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
Summary

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ALMEC Corporation
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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 xxx	National Highway No. xxx
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 xxx	Province Road No.xxx
PT	Person Trip
ROW	Right of Way
RR xxx	Ring Road No. xxx
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
TWG	Technical Working Group
TOD	Transit Oriented Development
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
VNR	Vietnam Railways
WB	World Bank

Executive Summary

Introduction

1. "The Project for Studying the Implementation of Integrated UMRT and Urban Development for Hanoi in Vietnam" (HAIMUD2) aims at assisting Hanoi City to formulate an appropriate implementation mechanism to successfully integrate the UMRT system with urban development and other transportation systems. It also aims at concretizing concept plans and realizing short-term projects proposed in HAIMUD conducted in 2011. The specific objectives of HAIMUD2 are as follows:

(i) To formulate concept plans including transport access improvement and integrated urban development for 18 stations of phase1 section of UMRT Line1 and Line2 by reviewing HAIMUD, relevant plans and projects which will to be used as inputs for Zone Plan currently being prepared by Hanoi People's Committee (HPC);

(ii) To conduct the pre-feasibility studies including (a) Pre-F/S on transport access improvement projects, (b) Pre-F/S on underground parking development project of Tran Hung Dao Station, and (c) Pre-F/S on TOD at Giap Bat Station Area,

(iii) To make recommendations on the necessary improvement of institutional framework for more effective implementation of the projects

Overview of Hanoi Urban and Transport Development and Related Plans

2. The territory of Hanoi capital city has reached 3,344 km² with population of 7.3 million people in 2014. Population growth rates are relatively higher in almost all directions along the main transport corridors indicating that the demand for urban services in the outer areas is also growing. While population tends to move towards outer areas for affordable housing and better living environment, proper housing infrastructure is not sufficient, especially for low- and medium-income groups, and transport access becomes a constraint. It is expected that UMRT and TOD can contribute to solve the above urban issues in an integral manner, thus promoting smart growth of urban areas of the city.

3. The "Hanoi Capital Construction Master Plan up to 2030 with Vision to 2050" (hereinafter referred to as the "General Plan") was approved on July 26th, 2011 by the Prime Minister. According to the General Plan's forecasts, population will increase from 6.4 million in 2008 to 10.8 million in 2050. The historic inner city area as well as the expanded inner city area shall be less populated in the future whereas newly developed urban areas, satellite urban areas and townships will absorb the increasing population. UMRT and TOD are expected to play a key role in supporting the above-mentioned urban development plans and strategies to control urban public spaces as well as new construction projects for multi-function development and public transport promotion.

4. The approved UMRT network plan is composed of eight lines with a total route length of 319 km. On-going construction includes phase1 of Line1, Line2, Line3 and Line2A. After completion, the Ancient Quarter (AQ), Hoan Kiem Lake area, and the French Quarter (FQ) will be covered with UMRT stations located at walking distance (about 1km) from each other.

Concept and Key Objectives of TOD

5. TOD refers to the design of a compact area for mixed residential and commercial uses in order to minimize the demand for private transport and to encourage transit ridership in public transport modes whose stops are located at walking distances from each other. The HAIMUD2 confirmed the importance and roles of TOD in Hanoi are as follows:

(i) **TOD will affect the ridership of UMRT:** The ridership of UMRT will be significantly affected by the conditions of access to the stations. Particular importance should be given on the improvement of walking conditions and environment in the area within walking distance of UMRT station (500-800 meter radius area), improvement of roads and provision of facilities for smooth access by various modes of transport including bicycle, motorcycle, taxi and bus.

(ii) **TOD will contribute to economic development at and around the stations:** UMRT will enhance economic development opportunities at and around the stations when the urban developments are planned and implemented adequately. TOD will also contribute farther enhancement of UMRT ridership and convenience of UMRT users.

(iii) **TOD will contribute to enhancement of social and environmental conditions in the influence area of UMRT:** Improvement of walking conditions within the station catchment area (500 - 800 meter radius), access roads, intermodal facilities at the station area, and integrated urban development will provide extensive opportunities for improvement of local communities.

Approach to TOD in Hanoi

6. UMRT is a key strategic instrument to promote the following:

(i) **Smart urban growth:** UMRT and associated TOD involve tremendous opportunities to guide urban growth in a sustainable manner. Rapidly expanding outer areas will be connected with the CBD by UMRT, and balanced distribution of population and activities will be encouraged.

(ii) **Reorganization/ revitalization of CBD:** Accessibility to and in CBD will be improved significantly due to UMRT. At the same time, entry of private vehicles to CBD can be restrained, when UMRT network has been completed.

(iii) **Local socio-economic development:** UMRT station areas can generate ample opportunities for integrated urban development with different purposes (residential, commercial, office/business, recreational, cultural, civic services, etc.).

7. The influence area of the UMRT with regard to TOD can be broadly classified in the following three levels for which concept plans are formulated:

(i) **District level:** The influence area of the phase1 section of UMRT Line1 and Line2 are classified into a number of urban clusters with more or less homogeneous urban characteristics. (i) North-West Urban Cluster including C1, C2, C3 and C4 stations, (ii) South of West Lake Urban Cluster including C5, C6 and C7 stations, (iii) Hanoi City Centre including C8&V6, C9, C10 and V8 stations, (iv) South Urban Cluster including V9, V10, V11 and V12 stations and (v) East Urban Cluster including V4 and V5 stations.

(ii) **Areas within walking distance of an UMRT Station:** This is the most important area to facilitate access to UMRT and covers more or less 500 to 800 meter radius of a station.

(iii) **Area at UMRT Station:** This is a station and its immediate environs, wherein provision of basic intermodal facilities as well as integrated urban development opportunities should be ensured.

8. In formulating TOD concept plans, followings are duly considered as well:

(i) **Sector Integration:** TOD plans should focus on three important scopes namely: (i) transport access to UMRT stations, (ii) integrated urban development, and (iii) community improvement in UMRT influence area.

(ii) **Institutional Integration:** Proposed TOD plans should be properly reflected or included in Zone Plans that are currently being finalized. Coordination among related organizations to planning and implementation of TOD should also be ensured.

(iii) **Action Oriented:** TOD plans should be implemented along with UMRT projects in time of UMRT operation. Users are provided with reasonable access to the network, and UMRT does not cause any traffic conflicts at and around the stations.

Formulation of TOD Concept Plan

9. TOD concept plans are prepared at three spatial levels. At cluster level, planning directions and concepts; at walking distance area level, planning focus is placed on the improvement of access roads including alleys, walking conditions and local traffic management, and at station area level, detail plans are prepared on various intermodal facilities such as station plaza, parking, bus bays, pedestrian walkways, traffic management and safety measures, among others. Utilization of underground space is also planned.

10. **TOD Concept Plan for North-West Urban Cluster:** UMRT development and TOD should be effectively coordinated with ongoing new development projects (Ciputra New Town, Ngoai Giao Doan, Tay Ho Tay) vice versa.

(i) **C1 Nam Thang Long Station (elevated):** By providing the common station plaza shared by UMRT and planned hospital, the station area can function as a community core which can serve both new town and existing communities.

(ii) **C2 Ngoai Giao Doan Station (elevated):** The station plaza to be developed within park area can enhance accessibility to public space and ridership of UMRT.

(iii) **C3: Tay Ho Tay (elevated):** Comprehensive station plaza should be developed both in planned commercial area and central government area. A bus terminal is developed to expand UMRT catchment area in the north and west of the city through provision of UMRT relay bus and feeder bus services, etc.

(iv) **C4 Buoi (underground):** The station will function as an important road – UMRT transfer point connecting the west. Intermodal facilities along Hoang Quoc Viet Street are provided and integrated redevelopment of old apartment is promoted.

11. **TOD Concept Plan for South of West Lake Urban Cluster:** The current high-dense residential areas without proper road network will be benefited from development of UMRTs (Line2, Line3 and Line5) and trunk roads. Opportunities for integrated urban development should also be tapped.

(i) **C5 Quan Ngua (underground):** As the station is located underground of two trunk roads (Hoang Hoa Tham Street and Van Cao Street) which have been widened, underground parking and walkway can be provided to enhance connectivity with the West Lake shore.

(ii) **C6 Bach Thao (underground):** The station area can add a new local urban service centre in existing traditional residential areas, when roads are developed in integration with UMRT and the station area including underground space is developed on TOD concept.

(iii) **C7 Ho Tay (underground):** This station area can strengthen gateway function for the West Lake and Ba Dinh Square, and contribute to improvement of traffic situation at the intersections. Underground parking can be developed in the space of Ly Thu Truong Flower Garden and Vietnam Film Company which serve as fringe parking of the city centre.

12. **TOD Concept Plan for Hanoi City Centre:** Development of three UMRT lines (Line1, Line2 and Line3) and associated TOD will contribute to significant improvement of traffic situation in the city centre. The city centre can be covered within walking distance of UMRT which will make it possible to restrict the entry of private vehicles in the city centre. Development of parking facilities at fringe areas can farther facilitate this areawide traffic management. Integrated urban redevelopment will contribute to revitalize AQ and FQ where new development opportunities are limited.

(i) **C8 Hang Dau (underground) & V6 Long Bien Nam (elevated):** The station area can be transformed to a notable public transport interchange node by integrated facilities of Line1, Line2 and Long Bien Bus Terminal, which are connected each other via underground and elevated walkways, and provided with station plaza of Long Bien Market and underground parking of Hang Dau Park. Together with integrated redevelopment at various locations including, among others, Long Bien Market, Long Bien Bridge, the space under the viaduct. The area can be transformed to much strengthened urban and transport hub at the north gateway of the city centre.

(ii) **C9 Hoan Kiem Lake (underground):** This station will contribute to improve traffic flow around the lake and AQ, to improve walking environment in harmony with cultural facilities, and to facilitate integrated development of EVN land.

(iii) **C10 Tran Hung Dao (underground):** By utilizing a leftover underground space at the terminal station of phase1 section of Line2, an integrated underground parking can be developed at reduced cost. This will contribute to improvement of traffic flow, and at the same time promotion of underground space development in FQ can be promoted where building heights are controlled.

(iv) **V8 Hanoi (elevated):** Development of the station area is critical from the viewpoints of traffic circulation and integrated urban development. Interchange of Line1 and Line3, elevated structure of Line1 and availabilities of VNR land should be leveraged. When Tran Hung Dao Street and Tran Nhan Tong Street can be extended to connect the roads on the west of the station area, traffic circulation in the area will be much improved. VNR land can be redeveloped in a large-scale of commercial and business purposes integrated with UMRT. Congested residential areas in Van Chuong Ward can also be redeveloped in integration with the above developments.

13. **TOD Concept Plan for South Urban Cluster:** UMRT development along NH-1 toward south will improve accessibility significantly between rapidly growing outer area and the city centre. Landuse separated by VNR structure in the east and west will be connected. TOD at Giap Bat station

area will realize a development of a new competitive CBD in suburban area. The development of this cluster can contribute to redistribution of population from densely populated city centre to outer areas without sacrificing accessibility and living conditions.

(i) **V9 C.V. Thong Nhat (elevated):** This station intends to connect two main roads of NH-1 and RR1, and Bach Khoa Station of phase2 of Line2 by providing extensive intermodal facilities. Park visitors, university students as well as local communities are provided with safe and convenient walking and traffic environment.

(ii) **V10 Bach Mai (elevated):** This station will greatly benefit a large number of hospital users and university students who require safe and affordable public transport service. Urban redevelopment opportunity of Bach Mai Hospital integrated with UMRT service is also desirable.

(iii) **V11 Phuong Liet (elevated):** UMRT development will provide an opportunity to restructure the urban space at and around the station. Local socio-economic activities and redevelopment of factories and public facilities can also be promoted.

(iv) **V12 Giap Bat (elevated):** This station will be a core of proposed new CBD in the south of the city to promote balanced urban growth. VNR land, a bus terminal and underutilized lands including pond, factories and degraded residential areas can provide opportunities for large-scale integrated development. Seamless feeder bus service will enhance the ridership and catchment area of UMRT and improve overall public transport system in the south of the city

14. **TOD Concept Plan for East Urban Center:** At present, this area is relatively isolated from the city centre, but will be significantly improved with UMRT and comprehensive intermodal facilities. Transit-based compact urban development can be promoted through integrated development of VNR land and factories, as well as redevelopment of adjoining areas.

(i) **V5 Long Bien Bac (elevated):** Integrated development of UMRT, road network and intermodal facilities will enhance opportunities to promote new mixed use development.

(ii) **V4 Gia Lam (elevated):** This station will become a transport hub connecting UMRT Line1, Line4, trunk roads (NH-1 and NH-5) and feeder bus services. VNR land and VNR factory should be redeveloped to provide various urban and intermodal facilities to serve as a core of new competitive CBD in the east of the city.

Required Type of Feeder Bus Service

15. UMRT is expected to provide a high quality public transport service, though its initial network is limited. In order to expand the coverage and to maximize the serviceability and operational efficiency of UMRT phase1, it is indispensable to strengthen following types of feeder bus services.

(i) **Reorganization of city bus routes and adjustment of services:** Supply and demand need to be suitably adjusted in such way that city bus should not compete with but complement UMRT services. Connectivity between city bus and UMRT should be strengthened including introduction of new access routes.

(ii) **Development of UMRT relay bus service:** UMRT relay bus should be developed along planned UMRT extension routes and provide seamless and high-quality feeder services in

outer areas. The relay bus route will be replaced with UMRT when the extension project has been completed.

(iii) **Provision of new type of bus services:** New type of bus services will be provided to farther strengthen public transport connectivity. They include among others, special bus or BRT using to-be-abandoned Long Bien Bridge, a circulation bus in the city center.

Environmental and Social Considerations

16. Environmental and social considerations (ESC) apply to all JICA projects in accordance with the Guidelines for Environmental and Social Considerations (April 2010). As HAIMUD2 is categorized as category B, Initial Environment Examination (IEE) was carried out for all planned stations to evaluate the impacts as required by the ESC Guidelines.

17. In addition to general environmental criteria such as pollution, natural environment, socioeconomic environment, TOD specific criteria is proposed including accessibility, traffic and accident, walking environment, safety and security and universal design. Mitigation measures for negative impacts and responses to environmental disasters are suggested to meet all criteria, and for each stage of the project including project preparation stage, project construction stage and operation and monitoring stage.

Pre-Feasibility Study on Transport Access Improvement Projects

18. This Pre-F/S is to identify necessary projects to ensure the smooth access to the UMRT stations in the 500 – 800 meter radius areas of the entire 18 stations included in the phase1 of Line1 and Line2.

19. Various types of project components for access improvement are included, but not limited to, priority road development, alleys and local roads improvement, station plaza, bus terminal, pedestrian crossing, elevated/ underground walkway, parking facility, traffic management, etc.

20. Identified projects are grouped into short-term projects and basic projects. Short-term projects refer to those that must be completed before the opening of UMRT. Among short-term projects, minimum projects are specified which do not require land acquisition because they are located inside ROW of UMRT, road, park, and public facility lands. Basic projects include those which UMRT station must be essentially provided with such as station plaza and other intermodal facilities.

21. Total project cost required for 18 stations is 8,000 billion VND or 372 million USD, of which, 2,275 billion VND or 29% for Line1, and 5,685 billion VND or 71% for Line2. Minimum projects share 3,000 billion VND or 37% of the total (see Table 1).

Table 1 Estimated Costs of Access Improvement Project Package

	by Phase (billion VND)			Total	
	Short-term		Basic	billion VND	%
		(of which minimum)			
HDOT	1,365	(944)	126	1,491	18.6
MOT-PMU	452	(452)	182	634	8.0
MRB	635	(635)	409	1,044	13.0
District	913	(913)	0	913	11.4
Private	0	(0)	3,917	3,917	49.0
Total	3,365	(2,944)	4,634	8,000	-

%	42.0	36.8	58.0	-	100.0

Source: JICA Project Team

22. Possible funding sources include DOT, MOT-PMU (Line 1), MRB (Line 2), District PC, private sector and their combinations (see Table 1). Roads included in Zone Plan will be covered by DOT, while local roads and alleys by District PC. UMRT related projects will be covered by UMRT project implementing body while those related to integrated urban development will be by private sector.

23. As many of the projects are either within ROW of UMRT or closely related to UMRT, UMRT implementing body should be the overall project management body. On those projects located outside ROW of UMRT close coordination with relevant organizations is necessary, especially DOT.

24. While the projects as a whole is economically viable with EIRR of 17.8%, it is not financially viable simply because many projects cannot generate revenue. Considering positive social and environmental impacts of the project on localities in terms of enhancement of accessibility, patronage of the people for UMRT and traffic environment in the local communities, the project can be justified and implemented with public sector initiatives, especially short-term projects which should be completed before UMRT operation. Basic projects will be studied farther for effective implementation by private sectors in combination with integrated urban development.

Pre-Feasibility Study on Underground Parking Development at Tran Hung Dao Station

25. Parking space in the city center (AQ and FQ) is very limited. Demand-supply gap will be expanded farther because of increasing demand for cars. There is a need for effective way to construct parking facilities in the city center because of limited space and high construction cost. This Pre-F/S is to estimate demand supply gap of parking facilities in the city centre and assess feasibility of constructing underground facilities at Tran Hung Dao Station together with UMRT development.

26. Tran Hung Dao Station is located underground of the intersection of Tran Hung Dao Street and Hue Street in the FQ. The underground parking space will be developed by utilizing underground space of the turnback section at the station, which will be constructed by cut and cover method. The length of the underground parking space is planned to be 255m long and 21.4m wide, which can accommodate approximately 200 cars.

27. The project can take advantage of reducing construction cost because excavation and temporary works are implemented in the station construction work. While underground parking construction costs 70-80 million VND/m^2, the project cost is 20 million VND/m^2. When the project is implemented as a part of UMRT station construction project, it costs only 200 billion VND.

28. Project is economically feasible due to reduction in on-road parking space and improvement of traffic flow and safety. It is also financially viable with FIRR of more than 12%, based on the assumption that the project parking will mainly serve cars of which the demand is high in the area. With attractive financial return, the project can be implemented on PPP scheme.

Pre-Feasibility Study on TOD at Giap Bat Station Area

29. This Pre F/S intends to look into Giap Bat Station area development with following objectives:

(i) To formulate a comprehensive concept plan showing compact and competitive multi-functional urban core based on TOD concept in basic compliance with Zone Plan

(ii) To assess viability such development from economic, financial, socio-environmental viewpoints and implementability of the plan and projects.

(iii) To preliminarily study possible application of alternative development mechanism such as "land readjustment" and "urban renewal" system which are widely practiced in Japan

30. Key concepts of Giap Bat TOD include (i) development of a new urban service center (CBD) to cover the southern part of the city, (ii) provision of different types of housing including affordable housing including social housing for resettlement inside the project area and from congested city center, (iii) generation of employment opportunities, (iv) creation of a regional park and urban green spaces and (v) creation of the first transit city which can be directly connected with the current city center (AQ and FQ).

31. The project comprises following three components;

(i) **VNR station area development (11.1ha):** The land will be utilized for multi-story high density commercial and business complex integrated with UMRT facilities and function. A total of 476,000m2 of floor area will be generated including a twin station buildings, facilities under the viaduct and others. Access roads and station plaza is also provided. Total project cost is estimated to be approximately 542 million USD. In comparison with the investment cost and expected revenue over the project life, it is estimated that FIRR is 30.4%.

(ii) **TRANSERCO bus terminal area development (4.5ha):** The location and function of existing bus terminal will match planned TOD concept perfectly. Redevelopment of the land can provide various types of feeder services including relay bus, provincial bus and local feeder services which contribute to expansion of UMRT services in the south of the city. Multi-story mixed use buildings can house renewed bus terminal, commercial/ business and residential floors of 121,000m^2. Existing 140 households can be resettled in the project area. The total investment cost of 114 million USD can be recovered with 25.2% FIRR.

(iii) **Integrated redevelopment of west area of the station (65.2ha):** The land includes different types of ownership and use including residential areas, factories, pond and public space and facilities. It is intended in the project that all stakeholders of both public and private sectors participate in the development and resettled within the project area based on alternative development methods such as "land readjustment" and "urban renewal" systems. The project area can be renewed to well organized urban area provided with a network of roads, park and space for public service facilities which also basically comply to Zone Plan. The 321 million USD project cost can be covered with 247 million USD to be generated from the sale of 7.9ha reserved land and 74 million USD to be shouldered by the authority for arterial road construction. 7.9 ha of new land will be ideal sites for modern high-rise commercial/ business facilities.

32. The project is highly viable, especially when three project components are implemented in coordinate and integrated manner. This type of large-scale strategic development including existing urban areas based on alternative methods will be become more and more needed and can be applied in many other parts of the city.

Conclusion

33. TOD is important in Hanoi. When TOD is implemented, it will improve accessibility of public transport users and contribute to increase in UMRT ridership, it will enhance socio-economic development at and around the stations, and it will benefit communities in many ways.

34. Main outputs of TOD include following:

(i) Prioritized improvement and development of main access roads included in Zone Plan, and TOD area connecting UMRT stations (Detail Plans are prepared for 18 stations)

(ii) Improvement of local roads and alleys, especially those located within the walking distance of UMRT stations (concept plans are prepared for 18 stations)

(iii) Enhanced traffic management in Hanoi City Centre based on three UMRT Line network (Line1, Line2 and Line3), fringe parking and restricted entry of private vehicles (concept plan is prepared)

(iv) Promotion of UMRT integrated parking facilities (concept plans are prepared and pre- F/S conducted for Tran Hung Dao Station)

(v) Provision of new bus services, including reorganization of existing city bus, development of UMRT relay bus and provision of new bus services (concept plan is prepared)

(vi) Creation of integrated urban development opportunities (concept plans are prepared for 18 stations)

(vii) Comprehensive TOD at main UMRT stations (concept plans are prepared for Hanoi, Giap Bat and Gia Lam Stations and pre-F/S is conducted for Giap Bat Station)

35. TOD concept plans and projects can be implemented from technical, financial and institutional viewpoints. TOD plan can be incorporated in Zone Plan, minimum projects can be implemented without additional land acquisition and resettlement, some short-term projects required minimum land acquisition without much difficulties, basic project can be implemented by private sector or on PPP scheme.

Recommendations

36. In order to move to the next step of implementing TOD, main recommendations of the project include followings:

(i) “TOD Area” specified in TOD concept plan should be designated in Zone Plan to ensure provision of necessary space for TOD facilities at and around UMRT stations.

(ii) Coordinating function in TOD planning and implementation should be strengthened, especially among transport, urban development and environmental management.

(iii) UMRT construction coverage should be expanded to include minimum access roads and intermodal facilities.

(iv) Private sector participation should be promoted especially for integrated urban development, and operation and management of public facilities.

(v) Alternative urban development methods should be father studied on land acquisition and resettlement, right conversion system, coordination with stakeholders, project funding and others. Necessary institutional arrangements should also be provided.

1 INTRODUCTION

1.1 Traffic problems in Hanoi City have been worsening due to growing traffic demand associated with economic development. The city is now experiencing prohibitive levels of congestion, along with deteriorated traffic safety, increased air and noise pollution, etc. To improve the situation, the Government of the Socialist Republic of Vietnam ("GOV") and Hanoi City have given priority to the construction of an efficient public transport system. To this regard, the Japan International Cooperation Agency ("JICA") and the GOV agreed to develop an Urban Mass Rapid Transit (UMRT) system in Hanoi. With the support of the JICA, the construction of two lines is currently on-going based on the Loan Agreement on "Hanoi City Urban Railway Construction Project (Line 1)" and the "Hanoi City Urban Railway Construction Project: Nam Thang Long – Tran Hung Dao Section (Line 2)".

1.2 To enhance the development effects of these two UMRT projects, developing urban facilities at and around the stations is important for improving inter-modal connectivity. The "Project for Studying the Implementation of Integrated UMRT and Urban Development for Hanoi" referred to as HAIMUD2, aims at assisting Hanoi City with formulating an appropriate implementation mechanism that would successfully integrate the UMRT system with urban development and other transportation systems. It also aims at concretizing concept plans and realizing short-term projects proposed in HAIMUD. The specific objectives of HAIMUD2 are as follows:

(i) Formulate concept plans including transport access improvement, integrated urban development and community improvement of all stations by reviewing HAIMUD and relevant plans and projects, to be used as inputs for the Zone Plan currently being prepared by Hanoi People's Committee (HPC)

(ii) Conduct pre-feasibility studies including (a) Pre-F/S on a package of projects to ensure adequate access to UMRT, including detailed plans of access facilities, (b) Pre-F/S on underground facility development project at Tran Hung Dao, and (c) Pre-F/S on TOD development at Giap Bat Station Area

(iii) Make recommendations on the necessary improvement of the institutional framework for more effective implementation of the projects

1.3 For the purpose of HAIMUD2, a Joint Coordination Committee (JCC) and a Technical Working Group (TWG) have been established, chaired respectively by Mr Nguyen Quoc Hung, Vice-Chairman of Hanoi People's Committee (HPC), and Mr Tran Duc Hoat, Deputy Director of Hanoi Authority for Planning and Investment (HAPI). This final report is the result of consultations with the JCC, the TWG, other relevant agencies and all relevant stakeholders.

1.4 The project area is circumscribed along Hanoi UMRT Line 1 and Line 2 (See Figure 1.1).

Figure 1.1 Location of UMRT Line 1 and Line 2 in Hanoi City

Source: JICA Project Team

2 OVERVIEW OF HANOI URBAN AND TRANSPORT DEVELOPMENT AND RELATED PLANS

2.1 Urban Development Characteristics

2.1 The territory of Hanoi capital city has reached 3,344 km² after the expansion of the boundaries in 2008. Nowadays, approximately 13.7% of the total area is built-up, in both urban and rural areas. While urbanization has been progressing rapidly, the overall land-use is still of rural nature. Green spaces in Hanoi, including agricultural land, rivers, lakes, and natural forests, are considered one of the most important features of the urban system. Agricultural land currently covers 56.6% of the city area. More than 1,000ha of agricultural land are converted into urban space annually. In spite of the availability of green space in the city, its coverage in the urban centre of Hanoi remains low. In addition to eight rivers systems – the main one being the Red River – Hanoi is also well known for the largest lake and pond area of Vietnam (with about 111 lakes and ponds). Yet, their total surface area has significantly shrunk, which affected the flood discharge and drainage capacity of the city. This has also caused adverse impacts on the urban natural landscape and ecosystem. Many places in Hanoi are heavily inundated during the rainy season, as the drainage system is still poor.

2.2 Air and noise pollution levels in Hanoi have also been increasing. Average dust content (TSP and PM10) is 1.5 to 3 times higher than the permissible standard (TCCP). The noise level sometimes reaches 85 to 88 dBA. Emissions of pollutants such as SO_2, NO_2, CO, Pb, CnHn, are also high in some localities.

2.3 The population of Hanoi was 6.4 million people in 2008; it has increased to 7.3 million people in 2014. The population increase rate has been most significant in the inner cluster (3.6%/year between 2009 and 2013), followed by the outer cluster (2.0%/year) and the city centre (1.9%/year), and last by the far outer cluster (1.4%/year). Because of a high population density of 276 persons/ha in the city centre, the population has started to increase in peri-urban areas. However, in spite of this high density, the population is still concentrating in the city centre.

2.4 Population growth rates are relatively higher in almost all directions along the main transport corridors indicating that the demand for urban services in the outer areas is also growing. While population tends to move towards outer areas for affordable housing and better living environment, proper housing infrastructure is not sufficient, especially for low- and medium-income groups. Transport access becomes a constraint. De-densification of congested urban centres must be associated with the development of proper urban areas provided with necessary infrastructure services and access transport at affordable cost.

2.5 It is expected that UMRT and TOD can contribute to solve the above urban issues in an integral manner, thus promoting smart growth of urban areas of the city.

2.2 Urban Transport Situation

2.6 The **urban transport network** is almost entirely provided by **a road system that** is a combination of radial and ring (belt) roads, constitutive of the structure of the city. As of 2012, the total length of the road network was 7,365 km in Hanoi (of which 20% were main roads), compared to 6,240 km in 2005. There were also 7 radial roads and 3 belt roads.

2.7 There are very **few public transportation** services available at new housing areas, and along secondary arterial and local roads. Therefore in these areas, most of the travel demand is met by individual mechanized transport modes (especially motorcycles), mostly using the major arterial roads to the central area, which generates heavy traffic on these major roads.

2.8 The city is also provided with 123 km of the **railway network** and 81 km long **inland waterway**. The roads are relatively densely developed in urban areas, but less developed in rural areas, making their access difficult. Hanoi has a proper street system in the central districts (mostly Hoan Kiem and Ba Dinh districts). However, in other urban districts, roads are usually short and narrow. In addition to the development and/or improvement of radial roads, the development of a belt road system composed of four ring roads has effects on road transport and on the formation of urban areas along with their construction.

2.9 Only the **sidewalks** located in the French quarter and in the new urban areas are wide enough for pedestrians. In the old quarter, sidewalks are very small, narrow, sometimes inexistent, and they are usually occupied by sellers, xe om, etc.

2.10 The existing **stations or transport terminals** are located at the entry points or the gateways towards the inner city, including Nam Thang Long, Giap Bat, Gia Lam, Luong Yen, and My Dinh. They are overloaded and generally too small compared to the frequentation. Hanoi is planning to build 10 inter-provincial terminals, four inter-modal transport centers, and nine new intercity bus stations.

2.11 **Terminals, yards, and parking areas** are shoddy, and unevenly distributed. Currently, the land for such static traffic accounts for only 0.35 % of built-up areas, accommodating only 10% of the demand approximately. Hanoi City plans to renovate and build more than 80 new parking areas in the city, and in Dong Anh and Tu Liem districts.

2.12 There are very limited **car parking areas** in the inner city compared to the demand. The vehicles are forced to park on the roadways, which results in traffic congestion. The city has started to implement a number of multi-level steel structure car parks along the inner city roads or in the apartment buildings of the new urban areas.

2.13 **Urban traffic demand of** Hanoi has increased significantly over the last decade, from 6.5 million trips/day (excluding walking and intra-zonal trip) in 2005 (HAIDEP) to 10.6 million in 2013. Main characteristics are: (i) “Motorcycle” shares 64% of the total demand; the number of trips increased by 1.7 times between 2005 and 2013; (ii) “Car” shares 5.4%, experiencing an increase by 3.2 times over the same period; (iii) “Bus” demand increased by 2.3 times, but the share of total demand is only 8.2% now; and (iv) “Bicycle” demand decreased but still shares 19% of the total demand.

