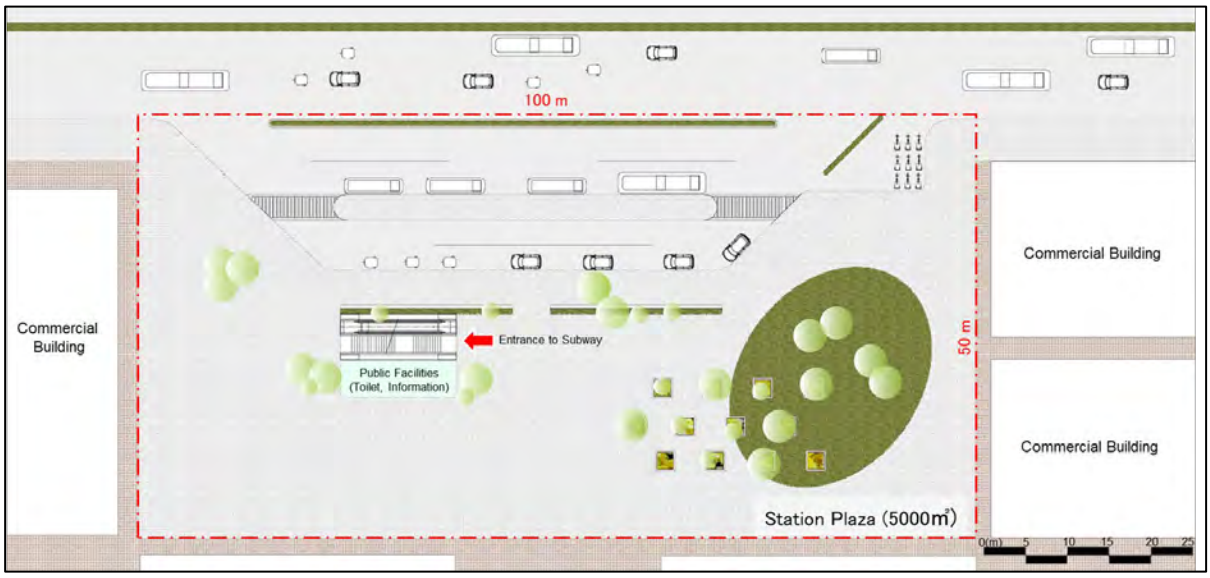
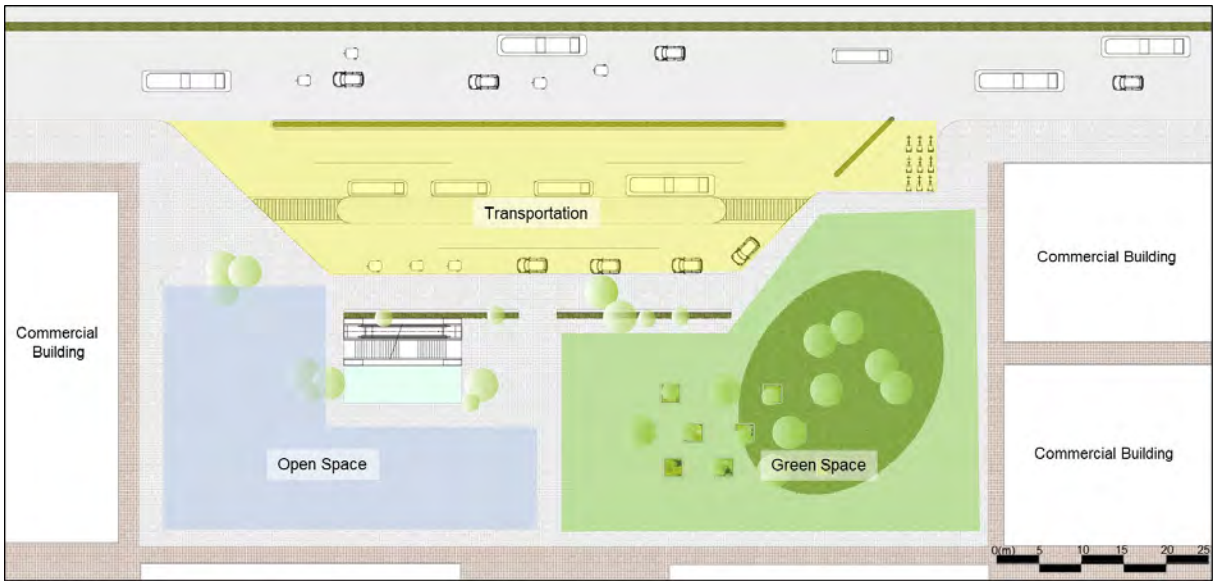


Source: JICA Study Team

Figure 3.5.6 Example of Medium Station Plaza



Source: JICA Study Team

Figure 3.5.7 Example of Facility Layout for Medium Station Plaza

Source: JICA Study Team

Figure 3.5.8 Example of Small Station Plaza

3.6 Policy Recommendation for TOD

1) Importance of TOD for Sustainable Development in Dhaka

(a) Role of Urban Level

3.188 Urban activities are lively in Dhaka, and life is becoming richer due to population increase, expanding urban area, enhancement of economic activities and promoting motorization. On the other hand, many urban problems, such as chronic traffic congestion, air pollution, noise, long commuting time and lack of affordable housings, will be emerged unless adequate urban strategies and frameworks are existing. According to RSTP, it was revealed that MRT 1, 5 and 6 will impact both transportation and land use planning, and it is necessary to integrate urban planning and transportation. In other words, urban railway can control urban sprawl in Dhaka and promote appropriate developments along urban railway and accomplish urban structure for TOD. In addition, accessibility to center of Dhaka will be improved and users of urban railway can avoid heavy traffic congestion to move. Moreover, air pollution has been alleviated and opportunities of economic growth have also increased. TOD is a method to maximize impact on urban railway and the policies below are necessary to promote TOD.

(i) Incorporation to official urban plan: Dhaka Structure Plan should be revised to incorporate urban railway plan and it should announce a basic policy of urban planning for TOD. It can ensure railway development as well as urban planning and influence urban planning and land use planning. In addition, it will be a tool for control and regulate urban development project by private companies.

(ii) Incorporation to Detailed Area Plan of MRT area: In the area which has urban railway projects, Detailed Area Plan for the TOD area (radius 1 km from stations) should be formulated to control and regulate development projects in details. Detailed Area Plan having TOD area can embody the basic policy in Structure Plan.

(iii) Promotion of urban development along railway: Urban development, above all large-scale development, should be considered with concepts of TOD in order to promote urban development even if the area is outside TOD area.

(b) Role of District Level (catchment area of MRT)

3.189 Urban railway has the influence on transportation and land use of the area along railway, especially catchment area of MRT. Most users access to MRT by walking and land price is widely varied by distance from the station. At the time, station plaza has a important role. Station Plaza has many roles from the viewpoint of transportation, such as transportation modal facilities, safety, comfortability, convenience for walkers, ease of transit to other transport system, park and ride, and it should be enhanced. In addition, station plaza has an important role to promote urban development integrated with surrounding areas from the viewpoint of urban development. The design and exitance of station plaza is necessary to maximize the impact on urban development.

3.190 It is difficult to secure land for station plaza because the planned MRT alignment go through in densely urban area in Dhaka. However, the railway will have functioned for long-term, 50 to 100 years, after construction, it should not be fixed by current restrictions. For example, the location of station plazas and current situations should be shown in Detailed Area Plan and it will have been secured the land of station plazas for long-term or as Detailed Plan shows the meaning of station plaza, it will be possible to obtain corporation of land owners.

3.191 It is necessary to consider the planning of station plazas carefully as the possibility below has increased sharply after development of station plazas.

(i) Promoting transit of feeder transportation: The transit to other transportation, buses and rickshaws, become easy by station plazas, and the number of users of MRT will increase. For implementing the increase of users, the access roads to station plazas should be developed. The development of access roads should be considered the traffic management, and safety and comfortability for pedestrians.

(ii) Improvement of living environment in the catchment area of MRT: There may be many people who don't use MRT in the catchment area of MRT. However, station plazas and access roads to station plazas can influence them. For example, when public facilities, such as market, administrative and parks, are developed in the station plazas or access roads are developed as community roads in the area, they can get benefits as well. Community planning should be formulated at the same time of MRT construction, and the plan should be implemented to improve the living environments and to gain supports of residents.

(iii) Development value capture: It is clear that land price around stations increase after construction of MRT from the examples in Japan. The range of increase near station (radius 100 m from stations) is 2 to 5 times as much as that of the fringe of catchment area (radius about 800 m from stations). The value capture like this should be return or utilize for urban railway projects or communities. Therefore, firstly TOD area should be assigned, and Detailed Area Plan also should be formulated for the TOD area. After that, the Detailed Area Plan should be operated with revision or reformulation regarding regulations and rules be mentioned later.

(c) Role of Eki-naka Level (inside station)

3.192 There are opportunities of TOD in Eki-naka as well. The profits gained from eki-naka business can be benefits of railway operators directory. Station is the area which many users load and unload and has the impact on commercial development. Points to be aware of regarding eki-naka development are to plan stations including commercial spaces beforehand and to avoid preventing the route and operation of MRT due to the development.

2) Legislation for TOD

3.193 The legislation and revision for TOD are shown below.

(a) Revision of Detail Area Plan

3.194 Land use for RAJUK area is designated by DAP. However, the DAP has not included the impact on urban railways and the land use is not appropriate for TOD. Therefore, land use around the planned station should be revised and it should be adapted for TOD development. DAP 2016-2035 formulated by RAJUK should include the contents of TOD and designate the location of stations. Moreover, RAJUK should consider regulations to control re-buildings for securing land of station plazas and need to specify the TOD area in DAP.

(b) Revision of Mahanagar Building Construction Act

3.195 For development along stations, the procedure to get permissions relates not only DAP but also Mahanagar Building Construction Act, and the permission of development along main roads must be considered by large-scale development committee according to the act. The most route of MRT is planned along main roads, and TOD development may need to get permission from the committee. Therefore, TOD area should be added into clause 8, and it is desirable that TOD experts participates in the committee to integrate urban planning into urban railways, and TOD experts in RAJUK or urban planner in DMTCL should be employed to join the committee.

Table 3.6.1 Revised Proposal of Special Project Permit for Large and Specialized Projects

Clause 8, Mahanagar Building Construction Act	
1	A residential building with more than 40 (Forty) dwelling units.
2	Any Project which is constituted with a floor area of more than 7500 (Seven Thousand Five Hundred) sq.m (under FAR).
3	Shopping centre which is constituted with a floor area of more than 5000 (Five Thousand) sq.m (under FAR).
4	Any Project which is directly connected with national and zonal highway or main road.
5	Industrial factories along with brick fields which are hazardous or create pollution.
6	Architecturally or historically important buildings or any building or development that is within 250 (Two Hundred Fifty) meter distance of that area.
7	Any building or development that is within 250 (Two Hundred Fifty) meter distance of an area of natural beauty.
8	Any building or development that is within 50 (Fifty) meter distance of a hilly area or a land which is visible as a hill or such land.
9	Any building or development that is within 250 (Two Hundred Fifty) meter distance of a riverside area.
10	**Any building or development that is within 500 (Five Hundred) meter distance from MRT stations. (Revision)**

Committee Member	Role
Member Planning (RAJUK)	President
Urban Planner Director (RAJUK)	Member
Chief Engineer (RAJUK)	Member
Representative of Architecture Department (Assistant Chief Architect's Rank)	Member
Representative of IAB (Institute of Architects Bangladesh)	Member
Representative, institution of Engineers Bangladesh	Member
Representative, Bangladesh Institute of Planners	Member
Director (Development and Control), RAJUK	Member
TOD Expert (RAJUK or DMTCL) (Revision)	**Member**

(c) Control Re-building in Densely Area around Stations

3.196 The most route of MRT will go thorough densely urban area and rebuilding implemented by private sectors has already been proceeded. However, lands for station plaza are necessary and it should be implemented even if the area is in densely urban area. Therefore, land acquisition will be prioritized at first, after that the possibility for expansion of station plazas should be considered. For securing the land, RAJUK should control rebuilding and development around stations according to DAP including the location of station plazas, and it promotes to secure lands for station plazas.

(d) Revision of Private Residential Land Development Rules

3.197 Urban development organized by private sectors has been implemented in a variety of area of Dhaka. According to the rules, the percentage of each land use, such as residential, education and park, is designated. Therefore, more than 1 ha land should be secured by private sectors for station plaza in the rules.

(e) Policy Formulation for Station Plaza

3.198 Bangladesh does not have the policy or guideline regarding station plaza and intermodal facility. The role of station plaza has been neglected due to difficulties for securing lands, but it is indispensable for alleviating traffic congestion and comfortability of users. For these reasons, the policy and guideline are necessary to understand the importance and role of station plaza correctly. In Japan, there are many methods for development of station plaza and the area of station plaza is determined by the number of passengers and percentage of each transportation system. There are many transportation forms, such as rickshaw, CNG and bus, in Dhaka, and it may be changed dramatically in the future. DMTCL should develop and formulate the policy and guidelines before starting planning of station plazas and it will show the basic concept and method to plan.

(f) Adjustment the Difference between Governmental Declare Price and Market Price

3.199 Government Declare Price has been decided by Ministry of Land and it is designated for ensuring the minimum tax income, and the price is far from market price. It is common that the market price is more than ten times as much as the government declare price and there are widely differences. 12 to 18 % of sale price is paid as registration tax. Therefore, the sale price is cheated to avoid payment of expensive tax as the difference between government declare price and market price is too large.

3.200 The land price of new-town developed by RAJUK is influenced by government declare price and the sale price is lower than other lands developed by private sectors. As TOD can impact the land price and gain a lot of profit from the increase of land price, it is necessary to adjust government declare price for decline the difference of land price. At present, many land owners of Purbachal new-town have obtained a large profit because of re-selling the land.

Table 3.6.2 Sell Price of Purbachal New Town

Allotment Type	Plot Size	Price(000BDT)	
		1st Phase	2nd Phase
General People (Allotted Plots)	3 Katha Plot	450	525
	5 Katha Plot	1,000	1,125
	7.5 Katha Plot	1,500	1,875
	10 Katha Plot	3,000	4,000
Affected People (land only)	3 Katha Plot	600	600
	5 Katha Plot	1,000	1,000
AADIBASHI (had under possession both land and dwelling & other units, homestead vegetation, etc.)	3 katha Plot	75	75

Source: RAJUK (1katha≒67 ㎡)

Table 3.6.3 Re-sell Price of Purbachal New Town

Plot Size	Price Range of the Plots Adjacent to Road Types (000BDT)			
	Regional Road (120'-300')	Primary Road (100')	Secondary Road (54'-75')	Tertiary Road (30'-54')
3 Katha Plots	n/a	n/a	11,000 to 13,000	9,000 to 12,000
5 Katha Plots	22,000 to 25,000	20,000 to 22,000		17,000 to 21,000
7.5 Katha Plots	60,000 to 75,000	40,000 to 50,000		35,000 to 40,000
10 Katha Plots	140,000 to 160,000	65,000 to 85,000		50,000 to 65,000

Source: Land Property Survey

(g) Transfer of Development Value to Urban Railway and TOD Project

3.201 When the legislation and revision above are implemented, the transfer of value capture to urban railway and improvement of living environments around stations will be proceeded. For example, the expenses may be imposed to residents in the area which is designated as TOD area based on DAP.

3) Roles of each section

3.202 The coordination with each section is necessary to implement TOD. DTCA DMTCL, RAJUK, DNCC, DSCC, private sectors and community have important roles and division of roles is indispensable (Table 3.6.4).

(a) DTCA

(i) **Formulation of TOD policy:** For TOD implementation, TOD policy is necessary, and if definition and meaning of TOD are not cleared, only word "TOD" will have been expanded and adequate urban planning will have not been implemented. Therefore, TOD policy should be formulated in early stage, and it should include the contents of both intermodal facilities form the viewpoint of urban railway and TOD area from the viewpoint of urban development. DTCA should play a role as a coordinator with other transportation. In addition, RAJUK also should TOD policy regarding urban development.

(ii) **Traffic management:** Loading and unloading are not implemented at appropriate places which are designated as bus stops, and it causes traffic congestion in Dhaka city. Therefore, traffic management that users can load and unload at bus stops at station plazas should be carried out by DTCA with development of station plazas.

(b) DMTCL

(i) **Formulation of design guideline of station plaza:** For calculation of area of station plazas, the number of passengers and the proportion of each transportation modes is necessary. As the guideline about station plaza and regulations are not formulated, it

is desirable that it should be formulate by DTCA, and DTCA is responsible for not only design but construction and management.

(ii) **Design of station plazas:** DMTCL should design station plazas based on design guidelines above.

(iii) **Capacity development:** In the situation that the person in charge does not have know-how and experiences about station plaza, it is impossible to manage station plazas. The person in charge who has appropriate acknowledgement about design guidelines and facility about station plaza should be placed.

(iv) **Management and maintenance of station plaza:** Management and maintenance of station plazas should be implemented in accordance with each case by DMTCL and local government, and developers, such as private companies and RAJUK, should manage and maintain station plazas by themselves when development projects relate with urban railway closely.

(c) RAJUK

3.203 RAJUK has an important role of TOD. For implementation of adequate TOD, RAJUK should not only plan but control and regulate urban planning. In addition, RAJUK should contribute to a consistent process for commercialization. Details are shown as below.

(i) **Revision of DAP:** RAJUK understood the meaning and importance of TOD in DAP 2016-2035 and try to formulate it. However, the method for land acquisition and land use are unclear for TOD, and it is desirable that RAJUK revise more. TOD area should be designated in DAP, and land use around stations and urban development planning also should formulated.

(ii) **Revision of Mahanagar Building Construction Act:** Large or special project approval committee (Clause 32) includes the member of RAJUK, DOA, IAB and so on, but the transportation sector is not included. Since the transportation sector will play an important role for TOD, TOD experts should be placed in RAJUK.

(iii) **Control rebuilding for station plaza:** the location of station plazas and urban development project around stations should be specified in DAP, and RAJUK should control re-building to secure land for station plazas. In the case that land acquisition is difficult in short-term, land acquisition should be implemented as long-term objectives. It is prospected that the timing of rebuilding is come every 30 to 40 years because most buildings in Bangladesh are RC structure, and it should be controlled for station plazas.

(iv) **Station plazas developed by private sectors under Private Residential Land Development Rules:** When private sectors implement large-scale development, the size of each land uses is designated under the rules. The land for station plazas should be designated, and private sectors can get a lot of profits due to MRT construction. Therefore, it should be the cost of development, management and maintenance should be covered the private sectors.

(d) Local government (DNCC, DSCC, Purshova)

(i) **Maintenance and management:** Revenue from holding tax will be prospected to increase due to the increase of land price influenced by MRT. Therefore, although it depends on each case, maintenance and management of station plazas should be

implemented by local government as well as road maintenance. In addition to the revenue from holding tax, the retail and shops can contribute to increase revenue of local governments.

(ii) **Information disclosure to community・hearing from community:** For revision of DAP in TOD area, the information disclosure and hearing should be implemented appropriately at all stages, and it should be reflected to DAP.

Table 3.6.1 Role of each sector

Role		DTCA	DMTCL	RAJUK	LG (DNCC, DSCC)	Other Stakeholders
Policy Making/Formulation		A TOD Policy	A Design Guide Line	A Land use in DAP	B	C
Planning		B Coordination	A Station Plaza Planning	A Urban development plan around stations	B	C
Institution/Regulation		B	B	A Control development by private sectors	B	C
Approval for development		B	B	A Approval for development around stations	B	B
Land acquisition		C	A	A	B	A Private sector/residents
Implementation	Development/ Construction	C	A	A	B	B
	Management/ Maintenance	C	B	A (Development by RAJUK)	A	B (Private sector: Large-scale development by private companies)
Monitoring		C	A	A (Revision of DAP in accordance with progress development around stations)	B	C

A: Main responsible
B: corporation
C: Hearing/ Consultation

4 Case Studies

4.1 Purbachal New Town

1) Profile of Purbachal New Town

4.1 As described in Chapter 4, Purbachal New Town is located on the east side of DMA, adjacent to the eastern boundary, within RAJUK's jurisdiction. The entire site of Purbachal New Town has been planned and developed by RAJUK. The total surface area is 2,500 hectares. The plan includes 26,000 residential plots and 62,000 apartments. As of January 2018, all residential plots were sold out, except for some blocks reserved for low-income housing. Once all development is completed, Purbachal New Town is expected to accommodate approximately 1 million residents and become one of the major sub-centers of the RAJUK area.

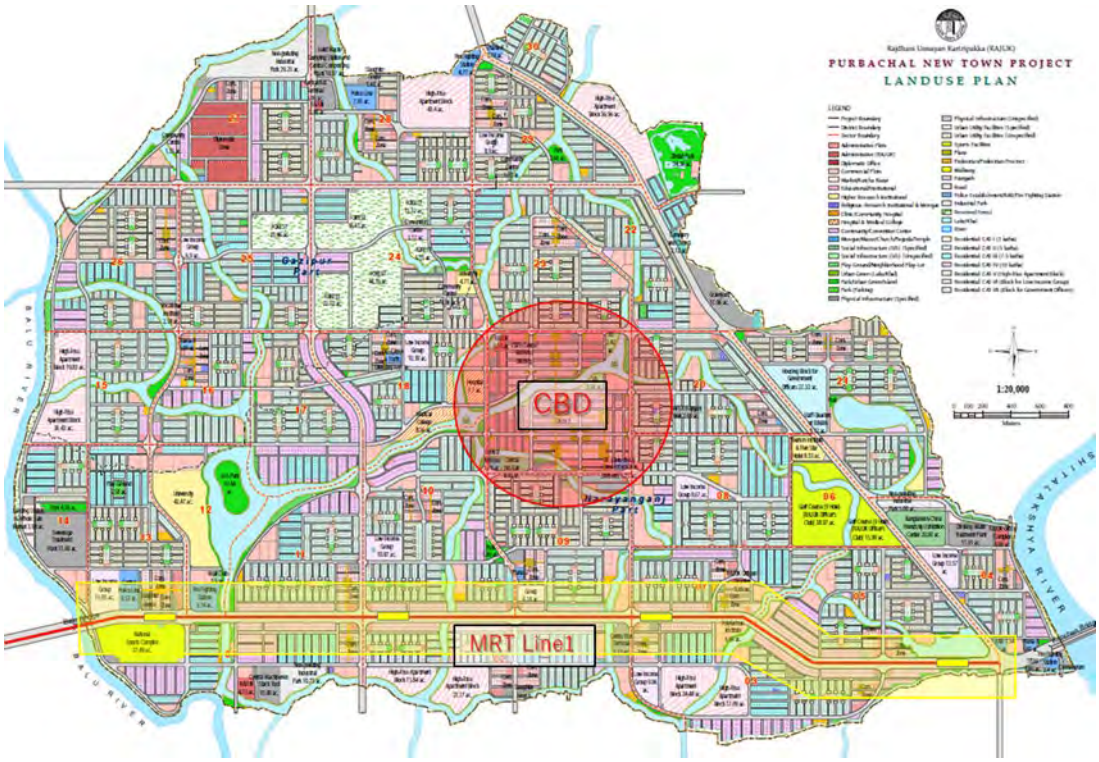


Figure 4.1.1 Purbachal New Town

2) Impact of MRT and Factors need to be Considered

4.2 As previously described, the primary objectives of TOD are: (i) increase in MRT, (ii) value capture, and (iii) local economic development. In order to achieve these objectives, enhancing the network is essential in terms of transport, society and economy, and environment, as explained below.

(a) Enhancement of Transport Network via station plaza and international feeder service.

4.3 Enhancing the transportation network will expand the catchment area of MRT, which will result in an increase in ridership. Enhancing the transportation network consists in developing various local transportation services and pedestrian access from MRT stations. Since provision of various transportation modes requires smooth transfers, some spaces should be secured for seamless intermodal facilities. Intermodal facilities range from a relatively large-scale station plaza to a small-scale community space where residents can take a rest, ride a community bus, rent a shared cycle, and so forth. It is necessary to developing various feeder services, including pedestrian access, bus services, and intermodal facilities for the enhancement of the transportation network. This will improve not only MRT stations' accessibility, but also the overall mobility in Purbachal New Town, which will result in a generally good quality of life in the new town. More details for the improvement of accessibility are provided in the following sections.

(b) Enhancement of Socio-Economic Network

4.4 Since MRT stations can be a strong driver to induce high-end commercial and business activities, strategic mixed-use developments should be promoted in the station area to maximize the potential of TOD. By taking advantage of the prime locations with direct access from/to MRT stations via ground floor or pedestrian deck, development type and intensity should be controlled through integrated development with MRT. Securing open space is necessary for organizing transfers among various transportation modes. It is also essential for integrated development of urban amenities and to encourage social interactions. Such integrated development will attract visitors, residents as well as office workers in the catchment area and result in an increase of land value, if it is appropriately planned and implemented. Therefore, integrated development will contribute to the value capture and stimulation of local economy in addition to the increase of ridership of MRT. Further details about integrated development are provided below.

Figure 4.1.2 Example of Stormwater Planter

(c) Enhancement of Environmental Network

4.5 Environmental network can be enhanced through the integration of an enhanced transport network, in particular, an enhanced street network. Continuous planting strips along sidewalks improves both natural environmental integrity and walking environment while providing shade for pedestrians. As shown in Figure 4.1.2, continuous planting strips could reduce the flooding of roads if it is designed to intercept storm water (rainwater)

thanks to storm water retention facilities.

4.6 Securing open space does not only enable smooth transfers and social interactions, it is also important for the environment. Purbachal New Town has been planned to accommodate a large number of office workers and students in addition to the approximately 1 million residents, therefore open space should be located at certain intervals and be used for evacuation in case of disasters.

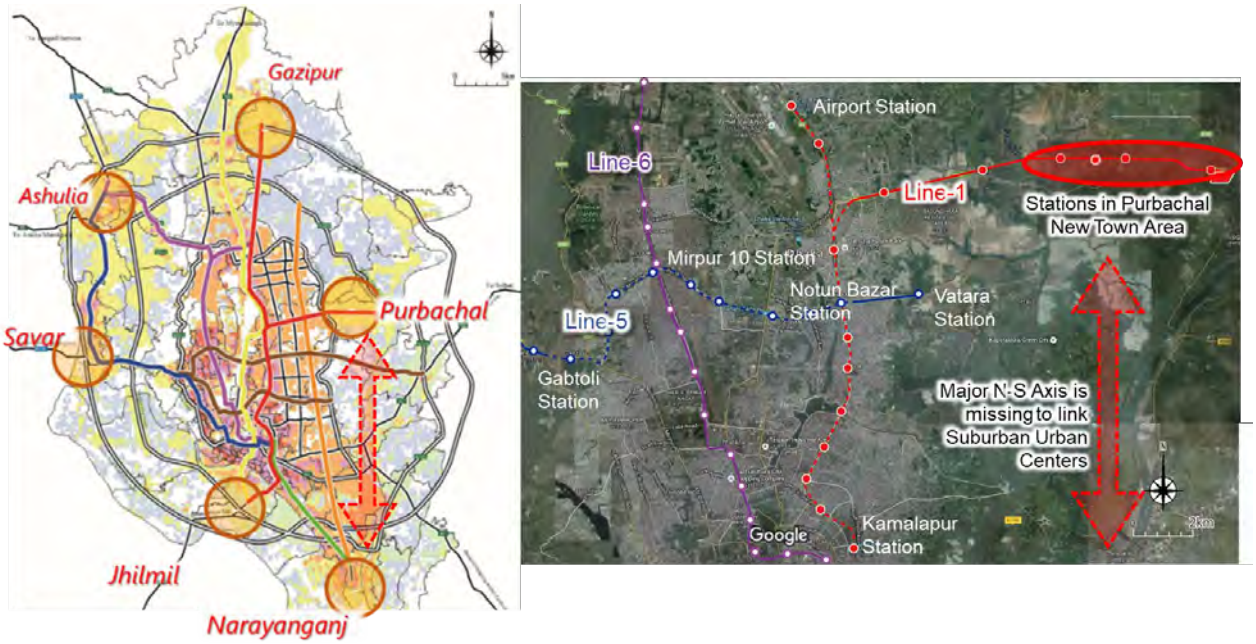
3) Improvement on Accessibility

(a) Roles of Street Network

4.7 The street network is a fundamental physical framework designed to sustain urban growth through ensuring the connectivity of the transport, socioeconomic, and environmental networks. If the street network does not function properly, sustainable urban growth will be impeded. Hence, the functionality of the street network must be assessed from regional to the local scale in order to design TOD capable of successfully resolving accessibility issues at all relevant scales.

(b) Street Network at Regional Scale

4.8 As shown in Figure 4.1.4, regional sub-centers will be connected by MRT lines. However, some connections among these sub-centers are missing among, including the north-south axis between Narayanganj and Purbachal New Town. Several urban development projects are underway in the south of Purbachal New Town and the improvement on north-south access is also necessary for the enhancement of connectivity with these development areas. Therefore, construction of a major access road between Purbachal New Town and Narayanganj should be undertaken in concert with the development of Purbachal New Town.



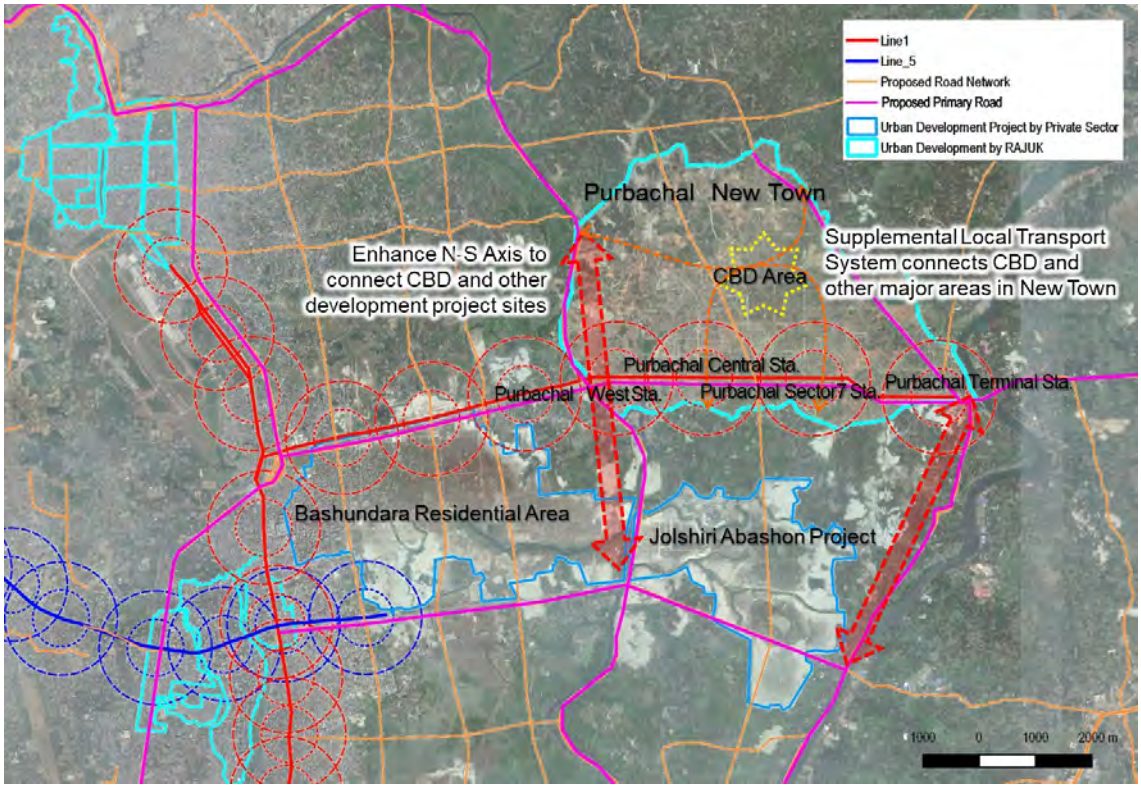
Source: JICA Study Team

Figure 4.1.4 Critical Issues for Regional Transport Connectivity

(c) Street Network at City Scale

4.9 Two major private residential and mixed-use projects are underway in the south of Purbachal New Town. In order to enhance connectivity with these areas, there is a need to develop north-south access roads as shown in Figure 5.1.3. The proposed street layout should be reflected in Purbachal New Town planning.

4.10 Since the Central Business District (CBD) area is located approximately 1km away from MRT Line1, a supplemental feeder transport system should be provided as well as transfer facilities. This type of complementary transport system should also be included in the planning of Purbachal New Town.



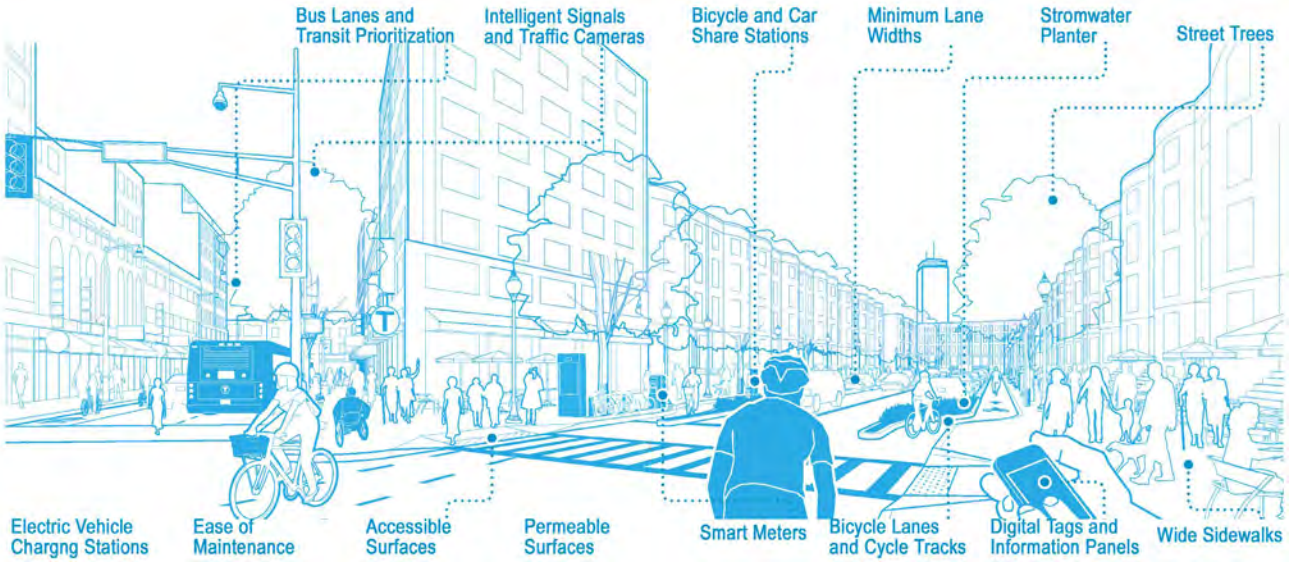
Source: JICA Study Team

Figure 4.1.5 Proposed Transport Network at City Scale

4) Street Network in the Vicinity of MRT Stations

(a) Principals

4.11 Streets and open spaces are the fundamental elements of transport, socio-economic and environmental networks, and form the backbone of the city. An area in which there is a coherent integration of open space and street is called a “Complete Street”, as shown in Figure 4.1.5. Since the development of Purbachal New Town will take place over several decades, the application ICT (Information and Communication Technology), as well as shared car and bicycles, should be considered in the long term.

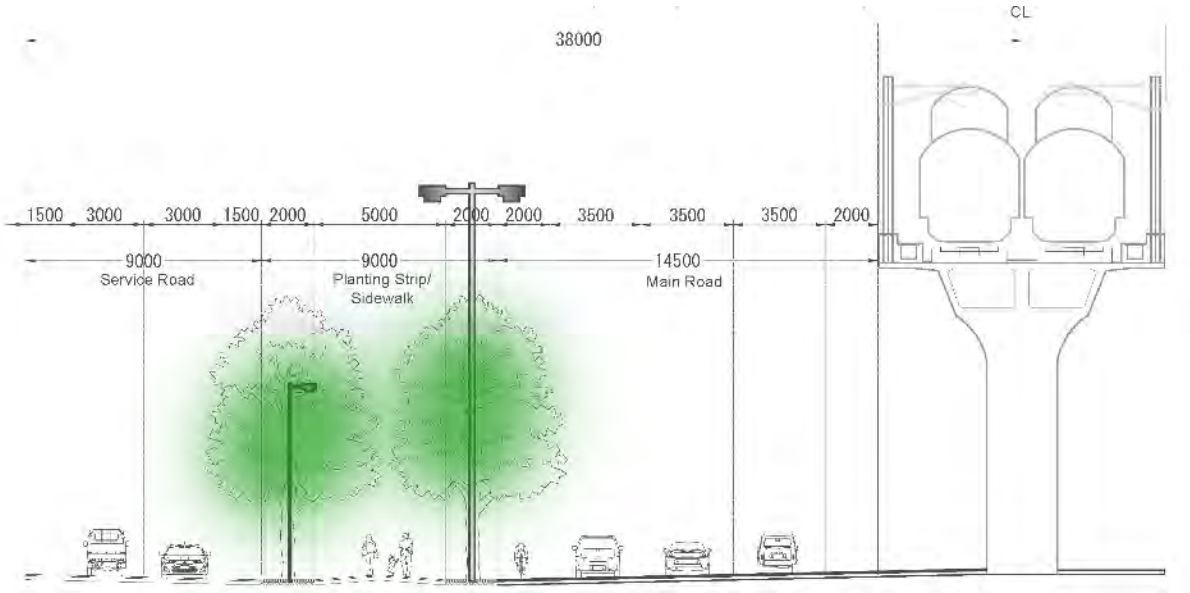


Source: City of Boston

Figure 4.1.6 Elements of Boston Complete Street Design

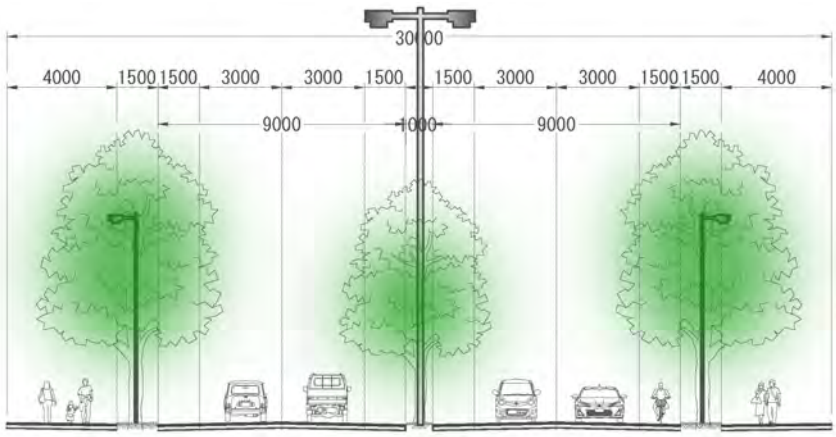
4.12 Four proposed MRT stations are to be located on the viaduct along the widest arterial road, with the width of 76m (250ft.), in Purbachal New Town. Since this arterial road can be a significant barrier, especially for the pedestrians, pedestrian crossings should be provided at maximum intervals of 150-200m, including the pedestrian decks at the MRT stations.

4.13 Streets, at maximum intervals of 150-200m, should have continuous planting strips and sidewalks to create a “Green Promenade” and a comfortable pedestrian network, as shown in Figure 4.1.7 and 4.1.8. Continuous planting strips also serve to trap some of the storm water to mitigate flooding, provide shade for pedestrians, and enhance environmental integrity by creating a habitat for some species of wildlife.



Source: JICA Study Team

Figure 4.1.7 Typical Section of Green Promenade (Primary Road: W=76m)



Source : JICA Study Team

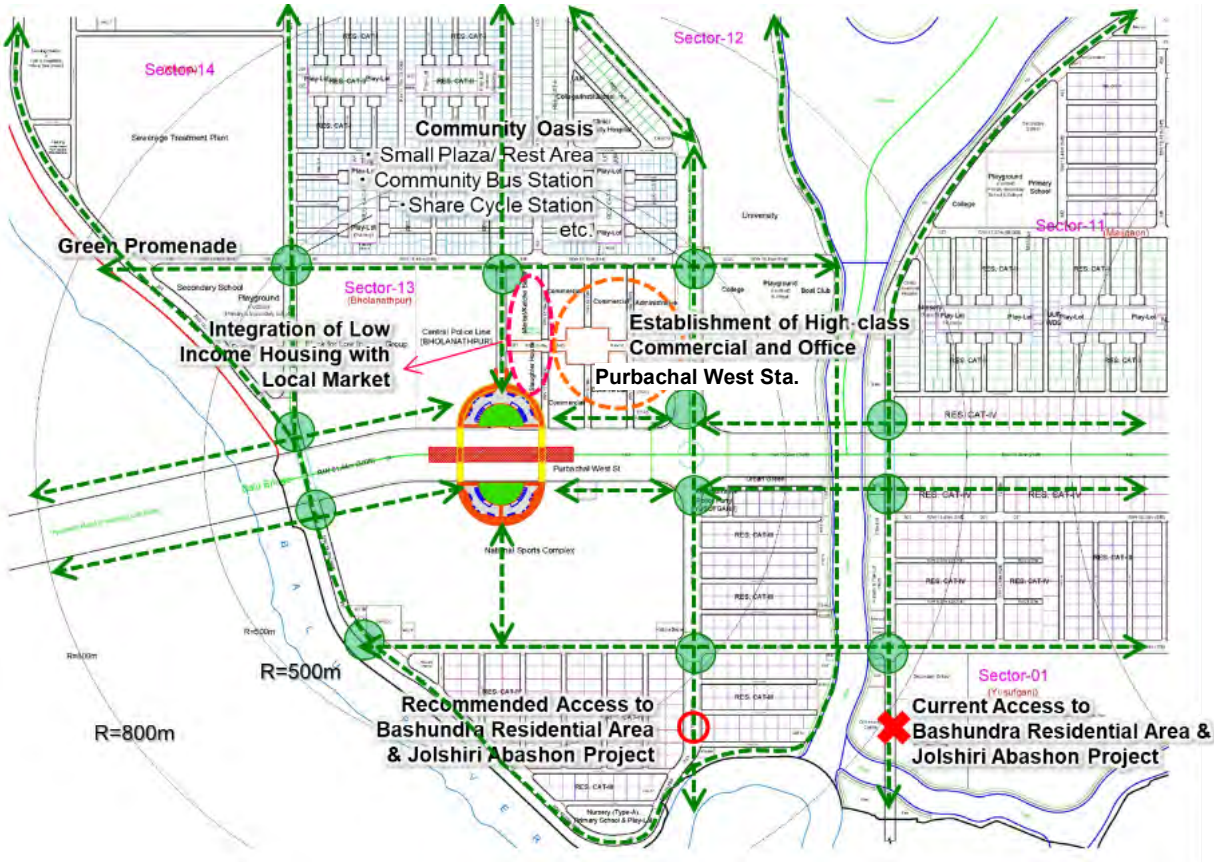
Figure 4.1.8 Typical Section of Green Promenade (Secondary Road: W=30m)

(b) Street Network in the Vicinity if MRT Stations

4.14 In addition to insufficient open space and pedestrian access, the street network in the vicinity of MRT stations in Purbachal New Town has additional issues pertaining to connectivity with development projects on the south side.

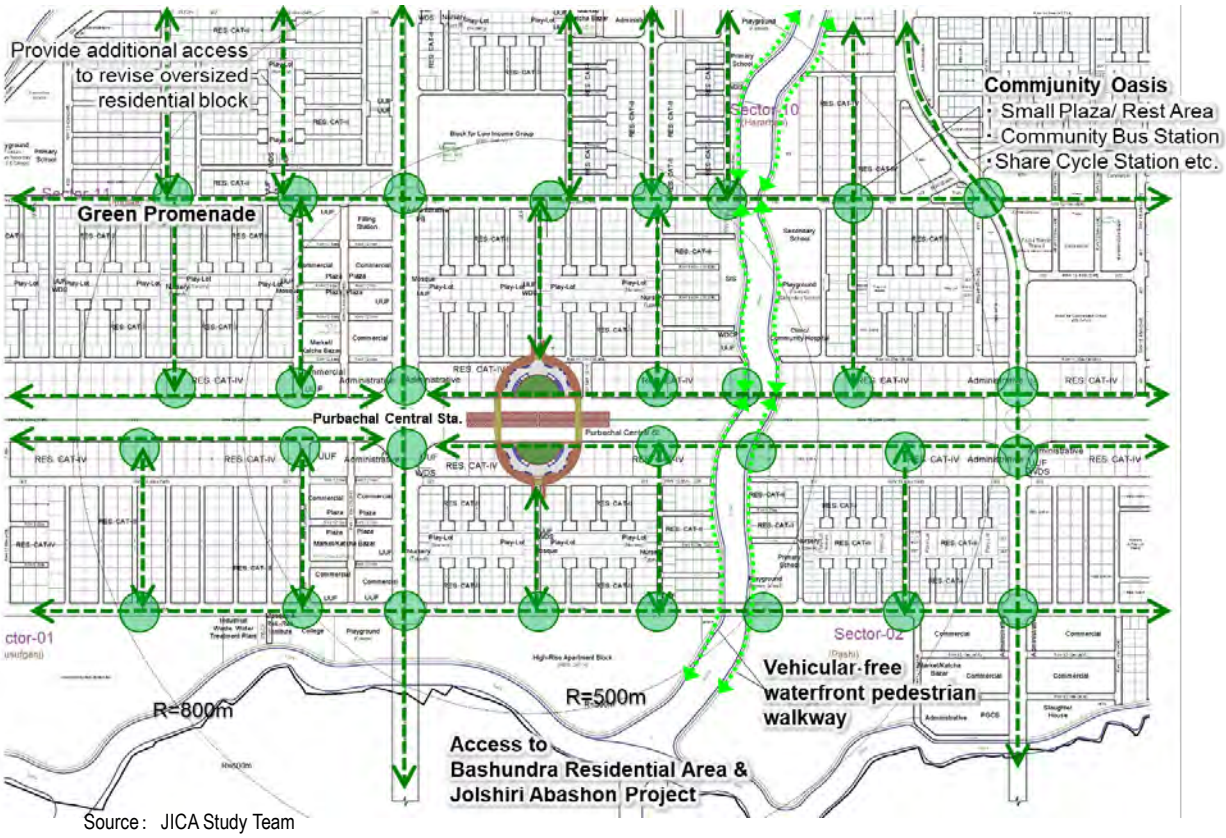
4.15 In terms of the connectivity with the developing areas to the south, the current access road (width=18m/ 60ft.) is located on the east side of the canal, in the vicinity of Purbachal West Station as shown in Figure 5.1.4. Since the arterial road located on the west side of the canal (width=30m/ 100ft.) will be directly linked with the main access road, located between both development sites, this arterial road should be designated as the access road to the south side of Purbachal New Town.

4.16 In the vicinity of Purbachal East Station, a main access road, with the width of 23m (75ft.), has been proposed to connect to the CBD, as shown in Figure 5.1.6. However, the road will have this width only on the east-west segment after crossing the canal south of the station, then it will narrow down to 9m (30ft.) in the north-south direction. In order to function as the consistent main access road connecting the CBD of Purbachal New Town and the on-going development areas in the south, the intersecting road running south should maintain the same width as the road as the main access road.



Source: JICA Study Team

Figure 4.1.9 Proposed Street Network in the Vicinity of Purbachal West Station

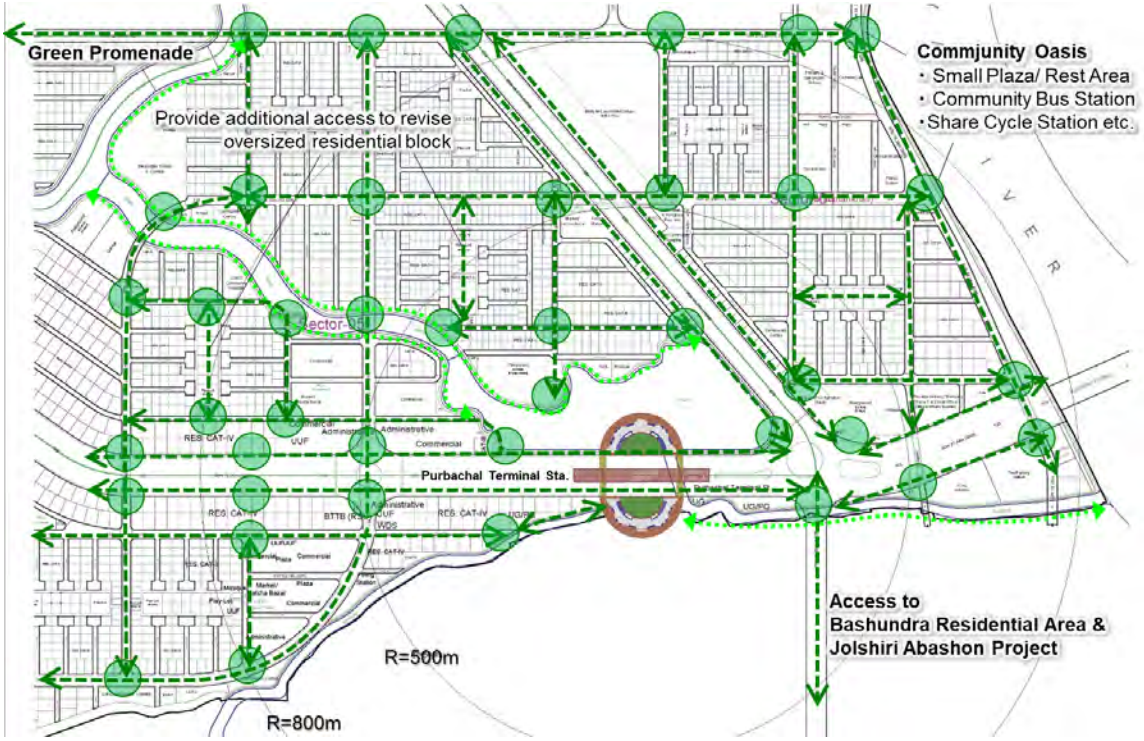


Source: JICA Study Team

Figure 4.1.10 Proposed Street Network in the Vicinity of Purbachal Central Station

Source： JICA Study Team

Figure 4.1.11 Proposed Street Network in the Vicinity of Purbachal East Station



Source： JICA Study Team

Figure 4.1.12 Proposed Street Network in the Vicinity of Purbachal Terminal Station

(c) Image if Urban Oasis on the Street Network

4.17 Several 300-m long residential blocks in the vicinity of Purbachal Central station, East station and Terminal station do not have any public access by road as they adopt a cul-de-sac design to prevent non-residents' intrusion by car. Therefore, the street layout of such oversized residential blocks should be restructured as shown in Figure 5.1.8-10. The canal should become pedestrian only as shown in Figure 5.1.7-10. In the long run, water transport should be considered as well as the integration with the waterfront access road.

4.18 As the nodes of the pedestrian network, open spaces (Community Oasis) also should be introduced for transfer, social interaction and evacuation in case of disaster to enhance the linkage of the street network as shown in Figure 4.1.13.

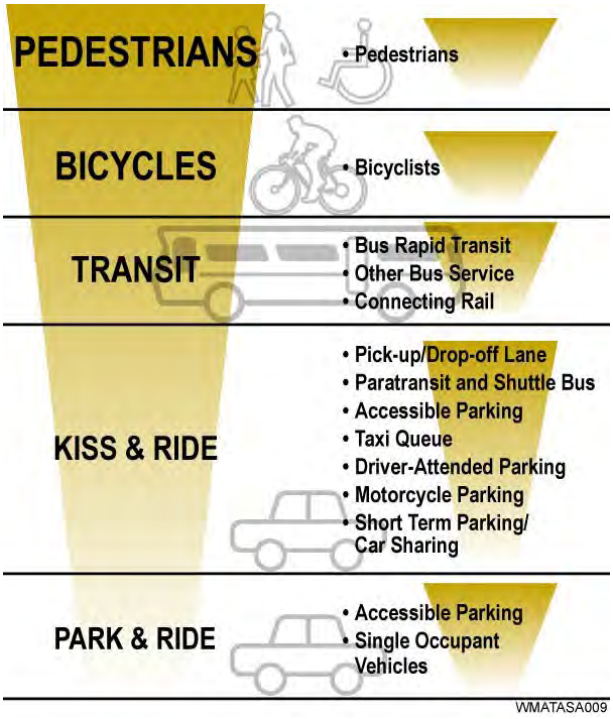
Source: City of Boston, JICA Study Team

Figure 4.1.13 Image of Urban Oasis

5) Station Plazas at MRT Stations

(a) Considerations

4.19 Station plazas at MRT stations are the minimum required open spaces to be completed together with the street network when MRT starts operating in order to maximize the impact of MRT development. As described in Chapter 4, while station plaza is the driver to promote investment and community development, such promotion cannot be expected without its essential function as a transportation hub. In other words, without sufficient space for safe, convenient and comfort transfer as well as pedestrian access, station plaza cannot fully maximize the effects of MRT in Purbachal New Town. Therefore, it is critical to secure at least 1-2 hectares of open space at the station plaza for each MRT station and to plan it concurrently with the station. The space should be allocated in accordance with the priority of accessibility as shown in Figure 4.1.14.

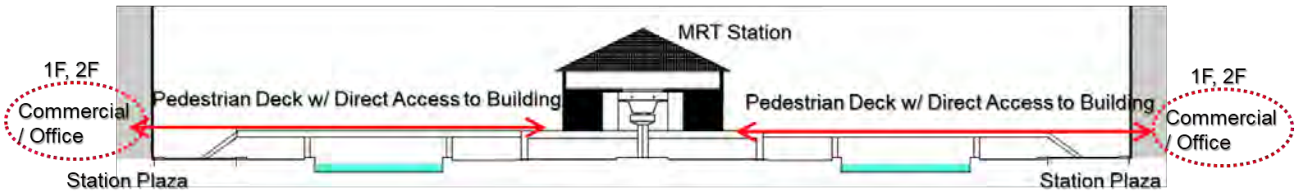


Source: Washington Metropolitan Area Authority

Figure 4.1.14 Hierarchy of Access for TOD

4.20 As previously described, all MRT stations in Purbachal New Town are located on a the viaduct along the widest arterial road that is 76-m-wide (250ft.) in Purbachal New Town. This road be a significant physical barrier hindering north-south circulation.

