

**5 Station Area  
Development Plan of UB  
Metro Corridor**

## 5. Station Area Development Plan of UB Metro Corridor

### 5.1 Objectives of Station Area Development Plan Necessity of Integrated Development

#### 5.1.1 Necessity of Integrated Development

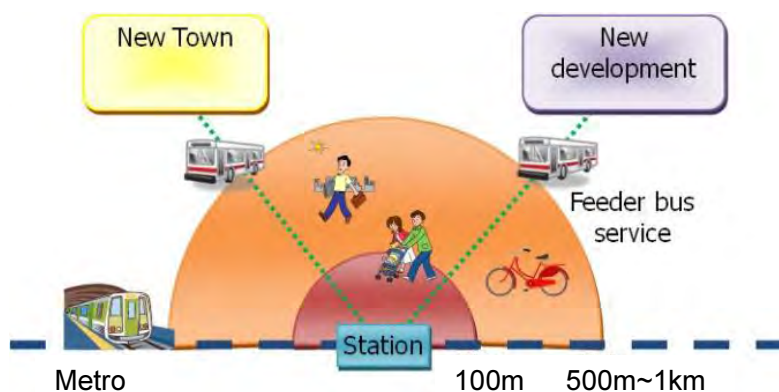
Ulaanbaatar (UB Metro) will cover various urban land uses from the Central Business District (CBD) to suburban and rural areas. With appropriate feeder bus service provision, accessibility of ger areas will be improved.

Different land uses at station areas require an adequate development approach to fit socio-economic activities and people's mobility, while the Metro is expected to encourage formulating and managing a station corridor development in an integrated manner, which is generally known as the "Transit Oriented Development" (TOD) concept.

- With the integration of the public transport system including metro, BRT and buses and the improvement of convenience of transfer, the number of passengers will be increased and accessibility of citizens will be improved.
- With the development of public service facilities and commercial and business facilities around metro stations, daily convenience will be enhanced; hence socio-economic development of the station areas will be promoted.

According to the TOD concept shown in Figure 5.1.1, Intermodal Transfer Facilities (ITFs) and commercial and business facilities, which serve for promoting public transport utilization, are developed with comfortable pedestrian space within approximately 100m radius from the station. Within the walking distance (app. 500m – 1km radius from the station), residential areas and various urban facilities of public service, commercial and cultural, are developed with bus feeder service.

In this chapter, a basic concept of the station area development and concept plans of each station are proposed, based on this TOD concept.



Source: JICA Study Team

**Figure 5.1.1 TOD Concept**

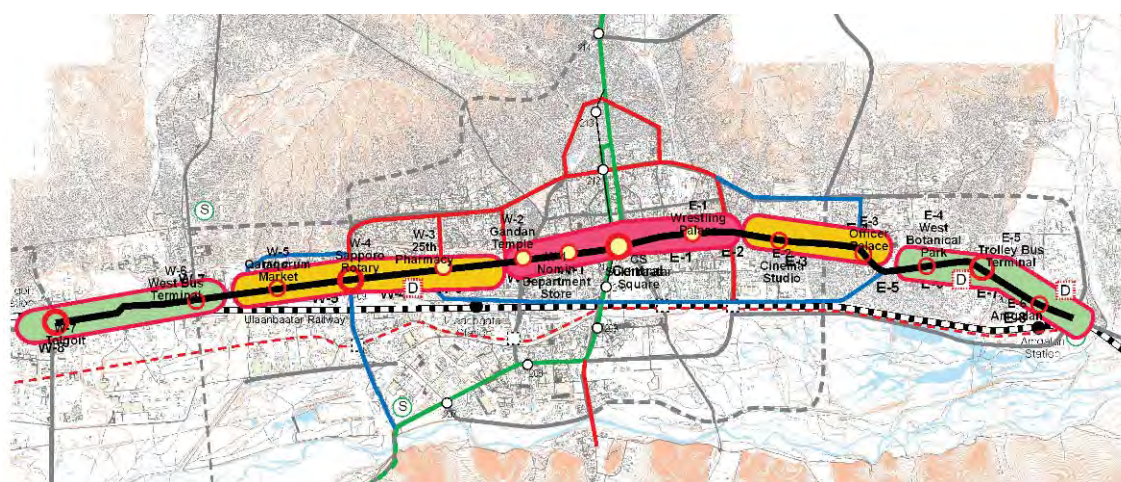
#### 5.1.2 Current Status of the Land Use and Traffic along Peace Avenue

In general, there are three types of land uses along Peace Avenue from Tolgoit to Amgalan (see Table 5.1.1 and Figure 5.1.2).

**Table 5.1.1 Types of Land Use Along Peace Avenue**

Zone	Stations	Main Land Use and Building Type
City center	W2-E1	Commercial and business facilities and apartments (two to four stories high with shops on the first floor)
Built-up area	W3-W5, E2-E3	Commercial facilities and apartments (nine stories high with shops on the first floor)
Suburban area	W6-W7, E4-E6	Apartments, railway-related facility areas, factories

Source: JICA Study Team



Source: JICA Study Team

**Figure 5.1.2 Typology of Land Use along Peace Avenue**

There are three types of land rights in compliance with the Land Law and the Land Privatization Law: land ownership right, land possession right and land use right.

Apartment areas are state-owned, while an apartment association owns the land possession right. Many apartments have shops on the first floor and many of them encroach the sidewalk. In addition, most of these shops are not registered.

On the other hand, lands of ger areas are privatized and owned by Mongolian citizens, but some citizens do not register their lands. In the case of foreign companies and personnel, only a land use right can be given .



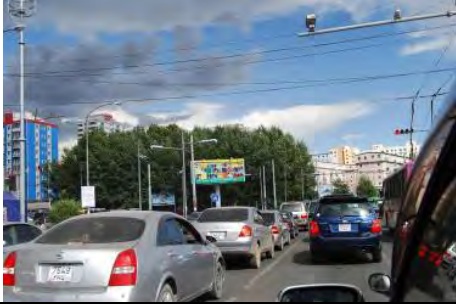


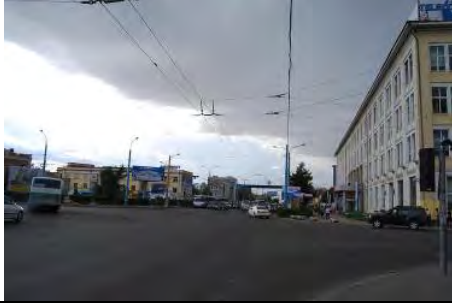




Table 5.1.2 and Figure 5.1.3 show the current condition of building use, land use and transport access for each station.

**Table 5.1.2 Current Status of Building Use, Land Use and Transport**

ID	Name of Station	Land Use and Building Type	Transport Access
W-7	Tolgoit	North: ger area of north of station South: Mixed land use including apartment, factories and warehouses	<ul style="list-style-type: none"> <li>• Tolgoit station of Ulaanbaatar Railway</li> <li>• South-North road to Chingiss Airport</li> <li>• Flyover of railway (planned)</li> <li>• Extension of South-North road (planned)</li> </ul>
W-6	West Bus	North: ger area	<ul style="list-style-type: none"> <li>• Access road to Bayankhoshuu</li> </ul>

	Terminal	South: apartments and industrial areas	• West Bus Terminal for long-distance buses
W-5	Qaraqorum Market	North: Unur South apartment complex South: market, apartments and industrial area	• Access road to Unur North ger area
W-4	Sapporo Rotary	North: apartments and commercial area South: apartments and industrial area	• 3 <sup>rd</sup> Ring Road/ access road to 3 <sup>rd</sup> Khoroolol (commercial area) • BRT (planned) • Flyover (planned)
W-3	25 <sup>th</sup> Pharmacy	Apartment area	• Access road to 3 <sup>rd</sup> Khoroolol • Narany Zam to Ulaanbaatar Station of Ulaanbaatar Railway
W-2	Gandan Temple	Commercial and apartment area Gandan Temple, Narantuul Hotel, Theater, Golomt Apartment, Grand Plaza, Ramada hotel, confectionery factory	• Access road to Ikh Toyruu (2 <sup>nd</sup> Ring Road) • Flyover (planned)
W-1	Nomin Department Store	Apartment and commercial area Nomin Department, park, circus	• 1st Ring Road • Chingiss Street • Olympic Street
CS	Sukhbaatar Square	Public, commercial & business and apartment area Sukhbaatar Square, Central post office, Central Tower, Opera House, embassies	• 1st Ring Road • Chingiss Street • Olympic Street
E-1	Wrestling Palace	Apartment and commercial area Ulaanbaatar Hotel, Wrestling Palace, Kempinsky Hotel, 3 <sup>rd</sup> Hospital	• BRT (planned)
E-2	Cinema Studio	North: Apartment area South: ger area Universities, supermarket	
E-3	Officers' Palace	North: Apartment area South: ger area Officers' Palace	• BRT (planned)
E-4	West of Botanical Garden	North: Apartment area and ger area South: ger area Botanical Garden	
E-5	Trolley Bus Terminal	Ger area Supermarket	• Trolley bus terminal
E-6	Amgalan	Ger area	• Amgalan Station of Ulaanbaatar Railway

Source: JICA Study Team

	
<p>E6: Ger area around Amgalan Station</p>	<p>E2: Eastern side of East Intersection of Kempinsky Hotel</p>
	
<p>E1: Congested East Intersection of Kempinsky Hotel</p>	<p>E1 – CS: From East Intersection to Sukhbaatar Square</p>
	
<p>CS: Congested area in front of Sukhbaatar Square</p>	<p>CS - W1: Intersection in front of Central Post Office</p>
	
<p>W2: In front of Nomin Department Store</p>	<p>W3: West Intersection in front of Golomt Apartment</p>
	
<p>W3 - W4: Widened Peace Avenue on the western side of West Intersection</p>	<p>W6 - W7: Few vehicles and buildings around Tolgoit Station</p>

**Figure 5.1.3 The Current Situation of Land Use and Traffic along the Metro Line**

### 5.1.3 Potential of Promoting the Urban Redevelopment Projects.

The Ministry of Construction and Urban Development (MCUD) has prepared the draft Urban Redevelopment Law. The draft Article 11 stipulates the following five urban redevelopment projects:

- i) Reconstruction of areas that do not meet architectural, urban development and urban planning requirements;
- ii) Demolition and reconstruction of old buildings and structures that do not comply with exploitation requirements;
- iii) Reorganization of ger area land;
- iv) Replanning and development of ger areas; and
- v) Replanning and development of public spaces.

Along Peace Avenue, there are various areas where land is not effectively used, such as old apartment areas, insufficiently built-up areas where roads and public facilities are lacking, and broad industrial areas and warehouses which are already closed. In such areas, renewal of land use and high-level efficient utilization are necessary in the future. It is expected that the implementation of urban redevelopment projects will be promoted particularly in areas along Peace Avenue in line with the City Master Plan and District Detailed Plan after constitution of the Urban Redevelopment Law. Thus, it is necessary to formulate an urban redevelopment project implementation plan around stations which are integrated with the UB Metro project.

### 5.1.4 Future Development Framework in Station Area

If the urban development is promoted and the transport condition is improved around stations, the daytime and nighttime population will be increased, and it is expected that these new residents, employees and students will be metro users.

To identify necessary volume of ITFs and station area development, future population framework is assumed.

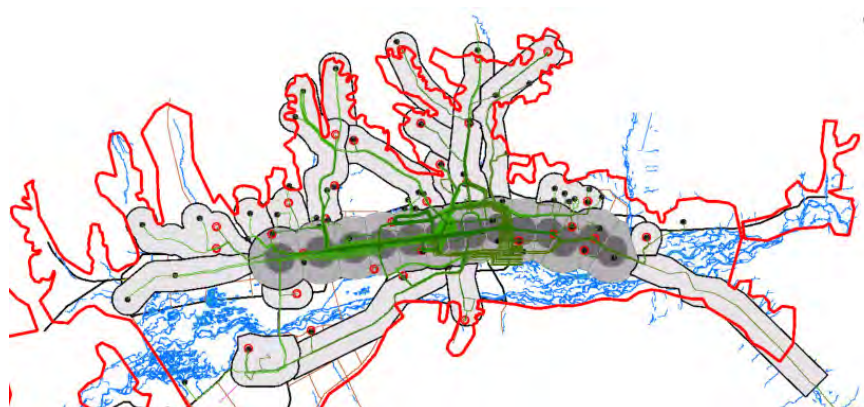
The population of the station area, including both station walking area (800m radius from station as a walking distance) and bus service coverage area, is estimated based on the future development plan of the UBMP 2030.

- Population is projected to continue to increase based on the trend until 2020, when an urban growth control policy takes effect.
- From 2020 to 2030, due to impacts of urban development policies and projects such as urban redevelopment projects in the city center, approximately 180,000 population, about 50% of the increased population of the city (population of city will be 1.4million in 2020 and 1.76 million in 2030, so increased population will be approximately 360,000), will live in the station area.
- A resettlement policy will be implemented for ger area residents who are prohibited to live (cf. hilly area, conservation area) in apartment areas. Approximately 55,000 populations, 25% of the target resettled population of the city, will live in the station area.
- The Metro corridor development is promoted with commercial and business establishment, highly developed educational facilities, and about 70% increase in the number of employees and 30% increase in the number of students will work and study in the station area.

**Table 5.1.3 Estimated Increased Population of Station Area from 2020 to 2030**

		Whole City	Share of station area	Station area
Increased night population	Increased residents	363,000	50%	181,500
	Resettled residents	221,110	25%	55,300
	Total	584,110	41%	236,800
Increased day population	Employment	222,300	70%	155,610
	Student	85,000	30%	25,500

Source: JICA Study Team



Source: JICA Study Team

**Figure 5.1.4 Coverage of Station Areas (800m radius from station)**

### 5.1.5 Number of Station Users and Population of Station Area

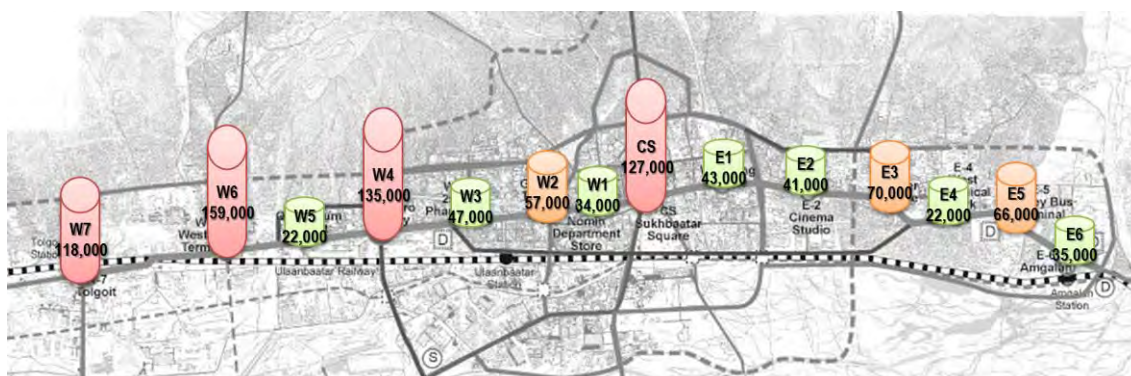
If the sub-center development will be realized in accordance with the UBMP 2030 draft, it is estimated that some station users of W6 West Bus Terminal will shift to use W7 Tolgoit due to the development of access road from ger areas to sub-centers. In case of E5 Trolley bus terminal and E6 Amgalan, station users will be appropriately distributed through the integrated sub-center development around these two stations. For estimation of volumes of ITF and future urban development in this chapter, based on the UBMP 2030 draft, the number of station users is redistributed from W6 and W7 to E5 and E6, respectively. This is based on the result of traffic demand analysis in Chapter 3 on the assumption that the users are lead to the central station of sub-centers delivered by rerouting bus routes.

Table 5.1.4 shows the estimated population of the station influence area (800m radius from station) and station area (including station influence area and feeder bus service coverage area). The total estimated population of whole station area is approximately 1.23 million, which covers around 70% of total population of the city (1.76 million in 2030). The population in the station influence area of 800m radius from the station is approximately 550,000, which covers around 31% of the total population of the city.

**Table 5.1.4 Estimated Number of Station Users and Population of Station Area in 2030**

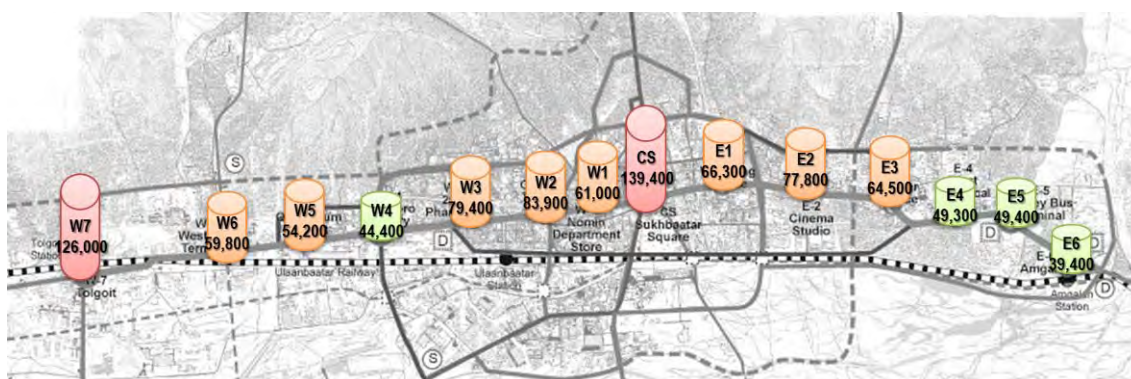
Station		No. of Station Users	Station Influence Area (800m radius from station)			Station Area (station influence area and bus service area)		
			Resident	Employment	Student	Resident	Employment	Student
W7	Tolgoit	117,572	63,600	9,400	53,400	244,900	62,700	201,400
W6	West Bus Terminal	158,941	29,500	5,300	25,000	76,500	18,600	58,600
W5	Qarakorum Market	21,582	28,300	6,400	19,500	39,500	10,000	29,800
W4	Sapporo Rotary	135,154	26,200	3,900	14,300	94,600	24,400	46,500
W3	25 <sup>th</sup> Pharmacy	46,645	48,300	11,400	19,700	62,500	17,100	31,700
W2	Gandan Temple	56,617	48,900	10,000	25,000	105,000	26,800	68,300
W1	Nomin Department	33,637	31,900	8,100	21,000	41,500	12,600	31,300
CS	Sukhbaatar Square	127,108	66,300	13,400	59,700	215,700	62,600	151,000
E1	Wrestling Palace	42,527	37,500	7,800	21,000	93,900	26,100	46,900
E2	Cinema Studio	40,556	47,100	11,400	19,300	56,300	15,800	26,600
E3	Officer Palace	70,137	40,800	8,300	15,400	72,900	18,500	34,200
E4	West Botanical Park	22,130	31,100	7,200	11,000	33,600	8,800	12,400
E5	Trolley Bus Terminal	65,974	32,200	7,100	10,100	48,600	12,900	18,300
E6	Amgalan	35,370	20,000	3,600	15,800	42,500	10,200	35,800
Total		973,950	551,600	113,300	330,200	1,228,000	327,100	792,800

Source: JICA Study Team



Source: JICA Study Team

**Figure 5.1.5 Distribution of Station Users of Each Station**



Source: JICA Study Team

**Figure 5.1.6 Distribution of Population of Station Area (800m radius) of Each Station**



## 5.1.6 Outline of Station Area Development Plan

### (1) Issues of Station Area Development

To promote utilization of the metro and develop a station as an attractive district center, it is necessary to meet the following requirements:

- a) To secure safe and convenient access from roads around station to station facility  
→ development of station related facilities
- b) To secure the safe and convenient transfer among other transport modes  
→ the development of intermodal transfer facilities and transport improvement
- c) To provide various services for station users and residents around stations  
→ the urban development in station areas

### (2) Components of Station Area Development Plan

The station area development plan aims to realize integrated urban and transport development based on the TOD concept. The plan includes a development orientation of the area with the proposed projects including station related facilities, intermodal transfer facilities and urban development.

**Table 5.1.5 Components of Station Area Development Plan**

Category	Components	Examples of Facility and Service
1. Station related facilities	a. Station	<ul style="list-style-type: none"> <li>• Station facility (elevated, at grade, underground)</li> <li>• Entrance</li> </ul>
	b. Access facility	<ul style="list-style-type: none"> <li>• Stairs, elevators, escalators</li> <li>• Underground passages, elevated pedestrian decks</li> </ul>
2. Transport development	c. Road improvement	<ul style="list-style-type: none"> <li>• Access road to station (bus, taxi, car)</li> <li>• Intersection improvement</li> <li>• Pedestrian space and facility (pavement improvement, street light, signboard)</li> </ul>
	d. Intermodal transfer facility	<ul style="list-style-type: none"> <li>• Transfer facility to other public transport modes (underground path, pedestrian deck)</li> <li>• Station plaza, bus terminal</li> <li>• Bus stop improvement</li> <li>• Park and Ride facility</li> </ul>
	e. Car parking	<ul style="list-style-type: none"> <li>• Car parking space, parking building, underground parking</li> </ul>
	f. Pedestrian network	<ul style="list-style-type: none"> <li>• Sidewalk, pedestrian mall</li> <li>• footbridge, pedestrian deck, underground passage</li> </ul>
	g. Traffic management	<ul style="list-style-type: none"> <li>• Private vehicle control (road pricing)</li> <li>• Common ticket system</li> </ul>
3. Urban development	h. Commercial and business promotion	<ul style="list-style-type: none"> <li>• Kiosk, shop</li> <li>• Commercial and business building (high-rise, mid-rise)</li> <li>• Public service facility</li> <li>• Hotel, amusement facility</li> <li>• Underground commercial mall</li> </ul>
	i. Residential facility development	<ul style="list-style-type: none"> <li>• Reconstruction of old apartments</li> <li>• Residential complex development</li> <li>• Public apartment development for mid and low income groups, resettlement from ger area</li> </ul>
	j. Living environment improvement	<ul style="list-style-type: none"> <li>• Central infrastructure improvement</li> <li>• Independent infrastructure development</li> </ul>

		<ul style="list-style-type: none"> <li>• Public service improvement</li> </ul>
	k. Urban design and amenity	<ul style="list-style-type: none"> <li>• Green area, park, open space</li> <li>• Toilet, police box, signboard, landmark facility</li> <li>• Cultural and historical building preservation</li> </ul>
	l. Institutional arrangement of urban development	<ul style="list-style-type: none"> <li>• Land use control, zoning system</li> <li>• Construction control (building height, building use)</li> <li>• Institutional arrangement (Tax Increment Financing, tax benefits, etc.)</li> </ul>

Source: JICA Study Team

### (3) Station Related Facilities

To make the UB Metro a new daily transport mode for citizens, the “universal design” concept should be adopted to design facilities which are easy and comfortable to be used by all users including elderly and the disabled.