2.14 People prefer private transport modes and are gradually shifting to the use of car, which is the main cause of worsened **traffic congestion**. Although bus is becoming more popular, its smooth operation is severely constrained because of limited road space to share with private transport. Nevertheless, traffic congestion has decreased significantly between

2011 and 2013, with a decreasing number of congestion points and reduced congestion times. One of the important reasons for this amelioration is the completion and implementation of a series of major transport projects, specifically the overpass bridges at key intersections such as Nguyen Chi Thanh - Kim Ma.

2.15 **The public transport system** of Hanoi has been experiencing ups and downs. Since 2000, Hanoi urban transport management and operation centre "TRAMOC" carried out two international projects to reorganize the bus operator companies through the establishment of TRANSERCO holding company (which is now the main bus operator in Hanoi). The number of bus passengers increased from 50 million in 2002 to 285 million in 2004 and 500 million in 2013. Daily bus users are mostly low-income workers and students who come from outside provinces (provincial immigrants) and cannot afford a motorcycle.

2.16 The main transport mode that complements public transport is the **taxi**. The modern taxi system appeared in Hanoi after 1994. Nowadays, Hanoi has an effective taxi system with 107 registered taxi operators and over 17,000 vehicles.

2.17 **Xe Om** began to appear in Hanoi after the "Doi Moi" in 1989, leading to the downward trend of the bus service, and simultaneously, the upward trend of the use of motorcycles. There are no statistics on the number of Xe Om in Hanoi. They originally competed with bus services, but their role has changed to serve as a low-cost alternative to taxis, and to act as feeder systems to bus stops. This is functional in some parts of Hanoi where accessibility is limited. Xe Om may remain active in Hanoi for a long time, unless a radical policy change is introduced.

2.18 The **cyclo** is the oldest individual type of public transport in Hanoi but their market share has been taken over by xe om. The use of cyclos is now limited to the tourism industry and to traditional weddings.

2.19 An **electric bus** has been operating as public transport in Hanoi since July 2010, with a pilot project whose target is tourists visiting the city centre. It contributed to reducing traffic and also protecting the environment. In fact, it is also used by local people and not only tourists.

2.20 The first **bus rapid transit (BRT)** route of Hanoi is now under construction along the route Kim Ma - Yen Nghia, i.e. 14 km. Operation should start in 2015. The total investment for this project is 49 million USD. The expected operation speed is about 22 to 25 km/hour on average, which is faster than the average speed of conventional buses (less than 15 km/hour).

2.21 **Level of traffic management:** The level of basic 3Es, comprising Engineering, Education, and Enforcement, is low. Infrastructure is neither properly developed, operated, nor maintained; people do not have sufficient knowledge on traffic rules for safety and efficient travel by different type of transport modes.

2.22 In 2013, Hanoi recorded 2,252 **traffic-related accidents** (a decrease by 8.8% compared to 2012), 323 fatalities (decrease by 5.6%) and 2,008 injuries (decrease by 4.2 %). Although the number of traffic accidents has decreased, the severity of traffic accidents remains very high. Main causes of accidents include (i) low traffic consciousness and bad behaviours of drivers and pedestrians (alcohol, wrong lanes, no helmet, etc.); (ii) Lack of enforcement by the Police of rules against traffic violations; (iii) Traffic and urban management still deficient and ineffective; Roadway and sidewalk encroachment problems by vendors and road vehicles; and (iii) Substandard quality of transport vehicles.

2.3 Hanoi Capital Construction Master Plan up to 2030 with Vision to 2050

2.23 The "Hanoi Capital Construction Master Plan up to 2030 with Vision to 2050" (hereinafter referred to as the "General Plan") was prepared by the Ministry of Construction (MOC) and approved on July 26th, 2011, by the Prime Minister. The General Plan covers the metropolitan area of Hanoi City, including Ha Tay Province, Me Linh District in Vinh Phuc Province, four wards of Luong Son District and Hoa Binh Province, which were merged into Hanoi City in August 2008.

2.24 The keywords of the General Plan's Vision are "Green", "Culture", "Civilization" and "Modernization." The objectives include (i) construction of sustainable urban structure, (ii) active development of overall space by integrating natural, historical and cultural resources, and (iii) efficient land use, modern infrastructure and sustainable environment.

2.25 The development of public transportation is considered the major means to connect central urban areas and satellite urban areas. Inner city areas and peripheral areas are to be upgraded, and population growth controlled. The General Plan has for objective to restructure Hanoi Capital from a single-pole to a multi-pole structure with (i) central urban area, connected to (ii) satellite urban areas, and (iii) other eco-towns in rural areas. According to the General Plan's forecasts, population will increase from 6.4 million in 2008 to 10.8 million in 2050. The historic inner city area as well as the expanded inner city area shall be less populated in the future whereas newly developed urban areas, satellite urban areas and townships will absorb the increasing population.

2.26 UMRT and TOD are expected to play a key role in supporting the above-mentioned urban development plans and strategies. The basic concept of TOD is referred to in the General Plan as controlling urban public spaces as well as new construction projects for multi-function development and public transport promotion. New construction projects shall comply with synchronous infrastructure connection. The plan encourages the development of multi-use high-rise facilities in new urban areas, surrounding stations, and transport connection centres. It promotes the development of new modern urban projects in a combination with new services- and commercial centres, and historic and cultural spaces. It supports transport with modern and synchronous technical infrastructure in an environmental-friendly manner, organizing TOD models in centres connecting transportation means, giving priority to public transport development. Public spaces shall be developed to create a diversified and modern image susceptible to attract people. Convenient connections with main public transport modes shall be planned.

2.4 Current Status of UMRT Projects

2.27 The approved UMRT network plan is composed of eight lines with a total route length of 319 km. On-going construction includes phase 1 of Line 1, Line 2, Line 3 and Line 2A. After completion, the Ancient Quarter (AQ), Hoan Kiem Lake area, and the French Quarter (FQ) will be covered with UMRT stations located at walking distance (about 1km) from each other.

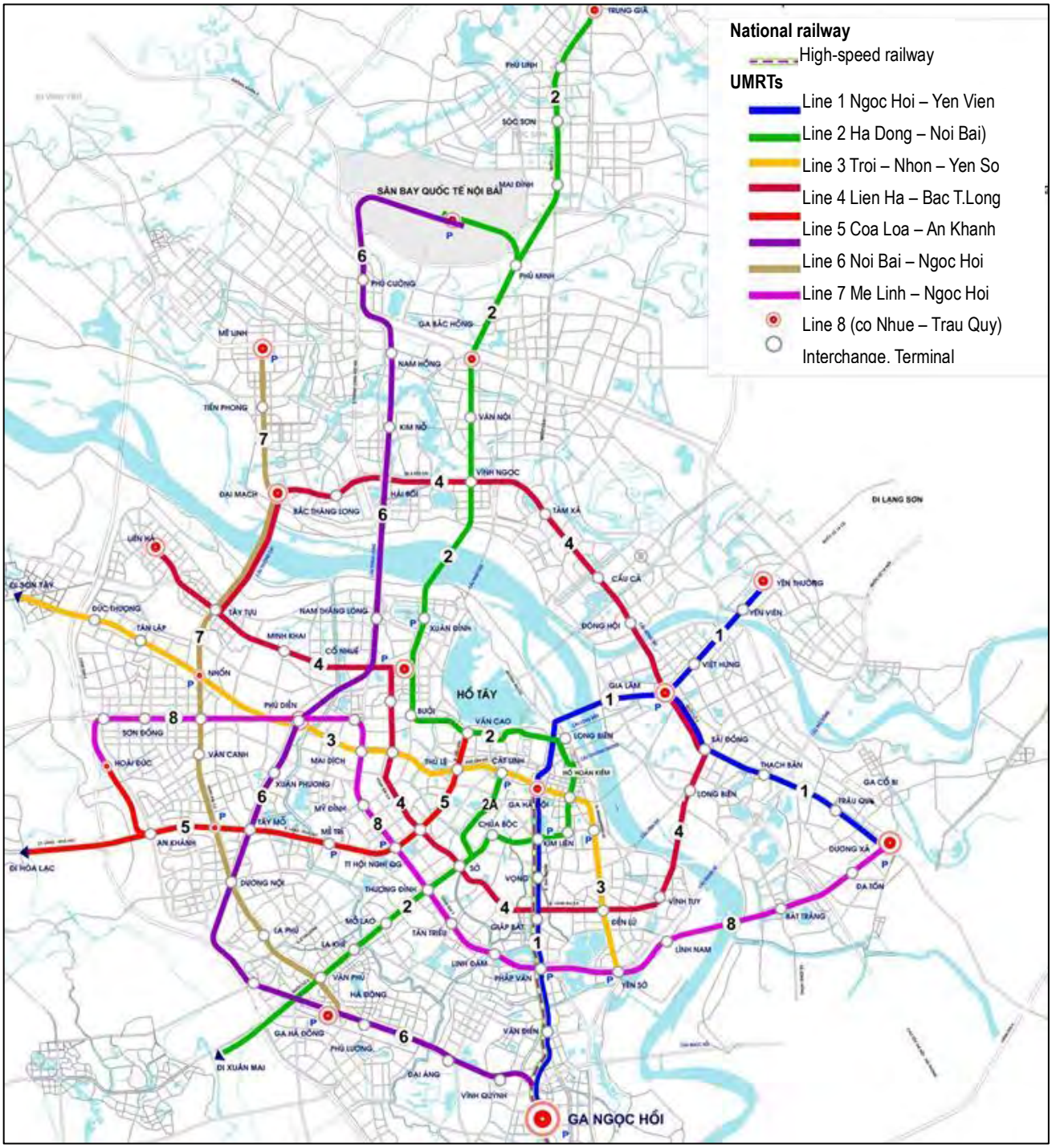
2.28 **UMRT Line 1:** Loan Agreement (L/A) of the engineering service of "Hanoi City Urban Railway Construction Project (Line 1)" was signed in March 2008. The phase 1 encompasses the section from Gia Lam to Giap Bat and Ngoc Hoi. It was signed in 2012 and construction is now on-going. The total length for this phase is 16.461km, including 8 elevated stations and 1 at-grade station. The overall schedule has been delayed mostly due to the uncertainty related to the location of the new bridge crossing the Red River.

2.29 **UMRT Line 2:** The L/A of "Hanoi City Urban Railway Construction Project: Nam Thang Long –Tran Hung Dao Section (Line 2)" was signed in March 2009. Since March 2011, the Phase 1 has been on-going. It concerns the section from Nam Thang Long Station to Tran Hung Dao Station (11.534km), including 3 elevated stations and 7 underground stations. A depot will be located in the South-west of Nam Thang Long Station. So far, the railway alignment (ROW, safety corridor, centreline) and the detailed plan of the depot were approved for both elevated and underground sections. Layout master plans were also approved for stations that do not require land acquisition. As for the other stations that require land acquisition, namely C5, C6, C9, and C10 stations, HAUPA requested MRB to conduct public consultation meetings in compliance with the Urban Planning Law. The MRB submitted draft station layout master plans of C5, C6 and C10 to HAUPA for appraisal. The phase 1 project is under re-evaluation by the Ministry of Planning and Investment (MPI) due to the increase of the estimated cost. The target year for the operation of phase 1 section is 2020 or 2021. The Feasibility Study of phase 2 section (from Cau Den to Thuong Dinh) was conducted by TEDI, and it is now under appraisal. The phase 3 section is stated in the General Plan, stretching from Nam Thang Long Station to Soc Son district toward the North of the Red River.

2.30 **UMRT Line 2A:** The Cat Linh–Ha Dong Urban Railway Project was approved in October 2008. The total length is 13.021km, with 12 elevated stations. It is under construction and in the process of land acquisition.

2.31 **UMRT Line 3**: The project of "Urban Railway Line3 Construction Project, Phase 1: section Nhon – Hanoi station" was approved in April 2009. The total length is 12.5km with 8 elevated stations and 4 underground stations. Hanoi People's Committee has already approved the ROW and the station layout master plans. The elevated sections are under construction.

Figure 2.1 Currently Approved UMRT Network Plan



Source: General Construction Plan of Hanoi Capital City till 2030, July 2011

3 APPROACH TO TOD IN UMRT DEVELOPMENT IN HANOI

3.1 TOD and Importance of Transit Oriented Development (TOD)

1) Concept of TOD

3.1 TOD refers to the design of a compact area for mixed residential and commercial uses in order to minimize the demand for private transport and to encourage transit ridership in public transport modes whose stops are located at walking distances from each other. TOD is essential not only to the successful operation of UMRT systems, but also to the smart growth of urban areas as well as to faster socio-economic development in areas around UMRT stations. When adequately planned and implemented, TOD can have significant and positive impacts on urban traffic, land use, and the environment. TOD is thus expected to create synergy between integrated transport and urban development, establish new urban spaces, and generate activities in the influence areas of the UMRT lines. Successful TOD will lead to increased ridership and better satisfaction among UMRT users. At the same time, urban development opportunities at various levels of the UMRT influence areas are expected to increase.

3.2 In this context, the objectives of TOD are summarized specifically as follows:

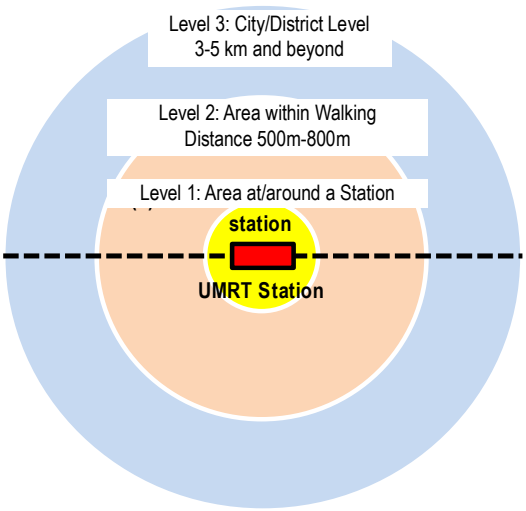
(i) TOD will affect the ridership of UMRT

(ii) TOD will contribute to local economic development at and around the station areas

(iii) TOD will contribute to enhancement of social and environmental condition in the influence area of UMRT (500 – 800 meter radius of station)

3.3 TOD affects urban areas at different spatial levels, depending on how TOD concepts are applied. The influence area of the UMRT with regard to TOD can be broadly classified in three levels: (i) Level 1: Area at and around an UMRT Station, (ii) Level 2: Areas within walking distance to an UMRT Station and (iii) Level 3: City/district level (see Figure 3.1).

Figure 3.1 UMRT Influence Areas

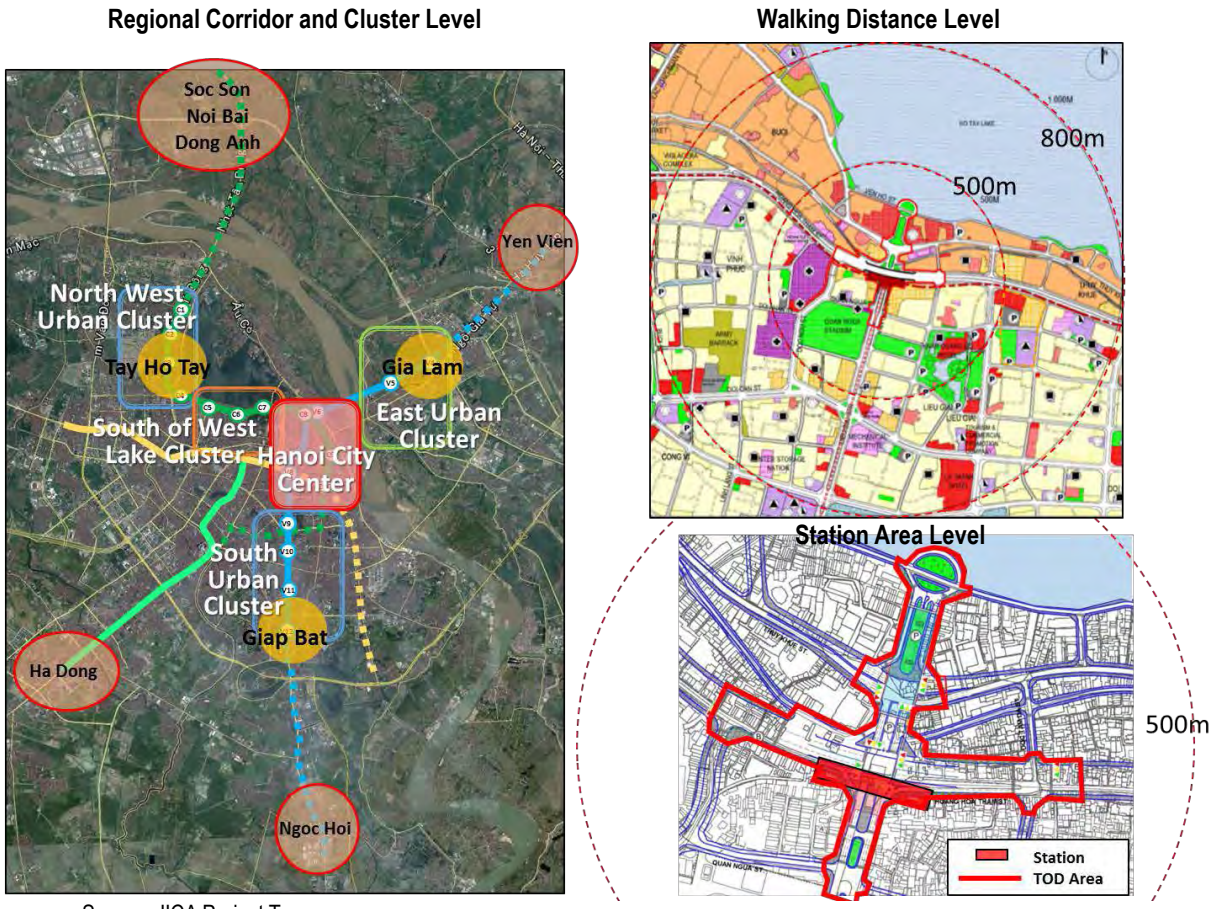


Source: JICA Project Team

3.4 In case of Hanoi City, UMRT can strengthen connectivity between city center and growth centers located in outer areas. For example, in the Phase 1 sections, Tay Ho Tay, Gia Lam and Giap Bat areas can be directly connected with UMRT. When the lines are extended, Soc Son, Noi Bai, Dong Anh in the north, Ngoc Hoi in the south will also be connected (see Figure 3.2).

3.5 This is one of the most important role and effect of UMRT to give opportunities for resettlement of the people living in the over-crowded city center to outer areas without losing accessibility to the city center. They can also have housing with better living environment when the resettlement areas are provided near or with good access to UMRT stations.

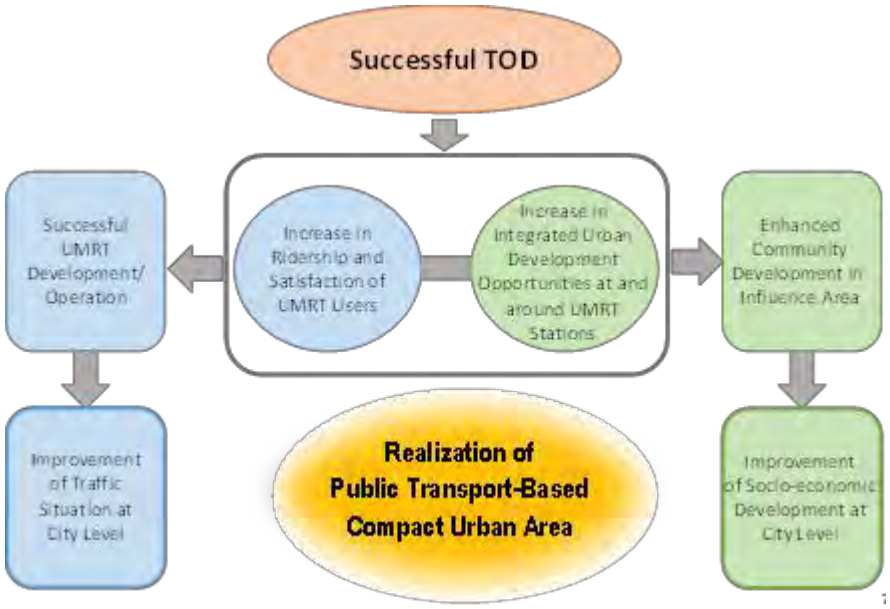
Figure 3.2 Target Areas for TOD Concept Plan Formulation of UMRT Line1 and Line2



Source: JICA Project Team

3.6 TOD intends to increase ridership of UMRT and satisfaction of UMRT users by providing improved access, and promoting socio-economic development and environmental sustainability through integrated urban development. If TOD is implemented for all stations of a route, UMRT users would be provided a seamless service and the effects of TOD would be exponential. An ultimate objective of TOD is to realize a public-transport-based compact urban area where inlands are effectively used, environment is preserved, high mobility and accessibility are ensured and impacts on climate change are limited (see Figure 3.3).

Figure 3.3 Successful TOD and its impact



Source: JICA Project Team

3.7 In accordance with spatial levels of TOD, outputs and expected outcomes of TOD are differed in a hierarchical manner (see Table 3.1). Expected outputs of each spatial level should be coordinated with official plans, for example; (i) TOD direction at regional level is corresponded to General Plan, (ii) TOD concept plan at corridor and cluster level is corresponded to Zone Plan, (iii) TOD concept plan and project at 500-800 meter radius and station area are corresponded to Zone Plan and Detailed Plan.

Table 3.1 Expected Outputs and Outcome of TOD

Spatial Level of TOD	Outputs	Expected Outcome
TOD at regional level	• TOD Direction	• Smart growth of urban area • Enhancement of city-wide mobility of public transport • New town development with good accessibility to CBD
TOD at corridor and cluster level	• TOD Concept Plan	• Improvement of traffic circulation • Increase in mobility and accessibility to urban service • Increase in urban development opportunities integrated with high quality public transport (UMRT)
TOD at 500 – 800 meter radius area level	• TOD Concept Plan • Access improvement plan • Integrated urban development plan • TOD project list • Implementation plan	• Improvement of local traffic conditions and environment for walking, bicycle and M/C users • Enhancement of local socio-economic activities • Promotion of effective landuse around UMRT station
TOD at station area level	• TOD Facility Plan • Basic Design of TOD facilities • TOD project list • Implementation plan	• Provision of facilities and services for smooth and safe intermodal transfer • Creation of attractive space for socio-economic and cultural activities in the community • Integrated urban development with efficient and high-dense landuse

Source: JICA Project Team

2) Good Practice of TOD

3.8 TOD has long been a key concept for both transportation and urban development in many large Japanese cities. Nowadays, Tokyo is the largest metropolitan area in the world with a total population of over 30 million. Yet, Tokyo is known as one of the most competitive, liveable and environmental-friendly city in the world. Many cases and experiences of Tokyo, can be used as good reference for the development of Hanoi from today towards the future.

3.9 Based on an international benchmarking focused on Japanese cities, the report provides illustrated examples of:

- Smart Growth of Cities Based on TOD
- CBD Traffic Management Improvement
- Fringe City TOD Development
- Comprehensive Station Area Development in major CBDs
- Station Building
- Intermodal Facilities
- Pedestrian Facilities and Walking Environment
- Use of Underground Space
- Opportunities for Local Economic Development around UMRT Stations
- Urban Development Schemes in Japanese TOD

3) Approach to TOD in Hanoi

3.10 UMRT is a key strategic instrument to promote the following:

(i) **Smart urban growth** of a large-urban area such as Hanoi, a city that has been compactly built with high population density in the city core can be promoted. De-densification of the city core and promoting population growth in outer areas is a basic urban growth policy of the city, which is currently led by the development of roads and active developments of the private sector. UMRT and associated TOD involve tremendous opportunities to guide urban growth in a sustainable manner. UMRT can promote convenient, liveable, and affordable suburban areas along the route. The outer area can conveniently be connected to the CBD with UMRT, the environment in outer areas can become better than in the city centre; the cost of housing and infrastructure can be more affordable.

(ii) **Reorganisation/revitalisation of CBD** can be promoted by mitigating traffic congestions or controlling the number of entries of private cars, enhancing transport environment (safety, noise and air pollution mitigation) and improving walkability. However, in order to achieve this, UMRT routes should be designed as an integrated network. This means that people who reside in or visit the city centre must be provided with UMRT stations within walking distance or convenient feeder transport means.

(iii) **Local socio-economic development** can be enhanced at and around UMRT station areas. Indeed UMRT stations generate extensive opportunities for urban development (residential, commercial, office/business, recreational, cultural, civic services, etc.) depending on the locational characteristics, and interests of communities, investors and other stakeholders.

3.11 In formulating TOD concept plans for each UMRT station, the three levels of influence areas have been considered. The concept applied to Hanoi has been further elaborated at three spatial levels:

(i) Urban Cluster: Urban areas along the UMRT lines have been broadly classified into a number of urban clusters with more or less homogeneous urban characteristics (see Figure 3.4):

- **Cluster 1 – North-West Urban Cluster**: North-western new urban core of commercial, public administration, residential and extension of transit toward Noi Bai: C1, C2, C3 and C4
- **Cluster 2 – South of West Lake Urban Cluster:** Existing dense urbanized area with public transport-oriented development area: C5, C6, C7
- **Cluster 3 - Hanoi City Centre:** old downtown, commercial, business district and pedestrian center: C8, C9, C10, V6, V8
- **Cluster 4 - South Urban Cluster:** Southern urbanizing area and expansion area: V9, V10, V11, V12
- **Cluster 5 - East Urban Cluster:** Eastern urbanizing area and expansion area: V4, V5

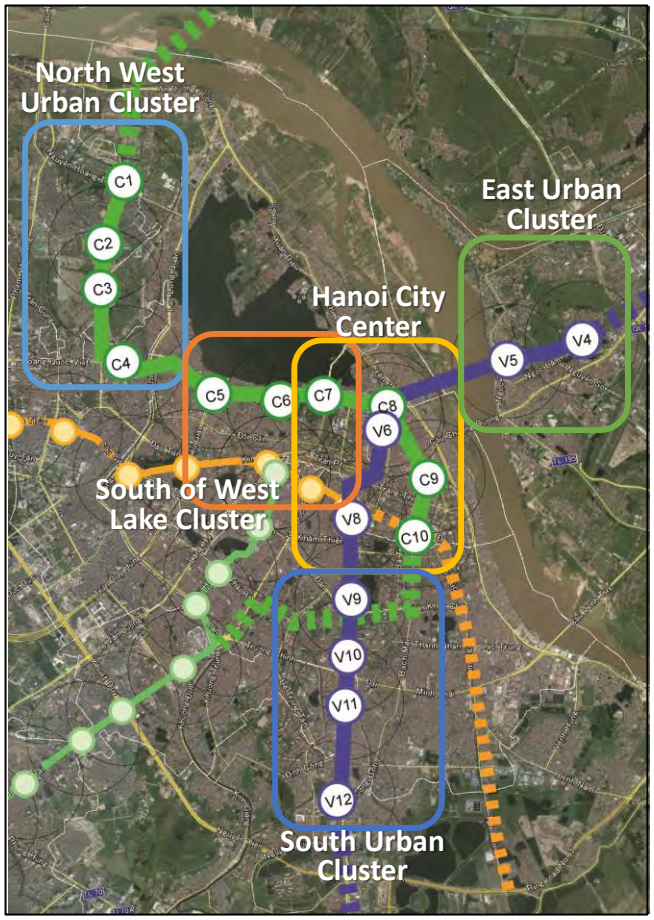
(ii) Area within Walking Distance: Though it varies according to physical conditions of a city in general and a station specifically, there is a general consensus that tolerable walking distance to a station ranges from 500m to 800m. In this study, discussions are mainly held on the 500-meter basis.

(iii) Station and TOD Areas: The area also varies for each station depending on its specific physical conditions. The station area is defined as the necessary surface area to ensure provision of basic intermodal facilities of UMRT. This particular area is farther defined for each UMRT station to delineate the specific boundary. It is proposed that the area is called “TOD Area” and is incorporated in the Zone Plan.

3.12 The aforementioned three spatial levels are not supposed to be separated but integrated in the formulation of plans and projects with due considerations of the following:

- **Sector Integration:** TOD plans should involve three important scopes namely: (i) transport at access, (ii) integrated urban development and (iii) community improvement. Urban development and redevelopment, which have been and will be undertaken, should also consider UMRT an opportunity to promote public transport use. The station areas will also provide opportunities for local socio-economic development as well as an opportunity to create a symbolic public space in the surrounding communities.
- **Institutional Integration**: Proposed TOD plans should be properly reflected or included in the Zone Plans that are currently being finalized. Moreover, a TOD plan is composed of various projects implemented by various bodies. Effective coordination among related organizations is necessary.
- **Action Oriented**: TOD plans should be implemented along with UMRT projects implementation so that at the time of operation, UMRT users are provided with reasonable access to the network, and UMRT does not cause any traffic conflicts at and around the stations. While those minimum requirements should be met timely, it is also important to establish a basis to farther promote TOD and contribute to sustainable development through (i) short-term and minimum projects to be implemented before the opening of UMRT, (ii) basic projects for enhancement of intermodal function of UMRT stations, and (iii) strategic projects for positive impacts in wider areas.

Figure 3.4 Clusters of the Influence Area of Line1 and Line 2



Source: JICA Project Team

4) Formulation of TOD Concept Plan

3.13 In formulating TOD concept plans for the stations located in phase1 section of UMRT 1 and 2, planning directions are made clear based on the discussion held comprehensively as explained in previous sections for the 500 meter radius areas of UMRT stations. On this basis of planning directions, a TOD concept plan is prepared as follows, for each UMRT station;

(i) TOD Area is designated to cover the UMRT ROW and the area wherein measures must be taken to ensure good accessibility to the station.

(ii) Concept plan is formulated in compliance with current zone plan as well as other approved plans. When it necessary to ensure effective use of UMRT, the proposal is shown in the concept plan.

(iii) The concept plan is composed of measures on transport access improvement to and from the station as well as for improvement of existing communities. Access transport improvement plan is worked out for the area within a kilometer radius of the station in general, and for the TOD Area more specifically.

3.14 Key scopes of TOD Concept Plan are composed of three aspects; (i) transport access improvement (walking, bicycle, motorcycle, bus), (ii) integrated urban development promotion, and (iii) community improvement and socio-environmental conditions improvement (resettlement, cultural values, etc.).

3.2 TOD Concept Plans in the North-West Urban Cluster

1) Area Characteristics

3.15 The North-West Urban Cluster is composed mostly of the western areas of Tay Ho District, and part of North Tu Liem and Cau Giay Districts. Population in the area was approximately 115,200 in 2009 and 129,500 in 2013. The population increase rate is high, at 3.0%/year. As large-scale new developments ("CIPUTRA New Town", "Ngoai Giao Doan New Urban Area" and "Tay Ho Tay New Urban Area") are progressing, future population is expected to increase to 150,000 or even more than 200,000 when they are fully developed.

