

**THE PREPARATORY STUDY ON THE DHAKA
MASS RAPID TRANSIT DEVELOPMENT
PROJECT (TOD) IN BANGLADESH**

**FINAL REPORT
SUMMARY**

DECEMBER 2018

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

**ALMEC CORPORATION
ORIENTAL CONSULTANTS GLOBAL CO., LTD.
NIPPON KOEI CO., LTD.
KATAHIRA & ENGINEERS INTERNATIONAL**

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1 Study Outline

Faced with extreme traffic congestion and deteriorating urban living conditions, Dhaka, the largest metropolitan area and rapidly urbanizing capital of Bangladesh, has embarked on the **development of a much-needed mass rapid transit (MRT) network**, with the support of Japan's International Cooperation Agency (JICA). According to Dhaka's Strategic Transportation Plan updated in 2014, the MRT network will include five lines, running both above- and underground. While Line 6 already is under construction, Line 1 and Line 5 currently are in their planning stage. The present executive summary synthesizes the results of the **preparatory study for Line 1 and Line 5**, conducted by a JICA study team between summer 2016 and spring 2018.

Line 1 and Line 5 constitute **major backbones of Dhaka's transportation network**. They will create connecting nodes with other mass transit lines and strengthen connectivity between Dhaka's city center and major places of the fast-urbanizing region, such as Dhaka International Airport, Kamalapur central train station, the new town of Purbachal, and Notun Bazar. With 19 stations, Line 1 is planned to develop along two branches, one running north-south parallel to Line 6, and the other running east-west towards Purbachal New Town. Line 5 will intersect both Line 1 and Line 6 with a major transfer point at Mirpur station.

The present preparatory study promotes an **integrated approach to urban and transportation planning, also known as "transit-oriented development" (TOD)**. When supported by an MRT system such as Dhaka's, TOD presents great potential to enhance long-term benefits of urban and transportation planning, in terms of economic development, sustainability, and livability. Nevertheless, successful TOD **requires concerted efforts and early coordination** of a wide range of stakeholders, both public and private, in charge of urban and regional planning, transportation, urban design, and urban land development. It was outside the scope of this study to identify in detail the institutional arrangements needed to make TOD feasible in Dhaka; however, it was precisely the object of the study to pave the way for a common understanding of the importance of TOD. It is particularly timely to start thinking and planning for TOD in the current preparatory stage of Line 1 and Line 5, given the opportunities provided by the upcoming construction stage to re-arrange land uses and transportation access in the station areas.

Concretely, for each station of Line 1 and Line 5, the study highlighted TOD opportunities and challenges in the station's catchment area, defined as the 1,500-meter radius circle surrounding the station. The focus was on the station area level because successful integration of land use and transportation at this level is critical for the success of TOD at the city- and regional levels. The study insisted on **three key conditions for successful TOD at the station area level**: (i) good station **accessibility**, especially for pedestrians, (ii) smooth connections between MRT and other transportation modes, also referred to as **intermodal integration**, and (iii) density and diversity of **land uses within walking distance of the station**. All three conditions can be met through careful design of a station plaza next to MRT stations.

For each station area, the study team formulated a series of concrete recommendations to

arrange for a **station plaza**, inspired by the long and successful Japanese experience of TOD planning since the post-WWII reconstruction era. All recommendations were developed considering the local context, including existing land uses, road access, and the legal and regulatory framework for urban and real estate development.

In addition, the study team conducted **three detailed case studies** applying to the stations circled in red in the figure below. The first study concerned Purbachal New Town, which is planned to have four Line 1 stations. The other two case studies concerned Gabtoli and Kamalapur stations, on Line 5 and Line 1 respectively.



Prepared by JICA Study Team, based on Google Earth

Figure 1.1 Map of Line 1, Line 5, and Line 6, with detailed case study locations

The present summary is organized as follows. After this introduction, a background section reviews two contemporary trends justifying the urgent need for an efficient MRT system in Dhaka, that of rapid urbanization and motorization of transportation modes. The two combined trends explain how congestion and pollution levels are getting worse every day, making Dhaka increasingly less sustainable and livable for its residents. The following section sets the grounds for successful TOD in Dhaka, based on a summary of the TOD opportunities and challenges highlighted in the extensive final report. Finally, the three case studies are summarized in the penultimate section, before presenting some brief conclusions and recommendations for successful TOD implementation in the next stages of Line 1 and Line 5 preparation.

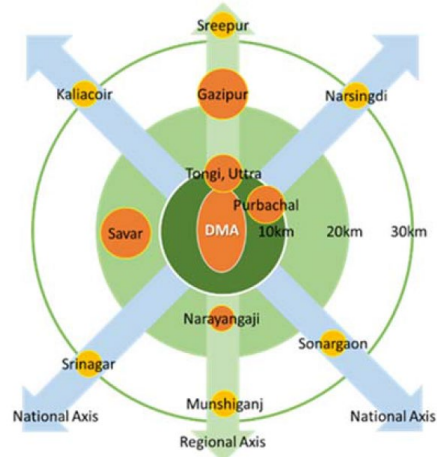
2 Urban and Transportation Planning Trends

2.1 Urban Development Context

Several characteristics of Dhaka's urban context are favorable to the success of MRT, especially if future land uses are truly integrated with urban transportation systems through TOD. First of all, Dhaka is known for being a **particularly dense city**, an important factor to ensure high patronage of the MRT system. Furthermore, **high-intensity mixed-use development** is common in Dhaka, especially along major arterial roads where commercial and industrial uses are commonly interwoven in the urban fabric with

residential uses. This form of **mixed-use development shall continue and be promoted in the future, especially near transit stations and along transit corridors**. Density and diversity of uses are important conditions for sustainable urban development, so that urban communities can rely on transit for most everyday transportation needs between homes, jobs, and other activities, in various locations of the rapidly expanding urban area.

Dhaka's population was **9.3 million inhabitants in 2011**; the city's population is expected to reach **13 million by 2035** and one of the highest population density in the world with 437 inhabitants per hectare. These figures concern Dhaka's Metropolitan Area (DMA) only, and exclude six sub-centers driving most urban growth in the region: (i) Gazipur, (ii) Purbachal, (iii) Sonargaon, (iv) Narayanganj, (v) Kareniganj, and (vi) Savar (see figure to the right). Each of these sub-centers will exceed 1 million inhabitants by 2035, except Sonargaon with 0.6 million. Gazipur and Savar, are rapidly becoming the two largest regional sub-centers, with more than 3.5 million inhabitants expected in each center by 2035. Narayanganj will have over 2 million inhabitants, Purbachal 1.6 million, and Kareniganj 1.1 million. Altogether, the region's urban population is expected to reach 26 million by 2035.



Source: RSTP

Figure 2.1 Future regional structure of GDA proposed in RSTP

As the historic urban center, **DMA concentrates core administrative functions, financial and commercial activities**, as well as industrial and residential activities. Yet, most of DMA's urban development occurred **without planning**. The southern part of DMA has the highest density in the urban region although it is most prone to natural disasters, especially inundations. There is basically no land available for large planned development in the south of DMA. In contrast, the northwestern areas have experienced massive development over the last few decades. In the relatively recent neighborhoods of **Gulshan, Baridhara and Banani, land and infrastructure development were properly planned**, with a hierarchized road network, dedicated areas for residential, commercial, and institutional land uses (including parks), and mixed uses along major arterial roads. The three neighborhoods now offer the best urban amenities and living conditions in the region. As a result, they soon became particularly attractive to foreign embassies, expats, upscale businesses, and high-income households, but highly unaffordable for other residents.

Most urban growth in Dhaka region is taking place outside DMA's boundaries, where land is available and exposure to natural disasters relatively low. Gazipur has been developing to the north, Savar to the west, and Purbachal to the east. **A new town planning model is being promoted** for these sub-centers. More information is provided below on the institutional and regulatory context supporting this model and its regional integration through transportation. Furthermore, Purbachal is the subject of a detailed case study.

2.2 Urban Transportation Context

2.2.1 Transportation modes and modal shares

Non-motorized transportation modes, especially walking and cycle rickshaws represent the **vast majority of all trips** in Dhaka. Compared to other fast-urbanizing regions of emergent economies, Dhaka is special in this sense for its extremely low dependence on motorized, carbon-based, and therefore polluting transportation modes. This background situation should be seen and used as **an asset to support future sustainable development** of the city. Existing non-motorized transportation modes have potential to become great complements to MRT so users can travel to and from MRT stations in a clean, healthy, and convenient manner.

- (i) **Walking** is indeed the dominant transportation mode in Dhaka. According to the most recent travel survey conducted for the revised strategic transportation plan in 2014, more than 50% of all trips were walking trips.
- (ii) Besides walking, Dhaka's streets are famous worldwide for the very large number of **cycle rickshaws** circulating the streets. They meet more than 25% of the transportation demand. There were more than 330,000 new rickshaws registered between 2004 and 2013, an underestimated figure given that a large number are not registered. Cycle rickshaws are the least expensive transportation mode after walking; moreover, they are environmentally friendly and provide a large number of low-skilled jobs in the city.
- (iii) Recently introduced in Dhaka, "**easy bikes**" powered by rechargeable electric batteries are a less labor-intensive version of cycle rickshaws.
- (iv) Finally, despite their low cost and high flexibility, **bicycles** have remained rare in Dhaka, in part for cultural reasons. It is deemed inappropriate for Muslim women to ride a bicycle. Nowadays, bicycles represent less than 2% of all vehicles on major arterial roads.

