Transitional Linkage

Redesigning Airport Railway Station with Integrated MRT and BRT station

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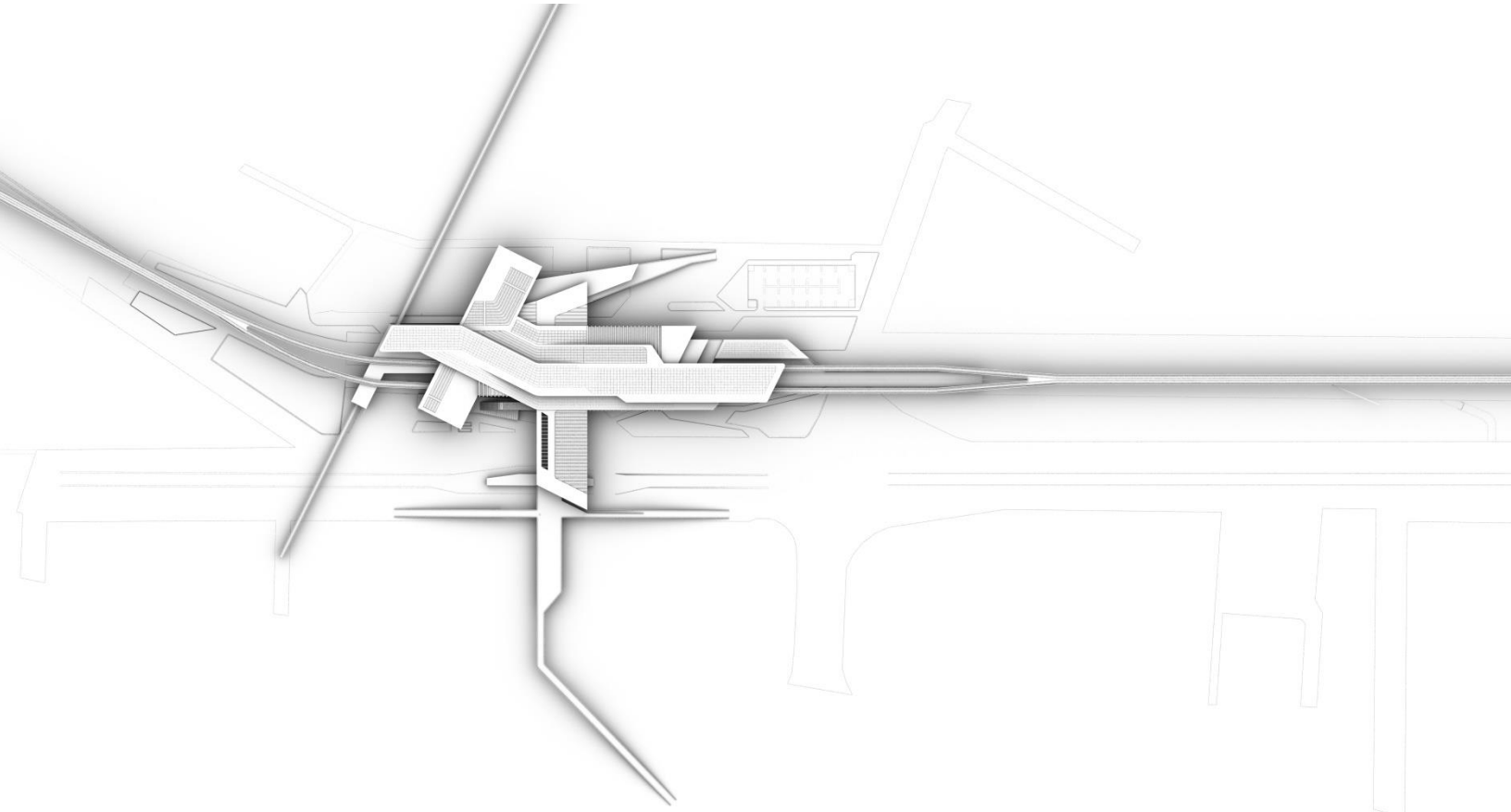

ABSTRACT

Dhaka, known to many as the traffic capital, is a city of dreams at the same time, chaos as the transport system works separately, inefficiently slowing down the people and nation. Traditional process of placing individual station for different mode of transport is not suitable for existing time of Dhaka. Dhaka's growth and urban development stumbles upon its ever growing population as it fails to keep up with its people and overbuilt space. The city's infrastructure which should connect the people with their destination is failing every moment. The issues of over population and inadequate transport facilities is known to both the government and the people which is why Bangladesh Government has planned to establish a couple of Metro rail over the roads of Dhaka as the roads and streets at ground level fails to move people at fast pace. The Bangladesh government along with Japan International Cooperation Agency (JICA) has reported a detail study and future action plan to build 6 MRT lines which would connect Dhaka with other districts as well as within its own neighborhoods. The government has reported in the Dhaka structure plan (2016-2035) that a metro line would be established to become a north eastern spine for the city. This metro line is named MRT line 4 which will begin from Uttora and end in Saidabaad. However, the line crosses a very significant node of the city when it goes over the airport rail way station beside the Shahjalal International Airport. As the airport and the rail way station both are situated together, this location plays a significant role in producing both pedestrian and vehicle traffic and after the completion of MRT line 4 over the railway station it will be crowded and dense than ever. Thus an integrated station is need which will serve the MRT line 4, BRT line and existing railway station as well as connects to the airport to create an integrate compound station to accommodate different passengers easily and efficiently.

The aim of the thesis was to study the urban issues and characteristics of the airport station site, its local pedestrian network, movement and vehicle traffic, nodes and transition points and the impact of future growth will prevail over this site. As the BRT, MRT and trains will pass over the site, the detail study of each transport modes and its effects and serving radius is studied and analyzed with qualitative and quantitative

research methods such as and survey, behavioral observation and interviews. The survey revealed local needs and demanded connections as well the requirements to serve the whole city in future. The research was conducted on how BRT and MRT as well as train station can coexist with physical connections to the airport. As the potential opportunity and threat were studied it was found that the local area has a vacancy for public place and that the site surrounding has been used for public functions. A huge amount of attention was given to consider the unbuilt open space beside the station which is barren now but can be used as public plaza and park to serve the passengers as well as the local people and environment. As the local habitants do not have public recreational place nearby it was very important to use the open land and existing small active space in the site to magnify its facilities to accommodate local needs of open space. More emphasis was given on the ease of horizontal public movement and preserving natural green by shifting the transport infrastructure vertically without undermining either of the functions.

In short, the thesis was an attempt to understand the morphology of different modes of transport system and how it can serve the city in both micro and macro scale to make human movement comfortable, easier, and efficient.

Acknowledgement

The thesis has spanned over 8 months during which all the data was collected and presented. During this long time, many faculties, friends and seniors have helped me with their time and knowledge and support for which I am extremely grateful.

My teachers Sirajuddin Raju, Nandini Awal, Iftekhar Ahmed, Md. Shajjad Hossain ,Tanzil Shafique for teaching me the fundamentals of architecture and inspired me at each step. I am grateful to Nesfun Nahar Nipa for guiding me and helping me from the very beginning of this project. My faculties Shams Mansoor Ghani and Dr. Habib Reza have continuously guided and shaped my design process and help me to develop critical thinking questioning my design steps. My utmost gratitude to Kazi Najeeb Hasan, who has been criticizing and mentoring me though this period. My friends Nasheen Jahan Nasir and Nafis Imtiaz, Aminul Haque Sumon, Heta Patel, Aniqa Nawar, Nur Riad, Salima Sharmin, Rafid, Rosemary, Pauroma Taan, Hridi Tasneem, Tahseen Reza Anika, Jannatun Nahar Anifa and Faiza Ali have constantly supported and helped me during the design process. Lastly, thanks to my family members, my parents for constant support and almighty Allah for his grace.

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Chapter 01

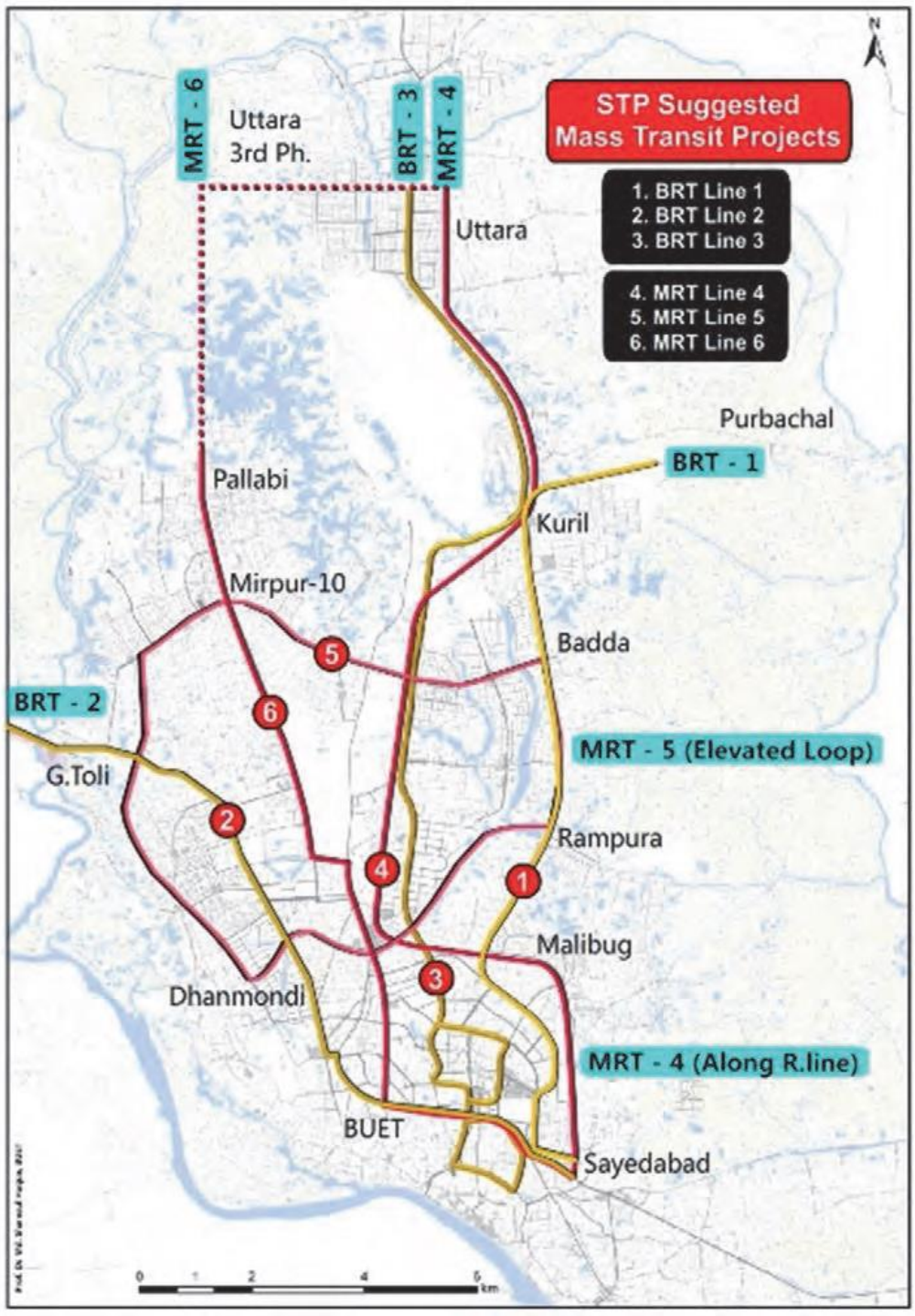
INTRODUCTION

Dhaka is one of the largest and most crowded cities. Dhaka's 14.6 million people live in just 125 square miles (325 square kilometers).Dhaka city has population density of 45,000 per square kilometer, nearly 75 percent more dense than Hong Kong. No city in the world uses land as efficiently as Dhaka. Dhaka city being the center of administration, business, trade and commercial, education as well as traditional cultural center, a large number of people from all over the country flock to Dhaka city in pursuit of education and job opportunities. However, despite being the capital and center of economy, it does not have sufficient infrastructure or efficient transportation system to accommodate 14.6 million people. As a result traffic congestion is a severe problem and menace for the dwellers of Dhaka city.

Urban transport in Dhaka mainly utilizes the land surface roadway system. The train network is used primarily for inter-city connections and waterways are designed for inter-district freight distribution. Inter-city bus transportation, which uses a fleet of 600 buses, is operated by the Road Transport Corporation. It is estimated that 80% of the residents in Dhaka cannot afford to pay for any type of transportation and travel by foot. The main physical traffic problem is related to this mix of transport modes: rickshaws, bicycles, bullock carts, buses and automobiles. (ENNO “ED” KOEHN, 2002)

With due consideration of this rapid urbanization situation in Dhaka, the Government of Bangladesh (GOB), through Dhaka Transport Coordination Board (DTCB) as the implementing agency, Japan International Cooperation Agency (JICA) as the executing agency, formulated a preparatory survey on Dhaka Urban Transport Network Development Study (Phase 1 Study) from March, 2009 to March 2010. The Phase 1 Study recommended a series of urban transport network development projects and programs. Three MRT line (4,5,6) ware proposed.MRT Line 6 project was selected in

the Phase 1 Study as the high priority project. MRT 4 was selected in phase 2 study. MRT 5 is proposed to be the last part of the project.



Source: DTCA Home page

Figure 1.A MRT and BRT Alignment

MRTline 4 starts from Uttora and connects Kuril, Banani, Baridhara, Tejgaon, khilgaon, komolapur and ends in Saidabaad. This line starts from airport railway station, alongside Dhaka Maymansing highway. Shahajalal international airport is situated alongside the road. According to August 2015 report by Japan International Cooperation Agency (JICA) MRTR line 4 is suggested to go over the rail way station in development phase plane. MRT line 4 is still in primary development phase. However, considering the contest of those MRT line 4areas and traffic situation there should be an important station integrated with the airport rail station. An inter-connected station is important to have since different category of people comes in this place from different directions, via multiple modes of transportation to arrive in and to depart from Dhaka city.

1.1 AIMS AND OBJECTIVES

Scope of this project lays in incorporating architectural and urban design issues together. This project is related to issues such as urban Transport Planning, Urban infrastructure design and planning, Pedestrian network, and Urban dead space Regeneration. The fun and the challenge of this project lie on how to address these issues and simplify them into a precise solution. The challenge of this project lies in accommodating efficient commute system for the large number of people from both inside and outside of the city. This project should not become hindrance for the local inhabitance furthermore; it should provide a local inhabitance not only with transportation system but also civic facilities and a cultural destination.

- Enhance the experience within transition at airport area
- Multiple mode of transportation.
- Preserve urban green and open space.
- integrate civic space for future generation.
- Integrate commercial, recreational, cultural activity

1.2 Reasons for choosing airport railway station

1.2.1 Regional, national and international connectivity

The existing function plays an important role in the project. The airport is a primary air travel gateway into Bangladesh and the hub of Biman Bangladesh Airlines, the country's national airline. Its strategic geographical location makes the airport an ideal transfer point for leisure and business passengers travelling around Bangladesh. Over 4 million international and 1 million domestic passengers as well as 150,000 tons of freight and mail exchange use Shah Jalal International Airport (DAC) on an annual basis. If the project is established hear then both local and international passenger will be benefited from it. Also there is a significant rail station which people from the northern area used to come to Dhaka and also to disperse else ware. If the transport hub is close by then the passengers arriving in the airport can easily come here and take the train route, MRT route or BRT (Bus Rapid Transit) and easily commute without facing any traffic jam.

The airport is situated at the center of the district to proved equal distance of access to passengers. As a result, the station to be designed here can reach people around the district as a central station which provides road transport, elevated expressway or MRT transport as well as access to airport.

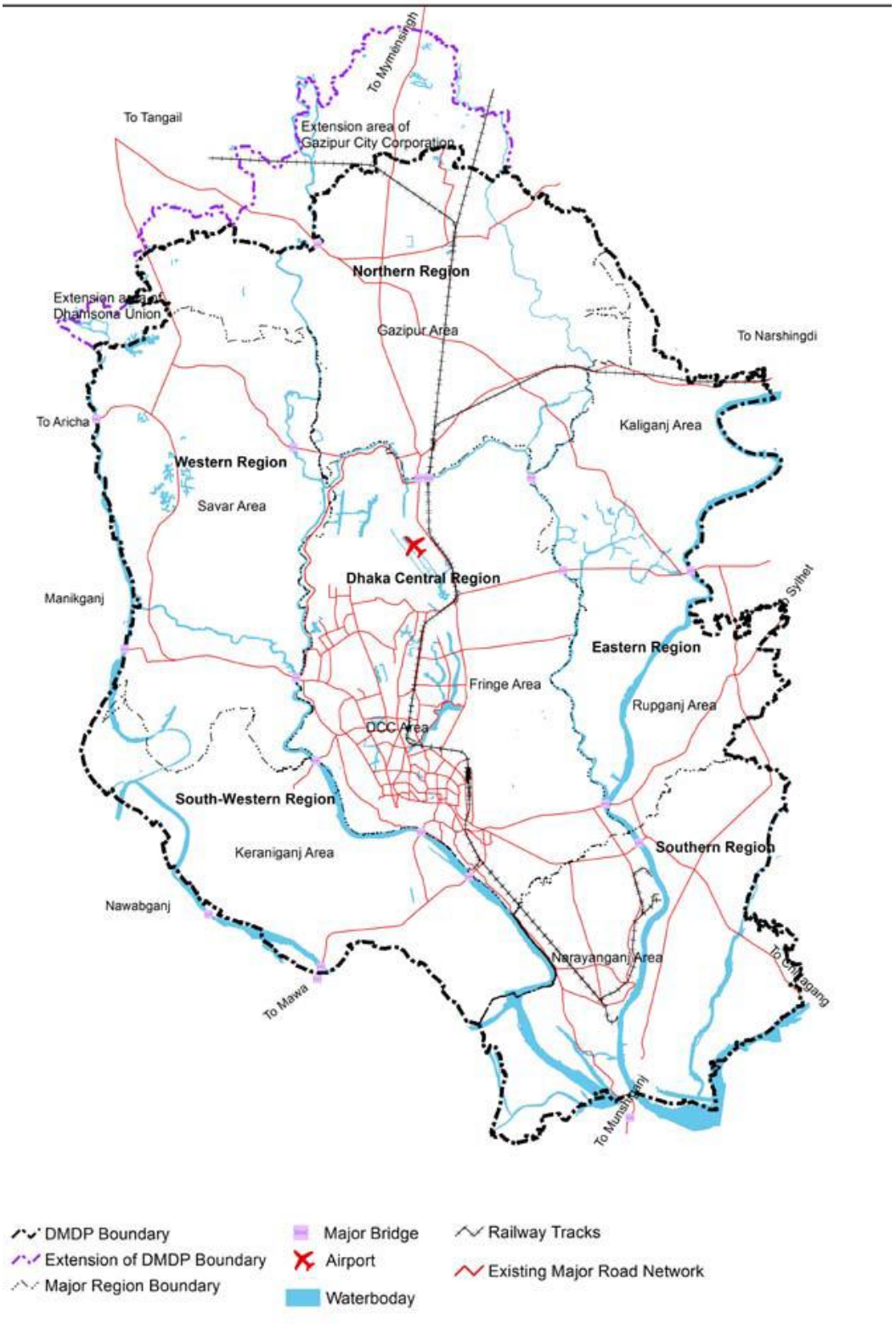


Figure 1.2.1.A Dhaka metropolitan region boundary,

Source: DHAKA STRUCTURE PLAN 2016—2035

1.2.2 Solution for traffic congestion:

As there is Dhaka Maymensingh highway in-between airport and the rail station, this route is highly used for heavy vehicle movement. People from Gazipur, Maymansing, Tongi use this route to enter Dhaka and people from Dhaka also use this route. As a result there is heavy traffic congestion in front of the airport road. If this transport hub is built here, then it can reduce traffic jam.

Government mentioned future goal and action plan in Dhaka structure plan 2016-2035. The government is planning to ring roads (outer, middle, inner ring roads surrounding different parts of Dhaka district. In order to connect those ring roads MRT line 4 would serve as the north eastern spine which connects the road via Flyover expressway which will ensure easier movement in and out of the city.

‘’• Providing a greater choice of travel modes (BUS/BRT/
MRT/RAIL/Taxi);
• distributing goods and services more efficiently;
• Improving road safety;
• Reducing the environmental impacts of the transport
System;
• Fostering medium density development;
• Utilization of water way transport network;’’ (Dhaka Structure Plan Report 2016—2035)

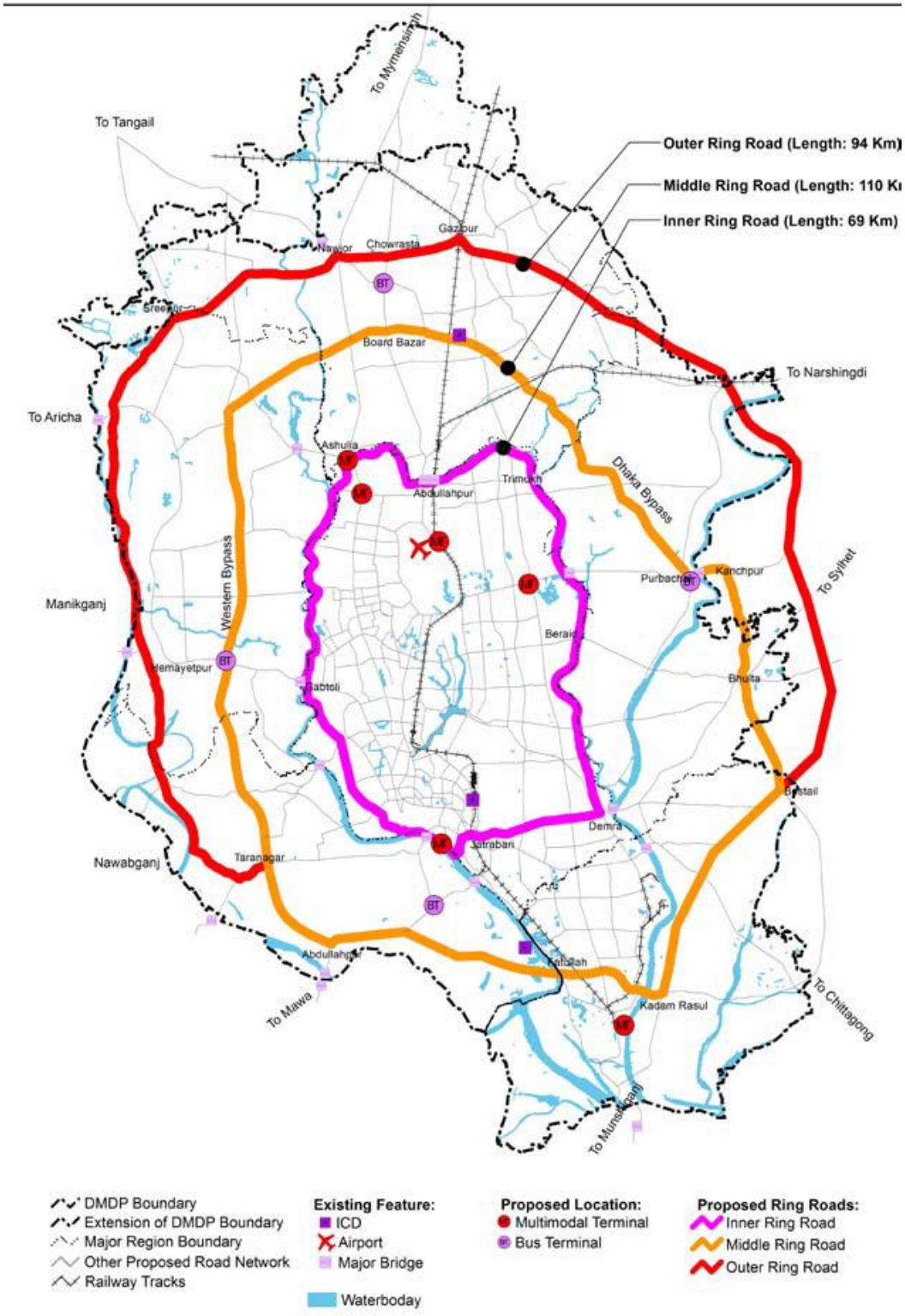


Figure *1.2.2*.A PROPOSED RING ROADS FOR RAJUK AREA,

Source: DHAKA STRUCTURE PLAN 2016—2035

1.2.3 Civic facility and Cultural destination

As this development is proposed for the future so it should provide the civic and cultural public facilities for the future generation. In future the population of Bangladesh is predicted to increase by 20% within 25years. For this incise of population that time the open public space of Dhaka will decries significantly. Since the area beside the airport rail station still vacant, it should be preserved as an open space for the future generation. That open space can be used for the local inhabitant as well as for the airport passengers as a recreational space.

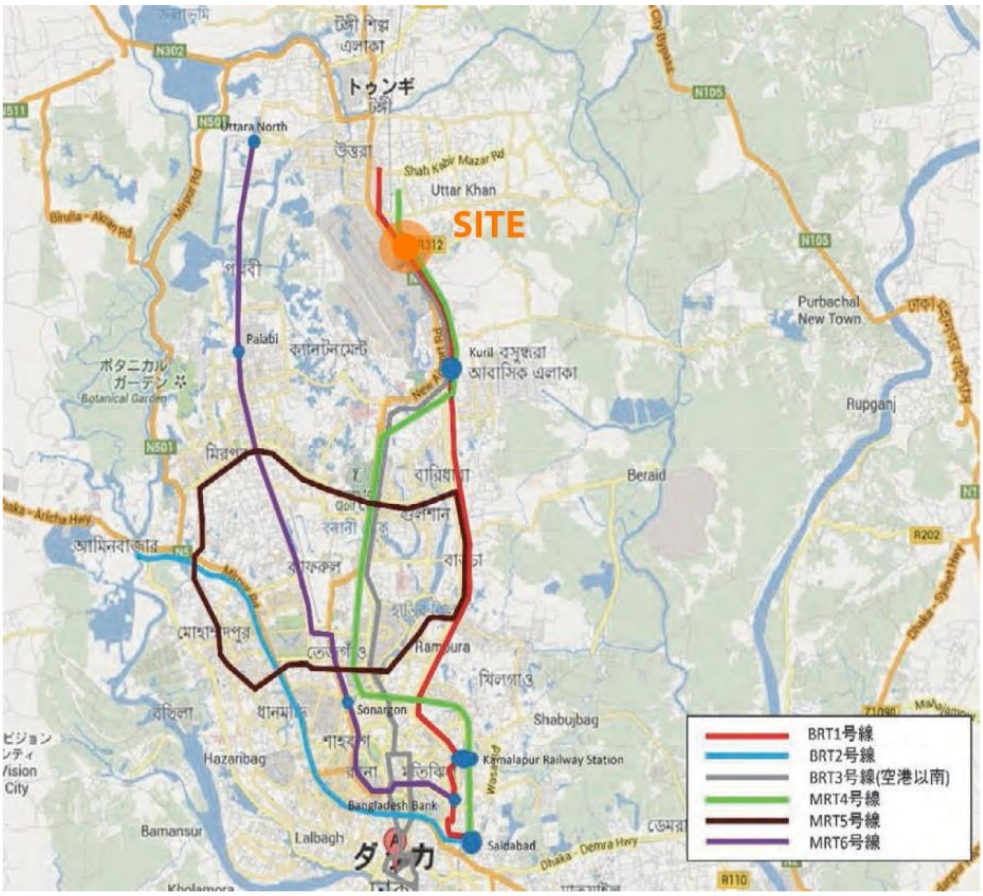


Figure*1.2.3.A* Dhaka Urban Transport Network Plan

Source: prepared by the authors based on STP,DHUTS,etc.

1.3 Project Specification

Name of project: Transition

Client: (P.W.D.)

Consortium Agencies: RAJUK, Dhaka City Co-Orporation, WASA, DESCO, Dhaka Metro Authority, Bangladesh Railway

Site Location: airport railway station

Site Area: 17 Acres

Source of Fund: Jaica, GOV, Public Private Partnership.

User group: airport and the railway station are important node of Dhaka where all people of Dhaka transit every day. So user group of this project will be all the people of Bangladesh.

1.4 Hypothesis:

Linking MRT and BRT with existing transport mediums on airport area will create potential for better ease of movement

1.5 Research question:

- What are the existing transport medium and what are the opportunities?
- What is the validity of MRT and BRT station in this site?
- What are the potential opportunity and threat of new MRT and BRT?
- What are the benefit harms of the different transport mediums?
- What can be done to fix the issues and improve the condition?

1.6 Rationale of the Project:

1.6.1Existing situation: Looking at the existing situation, it is easily visible that airport area has become busy transport area. The station and the surrounding area was not properly designed as transport area though it should have been designed that way as airport is one of the highest rated transport stations for national and international both. Rail station was designed at the same time as airport. However, Airport rail station was not properly well designed with proper services for all category passengers and other type of short distant travel vehicle ware not implemented well.

1.6.2 Existing transport node:

Airport rail station is working as a transport node because there is a airport and vehicular road connection with the existing rail station. Even though this has become a transport node, it is not working the way it was supposed to be working. As there is a MRT line going through this connection, there should be a MRT station to tie all other transportation as a hole for the ease of movement.