3.16 The route of Line 2 starts at Nam Thang Long Station (C1) located in CIPUTRA real estate development, and runs to Ngoai Giao Doan Station (C2) in Ngoai Giao Doan real estate development, Tay Ho Tay Station (C3) where a new governmental district is planned and to Buoi Station (C4). Line 2 depot is also located in this cluster, near Nam Thang Long Station (see Figure 3.5).

3.17 The area is currently known as the cluster of SMEs. In this area, people consider that public amenities, entertainment and cultural facilities are satisfactory. The situation in the cluster has been quickly changing due to extensive development.

3.18 Most of the land in the cluster is classified as urban residential land. A large-scale development is undergoing for residential complex, commercial and governmental administrative purposes. Existing urban residential areas are clustered along the Red River and West Lake, and in Xuan Dinh Ward. The area has many historical sites located on the shore of West Lake. The area could be one of the attractive recreational and tourism spots for domestic and international visitors.

3.19 In this cluster, there are only two East-West trunk roads, i.e. Nguyen Hoang Ton Street in the North and Hoang Quoc Viet Street in the South. As for North-South direction, Ring Road 3 (RR3) is the only trunk road in this area. RR2 between Nhat Tan Bridge and Hoang Quoc Viet Street will be completed in 2015, and connected with Noi Bai extension road towards the North. Bus services mainly pass through trunk roads to the city centre.

2) Impact of UMRT

3.20 Development of UMRT will bring about the following impacts in the cluster:

(i) Access to the city centre will be significantly improved. One of the most noticeable improvements in transport aspects will be time savings to reach the city centre.

(ii) Tay Ho Tay (C3) station has potential to become an important public transport gateway terminal providing extension services to UMRT using high-quality buses to connect the northern and the western areas.

(iii) UMRT will expand opportunities for urban development in new development areas. Through TOD, the New Developments will benefit from improved accessibility and additional commercial/business facilities developments, and UMRT from an increase in the ridership.

(iv) Positive impacts on local communities: great business opportunities, improved living environment, symbolic environment, landmark and modern urban landscape for local communities.

Figure 3.5 Location of North West Urban Cluster

Source: JICA Project Team

(v) Improved public transport services are likely to reduce traffic congestion, improve travel safety and comfort as well as air quality. At and around UMRT stations, there will be opportunities for additional public facilities, services, and businesses. UMRT station areas can also become an icon and symbolic space in the area.

3) TOD Planning Directions

3.21 In formulating TOD plans in the cluster, three aspects are duly considered:

(i) **Transport**: (i) Ensure that UMRT services are extended towards the North along the planned route with integrated service in line with Line 2, using a high-quality bus service (such as BRT or equivalent) on a common fare basis; (ii) provide bus feeder services connecting the western, north-western and northern parts of the city; (iii) develop a network of local roads in an integrated manner to strengthen connectivity among existing communities, new urban developments and UMRT.

(ii) **Integrated Urban Development**: As there is no space for intermodal facilities (station plaza) in front of the UMRT stations, it is strongly recommended that necessary space for adequate intermodal facilities is spared at C1, C2 and C3 stations.

(iii) **Benefiting Existing Communities:** TOD should not only benefit UMRT users but also be planned in a way that existing communities should be provided with smooth access to UMRT stations and facilities (shops and business, as well as recreational activities and civic services).

4) TOD Concept Plans for Nam Thang Long Station (C1) Area

3.22 Nam Thang Long Station (elevated) – the terminal of phase 1 section of UMRT Line 2 – will be located inside CIPUTRA new town at the North of Tay Ho Tay new development area. While there are three North-South trunk roads (RR2, RR2.5 and RR 3), Nguyen Hoang Ton street is the only Est-West trunk road in the cluster that most traffic and buses use. From the existing residential area of Xuan Dinh Ward, accessibility will become more difficult after construction of Line2 Depot. Around the station, high-end detached housings and high-rise apartments are being built, and the hospital will be built to the west of the station.

3.23 The TOD concept plan of Nam Thang Long Station Area includes three main components summarized as follows:

(i) **Transport access improvement:** Required measures including improvement of Nguyen Hoang Ton street, development of RR 2.5 along Line 2, improvement of local access roads in existing communities, development of a station plaza (comprehensive intermodal facilities) on the land of the planned hospital for shared use by both UMRT and hospital users, provision of pedestrian facilities and other local traffic management measures at and around the station area.

(ii) **Integrated urban development**: The land of the planned hospital can provide even more enhanced multi-functional urban development including medical functions and other public services. The station plaza can also accommodate small-scale commercial and public service facilities for the benefits of UMRT users, hospital visitors, and local residents.

(iii) **Community Improvement:** Local communities including non-UMRT users will benefit from improvement of access roads, local socio-economic development and provision of public services at and around the station.

5) Ngoai Giao Doan Station (C2) Area

3.24 Ngoai Giao Doan station is an elevated station that will be located in the Ngoai Giao Doan new development area. While trunk roads and distribution roads have been constructed by the developer, it is necessary to improve accessibility from existing communities and park visitors, and to provide intermodal facilities that are harmonized with the park's environment.

3.25 The TOD concept plan of Ngoai Giao Doan Station Area includes three main components summarized as follows:

(i) **Transport access improvement:** Provision of station plaza within the park area is important for access to the park and increased ridership of UMRT and should be designed in consideration of the both requirements. This component also includes development and improvement of access roads, pedestrian facilities and traffic management.

(ii) **Integrated urban development:** Integrated development of the park and station plaza will enhance the function and value of the space when the space is properly designed and provided with commercial and public service facilities.

(iii) **Community involvement:** Although existing communities are located near the station, it is necessary to pay attention to integrating them with new development through the improvement of access roads and transport services. Allocation of the space for local communities' events will also be beneficial.

6) Tay Ho Tay (C3) Station Area

3.26 The Tay Ho Tay station is elevated and located in the core of Tay Ho Tay new development area which will be surrounded with high-rise buildings and a variety of facilities for commercial, business, administrative, recreational and cultural activities and residential purposes. While trunk roads and distribution roads will be constructed by the developer, feeder services extending towards the northern and western areas across the Red River will be provided to become a transport hub in the North-west of the city center.

3.27 The TOD concept plan of Tay Ho Tay Station Area includes three main components summarized as follows:

(i) **Transport access improvement:** The station will be located in the activity hub of the new urban development area and requires (i) UMRT extension services using high-grade bus with common fare that connects UMRT and the areas located along the future extension of Line 2 towards the North, (ii) feeder bus services connecting other areas in the West and in the North-west of the city, (iii) circulation service within the cluster, among others. A comprehensive station plaza including bus terminal, parking, loading/unloading facilities, as well as extensive elevated walkway can provide effective multi-modal and multi-functional transport facilities.

(ii) **Integrated urban development:** Planned urban development on both sides of the station should be implemented in integration with the aforementioned TOD concept which will benefit the development of the planned commercial complex and the Government Office Complex in synergy. The integrated development can also contribute to increased ridership of UMRT.

(iii) **Community improvement:** Opportunities for existing communities through TOD are threefold: (i) improved mobility and accessibility to transport in the area, (ii) expanded commercial and public services, (iii) enhanced image of the area.

7) Buoi (C4) Station Area

3.28 Buoi station (C4) is underground and will be developed in Nghia Do Ward along Hoang Quoc Viet Street which is a main corridor to connect the city centre and the western parts of the city. As Hoang Quoc Viet Street will intersect with these major North-South roads (RR2, RR2.5 and RR 3), it will attract more traffic. The station will be an important road – rail transfer point, especially to and from the West.

3.29 The TOD concept plan of Buoi Station Area includes three components summarized as follows:

(i) **Transport access improvement:** The station is expected to function as the gateway to/from the city center where transport users can switch to congestion-free UMRT from bus and other vehicles. Although there is little space available, the existing space along Hong Quoc Viet Street should be utilized. It is proposed in the future to make some space of Vietnam Science & Technique Institute available to expand intermodal facilities at the station. Improvement of local roads for pedestrians and bicycles is also necessary to expand accessible areas.

(ii) **Integrated urban development:** Redevelopment of old apartment buildings into a multi-functional complex becomes highly feasible when it is integrated with UMRT. Development of parking facilities can also contribute to strengthening intermodal functions of the station.

(iii) **Community Improvement:** Communities can be benefited through the improvement of accessibility, enhanced bus services and increased urban development opportunities.

3.3 TOD Concept Plans in the South of West Lake Urban Cluster

1) Area Characteristics

3.30 The South of West Lake Urban Cluster embraces part of Tay Ho District (the lakeshore) and part of Ba Dinh District (the inland area) with a total population of 102,800 inhabitants in the UMRT influence area (500-meter radius of UMRT stations). The cluster is densely populated with an average of 254 persons/ha. The population is still increasing at a rate of 1.6%/year.

3.31 Four underground stations are located in this cluster: Buoi station (C4), Quan Ngua station (C5), Bach Thao station (C6), and Ho Tay station (C7) (see Figure 3.6). The latter is located in the middle of the Governmental complex. It is also the gateway to West Lake. Line 2 is planned to be connected to Line 5 at C5 station.

3.32 Dense residential areas mixed with small businesses characterize the cluster. In the eastern part of the cluster, there is a symbolic political and cultural centre (Government buildings, national heritages, botanical garden, gateway to West Lake, etc.).

3.33 The trunk road network is not properly developed in this cluster, with only four main roads going East-West (Thuy Khue, Hoang Hoa Tham, Doi Can) and two main streets going North-South (Hung Vuong and Van Cao). The other roads are mostly narrow alleys, called “Ngo”, providing direct access for residents. Lacking transport capacities in the area amplifies various traffic problems and degradation of living environment of existing communities such as traffic congestions, safety problems, and air pollution. Inhabitants are generally unsatisfied with the current level of infrastructure services, public amenities, greenery and recreational facilities.

3.34 Buses routes run mainly along the trunk roads, which are too narrow, too crowded, with insufficient sidewalks. The access to traffic-generating areas like West Lake and Truc Bach Lake shores, parks, sports/recreational facilities, hospitals, schools, markets and commercial facilities, needs to be greatly improved.

2) Impact of UMRT

3.35 This cluster will benefit the most from the development of transport infrastructure such as UMRT Line 2 and 3, RR2, Hoang Hoa Tham and UMRT 5. The implementation of TOD through the development of UMRT Line 2 and Line 3 is therefore a key planning objective. Expected impacts of UMRT include following:

(i) UMRT Line 2, together with Line 3, will improve public transport conditions dramatically in the cluster, especially along Thuy Khue and Hoang Hoa Tham streets.

(ii) UMRT Line 2 will create opportunities to access to West Lake and Truc Bach Lake shores and recreational facilities and tourism attractions located nearby.

(iii) Buoi Station can function as an inter-modal service point for public transport users who travel between the western part of the city and the city centre.

(iv) Most inhabitants living in the maze of alleys will be able to walk to the stations. This will be an opportunity for the communities to be transformed into transit-oriented urban areas while traditional values are preserved.

(v) UMRT development an opportunity for urban renewal and/or redevelopment in the stations areas.

Figure 3.6 Location of South of West Lake Urban Cluster

Source: JICA Project Team

3) TOD Planning Directions

3.36 Planning directions for the cluster include the following:

(i) **Transport**: (i) ensure smooth connectivity at Buoi Station for people travelling between the western part of the city and the city centre, by providing adequate intermodal facilities between UMRT, bus, and motorcycles; (ii) improve walking conditions from/to UMRT stations, (iv) develop underground parking areas under park space at Ho Tay Station (C7). This will function not only as intermodal facilities but also as a fringe parking area to reduce the number of entries of private vehicles (motorcycles and cars) into the city centre; (v) pay attention to the improvement of access conditions to West Lake shore, stadium, hospital, etc.

(ii) **Integrated Urban Development:** a number of locations will benefit from UMRT development and integrated development/redevelopment: (i) Integrated development of Van Cao Street – the section adjacent to West Lake shore – between Hoang Hoa Tham and Ven Ho Street, (ii) Redevelopment of Hanoi Beer Factory, (iii) Redevelopment of Vietnam Women's Center, (iv) Integrated development at C6 station, (v) Integrated Development of the Botanical Garden, among others.

(iii) **Community Improvement**: Reduced traffic due to the shift from congested roads to UMRT should mitigate air and noise pollution. The value of the space is likely to increase, especially in the areas surrounding the stations if accessibility is ensured. There will be increasing opportunities for new developments and redevelopment of existing communities.

4) Quan Ngua (C5) Station Area

3.37 Quan Ngua Station (C5) is an underground station and will be located in the south-west of West Lake, where traditional villages and high-density residential areas are clustered. The intersection above the station is a node of two primary roads with Van Cao Street. Thuy Khue Street runs in parallel to Hoang Hoa Tham Street, both forming the current east-west traffic corridor. Other roads are mainly alleys.

3.38 The TOD concept plan of Quan Ngua Station Area includes three components summarized as follows:

(i) **Transport access improvement:** After planning primary roads (Van Cao Street, Hoang Hoa Tham Street, Thuy Khue Street) and secondary roads around the station, accessibilityy of the station area will be significantly improved. Underground space of Van Cao Street near the lake can be utilized to develop underground walkway and underground parking.

(ii) **Integrated urban development:** The road space along Van Cao Street between Hoang Hoa Tham Street and Ven Ho Street will provide an opportunity for commercial and cultural developments. Underground parking facilities can contribute to enhancing the landscape value and the overall image of the area.

(iii) **Community improvement:** Existing communities can also benefit from the improvement of integrated urban development, enhancement of public transport services, among others.

5) Bach Thao (C6) Station Area

3.39 Bach Thao Station (C6) is an underground station and will be located in the south of West Lake, where traditional villages and high-density residential areas are clustered. There are two east-west trunk roads in parallel, Hoang Hoa Tham Street and the lakeside. Existing communities in Ngoc Ha Ward are mostly covered by a maze of alleys. The station area will be a new local urban center providing public transport, commercial and public services with a pedestrian-friendly environment, once the development of the station will be harmonized with the development of roads connecting the north and the south, and integrated with urban redevelopment around the station.

3.40 The TOD concept plan of Bach Thao Station Area is summarized as follows:

(i) **Transport access improvement:** The station area can provide an opportunity to connect Thuy Khue Street and Hoang Hoa Tham Street for vehicles and develop parking facilities. Pedestrians should be able to cross the main streets safely by using an underground walkway. An entire network of local roads and alleys will be improved to enhance walkability in the area.
(ii) **Integrated urban development:** There is great potential to redevelop the land in the south of the station after relocation of the existing Hanoi Green Company. The building of the station will be developed along with underground parking and walkway. The Women's Center may also be a potential site for redevelopment.
(iii) **Community improvement:** Existing communities will benefit from the improvement of alleys, the integrated urban development of the area, and the enhancement of public transport services, among others.

6) Ho Tay (C7) Station Area

3.41 Ho Tay Station (C7) is an underground station located at the gateway of West Lake, Truc Bach Lake, and Ba Dinh Square which are known for being some of the most popular recreational and tourism spots in the city. The area also functions as a traffic node in the north-west of the city center, though traffic is so heavy at the intersections that the walking environment around the parks and the lake are negatively affected. The development of the UMRT station and implementation of TOD provides a great opportunity to improve the traffic situation in this crucial area.

3.42 The TOD concept plan of Ho Tay Station Area includes three components summarized as follows:

(i) **Transport access improvement:** In order to improve traffic and walking conditions, and emphasize the landscape around the lake, traffic improvement measures at and around the station should be taken comprehensively: improve traffic circulation and management at intersections, provision of underground parking facilities at the Ly Thu Truong Flower Garden and Vietnam Film Company, development of underground walkways across congested intersections, among others.
(ii) **Integrated urban development**: While large-scale development is restricted around Ba Dinh area and lakeside, there are opportunities of redevelopment on the land of the Vietnam Film Company, Children Sports Center, etc., for commercial, tourism and public services.
(iii) **Community Improvement:** Opportunities for local socio-economic development will also increase along with the above-mentioned developments.

3.4 TOD Concept Plans in Hanoi City Centre

1) Area Characteristics

3.43 Hanoi City Center spreads over Hoan Kiem district and adjacent wards of Ba Dinh, Dong Da, and Hai Ba Trung districts and land use in this cluster is clearly divided into four types: (i) Governmental areas, (ii) Ancient Quarter, (iii) French Quarter and (iii) outside-of-dyke area. Ancient Quarter is considered the heart of Hanoi, and the French Quarter that also has heritage value. The population in the influence area of UMRT Line 1 and Line 2 is approximately 216,000 within 1 km-radius around the stations and 127,800 within 500-meter radius. The density is very high in many wards of the cluster. Therefore population growth is low and even negative in some wards.

3.44 Stations of UMRT Line 1, Line 2 and Line 3 are included in the cluster, with two stations of Line 1 (Long Bien Nam (V6) and Hanoi), three stations of Line 2 (Hang Dau (C8), Hoan Kiem (C9) and Tran Hung Dao (C10)), and Hanoi station on Line 3 (see Figure 3.7). The location of Long Bien Nam (C6) is subject to the final decision on the alignment of Line 1 where it crosses the Red River. All of the stations of Line 2 and Line 3 in the cluster are underground, while those of Line 1 are elevated.

3.45 The “city centre” cluster is the multi-functional traditional urban core of Hanoi City with a long history of urban development. There are different types and scales of commercial and business activities, government offices and head offices of large companies, schools and hospitals, etc. Various events are held in this cluster. Not only does it provide houses for the people to live but it also generates large volumes of socio-economic activities and employment opportunities. Moreover, this cluster is the best-known touristic destination in the region.

3.46 Although the city centre is covered with a dense network of roads in Hanoi, traffic congestion has become more and more serious. Demand is too large to be met by roads. Traffic management is not sufficient, neither are public transport services.

2) Impact of UMRT

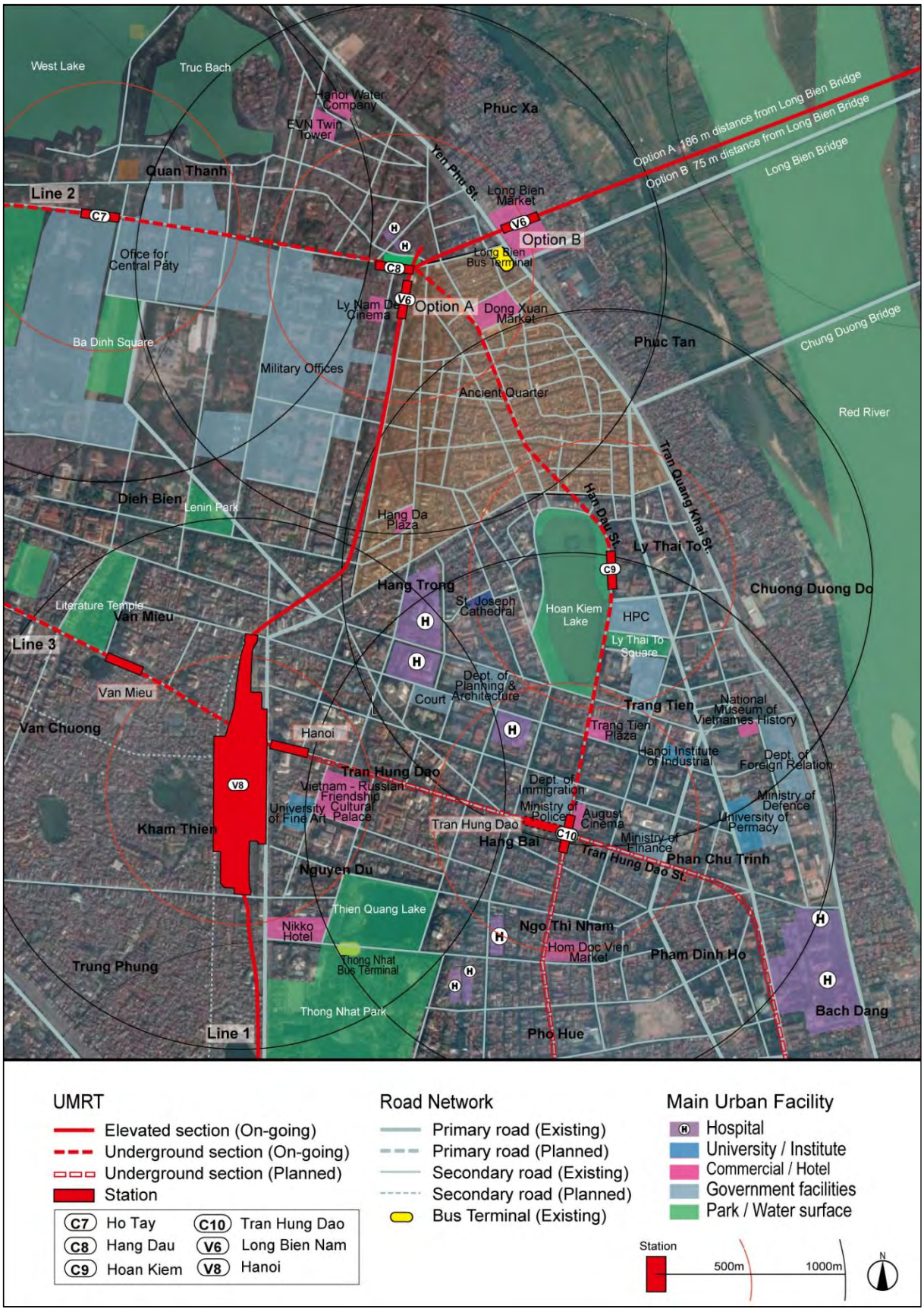
3.47 Expected Impacts of UMRT are as follows:

(i) Improvement of connectivity between the city centre and outer areas along the route (main transport corridor): UMRT will expand significantly overall traffic capacities along the corridors. Users are expected to shift mainly from buses as well as motorcycles, thus decongesting the roads and benefitting other road users too.

(ii) UMRT provides ample opportunities to improve traffic situation in the city centre: When Line1, Line 2 and Line 3 will be completed, the stations will cover most of the city centre within walking distance. There will be an opportunity to introduce more drastic measures to control the entry of private vehicles in the city centre through provision of “fringe parking” and “road pricing”. The traffic situation will be dramatically improved and road space can be more open for the use of pedestrians and other social and cultural activities.

(iii) UMRT can provide opportunities for the people who reside in the densely populated city centre to move to outer areas, while keeping their business in the city centre. Daily commutes will be facilitated.

Figure 3.7 Location of Hanoi City Centre



Source: JICA Project Team

(iv) UMRT may promote urban redevelopment in the city centre in a sustainable manner: UMRT can address both economic development and traffic issues at the same time by introducing the concept of TOD. Developments/redevelopments will be planned in a way that they are directly or effectively connected with UMRT stations through integrated architectural design, improved walkways including underground facilities, parking at strategic locations. This concept may also contribute to connect outside-of-dyke areas.

(v) TOD will enhance the value of the urban space in the city centre and optimise the land use from economic, social and environmental viewpoints.

3) TOD Planning Directions

3.48 Traffic congestion issues in the city centre cannot be solved without a network of underground or elevated mass-transit systems and/or restrictive measures regarding the entry of private vehicles in the city centre. In order to maximize the benefits of UMRT in this cluster, the following principles have been considered when formulating the TOD concept plans:

(i) Maximize the network effects of UMRT and introducing TDM in the Ancient Quarter and in the French Quarter: Line 1, Line 2 and Line 3 intersect in the city centre and the stations can cover all parts of the city centre within a maximum of about 800 meter. This makes possible the application of a policy to limit and control the entry of private vehicles in the city centre, providing that parking facilities exist in the fringe.

(ii) Contribute to removing bottlenecks in the city centre by (i) connecting the eastern and western urban areas at Hanoi Station (elevated) to mitigate traffic conflicts in Dong Da District, and (ii) encouraging the shift of cars and motorcycles from using Chuong Duong Bridge not only to using UMRT but also BRT and non-motorized traffic (NMT) on Long Bien Bridge.

(iii) Introduce special feeder transport services in the city centre to improve accessibility to UMRT stations as well as mobility in the city centre: expansion of existing E-minibus service and E-bike service. The stations should be located at UMRT stations.

(iv) Use effectively the space within ROW of UMRT: on Line 1 for example, using the space available under the viaduct to develop commercial activities, parking areas, and services.

(v) Integrate urban development at Long Bien Market, Hang Dau Park, EVN, Hanoi Police, VNR land at Hanoi Station

3.49 The development of UMRT Line 1 and Line 2 will have significant positive impacts on the transport environment in the problematic city centre if other measures mentioned above are implemented in a coordinated manner (limiting the number of vehicles in the city centre, and using Long Bien Bridge for BRT and NMT, in particular).

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

3.50 The station area of Hang Dau (underground) and Long Bien Nam[1] (elevated) should serve as a transit gateway in the north of the city centre where Line1, Line2 and main city bus corridor intersect. Although large-scale urban development is restricted in the Ancient Quarter, various types of integrated development/redevelopment can be

[1] There were two options on the alignment of Line1 which affects the location of V6 stations (the alignment of 186 meter and 75 meter north of existing Long Bien Bridge). In HAIMUD2, 75m option is used which HPC, MOT and MOC agreed with.

promoted in integration with UMRT. TOD in the area will not only contribute to the improvement of the stations' areas but also to the traditional city center as a whole.

3.51 The TOD concept plan of Hang Dau and Long Bien Nam Stations' Areas include three components summarized as follows:

(i) **Transport access improvement:** The two stations will be connected properly in any case, but especially if option B is finally chosen for the location of Long Bien Station. Parking facilities are provided at Hang Dau Park (underground) and Long Bien Market, which will function as fringe parking. The to-be-abandoned Long Bien Bridge section of VNR can be converted for public transport and non-motorized transport services, in integration with UMRT Stations.

(ii) **Integrated urban development:** Redevelopment of Long Bien Market area is highly possible, including the market itself, commercial and recreational facilities together with intermodal facilities. The space under the viaduct can also be utilized to provide pedestrian, shopping and parking space. The underground parking space of Hang Dau Park can also be integrated with commercial facilities.

(iii) **Community improvement:** While traditional living environment and socio-economic activities will be preserved, UMRT and integrated development will provide local communities with opportunities to upgrade to better living-, transport- and environmental conditions. They will also have opportunities to take part to commercial and socio-economic activities at and around the station.

5) Hoan Kiem (C9) Station Area

3.52 The Hoan Kiem Lake Station serves as the southern gateway to the Ancient Quarter and connects with the French Quarter. As Hoan Kiem lakeside area is a symbolic and holly space of the city, utmost care has been taken on the location of the station as well as its entrances to ensure tranquility and traffic order, which UMRT can contribute to.

3.53 The TOD concept plan of Hoan Kiem Lake Station Area is summarized as follows:

(i) **Transport access improvement:** Preserving and enhancing walking environment is particularly important in the station area to maintain comfortable and attractive space around the lake and the gateway area of the AQ, and to protect historical and environmental values. Current bus services will be replaced with more environmental friendly circulation bus services integrated with UMRT.

(ii) **Integrated urban development:** EVN land is located at an ideal location for integrated development. The land can provide space for multi-purpose commercial, tourism and recreation facilities. Opportunities of urban renewal based on TOD are not limited to EVN land but also expand to other degraded facilities and areas as well as underground space.

(iii) **Community involvement:** Local communities can benefit from improved walking conditions, less vehicle traffic and more opportunities for local economic development.

6) Tran Hung Dao (C10) Station Area

3.54 Tran Hung Dao station is the end station of the phase1 section of Line2. It will become an important interchange station when Line3 is extended from Hanoi Station to the east. Line2 is also to be extended farther south and connected with on-going Line2A.

Then the C10 station will become the transit hub in the French Quarter where large urban redevelopment opportunities exist.

3.55 The TOD concept plan of Hoan Kiem Lake Station Area is summarized as follows:

(i) **Transport access improvement:** Being located at the heart of the FQ, the Station area should not only satisfy improved access to UMRT but also increased parking facilities, which are absolutely lacking in the city center. Sidewalk space and facilities of well-articulated roads should be farther improved in term of pavement, safety facilities, street trees and shade, street furniture and traffic management. Underground parking facilities are developed using the space made available by open cut construction method of Line 2.

(ii) **Integrated urban development:** There are many governmental facilities in this area, including ministries, embassies and institutes. They may be relocated and therefore provide redevelopment opportunities. Among them, the land of the Hanoi Police that is adjacent to the station has potential for redevelopment into a multi-purpose complex. An underground walkway associated with commercial facilities could also be extended along Tran Hung Dao Street toward Hanoi Station and other main streets, which can be directly connected to basement floors of roadside facilities.

(iii) **Community improvement:** Local communities and employees of the station area can benefit from improvement of traffic flow, provision of intermodal facilities and parking space, increased opportunities for local socio-economic activities.

7) Hanoi Station Area (V8)

3.56 Hanoi station will be developed on VNR land (11ha), which has sufficient space to meet the demand for various types of transport and urban development. As the railway structures are elevated, the urban areas in the east and west can be directly connected and provide opportunities to strengthen articulation of road network. This will significantly improve traffic circulation in the area. Furthermore, opportunities will increase substantially for urban renewal and improved living conditions in the existing communities in Van Chuong Ward.

3.57 The TOD concept plan of Hanoi Station Area includes three components summarized as follows:

(i) **Transport access improvement**: Elevated rail facilities and connection of 2 UMRT stations of Line1 and Line3 will substantially improve the situation of public transport and road vehicle traffic in the area. After Tran Hung Dao Street and Quoc Tu Giam Street, as well as Tran Nhan Tong Street and Kham Thien Street will be connected, traffic circulation in the area will be significantly improved and traffic load will be lessened at complicated intersections in the north of the station area. There will be a road on the west side of the station that will run in parallel to Le Duan Street; it will improve even more the accessibility at and around the station. Line 3 station will be connected with Hanoi station by an underground walkway and an elevated walkway without conflict with road traffic. A comprehensive station plaza will strengthen the function of Hanoi station as an intermodal transport hub.

(ii) **Integrated urban development**: UMRT development will promote urban redevelopment of VNR land and urban renewal of congested residential areas in Van Chuong ward. Within VNR land, the station building and a comprehensive commercial and business complex can be developed after Tran Hung Dao Street is extended to the west. The location of VNR Hanoi Station can be moved and restored within VNR land, which can be

transformed into a railway museum and public space. Inside Van Chuong ward, there are opportunities and necessities for urban redevelopment including Van Chuong Collective Apartments, a water company, among others.

(iii) **Community improvement**: Existing communities can also benefit from the above-mentioned improvements of roads including alleys urban redevelopment, enhanced public transport services, etc.

