JTTRI-AIRO
Japan Transport and Tourism Research Institute
ASEAN-India Regional Office

The 149th Transport Policy Colloquium Bangkok Report
- Startup Series Part 4 -

New Stage of Urban Transportation in Asia

- Current Status and Future Trends on Rail and Bus Linkage Functions in Bangkok -

February 10, 2022

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2. General Situation of Railways and Buses in Bangkok
3. Field Survey on Rail and Bus Linkage Functions
4. Policy Trends Regarding Railways and Other Public Transportation in Thailand
5. Considerations and Suggestions for Future Urban Transportation

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1. Background of Research and Survey

- In Thailand, the development of an urban railway transportation network is steadily progressing in the Bangkok Metropolitan Region centered around Bangkok, the capital city.
- With the expansion of the urban railway network, the number of passengers has also increased, and more than one million people per day used the network before the COVID-19 pandemic broke out, making it a popular means of public transportation supporting the lives of citizens.


1999: Opening of Green Line


2004: Opening of Blue Line

2010: Opening of ARL

2016: Opening of Purple Line

2020: Opening of Gold Line

2021: Opening of Red Line

Under construction: Yellow Line

Under construction: Pink Line

Under construction: Orange Line

(Image source) Nation Thailand

1. Background of Research and Survey

- Although many of the urban railways have been developed by utilizing existing transportation infrastructure land, such as arterial roads and conventional railways, the land readjustment around stations accompanying the development has not progressed correspondingly.
- However, private sector development of areas around stations has advanced, making it difficult to secure land for public use in those areas, while many of the stations have not yet developed transportation hubs with sufficient space to include such things as station squares.

Area around BTS Asok Station

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(Image source) Bangkok Tourism hub

1. Background of Research and Survey

- Some stations have bus rotaries and P&R parking lots, but these are limited to only a few cases, for example suburban stations where vacant lots remain in the vicinity, as well as development projects around Bang Sue Station.

Area around BTS Khu Khot Station

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(Image source) Google Earth

1. Background of Research and Survey

■ In Japan, areas along railway lines have been developed systematically using land readjustment and other methods.

Integrated development of railways and areas along the line

- Tokyu Tama Den-en-toshi
  - ➢ Integrally planned and implemented railway development and land readjustment projects covering 58 districts
- Along Tsukuba Express Line
  - ➢ Based on approval under the Residential Land and Railway Act*, integrally planned and implemented railway development by the third sector and land readjustment projects by public entities (such as UR and local governments along the line)

*Act on Special Measures Concerning Residential Land Development and Railway Development in Large Cities

Development of areas along railway lines after railway development

- Shibuya station central district
  - ➢ Through a land readjustment project and multi-level city planning system, developed the district by extending part of the functions of the station square to station buildings and sites adjacent to the station square
- East district of Shim-Matsudo Station
  - ➢ A land readjustment project utilizing multi-level replotting has been approved, and a station square and access roads are planned to be developed in an area with narrow roads and densely built wooden houses.

Development that integrates urban development and railway construction

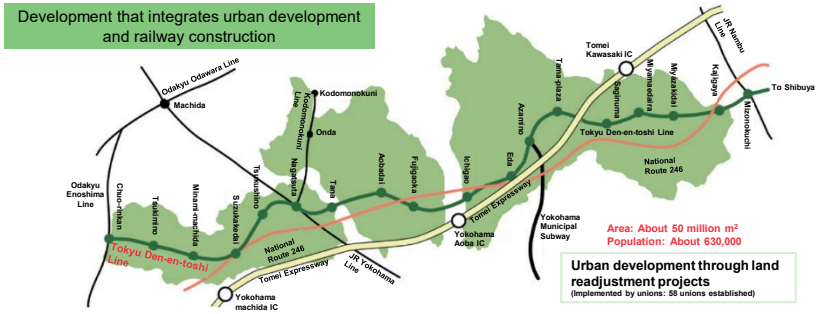
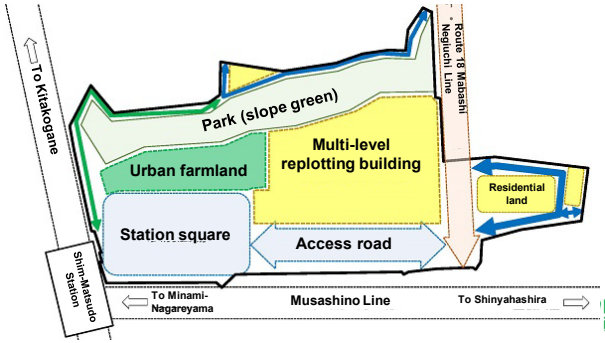


Fig. 1 Tokyu Tama Den-en-toshi



(Image source) le-to-machinami No.81

(Image source) Matsudo City Office website

1. Background of Research and Survey

■ In Thailand, the following issues have been pointed out, and as a result, areas along urban railway lines have not been developed systematically.

Land readjustment projects

- Development of the legal system has been completed with the enactment of the Land Readjustment Act in 2004 and the establishment of ministerial ordinances and regulations in 2012. Although there have been cases of approval in some local regions, there have been no cases of approval in the Bangkok Metropolitan Region.

Low land liquidity

- Previously, land and buildings, other than those used for leasing purposes, were exempted from land and building taxes.
- The tax system was revised in 2020, and land and buildings, including vacant land, are subject to the land and building tax, the taxable amount is reduced by 90% due to the COVID-19 outbreak.
- Inheritance and gift tax rates are much lower than those in Japan (Japan: 10-55%, Thailand: 5-10%)

Development by private enterprises

- Land development by private developers, assuming access by automobiles
- Lack of alignment with transportation plan due to weak land use regulations

Development by public enterprises

- The use of land expropriated for railway business for purposes other than railway business is restricted.

(Source 1) FUKUDA Atsushi "Current Situation of Land Development in the Area along Rail Based Public Transport Systems in Bangkok – Limit and Possibility – "
(Source 2) Tax System | Thailand - Asia – View by Country/Region - JETRO (jetro.go.jp)

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1. Background of Research and Survey

■ Issue Awareness

- What kind of issues have arisen in the situation where the development of transportation hubs such as station squares is not progressing?
- What kind of policy trends can be seen to improve the convenience of the transportation network centered on railways?

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1. Background of Research and Survey

■ In addition to urban railways and buses, which are the main means of public transportation, a variety of other means of transportation is available in Bangkok, and demand type and share-ride type road and water transportation have become widespread depending on the situation in each area.

Road transportation (demand type)

Taxi

Motorcycle taxi

Tuk Tuk

Road transportation (share-ride type)

Songthaew

Si Lo

Water transportation

River Boat

Canal Boat

■ In this report, railways and buses, which have a large number of users and are managed and operated by public entities, are the subjects of the research and survey.

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1. Background of Research and Survey

■ Issue Awareness
- What kind of issues have arisen in the situation where the development of transportation hubs such as station squares is not progressing?
- What kind of policy trends can be seen to improve the convenience of the transportation network centered on railways?

Focus on railways and buses as subjects

■ Contents of this report
- General Situation of Railways and Buses in Bangkok
- Field Survey on Rail and Bus Linkage Functions
- Policy Trends Regarding Railways and Other Public Transportation in Thailand

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2. General Situations of Railways and Buses in Bangkok

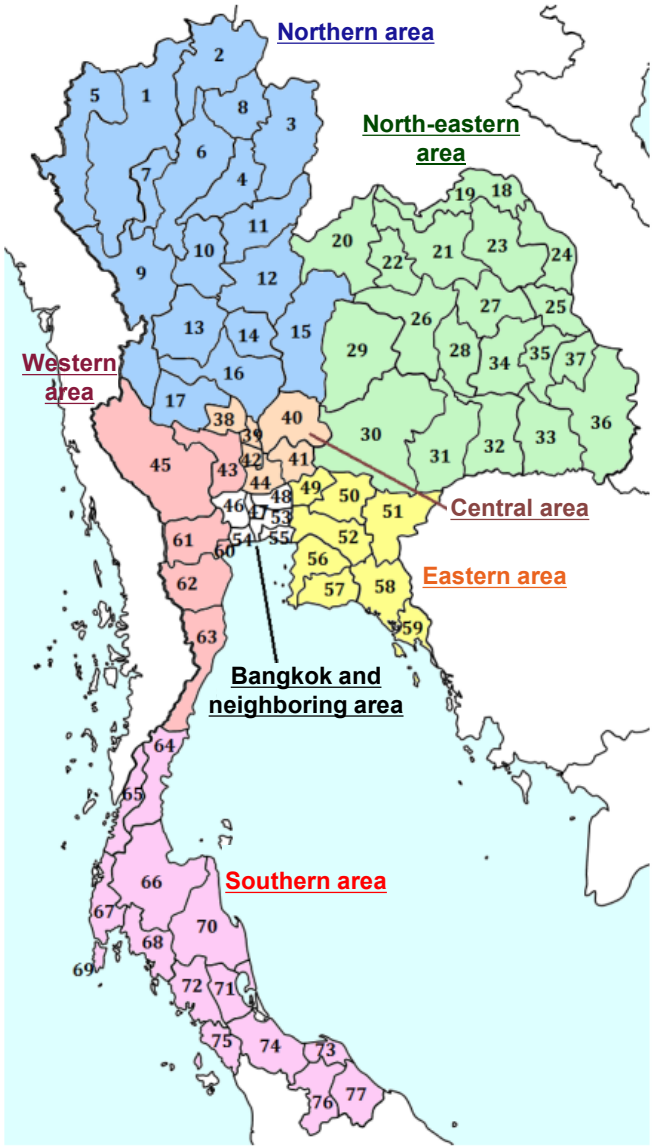
Overview of Bangkok Metropolitan Region

■ Bangkok Metropolitan Region

- Bangkok, the capital, and the five neighboring provinces
  (Nakhon Pathom, Nonthaburi, Pathum Thani, Samut Sakhon, Samut Prakan)
- Area: 1.5% of the nation
- Population: 23.5% of the nation
- Nominal GDP: 46.4% of the nation
- GDP per capita: About 450,000 THB
  (about 1,575,000 yen, at a rate of 3.5 yen per 1 THB)

