

Thailand

Office of Transport and Traffic Policy and Planning (OTP)

State Railway of Thailand (SRT)

**Data Collection Survey on Urban
Redevelopment in Bang Sue Area
in the Kingdom of Thailand**

Final Report

November 2017

Japan International Cooperation Agency (JICA)

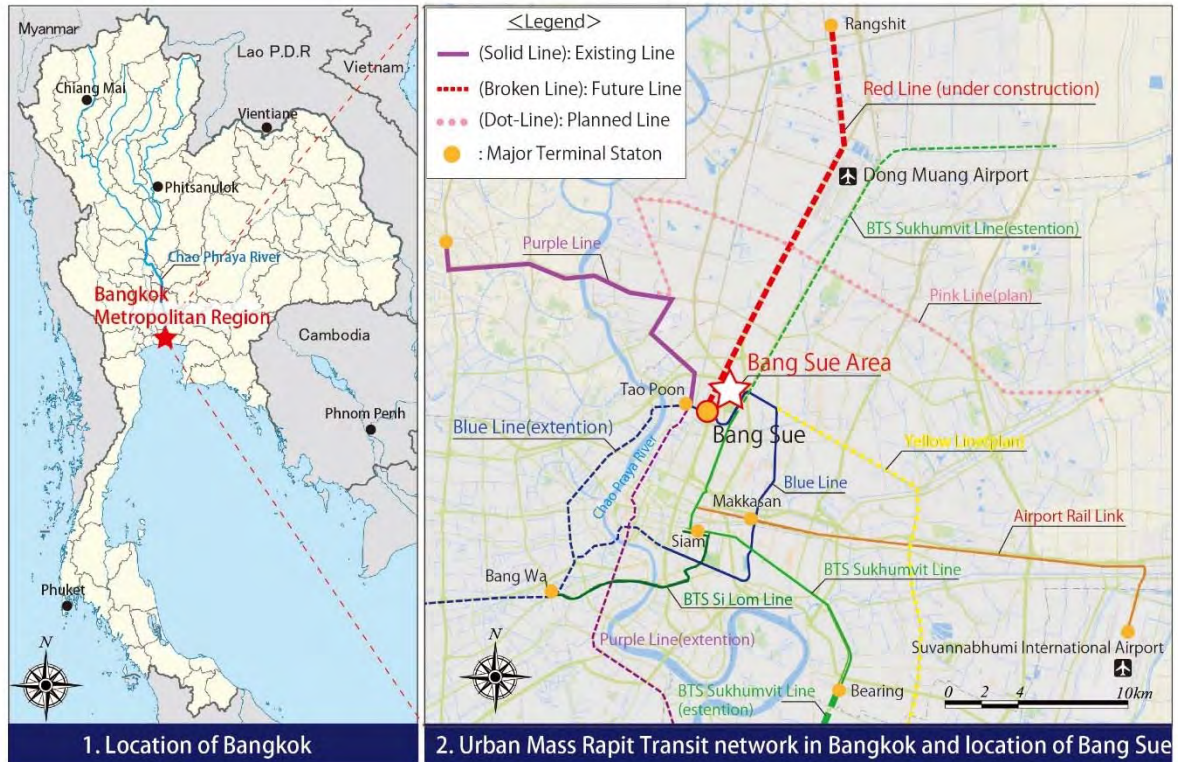
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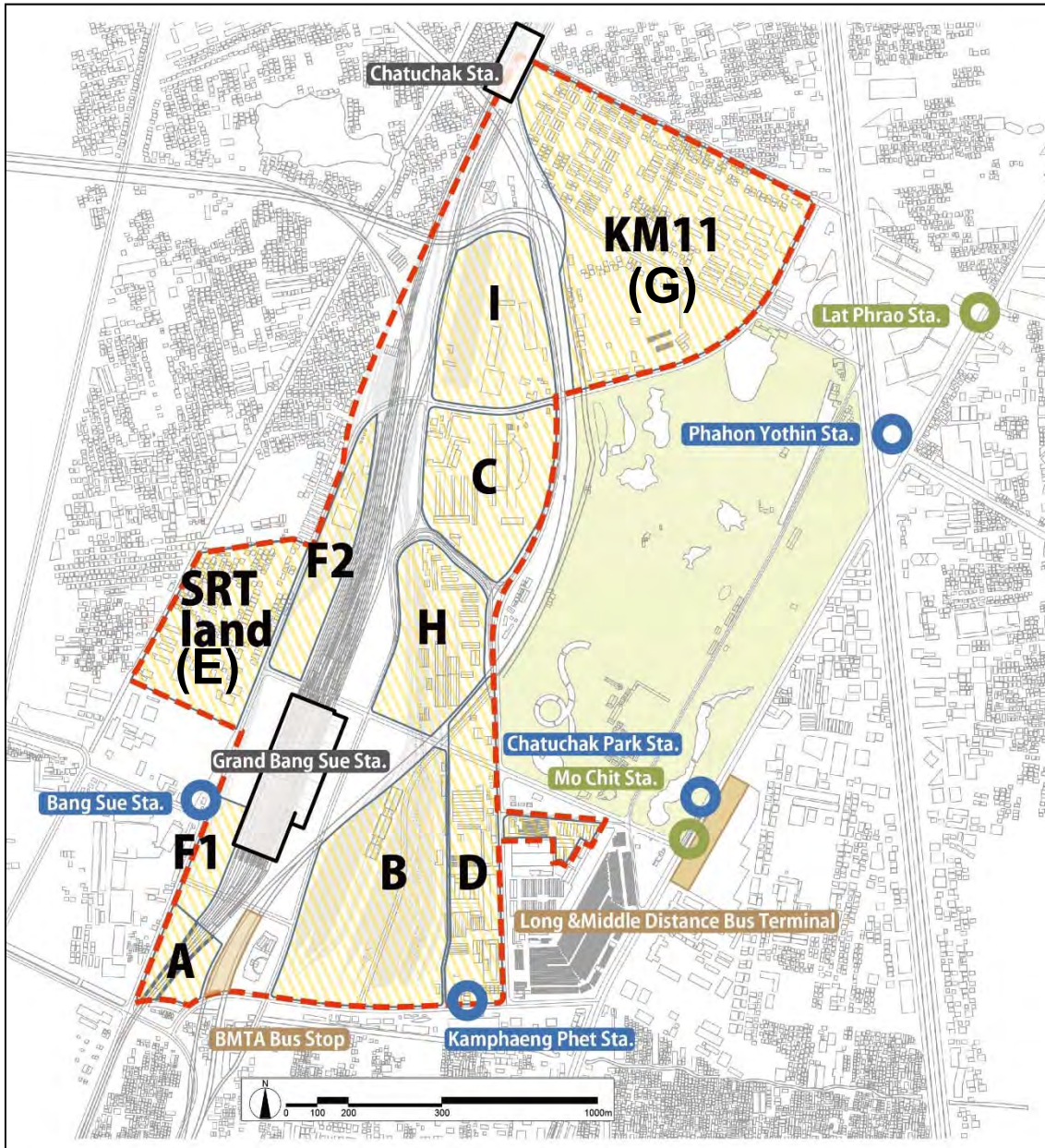
Data Collection Survey on Urban Redevelopment in Bang Sue Area
Final Report



3. Bang Sue Area Detailed Chart

Source: JST

Location Map



Note: In the present survey, each zone in survey area shall be named as shown above.

Source: JST

Bang Sue Area Zoning Map

Data Collection Survey on Urban Redevelopment in Bang Sue Area, Thailand Final Report

Table of Contents

Summary in Thai
Summary in English

Chapter 1	Introduction.....	1-1
1.1	Background	1-1
1.1.1	Survey Period	1-2
1.1.2	Survey Area	1-2
1.2	Working Groups/ Workshops	1-2
1.3	Seminar on Thailand – Japan Railway Cooperation for Connectivity Success	1-3
Chapter 2	Superior Plans.....	2-1
2.1	Urban Development Related Plans	2-1
2.1.1	National Spatial Development Plan 2057 of Thailand.....	2-1
2.1.2	Bangkok Comprehensive Plan	2-6
2.1.3	Mass Rapid Transit Master Plan of Bangkok	2-7
2.2	Policies and Plans for Economics and Industrial Promotion	2-7
2.2.1	Thailand 4.0.....	2-7
2.2.2	Twenty-year National Strategic Plan.....	2-8
2.2.3	National Economic and Social Development Plan	2-9
2.2.4	Thailand's Eastern Economic Corridor	2-10
2.2.5	Cluster-based Special Economic Development Zones Policy	2-11
2.2.6	Border Special Economic Zone Policy.....	2-11
2.3	Other Strategies and Policies	2-12
2.3.1	Ninth National Research Policy and Strategy (2017 - 2021).....	2-12
2.3.2	National Science, Technology, and Innovation Policy Plan.....	2-12
2.3.3	MICE Strategy in Thailand.....	2-13
2.3.4	Trends of Medical and Health- and Longevity-related Matters	2-15
2.4	Role of the Bang Sue Area in Thailand.....	2-16
2.5	Legal Systems and Policies Related to Urban Development.....	2-18
2.5.1	Process of Research on Legal Systems and Policies Related to Urban Development in Thailand.....	2-18
2.5.2	Current Legal Systems Related to Urban Development in Thailand.....	2-18
2.5.3	Major Methods for Relaxation of Regulations on Urban Development	2-22
2.5.4	Laws and Regulations Related to the Development of Bang Sue Area	2-25
2.5.5	Other Laws and Regulations to be Considered for the Development of Bang Sue Area.....	2-27
Chapter 3	General Conditions and Related Plans in Bang Sue Area.....	3-1
3.1	Status in Bang Sue Area.....	3-1
3.1.1	Location and Geographic Features	3-1
3.1.2	Administrative Boundary, Area, and Current Land Use.....	3-2
3.1.3	Population.....	3-5
3.1.4	Situation on the Residential Zone in Bang Sue Area	3-9
3.2	Situation of Existing Studies	3-10
3.3	Development Plan by OTP	3-10

3.3.1	Target Area	3-10
3.3.2	Development Concept	3-10
3.3.3	Development Plan	3-10
3.4	Development Plan by SRT	3-11
3.4.1	Purpose of the Study	3-11
3.4.2	Purpose of the Development	3-12
3.4.3	Development Concept	3-12
3.5	Traffic Plan by OTP	3-13
3.5.1	Vision	3-13
3.5.2	Pedestrian	3-14
3.5.3	Non-motorized Transport (NMT)	3-15
3.5.4	Automobile	3-15
3.5.5	Bus	3-16
3.5.6	Traffic Demand Forecast	3-18
Chapter 4	Current Status of Infrastructure	4-1
4.1	Railway	4-1
4.1.1	BTS (Light Green Line - Dark Green Line)	4-1
4.1.2	MRT (Blue Line - Purple Line)	4-3
4.1.3	SRT Red Line	4-3
4.1.4	Pink Line - Yellow Line - Orange Line	4-4
4.1.5	Airport Rail Link (ARL)	4-4
4.1.6	High-speed Train (Plan)	4-5
4.2	Road Transport and Bus Terminal	4-6
4.2.1	Road Transport	4-6
4.2.2	Bus Terminal	4-8
4.3	Status of Storm Drainage System	4-18
4.4	Status of Water Supply System	4-21
4.5	Status of Sewerage System	4-23
4.6	Status of Power Supply and Distribution Infrastructure	4-24
4.7	Status of Oil and Gas Pipelines	4-27
4.8	Waste Treatment	4-28
4.9	Smart City	4-28
4.9.1	Existing Plan by PTT	4-28
4.9.2	District Cooling System / Cogeneration	4-29
4.9.3	Energy Management System by Communication Infrastructure and Smart Grid	4-32
4.9.4	Energy Infrastructure (Electricity, Town Gas, Water, Communications)	4-34
4.9.5	Smart Transportation	4-35
4.9.6	Disaster Prevention	4-38
Chapter 5	Future Demand Forecast	5-1
5.1	Demand of Railway Passengers at State Railway of Thailand (SRT) Bang Sue Grand Station	5-1
5.1.1	Review of Existing Forecast	5-1
5.1.2	Railway Passengers in Bang Sue Area	5-11
5.2	Property Demand in Bangkok and its Environs	5-16
5.2.1	Property Submarkets in Bangkok and its Environs	5-16
5.2.2	Past Stocks and Planned Floor Area until 2021 in Bangkok and its Environs	5-17
5.2.3	Approach to Estimate Property Supply in Bang Sue Area after 2022	5-19
5.2.4	Shares of Central North and Inner North Submarkets in Property Supply in Bangkok and its Environs	5-22
5.2.5	Share of Chatuchak District in Property Supply at the Inner North	5-23
5.2.6	Property Supply in Chatuchak District after 2022 (Scenario 0 as a Basic Trend)	5-24
Chapter 6	Redevelopment Concept Paper and Scenario	6-1
6.1	Examination Fields and Progress	6-1
6.2	Vision	6-1

6.3	Development Concept Paper.....	6-2
6.3.1	Urban Functions Needed for Bang Sue Area.....	6-2
6.3.2	Development Concept Paper (Draft)	6-6
6.4	Development Scenario	6-8
6.4.1	Development Scenario	6-8
6.4.2	Adjustment of Demand Forecast for Scenario 2 (Integrated Development).....	6-10
6.4.3	Estimated Demand for Scenario 1 (Individual Development)	6-14
6.4.4	Stepwise Development	6-15
6.4.5	Stepwise Development by Zone	6-18
Chapter 7	Proposed Development Plan of Bang Sue Area	7-1
7.1	Basic Policies in the Development Plan.....	7-1
7.1.1	Basic Policies	7-1
7.2	Basic Plan.....	7-2
7.2.1	Basic Conditions for Plan Formulation.....	7-2
7.2.2	Project Area	7-2
7.3	Concepts on Urban Infrastructure Development.....	7-4
7.3.1	Fundamental Urban Infrastructure	7-4
7.3.2	Environment and Green Network	7-16
7.3.3	Transportation Network	7-20
7.3.4	Grade Up Facilities	7-36
7.4	Land Use Planning	7-39
7.4.1	Basic Policies for Land Use Planning	7-39
7.4.2	Land Use Plan	7-39
7.5	Volume Study	7-43
7.6	Cost Estimate	7-43
7.7	Guideline for Town Development.....	7-48
7.7.1	Objectives of Creating Urban Development Guidelines.....	7-48
7.7.2	Case Studies on Urban Development Guidelines in Japan	7-49
7.7.3	Desirable Guidelines for the Bang Sue Area	7-55
Chapter 8	Implementation Plan	8-1
8.1	Project Implementation Mechanism.....	8-1
8.1.1	Project Implementing Organization.....	8-1
8.1.2	Funding Mechanism	8-6
8.2	Financial Analysis	8-14
8.2.1	Objective and Approach.....	8-14
8.2.2	Analysis Scheme	8-16
8.2.3	Precondition and Parameter	8-16
8.2.4	Result	8-20
8.3	Economic Analysis.....	8-23
8.3.1	Objective and Approach.....	8-23
8.3.2	Analysis Scheme	8-23
8.3.3	Precondition and Parameter	8-24
8.3.4	Result	8-25
8.4	Project Schedule	8-25
8.4.1	Project Implementation (Phased Development)	8-25
8.4.2	Project Schedule	8-30
Chapter 9	Intention of Japanese Private Sector.....	9-1
9.1	Survey on the Intentions of Japanese Companies to Bang Sue Redevelopment Project	9-1
9.1.1	Briefing Seminar	9-1
9.1.2	Questionnaire Survey	9-1
9.2	Understanding the Intentions of Japanese Companies through Interview Survey	9-4
9.2.1	Interview Survey	9-4
9.3	Promoting Quality Infrastructure	9-5
9.3.1	Intention of Japanese Private Sector	9-5
9.3.2	Policy for Promoting Quality Urban Infrastructure.....	9-6

Chapter 10	Way Forward	10-1
10.1	Action Plan	10-1
10.1.1	Actions to be Taken by Thai Government	10-1
10.1.2	Actions to be Taken by SRT	10-3
10.2	Main Considerations in Implementing Bang Sue Area Redevelopment.....	10-4

TABLES

Table 2.1.1	Related Factors between Superior Plans and Bang Sue Area Development ..2-1	
Table 2.1.2	Outline of the National Spatial Development Plan 2057 of Thailand2-1	
Table 2.1.3	Policies on the Development of the Six Regions in the National Spatial Development Plan 2057 of Thailand.....2-2	
Table 2.1.4	Land Zoning Categories and Conditions to Obtain FAR Bonus in Bangkok Comprehensive Plan 20132-6	
Table 2.1.5	Summary of the Mass Rapid Transit Master Plans in Bangkok.....2-7	
Table 2.2.1	Ten Industries and Five Core Technologies Designated in Thailand 4.02-8	
Table 2.2.2	Outline of the 20-year National Strategic Plan.....2-9	
Table 2.2.3	Ratio of Total Research and Development Cost to GDP and Number of Researchers per 10,000 Working People2-9	
Table 2.2.4	Outline of the 12th Five-year National Economic and Social Development Plan2-10	
Table 2.2.5	Outline of the Cluster Policy2-11	
Table 2.2.6	Candidates for Border SEZs.....2-11	
Table 2.3.1	MICE-related Organizations in Thailand.....2-14	
Table 2.3.2	Convention and Exhibition Facilities in Bangkok2-14	
Table 2.4.1	Urban and Transport Functions for Three Locations Owned by SRT2-17	
Table 2.5.1	Outline of Town Planning Act 1975.....2-19	
Table 2.5.2	Outline of Town Control Act 19792-19	
Table 2.5.3	Outline of Land Readjustment for Area Development Act 2004.....2-20	
Table 2.5.4	Outline of Land Subdivision Act 20002-20	
Table 2.5.5	Outline of Enhancement and Conservation of National Environmental Quality Act 1992.....2-21	
Table 2.5.6	Outline of Comprehensive Planning Criteria and Standards 20062-21	
Table 2.5.7	Outline of Bangkok City Planning Standards 2010.....2-22	
Table 2.5.8	Floor Area Transfer in Major Methods of Easing Form Restrictions in Japan 2-23	
Table 2.5.9	Comparison Chart of Major Methods of Easing Form Restrictions.....2-24	
Table 2.5.10	BMA Comprehensive Plan 2013.....2-25	
Table 2.5.11	BMA Building Control Regulation 2001.....2-25	
Table 2.5.12	District Plans that Specify Redevelopment Promotion Districts2-26	
Table 2.5.13	District Plans with Adequate Distribution of Floor Area Ratios.....2-27	
Table 2.5.14	Integrated Design Measurement for the Whole Estate2-27	
Table 2.5.15	Major Points of Regulations for Property Leasing2-28	
Table 2.5.16	Major Points Relating to Installment of Cogeneration Plant.....2-29	
Table 3.1.1	Population Transition in Bangkok3-5	
Table 3.1.2	Population around Bang Sue Area (Administrative District)3-8	
Table 3.2.1	Cover Area of Existing Studies3-10	
Table 3.3.1	Development Direction of Zone D3-11	
Table 3.3.2	Area in Zone D3-11	
Table 3.4.1	Outline of Major Projects3-12	
Table 3.4.2	Potentials and Visions in Each Zone3-13	
Table 3.5.1	Demand Forecast for Pedestrian Volume.....3-14	
Table 3.5.2	Demand Forecast for BRT Passengers (Fare is set at THB 15).....3-17	
Table 3.5.3	Demand Forecast for Grand Bang Sue Station and Other Stations Passengers3-18	
Table 4.1.1	Existing Railway Around the Survey Area4-4	

Table 4.2.1	Existing Roads in Surrounding Bang Sue Area	4-6
Table 4.2.2	Traffic Survey Component	4-10
Table 4.2.3	PCU Factor	4-11
Table 4.2.4	Questions in the Interview Survey	4-11
Table 4.2.5	Interview Schedule	4-12
Table 4.2.6	V/C Analysis Result	4-14
Table 4.2.7	Questions in the Interview Survey	4-15
Table 4.4.1	Water Supply in MWA Region 2	4-21
Table 4.4.2	Water Price (MWA)	4-23
Table 4.5.1	Overview of WWTP in the Neighborhood of Target Area	4-23
Table 4.6.1	Electricity Prices	4-25
Table 4.6.2	Overview of Substations in Surrounding Target Area	4-26
Table 4.7.1	Overview of Oil and Gas Pipeline in Surrounding Target Area	4-27
Table 4.9.1	Energy Needed for Each Type of Facilities	4-31
Table 4.9.2	Types of Supply	4-31
Table 4.9.3	Main Instruments and Facility System	4-31
Table 4.9.4	Flooding Measures in Bangkok Metropolitan Region	4-38
Table 5.1.1	Master Plan in Bangkok Metropolitan Region	5-2
Table 5.1.2	Railway Passengers Forecast by OTP	5-3
Table 5.1.3	Dark Red Line Passenger Estimation	5-6
Table 5.1.4	Potential of Light Red Line	5-7
Table 5.1.5	Light Red Line Passenger Estimation	5-7
Table 5.1.6	Long-distance Train Passenger Estimation	5-7
Table 5.1.7	Demand Forecast of Planned High-speed Railways	5-8
Table 5.1.8	Comparison of Demand Forecast of Planned High-speed Railway by OTP and JST	5-8
Table 5.1.9	Share of ARL Users in Flight Passengers	5-9
Table 5.1.10	Airport Rail Link Passenger Estimation	5-9
Table 5.1.11	Demand Forecast of Passengers in MRT Bang Sue Station	5-11
Table 5.1.12	Forecast Framework	5-12
Table 5.1.13	Assumption of Extra (Non Commuter) Trips in Bang Sue Area	5-13
Table 5.1.14	Generated Trips in Bang Sue Area	5-14
Table 5.1.15	Passenger Estimation of Bang Sue Grand Station	5-15
Table 5.2.1	Districts and Counties in Each Submarket	5-17
Table 5.2.2	Estimated Property Stock in Bangkok and its Environs after 2022	5-22
Table 5.2.3	Share of Property Supply in Bangkok and its Environs (Office)	5-23
Table 5.2.4	Share of Property Supply in Bangkok and its Environs (Retail)	5-23
Table 5.2.5	Share of Property Supply in Bangkok and its Environs (Condominium)	5-23
Table 5.2.6	Share of Population at the Inner North	5-24
Table 5.2.7	Property Stock and Increment in Chatuchak District after 2022	5-24
Table 6.1.1	Study Fields and Result	6-1
Table 6.3.1	Urban Functions Required for Bang Sue Area in the Superior Plans	6-3
Table 6.3.2	Tips for Success in Bang Sue Area Development	6-5
Table 6.3.3	Major Findings from the Points of View to Determine Needed Urban Functions	6-5
Table 6.3.4	Urban Functions Needed in Bang Sue Area	6-6
Table 6.3.5	Essence of the Draft "Development Concept Paper"	6-7
Table 6.3.6	Urban Functions to be Assigned by Zone	6-8
Table 6.4.1	Comparison between "Integrated Development" and "Individual Development" ...	6-9
Table 6.4.2	Key Consideration Points for Development Planning and Demand Forecast	6-9
Table 6.4.3	Estimated Property Stock and Increment in Bangkok and its Environs after 2022	6-11
Table 6.4.4	Adjustment of Shares of Property Supply of Inner North in Bangkok and its Environs	6-11
Table 6.4.5	Adjusted Shares of Chatuchak District in Property Supply in Inner North	6-12
Table 6.4.6	Property Supply in Chatuchak District after 2022 (High-end Estimation)	6-13

Table 6.4.7	Basic Units for Conversion to Gross Floor Area	6-13
Table 6.4.8	Future Gross Floor Area in Chatuchak District in 2032 (Scenario 2)	6-14
Table 6.4.9	Conditions for Adjustment of Shares in Each Scenario	6-14
Table 6.4.10	Future Gross Floor Area in Chatuchak District in 2032 (Scenario 1 and 2)	6-14
Table 6.4.11	Comparison Table for Medium and Long Distance Bus Terminal.....	6-16
Table 6.4.12	Development Phasing of Each Zone According to the Thai Side's Existing Plan	6-17
Table 6.4.13	Recommendable Stepwise Development.....	6-17
Table 6.4.14	Recommendable Stepwise Development by Zone.....	6-19
Table 7.1.1	Plan Formulation Policies	7-1
Table 7.2.1	Areas Before and After Development	7-3
Table 7.3.1	Typical Cross Section	7-4
Table 7.3.2	Overview of Storm Drainage Plan	7-4
Table 7.3.3	Demand Forecast for Water Supply	7-5
Table 7.3.4	Power Load in Peak Time.....	7-6
Table 7.3.5	Power Demand Forecast.....	7-6
Table 7.3.6	Main Equipment and Quantity	7-6
Table 7.3.7	Main Equipment and Quantity	7-8
Table 7.3.8	Consideration of Energy System	7-10
Table 7.3.9	Methods of Supply.....	7-11
Table 7.3.10	Reference Specifications and Functions	7-13
Table 7.3.11	Overview of Equipment for Solar Power Generation	7-15
Table 7.3.12	Specifications of Energy Management System	7-16
Table 7.3.13	Consideration Process for Bus Terminals.....	7-21
Table 7.3.14	Formulas for Calculating Numbers of Berths for Buses and Taxis.....	7-22
Table 7.3.15	Calculation Results of Facilities (Middle and Long Distance Buses)	7-22
Table 7.3.16	Calculation Results of Facilities (BMTA).....	7-23
Table 7.3.17	Results of Facilities for Middle and Long Distance Buses and BMTA.....	7-25
Table 7.3.18	Trip Assignment Result.....	7-35
Table 7.3.19	Performance of Data Center (Reference).....	7-38
Table 7.3.20	Characteristics of the Data Center	7-38
Table 7.5.1	Volume Study	7-43
Table 7.6.1	Unit Price for Infrastructure.....	7-44
Table 7.6.2	Unit Price for Buildings	7-45
Table 7.6.3	Details on Cost Estimate for Bang Sue Area Redevelopment (Category)	7-45
Table 7.6.4	Details on Cost Estimate for Bang Sue Area Redevelopment (Detail)	7-46
Table 7.7.1	Plan Formulation Policies	7-49
Table 8.1.1	Funding Requirements for Each of the Organization Categories	8-11
Table 8.2.1	Major Parameters.....	8-17
Table 8.2.2	Precondition of Each Zone Development	8-18
Table 8.2.3	Infrastructure Cost and Allocation.....	8-19
Table 8.2.4	IRR of Private Investor	8-20
Table 8.2.5	Facility IRR* in Short Term (Phase 1).....	8-21
Table 8.2.6	Revenue of SOE	8-21
Table 8.2.7	Revenue of Central Government and BMA	8-22
Table 8.3.1	Population Generation Difference between Scenario-2 and Scenario-1	8-24
Table 8.3.2	Average Amount of Monthly Household Expenditure	8-25
Table 8.3.3	Economic Impact.....	8-25
Table 9.1.1	Outline of Briefing Seminar.....	9-1
Table 9.2.1	Major Opinions from Japanese Private Companies	9-4
Table 10.1.1	Actions to be Taken by Thai Government.....	10-1
Table 10.1.2	Actions to be Taken by SRT	10-3
Table 10.2.1	Main Consideration Points at Initial Stage for Thai Stakeholders	10-5

FIGURES

Figure 1.1.1	Bang Sue Area (Survey Area).....	1-2
Figure 1.2.1	Coordination between the Government of Thailand and the Government of Japan.....	1-3
Figure 1.3.1	Seminar on Thailand – Japan Railway Cooperation for Connectivity Success.....	1-3
Figure 2.1.1	Conceptual Drawing of the National Spatial Development Plan	2-4
Figure 2.1.2	Bangkok and its Vicinity Regional Plan.....	2-5
Figure 2.1.3	Land Zoning in Bangkok Comprehensive Plan 2013	2-6
Figure 2.2.1	Outline of Thailand 4.0.....	2-8
Figure 2.3.1	Framework of the National Science, Technology, and Innovation Policy Plan	2-13
Figure 2.3.2	Number of MICE tourist to Thailand by Purpose (2004-2014)	2-14
Figure 2.3.3	Location of Convention and Exhibition Facilities in Bangkok	2-15
Figure 2.4.1	Locations of the Three Candidate Areas for Development.....	2-17
Figure 2.5.1	Process of Research on Legal Systems and Policies.....	2-18
Figure 3.1.1	Location of Bang Sue Area	3-1
Figure 3.1.2	Bang Sue Area (Survey Area).....	3-2
Figure 3.1.3	Satellite Image Around Bang Sue Area (2017)	3-3
Figure 3.1.4	Land Use Map Around Bang Sue Area	3-4
Figure 3.1.5	Rate of Population Growth in Bangkok (2006-2011).....	3-6
Figure 3.1.6	Rate of Population Growth in Bangkok (2011-2016).....	3-6
Figure 3.1.7	Social Increase and Decrease in Bangkok Metropolitan Area (2005)	3-7
Figure 3.1.8	Social Increase and Decrease in Bangkok Metropolitan Area (2015)	3-7
Figure 3.1.9	Location of Residential Zone in Bang Sue Area.....	3-8
Figure 3.1.10	Residential Zone in Bang Sue Area	3-9
Figure 3.3.1	Classification in Zone D	3-11
Figure 3.4.1	Zoning Plan in Bang Sue Area.....	3-12
Figure 3.4.2	Development and Projects in Each Zone.....	3-13
Figure 3.5.1	Image of Skywalk.....	3-14
Figure 3.5.2	Development Plan for Pedestrian Road.....	3-15
Figure 3.5.3	Road Plan of Bang Sue Area	3-16
Figure 3.5.4	Parking Space in Bang Sue Grand Station.....	3-16
Figure 3.5.5	BRT Development Plan	3-17
Figure 4.1.1	Existing Network of BTS (Light Green Line - Dark Green Line)	4-1
Figure 4.1.2	Commercial Facilities Connecting to Stations of BTS Sukhumvit Line	4-2
Figure 4.1.3	Existing etwork of MRT	4-3
Figure 4.1.4	SRT Route Map	4-4
Figure 4.1.5	Planning Routes of High-speed Trains	4-5
Figure 4.2.1	Expressway in Surrounding Bang Sue Area	4-7
Figure 4.2.2	Elevated Roads in Surrounding Bang Sue Area	4-7
Figure 4.2.3	Layout of Bus Terminal	4-8
Figure 4.2.4	Platforms (Left: Medium Distance Bus; Right: Long Distance Bus)	4-8
Figure 4.2.5	Roads in Surrounding Area of Mo Chit 2 Bus Terminal.....	4-9
Figure 4.2.6	Inner-city Bus Routes	4-10
Figure 4.2.7	Location for Intersection Traffic Count Points	4-11
Figure 4.2.8	Traffic Count Survey	4-11
Figure 4.2.9	Interview Location.....	4-13
Figure 4.2.10	Traffic Volume by Time and Direction	4-14
Figure 4.2.11	Traffic Volume at Morning Peak Hour (7 – 10)	4-14
Figure 4.2.12	Level of Service	4-15
Figure 4.2.13	Proportion of Traffic Intersection Classified by Type of Car.....	4-15
Figure 4.2.14	General Attributes (Left: Age, Right: Residence)	4-16
Figure 4.2.15	Stated Preference for Traffic Mode Heading to Center of Bangkok	4-17
Figure 4.2.16	Stated Preference for Traffic Mode Heading to Closest Station.....	4-17
Figure 4.2.17	Maximum Walking Minutes	4-18

Figure 4.2.18	Congestion on Kamphaeng Phet 2 Road	4-19
Figure 4.3.1	Canal Network and Pumping Station	4-20
Figure 4.3.2	Drain Pipe Network (Existing)	4-20
Figure 4.3.3	Klong Prem Pra Chakon Trunk Drain Pipe (Opened in 2001).....	4-21
Figure 4.3.4	Beneath Klong Bang Sue Trunk Drain Pipe (under Construction)	4-21
Figure 4.3.5	Klong Prem Pra Chakon / Klong Bang Bua Trunk Drain Pipe (under Detailed Design)	4-22
Figure 4.4.1	Water Supply Network in Bangkosk	4-23
Figure 4.4.2	Bang Khen WTP	4-23
Figure 4.5.1	Location of WWTPs in Neighborhood of Bang Sue Area	4-24
Figure 4.5.2	Bang Sue WWTP	4-25
Figure 4.6.1	Power Distribution Network of Bangkok	4-26
Figure 4.6.2	Power Demand and Supply	4-26
Figure 4.6.3	Transmission Lines and Substations Planned to be Constructed in Target Area	4-27
Figure 4.7.1	Location of Oil and Gas Pipeline in Surrounding Target Area	4-29
Figure 4.9.1	Cogeneration and District Cooling System in Suvarnabhumi Airport	4-30
Figure 4.9.2	Example of Pipeline Arrangement for District Cooling System.....	4-31
Figure 4.9.3	Image of Energy Management System	4-34
Figure 4.9.4	Image of Energy Infrastructure System	4-34
Figure 4.9.5	Traffic Information Provision through Internet	4-38
Figure 4.9.6	Overview of PPTS	4-38
Figure 4.9.7	Image of Parking Information Provided on VICS	4-39
Figure 4.9.8	Image of Bus Location Systems	4-39
Figure 5.1.1	Framework of Demand Estimation.....	5-1
Figure 5.1.2	Daily Average Passengers on SRT in Thailand	5-3
Figure 5.1.3	Growth of Intra City Transportation Network	5-4
Figure 5.1.4	Comparison of MRT/BTS/Subways Extension and Users in the World	5-4
Figure 5.1.5	Average Daily Passengers of MRT, BTS, and Airport Rail Link by Station.....	5-5
Figure 5.1.6	Trip Length Distribution by MRT Passengers.....	5-6
Figure 5.1.7	Average Daily Alighting Passengers at Airport Rail Link by Station	5-9
Figure 5.1.8	Number of Passengers of Each Station and Population Density	5-10
Figure 5.1.9	Average Daily Passengers on the Blue Line on Weekdays by Section and Direction in 2016	5-11
Figure 5.1.10	Examples of Person Trips per Person per Day	5-13
Figure 5.1.11	Share of Purpose of Trips in Bangkok and Other Cities in Asia	5-13
Figure 5.1.12	Passenger Estimation of Bang Sue Grand Station	5-15
Figure 5.2.1	Property Submarket in Bangkok and its Environs.....	5-16
Figure 5.2.2	Past Stocks and Planned Floor Area until 2021 in Bangkok and its Environs (Office)	5-18
Figure 5.2.3	Past Stocks and Planned Floor Area until 2021 in Bangkok and its Environs (Retail).....	5-18
Figure 5.2.4	Past Stocks and Planned Units until 2021 in Bangkok and its Environs (Condominium).....	5-19
Figure 5.2.5	Past Stocks and Planned Rooms until 2021 in Bangkok and its Environs (Hotel)	5-19
Figure 5.2.6	Process of Future Property Supply in Bang Sue Area	5-20
Figure 5.2.7	Past Record and Estimated Trend of Property Supply in Bangkok Property Market	5-22
Figure 6.3.1	Three Points of View to Consider Urban Functions Needed for Bang Sue Area.	6-2
Figure 6.3.2	Recent Property Market Demand in Bangkok.....	6-4
Figure 6.4.1	Process of Future Property Supply in Bang Sue Area	6-10
Figure 6.4.2	Stepwise Development by Zone	6-19
Figure 7.2.1	Project Area	7-3
Figure 7.3.1	Urban Infrastructure Plan.....	7-7
Figure 7.3.2	Relay Stations around Bang Sue Area	7-8

Figure 7.3.3	Comparison of Temperature in Japan and Bangkok	7-9
Figure 7.3.4	Images of Entire Energy Infrastructure	7-12
Figure 7.3.5	Image of Energy Flow	7-12
Figure 7.3.6	Business Model for Energy Infrastructure (example)	7-15
Figure 7.3.7	Green Network.....	7-18
Figure 7.3.8	Landscape Creation.....	7-19
Figure 7.3.9	Road Planning	7-20
Figure 7.3.10	Time Variation on the Number of Waiting Bus Volume.....	7-23
Figure 7.3.11	Example of Middle & Long Distance Bus Route in Japan	7-24
Figure 7.3.12	Berths for Middle and Long Distance Buses in Bang Sue Grand Station ..	7-24
Figure 7.3.13	Arrangement of Bus Facilities	7-25
Figure 7.3.14	Routes of Middle and Long Distance Buses	7-26
Figure 7.3.15	Layout Plan of Old Mo Chit Bus Terminal	7-26
Figure 7.3.16	Reorganization of Ticket Counters (Left: Mo Chit 2; Right: Shinjuku Bus Terminal)	7-27
Figure 7.3.17	Routes of Circulating Buses.....	7-28
Figure 7.3.18	Public Transportation Planning	7-28
Figure 7.3.19	Traffic Zone in Bang Sue Area	7-29
Figure 7.3.20	Desire Line for Inner Trip	7-30
Figure 7.3.21	Trip Number in Bang Sue Area in 2032	7-30
Figure 7.3.22	Estimation Flow of Traffic Modal Split	7-31
Figure 7.3.23	Walk Split Model	7-31
Figure 7.3.24	BRT Station Sphere	7-32
Figure 7.3.25	Modal Share by Transportation Mode by OTP Interview Survey	7-33
Figure 7.3.26	Modal Share by Transportation Mode.....	7-33
Figure 7.3.27	Modal Share (Left : Inner Trip, Right : Inter Trip)	7-34
Figure 7.3.28	Result of Traffic Demand Forecast.....	7-35
Figure 7.3.29	Parking Information System in Bangkok (Lumpini Park).....	7-36
Figure 7.3.30	VMS in Bangkok (Chalerm Maha Nakhon Expressway)	7-36
Figure 7.3.31	ITSPlan	7-37
Figure 7.4.1	Land Use Plan	7-40
Figure 7.4.2	Image of Future Development	7-41
Figure 7.4.3	Image Pers [Bang Sue Area]	7-42
Figure 7.4.4	Image Pers [Around Bang Sue Grand Station]	7-42
Figure 7.7.1	Flowchart for Creation of Urban Development Guidelines	7-48
Figure 7.7.2	Creation of Walkway-type Open Spaces	7-50
Figure 7.7.3	Skylines	7-51
Figure 7.7.4	Basic Policy for Hubs and Structural Spaces.....	7-52
Figure 7.7.5	Guidelines for Guidance and Informational Signs.....	7-53
Figure 7.7.6	Urban Development Guidelines	7-54
Figure 7.7.7	Illustrative Image for Development of Public Spaces	7-54
Figure 8.1.1	Project Implementation Organization	8-2
Figure 8.1.2	Steering Committee and Working Groups	8-4
Figure 8.1.3	Stakeholder Chart.....	8-4
Figure 8.1.4	Required Functions within SRT Subsidiary Organization.....	8-5
Figure 8.1.5	Image of overall project coordination led by SRT Bang Sue Development Co.	8-6
Figure 8.1.6	Basic Funding Allocation Principles	8-7
Figure 8.1.7	Scope of Private Funding.....	8-8
Figure 8.1.8	Phased Usage of Fund Pool	8-9
Figure 8.1.9	Overall Funding Requirement	8-10
Figure 8.1.10	Funding Allocation by Organization	8-11
Figure 8.1.11	Overall Funding Requirements by Organization	8-12
Figure 8.1.12	Short Term (Phase 1) Funding Requirements by Organization.....	8-12
Figure 8.1.13	Middle Term (Phase 2) Funding Requirements by Organization.....	8-13
Figure 8.1.14	Long Term (Phase 3) Funding Requirements by Organization	8-13
Figure 8.2.1	Share Revenue of the Development Project by Business Segments	8-16

Figure 8.2.2	Financial Analysis Scheme	8-16
Figure 8.3.1	Economic Analysis Scheme.....	8-23
Figure 8.4.1	Relocaion Candidate Site of Railway Incidental Facilities.....	8-26
Figure 8.4.2	Project Stepwise Plan [Short Term (Phase 1)]	8-27
Figure 8.4.3	Project Stepwise Plan [Middle Term (Phase 2)]	8-28
Figure 8.4.4	Project Stepwise Plan [Long Term (Phase 3)]	8-29
Figure 8.4.5	Project Schedule.....	8-30
Figure 9.1.1	Outline of the Questionnaire	9-2
Figure 9.1.2	Result of Question 1	9-3
Figure 9.1.3	Result of Question 3	9-3
Figure 10.1.1	Thai Internal Process for Master Plan Implementation	10-2
Figure 10.1.2	Temporary Schedule for Actions to be Taken by Thai Government.....	10-2
Figure 10.1.3	Temporary Schedule for Actions to be Taken by SRT	10-4

APPENDICES

- 2-1 : Legal structure for Urban Development and Related Issues in Thailand and Japan
- 6-1 : Development Concept Paper (Draft)
- 7-1 : Infrastructure Plans (exisiting and plan)
- 7-2 : Facility Plan
- 7-3 : Development Images
- 8-1 : Fund Allocation Plan (details)
- 10-1 : Outline of “Act on Special Measures concerning Urban Regeneration”
- 10-2 : Outline of Regulations Regarding Underpass Development

ABBREVIATION

ARL	Airport Rail Link
ASEAN	Association of South - East Asian Nations
BCP	Business Continuity Plan
BMA	Bangkok Metropolitan Administration Region
BMTA	Bangkok Mass Transit Authority
BRT	Bus Rapid Transit
BTS	Bangkok Mass Transit System
CAPEX	Capital Expenditure
CBD	Central Business District
DOH	Department of Highway, Ministry of Transport
DPT	Department of Public Works and Town & City Planning, Ministry of Interior
EEC	Eastern Economic Corridor
EGAT	Electricity Generating Authority of Thailand
EPPO	Energy Policy and Planning Office
EXAT	Expressway Authority of Thailand
FAR	Floor Area Ratio
JICA	Japan International Cooperation Agency
JST	JICA Survey Team
LCC	Low Cost Carrier
MEA	Metropolitan Electricity Authority
METI	Ministry of Economy, Trade and Industry
MICE	Meetings, Incentives, Conferences and Exhibitions
MLIT	Ministry of Land, Infrastructure, Transport and Tourism, Japan
M-Map	Mass Rapid Transit Master Plan in Bangkok Metropolitan, Japan
MOE	Ministry of Energy
MOF	Ministry of Finance
MOT	Ministry of Transport
MRT	Mass Rapid Transit
MRTA	Mass Rapid Transit Authority of Thailand
MWA	Metropolitan Waterworks Authority
NESDB	Office of the National Economic and Social Development Board
NMT	Non-Motorized Transport
ODA	Official Development Assistance
OPEX	Operating Expense
OSR	Open Space Ratio
OTP	Office of Transport and Traffic Policy and Planning
PCU	Passenger Car Unit
PPP	Public-Private Partnership
PTPS	Public Transportation Priority Systems
PTT	PTT Public Company Limited
SEPO	State Enterprise Policy Office, Ministry of Finance
SPP	Small Power Producers
SRT	State Railway of Thailand
TOD	Transit Oriented Development
UMRT	Urban Mass Rapid Transit
WG	Working Group
WS	Work Shop

The exchange rate used in this report is
1USD=112.185 JPY
1THB=3.3069 JPY
(July 2017, JICA Monthly exchange rate)

บทสรุปผู้บริหาร

1.ความเป็นมา

กรุงเทพมหานครและปริมณฑลซึ่งประกอบไปด้วยเขตพื้นที่กรุงเทพมหานครและจังหวัดทั้งห้าที่ตั้งอยู่โดยรอบ ปัจจุบันมีจำนวนประชากรทั้งหมด 10,730,000คน จากข้อมูลรายได้ต่อหัวของประชากรในเขตพื้นที่กรุงเทพมหานครและปริมณฑลในปี พ.ศ. 2556 คิดเป็น 376,463 บาท ซึ่งสูงกว่ารายได้ต่อหัวของประชากรในประเทศที่ 193,394 บาทถึงเกือบสองเท่า นอกจากนี้ในเขตพื้นที่ดังกล่าวยังมีประชากรอาศัยอยู่มากที่สุด และถือเป็นศูนย์กลางของเศรษฐกิจและการเมืองในประเทศ

เพื่อแก้ไขปัญหาการจราจรติดขัดรวมถึงปัญหาสิ่งแวดล้อมที่เกิดขึ้นในพื้นที่กรุงเทพมหานครและปริมณฑล กระทรวงคมนาคมแห่งประเทศไทยได้เริ่มนำระบบการขนส่งมวลชนเข้ามาใช้ในช่วงปีพ.ศ. 2533-2542 จากข้อมูลเดือนมกราคม พ.ศ. 2560 พบว่า มีเส้นทางขนส่งมวลชนที่เปิดให้บริการด้วยกัน 4 เส้น ได้แก่ รถไฟฟ้าบีทีเอสสายสุขุมวิท รถไฟฟ้าบีทีเอสสายสีลม รถไฟฟ้ามหานครสายสีน้ำเงิน รถไฟฟ้ามหานครสายสีม่วง และเส้นทางระหว่างสนามบิน 1 เส้น ได้แก่ แอร์พอร์ตเรลลิงก์ นอกจากนี้ยังมีอีกหลายโครงการที่อยู่ระหว่างดำเนินการ และอยู่ระหว่างการก่อสร้างเพื่อที่จะขยายต่อเส้นทางปัจจุบัน รวมถึงการสร้างเส้นทางใหม่เพื่อที่จะยกระดับโครงข่ายระบบการขนส่งมวลชนในเมืองให้สมบูรณ์

สำหรับโครงการรถไฟฟ้าสายชานเมืองสีแดงของการรถไฟแห่งประเทศไทย (รฟท.) ซึ่งครอบคลุมถึงสถานีกลางบางซื่อโดยมีความยาวทั้งสิ้น 26.3 กิโลเมตร และมีแหล่งเงินทุนสำคัญหนึ่งมาจากเงินกู้ของรัฐบาลญี่ปุ่น รฟท.ในฐานะของผู้ดำเนินการพัฒนาโครงข่ายดังเป้าหมายที่จะเปิดให้บริการเดินรถได้ในเดือนกรกฎาคม พ.ศ. 2563 สถานีกลางบางซื่อจะกลายเป็นสถานีขนส่งที่ใหญ่ที่สุดในกรุงเทพมหานคร โดยมีระบบขนส่งมวลชนในเมืองหลายสาย รวมถึงรถไฟฟ้าสายชานเมืองสีแดงที่จะเข้าจอดที่สถานีกลางบางซื่อ

พื้นที่เป้าหมายในการศึกษาครั้งนี้ (ต่อไปนี้จะเรียกว่า "พื้นที่บางซื่อ") ประกอบด้วยสถานีกลางบางซื่อและที่ดินผืนใหญ่เพื่อระบบและสิ่งอำนวยความสะดวกทางราง ด้วยตำแหน่งที่ตั้งซึ่งจะเป็นศูนย์กลางการขนส่งของกรุงเทพมหานครในอนาคต พื้นที่ดังกล่าวจึงถือว่ามีศักยภาพอย่างมากที่จะเป็นพื้นที่ศูนย์กลางการพัฒนาเมืองทั้งนี้ทางสำนักนโยบายและแผนการขนส่งและจราจร (สนข.) และรฟท. ได้ทำการศึกษาแผนแนวคิดในการพัฒนาต่าง ๆ โดยรฟท. โดยมีความต้องการที่จะพัฒนาพื้นที่ดังกล่าวในรูปแบบของการร่วมลงทุนระหว่างระหว่างภาครัฐกับเอกชน อย่างไรก็ตามรฟท.ประสบกับอุปสรรคต่าง ๆ เป็นต้นว่า การขาดการพัฒนาแบบบูรณาการอย่างเป็นขั้นตอน การขาดการประสานงานในแต่ละโครงการซึ่งได้ออกแบบบนแผนแม่บทเดียวกัน

ท่ามกลางสภาวะดังกล่าว กระทรวงคมนาคมแห่งประเทศไทยจึงร้องขอให้กระทรวงที่ดิน ระบบโครงสร้างพื้นฐานคมนาคม และการท่องเที่ยวญี่ปุ่น (MLIT) ให้การสนับสนุนการพัฒนาแผนแม่บทซึ่งผ่านการผสมผสานบูรณาการเป็นแผนใหญ่เดียวกันสำหรับสถานีกลางบางซื่อและพื้นที่ต่อเนื่อง ด้วยความเป็นมาดังกล่าวสนข. รฟท. และ MLIT ได้ร่วมกันพิจารณา และเห็นถึงความจำเป็นอย่างมากของแผนแม่บทซึ่งจะต้องครอบคลุมแผนโครงสร้างพื้นฐานและรายละเอียดโครงการทั้งหมด ด้วยความตระหนักถึงความสำคัญดังกล่าวองค์การความร่วมมือระหว่างประเทศแห่งญี่ปุ่น (JICA) จึงเห็นควรที่จะให้ความร่วมมือในการตั้งทีมสำรวจเพื่อที่จะศึกษาและนำไปสู่การจัดร่างแผนแม่บทฉบับองค์รวม

1.1 วัตถุประสงค์การศึกษา

วัตถุประสงค์ของการสำรวจศึกษาในครั้งนี้มีดังต่อไปนี้

1. ทีมสำรวจของไจก้า (JST) จะรวบรวมและวิเคราะห์ข่าวสารและข้อมูลเพื่อการพัฒนาพื้นที่บางซื่อ โดยอ้างอิงตามผลการอภิปรายของคณะทำงาน และข้อมูลที่ MLIT ได้รวบรวมไว้ก่อนหน้านี้ ทั้งนี้ทีมสำรวจของไจก้าจะจัดทำ "วิสัยทัศน์การพัฒนา" และ "เอกสารเชิงหลักการ(ร่าง)" และผลักดันให้ผู้มีส่วนได้ส่วนเสียเห็นพ้องต้องกันเพื่อดำเนินงานตามแผนพัฒนาแบบองค์รวม

2. ทีมสำรวจของใจก้าจะจัดทำแผนทั้งหมดที่เกี่ยวข้องซึ่งประกอบด้วย โครงร่างเพื่อจัดดำเนินงาน โครงการ รวมถึงการจัดหาแหล่งทุนจากผู้มีส่วนได้ส่วนเสีย อาทิ รัฐบาลไทย องค์กรท้องถิ่น และ ภาคเอกชน เพื่อสนับสนุนการเตรียมโครงสร้างการจัดดำเนินงานเพื่อการพัฒนาพื้นที่บางซื่อ

1.2 พื้นที่สำรวจ

พื้นที่เป้าหมายในการสำรวจแสดงตามรูป 1



ที่มา: ทีมสำรวจใจก้า

รูป 1 พื้นที่บางซื่อ (พื้นที่สำรวจ)

1.3 คณะทำงาน และการประชุมเชิงปฏิบัติการ

ระหว่างการสำรวจ(ตั้งแต่เดือนมีนาคมถึงเดือนสิงหาคม พ.ศ. 2560) มีการจัดการประชุมคณะทำงาน 3 ครั้ง การประชุมระดับปฏิบัติการ 9 ครั้งในกรุงเทพมหานคร โดยมีจุดประสงค์เพื่อรวบรวมความคิดเห็นของผู้มีส่วนได้ส่วนเสีย 3 ราย (ได้แก่ กระทรวงคมนาคม สนข. และรฟท.)

2. แผนชั้นนโยบายประเทศ

2.1 แผนการใช้ที่ดิน แผนเพื่อการพัฒนาเมืองใหญ่ และแผนระบบรถไฟฟ้าขนส่งมวลชน

แผนสำคัญเพื่อการพัฒนาเมืองซึ่งเกี่ยวกับการพัฒนาพื้นที่บางซื่อมีรายละเอียดดังตาราง 1.