For this, (a) route setting with accessibility, (b) guide sign and information system, and (c) user-friendly facility and equipment are significant for station related facilities.

	
Elevator	Universal Design Toilet
	
Slope for Wheelchairs	Guidance by station staff

Source: JICA Study Team

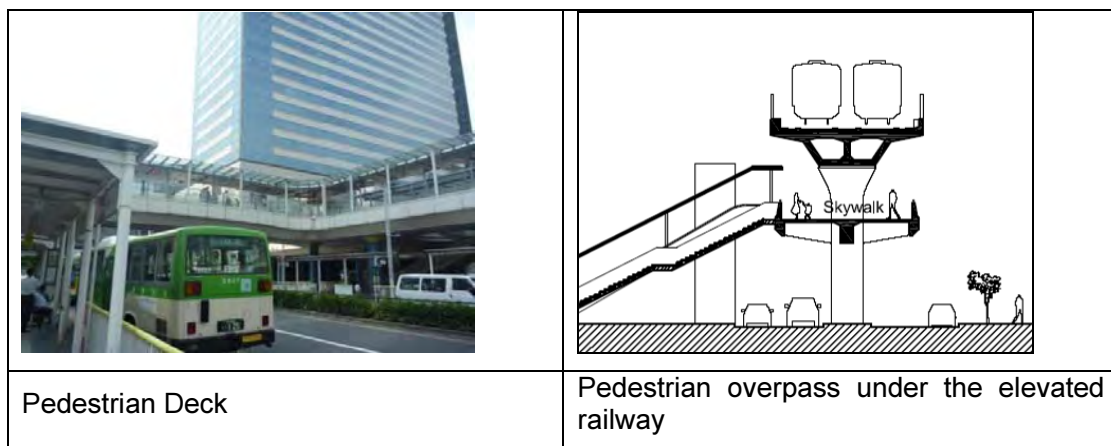
**Figure 5.1.7 Image Photos of Station Related Facilities**

Access facilities are necessary to access from roads around the station to the station facility. Stairs, escalators (ESCs) and elevators (EVs) are basically installed for all stations. In addition, facilities for intersections and trunk roads are installed for pedestrian’s safety.

- **Entrance:** Entrances of elevated and underground stations will be set as sidewalks or public spaces where land acquisition is not necessary. Stairs, ESCs and EVs are installed four directions for each station so that station users can access into the station directly

from the sidewalks. ESC and EV will be placed at least one each or two directions if possible.

- **Free concourse for elevated and ground stations:** Metro will be developed in the middle of the Peace Avenue. To have access to the station from the sidewalks, it is necessary to install two elevated free concourses (without payment) for both north and south sides (nine elevated stations of W7, W6, W5, W4, E3, E4, E5, E6, E7 and one ground station of E2). In case of E2 Cinema Studio Station, the concourse and gate will be elevated while the platform will be on ground, and so the elevated free concourse is necessary to secure accessibility. In case of W7 Tolgoit Station, the overpass for pedestrians is recommended to cross both the Metro line and the existing national railway line.
- **Underground passage for underground stations:** For underground stations (five stations of W3, W2, W1, CS, E1), underground passages (without payment) should be developed.
- **Pedestrian overpass at intersections:** For the stations located near the large intersections (W6 West Bus Terminal, W4 Sapporo Rotary, W2 Gandan Temple, CS Sukhbaatar Square), it is preferable to extend pedestrian decks or underground passages, and to develop pedestrian way under the elevated railway for safety of pedestrians crossing the intersections.



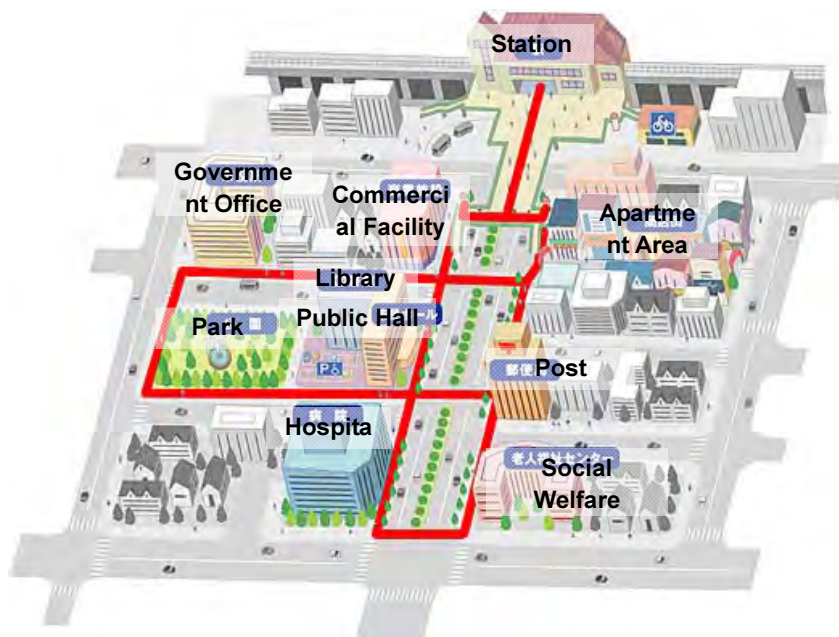
Source: JICA Study Team

**Figure 5.1.8 Image of Access Facilities**

#### **(4) Intermodal Transfer Facility and Transport Improvement**

Regarding the improvement of the transport condition, it is important not only to develop station related facilities above, but also to improve the transport condition of station areas for safe and comfortable accessibility and mobility to facilities around stations. Therefore, the following should be considered.

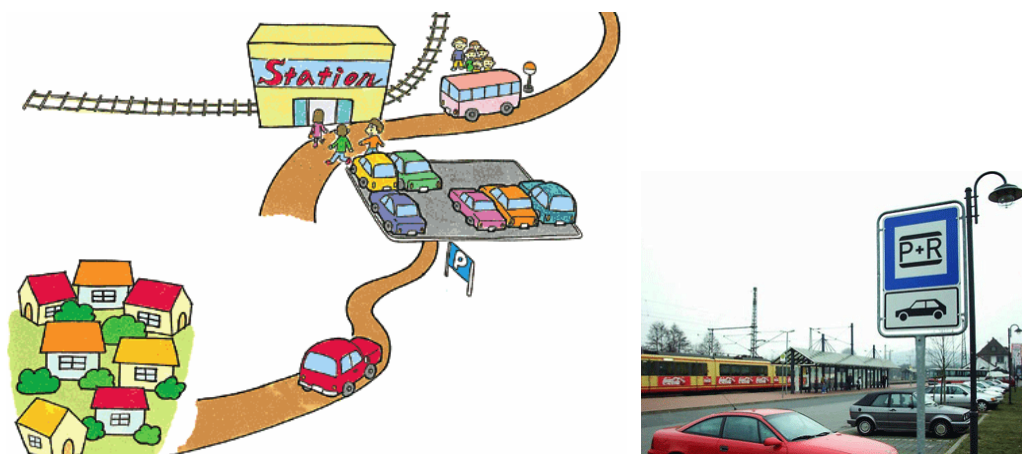
- (a) **Access road improvement:** Main access roads around stations (500m radius from each station) should be developed through other facilities including the pavement improvement, installation of street lights, parking control, installation of signboards, etc. It is preferable to install signals and pedestrian crossings for pedestrians near station.



Source: Website MLITT of Japan

**Figure 5.1.9 Image of Access Road Network around Station**

- (b) **Connectivity of urban facilities:** To secure accessibility to urban facilities (medical, public, commercial and business, culture, etc.), it is recommended that a direct connection between station facilities and urban facilities be provided based on the agreement of railway developers/operators and urban facility owners. Access roads and facilities to connect medical facilities (the Third Hospital of W4, the Railway Hospital of W3 and the Second Hospital of E1) should be designed carefully for facility users including patients, elderlies, etc.
- (c) **Development of Intermodal Transfer Facility (ITF):** ITF is a facility for passengers of various transport modes (metro, BRT, bus, taxi, and car) to transfer to other transport mode smoothly. ITF is also called the Station Plaza. The ITF is a transport core facility and will be the center of the district (see 5.2 for details).
- (d) **Park and Ride:** Park and Ride (P&R) is a system that allows citizens to park a private car at the nearest railway station of suburban areas and then ride the railway to the urban center. At the stations of suburban areas, the parking space for P&R is developed, and the discount ticket system for P&R is applied to promote P&R system. Basically, the parking space of P&R is not included in the ITF. The P&R facility is developed by local governments and/or railway operators and/or private sectors for promotion of the railway utilization to private car owners.



Source: Website

**Figure 5.1.10 Image of Park and Ride**

### **(5) Urban Development of station area**

In combination with station related facilities and the transport improvement, urban development around stations should be planned and implemented. Citizens will go to urban facilities such as commercial and business, public, education, etc. through the UB Metro if these facilities are located near the stations.

Urban redevelopment projects are proposed in line with the metro development in an integrated manner to improve the socio-economic condition of station areas as a whole.

## **5.2 Development Orientation of Intermodal Transfer Facility**

### **5.2.1 Necessity of Intermodal Transfer Facility**

A station plaza is an integrated Intermodal Transfer Facility (ITF), including “transport facility” to manage the traffic flow of bus, taxi and pedestrian, and “environmental facility” to create a space for station users and residents to enjoy events in appropriate urban landscape. The volume of the station plaza is planned based on local characteristics and traffic demand of each station.

Main viewpoints for station area planning are summarized as follows:

- To formulate safe and convenient access route planning separating pedestrians and vehicles, and develop facilities with barrier-free concept.
- To integrate with urban and transport development to serve as a gateway of the district.
- To develop a station area with appropriate role sharing and participation of railway developers, operators, local governments, private sectors and local communities.

### **5.2.2 Outline of Intermodal Transfer Facility**

In general, ITF includes transport facilities and spaces as follows:

- Bus facility: bus berth for boarding and alighting
- Taxi facility: taxi berth for boarding and alighting, taxi pool

- Private car facility: temporary car stop facility<sup>1</sup>
- Pedestrian and bicycle facility: sidewalk, elevator, escalator, underground passage, pedestrian deck, bicycle parking

### 5.2.3 Outline of Environmental Facility

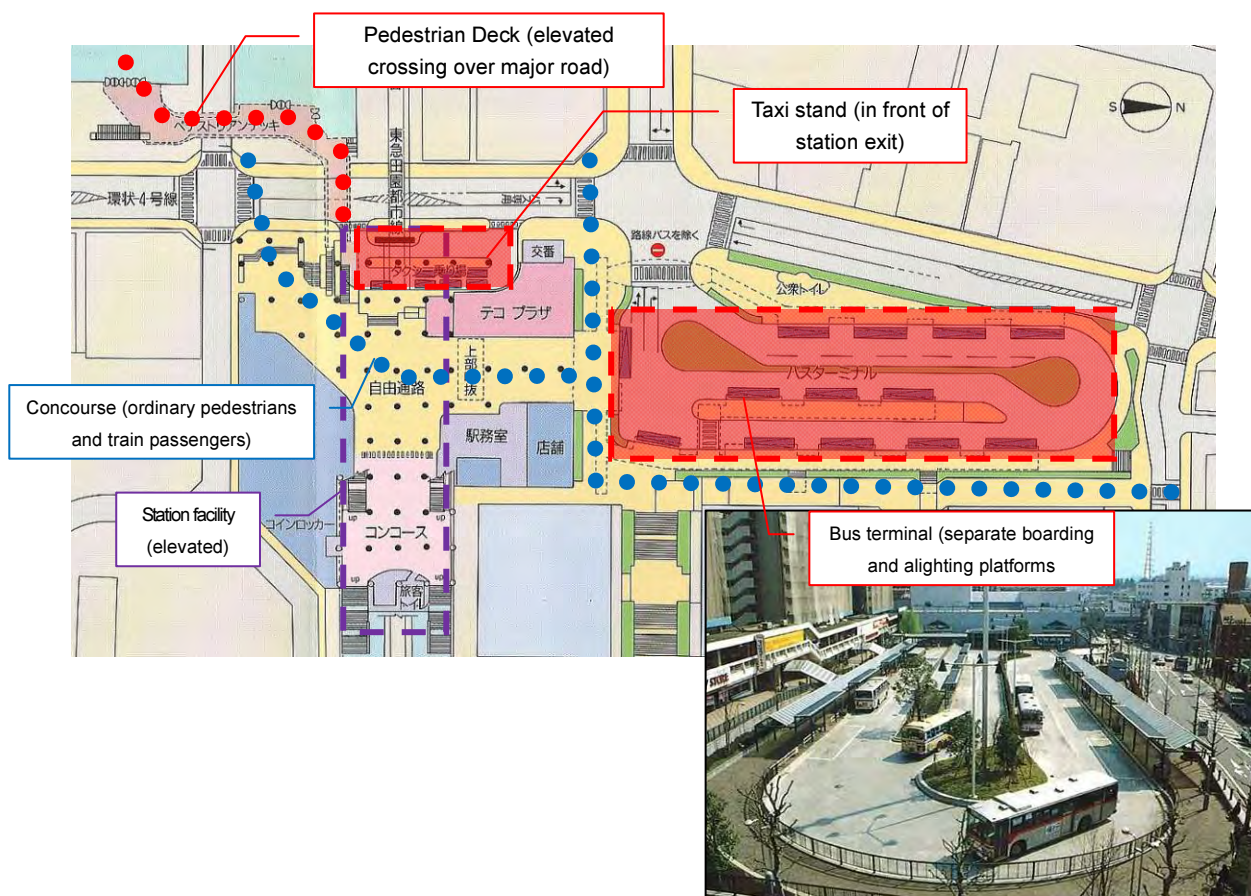
In addition to the “transport facility” above, the “environmental space” is developed as an open space with signboard, police box, toilet, bench, etc. In Japan, it is recommended to develop environmental space with 50% of the area of total transport facilities. Furthermore, to utilize ITFs safely and effectively, it is important to develop access roads to station, green space, and urban facilities to serve for railway users, in an integrated manner.

**Table 5.2.1 Necessary Facilities of Station Plaza**

Facility	Necessary Consideration
Sidewalk	<ul style="list-style-type: none"> <li>• To avoid grade crossing with carriage way (consider elevated crossing)</li> <li>• Designed for the pedestrian flow line not to cross, as waiting area for passengers of bus and taxi, or as waiting space of pedestrian crossing</li> <li>• To secure smooth walking space with which pedestrians feel no sense of detour</li> </ul>
Carriageway	<ul style="list-style-type: none"> <li>• Designed to be one-way in principle</li> <li>• To minimize crossing, merging and splitting of traffic of car running within the plaza</li> <li>• To minimize the number of entrance and exit</li> <li>• Planned to avoid traffic through the plaza</li> </ul>
Bus boarding & alighting facility	<ul style="list-style-type: none"> <li>• To be located in front of the station facility or nearby</li> <li>• Consider installation of traffic lights and pedestrian crossings in case that the bus stop and the stations are far</li> </ul>
Taxi stand and taxi pool	<ul style="list-style-type: none"> <li>• To be located if possible, near the station exit for users' convenience especially those with much baggage and the elderly</li> <li>• Designed not to cross tangle with buses and private cars</li> </ul>
Car parking	<ul style="list-style-type: none"> <li>• To enable cars to come in and go out smoothly, and keep users from crossing the carriage way in the plaza</li> </ul>
Temporary car stop	<ul style="list-style-type: none"> <li>• Same considerations for the taxi stand and pool</li> </ul>

Source: JICA Study Team

<sup>1</sup> This kind of system is called “Kiss and Ride, or K&R”, which is a system in which family member delivers railway users (commuters, students) to a station by car, and drop him at the station. K&R facility is developed to secure temporary car stop space in front of a station.



Source: Project Team based on materials of Tokyu Railway Corporation

**Figure 5.2.1 Example of Station Plaza (Aobadai Station, Tokyo Denentoshi Line)**

### 5.2.4 Estimation of Volume of Intermodal Station Facility

It is assumed that users of UB Metro go to a station on foot, or by car, bus or taxi. Its modal share differs from each station and local characteristic. In case of sub-center stations and stations located near the intersection, many users will go there by bus. To the stations of sub-urban areas, users will have access through private cars, park them at P&R facilities, and transfer to UB Metro for commuting. Table 5.2.2 shows modal share of each station.

**Table 5.2.2 Estimated Modal Share of Each Station**

Station	Modal Share (%)				Station	Modal Share (%)			
	Walking	Car	Bus	Taxi		Walking	Car	Bus	Taxi
W-7	21.4	25.5	43.1	10	CS	25.7	24.5	39.7	10
W-6	38.1	19.4	32.6	10	E-1	35.3	21.3	33.4	10
W-5	64.9	12.8	17.3	5	E-2	68.7	11.8	14.5	5
W-4	22.7	24.6	42.7	10	E-3	51.7	17.4	25.9	5
W-3	66.7	12.3	16	5	E-4	71.5	11.1	12.4	5
W-2	44.8	19.9	30.3	5	E-5	63.3	13.2	18.5	5
W-1	66.6	12.4	16.1	5	E-6	42.2	18.1	29.6	10

Source: JICA Study Team

The volume of ITFs is estimated based on the number of station users and its modal share.

Necessary volume of each facility is estimated based on the station plaza planning standard in Japan (See Table 5.2.3). These volumes have been calculated based on the future demand estimation as reference; and In actual, the station plazas shall not necessarily be developed as such.

**Table 5.2.3 Necessary Volume of Intermodal Transfer Facility of Each Station <sup>1)</sup>**

Station	No. of Station Users		No. of Bus Berth		No. of Taxi Berth			No. of Private Car Berth			Total Area (m <sup>2</sup> )
	Boarding	Alighting	Boarding	Alighting	Boarding	Alighting	Pool	Boarding	Alighting	Wheel chair	
W-7	52,953	64,619	7	5	2	5	9	13	14	1	30,300
W-6	76,898	82,044	7	5	2	8	12	13	17	1	38,200
W-5	9,845	11,737	1	1	1	1	1	2	2	1	3,500
W-4	65,921	69,233	8	6	2	7	10	14	18	1	37,400
W-3	28,268	18,377	1	1	1	2	2	2	4	1	6,300
W-2	31,378	25,239	2	2	1	2	2	4	7	1	10,300
W-1	22,281	11,356	1	1	1	2	1	2	3	1	5,100
CS	67,967	59,141	6	6	2	7	9	12	19	1	34,700
E-1	26,123	16,404	2	2	1	3	3	3	7	1	10,400
E-2	18,412	22,144	1	1	1	1	2	2	3	1	5,400
E-3	32,918	37,219	3	2	1	2	3	5	6	1	11,700
E-4	6,002	16,128	1	1	1	1	2	2	1	1	3,200
E-5	30,535	35,439	2	2	1	2	3	4	5	1	10,000
E-6	17,474	17,896	2	1	1	2	3	3	4	1	7,500

1) For estimation of facility volume, following periods of parking of each mode is applied: 5 min for boarding and 3 min for alighting at bus berth, 10 seconds for boarding and 30 seconds for alighting at taxi berth, 30 seconds for both boarding and alighting at car berth.

Source: JICA Study Team



### 5.2.5 Development Policy of Intermodal Transfer Facility at Each Station

ITFs are to be planned on the following design conditions, namely: (i) necessary volume of ITFs calculated based on the estimated future demand (See Table 5.2.4); (ii) necessity of connection with road network and other transportation modes; and (iii) necessity of development of transportation facility to enhance urban function.

In a short term, bus stops and walking environment for pedestrians shall be improved at all the stations, and ITFs shall be developed at the three major stations at W7 of Tolgoit, CS of Sukhbaatar, and E6 of Trolley Bus Terminal). These should be given priority. Table 5.2.4 describes of ITFs at each station and Figure 5.2.2 illustrates a development policy of ITFs at the major stations.

To develop ITFs, selection of the implementation body from the railway development body, state, city or the private sector, land acquisition or expropriation corresponding to the required size, location, and budget allocation need to be examined

Moreover, after the Urban Redevelopment Law is passed and enacted, projects will be implemented through the right conversion instead of land expropriation. Accordingly, urban redevelopment projects along Peace Avenue, including old apartment reconstruction projects, are expected to be facilitated. Development of ITFs together with such urban redevelopment projects should be considered.