	Area		Population		Nominal GDP		GDP per capita
	(km²)	(Composition ratio)	(thousand people)	(Composition ratio)	(billion THB)	(Composition ratio)	(THB)
National	513,120	(100.0%)	67,654	(100.0%)	15,452	(100.0%)	228,397
Bangkok Metropolitan Region	**7,762**	**(1.5%)**	**15,931**	**(23.5%)**	**7,167**	**(46.4%)**	**449,878**
Central area	16,593	(3.2%)	3,138	(4.6%)	838	(5.4%)	267,049
Eastern area	36,503	(7.1%)	5,707	(8.4%)	2,857	(18.5%)	500,613
Western area	43,047	(8.4%)	3,598	(5.3%)	539	(3.5%)	149,805
Northern area	169,644	(33.1%)	11,400	(16.9%)	1,183	(7.7%)	103,772
North-eastern area	168,855	(32.9%)	18,619	(27.5%)	1,496	(9.7%)	80,348
Southern area	70,715	(13.8%)	9,261	(13.7%)	1,371	(8.9%)	148,040

(Source) Created based on JBIC "Investment Climate in Thailand/November 2019." Each data is from 2017.



(Source) JBIC "Investment Climate in Thailand/November 2019"

2. General Situations of Railways and Buses in Bangkok

Plan for Railways in Bangkok Metropolitan Region

- Currently, railways in the Bangkok Metropolitan Region are planned and implemented based on the Mass Rapid Transit Master Plan in Bangkok Metropolitan Region (M-MAP) formulated by the Thai government in 2010. The period set for this plan is from 2010 to 2029.
- Plan: Line length 553.41 km, 14 lines, 367 stations
- In operation: Line length 211.94 km, 8 lines, 140 stations

Railway line	Planned line length (km)	Operating line length (km)	Progress
Light Green	71.80	55.80	0.78
Dark Green	14.00	14.00	1.00
Gold	2.80	1.88	0.67
Blue	55.00	47.00	0.85
Purple	46.60	23.00	0.49
ARL	50.50	28.70	0.57
Dark Red	78.90	26.30	0.33
Light Red	55.90	15.26	0.27
Pink	37.50		0
Yellow	33.00		0
Orange	35.90		0
Brown	22.10		0
Gray	39.91		0
Light Blue	9.50		0
Total	553.41	211.94	0.38

(Source) Created based on DRT "โครงข่ายรถไฟฟ้าในเขตกรุงเทพฯ และ ปริมณฑล 14 สายทาง ระยะทาง 553.41 กม. 367 สถานี"

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(Image source) Department of Rail Transport (drt.go.th)

2. General Situations of Railways and Buses in Bangkok

Railway Lines in Operation

■ The management and operation systems of railway lines are not unified, and each line is operated under a different organizational structure.

Common name	BTS	MRT	ARL	SRT	National Railway
Competent administrative entity	Capital Bangkok	Ministry of Transport	Ministry of Transport	Ministry of Transport	Ministry of Transport
Competent state-owned enterprise	-	MRTA	SRT	SRT	SRT
Operating entity	BTSC	BEM	SRTET ⇒CP Group	SRTET	SRT
Line in operation	Light Green Dark Green Gold*	Blue Purple	ARL	Dark Red Light Red	Northern Northeastern Eastern Southern Mae Klong
Line length	71.7km	70.0km	28.7km	41.6km	4,044km
Classification	Mass Rapid Transit	Mass Rapid Transit	Commuter Train	Commuter Train	Conventional line
Vehicle					

* Gold Line is operated by a fully automated unmanned vehicle system.

(Source) Websites and Annual Reports of each entity and enterprise

MRTA : Mass Rapid Transit Authority of Thailand
SRT : State Railway of Thailand
BTSC : Bangkok Mass Transit System Public Co., Ltd.

BEM : Bangkok Expressway and Metro Public Co., Ltd.
SRTET : SRT Electrified Train Co., Ltd.

(Image source) Nation Thailand

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2. General Situations of Railways and Buses in Bangkok

Railway Lines under Construction

Railway line	Yellow	Pink	Orange
Competent administrative entity	Ministry of Transport		
Competent state-owned enterprise	MRTA		
Operating entity	EBM (BTS Group)	NBM (BTS Group)	-
Line length	30.4km	34.5km	22.5km
Number of stations	23 stations	17 stations	17 stations
Classification	Monorail	Monorail	Mass Rapid Transit
Vehicle			-

EBM : Eastern Bangkok Monorail Co., Ltd..

NBM : Northern Bangkok Monorail Co., Ltd.

(Source) MRTA website

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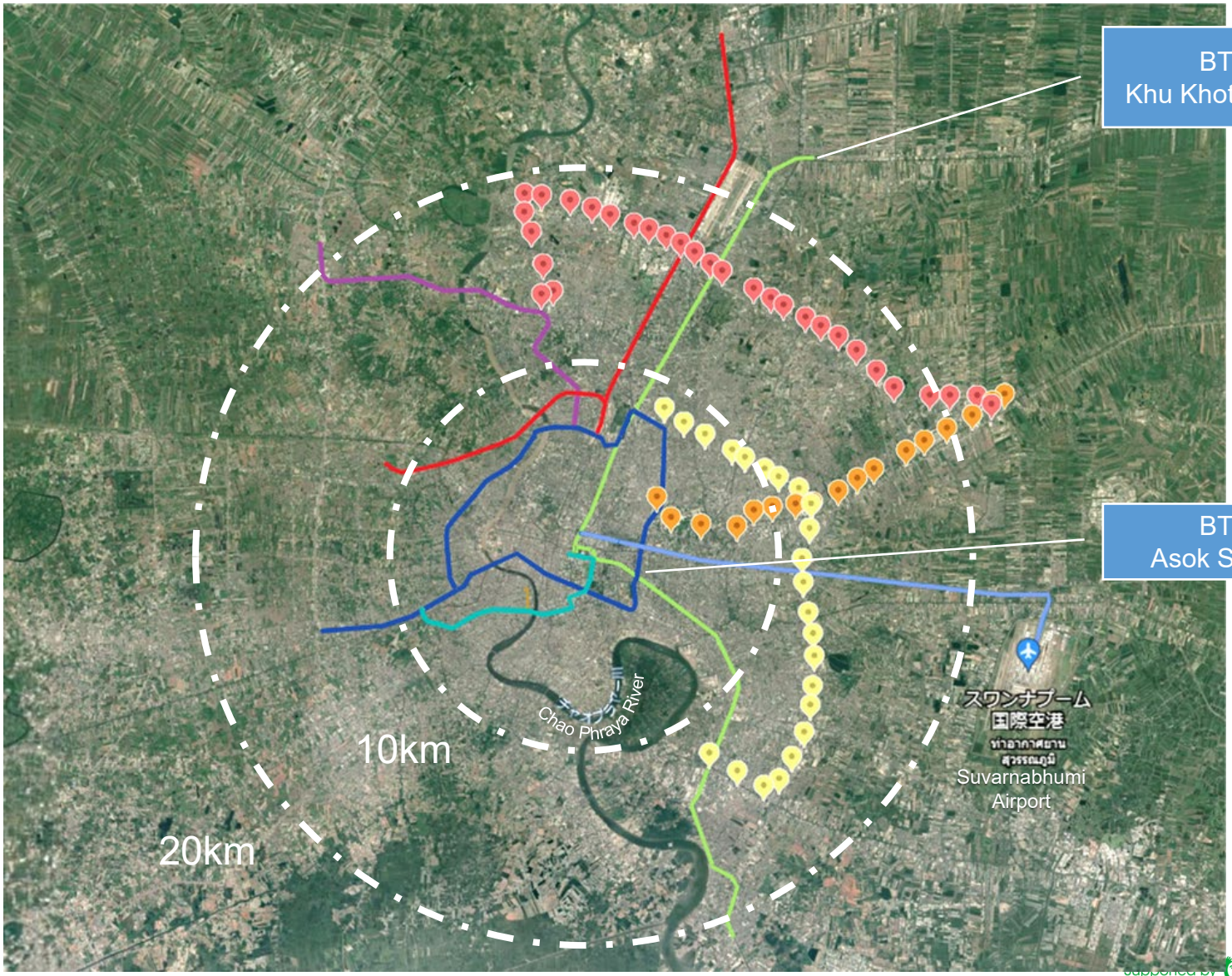
(Image source) Nation Thailand

