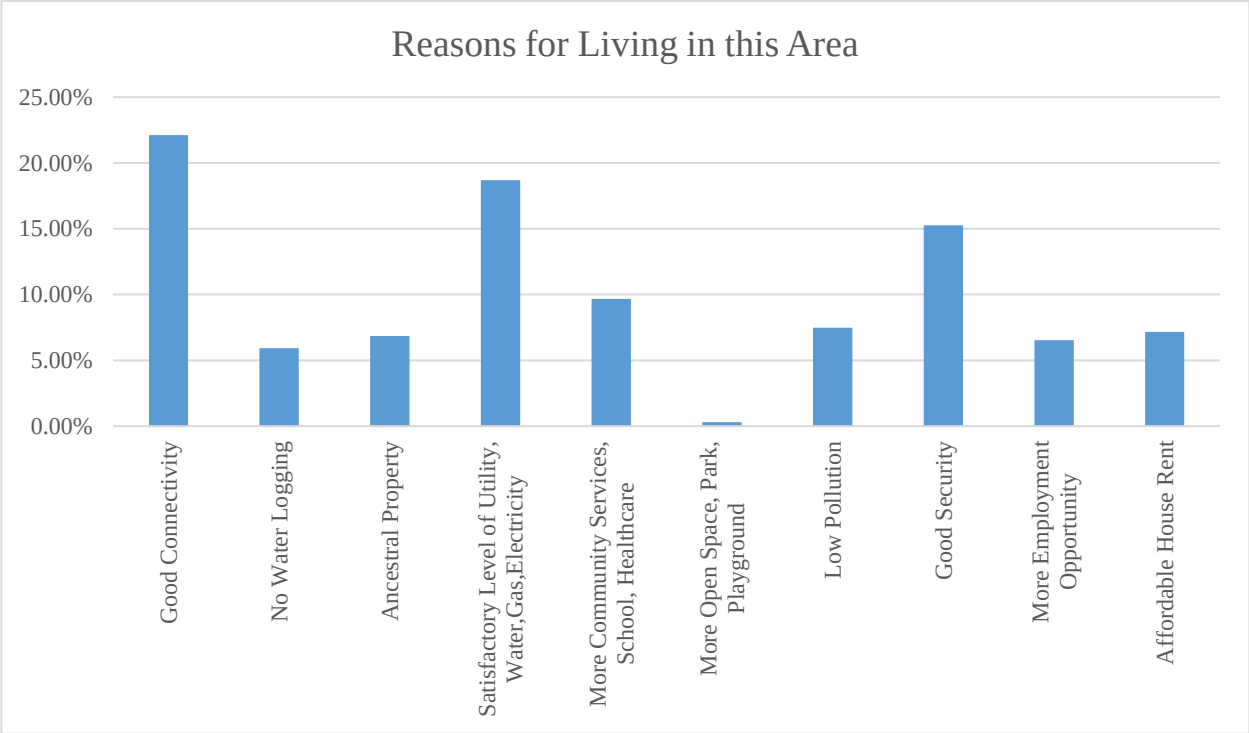


Figure 6.1: Reasons for Living in this Area

Existing Problems in the Area

Although Agargaon has been able to attract a large number of residents due to a number of beneficial characteristics, the area faces a number of obstacles. To mention a few, the most serious issue that residents in this neighborhood suffer is a lack of open space and playgrounds.

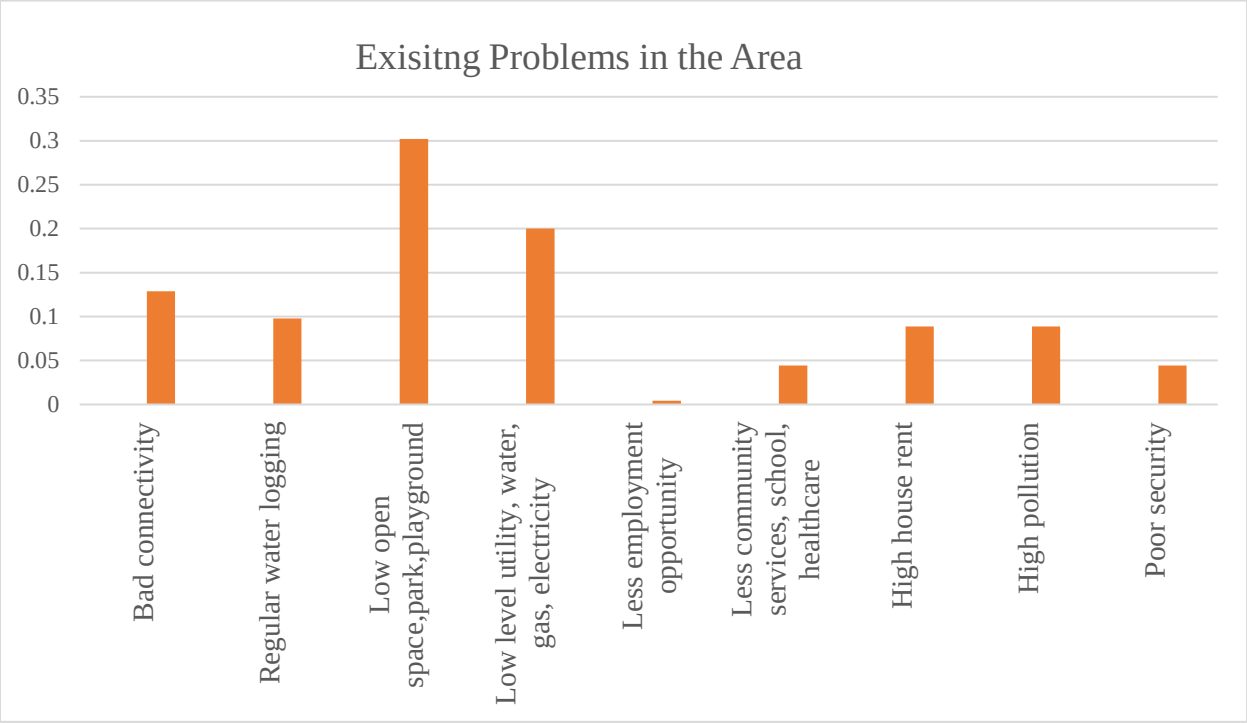


Figure 6.2: Existing Problems in the Area

There are several open spaces in the area, they are not accessible to the public. As previously said, the neighborhood does not have a lot of space for parks and playgrounds. Furthermore, while some residences enjoy consistent utility service, others have noted a low level of service for gas, water, and electricity.

Willingness to Redevelopment

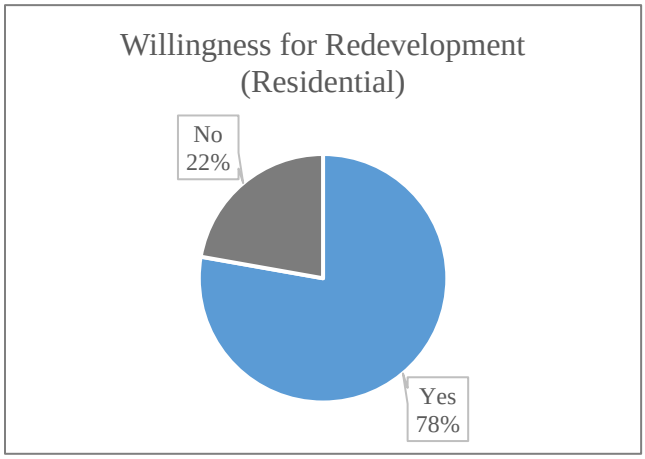


Figure 6.3 Percentage of Owners willed for Redevelopment

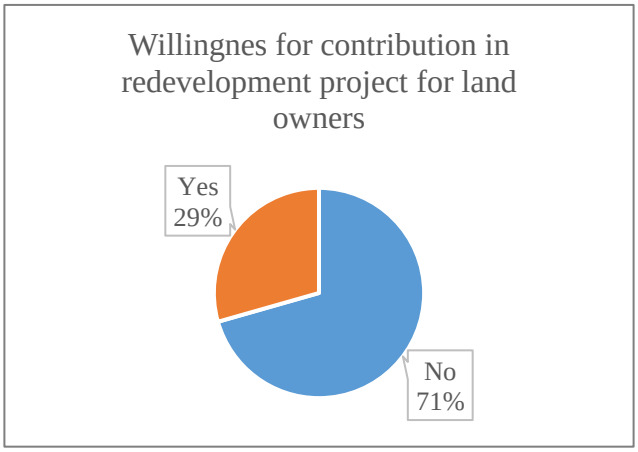


Figure 6.4 Percentage of Owners Willingness for contribution in redevelopment project for landowners

Landowners in residential neighborhoods will play a significant role in redevelopment when the MRT station is completed. When questioned about redevelopment, 78% of the owners said they wanted to see Agargaon developed into a TOD. They were then asked if they wanted to participate in the redevelopment process. Unfortunately, 71% of them were unwilling to contribute to the initiative. This means that the public and private developers will play a key role in the development of Agargaon.

Preferred Land Use by the Residents

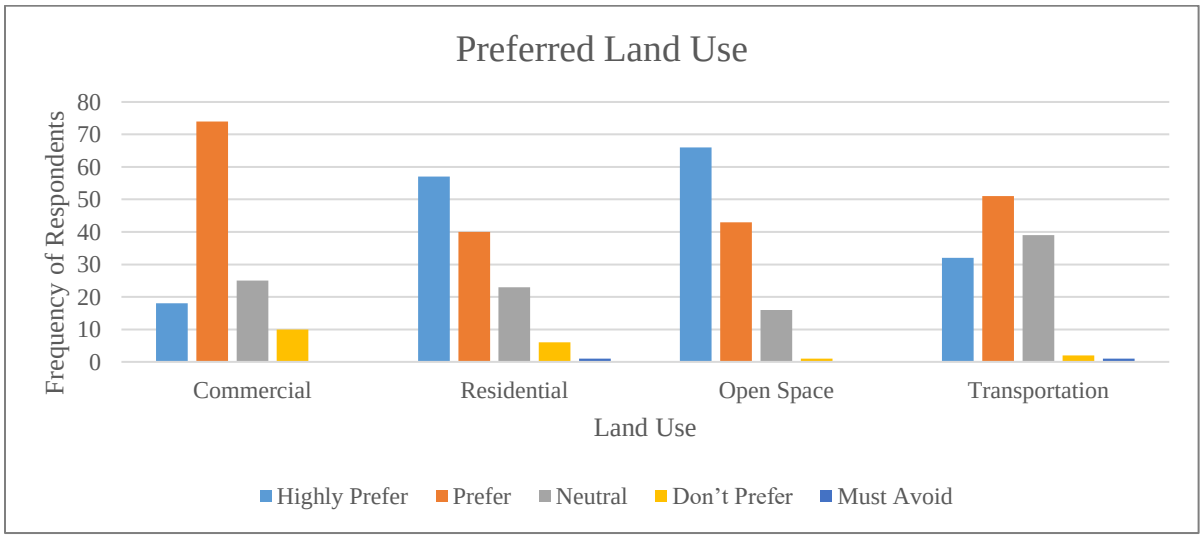


Figure 6.5 Land-use Preference by the Residents

Table 6.2 Land-use Preference Index by Residents

Land-use	Index Value	Rank of Order according to Preference Index
Commercial	0.7	4
Residential	1.15	2
Open Space	1.38	1
Transportation	0.9	3

Preference index was generated to understand the land use preference of the residents within 500m of the transit stations. The table shows that residential users have preferred open spaces as their preferable land use. Since the prevailing problem of this area was lack of open spaces, this choice is clear. However, the residents have given second preference to residential development within 500m of the transit station.

6.2 Commercial Land Use

Only 1.4% of the land in the study area is used for commercial purposes. However, when the transit station is completed, the entire area is likely to see greater commercial activity. As a result, it is critical to understand the viewpoint of commercial communities that are conducting business in this region. The reasons for conducting business in this area, the current challenges, and their expectations are critical in the redevelopment process.

Problems Faced While Conducting Business in This Area

Around half of the respondents stated that high rent is one of the challenges they face while conducting their business in this area. Low level of utility facilities also creates problem in conducting the business. Despite of that, the respondents chose to conduct business in this area because of some positive factors.

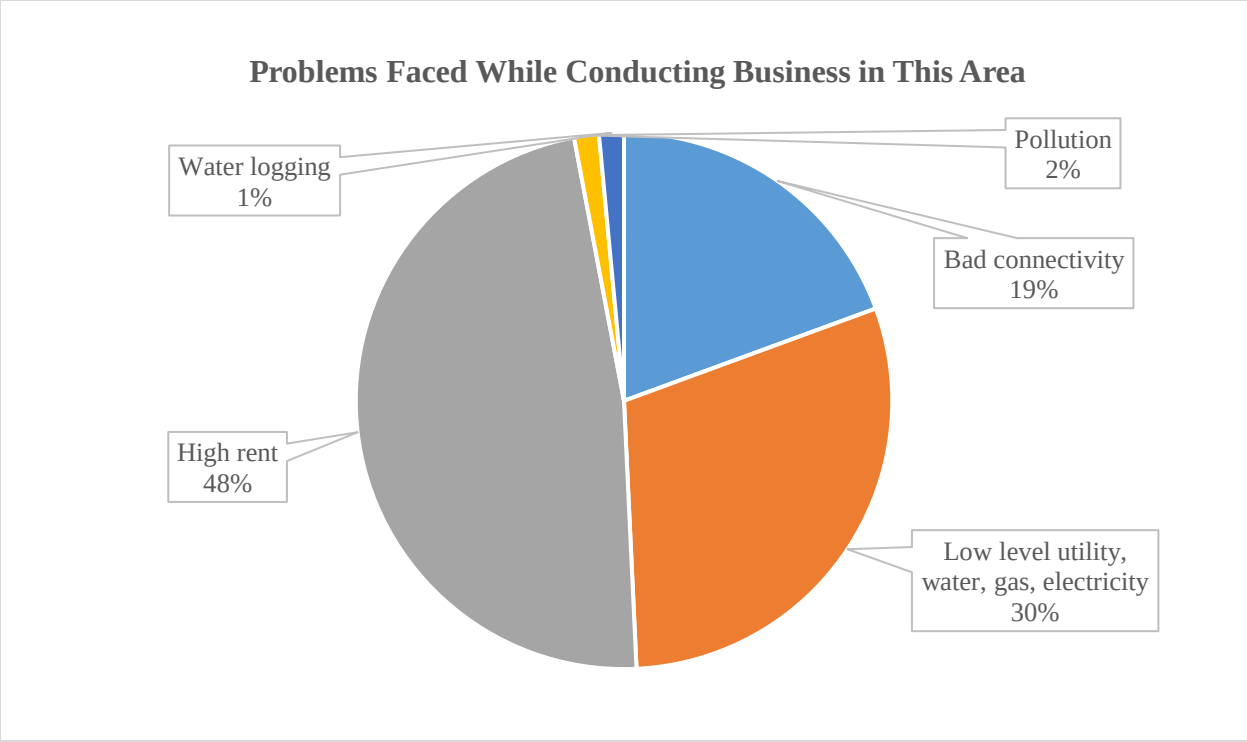


Figure 6.6 Problems Faced While Conducting Business in This Area

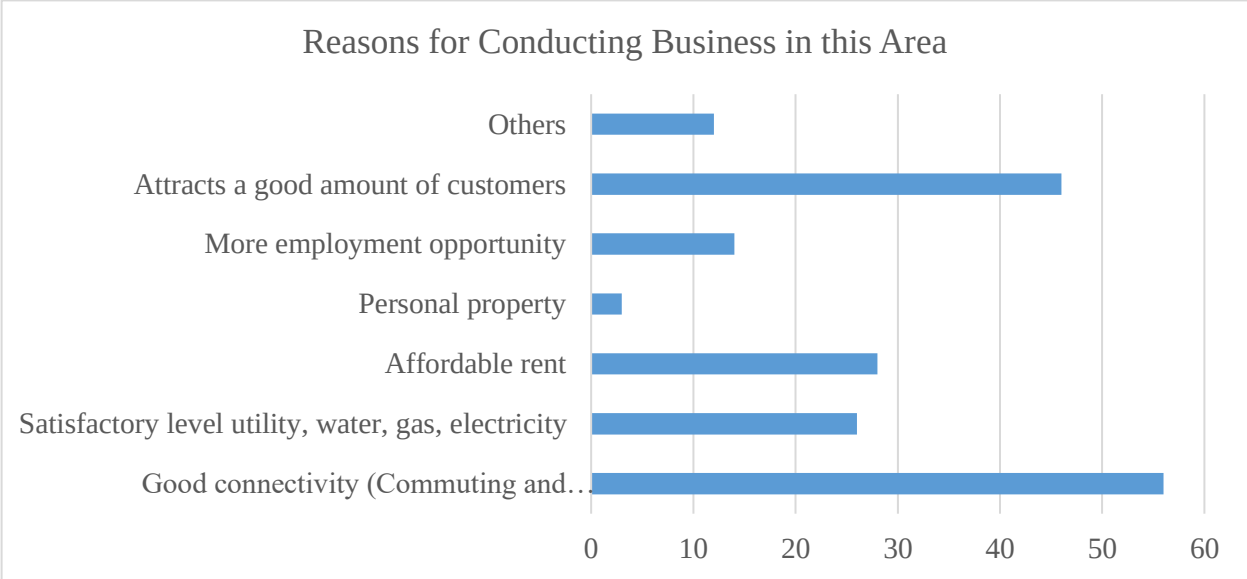


Figure 6.7 Reasons for Conducting Business in this Area

Reasons for Conducting Business in this Area

The commercial users stated that the area provides good connectivity and attracts a good number of customers as well.