1.6.3 Intermediate of short and long distance travel:

Airport is there for air long distant travel which connects Dhaka with rest of the world. In contrary, rail station is there for land long distance travel which connects Dhaka with other districts of Bangladesh. Only road is connecting the short distance travel which is working as intermediate connecting rout for rail station and airport. But that is not working properly for traffic jam and time is one important fact which needs to consider.

Analyzing the situation there should be another short distance vehicular connection which could be MRT line. So there is a necessity of MRT station in this location for short distance travel to save time.

1.6.4 Separate transport system:

In existing situation airport and rail station are working as separate entity. Even though it should work as a single identity for the ease of movement of national and international passenger, in existing situation transportation is a hassle for passengers as land and air travel is not connected properly. Road is connected with both airport and rail station. People use road to get both rail station and airport. But passengers from airport don't use rail for travel. Therefore, a station is required which provides direct and fast access from the airport to the railway station for both passenger types to use both of the transport system flexibly.

1.6.5 Ease of movement for local people:

Local people of that area travel to central Dhaka for different purpose such as office, school, university, business, and other reasons. For the ease of movement there is necessity for MRT station in this location. Road vehicular movement is getting too congested for this area as every day a lots of national and international passenger pass though this node. As a result, local residents face unwanted traffic jam in the streets to travel to short distance. If MRT station is established here then load on road will decrease as non-local arriving via air or train or can use elevated expressway to travel to their destination without using the streets and roads around the site.

1.6.6 Not properly designed and insufficient services (rail station):

Lack of service such as lack of seating space, waiting are, toilet information area in rail station etc is causing a great deal of problem for passengers. For this reason passengers from airport do not use rail station for travel even though it is cheaper. For the lack of services and lack of connection with airport people do not use this facility much. So there is a scope to redesign the rail station with proper services.

1.7 Methodology:

Study was conducted on airport area to understand the situation of transport system. This study was conducted using qualitative and quantitative method to collect necessary data. Method used in this research is questionnaire survey, behavioral observation and visual study. Qualitative method was used with questionnaire to collect data. Feedback was taken from 20 local people and 20 passengers as respondent.

Behavioral observation is one of the techniques of field studies are often used in social science research (Chua Yan, 2006). Behavioral observations were conducted to record the behavior of passengers such as preferred routes, walking direction and choice of vehicles. After qualitative and quantitative data was gathered, those data were studied in plan (zoning) to understand what the existing situation is.

Information obtained on the qualitative method was used to define then data gathered from the quantitative method. The maximum data came from quantitative method and then it was analyzed with the research question.

1.8 Program for transportation hub:

Programs may change according to site

- MRT Station
- Railway station
- BRT station
- Parking
- Restaurant
- Shopping
- Park
- Children Activity Centre
- Historic Appreciation Centre
- Auditorium
- Amphitheatre

- Art Gallery Exhibition space
- Administration and office
- Ticket counter
- Shopping stalls
- Indoor Restaurant and outdoor restaurant
- Cyber café
- Florist
- Pharmacy
- Vendors
- Newspaper stall
- Waiting zone
- Prayer space
- Staff space

Chapter 02

LITERATURE REVIEW

A city or mega city is an urban agglomeration with a population of 10 million or more. In 2009, 21 urban agglomerations qualified as megacities, accounting for 9.4 per cent of the world's urban population. (Children in an increasingly urban world, SOWC, UNICEF 2012). In 1975, New York, Tokyo and Mexico City were the only megacities. Today, 11 megacities are found in Asia, and Dhaka is in the 9th place with a population of 14.3 million. As cities grow and merge, new urban configurations are formed. These include mega regions, urban corridors and city-regions and urban sprawl. An urban sprawl means 'horizontal spreading' or 'dispersed urbanization'. The uncontrolled and disproportionate expansion of an urban area into the surrounding countryside, forming low-density, poorly planned patterns of development. Common in both high-income and low-income countries, urban sprawl is characterized by a scattered population living in separate residential areas, with long blocks and poor access, often too much dependent on motorized transport and missing well defined hubs of commercial activity. In case of Dhaka city, the urban sprawl is dense and highly unplanned due to dense population and high demand for land.

2.1 City, roads, streets and people

According to Kevin Lynch a city is formed by five urban elements; paths, edge, nodes, landmark and district. Paths are the most dominant element of the city. First and foremost, a path must be identifiable, and then followed by its continuity. Moreover, paths with clear and well-known origins and destinations have stronger identities and help tie the city together. After the directional qualities are determined, the next step is to consider the scale characters of paths. A series of nodes and landmarks are the most common way to achieve it. In general, it is impossible to create a clear city image while its paths remain confused and disordered (WenhaoYue, 2014, on Kevin Lynch's image of the city.) For Dhaka city where it is overbuilt everywhere, paths are the only remaining voids. Paths or streets are the main transport infrastructure of the city,

however, it is what is most neglected in this city. Most of the roads and streets are overtaken by buildings illegally. However, widening the streets is no solution.

Even if a road widening or flyover reduces congestion, the improvement is usually short-lived, since; expanding the available road space initially increases speed and comfort and thereby encourages more people to travel in private motor vehicles. More users use the wider road eventually, it returns to its original level of congestion—but with significantly more vehicles stuck in traffic. Street design should include safety, mobility, pedestrian accessibility, livability, sensitivity to local context and creative use of street.

Dhaka's roads are dominated by a couple of vehicle types. Each of them differs in speed, comfort, access, size. They include, rickshaw, cycle, auto rickshaw /cng, private motor cars and Bus. Rickshaws have become a symbol for Dhaka, as thousands of rickshaws are seen on the streets. They provide easy and affordable short distance mobility but due to slower speed create traffic congestion where motor vehicles are also driven.

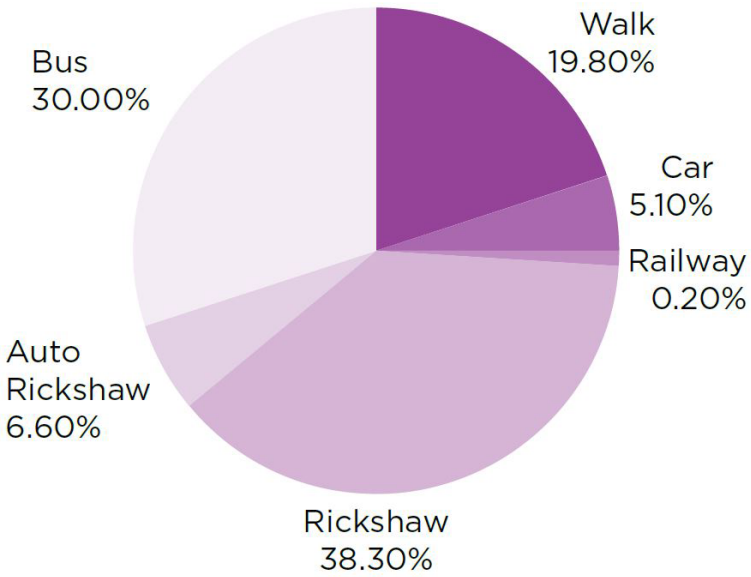


Figure *2.1.*A distribution of model share.

Source: JICA study team. DHUTS, DTCA

As shown in the above figure only 19% of the people prefer to walk. It is due to uneven street and disruptions of footpath. Many areas do not even have pedestrian footpaths and proper zebra crossing.

Year	Population	Growth Rate in Dhaka City (% per year)
Road-based Public Transport	Motorized	Public Bus, Auto Rickshaw, Taxi
	Non-Motorized	Rickshaw
Rail-based Public Transport		Bangladesh Railway (BR)
Water based Public Transport		Ferry, Boat

Source: JICA Study Team, DHUTS, DTCA

Figure *2.1.*A distribution of model share.

In the above figure, public transport in Dhaka is confined to Buses, autorickshaw and taxi. Among them taxi is not a preferable choice as it costs a lot and is not affordable or efficient for a single person to travel in taxi. People therefore, choos bus to travel both short and long distance.

Year	Total trip (1,000 trips)	To Work	To School	To Home	NHBB	Private
2013	29,580	17.74%	12.59%	44.73%	11.07%	13.87%
2015	32,595	17.81%	12.70%	44.88%	11.16%	13.45%
2025	45,540	18.04%	13.00%	45.33%	11.43%	12.20%
2035	54,340	18.15%	13.15%	45.55%	11.56%	11.59%

Source: Compiled by Consultants, 2014

Table-5.4: Present and Future Trip Rate By Each Mode (Unit: %)

Year	Total trip (1,000 trips)	Car	Bus	Rickshaw	Etc	Railway & Harbor	Walk	Total
2013	31,355	6.43	34.15	40.58	0.12	0.21	18.51	100.0
2015	34,877	7.22	36.97	37.69	0.14	0.25	17.72	100.0
2025	46,639	11.12	41.78	30.90	0.19	0.33	15.69	100.0
2035	59,774	16.29	41.46	27.37	0.20	0.34	14.35	100.0

Source: Compiled by Consultants, 2014

Figure *2.1.*B present and future trip rate by each mode.

2.2 BRT:

A large number of people in Dhaka use private motor cars and the private car owners are disregarded for using one car per person. To solve this scenario, the government has suggested using more buses. Bus rapid transit (BRT) can offer high-capacity and high-quality public transport—similar to a metro rail but at a lower cost—by providing an exclusive right-of-way for BRT buses.

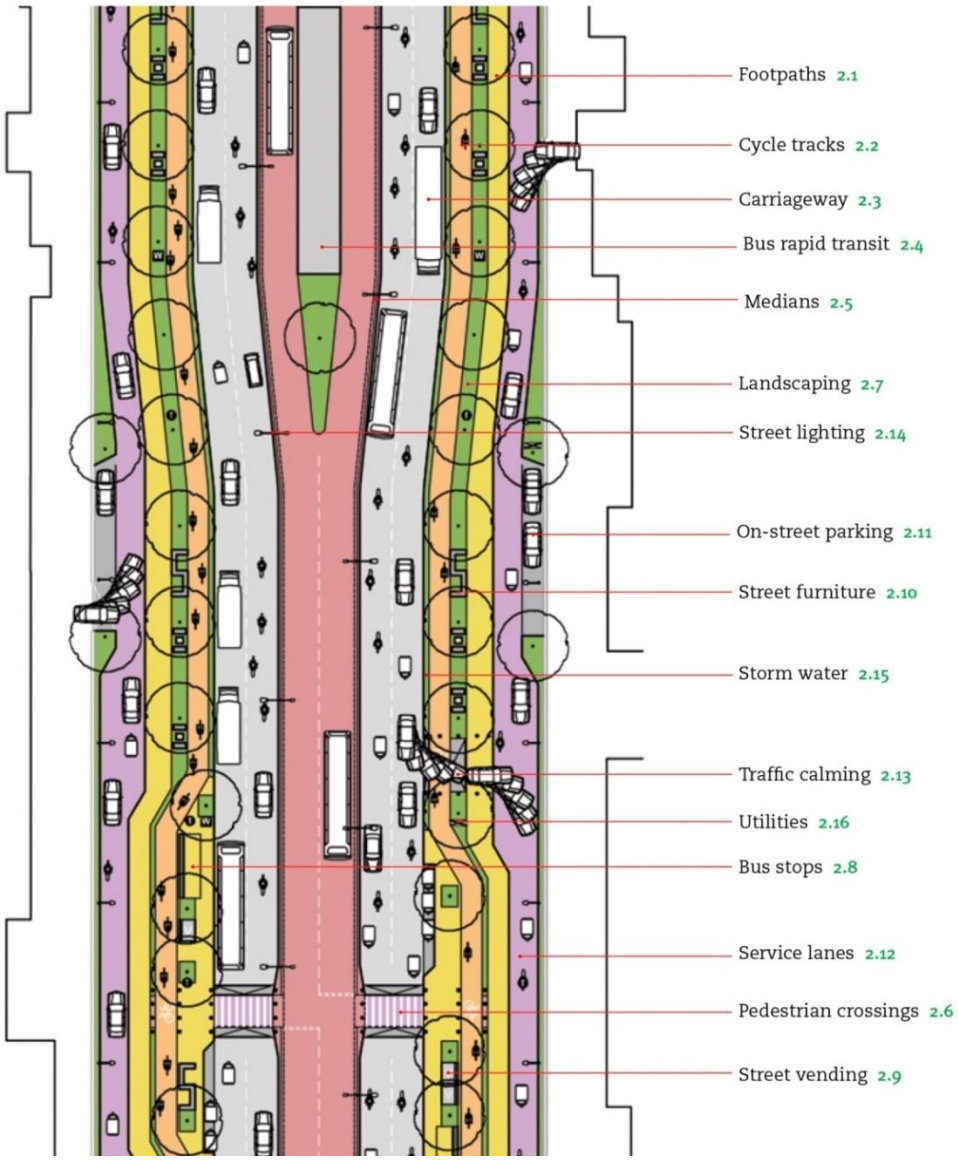
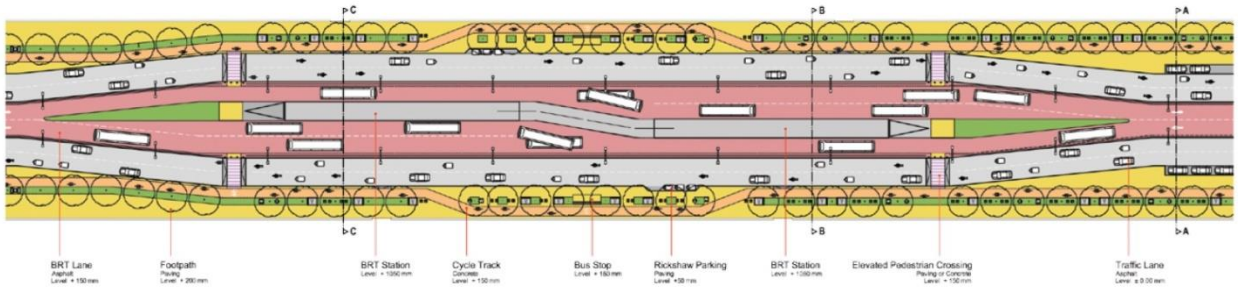
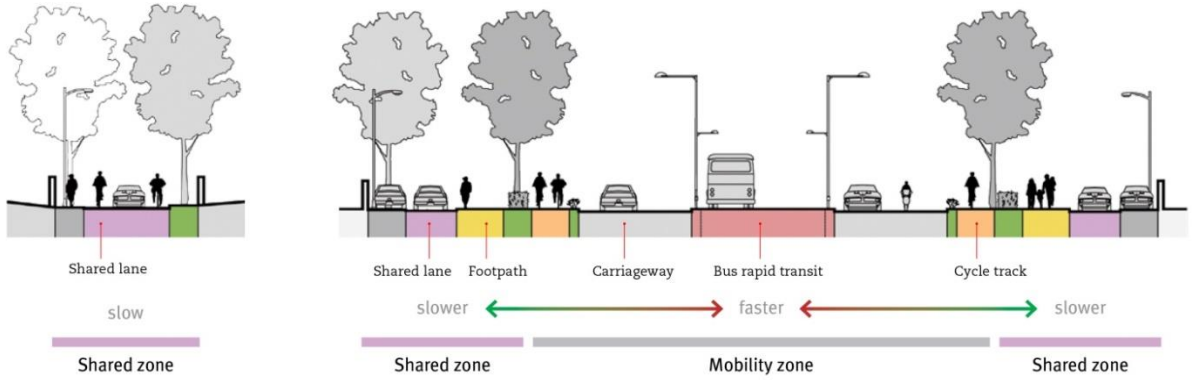


Figure *2.2.A* Street design elements.

Source: Better streets, better cities, December 2011





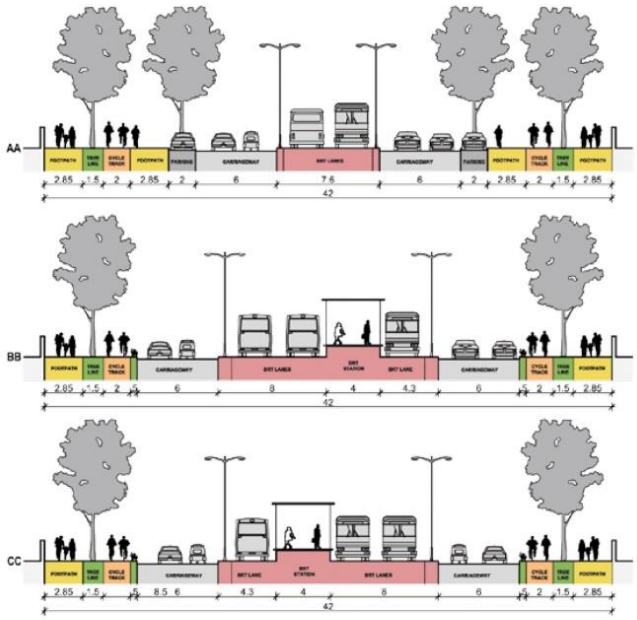


Figure *2.2.*B Bus rapid transit section.

Source: Better streets, better cities, December 2011

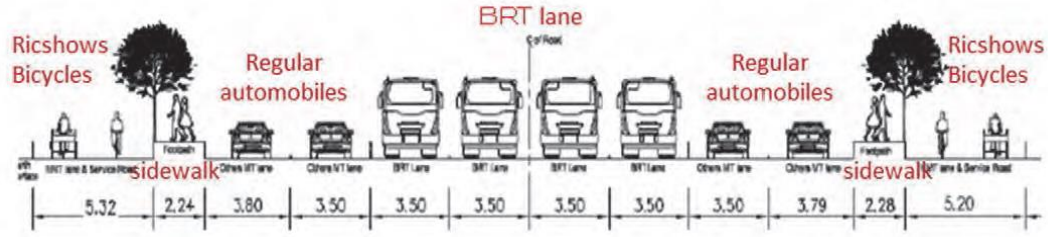


Figure 2.2.C Image of BRT Line (Ground-Level Section)

Source: GDSUTP

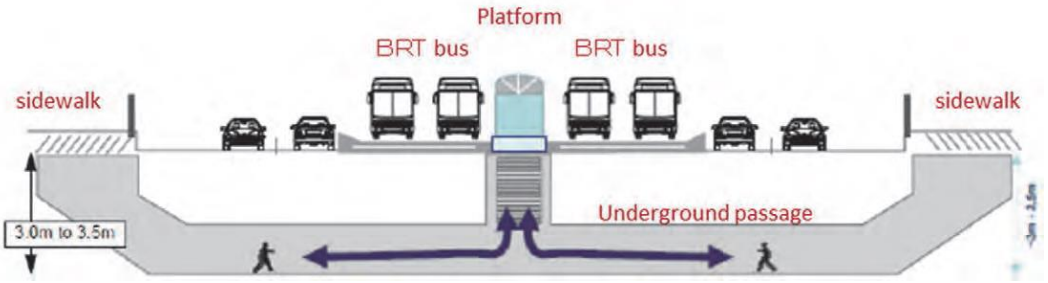


Figure 2.2.D Image of Station (Ground-Level Section)

Source: GDSUTP

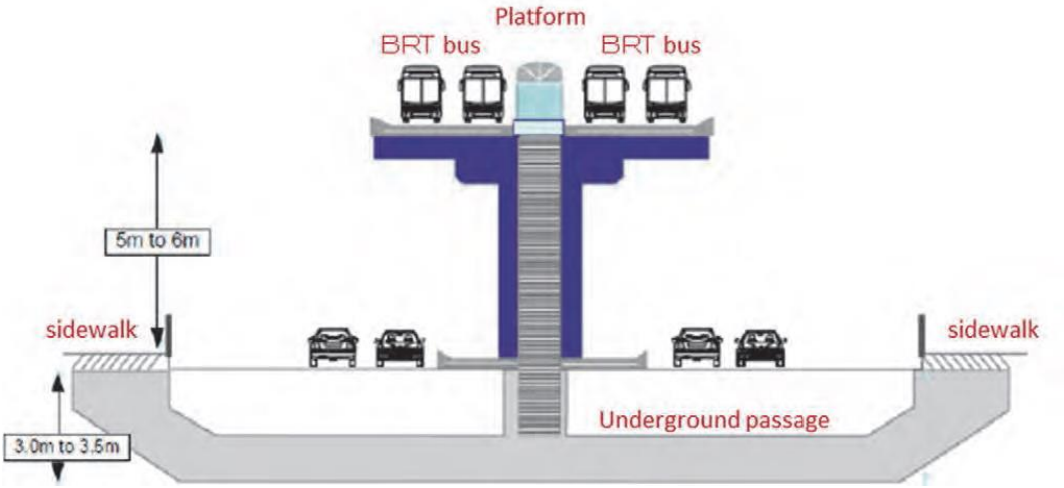


Figure 2.2.E Image of Station (Elevated Section)
Source: GDSUTP

These are some of the options of how a BRT station can be designed to provide easy and faster access. The options are shown for both ground level and elevated level.

It is planned that the approximately 8 km section starting from Airport Terminal will have two dedicated BRT line lanes per side, while the remaining 12 km section will have one dedicated BRT line lane per side. The Tongi area will be an elevated section with a length of approximately 4.5 km, while the 15.5 km ground-level section will be equipped with seven flyovers at intersections and six pedestrian bridges. There are plans to furnish both the Dhaka-Mymensingh Road and Joydhebpur-Chaurasta road (Japan International Cooperation Agency, 2015).

In Dhaka, buses tend to stop at various places in the road to take up passenger. Even though there are designated bus stops, the bus conductor halts wherever as they wish to take passengers. A possible solution for a crowded city like Dhaka is rail based system, where the passenger will not suffer for immobility as they suffer in buses.

“A sustainable city is one that wastes the least and conserves the maximum. Most importantly, it means making the existing system of people and resources work better--rather than throwing it away and trying to replace it with a single, capital-intensive project such as a subway or a rail-based system”
[Rabinovitch 1995].

A rail based Metro System is inescapable…World-over the practice is that when the population of a city reaches 1 million mark, the studies and investigations needed for a Metro System are taken up.” [Sreedharan 2004]

Rail technology decided the shape and form of these 19th century large cities in Europe and USA, also giving a great deal of importance to the central business district (CBD) as it could be fed by these trains.

2.3 MRT:

A rapid transit, underground, subway, elevated railway, metro or metropolitan railway system is an electric passenger railway in an urban area with a high capacity and frequency, and grade separation from other traffic. Rapid transit systems are typically located either underground tunnels or on elevated rails above street level. Outside urban centers, rapid transit lines may run on grade separated ground level tracks. (Rapid transit)

Metros, often designated as true heavy rapid transit, use fully segregated, and grade-separated track in central areas, the track may be elevated although the most common international term is for subway or underground. They employ very advanced control systems that allow high-frequency operations, and the trains are made up of multiple units of high-capacity ‘heavy’ cars. They can provide high levels of service (speeds and frequency) having the highest theoretical capacity, although they are also the most expensive form of MRT system. Metros in developing cities carried about 11 billion journeys in 2000, more than twice the ridership of commuter rail and more than four times the ridership of LRT systems (GTZ, 2005).

2.3.1 Commuter rail:

Suburban or commuter rail tends to be part of a larger rail network that carries passengers within urban areas or between urban areas and their suburbs, often at grade but separated from road traffic, and differs from Metros and LRT in that the passenger cars generally are heavier, the average trip length are usually longer, and the operations are carried out over tracks that are part of the railroad system in the area. Existing railway needs to be strengthened to introduce a new commuter rail as it often integrates with the existing systems. These systems have to operate within the context of the wider network demands, and are characterized by higher headways and longer station spacing as compared with both Metros and LRT.

Characteristics	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)	Metro	Suburban Rail
Current Applications	Widespread in Latin America & some developing cities	Most European & North American cities	Most Developed cities & few large developing cities	Most European & North American cities
Segregation	At grade	At grade	Mostly elevated or underground	At grade
Space requirement	2-4 lanes from existing road	2-3 lanes from existing road	Little impact on existing road if elevated/underground	-
Impact on Traffic	Depends on policy & design	Depends on policy & design	Reduces congestion	Depends on frequency
Public Transit Integration	Problematic with paratransit	Often difficult	Excellent	Usually existing
Initial cost (US$ million/km)	0.5-15	13-50	15-30 at grade 30-75 elevated 60-180 underground	-
Implementation time	Short	Medium	Long	-
Interaction with land development	Good	Very good	Excellent	Variable
Fuel	Mainly Diesel/CNG/LPG	Electricity	Electricity	Electricity
Air pollution & noise	Considerable	Low	Low	Low
Capacity (pass./hr/direction)	10-35,000	12-30,000	60,000+	30,000
Speed (km/hr)	17-20	20-50	30-80	40-45+
Traffic Accident	Minor	Minor	No	Minor (at level crossing)
System image & passenger attraction	Good	Very Good	Excellent	Variable

Sources: GTZ, 2005 ; World Bank, 2001 & 2002

Figure 2.3.1.A comparison of different mod of transport.

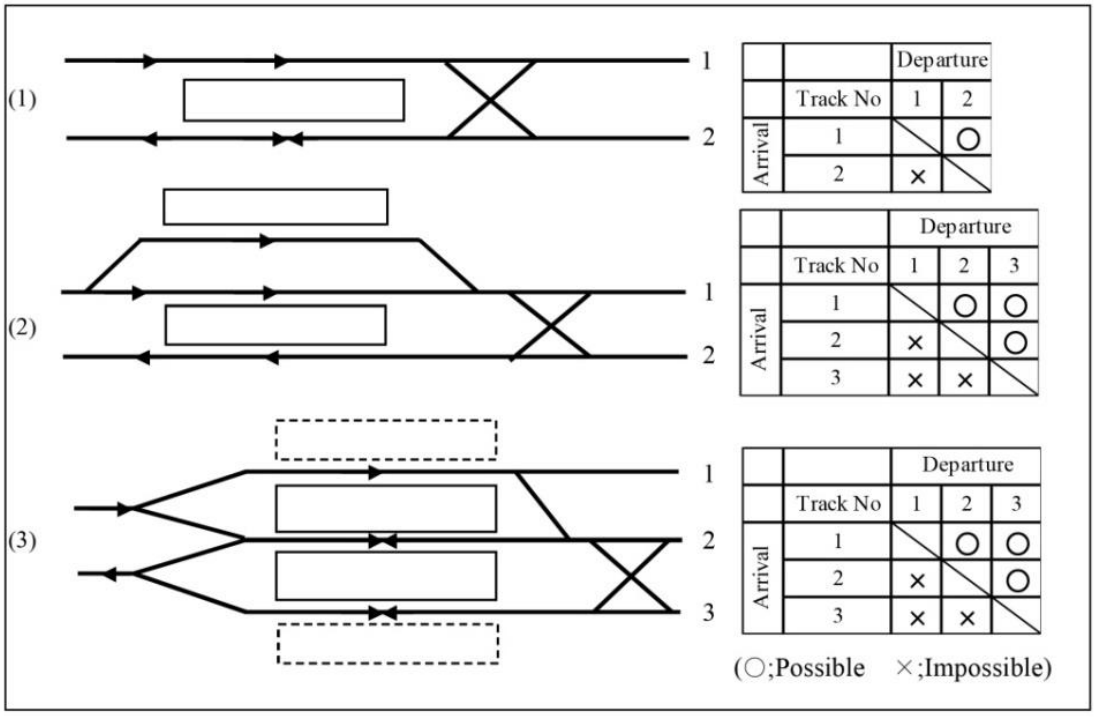


Figure 2.3.1.B Examples of Track Layouts and Crossing For Turn-Backs of Lead Tracks at Terminal Stations

