Coordinating Ministry for Economic Affairs
Republic of Indonesia

JABODETABEK Urban Transportation Policy Integration Project Phase 2 in the Republic of Indonesia

Annex 02: JABODETABEK Urban Transportation Master Plan (Detailed RITJ)

October 2019

Japan International Cooperation Agency (JICA)

ALMEC Corporation

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Exchange rates used in the report

EUR	1.00	= IDR	15,610.00
USD	1.00	= IDR	14,181.97
JPY	1.00	= IDR	131.69

(as of September 2019)

Table of Contents

List of Tables

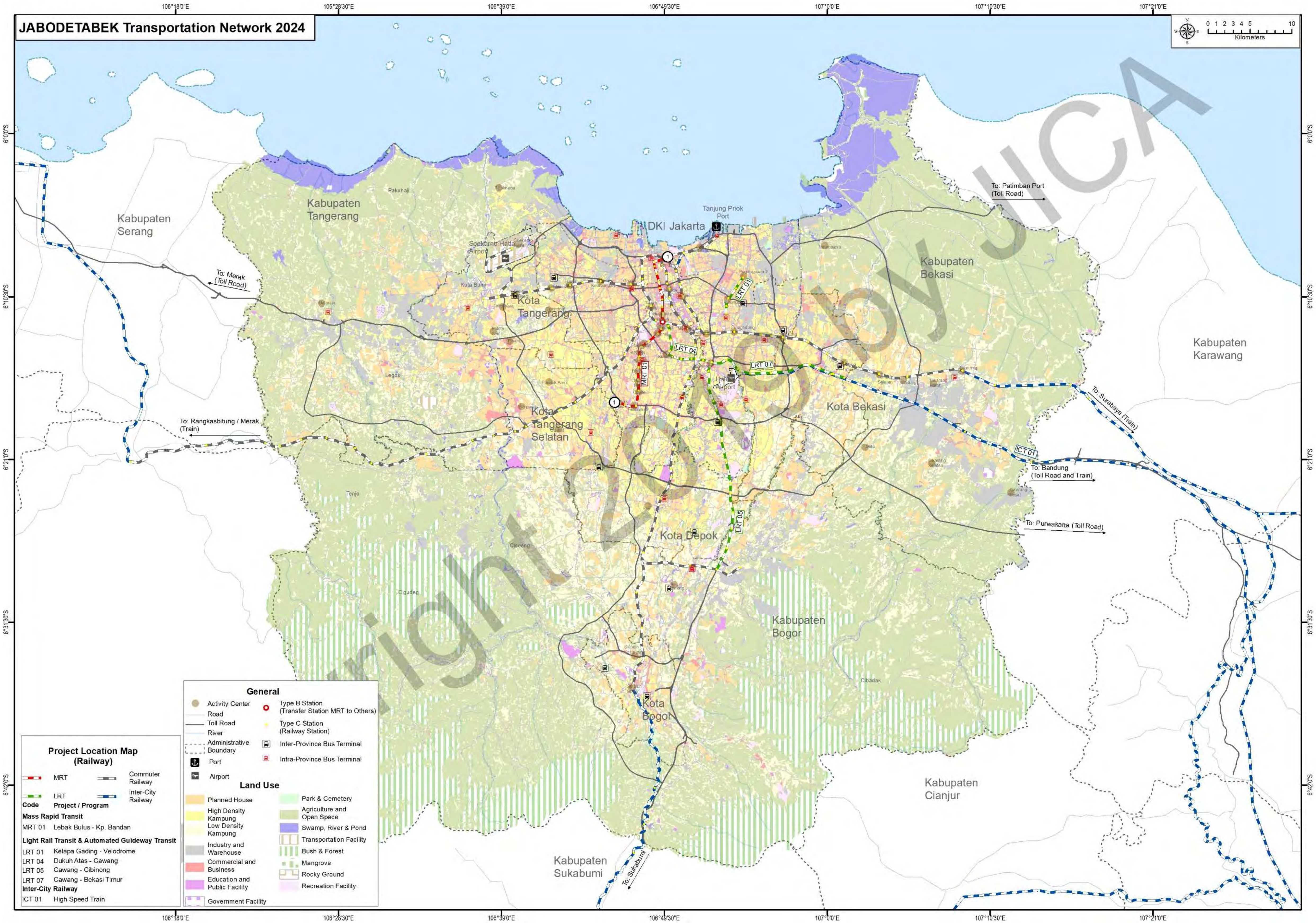
List of Figures

Abbreviations

ABM	Activity-Based Model
ADS	Activity-Travel Diary Survey
AGT	Automated Guideway Transit
AMER	Annual Monitoring and Evaluation Report
APBD	*Anggaran Pendapatan dan Belanja Daerah* (Regional Revenue and Expenditure Budget)
APBN	*Anggaran Pendapatan dan Belanja Negara* (State Revenue and Expenditure Budget)
B/C	Benefit/Cost
BAPPENAS	*Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency)
Bappeda	*Badan Perencana Pengembangan Daerah* (Regional Development Planning Agency)
BKSP	*Badan Kerja Sama Pembangunan* (Jakarta Metropolitan Cooperation Body)
BPN	*Badan Pertanahan Nasional* (National Land Agency)
BPPT	*Badan Pengkajian dan Penerapan Teknologi I* (Agency for the Assessment and Application of Technology)
BPS	*Badan Pusat Statistik* (Statistics Indonesia)
BRT	Bus Rapid Transit
BODETABEK	Bogor, Depok, Tangerang, and Bekasi
BPJT	*Badan Pengelola Jalan Toll* (Indonesian Toll Road Authority)
BPTJ	*Badan Pengelola Transportasi* JABODETABEK (Greater Jakarta Transportation Authority)
BUMD	*Badan Usaha Milik Daerah*/Regional Owned Enterprise
BUMN	*Badan Usaha Milik Negara*/State Owned Enterprise
CBD	Central Business District
CNG	Compact Natural Gas
CO	Carbon Oxide
CO_2	Carbon Dioxide
DCF	Discounted Cash Flow
DGR	Directorate General Railway
DJPK	*Direktorat Jenderal Perimbangan Keuangan*/Directorate General of Fiscal Balance) Ministry of Finance
DKI Jakarta	Jakarta Special Capital Province (*Provinsi Daerah Khusus Ibukota Jakarta*)
Dishub	*Dinas Perhubungan* (Transportation Agency)
EIRR	The Economic Internal Rate of Return
EPA	Environmental Protection Agency
ERP	Electronic Road Pricing
ETC	Electronic Toll Collection
FIRR	The Financial Internal Rate of Return
GAIKINDO	Association of Indonesia Automotive Industries
GCA	Government Contracting Agency
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GPS	Global Positioning System

GRDP	Gross Regional Domestic Product
HBO	Home-Based Other
HBS	Home-Based School
HBW	Home-Based Work
HH	Household
IDR	Indonesian Rupiah
IPF	Iterative Proportional Fitting
ITS	Intelligent Transportation System
JABODETABEK	Jakarta, Bogor, Depok, Tangerang, and Bekasi
JABODEBEK	Jakarta, Bogor, Depok, and Bekasi
Jagorawi	Jakarta, Bogor, Ciawi
Jakpro	Jakarta Propentindo (a regional owned enterprise for LRT Jakarta)
Japek	Jakarta Cikampek
JICA	Japan International Cooperation Agency
JORR	Jakarta Outer Ring Road
JTA	JABODETABEK Transportation Authority
JTrA	JABODETABEK Transit Authority
JUTPI	Project for JABODETABEK Urban Transportation Policy Integration
JUTPI 1	JABODETABEK Urban Transportation Policy Integration Project Phase 1
JUTPI 2	JABODETABEK Urban Transportation Policy Integration Project Phase 2
Kab.	*Kabupaten* (Regency)
Kota	City
KPI	Key Performance Indicator
KPPIP	*Komite Percepatan Pembangunan Infrastruktur Prioritas* (Committee for Acceleration of Priority Infrastructure Delivery)
KRL	*Kereta Rel Listrik* (Electric Train)
LCS	Limited Concession Scheme
LMAN	*Lembaga Manajemen Aset Negara* (State Asset Management Agency)
LOS	Level of Service
LTA	Land Transport Authority
LRT	Light Rail Transit
MLIT	Ministry of Land, Infrastructure, Transportation and Tourism
MP	Master Plan
MPO	Metropolitan Planning Organization
MoF	Ministry of Finance
MoT	Ministry of Transport
MRT	Mass Rapid Transit
NHB	Non-Home Based
NMT	Non-Motorized Transport
NO_x	Nitrogen Oxide
NPV	Net Present Value
OD	Origin-Destination
O&M	Operations and Maintenance
PCU	Passenger Car Unit
PDF	Project Development Facility
PM10	Particulate matter 10 micrometers or less in diameter
PT	*Perusahaan Terbatas* (a limited liability company in Indonesia)
PINA	*Pembiayaan Investasi Non-Anggaran* (Non-Government Budget