Another encouraging aspect for the prospects of MRT in Dhaka is the **high share of non-private transportation modes** in present day, including water vessels, intercity and commuter trains, buses and minibuses, human haulers, three-wheel rickshaws powered by compressed natural gas (CNGs), and cycle rickshaws mentioned above. Coupled with the fact that walking is the dominant transportation mode, such dependence on non-private transportation modes should **facilitate the modal shift towards MRT** use in the future. Dhaka's supply of non-private transportation services is particularly wide and diverse.

- (i) Taking advantage of the five rivers surrounding Dhaka, **water transportation** plays an important role to carry commuters and long-distance travelers to the main port of Dhaka, Sadarghat.
- (ii) **Intercity and commuter trains** brings hundreds of thousands of passengers to the central train station of Kamalapur every day.
- (iii) **Buses and minibuses** represent the large majority of motorized trips on inner-city streets. They are operated either by the Bangladesh Road Transport Corporation (publicly owned) or by small private operators. The city has been encouraging the

introduction of new lines and additional bus services to meet the increasing demand for public transportation.

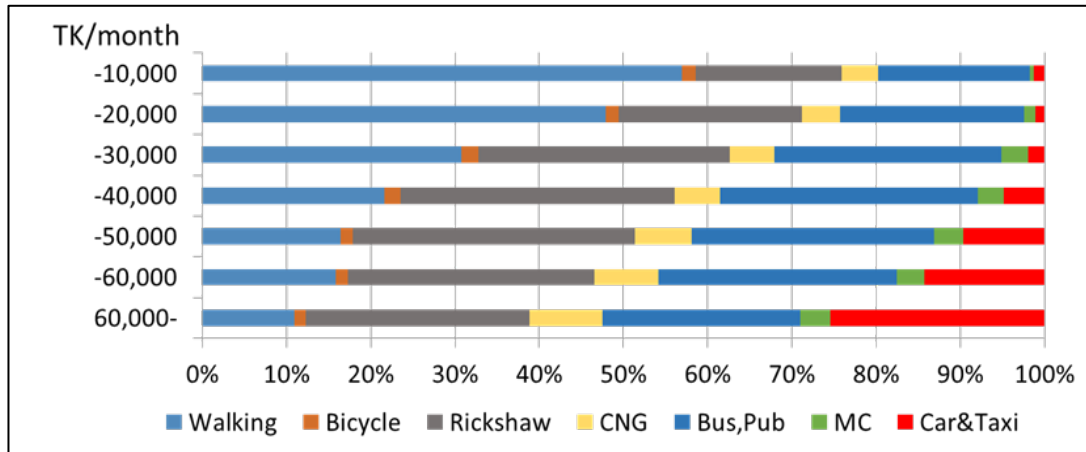
- (iv) **Human haulers** are a typically Bangladeshi road transportation mode. With a seating capacity of 10-20 people, they offer a smaller and more flexible form of public transportation than conventional buses.
- (v) **Three-wheel auto-rickshaws** are another typically Bangladeshi transportation mode. Since the old fleet of polluting “baby taxis” was entirely replaced in 2002 by clean three-wheel rickshaws powered by CNG, CNGs (for short) are an environmentally friendly transportation option used by more than 10% of the population every day. There were 23,500 CNGs in Dhaka in 2013.
- (vi) Finally, introduced after 2000 and operated by a number of private companies, **taxis** offer a more comfortable option than all other non-private transportation modes mentioned above. Yet they also are a much more expensive option that only higher-income population groups can afford. There were 9,000 taxis circulating the streets of Dhaka in 2013.

However, **private motorized transportation has been on the rise** for the last two decades, especially by car. The automobile modal share has been increasing dramatically since 2000, partly due to the growing number of taxis mentioned above, but also due to new registrations of private cars.

- (i) While the fixed initial cost to purchase a **private car** has become increasingly affordable to the emergent upper-middle class, the low operating cost is appealing as well since cars run on locally produced, and therefore rather cheap CNG. In 2009, the government put in place drastic measures to control automobile ownership growth, through huge import taxes in particular. Depending on the vehicle’s characteristics, import taxes represent between 30% and 500% of a vehicle base cost. This policy has proven effective to limit car registrations, which have more or less stagnated since 2010. The automobile represented a 30% modal share in 2014, including taxis and private cars.
- (ii) Finally, another aspect of the trend towards private motorization is the observed increase in the number of **motorbikes** in Dhaka. Although they do not represent a large share of all daily trips yet (< 5%), motorcycles have become increasingly popular over the last two decades due to their low initial price and operating cost, and high flexibility to navigate from door to door in congested traffic. Nearly 30,000 new motorbikes were added to the traffic of Dhaka in 2013. The government has also attempted to limit motorbike ownership growth with the introduction of import taxes since 2011.

Urban transportation trends are closely related to the income structure. Indeed, **modal shares vary by income** as illustrated by the figure below, and the walking and automobile shares (including private cars and taxi) show the most variation by income. On the one hand, walking is the dominant transportation mode for people in the two lowest income groups (more than 50% of all trips), whose monthly income is below TK30,000, whereas it represents barely more than 10% of all trips in the highest income group above TK60,000. On the other hand, whereas the share of automobile trips (both taxis and private cars)

approaches zero in the lowest income group, it represents about 25% of all trips in the highest income group. Therefore, there appears to be a substitution effect from walking to private motorized modes as income increases, which suggests an on-going **motorization trend** supported by economic development. **Demand for private motorized transportation is expected to increase in the future** as households' income will continue to increase.



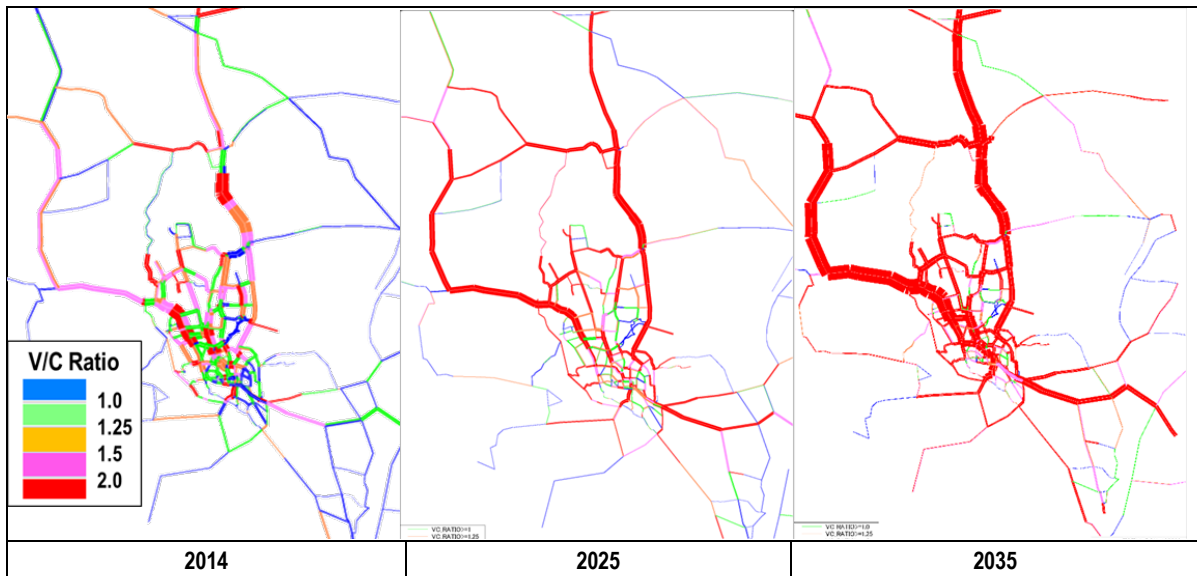
Source: RSTP travel survey

Figure 2.2 Modal shares by income

Finally, the **overall transportation demand is expected to increase** with economic development and urbanization. The total number of daily trips generated by Dhaka's population in 2014 was still rather low, less than two trips per person per day for people with a monthly income inferior to TK30,000, and slightly above two trips per person per day for people of higher income groups. As lower income groups represented the majority of the population, they also generated the majority of all trips (77%). With economic development and rising incomes, people's lifestyles are changing and the demand for discretionary trips (non-work related, for leisure or shopping for example), is likely to increase. With the urbanization trend, trip lengths are also likely to increase. Most transportation demand increase is expected to come from urban sub-centers such as Gazipur, Purbachal, Sonargaon, Kareniganj, and Savar.

2.2.2 Urban Transportation Challenges and Opportunities

Dhaka's transportation sector faces many challenges today, but the root cause is a **very strong competition for scarce road space**. This root problem explains many inefficiencies of all road-based transportation modes reviewed above, and resulting negative externalities such as **extreme congestion, air pollution, fatalities and injuries** due to traffic accidents. Local geographic and climatic conditions tend to worsen these negative externalities, especially during the rainy season when the streets of Dhaka are subject to many inundations. Furthermore, all these issues tend to aggravate rapidly due to the on-going motorization trend and travel demand increase. The figure below shows the expected vehicle/road capacity (v/c) ratios in 2014, 2025, and 2035 on major transportation roads of Dhaka according to the revised strategic transportation plan. If transportation networks were to remain the same, the situation would be one of a complete gridlock by 2035.