Source: GTZ, 2005, world bank, 2001 & 2002

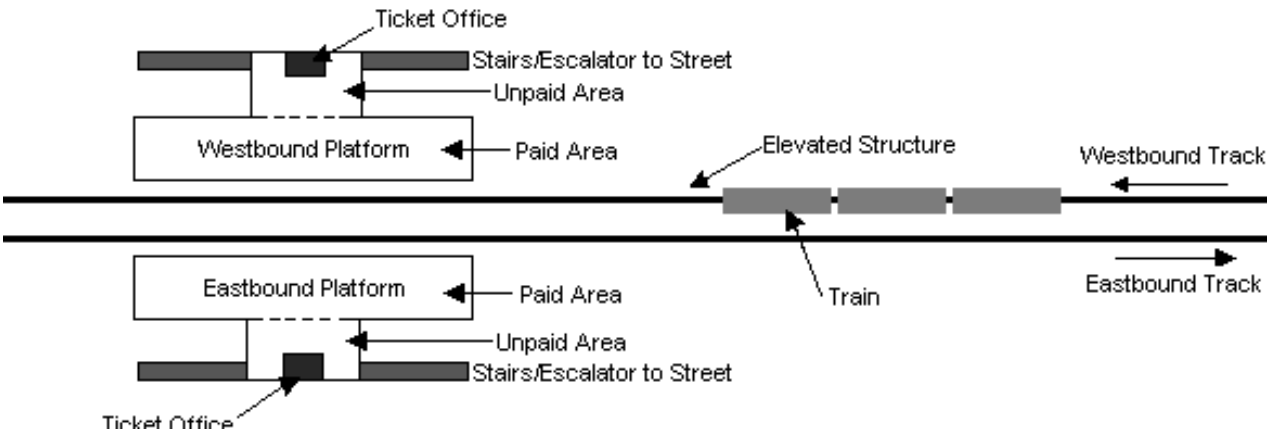


Figure 2.3.1.C Typical Elevated side platform station layout

Source: GTZ, 2005, world bank, 2001 & 2002

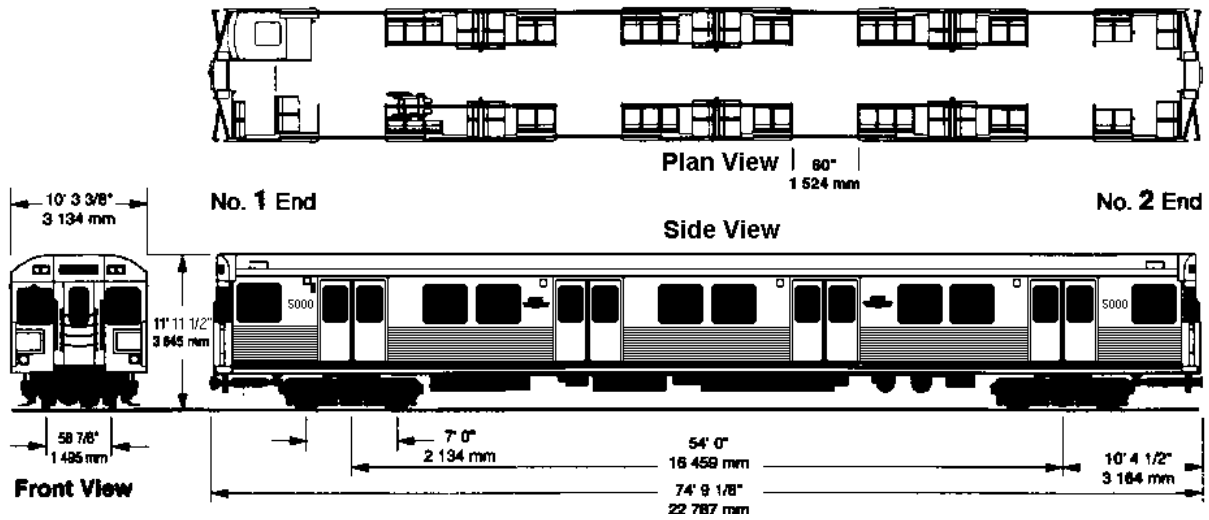


Figure 2.3.1.D Train bogie dimension

Source: GTZ, 2005, world bank, 2001 & 2002

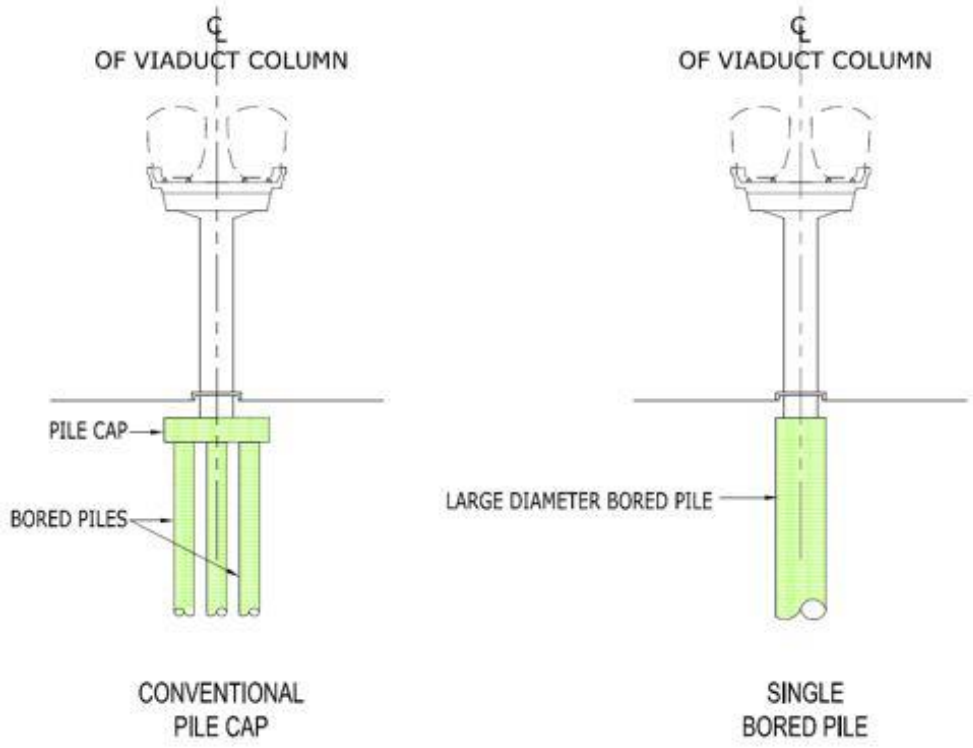


Figure 2.3.1.E shows an illustration of a conventional pile cap foundation and a single large diameter bored pile foundation.

Source: GTZ, 2005, world bank, 2001 & 2002

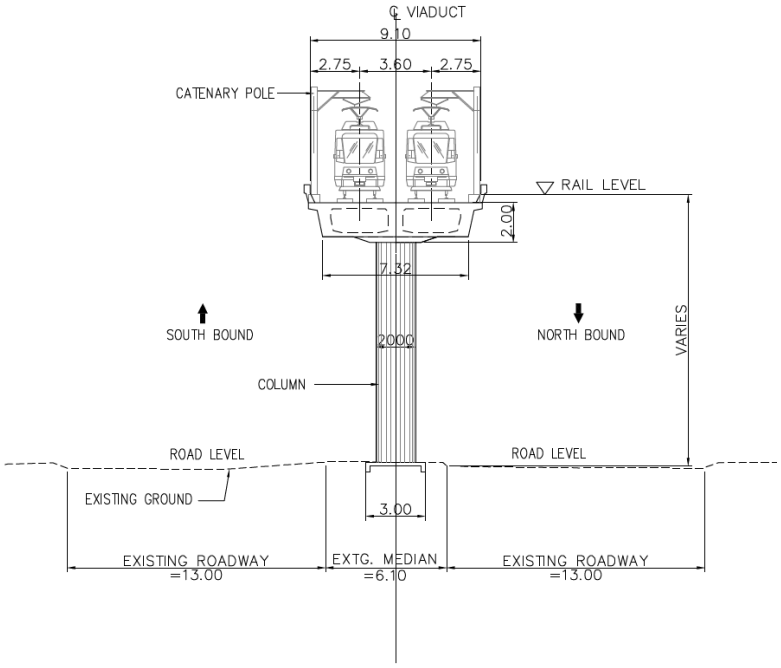


Figure 2.3.1.F CROSS SECTIONS of metro line. Drawing (Japan International Cooperation Agency (Jica), January 2011)

Source: GTZ, 2005, world bank, 2001 & 2002

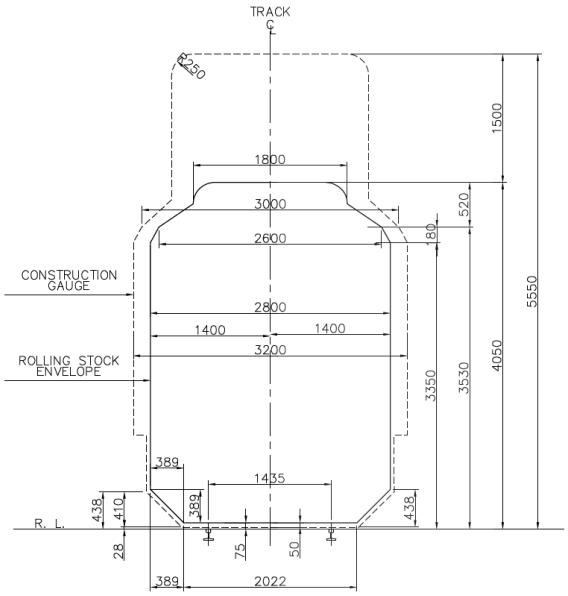


Figure 2.3.1.G Rolling Stock Envelope and Construction Gauge

Source: GTZ, 2005, world bank, 2001 & 2002

As shown in the figure, the limit of rolling stock width is 2,800 mm. In addition to this both side a 200 mm allowance is added. Therefore, the Construction Gauge is set at 3,200mm. On tangent track, the distance between RSE and the platform edge shall be kept at a minimum 50 mm. Along the platform the curve radius shall be a minimum of 600m.(Dhaka Transport Coordination Board (Dtcb), January 2011)

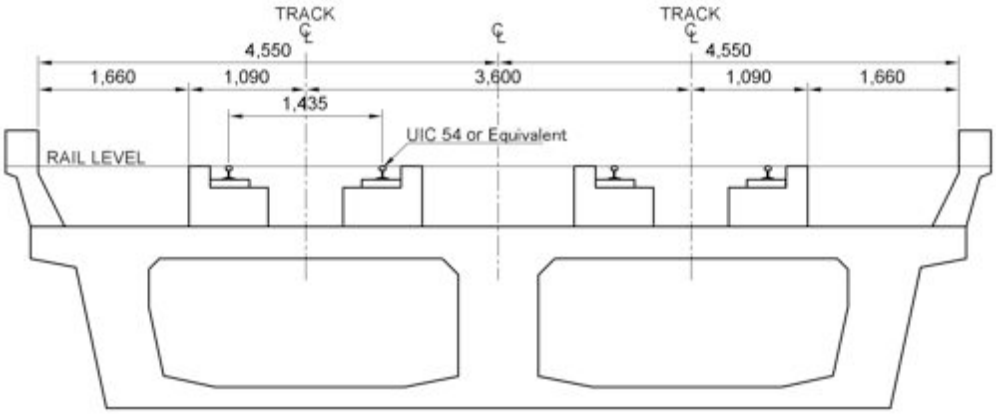


Figure 2.3.1.H Typical Cross Section of Double Track

Source: GTZ, 2005, world bank, 2001 & 2002

Figure 2.3.1.H shows on the tangent track Double Tracks Standard cross section, in which the distance between two tracks is shown as 3,600mm. Distance from track center to CG is 1,600mm. In addition to this, 200 mm□2 = 400 mm is provided.(Dhaka Transport Coordination Board (Dtcb), January 2011)

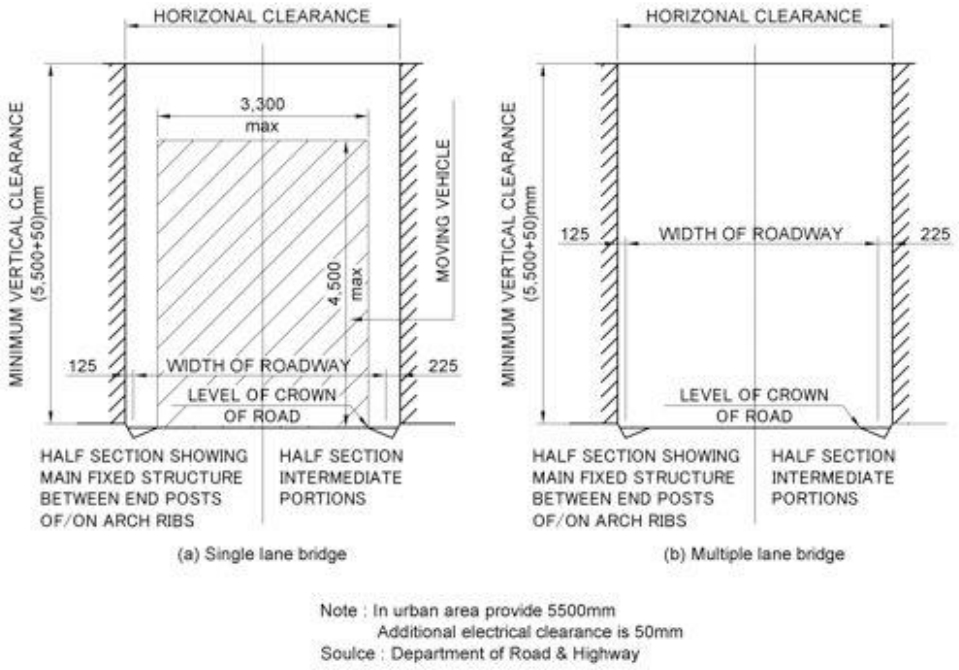
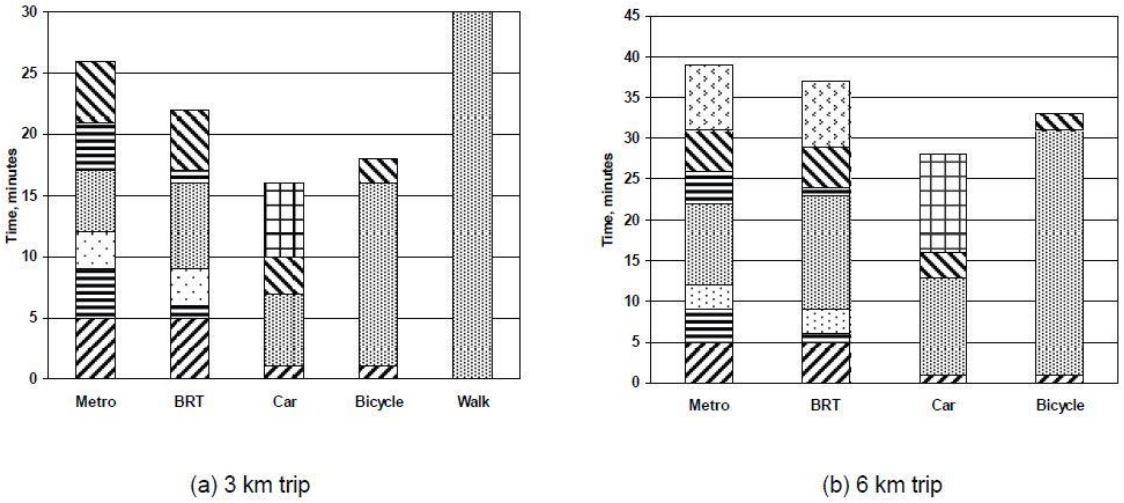
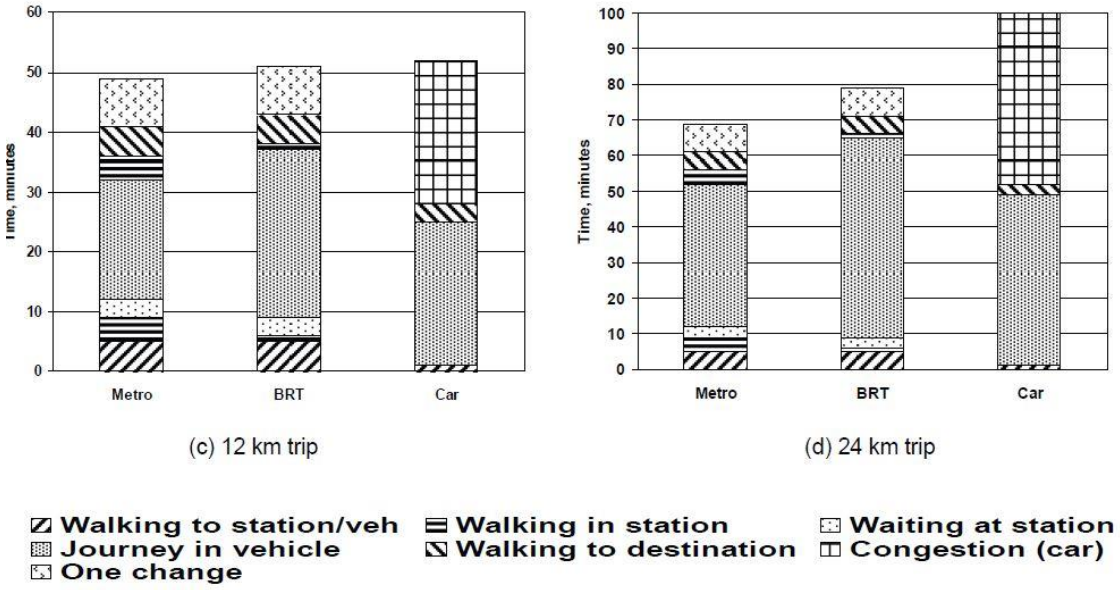


Figure 2.3.1.I Road Clearance

Source: GTZ, 2005, world bank, 2001 & 2002

Minimum clearance for road vehicle should follow the Bangladesh Road and Highway Design Standard. Minimum clearance is specified as 5.1m according to the Bridge Design Standards for the Road & Highways Department. On the other hand, some the bridges in the urban area were designed with





Notes: Metro: A generic term used for all underground or elevated mass transport systems including MRTS, light rail, monorail and sky bus.

BRT: Bus Rapid transit, bus system running on surface dedicated bus lanes.
Car: Term includes motorcycles.

2.4 Design Standard for the Project

MRT Line 4 Project is the second public urban railway system in Bangladesh. There are certain design standards of Bangladesh Railway already. However, most of the standards are based on British Standard. The Public Urban Railway System Network in Dhaka shall be developed through fair International Competitive Bidding (ICB).

The following Table shows the proposed design standards for MRT Line 6 System. These design standards will be discussed and approved by the Government of Bangladesh prior to design stage. Basically JICA Study Team will develop this proposal. (Dhaka Transport Coordination Board (Dtcb), January 2011)

Item		Description
Basic Spec.	Earthquake	Seismic Design
	Operation in case of Fire	Nonstop between stations (Train shall be driven to the nearest station).
	Rail Gauge	Standard gauge ; 1435 mm
	Car Gauge (Clearance)	As shown in Fig. 5.4-10 (widening at curve section)
	Construction Gauge	As shown in Fig. 5.4-10 (widening at curve section)
Alignment	Minimum Radius	600m (normal case), 200m (unavoidable case), 200m (Depot Area)
	Minimum Radium (Station)	600m (the track along the platform)
	Gradient	35‰ - 40‰ (between stations), Level for stations but 10‰ will be allowed for unavoidable case.
	Transition Curve	Cubic Parabola Curve or Clothoide.
	Minimum Length of Tangent Line between Transition Curve	20m but two transition curve will be allowed in case of unavoidable.
	Minimum Length of Curve Section	20m but two transition curve will be allowed in case of unavoidable.
	Distance between Rail Center	3.6 m (main tracks)
RailStructure	Rail	UIC 54kg/m (main track), 50 kg/m (side track and depot) CWR in curvature lager than 400m, to provide expansions joint at both ends.
	Rail Fastener	Basically Torsion Type.
	Turnout	No.10 for main track, No.8 or No.10 for side track and depot.
Station	Platform Length	Train Length +10m, Train Length + 5m with ATS/ATO.
	Platform Width	No structures are allowed within 2m from the end of platform. Minimum 5m for Island Type Platform. Minimum 4m for Lateral Type Platform. (exception case; 4m for Island Type and 2m for Separate Type).
	Consideration of people with handicaps	Universal Design, Barrier Free (Lift, Escalator, Tactile road tile for Blind, Slope, etc).
Power	Electric Power	Overhead Catenary Type, DC 1,500V
Rolling Stock		See Table 5.2-2

With regard to Rolling Stock, the following design criteria are proposed;

Figure 2.4.A Rolling Stock Design Criteria

2.5 Comparison between MRT and BRT

In Mythologies, Metros & Future Urban Transport by Dinesh Mohan, the comparisons between metro rail and BRT are discussed.

a. Travel by car or motorcycle will always give the least travel time compared to all other modes unless there is congestion on the road.
b. Travel by any rail system (metro) that is underground or elevated has a minimum door-to-door trip time of about twenty minutes. Walking is faster than using the metro for distances 1-2 km, and bicycling is faster for distances 3-4 km.
c. BRT gives lower travel times than the metro for distances less than ~ 6 km.
d. The metro becomes efficient for trip distances greater than 12 km.
e. If you introduce one change or one feeder trip for a metro trip, then travel by metro takes more time than by car or motorcycle for trips less than12 km even if there is congestion on the road.

These numbers make it quite clear that elevated and underground public transport systems do provide time saving compared to car or motorcycle use when there is congestion on the road, therefore, the trip becomes very long. At the same time, metro is also efficient when it comes to energy consumption and cost.

2.6 Space characteristics of stations and creating Civic space

Railway stations as sites for place making and community development have natural synergies that many of the researched projects identified in this paper have capitalized on.

Public transport nodes are natural gathering points which many people in social need information and services

In places where public transport is not privatized, railway stations are publicly-owned civic places that government authorities and the community may feel a sense of obligation to and ownership of, and may use these spaces to achieve civic pride and community expression.

Place making focuses on developing public spaces into places that have meaning for people, give them pleasure to be in, and that resonate with feeling and memory (Yencken, 1995).

2.6.1 Specifically, place making:

• aims to achieve enhanced civic engagement, social and economic development, cultural understanding, and deepen people's relationship to the environment via participatory processes and creative outcomes.
• strives to enable people to experience the public environment as a place where they belong, where they participate in the public and cultural life of the community.
(Train Stations as Places for Community Wellbeing By Village Well - July 2006)

The combination of a poorlydesigned railway environment, the presence of uncivil people, the lack of apparent securitymeasures, and negative media exposure have heavily influenced passenger insecuritieswhen travelling. Kennedy's (2008) study indicates that the three key situations in which
people feel most unsafe in the railway environment are:
(1) waiting at stations or platforms,
(2) walking to and from the station or platform and
(3) using the available toilets and waitingrooms.

It also reveals that many public transport users tend have an aversion to stations or stops that make them feel enclosed, trapped, or vulnerable to danger.

CHAPTER 03

SITE APPRAISALS

After the creation of Pakistan in 1947, Tejgaon Airport became the first civil airport in what was then East Pakistan, current day Bangladesh. In 1966 Pakistan government took a project to construct a new airport at present site north of Kurmitola was selected and tender floated for construction of terminal building and runway under technical support of French experts. For transportation of construction materials a rail station (present airport railway station) was built near the site. However, the new airstrip was halfway done when the Bangladesh Liberation War broke out in 1971. During war, the airstrip suffered severe damage. After independence the airport began operations in 1980 after the main runway and central portion of the present terminal building was formally opened. The project took a further three years to complete. Rail station was also built in the same time for land transportation.

It is the second stoppage for trains in Dhaka, after the Kamalapur railway station. Trains come from Noakhali, Sylhet, Rajshahi, Chittagong, Comilla and many important towns and cities. Its rail tracks provide both Meter gauge and Broad gauge. Therefore, broad gauge trains from Rajshahi and the Maitree Express can stop at that station easily. The station has two platforms. For the human traffic this station is really small. People from Dhaka and the north suburban area of Dhaka come to this station to disperse in different location. This station also works as a connecting line between suburban and urban.

History of this area is not that old but it is if not one of the important but the most important transport hub because, this is the place where Dhaka connects with the rest of the world. This place has one of the most important airports of Bangladesh.

The airport railways station nearby it which connects the land transport with rest of Bangladesh. Both are equally important as a transport hub. This transport area was

developed in 1980, that time this area was not urbanized. However, this area is completely changed now. People have grown more and building and roads have also increased. For this large population and vehicular traffic this rail station is not sufficient enough. Because of the development of Uttara and Tongi area now passengers has increased for the train station. As a result, due to heavy passenger traffic this station needs to evolve.

People grow with time, and with people, city grows and for city to grow properly, all the services and all the mechanical body of city need to grow with the city. If this growth does not happen with the growth of the city then that city will not serve the growing population properly.

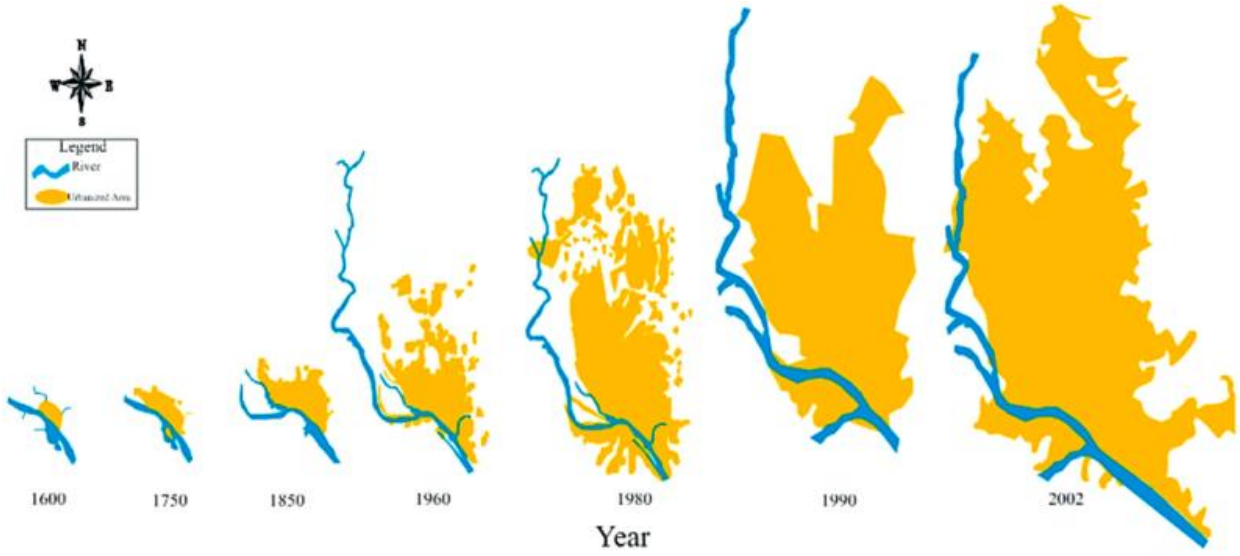


Figure 3.A: growth of urbanization in Dhaka city

Source: Dhaka City Corporation, 2004

3.1Site location:

Site is located east side of the Hazrat Shahjalal International Airport (DAC) Dhaka, the site of existing airport rail station. On the north of the site is Uttora, on the east Dakshin

Khan, on the west Hazrat Shahjalal International Airport and on the south it connects with the Dhaka city. Estimated Site area is 779532.2274 sq ft / 17 acre.

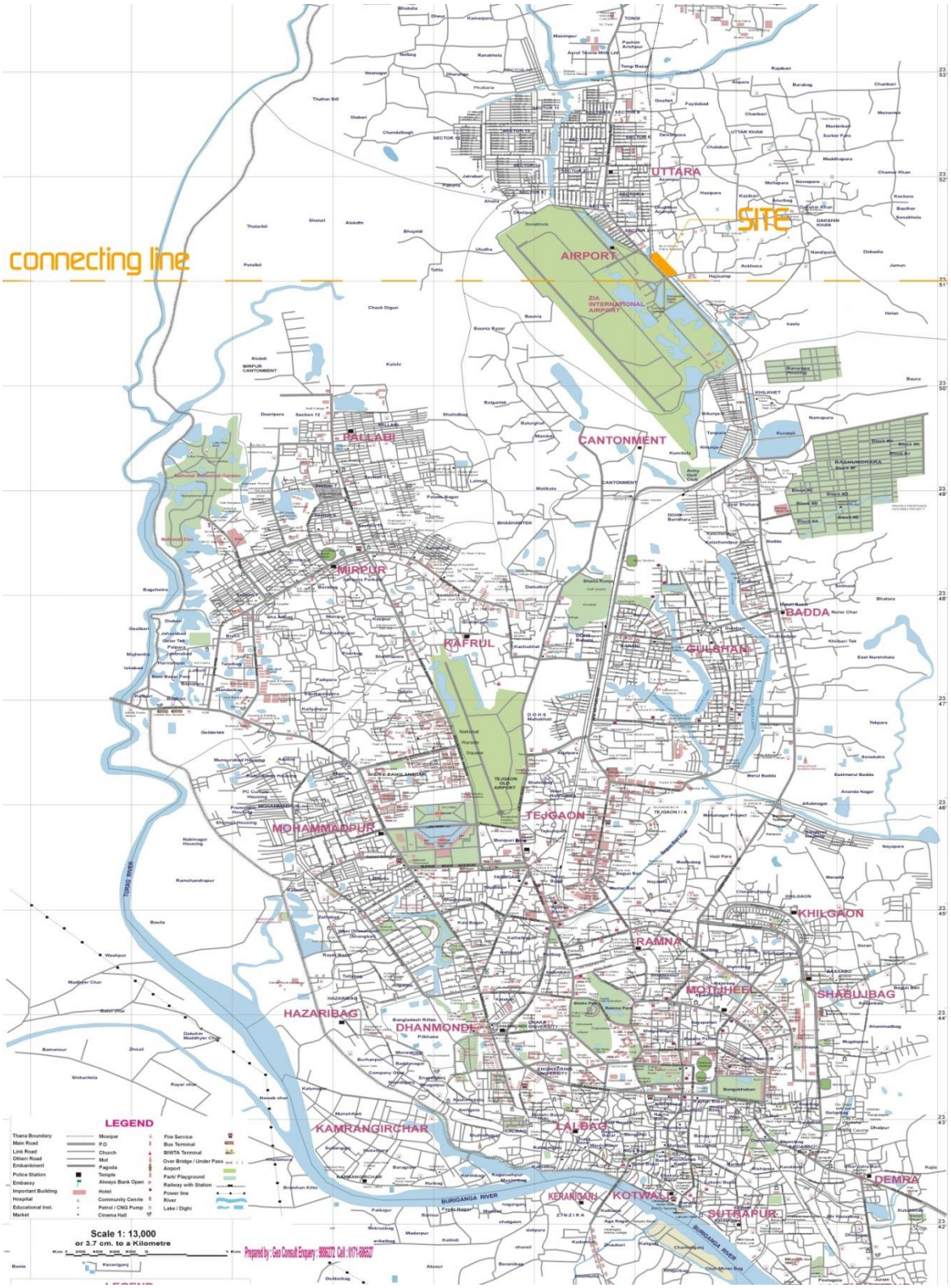


Figure 3.1.A. Site location with respect to Dhaka city.