	Investment Financing)
PJPK	*Penanggung Jawab Proyek Kerjasama* (Government Contracting Agency)
PMJ	*Polda Metro Jaya/*Regional Police of DKI Jakarta
PPD	*Pengangkutan Penumpang Djakarta (*Indonesia state-owned company in transportation sector)
PPP	Public-Private Partnership
PSN	*Proyek Strategis Nasional* (National Strategic Project)
PT. JJS	PT. Jasamarga Japek Selatan
PT. KAI	PT. Kereta Api Indonesia
PT. KCI	PT. Kereta Commuter Indonesia, subsidiary company of PT. KAI for commuter railway in JABODETABEK, previously known as PT. KCJ
PT. SMI	PT. Sarana Multi Infrastruktur
PT. Taspen	PT. Tabungan dan Asuransi Pegawai Negeri
PUPR	*Pekerjaan Umum dan Perumahan Rakyat* (Public Works and Housing)
RITJ	*Rencana Induk Transportasi JABODETABEK* (JABODETABEK Urban Transportation Master Plan)
RPJMD	*Rencana Pembangunan Jangka Menengah Daerah* (Regional Medium-Term Development Plan)
RPJMN	*Rencana Pembangunan Jangka Menengah Nasional* (National Medium-Term Development Plan)
RTRW	*Rencana Tata Ruang Wilayah* (Spatial Planning)
SITRAMP	The Study on Integrated Transportation Master Plan for JABODETABEK
SOE	State Owned Enterprise
TAZ	Traffic Analysis Zone
TDM	Transportation Demand Management
TfL	Transport for London
TIC	Transportation Impact Control
ToD	Time-of-Day
TOD	Transit-Oriented Development
TTC	Time Travel Cost
UMTAs	Unified Metropolitan Transport Authorities
UPP	*Unit Pengelola Parkir/*Parking Management Unit
USD	United States Dollar
VGF	Viability Gap Fund
VMT	Vehicle Mile Traveled
VOC	Vehicle Operating Cost
VOT	Value of Time
V/C	Volume/Capacity