Source: RSTP travel survey

Figure 2.3 Expected road transportation demand by 2025 and 2035

Along with the provision MRT, several measures need to be taken simultaneously in order to overcome transportation challenges, including (i) consolidating road networks, (ii) re-allocating road space in compliance with passenger volumes, (iii) enhancing pedestrian safety, and (iii) greening the transportation sector. Besides shifting future travel demand from automobiles to MRT, the planning and construction stages of MRT Line 1 and Line 5 constitute unique opportunities to implement such measures. Not taking such measures would constitute a great economic loss, considering congestion, pollution, and traffic fatalities represent a great social cost for the economy.

- (i) **Need to consolidate road networks.** Like many cities of emerging economies, Dhaka’s urban core developed as a walking city, in an unplanned fashion. As a result, there are **many missing links** especially within the secondary road network, and between the primary network of arterial roads and the chaotic network of access roads to dense residential areas. Such **poorly hierarchized road network** is not well suited to accommodate the rising demand for private motorized transportation in Dhaka. In recent years, many efforts have been made to **expand Dhaka’s road network**. With the support of the Asian Development Bank (ADB) in particular, the city has engaged in the construction of many elevated lanes over existing roads. Whereas such **overpasses** for motorized transportation only seem to alleviate traffic congestion in the short-term, they do **not constitute an optimal long-term solution** in terms of sustainability and livability. For example, the busy DIT road with its many shops, stores, and restaurants, has long constituted an attractive area for city dwellers to shop around, but it has become much less pleasant now that an overpass flies over it. It is much darker and feels very enclosed compared to before, notwithstanding the perturbations caused for shoppers and business owners alike during the construction time. Moreover, according to economists’ “fundamental law of road congestion,” additional road space always attracts more private vehicles, and therefore never alleviates traffic congestion in the long-term. This “law” has proven to hold true everywhere around the world.

- (ii) **Need to re-allocate road space in compliance with passenger volumes.** There is an unsustainable inverse relationship today in Dhaka between road space allocation and passenger volumes by transportation modes. Whereas **most trips are walking trips**, not all roads have sidewalks where pedestrians have the right of way. Neither are there any pedestrian-only streets in Dhaka. **Buses and minibuses represent the vast majority of all trips** generated in the city (72%), where few vehicles suffice to transport large volumes of passengers (only 11% of all vehicles registered in the city are buses); and yet they do not have priority on the roads. In the current situation, they have to compete for road space with private automobiles, which on the contrary represent a very small share of vehicle trips (12%), but a large share of all registered vehicles (81%). In recent years, some efforts have been made to **better regulate road space usage by transportation mode**. It is now forbidden for rickshaws to circulate on major arterial roads. Trucks, which meet nearly all the demand for freight in the region, cannot enter the city in the daytime. Such efforts **need to be pursued and better enforced**, following the general principle that the most used urban transportation modes (walking and bus), which also happen to be the most sustainable ones, should have priority over private automobiles. Another issue to be solved is that of **idling public transport vehicles** (buses and rickshaws in particular), which occupy much road space when waiting for passengers in non-designated areas, therefore contributing to pollution and congestion. In Dhaka's current context of severe road scarcity, dedicating some precious road space to public transportation operation would actually help improve traffic circulation rather than impede it.
- (iii) **Need to enhance pedestrian safety.** Pedestrians are the **primary victims of traffic accidents** in Dhaka. This situation is mostly due to the fact pedestrian facilities' provision is not commensurate with the walking demand. **Sidewalks are lacking, as well as safe dedicated crossing spaces.** As mentioned above, priority is not being given to pedestrian flows in Dhaka but to motorized traffic. In order to avoid traffic interruptions, the city prefers building elevated pedestrian crossing bridges rather than arranging for conventional crosswalks protected with traffic lights. However, pedestrians tend to dislike these bridges and therefore often risk their lives crossing dangerously through moving traffic rather than making a detour on their walking route and climbing up and down many flights of stairs to use the crossing bridges. Moreover, elevated bridges are not accessible to all pedestrians, such as the handicapped or the elderly whose mobility is impaired. Consistent pedestrian safety policies need to be implemented in Dhaka to protect pedestrians from the dangers of motorized traffic. **At-grade crosswalks are preferable to crossing bridges.** Walking is a common and dominant practice in today's Dhaka; it should be encouraged as much as possible rather than discouraged or made dangerous. Urban transportation policies should **always give priority to pedestrian flows over motorized flows**. It is a matter of equity and sustainability for the future of urban transportation in Dhaka. As a healthy, clean, and free habit for everyone, walking will constitute an excellent complement to MRT-based sustainable transportation in the future.
- (iv) **Need to reduce greenhouse gases emissions in the transportation sector.**

Along with congestion, air pollution has been increasing dramatically due to rising transportation demand and motorization of the transportation sector. The government has been making **efforts to promote the use of CNG** rather than carbon-based fossil fuels. Most **auto-rickshaws now run on CNG** in Dhaka. The government has also been encouraging the introduction of **CNG buses**. **Such efforts need to be pursued** so that eventually, all fleets of motorized vehicles have low greenhouse emission levels. The future of urban transportation in Dhaka will definitely become greener once MRT, combined with walking, will meet most of the transportation demand.

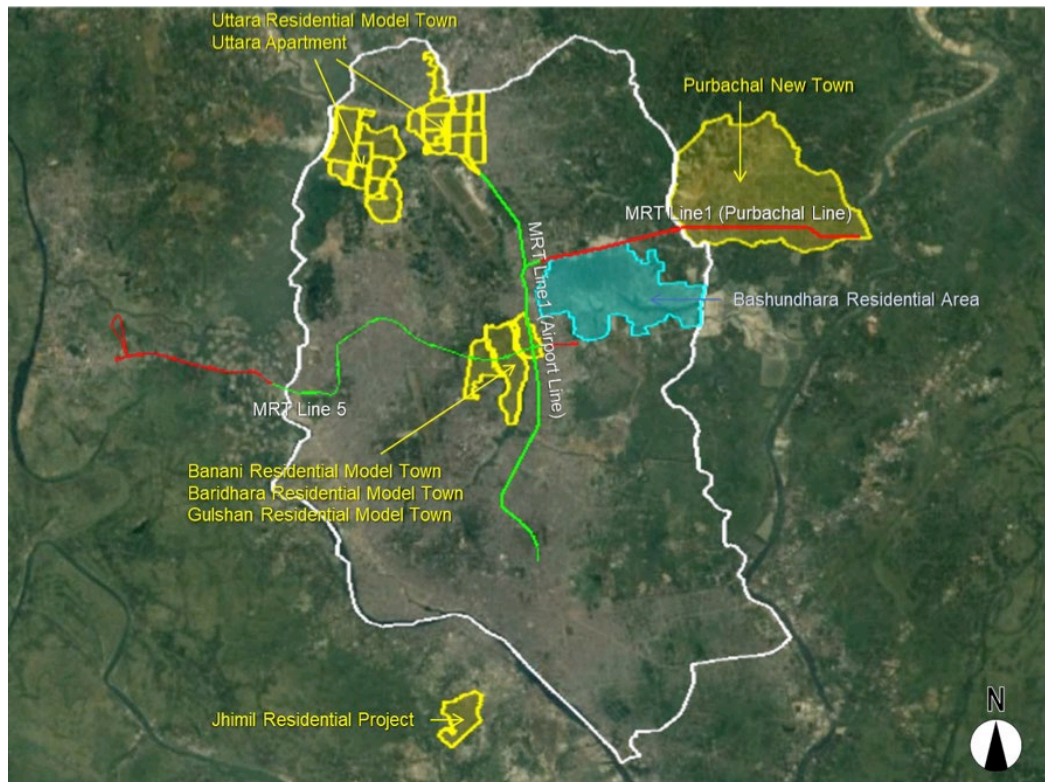
2.3 Regional and Urban Planning and the Role of Transportation

2.3.1 Major Stakeholders

Established in 1987 as the **Capital Development Authority**, *Rajdhani Unnayan Kartripakka (RAJUK)* is a major stakeholder for Dhaka's regional and urban planning. RAJUK acts both as public planning agency and as public-private developer. It has jurisdiction over the entire Dhaka region, including DMA and its outlying sub-centers. As a public agency, RAJUK is **in charge of zoning**. In 2010, the agency issued the first Detailed Area Plan (DAP) which provided land use details for the implementation of the urban general plans (master plan and structure plan, see below). RAJUK is in charge of revising the DAP on a regular basis. Since the approval of the Private Residential Rules enacted in 2004, RAJUK also has authority for **approving large development projects** exceeding 5 acres within DMA, and 10 acres outside DMA's boundaries. It grants exceptional building permits for all other smaller projects that exceed any building limits set by the **2008 Mohanagar Building Construction Act** (building code), in terms of building setbacks, floor area ratios (FAR), maximum ground coverage (MGC), and so on.

As a public-private developer, RAJUK pushes forward a **new model of town planning** that integrates land use and infrastructure planning. Following this model, the agency has issued concept plans for many large developments, including the ones it has carried out. It was responsible for the development of the three most recent urban neighborhoods within DMA (Gulshan, Baridhara and Banani neighborhoods). Outside the boundaries of DMA, it is in charge of developing new regional sub-centers, including Purbachal, Uttara, and Jhimil new towns (see figure below).

Another major stakeholder is the **Department of Architecture** under the Ministry of Housing and Public Works, which is in charge of planning for high-rise residential areas for low-income and middle-income groups. Such developments are being planned within the boundaries of RAJUK's Uttara new town project for example, located in the northwest of DMA near the airport.



