

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
HANOI PEOPLE'S COMMITTEE (HPC)**

**Project for Studying the Implementation of
Integrated UMRT and Urban Development
for Hanoi in Vietnam**

Final Report

Main Text Part II: Pre-Feasibility Studies

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Abbreviation List

ADB	Asian Development Bank
AFC	Automatic Fare Collection
AFD	L'Agence Française de Développement
AGR	Annual Growth Ratio
AQ	Ancient Quarter
BPPT	Buss Public Passenger Transportation
BRT	Bus Rapid Transit
CBD	Central Business District
CNG	Compressed Natural Gas
CTF	Clean Technology Fund
DGT	Direction Générale du Trésor
DOC	Department of Construction
DONRE	Department of Natural Resource and Environment
DOT	Department of Transport
E/S	Engineering Service
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EV	Electric Vehicle
EVN	Viet-Nam Electricity
FAR	Floor Area Ratio
FFEM	Fonds Français pour l'Environnement Mondial
FQ	French Quarter
GIS	Geographic Information System
HAIDEP	The Comprehensive Urban Development Programme in Hanoi Capital City
HAIMUD	Project on Integrated UMRT and Urban Development for Hanoi
HAPI	Hanoi Authority for Planning and Investment
HAUPA	Hanoi Authority for Urban Planning and Architecture
HCMC	Ho Chi Minh City
HPC	Hanoi People's Committee
HUPI	Hanoi Urban Planning Institute
IEE	Initial Environment Examination
ITS	Intelligent Transport System
JBIC	Japan Bank for International Cooperation
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
JR	Japan Railway
KTT	KHU TẬP THỂ (Collective Apartment Area)
LR	Land Readjustment
LRT	Light Rail Transit
M/P	master plan
MLIT	Ministry of Land, Infrastructure and Transport
MOC	Ministry of Construction
MOCPT	Management and Operation Center of Public Transportation
MOP	Ministry of Police
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
MRB	Metropolitan Railway Bureau
MRT	Mass Rapid Transit
NH	National Highway
NMT	Non-Motorized Transport

NMV	Non-Motorized Vehicle
NPO	Non – Profit Organization
O&M	Operation and Management
OD	Origin and Destination
P&R	Park & Ride
PC	People's Committee
PIC	Project Implementation Consultant
PPP	Public–Private Partnership
PR	Province Road
PT	Person Trip
ROW	Right of Way
RR	Ring Road
SAPI	special assistance for project implementation
SEA	Strategic Environment Assessment
SMEs	Small / Medium size Enterprises
TA	Technical Assistance
TCCP	Tieu Chuan Cho Phep: the permissible air quality standard in Vietnam
TDM	Travel Demand Management
TEDI	Transport Engineering Design, Inc
TOD	Transit Oriented Development
TWG	Technical Working Group
TRAMOC	Hanoi Public Transport Management and Operation Center
TSP	Total Suspended Particulates
TUPWS	Transport and Urban Public Works Service
TX	Tsukuba Expressway
UMRT	Urban Mass Rapid Transit
UR	Urban Redevelopment
VND	Vietnam Dong
VNR	Vietnam Railways
WB	World Bank

4 PRE-FEASIBILITY STUDY ON TRANSPORT ACCESS IMPROVEMENT PROJECTS

4.1 Objectives

4.1 Transport access to UMRT station is the most critical for effective operation of UMRT. After UMRT development, the most popular means of access to the station will be walking followed by bicycle and motorcycle. For appropriate traffic management at and around the station, private vehicles should be restricted and regulated. Furthermore, connectivity with bus is also critical to expand the catchment area of UMRT.

4.2 This pre F/S was conducted for the projects of improvement of accessibility to and from UMRT stations, which were identified in the TOD concept plans for the stations included in the phase 1 of UMRT Line 1 and Line 2. Basic objectives are as follows:

- (i) To improve facilities, services and environment for access transport
- (ii) To provide adequate facilities for smooth connection with UMRT at the station area
- (iii) To contribute to the improvement of overall walking and traffic conditions in the local communities

4.3 While the spatial extent of the access varies by station, the preliminary coverage of the study is the area within about 500m radius from the stations, which is considered walkable distance. Certainly, if the walking environment is favorable, the distance becomes longer and vice versa. In many developed cities, walkable distance can be 800 to 1,000 meters. When the access is assisted with bicycles and motorcycles together with parking facilities provided at the stations, the accessible distance can become much longer. Nevertheless, the coverage in the study is limited to about 500m radius area from UMRT stations, considering the importance of walkable access for the residents and visitors in the direct influence area of UMRT.

4.4 Approaches of the pre-feasibility study are as follows:

- (i) Formulate basic plans on transport access improvement based on the TOD concept plan for each UMRT station
- (ii) Identify projects and actions based on which the plan can be realized effectively. The identified project are evaluated from economic, financial, social, environmental and institutional viewpoints
- (iii) Package the identified projects and formulate implementation plan

4.2 Basic Plan on Transport Access Improvement for UMRT Stations

4.2.1 Nam Thang Long Station (C1) Area

1) Identified Projects

4.5 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.1-1).

(a) Identified Projects within 500m radius Area

- (i) Development of PR2.5 and widening of Nguyen Hoang Ton Street: To ensure main station access roads as well as to provide feeder service connecting to north of the city, it is required to develop these trunk roads in time.
- (ii) Improvement of Xuan Dinh Street: This is the main access road for local residential area where local socio-economic activities along roadside are clustered, a road space should be shared among vehicles and pedestrians.
- (iii) Improvement of access alleys in Xuan Dinn Ward: Alley spaces will be properly managed to ensure connectivity to RR2.5, Xuan Dinh Street or the new road along the depot to access to the station.
- (iv) Improvement of intersections: At the intersection along Nguyen Hoang Ton Street, intersections will be improved to ensure safe junction from alleys.

(b) Identified Projects in TOD Area

- (i) Priority development of main roads in TOD Area: Development of RR2.5 including the intersection with Nguyen Hoang Ton Street will be prioritized to develop intermodal facilities providing access points to the station.
- (ii) Development of shortcut road in UMRT Line 2 depot area: The access road along the depot will be developed in UMRT Line2 construction project, so the shortcut road to the RR2.5 will be additionally developed for convenient access to the station.
- (iii) Development of elevated walkway under the UMRT viaduct: To cross a large intersection safe and to ensure direct access to the station, the pedestrian bridge under the viaduct will be developed for pedestrian and NMV.
- (iv) Development of elevated walkway to provide direct connection between the UMRT station and the hospital area: It is proposed to connect between the station and the hospital directly at concourse level to ensure direct access.
- (v) Development of common station plaza: To share the intermodal space between the hospital and the station, it is proposed to develop a common station plaza in front of the station inside the hospital land.
- (vi) Provision of bus and intermodal facilities at the station along RR2.5 and Nguyen Hoang Ton Street: To provide feeder bus services near to the station, bus stops will be developed along trunk roads near to the station.
- (vii) Improvement of traffic management: Traffic management facilities will be provided at station plaza and intersections such as signs, lightings, etc.

Figure 4.2.1-1 Identified Project Location Map of C1 Nam Thang Long Station Area



Projects within 500m radius Area Area

1. Development of PR2.5 and widening of Nguyen Hoang Ton Street
2. Improvement of Xuan Dinh Street
3. Improvement of access alleys in Xuan Dinh Ward
4. Improvement of intersections

Projects in TOD Area

1. Priority development of main roads in TOD Area
2. Development of shortcut road in UMRT Line 2 depot area
3. Development of elevated walkway under the UMRT viaduct
4. Development of elevated walkway to provide direct connection between the UMRT station and the hospital area
5. Development of common station plaza
6. Provision of bus and intermodal facilities at the station along RR2.5 and Nguyen Hoang Ton St.
7. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement in 500m radius

4.6 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Development/ Improvement of RR2.5 and Nguyen Hoang Ton Street

4.7 Although the development of RR2.5 and the widening of Nguyen Hoang Tong Street are committed by DOT, it is advisable to complete the section when the UMRT is in operation. If the development and widening is not in time, at least the following measures should be implemented:

- (i) Improvement of sidewalk including repaving, marking of pedestrian crosswalks, etc. for Nguyen Hoang Ton Street (W=12m at present)
- (ii) Improvement of traffic management including parking ban, installation of traffic signs for Nguyen Hoang Ton Street (W=12m at present)
- (iii) Utilization of road for Line2 construction under viaduct for temporal road of RR2.5 (W=6m x 2 directions)

4.8 In this project, Nguyen Hoang Ton Street is widened from 12 to 64 meter, and RR2.5 of 50-meter width is newly developed in the station area. Within 500m radius from the station, the estimated area needed is 28,800m² (including 27,000m² of residential area) for widening of Nguyen Hoang Ton Street and 15,000m² (including 11,500m² of residential area) for development of RR2.5, respectively.

(b) Improvement of Xuan Dinh Street

4.9 In this station area, Xuan Dinh Street is the only road that provides important access to major urban facilities for local communities. The following measures should be implemented:

- (i) Improvement of sidewalk including installation of paved block for disabled, designating parking line in sidewalk, installation of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iii) Improvement of traffic management including marking of pedestrian crosswalks, installation of traffic signs

(c) Improvement of Alleys in Xuan Dinh Ward

4.10 In the existing residential areas of Xuan Dinh Ward, most alleys have no sidewalks, and the condition of pavement conditions is bad. The following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installation of bench and information board at open space
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning

(d) Improvement of Intersections

- (i) In this station area, four intersections are identified for improvement along Nguyen Hoang Ton Street and Xuan Dinh Street which connect local roads. It is proposed to install traffic signals, pedestrian crosswalks, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.11 Identified projects in TOD Area (36,900m²) are as follows (see Figure 4.2.1-2):

(a) Priority Development of Main RR2.5 and Nguyen Hoang Ton Street in TOD Area

4.12 Inside the proposed TOD Area, there are two trunk roads (RR2.5, Nguyen Hoang Ton Street) which will be main access roads to the station. Priority development road area in TOD Area is as follows:

- (i) RR2.5: L=170.0m, W=50m (8,500m², including intersection)
- (ii) Nguyen Hoang Ton Street: L=90.0m, W=64m (5,760m², excluding intersection)

(b) Development of Shortcut Road in UMRT Line 2 Depot Area

4.13 To ensure accessibility around the depot, the southern access road will be developed under the construction of UMRT Line 2. This access road will be extended to connect to RR2.5 as a shortcut road to the station. Before completion of RR2.5, this access road will connect to the temporary road under the viaduct, and cross the intersection to access the station.

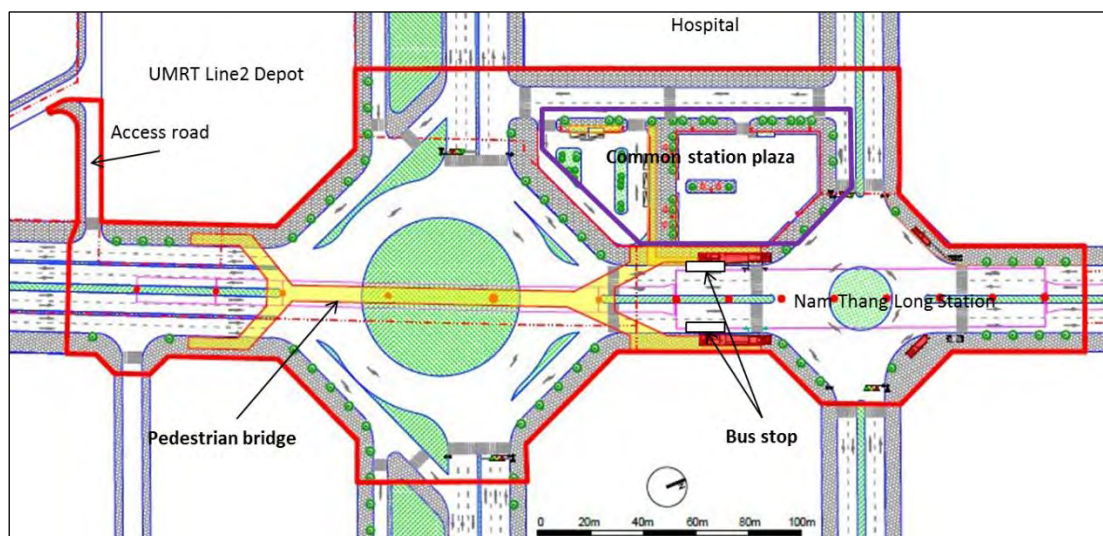
- (i) Shortcut road of depot: L=10m, W=9m including sidewalk of 3m-width (90 m²)

(c) Development of Common Station Plaza

4.14 The common station plaza includes rotary and parking facilities, which are used by users of both the hospital and the station. Inside the plaza, there is a walkway connecting to the hospital. Between the hospital and the station plaza, there is the main access road and sidewalks to the station plaza and hospital for vehicles and pedestrians.

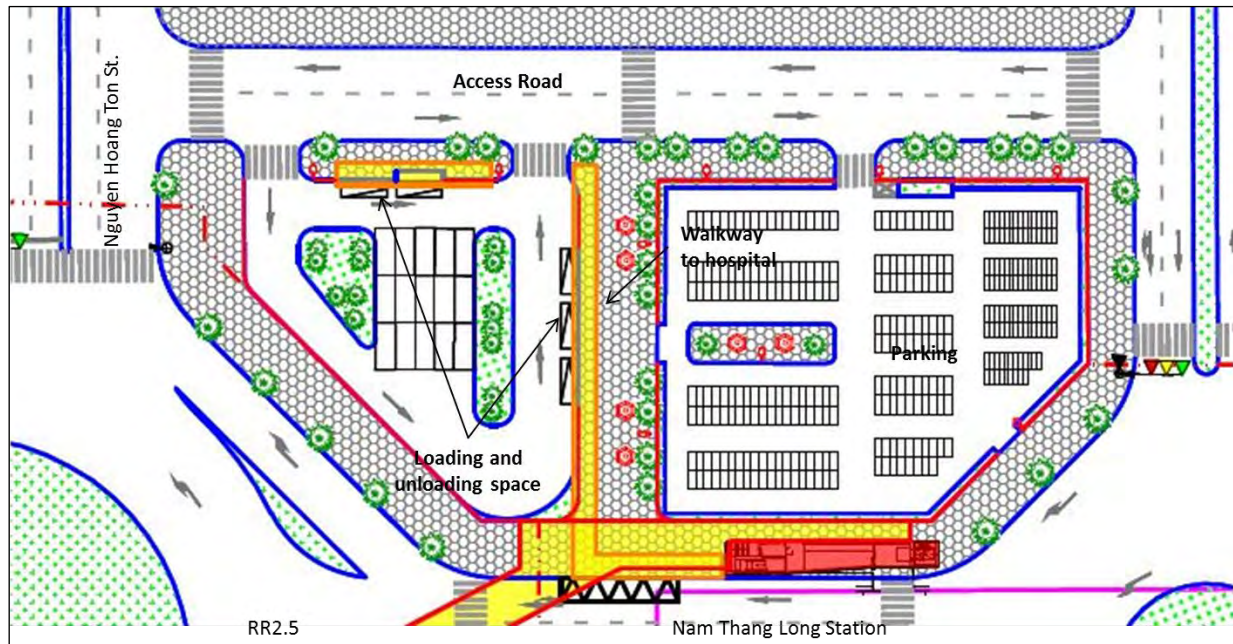
- (i) Rotary: loading and unloading space with roof, taxi berth and pool (1,500m²)
- (ii) Motorcycle parking (2,000m²)
- (iii) Walkway between the station and the hospital: W=10m, L=110m
- (iv) Access road to station plaza and hospital: W=23.5m, L=125m (carriageway), W=12.0m, L=125m (sidewalk, two sides)

Figure 4.2.1-2 Station Plaza and Pedestrian Deck of C1 Nam Thang Long Station



Source: JICA Project Team

Figure 4.2.1-3 Layout Plan of Common Station Plaza



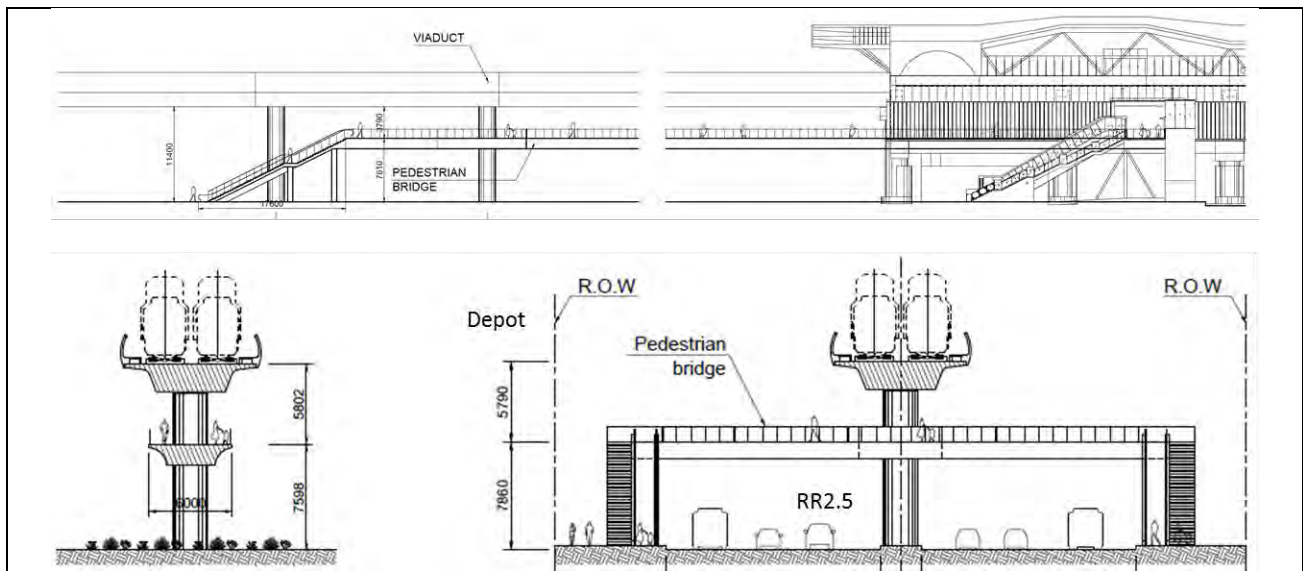
Source: JICA Project Team

(d) Development of Elevated Walkway under the UMRT Viaduct

4.15 Under the elevated UMRT, the pedestrian bridge is connected to the intersection of two trunk roads, using the space under the viaduct. The pedestrian bridge will be extended from the station to the hospital above the station plaza.

- (i) Elevated walkway: L=200m, W=6m, H=7.6m, 2 entrances near to Depot area

Figure 4.2.1-4 Pedestrian Bridge of C1 Nam Thang Long Station Area



Source: JICA Project Team

(e) Development of Elevated Walkway to Provide Direct Connection between the UMRT Station and the Hospital Area

4.16 To provide convenient and direct access between the station and the hospital, the elevated walkway above the station plaza will be provided in conjunction with the hospital development plan. It is preferable to develop the pedestrian deck to provide convenient services for users of the hospital and the station as well as local communities.

(f) Provision of Bus Bays and Facilities in TOD Area along RR2.5 and Nguyen Hoang Ton Street

4.17 The feeder bus services will be expanded from C1, C2 and C3 stations. For smooth transfer, bus stops will be developed along two trunk roads, but there will be no access inside the station plaza.

(g) Traffic Management in the TOD Area

4.18 Inside the TOD Area, parking along carriageway and sidewalk will be restricted, because it will affect CIPUTRA new urban area and the intersection. While the elevated walkway crossing the intersection is developed, traffic signals and pedestrian crosswalks are required around the intersection to ensure safe traffic flow at the roundabout.

4) Summary of Access Improvement Projects

4.19 The total estimated cost is 243,300 million VND, including 182,300 million VND (75% of total) for short (minimum) projects, 21,000 million VND (8% of total) for short projects, and 40,000 million VND (16% of total) for basic projects.

4.20 Short (minimum) projects include improvement projects for existing roads, alleys and intersections in the area within 500m radius, development of a shortcut road, an elevated walkway inside ROW of UMRT, a bus stop on the sidewalk, and traffic management. These projects using road land or inside ROW of UMRT are to be implemented in coordination with authorities such as DOT and MRB.

4.21 Short projects are composed of primary road development in the TOD area, including RR2.5 and Nguyen Hoang Ton Street. Without completion of these trunk roads, access would be limited to the existing Nguyen Hoang Ton Street (W=12m at present), so HPC should give priority to timely land acquisition and road development in the TOD area prior to UMRT operation.

4.22 Basic projects are composed of development of the common station plaza inside the hospital land and elevated walkway between the station and the hospital. As proposed, these facilities will be located inside the hospital land for convenience of users of both the station and the hospital. HPC should decide on how to acquire land from a part of the planned hospital area, and on how to finance such acquisition.

4.23 Resettlement is required on 6,400m² for priority roads development in the TOD area, whereas 35,700m² residential land is further required to develop trunk roads in the area within 500m radius.

4.24 The estimated costs for access improvement of C1 are shown in Table 4.2.1-1 for each project and in Table 4.2.1-2 by phase.

Table 4.2.1-1 Access Improvement Project List of C1

Category	ID	Project Name	Quantity	Estimated Cost (mil. VND)	Implementation Category	
Area within 500m Radius	a1	1. Improvement of Nguyen Hoang Ton St.	12,000m ² (12m x 1,000m)	21,000	Short (Minimum)	
		2. Widening of Nguyen Hoang Ton St.	51,200 m ² (64m x 800m)	91,000	Others ¹⁾	
		3. Development of RR2.5 (Nam Thang Long Street)	50,000 m ² (50m x 1,000m)	64,000	Others ¹⁾	
	a2	Widening/improvement of main secondary roads for pedestrians	1. Improvement	10,000 m ² (12.5m x 800m)	18,000	Short (Minimum)
			2. Widening	17,000 m ² (21.25m x 800m)	14,000	Others ¹⁾
	a3	Improvement of access alleys in Xuan Dinh Ward		20,800 m ² (4m x 5,200m)	45,000	Short (Minimum)
a4	Improvement of intersections		4 locations	800	Short (Minimum)	
Sub Total (excluding others)				84,800		
TOD Area	b1	Priority development of main roads in TOD area (RR2.5 and Nguyen Hoang Ton Street) ²⁾	14,000m ²	21,000	Short	
	b2	Development of shortcut road in UMRT Line 2 depot area	90 m ² (9m x 63m)	1,000	Short (Minimum)	
	b3	Development of elevated walkway under the UMRT viaduct	1,810 m ² (w=6m, L=200m)	89,000	Short (Minimum)	
	b4	Development of elevated walkway to provide direct connection between the UMRT station and the hospital area	420 m ² (w=6m, L=70m)	21,000	Basic	
	b5	Development of common station plaza (parking, loading& unloading space, walkway, lighting, green, sign, etc.)	7,400 m ²	19,000	Basic	
	b6	Provision of bus bays and intermodal facilities along PR2.5 and Nguyen Hoang Ton Street	2 locations	2,000	Short (Minimum)	
	b7	Improvement of traffic management in the TOD area (pedestrian crosswalks, signals, marking, etc)	4 signals 460m ² for marking	2,000	Short (Minimum)	
	Sub Total				155,000	
Total				239,800		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.2.1-2 Summary of Estimated Cost and by Phase for Access Improvement of C1

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a1-1, a2-1, b2, b3, b6, b7	178,800
	Short	b1	21,000
Basic		b4, b5	40,000
Total of TOD Project			239,800
Others (road development project in area within 500m radius)		a1-2, a1-3, a2-2	169,000
Grand total			408,800

Source: JICA Project Team

4.2.2 Ngoai Giao Doan Station (C2) Area

1) Identified Projects

4.25 The following projects were identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.2-1).

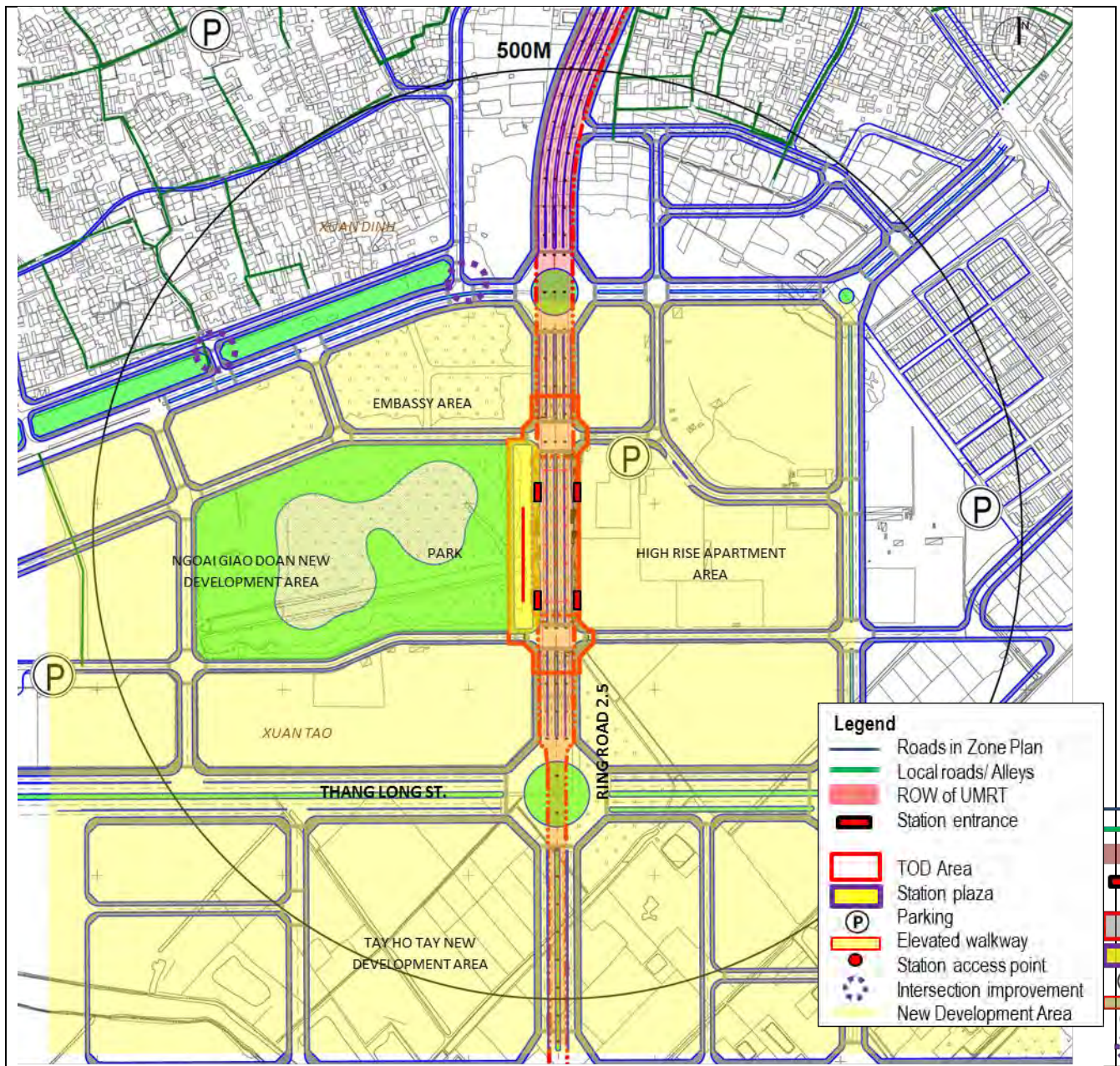
(a) Identified Projects within 500m radius Area

- (i) Development of RR2.5 and Thang Long Street: To ensure main access roads to the station, RR2.5 and Thang Long Street will be developed to connect to surrounding trunk roads.
- (ii) Development of distribution roads in new urban development area: New roads inside the development area will be developed in time to facilitate traffic flow around the station.
- (iv) Improvement of access alleys in Xuan Dinh Ward: Alley spaces will be properly managed to ensure connectivity to RR2.5, Xuan Dinh Street or the new road in the development area to access to the station.
- (iii) Improvement of intersections: At the intersection along new road at north of the station and RR2.5, intersections will be improved to ensure safe junction from alleys.

(b) Identified Projects in TOD Area

- (i) Development of station plaza on the park side of the station: To provide parking and service facilities in designated area around the park and station, the station plaza will be developed in front of the station inside of the park.
- (ii) Provision of bus and intermodal facilities at the station along RR2.5: To ensure smooth transfer between UMRT and buses, bus stops and loading/ unloading facilities will be developed along RR2.5.
- (iii) Improvement of traffic management: It is expected various types of citizens will visit the park and the station, so traffic safety needs to be ensured by providing traffic management facilities harmonized with the environment.

Figure 4.2.2-1 Identified Project Location Map of C2 Ngoai Giao Doan Station Area



Projects within 500m radius Area

1. Development of RR2.5 and Thang Long St.
2. Development of distribution roads in new urban development area
3. Improvement of access alleys in Xuan Dinh Ward
4. Improvement of intersections

Projects in TOD Area

1. Development of station plaza on the park side of the station
2. Provision of bus and intermodal facilities at the station along RR2.5
3. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement in 500m radius

4.26 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Development of RR2.5

4.27 Out of the development area, although the development of RR2.5 is committed by DOT, it is advisable to complete the section when the UMRT is in operation. In case the development and widening is not in time, the road for Line2 construction under the viaduct will be utilized as a temporal road instead of RR2.5 (W=6m, 2 directions).

4.28 Within 500-m radius from the station, estimated area needed include 7,500m² (including 7,500m² of residential area) for development of RR2.5.

(b) Development of Roads in New Urban Development Area

4.29 Inside the Ngoai Giao Doan development area, the developer has constructed the main roads (W=13.5m ~ 60.5m). So the access roads from RR3 will be ensured when the UMRT is in operation.

(c) Improvement of Xuan Dinh Street

4.30 In this station area, Xuan Dinh Street is the only road to provide important access to major urban facilities for local communities. The following measures should be implemented.

- (i) Improvement of sidewalk including installation of paved block for disabled, designating parking line in sidewalk, installation of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iii) Improvement of traffic management including marking of pedestrian crosswalks, installation of traffic signs

(d) Improvement of Alleys in Xuan Dinh Ward

4.31 In the existing residential areas in Xuan Dinh Ward, most alleys have no sidewalks, and the condition of pavement is bad. The following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installation of bench and information board at open space
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning

(e) Improvement of Intersections

4.32 In this station area, two intersections connecting local roads are identified for improving the access to Ngoai Giao Doan development area. It is proposed to install traffic signals, pedestrian crosswalks, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.33 Identified projects in TOD Area (20,000m²) are as follows (see Figure 4.2.1-2):

(a) Development of Station Plaza

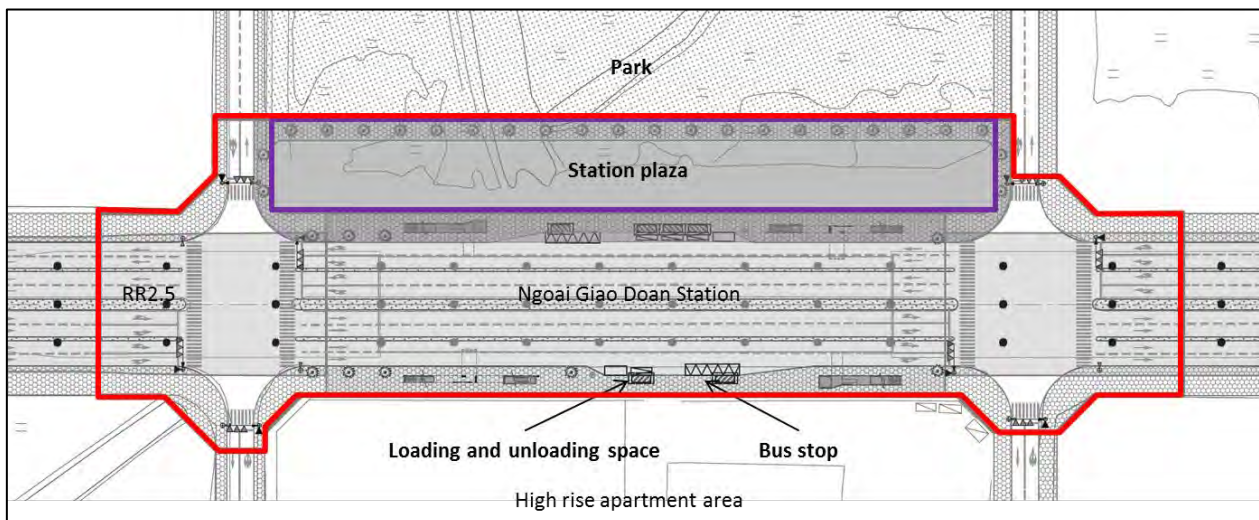
4.34 The station plaza is developed inside the park to ensure public space with service facilities for UMRT users and park visitors. Loading and unloading facilities are developed inside the sidewalk in front of the park. Inside the park, it is proposed to provide attractive and convenient facilities such as toilet, kiosk, police box, share bike rental facilities which are harmonized with the landscape of park.

- (i) Loading and unloading space along RR2.5
- (ii) Service facilities (toilet, kiosk, police box, share bike rental facilities, etc.)

(b) Provision of Bus Stops and Intermodal Facilities along RR2.5

4.35 The feeder bus services will be expanded from C1, C2 and C3 stations. For smooth transfer, bus stops will be developed along two trunk roads.

Figure 4.2.2-2 Station Plaza and Intermodal Facilities of C2 Ngoai Giao Doan Station



Source: JICA Project Team

(c) Traffic Management in the TOD Area

4.36 Inside the TOD Area, parking along carriageway and sidewalk is restricted, since the parking facilities are developed in the station plaza. To safe crossing of RR2.5, traffic signals and pedestrian crosswalks are installed at the intersections.

4) Summary of Access Improvement Projects

4.37 The total estimated cost is 32,500 million VND for short (minimum) projects.

4.38 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500m radius, development of station plaza, including parking inside the park, bus stop on the sidewalk, and traffic management. These projects using park or road land are implemented in coordination with authorities such as PMU of Ngoai Giao Doan Development and DOT.

4.39 There are no resettlements required for TOD project, while 7,500m² residential lands are required to develop trunk roads in the area within 500m radius.

4.40 The estimated costs for access improvement of C2 are shown in Table 4.2.2-1 for each project and Table 4.2.2-2 by phase.

Table 4.2.2-1 Access Improvement Project List of C2

Category	ID	Project Name	Quantity	Estimated Cost (mil. VND)	Implementation Category
Area within 500m Radius	a1	Development of RR2.5	20,000m ² (50m x 400m)	26,000	Others ²⁾
	a2	Development of secondary roads in new urban development area ¹⁾	(excluded)	(excluded)	Others ²⁾
	a3	Improvement of access alleys in Xuan Dinh ward	11,200m ² (5m x 2,200m)	24,000	Short (Minimum)
	a4	Improvement of intersections in the area within 500-m radius from the station	2 locations	400	Short (Minimum)
	Sub Total				24,400
TOD Area	b1	Development of station plaza on the park side of the station	2,600m ²	2,800	Short (Minimum)
	b2	Provision of bus bays and intermodal facilities along PR2.5 and Nguyen Hoang Ton Street	2 locations	1,200	Short (Minimum)
	b3	Improvement of traffic management in the TOD area (pedestrian crosswalks, signals, marking, etc)	8 signals 600m ² for marking	4,100	Short (Minimum)
	Sub Total				8,100
Total				32,500	

Source: JICA Project Team

- 1) Road sections inside of Ngoai Giao Doan development area have been developed by the private developer (ongoing).
- 2) Road development project in the area within 500m radius is excluded from TOD project.

Table 4.2.2-2 Summary of Estimated Cost and by Phase for Access Improvement of C2

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a3, a4, b1, b2, b3	32,500
	Short	-	0
Basic		-	0
Total of TOD Project			32,500
Others (road development project in area within 500m radius)		a1, a2	26,000
Grand total			58,500

Source: JICA Project Team

4.2.3 Tay Ho Tay Station (C3) Area

1) Identified Projects

4.41 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.3-1).

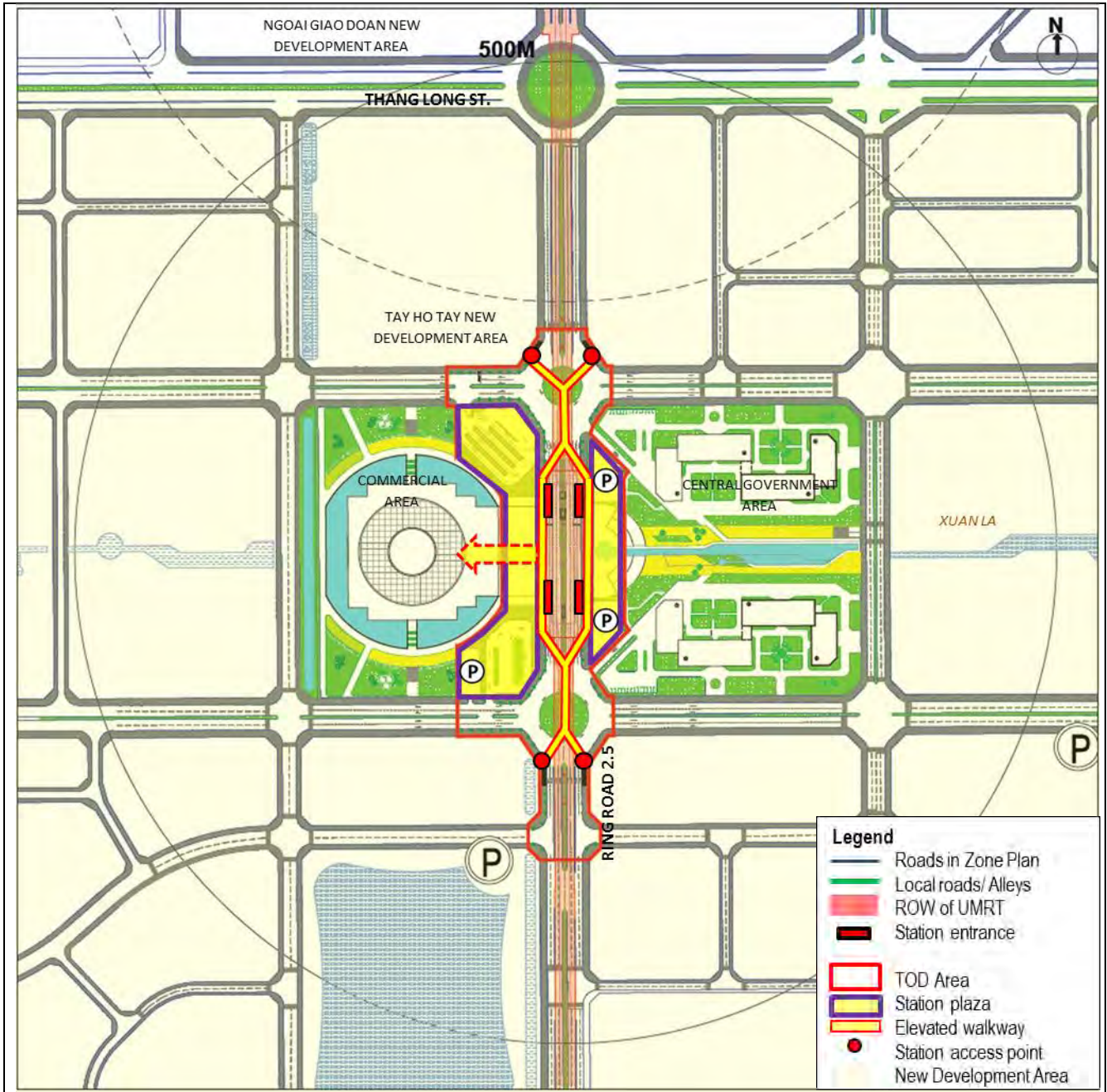
(a) Identified Projects within 500m radius Area

- (i) Development of RR2.5 and east- west roads at the station: To be a transport hub at the north of city center, regional road network will be formulated to connect to RR2, RR3 and other trunk roads.
- (ii) Development of distribution roads in new urban development area: In conjunction with Tay Ho Tay development, distribution road network will be developed in time to facilitate traffic flow around the station.
- (iii) Improvement of walkability in the area: To formulate a pedestrian oriented district, exclusive pedestrian spaces such as wide sidewalk, pedestrian mall, deck, etc. will be developed in the new development area.