JABODETABEK Transportation Network 2024
Kilometers
Kabupaten Serang
Kabupaten Tangerang
DKI Jakarta
Tanjung Priok Port
Soekarno Hatta Airport
Kota Tangerang
Kota Tangerang Selatan
Kabupaten Bekasi
Kota Bekasi
Kabupaten Karawang
Kota Depok
Kabupaten Bogor
Kota Bogor
Kabupaten Cianjur
Kabupaten Sukabumi
To: Merak (Toll Road)
To: Rangkasbitung / Merak (Train)
To: Patimban Port (Toll Road)
To: Surabaya (Train)
To: Bandung (Toll Road and Train)
To: Purwakarta (Toll Road)
To: Sukabumi
MRT 01
LRT 01
LRT 04
LRT 05
LRT 07
ICT 01
General
Activity Center
Road
Toll Road
River
Administrative Boundary
Port
Airport
Type B Station (Transfer Station MRT to Others)
Type C Station (Railway Station)
Inter-Province Bus Terminal
Intra-Province Bus Terminal
Land Use
Planned House
High Density Kampung
Low Density Kampung
Industry and Warehouse
Commercial and Business
Education and Public Facility
Government Facility
Park & Cemetery
Agriculture and Open Space
Swamp, River & Pond
Transportation Facility
Bush & Forest
Mangrove
Rocky Ground
Recreation Facility
Project Location Map (Railway)
MRT
Commuter Railway
LRT
Inter-City Railway
Code Project / Program
Mass Rapid Transit
MRT 01 Lebak Bulus - Kp. Bandan
Light Rail Transit & Automated Guideway Transit
LRT 01 Kelapa Gading - Velodrome
LRT 04 Dukuh Atas - Cawang
LRT 05 Cawang - Cibinong
LRT 07 Cawang - Bekasi Timur
Inter-City Railway
ICT 01 High Speed Train