Source: http://dhakadailyphoto.blogspot.com/2007/06/maps-dhaka-and-bangladesh.html

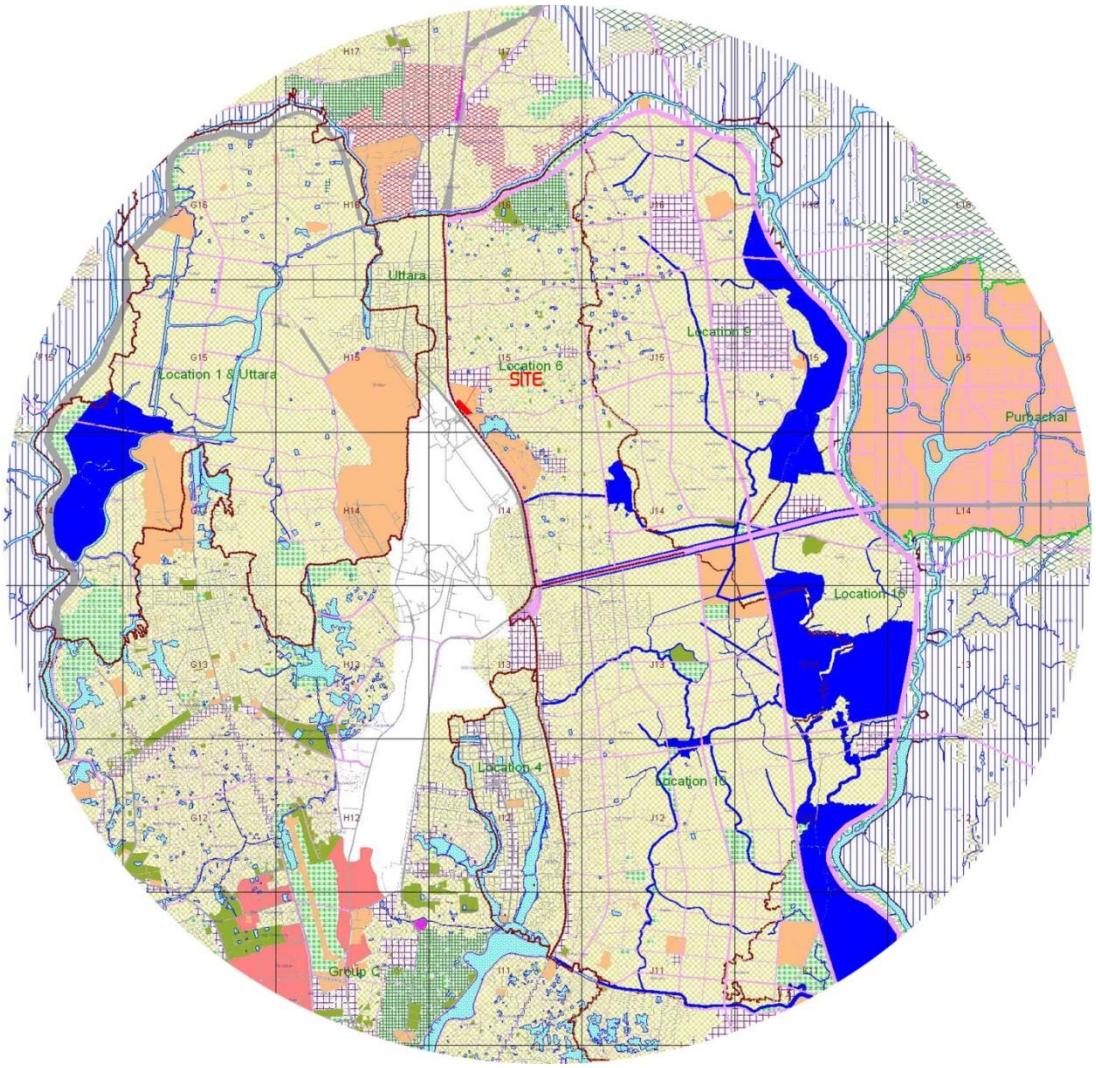


Figure 3.1.B. Integrated detail area plan map of DMP area (RAJUK) may 2010

Source: http://dhakadailyphoto.blogspot.com/2007/06/maps-dhaka-and-bangladesh.html

Figure 3.1.B. site location.

Source: Google maps

Surrounding area of airport area contain different zone. Maximum part of the east and northern area consist of residential area. Nearby area of the site contain mixed use zone where residential and commercial exist together. Some of the administrative function also coexists with other zone. A large area contains overlay zone. This zoning was done recently in May 2010, According to the development of the area by RAJUK.

Figure 3.1.C. Site adjoining functions

3.2 Existing situation with respect to site:

It can be easily identify that this area is not that developed. North and east side of the site is developed. But it is also noticeable that the developed area doesn't have much green area. On the south side of the site is really green and there are good amount of water body exist in there.

Solid void built mass map shows that compare to central Dhaka this area is more open. Even if we compare with the Dhaka kamalapur rail station with this airport rail station this station has more chances to expand as there are so much of open land to work with. Most of the area near by station is owned by government. It is easy to understand that there is a chance to expend the rail station so that it can complement the nearby airport.

Figure 3.2.A. Existing solid void map

Figure 3.2.B. Built map

Vegetation map shows that compare to central Dhaka this area have more vegetation as soakable land is large amount. West side of the Dhaka Mymensingh road has large green chunk but if it was compared with the land use map it is seen that those area are restrictive area owned by airport so public access is not authorized. Even though this area has so much green area still there is no civic space for the residential people. This area demands a civic space.

Figure 3.2.C. Vegetation map

Form water body map it is seen that this area have a lots of water body. Even if we see the history of this area it can be understood that this area was covered with water. Even inside the site area of rail station there was large amount of water. In existing situation a pond exists on the north east side of the station.

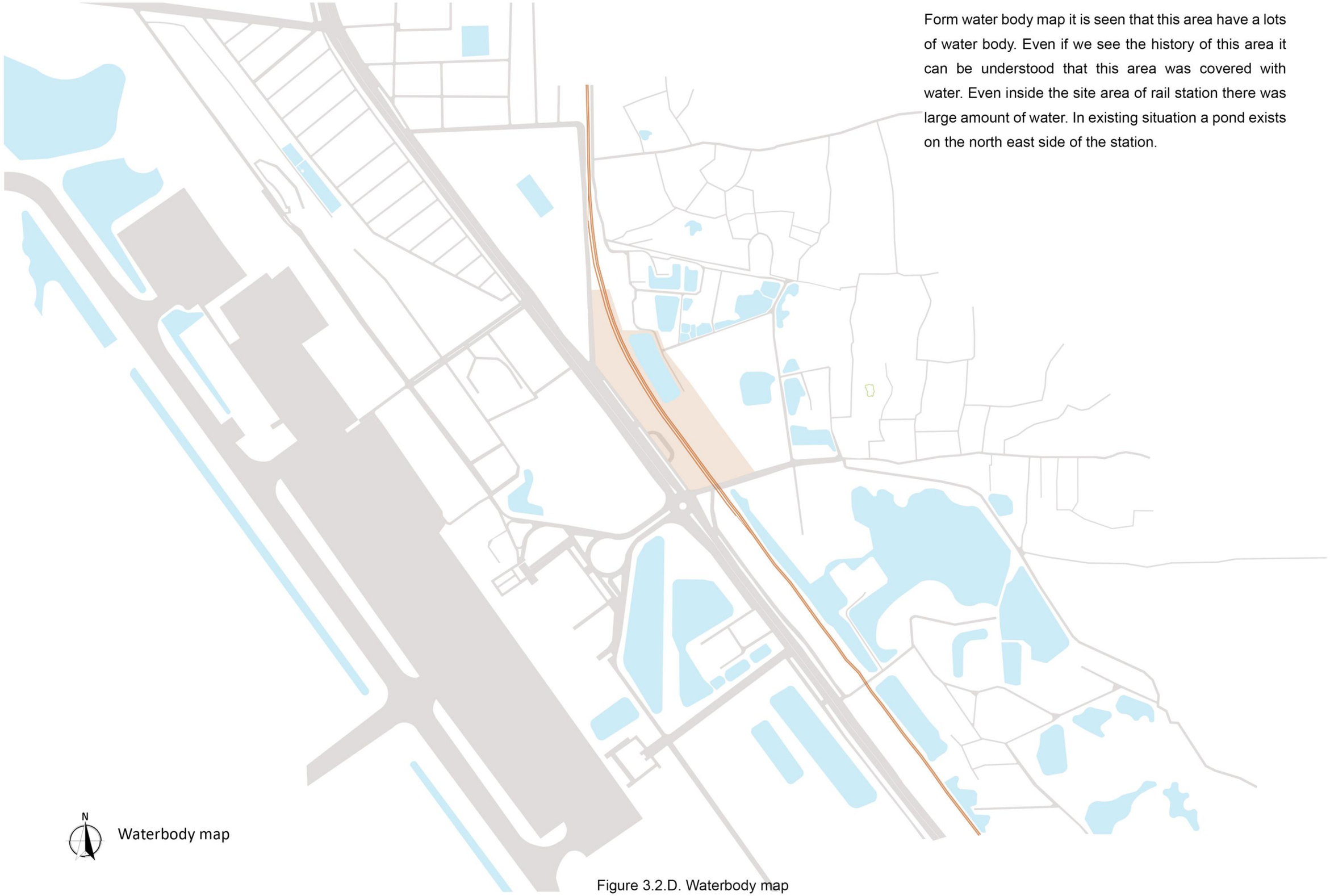


Figure 3.2.D. Waterbody map

The land use map shows all the different use of building nearby the rail station and airport area. By differentiating the land use building, it is easy to see which the active public functions are. By identifying the active public functions we can understand the public traffic on the road for those functions and the timing of traffic. From this map it is easily visible that most of the public functions are on the west side of the Dhaka Mymensingh road. For those function traffic movement from across the road is a lot, as there is residential area on the east side of the Dhaka Mymensingh road. And the existing train station is also on the east side of the road. For crossing that heavy vehicular road there is only one foot over bridge near by the node. The yellow buildings are restricted government office area so only hand full of people can go there. Form this map it is possible to get a gross idea of public density.

Figure 3.2.E. LAnd use pattern

3.2.1 Road& vehicle:

Analyzing the Dhaka maymansing road adjacent to the airport and airport rail station, it can be state that heavy vehicle congestion at a time in a single place. Traffic jam happens continuously in this area. Traffic is large because of the passenger who travels internationally and nationally comes in this area for train or air vehicle.

Road network map shows different in pattern on both sides. On the east side of the Dhaka mymensingh road there is completely unorganized development. Roads are not in any pattern. On the other hand roads on the west side of Dhaka mymensingh roads are well organized. Only two road connect the residential area with Dhaka mymensingh road for vehicular connection.

Analyzing the images we can see the situation of traffic. It was noon time even when traffic supposed to be minimum. It is clear that this area get congested more in after noon period.

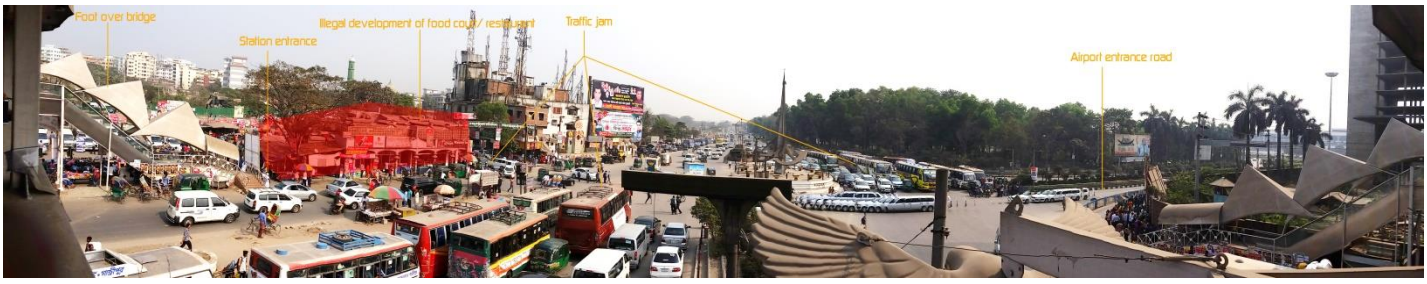


Figure 3.2.1.G: airport foot over bridge

These photos were taken from the foot over bridge on Dhaka Maymansing high way beside the airport. It can be clearly seen that human traffic movement from the airport to the main high way to disperse. Some illegal settlement can be visible on the left side of the figure 3.2.G. Those settlements are restaurant, other food shop which serve the people/ passenger or airport rail station.

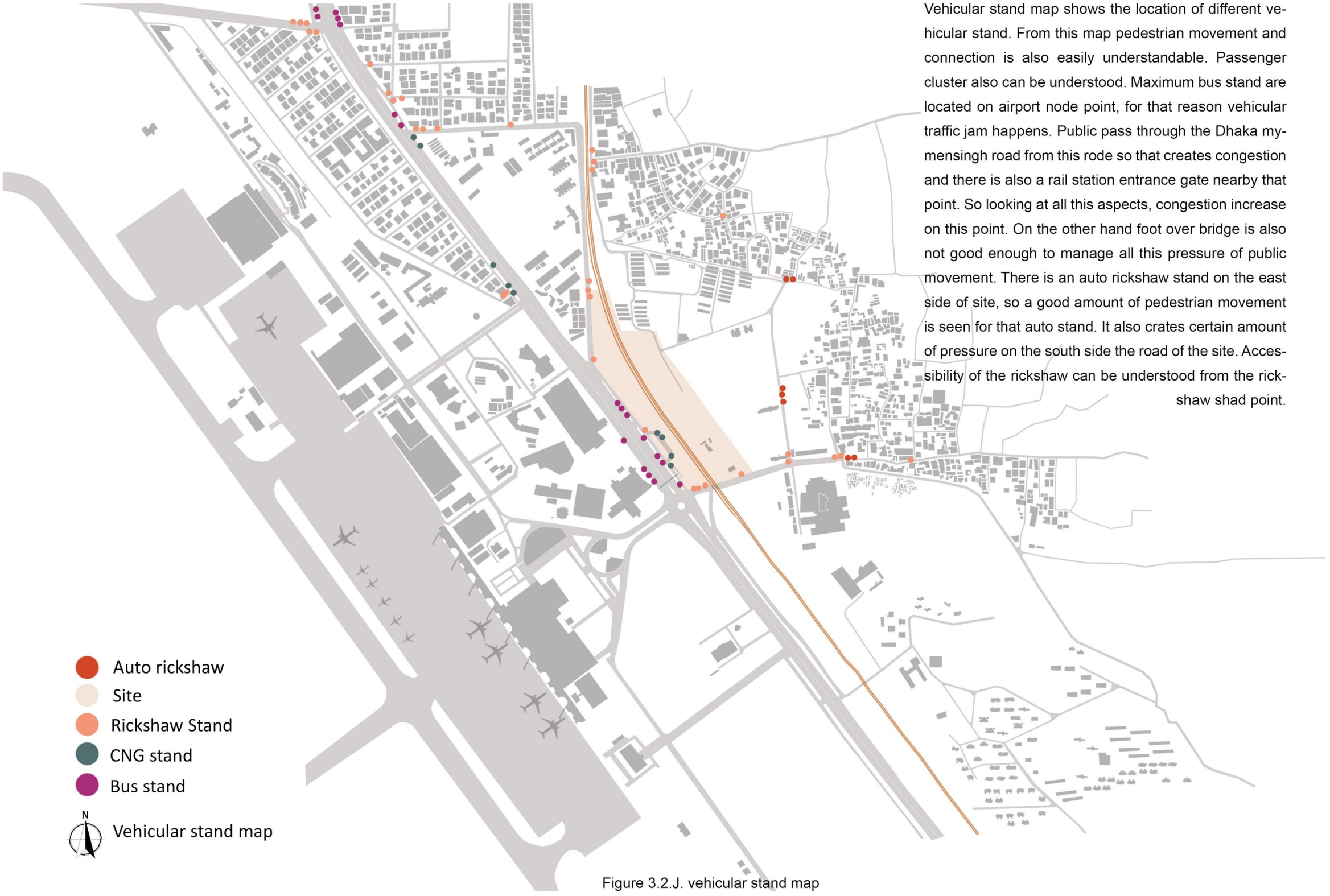
Figure 3.2.1.H: airport foot over bridge

On the figure 3.2.1.H we can observe that some new development is going on, which are on west side of the airport aril station opposite side of the Dhaka Maymansing high way. One of them is an office building and the other one is a shopping mall. Even though this area is not developed that much traffic jam happens all the time. The rail

station is not that big enough for this much growing people. The shopping mall which is undergoing construction is also one of the biggest shopping malls. After completion of this mall the traffic situation will be more hazardous. In future this road will not be able to handle this much traffic.

On this red marked area there are some undersigned bus stands. These bus stands create more traffic jam as it is near the node. Passing though vehicle has had time to pass.

Figure 3.2.1.I. Existing traffic pattern (bus)



Vehicular stand map shows the location of different vehicular stand. From this map pedestrian movement and connection is also easily understandable. Passenger cluster also can be understood. Maximum bus stand are located on airport node point, for that reason vehicular traffic jam happens. Public pass through the Dhaka mymensingh road from this rode so that creates congestion and there is also a rail station entrance gate nearby that point. So looking at all this aspects, congestion increase on this point. On the other hand foot over bridge is also not good enough to manage all this pressure of public movement. There is an auto rickshaw stand on the east side of site, so a good amount of pedestrian movement is seen for that auto stand. It also crates certain amount of pressure on the south side the road of the site. Accessibility of the rickshaw can be understood from the rickshaw shad point.

Figure 3.2.J. vehicular stand map

3.2.2. Pedestrian movement:

There is a dense pedestrian activity on both the south and west end of the site. The west end consists of two major bus stands serving both ways. For this bus stand people gather on the road and traffic congestion incises. Even though footpath is well defined, it is not sufficient for the pedestrian. Because 2 major transport system is there.

Image 1 image 2

Figure3.2.2.A: under the foot over bridge of airport road.

This image 1 shows the west side movement of pedestrian. On the left image it is shown that for that foot over bridge pedestrian movement is getting hampered. There is an informal bus stand under the foot over bridge, for that reason public movement is getting hampered. A large percentage of pedestrian comes from the airport to the west part of high way.

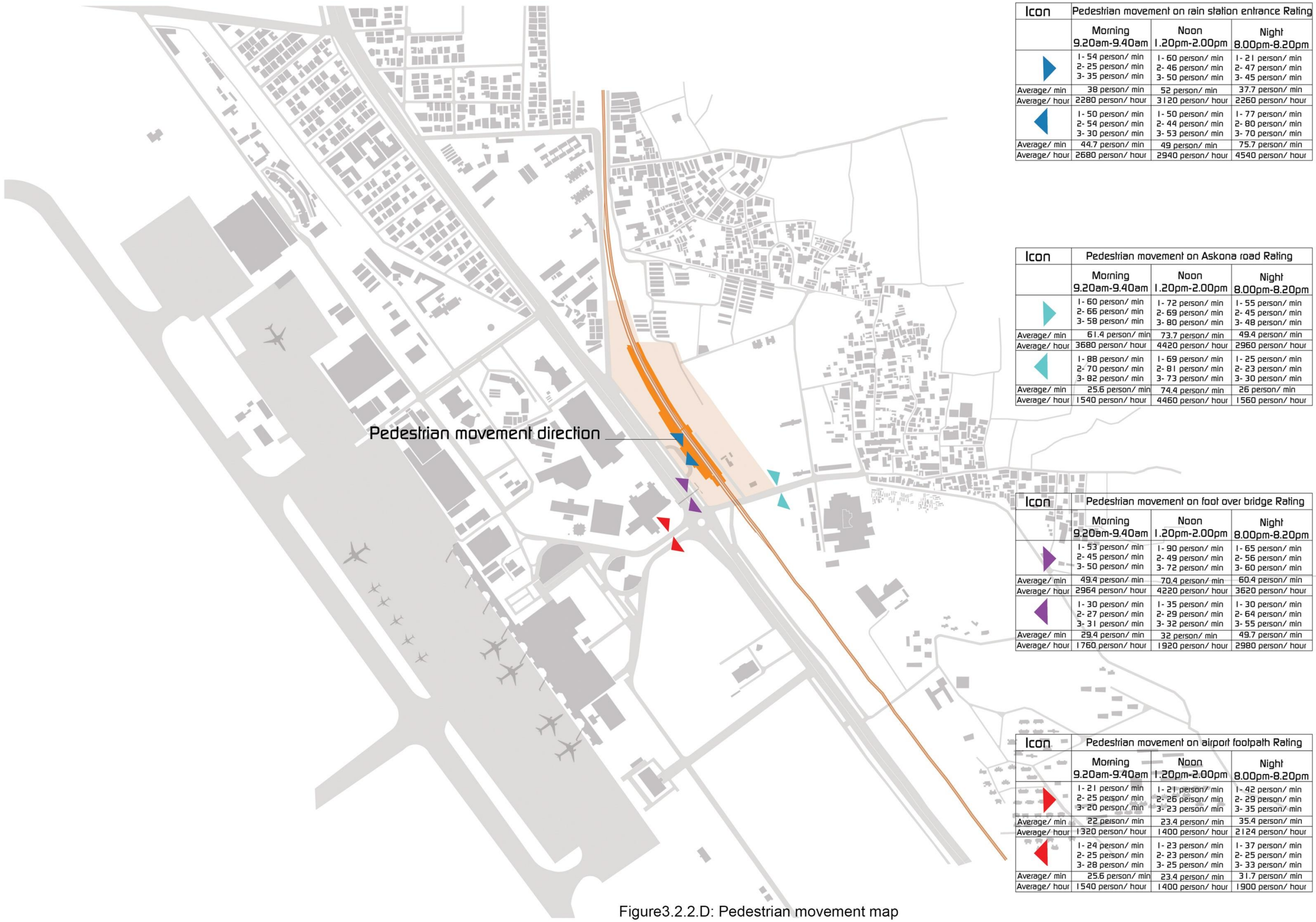
Figure3.2.2.B: Existing pedestrian flow map

Figure3.2.2.B: south side road of the site

Pedestrian activity on the south is completely a different situation. South side road of the rail station is a secondary road which connects the highway to Dakshin Khan. This is a busy road for both vehicular movement and pedestrian movement. This road do not have well designed pedestrian walk way and this road is not wide enough for vehicle and pedestrian movement. Moreover, footpath was invaded by temporary kachabazer. Even though it is not a permanent bazar, it stays permanently from morning to evening. Because of this people have to take over the road. So both vehicle and pedestrian movement is hampered. Pedestrian movement is a big issue for this site.

Pedestrian walking path map was done to understand the movement of pedestrian through the site. This map easily shows the path throughout the existing station and surrounding then station. And it is easy to understand the important pedestrian connection point. People movement on the node connection is large amount. Movement through the station can also be noticed so there is a demand for a pedestrian connection through the center of the rail station.

Figure3.2.2.C: Pedestrian walking path map



Icon	Pedestrian movement on rain station entrance Rating		
	Morning 9.20am-9.40am	Noon 1.20pm-2.00pm	Night 8.00pm-8.20pm
	1- 54 person/ min 2- 25 person/ min 3- 35 person/ min	1- 60 person/ min 2- 46 person/ min 3- 50 person/ min	1- 21 person/ min 2- 47 person/ min 3- 45 person/ min
Average/ min	38 person/ min	52 person/ min	37.7 person/ min
Average/ hour	2280 person/ hour	3120 person/ hour	2260 person/ hour
	1- 50 person/ min 2- 54 person/ min 3- 30 person/ min	1- 50 person/ min 2- 44 person/ min 3- 53 person/ min	1- 77 person/ min 2- 80 person/ min 3- 70 person/ min
Average/ min	44.7 person/ min	49 person/ min	75.7 person/ min
Average/ hour	2680 person/ hour	2940 person/ hour	4540 person/ hour

Icon	Pedestrian movement on Askona road Rating		
	Morning 9.20am-9.40am	Noon 1.20pm-2.00pm	Night 8.00pm-8.20pm
	1- 60 person/ min 2- 66 person/ min 3- 58 person/ min	1- 72 person/ min 2- 69 person/ min 3- 80 person/ min	1- 55 person/ min 2- 45 person/ min 3- 48 person/ min
Average/ min	61.4 person/ min	73.7 person/ min	49.4 person/ min
Average/ hour	3680 person/ hour	4420 person/ hour	2960 person/ hour
	1- 88 person/ min 2- 70 person/ min 3- 82 person/ min	1- 69 person/ min 2- 81 person/ min 3- 73 person/ min	1- 25 person/ min 2- 23 person/ min 3- 30 person/ min
Average/ min	25.6 person/ min	74.4 person/ min	26 person/ min
Average/ hour	1540 person/ hour	4460 person/ hour	1560 person/ hour

Icon	Pedestrian movement on foot over bridge Rating		
	Morning 9.20am-9.40am	Noon 1.20pm-2.00pm	Night 8.00pm-8.20pm
	1- 53 person/ min 2- 45 person/ min 3- 50 person/ min	1- 90 person/ min 2- 49 person/ min 3- 72 person/ min	1- 65 person/ min 2- 56 person/ min 3- 60 person/ min
Average/ min	49.4 person/ min	70.4 person/ min	60.4 person/ min
Average/ hour	2964 person/ hour	4220 person/ hour	3620 person/ hour
	1- 30 person/ min 2- 27 person/ min 3- 31 person/ min	1- 35 person/ min 2- 29 person/ min 3- 32 person/ min	1- 30 person/ min 2- 64 person/ min 3- 55 person/ min
Average/ min	29.4 person/ min	32 person/ min	49.7 person/ min
Average/ hour	1760 person/ hour	1920 person/ hour	2980 person/ hour

Icon	Pedestrian movement on airport footpath Rating		
	Morning 9.20am-9.40am	Noon 1.20pm-2.00pm	Night 8.00pm-8.20pm
	1- 21 person/ min 2- 25 person/ min 3- 20 person/ min	1- 21 person/ min 2- 26 person/ min 3- 23 person/ min	1- 42 person/ min 2- 29 person/ min 3- 35 person/ min
Average/ min	22 person/ min	23.4 person/ min	35.4 person/ min
Average/ hour	1320 person/ hour	1400 person/ hour	2124 person/ hour
	1- 24 person/ min 2- 25 person/ min 3- 28 person/ min	1- 23 person/ min 2- 23 person/ min 3- 25 person/ min	1- 37 person/ min 2- 25 person/ min 3- 33 person/ min
Average/ min	25.6 person/ min	23.4 person/ min	31.7 person/ min
Average/ hour	1540 person/ hour	1400 person/ hour	1900 person/ hour

Figure3.2.2.D: Pedestrian movement map

Icon	Pedestrian movement on rain station entrance Rating		
	Morning 9.20am-9.40am	Noon 1.20pm-2.00pm	Night 8.00pm-8.20pm
	1- 54 person/ min 2- 25 person/ min 3- 35 person/ min	1- 60 person/ min 2- 46 person/ min 3- 50 person/ min	1- 21 person/ min 2- 47 person/ min 3- 45 person/ min
Average/ min	38 person/ min	52 person/ min	37.7 person/ min
Average/ hour	2280 person/ hour	3120 person/ hour	2260 person/ hour
	1- 50 person/ min 2- 54 person/ min 3- 30 person/ min	1- 50 person/ min 2- 44 person/ min 3- 53 person/ min	1- 77 person/ min 2- 80 person/ min 3- 70 person/ min
Average/ min	44.7 person/ min	49 person/ min	75.7 person/ min
Average/ hour	2680 person/ hour	2940 person/ hour	4540 person/ hour

This chart describes the pedestrian traffic in train station during three periods of the day for both departure and arrival hour. At night traffic is highest, over 4000 people departing.

Icon	Pedestrian movement on Askona road Rating		
	Morning 9.20am-9.40am	Noon 1.20pm-2.00pm	Night 8.00pm-8.20pm
	1- 60 person/ min 2- 66 person/ min 3- 58 person/ min	1- 72 person/ min 2- 69 person/ min 3- 80 person/ min	1- 55 person/ min 2- 45 person/ min 3- 48 person/ min
Average/ min	61.4 person/ min	73.7 person/ min	49.4 person/ min
Average/ hour	3680 person/ hour	4420 person/ hour	2960 person/ hour
	1- 88 person/ min 2- 70 person/ min 3- 82 person/ min	1- 69 person/ min 2- 81 person/ min 3- 73 person/ min	1- 25 person/ min 2- 23 person/ min 3- 30 person/ min
Average/ min	25.6 person/ min	74.4 person/ min	26 person/ min
Average/ hour	1540 person/ hour	4460 person/ hour	1560 person/ hour

This chart describes the pedestrian traffic in train station during three periods of the day for both departure and arrival hour. It is highest in the train station with 3000-4000 people per hour in the morning and noon.

