Republic of Indonesia
Badan Pengelola Transportasi Jabodetabek

Republic of Indonesia

Preparatory Survey on Cikarang New Urban Transportation System Project in Indonesia

Final Report

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Japan International Cooperation Agency

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Abbreviation

Abbreviation	Definition
ADB	Asian Development Bank
AFC	Automatic Fare Collection
AFD	Agence Française de Développement
AGT	Automated Guideway Transit
AIIB	Asian Infrastructure Investment Bank
AMDAL	Environmental Impact Assessment (Analisa Mengenai Dampak Lingkungan)
ANDAL	Environmental Impact Analysis (Analisa Dampak Lingkungan)
AP	Availability Payment
ATC	Automatic Train Control
ATO	Automatic Train Operation
ATP	Automatic Train Protection
ATS	Automatic Train Supervision
B/C Ratio	Benefit and Cost Ratio
BAKORLANTAS	Traffic Coordination Body
BAPEDAL	Badan Pengendalian Dampak Lingkungan
BAPPEDA	Regional Development Planning Agency (Badan Perencanaan Pembangunan Daerah)
BAPPENAS	National Development Planning Agency (Badan Perencanaan Pembangunan Nasional)
BFIE	Bekasi Fajar Industrial Estate
BIFZA (= BP Batam)	Batam Indonesia Free Zone Authority (Badan Pengusahaan Batam)
BIIE	Bekasi International Industrial Estate
BKSP	Development Cooperation Agency
BLU	Public Service Board
BOO	Build, Own, and Operate
BOT	Build, Operate, and Transfer
BP Batam (= BIFZA)	Batam Indonesia Free Zone Authority (Badan Pengusahaan Batam)
BPPT	Agency for the Assessment and Application of Technology
BPS	Badan Pusat Statistik (Statistics Indonesia)
BPTJ	Jabodetabek Transportation Authority
BROT	Build, Rehabilitate, Operate, and Transfer
BRT	Bus Rapid Transit
BSTP	Urban Transportation System Development Directorate, MOT
CAAGR	Compounded Average Annual Growth Rate
CBD	Central Business District
CBTC	Communications-Based Train Control
CCTV	Closed Circuit Television
CMEA	Coordination Ministry of Economic Affairs
CNG	Compressed Natural Gas
CO2	Carbon Dioxide
Deltamas	Deltamas City
DFAT	Department of Foreign Affairs and Trade, Australia
DGLT	Directorate General of Land Transportation
DGR	Directorate General of Railways
DGT	Direction Généraledu Trésor
DISHUB	Dinas Perhubungan (Transportation Agency)
DKI Jakarta	Jakarta Special Capital Region
E&M	Electrical and Mechanical
E/S	Engineering Service
EA	Executive Agency
EBF	Equity Back Finance
EFS	Environmental Feasibility Study
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return

Abbreviation	Definition
EIS	Environment Information System
EJIP	East Jakarta Industrial Park
EMP	Environmental Management Plan
ENPV	Economic Net Present Value
EOI	Expression of Interest
EPC	Engineering Procurement Construction
ESDM	Ministry of Energy and Mineral Resources
FIRR	Financial Internal Rate of Return
FOCC	Financial Opportunity Cost of Capital
FS	Feasibility Study
GCA	Government Contract Agency
GDP	Gross Domestic Product
GIIC	Greenland International Industrial Center
GOI	Government of Indonesia
GOJ	Government of Japan
GPS	Global Positioning System
GRDP	Gross Regional Domestic Product
ICT	Information and Communications Technologies
IDR	Indonesia Rupiah
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IIGF	Indonesia Infrastructure Guarantee Fund
IMF	International Monetary Fund
IR	Registered Engineer
IT	Information Technology
ITDP	Institute for Transportation & Development
ITS	Intelligent Transport Systems
JABODETABEK	Jakarta, Bogor, Depok, Tangerang, and Bekasi
JABODETABEKPUNJUR	Jakarta, Bogor, Depok, Tangerang, and Bekasi, Puncak, Cianjur
JCC	Joint Coordinating Committee
JCM	Joint Crediting Mechanism
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JIE	Jababeka Industrial Estate
JMA	Jakarta Metropolitan Area / JABODETABEK
JOIN	Japan Overseas Infrastructure Investment Corporation for Transport & Urban Development
JPY	Japanese Yen
JUTPI	Jabodetabek Urban Transportation Policy Integration
KA-ANDAL	TOR for ANDAL Study（Kerangka Acuan Analisis Dampak Lingkungan Hidup）
KDN	Kementerian Dalam Negeri (Ministry of Home Affairs)
KPPIP	Committee for Acceleration of Priority Infrastructure Delivery
LCIP	Lippo Cikarang Industrial Park
LEAP	Leading Asia's Private Infrastructure Fund
LRT	Light Rail Transit
M/M	Minutes of Meeting
METI	Ministry of Economy, Trade and Industry, Japan
MHA	Ministry of Home Affairs
MIGA	Multilateral Investment Guarantee Agency
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
MM2100	MM2100 Industrial Town
MOE	Ministry of Environment
MOF	Ministry of Finance

Abbreviation	Definition
MOT	Ministry of Transportation
MP3EI	Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia (The Master Plan for Acceleration and Expansion of Indonesia Economic Development)
MPA	Metropolitan Priority Area for Investment and Industry
MPWH	Ministry of Public Works and Housing (Kementerian Pekerjaan Umum dan Perumahan Rakyat)
MRT	Mass Rapid Transit
NGO	Non Governmental Organization
NPV	Net Present Value
O&M	Operation and Maintenance
OCC	Operations Control Center
OCR	Ordinary Capital Resources
OD	Origin and Destination
ODA	Official Development Assistance
PC	Prestressed Concrete
PIL	Preliminary Environmental Information Report
PJKA	Perusahaan Jawatan Kereta Api
PLN	Perusahaan Listrik Negara
PPHPD	Passengers per hour per direction
PPI	Private Participation in Infrastructure
PPP	Public Private Partnership
PSOP	Private Sector Operations Department, ADB
PT SMI	PT Sarana Multi Infrastruktur
RAPBN	Draft Government Budget
RC	Reinforced Concrete
RDTR	Rencana Detail Tata Ruang
RKL-RPL	Environmental Management and Monitoring Plan (Rencana Pengelolaan Lingkungan Hidup dan Rencana Pemantauan Lingkungan Hidup)
ROT	Rehabilitate, Operate, and Transfer
RPE	Réserve Pays Emergents
RPJMN	Rencana Pembangunan Jangka Panjang Nasional (National Medium Term Development Plan)
RPJPN	Rencana Pembangunan Jangka Panjang Nasional (National Long Term Development Plan)
RTRW	Spatial Plan
RTRWN	National Spatial Plan
SC	Steering Committee
SEA	Strategic Environmental Assessment
SECO	Swiss Secretariat for Economic Affairs
SITRAMP	The Study on Integrated Transportation Master Plan for JABODETABEK
SKKLH	Decree on Environmental Feasibility (Surat Keputusan Kelayakan Lingkungan Hidup)
SNCF	Société Nationale des Chemins de fer Français
SOE	State Own Enterprise
SPC	Special Purpose Company
SPM	Minimum Service Standard
SPPL	Statement on Environmental Management (Surat Pernyataan Pengelolaan Lingkungan)
SPV	Special Purpose Vehicle
STEP	Special Terms for Economic Partnership
TDM	Traffic Demand Management
TOD	Transit Oriented Development
TOR	Terms of Reference
TTC	Travel Time Cost
UKL-UPL	Environmental Management and Environmental Monitoring Measure (Upaya Pengelolaan Lingkungan dan Upaya Pemantauan Lingkungan)

Abbreviation	Definition
UKP4	Presidential Working Unit for Development Control and Monitoring (Unit Kerja Presiden Bidang Pengawasan dan Pengendalian Pembangunan)
UNEP	United Nations Environmental Programme
UPS	Uninterruptible Power Supply
USD	United States Dollar
VAT	Value Added Tax
VFM	Value For Money
VGF	Viability Gap Fund
VOC	Vehicle Operating Cost
WACC	Weighted Average Cost of Capital
WB	World Bank
WG	Working Group

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1 Background

1.1 Socio-economic situations of Indonesia and the target area

1.1.1 Indonesia

(1) Location and Population

Indonesia, an island country located about 5,000km from south west of Japan, has 260 million population living in the 1.89 million km2 land that is 5 times the size of Japan (Figure 1-1 and Table 1-1)

Source: Ministry of Foreign Affairs webpage http://www.mofa.go.jp/mofaj/area/indonesia/index.html

Figure 1-1 Indonesia Map

Table 1-1 Indonesia Basic data

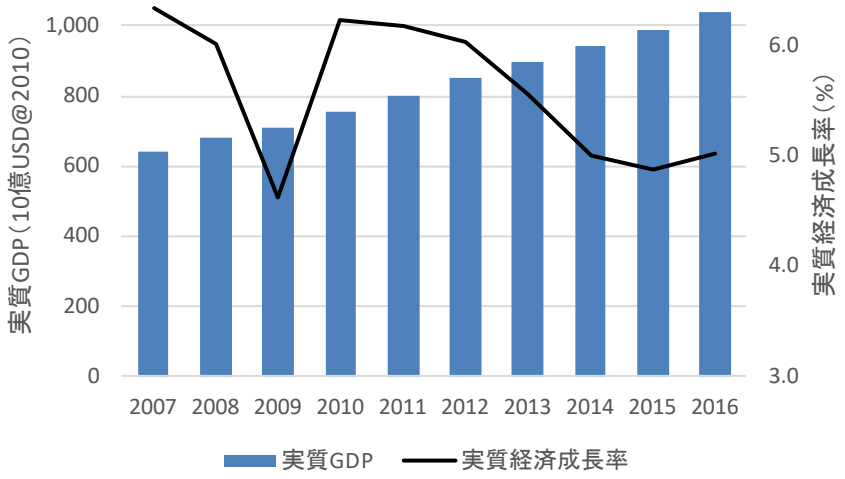
General Situation	Area	● About 1.89-million-kilometer square (approximately 5 times of Japan)
	Population	● About 255 million people (2015, Indonesia Government Statistics)
	Capital	● Jakarta (10.17 million people: 2015, Indonesia Government Statistics)
	Ethnics	● More than half are ethnic Malay (Javanese, Sundanese etc. about 300 ethnics group)
	Language	● Indonesian
	Religion	● Islam 87.21%, Christians 9.87%(protestant 6.96%, catholic 2.91%), Hindu 1.69%, Buddhism 0.72%, Confucianism, Others 0.50% (2013, Ministry of Religious Affairs)
Political Structure & Internal affairs	Regime	● Presidential system, Republic system
	Head of State	● President Joko Widodo (Inaugurate in October 20, 2014, 5 years term)

	Congress	● People's Representative Council (DPR): 560 members (5 years term) ● Regional Representative Council (DPD): 132 members (5 years term) ● (note) In addition, People's Consultative Assembly (MPR) can Constitution amendments, Dismissal of President & Vice president: 692 members (Consists of Parliament members 560 and local representative members 132)
	Cabinet	● The Cabinet is an assistant institution to the President and President has the right to appoint and dismiss the Minister of State Secretariat
Economy	Main industries	● Manufacturing Industry (20.51%): Transportation machine (two wheels etc.), Food and drink etc. ● Agriculture, Forestry and Fisheries industry (13.45%): palm oil, rubber, rice, cocoa, cassava, coffee beans etc. ● Commercial, hotel, food and drink industry (16.11%) ● Construction (10.38%) ● Transportation and communication (8.84%) ● Finance and Insurance (4.20%) ● Administrative Service, military, social security (3.86%) ● (In the brackets are 2016 Nominal GDP composition) (Indonesia Government statistics)

Source: Ministry of Foreign Affairs webpage http://www.mofa.go.jp/mofaj/area/indonesia/data.html

(2) Economy

In last 10 years (2007-2016), Indonesia has very high economic growth rate (real GDP growth rate) of 5.5%. Even during the global financial crisis in 2009, it managed to have continuous strong economic growth such as, maintaining 4.6% growth rate. In 2016, the real GDP is 1,038 billion USD (Based on 2010 in USD). (Figure 1-2)

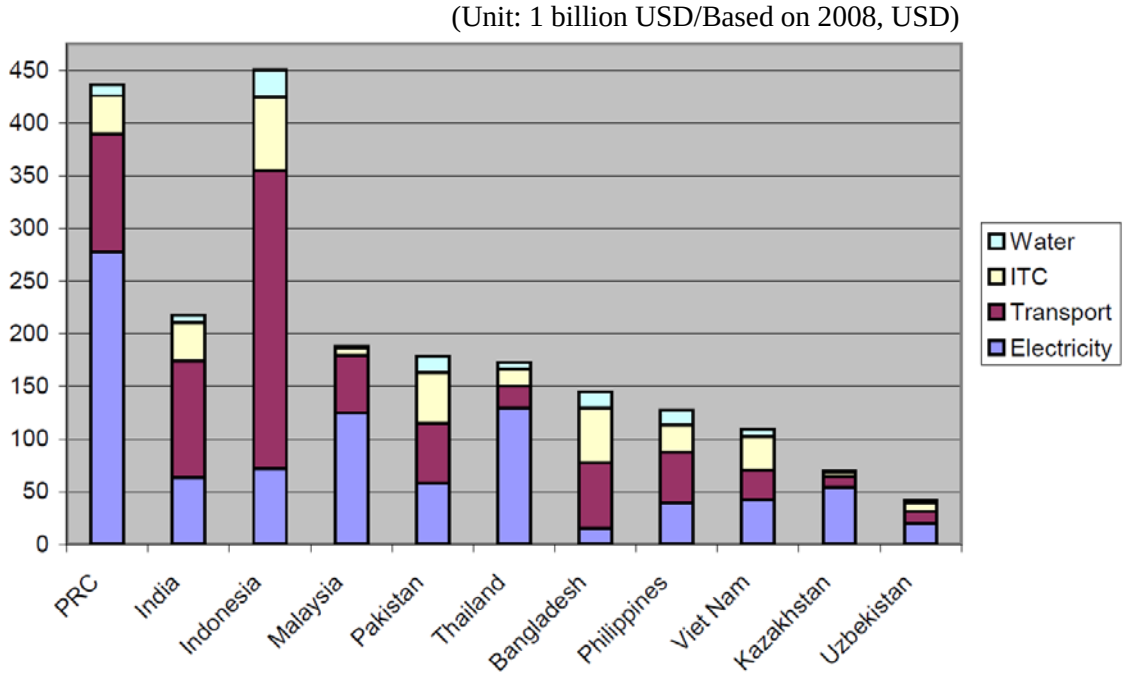


Source: Produced by JICA study team using World Bank's World Development Indicators Data

Figure 1-2 Real GDP and changes of Growth rate

(3) Infrastructure demand

According to the estimation of infrastructure demand in Asia region from 2010 to 2020, even in the top 11 countries, Indonesia infrastructure demand is striking out. In the same period, it is expected that the infrastructure demand equivalent to the 6.18% of Indonesia GDP. The details are, transportation sector 62.8% (3.88% of GDP), energy sector 15.9% (0.98% of GDP), ITC sector 15.7%(0.97% of GDP), health care sector 5.7% (0.35% of GDP), transportation sector is estimated to be 60 percent of total infrastructure demand[1].(Figure 1-3)



Source: ADB Institute (2010). Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water and Sanitation in Asia and the Pacific: 2010-2020.

Figure 1-3 Real GDP and changes of Growth rate, 2010-2020 Infrastructure demand

[1] ADB Institute (2010). Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water and Sanitation in Asia and the Pacific: 2010-2020

(4) Indonesia development policy

The 1997 Asian currency crisis also brought a major blow to Indonesia and a big dip in the infrastructure investment. As a scheme for the infrastructure investment recovery, the government has introduced the policy for encouraging PPP.

Here are the details that become the base of the development policy, 20 years of nation long term development plan (RPJPN 2005-2025) and 5 years midterm nation development plan (RPJMN) and RPJPN target, speeding up and expansion of economic development plan (MP3EI).

RPJPN 2005 - 2025

RPJPN 2005 – 2025 is decided by 2005 – 2025 years development plan and formed by below Eight pillars. (Figure 1-4Figure 1-4)

1. A society with high ethics and culture awareness
2. A developed society with high competitiveness
3. A democratized society as a rule of law: strengthen of civil society and local authority
4. Peaceful and united nation where public order are maintained
5. Society for people: employment secured, poverty reduced, welfare enrichment, society without discrimination
6. Sustainable development and balanced society
7. Science technology Improvement, resources protection, enhanced defense capability as a maritime nation
8. Awareness as a member of international society, international cooperation in nearby region

Source: RPJPN 2005-2025

Figure 1-4 Eight pillars of RPJPN 2005-2025

RPJMN

RPJPN comprises four midterm development plans (RPJMNs). As of end of March 2018, RPJMN 2015-2019 is in progress. (Figure 1-5)

STAGE 1 (RPJMN: 2005-2009)
- Promotion of national development, a safe and peaceful society, building a society that reflects fairness and democratically

STAGE 2 (RPJMN:2010-2014)
- Aim for improvement of the quality of human development, improvement of science and technology, promotion of economic power

STAGE 3 (RPJMN: 2015-2019)
- Aim for a highly competitive national economy based on rich natural resources

STAGE 4 (RPJMN: 2020-2025)
- Utilizing rich human resources and local characteristics, further development and self-sustaining nation

Source: RPJPN 2005-2025

Figure 1-5 Four midterm development plan (RPJMN)

MP3EI

MP3EI has the following three pillars as the vision for 2025 (The Vision for 2015).

1. Increase value added and value chain in industrial production, streamline logistics. Utilization of natural resources and human resources
2. Improvement of production efficiency and further integration of the domestic market for strengthening competitiveness and paving the national economy
3. Strengthening the structure of production and marketing innovation step up to strengthen international competitiveness and acquiring sustainable international competitiveness towards innovation-driven economics.

In the continuous high economy growth Indonesia, it is clear from the socioeconomic indicators such as population and GDP that JABODETABEK will become an important region in Indonesia. On the other hand, public transportation system has not caught up for rapid development, and extreme road traffic congestion has become a norm.

This project proposal aims to give optimal solutions to traffic problems that hinder economic development in the present and future by improving the public transportation system of the new transportation system in line with the commuter development at CIKARANG station. It aims to contribute greatly to promotion of national development plan based on development policy of Indonesia government. (Figure 1-6)

Source: JICA Study Team

Figure 1-6 Indonesia policy & upper-level plans and this project

National Railway Masterplan

Toward 2010, the National Railway Masterplan (Ministry of Railway: MOT) envisages a 12,100 km National Railways Network including a 3,800-km urban railway network:

1. Optimization of existing railway network;
2. Double tracking of Java North line (Jakarta – Cirebon – Semarang – Bojonegoro - Surabaya) and Java South line (Cirebon – Kroya –Jogjakarta – Solo – Madiun – Surabaya) and other main lines;
3. Electrification in the dense lines, including urban area;
4. High speed train network connecting: Merak, Jakarta, Cirebon, Semarang, Surabaya and Banyuwangi;
5. Urban railway network in Jabodetabek, Bandung, Yogyakarta, Semarang, Surabaya and other cities;
6. Seaport railway network: Tanjung Priok, Cirebon, Bojonegaro, Tanjung Mas and Tanjung Perak;
7. Airport railway network: Soekarno-Hatta, Kertajati, Adi Sucipto, Ahmad Yani, Adi Sumarmo and Juanda.

1.1.2 Project area (Bekasi)

(1) Population

JABODETABEK is a metropolitan area composed of Jakarta Special Province (DKI Jakarta) and its surrounding areas Bogor, Depok, Tangerang, Bekasi. The total area is 6,310 km^2 and the population from the 2010 census is 27 million[2]. This area is also called Greater Jakarta or Jakarta Metropolitan Area. (Table 1-2)

The population of JABODETABEK is growing at a rate of about 1.3 times (annual average growth rate of 2.8%) in 10 years and it is estimated that the population had reached 32 million in 2015[3]. The annual average growth rate of the population is about 1.3% in the Jakarta special province, but it is around 4.0% when included neighboring cities surrounding it, that is Bogor, Depok, Tangerang, Bekasi with a population of over 3 times speed increasing of population. (Figure 1-7)

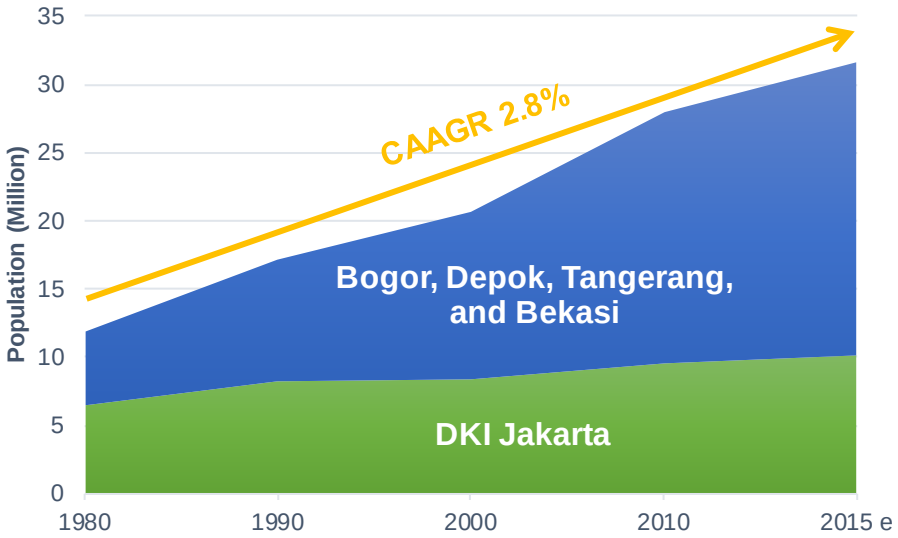
In this subject of this project, the population of Bekasi has reached approximately 2.63 million people which accounted 18.2% (Municipality 8.6%, Regency 9.6%) of the total population of JABODETADEK

Table 1-2 Area & Population in each region in JABODETABEK

Region	Area (km^2)	Population (Year 2010)	Population density (People/km^2)
DKI Jakarta	662.33	10,277,628	15,517.38
Bogor			
Municipality	119	950,334	7,986
Regency	2,711	4,711,932	1,738
Depok			
Municipality	200	1,738,570	8,693
Tangerang			
Municipality	154	1,798,601	11,679
Regency	1,012	2,834,376	2,801
Bekasi			
Municipality	207	2,334,871	11,280
Regency	1,245	2,630,401	2,113
Total	6,310	27,276,713	4,323

Source: Prepared by the JICA Study Team, based on the data of Indonesia Central Bureau of Statistics (Population) and Ministry of Home Affairs (Area).

[2] Estimated population in 2015 (Central Bureau of Statistics, Indonesia)
[3] Central Bureau of Statistics, Indonesia



Source: Prepared by the JICA Study Team based on the data of Indonesia Central Bureau of Statistics

Figure 1-7 JABODETABEK population transition

(2) Economy

JABODETABEK gross region GDP is 211.7 billion USD (2016 preliminary figure), of which about 72% is contributed by Jakarta Special Capital Region. In last 6 years (2011 – 2016), the same Special Capital Region GRDP shown an extremely high average annual growth rate of 12.2%.

On the other hand, even when included surrounding cities (Bogor, Depok, Tangerang and Bekasi), it also has high continuous annual growth rate of 10.2% and whole JABODETABEK has continue to grow at a high rate of 11.6%.

The target area of this project, Bekasi regency, have annual growth rate of 8.3% (Municipality 9.9%, Regency 7.9%) at the same period, and its 2016 GRDP has reached approximately 18,300 million USD.

Table 1-3 GRDP transition in each region of JABODETABEK

(Unit: million USD)

Region	2011	2012	2013	2014	2015(*1	2016(*2
DKI Jakarta	85,695	99,420	112,303	123,362	144,425	152,398
Bogor						
Municipality	1,454	1,628	1,826	2,040	2,266	2,478
Regency	7,313	8,423	9,512	10,590	11,768	12,892
Depok						
Municipality	2,072	2,330	2,804	3,180	3,400	3,876
Tangerang						
Municipality	5,030	5,300	5,855	6,619	7,983	8,727
Regency	4,779	5,249	5,640	6,399	7,110	7,642
Bekasi						
Municipality	3,354	3,619	4,040	4,488	4,955	5,376
Regency	12,534	13,172	14,425	15,931	17,224	18,344
total	122,231	139,141	156,405	172,609	199,131	211,733

*1) Provisional figure *2) Preliminary figure

Source: Prepared by the JICA Study Team based on the data of Indonesia Central Bureau of Statistics

1.2 Infrastructure development status related to railway (including new transportation system) by PPP in Indonesia

1.2.1 Indonesia PPP status

(1) PPP Projects in 1993 - 2017

PPP infrastructure projects planned or proposed between 1993 and 2017 (1st Quarter) in Indonesia totals 307[4]. The energy, ICT, transportation, sewage, and transportation 4 sector is 31 projects (10 percent) of the total projects. (Table 1-4)

Although the transportation sector comprises airport, harbors, railway and roads subsectors, only ports and roads subsectors can be confirmed in this list while railway subsector is not included.

PPP projects in the transportation sector, all of them are roads and harbors, are shown in Table 1-5.

Table 1-4 GRDP transition in each region of JABODETABEK

Primary sector	Subsector	Segment	Concluded	Active	Cancelled	Distressed	Total
Energy	Electricity	Electricity generation		64	3	1	68
	Natural Gas	Natural gas distribution and transmission		5			5
ICT	ICT	Land-based cable, Submarine cable		1			1
		Other		147	33		180
		Submarine cable		2			2
Transport	Ports	Terminal		8			8
	Roads	Bridge and highway		2			2
		Bridge, highway, and tunnel		1			1
		Highway	5	13	2		15
Water and sewerage	Treatment plant	Potable water treatment plant		8			8
	Water Utility	Water utility without sewerage		17			17
Total			5	268	38	1	307

Source: Prepared by the JICA Study Team based on the data from the Private Participation in Infrastructure Database (World Bank. Data retrieved in February 2018)

[4] Private Participation in Infrastructure Database (World Bank) <https://ppi.worldbank.org/>

Table 1-5 PPP infrastructure projects in the Transport sector in Indonesia

Subsector	Financial closure year	Segment	Project name	Total Investment	Subtype of PPI	Contract Period	Percent Private	Unsolicited Proposal	Main Revenue Source	Project status
Roads	1993	Highway	Kebon Jeruk-Tangerang Toll Road	51.5	ROT	18	n/a	Yes	n/a	Concluded
	1994	Highway	Cawang-Tanjung Priok Toll Road	n/a	BROT	29	100	Yes	User fees	Active
	1994	Bridge and highway	Ujung Pandang Tahap I	n/a	BROT	30	n/a	Yes	n/a	Active
	1994	Highway	Harbour Road	n/a	BROT	31	n/a	Yes	n/a	Active
	1994	Highway	Karawaci Toll Road	14.0	ROT	10	n/a	Yes	n/a	Concluded
	1994	Highway	Kali Hurip Toll Road	5.7	ROT	10	n/a	Yes	n/a	Concluded
	1994	Highway	Cibitung Toll Road	7.0	ROT	10	n/a	Yes	n/a	Concluded
	1995	Highway	Sentul Selatan Toll Road	7.7	ROT	9	n/a	Yes	n/a	Concluded
	2004	Highway	Magelang Toll Road	3.7	BOT	28	75	Yes	n/a	Active
	2004	Highway	Waru Juanda Toll Road	155.5	BOT	35	85	Yes	n/a	Active
	2006	Highway	Cikarang-Tanjung Priok Road	372.0	BOT	35	100	Yes	n/a	Active
	2007	Highway	Surabaya-Mojokerto Toll Road	249.0	BOT	29	84	Yes	User fees	Active
	2007	Highway	Kanci-Pejagan Toll Road	228.6	BOT	21	92	Yes	User fees	Active
	2007	Highway	Makassar Seksi IV Toll Road	49.0	BOT	n/a	100	Yes	User fees	Active
	2007	Highway	Jakarta Outer Ring Road Section W1	241.0	BOT	35	100	Yes	User fees	Active
	2007	Bridge, highway, and tunnel	PT Jasa Marga (Persero) Tbk	371.9	Partial	n/a	30	Yes	User fees	Active
	2012	Highway	Gempol Grati Pasuruan Highway	295.0	BOT	45	25	No	User fees	Active
	2012	Highway	Gempol Pandaan Toll Road	130.0	BOO	35	16	No	User fees	Active

Subsector	Financial closure year	Segment	Project name	Total Investment	Subtype of PPI	Contract Period	Percent Private	Unsolicited Proposal	Main Revenue Source	Project status
	2012	Bridge and highway	Bali Nusa Dua Benoa Toll Road	263.5	BOT	50	18	No	User fees	Active
	2012	Highway	Cikampek – Palimanan Toll Road	1,300.0	BOT	35	100	No	User fees	Active
	2016	Highway	Serpong - Balaraja Toll Road	462.0	BOT	n/a	100	No	User fees	Active
Ports	1995	Terminal	Balikpapan Coal Terminal	50.0	BOT	n/a	100	Yes	n/a	Active
	1995	Terminal	Tanjung Priok Koja Container Terminal	111.1	ROT	20	58	Yes	n/a	Active
	1995	Terminal	Pulau Laut	110.0	BOT	n/a	100	Yes	n/a	Active
	1999	Terminal	PT Jakarta International Container	160.0	BROT	20	51	Yes	n/a	Active
	1999	Terminal	PT Jakarta International Container	555.0	BROT	20	51	Yes	n/a	Active
	1999	Terminal	Tanjung Perak Container Terminal	473.0	BROT	20	49	Yes	n/a	Active
	2003	Terminal	Terminal Petikemas Makassar (TPM)	n/a	ROT	10	100	Yes	n/a	Active
	2009	Terminal	Samudera Palaran Terminal	60.0	BOT	50	75	Yes	User fees	Active

Legend BOO: Build, Own, and Operate; BOT: Build, Operate, and Transfer; BROT: Build, Rehabilitate, Operate, and Transfer/ ROT: Rehabilitate, Operate, and Transfer

Source: Produced by JICA Study team in according to the Private Participation in Infrastructure Database (World Bank. Data retrieved in February 2018)

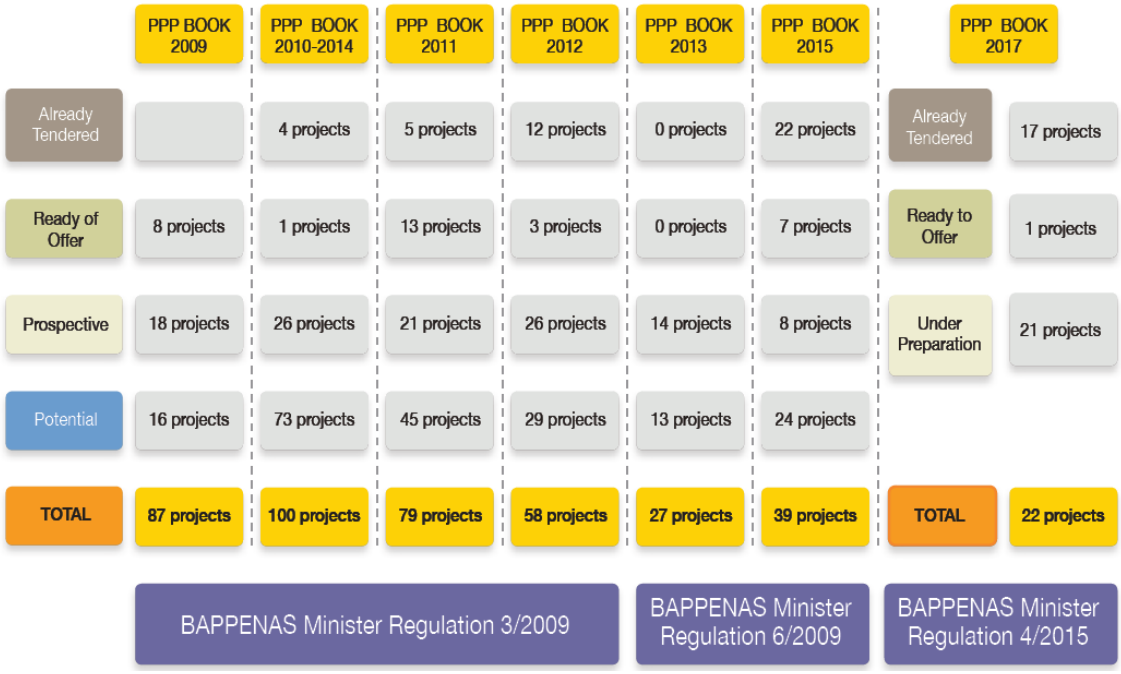
(2) Proposal status of PPP Book registration

1) Projects Status in 2009-2017

The latest version of the "Public Private Partnerships Infrastructure Projects Plan in Indonesia" (PPP Book), PPP Book 2017 by the National Development Planning Agency (BAPPENAS), categorizes domestic PPP projects into three stages of (1) Under Preparation (2) Ready to Offer and (3) Already Tendered[5]. The status of the projects from 2009 to 2017 are as shown in Figure 1-8.

The project status in PPP Book 2017 are (1) 21 projects under preparations, (2) 1 project Ready to Offer and (3) 17 projects already Tendered (excluding 21 projects which are already tendered)

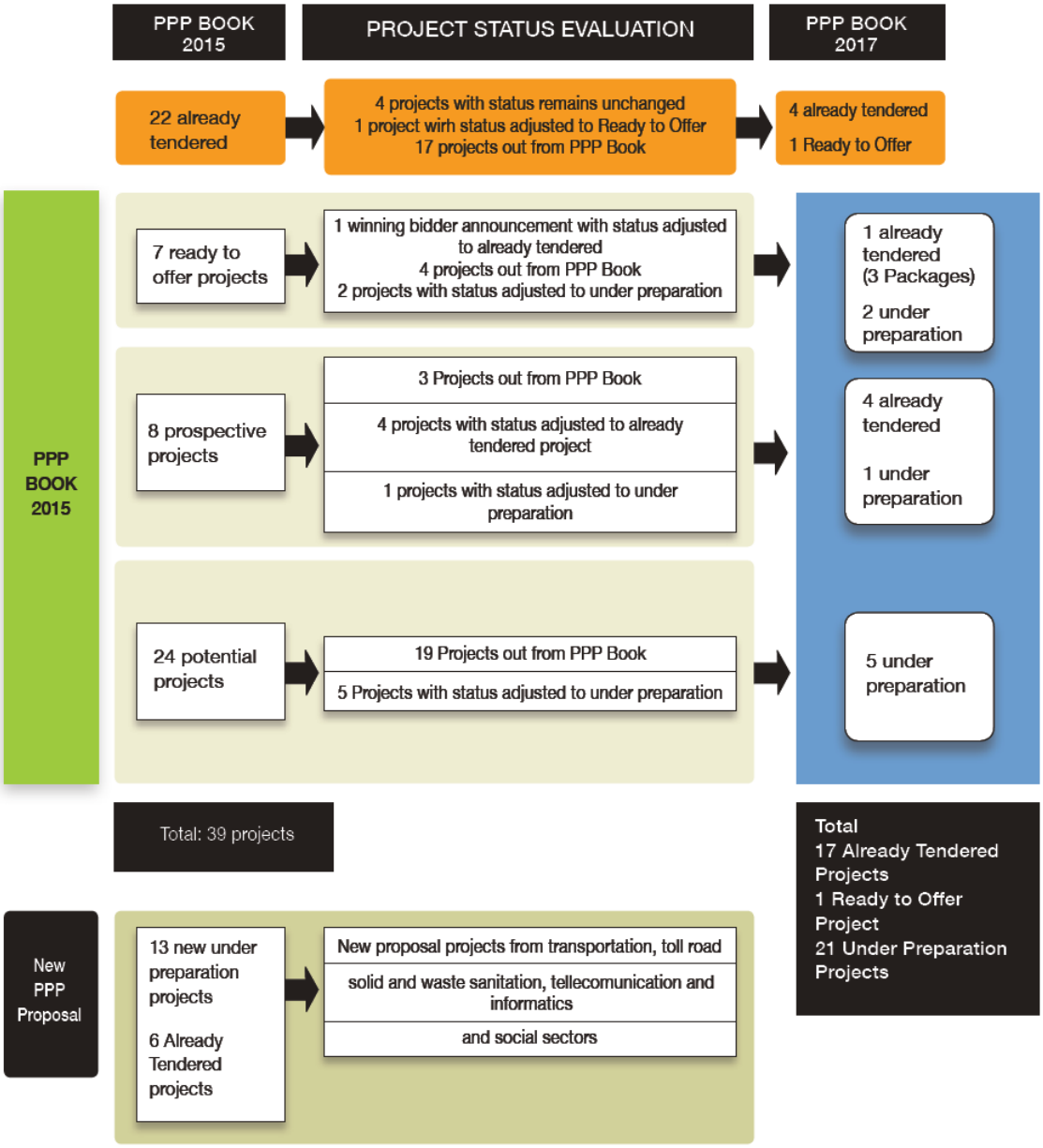
In addition, until PPP Book 2015, the Project Status are changed from 4 categories, which are Potential, Prospective, Ready to Offer and Already Tendered to 3 categories in PPP Book 2017. The changes for before and after are shown in Figure 1-9



Source: PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Figure 1-8 PPP Book summary (2008 – 2017)

[5] Until PPP Book 2016, PPP projects were organized into four stages, that is, (1) Potential, (2) Prospective, (3) Ready to Offer and (4) Already Tendered.



Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Figure 1-9 Categorization in PPP Book 2015 / 2017 versions

2) Status or the projects in the PPP Book 2017

PPP Book 2017 Projects status are show in Table 1-6 (Excluding 21 projects which were already Tendered[6]). (1)21 projects Under Preparation, (2)Railway projects from one of the Ready to Offer projects, which are “Batam Island Railway Project, Riau Island” (6.35 million USD) and “Urban Railway City of Medan, North Sumatera” (4.77 million USD) two cases, both are Under Preparation stage.

[6] There are no railway projects in the “Already Tendered” projects (17 projects).

Table 1-6 Status of Projects listed in the PPP Book 2017

Project Readiness	Sector / Sub-sector	Project Name	Estimated Project Cost (USD million)
Ready to Offer	Solid Waste and Sanitation		81.48
	Water Supply	Bandar Lampung Water Supply	81.48
Under Preparation	Transportation		5,996.97
	Sea Transportation	Development of Kabil Port (Tanjung Sauh Terminal), Batam	729.00
	Sea Transportation	Development of Kuala Tanjung International Hub Port, North Sumatera	3.67
	Sea Transportation	Development of Bitung International Hub Port, Bitung North Sulawesi	532.00
	Sea Transportation	Development of Makassar New Port, South Sulawesi	416.00
	Sea Transportation	Development of Patimban Port, West Java	3,203.00
	Railway	Batam Island Railway Project, Riau Islands	635.00
	Railway	Urban Railway City of Medan, North Sumatera	477.40
	Toll Road and Toll Bridge		1,601.00
	Toll Road	Sukabumi - Ciranjang Toll Road	103.00
	Toll Road	The 2nd Jakarta - Cikampek Toll Road	834.00
	Toll Road	Tanjung Priok Access Toll Road	281.00
	Toll Road	Yogyakarta - Solo Toll Road	113.00
	Toll Road	Yogyakarta - Bawen Toll Road	270.00
	Solid Waste and Sanitation		121.23
	Waste Disposal	Final Waste Disposal Site (TPPAS) Legok Nangka, West Java	43.73
	Water Supply	Pondok Gede Water Supply, Bekasi, West Java	25.00
	Water Supply	Pekanbaru Water Supply, Riau	35.50
	Water Treatment Plan	Sindang Heula Water Treatment Plant	17.00
	Telecommunication and Informatics		318.00
	Satellite	Government Multi Functions Satellite	318.00
	Social		276.10
	Correctional Institution	Nusakambangan Correctional Institution	51.50
	Sport	Sport Facility Papua	38.90
	Teaching Hospital	Sam Ratulangi Teaching Hospital, North Sulawesi	28.70
	Street Lighting	Bandung Street Lighting, West Java	157.00
TOTAL			8,393.88

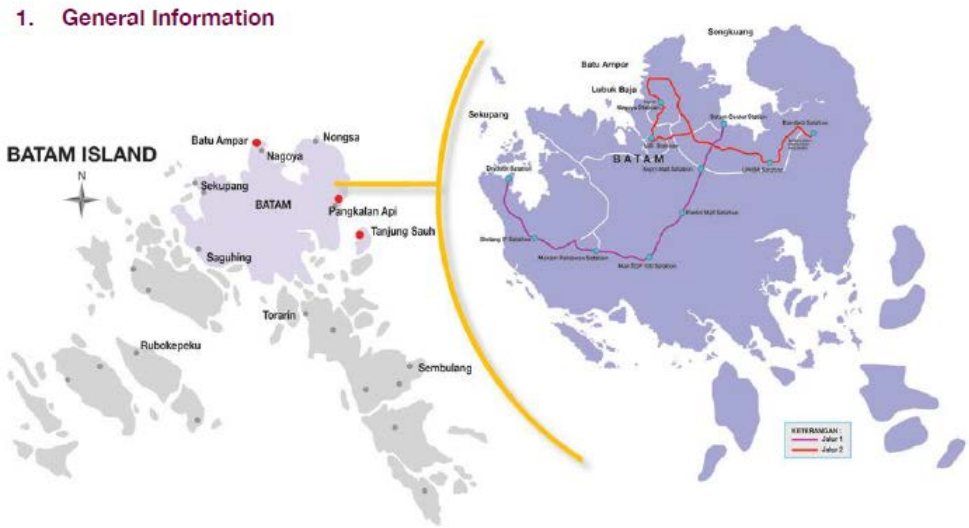
Source: PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

(3) Project status of PPP Railway projects

Here is the summary on two railway projects registered as “Under Preparation,” in the PPP Book 2017namely “Batam Island Railway Project, Riau Island” and “Urban Railway City of Medan, North Sumatera”

These projects are in the preparatory stage and have not been commercialized as a railway project utilizing the PPP scheme, but the “Batam Island Railway Project, Riau Island” aims to start construction in 2018 and “Urban Railway City of Medan, North Sumatera” aims to start construction in 2019, respectively.

Batam Island Railway Project, Riau Islands



Source: PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Figure 1-10 Project Map

Table 1-7 General Information

Government Contracting Agency	Batam Indonesia Free Zone Authority (BIFZA)
Implementing Unit	Batam Indonesia Free Zone Authority (BIFZA)
Preparation Agency	Batam Indonesia Free Zone Authority (BIFZA)
Estimated Project Cost	USD 635.00 million
Estimated Concession Period	49 years
Location	Batam, Riau Islands

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Table 1-8 Specification

Line I: Batam Centre – Tanjung Uncang		
	LRT Train	4 unit
	LRT Line	27.54 km
	LRT Station	19 stations
Line II: Batu Ampar – Batam Hang Nadim International Airport		
	LRT Train	4 unit
	LRT Line	27.93 km
	LRT Station	25 stations

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Table 1-9 Finance Requirements

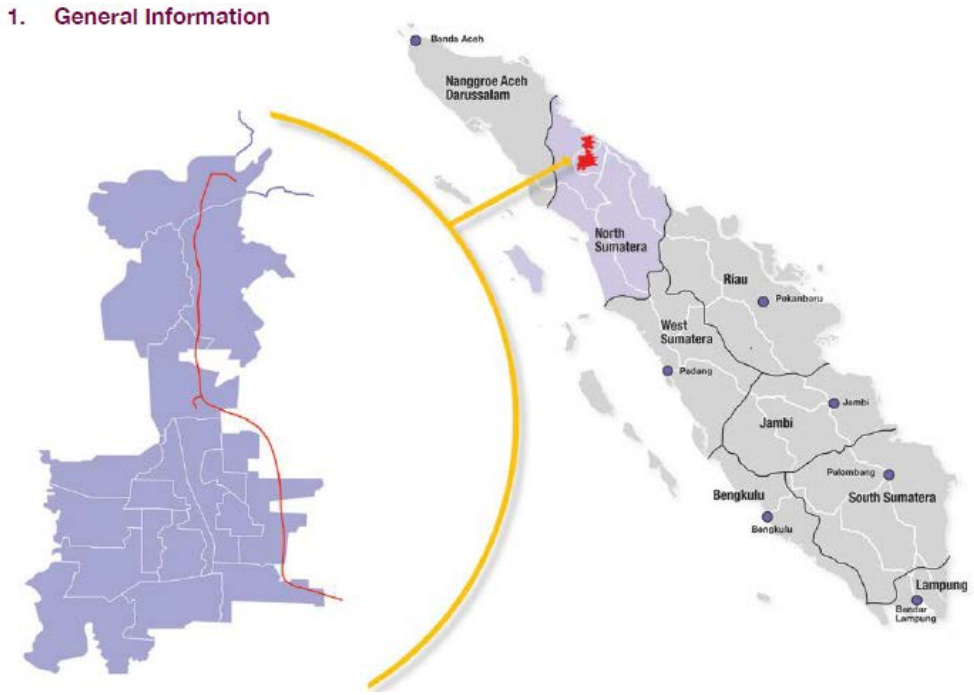
Estimated project cost	USD 635.00 million
O&M	USD 2,176.00 million
FIRR	14.17%

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Figure 1-11 Schedule

Urban Railway City of Medan, North Sumatera



Source: PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Figure 1-12 Project map

Table 1-10 General information

Government Contracting Agency	Mayor of Medan
Implementing Unit	Local Development Planning Agency, City of Medan
Preparation Agency	1. Local Development Planning Agency, City of Medan 2. Ministry of National Development Planning
Estimated Project Cost	USD 477.40 million
Estimated Concession Period	35 years
Location	Medan, North Sumatera

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Figure 1-13 Route Map

Table 1-11 Specification

Width		1067 mm
Maximum design speed		80 km/h
Horizontal Radius		60 m
Minimum curve		15 m
Maximum elevation	lane	110 mm
	platform	70 mm
Minimum vertical radius		1000 m
Maximum slope	lane	40 ‰
	station	1.5 ‰
	depo	60 ‰
Wesel Angle		#10
Track type		Direct Fixation Track

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Table 1-12 Financial Requirements

No		LRT	BRT	LRT+BRT
1	Interest rate	12.0% p.a	12.0% p.a	12.0% p.a
2	Financial fees	1.1%	1.1%	1.1%
3	Loan Term	20 years	20 years	20 years
4	Grace Period (2)	5 years	3 years	5 years
5	Length	22.74 km	13.40 km	36.10 km
6	Investment/km	USD 15.58 million	USD 2.00 million	USD 17.60 million
7	Total investment	USD 354.30 million	USD 27.67 million	USD 381.00 million
8	IDC	USD 88.00 million	USD 4.60 million	USD 92.60 million
9	Finc Fee	USD 3.50 million	USD 0.30 million	USD 3.80 million
10	Total investment + IDC	USD 445.80 million	USD 31.57 million	USD 477.40 million
11	FIRR			12.5%

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Source：PPP Infrastructure Projects Plan in Indonesia (2017. BAPPENAS)

Figure 1-14 Project schedule

(4) Local news coverage on railway projects by PPP

Regarding the status of “Batam Island Railway Project, Riau Islands” project and “Urban Railway City of Medan” project that introduced in previous section, local news reports are as follows.

For the moment, although there have not a railway project that utilized PPP scheme, “Batam Island Railway Project, Riau Islands” and “Urban Railway City of Medan, North Sumatera” these two projects have been recorded in PPP Book 2017. The former aims to start construction in 2018 and the later in 2019.

The former case has a foreign company that shown interest and from here, we can see part of the interest that the foreign have in Indonesia transportation infrastructure development.

Aside from this, although it cannot be said to be PPP in particularly, there are railway project that are PPP-like scheme, and the momentum of transportation utilizing private funds in Indonesia is rising

Batam Island Railway, Riau Islands projects

As reported in Antara News coverage[7] on May 5, 2017, the Batam Free Zone Supervisory Agency (BP Batam) reports that it will continue the LRT development plan at Batam Island. The plan is awaiting approval from the Batam City Government for the road or track that will pass by the train.

According the agency’s Deputy Secretary Purba Robet, although the improvement of the LRT in the area is not an urgent issue, it is essential for avoiding future traffic congestion and maintain the smoothness of the local community and industrial activities. Therefore, the plan has been proceeding from initial study of

[7] https://www.antaranews.com/berita/627664/bp-batam-tetap-teruskan-rencana-pembangunan-lrt

the plan to the next stage. The population of the island has already reached 1.3million and the agency is seeking investment to realize the plan as soon as possible.

Also, according to CNN Indonesia coverage[8] on March 7, 2018, BP Batam plans to invest 12.9 trillion IDR, but because of the construction is still further ahead, the financing prospect is not confirmed (the agency, Secretary Lukita Dinarsyah Tuwa).

Also, if the burden on the private sector in PPP is large, it may take another 4 to 5 years to raise funds (Secretary)

Urban Railway City of Medan, North Sumatera Projects

According to Waspada coverage[9] on April 19, 2017, SMRT International Pte Ltd(Singapore) has expressed a keen interest in this LRT development plan. The plan to develop LRT at Kota Medan, Binjai and Deli Serdang have been revealed during the meeting with the North Sumatra Provincial Government officials and the state governor welcome this.

As reported by REPUBLIKA news on June 7, 2017, this project is aiming for construction to started in 2019. Budi Karya Sumadi, Minister of Transportation said since the PPP scheme is less burdensome to the national government and local government budget, it is the most suitable way to construct LRT.

As stated in Bisnis.com coverage[10] on July 10, 2017, Medan Mayor Dzulmi Eldin, about one month ago, Medan city government and Indonesia Infrastructure financing company (PT SMI) are signing the contract on PPP infrastructure project's preparation facility and transaction. According to the KOMPAS coverage[11] on January 18, 2018 after the contract signing, this project has reached project feasibility study, Environment Impact Assessment, Traffic survey, license, local regulation clearance preparation stage.

[8] https://www.cnnindonesia.com/ekonomi/20180306220652-92-280983/batam-bakal-bangun-lrt-senilai-rp13-triliun
[9] http://waspada.co.id/warta/investor-singapura-berminat-bangun-kereta-api-ringan-di-medan/
[10] http://sumatra.bisnis.com/read/20170710/2/67221/kereta-api-ringan-medan-pemkot-tunggu-rencana-proyek-dari-smi
[11] https://kompas.id/baca/nusantara/2018/01/18/lrt-dibangun-di-medan/

1.2.2 Situation of Railway Network Development

(1) Situation of Commuter Railway

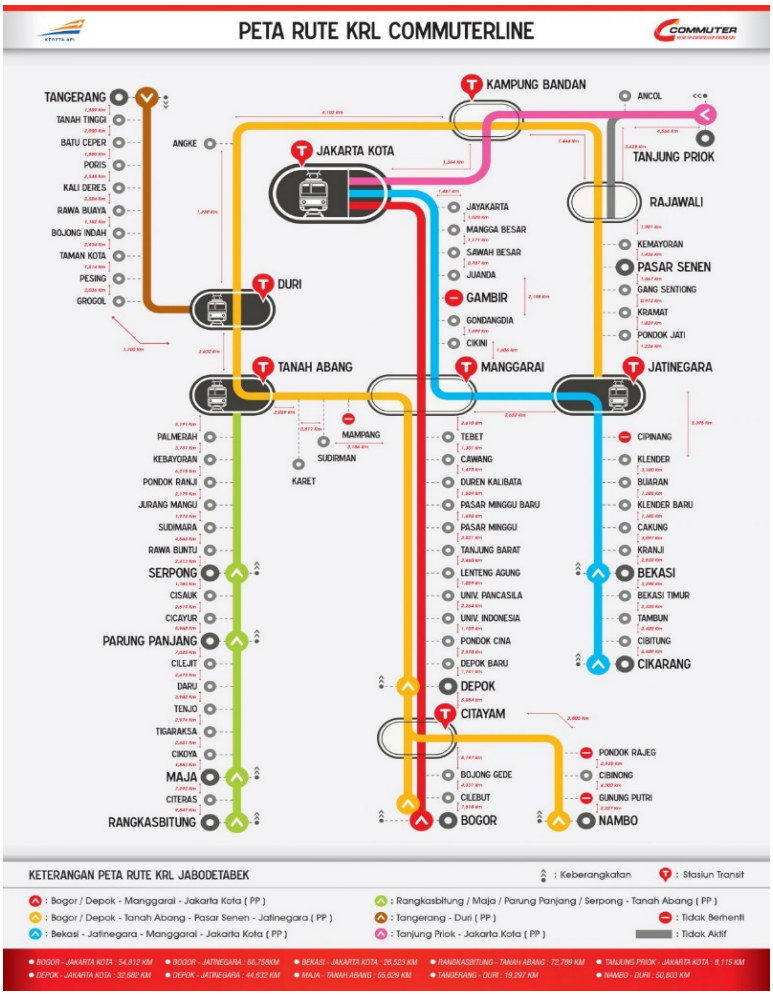
Railway property is owned by MOF. Railway infrastructure is owned by DGR of MOT and they are in charge of maintenance of those infrastructures. Operation is done by JABODETABEK Commuter Railway (PT.KAI COMMUTER JABODETABEK). This Company was originally a part of PTKA and become independent. The name of the company was changed to PT. Kereta Commuter Indonesia in September 2017.

Railway network of JABODETABEK reaches around 160 km and transport around 300 thousand people per day*. Most of this network in JABODETABEK is electrified. The network consists of 6 lines.

Section between Bekasi station and Cikarang station, which is connecting to the project area, is electrified and become double-double track in October 2017. Cikarang station is reconstructed as elevated station as well.

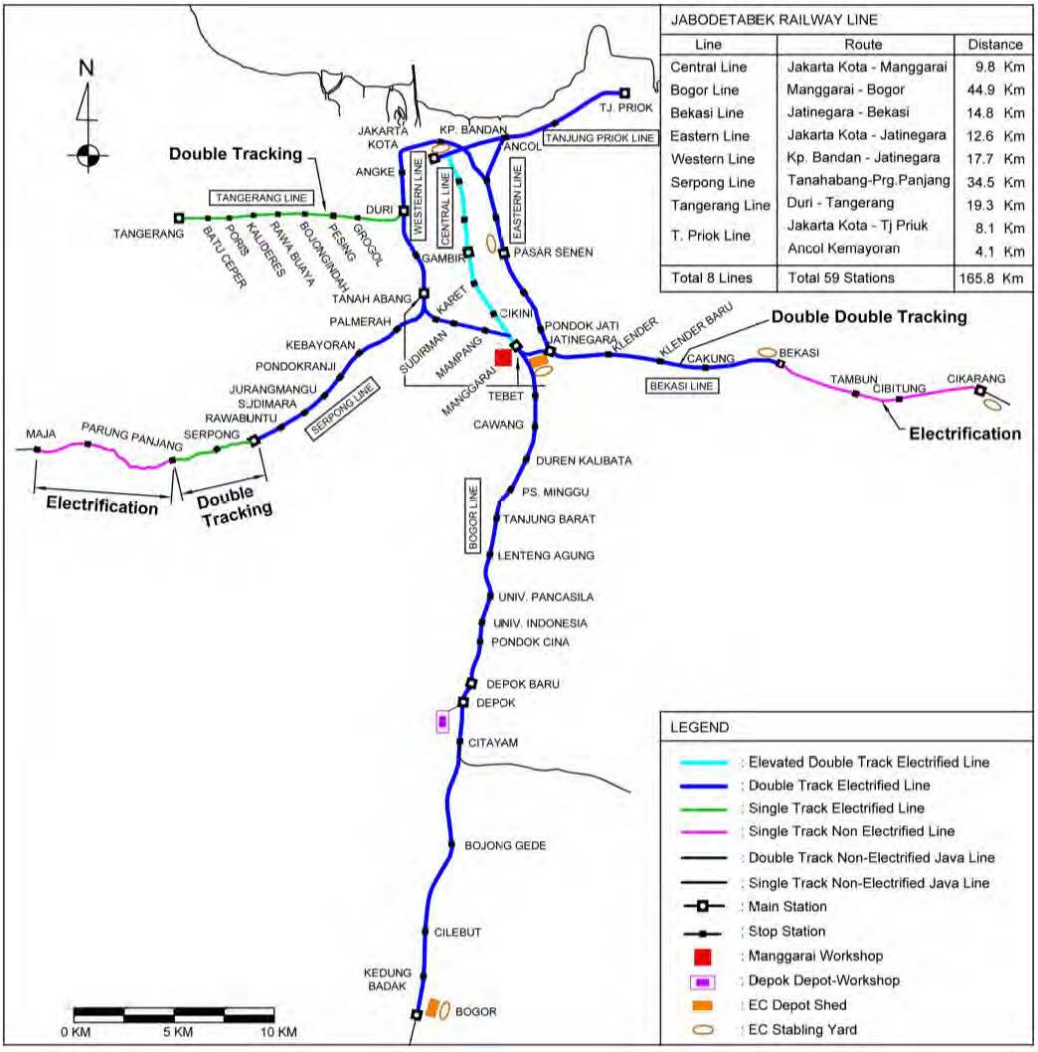
Operation scheme of 6 lines in JABODETABEK is shown in diagram below. Map of the network is shown in next page.

*Source: JICA Report 2009



Source: http://www.krl.co.id/peta-rute-loopline/

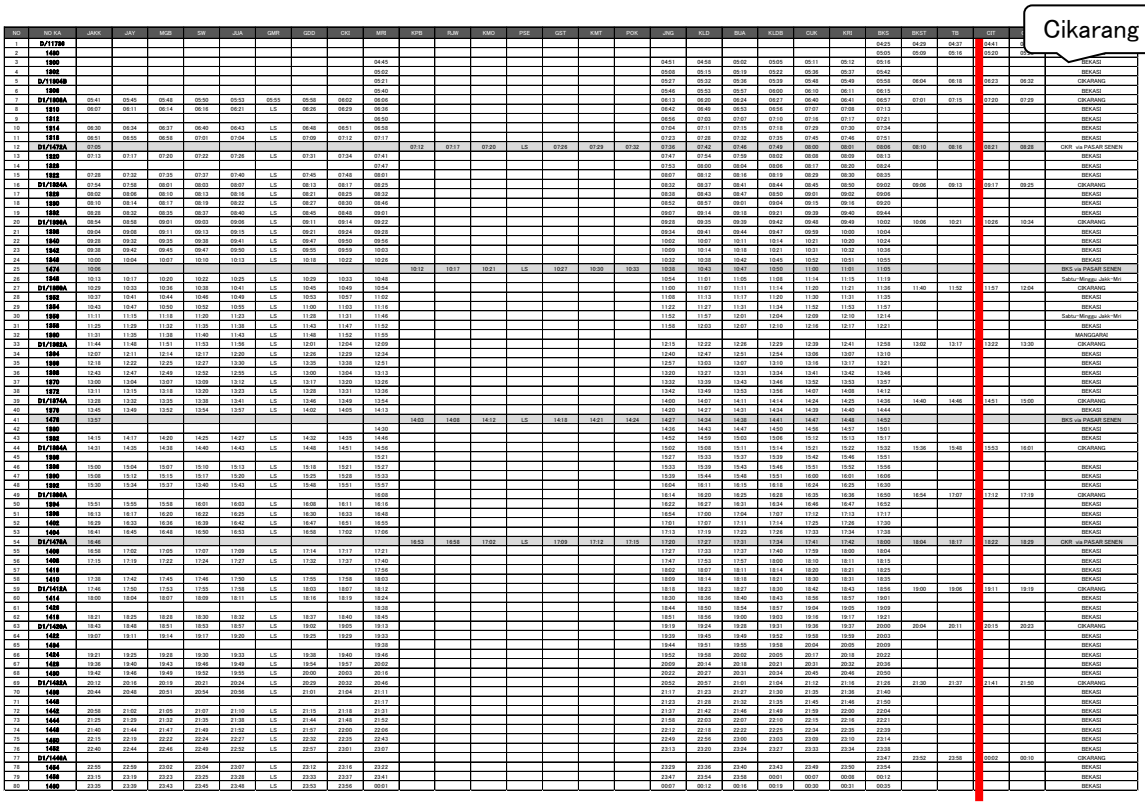
Figure 1-15 JABODETABEK Commuter Railway Network (Diagram)



Source: JUTPI

Figure 1-16 JABODETABEK Commuter Railway Network Map

76 commuter train services per day are operated Between Manggarai station in Jakarta center and Bekasi station. Number of services from Bekasi station to eastward is dramatically reduced into 1/4 and Commuter train services for Cikarang station is only 17 per day.



NO	NO.KA	JAKK	JAY	MGB	SW	JUA	GMR	GDD	CKO	MRI	KPB	RJW	KMO	PSE	GST	KMT	POK	JNG	KLD	BUA	KLDB	CUK	KRI	BKS	BKST	TB	CIT		
1	D/1179B																							04:25	04:29	04:37	04:41	04:45	
2	1400																							05:05	05:09	05:16	05:20	05:24	
3	1900									04:45								04:51	04:58	05:02	05:05	05:11	05:12	05:16					BEKASI
4	1902									05:02								05:08	05:15	05:19	05:22	05:26	05:27	05:42					BEKASI
5	D/1180AB									05:21								05:27	05:32	05:36	05:39	05:46	05:46	05:58	06:04	06:18	06:23	06:32	CIKARANG
6	1906									05:40								05:46	05:53	05:57	06:00	06:10	06:11	06:15					BEKASI
7	D/1908A	05:41	05:45	05:48	05:50	05:53	05:55	05:58	06:02	06:06								06:13	06:20	06:24	06:27	06:40	06:41	06:57	07:01	07:15	07:20	07:29	CIKARANG
8	1910	06:07	06:11	06:14	06:16	06:21	LS	06:26	06:29	06:36								06:42	06:49	06:53	06:56	07:07	07:08	07:13					BEKASI
9	1818									06:50								06:56	07:03	07:07	07:10	07:16	07:17	07:21					BEKASI
10	1914	06:30	06:34	06:37	06:40	06:43	LS	06:48	06:51	06:58								07:04	07:11	07:15	07:18	07:29	07:30	07:34					BEKASI
11	1818	06:51	06:55	06:58	07:01	07:04	LS	07:09	07:12	07:17								07:23	07:28	07:32	07:35	07:45	07:46	07:51					BEKASI
12	D/1479A	07:05									07:12	07:17	07:20	LS	07:26	07:29	07:32	07:36	07:42	07:46	07:49	08:00	08:01	08:06	08:10	08:16	08:21	08:26	CKR via PASAR SENEN
13	1920	07:13	07:17	07:20	07:22	07:26	LS	07:31	07:34	07:41								07:47	07:54	07:59	08:02	08:08	08:09	08:13					BEKASI
14	1820									07:47								07:53	08:00	08:04	08:06	08:17	08:20	08:24					BEKASI
15	1922	07:28	07:32	07:35	07:37	07:40	LS	07:45	07:48	08:01								08:07	08:12	08:16	08:19	08:29	08:30	08:35					BEKASI
16	D/1924A	07:54	07:58	08:01	08:03	08:07	LS	08:13	08:17	08:23								08:32	08:37	08:41	08:44	08:45	08:50	09:02	09:06	09:13	09:17	09:25	CIKARANG
17	1926	08:02	08:06	08:10	08:13	08:16	LS	08:21	08:25	08:32								08:38	08:43	08:47	08:50	09:01	09:02	09:06					BEKASI
18	1930	08:10	08:14	08:17	08:19	08:22	LS	08:27	08:30	08:46								08:52	08:57	09:01	09:04	09:15	09:16	09:20					BEKASI
19	1932	08:25	08:32	08:35	08:37	08:40	LS	08:45	08:48	09:01								09:07	09:14	09:18	09:21	09:39	09:40	09:44					BEKASI
20	D/1936A	08:54	08:58	09:01	09:03	09:06	LS	09:11	09:14	09:22								09:28	09:35	09:39	09:42	09:48	09:49	10:02	10:06	10:21	10:26	10:34	CIKARANG
21	1936	09:04	09:08	09:11	09:13	09:15	LS	09:21	09:24	09:28								09:34	09:41	09:44	09:47	09:59	10:00	10:04					BEKASI
22	1940	09:20	09:32	09:35	09:38	09:41	LS	09:47	09:50	09:56								10:02	10:07	10:11	10:14	10:21	10:20	10:24					BEKASI
23	1942	09:36	09:42	09:45	09:47	09:50	LS	09:55	09:59	10:03								10:09	10:14	10:18	10:21	10:31	10:32	10:36					BEKASI
24	1948	10:00	10:04	10:07	10:10	10:13	LS	10:18	10:22	10:26								10:32	10:38	10:42	10:45	10:52	10:51	10:55					BEKS via PASAR SENEN
25	1474	10:06									10:12	10:17	10:21	LS	10:27	10:30	10:33	10:38	10:43	10:47	10:50	11:00	11:01	11:05					
26	1948	10:13	10:17	10:20	10:22	10:25	LS	10:29	10:33	10:48								10:54	11:01	11:05	11:08	11:14	11:15	11:19					Sabtu/Minggu Jaks-Mri
27	D/1950A	10:29	10:33	10:36	10:38	10:41	LS	10:45	10:49	10:54								11:00	11:07	11:11	11:14	11:20	11:21	11:36	11:46	11:52	11:57	12:04	CIKARANG
28	1952	10:37	10:41	10:44	10:46	10:49	LS	10:53	10:57	11:02								11:08	11:13	11:17	11:20	11:30	11:31	11:35					BEKASI
29	1954	10:40	10:47	10:50	10:52	10:55	LS	11:00	11:03	11:16								11:22	11:27	11:31	11:34	11:52	11:52	11:57					BEKASI
30	1958	11:11	11:15	11:18	11:20	11:23	LS	11:28	11:31	11:46								11:52	11:57	12:01	12:04	12:09	12:10	12:14					Sabtu/Minggu Jaks-Mri
31	1958	11:25	11:29	11:32	11:35	11:38	LS	11:43	11:47	11:52								11:58	12:03	12:07	12:10	12:16	12:17	12:21					BEKASI
32	1958	11:31	11:35	11:38	11:40	11:43	LS	11:48	11:52	11:55																			MANGGARAI
33	D/1982A	11:44	11:48	11:51	11:53	11:56	LS	12:01	12:04	12:09								12:15	12:22	12:26	12:29	12:39	12:41	12:58	13:02	13:17	13:22	13:30	CIKARANG
34	1984	12:07	12:11	12:14	12:17	12:20	LS	12:26	12:29	12:34								12:40	12:47	12:51	12:54	13:06	13:07	13:10					BEKASI
35	1986	12:18	12:22	12:25	12:27	13:30	LS	13:35	13:38	12:51								12:57	13:03	13:07	13:10	13:16	13:17	13:21					BEKASI
36	1988	12:43	12:47	12:49	12:52	12:55	LS	13:00	13:04	13:13								13:20	13:27	13:31	13:34	13:41	13:42	13:46					BEKASI
37	1970	13:00	13:04	13:07	13:09	13:12	LS	13:17	13:20	13:26								13:22	13:29	13:43	13:46	13:52	13:53	13:57					BEKASI
38	1972	13:11	13:15	13:18	13:20	13:23	LS	13:28	13:31	13:36								13:42	13:49	13:53	13:56	14:07	14:08	14:12					BEKASI
39	D/1974A	13:28	13:32	13:35	13:38	13:41	LS	13:46	13:49	13:54								14:00	14:07	14:11	14:14	14:24	14:25	14:36	14:40	14:46	14:51	15:00	CIKARANG
40	1978	13:45	13:49	13:52	13:54	13:57	LS	14:02	14:05	14:13								14:20	14:27	14:31	14:34	14:39	14:40	14:44					BEKASI
41	1476	13:57									14:03	14:08	14:12	LS	14:18	14:21	14:24	14:27	14:34	14:38	14:41	14:47	14:48	14:52					BKS via PASAR SENEN
42	1980									14:30								14:36	14:43	14:47	14:50	14:56	14:57	15:01					BEKASI
43	1982	14:15	14:17	14:20	14:25	14:27	LS	14:32	14:35	14:46								14:52	14:59	15:03	15:06	15:12	15:13	15:17					BEKASI
44	D/1984A	14:31	14:35	14:38	14:40	14:43	LS	14:48	14:51	14:56								15:02	15:09	15:11	15:14	15:21	15:22	15:32	15:36	15:48	15:53	16:01	CIKARANG
45	1998									15:21								15:27	15:33	15:37	15:39	15:42	15:46	15:51					
46	1998	15:00	15:04	15:07	15:10	15:13	LS	15:18	15:21	15:27								15:33	15:39	15:43	15:46	15:51	15:52	15:56					BEKASI
47	1990	15:06	15:12	15:15	15:17	15:20	LS	15:25	15:28	15:33								15:39	15:44	15:48	15:51	16:00	16:01	16:06					BEKASI
48	1992	15:30	15:34	15:37	15:40	15:43	LS	15:48	15:51	15:57								16:04	16:11	16:15	16:18	16:24	16:25	16:30					BEKASI
49	D/1998A									16:08								16:14	16:20	16:25	16:28	16:35	16:36	16:50	16:54	17:07	17:12	17:19	CIKARANG
50	1994	15:51	15:55	15:58	16:01	16:03	LS	16:08	16:11	16:16								16:22	16:27	16:31	16:34	16:46	16:47	16:52					BEKASI
51	1996	16:13	16:17	16:20	16:22	16:25	LS	16:30	16:33	16:48								16:54	17:00	17:04	17:07	17:12	17:13	17:17					BEKASI
52	1498	16:29	16:33	16:36	16:39	16:42	LS	16:47	16:51	16:55								17:01	17:07	17:11	17:14	17:25	17:26	17:30					BEKASI
53	1484	16:41	16:45	16:48	16:50	16:53	LS	16:58	17:02	17:06								17:13	17:19	17:23	17:26	17:33	17:34	17:38					BEKASI
54	D/1478A	16:46									16:53	16:58	17:02	LS	17:09	17:12	17:15	17:20	17:27	17:31	17:34	17:41	17:42	18:00	18:04	18:17	18:22	18:29	CKR via PASAR SENEN
55	1498	16:58	17:02	17:05	17:07	17:09	LS	17:14	17:17	17:21								17:27	17:33	17:37	17:40	17:59	18:00	18:04					BEKASI
56	1498	17:15	17:19	17:22	17:24	17:27	LS	17:32	17:37	17:40								17:47	17:53	17:57	18:00	18:10	18:11	18:15					BEKASI
57	1418									17:56								18:02	18:07	18:11	18:14	18:20	18:21	18:25					BEKASI
58	1419	17:38	17:42	17:45	17:46	17:50	LS	17:55	17:58	18:03								18:09	18:14	18:18	18:21	18:30	18:31	18:35					BEKASI
59	D/1418A	17:46	17:50	17:53	17:55	17:58	LS	18:03	18:07	18:12								18:18	18:23	18:27	18:30	18:42	18:43	18:56	19:00	19:06	19:11	19:19	CIKARANG
60	1414	18:05	18:04	18:07	18:09	18:11	LS	18:16	18:19	18:24								18:30	18:36	18:40	18:43	18:56	18:57	19:01					BEKASI
61	1428									18:38								18:44	18:50	18:54	18:57	19:04	19:05	19:09					BEKASI
62	1418	18:21	18:25	18:28	18:30	18:32	LS	18:37	18:40	18:45								18:51	18:56	19:00	19:03	19:16	19:17	19:21					BEKASI
63	D/1428A	18:43	18:48	18:51	18:53	18:57	LS	19:02	19:05	19:13								19:19	19:24	19:28	19:31	19:36	19:37	20:00	20:04	20:11	20:15	20:23	CIKARANG
64	1428	19:07	19:11	19:14	19:17	19:20	LS	19:25	19:29	19:33								19:39	19:45	19:49	19:52	19:58	19:59	20:03					BEKASI
65	1494									19:38								19:44	19:51	19:55	19:58	20:04	20:05	20:09					BEKASI
66	1494	19:21	19:25	19:28	19:30	19:33	LS	19:38	19:40	19:46								19:52	19:58	20:02	20:05	20:17	20:18	20:22					BEKASI
67	1428	19:36	19:40	19:43	19:46	19:49	LS	19:54	19:57	20:02								20:09	20:14	20:18	20:21	20:31	20:32	20:36					BEKASI
68	1498	19:42	19:46	19:49	19:52	19:55	LS	20:00	20:03	20:16								20:22	20:27	20:31	20:34	20:45	20:46	20:50					BEKASI
69	D/1498A	20:12	20:16	20:19	20:21	20:24	LS	20:29	20:32	20:46								20:52	20:57	21:01	21:04	21:12	21:16	21:26	21:30	21:37	21:41	21:50	CIKARANG
70	1498	20:44	20:48	20:51	20:54	20:56	LS	21:01	21:04	21:11								21:17	21:23	21:27	21:30	21:35	21:36	21:40					BEKASI
71	1448									21:17								21:23	21:28	21:32	21:35	21:45	21:46	21:50					BEKASI
72	1446	20:58	21:02	21:05	21:07	21:10	LS	21:15	21:18	21:31								21:37	21:42	21:46	21:49	21:59	22:00	22:04					BEKASI
73	1444	21:25	21:29	21:32	21:35	21:38	LS	21:44	21:48	21:52								21:58	22:03	22:07	22:10	22:15	22:16	22:21					BEKASI
74	1448	21:40	21:44	21:47	21:49	21:52	LS	21:57	22:00	22:06								22:12	22:18	22:22	22:25	22:34	22:35	22:39					BEKASI
75	1480	22:15	22:19	22:22	22:24	22:27	LS	22:32	22:35	22:43								22:49	22:56	23:00	23:03	23:09	23:10	23:14					BEKASI
76	1482	22:40	22:44	22:46	22:49	22:52	LS	22:57	23:01	23:07								23:13	23:20	23:24	23:27	23:33	23:34	23:38					BEKASI
77	D/1540A																							23:47	23:52	23:58	00:02	00:10	CIKARANG
78	1484	22:55	22:59	23:02	23:04	23:07	LS	23:12	23:16	23:22								23:29	23:36	23:40	23:43	23:49	23:50	23:54					BEKASI
79	1488	23:15	23:19	23:23	23:25	23:28	LS	23:33	23:37	23:41								23:47	23:54	23:58	00:01	00:07	00:08	00:12					BEKASI
80	1490	23:35	23:39	23:43	23:45	23:48	LS	23:53	23:56	00:01								00:07	00:12	00:16	00:19	00:30	00:31	00:35					BEKASI