4.21 In order to prevent such physical disconnection, station plazas should encompass both the northern and southern sides of the station, connected by pedestrian decks as shown in Figure 4.1.15. These pedestrian decks can further improve convenience for pedestrians through direct access to adjacent buildings. Integrated development can potentially lead to cost sharing between all developers of adjacent buildings for the construction of pedestrian decks.



Source: JICA Study Team

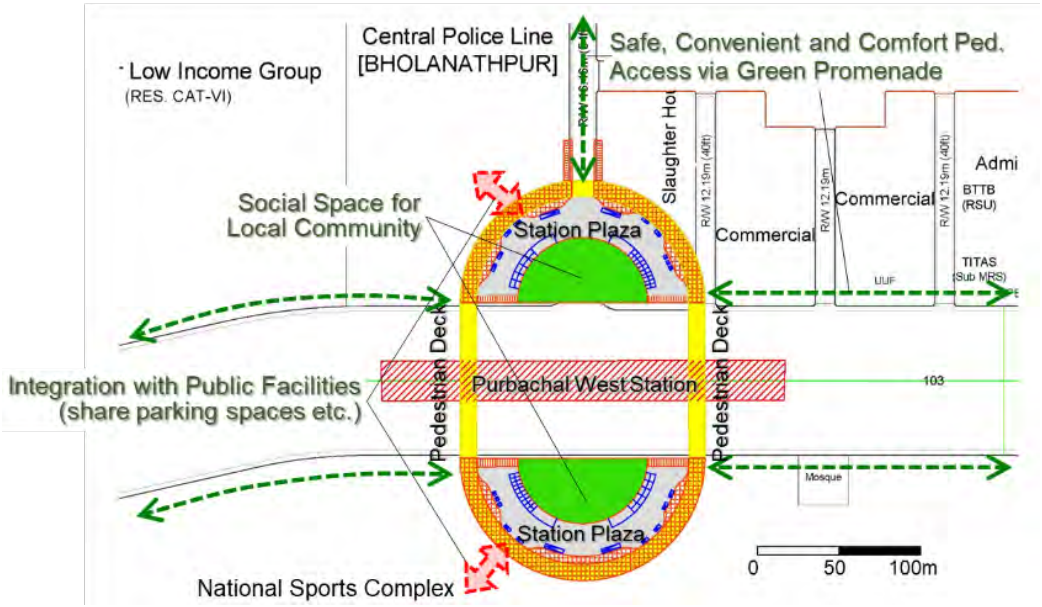
Figure 4.1.15 Proposed Pedestrian Access from MRT Station via Pedestrian Deck

(b) Purbachal West Station

4.22 Purbachal west station faces public facilities such as national sports complex and central police building with some flexibilities to accommodate the station plaza as shown in Figure 5.1.14. Since public facilities are supposed to secure certain spaces for parking of cars, motorcycles and bicycles, these areas should be expanded to accommodate the vehicles of MRT users as it also attracts more users for these facilities. Furthermore, once such requirements are clearly stipulated in the TOD Design Guideline and enforced for implementation, parking development costs can be shared with the private sector through

the integrated development.

4.23 Such proposal applies for the commercial area to be development on the north-eastern side of the station. Currently this area encompasses a local market with a slaughterhouse, but in the future mixed-use developments (commercial and office) should be considered given the prime location adjacent to the station plaza. Promotion of high quality integrated development adjacent to the station plaza allows further accessibility improvement due to parking spaces for MRT passengers and direct access to the buildings from the station. As shown in Figure 4.1.16, local market can be integrated with low-income housing planned on the north-western side of the station.

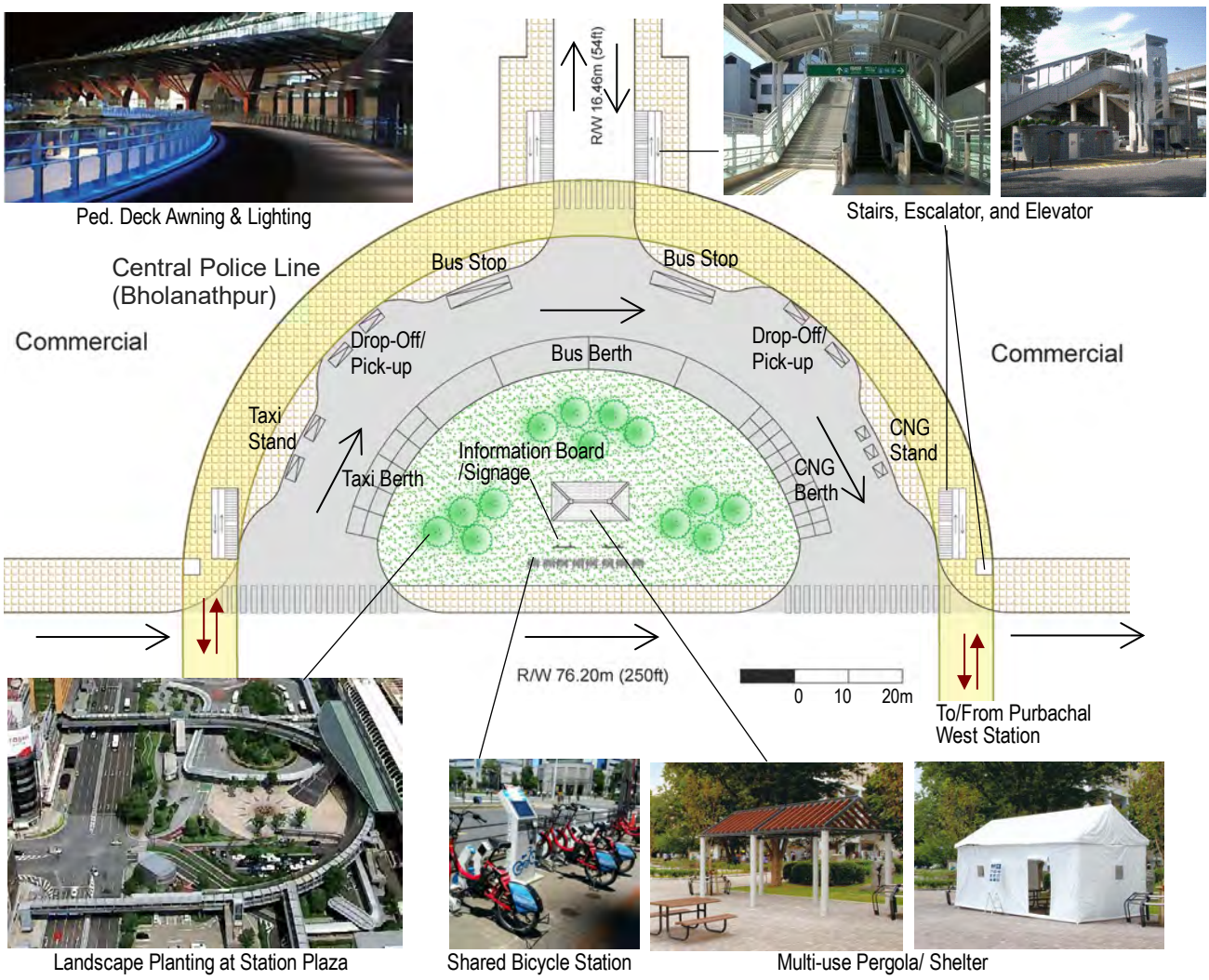


Source: JICA Study Team

Figure 4.1.16 Proposed Station Plaza at Purbachal West Station

4.24 The station plaza is supposed to provide sufficient space for pedestrians not only to access the station and adjacent facilities but also to transfer to feeder services such as buses, taxis and CNGs. Pedestrian deck with awning would secure safe and comfortable access under severe weather conditions as shown in Figure 4.1.16.

4.25 Social space for local community should be used for disaster prevention and mitigation by providing evacuation space. Therefore, the facilities in the space need to have multi-functions both for regular use and exceptional use in case of disaster as shown in Figure 4.1.17.

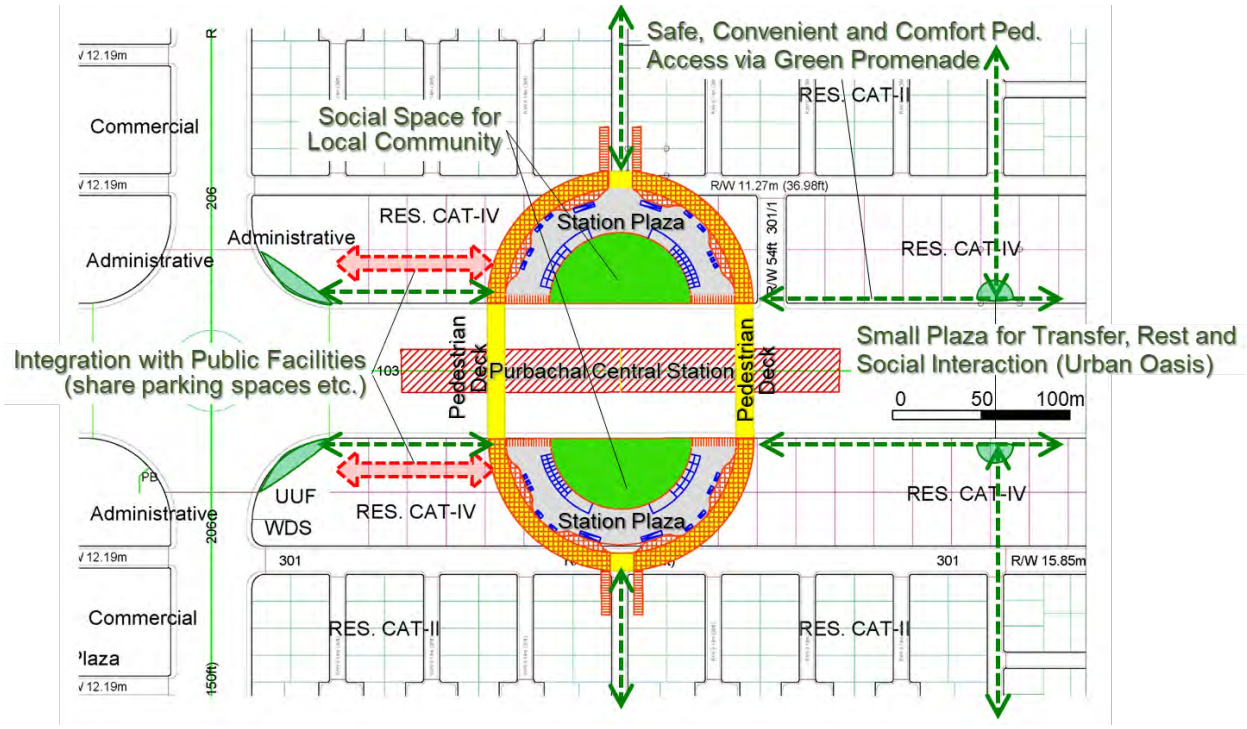


Source: Gifu City, Okazaki City, Townscape.Kotobuki.co.jp, Enjoytokyo.jp, JICA Study Team

Figure 4.1.17 Facility Layout Plan of Purbachal West Station

(c) Purbachal Central Station

4.26 Purbachal Central Station has been proposed facing residential lots of 10 Katha (approximately 670 m2) as shown in Figure 5.1.16. Although optimal locations of the station plaza are both north and south side of the station similar to Purbachal West Station, adjustment of the residential lots would be required based on the intensive consultation with the owners as they were already sold. Therefore, RAJUK sees this option (Alternative 1) as not feasible according to the site reconnaissance and discussion with the study team held in December 2017.

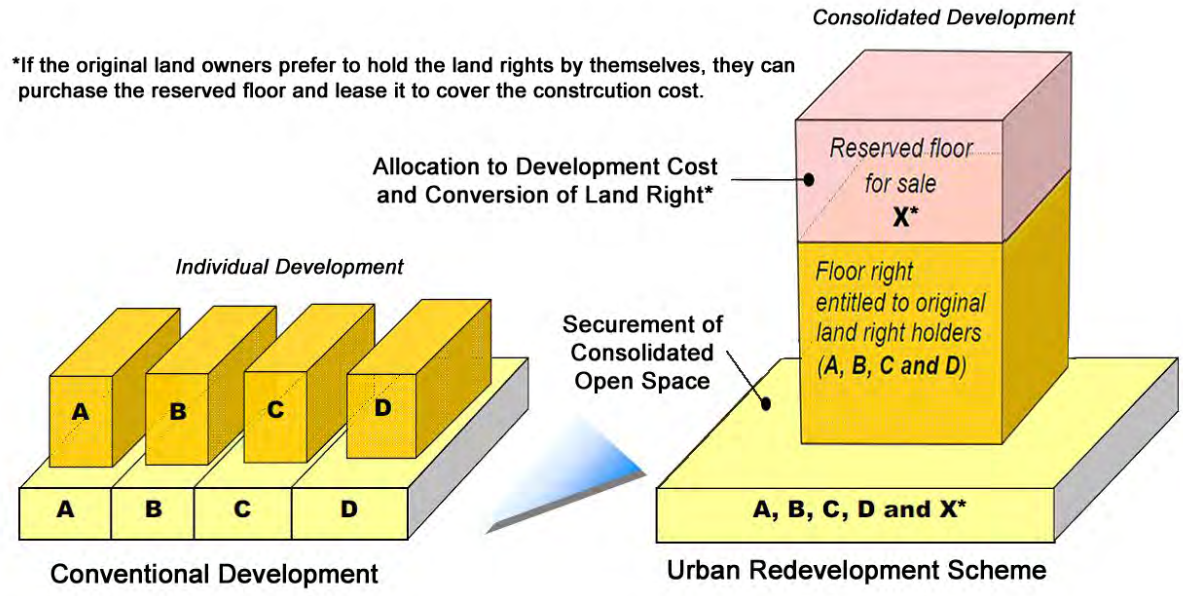


Source: JICA Study Team

Figure 4.1.18 Proposed Station Plaza at Purbachal Central Station (Alternative 1)

4.27 However, current layout of the residential lots along MRT line does not include any open space for transfers, social interactions, evacuation in case of emergency, etc., which are supposed to function as the nodes of the proposed street network for the enhancement on the linkage of society, economy and environment. Therefore, consolidation of these residential lots should be promoted by urban redevelopment scheme shown in Figure 5.1.17.

4.28 Since owner's association needs to be established based on the agreement on the consolidated large-scale residential development, certain incentive scheme (e.g. FAR bonus, tax exemption) has to be prepared in return for the securement of sufficient public open spaces, which can be utilized as the station plaza. To do so, FAR of these 10 Katha residential lots should be resumed in a conservative manner as the current FAR includes the possibility to reach the maximum due to the width of the frontage road (76.2m (250ft.)) based on the judgement by the special committee.



Source : JICA Study Team

Figure 4.1.19 Urban Redevelopment Scheme

4.29 Alternative 2 is the option without any impact on the residential lots through the integration with the commercial facilities near the intersection. Considering the distance from the station to the station plaza, the station needs to be located at the intersection as shown in Figure 5.1.18. Since the majority of residents, students and office workers will be in the north side of MRT Line, it is desirable to locate the station plaza on the northern side of the MRT Line.

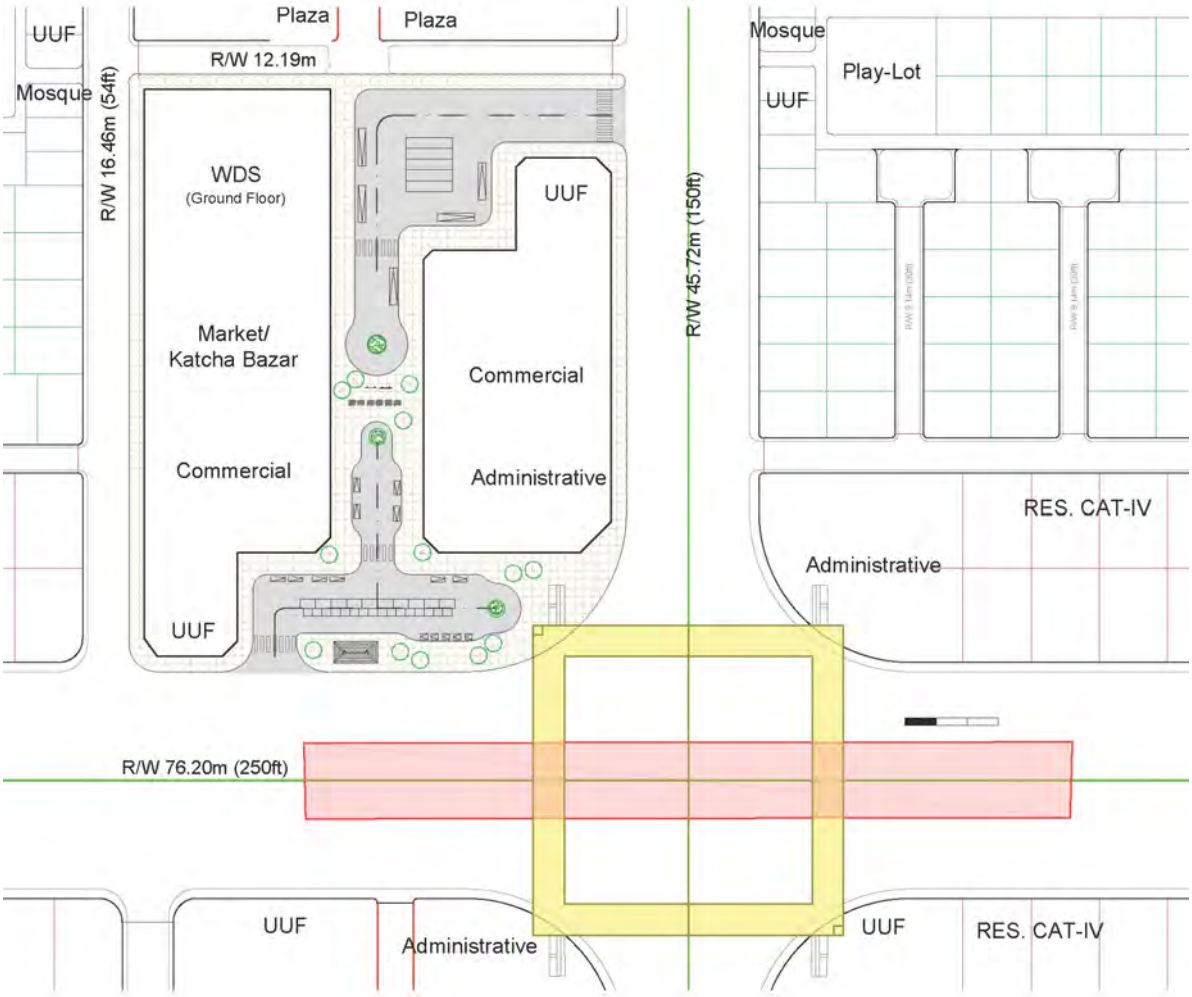


Figure 4.1.20 Proposed Station Plaza at Purbachal Central Station (Alternative 2)

(d) Purbachal East Station

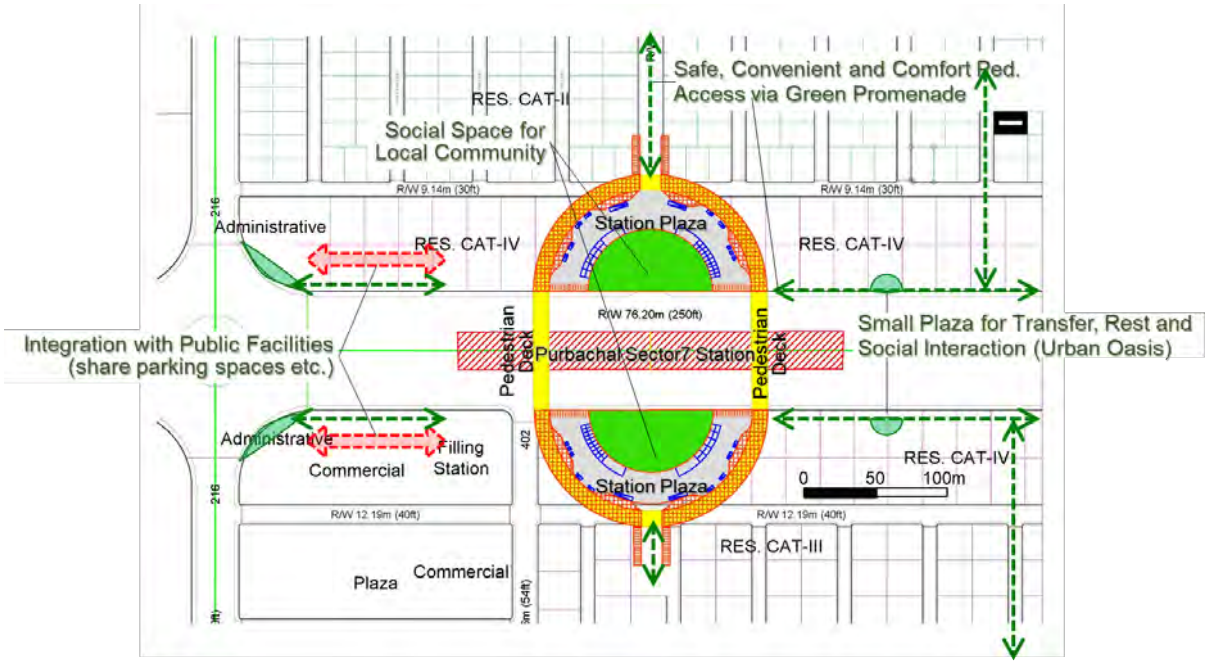


Figure 4.1.21 Proposed Station Plaza at Purbachal East Station (Alternative 1)

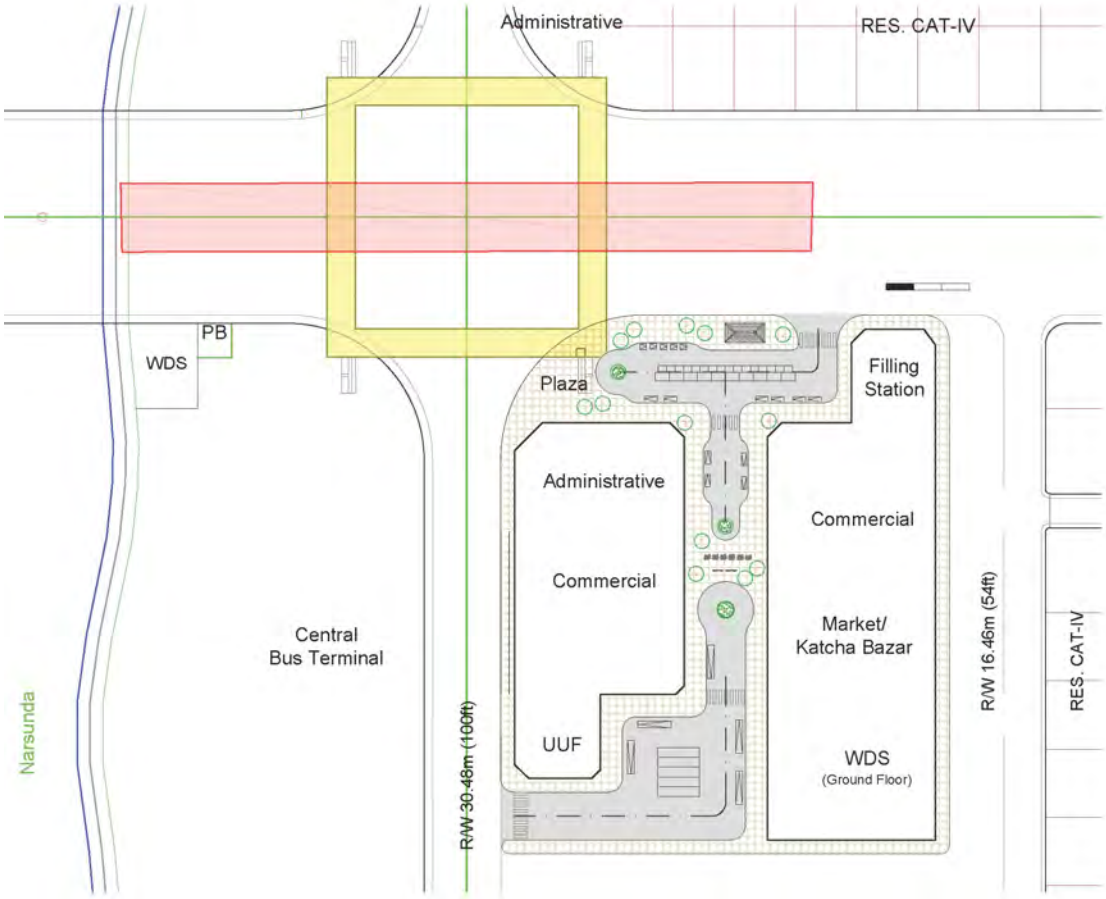


Figure 4.1.22 Proposed Station Plaza at Purbachal East Station (Alternative 2)

(e) Purbachal Terminal Station

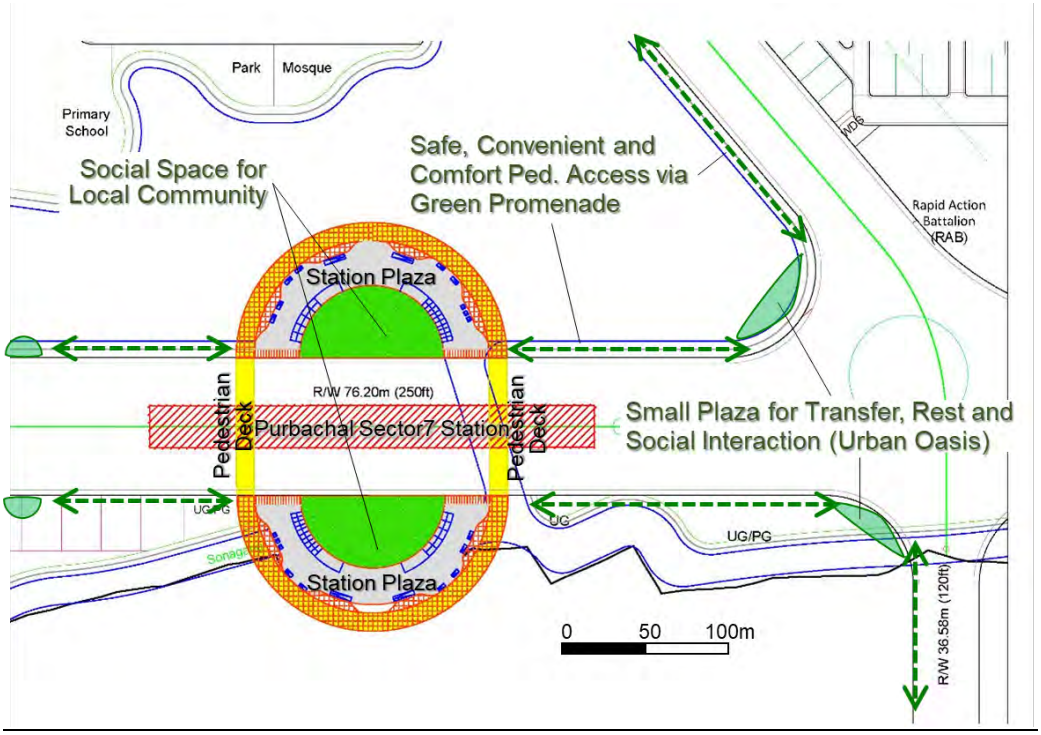


Figure 4.1.24 Proposed Station Plaza at Purbachal Terminal Station (Alternative 1)

4.2 Gabtoli Station

1) Profile of Gabtoli Station

4.30 Gabtoli bus terminal is an important transportation terminal in the outskirts of Dhaka. A cattle market, a bazar, and CNG stands are located in the vicinity of the station location. Urban development is currently occurring near the ferry terminal of Buriganga River. It is also a place for transportation and stocks for bricks produced near Amin bazar and Bilamaria. High-density urban area spread to the north, whereas wetlands that belong to the Ministry of Agriculture spread to the south of the bus terminal.

4.31 Bus operators' offices are located along National Highway No. 5, so the area is remarkably crowded. Passengers buy tickets, wait for the bus, get on and off the bus along the road. The Amin Bazar bridge is narrow so bus and trucks cause traffic jams. In addition, the intercity bus that came back from the suburbs makes a U-turn near the Gabtoli Bus Terminal and gets in the Gabtoli Bus Terminal, causing traffic jams in front of nearby intersections.

4.32 The Gabtoli Ferry Terminal was developed in 2013. It should take approximately 30 minutes to reach the Sadar Ghat, but in fact it is more like 75 minutes. In the vicinity of the ferry terminal, medium-sized ships come and go carrying coal and construction materials, but the river is narrow, and it is very unsafe.

4.33 The Gabtoli station is planned as the junction of MRT Line 5.

Source: JICA Study Team

Figure 4.2.1 Gabtoli Station Area

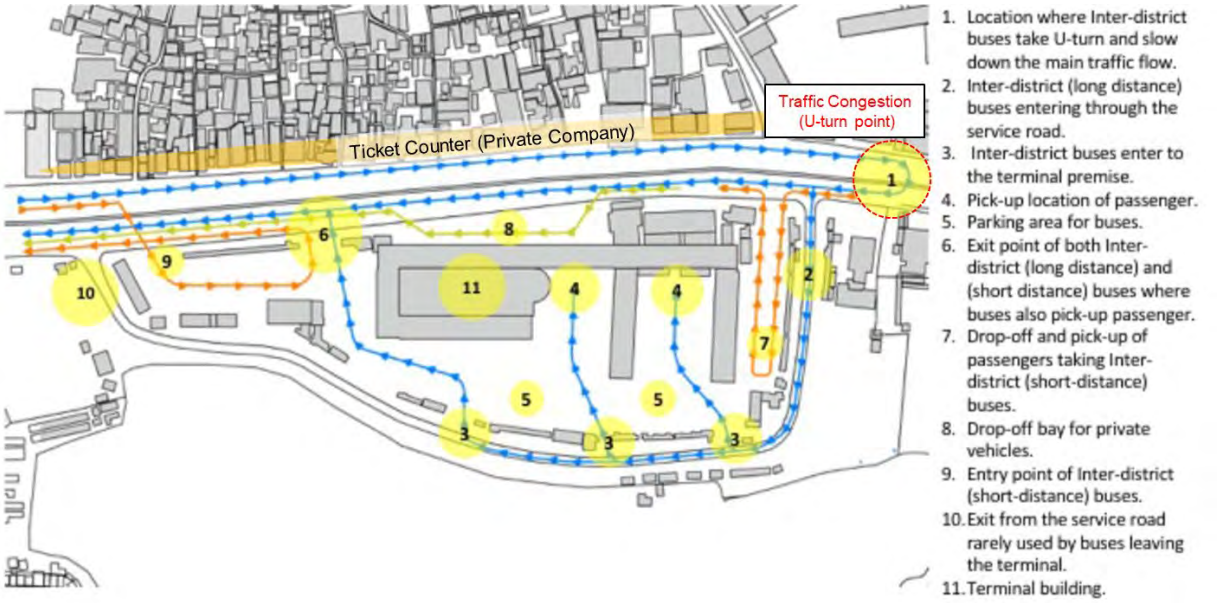
2) TOD Implementation Plan of Gabtoli Station

(a) Functions of Gabtoli Bus Terminal

4.34 Severe congestion affects the surroundings of Gabtoli Bus Terminal. For implementation of TOD, congestion mitigation measures should be considered. The features related to traffic around the station are as follows.

(i) Boarding / alighting of passengers, U-turns by large buses, and other movements to get in the Gabtoli Bus Terminal cause traffic jams. Gabtoli Bus Terminal serves as the bus depot and cannot be utilized for development in the current situation.

(ii) Ticket offices of private bus operators spread along the Dhaka – Aricha Highway. The passengers board and alight at various locations such as ticket counter causing traffic congestion.



Source: JICA Study Team

Figure 4.2.2 Traffic Condition around Gabtoli Bus Terminal

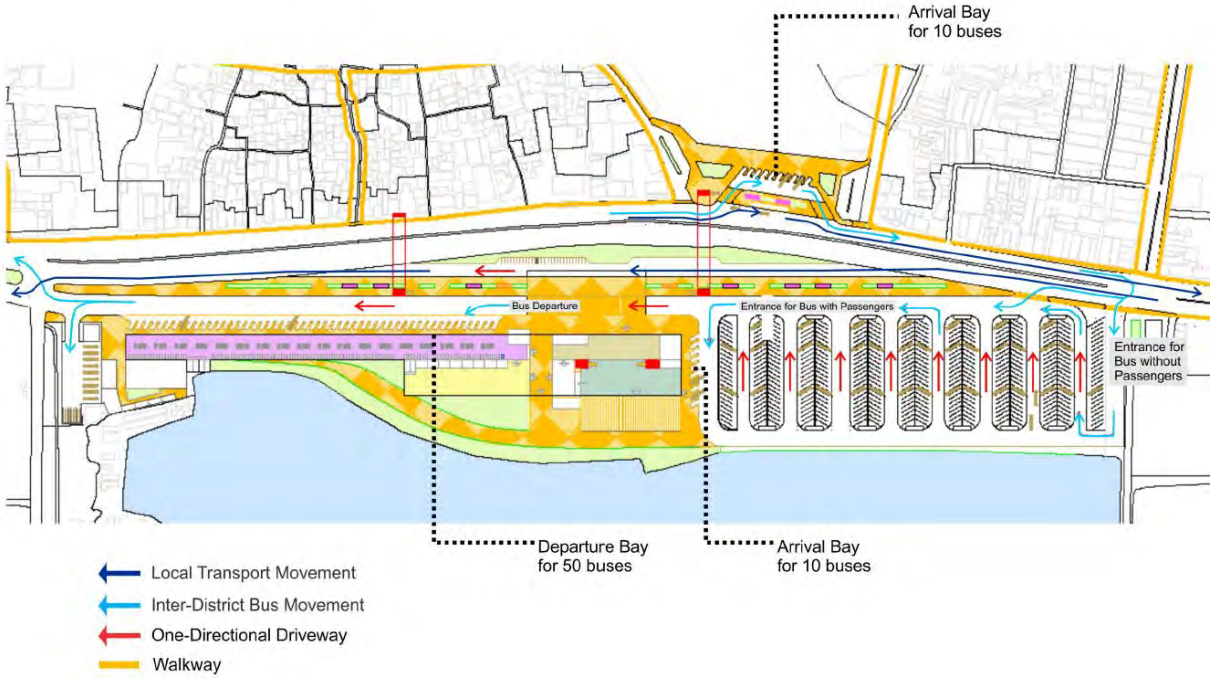
4.35 With the station area development, it is necessary to re-organize the functions of Gabtoli Bus Terminal. The main proposed measures are as follows and the details are shown in Appendix B, Gabtoli Station.

(i) Consolidation of ticket counters into the bus terminal and the spaces along the Dhaka – Aricha Highway, to be partly used as boarding/ alighting spaces for buses.

(ii) Expansion of bus terminal and rearrangement to distinguish boarding/alighting spaces and bus depot.

(iii) Expansion of waiting space for the passengers to improve comfort.

(iv) Provision of amenities such as food court, restaurant and public space.



Source: JICA Study Team

Figure 4.2.3 Improvement Measures of Gabtoli Bus Terminal

(b) Improvement of Accessibility

4.36 In the northern part of Gabtoli Station, there are dense residential are and the sidewalks connecting Gabtoli Bus Terminal and planned MRT station are in poor condition and too narrow.

4.37 To cross Dhaka-Aricha Highway, there is an underground walkway but it is narrow (4.0 m) and many people do not use it. Passengers need to make a detour to access it (Figure 4.2.4).

Source: JICA Study Team

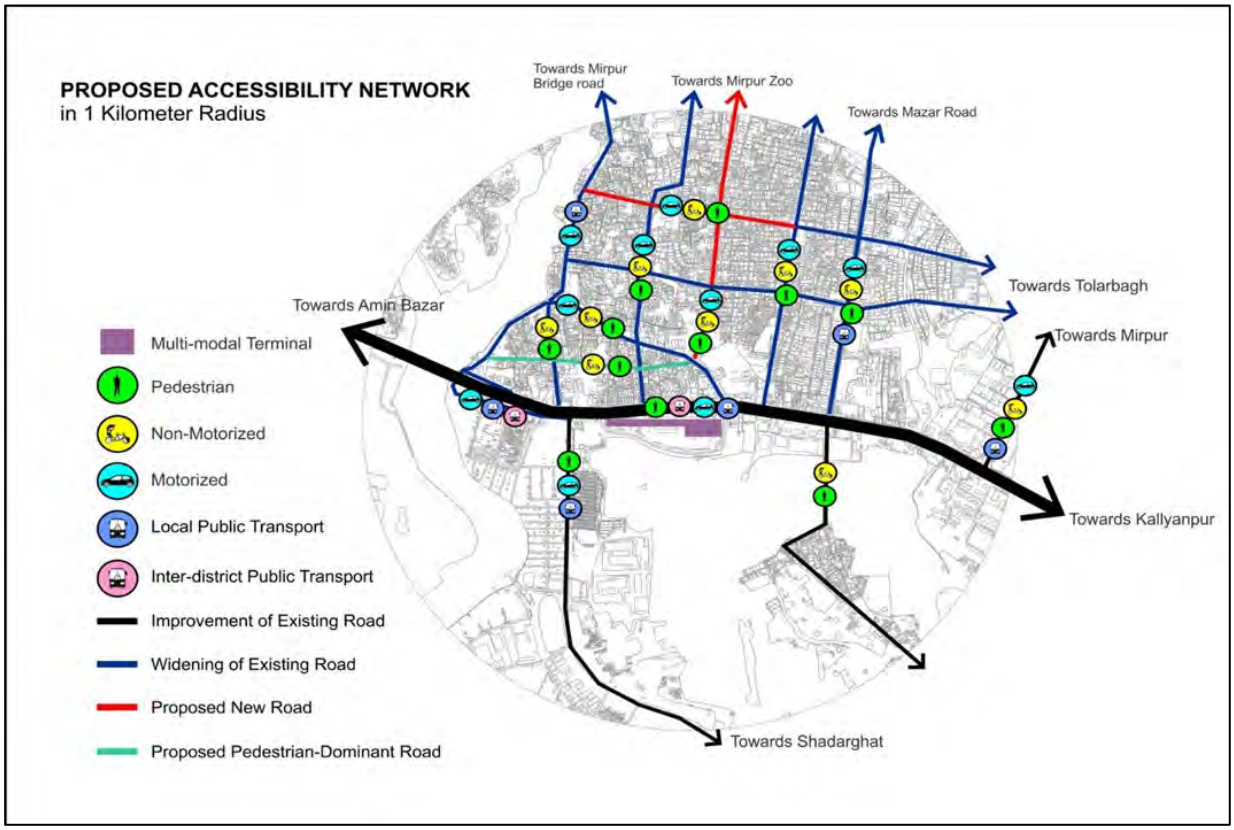
Figure 4.2.4 Current Situation of Underground Walkway on Dhaka – Aricha Highway

4.38 To improve station accessibility and expand its catchment area, the following measures can be proposed.

(i) Improvement and expansion of existing roads to ensure pedestrian accessibility.

(ii) Development of missing links in existing urban area, to improve both road network and living environment.

(iii) Development of underground walkway network to cross Dhaka – Aricha Highway.



Source: JICA Study Team

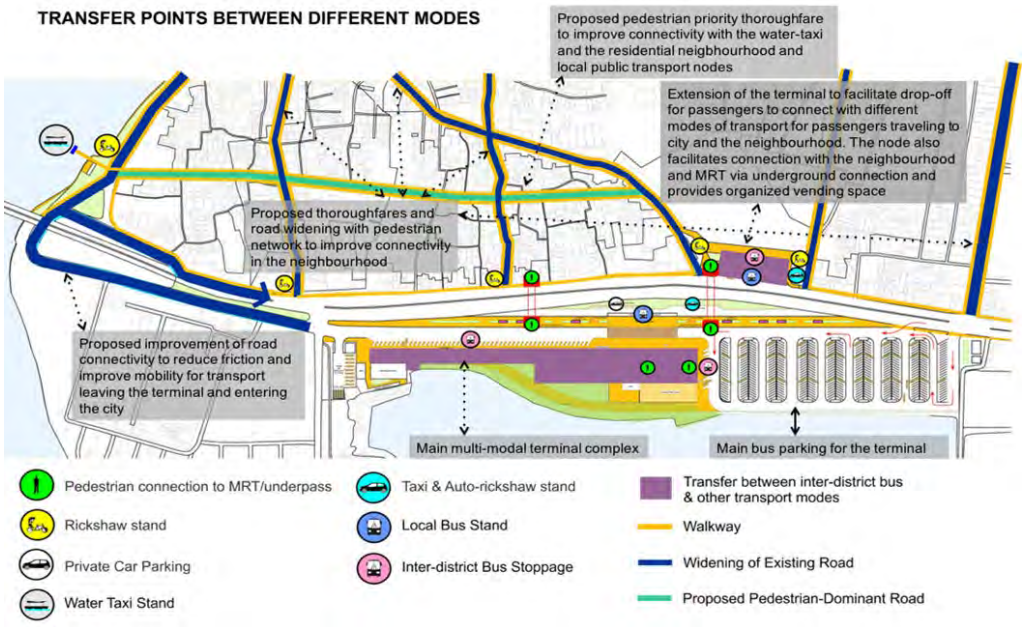
Figure 4.2.5 Access Improvement Measures on Gabtoli Station

(c) Intermodal Facility at MRT Stations

4.39 It is required to improve connectivity with intercity bus, city bus, CNG, rickshaw, and water transport. Development of intermodal facilities should proceed as follows to improve both function and accessibility of the bus terminal.

(i) Development of station plaza on both sides of Dhaka – Aricha Highway

(ii) Development of access roads to connect station plaza to water transport and residential areas. Priority to pedestrians to improve traffic safety and relieve congestion by separating flows of pedestrians and vehicles.

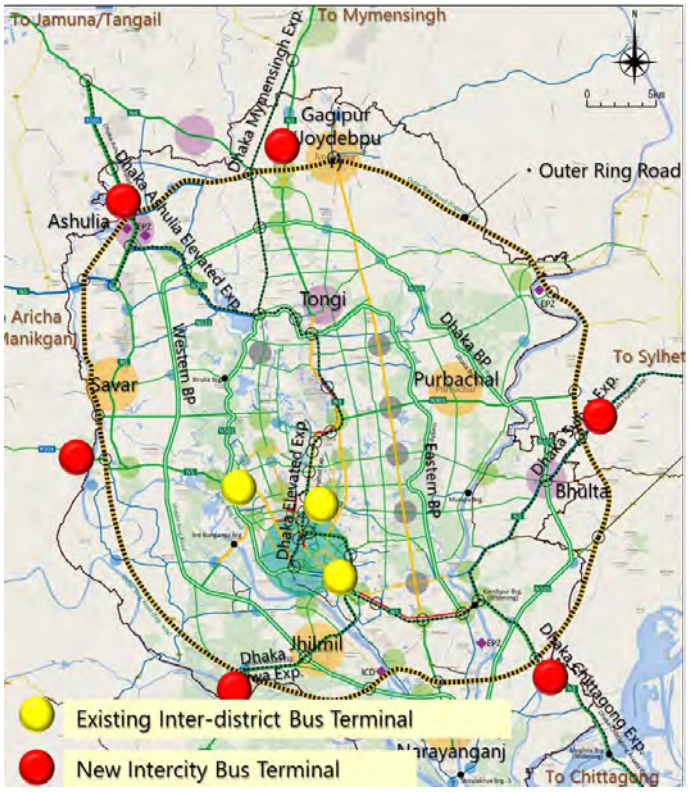


Source: JICA Study Team

Figure 4.2.6 Intermodal Facilities Development Plan

(d) Enhancement of TOD with relocation of Gabtoli Bus Terminal

4.40 Gabtoli Bus Terminal is affected by severe traffic congestion and the STP proposed to relocated the bus terminal to a suburban area along the outer ring road. Once Gabtoli bus terminal is relocated, the land made available can be used for future development.



Source: Worked out by JICA Study Team based on STP

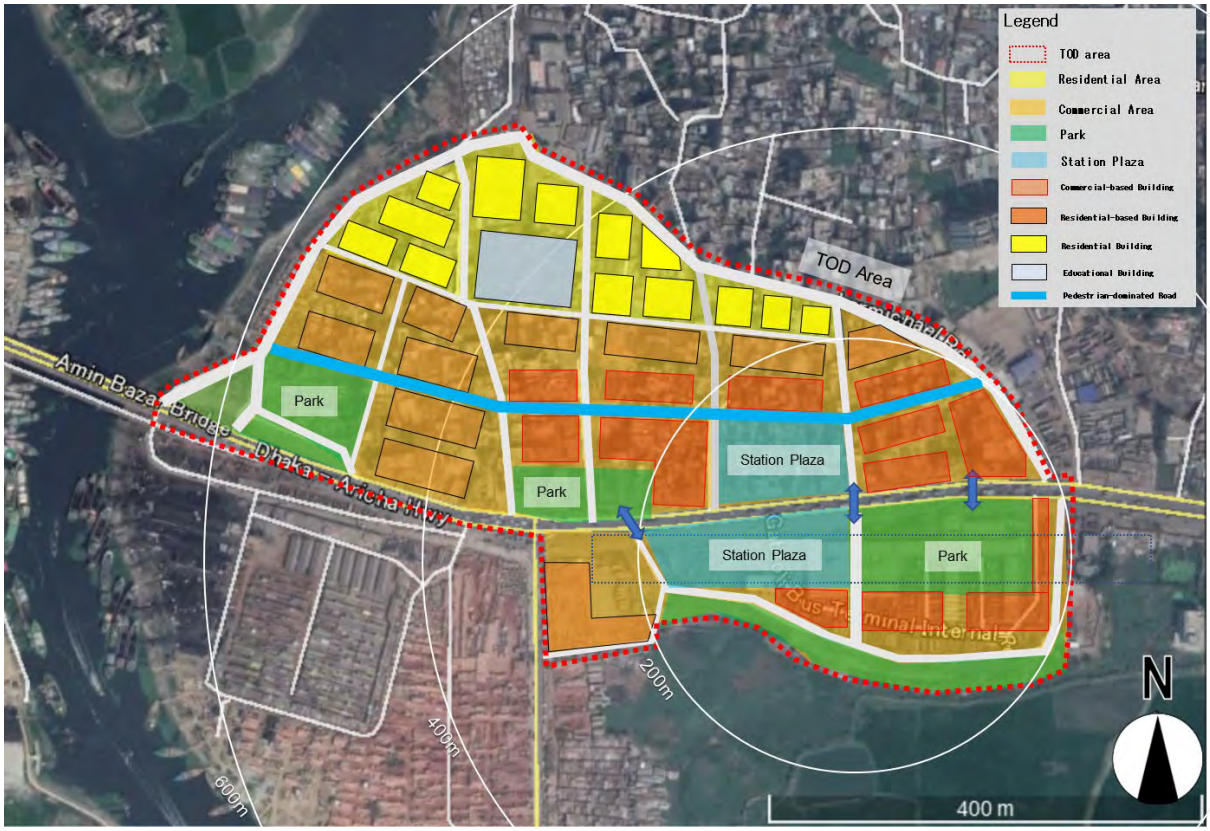
Figure 4.2.7 Bus Terminal Relocation Plan proposed in STP

4.41 To implement urban development effectively, it is necessary to prepare a landuse plan. The general concept for a land use plan is presented below (Figure 4.2.8):

(i) Develop a station plaza around the station and some commercial facilities around the station plaza.

(ii) Develop public spaces along agricultural land and river

(iii) Develop mixed-use commercial and residential buildings along the road, give priority to pedestrian flows.



Source: JICA Study Team

Figure 4.2.8 Draft Landuse Plan of Gabtoli Station Area

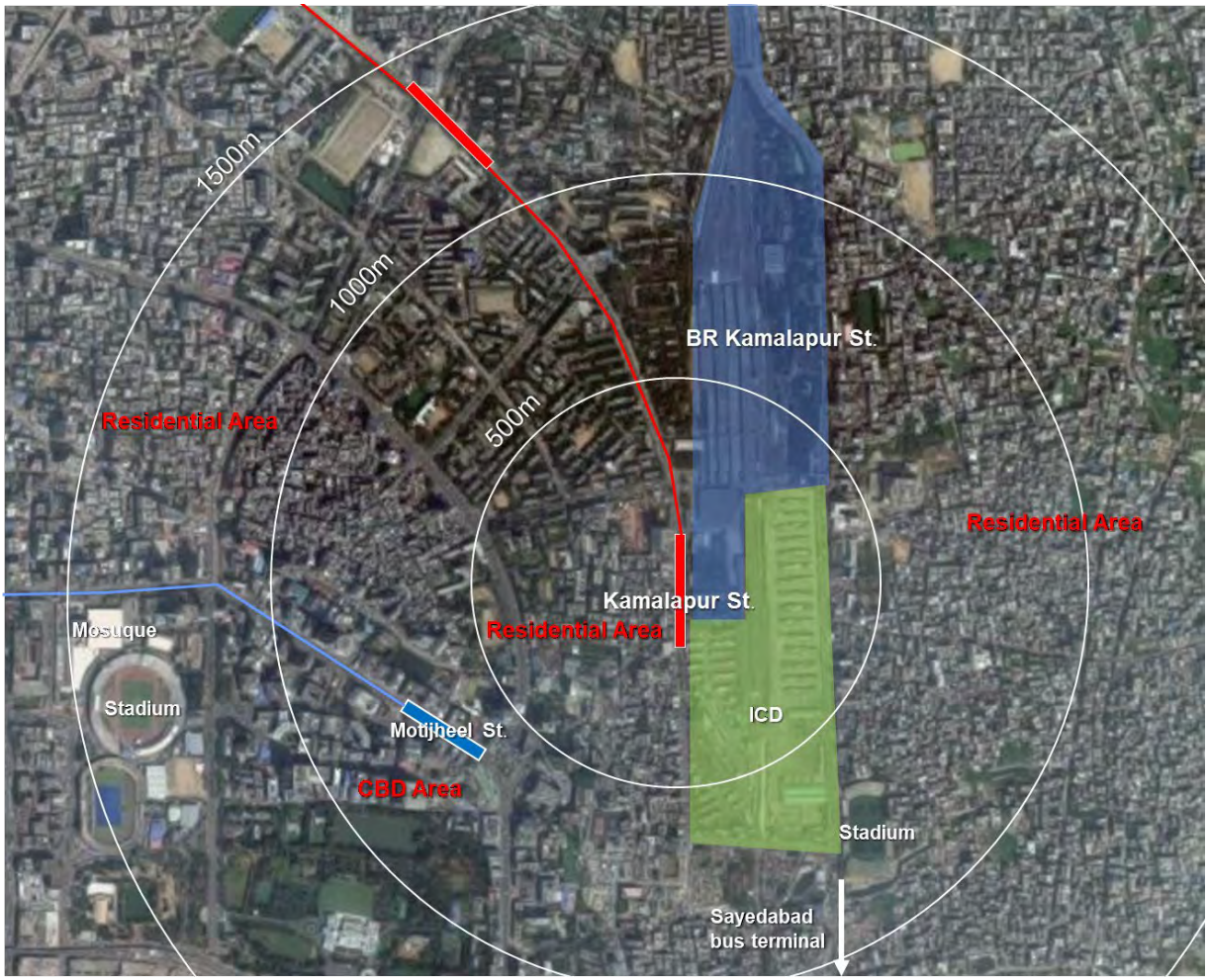
4.3 Kamalapur Station

1) Profile of Kamalapur Station

4.42 Kamalapur station is located close to Motijheel area where many government agencies and commercial facilities are located. It is also close to the central train station of Bangladesh National Railway.

4.43 Within 1,500 meters of the proposed station location, a national mosque and a national sport stadium attract many visitors in the Western part. Sayedabad Bus Terminal is the gateway to suburban areas in the southern part.

4.44 Between Kamalapur Station and Motjheel Station of MRT Line 6, there are old urban blocks and the access roads are narrow. Therefore, the active development occurring in the Motijheel area does not reach the Kamalapur station area. Furthermore, most of the land around Kamalapur station is owned by Bangladesh Railway and ICD. Access is poor to the residential area west of the station.



Source : Worked out by JICA Study Team based on Google earth

Figure 4.3.1 Kamalapur Station

2) TOD Implementation Plan of Kamalapur Station

(a) Access Improvement Plan of MRT Line 1 and MRT Line 6

4.45 Between MRT Line 1 Kamalapur Station and MRT Line 6 Motjheel Station, old urban blocks are located and the access road is quite narrow. When the flow of transferring MRT passengers will increase, the access road will be congested. In the short-term, a solution is to make the existing road pedestrian only, or at least restrict its access so only non-motorized transportation modes (pedestrians, bicycles and cycle rickshaws) can access it. In the long-term, provision of an underground walkway can be considered.

4.46 Direct distance between the stations is about 500m. In development of underground walkway, upper buildings on the walkway should be studied in Detailed Design Stage. To ensure the quick and effective movement for the passengers, provision of *moving walkway* can be proposed.

Source : Worked out by JICA Study Team based on Google earth

Figure 4.3.2 Proposal on Access Road between MRT Line 1 and MRT Line 6

(b) Station Plaza utilizing the Working Depot

4.47 The working depot is planned to be developed as a transfer area between the MRT Kamalapur Station and the Bangladesh Railway Station. The location is very appropriate for the development of intermodal facilities. Currently, the central train station of Kamalapur Station has some parking and loading space near the entrance but the space is not fully utilized. This space should be better used for the provision of station plaza and necessary intermodal transfer facilities.

4.48 To enhance transfer with other modes, the provision of the station plaza is necessary. This station will be the terminus of MRT Line 1 and will connect with Bangladesh Railway network. Pedestrian space and space for intermodal transfers should be arranged.

As shown in Figure 4.3.4, the station plaza can be provided by consolidation of working depot and adjoining vacant spaces. In this draft plan, parking space for private cars is as existing and the space for rickshaw and CNG is planned within the boundary. Early planning decisions will contribute to effective planning of the station plaza and the location of the entrances should be decided before construction starts.

4.49 In the future, the area should attract commercial development around the station and the land for a station plaza might become insufficient. When the land readjustment project will be implemented, the station plaza should be prepared and expanded according to the future urban development demand.