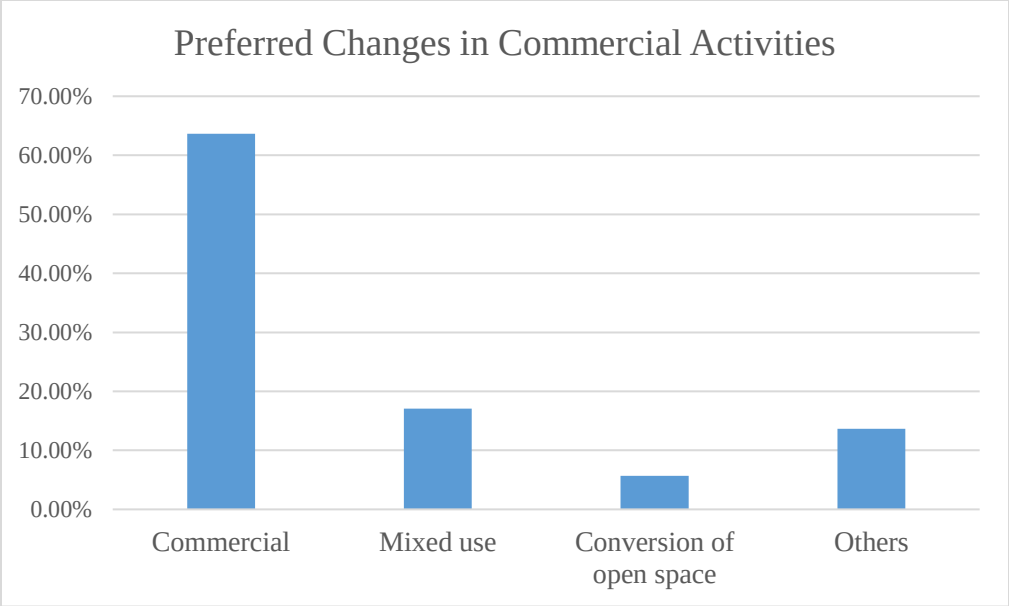


Figure 6.8 Preferred Changes after Completion of MRT

When the commercial respondents were asked what type of changes they expect through TOD, more than 60% of them wanted increase in commercial activities.

Preferred Land Use by Commercial Communities

Table 6.3 Land-use Preference Index (Commercial Communities)

Land-use	Index Value	Rank of Order according to Preference Index
Commercial	1.53	1
Residential	0.67	3
Open Space	0.37	4
Transportation	0.8	2

When asked about their desired land use, commercial community ranked commercial land use first and transportation second preference. To aid business activities transportation is important, and so they chose land uses so that their business might thrive more.

The above discussion made it clear that the entire area has high potential of being redeveloped with high density land use provisions. However, for allocating land use for redevelopment, the preference varied among residential and commercial respondents. While the residential users want increased open spaces and residential areas, commercial respondents were more interested in seeing increase in commercial activities. While redeveloping the area, preference of both stakeholders must be taken into consideration. There should be high density residential land use as well as commercial land use within the study area. In this away, in one hand, development would be compact on the other hand, the area would become a hub for commercial activities and more employment opportunities. Along with residential and commercial development, provision of open spaces within each neighborhood must be considered. When all these issues would be brough in the redevelopment process, our vision of a functional, livable TOD would be achieved.

CHAPTER 07: POLICY REVIEW AND FORMULATION OF VISION, MISSION AND OBJECTIVES

For the developing countries where cities are growing rapidly over the years, transit-oriented development has become opportunity to guide future growth around transit stations integrating land use and transportation planning. The planning theory of transit-oriented development has been included in national level policy in developing countries. The development of metro rail stations in Dhaka city has given a prospect to design future urban centers around transit stations. The role of policy for effective implementation of transit-oriented development is undeniable. Hence, some policies have been mentioned in Draft Dhaka Structure Plan, 2016-2035 and Draft Detailed Area Plan, 2016-2035 and these policies have been reviewed before formulating the vision, mission and objectives for the development around Agargaon MRT station.

7.1 Policy Review

7.1.1 Draft Dhaka Structure Plan, 2016-2035

1. In addition to identifying the extent and direction of projected urban expansion, the Draft DSP, 2016-2035 has outlined a number of policy directives to guide the development around transit station.
2. Mentioned policies and guidelines in Draft DSP, 2016-2035 regarding transit-oriented development around transit stations:
3. Proper integration of land use and transport system and promote Transit-Oriented Development (TOD) along BRT/MRT Stations in close cooperation with transport corridor and urban development.
4. Implementation of TOD schemes for compact urban growth through block-based development and the provision of compatible mixed use within a residential cluster.
5. RAJUK could take pilot project to implement block housing around MRT and BRT Stations and special financial incentives for commercial real estate companies for block housing development.
6. All urban centers should be developed providing wide variety of residence with public facilities to reduce travel demand.

7. Develop infrastructure and services around transit points, locate the job opportunities with short commutes and develop neighborhoods that promote walking.
8. Public sector housing agencies should take up housing projects close to transit points.
9. Low rent high rise (10-12 storied) Public Housing projects for low-income people near working place, CBD, and around TOD area.

7.1.2 Draft Detailed Area Plan, 2016-2035

In Draft DAP, 2016-2035, it has mentioned that around transit station a distinctive area will be develop that will attract people for living and job opportunities. For the implementation of transit-oriented development, Draft DAP, 2016-2035 has thoroughly mentioned policies, guidelines and strategic actions which includes,

1. 500m and 200m influential zones around transit stations have been identified as TOD zones.
2. Revised land use plan for existing land uses adjacent to public transport system
3. Regulations for high-density residential units and construction of high-rise buildings
4. Pedestrian friendly transport system
5. Allocations for public spaces
6. Integrated transport route plan with bus and other modes
7. Multi-storied residential, commercial or mixed land use at specific junctions in the TOD area. 8. Properly planned transit, vehicles and parking facilities at junctions
8. Parking spaces at 10 minutes walking distance from stations
9. Adequate space for parking bicycles and other vehicles at stations
10. Providing rental share scheme for bicycles and other facilities
11. Small shops (coffee shop, newspapers, and grocery stores) around stations

Implementation strategies for transit-oriented development:

1. Land acquiring for transit oriented development, which is applicable for lands with low-density structures and vacant land.
2. Land redevelopment
3. Land readjustment
4. Redeveloping existing land use through public or public-private initiatives.

Table 7.1: Land Use Regulations around Transit Oriented Development Mentioned in Draft DAP, 2016-2035

Effective Land Use along TOD	**Allowable Use**	**Non-allowable Use**
Employment	1. General Industry(Green/Orange A) 2. Commercial 3. Institutional 4. Mixed Use(Commercial-Industry)	1. Activities that create more traffic and less employment opportunities 2. Less intensified industries that requires large plots/land 3. Activities that depends mostly on traffic and requires large parking spaces
Residential units with high density	1. Housing with multiple units 2. Apartments 3. Bachelor Quarters 4. Labor Quarters 5. Hostels	
Recreational and Cultural Facilities	Open Space (Parks, Play fields, Waterbody)	

7.2 Formulation of Vision, Mission and Objectives

7.2.1 Vision

Creating a liveable, functional and economically efficient 'Urban TOD'.

7.2.2 Mission

Mission 01: To create walkable and compact communities that are inclusive and affordable for a liveable transit oriented development

Mission 02: To establish an effective transportation network for easy accessibility, connectivity and convenient mobility of NMT and pedestrians for a functional transit oriented development

Mission 03: To facilitate increase of economic & employment opportunities for a economically efficient transit oriented development

7.2.3 Objectives and Strategic Actions

To transform the vision and missions for transit-oriented development, some objectives and strategic actions have been undertaken. Strategic actions are based on the result of data analysis and following the strategic actions, some spatial and non-spatial strategies has been proposed.

Table 7.2: Objectives and Strategic Actions for Developing TOD

Vision: Liveable Urban TOD	
Mission 1	To create walkable and compact communities that are inclusive and affordable for a liveable transit oriented development
Objective 1.1	To promote compact development around transit station
Strategic Action 1.1.1	Promote high density residential land use around TOD area
Spatial	Blocked based housing development to build high rise residential apartments within 500m of the transit station, in zone A, zone B, zone C
Non-spatial	15 storied residential buildings within 500m of transit station, 10-12 storied residential buildings in zone C, 8-10 storied residential buildings in zone A and zone B
Strategic Action 1.1.2	Provision of compatible mixed use within the TOD area

Spatial	Provision of mixed land use within 500m TOD precinct as well as in residential neighbourhood
Non-spatial	Provision of mixed residential and mixed commercial land use
Objective 1.2	To provide affordable housing for low and middle income groups
Strategic Action 1.2.1	Affordable public housing projects around TOD area
Spatial	Provide high rise public housing within 500m of transit station
Non-spatial	1. 15-storey public housing, with floor area maximum 1000sqft. 2. 50% FAR incentive to private developers for providing 10% affordable units of the total housing units
Objective 1.3	To mitigate adverse effects of pollution and enhance natural environment
Strategic Action 1.3.1	To reduce the impacts of noise pollution near MRT station
Spatial	Relocation of Sher-e-Bangla Nagar Government Boys High School from the transit station.
Non-spatial	1. Buildings within 200m of the transit stations would be constructed using sound insulating building material 2. Planting evergreen trees and thick bushes surrounding 100m of sensitive building uses (Hospitals)
Strategic Action 1.3.2	To promote green environment
Spatial	1. Developing the open space of Old Airport as a “City Park”. 2. City Park Size: 100 acres and Service Area: 2mile radius 3. Providing each residential neighborhood with local open spaces (Playground, Local Parks). 4. Designated space for local park: 5acre
Non-spatial	1. Provision of circulation, walking trail, plantation, shading trees, grass bed, water body, resting area, seats. 2. Active and passive recreational facilities in the local parks namely sitting arrangements, playing equipment)

Vision: Functional Urban TOD	
Mission 2	To establish an effective transportation network for easy accessibility, connectivity and convenient mobility of NMT and pedestrians for a functional transit oriented development
Objective 2.1	To increase accessibility to MRT station
Strategic Action 2.1.1	Facilitate Use of Non-Motorized Vehicle (Rickshaw and Cycle) and Discourage the Use of Automobiles
Spatial	1. Construction of bicycle lane along Arterial road, and collector road. 2. Maximum width of the bicycle lane should be 6 feet (1.8 meter) (National Association of City Transportation Officials) 3. Provision of bicycle parking within 50m of the transit station. 4. Space designated for car parking in front of IDB building to be used as bicycle parking space. 5. Provision of rickshaw stand along Begum Rokeya Sharani near transit station
Non-spatial	1. Bicycle lane should be separated from motorized vehicle using physical barrier on Arterial road and using a solid white line on collector roads 2. Bicycle symbol, markings, and no parking symbol on separated bicycle lanes. 3. Provision of perpendicular bicycle parking near transit station 4. Bicycle parking near transit station: a. Construction: Outdoor b. Parking rent: Free c. Securing Method: Guarded d. Opening hours: 24 5. Rickhsaw stand fee: Free
Objective 2.2	To create pedestrian friendly environment
Strategic Action 2.2.1	Provide pedestrian friendly, safe, and secured sidewalks and crossings.

Spatial	1. Residential area: width of sidewalks 3.3m, 2.8m pedestrian zone, 1m street furniture zone (DTCA, 2021) 2. Commercial area: width of sidewalks 6.5m, 4m pedestrian zone, 1.5 m street furniture zone (DTCA, 2021) 3. Maximum height of sidewalks 0.15 meter (DTCA, 2021) 4. Provide pedestrian crossings at major intersections of Begum Rokeya Sharani. Pedestrian crossings should be provided at every 200m distance across roads (Draft DAP, 2016-2035)
Non-spatial	1. Provision of street furniture including (public benches, street lighting, sign signal) 2. Guided tile for visually challenged people. (Yellow tiles with textured surface and blister surface on the edges) 3. Provide access between vertical levels for wheelchair users using ramp. 4. Grade separated (underpass) along the 4 lane intersection of Begum Rokeya Sharani and at graded crossings at 'T' intersections inside TOD
Vision: Economically Efficient Urban TOD	
Mission 3	To facilitate increase of economic & employment opportunities for a economically efficient transit oriented development
Objective 3.1	To ensure access to employment opportunities
Strategic Action 3.1.1	Select strategic locations for establishment of vibrant commercial hubs around transit stations
Spatial	1. Commercial strip along roads near transit station 2. Vibrant night market (Footstalls, Vendors) on street at institutional zones to keep the place busy and secured after office hours. 3. Allocate space for public use near transit station
Non-spatial	1. Types of commercial: Grocery store, super shop, repair shops (bicycle repair along bicycle lane), restaurants, coffee shop, shopping mall etc.

Objective 3.2	To elevate informal economic activities into higher productivity levels
Strategic Action 3.2.1	Selection of site for providing informal business activities around transit station
Spatial	1. Provision of informal activities on sidewalks at 50m from intersections 2. Maximum (6*2) square meter allocated on sidewalks for each hawker (Draft DAP 2016-2035) 3. Dimension of sidewalks with informal activities provision: 2m for informal activities, 1m for customers, 3m for pedestrians (Draft DAP 2016-2035)
Non-spatial	1. Fixed hawkers can operate business for 24 hours. 2. Active hawkers can do business on street after office hours (5:00PM)

7.3 Comparison of Objectives with the Policies Mentioned in Draft DSP (2016-2035), Draft DAP (2016-2035) and Sustainable Development Goals (SDGs)

Table 7.3: Comparison of Objectives with the Policies Mentioned in Draft DSP (2016-2035), Draft DAP (2016-2035) and Sustainable Development Goals (SDGs)

Objectives	**Policies mentioned in Draft DSP (2016-2035) and Draft DAP (2016-2035)**	**Sustainable Development Goals (SDGs)**
Objective 1.1: To promote compact development around transit station	Compact development through the implementation of block based housing development has been proposed	SDG 11: Sustainable Cities and Communities Making cities sustainable means creating career and business opportunities, safe

		and affordable housing, and building resilient societies and economies. It involves investment in public transport, creating green public spaces
Objective 1.2: To provide affordable housing for low and middle income groups	In Draft DSP (2016-2035), policies has been mentioned to affordable houses to low income people. Draft DAP (2016-2035) has given some strategic actions for providing affordable housing.	SDG 11: Sustainable Cities and Communities Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
Objective 1.3: To mitigate adverse effects of pollution and enhance natural environment	The issue of environmental pollution has been addressed in both plans and some implementation tools has been given to mitigate environmental pollution	SDG 11: Sustainable Cities and Communities Making cities sustainable means creating career and business opportunities, safe and affordable housing, and building resilient societies and economies. It involves investment in public transport, creating green public spaces
Objective 2.1: To increase accessibility to MRT station	In both plans, it was mentioned to enhance the linkage between land use and transport as well as establish accessibility through transportation network	SDG 11: Sustainable Cities and Communities Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special

		attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
Objective 2.2: To create pedestrian friendly environment	In both plans, policies and strategic actions have been proposed to provide a safe and secured environment for pedestrians	SDG 11: Sustainable Cities and Communities Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
Objective 3.1: To ensure access to employment opportunities	Major significance have been to enhance economic growth. Following that, policies and strategies have been proposed.	SDG 8: Decent Work and Economic Growth The SDGs promote sustained economic growth, higher levels of productivity and technological innovation. Encouraging entrepreneurship and job creation. With these targets in mind, the goal is to achieve full and productive employment, and decent

		work, for all women and men by 2030.
Objective 3.2: To elevate informal economic activities into higher productivity levels	In both plans, the issue of accommodating informal business has been addressed. Policies have been proposed to provide economic access to different income group of people.	SDG 8: Decent Work and Economic Growth The SDGs promote sustained economic growth, higher levels of productivity and technological innovation. Encouraging entrepreneurship and job creation. With these targets in mind, the goal is to achieve full and productive employment, and decent work, for all women and men by 2030.

CHAPTER 08: DESIGN PROPOSALS

Design proposals have been proposed under each objective for implementing the transit oriented development schemes with a view to develop a distinctive urban TOD around Agargaon metro station, which will achieve the vision for making a livable, functional and economically efficient TOD area.

8.1 Objective 1.1: To promote compact development around transit station

Four zones in the study area has been considered for land redevelopment to build a compact neighborhood. Within the one kilometers radius of the transit station in the study area, compact development with high-density residential units and provision of compatible mixed use is proposed for 500m TOD precinct, zone A: residential cluster at the periphery, zone B: residential cluster beside the restricted area, zone C: government quarters and housing complex adjacent to zone A. Redevelopment potentials for the selected four zones has been evaluated.

a) 500m TOD precinct: There is a government housing quarter within 500m area of transit station. The average building height (floor numbers) of residential units is 1.19 which indicates a lower

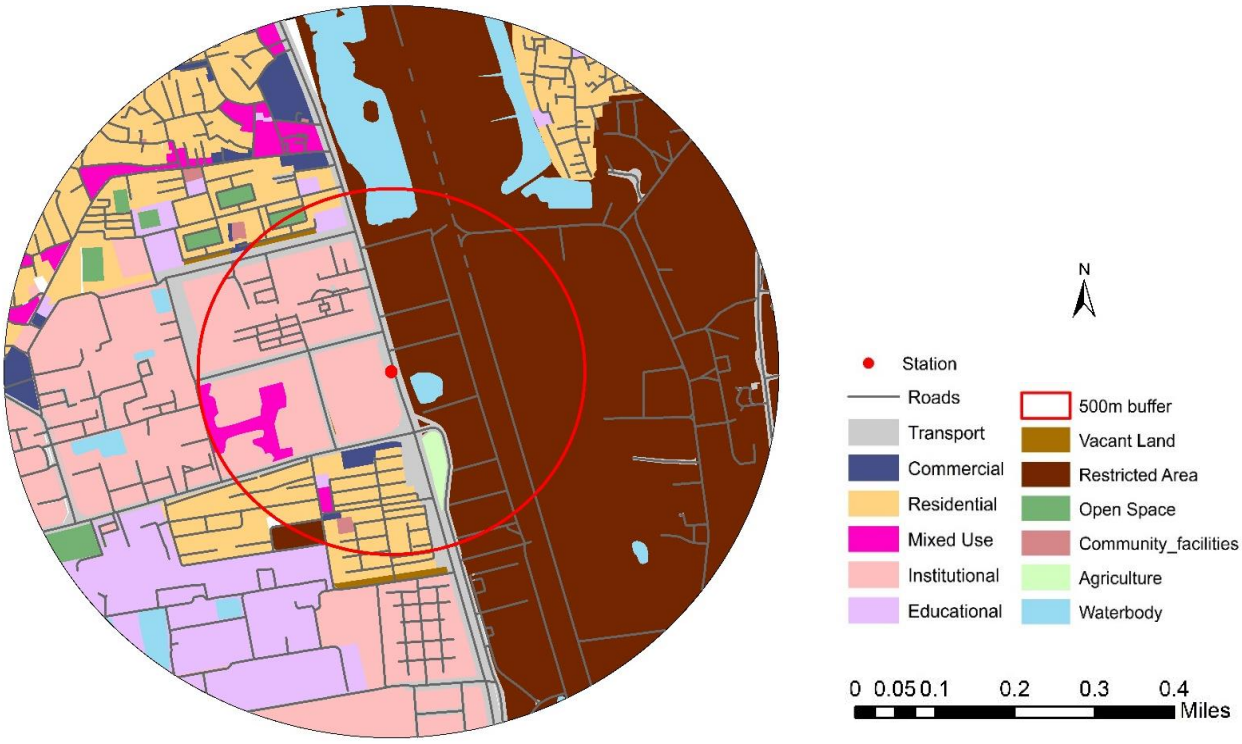


Figure 8.1: Existing Land Use Map of Agargaon TOD Area

density. According to Draft Density Zoning 2018, 12 stories for housing units are allowed in TOD precinct. The average building age in the area in 30 years and most of the buildings are 30 to 50 years. Considering these factors, it can be stated that there is an opportunity for redevelopment.