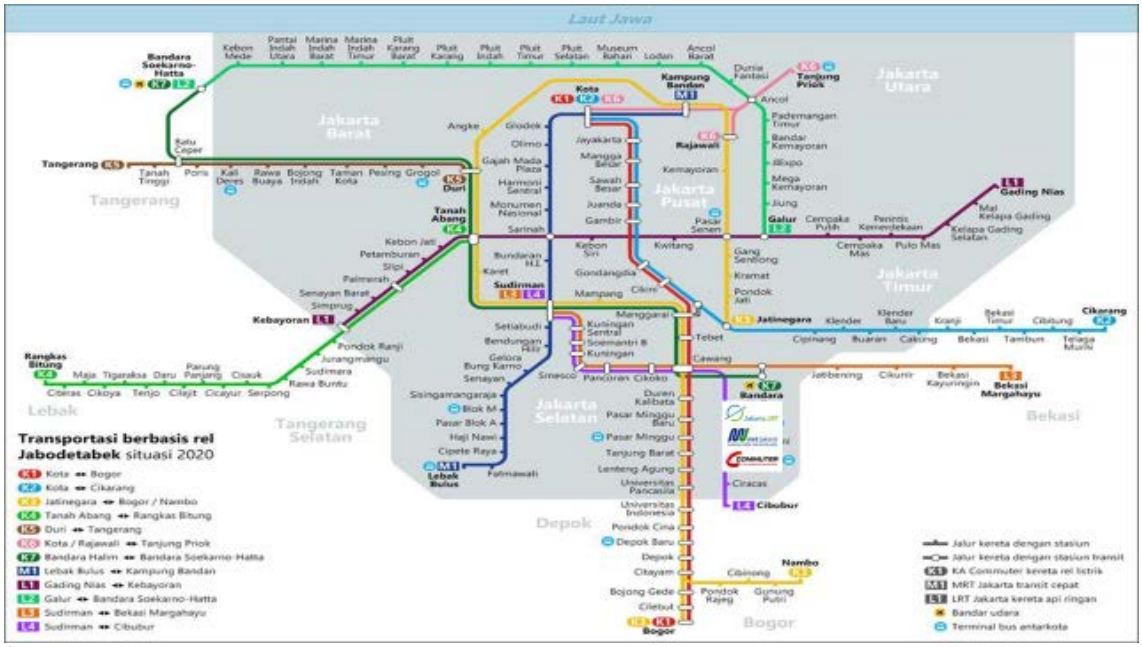
Source: Kereta Commuter Indonesia
http://www.krl.co.id/httpwww-krl-co-idwp-contentuploads201711update-jadwal-21-november-2017-2-xlsx/

Figure 1-17 Situation of Train Service for Cikarang Station

(2) Situation of MRT Development

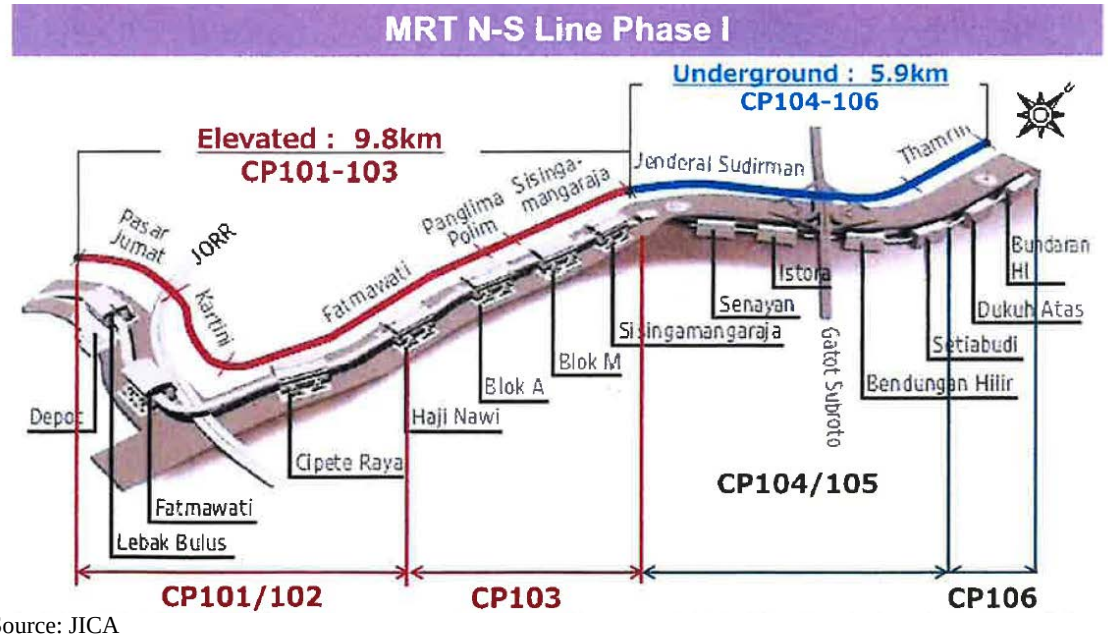
15.7 km section of MRT North-South Line is under construction as first phase and will be one of the Urban Railway Network of JABODETABEK area (shown in blue line below). Phase 1 section consists 9.8km elevated section and 5.9km underground section.

MRT East-West Line is planned from Dukuh Atas to Cikarang Jababeka as future expansion but route is not fixed yet.



Source: BPTJ

Figure 1-18 Urban Railway Network development plan for JABODETABEK Metropolitan Area



Source: JICA

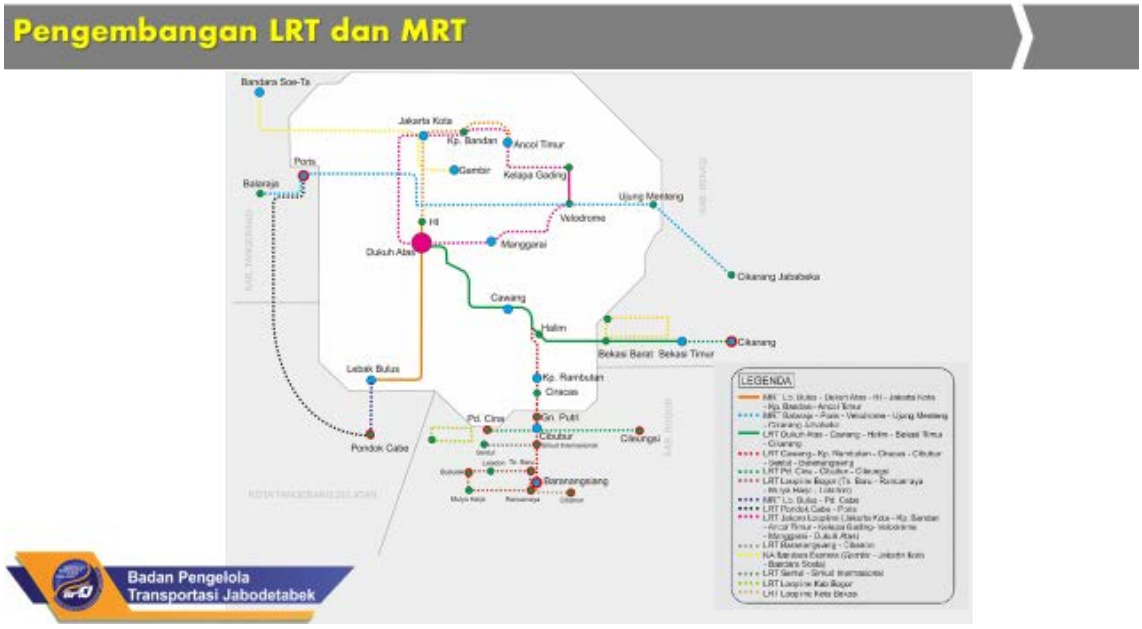
Figure 1-19 Diagram of Infrastructure of MRT North-South Line by section

1.2.3 Situation of LRT and AGT development

(1) Situation of LRT Development

Several LRT lines are planed inside JABODETABEK area. In this report, LRT refers to elevated light railway transit.

JABABEKA line has close relationship to the project area. Between Dukuh Atas and Bekasi Timur of this line is under construction. The line is planned to extend to Cikarang area.



Source: BPTJ

Figure 1-20 Plan of LRT & MRT network in JABODETABEK Metropolitan

(2) Situation of AGT development

Two examples are under operation or planning stage in Indonesia. No AGT example for the purpose of urban transport is found in Indonesia yet.

1) Korean AGT in Sukarno Hatta Airport as inter-terminal transportation.

Korean AGT manufactured by WOOJIN is introduced in Sukarno Hatta International Airport as inter-terminal transportation. This AGT connects each terminal and railway station.

Source: JICA Study Team

Figure 1-21 Korean AGT for Airport (Left; Rolling stock and Station, Right; Route Alignment)

2) Indonesian AGT in Bandung; “Metro Kapsul”

8 km length of AGT route is planned by Bandung City. 70 % of Rolling stock Component is manufactured in Indonesia.

Source (left): http://nasional.republika.co.id/berita/nasional/daerah/18/02/12/p41dkl384-kota-bandung-mulai-pembangunan -lrt-metro-kapsul
Reference (right): http://www.infobdg.com/v2/atasi-kemacetan-kota-bandung-canangkan-proyek- metro-kapsul -bandung/?fb_comment_id=1650876761670009_1653812004709818#f20369d2b6e77f6
(Left: Mock-up of rolling stock, Right; Route plan)

Figure 1-22 Indonesian AGT（Metro Kapsul）

1.3 Interest and trends of the railway sector

1.3.1 Interest related to this project

Interest of local and domestic companies and overseas enterprises concerning this project are as follows.

(1) Local/domestic company interest

- Local private enterprises are already pursuing urban development projects in the area, and there is a high interest in this project because of its contribution to the railway development
- 7 industrial parks in the railway area, especially the legal person of the JABABEKO and LIPPO located in the first stage railway area, are highly expecting this project

(2) Foreign company interest

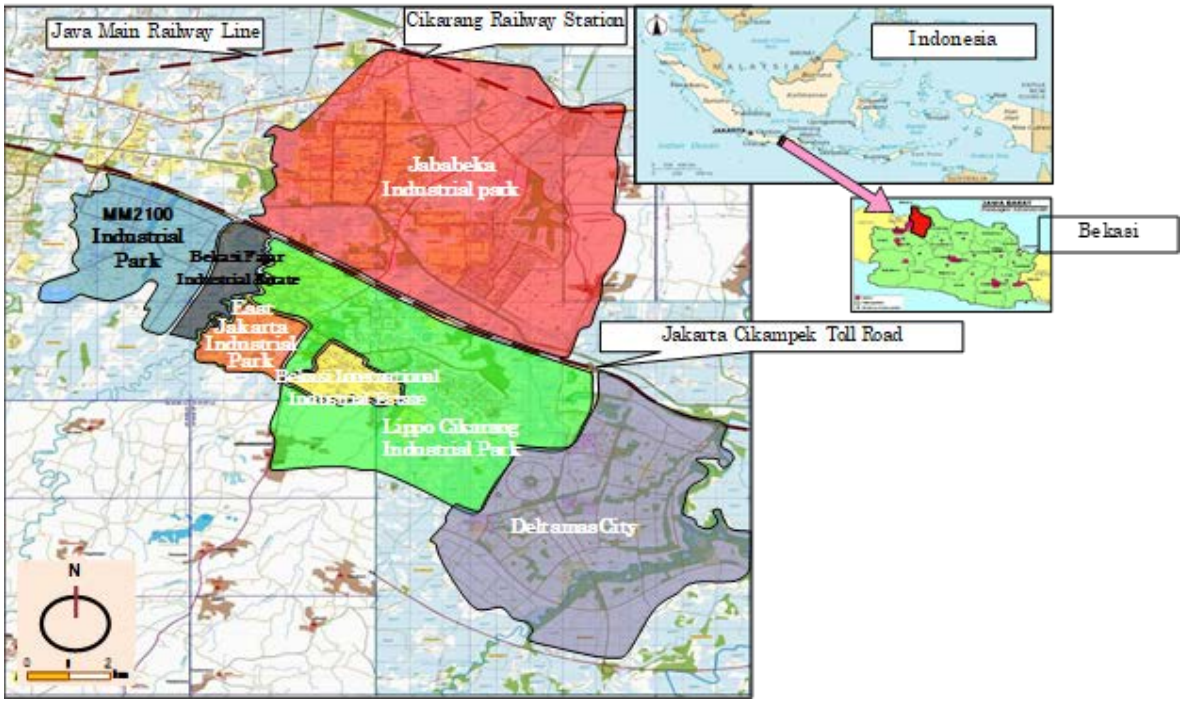
- Overseas businesses also keen to entry to this project. In addition, it is expected China who has pushed the HSR project and Korea whose AGT have been introduced in Soekarno Hatta International Airport will also be interested in the future.

(3) Development trend of target area

As mentioned above, in the target area of this project, local private enterprises are proactively promoting industrial park development, housing development, town planning, and this project plan can also make a big contribution to this. Because of this, this project can attract the attention of stakeholders.

Local developers in the area, including PT Jababeka TBK and PT Lippo Cikarang Tbk have been developing seven industrial Parks (7IPs) and because they want to ensure industrial employee and residents have comfortable means of transport, they highly anticipating this project.

Main industrial parks of the target areas overview are shown in Table 1-13～Table 1-19



Source: JICA Study Team

Figure 1-23The Seven Industrial Parks in the target area

Table 1-13 Jababeka Industrial Estate (JIE)

Name	Jababeka Industrial Estate
Developer	PT Jababeka Tbk
Capital Structure	PT. Jababeka Industrial Estate
Overview	● Total development area 5600 ha ● Industrial Park area 3,500 ha ● Residential area 50,000 unit in 1,400 ha aims for middle to upper class income customers ● Empty land 300 ha ● Land selling price 20,000 yen/m^2 ● Company 2000 domestic and foreign companies from 30+ countries ● Prominent Company ICI Paints, Mattel, Samsung, Unilever, United Tractors, Akzo Novel, Nissin Mas etc. ● Workers 700,000 people ● Resident 10,000 people
Source	http://www.bk.mufg.jp/report/aseantopics/ARS445.pdf http://www.jababeka.com/sites/default/files/basic-page-file/KIJA%20Presentation%20Material%20-%20November%202017_1.pdf

Source: JICA Study Team

Table 1-14 Delta Silicon Industrial Park

Name	Delta Silicon Industrial Park
Developer	PT Lippo Cikarang, Tbk
Capital structure	PT Kemuning Satiatama : 42.20% Other (Private companies) :57.80%
Overview	● Area 3,250 ha ● Land selling price: 21,000 yen/m^2 ● 1000 Companies from light industry (Worker population 484,300 people) ● Residential 16,661 Unit ● Population 50,720 people ● School 21 International School ● International Standard hotel

	● Japanese SMEs center ● Company Name PT Lippo Cikarang, Tbk ● Business name Japanese SMEs Center (Delta Silicon Industrial Park) ● Total development area 5 ha ● Tenant Company 26 Japanese Company ● Standard factory rental fees 760 yen/m^2/month
Source	http://www.lippo-cikarang.com/en/investor-information http://www.lippo-cikarang.com/en/news/press-release/lippo-group-invests-rp-278-trillion-develop-meikarta-new-jakarta http://www.lippo-cikarang.com/en/news/press-release/lippo-cikarang-sebagai-pemenang-fastest-growing-awards https://www.worldbuild365.com/news/koqobxvb2/building-architecture/jakarta-to-build-meikarta-an-entire-new-city, 2018/2/28 https://www.lippokarawaci.co.id/uploads/file/LPKR%20Presentation%20-%20Q3'17%20(UPDATED%20-%20NOV'17)(1).pdf http://biz.kompas.com/read/2017/06/12/111539528/newport.park.-.orange.county.di.meikarta.cbd.mulai.rp.6.jutaan.per.bulan

Source: JICA Study Team

Table 1-15 East Jakarta Industrial Park (EJIP)

Name	East Jakarta Industrial Park (EJIP)
Developer	PT East Jakarta Industrial Park
Capital structure	PT Spinindo Mitraday : 46% PT Lippo Cikarang Tbk : 5%
Overview	● Area 320 ha ● Residential none ● Company 103 (76 are Japanese company) ● Business area: Industrial Park O & M ● Total employer number 60,000 people
Source	http://www.sumitomocorp.co.jp/indpark/EJIP/ejip.html http://www.sumitomocorp.co.jp/files/user/doc/ir/2000/inv2000.pdf

Source: JICA Study Team

Table 1-16 Bekasi International Industrial Estate (BIIE)

Name	Bekasi International Industrial Estate (BIIE) (Kawasan Industri Hyundai)
Developer	PT. Hyundai Inti Development
Capital Structure	PT Lippo Cikarang Tbk Hyundai Corporation
Overview	● Area 200 ha ● Factory ● Residential ● Company 113
Source	http://klikbekasi.co/2015/10/22/terbukti-kawasan-industri-hyundai-bekasi-cemari-lingkungan/,http://www.daftar.co/perusahaan-di-kawasan-hyundai/

Source: JICA Study Team

Table 1-17 MM2100 Industrial Town (MM2100)

Name	MM2100 Industrial Town (MM2100)
Developer	PT. Megalopolis Mannuggal Industrial Development (MMID)
Capital Structure	Marubeni Corporation : 60% PT Bekasi Fajar Industrial Estate, *et al.* : 40%
Overview	● Area 805 ha ● Land selling price 27,000 yen/m^2 ● Residential ● Business ➢ Tenant company 190 ● Electric generation private power company PT. Cikarang Listrido private company. Second power station will be completed in December 2014, 755MW power generation in total ● Sewage treatment 72,000 m^3/day ● Public Hospital ● School MM2100 industrial job training school
Source Source	http://www.bk.mufg.jp/report/aseantopics/ARS445.pdf http://marubeni-industrialpark.com/indonesia/plan.html https://www.jetro.go.jp/ext_images/theme/fdi/industrial-park/developer-material/pdf/201703/idn_03.pdf

Source: JICA Study Team

Table 1-18 Greenland International Industrial Center (GIIC), Deltamas City

Name	Greenland International Industrial Center (GIIC), Deltamas City
Developer	PT Puradelta Lestari Tbk, PT Pembangunan Deltamas
Capital structure	Capital 59.4 billion yen Sojitz Corporation : 22.5% Sinarmas Land Group: 57.5% Other : 20%
Overview	● Total planned development area 1,600 ha ● Land selling price 19,000 yen/m^2 ● 83 Company, including 67 Japanese company ● GREENLAND BATAVIA industrial park (better known as light industry park in delta mas city): 73 company, including 5 Japanese company ● Residential area 1,600 ha ● Business ➢ Convenience store, Japanese Bank, different type of business shop ➢ Hospital (Japanese doctor, planned), sport center, mosque ➢ Administration ➢ Bekasi province prefectural office has been transferred to Delta Mas City ● Education ➢ Bandung Institute of Technology ➢ Private Technology University (Institut Teknologi Sains Bandung) ● Power supply in the Deltamas City, 60MW 2 plant, total 120MW transformation power supply ● Premium contract with PLN, lopping system for stable supply
Source	https://www.kota-deltamas.jp/ http://www.bk.mufg.jp/report/aseantopics/ARS445.pdf

Source: JICA Study Team

Table 1-19 Bekasi Fajar Industrial Estate (BFIE)

Name	Bekasi Fajar Industrial Estate (BFIE) (Daiwa Manunggal Industrial Estate)
Developer	PT Bekasi Fajar Industrial Estate Tbk (BEST)
Capital structure	The Ning King & Family (Argo Manunggal Group) : 48.1% Daiwa house : 10% Other : 41.9%
Overview	● Area 1,450 ha ● Land selling price 22,000 yen – 24,000 yen/m^2 ● Residential ● Business ➢ Company 300, around half are Japanese company ● Power supply, private power company PT. Cikarang Listrindo. Power generation ● Sewage treatment 72,000 m^3/day
Source	http://bekasifajar.com/?m=profile&s=company-group http://bekasifajar.com/images/08/AR-2016.pdf, pg 77, 84 http://www.daiwahouse.com/English/about/release/pdf/release_20171031_e.pdf https://www.jetro.go.jp/ext_images/theme/fdi/industrial-park/developer-material/pdf/201703/idn_02.pdf http://www.daiwahouse.co.jp/business/kaigaijigyo/index.html

Source: JICA Study Team

1.3.2 Movements in other Donors

World Bank, Asian Development Bank (ADB), Asian Infrastructure Investment Bank, Bank of Australia and Bank of France have been involved in the infrastructure projects including railways in Indonesia.

While ADB focuses on the development of railway networks connecting or runs West - East direction[12], the Cikarang New Urban Transportation System Project in ("the Project) aims to develop North - South railway connection of the target area. This means that ADB's railway projects and the Project might greatly contribute the transportation network in a complementally or synergistic way.

Table 1-20 World Bank railway related major projects

Project name		Indonesia Infrastructure Finance Facility
Project ID		P092218
	Sector	Multi-sector
	Executing agency	Ministry of Finance
	Overview	1. Oil and Gas (3%) 2. Energy Transmission and Distribution (48%) 3. Rural and Inter-Urban Roads (34%) 4. Ports / Waterways (4%) 5. Railways (11%)
	Approval	Project 1: June 24, 2009; Project 2: May 29 2017
	Period	Closing Date: February 28, 2022
	Scale	(Total Amount): 100 million (USD) Railways: ca. 11 million
	Source	http://projects.worldbank.org/P092218/indonesia-infrastructure-finance-facility?lang=en&tab=details
Project name		Railway Efficiency Project
Project ID		P004026
	Sector	Railways (100%), Other financial and private sector development
	Executing agency	PT Kai / Perumka
	Overview	1. To carry out sub-sector policy reform by restructuring the Railway State Enterprise(Perumka), reforming the relationship between it and the Government of Indonesia (GOI), and creating the foundations for expanded private participation 2. To rationalize sub-sector capital investments 3. To improve sub-sector management and operation 4. To increase the physical capacity of the Jakarta-Bandung corridor Detailed Contents ● A modern centralized traffic control signal system ● Double tracking 27.7 km of the line ● Remodeling of station trackage for a number of stations

[12] ADB (Indonesia Resident Mission) interview in this survey

	● Replacing 24 km of the existing partly worn out rail ● Technical assistance (TA) for project management and training of Perumka staff
Approval	November 21, 1996
Period	Closed: September 30, 2002
Scale	Total amount: 207 million (USD)
Source	http://documents.worldbank.org/curated/en/280761468285603173/pdf/31719.pdf

Project name	Railway Technical Assistance Project
Project ID	P003908
Sector	Railways (100%)
Executing agency	Former Indonesia National Rail (PJKA)
Overview	● Strengthening management information, costing, procurement, inventory control, train scheduling and rationalization of mechanical and track maintenance ● Others technical assistance, training of staff (train operations, marketing and sales, computer hardware and software) ● Handling equipment and by making physical improvements to facilitate container and intermodal traffic
Approval	December 10, 1987
Period	Closed Date: June 30, 1993
Scale	Total amount: 28 million (USD)
Source	http://projects.worldbank.org/P003908/railway-technical-assistance-project?lang=en&tab=details

Project Name	Railway Project (01)
Project ID	P003739
Sector	Railways (100%)
Executing agency	N/A
Overview	● Assist the Indonesian State Railway to arrest the ongoing decline and increase their transport capacity and efficiency through a program of rehabilitation and modernization ● The project which was to cover the first three years of a five-year investment plan included locomotives, passenger cars, equipment, materials, spare parts and a large amount of technical assistance (management practices, operations, technical aspects and the accounting system)
Approval	June 4, 1974
Period	Closed Date: June 30, 1979
Scale	Total amount: 48 million (USD)
Source	http://projects.worldbank.org/P003739/railway-project-01?lang=en

Table 1-21 Asian Development Bank railway related major projects

Project Name	Inclusive Growth through Improved Connectivity Program (Subprograms 1 and 2)
Project ID	46093-001 and 46093-004
Sector	Inclusive Growth through Improved Connectivity
Executing agency	BAPPENAS
Overview	1. Strengthened coordination, regulatory and institutional frameworks 2. Improved intra-island connectivity aimed at connecting rural areas with regional growth poles, and accelerated development and better maintenance of inland transport networks 3. Improved inter-island connectivity to enhance efficiencies and service performance of transport services; and 4. Improved international connectivity by making the country's key ports, logistics and intermodal systems more efficient in handling increasing traffic and trade volume Note: To strengthen Java Island connectivity, the government committed to improving the share of railway use in the transportation system
Approval	Subprogram 1: 16 Nov 2012; Subprogram 2: 27 Nov 2013
Scale	Total amount: 1,401 million (USD) ADB's ordinary capital resources（OCR）:700 million Others :701 million
Source	https://www.adb.org/sites/default/files/project-documents/46093/46093-001-pcr-en.pdf https://www.adb.org/projects/46093-001/main#project-pds https://www.adb.org/projects/46093-004/main#project-pds
Project Name	Infrastructure Reform Sector Development Program (Subprograms 1, 2, and 3, and an Infrastructure Project Development Facility)
Project ID	40009-013, 40009-023, 40009-033, and 40009-043
Sector	Infrastructure Reform Sector Development Program
Executing agency	BAPPENAS
Overview	1. Cross sector reforms for PPPs 2. Reforms to strengthen PSP in nine sectors, land transportation, railways, sea and air transportation, roads, power, oil and gas, telecommunications, and water supply and sanitation 3. PPP project transactions. The program also included an infrastructure project development facility(IPDF) to support the preparation and transaction of both national and regional PPPs, and $2 million in technical assistance(TA) to enhance PSP in infrastructure provision Note: JICA provided co financing in the form of a $100 million loan for each subprogram
Payment	Subprogram 1: 29 November 2006; Subprogram 2: 19 November 2008; Subprogram 3: 29 November 2010
Scale	Total amount: 880 million (USD) Subprogram 1 : 400 million Subprogram 2 : 280 million Subprogram 3 : 200 million
Source	https://www.adb.org/projects/40009-033/main#project-documents https://www.adb.org/sites/default/files/project-documents/40009/40009-023-pcr-en.pdf

Table 1-22 Asian Infrastructure Investment Bank railway related major projects

Project ID		Regional Infrastructure Development Fund Project
Project ID		000012
	Sector	Urban Infrastructure
	Overview	1. Urban transport 2. Urban water supply and sanitation 3. Drainage, flood and hazard risk 4. Solid waste management 5. Slum upgrading and affordable housing
	Period	April 15. 2017 - December 31, 2020
	Scale	Total amount: 406 million (USD) Asian Infrastructure Investment Bank (AIIB) : 100 million World Bank (WB) : 100 million Indonesia Government : 203 million Swiss Secretariat for Economic Affairs (SECO): 3 million
	Source	https://www.aiib.org/en/projects/approved/2017/_download/indonesia/document/project-document_Indonesia_Regional_Infrastructure_Development_Fund.pdf
Project ID		IFC Emerging Asia Fund
Project ID		000031
	Overview	1. Foster sustainable economic development, create wealth and improve infrastructure connectivity by investing in infrastructure and other productive sectors 2. Promote regional cooperation and partnership by working in close collaboration with other multilateral development institutions such as the International Finance Corporation (IFC)
	Approval	27 September 2017 (AIIB)
	Scale	Total amount: Target 1,000 million/commit: 640 million (USD) Asian Infrastructure Investment Bank（AIIB） : 150 million（Estimate） International Finance Corporation（IFC） : 150 million（Estimate） Others : 340 million（Estimate）
	Source	https://www.aiib.org/en/projects/approved/2017/ifc-asia-fund.html https://www.aiib.org/en/projects/approved/2017/_download/Asia/summary/IFC-Emerging-Asia-Fund_PSI_2017-09-27-003.pdf

Table 1-23 Department of Foreign Affairs and Trade(DFAT), Australia railway related major projects

Project Name		Indonesia Infrastructure Program (2016-26)
	Overview	● Bilateral assistance and infrastructure trust funds with the multilateral development banks, has provided support for physical infrastructure and policy and regulatory assistance in key sectors including urban and interurban transports (roads, ports and rail), water/sanitation and energy. ● Wastewater investment plans in eight cities of Indonesia, water supply for investments for Indonesia's two largest cities (Jakarta and Surabaya) ● Light rail Mass Rapid Transit options in Surabaya ● Makassar port master plan ● Others
	Source	http://dfat.gov.au/about-us/business-opportunities/tenders/Documents/revised-concept-note-indonesia-infrastructure-program.pdf

Table 1-24 Agence Française de Développement (AFD) railway related major projects

Project name		Urban rail system in either Bandung or Surabaya
Project ID		N/A
	Sector	Urban rail
	Overview	● The Government of France is considering giving assistance to an urban rail system in either Bandung or Surabaya using funds from the Direction Généraledu Trésor or Agence Française de Développement. ● In 2006-2007, the Société Nationale des Chemins de fer Français (SNCF), 17 for the benefit of the French government, conducted a feasibility study of implementing an urban rail system in Surabaya. The study concluded that the cost would be over $1.4 billion, which was then far above the cap of the RPE18 program ● A second study by SNCF was completed in 2009. It then recommended implementing first the downtown part of the network with the airport link with a revised price of $700 million
	Source	https://www.adb.org/sites/default/files/institutional-document/33652/files/ino-transport-assessment.pdf

2 Analysation of Project Necessity

2.1 Technical and Economical Certainty of this PPP Project

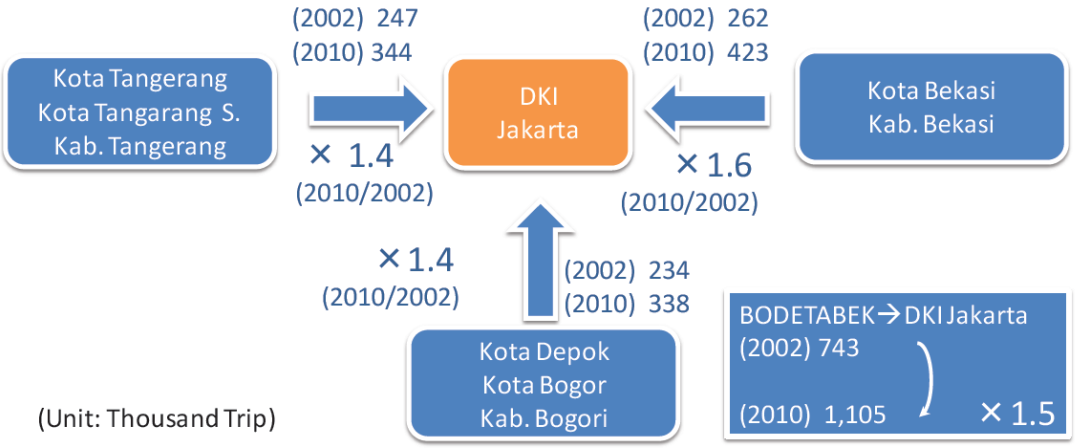
2.1.1 Necessity and importance of the Project

(1) View point from Wider Area

1) Necessity to reform Urban Structure of JABODETABEK Metropolitan Area.

In these days, overconcentration is accelerated. More commuter is coming into DKI Jakarta from surrounding area, while accumulation of urban function within JABODETABEK Metropolitan area.

Traffic from surrounding area to DKI Jakarta is increasing. Especially, Traffic from Kota Bekasi area increased 1.6 times up in this 8 years and reached around 420 thousand people per day. 。

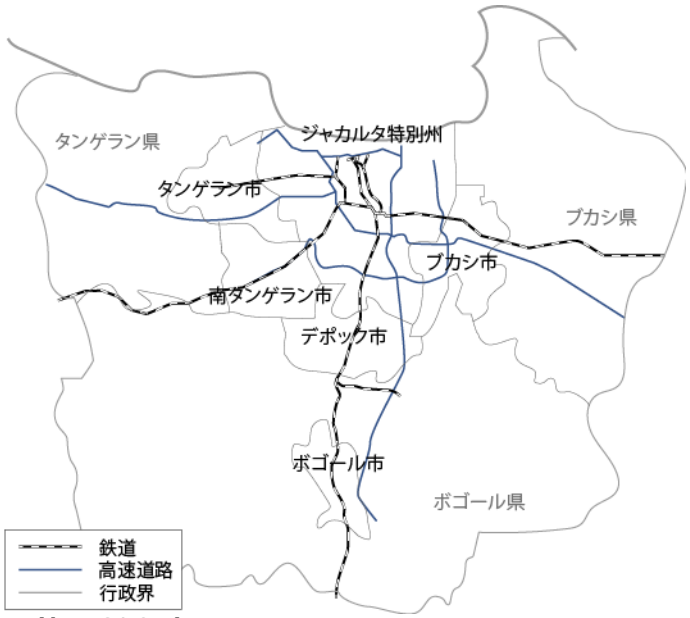


Source: JUTPI Final Report March 2012 CMEA, JICA

Figure 2-1 Changes of traffic volume in JABODETABEK Metropolitan area

On the other hand, transport infrastructure of JABODETABEK Metropolitan area is not enough corresponding to increase of traffic volume. Both highway and commuter railway network is not completed as is shown below; radial and ring route are incomplete.

Thus, toll road between DKI Jakarta and Bekasi regency is full of congestion especially during morning and evening.



Source: JUTPI and revised by JICA Study Team.

Figure 2-2 Administrative boundary and main infrastructure network in JABODETABEK

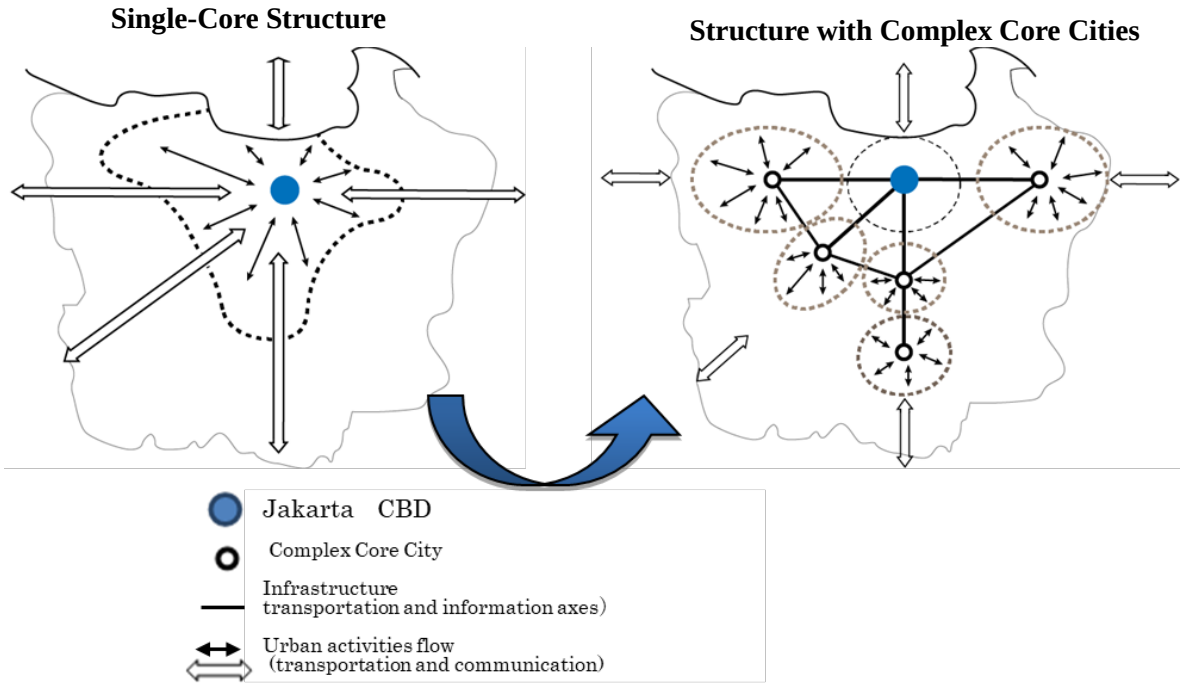
As mentioned before, road traffic of JABODETABEK area is concentrating in DKI Jakarta today. Urban structure reformation is required to revolve this situation; urban structure reformation from single core structure to structure with complex core cities; DKI Jakarta and complex core cities in surrounding area will share and complement urban function each other.