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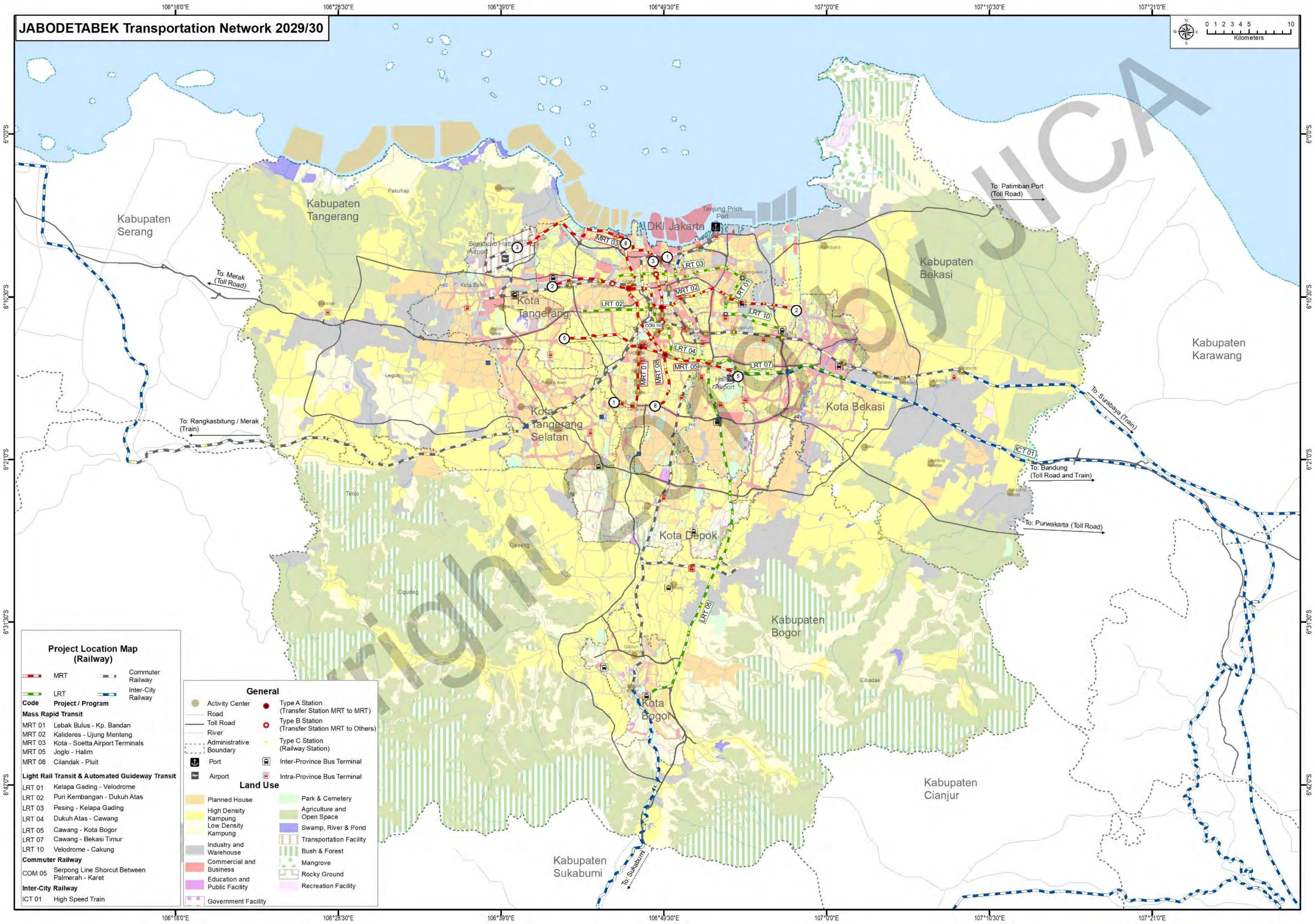
JABODETABEK Transportation Network 2029/30
0 1 2 3 4 5 10
Kilometers
Kabupaten Serang
Kabupaten Tangerang
DKI Jakarta
Tanjung Priok Port
Kabupaten Bekasi
Kabupaten Karawang
Kota Tangerang
Kota Tangerang Selatan
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MRT 01
MRT 02
MRT 03
MRT 05
MRT 08
LRT 01
LRT 02
LRT 03
LRT 04
LRT 05
LRT 07
LRT 10
COM 05
ICT 01
106°18'0"E
106°28'30"E
106°39'0"E
106°49'30"E
107°0'0"E
107°10'30"E
107°21'0"E
6°0'0"S
6°10'30"S
6°21'0"S
6°31'30"S
6°42'0"S
Project Location Map (Railway)
MRT
LRT
Commuter Railway
Inter-City Railway
Code
Project / Program
Mass Rapid Transit
MRT 01 Lebak Bulus - Kp. Bandan
MRT 02 Kalideres - Ujung Menteng
MRT 03 Kota - Soetta Airport Terminals
MRT 05 Joglo - Halim
MRT 08 Cilandak - Pluit
Light Rail Transit & Automated Guideway Transit
LRT 01 Kelapa Gading - Velodrome
LRT 02 Puri Kembangan - Dukuh Atas
LRT 03 Pesing - Kelapa Gading
LRT 04 Dukuh Atas - Cawang
LRT 05 Cawang - Kota Bogor
LRT 07 Cawang - Bekasi Timur
LRT 10 Velodrome - Cakung
Commuter Railway
COM 05 Serpong Line Shorcut Between Palmerah - Karet
Inter-City Railway
ICT 01 High Speed Train
General
Activity Center
Road
Toll Road
River
Administrative Boundary
Port
Airport
Type A Station (Transfer Station MRT to MRT)
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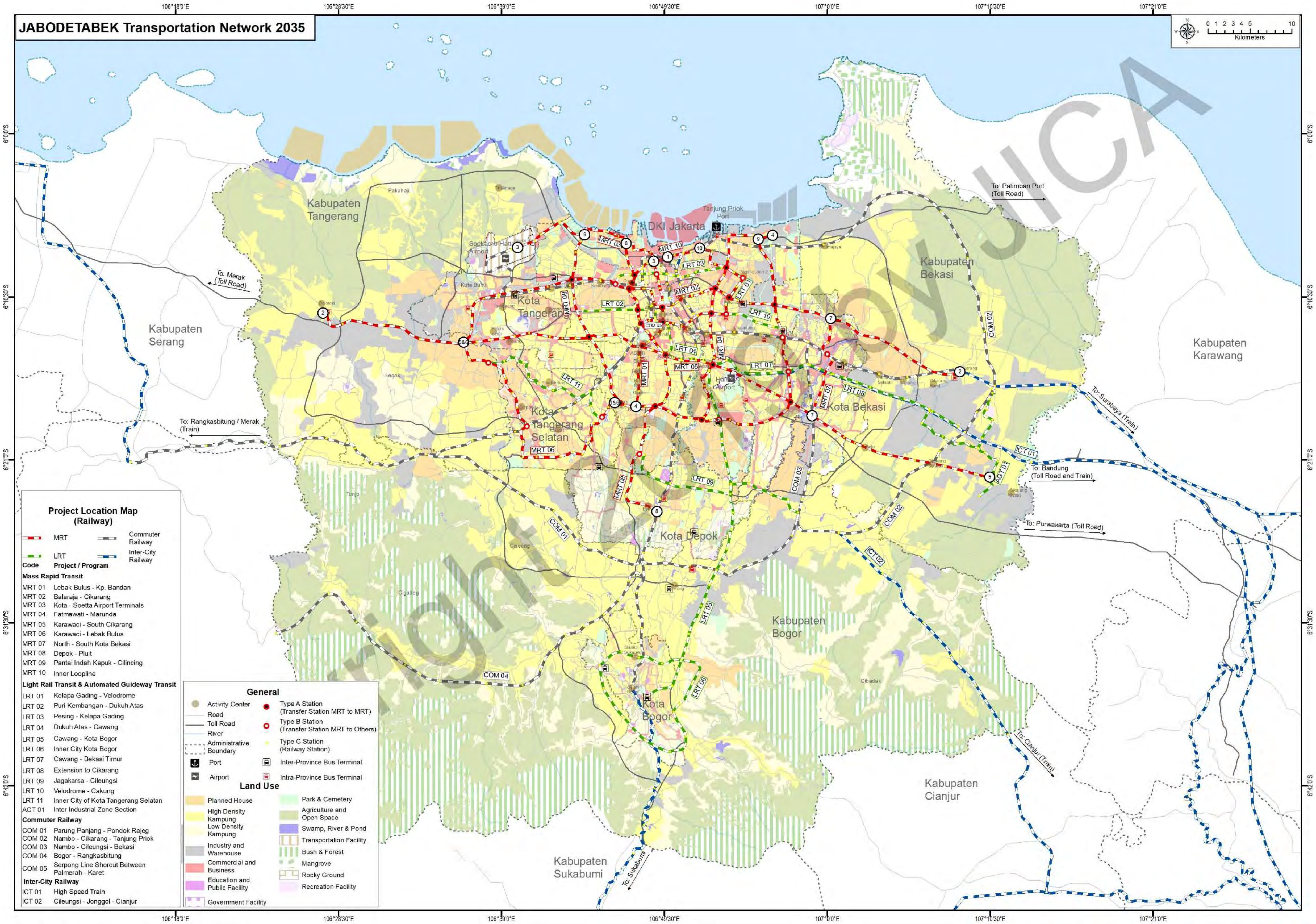
Rocky Ground
Recreation Facility


