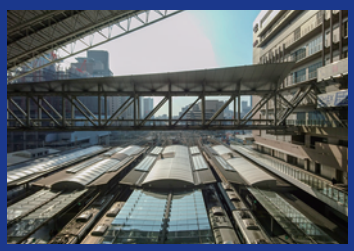
Transit Oriented Development

TOD for Sustainable Urban Development

～Planning and Implementation Approach～



Transit-oriented development(TOD) integrates land use and transportation around transportation hubs and a variety of medium-to high-density land uses, including residential areas. This promotes a walkable built environment and strengthens the linkage between mass transit and other transportation modes, which can result in urban revitalization and suburban area regeneration, reduced reliance on automobiles, and improved overall quality of life (QOL).

1. Overview and History of TOD

Transit-Oriented Development (TOD) is a combination of public transportation and urban development. In 1993, Peter Calthorpe proposed TOD as a new type of station development in suburban areas.

TOD and similar developments began in the early 1900s in England (E. Howard's Garden City) and Japan (Osaka, Umeda to Takarazuka, Tama Den-en-toshi), and have been used in the construction of new towns and the improvement of existing station areas around the world.

2. Initiator to Lead Comprehensive Development Masterplan (CDM) as a Basis of TOD

TOD is appreciated as a solution to metropolitan area issues. A comprehensive development plan should first be formulated, which stipulates policy objectives and framework, planning and programs, organizational and institutional arrangements, and specific measures.

In most cases, the national government takes the lead in formulating CDM in the capital region of each country, while local governments take the lead in other metropolitan areas.

3. Three Metropolitan Visions and Six Keys to TOD Success

Key to TOD Success ❶ Legal and Business Support System

The national government is responsible for enhancing legal and business support systems from the metropolitan area level to the site level in order to solve issues. Following this, local governments need to enact ordinances that establish procedures for the smooth implementation of TOD.

- Metropolitan Level: “Multi-Polar Patterns National Land Formation Promotion Act” and "Act on Special Measures concerning Promotion of Supply of Houses and Housing Lands in Urban Districts" (Tokyo Metropolitan Area); Grand Paris Act (Paris Metropolitan Area).
- Corridor Level: “Act on Special Measures concerning Comprehensive Advancement of Housing Development and Railway Construction in Metropolitan Areas" (Tokyo Metropolitan Area); Crossrail Act (London Metropolitan Area).
- Station Area and Site Level: Utilization of Special Floor-Area Ratio (revision of the City Planning Act and the Building Standards Act), "Act on Special Measures concerning Urban Reconstruction” (Metropolitan Areas in Japan), Land readjustment, Urban redevelopment, Continuous grade separation, and other existing regulations.

Key to TOD Success ❷ Variety of Financing Schemes

One of the obstacles to promote TOD in developing countries is financing. A variety of financing scheme is recommended.

- Land Value Capture (Cross-subsidy from real estate developer to transit operator, tax levied to development beneficiary, tax on land value increase)
- Premium Floor-Area-Ratio (FAR), Revenue from FAR sale. (e.g., Tokyo Station)
- Cost sharing by merging construction with public works (e.g., Shinjuku Station)
- Reduce transit operator’ s initial cost by separating infrastructure and operation (e.g., Japan Railway Construction, Transport and Technology Agency prepares and lends operational facilities)
- Loans from public institutions

Key to TOD Success ❸ Organizational Capability

Cooperation of different stakeholders, including government agencies involved in urban planning, private land developers, and rail and feeder transit operators, is essential for TOD implementation. If there is a lack of know-how or human resources for implementation, it is vital to consider support from others.