Candidate complex core cities will be surrounding regency of DKI Jakarta; Bogor, Depok, Tangerang, South Tangerang, Bekasi and its Cikarang complex city.

To functionalize this urban structure effectively, enforcement of railway network to connect each core cities and installation of urban transport infrastructure to cover traffic within each core city are both essential.

Reform JABODETABEK Metropolitan Structure

From Single structure to Structure with complex core cities



Source: JICA Study Team

Figure 2-3 Reformation of Urban structure of JABODETABEK Metropolitan area into structure with complex core cities

2) To form new network axis of passenger and freight traffic for structure reformation

Traffic between DKI Jakarta and Cikarang Complex City in Bekasi regency, which is the project area, depends mainly on toll road. Concentration of passenger and freight traffic on this toll road cause daily heavy congestion. Hence the improvement from both passenger and freight traffic is required.

Concerning passenger traffic, problem can be found in low ratio of public transport in modal split. According to new implementation of LRT, MRT and urban railway network, transformation of modal split into high dependency on public transport based on enforcement of railway network is highly required.

Concerning freight traffic, freight traffic from Cikarang Complex City to Tanjung priok port located in DKI Jakarta was interrupted by congestion mentioned above. Today, new development plan of Patimban port (pointed in drawing below; Cilamaya Port development plan was stopped and now Patimban port substitute that plan.) is proceeded under Japanese Yen loan. Hence, shift of freight traffic from current port to new Patimban port is required.

Distance
from Industrial Parks in Eastern Metropolitan Area (Cluster of Japanese IPs) to Ports

East Met. Industrial Park - Tanjung Priok Port (Existing)	*ca.* 70 km
East Met. Industrial Park - Patimban Port	*ca.* 70 km

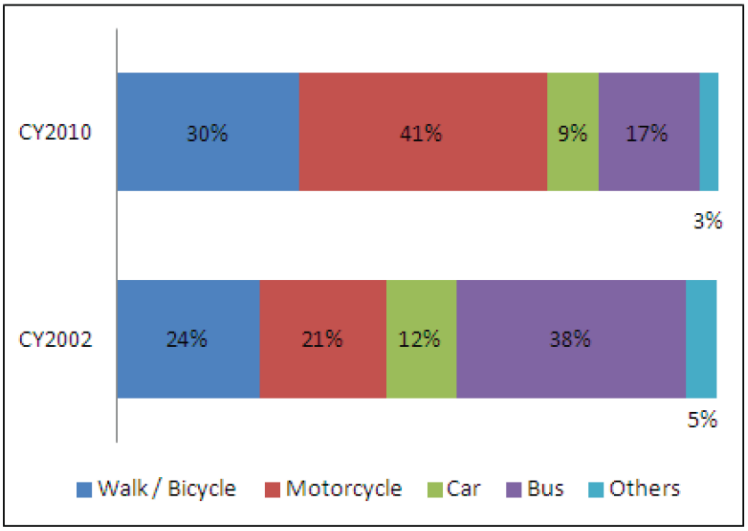
Source: JICA

Figure 2-4 Location of freight facility in JABODETABEK Metropolitan area

3) To form railway network to Jakarta for structure reformation

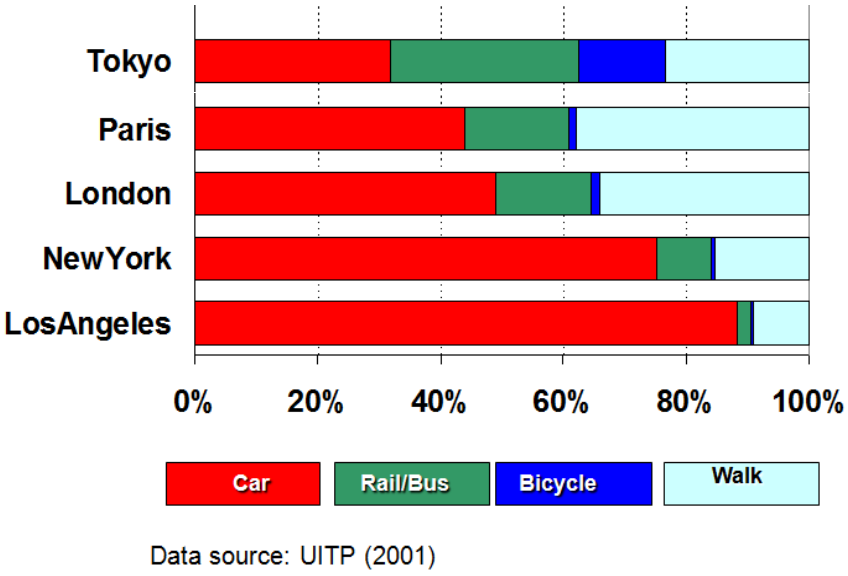
As mentioned, traffic from Bekasi regency to DKI Jakarta increased 1.6 times. Before, main public transportation mode inside JABODETABEK Metropolitan mainly depended on bus. Today, private vehicle like motorcycle and car is increasing from 33% to 50%. The increase and change of modal split cause much more congestions.

The urgent theme is to raise ratio of public transport in modal split close to other major cities in the world; Public transport share around 30 % in modal split in Tokyo.



Source: JUTPI Final Report March 2012 CMEA, JICA

Figure 2-5 Change of Modal Split in JABODETABEK Metropolitan area



Source: UITP（2001）

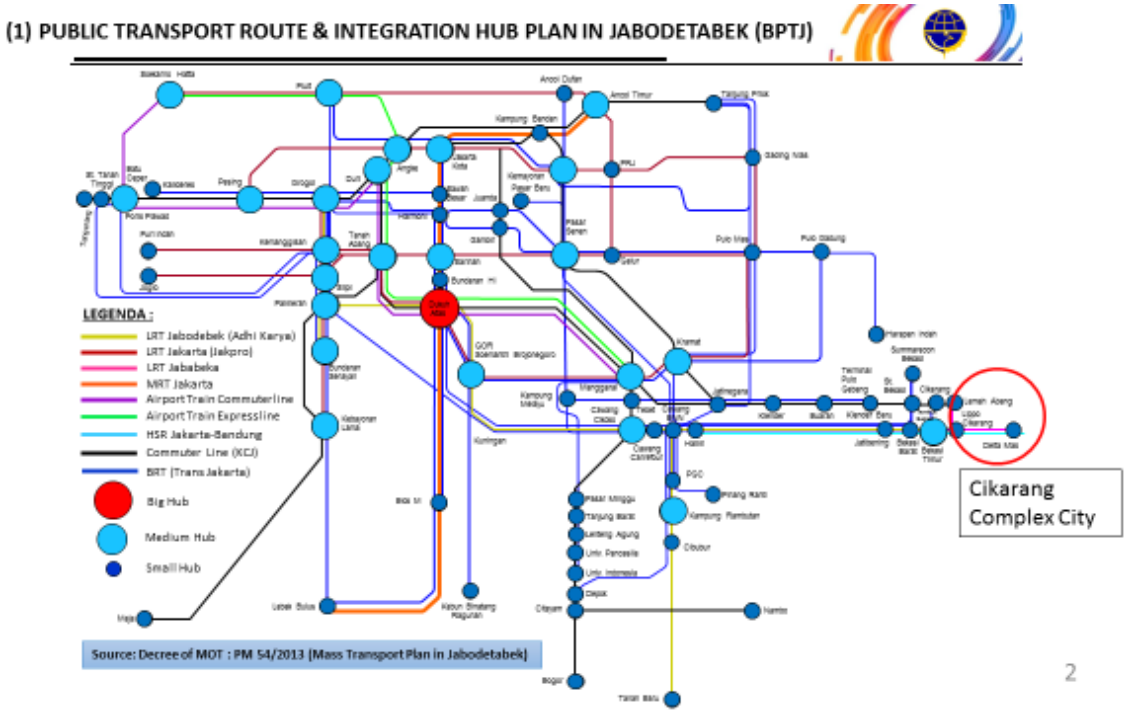
Figure 2-6 Change of Modal Split in Major Cities in the world.

4) Enforcement of Railway connectivity with DKI Jakarta and inner city AGT

According to BPTJ's JABODETABEK Metropolitan Public Transportation Master Plan, the project area has plan for three routes with different mode. First is improvement of existing commuter railway, second is East West MRT line, third is LRT line along toll road with elevated viaduct. All of those three routes are connecting DKI Jakarta with the project area in east- west axis. Innercity public transportation which is required to reform this area into one of the complex core cities is referred as "LRT JABABEKA" in the BPTJ's plan.

The AGT referred in this study correspond with this LRT JABABEKA. This line is expected to serve for commuters to and from DKI Jakarta with connection to existing commuter railway. In the same time, the line will connect three mass transit; commuter railway, East West MRT and LRT as trunk public transport within the Cikarang Complex City (shown in

Figure 2-9 North South Public Transportation system to support internal traffic). The role of this AGT line is important in terms of reformation of JABODETABEK into Structure with complex core cities.



Source: BPTJ, modified by JICA study team

Figure 2-7 Public Transport Master Plan for JABODETABEK Metropolitan area

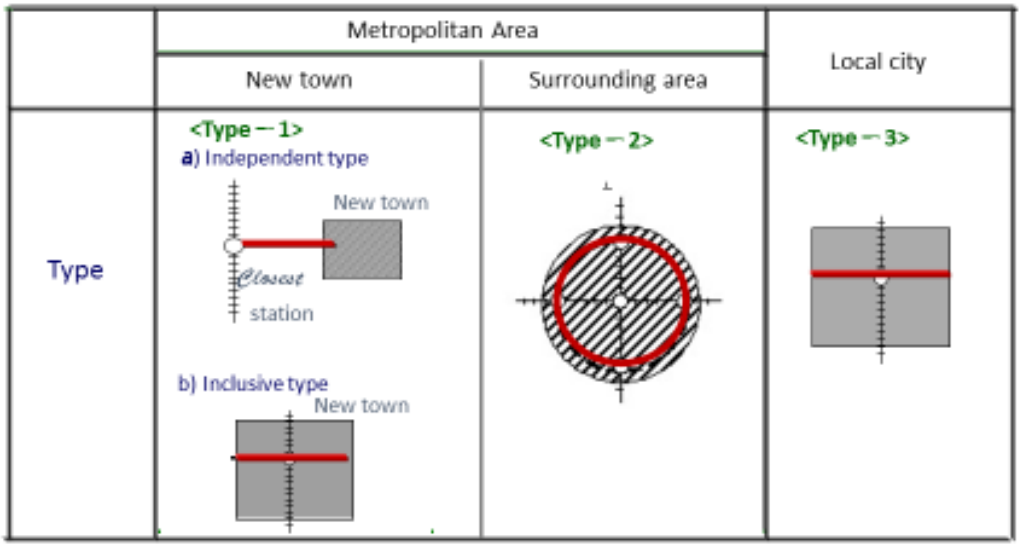
5) Role as pilot project for nationwide promotion

Possible implementation target of AGT is divided into three types: 1) Feeder line or inner city trunk line of new town in Metropolitan Area, 2) Circle line in Metropolitan Area and 3) trunk line in Locai City.

This project is located in type 1) and especially trunk line of new town.

As mentioned before, Cikarang Complex City has a role as pilot project to reform JABODETABEK Metropolitan into structure with Core Complex Cities. Hence, installation of AGT in this area can serve as showcase to promote trunk innercity public transport implementation to other Core Complex Cities in JABODETABEK Metropolitan area.

This project also serves as a showcase for other local major cities to implement trunk lines.



Source: JICA Study Team

Figure 2-8 Diagram of AGT implementation target

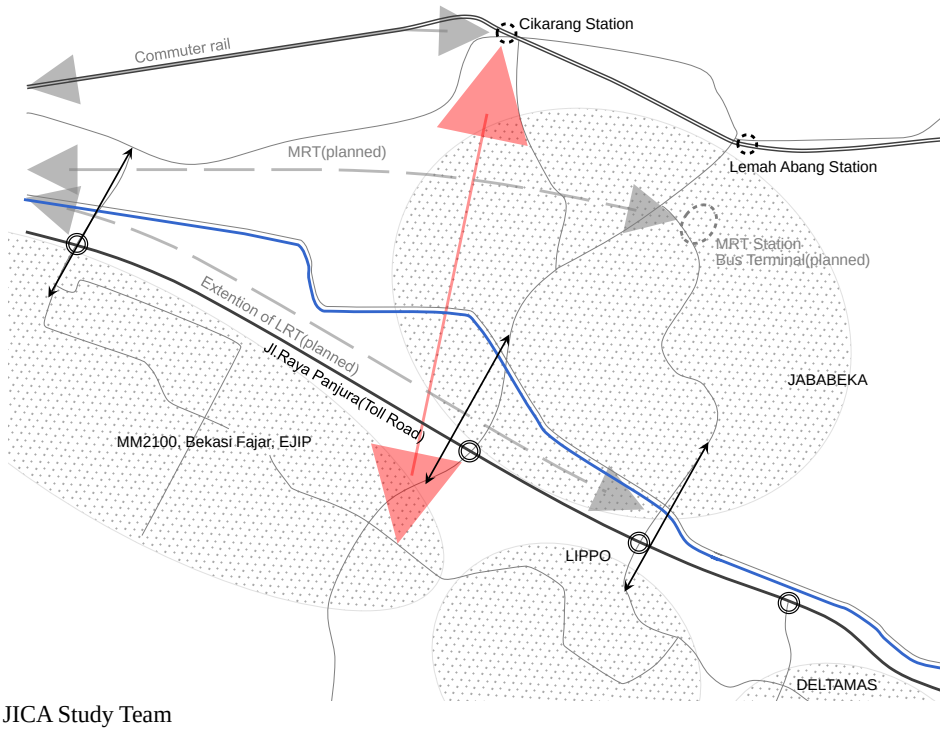
(2) View point from inside of the project area

1) To establish public transport network to support internal transportation

The diagram below shows future public transport network of the project area, based on development situation of toll road and railway for the project area. Problem can be found in connectivity between north and south of the project area. Development will be proceeding to connect east and west through commuter railway, extension of LRT and idea of MRT construction.

North and south connectivity is limited except three connecting road and cannot fulfil traffic demand of north-south direction. North-south public transportation implementation is required to improve current connectivity of the area and to develop integrated Cikarang Complex City.

Furthermore, the project has idea for second stage to implement east-west line in southern area of Toll Road. LRT JABABEKA line which is under construction now, is planned to be extend toward this project area along toll road but the east west AGT line is planned to introduce in southern side of toll road. Thus, service range of those two lines are different from each other.



Source: : JICA Study Team

Figure 2-9 North South Public Transportation system to support internal traffic

2) Solving disconnectivity due to waterway and toll road

As mentioned, the project area only has road access to connect north and south. The area is divided into north part and south part by waterway and wide toll road. Thus traffic in north south direction is limited.

Elevated public transport is required to enable effective traffic to solve bottle neck of internal traffic in north south direction.

3) Solving road traffic jam in north south direction

Bottleneck referred in last section and lack of appropriate road network development causes chronical congestion like shown in the picture below. The congestion causes huge economic loss, mentioned in later section. Elevated and high efficiency Public transport is required in this area to solve road traffic jam.

Source: JICA Study Team

Figure 2-10 Congestion on north south road

4) Increasing attractiveness of the city

As mentioned, the project area lacks transport infrastructure development and this prevent rapid development of the project area to become CBD with high-rise buildings.

Implementation of advanced cutting-edge transport system is required to promote investment from national and international sector to Cikarang Complex City and to develop the Complex Core Cities in JABODETABEK. Concerning required innovativeness and advantageousness, the project needs brand new public transport with modernist technology such as driverless operation.

Source: JICA Study Team

Figure 2-11 Situation od Cikarang Complex City Development

2.1.2 Purpose of the project

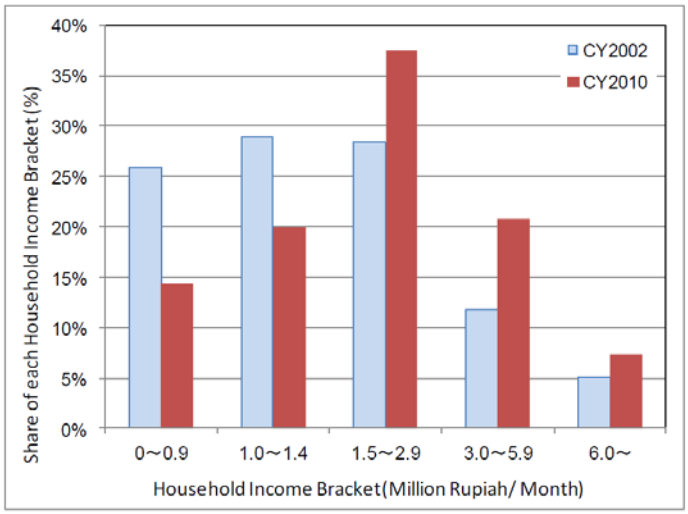
(1) To establish public transport network to improve access to DKI Jakarta

1) Economic loss caused by congestion on inter city traffic

As mentioned in the last section, connection between DKI Jakarta and Cikarang Complex City highly depend on toll road. Development of infrastructure is not rapid enough to catch up increase of traffic volume and threrefore heavy congestion is happening especially in morning and evening. It takes more than two and half hour for one way. Economic loss in rough calculation can be shown as follows.

[Duration]
Duration is 24 minutes if traveled 40km by 100km/h
Duration is increased more than 2 hours by congestion

[Time Value]
Working times for one month; 40hours/week×4=160hours/month
3,000,000IDR/160=18,750IDR/h; Time value upon average monthly income 3 million IDR



Source: JUTPI Final Report March 2012 CMEA, JICA

Figure 2-12 Household Income Bracket

[Economic Loss]
423,000people×2.0hours×18,750IDR×20days=317,250millionIDR/month

2) Economic Loss inner Cikarang Complex City
Same estimation of economic loss can be estimated for inner traffic of Cikarang Complex City
Time loss by congestion of north south traffic;1 hour
100,000people×1.0hour×18,750IDR×20days=37,500million IDR/month

3) Uncertainty of travel time
Estimation above only mention about economic loss calculated by travel duration. In fact congestion fluctuate a lot and travel duration happenly increase much more. The circumstance of this area is that travel time includes those uncertainty and thus expands much more than exact duration. 。

The purpose of this project is to improve rapidity and punctuality dramatically by implementing new public transportation under close relation with upgrading railway connection to DKI Jakarta.

4) First step for establishing inner city network to integrate the project area
One of the purpose of this project is that to make first step for establishing inner city network to integrate the project area as one of the Core Complex City in JABODETABEK Metropolitan Structure by introducing new public transport under close relation with upgrading existing railway and construction of new railway.

It means that the purpose of the project is to solve bottle neck of the area caused by waterway and toll road by introducing new public transport and create public transport network with existing railway. LRT and MRT.

Not only north south direction but also east west direction of public transport is required to develop integrated Cikarang Complex City. However, the project focus on north south direction as first priority.

(2) To promote urban development of the area

Introduction of innovating and cutting edge new public transport system is necessary to efficiently promote CBD development including transport hub in Jababeka area and Meikarta urban development aiming utilization of urban facilities in LIPPO area.

Hence, this project targets to promote additional attractiveness of newly created urban area by introducing new unique public transport system using modernist technology such as driverless operation.

2.2 The certainty of the PPP has a sustained demand and is measured from the inadequacy of service, both in quantity and quality

2.2.1 Demand Forecast

(1) Methodology

The methodology of demand forecast is based on the straightforward approach in which transport demand is estimated by multiplying the average utilizing ratio of transport system with number of inhabitants along the transport route, since there are no available data on existing traffic situation, current trip generation model and origin-destination information.

Outline of methodology is shown in Figure 2-13.

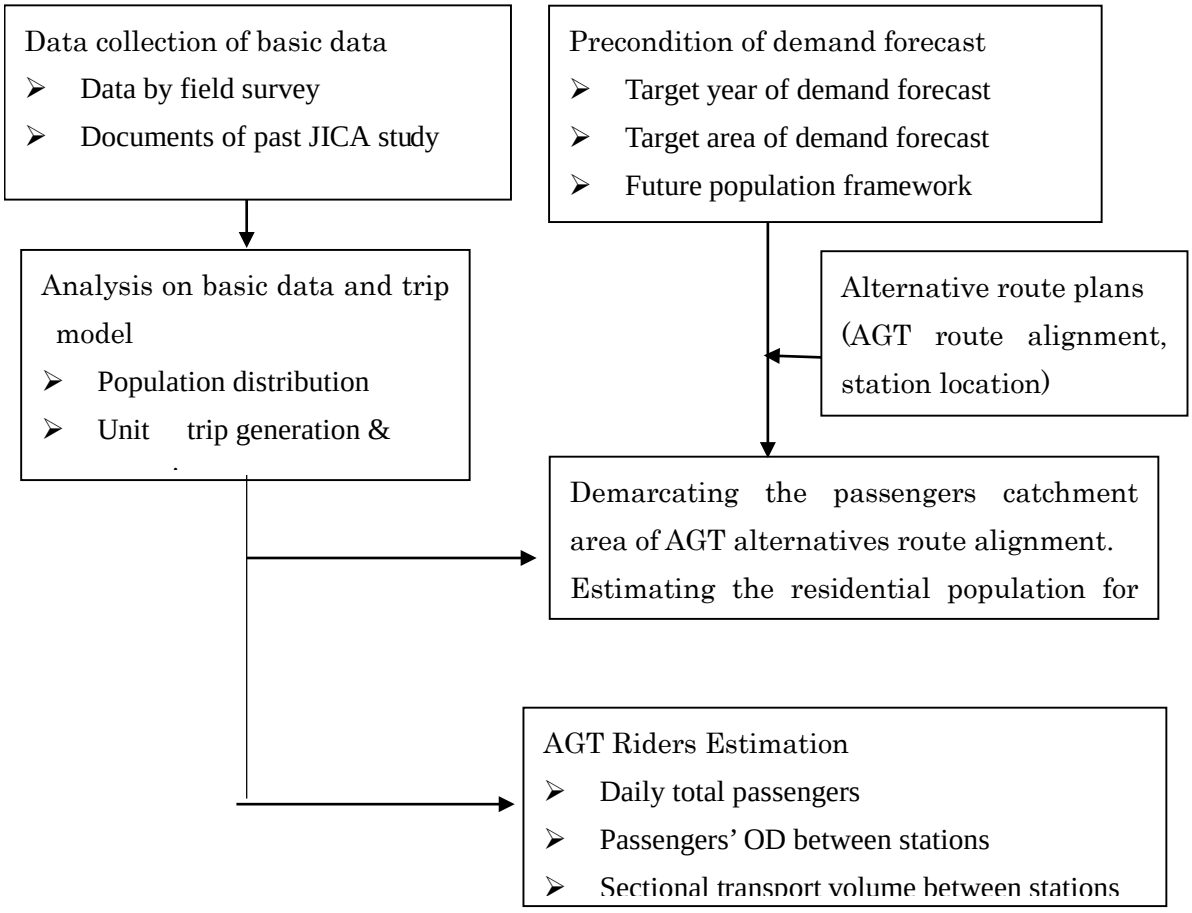


Figure 2-13 Flowchart explaining demand forecast process

(2) Precondition for Demand Forecast

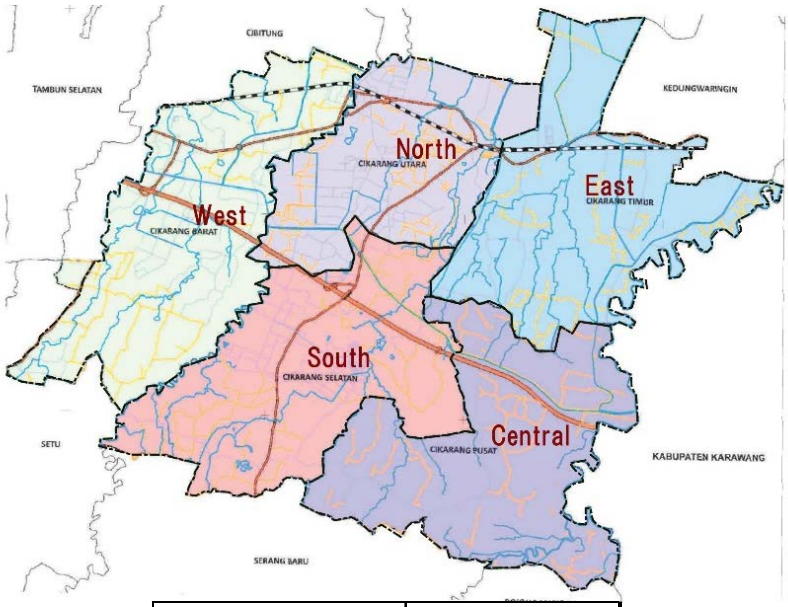
1) Target Year

As the target year of demand forecast, year 2020 and 2030 are selected. Year 2020 is corresponding to the opening year of AGT system and year 2030 is taken as a midterm period which 10 years go by after 2020.

2) Target area for demand forecast

As the target area of demand forecast, administrative district of “Kota Cikarang”, where objective transport system will be introduced, is selected. (herein after referred as “Cikarang district”)

Cikarang district is located in southern edge of Bekasi regency and composed of 5 sub-district, which features urbanized land-use area, mainly industrial function. Regarding the transport network situation of the target area, major trunk transport lines connecting east-west regions, i.e. toll roads, national roads and regional railways. However, the impact of future transport network provision by “East-west MRT project” and “LRT extension project”, is unconsidered in this study,

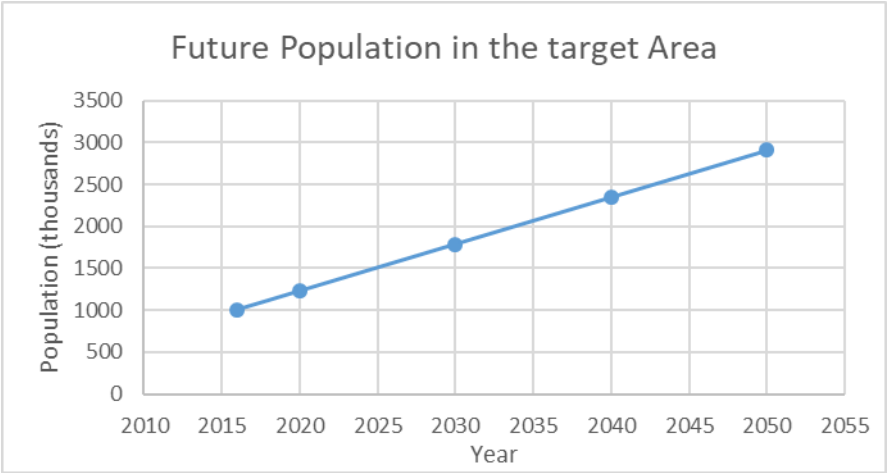


Division	Area(km2)
Central Cikarang	48
West Cikarang	54
East Cikarang	51
North Cikarang	43
South Cikarang	52
Total	248

Figure 2-14 Target Area

3) Population framework

Passengers demand is estimated based on the future population projection result as shown below. According to its result, future population of Cikarang district which is regarded as the target area of demand forecast, is projected to be 2 million in 20 years from 1 million of existing population at present.



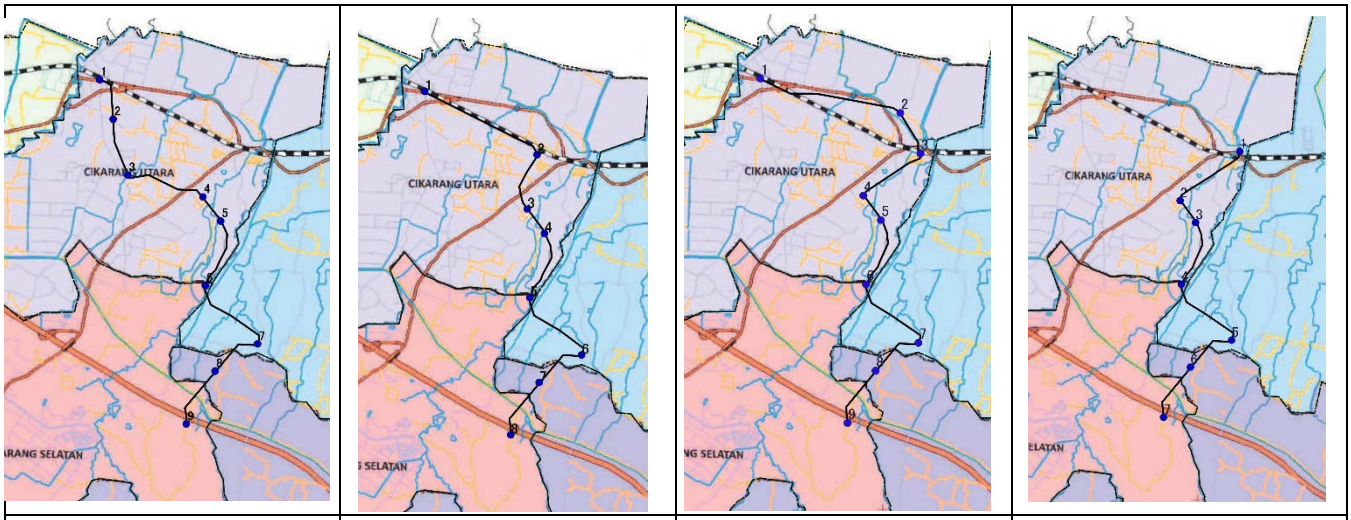
Year	2016	2020	2030	2040	2050
Population	1,003,453	1,228,000	1,789,000	2,351,000	2,912,000
Average Annual Increase Rate (%)		4.67	3.83	2.77	2.16

Figure 2-15 Future population projection for target area

(3) Route alternative plans

Following route alternatives plans are selected as preconditions of demand forecast.

（For detail information, refer to Table 3.4 in 3.2.1 Route planning）



Route A	Route B	Route C	Route D

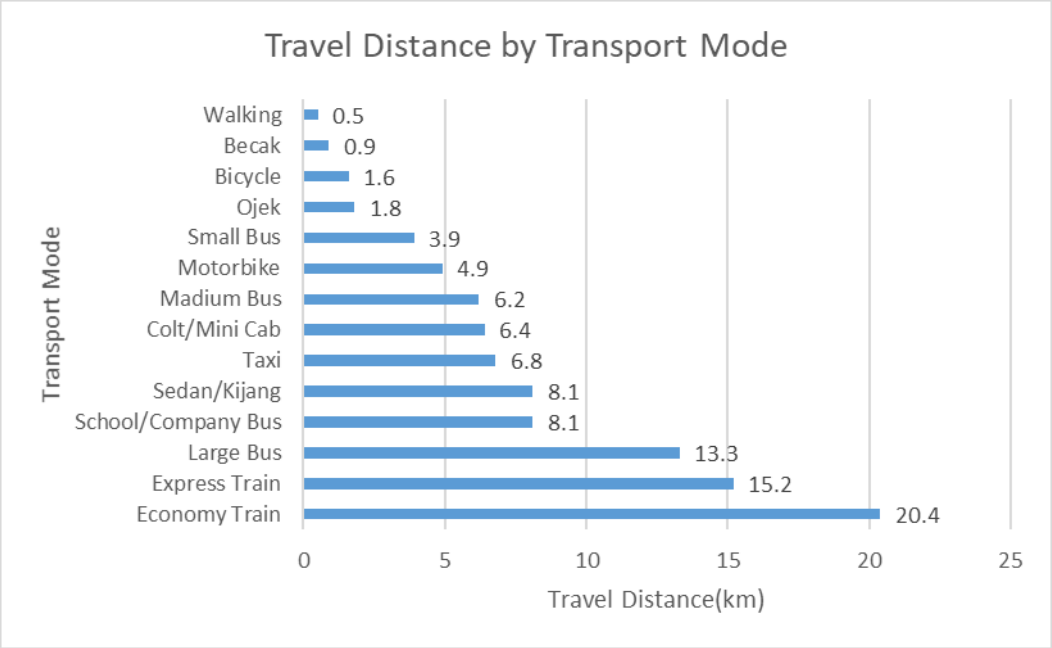
Figure 2-16 Route alternative plans

(4) Estimation of the population in passengers catchment area of AGT route

1) Demarcation of passengers catchment area of AGT system

The passengers catchment area of AGT system is a physical boundary where ordinal transport access is expected to take AGT system, technically it is defined by a specific distance to stations of AGT system. It depends on availability of secondary transport and AGT's role/ranking in total transport system. If the target system is a transport mode to serve relatively wide area of JABODETABEK, its access range could cover city-level area, however if it is local transport oriented, its access range is limited to just near the system route and its feeder transport is bicycle at best, mostly walking.

Target transport system is considered to be latter type of transport which is mainly serving part of Cikarang district, and its access transport is walking. According to the data on existing transport mode in JABODETABEK region, average travel distance is distributed as shown in Figure 2 17, travel distance of walking is around 500m. Accordingly, passengers catchment area is defined as an area in 500m from AGT system route.



Source：JUTPI

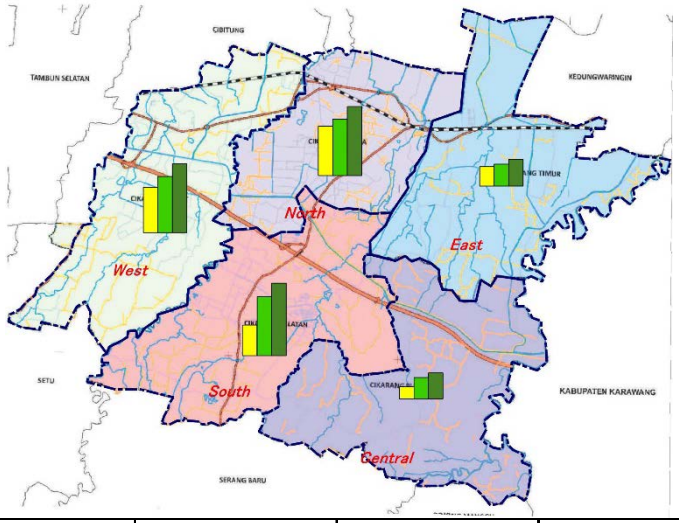
Figure 2-17 Average travel distance by Transport Mode

2) Estimation of the population in passengers catchment area of AGT system

Estimation of the population in passengers catchment area of AGT system is carried out as follows:

- Demarcating the catchment area of AGT system, offsetting average access length, 500m, from the center line of AGT system route.
- Measuring the partial section of the catchment area, checking intersection with administrative boundary of sub-district of Cikarang district, using GIS data.
- Estimating population of the catchment area by multiplying area with population density of sub-district.

Figure 2-18 shows the population distribution of sub-district in Cikarang district.



Division	2016	2020	2030
Central	99,446	121,699	177,297
West	262,044	320,683	467,184
East	102,579	125,534	182,882
North	263,603	322,591	469,963
South	275,781	337,494	491,674
Total	1,003,453	1,228,000	1,789,000

Source: JICA Study Team

Figure 2-18 Population distribution in Cikarang district

Based on the above, the population of passengers catchment area in 2020 is estimated as shown below.