3.5 TOD Concept Plans in the South Urban Cluster

1) Area Characteristics

3.58 The South Urban Cluster is composed of the south-eastern part of Dong Da District, the western part of Hai Ba Trung District, the eastern part of Thanh Xuan District and the north-western part of Hoang Mai District. About 235,400 people live in this high-density cluster (328 persons/ha in average). However there are also several vacant and underutilized plots of land that could be more effectively used.

3.59 Thong Nhat Station (V9), connected to Hanoi Station, leads to the South to Giap Bat Station (V12), which is the terminal station of Line 1 (Phase 1) (see Figure 3.8). Bach Mai Station (V10) and Phuong Liet Station (V11) are in between these two stations. All stations will be elevated along NH1. The route is planned to be extended towards the south, and to intersect with Line2 at V9 station.

2) Impact of UMRT

3.60 UMRT will have the following impacts on the cluster:

(i) Significant addition to the overall traffic capacity along the North-South corridor due to competitive public transport services (high standard, fast, punctual, comfortable, safe, pollution free and energy efficient) with affordable fares.

(ii) Enhanced socio-economic activities in the area along the route in general, at and around the UMRT stations in particular.

(iii) Better connection of land use of both sides of the routes because UMRT will be elevated, whereas land use has been segregated for long due to existing at-grade railway facilities. Opportunities to articulate the East-West road network should be tapped to promote integration of communities and socio-economic activities.

(iv) Large areas of land owned by VNR and other public corporations will become available to develop a core of new urban services in the South of the city. Strategic development of Giap Bat Station area including adjoining areas in compliance with the Zone Plan will make this kind of development feasible.

3) TOD Planning directions

3.61 Planning direction on TOD in the cluster are as follows:

(i) Access improvement: (i) Reorganize existing bus transport services in synergy with UMRT services, (ii) Find opportunities to strengthen east-west roads connection in the corridor, especially at and around UMRT stations, (iii) Develop an intermodal transport hub at Giap Bat Station (located at the end of phase 1 section and also close to Ring Roads) to integrate UMRT, city bus, suburban and intercity bus services as well as other local transport modes.

(ii) **Integrated urban development:** (i) Develop a new urban core (CBD) at and around Giap Bat station, which serves the southern part of the city, (ii) Promote integrated urban development/redevelopment of TOD potential areas along the route including Bach Mai hospital complex, universities, old apartment areas, among others.

(iii) **Community improvement:** (i) In the process of transport and integrated urban development, communities should be more intensively involved to protect and enhance their benefits; (ii) improvement of local roads and alleys is an opportunity to participate in commercial/business activities to be created through TOD at and around the stations, and in the provision of public service facilities.

Figure 3.8 Location of South Urban Cluster

Source: JICA Project Team

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

3.62 C.V. Thong Nhat Station is located at the intersection of NH-1 and Ring Road 1, the main transport corridors of the city. Therefore the development of the station area is expected to strengthen its function as an urban public transport hub in the southern gateway of the city. The impacts of UMRT will not only be limited to transport improvement. They will also include urban renewal and community improvement of traditional residential areas in Phuong Lien and Kim Lien wards.

3.63 The TOD concept plan of C.V. Thong Nhat Station Area includes three components summarized as follows:

(i) **Transport access improvement**: the area is separated from two wide roads with heavy traffic. It creates a pedestrian-friendly environment because of a ring-shaped elevated walkway that will be constructed. Intermodal facilities will be provided along NH1 using the space under the UMRT viaduct and preferably a part of existing communities in Phuong Lien. The future station of Line 2 (Phase 2) should be properly connected with this Line 1 station.

(ii) **Integrated urban development**: Urban renewal of traditional residential areas can be promoted in integration with UMRT. Integrated urban redevelopment in front of the station should include a station plaza.

(iii) **Community improvement**: Existing communities can benefit a lot from the above-mentioned transport improvement, integrated urban development, enhanced public transport services, etc. Visitors of Thong Nhat Park and universities can also experience some benefits.

5) Bach Mai Station Area (V10)

3.64 Bach Mai Station is an elevated structure located in between RR1 and RR2. Although the station is relatively close to V9 and V11, it provides additional accessibility to meet public transport demand from the hospital, surrounding universities and old areas of apartment buildings. The development of the station area will improve the accessibility to these facilities and to the residential areas; i twill also promote local socio-economic activities and opportunities to redevelop these urban facilities.

3.65 The TOD concept plan of Bach Mai Station Area includes three components summarized as follows:

(i) **Transport access improvement:** It is crucial to strengthen connectivity between the UMRT system and hospitals and universities. For this reason, walking conditions will be improved along NH1 and access roads will be developed as well as elevated walkways across NH.

(ii) **Integrated urban development:** Relocation or redevelopment of Bach Mai hospital is an opportunity to develop a station plaza and access roads. The redevelopment of Kim Lien area should be integrated with UMRT development.

(iii) **Community improvement:** UMRT development can contribute to improve the accessibility and mobility of local communities, and promote local socio-economic activities at and around the station.

6) Phuong Liet Station Area (V11)

3.66 Phuong Liet Station is located along NH1 between RR2 and RR2.5. The landuse is disorganized and the road network is poor in this area. Traditional residential areas, factories and governmental facilities are clustered densely. Elevated UMRT can provide an opportunity to restructure the urban space at and around the station.

3.67 The TOD concept plan of Phuong Liet Station Area includes three components summarized as follows:

(i) **Transport access improvement:** Although UMRT Line 1 is elevated, it is difficult to develop adequate access roads to the station and east-west connecting roads. Intermodal facilities can be provided in the space along NH and under the UMRT viaduct. To facilitate accessibility to UMRT, an elevated walkway should be provided to cross NH and a bridge to cross Lu River.

(ii) **Integrated urban development:** when factories and governmental facilities will be relocated to suburban areas, the area can be redeveloped into a multi-purpose complex. Old apartments in front of the station will also be redeveloped into the station building and a station plaza. Bach Mai airport is a favorable space for TOD.

(iii) **Community improvement:** Existing communities can benefit from the improvement of alleys and the possibilities for integrated urban development/redevelopment.

7) Giap Bat Station Area (V12)

3.68 Giap Bat Station will be an elevated structure located along NH1, between RR2.5 (Dinh Cong Street. – Tan Mai Street) and RR3. The station is the terminal of phase1 section of UMRT Line1. It is developed within the 11ha-land of the existing VNR Giap Bat Station. There are three large-scale planned transport projects in this area whose completion will significantly improve accessibility to Giap Bat station: widening of Kim Dong Street (RR2.5), development of UMRT Line 4 along RR2.5 and UMRT Line 8 along RR3. The station area includes some locations with great potential for integrated urban redevelopment: VNR land, TRANSERCO bus terminal, public land plots, factories, etc. If these locations are appropriately redeveloped according to a truly integrated TOD concept, Giap Bat station area can become a competitive CBD in the south of the city.

3.69 The TOD concept plan of Giap Bat Station Area is summarized as follows:

(i) **Transport access improvement:** Giap Bat station plays an important role in terms of access to the UMRT system for UMRT users in the influence area, as the station is located near two ring roads and at the terminus of phase 1 of Line 1. It is important to widen the coverage of the UMRT service through well-connected urban and inter-city bus services. For this purpose, the redevelopment of TRANSERCO bus terminal in integration with UMRT is considered the most effective solution.

(ii) **Integrated urban development:** Some locations in the station area have significant potential for integrated urban development: VNR land, Giap Bat Bus Terminal and the western part of the station area with its unused land and water reservoir (see Chap 6 for detail).

(iii) **Community improvement:** The integrated urban development in the area can generate opportunities for employment and socio-economic activities for the local communities as well as those living in the south of the city. Road improvement will also enhance landuse connectivity and integration between the eastern and western sides of NH-1.

3.6 TOD Concept Plans of East Urban Cluster

1) Area Characteristics

3.70 The East Urban Cluster spreads over Long Bien district only, located in the north-eastern part of the city and across the Red River. It is a fast-growing urban area lacking transport infrastructure and proper land use management.

3.71 Although Long Bien District has been growing fast, the areas within 1-km radius around the stations are not much populated: only 53,000 inhabitants in 2013, with a density of 110 people/ha. Low population density and availability of many vacant and underutilized lands are considered positive triggers for integrated urban development. The proximity to Gia Lam Airport, which should be converted into urban area, may also support TOD in the cluster.

3.72 The Eastern Urban Cluster encompasses only two stations, both elevated: Long Bien Bac Station (V5) and Gia Lam Station (V4), which is the terminal station of Line 1 (Phase 1) (see Figure 3.9). Long Bien Bac Station is still surrounded by rural residential and agricultural lands, while Gia Lam Station is surrounded by urban residential, commercial and agricultural lands.

3.73 The area is relatively less urbanized than other urban clusters and still comprises many households working in the agriculture sector. Environment is a major concern for the residents. Heavy traffic along NH1 and NH5 causes air and noise pollution and threatens the safety of local traffic. The areas facing the Red River are flood-prone and lack public hygiene facilities. The lack of recreational facilities is also a concern for the inhabitants.

3.74 Two trunk roads go through the cluster, i.e. Nguyen Van Cu (NH1) and NH5. Most buses routes connect the cluster to the city centre, crossing the Red River either on Chuong Duong Bridge or on Vinh Thuy Bridge and terminating at Long Bien bus terminal. Problems to access the city centre are mainly due to the limited capacity of the bridges crossing the river.

2) Impacts of UMRT

3.75 Expected impacts of UMRT include:

3.76 Mobility in and out the area will be significantly improved because of decreased road traffic volume. Whereas it currently takes 30 minutes to go from Gia Lam bus terminal to Hanoi Station by bus, this time should be reduced to only 10 minutes by UMRT.

3.77 As Gia Lam Station is located at the crossing point between NH1 and NH5, the area should function as the gateway and a transport hub in the eastern part of the city.

3.78 Large parts of land currently belonging to VNR will become available as well as underutilized land. The area can be used to promote transit-based compact urban development and create a new multi-functional urban core in the eastern part of the city too.

3) TOD Planning Direction

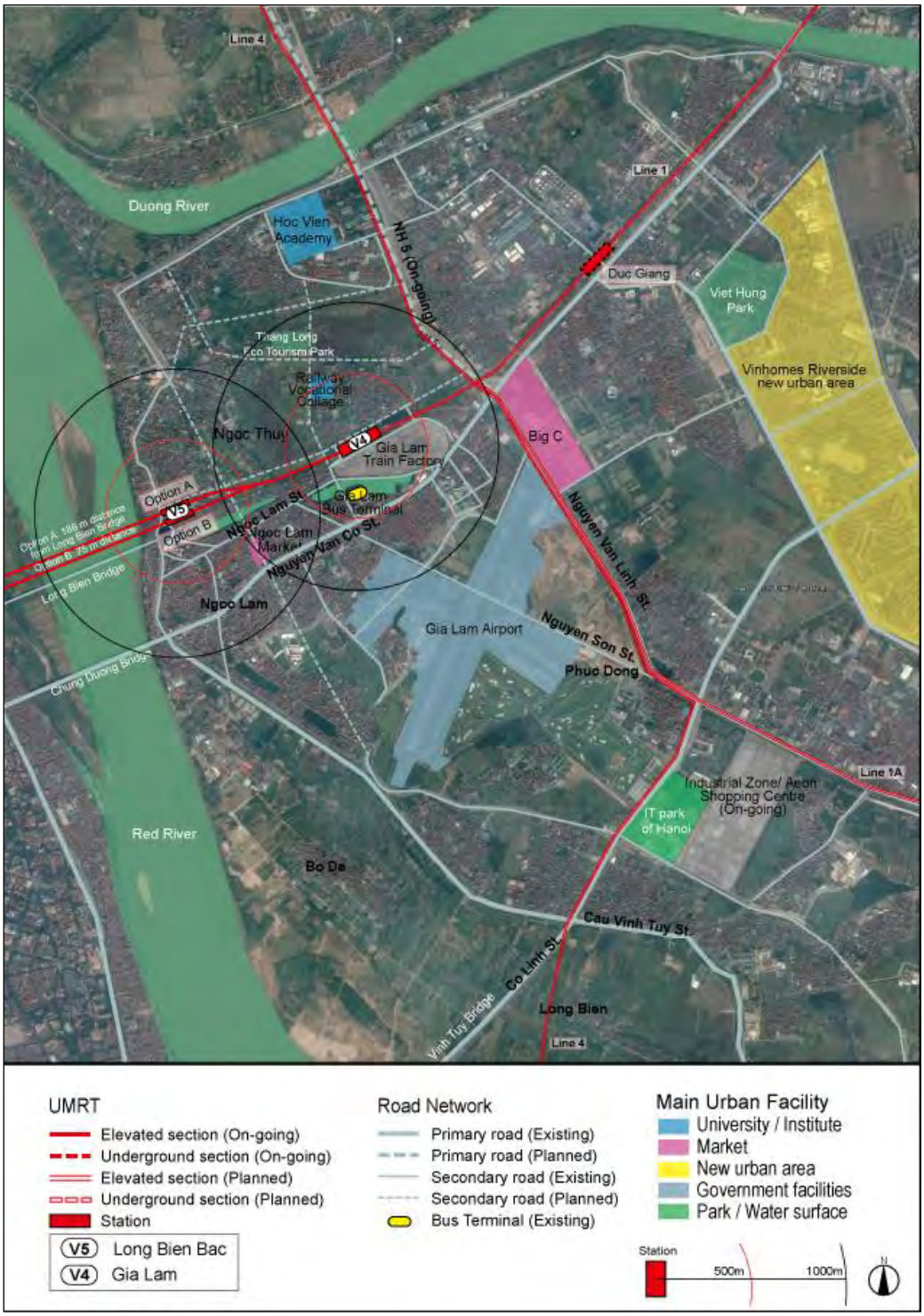
3.79 Planning directions on TOD in the cluster are as follows:

(i) **Improve accessibility to UMRT Stations:** (i) Develop access roads to UMRT stations to be integrated to the existing primary road network; (ii) Develop intermodal transport hub in the eastern part of the city to extend seamless service of UMRT along NH1 and NH5, (iii) Prepare for future effective integration with UMRT Line 4, (iv) Upgrade local roads and alleys; (v) improve traffic management.

(ii) **Integrated Urban Development:** (i) Redevelop VNR-owned factory land for multi-functional commercial and urban activities complex, (ii) Promote development/redevelopment in adjacent areas of Ngoc Thuy ward and Ngoc Lam Ward, (iii) Prepare for future integrated development opportunities at Gia Lam Airport

(iii) **Community Development:** Attention should be paid to access roads development and improvement.

Figure 3.9 Location of East Urban Cluster



Source: JICA Project Team

4) Long Bien Bac Station Area (V5)

3.80 Long Bien Bac Station is located a few hundred meters away from NH1, along the dyke road. Nowadays, there is no main road connecting the station with NH1; there are only local roads and alleys. The station area is a low-density traditional area with mixed use of a rural nature.

3.81 The TOD concept plan of Long Bien Bac Station Area includes three components summarized as follows:

(i) **Transport access improvement:** There is a need for developing access roads to the station in integration with UMRT development and a network of roads for urban development of the area.

(ii) **Integrated urban development:** The area provides ample opportunities for integrated urban development; it can be transformed into a transit-based urban area if it is properly integrated with UMRT development.

(iii) **Community improvement:** Local communities can experience significant benefits if they are properly involved in the above-mentioned development process.

5) Gia Lam Station Area (V4)

3.82 The location of Gia Lam Station is the current location of the existing VNR station. It is the terminal station of the phase 1 of Line 1. The station will serve both urban and inter-city passengers and freight transport services. Planned UMRT Line 4 will intersect phase 2 of Line 1 at the intersection of NH1 and NH-5. This station area is expected to become a transport hub and a new CBD in the eastern part of the city.

3.83 The TOD concept plan of Gia Lam Station Area is summarized as follows:

(i) **Transport access improvement:** In order to become a transport hub, a comprehensive station plaza will be developed with an appropriate road network around the station. Access roads to the station and north-south connection roads should be developed. Local roads and alleys should also be improved and upgraded to ensure safe environment for communities.

(ii) **Integrated urban development:** There are ample opportunities for integrated urban redevelopment, including VNR land, VNR factory and planned new town area.

(iii) **Community improvement:** Local communities can benefit significantly from the above-mentioned development.

3.7 Required Type of Feeder Bus Service

1) Integration of UMRT and Bus System

3.84 UMRT is expected to provide a high quality public transport service, but the initial network coverage will be limited. To maximize the serviceability and the operational efficiency of UMRT after completion of Phase 1, and thereby increase the total share of public transport, it is indispensable to build a feeder service. A variety of modes could perform feeder services for UMRT: bicycle, motorbike, private automobile, taxi, bus, walking, etc. The focal point of the present study is to integrate the currently operating bus services and the prospective UMRT extensions to ensure an increased and improved public transport capacity and service.

3.85 Feeder buses are operated to supplement public transport service coverage integrated with UMRT network. For this purpose, the service coverages and routes of feeder bus services are proposed based on the following criteria: (a) cover the areas where demand come from: town centers, residential areas, major urban facilities such as universities and industrial zones in order to increase patronage, (b) cover supplemental areas that are currently inconvenient to access by public transport means, (c) availability of space for bus operation (trunk roads, roadside facilities, etc.), (d) cover the route of UMRT extension.

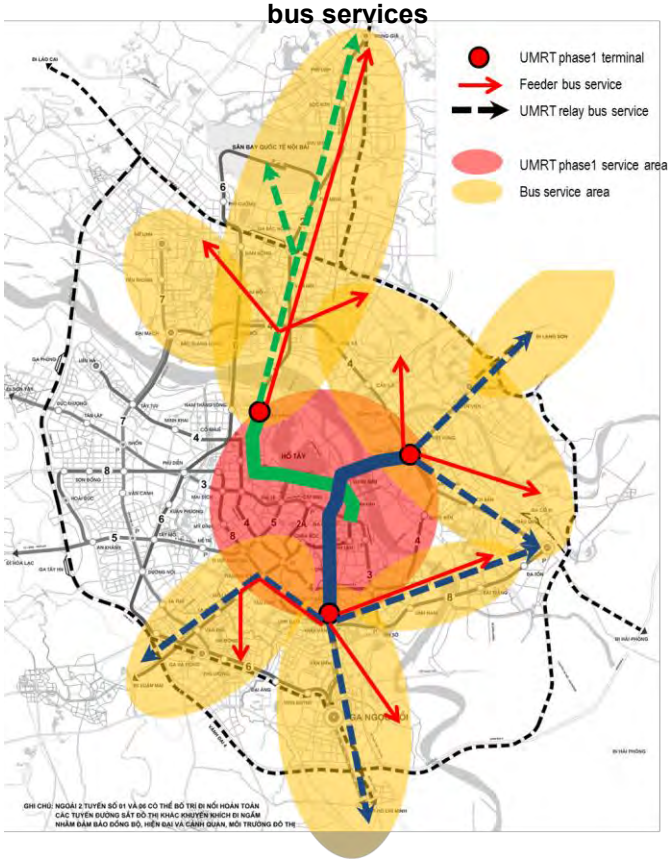
3.86 Three policies are recommended:

(i) Reorganization of city bus lines: supply and demand need to be suitably adjusted by rerouting lines that would compete with the prospective UMRT extensions, connect them to UMRT stations and introducing new access lines to the stations.

(ii) Development of UMRT relay bus service: the areas to be served by UMRT after extension need be linked to the initial UMRT stations by high-quality bus service for quick transfer to and from UMRT trains.

(iii) Introduction of new bus services to increase the number of public transport passengers: new bus services need be introduced to increase mobility in the vicinities of UMRT stations. At the same time, facilities that would fall into disuse due to UMRT development can be used to accommodate new types of bus service.

Figure 3.10 Coverage of Integrated UMRT and bus services



2) Route Reorganization of City Bus Lines

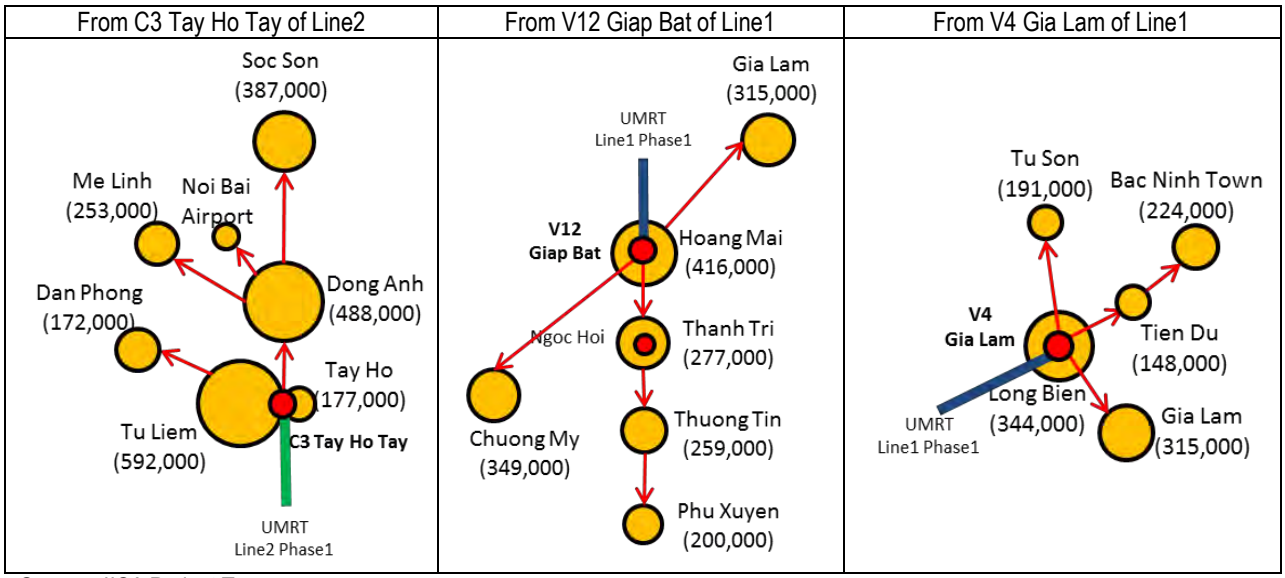
3.87 Existing City Bus lines should be integrated with UMRT through the following principles:

(i) **Adjusting Supply and Demand of Competing Bus Lines:** Many bus passengers are expected to switch to UMRT. A total of 28 bus lines might be affected: less passengers, lower service frequency, discontinued service, etc. The report proposes specific measures (closure, reduced frequency, or reduced route distance) for all the lines that will be affected by the development of UMRT. Exceeding bus fleet and/or bus drivers could be used to create a new bus feeder service to UMRT stations and therefore generate additional profit. However, it is not advisable to close all bus routes segments that would compete with the prospective UMRT extensions as these could provide emergency alternative service in case UMRT lines have operational problems.

(ii) **Rerouting Existing City Bus Lines:** It aims at (i) alleviating the competition with UMRT by including UMRT stations on their way, and (ii) facilitating the access to UMRT stations by changing buses routes' origin/destination points. The report comprises detailed propositions for rerouting and changing origin/destination points of existing lines. For example, 3 bus lines are designated to carry the increased demand of transfer passengers; the origin/destination points of ten bus lines are proposed to be changed to the nearby UMRT stations.

(iii) **Introducing New Bus Lines:** Additionally, new bus lines could be opened to strengthen the accessibility of prospective UMRT stations. This option should be chosen only where rerouting existing bus lines is considered difficult or where bus lines do not exist, but where demand is likely to grow with the provision of access for passengers, covering neighboring districts and towns in suburban areas (see Figure 3.11). The feeder bus services will be provided from the terminal stations of Line1 and Line2 phase1, except for C10 Tran Hung Dao station, which is located in the city center.

Figure 3.11 Neighboring Districts and Population in 2020 of Feeder Bus Service Areas



Source: JICA Project Team

3) Introduction of UMRT Relay Bus Services

3.88 It is necessary to promote the utilisation of UMRT by suburban people even though the UMRT network is not fully developed. A relay bus service would facilitate the transfer of passengers from/to the stations and reduce their travel time significantly. It would be faster than regular city buses, basically as fast as UMRT trains. The ticketing system and timetables

would be designed to support brisk mobility of transfer passengers. The fleet would be made of high-grade vehicles for safe and comfortable trips.

3.89 Proposed origin/destination points for relay bus lines are C1, V4 and V12 including a total of 10 routes. The UMRT relay buses will be operated by UMRT operators to provide seamless services with UMRT in terms of fare, operation schedule, service quality, etc. The UMRT relay bus services will be eliminated after UMRT extension, since these are temporary and alternative public transport services to UMRT.

Table 3.2 Proposed Routes for UMRT Relay Bus Service

Station		Route	Headway (min)
C3 (Tây Hồ Tây)	1	Nội Bài Airport - Võ Nguyên Giáp - Nhật Tân Bridge - C3 【Non-stop】	10
	2	Sóc Sơn - QL3 - Võ Nguyên Giáp - Nhật Tân Bridge - C3	15
	3	Nội Bài Airport - (Bắc Thăng Long - Nội Bài) - Thăng Long Bridge - C3	15
	4	Mê Linh - Phố Yên - Làng Đại Đồng - Đường 5 kéo dài - Nhật Tân Bridge – C3	15
V4 (Gia Lâm)	1	Nội Bài Airport – QL3 - Đông Anh – QL3 - Đường 5 kéo dài - Đông Trù Bridge – V4	15
	2	Bến xe Bắc Ninh - Từ Sơn - Ngô Gia Tự - V4	15
	3	Dương Xá - Nguyễn Đức Thuận - Nguyễn Văn Linh – V4	15
V12 (Giáp Bát)	1	Phú Xuyên - Thường Tín - Ngọc Hồi - Giải Phóng - V12	15
	2	Dương Xá - Nguyễn Đức Thuận - Thanh Trì Bridge – Pháp Vân - Giải Phóng - V12	15
	3	Xuân Mai - AH 13 - Chương Mỹ - Yên Nghĩa - Cầu Bươu - Giải Phóng - V12	15

Source: JICA Project Team

4) New Types of Bus Services

3.90 The development of two types of new bus services is recommended in order to ease the access to UMRT stations, especially for outsiders (foreigners, newcomers) and for people living in the suburbs of Hanoi.

(i) **Loop Bus Operation in the City Centre:** Travelling by bus is quite challenging for outsiders who are not accustomed to the geography of the city. It seems necessary to develop a new type of bus service having UMRT stations for origin/destination points and circulating among the major touristic spots in the city. This new bus service will improve mobility for short trips in the city's built-up area and help promote tourism. Two routes for loop buses are proposed with their origin/destination point at V8 (Ha Noi Station), which is the central UMRT node in the city centre. The route going through the French Quarter would stop at C10 (Tran Hung Dao) and C9 (Hoan Kiem), possibly attracting transfer passengers to and from these UMRT stations. These lines would also attract local transfer passengers to and from Hanoi Station (V8) as they would cover the areas where many offices and other institutions are located.

(ii) **Operation of Circulating Bus Service in the Suburbs:** a circulating bus service could be introduced in the outlying suburbs to ease round-trip mobility just as in the central parts of Hanoi. There are two areas where a circular bus service could substantially improve local mobility and promote tourism: (i) around C3 (Tay Ho Tay Station) and (ii) around Long Bien Bridge.

3.91 **Measures to Enhance Quality of Feeder Bus Service:** Concrete measures are proposed in the report for each type of proposed bus services, regarding the vehicle type, size, level of comfort, equipment (LCD screen, upholstery, etc.), bus facilities at UMRT stations and bus stops, timetables, information, fare system and management system. These are important measures to be considered to ensure the success of the feeder bus services.