(b) Identified Projects in TOD Area

- (i) Development of comprehensive station plaza on the both sides of the station: To provide feeder services extending to the north of Red River as well as circulation of new development area of west of the West Lake, station plazas will be developed at commercial area and central government area respectively.
- (ii) Development of elevated walkways under the UMRT viaduct along RR2.5: To cross a large intersection safe and to ensure direct access to the station, the pedestrian bridge under the viaduct will be developed for pedestrian and NMV.
- (iii) Provision of bus facilities at the station along RR2.5: Some bus routes will be stopped to load and unload passengers at bus stops along RR2.5 to ensure smooth transfer, rather than entering the bus terminal.
- (iv) Development of integrated UMRT extension bus terminal: To provide various types of feeder bus services to enhance public transport network integrated with UMRT serving for sub urban areas of north of the Red River, a new bus terminal will be developed at this station which various urban facilities will be clustered.
- (v) Improvement of traffic management: New type of traffic management measures will be applied in this new development area such as ITS, EV bus shuttle service, community bicycle services with appropriate traffic management measures.

Figure 4.2.3-1 Identified Project Location Map of C3 Tay Ho Tay Station Area



Projects within 500m radius Area

1. Development of RR2.5 and roads in new development area
2. Ensuring accessibility out of the new development area
3. Improvement of walkability in the area

Projects in TOD Area

1. Development of comprehensive station plaza on the both sides of the station
2. Development of elevated walkways under the UMRT viaduct along RR 2.5
3. Provision of bus facilities at the station along RR2.5
4. Development of integrated UMRT extension bus terminal
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement in 500m radius

4.42 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Development of RR2.5 and Roads in the New Development Area

4.43 In the station area in 500-m radius, all roads are developed by the developer, including RR2.5. So the access roads around the station should be completed in time for UMRT operation.

(b) Provision of local Circulation Bus Services

4.44 While accessibility is ensured inside the new development area, there are existing residential areas out of the development area, especially traditional villages in the east of RR2 around West Lake. Bus services for local circulation will be provided not only in the new development areas around C1, C2 and C3 stations, but also for the existing communities to connect to RR2 and RR3.

(c) Improvement of Walkability

4.45 In the new development areas, including a commercial area and an are of the central government, are promoted spaces for pedestrians and non-motorized vehicles (NMV), such as EV bus, shared EV motorcycles and bicycles. Improvement measures for walkways are as follows:

- (i) Provision of elevated/ underground walkway network connecting station and urban facilities
- (ii) Development of pedestrian street inside urban facilities (cf. shopping mall)
- (iii) Widening of pedestrian space by setback of urban facilities
- (iv) Designation of exclusive NMV space inside carriageway

3) Profile of Identified Projects in TOD Area

4.46 Identified projects in TOD Area (63,900m²) are as follows (see Figure 4.2.1-2):

(a) Development of Comprehensive Station Plaza on the Both Sides of the Station

4.47 In the TOD Area, 4 station plazas are developed in front of each side of the station. The western station plaza will provide feeder services covering the north-western part of the city and intermodal services for station users of commercial areas.

4.48 The eastern station plaza inside the central government area is to provide local circulation services covering governmental area and existing communities around RR2, and common parking facilities for the central government buildings.

4.49 To ensure a unified and modern landscape of Tay Ho Tay development area, the center of the development area will have open space with green and water for pedestrians, and station plazas will be located in the corner of the area.

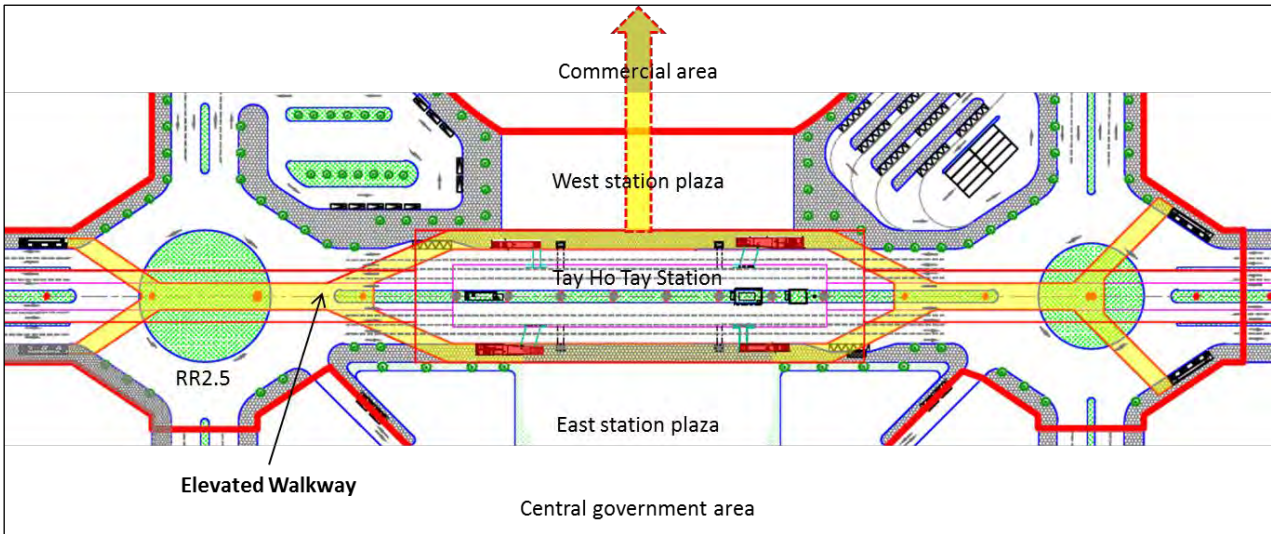
- (i) Western station plaza: bus terminal to provide UMRT relay bus and feeder bus services (9,000m²), rotary for taxi, car and motorcycles (7,000m²)
- (ii) Eastern station plaza: parking for motorcycles and bicycles, EV bus stops (9,000m²)

(b) Development of Elevated Walkway under the UMRT Viaduct

4.50 Under the viaduct of elevated UMRT, the pedestrian bridge is connected to cross intersection of two trunk roads, using the space under viaduct.

- (i) Pedestrian bridge under viaduct: L=130m at north and 150m at south, W=6m, H=7.6m

Figure 4.2.3-2 Layout Plan of Pedestrian Bridges



Source: JICA Project Team

(c) Provision of Bus Bays and Facilities in TOD Area along RR2.5

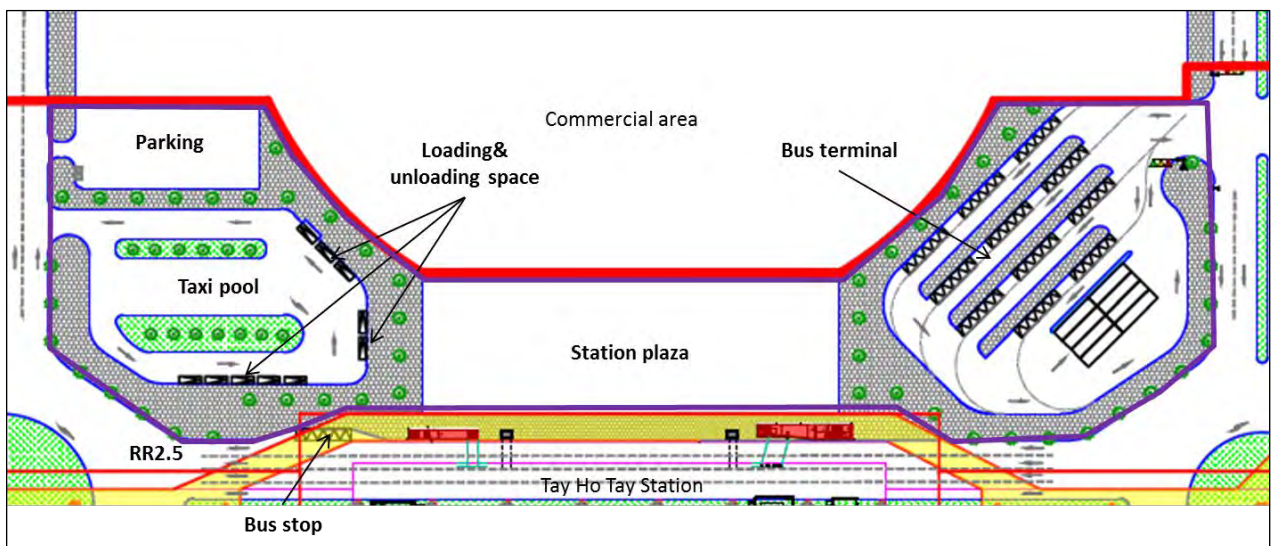
4.51 For smooth transfer of inner city buses, bus stops will be developed along RR2.

(d) Development of Integrated UMRT Extension Bus Terminal

4.52 As explained in the concept plan (Chapter3), the bus terminal is developed at C3 station to provide UMRT extension services and feeder bus services. For smooth transfer to the station and to the commercial area, the bus terminal is developed inside the commercial area, which has potential to develop multi-story bus terminal including commercial facilities.

- (ii) UMRT extension bus terminal: bus shelters with roof connecting to the station, benches, information boards, etc. (7,500m² of total area)

Figure 4.2.3-3 Layout Plan of West Station Plaza



Source: JICA Project Team

(e) Traffic Management in the TOD Area

4.53 Inside the TOD Area, parking along carriageway and sidewalk is restricted, since the parking facilities are developed in the station plaza. To safe crossing of RR2.5, traffic signals and pedestrian crosswalks are installed at the intersections.

4) Summary of Access Improvement Projects

4.54 The total estimated cost is 371,000 million VND, including 291,000 million VND (78% of total) for short (minimum) projects and 80,000 million VND (22% of total) for basic projects. In this station area, all roads will be newly developed by the private developer, so road projects are excluded from this TOD project.

4.55 Short (minimum) projects include the development of an elevated walkway inside the ROW of the UMRT system, the development of a bus stop on the sidewalk. These projects using ROW of UMRT or road lands are implemented in coordination with authorities such as DOT and MRB.

4.56 Basic projects include the development of the common station plaza inside the new development land and the elevated walkway. As proposed above, these facilities will be located inside the new development land for convenience of users of the station and the hospital, so HPC should decide on how to acquire land from a part of the new development area, and on how to finance such acquisition.

4.57 There is no resettlement needed for the TOD projects in this station area.

4.58 The estimated costs for access improvement of C3 are shown in Table 4.3.1-1 for each project and Table 4.3.1-2 by phase.

Table 4.2.3-1 Access Improvement Project List of C3

Category	ID	Project Name		Quantity	Estimated Cost (mil. VND)	Implementation Category
Area within 500m Radius	a1	Development of RR2.5 and east- west roads at the station ¹⁾		---	---	Others
	a2	Development of distribution roads in new urban development area ¹⁾		---	---	Short
	a3	Improvement of walkability in the area		---	---	Short
	Sub Total				0	
TOD Area	b1	Development of comprehensive station plaza on the both sides of the station	East station plaza	9,000m ²	20,000	Basic
			West station plaza	9,000m ²	29,000	Basic
	b2	Development of elevated walkways under the UMRT viaduct along RR 2.5	5,800m ² (w=6m, L=130m& 150m)	286,000	Short (Minimum)	
	b3	Provision of bus facilities at the station along RR2.5	Lump sum	1,000	Short (Minimum)	
	b4	Development of integrated UMRT extension bus terminal	7,500m ²	31,000	Basic	
	b5	Improvement of traffic management	Lump sum	4,000	Short (Minimum)	
	Sub Total				371,000	
Total					371,000	

Source: JICA Project Team

1) The station area within 500m radius has been developed by the private developer (ongoing).

Table 4.2.3-2 Summary of Estimated Cost and by Phase for Access Improvement of C3

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	b2, b3, b5	291,000
	Short	a2, a3	0
Basic		b1, b2, b4	80,000
Total of TOD Project			371,000
Others (road development project in area within 500m radius)			---
Grand total			371,000

Source: JICA Project Team

4.2.4 Buoi Station (C4) Area

1) Identified Projects

4.59 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.4-1).

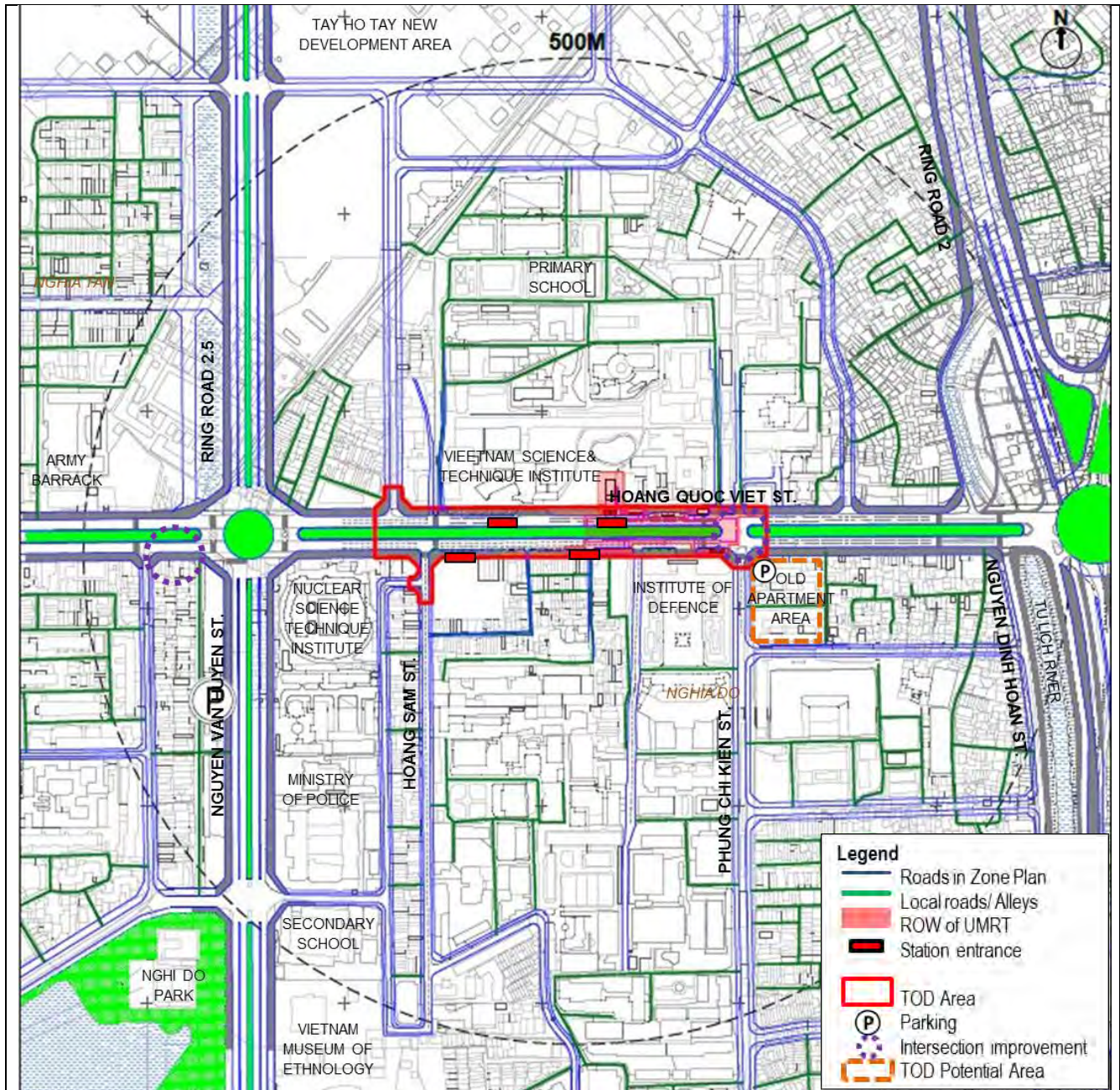
(a) Identified Projects within 500m radius Area

- (i) Development of RR2.5 and widening of Nguyen Van Huyen Street: To strengthen north and south connectivity around the station, RR2.5 including Nguyen Van Huyen Street will be developed and widened in time.
- (ii) Improvement of sidewalk and walking conditions of Hoang Quoc Viet Street, Hoang Sam Street, Phung Chi Kien Street and Nguyen Dinh Hoan Street: These are main access roads to the station, so pedestrian safety will be ensured with appropriate utilization of sidewalk spaces for parking and local socio-economic activities.
- (iii) Improvement of access alleys in Nghia Do and Nghia Tan wards: Conditions of alleys are better than other areas in terms of width and road surface, so its space will be shared both for traffic flow and local community space.
- (iv) Improvement of intersections: Traffic flow along Hoang Quoc Viet Street is much especially peak hour to connect to the city center, so intersections to connect this road will be improved to ensure smooth junction and pedestrian crosswalks.

(b) Identified Projects in TOD Area

- (i) Improvement of sidewalk and walking environment in the TOD Area: Main access spaces to the station are limited only sidewalk space along Hoang Quoc Viet Street, so this space will be properly shared for pedestrian and intermodal services.
- (ii) Provision of bus bays and facilities in TOD Area along Hoang Quoc Viet Street: Utilizing wide sidewalk space, loading and unloading facilities will be developed inside it for smooth transfer.
- (iii) Development of underground walkway and parking in consideration of redevelopment of old apartment area (TOD potential area): To provide commercial, civic service and parking services comprehensively, redevelopment of apartment area will be a potential to connect underground walkway and parking connecting to the station.
- (iv) Improvement of traffic management: To facilitate various traffic modes along the road, traffic management facilities such as signs and road markings will be installed.

Figure 4.2.4-1 Identified Project Location Map of C4 Bui Station Area



Projects within 500m radius Area

1. Development of RR2.5 and widening of Nguyen Van Huyen St.
2. Improvement of sidewalk of Hoang Quoc Viet St., Hoang Sam St., Phung Chi Kien St. and Nguyen Dinh Hoan St.
3. Improvement of access alleys in Nghia Do and Nghia Tan wards
4. Improvement of intersections

Projects in TOD Area

1. Improvement of walking environment in the TOD Area
2. Provision of bus bays and intermodal facilities in TOD Area along Hoang Quoc Viet Street
3. Development of underground walkway and parking in consideration of redevelopment of old apartment area (TOD potential area)
4. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement in 500m radius Area

4.60 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Development of RR2.5 and widening of Nguyen Van Huyen Street

4.61 Although the development of RR2.5 is committed by DOT, it is advisable to complete the section when the UMRT is in operation. When the development and widening is not in time, the road for Line2 construction under viaduct is utilized for a temporal road of RR2.5 (W=6m, 2 directions). Within 500m radius from the station, estimated area needed include 7,500m² (including 7,500m² of residential area) for development of RR2.5.

(b) Improvement of Sidewalk of Hoang Quoc Viet Street, Hoang Sam Street, Phung Chi Kien Street and Nguyen Dinh Hoan Street

4.62 In this station area, Hoang Quoc Viet Street is the only street to directly access the underground station. There are some secondary roads to connect from the residential areas to this street. The following measures should be implemented.

- (i) Improvement of sidewalk including installation of paved block for disabled, designating parking line in sidewalk, installation of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iii) Parking management including ensuring motorcycle and bicycle parking space inside sidewalks, designation of parking lines for motorcycle and bicycle

(c) Improvement of Alleys in Nghia Do Ward and Nghia Tan Ward

4.63 In this station area, urban blocks are clustered, so local road conditions are good enough to access the main roads (w=5m ~ 8m). For further improvement, the following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, lighting, installation of bench and information board at open space

(d) Improvement of Intersections

4.64 In this station area, two intersections are identified for improvement.

- (i) Location of intersections: (i) between Hoang Quoc Viet Street and Nguyen Van Huyen Street, (ii) Hoang Quoc Viet Street and Nguyen Dinh Hoan Street
- (ii) Improvement measure: installation of traffic signal and pedestrian crosswalks, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.65 Identified projects in TOD Area (21,500m²) are as follows (see Figure 4.2.4-2):

(a) Improvement of Walking Environment in the TOD Area

4.66 To utilize wide sidewalks on Hoang Quoc Viet Street (W=8m), walking space is improved to provide intermodal facilities, paved sidewalk, street furniture such as trees, benches and signs.

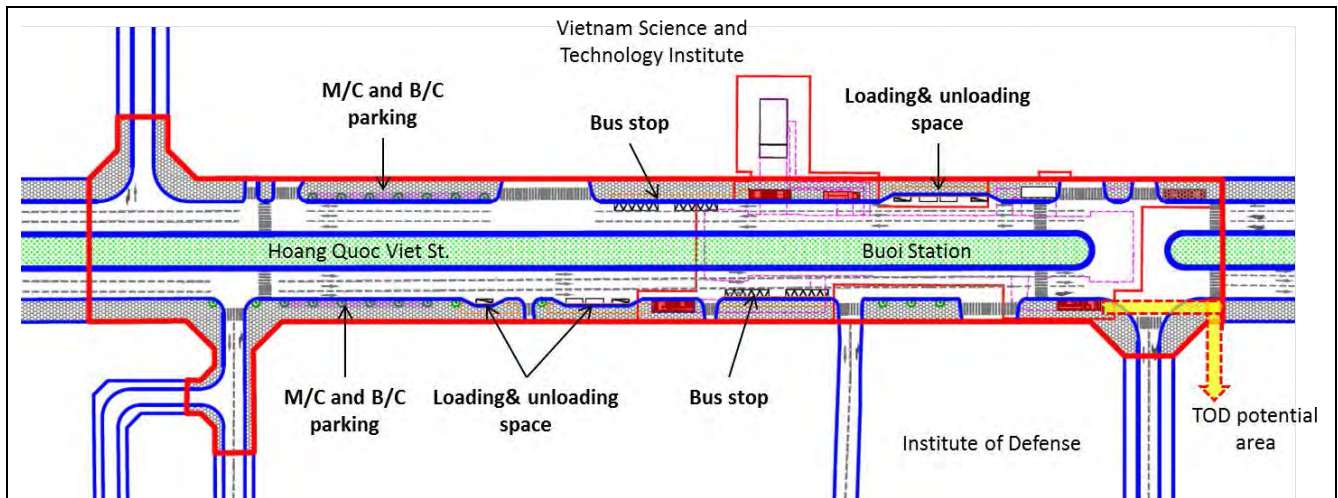
4.67 At the intersection, pedestrian signals for crossing are installed, and the pavement around the intersection is signalled with colored pavement.

(b) Provision of Bus Bays and Intermodal Facilities in TOD Area along Hoang Quoc Viet Street

4.68 To avoid traffic congestion caused by vehicles stopping around the station, loading and unloading space is developed along Hoang Quoc Viet Street by cutting sidewalk.

- (i) Loading and unloading space (W=2m, L=40m, both sides)
- (ii) Bus stops (W=2m, L=36m, both sides)
- (iii) Motorbike parking (W=2.5m, L=60m, both sides)

Figure 4.2.4-2 Bus Stops and Intermodal Facilities of C4 Bui Station



Source: JICA Project Team

(c) Development of Underground Walkway and Parking in Consideration of Redevelopment of Old Apartment Area (TOD Potential Area)

4.69 It is necessary to provide parking space around the station, especially urban facilities along Hoang Quoc Street such as Vietnam Institute of Science and Technology. There is potential to redevelop old apartment buildings in the south-east of the station to reconstruct a building complex with apartments, commercial and service facilities. This building will be connected to the station underground, and will provide underground parking (app. 4,800m²).

4) Summary of Access Improvement Projects

4.70 The total estimated cost is 563,000 million VND, including short (minimum) projects of 151,300 million VND (28% of total), basic projects of 415,000 million VND (72% of total).

4.71 Short (minimum) projects include the improvement of existing roads, alleys and intersections in the area within 500m radius, the development of a bus stop and intermodal facilities on the sidewalk, and traffic management. These projects using road land are implemented in coordination with authorities such as DOT.

4.72 Basic projects include the development of underground parking and walkway in conjunction with redevelopment of old apartment buildings. This project will be implemented by the private sector, including financing of underground walkway development in coordination with MRB.

4.73 There is no resettlement needed for these TOD project. For the road development project in the area within 500m radius, the resettlement of 20,300m² residential area is required.

4.74 The estimated costs for access improvement of C4 are shown in Table 4.2.4-1 for each project and Table 4.2.4-2 by phase.

Table 4.2.4-1 Access Improvement Project List of C4

Category	ID	Project Name		Quantity	Estimated Cost (Mil. VND)	Implementation Category
Area within 500m Radius	a1	Development of RR2.5	1. Development of RR2.5 (W=50m)	25,000m ² (50m x 500m)	32,000	Others ¹⁾
			2. Widening of Nguyen Van Huyen St. (W=50m)	7,500m ² (25m x 300m)	13,000	Others ¹⁾
	a2	Improvement of sidewalk and walking condition of Hoang Quoc Viet St., Hoang Sam St., Phung Chi Kien St. and Nguyen Dinh Hoan St.		26,100 m ² (W=3~8m, L=4,500m)	70,000	Short (Minimum)
	a3	Improvement of access alleys in Nghia Do, Nghia Tan wards		30,000m ² (W=3m, L=10,000m)	64,000	Short (Minimum)
	a4	Improvement of traffic management for smooth movement of pedestrian and vehicles		4 locations	800	Short (Minimum)
	Sub Total (excluding others)					134,800
TOD area	b1	Improvement of sidewalk and walking environment in the TOD area ²⁾		4,900m ²	13,000	Short (Minimum)
	b2	Provision of bus bays and intermodal facilities along Hoang Quoc Viet Street		Lump sum	3,000	Short (Minimum)
	b3	Development of underground walkway and parking in consideration of redevelopment of old apartment area (TOD potential area)	1. Underground walkway	180m ² (6m x 30m)	24,000	Basic
			2. Underground parking	4,800m ² (60m x 80m)	391,000	Basic
	B4	Improvement of traffic management (sign, marking, etc.)		10 sets of signs 360m ² for marking	500	Short (Minimum)
	Sub Total					431,500
Total					566,300	

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.2.4-2 Summary of Estimated Cost and by Phase for Access Improvement of C4

Project Type		Included Project ID	Estimated Cost (Mil. VND)
Short	Minimum	a3, a4, b1, b2, b4	151,300
	Short	-	0
Basic		b3-1, b3-2	415,000
Total of TOD Project			566,300
Others (road development project in area within 500m radius)		a1, a2	45,000
Grand total			611,300

Source: JICA Project Team

4.2.5 Quan Ngua Station (C5) Area¹

1) Identified Projects

4.75 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.5-1):

(a) Identified Projects for 500m radius Area

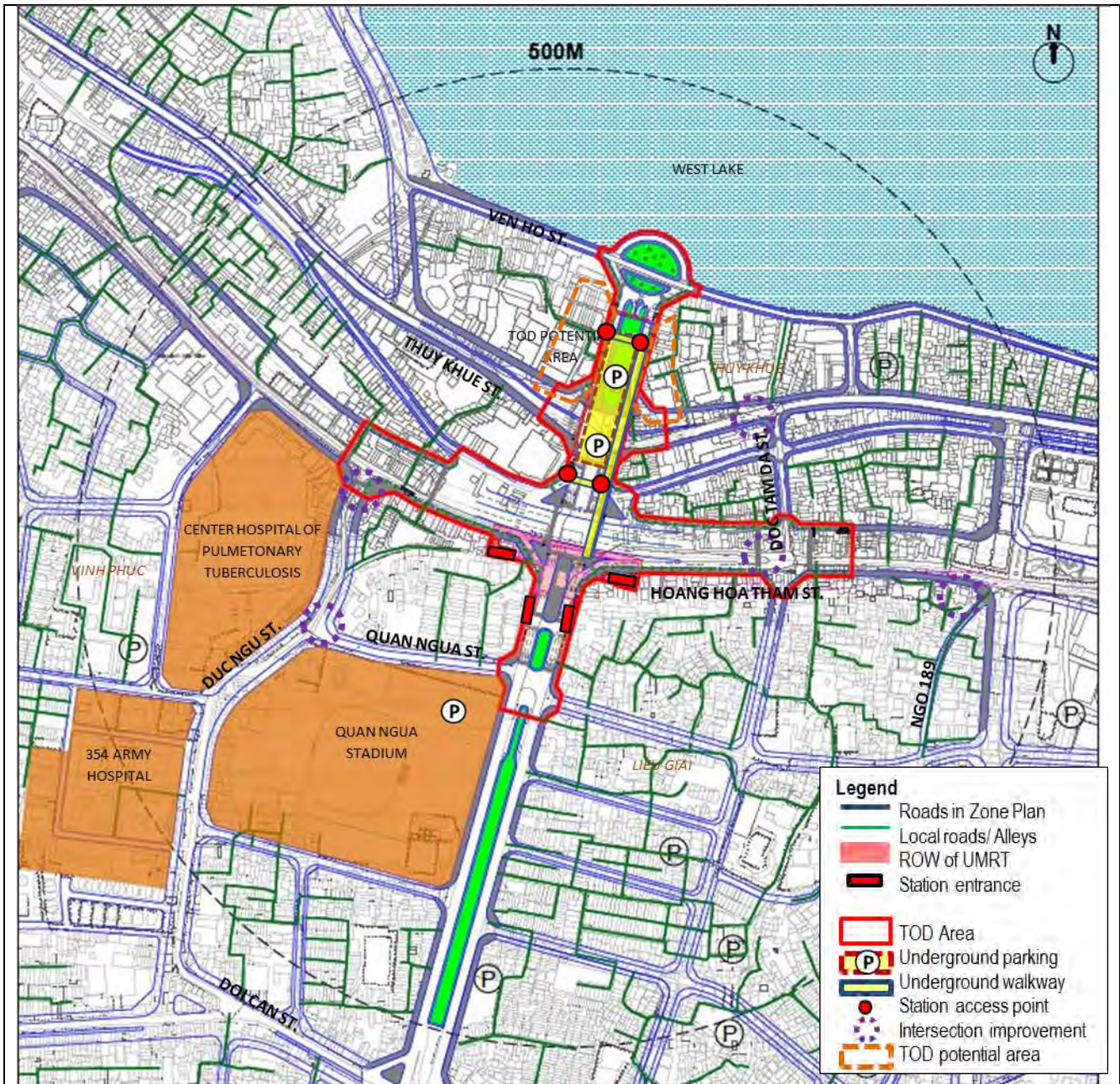
- (i) Widening of Hoang Hoa Tham St. and Thuy Khue Street: The station will be located at the intersection, so trunk roads will be widened timely to provide sufficient transport and pedestrian space around the station.
- (ii) Improvement of Duc Ngu Street, Ngo 189 and Doc Tam Da Street: These roads are important for visitors of urban facilities such as hospitals, temples, local market, as well as local communities to connect to alleys, so pedestrian spaces will be ensured to separate from traffic.
- (iii) Improvement of alleys in Thuy Khue, Lieu Giai Ward and Vinh Phuc Ward: Most of station areas are high-dense residential areas, so alleys will be improved to share limited space among motorcycles, pedestrians and other modes by providing road facilities and regulating traffic flow to prioritize pedestrians.
- (iv) Improvement of intersections: Intersections will be improved by providing markings, signals and pedestrian crosswalks to ensure smooth junctions from alleys and distribution roads to trunk roads.

(b) Projects in TOD Area

- (i) Priority development of main roads in TOD Area: As mentioned above, widening projects of Hoang Hoa Tham Street and Thuy Khue Street will be implemented in conjunction with UMRT project to ensure appropriate station access space.
- (ii) Development of integrated underground walkway and parking: To be a gateway of the West Lake, underground space will be utilized integrated with UMRT station to provide parking and walkway which will be connected roadside facilities and the lakeside terrace.
- (iii) Provision of bus and intermodal facilities along Hoang Hoa Tham Street and Van Cao Street: Bus stops and loading and unloading facilities will be developed along trunk roads with provision of pedestrian space to the station entrance.
- (iv) Improvement of traffic management: Large intersections and flyover make station users difficult to find orientation and location of station, so traffic management facilities such as signs, lights, pedestrian crosswalks will be installed properly with street furniture and green to attract road spaces.

¹ There is another option of the station location to shift to north of the flyover of Van Cao St. and Hoang Hoa Tham St. intersection to which won't require land acquisition of private land.

Figure 4.2.5-1 Identified Project Location Map of C5 Quan Ngua Station Area



Projects within 500m radius Area

- (1) Widening of Hoang Hoa Tham St. and Thuy Khue St.
- (2) Improvement of Duc Ngu, Ngo 189 and Doc Tam Da streets
- (3) Improvement of alleys in Thuy Khue, Lieu Giai Ward and Vinh Phuc Ward
- (4) Utilization of roads inside Vietnam Institute of Science and Technology at north and military areas at south
- (5) Improvement of intersections

Projects in TOD Area

- (1) Priority development of Hoang Hoa Tham St. and Thuy Khue St. in TOD Area
- (2) Development of integrated underground walkway and parking
- (3) Provision of bus bays and intermodal facilities along Hoang Hoa Tham St. and Van Cao St.
- (4) Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius

4.76 Identified projects for access improvement in the area within 500-m radius are as follows:

(a) Widening of Hoang Hoa Tham Street and Thuy Khue Street

4.77 Although widening Hoang Hoa Tham Street and Thuy Khue Street are committed by DOT, it is advisable to complete the section when the UMRT is in operation. If widening works are delayed, at least the following measures should be implemented.

- (i) Improvement of sidewalk including repaving, marking of pedestrian crosswalks,
- (ii) Improvement of traffic management including restricting encroachment of commodities of roadside shops, designating parking line, installation of traffic signs

4.78 In this project, Hoang Hoa Tham Street is widened from 13.5 to 53.5 meter, and Thuy Khue Street from 12 to 25 meter in the station area. Estimated area needed for widening include 20,000m² for Hoang Hoa Tham Street (L=500m excluding flyover section), and 7,540m² (L=580m).

(b) Improvement of Duc Ngu Street, Doc Tam Da Street and Ngo 189

4.79 In this station area, secondary roads provide great access to major urban facilities, especially Duc Ngu Street to hospitals, Doc Tam Da Street to local market area, and Ngo 189 to temples and hotel. The following measures should be implemented.

- (i) Improvement of sidewalk including installation of paved block for disabled, designating parking line in sidewalk, installation of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iii) Improvement of traffic management including restriction of car entry during peak-hour of local market, marking of pedestrian crosswalks, installation of traffic signs

4.80 In this project, Duc Ngu Street is widened from 8.5 to 22 meter, Doc Tam Da Street from 13.5 to 26 meter, and Ngo 189 from 7.5 to 17.5 meter. Estimated area needed for widening include 4,000m² (L=300m) for Duc Ngu Street, 1,500m² (L=130m) for Doc Tam Da Street, and 6,000m² (L=600m) for Ngo 189.

(c) Improvement of Alleys in Thuy Khue Ward, Lieu Giai Ward and Vinh Phuc Ward

4.81 In this station area, alleys that are connected to trunk roads are occupied by local shops and motorbike parking. Especially in Lieu Giai Ward, secondary roads are limited, and most alleys are narrow with no sidewalk (W=2 – 6 meter), so pedestrians and motorbikes share the space. The following measures should be implemented:

- (i) Improvement of alleys including drainage, pavement, installation of benches and information boards in the open space
- (ii) Improvement of traffic management including speed limit for motorbikes, restriction of car entry during peak-hour of local market, lighting

(d) Utilization of Roads inside Vietnam Institute of Science and Technology at North and Military Areas at South

- (i) Since the station is located between large public and military facilities, accessibility between east and west is limited. It is proposed to utilize roads of these facilities for public purpose.

(e) Improvement of Intersections

4.82 In this station area, six intersections are identified for improvement.

- (i) Location of intersections: (1) between Hoang Hoa Tham Street and Doc Ngu Street, (2) between Doc Ngu Street and Quan Ngu Street, between Doc Ngu Street and Doi Can Street, (3) between Hoang Hoa Tham Street and Ngo 189, (4) between Hoang Hoa Tham Street and Doc Tam Da Street, and (5) between Thuy Khue Street and Doc Tam Da Street.
- (ii) Improvement measures: installation of traffic signal and pedestrian crosswalks, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.83 Identified projects in TOD Area (61,300m²) are as follows:

(a) Priority Development of Roads in TOD Area

4.84 Inside the proposed TOD Area, there are three trunk roads (Van Cao Street, Hoang Hoa Tam Street, Thuy Khue Street.) which will be widened in compliance with the Zone Plan. Priority development road area in TOD Area is as follows:

- (i) Hoang Hoa Tam Street: L=315.0m, W=53.5m (17,000m²)
- (ii) Thuy Khue Street: L=80.0m, W=25.0m (2,000m²)

(b) Development of Integrated Underground Walkway and Parking in Conjunction with Redevelopment along Van Cao Street

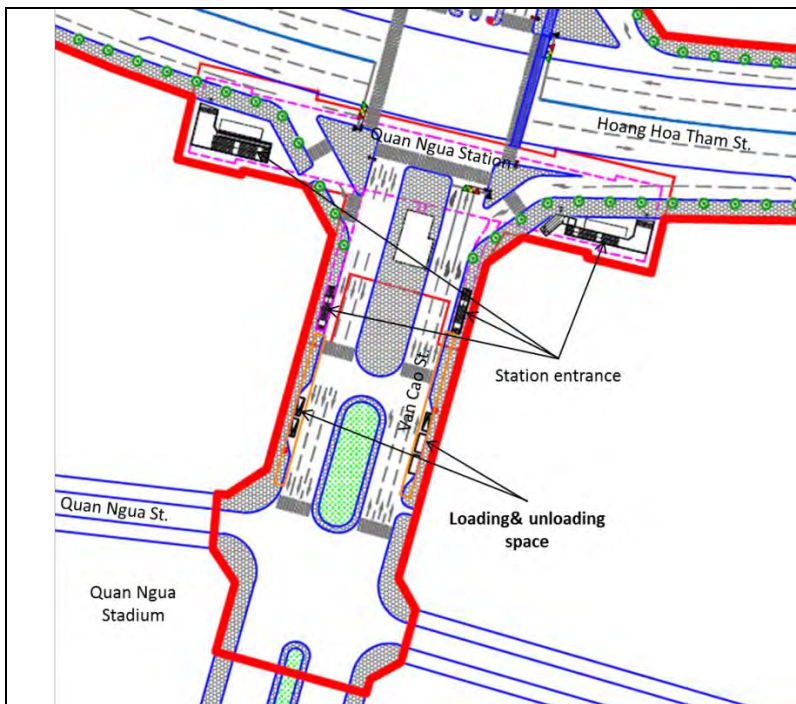
4.85 Taking opportunity to widen Van Cao Street in front of the West Lake, underground space is utilized to develop the underground parking and extend underground walkway from the station to the West Lake. It is proposed to develop a lakeside terrace inside the lake to enjoy scenery and natural breeze.

- (i) Underground parking is composed of 3 underground floors, with 11.5 ha parking space, and four entrances. The structure size is 45.5 meter (width) x 160m (length)
- (ii) Underground walkway is connected under the sidewalk along east of Van Cao Street (W=3m, L=330m) and two walkways are crossed to west of Van Cao Street (W=3m, L=50m).

(c) Provision of Bus Stops and Intermodal Facilities along Hoang Hoa Tham Street and Van Cao Street

4.86 For smooth transfer near to the station entrance, intermodal facilities are developed along Van Cao Street, since it is difficult to load/ unload along Hoang Hoa Tham Street because of the flyover. Bus bays are located near to the station entrance along Van Cao Street, and near to secondary roads (Doc Ngu Street and Doc Tam Da Street) along Hoang Hoa Tham Street.

Figure 4.2.5-2 Layout Plan of Intermodal facilities



Source: JICA Project Team

Figure 4.2.5-3 Layout Plan of Underground Parking and Walkway

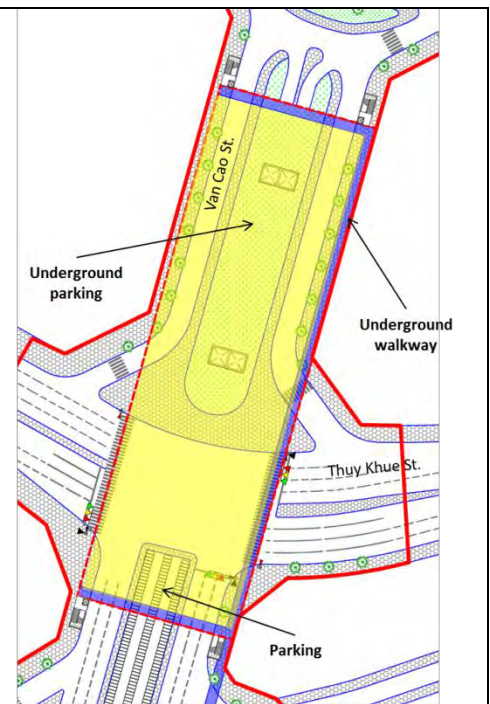
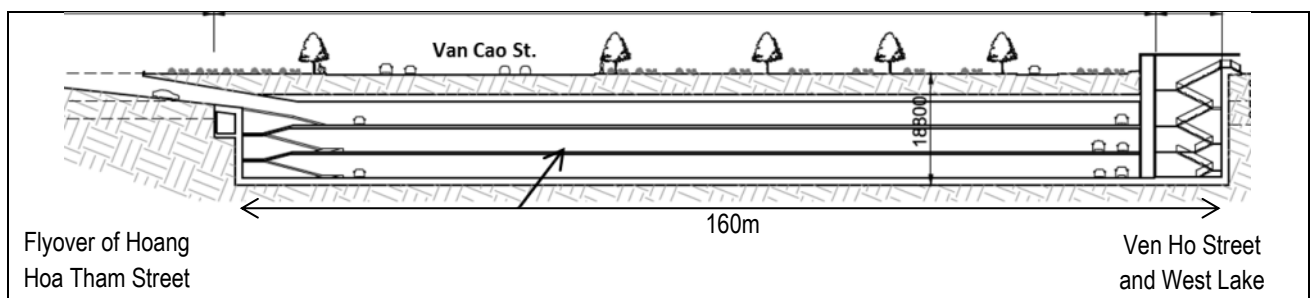


Figure 4.2.5-4 Cross Section of Underground Parking along Van Cao Street



Source: JICA Project Team

(d) Improvement of traffic management

4.87 Inside the TOD Area, pedestrian signals, road markings, traffic signs and street trees are installed to improve safety and comfort around the station.