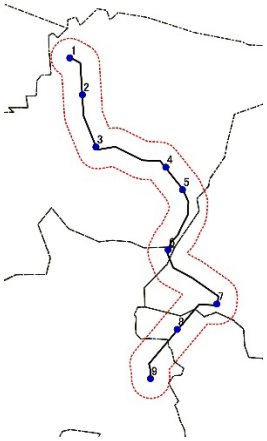
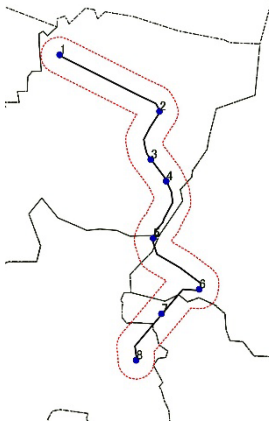
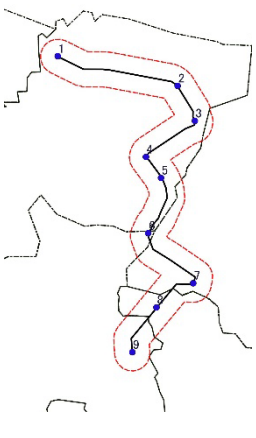
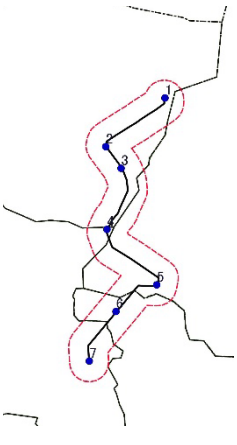
Route A	Route B	Route C	Route D
			
73,592 persons	74,246 persons	86,501 persons	52,429 persons

Figure 2-19 Estimation result of population expected in the passengers catchment area by route alternatives

(5) AGT riders estimation

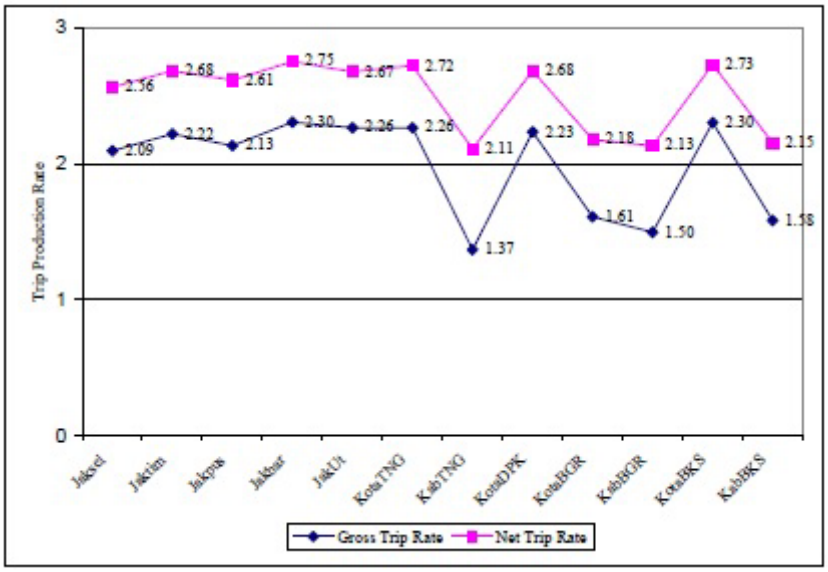
AGT riders estimation is made according to following steps:

1) Estimation of trip production for the passengers catchment area

Trip production corresponding to estimated population of the passengers catchment area is calculated by following formula.

Trip production ＝ Estimated number of population (person) * Gross Unit Trip productions rate (trips/person/day)

For the Gross Unit Trip productions rate, 1.94 (trips/person/day) is adopted based on the average value for Bekasi city & county as shown below.



Source: JUTPI[13]

Figure 2-20 Unit trip production rate for home based trips

[13] JABODETABEK Urban Transportation Integration（JUTPI）2009-2012

2) Increment trips by inbound trip makers

As part of AGT riders, trips from external zones are expected such as inbound commuters. For its estimation, following formula is evolved, comparing the trip production and sum of trip generation and attraction.

Increment trip rate = Σ (Gross Tr.Gen.& Gross Tr.Att.) / Σ (Gross Tr.Prod.)

It is calculated 1.54 (2.982 / 1.94) if trip data for Bekasi city and county are applied from Table 2-2 below. Accordingly increment trips for external origin is calculated to be 54% of trips estimated based on the passengers catchment area.

Table 2-1 Gross Unit trip Generation & Attraction for Bekasi city & county

Unit：thousand persons, thousand trips/day, trips/person/day

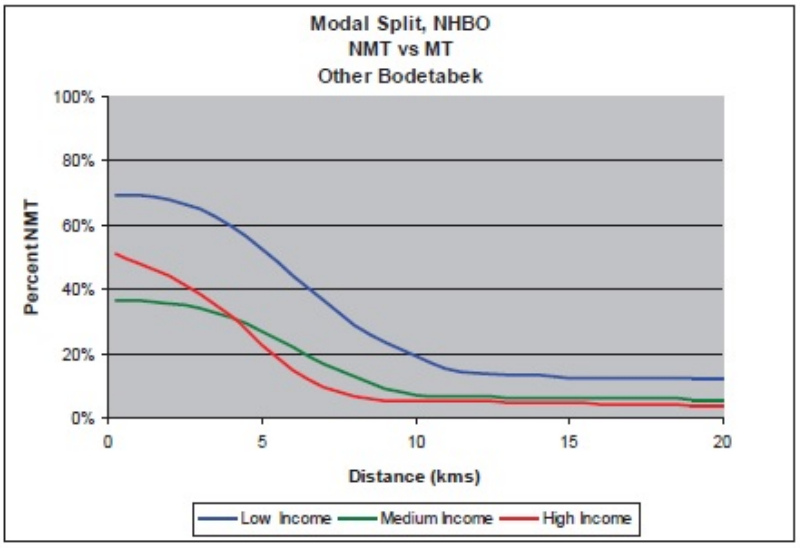
Zone		JABODETABEK	Jakarta	Bekasi(City+County)
Population(2010)		28,033	9,588	5,021
Tr. Gen. + Att.	To work	10,875	4,639	1,811
	To school	11,257	4,182	1,907
	Home based others	27,429	10,299	4,794
	Business	3,710	2,005	505
	Others	6,922	2,945	935
	Total	88,226	33,658	14,973
Unit trip Gen.+Att. Rate		3.147	3.510	2.982

Source: JUTPI

3) Elimination of No Motorized Trips (NMT)

In general, estimated trip generation and attraction contains NMT (No Motorized Trips), e.g. walking trip. Therefore, this NMT portion of trips is reduced from the total trip production estimated for passengers catchment area. Rate of NMT is set up 30% based on the below data, and reduced trip number is calculated as follows:

Reduced NMT trip volume = trip production volume * 30%



Source：JUTPI

Figure 2-21 NMT trip rate curve by trip length in Bekasi region

4) Total trip generation & attraction

Total trip generation & attraction=Trip production (1) + inbound trips (2) – trips for NMT (3)

In the above formula, number in parenthesis stands for column number appeared before.

5) Number of AGT riders

Number of AGT riders is estimated by multiplying total trip Generation & Attraction with average AGT choice rate. Where public transport mode choice rate is selected for the AGT choice rate. Based on the present public transport mode choice rate in Bekasi city & county area, 30% is adopted for the AGT choice rate, considering attractive aspect of AGT such as modern technology.

Table 2-2 Mode choice rate for commuter trips in home based criteria

Residential area	Car + MC	Public transport
Bekasi (county)	83.35%	16.65%
Bekasi (city)	72.11%	27.89%
Jakarta (south)	76.23%	23.77%
Jakarta (east)	71.54%	28.46%
Jakarta (central)	64.35%	35.65%
Jakarta (west)	83.48%	16.52%
Jakarta (north)	74.54%	25.46%
JABODETABEK	72.14%	27.86%

Source: JABODETABEK commuter transport census (2014)

based on the above, number of AGT riders is estimated by route alternatives as shown below:

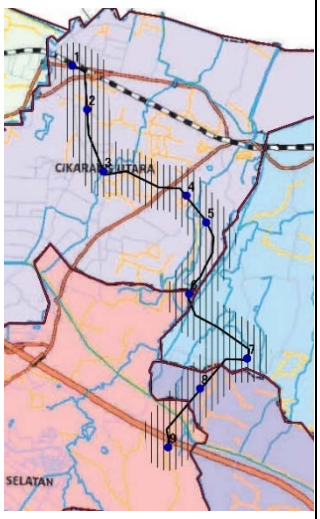
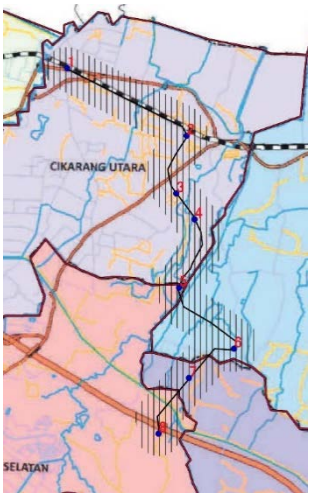
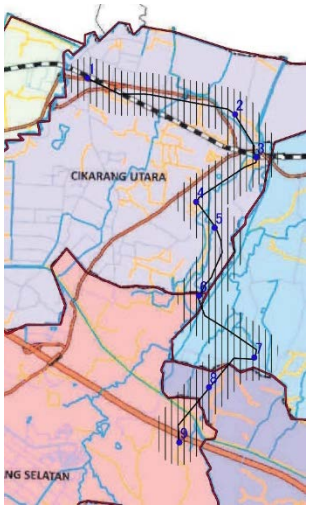
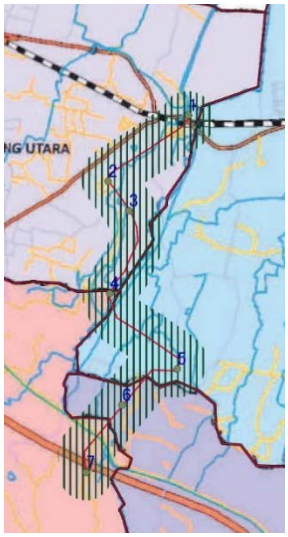
Route A	Route B	Route C	Route D
			
53,107persons/day	53,580 persons/day	62,423 persons/day	37,839 persons/day

Figure 2-22 Estimated number of AGT riders by route alternatives

6) Estimation of OD matrix between stations, sectional transport volumes

To make transport plan for AGT, it is necessary to estimate passengers mobility between stations, OD matrix between stations (OD：Origin Destination)

For its estimation, number of AGT riders estimated in total daily basis is converted into passengers mobility between stations. OD matrix between stations is formulated as follows:

① Division of trips into the intra zonal trips and the others

All trips are divided into intra zonal trips of which both trip-end are included in target area, and inter zonal trips of which either trip-end is located in outer zones of target area (Cikarang district).

Division of trips into intra trips and others is carried out by using intra zonal trip rate model. Intra zonal trip rate is in proportion to target area size, the larger area size is, the higher intra zonal trip rate is. Therefore following estimation model of which explanatory variable is area size is adopted.

$$\text{Intra zonal trip rate} = 0.015\sqrt{S/\pi} + 0.242$$

Where S：Area size of target area（ha）

Assuming the area is the range within 500m from AGT station, intra trip rate is calculated around 45%. Accordingly 45% of total trips is assigned to the mobility between stations and the rest is assigned to external trips outflowing through railway terminal like Cikarang station.

② Boarding & alighting passengers by station

Boarding & alighting passenger are estimated based on population's share of surrounding area of each station as shown in the scheme image.

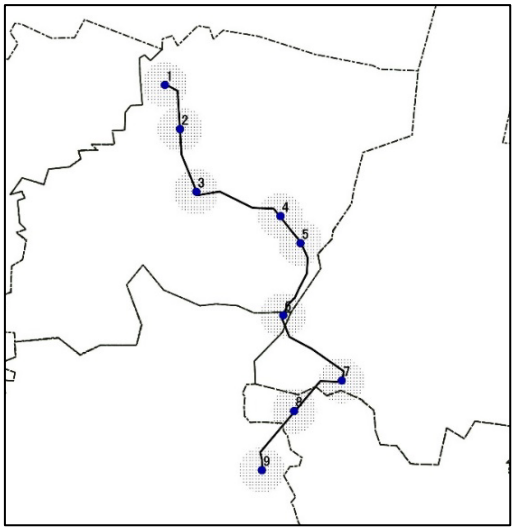


Figure 2-23 Calculation image on population coverage by station

③ Estimation of OD matrix and sectional passengers volume between stations

Table 2-3 OD matrix and sectional passengers volume by route alternatives

【Route A】

Unit: Persons/day

OD	1	2	3	4	5	6	7	8	9	Total
1	0	1,344	1,344	1,344	3,532	3,307	3,116	873	3,236	18,097
2	1,344	0	614	614	611	386	195	143	315	4,223
3	1,344	614	0	614	611	386	195	143	315	4,223
4	1,344	614	614	0	611	386	195	143	315	4,223
5	3,532	611	611	611	0	384	194	142	313	6,397
6	3,307	386	386	386	384	0	123	90	198	5,258
7	3,116	195	195	195	194	123	0	46	100	4,164
8	873	143	143	143	142	90	46	0	73	1,654
9	3,236	315	315	315	313	198	100	73	0	4,867
Total	18,097	4,223	4,223	4,223	6,397	5,258	4,164	1,654	4,867	53,107

Section (St.No.-St.No.)	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
Passengers volume (Persons/day_RT)	36,194	39,262	39,874	38,028	29,366	20,492	12,746	9,732

【Route B】

Unit: Persons/day

OD	1	2	3	4	5	6	7	8	Total
1	0	1,694	1,694	3,656	3,469	3,182	1,231	3,563	18,491
2	1,694	0	712	709	522	236	249	616	4,739
3	1,694	712	0	709	522	236	249	616	4,739
4	3,656	709	709	0	519	234	248	613	6,689
5	3,469	522	522	519	0	173	183	452	5,839
6	3,182	236	236	234	173	0	82	204	4,346
7	1,231	249	249	248	183	82	0	216	2,458
8	3,563	616	616	613	452	204	216	0	6,280
Total	18,491	4,739	4,739	6,689	5,839	4,346	2,458	6,280	53,580

Section (St.No.-	1-2	2-3	3-4	4-5	5-6	6-7	7-8
Passengers volume (Persons/day_RT)	36,982	39,680	39,532	32,614	24,162	16,614	12,560

【Route C】

Unit: Persons/day

OD	1	2	3	4	5	6	7	8	9	Total
1	0	1,469	1,422	1,469	4,043	3,892	3,635	1,073	3,962	20,965
2	1,469	0	569	616	614	462	204	217	533	4,682
3	1,422	569	0	569	567	426	188	200	492	4,433
4	1,469	616	569	0	614	462	204	217	533	4,682
5	4,043	614	567	614	0	461	203	217	531	7,249
6	3,892	462	426	462	461	0	153	163	400	6,418
7	3,635	204	188	204	203	153	0	72	176	4,834
8	1,073	217	200	217	217	163	72	0	188	2,347
9	3,962	533	492	533	531	400	176	188	0	6,813
Total	20,965	4,682	4,433	4,682	7,249	6,418	4,834	2,347	6,813	62,423

Section (St.No.-	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
Passengers volume (Persons/day_RT)	41,930	45,418	46,322	45,074	36,220	26,246	17,570	13,626

【Route D】

Unit: Persons/day

OD	1	2	3	4	5	6	7	Total
1	0	1,696	2,735	2,573	2,298	1,272	2,648	13,221
2	1,696	0	762	573	253	269	661	4,215
3	2,735	762	0	572	252	269	659	5,248
4	2,573	573	572	0	189	202	496	4,605
5	2,298	253	252	189	0	89	218	3,299
6	1,272	269	269	202	89	0	233	2,335
7	2,648	661	659	496	218	233	0	4,916
Total	13,221	4,215	5,248	4,605	3,299	2,335	4,916	37,839

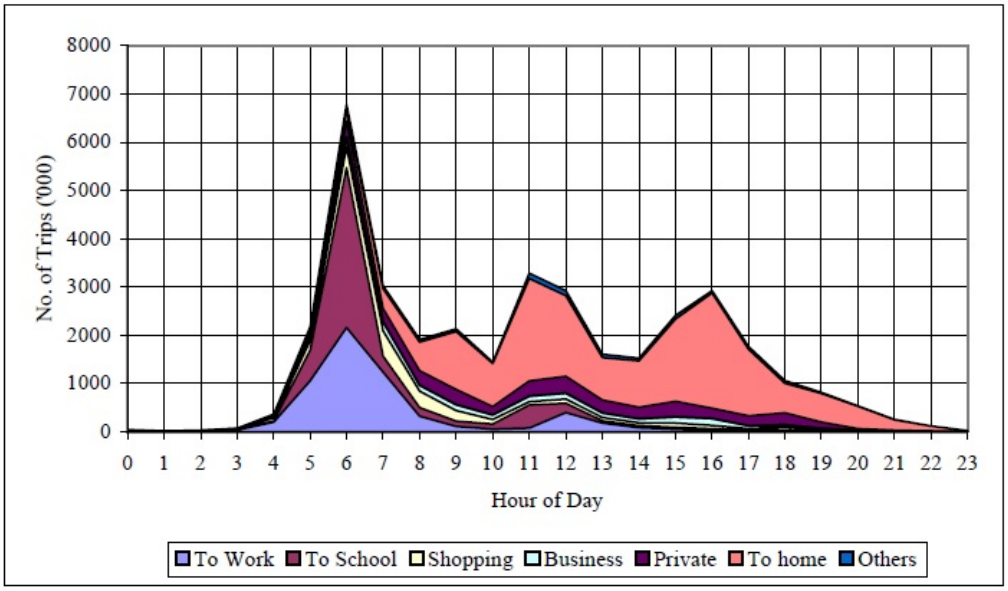
Section (St.No.-	1-2	2-3	3-4	4-5	5-6	6-7
Passengers volume (Persons/day RT)	26,442	28,086	24,596	18,936	13,568	9,832

7) Peak hour sectional passengers volume

① Peak hour ratio of passengers demand

Hourly fluctuation pattern of daily trip volumes by trip purpose, of which data were obtained in past survey on actual person trips (Home interview survey), is shown in Figure 2 24 Hourly fluctuation of trip volumes by trip departure time basis.

The data show that trip volume in a day reaches its peak at around 6 AM with its peak hour rate of 18%. It corresponds to the peak rate measured in one-way flow basis of daily trip generation, if considering peak hour rate in round trip basis, it is calculated to be 1/2 of the former because trip generation and trip attraction should be equal in daily total basis. One way peak hour trip volume is defined as 10% of round trip totals, taking into consideration of safety allowance in transport capacity.

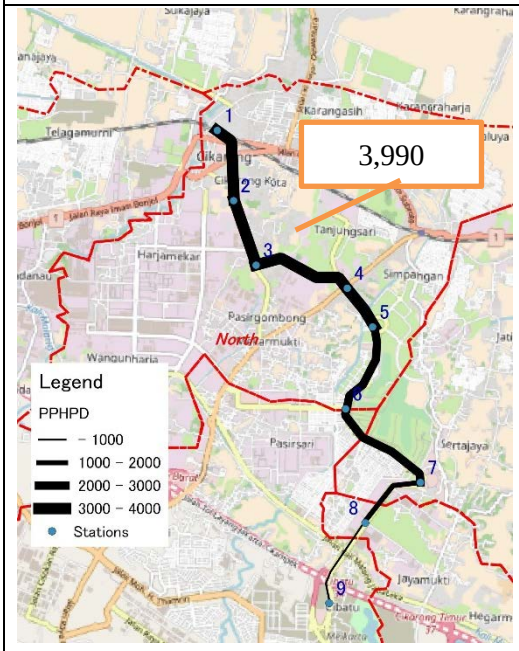
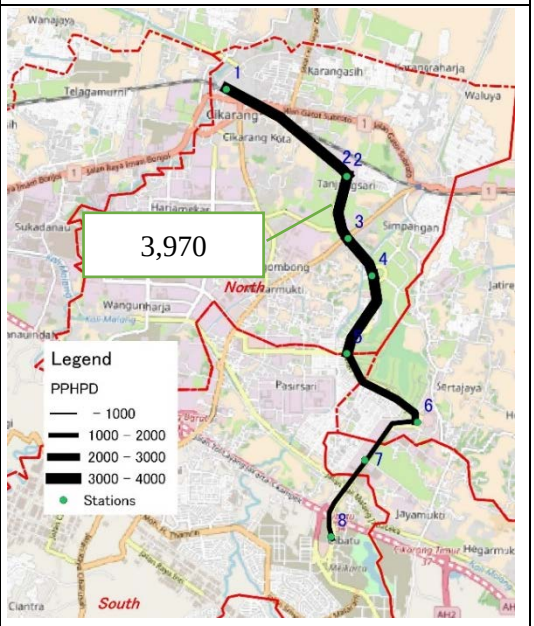
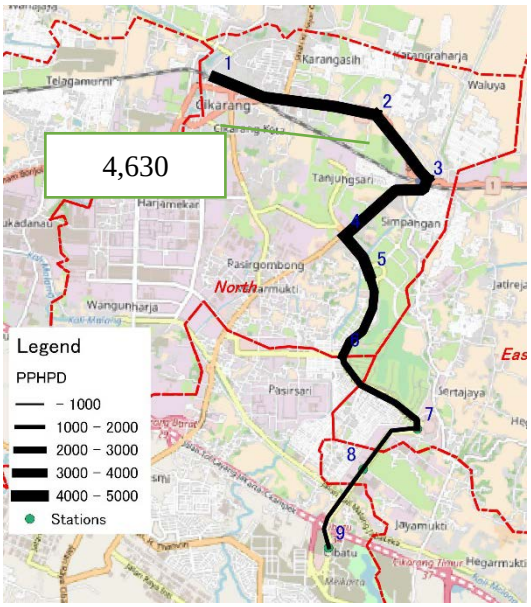
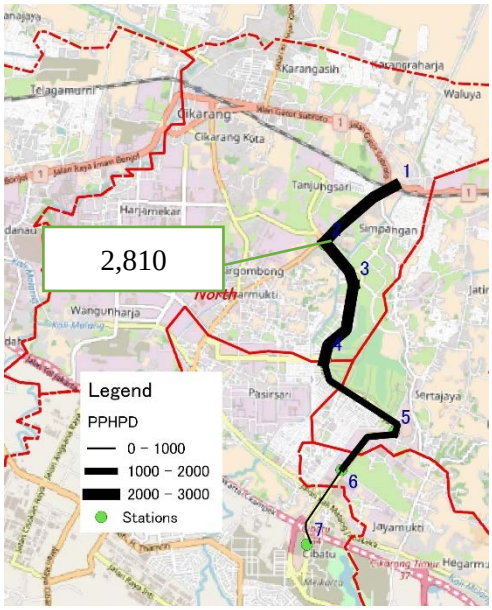


source：SITRAMP(2)Technical Report1

Figure 2-24 Hourly fluctuation of trip volumes by trip departure time basis

② Peak 1 hour sectional passengers volume by route alternatives

Unit : PPHPD

Route A	Route B
	
Route C	**Route D**
	

Note : Number in figures indicates the Maximum volume section.

Figure 2-25 Peak 1 hour sectional passengers volume by route alternatives

(6) Estimation of midterms demand in project duration

1) Calculation method

The population framework as the data base for demand forecast is prepared in 2016, 2020, 2030 and 2040 respectively, and demand forecast was done for the year 2020, which is close to opening year. (However, the value in 2016 is actual result.)

Applying the same methodology to estimate the demand after opening year, mid-term demand is calculated by extrapolation of year 2020's demand in proportion to population growth in the framework.

2) Result

Mid-term demand calculation result for 2024, 2030, 2040 are shown below:

Table 2-4 Trend of mid-term year demand

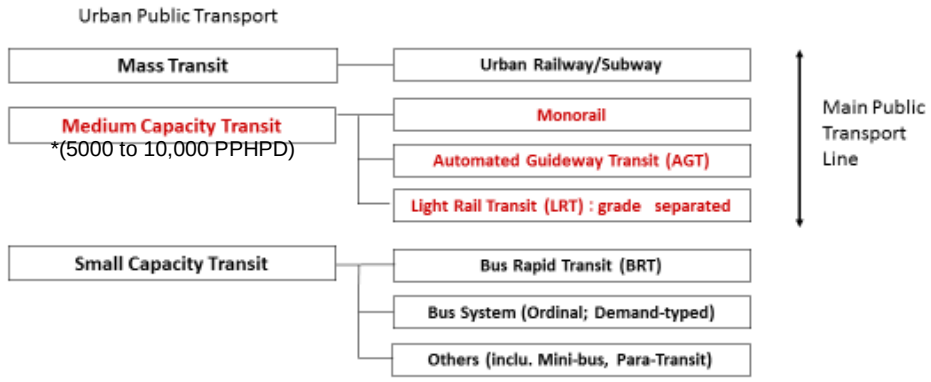
Items	Route	Year			
		2,020	2,024	2,030	2,040
Daily total passengers (persons/day)	A	46,234	55,000	67,000	89,000
	B	53,580	63,000	78,000	103,000
	C	62,423	74,000	91,000	120,000
	D	37,839	45,000	55,000	72,000
Peak 1hour One-way passengers (PPHPD)	A	3,990	5,000	6,000	8,000
	B	3,970	5,000	6,000	8,000
	C	4,630	5,000	7,000	9,000
	D	2,810	3,000	4,000	5,000

Source: JICA Study Team

2.2.2 Comparison of Public Transport System

(1) Range of selecting system from traffic volume; Medium Capacity Transit

Rough estimation in last section shows the demand of this line will be around 3,000 to 9,000PPHPD, though the estimation will be studied in detail in further study. This demand is correspondent to the Medium Capacity Transit. The length of line will be around 10 to 20 km thus the length is target of Medium Capacity Transit as well. Therefore, the line should be served as Medium Capacity Transit, the capacity of which is more than bus system and less than subway.



Source: JICA Study Team

Figure 2-26 Category of Urban Public Transport by Capacity

1) Flexibility corresponding to peak hour

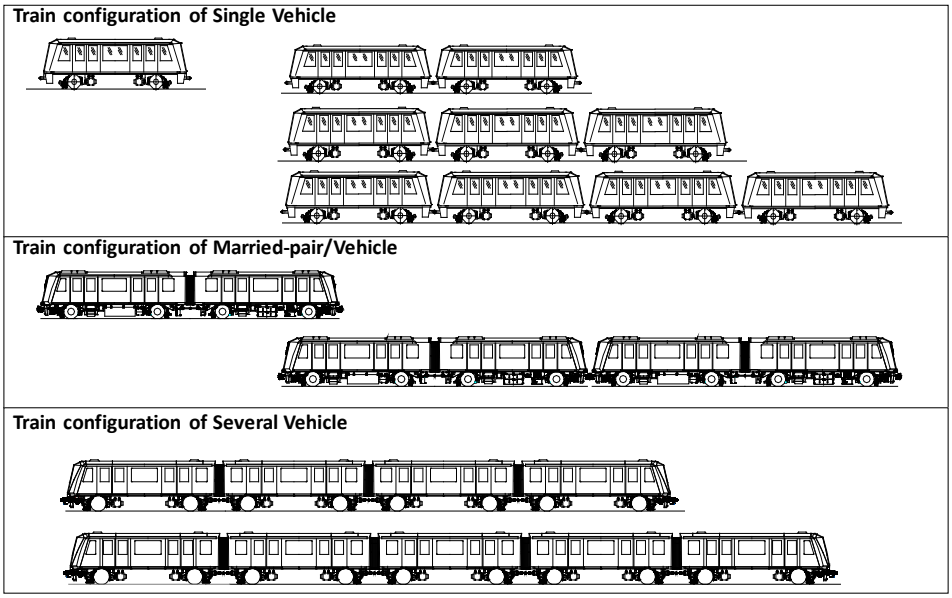
Medium capacity transit includes monorail, AGT and elevated tram. Difference can be defined in two characteristics; one is minimum curve radius capacity and other is maximum grade capacity. Those two characteristics directly connect to flexibility of route alignment. Flexibility of route alignment allows less land acquisition because the alignment fits to road space and smaller depot as well.

Table 2-5Comaprison between Medium Capacity Transit

	Monorail	AGT	LRT; Elevated Tram
			
Outline	The train runs with rubber tires on one rail(Straddle-type) or hang on the rail (Suspended-type).	The train runs with rubber tires on dedicated guideway with guide wheel. Mainly automated system.	The system is operated with lighter rolling stock than ordinal railway on dedicated steel track.
Min.curve radius	50m	30m	160m
Max.grade	6%	10%	3%

Source: JICA Study Team

AGT, which is automated, is capable to serve flexible operation by changing number of trains or cars without worrying about driver. Therefore, AGT is superior to other medium capacity transit in terms of passenger capacity flexibility.



Source: JICA Study Team

Figure 2-27 Example of flexible train sets for various passenger capacity

(2) Cutting edge public transport system for urban development

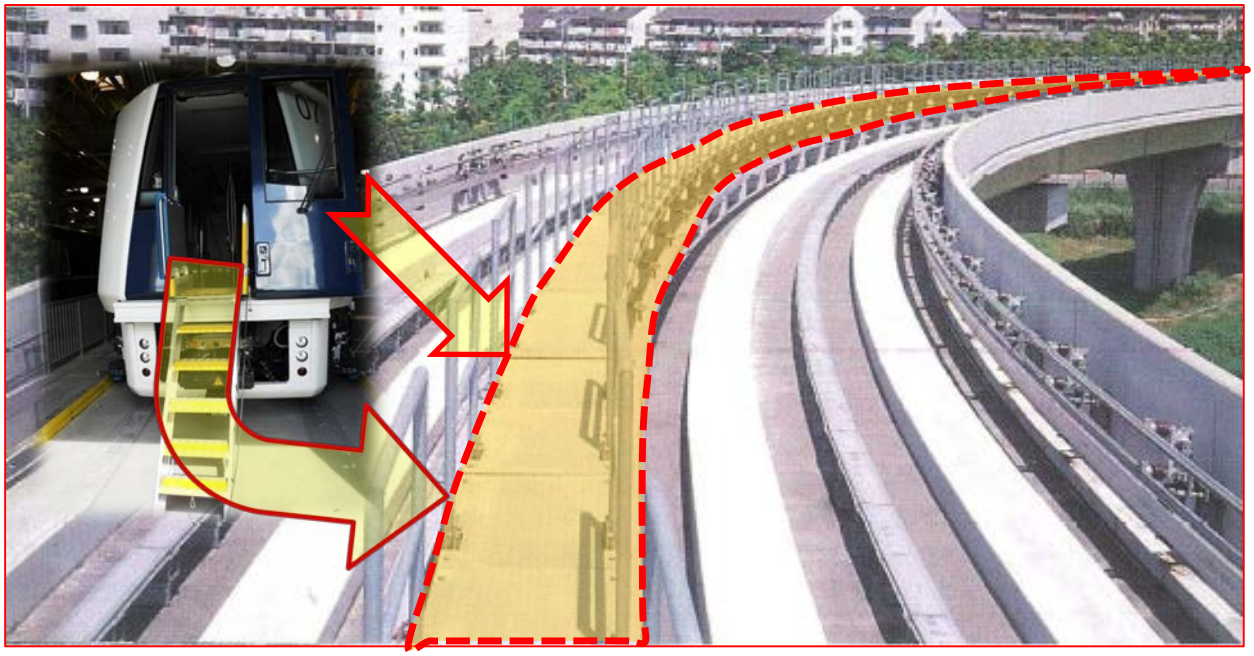
Attractive cutting edge public transport system is required for development of Complex City with CBD and customer facilities.

AGT is driverless operated system and suitable for this purpose. No driver is on board and security and safety of passenger are ensured by using computer based operation management system and monitoring camera in control center. Passenger can communicate with control center by using communication equipment in trains

In case of emergency, passenger will be guided from control center and will be able to evacuate safely through pathway for daily inspection or staff can access via that pathway immediately.

Source: : JICA STUDY TEAM
（left side; control center, right side; operating equipment in driverless operation

Figure 2-28 Image of driverless operation of AGT



Source: : JICA STUDY TEAM

Figure 2-29 Diagram of evacuation in case of accident

2.2.3 Estimation of greenhouse gas emission reduction

Estimation of traffic volume switching to AGT

Although the demand estimation is referred in detail in section 2.2, here uses 100,000 passenger/day as average for several route alternative and secular variation to estimate greenhouse gas emission reduction roughly.

Here demand of AGT and average travel distance is defined as;

① Demand of AGT 100,000 passenger/day

② Average travel distance 5km/passenger×day

Estimation of traffic mode before AGT operation

Modal Split is referred as follows in JUTPI report.

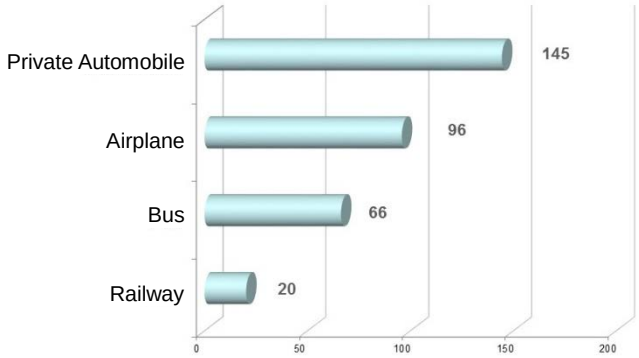
Motorbike; 41%, automobile; 9% →0.8:0.2

Estimation of reduction volume of CO2

Unit emission volume per passenger is referred as follows from Japanese MLIT.

Unit emission volume; automobile; 145-20=125g/passenger*km

Motorbike; 25g/passenger*km(defined as 1/5 of automobile)



Source: : MLIT

Figure 2-30 Volume of CO2 Emission per passenger traffic unit

Estimation of emission volume reduction

From those assumption, 8000 tons of CO2 will be reduced.

Automobile; 100,000 passenger×5km×0.2×125g×365day□4,560 ton/year

Motorbike; 100,000 passenger×5km×0.8×25g×365day□ 3,650 ton/year

2.3 Preliminary design, O&M plan, and Cost estimation

2.3.1 Implementation of rough design

(1) Cross-section standard composition of general section

Show outline of the civil engineering structure general section of superstructure and column.

1) General section of superstructure

For the superstructure, the PC box girder was set as the standard, because has been successful in the previous constructions. In the crossing section of the toll road, in the long-span section will be adopted the steel plate girder.

2) General section of column

The columns are built in the median strip of the road.

3) Others

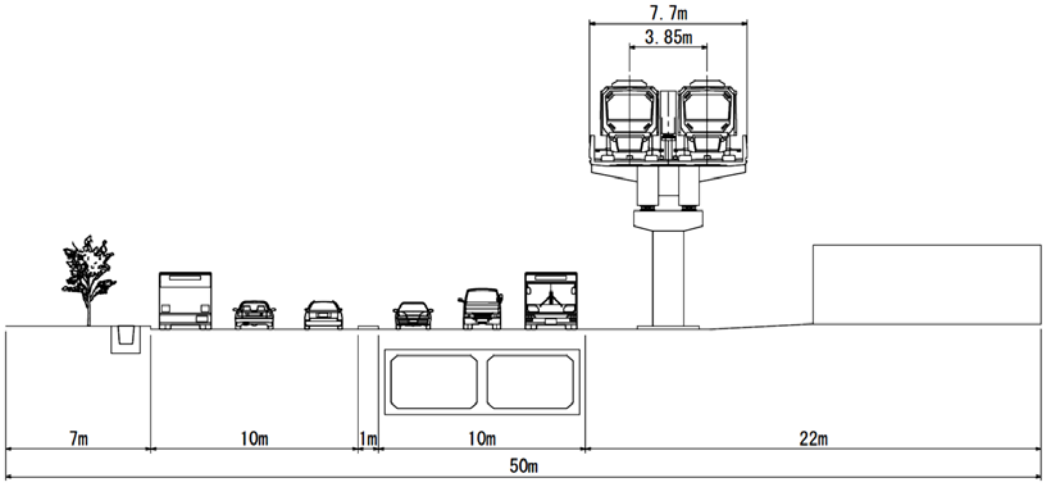
Detailed surveying on the site, geotechnical survey, survey of buried objects are required for the implementation design.