Prepared by JICA Study Team based on Google Earth

Figure 2.4 Large-scale developments in Dhaka

The **Bangladesh Army** owns substantial amounts of land available for future development and therefore is involved in the development process. The Jolshiri Abashon project for example is currently being implemented by the Army itself over 2,100 acres of land.

Finally, the **private real estate sector** plays an important role for the development of all other plots of land available on the private land market.

2.3.2 Legal and Regulatory Framework

The existing framework for Dhaka's **regional and urban planning generally lacks consideration for land use and transportation integration**, even the most recent plans such as the Dhaka Structure Plan 2016-2035 prepared with ADB assistance. The recent history of transportation planning in Dhaka has been focusing increasingly on mass transit development, including MRT rail systems and Bus Rapid Transit (BRT) systems, to support the implementation of regional and urban development plans. Nevertheless, the concept of **TOD has yet to be formalized** in transportation planning documents as well. The present study is a first stepping-stone towards this goal.

The **strategic planning framework** for Dhaka's regional and urban development has been continuously refined since the **first master plan issued in 1959**. The latter has been revised multiple times to adjust to major shifts in urbanization processes due to political circumstances (especially after the independence from Pakistan in 1971) or simply because urbanization population growth was exceeding the projections on which the plan was based. The **1995-2015 Metropolitan Development Plan** proposed an overall spatial structure for the future expansion of the Dhaka region. It was recently replaced by the **2016-2035 Structure Plan** (or Regional Development Plan) prepared with assistance from

ADB. The plan promoted the de-concentration of urban population and de-centralization of urban functions through a multi-polarization of urban sub-centers. It addressed issues related to many urban sectors including transportation, drainage, social services, public facilities, economic development, energy, and so forth with one main goal in mind: to promote the development of a livable and sustainable city. At this strategic level of regional and urban planning, no mention was ever made of the importance of land use and transportation integration, despite its critical role for enhancing sustainable economic development.

It is even more relevant to push the TOD concept forward that **Dhaka's transportation plans have promoted the development of MRT and BRT** to guide and support the general plans mentioned above. The table below summarizes Dhaka's major transportation plans and studies issued over the last fifteen years.

Table 2.1 Overview of Dhaka transportation planning projects

Project Description	Year	Status	Governmental Agency	International Donor
STP: Strategic Transport Plan	2004	Completed	GOB	WB
DHUTS Phase 1: Urban development scenario for the metropolitan area + identification of priority projects.	2009	Completed	DTCA	JICA
DHUTS Phase 2: Feasibility study for MRT Line 6		Completed	DTCA	JICA
Dhaka Mass Rapid Transit Development Project: loan agreement for MRT Line 6 construction	2013	On-going	GOB	JICA
BRT Line 3: Feasibility study		Completed		WB
BRT Line 3: Detailed design		On-going		WB
BRT Line 3 Extension: Basic design		Completed		ADB
BRT Line 3 Extension: Detailed design	2013	On-going		ADB
RSTP: Revised Strategic Transport Plan	2014	Completed	DTCA	JICA
Present study: Preparatory Study for MRT Line 1 & 6	2016	On-going		JICA

- (i) In 2004, the government of Bangladesh issued the first **Strategic Transport Plan (STP)**, which had been prepared with assistance from the World Bank. The overall objective of the plan was to lay out a regional transportation network guiding urban and regional development in compliance with the spatial organization proposed in the previously approved Metropolitan Development Plan. The STP first **decided the construction of MRT and BRT lines** to create intra-urban connections. Three BRT lines were initially supposed to start operating before 2010 but are still under preparation now.
- (ii) Following the STP, complementary studies were conducted with the assistance from the JICA, ADB, and the World Bank to further elaborate on the preparation of BRT Line 3, Line 6, and now Line 1 and Line 5. As the projects were being delayed, a **Revised Strategic Transport Plan (RSTP)** was prepared and issued in 2014 with the JICA's support. The RSTP paid closer attention than any plan before to the intrinsic link between land use and transportation. It laid out radial and circular transportation networks with DMA in their core to enable the proposed spatial re-organization and de-concentration of economic activity towards new urban sub-centers. The RSTP established the principle that poles of high density and intensity, and other major traffic generators such as the port, airport, industrial and economic zones, must be well connected to DMA through transportation networks, especially MRT. Within a well-hierarchized road network, feeder roads must be clearly identified to connect primary and secondary roads to the MRT system. Moreover, public transportation services must be developed hierarchically in

accordance with projected transportation demand between urban clusters, with a medium-capacity system connecting sub-centers or new towns, and a bus system connecting new towns together.

The decision to develop an **MRT/BRT network** mainly came as a **response to the expected saturation of Dhaka's road transportation network**. The plan is to develop seven lines in total, including five MRT lines and two BRT lines, for a total of 262.8 km of mass transit lines, including 78 km for BRT.

Now that MRT/BRT development has not only been approved but construction and implementation have actually started in Dhaka, it is particularly important that all major regional and urban planning stakeholders work together to promote TOD. **RAJUK in particular has an important responsibility to coordinate this effort**. First of all, the agency is about to issue the **DAP** supporting the most recent 2016-2035 Structure Plan, and then is in charge of updating it every five years. The DAP is the key zoning document to organize land uses in Dhaka, therefore it should specify TOD land use specifications and transport access requirements in MRT station areas and along MRT corridors, based on the general principles detailed in the next sections of this study. Moreover, RAJUK approves all large developments in the region, and also develops new towns. The agency is in a position to make sure that all **concept plans** guiding such developments are centered on the TOD concept, especially if the development encompasses a station area. Finally, RAJUK grants special building permits for projects that are either outside the limits set by the 2008 Building Construction Act, or located near a national highway, main road, building of heritage significance, protected area or riverside, and so forth. One very first regulation change would be to include MRT station areas to the list of urban environments for which private developers need a **special building permit** from RAJUK. This would grant RAJUK an important responsibility to ensure the implementation of the TOD concept in Dhaka.

3 TOD Guidelines

3.1 TOD Principles

3.1.1 Overview

Transport-oriented development (TOD) designates the integration of urban and transportation planning, and more specifically the integration of urban land use and rail transit development. Indeed, TOD works best when articulated by a rail-based MRT network as the one under development in Dhaka. TOD is a multi-faceted and multi-scalar concept that has been promoted for many decades in countries like Japan, Germany, or Denmark. It is particularly important for fast-urbanizing cities of emergent economies to adopt a TOD strategy as early as possible when developing an MRT system. Indeed, TOD presents great potential to achieve **(i) sustainable urban development, (ii) efficient urban transportation sector, and (iii) equitable socioeconomic development**, three strategic goals of major importance in rapidly expanding cities like Dhaka. It is necessary to conceptualize TOD at three levels of action—**regional, urban, and station-area levels**—in order to efficiently pursue these three goals.

The TOD goals and principles detailed below should be included in a TOD strategy for

Dhaka, and taken into consideration in any, regional, urban, and local planning decisions.

3.1.2 Conditions for Success

- (i) In regards with the “sustainable urban development” goal:
 - a. The **MRT system** shall be regarded as the **primary transportation system**, and other transportation networks as either feeders or complements to the MRT network. In a fast urbanizing region like Dhaka, this is a necessary condition to guarantee a sustainable urban form in the future. Emerging sub-centers certainly need to be connected to the existing city center by efficient transportation systems. However, different transportation systems shape more or less sustainable urban forms. Many examples around the world have proven that MRT systems tend to shape compact and therefore more sustainable urban agglomerations, where people can rely on non-polluting transit modes to access most activities located in different sub-centers. On the contrary, road-based transportation leads to sprawling and therefore non-sustainable urban forms, where people mostly use their private automobiles to commute over long distances between locations, especially between home and work.
 - b. The **symbiotic relationship between transportation systems and land uses** shall be activated by public agencies in charge of urban and regional planning. This is the basic TOD principle of integrating land uses and transportation. Indeed, for MRT to shape compact cities, urban land development must happen in ways that support transit use, following the key principle of **density and diversity** of land uses near transit stations and along transit corridors. This is a matter of triggering the virtuous circle between land uses and transportation, where the more density and diversity the more people can rely on transit (since they can access everything they need near transit), and the more transit users the more density and diversity of land uses.
 - c. Extensive MRT use must be promoted along with TOD to **relieve traffic congestion** and **reduce air pollution**, therefore creating the conditions for an improved quality of life in an environmentally friendly city.
- (ii) In regards with the “urban transportation efficiency” goal:
 - a. The **MRT system shall be articulated with other transportation networks**. To ensure regional connectivity, the system must be efficiently connected with the national railway network, international airport, and various terminals of long-distance ferries and buses. Transportation of goods and people between Dhaka and other locations in the country (and in the region) is indeed a key factor supporting national socioeconomic development. To ensure connectivity within the urban agglomeration, the **MRT system** must be **articulated as a network**, with special attention to connections between MRT lines. Furthermore, **intermodal connectivity** must be ensured so people can easily transfer from complementary transportation modes to MRT to cover the first part of their trip between origin and MRT station (and reciprocally from MRT to complementary modes to cover the last part between station and final