ตาราง 1 แผนสำคัญเพื่อการพัฒนาเมืองอันเกี่ยวเนื่องกับการพัฒนาพื้นที่บางซื่อ

พื้นที่	แผน	ผู้จัดทำ	สาระสำคัญ
ประเทศ	ผังประเทศไทยพ.ศ. 2600 (Thailand National Spatial Development Plan 2057)	กรมโยธาธิการ และผังเมือง (DPT)	เพื่อบรรลุวิสัยทัศน์ด้านการผังเมืองของประเทศภายในปี พ.ศ. 2600 จึงมีการศึกษาและกำหนด "กรอบแนวทางการพัฒนาผังเมือง" "พื้นที่ยุทธศาสตร์และแนวทางการพัฒนาในอนาคต" "อุปสรรคสำคัญในนโยบายการพัฒนาของประเทศ" และมาตรการดำเนินงานต่าง ๆ ตามนโยบายผังเมืองในระยะเวลา 50 ปี
ภูมิภาค	นโยบายการพัฒนา ระดับภูมิภาค	กรมโยธาธิการ และผังเมือง	นโยบายการพัฒนาของ 6 ภูมิภาคซึ่งประกอบด้วยภาค กรุงเทพมหานครและปริมณฑล ภาคตะวันออก ภาคกลาง

พื้นที่	แผน	ผู้จัดทำ	สาระสำคัญ
		(DPT)	ภาคตะวันออกเฉียงเหนือ ภาคเหนือ และภาคใต้
จังหวัด	ผังเมืองรวม กรุงเทพมหานคร พ.ศ. 2556	กรุงเทพมหานคร (BMA)	แผนผังกำหนดการใช้ประโยชน์ที่ดินและการพัฒนาโครงสร้างพื้นฐาน ซึ่งระบุถึงข้อกำหนดการพัฒนาพื้นที่ เช่น ประเภทและขนาดกิจการที่จะอนุญาตให้ดำเนินการ อัตราส่วนพื้นที่อาคารรวมกันทุกชั้นของอาคารทุกหลังต่อพื้นที่แปลงที่ดินที่ใช้เป็นที่ตั้งอาคาร (FAR) อัตราส่วนพื้นที่ว่างอันปราศจากสิ่งปกคลุมของแปลงที่ดินที่อาคารตั้งอยู่ต่อพื้นที่ใช้สอยรวมของอาคาร (OSR) เป็นต้น
ระบบรถไฟฟ้าขนส่งมวลชน	แผนแม่บทระบบขนส่งมวลชนทางรางในกรุงเทพมหานครและปริมณฑล (M-MAP)	สำนักงานนโยบายและแผนการขนส่งและจราจร (OTP)	แผนพัฒนาระบบขนส่งมวลชนทางรางจำนวน 12 เส้นทาง (ระยะทาง 556 กิโลเมตร) ในภาคกรุงเทพมหานครและปริมณฑล ในแผนดังกล่าวระบุให้พื้นที่บางซื่อเป็นศูนย์กลางการขนส่งสำคัญในกรุงเทพมหานคร

ที่มา: ทีมสำรวจใจก้า

2.2 นโยบายและแผนในการพัฒนาเศรษฐกิจและอุตสาหกรรม

นโยบายสำคัญและแผนในการพัฒนาเศรษฐกิจและอุตสาหกรรมของประเทศไทยมีรายละเอียดดังในตาราง 2

ตาราง 2 นโยบายสำคัญและแผนในการพัฒนาเศรษฐกิจและอุตสาหกรรมของประเทศไทย

แผน	ผู้จัดทำ	สาระสำคัญ
ประเทศไทย 4.0	รัฐบาลไทย	รัฐบาลไทยวางนโยบายที่จะปรับจากเศรษฐกิจปัจจุบันซึ่งเน้นการลงทุนจากต่างประเทศในกลุ่มอุตสาหกรรม อาทิ รถยนต์ไฟฟ้าและอิเล็กทรอนิกส์ ปีเตอร์เคมี ฯลฯ (ยุค 3.0) ไปสู่ระบบเศรษฐกิจที่ขับเคลื่อนด้วยความรู้ ความคิดสร้างสรรค์ และนวัตกรรมโดยมุ่งเน้นไปที่อุตสาหกรรมซึ่งเน้นการใช้ความรู้ อุตสาหกรรมสีเขียว พลังงานที่นำกลับมาใช้ใหม่ได้ การให้บริการทางการแพทย์ และการขนส่ง
แผนยุทธศาสตร์ 20 ปี (พ.ศ. 2560-2579)	สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ (NESDB)	รัฐบาลไทยได้กำหนดแผนยุทธศาสตร์ชาติเพื่อเป็นนโยบาย ระยะยาว ซึ่งประกอบด้วยเป้าหมายครอบคลุม 6 ด้าน โดยมี 6 ยุทธศาสตร์สำคัญและ 4 ยุทธศาสตร์ย่อยเพื่อสนับสนุนโดยมีรายละเอียดดังในตาราง 2.2.2 หรือที่เรียกกันว่า “ยุทธศาสตร์ 6-6-4”
แผนพัฒนาเศรษฐกิจและสังคมแห่งชาติ ฉบับที่ 12	สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ (NESDB)	แผนพัฒนาฉบับที่ 12 มีสาระสำคัญที่สานต่อแนวทางการพัฒนาจากแผนฉบับที่ 11 บนวิสัยทัศน์ว่าด้วย “สังคมแห่งความสุขซึ่งมีความเท่าเทียม ความยุติธรรม และความมั่นคงมีภูมิคุ้มกัน” โดยมี 10 ยุทธศาสตร์ที่มุ่งลดความเหลื่อมล้ำของรายได้ สร้างความเข้มแข็งทางเศรษฐกิจและพัฒนาความสามารถการแข่งขันในสังคมโลก
ระเบียบเศรษฐกิจภาคตะวันออก (EEC)	สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ (NESDB)	โครงการเขตเศรษฐกิจพิเศษภาคตะวันออกมีพื้นที่เป้าหมายครอบคลุมจังหวัดชลบุรี ระยอง และฉะเชิงเทรา โดยมีนโยบายเพื่อส่งเสริมการลงทุนในอุตสาหกรรมเทคโนโลยีขั้นสูง 10 กลุ่ม เช่น ยานยนต์พลังงานไฟฟ้า ยานยนต์พลังงานไฮบริด บริการทางการแพทย์ การบิน หุ่นยนต์ เป็นต้น
นโยบายการพัฒนาเขตเศรษฐกิจพิเศษคลัสเตอร์	สำนักงานคณะกรรมการส่งเสริมการลงทุนและรัฐบาลไทย	นโยบายมีจุดมุ่งหมายเพื่อสร้างเครือข่ายวิสาหกิจและสถาบันต่างๆที่เกี่ยวข้องเพื่อเกิดการรวมกลุ่มและดำเนินงานภายในพื้นที่เดียวกัน นโยบายคลัสเตอร์ทางธุรกิจมีจุดประสงค์เพื่อผลักดันให้เกิดการยกระดับการสนับสนุนและความร่วมมือในด้านต่างๆ ทางธุรกิจเพื่อที่จะทำให้ห่วงโซ่มูลค่าทางอุตสาหกรรม แข็งแรง ขึ้น เป็น การเสริมศักยภาพด้านการลงทุนและขีดความสามารถในการแข่งขันของไทยให้เพิ่มขึ้น และขยายการพัฒนาทางด้านสังคมและเศรษฐกิจสู่ภูมิภาคและท้องถิ่น
นโยบายเขตเศรษฐกิจพิเศษบริเวณชายแดน	รัฐบาลไทย	นโยบายครอบคลุมพื้นที่บริเวณกว้างโดยมุ่งพัฒนาเขตเศรษฐกิจพิเศษในเขตชายแดนของประเทศ ซึ่งได้มีการพัฒนาความร่วมมือทางด้านเศรษฐกิจในอนุภูมิภาคลุ่มแม่น้ำโขงกันมาก่อน

ที่มา: ทีมสำรวจใจก้า

2.3 นโยบายและยุทธศาสตร์อื่นๆ

นโยบายที่เกี่ยวข้องอื่นๆ อาทิ นโยบายและยุทธศาสตร์การวิจัยของชาติ (พ.ศ.2560-2564) นโยบายและแผนวิทยาศาสตร์ เทคโนโลยีและนวัตกรรมแห่งชาติ (พ.ศ.2555-2564) ฯลฯ ซึ่งได้กล่าวถึงกลยุทธ์การพัฒนาอุตสาหกรรมการจัดงานกิจกรรมทางธุรกิจ (MICE) แนวโน้มทางการแพทย์และสุขภาพและโครงสร้างประชากรที่จะเข้าสู่สังคมสูงวัย

2.4 ความสำคัญของพื้นที่บางซื่อในประเทศไทย

จากแผนแม่บทระบบขนส่งมวลชนทางรางในกรุงเทพมหานครและปริมณฑล (M-MAP) ซึ่งจัดทำโดยสนข.ได้ให้ความสำคัญของพื้นที่บางซื่อและพื้นที่มักกะสันเป็นศูนย์กลางการขนส่งต่อเนื่องหลายรูปแบบของกรุงเทพมหานคร นอกจากนี้จากผังเมืองรวมกรุงเทพมหานคร พ.ศ.2556 ระบุให้พื้นที่บางซื่อเป็นเขตพาณิชยกรรมซึ่งอัตราส่วนพื้นที่อาคารรวมต่อพื้นที่ดิน (FAR) กำหนดไว้สูงเป็นลำดับสองรองจากพื้นที่สีลมจากพื้นที่ทั้งหมดในกรุงเทพมหานคร จากข้างต้นพื้นที่บางซื่อจึงนับว่ามีศักยภาพในการที่จะพัฒนาเป็นใจกลางในการพัฒนาพื้นที่รอบสถานีขนส่งมวลชน (Transit Oriented Development-TOD) ซึ่งจะเป็นศูนย์กลางการคมนาคมสำคัญในอนาคต

2.5 ระบบกฎหมายและนโยบายที่เกี่ยวข้องกับการพัฒนาเมือง

ระบบกฎหมายที่เกี่ยวข้องกับการพัฒนาเมืองในประเทศไทยและสาระสำคัญมีรายละเอียดดังในภาคผนวก 2-1 “รายการระบบกฎหมายที่เกี่ยวข้องกับแผนพัฒนาเมืองของญี่ปุ่นเทียบเคียงของไทย” สำหรับระบบกฎหมายของไทยมีกฎหมายและข้อกำหนดสำคัญที่เกี่ยวข้องกับการดำเนินงานพัฒนาพื้นที่บางซื่อขึ้นซึ่งเป็นโครงการขนาดใหญ่ มีดังนี้ พระราชบัญญัติการผังเมืองพ.ศ.2518 พระราชบัญญัติควบคุมอาคารพ.ศ.2522 พระราชบัญญัติจัดรูปที่ดินพ.ศ.2547 พระราชบัญญัติการจัดสรรที่ดินพ.ศ.2543 พระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติพ.ศ.2535 เกณฑ์และมาตรฐานผังเมืองรวมพ.ศ.2549 มาตรฐานผังเมืองกรุงเทพมหานครพ.ศ.2553

3. สภาพโดยทั่วไปและแผนพัฒนาที่เกี่ยวข้องกับพื้นที่บางซื่อ

3.1 สภาพปัจจุบันของพื้นที่บางซื่อ

พื้นที่บางซื่อตั้งอยู่ห่างจากจุดศูนย์กลางธุรกิจขึ้นไปทางทิศเหนือประมาณ 10 กิโลเมตร โดยห่างจากสนามบินนานาชาติสุวรรณภูมิออกไปราว 35 กิโลเมตร และห่างจากสนามบินดอนเมืองซึ่งรองรับสายการบินภายในประเทศและสายการบินต้นทุนต่ำออกไปราว 14 กิโลเมตร ทั้งนี้พื้นที่บางซื่อได้รับการวางแผนเพื่อเป็นศูนย์กลางการคมนาคมในอนาคต โดยปัจจุบันในพื้นที่และรอบข้างมีเส้นทางรถไฟฟ้ามหานคร (MRT) สายสีน้ำเงินสถานีบางซื่อและสถานีกำแพงเพชร รถไฟฟ้าบีทีเอสสถานีหมอชิต และสถานีกลางบางซื่อของรฟท.

สภาพพื้นที่ในปัจจุบันประกอบด้วยสถานีขนส่งรถโดยสารและระบบรถไฟฟ้ารวมถึงรถไฟฟ้าสายสีแดงที่กำลังดำเนินการก่อสร้าง พื้นที่บางซื่อส่วนใหญ่มีรฟท.เป็นเจ้าของโดยใช้เป็นพื้นที่เพื่อรองรับโครงการรถไฟฟ้าสายสีแดง ทั้งนี้เมื่อเทียบกับพื้นที่ซึ่งมีขนาด 33 ตารางกิโลเมตร พบว่ามีจำนวนผู้อาศัยที่ไม่หนาแน่น จากข้อมูลของรฟท. จำนวนครัวเรือนในกม.ที่11 และในพื้นที่ของรฟท. มี 1,931 ครัวเรือนและ 509 ครัวเรือนตามลำดับ จากข้อมูลขนาดครัวเรือนในพื้นที่เขตเมืองโดยเฉลี่ยคิดเป็น 3.5 คน¹ จำนวนผู้อาศัยในพื้นที่ดังกล่าว ประมาณได้เป็น 7,000 คนในพื้นที่กม.11 และ 2,000 คนในพื้นที่รฟท. ตามลำดับ

¹ สำนักงานสถิติแห่งชาติ (พ.ศ.2548)

3.2 แผนพัฒนาโดยรฟท.และสนข.

รฟท.ได้จัดดำเนินการศึกษาความเป็นไปได้เพื่อการลงทุนพัฒนาพื้นที่บางซื่อในปี พ.ศ.2558 - 2559 เพื่อที่จะสร้างมูลค่าเพิ่มของที่ดินและเพื่อการบริหารทรัพย์สินของรฟท. โดยมีพื้นที่เป้าหมายโซน "เอ" (A) ขนาด 35 ไร่ โซน "บี" (B) ขนาด 78 ไร่ โซน "ซี" (C) ขนาด 105 ไร่ ในขณะที่สนข.ได้ทำการศึกษาพื้นที่โซน "ดี" (D)) ขนาด 80 ไร่ และพื้นที่ส่วนเชื่อมต่อในช่วงเวลาเดียวกัน

3.3 แผนการเชื่อมต่อระหว่างพื้นที่โดยสนข.

แผนการเชื่อมต่อระหว่างพื้นที่ของสนข.มีวัตถุประสงค์เพื่อเสริมสร้างการเชื่อมต่อระหว่างโครงข่าย และทำให้การสัญจรสามารถเดินทางถึงกันได้ เบื้องต้นสนข.ได้เสนอระบบรถโดยสารด่วนพิเศษ (บีอาร์ที) เพื่อเป็นรูปแบบการโดยสารสาธารณะหลักในพื้นที่

นอกจากนี้สนข.ได้ประมาณการความต้องการขนส่งและจราจรในปี พ.ศ. 2565 พ.ศ.2575 และพ.ศ.2580 โดยการสำรวจปริมาณจราจรบริเวณทางแยก ข้อมูลสัมภาระณตารางการเดินทาง (O-D) อัตราความเร็วในการเดินทาง โดยคาดการณ์ว่าในแต่ละวันจะมีผู้โดยสารจำนวน 1.42 ล้านคนที่ใช้งานสถานีกลางบางซื่อ

3.4 ฟังแนวความคิดเมืองอัจฉริยะโดยปตท.

พื้นที่บางซื่อนับเป็น 1 ใน 10 พื้นที่เป้าหมายที่รัฐบาลไทยต้องการผลักดันให้เป็นเมืองอัจฉริยะ โดยมีแนวความคิดเพื่อปรับปรุงประสิทธิภาพการใช้พลังงานทั้งในส่วนของการนำประปา ก๊าซ ไฟฟ้า พลังงานความร้อน ระบบการผลิตพลังงานร่วม (Co-generation) และระบบทำความเย็น ปตท.ได้ร่วมมือกับจุฬาลงกรณ์มหาวิทยาลัยเพื่อออกแบบฟังแนวความคิดการพัฒนาเมืองอัจฉริยะสำหรับพื้นที่บางซื่อ โดยให้มีระบบเทคโนโลยีสำคัญซึ่งมีรายละเอียดดังนี้ 1) ระบบรถไฟฟ้ามหานคร (MRT) 2) จุดให้บริการอินเทอร์เน็ตไร้สาย (Wi-Fi) สาธารณะ 3) ระบบทำความเย็น

4. ข้อมูลสภาพโครงสร้างพื้นฐาน

4.1 ข้อมูลสภาพโครงสร้างพื้นฐานบริเวณพื้นที่บางซื่อ

ข้อมูลสภาพโครงสร้างพื้นฐานบริเวณพื้นที่บางซื่อมีรายละเอียดดังในตาราง 3

ตาราง 3 ข้อมูลสภาพโครงสร้างพื้นฐานบริเวณพื้นที่บางซื่อ

ประเภท	ข้อมูลโดยสรุป
ระบบขนส่งมวลชนทางรางในเมือง	สภาพการจราจรที่แออัดบนถนนเส้นหลักในกรุงเทพมหานคร เป็นสิ่งที่ทราบกันโดยทั่วไป ปัจจุบันมีผู้ใช้บริการรถไฟฟ้าบีทีเอสกันอย่างมากมายโดยมองว่าเป็นรูปแบบการเดินทางที่สะดวกสามารถหลีกเลี่ยงรถติดได้ ระบบขนส่งมวลชนทางรางในกรุงเทพมหานครที่เปิดดำเนินการอยู่ ได้แก่ รถไฟฟ้าบีทีเอส (สายสีเขียวอ่อนและสายสีเขียวเข้ม) รถไฟฟ้ามหานคร (MRT สายสีน้ำเงินและสายสีม่วง) และรถไฟฟ้าแอร์พอร์ตเรลลิงก์ เส้นทางรถไฟที่เชื่อมต่อจากใจกลางเมืองสู่ชานเมืองฝั่งตะวันออก ได้แก่ รถไฟฟ้าสายสีชมพู รถไฟฟ้าสายสีเหลือง รถไฟฟ้าสายสีส้ม ทั้งนี้ รถไฟฟ้าสายดังกล่าวยังอยู่ใน ขั้นตอนการประกวดราคา หรือระหว่างการจัดวางแผน ยังไม่ได้เริ่มการก่อสร้างจากข้อมูล ณ เดือนตุลาคม พ.ศ. 2560
รถไฟความเร็วสูง	ในปี พ.ศ. 2559 รัฐบาลไทยได้ลงนามบันทึกข้อตกลงในการนำใช้เทคโนโลยีญี่ปุ่นในโครงการรถไฟความเร็วสูงเส้นทางกรุงเทพฯ-เชียงใหม่ โดยมีระยะทางทั้งสิ้น 670 กิโลเมตร เมื่อรวมกับเส้นทางอื่นๆจะมีด้วยกัน 5 เส้นทางที่รัฐบาลไทยกำหนดที่จะพัฒนา ในโครงการรถไฟความเร็วสูง

ประเภท	ข้อมูลโดยสรุป
ถนน	บริเวณโดยรอบพื้นที่บางซื่อมีถนนหลายสายตัดผ่าน อาทิ ทางด่วนดอนเมือง-โทลเวย์ ทางด่วนศรีรัช ถนนพหลโยธิน และถนนกำแพงเพชร ฯลฯ ซึ่งดำเนินงานโดยบริษัทเอกชน การทางพิเศษแห่งประเทศไทยสังกัดกระทรวงคมนาคม และสำนักการโยธากรุงเทพมหานคร
สถานีขนส่งผู้โดยสาร	สถานีขนส่งผู้โดยสารในพื้นที่บางซื่อซึ่งเรียกกันโดยทั่วไปว่า สถานีขนส่งหมอชิต 2 ดำเนินงานโดยบริษัทขนส่งจำกัด (บขส.) ซึ่งเป็นหน่วยงานรัฐวิสาหกิจสังกัดกระทรวงคมนาคม บขส.ยังให้บริการรถโดยสารระยะทางไกลด้วย รถโดยสารระหว่างเมืองมีด้วยกัน 2 ประเภท ได้แก่ รถโดยสารขนาดใหญ่ซึ่งให้บริการในเส้นทางระยะไกลสู่เมืองทางภาคเหนือ ภาคตะวันออกเฉียงเหนือ และประเทศเพื่อนบ้าน และรถตู้โดยสารสำหรับเส้นทางระยะกลางซึ่งทำรถให้ให้บริการจะอยู่แยกกันไป สถานีขนส่งหมอชิต 2 นอกจากนั้นยังมีสถานีรถโดยสารวิ่งรอบเมือง โดยองค์การขนส่งมวลชนกรุงเทพมหานคร (ขสมก.) เป็นผู้บริหารจัดการสถานีขนส่งและให้บริการเดินรถ จากข้อมูลปี พ.ศ. 2560 มีการให้บริการเดินรถทั้งหมด 209 เส้นทาง เฉพาะในพื้นที่บางซื่อมี 14 เส้นทางเดินรถที่มีต้นทางจากสถานีขนส่งขสมก. ข้อมูลปริมาณการสัญจรตามช่วงเวลาพบว่า การขนส่งและเดินทางจากฝั่งตะวันออกมีปริมาณมากกว่าเส้นทางอื่นในช่วงกลางวันตลอด 12 ชั่วโมง ทั้งนี้มีโครงการพัฒนาทางลาดหีจุดเชื่อมต่อสู่ภาคเหนือในเร็ววันนี้ จึงคาดว่าปริมาณการสัญจรจากทิศเหนือจะเพิ่ม มากขึ้นในอนาคต
ระบบระบายน้ำฝน	ระบบระบายน้ำฝนมีสำนักการระบายน้ำกรุงเทพมหานครทำการบริหารและดำเนินงาน พื้นที่บางซื่อตั้งอยู่ในที่ราบลุ่มแม่น้ำเจ้าพระยา ทั้งนี้ภูมิประเทศกรุงเทพมหานครเป็นพื้นที่ราบมีความสูงเฉลี่ยจากระดับน้ำทะเลประมาณ 0 เมตร การระบายน้ำอาศัยคลองตามธรรมชาติและทางระบายน้ำเพื่อที่จะระบายน้ำสู่แม่น้ำเจ้าพระยาซึ่งจะทำงานได้ดีในช่วงน้ำลง ดังนั้นการระบายน้ำโดยปกติจะใช้สถานีสูบน้ำและประตูน้ำในการปรับและระบายน้ำฝนสู่แม่น้ำเจ้าพระยา ทั้งนี้มีแผนที่จะก่อสร้างอุโมงค์ระบายน้ำใต้คลองบางซื่อเพื่อที่จะ ระบายน้ำสู่แม่น้ำเจ้าพระยาโดยตรง
ระบบน้ำประปา	ระบบน้ำประปาในกรุงเทพมหานครมีกรมประปานครหลวงเป็นผู้ให้บริการ โดยพื้นที่บางซื่ออยู่ในเขตสำนักงานประปาสภาวทยาไท กรมประปาฯสามารถจ่ายน้ำให้กับพื้นที่กรุงเทพมหานครได้ 98% น้ำประปาในพื้นที่บางซื่อผลิตโดยโรงผลิตน้ำบางเขน (กำลังผลิต 3.9 ล้านลูกบาศก์เมตรต่อวัน) และส่งน้ำโดยโรงสูบน้ำพหลโยธิน
ระบบระบายน้ำเสีย	ระบบระบายน้ำเสียในกรุงเทพมหานครมีสำนักการระบายน้ำกรุงเทพมหานครเป็นผู้ให้บริการ ในบริเวณใกล้เคียงพื้นที่บางซื่อมีโรงบำบัดน้ำเสีย 2 แห่ง ได้แก่ โรงบำบัดน้ำเสียบางซื่อ (120,000ลูกบาศก์เมตรต่อวัน) โรงบำบัดน้ำเสียจตุจักร (150,000ลูกบาศก์ เมตรต่อวัน)
ระบบการไฟฟ้า	พื้นที่บางซื่อและบริเวณใกล้เคียงได้รับพลังงานไฟฟ้าซึ่งจ่ายโดยสถานีย่อย 2 แห่งของ กรมไฟฟ้านครหลวง นอกจากนีรฟท.ยังมีแผนตกลงร่วมกับการไฟฟ้านครหลวงที่จะ พัฒนาสถานีไฟฟ้าย่อยแห่งใหม่ขนาดประมาณ 6,400 ตารางเมตรในอนาคต
ทอส่งน้ำมันและก๊าซ	ในพื้นที่บางซื่อมีทอส่งน้ำมันและทอส่งก๊าซในรูปแบบทอฝังอยู่ใต้ดิน ทั้งนี้ ทอส่งก๊าซมี ไว้เพื่อธุรกิจและอุตสาหกรรม ในขณะที่ครัวเรือนใช้ก๊าซโปรเพนเพื่อการหุงต้ม
ระบบกำจัดขยะ	การกำจัดขยะในกรุงเทพมหานครบริหารจัดการโดยสำนักสิ่งแวดล้อมกรุงเทพมหานคร ขยะในเมืองจะถูกรวบรวมไปที่สถานีขนถ่ายขยะมูลฝอย 3 แห่ง (สายไหม หนองแขม และ อ่อนนุช) และขยะจะถูกแยกออกเป็นขยะทั่วไป ขยะอันตรายจากโรงพยาบาลและโรงงาน และขยะรีไซเคิล หลังจากนั้นจะผ่านกระบวนการนำกลับมาใช้ใหม่ หรืออัด/เผา ขยะที่ ผ่านการกำจัดเบื้องต้นจะถูกส่งต่อไปยังโรงกำจัดสุดท้ายที่จังหวัดนครปฐม หรืออำเภอ พนมสารคามจังหวัดฉะเชิงเทราเพื่อฝังกลบ

ที่มา: ทีมสำรวจใจกล้า

5. การคาดการณ์ความต้องการในอนาคต

5.1 ผู้โดยสารรถไฟฟ้าในและรอบบริเวณพื้นที่บางซื่อ

การคาดการณ์จำนวนผู้โดยสารรถไฟฟ้าทั้งในและรอบบริเวณพื้นที่บางซื่อใช้วิธีประมาณการจาก 1) จำนวนผู้โดยสารซึ่งมาเปลี่ยนต่อรถที่สถานีกลางบางซื่อ 2) คนในพื้นที่บางซื่อที่เข้ามาเพื่อกิจกรรมต่างๆที่ออกแบบไว้ 3) ผู้มาเที่ยวชมทำกิจกรรมจากนอกพื้นที่บางซื่อ ตัวเลขจำนวนเที่ยวต่อคนต่อวันประมาณการไว้ที่ 2.0 -2.2 เทียบตามจุดประสงค์การเดินทาง สัดส่วนการใช้รถไฟฟ้าในพื้นที่บางซื่อคาดการณ์ว่าจะสูงถึง 40% ในอนาคต

จากประมาณการข้างต้น คาดว่าจะเกิดการเดินทางในพื้นที่บางซื่อทั้งสิ้น 136,000 เที่ยวในปีพ.ศ.2565 เพิ่มขึ้น 359,600 เที่ยวในปี พ.ศ.2570 และเพิ่มเป็น 624,000 เที่ยวในปี พ.ศ.2575 โดยตั้งอยู่บนสมมติฐานว่าหากมีการพัฒนาอย่างสอดคล้องประสานรวมพลังและมีประสิทธิภาพภายใต้แผนแม่บทฉบับบูรณาการ

5.2 ความต้องการของตลาดอสังหาริมทรัพย์ในกรุงเทพมหานครและสภาพการณ์ (ผลประมาณการต้นฉบับ)

การประมาณการความต้องการด้านอสังหาริมทรัพย์ในพื้นที่บางซื่อในอนาคตใช้ข้อมูลปัจจุบันของตลาดอสังหาริมทรัพย์ซึ่งประกอบด้วยข้อมูลจำนวนอสังหาริมทรัพย์ที่มีในสต็อกในช่วงปี พ.ศ. 2549-2559 และปริมาณพื้นที่อาคารรวมในช่วงปี พ.ศ.2560-2564 โดยตั้งสมมติฐานว่าอุปทานของตลาดจะสามารถรองรับความต้องการของตลาดได้ ในการศึกษาจึงประมาณการบนพื้นฐานว่าอุปทานของตลาดในอนาคตคือขนาดความต้องการของอสังหาริมทรัพย์ในอนาคต จากข้อมูลคาดการณ์จำนวนอสังหาริมทรัพย์ในสต็อกในปี พ.ศ.2564 ได้มีการประมาณการอุปทานของอสังหาริมทรัพย์ในเขตจตุจักร (ประมาณการต้นฉบับ) ในพ.ศ.2570, พ.ศ.2575, พ.ศ.2580 ไว้ตามข้อมูลดังกล่าวประมาณการอุปทานของอสังหาริมทรัพย์ในปี พ.ศ.2575 คิดเป็นพื้นที่สำนักงาน 55,704 ตารางเมตร(พื้นที่อาคารรวมสุทธิ) พื้นที่เพื่อการค้าปลีก 91,748 ตารางเมตร (พื้นที่อาคารรวม) คอนโดมิเนียม 27,367 หน่วย โรงแรม 656 ห้อง

6. รายงานสรุปเชิงหลักการโครงการพัฒนาพื้นที่ และแนวทางการพัฒนา

6.1 ประโยชน์ใช้สอยของเมืองที่จำเป็นในพื้นที่บางซื่อ

ประโยชน์ใช้สอยของเมืองที่จำเป็นในพื้นที่บางซื่อในผลศึกษาได้มาจากการทบทวนและวิเคราะห์แผนระดับนโยบายหรือแผนที่อยู่ในปัจจุบัน ความต้องการของตลาดอสังหาริมทรัพย์ และบทเรียนที่ถอดจากประสบการณ์ในอดีตของญี่ปุ่นโดยมีรายละเอียดดังในตาราง 4 สำหรับประโยชน์ใช้สอยสำคัญ ได้แก่ “ศูนย์ราชการ” “ศูนย์ประชุมและแสดงสินค้า (MICE)” “ศูนย์บ่มเพาะอุตสาหกรรมใหม่ (New Industry Incubation Center)” โดยประโยชน์ที่จะเกิดตามมาเป็นแหล่งสร้างรายได้สำคัญสำหรับเจ้าของที่ดิน สำนักงาน การค้าพาณิชย์ ที่อยู่อาศัย และโรงแรม

ตาราง 4 ประโยชน์ใช้สอยของเมืองที่จำเป็นในพื้นที่บางซื่อ

	แนวทาง 1	แนวทาง 2	แนวทาง 3
<u>ความท้าทาย</u>	<u>พื้นที่ราชการในบรรยากาศที่สะดวกสบาย</u> <u>สร้างสรรค์ ดึงดูดผู้มาใช้บริการ</u>	<u>จุดประสงค์ของผู้ที่เข้ามาในพื้นที่ที่</u> <u>หลากหลายมากขึ้น</u>	<u>เสริมสร้างอุตสาหกรรมอุดมปัญญา</u> <u>เน้นการวิจัยและพัฒนา</u>
<u>ประโยชน์ใช้สอยสำคัญ</u>	<u>ศูนย์ราชการ</u>	<u>ศูนย์ประชุมและแสดงสินค้า</u>	<u>ศูนย์บ่มเพาะอุตสาหกรรมใหม่</u>
<u>ประโยชน์ร่วม</u>	• อาคารราชการ • พิพิธภัณฑ์ • สำนักงาน • ธุรกิจการค้า • ที่อยู่อาศัย • โรงแรม	• ศูนย์ประชุม • โรงแรม • สำนักงาน • ธุรกิจการค้า • ที่อยู่อาศัย • พิพิธภัณฑ์	• สำนักงาน • มหาวิทยาลัย • ธุรกิจการค้า • ที่อยู่อาศัย • พิพิธภัณฑ์ • โรงแรม
<u>ผลที่คาดหวัง</u>	• รับประกันจำนวนผู้โดยสารรถไฟฟ้าโครงการใหม่ • เกิดการพัฒนาโครงสร้างพื้นฐานอย่างรวดเร็ว	• รับประกันจำนวนผู้โดยสารรถไฟฟ้าโครงการใหม่ • นำโอกาสทางธุรกิจมาสร้างประโยชน์สูงสุด	• รับประกันจำนวนผู้โดยสารรถไฟฟ้าโครงการใหม่ • ก่อร่างสร้างแนวทางอุตสาหกรรมของประเทศ

ที่มา: ทีมสำรวจใจกล้า

6.2 รายงานสรุปเชิงหลักการการพัฒนา(ร่าง)

สรุปสาระสำคัญของร่าง "รายงานสรุปเชิงหลักการการพัฒนา" มีรายละเอียดดังในตาราง 5 สำหรับร่าง"รายงานสรุปเชิงหลักการการพัฒนา" แสดงในภาคผนวก 6-1

ตาราง 5 สรุปสาระสำคัญของร่าง "รายงานสรุปเชิงหลักการการพัฒนา"

หัวข้อ	รายละเอียด
วิสัยทัศน์	บางซื่อ – ประตูสู่เทพนคร (Gateway to "City of Angels")
นโยบายพื้นฐาน	<u>แนวคิด 1:</u> เพื่อสร้างจุดศูนย์กลางซึ่งจะเป็นแกนดึงดูดในพื้นที่มหานครกรุงเทพฯ อันจะมีบทบาทสำคัญในสังคมนานาชาติ (1) สร้างศูนย์กลางทางธุรกิจและการแลกเปลี่ยนในระดับภูมิภาคและระดับประเทศ (2) สร้างหลักประกันความยั่งยืนทั้งในด้านความปลอดภัยและเป็นมิตรต่อสิ่งแวดล้อม <u>แนวคิด 2:</u> เพื่อสร้างเมืองอันเป็นศูนย์กลางแห่งใหม่ที่เต็มไปด้วยเสน่ห์มากมายซึ่งผู้คนจะหลงรักไม่เสื่อมคลาย (1) สร้างความมีเสน่ห์ดึงดูดของชีวิตในเมืองใหญ่ซึ่งหลากหลายผสมผสานรูปแบบเก่าใหม่ มีทั้งตลาดนัดจนกระทั่งตึกสูงระฟ้าทันสมัย (2) สร้างพื้นที่ทางเดินที่สะดวกสบายซึ่งผู้คนจะรู้สึกเพลิดเพลินไปกับการเดินทอดน่องสัญจรไปบนระเบียบทางเดิน <u>แนวคิด 3:</u> เพื่อสร้างสถานี่ขนส่งซึ่งเป็นมิตรกับผู้เดินทางที่ไม่ว่าใครก็ใช้งานได้ง่าย สะดวกสบาย (1) สร้างสถานี่ขนส่งมาตรฐานโลกซึ่งทั้งคนไทยและคนต่างชาติเข้าใจง่าย ใช้งานสะดวก (2) เพิ่มความสะดวกสำหรับผู้โดยสารในการเปลี่ยนต่อรถหลากหลายรูปแบบ <u>แนวคิด 4:</u> ภาครัฐและเอกชนได้ร่วมมือกันเพื่อให้แผนหลักการสู่การปฏิบัติ (1) เพื่อส่งเสริมความร่วมมือระหว่างภาครัฐและเอกชนในรูปแบบต่างๆ โดยภาครัฐเป็นผู้ริเริ่มเพื่อขับเคลื่อนให้แผนหลักการสู่การปฏิบัติ

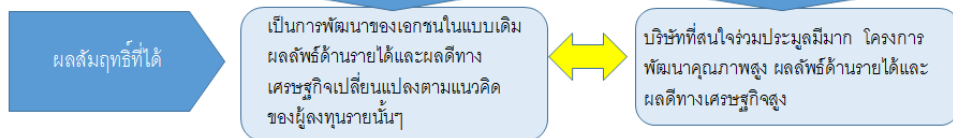
ที่มา: ทีมสำรวจใจกล้า

6.3 แนวทางในการพัฒนา

ในการพัฒนาโครงการตามแนวคิดข้างต้นมีด้วย 2 แนวทาง ได้แก่ แนวทางที่ 1:"การพัฒนาแบบแยกส่วน" และแนวทางที่ 2:"การพัฒนาแบบบูรณาการ" โดยมีรายละเอียดดังในตาราง 6 และตาราง 7 สำหรับแนวทางที่ 1 เป็นการพัฒนาโดยภาคเอกชนซึ่งตั้งอยู่บนจุดประสงค์เฉพาะของเอกชนรายนั้นๆ ส่วนแนวทางที่ 2 เป็นการตั้งให้เป็นโครงการระดับประเทศโดยกำหนดเป็นนโยบายที่จะยกระดับมูลค่าโดยรวมของพื้นที่บางซื่อด้วยแผนพัฒนาอย่างเป็นองค์รวมเพื่อที่จะสร้างให้เกิดผลประโยชน์สูงสุดกับผู้ลงทุน ในการที่จะสร้างหลักประกันการพัฒนาพื้นที่บางซื่ออย่างยั่งยืน โดยจัดวางให้เกิดประโยชน์ใช้สอยของเมืองใหญ่ตามที่แสดงในตาราง 4 โครงการพัฒนาโดยการนำของรัฐบาลเป็นสิ่งที่สำคัญอย่างยิ่ง จากข้างต้นผลการศึกษานี้จึงเสนอให้ใช้แนวทางที่ 2

ตาราง6 ผลสรุปเปรียบเทียบ “แนวทางพัฒนาแบบบูรณาการ” กับ “แนวทางพัฒนาแบบแยกส่วน”

กรอบการพัฒนา/ เงื่อนไขการลงทุน		แผน 1: แผนพัฒนาแบบแยกส่วน	แผน 2: แผนพัฒนาแบบบูรณาการ
กรอบการพัฒนา	วางนโยบายแผนแม่บท	แผนแม่บทอนุมัติโดยคณะกรรมการบริหารฟท.	แผนแม่บทอนุมัติโดยคณะรัฐมนตรี โดยถือเป็นโครงการพัฒนาพื้นที่พิเศษ
	รายละเอียดแผนแม่บท	ทำได้ในขอบเขตที่เอกชนสามารถพัฒนาได้เช่น พัฒนาสำนักงานให้เช่า ค้าปลีก ที่อยู่อาศัย	พัฒนาผลิตภัณฑ์มูลค่าเพิ่มและเป็นการประสานพลังระหว่างรัฐและเอกชนเกิดประโยชน์สูงสุดบนแนวคิดการพัฒนาในรูปแบบ TOD/เมืองอัจฉริยะ
	โครงสร้างการดำเนินงาน	การดำเนินงานระหว่างฟท.กับบริษัทเอกชน	ขับเคลื่อนโดย3เสาหลักได้แก่ รัฐบาล ฟท. และเอกชน
	กระบวนการประสานงาน	ประสานงานกับแต่ละหน่วยงานรัฐที่เกี่ยวข้อง	ผลักดันการพัฒนาในรูปแบบพื้นที่พิเศษผ่านกลไกช่องทางอนุมัติเบ็ดเสร็จในจุดเดียว (One stop)
	ขั้นตอนการพัฒนา	พัฒนาจากที่ดินผืนที่ว่างก่อนตามลำดับ	พัฒนาอย่างเป็นระบบขั้นตอนโดยมุ่งหวังเพิ่มมูลค่าที่ดิน
เงื่อนไขการลงทุน	ขั้นตอนประมวล PPP	เงื่อนไขประมวลและเอกสารต่างๆมีลักษณะไม่ยืดหยุ่น	เกิดเงื่อนไขการประมวลและเอกสารต่างๆผ่านการพูดคุยเจรจากับภาคเอกชนอย่างสร้างสรรค์ เกิดการรับประกันในด้านผลกำไรจากการปล่อยสินเชื่อแก่โครงการ(bankability)
	ระยะเวลาเช่าซื้อ	30 ปี	50 ปี (จากมาตรการพิเศษของกรุงเทพมหานคร)
	การสนับสนุนของรัฐ	ไม่มี	สิทธิประโยชน์ทางภาษีและระยะผ่อนปรนการชำระเงินคืนซึ่งเป็นส่วนหนึ่งของการสนับสนุนการพัฒนาพิเศษ



ที่มา: ทีมสำรวจใจกล้า

ตาราง7 ผลต่างระหว่างแนวทางพัฒนาแบบแยกส่วนกับแนวทางพัฒนาแบบบูรณาการ

ภาครัฐ/ภาคเอกชน	ประโยชน์ใช้สอยพื้นที่อาคาร	แผน 1: แผนพัฒนาแบบแยกส่วน	แผน 2: แผนพัฒนาแบบบูรณาการ
การพัฒนาในส่วนของเอกชน	สำนักงาน	-กรณีสัญญาเช่า 30 ปี การพัฒนาอาคารสำนักงานตึกะที่อาคาร A เป็นเชิงยาว การพัฒนาจะถูกจำกัดทำได้เพื่ออาคารความสูงปานกลาง เกต B ใช้เป็นอาคารสำนักงานเพื่อสนับสนุน เป็นต้น	-สามารถพัฒนาเป็นอาคารระที่ เกต A เพื่อเป็นอาคารสำนักงานสำหรับสำนักงานในชุมชนบริษัทได้ -อย่างไรก็ดีต้องประเมินสุขภาพของอาคารสำนักงานโดยรอบให้เกิดสมดุล เช่น กำหนดจุดพัฒนาของสำนักงานใหม่จนถึงปีพ.ศ.2570 ปีที่ 20% ของอุปทานรวมในพื้นที่กรุงเทพมหานครเหนือ
	ค้าปลีก	-ถูกจำกัดโดยอุปสงค์บนเวียน(flow-demand)ของผู้ใช้งานเพื่อผ่านสถานีกลาง เนื่องจากจะเป็นการพัฒนาลักษณะร้านค้าปลีกขนาดเล็กถึงกลางตอบสนองการจับจ่ายรายวัน	-การค้าปลีกในรูปแบบอุปสงค์บนเวียน และอุปสงค์คงเหลือ(flow and stock demand) ที่เกิดจากสำนักงานและที่อยู่อาศัย โดยเป็นการค้าปลีกขนาดเล็กใหญ่ซึ่งผู้ใช้งานมีจุดมุ่งหมายตั้งใจมาจับจ่ายที่นี่
	โรงแรม	-โรงแรมชั้นนักธุรกิจ โรงแรมขนาดกลางสำหรับกลุ่มลูกค้าจากต่างประเทศที่เข้ามาทำงานเป็นครั้งคราว	-โรงแรมชั้นนำ ขนาดสี่หรือห้าดาวซึ่งสามารถดึงดูดลูกค้าต่างประเทศ
	คอนโดมิเนียม/ที่พักอาศัย	-เนื่องจากเป็นการเช่า30ปี การสร้างบ้านเพื่ออยู่อาศัยจึงมีข้อจำกัด การพัฒนาคอนโดมิเนียมเองก็จะถูกจำกัดด้วยรูปแบบการเช่าระยะสั้น ปริมาณพื้นที่ที่จะพัฒนาจะถูกจำกัดตามไปด้วย	-กรณีสัญญาเช่า 50ปี สามารถพัฒนาคอนโดมิเนียมและบ้านที่อยู่อาศัยที่ถือครองสิทธิในช่วงหนึ่งได้ เมื่อมีการพัฒนาโครงการสีเขียวเริ่มเข้าด้วยกันทำให้เป็นแหล่งที่อยู่อาศัยชั้นนำ
	ศูนย์ประชุมและแสดงสินค้า(MICE)	-เนื่องจากอาจจะทำให้พื้นที่เป็นจุดขายหรือแหล่งดึงดูดซึ่งต้องมาทำได้อีก ไม่เชิงไม่มีความจำเป็น	-เกิดโมเดล และต้องโดดเด่นแตกต่างกับโมเดลอื่นในกรุงเทพมหานครเพื่อให้มีความสามารถในการแข่งขันทั้งในด้านขนาด และประโยชน์ใช้สอย
การพัฒนาในส่วนของภาครัฐ	ระบบการคมนาคมขนส่ง(ถนนภายในทางเดินรถไฟฟ้า ที่จอดรถและต่อรถอื่น ลานจอดรถแท็กซี่ ฯลฯ)	-งบประมาณรัฐมีจำกัดและใช้เวลานานในการพิจารณา ทำให้พัฒนาได้เพียงระบบการคมนาคมที่เป็นส่วนเสริมให้กับการพัฒนาโดยเอกชน ผลคือต้องยอมรับข้อจำกัดเรื่องความไม่สะดวกสบายในการเดินทางในเมือง	-สามารถผลักดันการพัฒนาคมนาคมขนส่งแบบTODให้เร็วกว่าแผนได้บนงบประมาณของรัฐ และวิธีรูปแบบPPPบนเงื่อนไขการจ่ายเมื่อพร้อม(Availability Payment) ผลที่ได้คือระบบคมนาคมในเมืองที่มีความสะดวกสบายสูง
	โครงข่ายสีเขียวและพื้นที่สีเขียวทางระบายอากาศ ฯลฯ)	-การประสานงานด้านผังเมืองทำได้ล่าช้า เนื่องจากเป็นแผนพัฒนาที่ดินของฟท. โดยฟท. ผลทำให้โครงข่ายสีเขียวถูกจำกัดไม่เข้าสู่การพัฒนา	-เนื่องจากเป็นแผนที่ผ่านการอนุมัติโดยรัฐมนตรี ซึ่งเนื่องจากที่เป็นแผนผังเมืองจึงมีงบประมาณด้วย ทำให้เกิดการพัฒนาคู่มือสีเขียวในอุดมคติได้ จากข้างต้นส่งผลให้เกิดมูลค่าเพิ่มในการพัฒนาย่านที่อยู่อาศัย และส่งผลดีในด้านภายนอกให้เข้ามาเพิ่มขึ้น
	โครงสร้างพื้นฐาน (ระบบบำบัดน้ำ ไฟ ก๊าซ) ระบบประปาพลังงานและระบบสิ่งแวดล้อม	-การพัฒนาโครงสร้างพื้นฐานเกิดล่าช้าเนื่องจากต้องประสานงานกับหน่วยงานราชการหลายส่วน ภาคเอกชนยังจำกัดกำลังอำนาจความสะดวกด้านสิ่งแวดล้อมแยกต่างหาก ทำให้ประสิทธิภาพของทั้งระบบไม่ดี	-ด้วยการที่มีหน่วยงานกลางที่เป็นประธานเบ็ดเสร็จ(One-stop) ทำให้การพัฒนาแบบดำเนินการได้รวดเร็ว สำหรับระบบเพื่อมุ่งสร้างเมืองอัจฉริยะก็จะมีงบประมาณมาด้วย

ที่มา: ทีมสำรวจใจกล้า

6.4 bการปรับผลการคาดการณ์ความต้องการอสังหาริมทรัพย์สำหรับแนวทางที่ 2 (แนวทางพัฒนาแบบบูรณาการ)

ความต้องการด้านอสังหาริมทรัพย์หลังปี พ.ศ. 2564 ซึ่งได้ประมาณการไว้ตามหัวข้อ 5.2 เป็นการคำนวณแนวโน้มด้วยวิธีกำลังสองน้อยที่สุด (least squares method) จากข้อมูลจนถึงปัจจุบันและปริมาณอุปทานของพื้นที่อาคารที่มีการวางแผนไว้ ทั้งนี้ หากเป็นการพัฒนาตามแนวทางที่ 2 ซึ่งนำโดยรัฐบาลในการพัฒนาพื้นที่บางซื่อแบบบูรณาการให้เกิดมูลค่าเพิ่มโดยรวมสูงสุด คาดการณ์ว่าจะเกิดความความต้องการด้านอสังหาริมทรัพย์มากขึ้น ในการศึกษาจึงมีการปรับค่าประมาณการโดยอ้างอิงตามเงื่อนไขของแนวทางที่ 2 โดยอุปทานด้านอสังหาริมทรัพย์ในเขตจตุจักร (ประมาณการด้วยค่าสูงสุดสำหรับแนวทางที่ 2) ในปี พ.ศ. 2575 มีรายละเอียดดังนี้ พื้นที่สำนักงาน 530,742 ตารางเมตร (พื้นที่อาคารรวมสุทธิ) พื้นที่เพื่อการค้าปลีก 730,664 ตารางเมตร (พื้นที่อาคารรวม) คอนโดมิเนียม 31,735 หน่วย โรงแรม 6,249 ห้อง

ประมาณการขนาดพื้นที่อาคารรวม (Gross floor area) ในอนาคตในเขตจตุจักรในปี พ.ศ. 2575 มีรายละเอียดดังในตาราง 8

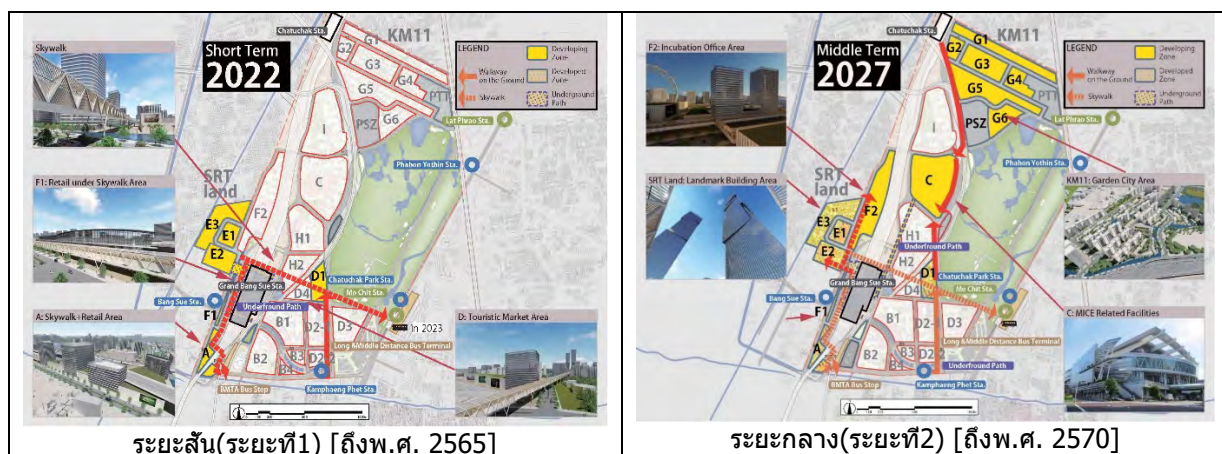
ตาราง 8 พื้นที่อาคารรวมในเขตจตุจักรในปี พ.ศ. 2575 (แนวทางที่ 2)

ประเภท	พื้นที่อาคารรวม	สัดส่วน
1) พื้นที่สำนักงาน	884,570 m ²	15.8%
2) พื้นที่เพื่อการค้าปลีก	730,664 m ²	13.0%
3) คอนโดมิเนียม	3,626,902 m ²	64.7%
4) โรงแรม	364,518 m ²	6.5%
รวม	5,606,654 m ²	100.0%

หมายเหตุ ประมาณการอุปทานในผลศึกษาเพื่อพิจารณาความต้องการและอุปสงค์ของตลาด
ที่มา: ทีมสำรวจใจกา คำนวณอ้างอิงจากข้อมูลโจนส์ แลง ลาซาลส์

6.5 การพัฒนาอย่างเป็นขั้นตอน

การพัฒนาอย่างเป็นขั้นตอนมีรายละเอียดดังรูป 2 และตาราง 9 การศึกษานี้ได้ผลสรุปสำหรับการพัฒนาอย่างเป็นขั้นตอนโดยพิจารณาจากมุมมองดังนี้ (ก) ช่วงเวลาเปิดให้บริการระบบรถไฟฟ้ามวลชนที่อยู่ระหว่างการก่อสร้างและที่จะก่อสร้างในอนาคต (ข) ขั้นตอนการเตรียมความพร้อมของที่ดิน (การได้สิทธิพัฒนาที่ดิน ช่วงเวลาการพัฒนาโครงสร้างพื้นฐานโดยภาครัฐเพื่อเพิ่มราคาที่ดิน) (ค) ความต้องการของตลาด (ง) การจัดหาเงินทุน





ที่มา: ทีมสำรวจใจก้า

รูป 2 ข้อเสนอการพัฒนาอย่างเป็นขั้นตอนแยกรายพื้นที่

ตาราง 9 ข้อเสนอการพัฒนาอย่างเป็นขั้นตอนแยกรายพื้นที่

ลำดับ	พื้นที่ / ระบบ	ระยะสั้น (ถึงพ.ศ. 2565)	ระยะกลาง (ถึง พ.ศ. 2570)	ระยะยาว (ถึงพ.ศ. 2575)
1	รถไฟฟ้าสายสีแดง / สถานีกลาง	เริ่ม-จบ	เสร็จสมบูรณ์	เสร็จสมบูรณ์
2	รถไฟฟ้าแอร์พอร์ตลิงก์	เริ่ม-จบ	เสร็จสมบูรณ์	เสร็จสมบูรณ์
3	โซน A	เริ่ม-จบ	เสร็จสมบูรณ์	เสร็จสมบูรณ์
4-1	โซน D1	เริ่ม	จบ	เสร็จสมบูรณ์
4-2*	โซน D2/D3*	-	-	เริ่ม*
5	ทางเดินเชื่อมตอลอยฟ้า (ทางแยก A-D)	เริ่ม	จบ	เสร็จสมบูรณ์
6-1	โซน B1, B2*	-	-	เริ่ม-จบ*
6-2	โซน B3, B4*	-	-	เริ่ม*
7	โซน C*	-	เริ่ม-จบ*	เสร็จสมบูรณ์*
8	กม.11(โซน G)*	-	เริ่ม-จบ*	เสร็จสมบูรณ์*
9	โครงการพัฒนาที่ราชพัสดุ (BKT, หมอชิตเก่า)	เริ่ม	จบ	เสร็จสมบูรณ์
10	รถโดยสารด่วนพิเศษ(บีอาร์ที รถโดยสารวิ่งรอบ)*	-	เริ่ม-จบ*	เสร็จสมบูรณ์
11-1*	ที่ดินรฟท. (โซน E1, E3)*	เริ่ม-จบ*	เสร็จสมบูรณ์*	เสร็จสมบูรณ์*
11-2*	ที่ดินรฟท. (โซน E2)*	เริ่ม*	จบ*	เสร็จสมบูรณ์*
12*	โซน F*	-	เริ่ม-จบ*	เสร็จสมบูรณ์*
13*	โซน H*	-	-	เริ่ม*
14*	โซน I*	-	-	เริ่ม-จบ*

หมายเหตุ ช่องที่ระบายสีเป็นหัวข้อซึ่งเสนอโดยผังญี่ปุ่น ช่องที่มีสัญลักษณ์ * คือหัวข้อที่เสนอต่างไปจาก ข้อเสนอแรกเริ่มของผังไทย

หมายเหตุ การเปิดให้บริการของรถไฟฟ้าสายสีแดง สถานีกลาง และรถไฟฟ้าแอร์พอร์ตลิงก์เป็นไปตามกรอบเวลาตามแผนปัจจุบันของผังไทย

ที่มา: ทีมสำรวจใจก้า (เริ่ม: ก่อสร้าง, จบ: เปิดให้บริการ)

7. แผนพัฒนาพื้นที่บางซื่อ

7.1 นโยบายพื้นฐาน

ในการจัดทำแผนพัฒนาพื้นที่บางซื่อ เพื่อให้บรรลุวัตถุประสงค์ตาม “วิสัยทัศน์” ที่ได้ตั้งไว้ ในการศึกษานี้ได้พิจารณาปัจจัยแวดล้อม อาทิ แผนในระดับนโยบาย สภาพเงื่อนไขในพื้นที่ และทิศทางทางเศรษฐกิจและสังคม ประกอบกับรายละเอียดของแผนโครงการซึ่งทางรฟท.และสนข.ได้จัดทำขึ้น และนำความรู้และประสบการณ์จากเมื่อครั้งที่ญี่ปุ่นทำการพัฒนาเมืองขนาดใหญ่มาใช้ ผลศึกษาได้ข้อสรุปนโยบายพื้นฐานและข้อควรพิจารณาใน