2. General Situations of Railways and Buses in Bangkok

Railway Lines in Operation and under Construction



(Source) Created using Google Earth

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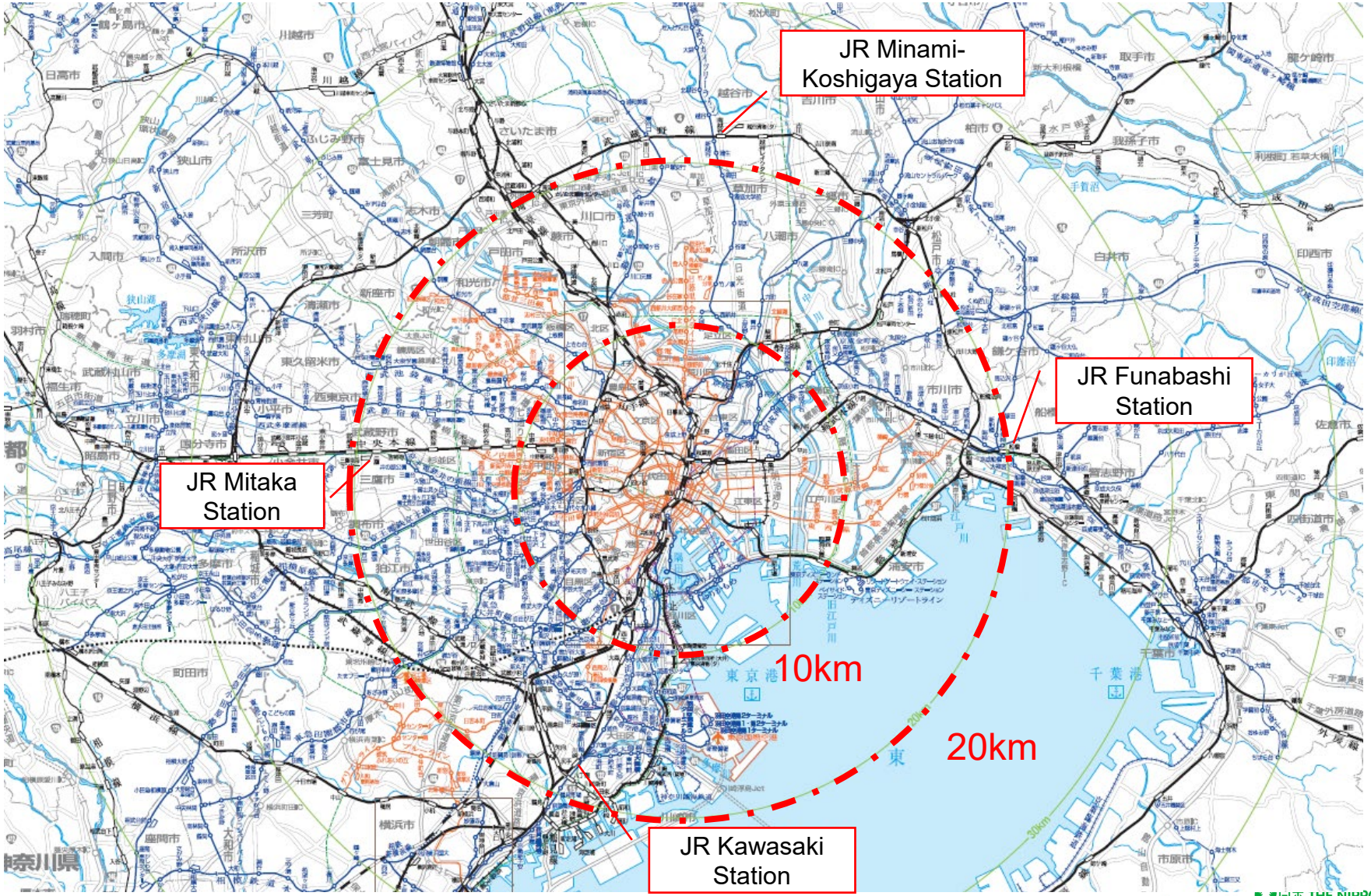
2. General Situations of Railways and Buses in Bangkok

(Reference) Railway Lines in Tokyo Area



(Source) Created based on Japan Railway Construction, Transport and Technology Agency's Tokyo Area Railway Network Diagram

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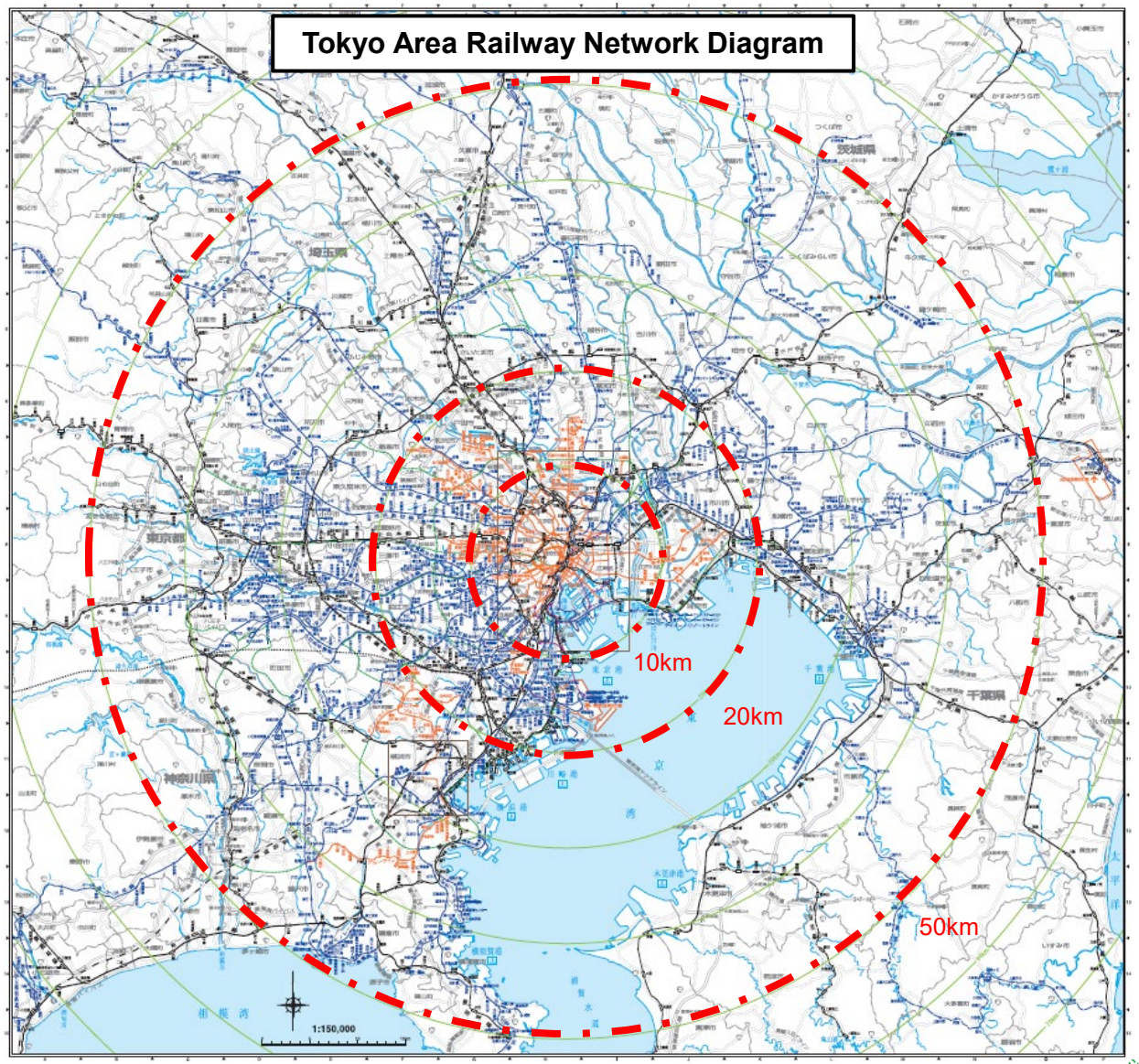
2. General Situations of Railways and Buses in Bangkok

(Reference) Railway Lines in Tokyo Area



(Source) Created based on Japan Railway Construction, Transport and Technology Agency's Tokyo Area Railway Network Diagram

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2. General Situations of Railways and Buses in Bangkok

Issues Related to Urban Railways

■ Regarding urban railways in the Bangkok Metropolitan Region, several survey results have been reported by JICA, and the linkage between railways and other transportation modes has been pointed out as one of the issues.

- Issues related to development along railway lines
  - ➢ In developing countries, cooperation between railway development and development of areas in front of stations and along railway lines is not always sufficient, which hinders convenience of users and does not lead to increase in the number of users.
  - ➢ Factors behind low accessibility to stations include low awareness of the importance of attractive station-front facilities, lack of cooperation with urban development, lack of opportunities for railway operators to be involved in planning and design stages, restrictions related to land, and complexity of landowners.

- Issues related to transportation hubs
  - ➢ The most important thing in the development of areas in front of stations and along railway lines is a transport node. If this node function is not ensured, original functions of railways will be greatly impaired. In developing countries, railway construction is being carried out while it is not clear who is responsible for this function in the railway development.
  - ➢ Due to low linkage between the urban railway network and the bus network, the number of bus users has been decreasing with the development of urban railways, and the urban railway development has not contributed to an increase in the number of public transportation users.
  - ➢ There are places where efforts to develop attractive station-front facilities are insufficient, such as lack of sufficient bus and van stopping lanes and direct access to adjacent stations.

- Other issues
  - ➢ Improvement in accuracy of demand forecasting, transportation capacity, etc.

(Source 1) JICA: Final report of the survey on the way of development that links railway development to urban/regional development (2017)
(Source 2) JICA: Final report of information collection and confirmation survey concerning the revised Mass Rapid Transit Master Plan (M-MAP2) in Bangkok Metropolitan Region, Thailand (2019)

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2. General Situations of Railways and Buses in Bangkok

Overview and Issues of Bus Service

- Bus services in the Bangkok Metropolitan region are operated by Bangkok Mass Transit Authority (BMTA), a state-owned enterprise, or jointly by private enterprises and BMTA.
- BMTA has an accumulated debt of over 120 billion THB, and a rehabilitation plan has been underway since 2018. Measures specified in the plan include strengthening of cooperation between buses and railways.