JABODETABEK Transportation Network 2035
Kilometers
Kabupaten Tangerang
DKI Jakarta
Tanjung Priok Port
Kabupaten Bekasi
Kabupaten Serang
Kota Tangerang
Kota Tangerang Selatan
Kota Bekasi
Kabupaten Karawang
Kota Depok
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MRT 04 Fatmawati - Marunda
MRT 05 Karawaci - South Cikarang
MRT 06 Karawaci - Lebak Bulus
MRT 07 North - South Kota Bekasi
MRT 08 Depok - Pluit
MRT 09 Pantai Indah Kapuk - Cilincing
MRT 10 Inner Loopline
Light Rail Transit & Automated Guideway Transit
LRT 01 Kelapa Gading - Velodrome
LRT 02 Puri Kembangan - Dukuh Atas
LRT 03 Pesing - Kelapa Gading
LRT 04 Dukuh Atas - Cawang
LRT 05 Cawang - Kota Bogor
LRT 06 Inner City Kota Bogor
LRT 07 Cawang - Bekasi Timur
LRT 08 Extension to Cikarang
LRT 09 Jagakarsa - Cileungsi
LRT 10 Velodrome - Cakung
LRT 11 Inner City of Kota Tangerang Selatan
AGT 01 Inter Industrial Zone Section
Commuter Railway
COM 01 Parung Panjang - Pondok Rajeg
COM 02 Nambo - Cikarang - Tanjung Priok
COM 03 Nambo - Cileungsi - Bekasi
COM 04 Bogor - Rangkasbitung
COM 05 Serpong Line Shorcut Between Palmerah - Karet
Inter-City Railway
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SUMMARY OF JABODETABEK URBAN TRANSPORTATION MASTER PLAN (DETAILED RITJ)