Icon	Pedestrian movement on foot over bridge Rating		
	Morning 9.20am-9.40am	Noon 1.20pm-2.00pm	Night 8.00pm-8.20pm
	1- 53 person/ min 2- 45 person/ min 3- 50 person/ min	1- 90 person/ min 2- 49 person/ min 3- 72 person/ min	1- 65 person/ min 2- 56 person/ min 3- 60 person/ min
Average/ min	49.4 person/ min	70.4 person/ min	60.4 person/ min
Average/ hour	2964 person/ hour	4220 person/ hour	3620 person/ hour
	1- 30 person/ min 2- 27 person/ min 3- 31 person/ min	1- 35 person/ min 2- 29 person/ min 3- 32 person/ min	1- 30 person/ min 2- 64 person/ min 3- 55 person/ min
Average/ min	29.4 person/ min	32 person/ min	49.7 person/ min
Average/ hour	1760 person/ hour	1920 person/ hour	2980 person/ hour

This chart shows the pedestrian traffic load on the foot over bridge that connects the airport and the station side of the road. Traffic is high at noon for arrival and high at night for departure.

Icon	Pedestrian movement on airport footpath Rating		
	Morning 9.20am-9.40am	Noon 1.20pm-2.00pm	Night 8.00pm-8.20pm
	1- 21 person/ min 2- 25 person/ min 3- 20 person/ min	1- 21 person/ min 2- 26 person/ min 3- 23 person/ min	1- 42 person/ min 2- 29 person/ min 3- 35 person/ min
Average/ min	22 person/ min	23.4 person/ min	35.4 person/ min
Average/ hour	1320 person/ hour	1400 person/ hour	2124 person/ hour
	1- 24 person/ min 2- 25 person/ min 3- 28 person/ min	1- 23 person/ min 2- 23 person/ min 3- 25 person/ min	1- 37 person/ min 2- 25 person/ min 3- 33 person/ min
Average/ min	25.6 person/ min	23.4 person/ min	31.7 person/ min
Average/ hour	1540 person/ hour	1400 person/ hour	1900 person/ hour

This chart shows pedestrian chart on the road in front of the airport with departure load.

3.3 Existing Rail Station:

Entrance of the rail station is in significant. Front part of the rail station was designed for vehicle movement, but analyzing the situation now this place is taken over by the hockers

Figure3.3.A: Entrance of the airport rail station.

Entrance of the rail station is in significant. Front part of the rail station was designed for vehicle movement, but analyzing the situation now this place is taken over by the hawkers. This illegal market like place is hassle for passengers. It was supposed to be temporary parking for passenger. Now it is hardly working as a temporary parking spot for the passenger. Even though this street hacker can be strength of this station as they serve a large number of people. But in this situation it is hampering public movement.

Figure3.3.B East side of the station (parking)

Back of the rail station has a pond and parking area. Parking on the back is not used efficiently even though that parking is well designed. One reason can be the south side road of the site is so busy and narrow that cars cannot enter easily. There are some green areas back of the site on the east, but those areas are not being used for any functional purpose. There are some temporary structures for rail stations staffs' residence.

More over the platform of the station is 1225', but there is only one connection on the middle to cross the rain line to get to the other side platform. Even that is not well thought out design. As the east side of the platform was added later.

Figure3.3.C East side of the station (pond, parking)

There is a pond north east side of the station which is well maintained. There are some informal food shops on one side of the pond which are really useful for passengers as there are not enough shops inside the station. One drawback of these shops is that they pollute the pond water by throwing dump.

Figure3.3.D: platform of airport rail station

Even though east and west side platform of the rail station is really long it does not have depth enough for passenger to sit, stand or rest. There is no shifty for the passenger. People walking along the rail line which is not safe.

Figure3.3.E: Inside the airport rail station

3.4 Environmental Considerations:

3.4.1Climate:

Climate of Dhaka is hot, wet and humid tropical climate. The city has a distinct monsoonal season, with an annual average temperature of 25 °C (77 °F) and monthly means varying between 18 °C (64 °F) in January and 29 °C (84 °F) in August.[1] Nearly 80% of the annual average rainfall of 1,854 millimeters (73.0 in) occurs during the

monsoon season which last from May till the end of September. Increasing air and water pollution emanating from traffic congestion and industrial waste are serious problems affecting public health and the quality of life in the city. (Climate of Dhaka)

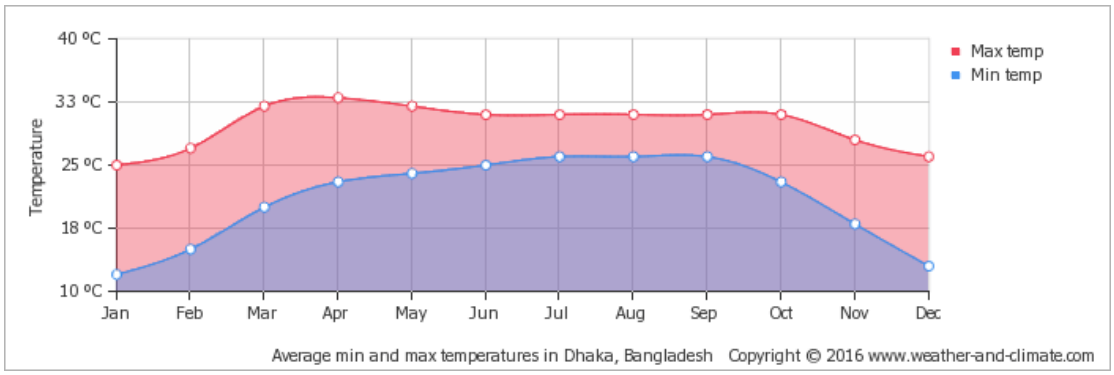


Figure3.4.1.A Temperature: Here is the annual temperature chart of Dhaka.

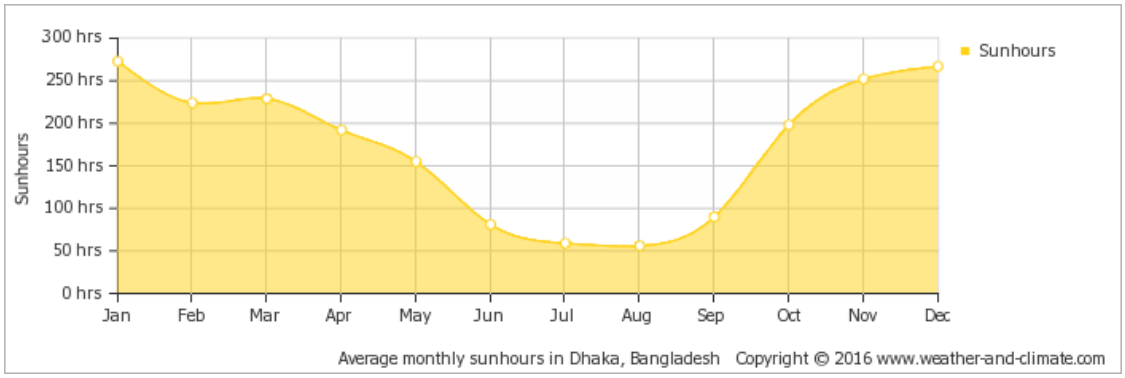


Figure3.4.1.B: Sun hour: This is the monthly total of sun hours

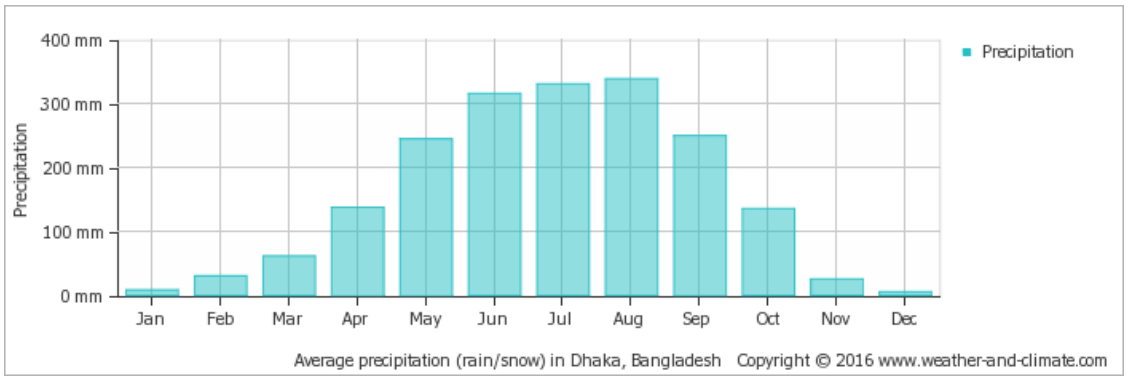


Figure3.4.1.C Precipitation: This is the mean monthly precipitation, including rain, snow, hail etc. Show in Inches.

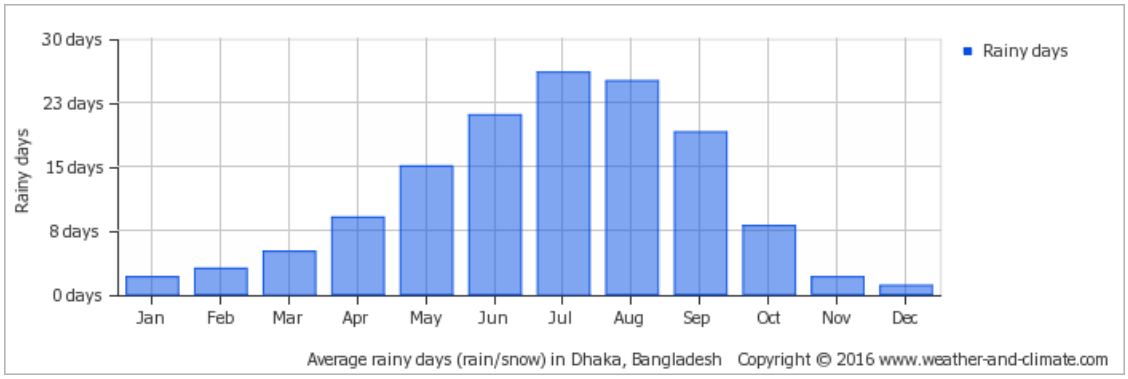


Figure3.4.1.D Rain fall: The average rainfall in Dhaka city is 75-80 mm.

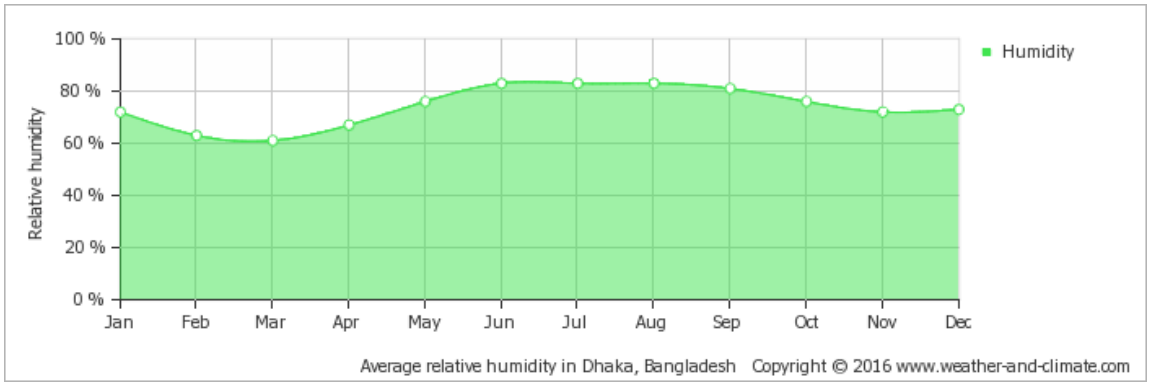


Figure3.4.1.E Humidity: Average relative humidity in Dhaka, Bangladesh.

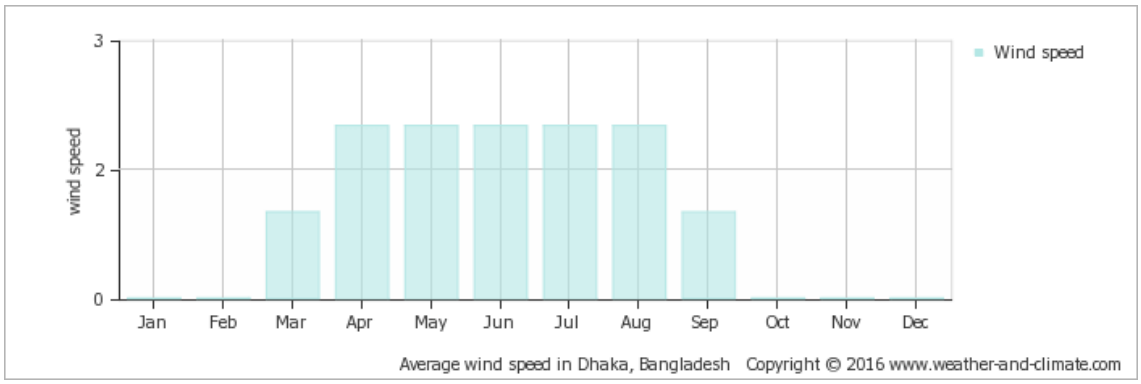


Figure3.4.1.F Wind speed: Average wind speed in Dhaka, Bangladesh

3.5 SWOT analysis:

Strength:

- The site is the connecting node between Dhaka and its surrounding districts.
- This site contains a large amount of green.
- Construction of new shopping mall on the west side of the high way.
- Hawker's market keeps the foot-path alive.
- Many transportation facility ease of mass access. It is somewhat hub of all public transportation system

Weakness:

- Poor foot path.
- Poor traffic system. No well defined bus stoppage.
- Vendor equipped the footpath where people could not access.
- Unused green space.
- Not enough space for seating.
- Unorganized bus stand.

Opportunity:

- Opportunity to have better transport system.
- Opportunity to represent our cultural in space and place making.
- Opportunity to unify airport, rail and MRT station.
- Potential public and civic space.
- Opportunity to use existing negative space for batter use.

Threat:

- Threat of unhealed rampant development

- Unplanned growth can result to a dangerous failure for the city
- Lack of public function and activities
- Safety issue can increase.

3.6 Findings of site analysis:

The information collected were analyzed and interpreted through maps, images and sections. The pedestrian and vehicle movement were studied thoroughly with the obstacles which worked as a catalyst for people to spontaneously create walking paths and routes on their own.

The site in overall is very hectic and crowded with high noise pollution and traffic jam. The surrounding area has been developing with no proper planning. The residential building are transforming into mix residential as demanded by the local people. The commercial zone and slow transformation to residential zone needed here is missing, which is why there is no space for market/bazaar, shops and restaurants.

The airport and the railway station are not properly linked which creates problems for pedestrians and passengers arriving from the station. The traffic generator functions have no open space or breathing space for the large amount of people coming here.
This is why, not only road traffic but also human traffic is extremely high.

Creating direct connection within the different transport modes:

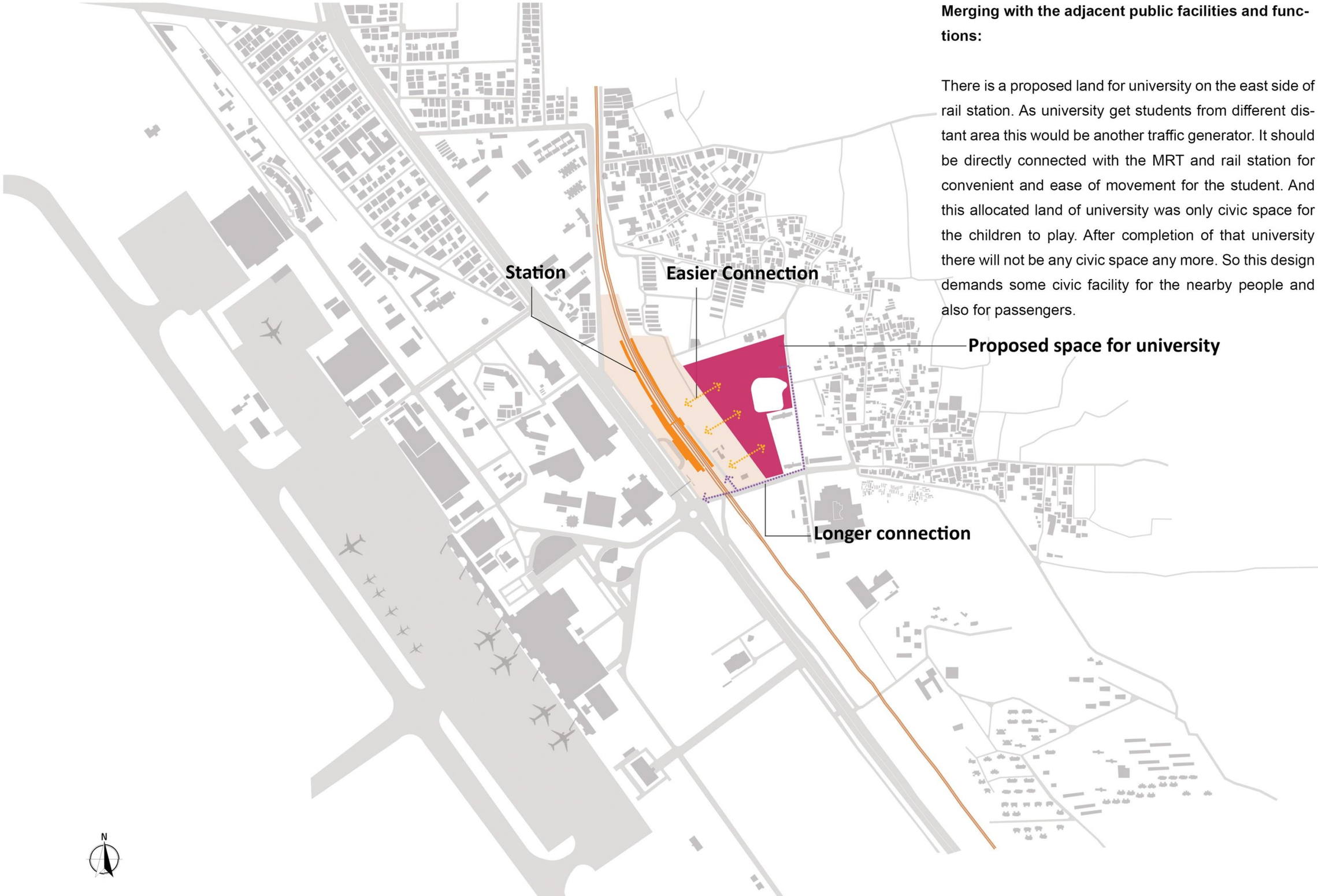
From the previous site survey major public traffic generator are airport itself and the new shopping mall that is on construction. For these to major function public movement from west to the east side of the highway is a lot. As government proposed a MRT line through the area so for that the pedestrian movement will increase more. So there should be a strong pedestrian connection through this traffic generator with the rail station. Direct pedestrian connection will minimize the congestion on the highway and it will prevent traffic jam in some level.

Figure3.6.A: Interpretation map 1

Demanded connection of local habitants:

Since all the public functions are on the west side of the highway, people from the residential area have to cross the road to get the facilities. There are only two roads which connect the residential area (dakshinkhan and askona) with the highway, which create a big congestion at the airport dakshinkhan road on the south side of rail station. There could be a solution for this congestion. There is a discontinued road more or less center of the other two connected road. That discontinued road demand a connection with the highway. This connected road can reduce pedestrian congestion on the south side airport dakshinkhan road. It will also compliment the pedestrian connection of the interpretation map 1.

Figure3.6.1.A: Interpretation map 2



Merging with the adjacent public facilities and functions:

There is a proposed land for university on the east side of rail station. As university get students from different distant area this would be another traffic generator. It should be directly connected with the MRT and rail station for convenient and ease of movement for the student. And this allocated land of university was only civic space for the children to play. After completion of that university there will not be any civic space any more. So this design demands some civic facility for the nearby people and also for passengers.

Figure3.6.3.A: Interpretation map 4

Redistributing vendors to ensure active public space and ease of movement:

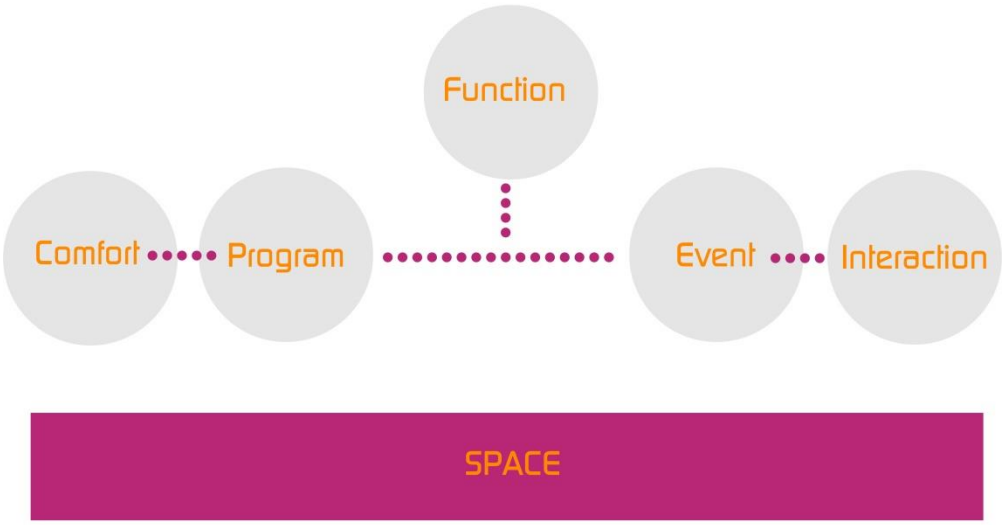
This interpretation maps shows that relocating vendor is necessary to decentralize the cluster of people. Because vendor attract people and more people cause congestion. This congestion also increases highway traffic. Existing location of vendor took over the parking area which is creating vehicular movement.

Figure3.6.4.A: Interpretation map 5

CHAPTER 04:

PROGRAM DEVELOPMENTS

Program can be a guideline for project development. But for urban project doesn't work as a perimeter. Program should generate from the contextual analysis is necessary for project. Function can be divided into two separate identity events and program. Event is like soul and program is like body which actually the factors what makes the space lively.



For the non-place context it is more needed to explore those event generating factors and design accordingly. If all those factors are considered while dealing with non-place, then it must create dialogue with the place and the people.

The program of this project can be derived in two categories. One is existing program what is already there and another is predictable program of future development. These

transport hub need to guide the future growth of development of that neighborhood area.

4.1Proposed projects in site:

- Rail station
- MRT Station
- Bus station

4.2 Requirement of surrounding area:

- Elevated Pedestrian facility along with existing rail station and proposed MRT station.
- Amenity facilities for residential neighborhood (lower order amenities and higher order amenity)
- Facility for people who serve this station
- Day care facility
- Docking station(auto rickshaw, cycle, taxi, service vehicle)
- Space for Vendor
- Urban recreation center (public gathering space, event space, gallery)
- Cultural facilities
- Park
- Toilet

4.3 Historical functional changes of the station

The site have transformed with time and people's demand. Additions and updates have been made since 2003 as population increased.

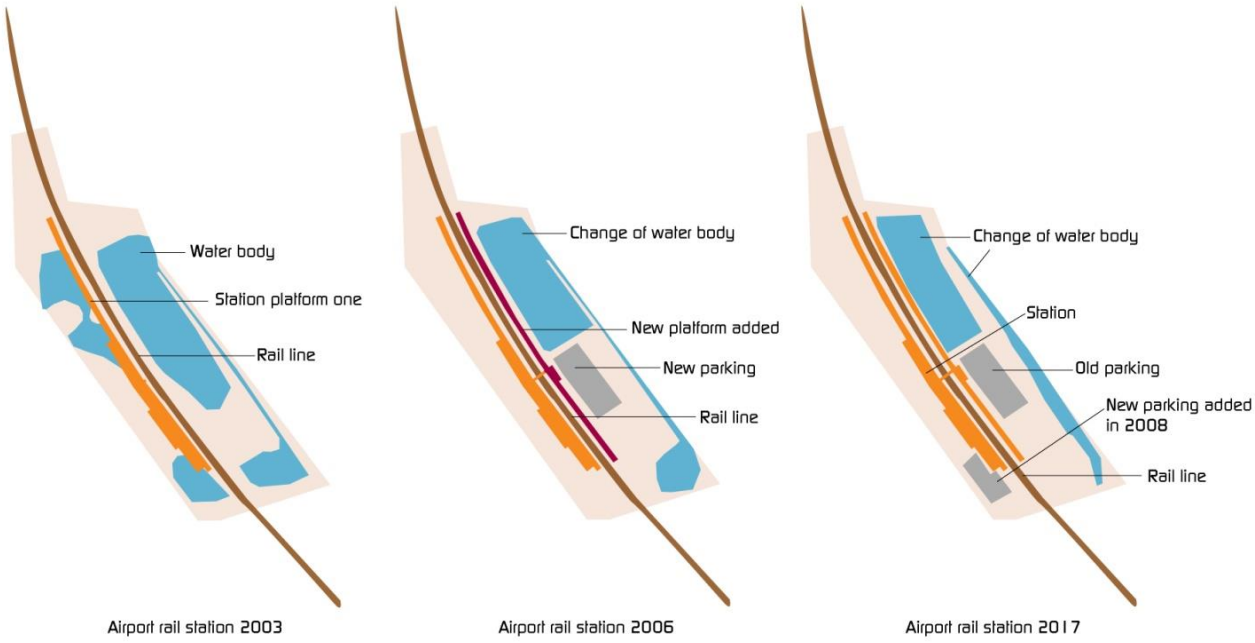


Figure 4.3.A: Historical timeline

Figure 4.4.A: Existing zoning of the train station

4.4 Existing program:

Even though parking is sufficient amount for existing situation, it is not properly working as vendor has taken over the front parking area. There is another parking on the back which is in good condition and well defined. For the south side roads busy ness, vehicle cannot enter easily sometime.

Office and ticketing area is located inside the station. But it is not sufficient for the increased population of city (uttora, dokhinkhan, askona). As this station is near the airport, slandered of the service is poor.

Figure 4.4.B: Ticketing area

Figure 4.4.B: Seating under the column

Waiting area is insufficient for the passengers. Maximum people have to stand, as insufficient amount of space for wait. In every hour more or less 3500 people come but this station has seating for only 300 people. Only 6 waiting room are provided size around 25x16=400sqft. There are some in build seating on the lower part of every column. Every column can provide seating for maximum 12 people and there is 50x2=100 column on each side of terminal. Seating under the column can provide 1200 people seat.

Figure 4.4.C: Existing two Platforms

Existing station consist of 2 terminal and 4 train lean. Terminals are 1124 foot long and width of terminal varies from 16-25'. Connection from one terminal to the other is really poor. Only one bridge connects the 2 terminal.

There are some illegally developed shops on the west side of the site. Those are really low slandered shop normally passenger do not get any facility from those shop. Those shops serve bus stuffs and rickshaw.

Stuff does not have good facilities. They don't have well designed dormitory to stay. They don't have any cafeteria. Even there office space is not sufficient enough.

4.5 Necessary functions and facility:

4.5.1 MRT:

Elevated pedestrian facility is really necessary in this area because Dhaka maymansing high way is dividing the 2 major transport airport and rail station, to connect those we need elevated walk way. MRT line is going to be constructing in future and for that pedestrian connection is necessary.

4.5.2 Amenities

Lower order amenity and higher order amenity is necessary for this kind of transport junction.

4.5.3 Services:

Services for staffs are also necessary as they work on this station for a long time. They should have good enough dormitory.

This station needs a good enough docking station to serve the station.

Facilities for passengers are not good enough, even though airport is beside this station. International passengers don't travel through train much as the facility is not good. Waiting room need to incise.
In addition a large space is also required for machines, HVAC system and generators etc. Starting from computer support to security system requires sufficient technical staff and hardware support for service.

4.5.4 Exhibition space:

As this rail station is connected with the airport, this station should represent Bangladesh. It should be the doorway which represents Bangladesh. It should facilitate some function like gallery where Bangladeshi style of art and sculpture will be exhibited. It needs to facilitate some space where it shows Bangladeshi culture.

The exhibitions can also serve the people arriving and departing everyday a soothing view and an outlook to local art and artists. Thus, a station can be more than just a boring station for people to pass through.

4.5.5 Public space and plaza:

Furthermore there are no civic spaces nearby for nearby residential area. As station is for public it should provide civic facility also like urban park.

The existing water body should be preserved and utilized to maximum. The proper design of water body can make the northern west side not a backside but the quieter side to enjoy nature. This space can adjoin with the vendors and existing Bazar to create a flea market at weekends and off days to keep the station joyful and festive.
A large number of passengers will need a large plaza to attract, hold events, and provide waiting space which can also serve a recreation space.

4.5.6 Restaurants and street food kiosks:

Both public space and exhibition spaces need food shops and restaurants. It is an absolute must for both passengers and for the staff to have good quality food and different options for food to serve diverse people coming every day.

Street food kiosks are a good way to keep the public space active and to give people a sense of purpose for coming to the public plaza. Moreover, the waterbody and the back side of the station can also become safe and active at night for all age and sex.

4.5.7 Shops:

Station is a good place to sell local goods which are necessary for everyday travel and life. For example, Pharmacy is necessary function. Shops such as clothing, shoes, and accessories can serve people during departure time or during waiting time before boarding. But there is no pharmacy in the existing rail station. In addition, Book shop/ newspaper shop and other category shops are also necessary functions.