Table 3.3 List of Proposed Bus Service Improvement Measures for 18 UMRT Stations

Station	City Bus			New Bus Service			Development of Facilities			
	Supply/ Demand Adjustment	Rerouting	New Route	Relay Bus	Loop Bus	Bridge Bus	New Bus Terminal	New Bus Stops	Waiting Facilities	LCD Monitor
C1										
C2			×					×		
C3		×	×	×		×	×	×	×	×
C4										
C5										
C6										
C7										
C8										
C9					×					
C10	×				×					
V4	×	×	×	×		×	×		×	×
V5						×				
V6						×		×		
V8	×				×			×	×	
V9	×									
V10	×									
V11	×									
V12	×		×	×			×		×	×

Source: JICA Project Team

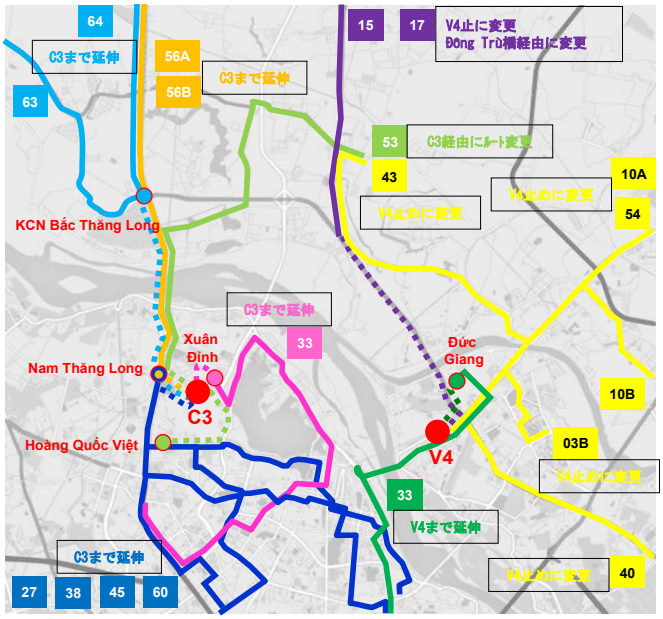
Table 3.4 Proposed Schedule for Implementation

Proposed Measure		Implementing Organization	Related Organization	Present	Operation Year of Line 2A&3	Line 1 and Line 2		
						Before Operation	Starting Operation	After Operation
City Bus	Analysis current situation	DOT	Bus Companies	■				
	Analysis before-after situation in the case of rerouting				■			
	Reconsideration of measures based on the analysis					■		
	Supply & demand adjustments, Provision of new route						■	
	Analysis after operation							■
Relay Bus	Establishment the Operation organization, deliberation among related organizations	O&M Association	DOT, Bus Companies	■	■	■		
	Procurement of vehicles			■	■	■		
	Operation						■	■
City Center Loop Bus	Establishment the Operation organization, deliberation among related organizations			■	■	■		
	Procurement of vehicles			■	■	■		
	Operation						■	■
Circulating Bus in Suburbs	Establishment the Operation organization, deliberation among related organizations			■	■	■		
	Procurement vehicles			■	■	■		
	Operation						■	■
Facilities	Survey of current condition of planned road	DOT O&M Association, Developers	Bus Companies, Police, Private Companies	■				
	Development/improvement of roads				■	■		
	Provision of bus stop					■		
	Development of bus terminal				■	■		
Other Measures	PR campaign	DOT, O&M Association	Propaganda Dept., Mass Media			■	■	■

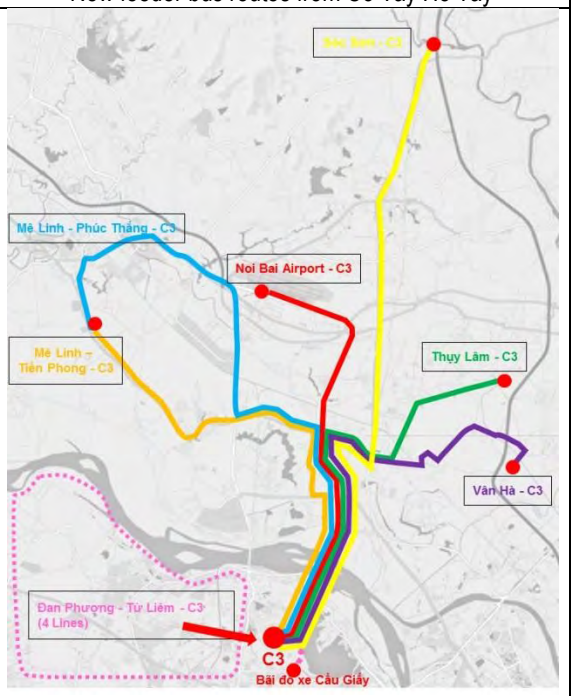
Source: JICA Project Team

Figure 3.12 Proposed Rerouting and Feeder Bus Service Network

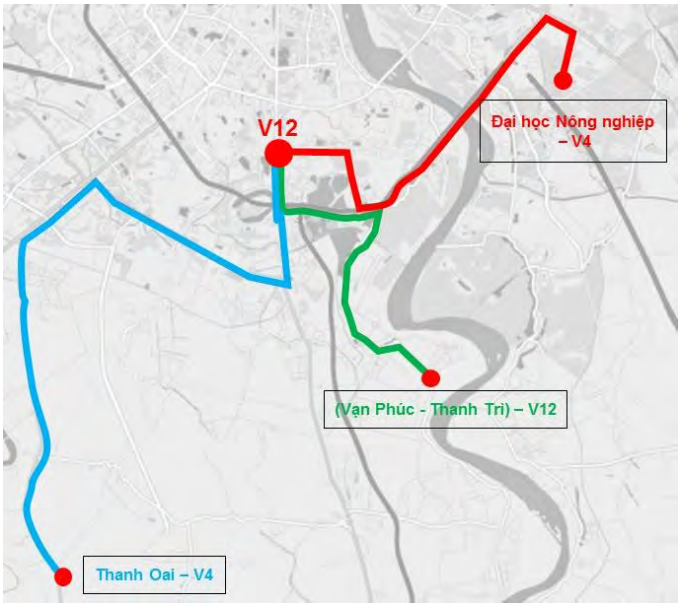
Rerouting of Present Routes



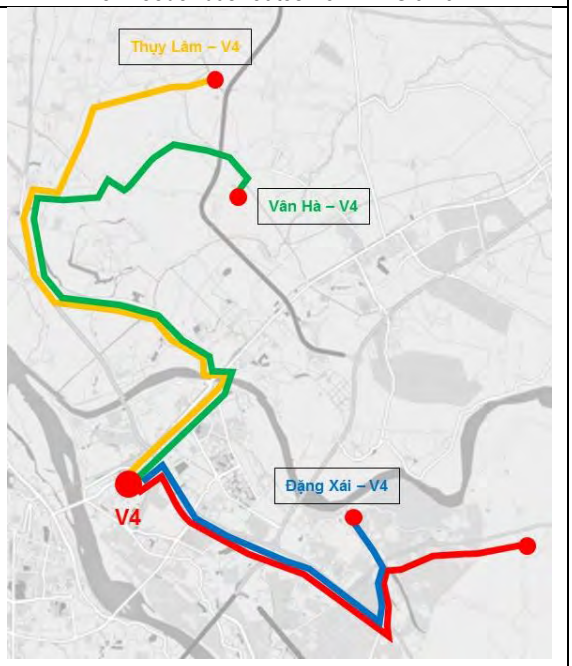
New feeder bus routes from C3 Tay Ho Tay



New feeder bus routes from V12 Giap Bat

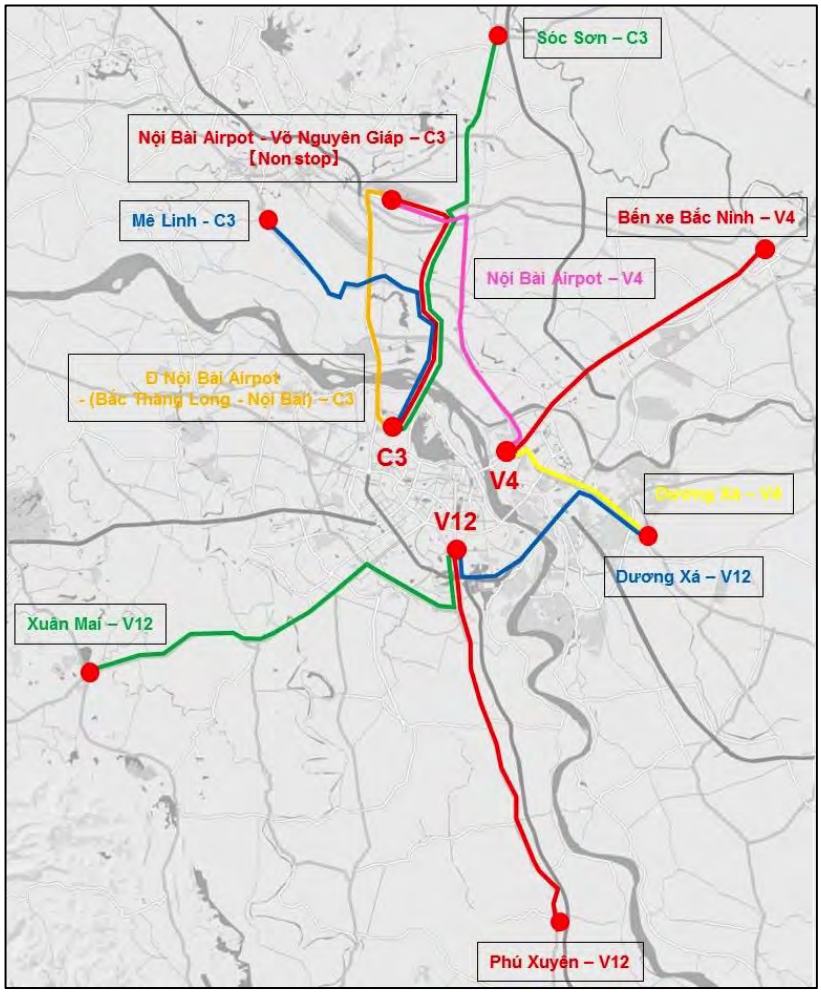


New feeder bus routes from V4 Gia Lam



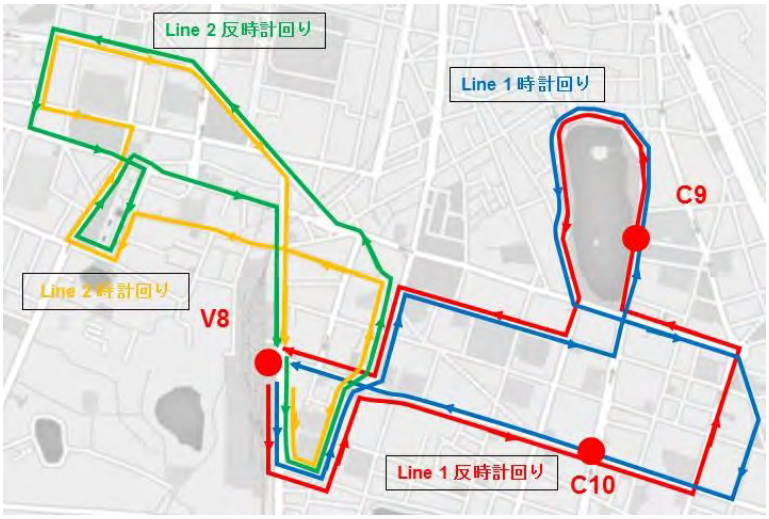
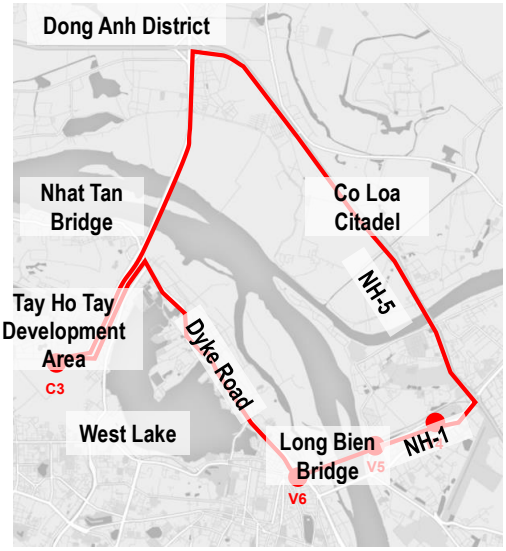
Source: JICA Project Team

Figure 3.13 Proposed Routes for UMRT Relay Bus Service



Source: JICA Project Team

Figure 3.14 Proposed New Bus Service Routes

City Loop Bus	Circulation Bus of Suburban Tourism Area
	

Source: JICA Project Team

3.8 Environmental and Social Considerations

1) Objectives and Approaches:

3.92 Environmental and social considerations (ESC) apply for all JICA projects in accordance with the Guidelines for Environmental and Social Considerations (April 2010). HAIMUD2 has been categorized as category B, which means the project may have adverse impacts on the environment (air, water, soil, ecosystem, flora and fauna) or the society (involuntary resettlement, impacts on vulnerable people, community safety, and social structures), but these impacts are less significant or are site-specific, and in most cases, they can be mitigated if appropriate mitigation measures are adopted. Initial Environment Examination (IEE) was carried out for all planned stations to evaluate the impacts as required by the ESC Guidelines.

2) Result of environmental scoping:

3.93 An environmental scoping has been carried out for all stations of Line 1 and Line 2 (Phase 1). The environmental criteria included in the scoping checklist were classified into 5 categories:

(i) Pollution: Air quality, Water quality, Noise and Vibration, Soil Pollution, Solid Waste, Odors;

(ii) Natural Environment: Protected areas, Ecosystem (Flora, Fauna and Biodiversity) and Hydrology

(iii) Socioeconomic environment: Involuntary resettlement, Living conditions and livelihood, Heritage and cultural value, Landscape, cultural and historical landscape, Ethnic minorities and indigenous people;

(iv) TOD specific criteria: Accessibility, Traffic and accident, Walking environment, Safety and Security, Universal design;

(v) Others: Operation and monitoring stages

3.94 For all criteria of categories 1 to 4, the result of the IEE was either “a positive impact is expected to some extent” (classified B+) or there is a “limited/negligible impact” for all stations of Line 1 and Line 2. Regarding the criteria of category 5 (TOD-specific criteria), the result was either “a significant positive impact is expected” (classified A+) or B+. Ample justifications are provided in the report.

3.95 Mitigation measures for negative impacts, and responses to environmental disasters are suggested to meet all criteria, and for each stage of the project: (i) project preparation stage, (ii) project construction stage, and (iii) operation and monitoring stages.

Table 3.5 Summary of Environmental Scoping Result by Station

Category	Indicator	Station Name (No.)								Station Name (No.)									
		Gia Lam (V4)	Bac Long Bien (V5)	Long Bien Nam (V6)	Hanoi (V8)	C.V Thong Nhat (V9)	Bach Mai (V10)	Phuong Liet (V11)	Giap Bat (V12)	Nam Thang Long (C1)	Ngoai Giao Doan (C2)	Tay Ho Tay (C3)	Buoi (C4)	Quan Ngua (C5)	Bach Thao (C6)	Ho Tay (C7)	Hang Dau (C8)	Hoan Kiem Lake (C9)	Tran Hung Dao (C10)
Pollution	Air Quality	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Water Quality	B⁻ / -	-	-	-	B⁻/ B⁻	-	B⁻ / -	-	-	-	-	-	-	B⁻ / -	B⁻ / -	-	B⁻ / -	-
	Noise and Vibration	B⁻ / -	B⁻ / -	B⁻ / -	B⁻ / -	B⁻ / -	B⁻	B⁻ / -	B⁻ / -	B⁻ / -	-	-	B⁻ / -	B⁻ / -	B⁻ / -	B⁻ / -	B⁻ / -	B⁻ / -	B⁻ / -
	Soil Pollution	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Solid Waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Offensive Odor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Natural Environment	Protected Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ecosystem (Flora, Fauna and Biodiversity)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hydrology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Socioeconomic Environment	Involuntary Resettlement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Living and Livelihood	-	-	B⁻ / -	- / B⁺	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heritage and Cultural Value	-	-	-	-	-	-	-	-	-	-	-	-	B⁻ / -	B⁻ / -	B⁻ / -	B⁻ / -	B⁻ / -	-
	Landscape, Cultural & Historical Landscape	-	-	-	-	-	B⁻	-	-	-	-	-	-	-	-	B⁻ /B⁻	-	B⁻ /B⁻	-
	Ethnic Minorities and Indigenous Peoples	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOD Specific	Accessibility	- / A⁺	- / A⁺	B⁻/ A⁺	- / B⁺	- / B⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / B⁺	- / B⁺	- / A⁺	- / A⁺	- / B⁺	- / A⁺	- / B⁺
	Traffic and Accident	B⁻/ A⁺	- / A⁺	- / B⁺	B⁻/ B⁺	B⁻/ B⁺	- / A⁺	B⁻/ A⁺	B⁻/A⁺	- / A⁺	- / A⁺	- / A⁺	- / B⁺	- / B⁺	- / A⁺	- / A⁺	- / B⁺	- / A⁺	- / B⁺
	Walk Environment	- / A⁺	- / A⁺	- / B⁺	- / B⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / B⁺	- / B⁺	- / A⁺	- / A⁺	- / B⁺	- / A⁺	- / B⁺
	Safety and Security	- / A⁺	- / A⁺	- / B⁺	- / B⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / B⁺	- / A⁺	- / A⁺	- / A⁺	- / B⁺	- / A⁺	- / B⁺
	Universal Design	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺	- / A⁺
Others	Operation and Monitoring Stages	A⁺	A⁺	B⁺	B⁺	A⁺	A⁺	A⁺	A⁺	A⁺	A⁺	A⁺	B⁺	B⁺	A⁺	A⁺	B⁺	A⁺	B⁺

Source: JICA Project Team

Note: A: Significant impact is expected B: Impact is expected to some extent
C: Extent of impact is unknown, further study is needed -: Limited impact/negligible impact

4 PRE-FEASIBILITY STUDY ON TRANSPORT ACCESS IMPROVEMENT PROJECTS

4.1 Approach

4.1 This Pre-F/S was conducted for projects aiming at improving accessibility to and from UMRT stations of Line 1 and Line 2, those described in the TOD concept plan of each station.

The objective of this pre-feasibility study is threefold:

(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 projects are evaluated from economic, financial, social, environmental and institutional viewpoints;
(iii) Package the identified project into two categories, i.e. short-term projects and basic projects, and formulate an implementation plan.

4.2 For each station of Line 1 and Line 2 (Phase 1), the pre-feasibility study proposes projects of two kinds: (i) projects within a 500m - 800m radius area, and (ii) projects in the TOD area. Following a narrative description, all the identified projects for each UMRT station of Line 1 and Line 2 are consolidated in the Appendix of this summary report.

4.3 The implementation of the pre-FS encompassed the following steps:

(i) Review TOD concept plans and relevant plans (Zone Plan, etc.)

(ii) Conduct site surveys to review road condition (width, pavement, sidewalk etc.), traffic condition, roadside facility condition, parking condition, areas to be improved, etc.

(iii) Elaborate projects within walking distance and within TOD area

(iv) Project packaging and cost estimation: to categorize projects by implementation phases (short – including minimum – and basic), implementation body, financial source, etc. and to compile into packages

(v) Project evaluation: to conduct economic and financial analysis to assess economic impacts and financial feasibility of the project packages

(vi) Implementation plan: to propose implementation mechanisms including phasing, organization and role sharing, private sector and community participation, etc.

4.2 Type of Identified Projects

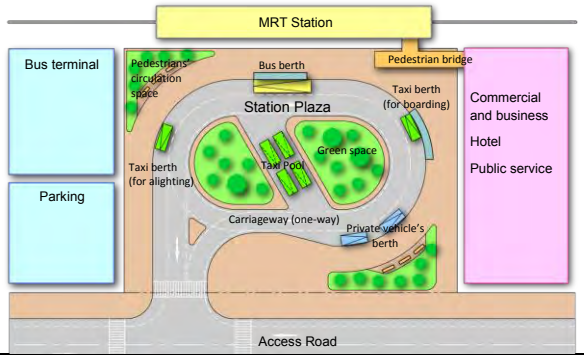
4.4 Elaborate projects within walking distance (500m - 800m radius), such as:

- Road improvement: to improve carriageway and sidewalk condition of main trunk roads and distribution roads to ensure accessibility to the station
- Road development and widening: to develop new roads and/or widen existing roads in compliance with the Zone Plan to create a road network around the station
- Upgrade alleys: improve the conditions of alleys (re-pavement, drainage, street light, road marking, etc.) in order to ensure the accessibility from built-up areas to the station
- Intersection improvement: to improve intersection (signal, pedestrian crossing, road marking, etc.) in order to ensure pedestrians' safety when crossing and to manage traffic flow

4.5 Elaborate projects within the TOD area, which includes the ROW of UMRT, some roads sections of the Zone Plan in the station area, and other areas of importance for the development of necessary intermodal facilities, such as:

- Priority roads within the TOD area: developing roads at the station is indispensable to access to the station
- Station plaza: to develop intermodal facilities and environmental space (pedestrian plaza, open space, etc.) in an integrated manner at the intermodal stations (see Figure 4.1)

Figure 4.1 Proposed Station Plaza

Typical Layout Concept	Station	Size (ha)	Land Availability
	C1 Nam Thang Long	0.6	B (hospital land)
	C2 Ngoai Giao Doan	1.0	A (park)
	C3 Tay Ho Tay	West: 2.0	B (VTV development)
		East: 0.9	A (government land)
	V4 Gia Lam	North: 0.6	C (residential land)*
		South: 3.4	A (VNR factory)
	V6 Long Bien Nam	0.7	A (Long Bien Market)
	V8 Hanoi	West: 0.4	C (residential land)*
		East: 1.6	A (ROW of UMRT)
	V12 Giap Bat	West: 0.5	C (residential land)*
		East: 2.5	A (ROW of UMRT)

Source: JICA Project Team
Note) A: in public land, B: in urban development land, C*: land acquisition required

- Bus terminal: to operate feeder buses including UMRT relay bus and circulating bus at the terminal stations and/ or intermodal stations
- Pedestrian crossing solutions: to ensure safety and time savings for pedestrians crossing the intersections
- Underground walkway: to ensure safety and time savings for pedestrians crossing the intersections and transferring to other stations
- Underground parking facility: to develop underground parking facility where it is difficult to secure at-ground space for parking in built-up areas

- Parking space: to ensure parking space for motorbikes and bicycles at the station plaza, space under the UMRT viaduct, public spaces such as roads, sidewalk space and parks (see Table 4.1)

Table 4.1 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

- Bus stop: to ensure smooth accessibility between UMRT station and buses near the station
- Traffic management: to install signals, pedestrian facilities, road marking, traffic signs, tactile for visually impaired person, designated lanes for motorbike, bus priority lane, etc

4.6 An adequate set of transport access improvement projects has been identified for each UMRT station in the area within 500m – 800m radius from the station and in the TOD area which covers immediate surroundings of the station (see Table 4.2).

Table 4.2 Summary of Transport Access Project by Station

Cluster	Station	Walking Distance				TOD Area								
		Road												
		Improvement	New/ widening	Alley	Intersection	Road (priority)	Station plaza	Bus terminal	Pedestrian bridge	UG walk-way	UG parking	Parking	Bus stop	Traffic management
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**

4.3 Project Packaging and Implementation Plan

4.7 **Packaging of the Projects:** As Identified projects for each UMRT station extend to a wide range and scope, they need to be packaged for implementation by different organizations and funding sources. It seemed practical to categorize the projects as follows:

(i) Short-term Projects: The projects in this category should be implemented before the start of UMRT operation. Out of a list of short-term projects, “minimum” projects – which do not require land acquisition – have been identified.

(ii) Basic projects: implementation of the projects in this category is considered desirable to enhance the function of UMRT stations.

4.8 **Summary of Estimated Cost:** The investment costs are estimated by UMRT Line, station and category (see Table 4.3, Table 4.4 and Table 4.5). Main findings are as follows;

(i) Total investment costs of access improvement projects are 7,960 million VND or 372 million USD.

(ii) Out of the total investment costs, 3,677 billion VND (46.2%) and 4,283 billion VND (53.8%) are required for short-term and basic projects, respectively. Out of the short-term projects, minimum projects require 3,170 billion VND (39.8% of the total cost).

(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.

Table 4.3 Estimated Costs for Access Improvement Projects by Station

Line	Station	Area within 500m radius	TOD area	Total	
				(million 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 4.4 Summary of Estimated Cost for Access Improvement Projects by Phase

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 4.5 Summary of Estimated Cost for Access Improvement Projects by Phase

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

4.9 **Possible Funding Sources (preliminary):** Possible funding sources include organizations such as DOT, MOT-PMU, MRB, District and private sector, or a combination thereof. In order to determine the share and methods, further discussions are necessary. Nevertheless tentative estimates are shown in Table 4.6, with the following main findings;

(i) Although futher study is necessary, possibilities for private sector participation are huge;

(ii) DOT shall be the main funding source, especially for the 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.

Table 4.6 Estimated Costs of Project Packages

	by Phase (billion VND)			Total	
	Short-term		Basic	billion VND	%
		(of which minimum)			
HDOT	1,365	(944)	126	1,491	18.6
MOT-PMU	452	(452)	182	634	8.0
MRB	635	(635)	409	1,044	13.0
District	913	(913)	0	913	11.4
Private	0	(0)	3,917	3,917	49.0
Total	3,365	(2,944)	4,634	8,000	-
%	42.0	36.8	58.0	-	100.0

Source: JICA Project Team

4.10 **Projects Evaluation:** The access improvement projects are expected to generate many positive impacts on local communities as well as on UMRT users. However, the projects require large investments including from the private sector. 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 deteriorate the local people's environmental conditions due for example to noise and vibrations caused by construction works. So, the proposed projects need to be evaluated from various viewpoints: social, economic, financial, environmental, etc. The results of projects evaluation are summarized as follows:

(i) Economic analysis: Time savings are assumed to be 3 minutes per beneficiary for all stations because of the access improvement projects (except for underground parking) since every project in each station has a time saving effect and integrated development of those projects is expected to further increase the effect. The result of analysis shows 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 financially viable to construct and operate them with parking fees.

(iii) Social and environmental impacts: Transport accessibility improvement will significantly contribute to social and environmental conditions. In addition to time savings in terms of access, traffic safety will reduce the number of traffic accidents; improvement of the walking environment will promote socio-economic development of local communities.

4.11 **Timing for Implementation:** Timing and implementation considerations are summarized as follow, by category of projects:

(i) Minimum Projects: These projects aiming at improvement of access roads, traffic management and walking conditions within the station influence area (500 – 800 meter radius of the station) can be launched immediately because no additional land acquisition is required. However, budgeting and implementation plans for Zone Plan roads within the TOD Area should be prepared as soon as possible.

(ii) Short-term Projects: Although the projects require partial land acquisition, they should also be launched as soon as possible.

(iii) Basic Projects: These projects including intermodal facilities such as station plaza,

underground parking, among others, require land acquisition and coordination among stakeholders, including with the private sector. They can be developed in integration with revenue generating urban development. Possibilities for private sector participation are huge. After underground parking and walkways will be constructed together with UMRT, the construction costs will be significantly reduced.

4.12 **Project Implementation Bodies:** Proposed implementation of the projects is as follows;

(i) HPC should primarily be responsible for transportation access improvement projects because they aim at ensuring public interest and safety; not only they benefit UMRT users but also communities in influence areas.

(ii) Station Plaza: Since the station plaza includes various functions and facilities using a certain size of land, 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.

(iii) Intermodal facilities at and around the UMRT stations should be implemented in close coordination with the UMRT project (see Table 4.7). Once the projects have been constructed, they should be transferred to HPC for subsequent management of the facility by DOT. More specifically:

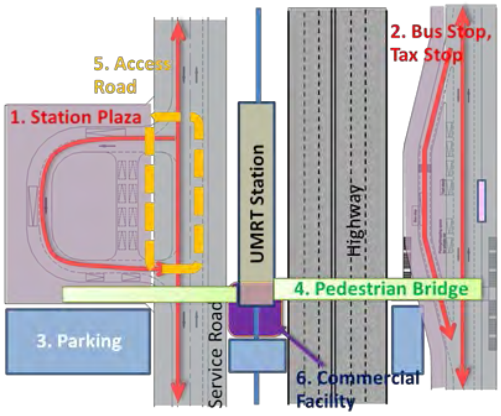
- Station Plaza: the station plaza within ROW of UMRT should be developed as a component of UMRT construction project by MOT-VNR and MRB.
- Elevated Walkway under the UMRT Viaduct and Loading/unloading Facilities in ROW of UMRT: They should be developed as a component of UMRT construction project
- Elevated walkways 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.

(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: They should be basically implemented by DOT though operation and management should involve local authorities and communities. For large-scale parking facilities participation of the private sector should be considered.

Table 4.7 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 Project Team

4.13 **Opportunities for Private Sector Participation:** In the area of TOD, there are ample opportunities where the private sector can participate directly and indirectly especially for revenue generating facilities and those that can be integrated with urban development (see Table 4.8). 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 UMRT stations such as C5, C6, C7, C8, C9 and C10

(iii) Station buildings including station plaza, underground parking and walkways that can be developed and operated at UMRT stations such as C4, C6, C9, C10, V4, V6, V8 and V12.

(iv) Station plaza located within private sector development projects such as C1 and C3

Table 4.8 Identified TOD Potential Areas

Existing use/ facilities	TOD Potential Area
Public facilities	C6 (Green Company), C7 (Film Company), V6 (Long Bien Market), C9 (EVN), C10 (Hanoi Police), V10 (Bach Mai Hospital)
Old apartment areas	C4 (Nghia Do), V9/V10 (Kim Lien)
VNR lands	V4 (Gia Lam), V8 (Hanoi), V12 (Giap Bat)
Underutilized bus terminal areas	V4 (Gia Lam), V12 (Giap Bat)
Planned new town areas	V4/V5 (Ngoc Thuy)
Underground space	C8 (Hang Dau Park), C10 (Hue St./ Tran Hung Dao St.)

Source: JICA Project Team

4.14 **Participation of Local Communities:** There are ample opportunities for participation of local communities, especially when UMRT stations are constructed as part of various projects, as explained below:

(i) Improvement and maintenance of alleys, walking space management and safety enhancement in the influence area of UMRT can be implemented with communities initiatives;

(ii) Vitalization of local markets and shops along main access routes to the UMRT system can be implemented with the support of local business associations created for this purpose;

(iii) Operation and management of various facilities provided in station plaza and the space under the UMRT viaduct including parking areas, small shops, public space, trees and plants, local events, among others.

4.15 **Necessary Institutional Arrangement:** 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.

5 PRE-FEASIBILITY STUDY ON UNDERGROUND PARKING DEVELOPMENT AT TRAN HUNG DAO STATION

5.1 Approach

5.1 The city centre and all main transport corridors of Hanoi suffer from increasing traffic congestion issues, one of the main reasons being the increasing lack of parking facilities while demand is increasing. This Pre-F/S aims at conducting:

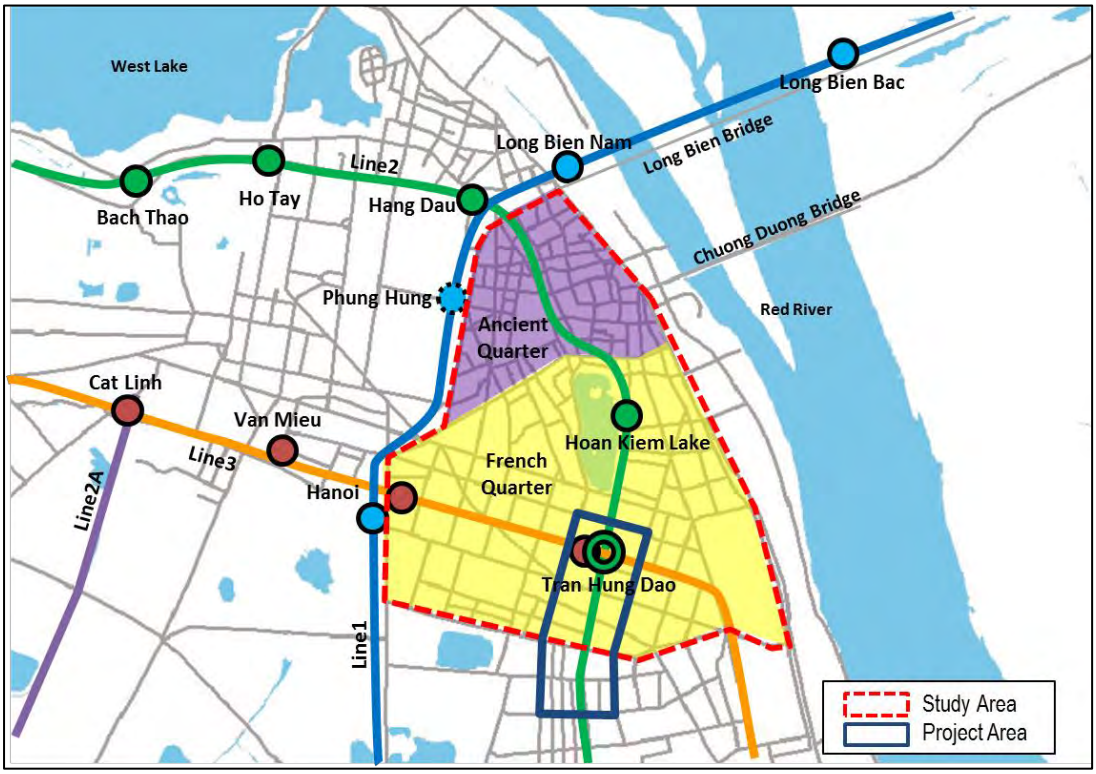
(i) A preliminary gap analysis on supply and demand for parking facilities in the central part of Hanoi (Ancient Quarter and French Quarter)

(ii) A pre-feasibility study on the development of integrated underground parking at Tran Hung Dao Station (C10).