Efforts for the MP development of transportation system in cooperation with JICA have been made throughout the years: SITRAMP in early (2000 – 2004) and JUTPI 1 (2009 – 2012). The most recent one would be JUTPI 1 that was completed in 2012 and produced MP with target year of Short Term (year 2011 – year 2015), Medium Term (Year 2016 – year 2020), and Long Term (year 2021 – year 2030). The MP also included recommendation of various policy measures to tackle the urban transportation problems and how to deal with traffic congestion problem.

Signature transportation projects were proposed in JUTPI 1 including the rail- and road-based transportation development plans as well as several other essential supporting projects. The review of development progress of JUTPI 1 in 2018 indicated that only 28% of all proposed projects were implemented as scheduled, 44% were implemented partially/delayed, and the rest of them had not been implemented for various reasons, such as; regulatory aspect, shortage of financial resources, difficulty in land acquisition, and institutional/ organizational aspect.

Regarding JUTPI 1's public transport development, BRT extensive development since the early stage resulted in an increase of passengers that is in line with the increase of fleet size and route expansion though the service capacity was nearly reached. BRT and the feeder bus development need to be integrated with one another as well as with the rail-based development such as commuter line and recently implemented – and yet to be expanded – MRT. The first half of north-south MRT line is fully operated and further east-west line is planned. The plans being realized in 2018 is somewhat in between the scenario of "moderate-intensive public transport system development" of JUTPI 1. There is also a plan that is considered no longer necessary, such as the plan of monorail development.