4) Summary of Access Improvement Projects

4.88 The total estimated cost is 940,600 million VND, including short (minimum) projects of 121,600 million VND (13% of total), short projects of 34,000 million VND (4% of total), basic projects of 785,000 million VND (83% of total).

4.89 Short (minimum) projects are composed of existing road improvement including alleys and intersections in the area within 500m radius, bus stop and intermodal facility development inside sidewalk, and traffic management. These projects using road lands are implemented in coordination with authorities such as DOT.

4.90 Short projects are composed of primary road development in the TOD area, including

widening of Hoang Hoa Tham St. and Thuy Khue St. HPC should prioritize to promote land acquisition and road development in TOD area in time for UMRT operation.

4.91 Basic projects are composed of development of underground parking and walkway along Van Cao St. This project uses only road lands without additional land acquisition, and will be implemented in conjunction with urban redevelopment of roadside facilities and in front of the West Lake, which the private sector is interested in. These developers will be able to develop underground parking and walkway together with commercial development.

4.92 Resettlement is required 18,600m² for priority road development roads in TOD area, while 17,800m² residential lands is further required to develop trunk roads in the area within 500m radius.

4.93 The estimated costs for access improvement of C5 are shown in Table 4.2.5-1 for each project and Table 4.2.5-2 by phase.

Table 4.2.5-1 Access Improvement Project List of C5

Category	ID	Project Name	Quantity	Estimated Cost (Mil. VND)	Implementation Category	
Area within 500m Radius	a1	Widening of Hoang Hoa Tham St. and Thuy Khue Streets	1. Improvement	13,000m ²	25,000	Short (Minimum)
			2. Widening	28,000 m ²	50,000	Others ¹⁾
	a2	Improvement of Doc Ngu, Ngo 189, Doc Tam Da Streets	1. Improvement	7,600 m ²	14,000	Short (Minimum)
			2. Widening	11,000m ²	19,000	Others ¹⁾
	a3	Improvement of Access Alleys in Thuy Khue, Ngoc Ha and Vinh Phuc Wards	36,000 m ² (W=3m, L=12,000m)	77,000	Short (Minimum)	
a4	Improvement of Intersections	6 locations	1,000	Short (Minimum)		
Sub Total (excluding others)				117,000		
TOD Area	b1	Priority Development of Roads in TOD Area ²⁾	19,000m ²	34,000	Short	
	b2	Development of Integrated Underground Walkway and Parking	1. Underground Walkways	1,000m ²	133,000	Basic
			2. Underground Parking	8,000m ³	652,000	Basic
	b3	Provision of bus bays and intermodal facilities along Hoang Hoa Tham St. and Van Cao St	Lump sum	800	Short (Minimum)	
	b4	Improvement of traffic management	Lump sum	3,800	Short (Minimum)	
Sub Total				823,600		
Total				940,600		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.2.5-2 Summary of Estimated Cost and by Phase for Access Improvement of C5

Project Type		Included Project ID	Estimated Cost (Mil. VND)
Short	Minimum	a1-1, a2-1, a3, a4, b3, b4	121,600
	Short	b1	34,000
Basic		b2-1, b2-2	785,000
Total of TOD Project			940,600
Others (road development project in area within 500m radius)		a1-2, a2-2	69,000
Grand total			1,009,600

Source: JICA Project Team

4.2.6 Bach Thao Station (C6) Area

1) Identified Projects

4.94 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.6-1):

(a) Identified Projects for 500m radius Area

- (i) Widening of Hoang Hoa Tham Street and Thuy Khue Street including development of connecting road between the two: The station will be located under Thuy Khue Street which will be widened and connected to Hoang Hoa Tham Street, so these road projects will be implemented in conjunction with UMRT project.
- (ii) Improvement of alleys in Ngoc Ha Ward and Thuy Khue Ward: Most of local roads are composed of narrow alleys, so improvement of alleys will be promoted not only physical improvement but also managing utilization of space such as speed control, parking ban, regulation of local commercial activities, etc.
- (iii) Study for development of new access road to connect between station and the West Lake: It is expected to connect the station to the West Lake at ground and underground, so appropriate location of access road and measures will be studied further including the Women's Union, residential complex, high school and local residential area.
- (iv) Improvement of intersections: Intersections between trunk roads and alleys will be improved to ensure smooth junction and safe pedestrian crosswalks.

(b) Projects in TOD Area

- (i) Priority development of main roads in TOD Area: New connecting road development and widening of two trunk roads will be prioritized to ensure smooth traffic flow and pedestrian space.
- (ii) Development of underground walkway connecting the station with Bach Thao Park: In conjunction with UMRT and road development, underground walkway will be extended to south connecting to Bach Thao Park to provide an exclusive station access space for high-dense residential areas in Ngoc Ha Ward.
- (iii) Development of underground parking in conjunction with redevelopment of TOD potential area: The land of Hanoi Green Company is designated as parking after station construction in the Zone Plan, so it is a good opportunity to construct station building with commercial and civic services as well as underground parking and walkway.
- (iv) Provision of bus bays and intermodal facilities along Hoang Hoa Tham Street and Thuy Khue Street: Bus stops and loading and unloading facilities will be developed along trunk roads with provision of pedestrian space to the station entrance.
- (v) Improvement of traffic management: Traffic management around the station will be studied further both in present road network and in future road network, which urban structure and traffic flow around the station will be drastically changed.

Figure 4.2.6-1 Identified Project Location Map of C6 Bach Thao Station Area



Projects within 500m radius Area

1. Widening of Hoang Hoa Tham Street and Thuy Khue Street including development of connecting road between the two.
2. Improvement of alleys in Ngoc Ha Ward and Thuy Khue Ward
3. Study for development of new access road to connect between station and the West Lake
4. Improvement of intersections

Projects in TOD Area

1. Priority development of roads in TOD Area
2. Development of underground walkway connecting the station with Bach Thao Park
3. Development of underground parking in conjunction with redevelopment of TOD potential area
4. Provision of bus bays and intermodal facilities along Hoang Hoa Tham St. and Thuy Khue St.
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius Area

4.95 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Widening of Hoang Hoa Tham Street and Thuy Khue Street including Development of Connecting Road between the Two.

4.96 Although the widening of Hoang Hoa Tham Street and Thuy Khue Street are committed by DOT, it is advisable to complete the section when the UMRT is in operation. When the widening is not in time, at least the following measures should be implemented.

- (i) Improvement of sidewalk including repaving, marking of pedestrian crosswalks, etc.
- (ii) Improvement of traffic management including restricting encroachment of commodities of roadside shops, designating parking line, installation of traffic signs

4.97 In this project, Hoang Hoa Tham Street is widened from 13.5 to 53.5 meter, and Thuy Khue Street from 12 to 25 meter in the station area. Estimated area needed for widening and development include 11,500m² for Hoang Hoa Tham Street (L=300m), and 1,300m² (L=500m), and 3,400m² (L=100m), respectively.

(b) Improvement of Alleys in Ngoc Ha Ward and Thuy Khue Ward

4.98 In this station area, alleys which are connected to trunk roads are occupied by local shops and motorbike parking. Especially in Ngoc Ha Ward, the secondary road is limited, and most of alleys are narrow without sidewalk (W=2 – 6 meter), which pedestrian and motorbike share the space. The following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installation of bench and information board at open space
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning

(c) Study for Development of New Access Roads to Connect between Station and the West Lake

4.99 Between Thuy Khue Street and Ven Ho Street in Thuy Khue Ward, urban facilities such as the Vietnam Women's Center, Co Co residential apartment complex, high school are clustered, so there are no access roads for public to go to the West Lake. It is proposed to study to ensure access roads directly from the station to the West Lake, including utilizing private lands, developing underground walkway, etc.

(d) Improvement of Intersections

4.100 In this station area, seven intersections are identified for improvement, where alleys connect to main roads directly, and congested intersections around schools.

- (i) Improvement measures: installation of traffic signal and pedestrian crosswalks, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.101 Identified projects for access improvement in TOD Area (24,600m²) are as follows:

(a) Priority Development of Roads in TOD Area

4.102 Inside the proposed TOD Area, there are three trunk roads (Hoang Hoa Tam Street, Thuy Khue Street, new connecting road) that will be widened and developed in compliance with the Zone Plan. Priority development road area in TOD Area is as follows:

- (i) Hoang Hoa Tam Street: L=200m, W=53.5m (10,000m²)
- (ii) Thuy Khue Street: L=200m, W=25.0m (5,000m²)
- (iii) New connecting road: L=200m, W=25.0m (5,000m²)

(b) Development of Integrated Underground Walkway Connecting the Station with Bach Thao Park

4.103 To improve accessibility to Bach Thao Park and residential areas in Ngoc Ha Ward without crossing trunk roads of Hoang Hoa Tam Street and Ngoc Ha Street, underground walkway is developed extending to the south. It is developed in conjunction with development of station, new connecting road and construction of station complex in the TOD project area including underground parking, so it is efficiently developed in terms of cost, time and reduction of negative impacts related to construction activities.

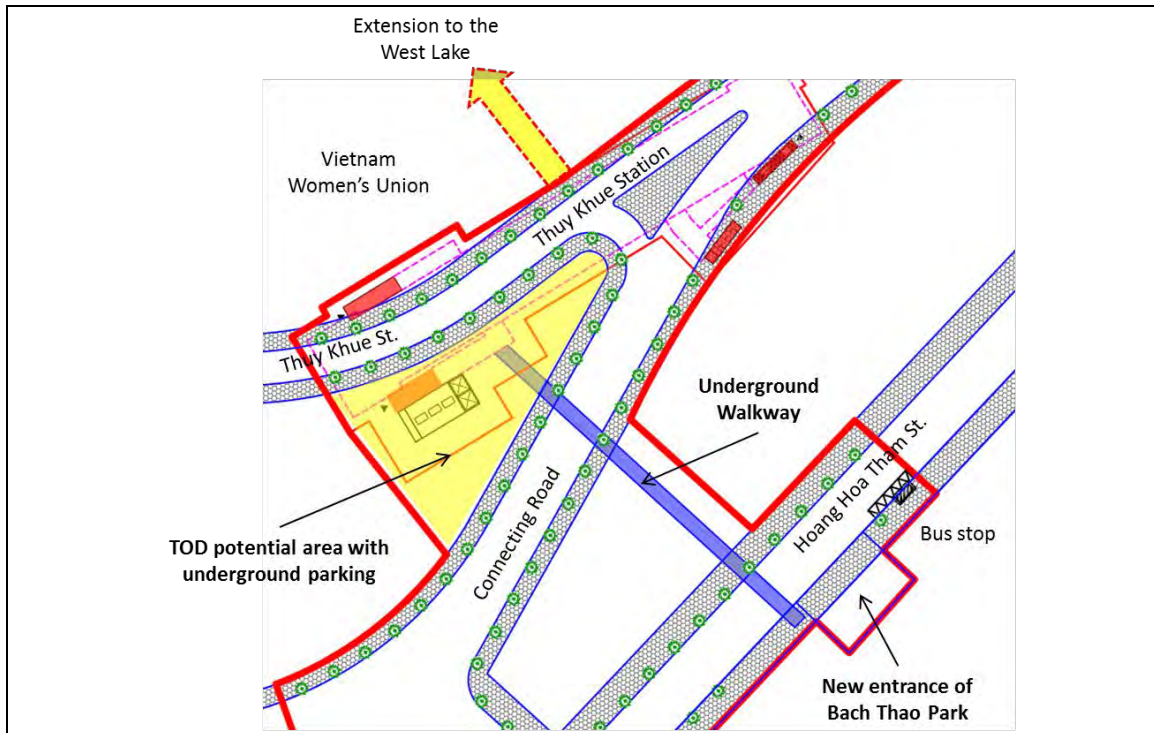
- (i) Underground walkway: W=4m, L=100m (4,000m²), 1 entrance with elevator
- (ii) New entrance of Bach Thao Park connecting to the underground walkway

(c) Development of Underground Parking in conjunction with Redevelopment of TOD Potential Area

4.104 In the UMRT Line2 construction project, the Hanoi Green Company which the underground station will be relocated. In the Zone Plan, this land is designated as the parking land. It is proposed not only installation of station entrance and ancillary facility inside ROW of UMRT, but also comprehensive development of station complex using the TOD potential area, to maximize development potential of this station area and to ensure parking spaces.

- (i) Station complex: commercial, civic service (1,200m² x 10 floors)
- (ii) Underground facility: parking, walkway (1,200m² x 2 floors)

Figure 4.2.6-2 TOD Potential Area connecting with Station and Underground Walkway



Source: JICA Project Team

(d) Provision of Bus Stops along Thuy Khue Street

4.105 For smooth transfer near to the station entrance, bus stops are developed along Thuy Khue Street. Because the station is located in the curve of the street, as an exception loading and unloading space is not developed in this station area.

(e) Improvement of Traffic Management

4.106 Inside the TOD Area, pedestrian signals, road markings, traffic signs and street trees are installed to improve safety and comfort around the station.

4) Summary of Access Improvement Projects

4.107 The total estimated cost is 988,200 million VND, including short (minimum) projects of 78,200 million VND (8% of total), short projects of 41,000 million VND (4% of total), basic projects of 869,000 million VND (88% of total).

4.108 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500m radius, development of a bus stop and intermodal facilities inside ROW of UMRT or sidewalk, and traffic management. These projects using road land are implemented in coordination with authorities such as MRB and DOT.

4.109 Short projects include development of primary roads in the TOD area, including widening Hoang Hoa Tham St., Thuy Khue St and new development of a connecting road. HPC should give priority to land acquisition and road development in the TOD area in time for UMRT operation.

4.110 Basic projects include the development of underground parking and walkway using TOD potential area after relocation of Hanoi Green Company, and road lands. It is promoted to implement the project in conjunction with UMRT station and road development, by using private

investment for integrated commercial development with underground facilities.

4.111 5,500m² require resettlement for priority road development roads in the TOD area, while 14,300m² of residential land is required to develop trunk roads in the area within 500-m radius.

4.112 The estimated costs for access improvement of C6 are shown in Table 4.2.6-1 for each project and in Table 4.2.6-2 by phase.

Table 4.2.6-1 Access Improvement Project List of C6

Category	ID	Project Name	Quantity	Estimated Cost (Mil. VND)	Implementation Category	
Area within 500m Radius	a1	Widening of Hoang Hoa Tham Street and Thuy Khue Street including development of connecting road between the two	1. Improvement	23,400m ²	42,000	Short (Minimum)
			2. Widening and development	38,500m ²	69,000	Others ¹⁾
	a2	Improvement of alleys in Ngoc Ha and Thuy Khue Wards	15,000m ² (W=3m, L=5,000m)	32,000	Short (Minimum)	
	a3	Study for development of new access road to connect between station and the West Lake	---	-	Short (Minimum)	
	a4	Improvement of intersections	8 locations	1,900	Short (Minimum)	
	Sub Total				75,900	
TOD area	b1	Priority development of roads in TOD area ²⁾	20,600m ²	41,000	Short	
	b2	Development of underground walkway connecting the station with Bach Thao Park	400m ² (W=4m, L=100m)	54,000	Basic	
	b3	Development of underground parking in conjunction with redevelopment of TOD potential area	10,000m ²	815,000	Basic	
	b4	Provision of bus bays and intermodal facilities along Hoang Hoa Tham St. and Thuy Khue St	2 locations	1,200	Short (Minimum)	
	b5	Improvement of traffic management (signals, signs, marking, etc.)	7 signals 1,130m ² for marking	1,100	Short (Minimum)	
	Sub Total				912,300	
Total				988,200		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.2.6-2 Summary of Estimated Cost and by Phase for Access Improvement of C6

Project Type		Included Project ID	Estimated Cost (Mil. VND)
Short	Minimum	a1-1, a2, a3, a4, b4, b5	78,200
	Short	b1	41,000
Basic		b2, b3	869,000
Total of TOD Project			988,200
Others (road development project in area within 500m radius)		a1-2	69,000
Grand total			1,057,200

Source: JICA Project Team

4.2.7 Ho Tay Station (C7) Area

1) Identified Projects

4.113 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.7-1):

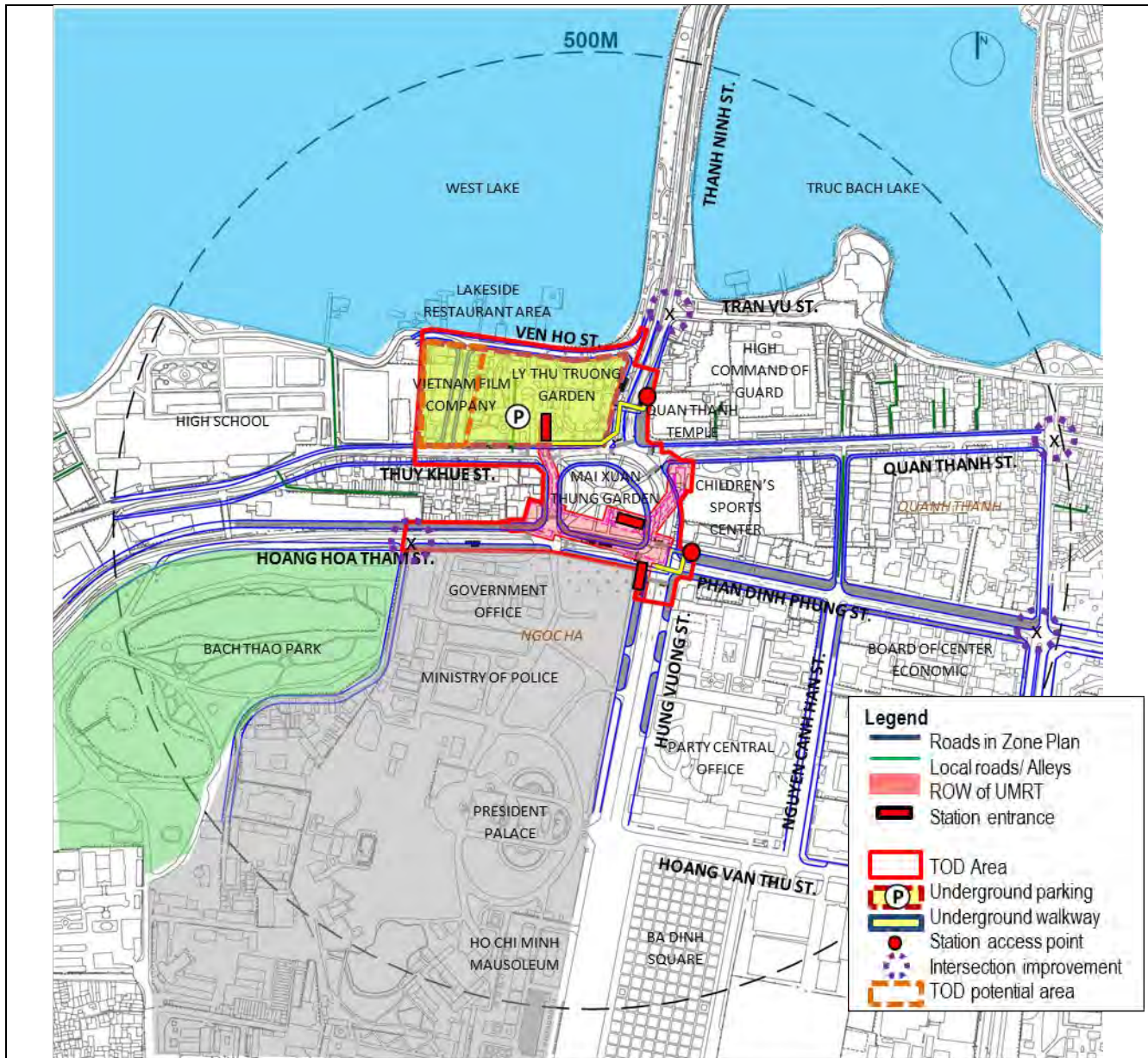
(a) Identified Projects for 500m radius Area

- (i) Improvement of Hoang Hoa Tham, Thuy Khue, Thanh Nien, Hung Vuong, Quan Thanh Street and Phan Dinh Phung Street: Road conditions of this station area with government area are good compared to other station areas, so road spaces will be further improved in terms of appropriate traffic flow and pedestrian crosswalks.
- (ii) Improvement of Ven Ho Street and Tran Vu Street: Streets along the West Lake will be improved in terms of streetscape and amenity.
- (iii) Development of access road connecting to the West Lake between Vietnam Film Company and Ly Thu Truong Garden: New access road to the West Lake will be developed in conjunction with redevelopment of Vietnam Film Company land.
- (iv) Improvement of alleys in Quan Thanh Ward and Ngoc Ha Ward: Since trunk road network is formulated, alleys are not expanded in this station area. Through traffic will be restricted inside the block to secure safety and tranquility of government area.
- (v) Improvement of intersections: There are many intersections of trunk roads, so pedestrian crosswalks with signals will be ensured.

(b) Projects in TOD Area

- (i) Priority development of main roads located in the TOD Area: Widening road projects in the TOD Area will be promoted in conjunction with UMRT development to ensure enough pedestrian space and smooth traffic flow.
- (ii) Development of two underground walkways: To enhance catchment area of station, underground walkways will be extended to the government area of east and temple and the West Lake at north.
- (iii) Development of underground parking under Mai Xuan Thung Garden and Ly Thu Truong Flower Garden: To preserve traditional and environmental space around the station as well as to provide a fringe parking of the city center, parking facilities will be developed underground utilizing park and road spaces.
- (iv) Provision of bus and intermodal facilities along Hoang Hoa Tham Street and Thuy Khue St: To ensure smooth transfer along two trunk roads, loading and unloading spaces will be developed inside park and sidewalk space near to the station entrance.
- (v) Improvement of traffic management: Rotary around the garden will be improved to facilitate traffic circulation and ensure safe pedestrian crosswalks.

Figure 4.2.7-1 Identified Project Location Map of C7 Ho Tay Station Area



Projects within 500m radius Area

1. Improvement of Hoang Hoa Tham, Thuy Khue, Thanh Nien, Hung Vuong, Quan Thanh Street and Phan Dinh Phung Street
2. Improvement of Ven Ho Street and Tran Vu Street
3. Development of access road connecting to the West Lake between Vietnam Film Company and Ly Thu Truong Garden
4. Improvement of alleys in Quan Thanh Ward and Ngoc Ha Ward
5. Improvement of intersections

Projects in TOD Area

1. Priority development of the roads located in the TOD Area
2. Development of two underground walkways
3. Development of underground parking under Mai Xuan Thung Garden and Ly Thu Truong Flower Garden
4. Provision of bus stops and intermodal facilities along Hoang Hoa Tham St. and Thuy Khue St
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius

4.114 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Improvement of Hoang Hoa Tham Street, Thuy Khue Street, Thanh Nien Street, Hung Vuong Street, Quan Thanh Street and Phan Dinh Phung Street

4.115 This station area is located in Ba Dinh political area, where many trunk roads come from all directions. There are wide sidewalks of these roads, except for west side of Hoang Hoa Tham Street (W=15m at present) and Thuy Khue Street (W=12m at present). Although the widening of Hoang Hoa Tham Street and Thuy Khue Street are committed by DOT, it is advisable to complete the section when the UMRT is in operation. When the widening is not in time, at least the following measures should be implemented.

- (i) Improvement of sidewalk including repaving, marking of pedestrian crosswalks, etc.
- (ii) Improvement of traffic management including restricting encroachment of commodities of roadside shops, designating parking line, installation of traffic signs

4.116 In the Zone Plan, most trunk roads around the government house will be widened. Estimated area needed for widening and development include 5,500m² for Hoang Hoa Tham Street (W=25m, L=550m), 6,900m² for Thuy Khue St (W=25m, L=530m), 300m² for Hung Vuong St (W=38m, L=30m at the east of flower garden), and Quan Thanh St between Hung Vuong Street and Dang Tat Street (W=21m, L=200m).

(b) Improvement of Ven Ho Street and Tran Vu Street

4.117 These lakeside streets are prioritized for pedestrians who enjoy the scenery. For improvement, colored pavement of sidewalks, streetlights and furniture are installed in harmony with the landscape (lake and temples). It is preferable to ban motorbike parking along these streets.

(c) Development of Access Road Connecting to the West Lake between Vietnam Film Company and Ly Thu Truong Garden

4.118 In the Zone Plan, the access road is planned to connect between Thuy Khue Street and Ven Ho Street, using the land of Vietnam Film Company. It is promoted to develop this street (W=12m, L=120m) in conjunction with redevelopment of this facility.

(d) Improvement of Alleys in Quan Thanh Ward and Ngoc Ha Ward

4.119 In this station area, there are few local roads so local communities do not have difficulties to access the trunk roads. Traffic management is required to restrict car entry, parking ban, etc. after UMRT starts operation.

3) Profile of Identified Projects in TOD Area

(a) Priority Development of Roads in TOD Area

4.120 Inside the proposed TOD Area, there are three trunk roads (Hoang Hoa Tam Street, Thuy Khue Street, new connecting road) that will be widened and developed in compliance with the Zone Plan. Priority development of road in the TOD Area is as follows:

- (i) Hoang Hoa Tam Street: L=150m, W=25m
- (ii) Thuy Khue Street: L=190m, W=25.0m
- (iii) Hung Vuong Street: L=40m, W=38m

(b) Development of Two Underground Walkways

4.121 To avoid conflicts between pedestrians and heavy traffic around the flower garden, underground walkways are extended toward West Lake and Ministries using sidewalk and road space. For effective implementation, the project will be implemented as part of underground parking development.

- (i) Underground walkway connecting to Thanh Ninh Street.: W=4m, L=120m (4,000m²), two entrances with one elevator
- (ii) Underground walkway connecting to Phan Dinh Phung Street.: W=4m, 60m (240m²), one entrance

(c) Development of Underground Parking under Ly Thu Truong Flower Garden and Vietnam Film Company land

4.122 In the Zone Plan, underground parking under Ly Tu Trong Flower Garden is planned. To maximize underground space utilization in this station area, underground space of Vietnam Film Company will be developed integrated with urban redevelopment project. It is noted that won't be feasible to develop underground parking under Mai Xuan Thuong Flower Garden which there are many large trees which won't be cut or replant.

- (i) Underground parking of Ly Thu Truong Flower Garden and Vietnam Film Company land: 12,000m²

(d) Provision of Bus Stops and Intermodal Facilities along Hoang Hoa Tham Street and Thuy Khue Street

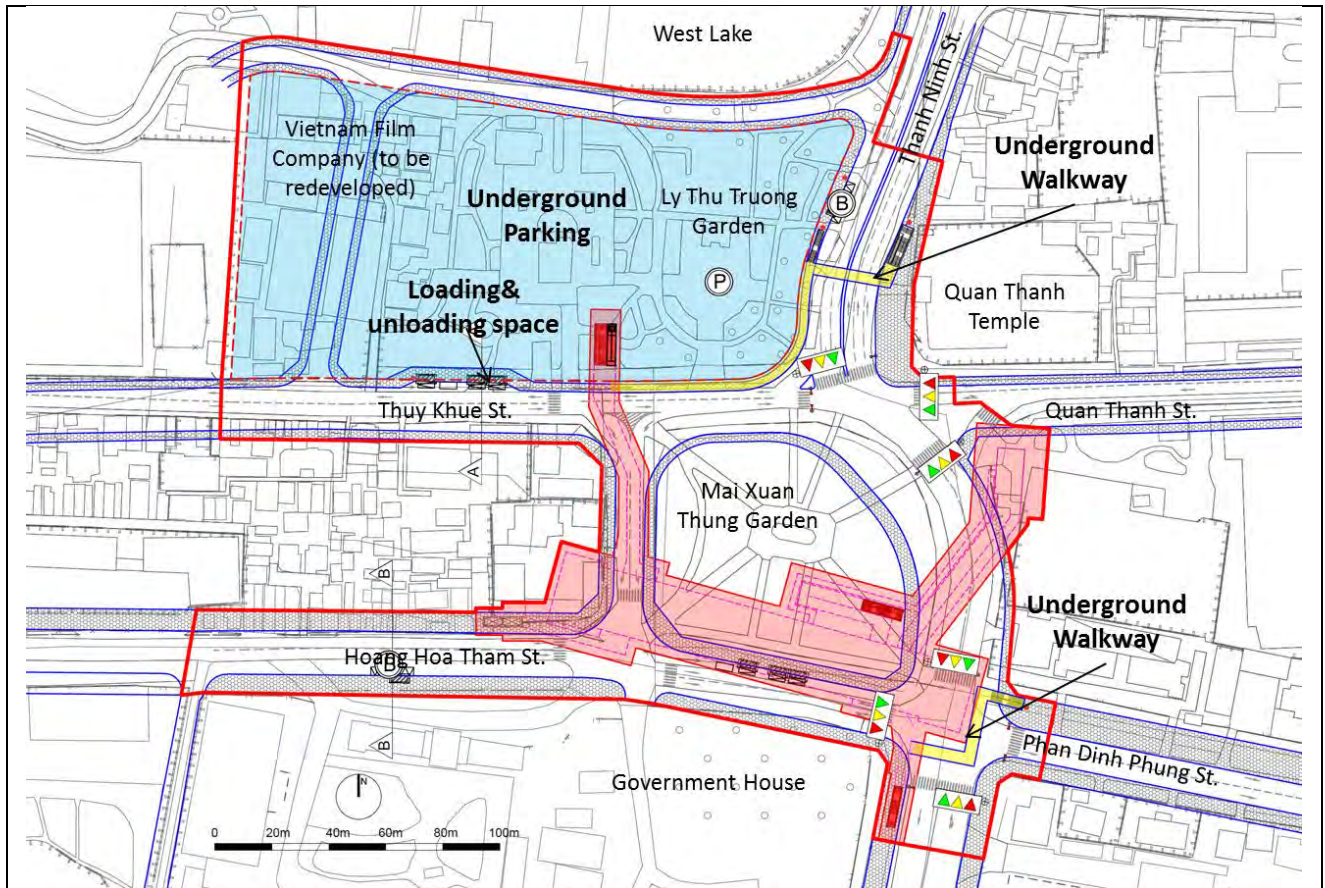
4.123 To avoid traffic congestion caused by vehicles stopping around the station, loading and unloading space is developed along Hoang Quoc Viet Street by cutting the sidewalk.

- (i) Loading and unloading space along Thuy Khue Street: W=2m, L=40m, north side
- (ii) Bus stop along Hoang Ho Tham Street: W=2m, L=20m, south side
- (iii) Bus stops along Thanh Ninh Street: W=2m, L=20m, west side

(e) Improvement of Traffic Management

4.124 Inside the TOD Area, pedestrian signals, road markings, traffic signs and street trees are installed to improve safety and comfort around the station.

Figure 4.2.7-2 Layout Plan of Underground Parking and Walkway of Ho Tay Station



Source: JICA Project Team

4) Summary of Access Improvement Projects

4.125 The total estimated cost is 1,243,800 million VND, including short (minimum) projects of 158,800 million VND (13% of total), short projects of 10,000 million VND (1% of total), basic projects of 1,075,000 million VND (86% of total).

4.126 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500-m radius, development of a bus stop and intermodal facilities inside ROW of UMRT or sidewalk, and traffic management. These projects using road land are implemented in coordination with authorities such as MRB and DOT.

4.127 Short projects include development of primary road in the TOD area, widening of Hoang Hoa Tham St., Thuy Khue St. and Hung Vuong St. and new road development connecting to West Lake. HPC should give priority to land acquisition and road development in the TOD area in time for UMRT operation.

4.128 Basic projects include the development of underground parking and walkway inside flower gardens and road lands. It is promoted to implement the project in conjunction with UMRT station and road development, by using private investment for commercial development integrated with underground facilities.

4.129 There is no resettlement needed for these TOD projects, whereas 2,500m² residential land is required to widen the trunk roads in the area within 500m radius.

4.130 The estimated costs for access improvement of C7 are shown in Table 4.2.7-1 for each project and Table 4.2.7-2 by phase.

Table 4.2.7-1 Access Improvement Project List of C7

		Project Name	Quantity	Estimated Cost (mil. VND)	Implementation Category	
Area within 500m Radius	a1	Improvement of Hoang Hoa Tham St., Thuy Khue St., Thanh Nien St., Hung Vuong St., Quan Thanh St., Phan Dinh Phung St.	1. Improvement	55,000m ²	97,000	Short (Minimum)
			2. Widening	3,000m ²	6,000	Others ¹⁾
	a2	Improvement of Ven Ho St., Tran Vu St.	9,800	17,000	Short (Minimum)	
	a3	Development of access road connecting to the West Lake between Vietnam Film Company and Ly Tu Truong Garden	1,800 (15m x 120m)	2,000	Others ¹⁾	
	a4	Improvement of access alleys in Thuy Khue Ward and Quan Thanh Ward	5,000m ² (W=5m, L=1,000m)	11,000	Short (Minimum)	
	a5	Improvement of intersections	4 locations	800	Short (Minimum)	
Sub Total (excluding others)				127,800		
TOD area	b1	Priority development of main roads in the TOD area (Hoang Hoa Tham Str., Thuy Khue Str., Hung Vuong Str., Quan Thanh Str.) ²⁾	4,400m ²	8,000	Short	
	b2	Development of two underground walkways	720m ² (W=4m, L=180m)	97,000	Basic	
	b3	Development of underground parking under Ly Tu Trong Flower Garden and Vietnam Film Company land	12,000m ²	978,000	Basic	
	b4	Provision of bus bays and facilities along Hoang Hoa Tham St. and Thuy Khue St	Lump sum	30,000	Short (Minimum)	
	b5	Improvement of traffic management	Lump sum	3,000	Short (Minimum)	
	Sub Total				1,116,000	
Total				1,243,800		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.2.7-2 Summary of Estimated Cost and by Phase for Access Improvement of C7

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a1-1, a2, a4, a5, b4, b5	158,800
		a1-2, a3, b1	10,000
Basic		b2, b3	1,075,000
Total of TOD Project			1,243,800
Others (road development project in area within 500m radius)			6,000
Grand total			1,249,800

Source: JICA Project Team

4.2.8 Hang Dau Station (C8) & Long Bien Nam Station (V6) Area

1) Identified Projects

4.131 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.8-1):

(a) Identified Projects for 500m radius Area

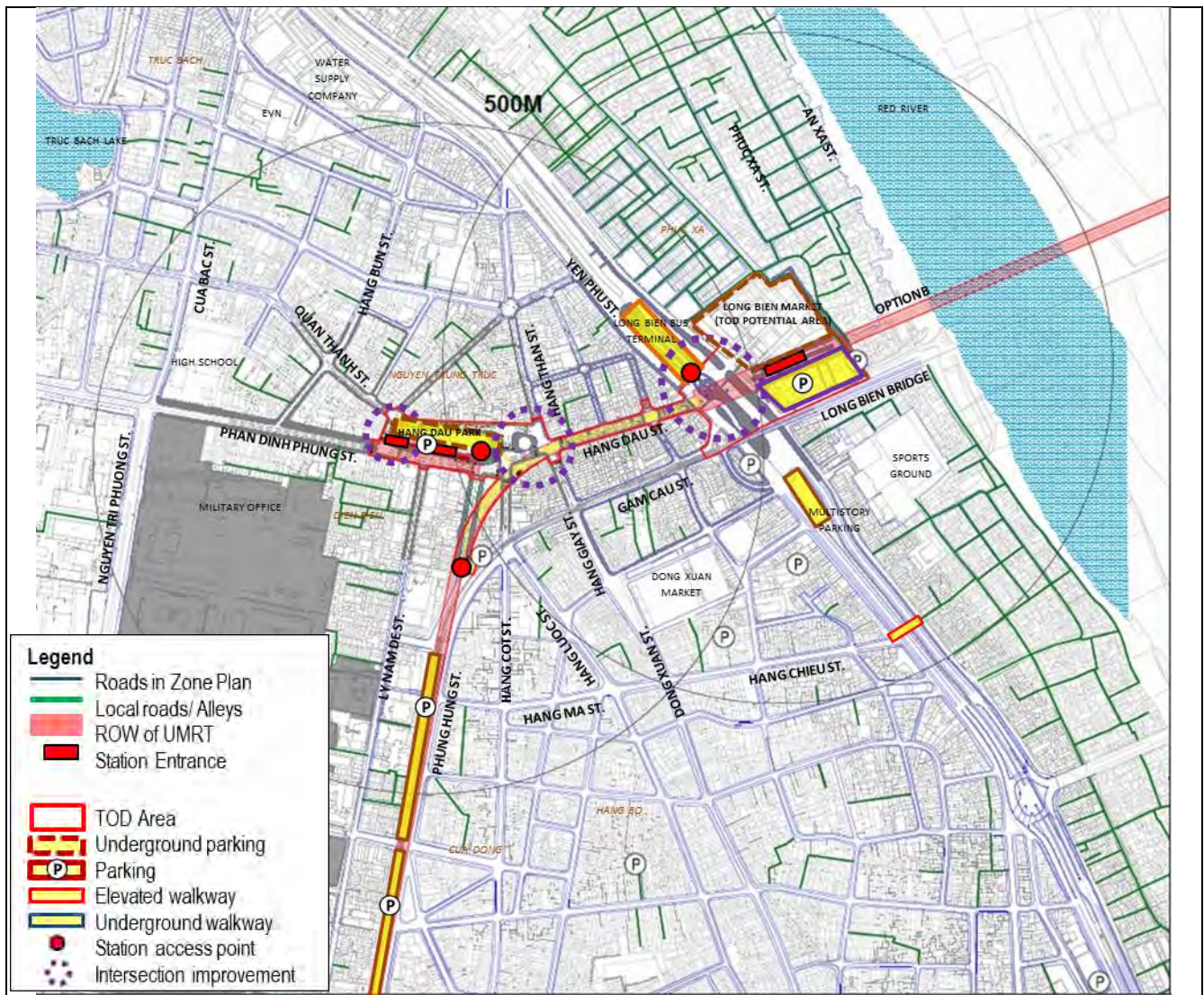
- (i) Strengthening of traffic management to regulate vehicle traffic flow and improvement of walkability: To formulate a pedestrian oriented district of the Ancient Quarter, traffic management measures will be studied comprehensively.
- (ii) Improvement of sidewalk of Pham Dinh Phung Street, Quan Thanh Street, Hang Dau Street, Gam Cau Street, Yen Phu Street: Since overall road network and its structure of the AQ won't be changed, sidewalk spaces will be secured for walking, while ensuring roadside socio-economic activities to some extent.
- (iii) Provision of pedestrian bridge crossing Tran Nhat Duat Street to connect to Hang Chieu Street: To enhance accessibility from out of dyke area, the pedestrian bridge will be developed connecting to the east of the AQ.
- (iv) Development of parking facilities along dyke roads (Yen Phu Street and Tran Nhat Duat Street) and Phung Hung Street: To provide fringe parking spaces around the AQ, wide road space of dyke roads and space under UMRT Line1 viaduct along Phung Hung Street will be used for parking.
- (v) Improvement of alleys in Nguyen Trung Truc Ward, Hang Dau Ward, Hang Giay Ward, Hang Cot Ward and Phuc Xa Ward: Urban structure with alley network is one of traditional values of the AQ, so the spaces will be improved to share for traffic flow, walking as well as local socio-economic activities.
- (vi) Development of new bus service and NMT space using to-be-abandoned VNR section including Long Bien Bridge section: To preserve Long Bien Bridge and VNR property around the AQ, it will be rehabilitated to provide transport space for bus, pedestrian, motorbike and bicycle which people enjoy scenery of the Red River and to ensure exclusive space without cars.
- (vii) Development of local circulation minibus and community bike service: Local transport services in the city center will be provided to provide feeder services at and around station for commuting and tourism to convert private vehicles to shared ones.
- (viii) Improvement of intersections: To facilitate through traffic and transport access to the AQ, intersections along trunk roads around the station will be improved.