(2) Cross sections standard of general section

Cross section standard of general section is shown as below

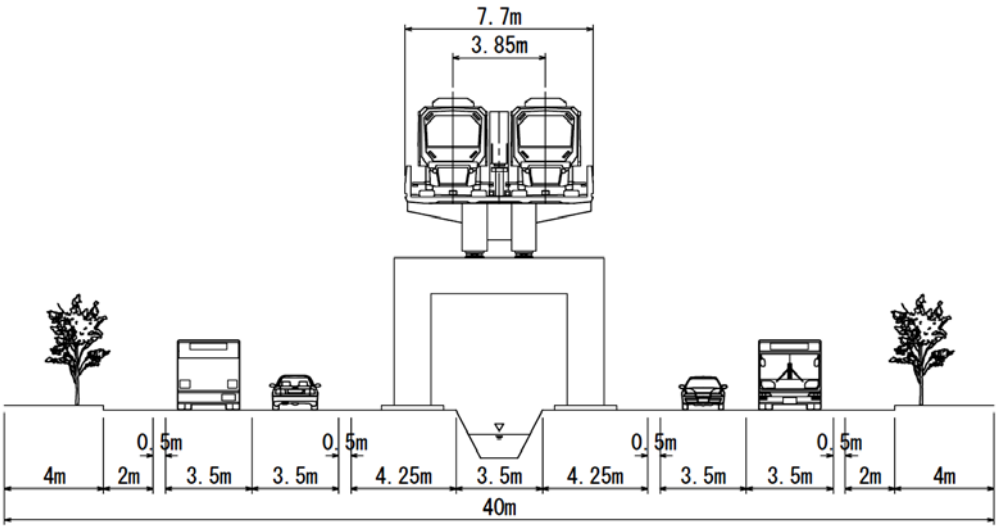
Figure 2-15 assumed an introduction into the road section with a width of 30m (near the intersection of roads: Jalan Raya Lemhabang and Jalan H Umar Ismail). In this section, since the width of the centre median strip was 1m, road widening construction is necessary to introduce AGT into the centre median. Furthermore, since water way were buried under the road, additional measures were also required. For these reasons, at this phase, the project assumed the introduction of AGT to the unused land of the road side.

Figure 2-16 is a standard cross section of a general section referring to a road section with a width of 40m (Jalan H Umar Ismail to Jalan Cikarang Baru Raya). Therefore, since there is a waterway in the center, it is possible to introduce AGT by making it as a gate type piers.



Source：JICA Study Team

Figure 2-31 Standard cross section of a general section（with underground water way）

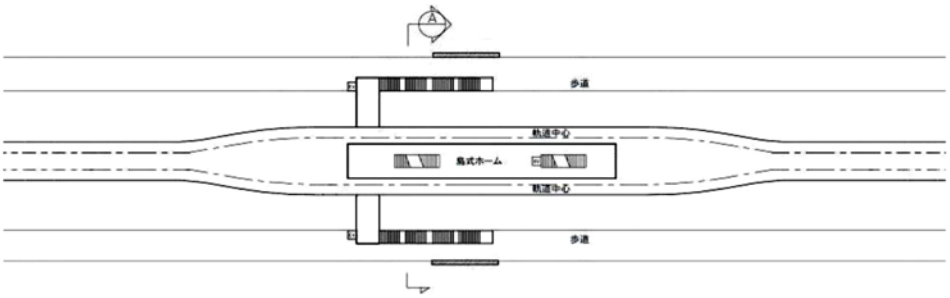


Source：JICA Study Team

Figure 2-32 Standard cross section of a general section（centre water way）

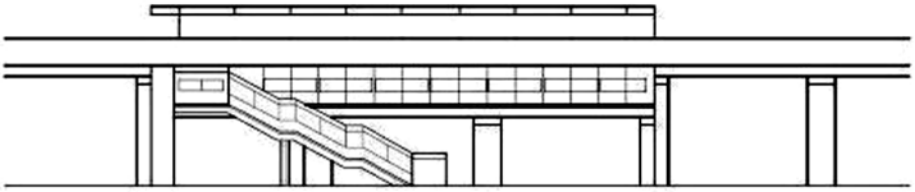
(3) Typical cross-section composition of station

In order to reduce the cost of vertical moving equipment and make the station platform width compact, etc., for the standard station building the island-style platform has been chosen. It is necessary to set the entrance, the one accessing the station, outside the road site. Figure ２.３２ to Figure ２.３４ The figure below shows the outline plan of the station building.



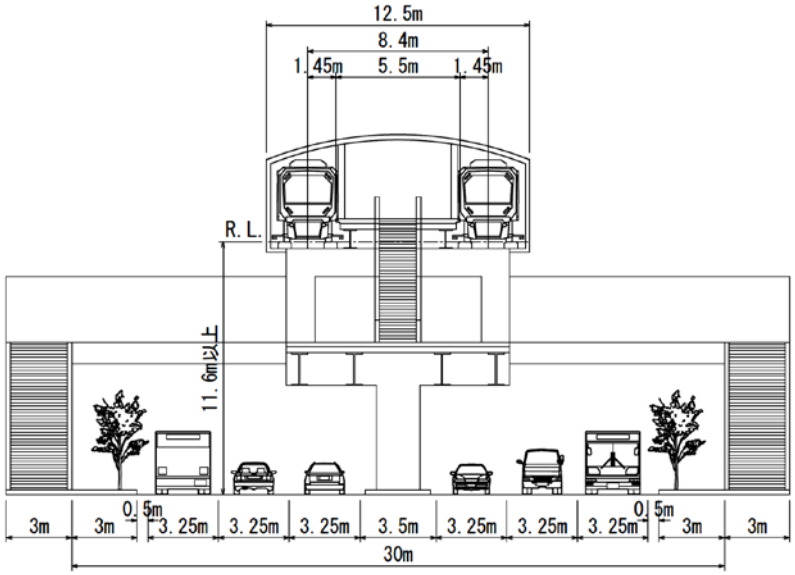
Source：JICA Study Team

Figure 2-33 Standard station building（floor plan）



Source：JICA Study Team

Figure 2-34 Standard station building（single view drawing）



Source：JICA Study Team

Figure 2-35 Standard station building（cross section plan）

(4) Vehicle, Track, Electricity, Signal and Telecommunication System Plans

1) Vehicle Plan

① Outline

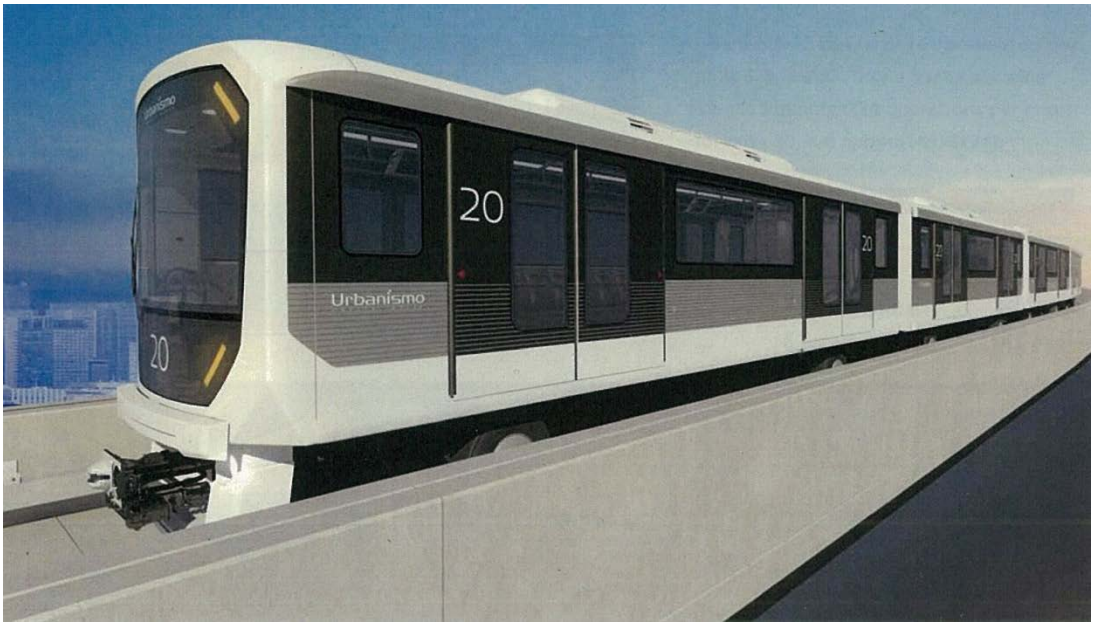
The train is a 4-car vehicle. Multiple vehicles can be coupled together using automatic couplers on both ends of vehicles for emergency rescue case. Fig.2.35 shows the overview of a sample AGT vehicle.

The car body is a welded design with aluminum alloy extrusions and panels in order to reduce weight and minimize energy consumption. As a result, AGT vehicle is making the feature of the new transport system evolve into reduction of the power consumption and silence.

A cart of AGT vehicle is the structure which suppresses shaking by an impact buffering system and improves ride quality as well as achieves durable maintenance and weight saving.

The exterior of AGT vehicle is the simple modern design and the interior takes universal design in. All generation user can be used safety, reliability and comfortably.

The AGT vehicle is usually nonattended operation.



Source：JICA Study Team

Figure 2-36 AGT Vehicle (Sample)

② Vehicle Type and Specifications

ⅰ) Key Parameters

The key parameters and overview of the AGT vehicle are shown in Table 2-6.

Table 2-6 Key Parameters

item	specification
Formation	4-cars /train
Total Train Length	Approx.46.5m
Car Width	Approx.2.8m
Car Height	Approx.3.8m
Weight/Train (without passengers)	59.2t
Maximum Weight/Train	92.8t
Capacity /Train (@ 7persons/m^2)	548 passengers
Minimum horizontal curve radius	30m
Maximum sustained gradient	10%
Maximum Speed	80 km/h
Maximum Acceleration	3.5km/h/s
Maximum Decelation	3.5km/h/s
Emergency Decelation	4.5km/h/s

Source：JICA Study Team

ii) On-Board Equipment (Command, Control and Communication System)

Following on-board equipment (command, control and communication system) is installed.

- ATP/ATO controller
- Vehicle communication Controller
- Dynamic sign
- Speaker
- Intercom
- Etc.

2) E&M Plan

① Track Course and guide Rails

The course is built from the following parts.

- Track course and guide rails
- Switches
- Buffer stops
- Emergency route

The track course will also carry power rails, electricity distribution lines, and cables for the signals and telecommunication in the cable trays.

ⅰ) Track Course

The appearances of track course are shown in Figure. The upper surfaces of two parallel cast-in-place concrete form the running surface for the cars. The track is made within the specified permissible range. The finished surface is ensured adequate friction between the rubber tires and the running surface when accelerating and decelerating under all conditions.

Source：JICA Study Team

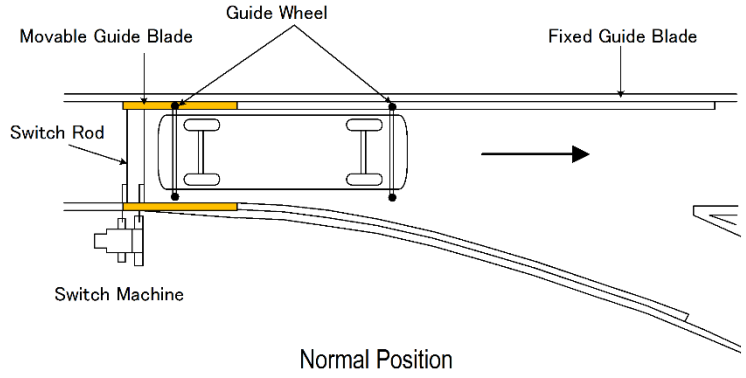
Figure 2-37 Appearance of the Track Course (running surface, guide rails, switches)

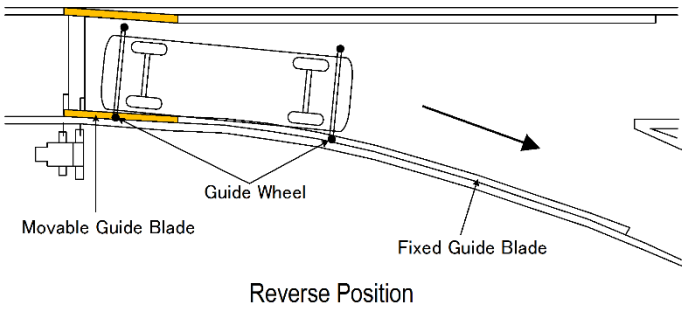
ⅱ) Guide Rails

The guide rails are the structures that support the car trains and weight transfers. The guide rail components include the guide rail, the base plates, and the installation equipment. In general, H-shaped steel beams are used for the guide rails.

ⅲ) Switches

The switch consists of fixed and moveable U-shaped board attached to both sides of the track course, shunts powered by electricity and connecting rods. The idler wheel of the car is guided by the movable boards and used to direct the movement into the desired direction. Switches are controlled by ATC system, and because it is particularly protected by ATP subsystem, safe train operation is possible



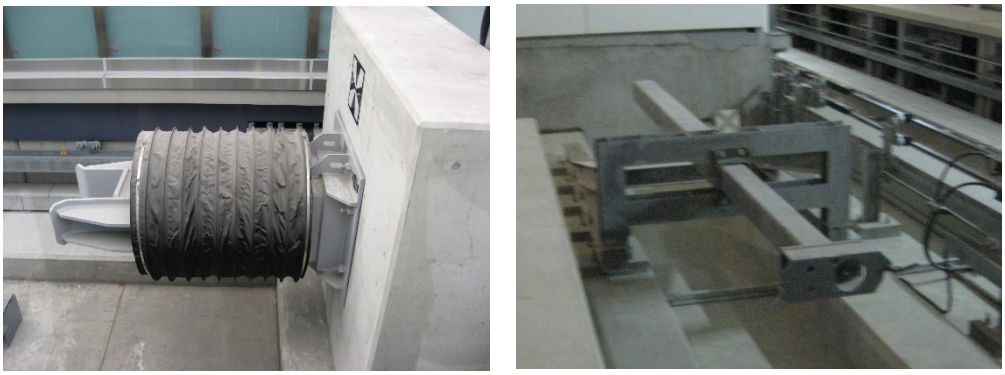


Source：JICA Study Team

Figure 2-38 Switch Mechanism

ⅳ) Buffer Stop

At every end of the track course, a hydraulic buffer is installed. The role of the buffer is to ensure the trains will be brought to a safe and controlled stop in the unlikely event that they overrun the designated stopping position.



Source：JICA Study Team

Figure 2-39 Buffer Stops

② Electrical Power Facilities

AGT system uses electric motors and major equipment such as the signal system and the facilities in stations and depot are powered by electricity. Therefore, power shortage or power interruption will directly result in disruption of train service. As a solution, a redundant power system is necessary.

The power system supplies efficient power for the train's operation in consideration of the system's redundancy. The power supply system, as a collector substation, uses electrical lines from the power station (PT PLN) to receive electricity and supplies electricity to each distributing substation and the station's substation along the track.

ⅰ) Collector Substation

At each of PT PLN's substations, AC150kV is received from overhead high voltage power transmission lines and stepped down to AC20kV.

For the AGT power distribution system, power is supplied from here to AGT receiving substations via the main line and auxiliary line. From these receiving substations AC20kV is distributed to each feeding substation and station electrical room in a 2 systems interconnection method.

At the feeding substations, AC20kV is rectified to DC750V and then provided as power for AGT operation to the depot along the main line.

Power for annex equipment is distributed to on-site equipment after the AC20kV received by the power rooms of each station and depot is stepped down to AC400V/200V by on premises transformers.

ⅱ) Distributing Substations

Each substation is arranged in a double ring redundant configuration. There are two fully rated heavy duty traction transformers capable of continuous operation for the proposed design.

iii) Backup Power Supply

The Uninterruptible Power Supply (UPS) provides power in the event that primary power is not available.

The UPS provides backup power for the following systems:

- ATC system including central control facility
- PDS control power
- Communications equipment (CCTV, public address, emergency phone, radio, dynamic sign)
- Emergency lighting
- Safety and security system
- Data communication, transmission system
- Switch machines

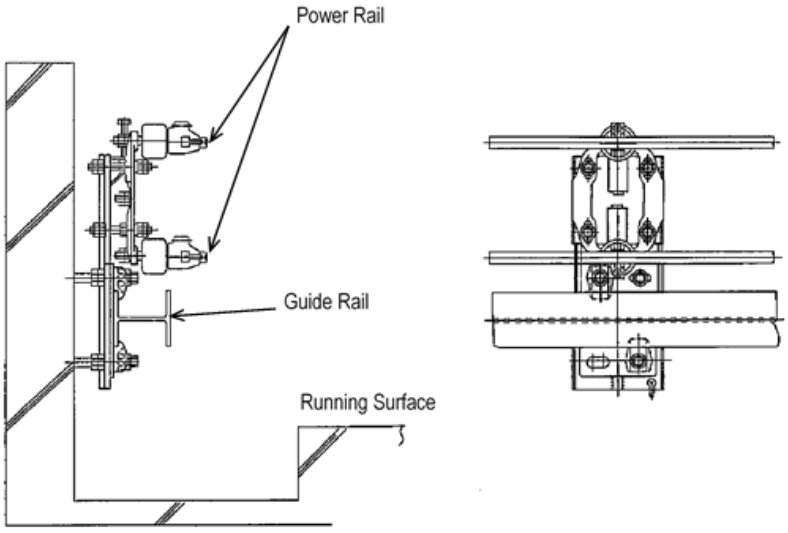
The UPS equipment uses sealed gel cell batteries. AC input is the power source to charge the batteries.

iv) Power Rails

Traction power is supplied to the vehicle through positive and negative power rails installed along the guide way. Propulsion power cables are connected each segment of the power rails on the guide way to the 750 V DC bus. The traction power is collected by two current collectors from two rigid, side contact power rails mounted on the guide way. Figure 2-40 shows power rail installation from other AGT system.

Power rails are made of the following.

- Power rails with aluminum and stainless steel compound
- Mounting devices to clamp the power rails in both the vertical and horizontal directions
- Supporting clamps and anchor bolts
- Thermal expansion points
- Terminal fixtures



Source：JICA Study Team

Figure 2-40 Power Rails

③ Signal System

The signal system of AGT system mainly encompasses three subsystems under the wireless train control system (CBTC).

- Automatic train protection (ATP) subsystem: ATP provides control functions in regards to safety
- Automatic train operation (ATO) subsystem: ATO provides automatic-mode train operation functions, subject to the constraints imposed by the ATP.
- Automatic train supervision (ATS) subsystem: ATS monitors system status and overall operation, manages the system communications interface. ATS performs data recording on operations and sends out warnings to the system when an abnormality occurs. In addition, ATS provides human-machine interface that can be controlled from the center.

Human interface for the ATS system is located in the operation control center (OCC), where the operators can monitor and control the system through ATS. In addition, OCC also allows the control and monitoring of the telecommunication system and changes in the power supply system.

Source：JICA Study Team

Figure 2-41 operation control center

ⅰ) ATP Subsystem

ATP subsystem includes the following main functions.

- Presence detection
- Route settings
- Unintentional motion detection
- Over speed prevention
- Overrun prevention
- Prevention of cars from disengaging
- Lost signal protection
- Detection of zero speed
- Prevention of unintentional door control
- Door control protection interlocking
- Departure interlocking
- Directional change interlocking
- Braking interlocking
- Switch interlocking

ATP functions have precedence over both the ATO and ATS functions.

ⅱ) ATO Subsystem

ATO subsystem includes the following main functions.

- Operation control
- Stop at fixed point by the program
- Door and stop-time control

ⅲ) ATS Subsystem

ATS subsystem includes the following main functions.

- Monitor the conditions of operations
- Control and override operations

④ Communication System

The communication system is for an effective daily operation of the railway system that provides monitoring information on the situation, necessary communication to restore the system quickly during an emergency. The main equipment is as follows.

- Wireless communication systems (Train radio, emergency alarms, wireless for maintenance)
- Telephone facilities (Office telephones, command telephones, interphones etc.)
- CCTV monitoring facilities
- Guidance broadcasting facilities
- Other facilities (Fiber optic LAN, clock, UPS)

ⅰ) Train radio and Emergency Alarm Systems

Train radio is for all communications between the OCC and each train on the route for a safe operation. Plus, the system provides an exchange of communication for smooth operations within the rail yard.

The emergency alarm system is a facility that responds when an emergency occurs on any train on the route that prevents secondary casualties with the emergency alarm features and emergency brake systems.

ⅱ) Telephone Facilities

The telephone facilities are made from a telephone line for office use that uses digital PBX and a line for direct method technical operations that is used only for commands. The office telephone at each station goes through fiber optic LAN equipment allowing the simultaneous use of cordless handsets.

The command telephones make communication between the 4 systems; operations, power supply, rail and the switch stand with the OCC possible. At the same time, the rail and the switch stand system can use the office phone simultaneously.

ⅲ) CCTV

Each station will be equipped with CCTV cameras to monitoring the situations at the platform and concourse from the OCC. An exclusive fiber optic LAN is used only for image transmission because the size of transmitted images is large. Plus, each station building can monitor its own station premises. These images at the station including the rail yard can be recorded.

ⅳ) Guidance Broadcasting Facilities

At each station, the approximation, arrival and departure of the train will be announced. General broadcasts will be broadcasted from the OCC's operation management facility. However, it is also possible for optional broadcasts from each station's broadcasting facility or from the OCC's.

v) Other equipment

For the OCC and the trains or among the stations to transmit regulated data or audio data efficiently, fiber optic LAN is used. The fiber optic cables allow high precision transmission even in environments that have a lot of background noises like induced noise, thunder and crosstalk interference.

The clocks used by the railway system is a master clock that sends time signals to secondary clocks that are placed at rail yards, each station, time servers that transmit information on the time to the rail yard management equipment, power management equipment and operation management equipment.

⑤ Station facility (Automatic Fare Collection)

Each station's automatic ticket vending machines, automatic ticket gates, exit fare machines are connected to the station's server. The station's server monitors each machine's condition and processes the calculations and sales of tickets. The station's server is connected to the centre's server accumulates processed data from the station and sends it to the centre's server.

(5) Depot plan

1) Outline of Depot

Maintenance management facilities of vehicles and facilities, the vehicle stabling yard and the management office are built in the AGT depot for safety operation and maintenance management.

2) Depot location

Depot location isn't shown in this report to be entrusted to another conference.

3) Depot area

Maintenance facilities necessary to the introduction stage of AGT system are set in the depot. And it's made the plan which considered expansion of facilities with future demand increase.

The area of the depot is necessary about 4 ha.

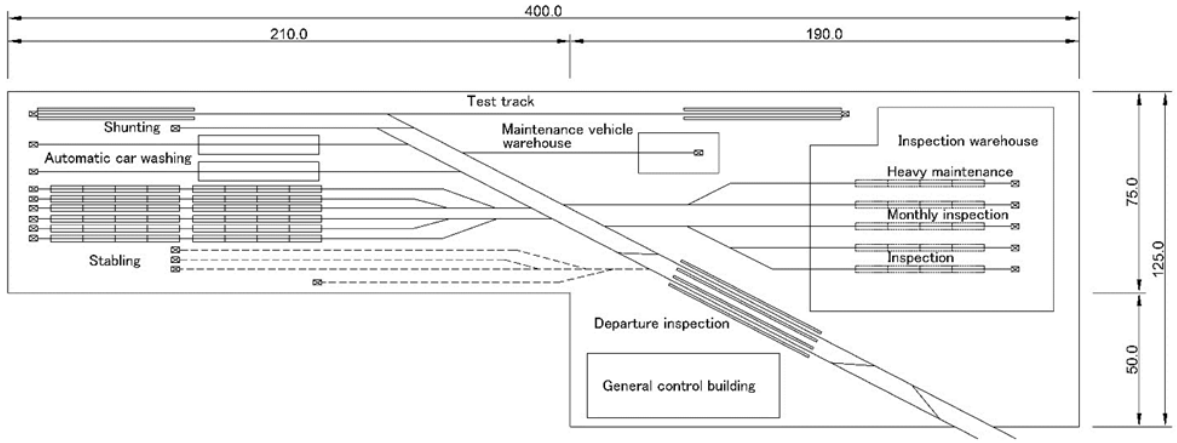
4) Depot Functions

The main functions of the depot are as follows.

- Stabling facility: stabling track for vehicles outside of operating service.
- Inspection and maintenance facility: Facility for inspection and maintenance of AGT system vehicles.
- General control building: General administration office which includes a system operation office and operation control room.
- Substation: For provision of a power source for main line and depot operating power, other various power and lighting.
- Maintenance vehicle stabling track: Stabling track for maintenance vehicles which carry out route, structure and electrical facility inspections and maintenance.
- Vehicle washing facility: Vehicle cleaning and vehicle washing facility
- Other: Drainage treatment facilities, warehousing, oil storage, etc.

5) Depot layout

Depot layout is shown in Figure 2-42.



Source：JICA Study Team

Figure 2-42 Depot layout

6) Function and Roles of Each Track

① Approach Track (2 tracks)

This track is the approach track between main line and depot. The entrance to the depot shall be a downgrade from elevated level. The gradient for the approach track shall be 60‰ or less.

② Arrival/Departure Inspection Track (2 tracks)

This track will be located on a straight, flat section which connects to the approach track for inspections of vehicles before departure.

③ Stabling Track (6 tracks)

6 stabling tracks will be installed for vehicle stabling in the depot.

6 stabling tracks will be installed at the operation opening stage and 4 tracks will be added for vehicle increase in the future.

④ Automatic Car Washing Track (2 track)

A vehicle washing machine will be installed on this track and used to wash vehicles. Vehicle interior cleaning will be carried out on the stabling track.

⑤ Test Track (1 track)

The test track is necessary to be installed in the depot in order to test runs of vehicles after maintenance. The length of this test track shall be approximately 300m.

⑥ Shunting Track

Shunting tracks will be installed to allow vehicles movement within the depot. Vehicles shall not be stabled on these tracks.

⑦ Stabling Track for Maintenance Vehicles (1 track)

Stabling track for maintenance vehicles will be installed for stabling maintenance vehicles that need to carry out a maintenance for running surface and other facilities.

7) Inspection/Maintenance Track and Frequency

① Heavy Maintenance Track (1 track)

Track for carrying out heavy overhauls (every year, every 3 years) and semi overhauls (every 6 years).

② Monthly inspection Track (2 tracks)

Track for carrying out train monthly inspections (every 3 months).

③ Inspection Track (2 tracks)

Track for carrying out train inspections (every 3 days).

8) Depot inspection and maintenance facilities

Typical main equipment is shown in Table 2-7.

Table 2-7 Typical Main Equipment

No.	Description
1	Car Washing Machine
2	Lifting Jacks, 6 t
3	Bogie Stand
4	Body Stand
5	Gantry Crane
6	Umbilical Power Cable (Stinger)
7	Wheel Tire Changer
8	Forklift
9	Mobile Lift Table

Source：JICA Study Team

9) General Control Building

In this building, OCC which carries out the operation of vehicles in the main line and depot, offices for management and maintenance division and other required facilities will be installed.

10) Other Facilities

- Receiving substation
- Warehouse, oil storage
- Drainage treatment facility
- Emergency garage
- Other

11) Depot Operation Mode

Vehicles are operated by semi-automatic driving mode in stabling track of the depot. When vehicles enter to maintenance workshop, vehicles are operated by driver's manual driving mode. Inside the workshop power is provided through the installed power cables (stingers).

(6) Complicated section and issues (Overhead power line, toll road cross section)

The issues of the part crossing the toll road regarding complicated sections, are shown as below:

① Since the current bridges are not designed to support the load of the AGT, it is necessary to install a bridge for AGT separately to ensure the AGT linearity. By this way the approach part to the intersection is necessary.

② In the AGT introduction route, the east side route is preferable; however when the bridge piers are installed between the main line and the ramp way, the route direction should be west side.

③ Because the main line of the toll road has 4 lanes on one side, 8 lanes in both directions, it is difficult to install bridge piers in the center of the toll road. Therefore, the bridge will be over 40m in span (3.5 m × 8 lane + 3 m median stripe + shoulder 2 m × 2 + pier + margin).

④ Since there is a lamp way besides the main road of the toll road, construction will be done in a narrow space and, at the time of construction, will be necessary to consider a replacement for the ramp way.

⑤ If the replacement of the ramp way is difficult, would be necessary to cross over the highway by 1 span so AGT's bridge may be adopted truss and ED bridge, etc.

(7) Operation Plan

Regarding the Route A, in the table of “Table 3-4 Comparative evaluation of each route” in 3.2.1 Determination of project scope (route planning) to be described later, it is evaluated and organized as "the difficulty of the project is the highest due to the temporal constraints of land acquisition".

Therefore, after this operation plan, for the detailed examination of 2.3.2 Rough Estimation of Project Cost and 2.3.3 O & M plan, we will carry out three options, "Route B", "Route C" and "Route D", which are alternatives to the route plan.

1) demand

A demand forecast using an operation plan are shown for each route.

Since Route A is assumed to be very difficult to secure short term introduction space in the prefectural road section (2.5 km section from Cikarang station), it is excluded from detailed examination after that.

(Reference: 3.2.1 Determination of project scope (route planning), Table 3.4 Comparative evaluation of each route)

Table 2-8 Demand Forecast Results（Route B）

Demand	Forecast Year		
	2024	2043	2053
No. of passengers per day (passenger / day)	63,000	111,700	140,700
Passengers per hour in peak direction(PPHPD)	5,000	8,600	10,600

Table 2-9 Demand Forecast Results（Route C）

Demand	Forecast Year		
	2024	2043	2053
No. of passengers per day (passenger / day)	74,000	128,700	157,700
Passengers per hour in peak direction(PPHPD)	5,000	9,600	11,600

Table 2-10 Demand Forecast Results（Route D）

Demand	Forecast Year		
	2024	2043	2053
No. of passengers per day (passenger / day)	45,000	80,700	109,700
Passengers per hour in peak direction PPHPD	3,000	5,600	7,600

Source: JICA Study Team

2) Transport Capacity

① Transport Capacity per Train

The transport capacity per train in 4 car formations is shown in Table 2-11 below.

The density of the standing passengers is calculated in a part of the peak time, and in order not to significantly lower the service level, to suppress the number of high cost vehicles, assuming an average congestion rate of about 180%, 7 passengers / m^2 was applied.

(18 passengers in each seat, 57 passengers in the standing (calculated in Japan's JIS standard: 0.3 m^2 / passengers), about 180% (137 passengers / car) against the capacity of 75 passengers)

Table 2-11 Transport Capacity per Train

Train Formation	Transport Capacity (passengers/train)		
	Seating	Standing	Total
4 car formation	72	476	548

Source: JICA Study Team

② Headway and Transportation Capacity

The train formation and operation interval are examined to secure a transport capacity suitable for the demand.

The route transport capacity for 4-car train of 3.5 minutes, 4 minutes, 5 minutes, 6 minutes, 8 minutes, and 10 minutes headway are shown in Table 2-12.

Table 2-12 Transport Capacity (PPHPD)

Headway (min.)		3.5	4	5	6	8	10
Train Formation	4 car formation	9,316	8,220	6,576	5,480	3,836	3,288

Source: JICA Study Team

3) Operation Conditions

① Service Hours

In order to fulfill a role as a railway feeder, the service hours of the line will be set 17 hours to from 5:30AM to 10:30PM based on estimates of the workers transit time.

Among this, the morning peak time will be set to the 2 hours from 6AM to 8AM and the evening rush to the 2 hours from 5PM to 7PM.

② Schedule Speed

The train schedule speed is estimated from the average distance between stations, train positive acceleration and maximum speed. In addition, the route will be installed elevated and separate from automobile traffic so road traffic will not have an effect on train speed. There are also no steep grade sections which will affect scheduled speed.

Dwell time at stations 20 seconds, the schedule speed is calculated at 30km/h.

4) Required Number of Vehicles

Route transport capacity will be expanded to accommodate future demand.

The number of required vehicles is determined from the train formation and headway based on the transport capacity needed to be provided at each stage.

Table 2-13 Headway and Required number of vehicles（Route B）

Year	Train Formation	Headway (min.)	Required Trains		Required Vehicles
			Operation	Standby/Spare	Total
2024~2026	4 car formation	6	9	2	44
2027~2032		5	11	2	52
2033~		4	13	2	60

Source: JICA Study Team

Table 2-14 Headway and Required number of vehicles（Route C）

Year	Train Formation	Headway (min.)	Required Trains		Required Vehicles
			Operation	Standby/Spare	Total
2024~2025	4 car formation	6	10	2	48
2026~2028		5	12	2	56
2029~2036		4	15	2	68
2037~		3.5	17	2	76

Source: JICA Study Team

Table 2-15 Headway and Required number of vehicles（Route D）

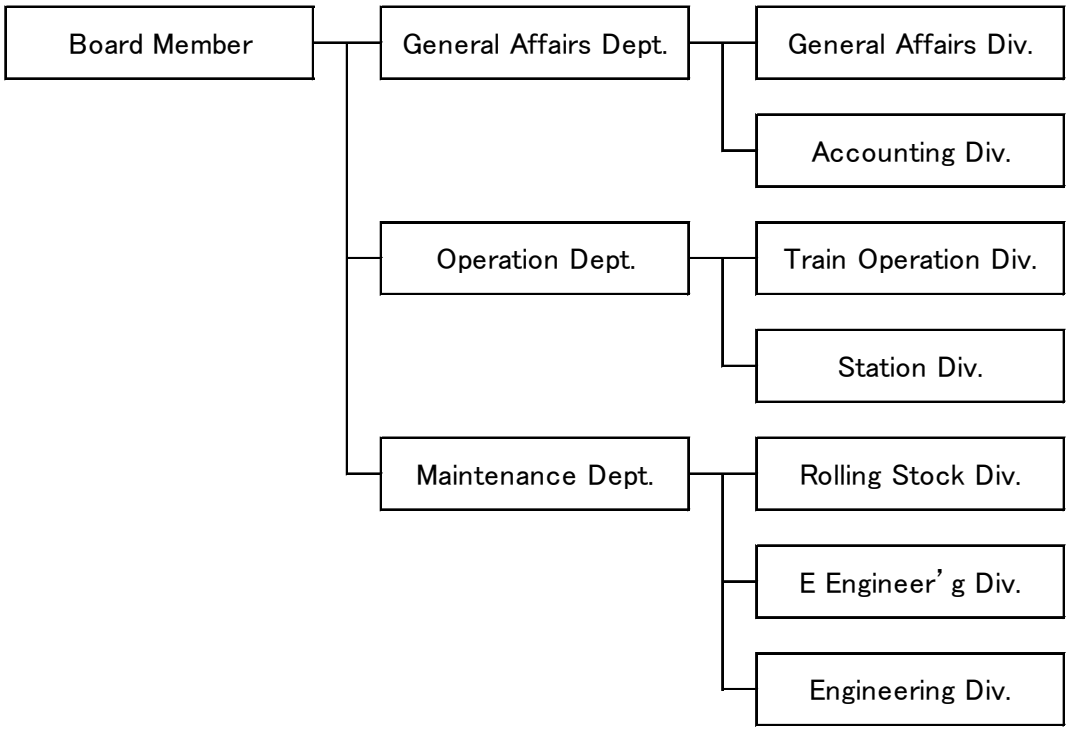
Year	Train Formation	Headway (min.)	Required Trains		Required Vehicles
			Operation	Standby/Spare	Total
2024~2025	4 car formation	10	5	2	28
2026~2029		8	6	2	32
2030~		6	7	2	36

Source: JICA Study Team

2.3.2 O&M Plan

1) Operation Organization

The operation organization of Cikarang AGT serves will be set up referencing the organization system of the Japanese AGT system with proven results. AGT operation organization proposal based on the example in Japan is shown in Figure 2-43.



Source：JICA Study team

Figure 2-43 Proposed Organization

2) Required Number of Staff

As for the number of Staff, we calculate with reference to the staffing system of AGT in Japan as well as operating system. The number of Staff at the opening time is shown below.

Table 2-16 Required Number of Staff（Route B）

Duty			Number of Staff	Note
Board Member			3	15% of Head Office
Staff	Head Office	General Affair	4	
		Operation	3	
		Engineering	2	
		E. Engineer's	2	
		Rolling Stock	3	
		Sub Total	14	15% of Field Operation
	Field Operation	Train Operation	10	3(on duty)×2.5(shift) ×1.3(spare)
		Station Staff	44	5.5 people per a station
		Engineering	11	0.9 people per 1 operation km
		E. Engineer's	17	1.4 people per 1 operation km
		Rolling Stock	9	0.2 people per 1 car
		Sub Total	91	
	Total		108	

Source：JICA Study team

Table 2-17 Required Number of Staff（Route C）

Duty			Number of Staff	Note
Board Member			3	15% of Head Office
Staff	Head Office	General Affair	4	
		Operation	3	
		Engineering	2	
		E. Engineer's	2	
		Rolling Stock	3	
		Sub Total	14	15% of Field Operation
	Field Operation	Train Operation	10	3(on duty)×2.5(shift) ×1.3(spare)
		Station Staff	50	5.5 people per a station
		Engineering	13	0.9 people per 1 operation km
		E. Engineer's	20	1.4 people per 1 operation km
		Rolling Stock	10	0.2 people per 1 car
		Sub Total	103	
	Total		120	

Source: JICA Study Team

Table 2-18 Required Number of Staff（Route D）

Duty			Number of Staff	Note
Board Member			3	15% of Head Office
Staff	Head Office	General Affair	4	
		Operation	3	
		Engineering	2	
		E. Engineer's	2	
		Rolling Stock	3	
		Sub Total	14	15% of Field Operation
	Field Operation	Train Operation	10	3(on duty)×2.5(shift) ×1.3(spare)
		Station Staff	39	5.5 people per a station
		Engineering	9	0.9 people per 1 operation km
		E. Engineer's	14	1.4 people per 1 operation km
		Rolling Stock	6	0.2 people per 1 car
		Sub Total	78	
	Total		95	

Source: JICA Study Team

3) Education and training

① Education and training of staff are indispensable for operation.