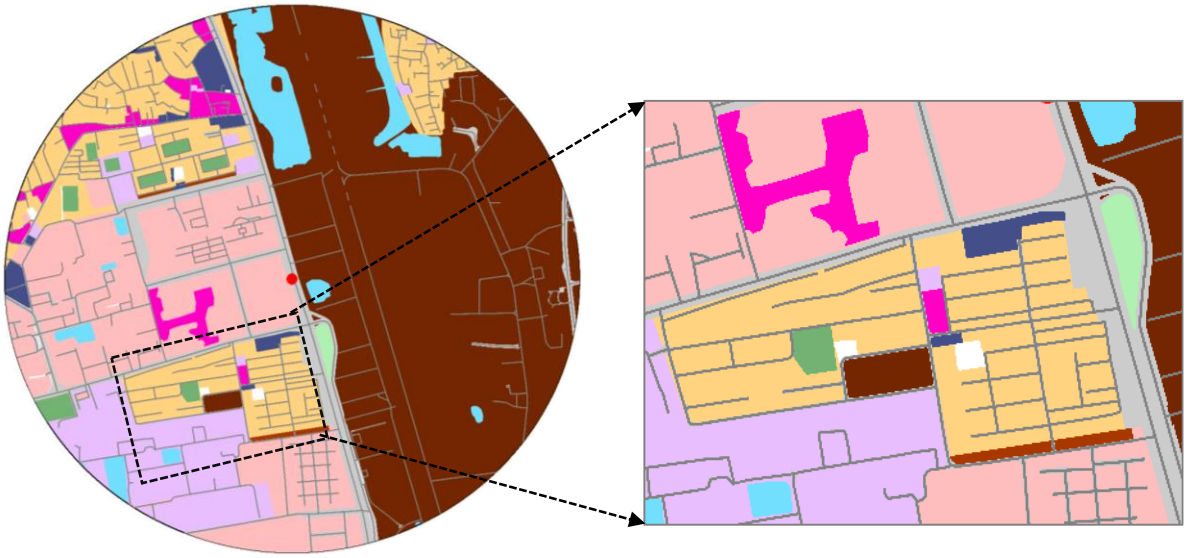


Figure 8.2: Existing government quarter within 500m TOD precinct

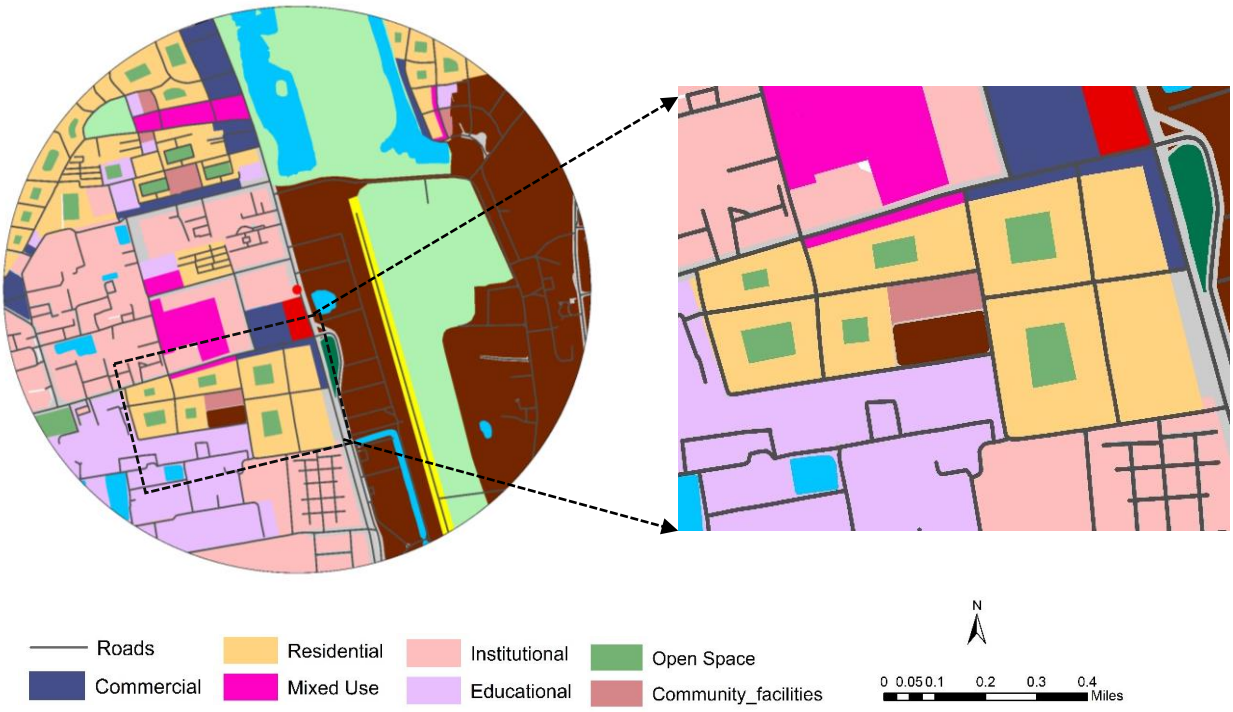


Figure 8.3: Block based development in the government quarter

Redevelopment within 500m TOD precinct: Block based housing development has been proposed to rebuilt the government quarter to encourage high-density residential land use (Figure 8.3) In Draft DAP, 2016-2035, it was mentioned that old government quarters could be brought under redevelopment for block-based housing development. Community facilities has been provided within the residential neighborhood.

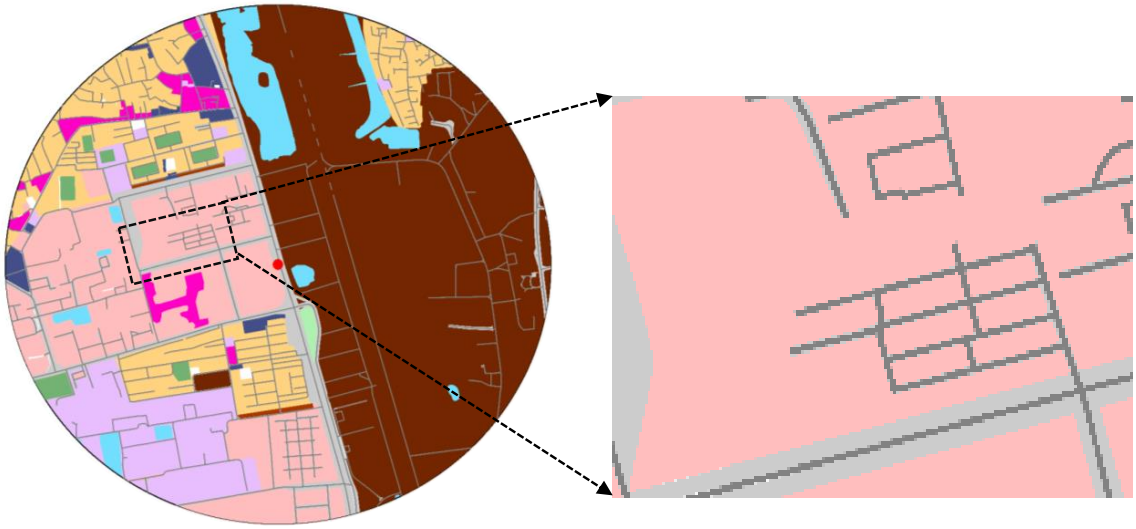


Figure 8.4: Low density housing complex and low income housing units in the adjacent land

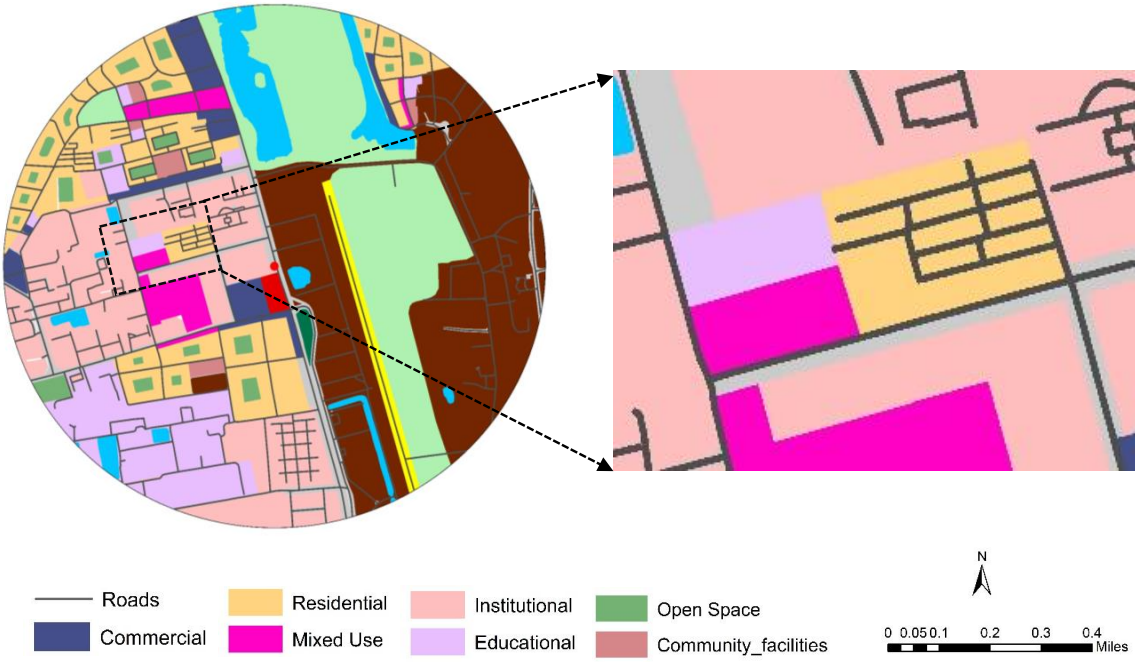


Figure 8.5: Redevelopment of high density housing unit and mixed land use in the adjacent land

In figure 8.4, there is situated a housing complex with low density and a low income housing is identified adjacent to the housing complex. For redevelopment, high density residential units will be rebuilt in the housing complex and in the adjacent land, mixed land use will be provided (Figure 8.5). 15-storey residential units will be constructed within 500m TOD precinct. The people of the low-income housing will be relocated in the affordable public housing units near transit station.

Provision of mixed land use within 500m TOD precinct: The percentage of mixed land use within 500m TOD area is very low. To promote compact development, providing mixed land uses

Figure 8.6: Provision of mixed land use within 500m TOD precinct

wthin residential neighborhood in one of the mandatory development scheme that will reduce travel frequency. More spaces have been allocated for the provision of the mixed land within 500m of the study area (Figure 8.6)

b) Zone A (Residential cluster at the periphery): The average building height (number of floors) of this residential cluster in the study area is 1.97 which indicates a very low density in a residential cluster. According to Draft Density Zoning 2018, 12 stories for housing units are allowed in TOD precinct. The average building age is 30 years; most of the buildings are 30 to 50 years. In the

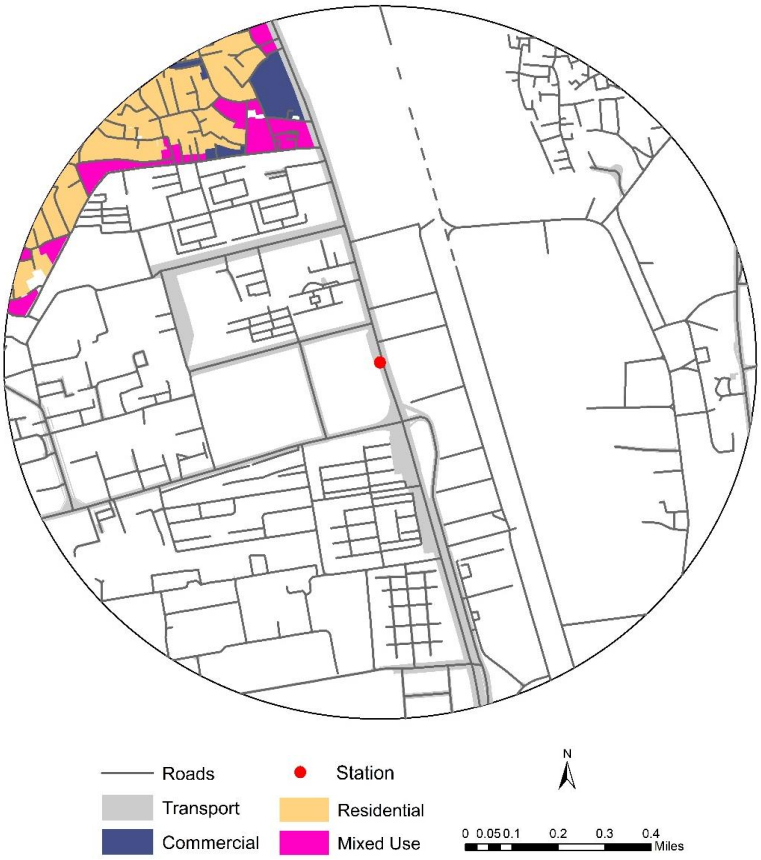


Figure 8.7: Existing Land Use of Zone A

residential cluster, existing land uses are residential, commercial and mixed use. Development of residential land uses has been occurred in an unplanned way. There is lack of open space, parks and playground in the neighborhood. There is a massive opportunity to redevelop this residential cluster into a compact neighborhood and guide its future growth to control the unplanned urban sprawl.

Redevelopment of Zone A: From the data analysis it is seen that residents' highly preferred land use is open space (preferred index value 1.38) following by residential land use (preferred index value 1.15). Block based development approach has been applied here. In the block based development high density housing building are constructed and a common open space is kept within a block. The open space can be used as community space for the residents which will help to build social capital. The open space within a block will also work as a urban breathing place among the high rise buildings.

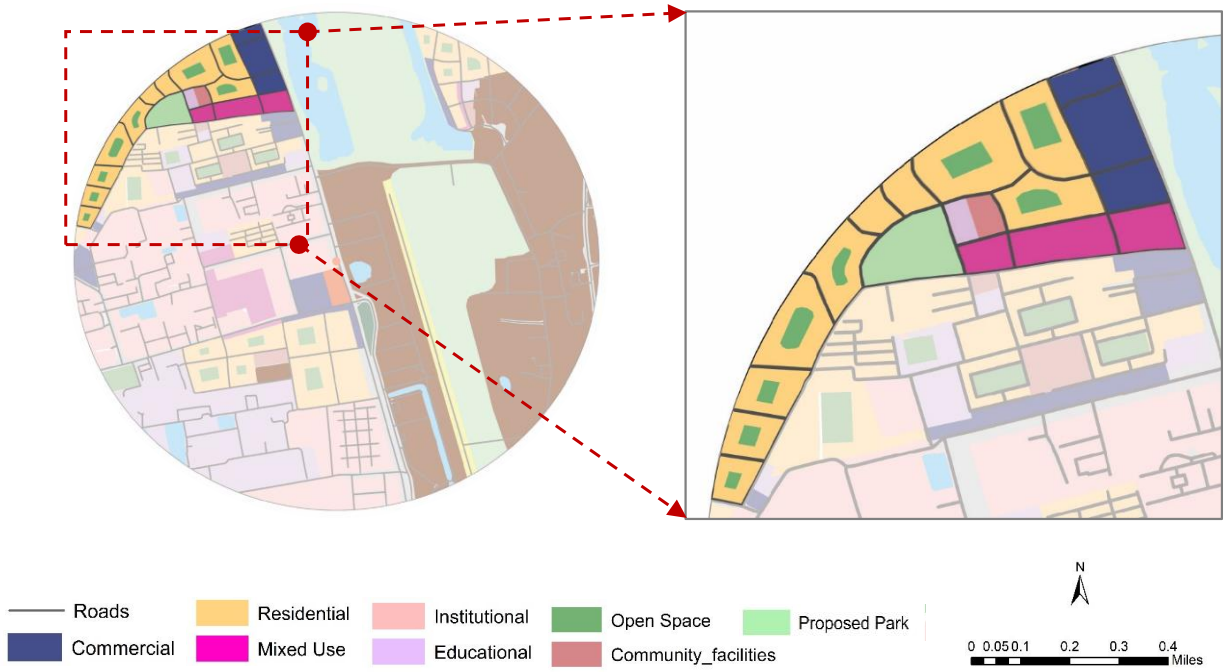


Figure 8.8: Proposed Land Use of Zone A

A local park of 5 acre is provided in this area to serve the neighborhood. Commercial uses are provided beside the Arterial road (Begum Rokeya Sharani) as land value is higher. Provision of mixed use has been done beside the collector road to keep local services within 10minutes walking distance. Along with this, a school and other community facilities are provided for the neighborhood. 8 to 10 storied residential buildings, 12 storied mixed use buildings and 15 storied commercial buildings will be developed in this area. Private developers has an opportunity to intervene and redevelop this area.

c) Zone B (Residential cluster beside the restricted area): The average building height (number of floors) of this residential cluster in the study area is 2.25 which indicates a very low density in

a residential cluster. According to Draft Density Zoning 2018, 12 stories for housing units are allowed in TOD precinct. The average building age is 30 years; most of the buildings are 30 to 40

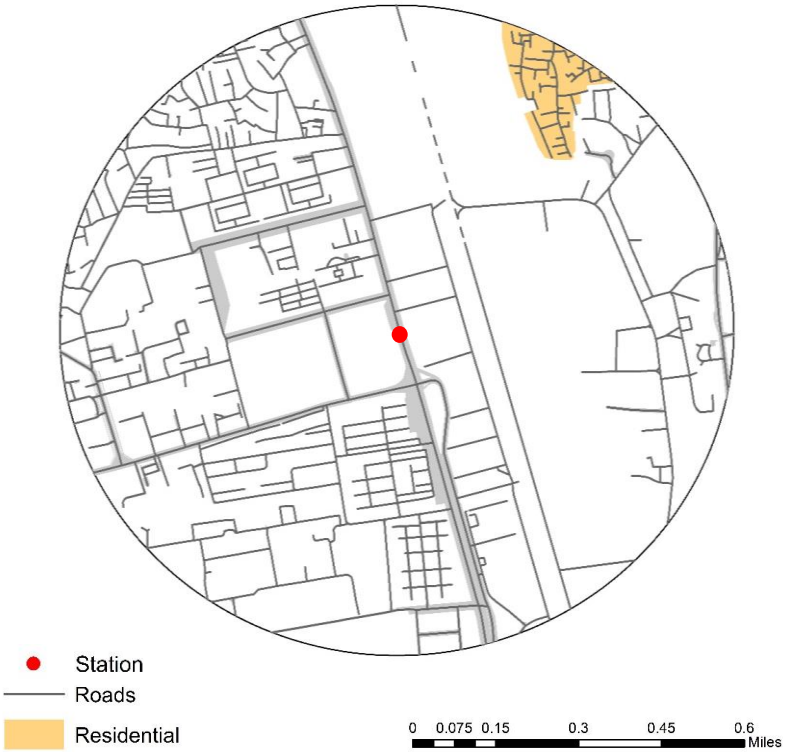


Figure 8.9: Existing Land Use of Zone B

years. In this residential cluster beside the restricted area, only residential land use dominates. There is lack of mixed land use, commercial uses, community facility as well as open spaces. It is necessary to redevelop this area for building a compact neighborhood and for developing a self-sufficient neighborhood, proper integration of different land uses and transportation network is important. In addition, in the questionnaire survey, most of the residents have stated that they do not have the access to the TOD area as the connecting road is restricted by walls. As a result, they are not willing to use the Agargaon MRT station for commuting. Most of the residents have demanded that the connecting road should be accessible and open for all.