(iii) Preliminary recommendations for a parking policy and the development of parking facilities in the city centre.

5.2 While the project area is limited to a number of street blocks surrounding the proposed underground parking at Tran Hung Dao UMRT Station, the study area covers the areas in the Ancient Quarter (AQ) and the French Quarter (FQ) to assess issues and opportunities in terms of parking in the city centre (see Figure 5.1).

Figure 5.1 Location of the Study Area and the Project Area



Source: JICA Project Team

5.2 Current Situation and Policies on Traffic and Parking

5.3 Nowadays, total traffic demand in the AQ and in the FQ is estimated at 237,200 and 490,300 trips/day, respectively. Characteristics of the traffic demand between the two areas are quite different. Trips on foot in the AQ are frequent, while trips by car in the FQ are common, due to the availability of roads. Bicycle is still being used in both areas. Motorcycle is the most popular mode both for the AQ and the FQ, where it shares 58.7 % and 63.6 % of trips respectively.

5.4 Traffic congestions in the area are getting worse due to a number of reasons such as increase in demand while road space remains unchanged, or increasing percentage of cars in road traffic. Conflicting uses of road space among vehicles tend to increase, pedestrians and roadside vendors are mixed, enforcement of traffic rule is rather lax, discipline of road users is low, and traffic management facilities are not sufficiently provided, and so on. An increasing number of motorcycles and cars tend to aggravate the situation.

5.5 According to the Institute of Transportation Science and Technology, the number of private transport vehicles has been increasing rapidly at a pace of about 10-15% per year. In 2020, there should be 36 million motorbikes and 3 million cars in Hanoi. According to the Department of Transportation, Hanoi has 1,178 parking spots with a total surface area of 43ha. However, this number of parking spots meets only 8-10% of the parking demand in Hanoi. This leads to the situation where sidewalks and paved roads are used for parking purposes.

5.6 The “Decision No.81/KH-UBND: Plan for Developing Transportation Infrastructure of Hanoi, Period 2011-2015” points out the following issues; (i) the focus of investments should be on constructing additional parking spots in the urban and suburban areas, in the multi-modal hubs and in the key hubs, (ii) the land fund should be spared to build parking spots in the zone of RR 2 & RR 3, (iii) investments should go in priority to elevated parking, mechanical parking, underground parking, (iv) 50 parking areas are needed including elevated, mechanical, underground parking in urban area; and (v) strict plans are needed to operate these parking facilities.

5.7 The DOT should issue a “2030 Master plan for parking and bus stations in Hanoi with orientation to 2050”, in which more details will provided on parking.

Table 5.1Current Situation of Parking in Hanoi by District (2011)

District	Car		Motorcycle		Total	
	Point	Area (m^2)	Point	Area (m^2)	Point	Area (m^2)
Hoan Kiem	144	18,317	177	12,547	321	30,864
Ba Dinh	121	71,320	102	5,417	223	76,737
Hai Ba Trung	106	22,304	137	4,762	243	27,066
Dong Da	77	11,656	82	3,034	159	14,690
Hoang Mai	18	72,572	8	2,700	26	75,272
Long Bien	9	13,353	18	2,095	27	15,448
Cau Giay	32	55,874	22	11,639	54	67,513
Thanh Xuan	15	679	61	8,815	76	9,494
Tay Ho	20	1,551	11	515	31	2,066
Ha Dong	6	378	7	594	13	972
Tu Liem	5	95,147	0	0	5	95,147
Total	553	363,153	625	52,118	1,178	415,271

Source: Doc. No.81/KH-UBND “Plan for developing transportation infrastructure of Hanoi, period 2011-2015"
Note: Data for Parking administrated by DOT, including On-Street and Off – Street Facilities

5.3 Estimate of Parking Demand Supply Gap in AQ and FQ

5.8 **Estimate of Parking Demand:** Traffic demand is estimated by vehicle type which enter the AQ and the FQ for different purposes (291,000 trips/day of bicycle and motorbike, and 118,000 trips/day of cars in 2020). The overall traffic demand in the city centre will not increase in the future due to the expected decrease in population density in the city centre. However, compared to 2005 and 2020, the demand for cars will increase (3.2 times) while that for motorcycles and bicycles will decrease (0.74 times).

5.9 Based on the above-mentioned traffic demand and other indicators, the demand for parking space has been estimated. Currently, parking demand in the study area amounts to 118,000 lots of which motorcycles share 82%, whereas cars share only 5%. Future total demand should not increase but the shift from motorcycle to car will require more space for parking. Current demand for parking space of 269,000m^2 will increase to 500,000m^2 in the future.

5.10 **Estimate of Parking Supply:** There is 19,868m^2 parking space in the project area or 25.3ha, according to the result of the parking survey conducted in the project area. The total parking capacity in the study area has been estimated based on this result. There are 31,000m^2 (2,094 PCU) in the AQ (80ha) and 238,000m^2 (15,886 PCU) in the FQ (217ha).

Table 5.2Estimated Parking Capacity in the Study Area

			Off - Road	On - Road	Total
FQ (217.1 ha)	No of Vehicles	MC	7,208	42,905	50,113
		Car	1,356	6,178	7,534
	Area (m^2)	MC	18,020	107,263	125,283
		Car	20,337	92,675	113,012
		Total	38,357	199,938	238,295
	Car Equivalent (PCU)		2,557	13,329	15,886
AQ (80 ha)	No of Vehicles	MC	1,328	7,905	9,233
		Car	100	455	555
	Area (m^2)	MC	3,320	19,763	23,083
		Car	1,499	6,830	8,329
		Total	4,819	26,593	31,412
	Car Equivalent (PCU)		321	1,773	2,094
Total (297.1 ha)	No of Vehicles	MC	8,536	50,810	59,346
		Car	1,456	6,634	8,089
	Area (m^2)	MC	21,340	127,026	148,366
		Car	21,836	99,505	121,341
		Total	43,176	226,531	269,707
	Car Equivalent (PCU)		2,878	15,102	17,980

Source: JICA Project Team

1) Potential Parking Capacity, is the number for parking vehicles when the roadside and street are utilized as the parking space
2) For Ancient Quarter, parking provision per land area is assumed a half for French Quarter South.

5.11 **Estimation of Parking Demand Supply Gap:** Parking supply demand gap has been estimated by comparing the parking demand and supply capacity at present and in the future in the study area. Main findings are as follows:

(i) At Present, there is a total shortage of 148,500m^2 of parking space, which is equivalent to 6,600 cars. As the road space for parking is basically fully utilized, the gap should be met with off-road parking facilities.

(ii) In the future, the gap should increase to 346,000m^2 which is equivalent to 15,300 car lots. The total gaps in the AQ and in the FQ are 121,000m^2 and 225,000m^2, respectively. The gaps are equivalent to 16% and 10% of the area of the AQ and the FQ, respectively. This indicates that it is hardly possible to meet the parking demand in the AQ unless underground space is extensively allotted for parking, or if parking is restrained. In the FQ, the situation is also critical but there are opportunities to expand off-road parking by providing multi-level elevated or underground parking facilities in integration with urban redevelopment projects by both the private and the public sector.

(iii) In the city centre, expansion of off-road parking should be promoted as on-road parking is becoming problematic both for smooth traffic circulation, amenity of road users and urban landscape. It is also necessary to introduce demand management measures to discourage the use of private vehicles in the city centre.

Table 5.3 Estimated Parking Demand Supply Gap in the Study Area

Indicators				AQ	FQ	Total
Area (ha)				80	217.1	297.1
Present	Demand	Vehicle Trips per day (000)	Bicycle	10.3	31.4	41.7
			MC	68.6	200.7	269.3
			Car	3.6	15.6	19.2
		Car Equivalent (000) 1)		16.8	54.3	71.0
	Supply	Area (000 m^2)	Off - Road	7.2	57.5	64.7
			On - Road	26.6	199.9	226.5
			Total	33.8	257.4	291.2
		Car Equivalent (000) 2)		2.1	15.9	18.0
	Gap (Supply - Demand)	Parking Factor 3)		0.31	0.36	0.35
		Parking Demand (000 Car Equivalent)		5.2	19.4	24.6
		Gap (000 Car Equivalent)		-3.1	-3.5	-6.6
		Area (000 m^2)4)		-69.9	-78.7	-148.5
Future	Demand	Vehicle Trips per day (000)	Bicycle / MC	62.8	180.1	242.9
			Car	13.2	48.7	61.9
		Car Equivalent (000) 1)		23.7	78.7	102.4
	Supply	The same as present above				
	Gap (Supply - Demand)	Parking Factor 3)		0.32	0.33	0.33
		Parking Demand (000 Car Equivalent)		7.5	25.9	33.3
		Gap (000 Car Equivalent)		-5.4	-10.0	-15.3
		Area (000 m^2)4)		-120.9	-225.0	-345.9

Source: JICA Project Team

1) Space per parking lot: for bicycle /MC (2.5 m^2) and car (15 m^2), and 6 Bicycles / MCs are equal to 1 car.

2) Space per parking lot: for Off-road (22.5 m^2 /car), for On-road (15 m^2 /car).

3) Estimated from the share by trip purpose and assumed turnover rate by trip purpose (to Work, to School, Business, Private and Others) and mode

4) Required space to provide off-street parking facilities.

5.4 Pre-Feasibility Study on Tran Hung Dao Underground Parking

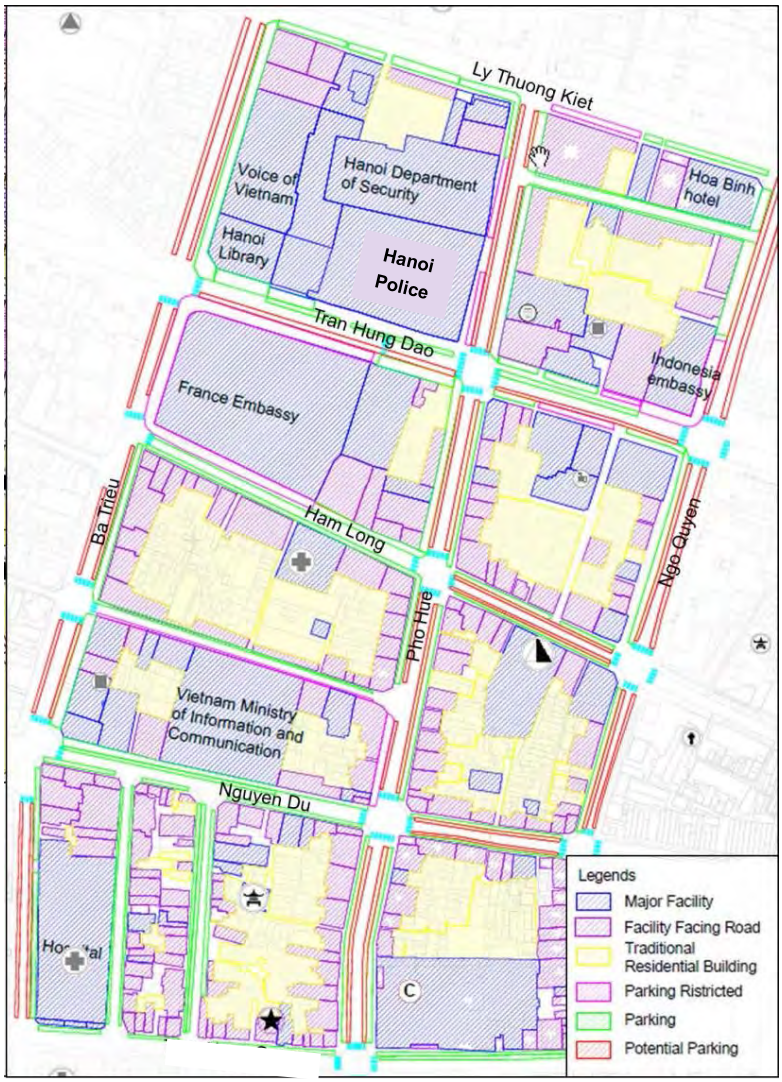
1) Parking Condition and Future Demand in the Project Area

5.12 The project area consists of the urban blocks surrounded by Ly Thuong Kiet Street, Ngo Quyen Street, Nguyen Du Street and Ba Trieu Street. Based on the results of surveys on urban facilities and parking facilities, the future demand for parking has been estimated. The facility plan of underground parking of Tran Hung Dao Station has been formulated and evaluated.

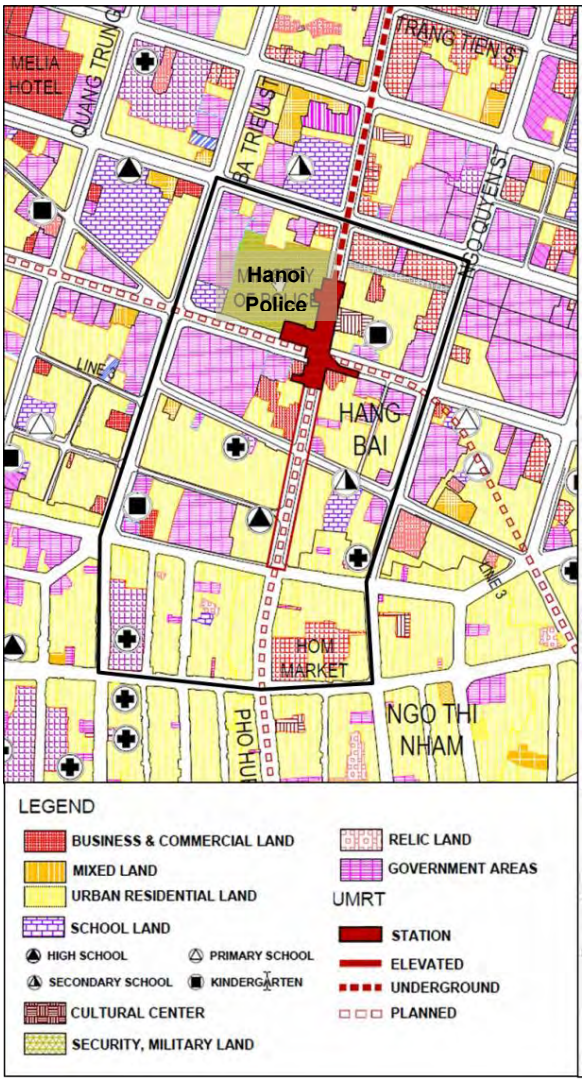
5.13 The project area is composed of two parts with different characteristics. The northern half is the area where mid- to high-rise mixed use buildings concentrate, while the southern half is the transitional area between traditional urban areas. At and around the UMRT station, there are large-scale urban facilities such as embassies, the Hanoi Police, the Department of Immigration, Voice of Vietnam, among others. In the Zone Plan, future land use is not expected to change significantly, while some buildings are targeted for redevelopment. The height of buildings is limited to 15 floors maximum.

Figure 5.2 Present and Future Landuse in Project Area

Existing Landuse



Zone Plan



Source: JICA Project Team, Based on the data from HAUPA

5.14 In order to obtain basic information on current conditions of parking facilities and their utilization, a supplemental survey was conducted in the project area both for off-street and on-road parking.

(i) Off-street Parking Facilities: There are a total of 232 facilities/buildings which occupy a total of 6,700 m^2 of off-street parking space out of which 28 buildings have off-street parking and only four buildings own underground parking facilities. The available space can accommodate approximately 300 cars;

(ii) On-Street Parking Facilities: A majority of parking space in the project area is on-road. A total of 4,454 meter of curbside of main roads are allocated for parking and managed by the public and the private sector. The road side space can accommodate 2,140 motorcycles and 222 cars.

(iii) Current Parking Management: There are parking facilities managed by local governments. The parking fee is 3,000 VND/ time for motorcycle, and 30,000 VND/ time for car. In case of car parking, 2-hours is the maximum, and another 30,000 VND/hour is charged if parking time exceeds 2-hours (for example, the parking fee for 3 hours costs 60,000 VND).

5.15 Future parking demand is estimated at a total of 2,185 car lots in this project area by application of parking guidelines in other countries. This clearly indicates that the project area will significantly lack parking space and facilities, especially off-road parking because it is getting more and more difficult and inappropriate to use the road space for parking.

2) Facility Plan of Underground Parking of Tran Hung Dao Station

5.16 Tran Hung Dao (C10) Station is located under the intersection of Tran Hung Dao Street and Hue Street in the French Quarter. Tran Hung Dao Street is connected to Hanoi Station of Line1 and Line3. This station will be a transfer station between Line2 and Line3 of phase 2, and Line2 will be extended to the south and to the west to connect to Line1 and Line2A in phase 2.

5.17 The underground parking space will be developed by utilizing underground space above the U-turn space of railway as a terminal of Phase1 section, which will be constructed by cut and cover method, the length of the underground parking space is planned to be 255m and the width 21.4m.

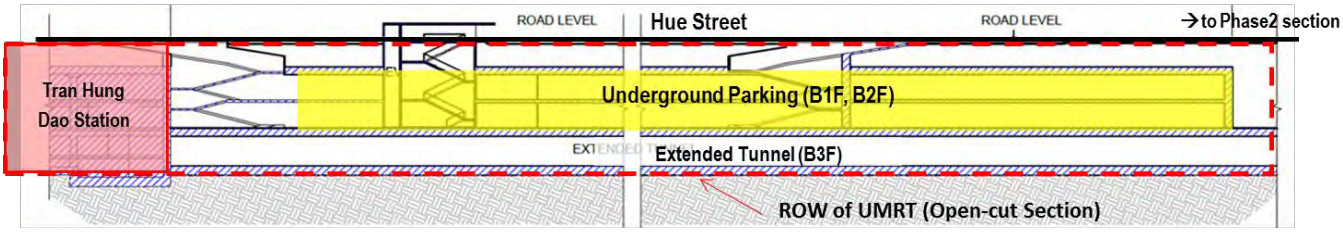
5.18 A significant advantage of this particular project is a reduction in the investment cost (one fourth of the construction cost in general), because the cost of excavation and temporary works can be excluded if it is constructed together with UMRT.

Table 5.4 Construction and Maintenance Cost for C10 Underground Parking

Type of Facility		Underground	Adjoining to the Station
Number of Floors		2	The 1st floor is for MC, 2nd floor is for Car
Land Area (m^2)		4,900	Without Land Acquisition
Construction Cost (million VND)		201,528	20.6 (million VND /m^2) * 4,900 (m^2)*2 floors
Maintenance Costs (million VND/ year)	Labour	288	48 (million VND / year / Person) * 6
	Power	1,441	0.123 (million VND / m^2)* 4,900 (m^2)*2 floors
	Water	519	0.053 (million VND / m^2) * 4,900 (m^2)*2 floors
	Others	225	10 % of all other maintenance Costs
	Total	2,473	

Source: JICA Project Team, based on the Report of Hanoi City Urban Railway Construction Project Line 2

Figure 5.3 Facility Plan (Cross Section) for Tran Hung Dao Underground Parking



Source: JICA Project Team

3) Proposal on Underground Parking Development integrated with UMRT

(a) Construction Method and Cost of Underground Parking

5.19 In general, the open-cut method is applied for construction of underground facility, including UMRT underground station and underground parking. There are several steps for construction, namely; (i) preparation work, (ii) instalment of diaphragm wall, (iii) covering, (iv) excavation with strutting, (v) concrete work and (vi) completion.

5.20 The process of covering can be alleviated in case of park and openspace, where it is not necessary to take into consideration of loading of the structure.

(b) Comparison of Construction Cost

5.21 The construction costs of underground parking are compared in case of the parking (a) under road, (b) integrated with UMRT station, (c) under road space and above the shield tunnel of UMRT, (d) under park and (e) under building (as a part of building facility).

5.22 Construction costs of the parking facility (width=22m, length=225m) are estimated with several types of parking (see Table 5.5).

Table 5.5 Breakdown of Construction Cost of Underground Parking under Road

	Type of Underground Parking	Floor Area (m^2)	No. of Floor	Total Floor Area (m^2)	Box Height (m)	Total Spatial Area (cum)	Car Parking	Total Construction Cost (million VND)	per m^2 (million VND)	per cum (million VND)	per Vehicle (million VND)
1	Under Road	4,950	3	14,850	17	84,150	300	1,443,000	97.2	17.2	4,810
2	UMRT Integrated	4,950	2	9,900	11.33	56,100	200	221,000	22.3	3.9	1,103
3	Under Road (Above Tunnel)	4,950	2	9,900	12	59,400	200	1,143,000	115.5	19.2	5,715
4	Under Park	4,950	1	4,950	5	24,750	100	355,000	71.7	14.4	3,551
5	Under building	4,950	3	14,850	N/A	N/A	300	226,000	15.3	N/A	755

Source: JICA Project Team

5.23 It shows that the underground parking integrated with UMRT can be constructed one-fourth of the cost of underground parking under the road. Because most of construction costs including (i) preparation work, (ii) instalment of diaphragm wall, (iii) covering, (iv) excavation with strutting, will be covered by UMRT Construction Project for U-turn space of UMRT. It means the construction cost for underground parking with the UMRT station is (v) concrete work only. It is also significant that this parking facility will be developed under the ROW of Line 2, the land acquisition is not required additionally.

5.24 In Hanoi City Urban Railway Construction Project (Nam Thang Long - Tran Hung Dao Section), underground parking project for other stations were also proposed to be developed.

5.25 In sum, it is proposed to develop underground parking integrated with UMRT station construction especially the terminal station which U-turn space will be excavated, and inside of ROW of UMRT and/or road and public spaces.

Table 5.6 Financial Analysis of Underground Parking Project, for Line 2 Stations

Items		C10 Tran Hung Dao	C5 Quan Ngua	C4 Buoi	C9 Hoan Kiem Lake
Number of Storey		2	3	2	3
Land Area (m^2)		4,900	7,889	5,310	1,454
Construction Cost (million VND)		201,528	1,884,324	731,034	347,295
Total Project Cost (million VND)		201,528	1,884,324	731,034	347,295
Capacity	a. Motorcycles / Bicycles	560	1,270	800	240
	b. Cars	100	312	122	20
Operating and Maintenance Costs	a. Labour	288	384	288	384
	b. Power	1,441	3,479	1,561	641
	c. Water	519	1,254	563	231
	e. Others	225	512	241	126
	f. Total	2,473	5,629	2,653	1,382
Parameters / Assumptions:					
Construction Cost (million VND per m^2)		20.6	79.6	68.8	68.8
Personnel Cost	Required Personnel	6	8	6	6
	Average Monthly Salary (million VND / MM)	4.0	4.0	4.0	4.0
Energy Cost (VND per m^2)	Underground	123,000			
	Elevated	147,000			
Water Cost (million VND per m^2)		53,000			
Other Operating Expenses (%)		10.0%			
Inflation Rate (%)		5.0%			

Source: JICA Project Team, based on the data from Hanoi City Urban Railway Construction Project (2011)

4) Project Evaluation

5.26 **Economic Analysis:** Roles of underground parking are to reduce on-street parking and vehicles driving to look for parking space, and to promote use of UMRT by providing Park and Ride (P&R) lots. Therefore, underground parking development is expected to have positive impacts on the problems caused by on-street parking such as traffic congestion and decrease in accessibility and safety for pedestrians. These effects were measured through a "with and without" comparison, that is, comparison of road traffic and walking environment with the underground parking (With project case) and without the project (Baseline case).

5.27 Based on these effects, the economic benefits can be divided into the following four types: (i) travel time savings, (ii) improvement of accessibility, (iii) enhancement of comfort and safety, and (iv) improvement of local environment. In sum, the development of underground parking with the underground station is expected to generate a large amount of economic benefits to the station area as well as to UMRT users.

5.28 The financial viability of the project was examined based on the project cost including initial construction and O&M costs and the expected revenue from the parking. In the analysis, it has been assumed that parking fee is 5,000 VND per motorcycle and 55,000 VND up to 2 hours for cars, utilization rates of parking lots and turn over fare (number of vehicles per lot per day) are 80% and 6.0, respectively. The costs and revenues are compared over the assumed project period of 30 years. The rules are as follows:

(i) If available parking lots are allotted to motorcycle (560 lots) and cars (100 lots), FIRR is only 3.8%. In order to operate the parking facilities commercially in a viable manner, approximately 40% of the initial cost should be subsidized.

(ii) If all available parking lots are allotted to cars and parking fee is increased by 10% every 2 years, FIRR becomes 12.1%, which is a commercial viable level.

5) Conclusion

5.29 It will be financially viable in case if underground parking spaces are used for cars with increased parking fees. For this, the parking facilities can be operated on commercial basis without financial burden to the government.

5.30 If the underground facility is constructed together with UMRT underground station, the construction cost becomes 1/3- 1/4 of new construction, because the cost of excavation and temporary works are implemented by station construction. At the terminal stations, an open-cut underground space inside of ROW of UMRT will be generated above the extended tunnel for U-turn, so it is proposed to utilize this vacant space for parking and/ or commercial facilities.

6 PRE FEASIBILITY STUDY ON TOD AT GIAP BAT STATION AREA

6.1 Approach

1) Objectives

6.1 Giap Bat station has been selected because of its location of strategic importance both in terms of urban development and transport. The station is also characterized with large underutilized plots of land, including VNR property and adjacent areas.

6.2 To formulate a competitive urban core (CBD) in the south of the City for balanced urban structure, it is significant to create employment opportunities to reduce travel distance for commuting to City Center and to provide opportunities for resettlement of the people living in overcrowded city center such as the Ancient Quarter. This prefeasibility study intends to look into development potentials of Giap Bat Station area, to verify following objectives:

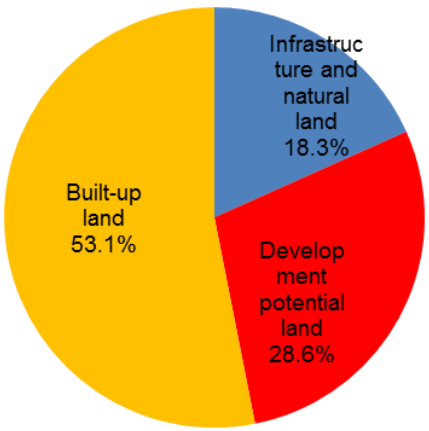
(i) To formulate a comprehensive concept plan showing compact and competitive multi-functional urban core based on TOD concept in basic compliance with Zone Plan
(ii) To assess viability such development from economic, financial, socio-environmental viewpoints and implementability of the plan and projects.
(iii) To preliminary study possible application of a new development mechanism such as “land readjustment” and “urban renewal” system which are widely practiced in Japan

2) Present Condition of TOD Planning Area

6.3 TOD planning area is selected about 500m-1km radius of the station, with boundaries of RR2.5 at north, Zone Plan road at east, Nguyen Huu Tho St. at south, and Set River at west. The whole TOD Planning Area covers a total area of 231.2ha (see Figure6.1, 6.2 and 6.3). More than one-fourth of land is categorized as development potential land including unused land, water, factory and governmental facility land which will be relocated. Road coverage is about 10%, but there are limited road network at the west of the station. In the built-up area, there are various types of buildings such as high-dense residential land, apartment in the new town, etc.