	BMTA Bus	Private Joint Bus
Number of buses owned	3,005 buses	6,094 buses (including vehicles such as vans)
Number of lines	112 lines	285 lines

As of 2020

BMTA Bus


Private Joint Bus


Public Van

Management issues of BMTA

- Large expenditures including personnel expenses and vehicle maintenance expenses
- Deterioration in the quality of bus service due to road congestion
- Decrease in bus users due to development of railways and other transportation
- According to the government policy, a high level of service is required for the bus service as a public service for middle- and low-income classes. On the other hand, BMTA has been unable to set appropriate fares and reorganize the lines, making its business less profitable.

Main contents of rehabilitation plan

- Reduction of expenses through early retirement of staff and use of buses owned by private enterprises as rental buses
- Strengthening of cooperation with other transportation modes such as railways
- Connection with the railway system through reorganization of bus lines
- Provision of traffic information at nodes using the latest technology.
- Introduction of air-conditioned buses
- New fare system
- Introduction of dedicated bus lanes

(Source) BMTA Annual Report and Rehabilitation Plan、Bangkok Post、Nation Thailand

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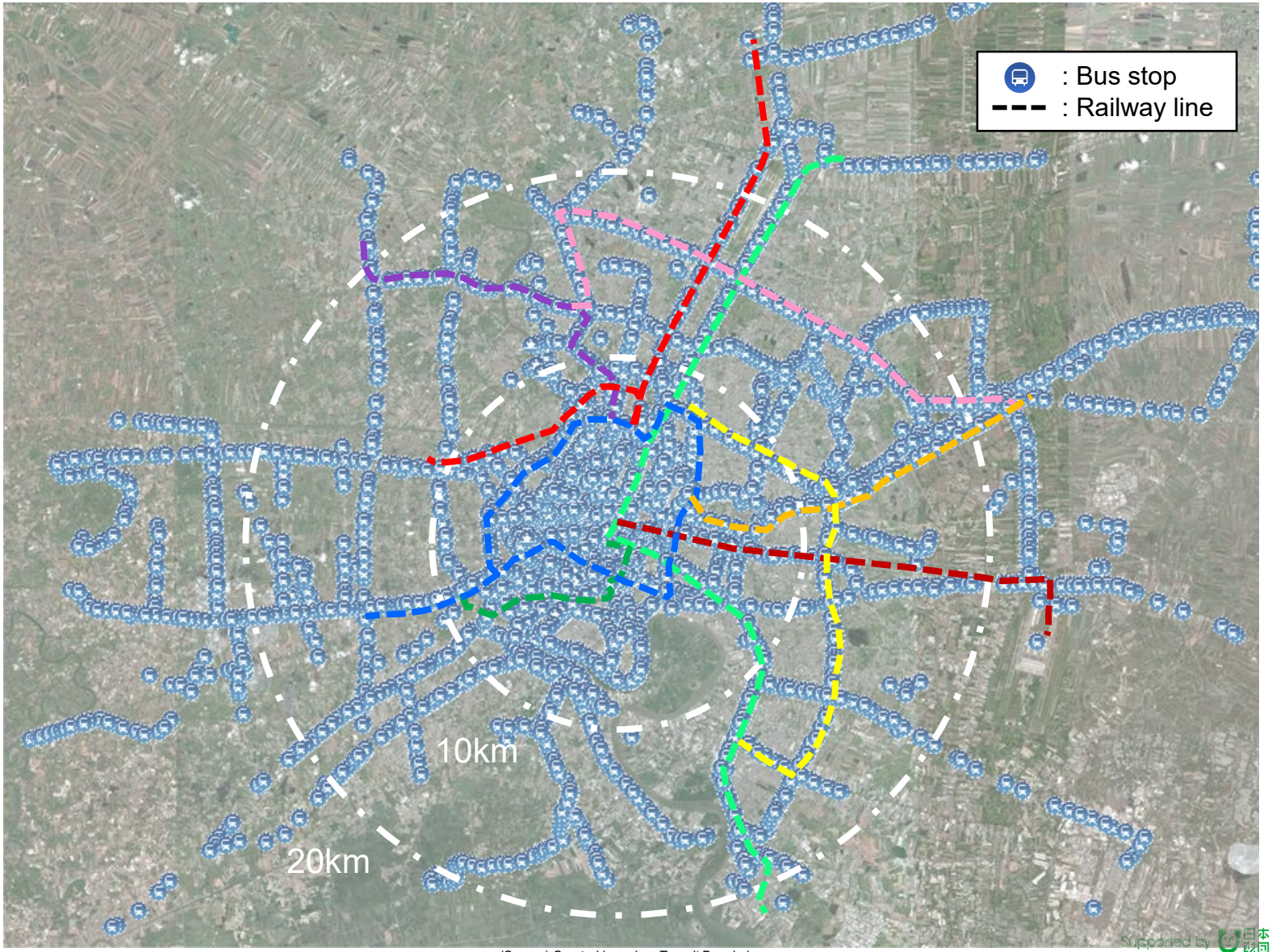
2. General Situations of Railways and Buses in Bangkok

Major Bus and Railway Lines

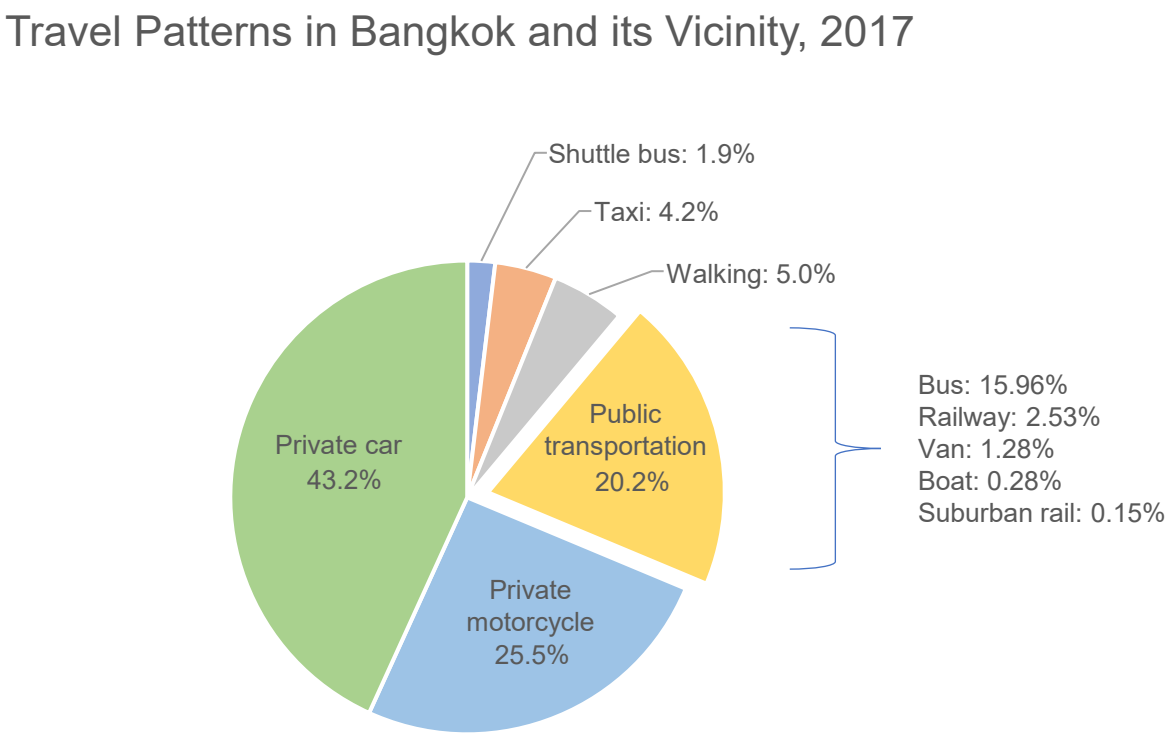


(Source) Created based on Transit Bangkok

2. General Situations of Railways and Buses in Bangkok

Modal Share of Transportation

- In the Bangkok Metropolitan Region, private cars and motorcycles account for about 70% of the modal share of transportation, and public transportation accounts for about 20% (based on a demand forecasting model).