แผนพัฒนาโดยมีรายละเอียดดังตาราง 10

ตาราง 10 นโยบายในการวางแผนพัฒนา

นโยบาย	ข้อควรพิจารณาในแผนพัฒนา
(1) เพื่อสร้างจุดศูนย์กลางซึ่งจะเป็นแกนดึงดูดในพื้นที่มหานคร กรุงเทพฯ อันจะมีบทบาทสำคัญในสังคมนานาชาติ	• การจัดทำแผนแม่บทฉบับบูรณาการเพื่อนำสู่การฟื้นฟูพื้นที่ทั้งหมดให้ประสบความสำเร็จ • การสร้างสิ่งอำนวยความสะดวกสำคัญอันได้แก่ สิ่งปลูกสร้างที่เป็นสัญลักษณ์ของเมือง เมืองอัจฉริยะ ฯลฯ • การพัฒนาให้เกิดประโยชน์ใช้สอยของเมืองใหญ่อันเป็นเสน่ห์ที่จะผลักดันศักยภาพการพัฒนาของพื้นที่ทั้งหมด
(2) เพื่อสร้างเมืองอันเป็นศูนย์กลางแห่งใหม่ที่เต็มไปด้วยเสน่ห์มากมายซึ่งผู้คนจะหลงรักไม่เสื่อมคลาย	• การพัฒนาระบบอำนวยความสะดวกพื้นฐานที่จะทำให้เกิดการเชื่อมต่อและเกิดโครงข่ายระหว่างพื้นที่ย่อย • การพัฒนาโครงสร้างพื้นฐานและพื้นที่สาธารณะที่จะเพิ่มศักยภาพของพื้นที่ทั้งหมด • การจัดเตรียมแนวทางที่จะส่งเสริมให้เกิดการพัฒนาพื้นที่ที่เป็นไปอย่างสมดุล • การพัฒนาโครงสร้างพื้นฐานและสิ่งอำนวยความสะดวกที่ระดับมูลค่าอันจะส่งผลให้ศักยภาพของพื้นที่สูงขึ้น • การสร้างและประชาสัมพันธ์ให้ผู้คนรู้จักการใช้งานและประโยชน์ใช้สอยซึ่งจะเพิ่มศักยภาพของพื้นที่ทั้งหมด • การวางแผนทางที่จะขับเคลื่อนการสร้างเมืองอย่างเป็นขั้นตอนตามแผน
(3) เพื่อสร้างสถานีขนส่งซึ่งเป็นมิตรกับผู้เดินทางที่ไม่ใช่ใครก็ใช้งานได้ง่าย สะดวกสบาย	• การสร้างการเชื่อมต่อเพื่อเปลี่ยนต่อระหว่างสถานีรถไฟกับรูปแบบการเดินทางอื่นๆให้ทำได้สะดวก • การสร้างทางเดิน และลานกว้างสาธารณะ • การนำรูปแบบการขนส่งเพื่อป้อนคน(เช่น รถ BRT) และระบบการขนส่งและการจราจรอัจฉริยะ (ITS) มาใช้ในพื้นที่
(4) ภาครัฐและเอกชนได้ร่วมมือกันเพื่อให้แผนหลักการสู่การปฏิบัติ	• การจัดทำแผนการดำเนินงานอย่างเป็นขั้นตอนเพื่อให้ปฏิบัติได้จริงและเห็นผลสัมฤทธิ์ • การส่งเสริมการนำศักยภาพของภาคเอกชนในด้านเงินทุน และโครงการริเริ่มมาใช้ • พิจารณาการแบ่งบทบาทหน้าที่ระหว่างภาครัฐและเอกชนเพื่อที่จะให้เกิดความร่วมมือที่ต่างฝ่ายต่างได้ประโยชน์

ที่มา: ทีมสำรวจใจก้า

7.2 แผนพัฒนาโครงสร้างพื้นฐานของเมือง

ผลการศึกษานี้ได้ข้อสรุปแผนพัฒนาพื้นที่บางซื่อโดยมีโครงสร้างพื้นฐาน สิ่งแวดล้อมและโครงข่ายประหยัดพลังงาน โครงข่ายการคมนาคมซึ่งมีรายละเอียดดังตาราง 11

ตาราง 11 หัวข้อพิจารณาที่เกี่ยวข้องเนื่องกับการพัฒนาโครงสร้างพื้นฐาน

หัวข้อใหญ่	หัวข้อย่อย
โครงสร้างพื้นฐาน	แผนการเตรียมที่ดิน แผนระบบถนน แผนระบบระบายน้ำฝน แผนระบบน้ำประปา แผนระบบระบายน้ำเสีย แผนระบบไฟฟ้า แผนระบบสื่อสาร ระบบพลังงาน (ระบบพลังงานร่วม ระบบทำความเย็น) ระบบบริหารจัดการพลังงาน (CEMS)
สิ่งแวดล้อมและโครงข่ายสีเขียว (กรีนเน็ตเวิร์ค)	มาตรการเรือนำท่วม การป้องกันและบรรเทาสาธารณะภัย/แผนสำรองเพื่อ ความต่อเนื่องทางธุรกิจ (BCP) โครงข่ายสีเขียว การสร้างภูมิทัศน์
โครงข่ายการคมนาคม	แผนระบบถนน แผนทางเดิน แผนระบบขนส่งสาธารณะ (รวมถึงสถานีขนส่งผู้โดยสาร) การสำรวจปริมาณการจราจร
สิ่งอำนวยความสะดวกเพื่อ ยกระดับ	ทางเดินลอยฟ้า ทางเดินใต้ดิน ระบบการขนส่งและการจราจรอัจฉริยะ (ITS)

ที่มา: ทีมสำรวจใจก้า

7.3 แผนการใช้ที่ดิน

แผนการใช้ที่ดินในการศึกษานี้แบ่งได้เป็น 3 ประเภท ได้แก่ (1) ที่ดินเพื่อการพาณิชย์ (ใจกลางพื้นที่) (2) ที่ดินเพื่อใช้ประโยชน์อเนกประสงค์ (พื้นที่เพื่อการพาณิชย์และธุรกิจเป็นส่วนหลัก และที่ดินเพื่อที่อยู่อาศัยเป็นส่วนรอง) (3) ที่ดินเพื่อที่อยู่อาศัย (เขตที่อยู่อาศัยซึ่งเน้นคุณภาพ)

แผนการใช้ประโยชน์ที่ดินมีรายละเอียดดังในรูป 3 สำหรับอนาคตภาพตามแผนดังกล่าวมีรายละเอียดดังรูป 4 และรูป 5



ที่มา : ทีมสำรวจใจก้า

รูป 3 แผนการพัฒนา



ที่มา : ทีมสำรวจใจกล้า

รูป 4 ขนาดภาพการพัฒนา [พื้นที่บางซื่อ]



ที่มา : ทีมสำรวจใจกล้า

รูป 5 ขนาดภาพการพัฒนา [สถานที่กลางบางซื่อโดยรอบ]

7.4 การวิเคราะห์ปริมาณพื้นที่และค่าใช้จ่ายโดยประมาณ

ผลการศึกษานี้มีการประมาณปริมาณพื้นที่อาคารสำนักงาน สิ่งอำนวยความสะดวกเพื่อการพาณิชย์ โรงแรม และอาคารที่อยู่อาศัยจากข้อมูลที่ได้จากการสำรวจตลาดและการสัมภาษณ์บริษัทอสังหาริมทรัพย์ในประเทศไทย ประมาณการพื้นที่อาคาร จำนวนประชากรที่จะเกิดตามมา และค่าใช้จ่ายการก่อสร้างมีรายละเอียดดังในตาราง 12 และตาราง 13 สำหรับค่าซ่อมบำรุงประมาณการไว้ที่ 2% ของค่าใช้จ่ายการก่อสร้าง

ตาราง 12 ประมาณการพื้นที่อาคารและประชากรที่จะเกิดตามมา

การใช้ที่ดิน	รายละเอียด	ขนาด(ตรม./ห้อง/คน)
(1) สำนักงาน	พื้นที่พิเศษ	530,760 ตรม.
	จำนวนคนในสำนักงาน	44,230 คน
(2) สิ่งอำนวยความสะดวกเพื่อการพาณิชย์	พื้นที่เช่า	365,350 ตรม.
	จำนวนลูกค้า	292,280 คน
(3) โรงแรม	จำนวนห้อง	31,735 ห้อง
	จำนวนคน	9,373 คน
(4) สิ่งอำนวยความสะดวกที่อยู่อาศัย	จำนวนห้อง	6,249 ห้อง
	จำนวนผู้อยู่อาศัย	126,942 คน

ที่มา : ทีมสำรวจใจกล้า

ตาราง 13 ประมาณการค่าใช้จ่ายการก่อสร้างเพื่อการพัฒนาพื้นที่บางซื่อ

ประเภท	หัวข้อย่อย	ค่าใช้จ่าย (หน่วย: 1,000\$)
โครงสร้างพื้นฐานของเมือง	-	159,371
โครงข่ายการขนส่งและคมนาคม	-	309,432
โครงข่ายสีเขียว	-	6,100
สิ่งแวดล้อม	-	103,127
การป้องกันสาธารณภัย	-	11,000
สิ่งอำนวยความสะดวกเพื่อยกระดับ	-	81,500
อาคารสิ่งปลูกสร้าง	สำนักงาน	2,653,800
	สิ่งอำนวยความสะดวกเพื่อการพาณิชย์	2,189,400
	อาคารที่อยู่อาศัย	10,880,700
	โรงแรม	1,093,500
	สิ่งอำนวยความสะดวกด้านวัฒนธรรม	550,000
	สำนักงานรัฐ	300,000
รวม		18,337,930

ที่มา : ทีมสำรวจใจกล้า

8. แผนปฏิบัติงาน

ในการนำแผนพื้นที่บางซื่อสู่การดำเนินงาน การจัดเตรียมองค์กรดำเนินงานและการจัดหาเงินทุนเป็นสิ่งที่มีจำเป็นอย่างยิ่ง ผลการศึกษานี้ได้ข้อสรุปเป็นข้อเสนอเกี่ยวกับองค์กรที่จะขับเคลื่อนการดำเนินงาน และกลไกในการจัดหาเงินทุนซึ่งมีรายละเอียดดังต่อไปนี้

8.1 องค์กรขับเคลื่อนโครงการ

โครงการพื้นที่บางซื่อจัดว่าเป็นโครงการขนาดใหญ่ทั้งในด้านขอบเขตของงานและความซับซ้อน ทั้งนี้เนื่องจากการพัฒนาหลายภาคส่วนทำให้มีส่วนได้ส่วนเสียด้วยกันหลายฝ่าย ผลการศึกษานี้ได้แบ่งการพัฒนาออกเป็น 5 ภาคส่วน ได้แก่ 1) โครงสร้างพื้นฐาน 2) โครงข่ายสีเขียวและสิ่งแวดล้อม 3) โครงข่ายการคมนาคมขนส่ง 4) สิ่งอำนวยความสะดวกเพื่อยกระดับพื้นที่ภายใต้แนวคิดการพัฒนาพื้นที่รอบสถานีขนส่งมวลชน (TOD) และเมืองอัจฉริยะ 5) การพาณิชย์และสิ่งอำนวยความสะดวกที่จะเป็นแม่เหล็กสำคัญ

ในการศึกษานี้พบว่า ลักษณะสำคัญของการพัฒนาในแต่ละภาคส่วนในโครงการนี้เป็นการพัฒนาบนผืนที่ดินของรฟท.ทั้งหมด จุดนี้เป็นสิ่งที่แตกต่างกับโครงการพัฒนาทั่วไปซึ่งเพิ่มความซับซ้อนให้กับโครงการ ตัวอย่างเช่น โครงข่ายถนนหลักในการพัฒนาขั้นที่ 1 โดยทั่วไปกรุงเทพมหานคร (กทม.) จะเป็นผู้จัดสร้างบนที่ดินของกทม. กรณีที่ต้องสร้างบนที่ดินของรฟท. จะต้องมีการลงนามบันทึกข้อตกลงระหว่างกทม.กับรฟท.เพื่อที่จะระบุส่วนรับผิดชอบในการก่อสร้าง การใช้งานและบำรุงรักษา (O&M) อย่างชัดเจน ทั้งนี้ไม่เฉพาะแต่การพัฒนาถนนสายหลัก ในเรื่องของโครงสร้างพื้นฐานอื่นๆก็จำเป็นที่จะต้องมีการจัดประสานงานกับองค์กรรัฐต่างๆ จากข้างต้นหากปราศจากกลไกซึ่งมีสิทธิอำนาจในการจัดประสานความร่วมมือดังกล่าว อาจทำให้ต้องใช้เวลาและกำลังแรงงานไปกับการประสานงานอย่างมาก

ผลการศึกษานี้จึงได้ข้อสรุปดังนี้ โครงสร้างการจัดดำเนินงานในลักษณะนโยบายจากรัฐบาลลงมา (Top-down) โดยให้ผู้มีส่วนได้ส่วนเสียทุกภาคส่วนเข้ามามีส่วนร่วมจะเป็นกุญแจสำคัญที่ทำให้การพัฒนาพื้นที่บางซื่อสำเร็จได้จากผลการศึกษาทีมสำรวจใจกล้าขอเสนอโครงสร้างกลไกการทำงานเพื่อขับเคลื่อนการปฏิบัติงานซึ่งมีรายละเอียดดังรูป 6 โครงสร้างดังกล่าวประกอบไปด้วย 6 กลไกทำงานซึ่งมีหน้าที่สำคัญของแต่ละส่วน ได้แก่ 1) คณะกรรมการกำกับดูแลโครงการ (Steering Committee) 2) บริษัทบริหารสินทรัพย์ของรฟท. (SRT Asset Holding Company) 3) สำนักเลขาธิการ (ประสานงานโดยรวม) (Secretariat/Overall Coordination) 4) บริษัทพัฒนาบางซื่อของรฟท. (SRT Bang Sue Development Company) 5) สำนักวางแผนและประสานงานโครงการ (Planning and Project Coordination) 6) คณะกรรมการประสานงานผู้มีส่วนได้ส่วนเสีย (Stakeholder Coordination Committee)

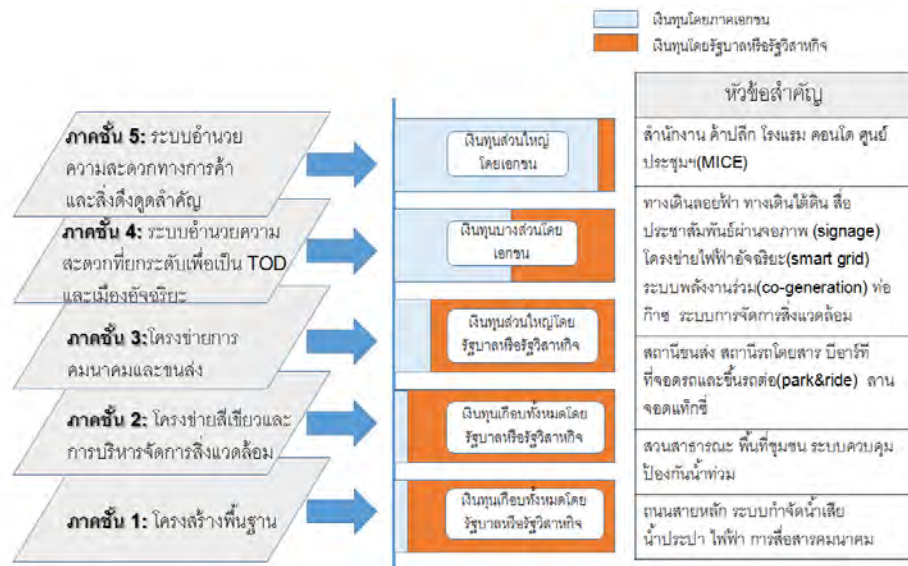


โดยจะต้องมีกลไกดำเนินงานทางธุรกิจที่สำคัญต่างๆดังมีรายละเอียดในรูป 7



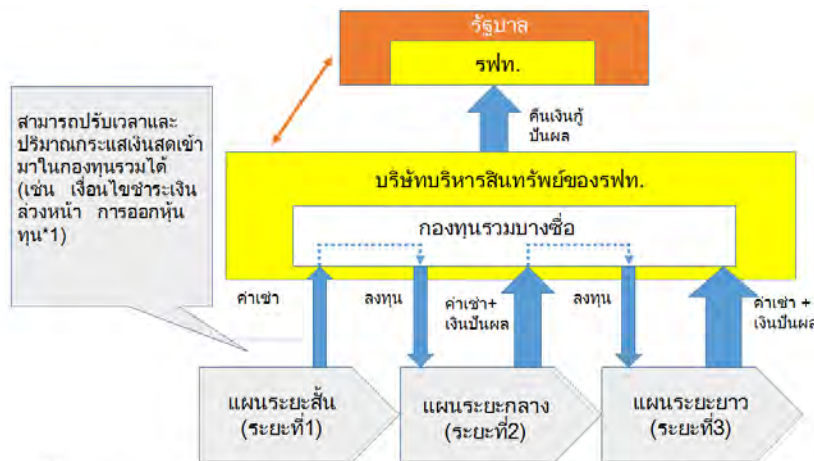
8.2 กลไกการจัดหาเงินทุน

การจัดหาเงินทุนสำหรับโครงการนี้จำเป็นต้องเป็นลักษณะผสมผสานระหว่างเงินทุนภาคเอกชนในลักษณะการร่วมลงทุนระหว่างภาครัฐและเอกชน (PPP) เงินทุนของรัฐบาล และเงินทุนของรัฐวิสาหกิจอย่างหลีกเลี่ยงไม่ได้ ทั้งนี้เนื่องด้วยโครงการนี้มีได้เป็นเพียงการพัฒนาสิ่งอำนวยความสะดวกเพื่อการพาณิชย์บนที่ดินของรฟท. จากข้างต้นในโครงการจะมีการพัฒนาด้วยกัน 5 ภาคชั้นโดยจำเป็นต้องพิจารณาแบ่งส่วนความรับผิดชอบด้านเงินทุนตามจุดเด่นของแต่ละการพัฒนา แนวคิดหลักการในการแบ่งส่วนความรับผิดชอบด้านเงินทุนมีรายละเอียดดังแสดงในรูป 8 และแนวคิดการใช้กองทุนเพื่อจัดหาเงินทุนแต่ละช่วงเวลาดังในรูป 9



ที่มา : ทีมสำรวจใจก้า

รูป 8 แนวคิดหลักการในการแบ่งส่วนความรับผิดชอบด้านเงินทุน



*1 รฟท. สามารถแปลงสิทธิการเช่าบางส่วนไปเป็นหุ้นของนิติบุคคลเฉพาะกิจ (Special Purpose Vehicles) ของรฟท. เมื่อนิติบุคคลเฉพาะกิจของรฟท. มีกระแสเงินสดจากการดำเนินงานที่เสถียรแล้ว สามารถนำขายหุ้นกองทุนโครงสร้างพื้นฐาน เช่น กอง REIT ได้

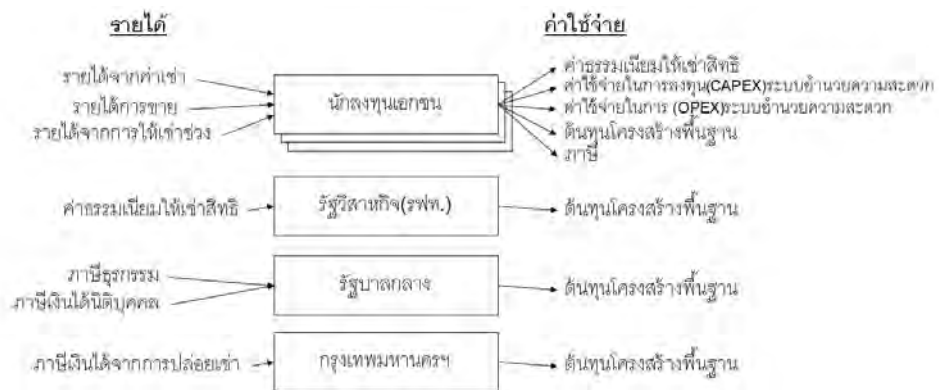
ที่มา : ทีมสำรวจใจก้า

รูป 9 แนวคิดการใช้กองทุนเพื่อจัดหาเงินทุนแต่ละช่วงเวลา

8.3 การวิเคราะห์ด้านการเงิน

เพื่อให้โครงการบรรลุผลสำเร็จได้ ในการศึกษาได้วิเคราะห์ศักยภาพทางการเงินและความสามารถในการแบกรับภาระการเงินซึ่งเป็นปัจจัยสำคัญ ผู้ที่มีส่วนเกี่ยวข้องของสำคัญในโครงการมีได้แก่ 1) ภาคเอกชน 2) รัฐวิสาหกิจ ได้แก่ กฟผ. และการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย(กฟผ.) ฯลฯ 3) รัฐบาลไทย ได้แก่ กระทรวงคมนาคม กระทรวงการคลัง ฯลฯ และ 4) กรุงเทพมหานคร (BMA)

รูป 10 แสดงผังวิเคราะห์การเงิน สำหรับรายละเอียดพารามิเตอร์สำคัญในแนวทางที่ 1 และแนวทางที่ 2 รวมถึงเงื่อนไขจะอธิบายไว้ในตัวเล่มรายงาน



ที่มา : ทีมสำรวจใจกา

รูป 10 แสดงผังวิเคราะห์การเงิน

ผลการวิเคราะห์ด้านการเงินสรุปได้ดังนี้ รายละเอียดจะแสดงในตัวเล่มรายงาน

1) ผู้ลงทุนเอกชน

ผลวิเคราะห์พบว่า ระหว่างแนวทางที่ 1 และแนวทางที่ 2 เกิดผลต่างอย่างชัดเจน กรณีแนวทางที่ 1 ผลตอบแทนผู้ถือหุ้น (Equity IRR) ที่ได้พบว่าน้อยกว่า 5% ในขณะที่แนวทางที่ 2 ผลตอบแทนผู้ถือหุ้นอยู่ที่มากกว่า 15% เกือบทั้งหมดทุกโซน

2) รัฐวิสาหกิจ

สำหรับรายได้จากการให้เช่าที่ดินกับผู้ลงทุนเอกชน หากคำนวณภายใต้เงื่อนไขการได้รับสิทธิผ่อนผันการชำระเงินต้นระยะเวลา 3 ปีแรกนับจากเริ่มเปิดดำเนินการ และเงื่อนไขชำระคืนเงินกู้ที่ 10 ปี รายได้ที่รฟท. ได้รับจะเริ่มสะสมตั้งแต่ปี พ.ศ. 2562 – 2587 ทั้งนี้รายได้ของรฟท.คำนวณจากมูลค่าปัจจุบันสุทธิ (NPV) จะสูงถึง 2.5 พันล้านบาทต่อปี ในขณะที่ต้นทุนค่าโครงสร้างพื้นฐานที่ต้องจ่ายสูงสุดต่อปีคิดเป็น 1.2 พันล้านบาท ดังนั้นกำไรที่ได้ขึ้นมาสสามารถนำไปลงทุนในการพัฒนาระยะถัดไปได้

3) รัฐบาลไทยและกรุงเทพมหานคร

ผลศึกษาพบว่า รายได้จากภาษีตามแนวทางที่ 2 คิดเป็นมูลค่าที่สูงมาก กรณีเป็นสัญญาเช่ากับแต่ละโซนย่อยตามแผนระยะสั้น (ระยะพัฒนาที่ 1) เป็นเวลา 50 ปีนับจาก พ.ศ. 2562 ประเมินการรายได้ภาษีในปี พ.ศ. 2611 รัฐบาลจะมีรายได้ 34 พันล้านบาท กรุงเทพมหานครจะมีรายได้ 25 ล้านบาท ซึ่งนับเป็นรายได้ที่สูงกว่าค่าการพัฒนาโครงสร้างพื้นฐานที่แต่ละฝ่ายได้ลงทุน ในทางตรงข้ามสำหรับกรณีแนวทางที่ 1 รายได้จากภาษีที่ได้ อยู่ที่ประมาณ 10% ของแนวทางที่ 2 ซึ่งถือเป็นมูลค่าที่ค่อนข้างน้อย จึงอาจกล่าวได้ว่า จากการที่ดินไม่ถูกพัฒนามูลค่าให้สูงขึ้น ผลกำไรที่นักลงทุนเอกชนได้รับจึงไม่สูง ทำให้รายได้จากภาษีที่ได้รับจากส่วนนี้จึงไม่เพิ่มตามไปด้วย

8.4 กำหนดเวลาของโครงการ

ในการพัฒนาพื้นที่บางซื่อ ผลศึกษานี้ได้ข้อสรุปเป็นข้อเสนอโครงการพัฒนาที่แบ่งระยะเวลาออกเป็น 3 ช่วง บนแนวคิดการพัฒนาแบบบูรณาการเป็นขั้นตอนและครอบคลุมพื้นที่ทั้งหมด การพัฒนาแบ่งเป็น 3 ระยะ ได้แก่ แผนระยะสั้น (ระยะที่1 เป้าหมายปี พ.ศ. 2565) แผนระยะกลาง (ระยะที่2 เป้าหมายปี พ.ศ. 2570) และแผนระยะยาว (ระยะที่3 เป้าหมายปี พ.ศ. 2575) รายละเอียดกำหนดเวลาของโครงการแสดงในตัวเล่มรายงาน

9. ความสนใจของนักลงทุนเอกชนญี่ปุ่น

ในการศึกษานี้มีการเก็บแบบสำรวจและสอบถามสัมภาษณ์กับ 1) บริษัทสมาชิกของสมาคมนักลงทุนเพื่อการพัฒนาเมืองเป็นมิตรต่อสิ่งแวดล้อม (J-CODE) 2) บริษัทสมาชิกของหอการค้าญี่ปุ่น-กรุงเทพฯ ชมรมกลุ่มการค้าก่อสร้าง (จำนวนบริษัทที่ตอบแบบสอบถาม 26 บริษัท) เพื่อสำรวจความสนใจของบริษัทญี่ปุ่นในการร่วมลงทุนในธุรกิจพัฒนาเมือง และความเป็นไปได้ที่จะนำเทคโนโลยีโครงสร้างพื้นฐานในการสร้างเมืองจากญี่ปุ่นมาใช้

ผลสำรวจพบว่า บริษัทญี่ปุ่นหลายแห่งมีความสนใจอย่างมากที่จะเข้าร่วมลงทุน โดยพิจารณาว่าโครงการพัฒนาบางซื่อเป็นแผนนโยบายจากระดับสูง มีระบบคมนาคมขนส่งที่สะดวก และการที่รฟท.เป็นเจ้าของที่ดินทั้งผืน เป็นต้น อย่างไรก็ตามก็ยังมีเสียงความคิดเห็นจากนักลงทุนที่ต้องการให้ปรับขยายระยะเวลาสัญญาเช่า (ความคาดหวังจาก 50 ปีปรับเป็น 70 ปี) และต้องการให้รัฐบาลเป็นผู้จัดเตรียมด้านโครงสร้างพื้นฐาน

10. การดำเนินงานต่อจากนี้

ผลการศึกษานี้ได้ข้อสรุปแผนปฏิบัติการสำคัญซึ่งจะต้องจัดดำเนินงานในช่วงต้น (จนกระทั่งปีพ.ศ.2562) โดยมีรายละเอียดดังนี้

(1) การดำเนินงานโดยรัฐบาลไทย

- 1) จัดทำแผนแม่บทฉบับสมบูรณ์
- 2) จัดตั้งคณะกรรมการกำกับดูแลการพัฒนา และ 3) กำหนดและส่งเสริมมาตรการการสนับสนุนของรัฐบาลอย่างเป็นขั้นตอน โดยมีภาระงานจนถึงครึ่งปีแรกของ พ.ศ.2562

(2) การรถไฟแห่งประเทศไทย(รฟท.)

- 1) ก่อตั้งและเริ่มดำเนินงานบริษัทบริหารสินทรัพย์ของรฟท.และบริษัทเพื่อพัฒนาพื้นที่บางซื่อภายในปี พ.ศ.2560
- 2) จัดเตรียมเพื่อรองรับการดำเนินงานแผนพัฒนาระยะสั้น (จนกระทั่ง พ.ศ.2565): นับแต่ปี พ.ศ.2561 เป็นต้นไป
- 3) จัดเตรียมเพื่อรองรับการดำเนินงานแผนพัฒนาระยะกลาง (จนกระทั่งพ.ศ.2570)
- 4) วางแผนและจัดเตรียมการพัฒนาเมืองอัจฉริยะ
- 5) วางแผนและจัดเตรียมการพัฒนาการพัฒนาพื้นที่รอบสถานีขนส่งมวลชน (TOD) และระบบโครงข่าย
- 6) วางแผนและจัดเตรียมการพัฒนาโครงสร้างพื้นฐาน
- 7) วางแผนและจัดเตรียมการพัฒนาอุตสาหกรรมการจัดงานกิจกรรมทางธุรกิจ (MICE): ตั้งแต่ปีพ.ศ.2562เป็นต้นไป

จบ

Executive Summary

1. Background

The Bangkok Metropolitan Region, Bangkok and its five surrounding prefectures, currently, has a population of 10,730,000 people. In 2013, the gross regional domestic product (GRDP) per capita was recorded at THB 376,463 which is slightly less than twice the gross domestic product (GDP) per capita for the whole country at THB 193,394 on the same year. The Bangkok Metropolitan Region has the biggest population and it is the center of economic and political activities in the country.

In order to solve heavy traffic and environmental problems in the Bangkok Metropolitan Region, Ministry of Transport (MOT) started introducing mass transit system in the 1990s. As of January 2017, four urban mass rapid transit (UMRT) lines, i.e., BTS Sukhumvit Line, BTS Silom Line, MRT Blue Line, MRT Purple Line, and one airport line, i.e., Airport Rail Link (ARL) are operated in Bangkok. Furthermore, they have several ongoing plans and under construction projects to extend these existing lines, as well as to construct new lines, to enhance UMRT networks.

State Railway of Thailand (SRT) Red Line Project, including Bang Sue Grand Station, has a total extension length of 26.3 km. One of the financial resources of the project is the yen loan. As the implementing agency, SRT aims to start its operation in July 2020. Bang Sue Grand Station shall be the biggest terminal station in Bangkok. Several UMRT lines, including Red Line shall stop at Bang Sue Grand Station.

The survey area (hereafter called as Bang Sue Area) includes Bang Sue Grand Station and large land for railway facilities. Being located at the future transport hub in Bangkok, it has a high potential for urban development. Office of Transport and Traffic Policy and Planning (OTP) and SRT studied on the development concept plans and SRT intends to redevelop the area by public-private partnership scheme. However, they are confronted with difficulties such as “lack of step-by-step integrated development” and “lack of arrangement of each project based on a single comprehensive master plan”.

In this context, MOT requested Japan Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) for support in developing an integrated master plan (MP) for Bang Sue Grand Station and the surrounding area. Accordingly, OTP, SRT, and MLIT established a Working Group for Urban Development (WG) in August 2016. Through the three WG sessions in August 2016, November 2016, and January 2017, OTP, SRT, and MLIT discussed the necessity of an integrated MP including an infrastructure plan and work items to be considered. With this situation in mind, Japan International Cooperation Agency (JICA) decided to take over the cooperation and assign a survey team to formulate an integrated MP.

1.1 Purpose of the Study

The purpose of the present survey are as follows:

1. Based on the discussions in the WGs and the former information gathering survey conducted by MLIT, the JICA Study Team (JST) shall collect and analyze related information and data for redevelopment in Bang Sue Area. JST shall formulate the “Development Vision” and “Draft Concept Paper”, and facilitate stakeholders to reach a consensus for integrated development.
2. JST shall formulate all plans including project implementation scheme and fund allocation

among stakeholders such as central government, local government and private sectors, which shall contribute to project implementation framework for redevelopment of Bang Sue Area.

1.2 Survey Area

The survey area is as shown in Figure 1.



Source: JST

Figure 1 Bang Sue Area (Survey Area)

1.3 Working Groups/ Workshops

During the survey period (from March to August 2017), three WGs and nine workshops (WS) were held in Bangkok to obtain opinions from major Thai stakeholders (MOT, OTP and SRT etc.).

2. Superior Plans

2.1 Spatial Plans/ Urban Development Related Plans/Urban Mass Rapid Transit Plan

Major urban development related plans which relate Bang Sue Area development are as shown in Table 1.

Table 1 Major Urban Development Related Plans which relate Bang Sue Area Development

Area	Name of Plan	Formulator	Outline
Nation wide	The National Spatial Development Plan 2057	DPT	To achieve the vision by 2057, “Development frameworks”, “Strategic position and future development trends”, “Major issues of national development policies”, and “Fields covered by the 50-year National Spatial Development Policy”, are specified in the plan.
Region	Regional Development Policies	DPT	Development policy of the six regions (Bangkok and its vicinity, Eastern Region, Central Region, Northeastern Region, Northern Region, and Southern Region) .
Province, City	Bangkok Comprehensive Plan (2013)	BMA	Zoning Plan, Floor Area Ratio, Open Space Conservation, Transport System Plan, and Infrastructure Development Plan etc.
Urban Mass Rapid Transit	Mass Rapid Transit Master Plan in Bangkok Metropolitan Region (M-MAP)	OTP	Development plan of 12 mass transit lines (556 km) in Bangkok Metropolitan region. In M-MAP, Bang Sue is noted as one of the important transportation hub in Bangkok.

Source: JST

2.2 Policies and Plans for Economics and Industrial Promotion

Major policies and plans for economic and industrial promotion in Thailand are as shown in Table 2.

Table 2 Major Policies and Plans for Economics and Industrial Promotion in Thailand

Name of Plan	Formulator	Outline
Thailand 4.0	The Government of Thailand	It aims to shift from the current economy led by foreign investments with focus on automobiles, electrical and electronics industry, petrochemicals, and others (Thailand 3.0) to an added-value economy based on knowledge, creation, and innovation focused mainly on the knowledge-intensive industry, the green industry, renewable energy, healthcare, and transport
20-year National Strategic Plan (2017-2036)	NESDB	As a long-term national plan created by the Government of Thailand, it consists of six areas, six primary strategies, and four supporting strategies as shown in Table 2.2.2. It is therefore also referred to as the “6-6-4 plan.”
The 12th National Economic and Social Development Plan	NESDB	The 12th plan continues the major direction of the 11th plan “the vision of “A happy society with equality, fairness, and resilience”, and the newly formulated ten strategies toward reducing income differences; strengthen economy and competitiveness in international society.
Eastern Economic Corridor (EEC)	NESDB	The target areas are three eastern provinces: Chonburi, Rayong, and Chachoengsao. The policy promotes investment in ten high-tech industry sectors including electric vehicles, hybrid vehicles, healthcare, aviation, and robots.
The Cluster-based Special Economic Development Zones Policy	BOI and The Government of Thailand	The policy is aimed at creating a cluster where interconnected businesses and related institutions are concentrated and operated within the same geographic areas. The aim of promoting business clusters is to boost the level of support and cooperation in all facets of business, in order to strengthen the industrial value chain, enhance Thailand’s investment potential and competitiveness, and expand socioeconomic development to regional and local levels.
Border Special Economic Zone Policy	The Government of Thailand	It is a large-scale policy to develop special economic zones (SEZ) in its national borders, with the Greater Mekong Sub-region Development Program as background.

Source: JST

2.3 Other Strategies and Policies

Other related policies such as “The National Research Policy and Strategy (2017 - 2021)”, “The National Science, Technology, and Innovation Policy Plan (2012-2021)”, MICE strategy in Thailand and trends of medical and health- and longevity-related matters are reviewed.

2.4 Role of the Bang Sue Area in Thailand

In the M-MAP formulated by OTP, Bang Sue is counted as a multi-modal transport node in Bangkok, as well as and Makkasan. In addition, in the Bangkok Comprehensive Plan 2013, land use in Bang Sue area is categorized as commercial zone, and FAR is set as the second highest in Bangkok after Silom area. Accordingly, Bang Sue area is expected to develop as urban Transit Oriented Development (TOD) core, as it shall be a transportation hub in the future.

2.5 Legal Systems and Policies Related to Urban Development

The legal systems related to urban development in Thailand and its structure outline are described in Appendix 2-1 “List concerning the legal structure of Japan related to urban planning and similar plans of Thailand”. Among the legal systems of Thailand, the following laws and regulations are especially important to implement the large-scale redevelopment in Bang Sue Area: Town Planning Act 1975, Building Control Act 1979, Land Readjustment Act 2004, Land Subdivision Act 2000, Enhancement and Conservation of National Environmental Quality Act 1992, Comprehensive Planning Criteria and Standards 2006, and Bangkok City Planning Standards 2010.

3. General Conditions and Related Plans in Bang Sue Area

3.1 Status in Bang Sue Area

Bang Sue Area is located at approximately 10 km to the north from the central business district (CBD). It is located at approximately 35 km from the Suvarnabhumi International Airport and 14 km from Don Muang Airport which is a base for domestic and low-cost carrier (LCC). Bang Sue Area is planned to be a future transportation hub. It has Metropolitan Rapid Transit (MRT) Bang Sue Station and Kamphaeng Phet Station (Blue Line), Mo Chit Station (Bangkok Mass Transit System (BTS)), and Bang Sue Grand Station (State Railway of Thailand (SRT)) in and around the area.

Currently, Bus terminal and railway facilities, and Red Line construction area are located inside of Bang Sue Area. Almost all land of Bang Sue Area is owned by SRT and utilized as facility area for Red Line project. Thus, the area has relatively less residents compared with its land area of 33 km². According to SRT, the number of households in KM 11 and SRT Land are 1,931 and 509, respectively. As the average number of people per household in urban areas is 3.5¹, it is estimated that there are approximately 7,000 and 2,000 residents in KM 11 and SRT Land, respectively.

3.2 Development Plan by SRT and OTP

SRT implemented a feasibility study for Bang Sue Area redevelopment from 2015 to 2016, in order to create additional land value of the area and SRT's asset management. The target area is Zone A (35 rai), Zone B(78rai), and Zone C(105rai) while Office of Transport and Traffic Policy and Planning (OTP) carried out a study for Zone D (80rai) and inter-area transportation at the same period.

3.3 Inter-Area Transportation Plan by OTP

In OTP's plan, the main purpose of inter-area transport is to enhance the connectivity and accessibility. OTP proposed Bus Rapid Transit (BRT) system as a major mode of public transportation in the area.

OTP also conducted traffic demand forecast through intersection traffic count, origin and destination interview, and travel speed survey. Traffic demand forecast was conducted for year 2022, 2032, and 2037. In 2037, OTP predicts approximately 1.42 million passengers per day using Bang Sue Grand Station in total.

3.4 Smart City Conceptual Plan by PTT

Bang Sue is one of ten candidate districts selected by the Government of Thailand to promote the model of Smart City. The model must improve the energy efficiency of the area in water supply, gas, power, heat supply, and cogeneration and district cooling system. PTT cooperated with the Chulalongkorn University to compose a conceptual plan of smart city for Bang Sue Area. The major points of technology installation of this plan are described in the following parts: 1) Mass Rapid Transit (MRT), 2) Provision of public free Wi-Fi, and 3) District Cooling System.

¹Thailand National Statistics (2005)

4. Status of Existing Infrastructure

4.1 Status of Existing Infrastructure around Bang Sue Area

The status of the existing infrastructure around Bang Sue Area is as shown in Table 3.

Table 3 Status of Existing Infrastructure around Bang Sue Area

Category	Outline
Urban Mass Rapid Transit	In Bangkok, congestion on major arterial roads is a common issue. The Bangkok Mass Transit System (BTS) Skytrain is now widely used by passengers because they acknowledged that Skytrain is a convenient mode of transport which can help them avoid running into a traffic jam. The current Urban Mass Rapid Transit (UMRT) in Bangkok consists of two lines of BTS (Light Green Line - Dark Green Line), two lines of the metro rapid transit (MRT) (Blue Line - Purple Line) and Airport Rail Link (ARL). Pink Line, Yellow Line, and Orange Line connect central area to suburban area to the east. These lines are under bidding or at the planning stage and have not been constructed at the time of October 2017.
High Speed Railway	In 2016, a memorandum was signed on applying Japanese technology for a high-speed rail connecting Bangkok and Chiang Mai. The total length is approximately 670 km. Including the other planned routes, a total of five routes have been considered to develop.
Road	Around Bang Sue Area, many roads such as Don Mueang Expressway, Si-Rat Expressway, Phahonyothin Road and Kampheang Phet Road are already developed. Major authorities who manage these roads are private operation companies, Expressway Bureau of the Ministry of Transport (MOT) and Bangkok Public Works Bureau of BMA.
Bus Terminal	The bus terminal in Bang Sue Area is called Mo Chit 2 Bus Terminal, operated by Transport Co., Ltd., a state enterprise under MOT. The company also operates long-distance bus service. There are two types of inter-city buses, i.e.: large bus (coach) for long distance trip to cities in norther and northeastern Thailand or to foreign countries, and van-type bus for medium distance trip. Each platform is separated in Mo Chit 2 Bus Terminal. Besides Mo Chit 2 Bus Terminal, inner-city bus terminal is also located. Inner-city buses and its terminal are operated by the Bangkok Mass Transit Authority (BMTA). In 2017, 209 routes of buses were operated. In Bang Sue Area, 14 routes depart from BMTA Bus Terminal. In terms of traffic volume by time, traffic flow from east direction has more volume than other directions throughout the 12 hours. A ramp will be developed in the near future in the north of the intersection. Therefore, traffic volume from the north direction is considered to be bigger in the future.
Storm Drainage System	Storm drainage system is managed by the Department of Drainage and Sewerage, BMA. Bang Sue Area is in the basin of the Chao Praya River. However, as Bangkok's geography is generally flat and average altitude is approximately 0 m, the drainage network using the natural water body and channel to discharge to the Chao Praya River can work only in low tide period. Therefore, normally, pumping stations and water gates are used to discharge storm water to the Chao Praya River. Moreover, a trunk drain pipe that directly connects to the Chao Praya River is planned and constructed to be installed under the ground of Bang Sue Area.
Water Supply System	Water supply system in Bangkok is managed by the Metropolitan Waterworks Authority (MWA) and its Phaya Thai Office covers Bang Sue Area. The coverage of water supply system in Bangkok is 98%. Water supply for Bang Sue Area is treated at Bang Khen Water Treatment Plant (WTP, 3.9 million m ³ /day) and delivered from Phahon Yothin Pump Station.
Sewerage System	Sewerage system in Bangkok is managed by the Department of Drainage and Sewerage, BMA. In the neighborhood of Bang Sue Area, there are two wastewater treatment plants (WWTPs): Bang Sue WWTP (120,000 m ³ /day) and Chatuchak WWTP (150,000 m ³ /day).
Power Supply and Distribution Infrastructure	In the Bang Sue Area and its surrounding area, electricity is supplied through two sub-stations which are managed by MEA. In addition, a new substation, having an area of about 6,400 m ² in the Bang Sue Area, is planned under the agreement between SRT and Metropolitan Electricity Authority (MEA).
Oil and Gas Pipelines	One oil pipeline and one gas pipeline are buried under a road in Bang Sue Area. However, gas pipeline is for business use only. In Bangkok, piped town gas is not supplied, instead, households are using propane gas.
Waste Treatment	Waste treatment in Bangkok is managed by the Department of Environment, BMA. The collected waste is hauled to one of the three transfer stations (Sai Mai, Nongkham, and On Nuch) where waste is classified into conventional waste, dangerous waste from the hospitals and factories, and recycling waste. Then, it is treated either by recycling or pressurization/incineration. After that treated waste will be transported to final treatment sites in Nakhon Pathom Province or Chachoengsao Province, Phanom Sarakham District for landfill.

Source: JST

5. Future Demand Forecast

5.1 Railway Passengers in and around Bang Sue Area

The number of railway passengers in and around Bang Sue Area was forecasted based on the following estimated numbers: 1) the passengers who transfer trains in Bang Sue Grand Station, 2) the generated/attracted people in Bang Sue Area, and 3) the visitors from outside of Bang Sue Area. The figure of trip per person per day was from 2.0 to 2.2 depending on purposes of trip. The modal share of railway in Bang Sue Area was estimated to reach 40% in the future.

Based on the above mentioned assumptions, the number of generated trip in Bang Sue Area was estimated as 135,600 in Year 2022, 359,600 in Year 2027, and 624,000 in Year 2032, in case of that the area is synergistically and efficiently developed under an integrated master plan.

5.2 Property Submarkets in Bangkok and its Environs (Original Estimation)

The future property demand in Bang Sue Area was estimated based on the recent property market data which contains the property stock from 2006 to 2016, and the planned floor area from 2017 to 2021. It is assumed that the market demand is naturally covered by the market supply; therefore, the estimated future supply shall be considered as the future demand. Based on the planned stock in 2021, the property supply in Chatuchak District (original estimation) in 2027, 2032, and 2037 is estimated. The estimated property supply in 2032 is: Office 55,704 m² (Net Floor Area), Retails 91,748 m² (Gross Floor Area), Condominium 27,367 units, and Hotel 656 rooms.

6. Redevelopment Concept Paper and Scenario

6.1 Urban Functions Needed for Bang Sue Area

The urban functions needed in Bang Sue Area derived from reviewing and analysis on related superior plans/existing plans, property market demand, and lessons learned from Japan's experiences are as shown in Table 4. The key functions are "Government Center", "MICE Center" and "New Industry Incubation Center". The collateral functions, which shall be the main income source for the landowner, are office, commercial, residential, and hotel.

Table 4 Urban Functions Needed in Bang Sue Area

	Option 1	Option 2	Option 3
<u>Challenging points</u>	<u>Government hospitality for visitors/ comfortable and creative public space</u>	<u>Further diversification of visitors' purposes</u>	<u>Enhancement of R&D, Intellectual Industry</u>
<u>Key function</u>	<u>Government Center</u>	<u>MICE Center</u>	<u>New Industry Incubation Center</u>
<u>Collateral functions</u>	• <u>Gov. building</u> • <u>Museum</u> • Office • Commercial • Residential • Hotel	• <u>Convention hall</u> • <u>Hotel</u> • Office • Commercial • Residential • Museum	• <u>Office</u> • <u>University</u> • Commercial • Residential • Museum • Hotel
<u>Expected effects</u>	• Ensure the ridership of new railways • Allow rapid infrastructure development	• Ensure the ridership of new railways • Make the best use of potential business chances	• Ensure the ridership of new railways • Initiate the country's industrial policy

Source: JST

6.2 Development Concept Paper (Draft)

The essence of the draft “Development Concept Paper” is as shown in Table 5. The draft “Development Concept Paper” is as shown in Appendix 6-1.

Table 5 Essence of the Draft “Development Concept Paper”

Essence	Content
Vision	Bang Sue – Gateway to “City of Angels”
Basic Concept	<u>Concept 1:</u> To grow up to a centripetal urban core in Bangkok Metropolitan Area, which plays important roles in the international community. (1) To form an international and regional business and interaction center. (2) To ensure sustainability including safety and environmental friendliness. <u>Concept 2:</u> To create an eternally beloved new central district full of various attractiveness. (1) To create various attractions of urban life, from old to new, from a bustle of market places to ultramodern skyscrapers. (2) To create a comfortable walking space so that everyone would enjoy strolling along decks and paths in the area. <u>Concept 3:</u> To create a visitor-friendly traffic terminal area comfortable for everyone. (1) To create a world-class traffic terminal area comfortable for both Thai and foreign visitors. (2) To upgrade the user-friendliness in terms of transfer by creating public spaces. <u>Concept 4:</u> To stepwisely realize the conceptual plan by both public and private sectors. (1) To enhance all kinds of partnership between public-private and private-private, beside a strong initiative by the public, in order to properly realize the conceptual plan.

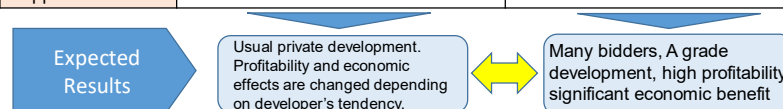
Source: JST

6.3 Development Scenario

There are two types of development, i.e.: Scenario 1 “Individual Development” and Scenario 2 “Integrated Development” as shown in Table 6 and Table 7. Scenario 1 consists of individual development thoroughly by the private sector on an ad hoc basis, while Scenario 2 is a national project based on the country’s distinct policy for upgrading the whole value of Bang Sue Area with an integrated development to provide potential investors with maximum advantages. Scenario 2, which is recommended for Bang Sue Area with the national government’s strong initiative, is indispensable to ensure a sustainable redevelopment with appropriate assignment of the urban functions described in Table 4.

Table 6 Comparison between “Integrated Development” and “Individual Development”

Development Framework/ Investment Condition		Scenario 1: Individual Development	Scenario 2: Integrated Development
Development Framework	M/P Positioning	M/P approved by SRT Board	M/P approved by Cabinet, designated as special development district
	M/P Contents	Primarily private development of office/retail/residential area, wherever feasible	Model case of TOD/Smart City with both public infrastructure and private development, orchestrated to maximize land value
	Implementation Structure	Implementation between SRT and Private	Implementation between Gov’t, SRT and Private
	Coordination Process	Coordinate separately with each related agency	Establish “One Stop” window for accelerated coordination within special district
	Development Steps	Develop primarily based on availability of land	Step-wise development to maximize land value
Investment Condition	PPP Tender Process	Tender conditions and documents are developed top-down	Tender conditions and documents are developed interactively with inputs from private, so as to ensure bankability
	Leasehold Period	30 years	50 years (based on BMA special zone regulation)
	Government Support	Nothing specific	Tax incentives and longer grace period as part of special development district support



Source: JST

Table 7 Differences between Individual Development and Integrated Development

Private/ Public	Floor use/ facilities	Scenario1: Individual Development	Scenario2: Integrated Development
Private Development Portion	Office	-Difficult to develop A grade skyscraper under 30 year leasehold condition. Suitable for back office demand, B grade, mid-low rise building.	-Possible to cultivate corporate HQ demand and develop A grade skyscraper. -However, balancing of office space supply is required. For example, ceiling supply set at 20% of total incremental supply forecast in North Bangkok area.
	Retail	-Limited to "flow-based" demand from terminal station pass-thru users. Primarily develop small-scale retail outlets to fulfill daily shopping needs.	-Both flow and stock (from office and residential dev) demand as catchment. Large scale retail development assuming destination shopping behavior.
	Hotel	-Business hotel to capture business trips from local cities, three star hotel.	-Capture international visitors, high grade, four to five star hotel.
	Condominium/House	-Difficult to justify landed house under 30year leasehold. Limited to apartments for short-term lease. Development area will need to be limited.	-Condominium and landed houses can be developed under 50year leasehold. Together with green network, prime residential district brand can be developed.
	MICE Facility	-MICE facilities are not feasible since it is difficult to develop as "destination" district.	-MICE facilities can be justified. However, size and function will need to take into account other competing MICE facilities in Bangkok.
Public Infrastructure Portion	Transport facilities (Inner zone roads, skywalk, park&ride, taxi bay, etc.)	-Limited gov't budget for inner zone transport. Private develops portions of transport facility, which may not be sufficient. As a result, transport convenience is sacrificed.	-Proactive development of transport facilities based on gov't budget and PPP availability payment scheme. Inner transport is extremely convenient and recognized as model case of TOD.
	Green and environment friendly network(park, green space, wind corridor, etc.)	-Coordination with city planning is delayed since this is SRT land solely developed by SRT. As a result, green network development is limited.	-Budgeting coordination with city planning is smooth, as this is cabinet approved special district. Ideal green network is developed, which will generate premium value for residential development and add to visitor demand generation.
	Basic utility (water treatment, electricity, gas), energy saving and other environment facilities	-Basic utility development requires coordination with multiple agencies, which could cause delay. Private is required to invest in own environment facilities, which sacrifices overall efficiency.	-"One stop" window allows coordinated planning and development of basic utilities. Budget/incentives for smart city related facilities are in place.

Source: JST

6.4 Adjustment of Demand Forecast for Scenario 2 (Integrated Development)

The estimated property demand after 2021 as shown in Section 5.2 was estimated by the least squares method based on the past trend and the planned floor supply. Be that as it may, more demand shall be expected with Scenario 2 which subjects to maximizing the gross value added of the redevelopment through government initiative. Therefore, the property demand estimation was adjusted based on conditions of Scenario 2. The property supply in Chatuchak District (high-end estimation for Scenario 2) in 2032 was estimated as follows: Office 530,742 m² (NFA), Retail 730,664 m² (GFA), Condominium 31,735 units and Hotel 6,249 rooms

The future gross floor area (converted) in Chatuchak District in 2032 was estimated as shown in Table 8.

Table 8 Future Gross Floor Area in Chatuchak District in 2032 (Scenario 2)

Category	Gross Floor Area	Share
1) Office	884,570 m ²	15.8%
2) Retail	730,664 m ²	13.0%
3) Condominium	3,626,902 m ²	64.7%
4) Hotel	364,518 m ²	6.5%
Total	5,606,654 m²	100.0%

Note: In this report, estimated supply shall be considered as market needs and demand.

Source: JST, based on data provided by Jones Lang LaSalle

6.5 Stepwise Development

The stepwise development that is shown in Figure 2 and Table 9 is recommendable in terms of the following points of view: (a) inauguration of new urban mass transit railways, which are being constructed or will be constructed, (b) land status (availability, infrastructure including different types of utility), (c) market demand, and (d) financial arrangements.