Redevelopment of Zone B: Block based development approach will be applied for building residential units. Residents can use the open space within a block as a community open space for social gathering and also, children of the residential units can play. The restricted road will be open for all and accessible and this road will create a linkage between the residential cluster and the

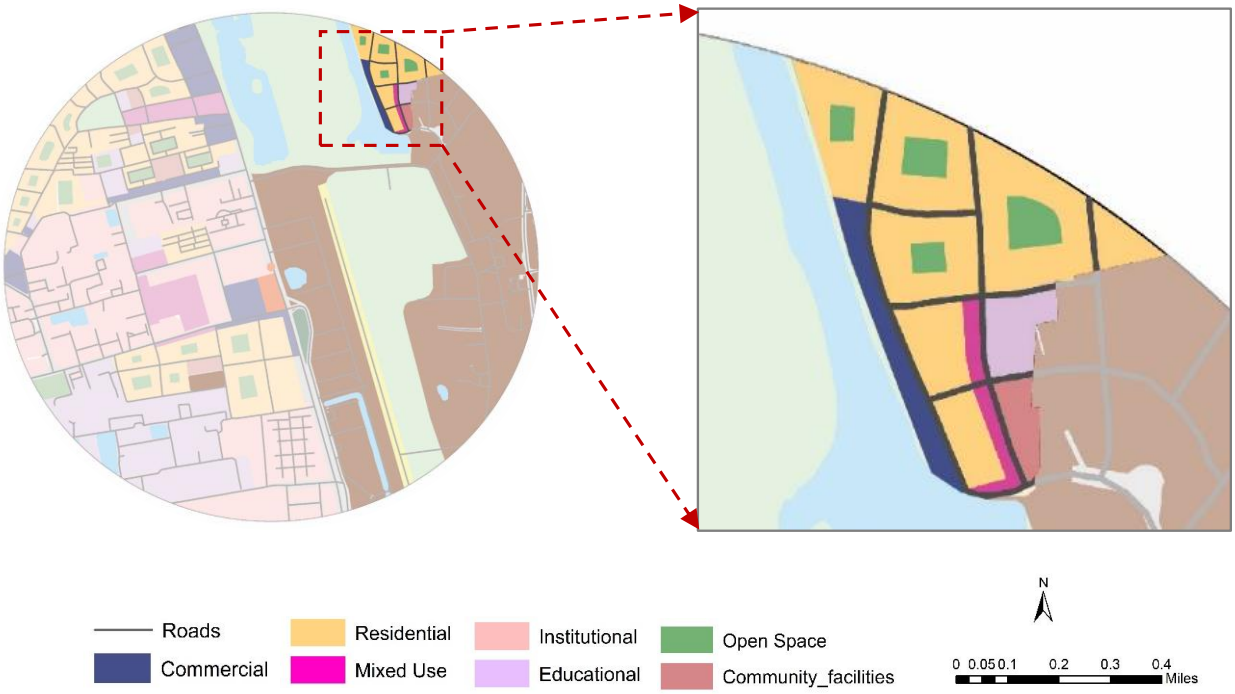


Figure 8.10: Proposed Land Use of Zone B

transit station. The residents will have easy access to transit station. Within this residential cluster, mixed land uses, school and other community facilities will be provided. A large scale park will be built in the restricted area beside this neighborhood. A pedestrian pathway will be constructed between the park and this neighborhood so that people can use the pedestrian path for active recreational use (morning or evening walk). Beside the pedestrian path a commercial strip will be developed for serving small service to the pedestrian that includes, food stalls, restaurants.

d) Zone C (Government quarters and housing complex): In this zone, mostly residential use dominates as there are government quarters and housing complex. As this residential zone is planned, there is adequate open space and educational buildings. There is lack of community facilities in this area. A few commercial uses are identified in this zone. Zone C has a lower density as the average building height (number of floors) of this residential cluster in the study area is 4.2 which indicates a very low density in a residential cluster. According to Draft Density Zoning 2018, 12 stories for housing units are allowed in TOD precinct. And, the average building age is 30 years which indicates the buildings can redeveloped for promoting high density residential cluster in this zone.

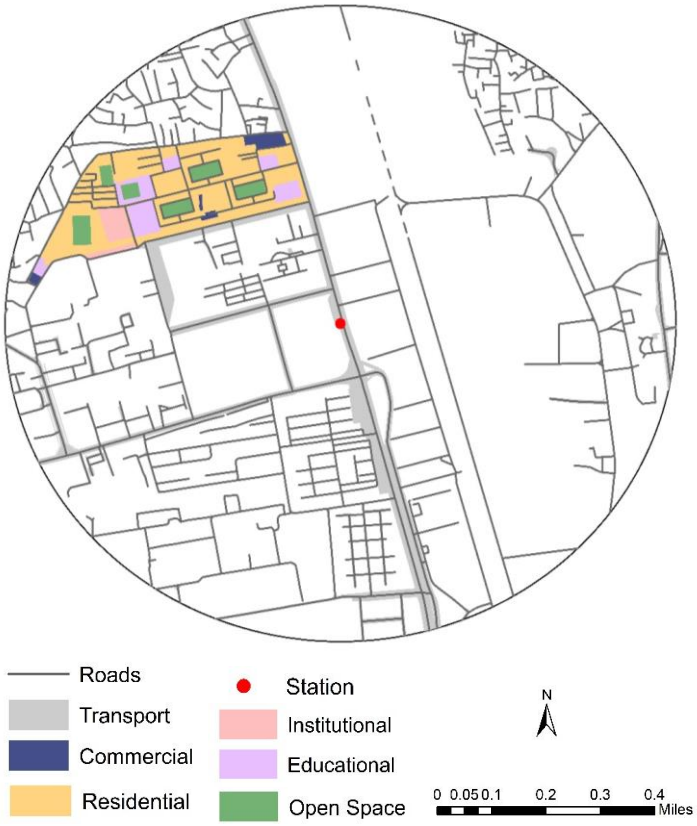


Figure 8.11: Existing Land Use of Zone C

Redevelopment of Zone C: Block based housing development has been proposed to rebuilt the government quarters and housing complex to encourage high-density residential land use (Figure

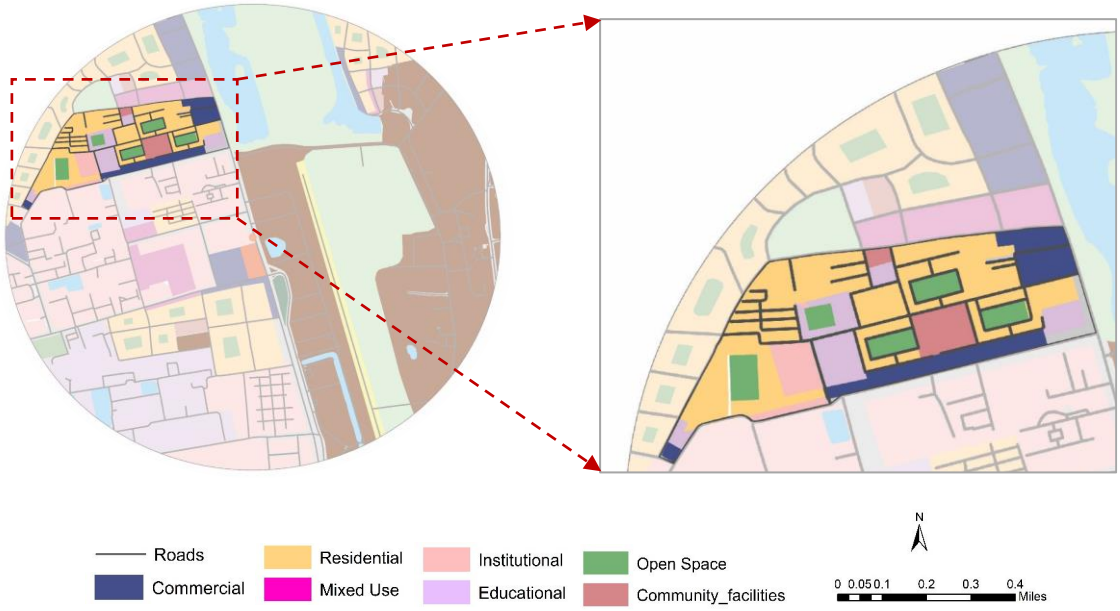


Figure 8.12: Proposed Land Use of Zone C

8.3) In Draft DAP, 2016-2035, it was mentioned that old government quarters could be brought under redevelopment for block-based housing development. Community facilities have been provided to serve the residential neighborhood.

Table 8.1: Summary of the mentioned four zones for redevelopment

Location	**Average Building Height (Number of Floors)**	**Average Age of Building Structure (in Years)**	**Existing Land Use**	**Redevelopment approach**
500m from transit station	1.19	30	Prevailing Land Use: Institutional, Residential (A few commercial and mixed land use)	Block based development for high density residential unit with compatible mixed and commercial use, community facilities
Zone-A	1.97	30	Prevailing Land Use: Residential (A few commercial and mixed land use)	Block based development for high density residential unit with compatible mixed and commercial use, local park, community facilities
Zone-B	2.25	30	Prevailing Land Use: Residential	Block based development for high density residential unit with compatible mixed and commercial use, and community facilities
Zone-C	4.2	30	Prevailing Land Use: Residential (Educational and adequate open space along with it)	Provision of high density residential units preserving existing open space

Justification for Promoting Compact Development:

Rather than focusing on individual parcel based development, to ensure planned and compact urban development, it is desirable to utilize Planned Unit Development (PUD).Planned Unit Development is a method of compact land development which promotes large scale, mixture of compatible land uses and dwelling types. It clearly departs from the old traditional application of zoning regulation by the plot or small block scale. The clustering of residential land uses makes it possible to provide public and common open space as well as some commercial spaces within the project site. This method of residential development will reduce travel to everyday destinations, reducing unnecessary traffic on the street which will help ease traffic congestion. The dwellers will enjoy many social and economic services close to their doorsteps. Compact development, on the other hand, can also secure much needed open spaces for the residents and citizens. (Draft DSP, 2016-2035)

Perimeter Block Development for Group Housing: Perimeter block developments involves one single building or multiple buildings placed along the perimeter of the site to create an internal open space shielded from its surrounding, commonly used as community space. Each housing unit in such developments shall have at least two sides open- one at the internal open space and the other at the external roadside. Depending upon the plot size and population such development may also be permitted to become high-rise development, provided that the internal open space in such development confirms to the criteria for minimum requirements of a courtyard. (Draft BNBC, 2015)

8.2 Objective 1.2: To provide affordable housing for low and middle-income groups

From the questionnaire survey, it is found that affordable rent is one of the reasons for the respondents to live in this area. Fear of increasing housing rent after the completion of TOD is prevailing. People can bear house rent up to 5-10% increase of housing rent. 7% of residential respondents live in this area because of affordable rent while 48.5% people spent 10,000-25,000 for house rent. 37% of them fear of increased house rent and 32% of them may shift in areas close to TOD if house rent increased. People are willing to shift near TOD because they want to avail the additional facilities of transit oriented development. To develop an inclusive urban TOD, it is

important to provide affordable housing units so that different income group of people can live harmoniously. The issue of providing affordable housing has been mentioned both in Draft Dhaka Structure Plan, 2016-2035 and Draft Detailed Area Plan, 2016-2035. In Draft DSP 2016-2035, it has been mentioned that public sector housing agencies should take up housing projects close to transit points and develop high rise (10-12 storied) housing projects for low-income people with affordable rent. In Draft DAP, 2016-2035 mentioned policies regarding affordable housing are as follows:

1. Give 50% FAR incentives to private developers for two units of affordable housing.
2. 10-15% space in residential land development projects taken by the government need to be accommodated for low income housing
3. The existing dilapidated government quarters will have to be rebuilt to accommodate 15-20% of the low-income people.

In our study area, affordable public housing has been provided near transit station within 500m TOD precinct (Figure 8.13). Along with it, 50% FAR incentive will be given to private developers for providing 10% affordable units of housing project while redeveloping the site.

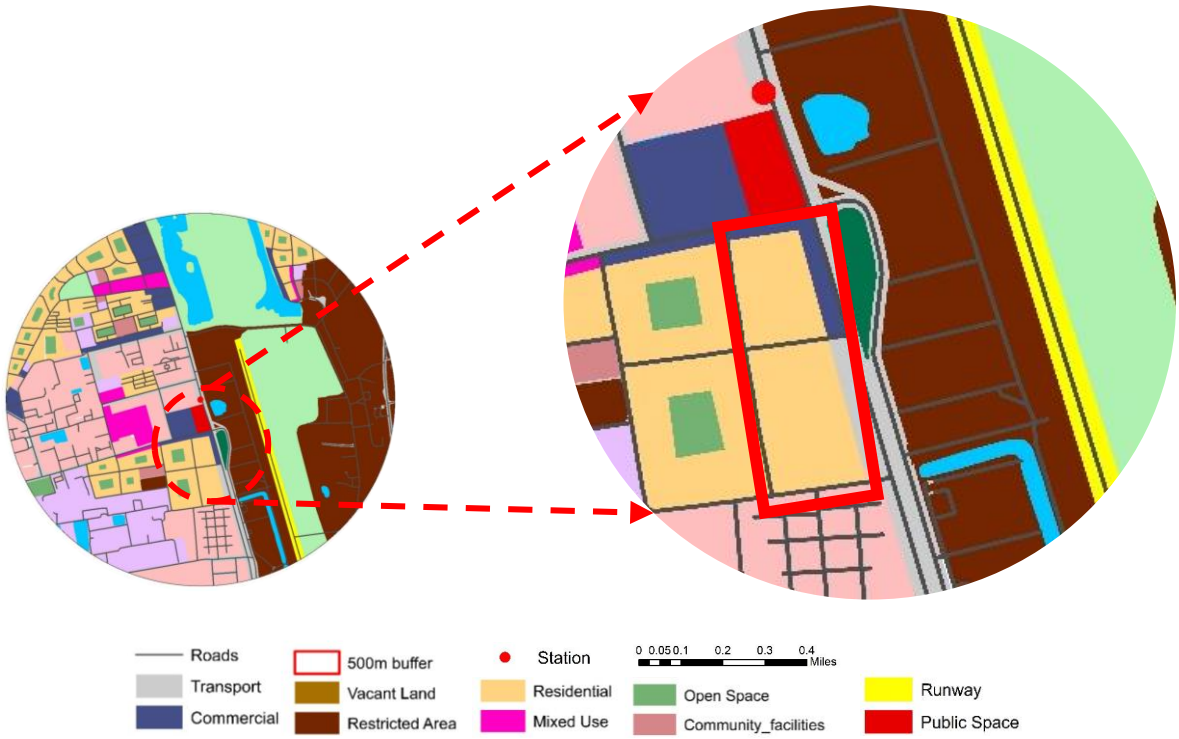


Figure 8.13: Affordable Public Housing near Transit Station

Justification for Providing Affordable Housing:

Apart from providing shelter, for most people affordable housing is the foundation for life's opportunities and a doorway to success. But many households are not able to secure affordable housing, with the problem most acute amongst those on low-to-moderate incomes. (Draft DSP, 2016-2035) About one third of the population live in low-income housing. For any development project, one of the major concerns should be accommodate different income groups and provide them a better lifestyle with livable environment. However, mostly the upper and upper middle-income groups are beneited from their housing projects. City's low-income groups receive a minimal share of their housing. It is our mission to develop a inclusive urban TOD where different income group of people can avail housing and job opportunities.