- Cooperation between urban transportation and urban development department (creation of organization in charge of TOD; e.g., Himeji Station)
- Request for support from organizations with know-how and expertise (e.g., UR Agency’s support)
- Smooth licensing via TOD One-stop-shop Service
- Industry, academia, government collaboration and TOD promotion activities (e.g., public interest corporations in Japan)

Three Metropolitan Visions Achieved through TOD

【Metropolitan Structure that Solves Social and Environmental Issues】

- Efficient decentralized urban structure through the formation of subcenters that share the functions concentrated in the city centers
- Formation of sustainable compact urban areas that are not dependent on automobiles by improving pedestrian and public transport access

【Economic and Quality-of-Life (QOL) Improvement of Metropolitan Area】

- Stimulation of economic activity through the formation of business centers where is highly convenient, brisk and attractive
- Improvement of the residential environment and easy access to commercial facilities
- Improvement of public transportation convenience and safety, including improvement of the pedestrian environment and increased barrier-free access

【Comfortable Urban Space based on Local History and Culture】

- Station facades and urban spaces rooted in local history and culture and in harmony with the surrounding landscape

Comfortable Urban Space based on Local History and Culture
e.g., Tokyo Station, Kanazawa Station, Himeji Station

＊Triggers to commence TOD (Timeliness-Land-Teamwork)
Timeliness: All aspects are ready to implement TOD, especially related to Key 1 and 2 of TOD success.
Land：Land is secured to implement TOD. Establishing an organization to manage unused public land is also an option (e.g., Japanese National Railways Settlement Corporation)
Teamwork：Stakeholders are united to implement TOD. Especially related to Key 3 of TOD success.

Key to TOD Success ❹ Smooth Transfer with Urban Transit Modes

Smooth transfer between rail and BRT to city bus, taxi, paratransit, and other feeder modes are important to increase passengers' convenience and overall usage.

- Smooth, safe, and fast transfer between rail/BRT and other transportation modes (between station and station area).
- Adequate-sized station plaza, access road, and last-mile pedestrian flow (between station area and surrounding area).

Key to TOD Success ❺ Importance of Non-Rail Business

In a station with large number of passengers, shopping, office, leisure and other non-rail business should be considered to improve business profitability.

- To raise profit, it is important for transit operators to establish non-rail business.
- It is important to make the distinction from regular shopping and office building development. Also important is to put effort in tenant leasing. (e.g., ecute, Gransta (JR East) and Eki Marché (JR West))
- When non-rail businesses are operating smoothly, it will create synergy with increased ridership and farebox revenue.

Key to TOD Success ❻ Understanding of Station Area and Site

It is important to understand the condition of land use, urban development, and mobility at the station area and site level to formulate TOD that matches local characteristics.

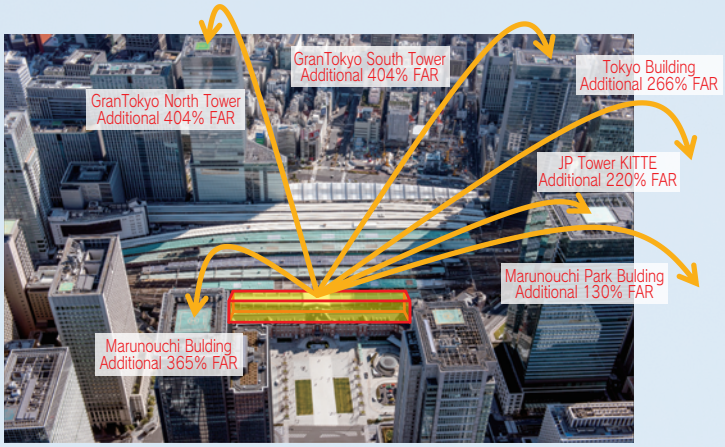
- Importance of station building façade as a city's gate that symbolizes its history, culture and future.
- Number of passengers and rail/BRT modal share in each station can be factors to help understand potential for success. In case of commercial- and business-oriented TOD, (i) more than 200,000 daily passengers can enable large-scale TOD deployment, and (ii) daily passengers between 30,000 and 200,000 can enable partial TOD deployment.
- An integrated regression model which correlates number of passenger with population and density, integrated with data in Japan, Europe, USA, Canada, and Australia, can be used as a Key Performance Indicator (KPI) of TOD from planning to implementation: $\log_{10}$ (passenger of a station) = 0.93456 + 1.15969 x $\log_{10}$ (population of a municipality) - 0.66575 x $\log_{10}$ (area of a municipality); R^2 = 0.672

4. Case Study of TOD in Japan

Key to TOD Success ❶ Legal and Business Support Systems

[Tokyo Station] Special Floor-Area Ratio system and sale of unused air right

Government did legal revision that allowed JR East to sell unused air rights to finance restoration of the historical station building.