- destination).
- b. The provision of **intermodal facilities** should be provided, and transportation modes prioritized in decreasing order of sustainability, based on road space consumption per passenger and greenhouse gases emission. In other words, intermodal transfers with walking should receive most attention, considering that walking is the most sustainable transportation mode, followed by bicycles, bus transit, local paratransit (human haulers, CNGs, rickshaws), motorbikes and finally automobiles (taxis and private cars). **Pedestrian accessibility** to station locations is of prime importance. Defined as the 600- to 800m-radius circle surrounding the station (a 10- to 15-minute walk), the **design of station areas should be pedestrian-friendly**, with safe and comfortable walking space, protected, paved and shaded sidewalks bordered with drainage and street lights, crosswalks protected with traffic signals (and/or pedestrian bridges or underpasses). Access roads must be carefully planned and road traffic re-organized within each station catchment area (800m- to 1,500m-radius circle) for all other road-based transportation modes to access the station.
 - c. MRT connectivity and accessibility is key to support riders' satisfaction, maximize the size of the catchment area, and therefore create the conditions for **extensive passenger use of the MRT system**. This is very important to ensure **fare revenues** from patronage, and ultimately the **financial viability** of the MRT system, a critical issue given the huge investment that MRT development represents for the nation. A solid revenue structure supports the quality of MRT operation and management, and therefore the quality and attractiveness of the service.
- (iii) In regards with the "equitable socioeconomic development" goal:
- a. **Land values shall be maximized and captured through TOD planning.** MRT stations will soon be considered attractive urban amenities, and highly accessible station areas are prone to become prime urban locations for **real-estate developers**. Land values near MRT stations will most likely increase tremendously, and such **valuation shall be maximized** to support local economic development. Conventional TOD planning strategies consist in promoting **dense and mixed-use developments** in MRT station areas and along transit corridors, with commercial uses on lower levels and residential uses on upper levels of middle- to high-rise buildings. Conventional incentives to developers include **density bonuses** and **increased FARs** for example, commonly implemented in station areas by planning agencies promoting TOD. City governments eventually collect additional revenues from developed land through property taxes, and regulatory measures should be taken to internalize these revenues into the MRT financial scheme (as part of the non-fare revenue structure). Public agencies can also generate land revenues directly by developing publicly-owned land, or by renting commercial space within MRT stations for example. A wide range of more innovative land value capture schemes and public-private partnerships exist and can be explored in the

future.

- b. Nevertheless, it is the responsibility of public planning agencies to **preserve the public interest** and make sure that private developments do not impede on other important functions of station areas. These include the provision of intermodal facilities, as well as the **provision of public and open space (plazas, parks, sidewalks)**. In extremely dense but rather low-rise cities like Dhaka, which historically developed in an unplanned fashion, public and open space is extremely scarce; yet it is the basic component for creating healthy urban communities. Public space is the space that everyone shares, the space where social encounters happen, the space in the city where private individuals grow together as a community. MRT development provides a unique opportunity to arrange for much-needed public and open space in Dhaka. It may seem difficult to public agencies to resist the pressure from private developers in prime locations near MRT stations; yet the long-term benefits for the public of improving urban living conditions for all residents shall not be sacrificed for short-term profits from real estate development, which mostly benefit the private sector.
- c. Finally, by generating a compact and sustainable urban form, TOD planning shall **avoid many environmental issues** associated with automobile dependence, especially **congestion** and **pollution**, which would negatively affect socioeconomic development in the long-run. TOD presents great potential to **improve the overall urban environment** for everyone, with better air quality, more public space, greater accessibility to places of opportunity. Therefore, TOD is key to creating **equitable cities**. At the core of the TOD concept is a type of transportation network (MRT) that is comfortable, affordable, and accessible to most population groups, regardless of age, income, and physical capabilities. Overall, TOD has potential to improve substantially the quality of life of all residents Dhaka, MRT users and non-users alike.

The figure below summarizes the mechanisms through which TOD operates. As illustrated by the figure, the **various conditions for TOD success are strongly interdependent**. The three goals of sustainable urban development, efficient urban transportation, and equitable socioeconomic development, must be pursued simultaneously in order to truly maximize the short- and long-term benefits of MRT.

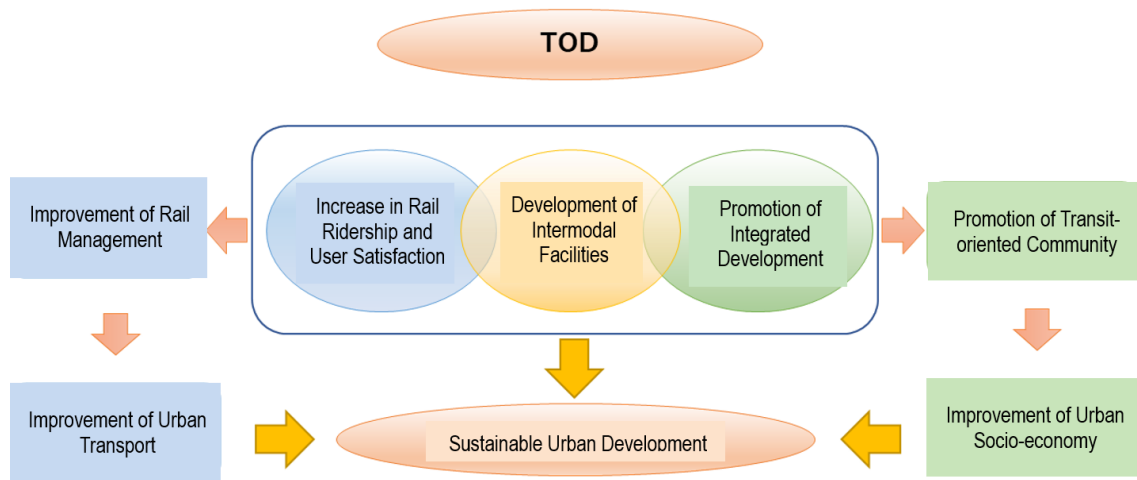


Figure 3.1 TOD conceptual diagram

3.1.3 Focus on Station plazas

Arrangements must be made to reserve at least some **public space near MRT stations**, and carefully design this space as a “**station plaza**.” This critical space must be organized and designed so as to maximize all benefits from MRT development. The station plaza is indeed the space where all three TOD strategic goals meet, where the conditions for successful TOD shall be implemented together (see figure to the right).

In terms of urban design, the basic features of a station plaza include:

- (i) **Pedestrian-oriented design** and provision of public space: the design of the station plaza shall be pedestrian-oriented and accessible to everyone.
- (ii) **Intermodal integration** and provision of intermodal facilities: some off-road space shall be reserved for intermodal facilities, such as bike racks, bus stops, pick-up/drop-off areas for paratransit and automobiles, some parking space; transit users must be provided with sufficient information at the station plaza on how to transfer from MRT to other transportation modes.
- (iii) **Density and diversity of land uses**: shall be at their maximum level near MRT stations, especially for all buildings adjacent to the station plaza.



Figure 3.2 Station Plaza Concept

The **development, operation and management** of station plazas shall involve both the **private and public sectors**. For example, the **joint development** of transit adjacent buildings is a common form of public-private partnership in transit cities around the world. In terms of operation and maintenance, it is important to ensure micro traffic management on station plazas for optimal intermodal integration. Typically, appropriate use of intermodal facilities must be carefully enforced to avoid a common situation in Dhaka today, where transfers happen on the road space, where buses and rickshaws frequently remain

still on the streets contributing to congestion while waiting for passengers.

Land acquisition is the main challenge regarding station plaza development, especially in the context of growing private development pressure. Based on the approved alignment of Line 1 and Line 5, there is basically no vacant land readily available for station plaza development next to any planned MRT station. It is planning agencies' responsibility to be creative, revise MRT and urban planning decisions, enter negotiations as soon as possible with landowners (both public and private). In Dhaka's context characterized by scarce vacant land and road space, station plazas can only be developed if public planning agencies show a strong political will and long-term commitment in favor of TOD.

The **planning process can be revised** as follows to make room for station plaza development:

- (i) **Reconsider MRT station location** if another location provides better possibilities to develop a station plaza;
- (ii) **Revise concept plans** of large-scale urban development (both public and private) so station plazas are embedded in the plan;
- (iii) **Prepare detailed TOD plans** for each station area with clear identification of land plots to be used for station plaza development, if not immediately, at least in the middle- or long-term.

The following options shall be considered for **land acquisition**, in this order of priority, for the development of station plazas:

- (i) MRT construction site once construction of the station is completed;
- (ii) Publicly owned land adjacent to MRT station;
- (iii) Privately owned land adjacent to MRT station.

The last option—using privately owned land for station plaza development—is the most difficult option to implement, as it requires arduous negotiations with the private sector. **Land re-adjustment schemes** shall be promoted as a profitable option for the private sector while making it possible to secure some open space for a station plaza. The figure below illustrates how land re-adjustment schemes work. The basic principle is twofold, it involves a re-allocation of private land use rights on the one hand, and the consolidation of open space on the other hand.