8.3 Objective 1.3: To mitigate adverse effects of pollution and enhance natural environment

Strategic Action 1.3.1: To reduce the impacts of noise pollution near MRT station

In Draft Dhaka Structure Plan, 2016-2035, a policy has been undertaken to minimize household exposure to unacceptable noise level. It has been mentioned in Draft DSP, 2016-2035 that residential and other sensitive developments should be located and designed to minimize noise impacts while recognizing the benefits of focusing housing around transport nodes or rail corridors. Also, neighborhood, educational institutes and hospitals would be provided with a green buffer zone to create noise preventive healthy environment. Draft DAP, 2016-2035 has proposed some strategies to reduce the noise impacts of transit station on residential and other sensitive use:

- Tree plantation along the major roads to reduce noise impacts.
- Construction of noise insulating walls while building structures to minimize noise impacts
- Dense buffer zones of trees around sensitive land uses.
- Residential housing, school, hospitals should be located at a minimum distance of transit station.
- Control speed of vehicular traffic in residential areas to minimize noise. Allowable maximum speed of vehicular traffic in collector road: 30km/hour

In our study area, there is a school located beside the transit station which may have noise impacts in the future after the completion of MRT station. Considering this fact, it has been proposed to relocate of Sher-e-Bangla Nagar Government Boys High School from the transit station (Figure 8.14) Along with this strategic action, other measures are taken to reduce noise impacts, which include:

1. Buildings within 200m of the transit stations would be constructed using sound insulating building material. Purpose built noise barriers made of bricks, concrete, fibreglass, fibre reinforced plastic or other materials can also be used to protect buildings from noise, external walls or partitions should have appropriate Sound Transmission Class (STC) to reduce external noise to the acceptable indoor background noise levels. (Draft BNBC, 2015)

2. It might be a preferable option to place a noise tolerant buffer zone, developing green belt, public gardens etc. between a noisy zone and a quiet zone. (Draft BNBC, 2015) Planting evergreen trees and thick bushes surrounding 100m of sensitive building uses (Hospitals)

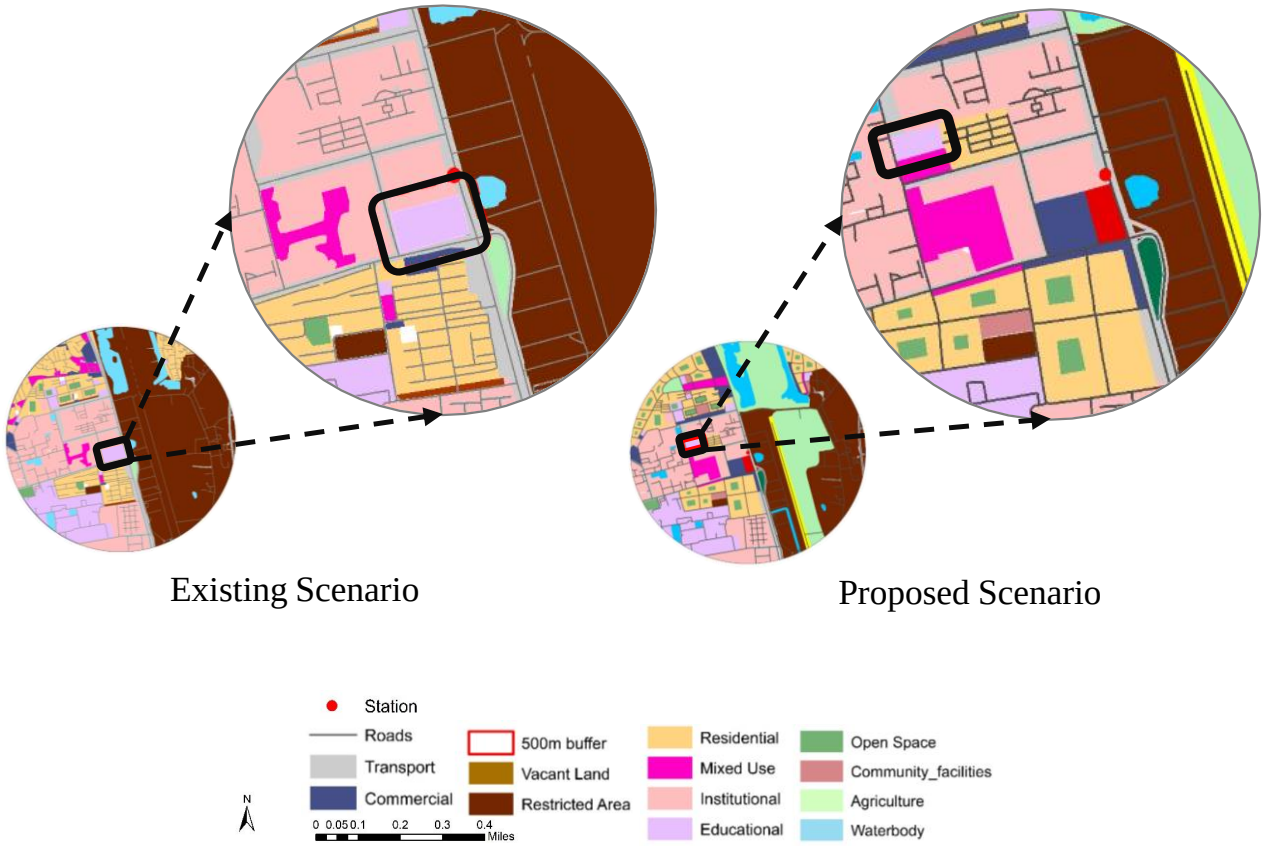


Figure 8.14: Relocation of Sher-e-Bangla Nagar Government Boys High School from the transit station

Justification for relocating Sher-e-Bangla Nagar Government Boys High School beside Agargaon transit station:

After the completion of MRT station, noise level may increase near transit station. According to National Institute of Deafness and Other Communication Disorders (NIDCD), human can tolerate the sound level at or below 70dBA which is considered safe. People who are exposed to noise levels at 85dBA or higher over a long time are at a risk of hearing loss (NIDCD). Noise impacts may arise on the students of the school after the completion of MRT station. Students may face hearing loss, loss of concentration due to increased level of noise. As of result of which, it is necessary to relocate the school before the opening of Agargaon MRT station.

Strategic Action 1.3.2: To promote green environment

From the questionnaire survey, after the analysis of the collected data it is found that majority of the people agreed that the restricted area should be transformed into a large scale park to built a urban breathing place in high density urban development. 30% of Residential respondents consider lack of open spaces as one of the major problems of this area. Open spaces are the most preferred land use to residential (preferred land use index: 1.38). 98.48% of the residents want more open space and 88% of them want the Old Airport to be developed as park. Considering the

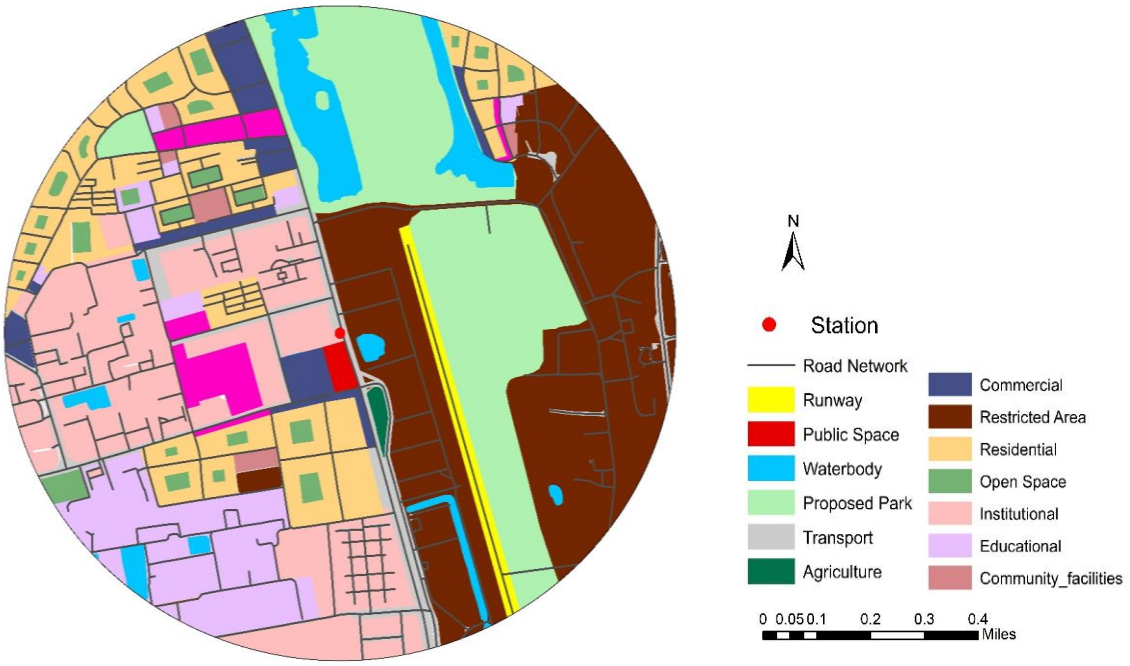


Figure 8.15: Developing the open space of Old Airport as a large-scale park

facts, a large-scale park will be developed in the restricted area (park size: 100 acre, service area: two miles radius) which will be accessible by all (Figure 8.15). In the park, there will be provision of circulation, walking trail, plantation, shading trees, grass bed, water body, resting area, seats for active as well as passive recreation for the citizens. The runway in the old airport will be conserved.

Walking trail

Source: The Daily Star, 2021

Waterbody

Source: The Business Insider, 2019

Cycle Lane

Source: Prothom Alo, 2021

Shading trees

Source: The New York Times, 2022

Grass beds

Source: CNN, 2018

Resting area

Source: CNN, 2022

Figure 8.16: Provision of circulation, walking trail, cycle lane, plantation, shading trees, grass bed, water body, resting area, seats in the park

Justification for transforming the 'Old Airport' as a park: In Draft DSP 2016-2035, it was mentioned that a green network would be created centering the old airport by transforming it into a central park of the Dhaka city. The ration of open space in Dhaka city is only 0.9% to the total area. In core Dhaka city available open space are in vulnerable state due to illegal encroachment and mismanagement. In a very high density city like Dhaka, open spaces serve as life blood for urban living. They must be preserved to improve quality of life of the millions of urban dwellers desperate for leisure to get rid of everyday monotony (Draft DSP, 2016-2035). A large percentage of land is under utilized in the old airport (46% open space) in Agargaon. Residents are not allowed to access the restricted area. Also, there is lack open spaces and parks in residential clusters of Agargaon and residents are confined to built-up urban as they lack opportunity for active recreation

in parks and green spaces. Transforming the old airport will not only serve the residents of Agargaon TOD area but it will also play the role of urban breathing place for whole Dhaka city and reduce the impacts of urban heat island.

8.4 Objective 2.1: To increase accessibility to MRT station

Strategic Action 2.1.1: Facilitate Use of Non-Motorized Vehicle (Rickshaw and Cycle) and Discourage the Use of Automobiles

After the analysis of collected data from questionnaire survey it was found that majority of the people prefer 'Rickshaw' as dominant travel mode to access public transport while going outside of the TOD. No people prefer using 'Bicycle' as there is lack of secured bicycle lane and other facilities. Considering the facts, a secured and connected bicycle network will be created in the TOD area. The following measures will be considered to create safe and secured bicycle network:

1. Construction of separated bicycle lane along Arterial road, collector road and proposed new road.
2. Maximum width of the bicycle lane should be 6 feet (1.8 meter), (National Association of City Transportation Officials)
3. Bicycle lane symbol, markings, and no parking symbol on lanes.

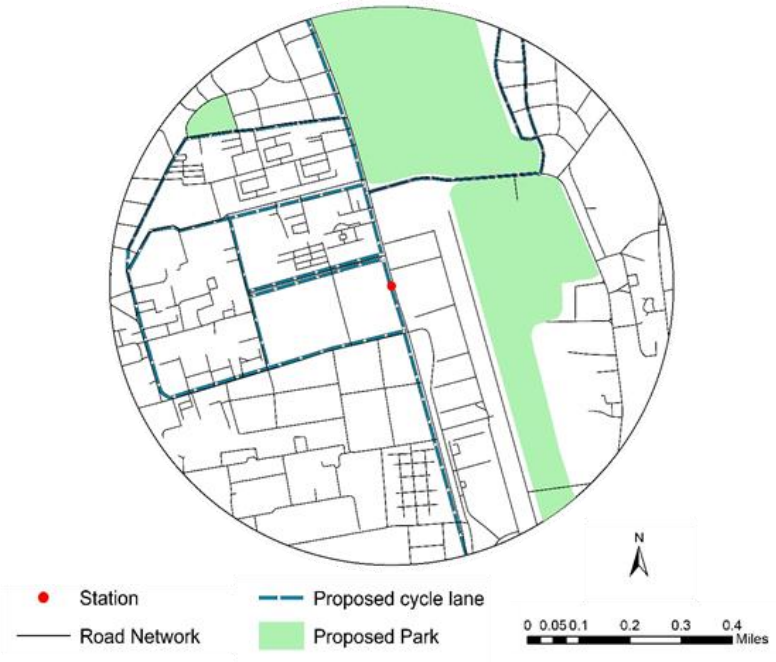


Figure 8.17: Proposed bicycle network inside TOD area

4. Provision of bicycle parking within 50m of the transit station. Space designated for car parking in front of IDB building to be used as bicycle parking space.

Discourage the use of motorized vehicles: The restricted road in old airport will be reopened and accessible by all to connect the residents in the restricted area with the transit station. But, motor vehicles will not be allowed on that road, walking and cycling will be permissible on that road to access transit station. As a result, people who use car have to use alternative route which will increase their travel time and cost of fuel. Consequently, people will reduce the use of motorized vehicles and prefer using active transport (walking or cycling). By implementing this scheme, carbon footprint will be reduced as well as there will be positive impacts on people's health and natural environment. Also, car parking provision will be limited in the area.

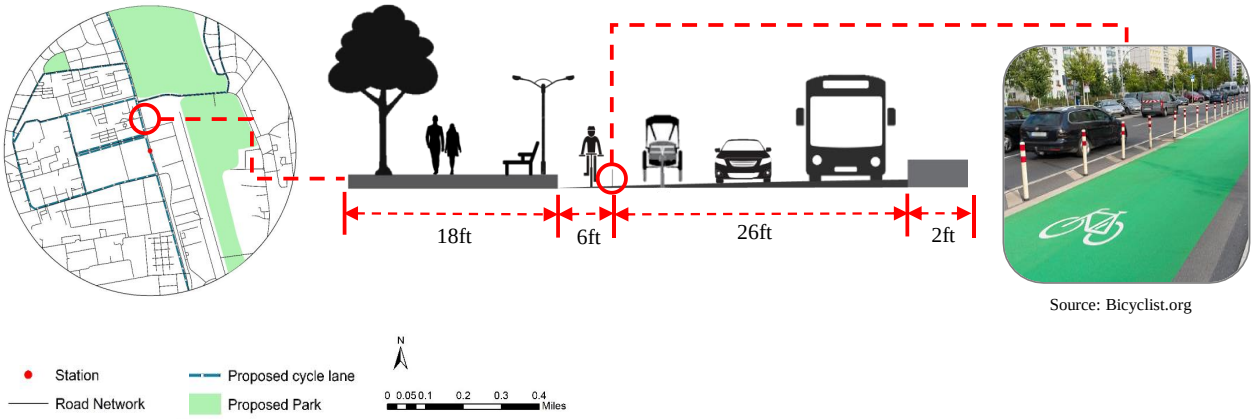


Figure 8.18: Proposed Bicycle Lane: Arterial Road (Begum Royeka Shoroni)

Physical barriers will be used for bicycle lanes on Arterial roads because there is high traffic volume and fatal accidents may occur if bicycle merges with motorized vehicles. (Figure 8.18)

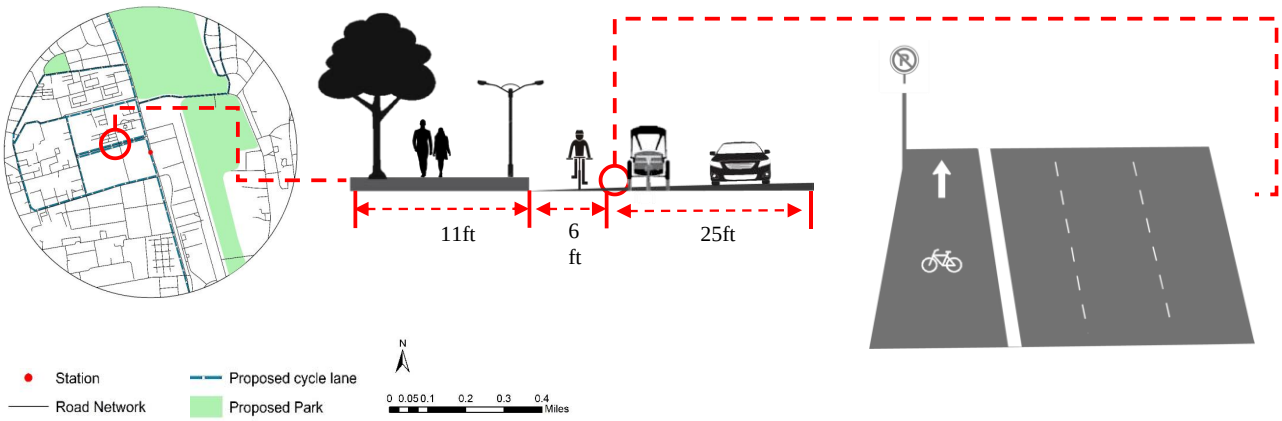


Figure 8.19: Proposed Bicycle Lane: Collector Roads

Physical barrier is not needed no collector roads for separating the bicycle lane as there is less traffic on collector roads. Solid white line marking will be used for separating the lanes. No parking sign will be used to prohibit on-street parking and encroachment of bicycle lane.

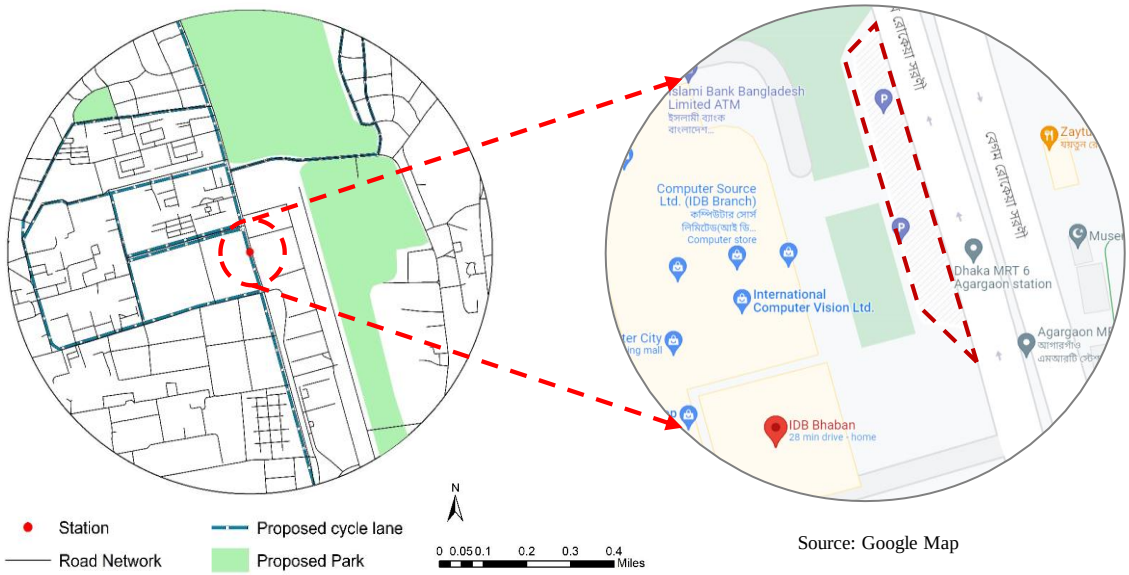


Figure 8.20: Existing Car Parking in front of IDB Building, Agargaon

The car parking in front of IDB building of Agargaon will be converted into bicycle parking to reduce the use of car and facilitate the use bicycle. This parking space is within 50m of transit station and can accommodate up to 60 bicycle.