Source: Created based on OTP "การเดินทางของประชาชนกรุงเทพมหานคร จังหวัดปริมณฑล และพื้นที่ต่อเนื่อง"

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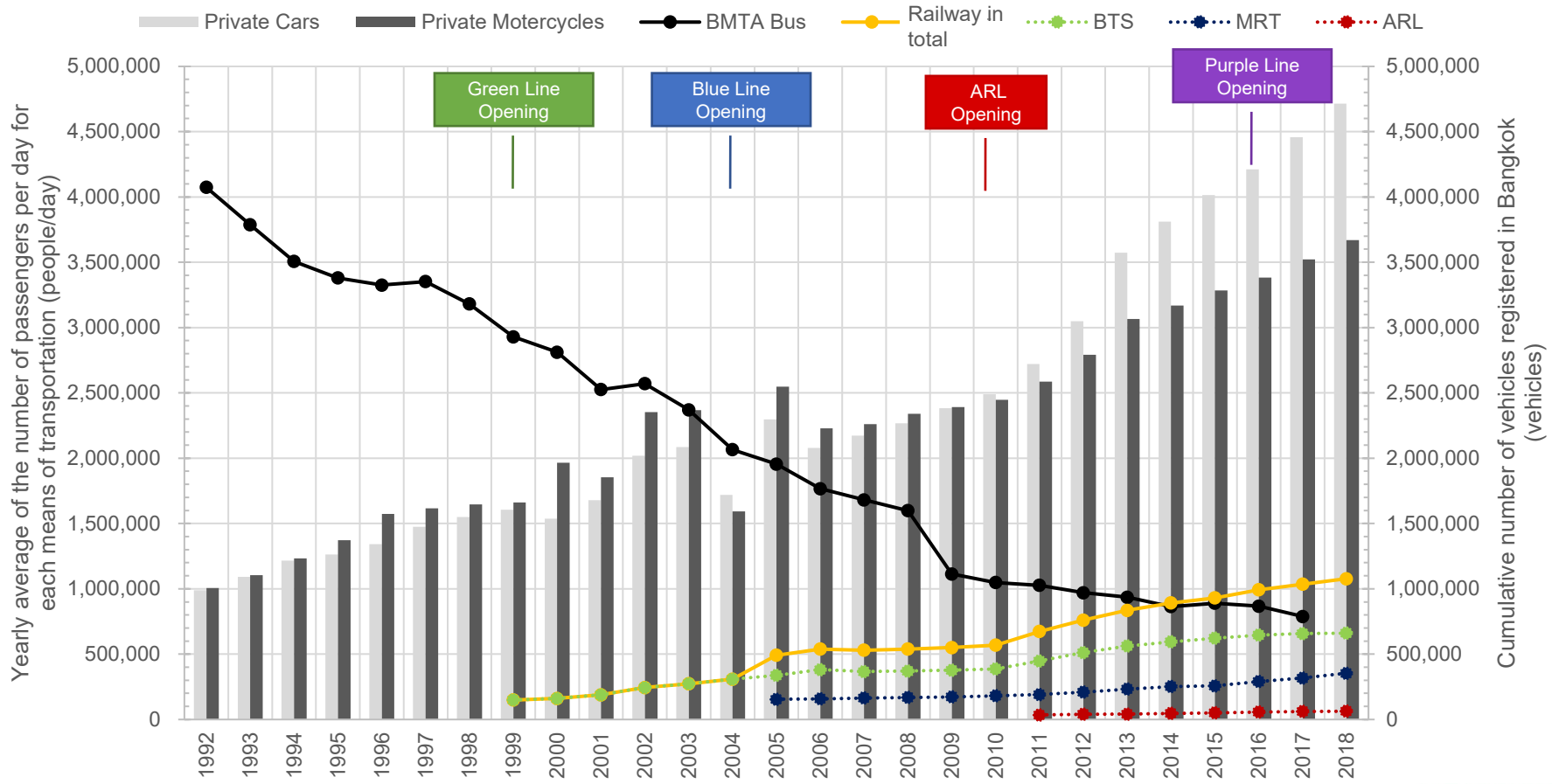
2. General Situations of Railways and Buses in Bangkok

Changes in the Number of Public Transportation Users before COVID-19 Pandemic

- With the spread of private cars and motorcycles, the number of BMTA bus users had been decreasing year by year, falling in 2017 to less than one quarter of the number 25 years previously.
- With the development of railway lines, the number of railway users has been increasing year by year.



(Source) Created based on MRT Annual Report 2019

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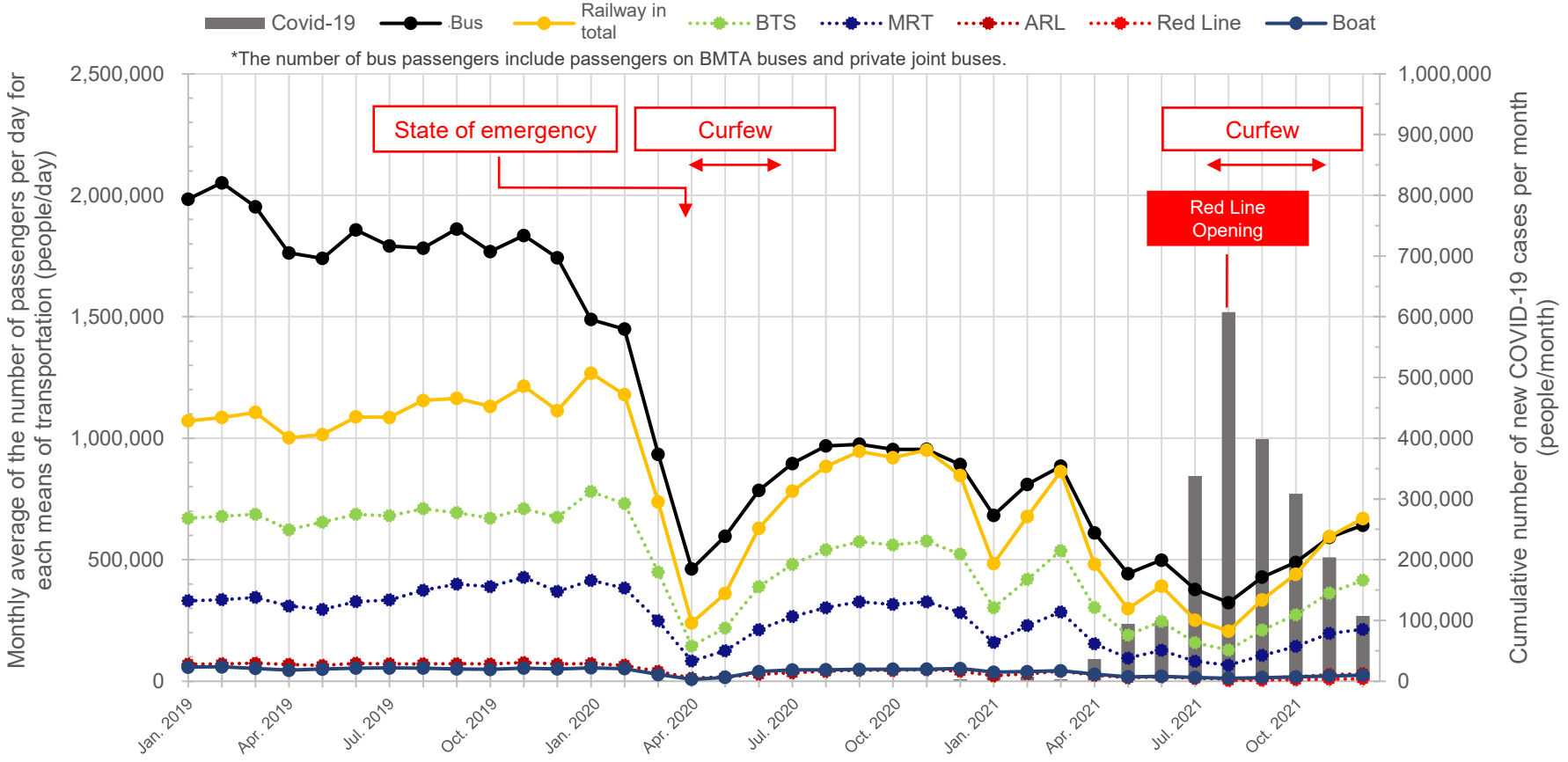
2. General Situations of Railways and Buses in Bangkok
Changes in the Number of Public Transportation Users during COVID-19 Pandemic

■ The overall number of users of public transportation modes has been decreasing due to the spread of COVID-19 and various regulations. In particular, the decrease in the number of bus users is noticeable, with the result that the total number of bus users and the total number of railway users have been broadly similar during the COVID-19 pandemic.



(Source) Created based on MOT Data Catalog. and DDC COVID-19 Interactive Dashboard (moph.go.th)

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2. General Situations of Railways and Buses in Bangkok

Summary and Consideration

■ Railways
- With the expansion of the railway network, the number of railway users has been increasing year by year. Further expansion of the railway network is also expected with the development of the lines currently under construction.
- Areas in front of stations and along railway lines have not been developed systematically, and poor linkage between the railways and other transportation modes has been pointed out.

■ Buses
- With the growing use of private motor vehicles, the number of bus users has decreased significantly.
- BMTA, which has accumulated a large amount of debt, has been taking initiatives based on a rehabilitation plan. As part of the rehabilitation plan, along with the reorganization of the bus lines, strengthening of linkage with other transportation modes including railways has been considered.

■ Impact of COVID-19
- With the outbreak of COVID-19, the overall number of public transportation users decreased sharply, and has fluctuated since then. The decrease in the number of bus users, especially in the period just prior to the pandemic, is more noticeable compared to that of railway users.

A common issue for both railways and buses is poor linkage with other transportation modes. As one of the measures to provide an expanded, sustainable and integrated public transportation service, it is necessary to improve linkage functions between both.

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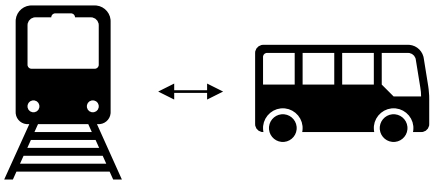
3. Field Survey on Rail and Bus Linkage Functions

Overview of Field Survey

- A field survey was conducted to assess the current situation of the linkage between railways and buses.
- Purposes
  - To identify local issues arising from the lack of transportation hubs.
  - To confirm the local situation regarding railway and bus transfer by reference to previous studies on the evaluation of the convenience of transportation hubs, etc. and using some of the evaluation items as a guide.