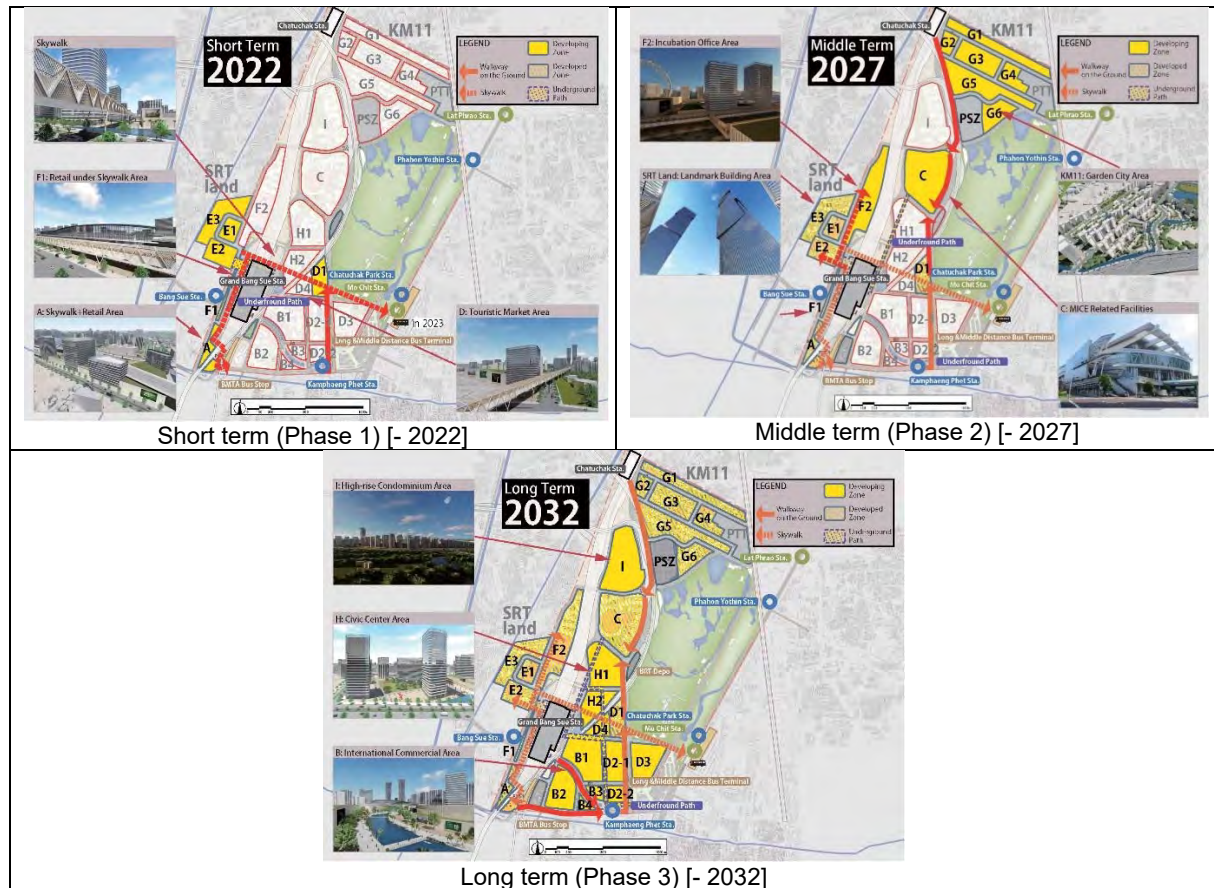


Figure 2 Recommendable Stepwise Development by Zone

Table 9 Recommendable Stepwise Development by Zone

No.	Development Zone/ Facility	Short (-2022)	Middle (-2027)	Long (-2032)
1	Red Line/ Grand Station	Start-End	Operated	Operated
2	Airport Link	Start-End	Operated	Operated
3	Zone A	Start-End	Operated	Operated
4-1	Zone D1	Start	End	Operated
4-2	Zone D2/D3	-	-	Start
5	Skywalk (A-D Intersection)	Start	End	Operated
6-1	Zone B1, B2	-	-	Start-End
6-2	Zone B3, B4	-	-	Start
7	Zone C	-	Start-End	Operated
8	KM11(Zone G)	-	Start-End	Operated
9	BKT (Old Mochit)	Start	End	Operated
10	BRT (Area Bus Service)	-	Start-End	Operated
11-1	SRT Land (Zone E1, E3)	Start-End	Operated	Operated
11-2	SRT Land (Zone E2)	Start	End	Operated
12	Zone F	-	Start-End	Operated
13	Zone H	-	-	Start
14	Zone I	-	-	Start-End

Note: Colored cells were proposed by the Japanese side. Red printed cells are different from the Thai side's original ideas.

Note: Red Line, Grand Station, and Airport Link inauguration timing is consistent with that of Thai side's existing plan.

Source: JST (Start: Groundbreaking, End: Inauguration)

7. Development Plan of Bang Sue Area

7.1 Basic Policies

A development plan for Bang Sue Area to achieve the realization of the vision was formulated based on various factors such as the content of the superior plans, the local conditions in the district, and the socioeconomic trends. It also referred to the contents of related plans that were developed under State Railway of Thailand (SRT) and Office of Transport and Traffic Policy and Plan (OTP), and introduced experience and know-how gained through past experiences of large-scale urban development projects in Japan. Basic policies for realizing such considerations are as shown in Table 10.

Table 10 Development Plan Formulation Policies

Policy	Matters for Care and Consideration
(1) To grow up to a new urban core in Bangkok Metropolitan Area which plays important roles in the international community	- To elaborate an integrated master plan for successful redevelopment of the entire area. - To place core facilities including a landmark tower building, smart city, etc. - To introduce attractive urban functions that boost development potential of the entire area.
(2) To create an eternally beloved new central district with full of various attractiveness.	- To introduce the main facility to connect and organize each zones - To develop infrastructure and public spaces that make the entire area more attractive. - To prepare a guideline to promote a well-balanced area development. - Introduce upgraded infrastructure and facilities that will contribute to increasing the potential of the district. - Place (and guide people to) applications and functions that will increase the potential of the entire area. - Introduce guidelines for driving planned urban development.
(3) To create a visitor-friendly traffic terminal area that is comfortable for everyone.	- To ensure comfortable transfer between railway stations and other transport modes. - To construct pedestrian decks and plazas. - To introduce a feeder transport mode (ex. BRT) and make the best use of ITS in the area.
(4) To step-by step implementation of the conceptual plan by both public and private sectors.	- To elaborate a stepwise implementation plan ensuring feasibility and viability. - Consider an appropriate division of labor to ensure a “win-win” To introduce vitality and resources of private sector. - To consider the best role-sharing system that ensure a win-win partnership for both public and private sectors.

Source: JST

7.2 Urban Infrastructure Development Plan

Development plan of basic urban infrastructure, environment and green network and transportation network are formulated. Major items planned are summarized in Table 11.

Table 11 Studied Items for Urban Infrastructure Development Plan

Large Category	Small Category
Basic urban infrastructure	Land Preparation Plan, Road Structural Plan, Storm Drainage Plan, Water Supply Plan, Sewage Plan, Power Supply Plan, Communication Plan, Energy Infrastructure (Cogeneration, District Cooling), Energy Management (CEMS)
Environment and green network	Measures against Floods (Disaster Prevention/BCP), Green Network, Landscape Creation
Transportation network	Road Plan, Sidewalk Plan, Public Transportation Plan (including bus terminal), Traffic Volume Survey
Grade up facility	Sky walk, Underpass, ITS

Source: JST

7.3 Land Use Plan

Land use is divided into three distinct categories: (1) Commercial land (the central core of the district), (2) Multi-purpose land (commercial and business as major land use, and residential as sub land use), and (3) Residential land (good quality residential zones).

A development plan is as shown in Figure 3. Images of future development based on the development

plan are as shown in Figure 4 and Figure 5.



Source : JST

Figure 3 Development Plan



Source : JST

Figure 4 Image of Future Development [Bang Sue Area]



Source : JST

Figure 5 Image of Future Development [Around Bang Sue Grand Station]

7.4 Volume Study/Cost Estimation

The area of floor for offices, commercial facilities, hotels, and residential buildings was calculated based on the information collected from market research and interviews with real estate companies in Thailand. Based on the area of floor, the generated population and the construction cost were estimated as shown in Table 12 and Table 13. The maintenance cost was assumed to be 2% of the construction cost.

Table 12 Estimated Floor Area and Generated Population

Land Use	Content	Scale (m ² ,room, people)
(1) Office	Exclusive Area	530,760 m ²
	Number of People in the Office	44,230 people
(2) Commercial Facilities	Tenant Area	365,350 m ²
	Number of Customers	292,280 people
(3) Hotel	Number of Rooms	31,735 rooms
	Number of People	9,373 people
(4) Residential Facilities	Number of Rooms	6,249 rooms
	Number of Residents	126,942 people

Source : JST

Table 13 Estimated Construction Cost for Bang Sue Area Redevelopment (Category)

Category	Small Category	Cost (USD 1,000)
Basic Urban Infrastructure	-	159,371
Transport Network	-	309,432
Green Network	-	6,100
Environment	-	103,127
Disaster Prevention	-	11,000
Upgrading Facilities	-	81,500
Buildings	Office	2,653,800
	Commercial Facilities	2,189,400
	Residential	10,880,700
	Hotel	1,093,500
	Cultural Facilities	550,000
	Public Offices	300,000
Total		18,337,930

Source : JST

8. Implementation Plan

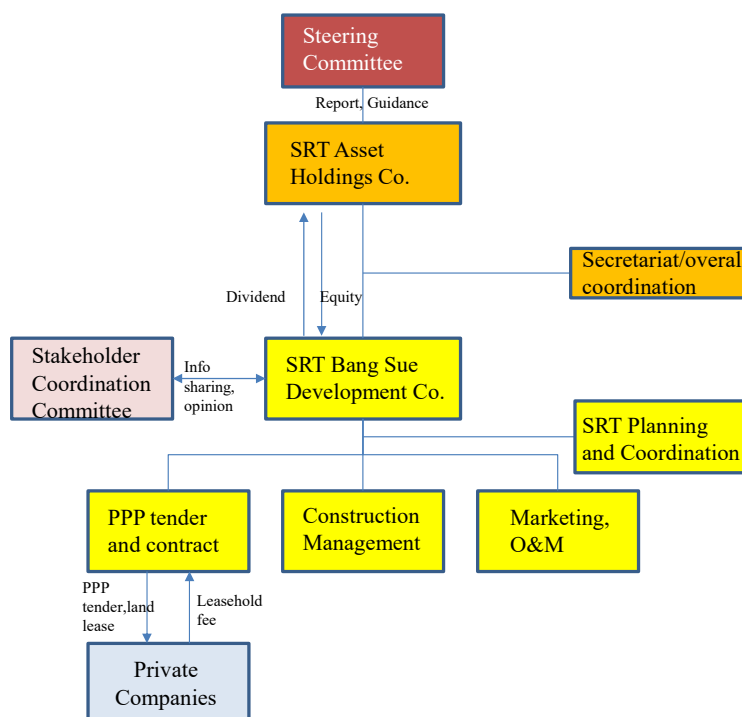
In order to implement the Bang Sue Redevelopment Project, organizational and funding arrangements are essential. In the present study, the project implementing organization and the project funding mechanism were proposed.

8.1 Project Implementing Organization

The Bang Sue Redevelopment Project is a massive project both in terms of size and complexity. It involves many stakeholders at each of the development layers. In the JICA Survey Team (JST) view, there are five layers of development: 1) Basic public infrastructure, 2) Green network and environment management, 3) Transportation network, 4) Upgrade facilities for transit-oriented development (TOD) and Smart city and 5) Commercial and magnetic facilities.

These development layers are all implemented on the land owned by State Railway of Thailand (SRT), which also adds complexity. For example, trunk road (in Layer 1) is typically developed on top of the land owned by the government. Trunk road development on SRT's land requires a memorandum of understanding (MOU) between SRT and Bangkok Metropolitan Administration (BMA), to clarify the responsibilities sharing of construction, operation and maintenance (O&M). Such coordination between SRT and each government department requires very strong coordination mechanism. Otherwise, the development will just take too much time and energy.

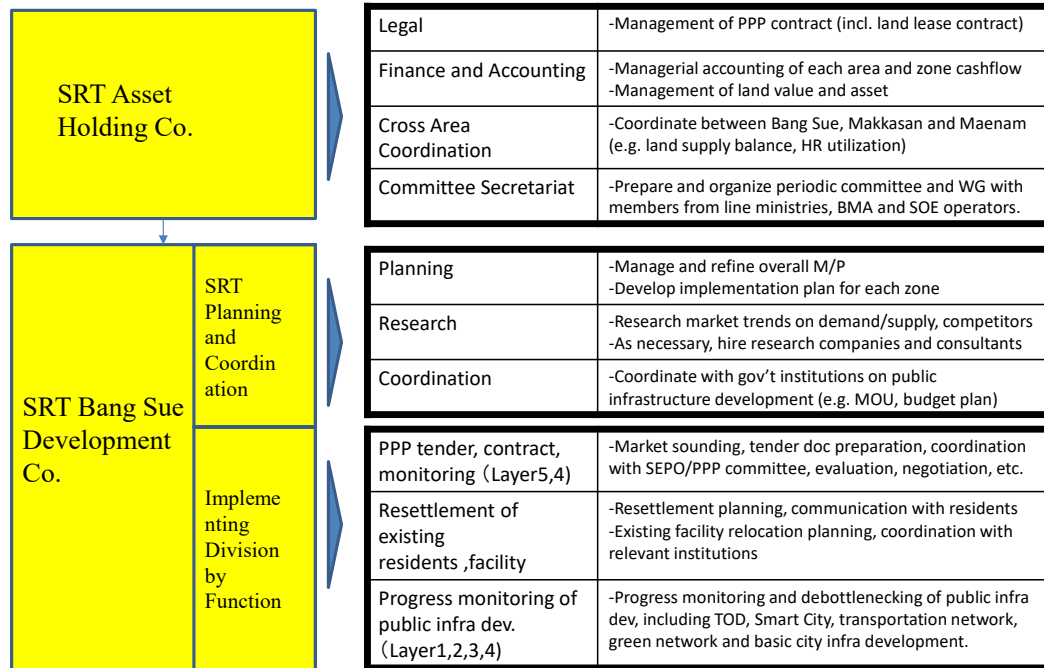
Therefore, government "top-down" implementation structure involving all key stakeholders is essential to successfully develop the Bang Sue Area. JST's suggested implementation structure is described in Figure 6. The key functions of this implementation structure are embedded in the following six key organizations: 1) Steering Committee, 2) SRT Asset Holding Company, 3) Secretariat/Overall Coordination, 4) SRT Bang Sue Development Company, 5) Planning and Project Coordination, and 6) Stakeholder Coordination Committee.



Source : JST

Figure 6 Project Implementation Organization

SRT Bang Sue Development Company should have the essential business functions described in Figure 7, and required to be the “Master Developer” and “Orchestrator” of the development project.

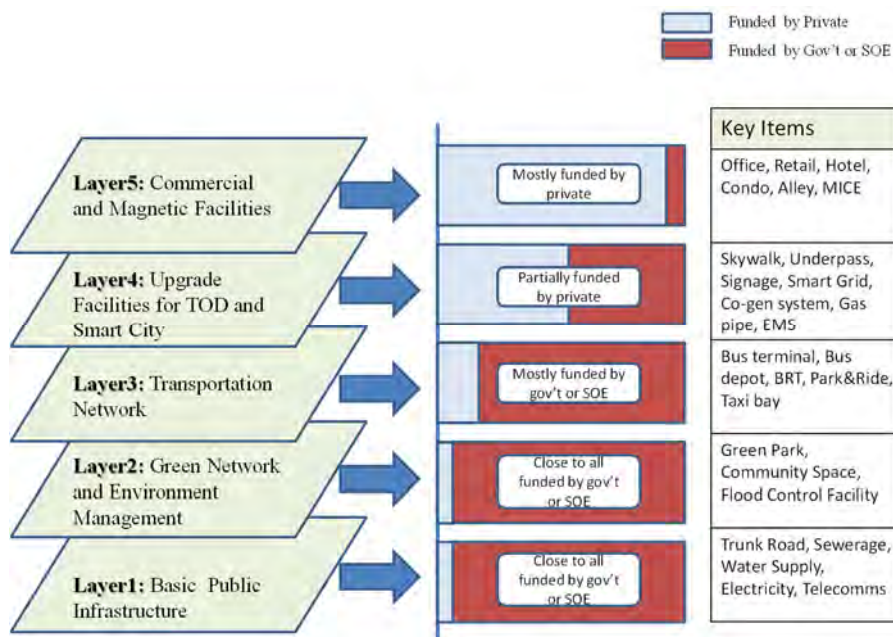


Source : JST

Figure 7 Required Functions within SRT Subsidiary Organizations

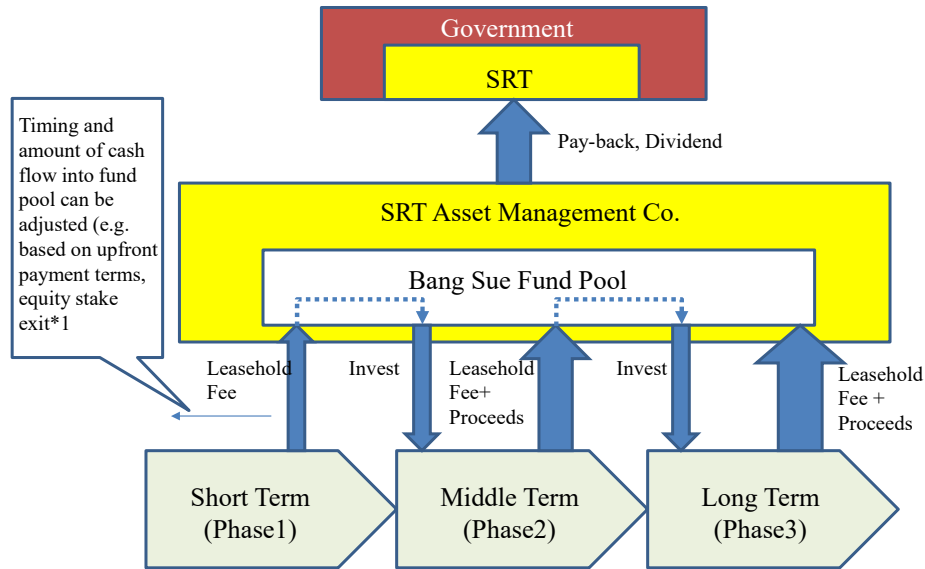
8.2 Funding Mechanism

Funding for this project shall inevitably be a combination of private funding via PPP, government funding, and state-owned enterprise (SOE) funding. This is because the project is not merely about developing commercial facilities on top of the SRT land. As described in 8.1, the project has five layers of development. Each layer shall have different funding characteristics. The basic fund allocation principles are described in Figure 8, the idea of phased usage of fund pool is described in Figure 9.



Source : JST

Figure 8 Basic Funding Allocation Principles



*1 SRT could convert leasehold rights into equity portion of SPC. Once SPC realizes stable operating cashflow, then, this could be sold to infrastructure fund (e.g. REIT)

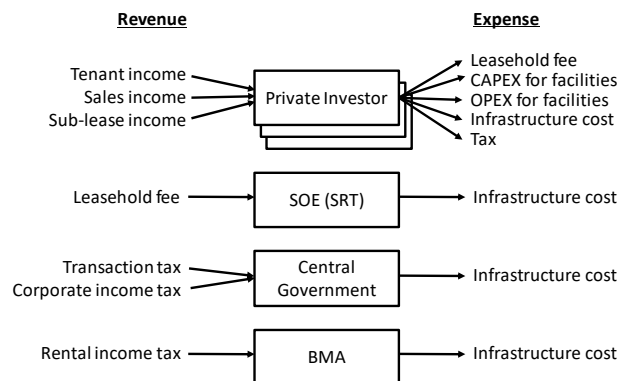
Source : JST

Figure 9 Phased Usage of Fund Pool

8.3 Financial Analysis

The objective of financial analysis is to check financial feasibility and affordability of the project. That must be critical factors for future success. It is assumed that there are four major players on the project: 1) Private investor, 2) State-owned Enterprise (SOE) operators, including State Railway of Thailand (SRT) and Electricity Generating Authority of Thailand (EGAT), etc., 3) Central Government (CG) including MOT, MOF, etc. and 4) Bangkok Metropolitan Administration (BMA).

The following sketch in Figure 10 shows the financial analysis scheme. Major parameters of Senario1 and Senario2 and other conditions are shown in the main report.



Source : JST

Figure 10 Financial Analysis Scheme

The output of the financial analysis is summarized as follows. The detailed results are shown in the main report.

1) Private investor

There is substantial difference between Scenario-1 and Scenario-2 where equity-IRR in Scenario-1 is less than 5% while the equity IRR in Scenario-2 is over 15% in most zones.

2) SOE

Land lease fee paid by private investors shall be gained during year 2019-2044 under the condition that the grace period is three years and pay-back term is set at ten years. The revenue of SOE would become THB 2.5 billion per year in net present value while maximum infrastructure cost would become THB 1.2 billion per year, so that the profit can reflux into the next phase investment.

3) Central Government and BMA

The tax revenue has a substantial impact in Scenario-2. On the other hand, in Scenario-1, the tax revenue is estimated only at 10% of Scenario-2. In Scenario 1, the land value would have increased not enough for private investors to gain profit, so that less private investors may join the project. As the result, the tax revenue based on profitability would not have increased much in Scenario 1.

8.4 Project Schedule

For the development of Bang Sue Area, a three-phase development program is recommended from the perspective of promoting well-planned, integrated development of the overall area. The three-phase consists of the Short Term (Phase 1: target year 2022), the Middle Term (Phase 2: target year 2027) and the Long Term (Phase 3: target year 2032).

9. Intention of Japanese Private Sector

A questionnaire survey on Bang Sue Area development was conducted to 1) member companies of the Japan Conference on Overseas Development of Eco-Cities (J-CODE), and 2) member companies of division of Engineering Work and Construction, the Japanese Chamber of Commerce, Bangkok, to understand the intention of Japanese companies to participate into urban development-related business and possibility of introducing qualified urban infrastructure.

Results of the questionnaire and interviews revealed that many Japanese firms are highly interested in business participation to the project, with the advantages in the position of Bang Sue Area in the superior plans, high public transport convenience, and the land of project area owned by one owner, the State Railway of Thailand (SRT). However, some requests were also clarified such as the extension of land lease period (50 to 70-year lease is desirable), and the basic infrastructure development by the government, etc.

10. Way Forward

Main actions to be taken at the very initial stage (until 2019) are as shown below.

1) The Government of Thailand

1) M/P Finalization, 2) Steering Committee Establishment, and 3) Clarification of menu of Government Assistance.

2) The State Railway of Thailand (SRT)

1) Establishment of Subsidiaries by 2017

2) Preparation for Short Term Development (until 2022): 2018 and after

3) Preparation for Middle Term Development (until 2027), 4) Smart City-related Planning, 5) TOD and Transport Networking-related Planning, 6) Basic Infrastructure-related Planning, 7) MICE-related Planning, and necessary coordination for every actions: 2019 and after

This is the end of the Executive Summary.

Chapter 1 Introduction

1.1 Background

The Bangkok Metropolitan Region, Bangkok and its five surrounding prefectures, currently, has a population of 10,730,000 people. In 2013, the gross regional domestic product (GRDP) per capita was recorded at THB 376,463 which is slightly less than twice the gross domestic product (GDP) per capita for the whole country at THB 193,394 on the same year. The Bangkok Metropolitan Region has the biggest population, and it is the center of economic and political activities in the country.

In order to solve heavy traffic and environmental problems in the Bangkok Metropolitan Region, the Ministry of Transport (MOT) started introducing mass transit system in the 1990s. As of January 2017, four urban mass rapid transit (UMRT) lines, i.e., BTS Sukhumvit Line, BTS Silom Line, MRT Blue Line, MRT Purple Line, and one airport line, i.e., Airport Rail Link (ARL) are operated in Bangkok. Furthermore, they have several ongoing plans and under construction projects to extend these existing lines, as well as to construct new lines, to enhance UMRT networks.

State Railway of Thailand (SRT) Red Line Project, including Bang Sue Grand Station, has a total extension length of 26.3 km. One of the financial resources of the project is the yen loan. As the implementing agency, SRT aims to start its operation in July 2020. Bang Sue Grand Station shall be the biggest terminal station in Bangkok. Several UMRT lines, including Red Line shall stop at Bang Sue Grand Station.

The survey area (hereafter called as Bang Sue Area) includes Bang Sue Grand Station and large land for railway facilities. Being located at the future transport hub in Bangkok, it has a high potential for urban development. Office of Transport and Traffic Policy and Planning (OTP) and SRT studied on the development concept plans and SRT intends to redevelop the area by public-private partnership scheme. However, they are confronted with difficulties such as “lack of step-by-step integrated development” and “lack of arrangement of each project based on a single comprehensive master plan”.

In this context, MOT requested the Japan Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) for support in developing an integrated master plan (MP) for Bang Sue Grand Station and the surrounding area. Accordingly, OTP, SRT, and MLIT established a Working Group for Urban Development (WG) in August 2016. Through the three WG sessions in August 2016, November 2016, and January 2017, OTP, SRT, and MLIT discussed the necessity of an integrated MP including an infrastructure plan and work items to be considered.

With this situation in mind, the Japan International Cooperation Agency (JICA) decided to take over the cooperation and assign a survey team to formulate an integrated MP. The objectives of the present survey are as follows:

1. Based on the discussions in the WGs and the former information gathering survey conducted by MLIT, the JICA Survey Team (JST) shall collect and analyze related information and data for redevelopment in Bang Sue Area. JST shall formulate the “Development Vision” and “Draft Concept Paper”, and facilitate stakeholders to reach a consensus for integrated development.
2. JST shall formulate all plans including project implementation scheme and fund allocation among stakeholders such as central government, local government, state-owned enterprise and private sectors, which shall contribute to project implementation framework for redevelopment

of Bang Sue Area.

1.1.1 Survey Period

The survey period is from March 2017 to November 2017.

1.1.2 Survey Area

The survey area is shown in Figure 1.1.1.

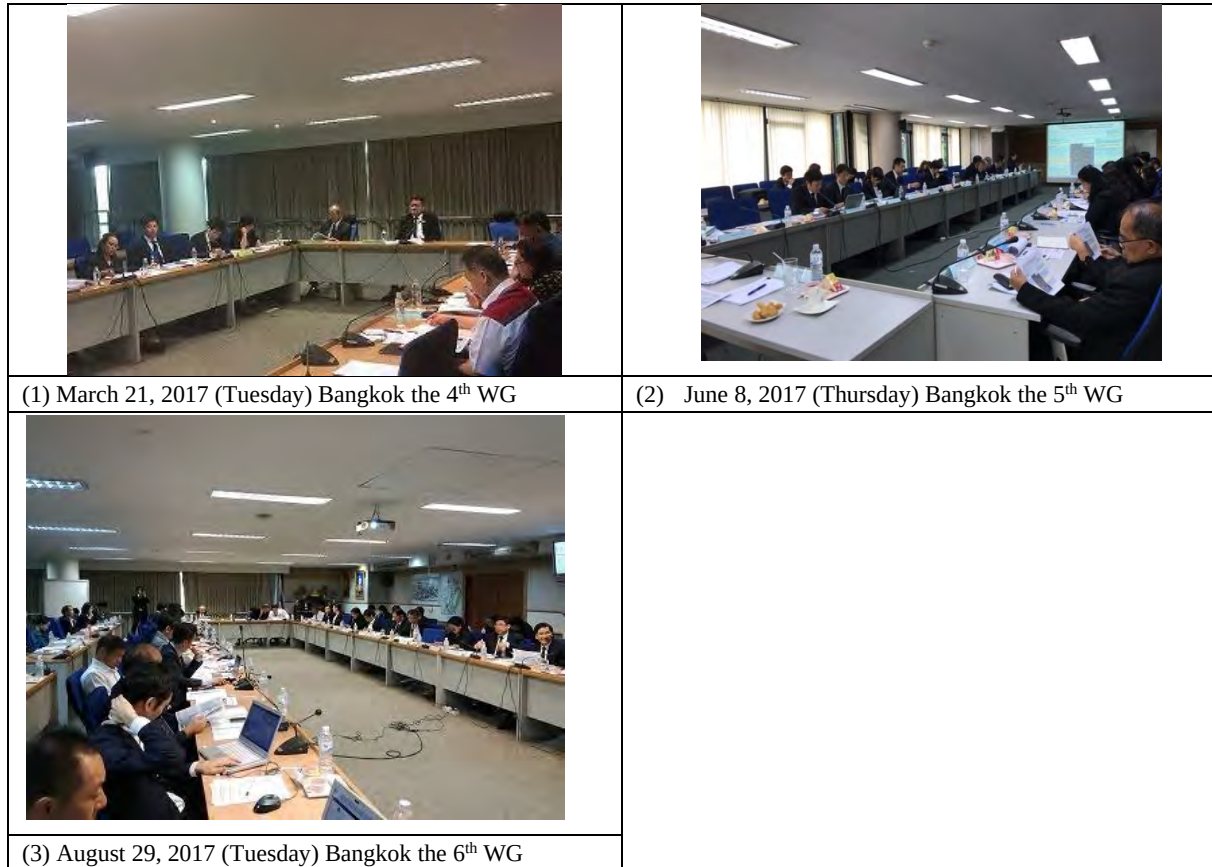


Source: JST

Figure 1.1.1 Bang Sue Area (Survey Area)

1.2 Working Groups/ Workshops

During the survey period (from March to November 2017), three sessions of WG on Urban Development were held by MOT and MLIT. JST reported the progress of the present study at the WGs to Thai stakeholders. In addition, nine workshops (WS) were held in Bangkok in order to discuss with Thai stakeholders and obtain their opinions.



Source: JST

Figure 1.2.1 Coordination between the Government of Thailand and the Government of Japan

1.3 Seminar on Thailand – Japan Railway Cooperation for Connectivity Success

The seminar on Thailand – Japan Railway Cooperation for Connectivity Success was held by JICA and OTP on 17th November 2017 in Bangkok. A presentation on Bang Sue Area redevelopment project (the result of the present survey) was given by JST, and PR video for the project was unveiled. In addition, a brief introduction of the present survey was given through panels and a brochure.



Figure 1.3.1 Seminar on Thailand – Japan Railway Cooperation for Connectivity Success

Chapter 2 Superior Plans

2.1 Urban Development Related Plans

The related factors between superior plans and Bang Sue Area development are as shown in Table 2.1.1.

Table 2.1.1 Related Factors between Superior Plans and Bang Sue Area Development

No.	Superior Plans	Factors related to Bang Sue Area Development
1	National Spatial Development Plan 2057	Urban development policy (Strategy, Land Use, Tourism, Transport, and Energy etc.)
2	Bangkok Comprehensive Plan	- Land Use Plan (Zoning, FAR) - Public contribution options for obtaining FAR bonus (Open space, parking, storage tank etc.)
3	Mass Rapid Transit Master Plan of Bangkok	- Public transport plan - Urban development around a train station

Source: JST

2.1.1 National Spatial Development Plan 2057 of Thailand

(1) Outline

National Spatial Development Plan 2057 of Thailand was formulated by the Department of Public Works and Town and Country Planning, Ministry of Interior (DPT), in response to the cabinet order dated July 9, 2002. Directions and policies for national spatial development are formulated for a 50-year period, and the plan also includes strategic plans for a 5-year period, 10-year period, and 15-year period.

The national development vision stated in the plan is “Thailand will be a world leader in agriculture, agro-industry, food technology, health services, and tourism. Thai people will have a good quality of life in the pleasant environment. The country will be solidly established with sustainable growth.”

To achieve the vision by 2057, following plans are specified in the plan, as shown in Table 2.1.2.: “Development frameworks”, “Strategic position and future development trends”, “Major issues of national development policies”, and “Fields covered by the 50-year National Spatial Development Policy”.

Table 2.1.2 Outline of the National Spatial Development Plan 2057 of Thailand

No.	Item	Descriptions
1	National development vision	“Thailand will be a world leader in agriculture, agro-industry, food technology, health services, and tourism. Thai people will have a good quality of life in the pleasant environment. The country will be solidly established with sustainable growth.”
2	Development frameworks	1) Potential economic development zone 2) Growth distribution to all regions 3) Linkage to other ASEAN countries
3	Strategic position and future development trends	1) Giving priority to increase in urban balance and urban clusters development with comparable economic activities and progress. 2) Promoting rural centers to get more strength, be self-reliant, and benefit from regional linkage.
4	Major issues of national development policies	1) Populations and workforce distribution 2) Economic development 3) Urban-rural organization according to proper roles and functions 4) Most efficient land use 5) Development of transportation systems, technology and communication, and energy
5	Fields covered by	1) Land use and development, (2) Agriculture, (3) Urban and rural development, (4) Industry,

No.	Item	Descriptions
	the 50-year National Spatial Development Policy	(5) Tourism, (6) Social services, (7) Transportation, energy, IT, telecommunication, and (8) Prevention of natural disasters

Source: JST

(2) Regional Development Policies

The National Spatial Development Policy consists of both the national plan and wide-area regional plan (national-regional plan) of which six regions --- 1) Bangkok and its vicinity, 2) Eastern Region, 3) Central Region, 4) Northeastern Region, 5) Northern Region, and 6) Southern Region --- are assigned as the wide-area regions. Table 2.1.3 shows policies on the development of the six regions and Figure 2.1.1 shows a conceptual diagram of the National Spatial Development Plan. Figure 2.1.2 shows the conceptual map of “Bangkok and its Vicinity Regional Plan” as part of the National Spatial Development Plan 2057.

Table 2.1.3 Policies on the Development of the Six Regions in the National Spatial Development Plan 2057 of Thailand

No.	Region	Development Policy
1	Bangkok and its vicinity [Bang Sue Area]	- Developing this region as a world-leading metropolitan area to make it an Asian hub of economy and air transport. - Making it a livable, beautiful, attractive city, and stopping the urban sprawl. - Making the most efficient use of the urban area to enhance the urban functions of Bangkok and its vicinity linking it with a comprehensive, state-of-the-art public transport system so that the urban functions will cover the entire region.
2	Eastern Region	- Developing this region as an industrial center and a world-class, leading-edge port city to enhance its functions as Asia’s economic gateway and center of transportation and distribution. - Providing support so that Chachoengsao, Chonburi, Pattaya, and Rayon, which are major cities, will become economic centers that will support the expansion of the metropolitan area.
3	Central Region	- Developing good agriculture, aiming to make this region a global food center and encouraging agricultural practice by positioning the region as the center of chemical-free farming techniques. - Managing world-class natural and historical tourist attractions and supporting clean industries. - Developing Ayutthaya, Saraburi, Ratchaburi, and Hua Hin as major cities that will support the economic expansion of the metropolitan area.
4	Northeastern Region	- Developing this region as the economic gateway for Indochina, conserving relics of ancient civilization and world heritage and maintaining good farmland. - Promoting the development of Nakhon Ratchasima, Khon Kaen, Udon Thani, Ubon Ratchathani, and Mukdahan as central cities that link the settlements.
5	Northern Region	- Developing this region as the economic center of countries along the Mekong River, developing road and railway networks, and developing Chiang Mai, Chiang Rai, Phitsanulok, and Nakhon Sawan as core cities of the Northern Region. - Maintaining the proportion of forests and water resources at 60% or higher in terms of area and creating settlements that are livable and maintain the characteristics of the Lan Na culture.
6	Southern Region	- Developing this region continuously as an economic bridge with other countries based on its cultural diversity and rich natural resources, and promoting the halal food industry to promote this region as a world-class tourist attraction. - Developing Hajai, Songkhla, Suratthani, Nakhon Si Thammarat, and Pattani as regional core cities.

Source: JST

(3) Major Features

The formulation of the National Spatial Development Plan 2057 was the first attempt in the history of urban planning in Thailand wherein it formulated official spatial policies at both the national and

regional levels.

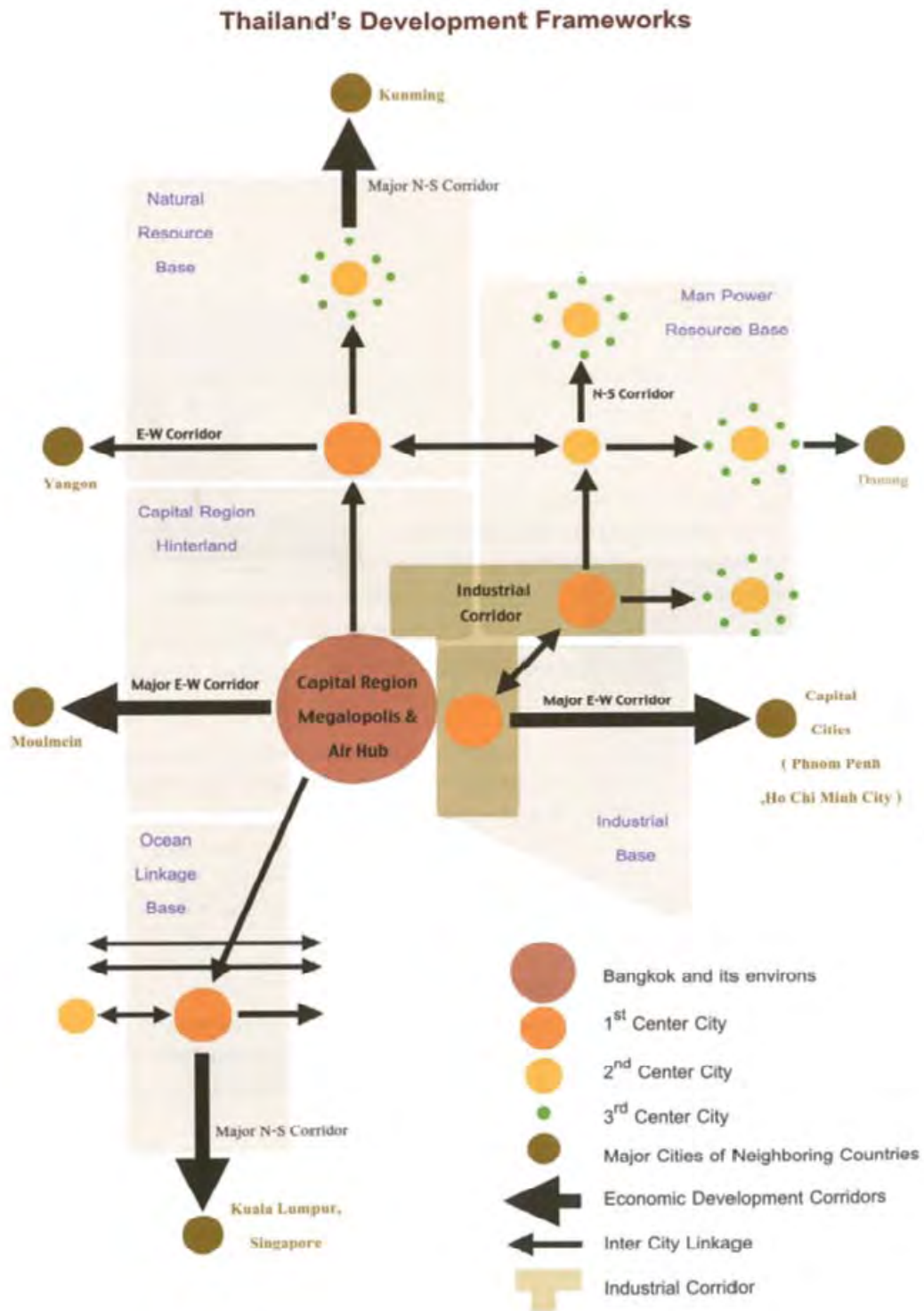
Thailand's former spatial development was done without official spatial policies, either at national or regional level, as explicit frameworks for leading, supervising, controlling, and integrating the urban-rural developments. In addition, development planning systems lacked united and efficient cooperation among agencies concerned resulting in numerous problems e.g. imbalanced developments of land use, society, and economy, improper natural resources management, urban and communities expansion in disorder, people's settlements in dangerous areas, diffusion of industrial plants and hazardous warehouses along with residential areas, natural resources and environments exacerbated, poverty problem, differences in growth and profits dispersal, insufficient public services and facilities for all urban and rural areas, etc. Other than a direct impact on people's quality of life, these problems also caused higher development costs and adversely affected national competitiveness and economic system¹.

The main purpose of the plan is to contribute such problems through followings:

- 1) Clarifying the vision of the national government on urban planning;
- 2) Formulating urban planning policies related to the development of the national strategic areas (major economic infrastructure, safe habitats, and good quality of life); and
- 3) Establishing policies, strategies, and measures for development areas, land use, infrastructure, and community structure.

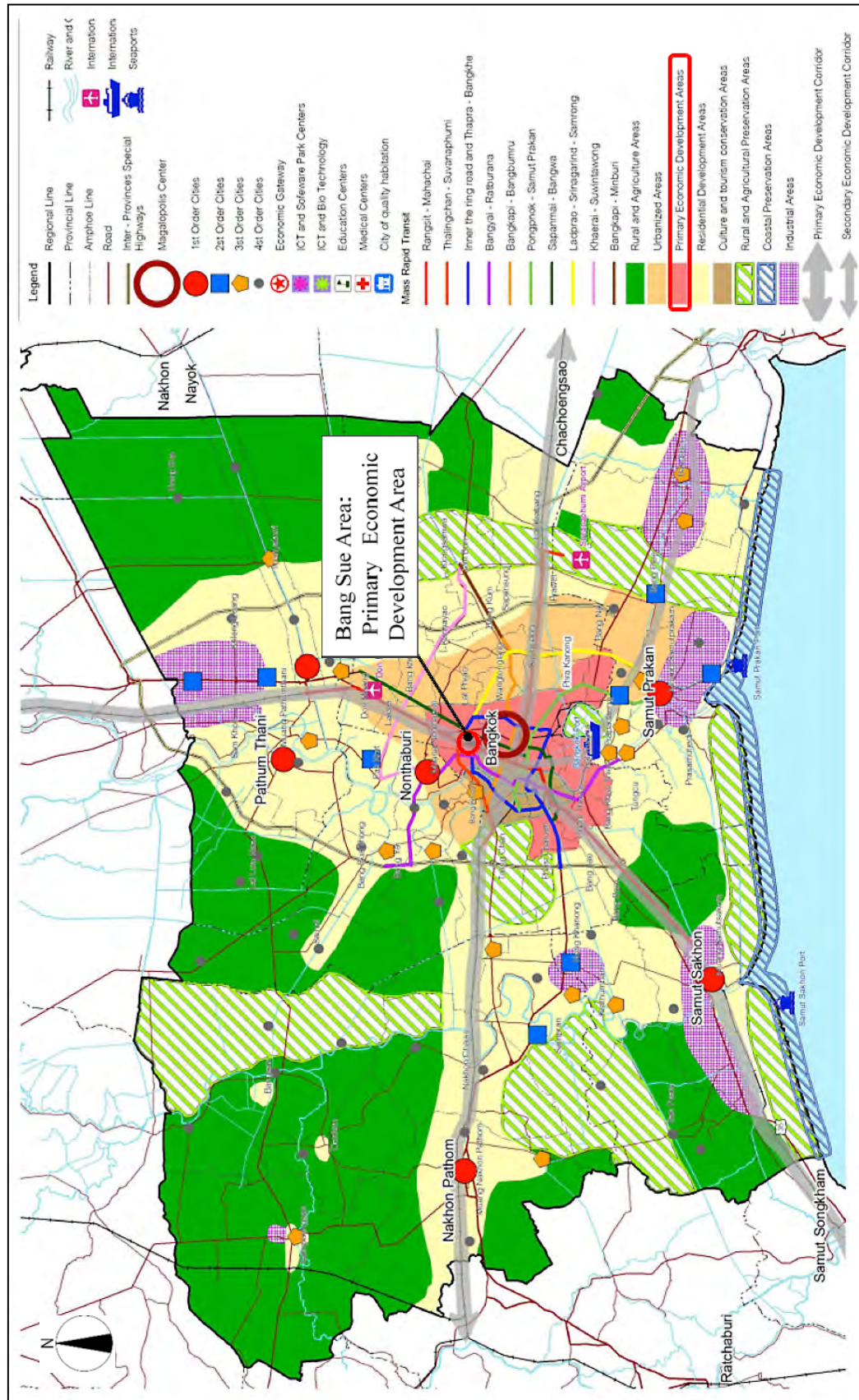
In addition, the plan positions Thailand as the gateway to the Association of Southeast Asian Nations (ASEAN) countries and southern China, and defines economic corridors such as the South-North Economic Corridor, East-West Economic Corridor, and South Economic Corridor as a long-term development strategy.

¹ An Overview of Spatial Policy in Thailand (MLIT)



Source: DPT (2009) Thailand National Spatial Development Plan 2057

Figure 2.1.1 Conceptual Drawing of the National Spatial Development Plan



Source: DPT (2009) Thailand National Spatial Development Plan 2057

Figure 2.1.2 Bangkok and its Vicinity Regional Plan

2.1.2 Bangkok Comprehensive Plan

The first Bangkok Comprehensive Plan was issued in 1992. In principle, the plan will be revised every five years with maximum of two times of two-year extension. It was revised in 1999, 2006, and 2013. At present, the Bangkok Comprehensive Plan 2013 is in operation, but a revised plan for 2018 is under preparation.

The Bangkok Comprehensive Plan 2013 contains the Zoning Plan, the Open Space Conservation, the Transport System Plan, and the Infrastructure Development Plan. The land zoning is categorized in ten major categories and 26 minor categories.

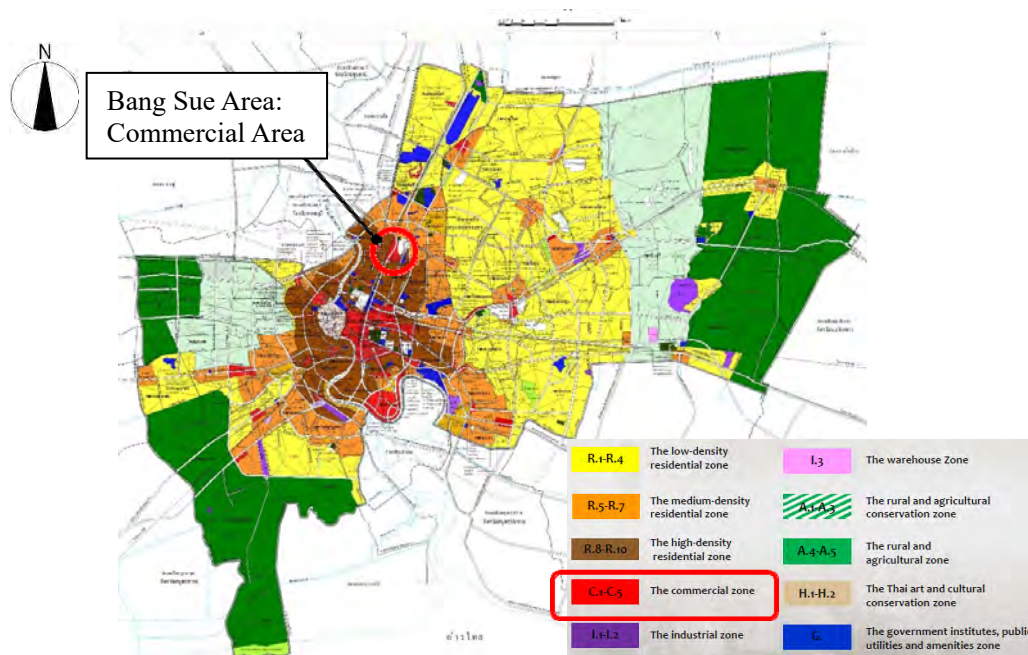
Since the Bangkok Comprehensive Plan 2006, Floor Area Ratio (FAR) and Open Space Ratio (OSR) as well as the idea of FAR bonus were introduced as new methods in order to control land use. Under these rules, land developers are able to obtain a maximum of 20% FAR bonus by satisfying certain conditions.

The land zoning categories and conditions for obtaining FAR bonus in the Bangkok Comprehensive Plan 2013 are as shown in Table 2.1.4. The land zoning in the Bangkok Comprehensive Plan 2013 is shown in Figure 2.1.3.

Table 2.1.4 Land Zoning Categories and Conditions to Obtain FAR Bonus in Bangkok Comprehensive Plan 2013

No.	Category	Content
1	Land Zoning (Ten major categories)	1) Residential (low density), 2) Residential (middle density), 3) Residential (high density), 4) Commercial, 5) Industrial, 6) Warehouse, 7) Conservation Zone for Agriculture, 8) Agriculture, 9) Conservation Zone for historical and cultural buildings, and 10) Government use.
2	Conditions for getting FAR bonus	Land developers can obtain a maximum of 20% FAR bonus by satisfying a minimum of one condition below. 1) Providing public open space, 2) Providing parking space, 3) Providing social housing, 4) Installing rainwater storage tank, and 5) Installing “green building” (energy saving).

Source: JST



Source: BMA (2013) The Bangkok Comprehensive Plan (2013)

Figure 2.1.3 Land Zoning in Bangkok Comprehensive Plan 2013

2.1.3 Mass Rapid Transit Master Plan of Bangkok

In 1994, Office of the Commission for the Management of Land Transport (OCMLT) prepared the Mass Rapid Transit Systems Master Plan (MTMP) proposing three mass transit lines with total distance of 238 kilometers. Later in 2001, OTP prepared the Urban Rail Transportation Master Plan in Bangkok and the Surrounding Area (URMAP) proposing seven mass transit lines with a total distance of 375 kilometers. The plan also proposed the development of three intermodal stations namely: Bang Sue, Makkasan, and Taksin.

In 2004, OTP prepared the Bangkok Mass Transit Master Plan (BMT) proposing eight mass transit lines with a total distance of 475 kilometers. Finally in 2010, OTP prepared the Mass Rapid Transit Master Plan in Bangkok Metropolitan Region (M-MAP) consisting of 12 mass transit lines with a total distance of 556 kilometers.

Table 2.1.5 Summary of the Mass Rapid Transit Master Plans in Bangkok

No.	Name of Plans	Year	Composer	Summary of Contents
1	Mass Rapid Transit Systems Master Plan (MTMP)	1994	OCMLT	• 3 lines with a total of 238 km in Bangkok Metropolitan Region
2	Mass Rapid Transit Systems Master Plan (MTMP)	2001	OTP	• 7 lines with a total of 375 km in Bangkok Metropolitan Region • Bang Sue, Makkasan, and Taksin are designed as intermodal nodes.
3	Bangkok Mass Transit Master Plan (BMT)	2004	OTP	• 8 lines with a total of 475 km in Bangkok Metropolitan Region • Bang Sue, Makkasan, and Taksin are continuously designed as intermodal nodes.
4	Mass Rapid Transit Master Plan in Bangkok Metropolitan Region (M-MAP)	2010	OTP	• 12 lines with a total of 556 km in Bangkok Metropolitan Region • Bang Sue, Makkasan, and Taksin are continuously designed as intermodal nodes.

Source: JST, based on M-MAP seminar document²

2.2 Policies and Plans for Economics and Industrial Promotion

2.2.1 Thailand 4.0

Thailand 4.0 formulated by National Economic and Social Development Board (NESDB) is the latest economic and industrial model of Thailand, which is advocated as linking the 20-year National Strategic Plan. It aims to shift from the current economy (Thailand 3.0) led by foreign investments with focusing on automobiles, electrical and electronics industry, petrochemicals, and others to an added-value economy based on knowledge, creation, and innovation focused mainly on the knowledge-intensive industry, the green industry, renewable energy, healthcare, and transport (see Figure 2.2.1).

Currently, Thailand is facing problems such as declining birthrate, aging population, shortage of advanced human resources, and income disparities, as well as middle-income trap. To solve these problems at the same time, the Government of Thailand deems it necessary to change the industrial structure by increasing the added-value of industries and products. The Government of Thailand has designated ten industries (five existing industries and five new industries) and five core technologies,

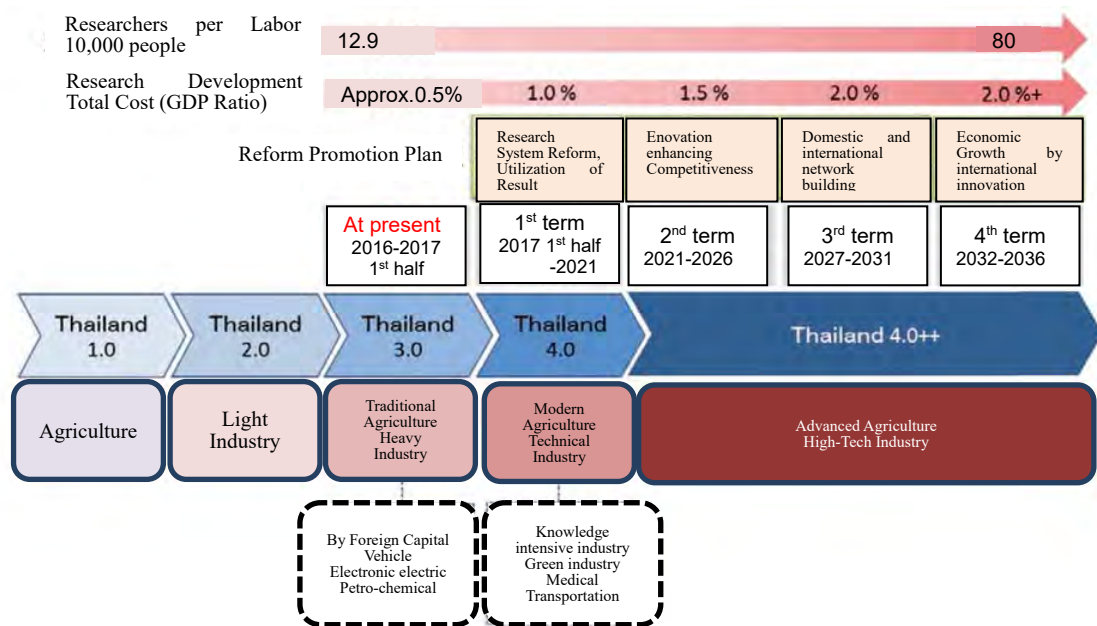
² The document of the second seminar of M-MAP, held in July 2009

which are listed in Table 2.2.1. as drives of Thailand 4.0 policy.

Table 2.2.1 Ten Industries and Five Core Technologies Designated in Thailand 4.0

No.	Category	Descriptions
1	Five existing industries (that maintain economic growth)	1) Automobiles including next-generation automobiles and automotive parts, 2) Smart electronics 3) High-quality tourism, 4) Agro and biotechnology, and 5) Next-generation food and food processing
2	Five new industries (that lead the economy to grow dramatically)	1) Robotics, 2) Transportation and aviation, 3) Bio industry, bioenergy, and biochemical, 4) Digital industry, and 5) Medical hub and medical and health industry
3	Five core technologies	1) Food technology, 2) Health technology, 3) Automation technology, 4) Digital technology, and 5) Cultural technology

Source: JST



Source: Toshio Ohta, 2017

Figure 2.2.1 Outline of Thailand 4.0

2.2.2 Twenty-year National Strategic Plan

NESDB has formulated a 20-year National Strategic Plan (2017-2036) as a long-term national plan created by the Government of Thailand. It consists of six areas, six primary strategies, and four supporting strategies as shown in Table 2.2.2. It is therefore also referred to as the “6-6-4 plan.”