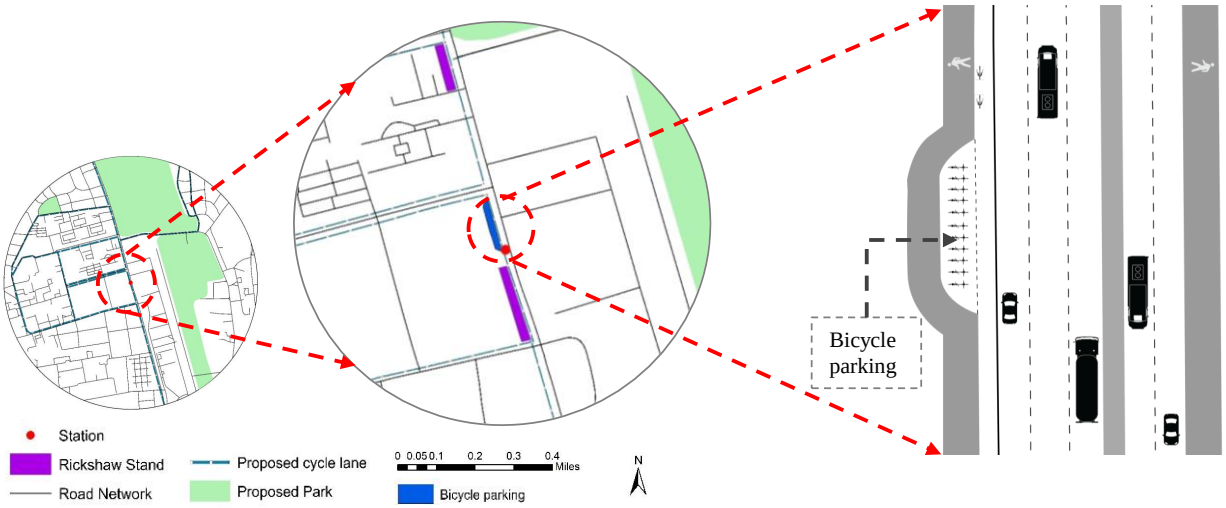
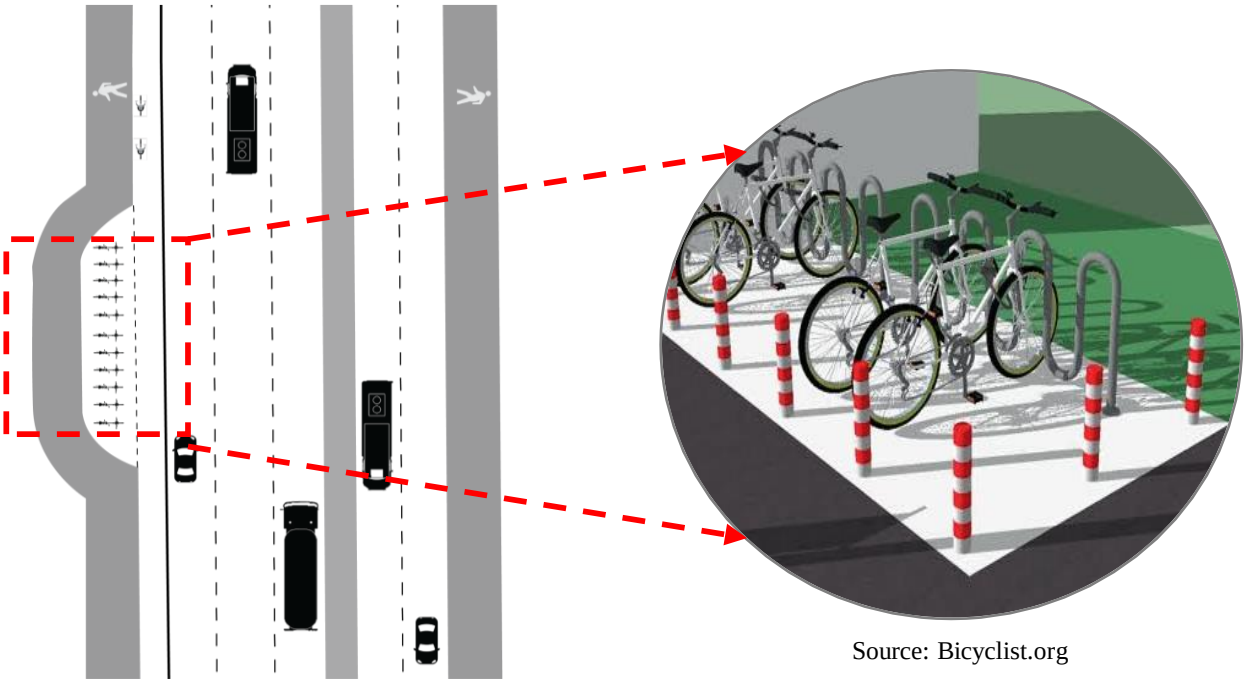


Figure 8.21: Proposed Bicycle Parking in front of IDB Building, Agargaon

Along with the bicycle parking, two rickshaw stands will be provided near transit stations. One of the major mode to access public transport is 'Rickshaw' and the use of rickshaw will increase after the completion of MRT station. Accumulation of rickshaws on major intersections near transit station will increase traffic congestion. Hence, this fact has been taken into consideration and rickshaw stands beside the Arterial road have been provided so that rickshaw can easily pick or drop passengers without creating any congestion on street.



Source: Bicyclist.org

Figure 8.22: Bicycle Parking in front of IDB Building, Agargaon

The bicycle parking in front of IDB building will be rent free. It will be guarded as it is outdoor parking. The provision of bicycle parking will be perpendicular with the bicycle lane.

Justification for promoting non-motorized friendly (bicycle) environment inside TOD: Cycling gives another convenient, inexpensive, and sustainable option for efficient transport inside the neighborhood and beyond if the road conditions are safe. It combines the convenience and flexibility of door-to-door commuting. It also provides numerous health benefits due to increased physical activity. Cycling is a highly efficient mode of transportation that uses little space and resources. Cycling allows the citizens more freedom and access to many services that may be out of walking distance. (ITDP, 2022)

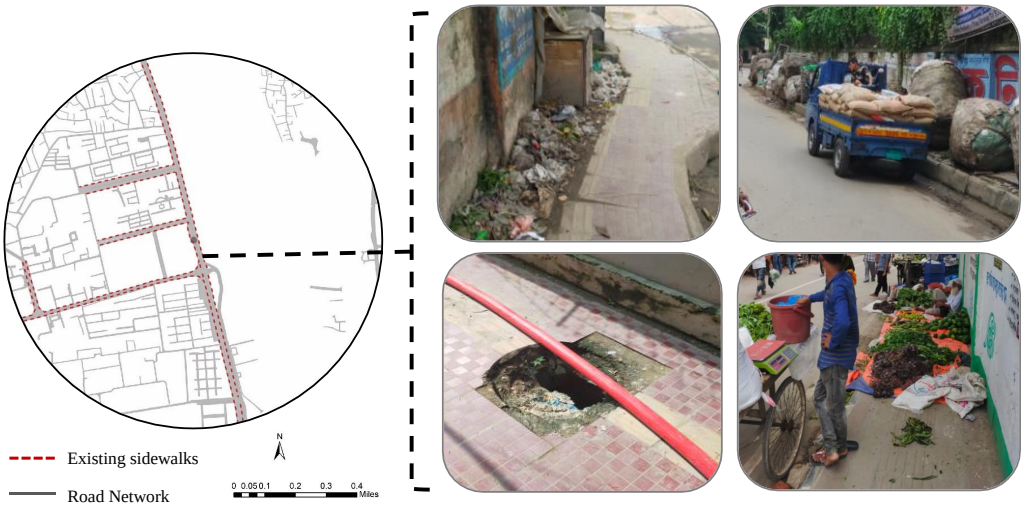
A green strip along bicycle lanes has been proposed in the TOD area to enhance the natural environment. Evergreen trees will be planted along the proposed green strip, cutting down of trees will be prohibited in the area.

Figure 8.23: Proposed green strip inside TOD area, Agargaon

8.5 Objective 2.2: To create pedestrian friendly environment

Strategic Action 2.2.1: Provide pedestrian friendly, safe, and secured sidewalks and crossings.

According to the analysis of the collected data from questionnaire survey, it is found that active transport (Walking) are of great priority among the respondents, one of the major modes for



Source: Reconnaissance Survey

Figure 8.24: Conditions of Existing Sidewalks in Agargaon

commuting inside TOD area is 'Walking'.13% of the residential respondents expect better pedestrian network and 97% of them want footpath upgrading. The conditions of existing sidewalks is very poor.

The key elements of pedestrian infrastructure are walkways and crosswalks, which are fundamental to safe walking. When designed well, they create a continuous pedestrian network that is safe from cars and accessible for all people including persons with disabilities, the elderly, and caregivers walking and strolling with young children. (ITDP, 2022)

Dhaka Transport Coordination Authority (DTCA) has provided some guidelines to create a pedestrian friendly environment through providing safe sidewalks and crossings.

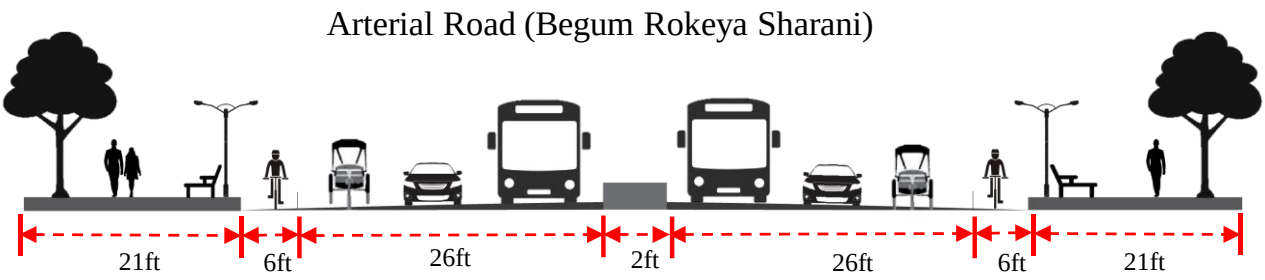


Figure 8.25: Sectional Drawing of Arterial Road (Begum Rokeya Sharani)

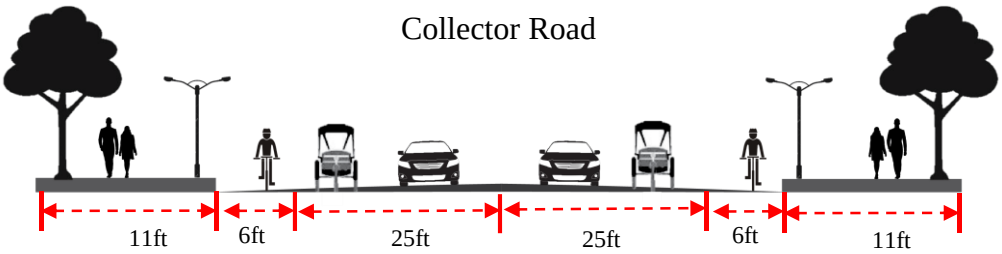


Figure 8.26: Sectional Drawing of Collector Road in Agargaon

According to the guidelines provided by DTCA, the width of sidewalks should be 21ft in the commercial areas. The width is kept wider than the usual sidewalks because in busy commercial areas, more pedestrian flow will be generated. There are 80 to 100 pedestrians per minute in the commercial areas. Hence, the proposed width of sidewalks on the Begum Rokeya Sharani is 21ft as core commercial area will be developed around transit station and it will generate more pedestrian flow in the future. There are three zones of the sidewalks which includes, i) building frontage zone, ii) pedestrian zone and, iii) utility zone. For commercial area, the frontage zone will

be 3ft, pedestrian zone will be 13ft and the utility zone, where street lights and street furniture are provided, will be 5ft.

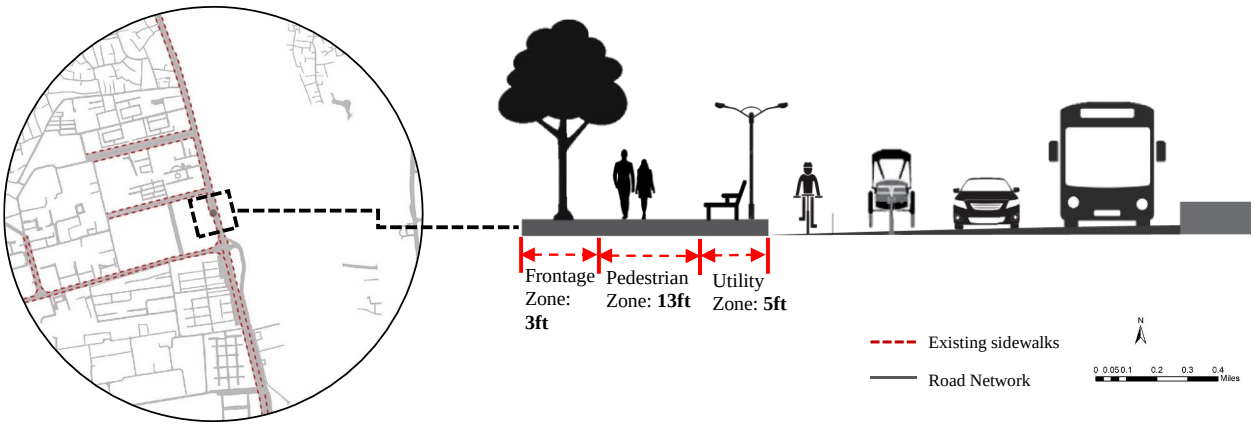


Figure 8.27: Sectional Drawing of Sidewalks on Arterial Road in Agargaon

According to the guidelines provided by DTCA, the width of sidewalks should be 11ft inside TOD in the residential areas. There are 50 pedestrians per minute inside TOD. Hence, the proposed width of sidewalks of collector roads is 11ft. For residential area, the frontage zone will be 2ft, pedestrian zone will be 6ft and the utility zone, where streetlights and street furniture are provided, will be 3ft. Maximum height of sidewalks 0.5ft (DTCA, 2021)

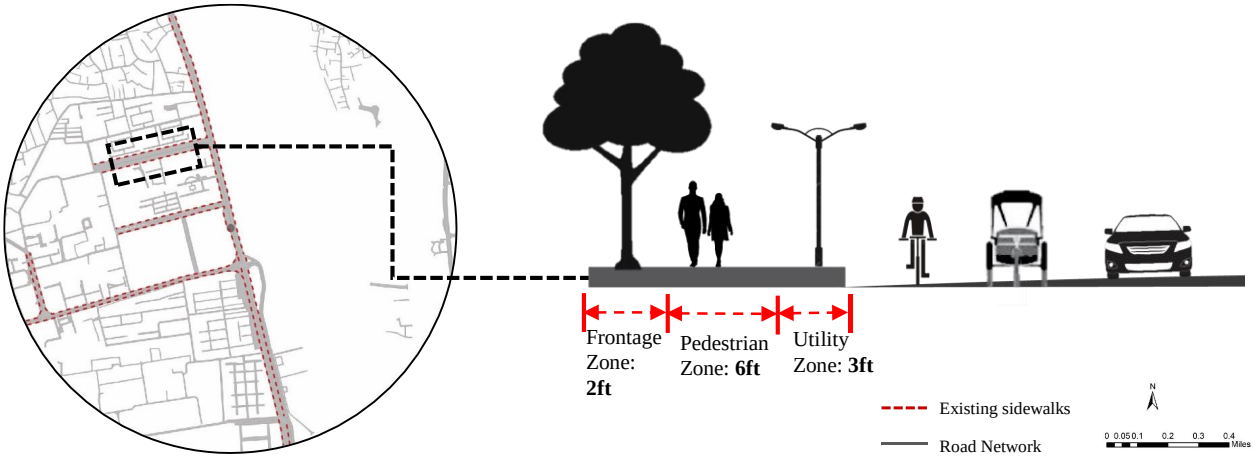


Figure 8.28: Sectional Drawing of Sidewalks on Collector Road in Agargaon

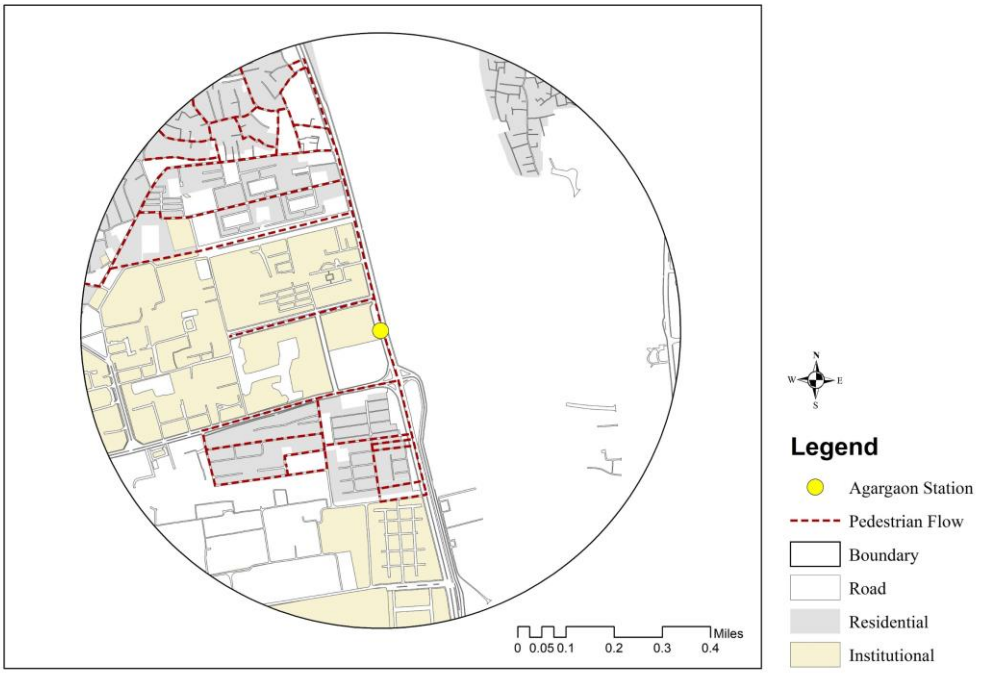


Figure 8.29: Pedestrian Flow inside TOD Area, Agargaon

Figure 8.29 shows the pedestrian flow generated from residential clusters towards the transit stations. There is high flow of pedestrian near transit station. More pedestrian conflicts may occur at major intersections near transit station. Figure 8.30 identifies the vulnerable points for pedestrian at major intersections.