- Period: December 2021 to January 2022
- Subjects: 40 railway stations and 111 bus stops in their vicinities
  *Based on the premise of transferring to/from railways or buses, bus stops in the vicinity of railway stations were selected according to the local conditions.
- Survey items: Identification of issues caused by the lack of development of transportation hubs, and the following items:

(1) Distance between railway station and bus stop



(2) Presence of roofs and benches at bus stops

(3) Presence of transfer route information

(Source) Tokyo Metro Navi

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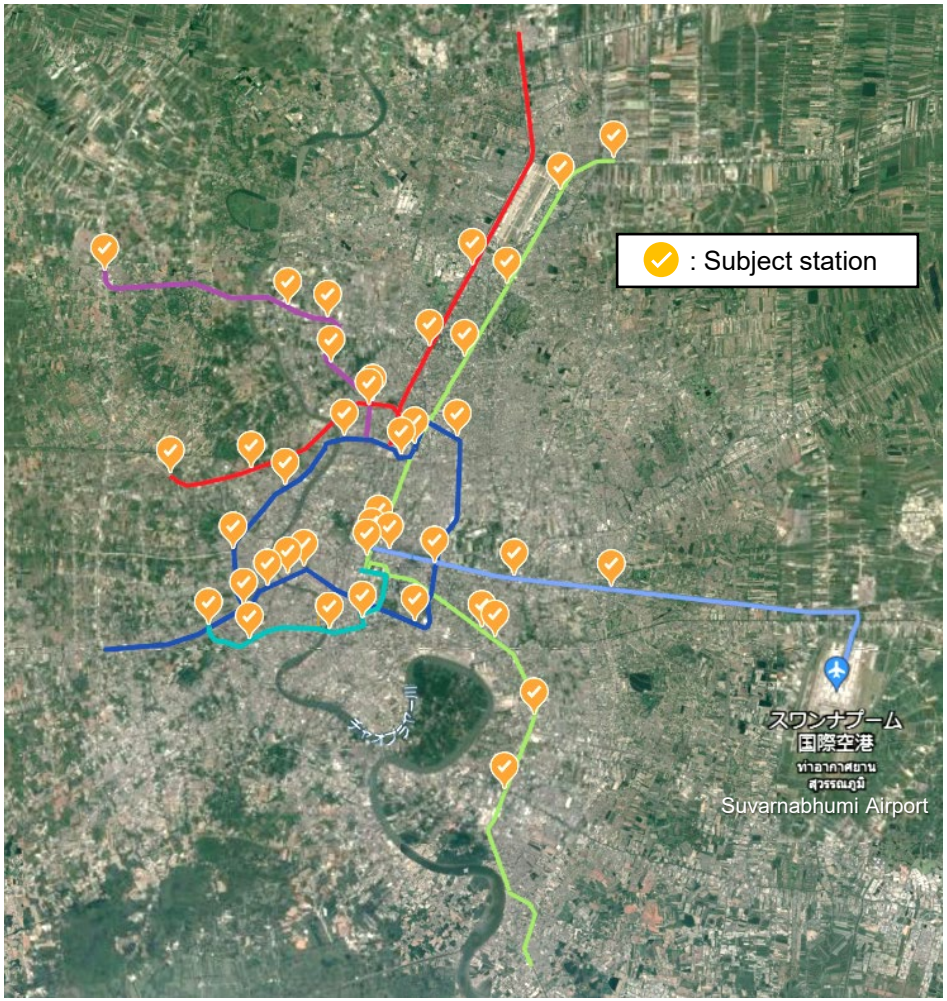
3. Field Survey on Rail and Bus Linkage Functions

Overview of Field Survey

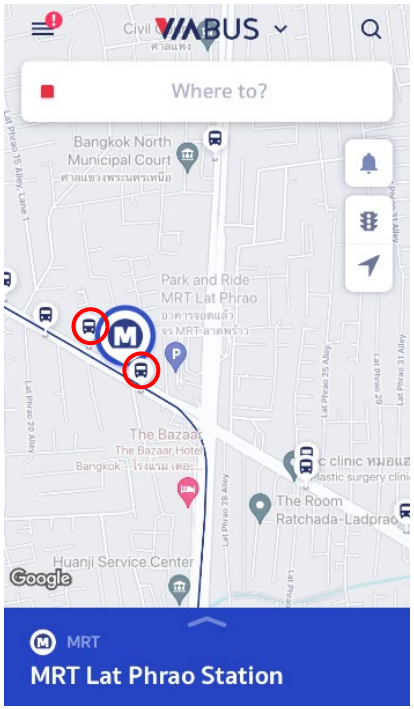
Subject stations

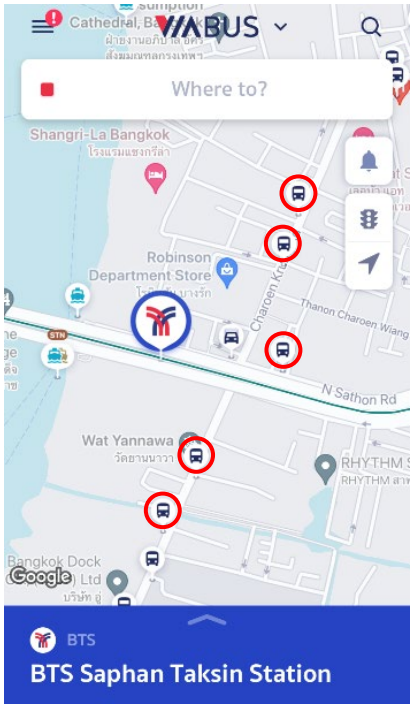


(Source) Created using Google Earth

Examples of subject bus stops

: Subject bus stop





(Source) Created based on ViaBus

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3. Field Survey on Rail and Bus Linkage Functions

Supplement: Previous Studies

- Previous Study (a)
  - TSUKADA Yukihiro, National Institute for Land and Infrastructure Management, et al.
  - Evaluation Method for Convenience of Transportation Hubs Based on Generalized Time (2006)
  - Evaluation items: Time required, mobility form, presence of transfer route information, presence of roofs in waiting spaces, etc.
- Previous Study (b)
  - SUZUKI Takamasa, Railway Technical Research Institute, et al.
  - A Modified Model for Rail-Bus Transfer Convenience Evaluation and Its Application to an Evaluation Tool (2015)
  - Explanatory variables: Walking time on roadway, walking time on sidewalk, time on stairs, time on escalator, bus stop shelters, bus stop seats, etc.
- Previous Study (c)
  - Kasetsart University นางสาวชนนิกานต์ ศักดิ์สิริโกศล, et al.
  - The Capacity of Bangkok Skytrain's Stations in Connecting with the Existing Transportation Systems in Peri – Urban Bangkok(2018年)
  - Distance between railway stations and points where other means of transportation are available, number of station exits, station size, number of stories in station buildings, etc.

■ In this survey, the following items were confirmed to accecc the overall tendency.

(1) Distance between railway station and bus stop

(2) Presence of shelters and seats at bus stops

(3) Presence of transfer route information

(Source) Tokyo Metro Navi

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Supplement: Example of Distance Measurement using Google Earth

- After confirming a route between a station and a bus stop on the spot, measure the distance using Google Earth.
- Set the starting point at the center of a station platform and the end point near the sign board of a bus station.
- Vertical movement by stairs, escalators, elevators, etc. is not included in the distance.

(Source) Created based on Google Earth

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3. Field Survey on Rail and Bus Linkage Functions

Issues as Transportation Hubs

- Ancillary facilities of stations, such as stairs, escalators and elevators, occupy part of surrounding sidewalks, meaning that effective widths of sidewalks cannot be sufficiently maintained.
- Motorcycles are parked on sidewalks because there are not enough parking spaces around the stations.

Occupation of a sidewalk by an ancillary facility of a station

On-street parking on a sidewalk around a station

- Walking environment around the stations is obstructed.

3. Field Survey on Rail and Bus Linkage Functions

Issues as Transportation Hubs

- Bus stops do not have enough waiting spaces for passengers, creating conflict with walking space.
- Even at bus stops with benches, many users stand and wait for buses. This may be attributable not only to the lack of space for users to wait but also to bus usage patterns unique to the local community.

Conflict between a space for users to stay and a walking space

Users waiting for a bus

- Environment of bus waiting spaces is not comfortable.

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3. Field Survey on Rail and Bus Linkage Functions

Issues as Transportation Hubs

- There are few bus stops with stopping lanes, and when there are vehicles parked around a bus stop, passengers may get on and off while the bus is temporarily stopped in an outer lane of a main road surrounding by moving traffic.
- Some bus stops have no lighting. Buses run roughly from 5:00 to 23:00.

Bus stopping temporarily in an inner lane of the roadway

Bus stop with no lighting

- Environment when using buses is not safe and secure.

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3. Field Survey on Rail and Bus Linkage Functions

Issues as Transportation Hubs

- In addition to buses, various means of transportation are concentrated in areas around stations, which users can choose from. Those means of transportation may be more convenient than buses from the viewpoint of transferring to/from trains because they often have boarding points near the station entrances/exits.