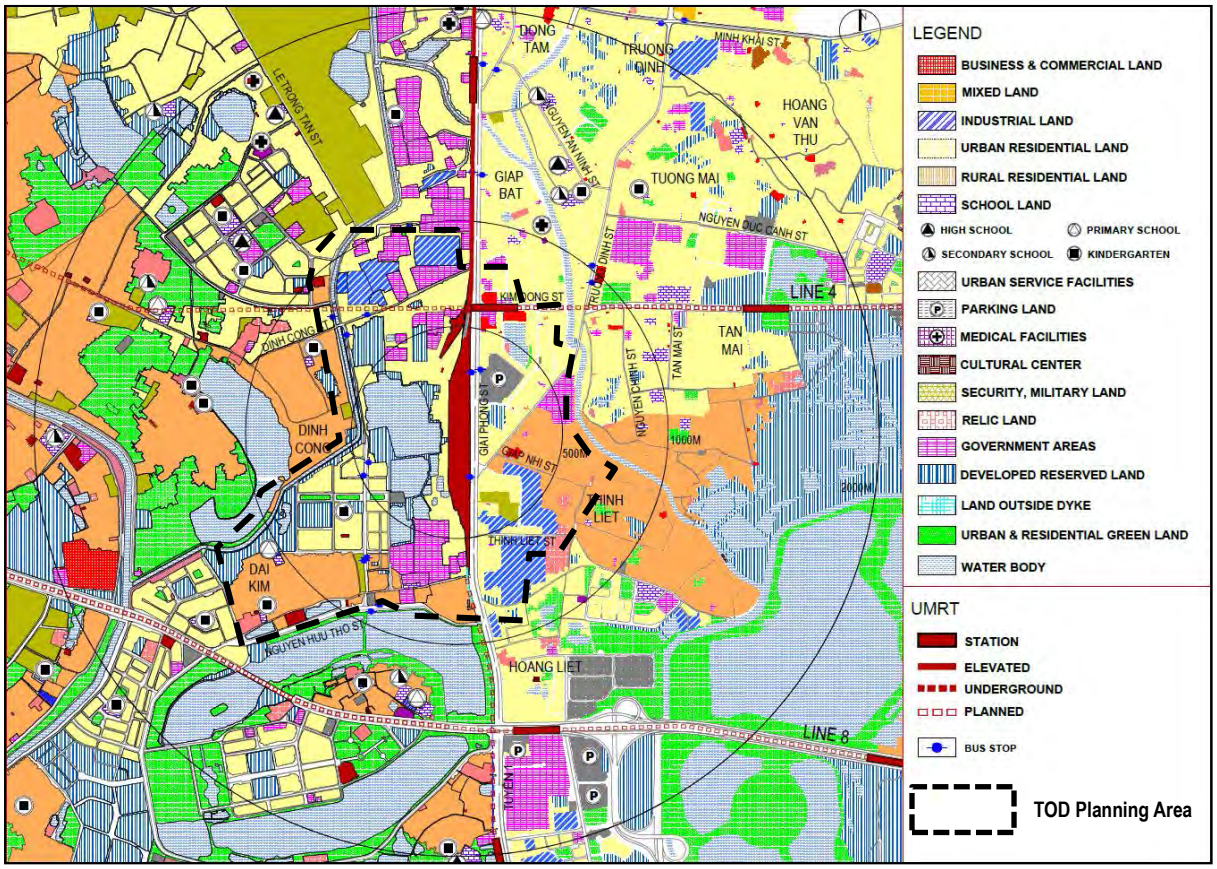
Figure 6.1 Composition of Existing Landuse

Category	Type	Area	
		ha	%
Infrastructure and natural land	Trunk road	8.6	3.7
	Distribution road	17	7.3
	Park and green	5	2.2
	River	0.3	0.1
	Railway	11.5	5
	Sub total	42.4	18.3
Development potential land	Unused land/ water	18	7.8
	Factory and governmental facility land	48.1	20.8
	Sub total	66.1	28.6
Built-up land	High-dense residential land	81.2	35.1
	Residential land	3.2	1.4
	Apartment land	35	15.2
	Cultural and educational land	1.5	0.7
	Cemetery	1.9	0.8
	Sub total	122.8	53.1
Total		231.2	100.0



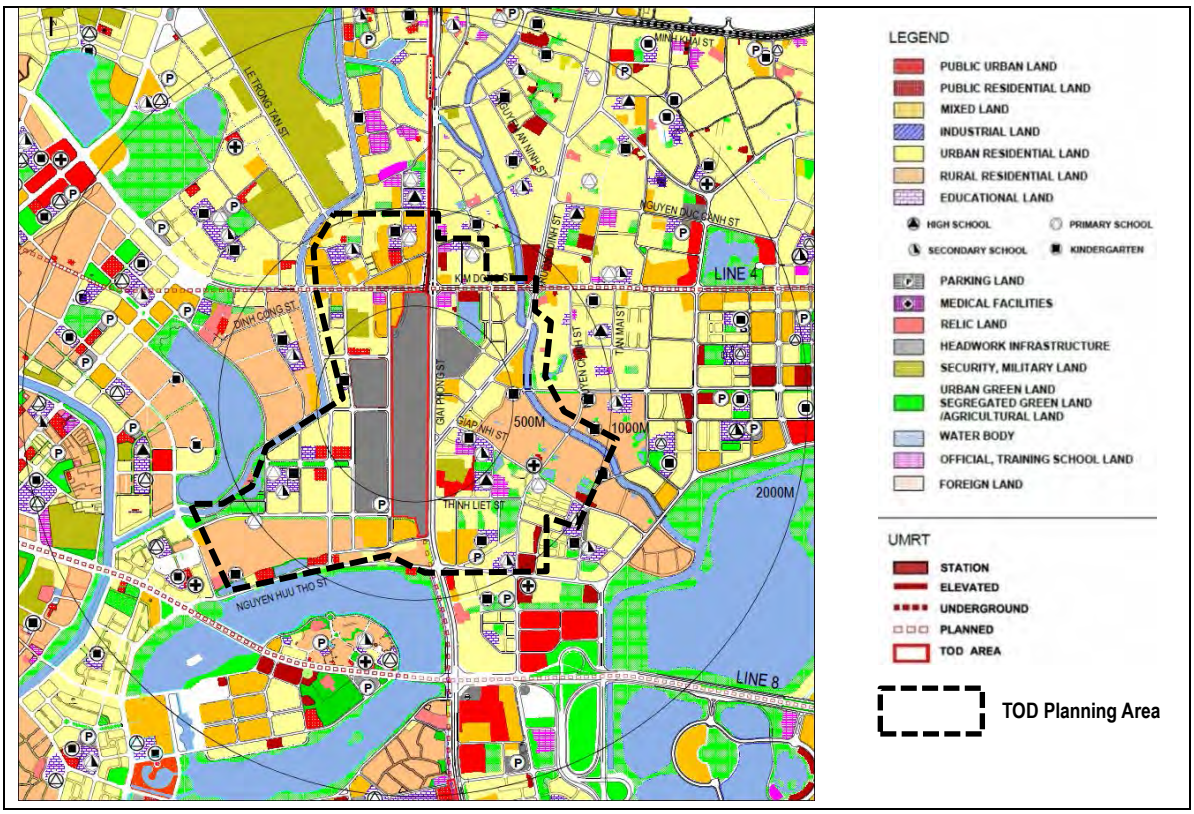
Source: JICA Project Team

Figure 6.2 Present Landuse of Giap Bat TOD Planning Area



Source: JICA Project Team

Figure 6.3 TOD Planning Area in Zone Plan



Source: JICA Project Team based on the Zone Plan

6.2 Overall Development Concept

1) Development Concept

6.4 The southern area of the city has been growing rapidly to meet increasing demand for housing, mainly through initiatives of the private sector at different scales. However, it still lacks a competitive multi-function CBD, which makes it impossible to provide diversified services and employment opportunities. Therefore people have to continue to depend on the city centre.

6.5 Key concepts of Giap Bat TOD include (i) development of a new urban service center (CBD) to cover the southern part of the city, (ii) provision of different types of housing including affordable housing including social housing for resettlement inside the project area and from congested city center, (iii) generation of employment opportunities, (iv) creation of a regional park and urban green spaces and (v) creation of the first transit city which can be directly connected with the current city center (the Ancient Quarter and the French Quarter).

6.6 Giap Bat station can function as a multi-modal transport hub where Ring Roads and North-South Corridor intersect. New towns and suburban developments spread in the south in a rather disintegrated manner. They could be connected, and landuse could be reorganized if TOD is adequately implemented at Giap Bat.

2) Identification of TOD Projects

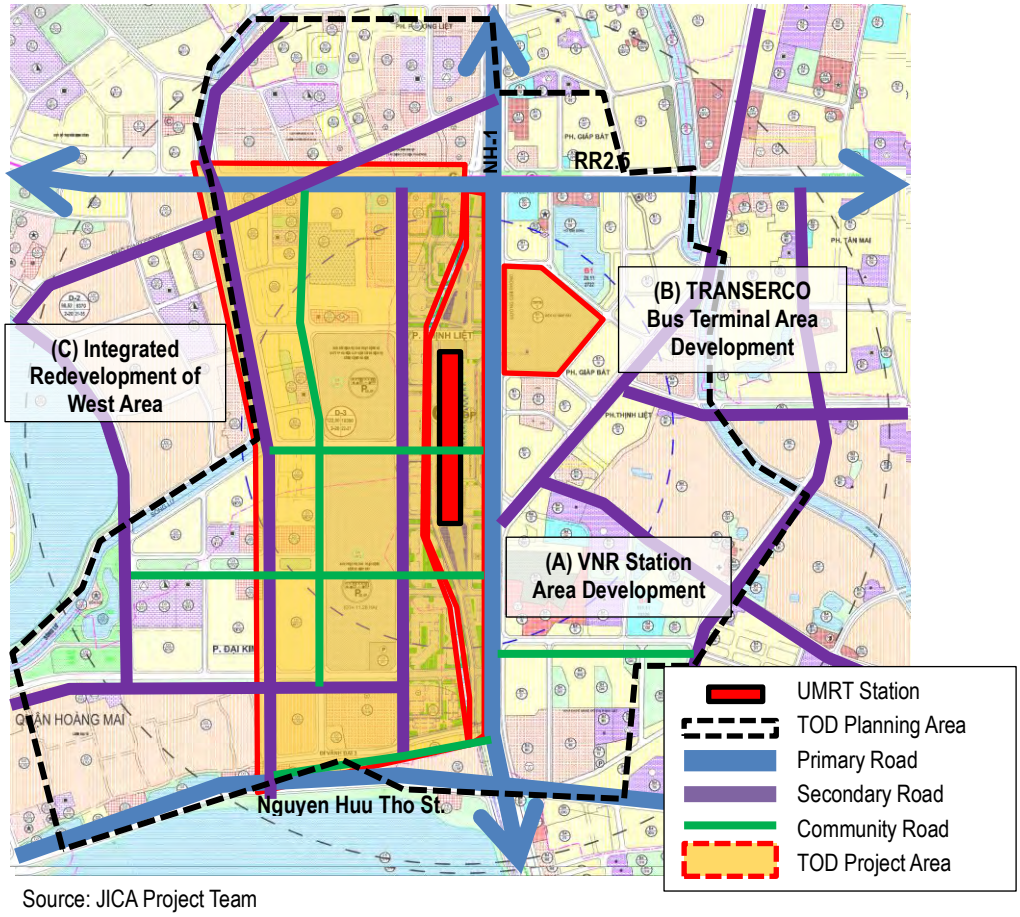
6.7 Three projects have been identified (see Figure 6.4):

(i) **Station complex development using VNR land (11.1ha):** A station complex will be developed on VNR land in order to enhance the potential station development, increase VNR land's value and make the CBD a new landmark.

(ii) **Integrated redevelopment of long-distance bus terminal (4.5ha):** After relocation of the intra-city bus terminal in front of UMRT station, the long-distance bus terminal will be redeveloped to utilize land at maximum and to provide convenient services for long-distance bus users and local communities.

(iii) **Comprehensive integrated urban redevelopment of the western area of the station (65.2ha):** By utilizing unused land and factory areas as well as degraded residential areas, a project of integrated urban redevelopment will be implemented to provide appropriate road and infrastructure network and to formulate a new CBD in the south. This should attract UMRT users, local communities as well as citizens of the south of Hanoi.

Figure 6.4 Development Orientation of Giap Bat TOD Project Areas



Source: JICA Project Team

6.3 Station Complex Development on VNR Land

6.8 **Development objectives:** This project aims to maximize the development potential of VNR land which is spread along VNR railway, and will be restructured when UMRT Line1 will be constructed. Objectives are summarized as follows:

(a) Strengthen the development capacity of UMRT station as a new CBD center in the south of the city

(b) Increase marketability of VNR land

(c) Utilize air right of the station and railway land

6.9 The proposed project will be evaluated from economic, financial and environmental viewpoints in order to assess how non-rail business will be able to contribute to VNR's overall business. If feasible, utilizing the land of the railway company and developing it comprehensively. this scheme could be applicable to other stations of Line1 such as Hanoi, Gia Lam, Ngoc Hoi, etc., where VNR owns land.

6.10 **Project area:** The project area is VNR's current land (11.1ha) including VNR station, yard and factory area. The total area of VNR station facilities is approximately 3,500m^2. Estimated current asset value is roughly 113 million USD including 1.8 million USD for the building and 111 million USD for the land.

6.11 **Project concept:** VNR land is the most convenient space for station users for direct access from/to the station. The station building will be a landmark of Giap Bat station area in terms of urban landscape. Since characteristics of station users will be diversified, it is necessary to provide various urban services and functions by various tenants including competitive private corporations, local companies and communities.

6.12 After the development of UMRT is completed, along with roads and transport facility, more than half VNR land (6.27ha, 56% of total land) will be utilized for urban development as mixed-use land, including the station. The integrated development projects of VNR land aims to utilize this development land for integrated development with UMRT, including the following projects (see Figure 6.5 and Figure 6.6):

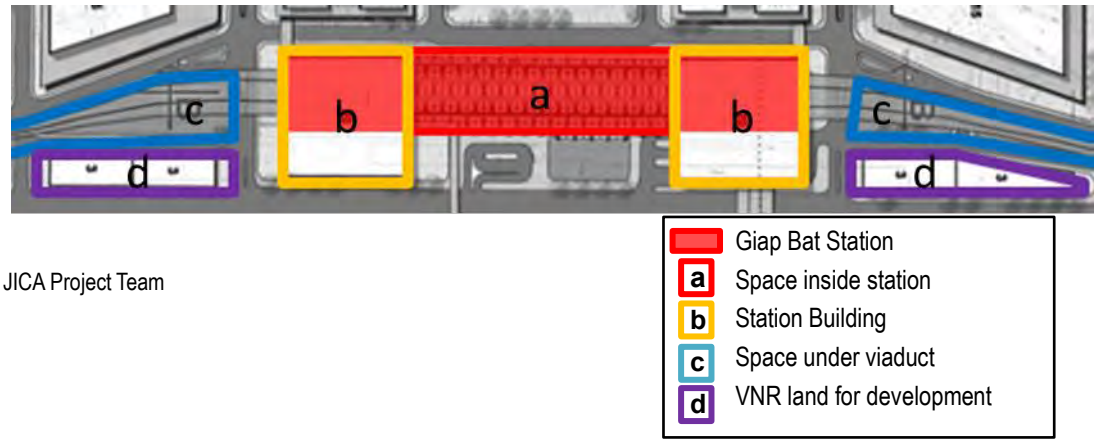
(iv) Provision of commercial and service facilities inside the station

(v) Utilization of space under viaduct for commercial and parking facilities

(vi) Construction of station buildings using space above the station (see Figure 6.7)

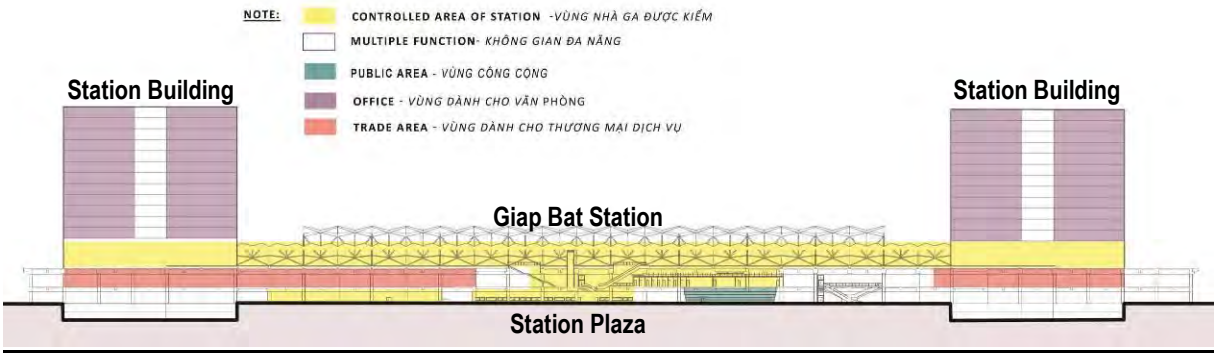
(vii) Construction of buildings along NH-1

Figure 6.5 Potential Area for Station Complex Development



Source: JICA Project Team

Figure 6.6 Section Plan of Giap Bat Station Buildings



Source: JICA Project Team

6.13 Such integrated development of VNR land will lead to efficient access roads to the station, a comprehensive station plaza, and a high-density building complex totalling 476,000m^2 of new floor-area at and around the station (see Table 6.1 and Figure 6.7).

Table 6.1 Future Condition of Station Complex Development

Category	Item		Area (m^2)	(%)
Land use	Transport	Station[1)]	17,200	15.5
		Viaduct[1)]	18,900	17.0
	Road		33,600	30.2
	Mixed use		41,300	37.2
	Total		111,000	100.0
Floor area	Space inside station		16,200	3.4
	Station building		328,000	68.8
	Space under viaduct		10,900	2.3
	Buildings in VNR land		121,500	25.5
	Total		476,600	100.0

Source: JICA Project Team

1) Station and viaduct space are utilized for commercial development. East station plaza is located at the 1st floor of the station building.

Figure 6.7 Development image of VNR Station Complex

Source: JICA Project Team

6.14 **Project cost:** The estimated total project cost (excluding UMRT station) is 542.0 million USD including roads and station plaza (13.42 million USD), and proposed facilities on VNR land (528.5 million USD) (see Table 6.2).

Table 6.2 Project Cost of Integrated Development of VNR Land

Item		Construction Unit Cost (USD/m^2)	Floor Area (m^2)	Project Cost (million USD)
Public facility	Road	276	33,600	9.27
	East station plaza	280	14,800	4.14
	Sub Total		48,400	13.42
Integrated development facilities	Facilities inside station	500	16,200	8.10
	Station building	1,560	328,000	511.68
	Facilities under viaduct	800	10,900	8.72
	Other buildings	1,440	121,500	174.96
	Sub Total		476,600	528.50
Total				541.92

Source: JICA Project Team

6.15 Renting newly-built additional floor-area will recover project investment costs including construction, operation and management. The developer (VNR or others) will operate businesses inside leased floors.

6.16 The total investment cost of 643.6 million USD and annual O&M cost of 31.8 million USD per year will be recovered by the revenue of floor lease, estimated at 201.5 million USD per year. The annual net revenue is expected to be 170 million USD per year.

6.17 **Project evaluation:** The project periods are set for each project accordingly (5, 7 and 15 years). FIRR at the project completion year is high enough to recover investment costs and generate profits (see Table 6.3). After integrated development, estimated future asset value is roughly 961.4 million USD including land and buildings.

Table 6.3 Estimated FIRR of Integrated Development of VNR Land

Item	Expenditure		Income	Net Profit (mil. USD/yr)	Evaluation	
	Construction Cost (mil. USD)	O&M Cost (mil. USD/yr)	Lease Revenue (mil. USD/yr)		Project Period (year)	FIRR (%)
Facilities inside station	8.1	2.0	8.1	6.1	5	51.4
Station building	426.4	20.7	137.8	117.1	15	21.4
Facilities under viaduct	8.7	1.4	4.6	3.2	7	31.3
Other buildings	175.0	7.7	51.0	43.3	15	17.4
Total	643.58	30.97	195.07	164.10	-	-

Source: JICA Project Team

6.4 Bus Terminal Complex Development Project

6.18 **Development objectives:** This project aims to integrate transport and other urban facilities to maximize development potential of the land and to provide added value to public transport services for UMRT and bus users. The objectives are summarized as follows:

(a) Reorganize and modernize services and facilities of the bus terminal to improve traffic flow, accessibility and convenience for users
(b) Enhance socio-economic development capacity to provide various urban services and facilities at the complex
(c) Promote participation of right holders to the project by protecting their rights
(d) Promote profitability of the project by construction, operation and management of the complex including the bus terminal

6.19 The proposed project will be evaluated from economic, financial and environmental viewpoints in order to assess how public transport service will be diversified and strengthened by integrating with other services and facilities, and how the bus operation companies will be able to expand business functions to non-transport services, in which private developers also participate. If the proposed project framework is feasible, this scheme will be applicable to other bus terminals such as Gia Lam, Nam Thang Long, etc.

6.20 **Project area:** The project area (4.5ha) includes the existing Bus Terminal of Giap Bat (3.5ha, 77.1%) and the adjacent residential areas (1.0ha, 22.9%). The floor area of the bus terminal is 7,000m^2, and the total floor area of residential buildings is estimated at 14,000m^2 including 140 households. The estimated current asset value is roughly 56.0 million USD including 10.9 million USD for buildings and 45.1 million USD for the land.

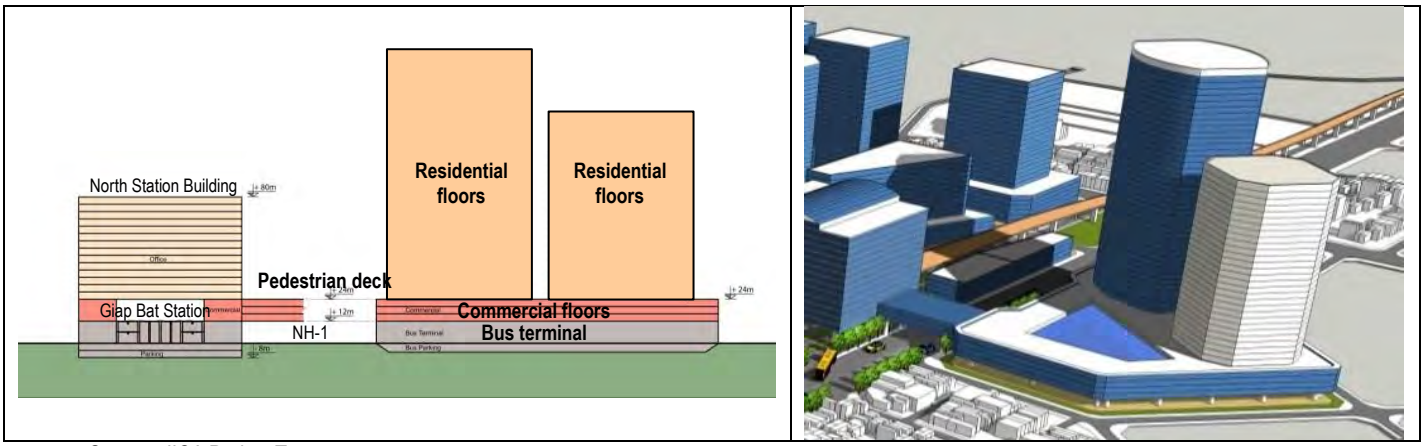
6.21 **Project concept:** It is proposed to develop a multi-purpose complex including long-distance bus terminal, commercial floors and apartments in order to enhance the value of the bus terminal area, by providing various urban services. Pedestrian space and openspace will be provided inside the project area to improve the living environment around the bus terminal.

6.22 As Giap Bat area is expected to play a role as service center for the southern part of Hanoi and the south-western suburbs, some facilities are needed such as commercial facilities (shopping mall), amusement facilities (roof-top playing facilities, movie theater, etc.). It is proposed to redevelop a complex building including the long-distance bus terminal (bus pool in B1F and ticketing and loading space in 1F), commercial floors in 2F-4F, and 2 residential apartments including flats for households originally living inside the project area, and others (apartments for sale).

6.23 To improve accessibility around the complex, a pedestrian deck will be developed to connect the UMRT station and the station plaza, including the city bus terminal to the west of NH-1 and the long-distance bus terminal to the east of NH-1. The will make the access more convenient for bus users as well as local communities coming from the east. The boundary of land will be utilized to ensure pedestrian space and motorbike space, so that the traffic flow around the terminal will be improved by separating spaces for pedestrian and motorbikes.

6.24 In the bus terminal complex, there will be new floors totalling 121,100m^2, including the bus terminal (30,000m^2), commercial floors (30,000m^2), apartment floors (61,100m^2 including for resettlement) (see Figure 6.8). The estimated future asset value is approximately U300 million USD.

Figure 6.8 Section Plan and Development Image of Bus Terminal Complex



Source: JICA Project Team

6.25 **Project cost:** The estimated total project cost is 114 million USD including construction of complex building of bus terminal, commercial and 2 high-rise apartments (see Table 6.4).

Table 6.4 Project Cost of Bus Terminal Complex Development

Item	Construction Unit Cost (USD/m^2)	Floor Area (m^2)	Project Cost (million USD)	Remarks
Bus terminal	800	30,000	24.0	B1F and 1F
Commercial facility	700	30,000	21.0	2F to 4F
Apartment for resettlement	700	11,100	7.8	20F, 140HH for resettlement
Apartment for sale	700	50,000	35.0	32F, 500 HH for sale
Overhead cost	-	-	26.3	30% of construction cost
Total	-	121,000	114.1	

Source: JICA Project Team

6.26 To recover construction costs of the low-rise building with bus terminal and commercial facilities, the charge of bus operators (2 USD/time for loading and unloading passengers, 2 USD/time to use the bus pool) and the rental fees of commercial floors (40 USD/m^2) are utilized.

6.27 **Project evaluation:** Based on the financial analysis of the project with the conditions mentioned above, the project is not viable financially (FIRR is 12% after 20 years, which is lower than the market rate). For cost recovery, it is proposed to build high-rise apartments, including flats for resettlement of 140 households. If apartments for 500 households will be developed, the profit generated by sales (100 mil. USD) can recover the project investment cost, and FIRR will reach 20% (see Table 6.5).

Table 6.5 Estimated FIRR of Bus Terminal Complex Project

Expenditure	Revenue		Evaluation	
Construction cost (mil. USD)	Apartment sales (mil. USD)	Debt (mil. USD)[1)]	Project period (year)	FIRR (%)
114.1	100.0	14.1	10	25.5

Source: JICA Project Team

1) Debts are repaid by charges of bus terminal and lease revenue of commercial floors.

6.5 Integrated Redevelopment Project of West Area

6.28 **Development objectives:** This project aims to create a new CBD in the south of Hanoi integrated with road and public infrastructure as well as various urban facilities by applying the Land Readjustment Scheme. The objectives are summarized as follows:

(a) Develop road and public infrastructure as part of an integrated urban redevelopment project with minimum public investment;

(b) Share costs and profit of the project equally among stakeholders including the public sector, private developers and right holders. Right holders will participate in the project to contribute to land and property rights for public infrastructure development and sales to market, while they will obtain benefits from improved infrastructure and urban facilities

(c) Apply land readjustment project implementation scheme

6.29 The proposed project will be evaluated from economic, financial and environmental viewpoints in order to assess the applicability of the land readjustment scheme (property assessment, right conversion, land contribution, etc.). If the proposed project framework is feasible, this scheme will be applicable to both built-up areas and agricultural areas to develop public infrastructure in conjunction with a comprehensive development/ redevelopment project.

6.30 **Project area:** The boundaries of the 65.2 ha- planned project area is delineated by the Ring Road 2.5 to the north, Nguyen Canh Di Street to the west, the planned east- west road to the south, and the boundary of VNR land to the east. The project area includes a new town, existing built-up areas, a water reservoir, government and factory land, residential area, etc. (see Table 6.6). The land use has not been consolidated yet. The estimated current asset value is roughly 915.2 million USD including 634.0 million USD for buildings and 301.2 million USD for land.

Table 6.6 Present Landuse Condition of West Area

Landuse		(m^2)	(%)
Public Land	Road	76,600	11.7
	Sub total	76,600	11.7
Private Land	Water reservoir	138,300	21.2
	Unused land, tree land	7,700	1.2
	Developable land	23,500	3.6
	Government land	54,000	8.3
	Factory land	103,000	15.8
	High dense residential land	165,900	25.4
	New town	33,900	5.2
	High rise apartment	40,200	6.2
	Army land, public facility	8,900	1.4
	Sub total	575,400	88.3
Total		652,000	100.0

Source: JICA Project Team

6.31 **Project concept:** The TOD concept of Giap Bat Station Area is to formulate a public transport oriented compact CBD. By implementing integrated urban redevelopment, road and infrastructure will be developed in compliance with the Zone Plan and urban facilities. The project components are organised in three categories, as follows:

(i) Road and infrastructure development: In compliance with the Zone Plan, a network of trunk roads will be designed by consolidating public land and unused land, to be converted into road and infrastructure land.

(ii) Apartment for resettlement and social housing development: Social apartments will be built for the resettlement of residents affected by the project, including (a) high-rise apartments for 3,000 households (12,000 population) who settle in TOD Project Areas at present, (b) social housings for resettlement and low-income households, (c) public facilities such as elementary school, hospital and nursery. Furthermore, apartments for sale will be additionally developed to recover construction costs of social housings. So the social housing construction project can be profitable for both public and private sectors.

(iii) CBD development in reserved land: After readjustment of land plots and development of road and infrastructure, vacant lands after resettlement of factory, public facilities and water reservoir and the reserved land which is newly developed will be used to develop the mixed-use CBD with multi-purpose facilities as well as public facilities (30.2ha, 46.4% of total area).

6.32 After comprehensive integrated development of the western area, roads will be developed in compliance with the Zone Plan, and public facilities will be efficiently developed (see Table 6.7). After readjustment of land plots, the new development area will be dedicated to the CBD development, and reserved land will be sold on the market to recover the investment cost, which will be also a part of CBD (see Figure 6.9 and Figure 6.10).

6.33 Estimated future asset value is 5,560.0 million USD including 4,600.0 million USD for buildings and 960.0 million USD for land.

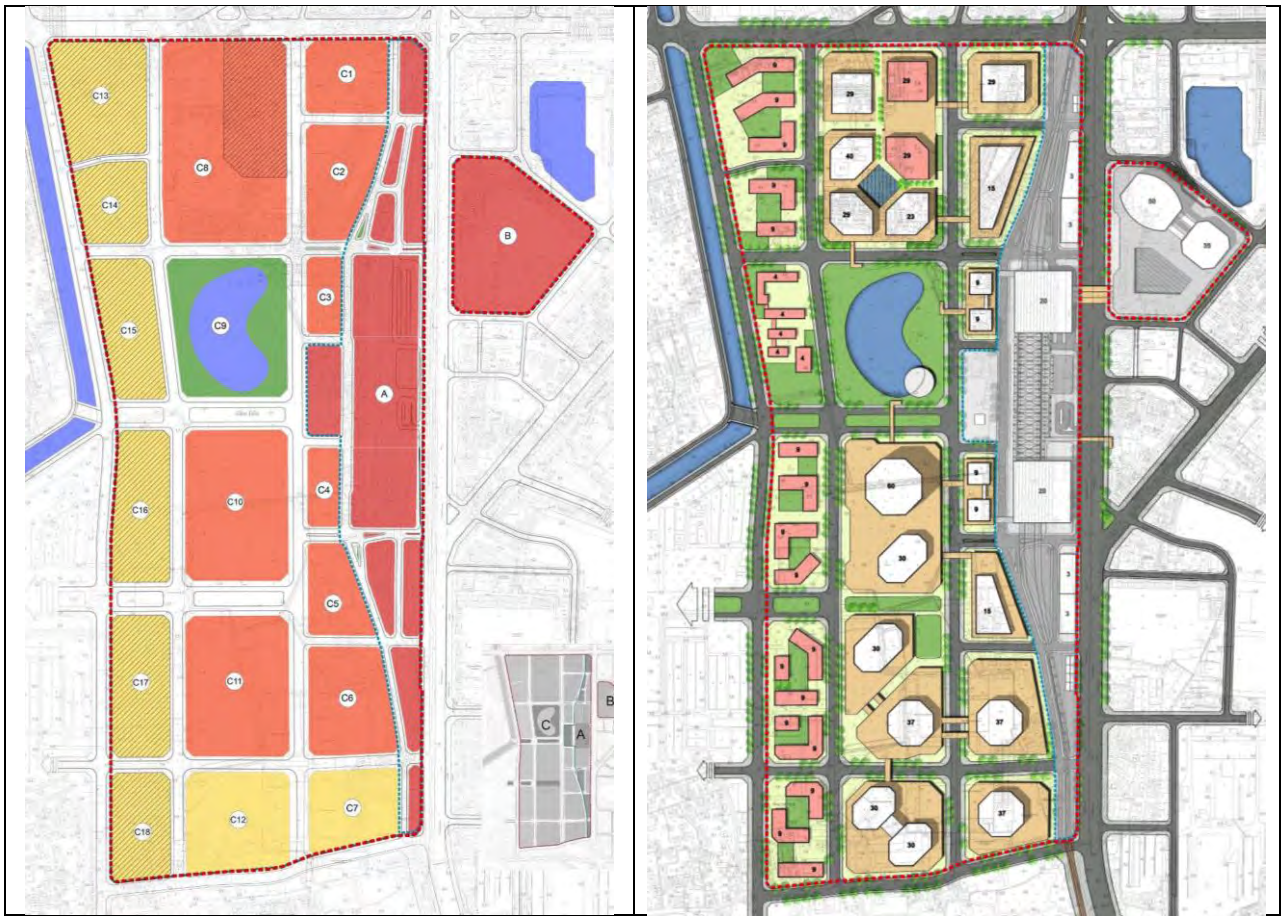
Table 6.7 Future Landuse Plan of West Area

Landuse		(m^2)	(%)
Public Land	Road	161,300	24.7
	Station plaza	10,600	1.6
	Park	47,000	7.2
	Sub total	218,900	33.6
Private Land	New development area[1)]	223,400	34.3
	High dense residential land	39,500	6.1
	Apartment for resettlement	20,800	3.2
	New town	28,800	4.4
	High rise apartment	34,200	5.2
	Army land, public facility	7,500	1.2
	Sub total	354,200	54.3
Reserved Land		78,900	12.1
Total		652,000	100.0

Source: JICA Project Team

1) New development area is consolidated lands of development potential land including water reservoir, Unused land, tree land, government land, factory land

Figure 6.9 Future Landuse Plan and Facility Layout Plan of West Area



Source: JICA Project Team

6.34 **Project cost for Land Readjustment Project:** The estimated total project cost is 320.9 million USD including construction costs for road and public infrastructure (73.8 million USD), compensation costs for people affected by road development, construction costs of resettlement apartments (139.4 million USD) and other construction-related costs such as land reclamation, utility development, survey and design, etc. (107.8 million USD) (see Table 6.8).