Figure 8.30: Vulnerable points for pedestrian at major intersections.

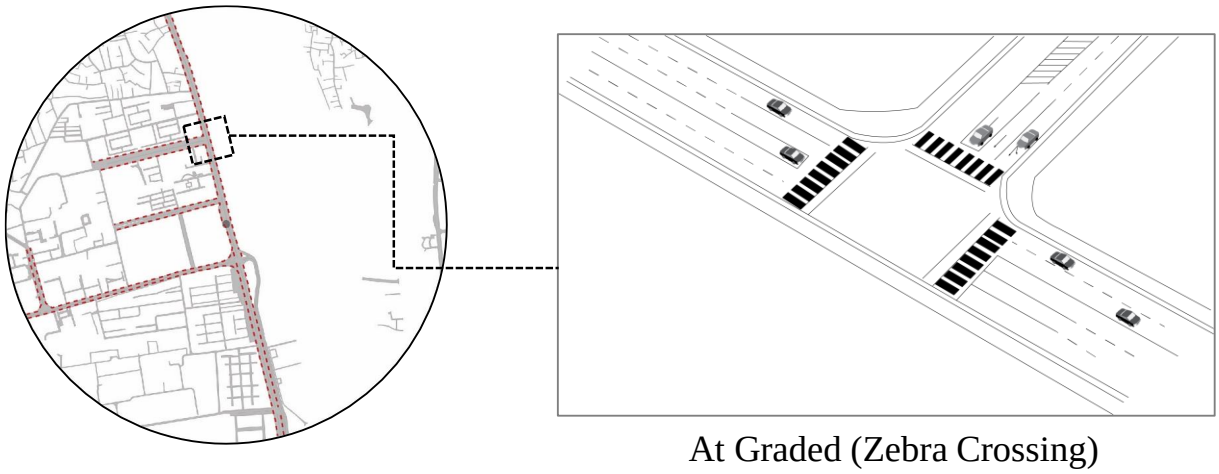


Figure 8.31: Sectional Drawing of At Graded Pedestrian Crossings at 'T' Intersection on Begum Rokeya Sharani

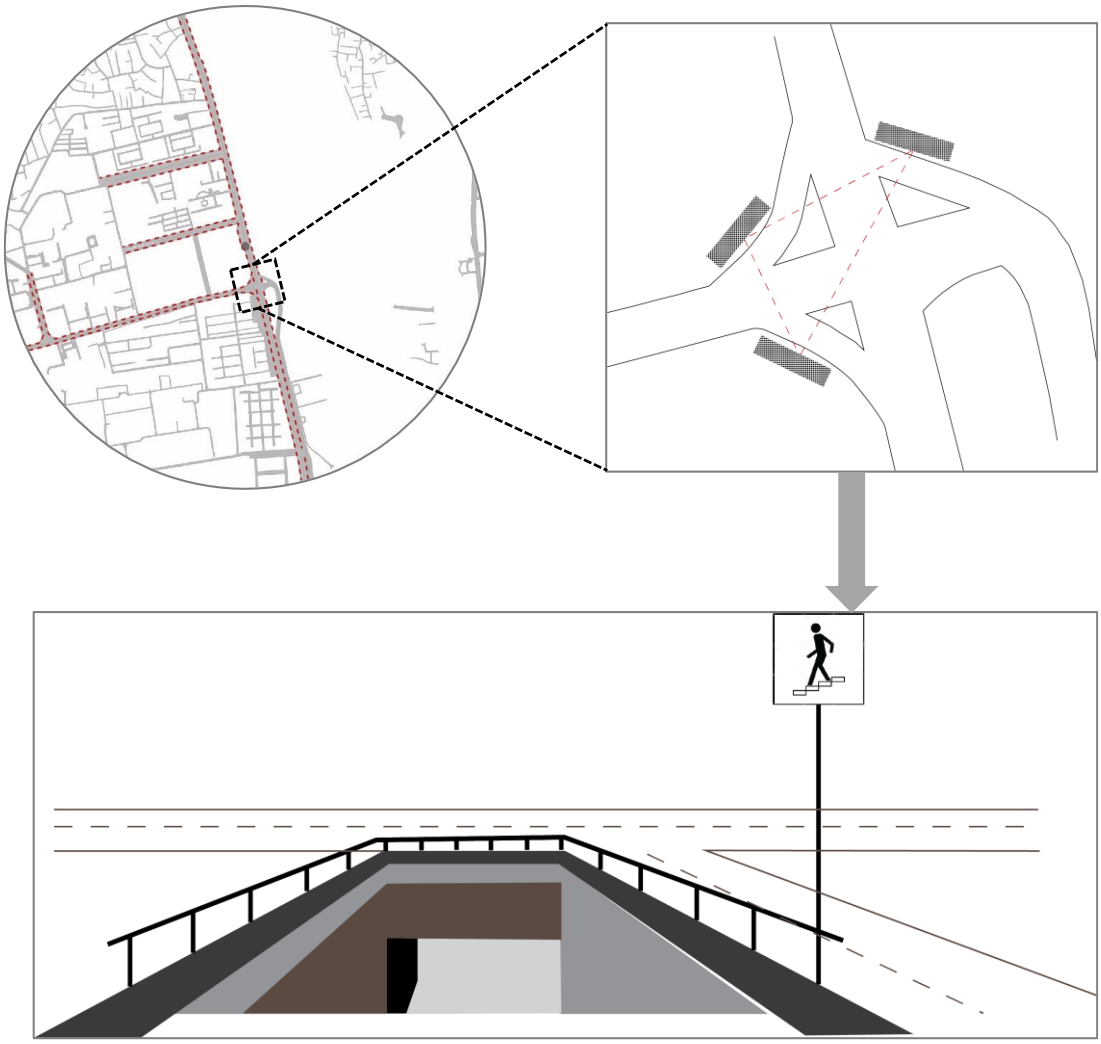


Figure 8.32: Sectional Drawing of Grade Separated (Underpass) Crossings at Cross Intersection on Begum Rokeya Sharani

To ensure pedestrian safety, it is important to provide pedestrian crossings at major intersections of Begum Rokeya Sharani. Pedestrian crossings should be provided at every 200m distance across roads (Draft DAP, 2016-2035). At graded pedestrian crossing at 'T' intersection and grade separated (underpass) crossing at cross intersection will be provided on Begum Rokeya Sharani. Guided tile for visually challenged people will be provided on side walks. (Yellow tiles with textured surface and blister surface on the edges). Provide access between vertical levels for wheelchair users using ramp.

Guided Tiles on Sidewalks for Blind People

Source: The Daily Star, 2021

Ramp on Sidewalks for Disabled People

Source: The New York Times, 2022

Figure 8.33: Safety Measures on Sidewalks

Justification for creating pedestrian friendly environment inside TOD: Walking is the foundation for sustainable and equitable access and mobility in a city and fundamental to the success of inclusive TOD. High-quality, unobstructed, universally accessible pedestrian infrastructure provides basic mobility for all regardless of age, economic status, or physical ability. Inviting features and design which centers around user comfort makes walking more enjoyable and gives people opportunities for interaction and community. (ITDP, 2022)

8.6 Objective 3.1: To ensure access to employment opportunities

Strategic Action 3.1.1: Select strategic locations for establishment of vibrant commercial hubs around transit stations

From the analysis of collected data in questionnaire survey, it is found that commercial land use has the most preference by the commercial residents (preference index value: 1.53). 45% commercial respondents give high rent to do business. Yet, 37% still running their business because of profitable sale. 94% of them want to expand their business after opening of MRT. Majority of the people expect in the increase of commercial activities after the completion of MRT station. As the land value is higher around transit station, developing commercial hubs near MRT station will increase employment opportunity and create a vibrant space.

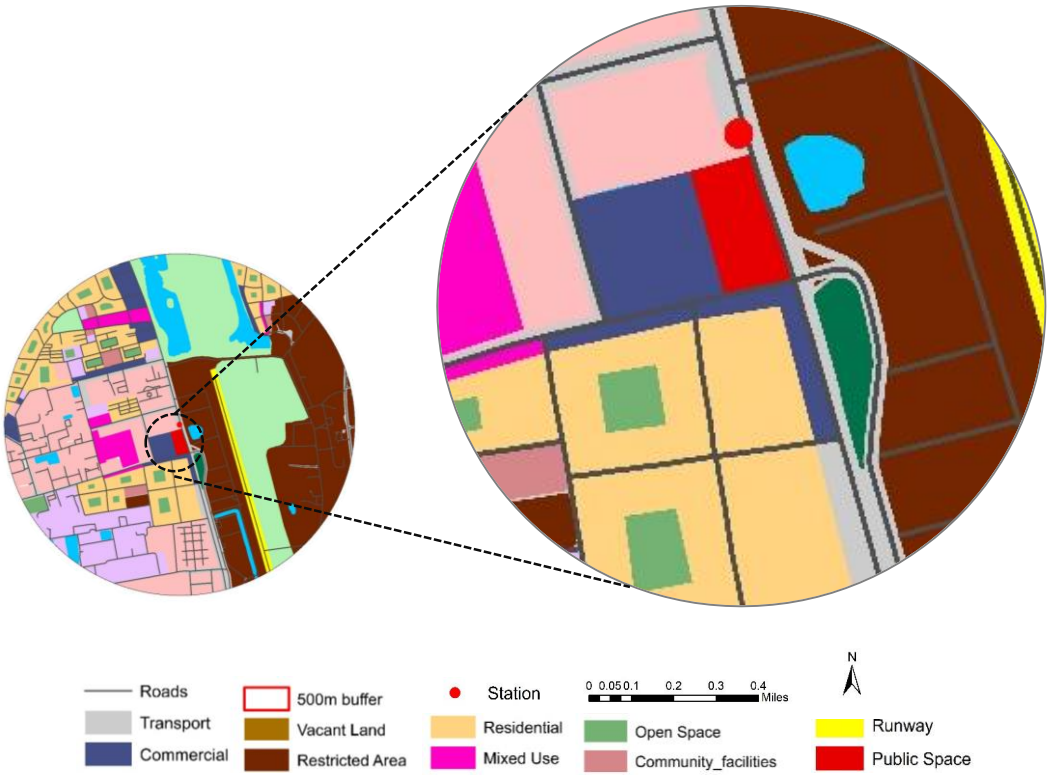


Figure 8.34: Commercial hub near transit station

A large scale shopping complex will be built on the land from where a school is proposed to relocate. Due to higher land value and increased accessibility, this shopping complex will be generate revenues and provide more employment opportunities to the people. In front of the

shopping complex, a public space will be allocated where general public can gather and spend some quality time while waiting for metro rail.

Source: The New York Times, 2022

Source: CNN, 2018

Figure 8.35: Public spaces around commercial hub near transit station

Commercial strips will be provided along roads near transit station to accommodate more business in the TOD area and facilitate employment opportunity so that people do not have to go outside for employment. Employment centres will be provided within walking distance of residential

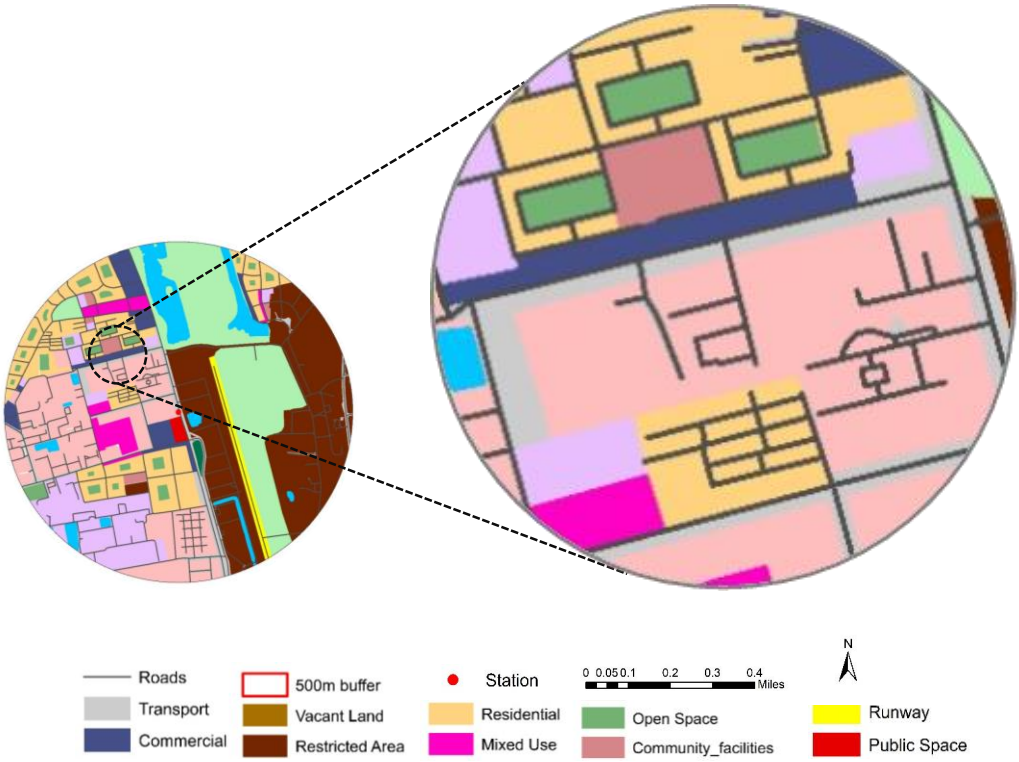


Figure 8.36: Commercial strips along roads inside TOD area

neighbourhood to reduce travel frequency. On street night markets are encouraged after office hours in order to increase security and create a vibrant environment during night. In the night market, different types of commercial activity can occur which includes street food stalls, cloth stalls, grocery stalls etc.

Source: Raohe Night Market in Taiwan (image: http://www.tmichinese.com/cultural-events/raohe-street-night-market/)

Figure 8.37: Vibrant night markets along roads inside TOD area

8.7 Objective 3.2: To elevate informal economic activities into higher productivity levels

Strategic Action 3.2.1: Selection of site for providing informal business activities around transit station

One of the major concern of developing the study area is to accommodate informal activities in the planning scheme. For the reconnaissance survey, it was seen that sidewalks are encroached by informal business. They are always at risk of eviction, as they do not have permanent place for doing business. It is important to accommodate informal activities, as they are a part to the economy. From questionnaire survey data, it has been found that 64% of the hawkers have the capability to pay for lease if the government provide a shop and 45% of them are not willing to relocate even if the government impose a forced eviction.

Source: Reconnaissance Survey

Figure 8.38: Informal activities on sidewalks

Both in Draft DSP (2016-2035) and Draft DAP (2016-2035), some policies has been mentioned for including the informal business and select site for them. In the study area of Agargaon, sites has been selected for informal activities near transit station. Informal business should be kept around transit station so that people can buy their daily necessities from them. According to the mentioned policies in Draft DAP (2016-2035), some measures have been taken for informal activities,

- Provision of informal activities on sidewalks at 50m distance from intersections
- Maximum (6*2) square meter space allocated on sidewalks for each hawker
- Dimension of sidewalks with informal activities provision: 6.6ft for informal activities, 3.3ft for customers, 10.1ft for pedestrians
- Fixed hawkers on sidewalks can operate business for 24/7 hours.
- Active hawkers will do business on street after office hours (5:00PM)

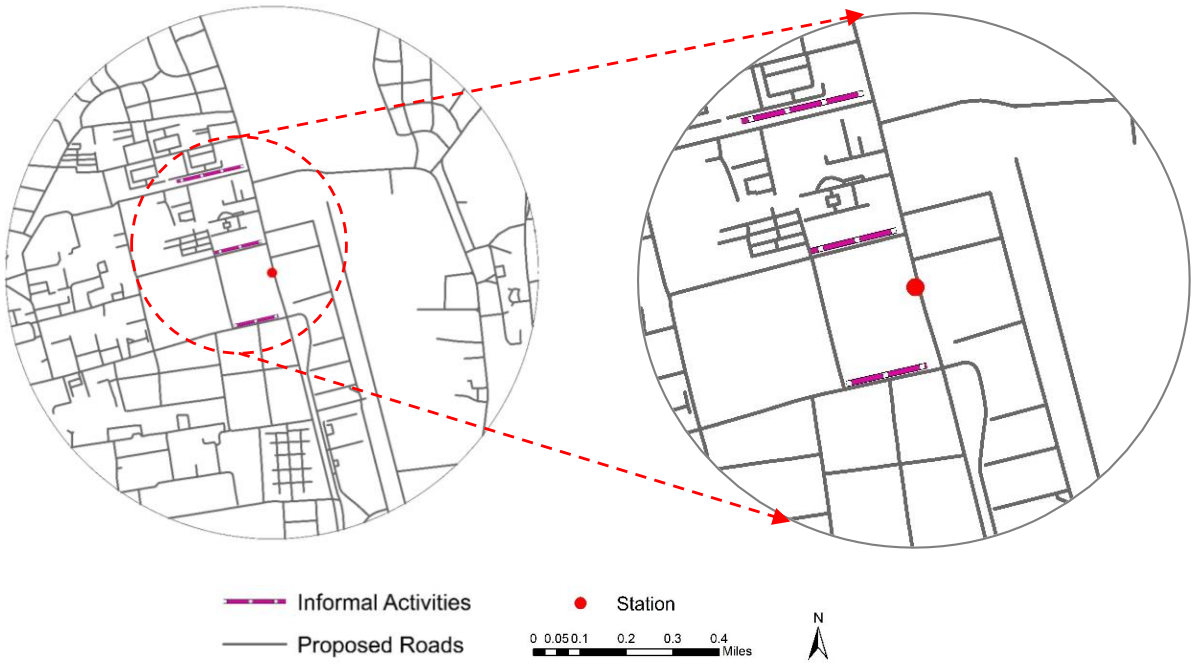


Figure 8.39: Selected sites for informal activities near transit station

In the study area, a particular zone of sidewalks on collector roads has been selected for hawkers. For that, the width of the sidewalks will be 20ft in which 6.6ft will be allocated for each hawker, 3,3ft for the movement of the customers and 10.1ft for pedestrians.