Source : Worked out by JICA Study Team based on Google earth

Figure 4.3.3 Planned Location of Working Depot

Source : JICA Study Team

Figure 4.3.4 Station Plaza Development Plan (Phase 1)

Station Plaza Facilities　　Transportation Network

Station Plaza Facilities	Area(㎡)	Capacity
Parking	2,300	Car 60, Bike 84
Bus Terminal Taxi Pool	7,330	Bus 9 (on 7, off 2) Taxi 5 (in 3, out 2)
CNG, Rikishaw	150	
Car Rotary	620	Car (in 3, out 3)
Pedestrian Space	13,000	
Total	24,000	

Source : JICA Study Team

Figure 4.3.5 Station Plaza Development Plan

4.50 To estimate required area for station plaza, various methods have been proposed.

Among the following 9 main components of the station plaza, (i) to (viii) are for transportation facilities. (ix) is environmental space and the required space should be estimated according to the demands of passengers and users of the related facilities.

(i) **Space for bus boarding/ alighting:** No. of berths * unit space per 1 berth + Waiting space for pedestrians.

(ii) **Space for taxi boarding/ alighting:** No. of berths * unit space per 1 berth + Waiting space for pedestrians.

(iii) **Space for private car boarding/ alighting:** No. of berths * unit space per 1 berth

(iv) **Space for paratransit boarding/ alighting:** Waiting space for CNG and rickshaw (as of existing)

(v) **Parking space:** Because the number of motorcycle will increase, a large space for motorcycles should be arranged. If the space is insufficient, elevated parking facilities can be proposed.

(vi) **Space for walkway**

(vii) **Space for motorway to handle traffic movements.**

(viii) **Space for other facilities.**

(ix) **Space for environmental space:** Because Kamalapur station is the terminal station, it will become attractive for future development, so enough environmental (public) space should be reserved before the entire area is filled with new developments. However, the current plan could not reserve enough space to accommodate future demand, the land in the western part also should be developed.

Source : JICA Study Team

Figure 4.3.6 Station Plaza Development Plan of Kamalapur Station

(c) Traffic Management of Public Transport

4.51 Management of public transport will be necessary to avoid irregular operations by bus, such as waiting for passengers for a long time and boarding / alighting on roadsides. CNGs and rickshaws should be well managed as well to minimize traffic impacts. Integrated implementation of station plaza development and traffic management would help mitigate traffic congestion and improve public transportation convenience.

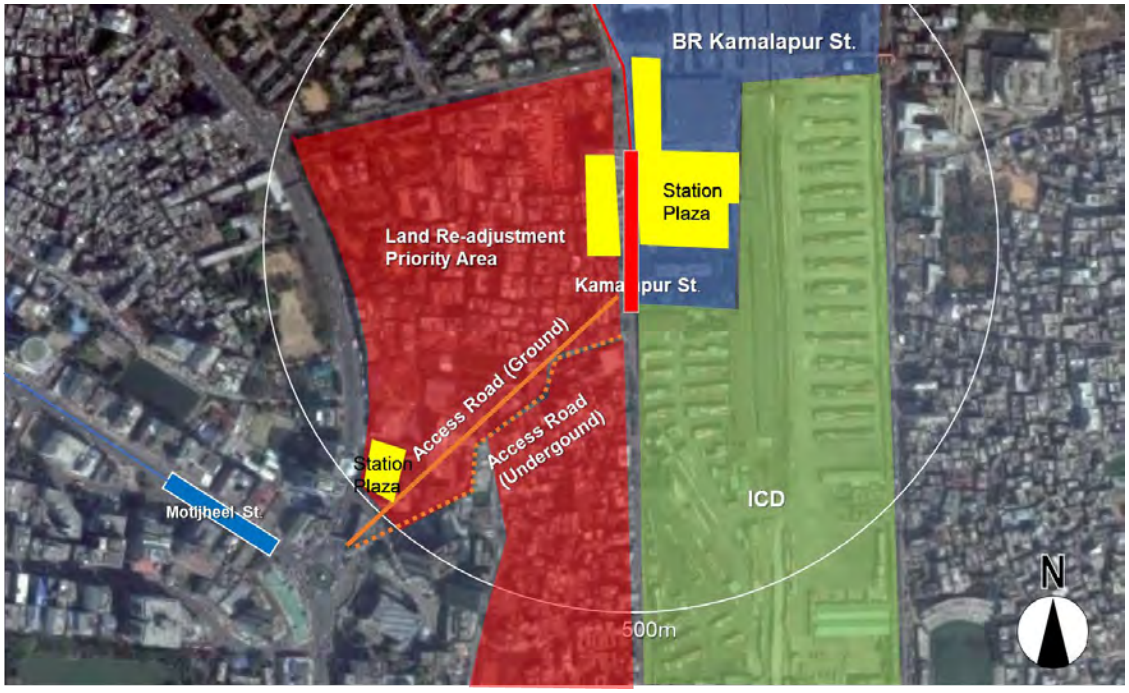
(d) Prioritized Area of Land Readjustment Scheme

4.52 MRT Line 1 Kamalapur Station is located at a distance of 500 m from MRT Line 6 Mothjheel Station, and the station area is prospering as Commercial Business District of South Dhaka. However, the existing old urban blocks and the activeness at Motijheel area does not extend all the way to Kamalapur Station. Large banks, administrative agencies and many high-rise buildings are located around Motijheel station. To improve connectivity with the commercial business district, the existing urban blocks should be rearranged in the long term.

4.53 Narrow streets and old buildings vulnerable to earthquakes separate Kamalapur and Mothijeel stations. The planning including the improvement of the disaster preventing ability should be improved. Rearrangement of existing urban blocks with utilization and mixed use of commercial and residential area is important to increase the ridership.

4.54 RAJUK plans to implement a pilot land readjustment project applying to existing urban blocks. It can be assumed that a scheme like Land Readjustment Scheme in Japan would be implemented. Although it is expected to take a very long time to implement, the commitment on the project is very important. Expansions of commercial business area and improvement access would contribute on the increase of the land price. And the provision of access road prioritized to the pedestrians and development of commercial facilities along the access road would induce economic impacts. In regard of the station plaza, MRT Line 1 Kamulapur Station can utilize the land for the working depot but MRT Line 6 cannot acquire the land. It is required to include the land acquisition of the station plaza into the land readjustment scheme.

4.55 Even after the implementation of the priority area, long term measures including adjoining areas would be important to expand the commercial area and improve disaster preventing ability



Source : Worked out by JICA Study Team based on Google earth

Figure 4.3.7 Proposal on the Priority Area of Land Readjustment Project

(e) Appropriate Transfer Movement Plan

4.56 MRT Line 1 Kamalapur Station is located at a distance of 500 m from MRT Line 6 Mothjheel Station. To enhance economic benefit, arrangement of the commercial facilities along the access road would be important. And the area can be assumed as the commercial center and the design of attractive space is necessary. Development of the landscapes and shop houses at lower levels, for not only shopping but also various activities.

4.57 Accessibility from the access roads between MRT stations and commercial facilities so that passengers can visit is important. The development walkway network to the bus terminal and existing urban area, to expand the accessible area from the station would increase the MRT ridership. Development of intermodal facilities to enhance the access not only by MRT, but also by bus, CNG, and taxi to the commercial facilities would increase the benefits of commercial facilities. Synergistic effects of transport users and facility users can also be expected.

4.58 Unlike the existing urban blocks, providing intervals of buildings is important to make space more attractive. Apart from Mohanagar Building Construction Act, A Special Licensing Scheme should be introduced and the design should be carefully considered on the main commercial facilities.

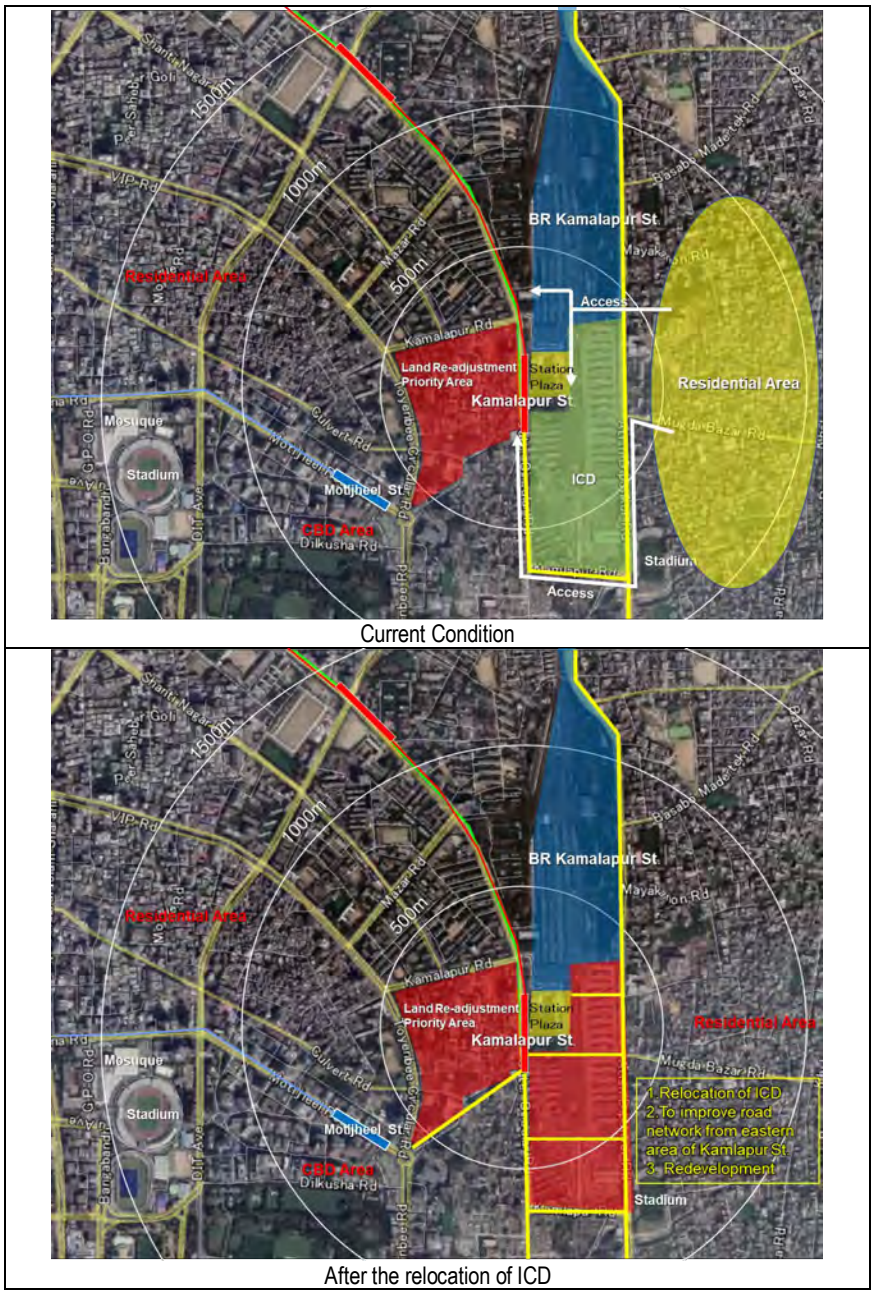
(f) Relocation of the Container Yard to Improve Walking Environment

4.59 In Japan, working depot and container yard are conventionally located close to major train stations. As land prices rise it will become necessary to relocate the depot of Kamalapur to make the space available for a proper station plaza. The plots surrounding that space should be developed as this is a prime location in the CBD. Kamalapur Station also has the container yard, which is owned by Chittagong Port Authority and interrupts the access from residential units from Eastern parts. To ensure the accessibility from the station,

relocation of ICD is necessary.

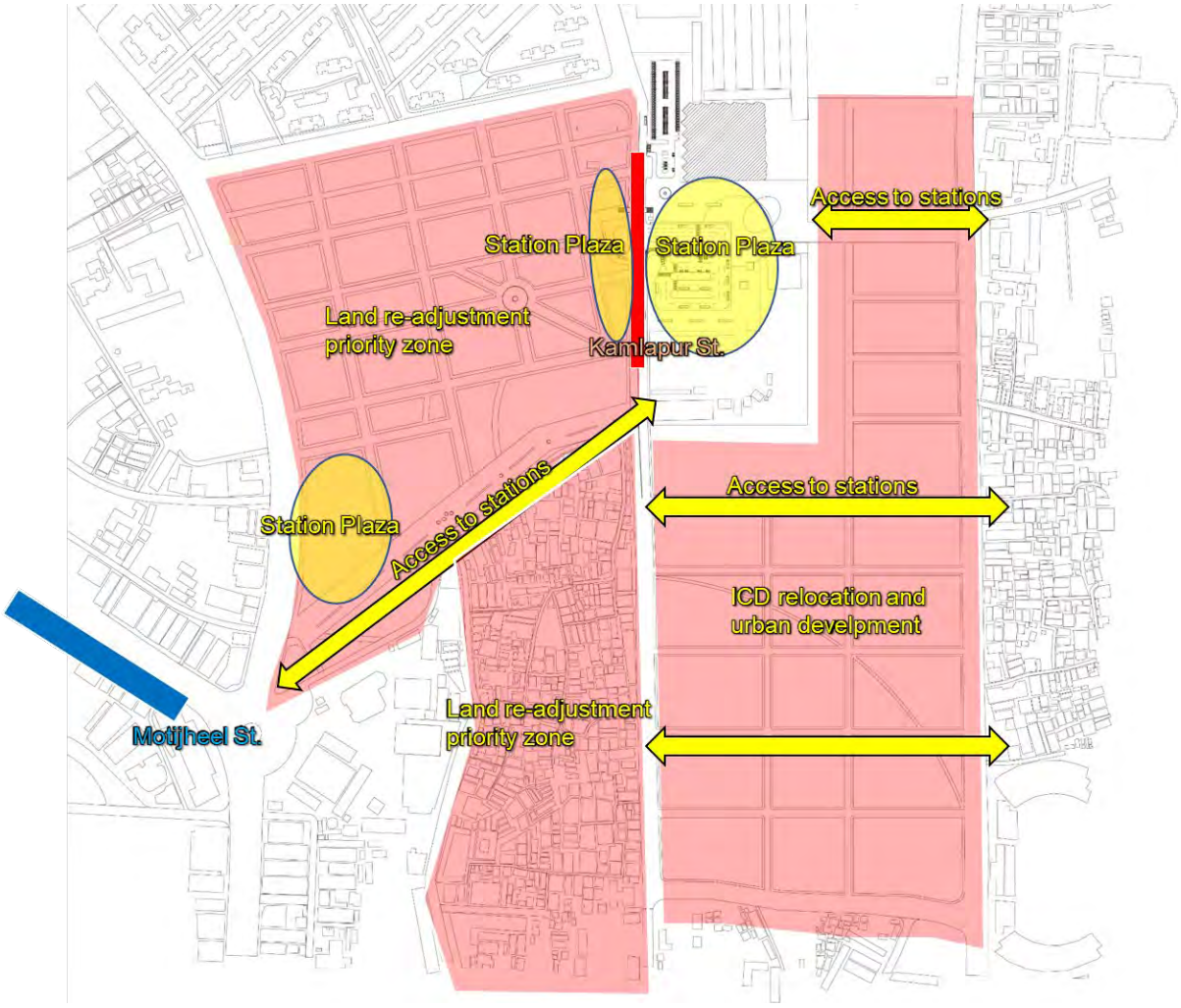
4.60 To rise the land price around the station and increase the railway ridership, development of commercial facilities, residential units, and utilization of the land use are also necessary. Therefore, the site of ICD would contribute to gain the benefit from railway area and commercial area.

4.61 Through the relocation of the container yard, accessible distance from Kamalapur Station of MRT Line 1 and Motjheel Sation of MRT Line 6 is 1 km, and ridership would increase.



Source : Worked out by JICA Study Team based on Google earth

Figure 4.3.8 Accessibility Improvement Measures by Relocation of the Container Yard (1)



Source: JICA Study Team

Figure 4.3.9 Accessibility Improvement Measures by Relocation of the Container Yard (2)

(g) Urban Development at the Site of the Container Yard

4.62 Urban development will be implemented at the site of the container yard. The container yard adjoins the Kamalapur Station and the development with residential and commercial functions for railway users can be expected. Mixed-use development with commercial space in lower levels and residential space in higher levels can be expected. The vicinity of the station is beneficial as the residential units and high demand also can be expected. To ensure the accessibility to the stations, pedestrian network with roads wide enough is important.

4.63 The development of the walkway should be included to ensure the accessibility would expand the station catchment area and benefit to the railway.

3) Step-wise Implementation of TOD

4.64 In implementation of TOD, the short-term measures and middle- and long-term measures should be considered.

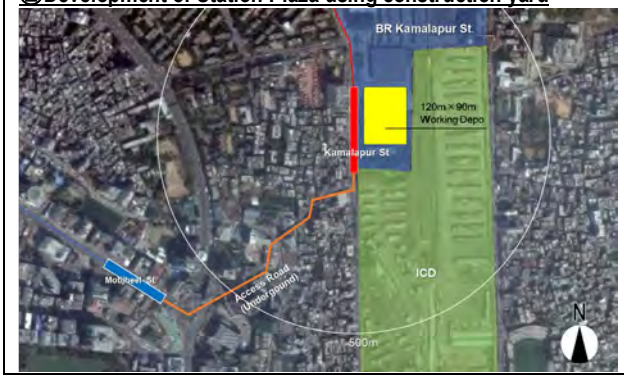
(i) To enhance railway ridership, the access route between MRT Line 1 and MRT Line 6 should be provided and the site of the working depot should be utilized as the station plaza.

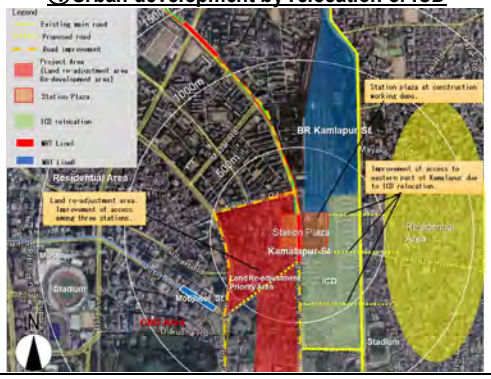
(ii) To improve connectivity with other modes and prevent disasters, schemes such as the land readjustment should be implemented and station area developed. The current location of the container yard prevents access to the station from Eastern part. To attract more passengers to the railway, the container yard should be relocated to the suburban and the site should be utilized for the urban development. Land prices are expected rise and the IDC, owners of the container yard will make huge benefits.

(iii) Development of commercial facilities around station will attract shopping customers and commuters. The railway ridership also will increase and huge benefits to the adjoining commercial facilities can be expected.

4.65 In Japan, station area development had been implemented over long periods of time. The combination of short-term measures and long-term measures is necessary. The stepwise development with creation of the city's vision would produce larger impacts of TOD.

Short-term Action	Long-term Action
① Improvement of Access road between MRT 1 and 6	③Urban development by land re-adjustment
②Development of Station Plaza using construction yard	④Urban development by relocation of ICD





Source: JICA Study Team

Figure 4.3.10 Step-wise Development Plan of Kamalapur Station Area

5 Economic and Financial Analysis for Station Plaza

5.1 This chapter analyzes the feasibility of TOD by economic and financial analysis. As explained in Chapter 3, definition of TOD is “access improvement including walk environment within 600-800m radius from stations”, “development of transport hub” such as station plaza, and “high-density and mixed-use development in station areas.” This study focuses on development of station plazas to optimize effects of railway development. Thus, the economic and financial analysis targets the station plaza development. Economic analysis evaluates the economic feasibility of station plazas. On the other hand, financial analysis assesses the financial viability of station plazas from a viewpoint of an implementing entity.

5.2 Economic evaluation conducts cost and benefit analysis for quantified benefits as well as qualitative evaluation for unmeasurable benefits. The costs of station plaza development include costs of land acquisition, land preparation and construction of station plazas that will be converted into economic price. The benefits are divided into railway user benefit and reduction of transport costs. Transfer time saving of railway passengers and reduction of VOC and TTC due to the mitigation of traffic congestion in the station areas will be summed as benefits for cost benefit analysis.

5.3 Financial analysis examines profitability of the station plaza development. The costs are the same as that for economic analysis but the market price is applied. The station plazas do not collect user’s fee. Therefore, increase in tax revenue due to land price increase is assumed to be revenue for the government as an implementing entity

5.4 The structure of this chapter is as follows. 5.1 will explain rough estimate of project cost and 5.2 will conduct cost benefit analysis. 5.3 will examine the land price increase in station areas duet to MRT development in order to compute revenue for financial analysis. Finally, profitability of the project will be evaluated on the assumption that revenue is increase in tax revenue by the rise in land price in 5.4.

5.1 Rough Estimate of Station Plaza

1) Cost Calculation Item of Rough Estimate

5.5 The unit price to estimate cost was calculated using information from Dhaka North City Corporation (DNCC), Ministry of Housing and Public Works, and Newtown Project of RAJUK.

5.6 Site for station plaza. In order to secure sites for station plazas in the vicinity of the station, land acquisition is necessary. There is a difference in the costs between public and private lands. According to the Land Acquisition Law revised in 2017, the price of land acquisition is determined as thrice the declared value while building cost is decided by building valuation. However, the declared land price of Dhaka is far from the market price. Therefore, when the gap is large between declared land and market prices, it is possible to apply to change the evaluated price. Since market price is unclear, this chapter adapts the higher price as the cost of land acquisition that is, in comparison, three times the declared land price and market price.

5.7 The cost of public land is calculated using the abovementioned method, though the cost of public land fluctuates depending on the coordination with relevant agency.

5.8 The size of important station plazas, such as terminal station and transfer station, is assumed to be 15,000 m^2. The rest are a total of 10,000 m^2 being there are two station plazas developed for both directions at 5,000 m^2 each.

Table 5.1.1 Cost of Land Acquisition

Land Acquisition								
Station		Station Plaza Area (m^2)			Land Acquisition Cost (BDT)			
		Type	Public-Owned Land	Private Land	(000)/m^2			Total Cost (million)
					Government Declared	Market Price	Adapted	
Line 1	Kamalapur	Large	15,000	0	471	524	1,413	21,193
	Rajarbagh	Medium	5,000	5,000	314	524	943	9,427
	Malibagh	Medium	0	10,000	223	337	670	6,697
	Rampura	Medium	0	10,000	400	150	1,200	12,004
	Hatir Jheel	Medium	5,000	5,000	83	165	248	2,482
	Badda	Medium	0	10,000	88	165	264	2,635
	Uttar Badda	Medium	0	10,000	77	165	231	2,307
	Notun Bazar	Large	7,500	7,500	129	262	387	5,810
	Future Park	Medium	0	10,000	90	300	300	2,996
	Khilkhet	Medium	5,000	5,000	45	412	412	4,119
	Airport Terminal 3	Medium	5,000	5,000	275	412	824	8,236
	Airport	Large	7,500	7,500	275	524	824	12,353
	Bashundhara	Medium	0	10,000	0	225	225	2,247
	POHS	Medium	5,000	5,000	45	225	225	2,247
	Mastul	Medium	0	10,000	51	225	225	2,247
	Purbachal West	Medium	10,000	0	4	225	225	2,247
	Purbachal Central	Medium	10,000	0	4	225	225	2,247
	Purbachal East	Medium	10,000	0	4	225	225	2,247
	Purbachal Terminal	Large	10,000	0	4	225	225	3,370
	Total							107,112
Line 5	Vatara	Large	0	15,000	77	150	231	3,461
	Gulshan-2	Medium	0	10,000	255	1,798	1,798	17,975
	Banani	Medium	0	10,000	129	1,273	1,273	12,732
	Kochukhet	Medium	0	10,000	110	165	331	3,309
	Mirpur-14	Medium	5,000	5,000	97	150	291	2,910
	Mirpur 10	Large	5,000	10,000	75	374	374	5,617
	Mirpur 1	Medium	5,000	5,000	51	374	374	3,745
	Dar-Us-Salam	Medium	5,000	5,000	66	300	300	2,996
	Gabtoli	Medium	10,000	0	51	127	154	1,543
	Amin bazar	Medium	0	10,000	0	93	93	929
	Bilamalia	Medium	0	10,000	0	52	52	524
	Baliapur	Medium	0	10,000	0	52	52	524
	Hemayetpur	Large	0	15,000	0	75	75	1,123
	Total							57,388

5.9 Land preparation cost. Due to the current situation, land improvement cost is greatly different. Since there are construction sites in wetlands, undeveloped sites that need enormous embankments and soil retaining walls, sites regulated by urban planning, and suitable sites for development, these are estimated considering the suitable development areas and inappropriate areas. It is assumed that the cost of an existing urban area with a building is BDT100 per m^2, an area with no buildings and unused land is BDT200 per m^2, and areas where large amounts of soil and soil retaining wall are needed (such as Bilamaria) is BDT 5,000 per m^2. The computation is the size of station plaza multiplied by the cost of land preparation cost.

5.10 In addition, the demolition fee of an existing urban area is based on the concept plan in Chapter 3. The cost depends on whether Reinforced Concrete (RC) buildings exists or not. Depending on the number of floors and structure of a building, the amount of cost varies widely but the calculated unit price was BDT10,000 per m^2.

Table 5.1.2 Land Preparation Cost

Land Preparation								
Station		Land Preparation			Demolition			Total Cost (million BDT)
		Unit (BDT/m²)	Quantity (m²)	Cost (000BDT)	Unit (BDT/m²)	Quantity (m²)	Cost (000BDT)	
Line 1	Kamalapur	100	15,000	1,500	10,000	0	0	1.5
	Rajarbagh	100	10,000	1,000	10,000	5,000	50,000	51.0
	Malibagh	100	10,000	1,000	10,000	10,000	100,000	101.0
	Rampura	100	10,000	1,000	10,000	10,000	100,000	101.0
	Hatir Jheel	100	10,000	1,000	10,000	5,000	50,000	51.0
	Badda	100	10,000	1,000	10,000	10,000	100,000	101.0
	Uttar Badda	100	10,000	1,000	10,000	10,000	100,000	101.0
	Notun Bazar	100	15,000	1,500	10,000	5,000	50,000	51.5
	Future Park	100	10,000	1,000	10,000	5,000	50,000	51.0
	Khilkhet	100	10,000	1,000	10,000	5,000	50,000	51.0
	Airport Terminal 3	100	10,000	1,000	10,000	0	0	1.0
	Airport	100	15,000	1,500	10,000	0	0	1.5
	Bashundhara	200	10,000	2,000	10,000	0	0	2.0
	POHS	200	10,000	2,000	10,000	0	0	2.0
	Mastul	100	10,000	1,000	10,000	0	0	1.0
	Purbachal West	100	10,000	1,000	10,000	0	0	1.0
	Purbachal Central	100	10,000	1,000	10,000	0	0	1.0
	Purbachal East	100	10,000	1,000	10,000	0	0	1.0
	Purbachal Terminal	100	15,000	1,500	10,000	0	0	1.5
	Total							673
Line 5	Vatara	200	15,000	3,000	10,000	0	0	3.0
	Gulshan-2	100	10,000	1,000	10,000	10,000	100,000	101.0
	Banani	100	10,000	1,000	10,000	8,000	80,000	81.0
	Kochukhet	100	10,000	1,000	10,000	5,000	50,000	51.0
	Mirpur-14	100	10,000	1,000	10,000	5,000	50,000	51.0
	Mirpur 10	100	15,000	1,500	10,000	5,000	50,000	51.5
	Mirpur 1	100	10,000	1,000	10,000	10,000	100,000	101.0
	Dar-Us-Salam	100	10,000	1,000	10,000	10,000	100,000	101.0
	Gabtoli	100	10,000	1,000	10,000	0	0	1.0
	Amin bazar	200	10,000	2,000	10,000	5,000	50,000	52.0
	Bilamalia	5,000	10,000	50,000	10,000	0	0	50.0
	Baliapur	5,000	10,000	50,000	10,000	0	0	50.0
	Hemayetpur	100	15,000	1,500	10,000	5,000	50,000	51.5
	Total							745

Source: JICA Study Team

5.11 Cost of transfer zone. When considering the construction cost of a station plaza, it is classified into traffic zone and environmental zone. Cost of transportation zone includes road construction cost and loading and unloading areas. The proportion of the traffic zone and environmental zone is about 1:1. Traffic zone is half the total area of the station plaza. BDT6,000 per m^2 is the designated unit cost of transportation zone considering the road pavement cost and shelter.

5.12 Environmental zone. Environmental zone includes pedestrian facilities and is half the area of the station plaza excluding the traffic zone. The unit price is assumed to be BDT3,000 per m^2. Footbridges for crossing roads are also considered. During detailed design, it is necessary to consider not only the pedestrian bridges but also the underpasses for crossing. In Purbachal New Town, the pedestrian deck cost was determined to be higher than with other stations due to the 300-ft road crossing. Therefore, the designated unit price of a normal station footbridge is BDT50 million and a footbridge over a 300-ft road is BDT200 million.

5.13 Traffic management facilities. Traffic signals are necessary to manage access from

main roads to station plazas. Signboards for pedestrians will also be required. It is assumed that traffic signal will be located at entrances of station plazas, and signboard will be located depending size of station plazas. It is calculated that unit price of large station plaza is BDT20 million and others is BDT10 million.

5.14 Landscape and furniture. The cost includes trees, bushes, street furniture such as bench, and lights. BDT2,000 per m^2 is the unit cost and multiplied by the size of the station plaza.

5.15 The construction cost of station plazas is calculated as total cost of above items. The cost is shown in Table 5.1.3 below.

Table 5.1.3 Rough Estimate of Station Plaza

Unit: million BDT

	Station	Type	Area (m^2)	Land Acquisition	Land Preparation	Road Work	Pavement/ Pedestrian	Traffic Management	Total Cost
Line 1	Kamalapur	Large	15,000	21,193	1.5	45	72.5	20	21,332
	Rajarbagh	Medium	10,000	9,427	51.0	30	65.0	10	9,583
	Malibagh	Medium	10,000	6,697	101.0	30	65.0	10	6,903
	Rampura	Medium	10,000	12,004	101.0	30	65.0	10	12,210
	Hatir Jheel	Medium	10,000	2,482	51.0	30	65.0	10	2,638
	Badda	Medium	10,000	2,635	101.0	30	65.0	10	2,841
	Uttar Badda	Medium	10,000	2,307	101.0	30	65.0	10	2,513
	Notun Bazar	Large	15,000	5,810	51.5	45	72.5	20	5,999
	Future Park	Medium	10,000	2,996	51.0	30	65.0	10	3,152
	Khilkhet	Medium	10,000	4,119	51.0	30	65.0	10	4,275
	Airport Terminal 3	Medium	10,000	8,236	1.0	30	65.0	10	8,342
	Airport	Large	15,000	12,353	1.5	45	72.5	20	12,492
	Bashundhara	Medium	10,000	2,247	2.0	30	215.0	10	2,504
	POHS	Medium	10,000	2,247	2.0	30	215.0	10	2,504
	Mastul	Medium	10,000	2,247	1.0	30	215.0	10	2,503
	Purbachal West	Medium	10,000	2,247	1.0	30	215.0	10	2,503
	Purbachal Central	Medium	10,000	2,247	1.0	30	215.0	10	2,503
	Purbachal East	Medium	10,000	2,247	1.0	30	215.0	10	2,503
	Purbachal Terminal	Large	15,000	3,370	1.5	45	222.5	20	3,659
	Total			107,112	673.0	630	2,315.0	230	110,960
Line 5	Vatara	Large	15,000	3,461	3.0	45	72.5	20	3,601
	Gulshan-2	Medium	10,000	17,975	101.0	30	65.0	10	18,181
	Banani	Medium	10,000	12,732	81.0	30	65.0	10	12,918
	Kochukhet	Medium	10,000	3,309	51.0	30	65.0	10	3,465
	Mirpur-14	Medium	10,000	2,910	51.0	30	65.0	10	3,066
	Mirpur 10	Large	15,000	5,617	51.5	45	72.5	20	5,806
	Mirpur 1	Medium	10,000	3,745	101.0	30	65.0	10	3,951
	Dar-Us-Salam	Medium	10,000	2,996	101.0	30	65.0	10	3,202
	Gabtoli	Medium	10,000	1,543	1.0	30	65.0	10	1,649
	Amin bazar	Medium	10,000	929	52.0	30	65.0	10	1,086
	Bilamalia	Medium	10,000	524	50.0	30	65.0	10	679
	Baliapur	Medium	10,000	524	50.0	30	65.0	10	679
	Hemayetpur	Large	15,000	1,123	51.5	45	72.5	20	1,312
	Total			57,388	745	435.0	867.5	160	59,596

Source: JICA Study Team

5.2 Economic Evaluation

5.16 The main purpose of economic analysis is to show the effects of the implementation of the station plaza from a national economy viewpoint. Economic feasibility of Lines 1 and 5 are analyzed in the aspects of quantitative analysis using cost benefit analysis and evaluation using qualitative data.

1) Economic Benefit

5.17 The benefits of station plazas are considered a railway-user benefit and reduction of transportation costs. The validity of station plaza is analyzed in the viewpoint of the economic benefits.

(1) Railway User Benefit

5.18 Short transfer time to other transportation systems and improvement of safety and comfort can be cited as benefits for railway users.

(i) Shortening Transfer Time by Station Plaza

5.19 The number of passengers is projected by traffic demand forecast. The projection for each station is calculated in the table below.

Table 5.2.1 Number of Passengers (Line 1)

Section	Stations	2025	2035	2055
Phase 1 Section (Main)	Airport St.	387,000	75,500	92,000
	Airport Terminal 3 St.	-	75,500	92,000
	Khilkhet St.	71,000	47,000	57,000
	Future Park St.	338,000	215,000	262,000
	Notun Bazar St.	318,000	250,000	305,000
	UttaraBadda St.	58,000	71,000	87,000
	Badda St.	64,000	77,000	95,000
	HatirJheel St.	51,000	62,000	75,000
	Rampura St.	144,000	119,000	145,000
	Malibagh St.	134,000	111,000	135,000
	Rajarbagh St.	95,000	77,000	95,000
	Kamalapur St.	110,000	274,000	335,000
	Sub-total	1,770,000	1,454,000	1,775,000
Phase 1 Section (Purbachal Branch)	Future Park St. (to Purbachal)	153,000	159,000	194,000
	Bashundhara St.	132,000	139,000	169,000
	POHS	122,000	128,000	155,000
	Mastul St.	65,000	64,000	78,000
	Purbachal West St.	99,000	96,000	117,000
	Purbachal Central St.	115,000	111,000	136,000
	Purbachal East	107,000	103,000	127,000
	Purbachal Terminal St.	205,000	199,000	243,000
	Sub-total	998,000	999,000	1,219,000
Total		2,768,000	2,453,000	2,994,000

Source: JICA Study Team

Note: Number of passengers is only reference and based on RSTP.

Table 5.2.2 Number of Passengers (Line 5)

Section	Stations	2028	2035	2058
Line 5 Phase 1 Section	Hemayetpur St	407,000	402,000	505,000
	Baliapur St.	49,000	98,000	123,000
	Modhunmoti St.	44,000	96,000	121,000
	Amin Bazar St.	94,000	48,000	60,000
	Gabtoli St.	167,000	585,000	735,000
	Dar-Us-Salam St.	57,000	98,000	123,000
	Mirpur1 St.	137,000	174,000	218,000
	Mirpur10 St.	369,000	312,000	392,000
	Mirpur14 St.	19,000	25,000	32,000
	Kochunkhet St.	2,000	54,000	67,000
	Banani St.	134,000	114,000	143,000
	Gulshan2 St.	179,000	133,000	167,000
	Notun Bazar St.	389,000	321,000	404,000
	Vatara St.	413,000	294,000	369,000
	Total	2,460,000	2,754,000	3,459,000

Source: JICA Study Team

Note: Number of passengers is only reference and based on RSTP.

5.20 Convenience of transfer to other transportation systems will be improved through the development of station plazas; therefore, reduction of transfer time is assumed as benefit of users.

5.21 The railway station planned in Dhaka will be located along main roads. There is a high possibility that some modes of transport, such as rickshaw and CNG, will be regulated if there is no space around stations. Transfers from MRT to rickshaw and CNG is assumed to take time as well. Also, buses are highly likely to line up on the streets around the station if these are not developed. Given these situations, it is assumed that pedestrians will spend so much time to transfer that will cause crowds around the station.

5.22 In this chapter, two cases were considered in the shortening of transfer time as user benefit per railway user. Case 1 is 3 minutes and case 2 is 5 minutes. Benefit is calculated based on the assumption.

5.23 Value of time (VOT) was calculated using the revised strategic transportation plan (RSTP) organized by JICA. The VOT of milestone is shown in Table 5.2.3.

Table 5.2.3 Value of Time (VOT)

Unit: BDT/min

Year	2014	2018	2025	2028	2035
VOT	108	111	150	165	204

Source : RSTP

5.24 Based on the number of passengers and VOT, the time reduction benefit of railway users is calculated separately for Lines 1 and 5 using the following formula.

Time reduction benefit = Passengers (no.) × Reduction Time (minutes) × VOT (BDT/minute) × 260 (days)[1]

5.25 Economic benefit based on above the formula is in Tables 5.2.4 and 5.2.5.

Table 5.2.4 Economic Benefit based on VOT (Line1)

million BDT

Year	2025	2035	2055
3min	10,795	13,011	29,116
5min	17,992	21,685	48,527

Source: JICA Study Team

Table 5.2.5 Economic Benefit based on VOT (Line5)

million BDT

Year	2028	2035	2058
3min	10,553	14,607	36,840
5min	17,589	24,345	61,400

Source: JICA Study Team

5.26 The benefit in the opening year between Lines 1 and 5 is not much different, but the benefit of Line 5 becomes bigger after 5 years. This is because Line 5 is the only line that extends east to west as the number of passengers increase.

(ii) Other Benefits

5.27 Other benefits of station plazas, which cannot be calculated quantitatively, are safety and comfort.

(i) Improvement of safety. Development of station plazas can possibly contribute to the

[1] 5 days (weekday) × 52week = 260 days/year

improvement of safety. In a high-density city like Dhaka, there is no vacant land around the station and passengers from stations might overflow and crowd. Considering the current situation of Bangladesh Railway, a lot of the passengers are disorderly that it can get very dangerous. Station plazas may have an appropriate waiting space and a transfer space to other transportation systems. Safety of passengers is important in the operation of railways.

(ii) Improvement of comfortability. Development of station plazas can improve the comfortability of users and pedestrians. Sidewalk expansion, parking space, and transfer zone allotment can also mitigate congestion on sidewalks and roadways. Pedestrians can even move comfortably. Installation of escalator or elevator in accordance with concept of universal design and to improve comfortability will make vertical movement (move up or down) easier.

(2) Mitigation of Traffic Congestion by Development of Station Plazas

5.28 The main modes of transportation at present are walking, cars, rickshaws, CNG, MC, and buses. The planned railway stations are located along main roads. Buses, CNG, cars, and others would be out of control as they wait passengers should there be no station plaza. In addition, if station plazas are not to be developed appropriately, there is a possibility to regulate rickshaw and CNG to access the area around stations in order to mitigate traffic congestions. Road capacity in the vicinity of station is also expected to decrease due to congestions.

5.29 In this chapter, assuming two cases of traffic capacity reduction rate of 5% and 10% within 350-m range of the station of Lines 1 and 5, VOC and TTC were compared in cases with and without station plaza. Using demand forecasting software, VOC and TTC were calculated for year 2025 (start of Line 1), year 2028 (start of Line 5), and with and without the station plaza (two cases). This is summarized in the tables below. It shows the benefit of transportation cost reduction.

Table 5.2.6 Reduction of VOC and TTC (Line 1)

Unit : million BDT

Year	Reduction Rate 5%		Reduction Rate 10%	
	TTC	VOC	TTC	VOC
2025	11.03	3.29	19.27	2.82
2028	13.94	5.09	24.85	5.69
2035	9.02	2.33	19.93	1.78

Source: JICA Study Team

Table 5.2.7 Reduction of VOC and TTC (Line 5)

Unit : million BDT

Year	Reduction Rate 5%		Reduction Rate 10%	
	TTC	VOC	TTC	VOC
2028	6.06	3.58	14.40	4.84
2035	4.98	2.18	8.19	3.51

Source: JICA Study Team

5.30 The results show VOC and TTC reduction in both Lines 1 and 5 when compared to the case with station plazas and the case without the station plaza where road capacity is reduced by 5% and 10%. In the case of Line 1, benefits will rise until 2028. Other routes will start to develop, so benefits will decline in 2035. But certain benefits are still to be expected. Similarly for Line 5, although benefits will decrease in 2035, there will still be some thereafter.

2) Cost Benefit Analysis

5.31 Discounted cash flow analysis for Lines 1 and 5 is implemented using time saving benefits, VOC and TTC reduction of the benefits calculated above, and the project cost converted to economic price. Preconditions set for analysis are as follows.

(i) Construction period. Line 1 is from years 2023 to 2025 and Line 5 is from years 2025 to 2027.

(ii) Analysis period. The analysis period is 20 years from the start of the project. Line 1 is 2023–2045 and Line 5 is 2025–2048.

(iii) Project life. The useful life of transportation projects is usually as long as 50 to 60 years. However, because facilities become old-fashioned due to technological innovation or become non-economic compared with the latest facility, economic project life is defined as 20 years and residual value is not considered

(iv) Economic evaluation index. Calculate the cost benefit ratio (B/C), net present value (NPV), and economic internal rate of return (EIRR) as an index of economic evaluation.

(v) Standard conversion factor (SCF). The SCF of 0.78 set by the Bangladesh Ministry of Planning is applied.

(vi) Social discount rate. The capital opportunity cost of 15% according to the Government of Bangladesh is applied.

(vii) Annual maintenance cost: The annual maintenance cost is set to 5% of construction cost.

(viii) Exchange rate. The exchange rate of ¥1 to Bangladesh taka is BDT1.40 and $1 to Japanese yen is ¥113.

5.32 As stated above, construction costs are converted financial prices to economic prices with an SCF of 0.78. The annual maintenance cost is 5% of the construction cost. So, the assumption is Line 1 is BDT196 million per year and Line 5 is BDT96 million per year. Breakdown of financial costs and economic prices of construction costs, maintenance costs, and investment schedule are summarized in the table below. Since cost benefit analysis is in Japanese yen, currency shows both foreign currency (Bangladesh taka and Japanese yen).

Table 5.2.8 Financial Price and Economic Price (Line 1)

Item	Million BDT		Million JPY	
	Financial Price	Economic Price	Financial Price	Economic Price
Land Acquisition	105,989	82,671	148,384	**115,740**
Land Preparation	673	525	942	**735**
Road Work	630	491	882	**688**
Pavement/Pedestrian	2,315	1,806	3,241	**2,528**
Traffic Management	230	179	322	**251**
Landscape	420	328	588	**459**
Total	110,257	86,000	154,359	**120,400**

Source: JICA Study Team

Table 5.2.9 Financial Price and Economic Price (Line 5)

Item	Million BDT		Million JPY	
	Financial Price	Economic Price	Financial Price	Economic Price
Land Acquisition	57,388	44,763	80,344	**62,668**
Land Preparation	745	581	1,043	**814**
Road Work	435	339	609	**475**
Pavement/Pedestrian	868	677	1,215	**948**
Traffic Management	160	125	224	**175**
Landscape	290	226	406	**317**
Total	59,886	46,711	83,841	**65,396**

Source: JICA Study Team

Table 5.2.10 Maintenance Cost (Economic Price)

	Mill BDT/year	Mill JPY/year
Line 1	140	196
Line 5	68	96

Source: JICA Study Team

Table 5.2.11 Investment Schedule (Line 1)

Unit : million JPY

Year	Land Acquisition	Land Preparation	Construction
2022	38,580	245	
2023	38,580	245	
2024	38,580	245	3,926
2025	Operation Start		

Source: JICA Study Team

Table 5.2.12 Investment Schedule (Line5)

Unit : million JPY

Year	Land Acquisition	Land Preparation	Construction
2025	20,889	271	
2026	20,889	271	
2027	20,889	271	1,914
2028	Operation Start		

Source: JICA Study Team

5.33 The cost benefit analysis results based on the above assumptions are summarized in Table 5.2.13. EIRR exceeds 15% except in the case of shortening transfer time by 3 min of Line 1, and EIRR is economically feasible as the reduction travel time is estimated to be more than 5 minutes on average after development of station plazas. The reason why EIRR of Line 1 is lower than that of Line 5 is the benefits mentioned above are small, the cost of land is large, and the project cost is nearly twice that of Line 5.

Table 5.2.13 Result of Economic Analysis (Line 1)

	Case 1		Case 2	
Reduction Time	3 min		5 min	
Reduction Rate	5%	10%	5%	10%
EIRR	10.9%	10.9%	17.2%	17.2%
B/C	0.71	0.71	1.18	1.18
NPV	-26,705	-26,658	16,738	16,785

Source: JICA Study Team

Table 5.2.14 Result of Economic Analysis (Line 5)

	Case 1		Case 2	
Reduction Time	3 min		5 min	
Reduction Rate	5%	10%	5%	10%
EIRR	20.3%	20.3%	28.5%	28.6%
B/C	1.48	1.48	2.47	2.47
NPV	24,131	24,1553	73,510	73,534

Source: JICA Study Team

5.34 The cash flow table is shown below. Since the opening schedule is in December 2026 for Line 1 and in December 2028 for Line 5, maintenance and administration cost and benefits for the first year are calculated as one month.

Table 5.2.15 Cash Flow Table of Line 1 (Time Saving: 3 min, Reduction Rate: 5%)

Unit: million JPY

Year		Cost				Benefit				Net Cash Flow
		Investment Cost		O&M Cost	Total	Time saved	TTC	VOC	Total	
		Land	Construction							
	2023	38,825	0	0	38,825	0	0	0	0	-38,825
	2024	38,825	0	0	38,825	0	0	0	0	-38,825
	2025	38,825	3,926	0	42,751	0	0	0	0	-42,751
1	2026	0	0	16	16	1,285	1	0	1,287	1,271
2	2027	0	0	196	196	15,734	15	4	15,753	15,557
3	2028	0	0	196	196	16,044	15	4	16,063	15,866
4	2029	0	0	196	196	16,354	14	4	16,372	16,176
5	2030	0	0	196	196	16,664	14	4	16,682	16,486
6	2031	0	0	196	196	16,974	14	4	16,992	16,796
7	2032	0	0	196	196	17,284	13	4	17,302	17,105
8	2033	0	0	196	196	17,595	13	4	17,611	17,415
9	2034	0	0	196	196	17,905	13	3	17,921	17,725
10	2035	0	0	196	196	18,215	13	3	18,231	18,035
11	2036	0	0	196	196	19,342	13	3	19,358	19,162
12	2037	0	0	196	196	20,470	13	3	20,486	20,289
13	2038	0	0	196	196	21,597	13	3	21,613	21,417
14	2039	0	0	196	196	22,724	13	3	22,740	22,544
15	2040	0	0	196	196	23,852	13	3	23,868	23,671
16	2041	0	0	196	196	24,979	13	3	24,995	24,799
17	2042	0	0	196	196	26,107	13	3	26,122	25,926
18	2043	0	0	196	196	27,234	13	3	27,250	27,054
19	2044	0	0	196	196	28,361	13	3	28,377	28,181
20	2045	0	0	196	196	29,489	13	3	29,505	29,308
Total		116,474	3,926	3,746	124,146	398,209	251	67	398,527	274,382
PV@15%		88,646	2,581	705	91,932	65,164	49	14	65,227	-26,705

Source: JICA Study Team

Table 5.2.16 Cash Flow Table of Line 1 (Time Saving: 3 min, Reduction Rate: 5%)

Unit: million JPY

Year		Cost				Benefit				Net Cash Flow
		Investment Cost		O&M Cost	Total	Time saved	TTC	VOC	Total	
		Land	Construction							
	2022	38,825	0	0	38,825	0	0	0	0	-38,825
	2023	38,825	0	0	38,825	0	0	0	0	-38,825
	2024	38,825	3,926	0	42,751	0	0	0	0	-42,751
1	2025	0	0	16	16	1,285	2	0	1,288	1,272
2	2026	0	0	196	196	15,734	27	4	15,764	15,568
3	2027	0	0	196	196	16,044	27	4	16,075	15,878
4	2028	0	0	196	196	16,354	27	3	16,385	16,188
5	2029	0	0	196	196	16,664	27	3	16,695	16,499
6	2030	0	0	196	196	16,974	28	3	17,005	16,809
7	2031	0	0	196	196	17,284	28	3	17,315	17,119
8	2032	0	0	196	196	17,595	28	3	17,625	17,429
9	2033	0	0	196	196	17,905	28	3	17,935	17,739
10	2034	0	0	196	196	18,215	28	2	18,245	18,049
11	2035	0	0	196	196	19,342	28	2	19,373	19,176
12	2036	0	0	196	196	20,470	28	2	20,500	20,304
13	2037	0	0	196	196	21,597	28	2	21,627	21,431
14	2038	0	0	196	196	22,724	28	2	22,755	22,559
15	2039	0	0	196	196	23,852	28	2	23,882	23,686
16	2040	0	0	196	196	24,979	28	2	25,010	24,813
17	2041	0	0	196	196	26,107	28	2	26,137	25,941
18	2042	0	0	196	196	27,234	28	2	27,264	27,068
19	2043	0	0	196	196	28,361	28	2	28,392	28,195
20	2044	0	0	196	196	29,489	28	2	29,519	29,323
Total		116,474	3,926	3,746	124,146	398,209	529	53	398,791	274,645
PV@15%		88,646	2,581	705	91,932	65,164	99	11	65,274	-26,658

Source: JICA Study Team

Table 5.2.17 Cash Flow Table of Line 1 (Time Saving: 5 min, Reduction Rate: 5%)

Unit: million JPY

Year		Cost				Benefit				Net Cash Flow
		Investment Cost		O&M Cost	Total	Time saved	TTC	VOC	Total	
		Land	Construction							
	2023	38,825	0	0	38,825	0	0	0	0	-38,825
	2024	38,825	0	0	38,825	0	0	0	0	-38,825
	2025	38,825	3,926	0	42,751	0	0	0	0	-42,751
1	2026	0	0	16	16	2,142	1	0	2,144	2,127
2	2027	0	0	196	196	26,223	15	4	26,242	26,046
3	2028	0	0	196	196	26,740	15	4	26,758	26,562
4	2029	0	0	196	196	27,257	14	4	27,275	27,079
5	2030	0	0	196	196	27,774	14	4	27,792	27,595
6	2031	0	0	196	196	28,291	14	4	28,308	28,112
7	2032	0	0	196	196	28,807	13	4	28,825	28,628
8	2033	0	0	196	196	29,324	13	4	29,341	29,145
9	2034	0	0	196	196	29,841	13	3	29,858	29,661
10	2035	0	0	196	196	30,358	13	3	30,374	30,178
11	2036	0	0	196	196	32,237	13	3	32,253	32,057
12	2037	0	0	196	196	34,116	13	3	34,132	33,936
13	2038	0	0	196	196	35,995	13	3	36,011	35,815
14	2039	0	0	196	196	37,874	13	3	37,890	37,694
15	2040	0	0	196	196	39,753	13	3	39,769	39,573
16	2041	0	0	196	196	41,632	13	3	41,648	41,452
17	2042	0	0	196	196	43,511	13	3	43,527	43,331
18	2043	0	0	196	196	45,390	13	3	45,406	45,209
19	2044	0	0	196	196	47,269	13	3	47,285	47,088
20	2045	0	0	196	196	49,148	13	3	49,164	48,967
Total		116,474	3,926	3,746	124,146	663,682	251	67	664,000	539,854
PV@12%		88,646	2,581	705	91,932	108,607	49	14	108,669	16,738

Source: JICA Study Team

Table 5.2.18 Cash Flow Table of Line 1 (Time Saving: 5 min, Reduction Rate: 10%)

Unit: million JPY

Year		Cost				Benefit				Net Cash Flow
		Investment Cost		O&M Cost	Total	Time saved	TTC	VOC	Total	
		Land	Construction							
	2023	38,825	0	0	38,825	0	0	0	0	-38,825
	2024	38,825	0	0	38,825	0	0	0	0	-38,825
	2025	38,825	3,926	0	42,751	0	0	0	0	-42,751
1	2026	0	0	16	16	2,142	2	0	2,145	2,128
2	2027	0	0	196	196	26,223	27	4	26,254	26,057
3	2028	0	0	196	196	26,740	27	4	26,770	26,574
4	2029	0	0	196	196	27,257	27	3	27,287	27,091
5	2030	0	0	196	196	27,774	27	3	27,804	27,608
6	2031	0	0	196	196	28,291	28	3	28,321	28,125
7	2032	0	0	196	196	28,807	28	3	28,838	28,642
8	2033	0	0	196	196	29,324	28	3	29,355	29,159
9	2034	0	0	196	196	29,841	28	3	29,872	29,676
10	2035	0	0	196	196	30,358	28	2	30,389	30,192
11	2036	0	0	196	196	32,237	28	2	32,268	32,071
12	2037	0	0	196	196	34,116	28	2	34,147	33,950
13	2038	0	0	196	196	35,995	28	2	36,026	35,829
14	2039	0	0	196	196	37,874	28	2	37,904	37,708
15	2040	0	0	196	196	39,753	28	2	39,783	39,587
16	2041	0	0	196	196	41,632	28	2	41,662	41,466
17	2042	0	0	196	196	43,511	28	2	43,541	43,345
18	2043	0	0	196	196	45,390	28	2	45,420	45,224
19	2044	0	0	196	196	47,269	28	2	47,299	47,103
20	2045	0	0	196	196	49,148	28	2	49,178	48,982
Total		116,474	3,926	3,746	124,146	663,682	529	53	664,264	540,118
PV@15%		88,646	2,581	705	91,932	108,607	99	11	108,717	16,785

Source: JICA Study Team

Table 5.2.19 Cash Flow Table of Line 5 (Time Saving: 3 min, Reduction Rate: 5%)

Unit: million JPY

Year		Cost				Benefit				Net Cash Flow
		Investment Cost		O&M Cost	Total	Time saved	TTC	VOC	Total	
		Land	Construction							
	2025	21,161	0	0	21,161	0	0	0	0	-21,161
	2026	21,161	0	0	21,161	0	0	0	0	-21,161
	2027	21,161	1,914	0	23,075	0	0	0	0	-23,075
1	2028	0	0	8	96	1,231	1	0	1,232	1,136
2	2029	0	0	96	96	15,586	6	3	15,595	15,499
3	2030	0	0	96	96	16,396	6	3	16,405	16,310
4	2031	0	0	96	96	17,207	6	3	17,216	17,120
5	2032	0	0	96	96	18,018	6	3	18,026	17,931
6	2033	0	0	96	96	18,829	6	3	18,837	18,741
7	2034	0	0	96	96	19,639	5	3	19,647	19,552
8	2035	0	0	96	96	20,450	5	2	20,457	20,362
9	2036	0	0	96	96	21,803	5	2	21,811	21,715
10	2037	0	0	96	96	23,157	5	2	23,164	23,068
11	2038	0	0	96	96	24,510	5	2	24,517	24,421
12	2039	0	0	96	96	25,863	5	2	25,870	25,775
13	2040	0	0	96	96	27,217	5	2	27,224	27,128
14	2041	0	0	96	96	28,570	5	2	28,577	28,481
15	2042	0	0	96	96	29,923	5	2	29,930	29,835
16	2043	0	0	96	96	31,277	5	2	31,284	31,188
17	2044	0	0	96	96	32,630	5	2	32,637	32,541
18	2045	0	0	96	96	33,983	5	2	33,990	33,895
19	2046	0	0	96	96	35,336	5	2	35,344	35,248
20	2047	0	0	96	96	36,690	5	2	36,697	36,601
Total		63,482	1,914	1,826	67,310	478,315	99	47	478,461	411,151
PV@15%		48,314	1,259	344	49,967	74,069	20	10	74,098	24,131

Source: JICA Study Team

Table 5.2.20 Cash Flow Table of Line 5 (Time Saving: 3 min, Reduction Rate: 10%)

Unit: million JPY

Year		Cost				Benefit				Net Cash Flow
		Investment Cost		O&M Cost	Total	Time saved	TTC	VOC	Total	
		Land	Construction							
	2025	21,161	0	0	21,161	0	0	0	0	-21,161
	2026	21,161	0	0	21,161	0	0	0	0	-21,161
	2027	21,161	1,914	0	23,075	0	0	0	0	-23,075
1	2028	0	0	8	96	1,231	1	0	1,233	1,137
2	2029	0	0	96	96	15,586	14	5	15,604	15,508
3	2030	0	0	96	96	16,396	13	5	16,414	16,318
4	2031	0	0	96	96	17,207	13	4	17,224	17,128
5	2032	0	0	96	96	18,018	12	4	18,034	17,938
6	2033	0	0	96	96	18,829	11	4	18,844	18,748
7	2034	0	0	96	96	19,639	11	4	19,654	19,558
8	2035	0	0	96	96	20,450	8	4	20,462	20,366
9	2036	0	0	96	96	21,803	8	4	21,815	21,719
10	2037	0	0	96	96	23,157	8	4	23,168	23,073
11	2038	0	0	96	96	24,510	8	4	24,522	24,426
12	2039	0	0	96	96	25,863	8	4	25,875	25,779
13	2040	0	0	96	96	27,217	8	4	27,228	27,133
14	2041	0	0	96	96	28,570	8	4	28,582	28,486
15	2042	0	0	96	96	29,923	8	4	29,935	29,839
16	2043	0	0	96	96	31,277	8	4	31,288	31,193
17	2044	0	0	96	96	32,630	8	4	32,642	32,546
18	2045	0	0	96	96	33,983	8	4	33,995	33,899
19	2046	0	0	96	96	35,336	8	4	35,348	35,252
20	2047	0	0	96	96	36,690	8	4	36,701	36,606
Total		63,482	1,914	1,826	67,310	478,315	181	72	478,568	411,258
PV@15%		48,314	1,259	344	49,967	74,069	39	15	74,122	24,155

Source: JICA Study Team

Table 5.2.21 Cash Flow Table of Line 5 (Time Saving: 5 min, Reduction Rate: 5%)

Unit: million JPY

Year		Cost				Benefit				Net Cash Flow
		Investment Cost		O&M Cost	Total	Time saved	TTC	VOC	Total	
		Land	Construction							
	2025	21,161	0	0	21,161	0	0	0	0	-21,161
	2026	21,161	0	0	21,161	0	0	0	0	-21,161
	2027	21,161	1,914	0	23,075	0	0	0	0	-23,075
1	2028	0	0	8	96	2,052	1	0	2,053	1,957
2	2029	0	0	96	96	25,976	6	3	25,985	25,890
3	2030	0	0	96	96	27,327	6	3	27,336	27,241
4	2031	0	0	96	96	28,678	6	3	28,687	28,592
5	2032	0	0	96	96	30,030	6	3	30,038	29,943
6	2033	0	0	96	96	31,381	6	3	31,389	31,294
7	2034	0	0	96	96	32,732	5	3	32,740	32,645
8	2035	0	0	96	96	34,084	5	2	34,091	33,995
9	2036	0	0	96	96	36,339	5	2	36,346	36,250
10	2037	0	0	96	96	38,595	5	2	38,602	38,506
11	2038	0	0	96	96	40,850	5	2	40,857	40,761
12	2039	0	0	96	96	43,106	5	2	43,113	43,017
13	2040	0	0	96	96	45,361	5	2	45,368	45,272
14	2041	0	0	96	96	47,617	5	2	47,624	47,528
15	2042	0	0	96	96	49,872	5	2	49,879	49,783
16	2043	0	0	96	96	52,128	5	2	52,135	52,039
17	2044	0	0	96	96	54,383	5	2	54,390	54,295
18	2045	0	0	96	96	56,639	5	2	56,646	56,550
19	2046	0	0	96	96	58,894	5	2	58,901	58,806
20	2047	0	0	96	96	61,150	5	2	61,157	61,061
Total		63,482	1,914	1,826	67,310	797,191	99	47	797,338	730,028
PV@15%		48,314	1,259	344	49,967	123,448	20	10	123,477	73,510

Source: JICA Study Team

Table 5.2.22 Cash Flow Table of Line 5 (Time Saving: 5 min, Reduction Rate: 10%)

Unit: million JPY

Year		Cost				Benefit				Net Cash Flow
		Investment Cost		O&M Cost	Total	Time saved	TTC	VOC	Total	
		Land	Construction							
	2025	21,161	0	0	21,161	0	0	0	0	-21,161
	2026	21,161	0	0	21,161	0	0	0	0	-21,161
	2027	21,161	1,914	0	23,075	0	0	0	0	-23,075
1	2028	0	0	8	96	2,052	1	0	2,054	1,958
2	2029	0	0	96	96	25,976	14	5	25,994	25,899
3	2030	0	0	96	96	27,327	13	5	27,345	27,249
4	2031	0	0	96	96	28,678	13	4	28,695	28,600
5	2032	0	0	96	96	30,030	12	4	30,046	29,950
6	2033	0	0	96	96	31,381	11	4	31,396	31,301
7	2034	0	0	96	96	32,732	11	4	32,747	32,651
8	2035	0	0	96	96	34,084	8	4	34,095	33,999
9	2036	0	0	96	96	36,339	8	4	36,351	36,255
10	2037	0	0	96	96	38,595	8	4	38,606	38,511
11	2038	0	0	96	96	40,850	8	4	40,862	40,766
12	2039	0	0	96	96	43,106	8	4	43,117	43,022
13	2040	0	0	96	96	45,361	8	4	45,373	45,277
14	2041	0	0	96	96	47,617	8	4	47,628	47,533
15	2042	0	0	96	96	49,872	8	4	49,884	49,788
16	2043	0	0	96	96	52,128	8	4	52,139	52,044
17	2044	0	0	96	96	54,383	8	4	54,395	54,299
18	2045	0	0	96	96	56,639	8	4	56,650	56,555
19	2046	0	0	96	96	58,894	8	4	58,906	58,810
20	2047	0	0	96	96	61,150	8	4	61,161	61,066
Total		63,482	1,914	1,826	67,310	797,191	181	72	797,445	730,135
PV@15%		48,314	1,259	344	49,967	123,448	39	15	123,501	73,534

Source: JICA Study Team

3) Conclusion

5.35 As a result of the cost benefit analysis, it was shown that economic benefit is feasible if transfer times for both Lines 1 and 5 were shortened by 5 minutes or more. Besides this, improvements on safety and comfort can also be expected. Other benefits include improvement of convenience like route information to the stations and community space for residents. From the perspective of the national economy, it is a project with adequate relevance and it is worth implementing.