(b) Projects in TOD Area

- (i) Provision of bus and intermodal facilities along Pham Dinh Phung Street and Quan Thanh Street: To ensure smooth transfer to the station, loading and unloading facilities will be developed along trunk roads near to Hang Dau Station.
- (ii) Development of elevated walkway under the viaduct of UMRT Line 1 to connect V8 and C6 stations and Long Bien Bus Terminal: To provide exclusive pedestrian walkway directly connecting to the stations and bus terminal, pedestrian bridge under the UMRT Line1 viaduct will be developed.

- (iii) Development of station plaza of Line 1 on Long Bien Market land: The station plaza will be developed between Line1 station and Long Bien Bridge to facilitate various traffic modes access to the station, and provide openspace to enjoy scenery of Long Bien Bridge and the Red River.
- (iv) Development of underground parking and commercial facility development under Hang Dau Park: In conjunction with Hang Dau station development, underground space of the park will be developed to provide parking and commercial facilities connecting to the station.
- (v) Improvement of traffic management: There are many intersections at and around station which are congested at present, so it is required to study further to facilitate traffic flow and improve traffic management around intersections.

Figure 4.2.8-1 Identified Project Location Map of C8 Hang Dau & V6 Long Bien Nam Area



Projects within 500m radius Area

1. Strengthening of traffic management to regulate vehicle traffic flow and improvement of walkability
2. Improvement of sidewalk of Pham Dinh Phung St., Quan Thanh St., Hang Dau St., Gam Cau St., Yen Phu St.
3. Provision of pedestrian bridge crossing Tran Nhat Duat St. to connect to Hang Chieu St.
4. Development of parking facilities along dyke roads (Yen Phu St. and Tran Nhat Duat St.) and Phung Hung St.
5. Improvement of alleys in Nguyen Trung Truc Ward, Hang Dau Ward, Hang Giay Ward, Hang Cot Ward and Phuc Xa Ward
6. Development of new bus service and NMT space using to-be-abandoned VNR section including Long Bien Bridge section
7. Development of local circulation minibus and community bike service
8. Strengthening of traffic management in and around the Ancient Quarter

Projects in TOD Area

1. Provision of intermodal facilities along Pham Dinh Phung Street and Quan Thanh Street
2. Development of elevated walkway under the viaduct of UMRT Line 1 to connect V8 and C6 stations and Long Bien Bus Terminal
3. Development of station plaza of Line 1 on Long Bien Market land
4. Development of underground parking and commercial facility development under Hang Dau Park
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius Area

4.132 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Strengthening of Traffic Management to Regulate Vehicle Traffic Flow and Improvement of Walkability

4.133 To realize the pedestrian oriented district of the Ancient Quarter, it is necessary to restrict vehicle entry to the AQ and to ensure walking space for pedestrian by regulating parking and commercial activities along sidewalk. UMRT development provides a good opportunity to implement comprehensive traffic management measures. At least the following measures should be implemented:

- (i) Provision of parking spaces around the Ancient Quarter to restrict vehicle entry
- (ii) Improvement of traffic management including restricting encroachment of commodities of roadside shops, designating parking line, installation of traffic signs

4.134 Inside the AQ, there are many challenges and good examples to manage traffic as follows (the coverage of streets and periods will be expanded):

- (i) Designate pedestrian streets for night market with provision of temporal parking spaces around these streets
- (ii) Designate carriageway for temporal motorbike parking during daytime
- (iii) Regulation of entry time for vehicles of goods distribution around Dong Xuan Market

4.135 In addition, the following measures are also applied to reduce traffic inside the AQ:

- (i) Application of joint distribution system by sharing trucks and motorbikes for goods delivery
- (ii) Increase of parking fees to restrict parking inside the AQ and to utilize extra charge for preservation activities of the AQ

(b) Improvement of Sidewalk of Pham Dinh Phung Street, Quan Thanh Street, Hang Dau Street, Gam Cau Street, Yen Phu Street

4.136 While trunk roads are developed around the station, sidewalks (W=2 ~ 5m) are occupied by obstacles such as parking and commodities, and road surfaces are damaged. By building consensus between commercial and business entities along these roads and local communities, the following management and improvement measures are applied:

- (i) Improvement of sidewalk including repaving, marking of pedestrian crosswalks, etc. (18,000m²)
- (ii) Provision of parking spaces for employees and customers out of the AQ (dyke road, Phung Hung Street, underground parking, etc.) to secure sidewalk space
- (iii) Restriction of encroachment of commodities of roadside shops

(c) Development of Pedestrian Bridge Crossing Tran Nhat Duat Street to Connect to Hang Chieu Street

4.137 To integrate the out of dyke area to the city center, the pedestrian bridge is developed crossing the dyke road to connect to the AQ.

(d) Development of Parking Facilities along Dyke Roads (Yen Phu Street and Tran Nhat Duat Street) and Phung Hung Street

4.138 To develop fringe parking around the AQ, the dyke road space and the space under Line1 viaduct along Phung Hung Street are used for car parking space.

- (i) Car parking space along Yen Phu Street and Tran Nhat Duat Street: L=500m, W=4m (2,000m²)
- (ii) Car parking space along Phung Hung Street: L=250m, W=4m (1,000m²)

(e) Improvement of Alleys in Nguyen Trung Truc Ward, Hang Dau Ward, Hang Giay Ward, Hang Cot Ward and Phuc Xa Ward

4.139 In this station area, most of local roads are narrow alleys that motorbikes have difficulties to cross. These alleys are used by local residents, so initiatives of local communities are indispensable to ensure safety and comfort.

(f) Development of New Bus Service and NMT Space Using to-be-Abandoned VNR Section including Long Bien Bridge Section

4.140 As proposed in the Concept Plan, the to-be-abandoned VNR facilities are used as a exclusive road space for bus and NMT.

(g) Development of Local Circulation Minibus and Community Bike Service

4.141 As proposed in Chapter3.9, local bus services are promoted to provide feeder services in the city center covering the AQ, the Hoan Kiem Lake area and the French Quarter.

3) Profile of Identified Projects in TOD Area

4.142 Identified projects for access improvement in TOD Area (68,400m²) as follows:

(a) Provision of Intermodal Facilities along Pham Dinh Phung Street and Quan Thanh Street

4.143 Around the Hang Dau Park, intermodal facilities are developed inside sidewalk space to transfer to Hang Dau Station.

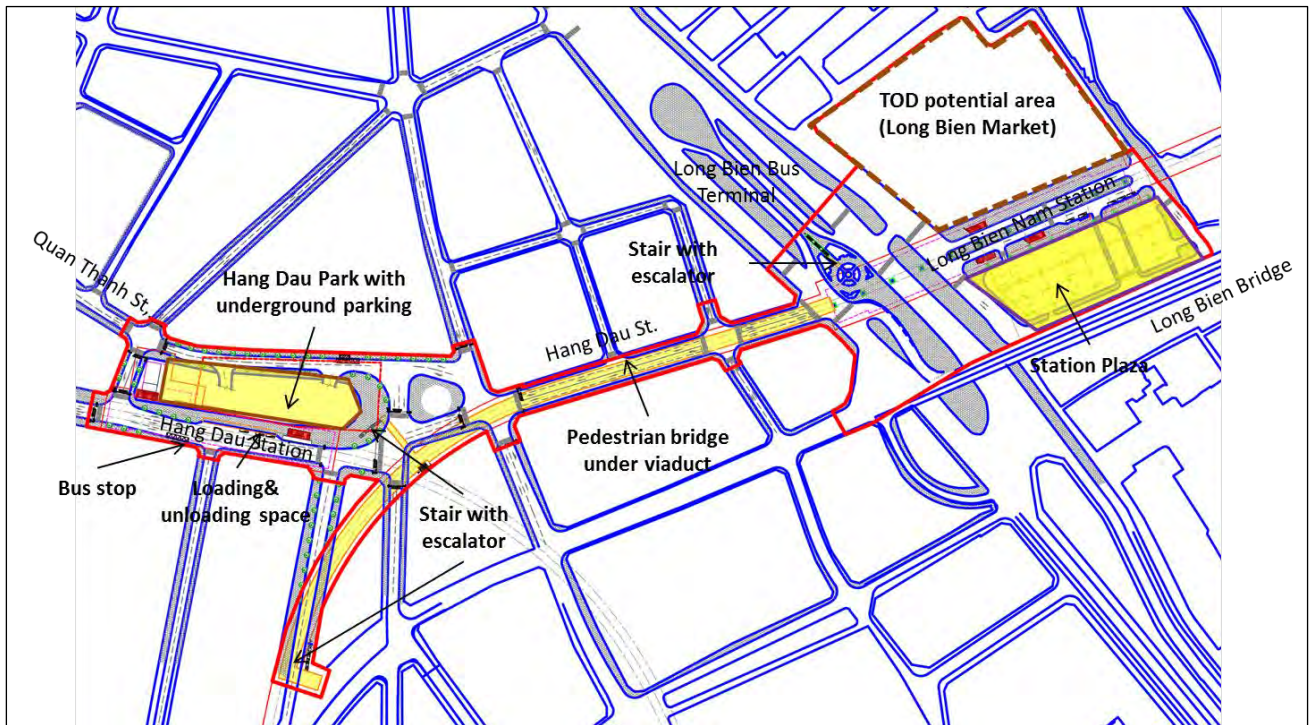
- (i) Loading and unloading space along Phan Dinh Phung Street at north: W=2m, L=50m
- (ii) Bus stop along Phan Dinh Phung Street at south: L=20m
- (iii) Bus stop along Quanh Thanh Street at north: L=20m

(b) Development of Elevated Walkway under the Viaduct of UMRT Line 1 to Connect V8 and C6 Stations and Long Bien Bus Terminal

4.144 To connect two UMRT stations and Long Bien Bus Terminal without crossing trunk roads, the elevated walkway is developed under the viaduct of Line1.

- (i) Elevated walkway: W=10m, L=600m
- (ii) One stair with escalator connecting to Hang Dau Park
- (iii) One stair with escalator connecting to Hang Dau Bus Terminal

Figure 4.2.8-2 Layout Plan of Pedestrian Bridge and Intermodal Facilities



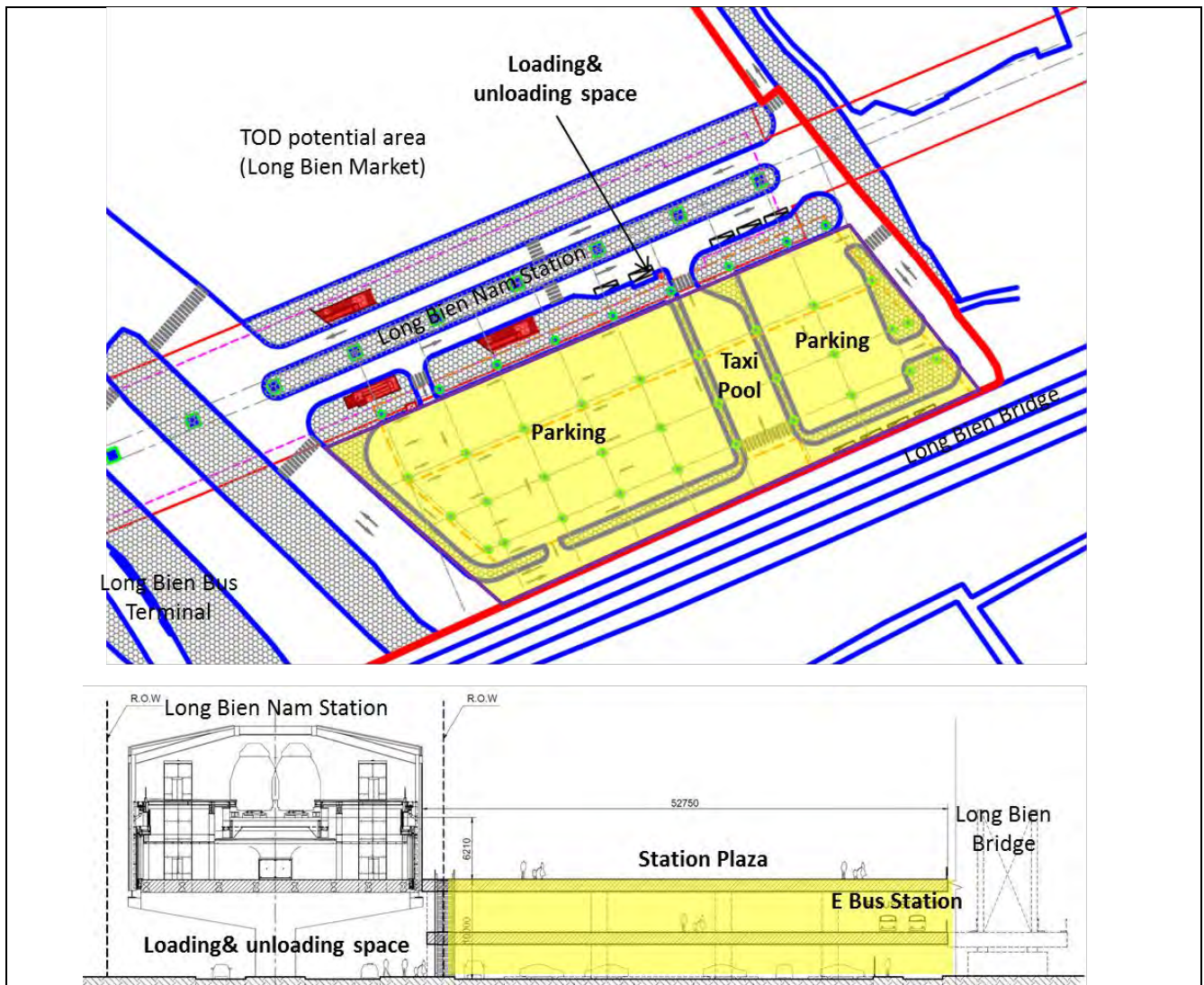
[Source: JICA Project Team

(c) Development of Station Plaza of Line 1 on Long Bien Market Land

4.145 In case if Long Bien Nam Station is developed inside the land of Long Bien Market, the comprehensive station plaza with pedestrian deck is developed between the station and the Long Bien Bridge, which is a public space to enjoy scenery of the Long Bien Bridge and the Red River.

- (i) Parking and rotary of 1st floor (7,000m²)
- (ii) Shopping mall of 2nd floor (7,000m²)
- (iii) Pedestrian plaza (open space with restaurant) of 3rd floor (2,000m²)

Figure 4.2.8-3 Layout Plan of Comprehensive Station Plaza of Long Bien Nam Station



Source: JICA Project Team

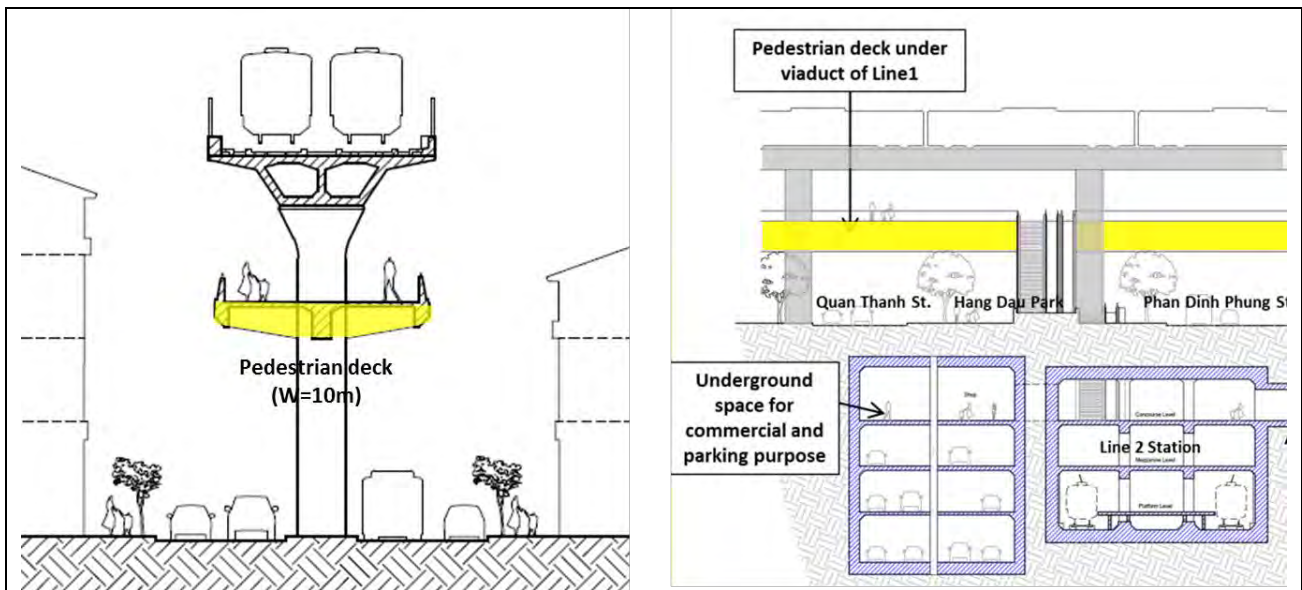
(d) Development of Underground Parking and Commercial Facility Development under Hang Dau Park

4.146 The underground parking under Hang Dau Park is developed to be a fringe parking of the north of the AQ, to provide underground commercial floor connected to Hang Dau Station.

- (i) Underground parking of Hang Dau Park: four underground floors, 2,000m²/ floor

Figure 4.2.8-4 Cross Section of Pedestrian Deck under Line1 viaduct

Figure 4.2.8-5 Cross Section of Underground Parking of Hang Dau Park



Source: JICA Project Team

(e) Improvement of Traffic Management

4.147 Inside the TOD Area, pedestrian signals, road markings, traffic signs and street trees are installed to improve safety and comfort around the station.

4.148 In particular, intersections at east of the Hang Dau Park (around the Water Tower) and intersections around the Long Bien Bus Terminal and Long Bien Market are further studied for smooth traffic flow after UMRT development.

4) Summary of Access Improvement Projects

4.149 The total estimated cost is 774,700 million VND, including short (minimum) projects of 471,700 million VND (61% of total), and basic projects of 303,000 million VND (39% of total).

4.150 Short (minimum) projects include the improvement of existing roads, alleys and intersections in the area within 500m radius, development of an elevated walkway under the viaduct of Line1, a bus stop and intermodal facilities inside ROW of UMRT or sidewalk, and traffic management. These projects using road land are implemented in coordination with authorities such as MRB and DOT.

4.151 Basic projects include the development of underground parking and walkway under Hang Dau Park, and station plaza development inside Long Bien Market land. The underground parking should be implemented in conjunction with C8 Hang Dau Station construction, which can be implemented by a private developer. Following the finalization on the location of V6 Long Bien Nam Station, a station plaza will be implemented as part of UMRT Line1 project using ROW of UMRT and road land.

4.152 There is no resettlement needed for these TOD projects and road development projects. The landuse right of Long Bien Market will be transferred to the UMRT project including the station and the station plaza.

4.153 The estimated costs for access improvement of C8 and V6 are shown in Table 4.2.8-1 for each project and Table 4.2.8-2 by phase.

Table 4.2.8-1 Access Improvement Project List of C8&V6

Project Name		Quantity	Estimated Cost (mil. VND)	Implementation Category	
Area within 500m Radius	a1	Strengthening of traffic management to regulate traffic flow and improvement of walkability in the areas in general and the area of 500-m radius from the station in particular	---	---	Minimum
	a2	Improvement of sidewalk of primary roads (Phan Dinh Phung St., Quan Thanh St., Hang Dau St., Gam Cau St., Yen Phu St.)	18,000m ²	49,000	Minimum
	a3	Provision of pedestrian bridge crossing Tran Nhat Duat St. to connect to Hang Chieu St.	135m ² (3m x 45m)	6,700	Minimum
	a4	Development of parking facilities along dyke roads (Yen Phu St. and Tran Nhat Duat St.) and Phung Hung St.	3,000m ² (W=4m, L=750m)	4,500	Minimum
	a5	Improvement of access alleys in Nguyen Trung Truc Ward, Hang Dau Ward, Hang Giay Ward, Hang Cot Ward and Phuc Xa Ward	40,000m ² (W=4m, L=10,000m)	84,000	Minimum
	a6	Development of new bus service and NMT space using to-be-abandoned VNR section including Long Bien Bridge section	---	---	Strategic ¹⁾
	a7	Provision of local circulation minibus and community bike service	---	---	Short
	a8	Improvement of intersections	9 locations	1,900	Minimum
	Sub Total			146,100	
TOD area	b1	Provision of intermodal facilities along Pham Dinh Phung Street and Quan Thanh Street	Lump sum	28,300	Minimum
	b3'	Development of elevated walkway under the viaduct of UMRT Line 1 to connect C8 and V6 stations and Long Bien Bus Terminal (600m x 10m)	6,000m ² (10m x 600m)	295,800	Minimum
	b4'	Development of station plaza of Line 1 on Long Bien Market land	7,100m ²	140,000	Basic
	b5	Development of underground parking and commercial facility development under Hang Dau Park	2,000m ²	163,000	Basic
	b6	Improvement of traffic management	Lump sum	1,500	Minimum
	Sub Total (excluding strategic project)			628,600	
Total			774,700		

Source: JICA Project Team

1) The cost of strategic project out of TOD Area is excluded from the total cost.

Table 4.2.8-2 Summary of Estimated Cost and by Phase for Access Improvement of C8

Project Type		Included Project ID	Estimated Cost (Mil. VND)
Short	Minimum ¹⁾	a1, a2, a3, a4, a5, a8	175,900
	Short	a7	0
Basic		b5	163,000
Strategic		a6	---
Total of TOD Project			338,900

Source: JICA Project Team

1) All road improvement projects within 500m radius are categorized in the project of C8 Hang Dau Station area.

Table 4.2.8-3 Summary of Estimated Cost and by Phase for Access Improvement of V6

Project Type		Included Project ID	Estimated Cost (Mil. VND)
Short	Minimum	b1, b2, b3', b6	295,800
	Short		0
Basic		b4	140,000
Total of TOD Project			435,800

Source: JICA Project Team

4.2.9 Hoan Kiem Lake Station (C9) Area

1) Identified Projects

4.154 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.9-1):

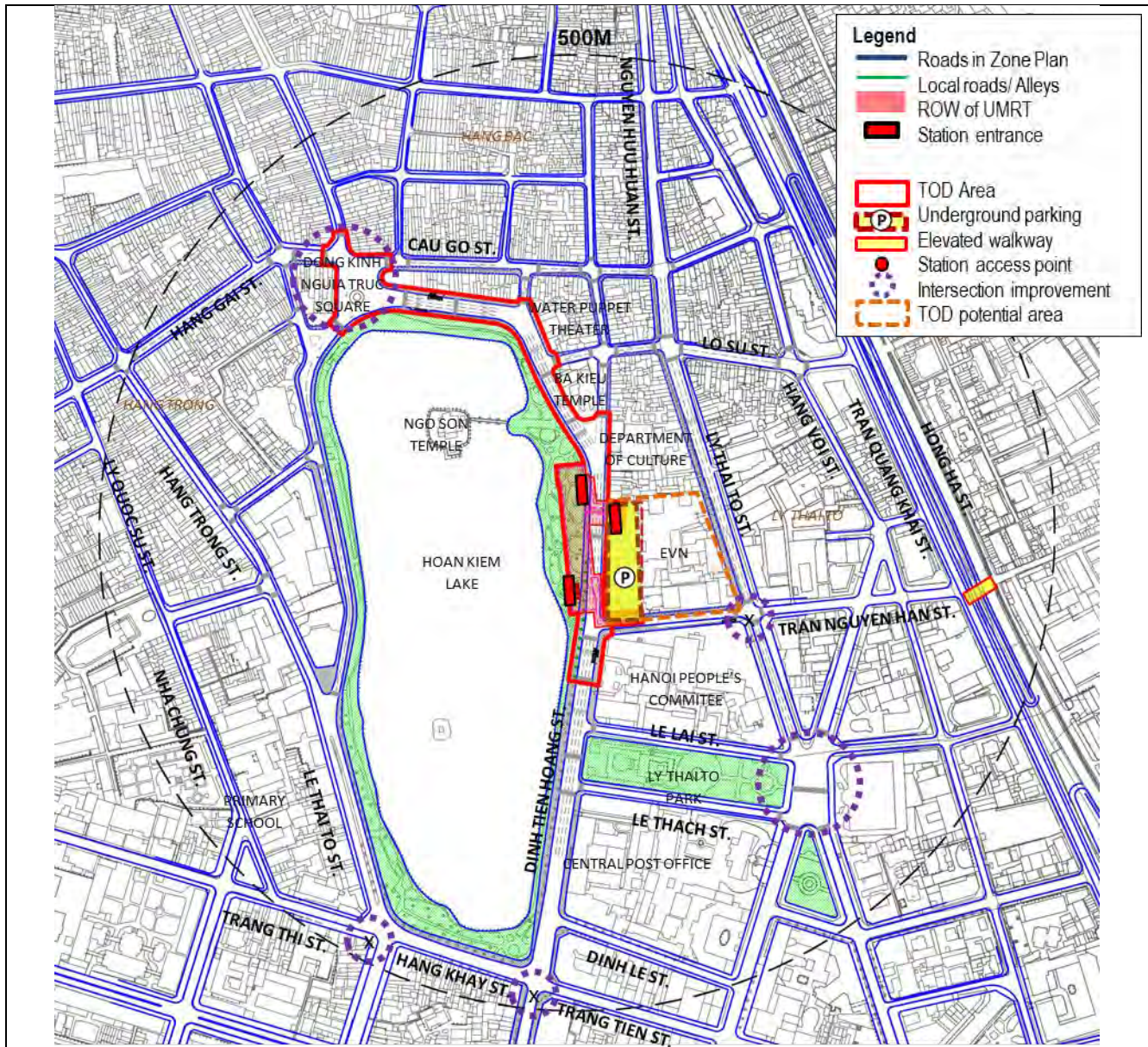
(a) Identified Projects for 500m radius Area

- (i) Improvement of walkability in the areas: To promote attractiveness of traditional and environmental space around Hoan Kiem Lake, pedestrian space is improved not only lakeside but also the AQ and surrounding roads.
- (ii) Improvement of pedestrian crosswalks across dyke road (Tran Quang Khai Street): To enhance accessibility from out of dyke area, the pedestrian bridge will be developed connecting to the east of the station.
- (iii) Improvement of alleys in Ly Thai To, Hang Bac, Hang Trong Ward, Chuong Duong Ward: While trunk roads are formulated around the lake, local road space will be improved to ensure traffic flow and socio-economic activities.
- (iv) Development of parking facilities along dyke road (Tran Quang Khai Street): To provide a fringe parking of the AQ and the lake area, road space of dyke road will be utilized to provide parking space.
- (v) Provision of local circulation minibus and community bike service: Local transport services in the city center will be provided to provide feeder services at and around station for commuting and tourism to convert private vehicles to shared ones.
- (vi) Improvement of intersections: To facilitate through traffic and transport access to the AQ and lake area, intersections along trunk roads around the station will be improved.

(b) Projects in TOD Area

- (i) Improvement of the space at the entrance/exit of the station: The station entrance at lakeside will be harmonized with scenery of lake and historical properties.
- (ii) Development of underground parking in conjunction with redevelopment of EVN area (TOD potential area): Underground parking will be developed connected to the station, as a part of complex facility in EVN land redevelopment project.
- (iii) Improvement of traffic management: To facilitate through traffic and transport access to the lake area, traffic management facilities will be installed such as signs and lights, and traffic entry will be regulated around the lake especially periods of night market and events.

Figure 4.2.9-1 Identified Project Location Map of C9 Hang Dau Station Area



Projects within 500m radius Area

1. Improvement of walkability in the areas
2. Improvement of pedestrian crosswalk across dyke road (Tran Quang Khai St.)
3. Improvement of alleys in Ly Thai To, Hang Bac, Hang Trong Ward, Chuong Duong Ward
4. Development of parking facilities along dyke road (Tran Quang Khai St.)
5. Provision of local circulation minibus and community bike services
6. Improvement of intersections

Projects in TOD Area

1. Improvement of the space at the entrance/exit of the station
2. Development of underground parking in conjunction with redevelopment of EVN area (TOD potential area)
3. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius Area

4.155 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Improvement of Walkability in the Areas

4.156 The space around the Hoan Kiem Lake is the most crowded and popular area for people to walk, with cultural property, water, trees, flowers, service facilities such as café, toilet, etc. On the contrary, roads around the lake are crowded by cars and motorcycles which make pedestrian difficult to walk. For this purpose, the following measures are to be implemented:

- (i) Provision of parking spaces around the Hoan Kiem Lake to restrict vehicle entry
- (ii) Improvement of traffic management including restricting encroachment of commodities of roadside shops, designating parking line, installation of traffic signs
- (iii) Restriction of car parking along sidewalk and promotion to develop fringe parking along the dyke road
- (iv) Increase of parking fees to restrict parking inside the AQ and the lake area and to utilize extra charge for preservation activities of the AQ and the lake

(b) Development of Pedestrian Bridge Crossing Tran Quang Khai Street to Connect to Tran Nguyen Han Street

4.157 To integrate the out of dyke area to the city center, the pedestrian bridge is developed crossing the dyke road to connect to the Hoan Kiem Lake.

(c) Improvement of Sidewalk of Ly Thai To Ward, Hang Bac Ward, Hang Trong Ward, Chuong Duong Ward

4.158 In this station area, alleys are not much except for the AQ, since most of urban blocks are surrounded by trunk road network. In the AQ, improvement measures of alleys are as follows:

- (i) Improvement of sidewalk including repaving, marking of pedestrian crosswalks, etc. (10,000m²)
- (ii) Provision of parking spaces for employees and customers out of the AQ (dyke road, Phung Hung Street, underground parking, etc.) to secure sidewalk space
- (iii) Restriction of encroachment of commodities of roadside shops

(d) Development of Parking Facilities along Dyke Road (Tran Quan Khai Street)

4.159 To develop fringe parking around the AQ, the dyke road space for car and motorcycle parking space.

- (i) Parking space along Tran Quan Khai Street: L=200m, W=6m (1,200m²)

(e) Development of Local Circulation Minibus and Community Bike Service

4.160 As proposed in **Chapter3.9**, local bus services are promoted to provide feeder services in the city center covering the AQ, the Hoan Kiem Lake area and the French Quarter.

3) Profile of Identified Projects in TOD Area

4.161 Identified projects for access improvement in TOD Area (23,100m²) are as follows:

(a) Improvement of the Space at the Entrance/Exit of the Station

4.162 The station entrances are installed inside the park near to Ngoc Son Temple. Around the station entrances, signs, benches, small shops are developed to attract passengers and visitors. The design of these facilities is paid attention to harmonize with traditional and environmental atmosphere.

(b) Development of Underground Parking in Conjunction with Redevelopment of EVN Area (TOD Potential Area)

4.163 In addition to the fringe parking along the dyke road, the parking facilities are still required to ensure pedestrian oriented district of AQ. For this, EVN land is utilized to develop underground parking in conjunction with integrated urban redevelopment.

(c) Improvement of Traffic Management

4.164 Inside TOD Area, pedestrian crosswalks with signals are installed, and parking along sidewalk is restricted to ensure walking space opposite of park.

4.165 Intersection around Dong Kinh Nghia Thuc Square is used for taxi parking, and events in weekends. There are no signals and pedestrian crosswalks, so it is very dangerous to cross. It is necessary to study further to improve this intersection in terms of smooth traffic flow and safe environment for pedestrian.

Figure 4.2.9-2 Layout Plan of Underground Parking

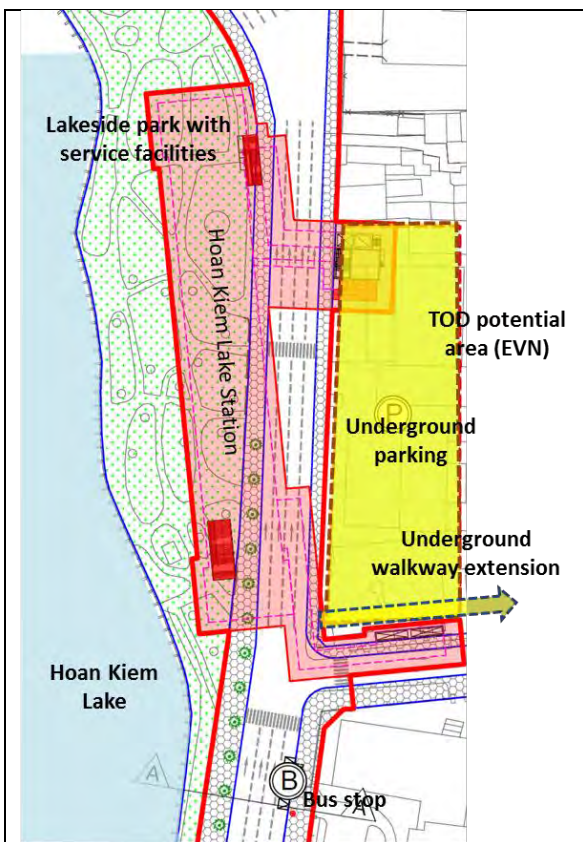
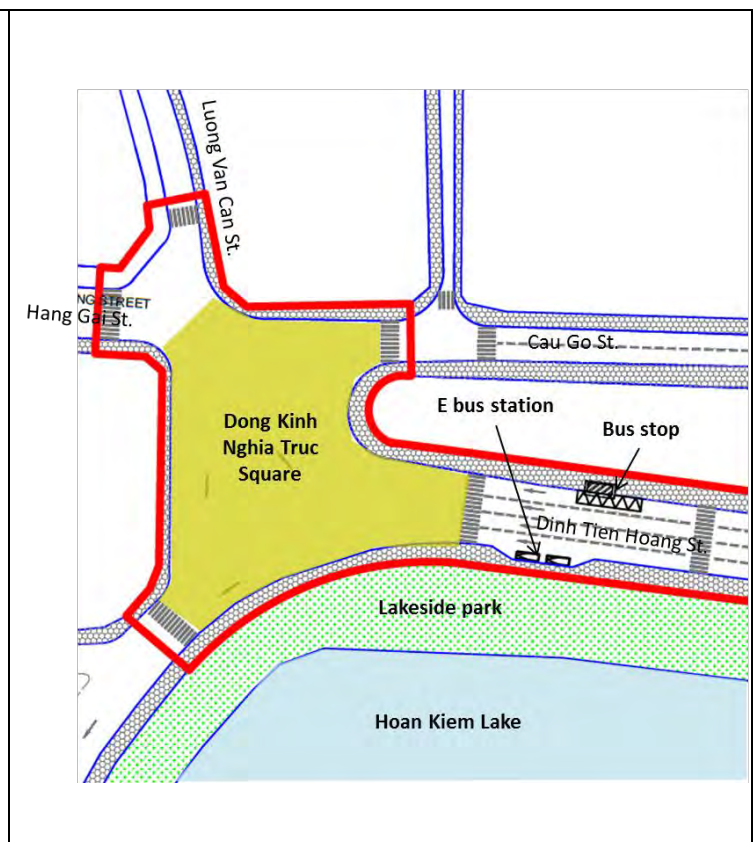


Figure 4.2.9-3 Layout Plan of E Bus Station and Improvement of Dong Kinh Nghia Truc Square



Source: JICA Project Team

4) Summary of Access Improvement Projects

4.166 The total estimated cost is 861,300 million VND, including short (minimum) projects of 44,300 million VND (5% of total), and basic projects of 817,000 million VND (95% of total).

4.167 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500m radius, development of parking space along existing roads, and traffic management. These projects using road land are implemented in coordination with local authorities such as DOT.

4.168 Basic projects include the development of underground parking and walkway using TOD potential area after relocation of EVN and road land. It is promoted to implement the project in conjunction with UMRT station and road development, by using private investment for commercial development integrated with underground facilities.

4.169 There is no resettlement needed for these TOD projects. After relocation of EVN, the land for underground parking and intermodal facilities will be transferred to the authority for transport and parking development and management.

4.170 The estimated costs for access improvement of C9 are shown in Table 4.2.9-1 for each project and Table 4.2.9-2 by phase.

Table 4.2.9-1 Access Improvement Project List of C9

Category	ID	Project Name	Quantity	Estimated Cost (mil. VND)	Implementation Category
Area within 500m Radius	a1	Improvement of walkability in the areas	---	---	Short (Minimum)
	a2	Improvement of pedestrian crosswalks across dyke road (Tran Quang Khai St.)	180m ² (3m x 45m)	7,000	Short (Minimum)
	a3	Improvement of access alleys within 500-m radius from the station	14,800m ² (W=4m, L=3,700m)	31,000	Short (Minimum)
	a4	Development of parking facilities along dyke road (Tran Quang Khai St.)	1,200m ² (W=6m, L=200m)	2,000	Short (Minimum)
	a5	Provision of local circulation minibus and community bike services	---	---	Short
	a6	Strengthening of traffic management around the Ancient Quarter and Hoan Kiem Lake	15 locations	3,000	Short
	Sub Total				43,000
TOD area	b1	Improvement of the space at the entrance/exit of the station	3 locations	300	Short (Minimum)
	b2	Development of underground parking in conjunction with redevelopment of EVN area (TOD potential area)	10,000m ²	815,000	Basic
	b3	Development of EV bus and community cycle station at the north of Hoan Kiem Lake	100m ²	2,000	Basic
	b4	Improvement of traffic management (sign, signals, markings, etc.)	360m ² for marking	1,000	Short (Minimum)
	Sub Total				818,300
Total				861,300	

Source: JICA Project Team

Table 4.2.9-2 Summary of Estimated Cost and by Phase for Access Improvement of C9

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a1, a2, a3, a4, b1, b4	44,300
	Short	a5, a6	0
Basic		b3	817,000
Total of TOD Project			861,300

Source: JICA Project Team

4.2.10 Tran Hung Dao Station (C10) Area

1) Identified Projects

4.171 The following projects are identified for the area within 500m radius from the station and for the TOD Area (see Figure 4.2.10-1):

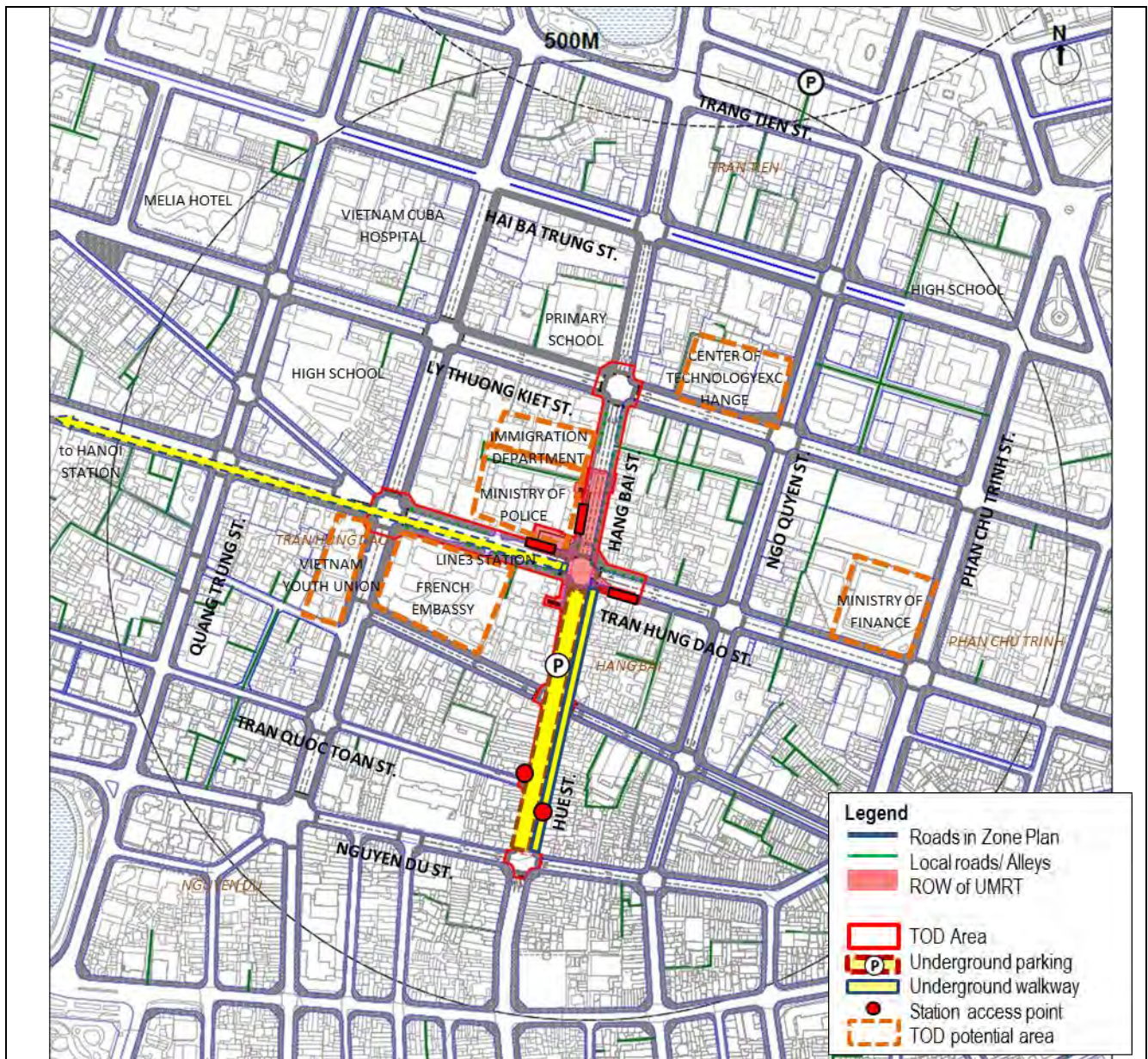
(a) Identified Projects for 500m radius Area

- (i) Improvement of vehicle traffic circulation and management of road space: To manage traffic flow in the trunk road network of the French Quarter, traffic management will be improved taking into consideration of station development, by regulating one way, separating spaces for cars and motorbikes, regulating parking inside carriageway and sidewalk, etc.
- (ii) Development of underground walkway along Tran Hung Dao Street: To enhance development potential of the French Quarter, underground walkway will be extended along Tran Hung Dao Street connecting Line2 and Line 3 stations as well as to the direction to Hanoi Station, which will be connected to underground floors of roadside facilities.
- (iii) Improvement of alleys in Hang Bai, Tran Hung Dao, Tran Tien, Phan Chu Trinh Ward: While alleys are limited in the French Quarter, local road spaces will be improved to ensure safety and tranquility.
- (iv) Provision of local mini-bus circulation and community bike services: To provide commuting and tourism services around the French Quarter, feeder services will be promoted using EV vehicles.