(Source: JICA Study Team based on photo by JR East Design Corporation)

Key to TOD Success ❷ Variety of Financing Schemes

[Shinjuku Station] Improvement of transit terminal and new station entrance

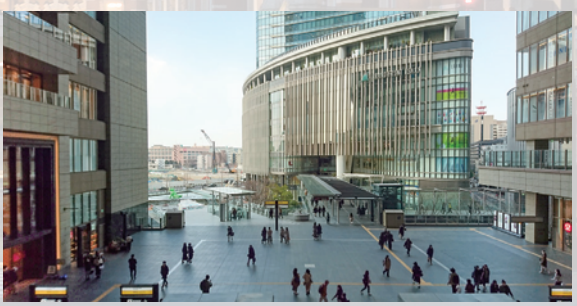
By merging construction and cost sharing with the road project, an artificial floor was constructed over the rail tracks; and bus and taxi terminals, station expansion, and commercial building development were integrated into the project. The construction of the artificial floor allows for increased FAR.

(Photo: JR East Design Corporation)

Key to TOD Success ❸ Organizational Capability

[Osaka Station] Development of former freight yard

Osaka City commissioned the experienced Urban Renaissance Agency (UR) to develop the infrastructure and other aspects of the former JNR freight yard (Umekita District) in accordance with its development concept of enhancing international competitiveness. After its completion, an organization was established to operate and manage the asset.



Metropolitan Structure that Solves Social and Environmental Issues

In the 1980s, Tsukuba Science Makuhari New Urban Center, M developed along with the connec relieve congestion in the Tokyo are

From Makuhari New Urban C Tokyo in 30 minutes, and was infrastructure and operation. Now

(Photo: JR East De

Economic and Quality-of-Life Improvementof Metropolita

Redevelopment of the aged east cemeteries to the suburbs, renova developed the East-West Passageway

(Photo: JR East De

Comfortable Urban Space on Local History and Cu

*A pedestrian-vehicle coexistence road where private vehicles are prohibited and only buses, taxis, and other public transportation and emergency vehicles are allowed to pass.

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[Makuhari New Urban Center]

City, Saitama New Urban Center, inato Mirai 21, and others were ting railways to decentralize and ea.
enter, the Keiyo Line can reach built with the aim of separating it is a subcenter of Chiba city.

esign Corporation)

e (QOL) n Area [Sendai Station]

side of Sendai Station, relocated ted and expanded the station, and , among other improvements.

esign Corporation)

Based ulture [Himeji Station]

th the improvement of Himeji Station l track(continuous grade separation ne "Otemae-dori" street connecting stle, a world heritage site, was nto a transit mall* and the sidewalks es were widened.
ion building was also relocated to ate the reconstruction, and the view Castle from the Shinkansen platform ed. In addition, the north and south azas were redeveloped, three ring ounding the station were constructed, el and other commercial/business re built.

Key to TOD Success 4 Smooth Transfer with Urban Transit Modes

[Shibuya Station] Development of pedestrian network

Construction of a multilevel pedestrian network to seamlessly connect Shibuya station, which is located in a valley, with its surroundings.

(Photo: JR East Design Corporation)

[Sakudaira Station]Development of station plaza

Even for a small-scale station, the station plaza is important for transfer between rail and urban transport modes.