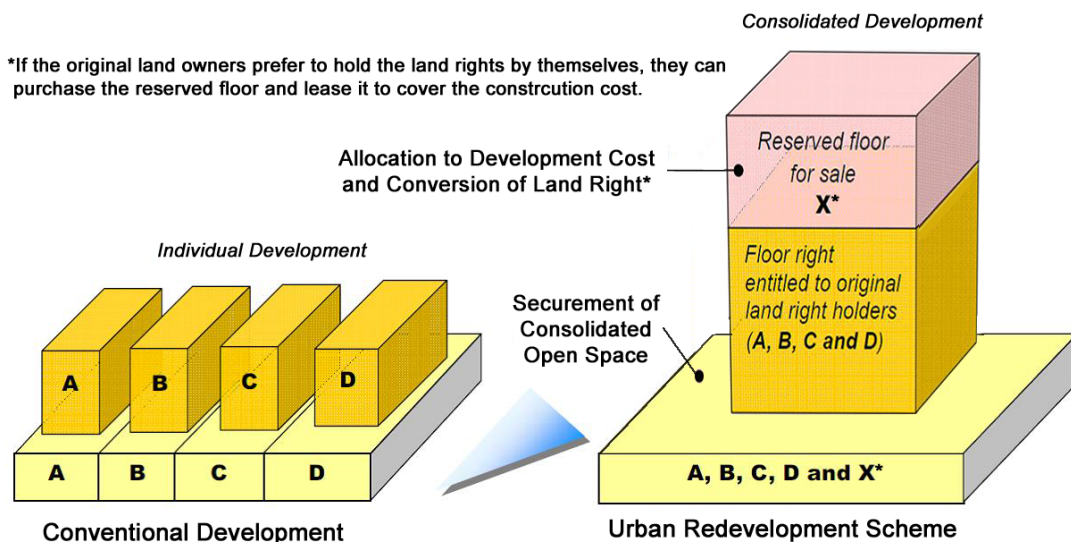


Figure 3.3 Urban redevelopment scheme

Eventually, the size and functions of each station plaza will depend how much land can be secured for station plaza development. In last resort, if open space cannot be acquired, small station plazas can be arranged using road space available. The section below provides more detail on the **size and characteristics of each station plaza** for all stations of MRT Line 1 and Line 5.

3.2 Focus on MRT Line 1 and Line 5

3.2.1 Overview of MRT Line 1 and Line 5

Although most TOD principles detailed in this section are valid for all MRT stations (in most transit cities around the world), the present study focuses in particular on the preparation of MRT Line 1 and Line 5 in Dhaka.

MRT Line 1 is prone to become the **north-south transportation backbone of Dhaka**. Line 1 will include two branches. With twelve underground stations, the **Airport branch** will connect Kamalapur central train station located in the south of Dhaka and the international airport in the north, passing under all major existing urban areas, many of which are densely populated and already have a high intensity of mixed land uses. With seven elevated stations, the **Purbachal branch** will run over the Purbachal express highway currently under construction and connect DMA with large-scale new developments to the east, including the new town of Purbachal.

MRT Line 5 is prone to become the transportation link connecting the eastern and western parts of Dhaka, where most urban development is occurring. It will be a **major backbone of the MRT transportation network** as it will intersect all MRT/BRT lines except for MRT Line 4. It is particularly important to ensure Line 5's connectivity with the various north-south transit routes. Running both above- and underground, the development of MRT Line 5 is planned in two stages. A first section will connect Hemayetpur (western terminus) to Vatara (eastern terminus). Then the route will be extended to the west towards Savar, where many universities and factories are concentrated, and to the east towards new residential areas.

While Line 1 mostly aims at alleviating road traffic between existing urban areas, Line 5 will play a significant role in shaping future urban development. The table below lists all Line 1 and Line 5 stations.

Table 3.1 List of stations on MRT Line 1 & Line 5

Line	Station	Line	Station
Line1 Total 19 Stations	Kamalapur	Line 5 (first stage) Total 14 Stations	Hemayetpur
	Rajarbagh		Baliapur
	Malibagh		Bilamalia
	Rampura		Amin Bazar
	Hatir Jheel		Gabtohi
	Badda		Dar-us-Salam
	Uttar Badda		Mirpur 1
	Notun Bazar		Mirpur 10
	Future Park		Mirpur 14
	Khilkhet		Kochunkhet
	Airport Terminal 3		Banani
	Airport		Gulshan 2
	Bashundhara		Notun Bazar
	POHS		Vatara
	Mastul		
	Purbachal West		
	Purbachal Central		
	Purbachal East		
	Purbachal Terminal		

3.2.2 Summary of Recommendations by Stations

It is particularly important and timely to take advantage of the huge public investments supporting the development of Line 1 and Line 5 to promote TOD.

For each station of Line 1 and Line 5, the preparatory study identified current land uses and traffic conditions in the 1,5-km radius area surrounding the station (catchment area), reviewed current and projected population and development trends, and highlighted space available for station plaza development and real estate development.

In line with the TOD principles laid out in the previous section, a basic TOD concept plan was formulated for each station, including general guidelines to improve pedestrian accessibility, ensure intermodal integration, and enhance urban land development in all station areas.

The table below summarizes the opportunities and recommendations provided in the final report, and indicates levels of priority and feasibility for each type of recommendation by station. More detail for each station can be found in the report.

Table 3.2 Summary of TOD concept plans by station

Line	Station	MRT accessibility			Station Plaza	Opportunity of integrated development				Adjustment MRT station location
		Improvement of walking environment in catchment area	Connection to MRT / BRT/BR	Connection to road based public transportation and water transportation		Improvement of living environment	Integrated development of private land	Integrated development of public land	Coordinated development of new towns (public and private)	
MRT 1 Airport Line	Kamlapur	⊙	○	○	⊙	○	○	○	—	—
	Rajarbagh	○	—	○	○	○	○	○	—	—
	Malibagh	○	—	○	△	○	○	—	—	—
	Rampura	○	—	○	△	○	○	—	—	—
	Hatir jheel	○	—	⊙	⊙	○	—	—	—	○
	Badda	○	—	○	△	○	○	—	—	—
	Uttar Badda	○	—	○	△	○	○	—	—	—
	Natun Bazar	⊙	○	○	⊙	○	—	—	—	—
	Future Park	○	—	○	○	○	○	—	○	—
	Khilkhet	○	—	○	⊙	○	—	○	—	—
	Airport Terminal 3	○	—	○	○	○	—	○	—	—
Airport	⊙	○	⊙	⊙	○	—	○	—	—	
MRT1 Purbachal Line	Bashundhara	○	—	△	○	○	—	—	○	—
	POHS	○	—	△	○	○	—	○	○	—
	Mastul	○	—	△	⊙	○	—	—	○	—
	Purbachal West	○	—	△	⊙	○	—	—	○	—
	Purbachal Central	○	—	△	⊙	○	—	—	○	○
	Purbachal East	○	—	△	⊙	○	—	—	○	○
	Purbachal Terminal	○	—	△	⊙	○	—	—	○	—
MRT 5	Hemayetpur	○	—	○	○	○	○	—	—	—
	Baliapur	○	—	△	⊙	○	—	—	—	—
	Bilamaria	○	—	△	⊙	○	—	—	—	—
	Amin Bazar	○	—	○	⊙	○	○	—	—	—
	Gabtolli	⊙	○	⊙	⊙	○	○	○	—	—
	Dar-Us-Salam	○	—	○	○	○	—	○	—	—
	Mirpur 1	⊙	—	○	○	○	—	○	—	—
	Mirpur 10	⊙	○	⊙	⊙	○	—	○	—	—
	Mirpur 14	○	—	○	○	○	—	○	—	—
	Kochukhet	○	—	○	△	○	—	○	—	—
	Banani	⊙	○	⊙	⊙	○	—	○	—	—
Gulshan 2	⊙	—	○	⊙	○	○	—	—	—	
Vatara	○	—	△	⊙	○	○	—	○	—	

⊙ : Very important
 ○ : Important
 △ : Limited

Prepared by JICA Study Team

3.2.3 Focus on Station Plaza by Station

Given the importance of such spaces to achieve successful TOD, the preparatory study formulated some **specific recommendations to arrange for station plazas** near each station. The table below summarizes the feasibility of station plaza development for each station.

Table 3.3 Method for development of station plazas and integrated development

			Proposed land and Development procedure	Opportunity for integrated development
	Necessity of Station Plaza	Possibility of land acquisition		
Kamalapur	A	A	Use of construction yard and ICD	B
Rajarbagh	B	A	Use of Public land (police)	C
Malibagh	B	C	Land re-adjustment project	C
Rampura	B	C	Land re-adjustment project	C
Hatir Jheel	A	A	Use of construction yard	C
Badda	B	C	Land re-adjustment project	C
Uttar Badda	B	C	Land re-adjustment project	C
Natun Bazar	A	A	Use of construction yard	C
Future Park	A	B	Use of private land (Jamuna future park)	C
Khilkhet	B	A	Use of construction yard	C
Airport Terminal 3	B	B	Use of private land (DEE) Ekinaka-kaihatsu (underpass to airport)	B
Airport	A	A	Development Multi modal hub	C
Bashundhara	B	B	Use of construction yard Use of private land (Bashundhara residential area)	A
POHS	B	B	Use of public land (POHS and Bashundhara residential area)	A
Mastul	B	A	Use of open space	A
Purbachal West	A	A	Change of new town plan by RAJUK	A
Purbachal Central	A	A	Change of new town plan by RAJUK	A
Purbachal East	A	A	Change of new town plan by RAJUK	A
Purbachal Terminal	A	A	Change of new town plan by RAJUK	A
Hemayetpur	B	B	Land re-adjustment project	B
Baliapur	C	A	Use of open space	A
Bilamalia	C	A	Use of open space	A
Amin Bazar	B	A	Use of open space	B
Gabtohi	A	A	Use of the land of bus terminal	B
Dar-us-Salam	B	B	Use of public land (residential area for staffs)	C
Mirpur 1	A	A	Use of public land (Directorate of primary education)	C
Mirpur 10	A	A	Use of public land (RAJUK and Fire bridge training complex)	C
Mirpur 14	B	A	Use of public and private land (police staff college)	C
Kochunkhet	B	C	Use of army land Use of public land	C
Banani	A	A	Use of open space along main road Use of public land (BR)	C
Gulshan 2	A	A	Use of public land (DNCC) Reformation of Gulshan 2 circle	C
Vatara	B	A	Use of open space	A

A: Very Important B: Important C: Limited

Station plazas will have different sizes and characteristics depending on each station area's location, characteristics, and land available for acquisition. The figures below provide examples of large, medium, and small station plaza designs.