(b) Projects in TOD Area

- (i) Development of underground parking and walkway along Hue Street: To provide a fringe parking of the French Quarter as well as P&R facility at the terminal station of phase1 of Line2, underground parking will be developed utilizing the structure developed by Line2 project.
- (ii) Development of underground walkway to connect Line 2 and Line 3 stations: Line3 station will be developed along Tran Hung Dao Street at west of Line2 station, so underground walkway will be developed.
- (iii) Provision of bus and intermodal facilities along Tran Hung Dao Street, Hue Street and Hang Bai Street: To ensure smooth transfer at the station, loading and unloading facilities will be developed inside sidewalk along trunk road.
- (iv) Development of station plaza in conjunction with redevelopment of Hanoi Police area (TOD potential area): To enhance accessibility of two UMRT stations and other traffic modes and space for public, the station plaza will be developed in conjunction with redevelopment of MOP land.
- (v) Improvement of traffic management: Traffic management facilities such as signs, lights and signals will be installed which are designed to harmonize with the streetscape of the French Quarter.

Figure 4.2.10-1 Identified Project Location Map of C10 Tran Hung Dao Station Area



Projects within 500m radius Area

1. Improvement of vehicle traffic circulation and management of road space
2. Development of underground walkway along Tran Hung Dao Street
3. Improvement of sidewalks in Hang Bai, Tran Hung Dao, Tran Tien, Phan Chu Trinh Ward
4. Provision of local mini-bus circulation and community bike services

Projects in TOD Area

1. Development of underground parking and walkway along Hue Street
2. Development of underground walkway to connect Line 2 and Line 3 stations
3. Provision of intermodal facilities along Tran Hung Dao Street, Hue Street an Hang Bai Street
4. Development of station plaza in conjunction with redevelopment of Hanoi Police area (TOD potential area)
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects

4.172 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Improvement of vehicle traffic circulation and management of road space

4.173 The road network in the French Quarter is developed with wide sidewalk and trees. To improve smooth traffic flow and utilize abundant road space, the following measures are to be implemented:

- (i) Promotion to develop parking facilities inside urban facilities to reduce on-street parking
- (ii) Improvement of traffic management including restricting encroachment of commodities of roadside shops, designating parking line, installation of traffic signs
- (iii) Increase of parking fees to restrict parking inside the FQ and to utilize extra charge for landscape improvement activities of the FQ

(b) Development of Underground Walkway along Tran Hung Dao Street

4.174 Once underground stations of Line2 and Line3 are developed, development potential of underground space will be increased. There are many public facilities such as ministries, embassies, institutes which will be relocated out of the city center, so underground floors and parking are connected to the public underground walkway along Tran Hung Dao Street.

(c) Improvement of Sidewalks in Hang Bai, Tran Hung Dao, Tran Tien and Phan Chu Trinh Ward

4.175 The space of sidewalk in the FQ is a part of street-scape with boulevard trees. So pavement of sidewalk is designed, and street furniture such as benches, signs are installed in TOD Area to attract passengers and visitors.

(d) Development of Local Circulation Minibus and Community Bike Service

4.176 As proposed in Chapter3.9, local bus services are promoted to provide feeder services in the city center covering the AQ, the Hoan Kiem Lake area and the French Quarter.

3) Profile of Identified Projects in TOD Area

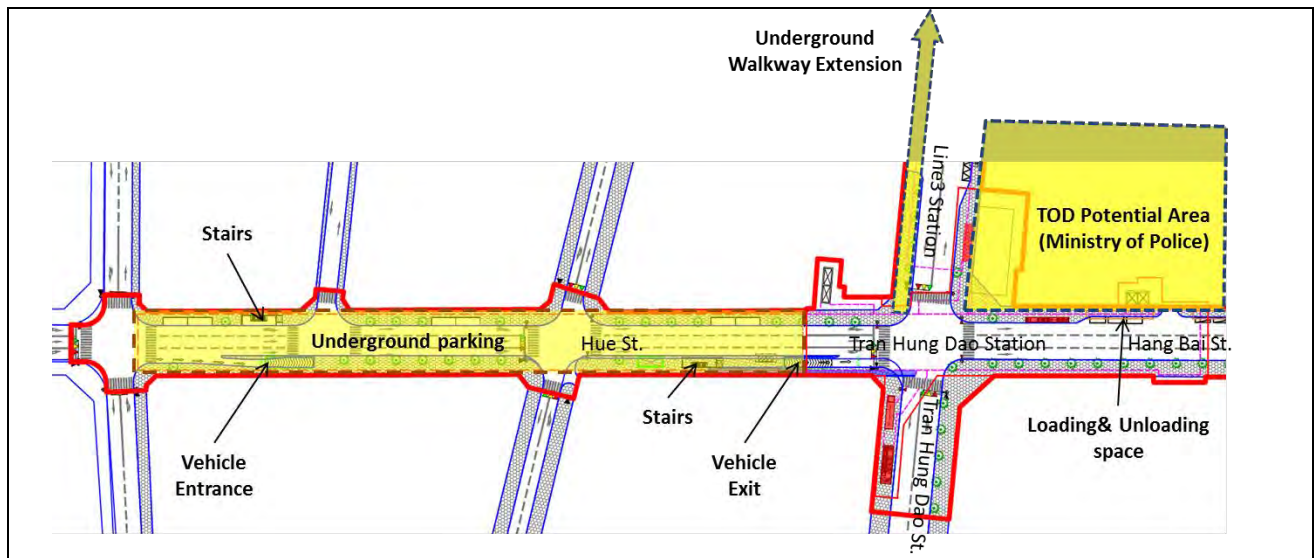
4.177 Identified projects for access improvement in TOD Area (24,800m²) are as follows:

(a) Development of Underground Parking and Walkway along Hue Street

4.178 In conjunction with UMRT Line2 station construction, the underground parking and walkway is developed utilizing vacant underground space (see Chapter5 in detail). To develop vehicle entrance, carriage way of Hue Street is widened while sidewalk space is used to install entrance/ exit.

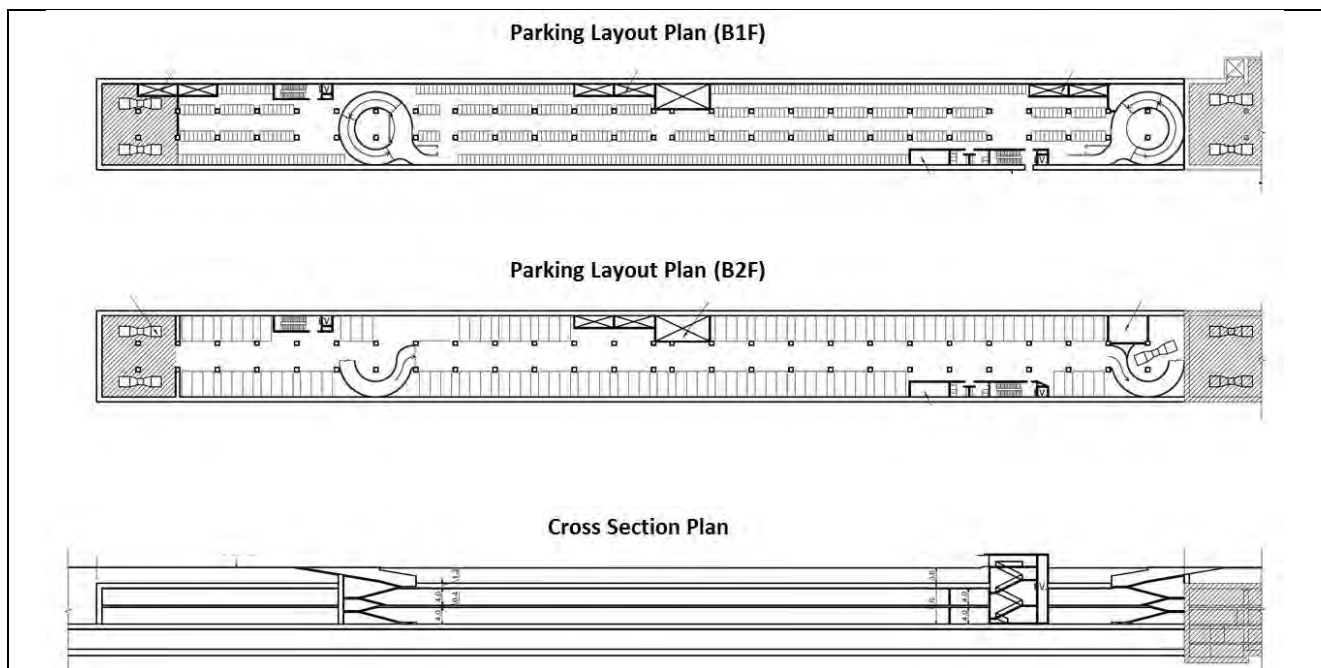
- (i) Underground parking: W=24.5m, L=255m, two floors (B1F for motorcycle parking, B2F for car parking), 93,000m² of total floor area
- (ii) Vehicle entrance/ exit: one entrance and 1 exit, W=4.5m using sidewalk of Hue Street
- (iii) Underground walkway: two entrances with stairs, W=3m using sidewalk of Hue Street

Figure 4.2.10-2 Project Location Map in TOD Area of C10 Tran Hung Dao Station



Source: JICA Project Team

Figure 4.2.10-3 Layout Plan of Underground Parking of Tran Hung Dao Station



Source: JICA Project Team

(b) Development of Underground Walkway to Connect Line 2 and Line 3 Stations

4.179 To connect two underground stations of Line2 and Line3, underground walkway is developed.

(c) Provision of Intermodal Facilities along Tran Hung Dao Street, Hue Street and Hang Bai Street

4.180 Intermodal facilities are developed inside sidewalk space to transfer to the station.

- (i) Loading and unloading space along Hang Bai Street at north west: W=2m, L=100m

- (ii) Bus stop along Tran Hung Dao Street at north west: L=20m
- (iii) Bus stop along Hue Street at south-east: L=20m

(d) Improvement of Traffic Management

4.181 Signal operation system is improved to prioritize period for pedestrian crosswalks.

4) Summary of Access Improvement Projects

4.182 The total estimated cost is 305,500 million VND, including short (minimum) projects of 251,100 million VND (82% of total) and short projects of 54,000 million VND (18% of total).

4.183 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500m radius, development of underground parking and walkway inside ROW of UMRT, and traffic management. The cost of underground parking and walkway development of C10 is much lower than usual, since the UMRT structure can be used for parking facilities. If this project is not implemented at the same time as C10 station development, the construction cost increase drastically.

4.184 The short project is the development of an underground walkway connecting Line2 and Line3 stations. After confirmation of the location and structure of Line3 station (phase2 of the project), the underground walkway will be developed as a part of Line3 project.

4.185 Basic projects include the development of underground parking and walkway using TOD potential area after relocation of the Hanoi Police and road land. It is promoted to implement the project in conjunction with UMRT station and road development, by using private investment for commercial development integrated with underground facilities.

4.186 There is no resettlement needed for TOD projects. After relocation of the Hanoi Police, the land for underground parking and intermodal facilities will be transferred to the authority for transport and parking development and management.

4.187 The estimated costs for access improvement of C10 are shown in Table 4.2.10-1 for each project and Table 4.2.10-2 by phase.

Table 4.2.10-1 Access Improvement Project List of C10

Category	ID	Project Name		Quantity	Estimated Cost (mil. VND)	Implementation Category
Area within 500m Radius	a1	Improvement of vehicle traffic circulation and management of road space		---	---	Short
	a2	Development of underground walkway along Tran Hung Dao Street		--	---	Strategic ²⁾
	a3	Improvement of access alleys in Hang Bai, Tran Hung Dao, Tran Tien, Phan Chu Trinh Wards		8,000m ² (W=4m, L=2,000m)	17,000	Short (Minimum)
	a4	Provision of local mini-bus circulation and community bike services		---	---	Short
	Sub Total					17,000
TOD area	b1	Development of underground parking and walkway along Hue Street	Parking ¹⁾	6,300m ² x 2 floors (W=24.5m, L=255m)	196,000	Short (Minimum)
			Walkway	200m ²	34,000	
	b2	Development of underground walkway to connect Line 2 and Line 3 stations		400m ²	54,000	Short
	b3	Development of underground parking in conjunction with redevelopment of Hanoi Police area (TOD potential area)		--	---	Strategic ²⁾
	b4	Provision of intermodal facilities along Tran Hung Dao Street, Hue Street an Hang Bai Street		2 locations	4,000	Short (Minimum)
	b5	Improvement of traffic management in TOD area (sign, marking, benches, trees, etc.)		450m ² for marking	500	Short (Minimum)
	Sub Total					288,500
Total					305,500	

Source: JICA Project Team

- 1) The civil work (excavation, construction of structure) is excluded which will be constructed by UMRT Line2 construction project.
- 2) The strategic project is not estimated.

Table 4.2.10-2 Summary of Estimated Cost and by Phase for Access Improvement of C10

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a3, b1, b4, b5	251,100
	Short	a1, a4, b2	54,000
Basic		a2, b3	--
Total of TOD Project			305,500

Source: JICA Project Team

4.2.11 Hanoi Station (V8) Area

1) Identified Projects

4.188 Projects identified for the area within 700m radius from the station, and in the TOD Area, are the following (see Figure 4.2.11-1):

(a) Identified Projects for 700 meter radius Area

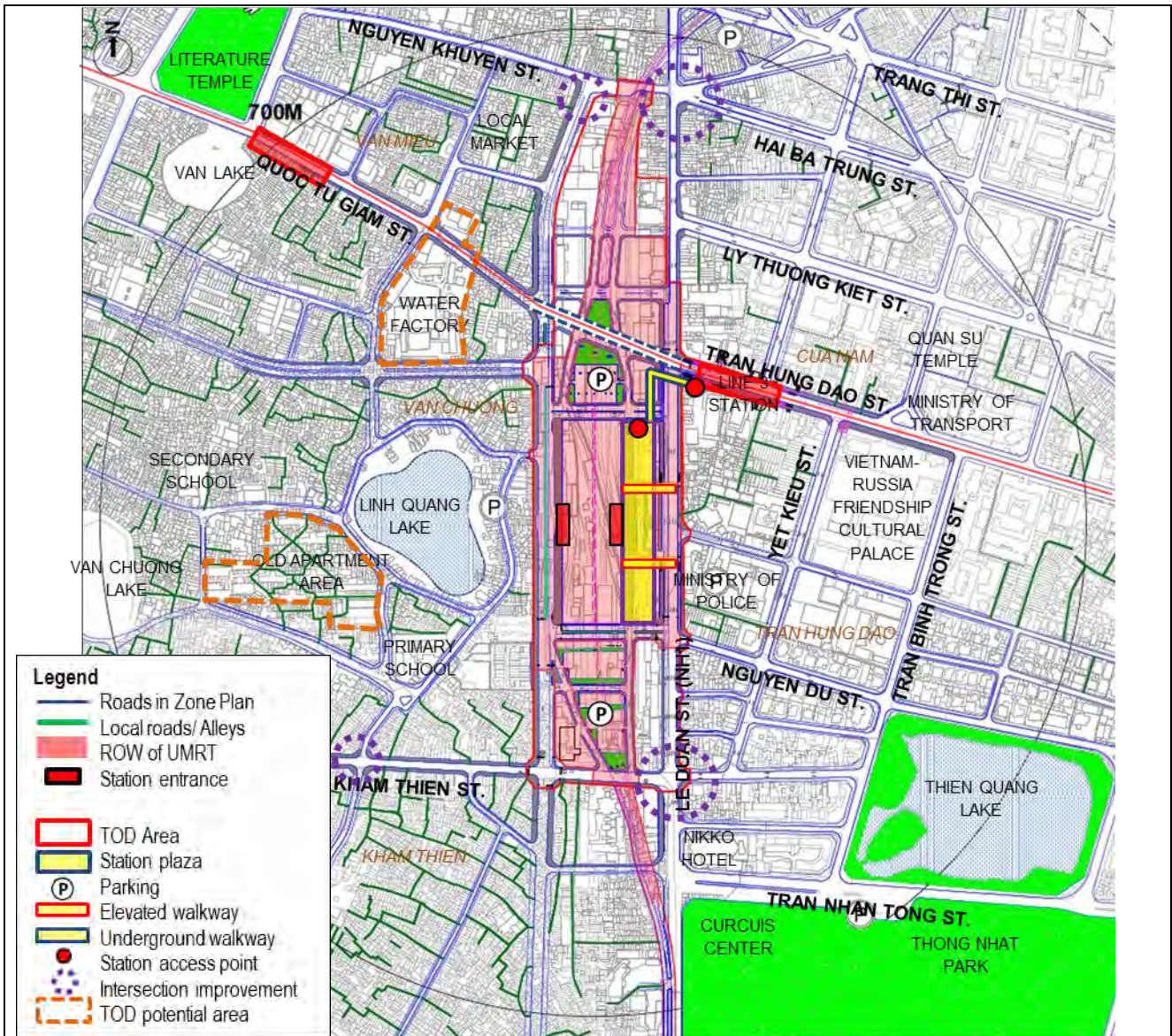
- (i) Development of missing link to connect Tran Hung Dao Street/ Ly Truong Kiet Street of east area and Quoc Tu Giam Street and Cat Linh Street of west area: To integrate eastern and western areas, extension of trunk roads from the French Quarter to the west of the city is required to reduce traffic jam at the intersection at NH1.
- (ii) Development of new access road in the west side of the station: To ensure accessibility from high-dense residential area of Van Chuong Ward, new road at west should be developed along VNR land.
- (iii) Study on traffic management of intersections in the north and in the south of the station along NH1: Improvement of intersections along NH1 will contribute to facilitate traffic flows between west and east areas, so it is necessary to study a comprehensive traffic management along NH1.
- (iv) Improvement of Quoc Nghi Giam Street, Ngo Si Lien Street, Tran Quy Cap Street and main access roads of western built-up area: To improve mobility and accessibility of west area, it is significant to improve secondary roads where both vehicles and pedestrians are coexisted.
- (v) Improvement of alleys in Van Chuong, Kham Thien, Tran Hung Dao Ward, Cua Nam, Nguyen Du Ward: Local roads will be improved by providing traffic management facilities, regulating vehicles to prioritize pedestrians as well as ensuring local socio-economic activities.
- (vi) Provision of local circulation mini-bus services and community bicycle services: The special bus service will be provided to supplement feeder service covering traditional city center (Ancient Quarter – Hoan Kiem Lake – French Quarter) for commuting and sightseeing.
- (vii) Improvement of intersections: To facilitate traffic flow from various directions, intersections along trunk roads are improved with signals and markings.

(b) Identified Projects in TOD Area

- (i) Priority development of roads located in TOD Area: To ensure station front streets, the west access road needs to be developed and NH1 to be widened in time.
- (ii) Improvement of Le Duan Street in front of the station (widening of sidewalk): In the short-term, it is proposed to widen the sidewalk on the eastern side, using carriageway to ensure pedestrian space.
- (iii) Development of station plaza in the east and in the west of the station: To create a transport hub of city center, station plazas will be developed to facilitate various transport modes and to provide pedestrian plaza for exchange and meeting.

- (iv) Development of underground walkway connecting stations of Line1 and Line3: Two stations of Line1 and Line3 will be connected underground to ensure convenient transfer and to provide commercial service along it.
- (v) Provision of parking facilities under the UMRT viaduct space: As one of the fringe parking of the city center, parking will be developed to utilize space under viaduct effectively.
- (vi) Improvement of traffic management: Since the station is surrounded by trunk roads, traffic management facilities such as signs, street lights, pedestrian crossings are provided properly.

Figure 4.3.1 Identified Project Location Map of V8 Hanoi Station Area



Projects within 700m radius

1. Development of missing link to connect Tran Hung Dao Street/ Ly Truong Kiet St. of east area and Quoc Tu Giam St. and Cat Linh St. of west area
2. Development of new access road in the west side of the station
3. Study on traffic management of intersections at north and south of station along NH1
4. Improvement of Quoc Tu Giam St., Ngo Si Lien St., Tran Qui Cap St., Linh Quang St., Van Chuong St.
5. Improvement of alleys in Van Chuong Ward, Kham Thien Ward, Tran Hung Dao Ward, Cua Nam Ward and Nguyen Du Ward
6. Provision of local circulation mini-bus services and community bicycle services

Projects in TOD Area

1. Priority development of roads located in TOD Area
2. Improvement of Le Duan St. in front of the station (widening of sidewalk)
3. Development of station plaza in the east and west of the station
4. Development of underground walkway connecting between Line1 and Line3 stations
5. Provision of parking facilities under the UMRT viaduct space
6. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 700m radius Area

4.189 Identified projects for access improvement in the area within 700m radius are as follows:

(a) Development of Missing Link between Tran Hung Dao Street and Quoc Tu Giam Street

4.190 As proposed in the Concept Plan, after elevated UMRT development, the ground space is utilized to develop roads connecting east and west areas. To develop a new connection road inside VNR land to connect to Quoc Tu Giam Street, there are two options shown in Table 4.2.11-1 and Figure 4.2.11-2:

Table 4.3.1 Comparison of Options for Development of Missing Link between East and West of Hanoi Station Area

	Option A: Extension of Tran Hung Dao St.	Option B: Indirect road connecting to Tran Hung Dao St.
Advantages	<ul style="list-style-type: none"> Tran Hung Dao St. is connected to the French Quarter and Cat Linh St. directly. It is near to 2 UMRT stations which enhance accessibility to stations from west area. Extended road is faced to the water factory which has a TOD potential. 	<ul style="list-style-type: none"> New road is developed inside the VNR owned land without affecting to any major facilities inside VNR land. VNR Hanoi Station won't be affected and remained.
Disadvantages	<ul style="list-style-type: none"> Residential areas are affected to develop the road. It is necessary to relocate the VNR Hanoi Station which has a historical value. 	<ul style="list-style-type: none"> The alignment of Tran Hung Dao St. (trunk road) is not straight to connect to west side, which may cause traffic congestion around the station.

Source: JICA Project Team

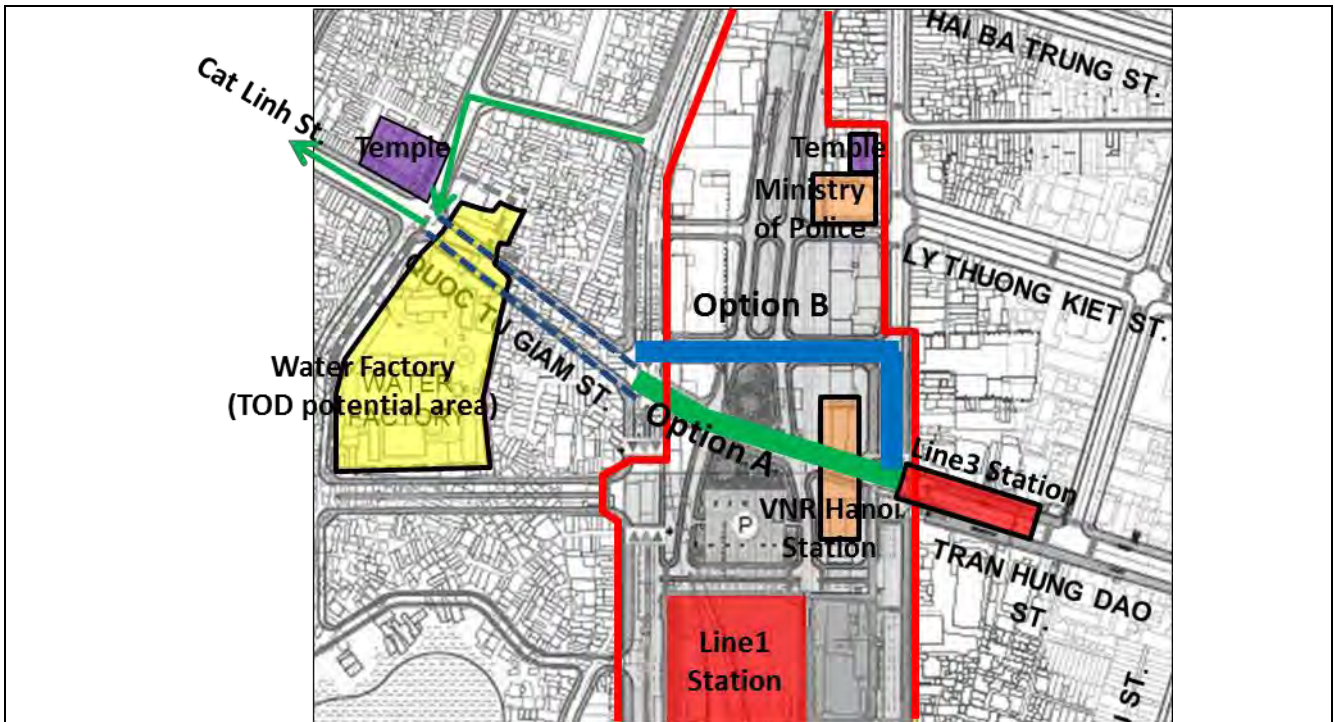
(b) Development of New Access Road in the West Side of the Station

4.191 In the western area, not only to develop the west access road inside ROW of UMRT, but also to extend it to the north and to the south to connect to trunk roads (Nguyen Khuyen Street at north and Kham Thien Street in the south). If the development is delayed, at least the following measures should be implemented:

- (i) Improvement of road including repaving, marking of pedestrian crossing, etc. for Tran Qui Cap Street (W=14m at present) and Linh Quang Street (W=8m at present)
- (ii) Improvement of traffic management including parking ban, installment of traffic signs for Nguyen Hoang Ton Street (W=12m at present)
- (iii) Utilization of new roads inside VNR land

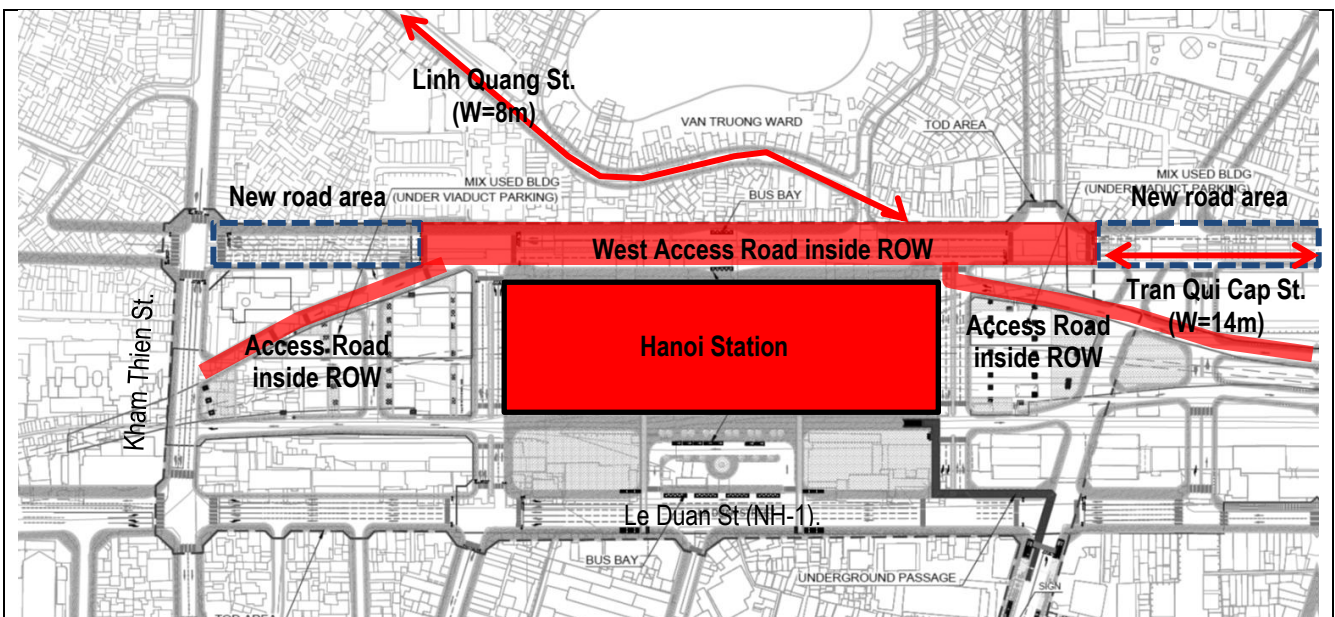
4.192 To complete the western access road, Tran Quy Cap Street is widened from 14 to 30 meters, and the 30m wide southern section is newly developed in the station area. Within 500-m radius from the station, the area needed is estimated to be 6,500m² (including the whole residential area) for widening of Tran Quy Cap Street and 3,800m² (including whole residential area) for road development in the southern section, respectively (See Figure 4.2.11-3).

Figure 4.3.2 Comparison of Options for Development of Missing Link between East and West of Hanoi Station Area



Source: JICA Project Team

Figure 4.3.3 West Access Road Development in Short-Term of Hanoi Station



Source: JICA Project Team

(c) Study on Traffic Management of Intersections at North and South of Station along NH1

4.193 After elimination of the railway crossing VNR, the traffic conditions at the intersections along Le Duan Street (NH1) will be improved. To facilitate traffic around the intersections, it is necessary to study the design of intersections and consider traffic management measures.

- (i) Northern intersection connecting 4 trunk roads: Nguyen Khuyen Street, Le Duan Street, Hang Bac Street and Hai Ba Trung Street;
- (ii) Southern intersection connecting 3 trunk roads: Le Duan Street, Kham Thien Street and Nguyen Thuong Hien Street;

(d) Improvement of Quoc Tu Giam Street, Ngo Si Lien Street, Tran Quy Cap Street and main access roads of west built-up area

4.194 In this station area, secondary roads provide important access to major urban facilities, especially Quoc Tu Giam Street to Literature Temple, Ngoc Si Lien Street to temple and hospital, and Tran Quy Cap Street and Linh Quang Street to Van Chuong apartment area and primary school, and Van Chuong Street to local market. Following measures should be implemented.

- (i) Improvement of sidewalk including installment of paved block for disabled, designating parking line in sidewalk, installment of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iii) Improvement of traffic management including restriction of car entry during peak-hour of local market, marking of pedestrian crossing, installment of traffic signs

(e) Improvement of Alleys in Van Chuong, Kham Thien Ward, Tran Hung Dao, Cua Nam Ward and Nguyen Du Ward

4.195 In this station area, most of alleys are narrow without sidewalk ($W=2 - 6$ meter, $100,000m^2$), which pedestrian and motorbike share the space. Following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installment of bench and information board at openspace
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning
- (iii) Improvement of openspace around local market, school, etc. to provide signs, benches, trees, etc.

(f) Provision of Local Circulation Mini-bus Services and Community Bicycle Services

4.196 As proposed in Chapter 3.9, local bus services are promoted to provide feeder services in the city center covering the AQ, the Hoan Kiem Lake area and the French Quarter.

4.197 In conjunction with road development of the west area of the station, the local circulation services will be expanded.

3) Profile of Identified Projects in TOD Area

4.198 Identified projects in TOD Area (186,600m²) are as follows:

(a) Priority Development of Roads Located in TOD Area

4.199 As shown in Figure 4.2.11-2 and Figure 4.2.11-3, in the TOD Area, in addition to new access roads of Line1 station inside VNR land, east – west connecting road inside VNR land and south-west access road out of VNR land are proposed. Priority development road area in TOD Area is as follows:

- (i) East-west connecting road of Option A to extend Tran Hung Dao Street: L=400m, W=22m (8,800m² for new development)
- (ii) East-west connecting road of Option B at the north of existing VNR Hanoi Station: L=350m, W=22m (7,700m² for new development)
- (iii) South-west access road: W=30m, L=120m (3,600m² for new development)

(b) Improvement of Le Duan Street in front of the Station (Widening of Sidewalk)

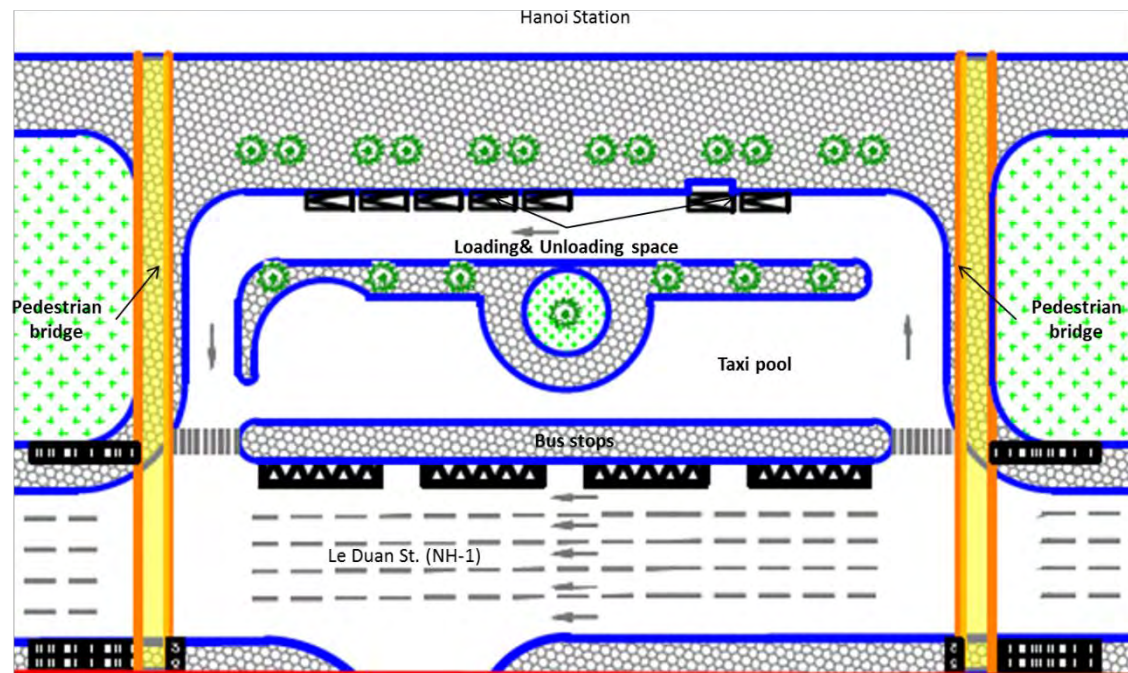
4.200 In the east side, widening of NH1 is required to ensure pedestrian space and install the elevated walkway. For this purpose, it is proposed to widen the sidewalk using carriageway.

- (i) Sidewalk widening of NH1: W=5m, L=600m (3,000m² for sidewalk of east side)
- (ii) Widening of NH1: W=30m, L=600m (10,200m² for whole widening)

(c) Development of Station Plaza in the East and West of the Station

4.201 To the east the station plaza is located along NH1. The bus stops are located along carriageway for smooth transfer. The rotary is developed including loading and unloading space and taxi berth. The E-bus local circulation services are provided at this station plaza.

Figure 4.3.4 Layout Plan of East Station Plaza of Hanoi Station



Source: JICA Project Team

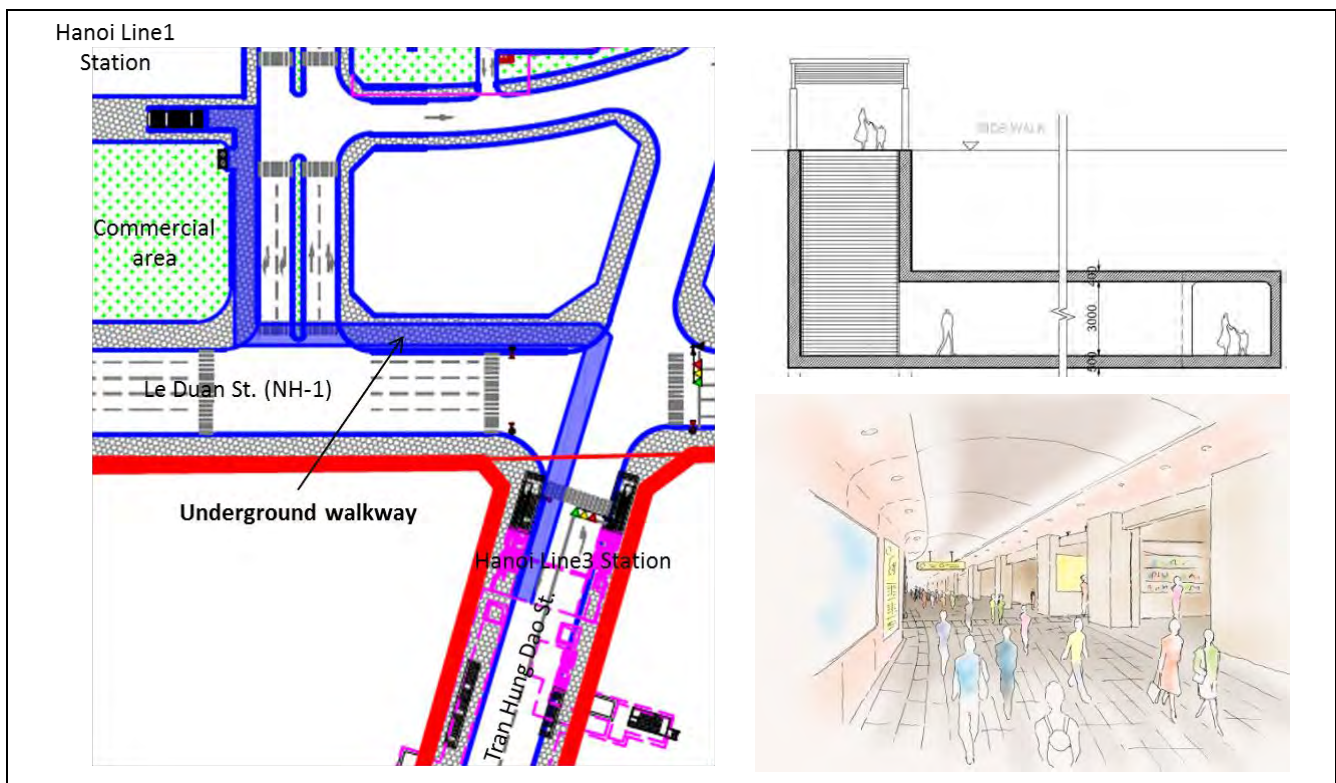
(d) Development of Underground Walkway Connecting between Line1 and Line3 Stations

4.202 The underground walkway is developed to connect stations of Line1 and Line3. The entrance of Line1 station is in the north of the pedestrian plaza, which will be connected to the underground parking and commercial floor of new buildings. It is connected directly to the underground walkway and entrance of Line3 station.

4.203 The underground walkway is located inside VNR land and carriageway and sidewalk space of Le Duan Street and Tran Hung Dao Street

- (i) Underground walkway: $W=4$ m, $L=250$ m ($1,000\text{m}^2$ of VNR land and road space), 2 entrances with stairs ($W=5$ m)

Figure 4.3.5 Layout Plan, Cross Section Plan and Image of Underground Walkway Connecting Between Hanoi Line1 and Line3 Stations



Source: JICA Project Team

(e) Provision of Parking Facilities under the UMRT Viaduct Space

4.204 The space under the viaduct is used for parking facilities as a fringe parking of the city center. It is necessary to develop more parking facilities inside VNR land in conjunction with integrated development, so that the viaduct space will be used not only as parking space but also for local socio-economic activities, etc.