Songthaew and motorcycle taxi stand near a station

Songthaew and taxi available near a bus stop

- Competition with various means of transportation concentrated in vicinities of stations

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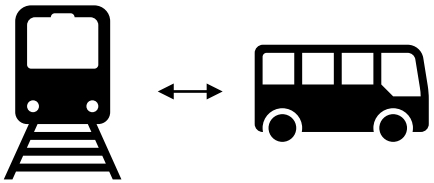
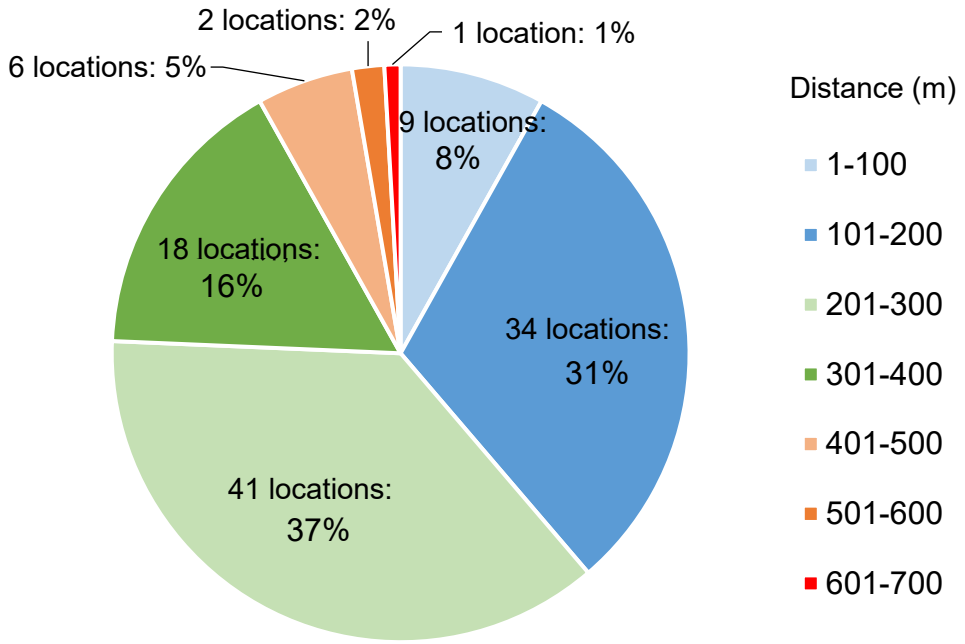
Survey Item (1): Distance Between Railway Station and Bus Stop

(1) Distance between railway station and bus stop



[Criteria for evaluation]
In the Previous Study (c), the following distance categories were used for evaluation.

- 0-200m: High level
- 201-400m: Moderate
- 401-800m: Low level



- Using the evaluation categories of previous studies as criteria, the results of this survey show that about 90% of the routes tend to be categorized into high or moderate level of convenience.
- However, it is inferred that the evaluation must take into consideration not only the travel distances but also the local walking environment and variety of transportation options.

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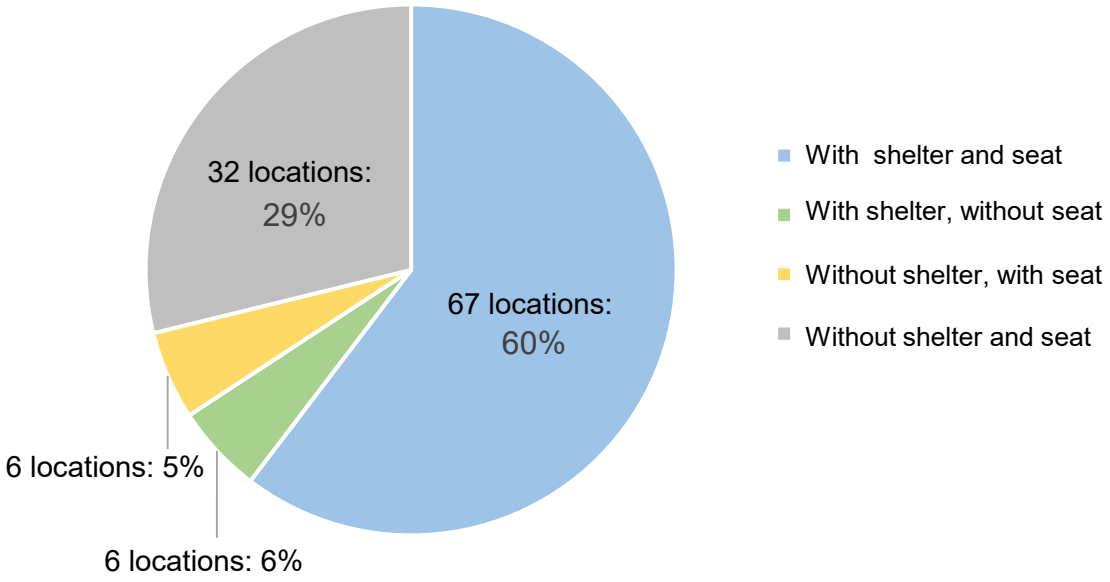
Survey Item (2): Presence of Shelters and Seats at Bus Stops

(2) Presence of shelters and seats at bus stops

[Criteria for evaluation]
In the Previous Study (a), time with psychological burden is considered in the absence of shelters.
In the Previous Study (b), transfer resistance is considered in the absence of and seats.



- Using the evaluation of previous studies as criteria, the results of this survey shows that psychological burden and transfer resistance tend not to have been considered at about 60% of the bus stops.
- However, it is inferred that the evaluation must take into consideration not only the presence of shelters and seats but also the comfort, safety and security of bus waiting spaces.

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Survey Item (3): Presence of Transfer Route Information

(3) Presence of transfer route information

(Source) Tokyo Metro Navi

[Criteria for evaluation]
In the Previous Study (a), lost time due to the lack of transfer route information is considered for purposes other than commuting.

Information on transfer routes from stations to bus stops (Check locations: Inside stations)

Object to be checked	What to check	Yes	No	Total number
Exit information	Presence of route information display to bus stop	1	39	40
Area Map	Presence of bus stop location display	31	9	40

Information on transfer routes from bus stops to stations (Check locations: Near bus stops)

Object to be checked	What to check	Yes	No	Total number
Information display	Presence of route information display to station	0	111	111
Area Map	Presence of Area Map itself	5	106	111

- Except for area maps inside stations, the majority of stations and bus stops tend not to provide information on transfer routes between railways and buses.
- In particular, when transferring from a railway to a bus, the positional relationship between a station and a bus stop differs from station to station. Therefore, it is inferred that the lack of transfer route information has a significant impact.

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Survey Item (3): Presence of Transfer Route Information

Information display of routes from BTS to MRT and boat

Information display of route from BTS to BRT

Information display of route from MRT to SRT

Information display of route from ARL to boat

■ Furthermore, given the fact that information on transfer routes to each transportation mode is provided on exit information displays and area maps at every station where transfer from railway to railway, from railway to boat and from railway to BRT (Bus Rapid Transit) are possible, there is relatively little information on transfer routes between railways and buses.

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Summary and Consideration

- Issues due to the lack of development of transportation hubs
  - Walking environment around the stations is obstructed.
  - Environment of bus waiting spaces is not comfortable.
  - Environment when using buses is not safe and secure.
  - Competition with various means of transportation concentrated in vicinities of stations

- Tendencies related to survey items
  - As for the hardware-related items, such as (1) Distance between railway station and bus stop and (2) Presence of roofs and benches at bus stops, linkage functions do not tend to be rated significantly lower when the evaluation of the previous studies is used as criteria. However, it is believed that the local conditions, such as the walking environment and the environment of bus waiting spaces, have a significant influence on the evaluation of linkage functions.
  - As for the software-related item of (3) Transfer route information, a tendency for less information to be provided has been confirmed, except for cases where information is provided on area maps inside stations. Moreover, it was confirmed that information on transfer routes between railways and buses was relatively limited when compared to other transfer patterns.

This report focuses on linkage functions between railways and buses, but it is necessary to identify issues, evaluate linkage functions and consider countermeasures after broadly taking into consideration various transportation conditions around stations.

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2. General Situation of Railways and Buses in Bangkok
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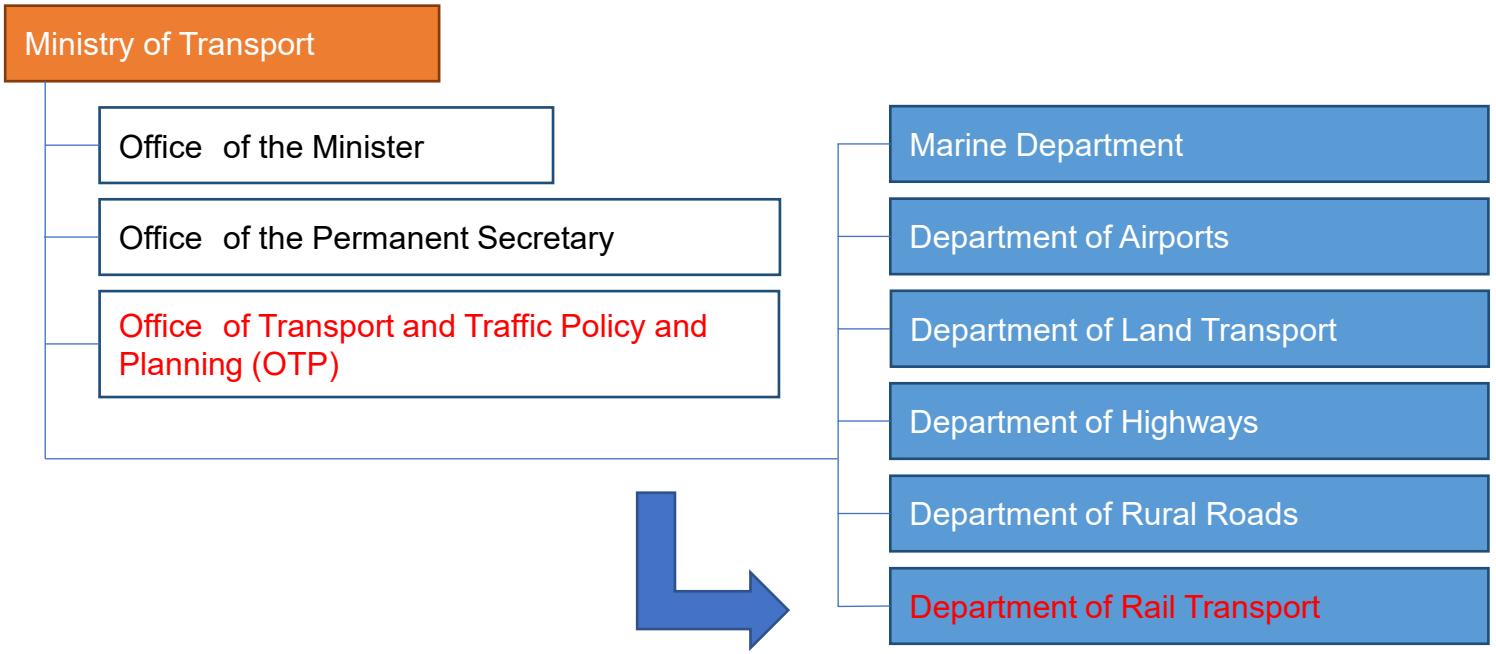
Organizational Structure of Thailand's Ministry of Transport

- In the past, the Thai Ministry of Transport had jurisdiction over policies and plans related to transport including railways, with OTP playing a central role.
- In April 2019, the Department of Rail Transport was established, clarifying the entity responsible for rail administration within the Ministry of Transport. However, the BTS is still under the jurisdiction of the Bangkok Metropolitan Administration.



