

Islamic Republic of Iran

**Data Collection Survey
on Transit Oriented Development (TOD)
in the Islamic Republic of Iran**

Final Report

May 2018

JAPAN INTERNATIONAL COOPERATION AGENCY

**NIKKEN SEKKEI RESEARCH INSTITUTE
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Abbreviations

| | |
|------|---|
| AGT | Automated Guideway Transit |
| BCR | Building Coverage Ratio |
| BHRC | Housing and Urban Development Research Center |
| BPO | Business Process Outsourcing |
| BRT | Bus Rapid Transit |
| CBD | Central Business District |
| DB | Deutsche Bahn |
| DMU | Diesel Multiple Units |
| FAR | Floor Area Ratio |
| GHG | Green House Gas |
| GMS | General Merchandise Store |
| ITDP | Institute for Transportation and Development Policy |
| IKIA | Imam Khomeini International Airport |
| JICA | Japan International Cooperation Agency |
| KL | Kuala Lumpur |
| LRT | Light Rail Transit |
| MOI | the Ministry of Interior |
| MRMO | Municipality and Rural Management Organization |
| MRUD | The Ministry of Road and Urban Development |
| NGO | Non-Governmental Organization |
| NTDC | New Town Development Company |
| ODA | Official Development Assistance |
| PBO | Planning and Budget Organization |
| PPP | Public Private Partnership |
| RAI | The Railways of the Islamic Republic of Iran |
| RER | Réseau express régional d'Île-de-France |
| ROW | Right of way |
| SC | Steering Committee |
| SPAD | Land Public Transport Commission |
| SPV | Special Promotion Vehicle |
| TDM | Transportation Demand Management |
| TfL | The Transport for London |
| TOD | Transit Oriented Development |
| TZS | Traffic Zone System |
| UMRT | Urban Mass Rapid Transit |

1. Introduction

1.1 Background

Air pollution is a serious problem in the metropolitan areas of the Islamic Republic of Iran. Reducing air pollution is one of the priorities in the Sixth Five-Year Economic, Cultural and Social Development Plan for 2016–2021 (hereafter referred to as “the Sixth Five-Year Development Plan”). The promotion of public transport has been listed as one of the measures for reducing air pollution in the Second Clean Air Action Plan in Tehran (2013). Moreover, Tehran Municipality and Rural Management Organization (MRMO) aims to increase the modal share of public transport in Tehran to 75% (30% of railway), up from 68% (13% of railway) in 2014.

The Ministry of Road and Urban Development (MRUD) is formulating a Transit Oriented Development (TOD) Guidelines. Since TOD is a new concept in Iran, MRMO requested the Government of Japan in 2015 to provide technical assistance for the development of policies and institutional structures toward implementing TOD. In response, the Japan International Cooperation Agency (JICA), an implementing agency for Official Development Assistance (ODA) of the Government of Japan, collected part of the relevant information through the Data Collection Survey on Urban Development and Transportation in Iran conducted in 2015-2016. It was judged necessary to conduct a further study for analyzing the issues in implementing TOD in Iran and for examining the possibility of future assistance by JICA. A joint venture of NIKKEN SEKKEI RESEARCH INSTITUTE and PADECO Co., Ltd., two of the leading Japanese consulting firms in this field, was selected to conduct the study.

1.2 Study Objectives

The objectives of this JICA study are as follows:

- to analyze the current situation and identify the issues in order to implement TOD, which has been promoted by the Government of Iran;
- to support the Government in drawing up draft TOD guidelines and confirm the implementation structure for the TOD effort in Iran; and
- to collect and analyze necessary information to formulate assistance measures by JICA for implementing TOD.

1.3 Study Area

The study area surveyed in this study is the Islamic Republic of Iran, focusing especially on the Tehran metropolitan area as shown in Figure 1-1.

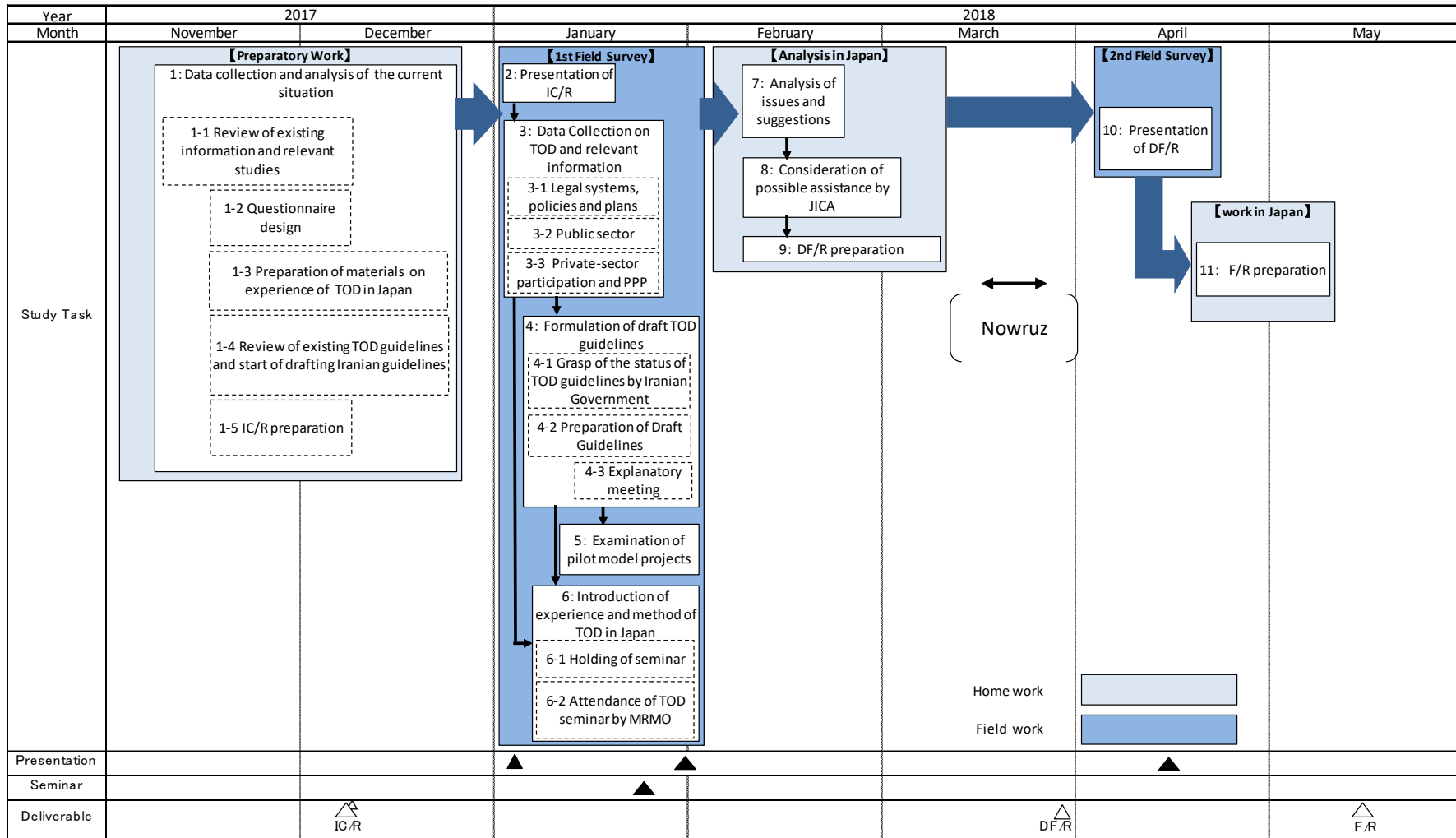


Source: Google, JICA Study Team

Figure 1-1 Study Area

1.4 Study Tasks and Flow

The tasks and the flow of the study are shown in Figure 1-2.



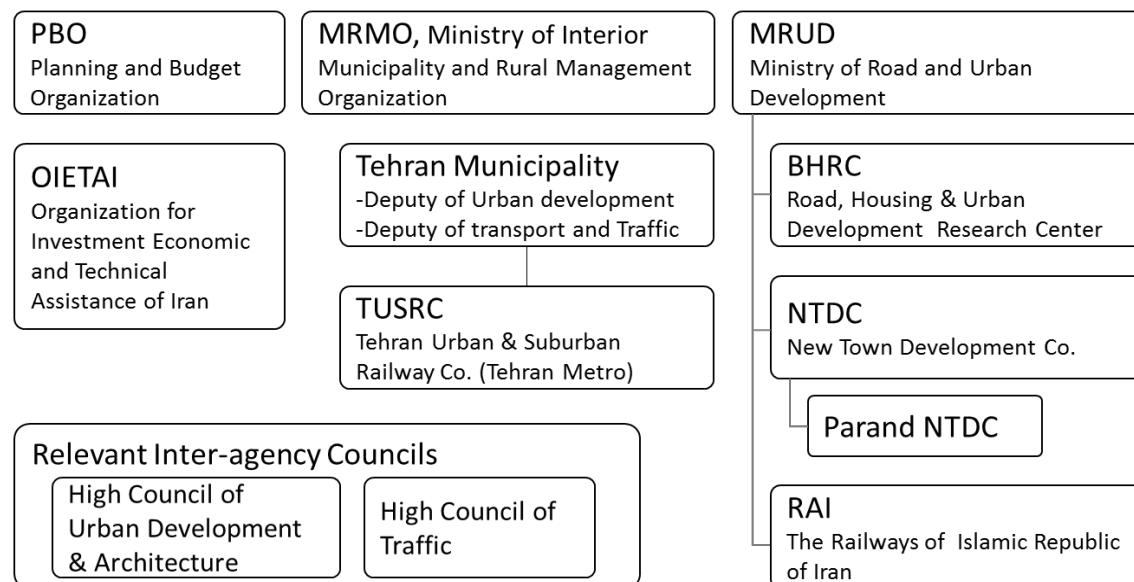
Legend: IC/R: Inception Report, DF/R: Draft Final Report, F/R: Final Report

Source: JICA Study Team

Figure 1-2 Tasks and Flow of the Study

1.5 Implementation Structure

Figure 1-3 shows the authorities relevant to the study. The main counterpart agencies of the JICA Study Team are MRMO, which is responsible for urban transportation, and MRUD, which is responsible for intercity transportation and urban planning.



Source: JICA Study Team

Figure 1-3 Authorities Relevant to the Study

Table 1-1 Major Authorities and their Roles

| Major Authorities for the Study | |
|---|---|
| MRMO Municipality and Rural Management Organization | To manage urban rail and urban development as the competent authorities. |
| MRUD Ministry of Road and Urban Development | Implementation of programs and policies of government in urban planning, housing and Suburban railway. Mehr Housing Project. |
| Other Authorities | |
| PBO Planning and Budget Organization | To examine the budget and approve investment for each project. |
| OIETAI Organization for Investment, Economic and Technical Assistance of Iran | A One-Stop Institution for Foreign Direct Investment in Iran or Iran's Investment abroad including Private Sector and PPP Scheme |
| Tehran Municipality, Deputy of Transport and Traffic | Urban planning in Tehran |
| Tehran Municipality, Deputy of Urban Development | Traffic and Transportation planning in Tehran |
| Tehran Urban & Suburban Railway Co | Tehran Metro and its extension to the suburbs |
| BHRC Road, Housing and Urban Development Research Center) | A research institute on housing and urban development under MRUD. In corporation with MRUD, BHRC is drafting the national TOD guidelines. |
| NTDC New Town Development Company | A subsidiary company for New Town development under MRUD. |
| RAI The Railways of Islamic Republic of Iran | A national Railway organization under MRUD. To manage urban railway and commuter railway from Tehran. |
| High Council of Traffic | Council under the president's direct control. |
| High Council of Urban Development and Architecture | Council under the president's direct control. |

Source: JICA Study Team

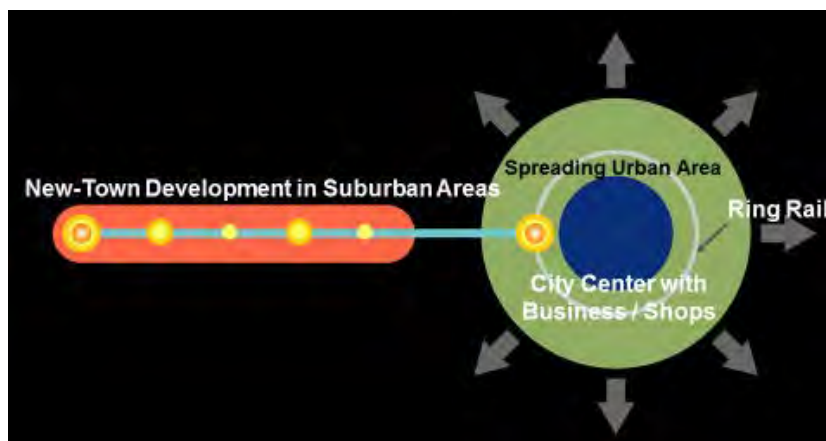
2. Study Approach

2.1 Introduction of Experiences and Methods of TOD in Japan

In Japan, many new towns along railway lines by private railway companies in the suburbs of metropolitan areas such as Tokyo, Osaka, and Nagoya were developed during the 1960s through the '80s, and urban development in areas along railways in the suburbs of the National Capital Region was initiated by the public sector following the approaches for suburban development by private railways¹. In the background of such developments were challenges such as needs to address serious traffic congestion and air pollution arising from rampant city expansion, conserve energy as a result of the oil shock, and improve the urban living environment, which are similar to the urban issues currently faced by the large cities of Iran. Although from a historical viewpoint it can be seen that urban planning in Iran has been influenced by the United States and Europe², it seems that the accumulation of urban planning experiences and know-how to address the above-mentioned urban problems in Japan is considered to be beneficial to present-day Iran as well.

Urban development based on railway improvement in large cities in Japan is what is called Transit Oriented Development (TOD). In urban development projects based on TOD, offices, residences, and other facilities are located within walking distance from a train station, thereby enabling people to be less dependent on automobiles. This results in an environmentally friendly city with reduced CO₂ emissions; concentration of urban services in the area around the station, which improves convenience; and a city with universal design spaces that is friendly to children, the elderly, and people who have difficulty moving around.

Figure 2-1 shows a model of TOD based urban development along railroads in major metropolitan areas of Japan. City functions such as business and commercial functions are established around the terminal stations in the city center and the suburbs, which many passengers use, and at the same time railroads connecting these hub stations and urban areas along railroads are developed. These project integrations have made it possible for both railway development and urban development projects to produce high synergy effects.

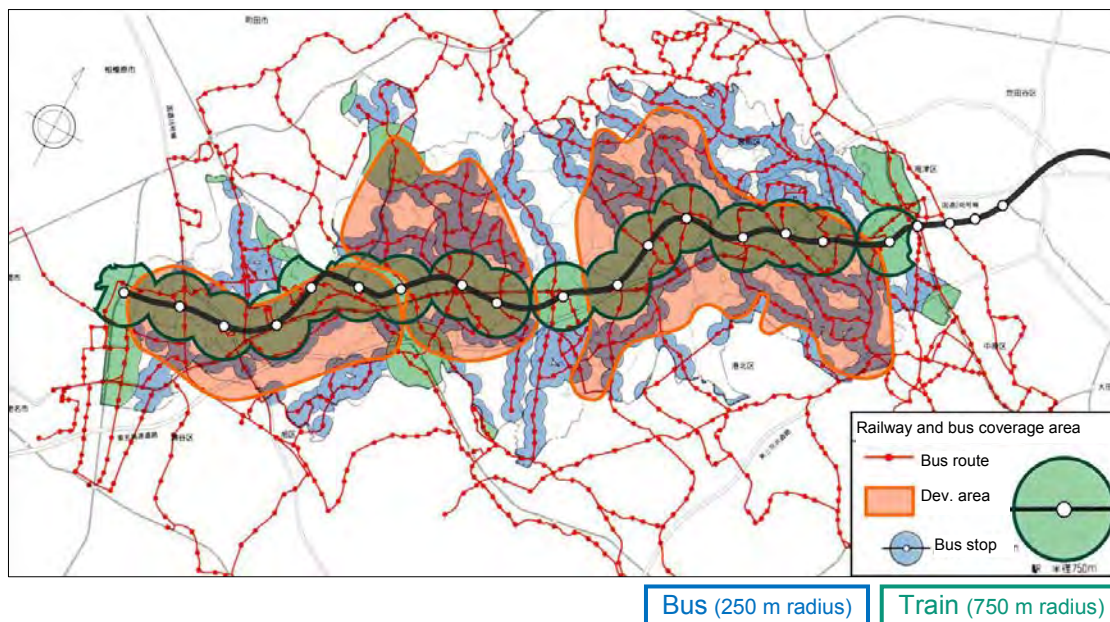


Source: JICA Study Team

Figure 2-1 TOD Based Urban Development Model in Metropolitan Areas of Japan

¹ Act on Special Measures Concerning Comprehensive Advancement of Housing Development and Railway Construction in Metropolitan Areas (enacted 1989)

² The city planning system in Iran is considered to be influenced by American type zoning system and German type city planning system.



Source: JICA Study Team

Figure 2-2 Coverage Areas by Public Transportation in the New Town in the Suburb of Tokyo

In Tama Den-en Toshi City, a typical TOD project in Tokyo, a railway was constructed starting from Shibuya Station as the hub station. In the area along this railway, housing development was implemented in the area within walking distance (within a radius of 750 meters / ten minutes' walk) of each station, and was then expanded over an area covered by a bus network connected to the station (see Figure 2-2). More than 50 years after the launch of the project, over 400,000 people live in a huge residential area of around 5,000 hectares.

Taking note of the similarities between the urban issues that were faced by Japan in the past and the challenges that Iran's large cities are currently up against, this study, upon consideration of the stage of development of cities in Iran and the situation of urban and urban transportation problems they face, provides a systematic introduction of Japan's experiences and expertise concerning TOD, as well as concrete examples of urban development and urban development methodology that can serve as reference. These can be utilized in studying guidelines for TOD in Iran.

2.2 Review of TOD Policies and Experiences in the World

Recent years have seen more active efforts to promote TOD throughout the world. Centering on North America, many TOD guidelines and related policy papers have been formulated with contents ranging from those focusing on policy and strategy to those including specific approaches and individual facility design guidelines. In developing nations as well, there are excellent examples such as India's TOD policies and TOD guidelines³ formulated by major cities. In addition, TOD-related policy papers, guidelines, and other materials issued by the World Bank and related research institutions are also believed to be valuable sources of information.

In addition to referring to the abovementioned TOD experiences and methodologies of Japan, this study also broadly reviews TOD guidelines, policy papers, and other data from around the world

³ For example, the TOD guideline "Transit Oriented Development - Policies, Norms, Guidelines -" published by the Delhi Development Authority in 2012 includes practical content.

in order to help support the formulation of Iran’s TOD guidelines. In fact, the study team confirmed that the TOD guidelines formulated by MRUD refer to the Institute for Transportation and Development Policy (ITDP) related papers and TOD policy of India as an introduction of the TOD basic policy. In addition, the TOD guidelines proposed by the study team shown in Chapter 4 were examined with reference to the elements of the guidelines indicated in Table 2-1, because some of them include practical contents which could supplement the TOD guidelines formulated in Iran.

Table 2-1 TOD Guidelines and Related Policies from Around the World

| | |
|-----------------------------|--|
| TOD guidelines | <ul style="list-style-type: none"> • USA: BART (San Francisco), DART (Dallas), Albany City, Kansas City, Allegheny County, etc. • Canada: Toronto, Montreal, Calgary, Edmonton, etc. • Others: Queensland (Australia), Delhi (India), etc. |
| Related policy papers, etc. | <ul style="list-style-type: none"> • World Bank: Financing Transit-Oriented Development with Land Values (2015), Transforming Cities with Transit (2013), Eco2 Cities (2010) • JICA : Project for Studying the Implementation of Integrated UMRT and Urban Development for Hanoi in Vietnam: Final Report, TOD Guideline (2015) • Institute for Transportation and Development Policy (ITDP): TOD Standard (2017) |

Source: JICA Study Team

In addition, with development of city railways in Southeast Asia, many TOD-related projects are being planned and implemented. In Bangkok, Thailand, where the development of urban railroads was carried out relatively early, the convenience of connecting to facilities in the area surrounding the station in the city center has improved since the development of pedestrian networks. Also, since housing development has been concentrated in the areas along the railway, the sprawl in the suburbs has been controlled. Meanwhile, in most of the cities in Southeast Asia such as Manila and Kuala Lumpur where urban railway development is progressing, the issues on TOD promotion as shown in Table 2-2 are also observed. In Iran where the promotion of TOD has just begun, taking the issues currently faced by the Southeast Asian countries into consideration seems to be useful for making the TOD policy in Iran, including TOD guideline formulation, more practical.

Table 2-2 Issues in Promoting TOD in Southeast Asia

| |
|---|
| <ul style="list-style-type: none"> • Gap between incentive policies and private sector needs • Lack of platforms for public-private dialogue • Lack of systems ensuring development of public facilities around stations • Lack of development of legislation for promoting TOD; the organizational silos of related government departments • Lack of development of concrete and practical guidelines for materialization of TOD; lack of clarification of the government desk handling the individual requests of private sector companies, etc. |
|---|

Source: JICA Study Team

2.3 Appropriate Implementation and Collaboration System for Promotion of TOD

The government agencies related to the promotion of TOD in Iran can be classified into the two groups shown in the following table.

Table 2-3 Grouping of Government Agencies Related to the Promotion of TOD in Iran

| |
|--|
| <p>Group (1) Group aiming for unified development of suburban railways and the areas along the lines</p> <p>Ministry of Road and Urban Development (MRUD), Iran Railways (RAI), New Town Development Company (NTDC), Road, Housing and Urban Development Research Center (BHRC), etc.</p> |
| <p>Group (2) Group aiming for unified promotion of urban railways and urban development</p> <p>Municipality and Rural Management Organization (MRMO), Transportation and urban planning related institution of each municipality (such as Tehran Urban and Suburban Railway Group of Companies (Tehran Metro), Tehran Municipality Deputy of Transport and Traffic, Tehran Municipality Deputy of Town Planning & Architecture), etc.</p> |

Source: JICA Study Team

In order to promote TOD, unified engagement and collaboration that go beyond the boundaries of government administration are needed, but this requires close cooperation between Group (2), which is concerned with the development and operations of railways in the city (urban railways), and Group (1), which is concerned with the development and operations of suburban railways that extend across municipal administrations. However, there is an exception to this organizational silo in Tehran, with Tehran Metro in Group (2) currently extending its metro line to outside the city area⁴.

In this study, under the initiative of MRMO, a Steering Committee (SC) with members from key government agencies that extend across the above two groups was established in order to effectively advance the study. The Planning and Budget Organization (PBO), the main agency responsible for the Iranian government's investment matters and coordination of the state budget, is also a member of the SC. This SC will be beneficial in coordinating views and examining cooperation measures and others for implementation of the TOD project. In addition, expectations are held that it will continue to serve a core role in the implementation of relevant projects based on the guidelines for TOD in Iran that this study will help formulate in Iran.

⁴ Through this extension, the Tehran Metro Line, which connects to Tehran Imam Khomeini International Airport located outside the city, opened for service in August 2017.

3. Current Situation of TOD in Iran

3.1 Policies Related to TOD

3.1.1 Sixth Five-Year Development Plan for 2016–2021

The Sixth Five-Year Economic, Cultural and Social Development Plan for 2016–2021 (hereafter referred to as “the Sixth Development Plan”), approved by the Iranian Parliament in March 2017, sets the policies, objectives and goals to be achieved by the country over the next five years. The national development policies for the transport sector are stipulated in “Chapter 11: Transportation and Housing” of the plan. While TOD-specific policies are not depicted in the plan, relevant content mentioned in Chapter 11 include the following:

- Article 52 stipulates policies to strengthen the railway sector, encourage non-governmental sector investment in this area, facilitate and accelerate project implementation, and improve public satisfaction with transport services provided by rail. The policies that may be relevant to TOD are as follows:
 - The non-governmental sector’s investment in the development and utilization of railway transportation within and between cities will be regarded as investment in less developed regions and will be subject to all laws and regulations that govern investment in less developed regions.
 - The Ministry of Road and Urban Development (MRUD) is obligated to establish suburban passenger railway transportation and develop suburban railway lines as a subsidiary of the Railways of the Islamic Republic of Iran (RAI) that is to be established. In cooperation with relevant municipalities, this subsidiary company will be responsible for performing all activities of passenger railway transportation in the suburbs.
- Article 59 stipulates that MRUD and the Ministry of Interior (MOI) are obligated to take actions for the revival, rehabilitation, improvement, reinforcement and recreation of minimum of two hundred seventy blocks in the framework of National Center for Sustained Urban Recreation studies.

3.1.2 Resolution regarding TOD by the High Council of Urban Planning and Architecture

The High Council of Urban Planning and Architecture sent a letter to Deputy of Traffic Department, MRUD and the letter has approved TOD related matter on June 12, 2017 that is to place emphasis on TOD in the agenda of national and regional development and in national, regional and local development plans. With the implementation of TOD, it is hoped to move toward the following:

- In social terms: Moving towards increased equality, citizenship rights and social justice
- In economic terms: Easier access of individuals to job opportunities and economic facilities
- In environmental terms with smart urban growth approach: Land use arrangement based on public transport, human-centered development and non-motorized transport, and preserving environmental resources and assets

The objectives and goals of TOD and the obligations and measures indicated in this approved document are as follows:

Objectives:

- The major objective of TOD is to place emphasis on the integration of “urban and local development” and “public transport”, which leads to improving the quality of urban life and the capacity of cities’ livability.

Micro Goals:

- Urban and local development planning, based on the integration of transport terminals, corridors, and public transport networks (including the possibility of improvement to rail-based systems, if necessary)
- Integration between appealing urban land use and stations by providing access to non-motorized transport systems, walking and bicycle riding
- Development of national and regional rail network in line with the situation and location of cities, work and activity centers and residential areas with development potential and in line with national and regional development plans
- Development of transport stations, in consideration of the role of the work and activity centers in urban redevelopment and an emphasis on sustainable urban policies
- Adopting spatial city perspective with maximum involvement of all beneficiaries and stakeholders
- Development of local communities
- Promotion of the sense of belonging among citizens

Obligations:

- In collaboration with relevant authorities, the Deputy of Transport Department of MRUD shall prepare TOD guidelines within two months. The guidelines prepared shall be sent to the High Council of Urban Planning and Architecture for approval.
- Where development plans (at national, regional and local levels) are in the process of revision or preparation, the measures introduced in this document shall be followed.
- All relevant authorities including the MRUD, municipalities and relevant stakeholders shall facilitate the implementation of TOD plans and projects.
- In view of the importance of public transport systems in the national TOD approach, the role of terminals in the cities within the framework of civil and development plans shall be reviewed and strengthened.

Measures to be taken:

- Through consultation with scholars, professionals and experts, this document shall be revised or amended within a particular timeframe, and the outcome shall be sent to the High Council for re-approval. The Deputy of Transport Department of MRUD is responsible for the follow-up of this activity.
- All guidelines associated with this document shall be prepared by the Deputy of Transport Department of MRUD, in collaboration with relevant planning offices and be sent to

higher committees for further assessment. Prioritized implementation of this document is recommended.

- This document and the formerly approved document (dated January 30, 2017) indicate the approach of the High Council of Urban Planning and Architecture regarding the need for integration of “land use planning” and “transport planning with emphasis on public transport” as two major elements of urban and local planning.
- Other TOD plans are prohibited prior to the approval of guidelines associated with this document.
- The Deputy of Transport Department of MRUD shall take the initiative to prepare an instruction to achieve consistency between transport comprehensive plans and urban comprehensive plans. This instruction shall be sent to the High Council of Urban Planning and Architecture within three months.

3.1.3 National TOD Guidelines

As of March 2018, MRUD, and the Road, Housing and Urban Development Research Center (BHRC) under MRUD have prepared a draft of the national TOD guidelines following the abovementioned resolution by the High Council of Urban Planning and Architecture. Details of the draft guidelines are described in Section 4 of this report.

3.1.4 Targets for Urban Transport Development

MRMO proposed a policy on urban transport improvement in 2016 (1395), which was approved by the Cabinet and announced to related agencies, along with the timeline to be achieved¹. The policy covers 5 sectors and 27 items related to urban transport including traffic safety, public transport promotion, traffic demand management (TDM), freight and passenger services integration, and environmental improvement.

In addition, MRMO proposed similar policy targets for urban transport improvement supporting the Sixth Five-Year Development Plan. In coordination with PBO, MRMO submitted the proposed policy to the national assembly for its approval. Table 3-1 shows the list of the policy targets.

¹ Cabinet approval 91025/115912.

Table 3-1 Policy Targets for Urban Transport Development

| # | Category | Policy Targets | | Current in 2014 | Quantitative Target 2020 |
|---|------------------------|--|----------------|--------------------|--|
| | | Items | Unit | | |
| 1 | TDM | Trip generation per person per day | Trip | 1.45 | 1.45 |
| 2 | | Share of motorized vehicles in total trips | % | 65% | 55% |
| 3 | Public transport | Share of public transport (the maximum share of taxicabs can be up to 20%) | % | 45.2% | <ul style="list-style-type: none"> • National average: 50% • 8 cities with more than 1 million population: 75% • 200,000 to 1 million: 50% • 50,000-200,000: 45% • <50,000: 40% |
| 4 | | Average age of buses | Years | 7.7 | 5 |
| 5 | | Average age of taxicabs | Years | 12.9 | 5 |
| 6 | Traffic safety | Number of fatalities per 100,000 population in urban area | Person | 7 | 5 |
| 7 | | Number of casualties per 100,000 population in urban area | Person | 410 | 300 |
| 8 | Energy and Environment | Greenhouse Gas (GHG) emission from transport sector | Ton-CO2/person | 2.60 | 2.55 |

Source: MRMO, JICA Study Team

It should be noted that there was a preceding regulation called the Public Transport Development and Fuel Consumption Management Regulation of 2008. The regulation specified the policy target for urban transport including the trip share of public transport of 75% during the period of 2011–2015 for the entire country.

The 2016 transport policy proposed by MRMO revised the 2008 regulation as follows: i) the 75% target for the trip share of public transport was maintained for large cities with more than 1 million population; ii) the target for national average was lowered to 50%, and softened for medium and small cities; and iii) the share of taxi was specified. Moreover, the transport policy target was refined for several categories, adding targets for GHG emission, traffic safety, and age of the vehicles for public transportation services.

These figures were estimated and specified by MRMO, based on the statistics aggregated with the data from municipalities, while the activities for improvement are to be planned and implemented by local governments and municipalities.

3.2 Status of Urban and Railway Development in the Tehran Metropolitan Area

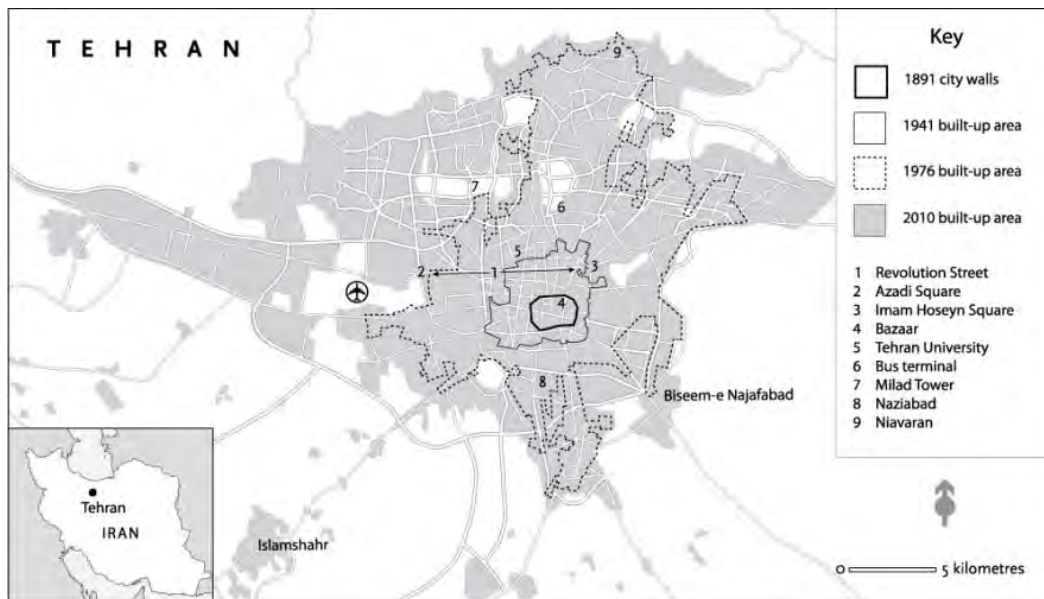
3.2.1 Urban Development in the Tehran Metropolitan Area

(1) Urbanization in Tehran

Until the 17th century Tehran was a small village located to the north of Shahr e Ray, a flourishing city with a history dating back over 6000 years. Qajar King choose Tehran as the capital of Iran in 1796 and the city was expanded with the bazaar as the center of business.

Up until the 1920s, Tehran was surrounded by a wall, and Tehran, Tajirish, and Ray had distinctly separate boundaries. Tehran developed rapidly under the reign of Reza Shah of the Pahlavi dynasty (1925-1979). The city wall was removed as a symbol of the new monarch and the city

was gradually expanded northward. In the 1960's the city was expanded especially to the east as shown in Figure 3-1.

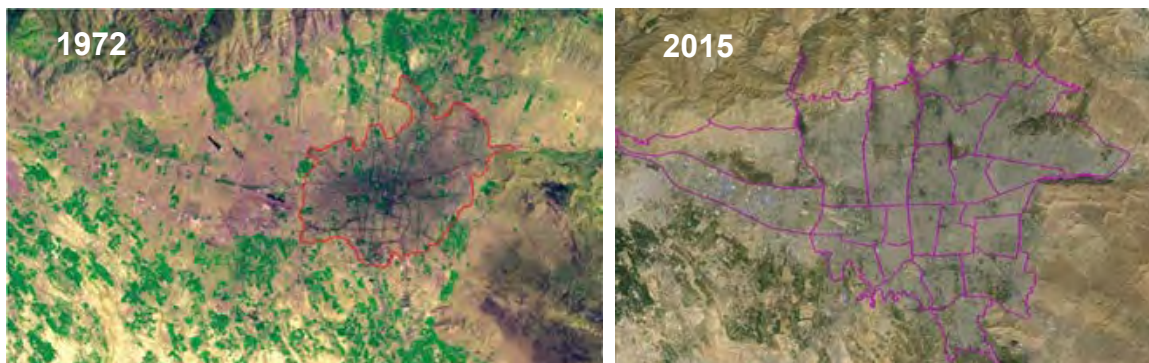


Source: Tehran Municipality

Figure 3-1 History of Urbanization in Tehran

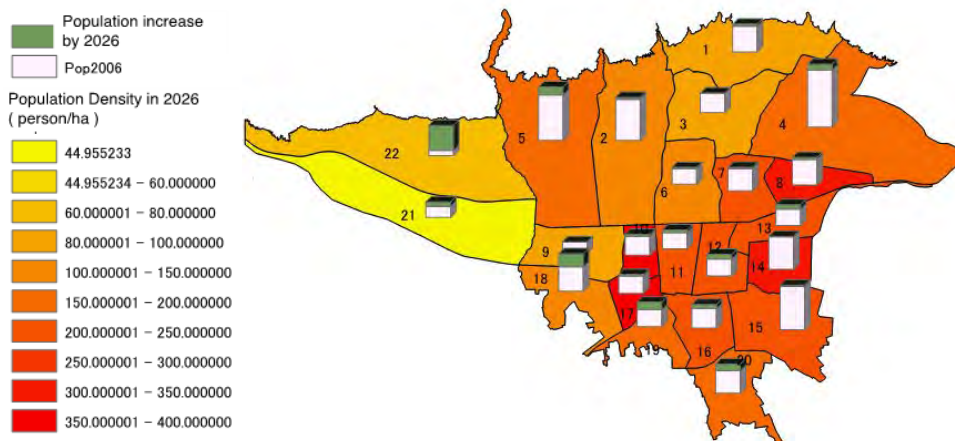
The aerial photos in Figure 3-2 show the state of urbanization of Tehran in 1972 and 2015. It indicates that urban development had taken place in the north-south direction by the 1970s, followed by the westward expansion of the urban areas after the development of the 1968 masterplan. At present, the population of Tehran is 8.20 million, and its density is 10,750 per sq.km (surface area of the municipality is 740 sq.km). The population growth of the whole city was around 0.4% in 2001-2011.

Tehran consists of 22 districts, and its population and population density by district are shown in Figure 3-3. It indicates that central districts of Tehran have a high population density. Generally, the low to middle income inhabitants reside in the southern and eastern areas, while the middle to high income inhabitants reside in the northern areas. The figure also depicts the forecasted population increase by 2026, with District 22 expected to have the biggest growth. Note that District 21, located to the south of District 22, consists of industrial zones and has relatively lower population density.



Source: Tehran Municipality

Figure 3-2 Urbanization of Tehran in 1972 and 2015



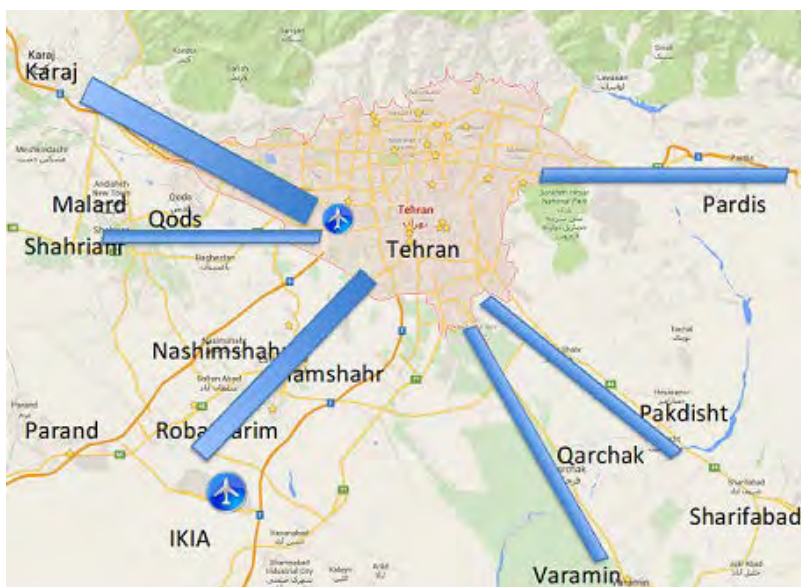
Source: Tehran Municipality

Figure 3-3 Population by District in 2006 and Future Growth by 2026

(2) Development Around Tehran

There are several major cities located around Tehran, as shown in Figure 3-4. Karaj is the largest with a population of 1.6 million in 2011, followed by Eslamshahr (400,000), Malard (290,000), Qods (280,000), and Soltanabad (270,000). These cities except Karaj are located to the southwest of Tehran. The blue bars in the map provide conurbations and corridors of those suburban cities, and the width of the bar represents relative size of the traffic to Tehran², indicating that Tehran-Karaj is the most heavily traveled corridor, followed by Tehran-southwest.

The average rate of population growth in Iran during 2006-2011 was 1.3% per annum, while its urban population grew at an average rate of 2.1% per annum. Population growth of Tehran Municipality was slow, at an average rate of 0.4% in 2001–2011. Over the period, much of the population growth in the Tehran Metropolitan Area occurred in cities around Tehran.



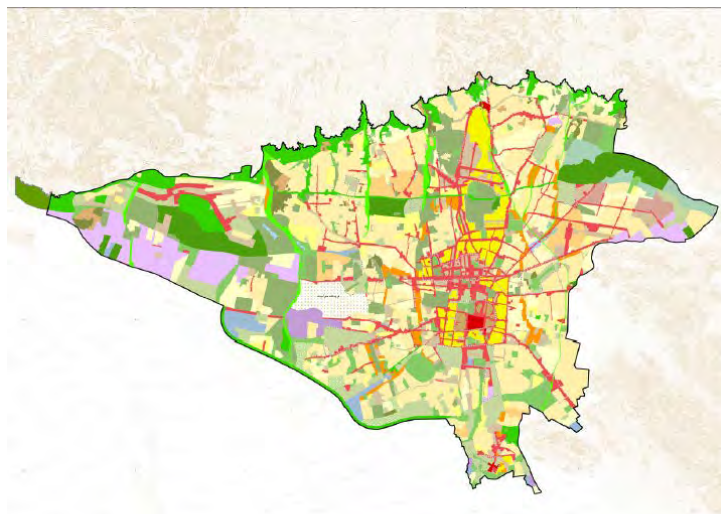
Source: JICA Study Team

Figure 3-4 Major Cities Around Tehran

² See Figure 3-15 for details.