② It is necessary to carry out education and training of the personnel before commencement of operation for smooth operating management. Also, it is necessary to create an education and training manual before education and training implementation.

③ Instructors shall be about 5 to 10 foreigners of operating companies with track records. After commencement of operation the instructors shall continue the personnel's education and training as the management, and maintain safe and smooth management organization.

④ The personnel strive for improvement in technologic abilities, receiving instructor's education at the workplace (OJT) from the preparatory step before commencement of operation, and get opportunities to receive more practical education and training.

2.3.3 Project Implementation Schedule

Table 2-19 shows the implementation schedule of proposed project. Implementation schedule is divided into the preparation stage, the construction stage and the operation preparation stage.

The proposed schedule finishes the preparations stage which are authorization, financing, and etc. by first in 2020 and puts construction work into effect in about 4 years after the preparation stage, and operation start in 2024.

AGT system is introduced for the first time in Indonesia, so operation regulations, employment regulations, operation schedule, instruction manuals and etc. should be made based on Indonesian railway operation regulations and the same operation regulations in Japan and neighborhood countries.

It's assumed that education and training for AGT system conducts in Japan where commercial operation is done before operation of AGT in Indonesia.

Table 2-19 Project Implementation Schedule

	Item	priod (month)	2017	2018	2019	2020	2021	2022	2023	2024
1	Preparation Stage									
1-1	JICA PPP Study	9								
1-2	EIA Study	6								
1-3	Tender/Contract	6								
1-4	Project Approval	1								
1-5	SPV Establishment	3								
1-6	Authorization	3								
1-7	Procurement of Funds	3								
1-8	Land Aquisition	6								
1-9	Utility Transfer	3								
2	Construction Stage									
2-1	Construction Preparation Period	3								
2-2	Detailed Design	12								
2-3	Structural Construction	48								
2-4	Test Running and Handover	12								
3	Operation Preparation Stage									
3-1	Project Organization Formation	8								
3-2	Creation of Operation Regulations	8								
3-3	Education and Training	8								
4	Commercia Operation Openning									★

Source：JICA Study Team

3 The compliance criteria

3.1 Compliance with applicable laws and regulations

3.1.1 Legal analysis

To secure compliance with applicable laws/regulations related to the Project, critical legal aspects required to clarify for project implementation have been reviewed by lawyers in Indonesia. Legal opinions by the lawyers are summarized as below.

(1) Legal framework for PPP

The framework of government-private cooperation is regulated under President Regulation No. 38 of 2015 on Cooperation between Government and Business Entity in Infrastructure Development ("**PR 38/2015**") and its implementing regulations which includes regulations from the Minister of Finance ("**MOF**") and Minister of National Development Planning / Head of National Development Planning Agency ("**Bappenas**").

Government-private cooperation is often referred to as "KPBU" (*Kerjasama Pemerintah dengan Badan Usaha*), or more commonly coined as public-private partnership (PPP).

Regulations pertaining to PPP generally set out general requirements and procedures of PPP but leave room for further sectoral regulatory to avoid conflicting provisions. As such, in practice the implementation of PPP in different sectors could be different depending on more specific regulations pertaining to each particular sector.

For example, PPP regulations do not name the name of licenses which should be acquired by Business Entity because that will depend on the requirements in each sector. Bappenas Regulation No. 4 of 2015 on Procedures for the Implementation of Public Private Partnership in Infrastructure Provision ("**Bappenas Reg. 4/2015**") provides that one of the responsibilities of the GCA is to assist the process of granting licenses for the implementation of PPP to the extent of its authority, but it makes no mention about what license to obtain.

Regulations on PPP provide various features which may look attractive to Business Entity, such as:

A) government support (which includes viability support (dukungan kelayakan, also known more commonly as Viability Gap Fund ("VGF"));

B) government (infrastructure) guarantee; and

C) availability payment method.

(2) Legal framework for the railway sector

Railway systems in Indonesia are regulated under Law No. 23 of 2007 on Railway ("**Law 23/2007**") and its implementing regulations, principally Government Regulation No. 56 of 2009 on Railway Operation ("**GR 56/2009**") as amended by Government Regulation No. 6 of 2017 on the Amendment of GR 72/2009 ("**GR 6/2017**"), and further ministerial regulations.

Law 23/2007 sets out different authorities for railways depending on the location of the railway lines, as follows:

A) for inter-province railway, the governing authority is the Ministry of Transportation ("MOT")

B) for inter-city or inter-regency railway, the governing authority is the governor of where the cities or regencies are located; and

C) for intra-city or intra-regency railways (i.e. where the railway sits within one single Regional Government area), the governing authority is the mayor or the regent.

The implementation of railway systems must at all times comply with national, provincial and city/regency railway master plans.

(3) Consistency between PPP laws/regulation and railway sector laws/regulations

Upon our checking on several regulations related to railways and PPP, we found no conflict between the two. As stipulated in Section, PPP regulations leave several aspects related to industries to sectoral laws and regulations to avoid overlapping.

The complementary nature of the two sets of regulations can be seen in MOT Reg. 15/2016 which makes a reference to PR 38/2015, stipulating that the procedure and mechanism for cooperation between government and business entities in the field of railways shall be in accordance with the laws and regulations applicable in the field of PPP in infrastructure provision.

(4) Possibilities for private participation into railway business

Implementation of public railways is divided into two parts, namely implementation of:

A) rolling stock (sarana); and

B) infrastructure (prasarana), which includes railway line, railway station, and operation facilities of the railway.

The implementation of rolling stock includes the procurement, operation, maintenance, and utilization of the rolling stock, whereas the implementation of infrastructure includes the construction, operation, maintenance, and utilization of the facilities.

Implementation of each the rolling stock and infrastructure facilities and can be conducted by a "Business Entity". A "Business Entity" is defined in Law 23/2007 as State-owned entity, Regional-owned entity, or Indonesian legal entity established specifically for railway. A Business Entity can implement railway rolling stock and infrastructure by itself or through a cooperation. The law is silent on who this cooperation may be conducted with, but based on our consultation with DGR officials, the cooperation may be conducted with government and private entities depending on the scope of the cooperation.

Articles 23 and 31 of Law 23/2007 provides that implementation of rolling stock and railway infrastructure may be conducted by a "Business Entity". As elaborated in the above, this also includes private parties. As an example, PT Kereta Cepat Indonesia (a limited liability company established in Indonesia) is the implementing Business Entity for the fast train connecting Jakarta and Bandung provinces.

A company in the business of implementation of rolling stock and railway infrastructure falls under KBLI[14] No. 49111 which foreign shareholding is not limited in President Regulation No. 44 of 2016 on List of Business Closed and Open with Conditions in Investment. Therefore this line of business is open to 100% foreign shareholding. We consulted this matter with Investment Coordination Board (BKPM) official who confirmed our understanding.

(5) Licenses/permits for railway business

For implementation of rolling stock, a Business Entity requires:

A) a business license (issued by MOT); and

[14] KBLI (*Klasifikasi Baku Lapangan Usaha Indonesia*) is a classification of economic activities which is issued by the Head of Statistics Center Agency.

B) an operational license (issued by either MOT, governor or regent/mayor, depending on their authority).

A Business Entity is not required to enter into any agreement for the implementation of rolling stock.

For implementation of railway infrastructure, Business Entity must:

A) be determined as a railway infrastructure implementor by either MOT, governor or regent/mayor (depending on their authority);

B) enter into an implementing agreement with either MOT, governor or regent/mayor (depending on their authority); and

C) obtain business license by either MOT, governor or regent/mayor (depending on their authority).

According to Article 18 of Law 23/2007, implementation of public railway infrastructure includes the following activities:

A) construction

B) operation;

C) maintenance; and

D) utilization of the infrastructure.

These set of activities are cumulative in nature, where the implementing Business Entity will be responsible from the construction stage until the operation, maintenance, and utilization stage. Therefore from the GCA's perspective, there is only one Business Entity in charge for the project.

For the implementation of facilities of public railway, there are three licenses that must be obtained, namely:

A) a business license;

B) a construction license; and

C) an operational license.

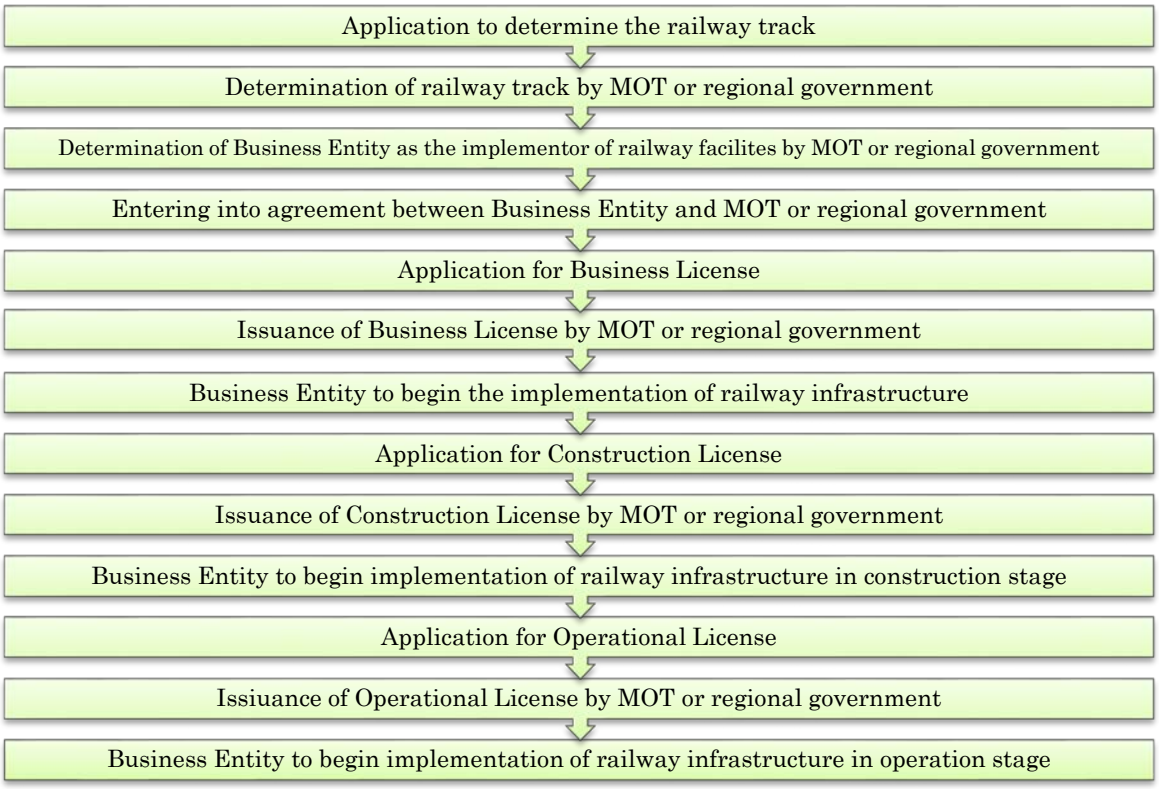
All these licenses must be obtained by and will be issued under the name of Business Entity.

In practice, the construction must be conducted by a contractor which has a construction permit, and the operation and maintenance may be conducted by a separate O&M service provider, or by Business Entity itself. We have consulted this further with DGR official who confirmed that Business Entity can engage other parties as deemed necessary in order to complete the Project.

(6) Process for licenses/permits

For the process of implementation of railway infrastructure, Business Entity must first enter into an agreement with the authorized government institution and thereafter apply for each license in stages.

The process can be seen in the following flowchart:



Source: JICA Study Team

Figure 3-1 Process for licensing

3.1.2 Foreign Investment

(1) Restriction of Foreign Investment

A railway project in a city/regency is categorized as KBLI49441 (trams, monorails, electric trains, subway, elevated trains, etc.) according to KBLI (classification of Indonesian business field). A railway project doesn't fall under Negative List, 100% of foreign investment is possible. It is noted that KBLI49211~49215 (land transportation for passengers) indicates transportation such as bus, which is fall under Negative List and restricted foreign investment.

(2) Incentives on foreign investment

Related to foreign investment, there are three incentives - i) Tax holiday, ii) tax allowance and iii) import duty. Among them, i) Tax holiday is not eligible for PPP projects. ii) tax allowance can be applied to city transportation (trams, subway, monorails, etc.).

It should be noted that KBLI no. used for application of tax allowance to MOF is no. 49413, but KBLI no. for BKPM application is different (KBLI49441). As there are possibilities that application may reject at appraisal on MOF, further clarification would be necessary.

(3) Restriction on Debt/Equity ratio

According to a regulation related to income tax (MOF reg. 169/PMK. 010, 2015), Debt-Equity ratio for foreign investment is regulated as D/E: 4/1, therefore 80%-20% would be standard. However, as the Project fall under PPP, different standard may be applied (BKPM officials subjected it). Further clarification with BAPPENAS and MOF would be necessary.

3.2 The suitability of PPP's location with the Regional Spatial Plan

3.2.1 Determination of project scope (Route planning)

(1) Setting route and station plan

The following four route suggestions, as shown in the next page, are based on the requested route of relative organizations, the current situation of the field survey and on the basic policy of the route plan.

1) Role of the proposed new public transport system

The function of this proposal system was feeder transport at the Cikarang station, as the commuter route railway station of the Java Main Line Railway. The proposed system was chosen to improve the service of public transport in Cikarang district and easing road congestion, establishing a route plan that can introduce a better public transport system, superior in punctuality and expressiveness.

The project assumed that commuter route railroad station starts in addition to the Cikarang station due to railway electrification and double-double tracking of Java main line in the future, and we set up a route plan from Cikarang station via Lemah Abang station or starting from Lemah Abang station.

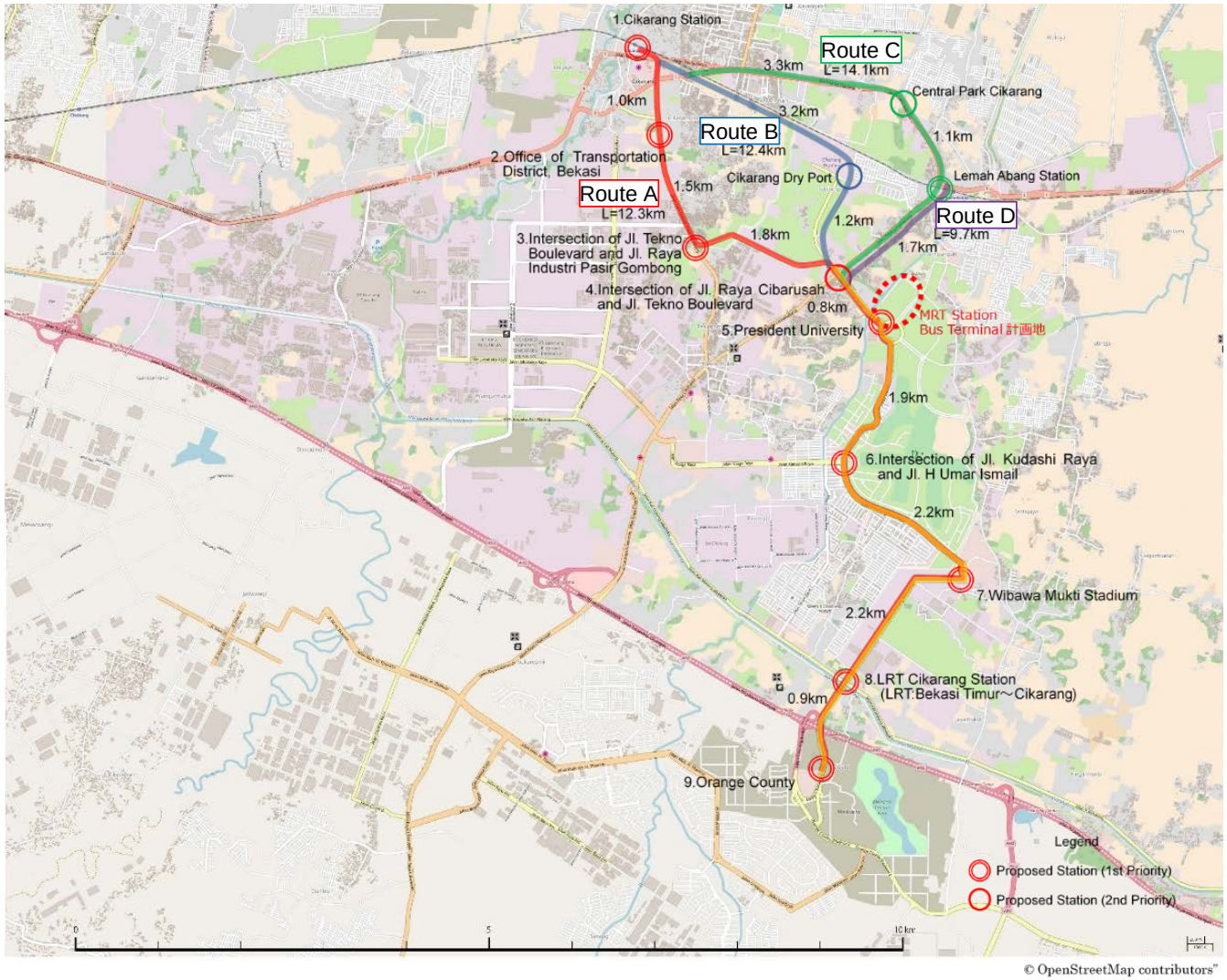
The project was expected to be established as a PPP project in the future. Therefore, the project will endeavor to enhance the public transportation network of this site with a view to establishing future new stations and construction of east-south line in order to encourage participation in the project by railway line developers.

2) Railhead/End point

The railhead is set to Cikarang station of Java main line railway station such as Cikarang station or Lemah Abang station. The end point is set to Orange County which is located in LIPPO Cikarang's CBD (Central Business District).

3) Introduction position of the railway

The project introduces a new transportation system connecting with transport hub sterically. Its purpose is to effectively utilize the limited infrastructure, and to minimize the influence of road traffic and congestion, as functional system.



Source：JICA Study Team

Figure 3-2 Proposed route and arrangement of AGT station candidates

(2) Current situations and issues of applicable roads to be introduced

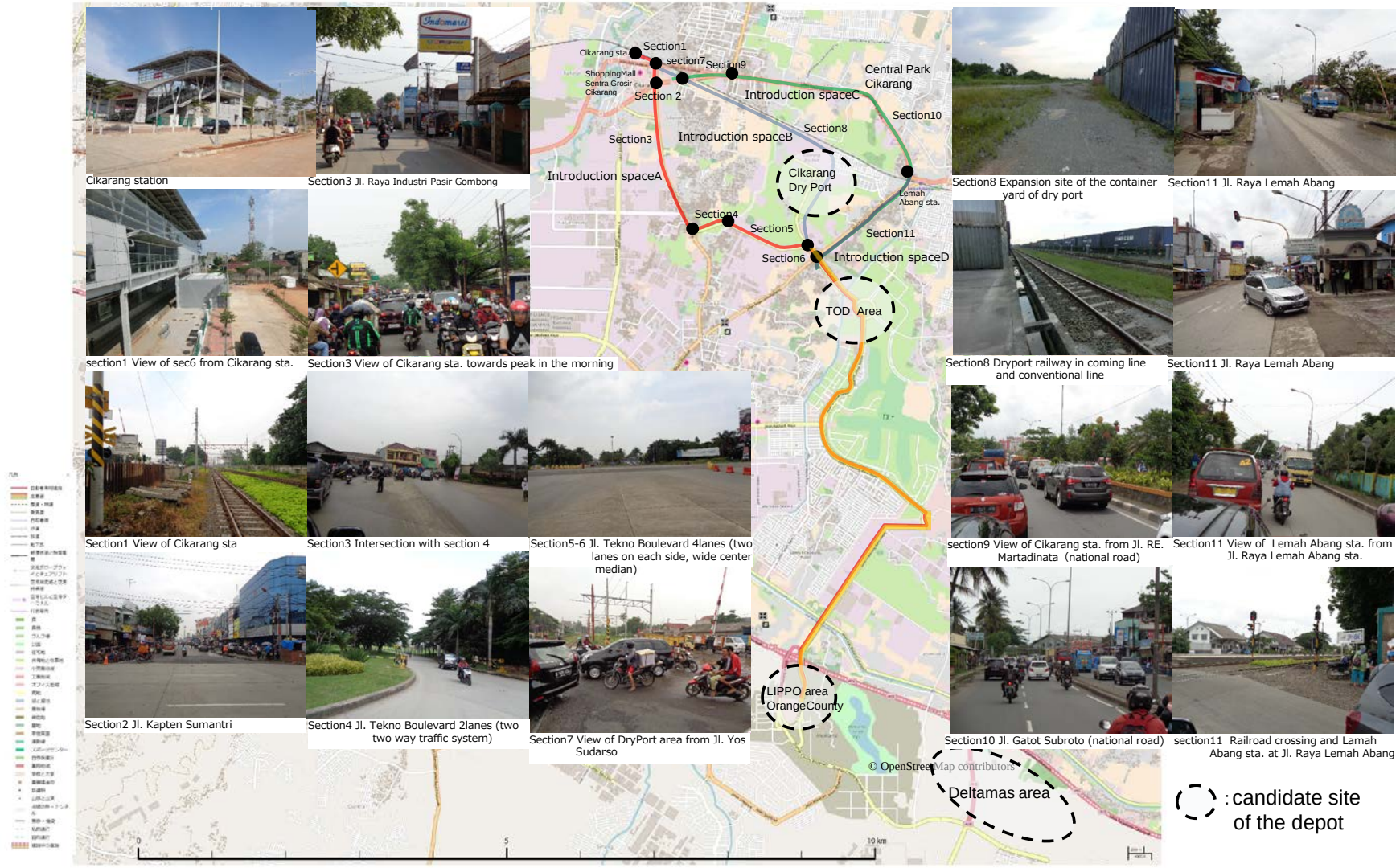
Based on the results of the field survey, organizing the following four routes as introduction target spaces starting from Cikarang station. The current situation and issues of each space are as follows.

Table 3-1 Current situation and issues of available space to be introduced

Introduction space	Current situation and future plan	Issues
Introduction space A Jl. Kapten Sumantri ~ Jl. Raya Industri Pasir Gombong (prefectural road) ~ Jl. Tekno Boulevard	・ Jl. Kapten Sumantri ：2 lanes (one way, width approx. 16m including a sidewalk), Jl. Raya Industri Pasir Gombong（prefectural road）：2 lane（two way traffic system, no road shoulder and sidewalk, width approx. 12m）, Jl. Tekno Boulevard：2 lane some section(two way traffic system, width approx. 10m), 4 lane another section（two lanes on each side、center median width approx. 15m）. ・ Located along the Jl. Kapten Sumantri and Jl. Raya Industri Pasir Gombong（prefectural road）are old commercial shops, shopping malls, government agencies, hospitals, educational institutions, etc. ・ Because the Jl. Raya Industri Pasir Gombong (prefectural road) is an access road to the Jababeka complex etc., road traffic congestion at morning and evening peak are chronic.	・Because the road width of the Jl. Raya Industri Pasir Gombong (prefectural road) is narrow, and facilities such as commercial buildings, administration buildings, medical facilities, and educational facilities are located along the roadside, therefore it is difficult to secure the space for introduction of the AGT.
Introduction space B Via the Cikarang dry port etc. on the south side of the Java Main Line Railroad	・ Land use is Cikarang dry port and agricultural land etc. on the south side of Java Main Line Railway.	・ Adjustment with the container yard extension plan is necessary at the backside area of a dedicated railroad siding of Cikarang Dryport.
Introduction space C Jl. RE. Martadinata (national road) ~ Jl. Gatot Subroto (national road) ~ Jl. Jl. Raya Lemah Abang (prefectural road)	・ Jl. RE. Martadinata（national road）～Jl. Gatot Subroto（national road）：4 lanes（two lanes on each side）, **Jl. Jl. Raya Lemah Abang（prefectural road）：2 lane（two way traffic system, no road shoulder、Both sides sidewalk 1m、width approx. 12m）** ・ Especially, located along the Jl. Raya Lemah Abang（prefectural road）has old commercial shops, shopping malls, government agencies, hospitals, educational institutions, etc.	・Because the road width of the Jl. Raya Lemah Abang (prefectural road) is narrow and facilities such as commercial buildings, administration buildings, medical facilities and educational facilities are located along the roadside, therefore it is difficult to secure the space for introduction of the AGT.

Introduction space D Jl. Jl. Raya Lemah Abang (prefectural road)	・ **Jl. Jl. Raya Lemah Abang （prefectural road）：2 lane （two way traffic system, no road shoulder、Both sides sidewalk 1m、width approx. 12m）** ・ Especially, located along the Jl. Raya Lemah Abang（prefectural road）has old commercial shops, shopping malls, government agencies, hospitals, educational institutions, etc.	・ Because the road width of the Jl. Raya Lemah Abang (prefectural road) is narrow and facilities such as commercial buildings, administration buildings and medical facilities and educational facilities are located along the roadside, therefore it is difficult to secure the space for introduction of the AGT.

Source：JICA Study Team



Source：JICA Study Team

Figure 3-3 Current situation of available introduction space

(3) Current situation and issues of the proposed hub station and depot location

For the proposed hub station and depot location the following situations must be considered.

1) Hub station

In industrial parks, spreading south of Cikarang Station and Jababeka complex cities, there is a potential demand for passengers over medium-level transportation. (employees, residents and visitors). Therefore, there is high necessity of introducing medium-volume transport system for these areas.

One of the railhead of the medium-level new transportation system (AGT) is Cikarang station where the Commuter route is already operated on the Java Main Line Railway, and the other one is the Lemah Abang station where the operation of the Commuter route is planned in the future. The end point is Orange County where currently being developed for the CBD (Central Business District) of LIPPO Cikarang.

The current situation and issues of the proposed hub station are listed below

Table 3-2 Current situation and issues of the proposed hub station

Candidate station		Current situation and future plan	Issues
Railhead	Cikarang Station	・ In December 2017, Cikarang Station was renewed open and modernized as part of Java Main Line Railroad Electrification and Double-Double Tracking Project Package B1 (Bekasi ~ Cikarang) by the Japanese ODA (Currently, switching of railroad stations of the new station has not been done yet Completion. ・ Functions and facilities such as station square as a transportation hub have been developed. ・ At the arrival and departure of the Commuter train of railroad running between Jakarta · Kota ~ Bekasi ~ Cikarang, transit congestion of ride to angkot (minibus of 6 to 7 seats), motorcycle taxi (Ojek), on-line taxi and pickup bike etc. have be seen in that area.	・ Around the southern part of Cikarang Station there are old streets mixed with street booth such as food stand shop and motorcycle parts dealers. Redevelopment around Cikarang station is necessary to develop the AGT station integrally with the existing Cikarang station and to enhance it as a transit center. ・ In the development of hub station, in order to improve the convenience of railway and AGT users, it is necessary to study feeder traffic in the future.
	Cikarang DryPort	・ The location can be accessed directly with the railroad, however there is handling containers by dedicated in-coming line. ・ Located in the middle of Cikarang station and Lemah Abang Station, introducing a new hub station with AGT is too short distance between railway stations.	・ Since it is land use as a dry port, creation of passenger demand and connection with a commuter route are subjects.

Candidate station		Current situation and future plan	Issues
	Lemah Abang Station	・It is close to the national highway on the front road, therefore there is no space such as the station square. ・Since there is a railway crossing at the intersection of the national and prefectural road near the station, traffic congestion occurs every time the railroad crossing gate is closed. ・In the future, electrification and Double-Double Tracking beyond Cikarang station is scheduled.	・Commercial facilities such as restaurants are gathered along the national road running north of Lemah Abang ・Commercial facilities such as restaurants are gathered along the national road running north of Lemah Abang ・Station, and when the transportation hub with AGT will be developed, it will be necessary to also develop urban land use for agricultural land on the north side of the national road. ・Commuter lines will not be connected at this time.
End point	Orange County	・County under development as LIOPO Cikarang‘s CBD is scheduled to connect with LRT, which links Jakarta - Bekasi - Cikarang. Therefore it is desirable to be connect with AGT with Orange County.	・It is necessary to promote the use for residents, employees and visitors of LIPPO Cikarang. ・In particular, it is assumed that residents of middle or high-income class people who actually use their own car will increase. Therefore, it is necessary to devise measures such as convenience and comfort of movement.

Source：JICA Study Team

2) Candidate site of depot

For the candidate sites of depot, the suitable site is regarded as a matter of future consultation. The positional relationship of Depot considered show in Table 3-4.

Table 3-3 Current status and issues of the depot candidate site

	Candidate site	Current status and issues
North side	Jababeka	・ There is a possibility of securing space in the TOD area around the MRT station in the Jababeka area.
	Dry Port	・ There is a space for depot. However, Dry Port requires various consultation with related organizations regarding various regulations for land use, such as export and import logistic functionalities.
South side	LIPPO Cikarang	・ There is no vacant space for the depot in the LIPPO Cikarang development area.
	Deltamas	・ There is a possibility of concession of land in the southern area (Deltamas area) ・ However the distance is too far from the study route.

Source：JICA Study Team

Source：JICA Study Team

Figure 3-4 Current situation of proposed hub station

(4) Comparative evaluation of each route and comprehensive evaluation

1) Comparative evaluation of each route

Table 3-4 Comparative evaluation of each route

Item	Route A	Route B	Route C	Route D
Route length	12.3 ㎞	12.4 ㎞	14.1 ㎞	9.7 ㎞
Stations	9 stations	8 stations	9 stations	7 stations
Average distance between stations	1.5 ㎞/ stations	1.8 ㎞/ stations	1.8 ㎞/ stations	1.6 ㎞/ stations
Number of average daily passengers (fiscal year 2024)※1	55,000 people/day	63,000 people/day	74,000 people/day	45,000 people/day
Related landowner	・Commercial district around Cikarang station ・Jl. Raya Industri Pasir Gombon soadside （prefectural road） ・Jababeka owned road etc.	・Commercial district around Cikarang station ・DryPort ・Jababeka owned road etc.	・Commercial district around Cikarang station ・Ministry of Health owned land (Lemah Abang Sta. south exit) ・Jl. Raya Lemah Abang soadside （prefectural road） ・Jababeka owned road etc.	・Commercial district around Cikarang station ・Ministry of Health owned land (Lemah Abang Sta. south exit) ・Jl. Raya Lemah Abang soadside （prefectural road） ・Jababeka owned road etc.
Introduction space issues	・The width of the JI. Dry Port Raya is about 10m, and it is assumed that the site along the existing railroad has to be secured with a width of 10m considering the construction vehicle space. ・The width of the Jl. Raya Industri Pasir Gombon (prefectural road) is around 10 meters, and there are many commercial buildings such as	・The width of the JI. Dry Port Raya is about 10m, and it is assumed that the site along the existing railroad has to be secured with a width of 10m considering the construction vehicle space. ・Since the restrictions are applied to the dry port due to the necessity of maintaining the logistics	・The width of the Jl. Raya Industri Pasir Gombon (prefectural road) is around 10 meters, and there are many commercial buildings such as administrative institutions, medical institutions, educational institutions etc. are gathered in the roadside, and the difficulty is the	・The width of the Jl. Raya Industri Pasir Gombon (prefectural road) is around 10 meters, and there are many commercials buildings such as administrative institutions, medical institutions, educational institutions etc. are gathered in the

	administrative institutions, medical institutions, educational institutions etc. are gathered in the roadside. It is very difficult because there is a time restriction on land acquisition. ・Therefore it is necessary to redevelop the prefectural road section from Cikarang station.	function, at present it is impossible to introduce the station facilities and AGT. In the future, it will be necessary to consider the upper space usage. ・It is necessary to redevelop the prefectural road section from Cikarang station.	highest because there is time restriction on land acquisition. ・It will be necessary to redevelop the prefectural road section from Cikarang station.	roadside, and the difficulty is the highest because there is time restriction on land acquisition.
Accessibility issues	・In order to form a wide area network, facilities that enable seamless transfer at Cikarang station will be necessary. ・Cikarang station does not assume the problem in the wide area network at the present time since Railway Electrification and Double-Double Tracking has already cleared.	・In order to form a wide area network, facilities that enable seamless transfer at Cikarang station will be necessary. ・If the introduction space can be secured along the existing railroads, a network with Commuter can be constructed, however land acquisition is a prerequisite. ・The section along the Dry port is inferior in demand.	・In order to form a wide area network, facilities that enables seamless transfer at Cikarang station will be necessary. ・It is necessary to add Railway Electrification and Double-Double Tracking to Lemah Abang Sta. (In the future, electrification beyond Cikarang station is scheduled.)	・Accessibility is inferior because there is no connection with Cikarang station which is the base station of Cikarang city. ・it is necessary to add Railway Electrification and Double-Double Tracking to Lemah Abang Sta. (In the future, electrification beyond Cikarang station is scheduled.)

Source：JICA Study Team
Note1. Approximate demand estimate value in 2024（Influence area of station area: 500m）

2) Comprehensive evaluation

Each route has various issues; however the characteristics of the route are arranged as follows.

① The viewpoint of securing demand

- At the connection station of railroad, shopping mall and many commercial stores are gathered, and Cikarang Station is planned to be completed as a railway station of the commuter line linking the

central part of Jakarta by Java main line railway's double-double tracking and electrification. Therefore Cikarang Station is desirable as development area.

- From the viewpoint of roadside land use situation of each route, the route A is expecting the greatest demand along the Route A line, where many urban facilities such as administrative agencies, medical institutions, commercial facilities etc. will be gathered. The next biggest demand is for route C and D; in route D is assumed that in the future the railway station on the Commuter route is started due to Railway Electrification and Double-Double Tracking of the Java main line railway. Under these circumstances, it is expected that demand of route D will decrease greatly because there is no connection with Cikarang Station.

② The viewpoint of securing introduction space

- In the width situation of current road, the required area of land acquisition will be more and more smaller in this order: D, C, A, and B route. The route extensions will be shorter and shorter in this order: route D, route A, route B, and route C. In these situations, route D is the most advantageous in terms of introduction space. Also, route C is subject to introduction space for national roads, therefore there are many coordination issues with prefecture in addition to the related organizations. On the other hand, route B has custom facilities, so there are inhibiting factors other than securing space for introducing new transportation system into the DryPort area.

③ The viewpoint of future city structure induction

- As a new urban transportation axis that crosses the development area and connects the railway at north side and the highway (connection with the LRT in the future) at south side, the route A or B which are not detouring to Lemah Abang station are preferable. In this case, the route A is preferable to aim for a demand-driven urban transportation axis on the premise of existing land use, and route B is considered desirable in order to become a new development type urban transportation axis premised on change of the land for the dry port.

However, there are many other issues besides securing the introduction space, such as conversion of land use and legal regulation, so it is necessary to coordinate with related organizations.

3.3 Social and Environmental Analysis

3.3.1 Environmental and Social Considerations

(1) Overview

Environmental and Social Considerations (ESC) survey for this project will be undertaken according to the guideline by Japan International Cooperation Agency (JICA), that is, the "Guidelines for Environmental and Social Considerations" (April 2010, JICA). (hereinafter referred to as "*the Guidelines*")

(2) Screening

As there are four route alternatives, ranging from 9 km to 14 km long, on the anvil in the first phase survey, JICA cannot estimate likely impact of the project on the environment and the society (screening[15]) in this stage. If the route length exceeds 10 km, the project will be classified as "category A", the strictest category in which a study that includes the analysis of alternative plans, the prediction and assessment of environmental impacts, and the preparation of mitigation measures and monitoring plans based on detailed field surveys are required. Otherwise, it will be classified as category B, a less strict category.

Thus, detailed EIA will be conducted in the second phase survey, in that phase a specific route alignment will be identified.

(3) Environmental Checklist for the Project

JICA prepared and publicizes the templates of environmental checklist for 18 infrastructure categories and other infrastructure projects[16]. The second phase survey will employ the "environmental checklist #8 for Railways" with appropriate modifications founded on the results of the first phase survey (specific route alignment, etc.).

Table 3-5 Environmental Checklists (Railways)

Category	Environmental Item	Main Check Items
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?
	(2) Explanation to the Local stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?