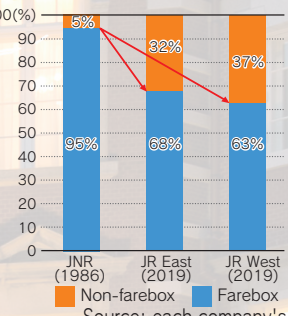
(Photo: townphoto.net)

Key to TOD Success 5 Importance of Non-Rail Business

[Shinagawa Station] Development of commercial/business facilities

Station interior is completely overhauled to make room for an in-station commercial facility (Ekinaka). New station was built in the adjacent stabling yard and commercial/business facilities are under construction. After the privatization of JNR, the ratio of each JR companies' non-rail business revenues continues to rise.

(Photo: JR East Design Corporation)



Source: each company's financial statement

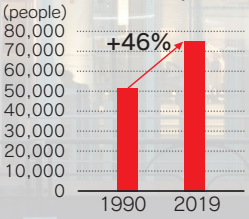
Key to TOD Success 6 Understanding of Station Area and Site

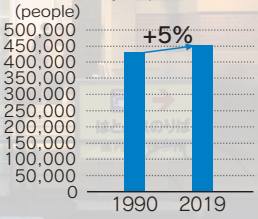
[Kanazawa Station] Station façade that shows locality as a gateway to the city

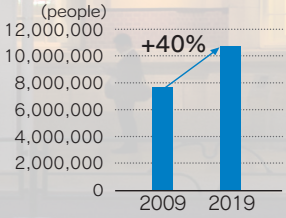
The east and west façades of the station are contrasting. The east exit has historic streetscape with a giant gate to welcome tourists. The west exit is modern and is primarily a gateway for local residents with bus stops and parking area.

East Exit(Tsuzumimon Gate)

West Exit Station Plaza(Photo: Kanazawa City)





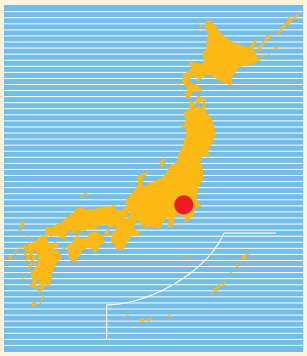


Source: JICA Study Team based on Census and Statistic data

5. Case Study of TOD Implementation in Six Metropolitan Areas

The followings are case studies as a reference to the CDM initiator.

Case 1 Tokyo Metropolitan Area(from 1980s onwards)



Saitama New Urban Center
(Photo: Urban Renaissance Agency)

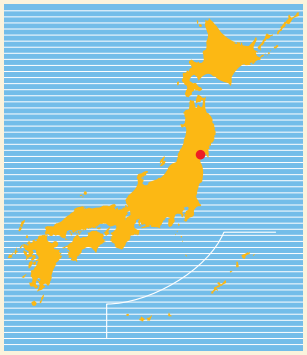
Minato Mirai 21
(Photo: Urban Renaissance Agency)

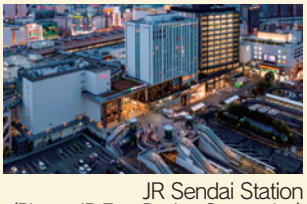
In the 1980s, the Tokyo Metropolitan Area was extremely congested due to its position as the major population and urban center of the region. In response, the Fourth National Capital Region Development plan was formulated to decentralize the Tokyo area and develop suburban cities to relieve the congestion. Additionally, related laws and regulations were introduced, and existing laws and regulations (e.g., the City Planning Act) were revised. TOD was also leveraged by Tsukuba Science City, Saitama New Urban Center, Makuhari New Urban Center, Minato Mirai 21, and others to facilitate the relocation of people and urban functions along new and expanded railway lines.

In the 1990s, the government shifted its policy to make Tokyo more competitive internationally. As a result, TOD policy now focuses on railway operators connecting central Tokyo and surrounding suburban cities.