The plan clearly specifies “science and technology, research, and innovation” as one of the four supporting strategies.

Table 2.2.2 Outline of the 20-year National Strategic Plan

No.	Item	Descriptions
1	Six areas	1) Security 2) Competitiveness enhancement 3) Human resource development 4) Social equality 5) Green growth 6) Rebalancing and public sector development
2	Six primary strategies	1) Enhancing and developing the potential of human capital 2) Ensuring justice and reducing social disparities 3) Strengthening the economy and enhancing competitiveness on a sustainable basis 4) Promoting green growth for sustainable development 5) Bringing about national stability for national development towards prosperity and sustainability 6) Enhancing the efficiency of public sector management and promoting good governance
3	Four supporting strategies	1) Infrastructure development and the logistics system 2) Science and technology, research, and innovation 3) Urban, regional, and economic zone development 4) International cooperation for development

Source: JST

In addition, the plan sets the following targets for the ratio of the total research and development cost to the gross domestic product (GDP) and the number of researchers (Table 2.2.3).

Table 2.2.3 Ratio of Total Research and Development Cost to GDP and Number of Researchers per 10,000 Working People

Periods	Ratio of Total Research and Development Cost to GDP	Number of Researchers Per 10,000 Working People
Up to 2017	-	12.9
2017 - 2021	1.0%	-
2022 - 2026	1.5%	-
2027 - 2031	2.0%	-
2032 - 2036	2.0% or higher	-
By 2036	-	80
2036 onwards	4.0%	-

Source: JST

2.2.3 National Economic and Social Development Plan

(1) Outline

In Thailand, the National Economic and Social Development Plan is formulated as a five-year guidance of economic and social development for the whole country. The National Economic and Social Development Plan is a framework of national policy and also a guidance for policy makers and government officers to formulate and revise economic and social development policies.

The composer of the plan is NESDB and the plan is approved by the Cabinet. After the approval of the Cabinet, it is enforced as a cabinet order.

The latest plan is “The 12th National Economic and Social Development Plan” (NESDP) targeting 2017 to 2021. Under the vision of “A happy society with equality, fairness, and resilience”, the 11th plan targeting 2012 to 2016 formulated six major strategies including human resource development, security of food and energy, natural resource and environmental management, and so on. The 12th plan continues the major direction of the 11th plan and the newly formulates ten strategies toward reducing income differences; strengthen economy and competitiveness in international society.

The outline of the 12th plan is as shown in Table 2.2.4.

Table 2.2.4 Outline of the 12th Five-year National Economic and Social Development Plan

No.	Items	Summary of Contents
1	Goal	1) Income per people : USD 13,000 by year 2036 2) Average yearly growing rate of GDP: 5~6% 3) Strong competitiveness, which is in second position among ASEAN countries after Singapore 4) Gini coefficient to show income gap: 0.36 5) Reduce greenhouse gas emission volume: Reduce 20~25% 6) Lifelong learning 7) Income security for elderly citizen
2	10 Strategies	1) Human capital development, 2) Ensure fairness and reduce social disparities 3) Strengthening of Thailand's economy on a sustainable basis, 4) Green growth, 5) Promote national stability, 6) Combat corruption and promote good governance, 7) Infrastructure and logistics development, 8) Develop science, technology, research, and innovation, 9) Urban and economic zone development, 10) International cooperation for development

Source: MITSUI & CO. GLOBAL STRATEGIC STUDIES INSTITUTE's report based on NESDB's documents

(2) Description on Urban Development

During the past decade, the National Economic and Social Development Plan did not clearly mention about the area and the contents of development along urban railway. The 10th plan 2007-2011 mentioned only “the development of mass transportation network in Bangkok and its vicinity for convenience, quickness, safety, time saving, and the decrease of energy consumption”.

The following 11th plan 2012-2016 mentioned brief purpose only: “the development of the public transportation network so that it covers more areas and responds the expansion of urban areas and land use. An electric train network should be built for public transportation. The efficiency of current public transportation in Bangkok and other municipal areas should be increased. Facilities to support commuting patterns should be developed that serve both private cars and public transportation.”

Recently, the 12th plan 2017-2021 firstly mentioned about “Bang Sue” and detailed contents of public transport development. It mentioned “The development of public transport in urban areas” by indicating “ten mass transit lines in Bangkok and its vicinity for a distance of 384 kilometers consisting of implementing projects. Mass Rapid Transit Authority of Thailand (MRTA) and State Railway of Thailand (SRT) shall be the major agencies to implement these transport projects.

The plan mentioned about “Development of Major Cities”. In particular to Bang Sue, it has a detailed statement as follows:

“To promote Bangkok to be the center of international business hub; educational center; international health and medical center, with high standard information and communication technology, in intermodal nodes, e.g., Bang Sue. Cities should be developed with adequate allocation of land use, public utilities and facilities, social services, and housing. In order to respond to the demand from increasing population, it shall consider solving urban environmental problems such as traffic congestion, solid waste, wastewater, air pollution, as well as providing better townscape, green areas, and public parks.”

2.2.4 Thailand's Eastern Economic Corridor

Thailand's Eastern Economic Corridor (EEC) is a project that was approved by the Government of Thailand in July 2016. It was proposed by NESDB. In this project, transport infrastructure shall be developed in the region along the corridor. The target areas are three eastern provinces: Chonburi, Rayong, and Chachoengsao. The project promotes investment in ten high-tech industry sectors

including electric vehicles, hybrid vehicles, healthcare, aviation, and robots.

This project shall also function as a part of the 12th Five-Year Plan and development shall be implemented from 2017 to 2021. As the first phase, the expansion and improvement of U-Tapao International Airport which is located between Chonburi Province and Rayong Province, is planned to take place. In addition, the expansion of Laem Chabang Port and Mab Taphut Port and plans to develop high-speed railways are also positioned as parts of the project.

2.2.5 Cluster-based Special Economic Development Zones Policy

Cluster-based Special Economic Development Zones Policy (hereafter, the “Cluster Policy”) formulated by the Board of Investment of Thailand (BOI) is aimed at creating clusters (Table 2.2.5), where interconnected businesses and related institutions are concentrated and operated within the same geographic areas. The aim of promoting business clusters is to boost the level of support and cooperation in all facets of business, both vertical and horizontal, in order to strengthen the industrial value chain, enhance Thailand’s investment potential and competitiveness, and expand Economic and Social development to regional and local levels. The Cluster Policy came into effect on September 16, 2015 after being approved by the Cabinet and Thai Board of Investment.

Table 2.2.5 Outline of the Cluster Policy

No.	Category	Field (Examples)
1	Super Cluster	1) Automotive and parts cluster 2) Electrical appliances, electronics, and telecommunication equipment cluster 3) Digital-based cluster 4) Eco-friendly petrochemicals and chemicals 5) Food innopolis 6) Medical hub
2	Other clusters	1) Agro-processing products 2) Textiles and garments

Source: JST

2.2.6 Border Special Economic Zone Policy

In July 2014, BOI formulated a large-scale policy to develop special economic zones (SEZ) in its national borders, that is called as “border SEZ policy”. As a background, there is the Greater Mekong Sub-region Development Program (hereafter, “GMS”), a framework of international cooperation in which five Mekong countries including Thailand and China have been involved since 1992.

In November 2014, a proposal to develop five SEZs, including ones along the major economic corridors specified in GMS, was confirmed as the first phase of the policy. Five other candidate areas were also selected for the second phase. This proposal is distinctive wherein it has specified industrial fields to be promoted in each SEZ, thereby encouraging the development of industrial clusters. The target business activities, which are specifically encouraged in each SEZ, are categorized into 13 industrial groups, and each SEZ has different industrial groups as targets. (Table2.2.6)

Table2.2.6 Candidates for Border SEZs

Phase	No.	Target Province	Country On The Other Side of the Border	Economic Corridor	Major Industrial Fields Where The Policy Aims To Develop Clusters
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Phase	No.	Target Province	Country On The Other Side of the Border	Economic Corridor	Major Industrial Fields Where The Policy Aims To Develop Clusters
First Phase	1	Tak	Myanmar	East-West	Distribution, labor-intensive industry
	2	Mukdahan	Laos	East-West	International trade, multi-modal transport, electrical and electronics industry, warehousing
	3	Sa Kaeo	Cambodia	South	Agro-processing, multi-modal transport/transport and regional wholesale, retail
	4	Trat	Cambodia	South Coastal	Ecotourism, multi-modal transport, setting of tax-free cross-border trade zone
	5	Songkhla	Malaysia	-	Rubber industry, fishery and fishery processing, halal food processing, distribution
Second Phase	6	Chiang Rai	Myanmar and Laos	South-North	Details unknown
	7	Kanchanaburi	Myanmar	South	Details unknown
	8	Nong Khai	Laos	-	Details unknown
	9	Nakhon Phanom	Laos	South Coastal	Details unknown
	10	Narathiwat	Malaysia	-	Details unknown

Source: JST based on data from JETRO

2.3 Other Strategies and Policies

2.3.1 Ninth National Research Policy and Strategy (2017 - 2021)

National Research Policy and Strategy formulated by National Research Council of Thailand is an action plan toward the goals illustrated in 20-year National Strategic Plan and the National Economic and Social Development Plan. Under the vision of “Formation of a knowledge-based, innovation nation”, the Ninth National Research Policy and Strategy (2017-2021)” consists of the following four strategies:

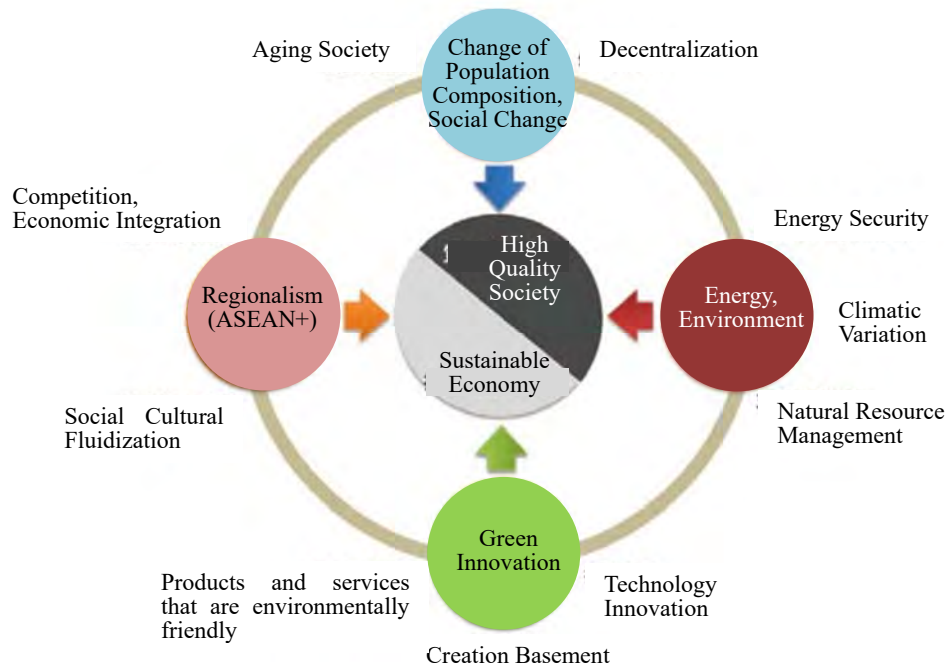
- 1) Promotion of research and development and utilization of innovations for economic growth and social development;
- 2) Increasing research and development investments made by the government and the private sector;
- 3) Reforming the national research system for the integration and efficiency improvement of research; and
- 4) Developing infrastructure and fostering human resources for research and development.

2.3.2 National Science, Technology, and Innovation Policy Plan

The National Science, Technology, and Innovation Policy Plan is a ten-year plan (2012 - 2021) that was announced by National Science, Technology, and Innovation Policy Office (STI). It was formulated with the aim of taking initiatives for “the development of science, technologies, and innovations” and for “the systematic introduction of innovations.” As keywords for the pillars of the framework, it stipulates: 1) Demographic and Social Changes; 2) Energy and Environment; 3) Green Innovation; and 4) Regionalism (ASEAN+).

The framework of the National Science, Technology, and Innovation Policy Plan is as shown in

Figure 2.3.1.



Source: Toshio Ohta, 2017

Figure 2.3.1 Framework of the National Science, Technology, and Innovation Policy Plan

2.3.3 MICE Strategy in Thailand

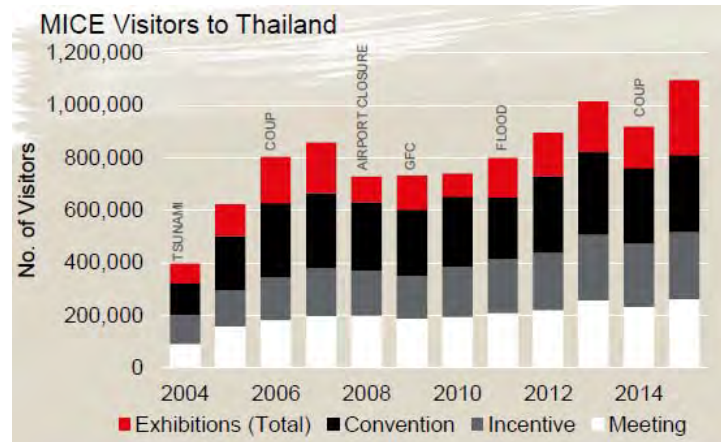
In Thailand, Thailand Convention and Exhibition Bureau (TCEB) is in-charge of undertaking marketing activities in the global market and promoting the development of Meetings, Incentives, Conferences and Exhibitions (MICE) in Thailand since 2004. Thailand has been promoting MICE because it shall produce a significant economic impact and is expected to bring a synergetic effect with tourism. TCEB was established as a part of a policy aiming at developing a value-creating economy to improve international competitiveness. Furthermore, human resource development is also promoted by attracting training programs implemented by international organizations in the MICE field such as Global Association of the Exhibition Industry (UFI) and International Association of Exhibitions and Events (IAEE).

As a result of these initiatives under public and private cooperation, the number of foreign tourists who traveled to Thailand for MICE purposes exceeded 1.2 million in FY2016. The average annual growth rate of international MICE tourist for 11 years from 2004 to 2014 exceeds 11.10%. Source: Jones Lang Lasalle

Figure 2.3.2 shows the number of international MICE tourist to Thailand by purpose from 2004 to 2014. In addition, the average expenditure of MICE tourist during their visit is THB 87,478 and it tends to be 2 or 3times of that of leisure tourist. In FY 2016, international MICE brought a revenue of THB 103 billion.

Thailand has thus become a driving force of the MICE market in the ASEAN region. Advantages of Thailand (Bangkok) are considered as 1) Good accessibility from other countries, 2) Good accessibility in city (pubic transportation, Urban Mass Rapid Transit), 3) Strong inithiative by the government, 4) Internatinal grade MICE facilities and hotels, 5) Tourist distinations, 6) International

cuisine, 7) Shopping etc. Especially, the advantage of Thailand in good accessibility from ASEAN region, East-Asia region, South-Asia region seems to be overtaking Singapore which is a strong competitor in ASEAN.



Source: Jones Lang Lasalle

Figure 2.3.2 Number of MICE tourist to Thailand by Purpose (2004-2014)

Table 2.3.1 shows MICE-related organizations in Thailand and Table 2.3.2 and Figure 2.3.3 show MICE facilities in Bangkok.

Table 2.3.1 MICE-related Organizations in Thailand

MICE-related Organizations	
Thailand Convention and Exhibition Bureau (TCEB)	Public
Thai Exhibition Association (TEA)	Private
Thai Incentive Convention Association (TICA)	Private
Sightseeing-related Organization	
Tourism Authority of Thailand (TAT)	Public

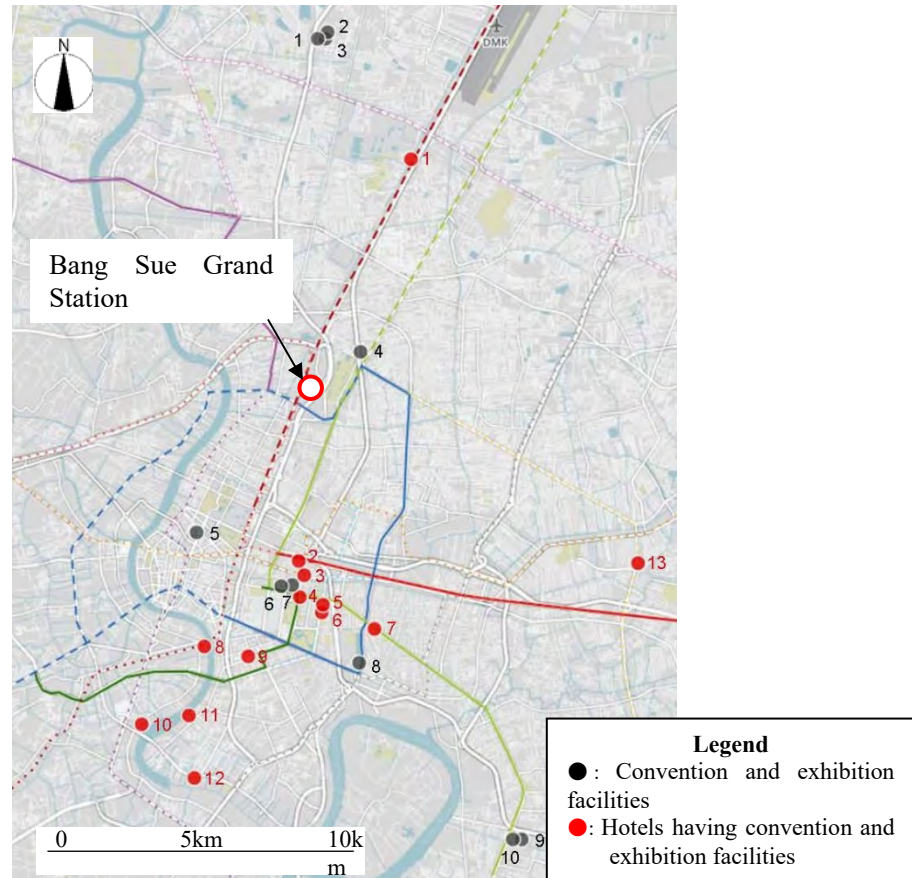
Source: JST

Table 2.3.2 Convention and Exhibition Facilities in Bangkok

Convention and Exhibition Facilities			Hotel (Number of Room)
No.	Convention and Exhibition Facilities	Area of Facility Use (m ²)	
1	IMPACT Challenger Hall	60,000	Novotel Bangkok IMPACT (380) ibis Bangkok IMPACT (587)
2	IMPACT Convention Centre	18,000	
3	IMPACT Exhibition Centre	47,000	Centara Grand (565)
4	Centara Grand at Central Plaza Ladprao	9,000	
5	United Nation ESCAP	6,125	—
6	Royal Paragon Hall	12,000	—
7	Bangkok Convention Center at CentralWorld	9,200	Centara Grand at CentralWorld (505)
8	Queen Sirikit National Convention Center	65,000	—
9	BITEC Bangna	50,400	—
10	BITEC Bangna Expansion	37,800	—
No.	Hotels Having Convention and Exhibition Facilities	Area of Facility Use (m ²)	Number of Room (Accommodation)
1	Miracle Grand Convention Hotel	6,830	270
2	Baiyoke Sky Hotel	1,540	658
3	The Berkeley Hotel Pratunam	3,190	788
4	Grand Hyatt Erawan	3,100	380
5	Plaza Athenee Bangkok	5,600	374

6	Conrad Hotel Bangkok	4,600	391
7	Hotel Windsor Suites and Convention	5,700	458
8	Millennium Hilton Bangkok Hotel	3,000	533
9	Narai Hotel	1,590	475
10	Avani Riverside Bangkok	1,500	251
11	Ramada Plaza Bangkok Menam Residence	8,000	525
12	Montien Riverside Hotel	2,700	462
13	The Grand Fourwings Convention Hotel	2,500	466

Source: JST based on data provided by Jones Lang Lasalle, Trip Advisor (number of room)



Source: JST based on data provided by Jones Lang Lasalle

Figure 2.3.3 Location of Convention and Exhibition Facilities in Bangkok

2.3.4 Trends of Medical and Health- and Longevity-related Matters

(1) Health Promotion and Tourism

In 2004, the Government of Thailand implemented a policy of becoming the “Medical Hub of Asia”. Since then, the Ministry of Public Health and various related organizations have been cooperating to formulate and implement systems for promoting medical tourism. The Tourism Authority of Thailand (TAT) organized the Thailand Health and Wellness Tourism Showcase, which was held from September 14 to 17, 2015, and unveiled the concept of “Anti-aging Tourism” as the concept for the next medical tourism. The purpose of this trade show was to provide a marketing opportunity for business operators in Thailand, allowing them to discuss future deals with (foreign) medical tourism operators and travel agencies interested in medical tourism.

(2) Future Trends of Medical-related Policy

The Government of Thailand has established “National Biotechnology Policy Framework” to make the country to be the center of the medical sector in the ASEAN region by 2020. Having established National Health Authority, the government has been promoting initiatives related to the strengthening of the advanced biotechnology business and industry, the promotion of biotechnology research, and the development of engineers. In addition, Ministry of Industry have been promoting the medical products industry strategy for 2012 to 2016 and initiatives such as the promotion of medical-related industry have been promoted proactively.

2.4 Role of the Bang Sue Area in Thailand

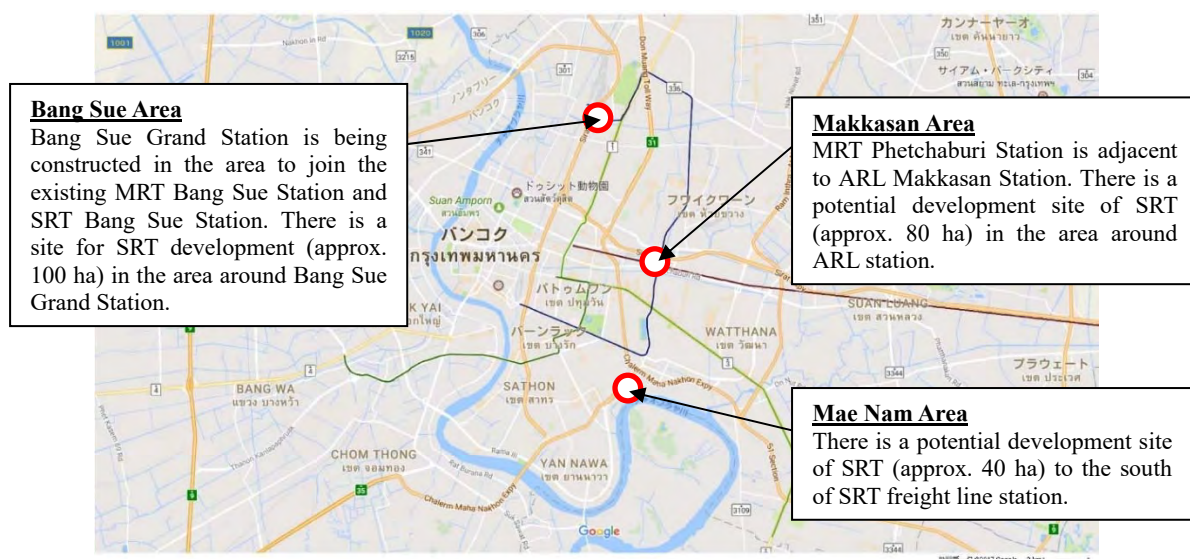
(1) Role of Bangkok in Thailand

As the capital of the country, Bangkok is aimed to become a world-leading metropolis as well as the Asian hub of economy. It is also expected to be a leading example of sustainable urban development by introducing public transport systems and improving the quality of life of people.

(2) Role of the Bang Sue Area in Bangkok

In the M-MAP formulated by OTP, Bang Sue Area is counted as one of the multi-modal transport nodes in Bangkok, as well as and Makkasan Area. In addition, in the Bangkok Comprehensive Plan 2013, land use in Bang Sue Area is categorized as commercial zone, and FAR is set as the second highest in Bangkok after Silom area. Accordingly, Bang Sue Area is expected to develop as urban Transit Oriented Development (TOD) core, as it shall be a transportation hub in the future.

Notably, in addition to the Bang Sue Area and Makkasan Area, Mae Nam Area is a candidate for development. SRT has huge land in these three locations (Figure 2.4.1). It is necessary to classify urban functions to be introduced to each area, so that urban functions should not compete with each other. The proposed urban functions for each area are as shown in Table 2.4.1 with consideration of superior plans, location, and surrounding environments.



Source: JST

Figure 2.4.1 Locations of the Three Candidate Areas for Development

Table 2.4.1 Urban and Transport Functions for Three Locations Owned by SRT

Area	Required Urban Functions	Required Transport Functions
Bang Sue	- Office facilities accumulated around Bang Sue Grand Station - Interaction, tourism, and hotel facilities linked to existing tourism resources such as Jatujak Market and parks - Other urban functions including commercial and residential facilities	- Good connectivity among Bang Sue Grand Station, MRT Bang Sue Station, and SRT Bang Sue Station. - Relocation of Mochit Bus Terminal and local bus stops - Intra-area transport such as BRT - Walkways
Makkasan	- Office facilities accumulated around Makkasan Station - Functions as national and international information center - Functions for visitors such as conferences rooms and hotels	- Boosting demand for Airport Rail Link (ARL), land use, and population distribution along ARL - Ensuring walkway connecting Makkasan Station and buildings - Controlling traffic in the area
Mae Nam	- Residential, office and commercial facilities with an image of water front for branding - Commercial function for the people living around the stations - Open space for interaction	- Improvement of connectivity to SRT Mae Nam Station and BTS Gray Line Station - Ensuring walkway connecting Mae Nam Station and buildings

Source: JST

(3) Approach to Attract Industries to Bang Sue Area

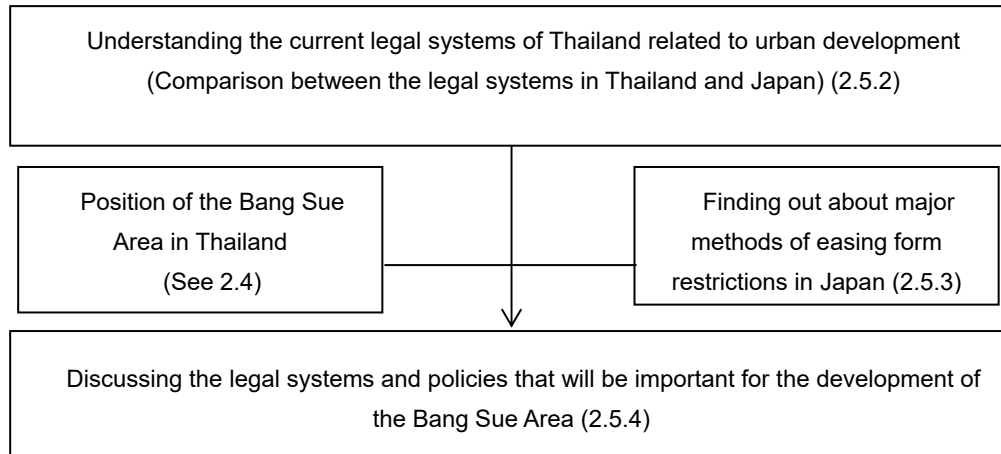
To attract industries to Bang Sue Area, the following points should be considered:

- 1) Good accessibility to the airports and the existing central business district (CBD).
- 2) Specific fields to be focused on, such as MICE, tourism, medicine and health, and research and development, which are emphasized in the superior plans.

2.5 Legal Systems and Policies Related to Urban Development

2.5.1 Process of Research on Legal Systems and Policies Related to Urban Development in Thailand

The process of research on legal systems and policies related to urban development in Thailand is shown in Figure 2.5.1.



Source: JST

Figure 2.5.1 Process of Research on Legal Systems and Policies

2.5.2 Current Legal Systems Related to Urban Development in Thailand

The legal systems related to urban development in Thailand and its structure outline are described in Appendix 2-1 "List concerning the legal structure of Japan related to urban planning and similar plans of Thailand". Among the legal systems in Thailand, the following laws and regulations are especially important to implement a large-scale redevelopment in Bang Sue Area:

- 1) Town Planning Act 1975
- 2) Building Control Act 1979
- 3) Land Readjustment Act 2004
- 4) Land Subdivision Act 2000
- 5) Enhancement and Conservation of National Environmental Quality Act 1992
- 6) Comprehensive Planning Criteria and Standards 2006
- 7) Bangkok City Planning Standards 2010

(1) Town Planning Act 1975

The outline of Town Planning Act 1975 is as shown in Table 2.5.1.

Table 2.5.1 Outline of Town Planning Act 1975

Content	Preparation and implementation of the comprehensive plans and specific plans
Objective	For the control of land uses and the development of infrastructure, i.e., transportation, public utilities, and facilities in urban area. For the implementation of urban renewal and development projects.
Definition	“Town Planning” means the preparation and implementation of a comprehensive plan and a specific plan to build or develop a new town or redevelop a damaged town. It shall consider the following points: providing or improving sanitation, amenity and convenience, beauty, public safety, and social security, of improving economy, social affair, environmental conservation, art, architecture, history or antiquity, natural resources, landscape, and so on. “The comprehensive plan” is used as guidance in a development and maintenance of a town and related areas. It shall contain plans on communication, transport, public service, and environment. “specific plan” means a detailed plan to develop or redevelop a specific area.
Implementation	The comprehensive plans are prepared and enforced in more than 200 localities in the country. Specific plans were prepared in three localities and implemented in two localities, i.e., Lam Chabang in Chon Buri Province and Mab Taphut in Rayong Province.
Other	The City Planning Act 1975 has been proposed for the amendment.

Source: JST

(2) Building Control Act 1979

The outline of Town Building Control Act 1979 is as shown in Table 2.5.2.

Table 2.5.2 Outline of Town Control Act 1979

Content	The control of building construction
Objective	For the purpose of archiving stability, safety, prevention of fire, public health, maintenance of the quality of the environment, town planning, architecture, and rendering of facilities to traffic as well as other activities necessary for compliance with the Act.
Definition	“Building” means house, shop, raft, warehouse, office, and other construction which people may live or utilize, and shall also include: A grandstand or other construction for public assembly. A dam, bridge, tunnel, waterway or drain, dockyard, waterside pavilion, pier, fence, wall, or gate built next to or near the public place or construction for general public use. A signboard or construction for fixing or holding signboard. On or standing on a public land with more than one square meter size, or weigh, including its structure, of exceeding ten kilograms. On or standing near the public land, which horizontal distance from public land is less than the height of such signboard measuring from the ground level, and with the size or weight exceeding those prescribed in the Ministerial Regulation. An area or construction to be used as car parking space, car reversing space, and car entrance and exit for the building prescribed under Article 8(9) of the Act. Other constructions prescribed in the ministerial regulation. Provided that the parts of those buildings shall also be included therein. “Building control area” means an area which designated by the local government to enforce specific control ordinance of construction. The local government is able to enact local ordinances to control the shape, height, volume, material, and design of buildings in the area.
Implementation	The Department of Public Works and Town and Country Planning (DPT) and local governments are cooperating to enforce this law on construction of buildings and structures all around Thailand. There have been 66 ministerial regulations enforced throughout the country. Also, many local governments enact local ordinances on construction of buildings and structures in localities, e.g., BMA, municipalities, Pattaya City, etc.

Source: JST

(3) Land Readjustment for Area Development Act 2004

The outline of Land Readjustment for Area Development Act 2004 is as shown in Table 2.5.3.

Table 2.5.3 Outline of Land Readjustment for Area Development Act 2004

Content	The implementation of land readjustment projects for urban development in Bangkok and other provinces of the country.
Objective	For undertaking land readjustment projects relating to urban planning principles or the comprehensive plans, and providing public benefits suiting to community contexts and future urban development.
Definition	“Land Readjustment” means the implementation of development of many plots of land by land replotting, improving or constructing infrastructure, and jointly bearing the burdens and equitably distributing the returns. To this end, there shall be cooperation between private sectors, or between the private sector and the public sector, with the objective of utilizing land more appropriately with regard to transportation, economics, social, environment, and communities, and so as to be in line with urban planning.
Implementation	Persons who may proceed with land readjustment are as follows: (1) Land readjustment associations; (2) Department of Public Works and Town and Country Planning, National Housing Authority, and local administration organizations; (3) State organizations or any other juristic persons established by the state for the purposes of land readjustment; (4) Any other state organizations as provided in the ministerial regulations. The Organization of Land Readjustment Project has to have an agreement from 2/3 of landlords. The organization has to submit a project plan to the provincial land readjustment committee, then starts developing infrastructure and replotting. There have been land readjustment projects undertaken in Bangkok and other provinces.

Source: JST

(4) Land Subdivision Act 2000

The outline of Land Subdivision Act 2000 is as shown in Table 2.5.4.

Table 2.5.4 Outline of Land Subdivision Act 2000

Context	Land subdivision control for residential, commercial, industrial, and agricultural purposes.
Objective	For the purpose of public health, environmental protection, transportation, traffic, safety, public utilities, and urban planning including other necessities in land subdivision suited to the conditions of the province.
Definition	“Land Subdivision” means the sale of plot of land that has been divided into ten plots upwards with property or other remuneration in return regardless whether it is divided from one or many adjacent plots. It also refers to the execution that the land has been divided less than ten plots and thereafter, within three years, it has been divided in total into ten plots onwards.
Implementation	There have been land subdivision regulations for residential, commercial, industrial, and agricultural purposes for Bangkok and all provinces of the country.

Source: JST

(5) Enhancement and Conservation of National Environmental Quality Act 1992

The outline of Enhancement and Conservation of National Environmental Quality Act 1992 is as shown in Table 2.5.5.

Table 2.5.5 Outline of Enhancement and Conservation of National Environmental Quality Act 1992

Content	The preparation and submission of Environmental Impact Assessment (EIA) reports.
Objective	(1) To encourage people and private organizations for participating in the environmental promotion and protection. (2) To arrange the environment management system in environmental management principles. (3) To identify the power and responsibility of public organizations, public enterprises, and local governments in collaboration with environmental promotion and protection and to identify guidelines for missions of which responsible authority is not yet clarified. (4) To identify pollution control measures by providing air pollution treatment system, waste water treatment system, waste treatment system, and tools and instruments for solving pollution problems. (5) To identify duty and responsibility of the polluters. (6) To provide incentive measures, e.g., funding and other supports for convincing the acceptance of environmental protection duties.
Definition	“Environment” means physical and biological human surroundings created by nature and man-made. “Environmental Impact Assessment (EIA)” is the study for forecasting the environmental impacts, both negative and positive impacts from development projects or significant activities.
Implementation	Public and private projects which may create environmental impacts will have to submit EIA reports to Office of Natural Resources and Environmental Policy and Planning (ONEP) for development permission. ONEP has an internal committee to check EIA report and issue development permission. Project developers need to have a development permission from ONEP before applying for a construction permission to the local authority.
Other	The responsibility for the approval of the environmental impact assessment reports has been transferred from Office of Natural Resources and Environment Policy and Planning (ONEP) to BMA and pilot provinces.

Source: JST

(6) Comprehensive Planning Criteria and Standards 2006

The outline of Comprehensive Planning Criteria and Standards 2006 is as shown in Table 2.5.6.

Table 2.5.6 Outline of Comprehensive Planning Criteria and Standards 2006

Content	The specification of criteria and standards for comprehensive planning under the Town Planning Act 1975
Objective	To provide comprehensive planning criteria and standards for Department of Public Works and Town and Country Planning (DPT) as a central government, Provincial Public Works and Town and Country Planning Office as a provincial government and local governments, i.e., BMA, municipalities, Pattaya City, etc.
Definition	Referred to Town Planning Act 1975 and ministerial regulations enforcing comprehensive plans. “Town Planning” means the preparation and implementation of a comprehensive plan and a specific plan in the area of a town and related areas or in the country in order to build or develop a new town or to replace a damaged town for the purpose of providing or improving sanitation, amenity and convenience, orderliness, beauty, use of property, public safety, and social security, of improving economy, social affair, and environment, of preserving a place and an object of interest or value in the field of art, architecture, history or antiquity, or of preserving natural resources, landscape of beauty or natural interest. “The Comprehensive Plan” means a plan, policy, and project including a measure of general control, to be used as guidance in the development and maintenance of a town and related areas, or of the country in the fields of use of property, communication and transport, public service, and environment, for the purpose of achieving the objective of town planning.
Implementation	To be used for the preparation of the comprehensive plans under the Town Planning Act 1975 by Department of Public Works and Town and Country Planning (DPT), Provincial Public Works and Town and Country Planning Office, local administrations, and consulting companies since 2006.
Other	DPT is preparing a “Comprehensive Planning Criteria and Standards for Towns/Communities” for replacing the Comprehensive Planning Criteria and Standards 2006.

Source: JST

(7) Bangkok City Planning Standards 2010

The outline of Bangkok City Planning Standards 2010 is as shown in Table 2.5.7.

Table 2.5.7 Outline of Bangkok City Planning Standards 2010

Content	The specification of standards for BMA comprehensive planning under the Town Planning Act 1975.
Objective	To provide standards of land uses and infrastructures, i.e., transportation, public utilities, and facilities for BMA comprehensive planning.
Definition	Referred to Town Planning Act 1975 and the ministerial regulations enforcing BMA comprehensive plans. “Town Planning” means the preparation and implementation of comprehensive plan and a specific plan in the area of a town and related areas or in the country in order to build or develop a new town or to replace a damaged town for the purpose of providing or improving sanitation, amenity and convenience, orderliness, beauty, use of property, public safety, and social security, of improving economy, social affair, and environment, of preserving a place and an object of interest or value in the field of art, architecture, history or antiquity, or of preserving natural resources, landscape of beauty or natural interest. “Comprehensive Plan” means a plan, policy and project including a measure of general control, to be used as guidance in the development and maintenance of a town and related areas, or of the country in the fields of use of property, communication and transport, public service, and environment, for the purpose of achieving the objective of town planning.
Implementation	The standards were used for the preparation of BMA Comprehensive Plan (third revision) which has been enforced by the ministerial regulation enforcing BMA comprehensive plan 2013.
Other	The standards shall be integrated to the “Comprehensive Planning Criteria and Standards for Towns/Communities” prepared by the Department of Public Works and Town and Country Planning (DPT).

Source: JST

(8) Other Legal Systems Related to Real Estate Development

Other laws related to real estate development that are similar to Japan’s Civil Code (real rights, usufruct, real rights obtained by security, claims, and others) and Real Property Registration Act include the Laws and Regulations Concerning Lands 1954. Department of Lands of the Ministry of Interior holds jurisdiction over land registration, registration of ownership of condominiums, site division, and other matters related to land registration.

Laws that are similar to Japan’s Act on Land and Building Leases and Act on Real Estate Appraisal include the Civil and Commercial Code and the Act on the Lease of Immovable Property for Commercial and Industrial Purposes. The latter stipulates that immovable properties shall be leased for commercial or industrial purposes for a period of longer than 30 years and up to 50 years. It also stipulates that when the lease period has expired, the lessor and lessee may agree to extend the lease period by up to 50 years from the date of the agreement.

A law that is similar to Japan’s Act on Building Unit Ownership and Act on Facilitation of Reconstruction of Condominiums is the Condominium Act 1979.

2.5.3 Major Methods for Relaxation of Regulations on Urban Development

As described in “2.4 Position of the Bang Sue Area in Thailand,” in the future, the Bang Sue Area will be the new transport node of Bangkok where diverse urban functions will be concentrated. It is aimed to develop a good city that will improve the quality of life, and introducing public transport systems. An efficient, effective, high-level use of lands is necessary for achieving this vision. One example of methods for easing form restrictions is transferring of excess floor area ratio, to secure privately-owned public spaces or green spaces and otherwise protecting the good urban environment.

The use of such methods for easing form restrictions in Thailand will be extremely meaningful in case the project is highly beneficial for the public and also contributes to create a good urban environment.

An outline of the floor area transfer in major methods of easing form restrictions in Japan is summarized in Table2.5.8. (For details, see Table2.5.9 “Comparison Chart of Major Methods of Easing Form Restrictions”)

Table2.5.8 Floor Area Transfer in Major Methods of Easing Form Restrictions in Japan

Method	Possibility of Floor Area Transfer			Example
	Between Adjacent lot	Between Adjacent block	Between remote lot	
District for intensive land use (development promotion districts)	OK	NO	NO	• Daikanyama Address (2.2ha, Shibuya-ward) • Roppongi-Ark Hills (8.8ha, Minato-ward)
Special District	OK	OK (multi block)	NO	• Nihonbashi-Mitsui tower (1.4ha, Chuo-ward) • COREDO Nihonbashi (0.82ha, Chuo-ward)
Floor area ratio relaxation districts	OK	OK	OK	• Dai MaruYu-area (116.7ha, Chiyoda-ward)
Special urban renaissance districts	OK	OK	OK	• Marunouchi Trust Tower (1.2ha, Chiyoda-ward, Chuo-ward)
District plans that specify redevelopment promotion districts	OK	OK	OK	• Toranomon-Hills (13.8ha, Minato-ward)
District plans with adequate floor area ratio distribution	OK	OK	OK	• Ponte Porta at Senju-Ohashi (69.3ha, Adachi-ward)
District plans for intensive use	OK	OK	OK	• Suzuran Station District (1.2ha, Kobe City, Kita-ward)
Integrated design measurement for a whole estate	OK	OK	OK	• Osaka ANA Hotel (4.6ha, Osaka City, Kita-ward)

Source: JST

Table2.5.9 Comparison Chart of Major Methods of Easing Form Restrictions

Method of Easing Form Restrictions	Outline	Floor Area Ratio	Road Setback Line Restrictions	Adjacent Property Setback Line Restrictions	North Side Setback Line Restrictions	Absolute Height of Low-rise Residential Zone	Shade Restrictions	Exterior Wall's Setback Distance in Low-rise Residential Zone	Building Coverage Ratio
1) High-level use districts (development promotion districts)	Districts in which the integration of sites, of buildings is promoted, small-scale buildings are controlled, and open spaces in the sites are to be secured, and where the floor area ratio eased for the high-level use of land and the renewal of urban functions.	The additional floor area ratio is determined through a gradual decrease of the building coverage ratio, specification of the wall setback distance, or by other means.	Eased by having the district designated under an urban plan and securing a privately-owned public space, which is adjacent to the road on the site.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.
2) Specified blocks	Districts in which urban areas are developed and improved by constructing buildings with good environments and sound forms, while at the same time easing the floor area ratio, of buildings with open spaces.	The additional floor area ratio is determined in accordance with the ratio of privately-owned public spaces.	Eased by specifying the height of each part of a building in accordance with its horizontal distance from the outer boundary of the site and from the center line of the road.					Eased by specifying the restrictions on the wall's position separately.	Controlled separately based on the open space ratio.
3) Special urban renaissance districts	Districts in urgent areas for urban renewal, where plans with a high degree of freedom are formulated by exempting them from regulations, such as uses based on the existing use districts and regulations on the floor area ratio.	The floor area ratio is determined in accordance with the level of contribution to urban renaissance.	Eased	Eased	Eased	Easing is impossible.	Exempted (Article 56, 2.4 of the law is applied.)	Easing is impossible.	Easing is impossible.
4) District plans that specify redevelopment promotion districts	District plans in areas with lands whose usage is changing significantly and that will lead to good projects, if public facilities are constructed in the districts and restrictions on the uses of buildings, floor area ratio, are eased.	The floor area ratio is increased on the condition that public facilities are constructed.	Eased on the condition that open spaces are secured on the site, etc.			The height limit is eased with an upper limit of 20 meters if the site area is 300 square meters or wider.	Easing is impossible.	Easing is impossible.	Eased by securing an open space of an appropriate size, with an upper limit of 60%.
5) District plans with an adequate distribution of floor area ratios	Plans to distribute floor area ratios in areas within the scope of the floor area ratios specified in the zoning plans for use so as to form or protect a good environment while also promoting the rational use of lands.	Determined by redistributing floor area ratios in a district where public facilities have been built appropriately.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.
6) District plans for high-level use	Plans to ensure the high-level use of lands and renew urban functions by promoting the integration of sites, of buildings, thereby controlling the construction of small-scale buildings, and securing open spaces on sites of buildings in areas where there are lands with public facilities of appropriate sizes and locations.	Eased by specifying contents that are same as those of high-level use districts and securing the contents with an ordinance.	Eased by securing an open space on the site that is adjacent to the road or by similar means.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.	Easing is impossible.
7) Integrated design measurement for a whole estate	A system under which regulations such as restrictions on floor area ratio, are applied in an integrated manner to multiple buildings that were designed in an integrated manner in districts on a specific land, by regarding them as being on a single site.	The ratio can be planned for the entire site in an estate instead of each site.	Setback line restrictions are eased because rules on the easing of two or more front roads are applied.	Mutual setback line regulations are eased for sites on an estate.		Easing is impossible.	Mutual shade regulations are eased for sites on an estate.	The distance can be planned for the overall sites on an estate, instead of individual sites.	Eased in low-rise residential zones that are also districts of residential facilities on a single estate.

*Created based on *Dai 8-ban toshi keikaku unyou shishin* (urban planning procedural guidelines, 8th edition) published by the Ministry of Land, Infrastructure, Transport, and Tourism in January 2015 and *Theory of Urban Development, Architecture and Real Estate 2014-15*

*Exceptional floor area ratio districts were omitted because the details are not designated in government ordinances, *toshi keikaku unyou shishin* (urban planning procedural guidelines), etc.

Source: JST

2.5.4 Laws and Regulations Related to the Development of Bang Sue Area

(1) Outline of the Existing Laws and Regulations in Thailand

In Bang Sue Area, several development plans were formulated by OTP, SRT and PTT Public Company Limited (PTT), they are planned based on Town Planning Act and Building Control Act.

To formulate an integrated master plan, it shall be based on BMA Comprehensive Plan 2013 and BMA Building Control Regulation. The outlines of the systems and points to be applied to Bang Sue Area are as shown in Table 2.5.10 and Table 2.5.11.

Table 2.5.10 BMA Comprehensive Plan 2013

Content	The preparation and enforcement of BMA Comprehensive Plan under the empowerment of Town Planning Act 1975
Title	The Ministerial Regulation Enforcing BMA Comprehensive Plan 2013
Responsible Agency	Department of City Planning, BMA
Major Concern	The preparation of future land use plan in relation to the development of mass transportation system.
Relating to Bang Sue Development Area	The proposition of the SRT's land around Bang Sue Station to be used for sub-central commercial district (C.4, FAR 800%) and for government institutions, public utilities and facilities, i.e., Chatuchak Park, Her Majesty Queen Sirikit Park, and Vachirabenjatas Park. BMA Comprehensive Plan 2013 has designated that private development project, which makes some benefit for public, can get FAR bonus of 20% in maximum. It means that Bang Sue Area will have FAR of 960% if development of the area can make some benefits for the public, e.g., having public park, public parking, and semi-public space. Land use control ordinance says that it is forbidden to have a power plant in Bang Sue Area so it is necessary to do construction plan of smart infrastructure carefully. In case of changing land use defined by BMA Comprehensive Plan 2013 in Bang Sue Area, SRT as the land owner need to propose to BMA and take necessary procedures.

Source: JST

Table 2.5.11 BMA Building Control Regulation 2001

Content	Building control by Building Control Act 1979
Title	BMA Building Control Regulation 2001
Responsible Agency	Department of Public Works and BMA district offices
Major Concern	To regulate: (1) Type, proportion, size, and area of building. (2) Weight loading, resistance, durability, as well as nature and quality of material used. (3) Weight loading, resistance, durability of building and supporting ground. (4) Fixing system of waterworks, gas, electricity, machinery, safety from fire or other disasters, and prevention of danger from chaotic situation. (5) Number of bathroom and lavatory. (6) System of building management, i.e., system of illumination, air ventilation, air conditioning, air purification, drainage, wastewater treatment, and waste and sewage disposal. (7) Level, height, space area outside the building, or boundary of building. (8) Distance or level between each building or land boundary of other person, or between the building and the road, lane, alley, pedestrian, route or public land. (9) Space area or construction for use as car parking or reversal, and car entrance and exit for certain kind or category of building, as well as the nature and size of such space area or construction.
Relating to Bang Sue Development Area	The development in Bang Sue Area has to follow Bangkok's construction control regulation. Especially, control of building height, building coverage, distance between buildings and streets, and the provision of car parking is an important input for development planning.

Source: JST

Project methods other than the above include projects for land readjustment under the Land

Readjustment Act mentioned in 2.5.2 “The current legal systems related to urban development in Thailand.” With regard to this, SRT is the only landowner in the Bang Sue Area. To implement a land readjustment project with SRT as the executor, SRT needs to be specified as the executor in the ministry ordinance in accordance with the provisions of the Land Readjustment Act. (This law stipulates that the executor of a land readjustment project shall be either the Land Readjustment Association, DPT, National Housing Authority (NHA), a local government, a public organization established as the executor of a land readjustment project, or any other organization designated by a ministry order.) If there is only one landowner, there is no need to reach an agreement with the other landowner(s). Accordingly, in this case, it is believed to be more realistic to develop roads and other infrastructures and residential lands as an act of development solely by SRT in accordance with the comprehensive urban planning standards of Bangkok than to adopt a land readjustment project implemented after legal procedures such as the approval of the project and the approval of the replotting plan. However, if there are multiple landowners with the inclusion of lands other than those owned by SRT, the possibility of a project to be implemented by the Land Readjustment Association or a local government also needs to be considered.

(2) Use of Methods of Easing Form Restrictions in Japan (Transfer of Floor Area Ratio)

It is expected that Bang Sue Area will be segmented more finely into high-density zones and low-density zones in the future planning of land use in the area. It is likely that this process will involve the use of methods of easing form restrictions (transfer of floor area ratio) described in “2.5.3 Outline of major methods of easing form restrictions in Japan.” As it is mentioned in 2.5.3, the use of such methods for easing form restrictions in Thailand will be extremely meaningful in case the project is highly beneficial for the public and also contributes to create a good urban environment.

From among the methods, the following are selected from two points of view: 1) the integrated development of roads and other public facilities and buildings, and 2) the development of buildings in districts with roads and other public facilities of appropriate sizes and locations.

1) Integrated development of roads and other public facilities and buildings

District plans that specify redevelopment promotion districts aim to be applied for a solid blocks of substantial underused/unused lands.

Table 2.5.12 District Plans that Specify Redevelopment Promotion Districts

Item	Description
Name	District plans that specify redevelopment promotion districts
Government office in charge	Ministry of Interior, Bangkok Metropolitan Administration
Outline	These district plans aim to develop urban infrastructure and buildings, in an integrated manner for high-level use of lands and enhancement of urban functions to promote efficient conversion of land use in districts with substantial lands, such as solid blocks of underused/unused lands. These plans enable the floor area ratio to be eased by securing open spaces and supplying facilities that contribute to the local communities.
Key points in application to the development of the Bang Sue area	The plan enables comprehensive development of underused/unused lands in the Bang Sue Area and the development of urban infrastructures such as roads in an integrated manner. The plan enables the transfer of the floor area ratio between adjacent sites, between adjacent blocks, and between non-adjacent lands. It is expected that a specific plan will be formulated based on the Town Planning Act.

Source: JST

2) Development of buildings in districts with roads and other public facilities of appropriate sizes and locations

District plans with an adequate distribution of floor area ratio and integrated design measurement for a whole estate are applied for a case to develop buildings in an area where roads and other public facilities are already developed.

Table 2.5.13 District Plans with Adequate Distribution of Floor Area Ratios

Item	Description
Name	District plans with adequate distribution of floor area ratio
Government office in charge	Ministry of Interior, Bangkok Metropolitan Administration
Outline	These district plans aim to create a good urban environment and ensure the rational use of lands with roads and other public facilities are developed, by applying regulations on floor area ratios in a detailed manner in accordance with the characteristics of each district. Floor area ratios are distributed within the scope of the total specified floor area ratios in the district.
Key points in application to the development of the Bang Sue Area	The plan enables the transfer of floor area ratios between adjacent sites, between adjacent blocks, and between non-adjacent lands in districts in the Bang Sue Area where the development of urban infrastructures such as roads have been carried out. It is expected that a specific plan will be formulated based on the Town Planning Act.

Source: JST

Table 2.5.14 Integrated Design Measurement for the Whole Estate

Item	Description
Name	Integrated design measurement for a whole estate
Government office in charge	Ministry of Interior, Bangkok Metropolitan Administration
Outline	This type of development aims to rationalize the application of various regulations and the development and improvement of the urban environment by recognizing that multiple buildings on a single estate or in a district of lands on a single estate are located on a single site. The floor area ratio can be eased by creating a construction plan that will secure a specific proportion of open spaces on the site (integrated design measurement).
Key points in application to the development of the Bang Sue Area	It enables the transfer of floor area ratio between adjacent sites, between adjacent blocks, and between non-adjacent lands in districts in the Bang Sue area where the development of urban infrastructures such as roads have been carried out. It is expected that a district with architectural regulations will be designated under a ministry order or ordinance based on the Building Control Act. Currently, a similar system (Plan Unit Development) is being studied in Bangkok. It is planned to be institutionalized in approximately two years.

Source: JST

2.5.5 Other Laws and Regulations to be Considered for the Development of Bang Sue Area

(1) Regulations for Property Leasing

Thailand has two legal restraints regarding property leasing as of August 2017. One is the Civil and Commercial Code (1992) and the other is the Lease of Commercial and Industrial Property Act (1999). The outline of each law is as shown in Table 2.5.15.