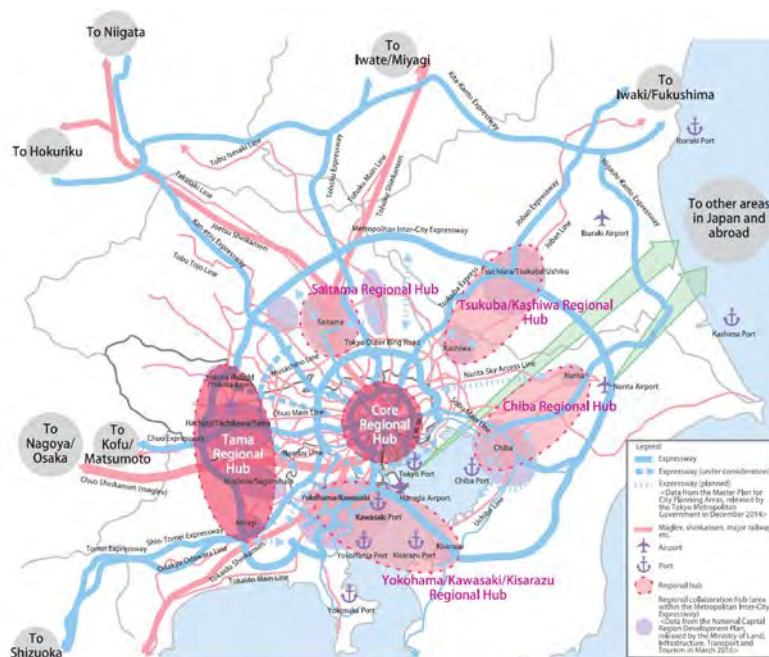
(3) Urban Planning in Tehran Municipality

The urban planning system in Iran consists of a dual structure, and the city master plan (Comprehensive Plan) sets the population goal of the entire city area and the land use plan. In addition, detailed plans for each district set usage, volume rate, floor height, unification of skyline, etc. Meanwhile, the urban image and urban structure on a regional level which is seen in the master plan of Japan, are not studied. Figure 3-5 shows the land use plan of Tehran on the Comprehensive Plan revised in 2007, Figure 3-6 shows the city structure of Tokyo.



Source: Tehran Municipality

Figure 3-5 Land Use Plan in Tehran



Source: Tokyo Metropolitan Government

Figure 3-6 Urban Structure Tokyo on a Regional Level

(4) Mehr Housing Project

The Mehr Housing Project is a major urban development approach that has been implemented by MRUD in Iran over the past decade. Originally, it was initiated in 2007 as a five-year scheme of affordable housing development led by the national government, although the provision of housing itself has been undertaken by private contractors, not by government entities. Private contractors of the Mehr Housing Project have been granted land for housing from the government and have implemented affordable housing business for low income people. The housing design is standardized as 75 sqm. Tenants can access low interest mortgage loans. The target number of housing is 2 million units in five years. Parand and Pardis, which are described below, are among the targets of the Mehr Housing Project.

(5) Parand and Other Cities to the Southwest of Tehran

Parand is a planned city located 30 km southwest of Tehran and its development started in 1997 (see Figure 3-4). The population of Parand is about 200,000 at present and is expected to increase to 500,000. The development has been planned in 0–6 phases. Phases 0 and 1 have been completed, characterized by low density development with flat and low-level apartments. For Phase 2 and 3, medium density development has been undertaken. Phases 4, 5 and 6 are designated as part of the Mehr Housing Project and have been developed to provide affordable housing with high-rise apartments.



Source: JICA Study Team

Figure 3-7 Zoning Plan of Parand

Figure 3-8 shows Parand and other major cities to the southwest of Tehran as well as the Imam Khomeini International Airport (IKIA). Several cities along the way to Parand including Eslamshahr, Slaehiye, and Nasirshahr form a part of the Tehran conurbation. Industrial zones and logistics sites are located in these cities. The red line in the map indicates the alignment of Metro Line 1, including the planned extension. The section between Tehran and IKIA was completed and opened in 2017, while the extension to Parand is yet to be started.



Source: JICA Study Team

Figure 3-8 Parand and Other Cities to the Southwest of Tehran

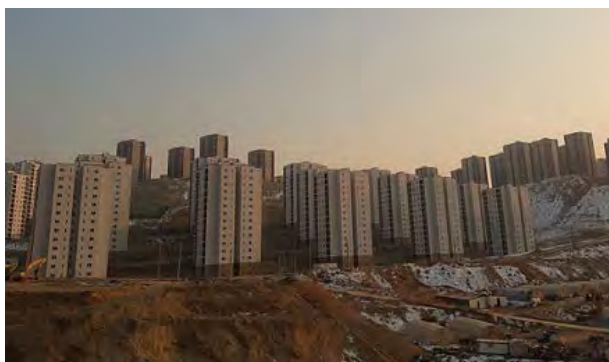
(6) Pardis

Pardis is located 20 km east of Tehran (see Figure 3-4) and is served by two expressways. Land development in Pardis has been undertaken in about eleven phases (see Figure 3-9), with the planned population being 450,000. Initial phases were completed ten to fifteen years ago, wherein local communities with commercial, social and religious functions have been developed. Figure 3-10 shows the current development undertaken by a Turkish contractor with 100 to 120 high-rise residential buildings constructed on relatively steep hills. There are bus services both local and to Tehran but on a limited scale, and the residents in the area mostly rely on their own cars.



Source: JICA Study Team

Figure 3-9 Pardis Development Plan



Source: JICA Study Team

Figure 3-10 Current Development in Pardis

(7) Informal Settlements

There are many informal settlements in the suburbs of Tehran as shown in Figure 3-11. They are mostly located along the expressways and highways to Tehran and provide inexpensive labor forces largely for the light metal and automobile sectors.



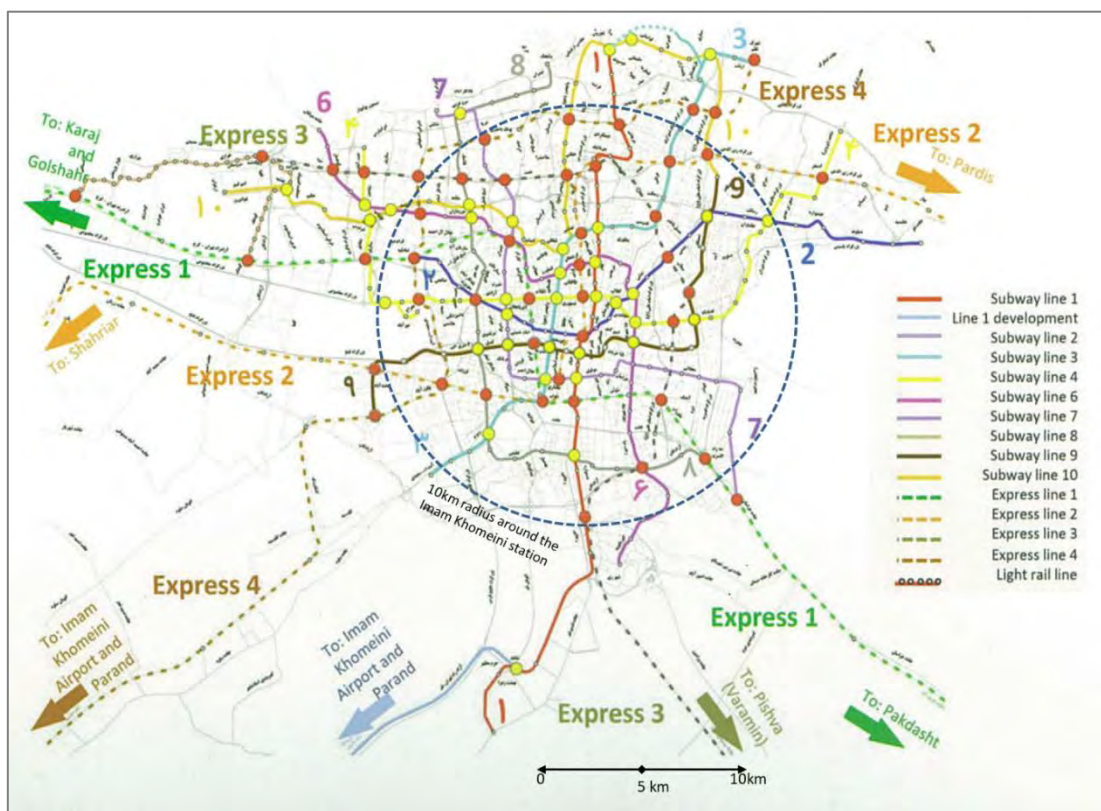
Source: Atlas of Tehran Metropolis

Figure 3-11 Low Income Settlements in the Suburbs of Tehran

3.2.2 Railway Network Development in Tehran Metropolitan Area

(1) Tehran Transport Masterplan 2013

Figure 3-12 shows the metro and railway network proposed in the Tehran transport masterplan prepared in 2010–2013. The target year of the masterplan is 2025. The total length of the proposed network is 747 km, of which about 175 km has been developed.



Source: Tehran Municipality, JICA Study Team

Figure 3-12 Tehran Railway Network in 2013 Transport Masterplan

Tehran Municipality is now revising and updating the transport masterplan by employing SYSTRA, the consulting firm that prepared the 2013 masterplan. The revision to be made is expected to be minor. Through the interview with the SYSTRA team, the JICA Study Team suggested to the Municipality about the importance of incorporating the TOD concept and application in the revised masterplan.

(2) Metro Network Development

Currently, there are five metro lines that are operated in Tehran, as shown in Figure 3-13. Lines 1 and 2 were developed first and are running along the historical urban axes, north-south and east-west. Line 1 has been extended to IKIA with its extended section opened in August 2017. Line 5 that connects with Lines 2 and 4 is the first suburban line in Tehran, providing express services along the Karaj–Tehran section. Line 3 that runs in parallel with Line 1 is planned to be extended toward the southwest of Tehran to connect with Eslamshahr and IKIA. Line 4 runs in parallel with Line 2 and has a branch connecting with the Mehrabad Domestic Airport.



Source: Tehran Urban and Suburban Railway Operation Co., JICA Study Team

Figure 3-13 Present Metro Network in Tehran

(3) Metro Assessment for TOD Aspects

Unfortunately, TOD has not been considered over the period of Tehran metro development. Some of the critical observations regarding the lack of TOD consideration include the following:

- Lack of coordination/convenient connections between the metro stations and surrounding urban development. For example, there are cases that only one exit has been constructed for stations that are located at four-leg junctions. There are even cases that the only exit constructed is located at the corner of less developed blocks.
- Lack of harmonization with passenger flows at and around metro stations. For example, there is lack of convenient connections with BRT/taxi stations, harmonization with surrounding social services such as schools and hospitals, and convenient walking access around metro stations.
- Lack of effectiveness of bus terminal use. There are several bus terminals connected with metro services in urbanized areas, but they have been underdeveloped and there is much room for improvement through TOD approaches to provide convenient intermodal connections.

There are also positive aspects of the Tehran metro in promoting TOD, which include the following:

- Value capture in the development around metro stations: Tehran Metro is selling the development rights to the private companies for the land it owns around the metro stations and is using the proceeds to partly finance the metro construction. This method was used for Shahid Sadr Station of Line 1 and Shahid Bagheri Station of Line 2. It is considered an effective way of financing metro development, using TOD and PPP approaches. On the other hand, Tehran Metro relies on the private sector for the provision of related facilities around stations, including those for improving pedestrian accessibility and intermodal transfer.
- Convenient interconnection: Generally, the interconnection between different Tehran metro lines is convenient, enabling smooth transfer of the passengers. For example, passengers can transfer between Line 2 and Line 5 on the same platform, which is an effective arrangement for mass transit services. The Metro lines have been developed along the historical urban axis, and are connected with major transport nodes, including bus terminals, central station and airports.
- Metro Lines 6 and 7 are almost developed and will be opened in a few years, then the constructions of Metro Lines 8 and 9 are expected to be commenced. Those will enhance the capacity of the metro network of Tehran, which may accommodate the expanded influx from growing suburbs.

(4) Future Development of Express Lines

The 2013 Tehran transport masterplan proposed the development of several express lines as shown in Figure 3-12. Although this proposal is at a conceptual level, the provision of express services would be critical as large-scale residential development is further progressed in the suburbs. The concept of the proposed express lines is similar to RER in Paris (Regional Express Network in English), which provides regional express services and facilitates the traversing of urban centers. The Transport for London (TfL) has also developed a similar railway called “Crossrail”, providing high frequency, high capacity services. Crossrail and RER lines are shown in Figure 3-14.



Source: JICA Study Team

Figure 3-14 Examples of Express Lines in Europe

(5) Start of Suburban Railway Services by RAI

Prior to 2012, NTDC had prepared a plan for the railway service extension to Eslamshahr and Parand, and some actions were taken to provide suburban railway services using RAI's infrastructure, but the plan did not materialize. In 2017, however, RAI procured the rolling stock for suburban services and started operation using RAI's existing railway network in and around Tehran. The services have been provided in four directions, i.e., toward Varamin, Qom, Parand and Karaj, as shown in Figure 3-15. BOX-1 on the next page shows the railway operation to Parand as an example.



Source: JICA Study Team

Figure 3-15 Network of Tehran Suburban Railway Services by RAI

(6) Suburban Extension of Metro Lines

Tehran Metro also has a plan to extend its existing metro lines including Lines 1, 2 and 3, as shown in Figure 3-16.



Source: MRMO

Figure 3-16 Plan of Suburban Extension of Metro Lines

These suburban lines are partly like the express lines proposed in the 2013 masterplan. As described earlier, Metro Line 1 has been extended up to IKIA and is in operation. Note also that the suburban railway services along the line toward Varamin and the line toward Qom (southward from Eslamshahr) have been provided by RAI, as described later.

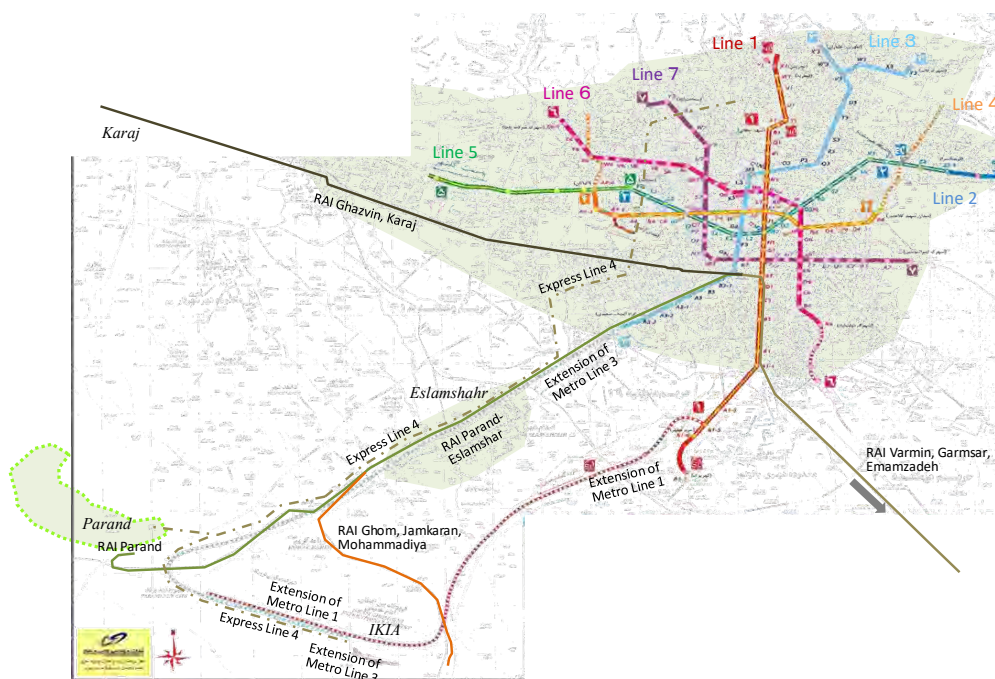
(7) Development of Suburban Railway Services by MRUD and RAI

In the first TOD seminar held in early 2016, the Minister of MRUD mentioned the priority development of suburban railway services as follows: (i) the lines between Karaj and Varamin (northwest-southeast), (ii) the lines between Pardis and Parand via Eslamshahr and IKIA (northeast-southwest), and (iii) development of related terminals and TOD.

In MRUD, the function of suburban railway development is undertaken by the railway department of the New Town Development Corporation (NTDC). Its priority is to develop the suburban line between Tehran and Pardis, and a feasibility study conducted internally has been completed.

(8) Overlapping among the Suburb Lines

As aforementioned, there are several plans and operations in the suburbs, including operation and plans for the Tehran Metro extension, the Express Lines, and operations of the RAI suburb lines. Figure 3-17 presents the geographic relations among those proposals.



Source: JICA Study Team

Figure 3-17 Rail Plan and Operation in the Tehran Suburb

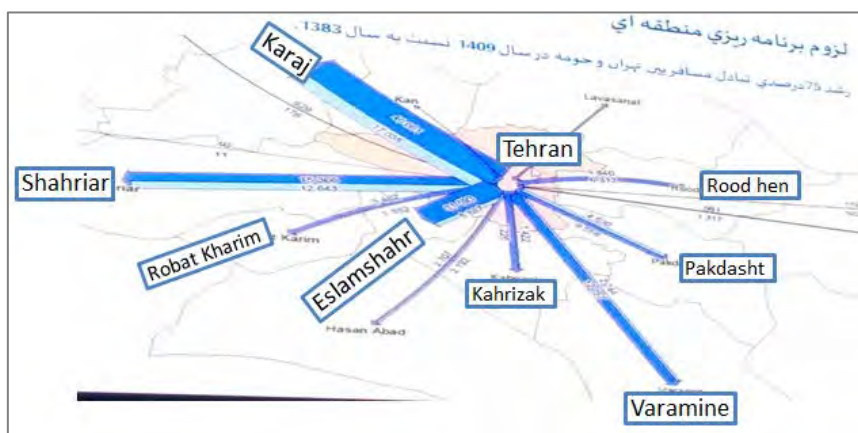
In the figure, the present metro lines from Line 1 to Line 5 and Lines 6 and 7 under construction are depicted. The green shaded areas roughly represent the built-up areas in Tehran and the suburbs. As for lines in the suburbs, the metro line 1 extension to the south, colored in red, has completed, and operation has started up to IKIA airport. The metro line 3 extension is under planning, drawn in light blue dotted lines, passing Eslamshahr and Parand and reaching IKIA airport. The RAI commuter services are drawn in the map by direct lines with similar color code shown in Figure 3-14. There are mainly four lines of the RAI commuter services, but the Line for

Parand (in green) and the Line for Ghom (in orange) share the alignment up to IKIA airport. The last one is the Express Lines, and Express Line 4 is presented in the figure. The actual alignment of the Express Lines in the suburbs have not been yet clarified, but its destination are defined in the masterplan.

As shown in the figure, the plans and operations of railways are overlapping along the Eslamshahr-Parand corridor. Coordination among the related stakeholders is necessary.

(9) Demand for Suburban Railway Services

Figure 3-18 shows an example of traffic forecast for suburban railway services around Tehran. It indicates that potential traffic demand for Karaj–Tehran is the biggest among the corridors shown in the figure. The traffic for Eslamshahr–Tehran also has a high growth potential, and if the extension beyond Eslamshahr is considered, the growth potential of this corridor would even be higher.



Note: Light blue bars represent the traffic in 2004, and blue ones show the forecasted traffic in 2030.
Source: MRUD-RAI TOD Seminar held on January 31, 2016, JICA Study Team.

Figure 3-18 Traffic Forecast for Suburban Railway Services

BOX-1: RAI's Suburban Railway Operation to Parand

Raja Rail Transportation Company and RAI started the operation of commuter rail services in the suburbs of Tehran in the summer of 2017, including the service in the direction of Parand and Eslamshahr. (Raja Rail is an affiliate body of RAI, undertaking passenger rail operations of RAI.) The rolling stock used is 4-car Diesel Multiple Units (DMUs) called Railbus in the local market, supplied by Hyundai Rotem. Based on the information obtained in January 2018, its operation to Parand covers four round trips in the morning and seven in the evening on weekdays, and two round trips on weekends. It connects Parand with Tehran in 60–70 minutes, stopping at several stations in between. The tariff for Parand–Tehran is 1.3 USD per trip per person.



Train arrival at Parand on time (at 17:20)

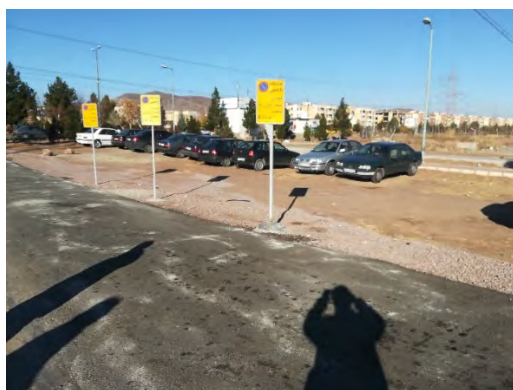
Timetable at Parand Station

[Right] About 150 passengers get off an evening train at Parand. At present, the station has a simple platform and benches without modern station facilities other than lighting. The structure seen in the photo is a platform that was built based on the previous plan but is not used now.



[Right down] Taxis and minibuses are on time, ready to transport railway passengers. Minibuses operate to some districts of Parand, 5–8 km away from the station.

[Left bottom] Park-and-ride free parking has also been developed, although it is unpaved and unguarded at present.



(10) Major Planning Issues on the Development of Suburban Railway Services

As described in this section, various plans have been prepared for the development of suburban railway services in the Tehran Metropolitan Area. Major planning issues in this regard may include the following:

- There are overlaps in the Suburban rail plans by different agencies.
 - For instance, the extension of Metro Line 3 planned by Tehran Metro, Express Line 4 proposed in the 2013 Tehran transport masterplan, and the suburban services currently provided by RAI.
- In the existing line, there are many stations between the suburban areas and Tehran, and this may not be suitable in providing express services.
 - For instance, the extension of Metro Line 1 will provide suburban railway services between Parand and Tehran via IKIA, but there are already many stations.
- The current rail infrastructure of RAI's suburban services is not capable of providing high frequency, high capacity suburban services.
- There should be coordination among the concerned agencies to formulate an integrated plan for the development of suburban railway services.

3.3 Major TOD-related Issues in Iran and Potential TOD for the Tehran Metropolitan Area

This section describes the major TOD-related issues in Iran that are based on the findings in the preceding sections and proposes TOD approaches that may potentially be implemented in the Tehran Metropolitan Area.

3.3.1 Major TOD-related Institutional Issues

(1) Need for Inter-Agency Coordination for the Development of Suburban Railway Services

Currently, the division of responsibility for transport planning in Iran includes the following: municipalities are responsible for the urban transport in the areas of their jurisdiction, with MRMO of the Ministry of Interior supporting the activities of the municipalities, while MRUD is responsible for intercity transport. However, with the population growth in the suburbs and expansion of urbanization, it will be increasingly necessary for municipalities to plan and develop transport systems beyond the municipal boundaries. For example, the Tehran municipality has planned the extension of Tehran metro services and the development of express lines, both extending beyond its municipal borders. At the same time, MRUD and RAI have started the operation of suburban railway services in the Tehran Metropolitan Area, which overlaps with the plans of the Tehran municipality.

As mentioned earlier, there should be coordination among the concerned agencies to formulate an integrated plan for the development of suburban railway services. It is important to undertake this coordination within the revision of the Tehran transport masterplan that is currently being conducted.

The JICA Study Team considers that TOD is a good opportunity in which MRUD and the Tehran municipality (with MRMO) can work together and coordinate the activities for transport development, including the planning and development of suburban railway services.

The Study Team understands that personnel exchange between the Tehran municipality and the central government including MRUD and MRMO is becoming active, especially at top and middle management levels. Such personnel exchange had been rare up until a few years ago. This movement is an important step towards realizing effective inter-governmental coordination. It is also extremely beneficial for the promotion of TOD as well as the coordination of transport developments related to TOD.

(2) Importance to Recognize the Gap between Housing and Public Transport Developments

As described in Section 3.2.1, there has been a clear trend of suburban population growth in the Tehran Metropolitan Area. Over the past decade, the development of affordable housing has progressed steadily in the suburbs, including Parand and Pardis, and high occupancy rates have generally been achieved for newly constructed affordable apartments.

On the other hand, the development of public transport to serve the growing suburban population has progressed slowly, leading to a large gap between the supply and demand for transport services in the suburbs. In Pardis, for example, there are bus services both local and to Tehran, but on a limited scale, and the residents in the area mostly rely on their own cars. Due to the need for developing the railway line between Tehran and Pardis, a feasibility study was conducted by NTDC. In Parand, the RAI railway station for suburban services is located at the very edge of the city entrance, forcing passengers to access the station by other transport modes. In addition, while Metro Line 1 has been extended to the IKIA, the extension to Parand is yet to be started.

Given the current supply-demand gap for suburban transport services, the development of rail transport should be prioritized in TOD in the suburbs³.

(3) Cooperation between Private Developers and Public Railways

In Japan, private railway companies played a major role in TOD undertaken in the suburbs of Tokyo and Osaka. On the other hand, private companies are not permitted to undertake railway development in Iran. Therefore, it would be realistic to consider a TOD model that does not rely on the potential entry of private companies into the railway development. One practical approach would be that the development of housing is to be undertaken by both public (NTDC) and private developers (local and Turkish) as practiced in the Mehr Housing Project and the railway development by public entities, with the overall implementation to be managed and coordinated by MRUD. This type of TOD model was also implemented in Japan for the development of Tsukuba Express and land development along the line to the northeast of Tokyo, which can be referenced for the planning of suburban TOD in Iran.

(4) Competition with Road-Based Transport and Pricing

One potential barrier against the promotion of TOD in Iran is the high level of dependency on road-based transport. In Iran, passenger cars are produced and sold at prices affordable even for low-income households. Gas prices are also kept low with the provision of gas subsidies. Moreover, an extensive network of highways and expressways has been developed in Tehran with no tolls imposed. It should be noted that area pricing and even-odd number plate regulation have already been implemented in Tehran and other major cities in Iran, which are the most strict traffic demand regulations in the world.

³ The detail analysis was given in the report of Tehran Long Term Urban Rail Plan, prepared by Tehran Urban and Suburban Railway Company (TUSRC) and SYSTRA in January 2007. This is the base of the Tehran Transport Masterplan 2013.

The Government of Iran has also been subsidizing the railway services, thereby keeping the tariff at low levels. For example, 70%-75% of the operations and maintenance expenditure of the Tehran metro has been covered by subsidies from the central government and the municipalities, with only 20%-30% financed by farebox and advertisement revenues. Given this situation, expanding the railway services would increase the financial burden on the public sector without implementing other cost recovery measures. As described earlier, Tehran Metro is selling the development rights to private companies for the land it owns around the metro stations, capturing its value for development. This kind of cost-recovery measure should be used extensively in the implementation of TOD.

The low cost of road transport also provides an advantage for the railway services. In Tehran, there is a large supply of shared or informal taxis that are priced at low levels. These taxis can provide railway passengers with transport services that are nearly door-to-door. It would be extremely important to incorporate taxis in the planning of TOD so that the combined railway-taxi transport can provide a higher level of service than the transport by private cars.

3.3.2 Major TOD-related Planning Issues

(1) TOD-related Planning Issues in Urban Areas

There has been a lack of TOD consideration in the urban areas of Tehran as manifested by the following issues, which is primarily due to the lack of inter-agency or inter-departmental coordination:

- Lack of integration with land use planning of the surroundings of the metro stations, and major transport hubs, including deregulation of volume control
- Lack of coordination/convenient connections between metro stations and surrounding urban development, such as the case that only one entrance has been constructed even for metro stations located in busy areas.
- Lack of convenient connections between metro stations and BRT/taxi stations, harmonization with surrounding social services such as schools and hospitals, and convenient walking access around metro stations, which is primarily due to the lack of inter-agency or inter-departmental coordination (e.g., between Tehran Metro and bus/taxi operating companies).
- Lack of convenient intermodal connections at the bus terminals connected with metro stations in urban areas.
- Lack of public land that can be used for further development in the urban areas of Tehran. In this regard, there are several areas of land owned by the Iranian Military that can be a candidate site for TOD, although the conversion of these areas to service centers is not progressing smoothly.
- Lack of experience with connecting metro stations with underground private sector facilities, which seems to be primarily due to security reasons.

(2) TOD-related Planning Issues in Suburban Areas

There has been a lack of TOD consideration in the suburban areas of Tehran as manifested by the following issues:

- There is no integration of urban development and transport development. Urban development starts first, and railway development follows.
- Overlapping of the Metro extension and RAI's commuter service operation can be identified. The engineering and rail operation specifications for the metro and the commuter services should be coordinated with the characteristics of the future demand.
- There are no examples for the value capturing planning in the suburbs.

3.3.3 Potential TOD in Urban Areas

(1) Development of Intercity Bus Terminals

There are some large bus terminals in central, west, south and east Tehran, accommodating intercity and intracity buses, the metro and taxis. Most of the terminals are located at the boundaries of the urban areas, surrounded by high volume highways and kept as an open lot with simple terminal functions for the intercity bus customers. In the peak hours, the concentration and mix of pedestrians and buses bring chaos to the surrounding streets.

The existing terminals are sufficient targets for TOD to implement the integrated development approach with commercial buildings or residential buildings. For the implementation, it will require the relaxing of the volume regulations on the terminal area. Furthermore, the usage of the area as terminals for the suburban railway lines could be considered, particularly for the express line function proposed in the Masterplan.

(2) Improvement in Accessibility of Existing Metro Stations

The metro stations are the key functions for TOD in the urban areas. Improvement of the accessibility of various transport modes with metro services would be the suitable approach of TOD in the urban areas, enhancing its integration of urban services and transport services.

3.3.4 Potential TOD in the Suburbs

(1) Railway Development to Connect Tehran and Suburban New Cities

There are several suburban railway development plans in Tehran. The development of suburban rail services is an effective approach to materialize the TOD in Tehran. The high level of population density in central Tehran and the pressure of population growth in the metropolitan area will accelerate the urbanization in the suburbs.

There are institutional difficulties in the implementation of the railway development plans. However, the institutional integration among municipal and central governments is progressing, and the time is about right to consider the railway development utilizing TOD approaches (see (3) of this section for a further approach of railway planning in the suburbs).

It is important to consider the transport market economics in pursuing the suburban railway development, as mentioned earlier. The road transport costs are arbitrarily kept low in the market, and passenger car users in the suburbs currently have low incentive to use the railway. Moreover, the low tariff of passenger rail services may not attract new investment to the rail infrastructure.

(2) Integrated Development of RAI Property and Railway Services

RAI is the key organization for the development of suburban railway services. However, so far, its approach for development is focused on the procurement of new rolling stock for suburban services. RAI owns a lot of unused lands along the corridors to Eslamshahr, Karaj and Varamin, which can be effectively utilized for the development of new housing. Some are close to international and domestic airports as well as the RAI network.

According to the interview with RAI, the organization requires justification of the new investment plans for the new railway services. The Study Team suggests the integrated development of those unused lands, including the scheme to capture the land value. The expected increase in land value will become the source of investment in the railway development, such as the track doubling, rehabilitation of the station structures, signaling and electrification. With the incorporation of the TOD approaches, RAI will be able to sustainably maintain its passenger demand as the residents can access their destination with railways. Under this scheme, RAI would be the major stakeholder, and other stakeholders would be public corporations in Iran, including the New Town Development Corporation. This will allow avoiding the PPP scheme, which is still an unfamiliar scheme in Iran.

(3) Development of Feeder Services in the Suburban Cities

The transport services at the suburban cities are designed to rely only on the road-based transportation so far. The number of residents is increasing, but it does not give a large impact to the housing market of Tehran, as the new residential areas are not so attractive to commuters to Tehran. The railway extension plans are expected to be implemented, although the residents must use taxis, buses or Park and Ride to fill the gap of the “last one mile” to their houses. These mode transfers decrease user satisfaction of the transport services, as there is a time gap between the feeder services and heavy rails, and users are always forced to wait for the feeder buses and taxis at the terminal.

The TOD approach always recommends the integration of the development of the heavy rail and residential areas. The Study Team suggests the extension of the suburban railway into the residential area, as a form of an integrated feeder service. The residential area has a wide road network which can accommodate the railways in the median. LRTs or elevated LRTs are possible approaches to fill the gap of feeder services. Considering the hilly terrains of the new residential areas in Pardis and District 21/22 in Tehran, the tire-based transport services, including Automated Guideway Transit (AGT) systems or monorails, can be considered.

4. Proposed TOD Guidelines

4.1 Formulating TOD Guidelines and Proposed Technical Guidelines

The JICA Study Team reviewed the content of the TOD guidelines¹ being formulated by the Iranian Government. Although the guidelines for TOD are based on current urban planning-related systems and organizational systems, as a guide for specific planning, they appear to go no further than making generalizations. Points of the TOD guidelines currently under formulation that are considered commendable and points requiring additional information are summarized below.

(1) Points of the TOD Guidelines under Formulation that are Commendable

- Organization of plan contents according to each level of development
The TOD guidelines currently under formulation establish levels for advancement of TOD ranging from macroscale to microscale, such as the regional level, corridor level, and station level, and arrange points including matters requiring attention and consideration to promote TOD at each of these levels. It is thought that the guidelines will be useful for the study of plans from the perspectives of level and progress of development.
- Specific guidance based on the current legal system
Specific guidance has been provided on how to incorporate TOD content in plans (i.e., urban complex plans, comprehensive plans, etc.) under the current urban planning system.
- Clarification of actions to be taken by each related organization
Actions to be implemented by each organization involved in realizing TOD (national and local governments, businesses, consultants, NGOs, others) are clearly indicated in the guidelines.

(2) Points of the TOD Guidelines under Formulation that Require Additional Information

- Necessity to clarify Iranian-style TOD
The content of the TOD plan is said to refer to guidelines from other countries, including those of the United States and India. Although it mentions the need for an Iranian-style TOD that considers the issues and actual situations in cities in Iran based on these guidelines, this is not specifically mentioned.
- Necessity of an institutionalized approach to realize TOD
It would be necessary to present organizational and systemic promotional policies in order to specifically realize TOD based on these guidelines; however, this point is not necessarily explained in a clear manner. Several approaches are described in the “Executive Approaches” section of the Appendix, but it would be necessary to specify these approaches in a more concrete manner.

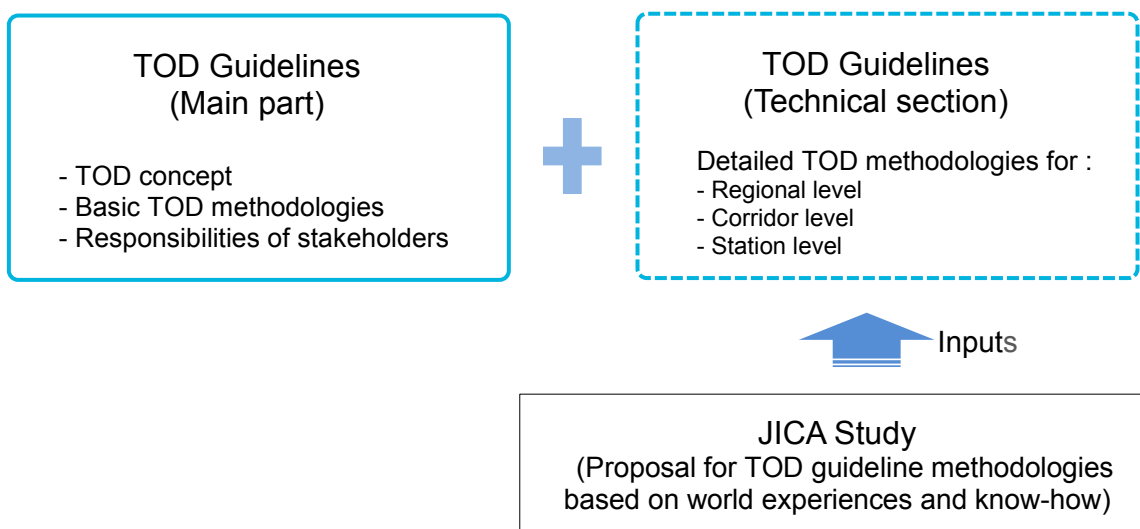
(3) Approaches for Implementation

The following kinds of approaches for implementation can be considered based on the above commendable points and points that require additional information.

¹ Draft version obtained from MRUD in February 2018.

- Clarification of an Iranian-style TOD and examination of concepts based on case analyses, other
In order to clarify an Iranian-style TOD, it would be necessary to examine planning concepts after a broad analysis of cases in Iran and overseas, based on an understanding of issues, such as current development in cities and around stations. Basic approaches are described in section 4.2.
- Development of legal systems and cross-sectoral organizations for implementation
Along with dispersing roles for the implementation of TOD among various departments, it is necessary to discuss and resolve issues in this regard in a comprehensive manner. To that end, cross-sectoral organizations and legal systems for support are needed. The basic approach for this will be outlined in section 4.4.
- Realization of a specific pilot project
In order to advance the above, it would first be necessary to establish a specific site and study ways to achieve an Iranian-style TOD through the form of a pilot project. The advancement of the pilot project will have to be ceded to the next stage, but site possibilities and the approaches for implementation are described in Chapter 5.

Based on the above implementation approach, the figure below shows the association between the items proposed in this study and the TOD guidelines under formulation by the Iranian government. As indicated by this figure, the proposals of this study are assumed to form the base of the TOD guidelines (technical section).



Source: JICA Study Team

Figure 4-1 Relationship between TOD Guidelines under Development and Items Proposed in the Survey

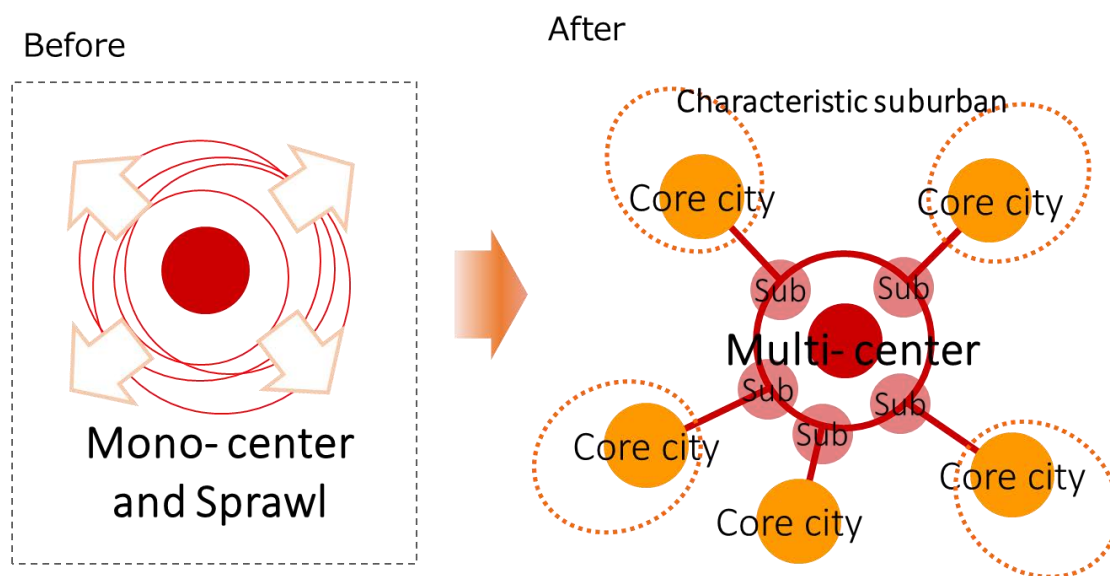
4.2 Proposed TOD Guidelines

4.2.1 Regional Level TOD

The current urban structure of the Tehran Metropolitan Area is a mono-center urban structure, where traffic congestion and air pollution are escalating due to the use of private transport, such as automobiles. The following points are indicated as potential solutions for rectifying these points from the perspective of urban structure.