5.3 Increase in Land Price around Station

1) Increase in Land Price of Japan

5.36 As the convenience of the station improves, the rise in land prices around stations occurs. So, land prices in Dhaka City is expected to rise as well after construction of MRT. Land price increase in the city is calculated in accordance with Japanese cases where MRT is already developed.

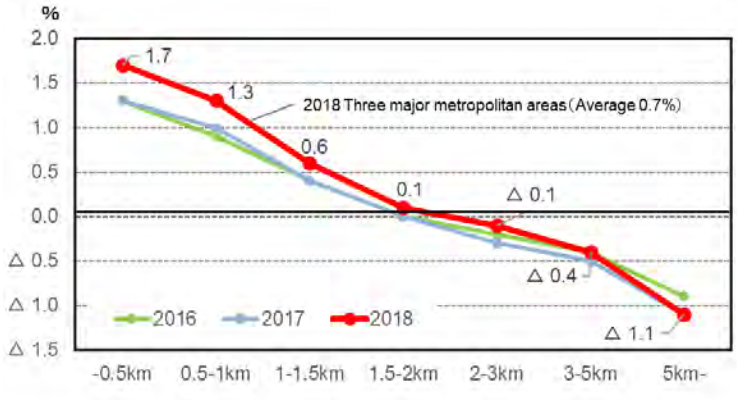
5.37 Firstly, the change of land prices due to the distance from stations occurs after MRT construction. The closer the stations are, the higher the land price is. Secondly, it is expected that land price will rise at a fixed rate with the economic growth. The increase in land price is analyzed from a viewpoint of the two effects: the rise in land price by MRT construction and that with the economic growth.

2) Increase in Land Price by Economic Growth

5.38 Economic growth and market conditions strongly affect the increase in land price. In Dhaka, although land price has rapidly increased until 2011, it has been stable or decreasing thereafter (Annex A).

5.39 The Ministry of Land, Infrastructure, Transport and Tourism of Japan made a summary regarding the relation between distance from stations and land price. Land price within 500 m from stations has risen at a rate of approximately 1.7% annually. The railway construction will improve the convenience around stations and will increase land prices. Unlike Japan, the population of Dhaka increase is still advancing and economic growth rate is high, so it can be assumed that the rise in land value around the stations will rise by at least 2%. In this survey, areas within 500 m from stations were considered.

5.40 The rate of 2% yearly increase in land price is shown in Table 5.3.1.



Source: Ministry of Land, Infrastructure, Transport and Tourism. *Public Land Price.*

Figure 5.3.1 Trend of Land Price Increase in Japan depending on Distance from Stations

Table 5.3.1 Rate of Land Price Increase (Economic Growth: 2% annually)

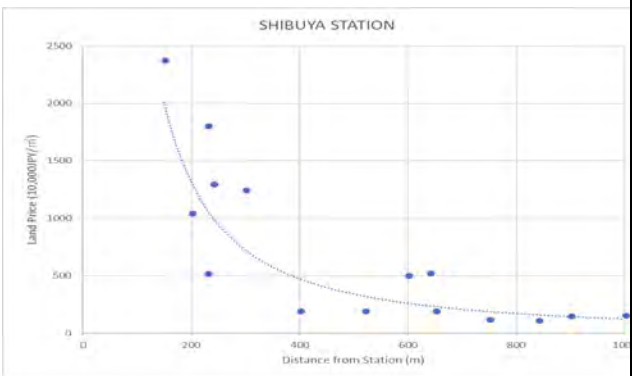
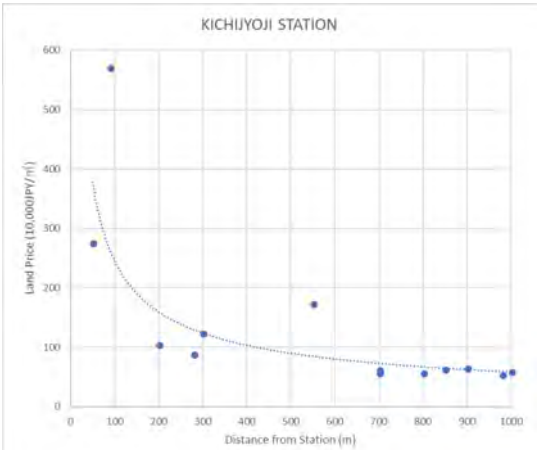
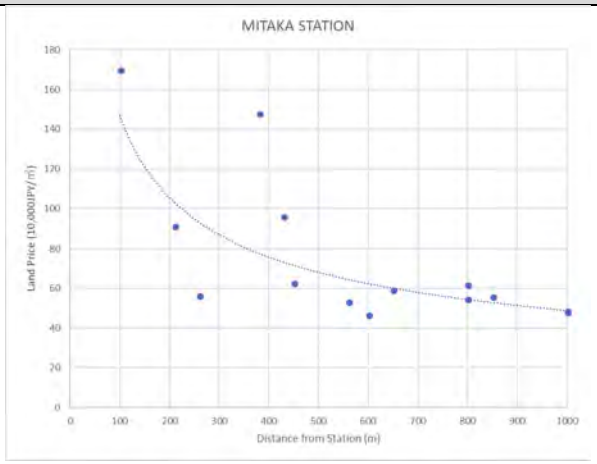
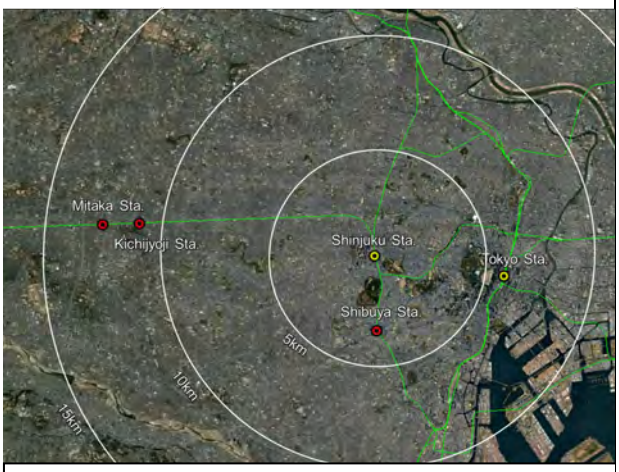
	Line1	Line 5
2025	1.00	
2026	1.02	
2027	1.04	
2028	1.06	1.00
2029	1.08	1.02
2030	1.10	1.04
2031	1.13	1.06
2032	1.15	1.08
2033	1.17	1.10
2034	1.20	1.13
2035	1.22	1.15
2036	1.24	1.17
2037	1.27	1.20
2038	1.29	1.22
2039	1.32	1.24
2040	1.35	1.27
2041	1.37	1.29
2042	1.40	1.32
2043	1.43	1.35
2044	1.46	1.37
2045	1.49	1.40
2046	1.52	1.43
2047	1.55	1.46
2048	1.58	1.49
2049	1.61	1.52
2050	1.64	1.55
2051	1.67	1.58
2052	1.71	1.61
2053	1.74	1.64
2054	1.78	1.67
2055	1.81	1.71

Source: JICA Study Team

3) Land price change by the distance from stations

5.41 Some stations were chosen to consider the change of land price by the distance from the station. The stations with more than 10 data on official land price and not having other stations within 1 km are chosen as examples to consider the impact of the public price (regarded as one station if there are transit stations and multiple routes). (See Table 5.3.2.)

Table 5.3.2 Changes in Public Land Prices due to Distance from the Stations

Shibuya Station	Kichijyoji Station
	
Number of Daily Average Passenger: 2,150,361 (person) Number of Lines: 10 JR Yamanote Line, JR Saikyo Line, JR Shinjuku-Shonan Line, Tokyo Metro Ginza Line, Tokyo Metro Hanzomon Line, Tokyo Metor Fukutoshin Line, Keio Inokashira Line, Tokyu-toyoko Line, Tokyu-Denen Toshi Line	Number of Daily Average Passenger: 424,654 (person) Number of Lines: 3 JR Sobu Line, JR Chuo Line, Keio Inokashira Line
Mitaka Station	**Station Location**
	
Number of Daily Average Passenger: 180.670 Number of Lines: 3 JR Sobu Line, JR Chuo Line, JR Chuo Main Line	Kichijyoji Station: About 10 km from Shinjyuku Station Mitaka Station: About 13 km from Shinjyuku Station

Source: Public Land Price (Ministry of Land, Infrastructure, Transport and Tourism) (2018 Kichijyoji Station, Mitaka Station), Land Price Checker (2018 Shibuya), Number of Daily Average Passenger: Ranking of Passengers (2008).

5.42 From the comparison of the three stations in Tokyo, the increase in land price of those within 500 meters from the stations can be confirmed and the rate of rise will vary depending on each station. But if the rate of 500 m from the station is 1.0, the rate at the 400-m point is approximately 1.1 (10% increase), the rate at the 300-m point is about 1.5 (50% increase), and the rate at the 200-m point is 2.0 (100% increase). (See Table 5.3.3.) It is assumed that land price increase in Dhaka will happen similar to the Japanese cases, so land price increase should be calculated.

Table 5.3.3 Rate of Land Increase (Cases in Tokyo)

Distance from Station (m)	Shibuya		Kichijyoji		Mitaka	
	Land Price (0000JPY/m²)	Ratio (per land price at 500 m from station)	Land Price (0000JPY/ m²)	Ratio (per land price at 500 m from station)	Land Price (0000JPY/m²)	Ratio (per land price at 500 m from station)
500	341	1.0	90	1.0	68	1.0
400	474	1.4	104	1.1	76	1.1
300	723	2.1	124	1.4	87	1.3
200	1314	3.9	160	1.8	105	1.5
100	3647	10.7	246	2.7	147	2.2

Source: JICA Study Team

5.43 Regarding the land price change in Dhaka, station plaza development and urban development around the stations will supposedly take 15 years. Land price increase will occur within that period, which is the same with Tokyo. The rate of increase is shown in Table 5.3.4.

Table 5.3.4 Rate of Land Increase

	0–200m	200–300m	300–400m	400–500m	0-500m (overall)
	62,800 (m²)	78,500 (m²)	109,900 (m²)	141,300(m²)	392,500 (m²)
Opening Year	1.000	1.000	1.000	1.000	1.000
1(year)	1.047	1.027	1.006	1.000	1.101
2	1.097	1.056	1.013	1.000	1.103
3	1.149	1.084	1.019	1.000	1.105
4	1.203	1.114	1.026	1.000	1.106
5	1.260	1.145	1.032	1.000	1.108
6	1.320	1.176	1.039	1.000	1.110
7	1.382	1.208	1.045	1.000	1.112
8	1.447	1.241	1.052	1.000	1.113
9	1.516	1.275	1.059	1.000	1.115
10	1.587	1.310	1.066	1.000	1.117
11	1.662	1.346	1.072	1.000	1.120
12	1.741	1.383	1.079	1.000	1.122
13	1.823	1.421	1.086	1.000	1.124
14	1.910	1.460	1.093	1.000	1.126
15	2.000	1.500	1.100	1.000	1.129

Source: JICA Study Team

4) Consideration of Land Increase in Dhaka after MRT Construction

5.44 The increase of land price in Dhaka is assumed to be in accordance with the following.

(i) As the result of 2), an annual increase of 2% will result from economic growth.

(ii) As the result of 3), the land price increase after 15 years of the opening of MRT within 0–200 m from stations is assumed as 100%, within 200–300 m is 50%, and within 300-400 m is 10%. Therefore, if the land price will change for 15 years, it will rise up to 4.73% in 0–200 m of the area, 2.74% in 200–300 m, and 0.64% in the 300–400 m every year until the 15 years.

5.45 Tables 5.3.5 and 5.3.6 show the rates of land price increase caused by the above assumptions.

Table 5.3.5 Land Increase Ratio (Line 1)

Line1		0–200m	200–300m	300–400m	400–500m	Total	a	b	a + b
	Year	62,800 (㎡)	78,500 (㎡)	109,900 (㎡)	141,300 (㎡)	392,500 (㎡)	MRT construction	Economic growth	Total increase rate
2025	Opening	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2026	1 (year)	1.05	1.03	1.01	1.00	1.01	1.02	1.02	1.04
2027	2	1.10	1.06	1.01	1.00	1.03	1.03	1.04	1.08
2028	3	1.15	1.08	1.02	1.00	1.05	1.05	1.06	1.12
2029	4	1.20	1.11	1.03	1.00	1.06	1.07	1.08	1.16
2030	5	1.26	1.14	1.03	1.00	1.08	1.09	1.10	1.20
2031	6	1.32	1.18	1.04	1.00	1.10	1.11	1.13	1.24
2032	7	1.38	1.21	1.05	1.00	1.12	1.13	1.15	1.29
2033	8	1.45	1.24	1.05	1.00	1.13	1.14	1.17	1.34
2034	9	1.52	1.28	1.06	1.00	1.15	1.16	1.20	1.39
2035	10	1.59	1.31	1.07	1.00	1.17	1.18	1.22	1.44
2036	11	1.66	1.35	1.07	1.00	1.20	1.20	1.24	1.49
2037	12	1.74	1.38	1.08	1.00	1.22	1.22	1.27	1.55
2038	13	1.82	1.42	1.09	1.00	1.24	1.25	1.29	1.60
2039	14	1.91	1.46	1.09	1.00	1.26	1.27	1.32	1.66
2040	15	2.00	1.50	1.10	1.00	1.29	1.29	1.35	1.72
2041	16	2.00	1.50	1.10	1.00	1.29	1.29	1.37	1.76
2042	17	2.00	1.50	1.10	1.00	1.29	1.29	1.40	1.79
2043	18	2.00	1.50	1.10	1.00	1.29	1.29	1.43	1.83
2044	19	2.00	1.50	1.10	1.00	1.29	1.29	1.46	1.87
2045	20	2.00	1.50	1.10	1.00	1.29	1.29	1.49	1.90
2046	21	2.00	1.50	1.10	1.00	1.29	1.29	1.52	1.94
2047	22	2.00	1.50	1.10	1.00	1.29	1.29	1.55	1.98
2048	23	2.00	1.50	1.10	1.00	1.29	1.29	1.58	2.02
2049	24	2.00	1.50	1.10	1.00	1.29	1.29	1.61	2.06
2050	25	2.00	1.50	1.10	1.00	1.29	1.29	1.64	2.10
2051	26	2.00	1.50	1.10	1.00	1.29	1.29	1.67	2.14
2052	27	2.00	1.50	1.10	1.00	1.29	1.29	1.71	2.19
2053	28	2.00	1.50	1.10	1.00	1.29	1.29	1.74	2.23
2054	29	2.00	1.50	1.10	1.00	1.29	1.29	1.78	2.28
2055	30	2.00	1.50	1.10	1.00	1.29	1.29	1.81	2.32

Source: JICA Study Team

Table 5.3.6 Land Increase Ration (Line 5)

Line 5		0–200m	200–300m	300–400m	400–500m	Total	a	b	a + b
	Year	62,800 (m^2)	78,500 (m^2)	109,900 (m^2)	141,300 (m^2)	392,500 (m^2)	MRT construction	Economic growth	Total increase rate
2028	Opening	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2029	1(year)	1.05	1.03	1.01	1.00	1.01	1.02	1.02	1.04
2030	2	1.10	1.06	1.01	1.00	1.03	1.03	1.04	1.08
2031	3	1.15	1.08	1.02	1.00	1.05	1.05	1.06	1.12
2032	4	1.20	1.11	1.03	1.00	1.06	1.07	1.08	1.16
2033	5	1.26	1.14	1.03	1.00	1.08	1.09	1.10	1.20
2034	6	1.32	1.18	1.04	1.00	1.10	1.11	1.13	1.24
2035	7	1.38	1.21	1.05	1.00	1.12	1.13	1.15	1.29
2036	8	1.45	1.24	1.05	1.00	1.13	1.14	1.17	1.34
2037	9	1.52	1.28	1.06	1.00	1.15	1.16	1.20	1.39
2038	10	1.59	1.31	1.07	1.00	1.17	1.18	1.22	1.44
2039	11	1.66	1.35	1.07	1.00	1.20	1.20	1.24	1.49
2040	12	1.74	1.38	1.08	1.00	1.22	1.22	1.27	1.55
2041	13	1.82	1.42	1.09	1.00	1.24	1.25	1.29	1.60
2042	14	1.91	1.46	1.09	1.00	1.26	1.27	1.32	1.66
2043	15	2.00	1.50	1.10	1.00	1.29	1.29	1.35	1.72
2044	16	2.00	1.50	1.10	1.00	1.29	1.29	1.37	1.76
2045	17	2.00	1.50	1.10	1.00	1.29	1.29	1.40	1.79
2046	18	2.00	1.50	1.10	1.00	1.29	1.29	1.43	1.83
2047	19	2.00	1.50	1.10	1.00	1.29	1.29	1.46	1.87
2048	20	2.00	1.50	1.10	1.00	1.29	1.29	1.49	1.90
2049	21	2.00	1.50	1.10	1.00	1.29	1.29	1.52	1.94
2050	22	2.00	1.50	1.10	1.00	1.29	1.29	1.55	1.98

2051	23	2.00	1.50	1.10	1.00	1.29	1.29	1.58	2.02
2052	24	2.00	1.50	1.10	1.00	1.29	1.29	1.61	2.06
2053	25	2.00	1.50	1.10	1.00	1.29	1.29	1.64	2.10
2054	26	2.00	1.50	1.10	1.00	1.29	1.29	1.67	2.14
2055	27	2.00	1.50	1.10	1.00	1.29	1.29	1.71	2.19

Source: JICA Study Team

5.46 In addition, the land price at the time the railway opens will rise to at least BDT150,000 per m^2 in consideration of the land price of the residential area in Dhaka City. For that reason, the section from Hemayetpur to Gabtoli will be adjusted to BDT150,000 per m^2.

5.47 Total land prices are calculated by multiplying the market prices by 392,500 m^2 (assuming about 50% of the site is either residential area or commercial area). The results will be multiplied to the total increase ratio (see Tables 5.3.5 and 5.3.6).

5.48 Due to the increasing convenience around the stations after MRT development, the increase of total land price of Line 1 will be BDT948 billion in 2035 and Line 5 will be BDT857 billion in 2035. In 2055, the total land price increase of Line 1 will be BDT2,859 billion and Line 5 will be BDT2,555 billion. (Table 5.3.8, Table 5.3.9). This rise in land prices greatly exceeds the railway construction cost, and the development effect to the surrounding area is great.

Table 5.3.7 Prospected Land Increase in Dhaka (Line 1)

	Current Market Price	Market Price (2025)	2025	2035	2055
			Land Value (Radius 500 m Area)	Land Value (Radius 500 m Area)	Land Value (Radius 500 m Area)
	000BDT/m^2	000BDT/ m^2	(billion BDT)	(billion BDT)	(billion BDT)
		(a)	(b) = (a) × 392,500		
Kamalapur	524	524	206	296	478
Rajarbagh	524	524	206	296	478
Malibagh	337	337	132	190	307
Rampura	150	150	59	85	136
Hatir Jheel	165	165	65	93	150
Badda	165	165	65	93	150
Uttar Badda	165	165	65	93	150
Notun Bazar	262	262	103	148	239
Future Park	300	300	118	169	273
Khilkhet	412	412	162	233	375
Airport Terminal 3	412	412	162	233	375
Airport	524	524	206	296	478
Bashundhara	225	225	88	127	205
POHS	225	225	88	127	205
Mastul	225	225	88	127	205
Purbachal West	225	225	88	127	205
Purbachal Central	225	225	88	127	205
Purbachal East	225	225	88	127	205
Purbachal Terminal	225	225	88	127	205
Total			2,164	3,112	5,023
Increase			0	948	2,859

Source: JICA Study Team

Table 5.3.8 Prospected Land Increase in Dhaka (Line 5)

	Current Market Price	Market Price (2025)	2025	2035	2055
			Land Value (Radius 500 m Area)	Land Value (Radius 500 m Area)	Land Value (Radius 500 m Area)
	000BDT/m^2	000BDT/m^2	(billion BDT)	(billion BDT)	(billion BDT)
		(a)	(b) = (a) × 392,500		
Vatara	150	150	59	85	136
Gulshan-2	1798	1798	706	1,015	1,638
Banani	1273	1273	500	719	1,160
Kochunkhet	165	165	65	93	150
Mirpur-14	150	150	59	85	136
Mirpur 10	374	374	147	211	341
Mirpur 1	374	374	147	211	341
Dar-Us-Salam	300	300	118	169	273
Gabtoli	127	150	50	72	116
Amin bazar	93	150	36	52	85
Bilamalia	52	150	21	30	48
Baliapur	52	150	21	30	48
Hemayetpur	75	150	29	42	68
Total			1,956	2,813	4,541
Increase			0	857	2,585

Source: JICA Study Team

5.4 Financial consideration from the tax revenue due to the rise in land prices

1) Tax revenue related to land price

5.49 Tax revenues related to land price increase in Dhaka are 12%–18% (depending on the area) of the land selling price for the Ministry of Land. About 12% of the rent is paid as tax for local governments.

Table 5.4.1 Method for Securing Tax Revenue by Raising Land Prices

Stakeholders	Increasing Tax
Local Government (DNCC, DSCC, PURUSHOBA)	Increasing Municipal Tax (12% of the rent fee is paid as tax)
Ministry of Land	12%–18% of the land selling price

Source: JICA Study Team, International tax Bangladesh Highlights (Deloitee)

2) Consideration of tax revenue by buying and selling land price

5.50 About 15% (12%–18%) of the selling price of land is tax revenue for the Ministry of Land. Therefore, as the land price rises, sales price is expected to also increase and lead to an increase in tax revenue. In the existing urban areas, newly developed sites are also limited, so land trading is rare. The suburbs of Dhaka, on the other hand, is undeveloped and there are areas where development is promoted after MRT construction. Three patterns about land selling are considered as follows (Table 5.4.2).

Pattern A (Existing urban area). Land sales occur every year at 0.5% of the total area after railway operation. Land trading area of each year is supposed to be 1,963 m^2 that is 0.5% of residential and commercial area (392,500 m^2).

Pattern B (Vacant land around the station is an existing urban area). Ten years after the opening of the railway, 10% of the site has a new development. In other sites, 0.5% of the total area will be sold every year. In the 10 years after the start of the railway, sales for 1.0% of new site and 0.5% of other sites will occur, and the total area of 5,888 m^2 or 1.5% of residential and commercial areas (392,500 m^2) will be developed. After that, 0.5% or 1,963 m^2 of the site will be dealt annually.

Pattern C (Undeveloped land). Fifty percent of the total area is developed in 10 years

after the opening of the railway. Transactions occur annually on 0.5% of the total area after railway opening in other areas. Ten years after the start of the railway, the development area will generate 5.0% of newly developed sales and 0.5% of site sales, resulting in a total of 5.5% or 21,588 m^2. After that, 0.5% of the site or 1,963 m^2 will be dealt annually.

Table 5.4.2 Land Price and Development Pattern at the Start of Railway

Station		Current Market Price	Market Price (2025)	Pattern
		000BDT/m^2	000BDT/m^2	
Line 1	Kamalapur	524	524	B
	Rajarbagh	524	524	A
	Malibagh	337	337	A
	Rampura	150	150	A
	Hatir Jheel	165	165	B
	Badda	165	165	A
	Uttar Badda	165	165	A
	Notun Bazar	262	262	A
	Future Park	300	300	A
	Khilkhet	412	412	A
	Airport Terminal 3	412	412	A
	Airport	524	524	A
	Bashundhara	225	225	B
	POHS	225	225	B
	Mastul	225	225	B
	Purbachal West	225	225	A
	Purbachal Central	225	225	A
	Purbachal East	225	225	A
	Purbachal Terminal	225	225	A
Station		Current Market Price	Market Price (2028)	Pattern
		000BDT/m^2	000BDT/m^2	
Line 5	Vatara	150	150	B
	Gulshan-2	1,798	1,798	A
	Banani	1,273	1,273	A
	Kochunkhet	165	165	A
	Mirpur-14	150	150	A
	Mirpur 10	374	374	A
	Mirpur 1	374	374	A
	Dar-Us-Salam	300	300	A
	Gabtoli	127	150	B
	Amin bazar	93	150	B
	Bilamalia	52	150	C
	Baliapur	52	150	C
	Hemayetpur	75	150	B

Source: JICA Study Team

5.51 The rates of increase in land prices were considered with the values in Tables 5.3.5 and 5.3.6 that adds the land price increase rate by MRT construction and the land price increase of 2% each year.

Table 5.4.3 Increase in Tax Revenue Related to Land Sale of Line 1

Year	Increase Rate (2025=1)	Pattern B		Pattern A		Tax Revenue Increase
		Annual Development Area/ station	Total Land Increase	Annual Development Area/ station	Total Land Increase	
	(a)	(b)	(c)	(d)	(e)	((c)+(e)) × 0.15
		392500 × (0.005 + 0.1/10) 392500 × 0.005	((a)1) × (b) × Station (Pattern B) (BDT/m²)	392500 × 0.005	((a)1) × (d) × Station (Pattern A) (BDT/m²)	
		(m²)	(million BDT)	(m²)	(million BDT)	(million BDT)
2025	1.000	0				
2026	1.037	5,888	297	1,963	301	90
2027	1.075	5,888	605	1,963	614	183
2028	1.115	5,888	925	1,963	938	279
2029	1.156	5,888	1,256	1,963	1,274	380
2030	1.199	5,888	1,599	1,963	1,623	483
2031	1.244	5,888	1,956	1,963	1,984	591
2032	1.290	5,888	2,325	1,963	2,359	703
2033	1.337	5,888	2,708	1,963	2,748	818
2034	1.387	5,888	3,106	1,963	3,151	939
2035	1.438	5,888	3,518	1,963	3,569	1,063
2036	1.492	1,963	1,315	1,963	4,003	798
2037	1.547	1,963	1,463	1,963	4,452	887
2038	1.604	1,963	1,616	1,963	4,918	980
2039	1.663	1,963	1,775	1,963	5,402	1,076
2040	1.725	1,963	1,939	1,963	5,903	1,176
2041	1.759	1,963	2,032	1,963	6,184	1,232
2042	1.795	1,963	2,126	1,963	6,471	1,289
2043	1.831	1,963	2,222	1,963	6,763	1,348
2044	1.867	1,963	2,320	1,963	7,061	1,407
2045	1.905	1,963	2,420	1,963	7,365	1,468
2046	1.943	1,963	2,522	1,963	7,675	1,530
2047	1.981	1,963	2,625	1,963	7,992	1,593
2048	2.021	1,963	2,731	1,963	8,315	1,657
2049	2.061	1,963	2,840	1,963	8,644	1,722
2050	2.103	1,963	2,950	1,963	8,979	1,789
2051	2.145	1,963	3,062	1,963	9,322	1,858
2052	2.188	1,963	3,177	1,963	9,671	1,927
2053	2.231	1,963	3,294	1,963	10,027	1,998
2054	2.276	1,963	3,414	1,963	10,391	2,071
2055	2.322	1,963	3,535	1,963	10,762	2,145
Total						35,480

Source: JICA Study Team

Table 5.4.4 Increase in Tax Revenue Related to Land Sale of Line 5

Year	Increase Rate (2028=1)	Pattern C		Pattern B		Pattern A		Tax Revenue Increase
		Annual Development Area/ station	Total Land Increase	Annual Development Area/ station	Total Land Increase	Annual Development Area/ station	Total Land Increase	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
		392500 × (0.5 / 10 + 0.005) 392500×0.005	((a)1) × (b) × Station (Pattern C) (BDT/m²)	392500 × (0.005 + 0.1 / 10) 392500×0.005	((a)1) × (d) × Station (Pattern B) (BDT/m²)	392500 × 0.005	((a)1) × (f) × Station (Pattern B) (BDT/m²)	((c)+(e) +(g)) × 0.15
		(m²)	(million BDT)	(m²)	(million BDT)	(m²)	(million BDT)	(million BDT)
2028	1.000							
2029	1.037	21,588	240	5,888	131	1,963	322	104
2030	1.075	21,588	488	5,888	266	1,963	656	212
2031	1.115	21,588	746	5,888	407	1,963	1,002	323
2032	1.156	21,588	1,013	5,888	553	1,963	1,362	439
2033	1.199	21,588	1,291	5,888	704	1,963	1,734	559
2034	1.244	21,588	1,578	5,888	861	1,963	2,120	684
2035	1.290	21,588	1,876	5,888	1,023	1,963	2,521	813
2036	1.337	21,588	2,186	5,888	1,192	1,963	2,936	947
2037	1.387	21,588	2,506	5,888	1,367	1,963	3,367	1,086
2038	1.438	21,588	2,839	5,888	1,548	1,963	3,814	1,230
2039	1.492	1,963	289	1,963	579	1,963	4,277	772

2040	1.547	1,963	322	1,963	644	1,963	4,758	858
2041	1.604	1,963	356	1,963	711	1,963	5,256	948
2042	1.663	1,963	391	1,963	781	1,963	5,773	1,042
2043	1.725	1,963	427	1,963	853	1,963	6,308	1,138
2044	1.759	1,963	447	1,963	894	1,963	6,608	1,192
2045	1.795	1,963	468	1,963	935	1,963	6,915	1,248
2046	1.831	1,963	489	1,963	978	1,963	7,227	1,304
2047	1.867	1,963	511	1,963	1,021	1,963	7,546	1,362
2048	1.905	1,963	533	1,963	1,065	1,963	7,870	1,420
2049	1.943	1,963	555	1,963	1,110	1,963	8,202	1,480
2050	1.981	1,963	578	1,963	1,155	1,963	8,540	1,541
2051	2.021	1,963	601	1,963	1,202	1,963	8,885	1,603
2052	2.061	1,963	625	1,963	1,249	1,963	9,237	1,667
2053	2.103	1,963	649	1,963	1,298	1,963	9,595	1,731
2054	2.145	1,963	674	1,963	1,348	1,963	9,961	1,797
2055	2.188	1,963	699	1,963	1,398	1,963	10,335	1,865
								29,366

Source: JICA Study Team

5.52 As a result, tax revenues of Line 1 related to land trading lead to an increase of about BDT5.5 billion by 2035 and BDT35.5 billion by 2055, and that of Line 5 is expected to reach BDT3.1 billion by 2035 and BDT29.4 billion by 2055.

Table 5.4.5 Increase in Tax Revenue Related to Land Sales

Unit : million BDT

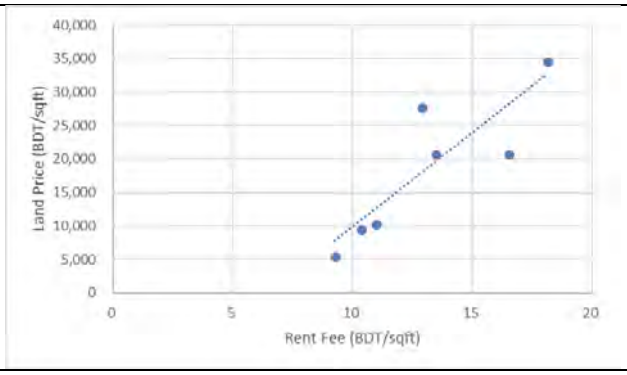
	Line 1	Line 5	Total
2035	5,529	3,134	8,663
2055	35,480	29,336	64,816

Source: JICA Study Team

3) Consideration of increase in tax revenue due to real estate rent

5.53 About 12% of real estate rent is collected as tax in Dhaka. An increase in land price will also increase rent fee. Figure 5.4.1 shows that when land price increases by BDT2,800 per ft^2, the rent increases by BDT1 per ft^2.

	Rent fee (BDT/sft)	Land price (BDT/sft)
Uttara	10.92	10,400
Banani	16.47	20,800
Gulshan	18.10	34,700
Mohamadpur	10.33	9,700
Mirpur	9.22	5,600
Lalmatia	13.44	20,800
Dhanmondhi	12.86	27,800



Source : Private Sector Housing

Figure 5.4.1 Relationship Between Land Price and Rent (2010)

5.54 According to Figure 5.4.1, the formula below will be used to calculate the rent fee.

(BDT/ft^2) = 2,800 × rent fee (BDT/ft^2) - 18,000 (BDT)

5.55 If approximately 50% of the total land is residential area, the rentable ratio is 80% and floor area ratio (FAR) is 5.0. The rentable area size is shown in Table 5.4.6. However, in undeveloped areas such as the locations of Bilamalia and Baliapur Stations, tax revenues due to land sales can be expected but tax revenue due to rent fee which cannot be expected is excluded since urban development projects only progress after railway operation.

5.56 In addition, the increase rate of land price is the total ratio computed by both the land price change due to the station plaza development and annual land price increase of 2% (Tables 5.3.5 and 5.3.6). The increase in tax revenue is due to the increase in rent fee multiplied by rentable floor area. That is equal to 12% of the increase in rent fee.

Table 5.4.6 Rentable Floor Area

Distance from station	Rentable floor area (m^2)
0–200 m	251,200
200–300 m	314,000
300m–400 m	439,600
400–500 m	565,200

Source: JICA Study Team

Table 5.4.7 Increase in tax revenue due to real estate rent

	Line 1				Line 5				Total Tax Revenue (million BDT)		Increase (million BDT)	
	0–200m	200–300m	300–400m	400–500m	0–200m	200–300m	300–400m	400–500m	Line 1	Line 5	Line 1	Line 5
2025	737	922	1,290	1,659	675	844	1,180	1,520	4,608	4,219		
2026	787	965	1,324	1,692	675	844	1,180	1,520	4,768	4,219	160	0
2027	840	1,011	1,359	1,726	675	844	1,180	1,520	4,936	4,219	328	0
2028	896	1,059	1,395	1,760	675	844	1,180	1,520	5,110	4,219	503	0
2029	957	1,109	1,432	1,795	721	884	1,213	1,550	5,293	4,368	685	149
2030	1,021	1,162	1,470	1,831	769	926	1,245	1,581	5,484	4,522	876	302
2031	1,090	1,217	1,508	1,868	821	970	1,278	1,613	5,683	4,682	1,075	462
2032	1,163	1,274	1,548	1,905	876	1,016	1,312	1,645	5,891	4,849	1,283	629
2033	1,241	1,335	1,589	1,944	935	1,064	1,346	1,678	6,108	5,023	1,501	804
2034	1,325	1,398	1,631	1,982	998	1,115	1,382	1,711	6,336	5,206	1,728	987
2035	1,414	1,464	1,674	2,022	1,065	1,167	1,418	1,746	6,574	5,397	1,966	1,177
2036	1,509	1,534	1,718	2,062	1,137	1,223	1,456	1,780	6,823	5,596	2,216	1,377
2037	1,611	1,606	1,763	2,104	1,214	1,281	1,494	1,816	7,084	5,805	2,476	1,585
2038	1,719	1,683	1,810	2,146	1,295	1,341	1,533	1,852	7,357	6,023	2,749	1,803
2039	1,835	1,762	1,857	2,189	1,383	1,405	1,574	1,889	7,643	6,251	3,036	2,031
2040	1,958	1,846	1,906	2,232	1,476	1,472	1,615	1,927	7,943	6,490	3,335	2,270
2041	1,997	1,883	1,945	2,277	1,575	1,541	1,658	1,966	8,102	6,740	3,494	2,521
2042	2,037	1,920	1,983	2,323	1,681	1,614	1,702	2,005	8,264	7,002	3,656	2,783
2043	2,078	1,959	2,023	2,369	1,794	1,691	1,746	2,045	8,429	7,277	3,821	3,057
2044	2,120	1,998	2,064	2,416	1,830	1,725	1,781	2,086	8,598	7,422	3,990	3,203
2045	2,162	2,038	2,105	2,465	1,866	1,759	1,817	2,128	8,770	7,571	4,162	3,351
2046	2,205	2,079	2,147	2,514	1,904	1,794	1,853	2,170	8,945	7,722	4,337	3,503
2047	2,249	2,120	2,190	2,564	1,942	1,830	1,890	2,214	9,124	7,876	4,516	3,657
2048	2,294	2,163	2,234	2,616	1,981	1,867	1,928	2,258	9,306	8,034	4,699	3,815
2049	2,340	2,206	2,278	2,668	2,020	1,904	1,967	2,303	9,492	8,195	4,885	3,975
2050	2,387	2,250	2,324	2,721	2,061	1,942	2,006	2,349	9,682	8,358	5,075	4,139
2051	2,435	2,295	2,370	2,776	2,102	1,981	2,046	2,396	9,876	8,526	5,268	4,307
2052	2,483	2,341	2,418	2,831	2,144	2,021	2,087	2,444	10,073	8,696	5,466	4,477
2053	2,533	2,388	2,466	2,888	2,187	2,061	2,129	2,493	10,275	8,870	5,667	4,651
2054	2,584	2,436	2,515	2,946	2,231	2,103	2,172	2,543	10,480	9,048	5,873	4,828
2055	2,635	2,484	2,566	3,005	2,275	2,145	2,215	2,594	10,690	9,229	6,083	5,009
										Total	94,911	70,852

Source: JICA Study Team

5.57 With or without development of station plaza, the increase in tax revenue due to real estate rent of Line 1 will be about BDT10.1 billion in 2035 and about BDT95 billion in 2055. For Line 5, the increase will be about BDT4.5 billion in 2035 and approximately BDT70.9 billion in 2055.

Table 5.4.8 Increase in tax revenue due to rent fee

	Increase in tax revenue Total (million BDT)		
	Line 1	Line 5	Total
2035	10,106	4,511	14,617
2055	94,911	70,852	165,763

Source: JICA Study Team

4) Conclusion

5.58 The rise in total land price of the area within 500 m of both Lines 1 and 5 after their construction is expected to exceed BDT5 trillion by 2055. This greatly exceeds the railway construction cost that has a big influence on the rise in the surrounding land price.

5.59 However, as shown in Table 5.4.9, the tax revenues obtained from the rise in land prices are limited and the increase in tax revenue is only about 4% against the rise in land price. Land owners, private sector, and developers holding land in the vicinity of the station will benefit, while the public side's profits are limited. It is indispensable to enhance the institutional aspect just so that the public profit from the increase in land price (as shown below).

Table 5.4.9 Relation between Land Price Increase and Tax Revenue

Unit : million BDT

	Total by 2035			Total by 2055		
	Line 1	Line 5	Total	Line 1	Line 5	Total
Increase in land price	948,340	857,371	1,805,711	2,859,374	2,585,091	5,444,465
Increase in tax revenue by land selling	5,529	3,134	8,663	35,480	29,366	64,846
Increase in tax revenue by rent fee	10,106	4,499	14,605	94,911	70,807	165,718
Total tax revenue	15,635	7,633	23,268	130,391	100,172	230,564

Source: JICA Study Team

(i) **Urban Development Profit by DMTCL and RAJUK.** Currently, RAJUK and DMTCL are the main institutions that can implement urban development as public projects. They can profit from the land price increase just by implementing urban development around the stations. There are no rules and regulations to distribute the profits obtained by DMTCL and RAJUK to other relevant organizations; therefore, it is necessary to consider the distribution and use of profits. Security of future maintenance and compensation of expenses for institutions that are responsible for maintenance of the station plazas, improvement of surrounding pedestrian environment, and so on are both important.

(ii) **Contributions from private companies.** It is necessary to demand contributions for the construction, maintenance, and management of MRT from private sectors that implement large-scale development projects within the vicinity of station. They can profit from selling land and property including the increase in land price because of the MRT. It is necessary to return to the public sectors in charge of the construction and maintenance of station plazas and public facilities in the vicinity of the stations. Effective utilization of private funds for accessibility improvement, such as underpasses, footbridges, sidewalks, and station plaza development may also be necessary.

6 Conclusion and Recommendations

6.1 Conclusion

6.1 Conclusions of TOD in the Study are as follows:

a) Roles of TOD: The main role of TOD is to promote sustainable urban development based on a mass transit network, at the core of which is an urban rail system. The development of urban rail transit is not an end in itself; it is a means toward improving urban transportation. Accessible railway stations are a necessary condition to maximize transit ridership. Urban rail transit also has middle- and long-term impacts on land uses and urban development patterns in station areas / railway catchment areas. TOD can be expected to (i) encourage rail transit ridership by improving accessibility, (ii) improve urban livability in station catchment areas, and (iii) stimulate economic development due to enhanced investment opportunities.

b) Station Plaza (off-street intermodal facilities): One of the most important features of TOD is the Station Plaza, or off-street intermodal facilities. Urban rail transit must be accessible for pedestrians and well connected and other road-based public transportation modes. It is necessary to improve walking conditions in the vicinity of rail transit stations. Appropriate facilities and information must be provided at the station plaza to enable transfers between MRT and feeder services such as buses and rickshaws. Because various transportation modes concentrate in the station area, micro traffic management is important. Without such facilities and management, new bottlenecks will be created at the level of station areas and on the roads near railway stations.

c) Provision of Access Road: Development of access roads to/from the railway station, especially within station catchment area (800–1,000 m) is important. For pedestrians, a safe and comfortable walking space includes paved and shaded sidewalks, drainage, protected crosswalks (and/or pedestrian bridges), traffic signals, and street lights. Such improvements will benefit not only rail transit users but also non-users of the neighboring communities.

d) Station Plaza and Integrated Urban Development: Considering the importance of station plaza (to increase railway ridership and improve local transport situation), the development of station plazas should be integrated with the railway project. However, the size and functions of the station plaza will depend on the location and characteristics of the station area, which should be carefully considered in the upcoming planning stages of MRT. Provision of space for developing appropriate station plazas would promote real estate development in station area and contribute to raising land prices. Without station plazas, the transportation conditions at the station area will worsen and development opportunities will be limited.

e) Land Acquisition: In general, station plazas will be developed in existing urban areas. Therefore, rail transit planners tend to find it difficult to provide space for station plazas, and are likely to leave it up to private developers. Such attitude may cause new bottlenecks in the planning process once the rail transit system will be built, and countermeasures would require huge financial burden. The provision of station plazas

should be integrated with rail transit development and land acquisition should be implemented at an early stage of the project, targeting not only public land and construction sites, but also private land. An effective measure to ensure space for station plazas is the rearrangement of land use rights; the "Land Adjustment" scheme should be introduced. Additionally, incentives for private developers to build high-density mixed-used buildings should be provided through zoning.

f) Consideration of Station Location, Station Plaza, and Development along Railway: The station location should be selected considering the accessibility and opportunities of integrated urban development. Especially, pressures on urban development in Dhaka are quite huge and this trend can be expected to continue. Stations' locations should be selected to optimize future land use efficiency, not based on existing land uses. For example, wetlands should be intentionally developed considering the necessity of preservation from an environmental viewpoint. Such development can represent opportunities for new projects for rail transit operators.

6.2 Recommendations

6.2 Construction of railway network is a great opportunity to convert to Transit Oriented Development and contributes to alleviate traffic problem in Dhaka. TOD is an important key for Dhaka and recommendations are shown as below.

a) Formulation of TOD Plan: TOD area at each station should be designated and urban development plan should be also formulated. TOD plan includes the contents as below.

(i) Vision and community development strategy

(ii) DAP

(iii) Traffic management plan

(iv) Extraction of TOD project

b) Formulation of TOD Policy: For better understanding of TOD and manage, TOD policy has three components as below.

(i) Intermodal facility plan and development policy

(ii) Policy to control and regulate urban planning in TOD area

(iii) Policy to transfer value capture to railway companies

c) Detailed Design of Station Plaza: Detailed design for each station plaza should be planned in accordance with b) TOD policy and the scale is about 1/500. It includes in the contents as below.

(i) Size of area and facilities of station plaza

(ii) Layout

(iii) Land acquisition

(iv) Organization regarding management and maintenance

d) Institutional Development: Institutional development and revision are necessary to maximize impacts on TOD. The contents as below should be considered.

(i) Method to evaluate land price: As there is a great difference between land declare price and market price, it is difficult to obtain profits from the increase of land price due to MRT construction. Therefore, method to evaluate land price appropriately should be developed.

(ii) Oblige to ensure land for station plazas by private sectors under Private Residential Land Development Rules: When private sectors implement urban development project, land for station plazas should be ensured by private sectors as well as parks in Residential Land Development Rules.

e) Capacity Development: For implementation TOD, it is indispensable that the capacity of person in charge is enhanced. The necessary components are as below.

(i) DTCA: To secure human resources who has expertise about urban planning and to enhance the ability to coordinate with relevant organization and public sectors.

(ii) DMTCL: To enhance the ability to design, manage, maintenance station plazas.

(iii) RAJUK: To enhance the ability of planning TOD zoning and better understanding of TOD.

6.3 Enhancement of Corporation among Stakeholders: The corporation and coordination with many stakeholders are necessary for implementation for TOD. The components for enhancing corporation are as below.

(i) Coordination meeting with relevant stakeholders: Stakeholder meeting should be held with DTCA, DMTCL, RAJUK, DOA, private sectors and land owners to discuss TOD implementation.

(ii) Participating in development committee: Approval is necessary to develop the area around stations under Mahanagar Building Construction Act because the location of stations is along main roads. Therefore, the participants from RAJUK should learn TOD and urge to promote appropriate urban development around stations.

Appendix A: Trend of Land Property in Dhaka

Table of Contents

1 Land Property System in Dhaka

1.1. From the time when the beginning of the human civilization all social, economic and cultural activities developed involving land. Land is considered a most important and valuable component of urban system. The step of urbanization in the developing country over the next decades is expected to be very rapid. Especially in mega cities, urbanization process is closely associated with economic aspects and at the same time push up the demands for serviced land for various kinds of urban uses, infrastructure and services.

1.2. Dhaka is the largest city of Bangladesh and core of the political, social and economic activity. The main stream of urbanization process of Bangladesh is focused on towards this capital. To cope up with the heavy pressure of development, Dhaka is in vital need of accurate and systematic information about its land market. Most of the land market of Dhaka is controlled by private land owners and real estate developers. And it is very difficult to control over the land price and systematic way of purchasing. It is very difficult to manage and operate land transaction process with old-dated land transection system, taxation structure.

1.3. The administrative structure of land management in Bangladesh is built around three basic functions: (ⅰ) record keeping, (ⅱ) registration, and (ⅲ) settlement. These functions of land administration are maintained by various departments of two Ministries, The Ministry of Land (MoL) and The Ministry of Law, Justice and Parliamentary Affairs (MLJP). While the MoL discharge most of the land-related activities including survey, collection of land development tax, arbitration process, the MLJP mainly records land mutation and transfers.

1.4. Land registration is a deed of maintenance of a public register, which is a record of an isolated transaction. Sub-Register (SR) registers transfer of any parcel of land through a deed with stamp on the property value as Immovable Property Transfer Tax (IPTT). When any deed is registered in Registration office, Land Transfer (LT) notice is to be sent to the Office of Assistant Commissioner's (AC, Land) Office. Mutation is the process of revising and updating the Record-of-Rights (ROR) on transfer of land ownership and on subdivision and amalgamation of landholdings. The AC (Land) working under Deputy Commissioner (DC) updates or revises partially these land records through mutation process.