The duration of both private and public property leasing is not more than 30 years; there could be an extension of not more than 30 years enforced by Article 540 of the Civil and Commercial Code. However, after the economic crisis of Thailand in 1998, the Lease of Commercial and Industrial Property Act 1999 was enacted with a reason that “the regulation of property leasing under the Civil and Commercial Code is not responsive to the economic situation and a long-term investment of

commercial or industrial development, which requires a security of right in leasing contract. Consequently, it is necessary to enact a law supporting a long-term commercial and industrial property leasing, which will provide more security for leasing right. The promotion of a long-term commercial and industrial property leasing will be a measure for recovering the whole country's economy."

Consequently, according to this act, the leasing contract for both public and private commercial and industrial properties will have a duration of not more than 50 years and can be extended for not more than 50 years or a total of 100 years. In addition, there has been a proposal for extending the property leasing period to 99 years and it is under the consideration of the government.

Table 2.5.15 Major Points of Regulations for Property Leasing

Law	Article and Major Points	Remarks
Civil and Commercial Code (1992) [Office of the Council of State]	Article 540 : - The duration of a lease of immovable property cannot exceed thirty (30) years. If it is made for a longer period, such period shall be reduced to thirty (30) years. - The aforesaid period may be renewed, but it must not exceed thirty (30) years from the time of renewal	In general, land lease hold contract consists of 30 years leasing period with first right of contract renewal, based on the Civil and Commercial Code (1992).
The Lease of Commercial and Industrial Property Act (1999) [Department of Lands, Ministry of Interior]	Article 3 : - The act has defined that "leasing" means "the lease of commercial or industrial property for more than 30 years but not more than 50 years." Article 4 : - The lease according to this act must be written and registered to the officer, otherwise it will be invalid. - When the leasing period is due, the lessor and the lessee may agree to extend the lease duration for not more than 50 years from the day of the agreement and register to the officer, otherwise it will be invalid.	Conditions to be applied for "the Lease of Commercial and Industrial Property Act" <u>Condition 1:</u> The land shall be located at one of the following areas: - Commercial or industrial use defined in the comprehensive plan. - Industrial parks which appointed by the Industrial Estate Authority of Thailand <u>Condition 2:</u> Commercial or industrial project can use the land if it shall cover at least one of the following conditions: - A commercial project with over THB 20,000,000 - A project which can be applied to Investment Promotion Act - A project, which is approved by the cabinet, will make contribution to the national economy and industry. <u>Condition 3:</u> Investor/developer should prepare all of the following documents: - Business plan including land use, fund source, business period, and employment. - Environmental Impact Assessment Report based on Enhancement and Conservation of National Environmental and Quality Act. - Official confirmation document issued by the Provincial City Planning Department or Industrial Estate Authority of Thailand to confirm that the land use of target area is commercial or industrial. - Project approval documents issued by related agencies. - Documents on financial arrangement both of investor and lender. <u>Condition 4:</u> If the target land is over 16 ha, the project shall cover at least one of the following conditions: - The project enhances export value or promotes domestic employment. - The project shall be innovative and/or supply does not meet the demand. - The project utilizes the latest technology and/or production method - A project which is approved by the cabinet to make contribution to national economy and industry.

Source: JST

(2) Position of Cogeneration Plant in the Zoning Ordinance of BMA Comprehensive Plan

The Ordinance in the Ministerial Regulation Enforcing BMA Comprehensive Plan 2013 under C.4 Commercial Zones has prohibited “all types of industries under laws related to industrial control, except the types of industries specified in the annex of the ministerial regulation, which do not cause nuisances under laws related to public health, or do not have impacts under laws related to national environmental promotion and protection to community or environment, and are not shop-house industries, as well as not more than 500 m².

Thus, item 88 in the annex of the ministerial regulation has allowed the operation of power plants only in I.2 Industrial Zones (operated by the Industrial Estate Authority of Thailand), and in A.4 Agricultural Zones. Therefore, the construction of cogeneration plant in C.4 commercial zones will require a proposal from concerned authorities, i.e., State Railway of Thailand, submitting through the local authorities, i.e., BMA, Department of Public Works, and Town and Country Planning, and finally to City Planning Board for approving the partial amendment of BMA Comprehensive Plan according to Article 26/1 of Town Planning Act 1975 and its amendment by Town Planning Act (No. 4) 2015.

Table 2.5.16 Major Points Relating to Installment of Cogeneration Plant

Law	Article and Major Points
Ordinance in the Ministerial Regulation Enforcing BMA Comprehensive Plan 2013 (2013) [Ministry of Interior]	The C.4 Commercial Zones has prohibited “all types of industries under laws related to industrial control, except the types of industries specified in the annex of the ministerial regulation. The conditions are as follows: - It does not cause nuisances under laws related to public health, - It does not have community or environmental impacts, - It is not shop-house industries, and - It is not more than 500 square meters.
Ordinance in the Ministerial Regulation Enforcing BMA Comprehensive Plan 2013 Appendix (2013) [Ministry of Interior]	Item 88: The operation of power plants is allowed only in : - I.2 Industrial Zones (operated by the Industrial Estate Authority of Thailand), and - A.4 Agricultural Zones.

Source: JST

(3) Connection between Buildings and Railway Stations including Underpass

1) Facilities belonging to MRTA

Regarding direct connection between buildings and underground passage in Bangkok, connecting buildings to MRT stations/underpasses probably the most popular case. To connect a building to an underpass, a building owner should take necessary procedures which are set by Mass Rapid Transit Authority of Thailand (MRTA). It supposes that the detailed conditions are negotiated and mentioned in each contract. The procedures are as follows:

- 1) Submission of the proposal
- 2) Architectural and engineering inspections
- 3) Consideration of terms and agreements
- 4) Approval from the authorized bodies
- 5) MRTA’s contract signing

2) Facilities belonging to BMA

In case of Bangkok Mass Transit System (BTS) and State Railway of Thailand (SRT) stations, although their properties are usually not underground facilities, they have their own rules in connecting buildings to their facilities.

In case of BTS, the connection between buildings and stations is regulated under “the BMA Announcement of the Permission Criteria and Fee for the Construction of Connecting Passages between Extended BTS Lines and Private Buildings (2012)”. The document identifies the following:

- 1) Submission of proposal
- 2) Consideration of the proposal
- 3) Connecting fee
- 4) Permission conditions
- 5) Miscellaneous

It supposes that the detailed conditions are negotiated and mentioned in each contract.

3) Facilities belonging to SRT

In case of SRT, the connection between buildings and mass transit stations is under the permission for the use of air right. Therefore, the construction of posts for hanging wires across the railway lines, the construction of pipes under the railway lines, the construction of roads, drain lines, landscaping, public parks, children playgrounds, medical gardens, etc., require to ask for permission based on the criteria and methods set by SRT.

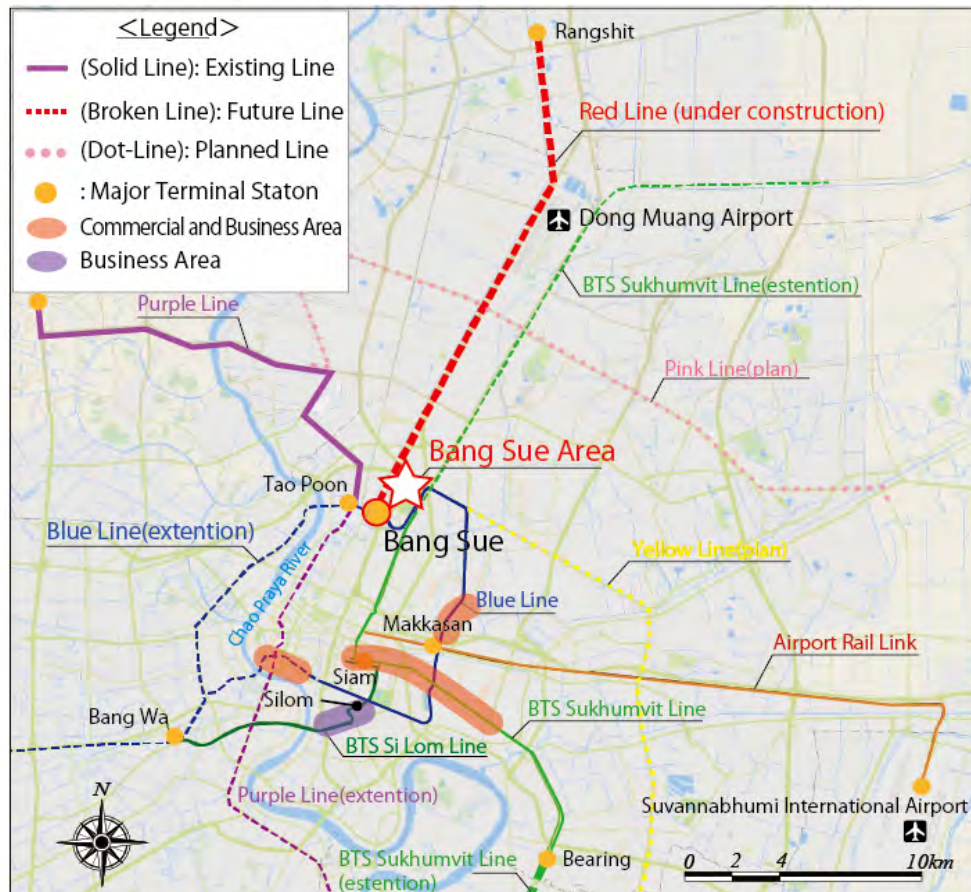
Chapter 3 General Conditions and Related Plans in Bang Sue Area

3.1 Status in Bang Sue Area

3.1.1 Location and Geographic Features

(1) Location

Bang Sue Area is located at approximately 10 km to the north from the central business district (CBD). It is located at approximately 35 km from the Suvarnabhumi International Airport and 14 km from Don Muang Airport which is a base for domestic and low-cost carrier (LCC). The area shall be a future transportation hub. The area has the Metropolitan Rapid Transit (MRT) Bang Sue Station and Kamphaeng Phet Station (Blue Line), Mo Chit Station (Bangkok Mass Transit System (BTS)), and Bang Sue Grand Station (State Railway of Thailand (SRT)). Tao Poon Station of MRT Purple Line located at approximately 1 km to the west of Bang Sue Area. 1 year behind to the opening of MRT Purple Line, MRT Blue Line has been extended to the Tao Poon Station in August 2017.



Source: JST

Figure 3.1.1 Location of Bang Sue Area

(2) Geographical Features

Bang Sue Area belongs to the watershed of the Chao Praya River. Ground elevation in Bang Sue Area is lower than the highwater level of the river. Therefore, it is necessary to use pumps to drain rain water from Bang Sue Area to the river, when the water level of the river is high.

3.1.2 Administrative Boundary, Area, and Current Land Use

(1) Administration Boundaries

Bang Sue Area (Figure3.1.2) belongs to both Chatuchak District and Bang Sue District.

(2) Area

The area of Bang Sue Area is approximately 100 ha.



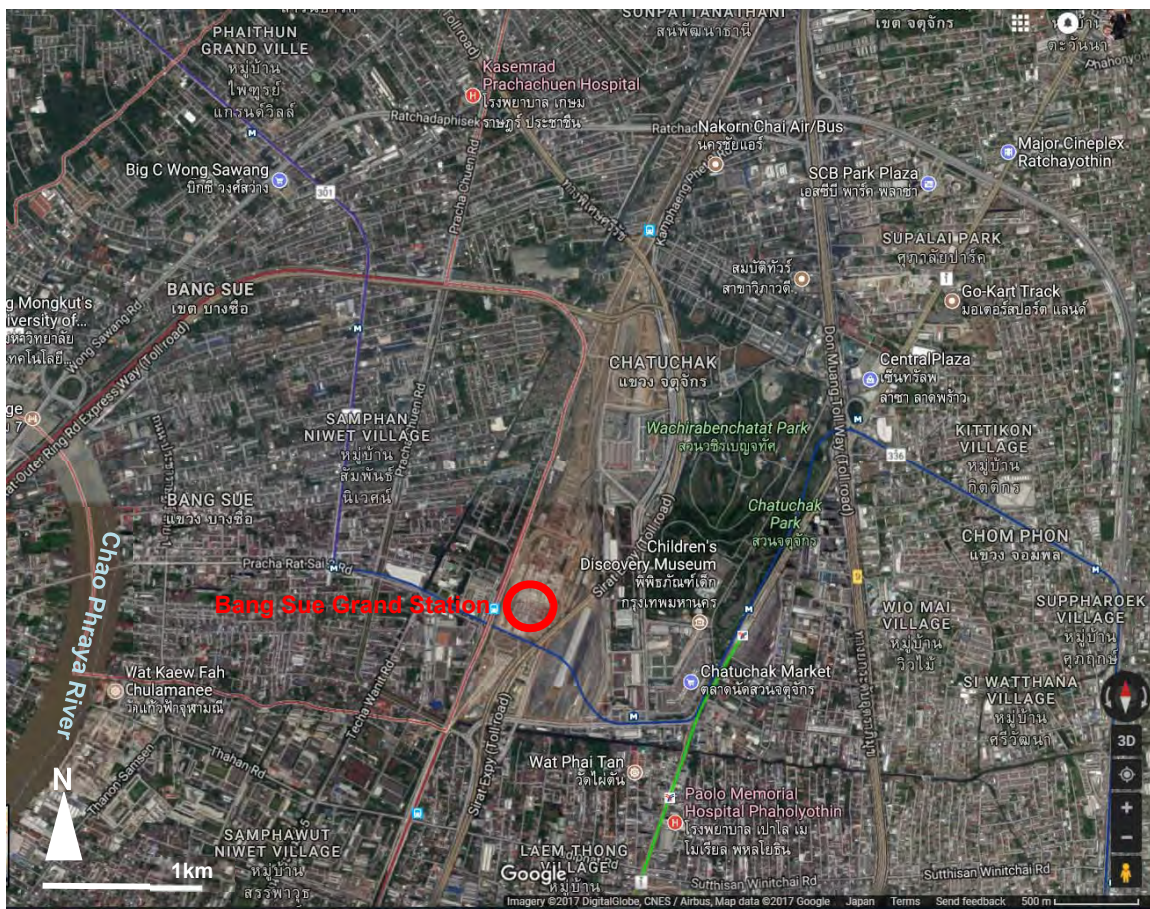
Source: JST

Figure3.1.2 Bang Sue Area (Survey Area)

(3) Current Land Use

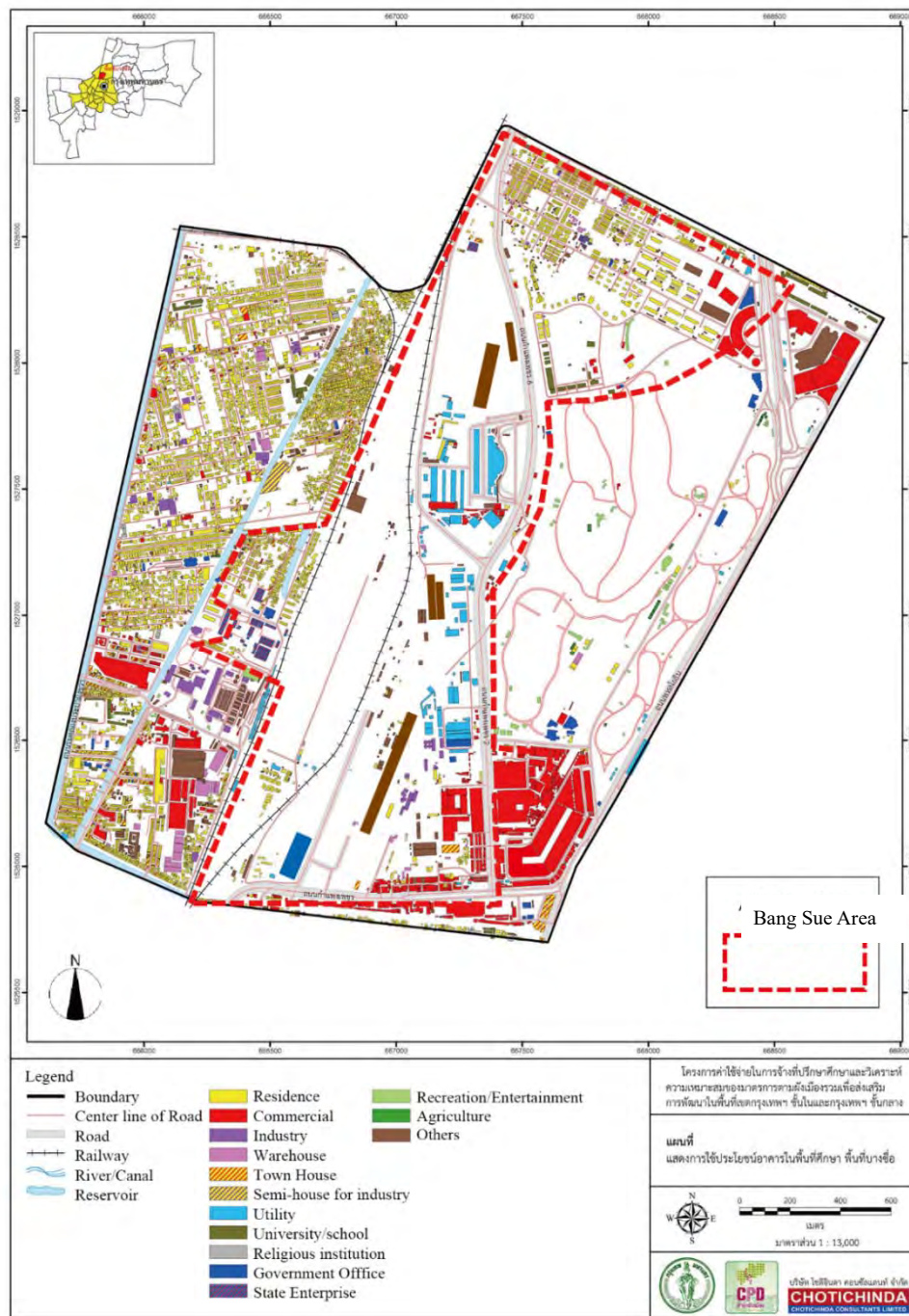
The satellite image around Bang Sue Area is as shown in Figure3.1.3. Bang Sue Area is located 2 to 3 km east to Chao Phraya River. The area is surrounded by built-up area. Western side of the area seems less density than eastern side.

The latest available data of land use including Bang Sue Area (year 2013) is as shown in Figure3.1.4. The area has a bus terminal and railway facilities, and Red Line construction zone. The area has commercial complexes i.e., JJ mall and small shops in the southeast part, next to Chatuchak Market. The area also has PTT energy complex which is a mixed used office and commercial complex at the northeast corner. In contrast, at the west side to the existing Bang Sue Station, the land is densely packed with low-rise houses. Since 2013 the land use of Red Line construction zone has changed for the progress of Red Line and railway facilities (depot etc.) construction.



Source: Google Map

Figure3.1.3 Satellite Image Around Bang Sue Area (2017)



Source: JST based on BMA reference

Figure3.1.4 Land Use Map Around Bang Sue Area

3.1.3 Population

(1) Demographic Trend

The population transition in Bangkok is as shown in Table 3.1.1. The rate of population growth from 2006 to 2011 is as shown in Figure 3.1.5. and Figure 3.1.6. In whole Bangkok, the population remains at almost the same size. In details, the population of the central area including Rattanakosin is decreasing, while the population of the suburban areas is increasing.

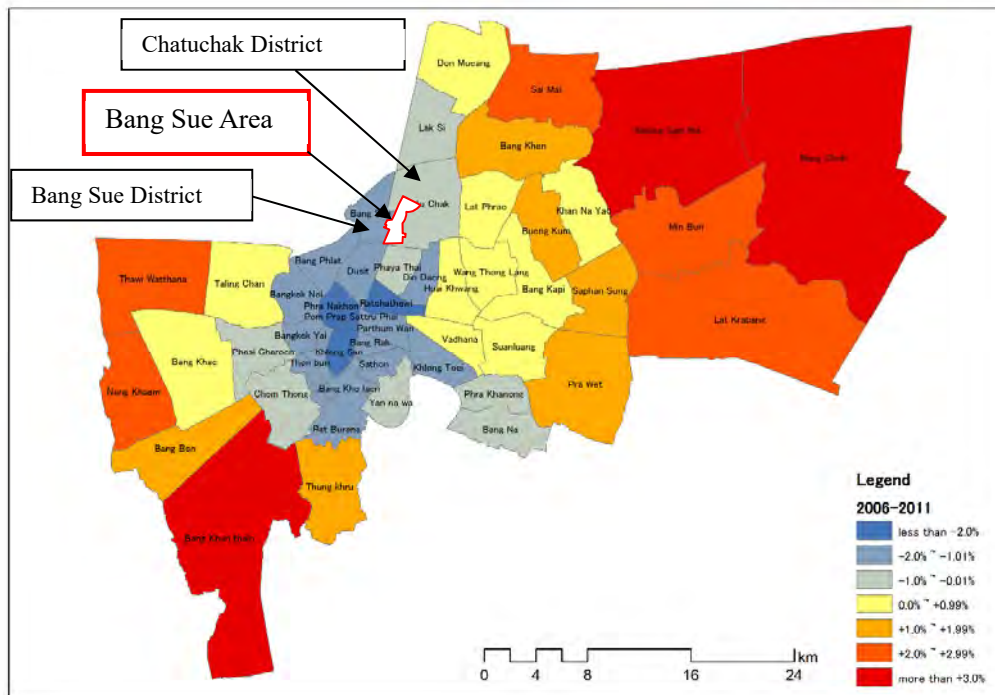
(2) Social Increase and Decrease in Population in Bangkok Metropolitan Area

Social increase and decrease between 2005 and 2015 in Bangkok Metropolitan Area is as shown in Figure 3.1.7 and Figure 3.1.8. In the central area, the number of out-migrants is superior to that of in-migrants, while suburban areas such as Nonthaburi Province and Pathum Thani Province have more in-migrants than out-migrants. The trend shows that the registered population moved to the suburban areas.

Table 3.1.1 Population Transition in Bangkok

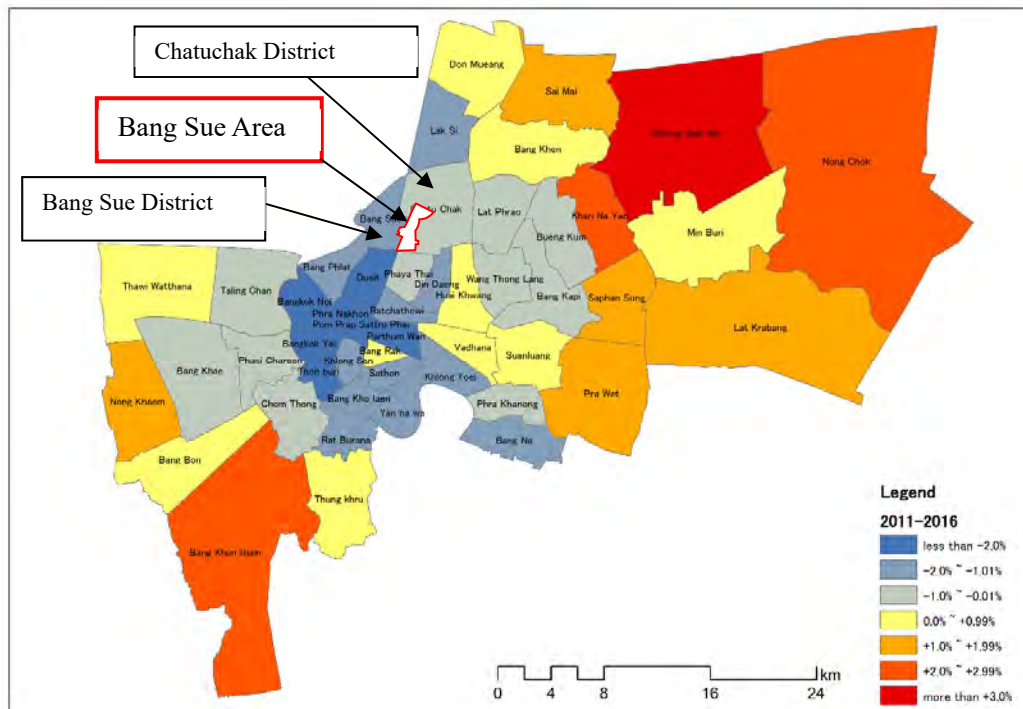
	Area (km ²)	Population Year 2006 (person)	Population Year 2011 (person)	Population Year 2016 (person)	Population Growth Rate/Year (2006~2011)	Population Growth Rate/Year (2011~2016)
Bangkok	1,568.7	5,658,953	5,701,394	5,686,646	+0.01%	-0.01%

Source: JST based on the data from the Department of Provincial Administration, Ministry of Interior, Survey and Mapping Division, City Planning Department, BMA



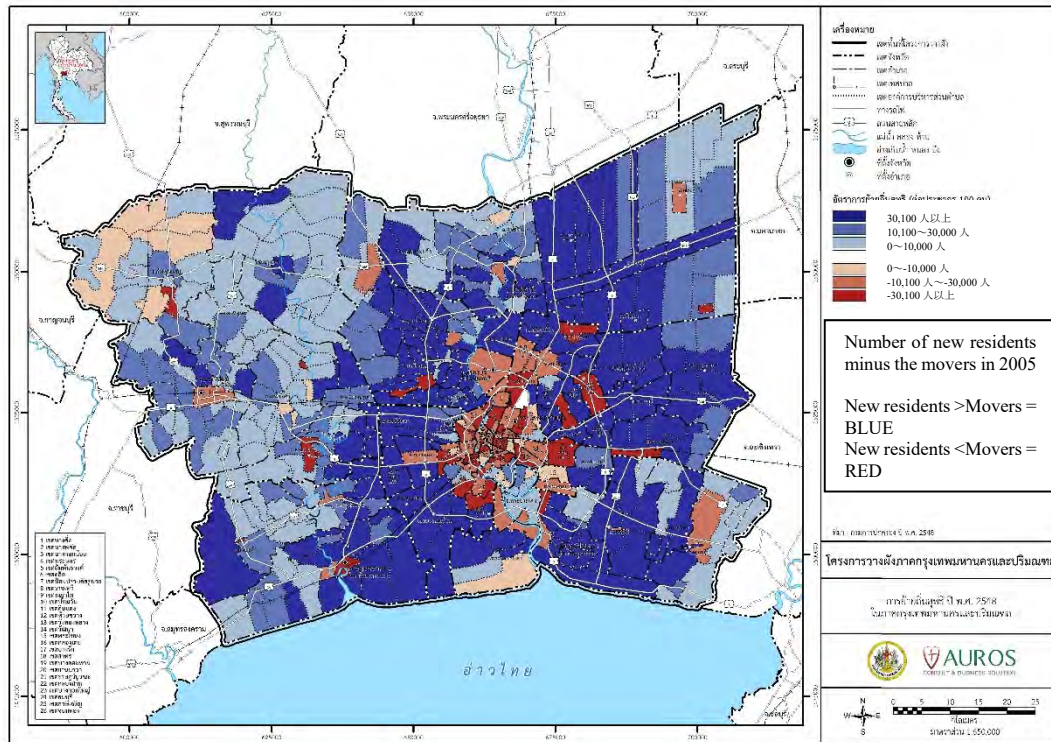
Source: JST based on the data from the Department of Provincial Administration, Ministry of Interior, Survey and Mapping Division, City Planning Department, BMA

Figure 3.1.5 Rate of Population Growth in Bangkok (2006-2011)



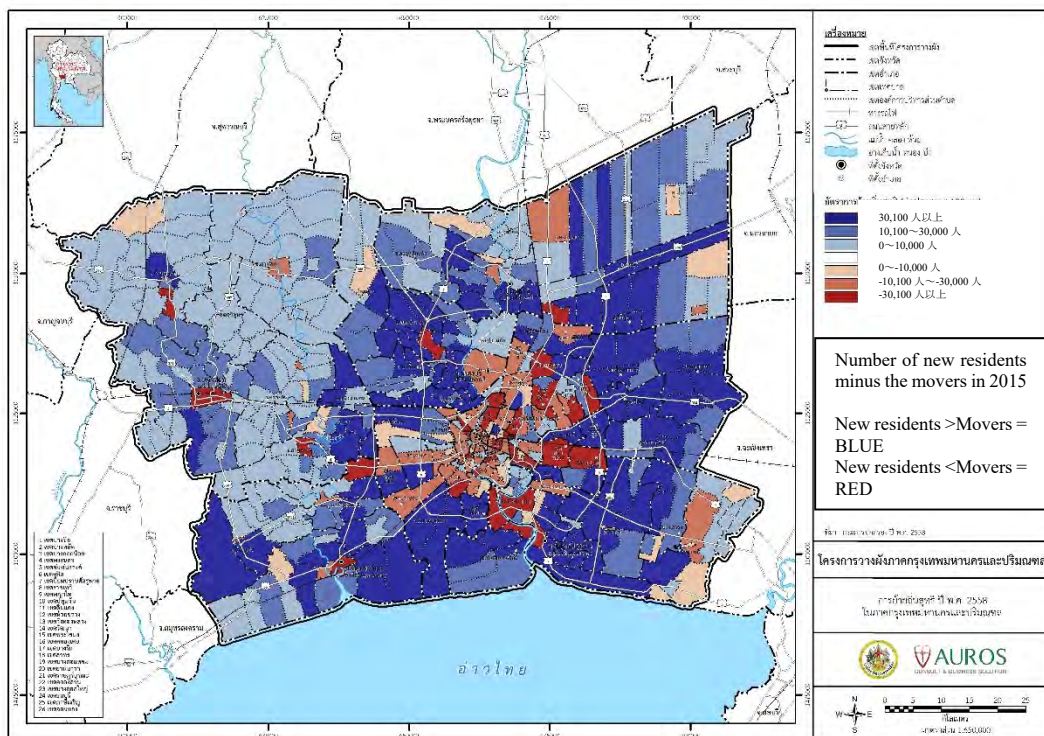
Source: JST based on the data from the Department of Provincial Administration, Ministry of Interior, Survey and Mapping Division, City Planning Department, BMA

Figure 3.1.6 Rate of Population Growth in Bangkok (2011-2016)



Source: Department of Public Works and Town and City Planning, Ministry of Interior

Figure 3.1.7 Social Increase and Decrease in Bangkok Metropolitan Area (2005)



Source: Department of Public Works and Town and City Planning, Ministry of Interior

Figure 3.1.8 Social Increase and Decrease in Bangkok Metropolitan Area (2015)

(3) Population in Bang Sue Area

The population of Bangkok has been stagnated since 2006 as shown in Table 3.1.2. The population of Chatuchak District and Bang Sue District has been decreasing slightly. Almost all of Bang Sue Area is owned by SRT and utilized as facility area for the Red Line project. Thus, the area has relatively less residents compared with its land area of 33 km².

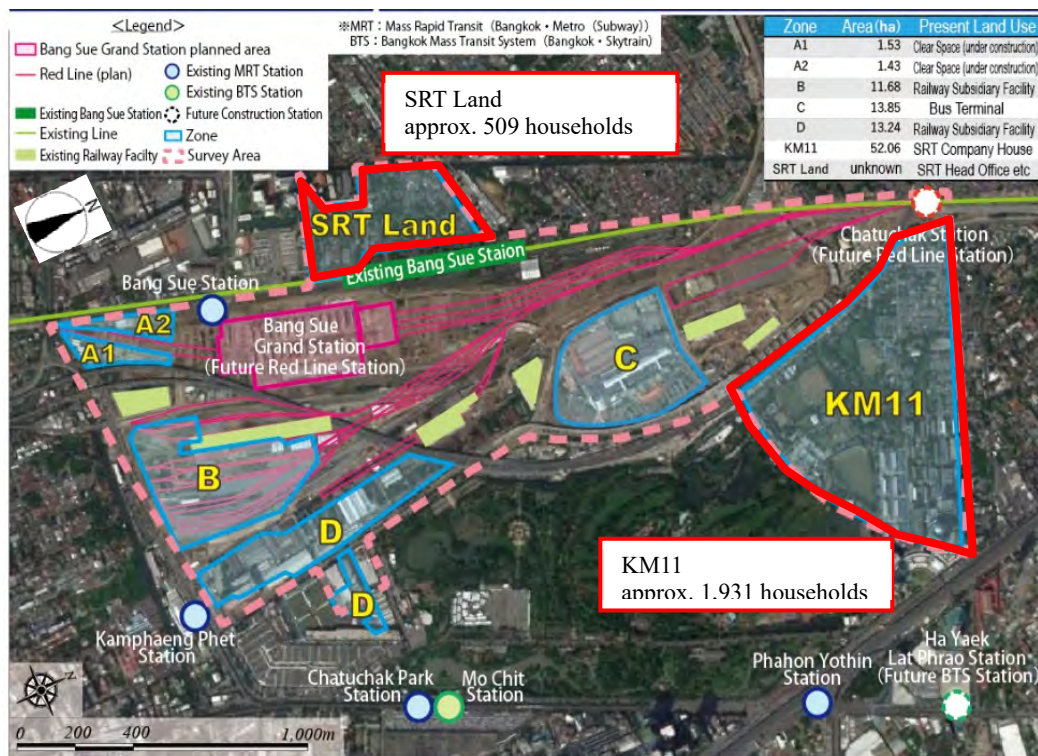
According to SRT, the number of households in KM 11 and SRT Land in Figure 3.1.9 are 1,931 and 509, respectively. As the average number of people per household in urban areas is 3.5¹, it is estimated that there are approximately 7,000 and 2,000 residents in KM 11 and SRT Land, respectively.

Table 3.1.2 Population around Bang Sue Area (Administrative District)

	Area (km ²)	Population Year 2006 (Person)	Population Year 2011 (Person)	Population Year 2016 (Person)	Population Growth Rate/Year 2006~2011	Population Growth Rate/Year 2011~2016
Bangkok	1,568.7	5,658,953	5,701,394	5,686,646	+0.01%	-0.01%
Bang Sue District	11.5	151,788 (2.7%)	138,653 (2.4%)	126,136 (2.2%)	-0.18%	-0.19%
Chatuchak District	33.0	169,113 (3.0%)	162,838 (2.9%)	158,130 (2.8%)	-0.08%	-0.06%

Note : % in above cell shows the percentage of Bang Sue District and Chatuchak District to Bangkok.

Source: JST based on the data from the Department of Provincial Administration, Ministry of Interior, Survey and Mapping Division, City Planning Department, BMA



Source: JST

Figure 3.1.9 Location of Residential Zone in Bang Sue Area

¹Thailand National Statistics (2005)

3.1.4 Situation on the Residential Zone in Bang Sue Area

The townscape of SRT Land and KM11 is shown in Figure 3.1.10.



Source: JST

Figure 3.1.10 Residential Zone in Bang Sue Area

3.2 Situation of Existing Studies

Office of Transport and Traffic Policy and Planning (OTP) and State Railway of Thailand (SRT) studied on a development plan of Bang Sue Area in 2016. The cover areas of existing studies are as shown in Table 3.2.1.

SRT studied on a development plan for ZoneA, B, C and KM11 including development concept for each zone, land use and development phasing. Land use and location of urban function could be reconsidered as well as the development schedule. It is necessary to make the latest conditions cleared.

OTP studied on mainly ZoneD and Inter-area transportation. Networking of roads and bus service might be reconsidered based on land use.

Table 3.2.1 Cover Area of Existing Studies

Studied by	Cover Area						
—	ZoneA	ZoneB	ZoneC	ZoneD	KM11	Transport	Others
SRT	○	○	○	—	○	—	○
OTP	—	—	—	○	—	○	○

Source: JST

3.3 Development Plan by OTP

3.3.1 Target Area

The target area studied by OTP (2016) is Zone D in Bang Sue Area.

3.3.2 Development Concept

In Zone D, the following concepts are proposed to realize the future vision of "New Bangkok as the Association of Southeast Asian Nations (ASEAN) CBD":

- Development concept with pedestrian priority as the center of transit-oriented development (TOD);
- Promotion of the mixed-use development (commercial and residential);
- Pedestrian-friendly road network;
- Bicycle parking area and surrounding amenities;
- Bus rapid transit (BRT) connecting activities within walking distance to Bang Sue Grand Station; and
- Green Network.

3.3.3 Development Plan

In accordance with the OTP Report, Zone D is divided into three sub zones (Figure 3.3.1, Table 3.3.1, and Table 3.3.2).



Source: OTP

Figure 3.3.1 Classification in Zone D

Table 3.3.1 Development Direction of Zone D

Sub Zone	Development Direction, Function
D1	- Connectivity with Bang Sue Grand Station should be kept - Collaboration with Zone A development should be considered - Office, retail, rental office - Open space for event
D2	- Sub Zone D2 consists of 2 blocks - Shopping mall, service facility, parking area - Rental office, fitness food and drink along Kamphaeng Phet 2 Road
D3	- Retail and facility for entertainment - Food and drink, show center, sport arena, hotel, office condominium

Source: OTP

Table 3.3.2 Area in Zone D

No.	Land Lots	Total Area (rai)	Total Area (m ²)	Total Floor Area (m ²) (FAR 8:1)	Total Open Space (m ²) (OSR 4%)	Total Building Coverage [BCR] (m ²)
	Zone D	80.86	129,375	-	-	-
1	Zone D1	25.04	40,075	350,800	14,032	29,818
2	Zone D2	40.49	64,795	488,000	19,520	41,480
3	Zone D3	15.31	24,505	227,120	9,085	19,305

Source: OTP

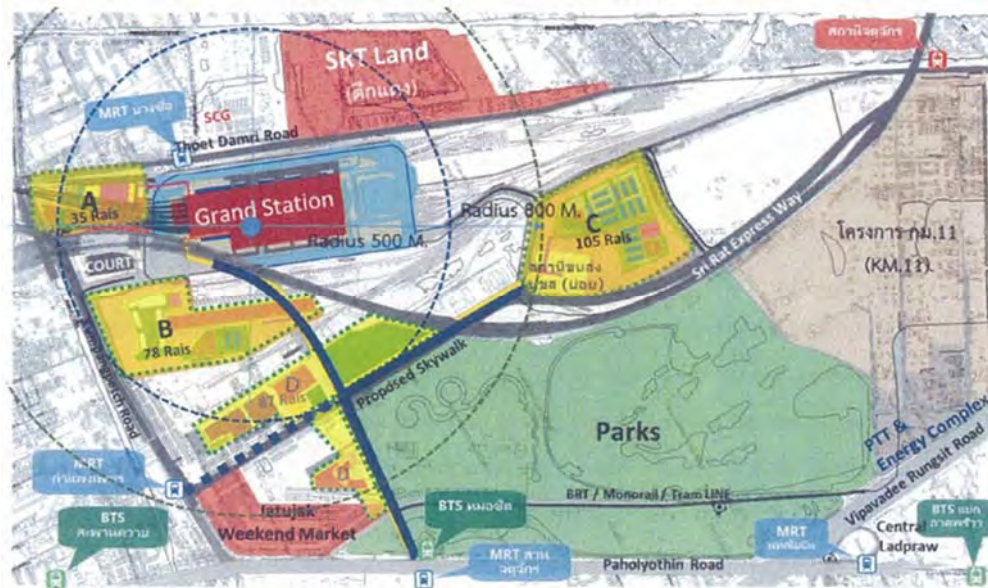
3.4 Development Plan by SRT

3.4.1 Purpose of the Study

SRT implemented a feasibility study to create additional land value in Zone A (35 rai), Zone B (78 rai), and Zone C (105 rai).

3.4.2 Purpose of the Development

The purpose of the development is to enhance TOD of Bang Sue Grand Station and surrounding area where is expected to become one of the major ASEAN hubs.



Source : SRT

Figure 3.4.1 Zoning Plan in Bang Sue Area

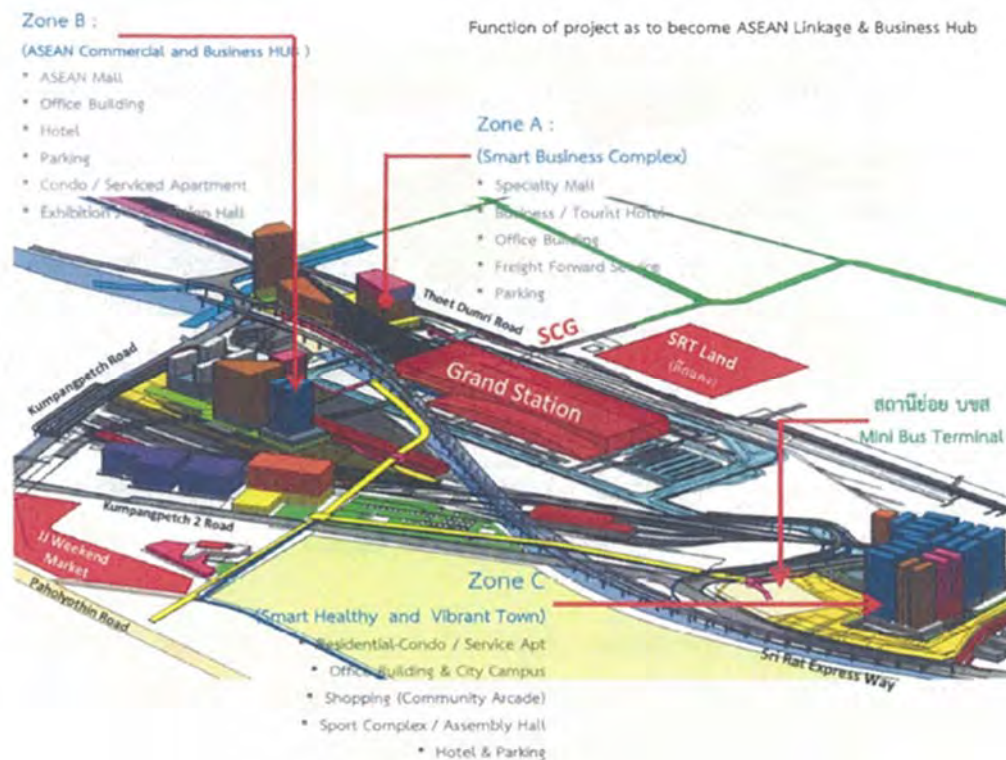
3.4.3 Development Concept

According to the report of SRT, the outline of the major projects is as shown in Table 3.4.1. It considers the concept of TOD and lifestyle in Thailand. The potentials and visions in each zone are summarized in Table 3.4.2.

Table 3.4.1 Outline of Major Projects

Item	Outline of Major Project
Concept	Connectivity with Asia, business hub
Center of Four Railway Systems	1. City link railway, 2. Red Line 3. Express railway, 4. Airport rail link
Mass Transit Station	MRT Blue Line, (Purple Line) BTS Green Line
Zone A (Smart Business/Complex)	• Mall • Business/hotel • Office • Cargo • Parking
Zone B (ASEAN Commercial and Business Hub)	• ASEAN Mall • Office • Hotel • Parking • Mansion/service apartment • Exhibition/hall
Zone C (Mart Healthy Vibrant Town)	• Residence • Office and city campus • Shopping • Sport complex • Hotel and parking

Source : SRT



Source : SRT

Figure 3.4.2 Development and Projects in Each Zone

Table 3.4.2 Potentials and Visions in Each Zone

Zone Concept	Outline of Main Project
Zone A (Smart Business/Complex)	- Retail, restaurant, office, hotel, logistics service to support tourism - Collaboration between urban development and Bang Sue Grand Station as a nationwide transportation hub
Zone B (ASEAN Commercial and Business Hub)	- Collaboration with Chatuchak Market to build a central retail center - ASEAN Mall, modern office, hotel to attract tourists - Convention hall for MICE, residence and service apartment
Zone C (Smart Healthy Vibrant Town)	- Residence and office in creative and comfortable environment - Collaboration of parks - Office, international headquarters, city campus, hotels - Residence and serviced apartment for foreign visitors - Sport complex, community mall to upgrade quality of life

Source : SRT

3.5 Traffic Plan by OTP

3.5.1 Vision

In the report of OTP, the main purpose of inter-area transport is to enhance the connectivity and accessibility of the Bang Sue Area. The following are the major development policies:

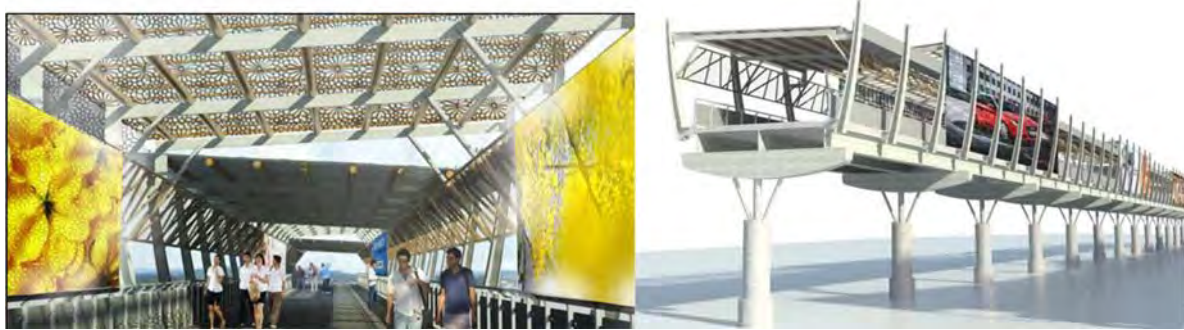
- Enhancing the potential and overcome the physical limitations.
- Making Bang Sue Grand Station as the focal point of TOD to promote pedestrian-friendly development.
- Providing easy and convenient access from arterial roads, rail stations, and major activities.

- Creating a livable neighborhood surrounded by good natural environments.
- Utilizing the existing public parks and commercial areas.
- Reducing through-traffic volume coming from outside Bang Sue Area.

The details of each transport component in the plan are summarized below.

3.5.2 Pedestrian

Considering the huge area of development, it is planned to install a skywalk from Bang Sue Grand Station to BTS Mo Chit Station and Chatuchak Station as east–west direction. A part of the skywalk is being planned to be constructed under the Sirat Expressway (Figure 3.5.1). Regarding the north–south direction, a pedestrian road is planned to be constructed from Kamphaeng Road to Zone C via Zone D. According to the demand forecast, pedestrian volume is predicted to be 4,778 people per day for the south–north direction and 36,982 people for the east–west direction (Table 3.5.1).



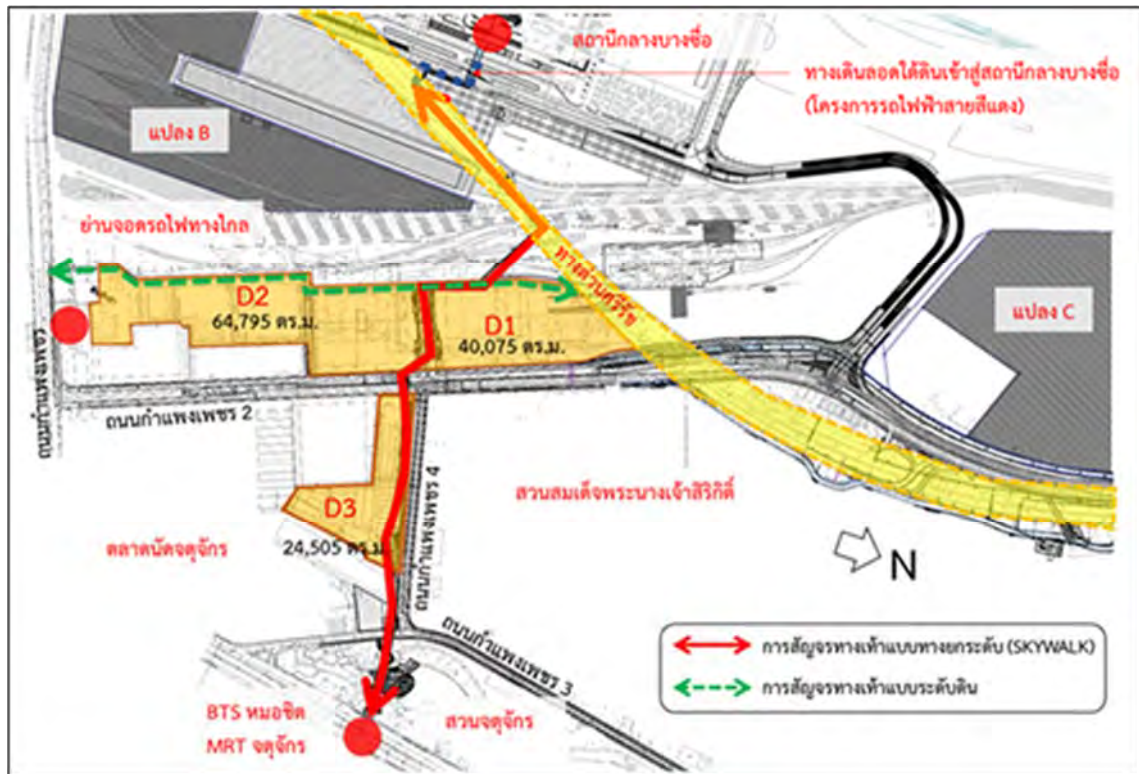
Source: OTP Report

Figure 3.5.1 Image of Skywalk

Table 3.5.1 Demand Forecast for Pedestrian Volume

Year	Number of Pedestrian (People/Day) East – West Direction	Number of Pedestrian (People/Day) South – North Direction
2022	14,977	1,673
2032	29,395	3,099
2037	36,982	4,778

Source: OTP



Source: OTP

Figure 3.5.2 Development Plan for Pedestrian Road

3.5.3 Non-motorized Transport (NMT)

OTP's plan suggests promoting bicycle use in Bang Sue Area considering the needs for modal shift in Bangkok. In the plan, cycling roads are proposed along with the BRT route and the boundary of Zone B and Zone D. The width of the cycling road is 3 m. In addition, cycle parkings are planned at every BRT stations and main train stations and commercial buildings.

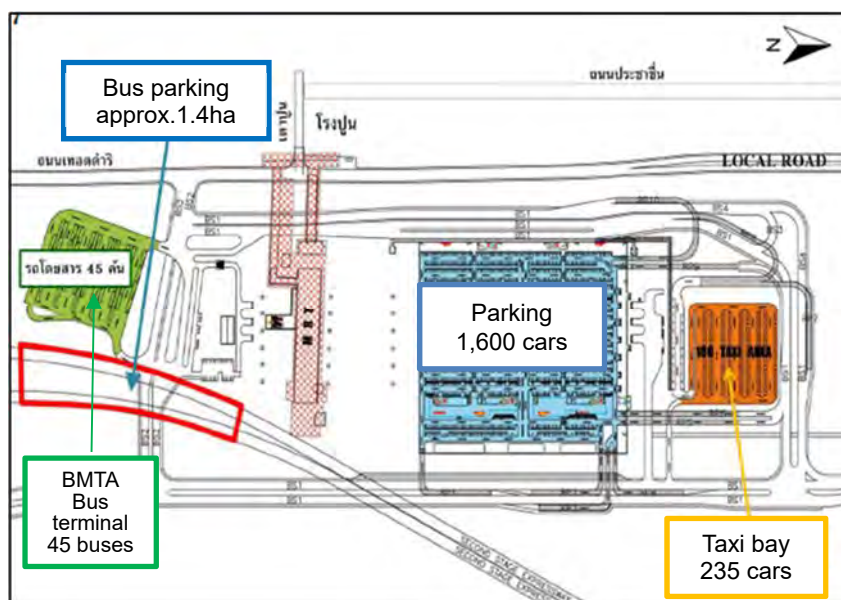
3.5.4 Automobile

In their study, OTP conducted a traffic demand forecast by counting intersection traffic volume, amount of pedestrian, and collecting origin-destination information. Based on the traffic demand forecast, improvement of several roads is proposed such as Kamphaeng Phet 6 Road, Phahon Yothin Road, and Terddamri Road. Each lane has 3.5 m in width in the plan. As for parking space, a parking for 1,600 vehicles is planned in Bang Sue Grand Station (Figure 3.5.3). Likewise, a parking space for 235 taxis is also introduced in Bang Sue Grand Station.



Source: OTP

Figure 3.5.3 Road Plan of Bang Sue Area



Source: OTP

Figure 3.5.4 Parking Space in Bang Sue Grand Station

3.5.5 Bus

As for inner-city bus, Bangkok Mass Transit Authority (BMTA) Terminal shall be relocated to Zone A after the opening of Bang Sue Grand Station. It shall accommodate around 45 buses. However, according to OTP, the planned bus terminal in Zone A may be planned as a bus terminal for four buses (as of August 2017).

The inter-city bus terminal is currently located in Zone C as Mo Chit 2 Bus Terminal that has a land area of about 11 ha. OTP suggests relocating and downscaling the bus terminal to the south of Mo Chit 2 Bus Terminal, same as the current BMTA Terminal (2.6 ha). Since the land area for the planned BTMA Terminal is less than the current one, one-third of the passengers are expected to use another planned

bus terminal in Rangsit (6.4 ha).

The traffic volume around Mo Chit 2 Bus Terminal is expected to be saturated if Mo Chit 2 Bus Terminal is relocated to the area of current BMTA Terminal. OTP calculates the volume/capacity (V/C) of Kamphaeng Phet 2 Road and it revealed that V/C will be over 1.0 for north direction due to large buses. In general, over 1.0 means over the design capacity, thus, traffic congestion is supposed to occur in peak hours.

In addition to inter-city bus and inner-city bus, Bus Rapid Transit (BRT) development plan is also proposed. The objective of introducing BRT is to utilize it as intra-zonal mode in Bang Sue Area. The BRT passes through BTS Mo Chit Station, MRT Chatuchak Park Station, Ha Yaek Lat Phrao Station, and Bang Sue Station. The route is bidirectional. The fare is set at THB 15 regardless of distance and operation starts in 2022. The fare is decided considering current fare for walking distance is THB 8 to 12 and future price escalation. Future BRT passenger is expected to be 105,700 people per day in 2037 as shown in Table 3.5.2. To develop the BRT system, exclusive lane and Public Transportation Priority Systems (PTPS), elevated road, and depot will be introduced. Depot is planned at the area of 1.4 ha, where currently gas facilities of PTT are located at, and maintenance facility, filling station, parking space, and office are planned in the same place (Figure 3.5.5.)