(1) Transition from Mono-Center urban Structure to a Multi-Center urban Structure

Considering the current scale of the population in the Tehran Metropolitan Area and its serious urban problems, such as traffic congestion and air pollution caused by the mono-center urban structure of the area, a transition to a multi-center urban structure, such as that shown in Figure 4-2, is inevitable. To this end, it is necessary to clearly position sub-city centers and satellite cities in urban planning master plans and other relevant plans at the urban area level and develop legal systems to promote these urban policies. These policies must be coordinated with the direction of development for the entire urban area, such as population placement and industrial location policies. In the Tokyo Metropolitan Area in Japan, factory location laws are implemented as industrial location policies, in addition to the formulation of urban planning master plans in the metropolitan area and each city (see examples on the following pages).



Source: JICA Study Team

Figure 4-2 Transition to a Multi-Center Urban Structure


Case Study: Policy shift to multi-center urban structure (Tokyo Metropolitan Area)

Both before and after WWII, mono-pole development progressed in the Tokyo Metropolitan Area. However, the area underwent a shift to a multi-pole urban structure through various urban policies in order to cope with urban issues, such as traffic congestion and environmental pollution, and create an optimal arrangement for the rapidly increasing population and industries.

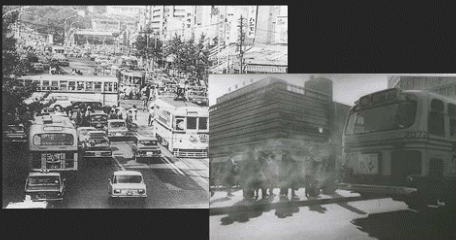
Specifically, the cores of the city center and suburbs were clarified in the development plans of the Tokyo Metropolitan Area, which guided the relocation of factories and universities to the suburbs.

The Tokyo Metropolitan Area integrated the location of these urban functions and development along railroads connecting the city center with the suburbs, resulting in the development of a multi-center urban structure with public transportation as its main function.

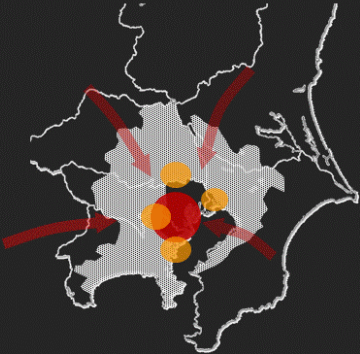
1950s
Concentration of population and industry to central Tokyo after World War II




Air pollution caused by concentration of industries in the coastal areas




Traffic congestion and air pollution by cars



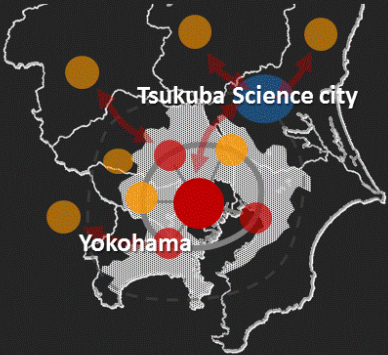
1980s-1990s
Development of a multi-center structure
The 3rd metropolitan master plan (1976)
The 4th metropolitan master plan (1986)

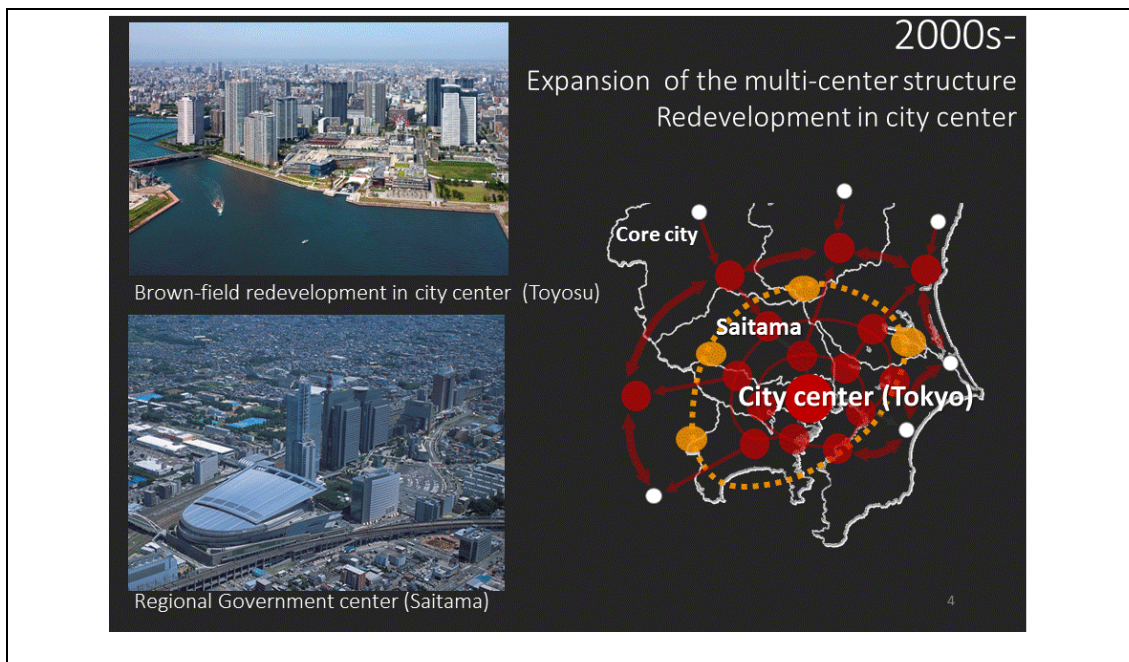


Science city (Tsukuba)



New CBD (Yokohama)

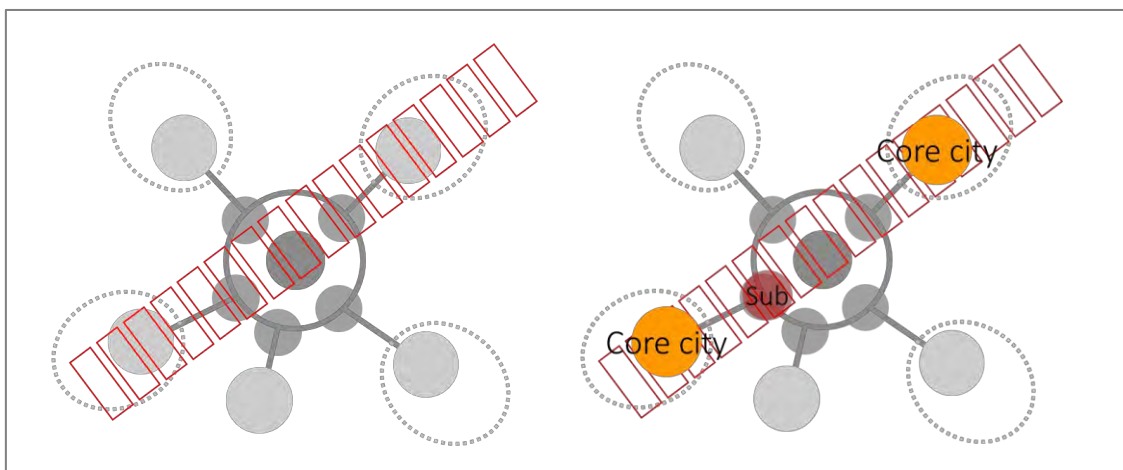




Source: JICA Study Team

(2) Setting Priority Development Axes and Nodes

Priority developmental axes are set to expand and develop existing core cities as an action plan to achieve the above. The future direction of development will be clarified to offer guidance on public transportation along these axes and urban development associated with them. In addition, nodes will be clearly set in order to exert a pull on the abovementioned priority development axes (see Figure 4-3). These nodes correspond to sub-cities and satellite cities in multi-pole urban structures. It is necessary to comprehensively assess this area based on the land situation (environment and land ownership, other), so that sub-cities and satellite cities can be developed at an early stage. Examples from Copenhagen (Denmark), Denver (USA), and Kuala Lumpur (Malaysia) related to these matters are shown on the following pages.



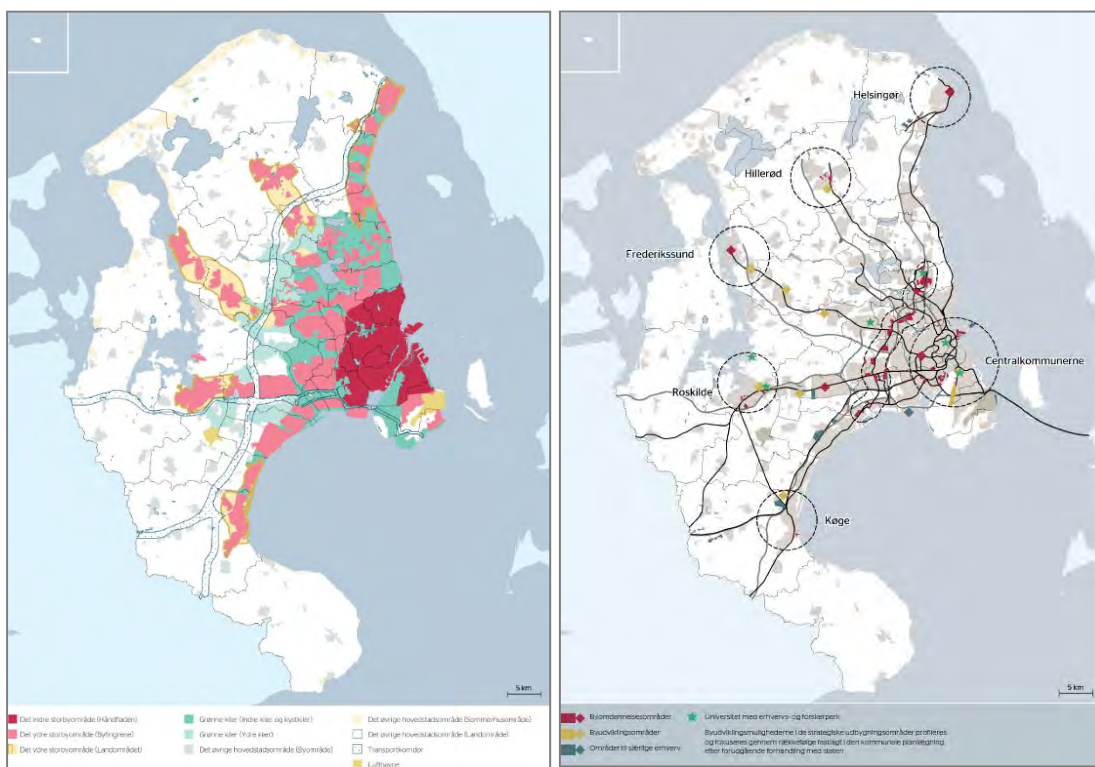
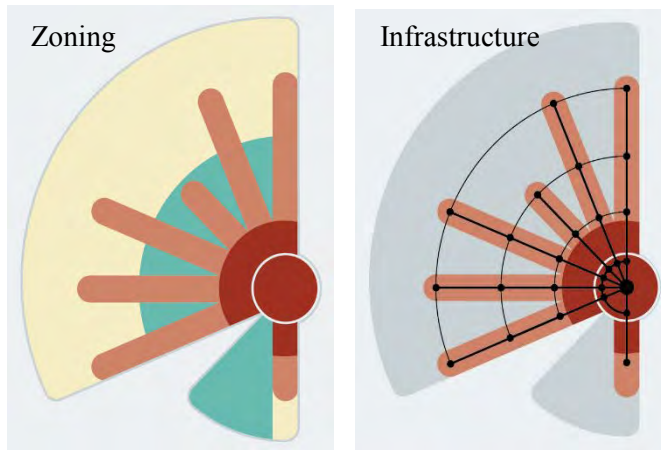
Source: JICA Study Team

Figure 4-3 Setting Priority Development Axes and Nodes

Case Study: Guidance for urban structures linked with transportation networks (Copenhagen, Denmark)

Copenhagen presents an urban structure linked with transportation networks in “Fingerplan 2013”, the city’s comprehensive urban policy. Specifically, the plan shows the following four geographical zones and the location of traffic infrastructure and development of nodes.

The four geographical zones:
Core urban region
Peripheral urban region
Green wedges
Rest of Greater Copenhagen



Source: Danish Ministry of the Environment (2013)

Case Study: Public transportation networks linked with urban centers (Denver, USA)

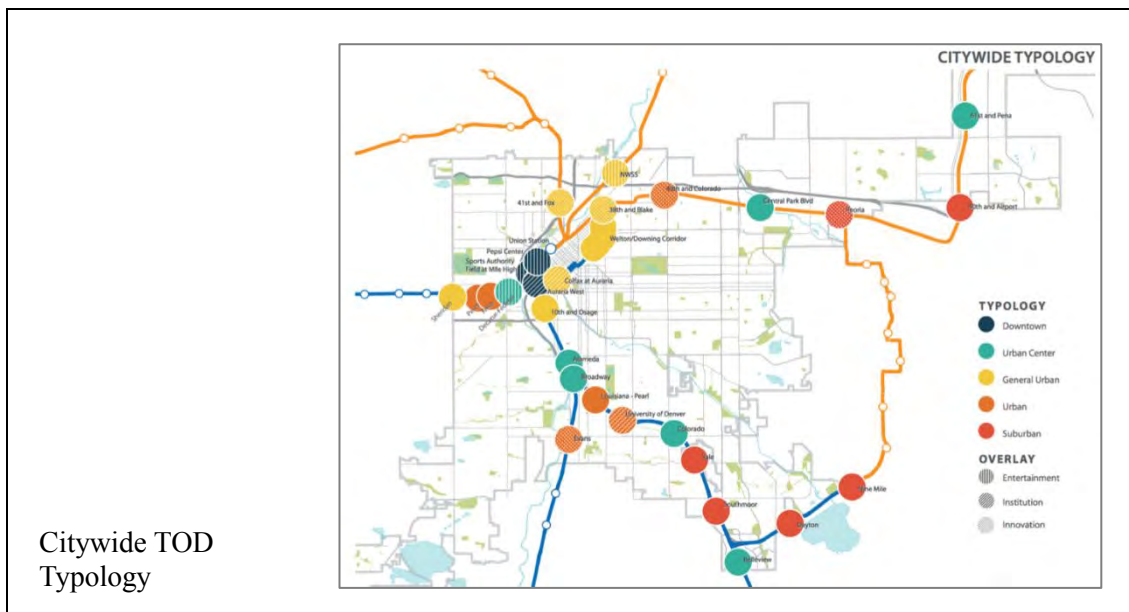
Urban Centers in Denver are set as the future image of the city in its “Metro Vision 2035”. These centers are connected to public transportation, with a concentrated arrangement of future functions, such as for housing and offices.



In addition, a comprehensive TOD strategy is defined in the Strategic Plan for Transit Oriented Development, a public transportation strategy that also includes a public transportation corridor and development strategy for individual stations (TOD Typology).



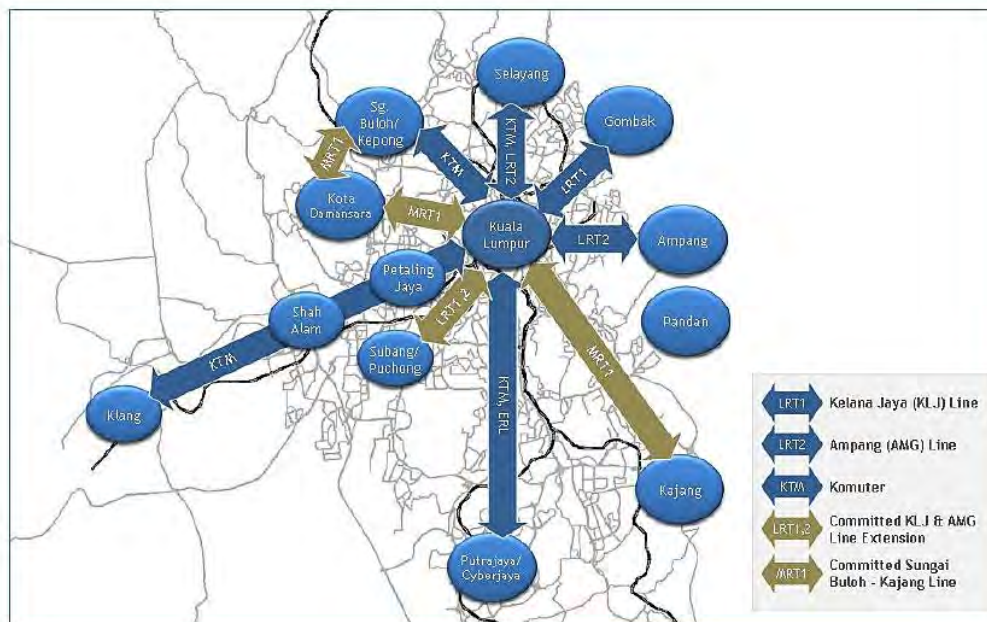
FasTracks System Plan



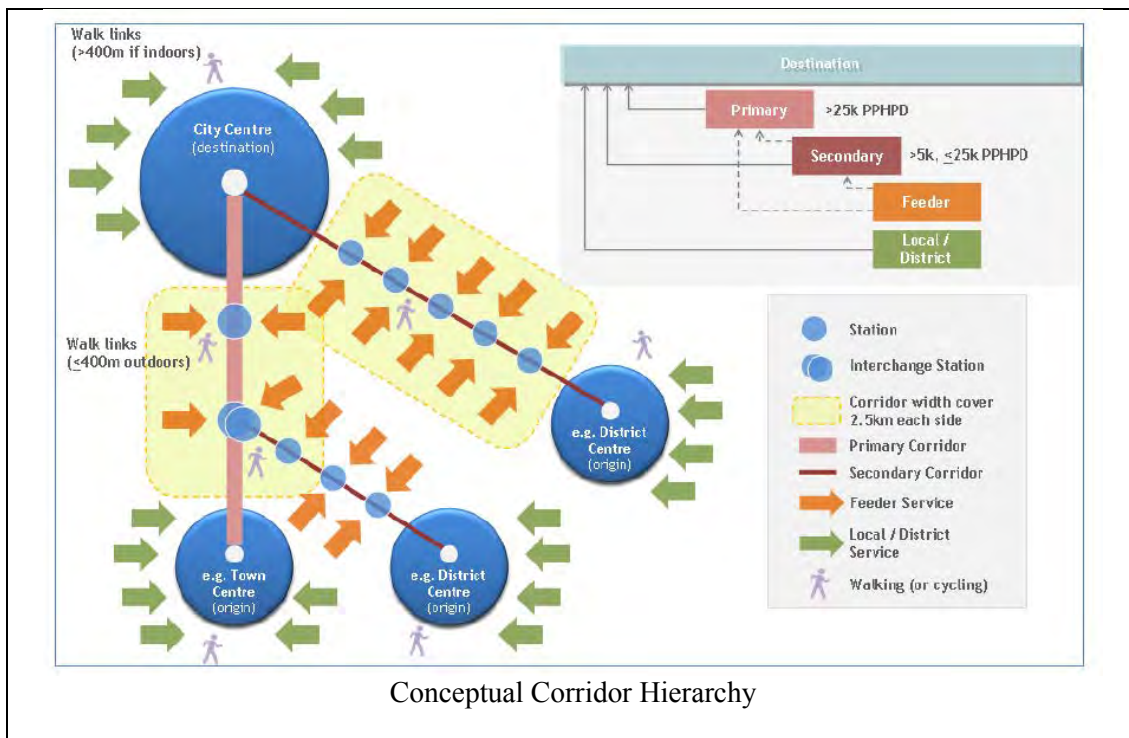
Citywide TOD Typology

Case Study: Placement of TOD corridors in the metropolitan area (Kuala Lumpur, Malaysia)

TOD corridors and peripheral nodes are positioned in the Kuala Lumpur Metropolitan Area centered on Greater Kuala Lumpur. Specifically, the contents of the figure below are set in the Greater KL/Klang Valley Land Public Transport Master Plan (prepared by the Land Public Transport Commission (SPAD) and published in June 2013). In addition, each corridor is classified into levels, and distance for walking areas is also set. Transit Zones centered on stations are set based on corridors positioned in this master plan to try to properly guide land use and density around stations in the KL Metropolitan Area. Although these approaches are still under development, they may be of reference to newly emerging economies.



Primary Corridors - Greater Kuala Lumpur / Klang Valley



4.2.2 Corridor Level TOD

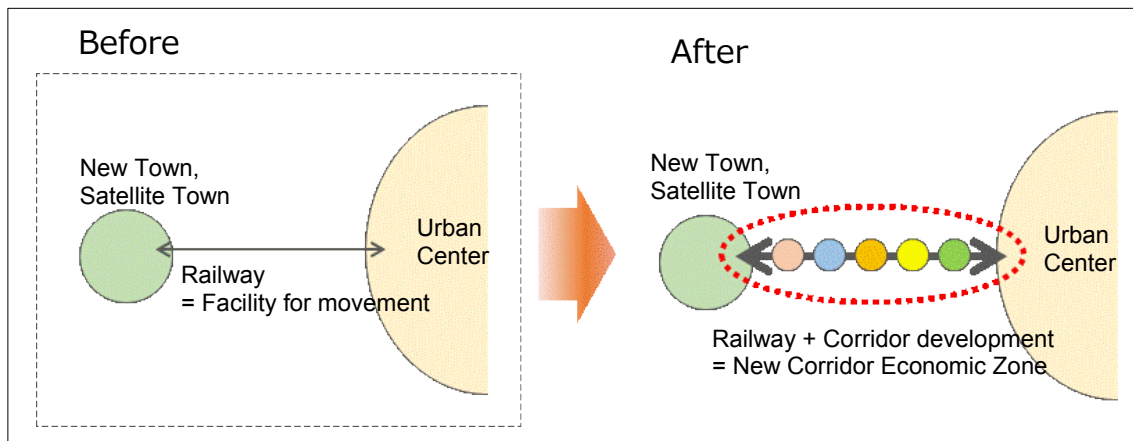
Several suburban new towns are being constructed in the Tehran Metropolitan Area. However, these new towns are not being integrated with the planning and development of commuter railroads connected to the city center. One of the reasons for this is that most people commute from the suburbs to the city center by car and the needs of railway users are not high, which lowers the priority of railway development. It is also common to regard new towns only as railway terminal points with a concentration of housing, no progress in the development of complex urban functions, and little development other than sprawling residential areas along railway lines leading to terminal stations.

Points for promoting TOD for Corridor Level in the Tehran Metropolitan Area are shown below.

(1) Creation of new urban economic zones along railways

It is important to look at railways as economic zones integrated with urban functions along railway lines, not merely as a means of movement connecting the city center with the suburbs. The ultimate goal of an economic zone is the sound development of the city, inducement of urban functions along the railway, and solutions to social issues (see Figure 4-4).

Business models for private railways in metropolitan areas in Japan (see examples on the following pages) contain plans to arrange urban functions (offices, housing, universities, entertainment, other) along railway lines from the perspective of realizing a future suburban lifestyle, in addition to increasing the number of passengers using the railway.



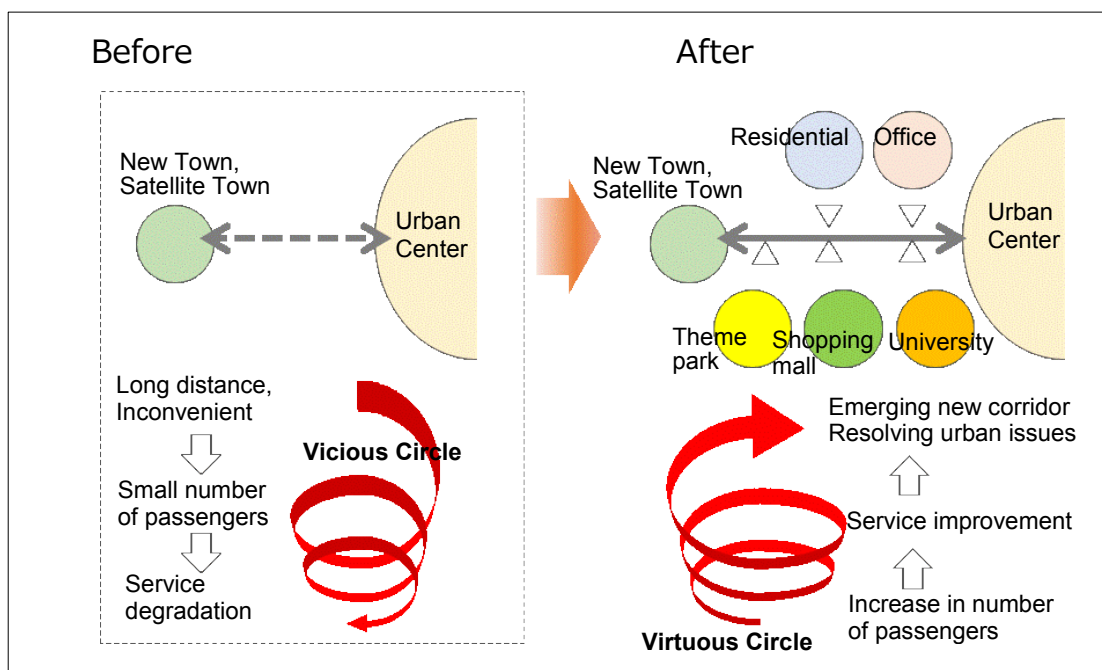
Source: JICA Study Team

Figure 4-4 Creation of Economic Zones along Railway Lines

(2) Guidance and arrangement of functions along railway lines and clarification of positioning of each station

In order to achieve the above, it is necessary to strategically examine the types of urban functions that should be arranged at the starting and ending points along the line. It is also important to clarify the positioning of each individual station. Figure 4-5 shows the guidance and arrangement of urban functions along railway lines.

Examples promoting a corridor-type TOD in Japan related to these matters, as well as case studies in Amsterdam where the public sector develops corridors in master plans, are illustrated on the following pages.

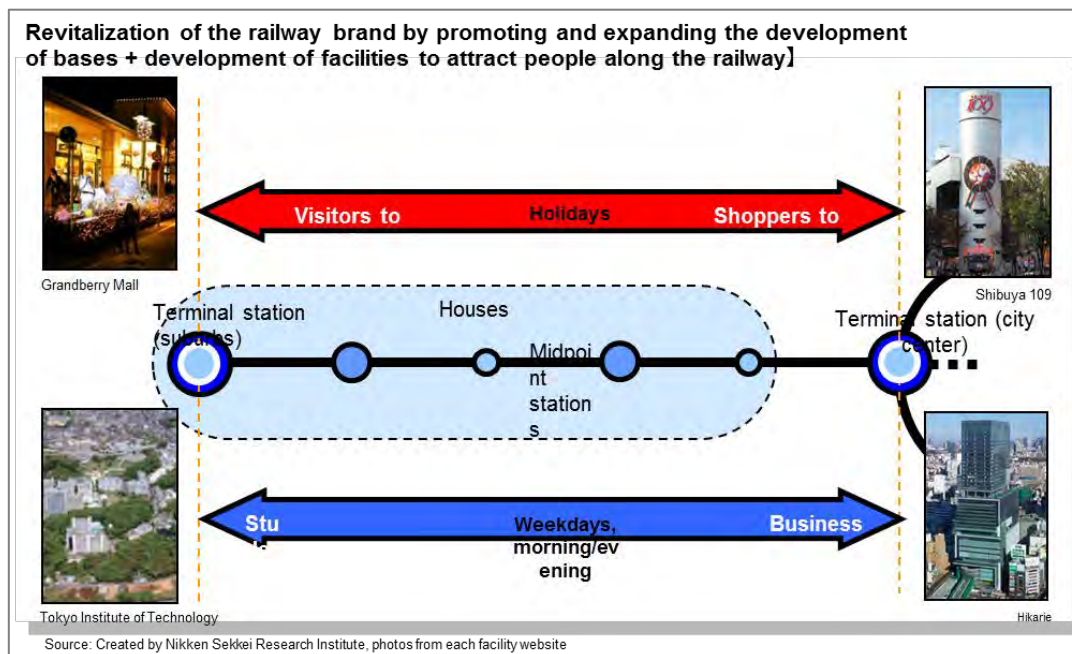


Source: JICA Study Team

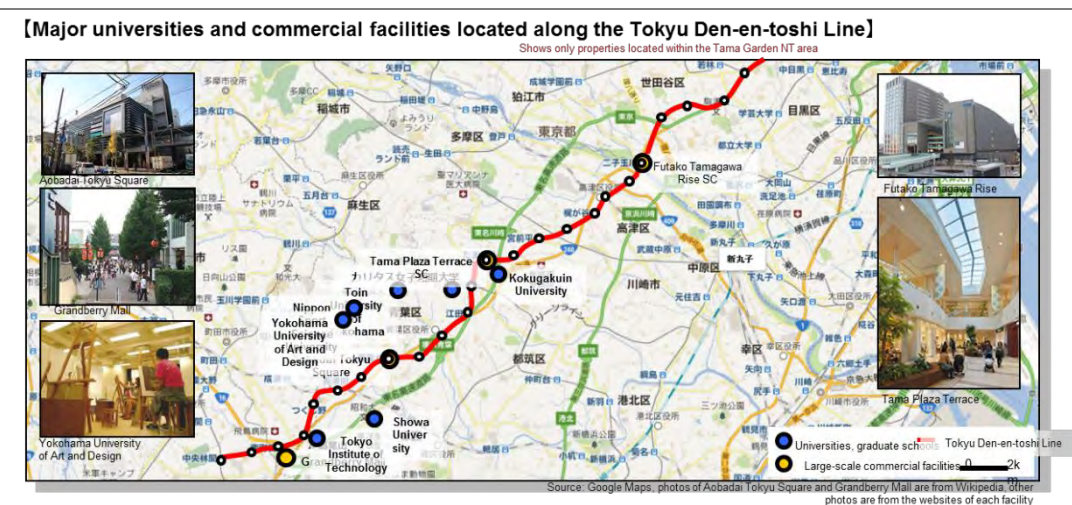
Figure 4-5 Guidance and Arrangement of Urban Functions along Railway Lines

Case Study: Model for the development of private railway lines in Japan's metropolitan areas (Tokyu Corporation)

Railroads and railway line development by private railways companies have been integrated in metropolitan areas of Japan. One example of this is an introduction to the efforts by Tokyu Corporation.



The basic concept of this model is the development and induction of commercial and office concentrations around terminal stations in city centers and the development and induction of facilities with a high level of purpose, such as universities and entertainment facilities, around suburban terminal stations. The midpoint is the improvement and inducement of housing functions, making it possible for various users to always use the railway regardless of whether it is morning or night, a weekday or holiday. This can be regarded as an excellent business model from the perspective of Land Value Capture, in which real estate value along railway lines can be improved as a result of the railway business.



As Tokyu Corporation is itself a developer, it promotes development around the station in cooperation with residents and others in the surrounding area and is actively attracting universities and other facilities.

However, in the background of the abovementioned private railway model in Japan is the fact that land in the suburbs was able to be purchased relatively inexpensively before the metropolitan area such as Tokyo expanded. In addition, railway development, operation, and peripheral development are often separated overseas, making players such as the private railway companies in Japan uncommon.

However, various efforts are being made to achieve the above business model. Even in Japan, there are cases, such as the Tsukuba express, which has promoted the above model based on legal systems. Hong Kong Metro has also implemented similar efforts and contracts for railway development, and in Hyderabad, India, development along railway lines have been integrated.

Case Study: Development model along railway lines through public-private partnerships (Tsukuba Express)

There are models for new development along railway lines in the metropolitan area. This is a mechanism that can be promoted through public-private partnerships by developing legal systems for the above private development along railway lines.

In this mechanism, a framework was prepared that would integrate development of the railway and around the station by first having the government formulate a master plan for the railway line around the station and implement a “Land Readjustment Project”, which is a method of promoting urban development around stations in Japan, resulting in the integration of railway and periphery development. (The Land Readjustment System allows for the development of infrastructure, such as roads and parks, without eviction by allowing landowners to legally transfer some land to the public.)

At the same time, the public sector promoted urban development by appealing to residents along the railway lines by naming the lifestyle along the line, the “Tsukuba Style”.

【Tsukuba Express line and land readjustment project area】

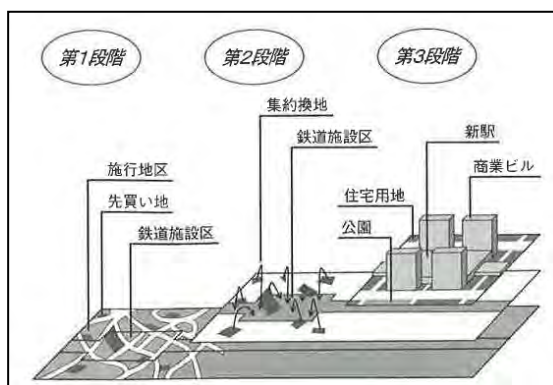
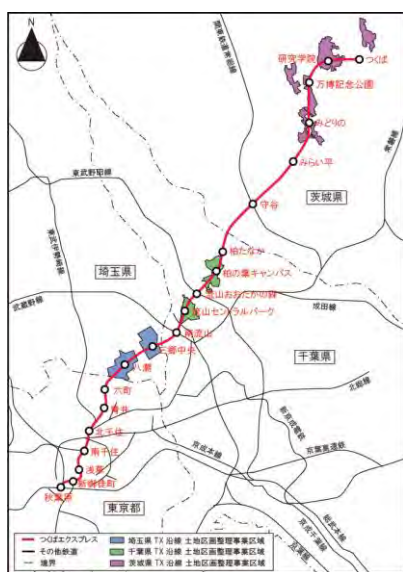


Image of integrated land readjustment project

Source: Created by Nikken Sekkei Research Institute based on materials from each prefecture

■ Proposals for new suburban communities

- Development in the area along the TX is being carried out for new communities with mixed academic, industrial and cultural functions, such as the Tsukuba Science City and Kashiwanoha Campus City.
- Information is actively being disseminated under the slogan of "Tsukuba Style" in order to convey the attraction of cities blending the natural environment and knowledge.

【Kashiwanoha Campus City】



Source: Mitsui Fudosan website

【Tsukuba Style website】



Source: Tsukuba Style website

■ Linkages and exchange of railway-oriented cities

- The Tsukuba Science City is directly connected to central Tokyo by the TX, which enhances collaborative exchange and promotes the mutual development of diverse cities along the railway through the medium of railways.

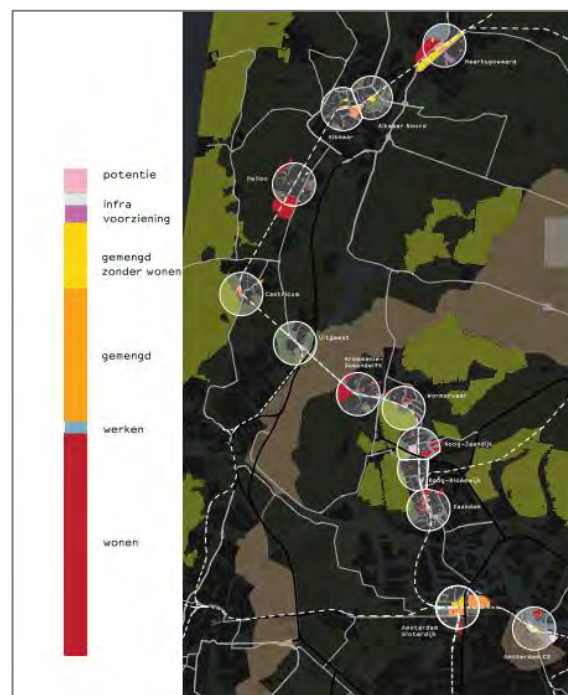
Source: Development of Railroads and Cities Along Railway Lines (Toshio Takatsu, Seizendo-Shoten Publishing Co., Ltd. 2008)

Case Study: Planning for each station on a corridor scale (Zaancorridor, Amsterdam)

In Amsterdam, the railway corridor is considered to be a suitable level for coordinating transport and land use development. One of the corridors defined in TOD strategy (Maak Plaats!) is the Zaancorridor indicated in the figures below.



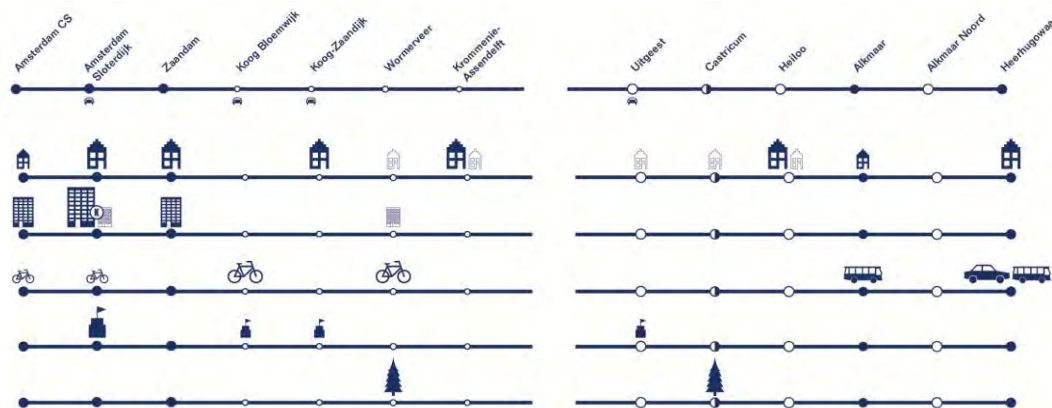
Source: Province of Noord-Holland & Deltametropolis Association (2013)



Source: Deltametropolis Association (2013)

Challenges for each station

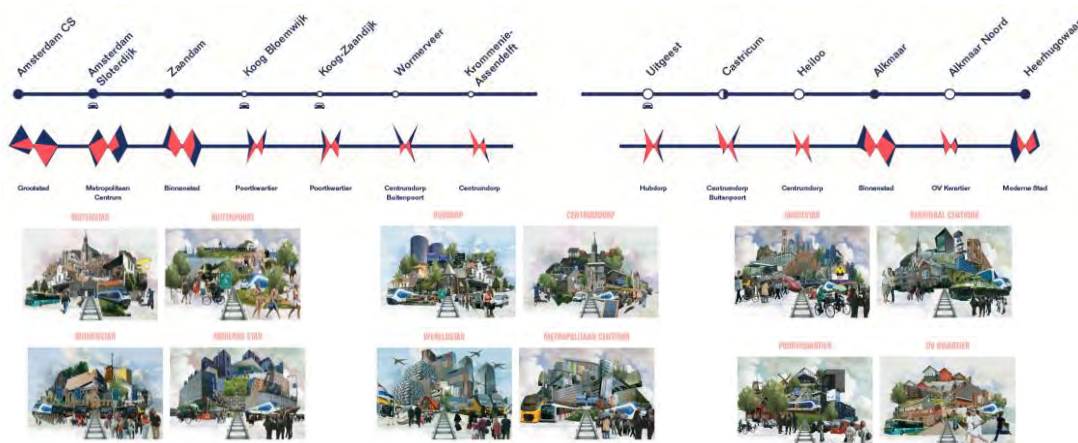
For each of the stations along the Zaancorridor, the challenges in terms of housing, offices, chain mobility, amenities, and recreation are described.



Source: Province of Noord-Holland & Deltametropolis Association (2013)

Station typologies

Twelve promising station typologies have been developed. Such typologies allow each station along a railway line and in a railway network to develop complementarily, so that they do not compete with each other.