Figure 3.4 – Example of large station plaza design

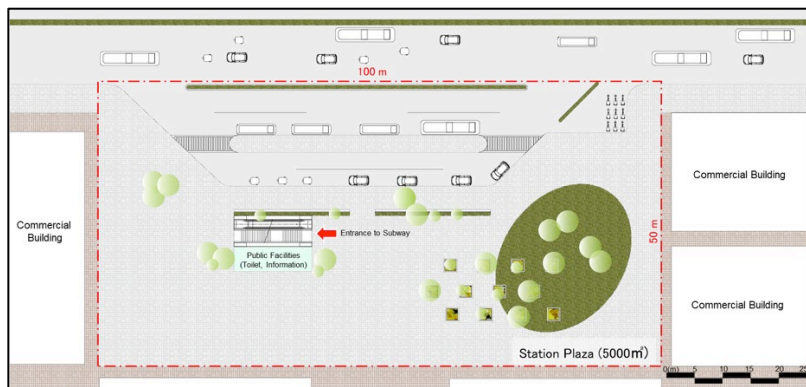


Figure 3.5 – Example of medium-size station plaza design

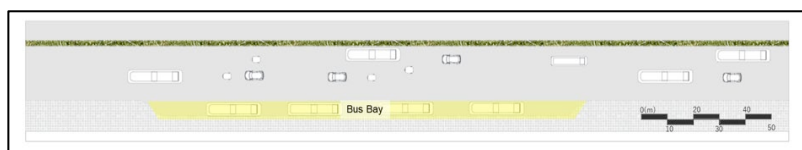


Figure 3.6 – Example of small station plaza design

In all cases, **pedestrian accessibility must be ensured**, and **high-density and diversity of land uses** promoted on adjacent land plots. What will differ is the amount of public space and arrangement of intermodal facilities:

- (i) **Medium to large station plazas (> 10,000 m²)** should be developed at terminal stations such as Kamalapur, Vatara, and Hemayetpur. Such station plazas constitute an opportunity to provide large public space that is highly accessible to all urban residents. Intermodal integration must be ensured, including with national transportation networks (long-distance buses and water vessels), and local urban transportation modes (buses, CNGs, rickshaws, taxis, private cars and motorbikes). Abundant space should be provided for public transportation boarding/alighting, as well as some park-and-ride facilities and parking space.
- (ii) **Medium Station Plaza (approximately 5,000 m²)** should focus primarily on providing intermodal facilities to ensure intermodal connectivity between various transportation modes.
- (iii) **Small Station Plaza:** Most planned stations of MRT Line 1 and MRT Line 5 are located within existing urbanized areas where it is difficult to acquire land for station plaza development. At least, connectivity with other modes must be ensured, if necessary using existing road space.

Finally, table 3.4 below summarizes the intermodal facilities to be provided on station plazas of different sizes, and table 3.5 proposes tentative institutional arrangements for station plaza development in different contexts of land acquisition.

Table 3.4 Intermodal facilities by station plaza size

Size of Station Plaza	Transportation Square (Bus)	Rickshaw CNG	Car Taxi Pool	Parking (Car, Bike)	Environmental Space
Large (> 10,000 m ²)	○	○	○	○	○
Medium (5,000 m ²)	○	○	○	—	○
Small	○	—	—	—	—

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Table 3.5 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

3.3 Detailed Case Studies

3.3.1 Overview

Three detailed case studies were conducted as part of the preparatory study for MRT Line 1 and Line 5. The first case study concerned Purbachal New Town and its four Line 1 stations, the second case study focused on Gabtoli station on Line 5, and the third on Kamalapur station, the southern terminus of Line 1. This section provides brief justifications for why these specific locations deserve special attention and should have priority when implementing TOD in Dhaka. For more detail about the content of each case study, please refer to the extensive final report (chapter 4).

3.3.2 Case Study #1: Purbachal New Town

Purbachal is an interesting case study because it is an **entirely new town** that will be connected with the rest of the urban agglomeration by **four Line 1 stations**. With a projected population exceeding one million inhabitants, Purbachal is a major sub-center driving urban development and population growth in the Dhaka region. Furthermore, RAJUK has full responsibility for this model town planning and development, which grants the Capital Development Authority great possibilities to push TOD forward in Purbachal. The new town has **potential to develop into a TOD showcase** not only for Dhaka, but

also for other fast-urbanizing regions of emergent economies. Excellent transit accessibility coupled with careful and timely TOD planning should create the conditions for sustainable urban environment and great quality of life in Purbachal.

Table 3.6 Land uses in Purbachal

Land Use		Area			
		Katha	Acre	ha	Percentage (%)
Residential	Residential Block	20,497	339	139	5.6
	Residential Plot	121,103	2,002	821	33.1
Commercial		12,751	211	86.5	3.5
Industrial		5,686	94	38.5	1.6
Public Service	Heath	1,701	28	11.5	0.5
	Education	14,741	244	100	4.0
Government / Institutional	Administrative	9,164	151	61.9	2.5
	Research and Institutional	5,957	98	40.2	1.6
	Community Organization	1,721	28	11.5	0.5
Infrastructure/ Utility	Pedestrian	7,966	132	54.1	2.2
	Physical Infrastructure	8,623	143	58.6	2.4
	Road	86,545	1,430	586	23.6
	Social Infrastructure (SIS)	5,499	91	37.3	1.5
	Urban Utility Facilities	2,744	45	18.5	0.8
Open Space / Natural Resources	Sports Facilities	6,854	113	46.3	1.9
	Forest and Eco-Park	10,072	166	68.1	2.8
	Play-Ground/Play-Lot	2,157	36	14.8	0.6
	Plaza	1,444	24	9.8	0.4
	Urban Green	14,079	233	95.5	3.9
	Water-Body	26,165	432	177	7.2
	Warf Land	18	0	0.0	0.0
GRAND TOTAL		365,468	6,041	2,476.8	100

Source: RAJUK

Purbachal is the **largest new town currently being planned by RAJUK**. Adjacent to the eastern boundary of DMA, the overall surface area is 2,500 hectares. 26,000 residential plots have been defined and 62,000 apartments shall be built. Agricultural land was acquired by RAJUK below market price before urban development. Residential plots were sold at market price ensuring the profitability of the urban development process. Bids for commercial plots shall be carried out in the near future. Purbachal as been planned as a bounded urban entity, including residential, commercial, and institutional areas (education, parks, and administrative uses). Table 6 above summarizes the planned land uses in Purbachal. A significant share of the land (23%) has been allocated to road infrastructure development. However, there is **no land allocated to TOD near MRT stations** in the current plans guiding Purbachal development.

There will be four MRT Line 1 stations in Purbachal New Town in the future, namely (i) Purbachal West station, (ii) Purbachal Central station, (iii) Purbachal East station, and (iv) Purbachal Terminal station. The detailed case study emphasized the importance of fully **integrating MRT stations with the planned road network**, given that the four stations will be located along a major arterial road (76-meter wide, or 250-feet) running east-west, and potentially interrupting north-south connectivity for pedestrians.

The general concept promoted by the study is one where **large station plazas** are to be developed **on both sides of each station (north and south)** to provide safe, direct and

convenient **pedestrian access** despite the large arterial road acting as a strong barrier in the area. Traffic calming measures need to be implemented near MRT stations, along with protected crosswalks at regular intervals (every 150 to 200 meters). Furthermore, the study recommends that the arterial road is developed as a “**complete street**,” *i.e.* a shared space for all transportation modes, with dedicated bus and bike lanes and off-road space for bus stops. Organized as a system, the arterial road and station plazas together should be envisioned as a **green corridor** and **large connected open space**. The median and sidewalks should be planted and storm water infiltration permitted. Connections should be ensured with the canal’s waterfront nearby on which water transportation could be developed in the future.

For each station, the detailed case study provided a description of planned land uses, a detailed design for multimodal integration and public/open space development, a detailed traffic circulation plan, a proposal for residential, commercial and mixed-use development. It seems highly feasible to **push forward the proposed TOD concept in Purbachal New Town**, except near Purbachal West station where the feasibility is compromised. Unfortunately, most land in the planned station area has already been sold out as low-rise residential land. This is an example of missed TOD opportunity that can potentially be rectified but at a great negotiation and financial cost. RAJUK has expressed some interest in using this area as a pilot land redevelopment project, which should be feasible but would require much negotiation with private landowners.

3.3.3 Case Study #2: Gabtoli Station

Gabtoli station (MRT Line 5) is a great case study for **efficient integration of transportation networks**, both national and local transportation networks, through TOD.

In the current situation, Gabtoli station is a **major transportation hub** located in the eastern part of Dhaka. Near the planned station location is a ferry terminal that opened on the Buriganga River in 2013. More importantly, it is the location of a large **bus terminal** connecting Dhaka to other parts of Bangladesh. The area is known for its **extremely high congestion levels** due long buses making U-turns to enter the bus terminal, large crowds of people waiting either for their boarding time or for buying a ticket, a large number of ticket booths along the main roads, many minibuses waiting for passengers, and so forth.