1.5. After the finalization of land records in survey operation the Directorate of Land Record and Survey (DLRS) under MOL sends *khatians, mauza* maps to the DC office that preserves them in the District Record Room which is maintained in AC (land) Office. These Land Records provide the base to conduct further survey and preparation of master plan, structure plan, infrastructure development plan, valuation of property tax, etc.

1.6. The land administration system should be made stronger and transparent. And land record preparation, updating of ROR and land transfer registration are the integral parts of land administration and these should be coordinated well. However, at present the responsible ministries and agencies involved for land management and administration work independently with little coordination among them. The whole process is age-old land management so it is manual, laborious and time intensive. Multiplicity of documents or records of right maintains in different offices under different un-coordinated ministries. Moreover, ROR or *Khatian* is not conclusive evidence of ownership, and these merely

provide basis for possession at the recording time.

2 Right of land

1.7. British colonial rulers established feudalism in this Subcontinent deeply. In 1875 they enacted 'The Survey Act, 1875' and under this act a survey namely 'The Cadastral Survey' was conducted from 1888 to 1938 throughout the then Bengal presidency province of India. Records of Rights i.e. RoR/ khatians were prepared by this survey operation. All particulars of land, including name of the owners/ zamindars, occupants, description of land, and amount of revenue were described in those khatians. Copies of those records were preserved in the district record room and zamindars' tax office i.e. kachari or tahsil offices.

1.8. On the other hand newly appointed feudal lords/ Zamindars started exploitation and mismanagement in land administration. People became tenants/ rayats rather than citizen and started struggling. They struggled for survival. Once it turned into movement against feudalism/ zamindari system. As a result the then British government enacted a law namely 'The Bengal Tenancy Act, 1885' to ensure tenants' right. Peasants' occupancy right to land was addressed by this law; mutation for tenants to land records was provisioned. Due to this act tenants' name was been written in survey records as occupants. But it was not implemented properly. As a result of continuous struggle and movement of the peasants an inquiry commission was established after enactment of 'The Government of India Act, 1935' by the British government. This commission recommended to acquire all zamindaris with due compensation and bring the peasants/ rayats directly under the government. This recommendation was implemented by government of the east Bengal, state of Pakistan, after independence in 1947. The then government enacted 'The East Bengal States Acquisition and Tenancy Act, 1950' and acquired all estates with all rent receiving interests and thereby brought all peasants/ rayats directly under the government as the owners of land.

1.9. According to National Land Policy 2016, All Land in Bangladesh shall be classified as Private, State, Public and Community Land.

1.10. **Private Land:** Private land denotes land held by and individual or other legal entity under freehold or leased tenure.

1.11. **State Land:** State land refers to agricultural and non-agricultural *Khas* land that the state manages on behalf of public.

1.12. **Public Land:** Public land denotes all land owned by the Government including its agencies and allotted for a specific public use. Public land may also be allotted for large-scale development projects implemented under public-private sectors partnership.

1.13. **Community Land:** Community land denotes land lawfully or customarily held, managed and use by specific social or religious entities in a defined geographic location. To promote tenure security and sustainable utilization of land resources, the Government shall map and document agricultural land or pastureland owned and managed by specific community and incorporate such land into the formal land registries.

3 Land Property Registration system

1.14. All over Bangladesh, land properties have been in sale-resale for hundreds of years, the process gradually becoming more and more formal as the space available for

development shrinking unabatedly. There were times in the past, not very long ago during our immediate previous generation, when one or two cubit of land along the common aisle (earthen ridge divide) would be relinquished by the peace-loving, simple village people in turn to avoid disputes and quarrels with People who are met almost every sunrise. But the scenario has drastically changed with the introduction of the so-called Free Market Economy and more particularly its convenient interpretation by the opportunists. People are much more selfish and self-centered now than ever before. Blood-feud and murder are not uncommon in incidents regarding land.

1.15. In rural and secondary/tertiary towns, this registration process is administered by Sub-Registry Office. There are prices fixed for land according to category and utility but these are seldom followed. Actual prices are either higher in most of the cases; or in poor socio-economic and sleepy economic activity areas, prices are rather lower than the government price. This author paid more prices to his seller elder brother than was printed in government documents.

1.16. In cities and large towns, this process is accomplished by Bhoomi (Land) Offices.

Steps in Land Registration

1.	Verification of the record of rights from AC Land Office
2.	Application for Mutation on Property to AC Land
3.	Investigation by the AC Land's Office on Khatian or RoR (Records of Rights)
4.	Obtaining the Non-encumbrance certificate
5.	Preparing transfer deed and payment of stump
6.	Paying registration fee, VAT, and other taxes
7.	Applying for registration at the sub-registry office
8.	Registering the change in ownership at AC Land office

1) Mutation Fee:

1.17. From July 1, 2015, the government is taking Tk. 1000 as mutation fee for each khatian (RoR). This amount is much larger than the earlier one of Tk. 245. This increased rate would discourage land owners to do mutation of their land that would put land management and determination of land ownership in jeopardy. Moreover, this increased rate would increase corruption as well.

2) Registration Fee:

1.18. According to THE INCOME TAX ORDINANCE, 1984 (XXXVI OF 1984) [As amended up to July, 2014]

1.19. [53H. Collection of tax on transfer, etc. of property.- (1) Any registering officer responsible for registering any document of a person under the provisions of clause (b), (c) or (e) of sub-section (1) of section 17 of the Registration Act, 1908 (XVI of 1908) shall not register any document unless tax is paid at such rate as may be prescribed in relation to the property to which the document relates and on which stamp-duty is chargeable under Stamp Act, 1899 (II of 1899) by the person whose right, title or interest is sought to be transferred, assigned, limited or extinguished thereby, at the time of registration of such document:

1.20. Provided that the rate of tax shall not exceed taka ten lakh and eighty thousand per katha (1.65 decimal) for land, taka six hundred per square meter for any structure, building,

flat, apartment or floor space on the land, if any, or four per cent of the deed value, whichever is higher.

4 Registered Land Price and Actual Land Price

1.21. Land Transaction is made through the office of the Sub-Registrar land transaction record kept in every Sub-Registry office. Every Sub- Registry office has a government stated minimum price of Land transaction. No one can buy land from other less then govt. stated price of that area where transaction will be occurred. But this official price are usually far below then the real market price.

1.22. Since Registration fees in Bangladesh are quite high, this makes registration cost high for land purchasers. The impact of this high fee is felt more prominently in areas where land price is quite high. In such a situation, deed writers tempt land purchasers to show lower land prices and thus encourage them to evade tax. The registry officials tacitly approve their wrongdoings without taking any disciplinary measures.

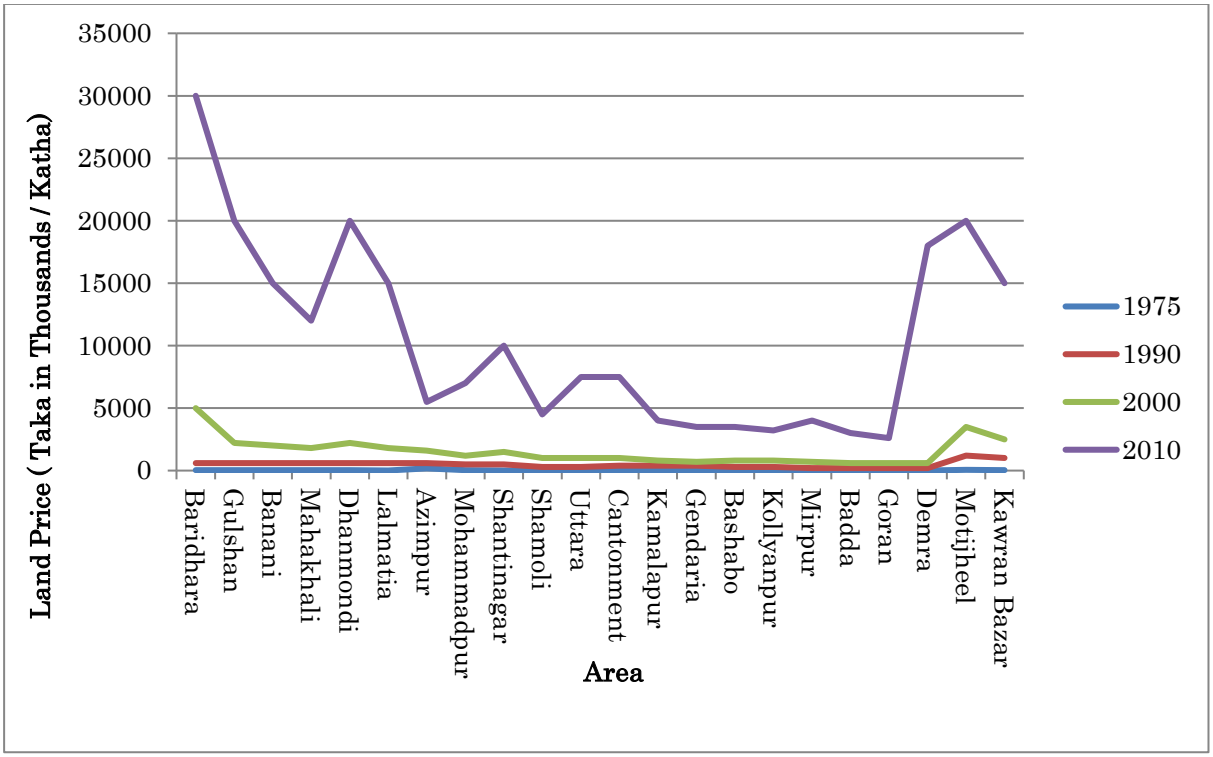
1.23. Since the registration fee is paid on basis of official land price, every year Government is deprived of a huge amount of revenue from land transaction. Discrepancy between the official and actual land price should be eliminated by establishing and effective Land Information System which will result in better management of land and revenue collection.

5 Trend of Land Price in Dhaka City

1.24. Dhaka has experienced an exceptional increase of land value since the early seventies. But the value of land in Dhaka City, mainly in the central area, has increased at a rate very much higher than the rate of any other commodity after 1990. After 2000, the rise in land price became steeper.

1.25. In Figure1 Land value of Dhaka city has drastically increased in last decade are shown.

Figure 5.1 Chronological changes in Land Price of Different area of Dhaka



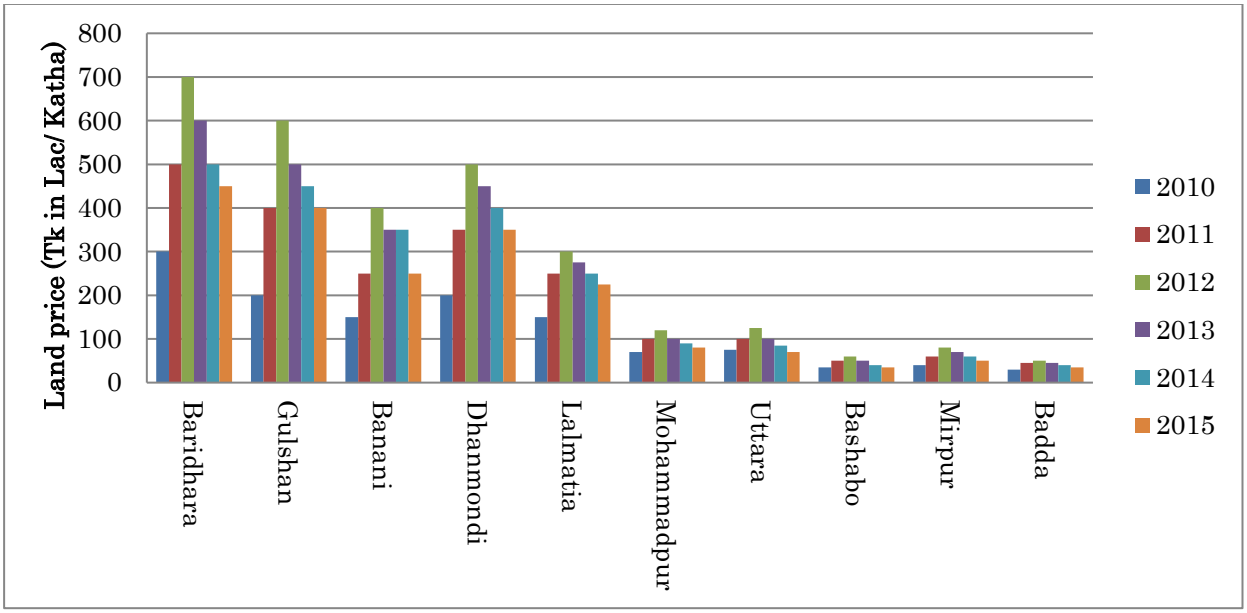
Data Source: Sheltech (pvt.) Ltd. 2010

1.26. With the increase of population in Dhaka the housing demand is getting an expansion, thus further increasing the value of housing units. As a result, the settlement area of the city is increasing and people are getting more inclined at the outskirts. As a result the surrounding areas of the city are also experience a rise in the land price.

1.27. From 2010 to 2015, Land Market is very much fluctuated. Fluctuating rate was higher in 2012 due to real-estate land development and housing projects all around the Dhaka city. The activities of Real estate companies have been responsible for the high price of land because they pay a much higher price for a good piece of land.

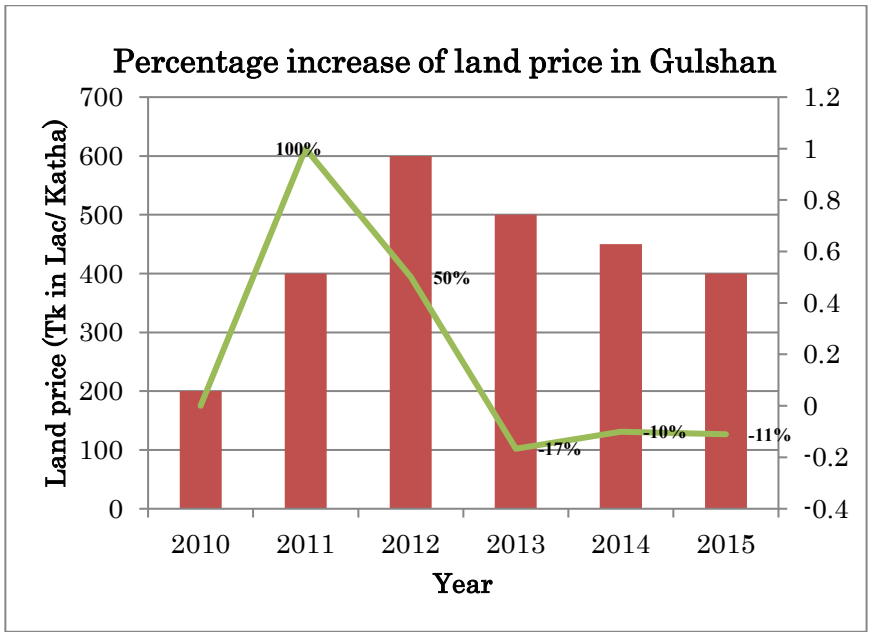
1.28. Land use transformation is one of the key factors to increase land price of some area in Dhaka city. For Example, the transformation of land use of Dhanmondi residential area to commercial use has made its land price higher than any other planned areas. Gulshan, Banani also in same trends. Baridhara Residential area is use mainly for diplomatic mission like embassy and highly secured, planned residential area. It is the cause of high land price within this area among all over the Dhaka city. Land price comparison of different area of Dhaka from 2010 to 2015 is shown in Figure 5.2.

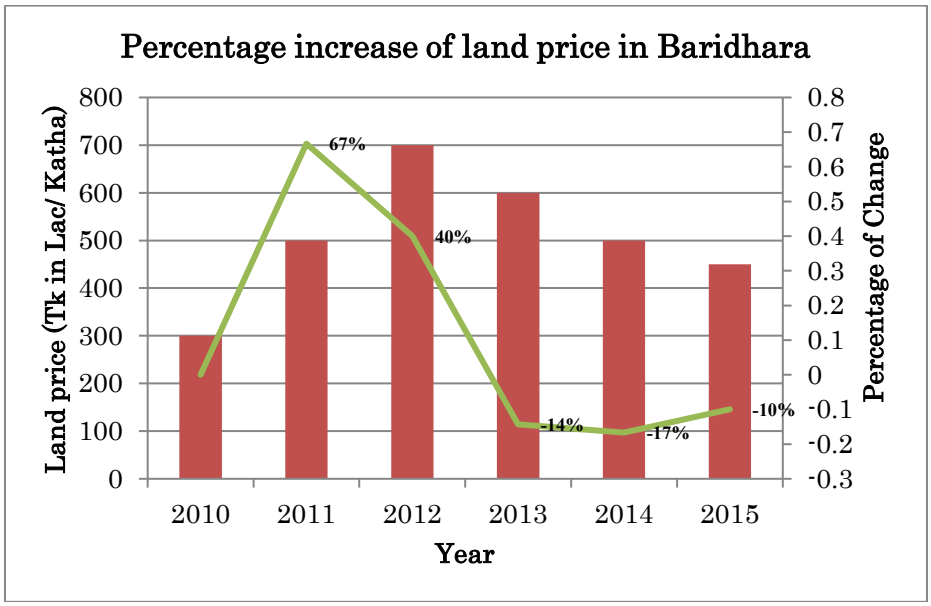
Figure 5.2 Land Price comparison of different area of Dhaka (2010-2015)

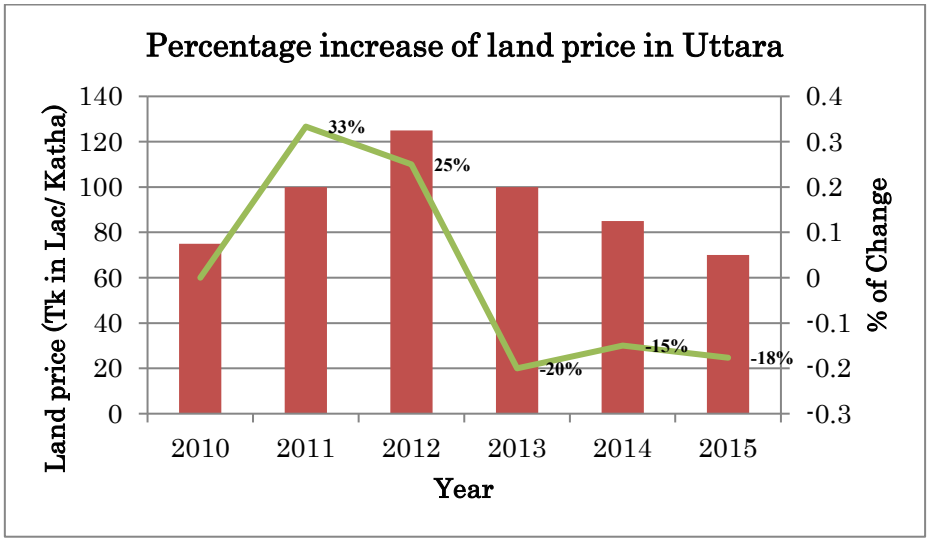


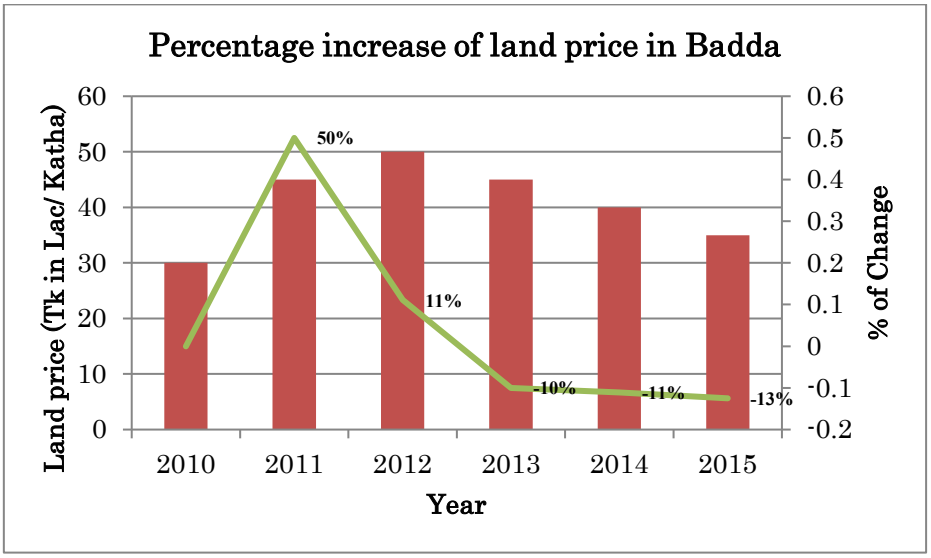
Data Source: Sheltech (pvt.) Ltd. 2016

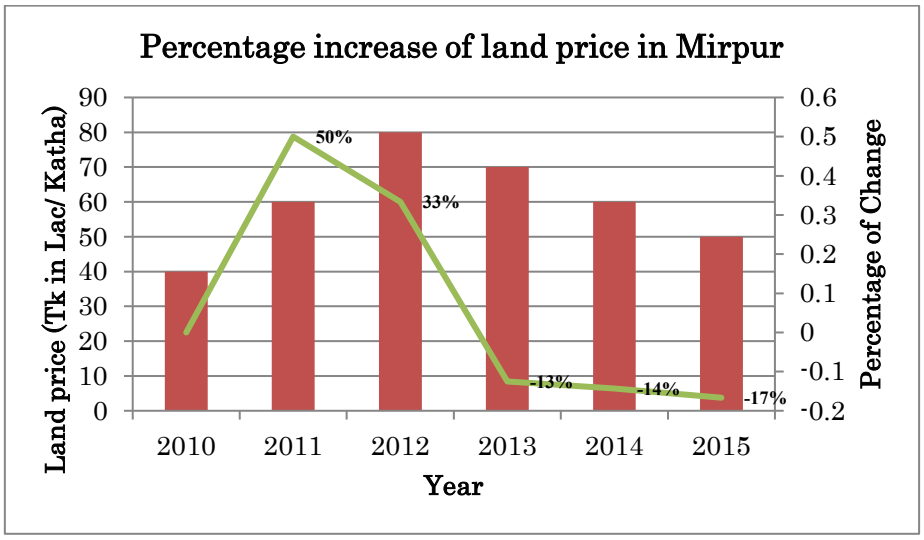
1.29. Figures shown in below provide some idea regarding the percentage increase of land price in some prominent area of Dhaka since 2010 to 2015.




Percentage increase of land price in Baridhara
Land price (Tk in Lac/ Katha)
Percentage of Change
Year
800
700
600
500
400
300
200
100
0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
2010
2011
2012
2013
2014
2015
67%
40%
-14%
-17%
-10%


Percentage increase of land price in Uttara
Land price (Tk in Lac/ Katha)
% of Change
Year
140
120
100
80
60
40
20
0
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
2010
2011
2012
2013
2014
2015
33%
25%
-20%
-15%
-18%


Percentage increase of land price in Badda
Land price (Tk in Lac/ Katha)
% of Change
Year
60
50
40
30
20
10
0
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
2010
2011
2012
2013
2014
2015
50%
11%
-10%
-11%
-13%



6 Land Property Related Law

6.1 TRANSFER OF PROPERTY ACT, 1882

1.30. According to section 58(a) of the Transfer of Property Act 1882, A mortgage is the transfer of an interest in specific immoveable property for the purpose of securing the payment of money advanced or to be advanced by way of loan, an existing or future debt, or the performance of an engagement which may give rise to a pecuniary liability.

- The transferor is called a mortgagor;
- The transferee a mortgagee;
- The principal money and interest of which payment is secured for the time being are called the mortgage-money; and
- The instrument (if any) by which the transfer is effected is called a mortgage-deed.

1.31. According to section 53-D TP Act, 1882, an immovable property under registered mortgage must not be re-mortgaged or sold without the written consent of the mortgagee, and any re-mortgage or sale made otherwise must be void. [Amended by the Act 26 of 2004]

1.32. **TYPES/ FORMS OF MORTGAGE:** According to Section 58 of T P Act, 1882, the types of mortgage are discussed below:

1. **Simple mortgage [Section: 58(b) of TP ACT 1882]:-** Where, without delivering possession of the mortgaged property, the mortgagor binds himself personally to pay the mortgage-money, and agrees, expressly or impliedly, that, in the event of his failing to pay according to his contract, the mortgagee shall have a right to cause the mortgaged property to be sold and the proceeds of sale to be applied, so far as may be necessary, in payment of the mortgage-money, the transaction is called a simple mortgage and the mortgagee a simple mortgagee.

2. **Mortgage by conditional sale [Section: 58© of TP ACT 1882]:-** Where, the mortgagor ostensibly sells the mortgaged property –

✓ on condition that on default of payment of the mortgage-money on a certain date the sale shall become absolute, or

- ✓ on condition that on such payment being made the sale shall become void, or
- ✓ on condition that on such payment being made the buyer shall transfer the property to the seller,

1.33. The transaction is called a mortgage by conditional sale. However, no such transaction shall be deemed to be a mortgage, unless the condition is embodied in the document which effects or purports to affect the sale. In order to determine that a document is a mortgage by conditional sale, the following tests, though not exhaustive, should be applied:

- ✓ The existence of debt.
- ✓ The period of repayment, a short period being indicative of a sale and a long period of a mortgage.
- ✓ The continuance of the grantor in possession indicates a mortgage.
- ✓ A stipulation for interest on payment indicates a mortgage.
- ✓ A price below the true value indicates a mortgage.
- ✓ A contemporaneous deed stipulated for convenience indicates a mortgage, but one executed after a lapse of time points to a sale.

3. **Usufructuary mortgage [Section: 58(d) of TP Act 1882]:-** Where the mortgagor delivers possession or expressly or by implication binds himself to deliver possession of the mortgaged property to the mortgagee, and authorizes him to retain such possession until payment of the mortgage-money, and to receive the rents and profits accruing from the property or any part of such rents and profits and to appropriate the same in lieu of interest or in payment of the mortgage-money, or partly in lieu of interest or partly in payment of the mortgage-money, the transaction is called a usufructuary mortgage.

4. **English mortgage [Section: 58© of TP Act 1882]:-** Where the mortgagor binds himself to repay the mortgage-money on a certain date, and transfers the mortgaged property absolutely to the mortgagee, but subject to a proviso that he will re-transfer it to the mortgagor upon payment of the mortgage-money as agreed, the transaction is called an English mortgage.

5. **Mortgage by deposit of title-deeds [Section: 58(f) of TP Act 1882]:-** Where a person in the town of Dhaka, Narayangonj and Chittagong and in other town which the government, by notification in the Official Gazette, specify in this behalf, delivers to a creditor or his agent documents of title to immovable property, with intent to create a security thereon, the transaction is called a mortgage by deposit of title-deeds.

6. **Anomalous mortgage [Section: 58(g) of TP Act 1882]:-** A mortgage, an English mortgage or a mortgage by deposit of title-deeds within the meaning of s 58 of the TP Act is called an anomalous mortgage.

1.34. Rights and Liabilities of Mortgagor [Sections 60-62, 83 of TP Act 1882]:-

- Right of mortgagor to redeem [Section:60 of TP Act 1882];
- Redemption of portion of mortgaged property [Section:60 of TP Act 1882];
- Right to redeem separately or simultaneously [Section:61 of TP Act 1882];
- Right of usufructuary mortgagor to recover possession [Section: 62 of TP Act 1882];
- Power to deposit in court money due on mortgage [Section:83 of TP Act 1882];
- Right to money deposited by mortgagor.

1.35. **RIGHT OF MORTGAGOR TO REDEEM:-**According to s 60 of TP Act, at any time after the principal money has become due, the mortgagor has a right, on payment or

tender, at a proper time and place, of the mortgage-money, to require the mortgagee-

- ✓ to deliver to the mortgagor the mortgage-deed and all documents relating to the mortgaged property which are in the possession or power of the mortgagee,
- ✓ where the mortgagee is in possession of the mortgaged property, to deliver possession thereof to the mortgagor, and
- ✓ at the cost of the mortgagor either to re-transfer the mortgaged property to him or to such third person as he may direct, or to execute and (where the mortgage has been effected by a registered instrument) to have registered an acknowledgement in writing that any right in derogation of his interest transferred to the mortgagee has been extinguished.

1.36. **REDEMPTION OF PORTION OF MORTGAGED PROPERTY:-** Section 60 of TP Act also provides that a person interested in a share only of the mortgaged property is not entitled to redeem his own share only, on payment of a proportionate part of the amount remaining due on the mortgage, except only where a mortgagee, or, if there are more mortgagees than one, all such mortgagees, has or have acquired, in whole or in part, the share of a mortgagor.

1.37. **RIGHT TO REDEEM SEPARATELY OR SIMULTANEOUSLY:-** According to s 61 of TP Act, a mortgagor who has executed two or more mortgages in favor of the same mortgagee shall, in the absence of a contract to the contrary, when the principal money of any two or more of the mortgages has become due, be entitled to redeem any one such mortgage separately, or any two or more of such mortgages together.

1.38. **RIGHT OF USUFRUCTUARY MORTGAGOR TO RECOVER POSSESSION:-** Section 62 of TP Act provides that in the case of a usufructuary mortgage, the mortgagor has a right to recover possession of the property together with the mortgage-deed and all documents relating to the mortgaged property which are in the possession or power of the mortgagee,-

1.39. where the mortgagee is authorized to pay himself the mortgage-money from the rents and profits of the property,-when such money is paid;

- ✓ where the mortgagee is authorized to pay himself from such rents and profits or any part thereof a part only of the mortgage-money,-when the term (if any) prescribed for the payment of the mortgage-money has expired and the mortgagor pays or tenders to the mortgagee the mortgage-money or the balance thereof or deposits it in court.

1.40. **POWER TO DEPOSIT IN COURT MONEY DUE ON MORTGAGE:-** Section 83 provides that at any time after the principal money payable in respect of any mortgage has become due and before a suit for redemption of the mortgaged property is barred, the mortgagor, or any other person entitled to institute such suit, may deposit, in any court in which he might have instituted such suit, to the account of the mortgagee, the amount remaining due on the mortgage.

1.41. **RIGHT TO MONEY DEPOSITED BY MORTGAGOR:-** The court shall thereupon cause written notice of the deposit to be served on the mortgagee, and the mortgagee may, on presenting a petition (verified in manner prescribed by law for the verification of plaints) stating the amount then due on the mortgage, and his willingness to accept the money so deposited in full discharge of such amount, and on depositing in the same court the mortgage-deed and all documents in his possession or power relating to the mortgaged

property, apply for and receive the money, and the mortgage-deed, and all such other documents so deposited shall be delivered to the mortgagor or such other person as aforesaid.

1.42. Where the mortgagee is in possession of the mortgaged property, the court shall, before paying to him the amount so deposited direct him to deliver possession thereof to the mortgagor and at the cost of the mortgagor either to re-transfer the mortgaged property to the mortgagor or to such third person as the mortgagor may direct or to execute and (where the mortgage has been effected by a registered instrument) have registered an acknowledgement in writing that any right in derogation of the mortgagor's interest transferred to the mortgagee has been extinguished.

1.43. Rights of the Mortgagee: [Sections: 67-72 of TP Act 1882]:-

1. **Right to Foreclosure or sale:-** Section 67 of TP Act provides that in the absence of a contract to the contrary, the mortgagee has, at any time after the mortgage-money has become due to him, and before a decree has been made for the redemption of the mortgaged property, or the mortgage-money has been paid or deposited, a right to obtain from the court a decree that the mortgagor shall be absolutely debarred of his right to redeem the property, or a decree that the property be sold. A suit to obtain a decree that a mortgagor shall be absolutely debarred of his right to redeem the mortgaged property is called a suit for foreclosure.

- However, nothing of the above provisions shall be deemed-
- to authorize any mortgagee other than a mortgagee by conditional sale or a mortgagee under an anomalous mortgage by the terms of which he is entitled to foreclose, to institute a suit for foreclosure, or a usufructuary mortgagee as such or a mortgagee by conditional sale as such to institute a suit for sale; or
- to authorize a mortgagor who holds the mortgagee's rights as his trustee or legal representative, and who may sue for a sale of the property, to institute a suit for foreclosure; or
- to authorize the mortgagee of a railway, canal, or other work in the maintenance of which the public are interested, to institute a suit for foreclosure or sale; or
- to authorize a person interested in part only of the mortgage-money to institute a suit relating only to a corresponding part of the mortgaged property, unless the mortgagees have, with the consent of the mortgagor, severed their interests under the mortgage.

2. **Mortgagee when bound to bring one suit on several mortgages:-** Section 67A provides that a mortgagee who holds two or more mortgages executed by the same mortgagor in respect of each of which he has a right to obtain the same kind of decree under s 67, and who sues to obtain such decree on any one of the mortgages, shall, in the absence of a contract to the contrary, be bound to sue on all the mortgages in respect of which the mortgage-money has become due.

3. **Right to sue for mortgage-money:-** Section 68(1) provides that the mortgagee has a right to sue for the mortgage-money in the following cases and no others, namely,-

- where the mortgagor binds himself to repay the same;
- where, by any cause other than the wrongful act or default of the mortgagor or mortgagee, the mortgaged property is wholly or partially destroyed or the security is rendered insufficient within the meaning of s 66, and the mortgagee has given

the mortgagor a reasonable opportunity of providing further security enough to render the whole security sufficient, and the mortgagor has failed to do so;

- where the mortgagee is deprived of the whole or part of his security by or in consequence of the wrongful act or default of the mortgagor;
- Where, the mortgagee being entitled to possession of the mortgaged property, the mortgagor fails to deliver the same to him, or to secure the possession thereof to him without disturbance by the mortgagor or any person claiming under a title superior to that of the mortgagor.

1.44. However, in the case referred to in clause (a), a transferee from the mortgagor or from his legal representative shall not be liable to be sued for the mortgage-money. Section 68(2) provides that where a suit is brought under clause (a) or clause (b) of sub-section (1), the court may, at its discretion, stay the suit and all proceedings therein, notwithstanding any contract to the contrary, until the mortgagee has exhausted all his available remedies against the mortgaged property or what remains of it, unless the mortgagee abandons his security and, if necessary, re-transfers the mortgaged property.

4. **Power of sale when valid:-** Section 69 provides that a mortgagee, or any person acting on his behalf, shall, subject to the provisions of this section have power to sell or concur in selling the mortgaged property or any part thereof, in default of payment of the mortgage-money, without the intervention of the court, in the following cases and in no others, namely:

- where the mortgage is an English mortgage, and neither the mortgagor nor the mortgagee is a Hindu, Muslim or Buddhist or a member of any other race, sect, tribe or class from time to time specified in this behalf by the Government, in the Official Gazette;
- where a power of sale without the intervention of the court is expressly conferred on the mortgagee by the mortgage-deed and the mortgagee is the government; or schedule bank as defined in Art 37 of the Bangladesh Bank Order 1972; and
- where a power of sale without the intervention of the court is expressly conferred on the mortgagee by the mortgage-deed and the mortgaged property or any part thereof was, on the date of the execution of the mortgage-deed, situate within the town of Dhaka or in any other town or area which the Government may, be notification in the Official Gazette, specify in this behalf.

1.45. However, as s 69(2) provides, the above power of sale must not be exercised unless and until –(i) notice in writing requiring payment of the principal money has been served on the mortgagor, or on one of several mortgagors, and default has been made in payment of the principal money, or of part thereof, for three months after such service; or (ii) some interest under the mortgage amounting at least to Tk 500/- is in arrear and unpaid for three months after becoming due: Provided that the power of a schedule bank under clause (b) of s 69(1) as mentioned above should further be subject to such conditions as may be prescribed in this behalf by notification in the official Gazette by the Government in consultation with the Bangladesh Bank.

5. **Rights of mortgagee in possession:-** Section 72 of TP Act provides that a mortgagee may spend such money as is necessary –

- ✓ for the preservation of the mortgaged property from destruction, forfeiture or sale;
- ✓ for supporting the mortgagor's title to the property;
- ✓ for making his own title thereto good against the mortgagor; and
- ✓ when the mortgaged property is a renewable lease-hold, for the renewal of the lease; and may, in the absence of a contract to the contrary, add such money to the principal money, at the rate of interest payable on the principal, and, where no such rate is fixed, at the rate of nine percent per annum:

1.46. Provided that the expenditure of money by the mortgagee under clause (2) or clause (3) shall not be deemed to be necessary unless the mortgagor has been called upon and has failed to take proper and timely steps to preserve the property or to support the title.

1.47. Where the property is by its nature insurable, the mortgagee may also, in the absence of a contract to the contrary, insure and keep insured against loss or damage by fire the whole or any part of such property, and the premiums paid for any such insurance shall be added to the principal money with interest at the same rate as is payable on the principal money or, where no such rate is fixed, at the rate of nine per cent per annum. But the amount of such insurance shall not exceed the amount specified in this behalf in the mortgage-deed or (if no such amount is therein specified) two-thirds of the amount that would be required in case of total destruction to reinstate the property insured.

6. <u>Liabilities of mortgagee in possession [Section:76 of TP Act 1882]:-</u>
According to s 76 of TP Act, when, during the continuance of the mortgage, the mortgagee takes possession of the mortgaged property, -

- ✓ he must manage the property as a person of ordinary prudence would manage it if it were his own;
- ✓ he must try his best endeavors to collect the rents and profits thereof;
- ✓ he must, in the absence of a contract to the contrary, out of the income of the property, pay the government revenue, all other charges of a public nature and all rent accruing due in respect thereof during such possession, and any arrears of rent in default of payment of which the property may be summarily sold;
- ✓ he must in the absence of a contract to the contrary, make such necessary repairs of the property as he can pay for out of the rents and profits thereof after deducting from such rents and profits the payments mentioned in clause © and the interest on the principal money;
- ✓ he must not commit any act which is destructive or permanently injurious to the property;
- ✓ where he has insured the whole or any part of the property against loss or damage by fire, he must, in case of such loss or damage, apply any money which he actually receives under the policy or so much thereof as may be necessary, in reinstating the property, or, if the mortgagor so directs, in reduction or discharge of the mortgage-money;
- ✓ he must keep clear, full and accurate accounts of all sums received and spent by him as mortgagee, and, at any time during the continuance of the mortgage, give the mortgagor, at his request and cost, true copies of such accounts and of the vouchers by which they are supported;
- ✓ his receipts from the mortgaged property, or, where such property is personally occupied by him, a fair occupation-rent in respect thereof, shall, after deducting the expenses properly incurred for the management of the property and the collection of rents and profits and the other expenses mentioned in clauses © and (d), and interest thereon, be debited against him in reduction of the amount (if any) from time to time due to him on account of interest and, so far as such receipts exceed any interest due, in reduction or discharge of the mortgage-money; the surplus, if any, shall be paid to the mortgagor;
- ✓ when the mortgagor tenders, or deposits in the manner hereinafter provided, the amount for the time being due on the mortgage, the mortgagee must, notwithstanding the provisions in the other clauses of this section, account for his receipts from the mortgaged property from the date of the tender or from the earliest time when he could take such amount out of court, as the case may be, and shall not be entitled to deduct any amount therefrom on account of any expenses incurred after such date or time in connection with the mortgaged property.

6.2 THE REGISTRATION ACT, 1908

1.48. The following documents shall be registered, if the property to which they relate is situate in a district in which, and if they have been executed on or after the date on which, this Act came or comes into force, namely:- (i) instruments of gift of immoveable property, (ii) declaration of heba under the Muslim Personal Law (Shariat); (iii) other non-testamentary instruments which purport or operate to create, declare, assign, limit or extinguish, whether in present or in future, any right, title or interest, whether vested or contingent, to or in immoveable property

1.49. **Explanation –** In the case of an assignment of a mortgage the consideration for the deed of assignment shall be deemed to be the value for registration.

- Non-testamentary instruments (other than the acknowledgement of a receipt or payment made in respect of any transaction to which an instrument registered under clause (o) relates) which acknowledge the receipt or payment of any consideration on account of the creation, declaration, assignment, limitation or extinction of any such right, title or interest; and
- instrument of mortgage referred to in section 59 of the Transfer of Property Act, 1882;
- leases of immoveable property from year to year, or for any term exceeding one year, or reserving a yearly rent;
- non-testamentary instruments transferring or assigning any decree or order of a Court or any award when such decree or order or award purports or operates to create, declare, assign, limit or extinguish, whether in present or in future, any right, title or interest, whether vested or contingent, to or in immoveable property;
- instrument of partition of immovable property effected by persons upon inheritance according to their respective personal laws;

1.50. instrument of sale in pursuance of an order of the Court under section 96 of the State Acquisition and Tenancy Act, 1950]

1.51. Provided that the Government may, by order published in the official Gazette, exempt from the operation of this sub-section any leases executed in any district, or part of a district, the terms granted by which do not exceed five years and the annual rents reserved by which do not exceed fifty taka.

- ✓ Nothing in clauses (b) and (c) of sub-section (1) applies to-
- ✓ any composition deed;
- ✓ any instrument relating to shares in a Joint Stock Company, notwithstanding that the assets of such Company consist in whole or in part of immoveable property
- ✓ any debenture issued by any such Company and not creating, declaring, assigning, limiting or extinguishing any right, title or interest, to or in immoveable property except in so far as it entitles the holder to the security afforded by a registered instrument whereby the Company has mortgaged, conveyed or otherwise transferred the whole or part of its immoveable property or any interest therein to trustees upon trust for the benefit of the holders of such debentures
- ✓ any endorsement upon or transfer of any debenture issued by any such Company
- ✓ any document not itself creating, declaring, assigning, limiting or extinguishing any right, title or interest to or in immoveable property, but merely creating a right to obtain another document which will, when executed, create, declare, assign, limit or extinguish any such right, title or interest
- ✓ any decree or order of a Court except a decree or order expressed to be made on a compromise and comprising immoveable property other than that which is the subject-matter of the suit or proceeding
- ✓ any grant of immoveable property by the Government
- ✓ any instrument of partition made by a Revenue-officer

- ✓ any order granting a loan or instrument of collateral security granted under the Land Improvement Act, 1871, or the Land Improvement Loans Act, 1883
- ✓ any order granting a loan under the Agriculturists' Loans Act, 1884, the Bangladesh Krishi Bank Order, 1973 or under any other law for the time being in force relating to the advancement of loans for agricultural purposes, or any instrument under which a loan is granted by a co-operative society for any such purpose, or any instrument made for securing the repayment of a loan so granted
- ✓ any endorsement on a mortgage-deed acknowledging the payment of the whole or any part of the mortgage-money, and any other receipt for payment of money due under a mortgage
- ✓ any certificate of sale granted to the purchaser of any property sold by public auction by a Civil or Revenue-officer
- ✓ any counter-part of a lease, where the lease corresponding thereto has itself been registered
- ✓ Authorities to adopt a son, executed after the first day of January 1872, and not conferred by a will, shall also be registered.

6.3 ON-AGRICULTURAL TENANCY ACT, 1949

- A non-agricultural tenant may hold non-agricultural land for- (a) homestead or residential purposes; (b) manufacturing or business purposes; or (c) religious or other purposes.
- Notwithstanding anything contained in any other law for the time being in force or in any contract, where any non-agricultural land is held under a lease in writing for a term of not less than twelve years specified in such lease, the tenant holding such land shall, on the expiration of the period so specified, be entitled to the renewal of such lease for perpetuity on such fair and reasonable rent as may be determined.
- if the non-agricultural land comprised in any tenancy is held specifically for any religious purpose for any period under a lease in writing in which such purpose is specified, then such tenancy shall be deemed: Provided that the tenant holding such land shall not be ejected by his landlord from such land except on the ground that he has used such land for any purpose other than the said religious purpose or has not used the land for the said religious purpose for more than three years.
- an under-tenant shall, subject to the provisions of this Act, be liable to ejectment on one or more of the following grounds, and not otherwise, namely:- (a) on the ground that he has used the non-agricultural land comprised in his tenancy in a manner which renders it unfit for use for any of the purposes (b) on the ground that the term of his lease has expired when he holds the non-agricultural land under a written lease.
- Every transfer of non-agricultural land held by a non-agricultural tenant or of any portion or share thereof shall, except in the case of a bequest or a sale in execution of a decree or of a certificate signed under the Public Demands Recovery Act, 1913, be made by registered instrument, and a Registering officer shall not accept for registration any such instrument unless the sale price or, where there is no sale price, value of the land or portion or share thereof transferred is stated therein, and unless it is accompanied by- (a) a notice giving the particulars of the transfer in the prescribed form, together with the process fee prescribed for the service thereof on the landlord who is not a party to the transfer, and (b) such notices and process fees as may be required by sub-section (4).

- If a portion or share of the non-agricultural land held by a non-agricultural tenant is transferred, one or more co-sharer tenants of such land may, within four months of the service of notice issued under section 23 and, in case no notice had been issued or served, then within four months from the date of knowledge of such transfer, apply to the court for such portion or share to be transferred to himself or to themselves, as the case may be.
- If any non-agricultural tenant holding any non-agricultural land desires that evidence relating to any improvement made in respect thereof be recorded, he may apply to the prescribed Revenue-officer and such Revenue-officer shall thereupon, at a time and place of which notice shall be given to the parties, record the evidence.
- No non-agricultural tenant shall be ejected from the tenancy or from any non-agricultural land which he holds except in execution of a decree of a competent Civil Court.

6.4 East Bengal State Acquisition and Tenancy Act, 1950

1.52. East Bengal State Acquisition and Tenancy Act 1950 a law relating to tenancies to be held under the state and other matters connected therewith. Prior to its enactment, agrarian law of Bengal mainly consisted of the Bengal permanent settlement regulations of 1793 and the bengal tenancy act 1885. The Permanent Settlement regulations made zamindars owners of their land subject to payment of a fixed amount of their land revenue to the government and they were entitled to collect rent from their subordinate tenants, who were again entitled to create subordinate interests. Permanent Settlement regulations 1793 created a landed aristocracy, which was supposed to be loyal to the British regime. Bengal Tenancy Act of 1885 defined the rights and liabilities of the tenants in relation to their superior landlords.

1.53. The permanent settlement outlived its utility and there was a demand for agrarian reform, which culminated in the formation of a Land Reform Commission in 1938 under the chairmanship of Sir Francis Floud. Floud commission was assigned to report, amongst other things, whether it was practically desirable for the government to acquire all superior interest to bring actual cultivators into direct contact with the government. The recommendation of Land Revenue Commission remained under consideration of the government. To implement the decision, Bengal State Acquisition Tenancy Bill was introduced on 10 April 1947 but no further progress was made because of Partition of Bengal. After Partition, East Bengal State Acquisition and Tenancy bill was framed and published on 31 March 1948. It was then referred to Special Committee of the House. Thereafter the bill was passed and it got the assent on 16 May 1951.

1.54. Under the scheme of the Act, the government became the only landlord to acquire all rent receiving interest by phases. By operation of section 3 of the Act, all holders of land became directly tenants under the government and they are described as malik (owner), but all interest in subsoil right to minerals, hats, bazaars, forests, fisheries and ferries are vested in the government. The said law authorizes the government to own and manage hats, bazaars, ferries, fisheries, etc.

1.55. The Act is composed of 152 sections divided into five parts and nineteen chapters. Chapter 1 deals with definitions. Chapter II contains special provisions for acquisition of

interest of certain rent receivers. It enabled the government to acquire all rent receiving interest vested in the government. Chapter III deals with provisions regarding land held in lieu of service. Chapter IV deals with preparation of record of rights by incorporating change in consequence of operation of provisions of State Acquisition and Tenancy Act and the changes caused by transfer and inheritance. Chapter V deals with alternative methods of acquisition of compensation assessment roll and record of right and it came into force in different parts of the country by notifications. Chapter VA deals with the preparation of compensation assessment roll in respect of properties acquired under chapter II. Chapter VI deals with authorities for the preparation of compensation assessment roll. Chapter VII describes the process of revision of compensation assessment roll and decision regarding disputes with regard to compensation. Chapter VIII gives the method of payment of compensation. Chapter IX provides provisions relating to arrears of revenue, rent and excise. Chapter IXA describes special provisions relating to arrears of rent. Chapter X describes provisions relating to indebted rent receivers. Chapter XI deals with law relating to settlement of government land and miscellaneous matters.

1.56. Chapter XII deals with the consequences of coming into force of part V of the Act at different parts of the country at different times. Chapter XIII describes the incidence of holding of raiyats, effect of alluvion and diluvion, preemption and restriction of transfer by aboriginal persons. Chapter XIV provides assessment, enhancement and reduction of rent. Chapter XV deals with provisions relating to amalgamation, subdivision and consolidation of holding. Chapter XVI relates to provisions as to rent and its realization. Chapter XVII relates to procedure for maintenance and revision of record of rights. Chapter XVIII provides for procedure relating to jurisdiction, appeal, revision and review. Chapter XVIIIA relates to special provision for exemption of rent for place of worship, graveyard and Chapter XVIIIB relates to special provision for exemption of land revenue in respect to agricultural land up to 3.52 hectare. Chapter XIX relates to rule making power and the schedule of the act and regulations, which have been partly or wholly repealed.

1.57. In consequence of introduction of the State Acquisition Act, there exists no intermediary interest between the government and tenant, the government has become the only landlord and the cultivators were relieved of the baneful effect of subinfeudation and intermediate class. The service tenures in vogue in Bengal, more particularly in the district of sylhet, were done away with. Acquisition of rent receiving interest has been done under a scheme of payment of compensation to zamindars and intermediary interest holders. Initially, the law had imposed ceiling in land holding at 13.48 hectare, which was increased threefold but by further amendment. The said ceiling was later reduced to 8.79 hectare per family. The law had abolished zamindari system but a hierarchy of revenue officials substituted it with the Board of Land Administration at the top and revenue officers, now called Assistant Commissioners (Land), at the bottom. Collector and Deputy Commissioner acted as the heads of revenue administration at the district. An Additional Deputy Commissioner (revenue), one revenue deputy collector, and a number of tahsildars, kanungos and surveyors assist Deputy Commissioner or collector. The enactment was followed by legal battles in the court, particularly of the zamindars and landholders, who did not immediately give in, and the government had to resort to innumerable amendments to eliminate the intermediary interest holders between the government and the tenants.

1.58. Bangladesh is a delta land and is constantly washed by innumerable rivers. The present law deals with the question of new formation by accretion and reformation in old situ. Earlier accretion to any holding from public navigable river used to enhance the holding of the landholder. The reformation in old situ within 20 years would revert to the old tenant. But after liberation of Bangladesh, accretion enhanced the domain of the government and in case of diluvion, the tenant is entitled to abatement of rent and in case of reformation of situ within 30 years, old tenant is given priority in resettlement if the land regained exceeds the ceiling imposed by law. However, under the act, only the landless cultivators are entitled to get settlement of government land gained by accretion or otherwise.

1.59. Under State Acquisition of Tenancy Act, khatiyan is prepared in the names of respective tenants directly under the government and the Act provides for a process of updating khatiyan in the names of the persons by transfer, inheritance, and settlement from government. That Act provides a process of pre-emption of land by a co-sharer of contiguous tenant if the transfer is made to any stranger. The Act also provides a scheme of precedence of any co-sharer by inheritance against any co-sharer by purchase. This provision of pre-emption was first introduced as a part of general law incorporated in Bengal Tenancy Act of 1885 relating to agricultural tenancy. However, pre-emption for non-agricultural tenancy is governed by the provision of non-agricultural tenancy act.

6.5 Acquisition of Waste Land Act, 1950

- Whenever it appears to the Government that any waste land is needed or is likely to be needed for any public purpose, a notification to that effect shall be published in the official Gazette, and the Collector shall cause public notice of the substance of such notification to be given at convenient places on or near the land.
- Any person interested in any land as being needed or likely to be needed for a public purpose, may, within fifteen days after the issue of the notification, object to the acquisition of the land.
- Whenever any land shall have been declared to be needed for a public purpose, the Government, or some officers authorized by the Government in this behalf, shall direct the Collector to take order for the acquisition of the land.
- The Collector shall then cause public notice to be given at convenient places on or near the land to be taken; stating that the Government intends to take possession of the land, and that claims to compensation for all interests in such land may be made to him.
- At any time after the expiration of fifteen days from the publication of the notice, the Collector may take possession of the land, which shall thereupon vest absolutely in the Government free from all encumbrances.
- In determining the amount of compensation the Collector shall be guided by the following provisions, namely:-
- If the land does not yield any income, the immediate owner of the land shall receive compensation at the rate of rupees ten per acre;
- if the land yields any income, the immediate owner of the land shall get compensation

of an amount equivalent to five times the net annual income to be determined in the manner prescribed or ten times the annual rent paid by occupancy raiyats for an equal area of cultivated land in the neighborhood which the Collector may select as being appropriate for the purpose, whichever is greater;

- In either case, the superior landlords shall get compensation of an amount equivalent to ten times their respective net annual incomes from such land determined in the prescribed manner on the basis of the rental value of such land.
- The Government shall be at liberty to withdraw at any time from the acquisition of any land, before the award has been made.

6.6 Bangladesh Land Holding (Limitation) Order, 1972

- No family shall be entitled to retain any land held by it in excess of one hundred standard bighas in the aggregate and all lands held by it in excess of that quantity shall be surrendered to the Government; and no family 10[or body] shall be entitled to acquire any land by purchase, inheritance, gift, heba or otherwise which, added to the land already held by it exceeds one hundred standard bighas in the aggregate.
- The Government may relax the limitations, if, (a) a co-operative society of farmers where the members thereof surrender their ownership in the lands unconditionally to the society and cultivate the lands themselves; (b) land used for cultivation of tea, rubber or coffee 11[or covered by orchards]; (c) an industrial concern holding land for the production of raw materials for manufacture of commodities in its own factories; (d) any other case where such relaxation is considered necessary in the public interest.
- A family holding a total quantity of land in excess of one hundred standard bighas in the aggregate shall have the option to select the lands to be surrendered to the Government being in excess of one hundred standard bighas: Provided that all lands mortgaged to the Government, the Agricultural Development Corporation, the Agricultural Development Bank, the House Building Finance Corporation or a Co-operative Society shall be included within the quantity of land which the family is entitled to retain under this Order, to the extent they can be covered by such quantity, and shall not be so surrendered.
- Land Reforms Ordinance, 1984
- No malik (land owner) who or whose family owns more than sixty standard bighas of agricultural land shall acquire any new agricultural land by transfer, inheritance, gift or any other means.
- If any malik acquires any new agricultural land in contravention of the provisions of this section, the area of land which is in excess of sixty standard bighas shall vest in the Government and no compensation shall be payable to him for the land so vested, except in the case where the excess land is acquired by inheritance, gift or will.
- No person shall purchase any immovable property for his own benefit in the name of another person.