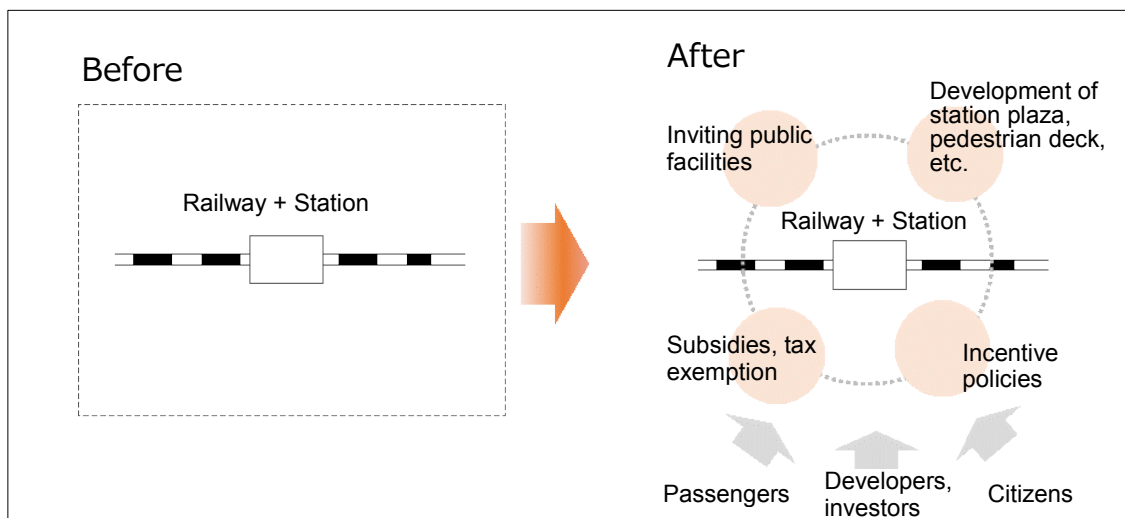
Source: Province of Noord-Holland & Deltametropolis Association (2013)

(3) Examination of Legal Systems and Incentives to Induce Development along Railway Lines

In order to induce development of the above corridors, it is necessary not only to develop stations and railways as has been done conventionally but also to design legal systems and incentives to induce the development of business through public-private cooperation (see Figure 4-6). This requires the guidance of administrative and public functions in the early stages of development and the introduction of incentives (subsidies, reductions in tax, relaxation of floor area ratio (FAR), etc.) to encourage private development. On the contrary, if the potential for development around the stations is high, development can be controlled with the collection of contributions for development and appropriation to railway infrastructure development costs. Policies to promote

this type of development along railway lines should be appropriately assessed and applied according to individual situations.

Examples from Japan, London (UK), and Hyderabad (India) are shown on the following pages as policies to guide development along railways and the mechanism of Land Value Capture.

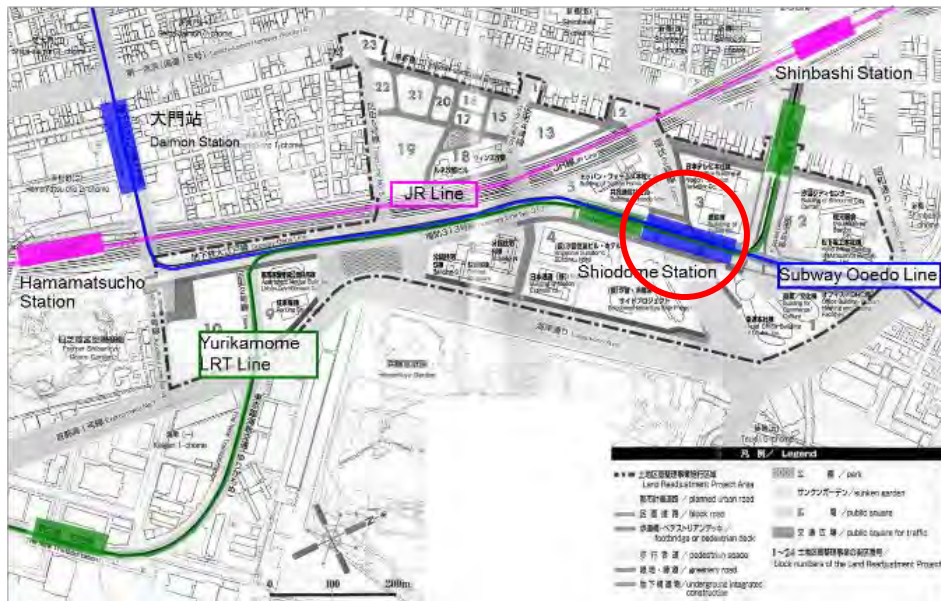


Source: JICA Study Team

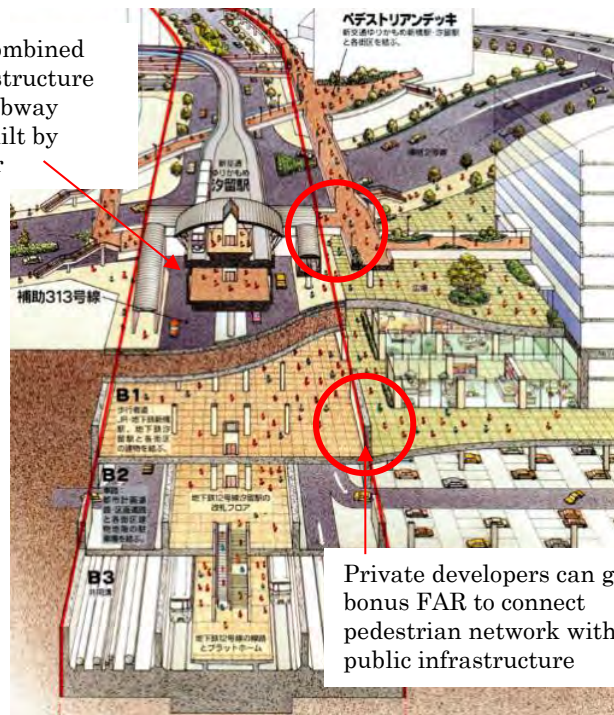
Figure 4-6 Legal Systems and Incentives to Induce Development along Railway Lines

Case Study: Promotion of TOD through master plans and incentives (Shiodome Sio-site)

The Shiodome Sio-site is a type of large-scale urban development around Shinbashi Station in central Tokyo. Public urban functions, such as the station plaza, as well as pedestrian decks and underground pedestrian networks connecting to public transportation, are positioned in the master plan. Based on this, it is a “carrot and stick” measure where FAR bonuses are provided in the case of development by private industries. While the public sector can encourage intentional city development, private businesses can also receive bonuses that correspond to this.



Vertically combined urban infrastructure including subway station is built by public sector



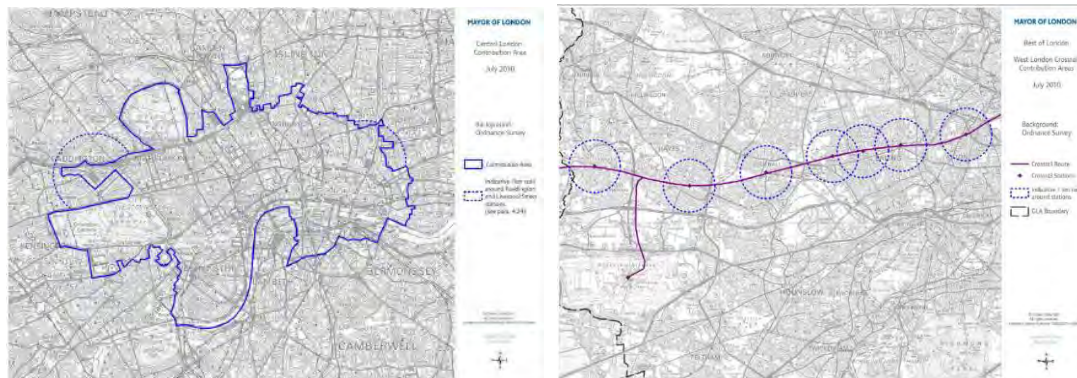
Private developers can get bonus FAR to connect pedestrian network with public infrastructure

Public

Private

Case Study: Collection of development charges from development along railway lines (London)

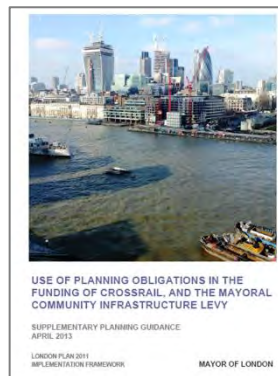
In London, certain charges are levied on developers including those of offices and commercial facilities around public transportation stations. The amount of contribution is determined by area and application.



Target areas for charges (left: central area, right: around railway station)

Table 2: Indicative Level of Charge per sq.m, by land use and location as at July 2010

| type of dev | central London (See Annex 1) | Isle of Dogs (see Annex 2) | rest of London (See Annex 3) |
|-------------|--|--|--|
| | Including approximate 1 km indicative radii outwards around Paddington and Liverpool Street Stations | Including approximate 1 km indicative radius outwards around the proposed Canary Wharf station at West India Quay inclusive of and south of the Poplar DLR lands | Including approximate 1 km indicative radius outwards around the proposed Canary Wharf station at West India Quay north of the Poplar DLR lands as well as such radii around all other stations outside the Central Contributions Areas apart from Woolwich Arsenal. |
| office | £140 | £190 | £31 |
| retail | £90 | £121 | £16 |
| hotels | £81 | £84 | - |

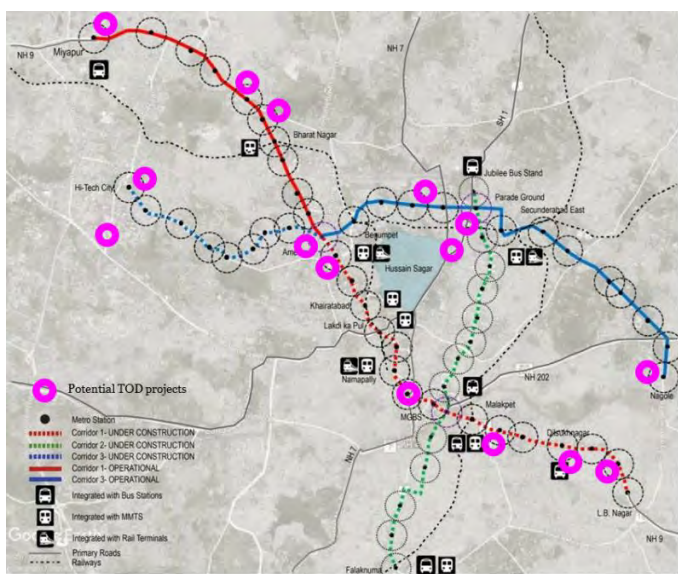


Amount of charges

Case Study: Integrated development of railways and along railway lines in concession-type development (Hyderabad)

A metro with three lines is currently being planned (partially opened) in Hyderabad. It is a concession style of development, where business operators that develop and operate railway infrastructure gain the right to urban development around the station in return.

Specifically, the Special Promotion Vehicle (SPV) and Hyderabad Metro Rail Ltd., the main bodies for railway improvement and development, were established, facilitated by the regional government and public development corporations. From this SPV, Design, Build, Finance, Operate, Maintain and Transfer are collectively outsourced to private enterprises in a concession style of development. For the government, while it is possible to outsource the development of the railway and along the railway, private businesses have the benefit of acquiring development rights around the station.



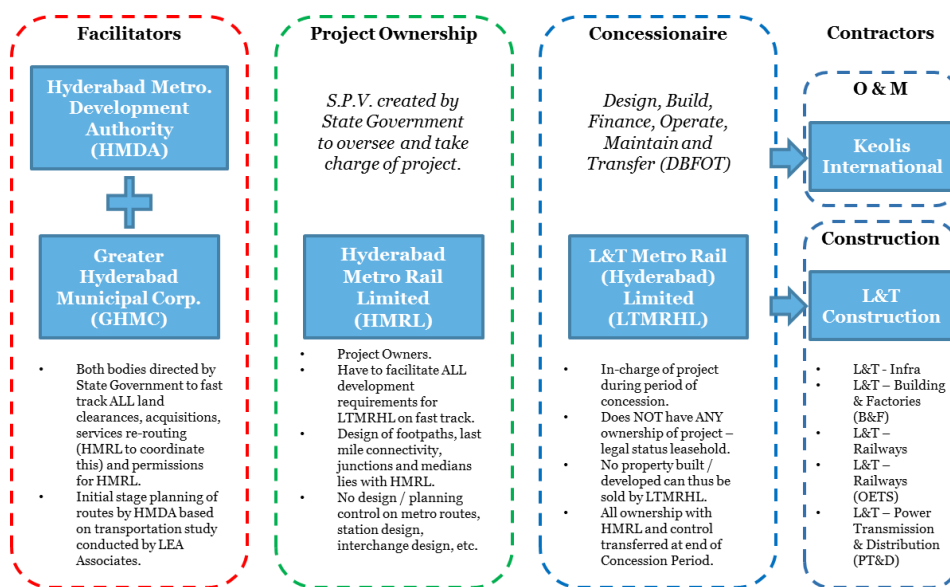
Potential TOD projects planned in Hyderabad



LEGEND
 --- Metro tracks
 Workshop & Maintenance area
 L&T office
 Utilities
 Probable Location of L&T TOD

Metro lines and land for urban development (pink circles)

Urban development sites (purple area)

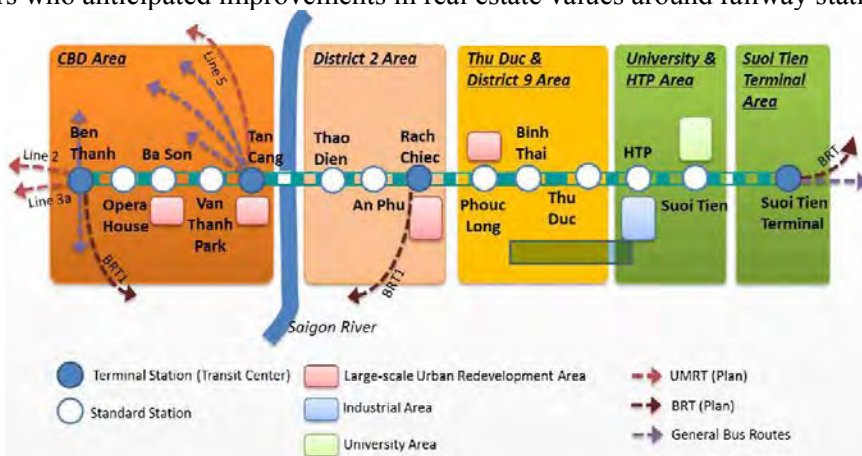


Roles shared by each entity

BOX: TOD issues in cities in newly emerging economies(Example of Ho Chi Minh City in Viet Nam)

In large Asian cities, public transport such as urban railways is being introduced at a rapid pace in response to the emergence of urban issues that have accompanied the rapid increase in population. However, often only traffic functions are prioritized and responses from the perspective of urban planning, including land use along railways, tends to fall behind. This has resulted in a number of situations where disorganized cities have developed along railway lines and do not lead to solutions to urban issues, such as alleviating traffic congestion and improving environmental pollution through the introduction of public transportation, which is its original purpose.

In Ho Chi Minh City in Viet Nam, although the development of the UMRT Line No. 1, the first railway in the city, is a priority, the city is facing a situation where sufficient measures cannot be taken by the government, as a result of the unorganized purchase of land by private developers who anticipated improvements in real estate values around railway stations.



Overview of UMRT Line No. 1 in Ho Chi Minh City

As shown in the figure below, urbanization is moving forward in most of the areas around the planned station area, so TOD-type urban development cannot be promoted.



4.2.3 Station Level TOD

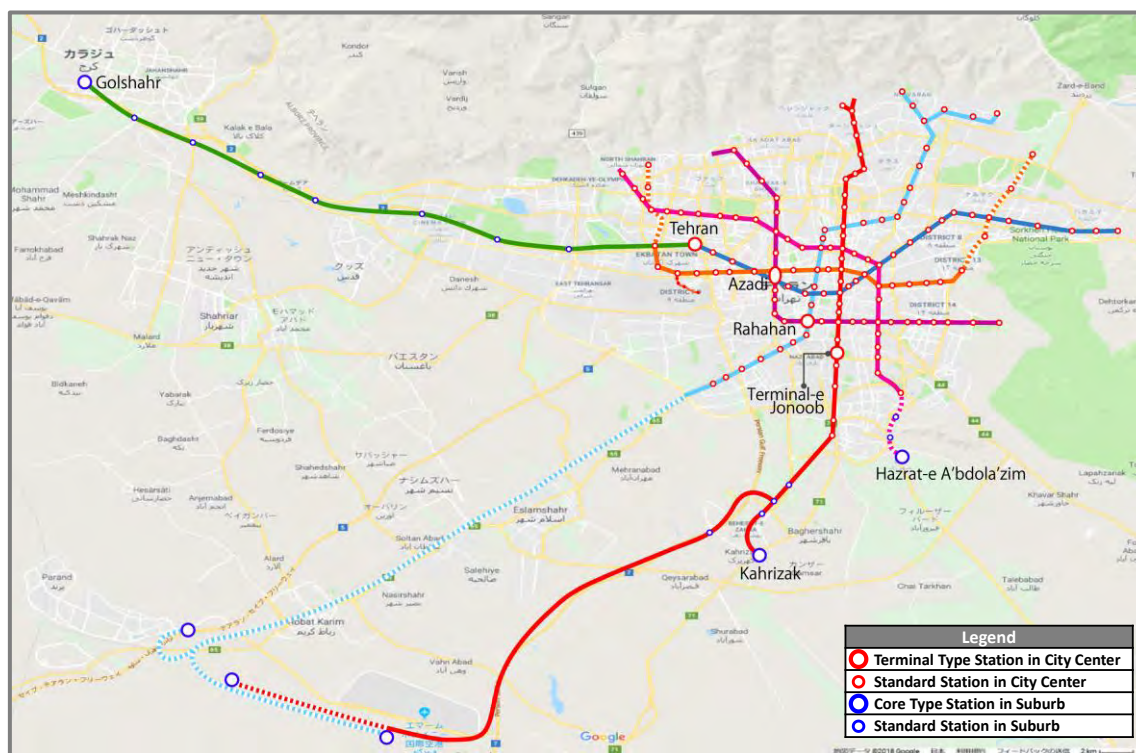
The four types of stations indicated in Table 4-1 are set when indicating the Station Level TOD guidelines. Different requirements will be indicated for each type of TOD in the guidelines.

Table 4-1 Hierarchy of Station in the TOD Guidelines

| Type of Station | Overview and Requirements |
|---|---|
| a) Terminal Type Station in City Center | Transfer terminal type station with multiple intersecting lines located in the center of the city. Recommended for use as a city base through high-volume and mixed use. |
| b) Standard Station in City Center | Station located in city center. Although its potential drops in comparison with transfer terminal type stations, it is recommended for this type of station to be developed into a base for mixed use that can accommodate the number of passengers. |
| c) Core Type Station in Suburb | Core type station with multiple intersecting lines located in the suburbs. Recommended for residential, commercial, and business functions to be concentrated in medium to high density in this type of station. |
| d) Standard Station in Suburb | Station located in the suburbs. Recommended to have suitable functions in place to support daily life, with the main application of low- to medium-rise housing. |

Source: JICA Study Team

The following figure illustrates a draft idea for the above station types in the Tehran Metropolitan Area. The type of station will ultimately be decided after consultations with counterpart organizations.



Source: JICA Study Team

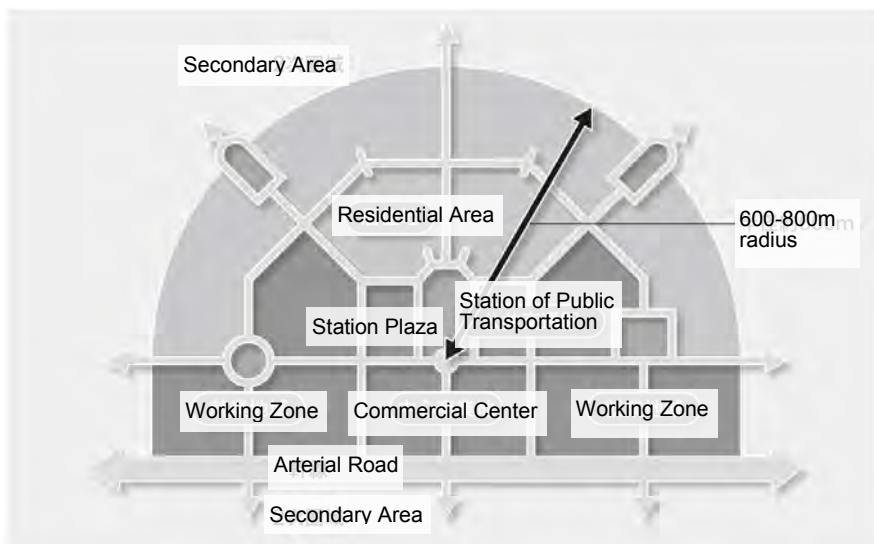
Figure 4-7 Map of Rail Network in the Tehran Metropolitan Area (draft idea)

(1) Land Use

- Current Issues in Iran
 - The use of land in areas surrounding stations does not take advantage of the increase in potential for urban development through improvements to railway stations.
 - Urban functions that can fully demonstrate the functions of railway stations are not in place in areas around stations.
 - Land is not secured to develop an intermodal facility, such as a station plaza and parking lots in adjacent areas around the station.
- Basic Orientation of Guidelines
 - Setting land use regulations (applications, volume, height regulations) in areas surrounding the station that utilize the effects of station improvements.
 - Development of urban functions (intermodal facilities and facilities suitable for the station area) in order to fully demonstrate the effects of improvements to railway stations.
 - Secure appropriately-sized land for the development of intermodal facilities through urban planning (prohibit development for other applications).

a) Basic Land Use for the Station Area

Figure 4-8 shows the basic orientation for land use in areas around stations. The figure shows the arrangement of areas around a public transport station where commercial functions are concentrated, areas where work functions are located, and areas where residential functions are located. However, in order to improve energy efficiency and convenience for pedestrians, it is preferable for the area around the station to have a mix of various applications in medium to high density and to significantly change countermeasures depending on the station type, urban development of target areas, and the development situation of infrastructure.



Source: The Next American Metropolis: Ecology, Community, and the American Dream by Peter Calthorpe (1993).

Figure 4-8 Basic Orientation of Land Use for the Station Area

Table 4-2 shows the preferred type of basic land use for development in areas around stations. Based on these types of land use, different land use patterns will be set according to the four types of stations mentioned above. For example, development for office use is limited in Core Type

Station in Suburb and Standard Station in Suburb. And convenient facilities for Standard Station in Suburb will be small-scale.

Table 4-2 Basic Land Use for the Station Area

| |
|---|
| <ul style="list-style-type: none"> • Convenient facilities: Commercial (Retail, restaurants, GMS) • Convenient facilities: Public facilities • Intermodal facilities (station plazas (bus berths, taxi bays, spaces for Kiss & Ride), car and bicycle parking areas, spaces for pedestrian networks, amenities such as green and open spaces) • Amenity facilities: Green areas, parks, open spaces • Housing • Offices |
|---|

Source: JICA Study Team

b) Volume of Facilities Located in the Station Area

The main planning criteria for determining the preferred volume of a facility that will be located in an area around a station are floor area ratio (FAR), building coverage ratio (BCR), and height restrictions.

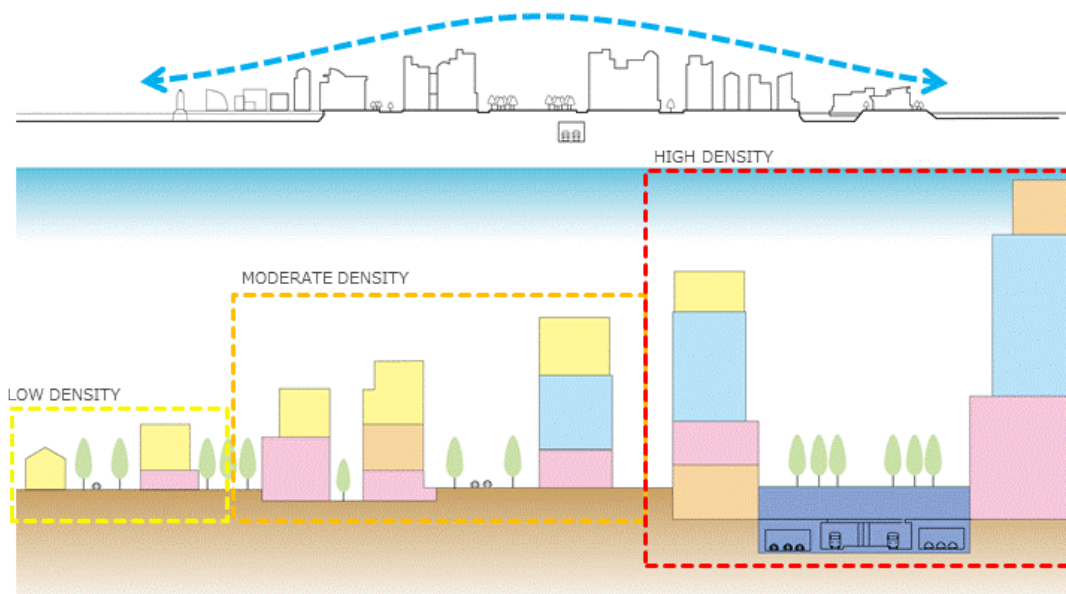
First, the standard FAR reference values for each station type are shown in Table 4-3. FAR is the most important planning criterion for determining volume. Setting an excessive reference value for FAR may result in an acute situation in areas surrounding the city center, such as traffic congestion and a shortage of supply for various city services. Therefore, when setting FAR, it is necessary to carefully consider the state of development of infrastructure such as roads in the target area.

Table 4-3 Standard FAR by Station Type

| Type of Station | Standard FAR (net) |
|---|--------------------|
| a) Terminal Type Station in City Center | 400%-600% |
| b) Standard Station in City Center | |
| c) Core Type Station in Suburb | 300%-400% |
| d) Standard Station in Suburb | 200%-300% |

Source: JICA Study Team

Figure 4-9 shows the formation of a basic skyline based on setting the facility development density oriented around a station. As shown in this figure, by setting facility density into high, medium, and low density in order from areas closest to the station, it is possible to take complete advantage of the benefits of station development and urban functions concentrated in the area around the station based on movement by foot.



Source: JICA Study Team

Figure 4-9 Concept of Setting Station-Oriented Skylines

c) Size of Station Plaza

It is necessary to secure land adjacent to the station in urban plans in order to develop intermodal facilities, such as station plazas and parking for cars and bicycles, and permanently eliminate urban development for other applications in that area. Table 4-4 shows the scale needed for the standard development of a station plaza according to the number of passengers at the station. The figures shown in this table are only a guide. In actual urban planning, it is necessary to designate scale taking into consideration bus routes connected to each station and the area required for taxi bays and Kiss & Ride.

Table 4-4 Standard Size of Station Plazas by Number of Passengers*

| Daily Ridership (No. of passengers per day) | Standard Size of Station Plaza |
|--|--------------------------------|
| Less than 5,000 | 1,000-3,000 m ² |
| 5,000-10,000 | 2,000-4,000 m ² |
| 10,001-20,000 | 3,000-5,000 m ² |
| 20,001-30,000 | 4,000-7,000 m ² |
| 30,001-50,000 | 5,000-10,000 m ² |
| More than 50,000 | More than 7,000 m ² |

*Indicates only standard values. In actual planning, it is necessary to designate scale by taking into consideration bus routes connected to each station and the area required for taxi bays and Kiss & Ride.

Source: JICA Study Team

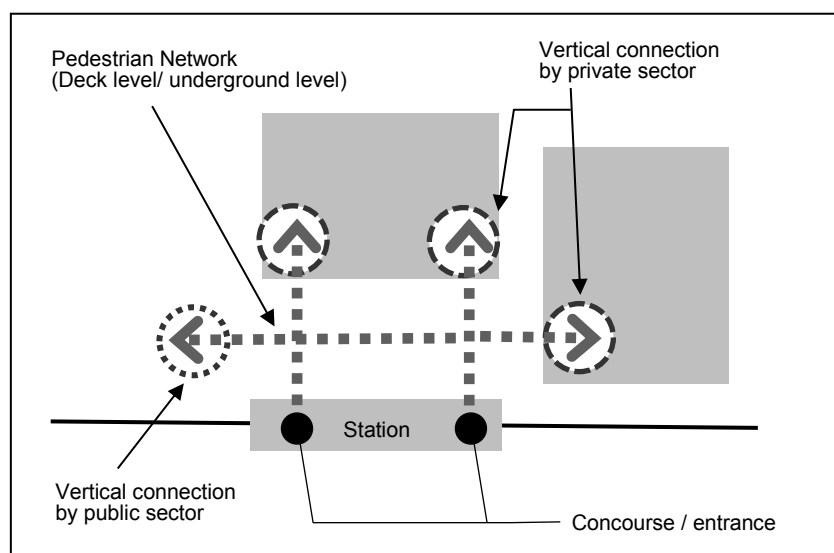
(2) Pedestrian Network

- Current Issues in Iran
 - The volume of traffic is generally high in the central areas of large cities. Traffic is particularly concentrated in areas where railway stations have been developed.
 - Roads intersect in many of the areas around railway stations, turning the area into an environment where pedestrians are unable to walk in an unbroken line.
- Basic Orientation of Guidelines
 - A pedestrian network should be developed where pedestrians can safely and comfortably access surrounding areas directly from the station.
 - A universal-design pedestrian network should be developed so that it can be used by the elderly and people with disabilities.

a) Development of continuous pedestrian flow lines from the station

Pedestrian flow lines should be developed to allow pedestrians to directly access surrounding areas from the station. By developing pedestrian flow lines, an environment can be secured that allows pedestrians to walk safely and comfortably without crossing vehicle traffic flow lines as much as possible.

Figure 4-10 shows the basic idea of the development of a continuous pedestrian network from the station to neighboring areas. The pedestrian network should be secured that continues on to surrounding areas, preferably at the underground or deck level (2F-level above ground), to avoid requiring pedestrians to cross roads from the entrances/exits of the station concourse to surrounding areas. Facilities for vertical connections (underground and aboveground level or aboveground and deck level), such as stairs, elevators, and escalators, should be suitably arranged in the network to improve convenience for pedestrians. Facilities for vertical connections can be made more convenient for pedestrians through cooperation between the public and private sectors.

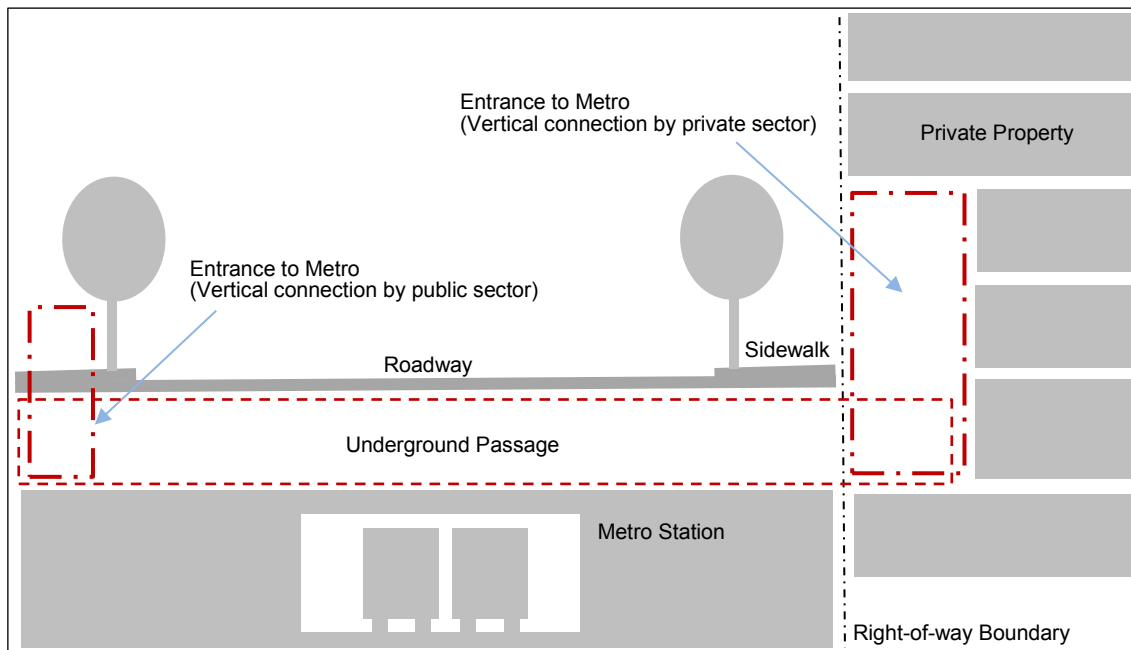


Source: JICA Study Team

Figure 4-10 Concept of Development of Pedestrian Network

For an underground station, as many entrances as possible should be set to the underground area to reach the target direction without requiring pedestrians to cross roads. As shown in Figure 4-11, it is possible to secure a number of safe and comfortable connections to underground stations

by using vertical connections such as escalators and elevators that have been developed on private property located next to a station facility.

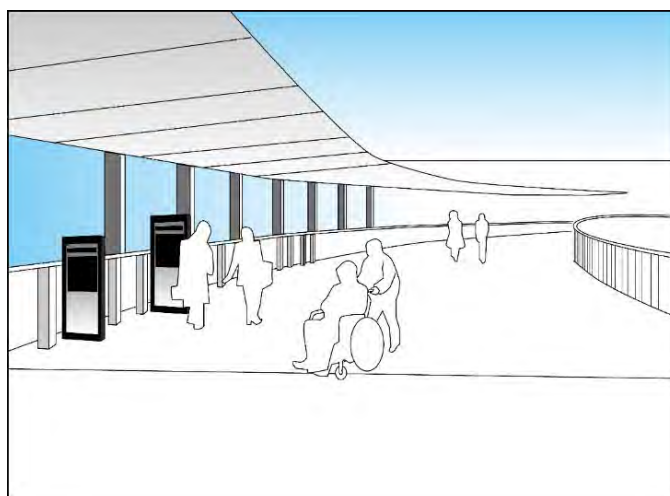


Source: JICA Study Team

Figure 4-11 Concept of Development of Pedestrian Networks in Underground Stations

b) Development of universal design for pedestrians

Pedestrian networks must be developed in a universal design to ensure that the elderly and persons with disabilities are able to use the network easily. To this end, consideration must be paid to (1) securing comfortable walking spaces without level differences, (2) developing shelters such as continuous roofs so that pedestrians can walk even when it is raining, and (3) installing signs that take people who are visually impaired into consideration. Figure 4-12 shows an image of a universal design space.



Source: JICA Study Team

Figure 4-12 Image of Universal Design Space in a Pedestrian Network

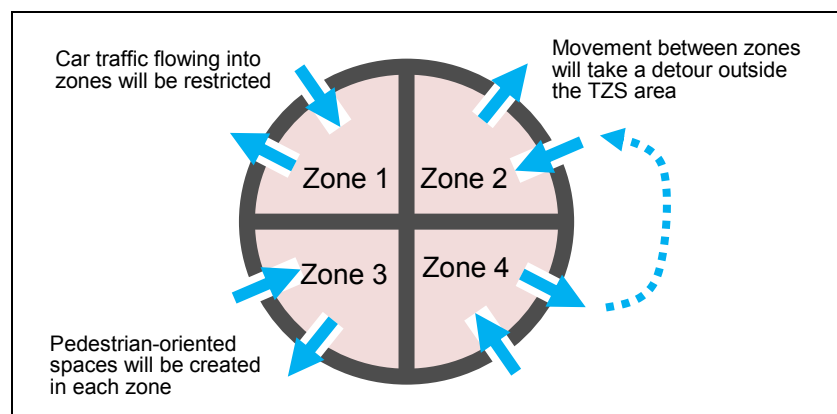
(3) Traffic Network

- Current Issues in Iran
 - There is a shortage of access roads to properly handle generated traffic at stations that function as bases, such as Terminal Type Station in City Center and Core Type Station in Suburb.
 - Since vehicular traffic around stations can be chaotic, it makes walking difficult for pedestrians.
- Basic Orientation of Guidelines
 - In stations that function as bases, a walkable environment should be developed by improving basic access roads and controlling vehicular traffic flowing into the area around stations.

a) Introduction of Traffic Zone System (TZS) to create a pedestrian priority area

A Traffic Zone System (TZS) should be introduced in areas around stations that function as area bases, such as Terminal Type Station in City Center and Core Type Station in Suburb in order to convert the entire area into a pedestrian priority space, while also securing the basic access roads needed for station functions. Figure 4-13 illustrates the basic concept of TZS.

TZS is a system developed to create a walkable environment and reduce vehicular traffic by setting an entire area and combining traffic control measures (pedestrian-only roads, one-way streets, road narrowing, etc.) and detour measures (development of ring roads and underground passages, etc.). The TZS was first implemented in Europe (Bremen, Gothenburg) from about 1960, and today, has been adopted in many cities that are promoting urban development with a priority focus on pedestrians.

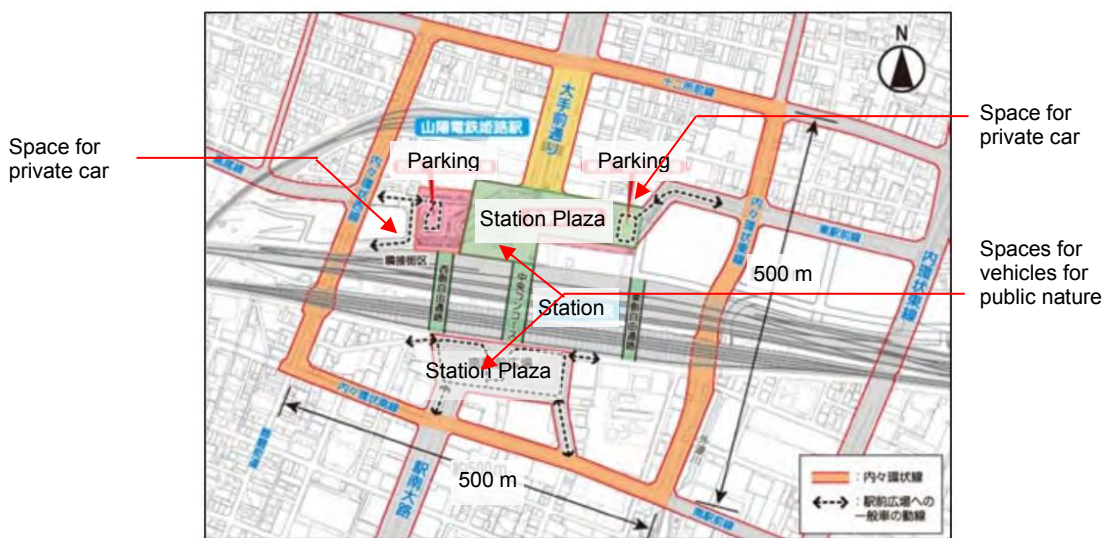


Source: JICA Study Team

Figure 4-13 Basic Concept of Traffic Zone System (TZS)

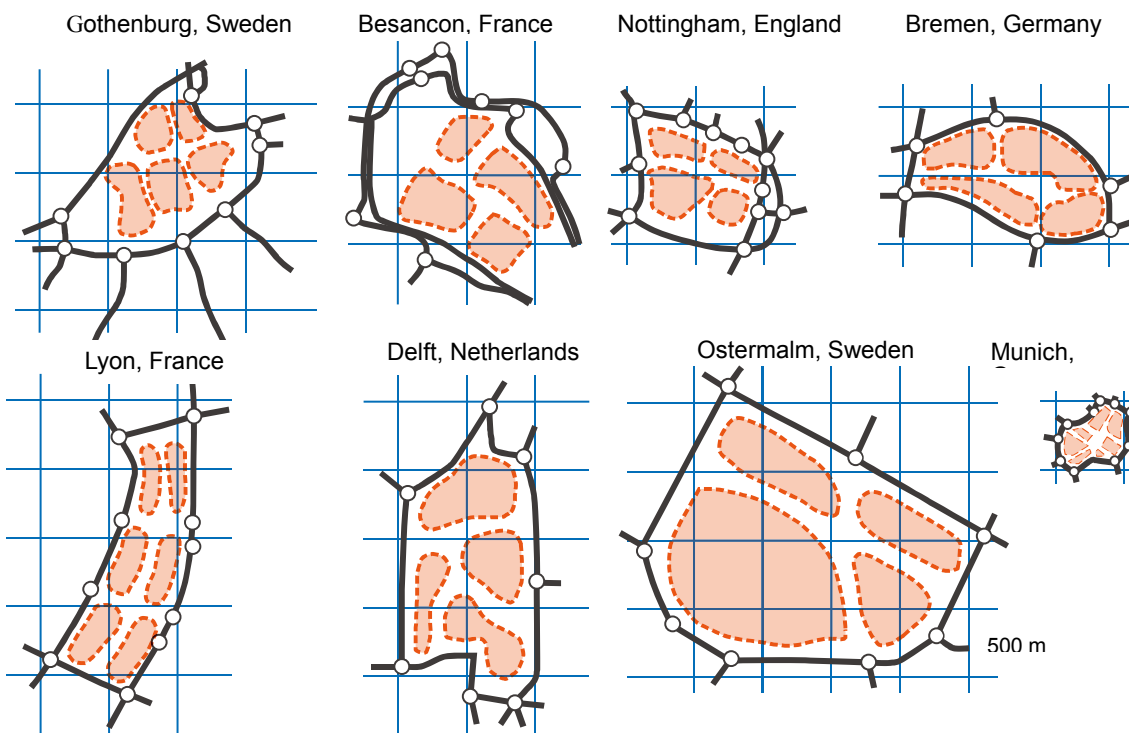
Figure 4-14 shows an example as reference for a traffic network in a Station Area (case of Himeji City in Japan). In this reference example, a traffic plan has been formulated based on the concept of TZS. That is, the roads accessible to the station squares are secured on both sides of the station, private cars are restricted to enter the squares except in designated places, and only vehicles of public nature such as buses and taxis are allowed to enter and stop. The entire station area is planned as a pedestrian priority area by designating most of the roads as a one way traffic and restricting vehicular traffic.