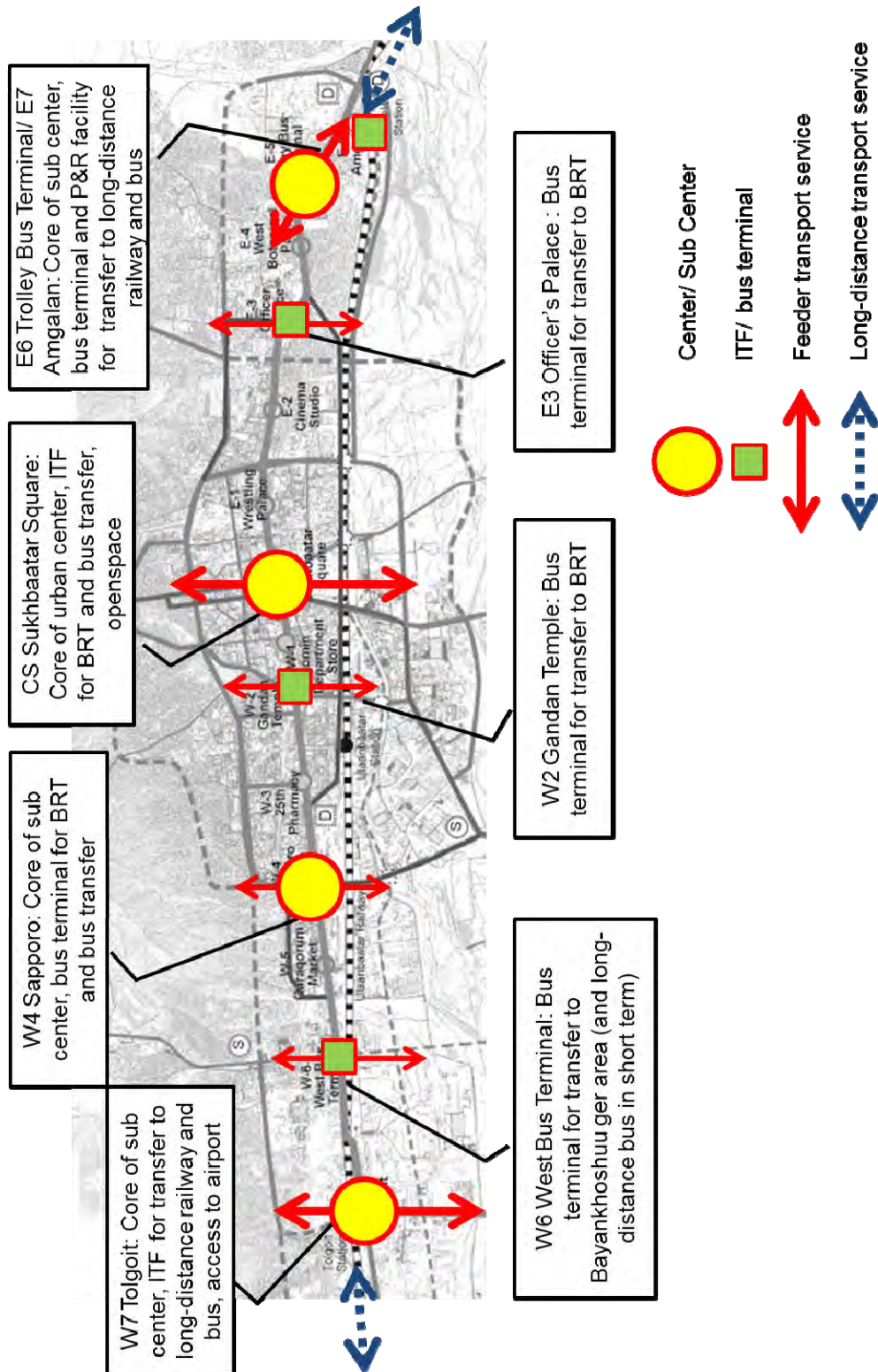
**Table 5.2.4 Outline of Intermodal Transfer Facilities at Each Station**

		W7	W6	W5	W4	W3	W2	W1	CS	E1	E2	E3	E4	E5	E6	E7
Convenience in transferring from other transport modes	Development of ITF and Bus terminal	•							•						•	•
	Improvement of bus stop		•	•	•	•	•	•		•	•	•	•	•		
	Development of P&R (car parking)	•		▲											•	
	Development of K&R (temporary car stop)	•			•				•			•			•	•
	Connection with BRT <sup>1)</sup>			▲			▲		•			▲				
Pedestrian environment nearby	Installation of Sign board	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Development of Concourse (Elevated, underground)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Connection with nearby facilities and passage (concourse)			▲	▲		▲	▲		▲						
	Improvement of Access road	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Note:

- 1)Excluding North-south Line; BRT plan is not approved yet by Public Transportation Dept., UB City ▲
- 2)P&R means park and ride. It is a system that allows citizens to park a private car at the nearest railway station and then ride the railway by the development of parking spaces connected to stations.
- 3)K&R stands for kiss and ride. The driver of a car (usually a family member) drops off his or her passenger at a station after a goodbye kiss. The system is used to promote the use of the railway. A K&R facility is developed to secure a passenger drop-off space in front of a station.

Source: JICA Study Team



Source: JICA Study Team

**Figure 5.2.2 Intermodal Transfer Facility Location of UB Metro Network**

## **5.3 Development Orientation of Metro Station Area**

### **5.3.1 Urban Development Strategy integrated with Metro**

Urban planning aims at formation of convenient, livable living environment, thereby enhancement of attraction of investment environment of area which becomes more competitive and enlargement of tax base in UB City. To this end, issues to be addressed are efficient land use such as intensive land use, middle- and high-rise buildings, and efficient service of infrastructure, security of citizens' mobility by improvement of public transportation service, environmental protection and amenity enhancement by controlling sprawl and alleviating air pollution.

Urban development integrated with Metro is expected to bring the following effects:

- Environmental Improvement: Alleviation of air pollution by reduction of traffic congestion and private car trips
- Economic vitalization: Renewal of urban function and vitalization of economic activities along Peace Avenue
- Formation of real estate market: Formation of new real estate market by development of commercial, office, and apartment buildings around the stations
- Job creation: Job creation by urban redevelopment projects and by new commercial and business activities
- Increase in tax revenue: Increase in taxes related to hike of real estate value and enhanced economic activities along Peace Avenue, such as VAT (value added tax) on real estate, other land related tax, business tax, and income tax

The JICA Project Team proposes the following development purpose and strategies to maximize the effect brought by Metro development and contribute to improvement of living environment:

Purpose: Formation of a Compact City with Metro as urban spatial spine

Strategy: (1) Formation of urban structure integrated with Metro

(2) Restructuring of public transportation network

(3) Facilitation of development around the stations

### **5.3.2 Formulation of Urban Structure integrated with Metro**

Urban development integrated with urban railway can change urban spatial structure. In many cities in Japan, new towns and urban sub-centers have been developed together with railways in an integrated manner, and have formed urbanized area which is convenient to citizens. Figure 5.3.1 shows an example of images of urban development integrated with urban railway in a suburban area in Japan.

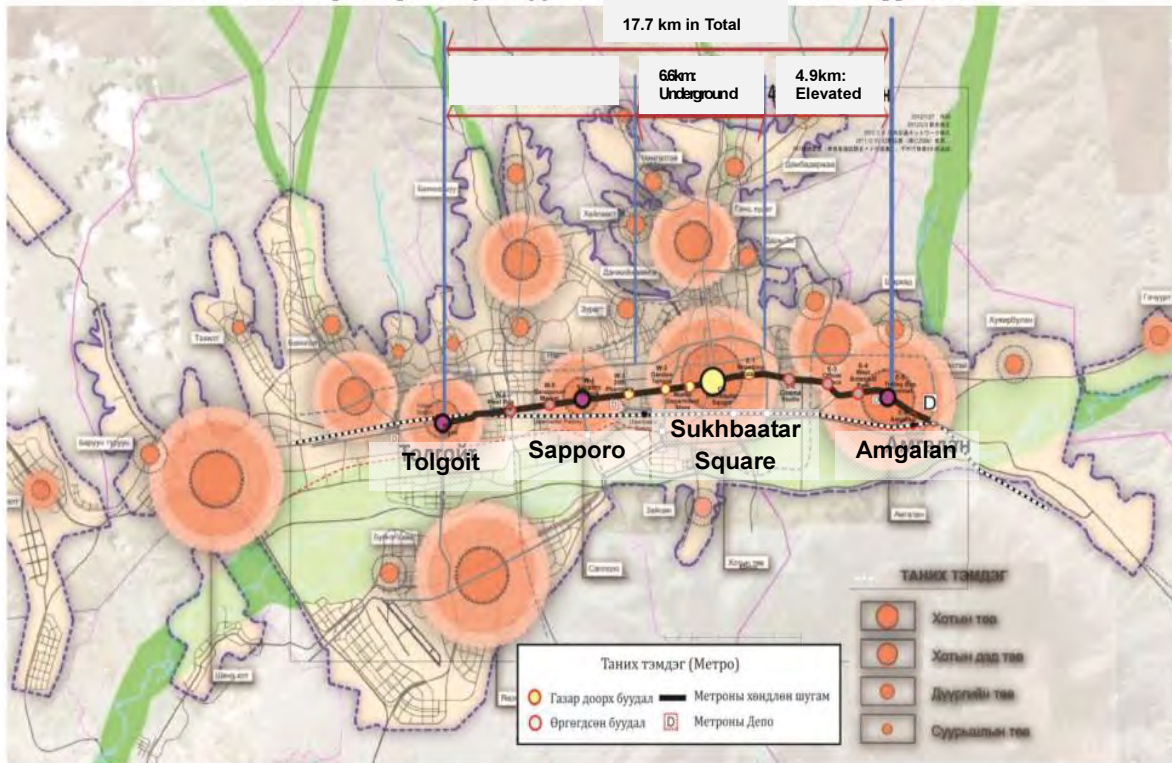
The UB Metro will allocate Metro stations to form district centers at the urban center and sub-centers which are planned by the UBMP 2030 (draft), namely: the center of Sukhbaatar Square, and sub-centers of Tolgoit, Sapporo, and Amgalan. At and around the station, there are many people gather including residents, workers and employees, which facilitates establishment of commercial and business, and public facilities. Accordingly, the stations are expected to form cores of the district centers. Figure 5.3.2 illustrates district centers of UBMP2030 (draft) and the location of Metro stations.



Source: Urban Renaissance Agency, Japan

**Figure 5.3.1 Image of Development of Urban Railway and Urban District Centers (Tsukuba Express, Japan)**

Улаанбаатар метротой уялдуулан хот байгуулалтыг хөгжүүлэх нь

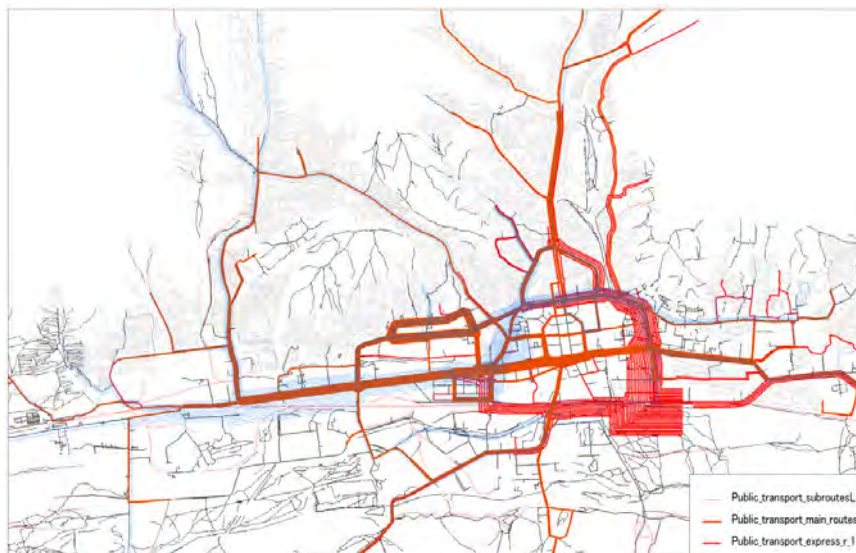


Source: JICA Study Team based on UBMP2030(draft)

**Figure 5.3.2 Location of District Centers in UB City and Metro Stations**

### 5.3.3 Reconfiguration of Public Transportation Network

Trolley buses and buses which are currently UB city's major urban public transportation are operated on the routes connecting the city center and the suburban areas in a radial pattern as shown below. Accordingly, they are concentrated in the central area and contribute partly to heavy traffic jam in commuting on rush hours.

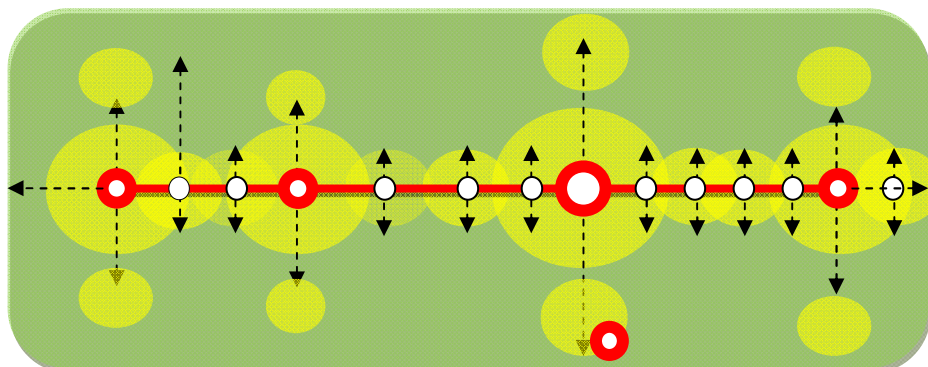


Source: JICA Study Team

**Figure 5.3.3 Existing Bus Routes**

Once the UB Metro is introduced, buses will no longer connect directly the city center and suburban areas as in the present; they, however, will connect bus stops (terminals) near the stations to provide the feeder service to the Metro. For this purpose, it is important to develop station plazas and bus stops (terminals) at the major stations, establish a discount fare system to transfer from bus to railway (Metro), and introduce a convenient transfer system.

Such restructured bus routes will provide transportation services in proportion to transportation capacity of buses and Metro, and thereby give users ease and convenience in transport.



Source: JICA Study Team

**Figure 5.3.4 Conceptual Image of Reconfigured Bus Routes**

### 5.3.4 Facilitation of Development around Stations

#### (1) Impact expected from Development around Stations

The development of station areas is expected to generate the following impacts, as described in the TOD (Transit Oriented Development) concept:

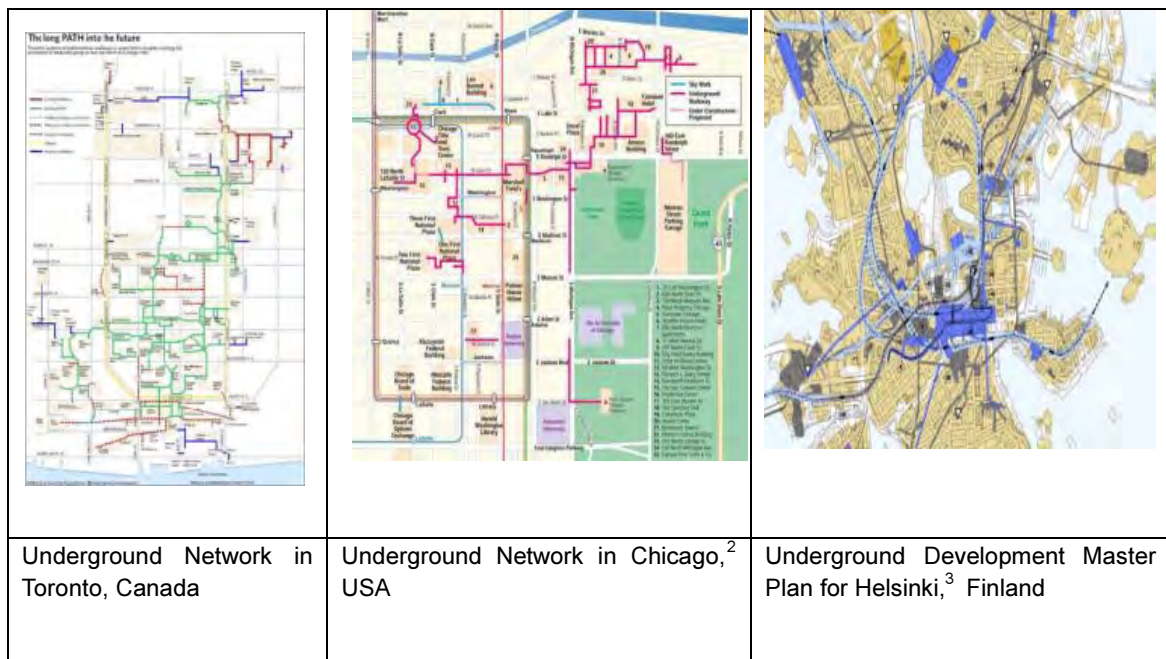
- Economic impact: vitalization of CBD by the commercial and business development
- Physical impact: reconstruction of old buildings and infrastructure along Peace Avenue, and underground development
- Social impact: provision of safe and comfortable public transportation services, job creation by the commercial and business development, and improvement of urban environment

In the development around the stations, it is preferable to develop not merely commercial and business facilities, but also public service, cultural and entertainment facilities, and others which citizens can receive services from and enjoy. The concept of the development around each station is described in section 5.4. Figure 5.3.5 shows photos of the development around stations in Japan to illustrate examples.

#### (2) Effective Use of Underground Space

##### 1) Examples of Use of Underground Space in Cities

There are many cities in the world which use underground space against the severe cold during winter, such as Toronto in Canada with a 27-km underground path, Montreal in Canada, Stockholm in Sweden, Helsinki in Finland, Paris in France, and Sapporo in Japan. Figure 5.3.5 shows examples of underground networks.



**Figure 5.3.5 Underground Network in Foreign Countries**

These countries make the efficient use of land and provide comfortable urban spaces by the utilization of the underground in cities. The following are the specific effects brought by the

<sup>2</sup> <http://www.spiegel.org/pedway/ped.jpg>

<sup>3</sup> <http://www.hel.fi>

effective use of underground spaces.

- 1) Enlargement of areas in which citizens can engage in activities;
- 2) Revitalization of commercial activity during the winter months;
- 3) Efficient utilization of land in cities;
- 4) Improvement of safety in cities; and
- 5) Improvement of accessibility by the development of the underground paths for pedestrians.

UB City is confronted with severe cold in winter, forcing some commercial, entertainment, and other establishments to temporarily close and curtailing citizens' activities. The development of the Metro provides a good opportunity to develop a convenient and comfortable underground space which integrates urban and transportation spaces.

In addition, many lines and pipes of utilities are laid under Peace Avenue, which are old and need to be reconstructed, if not replaced. Accordingly, the development of the utility common duct space integrated with the Metro is expected to form efficient infrastructure systems.

Figure 5.3.6 shows pictures of the station area development in Japan.

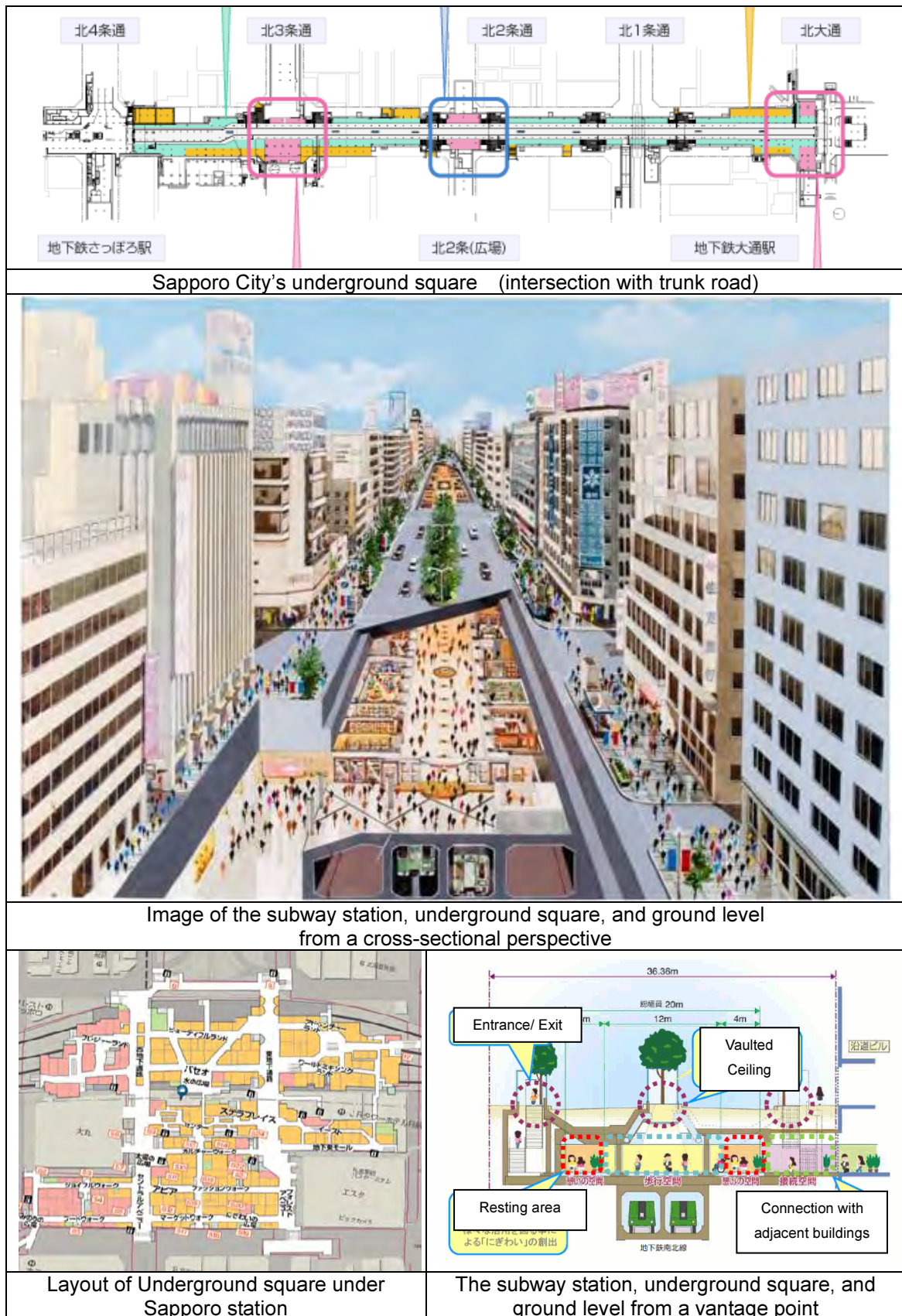


Figure 5.3.6 Sapporo City's Underground Square (Sapporo City, Japan)



## 2) Policy and Points to Note for the Development of Underground Space

Underground squares/spaces shall be developed under public facilities such as roads and station plazas. The public underground space shall be used properly and shall secure safety for users. Underground space entails many issues to be addressed particularly from the disaster management point of view. Being under the roads or buildings, the development may restrict its uses in the future.

For the development of underground square/space, a guideline of underground space use is required, including rules and regulations of handling underground utility pipes, connection with buildings, operation and maintenance of the underground space, and safety. In addition, the underground space use must comply with the Urban Development Law, the Road Law, the Firefighting Law, and other related laws.

### **Development policy of underground town/square:**

- (a) Development of underground amenity spaces: underground commercial facilities and open amenity space which are cozy and warm in the winter;
- (b) Assurance of spaces for pedestrians: the assurance of safety by providing space exclusive for pedestrians, development of pedestrian network, and development of underground access to adjacent buildings;
- (c) Development of car parking: the assurance of underground parking for cars, motor cycles, and bicycles, and convenient transportation transfer function; and
- (d) Development of underground utilities: the utility development integrated with the development of the Metro and underground spaces/squares and proper operation and maintenance system, such as a common utility duct.

### **Safety measures**

The underground space is enclosed, and must have firefighting, disaster prevention and evacuation facilities in preparation for disasters like fire, earthquake, etc. Underground spaces, including Metro stations, require the establishment of underground safety code, evacuation plan and periodic evacuation drills with the assurance of evacuation routes.

As for the safety of the underground spaces, countermeasures for all possible disasters including earthquake, fire, flash flood, terrorism, etc. must be taken into account because the Metro stations and underground spaces are public facilities to attract many people.

With respect to earthquakes, underground structures are more quake-resistant than structures on the ground because underground structures move synchronizing with earthquakes. However, careful attention must be paid in case of a soft ground.

### **Management of underground squares/spaces**

The underground space consists of underground paths and squares for people's daily use and commercial space owned and/or possessed by the private sector.

Public pedestrian paths will be developed mainly by the government; it should be considered, however, that commercial facilities connected by the public path shoulder a part of the development cost.

Management of the underground space shall be financed by revenue from tenants, parking, events, etc. A management plan of the underground space/town should be made, including a financial plan, operation and maintenance plans, and a management organization plan, after studying possibility of the participation of the private sector and public-private-partnership.