- (i) Parking facilities under the viaduct space: $13,000\text{m}^2$

(f) Improvement of Traffic Management

4.205 In the TOD Area, many access roads will be developed to connect to NH1 and other trunk roads. Traffic flow and management is further studied to facilitate various traffic modes to access to station and to pass through the station area, and to ensure pedestrians' safety.

4) Summary of Access Improvement Projects

4.206 The total cost is estimated at 427,600 million VND, including short (minimum) projects of 352,600 million VND (82% of total) and short projects of 75,000 million VND (18% of total).

4.207 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 700m radius, the development of the eastern station plaza, of the underground elevated walkway connecting Line1 and Line3 stations under ROW of UMRT and road land, and traffic management. These projects using road land or inside ROW of UMRT are implemented in coordination with authorities such as DOT, MOT-PMU and MRB, including UMRT Line3 project.

4.208 Short projects include the development of primary road in the TOD area, including east-west connecting road and western access road, and elevated walkway crossing to the east, which requires widening sidewalks to install stairs. Without completion of these trunk roads, accessibility is limited only from existing alleys from west area, so HPC should prioritize to promote land acquisition and road development in TOD area in time for UMRT operation.

4.209 Resettlement is required 27,100m² for priority road development roads in TOD area, while 18,100m² residential lands are further required to develop trunk roads in the area within 500m radius.

4.210 The estimated costs for access improvement of V8 are shown in Table 4.2.11-2 for each project and Table 4.2.11-3 by phase.

Table 4.3.2 Access Improvement Project List of V8

		Project Name		Quantity	Estimated Cost (mil. VND)	Implementation Category
Area within 700m Radius	a1	Development of missing link to connect Tran Hung Dao – Ly Thuong Kiet St at east area and Quoc Tu Giam St-Cat Linh St at west areas	Option A (New road – link Tran Hung Dao St – Quoc Tu Giam St – Cat Linh St) of west area	8,800 m ²	16,000	Short
			Option B (north of VNR station) of east area	7,700 m ²	14,000	
	a2	Development of new access road in the west side of the station	24,000m ² (30m x 800m)	51,000	Others ¹⁾	
	a3	Study on improvement of intersection at north and south of station along NH1(Le Duan St)	---	---	Short	
	a4	Improvement of secondary roads including Quoc Tu Giam St., Ngo Si Lien St., Tran Qui Cap St. of west built-up area	21,000 m ²	38,000	Short (Minimum)	
	a5	Improvement of access alleys in Van Chuong, Kham Thien, Tran Hung Dao, Cua Nam, Nguyen Du Wards	42,000 m ² (W=3m, L=14,000m)	88,000	Short (Minimum)	
	a6	Provision of local circulation mini-bus services and community bicycle services	---	---	Short	
	a7	Improvement of intersections in the area within 500 m radius of the station	3 locations	600	Short (Minimum)	
Sub Total					146,600	
TOD area	b1	Priority development of roads located in TOD Area (Le Duan St, new west access road) ²⁾	1. Widening of NH1	10,200m ²	18,000	Short
			2. New west access road (W=30m)	3,600 m ²	6,000	Short
	b2	Development of station plaza in the east and west of the station	1. East station plaza	6,200m ²	23,000	Short (Minimum)
			2. West station plaza	---	---	Basic
	b3	Development of underground walkway connecting between Line1 and Line3 stations and bridges connect to the station	1,000m ² (4m x 250m)	191,000	Short (Minimum)	
	b4	Development of pedestrian bridge crossing NH1	643m ²	31,000	Short	
	b5	Provision of parking facilities under the UMRT viaduct space	13,300 m ²	7,000	Short (Minimum)	
	b6	Improvement of traffic management	Lump sum	5,000	Short (Minimum)	
Sub Total					281,000	
Total³⁾					427,600	

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.
- 3) Total cost includes the cost of Option A of a1.

Table 4.3.3 Summary of Estimated Cost and by Phase for Access Improvement of V8

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a3, a4, a5, a7, b2-1, b3, b5, b6	352,600
	Short	a1, a6, b1-1, b1-2, b4	75,000
Basic		b2-2	--
Total of TOD Project			427,600
<i>Others (road development project)</i>		a2	51,000
Grand Total			478,600

Source: JICA Project Team

4.2.12 C.V. Thong Nhat Station (V9) Area

1) Identified Projects

4.211 Projects identified for the area within 500m radius from the station, and in the TOD Area, are the following (see Figure 4.2.12-1):

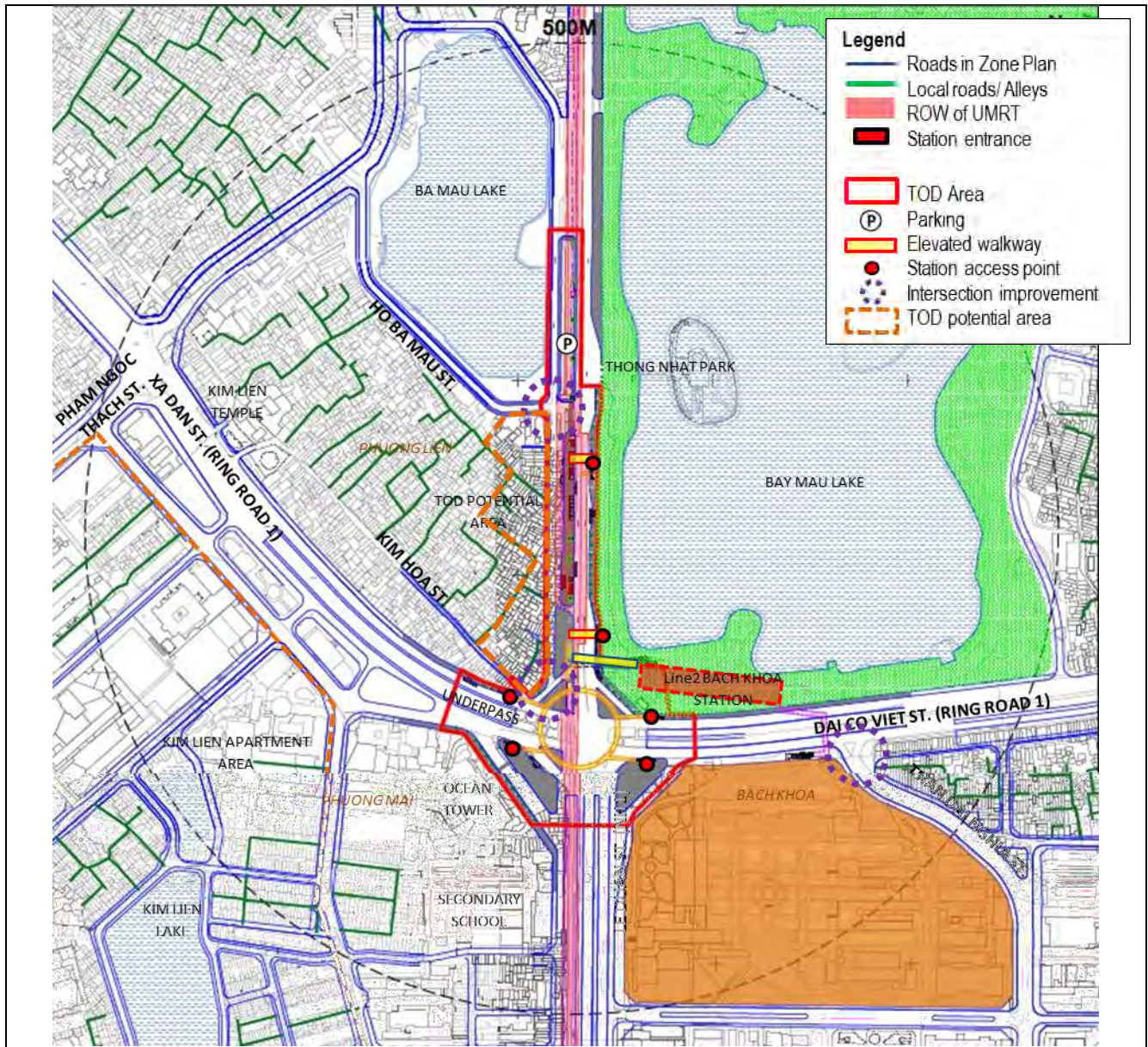
(a) Identified projects for 500m radius Area

- (i) Study on improvement of transport access conditions of RR1 (Dai Co Viet Street- Xa Dan Street), NH1 (Le Duan Street): Since the station is located near to the large intersection and access road is limited only to NH1, it is necessary to study traffic management around the station.
- (ii) Development of new road connecting to Pham Ngoc Thach Street along the west of Ba Mau Lake: To enhance mobility of high-dense residential area, new road will be developed in compliance with the Zone Plan, which will be developed in conjunction with an urban renewal project.
- (iii) Improvement of Tran Dai Nghia Street, Ho Ba Mau Street, Hoang Tich Tri Street and Kim Hoa Street: These roads are main access roads for residential areas and urban facilities, both traffic flows and pedestrian spaces will be ensured.
- (iv) Improvement of alleys in Kim Lien Ward, Phuong Mai Ward and Bach Khoa Ward: Since most of alleys are very narrow and some main alleys are occupied by local shops, not only physical improvement, but also behavior of transport and commercial activities will be improved in terms of traffic safety.
- (v) Improvement of intersections: Intersections of NH1 and RR1 connecting to distribution roads will be improved to facilitate traffics to the station.

(b) Identified Projects in TOD Area

- (i) Development of elevated walkways at the intersection of RR1 (Dai Co Viet Street- Xa Dan Street) and NH1 (Le Duan Street): It is difficult to cross wide trunk roads on foot, so exclusive elevated walkways will be provided for pedestrian and NMV.
- (ii) Development of intermodal facilities under station and along Le Duan Street: It is effective to facilitate traffics to access to the station along NH1, so intermodal facilities will be developed utilizing the space under the elevated station.
- (iii) Provision of parking and retail facilities under the UMRT viaduct space: To provide services for station users, local communities and visitors of urban facilities, the space under the viaduct will be utilized for local socio-economic activities and parking.
- (iv) Provision of space for future connection with the underground station of Line 2: This station will be connected to Bach Khoa Station of phase 2 of Line 2, so underground space will be ensured to develop walkway connecting to stations.
- (v) Improvement of traffic management: Since this station will be utilized by various type of citizen whole day, facilities such as signs, street lights, pedestrian crossings will be provided.

Figure 4.3.6 Identified Project Location Map of V9 Thong Nhat Park Area



Projects within 500m radius

1. Study on improvement of transport access conditions of RR1 (Dai Co Viet St.- Xa Dan St.), NH1 (Le Duan St.)
2. Development of new road connecting to Pham Ngoc Thach St. along the west of Ba Mau Lake
3. Improvement of Tran Dai Nghia St. and Ho Ba Mau St.
4. Improvement of alleys in Kim Lien Phuong Mai, Bach Khoa Wards
5. Improvement of intersections

Projects in TOD Area

1. Priority development of roads in TOD Area
2. Development of elevated walkways at the intersection of RR1 (Dai Co Viet St.- Xa Dan St.) and NH1 (Le Duan St.)
3. Development of intermodal facilities under station and along Le Duan St.
4. Provision of parking and retail facilities under the UMRT viaduct space
5. Provision of space for future connection with the underground station of Line 2
6. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius Area

4.212 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Study on Improvement of Transport Access Conditions of RR1 (Dai Co Viet Street- Xa Dan Street), NH1 (Le Duan Street)

4.213 The station is located near to a large intersection as well as west side of NH1. Since the new access road will be developed under the station and viaduct (one-way from north to south direction), traffic management plan is required how to facilitate traffic flow around the station and intersection.

(b) Improvement of Sidewalk of RR2 (Truong Chinh Street – Dai La Minh Khai Street)

4.214 To improve accessibility from out of station area, sidewalks of RR2 are improved.

- (i) Improvement of RR2: $W=10m$, $L=650m$ ($6,500m^2$)

(c) Development of New Road Connecting to Pham Ngoc Thach Street along the West of Ba Mau Lake

4.215 The new road development connecting Xa Dan Street to Kham Thien Street is promoted to enhance accessibility of high-dense residential areas of Phuong Lien Ward. This street will connect to the west access road of Hanoi Station, so accessibility of west residential area and 2 stations will be improved.

- (i) New south-north connecting road inside Phuong Lien Ward: $W=30m$, $L=800m$

(d) Improvement of Tran Dai Nghia Street and Ho Ba Mau Street

4.216 In this station area, secondary roads provide important access to major urban facilities, especially Tran Dai Nghia Street to universities, Ho Ba Mau Street to Ba Mau Lake and residential areas. Following measures should be implemented.

- (i) Improvement of sidewalk including installment of paved block for disabled, designating parking line in sidewalk, installment of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iii) Improvement of traffic management including restriction of car entry during peak-hour of local market, marking of pedestrian crossing, installment of traffic signs

(e) Improvement of Alleys in Kim Lien Ward, Phuong Mai Ward, Bach Khoa Ward

4.217 In this station area, most alleys are narrow with no sidewalk ($W=2 - 6$ meter, $20,000m^2$), so pedestrians and motorbikes share the space. Kim Hoa Street is the only main access road to NH1 and RR1. It is used as a local market street. The following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installment of bench and information board at open space
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning especially Kim Hoa Street
- (iii) Improvement of open space around local market, school, etc. to provide signs, benches, trees, etc.

(f) Improvement of Intersections

4.218 In this station area, five intersections are improved:

- (i) Location of intersections: (i) Dai Co Viet Street and Tran Dai Nghia Street, (ii) Xa Dan Street and Pham Ngoc Thach Street, and (ii) 3 intersections inside Kim Lien apartment area connecting to Xa Dan Street
- (ii) Improvement measures: installment of traffic signal and pedestrian crossing, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.219 Identified projects in TOD Area (52,000m²) are as follows:

(a) Priority Development of Roads Located in TOD Area

4.220 In TOD Area, new western access road is developed in conjunction with UMRT development. Priority development road area in TOD Area is as follows:

- (i) West access road: W=29.5m (including W=4.5m sidewalk, W=5.5m of carriageway, W=19.5m of station space), L=300m
- (ii) Integrated urban renewal area including station plaza and west access road: 15,000m²

(b) Development of Elevated Walkways at the Intersection of RR1 (Dai Co Viet Street- Xa Dan Street) and NH1 (Le Duan Street)

4.221 To ensure pedestrians' safety to cross the wide trunk roads and intersection and to connect the park area, three elevated walkways are developed:

- (i) North pedestrian bridge crossing NH1: W=4m, L=20m (80m²), 1 stair and 1 elevator
- (ii) South pedestrian bridge crossing NH1: W=4m, L=75m (300m²), 1 stair and 1 elevator
- (iii) Circular pedestrian bridge crossing intersection of NH1 and RR1: W=4m, Diameter=85m, four stairs

(c) Development of Intermodal Facilities under Station and along Le Duan Street

4.222 Under the elevated station, loading and unloading space is developed for traffic vehicles going north-south. Along the eastern sidewalk, in front of Thong Nhat Park, a bus stop is developed near to the entrance of the pedestrian bridge.

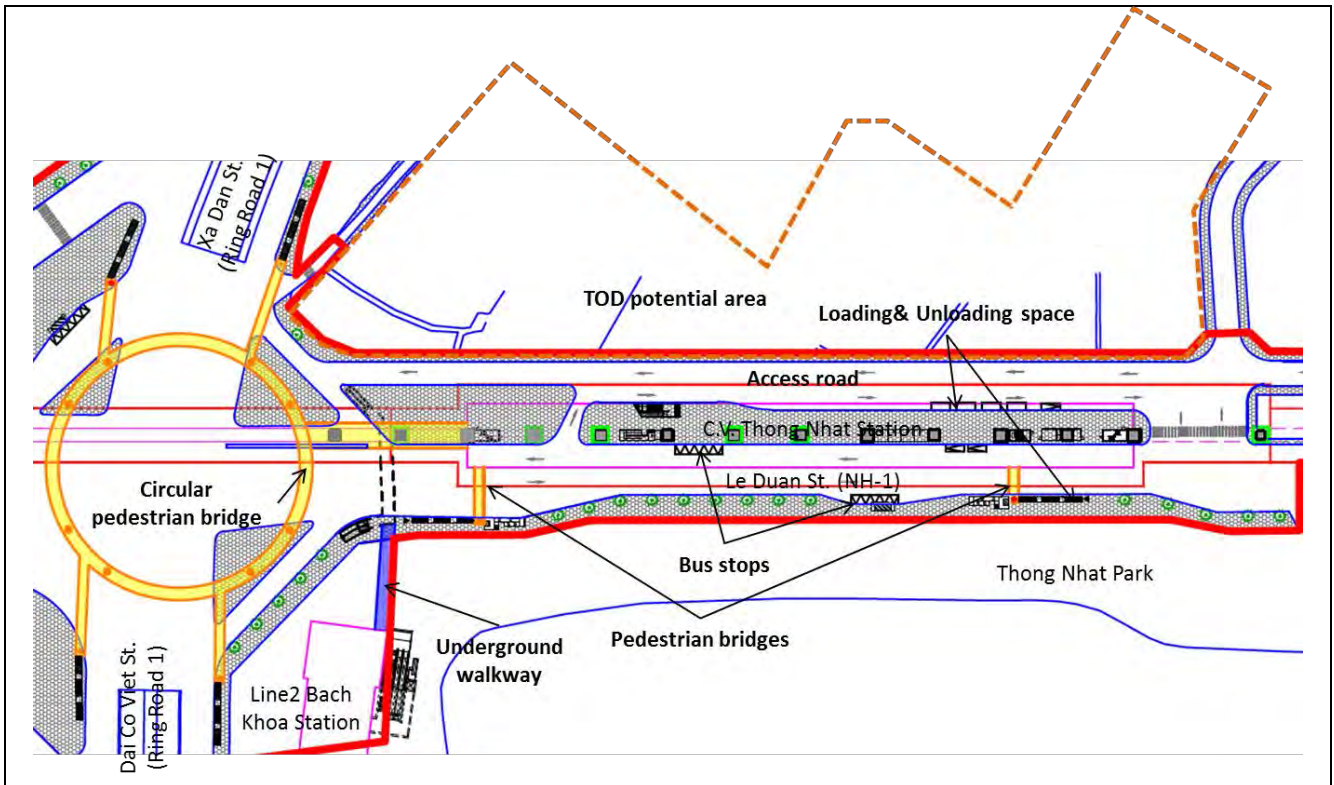
- (i) Intermodal facilities under the station: bus stop (W=2m, L=20m), taxi berth (W=2m, L=40m), loading and unloading space (W=2m, L=20m)
- (ii) Bus stop along east of NH1: bus stop (W=2m, L=20m)

(d) Provision of Parking and Retail Facilities under the UMRT Viaduct Space

4.223 At present, the space between NH1 and Ba Mau Lake is used for car parking. After UMRT development, this space including under viaduct is used not only for parking but also small-scale commercial and civic service facilities.

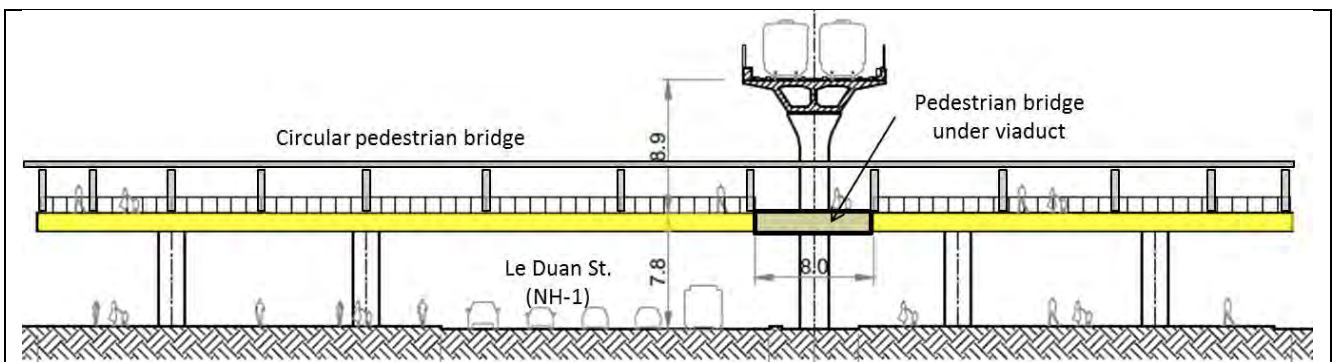
- (i) Parking and retail facility space under the viaduct: W=15m, L=150m (2,250m²)

Figure 4.3.7 Layout Plan of Pedestrian Bridges and Intermodal Facilities



Source: JICA Project Team

Figure 4.3.8 Cross Section of Pedestrian Bridge crossing Intersection of NH1 and RR1



Source: JICA Project Team

(e) Provision of Space for Future Connection with the Underground Station of Line2

4.224 Bach Khoa Station on Line2, after Phase2, will be developed in the south-east of Thong Nhat Park. The space for underground walkway development will connect Line1 and Line2 stations, using park and road spaces.

4) Summary of Access Improvement Projects

4.225 The total estimated cost is 282,000 million VND, including short (minimum) projects of 215,000 million VND (76% of total) and basic projects of 67,000 million VND (24% of total).

4.226 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500m radius, development of an elevated walkway crossing NH-1 and intersection of NH-1 and RR1 using ROW of UMRT and road land, and traffic management. These projects using road land or inside ROW of UMRT are implemented in coordination with authorities such as DOT and MOT-PMU.

4.227 Basic projects include development of underground walkway between stations of Line1 and Line2 (phase2). After confirmation of the location and structure of Line2 phase2 station, necessary land should be secured for underground walkway which will be constructed as a part of Line2 phase2 project.

4.228 There is no resettlement needed for TOD projects, whereas 8,500m² residential land is required to develop trunk roads in the area within 500-m radius.

4.229 The estimated costs for access improvement of V9 are shown in Table 4.2.12-1 for each project and Table 4.2.12-2 by phase.

Table 4.3.4 Access Improvement Project List of V9

	Project Name		Quantity	Estimated Cost (mil. VND)	Implementation Category	
Area within 500m Radius	a1	Improvement of transport access conditions of main roads including RR1 (Dai Co Viet - Xa Dan St.), NH1 (Le Duan St.), Pham Ngoc Thach St	---	---	Short (Minimum)	
	a2	Improvement of RR1	1. Improvement	8,000m ²	14,000	Short (Minimum)
			2. Widening of Dai Co Viet St. (W=67m)	5,100m ²	9,000	Others ¹⁾
	a3	Development of new road of west of Ba Mau Lake	8,000m ²	16,000	Others ¹⁾	
	a4	Improvement of sidewalk/road surface of Tran Dai Nghia St., Ho Ba Mau St., Hoang Tich Tri St. and Kim Hoa St.	25,000m ²	35,000	Short (Minimum)	
	a5	Improvement of access alleys in Kim Lien Phuong Mai, Bach Khoa Wards	9,000m ² (W=3m, L=3,500m)	22,000	Short (Minimum)	
	a6	Improvement of intersections in the area within 500m radius of the station	6 locations	1,000	Short (Minimum)	
Sub Total (excluding others)				72,000		
TOD area	b1	Development of elevated walkways at the intersection of RR1(Dai Co Viet St.– Xa Dan St) and NH1 (Le Duan St)	1. North pedestrian bridge crossing NH1	87m ²	20,000	Short (Minimum)
			2. South pedestrian bridge crossing NH1	311 m ²		Short (Minimum)
			3. Circular pedestrian bridge crossing intersection	2,400m ²	118,000	Short (Minimum)
	b2	Development of intermodal facilities under the station and along Le Duan St.	Lump sum	3,000	Short (Minimum)	
	b3	Provision of parking and retail facilities under the UMRT viaduct space	3,200m ²	1,000	Short (Minimum)	
	b4	Provision of necessary space for future connection with the underground station of Line 2 ²⁾	500m ²	---	Short	
	b5	Improvement of traffic management measures in TOD Area	Lump sum	1,000	Short (Minimum)	
Sub Total				168,000		
Total				240,000		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) This project aims to ensure the space for future development of walkway, so the construction cost is not estimated.

Table 4.3.5 Summary of Estimated Cost and by Phase for Access Improvement of V9

Project Type		Included Project ID	Estimated Cost (Mil. VND)
Short	Minimum	a1, a2-1, a4, a5, a6, b1-1, b1-2, b1-3, b2, b3, b5	215,000
			--
Basic		b4	0
Total of TOD Project			215,000
Others (road development)		a2-2, a3	25,000
Grand Total			240,000

Source: JICA Project Team

4.2.13 Bach Mai Station (V10) Area

1) Identified Projects

4.230 Projects identified for the area within 500m radius from the station, and in the TOD Area, are the following (see Figure 4.2.13-1):

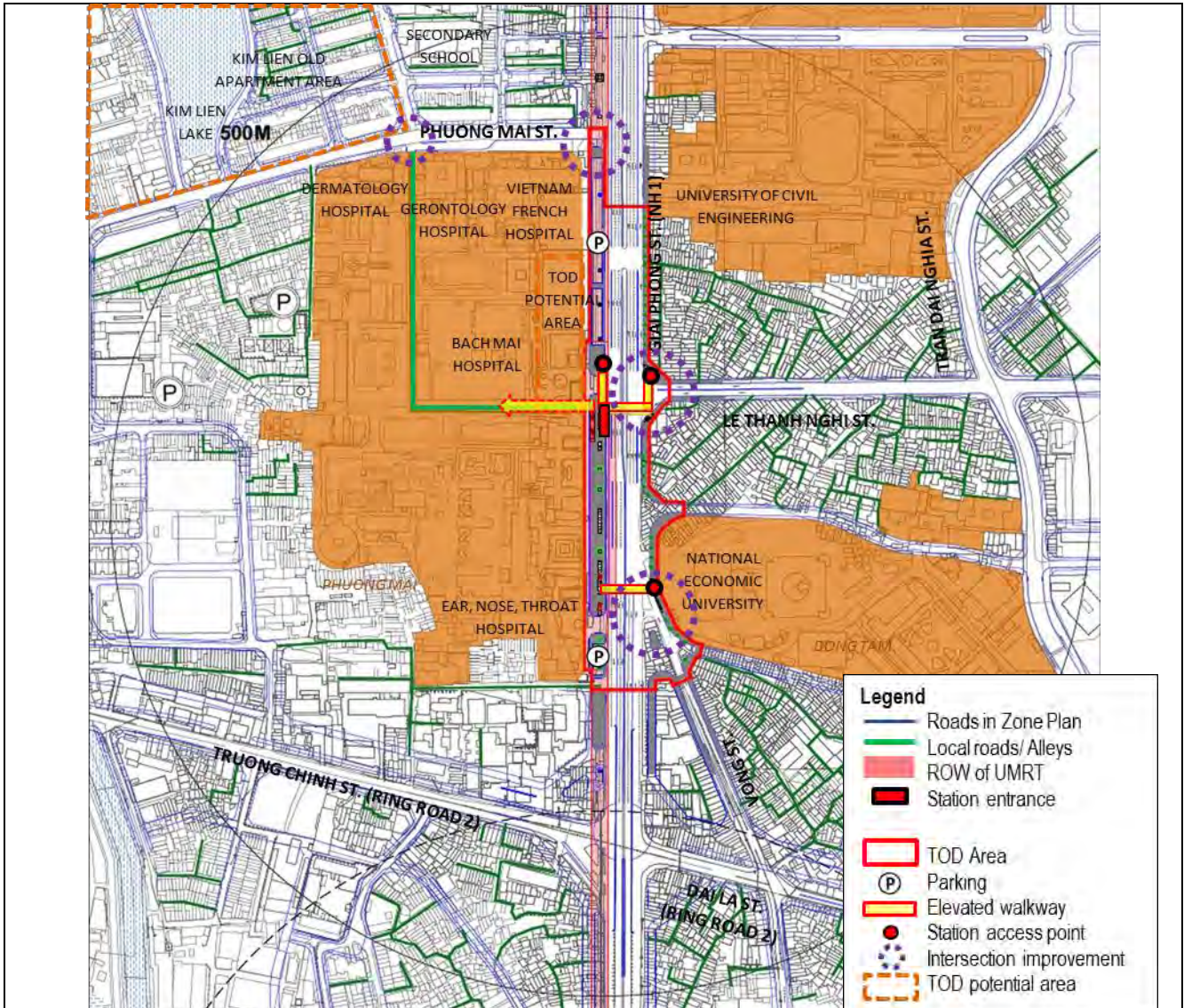
(a) Identified projects for 500m radius Area

- (i) Improvement of NH1 (Giai Phong Street), RR2 (Truong Chinh Street – Dai La Minh Khai Street) and Le Thang Nghi Street: There are much traffics from out of the station area to universities, hospitals and the station, trunk road conditions especially sidewalks will be improved.
- (ii) Improvement of Tran Dai Nghia Street, Vong Street and Phuong Mai St: These roads are the main access roads of residential areas and urban facilities, road conditions will be improved in terms of surface condition and management of sidewalk spaces.
- (iii) Improvement of alleys in Phuong Mai Ward, Bach Khoa Ward and Dong Tam Ward: The alleys of this station area contribute to promote local community activities, so it is effective to improve local roads where people often gather to enhance traffic safety and community activities.
- (iv) Improvement of intersections: It is difficult to cross NH1 for pedestrian because of its width and traffic volume, so intersections of NH1 and other trunk roads will be improved to prioritize pedestrian crossing and smooth traffic flow.

(b) Identified Projects in TOD Area

- (i) Priority development of main roads located in TOD Area: It is prioritized to widen NH1 around the station to ensure sidewalk space and install pedestrian bridge with elevator along NH1 at east.
- (ii) Development of intermodal facilities under station and in the east side of the station along NH1: It is effective to facilitate traffics to access to the station along NH1, so intermodal facilities will be developed utilizing the space under the elevated station.
- (iii) Study on traffic management for smooth movement between UMRT station and hospital areas: To ensure safety and tranquility of hospital area, traffic management around station especially near the hospital entrance will be studied further, while it is proposed to provide elevated walkway to cross the hospital entrance, and to extend it inside public space of hospital areas to ensure direct access to the station.
- (iv) Provision of parking and retail facilities under the UMRT viaduct: To provide convenient services for station and facility users as well as local communities, space under the viaduct will be utilized for retail and parking service with pedestrian space.
- (v) Improvement of traffic management: Traffic safety facilities are provided to ensure “barrier free” road and UMRT space for various types of people.

Figure 4.3.9 Identified Project Location Map of V10 Bach Mai Area



Projects within 500m radius

1. Improvement of NH1 (Giai Phong St.), RR2 (Truong Chinh St. – Dai La Minh Khai St.) and Le Thang Nghi St.
2. Improvement of Tran Dai Nghia St., Vong St. and Phuong Mai St
3. Improvement of alleys in Phuong Mai, Bach Khoa, Dong Tam Wards
4. Improvement of intersections

Projects in TOD Area

1. Priority development of main roads located in TOD Area
2. Development of intermodal facilities under station and in the east side of the station along NH1
3. Study on connecting facilities and traffic management for smooth movement between UMRT station and hospital areas
4. Study on utilization of spaces under the UMRT viaduct
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius Area

4.231 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Improvement of Sidewalk of NH1 (Giai Phong Street), RR2 (Truong Chinh Street – Dai La Minh Khai Street) and Le Thanh Nghi Street

4.232 To improve accessibility of station area, sidewalk of trunk roads including NH1, RR2 and Le Thanh Nghi Street are improved.

- (i) Improvement of Giai Phong Street (NH1): $W=10m$, $L=820m$ ($8,200m^2$)
- (ii) Improvement of RR2: $W=10m$, $L=650m$ ($6,500m^2$)
- (iii) Improvement of Le Thanh Nghi Street: $W=6m$, $L=460m$ ($4,600m^2$)

(b) Improvement of Tran Dai Nghia Street, Vong Street and Phuong Mai Street

4.233 In this station area, secondary roads provide important access to major urban facilities, especially Tran Dai Nghia Street to Hanoi Engineering University and residential areas, Vong Street to National Economic University and residential areas, and Phuong Mai Street to hospital and Kim Lien apartment area. The following measures should be implemented:

- (i) Improvement of sidewalk including installment of paved block for disabled, designating parking line in sidewalk, installment of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iii) Improvement of traffic management including restriction of car entry during peak-hour of commuting, marking of pedestrian crossing, installment of traffic signs

(c) Improvement of Alleys in Phuong Mai Ward, Bach Khoa Ward and Dong Tam Ward

4.234 In this station area, there are not many alleys ($8,000m^2$). Hospitals and universities are barriers for local communities to access the trunk roads, excluding some inner-roads opened to public. Following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installment of bench and information board at open space
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning
- (iii) Improvement of open space around local market, school, etc. to provide signs, benches, trees, etc.
- (iv) Utilization of roads inside urban facility lands for public

(d) Improvement of Intersections

4.235 In this station area, three intersections are improved:

- (i) Location of intersections: (i) Tran Dai Nghia Street and Le Thanh Nghi Street, (ii) RR2 and Vong Street, and (iii) intersection in Kim Lien apartment area along Phuong Mai Street
- (ii) Improvement measures: installment of traffic signal and pedestrian crossing, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.236 Identified projects in TOD Area (38,300m²) are as follows:

(a) Priority development of roads located in TOD Area

4.237 In TOD Area, widening of NH1 is prioritized to ensure sidewalk of east and install pedestrian bridges with elevators.

- (i) Widening of NH1: W=67m, L=800m (12,400m² for widening)

(b) Development of Intermodal Facilities under Station and in the East Side of the Station along NH1

4.238 Under the elevated station, loading and unloading space is developed for traffics from north to south direction. Along the east sidewalk, bus stop is developed near to the entrance of the pedestrian bridge.

- (i) Intermodal facilities under the station: bus stop (W=2m, L=20m), loading and unloading space (W=2m, L=100m)
- (ii) Bus stop along east of NH1: bus stop (W=2m, L=20m)

(c) Provision of Parking and Retail Facilities under the UMRT Viaduct Space

4.239 The space under viaduct is used not only for parking but also small-scale commercial and civic service facilities, which serves for hospital users and university students as well.

- (i) Parking and retail facility space under the viaduct: W=15m, L=160m (2,400m²)

(d) Development of Elevated Walkway for Smooth Movement between UMRT Station and Hospital Areas

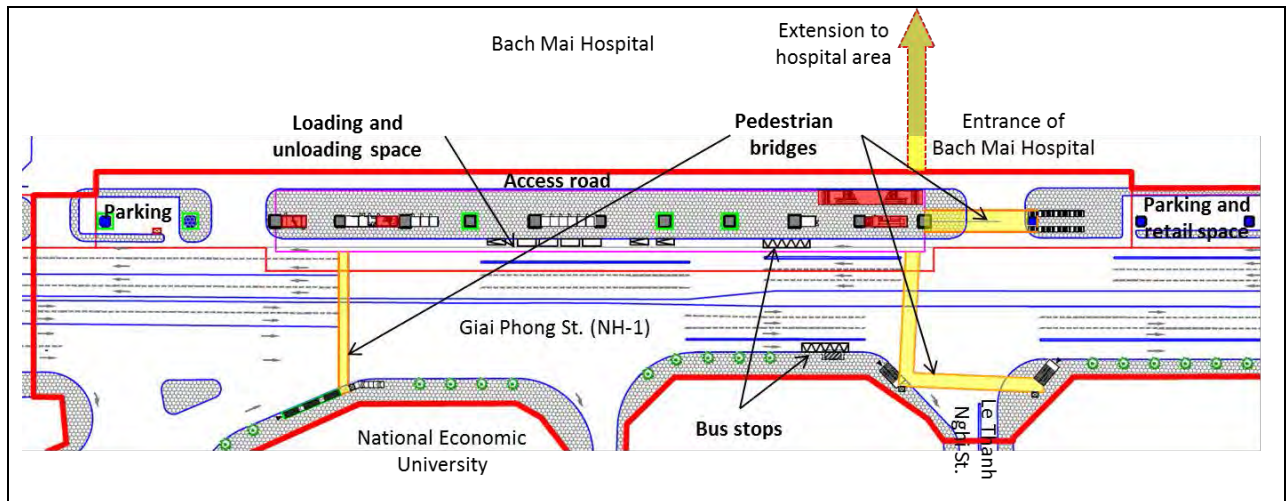
4.240 At present, there is only one pedestrian bridge near to the entrance of Bach Mai Hospital. After UMRT development, passengers and university students use elevated walkways for crossing NH1. For this, 3 pedestrian bridges are developed.

- (i) North pedestrian bridge connecting Le Thanh Nghi St, station and hospital entrance: W=4m, L=80m (320m²), 1 stair and 1 elevator
- (ii) South pedestrian bridge connecting to Vong Street and station: W=4m, L=40m (160m²), 1 stair and 1 elevator
- (iii) Pedestrian bridge under the viaduct crossing the hospital entrance: W=7m, L=30m (210m²), 1 stair
- (iv) Furthermore, it is proposed to study further to extend the elevated walkway inside the hospital area, especially direct connection to the hospital building at the 2nd floor.

(e) Improvement of Traffic Management

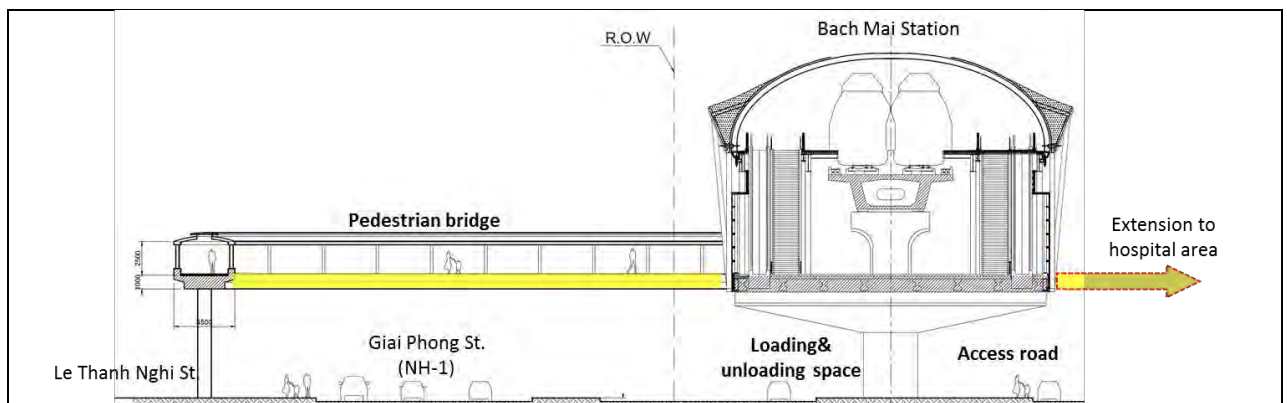
4.241 To ensure pedestrian crossing, improvement of intersections of NH1 at Le Thanh Nghi Street, Vong Street and Phuong Mai Street is required, by installment of pedestrian crossing with signals, colored pavement at the corner, etc.

Figure 4.3.10 Layout Plan of Pedestrian Bridges and Intermodal Facilities



Source: JICA Project Team

Figure 4.3.11 Elevation Plan of Pedestrian Bridge Crossing NH1



Source: JICA Project Team

4) Summary of Access Improvement Projects

4.242 The total estimated cost is 197,000 million VND, including short (minimum) projects of 151,000 million VND (77% of total) and short projects of 46,000 million VND (23% of total).

4.243 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500m radius, development of bus stops, intermodal facilities, elevated walkway crossing NH-1 inside ROW of UMRT and road land, and traffic management. These projects using road land or inside ROW of UMRT are implemented in coordination with authorities such as DOT and MOT-PMU.

4.244 Short projects include development of primary road in the TOD area, widening NH-1, and elevated walkway crossing NH-1, which requires widening the sidewalk for installment of stairs. HPC should give priority to land acquisition and road development in the TOD area in time for UMRT operation.

4.245 4,700m² resettlement is required for priority road development in the TOD area, whereas 40,000m² residential land are further required to widen RR2 in the area within 500m radius.

4.246 The estimated costs for access improvement of V10 are shown in Table 4.2.13-1 for each project and Table 4.2.13-2 by phase.