In addition, Figure 4-15 shows the same scale of the area where TZS was introduced in European cities.



Source: JICA Study Team based on Himeji City Urban Planning Information

Figure 4-14 Example of Station Area Traffic Network Plan



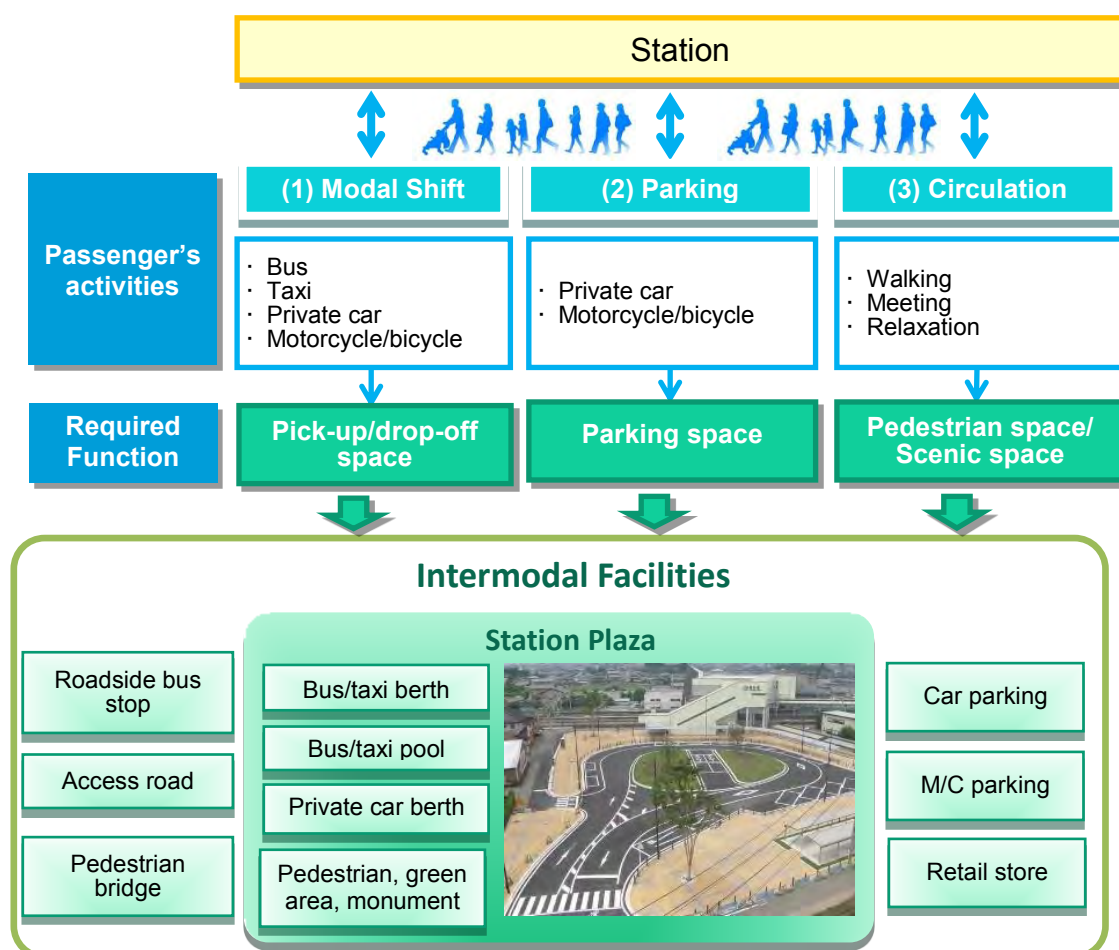
Source: JICA Study Team

Figure 4-15 Same Scale of the Cities in Europe where TZS was Introduced

(4) Intermodal Facilities

- Current Issues in Iran
 - Means for users to easily access stations are not in place.
 - Facilities to allow the use of feeder modes, such as buses and taxis, are not adequately developed. (In many stations, bus berths and taxi bays are not located close to the station. If they are, they cannot be easily accessed.)
 - Coordination among transportation operators (metro, bus, BRT, taxi, etc.) is not properly conducted in developing related facilities.
- Basic Orientation of Guidelines
 - Development of functions to improve accessibility to railway stations for feeder modes, such as buses and taxis (Improvement of station plazas equipped with appropriate functions).
 - Development of facilities for Park & Ride and Kiss & Ride (car and bicycle parking, spaces for Kiss & Ride).
 - Creation of space for pedestrians and amenities to support these functions.

a) Basic Component of Intermodal Facilities



Source: JICA Study Team

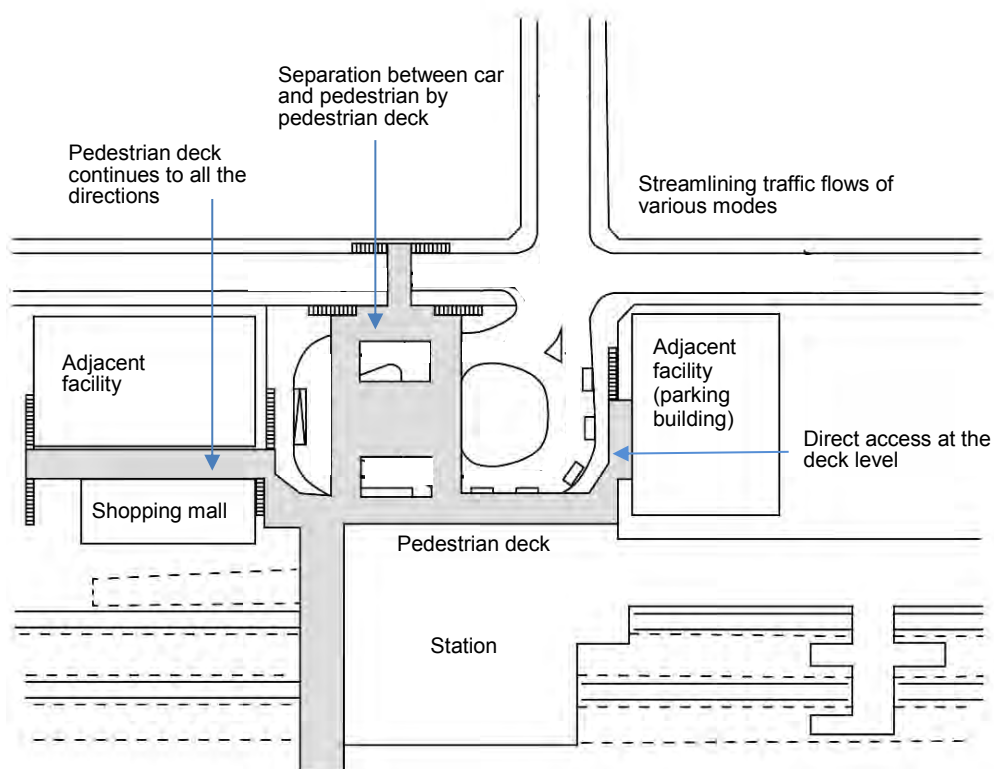
Figure 4-16 Basic Component of Intermodal Facilities

Figure 4-16 shows the basic components of intermodal facilities. As shown in this figure, intermodal facilities consist of three elements: (1) facilities for transferring (modal shift) between railways and other transport modes, such as buses, taxis, private cars, motorcycles, and bicycles; (2) parking spaces for private transport, such as cars, motorcycles, and bicycles; and (3) circulation spaces for buses and cars, as well as amenity spaces, such as green areas and open spaces (including space for retail stores).

The scale for these components is set in consideration of the type of station, passengers, bus routes and required size/number of taxi bays connecting to the station on adjacent land. In order to effectively demonstrate the functions of each component, placement plans must be formulated for each element oriented on the station plaza. Of the types of stations mentioned above, there may be cases where intermodal facilities are not needed, such as for the Standard Station in City Center, or where only spaces for Kiss & Ride would be required.

b) Basic Layout Plan of Intermodal Facilities

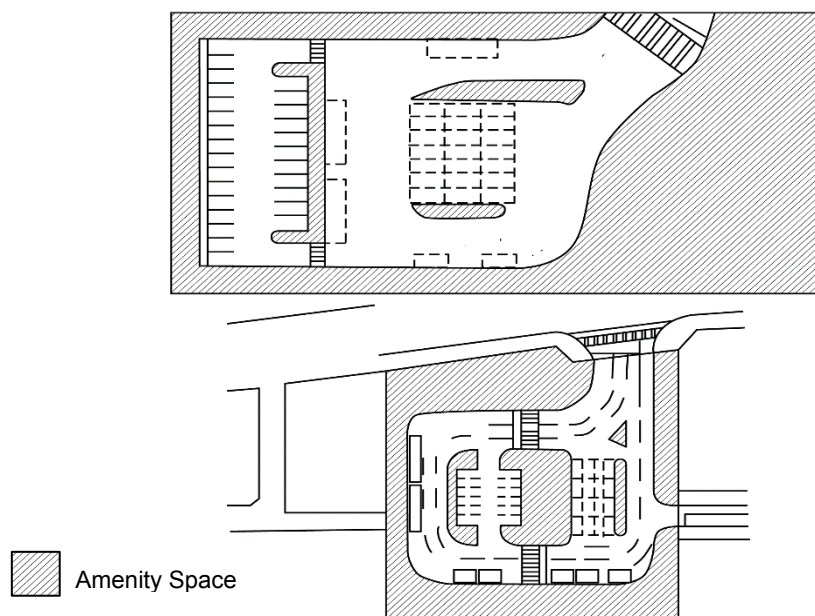
Figure 4-17 shows an idea of the basic arrangement plan for intermodal facilities in the suburbs. First, it is possible to develop continuous pedestrian decks from stations to surrounding areas in order to separate car traffic and pedestrians, as well as to provide access to adjacent facilities and malls and allow pedestrians to cross main roads and move to the opposite sides of the railway tracks. In addition, station plazas that can smoothly handle the flow of traffic for bus berths, taxi bays, and Kiss & Ride should be centrally located in front of the station. In some cases, these facilities may need to be located on both sides of station's railway lines. Furthermore, parking facilities for Park & Ride will be needed next to the station plaza.



Source: JICA Study Team

Figure 4-17 Basic Layout Plan of Intermodal Facilities in Suburban Station

Spaces to improve amenities are needed to improve station plazas, such as spaces for placing benches for people to rest and spaces for green areas, in addition to spaces for pedestrians to take buses and taxis and to wait. The size of these Amenity Spaces should be set to about 50% for station plazas that are a standard scale of 4,000 to 10,000 m² (see Figure 4-18).



Source: JICA Study Team

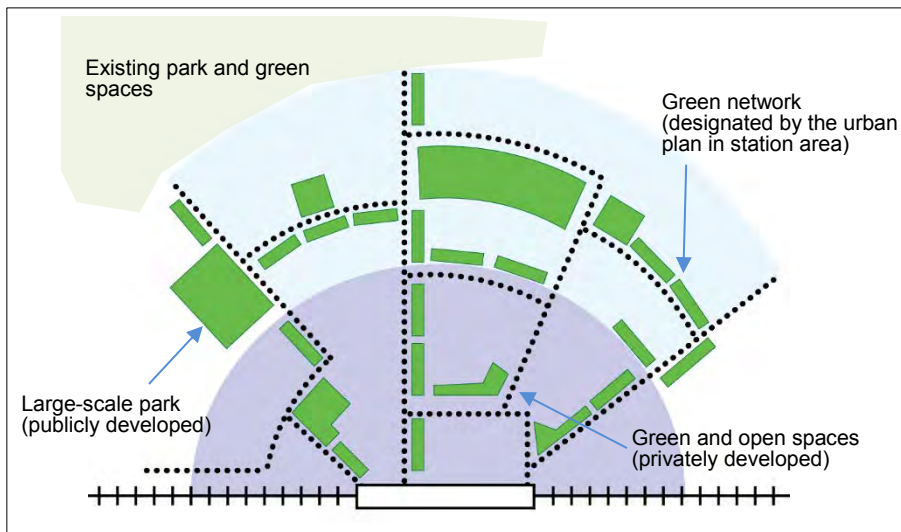
Figure 4-18 Amenity Space for Station Plaza

(5) Green and Open Space Network

- Current Issues in Iran
 - There is a lack of amenity spaces, such as green and open spaces, in areas around stations both in city centers and the suburbs.
 - There are no vibrant, comfortable spaces using these types of amenity spaces in areas around stations.
- Basic Orientation of Guidelines
 - Development of a continuous network of green areas and open spaces from the station to surrounding areas.
 - Systematic consideration of networks where urban functions, such as commercial functions, and amenity spaces are integrated to create a vibrant space.

a) Development of Green and Open Space Network connecting the Station and Surrounding Blocks

Figure 4-19 shows an image of green and open space networks connecting the station and surrounding blocks. As shown in this figure, green and open space networks are formed by connecting amenity spaces in various ways through public-private partnerships. For example, continuity in amenity spaces can be secured by connecting spaces designated for development through urban planning in areas around stations, spaces such as large-scale parks needed in the target area, and spaces created by opening up private green areas and spaces to the public.

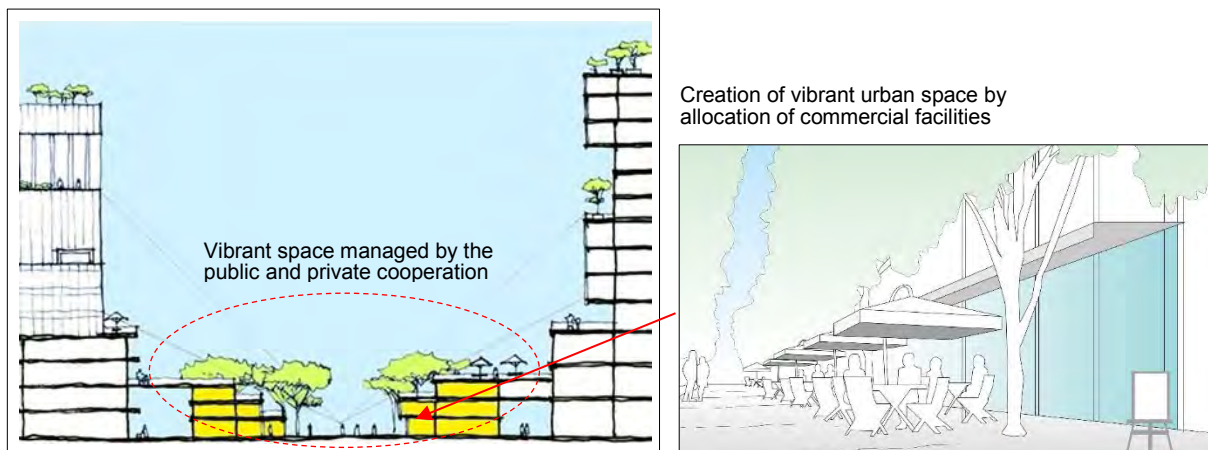


Source: JICA Study Team

Figure 4-19 Image of Green and Open Space Network Connecting between the Station and Surrounding Blocks

b) Creation of vibrant spaces along green and open space networks

Vibrant spaces can be created by guiding the development of commercial facilities, such as shops, through urban planning along the green and open space network mentioned above. It is also possible to create green and open space networks as spaces that are always vibrant and can continue to be used comfortably through cooperation and management by the public and private sectors (see Figure 4-20).



Source: JICA Study Team

Figure 4-20 Creation of Vibrant Urban Space by Allocation of Commercial Facilities

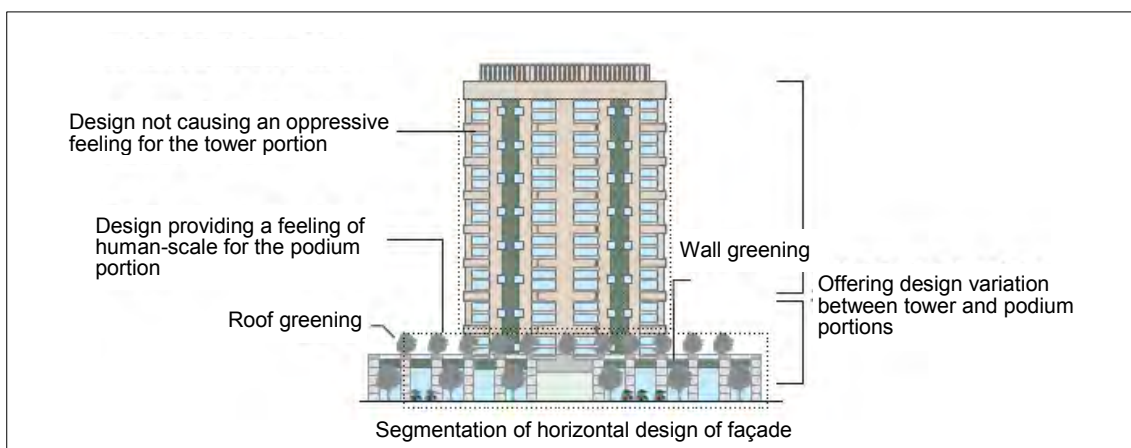
(6) Building Design

- Current Issues in Iran
 - Spaces have not been developed for pedestrians to move comfortably because buildings located in the vicinity of railway stations have been built without consideration for pedestrians, such as ground levels.
 - Construction and urban planning regulations are insufficient for improving building spaces to allow pedestrians to pass the time comfortably and easily move around and to form attractive cityscapes.
- Basic Orientation of Guidelines
 - Create comfortable pedestrian network spaces and attractive cityscapes around the station by proceeding with the development of pedestrian networks that can smoothly access peripheral blocks connected from the station, as indicated in (2), and guiding the appropriate design of buildings located along the network.

a) Introduction of design guidelines for buildings in order to form comfortable walkable spaces in areas around the station

Blocks in areas surrounding stations in the suburbs are likely to be large in scale. Buildings constructed in these types of large-scale blocks are likely to overstep human scale, which may cause pedestrians to feel cooped up and oppressed. For this reason, design guidelines should be introduced for buildings to form spaces for pedestrians of human scale, as shown in Figure 4-21. Also, the guidelines include provisions for forming attractive cityscapes in the station area.

- Segment buildings by design in order to change extended wall surfaces in a horizontal direction.
- In high-rise buildings, apply changes to the designs for the podium and tower portions.
- Use materials that have a human scale in the podium portion.
- Devise methods to approach human scale by utilizing natural materials, such as natural stones and trees in the podium portion.
- Provide a visual contribution to the surrounding area by greening the walls and rooftops on the podium section.
- In cases where highly reflective exterior materials are used, such as glass, give due consideration to the reflection and glare on the surrounding area.



Source: JICA Study Team based on the Guidelines of Yokohama City

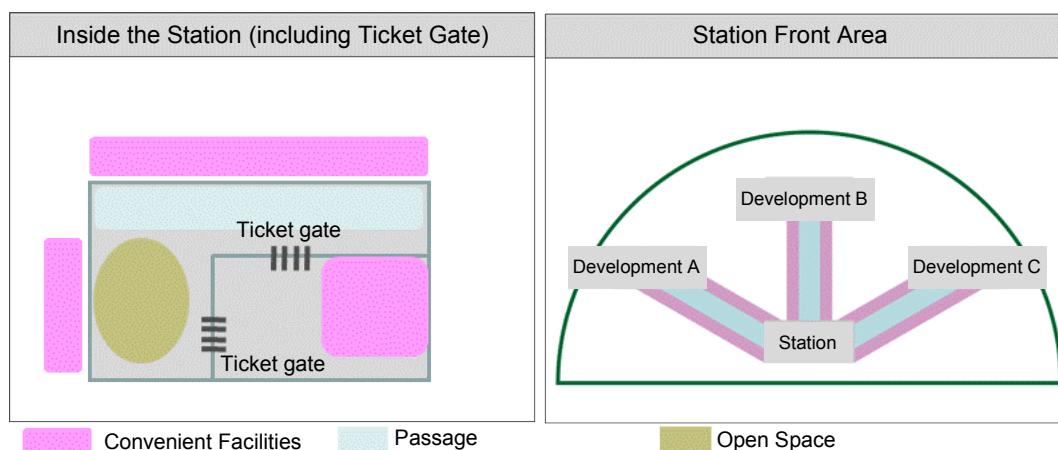
Figure 4-21 Concept of Design Guidelines for Podium Portion of Buildings

(7) Convenient Facilities

- Current Issues in Iran
 - Currently, urban functions developed in the station and areas around the station are limited. The development potential of stations that attract large crowds is not being fully utilized.
 - Facilities such as commercial and public facilities are often located in places that are removed from the station, which impedes the improvement of convenience and appeal of the station.
- Basic Orientation of Guidelines
 - Creation of a vibrant, appealing space by improving convenient facilities within the station and in the Station Front Area around the station.
 - Improve convenience of the area around the station by constructing public facilities, daycare centers, and stores, such as supermarkets, along the pedestrian network in the station front area.

a) Placement and function of convenient facilities

By placing lifestyle convenient facilities inside the ticket gates of the station, along the pedestrian passages in the Station Front Area, and in the podium portion of development around the station, station convenience will be improved and create a vibrant space (see Figure 4-22). Table 4-5 shows examples of convenient facilities that would be recommended for development in areas around stations.



Source: JICA Study Team

Figure 4-22 Concept of Placement of Convenient Facilities

Table 4-5 Example of Recommended Convenient Facilities for Development in Areas around Stations

| | |
|----------------------------------|---|
| • Branches of government offices | • Supermarkets |
| • Post offices | • Retail stores |
| • Libraries | • Restaurants |
| • Clinics, dentist offices | • Entertainment (movie theaters, cultural facilities) |
| • Banks, ATMs | • Co-working spaces |
| • Daycare centers | |

Source: JICA Study Team

(8) Underground Development (Confirmation of Development Plans for Underground Spaces Formulated by Tehran Metropolitan Government)

- Current Issues in Iran
 - Although Iran is not carrying out the full-scale development of underground spaces at this time, there is a high likelihood that underground development will be promoted in the future, utilizing underground stations that will draw a number of users.
 - In this case, safety standards and guidelines to improve amenities in underground spaces will be required for the development of underground spaces.
- Basic Orientation of Guidelines
 - Establishment of safety standards for underground development.
 - Creation of guidelines to improve amenities in underground spaces.

a) Establishment of Safety Standards

In underground development, it is necessary to establish appropriate safety standards and develop spaces according to those standards. In particular, if a fire occurs in an underground space, it could result in a life-threatening situation, which makes it necessary to develop facilities and equipment based on expectations of responding to fires. Table 4-6 shows the items required as safety standards in underground development.

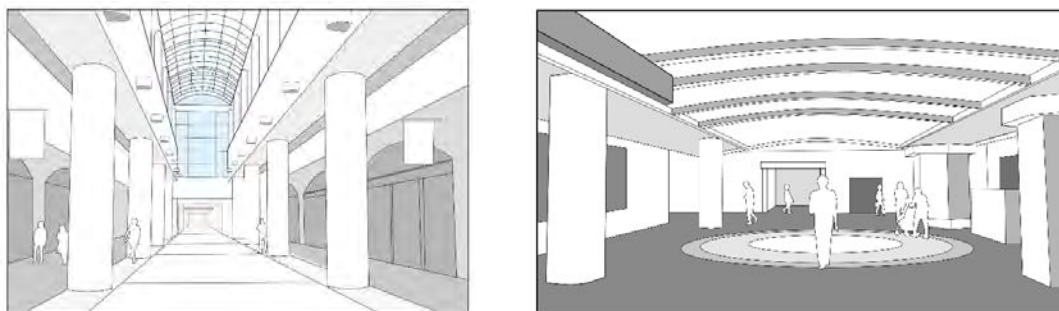
Table 4-6 Items Required as Safety Standards in Underground Development

- | |
|---|
| <ul style="list-style-type: none">▪ Prohibited usage▪ Underground passage (evacuation distance, minimum width and height, slope, etc.)▪ Criteria for stairs and elevator equipment▪ Fire protection (division by fire walls or shutters, etc.)▪ Smoke extraction (placement of smoke ventilation, smoke partition, etc.)▪ Ventilation (ventilated capacity)▪ Building service equipment (emergency light, drainage facility, etc.)▪ Central control system, etc. |
|---|

Source: JICA Study Team

b) Development of guidelines to improve amenities

Underground spaces tend to be enclosed, dark, and monotonous. Therefore, in order to incorporate a feeling of openness and brightness in an underground space, measures should be devised to incorporate natural light. With further improvements, it is possible to create a space that is comfortable for those users who may be directionally challenged to easily know their location and direction. Guidelines to improve these types of amenities should be developed (see Figure 4-23).



Source: JICA Study Team

Figure 4-23 Image of Amenity Space for Underground Development

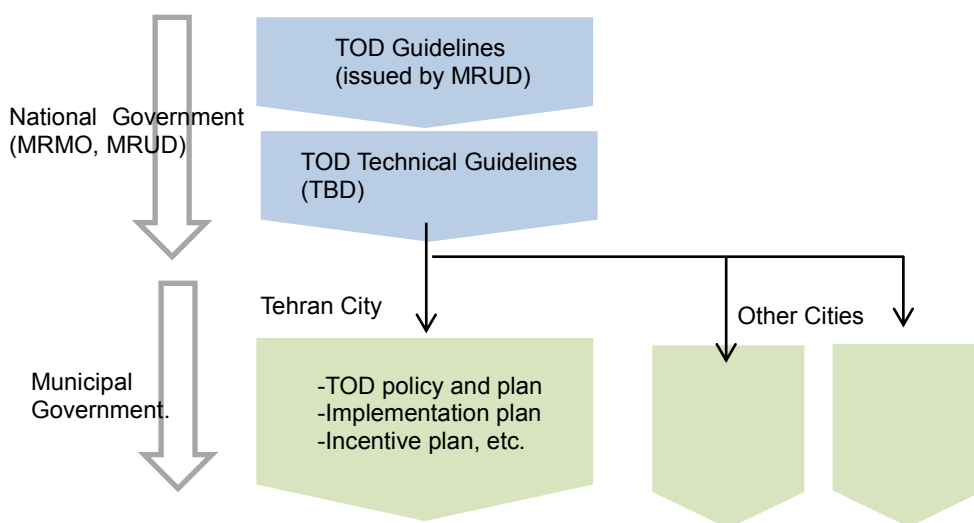
4.3 Proposed Institutional Framework for TOD Implementation

In order to promote TOD in each city in Iran in the future, it is necessary to develop mechanisms to promote TOD according to the actual situations in each city and region based on the TOD guidelines currently being formulated by MRUD. It will also be necessary to promote the development of an area management mechanism for TOD to be sustainable, with local governments taking the initiative and cooperating with railway operators and private businesses that will actually carry out development.

(1) Formulation of TOD Master Plans and Local Rules at the Local Government Level

MRUD’s TOD guidelines target cities throughout Iran. However, in reality, there are various targets, ranging from major cities, such as Tehran, to regional cities with populations of a few hundred thousand, each with its own urban issues. In order to realistically solve these issues, it is necessary to prepare local rules such as policies and plans on TOD at the local government level. Basically, these local rules will be formulated based on the existing urban and transportation planning system in Iran, but if necessary, a new planning framework such as TOD master plan will be considered (see Figure 4-24).

Specifically, it is necessary to set corridors in each metropolitan area, set major nodes, and consider master plans around each station, as well as determine local rules (deregulation, subsidies, etc.) to promote TOD in these areas.

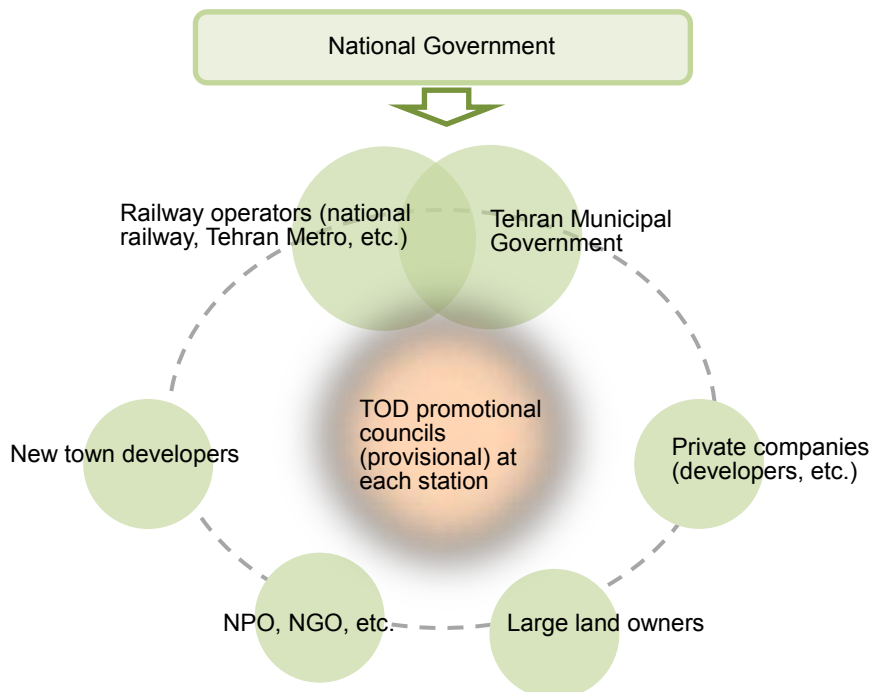


Source: JICA Study Team

Figure 4-24 Necessity for TOD Policies and Plans at the Local Government Level

(2) Composition of Councils in each Area around Stations

In order to create TOD master plans in each station and in surrounding areas, it is necessary to set up a place where stakeholders can meet and discuss plans for the future image of the area and the process to achieve this. For example, with the core members of Tehran City and railway operators, it is conceivable that a place can be arranged to gather members together, such as new town development operators, other private companies, and civic groups, according to the situation in areas around stations and according to need (see Figure 25).

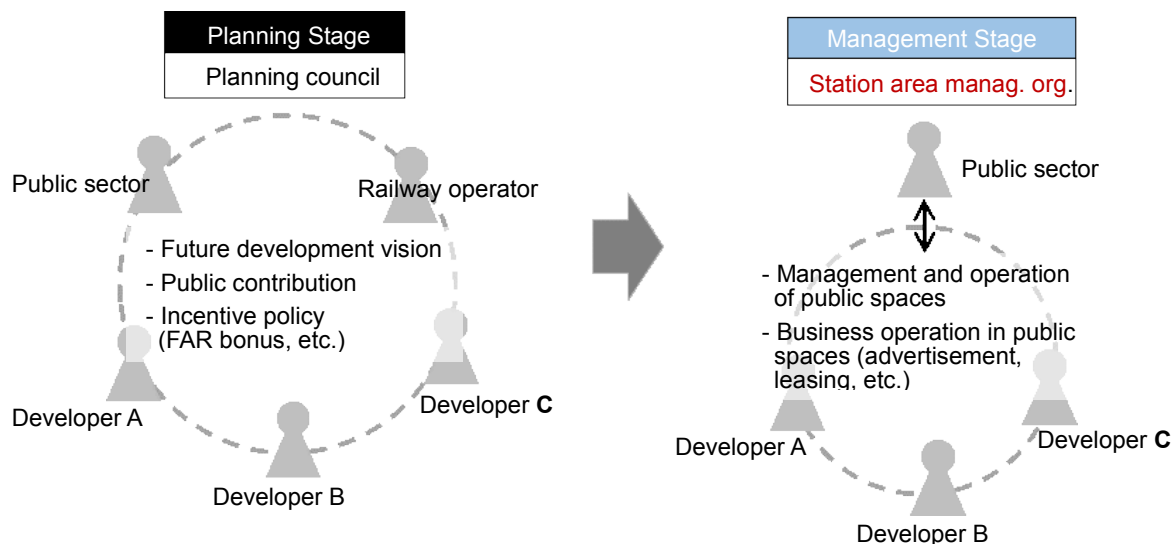


Source: JICA Study Team

Figure 4-25 Image of TOD Promotional Councils at Each Station

(3) Promotion of Station Area Management

After TOD is achieved at each station and in surrounding areas, it is effective to carry out the practice of station area management to maintain and improve the area's appeal and convenience for residents, as well as to improve real estate values.



Source: JICA Study Team

Figure 4-26 Image of Promotion of Station Area Management

For example, there is a possibility that station spaces and pedestrian decks and public spaces connecting these spaces are not sufficiently maintained and managed. It is conceivable that area management groups will take over these issues and carry out integrated maintenance and management, including for stations and facilities in the surrounding area. It is also possible to organize town events around stations and create an identity that includes residents in surrounding areas. Specifically, it is conceivable to expansively formulate the aforementioned councils as area management groups. Figure 4-26 illustrates the image of promotion of area management in areas around each station.

Examples of area management in Japan and the United States are shown on the following pages.

Case Study: Area management in Shiodome Sio-side

■ Overview of area management

Shiodome Sio-site is a large-scale redevelopment project of a former railroad yard around Shinbashi station in central Tokyo.

A council was created for the redevelopment of the area with the government railroad companies and several developers to consider ideas about how to manage the town from the planning stage. Underground public spaces and other areas were developed using the power of the private sector by relaxing floor area ratios. After completion, the council was reorganized as an area management group, carrying out cleanup of developed public spaces and small-scale maintenance through contracts with the government that owns the area. In addition, efforts are also being made to increase the name recognition and value of the area by carrying out events and managing a website for area branding of the Shiodome Sio-site.



Developed public spaces

Seasonal event

■ Operation of profit-making businesses in public spaces

Project costs are reduced by renting out spaces to shops in underground passages and using pillars and walls as advertising space, as well as through investment from group members, in order to maintain and manage public spaces and carry out small-scale repairs in a stable manner. The government also permits area management organizations to occupy public spaces for city planning. Out of the annual operating costs of JPY 300 million, JPY 100 million is generated from these types of profit-making businesses (the remaining amount is generated from costs outsourced by the government and contributions from developers).



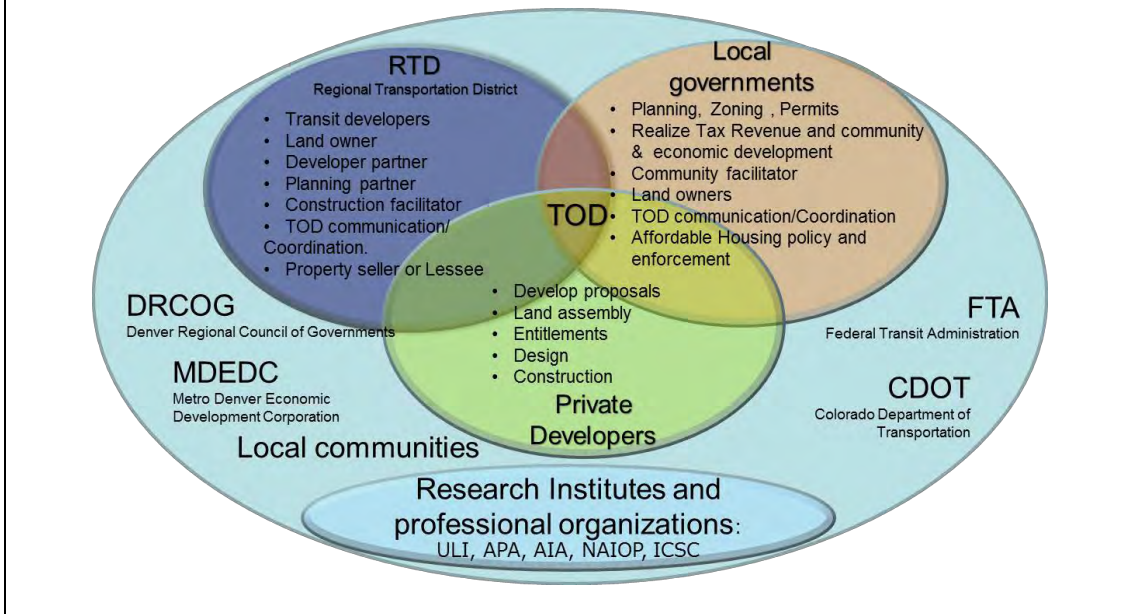
Advertisements in underground passage



Shops in underground passage

Case Study: Developing collaborative systems with various stakeholders (Denver, USA)

To promote TOD in the city of Denver in the US, a broad collaborative system, including local stakeholders, the local government, private developers, and external organizations, has been created, as shown in the figure below.



5. Candidate Sites for TOD in the Tehran Metropolitan Area

5.1 Candidate Sites in Urban Areas

This section proposes TOD approaches that may be applied in the urban areas of Tehran. Potential candidate sites described herein include the following:

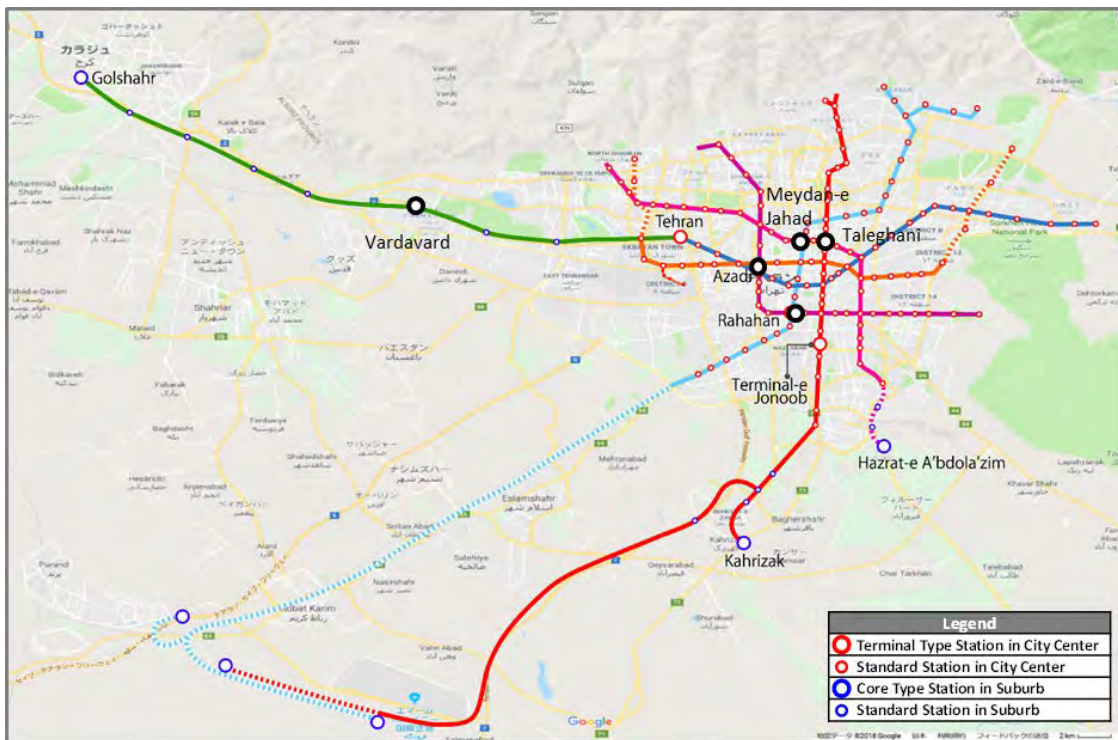
- Large transport terminals with intermodal transfer functions: Rah Ahan (Tehran Station) and Azadi Square Station.
- Metro stations in urban areas: Taleghani Station on Metro Line 1 and Meydane e Shohada Station on Metro Line 3.
- Stations along the suburban railway lines: Vard Avard Station on Metro Line 5.