Furthermore, a legal system or guidelines are necessary for the comprehensive development of

the underground town network, particularly the adjustment with urban utility pipes and a main policy of underground use by depth such as the connection between the underground space and the basement of buildings.

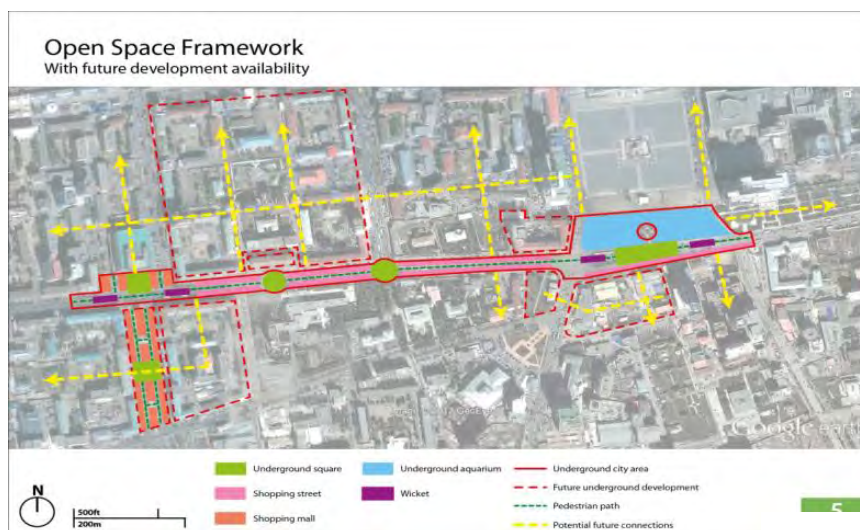
### 3) Proposed Underground Development in the Center of Ulaanbaatar City

This study examined a possibility of the underground development between Sukhbaatar Square and Nomin (State) Department Store under Peace Avenue integrated with the Metro project. As for the area to be covered by the underground town, the distance from Sukhbaatar Square to Nomin Department Store is 1,100 meters long and the area is about 5.65 ha. The distance of this section is almost the same as that of a section between Bileg Department Store and Urgoo Cinema in the Third District. Main commercial areas are located in the section. Figures 5.3.7 and 5.3.8 show a map of the proposed section and the area of the underground town, respectively.



Source: JICA Study Team

**Figure 5.3.7 Section of Proposed Underground Town**



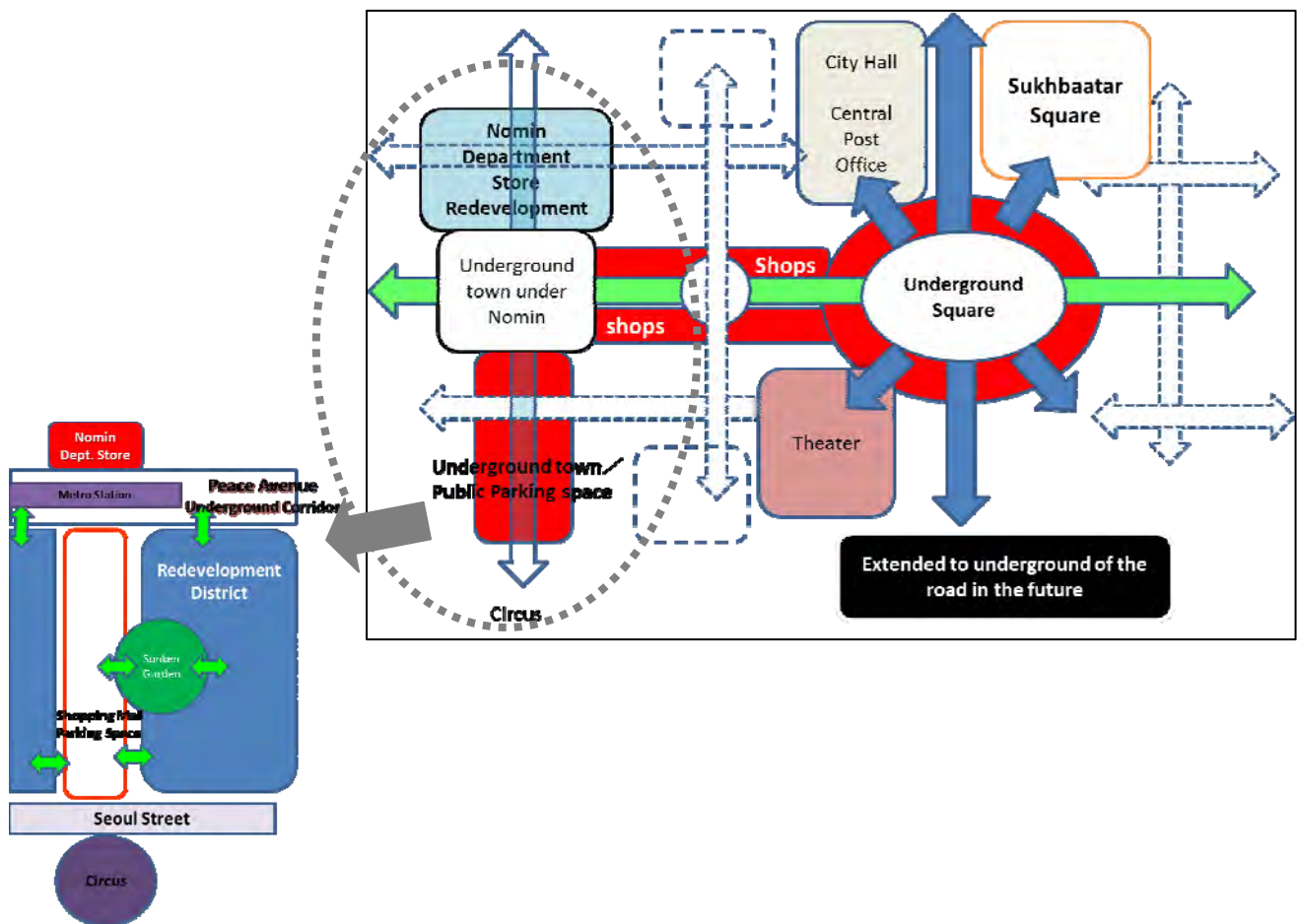
Source: JICA Study Team

**Figure 5.3.8 Area of Proposed Underground Town**

### Formulation of Underground Network

Pedestrian accessibility will be improved by the development of underground paths to connect between the underground town and other districts along the railway line. An underground square and cultural facilities are placed closed to Sukhbaatar Square and then underground shopping malls are developed between the underground square and underground of Nomin Department Store. An underground network is also developed to secure the direct access from the underground town to the business and commercial areas and government offices.

In the future, an underground town linked with the Circus and public parking spaces will be developed integrated with redevelopment projects in areas in front of Nomin Department Store (see Figure 5.3.9).

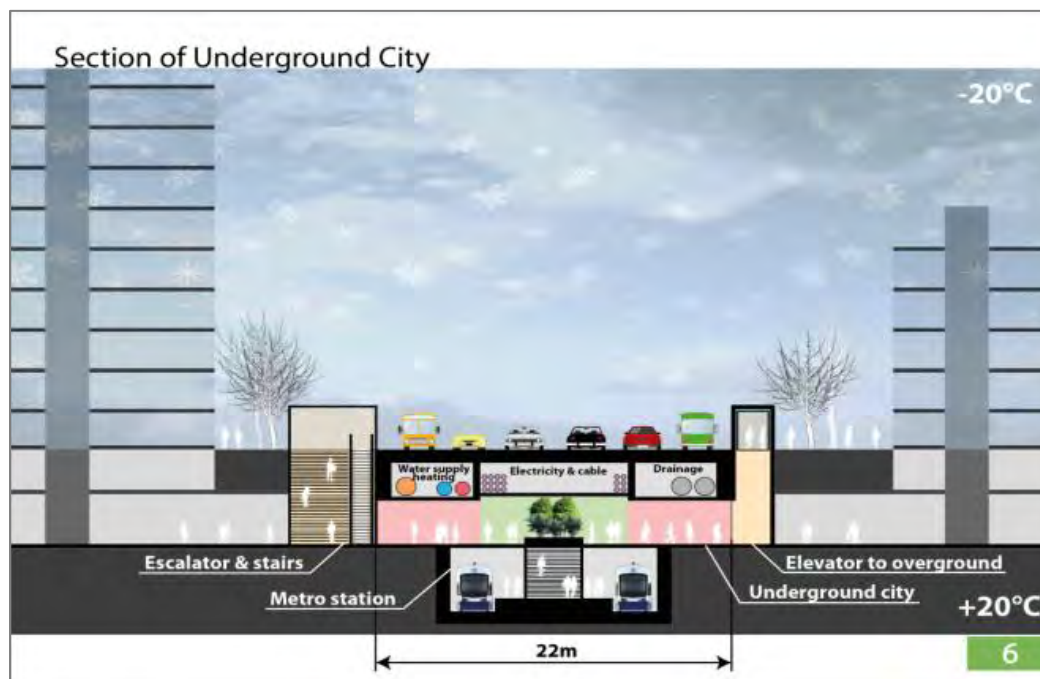


Source: JICA Study Team

Figure 5.3.9 Structure of Underground Space in the UB City Center

### Section of Underground Town

Figure 5.3.10 illustrates a section of underground space. There is a station in the lowest layer; and ticket gates and underground passages are located above the station, which connect to shopping malls and buildings around the station. Above those, underground utility ducts are placed.



Source: JICA Study Team

**Figure 5.3.10 Section of Underground City**

### **Rough Estimate of the Underground Development Cost**

It is difficult to exactly estimate the underground development cost since the investigation on the current status of underground utility pipes has not been implemented, and it has not been decided how to share the cost of the underground commercial area and utility pipes development. Therefore, here, a rough estimate of the cost is shown based on the general conditions. As a result, the total cost of the underground development is about US\$3.2 billion, of which commercial facilities, public square and passages account for 25% to 30%, respectively (see Table 5.3.1).

**Table 5.3.1 Rough Estimate of the Underground Development Cost**

Facility	Area (m <sup>2</sup> )	Cost (US\$ M)	Cost Ratio (%)
Safety Facilities	1,700	11.9	3.7
Parking Space	5,300	37.1	11.7
Commercial Facilities	13,200	92.4	29.0
Public Square	12,100	84.7	26.6
Public Paths	13,200	92.4	29.0
<b>Total</b>	<b>56,500</b>	<b>318.5</b>	<b>100</b>

Source: JICA Study Team

## 5.4 Development Concept of Metro Station Area

### 5.4.1 Outline

Table 5.4.1 summarizes the present local conditions and transport access conditions as well as the proposed future station development concept, which will contribute to promoting the Metro utilization and socio-economic development of station areas.

**Table 5.4.1 Development Concept of Metro Station Area**

Station		Structure	Local Condition and Facilities	Transport Condition	Future Development Concept
W-7	Tolgoit	Elevated	Ger area of north, industrial area of south	<ul style="list-style-type: none"> <li>Tolgoit station of UB Railway</li> <li>Tolgoit-Sonsoglon Street connecting to Chingiss Airport</li> <li>Railway flyover (planned)</li> <li>Tolgoit-Sonsoglon Street extension to north (planned)</li> </ul>	<ul style="list-style-type: none"> <li>International gateway of west of UB City</li> <li>Intermodal transfer facility development of Ulaanbaatar Railway and airport (CAT, hotel, tourism service)</li> <li>Industrial area redevelopment (logistic, advanced technology and research center)</li> <li>Park and Ride facility</li> </ul>
W-6	West Bus Terminal	Elevated	Ger area of north, industrial area of south	<ul style="list-style-type: none"> <li>Access road to Bayankhosuu ger area</li> <li>Long distance bus terminal</li> </ul>	<ul style="list-style-type: none"> <li>District commercial center to serve ger area harmonized with green space</li> <li>Intermodal transfer facility and feeder bus services to ger area</li> <li>Redevelopment of industrial area in the south</li> <li>Park and Ride facility</li> </ul>
W-5	Qarakorum Market	Elevated	Unur South apartment area of north, industrial area of south	<ul style="list-style-type: none"> <li>Access road to Unur North ger area</li> </ul>	<ul style="list-style-type: none"> <li>Service Center for apartment areas (medical, educational, childcare, and commercial services)</li> <li>Rehabilitation of Unur apartments</li> <li>Redevelopment of Qarakorum Market of south and commercial buildings of north</li> <li>Redevelopment of industrial area of south</li> <li>Feeder bus service to ger area of north</li> </ul>
W-4	Sapporo Rotary	Elevated	Apartment and commercial area in the north, apartment and industrial area in the south 1 <sup>st</sup> hospital	<ul style="list-style-type: none"> <li>Access road to 3<sup>rd</sup> Khoroolol (commercial area)</li> <li>Ring Road (planned)</li> <li>Flyover (planned)</li> <li>BRT (planned)</li> </ul>	<ul style="list-style-type: none"> <li>Competitive sub-center development of west of the city center (foreign invested hotel, department, bank)</li> <li>Intermodal transfer facility to access the airport, BRT</li> <li>Redevelopment of 1<sup>st</sup> Hospital (higher medical center)</li> </ul>
W-3	25 <sup>th</sup> Pharmacy	Underground	Apartment area Railway Hospital	<ul style="list-style-type: none"> <li>Access road to 3<sup>rd</sup> Khoroolol</li> <li>Access road to Narany Zam and Ulaanbaatar Station of UB Railway</li> </ul>	<ul style="list-style-type: none"> <li>District public service center development</li> <li>Convenient transfer to Narany Zam (bus terminal, pedestrian street to Ulaanbaatar Station)</li> <li>Commercial and service development</li> </ul>
W-2	Gandan Temple	Underground	Apartment area Gandan Temple, Golomt high-rise apartment complex, Cultural Hall, Grand Plaza, Ramada Hotel,	<ul style="list-style-type: none"> <li>Access road to Ikh Toyruu</li> <li>Flyover (planned)</li> <li>BRT (planned)</li> </ul>	<ul style="list-style-type: none"> <li>Cultural center of Gandan Temple</li> <li>Art and cultural corridor from Gandan Temple ~ Cultural Hall ~ Seoul Street</li> <li>Station plaza development (Metro, BRT, bus and open space)</li> </ul>

Station		Structure	Local Condition and Facilities	Transport Condition	Future Development Concept
			Architecture University		<ul style="list-style-type: none"> <li>• Redevelopment of Cultural Hall</li> <li>• Redevelopment of old apartments and factories (commercial and business, apartments)</li> </ul>
W-1	Nomin Department	Underground	Apartment area Nomin Department, park, circus	<ul style="list-style-type: none"> <li>• Access road to Seoul Street</li> </ul>	<ul style="list-style-type: none"> <li>• Commercial center of UB City</li> <li>• Underground shopping mall development from Nomin Department to Sukhbaatar Square</li> <li>• Distribution road development of residential blocks</li> <li>• Redevelopment of old apartments</li> </ul>
CS	Sukhbaatar Square	Underground	Apartment area Sukhbaatar Square, National Assembly, Central Post Office, UB Municipal Office, Opera Theater, Central Tower, Blue Sky Tower	<ul style="list-style-type: none"> <li>• Ring Road</li> <li>• Chingiss Avenue</li> <li>• Olympic Street</li> <li>• BRT (planned)</li> </ul>	<ul style="list-style-type: none"> <li>• Political and art center of UB City</li> <li>• Art corridor development between theaters and square (event space, urban design)</li> <li>• Redevelopment of post office</li> <li>• Underground shopping mall development from Nomin Department to Sukhbaatar Square</li> <li>• Intermodal transfer facility (Metro, BRT, bus)</li> </ul>
E-1	Wrestling Palace	Underground	Apartment area Wrestling Palace, 2 <sup>nd</sup> Hospital, Ulaanbaatar Hotel, Kempinsky Hotel, Chingiss Khan Hotel	<ul style="list-style-type: none"> <li>• Tokyo Street</li> <li>• BRT (planned)</li> </ul>	<ul style="list-style-type: none"> <li>• District service and amusement center of apartment area</li> <li>• Redevelopment of old apartments</li> <li>• Distribution road development of residential blocks</li> <li>• Underground path connecting to 2<sup>nd</sup> Hospital and BRT station</li> </ul>
E-2	Cinema Studio	At grade	Apartment area of north, ger area (14 <sup>th</sup> Khoroolol) of south Film University	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• Academic and service center for students and residents</li> <li>• Distribution road development and redevelopment of 14<sup>th</sup> Khoroolol</li> </ul>
E-3	Officer's Palace	Elevated	Apartment area of north, ger area of south	<ul style="list-style-type: none"> <li>• Access road to ger area of north</li> <li>• BRT (planned)</li> </ul>	<ul style="list-style-type: none"> <li>• Gateway of east of city center</li> <li>• Distribution road development and redevelopment of ger area</li> <li>• Reformation of intersection and traffic management</li> <li>• Intermodal transfer facility (Metro, BRT, bus)</li> </ul>
E-4	West Botanical Park	Elevated	Ger area Botanical Park	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• Residential service center</li> <li>• Distribution road development and redevelopment of ger area and industrial area</li> </ul>
E-5	Trolley Bus Terminal	Elevated	Ger area Trolley bus terminal, botanical park	<ul style="list-style-type: none"> <li>• Trolley bus terminal</li> </ul>	<ul style="list-style-type: none"> <li>• Amgalan sub center development</li> <li>• Intermodal transfer facility</li> <li>• Distribution road development and redevelopment of ger area and industrial area</li> <li>• Park and Ride facility</li> </ul>
E-6	Amgalan	Elevated	Ger area	<ul style="list-style-type: none"> <li>• Amgalan Station of Ulaanbaatar Railway</li> </ul>	<ul style="list-style-type: none"> <li>• International gateway of east of UB City</li> <li>• Transfer to UB Railway</li> <li>• Park and Ride facility</li> </ul>

Source: JICA Study Team

#### 5.4.2 Estimation of Development Volume of Station Area

The Metro and its station area development will increase the number of population, employees and students. Table 5.4.2 shows the estimated number of increased population and necessary floor areas.

**Table 5.4.2 Estimated Increase in the Number of Population and Necessary Floor Areas around Station Areas in 2030**

	Increased population (persons)	Floor area per persons (m <sup>2</sup> / person)	Total floor area (ha)
Residential	236,800	35	829
Employment	155,600	27	420
Student	25,500	27	69
Total	-	-	1,318

Source: JICA Study Team

The development volume including floor area ratio (FAR) and total development area of each station differs depending on the local characteristics and development potentials. Table 5.4.3 shows the estimated necessary development area of each station. In station areas, in addition to construction lands such as lands for housing and commercial and business facilities, lands for roads and public facilities (parks, etc.) are necessary; therefore, the average gross FAR is approximately 150% - 275%.

**Table 5.4.3 Estimated Necessary Floor Areas and Total Development Areas in 2030**

Station		No. of Station Users (2030)	Floor Area (ha)				Development Area	
			Residential	Commercial and business	Educational	Total	Gross FAR	Area (ha)
W7	Tolgoit (sub center)	118,000	98.3	49.8	8.2	158.2	200%	79.7
W6	West Bus Terminal	159,000	137.0	69.5	11.4	215.9	200%	107.3
W5	Qarakorum Market	22,000	18.4	9.3	1.5	29.5	150%	19.8
W4	Sapporo Rotary (sub center)	135,000	115.0	58.3	9.6	182.5	200%	91.1
W3	25 <sup>th</sup> Pharmacy	47,000	39.7	20.1	3.3	63.3	275%	23.1
W2	Gandan Temple	57,000	48.2	24.4	4.0	76.8	275%	28.0
W1	Nomin Department	34,000	28.6	14.5	2.4	45.8	150%	30.6
SC	Sukhbaatar Square (center)	127,000	108.2	54.8	9.0	171.6	250%	68.6
E1	Wrestling Palace	43,000	36.2	18.3	3.0	57.8	200%	29.0
E2	Cinema Studio	41,000	34.5	17.5	2.9	55.2	175%	31.6
E3	Officer Palace	70,000	59.7	30.3	5.0	94.7	175%	54.0
E4	West Botanical Park	22,000	18.8	9.5	1.6	29.8	150%	19.8
E5	Trolley Bus Terminal (sub center)	66,000	56.1	28.5	4.7	89.2	175%	50.9
E6	Amgalan	35,000	30.1	15.3	2.5	47.5	200%	23.6
Total		976,000	828.8	420.1	68.9	1,317.8	200%	657.2

Source: JICA Study Team

### 5.4.3 Proposed Projects of Station Area Development

Based on the development concepts, various projects of station area development are proposed, including station related facility development (ID is “S”), transport development (ID is “T”), and urban development (ID is “U”).