Table 4.3.6 Access Improvement Project List of V10

		Project Name	Quantity	Estimated Cost (mil. VND)	Implementati on Category	
Area within 500m Radius	a1	Improvement of sidewalk of NH1 (Giai Phong St.), RR2 (Truong Chinh St.) and Le Thanh Nghi St.	1. Improvement	17,600m ²	31,000	Short (Minimum)
			2. Widening	15,000m ²	26,000	Others ¹⁾
	a2	Development of secondary roads including Tran Dai Nghia St, Vong St. and Phuong Mai St	16,000 m ²	29,000	Short (Minimum)	
	a3	Improvement of access alleys in Phuong Mai, Bach Khoa, Dong Tam Wards	36,000 m ² (W=4m, L=9,000m)	76,000	Short (Minimum)	
	a4	Improvement of intersections	6 locations	1,000	Short (Minimum)	
	Sub Total				137,000	
TOD area	b1	Priority development of roads located in TOD Area (NH1) ²⁾	12,400 m ²	22,000	Short	
	b2	Development of intermodal facilities under station and in the east side of the station along NH1	2 locations	1,000	Short (Minimum)	
	b3	Provision of connecting facilities for smooth movement between UMRT station and hospital areas	1. North of NH1 (W=4m)	320m ²	16,000	Short
			2. South of NH1 (W=4m)	160m ²	8,000	Short
			3. Under viaduct (W=7m)	210m ²	10,000	Short (Minimum)
	b4	Provision of parking and retail facilities under the UMRT viaduct space	4,500 m ²	1,000	Short (Minimum)	
	b5	Improvement of traffic management	3 signals 150m ² for marking	2,000	Short (Minimum)	
Sub Total				60,000		
Total				197,000		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.3.7 Summary of Estimated Cost and by Phase for Access Improvement of V10

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a1-1, a2, a3, a4, b2, b3-3, b4, b5	151,000
		a1-2, b1, b3-1, b3-2	46,000
Basic			0
Total of TOD Project			197,000
Others (road development project)			26,000
Grand Total			223,000

Source: JICA Project Team

4.2.14 Phuong Liet Station (V11) Area

1) Identified Projects

4.247 Projects identified for the area within 500m radius from the station, and in the TOD Area, are the following (see Figure 4.2.14-1):

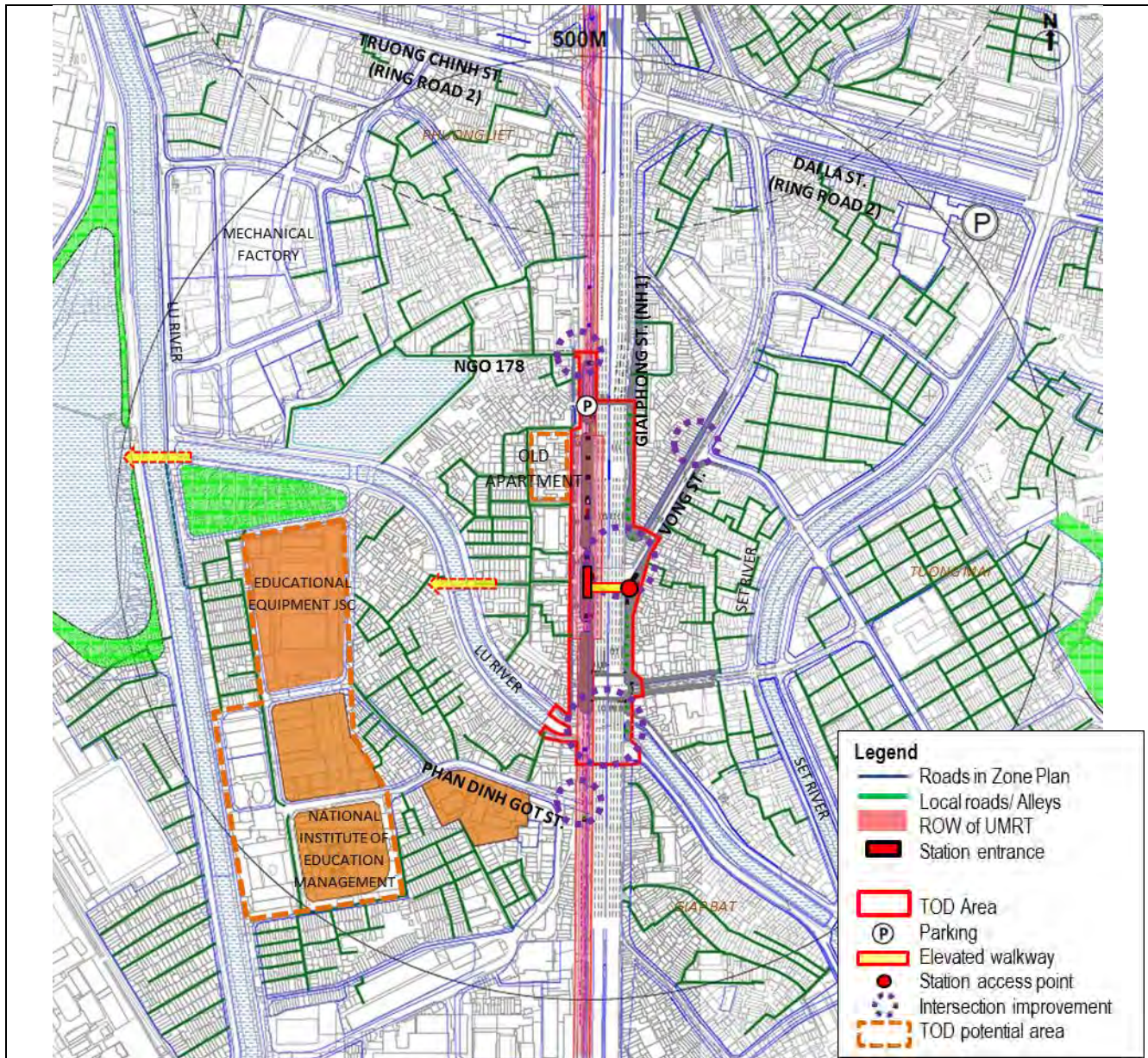
(a) Identified Projects for 500m radius Area

- (i) Improvement of Vong Street, Nguyen An Ninh Street Giap Bat Street, Phan Dinh Got Street, Ngo 178: This station will be contributed to local communities of residential areas, so main access roads will be improved connecting to the station.
- (ii) Improvement of roads along Lu river and Set River: Riverside streets are used for local market and environmental space, so these roads will be one of main access roads to the station where local communities enjoy amenity and services.
- (iii) Development of a new bridge across Lu River and improvement of connecting road on the west side of the station: To connect the area over the river to the station area, it is effective to develop a bridge and short-cut access road.
- (iv) Improvement of alleys in Phuong Liet Ward, Dong Tam Ward, Giap Bat Ward: Most of alleys are used by local residents rather than visitors, so main local roads will be prioritized to improve road and parking condition by communities.
- (v) Improvement of intersections: The Y-shaped intersection of Vong Street and NH1 is Y-shaped will be improved by providing turn priority lane, stop sign, etc.

(b) Identified Projects in TOD Area

- (i) Priority development of main roads located in TOD Area: It is prioritized to widen NH1 around the station to ensure sidewalk space and install pedestrian bridge with elevator along NH1 at east.
- (ii) Provision of intermodal facilities under station and on the east side of the station along NH1: It is effective to facilitate traffics to access to the station along NH1, so intermodal facilities will be developed utilizing the space under the elevated station.
- (iii) Provision of parking and retail facilities under the UMRT viaduct space: Since there are few commercial and civic service facilities in this station area, it is convenient to provide such services and parking under the viaduct.
- (iv) Improvement of traffic management: To ensure traffic safety of local communities and station users, traffic management facilities will be installed such as signs, lights, pedestrian crossings, etc.

Figure 4.3.12 Identified Project Location Map of V11 Phuong Liet Area



Projects within 500m radius

1. Improvement of Vong St., Nguyen An Ninh St. Giap Bat St., Phan Dinh Got St., Ngo 178
2. Improvement of roads along Lu river and Set River
3. Improvement of alleys in Phuong Liet, Dong Tam, Giap Bat Wards
4. Improvement of intersections

Projects in TOD Area

1. Priority development of main roads located in TOD Area
2. Provision of intermodal facilities under station and on the east side of the station along NH1
3. Provision of parking and retail facilities under the UMRT viaduct space
4. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius Area

4.248 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Improvement of Vong Street, Nguyen An Ninh Street Giap Bat Street, Phan Dinh Got Street, Ngo 178

4.249 In this station area, there are no connecting roads between the eastern and western areas, except for RR2. In the east, alleys and local roads connect to Vong Street to access to NH1. In the western area, local roads directly connect to NH1, so people walk along VNR railway area. The following measures should be implemented.

- (i) Development of pedestrian walkway under Line1 viaduct
- (ii) Improvement of sidewalk including installment of paved block for disabled, designating parking line in sidewalk, installment of signboard to indicate orientations of urban facilities and station, street lights
- (iii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iv) Improvement of traffic management including restriction of car entry during peak-hour of commuting, marking of pedestrian crossing, installment of traffic signs

(b) Improvement of Roads along Lu River and Set River

4.250 Roads along Lu River and Set River are one of major roads for local communities for commuting and shopping along local market. To improve the living environment in harmony with rivers and ponds around the station area, and to enhance accessibility from the opposite side of Lu River, the following measures should be implemented:

- (i) Improvement of traffic management including restriction of running motorcycle during peak-hour of commuting
- (ii) Improvement of streetscape including re-pavement, installment of street lights, unification of colors of shelters and tents of local markets
- (iii) Development of a new bridge across Lu River and improvement of connecting road on the west side of the station

(c) Improvement of Alleys in Phuong Liet Ward, Dong Tam Ward, Giap Bat Ward

4.251 In this station area, most local communities use alleys to access the trunk roads (11,000m²). While their width is 6~8m, there are no sidewalks on most alleys. The following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installment of bench and information board at open space
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning
- (iii) Improvement of open space around local market, school, etc. to provide signs, benches, trees, etc.

(d) Improvement of Intersections

4.252 In this station area, three intersections are improved:

- (i) Location of intersections: (i) Vong Street and Nguyen An Ninh Street, (ii) NH1 and Vong St, and (iii) NH1 and Phan Dinh Got Street
- (ii) Improvement measures: installment of traffic signal and pedestrian crossing, colored

pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.253 Identified projects in TOD Area (28,900m²) are as follows:

(a) Priority Development of Roads located in TOD Area

4.254 In the TOD Area, widening NH1 is a priority to create a sidewalk to the east and install pedestrian bridges with elevators.

- (i) New west access road under viaduct: W=15.5m, L=370m (1,000m² for widening)
- (ii) Widening of east of NH1: W=45.0m (W=8m for sidewalk), L=370m (3,000m² for widening of sidewalk)

(b) Development of Intermodal Facilities under Station and in the East Side of the Station along NH1

4.255 Under the elevated station, loading and unloading space is developed for traffic going north-south. Along the eastern sidewalk, a bus stop is developed near the entrance of the pedestrian bridge.

- (i) Intermodal facilities under the station: bus stop (W=2m, L=20m), loading and unloading space (W=2m, L=100m)
- (ii) Bus stop along east of NH1: bus stop (W=2m, L=20m)

(c) Provision of Parking and Retail Facilities under the UMRT Viaduct Space

4.256 The space under the viaduct is used not only for parking but also for small-scale commercial and civic service facilities.

- (i) Parking and retail facility space under the viaduct: W=15m, L=50m (750m²)

(d) Development of Elevated Walkway Crossing NH1

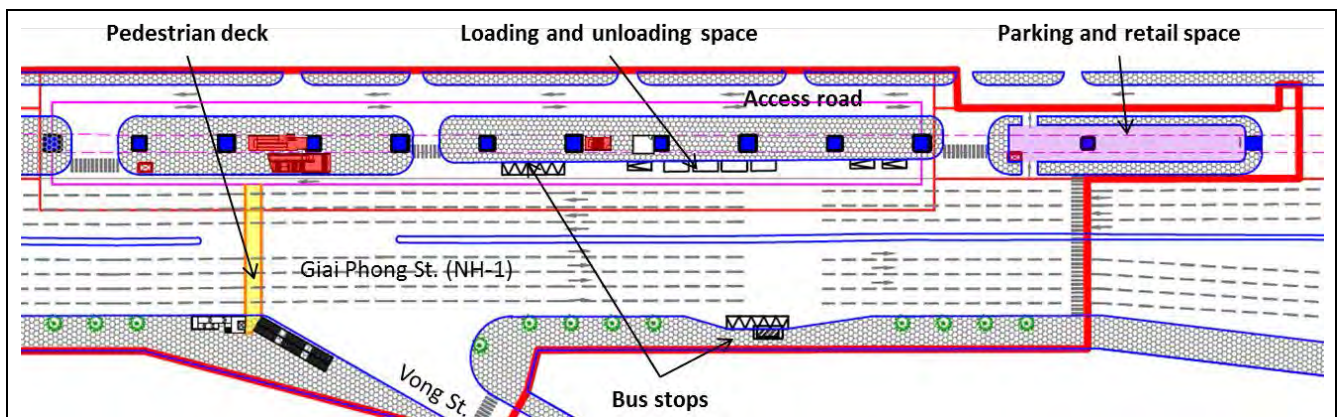
4.257 1 pedestrian bridge is developed to cross NH1.

- (i) Pedestrian bridge: W=4m, L=35m (140m²), one stair and one elevator

(e) Improvement of Traffic Management

4.258 To ensure pedestrian crossing, improvement of intersections of NH1 at Vong Street, Giap Bat Street and Phan Dinh Got Street is required, by installment of pedestrian crossing with signals, colored pavement at the corner, etc.

Figure 4.3.13 Intermodal Facilities Development Plan in TOD Area of V10 Bach Mai Station



Source: JICA Project Team

4) Summary of Access Improvement Projects

4.259 The total estimated cost is 177,200 million VND, including short (minimum) projects of 138,400 million VND (78% of total) and short projects of 38,800 million VND (22% of total).

4.260 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500m radius, development of bus stops, intermodal facilities, elevated walkway crossing NH-1 inside ROW of UMRT and road land, and traffic management. These projects using road land or inside ROW of UMRT are implemented in coordination with authorities such as DOT and MOT-PMU.

4.261 Short projects include development of primary road in the TOD area, widening NH-1, and elevated walkway crossing NH-1, which requires widening the sidewalk for installment of stairs. HPC should give priority to land acquisition and road development in the TOD area in time for UMRT operation.

4.262 4,200m² resettlement is required for priority road development in the TOD area, whereas 9,200m² of additional residential land is required to widen trunk roads in the area within 500-m radius.

4.263 The estimated costs for access improvement of V11 are shown in Table 4.2.14-1 for each project and Table 4.2.14-2 by phase.

Table 4.3.8 Access Improvement Project List of V11

		Project Name	Quantity	Estimated Cost (mil. VND)	Implementation Category	
Area within 500m Radius	a1	Improvement of Vong St., Nguyen An Ninh St. Giap Bat St., Phan Dinh Got St., Alley 178 – Giai Phong St.	1. Improvement	15,000m ²	27,000	Short (Minimum)
			2. Widening	9,200m ²	16,400	Others ¹⁾
	a2	Improvement of road along Lu river (only one side)	7,000m ²	13,000	Short (Minimum)	
	a3	Development of a new bridge across Lu River and improvement of connecting road on the west side of the station	1,000m ²	4,800	Short	
	a4	Improvement of access alleys in Phuong Liet, Dong Tam, Giap Bat Wards	45,000m ² (W=3m, L=15,000m)	95,000	Short (Minimum)	
	a5	Improvement of intersection in the area within 500 m radius of the station	3 locations	600	Short (Minimum)	
Sub Total				140,400		
TOD area	b1	Priority development of main roads located in TOD Area (NH1) ²⁾	15,000m ²	27,000	Short	
	b2	Development of intermodal facilities under station and in the east side of the station along NH1	900m ²	700	Short (Minimum)	
	b3	Provision of parking and retail facilities under the UMRT viaduct space	750m ²	300	Short (Minimum)	
	b4	Provision of elevated walkway crossing NH1 (W=4m)	140m ²	7,000	Short	
	b5	Improvement of traffic management		1,800	Short (Minimum)	
	Sub Total				36,800	
Total				177,200		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.3.9 Summary of Estimated Cost and by Phase for Access Improvement of V11

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a1-1, a2, a4, a5, b2, b3, b5	138,400
	Short	a1-2, a3, b1, b4	38,800
Basic			0
Total of TOD Project			177,200
Others (road development)			16,400
Grand Total			193,600

Source: JICA Project Team

4.2.15 Giap Bat Station (V12) Area

1) Identified Projects

4.264 Projects identified for the area within 700m radius from the station, and in the TOD Area are the following (see Figure 4.2.15-1):

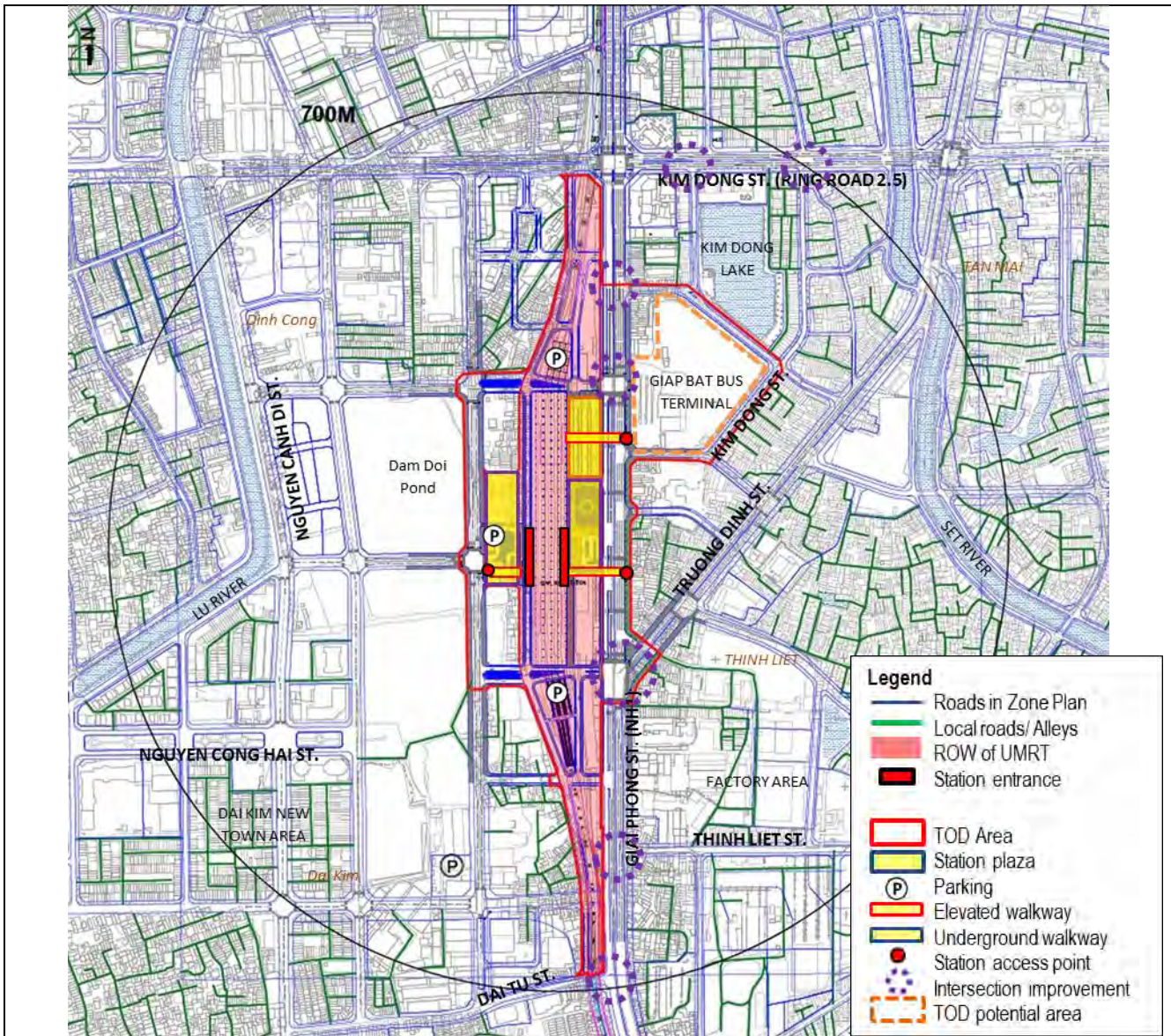
(a) Identified Projects for 700m radius Area

- (i) Development of RR2.5 and new west access road to station: To be a transport hub of south of the city, trunk road connecting west and east of the city and the west road will be developed.
- (ii) Development of distribution roads of west in consideration of comprehensive TOD development in the west: Hierarchical road network will be developed in west area to facilitate vehicle traffic and to ensure exclusive pedestrian space.
- (iii) Improvement of Truong Dinh Street, Giap Nhi Street, Giap Bat Street, Nguyen Khanh Di Street: These roads are main access roads from residential areas to NH1, so road spaces are effectively used for smooth traffic flow by regulating parking and roadside activities.
- (iv) Improvement of alleys in Thinh Liet, Dinh Cong Ward, Dai Kim Ward and Tan Moi Ward: Most of local communities use motorbikes rather than walk, so it is necessary to regulate motorbike traffic by designating pedestrian space, speed limit, etc.
- (v) Development of a new bridge across Lu river and improvement of connecting road on the west side of the station: To enhance connectivity over the river, exclusive bridges for pedestrians and bicycles will be developed which need short-cut access to the station.
- (vi) Improvement of intersections: There are many intersections which are occupied by buses and trucks, so traffic signals need to be properly managed and pedestrian signals will be installed to ensure safe crossing of NH1.

(b) Identified Projects in TOD Area

- (i) Priority development of main roads located in TOD Area: New west access road and widened NH1 will be provided timely to ensure main access roads.
- (ii) Development of east and west station plazas: To be a transport hub and a landmark, station plazas with inner-city bus terminal and pedestrian plazas will be developed.
- (iii) Development of connecting facilities between the station and Giap Bat Bus Terminal crossing NH1: To ensure smooth transfer between long-distance bus and inner city bus terminal to UMRT station, pedestrian bridge will be installed connecting these bus terminals to the concourse floor of the station.
- (iv) Provision of parking facilities under the UMRT viaduct space: There are large space under viaduct, which accommodates parking connecting to the station.
- (v) Improvement of traffic management: Traffic management facilities such as signs and lights will be installed at station plazas and intersections.

Figure 4.3.14 Identified Project Location Map of V12 Giap Bat Area



Projects within 700m radius

1. Development of RR2.5 and new west access road to station
2. Development of distribution roads of west in consideration of comprehensive TOD development in the west
3. Improvement of Truong Dinh St., Giap Nhi St., Giap Bat St., Nguyen Khanh Di St.
4. Improvement of alleys in Thinh Liet, Dinh Cong, Dai Kim and Tan Moi Wards
5. Development of a new bridge across Lu river and improvement of connecting road on the west side of the station
6. Improvement of intersections

Projects in TOD Area

1. Priority development of roads in TOD Area
2. Development of east and west station plazas
3. Development of connecting facilities between the station and Giap Bat Bus Terminal crossing NH1
4. Provision of parking facilities under the UMRT viaduct space
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 700m radius Area

4.265 Identified projects for access improvement in the area within 700m radius are as follows:

(a) Development of RR2.5 and New West Access Road to Station

4.266 Although the development of RR2.5 (W=40m) and west access road (W=30m) is committed by DOT, it is advisable to complete the section when the UMRT is in operation. When the development and widening is not in time, new access roads inside VNR are used.

4.267 Within 500m radius of the station, estimated area needed include 18,000m² (including 18,000m² of residential area) for RR2.5 (W=40m, L=450m) and 39,000m² (including 3,000m² of residential area) for development of west access road (W=30m, L=1,300m), respectively.

(b) Development of Distribution Roads of West in Consideration of Comprehensive TOD Development in the West

4.268 The roads in west area of station are developed in conjunction with integrated urban redevelopment, by applying Land Readjustment Scheme (see Chapter6).

(c) Improvement of Truong Dinh Street, Giap Nhi Street, Giap Bat Street and Nguyen Khanh Di Street

4.269 In this station area, there are no connecting roads between east and west areas.. In the east, alleys and local roads connect to Truong Dinh Street to access to NH1. In the west area, there are no distribution roads for 1km around the station. Following measures are implemented:

- (i) Development of new access roads inside VNR land
- (ii) Improvement of sidewalk including installment of paved block for disabled, designating parking line in sidewalk, installment of signboard to indicate orientations of urban facilities and station, street lights
- (iii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iv) Improvement of traffic management including restriction of car entry during peak-hour of commuting, marking of pedestrian crossing, installment of traffic signs

(d) Improvement of Alleys in Thinh Liet Ward, Dinh Cong Ward, Dai Kim Ward and Tan Moi Ward

4.270 In this station area, most of local communities use alleys to access to trunk roads (5,000m²). While its width is 6 ~ 8m, there are no sidewalks of most of alleys. Following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installment of bench and information board at open space
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning
- (iii) Improvement of open space around local market, school, etc. to provide signs, benches, trees, etc.

(e) Development of a New Bridge across Lu River and Improvement of Connecting Road on the West Side of the Station

4.271 There are few bridges crossing of Lu River, so local communities need to bypass to Dinh Cong Street which are very narrow at present (W=13.5m). It is proposed to develop a new

exclusive bridge for pedestrian and bicycles.

(f) Improvement of Intersections

4.272 In this station area, three intersections are improved:

- (i) Location of intersections: (i) Kim Dong Street and RR2.5, (ii) Thinh Liet Street and NH1, and (iii) Dai Tu Street and NH1.
- (ii) Improvement measures: installment of traffic signal and pedestrian crossing, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.273 Identified projects in TOD Area (149,300m²) are as follows:

(a) Priority Development of Roads in TOD Area

4.274 In TOD Area, widening of NH1 and development of west access road are prioritized to ensure access of various traffics and pedestrian.

- (i) New west access road under viaduct: W=15.5m, L=370m (1,000m² for widening)
- (ii) Widening of east of NH1: W=45.0m (W=8m for sidewalk), L=370m (3,000m² for widening of sidewalk)

(b) Development of East and West Station Plazas

4.275 The east station plaza is located along NH1, including the inner-city bus terminal, pedestrian plaza and the rotary.

(c) Development of Connecting Facilities between the Station and Giap Bat Bus Terminal Crossing NH1

4.276 3 pedestrian bridges are developed to cross the station plaza.

- (i) North-east pedestrian bridge connecting to Giap Bat long-distance bus terminal: W=4m, L=60m, four stairs (two stairs connecting to bus bays of inner-city bus terminal)
- (ii) South-east pedestrian bridge crossing the station plaza: W=4m, L=60m, two stairs
- (iii) West pedestrian bridge crossing the western station plaza: W=4m, L=45m, two stairs

(d) Provision of Parking Facilities under the UMRT Viaduct Space

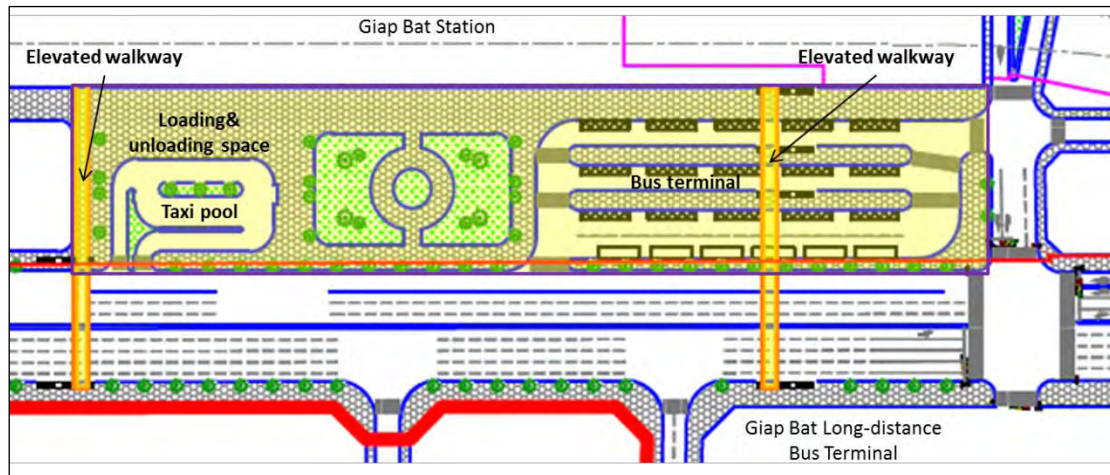
4.277 The space under the viaduct is used for parking facilities as a fringe parking of the city center. It is necessary to develop more parking facilities inside VNR land in conjunction with integrated development, so that the under viaduct space will be utilized not only parking space but also local socio-economic activities, etc.

- (i) Parking facilities under the viaduct space: 2,800m²

(e) Improvement of Traffic Management

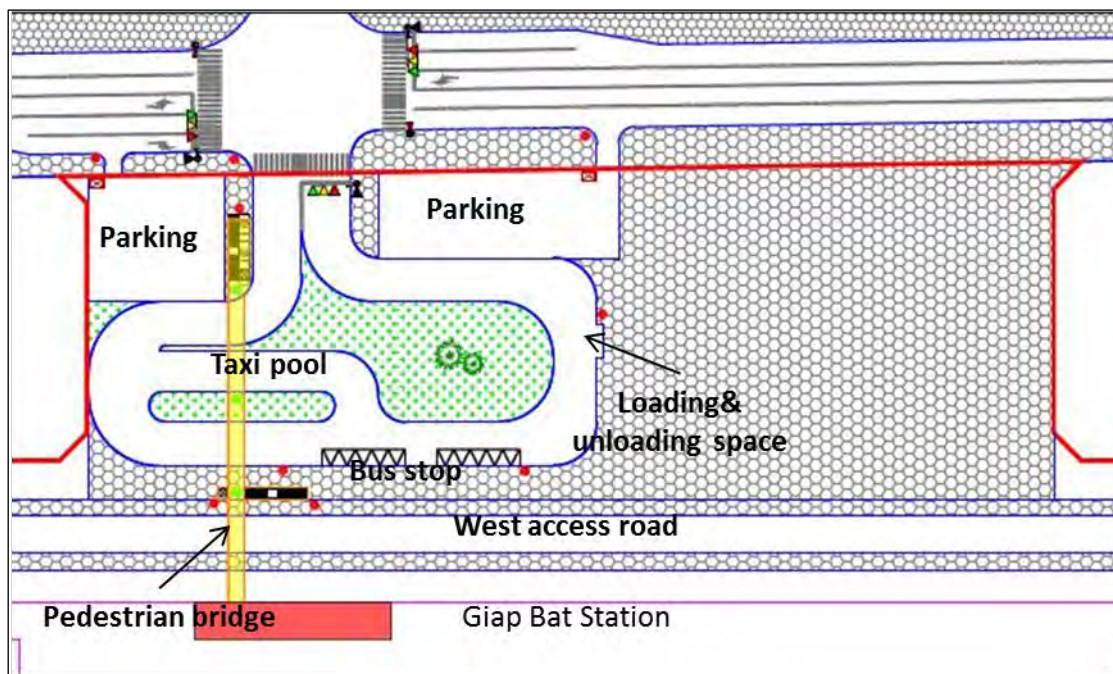
4.278 In the TOD Area, many access roads will be newly developed which connect to NH1 and other trunk roads. Traffic flow and management is further studied to facilitate various traffic modes to access to station and to pass through the station area, and to ensure pedestrian's safety.

Figure 4.3.15 Layout Plan of East Station Plaza



Source: JICA Project Team

Figure 4.3.16 Layout Plan of West Station Plaza



Source: JICA Project Team

4) Summary of Access Improvement Projects

4.279 The total estimated cost is 375,000 million VND, including short (minimum) projects of 265,000 million VND (71% of total), short projects of 72,000 million VND (19% of total) and basic projects of 38,000 million VND (10% of total).

4.280 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 700m radius, development of the eastern station plaza inside ROW of UMRT, the elevated walkway development crossing NH-1, and traffic management. These projects using road land or inside ROW of UMRT are implemented in coordination with authorities such as DOT and MOT-PMU.

4.281 Short projects include development of primary road in the TOD area, including widening of NH-1 and development of western access road. Without completion of these trunk roads, there are no access roads from the western area, so HPC should give priority to land acquisition and road development in the TOD area in time for UMRT operation.

4.282 Basic projects include the development the western station plaza and elevated walkway which will be integrated with comprehensive urban redevelopment projects.

4.283 13,600m² resettlement is required for priority road development in the TOD area, whereas 39,300m² additional residential land is required to develop trunk roads in the area within 700m radius.

4.284 The estimated costs for access improvement of V12 are shown in Table 4.2.15-1 for each project and Table 4.2.15-2 by phase.

Table 4.3.10 Access Improvement Project List of V12

	Project Name		Quantity	Estimated Cost (mil. VND)	Implementation Category	
Area within 700m Radius	a1	Development of RR2.5 and new west access road	20,600m ²	37,000	Others ¹⁾	
	a2	Improvement of NH1, Truong Dinh St.	1. Improvement	13,000m ²	24,000	Short (Minimum)
			2. Widening	30,000m ²	53,000	Others ¹⁾
	a3	Improvement of Kim Dong St., Nguyen Huu Tho St, Dai Tu St., Ngyen Canh Di St.	1. Improvement	19,000m ²	34,000	Short (Minimum)
			2. Widening	11,000m ²	20,000	Others ¹⁾
	a4	Development of distribution roads of west in consideration of comprehensive TOD development in the west	---	---	Strategic	
	a5	Improvement of access alleys in Think Liet, Dinh Cong, Dai Kim and Tan Mai Wards	45,00 m ² (W=3m, L=15,000m)	95,000	Short (Minimum)	
	a6	Improvement of intersections	5 locations	1,000	Short (Minimum)	
Sub Total (excluding others)				149,000		
TOD area	b1	Priority development of roads located in TOD Area ²⁾	1. Widening of NH1 (Giai Phong St)	15,000 m ²	27,000	Short
			2. Development of new west access road	27,000 m ²	45,000	
	b2	Development of east and west station plazas	1. East station plaza with inner city bus terminal	16,300 m ²	57,000	Short (Minimum)
			2. West station plaza	6,600 m ²	26,000	Short
	b3	Development of connecting facilities	1. East pedestrian bridge connecting to Giap Bat Bus Terminal	850 m ²	49,000	Short (Minimum)
			2. West pedestrian bridge	140m ²	12,000	Short
	b4	Provision of parking and retail facilities under the UMRT viaduct space	2,800 m ²	2,000	Short (Minimum)	
	b5	Improvement of traffic management	---	8,000	Short (Minimum)	
Sub Total				226,000		
Total				375,000		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.3.11 Summary of Estimated Cost and by Phase for Access Improvement of V12

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a1-1, a2-1, a3-1, a5, a6, b2-1, b3-1, b4, b5	228,000
	Short	a1-2, a2-2, a3-2, b1, b2-2, b3-2	72,000
Basic			38,000
Total of TOD Project			375,000
Others (road development project)		a1, a2-2, a3-2	110,000
Grand Total			485,000

Source: JICA Project Team

4.2.16 Long Bien Bac Station (V5) Area¹

1) Identified Projects

4.285 Projects identified for the area within 500m radius from the station, and in the TOD Area, are the following (see Figure 4.2.16-1):

(a) Identified Projects for 500m radius Area

- (i) Development of new roads at north of the station: Since there are no trunk roads at north, it is required to develop new road network in conjunction with UMRT development.
- (ii) Improvement of Gia Thuong Street (dyke road), Ngoc Thuy Street, Long Bien Street: At present, dyke road is the only main access road to the station, so road and transport condition will be improved by installment of lights, bollards, etc.
- (iii) Improvement of alleys in Ngoc Lam Ward and Ngoc Thuy Ward: Since the station area is low land, drainage and road surface will be improved.
- (iv) Development of new bus service using to be abandoned VNR section including existing Long Bien Bridge section: It is effective to utilize to-be-abandoned VNR space for buses, pedestrians and NMV. Furthermore, after redevelopment of bridge girder to ensure clearance for bus operation, bus service will be enhanced to north area.
- (v) Improvement of intersections: There are many intersections along the dyke road including rotary around the park, so these are improved to prevent accidents.

(b) Identified Projects in TOD Area

- (i) Priority development of main roads in TOD Area: Either option A and B, station access road is required connecting to the dyke road and other roads. Otherwise, station users only access from the dyke road which may cause traffic jam and accident.
- (ii) Development of integrated station plaza of UMRT and new bus service: There is a potential to develop a station plaza in conjunction with urban renewal, since UMRT users will be increased after development of unused land at north.
- (iii) Development of intermodal facilities under station: In conjunction with access road development, intermodal facilities will be developed under the station for convenient transfer.
- (iv) Provision of parking and retail facilities under the UMRT viaduct space: To provide local commercial and civic services at the station, the space under the viaduct will be utilized for shops and public facilities as well as parking.
- (v) Improvement of traffic management: To ensure safety of station users and local communities, traffic safety facilities such as colored sidewalk, bollards, pedestrian crossings, signs will be installed to realize pedestrian oriented residential areas in conjunction with new road development.

¹ Another station location is proposed in 3.8 of Chapter3 which is shifted to east side. In this Chapter4, the station location which TEDI proposed is applied.

Figure 4.3.17 Identified Project Location Map of V5 Long Bien Bac Area



Projects within 500m radius

1. Development of new roads at north of the station
2. Improvement of Gia Thuong Street (dyke road), Ngoc Thuy Street, Long Bien St
3. Improvement of alleys in Ngoc Lam and Ngoc Thuy Wards
4. Development of new bus service using to be abandoned VNR section including existing Long Bien Bridge section
5. Improvement of intersections

Projects in TOD Area

1. Priority development of main roads in TOD Area
2. Development of integrated station plaza of UMRT and new bus service
3. Development of intermodal facilities under station
4. Provision of parking and retail facilities under the UMRT viaduct space
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 500m radius Area

4.286 Identified projects for access improvement in the area within 500m radius are as follows:

(a) Development of New Roads at North of the Station

4.287 In this station area, there are few roads in the existing residential area. In conjunction with UMRT development, new road development is required to ensure accessibility including bus service provision.

4.288 Within 500m radius of the station, estimated area needed include 46,000m² (including 11,000m² of residential area) for new roads in north area (17.5m x 500m, 20m x 500m, 30m x 900m).

(b) Improvement of Ngoc Lam Street, Gia Thuong Street (dyke road), Ngoc Thuy Street and Long Bien Street

4.289 The pavement condition of these roads in the south of the station are fair, so improvement of sidewalk and traffic management are required to be main access roads to the station.

- (i) Improvement of sidewalk including installment of paved block for disabled, designating parking line in sidewalk, installment of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of traffic management including, marking of pedestrian crossing, installment of traffic signs

(c) Improvement of Alleys in Ngoc Thuy Ward and Ngoc Lam Ward

4.290 In this station area, most of local communities use alleys to access to trunk roads (12,000m²). While its width is 4 ~6 m, there are no sidewalks of most of alleys. Following measures should be implemented:

- (i) Improvement of alley including drainage, repaving, installment of bench and information board at openspace
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning
- (iii) Improvement of openspace around local market, school, etc. to provide signs, benches, trees, etc.

(d) Improvement of Intersections

4.291 In this station area, 5 intersections are improved along Gia Thuong Street which is the main access road for local communities.

- (i) Improvement measures: installment of traffic signal and pedestrian crossing, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.292 Identified projects in TOD Area (18,400m²) are as follows:

(a) Priority development of roads located in TOD Area

4.293 In TOD Area, station access roads are indispensable to connect to the existing dyke road at least, and to new north-south road.

- (i) New access road around the station: L=360m (5,400m²)

(b) Development of Intermodal Facilities under Station

4.294 Under the elevated station, loading and unloading space is developed.

- (i) Intermodal facilities under the station: bus stop (W=2m, L=20m), loading and unloading space (W=2m, L=100m)

(c) Development of Integrated Station Plaza of UMRT and New Bus Service

4.295 Since it is near to the to-be-abandoned VNR property, the station plaza is developed to connect UMRT Line1 station and E bus station along VNR property.