Table 5-1 Hierarchy of Station in the TOD Guidelines and Candidate Sites shows candidate sites categorized into station types indicated in 4.2.3

Table 5-1 Hierarchy of Station in the TOD Guidelines and Candidate Sites

| Type of Station | Overview and Requirements | Candidate Sites |
|---|--|---|
| a) Terminal Type Station in City Center | Transfer terminal type station with multiple intersecting lines located in the center of the city. Recommended for use as a city base through high-volume and mixed use. | Rah Ahan (Tehran Station) Azadi Square Station |
| b) Standard Station in City Center | Station located in city center. Although its potential drops in comparison with transfer terminal type stations, it is recommended for this type of station to be developed into a base for mixed use that can accommodate the number of passengers. | Taleghani Station on Metro Line 1 Meydane e Shohada Station on Metro Line 3. |
| c) Core Type Station in Suburb | Core type station with multiple intersecting lines located in the suburbs. Recommended for residential, commercial, and business functions to be concentrated in medium to high density in this type of station. | - |
| d) Standard Station in Suburb | Station located in the suburbs. Recommended to have suitable functions in place to support daily life, with the main application of low-to medium-rise housing. | Vard Avard Station on Metro Line 5. |

Source: JICA Study Team



Source: JICA Study Team

Figure 5-1 TOD Candidate Sites in Tehran Metropolitan Area

5.1.1 Rah Ahan (Tehran Station)

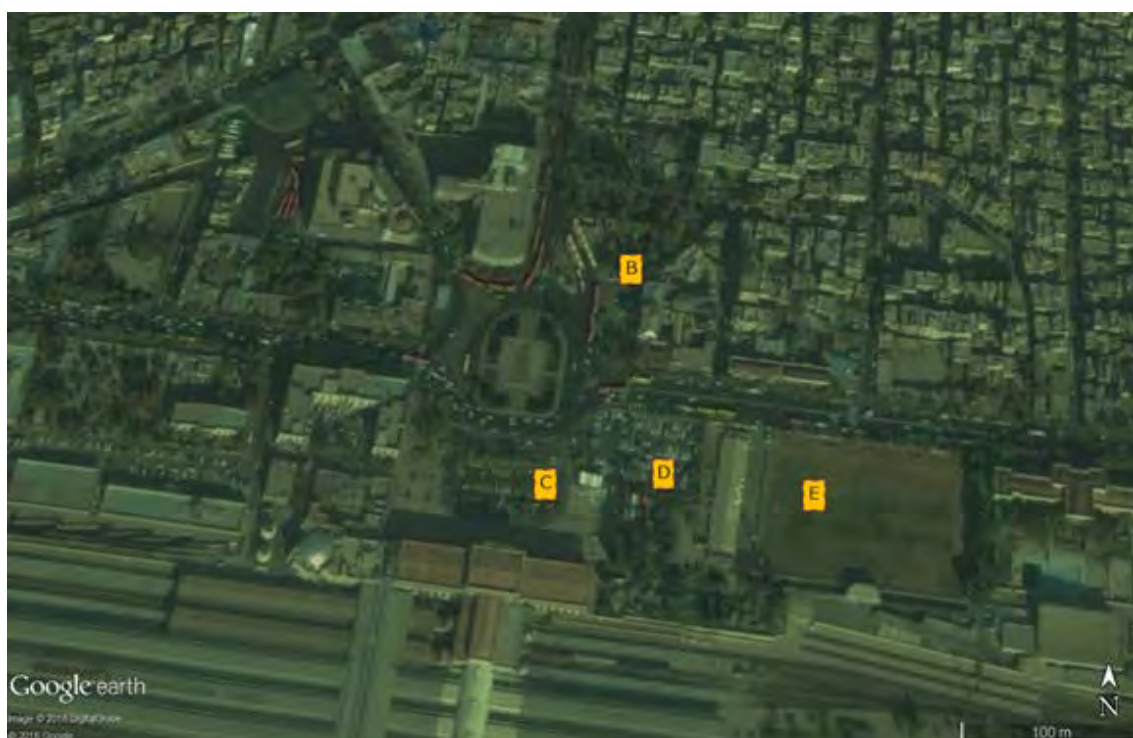


Source: JICA Study Team

Figure 5-2 Tehran Station – Current Situation

The open space in front of the central railway station is utilized generally for the taxi operation, and there is no open pedestrian access to cross the station. The figure above shows the current situation of the Tehran Station, and a detailed description is provided below.

- 1: Tehran main passenger gate.
- 2, 2A, and 3: Three metro entrances. The underground passage for the metro is not directly connected to the concourse of the central station. Currently, major passenger flows are seen from the main passenger gate 1 to entrance 2A, which was opened in 2017. Before 2017, passengers had to exit from exits 2 or 3 and walk to entrance 1. Entrance 2 is not facing south. Entrance 3 faces the station; the space in front of the entrance has been expanded.
- 4: The BRT terminal for Line 7 is 200 m away from the central station and 100 m away from the metro, and passengers need to cross the roads to access the terminal.
- 5: The taxi bay is located at a very convenient place, but business is slow. The area was redesigned in 2017, and taxi bays were moved out of this area.
- 6: Another bus terminal.
- 7: Private car parking area.



Source: JICA Study Team

Figure 5-3 Reorganization of Tehran Station in Consideration of TOD

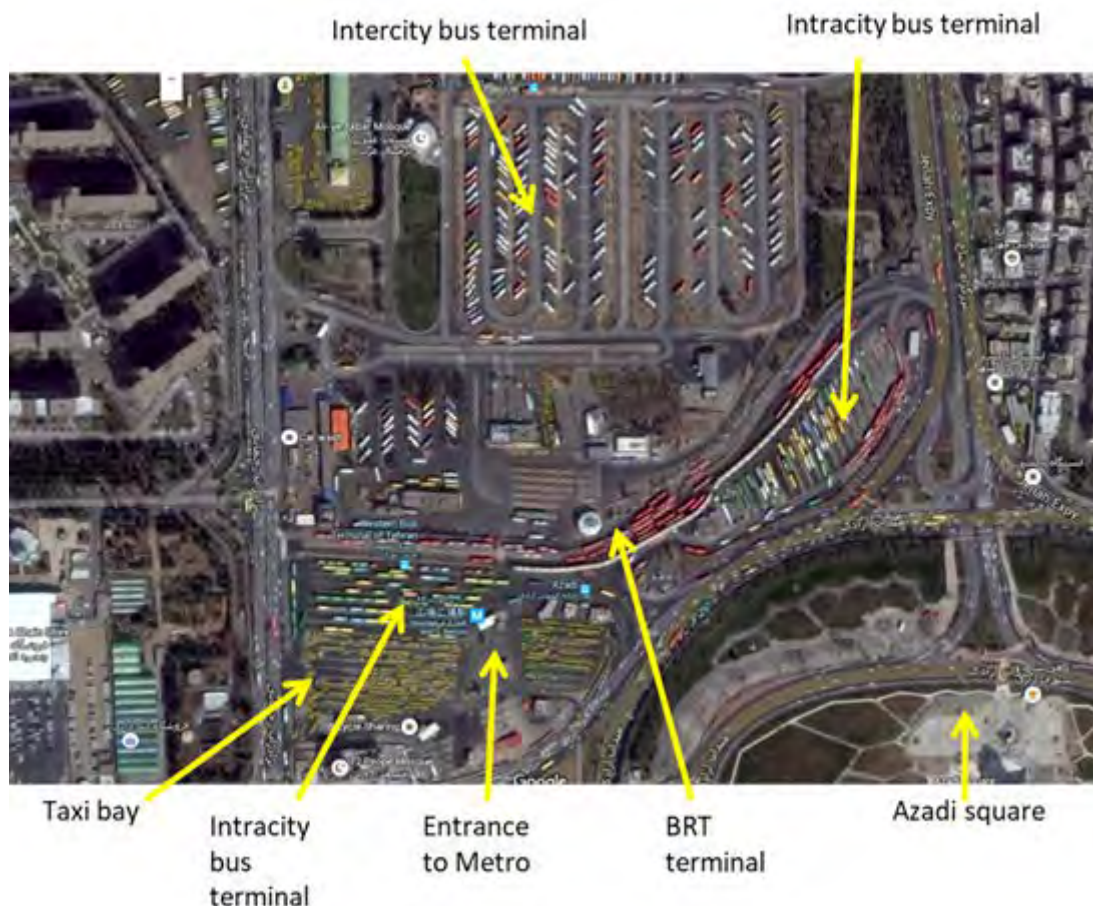
Reorganization of Tehran Station in consideration of TOD

- B: Construct a metro entrance integrating with the BRT for metro passengers.
- C: Remove the taxi bay, and possibly create a BRT bay as well as those in B above.
- D: Remove the private parking and relocate the taxi bay; and apply the shotgun assignment method.

E: Use this area for urban development purposes to decrease the volume ratio.

Overall: Area development regulations can be softened. As mentioned in the Tehran Central Station masterplan, the railway yards can be developed for commercial and residential areas.

5.1.2 Azadi Square



Source: JICA Study Team

Figure 5-4 Azadi Bus Terminal – Current Situation

The Azadi Bus Terminal, also called the western bus terminal, accommodates intracity buses, intercity buses, taxis, and Metro Line 2. All transport functions are connected at the surface level and are accessible to all transport modes. The terminal is surrounded by multilane roads with heavy traffic. The neighboring districts on the western side are mostly 10-15 stories residential apartments, but no access functions connecting to the residential area are available.

The Study Team proposes the application of an integrated development including a commercial hub development, express line terminal development, as well as zoning relaxation and volume regulation in this district. In particular, the intercity bus terminal area is utilized as a parking for intercity buses and is operated inefficiently.

There are several bus terminals with an open area at the edge of the urban area in Tehran. These locations may be utilized to accommodate the terminals of the proposed express lines.

5.1.3 Taleghani Station on Metro Line 1



Source: JICA Study Team

Figure 5-5 Taleghani Station on Tehran Metro Line 1 – Current Situation

Taleghani Station on Tehran Metro Line 1; Typical single station in the CBD

- 1: The metro station is located at the 4-leg intersection, but the entrance is open at the northwest corner only, which has the entrance facing north. The US embassy is located in the area behind the station, and its wall stretches 200 m each direction from the corner.
- 2: The largest demand in this area is expected at the southeast corner, but passengers utilizing the metro need to cross the street. The passengers crossing the street at the surface level may increase conflict with the vehicle traffic, causing accidents and congestions.
- 3: There is a large hospital complex nearby, and patients must cross the busy street to access the metro.
- 4: A large sports complex is located north of this block.



Source: JICA Study Team

**Figure 5-6 Reorganization of Tehran Metro Line 1 Taleghani Station
in Consideration of TOD**

Reorganization of Tehran Metro Line 1 Taleghani Station in Consideration of TOD

A/B/C: Open new entrances at each corner to minimize the need to cross the street. In terms of priority, A is first, followed by B (see Figure 5-5).

B: Implement a barrier-free (normalization) design for hospitals users.

D: Improve pedestrian accessibility for hospital users.

E: If possible, push back the area and develop a taxi bay at the corner.

5.1.4 Meydane e Shohada (Fatemi Sq.) Station on Metro Line 3



Source: JICA Study Team

**Figure 5-7 Meydane e Shohada Station on Tehran Metro Line 3
– Current Situation**

Meydane e Shohada Station on Tehran Metro Line 3; in the shopping district

- 1: The metro station is located at the 3-leg intersection, with two entrances. In Figure 5-6 above, 1 indicates the location of the main entrance, which has up and down escalators.
- 2: Other entrance has no escalator.
- 3: The passengers in this district cannot access the metro entrance without crossing the busy street. In 2017, a pedestrian bridge was developed, connecting 3 (see above figure) with the main station's entrance.
- 4/5: The bus stops of BRT Line 7 are located along Vali-e-asr Street, forcing passengers to walk 50 m from the station. Meydane e Shohada station is the transit point for Metro Line 3 and BRT Line 7.
- 6: Fatemi Square. Another area for taxi services is located here, but there is no proper approach for pedestrians.



Source: JICA Study Team

Figure 5-8 Reorganization of Tehran Metro Line 3 Meydane e Shohada Station in Consideration of TOD

A: Open another entrance to improve the accessibility to metro services rather than the bridge for pedestrians that was developed.

B/C: Integrate the BRT and metro. Improved information exchange as well as physical integration can be expected.

D: Improve the pedestrian approach to Fatemi Square for taxi users.

5.1.5 Vard Avard Station on Metro Line 5



Source: JICA Study Team

Figure 5-9 Vard Avard Station on Tehran Metro Line 5 – Current Situation

Vard Avard Station on Tehran Metro Line 5; Typical suburban station

- 1: The metro station is located near the Karaj freeway and is affected by the freeway demand.
- 2: Property development has not been started yet in the accessible areas from the metro station.
- 3: New town development can be seen along the main corridor from the accessible areas to the Karaj freeway.
- 4: Another freeway is located nearby, which is attracting more development.



Source: JICA Study Team

Figure 5-10 Vard Avard Station on Tehran Metro Line 5 – TOD approach (Above) and Comparison with Tama Center Station in Tokyo, Japan (Below)

Possible improvements to the Vard Avard Station of Tehran Metro Line 5 with TOD approaches is described below. In addition, the station is compared with the Keio Line Tama Center Station, located in the suburbs of Tokyo in Japan, which has similar characteristics to the Vard Avard Station.

- 1: The open space in front of the station has already been developed, but the development of the area within accessible distance from the station has not made much progress.
- 2: Vehicle accessways are surrounding the open space in front of the station, and therefore the sidewalk lacks continuity.
- 3: Development of the residential area can be seen in both sides of the Tama Center Station, which is not seen in the Vard Avard Station and other suburban stations of Line 5.
- 4: Sidewalk continuity is seen.
- 5: A monorail line was developed for a broad feeder service, not relying on motorized transport such as taxis/buses.

5.2 Candidate Sites in the Suburbs (Parand New Town)

In this section, the TOD approach for the railway development in Parand is considered as one of the approaches for the implementation of TOD in the suburban regions of Tehran.

5.2.1 Possibility of Implementation of TOD in Parand



Source: JICA Study Team

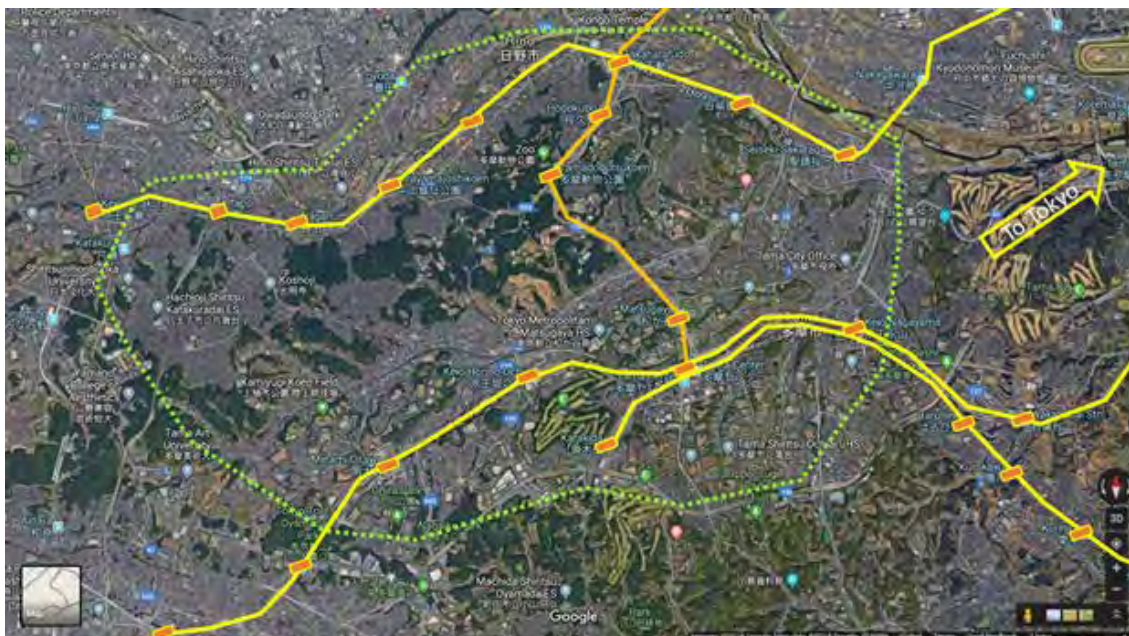
Figure 5-11 Parand Housing Development and Its Rail Services

Parand is located 35 km away from the border of Tehran, 50 km away from the center of Tehran, and 55 km away in railway distance to the Tehran Station. The railway station for commuter services is located at the very edge of the city entrance, which forces passengers to access the station by other transport modes and does not attract pedestrians. The RAI rail infrastructure is operated by a single track to Tehran. The size of the housing development is about 25 sq. km in total.

There are 7 districts, phases 0 to 6, in the City of Parand. Phases 0 to 4 are developed by Iranian developers, providing residents with 1- to 5-story housing for the middle class. The development started in 2010 and the communities seem to be well-structured already. On the other hand, phases 5-6 (the area indicated by red in the above figure) are being developed by the Turkish contractor KUZU, providing 10- to 15-story apartments that are affordable to low income residents. These

apartments are expected to accommodate 300,000-500,000 people, but the districts are far from the railway station.

5.2.2 Reference: Tama New Town as TOD in Tokyo, Japan



Source: JICA Study Team

Figure 5-12 Tama New Town in Tokyo, Japan

The Tama New Town (Tama NT) is the largest housing and new town development undertaken in the suburbs of Tokyo. The area is 35 km away from the center of Tokyo, with 22.5 sq. km development area in total, as shown in the green dotted line in the figure above. It was initiated and implemented during the 1960s to '80s to accommodate the growing population in the suburbs of Tokyo and succeeded to create new housing capacities. The Tama NT development concept had incorporated TOD aspects.

The major rail-based transport services for the commuters to the center of Tokyo are connected by the two urban heavy rail services with double track rails, as shown in the yellow lines in the figure above. The new railway access from the area to the center of Tokyo was operated within 30 to 40 minutes in the 1970s. Since the 1990s, the monorail services, shown in orange, have been added to the network as an internal network within the Tama NT. In the 1970s to '80s, the people fully relied on road-based transport for the movement within the area and suffered from road congestions due to the increase in the number of private cars. The elevated monorail lines constructed in the median of the roads gave additional capacity to the roads and provided smooth transport services for the residents.

The housing development was initiated by public entities (the Urban Housing Public Corporation of Japan), Tokyo Metropolitan Government, and the local government. The railway development was coordinated by private railway companies (Odakyu Corporation and Keio Railway Corporation). The public entities invested in the infrastructure and housing, based on the expected gains from land value. The railway companies were provided with tax incentives for their railway investments. The Monorail was developed with the assistance of the road development fund.

5.2.3 Comparison: Parand and Tama New Town



Source: JICA Study Team

Figure 5-13 Comparison of Tama NT and Parand in Rail-based TOD Aspects

The figure above shows the comparison of Parand and Tama NT in the same scale. The rail network is also shown in the map. The magnitude of the development of the residential area (shaped in green dotted lines) are similar for both (20-25 sq. km).

This comparison could suggest the following:

- For Parand, the rail network service can be directly connected to the residential area to improve the accessibility in the districts with higher population density, as conducted in Tama NT.
- For Parand, multiple rail connections to Tehran can be developed, not only with RAI but also with other suppliers.
- For Parand, internal feeder rail services including LRT or Monorail can also be developed.

5.2.4 Possible Proposals for Parand



Source: JICA Study Team

Figure 5-14 Proposal of Potential Feeder Service in Parand

The potential proposals for Parand are summarized as follows:

- Double tracking to Tehran: the present RAI single track could be doubled and electrified to cover further demand from the corridors to Tehran.
- Extension of the rail lines within the City of Parand (as an example, the yellow line and several stations shown in the figure above): The railway can be extended within the city districts to catch the urban population. New stations should be located at the center of community of each district to maximize the catchment area.
- Elevated LRT for feeder services (as an example, the orange line in the figure above): Monorail/AGT/LRT services could be proposed to cover the area with high population density.
- Feeder services by buses and taxis could be provided within the city districts.

5.2.5 Proposed Open Access Policy for Suburban Railway Services

(1) Need for an Integrated Development of Suburban Railway Services

As mentioned earlier, there are overlapping plans for the development of the suburban railway services along Tehran–Eslamshahr–Parand. These include the extension of Metro Line 3, Express Line 4 proposed in the 2013 Tehran transport masterplan, and the suburban services currently provided by RAI.

In the implementation of Line 3 extension, Tehran Metro is considering the development of a new alignment. However, there are difficulties in land acquisition, as similarly experienced in the Metro Line 1 extension. On the other hand, RAI owns the land for the right-of-way and tracks of the existing line that runs between the Tehran Central station and the major cities along the line including Eslamshahr and Parand, and it can provide the existing local residents with access to railway services. However, although RAI and Raja have experiences in intercity rail operation, they do not have much experience in the urban transport services. For example, its current

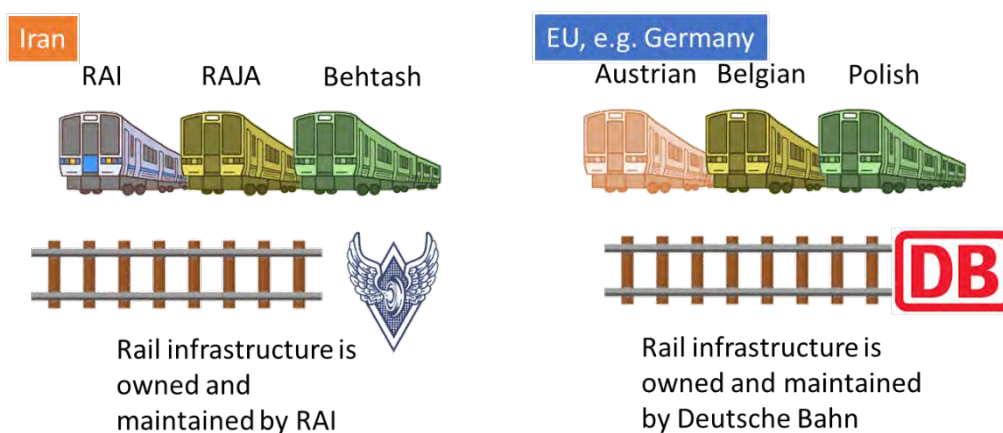
operation of suburban rail services is much less frequent than that of Metro Line 5, a suburban railway line operated by Tehran Metro.

The Study Team recommends the integration of railway development with the implementation of the open access policy described below.

(2) Open Access Scheme of Railway Operation

The open access scheme is commonly incorporated in the intercity rail operation among the EU countries as well as in Iran. The ownership of the railway is maintained by the National Railway company and the operation of the railway services is undertaken by several operating companies, private or public. The operators pay the access fee to the owner of the railway infrastructure.

In Iran, the railway infrastructure is owned by RAI, and RAI, Raja, Behtash, etc. have access to the rail and can operate their passenger railcars and freight services. In Germany, the Deutsche Bahn (DB, German National Railway Corporation) owns the railway infrastructure, and several companies of surrounding countries have access to the DB railway network. In order to allow access to the network by foreign train operators, it is essential to standardize the railway technologies, including signaling, communication, and specification of track and safety requirements. This open access scheme would improve the intercity railway services, attract intercity passengers that travel in private cars, and decrease the consumption of fossil fuel in the EU market. Therefore, the EU made large investments in the standardization of signals and train communication since the 1990s. Also, the open access scheme can attract decent train service operators to enhance the quality of services, and the owner of railway infrastructure can focus its resource in the maintenance of the infrastructure.



Source: JICA Study Team

Figure 5-15 Open Access Scheme

(3) Open Access Scheme for Metro and Suburban Railway Services in Japan

Tokyo's urban railways, operated by several private suburban railway companies as well as public metro companies, have unique market characteristics; in particular, these companies apply the open access scheme for the operation of the metro and suburban railways.

An example is the Fukutoshin Line. This Line was constructed as the 13th Tokyo Metro Line (public company) in the central area of Tokyo, connected to three other private suburban railways, i.e., Tokyu, Tobu, and Seibu railways. The Fukutoshin Line applies the open access policy to allow the access and operation of those three lines. The passengers are not required to transfer at the terminal stations, and the train operators have been able to expand their catchment areas.

Moreover, the transport planners in the government have been able to realize region-wide services with minimum investment. It should be noted that the connection of railway infrastructure and engineering interface, including signaling standardization, has been subsidized by the National and Local governments.

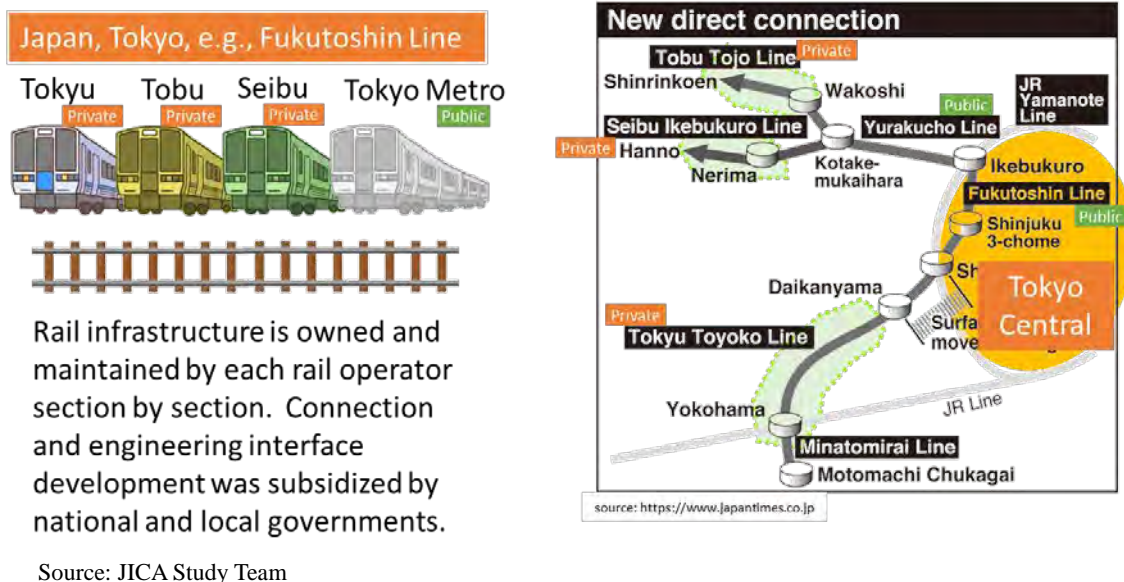


Figure 5-16 Open Access Scheme Applied in Tokyo Metro and Suburban Railways

(4) Application of the Open Access Scheme to Eslamshahr–Parand Line

The Study Team proposes the following action plans for the implementation of railway services in the Tehran–Eslamshahr–Parand Corridor.

- Application of the open access policy to RAI’s Eslamshahr–Parand right of way, allowing access of Line 3 extension and Express Line 4.
- Careful assessment of the engineering policy of track opening. There are two options for open access: i) open the right of way, and accept the individual new track construction owned by Tehran Metro, or ii) open the railway access, and improve RAI’s railway track to be compatible to Tehran Metro Line 3.
- If option ii) is applied, electrification of the RAI rail is required to accommodate Metro Line 3, as well as connection, double tracking, and signalization¹. The additional investment can be subsidized by the national and local governments as it is expected to reduce fuel consumption and contribute to the decrease in fossil fuel subsidies.
- Extension of Metro Line 3 with minimum expenditure for the land acquisition by Tehran Metro: Tehran Metro shall make the lease payment to RAI in accordance with the use of infrastructure. Moreover, with RAI’s alignment running close to the existing urbanized areas, Tehran Metro can increase the number of passengers without any feeder services.
- Continuation of rail operation by RAI and Raja. Passengers along the alignment should be able to directly access the stations of Metro Line 3 and Tehran Central Station.

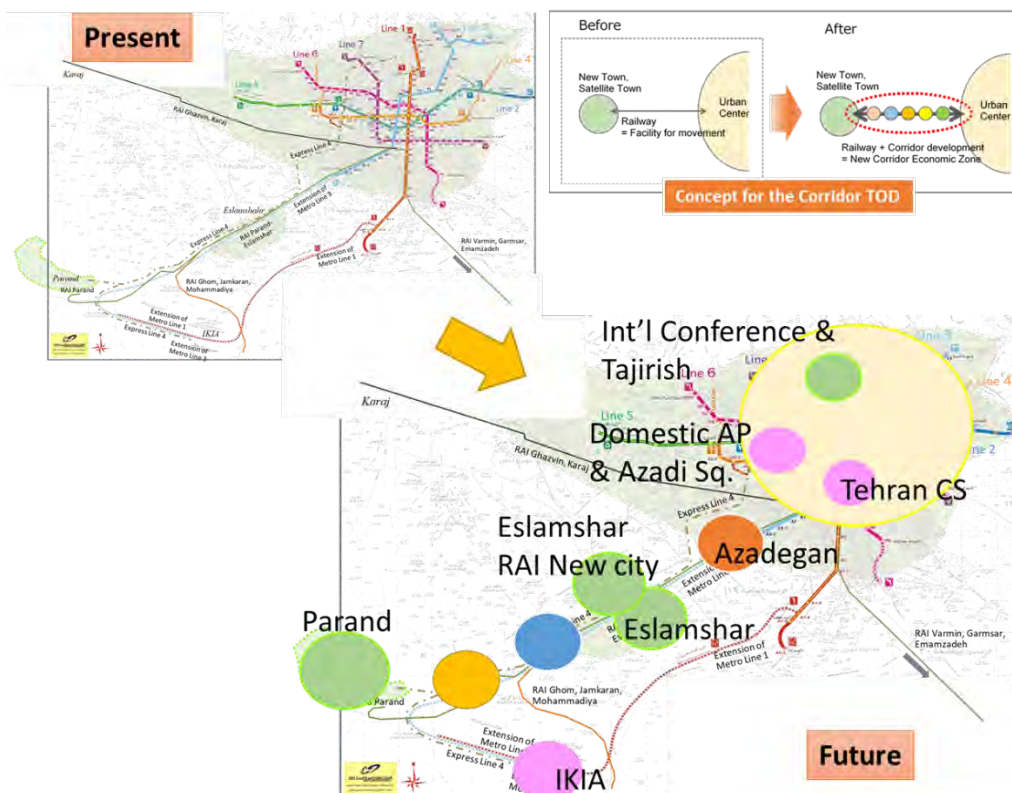
¹ It should be noted that there are disadvantages of the integrated operation. For example, it may induce larger system failure in the railway network when any failure of one rail company happened along the shared track sections with other rail companies.

- Consideration of the technical standards of the railway to accommodate Express Line 4 in the future. Express Line service standards shall be formulated and should be compatible to the future standards of Metro Line 5 and the other Express Lines.
- Development targeting RAI's vacant lands along the corridors for further TOD development. RAI would be able to recover the increase in land value, which then should be used for its network improvement.
- Development of qualified housing and urban functions in the suburbs by urban planners in the government, to absorb the informal settlements with efficient transport accessibility.
- Realization of the Metro Line 3 extension and the Express Line 4 functions by the Tehran Municipality and development of effective settlements in the suburbs to absorb the saturated population, particularly in the southern area. This will be consistent concept of the Corridor Level TOD, presented in the Section 4.2.2.

5.2.6 TOD in the Eslamshahr - Parand Corridor

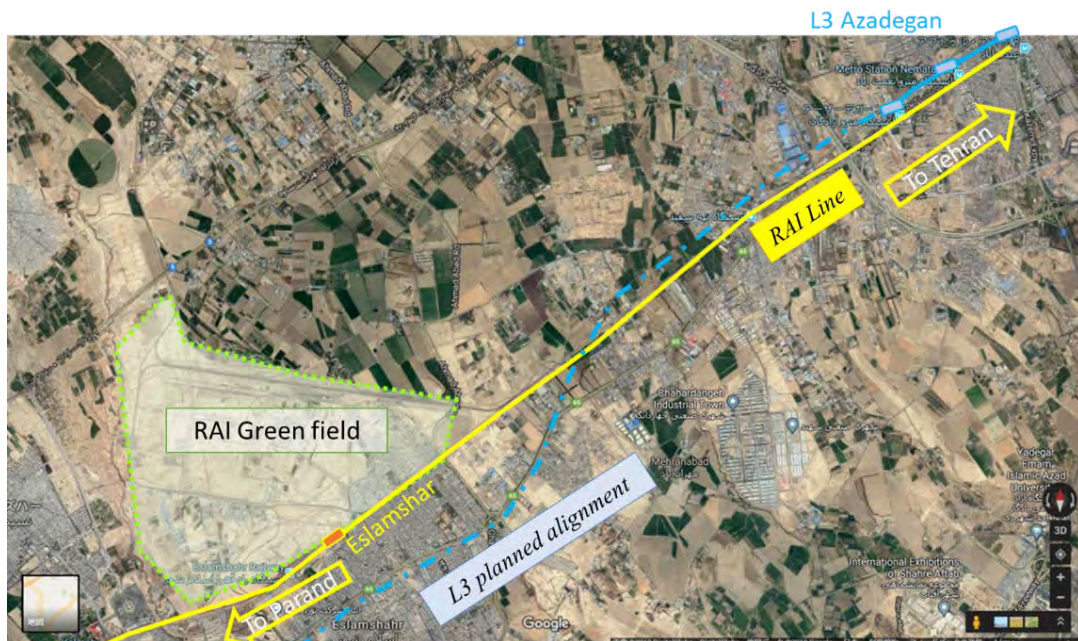
As previously discussed, the actual case study based on the open access scheme is proposed to realize the corridor development with TOD approaches along the Eslamshahr - Parand Corridor, which has a large gap in the demand and supply as well as growth potential due to its proximity to the international and domestic airports. The concept is depicted in Figure 5-17.

The base of this concept is attributed to the land owned by RAI close to the Eslamshahr. The value capturing approach can be applied to this land, to recover the railway infrastructure investment, which can justify the investment by RAI. Moreover, the overlapped railway plans among RAI, Tehran Metro, and NTDC can be integrated to minimize the total investment. The location of RAI's land and planned alignment of the Metro Line 3 extension are depicted in the Figure 5-18.



Source: JICA Study Team

Figure 5-17 Application of Corridor TOD concept to the Parand Corridor



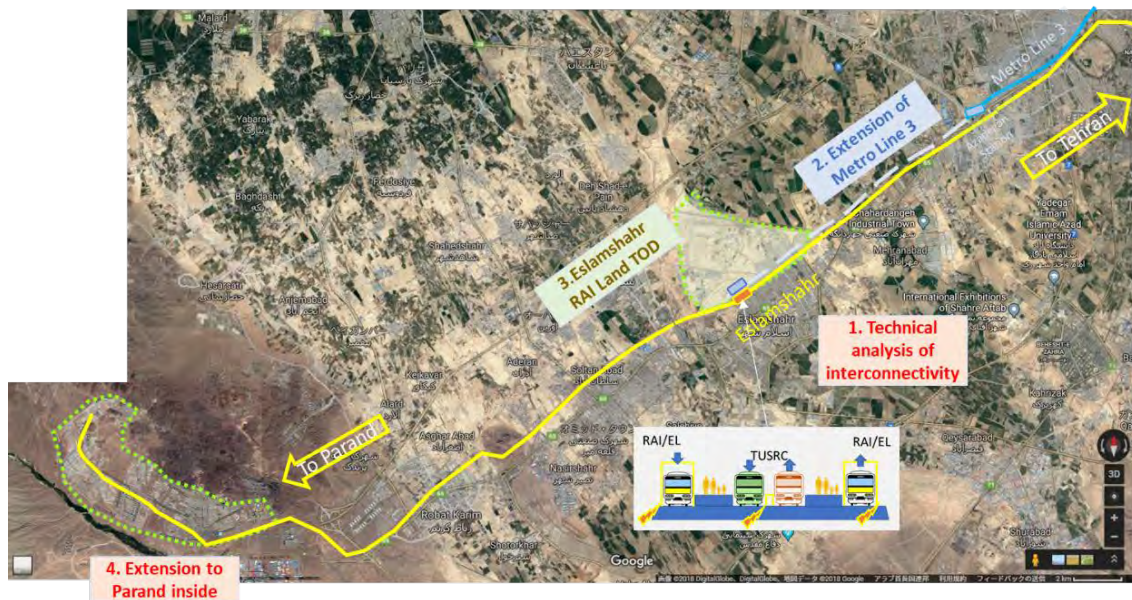
Source: JICA Study Team

Note: The shape and location of the RAI owned land is not accurate.

Figure 5-18 RAI's Green Field and Alignment overlapping the Tehran Metro Line 3 Extension

(1) Phase 1: Initial Approaches

The first phase would consist of four projects as follows:



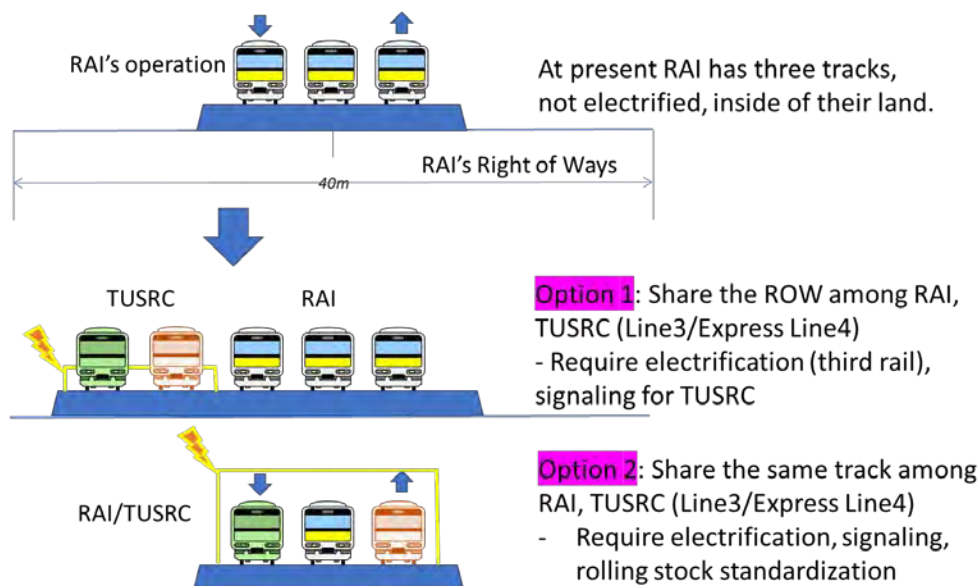
Source: JICA Study Team

Figure 5-19 Phase 1 for Eslamshahr - Parand Corridor TOD

1. Technical analysis and planning of interconnectivity

This study will include the following analysis and technical planning:

- Analysis on the engineering policy of track development and consensus building among stakeholders: i) make only the right of way available and accept the construction of new tracks by Tehran Metro, or ii) open the railway access and improve railway tracks owned by RAI to be compatible with Tehran Metro Line 3. (Figure 5-20)



Source: JICA Study Team

Figure 5-20 Phase 1 for Eslamshahr- Parand Corridor

- Designing of the double track
- Preparation of the technical standards including the following:
 - If option i) is applied, the technical standards of Tehran Metro Line 3 shall be applied.
 - Conceptual designing of the transferring station which will accommodate Line 3 and RAI's commuter rail transfer at the same platform.
 - If option ii) is applied, electrification of the RAI rail is required in order to accommodate Metro Line 3, as well as connection, double tracking, and signalization.
 - The technical methodology to extend Metro Line 3 at the Azadegan Station needs to be considered.
 - In the future, the new technical standard should be considered to realize the interconnectivity of Express Line 4 on the same track.
- Formulation of an operation plan of Line 3 and RAI's commuter services.
- Analysis of economic and financial feasibility.
- Preparation of the plan for long term and phased extension.