4.6 Proposed programs:

This program is estimated considering national and international Rail and MRT slandered. Some of the new program is proposed as findings from site analysis demand those programs. New programs square feet were calculated by analyzing the case study and existing site situation.

Category	Space type	Enclosure	Spaces	Sqft/unit	units	total sqft	observations
MAIN	public	open	reception	5000 sqft	1	5000	
	semi private	semi enclosed	Ticketing offices	538 sqft	4	2152	
	private	Enclosed	security office	170 sqft	4	688	
	semi private	open	station information center	216 sqft	8	1728	Every 656 ft
	public	open	waiting area	2000 sqft	12	24000	Distributed
circulation	10%					4220	
passengers	private	Enclosed	security area	9.6 sqft	500	4800	Restricted zone area per person
	semi private	Enclosed	gates and corridors	9.6 sqft	500	4800	Restricted zone area per person
	public	open	waiting lounge	7.6 sqft	200	1520	personal comfort zone per person
	public	open	Transit area	12.6 sqft	2000	25200	free zone area per person
	public	semi enclosed	children area	5381 sqft	1	5381	Distributed
Staff	private	Enclosed	manager and chamber office	2150 sqft	1	2150	
	private	Enclosed	employees offices	258 sqft	4	1032	1 unit fits 4 employee
	private	Enclosed	Lockers area	430sqft	2	860	
	public	semi enclosed	Lounge/ Cafeteria	40 sqft	10	400	
	private	Enclosed	Meeting rooms	320 sqft	1	320	
	private	Enclosed	Platform supervisor's booth	96 sqft	4	384	
	private	Enclosed	Dormitory	34 sqft	20	680	floor area per person
	private	Enclosed	Storage	172 sqft	2	344	
	private	Enclosed	Toilets	430 sqft	2	860	
circulation	30%					2109	
Technical	public	semi enclosed	Train platforms	24000 sqft	3	72600	
	public	Enclosed	Metro platforms	4335 sqft	2	8670	
	private	Enclosed	sick line	24000 sqft	1	24000	
	private	Enclosed	control room	270 sqft	1	270	
	private	Enclosed	Electrical room	270 sqft	1	270	
	private	Enclosed	Mechanical room	516 sqft	1	516	
	private	Enclosed	fire suppression room	322 sqft	1	322	
	private	Enclosed	switch room	215 sqft	1	215	
circulation	25%					26715	
services	semi private	Enclosed	first aid room	484 sqft	1	484	
	semi private	Enclosed	prayer room	3000 sqft	1	3000	
	public	open	tourist information room	96 sqft	3	288	
	semi private	semi enclosed	lost and found office	100 sqft	1	100	
	public	Enclosed	restroom	430 sqft	3	1290	
circulation	25%					1290	
commercial	public	semi enclosed	shops	269 sqft	12	3228	
	public	semi enclosed	Book shops	269 sqft	1	269	
	public	semi enclosed	Cyber café	320 sqft	1	320	
	public	Enclosed	restroom	430 sqft	1	430	
Restaurant and café	public	semi enclosed	restaurant	862 sqft	3	2586	
	public	semi enclosed	café	322 sqft	2	644	
	public	semi enclosed	Pharmacy	140 sqft	2	280	
	private	Enclosed	kitchen	180 sqft	2	360	
circulation	25%					1812	
Gallery	public	open	Gallery	3600 sqft	1	3600	
Vendor	public	open	vendor	6000 sqft		6000	
parking	public	open	parking area	16x8=128 sqft	100	22600	ground and underground
Total sqft						270787	
structural	12%					32494	
Total Gsqft						303281	
park	public	open	park				
bicycle path	public	open	Track				
Docking station	public	open	vehicular stand				

Figure 4.5.A: Proposed functions

CHAPTER 05

CASE STUDY

5.1 Rotterdem Central Station

Rotterdem Central Station was designed by Benthem Crouwel Architects, MVSA Architects, West 8. It's located in Stationsplein, Rotterdam. Project started in 2008 and it was completed in 2014.

Figure 5.1. A bird's eye view of Rotterdem Central Station

Source: http://www.archdaily.com/588218/rotterdam-central-station-benthem-crouwel-architects-mvsa-meyer-en-van-schooten-architecten-and-west-8

5.1.1 Program:

Public transport terminal: Integral station roof (30,000 m²), concourse and passage, platform fit-out, commercial spaces offices, restaurants and cafés and facilities for travellers. Ca. 67,000 m²gfa

-Reception hall

-Ticketing office

-Waiting hall

-Entry gates

-2platforms for high-speed train

-9platforms for light rail

-6 platforms for subway

Domestic passenger numbers have been growing rapidly too: currently110,000 people use the station every day via HSL, train, metro, tram, bus, taxi and bicycle, a figure that is set to increase to 320,000 by 2030. Annual passengers: 110 million by 2050

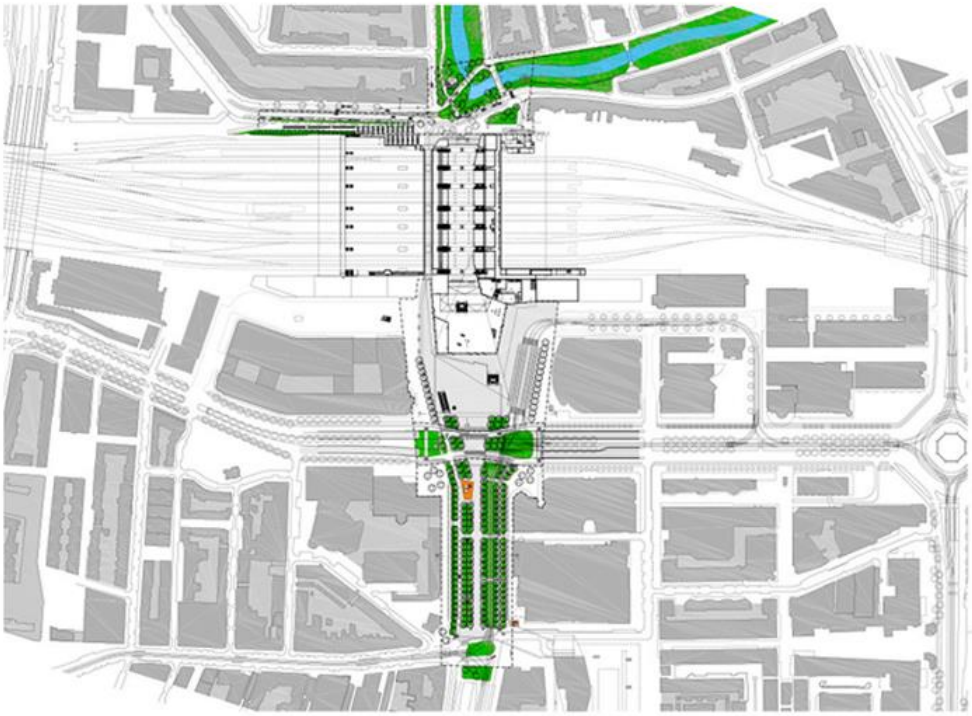


Figure 5.1.B Plan

Source: http://www.archdaily.com/588218/rotterdam-central-station-benthem-crouwel-architects-mvsa-meyer-en-van-schooten-architecten-and-west-8

5.1.2 Approach:

Before the construction of the new station could start, a complete temporary station with replacement station hall was put in Place and the old station buildings were demolished.

The new station is much larger, with one integral glass roof covering the railway and platforms. On the city center side there is now a spacious station hall, with retail facilities underground and 4000m2 of new office space. There is also a station entrance on the Provender's side, merging the public neighborhood area seamlessly with the station's domain.
The city of Rotterdam is drawn to the new station via the compaction of the small-scale urban texture surrounding the public transport terminal. The entire railway zone becomes one with the city. This finer urban texture with new sightlines and a mixture of living and working will dramatically improve the quality of life and the environment of the station area.

One of the fundamental challenges of Rotterdam Central station was the difference in the urban character of the north and south side of the station. The entrance on the north side has a modest design, appropriate to the character of the neighborhood Provenierswijk and the smaller number of passengers. The entrance gradually connects to the city. In the Provenierswijk the character of the 19th-century Dutch provincial town is strengthened. Large architectural extensions are avoided on this side of the station, the presence of green is ameliorated and the station is transparent.

In contrast, the grand entrance on the city side is clearly the gateway to the high-rise urban center. Here the station derives its new international, metropolitan identity from the hall made of glass and wood. The roof of the hall, fully clad with stainless steel, gives rise to building's iconic character and points to the heart of the city.

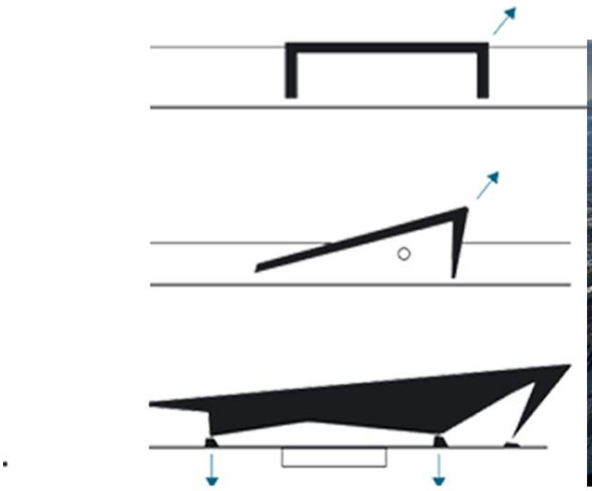


Figure 5.1.2 A Concept diagram

Figure 5.1.2 A:Bird view of station

Source: http://www.archdaily.com/588218/rotterdam-central-station-benthem-crouwel-architects-mvsa-meyer-en-van-schooten-architecten-and-west-8

The city of Rotterdam is drawn to the new station via the compaction of the small-scale urban texture surrounding the public transport terminal. The entire railway zone becomes one with the city. This finer urban texture with new sightlines and a mixture of living and working will dramatically improve the quality of life and the environment of the station area

Figure 5.1.2 C: South side grand entry

Figure 5.1.2. D: North side small entry

Source: http://www.archdaily.com/588218/rotterdam-central-station-benthem-crouwel-architects-mvsa-meyer-en-van-schooten-architecten-and-west-8

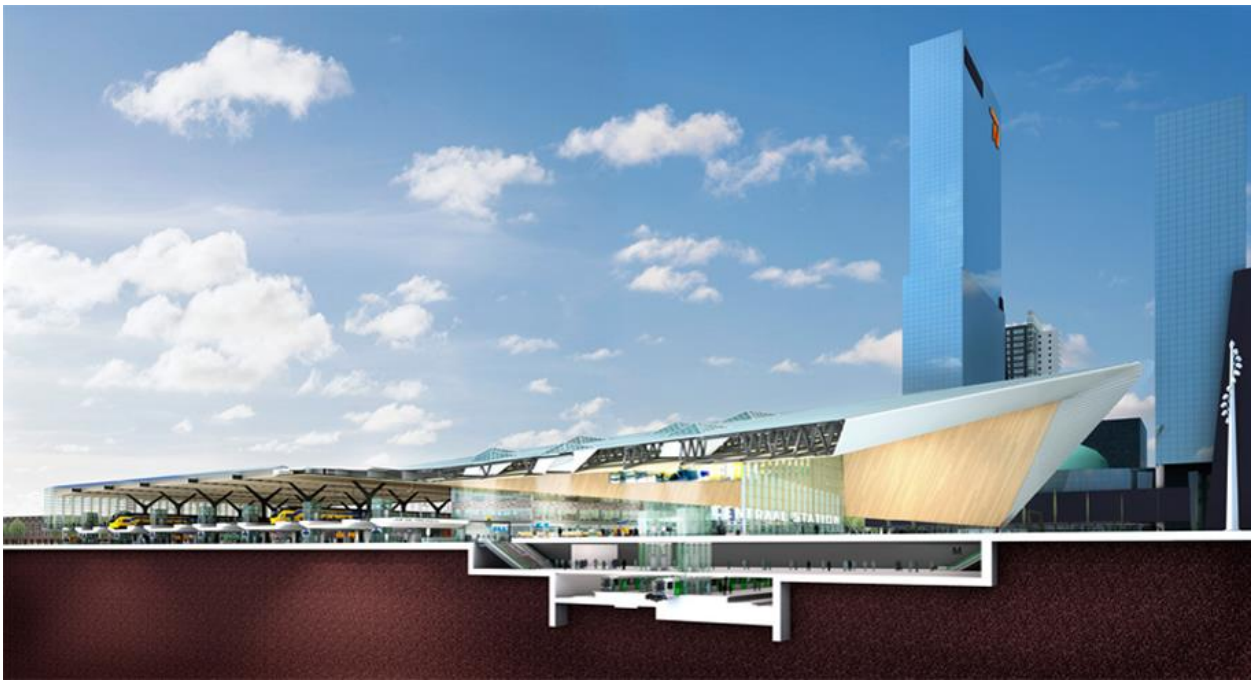


Figure 5.1.2 D: Section through south entrance to north entrance

Source: http://www.archdaily.com/588218/rotterdam-central-station-benthem-crouwel-architects-mvsa-meyer-en-van-schooten-architecten-and-west-8

The new Rotterdam Central Station is a pleasant, open and transparent public transport terminal which functions as an iconic meeting point. Interwoven into the urban network, the station connects the diverse characters of the city and marks the beginning of Rotterdam's cultural axis. This modern and efficient building offers travelers to and from the port city all the amenities and comfort they could want or need in the present and the future.

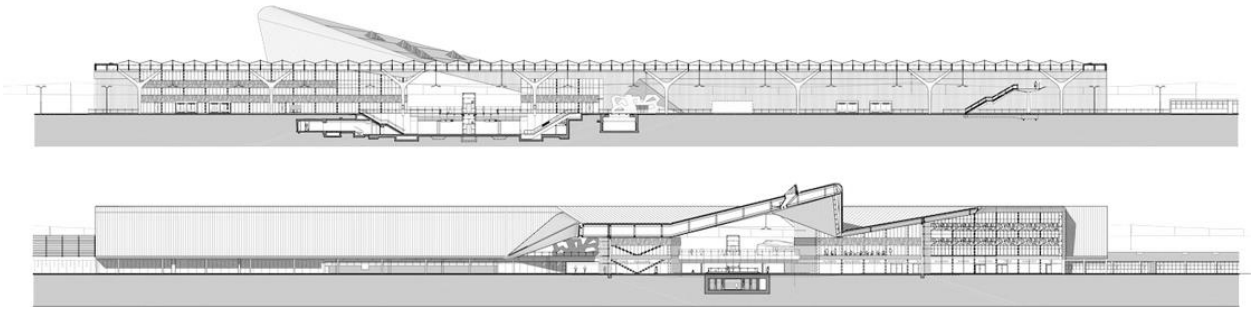


Figure 5.1.2 E: section

Natural light:

Incorporation of natural light, the warmth of the sun's rays and a modern look are important elements in the design. The platform roof on the Proveniers side is transparent. When the train drives into the station, there is an almost tangible feeling of being enshrouded in the station building. Upon entering in the bright high hall through the center side, the traveler gets an overview of the entire complex and a view to the trains that are waiting invitingly along the platforms

Figure 5.1.2 F,G,H:

5.1.3 Interior space and appearance:

The esplanade in front of the station is a continuous public space. To achieve this simplicity a parking garage for 750 cars and a bicycle shed for 5,200 bicycles are located under the square. The tram station is moved to the east side of the station, so the platforms broaden the square. Bus, tram, taxi and the area for short-term parking

are integrated into the existing urban fabric and do not constitute barriers. The red stone of the station floor continues into the forecourt, merging the station with the city. Pedestrian and cycling routes are pleasant and safe and arriving travelers now have dignified entrance to the city, free from traffic.

Figure 5.1.3 A:

The wood finish on the inside of the hall, combined with the structural wooden beams of the platform roof creates a warm and welcoming ambience, inviting visitors to linger. The largely transparent roof structure which covers all the tracks over a length of 250 meters, flood the platforms with light. The glass plates of the roof vary the level of light transmittance by utilizing different solar cells patterns, which produce an ever-changing and fascinating play of shadows on the platforms

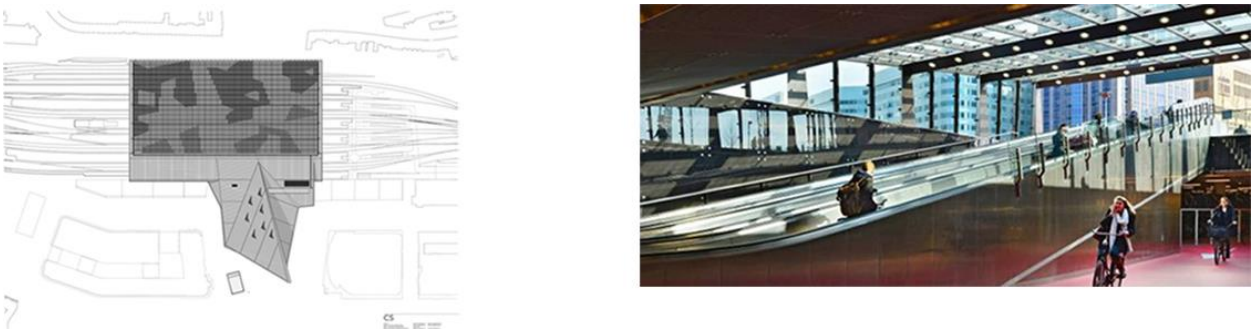


Figure 5.1.3.D:

5.1.4 Routing and Layout:

The routing through the station is logical; travelers are guided by a direct view of the trains and by the daylight that penetrates to the traveler's passage via the voids that

extend through the transparent roof platform and down to the stairs. Because of its transparency the widened traveler's passage, lined with commercial functions, forms a natural part of the station. Escalators, lifts and stairs lead up to the new platforms, which feature inviting and comfortable platform furniture. On the west side of the station there is a footbridge over the tracks for travelers in transit. This footbridge also functions as an escape route in the event of an emergency

5.1.5 *Interpretation:*

- Large entrance space which is light weight as it have large span.
- Different scale of entrance according to the urban fabric. This idea could be conflicting.
- All the space area easily identifiable for passenger as functions is well organized.
- The Entrance Interior space is cladded with wood which is visually pleasing and can absorb noise somewhat.
- Structure of this project is interesting as with this Y column like structure can contain large span which is really necessary for this kind of public project.
- Roof of the platform area has different approach then the entrance interior space. As terminal need more light the roof is made of glass with louver like structure.
- Large plaza space is necessary for project of this scale which is full field really well. This plaza space connects with front road.
- West side of the station there is a footbridge which also functions as an escape route in the event of an emergency. This is really necessary for accident.

5.2 High Speed Train Station Napoli-Afragola

High Speed Train Station Napoli-Afragola was designed by Zaha Hadid in naples, Italy. The site area was 30000 sqm.

5.2.1 Significance:

The New High Speed Station Napoli Afragola is a bridge above the tracks. The key challenge of the architectural scheme is to create a well-organized transport interchange that can simultaneously serve as a new landmark to announce the approach to Naples – thus a new gateway to the city. The concept of the bridge emerges from the idea of enlarging the overhead concourse, required to access the various platforms, to such a degree that it can become the main passenger concourse itself. Providing an urbanized public link across the tracks, the task is to give expression to the imposition of a new through-station that can also act as the nucleus of a new proposed business park linking the various surrounding towns. The bridge concept further allows two strips of extended park-land to move openly through the site alongside the tracks opening and connecting the site to the surrounding landscape and Business Park.

The architectural language proposed, geared towards the articulation of movement, is pursued further within the interior of the building, where the trajectory of the travelers determines the geometry of the space. (Zaha Hadid Architects - High Speed Train Station Napoli-Afragola)

5.2.2 Interpretation:

Zaha Hadid's deconstructive forms and how it emerges from urban fabric and motion can be seen from this project. The atrium space is very inspirational and how circulation functions can be integrated with the atrium space and also bring in light and ventilation into the project. The steel frame details provide the notion of how such dynamic spaces and forms can be perceived through the use of extra skeletal frames. Integration of

fenestration such as glass, louvers and steel coverings with the steel frame can also be seen in this project.

Figure 5.2.2 A : Computer-Generated View of the Station

Source: http://www.zaha-hadid.com/architecture/napoli-afragola-high-speed-train-station/

Figure 5.2.2 B : Inspirational Atrium Space enlighting and uniting the interior environment

Source: http://www.zaha-hadid.com/architecture/napoli-afragola-high-speed-train-station/

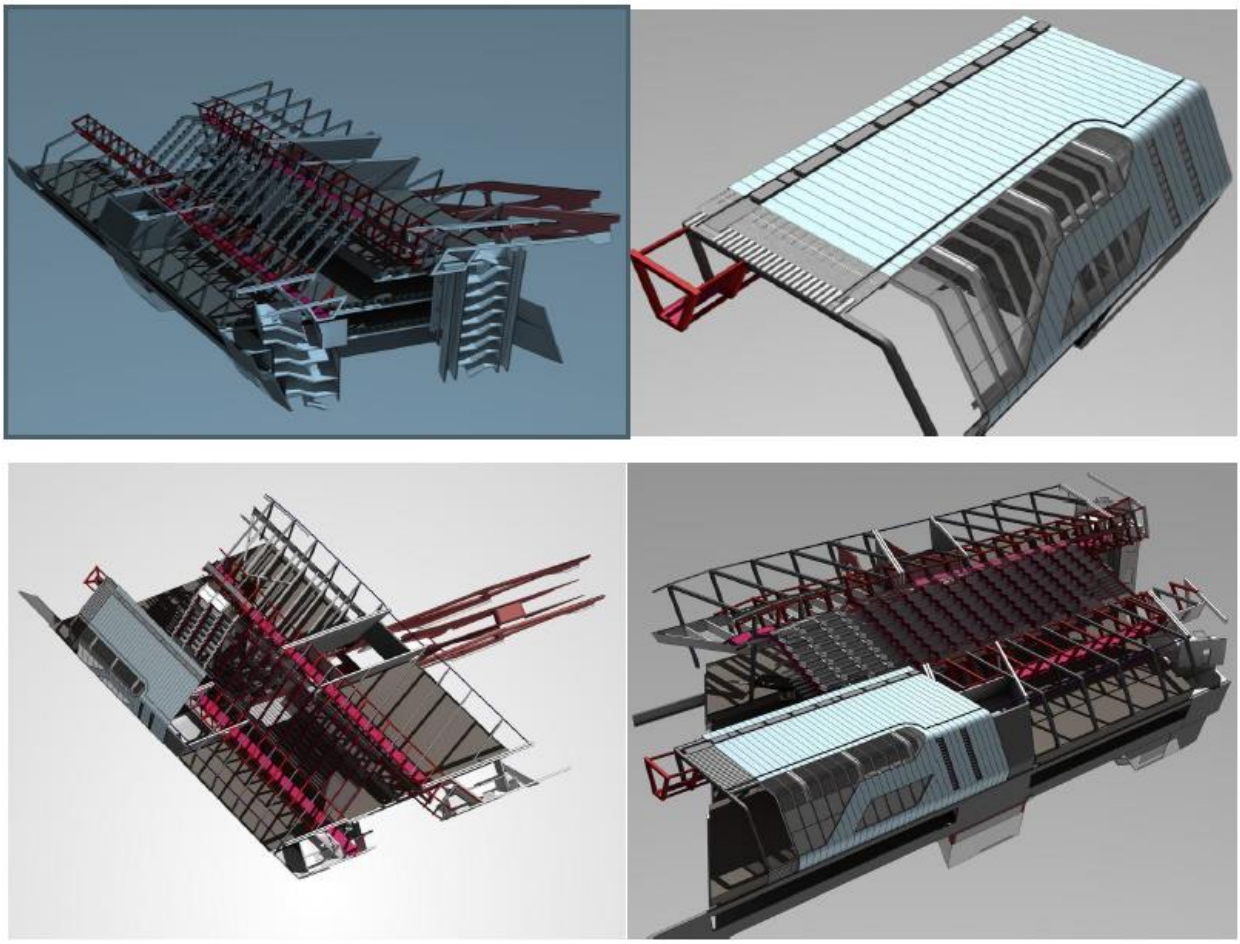


Figure 5.2.2.C : Intregration of structural shell and fenestrationFigure

Source: http://www.zaha-hadid.com/architecture/napoli-afragola-high-speed-train-station/

5.3 Makkah Metro C-Line Stations

Makkah Metro C-Line Stations was designed by snohetta in Makkah, Saudi Arabia. It was designed in 2013.

5.3.1 *Significance:*

The station – a sleek skin of the future, hovers delicately above the rising urban landscape of the city, creating a new public arena in the space between the ground and the sky. Linking again with tradition, the wrap is a unique ceramic tile with varying degrees of textures and signatures developed in cooperation with local artists. On the inside, the hard shell of the station is revealed to have a soft and ornamented interior consisting of a complex yet contextual mashrabiya screen.

The screen links both history and technology, consisting of traditional patterns applied through the latest of computer and fabrication technologies – symbolizing the duality between the future and the past. From station to station the mashrabiya screen changes again in color and material offering each station a personal signature whilst retaining a coherent identity throughout the line.

Figure 5.3.1.A:
Source: http://aasarchitecture.com/2014/04/makkah-metro-c-line-stations-by-snohetta.html

The meeting point, suspended between these two moments, as the plaza rises and the station reaches down, represents the common link between these two distinct elements within the public realm. Creating a bold yet elegant icon for each station – the design defines the network as a coherent unit changing slightly from station to station, because of the different city pattern.

Figure 5.3.1.D:
Source: http://aasarchitecture.com/2014/04/makkah-metro-c-line-stations-by-snohetta.html

5.3.2 Interpretation:

Unique screen which reflect both future and past is the best conceptual representation of this project.

5.4 Raised Gardens of Sants in Barcelona

Raised Gardens of Sants in Barcelona was designed by Sergi Godia, Ana Molino architects in Barcelona Sants, Carrer del Rector Triadó, and Barcelona, Spain. Project completed in 2016.

Figure 5.4.A:

Source: http://www.archdaily.com/801120/raised-gardens-of-sants-in-barcelona-sergi-godia-plus-ana-molino-architects

5.4.1 Reason behind the project:

For a long time, the line of train and metro tracks through the district of Sants (Barcelona) has been an open line in its urban fabric, dividing the district into two virtually unconnected parts along an 800-metre section, from Plaza de Sants to calle Riera Blanca, creating the resulting urban dysfunctions in terms of acoustic pollution and deterioration of the surroundings.

Decision making of the project:

Figure 5.4.1.A:

Source: http://www.archdaily.com/801120/raised-gardens-of-sants-in-barcelona-sergi-godia-plus-ana-molino-architects

In the year 2002 the city's administration decided to start up an urban renewal project for the Sants railway corridor. Having ruled out the option of putting it underground, it was decided to confine it inside a lightweight, transparent box for a good part of the section, with the roof being turned into an 800-metre-long raised and landscaped boulevard which would later be extended along the neighboring municipalities as far as Cornellá, giving rise to a 5-km-long "green corridor".

Figure 5.4.1.B:

Source: http://www.archdaily.com/801120/raised-gardens-of-sants-in-barcelona-sergi-godia-plus-ana-molino-architects

5.4.2 Structure and accessibility:

The structure that holds up the building/container is comprised of prefab concrete parts in a sequence on a diagonal which adopts the shape of a great Warren beam evoking the old railway bridges, leaving large empty triangles that lend themselves to glazing them over to allow a view of the train passing through the city, reducing its acoustic impact to a minimum. Not fully glazing the building allowed three great green inclines to be built which rise from the lowest levels right up to roof level. These embankments “anchor” the building into its setting allow the roof vegetation to spill down to the lateral streets and support pedestrian ramps that provide a “natural” access to the roof.

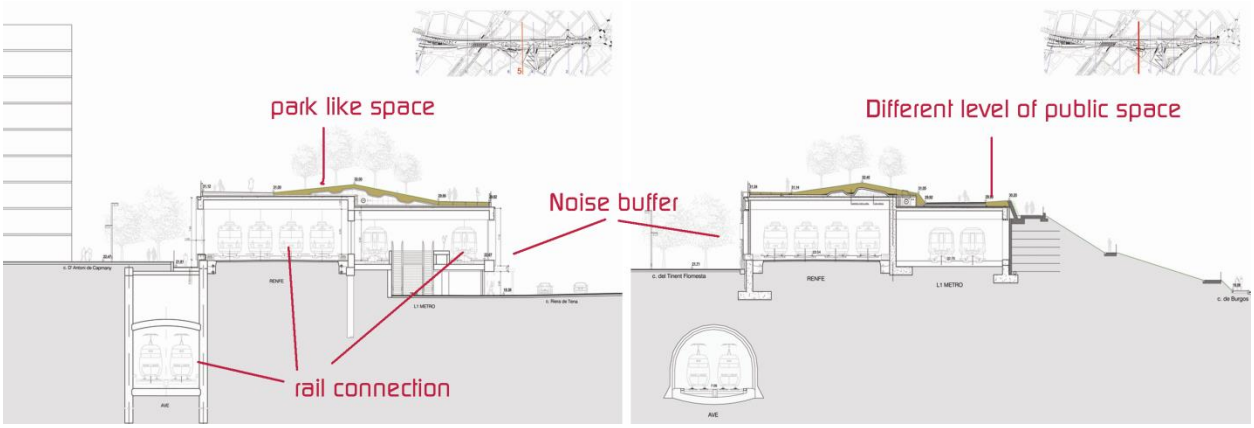


Figure: 5.4.2.A: section

Upper part of the project is designed as a park like space which in the higher level then normal road high. The elevations present in the topography, reinforced by the density and the strategic position of the tree groves, favor the creation of spaces in which the passers-by lose the feeling of being in a city and are immersed in a natural environment.