**Table 5.4.4 Proposed Project List of Station Area Development (preliminary)**

Station	ID	Project	Period	Outline	Land Acquisition	
W7	Tolgoit	S1	Station (elevated)	-		None
		T1	Pedestrian deck of south – north	Short	Construct a deck cross railway between south and north	Required
		T2	South ITF	Short		Required
		T3	North ITF	Mid		Required
		T4	Railway Flyover	Long	Extend Tolgoit – Songolon Street to cross railway (Planned)	
		T5	South – North trunk road	Long	Extend Tolgoit – Songolon Street (Planned)	Required
		U1	Tolgoit Sub Center development	Long		-
W6	West Bus Terminal	S1	Station (elevated)	-		None
		T1	North-West ITF	Short	Develop ITF for bus and taxi	Required
		T2	North-East ITF	Short	Develop ITF for private cars	Required
		T3	South bus stop	Short	Improve bus stop	Required
		U1	Redevelopment of unused land of south	Long	Develop public apartments for resettlement from ger area	-
		U2	Redevelopment of commercial complex	Long	Develop a district service center of Songinokhairkhan District	-
W5	Qarakorum Market	S1	Station (elevated)	-		None
		T1	North ITF	Short		Required
		T2	South ITF	Short	Develop south ITF in front of Qarakorum Market	Required
		U1	Redevelopment of Qarakorum Market	Mid		-
		U2	Redevelopment of unused land of South	Long	Develop public apartments for resettlement from ger area	-
W4	Sapporo Rotary	S1	Station (elevated)	-		None
		T1	Pedestrian deck crossing rotary	Short	Construct a deck under viaduct to cross intersection	Required
		T2	North ITF	Short	Develop north ITF in front of 3 <sup>rd</sup> Hospital	Required
		U1	Redevelopment of 3 <sup>rd</sup> Hospital	Long		-
		U2	Sapporo Sub Center development	Long		
W3	25 <sup>th</sup>	S1	Station (underground)	-		None



Station		ID	Project	Period	Outline	Land Acquisition
	Pharmacy	T1	North ITF	Short		Required
		T2	Pedestrian mall to Ulaanbaatar Palace	Short		Required
		U1	Development of public service center of Bayangol District	Mid		-
		U2	Redevelopment of Ulaanbaatar palace	Long		-
W2	Gandan Temple	S1	Station (underground)	-		None
		T1	South ITF	Short	Develop South ITF utilizing car parking space of cultural hall	Required
		T2	Underground path connecting to BRT station	Short		None
		T3	Pedestrian street from Gandan Temple to Seoul Street	Short		None
		T4	Road flyover	Mid		
		U1	Redevelopment of National Architecture University	Mid		-
		U2	Redevelopment of old apartments	Mid		-
		U3	Redevelopment of factory	Long		-
		U4	Redevelopment of cultural hall	Long		-
W1	Nomin Department	S1	Station (underground)	-		None
		T1	North bus stop	Short	Construct bus stop in front of Nomin Department	Required
		T2	Pedestrian street around department	Short		None
		T3	Pedestrian mall around Tsrendorg Park	Mid	Prohibit car entry	None
		U1	Underground shopping mall from W1 to CS station	Mid		-
		U2	Reconstruction of old apartments	Mid		-
		U3	Reconstruction of old apartments	Mid		-
		U4	Reconstruction of old apartments	Mid		-
CS	Sukhbaatar Square	S1	Underground station and entrances	-		None
		T1	South station plaza	Short	ITF of Metro, BRT and bus	Required
		T2	Intersection improvement	Short	Traffic management for cars, bus and BRT	Required
		T3	Pedestrian space improvement	Short	Sidewalk improvement	None
		T4	Access road development	Short	Road widening and pavement improvement	Required
		T1	South station plaza	Short	ITF of Metro, BRT and bus	Required
		U1	Underground shopping mall development	Mid	Utilizing underground space above Metro between W1 and CS	-
		U2	Commercial and amusement facilities development	Mid	Urban redevelopment project of private lands	-
		U3	Urban design of art and cultural	Mid	Construction control and	-

Station		ID	Project	Period	Outline	Land Acquisition
			corridor		landscape improvement	
		U4	Public service center development	Mid	Redevelopment of central post office	-
		U5	Art and Cultural center development	Long	Urban redevelopment project of private lands	-
E1	Wrestling Palace	S1	Station (underground)	-		None
		T1	Underground path to Tokyo Street	Short		Required
		T2	East ITF	Short	Develop East ITF in front of 2 <sup>nd</sup> Hospital	Required
		T3	Distribution road improvement among residential blocks	Short		None
		U1	Townscape improvement around Wrestling Palace	Mid	Develop an open space and green in front of palace	-
		U2	Reconstruction of old apartments	Short		-
		U3	Reconstruction of old apartments	Short		-
E2	Cinema Studio	S1	Station (at grade)	-		None
		T1	North bus stop	Short		None
		T2	North bus stop	Short		Required
		T3	Distribution road development of ger area	Short		Required
		U1	Redevelopment of ger area	Mid		-
E3	Officer's Palace	S1	Station (elevated)	-		None
		T1	Pedestrian deck connecting to ITF	Short	Construct a deck under viaduct to cross intersection	None
		T2	Pedestrian deck connecting to BRT station	Short	Construct a deck under viaduct to cross intersection	None
		T3	East ITF	Short	Develop East ITF for convenient transfer between Metro, BRT and bus	Required
		T4	Intersection improvement	Short	Reform intersection for appropriate crossing of Metro, BRT, bus and cars	None
		U1	Redevelopment of unused land	Mid		-
		U2	Redevelopment of unused land	Mid		-
		U3	Redevelopment of unused land	Mid		-
E4	West Botanical Park	S1	Station (elevated)	-		None
		T1	North bus stop	Short		Required
		T2	South bus stop	Short		Required
		U1	Commercial building development	Mid		-
		U2	Redevelopment of industrial area	Long		-
E5	Trolley Bus Terminal	S1	Station (elevated)	-		None
		T1	North ITF	Short	Develop a long-distance bus terminal	Required
		U1	Open space development of botanical park	Short		-
		U2	Redevelopment of trolley bus terminal	Mid		-

Station		ID	Project	Period	Outline	Land Acquisition
		U3	Amgalan Sub Center development	Long		
E6	Amgalan	S1	Station (elevated)	-		None
		T1	Pedestrian street to Amgalan Station of UB Railway	Short		Required
		U1	Redevelopment of ger area	Long		-

Source: JICA Study Team

#### 5.4.4 Cost Estimate of Station-Related Facility Development Project (preliminary)

The project cost for the station-related facility development is preliminarily estimated, based on actual construction costs in Ulaanbaatar City as well as the ones in other developing cities (see Table 5.4.5).

**Table 5.4.5 Unit Cost of Construction for Station-Related Facility Development (estimated)**

Facility Type	Unit Cost (US\$)
(a) Elevated Pedestrian Deck of Station	3,000/m <sup>2</sup>
(b) Underground Pedestrian Way	7,000/ m <sup>2</sup>
(c) Pedestrian Deck	3,000/ m <sup>2</sup>
(d) Improvement of Bus Stop	18,000/No
(e) Intermodal Transfer Facility (Station Plaza)	100/ m <sup>2</sup>
(f) Car Parking Space	80/ m <sup>2</sup>
(g) Improvement of Access Road	3,000/ m <sup>2</sup>
(h) Urban Infrastructure	50/ m <sup>2</sup>

As a result, the cost of station-related facility development is approximately US\$476.4 million. Of this amount, urban infrastructure cost is approximately US\$328.6 million (approximately 70% of the total) and those of station-related facilities and transport facilities are US\$147.8 million (approximately 30% of the total).

Table 5.4.6 shows the breakdown of the project cost excluding the cost of underground development described in Section 5.3.4.

**Table 5.4.6 Breakdown of Estimated Project Cost for Station-Related Facility of Each Station**

Station	Station-Related Facility							Station-Related Facility Subtotal	Urban Infrastructure	Station-Related Facility and Urban Infrastructure Total
	Elevated Pedestrian Deck of Station	Underground Pedestrian Way	Pedestrian Deck	Improvement of Bus Stop	Intermodal Transfer Facility	Car Parking Space	Improvement of Access Road			
	US\$3,000/m <sup>2</sup>	US\$7,000/m <sup>2</sup>	US\$3,000/m <sup>2</sup>	US\$18,000/No	US\$100/m <sup>2</sup>	US\$80/m <sup>2</sup>	US\$3,000/m <sup>2</sup>			
W-7	W=8 m L=200 m 4.8	— 0.00	W=16 m L=150 m 7.20	3 0.05	30,400 m <sup>2</sup> 3.04	16,110 m <sup>2</sup> 537 台 1.29	L=500 m W=24 m 1.50	17.88	79.7 ha 39.83	57.71
W-6	W=8 m L=150 m 3.6	W=8 m 0.00	W=8 m L=200 m 4.80	4 0.07	38,200 m <sup>2</sup> 3.82	8,790 m <sup>2</sup> 293 台 0.70	L=1,700 m W=24 m 5.10	18.1	107.3 ha 53.67	71.77
W-5	W=8 m L=100 m 2.4	0.00	W=8 m L=100 m 2.40	4 0.07	3,600 m <sup>2</sup> 0.36	1,290 m <sup>2</sup> 43 台 0.10	W=24 m L=200 m 0.60	5.94	19.8ha 9.90	15.84
W-4	W=8 m L=100 m 2.4	0.00	W=8 m L=250 m 6.00	3 0.05	37,400 m <sup>2</sup> 3.74	12,000 m <sup>2</sup> 400 台 0.96	L=1,500 m W=24 m 4.50	17.65	91.1 ha 45.57	63.22
W-3	0.0	W=8 m L=120 m 6.72	0.00	3 0.05	6,400 m <sup>2</sup> 0.64	1,920 m <sup>2</sup> 64 台 0.15	W=24 m L=400 m 1.20	8.77	23.1 ha 11.54	20.31
W-2	0.0	W=8 m L=160 m 8.96	0.00	3 0.05	10,400 m <sup>2</sup> 1.04	6,090 m <sup>2</sup> 203 台 0.49	W=24 m L=1,000 m 3.00	13.54	28.0 ha 13.99	27.53
W-1	0.0	W=8 m L=100 m 5.60	0.00	3 0.05	5,300 m <sup>2</sup> 0.53	2,220 m <sup>2</sup> 74 台 0.18	W=24 m 0.00	6.36	30.6 ha 15.30	21.66
CS	0.0	W=8 m L=200 m 11.20	0.00	2 0.04	34,700 m <sup>2</sup> 3.47	13,770 m <sup>2</sup> 459 台 1.10	W=24 m L=200 m 0.60	16.4	68.6 ha 34.30	50.70
E-1	0.0	W=8 m L=100 m 5.60	0.00	2 0.04	10,600 m <sup>2</sup> 1.06	4,890 m <sup>2</sup> 163 台 0.39	W=24 m 0.00	7.09	29.0 ha 14.51	21.60
E-2	0.0	0.00	W=8 m L=100 m 2.40	3 0.05	5,500 m <sup>2</sup> 0.55	2,490 m <sup>2</sup> 83 台 0.20	W=24 m L=400 m 1.20	4.4	31.6 ha 15.82	20.22
E-3	W=8 m L=100 m 2.4	0.00	W=8 m L=100 m 2.40	2 0.04	11,700 m <sup>2</sup> 1.17	4,680 m <sup>2</sup> 156 台 0.37	W=24 m L=500 m 1.50	7.88	54.0 ha 27.00	34.88
E-4	W=8 m L=100 m 2.4	0.00	W=8 m L=100 m 2.40	2 0.04	3,300 m <sup>2</sup> 0.33	780 m <sup>2</sup> 26 台 0.06	W=24 m 0.00	5.23	19.8 ha 9.90	15.13
E-5	W=8 m L=100 m 2.4	0.00	W=8 m L=150 m 3.60	2 0.04	10,100 m <sup>2</sup> 1.01	3,840 m <sup>2</sup> 128lots 0.31	W=24 m L=600 m 1.80	9.15	50.9 ha 25.46	34.61
E-6	W=8 m L=100 m 2.4	0.00	W=8 m L=150 m 3.60	2 0.04	7,400 m <sup>2</sup> 0.74	2,850 m <sup>2</sup> 95lots 0.23	W=24 m L=800 m 2.40	9.41	23.6 ha 11.81	21.22
<b>Total</b>	<b>23.0</b>	<b>38.1</b>	<b>34.8</b>	<b>0.7</b>	<b>21.5</b>	<b>6.5</b>	<b>23.4</b>	<b>147.8</b>	<b>328.6</b>	<b>476.4</b>

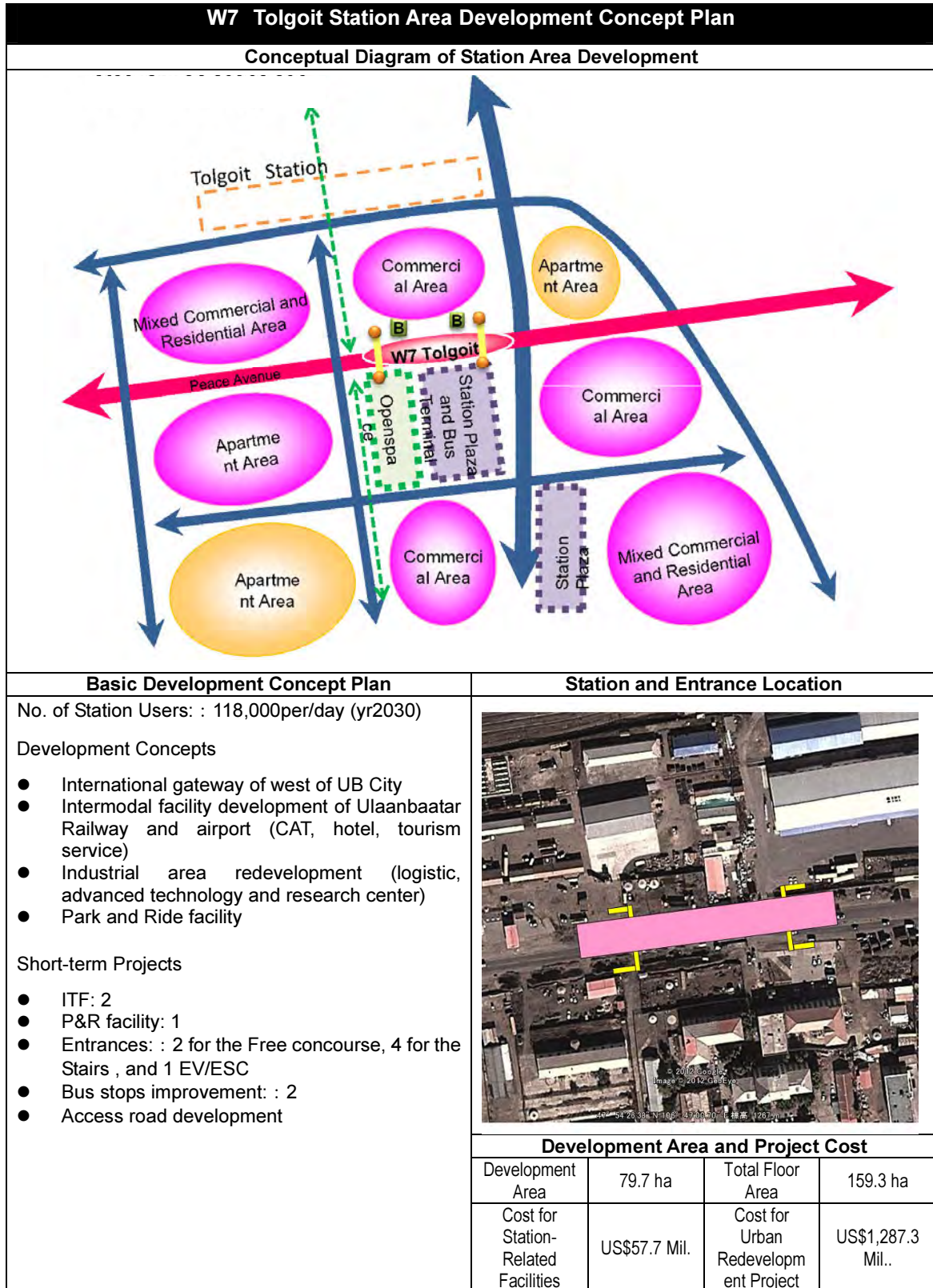
Source: JICA Study Team

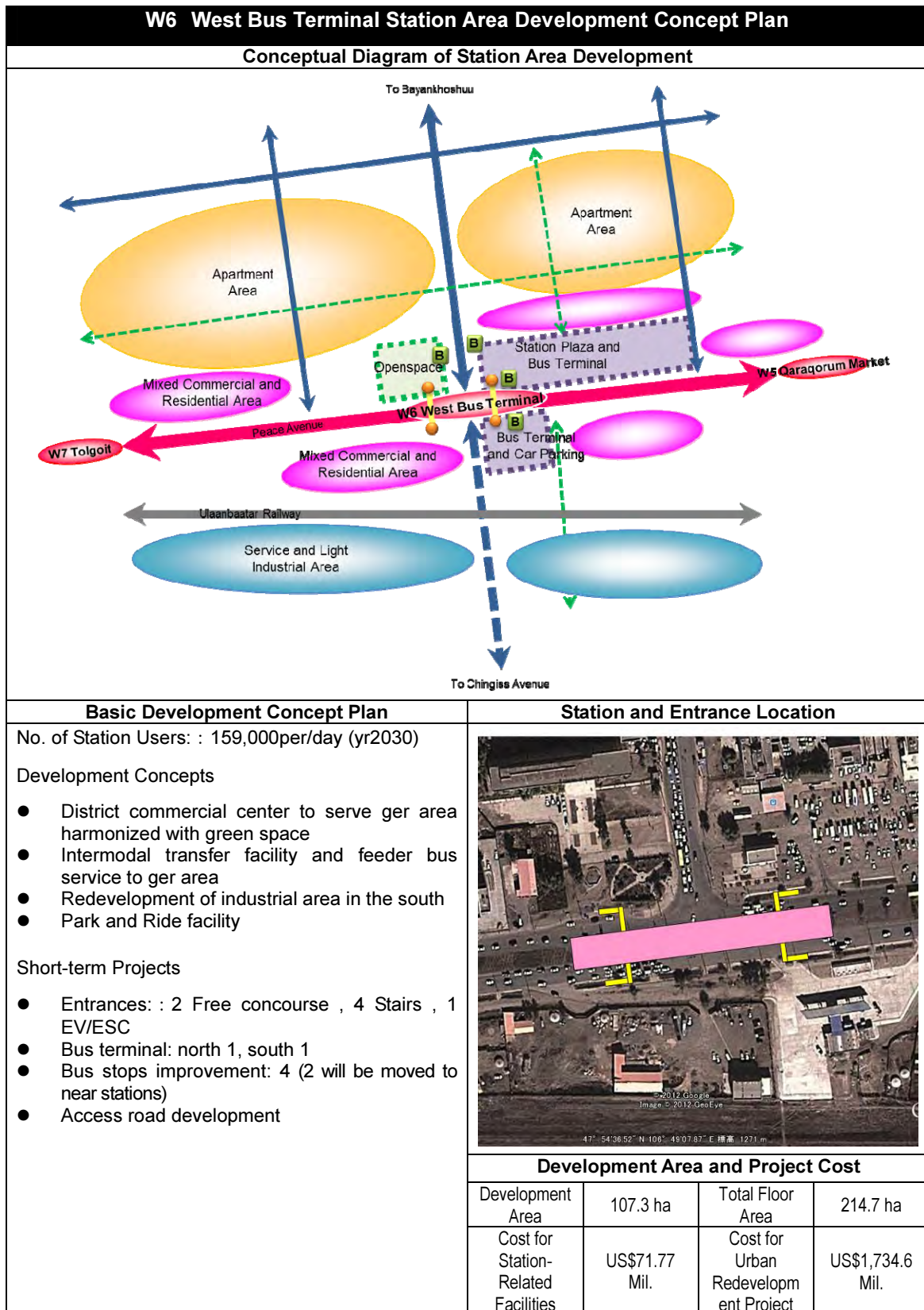
On the other hand, apart from the station-related facility development, it is expected that a high-level use of land and urban redevelopment projects, such as old apartment reconstruction projects and apartment projects in ger areas, will be promoted around stations. These projects are implemented mainly by using the private sector investment. The total value of newly created real estate market is estimated to be US\$10,151 million.

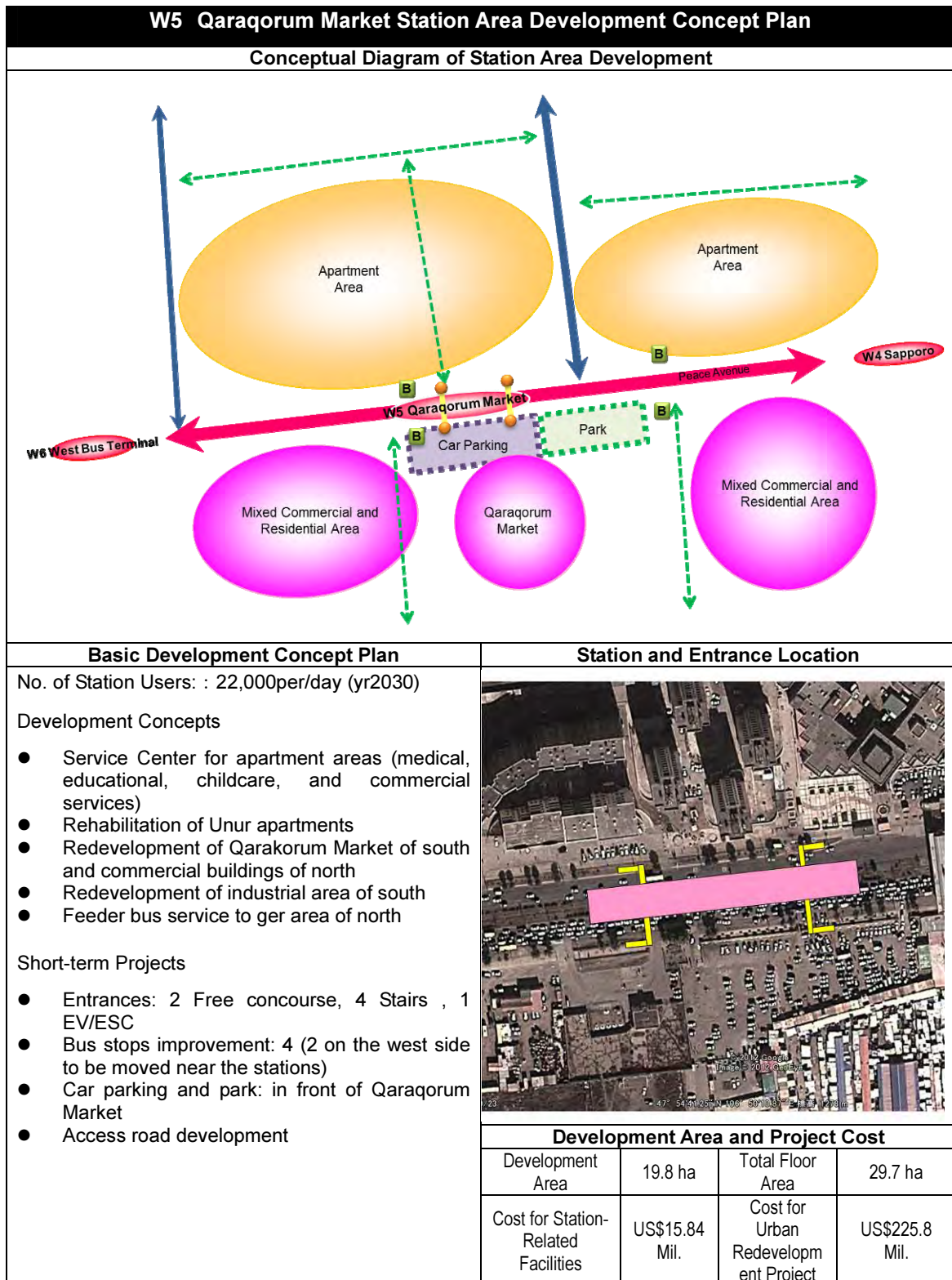
**Table 5.4.7 Estimated Total Project Cost for Station Area Development (Preliminary)**