2. Extension of Metro Line 3

The construction of Metro Line 3 has been completed up to the underground Azadegan Station at the edge of the Tehran municipality. As proposed in the initial phase, the Study Team proposes the realization of metro service extension up to Eslamshahr Station with electrified double track. The project shall also include the implementation of the new extended section.

- One of the stations between Azadegan Station and Eslamshahr Station can be designed to accommodate the transfer function between the Commuter Rail and Metro Line 3. The station should have 2 island-type platforms to accommodate the two lines (Figure 5-21). The metro lines shall be separated at the northern side and connected to the subgrade sections leading to the Azadegan Station. The RAI lines shall be operated at the surface level to the Tehran Central Station.
- Designing and implementation of the extended section.

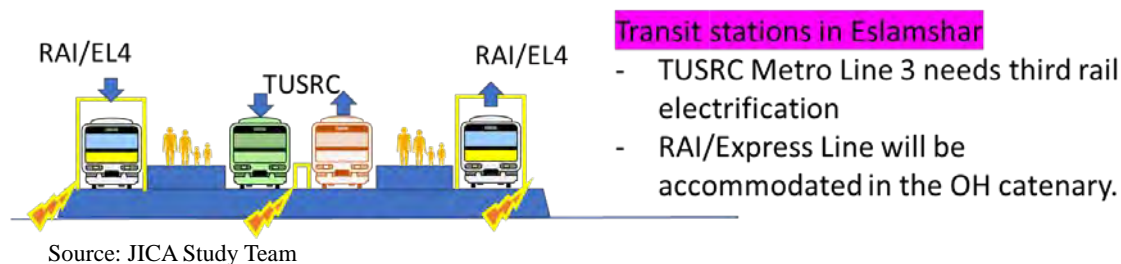


Figure 5-21 Concept for Transit Station in Eslamshahr

3. TOD in land owned by RAI in Eslamshahr

RAI owns a large unused land connected to the northern side of the railway tracks. An urban development plan to connect the RAI commuter rail service and Metro Line 3 and improve accessibility shall be formulated and implemented. The plan should include the following:

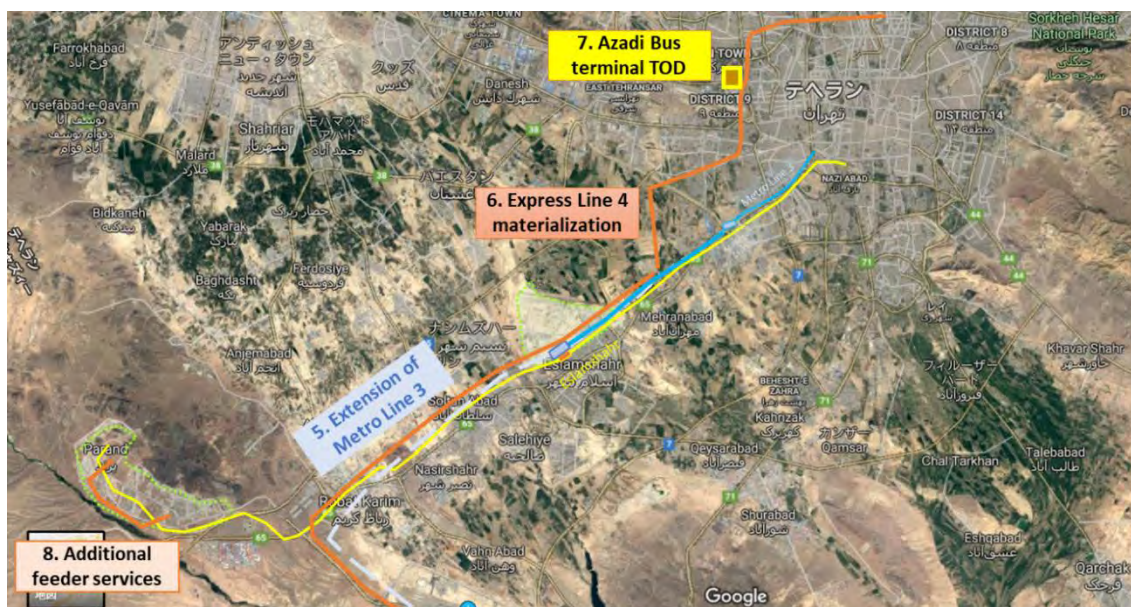
- Possibility of the usage of the existing RAI rail track in the vacant land for feeder service to the TOD development area.
- Designing of the institutional mechanism to capture land value.
- Preparation of the detailed plans for land use, transportation, infrastructure, etc.
- Invitation of private contractors for development of urban infrastructure and housing.
- Designing of the urban service operation plan

4. Extension of the Parand Internal Rail

The extension of the rail infrastructure in the Parand district proposed in the Section 5.2.4. shall be implemented in the first phase.

(2) Phase 2: Further Expansion

The second phase would consist of four projects:



Source: JICA Study Team

Figure 5-22 Phase 2 for Eslamshahr- Parand Corridor TOD

5. Extension of Metro Line 3 up to IKIA and Parand

Metro Line 3 operation can be extended to the IKIA and/or Parand if its feasibility is confirmed. This extension can be altered by the Express line 4 service or RAI commuter services.

6. Development of Express Line 4

Express Line 4 shall be branched out at certain locations between Azadegan station and Eslamshahr station, connecting to the domestic airport and the International Convention Center. The alignment should be planned to be properly integrated with Metro Line 3 and RAI commuter services.

7. TOD in Azadi Square Bus Terminal

The Express Line 4 is planned to pass the Azadi square bus terminal, in which a TOD potential has been suggested in the section 5.1.2. The development plan of the station for the express line 4 at the Azadi square bus terminal can be formulated and integrated with urban subcenter function redevelopment of the Tehran itself, as a case of regional TOD shown in the chapter 4 to realize the multi core urban structure.

8. Feeder Transport Services Development in Parand

Proposed as the section 5.2.4, the feeder transport services in Parand can be developed if it is feasible. Due to the steepness terrain in Parand, a transport mode with rubber-tire can be considered rather than steel-wheel basis transport.

6. TOD Promotion in Iran and Activities in Qazvin

6.1 TOD Target City Designation

The city of Qazvin is recognized for having advanced approaches to TOD implementation. MRUD has issued a letter for TOD promotion, and PBO and MRMO have issued a letter approving the budget for the TOD study in Qazvin.



Letter from Qazvin Provincial MRUD office to MRUD minister, requesting TOD promotion in Qazvin. Showing the importance of integration of transport planning with city heritage conservation, importance of BRT installation, etc. The Secretaries of the MRUD substantiated the letter to approve the promotional activities of

Letter of Qazvin Provincial PBO office to the Qazvin Provincial MRMO, approving the 3000 million Rial (approx. 80 thousand USD) for the promotional study of TOD in Qazvin, dated May 2017

Source: City of Qazvin

Figure 6-1 TOD Promotion Approvals by National Agencies for Qazvin

The Study Team has visited Qazvin to observe the state of the practice of TOD in Qazvin.

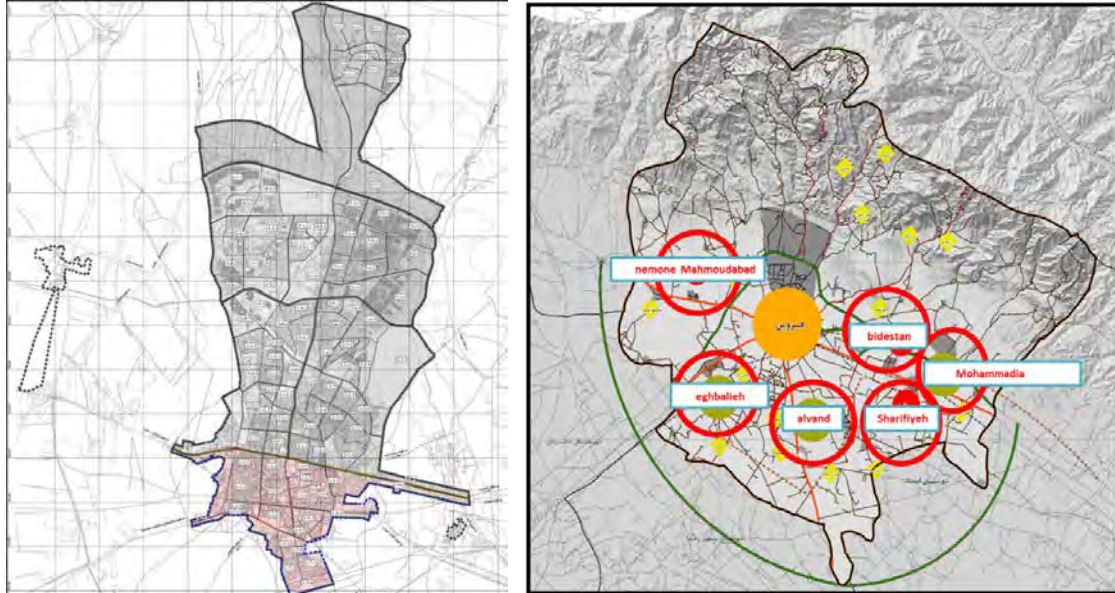
6.2 State of the Practice of TOD in Qazvin

(1) Outline of the Qazvin City

The City of Qazvin is located 160 km west of Tehran, at the intersection of corridors connecting Tehran to Tabriz, and Zanjan and Tehran to the Caspian Sea. It is the capital of the Qazvin province.

The population of the city is around 300 thousand; however, the population of the whole metropolitan area including surrounding industrial and residential cities is approximately 1.30 million. The city has Alborz Industrial Zone, which was developed and opened in 1968 as the first industrial zone in Iran. The city boasts 12 universities and colleges with 130 thousand students.

Being the old capital of Iran in the 16th century, Qazvin has a rich history and maintains various cultural heritages and archeological sites within its boundaries. Its urban functions are well-organized and concentrated in the center. Urban sprawl has been controlled by the historical green-belt in the southern end of the city.

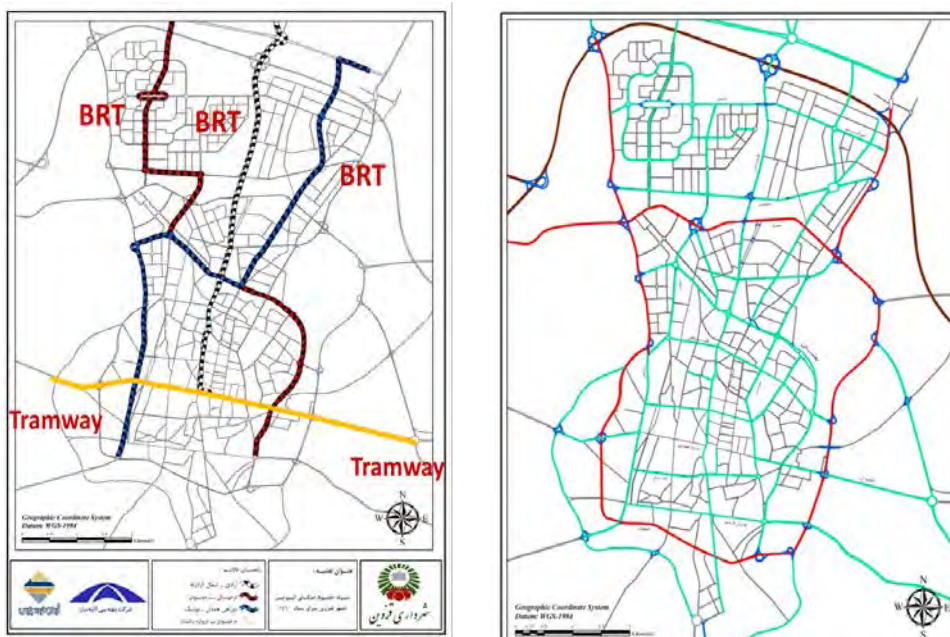


Source: City of Qazvin

Figure 6-2 Urban Planning of Qazvin and Its Metropolitan

(2) Transport Masterplan in 2014 and TOD Promotion

Qazvin city developed its transport masterplan in 2014 and prepared an investment plan to develop the railway, LRT, BRT and road network including the ring road, as shown below.



Source: City of Qazvin

Figure 6-3 Public Transport and Road Network Proposals in the Masterplan 2014

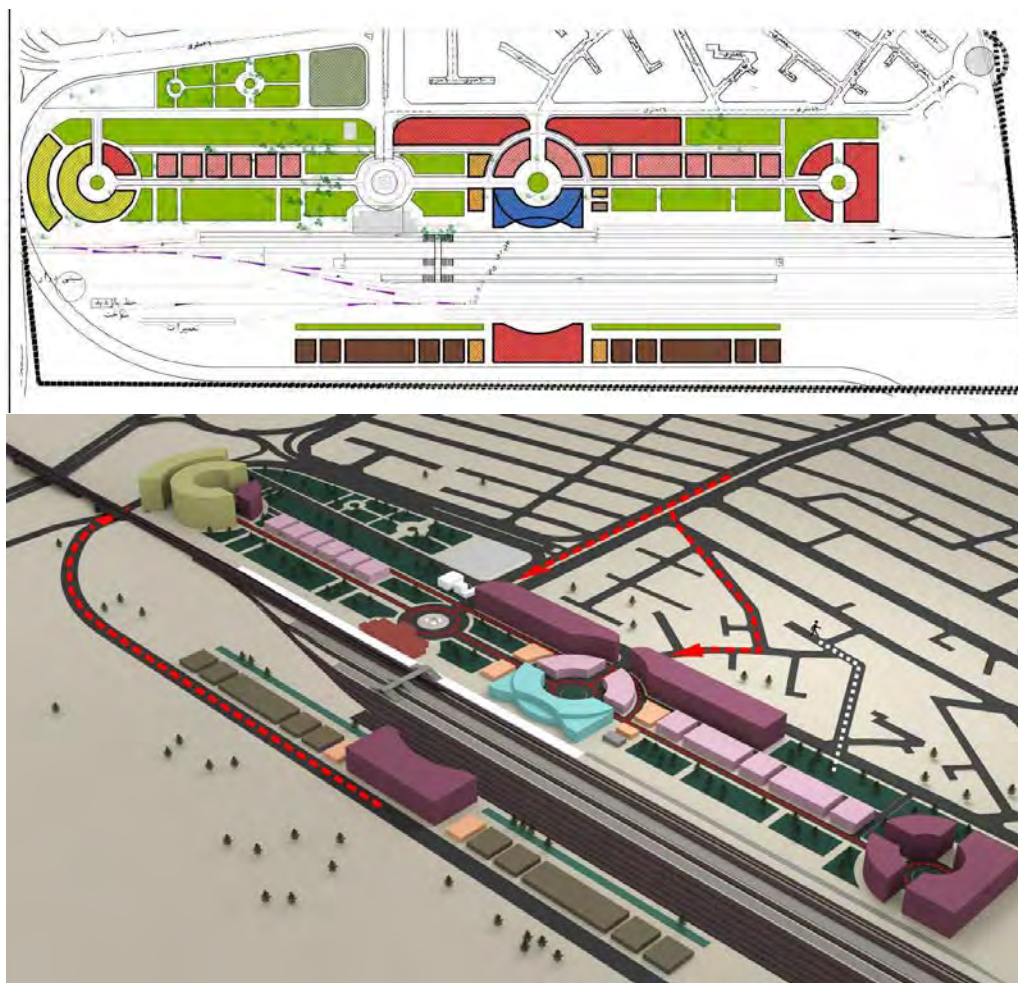
The urbanization of Qazvin is expanding to the north. The three lines of BRT were proposed extending to the north and south, and the tram line was proposed to cross the southern side of the city, where the population density is relatively higher and the road density is lower than the northern side. The three BRT lines cross each other in the northern side of the city and connect the large universities in the north. The masterplan and the BRT and LRT lines have been approved by the high traffic council, and it is planned that the BRT lines shall be developed from 2018 to 2020. The LRT development is targeting the opening by 2025. French private groups including Alstom have shown interest in LRT development in Qazvin. At the same time, the ring road development and city arterial road network development have been proposed in the masterplan.

The LRT lines are proposed in the masterplan to be extended to the surrounding cities including the Alborz Industrial City and Hashtgerd New Town, which have populations of 150 to 200 thousand.

Qazvin city administration is open to implementing advanced and integrated approaches for TOD promotion. TOD promotion in Qazvin was initiated in 2015 by the leadership of the Governor of the Qazvin Provincial Government and the Parliament Member of Qazvin. They confirmed that the Transport Masterplan already contains essences of TOD promotion in Qazvin, and that necessity of TOD should be incorporated into it. A committee for TOD promotion in Qazvin was organized in 2016, including the provincial offices of PBO, MRUD, MRMO, RAI, and municipality of Qazvin. 6 coordination meetings were held by March 2018, 18 items related to TOD, including promotional activities targeting the National Government.

The TOD planning study for Qazvin is on-going and being undertaken by RAI with assistance of a local subcontractor. The major proposals of the TOD plan can be summarized as follows:

- Development plan of RAI Qazvin station and surroundings
- Evaluation of current land use, urban function, architecture, public space and social economic infrastructure
- Passengers of the RAI rail services and its analysis
- Evaluation of the pedestrian network and pedestrian traffic volume
- Proposals for necessary infrastructure, street development, amenity improvement
- Multi modal connectivity improvement at the station.
- Proposals for the permanent car-free street development, and the transit mall development



Source: City of Qazvin

Figure 6-4 Qazvin RAI Station and TOD plan – Current Proposal

6.3 Qazvin for TOD Pilot Project

The state of practice of TOD trials in Qazvin can be reviewed as follows:

- Institutionally, organizations related to MRUD, responsible for urban planning and intercity transport, and organizations related to MOI and MRMO, responsible for urban transport, jointly develop the TOD planning. Moreover, PBO has authorized the budget for the initial TOD planning.
- The TOD concept in Iran is applicable not only to large cities and surrounding cities of the mega cities, but also medium and small cities with population of less than 1 million. Qazvin is the top runner of the TOD application of the medium and small class cities.
- The present TOD plan is prepared for the districts adjacent to the RAI Qazvin station; however, the plan itself does not seem attractive as the passenger volume of the RAI rail services are small. On the other hand, further TOD approaches can be considered in the central districts of the Qazvin, where several touristic and historical attractions and urban functions shall be connected with the BRT, LRT and permanent car-free streets in the near future. Moreover, public transport connectivity improvement with the suburban satellite cities can be essential to TOD in Qazvin.

- Considering above, it is reasonable to include the city of Qazvin and its surroundings to the TOD pilot project sites if JICA's further studies for Iranian TOD would be implemented.

The following aspects can be considered for the further TOD planning in Qazvin.

- Development of the pedestrian network, urban districts and urban function for cities with populations of 300 to 500 thousand.
- Inter-modal connection development between the RAI rail station and other transport modes.
- Inter-modal connection development between taxis and buses.
- TOD development connecting satellite cities, and public transport service development without depending on private car usage.
- Railway network development utilizing the existing RAI rail network to the Metropolitan region.

7. Issues and Recommendations on TOD in Iran

7.1 Issues on TOD in Iran

The issues related to TOD in Iran are summarized as below:

- TOD is a new concept in Iran; therefore, policy tools to promote it at the national level, such as guidelines, are needed.
- In the suburbs of major cities, housing development has been progressing including new towns promoted by the public sector; however, public transportation systems which are expected to support the residents of those suburbs have not sufficiently been developed. In particular, the development of a suburban railway connecting the city center and the suburbs is delayed.
- At the metro stations in the Tehran Metropolitan Area, it is inconvenient to connect with other transport modes such as the bus, BRT, and taxi. In addition, the number of entrances and exits is limited at many metro stations, and the pedestrian network to major facilities around the station is not adequately developed.
- To promote TOD, a comprehensive approach is necessary. However, sectional divisions in the authorities at the central and local level administrations, including between urban planning and traffic planning departments, is hindering the planning and implementation of TOD.
- For TOD promotion, close cooperation between the public and private sectors is necessary. However, laws and regulations to implement TOD related projects through cooperation of the public and private sectors have yet to be established.

7.2 Recommendations for Promoting TOD in Iran

(1) Formulation of a Practical TOD Guideline

In order to promote TOD in all levels in the country in the future, the TOD guidelines currently under formulation in Iran need to be developed based on the actual situation and challenges of its cities. As explained in Chapter 4, these guidelines broadly organize the TOD concept and describe such matters as the basic role of TOD stakeholders and the direction of measures grounded on Iran's planning system. These guidelines are believed to be beneficial for Iran, where the concept of TOD is not necessarily shared. However, the content of the guidelines is limited to basic concepts and directions. In order to actually advance TOD-related projects in Iran, practical guidelines that set forth detailed methodologies giving due consideration to the real conditions of Iran's cities are needed.

The proposed TOD guidelines discussed in Chapter 4 of this report set forth methodologies to advance TOD by three levels: regional level, corridor level, and station level, which were outlined in the guidelines currently under formulation in Iran. Based on this proposal, it is hoped that practical TOD guidelines that can be applied in Iran will be prepared.

(2) Elaborating on the TOD Guideline through a Pilot Project

In order to add detail to the abovementioned practical TOD guidelines, it would be necessary to advance this task by applying the guidelines in an actual TOD-related pilot project. The actual implementation of specific development projects in the area around a station in a city in Iran, for instance, the construction of a station plaza, pedestrian network, and other facilities mentioned in the section on intermodal facilities in the station level guidelines of Chapter 4, would reveal many

matters that should be fed back to the guidelines. It is believed that the practical TOD guidelines can be elaborated through this process of applying the guidelines to a pilot project.

Chapter 5 of this report sets forth candidate locations for the pilot project in the urban center and suburbs of the Tehran Metropolitan Area. Qazvin City indicated in Chapter 6 could also be included as a candidate site, which is designated by the government of Iran (MRUD) as a city promoting TOD. In order to advance elaboration of the practical TOD guidelines, the implementation of TOD-related development projects in areas, including these candidate locations, and reflection in the guidelines of the lessons and methodologies gained through the pilot project should be an ongoing process.

(3) Establishment of Policy and Plan Formulation System to Promote TOD

In order to actually advance TOD-related projects using the TOD guidelines, other than formulating the abovementioned practical guidelines that outline detailed methodologies, it would also be necessary to build a system and organizational framework for its operation.

Chapter 4 of this report indicated the necessity of having local rules such as a TOD policy and plan, implementation plan and incentive policy formulated on the local metropolitan area level based on the TOD guidelines prepared on the central government level, as well as the importance of establishing an organizational framework such as a council to implement these local rules and, moreover, an area management organization to enhance the area's attraction and property value. As were the abovementioned TOD methodologies, these proposals were also studied based on the TOD experience and expertise of Japan and the world. In order to apply these proposals to Iran's cities, their contents need to be elaborated through the formulation of guidelines and relevant policies that consider Iran's actual situation, and through the implementation of a pilot project.

Through the interviews with the relevant departments of the city of Tehran in this study, it was revealed that coordination between urban and transportation planning has not been properly executed. That is, in formulating the city plan of Tehran (Comprehensive Urban Planning Master Plan and Detailed Plans), the process to reflect the transportation policies and plans, such as the traffic master plan, was not sufficiently secured. In order to promote TOD, it is necessary to integrate the planning process and to implement TOD related plans through close cooperation between urban and transportation planning agencies. Breaking down this kind of sectional division in Iran is needed for TOD promotion.

(4) Establishment of a Framework for Public-private Partnership to Promote TOD

Currently almost no system exists in Iran for the public and private sectors to cooperate to implement projects related to TOD; however, in order to promote TOD, public and private sector cooperation at all levels is necessary. For example, urban development by private enterprises is necessary to make full use of the enhanced urban development potential and form a corridor economic zone through railway development by the public sector. Also, in order to make the station areas comfortable and convenient, it is necessary for the private sector to make some contributions such as development of business and commercial facilities and open and green spaces, by following the TOD guidelines as shown in Chapter 4. With regard to the metro entrance and exit in the city center, although there is a security problem, if private facilities and private land could be utilized including the underground space, the convenience of metro users would be greatly improved. Therefore, to promote TOD in Iran, it is necessary to urgently establish an institutional framework for public and private cooperation on TOD related projects.

(5) Integration with Rail and Transport Sector

As explained in Chapter 3, the level of service of the road transport and private vehicle utility are quite high in Tehran and the surrounding cities. Promotion of TOD will require further integration of public transport services including railway network development. The pilot projects mentioned above should cover the railway and transport sector as well as urban development. The followings can be suggested as necessary further actions.

- There is still institutional barrier to materialize consecutive railway network connecting railways in and outside of the city. It is necessary to overcome the institutional barrier by applying the concept of TOD.
- In particular, the integration of railway planning including the express lines and commuter rails should be properly considered, to avoid unnecessary investment.
- The mechanism of value capturing to recover the railway investment should be adopted.
- Regarding the private operator involvement in the railway market suggested in the five-year-development plan, it is necessary to clarify in which sector this is needed. Also, institutional arrangement of the public sector to arrange and promote such involvement is required.
- The importance of taxi in the market cannot be ignored in Iran. Creating a TOD specific to Iran's needs, including the role of taxi, will be necessary.
- The tariff and price of the transport services, particularly for the lower rate of the railway services, should be re-considered to promote foreign investment. The present low rate of the tariff cannot recover the investment without public subsidy.

Appendices

Appendix 1

Summary of Meetings and Seminars

A1 Summary of Meetings and Seminars

1st Survey

| Date | Meeting With | Outline |
|----------------------|--|---|
| 7 th Jan | JICA | • Kick off |
| 7 th Jan | Steering Committee | • Explanation of ICR • Request for collaboration and relevant information |
| 8 th Jan | MRMO | • Explanation of outline of study • Interview about current issues and situation |
| 9 th Jan | Tehran Municipality, International Dept. | • Explanation of outline of study • Interview about current issues and situation |
| 9 th Jan | Tehran Municipality, Transportation Dept. | • Explanation of outline of study • Interview about current issues and situation |
| 10 th Jan | MRMO, Deputy of Transportation | • Explanation of outline of study • Request for collaboration and relevant information |
| 10 th Jan | MRMO, Urban Development Dept. | • Explanation of outline of study • Interview about current issues and situation |
| 11 th Jan | EOJ | • Explanation of outline of study |
| 13 th Jan | MRUD+BHRC | • Explanation of outline of study • Interview about current issues and situation • Interview about the status and outline of TOD guideline |
| 15 th Jan | Tehran Municipality, Urban Planning Dept. | • Explanation of outline of study • Interview about current issues and situation |
| 15 th Jan | NTDC | • Explanation of outline of study • Interview about current issues and situation |
| 17 th Jan | TOD seminar by study team | • Showcase examples of TOD in Japan and other countries |
| 21 st Jan | 3rd TOD Conference by MRUD | • Showcase examples of TOD in Japan and other countries |
| 22 nd Jan | Parand NTDC | • Interview about current situation and plan • Field survey |
| 23 rd Jan | BHRC/MRUD | • Interview about Candidate places as TOD model project • Interview about current issues and situation |
| 24 th Jan | Tehran Municipality, Urban Planning Dept. | • Interview about Candidate places as TOD model project • Interview about current issues and situation |
| 24 th Jan | Parand NTDC/ Local Consultant | • Discussion on transportation plan in Parand |
| 29 th Jan | MRMO | • Agenda of SC |
| 29 th Jan | JICA | • SC and procedure |
| 30 th Jan | Tehran Municipality, Transportation Dept. | • Interview about Candidate places as TOD model project • Interview about current issues and situation |
| 31 st Jan | Steering Committee | • Procedure • MOU among SC |
| 31 st Jan | MRUD | • Technical advice on TOD Guidelines |
| 1 st Feb | JICA | • Report about SC • Procedure |

| Date | Meeting With | Outline |
|---------------------|---|---|
| 4 th Feb | Tehran Municipality, Urban Planning Dept. | <ul style="list-style-type: none"> • Interview about Candidate places as TOD model project • Request for relevant information |
| 5 th Feb | RAI, Infrastructure department | <ul style="list-style-type: none"> • Interview about Candidate places as TOD model project • RAI's plan on TOD |
| 5 th Feb | RAI, Commuter train | <ul style="list-style-type: none"> • Plan of Commuter Train |

2nd Survey

| Date | Meeting With | Outline |
|------------------------|--|--|
| 15 th April | JICA | <ul style="list-style-type: none"> • Explanation of DFR |
| 16 th April | Steering Committee | <ul style="list-style-type: none"> • Explanation of DFR • Request for relevant information |
| 16 th April | MRMO | <ul style="list-style-type: none"> • Candidate places as TOD model project • Future plan |
| 17 th April | MRUD/BHRC/RAI, Dr. Taghizadhe | <ul style="list-style-type: none"> • Explanation of DFR |
| 17 th April | MRUD/BHRC | <ul style="list-style-type: none"> • Explanation of DFR • Discussion TOD guidelines |
| 17 th April | Tehran Municipality, Deputy of mayor of urban planning | <ul style="list-style-type: none"> • Explanation of DFR • Request for future collaboration |
| 21 st April | Qazvin | <ul style="list-style-type: none"> • Explanation of DFR • Interview about current situation and issues in Qazvin • Field survey |
| 22 nd April | Tehran Municipality, Transportation Dept. | <ul style="list-style-type: none"> • Explanation of DFR |
| 22 nd April | Tehran Municipality, Deputy of mayor of Transportation | <ul style="list-style-type: none"> • Explanation of DFR |

Appendix 2

Main Points Indicated by Concerned Agencies

A2 Main Points Indicated by Concerned Agencies

The JICA Study Team interviewed concerned agencies during the field survey conducted in January 2018 and discussed the current situation and major issues regarding TOD in Iran. Main points indicated by these agencies are summarized below.

Main Points regarding TOD Indicated by Concerned Agencies

| Agency | Main Points |
|---------------------|---|
| MRMO | <ul style="list-style-type: none"> Municipalities are responsible for metros in Iran. Metro lines running between urban areas and suburbs are under the responsibility of the municipalities of the origin of such lines. There is a plan to establish a new company to operate metro lines in the suburbs. |
| MRUD, BHRC | <ul style="list-style-type: none"> It is intended that TOD currently considered will cover the development from station to regional/corridor levels. MRUD and BHRC expect the JICA Study Team to assist in the technical aspects of TOD that would be necessary for its implementation, e.g., concrete TOD approaches along with relevant experiences in Japanese cities. |
| Tehran Municipality | <p>< Urban Planning Department ></p> <ul style="list-style-type: none"> In Tehran, there are several areas of land owned by the Iranian Military that can be a candidate site for TOD, including Hossein Abad. Conversion of military-owned land to service centers has been directed by the Supreme Leader over the past decade, but actual conversion has progressed very slowly. Due to the lack of public land for further development in Tehran, a masterplan for underground development has been prepared to utilize the underground for commercial and social services, car parking, etc. However, connecting metro stations with underground private sector facilities may be difficult due to security reasons. There has been a discussion with Tehran Metro about the development of a station complex composed of commercial facilities and parking. One candidate is along the Vali-e-asr Street. <p>< Transport Department ></p> <ul style="list-style-type: none"> Major issues on transport in Tehran include chronic traffic congestion and air pollution caused partly by the concentration of population. If TOD attracts more people to Tehran, its implementation may not be desirable. The Tehran Transport Masterplan is a subordinate plan of the Comprehensive Plan of Tehran. However, there has not been a feedback mechanism from the transport policy to the Comprehensive Plan. Inconvenient intermodal transfers and insufficient provision of related public facilities (e.g., station plazas, park-and-ride/kiss-and-ride lots) at/around metro stations are primarily due to the lack of inter-agency or inter-departmental coordination (e.g., between Tehran Metro and bus/taxi operating companies). Connecting metro stations with underground private sector facilities may be possible, although there has not been such a case so far. On the other hand, there are some metro entrance/exit passageways that are located on private property. |
| NTDC | <ul style="list-style-type: none"> Over the past decade, the Mehr Housing Project has supplied affordable housing on a large scale and is now in the final stage. The focus would be shifted to such themes as pursuing quality of life and energy-saving. Eco-Smart City and TOD are an essential concept in the masterplan of the next generation. NTDC would like to receive technical assistance from Japan regarding Smart City and energy saving technologies. MRUD designated Parand as the first target for TOD-based urban development to be implemented on a pilot basis. NTDC has already hired local consultants to develop a TOD plan for Parand (including a transport plan within Parand) and expects to receive technical support from Japan as it has little experience and knowledge on TOD-based urban development. |

| Agency | Main Points |
|--------|--|
| RAI | <ul style="list-style-type: none">• It is planned to increase the number of RAI stations where passengers can efficiently transfer to metro lines.• It may be possible to establish a system to share tracks between RAI's commuter trains and metro suburban trains.• The TOD-based development around RAI stations is now planned to make them the landmark of the cities with over one million population. As of February 2018, an overall masterplan for redevelopment around major stations, as well as a redevelopment masterplan for Tehran Railway Station (Rah Ahan), is being prepared.• For Parand, the extension of RAI services to within the city should be reasonable from TOD perspective, but the investment for the extension would not be financially justified. |



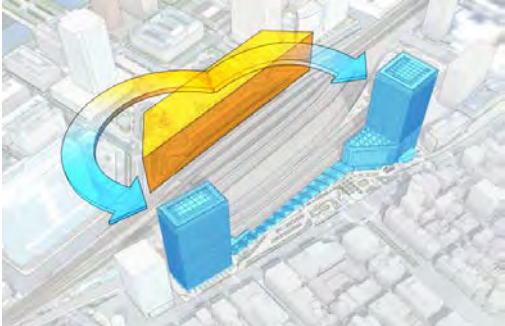
Source: Relevant personnel of the above agencies, JICA Study Team

Appendix 3




Sample TOD Projects

A3 Sample TOD Projects

Example of a) Terminal Type Station in City Center

| | | | |
|----------------|--|-----------------|---------------------------|
| Name | Tokyo Station | Location | Tokyo (Japan) |
| Site Area | — | Business Entity | JR East Japan |
| Project Period | — | Ridership | approx. 1,280,000 pax/day |
| Project Scheme | Transfer of Development Rights (transfer of the air rights, or floor area ratio (FAR) above the station of Tokyo Station building to neighboring sites). The neighboring sites are in part designated as “Special Urban Renaissance Districts,” with FAR standards, land use policies, etc. designed to mitigate significant environmental effects. | | |
| Outline/ Image |  <p>The historic, symbolic station building and surrounding high-rise buildings</p>  <p>The Tokyo Station Grand Roof on the south side is low so as to give an uninterrupted perspective.</p>  <p>Transfer of development rights (TDR) is a technique that enables both conservation of the station building and development on neighboring sites.</p> | | |

Example of b) Standard Station in City Center

| | | | |
|----------------|--|-----------------|---|
| Name | Roppongi 1-chome station/ Izumi Garden | Location | Tokyo (Japan) |
| Site Area | 23,868.51 m ² | Business Entity | Teito Rapid Transit Authority (Tokyo Metro of the present day, Sumitomo Realty & Development Co., Ltd., etc.) |
| Project Period | 1986 Formation of the association、 1999-2002 | Ridership | approx. 74,200 pax/day |
| Project Scheme | Urban Redevelopment Project | | |
| Outline/ Image |  <p>The site is between a subway station and an old mansion with a historic garden.</p>  <p>An Urban Corridor directly connects the metro station through a hilltop green area.</p>  <p>The Urban Corridor also provides sunlight and fresh air for the underground space.</p> | | |

Example of c) Core Type Station in Suburb

| | | | |
|----------------|---|-----------------|------------------------|
| Name | Tama Plaza Station | Location | Yokohama (Japan) |
| Site Area | — | Business Entity | Tokyu Corporation |
| Project Period | 2010 (Tama Plaza Terrace) | Ridership | approx. 82,000 pax/day |
| Project Scheme | Urban Redevelopment Project | | |
| Outline/ Image |  <p>Tama Plaza station was developed as the center of the Tama Garden City. The station plaza and the shopping mall attached to the station are always busy.</p>  <p>The shopping mall sometimes holds events, which attracts even more people.</p>  <p>The concourse is seamlessly connected to the station plaza, and passengers can see and feel passing trains on the concourse or even in some shops.</p> | | |

Example of d) Standard Station in Suburb

| | | | |
|----------------|--|-----------------|------------------------|
| Name | Ichigao Station | Location | Yokohama (Japan) |
| Site Area | — | Business Entity | Tokyu Corporation |
| Project Period | — | Ridership | approx. 44,000 pax/day |
| Project Scheme | Development Based on City Planning | | |
| Outline/ Image |  <p>Owing to its topography, the road penetrates the station above the track, so that the road has no railway crossing. There is a supermarket owned by the railway company above the station; and there is also a bus terminal on the north side of the station.</p>  <p>In spite of its relatively low ridership, the station also includes some facilities for daily life, such as a café, a cleaning shop and a bank. Therefore, passengers using this station can enjoy a convenient lifestyle.</p> | | |

Example of Station Level TOD (1) Land Use


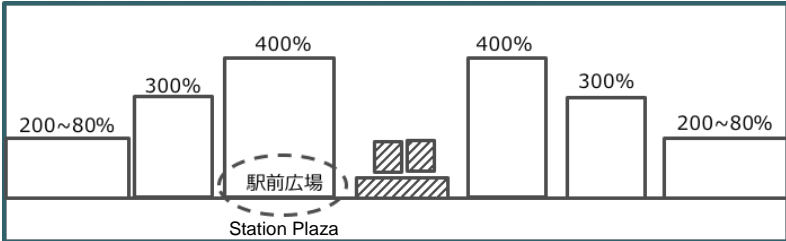
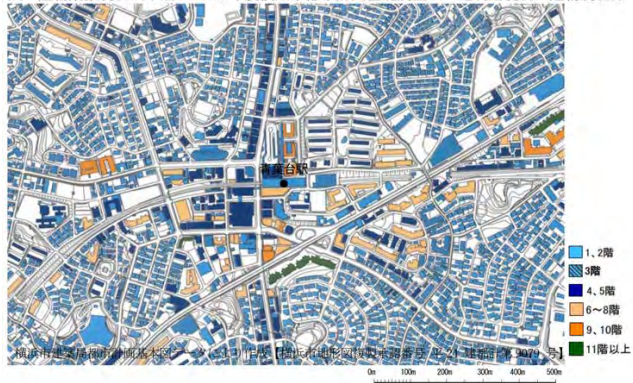
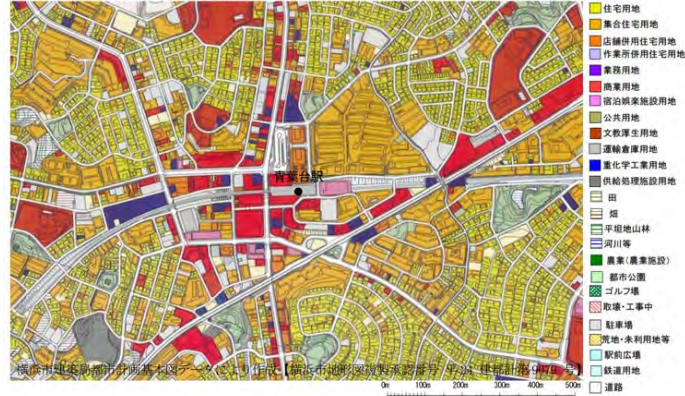
| | | | |
|----------------------------------|--|-----------------|-------------------|
| Name | Aobadai Station, Fujigaoka Station | Location | Yokohama (Japan) |
| Site Area | — | Business Entity | Tokyu Corporation |
| Project Period | 2000 (commercial facility) | Project Cost | — |
| Project Scheme Outline/ Image | <p>Development Based on City Planning (Land Use)</p> <p>Aobadai Station (Ridership: approx. 113,000 pax/ day)</p>   <p>According to the official urban planning map, the areas surrounding the station and along arterial roads are designated for commercial use with high FARs. Other areas are mostly for residential purpose with low FARs. There is also a station plaza on the north side of the station.</p> <p>図 建物階数現況 (平成 21・22 年度横浜市都市計画基礎調査 (土地利用現況・建物現況))</p>  <p>The closer to the station, the higher the buildings tend to be. Thus, FAR control makes the skyline surrounding the station distinct.</p> | | |

図 土地利用現況 (平成 21・22 年度横浜市都市計画基礎調査 (土地利用現況・建物現況))

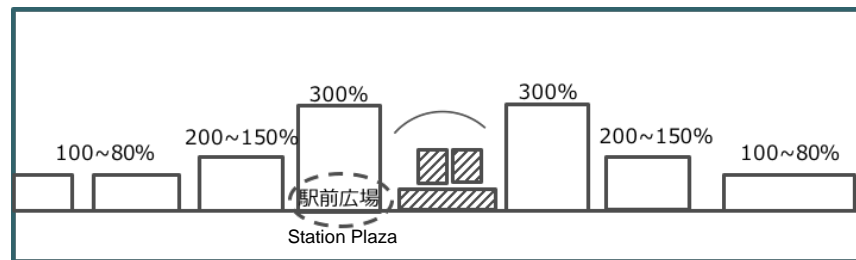


Compared with the location of detached housing, the areas of housing complexes and apartments tend to be closer to the station.