Table 6.8 Project Cost of Integrated Development of West Area

Item			Quantity (m^2)	Amount (million USD)
Public infrastructure cost	Road	Trunk Road	4,566	46.43
		Access Road	2,524	16.29
		Sub-total	7,090	62.72
	Park &Green		47,000	7.99
	Station Plaza		10,600	3.10
	Sub- total			73.81
Compensation cost	Compensation affected by trunk road development		88,500	92.93
	Apartment construction for resettlement			46.46
	Sub-total			139.39
Other costs	Land reclamation and preparation			6.99
	Utility	Drainage work	0	8.55
		Water supply	4,566	14.66
		Electric	9,132	4.05
		Sub-total	9,132	27.25
	Overheads cost			6.93
	Survey and Design fee			9.07
	Repayment of interest			31.16
	Operation cost			26.34
	Sub-Total			107.75
Total				320.94

Source: JICA Project Team

6.35 The total amount of revenue and expenditure must be equal to settle the project finance after completion of the project (see Table 6.9). To recover the investment costs, reserved land for development should be sold on the market. Since this is aimed to develop public infrastructure and reorganize land plots, there will be no profitable development. After development of road, infrastructure and land plots, the value of this western area will be significantly increased, which will promote the development of CBDs in other development areas.

Table 6.9 Income and Expenditure of Land Readjustment Project

Item			mill USD	Share (%)
Income	Sales of Reserved Land		247.13	77.0
	Arterial Road Cost sharing from Road Authority		73.81	23.0
	Total		320.94	100.0
Expenditure	Public Use	Road	62.72	19.5%
		Park &Green	7.99	2.5%
		Station Plaza	3.10	1.0%
		Sub-Total	73.81	23.0%
	Compensation related cost		139.39	43.4
	Other Cost	Land arrangement (reclamation)	6.99	2.2
		Infrastructure(drainage, electricity, water)	27.25	8.5
		Others (survey' design, operation cost, etc.)	73.51	22.9
		Sub-Total	107.75	31.4
	Total		320.94	100.0

Source: JICA Project Team

6.36 **Project Cost for CBD Development:** Though the principle of land readjustment project is to develop lands with road and infrastructure as non-profitable project, the profits are generated by development and leasing of commercial and business facilities. If the regulation of building height is 30F at maximum, 521.0ha of floors are newly created inside 65.2ha land (see Table 6.10 and Figure 6.10).

Table 6.10 Project Cost of CBD Development

Area	Facility	Development Indicators	Floor Area (m^2)	Construction Cost (million USD)	Remarks
Apartment for social housing (Block C7 and C12)	Apartment for resettlement and social housing	Land area: 41,700m^2 BCR: 70% Building area: 29,200m^2 Number of floor: 25F Total floor area: 730,000m^2 Construction unit cost: 700USD/m^2	280,000	196	3,500HH (80m^2/HH at average)
	Apartment for sale		200,000	140	2,000HH (100m^2/HH at average)
	Public facilities and commercial facilities		200,000	140	School, hospital, nursery, park, supermarket, etc.
CBD (Block C1-C6, C8-C11)	Commercial and office building	Land area: 216,000m^2 BCR: 70% Building area: 151,000m^2 Number of floor: 30F Construction unit cost: 700USD/m^2	4,530,000	3,171	CBD area
Total			5,210,000	4,046	

Source: JICA Project Team

Figure 6.10 Development Image of Integrated Urban Development of West Area

Source: JICA Project Team

6.6 Implementation Mechanism

1) Principle of Integrated Development for TOD

(a) Principle of Capital Gain

6.37 The proposed integrated development project is aimed to share costs and profits of the project equitably among stakeholders including existing property owners, new investors and governments, based on the principle of "Capital Gain". The capital gain of a project can be used to recover the investment costs including for public facilities through an increased asset value. By using this increased value, all stakeholders including the government, private developers, and right holders, will benefit from the projects, as follows (see Figure6.11):

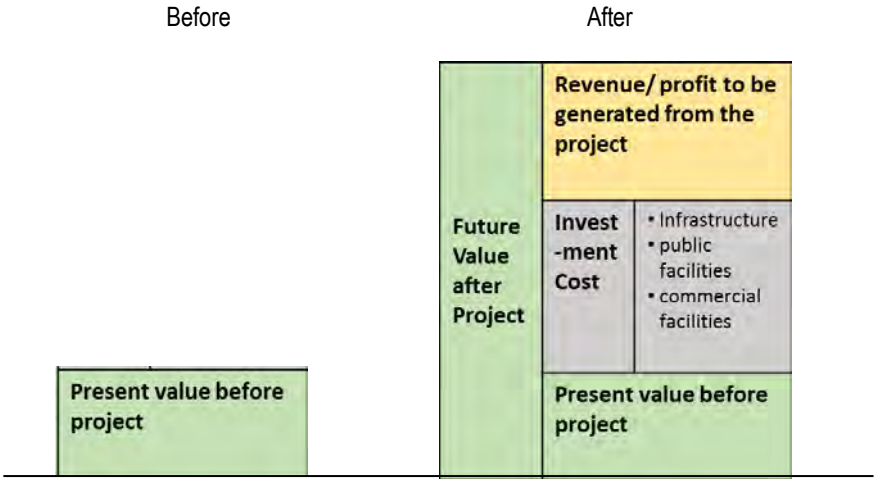
(i) The government can develop public infrastructure and facilities as part of an integrated project, and thereby raise profits through increased property tax;

(ii) The developer can recover the investment costs by selling reserved land (or reserved floor);

(iii) The right holders can participate in the project with their property asset and be provided with new properties (apartments) ;

(iv) Existing local communities benefit from improved transport and infrastructure and attractive urban facilities, and increased asset value as external economy.

Figure 6.11 Capital Gain Concept of Integrated Development



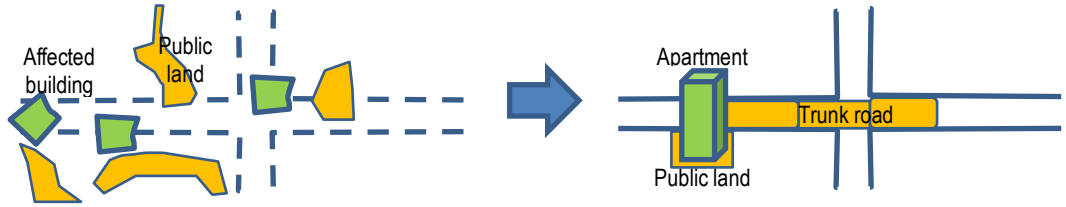
Source: JICA Project Team

(a) Land Replotting and Consolidation for Public Land for Road and Infrastructure

6.38 Based on this priniciple of right conversion, it should be possible to consolidate developable land near the station. Land in the vicinity of the station could be converted as well as developable land a little away from the station (factories, public land, etc.). This process is called "consolidated land replotting"; it facilitates complex urban developments at and around the station area. The mechanism of right conversion and land replotting should be accepted by Hanoi citizens.

6.39 For example, the existing facilities inside lands for planned roads must be relocated to make land vacant. To provide land and facilities for resettlement of affected households, the government will readjust public lands and unused lands to make land available for road and resettlement apartments, as shown in Figure 6.12. After consolidation of public land, and after development of roads, the government will sell the remained public lands, or build public apartment buildings for resettlement of the relocated households and low-income groups, and for sale, in order to recover the project costs.

Figure 6.12 Replotting and Consolidating of Public Land for Public Infrastructure Development



Source: JICA Project Team

(b) Mechanism of Integrated Urban Development

6.40 Right conversion system is proposed as an option which is to swap (exchange) properties of land and buildings to other land and buildings inside the project area after development project, without necessity of land acquisition with compensation and resettlement. By applying this method, prior investments are much reduced compared to BT method, since land replotting is agreed based on contract with right holders, without payment of compensation. For investors, they can acquire reserved land for sales or development to recover project investment cost. It is also significant for right holders that they can choose preferable conditions from some options including exchanging properties to other area inside the project area by participating in the project, or receiving compensation or lands in other area for resettlement as usual.

6.41 Right conversion development scheme such as Land Readjustment or Urban Redevelopment projects are proposed. By these mechanisms, a cumbersome negotiation procedure of land acquisition and resettlement could be eased; an option of resettlement within the project area could be offered; and efficient land use could be realized by integral urban development.

6.42 As these mechanisms raise fund for the project by selling “Reserved land” for Land Readjustment project, or “reserved floor” for Urban Redevelopment Projects, the project stand-alone accounting system should be adopted. Such an accounting system should be practiced for the project implementation in Hanoi.

2) Coordination with relevant plans and institutional arrangements

(a) Designation of TOD Planning Area for Integrated Urban Development

6.43 In addition to designation of “TOD Area” in the Zone Plan to ensure development access roads and facilities at and around the station, “TOD Planning Area” should be incorporated in the Zone Plan to promote an integrated TOD development adjacent to or in the vicinity of the UMRT stations, where a TOD project will be implemented on the basis of public-private partnership.

6.44 TOD Planning Area supposes more efficient land use and improvement of livelihoods. Development issues can be addressed through integrated development with the UMRT station, from an economic, social, and environmental perspective.

6.45 It can not be planned by the public sector alone, but it may be proposed to HPC by the private sector. However, the limits of the TOD planning area can only be stipulated and decided by the public sector and the designated in the Zone Plan (a rigorously authorized plan) for appropriate urban development management.

6.46 The TOD planning area proposed by the private sector must be deliberated by the evaluation council composed of the representatives of the relevant governmental agencies, and academic experts and experienced persons. Criteria for appraisal include :

(i) More efficient land use, especially for public land and land occupied by factories

(ii) Improved livelihoods in currently congested built-up areas;

(iii) Possibly, changes in land uses, BCR and building height limits designated in the Zone Plan (as incentives to promote TOD);

(iv) The private sector should provide some infrastructure required in Zone Plan as the priority projects

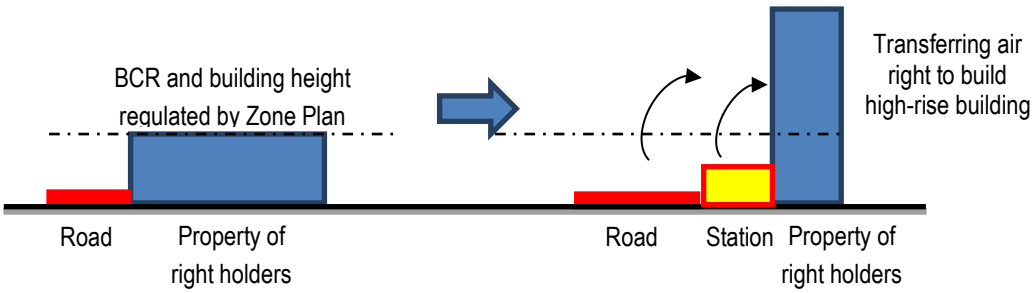
(v) To ensure better living environment and employment opportunities along UMRT lines, social housings are obliged to develop inside TOD planning area to accommodate resettled households in the TOD project areas and other resettlements affected UMRT and public infrastructure projects, and resettlements from the city center;

(vi) Individual (small-scale) development is limited to realize a comprehensive urban development in a consoildated (large-scale) land.

(b) Incentives of Air Right Transfer to Maximize Development Impacts

6.47 For an integrated development covering a broad area, the road network and public infrastructure must be developed to comply with the Zone Plan, Building Code and other legal bases. As an incentive for developers, providing supplemental air rights to recover infrastructure cost will be preferable to develop consolidated TOD area with public facilities so as to utilize the space in the project area more intensively (see Figure 6.13).

Figure 6.13 Concept of Air Right Transfer



Source: JICA Project Team

3) Participation of Stakeholders

(a) Roles and Responsibilities of Stakeholders

6.48 It is noted that TOD project is a project with public benefit, private initiative and community participation. For this, all stakeholders own their benefits and responsibilities based on the beneficiary to pay principle (see Table 6.11).

Table 6.11 Benefits and Responsibilities of Right Holders

	Benefits	Responsibilities
Government	• to increase public benefits by improvement of overall living and transport environment • to increase public revenue (tax income, landuse levy, etc.) • to reduce land acquisition with compensation	• to establish TOD project implementation committee • to protect rights of right holders during project implementation process (based on contract among three parties of government, investor and right holders) • to provide social housings in TOD project area
Investors	• to acquire development approval and landuse rights for comprehensive urban development around the station • to enjoy development incentives in TOD project (reduction of regulation of number of floors, exemption of land-related tax, soft loan, etc.) • to ensure stable and sustainable customers and profits in line with increased ridership of UMRT and increased employees • to promote urban development projects with endorsement and support by governments	• to participate in TOD project implementation committee. • to develop road and public infrastructure in compliance with the Zone Plan • to develop social housings including resettlements inside TOD project area and other areas • to ensure temporal housing during construction • to procure funds for project implementation • to negotiate with right holders for consensus building
Right holders	• to be ensured property rights during the project implementation process based on contracts agreed between the developer and the right holders (with endorsement by the government is preferable) • to acquire new apartment flats of the same value as their original property before the project, based on right conversion • to ensure employment opportunities in TOD project area to sustain livelihoods • to have opportunities to participate in the planning process and voice on new apartments as well as the whole project • to get profits from reserved lands if land price will be increased after the project	• to contribute a part of lands as land contribution for public infrastructure development, and/or reserved land for sale • to reduce floor size of apartment flats based on property appraisal, maintaining the same value before and after the project • to resettle in temporal housings in other areas during the construction period • to take a long time for project formulation, consensus building and construction

Source: JICA Project Team

(b) Establishment of TOD project implementation committee

6.49 To promote TOD projects, it is necessary to set up the organizational structure which all relevant stakeholders participate in whole process of the project planning, implementation and management. The project implementation committee for Giap Bat TOD will be established led by District PC, with participation of MOT-PMU, VNR, HAUPA, DOT, DOC, DONRE, DOF, TRANSERCO, Ward PCs and representatives of local communities.

6.50 The PMU conducts the competition to select a private developer (or JV consortium) which formulates the whole TOD plan, facilitates and invests projects. The developer formulates the project implementation plan including physical plan, financial plan and right conversion plan, by discussing with PMU or Steering Committee and public consultation with local communities.

6.51 The role of HPC is to monitor the project and provide technical and financial supports if required. The PMU must protect rights of right holders during the project implementation process. At the end of the project, increased property value will be shared equitably among stakeholders.

(c) Guidance for and Control on the Private Sector

6.52 A Major purpose of TOD, as an integrated development concept, is to develop infrastructure. For this purpose, HPC should take the initiative to involve the private sector in its implementation.

6.53 The Build-Transfer (BT) method is commonly used in Vietnam. With this method, developers are given permission to develop other areas whose value is equivalent to the cost of public infrastructure that they are obliged to develop within the project area. With this method, however, sometimes the developer does not develop infrastructure as agreed, but only invests in the permitted other development areas. There are no written standards for BTs about role and responsibility sharing between the public and the private sector, and the terms and conditions depend on the negotiation and agreement between the government and the developer, based on the content of the project.

6.54 Some guidelines should be established to provide guidance on TOD to ensure a certain level of service. They should apply to all the station areas.

(d) Participation of Right Holders

6.55 As mentioned above, original right holders can choose between two options: (i) participate in the project and settle in new apartments within the project area, and (ii) move out from the project area, with compensation.

6.56 Social housings are developed in TOD project area for resettlement of original property owners, and employment opportunities are ensured to sustain livelihoods and improve socio-economic activities for local communities.

6.57 Right holders who participate in the project can raise opinions for project contents not only housing issues but also overall project concept how to improve station area for new and original communities, since original residents know well issues of area and necessity for living environment improvement.

6.7 Conclusion and Recommendations

(1) Conclusion

6.58 After verification of proposed TOD projects of the Pre F/S, it is found project objectives are achieved as follows:

(a) Formulation of comprehensive concept plan in compliance with Zone Plan

- Zone plan can be realized with TOD concept to formulate a compact and competitive multi-functional urban core.
- For this, road transport facility project should be implemented as soon as possible for accessibility to station and for appropriate land use with road network.
- Landuse around the station should be mixed-use together with transport facilities to provide attractive functions and facilities for UMRT users, employees and communities.

(b) Project viability

- In case of VNR station area development, expected FIRR is from 17% to 51% which is highly viable to utilize VNR land and space above the station (air right) efficiently.
- Integrated bus terminal development project is also feasible with 25.5% of FIRR by ensuring financial profits of apartment and commercial facility development with the bus terminal. It is said that utilization of transport land for mixed-use is viable in terms of transport service improvement and socio-economic development.
- Integrated redevelopment project of west area realizes basic infrastructure on self-financing basis including roads, park and public facilities land. By reducing regulation of number of floors in the Zone Plan to utilize air rights, new floors are generated around the station which will raise profits for investors.
- Though each TOD project can be implemented independently, overall management of these TOD projects is significant in synergy. Implementation of TOD projects in VNR land and bus terminal land should be promoted at first in line with UMRT construction project. These TOD projects at the station and bus terminal will farther promote integrated development of west area in terms of promotion of UMRT ridership and understanding of TOD, provision of social housings, promotion of private investment, etc.

(2) Recommendations

6.59 Participation of various stakeholders to the project is the basis for success by providing resettlement housings inside the project area, and opinions and needs of stakeholders are properly reflected to the project.

6.60 Core investors must be found who are interested in proposed TOD concept plan and capable in terms of financial and technical capacity to realize the comprehensive and consolidated urban development around the station.

6.61 Capable project implementation body with coordinating capacity should be established to implement integrated development project involving various stakeholders,

6.62 Proposed right conversion system has advantages compared to the land acquisition method with compensation and resettlement at present. It protects rights of residents by converting of present property rights into new apartment flats without compensation and resettlement to other areas. For developers, they can reduce initial compensation costs which are the burden at present. To apply new methods including right conversion system, “Land Readjustment” method which is popular in Japan will be studied farther for appropriate application to Hanoi City.

7 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

1) Importance of TOD

7.1 While UMRT projects in Hanoi have been making progress including Line 1, Line 2, Line 2A and Line 3 at different stages of development, it is becoming an increasingly important concern on planning and implementation of TOD related to UMRT. The HAIMUD2 Study confirmed the roles of TOD in Hanoi are as follows:

(i) **TOD will affect the ridership of UMRT:** The ridership of UMRT will be significantly affected by the conditions of access to the stations. Particular importance should be given on the improvement of walking conditions and environment in the area within walking distance of UMRT station (500-800 meter radius area), improvement of roads and provision of facilities for smooth access by other modes of transport including bicycle, motorcycle, taxi and bus.

(ii) **TOD will contribute to economic development at and around the stations:** UMRT will enhance economic development opportunities at and around the stations when the urban developments are planned and implemented adequately. The urban and transit integrated development (TOD) will also contribute farther enhancement of UMRT ridership and convenience of UMRT users.

(iii) **TOD will contribute to enhancement of social and environmental conditions in the influence area of UMRT:** Improvement of walking conditions within the station catchment area (500-800 m radius), access roads, intermodal facilities at the station area, and integrated urban development will provide extensive opportunities for improvement of local communities.

7.2 While the impact of UMRT is extensive, TOD should be planned at three spatial hierarchy as follows:

(i) **TOD at Regional Scale:** UMRT in Hanoi is planned as an integrated network to cover the urban area so extensively future urban growth and landuse will be affected significantly. At this level main focus should be placed on integration of long-scale urban development such as new urban development around the West Lake, Hoa Lac High-tech Park, other large-scale potential new town developments along UMRT Lines.

(ii) **TOD at UMRT Corridor and Cluster Level:** As UMRT is to serve accessibility and mobility along UMRT line; TOD should focus on the opportunities of traffic improvement and urban development opportunities along UMRT corridor and urban cluster. Development of Line 1, Line 2 and Line 3 which covers Hanoi city centre area is the most important in this context.

(iii) **TOD at and around UMRT Station:** Planning and development of TOD at this level will directly affect the performance of UMRT in terms of ridership and socio-economic development and environmental management in the localities.

2) Main Outputs of TOD

7.3 HAIMUD2 covers a total of 18 stations included in the phase 1 of UMRT Line 1 and Line 2. In order to maximize the impacts of UMRT in the most effective manner as in

aforementioned manner, main measures and interventions that have been planned in the Study include followings:

(i) **Improvement and Development of Main Roads included in Zone Plan:** Main roads included in Zone Plan which connect UMRT stations should be given priority in improvement and development, especially in the areas at and around the stations in integration with UMRT development. This will not only facilitate efficient implementation of both projects but also provide more effective opportunities in resettlement of affected households and land acquisition.

(ii) **Improvement of Local Roads and Alleys**: Main mode of access to UMRT is walking as is experienced in many other transit cities in the world. The improvement of walking conditions and environment is so important that level of improvement affects the spatial coverage of UMRT influence area. In Hanoi, access to UMRT station by bicycle and motorcycle should also be duly considered. The improvement of local roads and alleys including pavement, drainage, traffic signage and control, street lighting, tree planting, safety facilities, among others, should not only focus on the improvement of access to UMRT but also the overall improvement of mobility and living environment of local communities.

(iii) **Enhanced Traffic Management of Hanoi City Centre:** Development of UMRT Line 1, Line 2 and Line 3 will provide a significant opportunity for Hanoi City to improve traffic situation in the city centre. The city centre will be provided with UMRT stations including Hang Dau, Long Bien Nam, Hoan Kiem Lake, Tran Hung Dao and Hanoi Stations (Phung Hung Station could be added due to decision on 75 meter option alignment). Almost entire areas in AQ and FQ are covered within the walking distance of UMRT. Together with provision of parking facilities at the periphery, special circulation bus and restrain measures against the entry of car, there is a high possibility of improving traffic situation in the city centre dramatically.

(iv) **Promotion of UMRT Integrated Parking Facilities:** Although UMRT station must be provided with adequate parking facilities to strengthen intermodal connectivity, there are many stations which lack proper space for provision of parking facilities especially in the city centre. Therefore considerations must be given on the use of space under the viaduct and integrated development of underground space which will be made available during the construction of UMRT[2].

(v) **Provision of New Bus Services:** In addition to reorganization of existing city bus services (rerouting and adjustment of bus frequencies) it is advisable to add new bus services in integration with UMRT services. One is UMRT relay bus which provide high quality services along planned extension route of UMRT. The relay bus is directly connected at the end or near end stations of phase 1 section such as Tay Ho Tay of Line 2 and Giap Bat and Gia Lam of Line 1 based on common fare. This will complement relatively short phase 1 section of UMRT with seamless services to attract passenger of outer areas[3]. Circulation services using smaller capacity buses in the city centre and specific areas will also be feasible.

[2] For example, as is in the case of Tran Hung Dao station underground parking facilities can be constructed at much lower cost when it is constructed together with UMRT.

[3] When Phase 2 sections are completed, the relay bus services will be farther moved to outer areas.

(vi) **Creation of Integrated Urban Development Opportunities:** UMRT can create ample opportunities for integrated urban development/redevelopment which will be benefited through improved accessibility. They include, but not limited to, (i) public facilities such as hospitals, universities, factories, government facilities, etc., (ii) old public apartment areas, (iii) VNR lands, (iv) underutilized bus terminal areas, (vi) planned new town areas, and (vii) underground space.

(vii) **Comprehensive TOD at Main UMRT Stations:** Among the stations, there are a number of potential stations which can serve as key inter-modal nodes and, at the same time, as a new urban core. They include Hanoi station, Giap Bat station and Gia Lam station, and are provided with ample underutilized land and space. With implementation of comprehensive TOD, concentrated CBD function in the city centre can more adequately be dispersed to outer areas. Promotion of development of new sub CBD in outer areas in integration with UMRT will not only improve traffic situation but also contribute to urban growth management and effective landuse of the city.

3) Pre-Feasibility Studies

7.4 In order to verify the aforementioned TOD opportunities, pre-feasibility studies were conducted on three projects, including (i) Transport Access Improvement of UMRT, (ii) Underground Parking Facilities at Tran Hung Dao Station and (iii) TOD at Giap Bat Station Area. Findings and conclusions are as follows:

(a) Pre-FS on Transport Access Improvement of UMRT

(i) **Objective:** This is identify necessary projects to ensure the smooth access to UMRT stations in the 500 meter radius areas of the entire 18 stations included in the Phase 1 of Line 1 and Line 2.

(ii) **Project Grouping by Implementation Stage:** Identified projects were grouped into short-term projects, minimum projects and basic projects. Short-term projects refer to those that must be completed before the opening of UMRT. Minimum projects are those included in short-term projects and require no land acquisition. Basic projects include those which UMRT station must be essentially provided with such as station plaza and other intermodal facilities.

(iii) **Project Cost**: Total project cost required for 18 stations is 7,980 billion VND or 372 million USD, of which, 2,275 billion VND or 29%, and 5,685 billion VND or 71% for Line 1 and Line 2, respectively. Minimum projects share 3,170 billion VND or about 40% of the total.

(iv) **Possible Funding Sources:** Possible funding sources include DOT, MOT-PMU (Line 1), MRB (Line 2), District PC, private sector and their combinations. Roads included in Zone Plan will be covered by DOT, while local roads and alleys by District PC. UMRT related projects will be covered by UMRT project implementing body while those related to integrated urban development will be by private sector.

(v) **Project Management:** As many of the projects are either within ROW of UMRT or closely related to UMRT, UMRT implementing body should be the overall project management body, on those outside ROW of UMRT close coordination with relevant organizations is necessary, especially DOT.

(vi) **Project Evaluation:** While the project is economically viable with EIRR of 17.8%, it is not financially viable simply because many projects cannot generate revenue.

Considering positive social and environmental impacts of the project on localities, the project can be justified and implemented with public sector initiatives.

(b) Pre-FS on Underground Parking Development at Tran Hung Dao Station

(i) **Objective:** The Study is to define demand supply gap of parking facilities in the city centre and assess feasibility of underground facilities at Tran Hung Dao Station.

(ii) **Project Cost:** The project can take advantage of reducing construction cost of underground parking at 1/3 – 1/4 by constructing the facilities simultaneously with UMRT. Normally underground parking construction cost is 70-80 million VND/m^2, while the project cost is 20 million VND /m^2.

(iii) **Project Evaluation:** Project is economically feasible due to reduction in on-road parking space, improved traffic flow and safety. When the underground parking mainly serves car, it is also financially viable with FIRR of more than 12%.

(iv) **Need for underground parking development Integrated with UMRT:** It is desirable to study development of underground parking facilities for other UMRT stations.

(c) Pre-FS on TOD at Giap Bat Station Area

(i) **Objective:** This is to assess feasibility of developing Giap Bat station area as a comprehensive intermodal node and new urban core to promote sustainable development of rapidly growing urban areas in the south of Hanoi.

(ii) **TOD Project Concept and Components:** While overall project concept is to assess opportunity to create a new competitive urban centre, it will comprise three project components including (i) Redevelopment of VNR land including UMRT station, (ii) Redevelopment of bus terminal, and (iii) Development of west areas of the station. Because of the provision of competitive mass-transit service of Line 1 and planned Ring Roads, the areas have very high opportunities for more value added and high density developments to transform the suburban areas to competitive urban centre.

(iii) **Project Evaluation:** It is expected that aforementioned TOD through three project components will enhance the value of the space, land and facilities dramatically. However, in order to implement the concept, a new approach is necessary including, among others, land readjustment, right conversion, air right, which require institutional arrangements.

7.2 Recommendations

7.5 In order to move to the next step of implementing TOD, main recommendations of the study include following:

(a) **Inclusion of TOD Plan in Zone Plan:** As Zone Plan is the official urban plan with legal binding, proposed TOD plan should be included in Zone Plan. While this has been attended in HAIMUD2 through coordination with HAUPA, it must be applied to other UMRT stations as well.

(b) **Strengthening of Coordinating Function in TOD Planning and Implementation:** TOD involves wide range of projects and require cross sector attention at different spatial scale and by different stakeholders. Projects include transportation (roads, traffic control and management, bus operation, etc.), urban development (commercial facilities, housing, various public facilities) and environmental management (street trees, street lighting, drainage, etc.). TOD involves various government organizations and departments as well as private sector and communities. In order to facilitate effective planning and implementation of TOD, there is a need for designating main coordinating body in planning and implementation. While HAIMUD2 is implemented through HAPI for coordinated planning, a main body for implementation of TOD projects in coordinated manner should be identified.

(c) **Expansion of UMRT Project Coverage:** At present, UMRT projects are limited to those which are directly related to UMRT construction and operation. UMRT ROW is also limited to the area to include the facilities required for operation of UMRT itself. As TOD at the station area will directly affect the performance of UMRT, it is necessary to expand the responsible area and scope of UMRT.

(d) **Promotion of Private Sector Participation:** There are ample opportunities in TOD where private sector can effectively participate, especially through integrated urban development and operation and management of public facilities. However, in order to guide and manage initiatives and capacities of private sector, it is necessary for government to provide a set of rules and guidelines to ensure the balance between public and private sector benefits.

(e) **Considerations on Institutional Arrangements:** In order to implement proposed TOD in the most effective manner, it is also necessary to provide adequate institutional framework with particular regard to the following:

  (i) **Designation of TOD Area and Provision of Development Guideline:** In order to farther ensure integrated development of proper infrastructure and facilities the coverage of TOD area should be clearly delineated. The TOD area should not only included in Zone Plan but also will be provided with a set of rules and guidance for implementation of the identified projects. For example, the projects located in TOD area should be given priority for their completion in time of UMRT operation.

  (ii) **Establishment of TOD Planning and Projects Coordination Mechanism:** Necessary institutional arrangements should be considered on effective planning and implementation of TOD based on farther study.

  (iii) **Introduction of Alternative Urban Development Methods:** While TOD is mostly practiced in existing urban areas, land acquisition, resettlement and adjustment of various rights of different stakeholders cannot be avoided. As is practiced in many other developed cities, there are useful references that can be introduced in Hanoi as alternative to currently practiced methods. Those which are found effective in TOD include “land readjustment” and “urban renewal” that have been widely experienced in Japan’s cities.