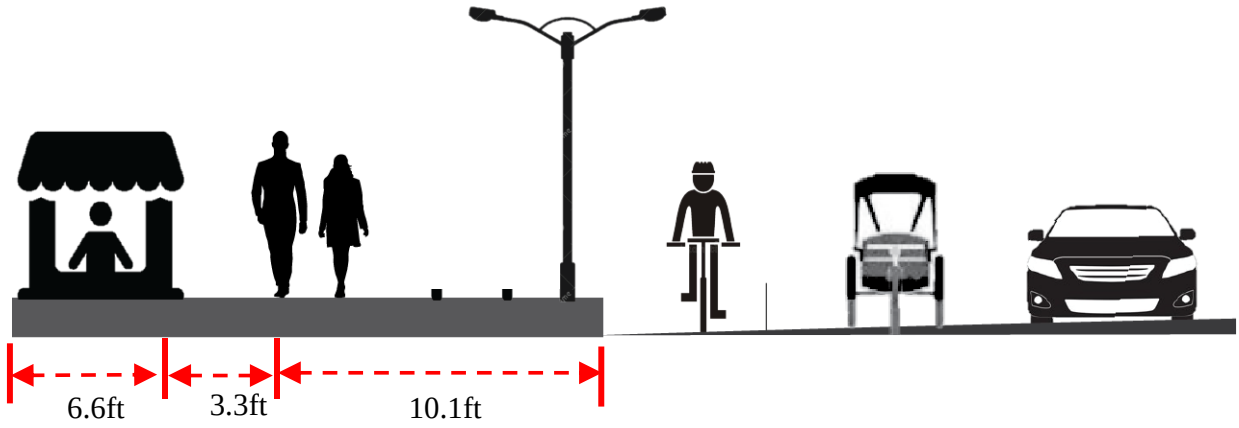


Figure 8.40: Selected sites for informal activities on sidewalks of collector roads

Justification for encouraging commercial activities near transit station: Each transit-oriented development requires a core commercial area, which will include convenient shopping, offices, restaurants, and service commercial, and entertainment uses. Hence, people coming to transit stations can do their daily shopping near station rather than going to any other places. Transit stations attract people with its various commercial activities. Commercial activities near transit station will create employment opportunities for the people living inside TOD. High density residential neighborhoods should be supported by commercial activities otherwise the TOD will not be self sufficient.

CHAPTER 09: MAJOR FINDINGS

Transit oriented development requires integration of different land uses and transportation network for developing a self-sufficient community which promotes high density residential land use along compatible mixed use and diversified commercial activities. Detailed land use proposals have been given in this study for developing TOD area around Agargaon MRT station. The summarization of different land use proposal for TOD area is given as follows:

Residential Land Use: For developing a compact urban TOD**,** residential neighborhoods within TOD area will have high-density residential buildings along with the provision of local services and facilities. Block based housing development approach can be implemented to redevelop the residential clusters with low density.

Mixed Land Use: Mixed land use will be provided near transit station and in residential neighborhoods instead of single use. Mixed land denotes both mixed residential and mixed commercial depending on the use. Provision of mixed land uses will help to provide services within 10 minutes walking distance and reduce travel demands in the TOD area.

Commercial Land Use: Due to high land value, commercial land uses will be provided near transit station. Development of commercial area near transit station will include convenient shopping, offices, restaurants, service centers, retail shop and entertainment uses. Diversified commercial activities near transit station will increase employment opportunity and economic accessibility.

Transport: The use of active transport (walking and cycling) is encouraged within a TOD precinct. It is important to establish an efficient transportation network which will reduce the use of car and ensure connectivity of public transports. For increasing accessibility to public transport from neighborhood, facilitating non-motorized transport is necessary.

Open Space: For building a environmentally sound neighborhood, there should be adequate open space within TOD precinct. For every neighborhood, a local level park will be provided. Besides, a central park will be developed in the TOD area to facilitate active recreation.

Public Space: Public spaces will be provided near transit stations besides the commercial area with a view to create a vibrant environment to promote social gathering.

CHAPTER 10: CONCLUSION AND RECOMMENDATION

10.1 Conclusion

To solve the transportation problems in Dhaka, Transit Oriented Development can be a new door of hope. Integration of transport and land use is very important for a city. Before planning a TOD, assessment of the impacts of Mass Rapid Transit on socio-economic condition, demography, economy is of great importance. The study revealed that Commercial land use is mostly preferred by commercial respondents while residents prefer open space more. Provision of non-motorized vehicle lane was absent from the area. These were considered in proposition of the land use plan. After the MRT becomes fully operational, the area may go through several land use changes. If it can be guided properly, Agargaon MRT station area has a great scope of being a brilliant TOD. Again, the proposals and findings from this study can be very helpful for the development of the TOD in the study area.

Because of the unique characteristics of the study area and some limitations, the results may not be representative of every MRT station areas of Dhaka and design proposals may not be implemented for all TODs. But the methodology and design proposals of this real-life study can be, to some extent, impactful for policymakers and relevant government authorities in future development projects around MRT station areas of the city.

10.2 Recommendation

Some basic recommendations can be made from the study for relevant authorities that can be helpful in developing TOD in Agargaon:

- The land use proposals and strategic actions that have been implemented in this study can be followed while developing TOD. The proposal ensures compact development with high density land use along with pedestrian and bicycle friendly community.
- The approach and methodology which was followed in making land use design proposals in this study can be very helpful and effective in future for policymakers and authorities as the opinion of common people was taken into account.

- Basic elements and principles of Transit Oriented Development should be followed while formulating strategies for MRT station areas. Compactness and variety in land use should be considered in planning. Provision of open spaces and parks should also be mandatory.
- Integration between commercial centers and transit facility should be ensured. Major activities should be linked together and made accessible.
- In Agargaon TOD, restricted land use should be made accessible to the mass people as huge portion of vacant field is left unused. The scope of redevelopment around MRT Station areas should be utilized.
- Block based development with high rise buildings in TOD can be helpful as mentioned in draft Detailed Area Plan (2016-35) for compact development, avoiding cul-de-sac and curvilinear road pattern.
- Provision of attractive sidewalk, landscapes, benches for pedestrian walkways is recommended. Roads should be designed with proper sidewalks and footpaths.
- The use of non-motorized vehicles should be encouraged as it saves energy and promote healthy and safe environment.
- Redevelopment schemes can be introduced in future for zonal development. The concept of Transit Oriented Development should be more emphasize in next Detailed Area Plan for Dhaka.

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GLOSSARY

Arterial Road is a high-capacity urban road beside freeways or motorways on the road hierarchy in terms of traffic flow and speed.

Bicycle Lanes are separate lanes on the roadway for cyclists only.

Feeder Service is a secondary transportation service to reach the primary transportation service or bus, metro station.

Sidewalk Utility Zone is the zone closest to the road. It can have urban furniture like benches and trees

Sidewalk Pedestrian Zone is the zone after utility zone. It is the zone where actually walk and it should have no obstacles

Sidewalk Frontage Zone is the zone closest to buildings. It consists of the furniture of commercial establishments and allows people to move around in front of buildings without disrupting the flow of the walkers in the pedestrian zone.

At Grade Crossing is a crossing on the same level as the roads.

Grade Separated Crossing is a crossing that is one a different height than the roads so that traffic flow is not disrupted.

APPENDIX

QUESTIONNAIRE FOR RESIDENTIAL AREA

Bangladesh University of Engineering and Technology

Department of Urban and Regional Planning

Questionnaire for

Potentials of development in proposed MRT station areas-A study on Agargaon MRT station."

Questionnaire No: _____

Assalamualaikum/Adab. We are the Level-3, Term-1 students of Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology (BUET). We are conducting a research 'Potentials of Development in Proposed MRT Station Areas-A Study on Agargaon MRT Station.'. For the study, we need socio-economic and land use data in surrounding areas of proposed MRT Line 6 station at Agargaon. This research is designed solely for academic purpose and all your responses will remain confidential. We shall be extremely grateful if you agree to cooperate with us and give some of your time to answer a set of questions. We thank you in advance for your kind cooperation.

For further query, please contact Department of Urban and Regional Planning (URP), Bangladesh University of Engineering and Technology (BUET), Dhaka-1000.

A. General Information of the Respondent:

1. Name of the respondent: _____

2. Gender: _____

3. Age: _____

4. Relationship with household head: _____

5. Duration of living in the area: _____

B. Socio-Economic Background of the Respondent:

Household information:

Serial no. of family member	Gender	Age (years)	Educational Background	Occupation

1. Residential status	☐ With family ☐ As individual ☐ Others
2. Monthly household income (BDT)	☐ Below 10,000 ☐ 10000-20000 ☐ 20000-30000 ☐ 30000-50000 ☐ 50000-70000 ☐ 70000-100000 ☐ Above 100000
3. Daily commuting cost (BDT)	
4. Resident type	☐ Apartment ☐ Single dwelling units ☐ Multi-storied flats ☐ Others
5. Floor area of the housing unit	
6. Tenancy type	☐ Owner ☐ Tenant ☐ Other

C. Travel Behavior of Family Members:

Serial no. of family member	Travel purpose	Travel Origin	Travel Destination	Major mode	Mode used to access/egress transit (in case major mode is public transport)

D. Information about Vehicle Ownership

1. Number of Vehicle Owned	☐ None ☐ 1 ☐ 2 ☐ 3 ☐ More than 3
2. Type of Vehicle Owned	☐ Bicycle ☐ Car ☐ Bike ☐ Others

For Tenants:	
1. House Rent (BDT)	☐ Below 5000 ☐ 5000-10000 ☐ 10000-25000 ☐ 25000-35000 ☐ 35000-45000 ☐ 45000-60000 ☐ 60000-70000 ☐ Above 70000
2. There is a possibility that your house rent will increase due to MRT project, are you willing to shift from this area?	☐ Yes ☐ No
3. If your answer is yes for the previous question then mention preferable location?	☐
4. There is a possibility that your house rent will increase due to MRT project, how much increase are you capable of bearing?	☐ 5% ☐ 10% ☐ 20% ☐ 30% ☐ 40% ☐ Above 40% rent increase
For Landowners:	
1. Land Ownership	☐ Individual ☐ Multiple
2. Rental Status	☐ Give rent to tenants ☐ Doesn't give rent to tenants

3. If land value increases, in which type do you want to convert your current land use?	☐ None ☐ Commercial ☐ Mixed used ☐ Others
4. Do you want redevelopment of this area?	☐ Yes ☐ No
5. If redevelopment projects take place in Agargaon will you contribute your land to the project?	☐ Yes ☐ No
6. If yes, what would be your preferred option?	☐ Wants to be a partner with government in the development of plot ☐ Wants to be a partner with private in the development of plot ☐ To be developed in own initiative ☐ Others

E. Information Related to MRT Station:

1. Why did you choose to live in this area?

☐ Good connectivity
☐ Satisfactory level of utility, water, gas, electricity
☐ Low pollution
☐ No water logging
☐ More community services, school, healthcare
☐ More employment opportunity
☐ Good security
☐ Ancestral property
☐ More open space, park, playground
☐ Affordable house rent
☐ Others

2. What problems do you face living in this area?

☐ Bad connectivity
☐ Low level utility, water, gas, electricity
☐ High pollution
☐ Regular water logging
☐ Less community services, school, healthcare
☐ Less employment opportunity
☐ Poor security
☐ Low open space, park, playground
☐ High house rent
☐ Others

3. What changes do you expect after the opening of Agargaon MRT station?

Benefits	Problems
☐ Accommodate street vendors ☐ Increase hotel and restaurant ☐ Planned parking spaces ☐ Developed infrastructure facilities ☐ Compact density ☐ Higher level of automobile access ☐ Better pedestrian network ☐ Multi-family housing ☐ Higher land value ☐ Others	☐ Increased population density ☐ Increase of house rent ☐ Others ---------- ----------

4. What type of land use do you prefer near (1 km) the MRT station?

Commercial	Highly prefer	Prefer	Neutral	Don't prefer	Must avoid
Residential	Highly prefer	Prefer	Neutral	Don't prefer	Must avoid
Open space	Highly prefer	Prefer	Neutral	Don't prefer	Must avoid
Deferred area	Highly prefer	Prefer	Neutral	Don't prefer	Must avoid
Transportation	Highly prefer	Prefer	Neutral	Don't prefer	Must avoid

5. Would you prefer MRT as alternative of your present transportation system?

☐ Yes
☐ No

F. Recommendations/Comments:

Content	Problems and Recommendation
Transformation of Old Airport	
Public Open space	
Presence of waterbody	
Traffic Congestion	
Upgrading Footpath	
Drainage Improvement	
Waste Management	
Reducing the use of private cars	
Others (if have any)	

QUESTIONNAIRE FOR COMMERCIAL AREA

Bangladesh University of Engineering and Technology

Department of Urban and Regional Planning

Questionnaire for

Potentials of development in proposed MRT station areas-A study on Agargaon MRT station."

Questionnaire No: _____

Assalamualaikum/Adab. We are the Level-3, Term-1 students of Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology (BUET). We are conducting a research 'Potentials of Development in Proposed MRT Station Areas-A Study on Agargaon MRT Station.'. For the study, we need socio-economic and land use data in surrounding areas of proposed MRT Line 6 station at Agargaon. This research is designed solely for academic purpose and all your responses will remain confidential. We shall be extremely grateful if you agree to cooperate with us and give some of your time to answer a set of questions. We thank you in advance for your kind cooperation.

For further query, please contact Department of Urban and Regional Planning (URP), Bangladesh University of Engineering and Technology (BUET), Dhaka-1000.

A. General Information of the Respondent:

1. Name of the respondent: _____

2. Relation with the shop owner: _____

3. Age: _____

4. Duration of working in this area: _____

B. Information on Commercial Activities:

1. Tenancy Type	☐ Owner ☐ Tenant ☐ Lease ☐ Others
2. Number of workers in the shop	
3. Year of establishment	
4. Floor area of shop	
5. Location of shop in the building	
6. Type of shop (based on selling products)	
7. Monthly gross income (BDT)	☐ Below10000 ☐ 70000-90000 ☐ 10000-30000 ☐ 90000-100000 ☐ 30000-50000 ☐ 100000-150000 ☐ 50000-70000 ☐ Above 150000
8. Rent of shop (for tenant) (BDT)	☐ Below 5000 ☐ 5000-10000 ☐ 10000-20000 ☐ 20000-30000 ☐ 30000-40000 ☐ 40000-50000 ☐ 50000-60000 ☐ Above 60000

9. For Employee

Serial no. of employee	Travel purpose	Travel Origin	Travel Destination	Major mode	Mode used to access/egress transit (in case major mode is public transport)

10. For Owner:

1. Shop Ownership	☐ Individual ☐ Multiple
2. How many shops do you have in this area?	
3. Do you live near your workplace?	☐ Yes ☐ No
4. There is a possibility that your shop rent will increase, are you willing to relocate your business?	☐ Yes ☐ No
5. If your answer is yes for the previous question then mention preferable location	☐
6. What is your expectation regarding changing business after the opening of the MRT station?	☐ Expand ☐ Contract ☐ Switch ☐ None
7. Expectation regarding switching business (If any)	
8. Do you want redevelopment of this area?	☐ Yes ☐ No

C. Information Related to MRT Station:

1. Why did you choose to do business in this area?

☐ Good connectivity (Commuting and transporting goods)

☐ Satisfactory level utility, water, gas, electricity

☐ More employment opportunity

☐ Affordable rent

☐ The area attracts a good amount of customers

☐ Others

2. What problems do you face while doing business in this area?

- ☐ Bad connectivity
- ☐ Low level utility, water, gas, electricity
- ☐ Low land value
- ☐ High rent
- ☐ Others

3. What changes do you expect to happen in commercial activities after opening MRT station?

- ☐ Commercial use
- ☐ Mixed use
- ☐ More facilities
- ☐ Conversion of open space
- ☐ Others

4. What other changes would you prefer or expect?

- ☐ Accommodate street vendors
- ☐ Increase hotel and restaurant
- ☐ Planned parking spaces
- ☐ Developed infrastructure facilities
- ☐ Compact density
- ☐ Higher level of automobile access
- ☐ Better pedestrian network
- ☐ Multi-family housing
- ☐ Higher land value
- ☐ Others

5. What type of land use do you prefer near (1 km) the MRT station?

Commercial	Highly prefer	Prefer	Neutral	Don’t prefer	Must avoid
Residential	Highly prefer	Prefer	Neutral	Don’t prefer	Must avoid
Open space	Highly prefer	Prefer	Neutral	Don’t prefer	Must avoid
Deferred area	Highly prefer	Prefer	Neutral	Don’t prefer	Must avoid
Transportation	Highly prefer	Prefer	Neutral	Don’t prefer	Must avoid

6. Would you prefer MRT as alternative of your present transportation system?

- ☐ Yes
- ☐ No

D. Informal Business Activities

1. Are you willing to relocate your business if government force for eviction?

- ☐ Yes
- ☐ No

2. Do you have the financial capability to pay for lease if government provide a shop?

- ☐ Yes
- ☐ No

E. Recommendations/Comments:

Content	Problems and Recommendation
Transformation of Old Airport	
Public Open space	
Presence of waterbody	
Traffic Congestion	
Upgrading Footpath	
Drainage Improvement	
Waste Management	
Reducing the use of private cars	
Others (if have any)	

CHECKLIST FOR RECONNAISSANCE SURVEY

Land Parcel ID		
Land use type	☐ Residential	
	☐ Commercial	
	☐ Mixed residential	
	☐ Mixed commercial	
	☐ Others	
Land Parcel Size (katha/acre)		
Building Storey		
Structure Type	☐ Kutcha ☐ Semi-pucca ☐ Pucca	
Road hierarchy	☐ Primary road ☐ Collector road ☐ Access road	
Parking provision	Available or not? ☐ Yes ☐ No	
	Parking type: ☐ Multi-storied ☐ Underground ☐ Ground floor ☐ On-street parking ☐ Off-street parking	
Width of Access Road		