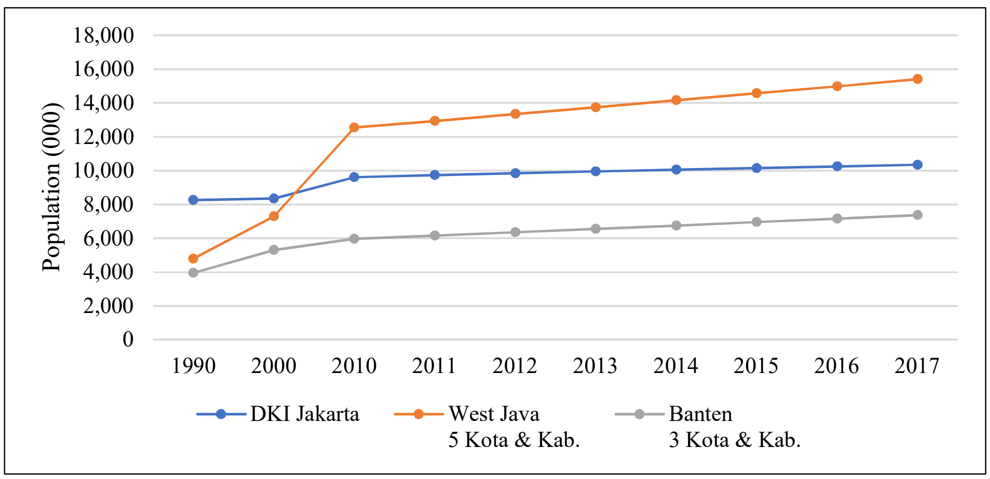
The road-based development has been indicating quite significant progress in which is mostly dominated by the toll road development. Both ring and radial toll roads have been developed and shall be continuously developed even with additional plans that are initiated by the Indonesian side (not the part of JUTPI 1 MP). Non-JUTPI 1 MP toll road projects that are worth mentioning are: the elevated toll road above the existing toll road towards eastern JABODETABEK that is under construction and planned to be completed in 2020, and the toll road that connects existing seaport of Tanjung Priok and the newly developed seaport of Patimban. JUTPI 1's non-toll road development has also been significantly implemented although some are justified no longer necessary for the reason of coexisting with other plans.

With changes in JUTPI 1 MP actual implementation period, unpredictable changes of land use, and significant factors of demographic and socioeconomic development, the surge of travel pattern, vehicle ownership, and lifestyle alterations of citizens in JABODETABEK occurred. Population of JABODETABEK has been doubled in the last 3 decades (from 1990-2017) with an average growth of 3.6%. Population growth rate of BODETABEK area has continuously increased throughout the period and is currently higher than that of DKI Jakarta (see Table i and Figure i).

Table i Time-series Population in JABODETABEK

Region	Population (unit: 1,000 persons)									
	1990	2000	2010	2011	2012	2013	2014	2015	2016	2017
DKI Jakarta	8,254	8,347	9,618	9,730	9,839	9,947	10,052	10,154	10,254	10,350
Kota&Kab. Bekasi, Kota&Kab. Bogor, Kota Depok	4,797	7,300	12,540	12,939	13,343	13,749	14,160	14,574	14,990	15,410
Kota&Kab. Tangerang, Kota Tangerang Selatan	3,949	5,300	5,959	6,155	6,354	6,553	6,757	6,960	7,165	7,369
JABODETABEK	**16,956**	**20,964**	**28,117**	**28,824**	**29,536**	**30,249**	**30,969**	**31,688**	**32,409**	**33,129**

Source: Projected Population of *Kabupaten/Kota* of DKI Jakarta, West Java, and Banten Provinces 2010 - 2020 (by BPS, UNFPA, 2015)



Source: Projected Population of *Kabupaten/Kota* of DKI Jakarta, West Java, and Banten Provinces 2010 - 2020 (by BPS, UNFPA, 2015)

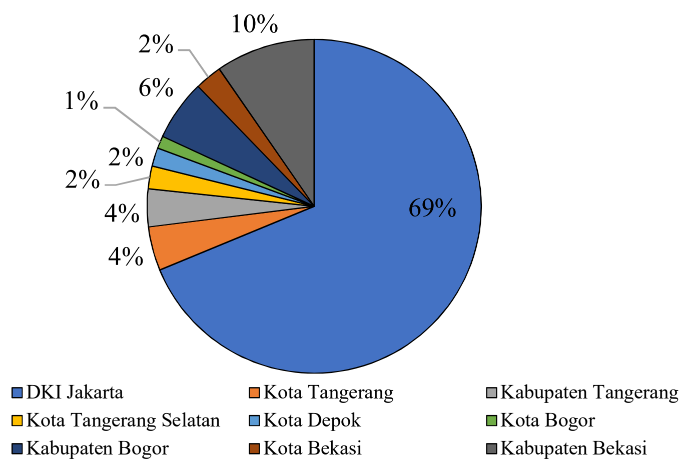
Figure i Population Trend in JABODETABEK

Most of the population come from a productive age (15-64), which contributes 70% of the total population. The overall sex ratio is 1.03, which indicates that male population is slightly higher than that of female.