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(Source) Ministry of Transport (mot.go.th)

Formulation of New Master Plan

- The period for the current Mass Rapid Transit Master Plan (M-MAP) is from 2010 to 2029, and a new Mass Rapid Transit Master Plan (M-MAP2) is currently being formulated under the Thai Department of Rail Transport.
- Based on a request for assistance from the Thai government, JICA has been cooperating with the Thai Government since 2017 by, for example, conducting basic surveys, setting up working groups and providing technical advice.

Main contents of basic survey report (M-MAP2 Blueprint)

- Transportation issues (extracts)
  - Serious traffic congestion
  - Inadequate public transportation network
  - Lack of accessibility between transportation modes
- Policies and measures for urban railway development (extracts)
  - Expansion of transportation capacity of existing urban railway lines
  - Development of railway lines in areas in the city center where convenient railway service is not available
  - Strengthening of multimodal public transportation network in cooperation with bus, river and other transportation modes
  - Strengthening of transportation terminals
  - Enhancement of accessibility to railway stations

Main contents of M-MAP2 formulation work

- Creation of a new railway demand forecasting model
- Formulation of detailed plan for M-MAP2
  - Identify and analyze major issues such as connectivity with stations, routes and other transportation modes, and promotion of integration of urban railways and urban development plans, and consider improvement plans
  - Formulation of new railway line plans
  - Formulation of development plans and policies for new railway lines

Along with the development of railway lines, initiatives are expected to strengthen linkage between railways and other transportation modes.

(Source 1) JICA: Final report of information collection and confirmation survey concerning the revised Mass Rapid Transit Master Plan (M-MAP2) in Bangkok Metropolitan Region, Thailand (2019)
(Source 2) JICA website

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Development of Railway-related Laws and Regulations

- Thailand thus far has no laws or regulations that comprehensively deal with railway matters, and each business entity conducts its railway business based on individual laws, regulations and systems specified for each business entity.
- In July 2021, a draft bill for the Rail Transport Act, which covers the entire railway business, was in principle approved by the Cabinet and is currently under consideration by the Legislative Committee.

(Source) Department of Rail Transport (drt.go.th)

- Main contents of the draft bill for the Rail Transport Act
  - General matters
  1. Policy committee
  2. Railway business plan
  3. Setting of railway system zone and safety zone
  4. Business supervision
  5. Accident investigation
  6. Inspector
  7. Staff
  8. Vehicle registration
  9. Protection of passengers and users
  10. Penal provisions
  - Transitional measures

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Outline of Draft Bill for Rail Transport Act

■ The draft bill includes provisions on the development of real estate and other assets, promotion of TOD, and connection between railways and other transportation modes.

Article 4: Competent Minister

The competent minister shall be the Minister of Transport, and a cabinet order concerning the following matters shall be established.

① Regulations, procedures and conditions pertaining to use of railway facilities and assets necessary for rail transport business
② Regulations, procedures and conditions pertaining to promotion of TOD
③ Regulations, procedures and conditions pertaining to connection between railways and other transportation modes
④ Regulations, procedures and conditions pertaining to development of real estate and other assets that benefit from railway business
⑤ Regulations pertaining to standards for rail transport
⑥ Setting of various charges including fares

Article 9: Responsibility and Authority of Policy Committee

① Approval of the rail transport development plan and proposal to the Cabinet
② Approval of the government agency responsible for implementing rail transport business
③ Proposal to the Cabinet for guidelines pertaining to the development of real estate and other assets that benefit from railway business
④ Proposal to the Cabinet for guidelines pertaining to promotion of TOD
⑤ Proposal to the Cabinet for guidelines pertaining to connection between railways and other transportation modes
⑥ Regulations pertaining to fare ceiling, freight charges, railway facility charges, and other charges
⑦ Establishment of standards and calculation methods for the charges prescribed in the preceding paragraph
⑧ Approval of ministerial ordinances
⑨ Report to the Cabinet of problems and barriers relating to the execution of rail transport business
⑩ Appointment of subcommittees, advisors and working groups

* The Policy Committee is headed by the Prime Minister and composed of ministers, etc. of relevant ministries and agencies.

(Source) Created based on materials from Office of the Council of State

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Outline of Draft Bill for Rail Transport Act

(Continued from the previous page)

Article 13: Responsibilities and Authority of Department of Rail Transport

- Related work as the secretariat of the Committee
- Preparation of the rail transport development plan
- Conduct surveys and analysis on matters including development of real estate and other assets, promotion of TOD and connection between railways and other transportation modes, and propose guidelines to the Policy Committee
- Other general railway administration including preliminary surveys for selection of railway lines, preparation for establishment of rail transport standards, surveys and analysis on fare setting, business evaluation and coordination with domestic and overseas organizations

Article 21: Proposal of Rail Transport Business Without Private Capital
Article 22: Proposal of Rail Transport Business Involving Private Capital

- These articles prescribe items necessary for proposal of rail transport business, and, in each case, items related to development plan of real estate and other assets, TOD plan and connection between railways and other transportation modes are included

(Source) Created based on materials from Office of the Council of State

With the enactment and implementation of this bill, it is expected that unified regulations will be established for the railway business in Thailand, and that a system to improve linkage between railways and other transportation modes will be established.

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Summary and Consideration

■ Establishment of Department of Rail Transport

- In 2019, the Department of Rail Transport was established within the Ministry of Transport, clarifying the entity responsible for rail administration.

■ Formulation of new master plan

- A new master plan is being formulated mainly by the Thai Department of Rail Transport.
- Along with the improvement in accuracy of a demand forecasting model and promotion of integration of urban railways and urban development plans, other improvement measures are being considered, with the main issue being the linkage between railways and other transportation modes.

■ Development of railway-related laws and regulations

- A draft bill that comprehensively governs the handling of railway matters in Thailand was prepared and, in principle, approved by the Cabinet in July 2021, and is currently under consideration by the Legislative Committee.
- The draft as of February 2022 includes not only provisions related to the railway business itself but also provisions related to development of real estate and other assets, promotion of TOD and connection between railways and other transportation modes.

With the development of policy aspects (administrative systems, master plans, legal systems, etc.) related to the railway business, it is expected that efforts will be made to improve not only railways but also the entire transportation network centered on railways.

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5. Consideration and Suggestions for Future Urban Transportation

- In Thailand, while the railway network is expanding, systematic development of areas around stations has not progressed sufficiently, and therefore user-friendly transportation hubs have not yet been developed.
- Also, in other Southeast and South Asian countries, there are many cases where railways are developed under or above road sites with heavy traffic, and it is inferred that these countries have similar issues in terms of linkage functions.

- Railways to be developed in the future
  - For planning and development of railways, it is necessary to consider not only the expansion of the railway network but also the linkage with other transportation modes and the entire transportation network.

- Railways developed so far
  - It is a very difficult task to plan and implement redevelopment of areas around stations while areas along railways constructed in urban areas are being developed by private enterprises.
  - It is necessary to consider appropriate measures for redevelopment of areas around existing stations by evaluating local situations and issues and utilizing various systems.
  - In terms of software, improvement is expected to be made through measures such as enhancement of transfer route information.
  - In terms of tangible changes, improvement is expected to be made by devising measures such as transportation hubs that utilize space three-dimensionally, for example, expanding concourses of elevated stations, passenger waiting areas and skywalks (pedestrian decks).

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5. Consideration and Suggestions for Future Urban Transportation

■ In the past, Japan also set forth policies for promotion of seamless linkage between railways and other transportation modes and smooth transfer in the Council for Transport Policy Report No.18 (2000) and the General Principles of Universal Design Policy (2005). It is expected that examples of initiatives in Japan based on these policies will serve as a reference for solving the local issues in Thailand

Council for Transport Policy Report No.18

(1) Promotion of barrier-free and seamless transportation service

In addition, in order to facilitate transfer not only between railways but also between railways and buses, taxis, private cars, etc., measures on the software side, such as promotion of an integrated ticketing system common to railways and buses and provision of transfer information, shall be taken along with measures on the hardware side, such as reduction in transfer distances between railway stations and bus stations and development of parking lots for park and ride.

General Principles of Universal Design Policy

6 Realization of public transportation that all people can use safely and smoothly

- ○ Promotion of smooth transfer between public transportation modes in areas around transportation hubs
- ○ In order to comprehensively promote measures based on the concept of universal design, measures to facilitate the use of public transportation shall be promoted in cooperation with related projects so that people can move freely and safely at transportation hubs.

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