- Where in the rural areas any khas land fit for being used as homestead is available, the Government shall, in setting such land, give preference to landless farmers and labourers: Provided that not more than five kathas of such land shall be allotted for such purpose to any individual.
- No person shall allow another person to cultivate his land and no person shall cultivate the land of another person on condition of sharing the produce of such land between them unless they execute a contract for such cultivation in such form and manner as may be prescribed.
- No person shall cultivate the land of another person except under a barga contract or complete usufructuary mortgage or as a servant or labourer.
- The produce of any barga land shall be divided in the following manner, namely (a) one-third shall be received by the owner for the land; (b) one third shall be received by bargadar for the labour; (c) one-third shall be received by the owner or the bargadar or by both in proportion to the cost of cultivation, other than the cost of labour, borne by them.
- Where the owner intends to sell the barga land, he shall ask the bargadar in writing if he is willing to purchase the land.
- No bargadar shall be entitled to cultivate more than fifteen standard bighas of land.

Appendix B : Gabtoli Station

Table of Contents

1. INTRODUCTION

This report is the Preliminary Conceptual Planning of the Proposed Gabtoli Mass Rapid Transit (MRT)
It presents the preliminary conceptual plan for the development of the station as a transit hub. The aim remains on exploring how to develop a Transit Oriented Development (TOD) for the community around the proposed Gabtoli MRT station to
closely connect the neighborhoods and orient towards a quality transit service with a view of efficiently connecting the Gabtoli community with the rest of Dhaka metropolitan region.

The conceptual planning strategies includes the following:

- **A summary of the rationale for TOD planning in Gabtoli MRT station area;**
- **General principles of conceptual planning;**
- **Conceptual plans and illustrations of access to the station; and**
- **Implementation strategy.**

2. THE PLANNING CONTEXT

2.1. The planning area

The Government of Bangladesh and the Japan International Cooperation Agency are planning to construct a MRT line that will connect the eastern and western parts of
Dhaka. The Gabtoli MRT station will be one of the station in the line. The station will be integrated with the existing Gabtoli Bus Terminal and developed as a multi-modal
transit hub, taking advantage of the different types of transportation facilities that are there in the area and are expected to expand in future.

The Gabtoli terminal complex is envisioned to be a multi-modal facility- integrating metro rail station with inter-district buses and passengers, intra-city (local) buses and passengers, cars, non-motorized transport (e.g., rickshaws), and pedestrians.

It is also envisaged to accommodate other public functions (e.g. formal and informal retail, commercial etc.).

Gabtoli Bus Terminal connects the capital city Dhaka with 46 of the 64 districts of the country. At present, the terminal serves almost one fourth of the passengers who use inter-district transport from five (5) different terminals of the city. The bus services
connect mostly of north and south-western parts of the country. The bus terminal and adjoining facilities are located on approximately 55,000 m^2 land area (calculated fro m Google earth).

2.2. The users

The Gabtoli bus terminal area (and spill overs) accommodate around 3,000-3,500 buses daily. The survey conducted for this report found that of the total 3,333 buses and human haulers using the bus terminal, about 77 percent remain in operation; hence 1,730 inter-district buses operate during the two peaks of four hours each (4-7 am and 4-7 pm). On the other hand, 244 small buses and human haulers serve the city users.

Daily 3,000-3,500 Buses and other public vehicles use the terminal and surrounding stops.

Each of these buses carry on average between 50-60 passengers; therefore, Gabtoli receives around 150,000 - 210,000 passengers per day. Also, an estimated 18,000 to 26,000 visitors accompany the passengers. Based on findings, approximately 10,000 passengers use the terminal during peak hours of early morning and evening.

On an average, 1,730 inter-district and 244 local buses operate during the peak eight hours of both morning and evening.

Approximately, 150,000-210,000 passengers use the terminals and stops daily.

On an average, 10,000 passengers use the terminal facilities during peak hours.

Majority of the residents surrounding the bus terminal in Gabtoli rely on the terminal-related activities and services. The socio-economic study revealed that around 79 percent of the surveyed households belonged to this group who relied on the bus terminal for livelihood and employment. Majority of them are employed as drivers, unskilled or low- skilled laborers, or are engaged in informal economic activities, such as hawking, among others. Most them either walk or use non-motorized vehicles to come to the terminal.

79% of the residents of the adjoining neighborhood depend on the terminal for their livelihood.

Table 1: Number of buses operating at present

Type	In operation			Under maintenance			Total	% in operation	In operation during off-peak (16 hours)		In operation during peak (8 hours)	
	A/C	Non-A/C	Total	A/C	Non-A/C	Total			%	Number	%	Number
Large bus	89	1,285	1,374	27	339	366	1,740	79%	21%	289	79%	1085
Medium bus	-	838	838	-	280	280	1,118	75%	23%	193	77%	645
Dhaka service bus	-	307	307	-	118	118	425	72%	27%	83	73%	224
Human Haulers	-	32	32	-	18	18	50	64%	38%	12	62%	20
TOTAL	89	2,462	2,551	27	755	782	3,333			536		1975

2.3. Travel pattern

The present Gabtoli bus terminal is used by inter-district buses only. They operate in 88 routes, where 61 routes are greater than or equal to 100 km long. Since buses along these routes take some time to reach their destination, the number of round trips undertaken (e.g., from origin to destination and back) is lower. Passengers buy ticket from 174 counters in the terminal.

Of the 88 routes the inter-district buses serve, 61 are considered as long-distance for traveling equal or more than 100km.

The local buses and human haulers serving the city stops on roads around the terminal to drop-off or pick-up passengers. Although Gabtoli is the end location of the routes; however, there are no designated bus stops or lay-over facilities for local buses in the terminal. They operate mostly in two routes a) Gabtoli to Jatrabari via Firmgate, Shabagh, Motijheel, Saidabad; and b) Gabtoli to Sadarghat via Asadgate, Azimpur, and Gulistan.

Local buses and human haulers run along two routes connecting other transportation hubs.

2.4. Transit connections

Passengers using Gabtoli Bus Terminal, usually, transfer from/to local buses, human hauler, private cars, and CNG driven tri-wheelers in roads near the terminal or walk to the nearest convenient locations to access different transportation of other routes. There is no designated area in the terminal to interchange between inter-district and local buses. The drop-off/pick-up bay is used by cars and CNG-driven three wheelers.

Non-motorized vehicles are not allowed in the Dhaka Aricha Higway - the only access road to the bus terminal; hence they sporadically use the terminal. Passengers and neighborhood residents of Gabtoli who work in the terminal either walk to the terminal or use non-motorized vehicles to come up to the main road and then cross to the terminal. An underpass, located in front of the terminal is the only safe crossing for pedestrian.

At present, some interchange between different modes takes place informally but they are nor defined neither supported by any facilities.

A water-taxi landing station is located within one (1) km of the terminal. Twelve waterbuses ply from Gabtoli to Shadarghat along the Turag river twice a day. Nevertheless, access to the landing station is difficult discouraging passengers for inter-change between road to water-based transportation.

2.5. Bus parking facilities

Bus parking facilities inside the terminal are not adequate for the number buses using the terminal. The spillover of buses cause traffic disruptions as buses drop-off/pick-up passengers from small individual bus counter and waiting facilities along the highway. Some operators own or rent private garage around the terminal. Many buses simply park on surrounding roads.

The approximate 125 bus parking and bay area are not adequate to serve the operating buses.

Parking area are used for repairing and maintenance.

3. GENERAL PRINCIPLES FOR PRELIMINARY CONCEPTUAL PLAN

3.1. Vision for Gabtoli area

The visions for the Gabtoli area have been derived considering the location, economic significance, socio-economic characteristics, and potentials for development in the future.

Gabtoli is one of the busiest transport hubs in Bangladesh. The Gabtoli bus terminal connects 46 north and south-western districts of Bangladesh. Many local buses run between Gabtoli and other parts of the city. In addition, the Turag river connects Gabtoli with western parts of Dhaka city through a circular waterway. Gabtoli also serves as a hub for goods transportation, particularly, goods for daily consumption and construction industry.

A transportation and service lifeline for the city

A multi-modal facility coupled with MRT service in Gabtoli will significantly facilitate travel of business travelers and visitors from different districts of the country to Dhaka City. The multi-modal facility will replace the current and inadequate bus terminal.

Centering MRT station, the Gabtoli neighborhood area has the potential to be developed as a mixed-use area that would create livelihood and opportunities for current residents, facilitate access to basic public facilities and services, and link the community to the rest of the Dhaka city. Neighborhood and city-level mass services, for example, hospitals, educational institutes, public recreational and commercial centers, may use opportunities created by the MRT. For these to take place, the quality of urban space and the infrastructure and facilities in the neighborhood will

People-centered neighborhood development

need to be improved and land use will have to be enhanced and made efficient to prioritize people in the overall development.

Gabtoli is a significant location to access economic opportunities particularly by the poor. A number of them are engaged in informal economic activities related to the bus terminal and associated services. The development of the Gabtoli neighborhood needs to be inclusive, rendering significant considerations to the space needs of residents for economic activities in the development as well as affordability of housing within proximity as is present and benefiting them.

Dhaka city is exposed to both pluvial and fluvial flood risks. Gabtoli, especially the south side of the bus terminal is designated as the flood water retention area connected with the flood flow zone of the city to reduce city's flood risks. However, illegal encroachments are increasing risks of losing this essential flood retention area. On the other hand, the land around the vast water-body has not been utilized to their fullest potential. The neighborhood to the north of the terminal is a very high density development that developed with community's initiatives without any public recreational facilities.

Flood resilient development of under-utilized build-up landscape

The MRT station will need to take into consideration the high flood risks, especially since the MRT will be grade separated in this station. The station development may take advantage of the presence of the water body for development of the under-utilized built-up landscape.

3.2. Objective of the station

Gabtoil MRT station as a multi-modal transportation hub need to consider the following:

- position of interchange in transport networks in existing site to fulfill its transport function.
- interchange layout for seamless transfer.
- access modes in order of priority – walk, feeder services, local buses etc.
- improvement options of existing roads in the neighborhood for Transit Oriented Development.

3.3. Guiding principles

In order to generate guiding principles and possible space demands, some assumptions were made based on the exiting context. No projections were made as MRT is expected to increase number of users and the projected number is subject to in-depth studies beyond the premise of this report.

Number of passengers using and waiting in the transit hub

Based on the number of buses using the terminal and the peak usage hours, it is estimated that 217 inter-district and 30 local buses and human haulers will serve about 10,000 passengers per hour. Judging from evidence in South Asian region, between 30-40 percent of these passengers usually interchange to MRT, hence about 3,500 passengers from the inter-district buses will use the MRT per hour during the peak. If it is assumed that, since these passengers are not commuters, their average waiting time is 30 minutes. The local transport users usually wait between 8-10 minutes. Calculating from the numbers it is expected that the transit hub will need waiting area for at least 4,700 -5,000 passengers waiting in the premise as shown in Table 2.

Table 2: Number of passengers using the transit hub

Type	Average number of bus per hour during peak	Passenger per hour during peak	Passenger per hour changing to MRT (35%)	Time passenger wait in waiting area (min)	Number of passenger in waiting area per hour
Large bus	136	6784	2374	30	3392
Medium bus	81	2420	847	30	1210
Dhaka service bus	28	840	294	10	140
Human hauler	2	50	17	10	8
Total	247	10094	3533		4750

Ticketing and waiting facilities

Further assumptions are made on the number of passengers waiting for pick-up or boarding buses approximately 5,500-6,000 m^2 area will be required for waiting. In general, if one out of every four passengers in the waiting is assumed to buy inter-district bus ticket from the terminal while one out of every ten passengers to buy ticket for MRT the space demand for ticketing and waiting facilities will require at least 1,300 - 1,500 m^2 for ticketing facilities as shown in Table 3.

Table 3: Calculation of waiting and ticketing facilities

Type	Number of passenger in waiting area per hour	Area per passenger in waiting (m^2)	Total area for waiting (m^2)	Number of passenger in bus ticketing area	Number of passenger in MRT ticketing area	Ticketing area for inter-district bus (m^2)	Ticketing area for MRT (m^2)
Large bus	3392	1.2	4070	848	237	763	214
Medium bus	1210	1.2	1452	302	85	272	76
Dhaka service bus	140	0.9	126		29	0	26
Human hauler	8	0.9	7		2	0	2
Total	4750		5656		353	1035	318

Platform for MRT

The Bangladesh National Building Code suggest to allocate 0.15 m^2 area per passengers using any transport terminal. Calculating from the 3,500 passengers using the MRT per hour, approximately 530 m^2 area needs to be allocated. Also, usually a three-car MRT, as suggested for Dhaka, need at least 85m running way.

Table 4: Area for MRT platform

Type	Number of passenger per hour during peak	Number of passenger per hour changing to MRT	Total platform area (m^2)
Large bus	6784	2374	356
Medium bus	2420	847	127
Dhaka service bus	840	294	44
Human hauler	50	17	3
Total	10094	3533	530

Number of bus bays and maneuvering area

The number of required bus bays, 108 for inter-district and 8 for local bus and human hauler are calculated based on the assumption that the long-distance buses will need 30 minutes to drop-off/pick-up passengers. Based on the number of buses using the terminal during peak hours of morning and evening, it is estimated that more than 7,000 m^2 area will be required for buses. For maneuvering, usually the same area will be required as drive-ways. The calculations are shown in Table 5.

Table 5: Number of bus bay and area

Type	Number in operation during peak (8 hours)	Average number per hour during peak	Average interval time (min)	Number of bay required	Average area per bay (m^2)	Total area for bus bay (m^2)
Large bus	1085	136	30	68	70	4749
Medium bus	645	81	30	40	50	2016
Dhaka service bus	224	28	15	7	50	350
Human hauler	20	2	15	1	30	19
TOTAL	1975	247		116		7134

Parking area

The existing bus parking area is inadequate, an estimated 68 buses can use bays while additional 65 buses can be parked within the premise (counted from the google map). At present buses are allowed to remain within the premise for 30 minutes and many of the parking area is used for maintenance and repairing. The exiting proportion of buses that lay idle for maintenance is about 23 percent. In the proposed transit hub if assumption is made for 4 hours lay over period for inter-district buses, parking facilities will be required for more than 350 buses. Some of the local buses which will be laid over in the terminal will need additional parking facilities. The total parking facilities will require at least 30,000 m^2 area. Considering the site area to be 55,000 m^2 it is expected that there will be need for multi-level bus bay and parking areas for inter-district buses. In that case, additional area will be required for movement of buses between layers. In addition, MRT and introducing other functions will require parking facilities for private cars and taxi.

Table 6: Parking number and area

Type	Total number of bus in operation	Number of bus parked in terminal	Average parking area (m^2)	Total parking area for buses	Total maneuvering area (m^2)
Large bus	1,740	229	49	11,221	7,855
Medium bus	1,118	140	35	4,888	3,422
Dhaka service bus	425				
Human hauler	50				
TOTAL	3,333	369		16,109	11,277

Supporting facilities

Apart from these key functions the transit hub will require supporting facilities for operation and maintenance of the hub.

4. ACCESS TO THE STATION

Gabtoli station development will include the MRT station, inter-district bus terminal, local bus-stops and roads surrounding the site to develop following TOD. The efficiency of the transit hub in Gabtoli will significantly depend on facilitating access to and from the transit hub. While analyzing the findings from the physical survey the focus remains on

- creating more thoroughfares to increase permeability into the neighborhood and connectivity with the station
- establishing a system of hierarchy—plan new road networks based on pedestrian and vehicular movement
- minimizing the number of intersection and reduce friction between different modes of transport
- identifying needs and opportunities to create a high-quality pedestrian environment and to encourage walking
- ensuring transit-related functions and needs are accommodated at the hub while creating seamless connections between all transit modes
- addressing access, loading, parking, and servicing issues to create opportunities for a viable and attractive mixed-use development

4.1. Pedestrian Access

The TOD planning approach prioritizes pedestrian access and circulation within the transit hub as well as creating the provision of direct linkages, high quality pedestrian environments, and most importantly, safe and accessible sidewalks and crosswalks. The socio-economic context analysis of the Gabtoli area projected high pedestrian demand at the transit hub and transfer movements between modes within the hub - reflective of the role TOD around MRT is expected to play. The strategies and activities to support those strategies that can be applicable for Gabtoli from the established practices are summarized below.

STRATEGY	ACTIVTIES
Encourage pedestrian friendly, non-motorized access to the transit hub. **Maintain and enhance existing pedestrian connections.** **Explore opportunities for future connections across the highway and within neighborhood.** **Ensure safe, convenient and high quality pedestrian environment.** **Address conflict points between pedestrians and other road users.**	▪ Planning Pedestrian Access Routes; ▪ Providing generous sidewalks, particularly where pedestrian activity has been high as illustrated in PSPL survey and is anticipated to be higher in future, for example, directly around transit hub, connections between transit modes and to/from different nodes and across the neighborhood; ▪ Identifying and improving direct pedestrian connections to the hub from the neighborhood on the other side of the road and trip origins; ▪ Minimizing walking distances between transit modes so that all transfer movements can be accommodated within a 5-minute, or 400-metre walking radius; ▪ Developing a streetscape plan that reflects the unique role of the transit hub while integrating with the character of the surrounding context; ▪ Creating active frontages along major pedestrian routes to increase visual interest, provide passive surveillance, and increase street-level activity; ▪ Providing safe pedestrian crossings, especially across the road in front of the hub. Ensuring all walkways and crossings are well marked and illuminated at night, introducing measures to increase pedestrian priority within the neighborhood; ▪ Providing weather protection for the warm-humid climate along linkages between transit modes and at transit stops; providing street trees for shade and wind; ▪ Providing a wayfinding and signage program to assist in pedestrian navigation in the transit hub. ▪ Providing street furniture and other pedestrian amenities, for example, shelter, seating arrangements, waste receptacles, particularly at transit stops and passenger waiting areas.

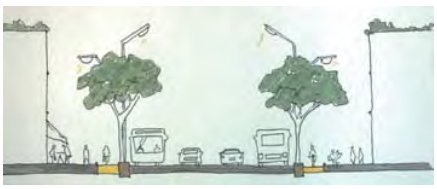
Figure 1: Pedestrian access for the neighborhood

Figure 2: Pedestrian access for the station

Figure 3: Road sections

Neighborhood roads with
Rickshaw &cycle lane, Furnishing zone, Pedestrian zone and Front zone

Connecting roads with
Local bus lane, Rickshaw and Cycle lane, Furnishing zone, Pedestrian zone and Front zone



Main roads with
Local bus lane, Car lanes, Furnishing zone, Pedestrian zone and Front zone

4.2. Transit access

The Gabtoli station will act as gateway to Dhaka, therefore, be the transfer point between inter-district and local buses. Also through the MRT, the station will be a destination in itself for access transit services.

STRATEGY	ACTIVTIES
Create short, clear, direct, and uninterrupted connections between transit modes. Maximize passenger convenience and reduce barriers between modes and service providers. Allow for safe and efficient movement of transit vehicles into, out of, and through the transit hub.	▪ Plan direct, barrier-free, access to the main concourse from grade separated MRT platforms; ▪ Provide easy connection between MRT and inter-district bus terminal. ▪ Plan for off-board fare vending to speed boarding; ▪ Design passenger information and service amenities, particularly given higher proportion of users from inter-district services who will be less familiar with the system; ▪ Design multiple access to MRT platform to distribute boarding along trains to reduce dwell times and delay for MRT vehicles; ▪ Clear demarcation of running way and pedestrian realm to reduce conflicts and safety issues. ▪ A grade separated inter-district bus terminal to accommodate the loading and unloading of passengers; ▪ Create clear passenger queuing and waiting areas for intercity bus loading that does not conflict with other pedestrian circulation; ▪ Provide transit priority measures to speed up bus movements through the hub; ▪ Accommodate on-street transfers between local bus services to provide fast transfers between services; ▪ Provide an off-street facility allowing Local bus routes that terminate at the Gabtoli station to turn around and layover, if necessary; ▪ Ensure that multiple points for drop-off and pickup are available at the station within close proximity to weather protected waiting areas and customer service; ▪ Provide opportunities for operational, service, and space savings between transit service providers. ▪ Design bus bay space so they can be easily shared between service providers. ▪ Plan a designated parking area for short and extended layovers. ▪ Plan dedicated access to the circular water-way landing station.

Figure 4: Transit access for the neighborhood

Figure 5: Transit access for the station

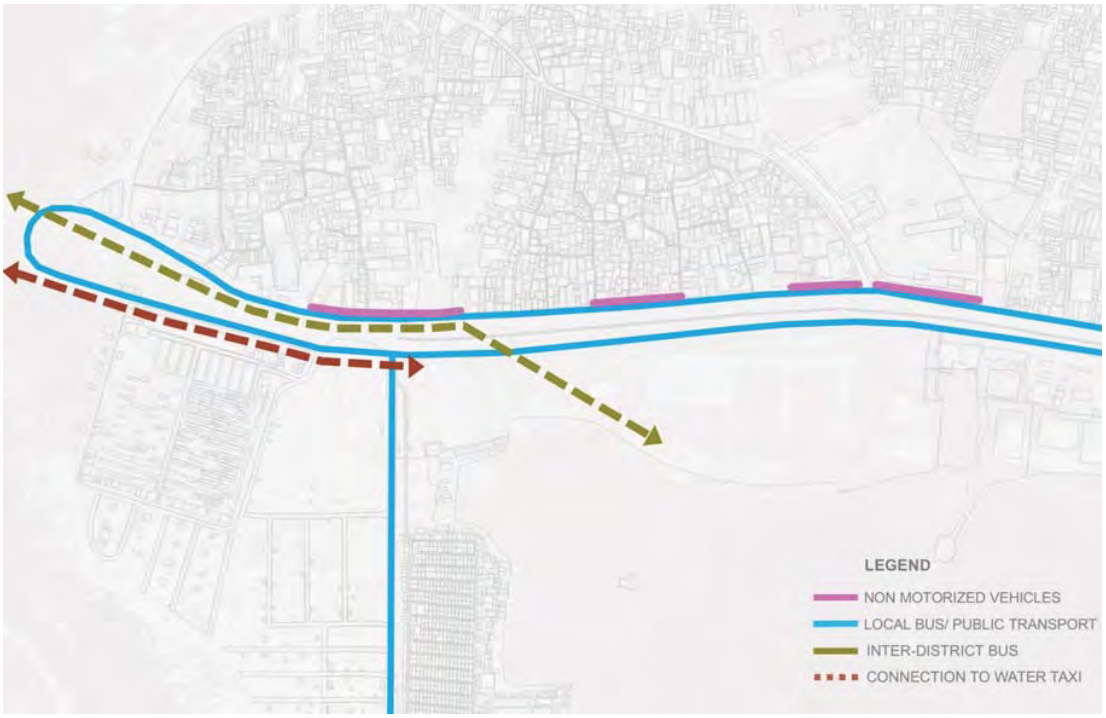
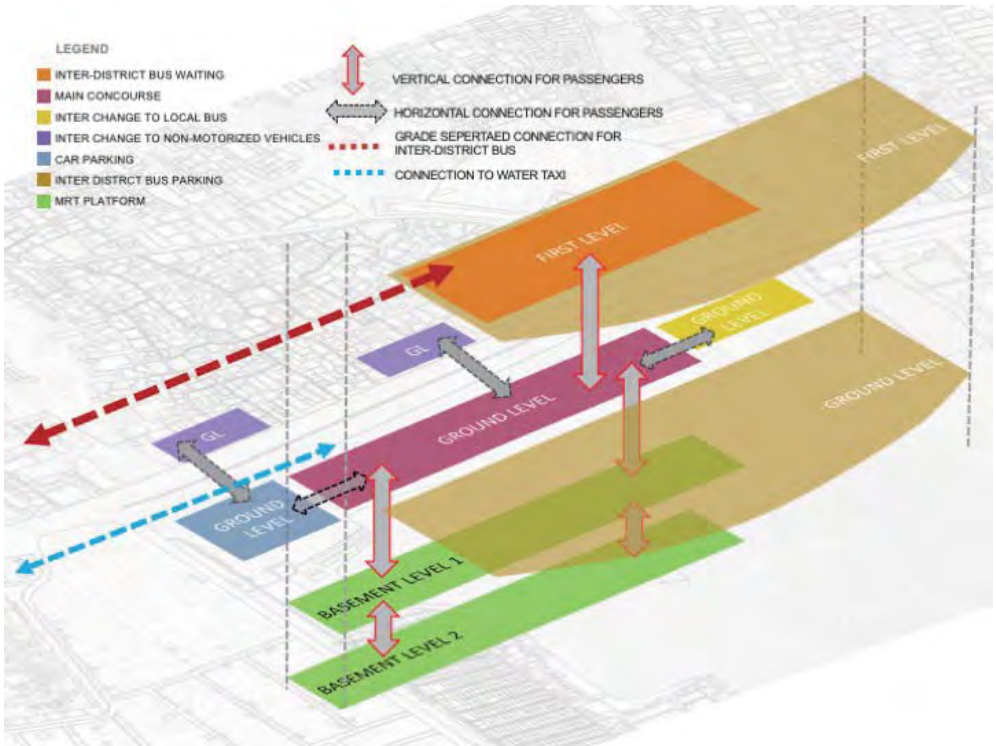


Figure 6: Transit interchange plan



4.3. Motorized and non-motorized vehicular access

Access of motorized vehicles, especially privately owned cars, are limited in the exiting bus terminal. However, vehicular access need to be considered at any transit hub as passengers may access the transit hub or near-by destinations for other purposes, kiss and ride, use on-site park and ride. In addition, if commercial, retail or and public amenities are integrated with the station development, parking will serve them along with the transit hub. Vehicular access will also need to take into account the service and delivery needs of the Transit Hub.

STRATEGY	ACTIVTIES
Discourage dependency on motorized vehicles. **Segregation of motorized and non-motorized vehicles.** **Mitigate traffic impacts.** **Limit traffic infiltration and on-street parking impacts in surrounding neighborhood.**	▪ Plan for adequate site access to on-site parking and to passenger pick-up and drop-off facilities; ▪ Integrate delivery and service areas and accesses, including loading docks and service vehicle parking; ▪ Design direct access to parking from the inter-district bus terminal. ▪ Explore possibilities of a transfer point on the other side of the road for safety and better traffic management. ▪ Limit non-motorized vehicle within the neighborhood with waiting facilities. ▪ Plan drop-off/ pick-up points for non-motorized vehicle close to pedestrian crossings.

Figure 7: Vehicular access for the neighborhood

4.4. Key design features

Based on the findings and guidelines the transit hub will need to include some of the following features:

- Facilities that support access for customers of all ages and abilities
- Facilities that support access for pedestrians
- Ticketing facilities
- MRT Station platform(s)
- Drop-off and pick-up bays for inter-district buses
- Waiting area for inter-district buses
- Parking facilities for inter-district buses
- Provision for short-term pick-up/drop-off of transit patrons by taxi, etc.
- Waiting shelters for all public transit routes serving the station
- Short-term lay over parking for local buses
- Administrative and operational support
- Maintenance and repairing facilities

However, in order to make the transit hub efficient and active more features can be considered, such as:

- Formal and informal retail
- Commercial
- Public entertainment
- Public amenities

5. IMPLEMANTATION STRATEGY

The development of the transit hub can be phased for implementation. Some of the activities identified for the development are relatively low-cost, no regret investment, with high visibility impact. Those can be done within short- to medium- term:

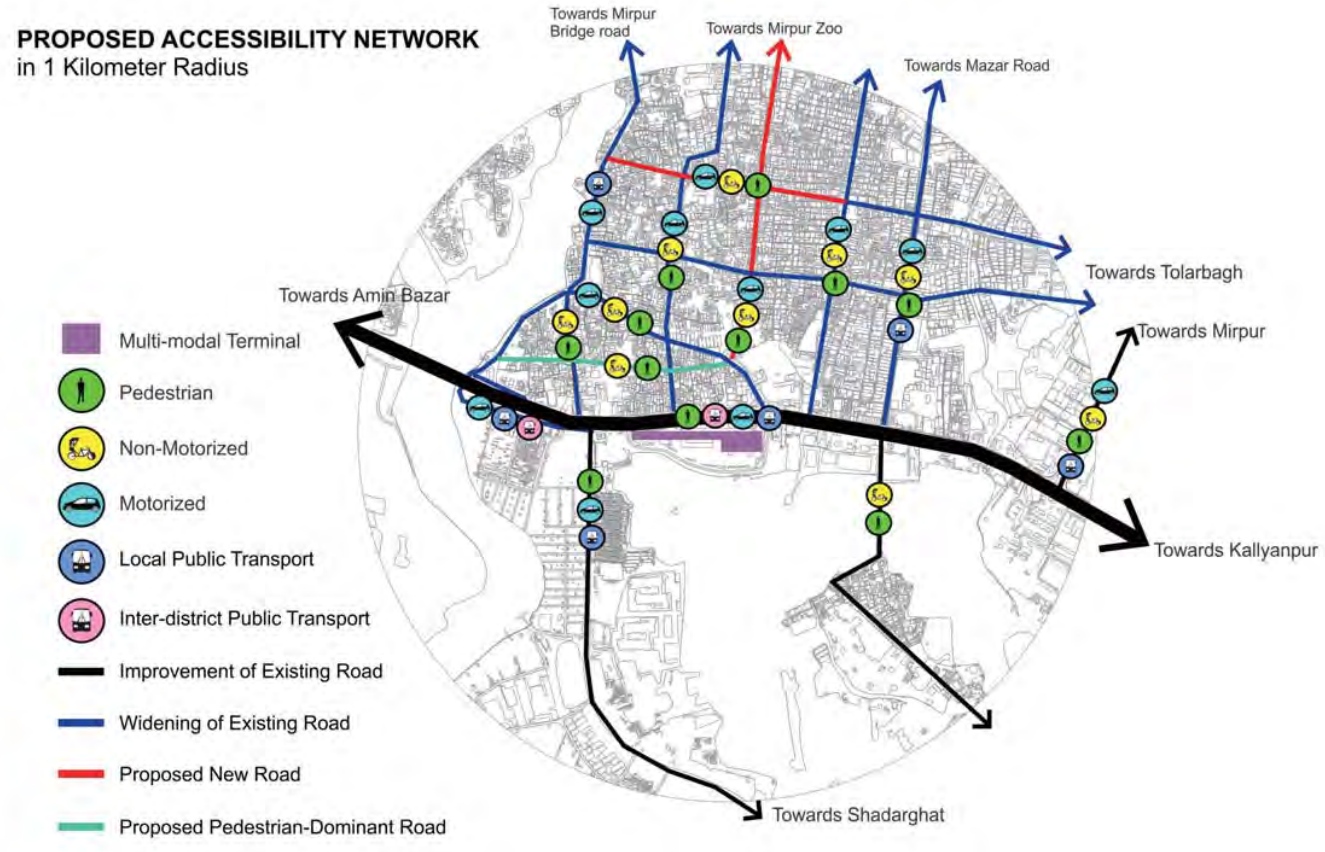
- Improving/upgrading of the main road;
- Improving streetscape along the main access road;
- Upgrading infrastructure for pedestrian;
- Geometric improvement of junctions;
- Creating new pedestrian thoroughfare within the neighborhood;
- Relocating of water-taxi landing station connected with the development of streetscape along the main road;
- Organizing vending activities;

- Adopting traffic calming measures and enforcement of regulations;
- Creating a system of hierarchy for mobility;
- Activities to improve the law and order around the neighborhood.

To fully realize the potential of the multi-modal transit hub, strong political will, efficient management of transport corridor and the station will be essential. The following actions plans will be critical for strategic planning of the station.

- Management plan for operation of the multi-modal station;
- Management plan for transport corridor and enforcement of road hierarchy, modal split and safeguarding pedestrian network;
- Establish projected demand for inter-district bus terminal facilities;
- Guideline for creating pedestrian networks and implementation strategy.
- Guidelines for transformation of the neighborhood following exiting planning environment, for example, land readjustment action plan and implementation strategy, strategic plan to diversify mixed-use development and to encourage regulated private sector investment.

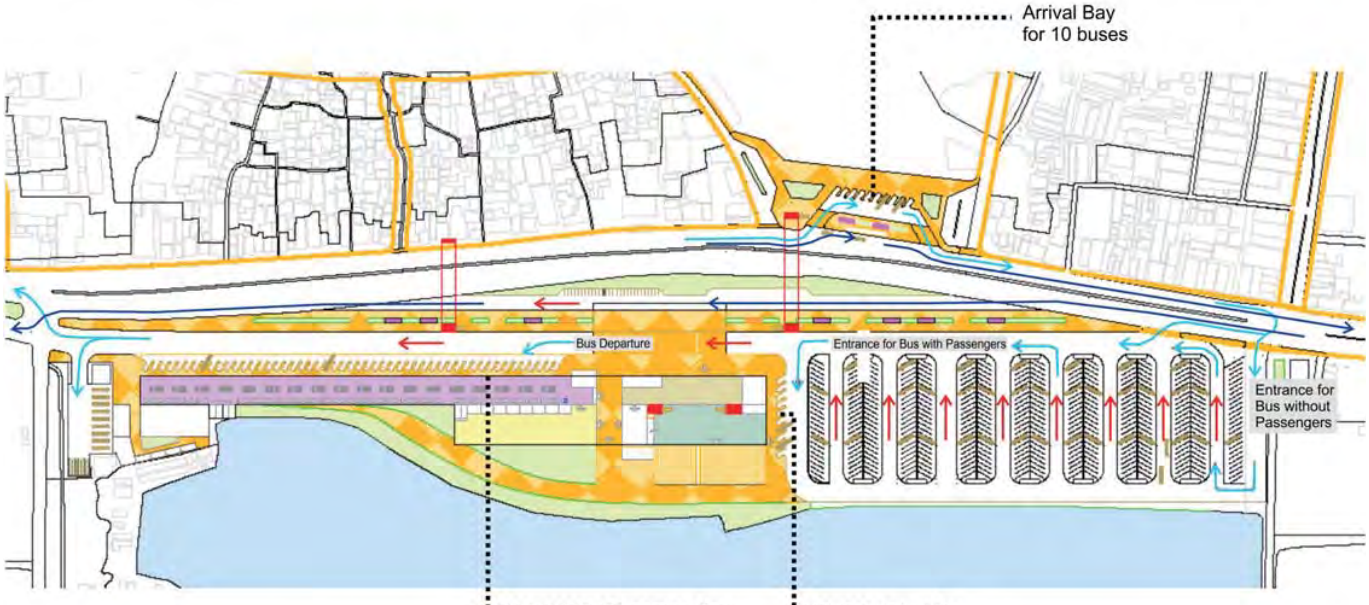
CONCEPTUAL DESIGN
GABTOLI MULTIMODAL TERMINAL



TRANSFER POINTS BETWEEN DIFFERENT MODES

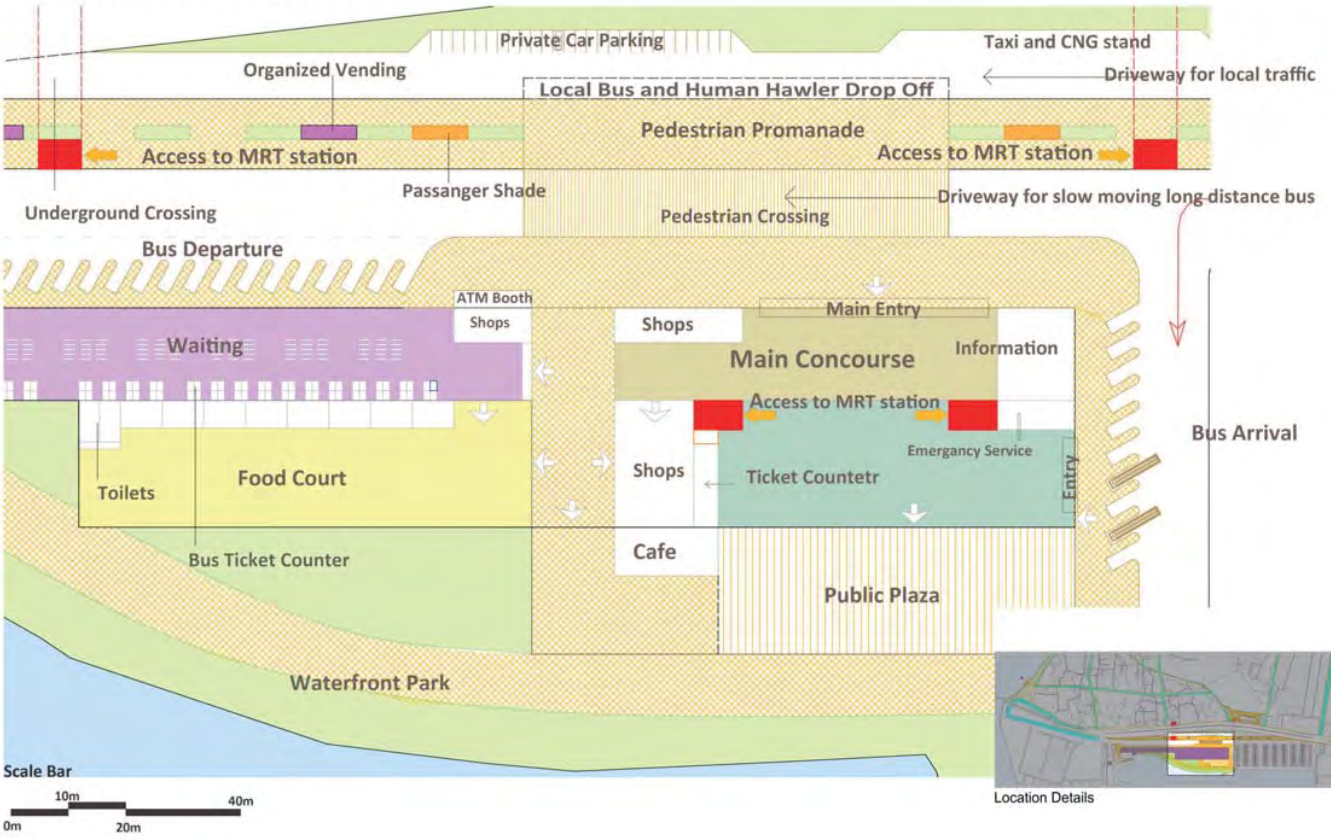
- Pedestrian connection to MRT/underpass
- Rickshaw stand
- Private Car Parking
- Water Taxi Stand
- Taxi & Auto-rickshaw stand
- Local Bus Stand
- Inter-district Bus Stoppage
- Transfer between inter-district bus & other transport modes
- Walkway
- Widening of Existing Road
- Proposed Pedestrian-Dominant Road

VEHICULAR ARRIVAL & DEPARTURE MOVEMENT



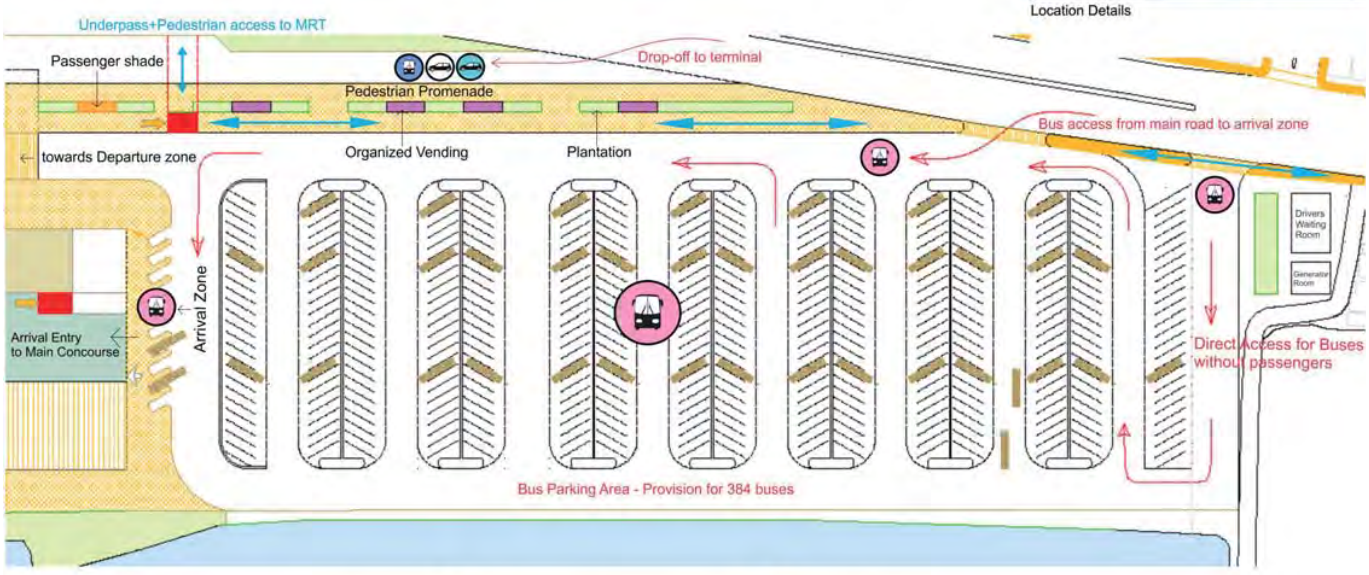
- Local Transport Movement
- Inter-District Bus Movement
- One-Directional Driveway
- Walkway

MAIN CONCOURSE DETAIL



INTER-DISTRICT BUS PARKING AREA

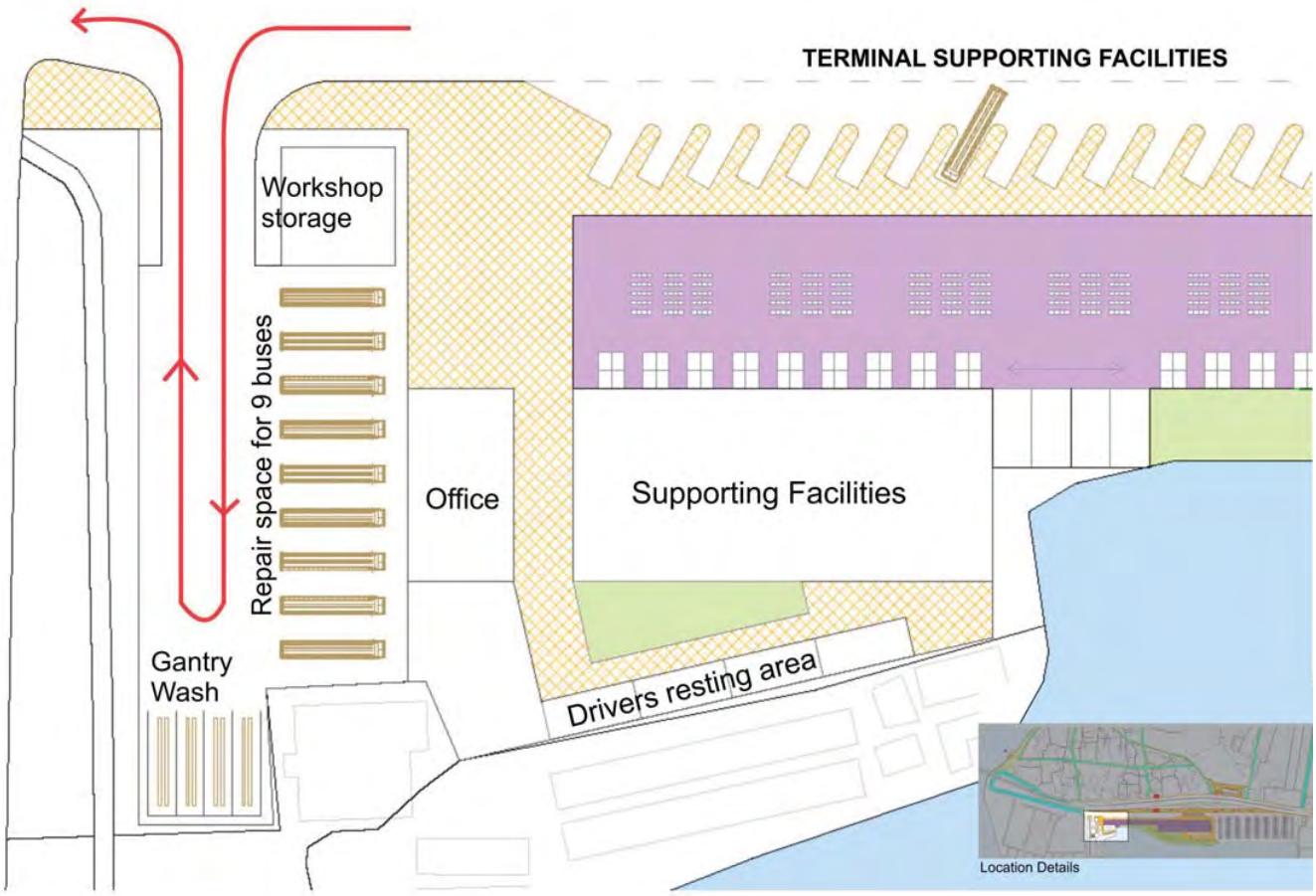
Parking space for 384 buses



Vehicular Movement
Pedestrian Movement
Walkway

Private Vehicle
Taxi and Auto-Rickshaw

Local Bus
Inter-district Bus


TERMINAL SUPPORTING FACILITIES
Workshop storage
Repair space for 9 buses
Office
Supporting Facilities
Gantry Wash
Drivers resting area
Location Details


Water Taxi Platform
WATER TAXI LANDING STATION
Linear Park
Rickshaw Stand
Kotbari Neighborhood
Deck
Passenger Shade
Non-Motorized Pedestrian-Dominant Road
Linear Park
Kotbari Neighborhood
Location Details

SECTION ACROSS WAITING AREA

SECTION CAFÉ & LINEAR PARK

ANNEX 1: RESULTS OF THE PUBLIC SPACE AND PUBLIC LIFE SURVEY

1. The rationale for studying public space and public life

Creating cities for people is about prioritizing people. While most cities have data on vehicular traffic volume, needs and projection for the future, there is hardly any data on pedestrian and the public life that are generated around circulation paths. Urban planners and designers make decisions based on the data available and often lose focus on people. However, cities are created for people; the aim of any interventions should be on prioritizing their needs in order to make cities more livable.

The Public Space and Public Life (PSPL) survey is a tool that aims to identify and prioritize people's needs and make them visible to inform the planning process. The tool was developed by Jan Gehl, a key figure behind transformation of Copenhagen as a people friendly city for walking and biking. Gehl Institute has developed the PSPL survey protocol and has made it an open source for wider use. The PSPL survey provides two key indicators that help planners and city leaders make better decisions about what investments to prioritize to make people friendly city: (a) people's movement-- how people are walking and (b) stationary activities-- what are people doing when they are lingering in a space.

The main purpose of conducting a PSPL survey for the TOD planning for Gabtoli is to better integrate a pedestrian and public space network in the preparation of a preliminary transit oriented development (TOD) plan for Gabtoli. The tool will further help understand, perception of safety, comfort and enjoyment by users of Gabtoli. The results are expected to bring out the aspects that may help to improve the commuting experience of pedestrians and passenger's and at the same time, enhance the residents' quality of life with a view of making the Gabtoli neighborhood more inclusive, safe and vibrant.

The survey was carried out on October 25, 2017 (weekday), October 27, 2017 (weekend), and October 31, 2017 (river edge activity mapping) from 8am to 11 pm (each element was counted for 10 minutes per hour for 16 hours). It covered various locations in Gabtoli along the main road and river edge. The locations of data collection are indicated in Figure 1. The locations were chosen near different nodes and spaces where most activities happen. The key findings from the survey are described in the following sections.

Figure 1: PSPL survey locations

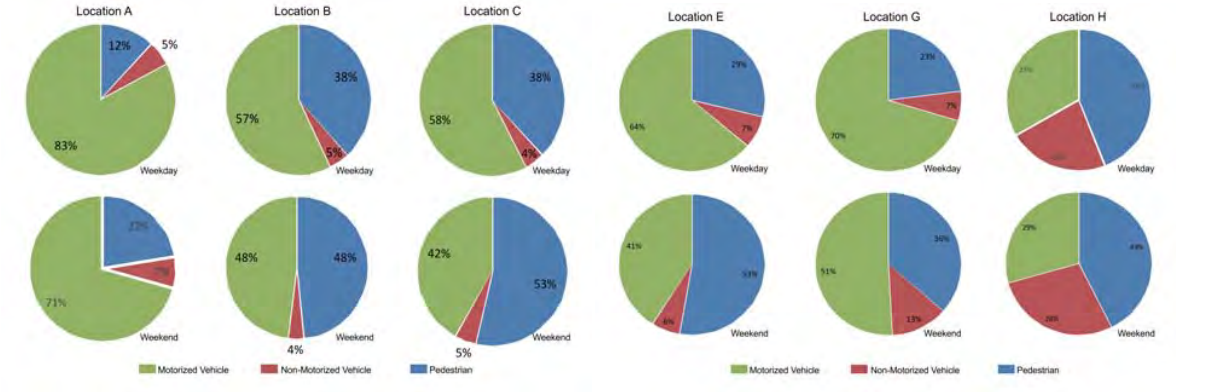
2. Types of traffic and their volume

The counting survey identified that many pedestrians use the pavements and roads to walk in Gabtoli: to use the terminal, to go work, to go home, and for leisurely purposes. The vehicular traffic comprised of both motorized (car, motor-cycle, CNG driven three-wheeler, bus, human hauler, trucks etc.) and non-motorized (rickshaw, cycle, rickshaw van etc.) vehicles. The number and proportion of pedestrians, motorized, and non-motorized vehicular traffic volume tend to vary depending on the type of the road and land-use pattern along the roads. Also over weekdays and weekends, there are changes in the number of pedestrian and vehicular volumes along various points within the survey area.

2.1. Proportion of pedestrian vs. vehicular traffic volume

Locations A and B are along the main road to the east of the existing Gabtoli terminal, approximately 1,000 meters and 300 meters from the terminal, respectively. Location C covers the immediate area across the bus terminal, location E is the part of the main road across the cattle market to the west of the bus terminal. Locations G and H are again near nodes of important intersections to the east of the terminal. The general trend of traffic volumes across each of these locations are given below in Figure 2.

Figure 2: percentages of motorized, non-motorized vehicular and pedestrian traffic volume



The largest vehicular counts in location A both in weekdays and weekends (83% and 71% respectively), while locations C and H shows the largest volume of pedestrian counts for both weekdays and weekends. The volume of non-motorized vehicles is the lowest relative to motorized and pedestrian volumes in all cases. There is an increase in the percentage of pedestrian volume across all locations in weekends compared to weekdays. The significant reading is the percentage volume of pedestrians in location C right at the bus terminal area, where there is high count for both weekdays and weekends. The weekend count of pedestrian percentage in location C is 53 percent as opposed to 42 percent of motorized vehicle volume.

Figure 3: Total counts of pedestrian and vehicles

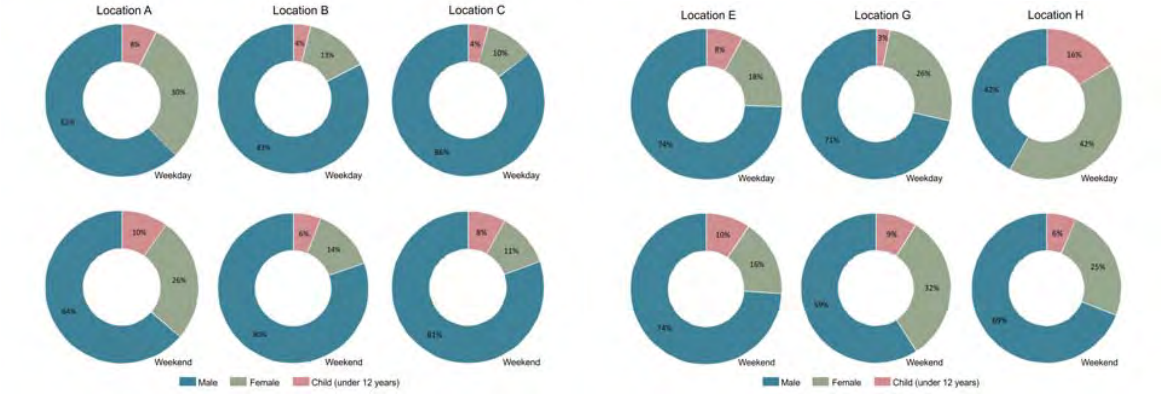
The total count for vehicles (around 40,000 per day) over weekdays and weekends are nearly the same, but the pedestrian total count per day rises from 20,000 per day in weekdays to 30,000 per day for weekends, which is an increase of 50 percent. A high ratio of vehicles is exhibited in location A and then drops in location B indicates a big portion of the vehicular traffic is going towards G. This is further reinforced by high vehicle count in location G. In locations B and C, the network path leading to the terminal shows a high ratio of pedestrians, which again drops in location E suggesting that majority of the pedestrians are using this route to access the bus terminal. The high ratio of pedestrians along the access road G and H also indicates that the people living in the neighborhood and using the route to connect to the main Gabtoli road to commute to other parts of the city. Significant reading is the total counts of both pedestrians and vehicles at location B, where it changes drastically from weekday to weekend. While the vehicular count increases by 80 percent, the pedestrian count increases by a staggering 170 percent.

2.2. Differences in pedestrians based on age and sex

The survey also identified difference in pedestrians based on sex and age in different locations as shown in the following diagrams.

In general, very small proportion of children (on an average 3%) form the volume of pedestrian. More children were seen using the pavements and roads near the road connecting residential area in location H as well as in location E, where the roads connect between residential areas and the Darussalam road along which many of the educational institute are located. More females were seen in location E (16%) for similar reasons. The node connecting the main road and the residential area is also more used by female (16% in location H and 30% in location A) in comparison to locations B and C near the terminal along the main road. The 500m core area of the terminal is dominated by male users. The percentage of male, female and children users of the total pedestrian counts per location is shown in Figure 4.

Figure 4: percentage of male, female and children pedestrians



While the ratio of females and children remain nearly the same over weekdays and weekends (Figure 4), there are certain locations (H), where greater percentage of females are noted in weekends.

2.3. Numbers, peak and off-peak of traffic

The average pedestrian counts per minute at different locations are A 14.4, B 51.73, C 33.6, E 25, G 24.5, and H 18.7. In and around the terminal (location B and C) the proportion of pedestrian traffic volume remains higher towards evening, from 5-9 pm. One of the peak of pedestrian traffic was observed in location B, in between the terminal and connecting road from the residential areas during morning, from 8-9 am. In these locations, the off-peak hours are usually during noon, 12-3 pm. Location H, near the node connecting the main road and residential area, more people were observed using the pavements and roads during evening hours, from 5-7 pm.