	Metropolitan Level	Corridor Level	Station Area Level	Site Level
Policy Objective	Realize the multi-polar and decentralized land use by fixing the concentration of population and urban functions in Tokyo.	Strengthen access between Tokyo and suburban core cities and between suburban core cities by road, rail, and others.	Upgrade urban functions, improve living environment, and develop internationally competitive hubs to deal with a declining birthrate and aging population.	
Policy Plan	The Fourth National Capital Region Development Plan (1986): Develop suburban cities, strengthen cooperation, and promote the relocation of population and urban functions from Tokyo to the suburban areas.		Establish the Advisory Council for the Promotion of Urban Renewal (2000).	
Organization	Establish the National Land Agency (1974)		Establish or expand relevant national departments (as needed).	
Framework	Multi-Polar Patterns National Land Formation Promotion Act (1988), Act on Special Measures concerning Comprehensive Advancement of Housing Development and Railway Construction in Metropolitan Areas (1989), and others. Flexible application of Factory Location Law and University Establishment Guidelines, etc.		Amendment of City Planning Act, etc. (Addition of Special Floor-Area-Ratio, City Plan Proposal System, etc.), Act on Special Measures concerning Urban Reconstruction (2002), and others.	
Policy Development	Promote the relocation of government research institutes (86 institutions), universities, and others to the Saitama New Urban Center, Makuhari New Urban Center, Minato Mirai 21, Chiba New Town, Tsukuba Science City, Tachikawa, Hachioji, and others.	Railway: Develop Tsukuba Express, Hokuso Line, Keiyo Line, Yokohama Municipal Subway, etc. Promote through service of different lines, etc. Roads: Develop Tokyo Outer Ring Road and Ken-O Expressway.	Designate Chiba, Tokyo, Yurakucho, Akihabara, Kanda, Shinjuku, Shinagawa, Osaki, Shibuya, Ikebukuro, Yokohama, and Kawasaki Station Area as Special District for Urban Regeneration that promote TOD. Develop new station and urban redevelopment of former rail yard between Shinagawa and Tamachi Station.	

Case 2 Sendai Metropolitan Area(from 1970s onwards)



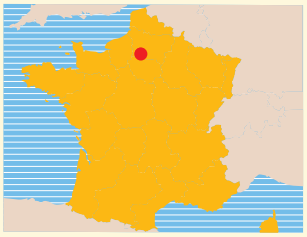


JR Sendai Station
(Photo: JR East Design Corporation)

In line with The Third National Comprehensive Development Plan, the Sendai Metropolitan area has been developed as the economic center of the Tohoku region. TOD components such as commercial and residential area development and the expansion of railway lines were implemented at Sendai Station, along the Airport Access Line, and others.

	Metropolitan Level	Corridor Level	Station Area Level	Site Level
Policy Objective	Ensure its position as the largest economic center in the Tohoku region.	New construction and extension of rail lines and roads to accommodate the expansion of residential areas.	Implementation of urban development as the largest economic center in the Tohoku region. Re-development of the east side of the Sendai station following the post-war land readjustment of the station's west side.	
Policy Plan	Following the "Settlement Concept" proposed in The Third Comprehensive National Development Plan (1977), the goal is to establish a stable living area based on the development of a settlement area while taking into account the role of the Tohoku region. Also, it improved its independence as an integrated area by maintaining connection with Tokyo and revitalizing intra-regional connection.		Began redevelopment of the entire east side of Sendai Station, which was burned down during the war. Began land readjustment projects in the Sendai Station East District (From 1973) and Sendai Station East District 2 (From 1988).	
Organization	Establish the National Land Agency (1974).		Sendai became an ordinance-designated city (1989).	
Framework	IImplementation of Three Northeast Development Laws (1957), The 3rd Comprehensive National Development Plan (1977), Multi-Polar Patterns National Land Formation Promotion Act (1988), Act on Special Measures concerning Urban Reconstruction (2002).		Utilization of existing system (land readjustment, continuous multi-level crossing, etc.), designation of Sendai urban area as Special District for Urban Renaissance (2020), etc.	
Policy Development	Development and extension of the Tohoku Shinkansen line (started in 1982 between Morioka and Omiya). Development of Tohoku Expressway (started from Iwatsuki IC in Saitama, opened to Izumi IC in Sendai in 1975, opened to Aomori IC in 1979).	Rail: relocation, undergrounding, and extension of the Senseki Line west of the station; construction of the subway Namboku Line (opened in 1987), Airport Access Line (opened in 2007), and subway Tozai Line (opened in 2015) Roads: Highways improvement (e.g., East-West North-South Road, etc.).	Land readjustment projects in the Sendai Station area, continuous multi-level crossing projects, etc. Sub-center development in the Izumi-Chuo district, redevelopment of the Nagamachi district, large-scale residential land development along the Airport Access Line, etc. Renovation and expansion of Sendai Station and its surrounding area (development of the East-West Passageway, hotels, etc.).	