Station		Old Apartment Reconstruction Project	Apartment Project in Ger	Sub-total
	Unit Cost	US\$800/m2	US\$1,100/m2	US\$ Mil.
W-7	Assumed share (%)	30%	70%	
	Development Area	23.9 ha	55.8 ha	79.7 ha
	Total Floor Area	47.8 ha	111.5 ha	159.3 ha
	Project Cost (US\$ Million)	305.9	981.4	<b>1,287.3</b>
W-6	Assumed share (%)	30%	70%	
	Development Area	32.2 ha	75.1 ha	107.3 ha
	Total Floor Area	64.4 ha	150.3 ha	214.7 ha
	Project Cost (US\$ Mil.)	412.2	1,322.4	<b>1,734.6</b>
W-5	Assumed share (%)	50%	50%	
	Development Area	9.9 ha	9.9 ha	19.8 ha
	Total Floor Area	14.9 ha	14.9 ha	29.8 ha
	Project Cost (US\$ Mil.)	95.1	130.7	<b>225.8</b>
W-4	Assumed share (%)	60%	40%	
	Development Area	54.7 ha	36.5 ha	91.2 ha
	Total Floor Area	109.4 ha	72.9 ha	182.3 ha
	Project Cost (US\$ Mil.)	699.9	641.6	<b>1,341.5</b>
W-3	Assumed share (%)	50%	50%	
	Development Area	11.5 ha	11.5 ha	23.0 ha
	Total Floor Area	31.7 ha	31.7 ha	63.4 ha
	Project Cost (US\$ Mil.)	203.1	279.2	<b>482.3</b>
W-2	Assumed share (%)	60%	40%	
	Development Area	16.8 ha	11.2 ha	28.0 ha
	Total Floor Area	46.2 ha	30.8 ha	77.0 ha
	Project Cost (US\$ Mil.)	295.5	270.9	<b>566.4</b>
W-1	Assumed share (%)	50%	50%	
	Development Area	15.3 ha	15.3 ha	30.6 ha
	Total Floor Area	23.0 ha	23.0 ha	46.0 ha
	Project Cost (US\$ Mil.)	146.9	202.0	<b>348.9</b>
CS	Assumed share (%)	15%	85%	
	Development Area	10.3 ha	58.3 ha	68.6 ha
	Total Floor Area	25.7 ha	145.8 ha	171.5 ha
	Project Cost (US\$ Mil.)	164.6	1,282.6	<b>1,447.2</b>
E-1	Assumed share (%)	60%	40%	
	Development Area	17.4 ha	11.6 ha	29.0 ha
	Total Floor Area	34.8 ha	23.2 ha	58.0 ha
	Project Cost (US\$ Mil.)	222.9	204.4	<b>427.3</b>
E-2	Assumed share (%)	60%	40%	
	Development Area	19.0 ha	12.7 ha	31.7 ha
	Total Floor Area	33.2 ha	22.1 ha	55.3 ha
	Project Cost (US\$ Mil.)	212.6	194.9	<b>407.5</b>
E-3	Assumed share (%)	50%	50%	
	Development Area	27.0 ha	27.0 ha	54.0 ha
	Total Floor Area	47.3 ha	47.3 ha	94.6 ha
	Project Cost (US\$ Mil.)	302.4	415.9	<b>718.3</b>
E-4	Assumed share (%)	80%	20%	
	Development Area	15.8 ha	4.0 ha	19.8 ha
	Total Floor Area	23.8 ha	5.9 ha	29.7 ha
	Project Cost (US\$ Mil.)	152.1	52.3	<b>204.4</b>
E-5	Assumed share (%)	70%	30%	
	Development Area	35.6 ha	15.3 ha	50.9 ha
	Total Floor Area	62.4 ha	26.7 ha	89.1 ha
	Project Cost (US\$ Mil.)	399.2	235.3	<b>634.5</b>
E-6	Assumed share (%)	80%	20%	
	Development Area	18.9 ha	4.7 ha	23.6 ha
	Total Floor Area	37.8 ha	9.5 ha	47.3 ha
	Project Cost (US\$ Mil.)	242.0	83.2	<b>325.2</b>
<b>Total</b>		<b>3,854</b>	<b>6,297</b>	<b>10,628</b>

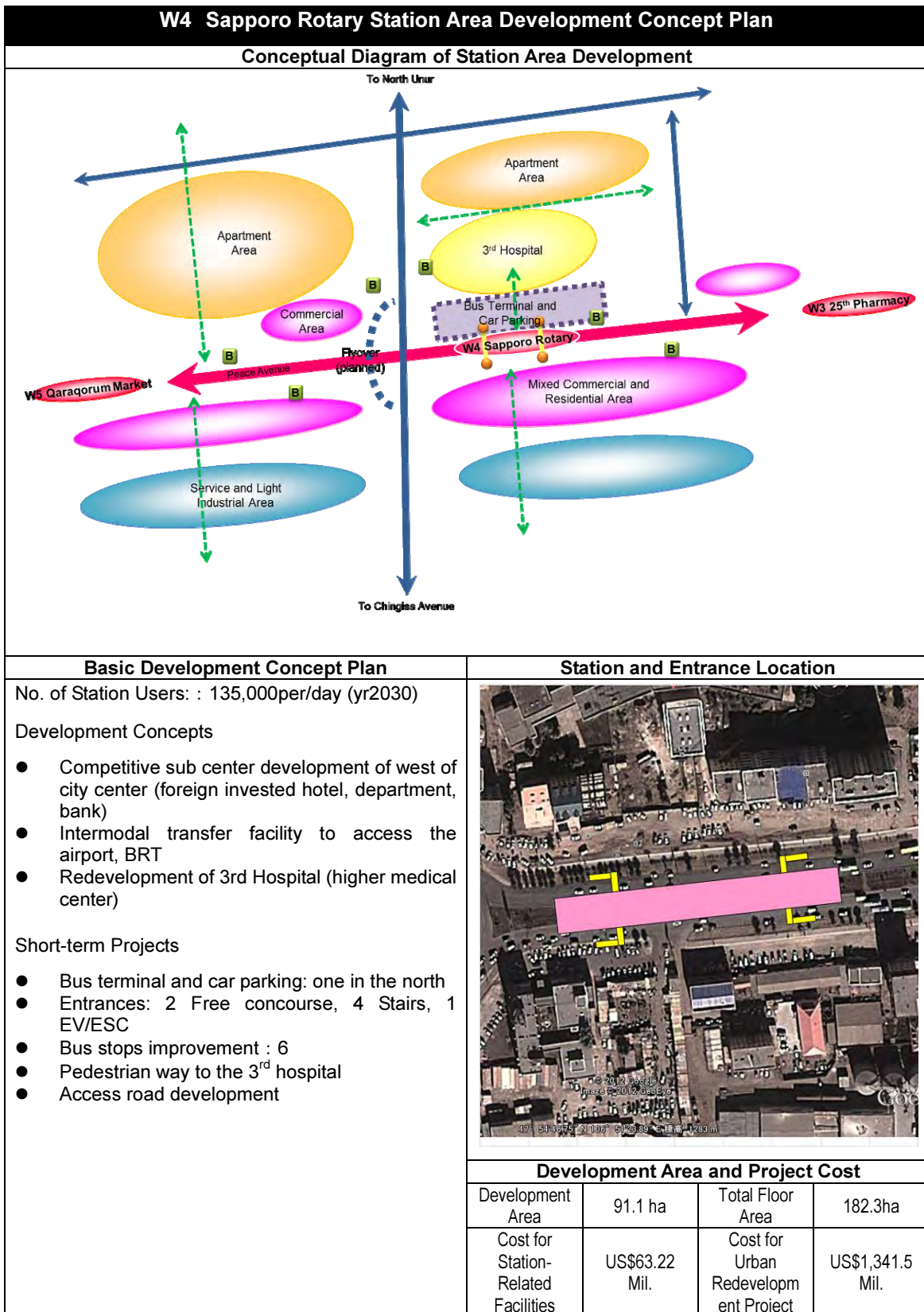
5.4.5 Station Area Development Concept Plans