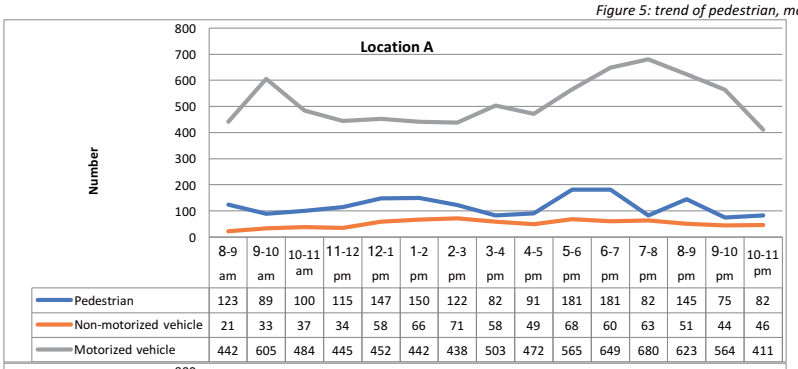
The number of motorized vehicles remains higher along the main road going towards the terminal from the city (location A, B and G). On an average the peak-hour of motorized vehicles remain towards the evening 6-8 pm; however, near the terminal the peak-hour remains during 12-3 pm. The node near location G that connect Gabtoli and other eastern area the northern part of the city remains busier than the node near location H which connect to the residential areas.

Both pedestrian and vehicular traffic volume follow similar pattern in increase or decrease during evening hours in all other location apart from H., the number of pedestrian increases there. The proportion of pedestrian decreases and motorized-vehicular increases within the 500m core area of Gabtoli around after noon (from 12-3 pm).

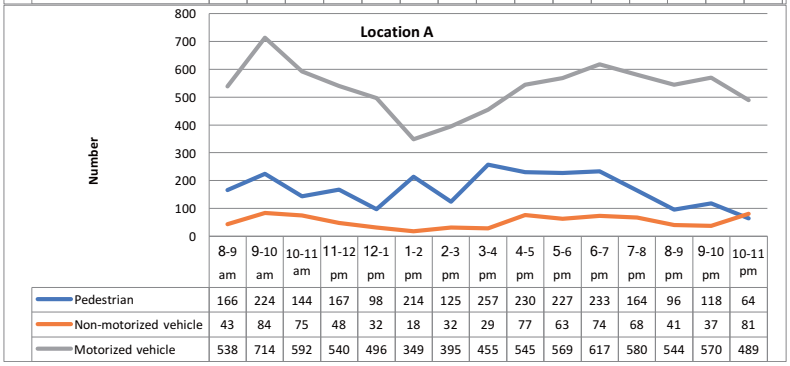
The counts for pedestrians, motorized and non-motorized vehicles across each location over time follow similar trend of peaks and troughs over the time in terms of location. Significant reading is the comparison of pedestrian and motorized vehicles in location C (bus terminal) where the count of pedestrians is greater than vehicular count for the peak hours from afternoon till evening.

Figure 5 shows the trend of pedestrian, motorized and non-motorized vehicular count over time per location for weekdays and weekends.

Figure 5: trend of pedestrian, motorized and non-motorized vehicular counts in different locations



	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm
Pedestrian	123	89	100	115	147	150	122	82	91	181	181	82	145	75	82
Non-motorized vehicle	21	33	37	34	58	66	71	58	49	68	60	63	51	44	46
Motorized vehicle	442	605	484	445	452	442	438	503	472	565	649	680	623	564	411



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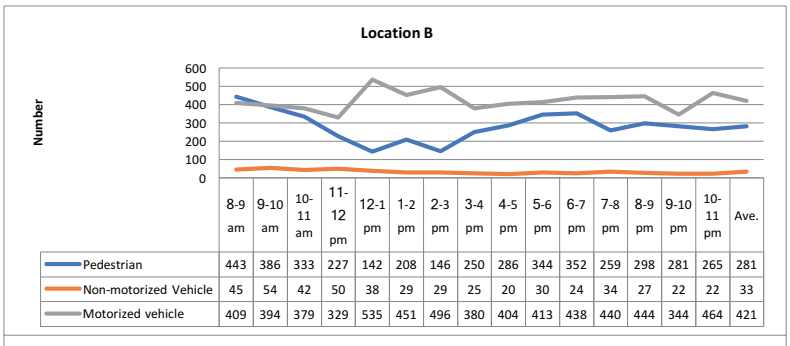
Pedestrian	166	224	144	167	98	214	125	257	230	227	233	164	96	118	64
Non-motorized vehicle	43	84	75	48	32	18	32	29	77	63	74	68	41	37	81
Motorized vehicle	538	714	592	540	496	349	395	455	545	569	617	580	544	570	489



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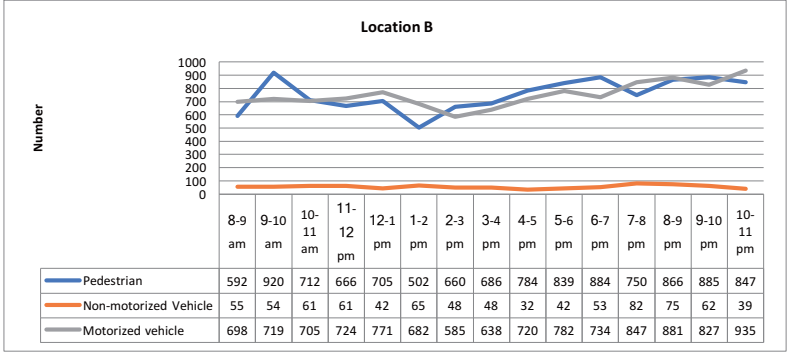
Pedestrian	443	386	333	227	142	208	146	250	286	344	352	259	298	281	265	281
Non-motorized Vehicle	45	54	42	50	38	29	29	25	20	30	24	34	27	22	22	33
Motorized vehicle	409	394	379	329	535	451	496	380	404	413	438	440	444	344	464	421



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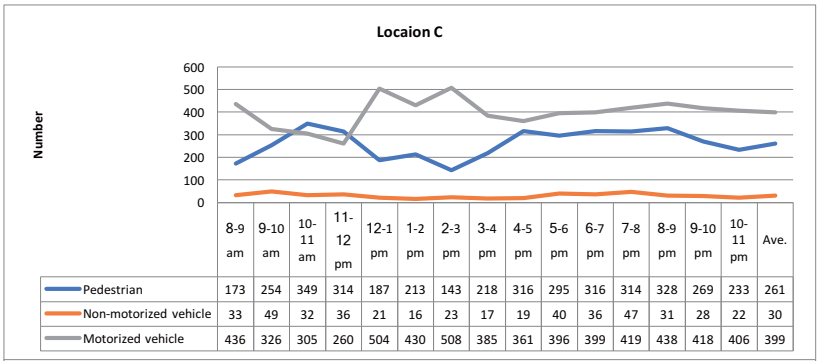
Pedestrian	592	920	712	666	705	502	660	686	784	839	884	750	866	885	847
Non-motorized Vehicle	55	54	61	61	42	65	48	48	32	42	53	82	75	62	39
Motorized vehicle	698	719	705	724	771	682	585	638	720	782	734	847	881	827	935



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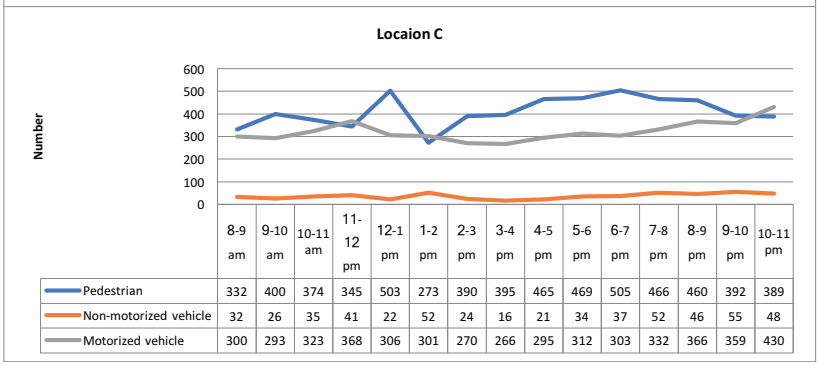
Pedestrian	173	254	349	314	187	213	143	218	316	295	316	314	328	269	233	261
Non-motorized vehicle	33	49	32	36	21	16	23	17	19	40	36	47	31	28	22	30
Motorized vehicle	436	326	305	260	504	430	508	385	361	396	399	419	438	418	406	399



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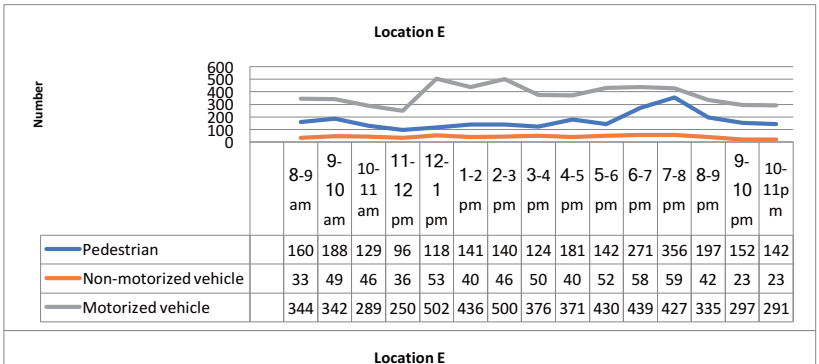
Pedestrian	332	400	374	345	503	273	390	395	465	469	505	466	460	392	389
Non-motorized vehicle	32	26	35	41	22	52	24	16	21	34	37	52	46	55	48
Motorized vehicle	300	293	323	368	306	301	270	266	295	312	303	332	366	359	430



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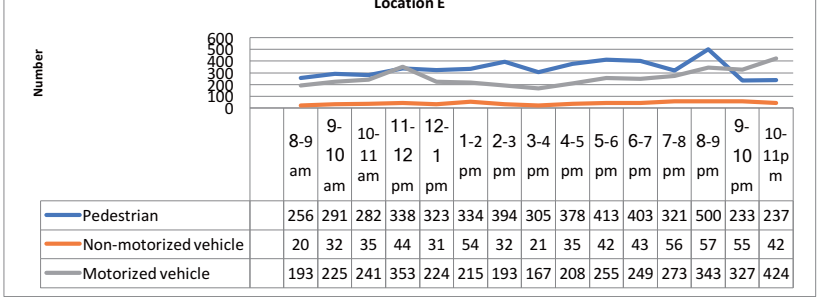
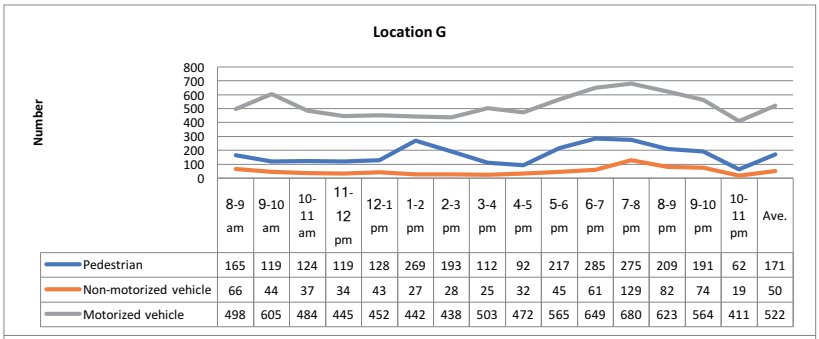
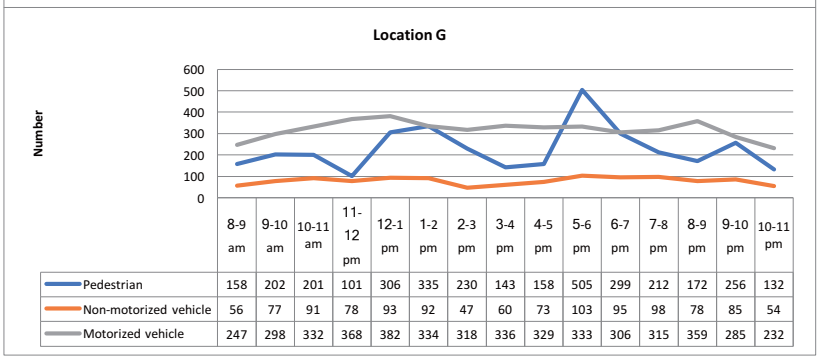
Pedestrian	160	188	129	96	118	141	140	124	181	142	271	356	197	152	142
Non-motorized vehicle	33	49	46	36	53	40	46	50	40	52	58	59	42	23	23
Motorized vehicle	344	342	289	250	502	436	500	376	371	430	439	427	335	297	291



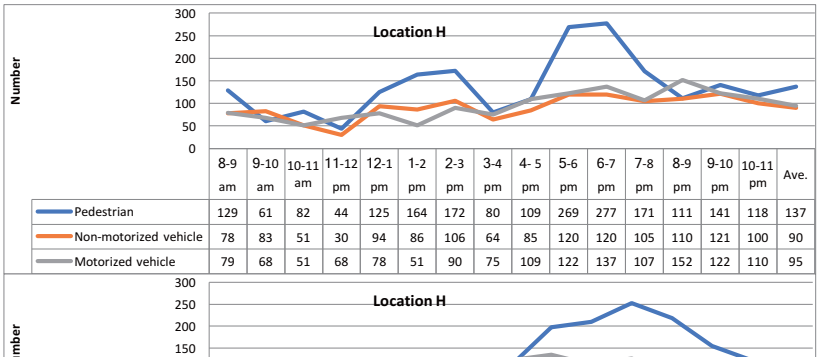
	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11pm
Pedestrian	256	291	282	338	323	334	394	305	378	413	403	321	500	233	237
Non-motorized vehicle	20	32	35	44	31	54	32	21	35	42	43	56	57	55	42
Motorized vehicle	193	225	241	353	224	215	193	167	208	255	249	273	343	327	424



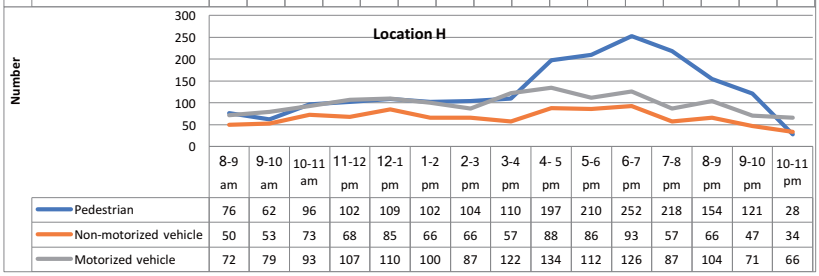
	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm	Ave.
Pedestrian	165	119	124	119	128	269	193	112	92	217	285	275	209	191	62	171
Non-motorized vehicle	66	44	37	34	43	27	28	25	32	45	61	129	82	74	19	50
Motorized vehicle	498	605	484	445	452	442	438	503	472	565	649	680	623	564	411	522



	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm
Pedestrian	158	202	201	101	306	335	230	143	158	505	299	212	172	256	132
Non-motorized vehicle	56	77	91	78	93	92	47	60	73	103	95	98	78	85	54
Motorized vehicle	247	298	332	368	382	334	318	336	329	333	306	315	359	285	232



	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4- 5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm	Ave.
Pedestrian	129	61	82	44	125	164	172	80	109	269	277	171	111	141	118	137
Non-motorized vehicle	78	83	51	30	94	86	106	64	85	120	120	105	110	121	100	90
Motorized vehicle	79	68	51	68	78	51	90	75	109	122	137	107	152	122	110	95



	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4- 5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm
Pedestrian	76	62	96	102	109	102	104	110	197	210	252	218	154	121	28
Non-motorized vehicle	50	53	73	68	85	66	66	57	88	86	93	57	66	47	34
Motorized vehicle	72	79	93	107	110	100	87	122	134	112	126	87	104	71	66

2.4. Direction of traffic flow

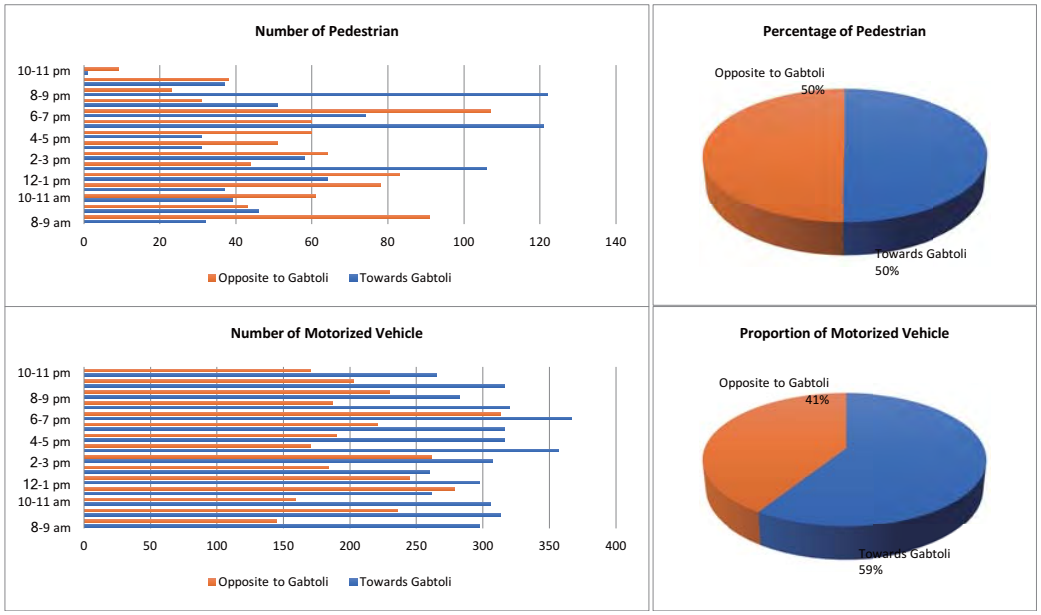
Some differences were observed in the changes in volume of traffic going towards and away from Gabtoli and other areas. As expected most pedestrian walk towards the terminal from all of the locations in the peak hours. Significant proportion of motorized traffic is generated from the terminal area that moves away from the city along the highway.

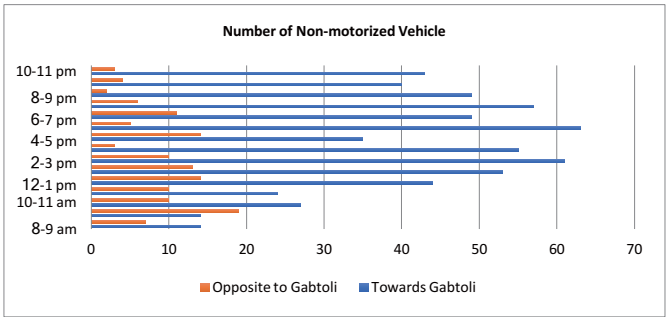
Location A exhibits greater pedestrian and vehicular movement towards the bus terminal in general compared to moving away from the terminal. Location B shows more movements of all kinds opposite to the bus terminal especially during peak hours. In location C, all kinds of movement are going away from terminal. Location E shows balance of movement towards and away from the bus terminal.

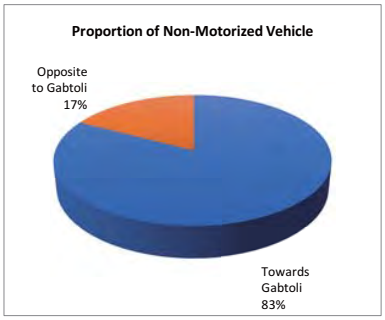
The data infers that both vehicular and pedestrian networks within 1000 meters radius of the study area are intensely used from all directions.

Figure 6: ratio of pedestrian, motorized and non-motorized counts towards and opposite Gabtoli station

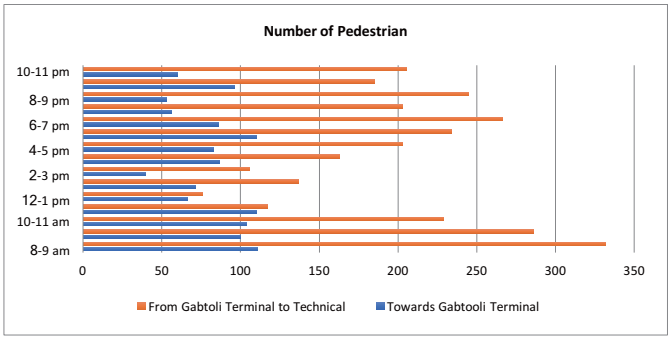
Location A

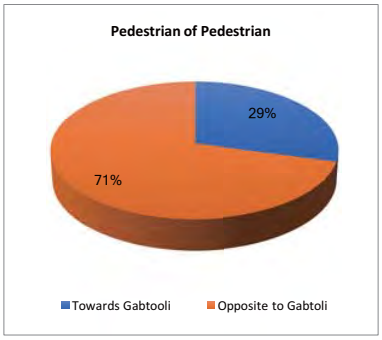


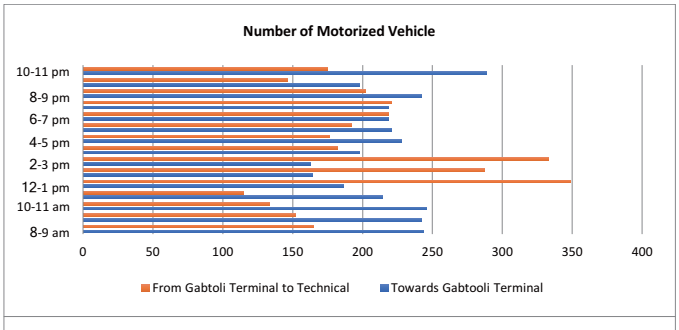

Number of Non-motorized Vehicle
10-11 pm
8-9 pm
6-7 pm
4-5 pm
2-3 pm
12-1 pm
10-11 am
8-9 am
0
10
20
30
40
50
60
70
Opposite to Gabtoli
Towards Gabtoli

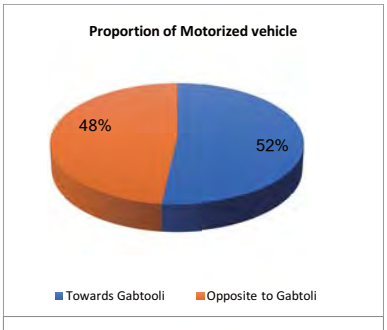

Proportion of Non-Motorized Vehicle
Opposite to Gabtoli 17%
Towards Gabtoli 83%

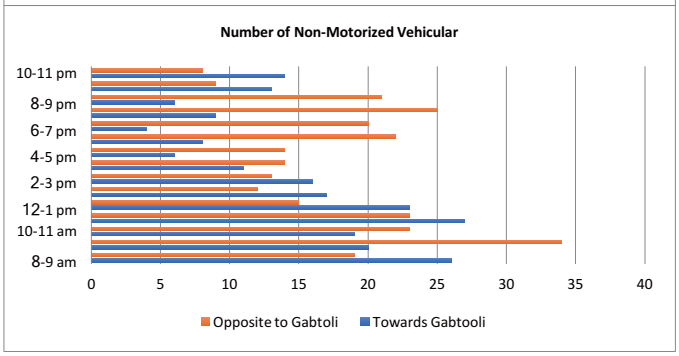
Location B

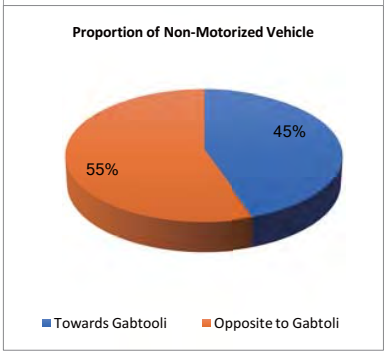

Number of Pedestrian
10-11 pm
8-9 pm
6-7 pm
4-5 pm
2-3 pm
12-1 pm
10-11 am
8-9 am
0
50
100
150
200
250
300
350
From Gabtoli Terminal to Technical
Towards Gabtooli Terminal


Pedestrian of Pedestrian
29%
71%
Towards Gabtooli
Opposite to Gabtoli

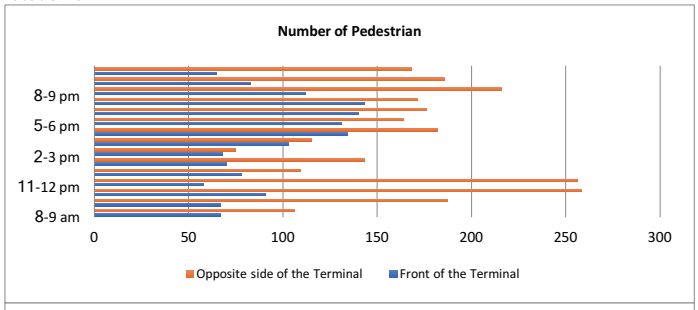

Number of Motorized Vehicle
10-11 pm
8-9 pm
6-7 pm
4-5 pm
2-3 pm
12-1 pm
10-11 am
8-9 am
0
50
100
150
200
250
300
350
400
From Gabtoli Terminal to Technical
Towards Gabtooli Terminal

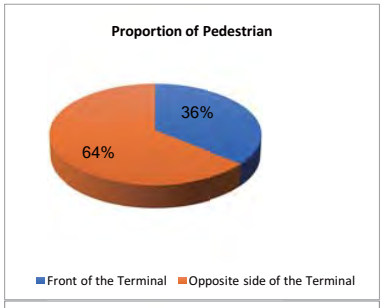

Proportion of Motorized vehicle
48%
52%
Towards Gabtooli
Opposite to Gabtoli

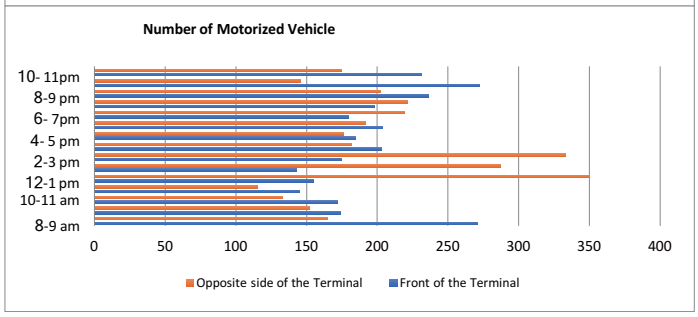

Number of Non-Motorized Vehicular
10-11 pm
8-9 pm
6-7 pm
4-5 pm
2-3 pm
12-1 pm
10-11 am
8-9 am
0
5
10
15
20
25
30
35
40
Opposite to Gabtoli
Towards Gabtooli

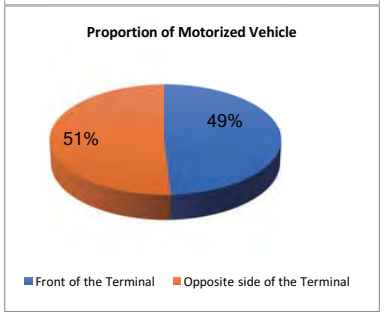

Proportion of Non-Motorized Vehicle
45%
55%
Towards Gabtooli
Opposite to Gabtoli

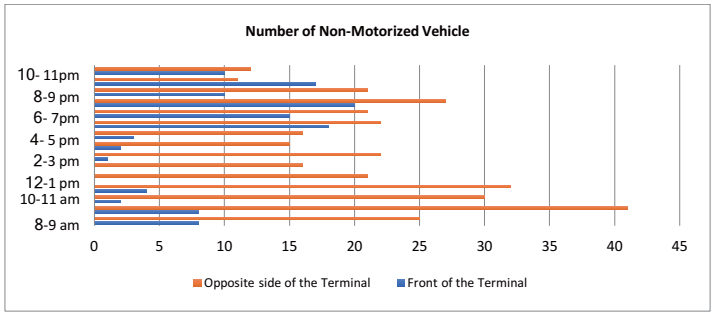
Location C

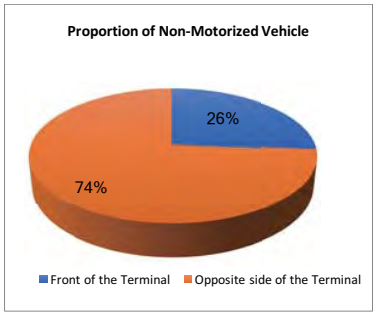




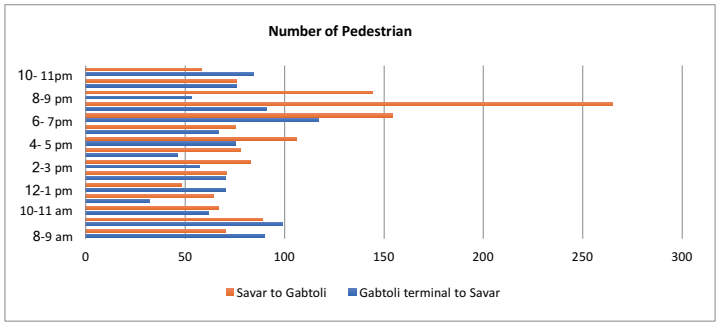


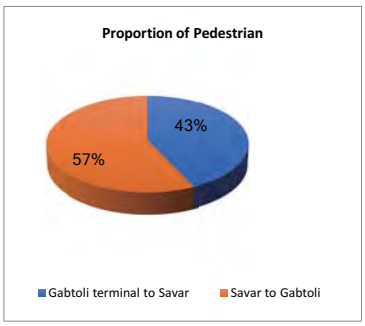


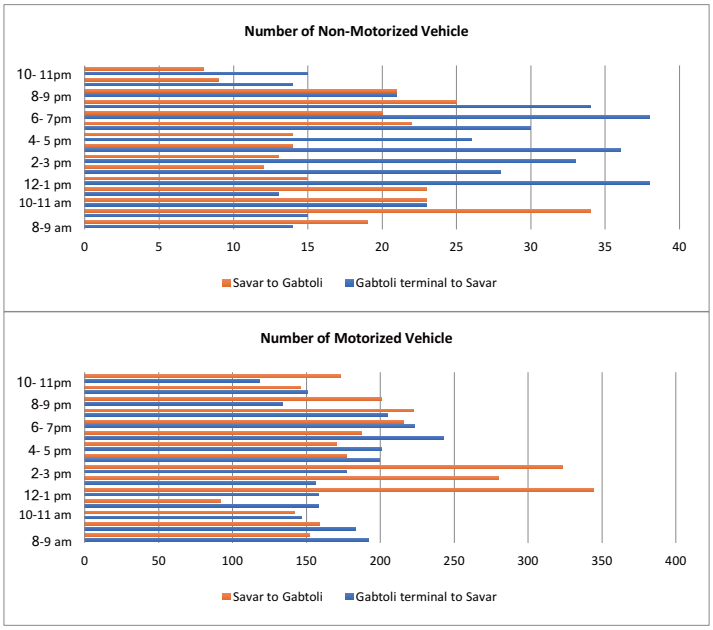


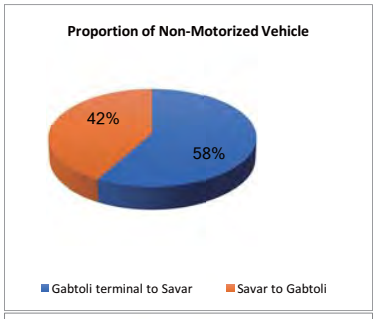


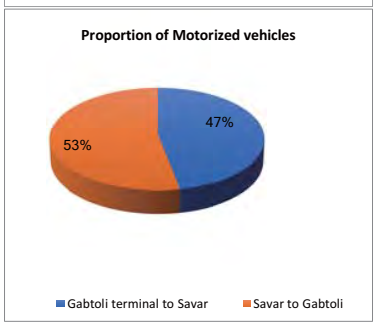
Location E









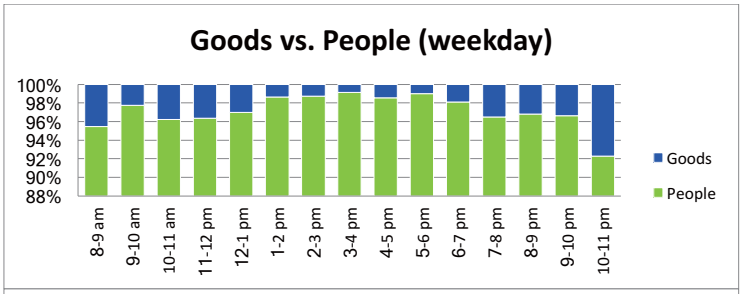


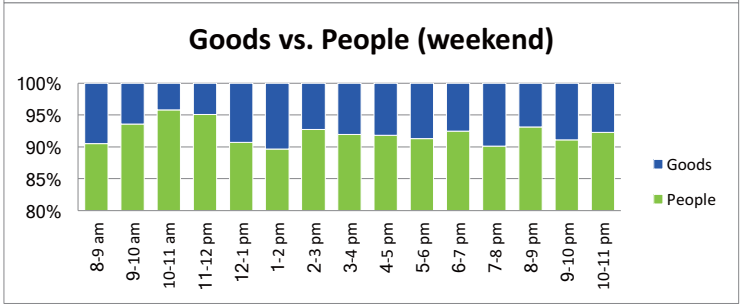
2.5. Proportion of people and goods carrying vehicles

Movement of goods carrying vehicles like trucks are allowed to ply within the city during 6am to 10 pm only; hence, in all of the locations the count of goods carrying vehicles were very negligible in comparison to vehicles carrying people. The example of location A shown in Figure 6 illustrate this phenomenon. The counts include smaller goods carrying vehicles like covered vans. The trends for weekdays and weekends are shown in Figure 7.

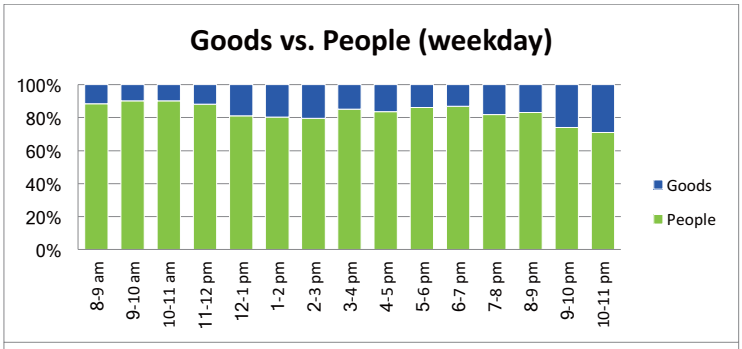
Figure 7: ratio of vehicles carrying people and goods

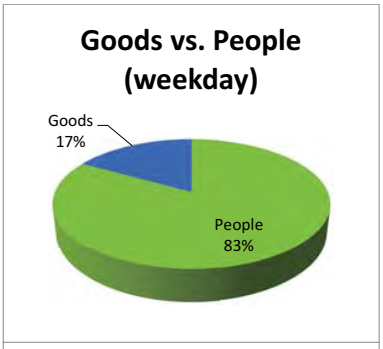
Location A

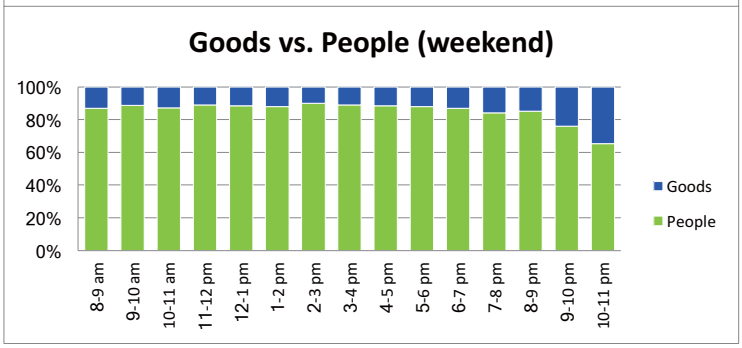




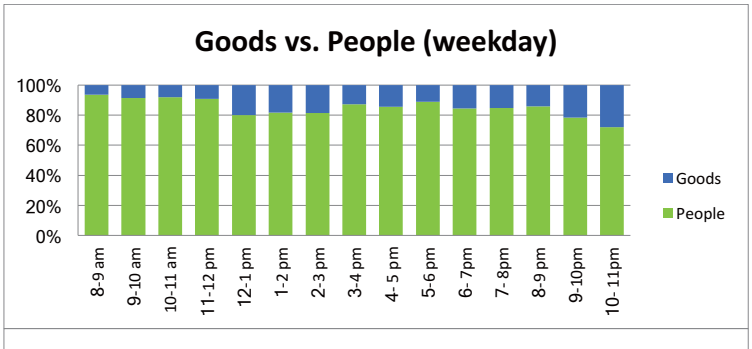
Location B

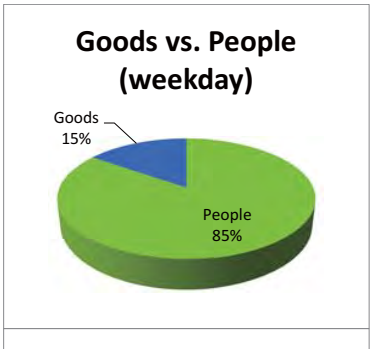


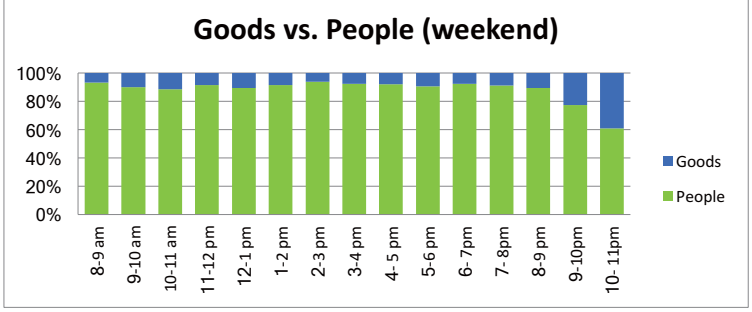




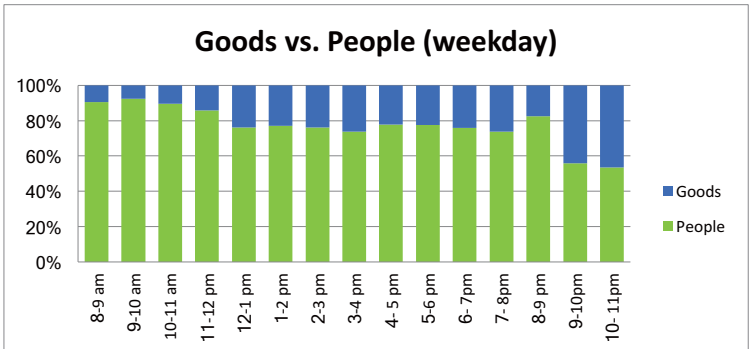
Location C

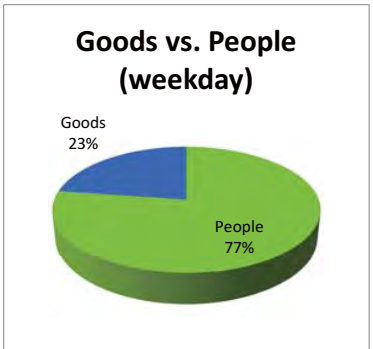


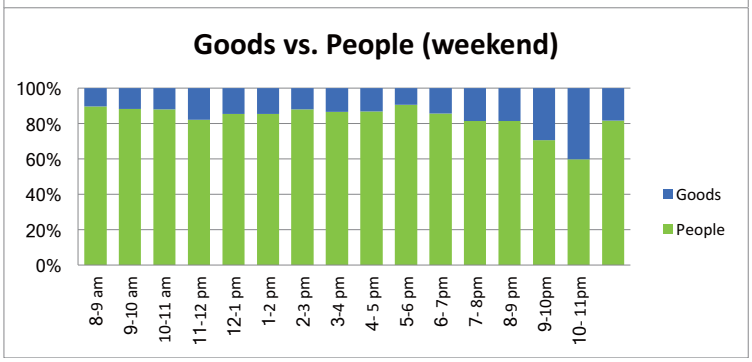




Location E







3. Combining quality criteria and place inventory

3.1 Quality criteria survey and place inventory rationale

PROTECTION	Protection against accident	Protection against Crime	Protection against unpleasant sensory experience: noise, dust, smells, or other pollution	QUAILTIES ESSENTIAL FOR ANY PLACE
COMFORT	Ease of accessibility	Options to stand and linger	Options for sitting	QUALITIES IMPORTANT TO HAVE FOR A GOOD PUBLIC SPACE
	Options for talking and listening/hearing	Options for play, exercise, and activities		
ENYOYMENT	Scale. If the place has a human scale, is it easy to get lost?	Opportunities to enjoy the positive aspects of climate and different kinds of weather	Experience of aesthetic qualities and positive sensory experiences	QUALITILIES THAT MAKES A GREAT PUBLIC SPACE
	RATING	POSITIVE (+)	NEUTRAL	NEGATIVE (-)

By Gehl Institute

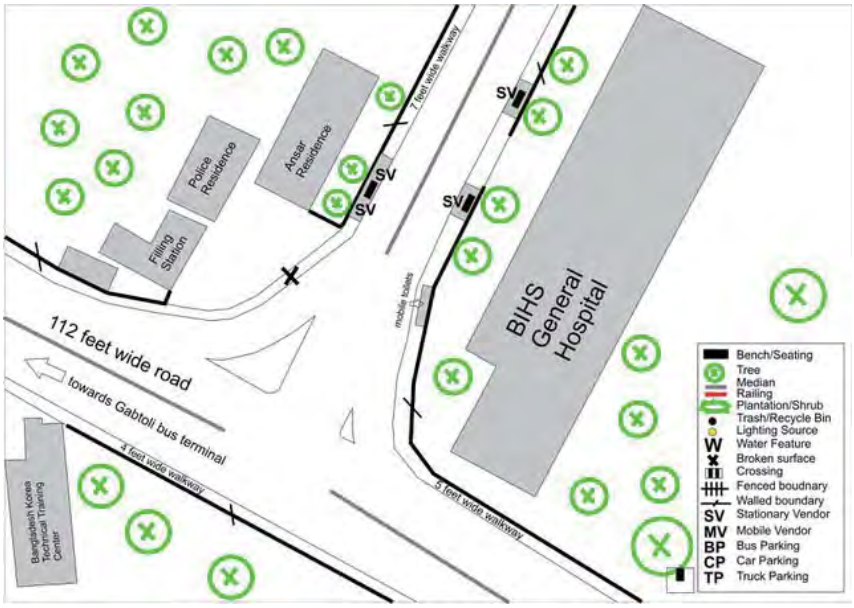
The 12 Quality Criteria by Gehl Institute helps analyze the functioning of the public spaces and evaluate the experiential quality of a space using the hierarchy of needs in a space: protection, comfort, and enjoyment. Protection refers to a space that provides basic protection from accidents, crime, and unpleasant sensory experience arising from noise, and dust, among others. Comfort pertains to elements that make walking, standing, sitting, seeing, and conversing easy. Enjoyment is a measurement that helps define and distinguish a great place from a good one. It includes elements that attract people to be active and make use of the positive aspects of microclimate and human scale. The user simply assesses his or her appreciation of space by providing positive, neutral, or negative value to each of the criteria. Quality criteria survey was done in 9 different locations (see figure 1). Location C was sub-divided into two. 50 respondents were interviewed from each location, culminating in a sample size of 500 participants.

The place inventory included a mapping exercise that helped take stock of the physical features in a place that support public life, such as seating, plant life, lighting, etc. It was also used as a qualitative survey tool that helped assess the experience of the space, including its overall look and feel.

When used in conjunction with counting and quality criteria survey, this can overlay evaluation of physical features and feelings with observations about who is spending time and moving through a space. This helps to draw conclusions about the interplay of these elements and to determine what kinds of interventions might improve the space.

3.2 Results of the Place Inventory and Quality Criteria Survey

LOCATION A

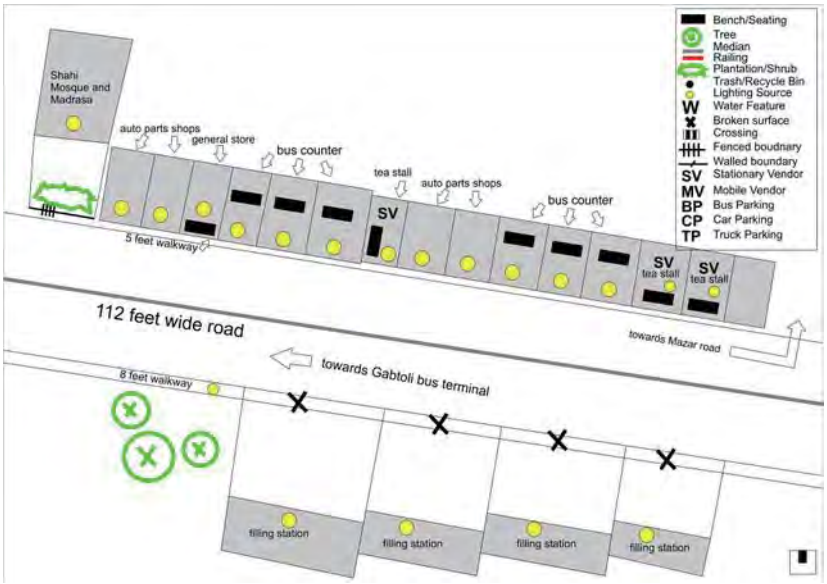


-Location A is also known as the 'Technical moor'.
-This node located nearly 900 meters to the east of the Gabtoli bus terminal.
-The average width of pedestrian walkways in this location is a little more than 5 feet.
-There are no formal bus stops here, yet local buses and human howlers drop off or pick up passengers.
-Although there is lots of greenery surrounding the node, the solid walls of 8 to 10 feet seclude the greenery from public visibility.
-There are no places for public gathering outside the boundaries of these complexes
-Tea stalls take up spaces on the walkways creating hindrance to the flow of pedestrians.
-These tea stalls are the only places where people can sit and are the most active public spaces within the location.
-There are no formal zebra crossings or overpass or underpasses for people to cross the main road.

	LOCATION A		
Protection			
Comfort			
Enjoyment			

Survey respondents generally consider Location A as having negative value in terms of protection, comfort, and enjoyment. In terms of protection from accidents and crime, the respondents are generally indifferent. However, in terms of safety from unpleasant sensory experiences such as noise and dust, the respondents attached negative value. Location A is generally considered as unpleasant in terms of walking, sitting, lingering, and doing other activities. In terms of enjoyment, respondents also attached neutral to negative value.

Location B

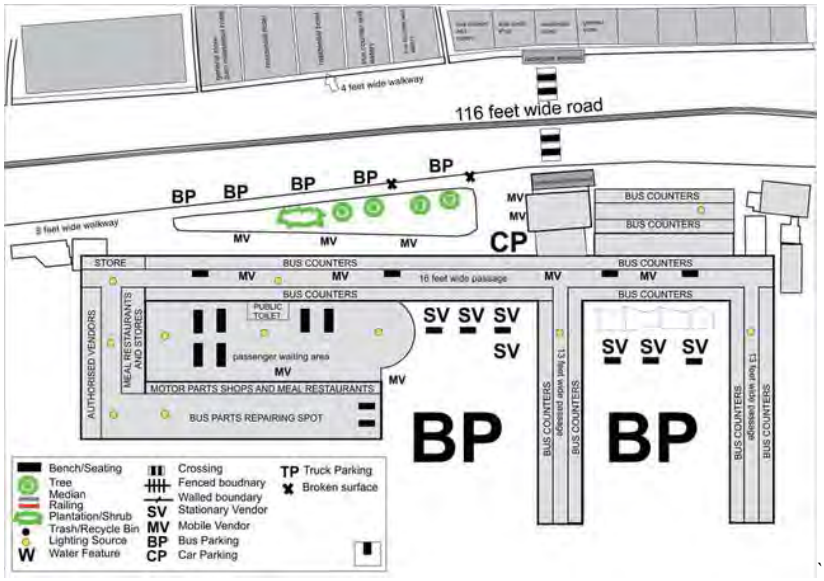


-Location B is located approximately 400 meters east of the Gabtoli.
-This location falls along the main road fronted with various mixed use activities on the north side and four (4) fueling stations on the south. Although the pedestrian walkway along the fueling stations is 8 feet wide, the quality of the walkway is poor and is broken in many places.
-The mixed use functions are housed in mostly 1-storey buildings, out of which most are bus counters with passenger resting areas for inter-district long routes, accompanied by small eateries and tea stalls and auto parts repairing and retail shops.
-The walkways on both sides of the road is very active with mobile crowd, but the long route buses stopping in front of their respective counters create hindrance to pedestrian movement.
-There are no mobile vendors taking up spaces of the walkways in this location. Compared to the south edge of the main road, the north part is more active and better lit due to presence of the counters and shops.
-The Shahe Mosque and Madrasah has an open green lawn facing the main road, but is not accessible by the public.

	LOCATION B		
Protection			
Comfort			
Enjoyment			

For Location B, respondents have identified some good elements of the space. These include safety from accidents and crime, options for sitting, human scale, and possibilities to enjoy the positive aspects of climate and weather. However, respondents consider Location B as poor in terms of comfort elements: ease of access, options for standing, sitting, and lingering. The location is also considered poor in terms of aesthetic value and attractiveness.

Location C

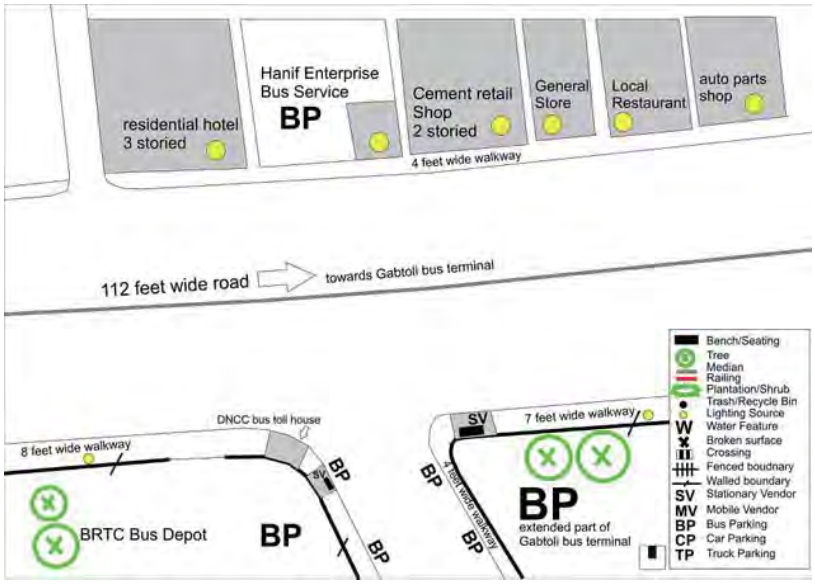


- Location C is the existing bus terminal area. There are quite a few shaded areas for the public as well as other public facilities such as food stalls and toilets.
-The shaded areas are generally well lit, but greatly lack in quality of space, and can be overcrowded especially during the peak hours of terminal usage.
-The terminal building is mostly unseen from the main road due to constant bus parking right in front of it, as they pick up passengers.
-The other side of the terminal along the main road has mainly residential hotels and restaurants.

	LOCATION C:		
Protection			
Comfort			
Enjoyment			

Respondents generally consider Location C as safe from accidents, but unsafe from noise and dust. Respondents feel indifferent when it comes to safety of the place from crime. In terms of comfort elements, the respondents are also generally indifferent. However, they think that Location C has human scale and provides opportunities to enjoy the positive aspects of climate and weather, mostly because this location provides the most shaded public spaces within the entire stretch of the main road.

Location D

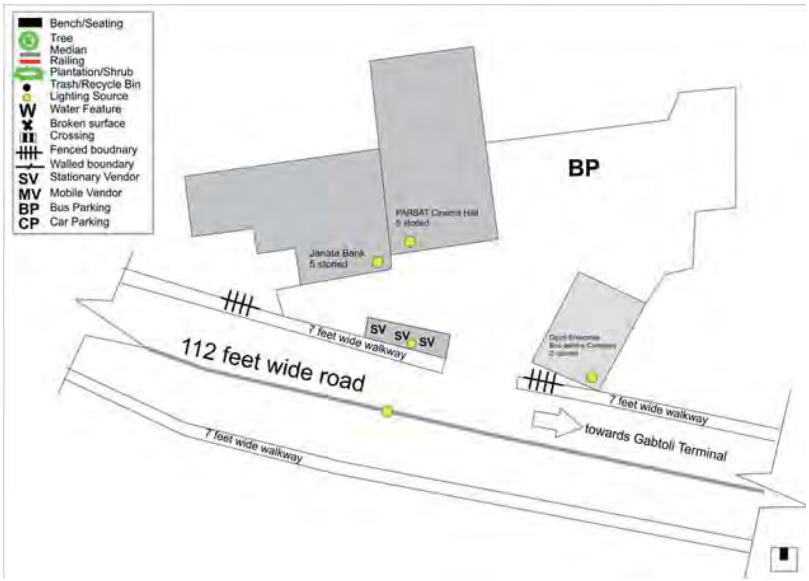


-This location is approximately 300 meters from the bus terminal.
This location is the point where the bus terminal service road intersects with the southern part of the main road.
-There are bus depots located, and fronted with solid walls, along which the 8 feet wide walkways have been constructed.
-There are tea stalls and also the bus toll counter blocking the walkways along the main road.
-Local buses are parked along both sides of the service road.

	LOCATION D:		
Protection			
Comfort			
Enjoyment			

For Location D, respondents are indifferent in terms of the protective value of the space. They consider the location as accessible, but does not provide amenities for standing, sitting, lingering, listening, and doing activities, e.g., exercises. Moreover, they also attach negative value to enjoyment elements including human scale and aesthetic and attractiveness quality.