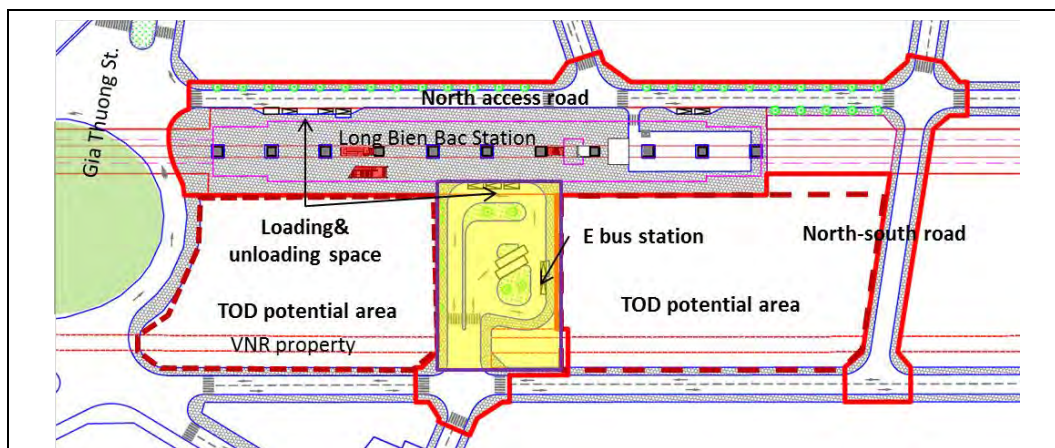
- (i) Station plaza: loading and unloading space, taxi pool, bus stop, E bus station (3,500m²)

(d) Provision of Parking and Retail Facilities under the UMRT Viaduct Space

4.296 The space under viaduct is used not only for parking but also small-scale commercial and civic service facilities.

- (i) Parking and retail facility space under the viaduct: W=15m, L=60m (900m²)

Figure 4.3.18 Layout Plan of Station Plaza and Intermodal Facilities



Source: JICA Project Team

4) Summary of Access Improvement Projects

4.297 The total estimated cost is 153,800 million VND, including short (minimum) projects of 131,800 million VND (85% of total), short projects of 10,000 million VND (7% of total) and basic projects of 12,000 million VND (8% of total).

4.298 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 500m radius, development of bus stops and intermodal facilities inside ROW of UMRT and traffic management. These projects using road land or inside ROW of UMRT are implemented in coordination with authorities such as DOT and MOT-PMU.

4.299 Short projects include development of primary road in the TOD area around the station. Without completion of these trunk roads, accessibility is limited to the dyke road, so HPC should give priority to land acquisition and road development in the TOD area in time for UMRT operation.

4.300 Basic projects include the station plaza between the station and the to-be-abandoned VNR property, which will be implemented as part of urban redevelopment project of the south of station area.

4.301 Resettlement is required, 3,400m² for priority road development in the TOD area, whereas 10,000m² additional residential land is required to develop trunk roads in the area within 500m radius.

4.302 The estimated costs for access improvement of V5 are shown in Table 4.2.16-1 for each project and Table 4.2.16-2 by phase.

Table 4.3.12 Access Improvement Project List of V5

	Project Name		Quantity	Estimated Cost (mil. VND)	Implementation Category
Area within 500m Radius	a1	Development of new roads at north of the station ¹⁾	46,000m ²	81,000	Others ²⁾
	a2	Improvement of Ngoc Lam St., Gia Thuong St. (dyke road), Ngoc Thuy St., Long Bien St No. 1&2	22,500	40,000	Short (Minimum)
	a3	Improvement of access alleys in Ngoc Lam and Ngoc Thuy Wards	36,000 (W=3m, L=12,000m)	76,000	Short (Minimum)
	a4	Development of new bus service using to be abandoned VNR section including existing Long Bien Bridge section	---	---	Strategic
	a5	Improvement of intersections in the area within 500m radius of the station	4 locations	800	Short (Minimum)
	Sub Total (excluding others)				116,800
TOD area	b1	Priority development of roads in TOD Area ³⁾	5,400	10,000	Short
	b2	Development of integrated station plaza of UMRT and new bus service	3,500	12,000	Basic
	b3	Development of intermodal facilities under station	2 locations	14,000	Short (Minimum)
	b4	Provision of parking and retail facilities under the UMRT viaduct space	800	500	Short (Minimum)
	b5	Improvement of traffic management	3 signals 100m ² for marking	500	Short (Minimum)
	Sub Total				37,000
Total				153,800	

Source: JICA Project Team

- 1) It is necessary to readjust alignment of Zone Plan to ensure access roads to the station.
- 2) Road development project in the area within 500m radius is excluded from TOD project.
- 3) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.

Table 4.3.13 Summary of Estimated Cost and by Phase for Access Improvement of V5

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a2, a3, a5, b3, b4, b5	131,800
		a1	10,000
Basic		b2	12,000
Total of TOD Project			153,800
Others (road development project)			81,000
Grand Total			234,800

Source: JICA Project Team

4.2.17 Gia Lam Station (V4) Area

1) Identified Projects

4.303 Projects identified for the area within 700m radius from the station, and in the TOD Area, are the following (see Figure 4.2.17-1):

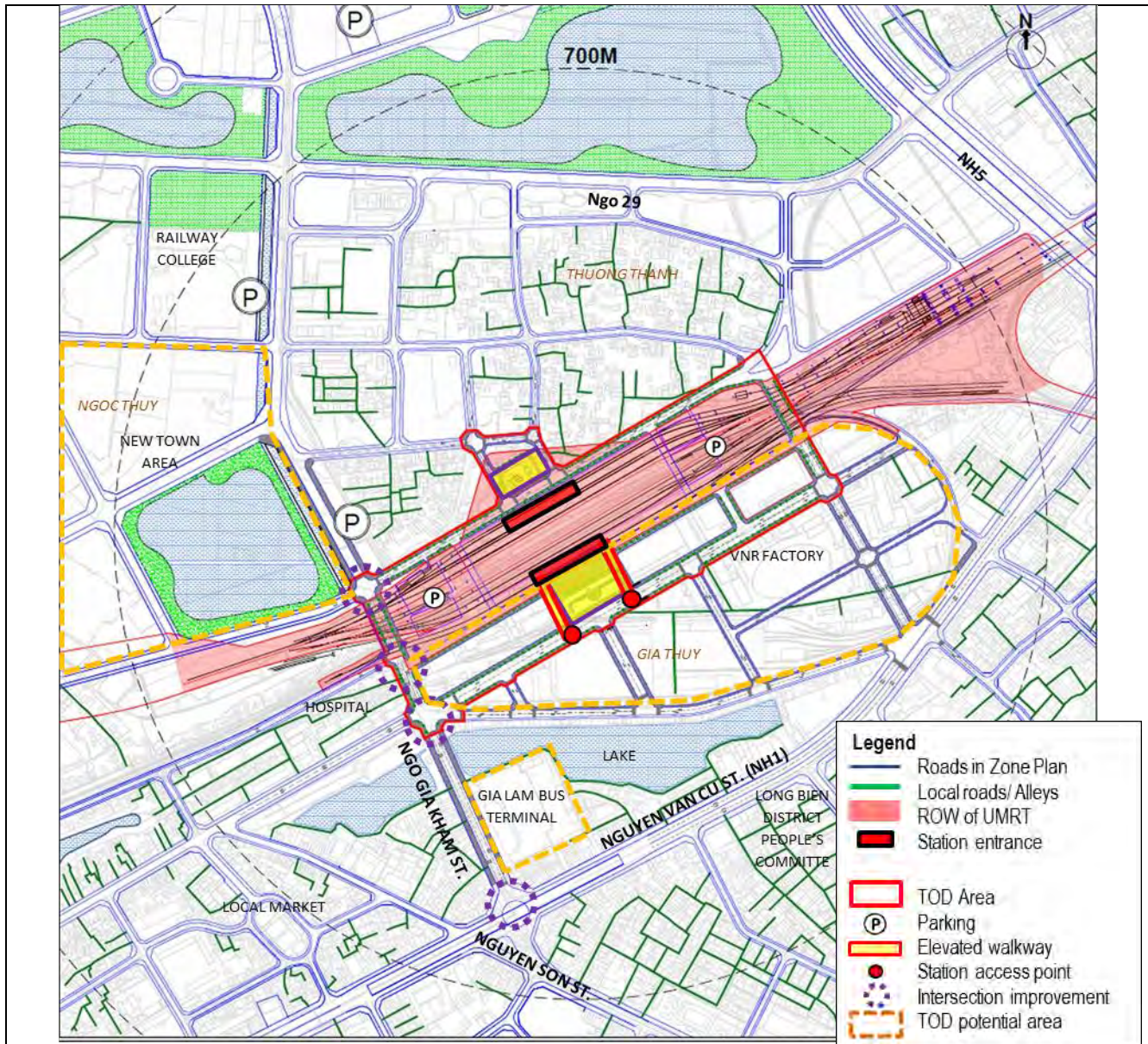
(a) Identified Projects for 700 meter radius Area

- (i) Development of new station access roads in the north and south of the station: Without new road development at the station, it will be mostly impossible to access to the station using existing narrow roads. Development of north and south access roads and north-south crossing road are indispensable to ensure accessibility.
- (ii) Improvement of Ngoc Lam Street, Ngo Gia Kham Street and Doc Ga Street: These are collecting roads of local communities, so pedestrian spaces will be ensured.
- (iii) Development of new roads inside VNR factory and new town area in conjunction with urban development/ redevelopment projects: To enhance accessibility from new development/ redevelopment areas, new roads will be developed in conjunction with urban development/ redevelopment projects.
- (iv) Improvement of alleys in Ngoc Lam Ward and Ngoc Thuy Ward: Alleys in rural village of Ngoc Thuy are well managed by local communities, so safety and tranquility will be ensured after UMRT operation when station users use these alleys.
- (v) Improvement of intersections: Traffic signals will be installed at intersections around the station to manage traffic flow properly and ensure pedestrian crossing.

(b) Identified Projects in TOD Area

- (i) Priority development of main roads in TOD Area: As mentioned above, station access roads around the station will be developed in time.
- (ii) Development of station plazas in the north and south of the station: To be a transport hub of east of the city, station plazas will be developed at north and south to facilitate various traffic modes and to provide open space for station users, visitors and local communities.
- (iii) Provision of parking facilities under the UMRT viaduct space: There is a large space under viaduct, which accommodates parking connecting to the station.
- (iv) Development of inner-city bus terminal inside south station plaza to provide feeder bus services including UMRT relay bus service: By relocating inner-city bus terminal in front of the UMRT station, feeder bus services will be enhanced along NH1 and NH5.
- (v) Improvement of traffic management: Traffic management facilities will be installed in the station plazas, existing and new roads around the station to formulate a pedestrian oriented district of new development area at north.

Figure 4.3.19 Identified Project Location Map of V4 Gia Lam Station Area



Projects within 700m radius

1. Development of new station access roads in the north and south of the station
2. Improvement of Ngoc Lam St., Ngo Gia Kham St.
3. Development of new roads inside VNR factory and new town area in conjunction with urban development/ redevelopment projects
4. Improvement of alleys in Ngoc Lam and Ngoc Thuy Wards
5. Improvement of intersections

Projects in TOD Area

1. Priority development of main roads in TOD Area
2. Development of station plazas in the north and south of the station
3. Provision of parking facilities under the UMRT viaduct space
4. Development of inner-city bus terminal inside south station plaza to provide feeder bus services including UMRT relay bus service
5. Improvement of traffic management

Source: JICA Project Team

2) Profile of Identified Projects for Access Improvement within 700m radius

4.304 Identified projects for access improvement in the area within 700m radius are as follows:

(a) Development of new station access roads in the north and south of the station

4.305 Although the development of new roads around Gia Lam Station is committed by DOT, it is advisable to complete the section when the UMRT is in operation. Without new road development at the station, the existing access road is limited only Ngo Kia Kham Street (W=13-18m at present) from south direction. At north side, there are only alleys in the rural residential area to access to the north of the station.

4.306 For this, when the development and widening is not in time, at least following measures should be implemented, and access roads inside VNR land should be developed.

- (i) Improvement of Ngo Kia Kham St. to connect to the south entrance (W=13m at present)
- (ii) Extension of Ngo Kia Kham St. to north (W=30m)

4.307 Within 700m radius of the station, estimated area needed include 73,500m² (including 9,000m² of residential area) for development of new roads at north.

(b) Improvement of Ngoc Lam St. and Ngo Gia Kham St.

4.308 In the north of the station area, there are few connecting roads between north and south areas, except for railway crossing inside VNR Gia Lam Station. In the north, there are distribution roads which surround rural residential area and alleys inside this area, which capacities won't be able to accommodate traffic flow to the station.

- (i) Improvement of sidewalk including installment of paved block for disabled, designating parking line in sidewalk, installment of signboard to indicate orientations of urban facilities and station, street lights
- (ii) Improvement of road including colored pavement around local market, designating parking line in carriageway, re-pavement of road
- (iii) Improvement of traffic management including restriction of car entry during peak-hour of commuting, marking of pedestrian crossing, installment of traffic signs

(c) Development of new roads inside VNR factory and new town area in conjunction with urban development/ redevelopment projects

4.309 In the south of the station, the VNR factory is the barrier to access to the station. After relocation of the factory, it is expected to redevelop the land including road and station facilities.

4.310 In the north of the station, the new town development is expected. The project should include road and parking facility development to enhance accessibility to the station.

(d) Improvement of alleys in Ngoc Lam and Ngoc Thuy Wards

4.311 In the north of the station area, narrow alleys without sidewalks (W=3 ~ 5m) are spread inside rural residential area, and there are no roads inside paddy fields. Following measures should be implemented:

- (i) Improvement of alley including drainage, repaving
- (ii) Improvement of traffic management including speed limit of motorbikes, restriction of car entry during peak-hour of local market, lightning

4.312 Improvement of openspace around local market, school, etc. to provide signs, benches, trees, etc.

(e) Improvement of intersections

4.313 In this station area, 3 intersections are improved along Ngo Gia Kham St. which connects between NH-1 and the station.

- (i) Improvement measures: installment of traffic signal and pedestrian crossing, colored pavement, stop sign, etc.

3) Profile of Identified Projects in TOD Area

4.314 Identified projects in TOD area (181,200m²) are as follows:

(a) Priority development of roads in TOD area

4.315 In TOD area, development of north, south and north-south connecting roads are prioritized to ensure access of various traffics and pedestrian.

- (i) New north access road: W=21m, L=600m (12,600m² including 3,000m² residential area)
- (ii) New south access road: W=30m, L=600m (18,000m² of VNR factory land)
- (iii) Extension of Ngo Gia Kham St.: W=30m, L=260m (7,800m² including 700m² residential area)
- (iv) New east access road: W=26m, L=250m (6,500m² including a part of VNR factory land)

(b) Development of south and north station plazas

4.316 The south station plaza is located using the VNR factory land, including bus stops, loading and unloading space and pedestrian plaza. The inner-city bus terminal will be relocated from the existing Gia Lam Bus Terminal to the station plaza for smooth transfer between UMRT and buses, and to provide feeder bus services including UMRT relay services.

- (i) South station plaza: 8,800m²

4.317 The north station plaza is located using the pond and residential land, including bus stops and loading and unloading space.

- (i) North station plaza: 6,100m²

(c) Provision of parking facilities under the UMRT viaduct space

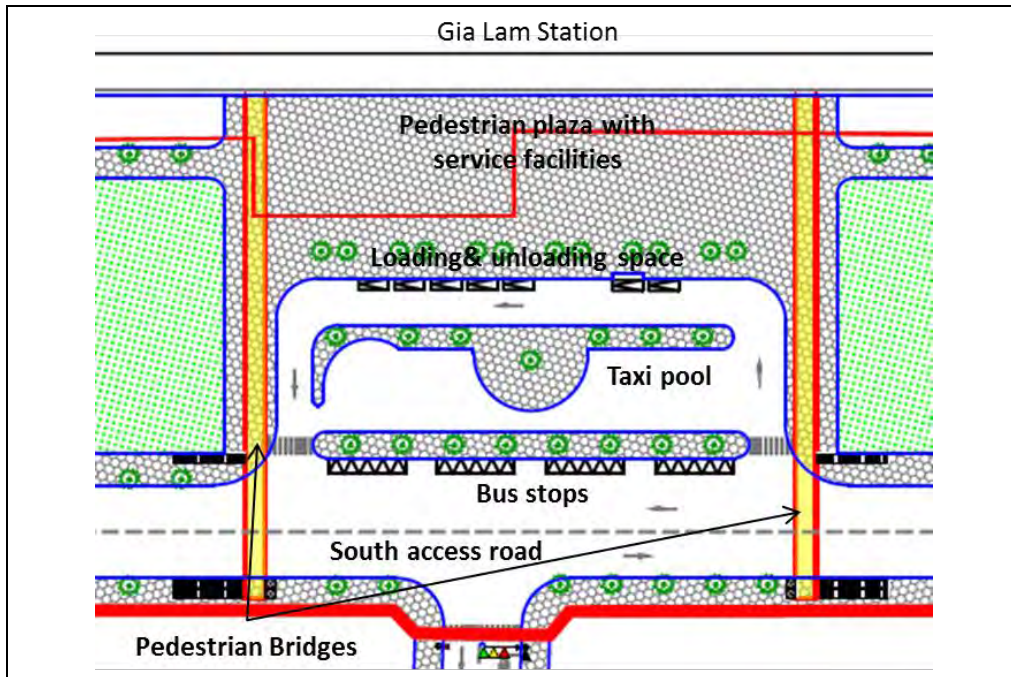
4.318 The space under the viaduct is used for parking facilities as a fringe parking of the city center. It is necessary to develop more parking facilities inside VNR land in conjunction with integrated development, so that the under viaduct space will be utilized not only parking space but also local socio-economic activities, etc.

- (i) Parking facilities under the viaduct space: 11,000m²

(d) Improvement of traffic management

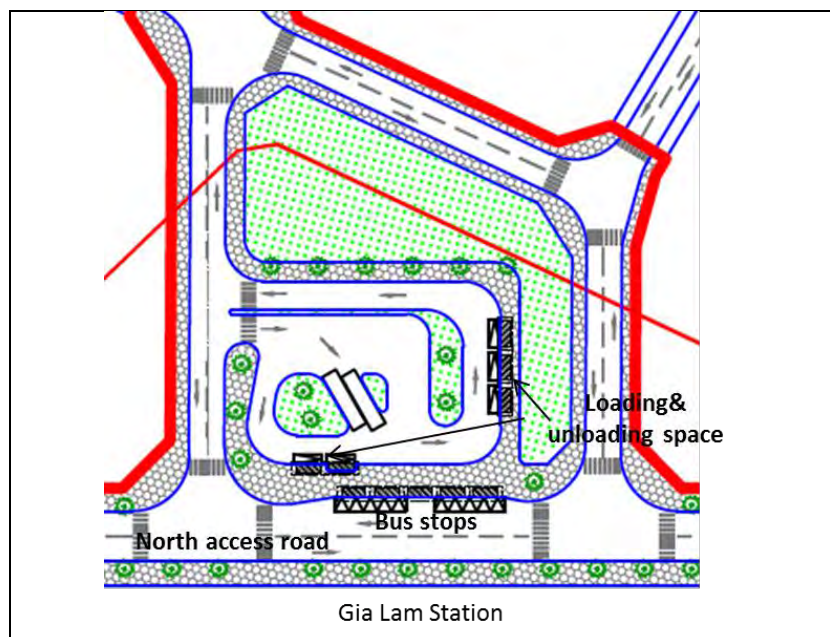
4.319 In the TOD area, many access roads will be newly developed which connect to NH-1 and other trunk roads. Traffic flow and management is further studied to facilitate various traffic modes to access to station and to pass through the station area, and to ensure pedestrian's safety.

Figure 4.3.20 Layout Plan of South Station Plaza



Source: JICA Project Team

Figure 4.3.21 Layout Plan of North Station Plaza



Source: JICA Project Team

4) Summary of Access Improvement Projects

4.320 The total estimated cost is 294,000 million VND, including short (minimum) projects of 136,000 million VND (46% of total), short projects of 105,000 million VND (36% of total) and basic projects of 53,000 million VND (18% of total).

4.321 Short (minimum) projects include improvement of existing roads, alleys and intersections in the area within 700m radius and traffic management. These projects using road land or inside ROW of UMRT are implemented in coordination with authorities such as DOT and MOT-PMU.

4.322 Short projects include development of primary road in the TOD area around the station. Without completion of these trunk roads, accessibility is limited to alleys from the north and the narrow street of Nguyen Gia Kham. From the south, so HPC should give priority to land acquisition and road development in the TOD area in time for UMRT operation.

4.323 Basic projects include the northern station plaza using pond and residential land, and the southern station plaza using VNR factory land. In order to become the north-east transportation hub, at least one station plaza is required in time for UMRT operation.

4.324 Resettlement is required 3,700m² for priority road development in the TOD area, whereas 9,000m² additional residential land is required to develop trunk roads in the area within 700m radius.

4.325 The estimated costs for access improvement of V4 are shown in Table 4.2.17-1 for each project and Table 4.2.17-2 by phase.

Table 4.3.14 Access Improvement Project List of V4

	Project Name		Quantity	Estimated Cost (mil. VND)	Implementation Category	
Area within 500m Radius	a1	Development of new station access roads at the north and south of the station	73,500m ²	131,000	Others ¹⁾	
	a2	Improvement/ widening of main access roads including Ngoc Lam St., Ngo Gia Kham St. and Doc Ga St.	Improvement	18,000m ²	32,000	Minimum
			Widening	14,000m ²	25,000	Short
	a3	Improvement of secondary roads including Gia Quat St, Alley 29 – Thuong Thanh St	6,700m ²	12,000	Short (Minimum)	
	a4	Improvement of access alleys in Ngoc Lam and Ngoc Thuy Wards	36,000m ² (W=3m, L=12,000m)	76,000	Short (Minimum)	
	a5	Improvement of intersections	5 locations	1,000	Short (Minimum)	
Sub Total (excluding others)				146,000		
TOD area	b1	Development/improvement of roads in TOD Area (new north and south access roads, Ngo Gia Kham St) ²⁾	45,000m ²	80,000	Short	
	b2	Development of station plaza in the north and south of the station	North station plaza	6,100m ²	19,000	Basic
			South station plaza	8,800m ²	34,000	Basic
	b3	Provision of parking facilities under the UMRT viaduct space	11,000m ²	7,000	Short (Minimum)	
	b4	Development of inner-city bus terminal inside south station plaza to provide feeder bus services including UMRT relay bus service	---	---	Strategic ³⁾	
	b5	Improvement of traffic management	14 signals 500m ² for marking	8,000	Short (Minimum)	
Sub Total				148,000		
Total				294,000		

Source: JICA Project Team

- 1) Road development project in the area within 500m radius is excluded from TOD project.
- 2) Quantity and coverage of road projects within 500m radius and projects in TOD area are not overlapped.
- 3) The cost for strategic project is not estimated.

Table 4.3.15 Summary of Estimated Cost and by Phase for Access Improvement of V4

Project Type		Included Project ID	Estimated Cost (mil. VND)
Short	Minimum	a2-1, a3, a4, a5, b3, b5	136,000
	Short	a2-2, b1	105,000
Basic		b2-1, b2-2	53,000
Total of TOD Project			294,000
Others (road development project)		a1	131,000
Grand Total			425,000

Source: JICA Project Team

4.3 Project Packaging and Implementation Plan

1) Packaging of the Projects

4.326 Adequate set of transport access improvement projects are identified for each UMRT station for the area more or less within 500 meter of the station and TOD area which covers immediate environs of the station (see Table 4.3.1).

4.327 As Identified projects for each UMRT station extend to a wide range and scope, they need to be packaged for implementation by different organization and funding source. It is considered practical to categorize the projects as follows;

- (i) Short-term Projects: The projects in this category should have been implemented before the opening of UMRT operation. Of the short-term projects, “minimum” projects which do not require land acquisition are identified.
- (ii) Basic projects: The projects in this category are considered desirable for implementation to farther enhance the function of UMRT stations

Table 4.3.1 Summary of Transport Access Project by Station

Cluster	Station	Walking Distance				TOD Area									
		Road			Intersection	Road (priority)	Station plaza	Bus terminal	Pedestrian bridge	UG walkway	UG parking	Parking	Bus stop	Traffic management	
		Improvement	New/widening	Alley											
North West	C1	A	B*	A	A	B*	C	-	A	-	-	A	A	A	
	C2	A	B*	A	A	-	A	-	-	-	-	A	A	A	
	C3	A	B*	A	A	-	C	A	A	-	-	A	A	A	
	C4	A	B*	A	A	A	-	-	-	C	C	A	A	A	
South of West Lake	C5	A	B*	A	A	B*	-	-	-	C	C	A	A	A	
	C6	A	B*	A	A	B*	-	-	-	C	C	C	A	A	
	C7	A	B*	A	A	B	-	-	-	C	C	C	A	A	
City Center	V6	A	-	A	A	-	A	-	A	-	-	A	A	A	
	C8	A	-	A	A	-	-	-	-	-	-	C	A	A	
	C9	A	-	A	A	-	C	-	-	C	C	C	A	A	
	C10	A	-	A	A	-	C	-	-	B	A**	A**	A	A	
	V8	A	B*	A	A	B*	A** -C*	-	B*	B	-	A**	A	A	
South	V9	A	B*	A	A	B*	C*	-	A	C	-	A**	A	A	
	V10	A	B*	A	A	B*	C*	-	B*	-	-	A**	A	A	
	V11	A	B*	A	A	B*	-	-	B*	-	-	A**	A	A	
	V12	A	B*	A	A	B*	A** -C*	A	B*	-	-	A**	A	A	
East	V5	A	B*	A	A	B*	C*	-	-	-	-	A**	A	A	
	V4	A	B*	A	A	B*	C -C*	B	-	-	-	A**	A	A	

Source: JICA Project Team

A: short-term (minimum) project, B: short-term project, C: basic project

* needs land acquisition of residential land

** within ROW of UMRT project

2) Summary of Estimated Cost

4.328 The investment costs are estimated by UMRT Line, station and category (see Table 4.3.2). Main findings are as follows;

- (i) Total investment costs of access improvement projects is 7,960 billion VND or 372 million USD.
- (ii) Of the total investment cost, 3,677 billion VND (46.2%) and 4,283 billion VND (53.8%) are required for short-term and basic projects, respectively. Of the short-term projects, minimum projects require 3,170 billion VND (39.8% of the total cost) (see Table 4.3.3).
- (iii) UMRT Line1 requires 2,275 billion VND or 28.6% while Line2 requires 5,685 billion VND or 71.4% of the total cost (see Table 4.3.4).

Table 4.3.2 Estimated Costs for Access Improvement Projects by Station (Preliminary)

Line	Station	Area within 500m radius	TOD area	Total	
				(mil VND)	%
Line1	V4	146,000	148,000	294,000	3.7
	V5	116,800	37,000	153,800	1.9
	V6	(included in C8)	435,800	435,800	5.5
	V8	146,600	281,000	427,600	5.4
	V9	72,000	143,000	215,000	2.7
	V10	137,000	60,000	197,000	2.5
	V11	140,400	36,800	177,200	2.2
	V12	149,000	226,000	375,000	4.7
	Sub Total	907,800	1,367,600	2,275,400	28.6
Line2	C1	84,800	155,000	239,800	3.0
	C2	24,400	8,100	32,500	0.4
	C3	0	371,000	371,000	4.7
	C4	134,800	431,500	566,300	7.1
	C5	117,000	823,600	940,600	11.8
	C6	75,900	912,300	988,200	12.4
	C7	127,800	912,000	1,039,800	13.1
	C8	146,100	192,800	338,900	4.3
	C9	43,000	818,300	861,300	10.8
	C10	17,000	288,500	305,500	3.8
	Sub Total	770,800	4,913,100	5,683,900	71.4
Total	million VND	1,678,600	6,280,700	7,959,300	100.0
	million USD	78.4	293.3	371.7	100.0

Source: JICA Project Team

Table 4.3.3 Summary of Estimated Cost for Access Improvement Projects by Phase (Preliminary)

Line	Station	By Phase			Total (mil. VND)
		Short (Minimum)	Short	Basic	
Line1	V4	136,000	105,000	53,000	294,000
	V5	131,800	10,000	12,000	153,800
	V6	295,800	0	140,000	435,800
	V8	352,600	75,000	0	427,600
	V9	215,000	0	0	215,000
	V10	151,000	46,000	0	197,000
	V11	138,400	38,800	0	177,200
	V12	265,000	72,000	38,000	375,000
	Sub Total	1,685,600	346,800	243,000	2,275,400
Line2	C1	178,800	21,000	40,000	239,800
	C2	32,500	0	0	32,500
	C3	291,000	0	80,000	371,000
	C4	151,300	0	415,000	566,300
	C5	121,600	34,000	785,000	940,600
	C6	78,200	41,000	869,000	988,200
	C7	158,800	10,000	871,000	1,039,800
	C8	175,900	0	163,000	338,900
	C9	44,300	0	817,000	861,300
	C10	251,500	54,000	0	305,500
	Sub Total	1,483,900	160,000	4,040,000	5,683,900
Total	million VND	3,169,500	506,800	4,283,000	7,959,300
	million USD	148.0	23.7	200.0	371.7
	%	39.8	6.4	53.8	100.0

Source: JICA Project Team

Table 4.3.4 Summary of Estimated Cost for Access Improvement Projects by Phase (Preliminary)

Phase		By Line (billion VND)		Total	
		Line1	Line2	billion VND	million USD
Short	Minimum	1,685	1,484	3,170	148.0
		347	160	507	23.7
Basic		243	4,040	4,283	200.0
Total	billion VND	2,275	5,684	7,960	371.7
	%	28.6	71.4		100.0

Source: JICA Project Team

3) Possible Funding Source (preliminary)

4.329 Possible funding sources include such organizations as DOT, MOT-PMU, MRB, District and private sector, or combination thereof. In order to determine the share and methods, farther discussions are necessary. Nevertheless it is tentatively estimated in Table 4.3.5 with following main findings;

- (i) Although farther study is necessary, possibilities for private sector participation are high
- (ii) DOT is a main funding source, especially for development of access roads including Zone Plan roads
- (iii) District is to fund improvement of alleys and related traffic management
- (iv) MOT-PMU of Line1 and MRB of Line2 are to be responsible for the facilities which are directly related to on-going UMRT construction projects. In case if the facilities are located out of ROW of UMRT (pedestrian bridge, extended underground walkway, etc.), it is necessary to readjust ROW of UMRT to include these facilities as a part of UMRT station

for proper operation and management by railway body, If readjustment of ROW of UMRT is difficult, DOT will be in charge of these facilities as transport facilities.

Table 4.3.5 Estimated Costs of Project Packages (preliminary)

Agency	Short (bil. VND)		Basic (bil. VND)	Total		
	Total	Of which minimum		billion VND	million USD	%
DOT	1,398	946	126	1,524	71.2	19.2
MOT-PMU	462	462	182	644	30.1	8.1
MRB	635	635	342	977	45.6	12.3
District	913	913	0	913	42.6	11.5
Private	0	0	3,901	3,901	182.2	49.0
Total	3,408	2,956	4,551	7,960	371.7	100.0

Source: JICA Project Team

4) Project Evaluation

4.330 The access improvement projects are expected to generate many positive impacts on local communities as well as UMRT users. However, the projects require large amount of investment including private sector involvement and economic rationality is necessary to determine the implementation. From the standpoint of an operator, financial viability is also indispensable. In addition, the implementation of the projects may possibly affect living environment of local people such as noise and vibration by construction works. So, the proposed projects need to be evaluated from the various viewpoints, social, economic, financial, environmental etc.

4.331 The results of project evaluation are summarized as follows:

- (i) Economic analysis: Saved time is assumed to be 3 minutes per beneficiary for all stations by the access improvement projects (except for underground parking) since every project in each station has the time saving effect and integrated development of those projects is expected to further increase the effect. The result of analysis show that EIRR is 17.8% and thus the proposed access improvement project is economically feasible.
- (ii) Financial analysis: Transport access improvement projects are non-revenue projects except for parking fees, so these are not viable financially. In case of ground parking, it is feasible to construct and operate them with using parking fees.
- (iii) Social and environmental impacts: Transport accessibility improvement will contribute social and environmental aspects significantly. In addition to time saving of access, traffic safety will contribute to reduce traffic accident, improvement of walking environment will contribute to promote socio-economic development of local communities.

5) Implementation Plan

4.332 In order to implement different types of the projects effectively in time and place, following should be duly considered;

(a) Timing for Implementation

4.333 Timing and consideration on implementation of the projects by category are as follows;

- (i) Minimum Projects: Improvement of roads, traffic management walking environment within the station influence area (500 – 800 meter radius of the station) can be commenced immediately because no additional land acquisition is necessary. At the same time,

budgeting and implementation for Zone Plan roads within TOD Area should be prepared soonest.

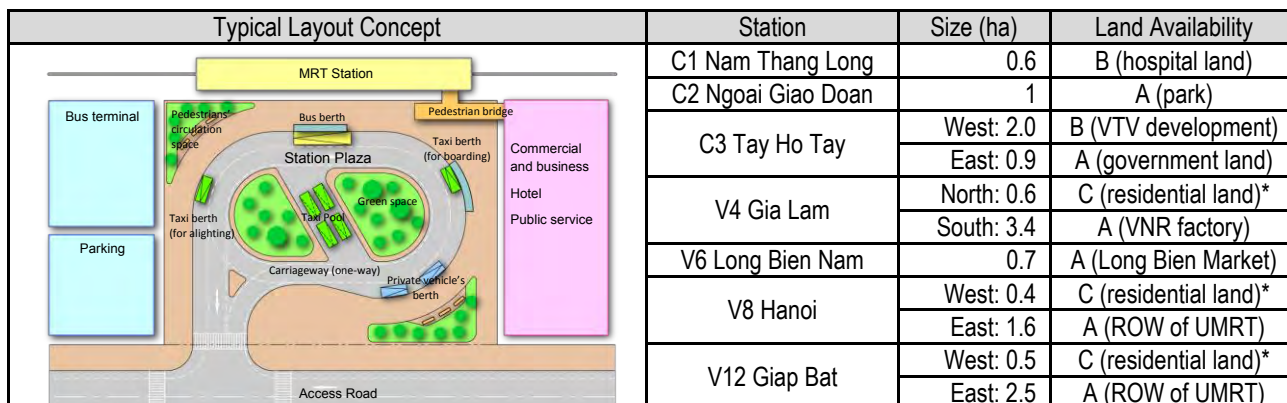
- (ii) Short-term Projects: Although the projects require partial land acquisition, they also should be attended as early as possible.
- (iii) Basic Projects: The projects include such intermodal facilities as station plaza, underground parking, among others, requiring land acquisition and coordination among stakeholders including private sector. As they can be developed in integration with revenue generating urban development, possibilities for private sector participation are high. When underground parking and walkway are constructed together with UMRT, their construction costs will be significantly reduced.

(b) Project Implementation Bodies

4.334 Implementation of the projects is considered as follows (see Table 4.3.7);

- (i) HPC should primarily be responsible transportation access improvement projects because they intend to ensure public interests and safety, and benefit not only UMRT users but also communities in influence area.
- (ii) Station Plaza (see Figure 4.3.1) includes various functions and facilities using a certain size of land, so implementation methods are various, while railway operators (MOT-PMU and MRB) and DOT will take responsibilities of operation and management of the station plaza. In case of bus related facilities, DOT and TRAMOC are the main owners while other facilities such as parking, pedestrian plaza will be managed by the railway operators to provide good environment for station users. They are more specifically as follows;
 - Inside ROW of UMRT, the railway developer will plan, construct and manage the station plaza as a part of station facility (cf. V4, V8, V12).
 - In case of the station plaza is proposed in new development area which is out of ROW of UMRT, HAUPA should guide the private developer to include the station plaza planning and construction in their development project, since the private sector also can get profits by development of station plaza for improvement of accessibility (cf. C1, C2, C3).
 - In case of the station plaza is proposed out of ROW of UMRT and inside built-up areas, it is difficult to acquire lands of station plaza in short-term. But to ensure the space for accessibility improvement and service provision around the station, it is proposed implement integrated urban redevelopment projects (as proposed in the concept plans of C6, V6, V8, V9, V11, V12, V5 stations), by applying right conversion method to swap original lands in front of station to other neighboring station areas.

Figure 4.3.1 Proposed Station Plaza



Source: JICA Project Team

Note) A: in public land, B: in urban development land, C*: land acquisition required

(iii) Intermodal facilities at and around the UMRT stations should be implemented in close coordination with UMRT project. Once the projects have been constructed, they should be transferred to HPC for subsequent management of the facility by DOT (see Table 4.3.6).

- Elevated Walkway under the UMRT viaduct and Loading/unloading Facilities in ROW of UMRT: They should be developed as a component of UMRT construction project
- Elevated walkway outside ROW of UMRT: As they are to be connected directly with UMRT stations, they should be developed as a component of UMRT construction project
- At-grade space under the Line1 viaduct: They should be developed as a component of UMRT construction project
- Underground walkway: While extended underground walkway is out of ROW of UMRT, it is recommended that railway operators are responsible for O&M as a part of station facility. If these walkways will be opened 24hours for local communities, local governments need to manage it in terms of safety and security.

Table 4.3.6 Demarcation of Responsibilities of O&M for the Intermodal Facilities

Component	Main Agency	Related Agency	Layout Image
1) Station plaza	- Railway operators - DOT	- Private sector - Local government	
2) Bus facility	- TRAMOC	- DOT	
3) Parking	- Railway operators	- DOT	
4) Pedestrian Bridge	- Railway operators	- DOT	
5) Access road	- DOT - Local government	- Traffic Police	
6) Commercial and service facility	- Railway operators - Local government	- Private sector - Local community	

Source: JICA Study Team

- (iv) With regard to bus service improvement, UMRT will implement UMRT relay bus while TRAMOC is responsible for other feeder bus services.
- (v) Traffic Management and Safety Projects: They should be primarily implemented by DOT and Traffic Police, though measures at community levels should be implemented in participation of local authorities and people.
- (vi) Parking Projects (see Table 4.3.7): They should be basically implemented by DOT though operation and management should involve local authorities and communities. For large-scale parking facilities participation of private sector should be considered.

Table 4.3.7 Proposed Parking Space

Type of Parking		Ground parking			Underground parking		Integrated parking in TOD potential area
		Station plaza	Under viaduct	Public land	Road ROW	Park space	
Line2 Stations	C1	•					
	C2	•		•			
	C3	•					
	C4			•			•
	C5			•	•		
	C6						•
	C7					•	•
	C8					•	
	C9						•
	C10				•		•
Line1 Stations	V4	•	•				•
	V5	•	•				•
	V6	•	•				•
	V8	•	•				•
	V9		•				
	V10		•				•
	V11		•				
	V12	•	•				•

Source: JICA Project Team

(c) Opportunities for Private Sector Participation

4.335 In the area of TOD, there are ample opportunities where private sector can participate directly and indirectly especially on revenue generating facilities and those that can be integrated with urban development. They are, for example, as follows;

- (i) Parking facilities under viaduct of Line1
- (ii) Underground parking facilities that can be integrated with commercial facilities at such UMRT stations as C5, C6, C7, C8, C9 and C10.
- (iii) Station buildings including station plaza, underground parking and walkway that can be developed and operated at such UMRT stations as C4, C6, C9, C10, V4, V6, V8 and V12.
- (iv) Station plaza located within private sector development projects such as C1 and C3

(d) Participation of Local Communities

4.336 There are ample opportunities for local communities where UMRT stations and

constructed to participate in various projects as explained below;

- (i) Improvement and maintenance of alleys, walking space management and safety enhancement in the influence area of UMRT that can be implemented with communities initiatives
- (ii) Vitalization of local markets and shops belong main access routes of UMRT users through improvement of environment and organization of local commercial associations
- (iii) Operation and management of various facilities provided in station plaza and the space under the UMRT viaduct including parking small shops, public space, trees and plants, local events, among others.

6) Necessary Institutional Arrangement

4.337 In order to implement TOD projects including transport access improvement and integrated urban development institutional arrangements are required with particular to the followings;

- (i) Coordination and Integration with Zone Plan: Access roads to UMRT stations should be clearly reflected in Zone Plan
- (ii) Designation of “TOD Area”: In order to ensure necessary accessibility of UMRT users to the station and intermodal function at the station area. TOD Area which is defined in the study should be overlaid in Zone Plan. Once it is included in Zone Plan, development in the area will be controlled and land will be acquired. At the same time priority will be given to develop public infrastructure including roads.
- (iii) Development control and management of TOD Area: For appropriate station related facility and access road development, traffic management and promotion of integrated urban development, management of “TOD Area” is further discussed in terms of urban planning management, traffic management as well as community improvement, including legal and institutional framework, such as inclusion of boundary of TOD Area into the Zone Plan. It is proposed that local governments (District and Ward PCs) and local communities should operate TOD Area properly to ensure safe and comfortable station area development.
- (iv) Private sector’s involvement for transport access facility development: Though access improvement projects should be initiated by HPC for public interests, some facilities such as station plaza, parking and pedestrian walkway are contributed to increase visitors to commercial and business facilities near to the station and to facilitate traffic flow around commercial and business facilities, which private sectors can get benefits. Furthermore, in case of parking facility, it can generate profits by parking fees to recover operation costs. In this context, it is recommended to negotiate with private investors and facility owners around the station to develop access facilities on behalf of public sector.