5.4.3 Interpretation:

- This project work as a noise buffer zone for the nearest urban people, in this way it is a successful project.
- It also works as a berthing space for surrounding people.
- Its criticism can be, previously the rail line was dividing the urban fabric but now this project is creating a barrier for the city. As it has a large volume and have less visual connection.

5.5 11th Street Bridge Park:

11th Street Bridge Park was designed by OMA, in Washington DC, USA. Project completed in 2014- ongoing.

The 11th Street Bridge Park project is an incredible opportunity to contribute to the civic fabric of Washington, D.C. through the design of an iconic, multi-functional landscape which promotes the health of the river and its adjacent communities acting as a model both nationally and globally.

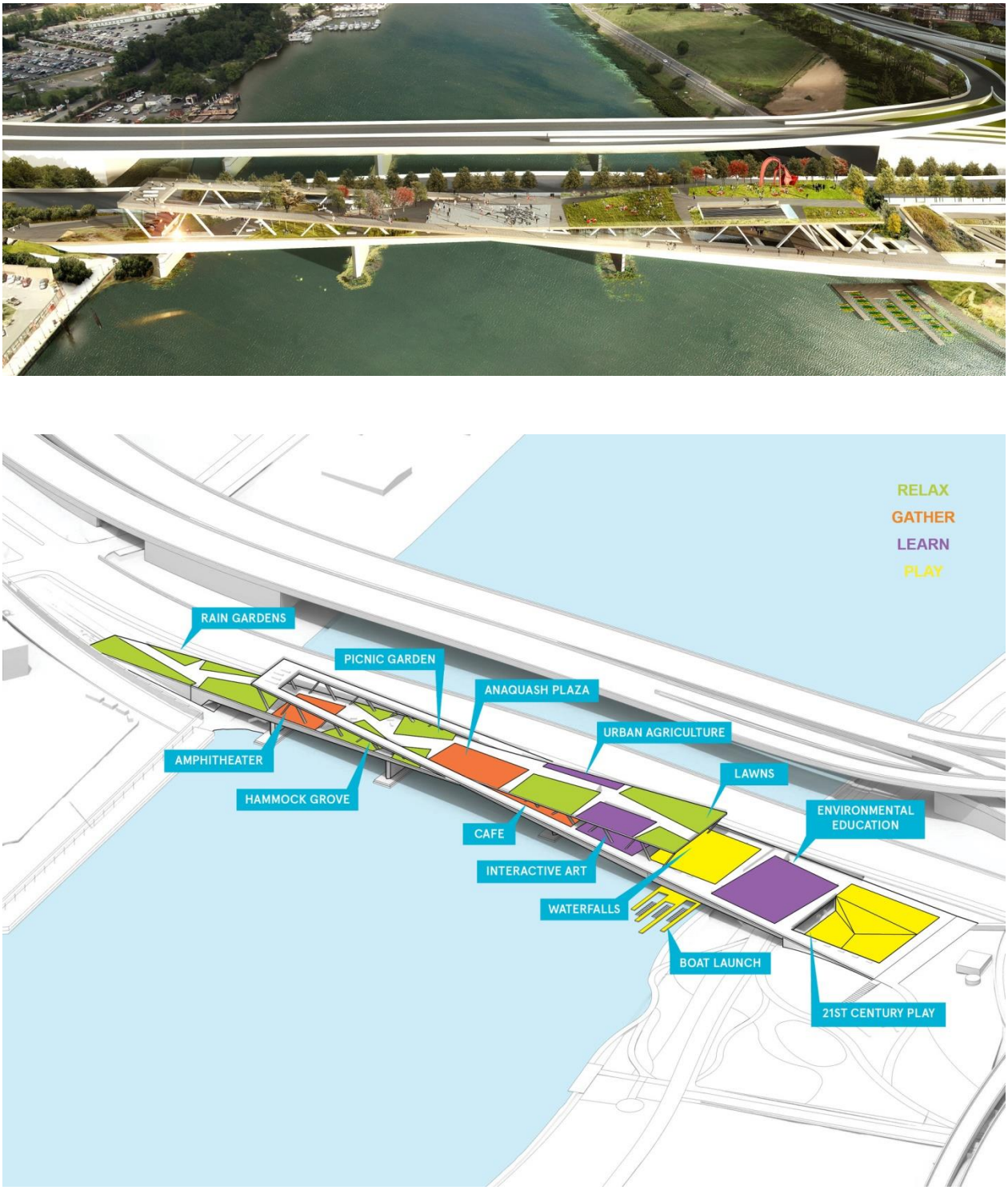


Figure: 5.5.A: Functional diagram of 11th Street Bridge Park

Source: http://oma.eu/projects/11th-street-bridge-park

The design is like X shape which provides programs such as a performance space and a cafe, as well as plenty of open space for plazas, lawns and urban agriculture plots. This manipulation of the form also turns the thoroughfare into a destination all of its own above the river.

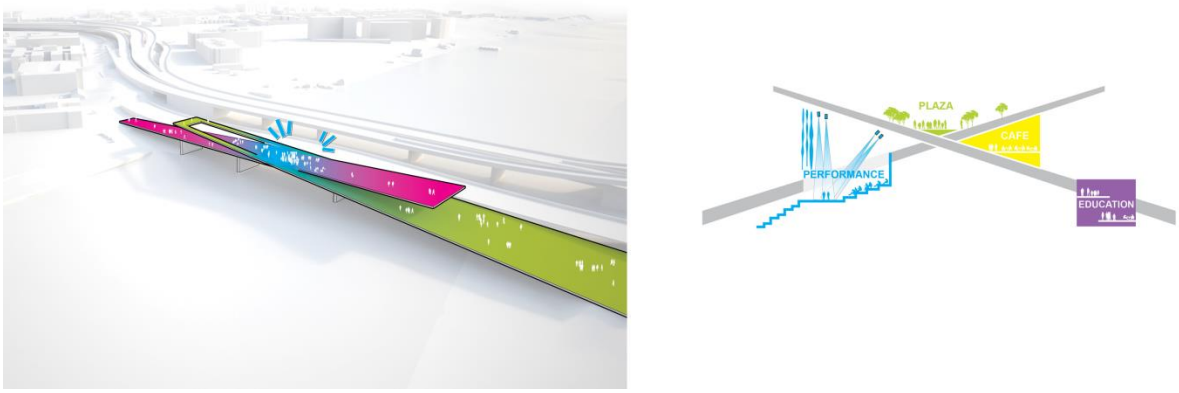


Figure: 5.5.B:

Source: http://oma.eu/projects/11th-street-bridge-park

5.5.1 Concept:

This design creates a literal intersection and a dynamic, multi-layered amenity for both sides of the river, explained OMA Partner-in-Charge Jason Long. “It simultaneously functions as a gateway to both sides of the river, a lookout point with expansive views, a canopy that can shelter programs and a public plaza where the two paths meet. The resulting form of the bridge creates an iconic encounter, an “X” instantly recognizable within the capital’s tradition of civic spaces”.

Figure: 5.5.A:

5.5.2 Interpretation:

- Innovative way to use the idea of X like bridge, it goes with the concept really well.
- Functional use of this X shaped ramp like structure is also well distributed according to concept.
- Any kind of large connection can have this kind of public space quality so that the connection can work properly.
- This project also shows how linear public space can be designed.
- New invention for civic space.

5.6 Highline:

Highline was designed by Diller Scofidio + Renfro, in New York. Project completed in 2014- ongoing.

It was a competition win project for James Corner Field Operations with dill scofidio + renfro. 36 countries compete for this competition. It is a 1.45 mile-long elevated, steel structure built in the 1930s for freight trains; the last train ran on it in 1980. Stretching across the west side of the city, it runs from Gansevoort Street, in the Meatpacking District, through the West Chelsea gallery neighborhood, and ends at 34th Street, next to the Jacob Javits Convention Center. In 2003, an open competition was held to convert the existing infrastructure into a public park. Inspired by the wild seeded landscape left after the line had been abandoned, the team created a paving system that encourages natural growth which creates a ‘pathless’ landscape. ”Through a strategy of agri-tecture - part agriculture, part architecture – the High Line surface is digitized into discrete units of paving and planting which are assembled along the 1.5

miles into a variety of gradients from 100% paving to 100% soft, richly vegetated biotopes," explained DS + Renfro. This undefined and unobtrusive environment allows the public to meander and experience the park as they wish.

Figure 5.6.A

Source: http://www.archdaily.com/24362/the-new-york-high-line-officially-open

Figure 5.6.*B*

Source: http://www.archdaily.com/24362/the-new-york-high-line-officially-open

Before the new landscape could take form atop the High Line, every component of the structure was tested and treated to ensure its structural strength. As each piece of rail was removed, it was marked and mapped so that later, it could be returned to its original location as an integrated planting piece. Energy-efficient LED lights gently illuminate the park's pathways and allow the eyes to adjust to the ambient light of the surrounding city sky. Lights installed on the underside of the High Line illuminate the sidewalk below.

5.6.1 Interpretation:

- Idea of making the old rail line into a elevated park like space is amazing.
- Lower part of the Highline Park is also usable for different purpose.
- This project can strengthen my concept for the elevated connection from airport to metro.
- People will use it not only to pass through but also to see the natural beauty of urban fabric.
- This gives an idea of vertical connection should not be only for passing it, also it can be activity generator.

CHAPTER 06

Design development

6.1 Concept development

Main concept of the design developed from the site analysis and movement study of the context. As this kind of design is more towards people oriented, understanding the stagnation of people and also the movement of people is the vital

Vehicular stand map shows the location of different vehicular stand. From this map pedestrian movement and connection is also easily understandable. Passenger cluster also can be understood. Maximum bus stand are located on airport node point, for that reason vehicular traffic jam happens. Public pass through the Dhaka Mymensingh road from this rode so that creates congestion and there is also a rail station entrance gate nearby that point

Pedestrian walking path map was done to understand the movement of pedestrian through the site. This map easily shows the path throughout the existing station and surrounding then station. And it is easy to understand the important pedestrian connection point. People movement on the node connection is large amount. Movement through the station can also be noticed so there is a demand for a pedestrian connection through the center of the rail station.

Figure 6.1.A concept interpretation map

From the pedestrian trail map it is easily visible that there is an invisible path that is used by the local people. So developing that path is one big priority because, naturally it belongs there for local people. As the airport and rail station is on both side of the road, big amount of people have to cross the mymensingh highway for different vehicle.

6.1.1 Concept diagram

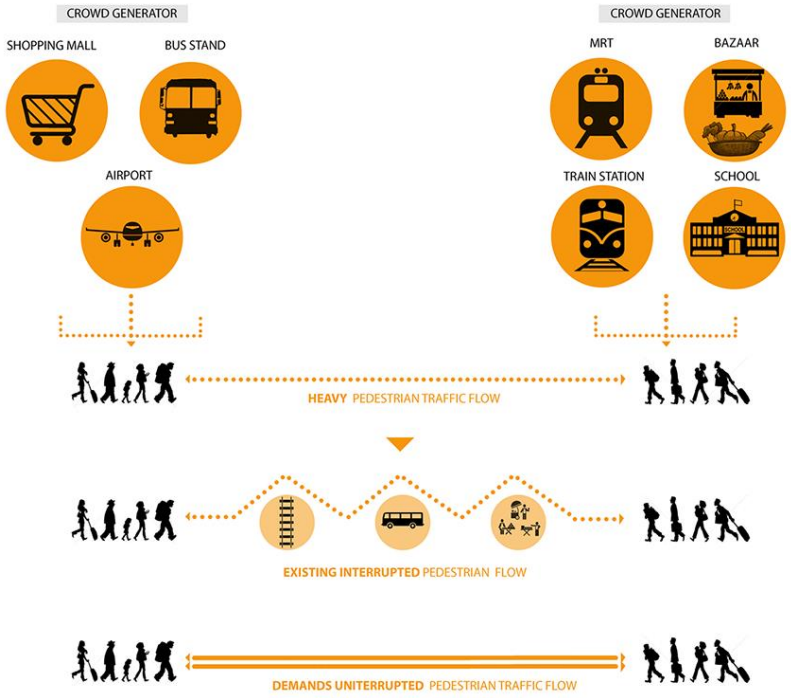


Figure 6.1.1.B Concept diagram 1

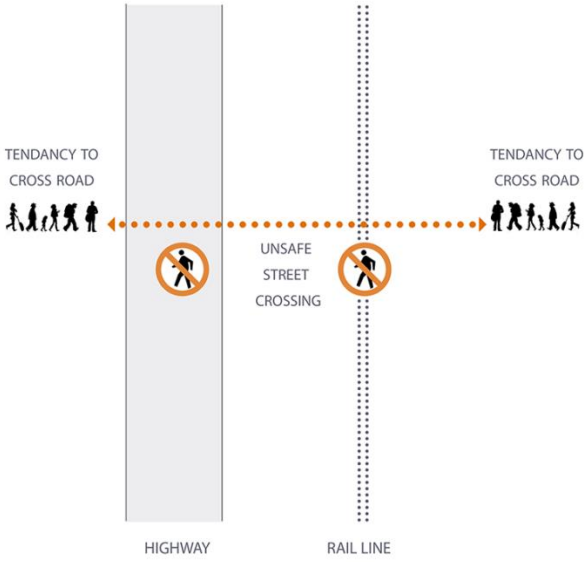


Figure 6.1.1.B Concept diagram 2

Even though there is a invisible pedestrian path it is not a safe path for pedestrian. That path has to cross 2 mode of transport which is not safe for a pedestrian path. But establishing that path is necessary because there is a demand for that path for local people.

That path needs to connect with the airport also so that pedestrian passengers can move though this path easily. This path can guide the passengers to their destination without any obstruction.

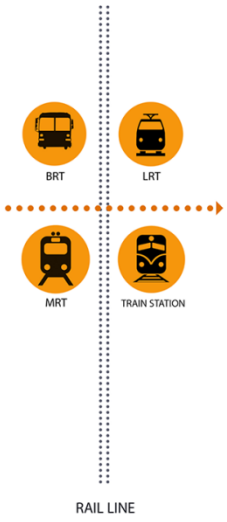


Figure 6.1.1.C Concept diagram 3

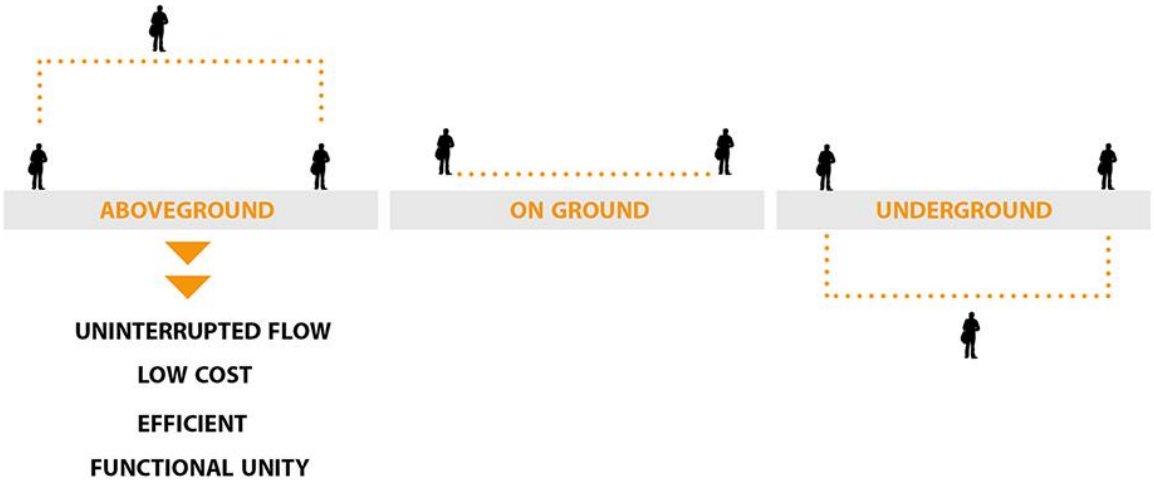


Figure 6.1.1.D Concept diagram 4

To build that path, there could be three possibilities respecting the ground. Those are on ground, above ground, underground. According to the diagram, it Sims that above ground is the batter option in response to the site considering all site forces, cost and functional unity. As there is six kind of transportation those need to stacked vertically and this path is placed in such a way that all of those transport can be connect easily.

Path is established on above ground and all six transport mode is getting connected with that path so that it can be a central lobby for passengers and at the same time it will be pedestrian crossing path for local people.

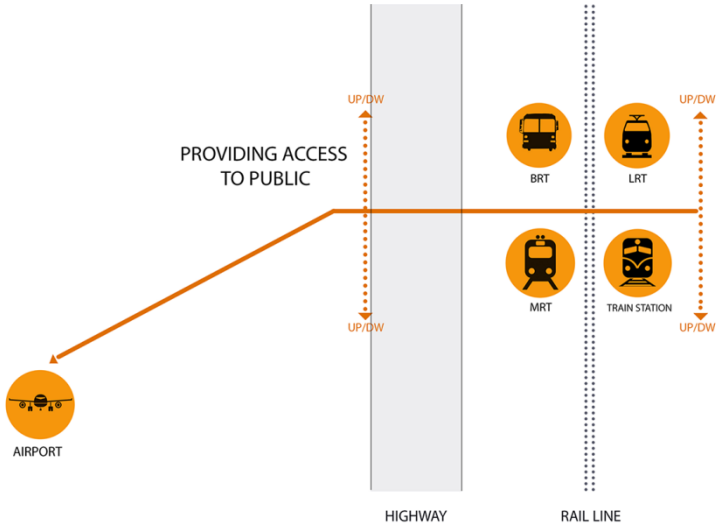


Figure 6.1.1.E Concept diagram 5

As this path is central lobby space for passengers transit people can move to the center and disperse through transport and non-transit people can just cross the path.

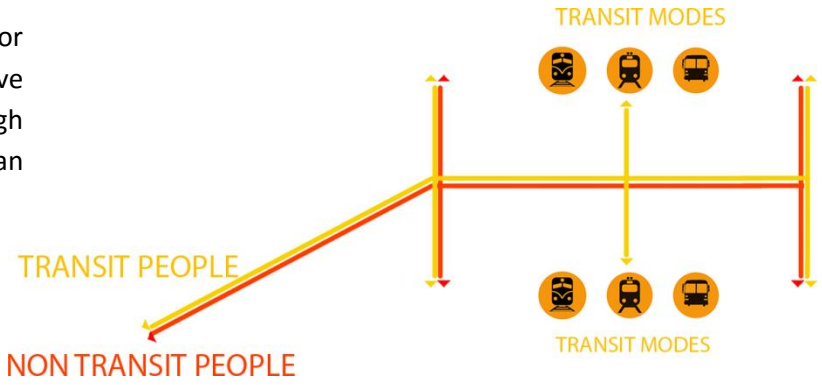


Figure6.1.1.F Concept diagram 6

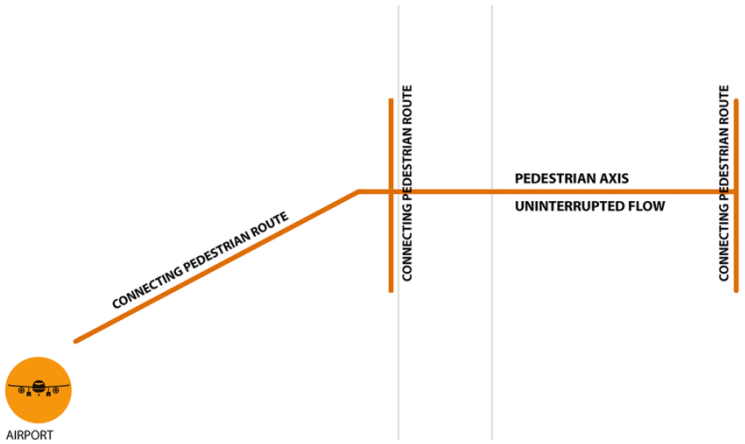


Figure 6.1.1.G Concept diagram 7

6.1.2 Concept sketch

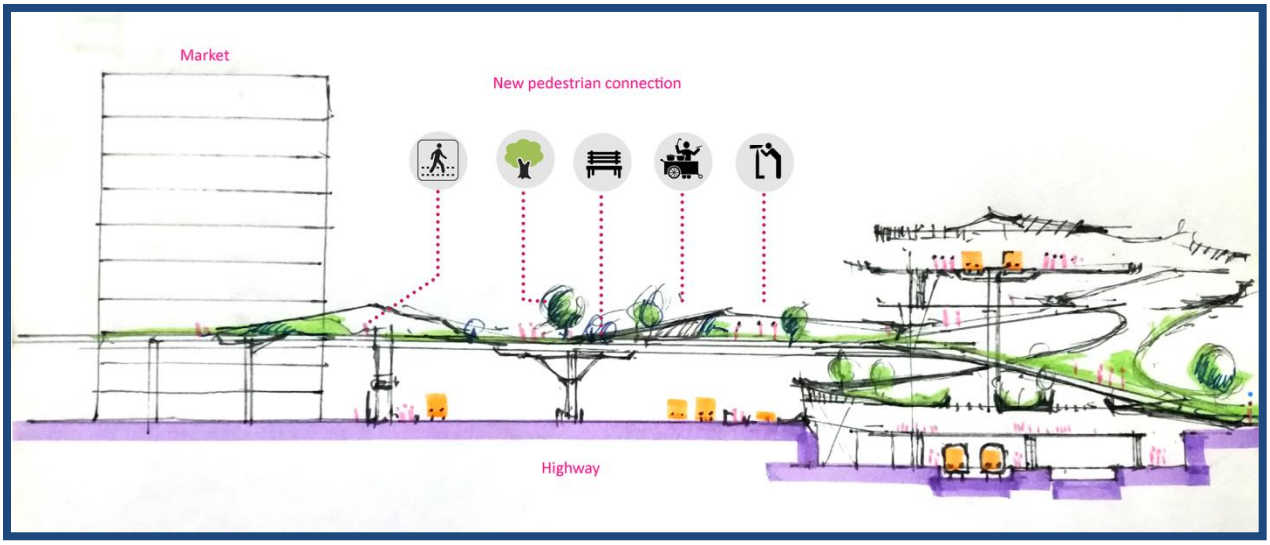


Figure 6.1.1.G Concept sketch 1

Develop of that concept path help makes vision easier to portray. Concept sketch are done by kipping functional complexity in mind. On those concept sketch tried to make some vision which gives something to the city.

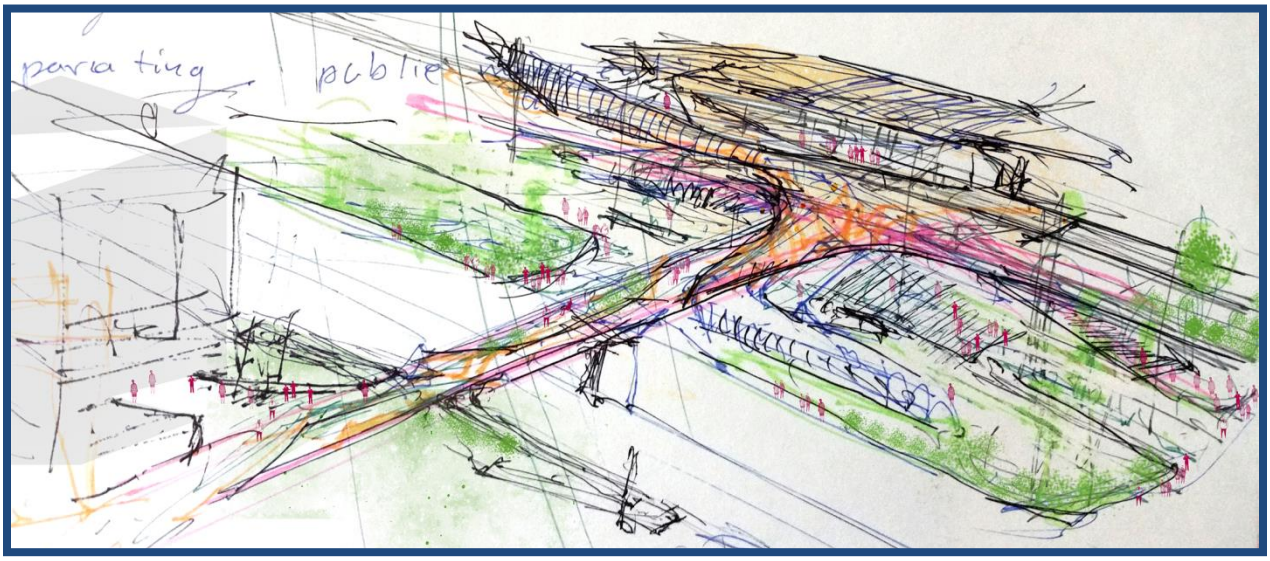


Figure 6.1.1.G Concept sketch 1

6.2 Form development

Development of the concept path leads to the functional connectivity of the project. The main function which is transport systems ware connected along the line that ware proposed by government. That demanded concept path worked as spine for this project. All of those transport modes ware connected with this path.