Table 3.5.2 Demand Forecast for BRT Passengers (Fare is set at THB 15)

Year	Passengers/Day (people)	Maximum Passenger/Hour (people)
2022	33,400	992
2032	63,600	2,693
2037	105,700	4,258

Source: OTP



Source: OTP

Figure 3.5.5 BRT Development Plan

3.5.6 Traffic Demand Forecast

In the study, OTP conducted traffic demand forecast through intersection traffic count, origin and destination interview, and travel speed survey. Traffic demand forecast was conducted for year 2022, 2032, and 2037. In 2037, OTP predicts approximately 1.42 million passengers per day using Grand Bang Sue Station in total (Table 3.5.3).

Table 3.5.3 Demand Forecast for Grand Bang Sue Station and Other Stations Passengers

Station		Year 2022 (people)		Year 2032 (people)		Year 2037 (people)	
		Boarding	Alighting	Boarding	Alighting	Boarding	Alighting
Grand Bang Sue Station	Dark Red	105,600	106,100	185,200	185,100	217,100	218,000
	Light Red	65,400	65,900	89,000	88,500	96,900	96,900
	Long Distance Train	29,300	29,600	86,100	86,100	106,500	106,100
	HSR	38,600	38,600	69,200	69,100	85,700	86,100
	ARL Ext	30,700	30,800	48,400	48,600	60,300	60,100
	Blue	56,700	56,500	121,500	121,300	145,400	144,600
Subtotal		326,300	327,500	599,400	598,700	711,900	711,800
Kamphaeng Phet Station		33,000	33,100	67,000	67,300	82,900	82,900
Chatuchak Station		78,200	77,900	169,400	170,000	195,600	195,500
Mo Chit Station		95,600	95,500	170,600	171,200	184,900	185,700
Total		533,100	534,000	1,006,400	1,007,200	1,175,300	1,175,900

Source: OTP

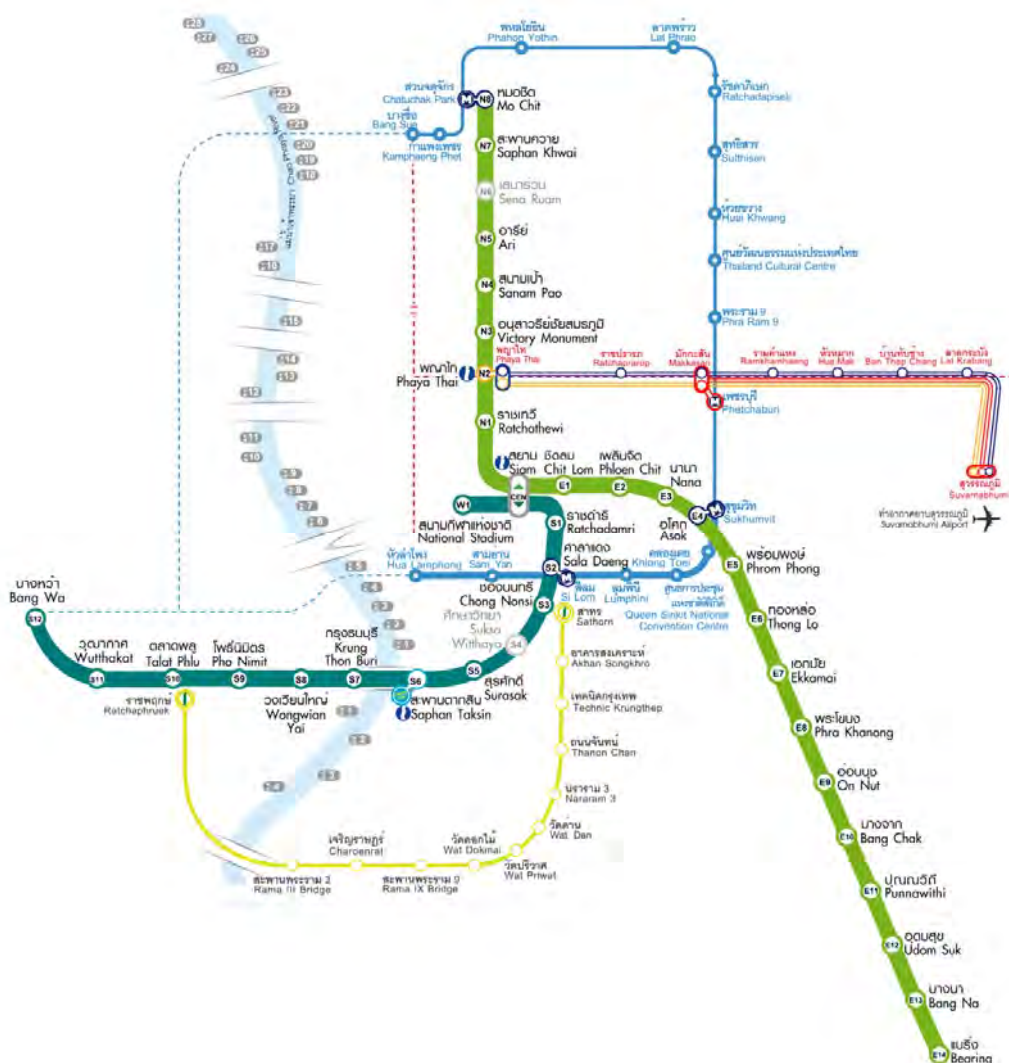
Chapter 4 Current Status of Infrastructure

4.1 Railway

In Bangkok, the congestion at major arterial roads is a common issue. BTS Sky train is now widely used by passengers. They have acknowledged that Skytrain is a convenient mode of transport which can help them to avoid running into a traffic jam. Current Urban Mass Rapid Transit (UMRT) in Bangkok consists of five lines in total including; two (2) lines of BTS (Light Green Line - Dark Green Line), two (2) lines of MRT (Blue Line - Purple Line) and ARL (Airport Rail Link). Status of existing and planned railway based on transit systems is shown below.

4.1.1 BTS (Light Green Line - Dark Green Line)

Existing network of BTS (Light Green Line - Dark Green Line) is as shown in Figure 4.1.1.



Source : BTS

Figure 4.1.1 Existing Network of BTS (Light Green Line - Dark Green Line)

(1) BTS Sukhumvit Line (Light Green Line)

BTS Sukhumvit Line has 22 stations with a total length of 22.1 km from Mo Chit Station (North Terminal) to Bearing Station (South Terminal). The entire line is aboveground. It runs along Sukhumvit Street, one of the main streets in Bangkok, to Thong Lo Station – Phromphong Station – Asok Station (an interchange with Sukhumvit Station of MRT Blue Line) – Nana Station – Chit Lom Station – Siam Station (an interchange with BTS Si Lom Line).

At present, the extension of 13 km consisting nine (9) stations to the East from Bearing Station to Samut Prakan is under construction and it is expected to be opened in 2018 (In April 2017, Samrong Station, next to Bearing Station, was newly opened).

These existing stations are in the downtown area which is filled with office buildings and commercial buildings. As shown in Figure 4.1.2, there are large department stores (Enporium, Siam Paragon etc.) and shopping malls (Terminal 21, Siam Square 1 etc.) which are connected to stations by pedestrian bridges or pedestrian decks along BTS Sukhumvit Line. It can be considered as the typical example of TOD in Thailand, in context of commercial development.



Source : Asia Travel Note



Source : Bangkok Navi

Figure 4.1.2 Commercial Facilities Connecting to Stations of BTS Sukhumvit Line

(2) BTS Si Lom Line (Dark Green Line)

BTS Si Lom Line has 13 stations with a total length of 13.8 km from National Stadium Station (CBD Terminal) to Bang Wa Station (West Terminal). It is the main line connecting the left and right bank of Chao Praya River. The entire line is aboveground.

This line runs from National Stadium Station, the terminal in CBD to Siam Station (interchange station with BTS Sukhumvit Line) which is probably the most popular shopping area, to Ratchdamri Station which is surrounded by green spaces in the middle of Bangkok, the Royal Bangkok Sport Club which includes Lumpini Park, horse racecourses and luxury golf courses, to Sala Daeng station (connecting with Si Lom Station of MRT Blue Line) where CBD of Bangkok has been formed, to Chong Nonsi Station, Surasak Station and to Saphan Taksin Station on the left bank of Chao Praya River. It then passes the river, to several stations on the right bank and terminates at Bang Wa Station.

BTS Si Lom Line is not only connected to MRT Blue Line but also to other public transport modes. It is also possible to transfer to BRT terminal by elevated pedestrian bridges from Chong Nonsi Station. It is also possible to use water transport on Chao Praya River at Saphan Taksin Station. Prices of real estates around new stations of BTS Si Lom has been increasing 33% since the past 2 years.

4.1.2 MRT (Blue Line - Purple Line)

The existing network of MRT is as shown in Figure4.1.3.

(1) MRT Blue Line

MRT Blue Line was financed by Japanese Official Development Assistance (ODA) and opened in 2004. As of November/June 2017, it is the single subway line in Bangkok. It runs from Hua Lamphong Station located near to CBD to Bang Sue Station with total 18 stations in 20.8 km length. It is connected to BTS Si Lom Line at Si Lom Station, to BTS Sukhumvit Line at Sukhumvit Station, to ARL at Phetchaburi Station, and again to BTS Sukhumvit Line at Chatuchak Station. Along the route of MRT Blue Line, which runs through city center, recently, urban development has been activated by private capital, especially for area surrounding Phra Ram 9 Station.

(2) MRT Purple Line

MRT Purple Line, built by Japanese ODA, runs from Khlong Bang Phai Station (Northwest side of the downtown area) to Tao Poon Station (North side of the central downtown area) with 16 stations in 23 km. It was opened in 2016. The existing downtown area is sprawling along the route of Purple Line, and condominiums are being built by private developers. Bang Sue Station of Blue Line is located in one (1) km to the East of Tao Poon Station. Blue line was extended to Tao Poon Station in August 2017, so that passengers can transfer Blue Line and Purple Line at Tao Poon Station.



Source : Urban Transportation Plan of Bangkok 2017

Figure4.1.3 Existing network of MRT

4.1.3 SRT Red Line

SRT Red Line is under construction partially by Japanese ODA. It shall be operated from Bang Sue Station (North side of central downtown area) to Rangsit Station (Northern suburban area) with ten (10) stations in 26.3 km. It is expected to be completed in 2020. Red Line is planned to be integrated with the existing inter-city railway that runs alongside and to be elevated to ease the congestions caused by at ground intersections. The network of SRT Red Line is as shown in Figure4.1.4.

4.1.4 Pink Line - Yellow Line - Orange Line

Pink Line, Yellow Line and Orange Line will connect central area to suburban area to the east.

planned contents of each line Esare as as shown in Table 4.1.1. These lines are under bidding or planning stage, and has not been construction as of November 2017.

Table 4.1.1 Existing Railway around Survey Area

Line	Outline
Pink Line	Monorail, total length of 34.5 km with 30 stations Nonthaburi (Northern suburban area) to Min Buri (Eastern suburban area)
Yellow line	Monorail, total length of 30.4 km with 23 stations Ratchada (Northeast side of central area) to Samrong (Southeast side of central area)
Orange Line	Heavyrail, total length of 39.6 km with 30 stations Taling Chan (West side of central area) to Min Buri (Eastern suburban area)

4.1.5 ARL (Airport Rail Link)

ARL is the elevated railway that connects Suvarnabhumi Airport (eastern suburb), to CBD with eight (8) stations in 28.6 km. It opened in 2010. There is a candidate location for TOD at the surrounding area of Makkasan Station. Makkasan Station is connected to Phetchaburi Station of MRT Blue Line. At the time of opening in August 2010, it was operated in two (2) modes: express train (direct from Airport to Makkasan) and local train. However, the express service has been stopped since 2014. In the future, there is a plan to extend this line to Don Muang Airport by passing through Bang Sue Station. The existing network of ARL is as as shown in Figure4.1.4.



Figure4.1.4 SRT Route Map

4.1.6 High-speed Train (Plan)

In 2016, a memorandum was signed on applying Japanese technology for the high-speed train

connecting Bangkok and Chiang Mai. Total length is approximately 670 km. Including other planned routes, total 5 routes are being considered to be developed.

- 1st route : Bangkok – Phitsanulok - Chiang Mai
- 2nd route : Bangkok – Ubon Ratchathani
- 3rd route : Bangkok - Nakorn Ratchasima - Nong Khai
- 4th route : Bangkok - Hua Hin - Padang Besar
- 5th route : Bangkok - Rayong

Planned network of highspeed train is as shown in Figure4.1.5.



Source : SRT

Figure4.1.5 Planning Routes of High-speed Trains

4.2 Road Transport and Bus Terminal

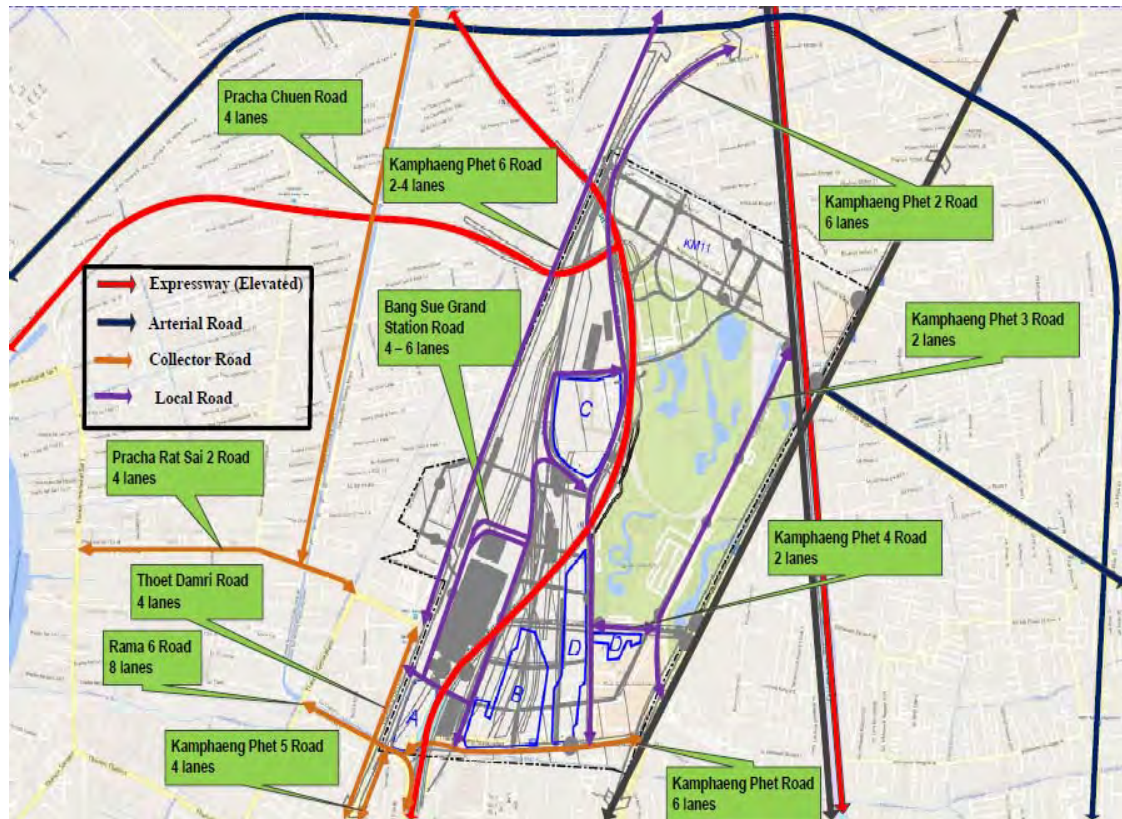
4.2.1 Road Transport

Status of surrounding road network is as shown in Table 4.2.1, Figure4.2.1 and Figure4.2.2.

Table 4.2.1 Existing Roads in Surrounding Bang Sue Area

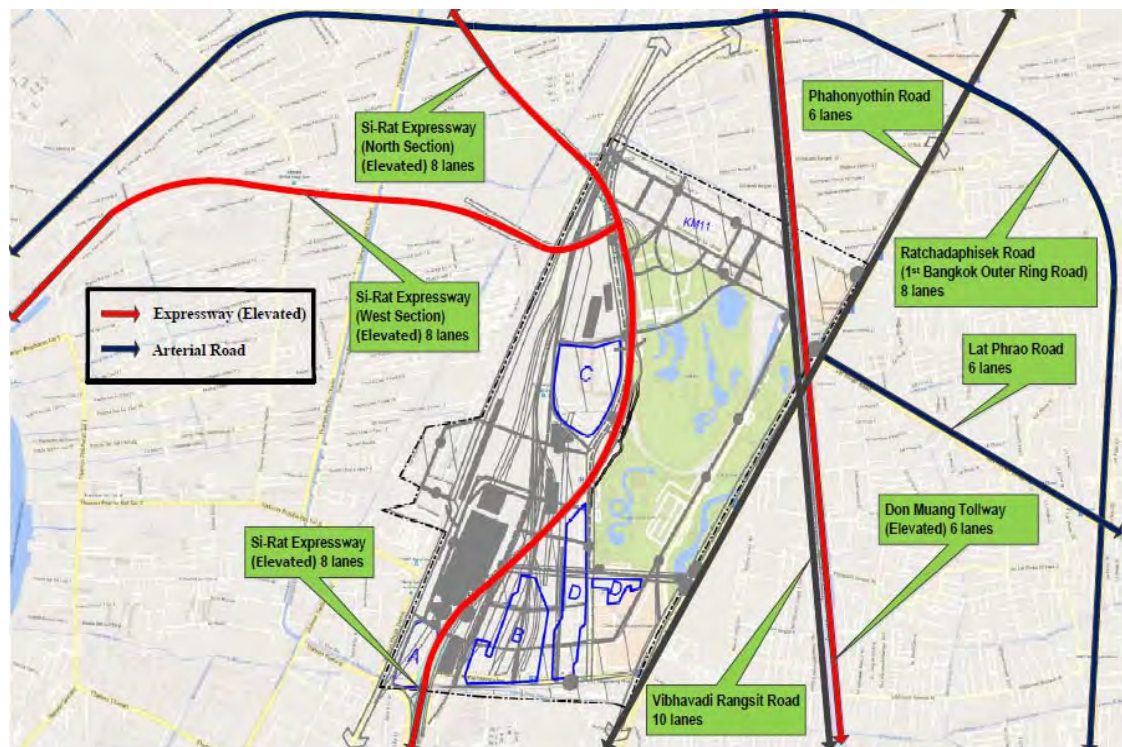
No.	Name	Type of road	Authority
1	Don Muang Expressway	Toll Expressway	Private Operation Company/Expressway Bureau of MOT
2	Si-Rat Expressway	Toll Expressway	Private Operation Company/Expressway Bureau of MOT
3	Si-Rat Expressway - Bangkok Outer Ring Road	Toll Expressway	Private Operation Company/Expressway Bureau of MOT
4	Vibhavadi Rangsit Road	Major Trunk Road	Expressway Bureau of MOT
5	Phahonyothin Road	Expressway	Expressway Bureau of MOT
6	Rachadaphisek Road	Trunk Road	Bangkok Public Works Bureau
7	Lat Prao Road	Trunk Road	Bangkok Public Works Bureau
8	Kampheang Phet Road	Major Collective Road	Bangkok Public Works Bureau
9	Rama 6 Road	Major Collective Road	Bangkok Public Works Bureau
10	Thoet Damri Road	Collective Road	Bangkok Public Works Bureau
11	Kampheang Phet 5 Road	Collective Road	Bangkok Public Works Bureau
12	Pracha Rat Sai 2 Road	Collective Road	Bangkok Public Works Bureau
13	Pracha Chuen Road	Collective Road	Bangkok Public Works Bureau
14	Kampheang Phet 6 Road	Collective Road	Bangkok Public Works Bureau
15	Kampheang Phet 2 Road	Local Road	Bangkok Public Works Bureau
16	Kampheang Phet 3 Road	Local Road	Bangkok Public Works Bureau
17	Kampheang Phet 4 Road	Local Road	Bangkok Public Works Bureau
18	Road around Bang Sue Grand Station	Local Road	Thai National Railway (SRT)

Source: JST



Source: JST

Figure4.2.1 Expressway in Surrounding Bang Sue Area



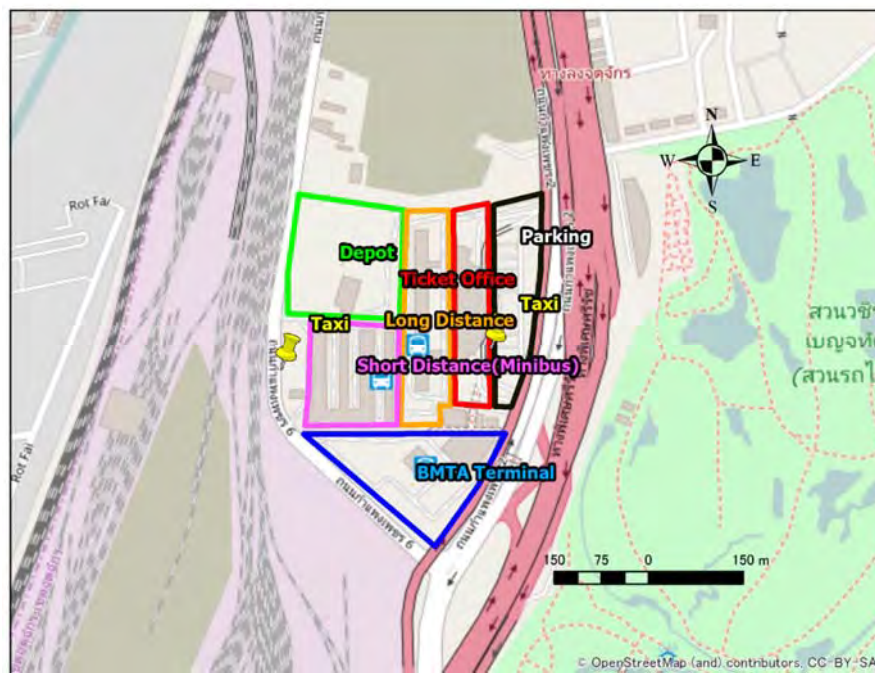
Source: JST

Figure4.2.2 Elevated Roads in Surrounding Bang Sue Area

4.2.2 Bus Terminal

The bus terminal in Bang Sue Area is called Mo Chit 2 Bus Terminal, operated by Transport Co., Ltd., a state enterprise under Ministry of Transport (MOT). The company also operates long-distance bus service. Mo Chit 2 Bus Terminal is a terminal station for buses mainly going from Bangkok to the northern and northeastern Thailand and to neighboring countries such as Cambodia and Laos. In the statistical data from October 2015–September 2016, the terminal served 2.3 million buses and 38 million passengers annually. Besides Mo Chit 2 Bus Terminal, inner-city bus terminal is also located. Inner-city buses and its terminal are operated by Bangkok Mass Transit Authority (BMTA).

The plan view of Mo Chit 2 Bus Terminal and BMTA Bus Terminals is as shown in Figure 4.2.3. Mo Chit 2 Bus Terminal has an area of 14 ha facilitated with bus parking area, platforms, ticket offices, a depot, and an office building of Transport Co., Ltd.



Source: JST

Figure 4.2.3 Layout of Bus Terminal



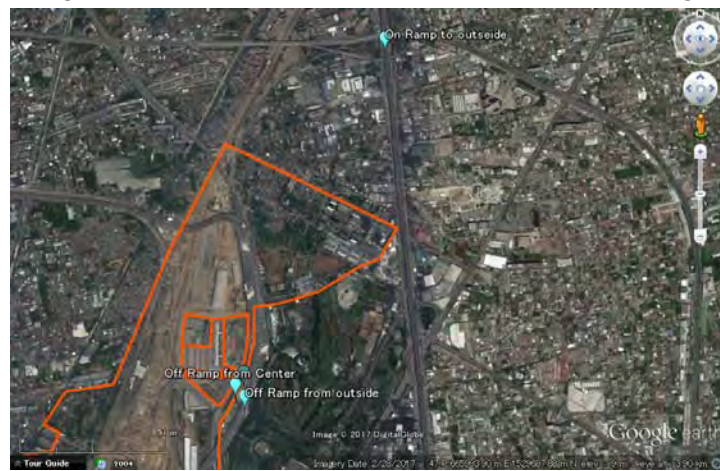
Source: JST

Figure 4.2.4 Platforms (Left: Medium Distance Bus; Right: Long Distance Bus)

(1) Inter-city Bus Service

There are two types of inter-city buses, i.e.: large bus (coach) for long distance trips to cities in northern and northeastern Thailand or to foreign countries, and van-type bus for medium distance trip. Each platform is located at Mo Chit 2 Bus Terminal separately. It has 130 platforms for long distance buses and 133 platforms for medium distance buses. However, each platform for medium distance bus can only serve two buses, so the number of medium distance buses is larger than that of long distance. The inter-city buses use the expressway. Buses, which come to Bangkok use Sirat Expressway which passes just next to Mochit 2 Bus Terminal. For those heading to other cities, they use Don Muang Expressway via a ramp located in the northeast of Bang Sue Area.

Roads in the surrounding area of Mo Chit 2 Bus Terminal are as shown in Figure 4.2.5.

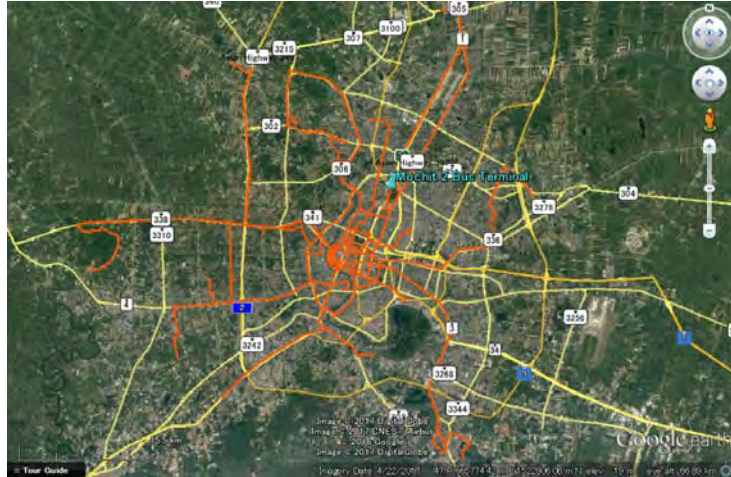


Note: Red lines show the roads in the surrounding area of Mo Chit 2 Bus Terminal
Source: JST

Figure 4.2.5 Roads in the Surrounding Area of Mo Chit 2 Bus Terminal

(2) Inner-city Bus Service

Inner-city bus service is managed by BMTA. In 2017, 209 routes are operated. In Bang Sue Area, 14 routes depart from BMTA Bus Terminal. However, there are some bus routes which do not stop at BMTA Bus Terminal. BMTA bus routes are as shown in Figure 4.2.6.



Note: Orange lines show inner-city bus routes

Source: BMTA

Figure4.2.6 Inner-city Bus Routes

(3) Traffic Survey on Mo Chit 2 Bus Terminal

1) Outline of the Traffic Survey

OTP reports the current location of the Mochit 2 Bus Terminal affects to traffic flow in surrounding roads, and it causes the traffic congestion. The objective of the traffic survey is to study adequate bus location and operational plan by clarifying current traffic flow and tendency of bus users' trips. In the present survey, the traffic volume survey and the interview survey are implemented.

Table 4.2.2 Traffic Survey Component

Items	Survey Component
Traffic Volume Survey	• Current traffic volume • Traffic signal cycle
Interview Survey	• OD information of bus users • Stated preference for traffic mode

Source: JST

2) Traffic Volume Survey

The traffic volume survey was conducted at the intersection near Mo Chit 2 Bus Terminal as shown in Figure4.2.7. The traffic count was conducted manually for 12 hours, by directions and by nine (9) car types. The survey was conducted from 7 a.m. to 7 p.m. on 7th June, 2017. An intersection near Mo Chit 2 Bus terminal is selected as traffic survey point since all vehicles must pass the intersection to access the Mo Chit 2 bus terminal. Therefore it is considered an ideal location to analyze the affection of the bus terminal.



Source: JST

Figure4.2.7 Location for Intersection Traffic Count Points



Source: JST

Figure4.2.8 Traffic Count Survey

Passenger Car Unit (PCU) factors were defined by OPT as following in Table 4.2.3.

Table 4.2.3 PCU Factor

Type of vehicle	PCU factor
Motorcycle	0.333
Car, Taxi	1.000
Small bus, Van, Pickup	1.500
Medium Bus	1.5000
Large Bus	2.100
Light Truck<2 axis	1.000
Medium Truck 3 axis	1.500
Large Truck 5 axis	2.500
Trailer	2.500
Cycle	0.000
Type of vehicle	PCU factor

Source: OTP

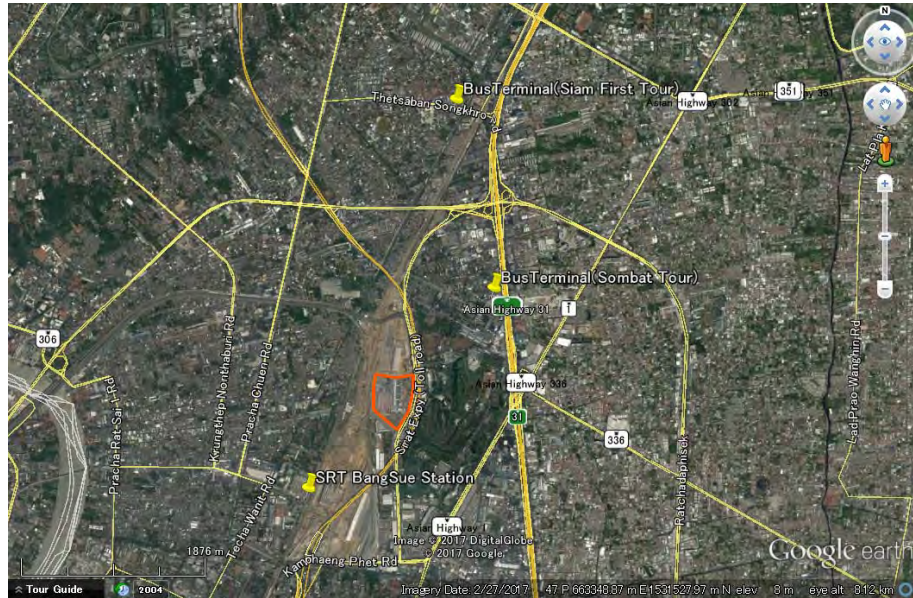
3) Interview Survey

The interview survey was conducted to collect attributes of bus users, Origine and Distination (origin and destination (OD)) information and stated preference. As for OD information, it is figured out from tendency of transshipment from bus to other modes. As for stated preference, it is asked that possibility of changing current traffic mode, if Mo Chit 2 Bus Terminal would be relocated and improved connectivity to other traffic mode. The interview was conducted at two private bus stops which are which locate atnear Mo Chit 2Bus Terminal and SRT Bang Sue Station. Questions are as as shown in Table 4.2.4.

Table 4.2.4 Questions in the Interview Survey

Category	Items
Attribute	• Gender • Age • Vehicle ownership • Residence
Trip Information	• Trip Purpose • Origin and destination
Bus Usage Situation	• Frequency of use • Transshipment to railway
Stated Preference	• Maximum walk distance • Stated preference for each traffic mode

Source: JST



Source: JST

Figure 4.2.9 Interview Location

Table 4.2.5 Interview Schedule

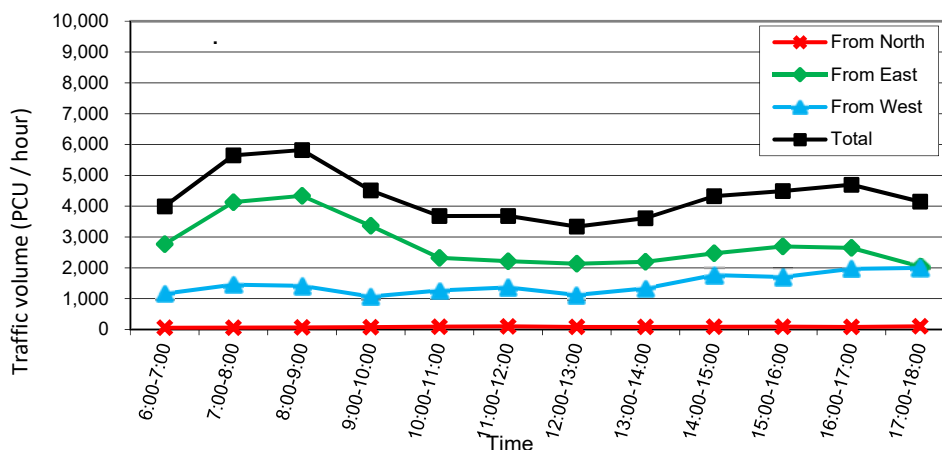
Date	Time	Location
7 th June	10:00 – 19:00	SRT Bang Sue Station
	18:00 – 21:00	Bus terminal (Siam First Group)
9 th June	5:00 – 9:00	Bus terminal (Sombat Tour)
	15:00 – 19:00	Bus terminal (Sombat Tour)
10 th June	5:00 – 9:00	Bus terminal (Siam First Group)
	5:00 – 9:00	Bus terminal (Sombat Tour)
	17:00 – 21:00	Bus terminal (Siam First Group)
	17:00 – 21:00	Bus terminal (Sombat Tour)

Source: JST

According to OTP, Mo Chit 2 Bus Terminal is planned to relocate by 2023 to toMOF's property is located at next to MRT Chatuchak Park Station and BTS Mo Chit Station. Its total area is 112,000m², is used to be operated as a bus terminal before. New bus terminal will be developed along with commercial development. To consider an adequate place for relocation, JICA survey team refers the traffic survey result. Also the result should be considered in the planning stage of the development plan and the business plan.

Result of Traffic Volume Survey

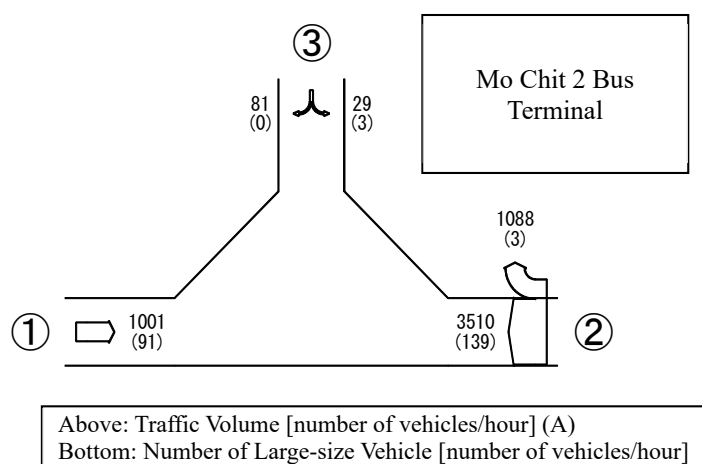
In terms of the traffic volume by time, the traffic flow from east direction has more volume than other directions throughout 12 hours, as shown in Figure 4.2.10. A ramp will be developed near future in the north of the intersection. Therefore, the traffic volume from north direction is considered to be bigger in the future.



Source: JST

Figure4.2.10 Traffic Volume by Time and Direction

Figure4.2.10 shows traffic volume by time and direction. In the morning peak, the traffic flow from east is its peak. As the result of V/C analysis, East-West and East-East (U-turn) direction exceeds its capacity as shown in Table 4.2.6. V/C. If Volume/ Capacity (V/C) was lower than 1.0 the result was indicated as "OK", otherwise result was indicated as "NG". If V/C exceeds 1.0, chronic traffic congestion is occurred. In terms of the level of service¹, it was diagnosed as F rank. F rank is the lowest rank in the six categories in the Highway Capacity Manual.



Source: JST

Note: Upper figure indicates total traffic volume per hour. Lower figure indicates traffic volume of heavy vehicle per hour

Figure4.2.11 Traffic Volume at Morning Peak Hour (7a.m. – 10a.m.)

Table 4.2.6 V/C Analysis Result

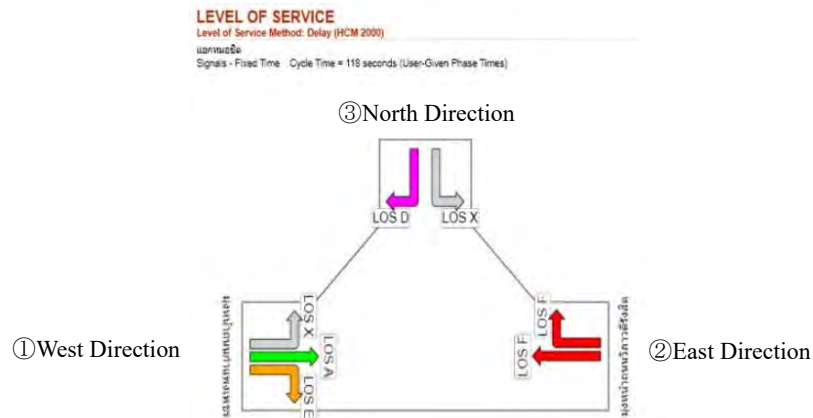
Points	①		②		③	
Direction	Straight	U-Turn	Straight	U-Turn	Left	Right
Number of Lanes	3	1	2	1	1	2
Volume / Capacity q / C_i	0.304	0.000	1.542	1.522	0.021	0.062

¹ Level of service(LOS) indicates the condition of traffic management which is described as six categories from A to F. LOS for signalized intersections is defined in terms of average delay time that is subtraction of travel time with signalized intersection and without signalized intersection.

Result	OK	OK	NG	NG	OK	OK
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Note: OK= Volume/ Capacity (V/C) is less than 1.0. NG=V/C is over 1.0.

Source: JST



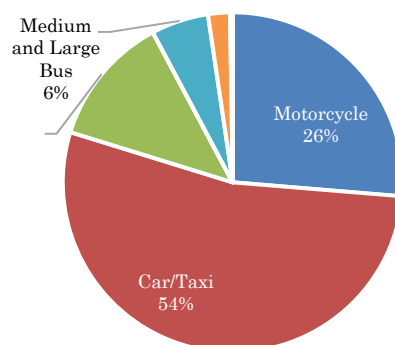
Source: JST

Figure4.2.12 Level of Service

Figure4.2.13 shows the proportion of traffic mode on intersection. The middle and longdistance buses occupies six (6) percent of all traffic mode. They are converted to 1.5 – 2.0 PCU, thus it affects the traffic flow compared to the standard-sized automobile.

Relocation of Mochit 2 Bus Terminal will decrease bus trips and other related trips such as taxi trips from Mo Chit 2 Bus Terminal to center of Bangkok. Therefore, the relocation is expected to contribute to the alleviate the traffic flow at Kam Phaeng Phet 2 Road. On the other hand, at the heaviest traffic volume on intersection (East- East direction and East - West direction), the ratio of bus in the total traffic is not high. Therefore, bus does not affect on the traffic congestion at the intersection.

However, traffic congestion prevents bus operators from their smooth operation. JICA survey team recommends to alleviate the traffic flow at Kam Phaeng Phet 2 Road by improvement the detour road or Kam Phaeng Phet 2 Road itself, or, Mo Chit 2 Bus Terminal should be relocated to other places where the traffic volume is smaller and the congestion is much less.



Source: JST

Figure4.2.13 Proportion of Traffic on Intersection Classified by Type of Car

5) Result of Interview Survey

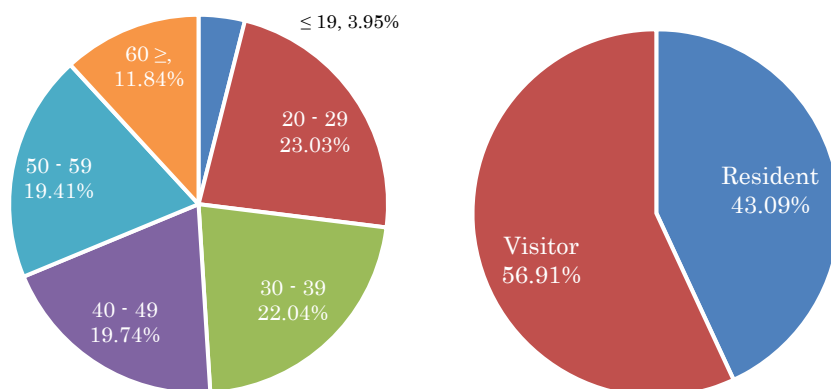
As for interview survey, 300 samples were collected to gather the opinions about Mochit 2 Bus

Terminal. The results were used to determine the adequate bus terminal location and necessary infrastructure around the new bus terminal. Questions are as shown again in Table 4.2.7. The results are summarized in below. Basic characteristics are summarized in Figure 4.2.14.

Table 4.2.7 Questions in the Interview Survey

Category	Items
Attribute	• Gender • Age • Vehicle ownership • Residence
Trip Information	• Trip Purpose • Origin and destination
Bus Usage Situation	• Frequency of use • Transshipment to railway
Stated Preference	• Maximum walk distance • Stated preference for each traffic mode

Source: JST

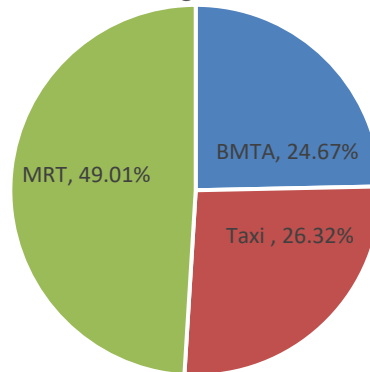


Source: JST

Figure 4.2.14 General Attributes of Interviewee (Left: Age, Right: Residence)

Interviewees were asked about their stated preference on the traffic mode from Mochit 2 Bus Terminal to the center of Bangkok. The results revealed that over a half of the interviewees chose MRT. It is assumed that MRT is preferred because it is more punctual and time-saving than other traffic modes. It means most of the interviewees choose the time regardless of their fare, since BMTA is generally cheaper than MRT's fare. From this result, the JICA survey team suggests to make the bus terminal close to a MRT station.

Which do you prefer to use for a trip to the center of Bangkok?

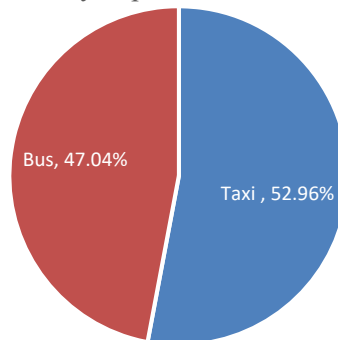


Source: JST

Figure4.2.15 Stated Preference for Traffic Mode Heading to Center of Bangkok

Interviewee were also asked about their stated preference on traffic mode from certain place to other places beyond the walking distance. The results revealed that 47% of interviewee choosed bus. Therefore, JICA survey team suggests to introduce bus service as inter-area transport in Bang Sue Area.

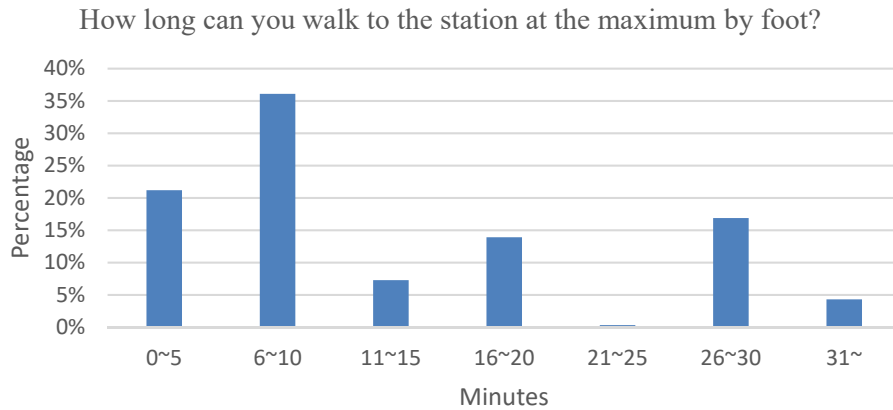
If distance beyond maximum walking distance, which do you prefer to use for a trip?



Source: JST

Figure4.2.16 Stated Preference for Traffic Mode Heading to Closest Station

Interviewee are asked about maximum acceptable walking time to the bus terminal or train station, in case of using the skywalk that covered by roof. Result is as shown in Figure4.2.17. Peak appeared in six (6) to ten (10) minutes. Avagrage walking minutes is 16 minutes. The bus terminal over than walking distance from the other public transport modes, since many people tend to use train to trips to center of Bangkok. Average walking distance should be considered in the development plan.



Source: JST

Figure4.2.17 Maximum Walking Minutes

From the result of the traffic survey on Mochit 2 Bus Terminal, findings are concluded as follows.

- An arterial road around Mo Chit 2 Bus Terminal has much more traffic flow than its capacity. Traffic congestion affect to effective bus operation.
- Impact of bus terminal is limited in terms of traffic situationthe share of in current traffic volumesmaller.
- Considering transshipment from bus to other mode, walking distance to other traffic mode should be less than 10 minutes.
- Bus terminal should be located near a train station.
- Bus terminal should be connected to route bus service operated inside Bang Sue Area.

(4) Issues of Mo Chit 2 Bus Terminal

Current issues of Mo Chit 2 Bus Terminal are summarized as follows:

1) Lack of accessibility from train, especially UMRT stations

The distance from Mo Chit 2 Bus Terminal to the nearest UMRT stations, BTS Mo Chit Station and MRT Kamphaeng Phet, is about 1.05km and 1.45km, respectively. Hence, it can be inferred that passengers transferring from Mo Chit 2 Bus Terminal to those stations are rare. Therefore, it would be necessary to relocate bus terminal to near train station to increase the number of passengers transferring between these two traffic (2) modes.

2) Length of standing time

As buses are spending long time staying at platforms, by shortening the time interval, it is possible to operate with larger number of buses and smaller number of platforms effectively.

3) Congestion in surrounding area

In surrounding area of Mo Chit 2 Bus Terminal, congestion has become a chronic issue. Kamphaeng Phet Road is the arterial road in front of Mo Chit 2 Bus Terminal, but congestion occurring in peak hours may affect the punctuality of the bus operation.



Source: JST

Figure4.2.18 Congestion on Kamphaeng Phet 2 Road

4) Bus depot

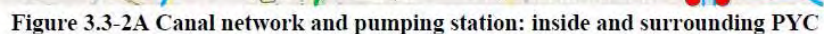
Short distance bus operators in Mo Chit 2 Bus Terminal use multiple places outside the bus terminal, e.g. under the space of Don Muang toll road, to park their vehicles. For long distance bus operators use a bus depot next to Mo Chit 2 Bus Terminal. Area of the depot is about 3.2 ha. It could be possible to discuss the relocation of this depot to outside of Bang Sue Area.

4.3 Status of Storm Drainage System

Storm drainage system is managed by Department of Drainage and Sewerage, Bangkok Metropolitan Administration (BMA).

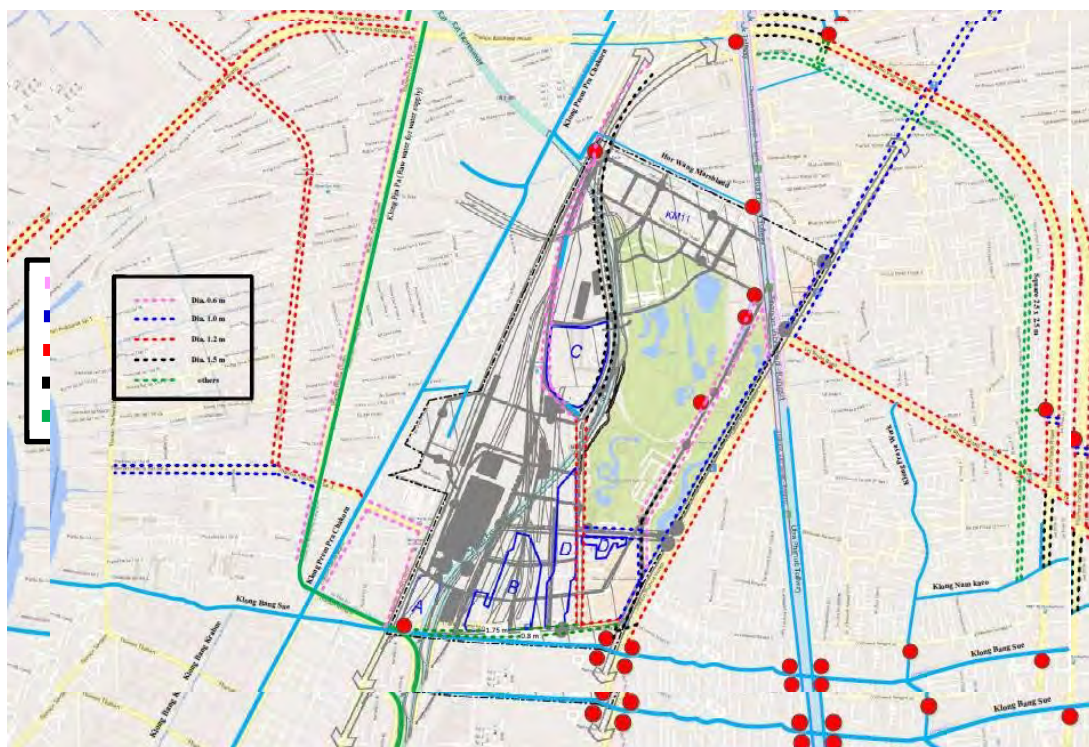
Bang Sue Area is in the basin of Chao Praya River. However, as Bangkok's geography is generally flat and average altitude is approximately 0 m, the drainage network using natural water body and channel to discharge storm water to Chao Praya River can work only in low tide period. Therefore, normally, pumping stations and water gates are used to discharge stormwater to river. Moreover, trunk drain pipes that directly connect to river are planned to be installed under the ground of Bang Sue Area.

The drainage system is as shown in Figure4.3.1, Figure4.3.2, Figure4.3.3, Figure4.3.4 and Figure4.3.5.