Fast urban development is happening in the Gabtoli area, especially by the Buriganga River nearby. However, urban development is limited by the presence of **wetlands** to the south of the station owned by the Ministry of Agriculture, a cattle market and large expanses of land used for stocking and selling construction materials. Such land uses contribute to traffic congestion in the area and shall be reconsidered to permit urban land development.

The development of MRT Line 5, which will include a station at Gabtoli, provides an opportunity to **re-organize traffic circulation and ensure intermodal integration** through TOD. The detailed case study formulated a tentative proposal for the spatial organization of a station plaza at Gabtoli MRT station, ensuring connectivity with other transportation networks currently present in the area.

The proposed measures included: consolidation of ticket selling booths, waiting space, bus depots, and boarding/alighting space; re-organization of traffic circulation; and

provision of urban amenities. The case study includes a detailed circulation plan with allocation of road space to different transportation modes (intermodal facilities development plan), as well as a tentative detailed land use plan for the station area. The two figures below show the current and proposed circulation patterns as identified by the detailed case study.

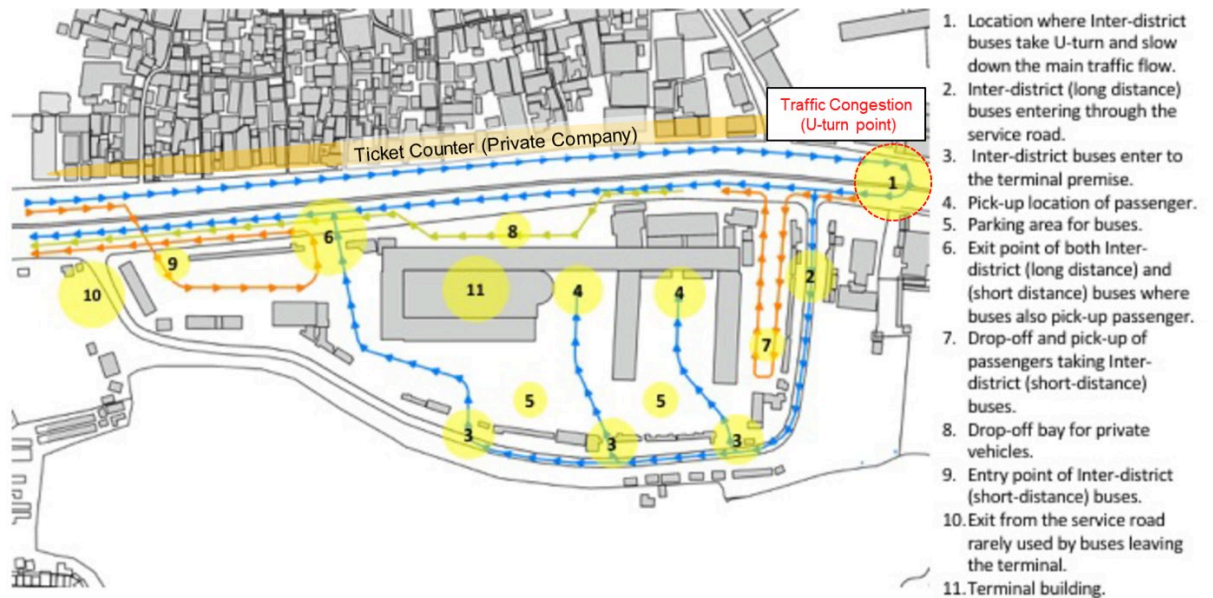


Figure 3.7 - Current circulation patterns at Gabtoli transportation terminal

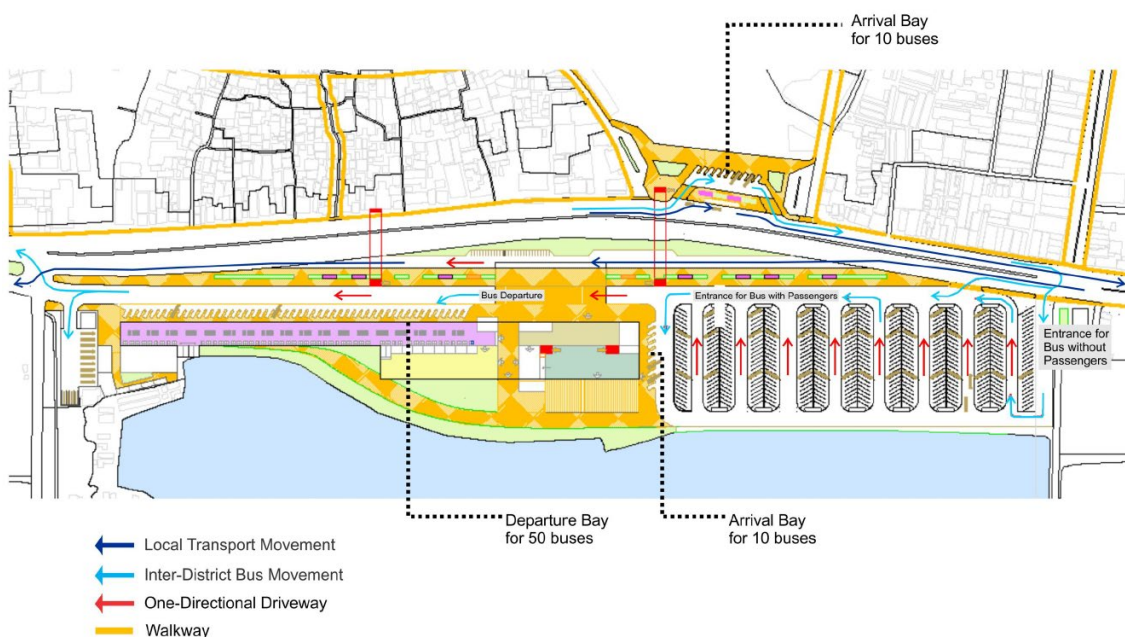


Figure 3.8 – Proposed circulation patterns near Gabtoli future MRT Line 5 station

3.3.4 Case Study #3: Kamalapur Station

Finally, Kamalapur station presents a rich and interesting case study in many regards, as it presents:

- (i) Land re-development opportunities and challenges in a prime central location;

- (ii) Intermodal connectivity within MRT network and other transportation networks;
- (iii) Opportunity for public and open space provision.

Located in the core of Dhaka's old city center, Kamalapur station will be the underground **southern terminus of Line 1**. It will be located next to the existing **central train station** owned and operated by the Bangladesh Railway public company. An elevated MRT Line 6 station will be located nearby, approximately 500-meter away, in the core of active and fast-developing Motijheel area. Altogether, Kamalapur and Motijheel constitute Dhaka's historical central business district, with a concentration of commercial and institutional facilities (commercial banks, public administrations, a sport stadium, and a large mosque attract many people in the area) interspersed with extremely dense residential areas. An intense development trend characterizes the Motijheel area nearby but somehow does not extend all the way to the Kamalapur area. **Development is impeded near Kamalapur** due in particular to a large inland container depot (ICD) adjacent to Kamalapur central train station. ICD also severely impacts the actual and potential accessibility of the existing train station and future MRT station. In the current situation, there is **no road access** from the areas located to east of the train station to the station itself; only a narrow-elevated pedestrian bridge above the ICD enables eastern access to the station.

The **presence of ICD limits development possibilities and transit accessibility** near the future MRT station. Given the central location of Kamalapur, land in the area is becoming increasingly valuable, and this trend will be further emphasized once the MRT station opens. Therefore, such a vast expanse of non-developable industrial land represents a striking example of **land use misallocation**. Eventually, ICD shall be relocated.

The case study formulated a proposal to **develop a large station plaza incrementally**. First, some existing parking space not efficiently used in the current situation should be consolidated as a small- to medium-size station plaza. In a second stage, the land made available by ICD's relocation should be used to expand the size the station plaza so it becomes a **major public space with excellent pedestrian accessibility and full intermodal integration** in the core of the city. The case study in chapter 4 of the study provides a detailed development plan for the station plaza, as well as a traffic management plan for public transport.

Given the central and attractive location of Kamalapur station, on the one hand it is important for economic reasons that the public sector **promote dense and urban development** in the area using incentives such as tax exemptions, density bonuses, increased FARs, and so forth, to attract private developers. The land redevelopment scheme can be implemented to **redevelop existing residential blocks** nearby. On the other hand, it is equally important for sustainable and community development reasons that the public sector **forbid private development in the space reserved for the future station plaza**.

Another challenge related to Kamalapur MRT Line 5 station is the **connection with Motijheel MRT Line 6 station** nearby. In the current situation, a narrow street with no sidewalk is the most direct connection between the two locations. It is a 10- to 15-minute walk on a busy street lined with shop-houses and street vendors. In the short-term, there might be an opportunity to **transform this street as a non-motorized street**, where only

pedestrians, bicycles, and cycle-rickshaws would be allowed to circulate, providing smooth and safe transferring conditions between the two stations. This might also be a way to preserve local activity and an authentic sense of place in the core of a fast-changing historic area of Dhaka. While using typical transportation modes to transfer, residents and visitors alike would enjoy the presence of local businesses at the bottom floor of traditional shop-houses. In the long-term, it might be possible to consider an underground walkway connecting the two stations, with a moving walkway.

4 Conclusions and Next Steps

4.1 Conclusion

Conclusions of TOD in the Study are as follows:

- (i) **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.
- (ii) **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.
- (iii) **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.
- (iv) **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.

- (v) **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.
- (vi) **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.

4.2 Recommendations

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.
- 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.