Case 3 Paris Metropolitan Area(from 2009 onwards)

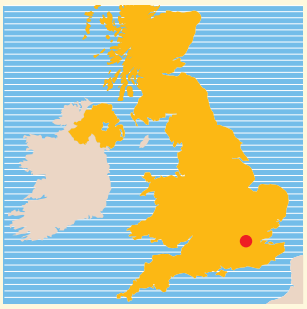


Grand Paris Express Map

The Grand Paris Act of 2010 started the Grand Paris Project, which involves construction of subway networks in the suburbs and redevelopment of the station areas. The aim is to promote sustainable economic growth and to fix the administrative inefficiencies of the separation of city of Paris and its surrounding municipalities.

	Metropolitan Level	Corridor Level	Station Area Level	Site Level
Policy Objective	Compete with the world's largest cities and promote sustainable economic growth. Fix administrative inefficiencies in the capital city, in the City of Paris, and in other municipalities in the metropolitan area.	Reinforce the public transportation system that connects the entire Paris metropolitan area as an integrated region with the city of Paris at its core.	Promote urban (re)development linked to the metropolitan level and the corridor level policy.	
Policy Plan	Establish a public corporation that will effectively lead the project as a higher-level organization of the local government and will also be in charge of redevelopment and subway construction.		Redevelopment along the subway line to improve the impact of subway development.	
Organization	Establish Société du Grand Paris (SGP).		Strengthen organizational capability of administration in each region.	
Framework	Grand Paris Act (2010) and increased lodging and business taxes.			
Policy Development	Tax increase (120 million €/year) to be provided to SGP, the operator.	Subway construction by SGP. Construction below 30m below ground level, where no compensation for subway construction is required.	Dozens of station areas were redeveloped at the same time as the subway construction.	

Case 4 London Metropolitan Area(from 1999 onwards)

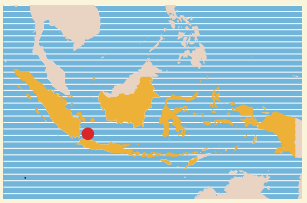


Crossrail Subway Map

Following the formulation of the London Transport Strategy in 2000, Transport for London decided to expand the subway networks in preparation for the 2012 Olympics. The 2016 edition of the London Plan, the City of London's spatial development strategy, outlines strategies for its implementation.

	Metropolitan Level	Corridor Level	Station Area Level	Site Level
Policy Objective	Respond to economic and population growth, strengthen international competitiveness, and address climate change.	Relieve road congestion and increase transportation capacity, reliability, and connectivity of railways, buses, and other public transportation.	Improvement in urban planning, rail station, and bicycle / pedestrian access.	
Policy Plan	London Transport Strategy (2000), The London Plan (spatial development strategy; revised 2016)		Strategic implementation of the objectives above based on The London Plan.	
Organization	Establish Greater London (Greater London Authority, London Assembly, Mayor of London; 1999)		Strengthen organizational capability of administration in each region.	
Framework	Greater London Authority Act (1999)	Congestion Charge (2003), Crossrail Act (2008), Business Rates Supplements Act (2009; used to pay for Crossrail construction)	Utilize existing systems to promote urban planning (e.g., mixed-use development), rail station-related (e.g., improvement of transportation connectivity), and bicycle/pedestrian-related (e.g., development of pedestrian networks).	
Policy Development	Expansion of the subway network, including improved access to airports and London Olympics facilities, etc.	Develop new line development (Crossrail) and extension, transit capacity expansion, and improvements according to the London Transport Strategy.	Other than as stated above, there are station area developments at 5 Crossrail stations (development profits to be used for Crossrail construction).	