[15] Screening is a process in which JICA classifies each project into one of four Environmental Categories (A, B, C, and FI) depending on the level of Environmental and Social Considerations ("The Basics of the Environmental and Social Considerations", August 2013 JICA)

[16] Available on the JICA's Website;
https://www.jica.go.jp/english/our_work/social_environmental/guideline/ref.html

		(b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?
2 Pollution Control	(1) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? (b) Do effluents from the project facilities, such as stations, comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas not to comply with the country's ambient water quality standards?
	(2) Wastes	(a) Are wastes generated from the project facilities, such as stations and depot, properly treated and disposed of in accordance with the country's regulations?
	(3) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?
	(4) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence (especially in case of Undergrounds/Subways)?
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? (e) Is there a possibility that installation of rail roads will have impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?
	(3) Hydrology	(a) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?
	(4) Topography and Geology	(a) Is there a soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there a possibility that civil works, such as cutting

		and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?
	(2) Living and Livelihood	(a) Where railways are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts? (b) Is there any possibility that the project will adversely affect the living conditions of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (d) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increases in traffic congestion and traffic accidents)? (e) Is there any possibility that railways will impede the movement of inhabitants? (f) Is there any possibility that structures associated with

		railways (such as bridges) will cause a sun shading and radio interference?
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?(d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation).

		(b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Source: Japan International Cooperation Agency

(4) Monitoring plan

JICA will decides monitoring items based on the results of the Environmental Review, and the project proponents will submit the monitoring results on a periodic basis to JICA. using methods and formats agreed by both sides[17].

[17] Monitoring form template is available on the JICA's Website;
https://www.jica.go.jp/english/our_work/social_environmental/guideline/ref.html

3.3.2 Environmental Assessment system in Indonesia

(1) Overview

Environmental Assessment system in Indonesia has three categories of assessment level, namely AMDAL level, UKL-UPL level, and SPPL level. As discussed below, AMDAL and UKL-UPL levels are roughly equivalent to "EIA level" and "IEE level", respectively.

Flow of Indonesian Environmental Clearance is shown in Figure 3-5.

1) AMDAL level

Bahasa Indonesia acronym AMDAL (Analisa Mengenai Dampak Lingkungan) refers to Environmental Impact Analysis in general, but in a narrow since, it means "Environmental Impact Assessment (EIA) level study". An "EIA level study" is "a study that includes the analysis of alternative plans, the prediction and assessment of environmental impacts, and the preparation of mitigation measures and monitoring plans based on detailed field surveys[18]".

In an AMDAL level study, environmental impact analysis (Analisa Dampak Lingkungan: ANDAL) and environmental management & environmental monitoring plan (Rencana Pengelolaan Lingkungan Hidup dan Rencana Pemantauan Lingkungan Hidup: RKL-RPL) are mandatory.

2) UKL-UPL level

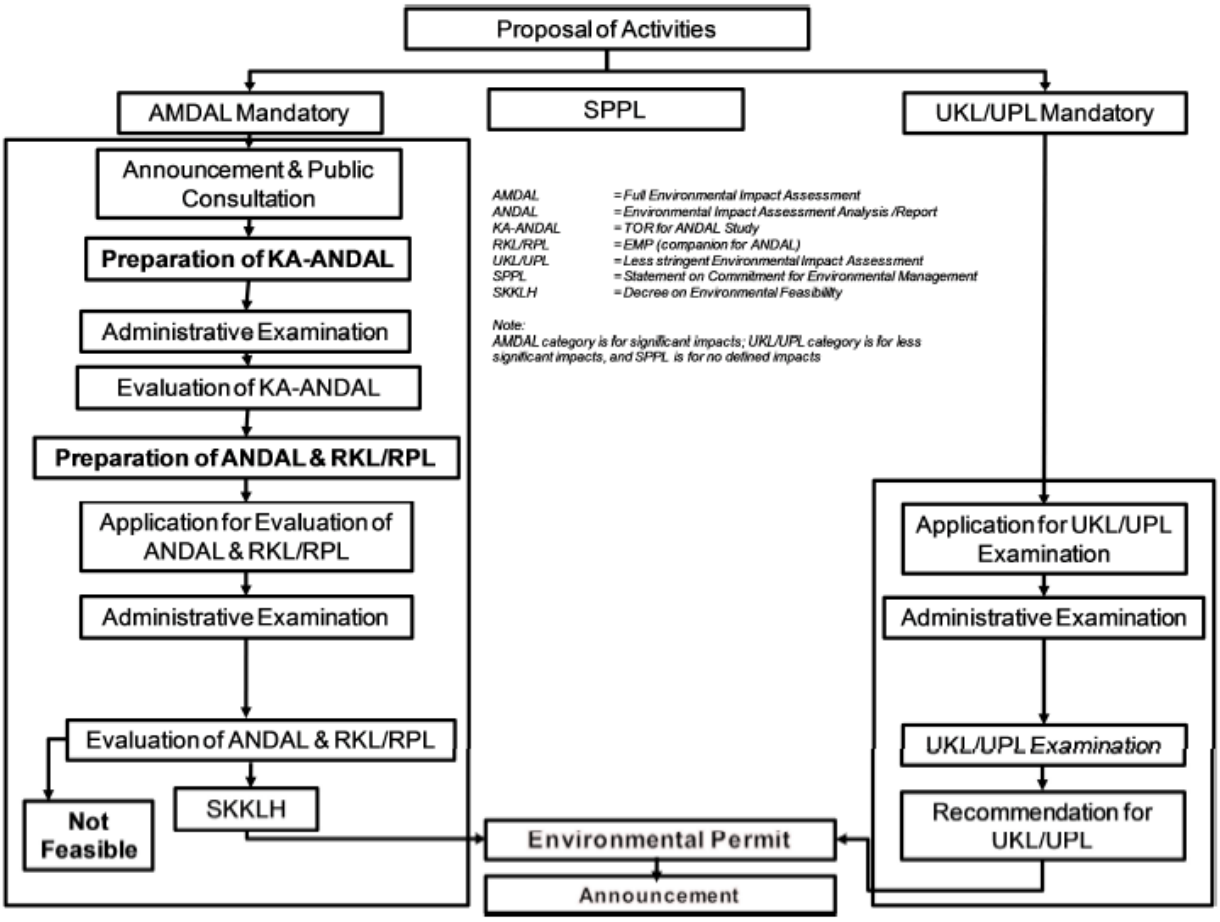
UKL-UPL (Upaya Pengelolaan Lingkungan dan Upaya Pemantauan Lingkungan), which means environmental management and environmental monitoring measure, is an assessment level less stringent than AMDAL level which requires RKL-RPL[19]. The UKL-UPL level approximately corresponds to "Initial Environmental Examination (IEE) level study". An "IEE level study" is "a study that includes an analysis of alternative plans, a prediction and assessment of environmental impacts, and a preparation of mitigation measures and monitoring plans based on easily available information including existing data and simple field surveys[20]".

In an UKL-UPL level study, environmental management measure & environmental monitoring measure (Upaya Pengelolaan Lingkungan dan Upaya Pemantauan Lingkungan: UKL-UPL) is required.

3) SPPL level

SPPL（Surat Pernyataan Pengelolaan Lingkungan）means "Statement and Management Capability" in Bahasa Indonesia. Preparation of an SPPL required in this level, but neither AMDAL nor UKL-UPL are required.

[18] Guidelines for Environmental and Social Considerations (April 2010, JICA)
[19] "Rencana" and "Upaya" mean "Plan" and "Effort", respectively.
[20] Guidelines for Environmental and Social Considerations (April 2010, JICA)



Legend:

AMDAL	Full Environmental Impact Assessment
ANDAL	Environmental Impact Assessment Analysis / Report
KA-ANDAL	TOR for ANDAL Study
RKL/RPL	EMP (companion for ANDAL)
UKL/UPL	Less Stringent Environmental Impact Assessment
SPPL	Statement on Commitment for Environmental Management
SKKLH	Decree on Environmental Feasibility

Note:

AMDAL category is for significant impacts; UKL/UPL category is for less significant impacts, and SPPL is for no defined impacts.

Source: Indonesia: Flood Management in Selected River Basins Sector Project (Draft) (May 2010 Ministry of Public Works and Housing of the Republic of Indonesia for the Asian Development Bank)

Figure 3-5 Flowchart of Indonesian Environmental Clearance

(2) Comparison of JICA Guideline and AMDAL Project Categories

A comparison table of Guidelines for Environmental and Social Considerations" (April 2010, JICA: "the JICA Guidelines") and project categories in Indonesia is shown in Table 3-6.

AMDAL level assessment corresponds the Category A of *the JICA Guidelines*, which requires an EIA level assessment, and they are roughly equivalent. On the other hand, UKL-UPL level examination requires IEE level examination, but it requires only less stringent than *the JICA Guideline*. (Table 3-6)

Some checklist items such as "Heritage", "Waste", "Ecosystem", "Working conditions (including occupational safety)" are not adequate in comparison with *the JICA Guidelines*.

Table 3-6 JICA Guideline and AMDAL Project Categories

JICA Guideline	AMDAL Project Categories
Category A Category A: Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. These impacts may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors, projects that have characteristics that are liable to cause adverse environmental impacts, and projects located in or near sensitive areas. An EIA level*1 assessment is required.	**AMDAL Level** Projects that according to law requires an Environmental Impact Assessment (AMDAL)
Category B Proposed projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally, they are site-specific; few if any are irreversible; and in most cases, normal mitigation measures can be designed more readily. An IEE level*2 examination is required.	**UKL-UPL Level** Projects that according to law requires Environmental Monitoring Measure (UPL). However, special discretion and judgment of environmental agencies at local and national level (based on particular consideration) may override the category, and UKL/UPL Category may be "upgraded" to AMDAL Category.
Category C Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.	**SPPL Level** Projects that do not require AMDAL or UKLUPL are obliged to submit a 'statement of management and environmental monitoring ability' or SPPL.
Category FI Proposed projects are classified as Category FI if they satisfy all of the following requirements: JICA's funding of projects is provided to a financial intermediary or executing agency; the selection and appraisal of the sub-projects is substantially undertaken by such an institution only after JICA's approval of the funding, so that the sub-projects cannot be specified prior to JICA's approval of funding (or project appraisal); and those sub-projects are expected to have a potential impact on the environment.	Not Applicable

*1 An “Environmental Impact Assessment (EIA) level study” is a study that includes the analysis of alternative plans, the prediction and assessment of environmental impacts, and the preparation of mitigation measures and monitoring plans based on detailed field surveys.
*2 An “Initial Environmental Examination (IEE) level study” is a study that includes an analysis of alternative plans, a prediction and assessment of environmental impacts, and a preparation of mitigation measures and monitoring plans based on easily available information including existing data and simple field surveys.

Source: Prepared by JICA Study Team based on “Indonesia: Flood Management in Selected River Basins Sector Project” (Draft) （May 2015 Ministry of Public Works and Housing of the Republic of Indonesia for the Asian Development Bank.） and “Guidelines for Environmental and Social Considerations” (April 2010, JICA).

3.3.3 EIA clearance status of the target area

Candidate routes (Routes A, B, C and D) mainly run through the Jababeka Industrial Estate and the Delta Silicon Industrial Park (Lippo Cikarang Industrial Park). And matter of course, EIA / AMDAL procedure for the areas had already been done for the industrial park development and the dry port development, and SKKLHs (Decree on Environmental Feasibility) were issued for the respective project.

In the second phase of the survey, EIA / AMDAL based on the railway specific TOR (Environmental Checklists, etc.) will be conducted.

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4 Income potential and project financing scheme

4.1 Availability Payment (AP)

4.1.1 Concept and Mechanism of AP

Availability Payment is long-term agreement with fixed periodic payments to the private entity for DBFOM (Design, Build, Finance, and Operation & Maintenance) facilities and services. Unlike a full concession, the scope of services for the private entity would not include ridership (demand) risks. Funding to the public sector are farebox revenue, general tax revenue allocation, and other intergovernmental transfers.

The public sector pays the private entity a periodic certain amount of payment that are set in PPP agreement. Availability Payments compensate to the private entity for both capital and operating costs, and finance costs. Payments typically begin after completion of the works and commences operations.

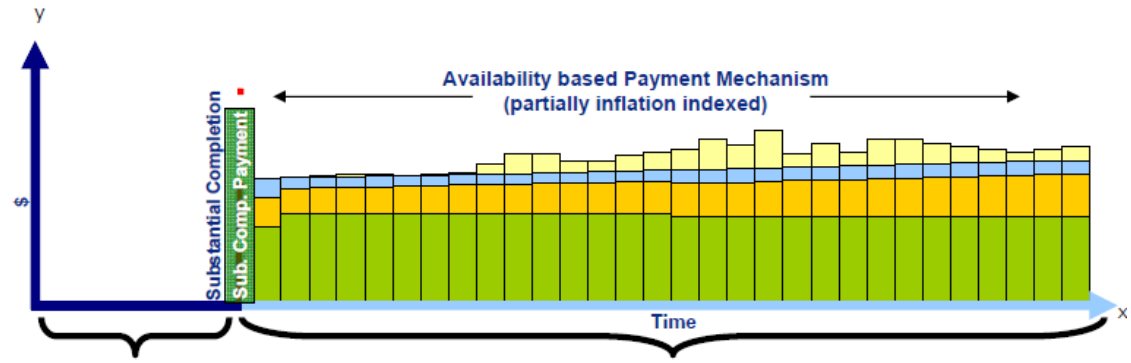
For the payment to the private entity is evaluated each period in terms of

i) availability of facilities and services
ii) performance of private sector partner

Also, each periodic payment is adjusted to reflect

i) deductions for non-compliance with pre-determined service levels
ii) credits for enhanced performance

The private entity finances (debt and equity) against payment stream of AP from the public sector. Return on equity investment on the private entity reflects level of transferred risk to the private entity.



Source: KPMG

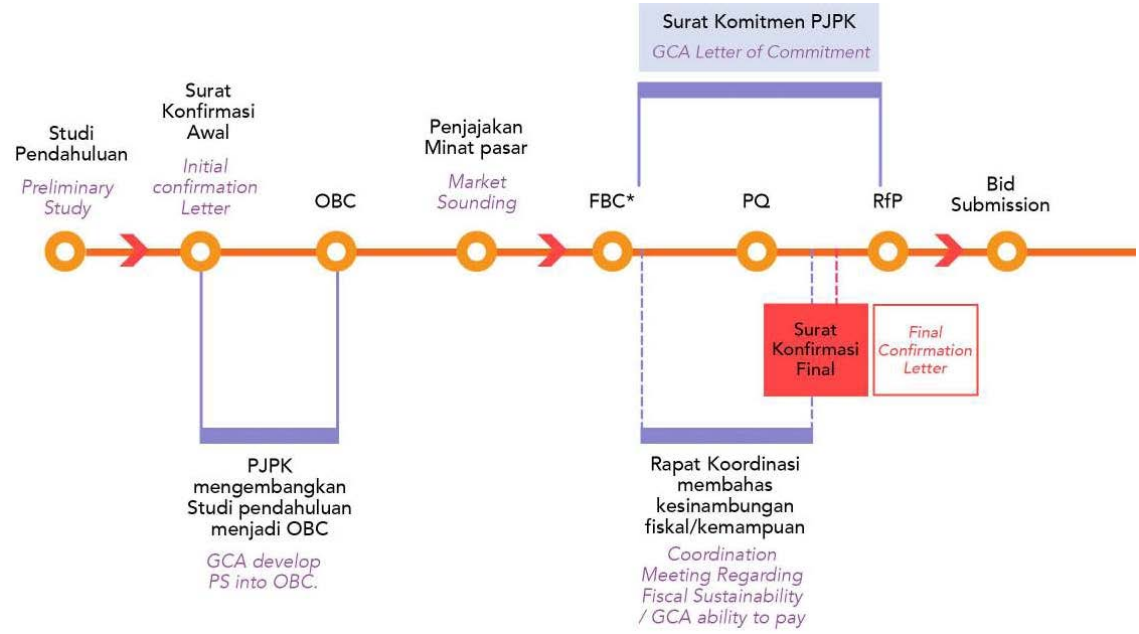
Figure 4-1 Concept of Availability Payment

4.1.2 Availability Payment on the Project

In principle, to apply Availability Payment to the Project is possible. To realize AP, it is important, first, which agency act as GCA, second, justification for necessity of the project is consolidated, and thirdly alignments and selection of technology are endorsed by demand.

AP is sourced from GCA's budget, which is allocated from Directorate General Budget (DG Budget) of MOF. On the other hand, VGF is sourced from MOF's budget[21].

Application process of AP is initiated from the early stage of project formation in PPP process. More specifically, GCA submits an application to DG Budget before OBC (Outline Business Case), and through appraisal, an approval for AP application is made before RfP (request for proposal). Once approved, DG Budget issues GCA "Final Confirmation Letter" as an internal document in the government.



Source: MOF

Figure 4-2 AP process in Indonesia

MOF's appraisal for AP application is made in terms of financial capacity of MOT as GCA. It means that MOF access a capacity of the whole MOT, not a capacity of particular department such as BPTJ, DGR. There are no threshold like "AP amount should not exceed **% of the total budget of the ministry.

Regarding recognition of AP in terms of GOI's public accounts, AP doesn't regard as public debt. Namely, it doesn't commit for guarantee on public debt for multiple years.

As AP is sourced from GCA's annual budget, GCA conducts budget request to DG Budget each year. DG Budget allocates annual budget including a budget on AP within a regular budget to the ministry (i.e. it is neither additional budget nor is allocated on-top of a regular budget of the ministry). GCA makes payments of AP according to payment obligation set in PPP agreement.

As a coverage of IIGF, IIGF can guarantee a default of payment including AP paid by GCA to the private entity. By those complement facilities, credit enhancement on the whole GOI is completed.

[21] AP is defined as payments for service provision to the private entity, while VGF is kind of subsidy from the government. Because of this, it is presumed that responsible agency on budgets are separated.

Specific criteria for AP application is stipulated in ”Ministerial regulation of finance 260/PMK.08/2016: "procedure of availability payment on PPP project in infrastructure provision“ (Article 5).

a) Economic and social infrastructure projects has great benefits for the community as users of the Service;

b) Project as referred to in letter a) which the return on investment is not sourced from payment by user over the Service tariff the amount set by the government;

c) In case the KPBU project gets revenue from payment by user over the Service rate as referred to in letter b), then the PJPK is not can calculate the amount of income from payment of the Service user for implementing Service Availability Payments to the Board of Executives; and

d) Project as referred to in letter a and letter b) the procurement of its Business Entity is done through fair, open and transparent election stages, as well as paying attention to business competition healthy.

In addition to this, legal aspects and demand forecast will be examined. Especially, it is examined if demand forecast is estimated through appropriate methodology.

4.1.3 Laws/Regulations related to Availability Payment

(1) Legal framework for Availability Payment

Basic regulations on AP is MOF Regulation No. 260/PMK.08/2016 on Guidelines for Availability Payment in Government and Business Entity Cooperation Projects in Infrastructure Provision ("**MOF Reg. 260/2016**").

MOF Regulation No. 190/PMK.08/2015 on Availability Payment in Cooperation between Government and Business Entity in Infrastructure Provision ("**MOF Reg. 190/2015**") has been revoked with the said "**MOF Reg. 260/2016**".

There are two notable changes from MOF Reg. 190/2015 to MOF Reg. 260/2016, namely:

A) Introduction of Fiscal Facility in MOF Reg. 260/2016

B) Limitation of availability payment in MOF Reg. 260/2016 to apply only to PPP projects where the GCA is the central government

Availability payment is periodical payment paid to Business Entity for the provision of infrastructure facility in accordance with the quality and/or criteria as contracted under the PPP agreement. It is important to note that based on MOF Reg. 260/2016, availability payment is available only for PPP projects where the GCA is the central government (either through Minister or Head of Institution). For PPP projects where the GCA is Head of Region or Region Owned Company, the availability payment mechanism is governed under Ministry of Internal Affairs Regulation No. 96 of 2016 on Availability Payment in Government and Business Entity Cooperation in Infrastructure Provision in Region.

(2) AP is not government support

Availability payment is different from government support. Government support is not a method of payment for the project implementation conducted by Business Entity. It is defined in PR 38/2015 as contribution in the form of fiscal contribution or other that is granted by the Minister/ Head of Institution/ Head of Region and/or MOF in order to improve the feasibility/ worthiness of the KPBU. It should be noted that under MOF Reg. 260/2016, PPP projects with availability payment method are not eligible for VGF.

4.2 Fare box revenue

4.2.1 Fare setting

(1) Understandings on fare setting for the Study

Fare setting is highly critical aspect. Basic idea/concept of GOI on the method of fare setting for public transportation should be analyzed.

In the phase 1 of the Study, it is required to figure out impacts on financial viability of the Project (i.e. to what extend fare box revenues could cover required expenditures). Therefore, a fare for the Project is tentatively set based on fares of neighboring urban transportation, and it is used to examine a conceptual business scheme.

More practical fare setting for the Project will be examined in the phase 2 of the Study taking into account basic idea/concept of GOI, by SP survey and others.

Fare setting for scenario I

With reference to a fare IDR 3,500 on Trans Jakarta (BRT), the initial fare for the project is set as follows. It is added IDR 3,000 in consideration with comfortability and punctuality of a proposed system, and inflation[22]. Fare is unit rate (flat fee) for all section.

$$(3{,}500+3{,}000) \times 1.045_8 = 9{,}240 \fallingdotseq \text{IDR}9{,}000$$

Revision of fare will be made once three years by reflecting CPI fluctuation in consideration with inflation.

Fare setting for scenario II

The initial fare for the project is set as IDR 12,000. Fare is unit tariff (flat rate) for all section. Revision of fare will be made once three years by reflecting CPI fluctuation in consideration with inflation.

Currently MRT project is under construction, its management consulting service has proposed that a fare for MRT project is IDR 8,500. IDR 8,500 has been set taking into account willing ness to pay and other factors. Also it selects unit tariff in consideration with TranSMART that unit tariff (flat fee) is used, and the average trip distance 7.5 km per journey on the MRT is relatively short.

With reference to MRT project, the initial fare is set as IDR 12,000, which is estimated based on MRT's fare IDR 8,500 in 2014 plus inflation to 2024 as the commence of operation year.

Fare revision

For both scenario I and II, fare revision will be made once three years. Formula of fare revision is as follows

Fare after revision=Fare before revision +Fare before revision * (CPI after revision – CPI before revision)÷ CPI before revision

[22] It is referred METI F/S (2011) "New Urban Transportation System Project in Cikarang".

(2) Laws/Regulations related to fare

MOT Reg. 15/2016 provides that a PPP agreement should contain the agreed initial tariff and formula for tariff adjustment. The determination of the tariff is calculated based on capital, operational cost, maintenance cost, and profit.

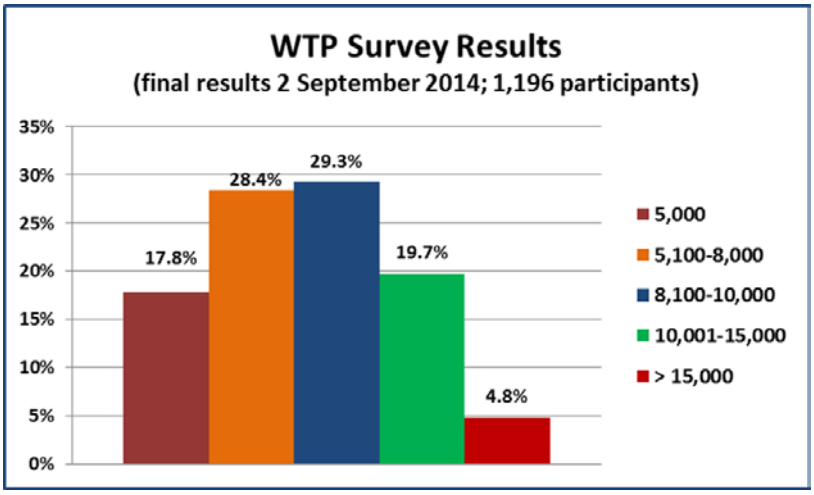
MOT also issued a guideline under MOT Regulation No. 83 of 2010 on Guidelines of Implementation of Government-Private Cooperation in Provision of Transportation Infrastructure which covers tariff planning. At the stage of project planning, after conducting the necessary analysis, Center for Analysis of Partnership and Service of Transportation Service and any related sub sectors in MOT will determine the tariff structure.

4.2.2 Willingness to pay of users

The phase 1 of the Study doesn't conduct affordability to pay survey and willingness to pay survey for expected users.

To examine a relation between fare setting and demand, selection condition regarding routes (required time, fare) and intention to use (intention to convert from cars/bikes) should be analyzed through SP survey. However, as the phase 1 of the Study is still preliminary stage (route selection stage), SP survey will be carried out in the phase 2 of the Study that route will be determined.

As the Project has similarity with MRT project, the Study refers a result of a willingness to pay survey done under MRT project. The survey was conducted from late June 2014 to August 31, 2014. 1,196 people participated in the survey. In response to the question regarding fare, 77% of the responses stated a willingness to pay a fare between IDR 5,100 and IDR 15,000 (see the Figure below).



Source: Management Consulting Service for Jakarta MRT System Project

Figure 4-3 WTP results for MRT project

4.2.3 Fare box revenue

In principle, revenues for the Project is fare paid by users. Fare box revenues calculated based on demand forecast for route C and D are elaborated in Part I, Chapter 3.

4.3 Other income potential

Related to implementation of the Project, there could be other source of income - both direct income potential and indirect income potential. As direct income potential, non-fare box revenue, such as shops and tenant in the stations, advertisement in rolling stocks and stations could be sources of revenue. As indirect income potential, commercial development and redevelopment on surround area of stations and real estate development along the alignment could be potential.

The phase 1 of the Study doesn't cover a study for TOD (Transit Oriented Development), and revenues from TOD are not considered in the financial analysis. On the other hand, possibility of TOD is critical aspect to enhance viability of the Project, its possible framework is examined through discussion with local developers.

More detail and specific study for TOD planning and income potential will be carried out in the phase 2 of the Study.

4.4 Estimates of forms of government support

Government Support (fiscal support from the government) is not expected to any scenario of the Project.

5 Recommendations and follow-up plans

5.1 Recommendation of form of PPP

5.1.1 Position of this project

(1) View point from wider area

1) The project will be trigger to reform Cikarang Complex City to be more public transport based city in coordination with JABODETABEK's railway network including commuter railway, MRT and LRT to realize JABODETABEK as structure with complex core cities.

2) Thus, the project will reduce traffic jam between DKI Jakarta and Cikarang area and therefore the purpose of the project is to cancel loss of time value (3.8 trillion IDR)

In addition, automated operation system which is target transport mode to be implemented in this project is highly recommended to other complex core city in JABODETABEK or other local city in Indonesia. This project will be showcase for those cities.

3) In the view of these role and effect mentioned above, this project should be implemented as national strategic project rather than merely local project in local area.

(2) View point from inside of the project area

1) The project will solve disconnectivity of the area due to waterway and toll road and will ease road traffic jam in north south direction inner the area.

2) On the other hand, the project will create innercity public transport network along with existing commuter line, extension of LRT and implementation of MRT.

3) Because of the advantageous characteristics of AGT, the project plays a role to make the area attractive to be complex urban core which attracts domestic and oversea investment.

5.1.2 Route Alignment

(1) Connectivity to Jawa Railway

1) Terminal should be located in Cikarang Station which has access by electrified double double track commuter railway.

2) Alternative location of terminal will be Lemah Abang station if AGT cannot connect to Cikarang Station.

(2) Route Alignment

1) Origin of AGT should be Cikarang station or Lemah Abang station of commuter railway. Destination of AGT should be Meikarta district in Lippo area.

2) Four route alternatives are studied in this study. A; 12.3km route from Cikarang station to south along regency road. B;12.4km route along commuter railway from Cikarang station. C; 14.1km route along national road from Cikarang station. D;9.7km route from Lemah Abang station.

3) A is difficult to connect Cikarang station because of narrow width of regency road and small buildings or stores will be obstacle for land acquisition. Route B has a bottleneck in dryport located along the route. Function of dryport is regulated to be remain as freight traffic node and thus land acquisition for the route is difficult. Route D has problems in small size of Lemah Abang station and connectivity of commuter railway to DKI Jakarta is limited due to non-electrified double track. Lemah Abang station needs upgrading and requires double double track and electrification to become terminal of AGT, which takes a while to be realised. Route C will be

suitable because of enough width of national road but also problem remains on regency road section due to narrow width and small stores along regency road.

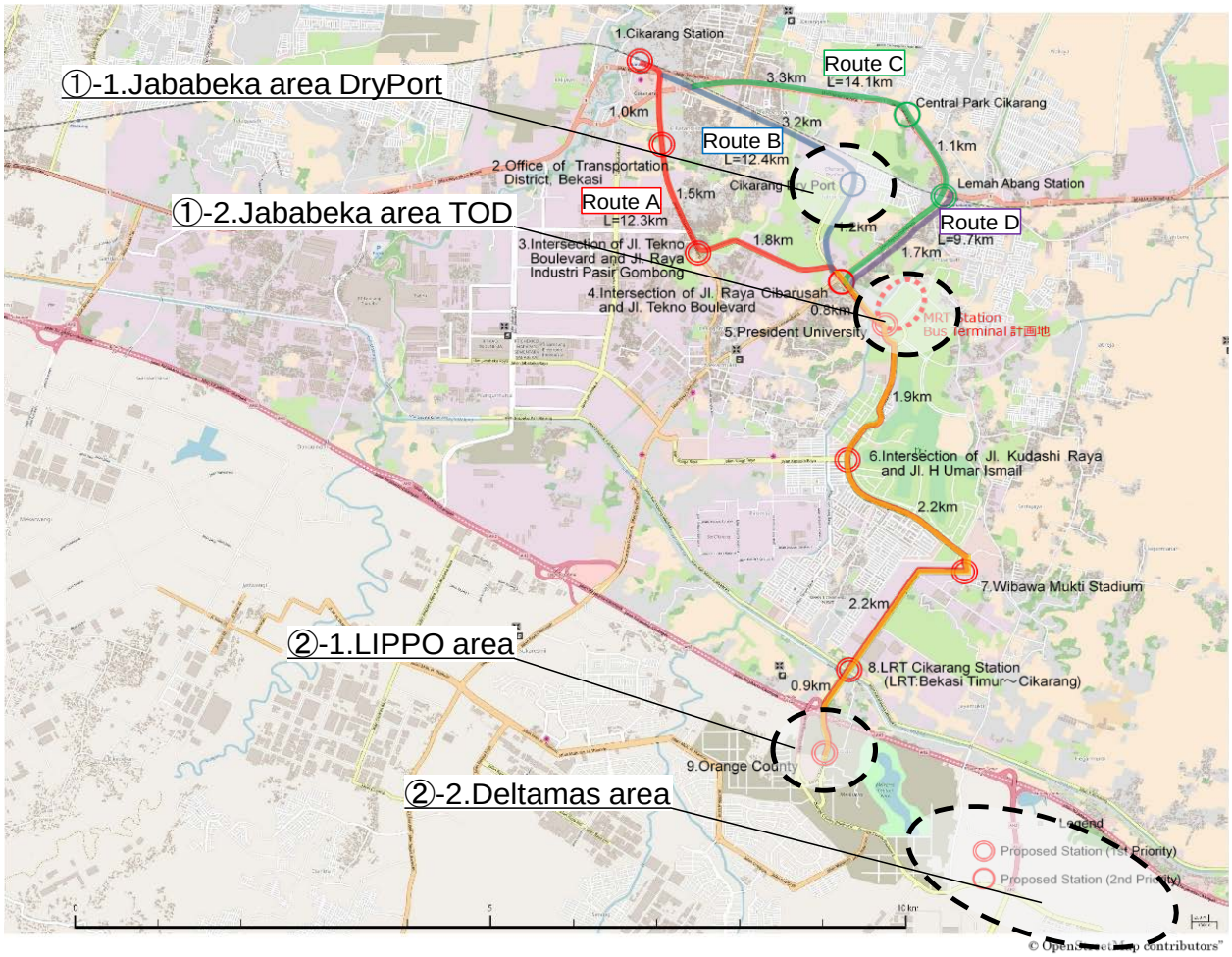
(3) Depot

1) Space need be secured along the route line in the TOD area around MRT Station in the Jababeka area. Meanwhile, though Dryport in the Jababeka area can be considered as a candidate, it has restraints like logistic facility planning, etc. In addition, as joint development has already been proceeded in the southernmost Lippo area, it is difficult to secure land in the area.

2) Although there is possibility of securing land in the Deltamas area except for the expected route line, the Deltamas area is inconvenient, considering that Deltamas is a bit far from the southernmost Lippo area.

Current candidate depot is assumed TOD area in Jababeka development area, however discussion and coordination with relative organizations are necessary

The positional relationship of considered depot is shown in Figure 1-1.



Source: JICA Study Team

Figure 5-1 Position relations of routes and the vehicle base

5.1.3 Demand forecast

(1) Method of demand forecast

1) Demand forecast in this stage depends on number of residence along the route and JUTPI report. Simple method was chosen due to the lack of data in this phase. Passenger volume was calculated from average use frequency per population, which was estimated from unit generation and modal split ratio.

2) Prediction is executed under following schedule; from 2020 to 2023 is for construction and operation starts from 2024.

3) Station sphere is defined as 500m according to JUTPI report.

(2) Results of demand forecast

1) Results of demand forecast is as follows; passenger volume will be from 50thousand to 120 thousand per day.

Route A; 55 to 89 thousand/day
Route B; 63 to 103thousand/day
Route C; 74to 120thousand/day
Route D; 45 to 72thousand/day

2) The range of PPHPD is 5,000 to 9,000passenger/hour and correspondent to AGT capacity.

Route A; 8,000 passenger/hour
Route B; 8,000 passenger/hour
Route C; 9,000 passenger/hour
Route D; 5,000 passenger/hour

3) Demand forecast in this phase is rough estimation to characterize four route alternatives. Further study such as traffic volume survey and preference survey should be executed and demand forecast should be revised based on those survey in phase two to estimate feasibility of the project in detail.

5.2 Recommendation on Business Plan

5.2.1 GCA

From analyzation over intension of Indonesian Authorities, related regulation, capability of those authorities etc., the project should be conducted by MOT; Ministry of Transportation as GCA; Government Contract Agency. JICA Study Team also propose BPTJ as Implementation unit.

Supposed Authority for Permission including Business permit, Construction permit and Operating permit for this project will be proposed as follows; DGR as evaluation, investigation and approval authority and Bekasi Regency as publishing authentic permission announce authority. The alignment is located inside Bekasi regency. Therefore, publishing authentic permission is operated by Bekasi regency according to related regulation. On the other hand, MOT will operate technical approval for railway project owned by states, regency or city according to Indonesian railway policy by MOT/DGR.

Related regulation does not define whether GCA and permission announce authority should be same or not. Therefore proposition that MOT should be GCA, DGR work on technical procedure of evaluation, investigation and approval and Bekasi regency work on permission announcement, is not a problem regarding related regulation or practice.

5.2.2 Project Scheme

JICA Study Team propose that scheme of this project should be solicited proposal conducted by Indonesian Government and will be proceed as BOT or BTO project with Availability Payment.

Financial Gap will arise between total amount of Availability Payment for SPV from public sector and total amount of fare revenue from SPV. Availability Payment can be based on fare revenue in 40% to 50% but rest 55% to 60% of Availability Payment will be burdened payed by APBN; State Budget of public sector.

The project will not only solve traffic jam but also enhance economic activity of the area and causes increase of land value and results increase of tax income. Therefore, economic-social benefit of this project will be high enough for private sector to pay for the financial gap in case that fare revenue is not enough to cover total amount of availability payment.

5.2.3 Nominating to infrastructure project priority list

This project should be based on the system to promote infrastructure development in Indonesia. In that viewpoint, this project must be listed in PPP Book, which allow the project to be implemented through PPP procedure.

In addition, we propose the project to list in National Strategic Project by KPPIP. Furthermore, the project will be listed as Priority Project of KPPIP. By listing on those priority project list will promote project's implementation through shortening time duration of approval procedure, solving bottleneck of the project smoothly.

5.2.4 Intension of local developer for joining the project

Positive discussions about alignment and depot location were made between main local developers and JICA Study Team. JICA Study Team confirmed the intensions of those developers to support this project are in general confirmed through the discussion. Especially, Jababeka and Lippo, who are likely to be land owner of the area where line will be located, will join to discuss in detail about main point of the project such as terminal and station construction, land donation for the route and depot and investment to the project after phase one study.

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