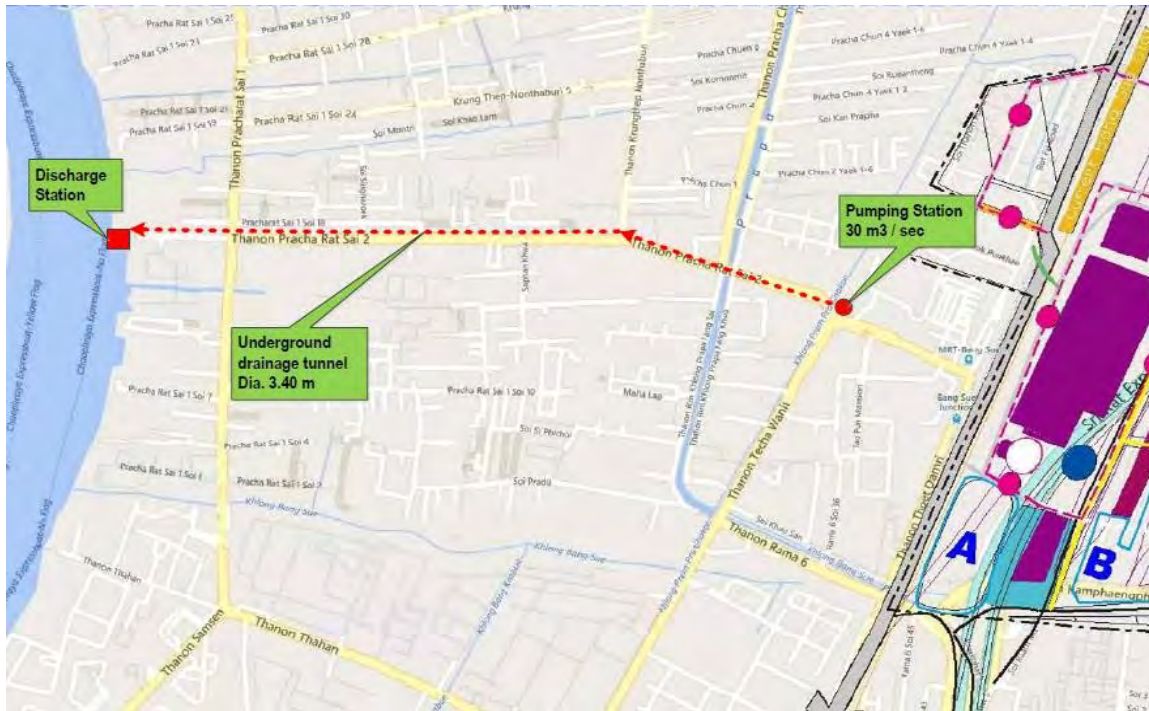
Source: JST

Figure4.3.1 Canal Network and Pumping Station



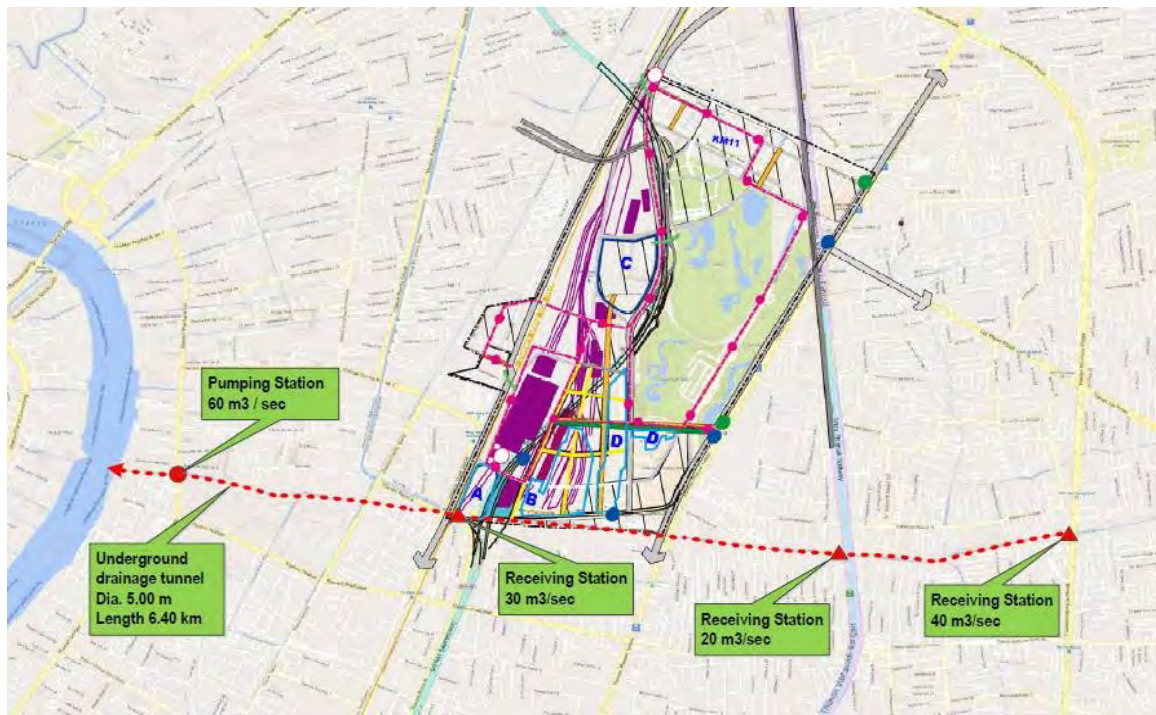
Source: JST

Figure4.3.2 Drain Pipe Network (Existing)



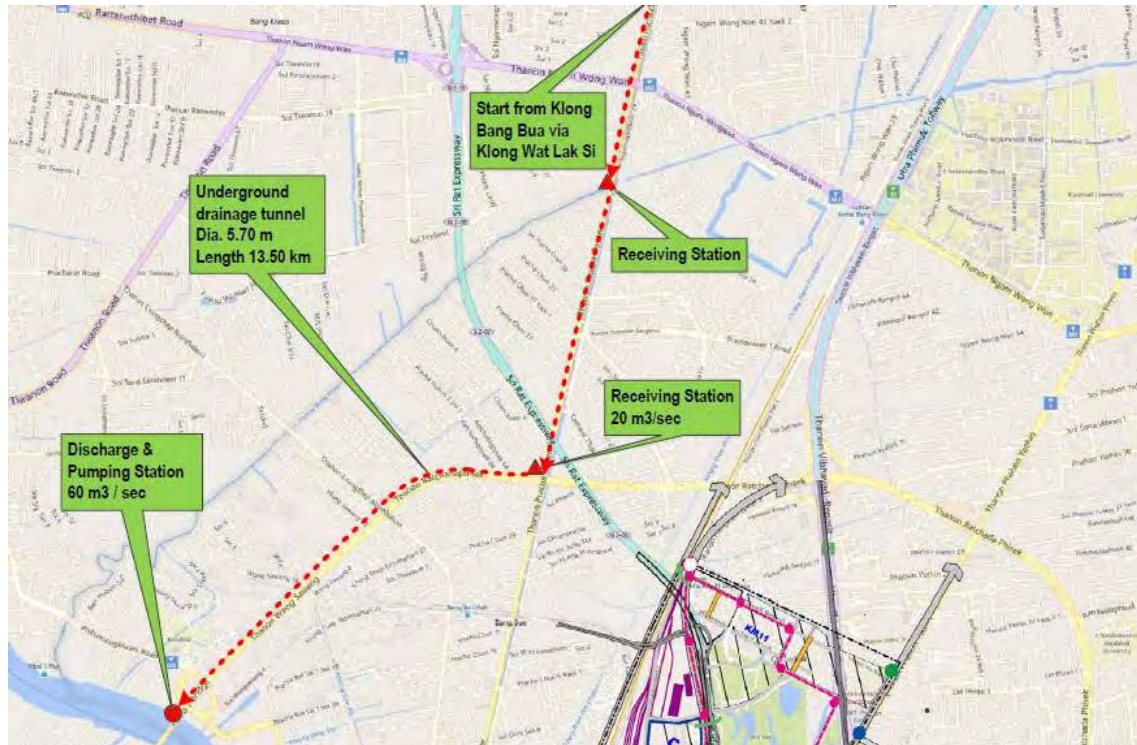
Source: JST

Figure4.3.3 Klong Prem Pra Chakon Trunk Drain Pipe (Opened in 2001)



Source: JST

Figure4.3.4 Beneath Klong Bang Sue Trunk Drain Pipe (under Construction)



Source: JST

Figure4.3.5 Klong Prem Pra Chakon / Klong Bang Bua Trunk Drain Pipe (under Detailed Design)

4.4 Status of Water Supply System

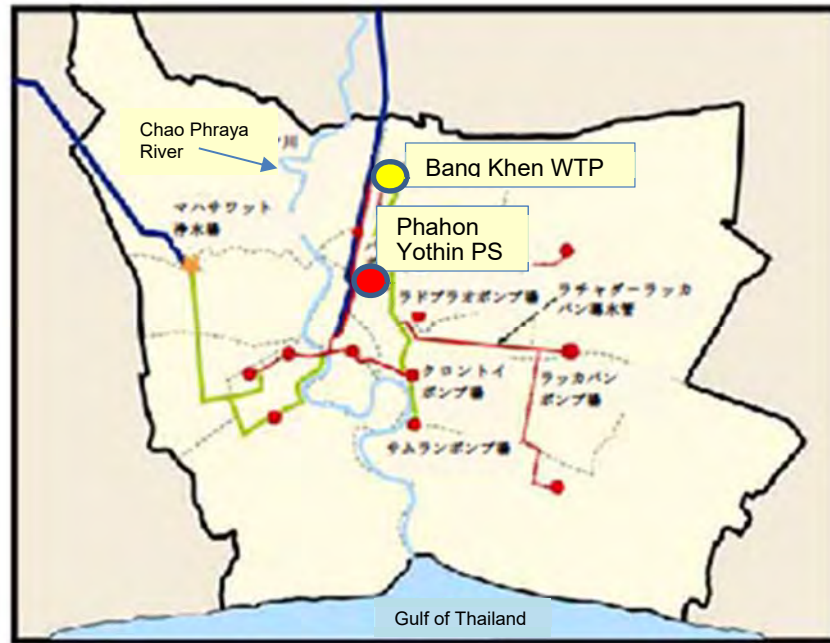
Water supply system in Bangkok is managed by Metropolitan Waterworks Authority(MWA). The status of Region 2, which covers Bang Sue Area and is managed by Phaya Thai office, is as shown in Table4.4.1.

Table4.4.1 Water Supply in MWA Region 2

No.	Items	Description
1	Supply area	60.91 km ²
2	No. of contracts	88,281
3	Annual supply volume	127.117 million m ³
4	Water leakage ratio	23.36%
5	Total length of pipeline	approx. 1,389km

Source : MWA yearly report (2015)

Water supply network of Bangkok is as shown in Figure4.4.1. The coverage of water supply system in Bangkok is 98%. Water supply for Bang Sue Area is treated at Bang Khen WTP (3.9 million m³/day) and delivered from Phahon Yothin Pump Station.



S

Source: JST

Figure4.4.1 Water Supply Network in Bangkok

Bang Khen WWT is as shown in Figure4.4.2.



Source: JST

Figure4.4.2 Bang Khen WTP

For water quality in Bangkok, the water treated at WTP satisfies a certain standard for drinking water, but the quality is declining as it flows through pipeline or stored at water tank, thus, the water from household taps is not drinkable anymore. Instead, people in Bangkok buy drinking water from bottled water or tanked water sold at vending machine, or, purified water by purification machine. Water rates per square meter is about from 8.50 to 14.45 Bahts. As shown in Table4.4.2, the water rates are defined depend on consumption volume.

Table 4.4.2 Water Price (MWA)

Household		Commercial, Government, Industry	
Consumption Volume (m ³)	THB/m ³	Consumption Volume (m ³)	THB/m ³
1-30	8.50	0-10	9.50
31-40	10.03	11-20	10.70
41-50	10.35	21-30	10.95
51-60	10.68	31-40	13.21
61-70	11.00	41-50	13.54
71-80	11.33	51-60	13.86
81-90	12.50	61-80	14.19
91-100	12.82	81-100	14.51
101-120	13.15	101-120	14.84
121-160	13.47	121-160	15.16
161-200	13.80	161-200	15.49
over 200	14.45	over 200	15.81

Source: MWA

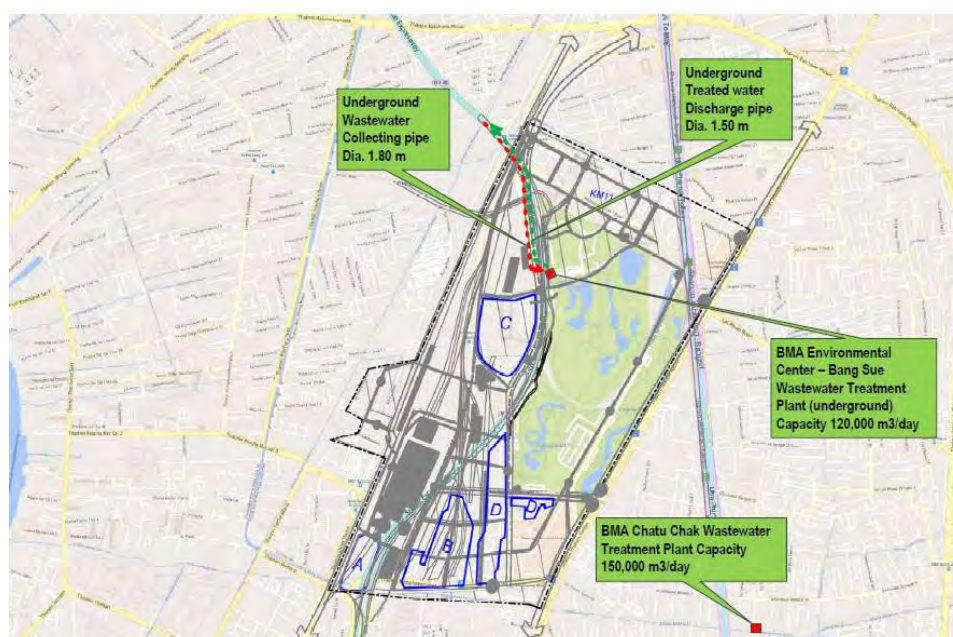
4.5 Status of Sewerage System

The sewerage system in Bangkok is managed by Department of Drainage and Sewerage, Bangkok Metropolitan Administration (BMA). In the neighborhood of Bang Sue Area, there are two wastewater treatment plants (WWTPs) which are described as follows:

Table 4.5.1 Overview of WWTP in the Neighborhood of Target Area

No.	Facility	Capacity	Remark
1	Bang Sue WWTP	120,000 m ³ /day	In December 2016, the WWTP is already operating at its full capacity. However, according to BMA, its capacity can be increased to 200,000 m ³ /day if the facility is improved.
2	Chatuchak WWTP	150,000 m ³ /day	As this WWTP is located upstream of the target area, it is not economical to consider this plant for development in the target area.

Source: JST



Source: JST

Figure 4.5.1 Location of WWTPs in Neighborhood of Bang Sue Area

Bang Sue WWTP(Figure 4.5.2) started its operation in 2012 as the latest facility in Bangkok. The characteristics of the Bang Sue WWTP are: that most of the main facilities for water treatment are settled underground; and Bang Sue Environmental Education and Conservation Center (Bang Sue EECC) has been constructed on the ground. Treated water is used for water-friendly pond in the area of Bang Sue EECC.



Source: JST

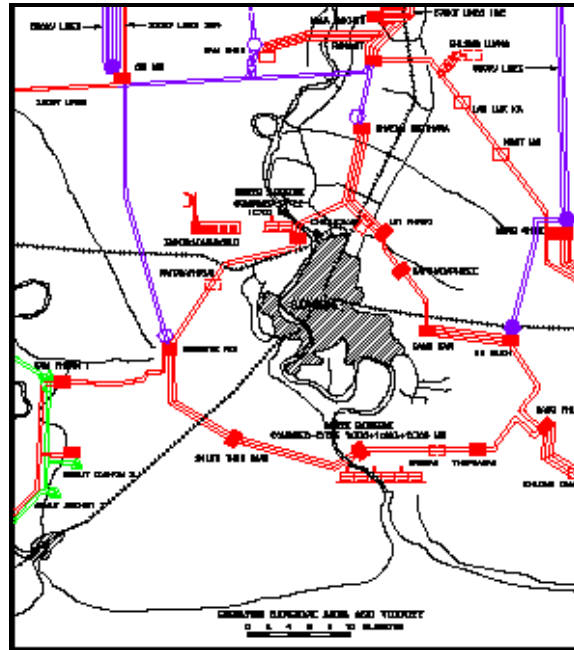
Figure 4.5.2 Bang Sue WWTP

4.6 Status of Power Supply and Distribution Infrastructure

In Thailand, there are three major power suppliers: Electricity Generating Authority of Thailand (EGAT), Metropolitan Electricity Authority (MEA), and Provincial Electricity Authority (PEA). EGAT is a state enterprise managed by Ministry of Energy (MOE), which is responsible for power generation and supply throughout the country. MEA is responsible for power distribution in Bangkok Metropolitan Area. PEA is responsible for power distribution in all 72 provinces except for those in the service area of MEA. PEA also promotes electrification in rural villages. Both MEA and PEA are state enterprises under the Ministry of Interior (MOI). The provision of infrastructure for power generation and distribution in Bangkok is managed by MEA. The power supply network in Bangkok (220 kV) is as shown in Figure 4.6.1.

In Thailand, Small Power Producers (SPP) Program was introduced in 1992. Through this program, the Government of Thailand aimed to: 1. Improve the efficiency of energy use by utilizing by-product of common power source and renewable energy, and 2. Reduce usage and import of oil.

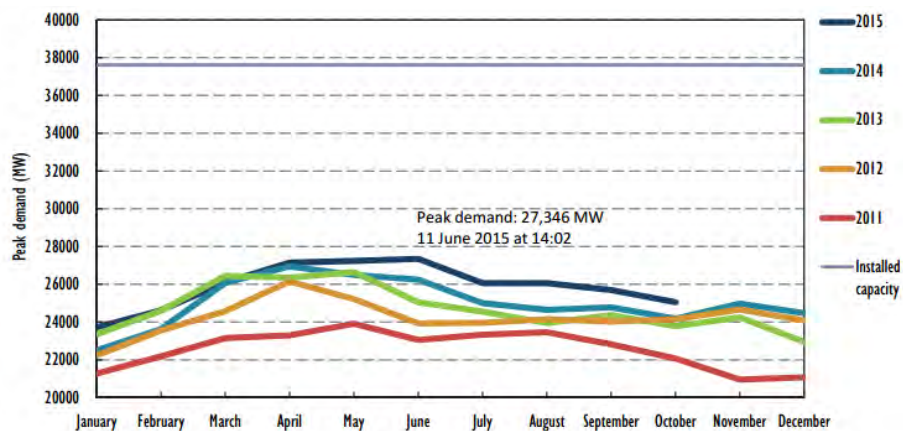
SPP will apply to projects of EGAT, and if the project satisfies a certain standard, it will be approved as an SPP project. The prices of generated power and other selling conditions are given by EGAT at the time of application. For SPP, who joins the program, EGAT will ensure to purchase the generated power up to 90,000 kW. SPP can sell the rest of electric power and heat (steam, cooling water) to manufacturers in industrial zones or other customers, independently.



Source: JST

Figure4.6.1 Power Distribution Network of Bangkok

Figure4.6.2 shows the trend of power generation capacity and consumption in 2015. At peak season, i.e. April, it still has remaining capacity which is about 25% of installed capacity.



Source: EGAT (2016), "Grid governance and management", presentation to IEA Review Team.

Source: EGAT

Figure4.6.2 Power Demand and Supply

As shown in Table4.6.1, electricity prices are defined depend on voltage and used volume. The rate per kwh is about 3.2 – 4.4 Bahts.

Table4.6.1 Electricity Prices

Voltage	Used volume	(Bahts/kwh)
12-24kV	No limit	3.9
Less than 12kV	Less than 150kWh	3.2
	151kWh - 400 kWh	4.2
	More than 400 kWh	4.4

Source: MEA

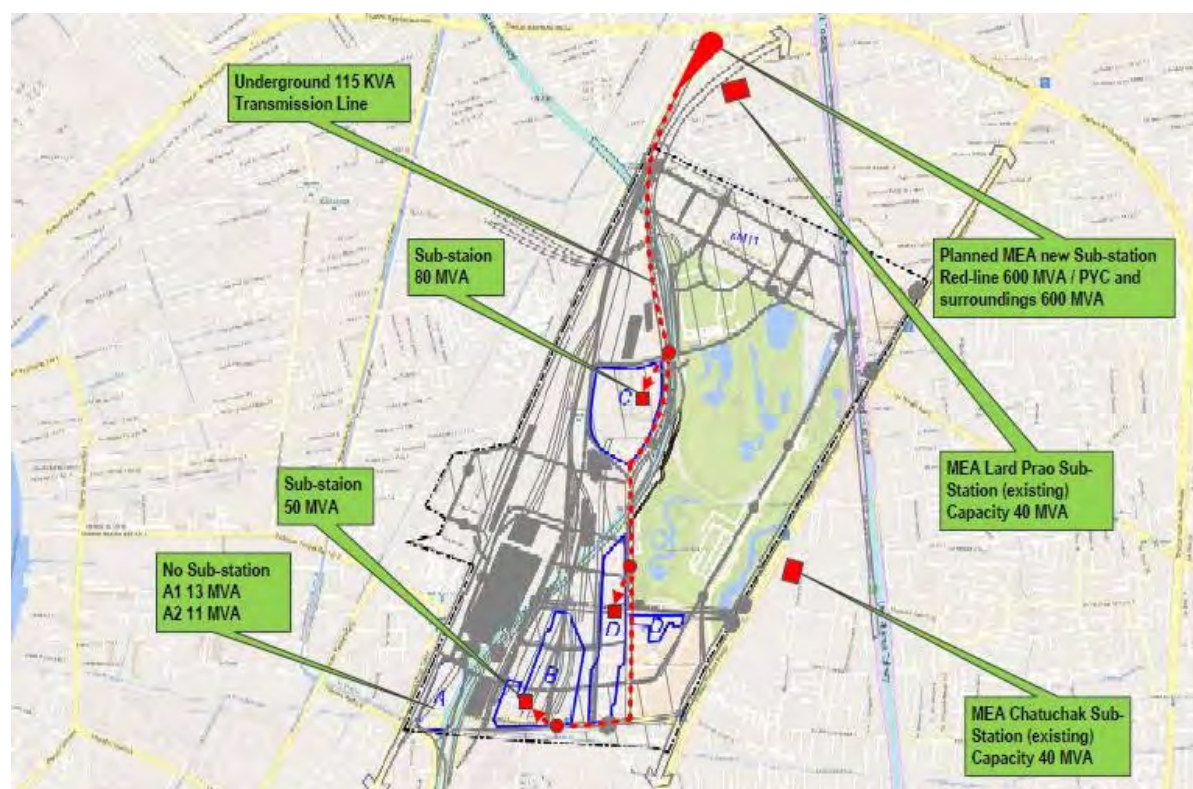
In the Bang Sue Area and its surrounding area, electricity is supplied through two sub-stations which are managed by MEA. In addition, a new substation, having an area of about 6,400 m² in the Bang Sue Area, is planned under the agreement between SRT and MEA.

The overview of substations is as shown in Table 4.6.2 and their locations are as shown in Figure 4.6.3.

Table 4.6.2 Overview of Substations in Surrounding Target Area

No.	Facility Name	Status	Capacity	Operation Rate	Remarks
1	Lard Prao Substation	In service	40 MVA	50%	Remaining capacity of two substations is 40 MVA
2	Chatuchak Substation	In service	40 MVA	50%	
3	EGAT Chatuchak High-voltage Substation	Planning		—	—
4	MEA Substation (for Red Line, ARL)	Composing detailed plan	600 MVA	—	Construction starts in 2017 and is expected to be carried out for three years.
5	MEA Substation (for urban development in surrounding area of Bang Sue Station)	Planning	600 MVA (+ 300 MVA)	—	• Reserve capacity of + 300 MVA. • Power transmission lines in Zone-B, C, D are expected to be installed underground. • Transmission line: 115 KVA • Duct's diameter : 1.8 m

Source: JST



Source: JST

Figure 4.6.3 Transmission Lines and Substations Planned to be Constructed in Target Area

In Thailand, solar PV rooftop feed-in tariff (FiT) policy was announced in 2013. It is stated that power generated from solar PV installed on commercial/residential rooftop and governmental rooftop shall be purchased up to 100,000 kW and 800,000 kW, respectively. As the quota for commercial/residential rooftop has already reached to full capacity, the remaining applications are for government buildings rooftop only. According to MOE, it is planned to stop FiT for solar PV; instead, FiT for liquefied natural gas (LNG) generation is being considered as LNG is more economical choice at the present time. Therefore, in the future, residential self-consumption will be the main demand for solar PV power.

Thailand has rich amount of solar radiation, about 1.5 times of that of Japan (1,000 kW/m²). As solar panels work more efficient under lower temperature, however, the temperature is high throughout the year in Thailand. Thus, scale of a solar panel must be 1.3 times in Thailand in order to reach the same storage level as in Japan.

In Thailand, solar power is not very popular in general and the panels are installed in some condominium/apartment/factory/hospital/large-scale commercial buildings only. In addition, it takes a long time to apply and obtain approval on installation from the government, which resulted to the slow growth of solar power utilization in Thailand.

4.7 Status of Oil and Gas Pipelines

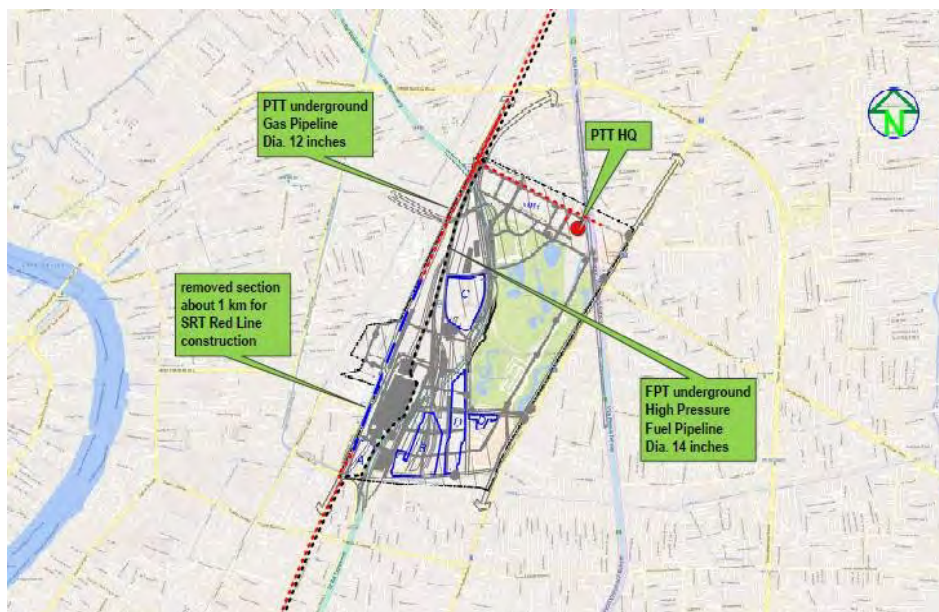
In the target area, there is one oil pipeline and one gas pipeline. The overview of these facilities is as shown in Table 4.7.1 and Figure 4.7.1. However, gas pipeline is for business use only. In Bangkok, piped gas is not supplied to each household, instead, people use propane gas.

Table 4.7.1 Overview of Oil and Gas Pipeline in Surrounding Target Area

No.	Type of Pipeline	Owner	Remark
1	Oil pipeline	Fuel Pipeline Transportation Limited (FPT)	Supply for Don Muang Airport
2	Pressurized natural gas pipeline	PTT Public Company Limited	• Installed underground • Diameter: 300 mm • At present, 300 MMscfd^{*1}(1.17 MPa)

*1 : MMscfd: Million standard cubic feet per day, is a unit of measurement for gases.

Source: JST



Source: JST

Figure4.7.1 Location of Oil and Gas Pipeline in Surrounding Target Area

4.8 Waste Treatment

Waste treatment in Bangkok is managed by Department of Environment, Bangkok Metropolitan Administration (BMA). In Thailand, waste is categorized into three (3) major groups: conventional waste, industrial waste and infectious waste. They have three (3) treatment methods: incineration, landfill and recycling.

Bangkok is divided into 50 sub--districts. From 8p.m.a.m. to 3p.m.a.m. everyday, garbage trucks patrol around the city to collect waste from collecting points. The collected waste is hauled to one of the three (3) transfer stations (Sai Mai, Nongkham, On Nuch) where waste is classified into conventional waste, dangerous waste from hospitals and factories, and recycling waste. Then, it is treated either by recycling or pressurization/incineration. After that, treated waste will be transported to final treatment sites in Nakhon Pathom Province or Chachoengsao Province Phanom Sarakham District for landfill.

4.9 Smart City

4.9.1 Existing Plan by PTT

Bang Sue Area is one of the ten (10) candidate districts selected by Government of Thailand to promote a model of Smart City. The model must improve the energy efficiency of its area in water supply, gas, power, heat supply and cogeneration. PTT cooperated with Chulalongkorn University to compose a conceptual plan of Smart City for Bang Sue Area. major points of this plan are described in the following parts.

(1) Mass Rapid Transit (MRT)

Bang Sue Area will be planned to construct MRT and monorail so that public transport accessibility is expected to become much better and convenient for visitors. As te result, the number of vehicles inside

the area may decrease and traffic congestions may be eased.

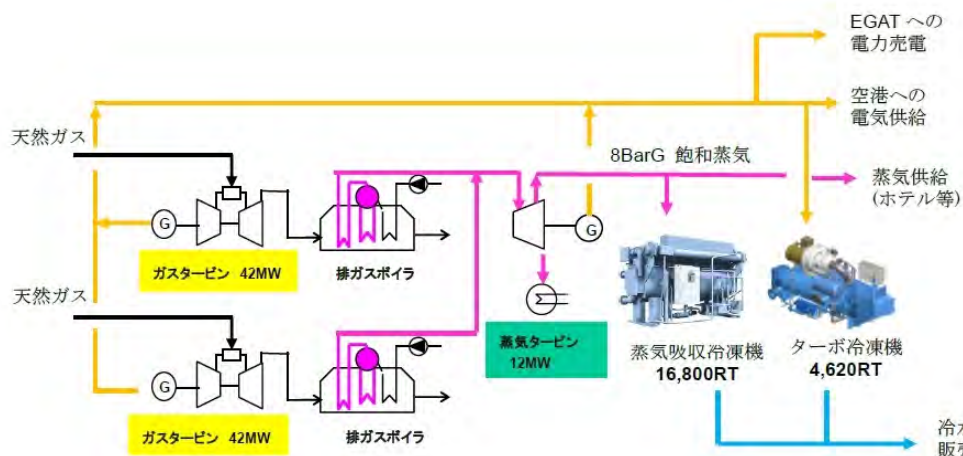
(2) Provision of Wi-Fi

Free public Wi-Fi will be provided in Bang Sue Area. Wi-Fi is not only for accessing to internet but also for supporting society in distributing application and service. also, it would be possible to maintain and operate the Wi-Fi efficiently. Wi-Fi will become a social infrastructure which will help utilize big data and open data as “Data resources”. This new resource will generate innovations in service, industry and social activities.

(3) District Cooling System

District cooling system will be introduced in Bang Sue Area and solar panels will be installed at various places. Public common ducts are planned to accommodate smart grid, gas pipes and underground cooling pipes.

In Thailand, there is a FIT policy for electricity generated by cogeneration to be purchased at fix tariff. It is becoming popular for industrial facilities. For example, in Suvarnabhumi Airport, gas turbine cogeneration is used, exhaust heat is used for vapor absorption refrigerator to provide cool water. This system is very efficient as it is not only supplying electricity for the airport, sells electricity to EGAT, but also supply vapor for hotels, and sells cool water.



Source: Survey on Technology Introduction in Reduction of Carbon Dioxide for Realizing a Low-carbon Society in Asia in 2018

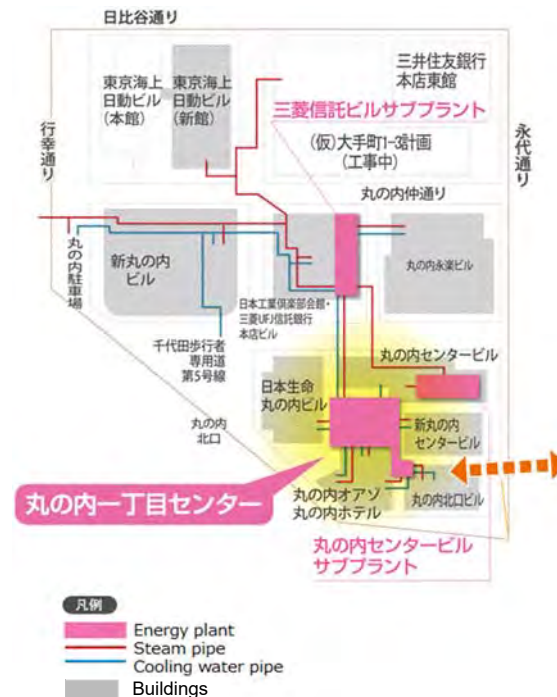
Figure 4.9.1 Cogeneration and District Cooling System in Suvarnabhumi Airport

4.9.2 District Cooling System / Cogeneration

(1) Overview of District Cooling System / Cogeneration

In terms of an area where cooling water is supplied, the area with larger Floor Area Ratio (FAR) will be prioritized and energy center will be located at near a building with largest heat demand. Pipelines will be arranged near the center of heat demand in each building so that distance to each target building is uniform and from supply trunk pipes from energy center can supply for multiple buildings. In case there are multiple targets in the supply area, distributed system with sub plant will be considered. In the area with large number of small buildings which have relatively small FAR and total floor area less

than 3,000 m², in order to save the cost of construction common utility, heat source for each building can be considered. However, in case of underground floors of large buildings are connected to buildings around, district cooling will be considered even for small buildings. In pipeline arrangement, trunk pipes will be installed in common ditch or common underground floor as it would be easy for maintenance, and branches to each building will be buried to save construction cost of big common ditch. In Bang Sue Area, on vacant lot, open-cut method will be used while on buildings or deeper location where it is difficult for open-cut, jacking method or shield method will be used for open common ditch (or service tunnel).



Source: Marunouchi Heat Supply Co., Ltd.

Figure 4.9.2 An Example of Pipeline Arrangement for District Cooling System

For district cooling heat source to use waste heat from cogeneration more efficiently, Absorption Chiller Heater with Auxiliary Waste Heat Recovery (GENELINK) is considered. To respond to the fluctuation of demand or heat supply from cogeneration, it is considered to install turbo cooling machines which have large capacity and high efficiency. Either absorption cooling machine or turbo cooling machine is in part-load operation, and for entire operation, high efficiency is maintained by using machines with high Integrated Part Load Value (IPLV) and capacity demarcation. In addition, if there is demand for vapor, e.g., hotels near the location of heat source, supply of vapor from wasted heat of cogeneration shall also be considered. To deal with the peak-load in midday, heat storage tank shall be considered, and it shall also be used as water tank for firefighting or emergency.

(2) Overview of Basic Framework of Developing Cogeneration and District Cooling System

The overview of basic framework of developing cogeneration and district cooling system in Bang Sue Area is considered as follows:.

1) Energy Infrastructure for Target Facilities

The type of energy needed for each facility is listed in Table4.9.1. For vapor supply, except for hotels, it may be used for vapor absorption cooling machine installed in some buildings; however, demand is expected to be small. In case of newly constructed buildings, main demand must be cooling water supply to each building. Considering the cost of constructing distribution pipeline to each zone, cooling by independent heat source will be applied in case that the target buildings are located too far from the energy center or buildings are too small.

Table4.9.1 Energy Needed for Each Type of Facilities

Type	Assumed Energy
Office, Government Building	Cold Water, Electrical, Water supply and sewage system, Telecommunications
Commercial Building	Cold Water, Electrical, Town Gas, Water supply and sewage system, Telecommunications
Hotel	Cold Water, Vapor, Electrical, Town Gas, Water supply and sewage system, Telecommunications
Condominium	Cold Water, Electrical, Town Gas, Water supply and sewage system, Telecommunications
Convention Center	Cold Water, Electrical, Water supply and sewage system, Telecommunications

Source:JST

2) Types of Supply and Installation Plan

There are three types of systems for district heating and cooling supplying in Japan, i.e., 1) heat supply project type, 2) concentration plant type, and 3) inter-building type. These types are selected based on the building's function, scale, heat demand, distance to energy center, and route of district pipeline. The location of energy center would be selected to be near the building with highest heat demand or at the center of a group of relatively big buildings.

Table4.9.2 Types of Supply

Classification	Scale	Agreement	Supply Entity	Supply Form	Others
1. Heat Supply Business Type	Large	Supply Regulation based on the Law of Heat Supply Business	Heat Supply Business Person based on the Law	Supply Duty based on the Law of Heat Business	Permission of Road Occupancy is handled conformed to Road Occupancy
2. Central Plant Type	Middle to Small	Agreement on Supplier and Consumer	Energy Supply Business Person based on Agreement	Supply Duty based on Agreement	Permission of Road Occupancy is possible on the system
3. Buildings Accommodation Type	Small	Mutual Agreements in each Building owners	Plural Building Owners	Decision by mutual Agreements	Permission of Road Occupancy is possible on the system

Source:JST

3) Considered Main Instruments and Facility System

Main instruments and facility system for energy infrastructure of Bang Sue Area are considered in Table4.9.3. Cogeneration, which higher energy efficiency and absorption cooling machine using GENELINK with higher COP, shall be applied.

Table4.9.3 Main Instruments and Facility System

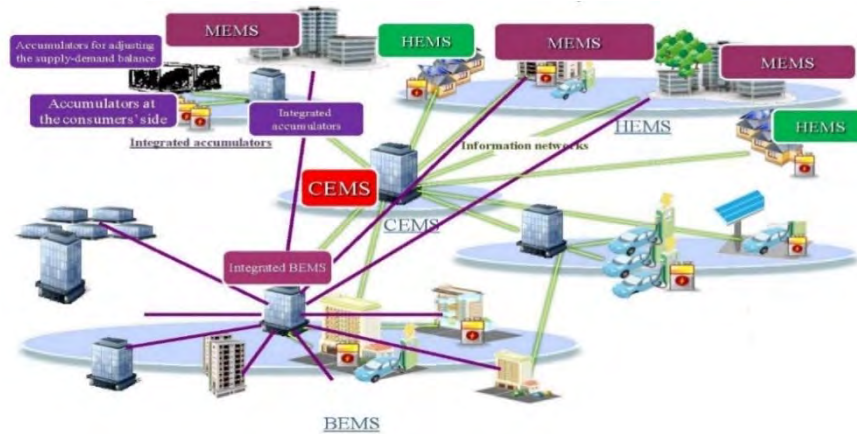
Main instruments	Facility system
Natural gas cogeneration	Highly efficient machine that is fueled by natural gas distributed by gas pipe of PTT nearby Bang Sue Area will be used. Gas engine and gas turbine are two of the main types of cogenerations. As in Bang Sue Area, heat demand is mainly for business and commercial

Main instruments	Facility system
	use while demand for industrial use are relatively low (thermal electric ratio is low), from the perspective of total efficiency, gas engine is being considered. Brief specs : Generation capacity 5,200~7,800kW (for reference)  Highly efficient gas engine cogeneration by K company (for reference)
Vapor firing GENELINK absorption cooling machine	Equipped with GENELINK using vapor from cogeneration and natural gas, used as base machine for operation Brief specs : Cooling capacity 281~3,517kW (1,000USRT, JIS Standard COP1.43 (for reference)  Highly efficient GENELINK absorption cooling machine by K company (for reference)
Inverter-Turbo-cooling machine	Equipped with part load high efficient inverter, it will follow the fluctuation of heat load. Combined with absorption cooling machine as an entire heat source, it will control the operation to minimize total energy Brief specs : Cooling capacity 500~5,400USRT,COP6.5 (for reference)  Highly efficient Inverter-Turbo-cooling machine by M company(for reference)
Cooling water heat storage tank	Introduced for peak-cut of maximum load in day time. Also can be used as water tank for daily use or firefighting in emergency situation to save construction cost. Brief specs : Constructed on-site
Renewable energy facility	Install solar power generation facilities in vacant areas or on rooftop. Can also be used as a dispersed power source for households.
Regional delivering pipe	Trunk pipe of cooling water and vapor are SGP of utility corridor, buried pipes are prefab pipes.

Source: JST

4.9.3 Energy Management System by Communication Infrastructure and Smart Grid

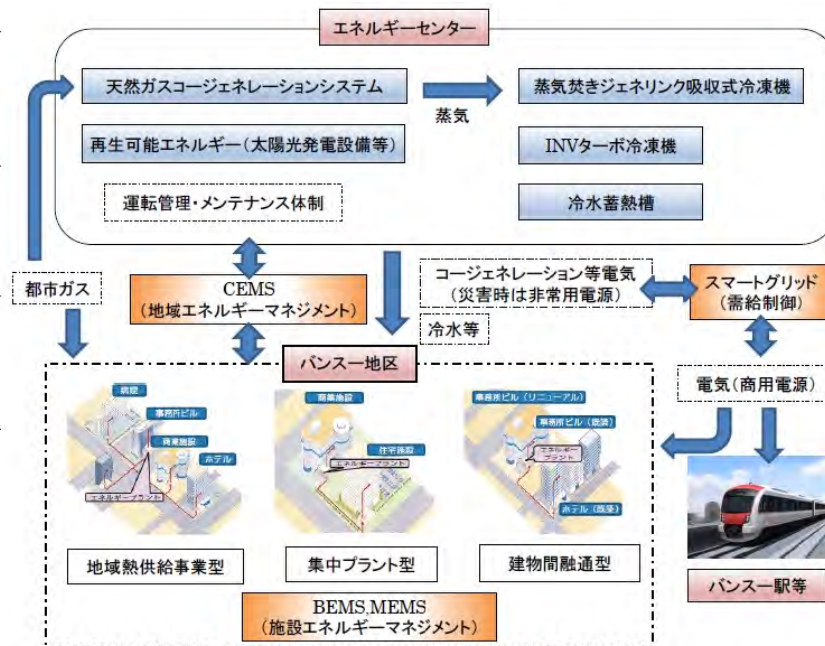
Energy management (CEMS, BEMS, and MEMS) and smart-grid are introduced as part of Smart City technology. By introducing BEMS in buildings, e.g., office, commercial buildings, and condominiums, it would be possible to optimize energy use for each building. Also, CEMS shall help control energy data in facilities, cogeneration of energy center, and supply-demand of district cooling system. Thus, it is possible for energy use optimization at a district level.



Source : METI

Figure4.9.3 Image of Energy Management System

Image of energy infrastructure system is as shown in Figure4.9.4.



Source: METI

Figure4.9.4 Image of Energy Infrastructure System

To select whether thermal or electric energy shall be the main power source, it must be necessary to consider the ratio between thermal and electric energy to be use of facilities which are expected to be constructed in Bang Sue Area. Electricity will be generated by cogeneration as a base and supplement and commercial power supply shall be controlled by grid. In addition, operation of cogeneration and heat sources shall be optimized by CEMS and BEMS by utilizing the data on energy demand in each facility and the whole area.

Development policies to implement the concept are described below:

- ① Commercial power supply in redeveloped area shall be distributed depending on power demand

after smart grid adjusts the supply-demand balance.

- ② Making electricity and cooling water interchangeable based on building scale and electric-heat demand (heat supply project type, concentration plant type, and inter-building type)
- ③ Optimizing energy system by installing CEMS, BEMS, and MEMS to control energy use in the area, in office buildings, commercial buildings, or residential buildings
- ④ In case of power cut due to disaster, electricity shall be generated by cogeneration using town gas
- ⑤ The arrangement of utility common duct accommodating pipes for heat supply, gas, water supply and power supply, must be planned with consideration on density of supply area, road arrangement, and flexibility in case of degradation or urban re-organization
- ⑥ Currently, according to Bangkok Comprehensive Plan 2013, it is regulated to install cogeneration in Bang Sue Area as it is a commercial area. It needs the help of authorities to make necessary procedure to install the cogeneration plant in Bang Sue Area.

4.9.4 Energy Infrastructure (Electricity, Town Gas, Water, Communications etc.)

(1) Electricity

Capacity and arrangement plan of cogeneration shall be decided with consideration on heat supply and balance. Cogeneration power source is connected to commercial power supply system, so that it can be used as an emergency generator during electricity outage. Also, capacity of cogeneration will be decided based on power demand, commercial electricity rate, and gas prices. The remaining electricity can be sold via SPP program.

(2) Town Gas

There is a town gas pipelines near Bang Sue Area. In the future, it should be branched to each building.

(3) Water Supply and Sewerage

This will be developed based on standards of management authorities.

(4) Communications (for Infrastructure Related to Energy)

Introduction of CEMS and smart-grid is considered as a part of Smart City. In Japan, there are some examples in which the systems are installed by manufacturers' initiative. In addition, by introducing BEMS and MEMS in buildings, e.g., office, commercial buildings, condominiums, it would be possible to optimize energy use for each building, and for district level if CEMS is introduced.

(5) Common Duct

Common duct is constructed mainly for installing cooling water and vapor pipeline. Depending on the construction conditions, e.g., location and diameters, cooling water pipes can also be buried. Town gas, water supply, and sewerage pipeline will be installed following the standards of management authorities; however, in order to save cost of tunnel opening and make it easier for maintenance, in some cases, they shall be installed collectively with another infrastructure. Infrastructure of communication will utilize common duct as much as possible.

On 30 June 2016, MEA, in cooperation with TOT Public Company Limited, announced that they

shall implement a project to bring power transmission lines and communication lines underground. According to this announcement, THB 51.7 billion (approx. JPY 150 billion) shall be invested and at the end of 2020, along the major roads in Bangkok Metropolitan Region (Rama-III Road, Rama-IV Road, Ratchada Road, etc.), there would be 127 km of utility corridor to be constructed.

(6) Others

Renewable energy and energy saving is also considered. If there is an available space, installation of solar panels shall be considered on rooftop, solar hot water system or solar panels shall also be considered. Also, to obtain FAR bonus as described by urban planning law, energy saving green building shall be built.

4.9.5 Smart Transportation

In developing the concept of Smart City, smooth traffic management is important. Therefore, it would be important to use ITS to control traffic flows smoothly. ITS items, which is applicable to Bang Sue Area, are listed below. In Thailand, there is an ITS Masterplan 2012-2017, and below items are proposed upon consideration of ITS described in the master plan:.

(1) Provision of Road Traffic Information

For road traffic information, traffic volume could be collected by using probe data or devices installed on gantry. As for probe data, it is collected by the global positioning system (GPS) installed on probe vehicles and processed at data centers. Besides measuring traffic volume, it would also be possible to introduce a system for predicting congestion length by calculating road occupancy.

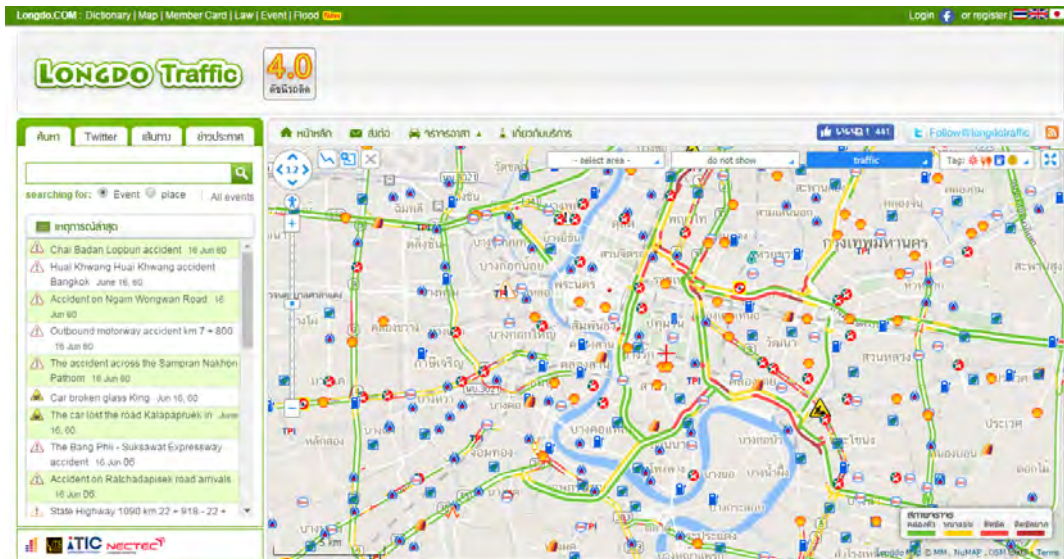
For traffic volume measurement, up to now, Thailand has introduced the following methods:

Firstly, the MOT and Ministry of Communication (MOC) implemented a project that installs GPS on 700 taxis to collect and analyze probe data. As a result, 10,000 taxis in Bangkok were installed with GPS, collected data on congestion are provided via an application named T-Square.

In terms of collecting data using devices on gantry, it may be possible to be installed, as Expressway Authority of Thailand (EXAT) is using closed circuit television (CCTV) to measure traffic volume. Traffic information collected by EXAT is publicized on multiple pages like BKKTraffic.com, BMA Live Traffic, and Longdo Traffic/Traf.

For either of the systems above, it is not expected that the system shall uniquely cover only the traffic information in Bang Sue Area, but it should be an extension of the existing system already covering for Bangkok. The reasons are that for road users, traffic information outside Bang Sue Area is also useful, and it would save cost for installing new system or new traffic control center.

Also, at present, collected traffic data in Bangkok are available on the internet but it would be necessary to provide traffic data to road users in Bang Sue Area on Variable Message Sign (VMS) and information devices in the district. Examples of VMS installation are that EXAT and BMA installed information board in front of the expressway toll gates to provide traffic information to users, such as congestion level (Green: normal, Yellow: low speed, Red: congested), and estimated travel time. In Bang Sue Area, if information board is installed in front of major intersection, road users may change their behaviors and thus, it would contribute to ease traffic jams.



Source: iTIC

Figure4.9.5 Traffic Information Provision through Internet

(2) Public Transportation Priority System (PTPS)

By introducing Public Transportation Priority System, which will prioritize public transportation vehicles like buses, it would reduce the burden on public transportation operation and increase the convenience by warranting the punctuality of the service. The same system has been stated in OTP report and has been proposed to ensure the smooth operation of the BRT. The overview of PPTS is as shown in Figure4.9.6



Source : OTP

Figure4.9.6 Overview of PPTS

(3) Signal Coordination System

This system will set signal timing based on traffic situation and coordinate among signals to control the traffic flow in the city. Particularly, it will modify the length of cycle in peak-hours and off-peak hours, also, it will modify the length of green time of successive signals. At present, in Bangkok, although the length of cycles is pre-set, policemen still should switch the signals manually to respond to the traffic situations. In addition, by installing Emergency Vehicle Preemption System (FAST), it is expected that emergency vehicles would be prioritized to pass quickly to increase the survival rate, crime

clearance rate and prevent traffic accidents at the intersections, in cases of emergency service response.

Normally, traffic signals are managed by police; hence, it is necessary to collaborate with them to implement this concept. In Bangkok, installation, maintenance, and management of CCTV as part of the existing ITS facility, are the responsibilities of BMA and operated by the police.

(4) Parking Information System

Parking information system will utilize data from ITS to provide availability and price of parking lots for drivers. This system is expected to guide drivers to appropriate parking area, eliminate illegal parking, and reduce the traffic of cars searching for parking. Information will be provided via cellphones, road signals, community antenna television (CATV), and car navigation. Image of parking information provided on the vehicle information and communication system (VICS) in Japan is as shown in Figure4.9.7.

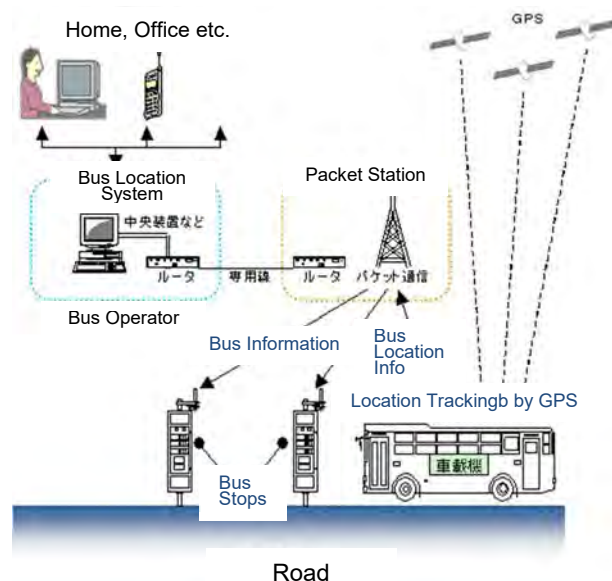


Source : Urban Development Bureau of Tokyo

Figure4.9.7 Image of Parking Information Provided on VICS

(5) Bus Location System

The system will provide information of the bus location on the information boards at bus stops and internet, so that the passengers can know the arrival time and current location of a bus. This system may be suitable for Bang Sue Area for circulating buses and inter-city buses by BMTA. The information can be provided through information boards installed at bus stops or to passengers via internet.



Source: MLIT

Figure4.9.8 Image of Bus Location Systems

(6) System for Information Provision

This system will inform the traffic situation and departure/arrival of taxi. This system will use the same devices with road traffic information provision system shown in Figure4.9.8. However, besides road traffic information, information on taxi booking, weather, flooding information in case of heavy rain, and local shops in Bang Sue Area would also be provided. Firstly, providing taxi booking system via cellphones or devices installed in the neighborhood will increase the convenience for this mode. Along with information provision system, it is expected to provide useful information for road users.

(7) Common Smart-card

Common Smart-card is proposed to be used for renting bicycles and for circulating buses. At present, for both BTS and MRT, IC cards are used but they are not interchangeable. If IC cards for trains are unified and integrated with payment function for shopping or for use in buses in Bang Sue Area, it would be more convenient for users.

(8) Autonomous Driving

In recent years, autonomous driving has been steadily developed, mainly in European countries. In France, according to the roadmap of Autonomous Driving Program, it is expected that autonomous small buses, large buses, and trucks would be on public road from 2020. From this fact, it is also expected that self-driving buses shall be operated in Bang Sue Area in future.

4.9.6 Disaster Prevention

The main disaster in Thailand is flooding occurring during heavy storm. The most recent large-scale flood occurred in 2011, in which, flooding and landslides spreading over the north, northeast, and central regions of Thailand. It is reported that flood is caused by heavy storm during typhoon which increases discharged water volume from dam in the north and causes storm surge.

Flooding measures in Thailand are as follows.

(1) Current Flooding Measures in Bangkok

Flooding measures in Bangkok consist of soft-measures and hard-measures. Descriptions are as shown in Table4.9.4.

Table4.9.4 Flooding Measures in Bangkok Metropolitan Region

Hard measures	Soft measures
- Construct outer dike and water gates at channels to prevent flooding flow from Northeast. - Preserve the area between outer dike and downtown area as spring water area. - Construct channel and pump to discharge storm water to Chao Praya River - Construct embankment and water gates at channels to prevent flooding of Chao Praya River.	- Preserve rice field area outside the outer dike as green belt and ensure its function in flood controlling. - Appoint area in the urban with relatively low elevation to serve as retention area (where it is not allowed to be developed without government's approval) - Develop flooding information system and flooding response center to instruct and control urbanization process and water bodies.

Source: Sustainable Watershed Policy Scenario in Population Surge Region, Correspondent Strategy to Global Scale Cyclical Fluctuation in Monsoon Asia Region, Kengo SUNADA and Other, 2009)

(2) Situation of Bang Sue Area after heavy rain

In Bang Sue Area, rain water is drained quickly although sometimes roads are temporarily flooded after heavy rain for short period. There are drainage pipes and pumping stations around Bang Sue Area. In addition, two (2) trunk drainage pipes named “Klong Prem Pra Chakon” and “Klong Bang Sue” are developed. These drainage facilities work well and it prevent serious flood in Bang Sue Area in these years.

(3) Business Continuity Planning (BCP) for Flooding

Although Japan and Thailand have different geographical conditions, “Guideline for making BCP for flooding measures in office” written by MLIT – Kanto Regional Development Bureau can be a source of reference.

1) Characteristics of Flooding BCP

- ① Flooding is different from earthquake as there is a lead time until disaster strikes.

Different from earthquake disaster which is unexpected, flooding disaster occurs after a certain time from raining. Therefore, if actions are planned appropriately based on flooding BCP, it would be possible to reduce damage drastically.

- ② Flooding is different from earthquake as there are some regions left undamaged.

Flooding will come from burst points on dike and sweep throughout a wide area in the downstream. However, there are some regions may be left totally undamaged. Therefore, it is necessary to understand the flood risk from hazard map or other resources.

- ③ Flooding is different from earthquake as direct damage will last longer.

Earthquake only lasts for few seconds to few minutes, but flooding can last for few days to few weeks. Therefore, it is necessary to consider measures to deal with flooding in a long period.

2) Items for consideration in making flooding BCP

Prevent measure in advance, initial and emergency response are taken into consideration.

a) Prevent measures in advance

Data collection in advance: Flooding hazard maps.

Flooding measures for buildings: facility rooms, e.g. electric and mechanical room, should be in high position, water resistant materials should be applied for outer wall.

Apply for insurance.

b) Initial response

Collect data on real-time water level.

Collect rare information and evacuation information.

c) Emergency response

Instruction structure: establish a department for disaster measures.

Base: settle back-up facilities in undamaged area.

Information transmission: inform partners and stakeholders about the damage and

rehabilitation.

Securement of staff: secure important business continuity and rehabilitation resources.

Supply chain: prepare multiple supplier, supply route and modes.