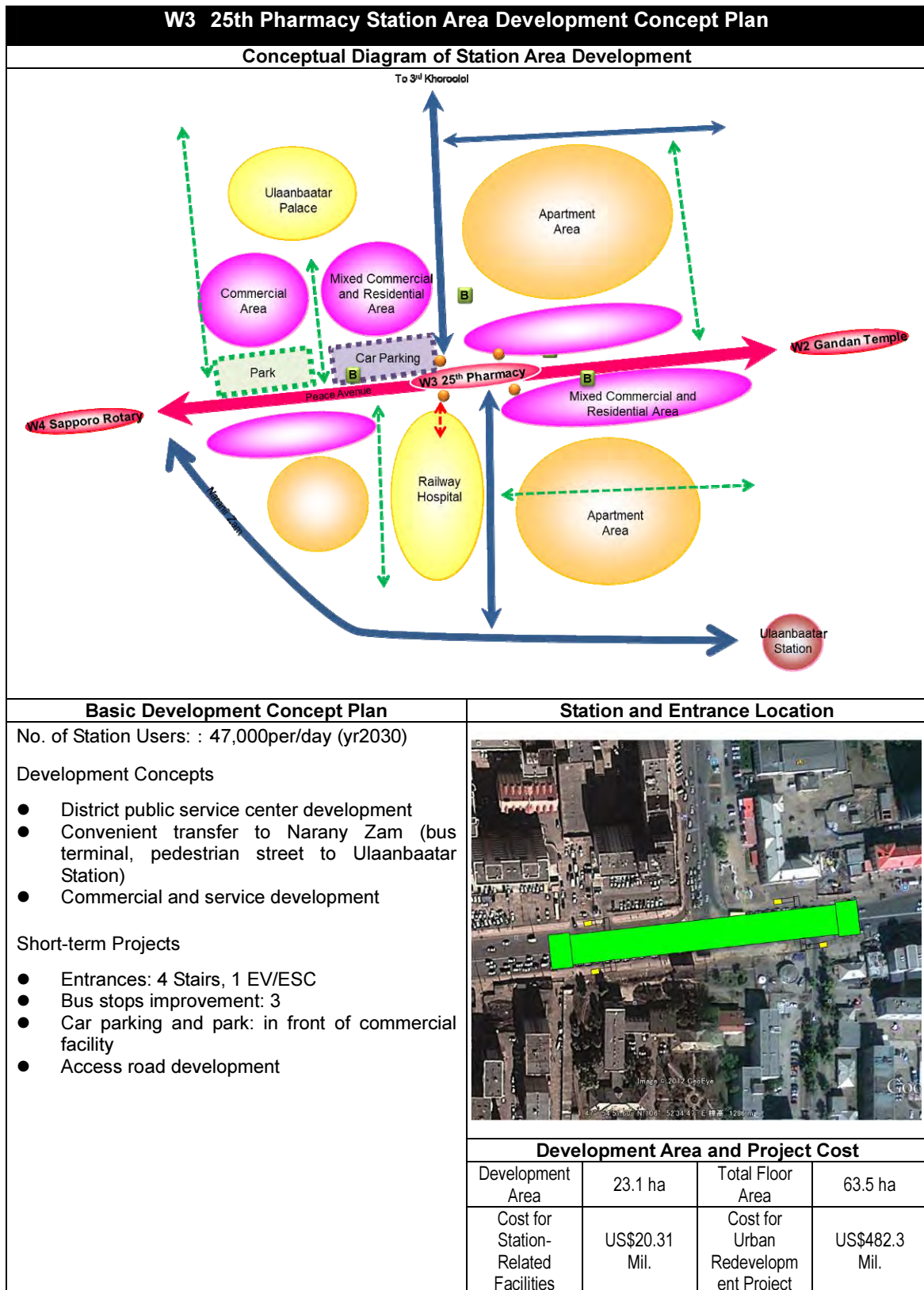


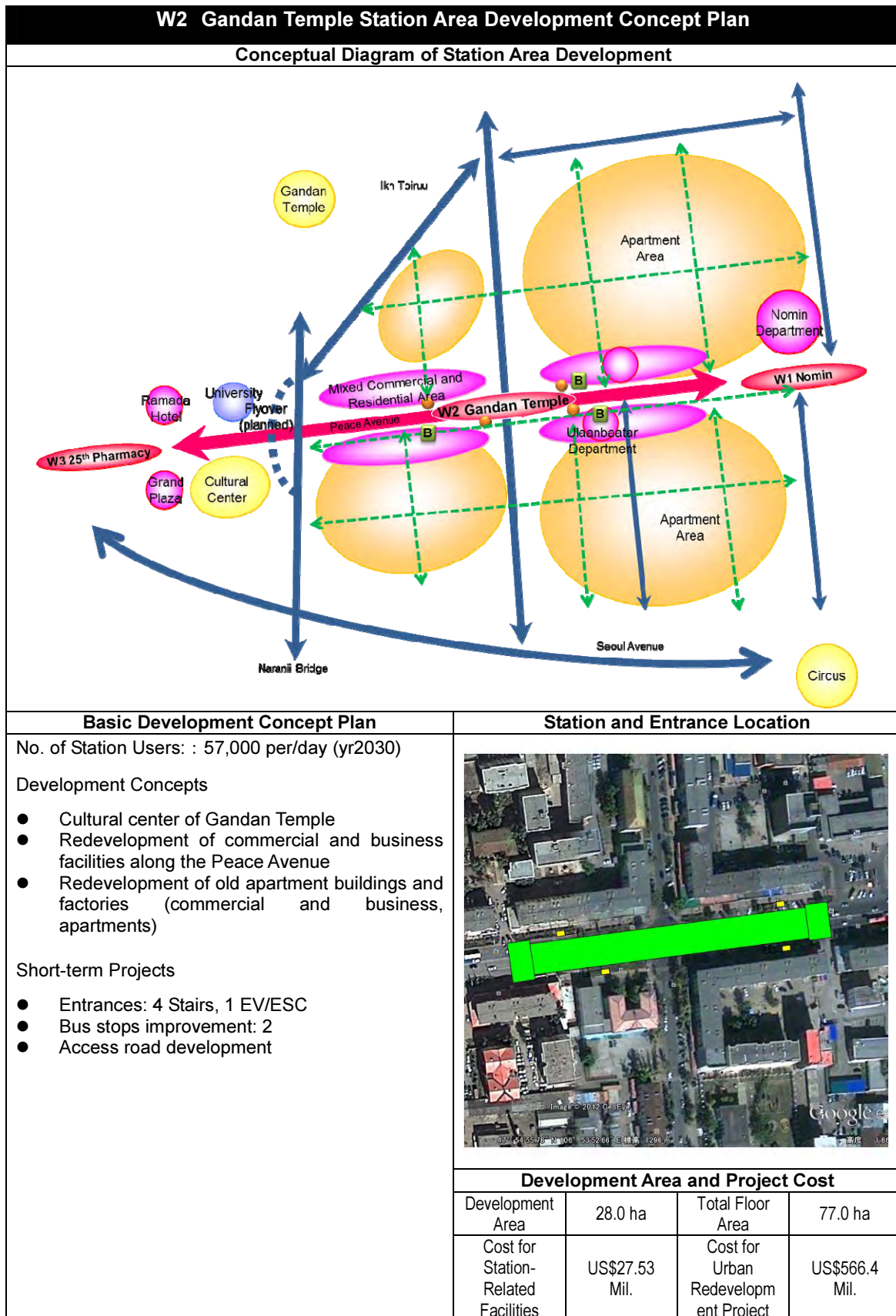


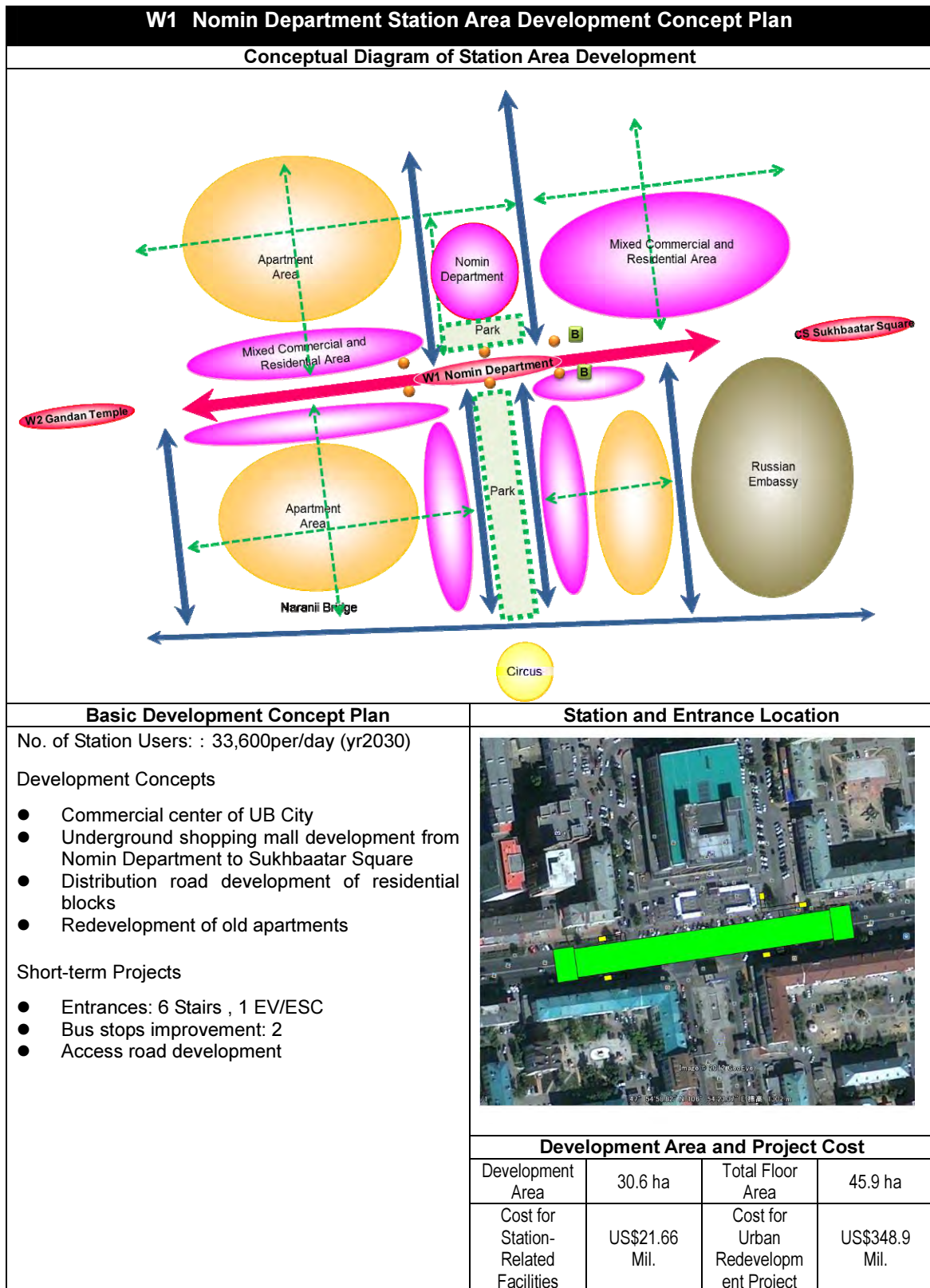


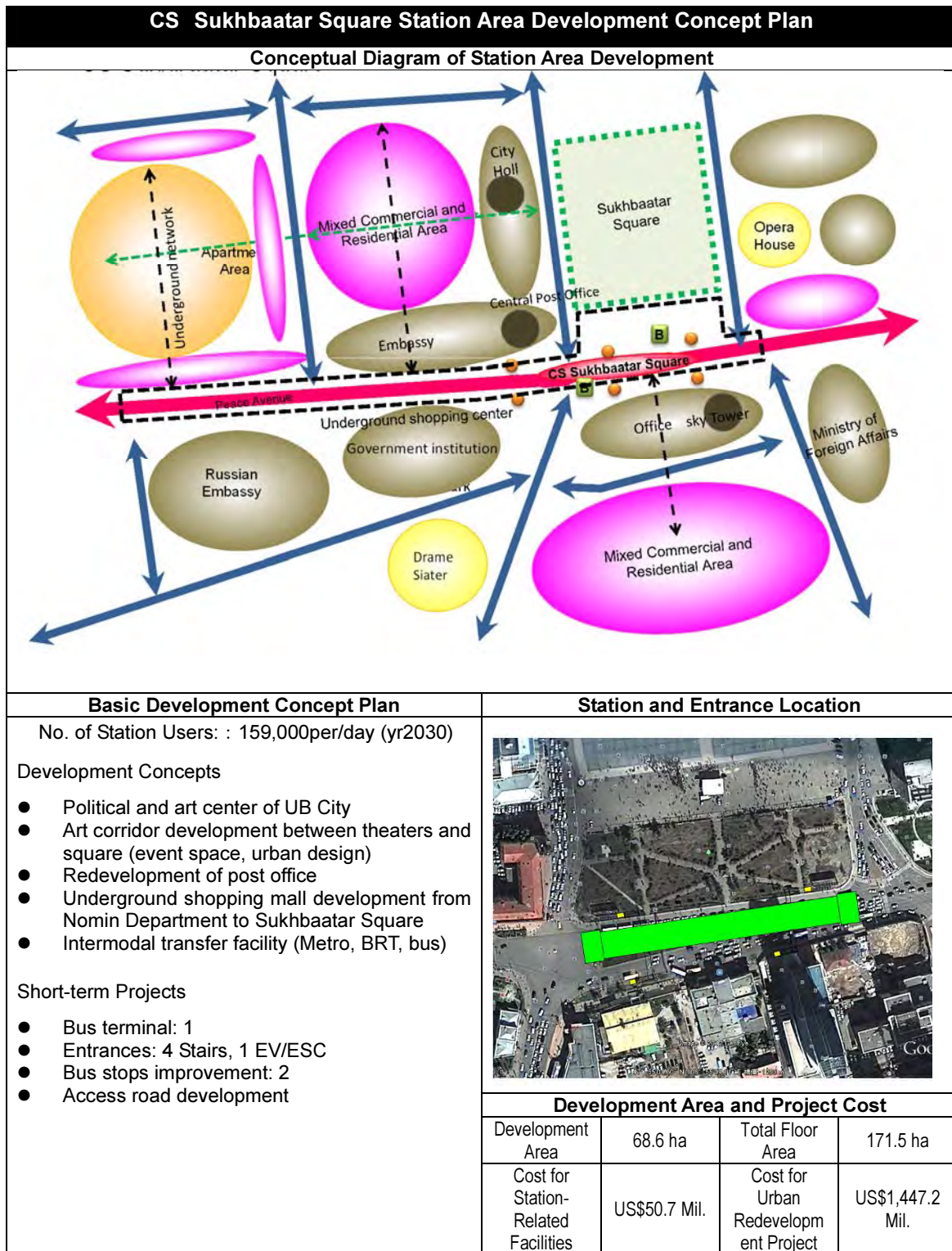


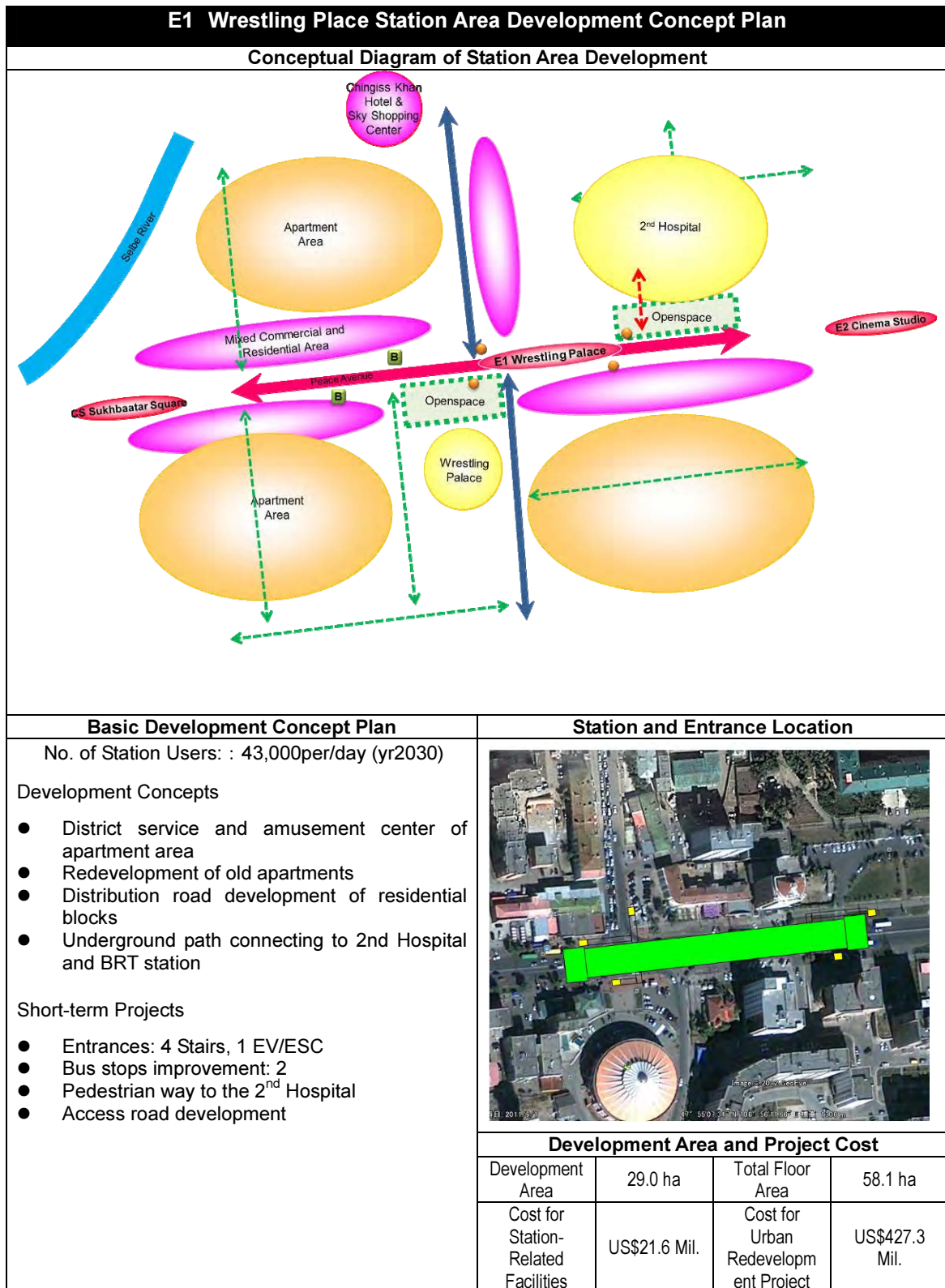


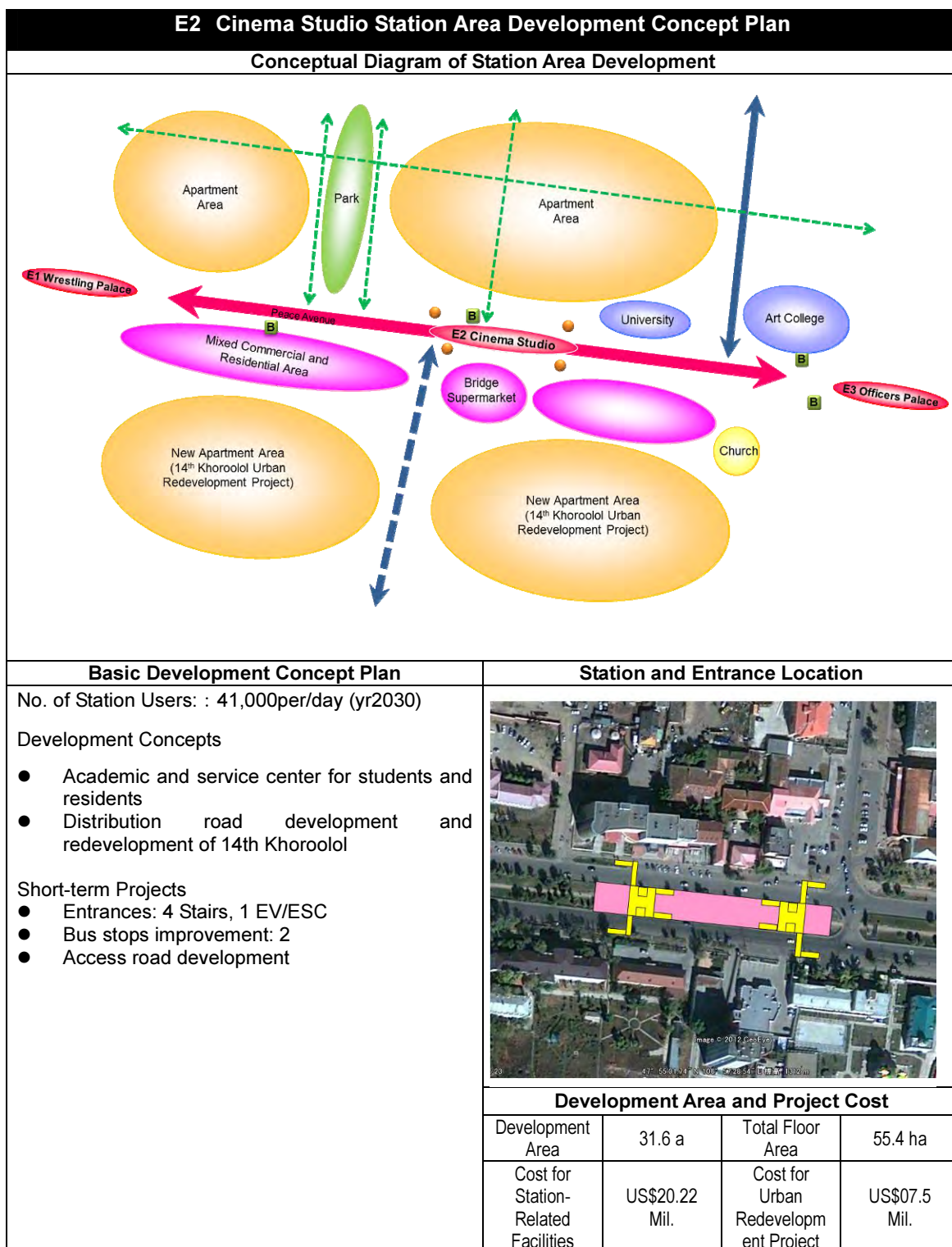


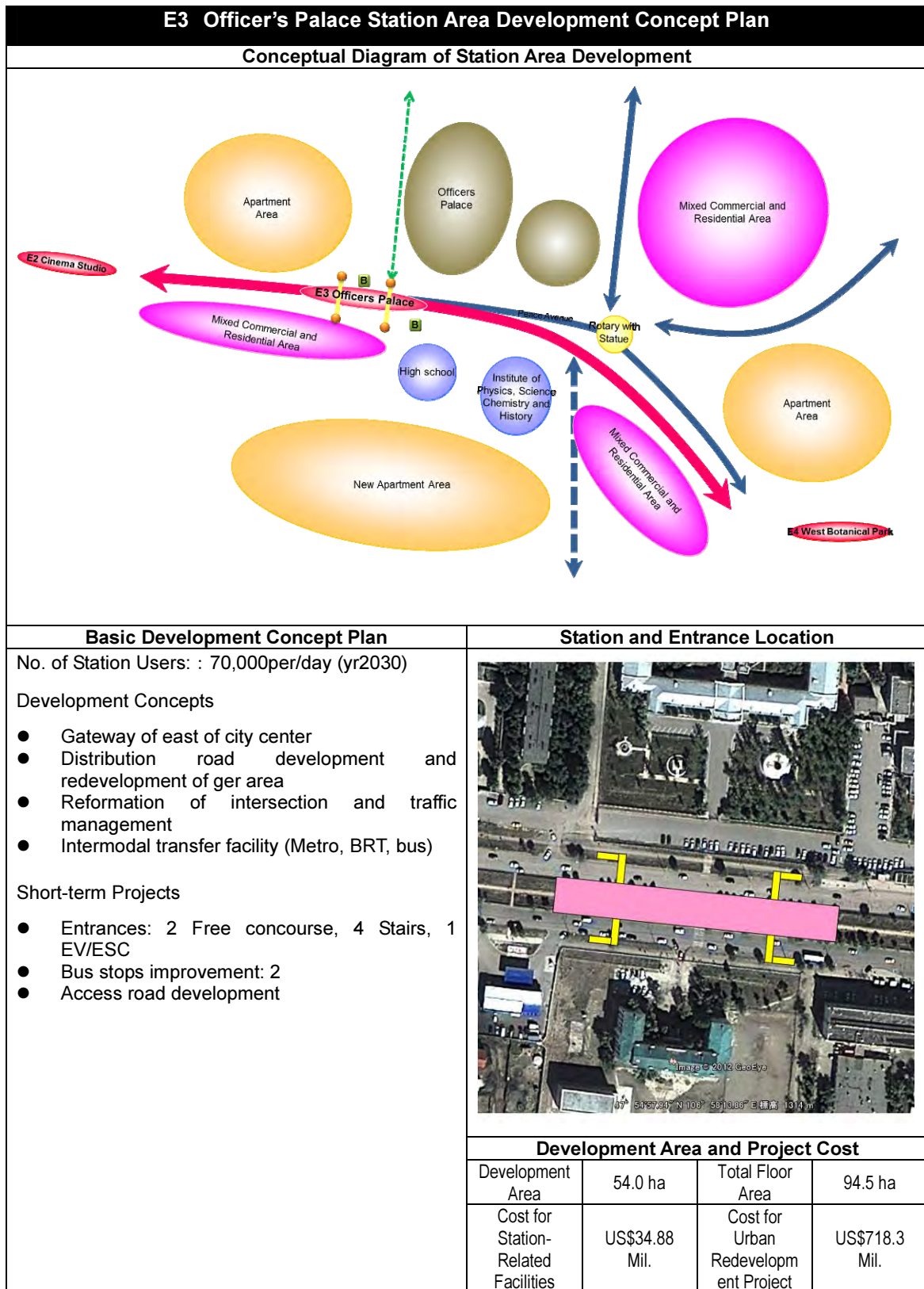




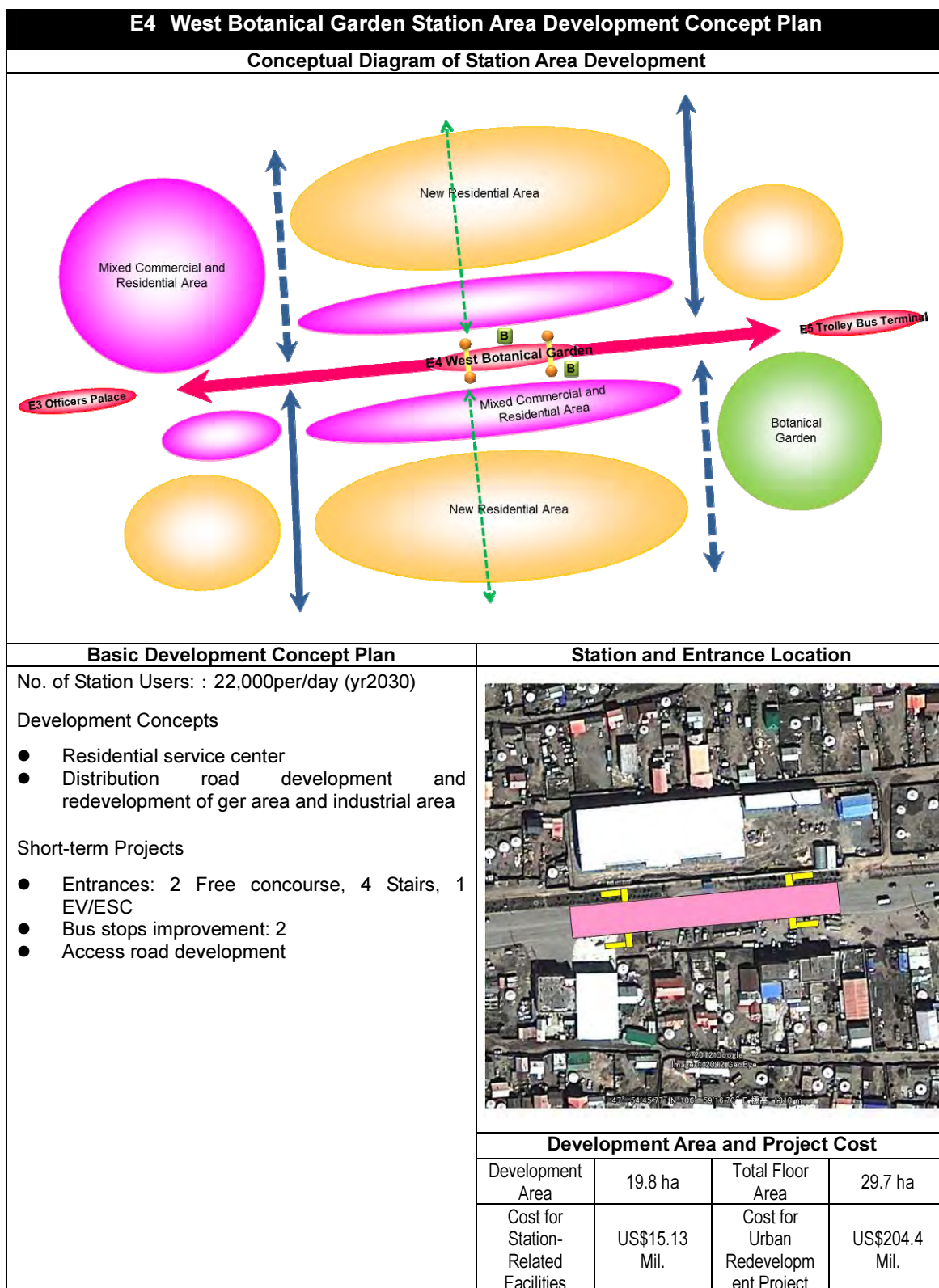


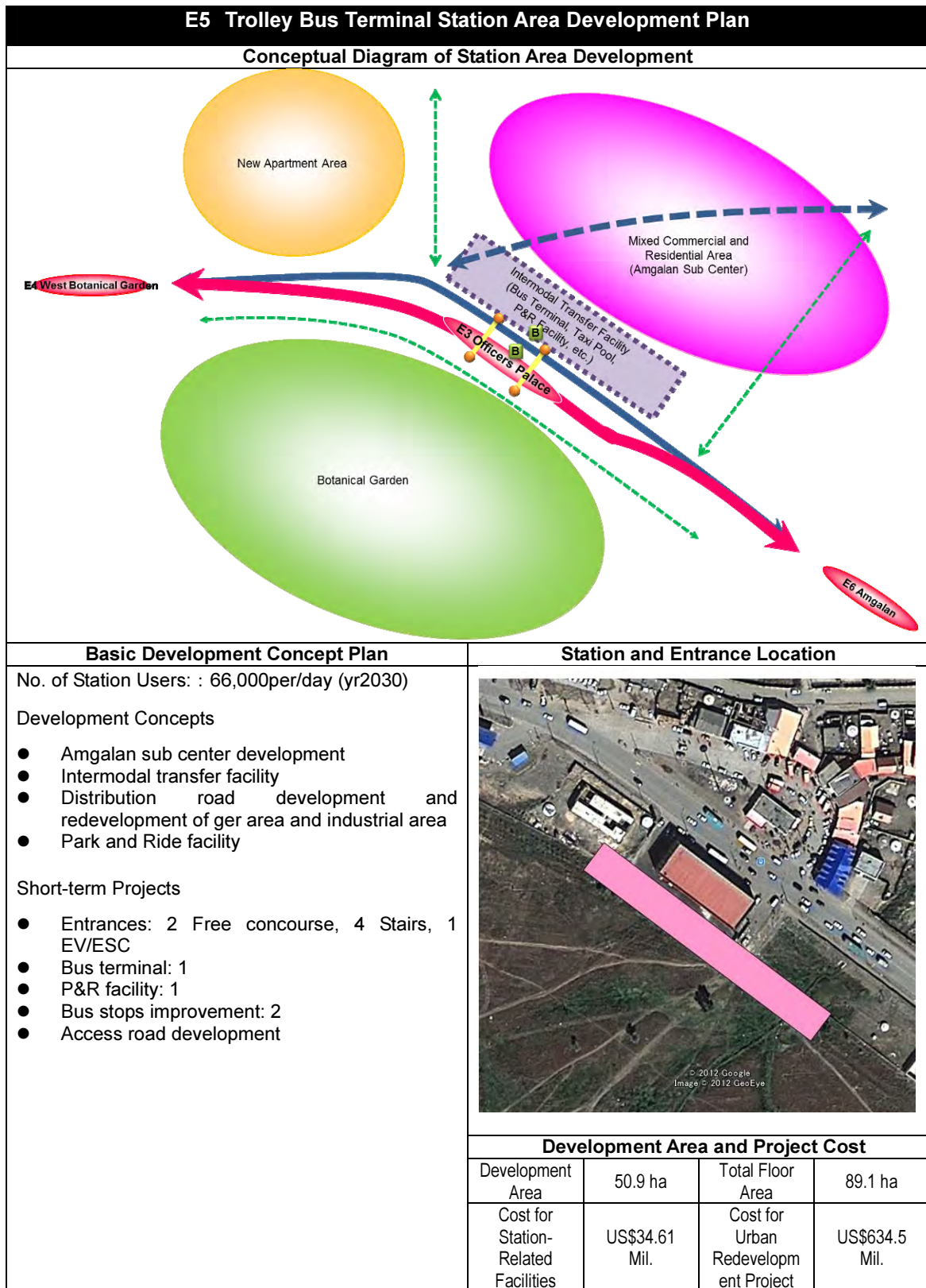


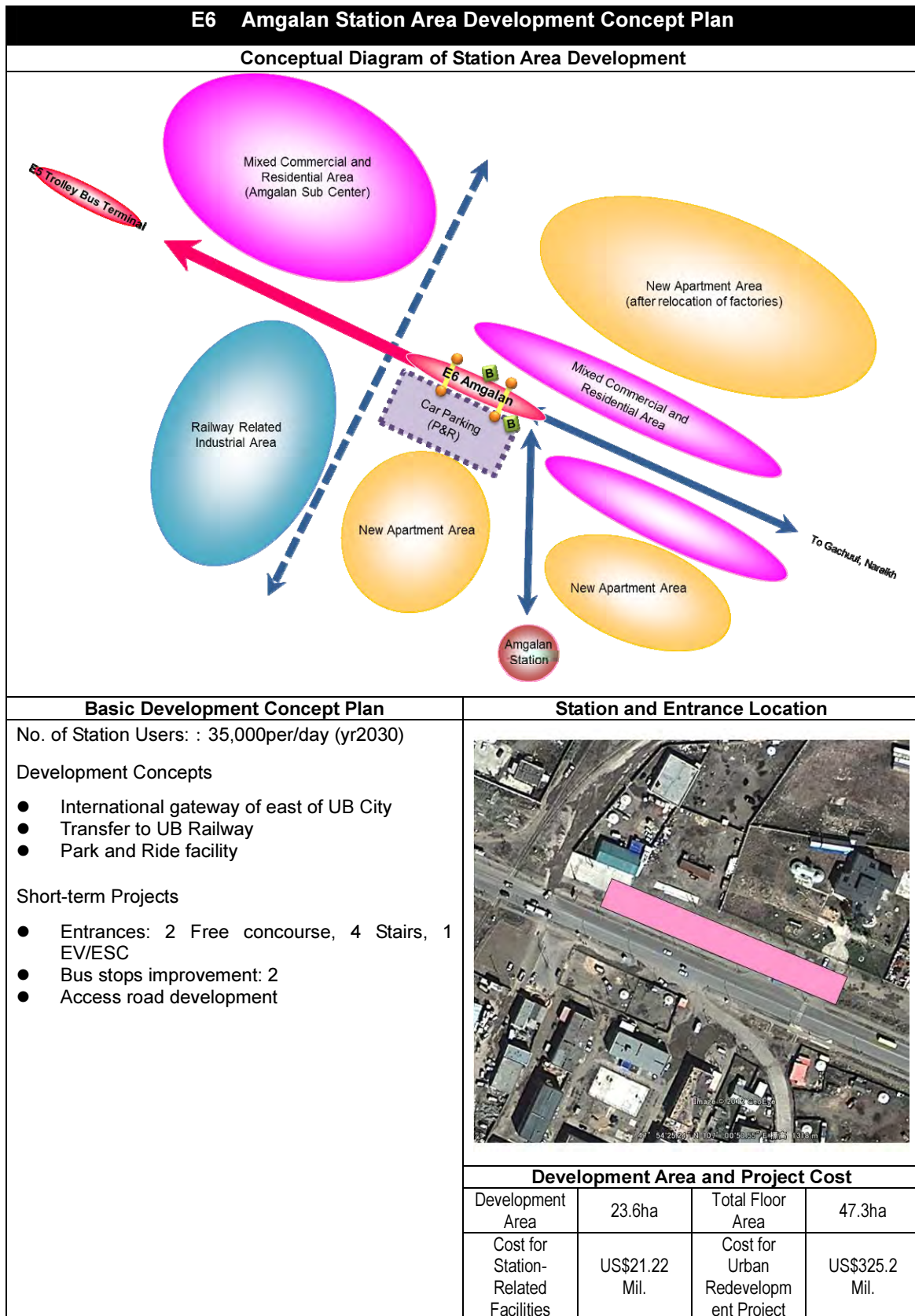












## 5.5 Proposed Implementation Mechanism of Station Area Development Projects

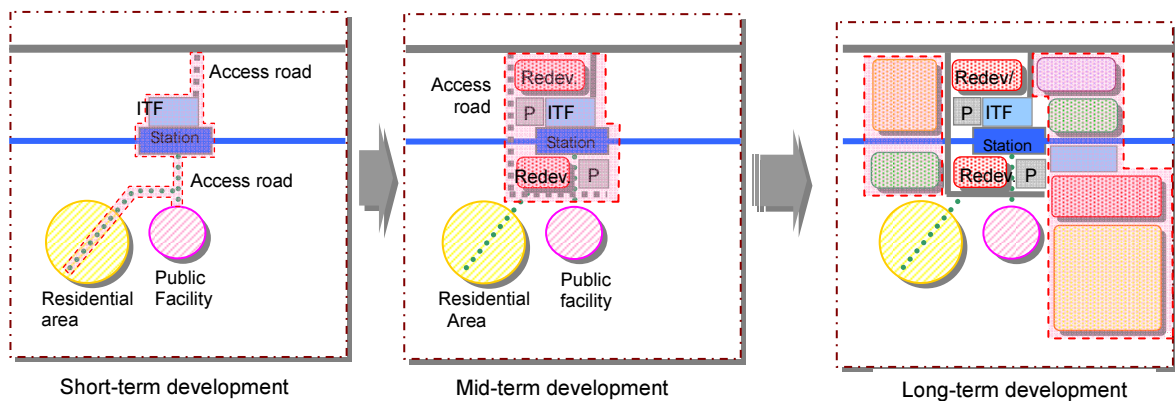
### 5.5.1 Consideration for Station Area Development and Necessity of Phased Implementation

In general, urban development projects take a long time to materialize. Particularly, as an area along Peace Avenue is already built up, it seemingly takes too long especially for coordination of rights and acquisition of land. In addition, the metro development and the station area development have different project areas and organizations concerned. Accordingly, it is required to coordinate the concerned organizations and clarify their roles and functions prior to making the plan and implementation of the project. Although the Urban Redevelopment Law is scheduled to be constituted before long, and regulations will also be developed to implement such urban development projects, the following items need to be considered:

- (i) Consistency with the UB City Master Plan and District Detail Plans;
- (ii) Coordination with the metro project;
- (iii) Coordination with the road development plan and the public transportation plan;
- (iv) Land acquisition and compensation; and
- (v) Clarification of rules and functions of the public sector, the railway operator and the private sector.