Fujigaoka Station (Ridership: approx. 27,300 pax/ day)



Its overall structure is similar to that of Aobadai station, except that the commercial zone is a little smaller. There is a small station plaza adjacent to the station.



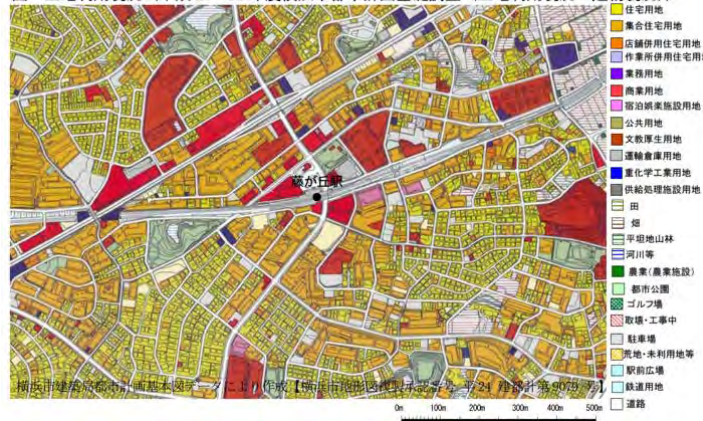
The biggest difference between Fujigaoka Station and Aobadai Station is the FAR surrounding the station. FARs should be decided according to the scale of the station; rather than setting different FARs to different stations, those stations can be hierarchized.

図 建物階数現況 (平成 21・22 年度横浜市都市計画基礎調査 (土地利用現況・建物現況))





Except along the arterial road, each building tends to be lower and smaller.

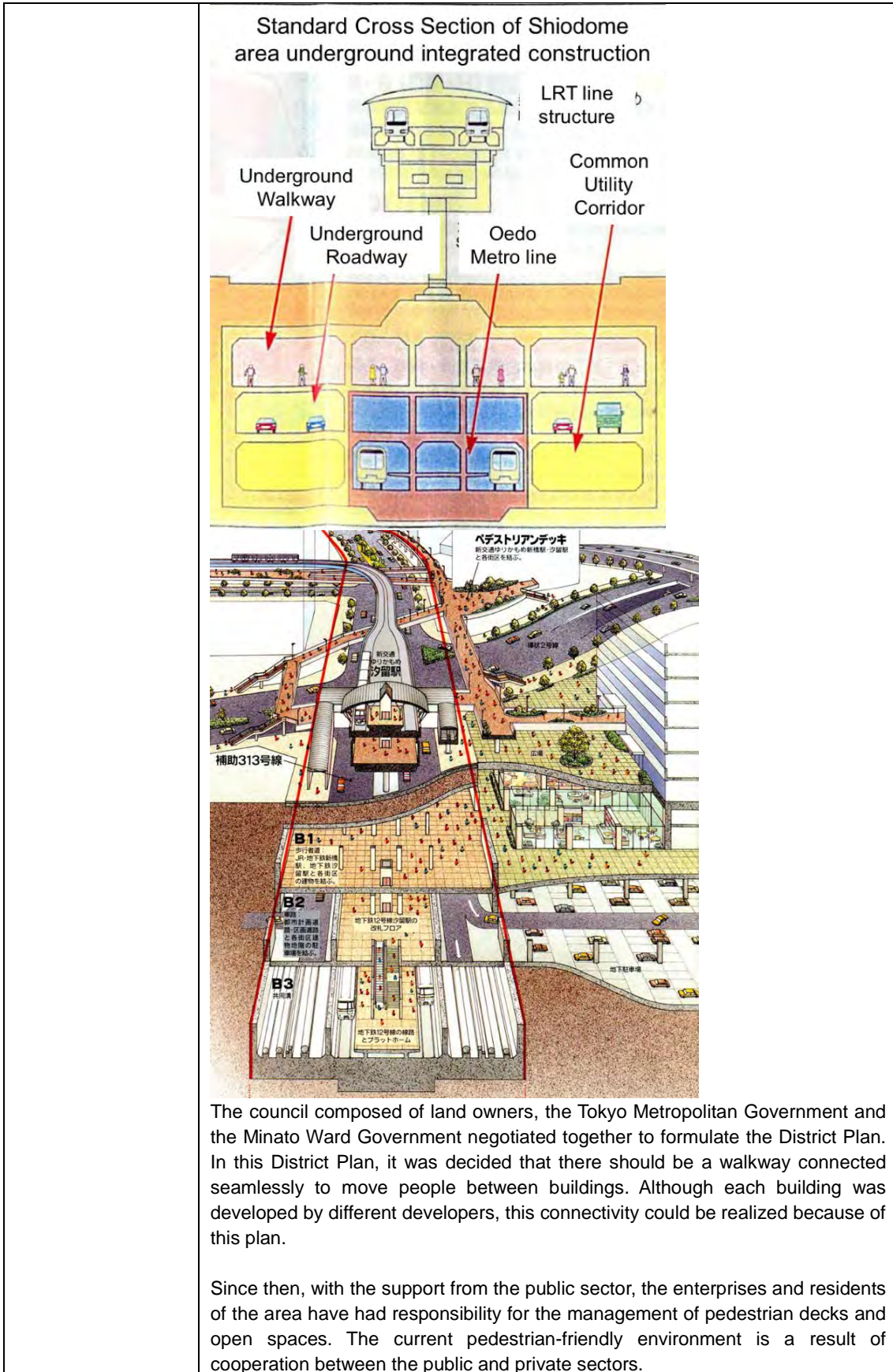
図 土地利用現況 (平成 21・22 年度横浜市都市計画基礎調査 (土地利用現況・建物現況))





There are some large commercial facilities along the arterial road, but the commercial area is more compact than Aobadai station's, which resulted from the different urban planning.

Example of Station Level TOD (2) Pedestrian Network

| | | | |
|----------------|---|-----------------|--|
| Name | Shiodome Sio-Site | Location | Tokyo (Japan) |
| Site Area | Approx. 31 ha | Business Entity | Shiodome Development Council |
| Project Period | 1985 Formulation of plan, 2007 Completion | Project Cost | Public facility (roads, etc.) 146.3 billion yen |
| Project Scheme | Land Readjustment Project District Plan under the Enhanced Redevelopment District Plan Station area management by the council (referring to BID) | | |
| Outline/ Image | <p>Shiodome Station (Ridership: approx. 62,000 pax/ day) Shimbashi Station (Ridership: 950,000 pax/ day)</p>   <p>In 1986, the freight station of Shiodome was abolished, and the Tokyo Metropolitan Government drew up a master plan for this area. Following the master plan, this area has been developed including business, cultural, commercial and residential functions.</p> | | |



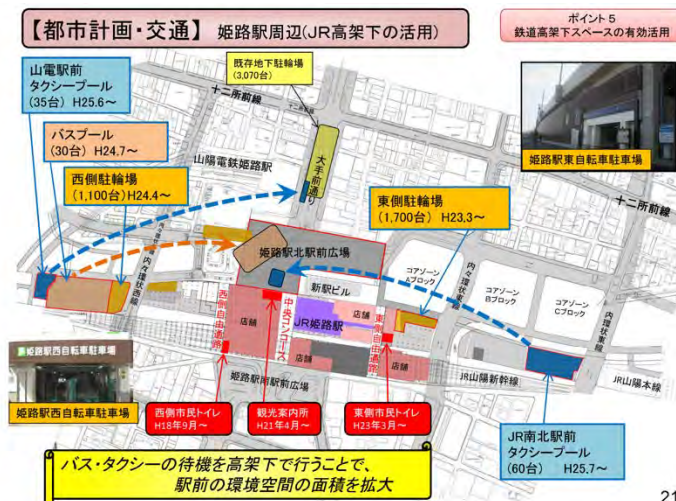
Example of Station Level TOD (3) Traffic Network

| | | | |
|----------------|--|-----------------|---|
| Name | Himeji station north exit | Location | Himeji City (Japan) |
| Site Area | Approx. 200 m (road length) | Business Entity | Himeji City, Transportation business operator, etc. |
| Project Period | 2015- (ongoing) | Project Cost | — |
| Project Scheme | Station Environment Development Based on Revised City Planning Through the Cooperation Between the Government and the Private Sector | | |
| Outline/ Image | <p>Himeji Station (Ridership: approx. 130,000 pax/ day including Sanyo Railway)</p>  <p>In the late 1980s, Himeji City decided to enhance the quality of the Himeji station area. The plan included the elevation of JR tracks and widening the ring roads surrounding the station, which is expected to lead the reduction of car traffic.</p>  <p>The change in urban planning has encouraged some organizations, such as the Chamber of Commerce, to participate in the proposal of the station plaza on the north side of the Himeji station. At the same time, the plan suggests creating a transit mall in the main street. The concept of “transit mall” entails excluding private cars from the street and allowing only public transportation.</p> | | |



The year 2015 saw the completion of ring roads and station plaza, and the introduction of the transit mall, which is mainly for public transport, bicycle, and pedestrian use; however, some private vehicles, such as freight trucks or ambulances, are allowed to enter the zone.

The experimental project had been conducted to grasp the benefits and problems of the transit mall program.



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This program, combined with other improvements surrounding the station, has had three effects: vitalization of the city center, traffic improvement and public transportation improvement.

Example of Station Level TOD (4) Intermodal Facilities

| | | | |
|---|---|-----------------|------------------------|
| Name | Hamamatsu station north exit | Location | Hamamatsu City (Japan) |
| Site Area | Approx. 1.8 ha | Business Entity | Hamamatsu City |
| Project Period | 1982, 2011 re-examination | Project Cost | — |
| Project Scheme | Land Readjustment Project | | |
| Outline/ Image | Hamamatsu Station (Ridership: approx.88,000 pax/ day) | | |
|  | | | |
|  <p>①施設整備状況</p> <p>●C地区(完了) ●B地区(完了) ●A地区(準備中)</p> <p>旭・振屋地区第一種市街地再開発事業</p> <p>広島局(原宿)副都心通切</p> <p>新浜松駅</p> <p>ソラモ (SOLAMO)</p> <p>通鉄百貨店</p> <p>メイトワン 浜松駅</p> <p>アクトシティ</p> <p>凡例</p> <ul style="list-style-type: none"> 地下通路 デッキ バスバース 駅前広場 都市計画区域 | | | |
| <p>The station plaza on the north side of the Hamamatsu station has a taxi pool and stands, a kiss & ride lane, and a massive bus terminal. The station, surrounding buildings, and the bus terminal are connected by the underground passage, allowing pedestrians to go up and down without being interrupted by cars. Taxi stands are located at the most strategic spot, because taxi users might put priority on efficiency and convenience.</p> | | | |


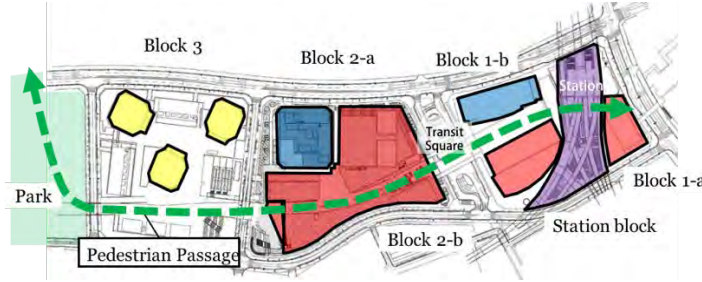

The diagram illustrates the layout of the Hamamatsu Bus Terminal, featuring 16 bus stops arranged in a circular pattern, each distinguished by a unique color. Surrounding the terminal are various facilities, including a ticket center, waiting areas, and shops. To the right of the terminal, a detailed table lists the destinations for each of the 16 bus stops, organized into two columns (01 and 02) and numbered 1 through 16. The destinations include local routes like 'Hamamatsu City' and 'Hamamatsu Station', as well as regional routes to cities like 'Nagasaki' and 'Tokyo'.

| 01 | 02 |
|-----------|------------|
| 1 山形県 山形市 | 9 静岡県 静岡市 |
| 2 静岡県 浜松市 | 10 静岡県 浜松市 |
| 3 静岡県 浜松市 | 11 静岡県 浜松市 |
| 4 静岡県 浜松市 | 12 静岡県 浜松市 |
| 5 静岡県 浜松市 | 13 静岡県 浜松市 |
| 6 静岡県 浜松市 | 14 静岡県 浜松市 |
| 7 静岡県 浜松市 | 15 静岡県 浜松市 |
| 8 静岡県 浜松市 | 16 静岡県 浜松市 |

The bus terminal is huge with 16 bus stops, as the bus seems the most important public transportation in Hamamatsu City. The buses whose destinations are in the same direction depart from the same bus stop and each bus stop has a different symbol color, making the complicated bus system more understandable.

Hamamatsu City– the central government (MLIT), the police, experts, local associations, taxi companies, bus companies, and so on – constituted a committee to conduct a survey aimed at upgrading the traffic conditions and intermodal facilities surrounding the station. The survey included a questionnaire survey to citizens, as well as a traffic census. The result was taken into consideration in formulating an improvement plan.

Example of Station Level TOD (5) Green and Open Space Network

| | | | |
|-------------------|--|-----------------|-------------------------|
| Name | Futako-Tamagawa Rise | Location | Tokyo (Japan) |
| Site Area | Approx. 8.1 ha | Business Entity | Tokyu Corporation |
| Project Period | 2007-2015 | Project Cost | Approx. 100 billion yen |
| Project Scheme | Urban Redevelopment Project | | |
| Outline/ Image | <p>Futako-tamagawa Station (Ridership: approx. 160,000 pax/ day)</p>  <p>Futako-tamagawa is said to be “the western gateway to Tokyo.” Surrounded by beautiful nature, the area has been redeveloped in consideration of the natural environment, as well as vitalization of commercial, residential and business functions.</p>   <p>Futako-tamagawa Rise is located between the train station and a park. A pedestrian passage, named “Ribbon Street” runs in between. The passage, on which many small shops are located, is designed to be full of trees, making it more comfortable for people to walk up and down. In the residential area (shown as yellow), the green coverage ratio is more than 30%.</p> | | |



There are also green roofs on buildings. The rooftop gardens are intended to function as a biotope, contributing to biodiversity in this area. Also, people can enjoy the scenery of Kokubunji Terrace, Tama River and even Mt. Fuji from this garden.

This nature-oriented project could be realized because it is located in the suburbs. Some companies were attracted by the project and decided to move their offices here, including one of the largest IT companies in Japan. The centralized urban structure could be mitigated by such moves.

Example of Station Level TOD (6) Building Design-1

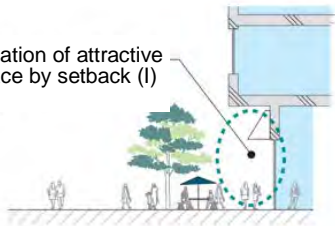
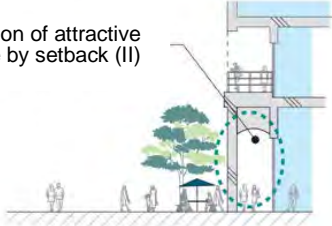
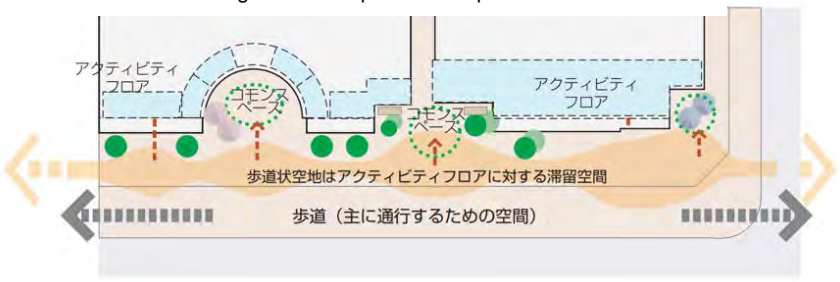
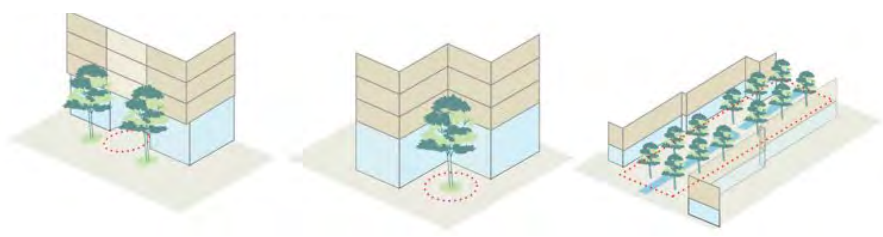
| | | | |
|----------------|---|-----------------|------------------|
| Name | Minato-mirai 21 landscape guideline | Location | Yokohama (Japan) |
| Site Area | Approx. 115.7 ha | Business Entity | Yokohama City |
| Project Period | 2008 Enforced | Project Cost | — |
| Project Scheme | Landscape Planning Based on Landscape Act and Based on Landscape Regulation (Guidelines) | | |
| Outline/ Image | <p>Yokohama City introduced landscape guidelines for the Minato-mirai area, the most developed bayside district of Yokohama.</p> <p>The guidelines cover the items below:</p> <ul style="list-style-type: none"> - Activity floor: a floor which faces pedestrian passage <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Creation of attractive space by setback (I)</p>  </div> <div style="text-align: center;"> <p>Creation of attractive space by setback (II)</p>  </div> </div> <ul style="list-style-type: none"> - Open space for pedestrians Image of vibrant pedestrian spaces <div style="text-align: center;">  </div> <ul style="list-style-type: none"> - Common space Image of various common spaces <div style="text-align: center;">  </div> | | |

Image of creation of rooftop design by the guidelines

(地区内)

- Skyline

Image of creation of symbolic skyline by the guidelines

Streetscape

Image of creation of human-scale design by the guidelines

Example of Station Level TOD (6) Building Design-2

| | | | |
|----------------|---|-----------------|-----------------|
| Name | Region exchange center, etc. development instruction project | Location | Sapporo (Japan) |
| Site Area | — | Business Entity | Sapporo City |
| Project Period | 2017 | Project Cost | — |
| Project Scheme | The Floor Area Ratio Bonus and Subsidy Due to Conforming to Open Space Guidelines | | |
| Outline/ Image | <p>The guidelines illustrate the cases in which FAR bonus and subsidies are provided to developers.</p> <p>Sapporo City has started a new approach to improve the built environment surrounding the metro stations by giving FAR bonus and subsidies to developers if they contribute to the improvement of surrounding areas.</p> <p>Sapporo City also formulated the Open Space Guidelines, which contain the guidelines for the creation of open spaces for pedestrians, passages inside their properties, bicycle parking lots, and plazas. The guidelines also include how to design open spaces, as well as how to manage them.</p> | | |

Example of Station Level TOD (7) Convenient Facilities

| | | | |
|----------------|--|-----------------|---------------|
| Name | Shinagawa Station | Location | Tokyo (Japan) |
| Site Area | — | Business Entity | JR East Japan |
| Project Period | 2005-2011 | Project Cost | — |
| Project Scheme | Commercial Development by a Railroad Company / Urban Redevelopment Project, Redevelopment District Plan | | |
| Outline/ Image | <p>Shinagawa Station (Ridership: approx. 1,100,000 pax/ day)</p>  <p>Shinagawa Station is one of the largest terminal stations in Tokyo and serves as a southern gateway of Tokyo: people can take the Shinkansen (high-speed railway) from Shinagawa and arrive at Haneda Airport in no time at all. The committee, established in 1990, formulated a redevelopment plan of the east side of the station in 1992. The opening of the Shinkansen station in 2003 triggered further business and residential development.</p>   <p>In 2005, 'Ecute Shinagawa' started its operation. Ecute, managed by JR (the railway company), is the brand name of commercial facilities inside the station precincts. This means that passengers can enjoy shopping without going out of the station when they transfer to another train. Until 2011, the area had been enlarged to attract more customers. Now Ecute is located at seven stations in Tokyo.</p> | | |




JR also operates an outside-station commercial facility, named Atré, at 22 stations in Tokyo. Atré Shinagawa, located adjacent to Shinagawa Station, is a four-story supermarket which contains a grocery store, restaurants and cafés, small shops and so on.



On the east side of the station is a redevelopment area where many office buildings are built. Like the station area of Shiodome, these buildings are connected by a pedestrian deck called Skyway, and each building is connected to this deck. The District Plan regulates the wall surface line of buildings, which ensures this connectivity. Also, the pedestrian passage penetrating the station also enhances walkability between both sides of the station.

Example of Station Level TOD (8) Underground Development

| | | | |
|----------------|---|-----------------|--|
| Name | Tenjin underground shopping center | Location | Fukuoka (Japan) |
| Site Area | Approx. 5.3 ha | Business Entity | Tenjin underground shopping center Development Co., Ltd. |
| Project Period | Opened in 1976, renewed in 2015 | Project Cost | Early phase : 16.0 billion yen Newly-built : 21.8 billion yen |
| Project Scheme | Road Occupying Permission + City Planning Decision | | |
| Outline/ Image | <p>In 1958, a construction company suggested the plan of underground shopping mall to mitigate traffic congestion. At the beginning the authority was opposed to the plan because of structural problems and some conflicts with other plans or commercial districts; but finally, in 1973, the prefectural government permitted the development.</p> <p>In 2015, when a new subway started its operation, the mall was extended. Now there are as many as about 150 shops with 200,000 to 300,000 people visiting the mall on a daily basis.</p> <div style="text-align: center;">  </div> <p>Tenjin Underground Shopping Mall is designed in European style, which induces a special atmosphere.</p> | | |

Example of Station Level TOD (9) Management-1

| | | | |
|----------------|--|-----------------|--|
| Name | Shiodome Sio-Site | Location | Tokyo (Japan) |
| Site Area | Approx. 31 ha | Business Entity | Shiodome Development Council |
| Project Period | 1985 Formulation of plan, 2007 Completion | Project Cost | Public facility (roads, etc.) 146.3 billion yen |
| Project Scheme | Land Readjustment Project District Plan under the Enhanced Redevelopment District Plan Area management by council (referring to BID) | | |
| Outline/ Image | <p>Shiodome Station (Ridership: approx. 62,000 pax/ day) Shimbashi Station (Ridership: 950,000 pax/ day)</p> <p>As mentioned above, "Shiodome Siosite" is managed by the council which consists of both public and private sectors. This council mediates between companies which develop in each site and the local authorities which are responsible for infrastructure development.</p> <p>At the time of development, the companies and residents participated in making the District Plan, and even paid a part of initial cost in order to make the area even better. Also, now the companies take charge of physical design and station area management, at the thought of making the station area more comfortable and valuable.</p> | | |

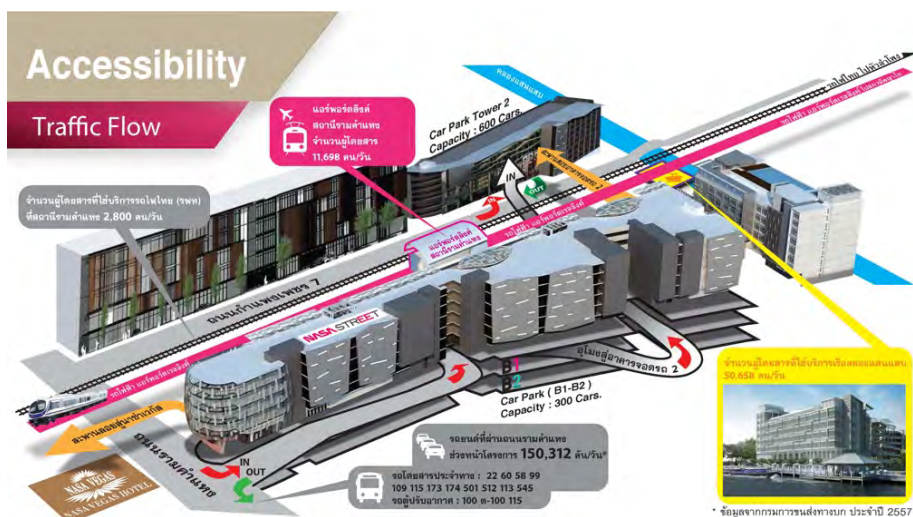
Example of Station Level TOD (9) Management-2

| | | | |
|----------------|---------------------------------|-----------------|------------------------------|
| Name | NASA STREET | Location | Bangkok, Thailand |
| Site Area | Approx. 2.5 ha | Business Entity | A-Link Thonglor Ramkhamhaeng |
| Project Period | 2013 | Project Cost | — |
| Project Scheme | Development by a Sole Developer | | |

Outline/ Image



NASA STREET is a development project at Ramkhamhaeng Station, Airport Rail Link, in Bangkok. The site is adjacent to a railway track. The land is owned by the developer (A-Link) and State Railway of Thailand (SRT), but SRT is renting out its land so that the developer can use the land as a whole. Instead of the lease, the developer takes charge of the management of the site.



The developer constructed not only complex buildings but also a station plaza, parking lots, pedestrian decks and a pier for public transportation. These facilities contribute to the functionality of the station as well as the development. In fact, this is the only station-oriented area development in suburban Bangkok.

The factor that enabled this project is the right to develop in public lands given to a private company that is eager to develop the land into a more valuable space.




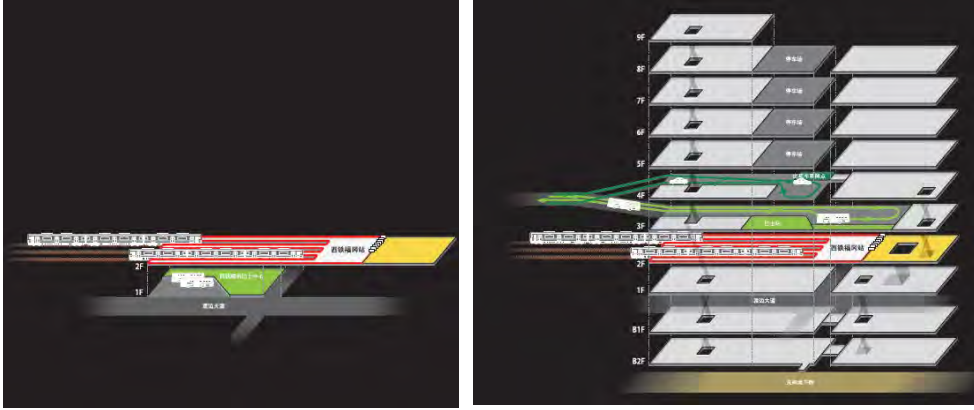
(top left): Part of the station plaza where some street vendors are located. Generally, street vendors in Bangkok are illegal, but here they pay some fee for the permission to use the land. So in this case, they are operating legally.

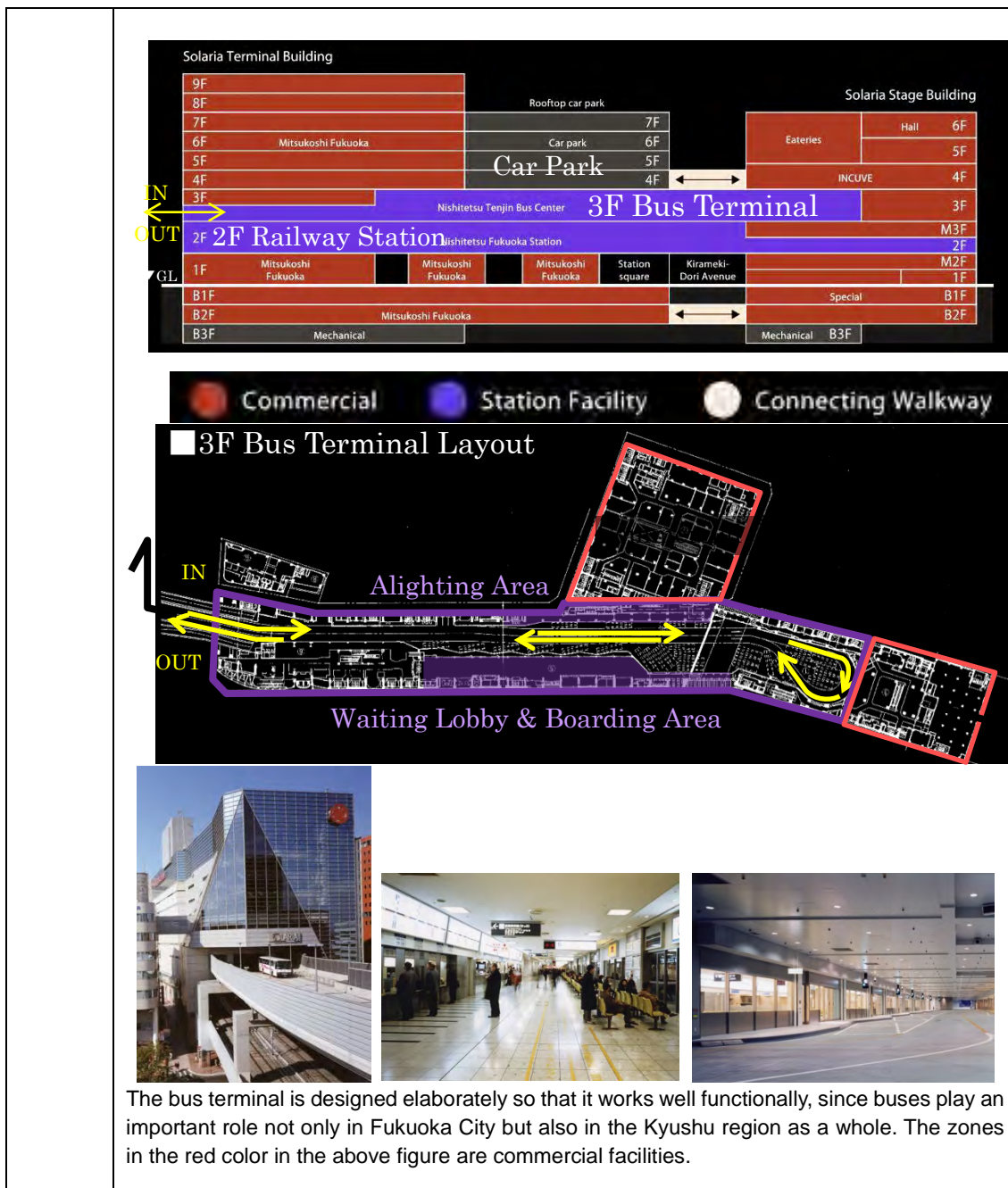
(top right): Part of the station plaza which serves as an intermodal space.

(bottom left): The pier, which is used by public boat transportation (Saen Saep Canal Boat). The facility is much better compared to other piers.


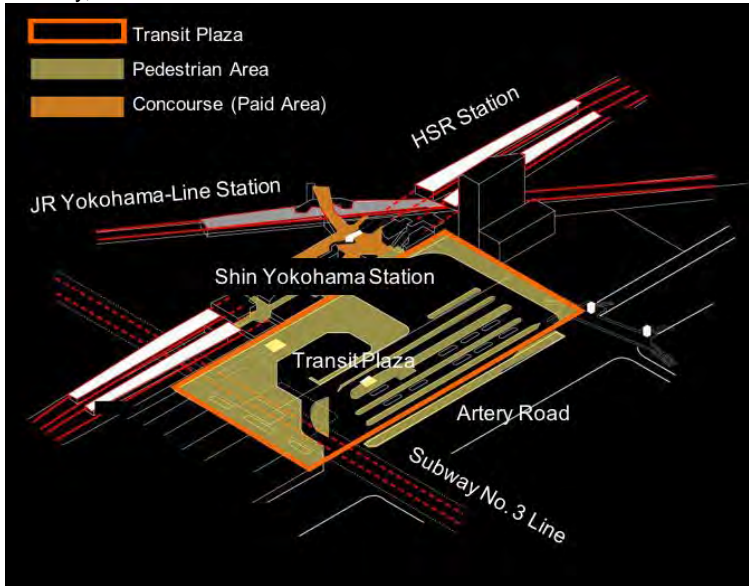
(bottom right): The site right next to the track of SRT. A-Link is planning to renovate the platform.

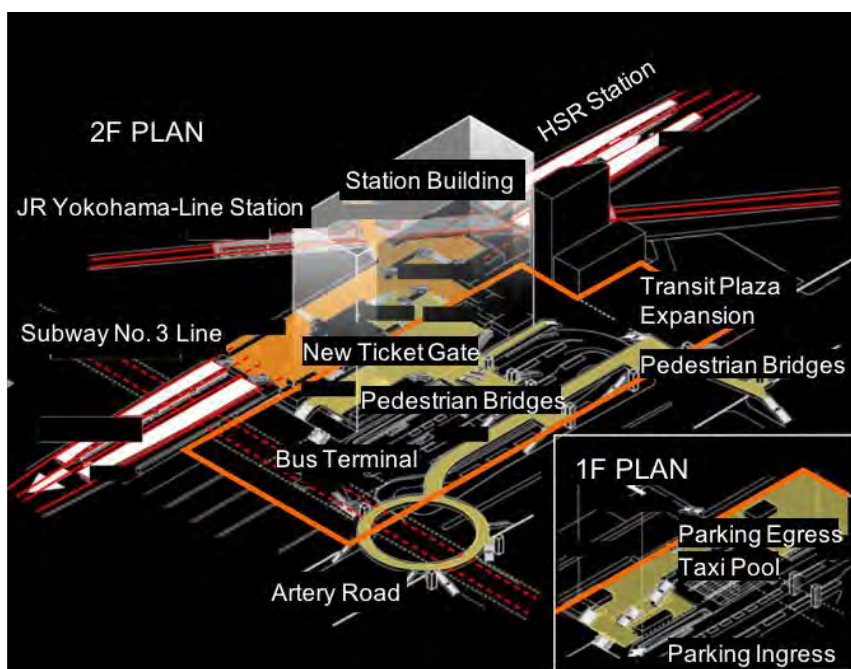
Example of Station Level TOD (10) Integrated Development-1

| | | | |
|-----------------|--|-----------------|---------------------------------|
| Name | Solaria Plaza | Location | Fukuoka (Japan) |
| Site Area | Gross floor area: 6.3 ha | Business Entity | Nishi-Nippon Railroad Co., Ltd. |
| Project Period | 1989 | Project Cost | — |
| Project Scheme | Urban Redevelopment Project | | |
| Outline / Image | <p>Nishitetsu-Fukuoka Station (Ridership: approx. 131,000 pax/ day) Tanjin Station (Ridership: 159,000 pax/ day) Tenjin-Minami Station (Ridership: 48,000 pax/ day)</p>  <p>Solaria Plaza is a complex building located in the center of Fukuoka, the largest city in Kyushu, which contains a train station, a large bus terminal, commercial and cultural facilities and a hotel.</p>  <p>Before 1989, there was only a train station. With a view to utilize the site, the site was redeveloped and the 19-story building was constructed. A new bus terminal was allocated on the 3rd floor, taxi pools on the 4th floor and a parking lot on the 4th to 7th floors.</p> | | |



Example of Station Level TOD (10) Integrated Development-2

| | | | |
|----------------|---|-----------------|---|
| Name | Cubic Plaza Shin-Yokohama | Location | Yokohama (Japan) |
| Site Area | Gross floor area: 9.6 ha (In the entire Shin-Yokohama central building) | Business Entity | Shin-Yokohama Station Development Co.,Ltd. (The subsidiary of JR East Japan) |
| Project Period | 2008 | Project Cost | — |
| Project Scheme | | | |
| Outline/Image | <p>Shin-Yokohama Station (Ridership: approx. 260,000 pax/ day)</p>  <p>Shin-Yokohama is a station of high-speed railway (HSR)/ Shinkansen, ordinary train and subway, where a bus terminal is also attached.</p>  <p>Although there was a transit plaza and some connectivity facilities before the redevelopment, the pedestrian network was not convenient at all. The development potential of the land owned by the railway company was not made best use of.</p> | | |



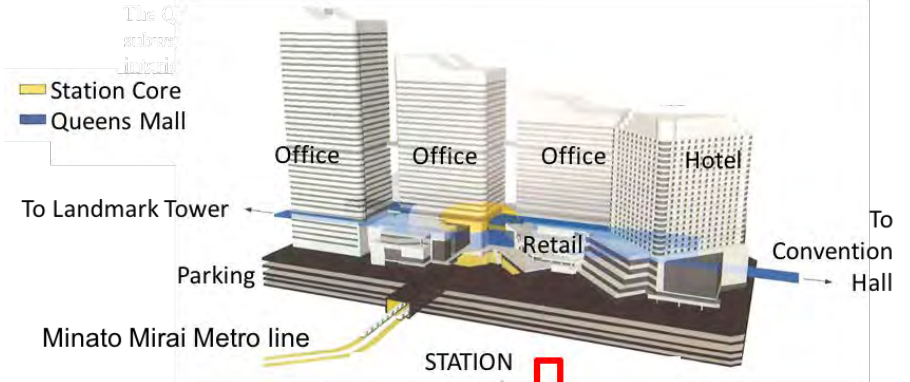



After the redevelopment, the transit plaza was expanded, and a new building was developed above the transit plaza and a part of HSR tracks. Pedestrian connectivity was also enhanced by pedestrian bridges. The building is occupied by commercial facilities, restaurants, offices and a hotel. Parking lots are located underground.



Taxi stands are located on the 1st floor of the building, so passengers can directly take a taxi ride without any exposure to uncomfortable weather.

Example of Station Level TOD (10) Integrated Development-3

| | | | |
|----------------|---|-----------------|----------------------------|
| Name | Queen's Square | Location | Yokohama (Japan) |
| Site Area | Gross floor area: 4.4 ha | Business Entity | Private sector cooperation |
| Project Period | 1997 (station); 2004 | Project Cost | — |
| Project Scheme | | | |
| Outline/ Image | <p>Minatomirai Station (Ridership: approx. 81,000 pax/ day)</p>   <p>Yokohama Queen's Square is located in the bayside area of Yokohama City. There is a subway station on the 3rd basement floor of the commercial building. People inside the building can feel winds blow when a train passes.</p>   <p>The development is composed of several buildings, including offices, commercial facilities and a hotel. At the ground level, a mall (Queen's Mall) connects to this building with surrounding developments, such as the super high-rise building Landmark Tower and a huge-scale convention and exhibition center.</p> | | |