Case 5 Jakarta Metropolitan Area (from 2022 onwards)



Sudirman Station

While there has been rapid population movement from Jakarta to the surrounding areas, the road and rail network connecting both has been slow to develop. In the surrounding areas, residential development is progressing without connecting to the existing rail network. There is an urgent need for TOD that coordinates development within the metropolitan area and the public transportation network.

	Metropolitan Level	Corridor Level	Station Area Level	Site Level
Policy Objective	Improve the quality of life and reduce road traffic congestion.	The challenge is to improve the public transportation utilization rate (60% in 2002 ➡ about 10% in 2018).	Various conditions need to be established to facilitate TOD implementation.	
Policy Plan	Update of the Metropolitan Area Transportation Master Plan (conversion to an effective plan) is an issue.	Improve the rail network, increase transportation capacity, and facilitate of transfers.	Strengthening local government's ability to plan and implement TOD is an issue (integration of TOD systems of various ministries).	
Organization	Improve cooperation between urban development and urban transportation.	Strengthen the organizational capacity of railroad operators and operators.	Strengthening collaboration among ministries and departments in charge of TOD is an issue.	
Framework	Need to establish a national-level model project to support coordinated planning and project development by urban development and urban transportation and a new system to support project financing.		Need to establish organizations to support TOD development. Enhancement of legal system (e.g., legalization of land readjustment outline, application to existing urban areas).	
Policy Development	Collaborative organizations are key to TOD implementation. Need to strengthen cooperation between public and private sectors.			

Case 6 Bangkok Metropolitan Area(from 2000 onwards)

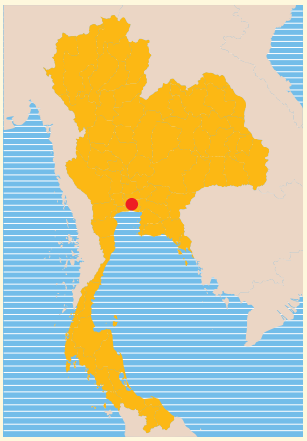
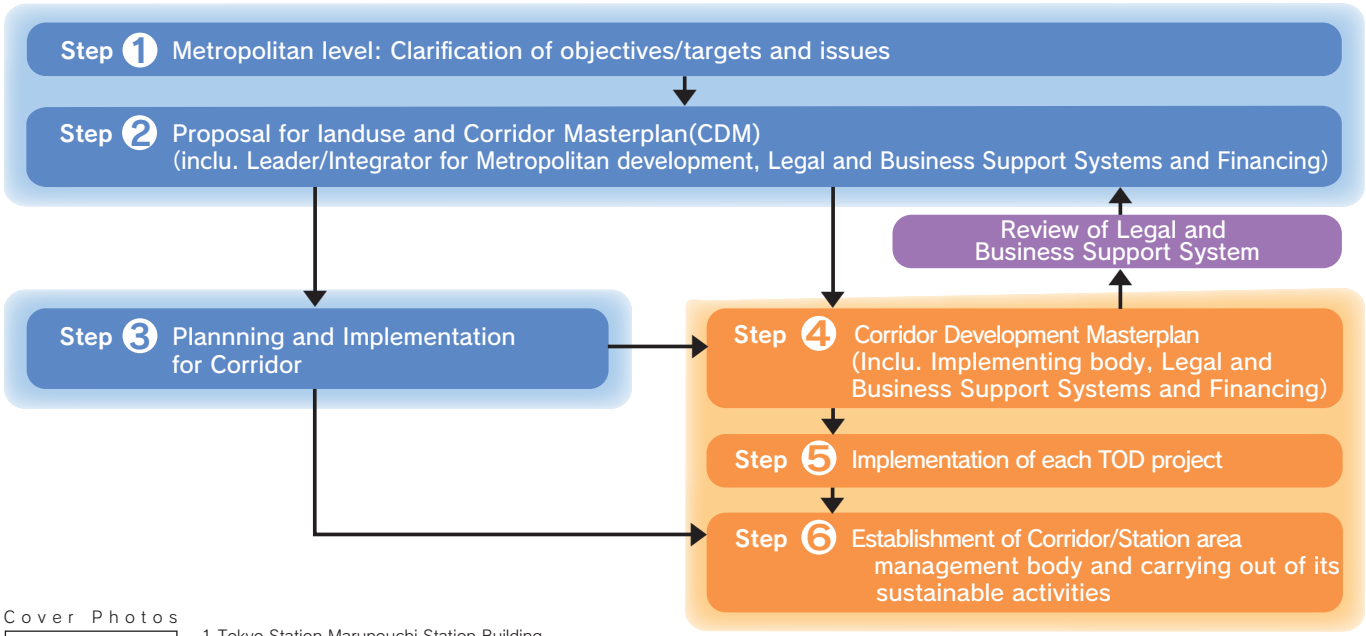