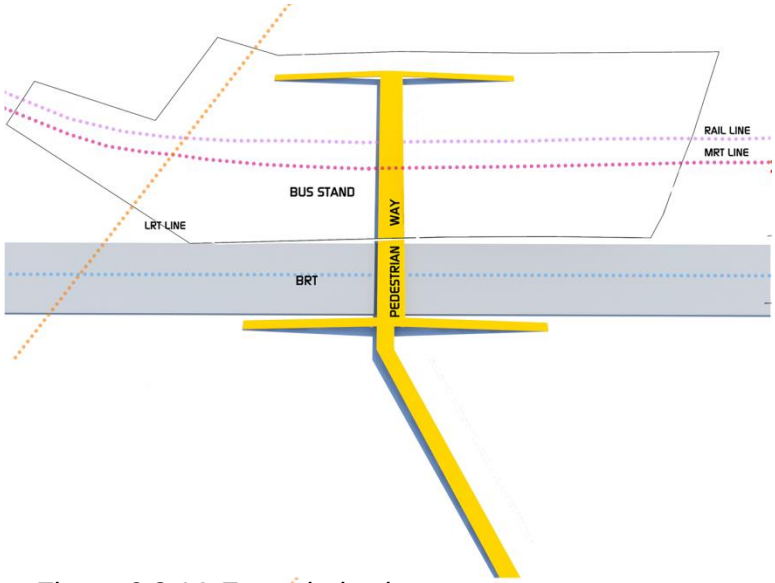


Figure 6.2.1A Form derivation

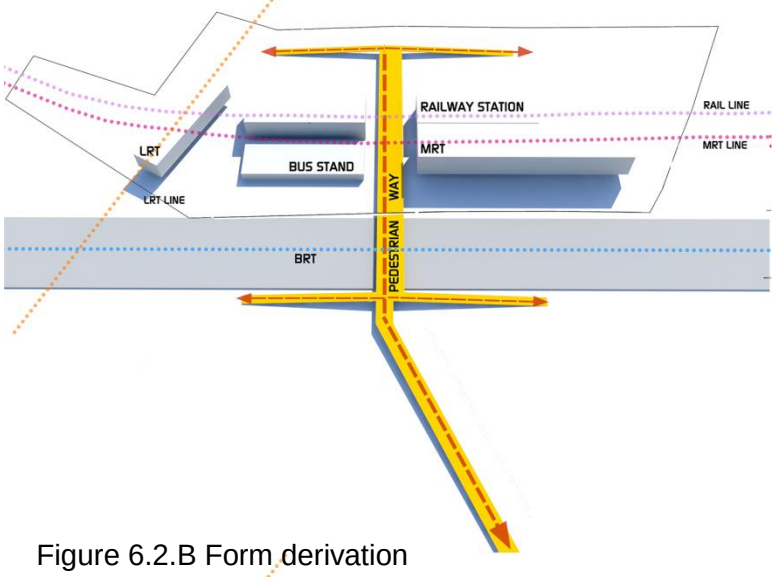


Figure 6.2.B Form derivation

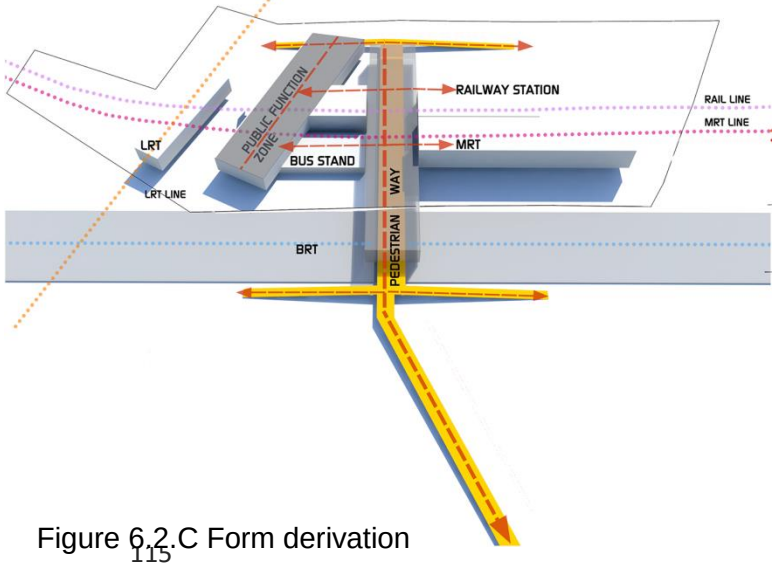


Figure 6.2.C Form derivation

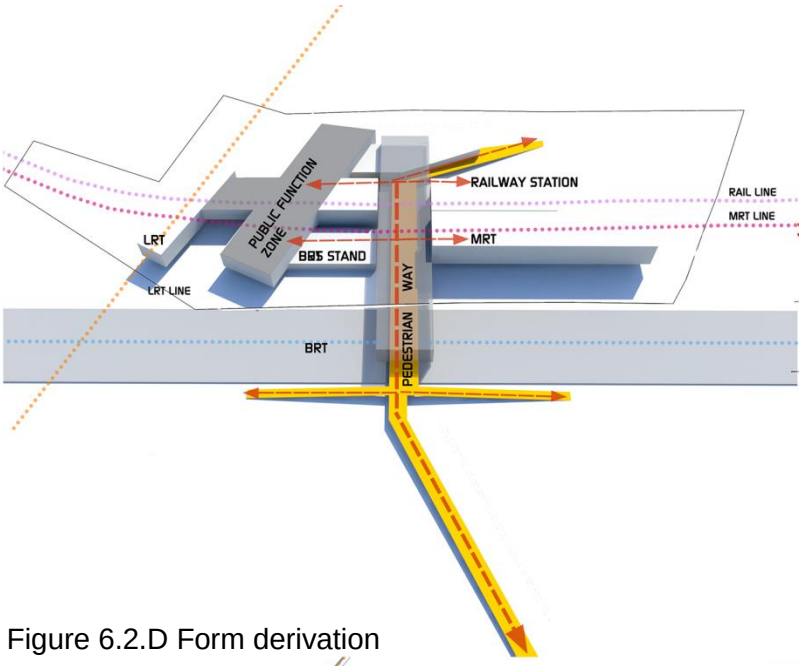


Figure 6.2.D Form derivation

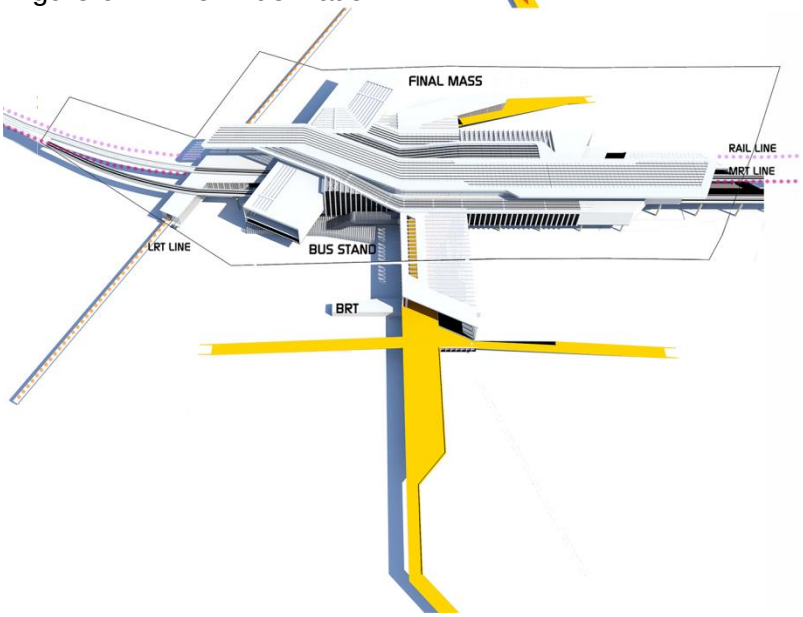


Figure 6.2.E Form derivation

6.3 Functional Placement

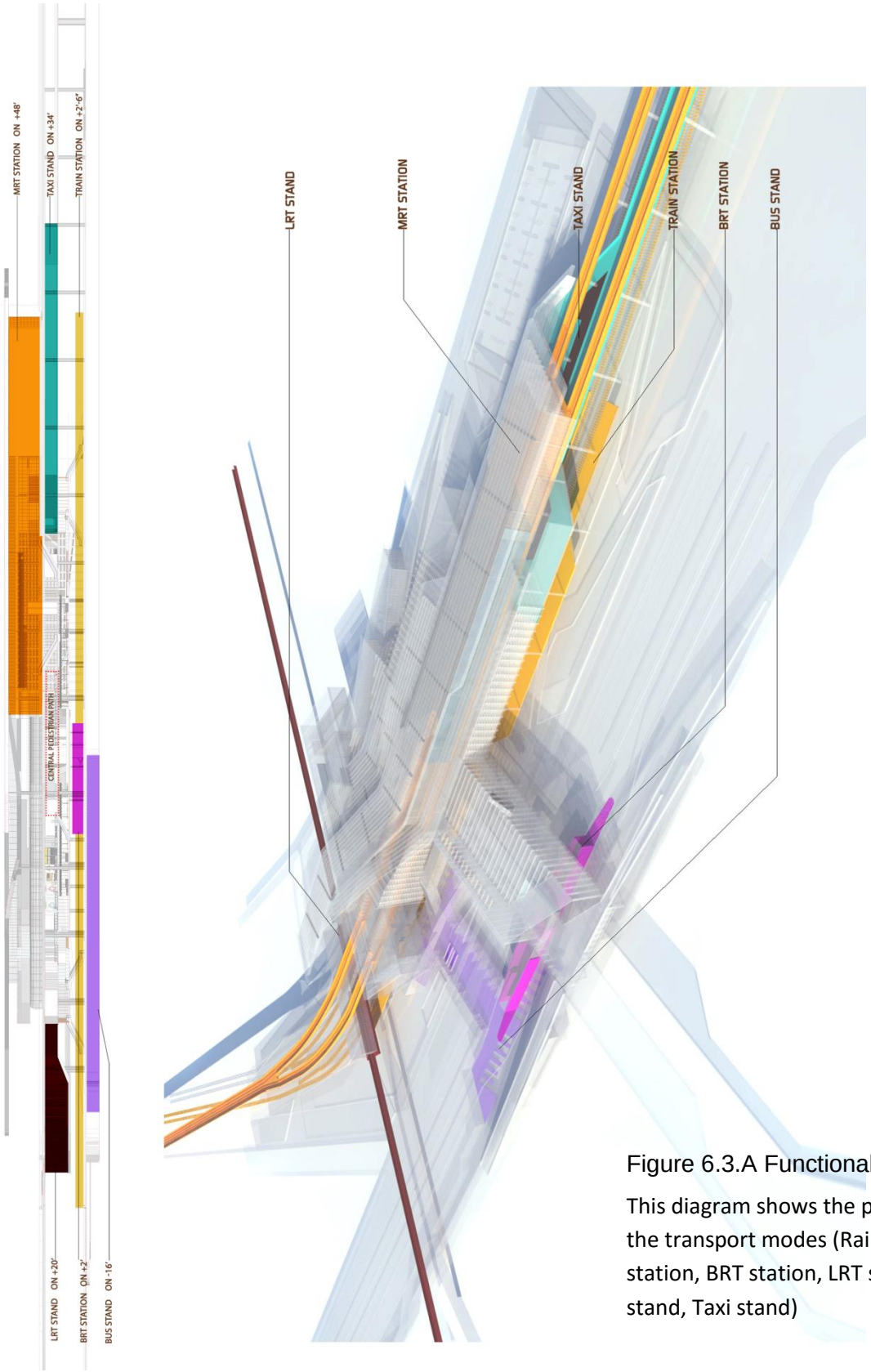


Figure 6.3.A Functional Placement

This diagram shows the placement of all the transport modes (Rail station, MRT station, BRT station, LRT station, Bus stand, Taxi stand)

6.4 Drawings, section & perspectives

Figure 6.4.A Site plan

The four points that are marked are proposed LRT stand which are placed accordance to their demand.

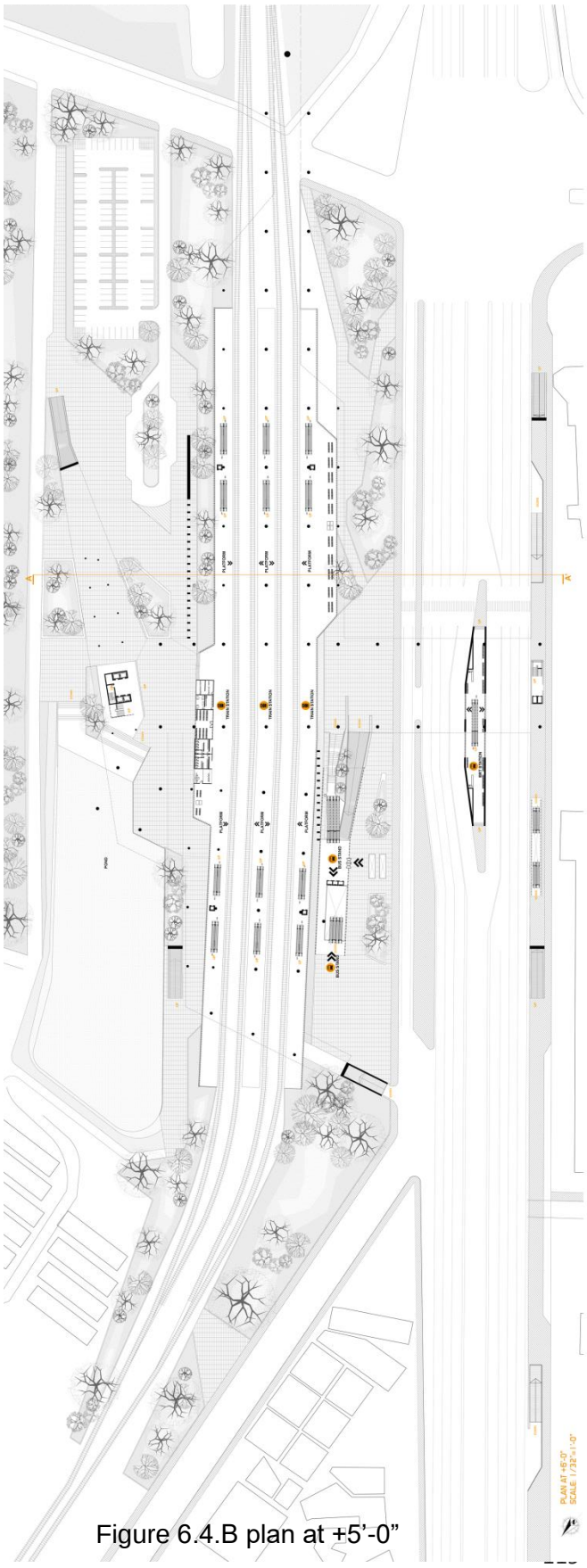


Figure 6.4.B plan at +5’-0”

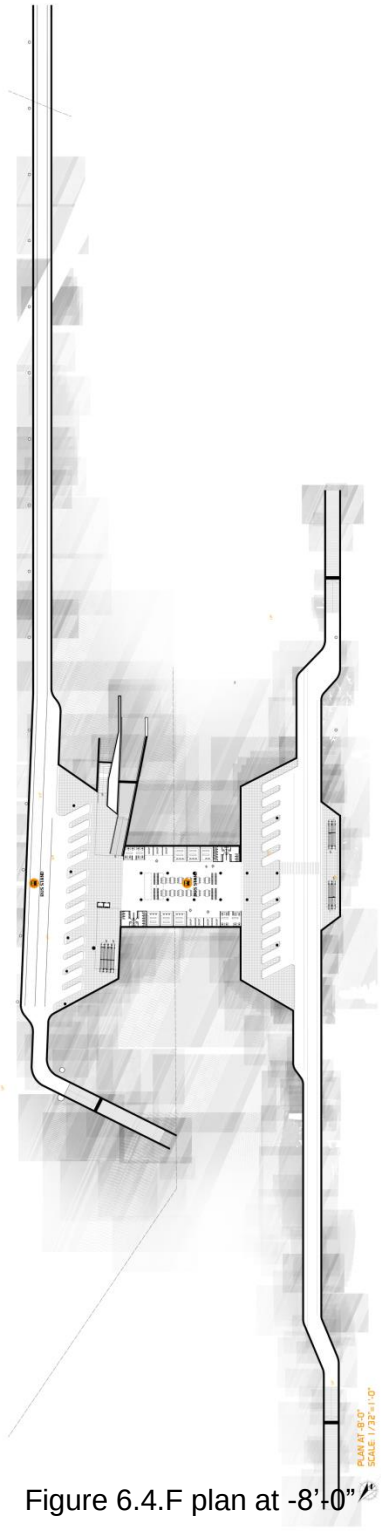


Figure 6.4.F plan at -8’-0”

Figure 6.4.D plan at +26’-0”

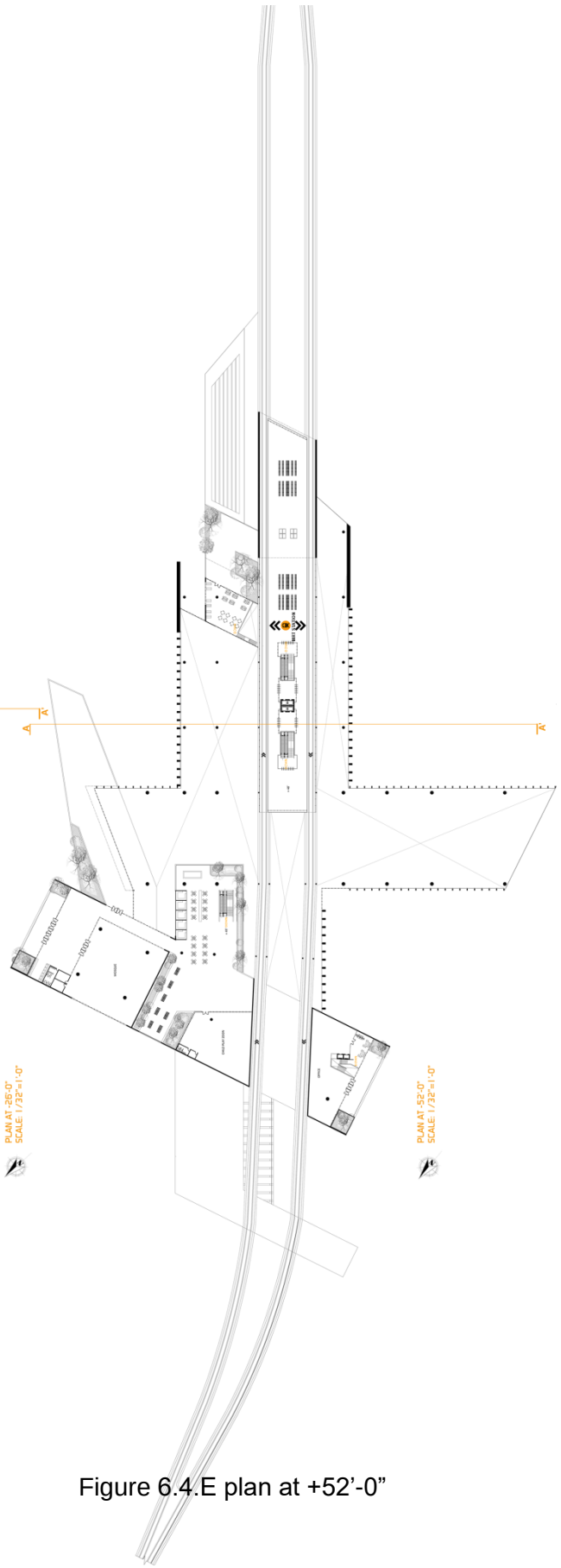


Figure 6.4.E plan at +52’-0”

This floor is the main floor where the lobby space is located and at the same time crossing path for non-transit people. All type of transport leads to this space so that circulation is simple and easy.

All kind of public facility is also on this floor as it would be most busy with all passengers and local people. Some of those public functions are retail shops, dispensary, large brand shops, restaurant, and book café, Normal coffee shop etc.

One transport mode is on this floor which is Taxi stand with electrical charging station.

Figure 6.4.F plan at +38'-0"

Figure 6.4.G Elevation 1

Figure 6.4.H Elevation 2

Figure 6.4.I Section

Figure 6.4.J exterior perspective 1

Figure 6.4.K Exterior perspective 2

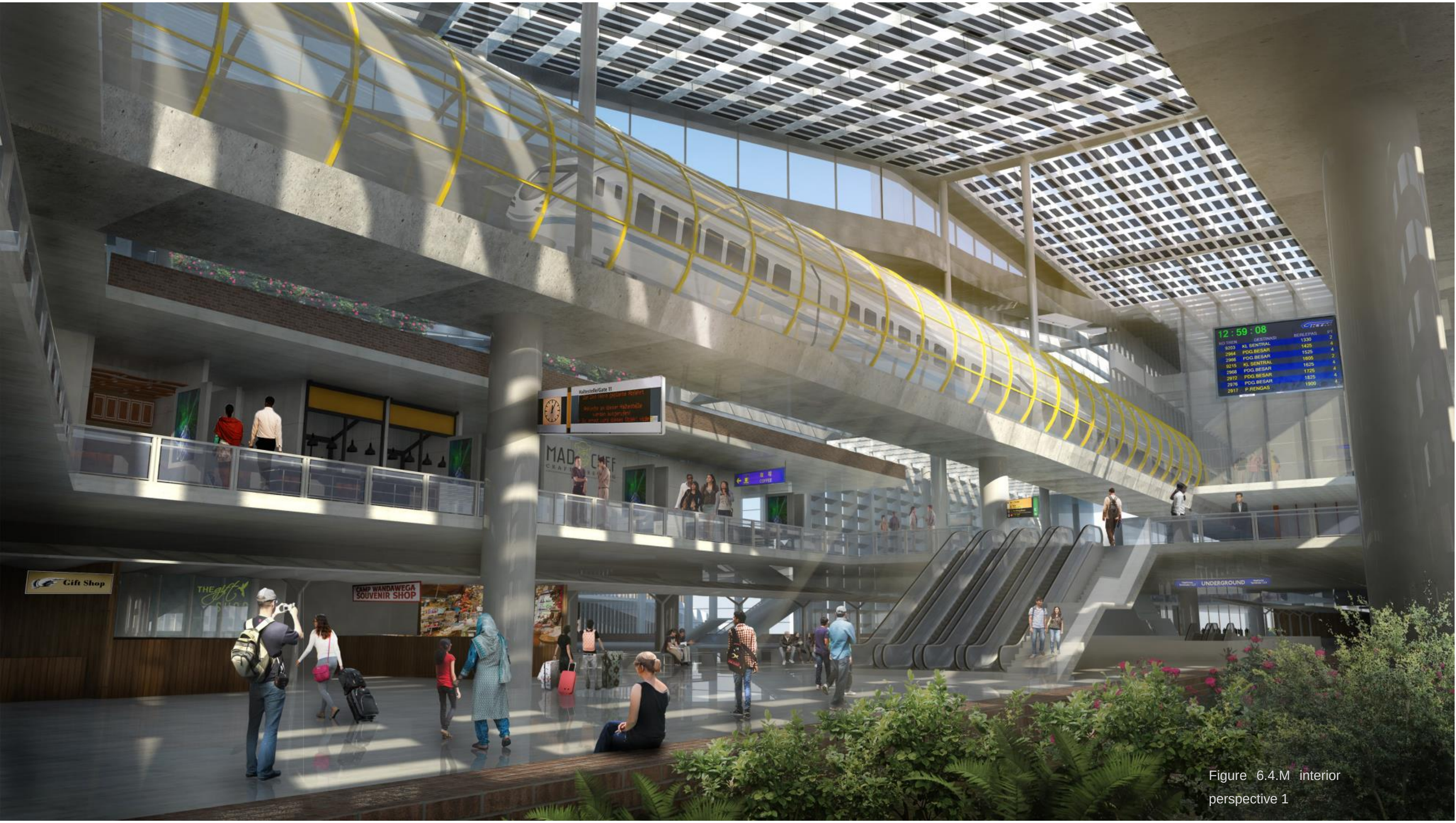
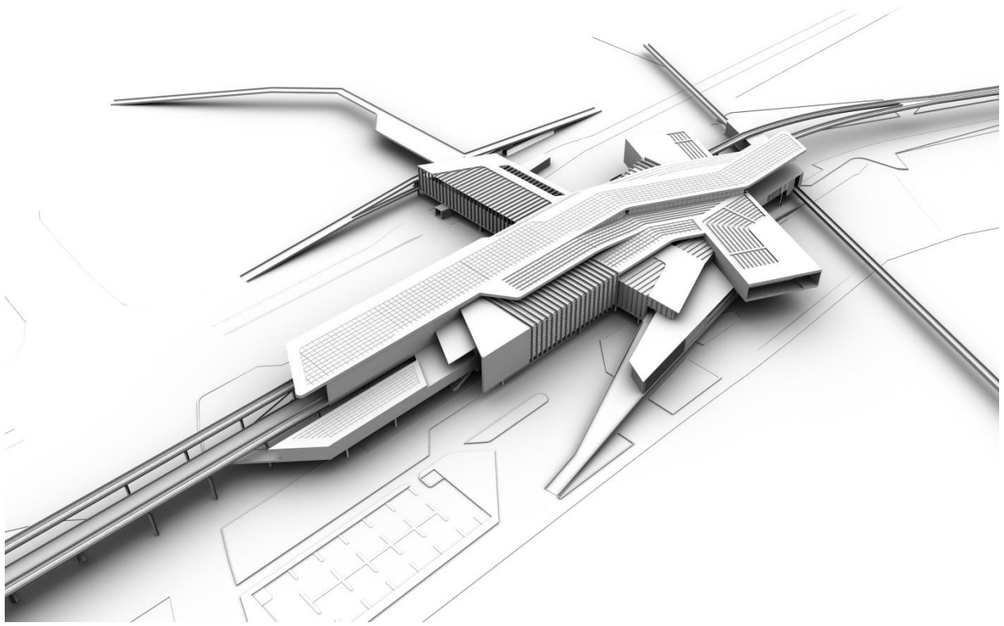
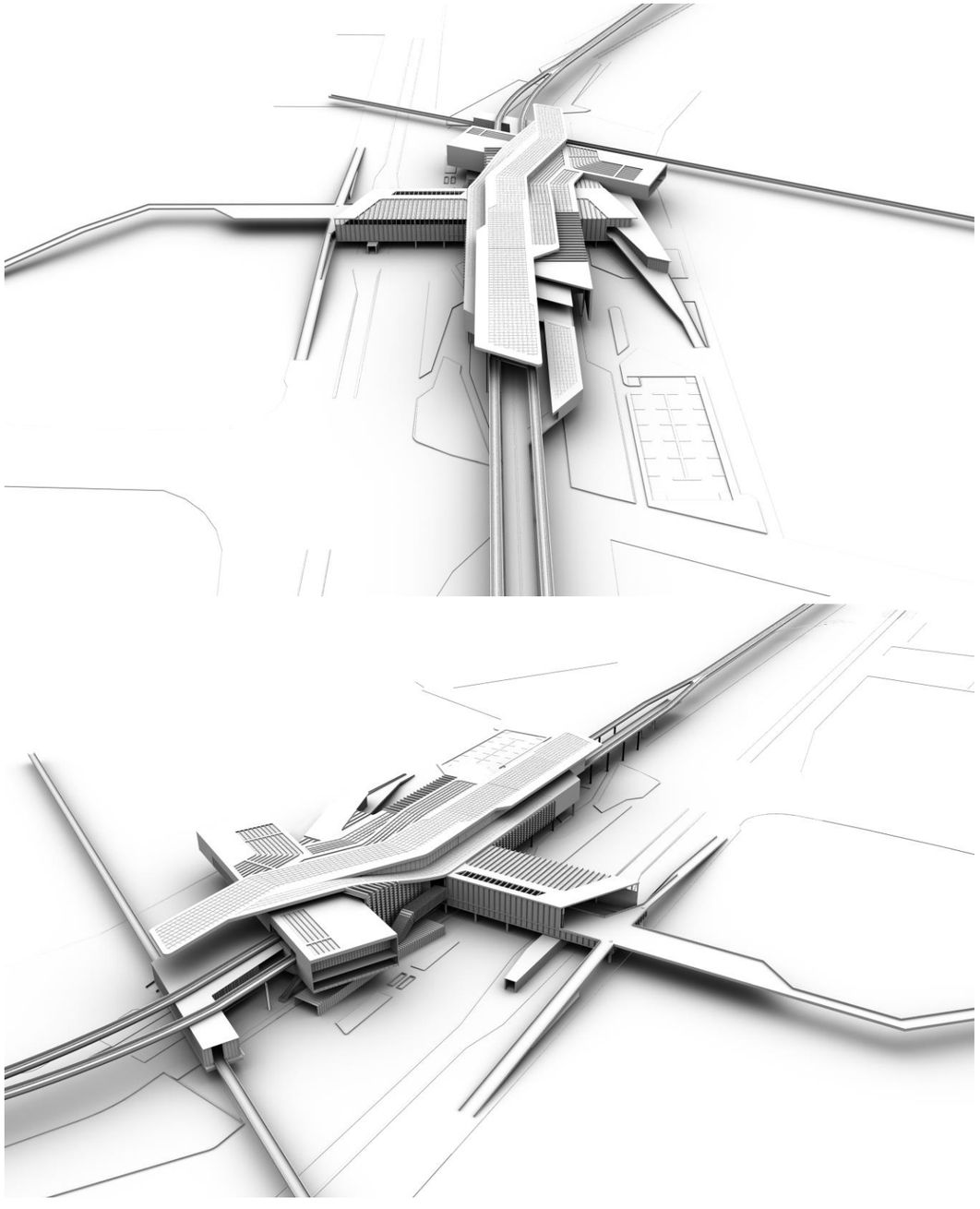


Figure 6.4.M interior perspective 1

Figure 6.4.N interior perspective 2

Figure 6.4.O interior perspective 3





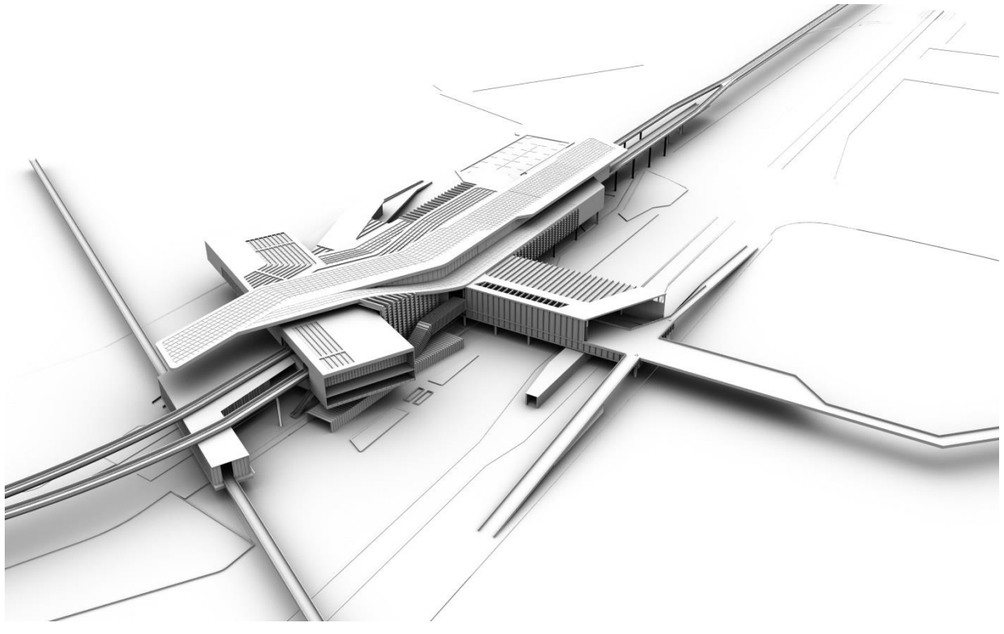


Figure 6.4.P Bird eye perspective

CHAPTER 07

Conclusion

Traditionally our country builds any kind of station as a individual station, with low cost. Our country's people are used to with this kind of stations. So people don't aspect batter things, because they there is no good example of any kind of multi modal station. So usually the thing we don't see or experience, we cannot demand for that. They deserve comfort and convenience of movement but the government do not emphasize on the design consideration and need of the people. Since for the 1st time multiple transport modes are being built so the government should take the planning consideration seriously and set guidelines that fallow context user need and international standards.

It is very important to have a common space that links so many transport modes for the people to find fast and easily. Also any building should consider its local context, climate and inhabitant needs and the impact it have in them. It should be designed considering the future growth of population; land use diversity and traffic load so that it can accommodate all the people and necessary function. As this is a huge multimodal transport hub it should facilitate civil space for the large moving passengers and local people. If the multi modal transport is designed considering these factors such as Comfort, convenience, access, mobility, efficiency then the people will benefit and the country will develop.

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