Location E

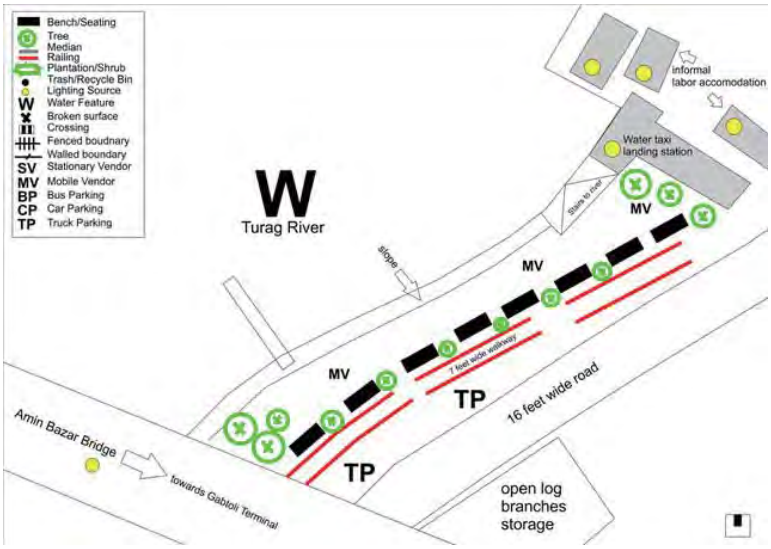


-The location also called the Parbot cinema hall area.
-It is located nearly 600 meters from the Gabtoli bus terminal.
-It is an important area for leisure activities as the Cinema Hall is located here.
-There are tea stalls within the compound and the same compound also houses bus parking and office for one of the prominent Bus service companies.
-There is serious lack of greenery, and the area is also not very well lit at night.
-There are no spaces for seating and interaction within the compound.

	LOCATION E:		
Protection			
Comfort			
Enjoyment			

Location E is one of the two (2) locations that respondents consider as having positive value in many aspects of public space. They consider the area as safe from accidents and crime and is relatively accessible. Comfort and enjoyment elements are also present. However, protection from noise and dust, options for lingering and listening/hearing are still considered as challenges.

Location F1

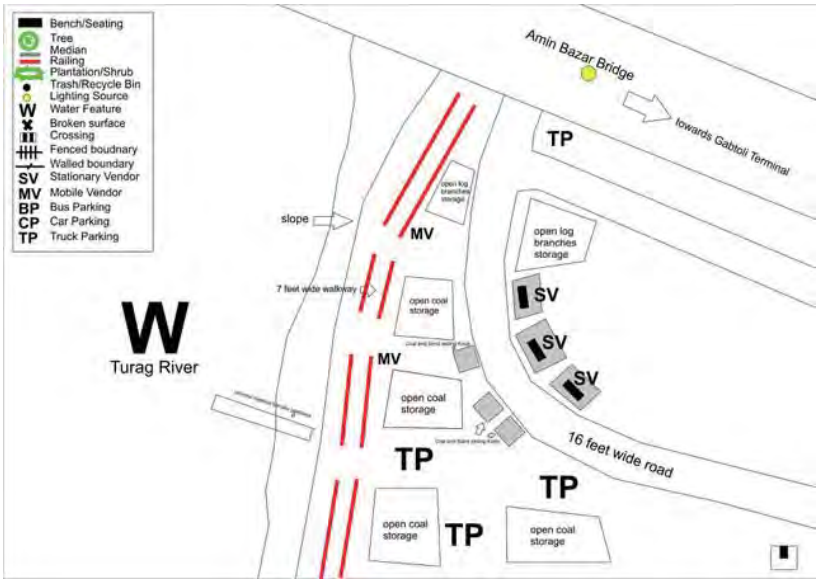


-This location is along the river Turag right under the Aminbazar bridge looking towards north.
-It is approximately 750 meters to the west of the Gabtoli Bus terminal.
-Part of the bank of the river where loading and unloading of goods via waterways is done, this area particularly serves the local community recreation and passenger service via water taxi.
-It is one of the few green spaces within the river bank accessible to the public, but it is difficult to reach this location as the walkable space leading to this area is virtually undefined.
-While the Passenger landing station is located here, but not many passengers come due to difficulty in accessibility.
-There are mobile vendors serving the visiting people, but the location loses people at night due to poor lighting facilities.
-There are benches for people to sit and interact.

Respondents attach positive value on safety from accidents for Location F1. However, for the rest of the protection, comfort, enjoyment elements, they are indifferent or consider the location as poor.

	LOCATION F1:		
Protection			
Comfort			
Enjoyment			

Location F2

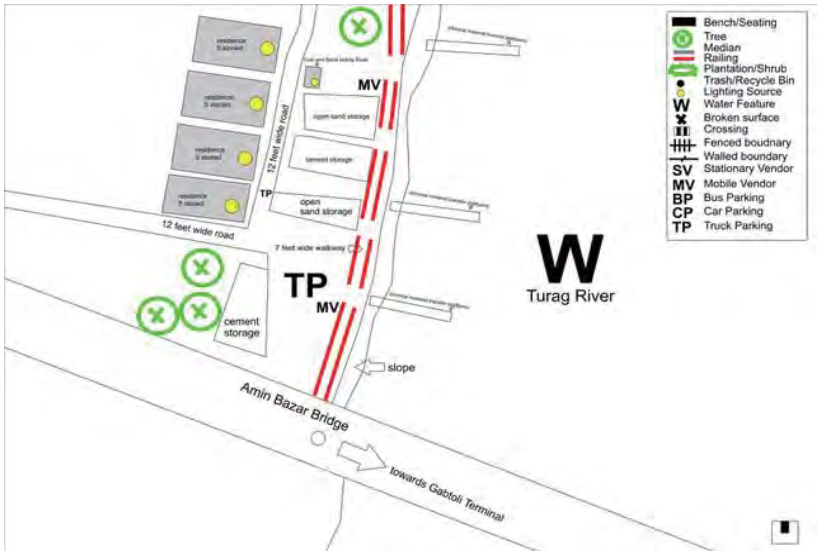


-Along the Turag river, the location is to the southern part of the Aminbazar bridge, and approximately 750 meters to the west of Gabtoli terminal.
-This location is vibrant with loading and unloading of construction goods, mainly coal coming via trawlers and ships.
-There are supporting tea stalls for the people working in the location, and the road adjoining the area is used by the trucks to carry the goods from the open storages to their destinations.
-This area is not very well lit, although the goods are stored open.

	LOCATION F2:		
Protection			
Comfort			
Enjoyment			

Based on responses, Location F2 exhibits a number of good public space elements. Respondents consider the location as safe from accidents and crime, easily accessible, has options for standing, sitting, and listening. It has human scale, and has provides options for enjoying the climate and weather. However, respondents consider Location F2 as poor in terms of safety from noise, dust, and bad smell, and aesthetic and attractiveness quality.

Location F3

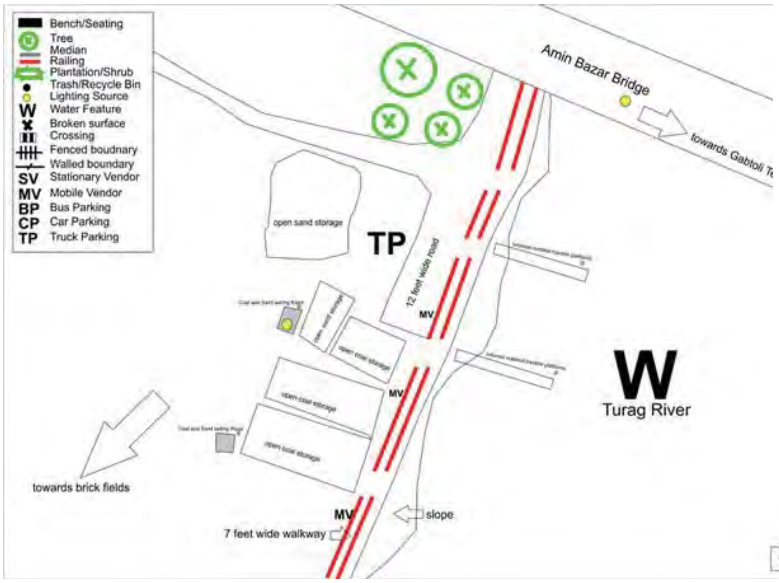


-This is on the other side of the Turag river, approximately 1000 meters from the Gabtoli bus terminal.
-This location is mostly occupied by construction material related work.
-There are no spaces for leisure activities for the people.
-Residential buildings are within very close proximity to the river edge.

	LOCATION F3:		
Protection			
Comfort			
Enjoyment			

Respondents consider Location F3 as safe from crime and accessible. But, they are indifferent in terms of safety from accidents, and from noise and dust. Respondents generally do not think that the location has any enjoyment elements. It does not have human scale. It does not offer opportunities to enjoy the positive aspects of climate and weather, and it does not have aesthetic value.

Location F4



This is located approximately 1000 meters to the west of Gabtoli terminal, on the other side of the Turag river.
This area is mostly used for construction material operations.
It is in close proximity to the brick fields, which use the coal that is stored in this area.
Not so well lit, this area lacks in providing leisure facilities for the general people.

	LOCATION F4:		
Protection			
Comfort			
Enjoyment			

For Location F4, respondents consider the area as safe from crime and easily accessible. However, they are indifferent in terms of safety from accidents, as well as protection from noise and dust. Respondents also are generally indifferent in terms of the area providing options for lingering, sitting, and doing activities. The area is generally considered as poor in terms of enjoyment elements. Respondents think that the area does not exhibit human scale, does not provide opportunities to enjoy the positive aspects of climate and weather, and does not have any aesthetic or attractiveness value.

Apendix C : Kamalapur Station

Table of Contents

Table of Figures

1. INTRODUCTION

This report is the deliverable for the Preparation of Transit Oriented Development (TOD) Conceptual Strategies for Kamalapur MRT Station Area, Dhaka, Bangladesh.

The report aims, firstly, to illustrate physical survey findings of the area within one (1) km of the existing railway station, near which the proposed MRT station will be located. The findings establish the rationale for adopting TOD planning approach for the area. Secondly, to use the survey findings for generating conceptual strategic planning for TOD for the station adjoining areas. Thirdly, to demonstrate some schematic plans and sections of the station and adjoining areas that are informed by survey findings and complements conceptual strategic planning.

This report complements with the annexures on household, bus operator, rail passenger, bus passengers and pedestrian profiles of the area within 500 m of the station.

The TOD conceptual planning for Kamalapur station includes the following:

- **An analysis of the planning context.**
- **Preliminary conceptual planning strategies for TOD.**
- **Schematic plans and sections of the station and adjoining areas.**

2. THE PLANNING CONTEXT

2.1. Study Background

Kamalapur area is part of Motijheel Thana, one of the administrative divisions of Dhaka city. Motijheel Thana occupies a land area of 4.69 km^2. In 2011, Motijheel Thana registered a total residential population of 223,676 distributed in 36,059 households. Motijheel along with Dilkusha comprises the Central Business District (CBD) of Dhaka. The area houses more offices and business institutions than any other part of the city. Most corporate headquarters are located in the area. Many service providing, retail and commercial organizations and agencies developed in the adjoining area to support the commercial activities. In terms of employment, majority of the population (84,155) are engaged in services and 11,684 are employed in the industry.

Kamalapur will be one of the major stations of Line 1 (Gazipur – Airport – Kamalapur – Jhilmil –Purbachal – Khilkhet); and is expected to develop with intermodal gateway facilities connecting Bangladesh Railway (BR), Line 1 and Motijheel station of Line 6.

The key concept for developing the station is to leverage MRT, BR and TOD to enhance the area as a competitive multi-modal transport hub and cross cultural urban core.

The Dhaka Transport Co-ordination Authority (DTCA), from passenger forecast, predicts Line 1 to have one of the highest passenger demands - nearly 1.9 million passengers per day, and 37,770 PPHPD in 2035. The reason being Line 1 will connect the CBD of Dhaka city with the northern and southern suburbs. The line will be a combination of grade separated and underground lines and stations; Kamalapur station will be an underground station.

2.2. Site Context

2.2.1. Socio-economic characteristics

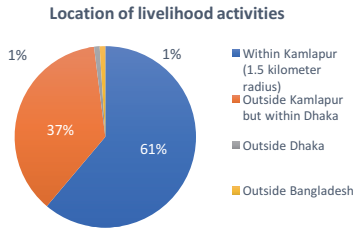
The survey among 500 household living within 500m of the Kamalapur Railway Station showed that the average length of stay of all household- respondents in Kamalapur is 13 years. The availability of work or business opportunities is the primary reason why the household- respondents chose to live in Kamalapur. Almost half (49%) household heads work within Kamalapur area while 37 percent are working outside Kamalapur, but within Dhaka city.

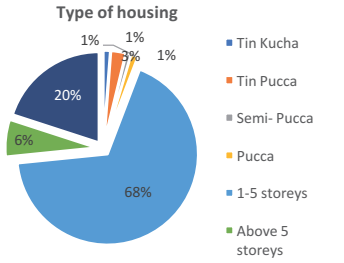
The average household size in the community is 4.4 and average age of the household head is 46 years. Around 43 percent of the household heads have post-graduate degrees while 11 percent have reached or completed college education. Around 21 percent have at least attended primary or high school. The remaining 19 percent do not have any formal education; majority of them are residing in and around the Railway Station.

Around half of the household respondents (46%) are employed by government or private offices. Most of them live in AGB colony, Bank colony and North Mugdapara. Around 26 percent of the household heads are engaged in business activities. They mostly reside in Ahmedbag, North Mugdapara, and Kabi Jasim Road private housing. Homeless people in and around Kamalapur railway station work as laborers or transport workers while others are engaged in begging and prostitution.

The reported average monthly income of households is around BDT 65,050. However, homeless people in and around Kamalapur railway station only earn BDT 7,118 per month, which is only 11 percent of the average household income in the area. The average monthly income of households in Kamalapur area is higher than those in Dhaka City in general1 in the amount of BDT 55,086.

Food and rent take up the largest share of household expenditures at 28 percent and 20 percent, respectively. Approximately, 68 percent of the household- respondents live in 1-5 storey housing structures while 20 percent are homeless. Majority use electricity for lighting (78%); most of the households have access to piped water (80 percent[2]); only 77 percent use private toilets while four (4) percent use shared toilet facilities. Annex 1 has more details of the findings.





[1] UNDP.2016. Politics, Governance, and Middle Income Aspirations Realities and Challenges: An Empirical Study
[2] The 20 percent comprise the homeless people in and around Kamalapur

2.2.2. Connectivity with the city

Kamalapur railway station is the main railway terminal connecting almost all major destinations of the country connected through rail. When the new station was built in 1968, the intention was to shift the rail tracks east of the CBD to avoid creating an east-west barrier in between the growing city.

Kamalapur is well-connected with the CBD (Motijheel and Dilkusha) through Kamalapur road and Mazar Road within the one (1) km radius. The recently constructed Culvert Road is frequently used by non-motorized vehicles. Motijheel Road and Toyenbee Road originating from the Shapla Chottor, near the proposed Motijheel station of Line 6, connect Kamalapur area with the administrative and commercial zones of the city on the east. The Toyenbee Road is almost the only major artery connecting the Kamalapur area with the commercial areas of old Dhaka on the south.

The Outer Circular Road, running along the front of the station serves mostly housing for personnel of different government organizations who use the road to go their work places. The Atish Dipankar Road running along the eastern edge of the terminal and Inland Container Depot (ICD) connect the area to Saidabad bus terminal to the South and Khilgaon residential area to the north. This road is considered as an embankment for the city on the east and connects all of the privately developed residential areas namely Maniknagar, Kadamtala and Bashabo.

Figure 2: Connectivity of Kamalapur station with the city

2.2.3. Land use pattern

Land use pattern within one (1) km radius area of the railway station is dominated by residential usage – both public and private. Different agencies and organizations provide housing developed by government, marked as public residential zone in the map. Bangladesh Railway also has housing for their employees within Kamalapur area.

The eastern side of the station (comprising of Ahmedbag, Mugdapara, Maniknagar, Dokkhin Bashabo and Kadamtala) are almost homogeneous in character – residential areas developed in privately owned land developed in a very organic manner with narrow streets and closely knit buildings. Different commercial and retail activities have developed along the major connections to serve the residential area.

Motijheel and Dilkusha areas outside the 500m but within one (1) km radius are densely dotted with different offices of finance and service sectors (marked in orange).

Some residential areas have developed towards the north of Motijheel (Fakirapul and Arambagh) marked as mixed used zone in the map. These are high density, low rise residential buildings, some parts of which are converted for commercial and retail usage as an extension of the Motijheel's business activities (marked in yellow).

Land use of South Kalamapur and Gopibag, the area marked as mixed commercial zone in the map, is mostly residential, but also accommodates parking areas for privately owned inter-district buses, covered vans, trucks and repairing garages for different types of motorized vehicles.

Figure 3:Land use pattern of within one km of Kamalapur station

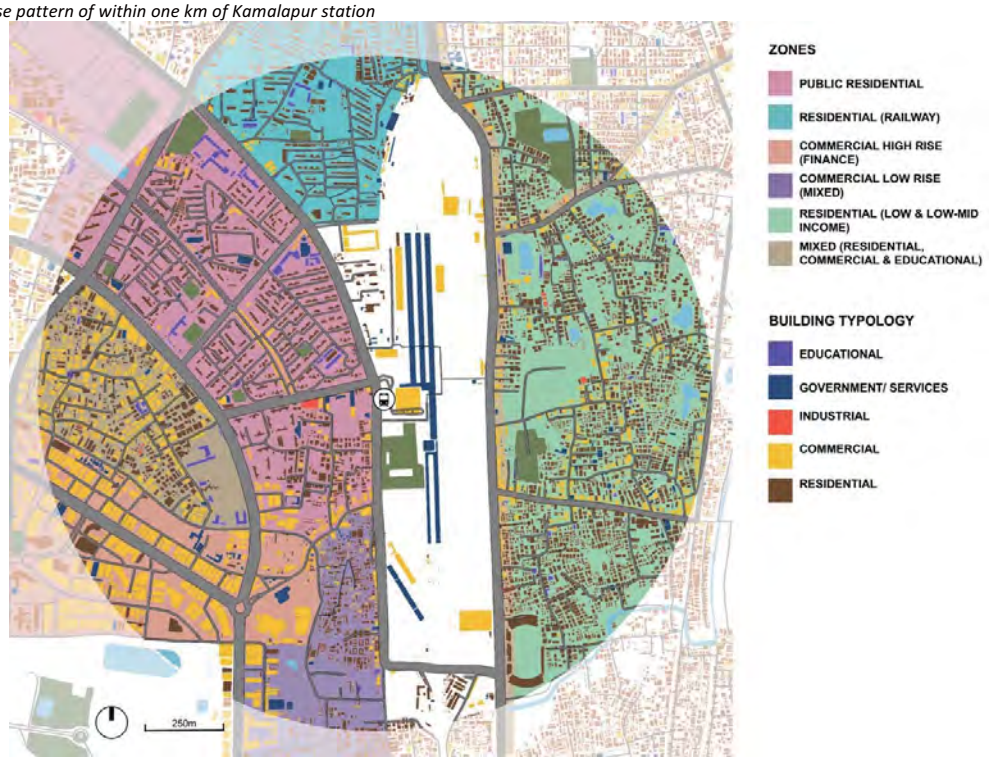


Image 1: Mugdapara

Image 2: Motijheel

Image 3: Atish Dipongkor road

Image 4: ICD and Hospital

2.2.4. Pedestrian circulation pattern

Most major roads on the west side of the railway station have accessible pavements for pedestrians. Some of them are frequently used and others are not, marked in blue and yellow respectively on the map. Some of these pavements are frequently used because of the land use pattern beside them.

For example, many pedestrian use pavements of Motijheel road to for both formal and informal economic activities. On the other hand, despite DIT Avenue having accessible pavements, few pedestrians use them because of the low density walled residential area on both sides of the road. Although Mazar road has similar land use but the location of two schools, a street-side market and vendors make the pavements dynamic.

The pavements around the peripheral wall of the ICD is occasionally used by pedestrians while the other sides both of Atish Dipankar and Outer Circular Roads are frequently used. Buses and trucks parked by the pavements, and walled area without building frontage make them inaccessible and unsafe for pedestrians.

Some of the pavements naturally attract vendors. These pavements are frequently used and vendors take that advantage selling a wide range of products.

Most of the connecting roads inside residential areas do not have designed pavements even though pedestrians dominate the roads. The residential areas east of the railway station have such characters.

Figure 4: Pedestrian circulation pattern around the station and adjoining areas

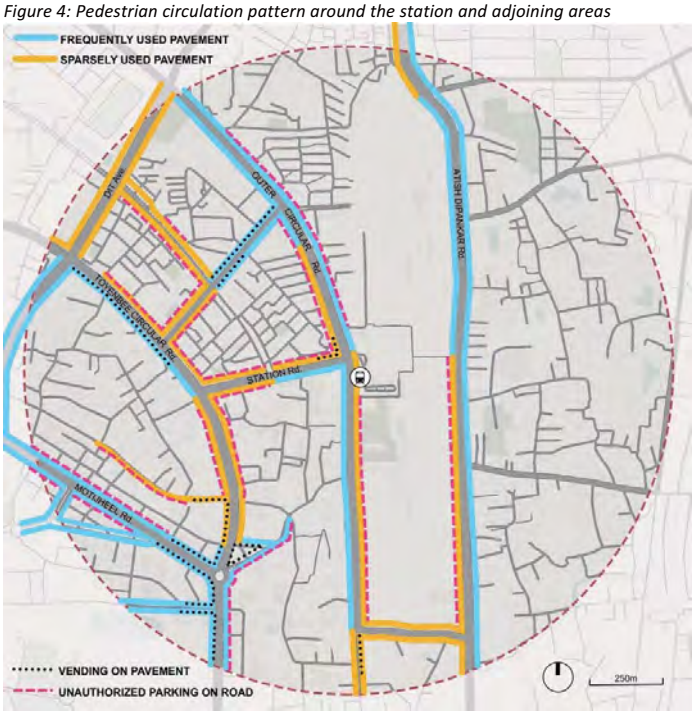


Image 5: Homeless people living in pavement

Image 6: Parking beside pavement

Image 7: Vendors in pavement and road

Image 8: Newly constructed pavement

Residents of Kadamtala, Mugdapara and Maniknagar, when they need to come to Motijheel have to travel more than one (1) kilometer since the entire railway track, the station and ICD are surrounded by a wall. The traffic halts for a long time when trains move near TT Para rail crossing.

The most convenient alternative is to walk across the platform through a foot over bridge provided by the BR. From Mugdapara, the bridge can be accessed from both side of Atish Dipankar Road. From the station side, pedestrians can access from two locations: one in front of the delivery area of the railway storage (location A) and the other one near the main terminal connected to the commuter terminal parking area (location B).

Results of the pedestrian survey in these locations show that around 47 percent of the pedestrians at the foot over bridge are from within Kamalapur area and 53 percent are from areas outside Kamalapur, but within Dhaka. The destination of the majority (94%) are within Kamalapur.

A count during morning peak and off peak hours for half an hour illustrated the nature of pedestrian users of the foot over bridge.

Time	**Number in Location A**	**Number in Location B**
8.45 – 9.15 am	1118	1246
11.00 -11.30 am	482	807

Pedestrians interviewed at the foot over bridge generally expressed dissatisfaction with their overall walking experience. Majority express that they are dissatisfied with the conditions of pavements and crossings, personal safety especially for women and children. Protection from adverse weather condition, places to sit, things to see and do; and visual appearance, options for transferring to other modes added to the list. They are neither satisfied nor dissatisfied with adequacy of pavements, street lighting, and availability of signage and street signs.

Figure 5: Location of foot over bridge across the rail track

Pedestrian survey in Location C near the BRTC depot illustrates that most pedestrian come from Kamalapur area (85%). Almost half (48%) are bound to Kamalapur area and the remain 52 percent are bound to areas outside Kamalapur, but within Dhaka.

Overall, 69 percent of the pedestrians originate within Kamalapur area while 31 percent are from other parts of Dhaka. Around 68 percent walk towards Kamalapur area while 32 percent are going outside Kamalapur area. Seventy-one percent (71%) of the pedestrians walk/travel in the area every day.

Majority of the pedestrians walk to or from work (84%) while five (5) percent go to or from school. Eight (8) percent of pedestrians express that the walk to do errands in the area. The two survey areas exhibit the same pattern.

Pedestrians interviewed in the location are generally satisfied with availability of pavements and their conditions, adequacy of street lighting, ease in transferring to other modes (bus and/or railway, and personal safety in pavements and street crossing. However, they are leaning towards dissatisfaction when asked about connectivity of the walkways towards their destinations, and protection from adverse weather conditions, places to sit, things to see and do, visual appearance, cleanliness of the surroundings. Majority of them express dissatisfaction in terms of ease in crossing the streets and availability of street signage. Annex 2 for has details of the findings.

Image 9: Foot over bridge across platform

Image 10: Access and interchange point

Image 11: Foot over bridge along platform

Image 12: Access and interchange point

2.2.5. Vehicular circulation pattern and parking

Majority of the residents work within Kamalapur area (61%) and they generally travel by rickshaw, minibus or walk to work.

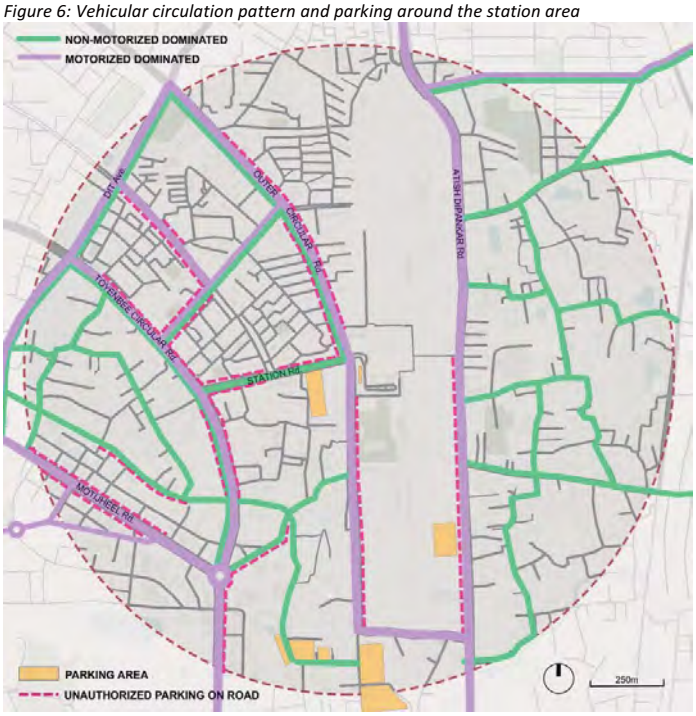
All roads and streets in the area are two-way. Also, both motorized and non-motorized vehicles ply in these roads and streets. However, as shown on the map, some roads are dominated by motorized or no-motorized vehicles while some have almost equal presence.

There are very few designated parking spaces for buses and trucks, and none for cars. Lack of parking space serving the CBD is one of the key challenges of the area. Cars and staff buses are parked along the roads, often during office opening and closing times.

There is a parking area for trucks using the ICD. However, it is inadequate for the number of trucks using the ICD and, therefore, they spill over to Atish Dipongkor Road.

Also, two intra-city bus routes start from Kamalapur which do not have any designated lay over space. They usually park along roads, for example along Outer Circular Road.

Figure 6: Vehicular circulation pattern and parking around the station area



2.2.6. Bus operation profile

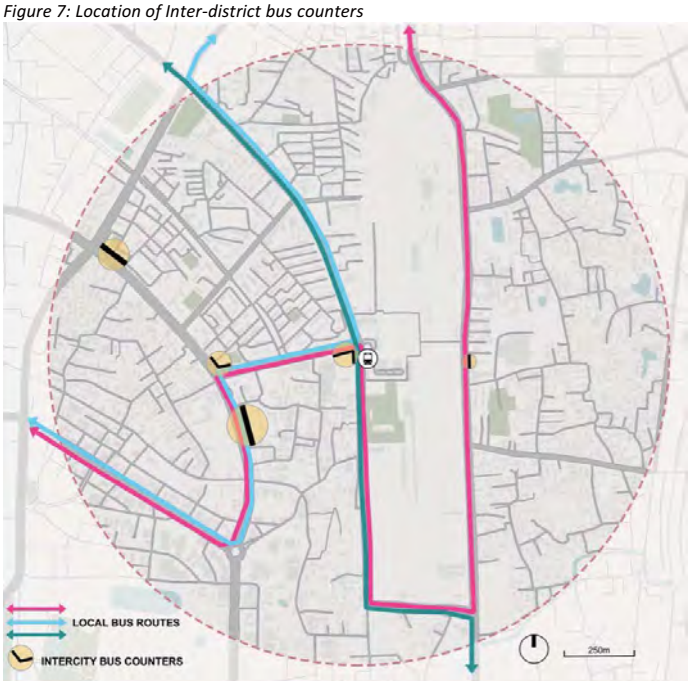
Some inter-district buses connecting south-eastern districts of the country operate from Kamalapur as spill over from the Saidabad bus terminal. Most of the bus counters or waiting areas are located along the Toyenbee circular and Atish Dipongkor roads as shown in the map.

A total of 16 bus operators operate from Kamalapur area. Majority can be considered medium-scale operators, with 44 percent owning 10-29 buses and 19 percent owning 30-49 buses. Only two operators have a fleet of 50 or more buses. In terms of bus type, the fleet of bus companies surveyed are mostly mini-buses (73%) and non-air conditioned (82% of total) buses. Only a few operators offer air-conditioned bus services. Most of the buses owned by the bus companies surveyed run on diesel (93%).

In terms of age, all of the buses are less than 10 years old. 69 percent of these buses are less than 5 years old. A study, however, indicated that determining the age of buses can be less straightforward as the age of imported buses are counted from the date of registration in Bangladesh and not by the year it was made. At the time of the survey, 89 percent of the total number of buses are operational. About 93 percent of the large buses and 86 percent of the mini buses are in operation.

The bus companies surveyed service a total of 48 routes, almost all are considered long distance (greater than or equal to 100 km). The average route length is 218 kilometers. Since buses along these routes take long time to reach their destination, buses can only make one round trip (e.g., from origin to destination and back) is 1. Fifteen (15) bus operators have one (1) ticket counter in Kamalapur. Only one operator has two (2) ticket counters. See Annex 3 for details.

Figure 7: Location of Inter-district bus counters



2.2.7. Bus passenger profile

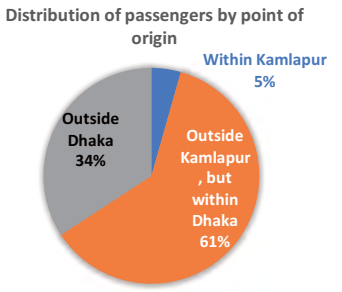
A total of 500 bus passengers of inter-district buses were surveyed in the area. Results show that the passengers are predominantly young male (90%), with average age of 33 years. They travel to visit family/friends (46%), go to/from work (17%) because majority are working as office employees (26%) or are engaged in business (26%). Around 39 percent of the trips happen once a month and 24 percent take the trip at least once a year. This shows that majority of the respondents are considered migrant population, whose familial and social ties lies outside Dhaka.

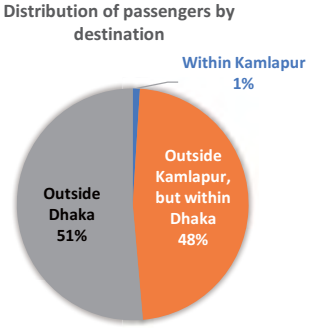
Majority of passengers (98%) riding the buses from point of origin to Kamalapur area use non-air-conditioned buses; on the other hand, from Kamalapur to destination majority use air-conditioned buses (71%). Depending on the private and public bus operators, the percentage of passengers from areas outside Dhaka varies from half to 83 percent. On average, 42 percent of the respondents originating from within Dhaka, but outside Kamalapur area take a trip to go other parts of the country.

Around 61 percent of the respondents are satisfied that the buses are accessible. Only around 40 percent of the respondents consider that buses are adequate for their travel needs. Half of the respondents disagree that buses are on schedule. The hours of service generally do not meet the respondents' needs. Around 77 percent of the respondents expressed that there is no information available that would help them determine routes and schedules. Therefore, 44 percent respondents are generally dissatisfied and 13 percent are completely dissatisfied with the reliability of bus services.

Bus passengers covered by the survey are generally dissatisfied with bus operation services in Kamalapur. More than half of them expressed dissatisfaction in 8 of 18 key areas of assessment. These include adequacy of buses, reliability of bus service, reasonableness of travel time, courtesy of drivers and bus supervisors, safety and reasonableness of driving, safety of pick up and drop off points, adequacy of waiting area, and protection of passengers from heat and rain.

Moreover, majority of bus passengers are neither satisfied nor dissatisfied in the ease of transferring from bus to bus, personal safety while riding the bus, reasonableness of waiting time, cleanliness and comfort of buses, ease in identifying buses and availability of information on bus schedule. Bus passengers have expressed satisfaction in two key areas: accessibility of buses and reasonableness of bus fares. See Annex 4 for details.





2.2.8. Interchange between different modes of transports

There are currently four types of interchange between different modes of transports within the study area:

a. Inter-district bus ↔ Intra-city bus
b. Train ↔ Non-motorized vehicles
c. Motorized vehicles ↔ Non-motorized vehicles/ pedestrian
d. Non-motorized vehicles ↔ pedestrian

Passengers interchanging from local transport to inter-district buses usually wait half an hour in counters. Bus passenger survey shows that they use rickshaw (24%) and CNG driven three-wheelers (11%), while the rest use local buses or private cars. Around 54 percent of the passengers expressed dissatisfaction with the relative ease in transferring from bus to bus or from bus to other modes of transport.

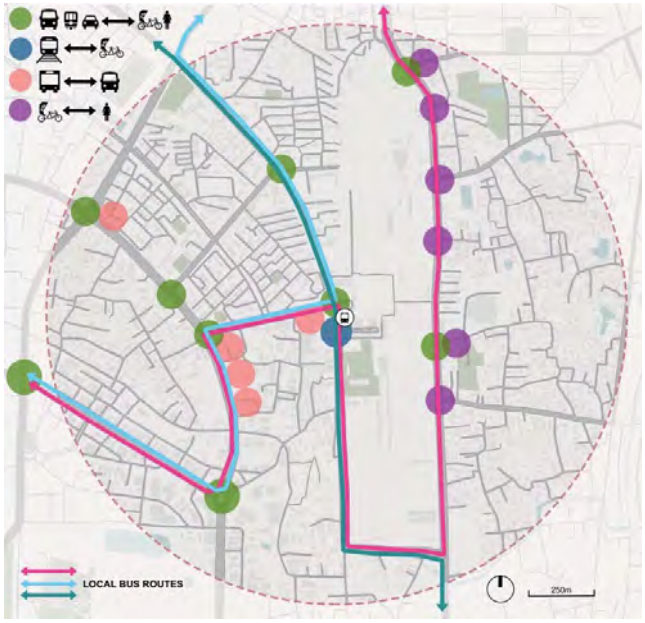
Majority of the rail passengers use local buses from point of origin to Kamalapur station (44%). Around 25 percent use rickshaws while 16 percent use other motorized vehicles. Only 2 percent passenger walk to the station.

A count of vehicles plying and stopping during weekday for six hours, ten minutes for different types of vehicles every hour in front and opposite of terminal illustrate a dominance of non-motorized vehicles.

Types	Opposite to station	In front of station	Pickup/ Drop-off area
Bus	43	17	13
Minibus	31	14	4
Human Hauler	29	6	0
CNG driven three-wheeler	253	125	163
Rickshaw	1,108	373	795
Bicycle	8	21	0

Most passengers along Atish Dipongkor road transfer to non-motorized vehicles or walk to travel inside the residential area.

Figure 8: Interchange location between different modes and bus routes



2.2.9. The Railway station

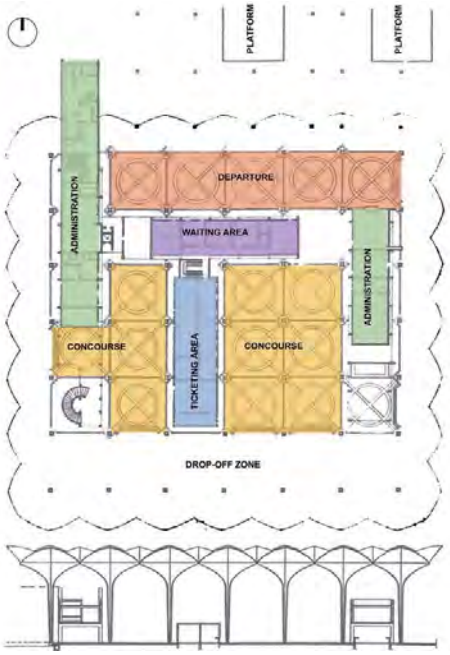
Kamalapur railway station, a key modernist building in Dhaka city designed by American architects Daniel Dunham and Robert Boughey, was completed in 1968[3]. The iconic parasol roof – a unique cusped shell concrete canopy – reminisces the form of lotus.

The roof is divided into six 25 feet square bays on each side. The roof covers a series of interlinked functional spaces: 10 platforms, 11 booking counters, several eateries and two passenger lounges. The station building offers a flexible and adaptive space with potentials for expansion of the support spaces within. A marriage between structural and spatial conception culminated in an aesthetically sound and culturally sensitive design.

In 2015-16, the Kamalapur Railway Station served over seven million passengers (around 20,000 passengers per day) and a million kilograms of goods.

Image 13: Kamalapur Railway station

Figure 9: Plan and elevation of Kamalapur railway station



[3] Adnan and Nahar, 2017, DAC

2.2.10. Rail passenger profile

A rail passenger survey conducted in December 2017, shows that majority of the rail passengers are from areas outside Kamalapur, but within Dhaka city (60%). Almost all of them are traveling outside of Dhaka. Majority of the rail passengers travel once a month (59%).

Rail passengers interviewed are generally dissatisfied with their overall rail travel experience. Majority express that they are dissatisfied with (a) personal safety while on board, (b) length of time the journey was scheduled to take, (c) comfort of the seating area, (d) frequency of trains, (e) capacity of rail cars, (f) reliability of trains, (g) reasonableness of waiting time, and (h) cleanliness and comfort of rail cars.

Rail passengers expressed satisfaction in the following areas of rail station services: adequacy of information on route and schedule, adequacy in connections with other modes of public transport, and ease in transferring from/to other modes of transport. Fare is considered reasonable.

However, they express dissatisfaction in the services and amenities provided by the Kamalapur railway station. In particular, they express dissatisfaction in: ease in buying tickets, personal security at the station, safety of women and children, safety of the surrounding area of the rail station, adequacy of wash rooms and comfort rooms for female passengers, cleanliness of the station, and provision of feedback or complaints mechanism. Rail passengers are neither satisfied nor dissatisfied in the adequacy of lighting of rail station at night and adequacy of security personnel at the station.

Rail passengers consider the following improvements: make buying of tickets easy (first priority), improve security at the rail station (second priority), and provide adequate washrooms for both male and female (third priority). Annex 5 contains details of the survey.

Image 14: Main concourse

Image 15: Interchange to motorized and non-motorized transports

3. CONCEPTUAL PLANNING FOR TRANSIT ORIENTED DEVELOPMENT

3.1. Vision

Eastern side of the Kamalapur station (comprising of Ahmedbag, Mugdapara, Maniknagar, and Kadamtala) are sparsely connected with the proposed MRT station area, existing railway station and the commercial business district. Residential area, to the north of the station, are low-density, residents of which mostly travel short distance for work and others necessities. Area to the south of the station are within the catchment area of Motijheel station of Line 6. Potentially residents of the eastern side will be the main users of the Kamalapur station to access MRT network. However, the inadequate pedestrian foot over bridge above the railway platform is the shortest and most frequently used option for them. Local bus service and other vehicular access options for them are disrupted by railway crossing.

Connect eastern part of the Kamalapur station to the MRT network and CBD.

One of the key visions for Kamalapur will be to connect the eastern part of the TOD focus area with MRT network and CBD.

Kamalapur railway station is the main hub for railway network. BRTC bus depot located near the station is the main hub for public bus operator who operates in different districts within the country and to international destinations in India. Some of the local bus routes terminate and originate in Kamalapur. Non-motorized vehicles are allowed in all roads to serve the short-distance travel requirement of people working in CBD, traveling from residential areas to educational institutes and hospital. Yet these modes of transport are not well connected, residents and users of these transport modes identified interchange between different modes to be problematic.

Create links between different modes of transports to improve mobility.

The TOD around MRT station will establish easy interchange and seamless transfer between different modes of transports.

Government housing in Kamalapur, apart from railway housing and station yard, cover approximately 425,500 m^2 or 44.5 hectares of land. Most of the buildings for public-sector employees have been developed more than 50 years ago and are dilapidating. Also, the low-density development does not conform with the high demand for housing for both public and private sector employees serving the CBD. In the absence of retail and neighborhood facilities, different street-side markets have developed informally, vendors have occupied pavements obstructing pedestrian movement.

Rethink land use pattern for residential and mixed-use development.

TOD centering Kamalapur MRT station will rethink the land use pattern, especially to improve the quality of public housing, incorporate mixed-use development, and explore opportunities for partnership and affordable housing.

3.2. Accessibility

3.2.1. Pedestrian access to the station

The existing connection to the eastern side through the foot over bridge is inadequate and inaccessible to all. The users identified visual appearance and lack of activities among others reasons for their dissatisfaction about the bridge despite recognizing its necessity.

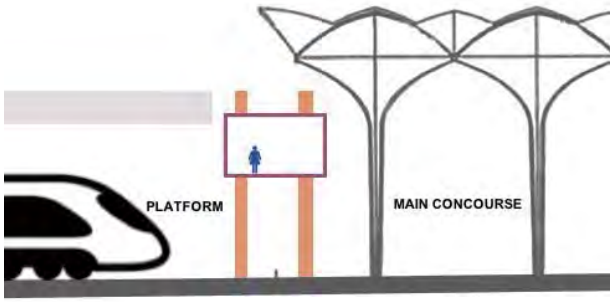
A new connection can be conceptualized in between the parasol roof of the concourse and platform as shown in figure 10. There can be different advantages – the connection will work as a shade for the connection between the concourse and platforms, pedestrian on the connection will have visual linkage to trains, seamless vertical connections can be established between elevated pedestrian way, to the railway concourse and the under-ground MRT platforms. Planning in such location will create limited disturbance to the activities of railway station, ICD and visual appearance of the iconic terminal structure.

The grade separated connection can terminate in public plaza near the Hospital in Mugdapara. In such scenario, hospital users will be able to take advantage of the MRT.

New pedestrian prioritized streets have to be created within the neighborhoods on the eastern side to make the area accessible with walking for 10- 15 mins. As a short-term strategy, some of the existing connectors can be improved with pedestrian access and interchange facilities to non-motorized vehicles. New development of the area will be guided to design new connectors.

New underground connections across the ICD area can be conceptualized without hampering the ICD's functioning. However, such option need careful consideration for making them safe with activities along the path and flood protection since flooding and waterlogging risks are higher in Mugdapara and surrounding areas.

Figure 10: Conceptual pedestrian connection between concourse and platform



The major connecting roads of western side of the station area have pavements. Some of them are used frequently, but some are not due to their poor physical conditions, street lighting and furniture; lack of activities on the street frontage. In many places vendors and other activities occupy the pavements. Unauthorized parking and lack of visibility make the pavement unsafe.

As a short-term strategy, the streetscape of Station road, Outer circular road, Toyenbee circular road and Mazar road can be improved to accommodate more pedestrian and create a pedestrian network.

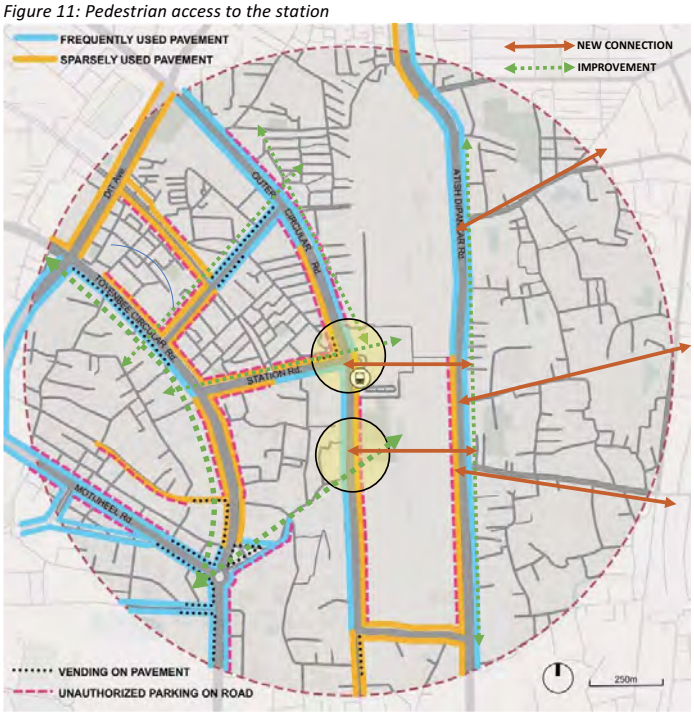
In order to better connect with the Motijheel station of Line 6 near Shapla chottor, the Culvert road can be expanded with adequate pedestrian-oriented facilities.

Organizing and managing vendors beside these pavements can make the streetscape lively and attractive.

As a long-term strategy, the government housing area can be redeveloped with mixed-used buildings and public facilities along the main connectors like the Mazar road, Station road and Culvert road.

In such scenario, one option can be to convert Station road as pedestrian only access to the MRT station which will facilitate short transfer to Motijheel station through Toyenbee circular road and provide better pedestrian access to CBD from MRT.

Figure 11: Pedestrian access to the station



3.2.2. Motorized vehicular access and parking

Traffic management in Motijheel and Dilkusha areas, especially in terms of parking, is already problematic. With the introduction of Motijheel station of MRT Line 6 and Kamalapur station of Line 1, it expected that the traffic congestion will be reduced.

However, some existing roads can be better managed as one-way, some can be converted to accommodate on-street car parking. The non-motorized transport dominated roads can have interchange points for better management as well. Roads with both motorized and non-motorized vehicles can have dedicated lanes to improve speed.

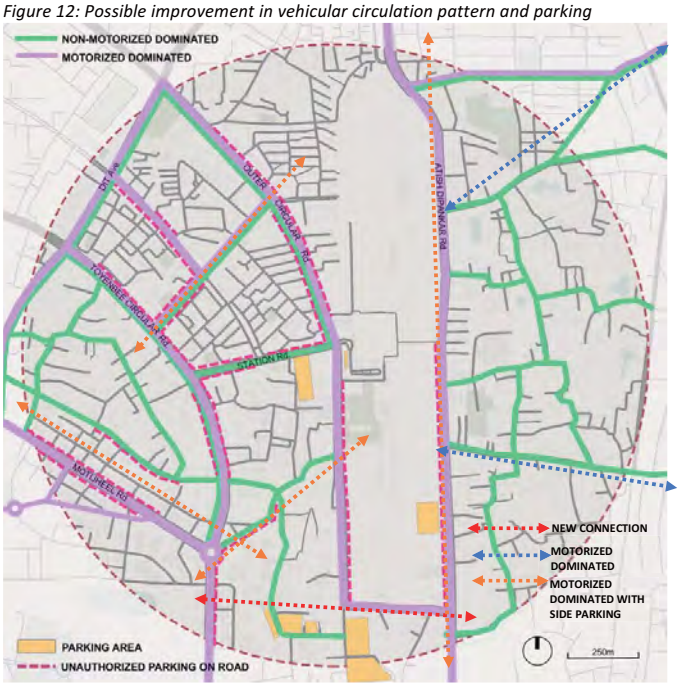
If mixed-used development is explored in place of public housing, parking guidelines and codes need to be followed to accommodate new parking needs. The development can incorporate parking lots for commercial usage to meet the demand of CBD.

New road can improve connectivity of inter-district buses travelling through Saidabad from Toyenbee Circular and Atish Dipongkor roads. A north south connection between these two roads beside private bus parking areas can ease the traffic of inter-district buses.

Saidabad bus terminal and BRTC bus depot have parking spaces, both of these terminals need to enhance traffic management to avoid spill over in the adjoining roads. Private parking garage for buses can be formalized to develop as parking lots.

ICD must develop better parking facilities for the trucks and covered vans using the depot.

Figure 12: Possible improvement in vehicular circulation pattern and parking

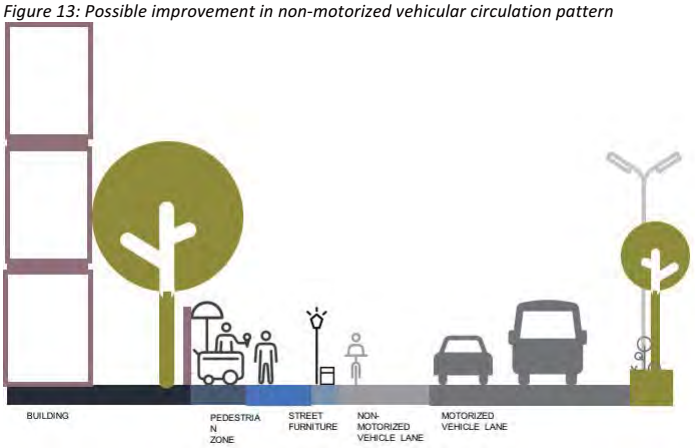


3.2.3. Non-motorized vehicular access and parking

The dominance of non-motorized vehicles and pedestrians going to work and other places can be considered as opportunity for TOD planning in Kamalapur.

However, non-motorized vehicular movement needs to be better managed with planning for dedicated lanes, signaling, pedestrian friendly crossing and interchange points. None of the roads should be made off-limit to non-motorized vehicles like other parts of the city. The physical survey illustrates that Mazar road, DIT road, Outer circular road and Toyenbee circular road are wide enough to accommodate lanes for non-motorized vehicles.

Figure 13: Possible improvement in non-motorized vehicular circulation pattern



3.2.4. Interchange between modes

Interchange between different modes need to be given priority considering the users' response from the survey. Since Kamalapur will not be developed as a multimodal transport hub, rather different modes located near-by will be connected; access to different modes and interchange will have to be designed in different locations. These points need to be designed with street lights, pedestrian crossings and signaling to make them accessible and safe.

3.3. Diversification of land use

3.3.1. Housing development

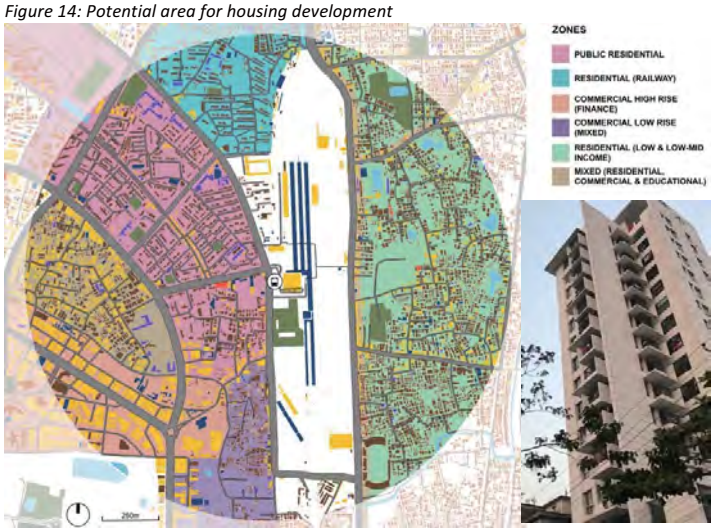
The existing government housing stock located in Kamalapur (AGB colony, T&T colony, and Bangladesh Bank colony) is situated on approximately 44.5 hectares of land, while railway housing is located on additional 42 hectares, part of which is within the one (1) km radius of the station area. Most of these public housing is low density and some in very poor conditions. New buildings are developing in isolation to address the housing demand for government employees without any comprehensive planning.

There is enormous possibility to develop the entire area through comprehensive planning for housing and supporting facilities. The land ownership by the government is an opportunity for development. The MRT station can contribute to the housing development by providing easy access to work and other facilities through Line 1.

On the eastern side of the station, high density private housing has developed by individual owners without any prior planning guidelines. The area can be redeveloped using different land management methods. There is demand for new and affordable housing with community facilities, the development by real estate developers are indication of those demands.

The eastern side of the station is part of the Eastern Dhaka, which is expected to experience major development as city's land become saturated on the other sides. Adopting TOD for the area can be seen as example of better urban living conditions.

Figure 14: Potential area for housing development



3.3.2. Mixed use development

Motijheel and Dilkusha commercial areas developed during early 50s and 60's as CBD central business district without any planning for diversified land. The area become almost dead after dark. Similarly, ICD isolates residential areas to the east of the station by the high boundary wall without any street frontage. Large part of the area become unsafe after dark. Different commercial, retail and community facilities have developed within government colony and along the main connectors of the eastern part to support the neighborhoods.

There are possibilities to diversify land use in the area and promote mixed-use development. The area on both side of the station road can be planned for such development that will encourage pedestrian activities along the main connectors to the MRT stations. A few roads can be developed for pedestrian only with retail and commercial activities with vehicular access on time sharing basis or in emergency. Similarly, Mazar road and Culvert road can be converted to have both pedestrian and vehicular access with retail and commercial activities as street frontage.

The long stretch along the Atish Dipongkor road can be developed to attract pedestrians and create interchanging points to different modes of transport. Such planned development will complement the increase in land value that usually MRT brings to any area, also serve the adjoining neighborhood.

Figure 15: Potential improvement in interchange between different modes

3.3.3. Partnership for development

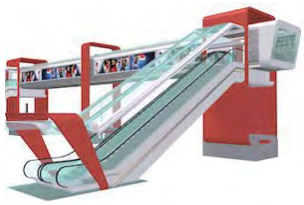
Mixed used development can be strategically planned to encourage partnerships among different groups, for example, public private partnership. Such development can explore affordable housing for different income groups for bringing diversity in the area.

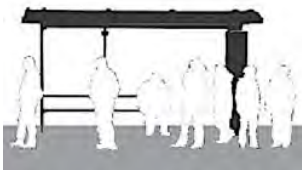
4. SCHEMATIC DESIGN OF THE STATION

4.1. Key considerations for site development

- Retain and renovate the iconic Kamalapur Railway Terminal building.
- Improve streetscape of Station road (preferably with pedestrian access only).
- Design public plaza at the entrance of MRT station.
- Improve connection across ICD and railway tracks.
- Improve streetscape of main connecting roads and streets.
- Provide parking facilities for non-motorized and motorized transport and local bus.
- Design bus stop for local bus.
- Consider future expansion of railway terminal and tracks.
- Propose new corporate office for Bangladesh Railway.
- Introduce formal and informal commercial activities.
- Retain existing greenery.

These considerations are incorporated in schematic site plan (Figure 16).





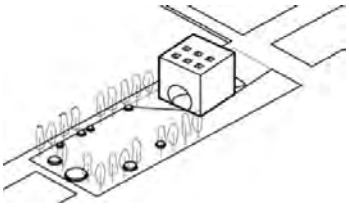


Figure 16: Site plan