Image of Bang Sue District Development
(Source: JICA report)

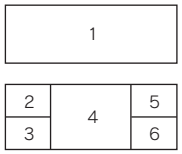
Population and urban functions are increasingly concentrated in Bangkok's built-up area. The Bangkok Central Station in Hua Lamphong is congested all day, while slowly deteriorating and losing its functionality. In response, the Thai government has decided to promote the development of smart cities as well as industrial and technological innovation under its "Thailand 4.0" policy. As the first step, the Ministry of Transportation and the State Railways of Thailand built a new central station in the Bang Sue district with multiple train lines arriving and departing, and is currently developing the station area (372 ha).

	Metropolitan Level	Corridor Level	Station Area Level	Site Level
Policy Objective	Solution to the population and urban functions concentration in the Bangkok's built-up area.	Starting with the connection of the Blue Line (Hua Lamphong to Bang Sue) in 2004, several lines will be consolidated at Bang Sue, making it the new central station of Bangkok.	The station area will be developed as a smart city (372 ha), aiming to create a diverse city with business, shopping, residential, cultural and tourist facilities to become the hub of Bangkok as an international city.	
Policy Plan	Implement Thailand 4.0, which will accelerate the digitalization of the economy and society. Break out of the "middle-income trap" and become a developed country in 20 years.		Introduce advanced technology and ICT in smart cities to avoid concerns about future urban problems.	
Organization	National Digital Economy Commission (chaired by the Prime Minister; Members include experts) Smart Cities Commission (chaired by the Deputy Minister of Transportation)		Organizational development for smart city implementation in Bang Sue.	
Framework	Seven smart criteria were established. Working groups were established for each standard, with the Office of Transportation Policy and Planning (OTP) as the secretariat.		Because is it the first time, technical assistance from Japan's JICA and UR are requested.	
Policy Development	To avoid risks associated with operation and maintenance, the private sector, which is the contractor, assumes the risk. Fares are determined by the government's upper and lower limits, and contractor operates within the limits.	Railway: Development and connection of BTS Line, Purple Line, Red Line, Yellow Line, and Airport Link line. Utilize Japanese government loans and others for the development.	The project is implemented in three phases of 5 years each: short, medium, and long term. The project is planned to be completed by 2032 and will be financed by Japanese government loans and others.	

6. Steps to Achieve TOD



Cover Photos



1.Tokyo Station Marunouchi Station Building
(Photo: JR East Design Corporation)
2.Tokyo Marunouchi Station Plaza
3.View of Osaka Station's Platform from North-South Bridge
4.Tokyo Station Yaesu Exit at Dusk
5.View of Himeji Castle from Himeji Station Building
6.Shopping Center at Yokohama Station Building
※ Photos without credit are provided by Japan International Consultants for Transportation Co., Ltd.

*This material is prepared based on the Study: "Information Collection & Confirmation Study on Planning & Implementation of TOD for Sustainable Cities around the World."
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