Station area development, as described in section 5.1.6, is classified into three types: (a) development of station-related facilities, (b) development of intermodal transfer facilities and transport improvement, and (c) urban development in station area. A phased development approach is preferable for implementation of these projects. The phased development is briefly described below (see Figure 5.5.1).

- **Short-term development:** This involves the development and improvement of station-related facilities for station use such as an intermodal transfer facility (station plaza), car parking, bus stop, access road to the station, and pedestrian path.
- **Mid-term development:** This involves highly implementable projects such as small-scale ones or those which can easily acquire land, and urban development projects with high synergy effect when developed concurrently with the metro's opening such as commercial area development near stations, old apartment reconstruction projects, improvement of utilities.
- **Long-term development:** The time required for this type of development is medium to long term considering the aspects of land acquisition and financing, investment from the private sector, infrastructure conditions, and legal setting, e.g., urban redevelopment projects and new town development projects.



Source: JICA Study Team

**Figure 5.5.1 Image of Phased Station Area Development**

### 5.5.2 Implementation Body of Station Area Development

Major stakeholders involved in urban development integrated with the metro are the public sector, the metro operator, and the private sector. Their roles and functions are as follows:

- (a) **Public Sector:**(i) Promotion of metro project, (ii) Coordination for formulation and implementation of grand design of station area development, (iii) Improvement of transportation environment to promote the metro use such as the improvement of bus service and the development of other public transport, and (iv) Land acquisition for station area development
- (b) **Metro operator:**(i) Improvement of facilities and service integrated with other transportation modes, and (ii) Request necessary for the improvement of the metro operation and service to organizations related to the urban development
- (c) **Private sector:**(i) Participation in commercial and service business related to the metro operation, and (ii) Participation in urban development in station area

### 5.5.3 Materialization Approach by Project and Schedule of Station Area Development

The scope of the metro project encompasses the construction of station facilities and tracks, with sections elevated, underground and at grade. Station-related facilities such as an intermodal transfer facility, car parking, and an access road are not included in the railway development area and therefore these are not part of the metro project. In addition, such urban development projects nearby stations are implemented separately from the metro project. It is preferable that the development of the station-related facilities (short-term), and urban redevelopment projects (mid-term) should be realized in the following steps.

- (a) **Development of station-related facilities (short-term project):** Station-related facilities and access roads are categorized as public facilities, and UB City, especially the Master Plan Department and the Road Department, is expected to be involved. UB City is required to secure land and financing for facilities which are minimally necessary to operate the metro and provide safe service. By this, the possibility of urban development in the station area is enhanced, thereby triggering the private

sector's involvement. It is better to utilize public-owned land for the development of station-related facilities. In the case of acquisition of private land, land should be acquired by paying compensation.

- (b) **Urban development in station area (mid- and long-term project):** Various projects are promoted, examples of which are projects which enhance the possibility of the socio-economic development in the station area, such as development of commercial facilities around the metro stations and along Peace Avenue, old apartment reconstruction project, and effective use of public land and idle land. Once the Urban Redevelopment Law is constituted, these types of area development projects will be implemented based on "right conversion system," which is the transfer of original right before the project to right after the project, keeping the original right during the project implementation and conferring to the holder the right to live in the same area. As consensus of the right holders should be gained before the implementation, from the early stage of the project, it is expected, for a smooth project implementation, to formulate a detailed plan around the station, designating the project area and boundary, consensus building of the right holders, and selecting the project implementer based on the Urban Redevelopment Law. Table 5.5.1 summarizes a draft implementation schedule of station area development.

**Table 5.5.1 Implementation Schedule of Station Area Development (preliminary)**

Target Year	Metro project	Station Area Development Project		
		Short-term	Mid-term	Long-term
	Station facility, track, signaling, system	Station-related facilities, access roads, etc.	Small-scale development in station area	Urban development in station area
2013	Approval procedure	Decision of facilities to be developed, implementation body, financing	Establishment of legal framework for urban redevelopment projects <sup>1)</sup>	
2014	Detailed Design			
2015	Construction	Plan & design of station-related facilities development	Formulation of Station Area District Detailed Plans	
2016		Facilities development		
2017			Facilities development	Formulation of Project Implementation Plan and Implementation
2018				
2019				
2020	Metro opening	Completion, start of operation	Facilities development	
2025				
2030				

1) This includes the Urban Redevelopment Law and its related rules and regulations, land-related laws and the amended Urban Development Law.

Source: JICA Study Team

## 5.6 Development Effect of UB Metro

### 5.6.1 Effect, Impact and Indicator of Station Area Development

With regard to the “effect and impact of the railway business,” multi-faceted spillover effects are expected such as the effects on the citizens’ living condition, local economy, safety, environment and local society. These expected spillover effects by 2030 are listed in the following table.

**Table 5.6.1 Effects, impacts and indicators of the railway development**

Evaluation Criteria		Effect/Impact	Indicator	
Effect / impact on the residents' life	Effect / impact on users	<p>Travel time is lessen.</p> <p>Increase in service frequency and punctuality enhance accessibility compared to bus service.</p> <p>Connection between the public transportation gets more efficient by the restructure of the bus routes.</p> <p>A feeling of comfort and security in traveling are increased by connecting the east and west areas with one railway line on which trains frequently run.</p>	<p>Reduction of travel time from Tolgoit to Sukhbaatar Square (67 min → 18 min)</p> <p>Fare increase (400MNT→650MNT)</p> <p>Long time saving effect</p> <p>Increase in service frequency</p> <p>Decrease in the number of public transport transfer.</p> <p>Better accessibility in a whole city (higher traveling speed)</p>	
	Effect / impact on suppliers	Increase in the number of passengers that leads to the stabilization of management	Increase in the number of passengers (500,000 to 600,000 passengers per day)	
	Residents' living condition	Improvement of accessibility to district centers	More people have access to the center/sub-centers due to the reduction of travel time.	The nighttime population in areas within 10-minute distance by train from the center/sub-centers of target areas is increased.
		Improvement of accessibility to intermodal transfer facilities	Reconfigured bus routes and connection with BRT reduce travel time to the city center.	The nighttime population in areas within 20-minute distance by train from stations and sub-center stations of target areas is increased.
		Reduction of regions which has no railway	New stations improve the accessibility of local people living in areas where it was inconvenient to move by the public transport.	The nighttime population in areas within 10-minute distance by train (800 m) from stations of target areas is increased.
		Improvement of convenience	Residents are able to get access to more facilities related to their living since travel time is shortened by train.	It is easier to get access to facilities related to living, public facilities (e.g. community centers), commercial buildings such as shopping malls and high advanced medical facilities, which are planned to be built in 20 minute-distance areas from stations.

	Local economy	Revitalization of local community	Productivity is increased due to better accessibility.	Business potential (sales potential) at station areas is increased.
		Investment promotion	Possibilities to lure companies and scale of the investment are increased by the increased productivity of the improvement of accessibility.	Potential of investment (possibility of establishment of new business facilities) in station areas is increased. Large scale investment in station areas is expected along with the railway business.
		Revitalization of real estate market	Additional real estate investment is generated with better accessibility.	1,318ha of real estate investment for commercial purposes will be done in station areas.
		Creation of employment	Incremented city functions by redevelopment at station areas is expected to increase employment	155,000 new employment opportunities are created at station areas (within 800m) by the development of the UB Metro by 2030.
		Increase in tax revenue	Increase in tax revenue with the growth of economic activities is expected.	Increase in revenue from tax on sales, CIT, real estate tax and new taxes related to redevelopment.
Effect/impact on the society	Local community	Redevelopment of urban city	The density of the urban areas is increased and city functions are accumulated according to the scale of the intermodal transfer facility	The population of the railway station sphere is increased. Redevelopment of the station areas is promoted.
	Environment	Improvement of global environment	It minimizes the impact of global warming since car users are expected to change their transport mode to the Metro for better accessibility.	CO <sub>2</sub> emitted by cars on main roads is reduced by 34,000 tons per year by 2030 NO <sub>x</sub> emitted by cars on main roads is decreased by 1,754 tons per year as of 2030
		Improvement of local environment	It assumes to solve the environmental problems in local areas since car users are expected to change their transport mode to the Metro for better accessibility.	
	Safety	Decrease in road accidents	It is expected to decrease the number of road accidents since car users are urged to use the Metro for better accessibility.	It is expected to decrease the number of road accidents which is quite high on the main roads along the railway.

Source: Manual on Evaluation Tool for Railway Project 2012 added by JICA Project

## 5.6.2 Effect and Impact on Life of the Metro Users

### (1) Effect and impact on metro users

#### 1) Travel time saving

- The average speed of the UB Metro is 30km/h and that of buses is 8km/h which means that it is possible to save travel time by taking the metro.
- Travel time from Tolgoit to Sukhbaatar Square (about 9km) is reduced (from 67 minutes to 18 minutes).



- Reliability and punctuality of the public transportation system is secured.
- Commuting time is reduced drastically by the shortened travel time and punctuality.

## **2) Time cost saving**

- The UB Metro fare is 600MNT/trip which is higher than bus fare, 400MNT/trip. But, the reduction of commuting time brings the time cost saving, and as a result the total travel cost is reduced.
- The time cost saving effect of the public transport on users by the reduction of travel time is estimated as follows. The time value of the public transport users is 0.725USD per hour (16.7MNT/min) in 2020 (See table 10.1.2). When it is assumed that the travel time is saved by 12 minutes through the UB Metro compared to the travel time by bus, its economic value is about 200MNT. Therefore, it is possible to say that if the time saved by the metro is 12 minutes, its economic effect is equivalent to the increase in the fare from 400MNT to 600MNT<sup>4</sup>.

## **3) Improvement of punctuality and accessibility**

- Reconfigured bus routes decreases the number of changing public transportation services.
- The service frequency of the UB Metro is assumed to be one train per five minutes, which improves accessibility.
- Connecting the east and west areas with one railway line, on which trains frequently run, provides a feeling of security and comfort in travel due to easy access and fast transit.

## **(2) Effect and impact on suppliers**

- The stability of the management is seen through the increase in the metro users (5 to 6 billion passengers per day are expected in 2030).
- The Ulaanbaatar Metro Authority (UBMA) is possible to secure enough operational profit (financial viability) from its fare revenue (refer to 10.2 of Chapter 10).

## **(3) Residents' living condition**

### **1) Improvement of accessibility to district centers**

- More people are able to get access to the center of each district since travel time is reduced.
- The nighttime population of areas within 20-minute distance by train from central districts of target areas is increased.

### **2) Improvement of accessibility to intermodal transfer facilities**

- The restructuring of bus routes from stations and the connection to BRT save the travel time to the city center.
- The nighttime population of areas within 20-minute distance by train from stations and sub-center stations of target areas is increased.
- The current public transport services are trolley bus, fixed-route bus and minibus. The most routes of these transport services are directly connected to the city center

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<sup>4</sup> The economic effect is discussed in detail in 10.1 of Chapter 10.

where the traffic is attracted. Therefore, there is a heavy traffic congestion in the center during rush hour, which makes the travel time longer.

- The public transport which people take is expected to drastically change in the metro areas after it starts operation.
- The public transport system caters to almost 70% of the urban area population since the division of roles (covered areas and functions) among the different public transport services is developed such as the restructuring of bus routes.
- It is possible for residents to reach their destinations in a shorter time as well as on time by the development of more convenient railway network integrated with north-south BRT line and bus networks.
- Traffic congestion is eased and travel time by car is reduced.

### 3) Improvement of accessibility related to the living condition

- Residents are able to get access to more facilities related to their living since travel time is saved by train.
- It is easier to get access to facilities related to living, public service facilities (e.g. community centers), commercial buildings such as shopping malls and high advanced medical facilities, which are planned to be built in 20minute areas from the stations.
- Opportunities to go shopping, take medical treatment and do recreational activities are increased through having an easier access to the city center and sub-centers.
- In the center, it's possible to make comfortable urban spaces where people can enjoy shopping and recreations even in a season of severe cold by the development of underground passages and shopping centers.
- A guideline for the underground pedestrian network makes it easier for pedestrians to move between buildings in the center during severe winter.
- Economic activities in UB city are revitalized during severe winter.



## (4) Local economy

### 1) Revitalization of local economy

- Better traffic accessibility increases the productivity of local business.
- Business potential (sales potential) at station areas is increased.
- Revitalization of economic activities in UB city through the development of the UB Metro increases citizens' income.

### 2) Investment promotion

- Possibilities to lure companies and large scale investors are increased by the increased productivity brought about by the improvement of the accessibility.
- Potential of investment (possibility of establishment of new business facilities) in station areas is increased.

- Urban redevelopment is promoted in areas within a distance of 800 m from stations which increases up to 1,317 ha of the floor area development in 10 years from 2020 to 2030.

### 3) Revitalization of real estate market

- Currently, the land price is on the upward trend and it seems to be the land bubble. The UB Metro contributes to increase the land productivity by leading increased population to the urban areas and revitalizing economic activities of enterprises located in station areas.
- As a result, it is assumed that about 1,318 ha of real estate investment will be done in station areas (within 800 meters from stations) from 2020 to 2030 and the market size will be **one billion USD**.

<u>Increase in gross floor area</u>		<u>Net floor area ratio</u>		<u>Net floor area</u>
<u>in 2020~2030</u>				
1,318ha	×	80%	=	1,054ha
<u>Net floor area</u>		<u>market price</u>		<u>Total value of real estate market</u>
1,054ha	×	1000\$/m <sup>2</sup>	=	10,500 million USD

- The UB Metro creates a new real estate market and increases economic activities. In addition, it is expected that networks with other railway stations are formulated and the downward trend of the land price around the city center and station areas goes down.

### 4) Creation of employment

- It is expected that 155,000 of new employment is created at station areas by the development of the UB Metro. The increase in new employment is promoted particularly in the center and sub-centers and the formulation of business areas is accelerated.
- The UB Metro contributes to the formulation of the sub-centers as well as in keeping the center active.
- The UB Metro contributes to the formulation of efficient commercial and business centers along the railway line and realizes a compact city.

### 5) Increase in tax revenue

It is expected that the tax revenue of the government and UB city is increased because the national income is raised and economic activities are revitalized which increase the asset value.

#### i) Impact on tax revenue on a house rent

If it is assumed that 30 % of increased floor areas between 2020 and 2030 is rental offices and housings, the following formula shows that the increased VAT revenue reaches about **76 million USD per year**.

Increased floor area in 2020~2030	<u>Rent rate</u>	<u>Net floor area ratio</u>	<u>Average rent fee</u>	<u>month</u>	<u>Tax rate</u>	<u>Increased tax revenue per year</u>
1,318ha	× 30%	× 80%	×20USD/m <sup>2</sup>	× 12	× 10%	=75.9 million USD

### ii) Impact on individual income tax revenue by the employment growth

The revenue of individual income tax is also expected to increase with the growth of employment. As the following formula shows, the total increased tax revenue is about USD 46.5 million per year on the assumption that the average monthly income is USD 500 per person, 50% of which is taxable.

<u>The number of employment increased by 2030</u>	<u>Average monthly income</u>	<u>Rate of taxable income</u>	<u>month</u>	<u>Tax rate</u>	<u>Increased tax revenue per year</u>
1,550,000 人	×\$500	×50%	×12	×10%	=46.5million USD

### iii) Impact on real estate tax

The amended real estate tax was enforced on January 1, 2013, which raises the tax rate from 0.6 % to 1.0 %<sup>5</sup> of the taxable value of property<sup>6</sup>. Here, it is assumed that 60% of the floor area value is the amount of registered property and the tax rate is 1.0 %. The increased tax revenue is expected to be 63.3 million per year.

Developed floor area	Floor area ratio	Net Floor price	Registration rate	Tax rate	Increased tax per year
1,318ha	× 80%	× 1,000USD/m <sup>2</sup>	×60%	×1.0%	=63.3 million USD

### iv) Impact on corporate Income Tax (CIT)

The increased revenue of CIT is calculated based on sales related to the employment in station areas and the sales profit ratio. As the following formula shows, the increased revenue of CIT is USD 46.5 million on the assumption that the sales labor cost ratio is 30%, the sales profit ratio is 10%, and the average CIT is 15%.

Labor cost	Sales labor cost ratio	Sales profit ratio	CIT rate	Increased tax per year
\$930million	÷30%	×10%	×15%	=46.5million USD

<sup>5</sup>According to the amendment of the real estate law in Jan 1, 2013, 1% of tax rate is applied to citizens and enterprises/organizations that own properties in the first grade area. 0.8 % is for the second and third grade areas and 0.6 % is for the fourth and fifth grade areas.

<sup>6</sup> The amount of the ratable value of other registered property than land

## 6) Effect on the tax increase

In summary, the amount of increased taxes in 2030 is as follows.

Tax on a house rent: 75.9 million USD

Individual income tax: 46.5 million USD

Real estate tax: 63.3 million USD

Corporate income tax: 46.5 million USD

Consequently, the total amount of increased taxes is expected to reach 232 million USD in 2030.

## (5) Recommendation of a new tax related to the station area development

### 1) Tax on the urban development

The rate of land use fee<sup>7</sup> is classified by area zone. But, the land value should be assessed according to its profitability in the market economy. Particularly, it is expected that the development of the real estate in station areas proceeds prior to that of the railway business. Therefore, the government need to secure the tax revenues for the urban development.

However, in order to reevaluate the value of land according to the profitability, the amendment of the land law is necessary and the amendment may not be completed before the development starts. Consequently, it is necessary to provisionally secure the tax revenue for the urban development related to the metro project by imposing tax (tax on urban development) on a part of the profit from the development of station areas. Another option is to issue a bond based on the future tax increment which is guaranteed by the investment in the urban development like the Tax Increment Financing (TIF) adopted by the US. In this case, it is possible to issue 279 million USD of bonds on the assumption that the interest rate is 7 % and the maturity is 20 years.

### 2) Revenue from a new tax on the urban development

As a general principle, beneficiaries who receive urban services shall pay taxes according to the services. In particular, the basic principle of sustainable urban development is that the tax revenue according to the volume of economic activities is secured. Therefore, it is necessary to impose taxes on the beneficiaries based on the new urban services (the UB Metro).

In addition, the establishment of an impact fee system is another option to secure immediate funds. Under the system, the impact fee of 50 USD/m<sup>2</sup> is imposed with the approval of the development concession. The redevelopment area is supposed to be about 331 ha and therefore the tax revenue of 165.5 million USD is expected.

## (6) Effect and impact on the improvement of global environment

- The current car users are expected to take the metro for better accessibility after the UB Metro is developed. It is assumed that the number of cars is decreased, and consequently CO<sub>2</sub> emitted by cars is reduced by **34,000 tons** per year and NO<sub>x</sub> is decreased by about **1,754 tons** per year
- It is expected that people change the transport mode from cars to the metro which reduces the car traffic volume. This equals to the reduction of the total traveled kilometer per day by **198,000 km**. Therefore, it is also expected that the number of

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<sup>7</sup> The land use fee in the center (the first grade zone) for the commercial purpose is 1m<sup>2</sup>=440Tgs.

traffic accidents is reduced and the environment load such as air pollution and global warming is reduced.

#### **(7) Improvement of safety and comfort and decrease in the traffic accidents**

- The UB metro urges local people to use it instead of cars and decreases the car traffic volume by 16%. As a result, the velocity of cars is increased by 25% and the traffic congestion in the city center is relieved.
- The number of traffic accidents is expected to decrease because car users are urged to take the metro for better accessibility.

#### **5.6.3 Necessity of Integrated Urban Development**

The UB Metro is expected to be a backbone of the public transportation systems, which connects centers and sub-centers of a central business area and residential and market areas stretching from east to west along Tuul river. This connection revitalizes relations between the centers which have a variety of functions. In addition, the UB Metro is a primary transport mode for commuters integrated with the BRT north-south line.

Besides, it is certain that the UB Metro is an effective project which has a big impact on urban development and local economy of UB city. The metro is a trigger of restructuring of the city and vitalizes economic activities in various fields. It is essential to take the following measures in order to ensure these effects and impacts.

- To formulate an urban city structure in which the city center and sub-centers play a role of promoting integration of urban functions as the hub centers. In addition, the centers and other areas within the UB city region should be organically linked. It is also necessary to increase the density of urban areas by promoting an efficient utilization of land and develop the city areas with an intensive utilization, establishment of tall buildings and transforming it with a highly dense population.
- To relieve the traffic congestion and restrict expansion of urban areas by urging to reconstruct old apartment buildings and move people from an urban fringe of ger areas.
- To develop district centers hierarchically in metro station areas and to build the urban spaces which have necessary functions for residents on easy access.
- To secure the urban accessibility and reduce energy per unit traffic by the way of connecting various public transportation systems such as MRT, BRT, Bus to expand areas covered by the public transportation services.
- To develop urban cities responding to contemporary issues, such as an energy-saving city, a city with high accessibility or a comfortable environment, an eco-city and a compact city.