Employment is classified into three sectors: primary (harvest raw materials from the natural environment – mining, farm, and fishery), secondary (manufacturing e.g., making cars and steel, water supply, and construction) and tertiary (wholesale and retail trade, information/communication, financial and insurance service, and other service activities). In JABODETABEK, the number of primary sector workers has decreased while secondary and tertiary sectors have been showing increasing trend over the last two decades. This indicates changes in economic activities and land conversion.

For almost a decade apart, the number of students in urban area grew in various directions but centered in downtown areas like Jakarta Pusat and Jakarta Selatan, while other parts of the city showed the opposite tendency. This may be related to the fact that the development of residential areas, that are mostly vertical in structure across both areas, has been contributing to the resettlement of family at city centers.

GRDP of JABODETABEK contributes to 25% of the total GDP of Indonesia with growth of 6.17% on average from 2010 to 2017. Kota Tangerang Selatan is the most rapidly growing region with the highest GRDP growth among all with an average of 7.9%. The biggest share of JABODETABEK GRDP in 2017 is found in DKI Jakarta with 69.0% (see Figure ii). Average GRDP per capita of JABODETABEK is IDR 71.80 million. DKI Jakarta has the highest GRDP per capita, followed by Kabupaten Bekasi and Kota Tangerang. Further information on current socioeconomic state and changes will be explained in Chapter 2.1.



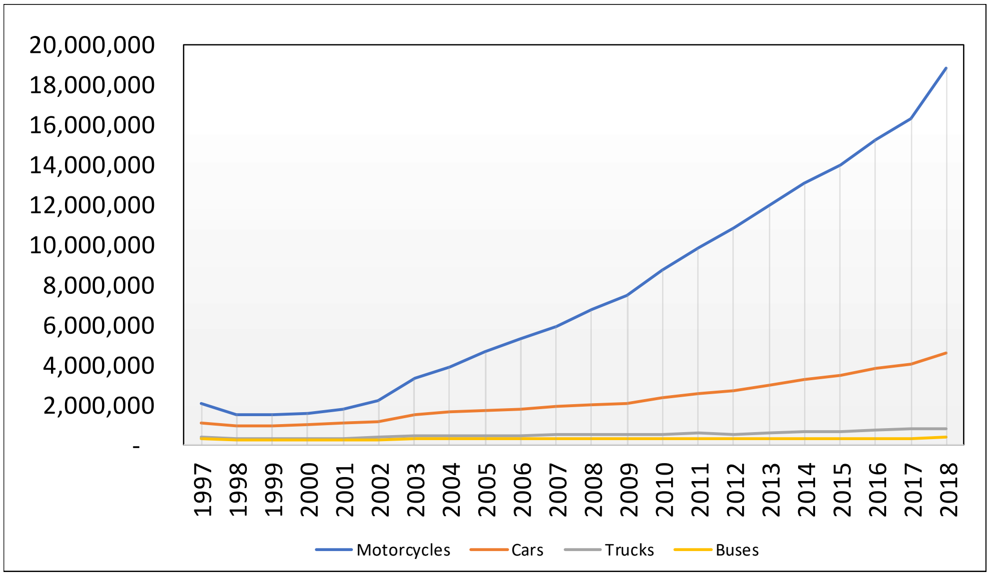
Source: JUTPI 2 based on BPS data

Figure ii Share of Each Kota and Kabupaten to JABODETABEK GRDP in 2017

Manufacture industry is the biggest contributor for JABODETABEK economy that takes 24% of the region, followed by wholesale and retail (15%) and construction (12%) in 2017. The tertiary sector especially information and communication and financial has a profound contribution in some areas of BODETABEK of which development is higher than the trade sector.

In addition to the changes in socioeconomic and demographic factors mentioned above, another factor worth noting is the vehicle ownership that has been continuously increasing and impacting the travel pattern. This condition may be affected by the public transportation development that is being outrun by private vehicle growth in which a simpler and more attractive purchase scheme is being offered.

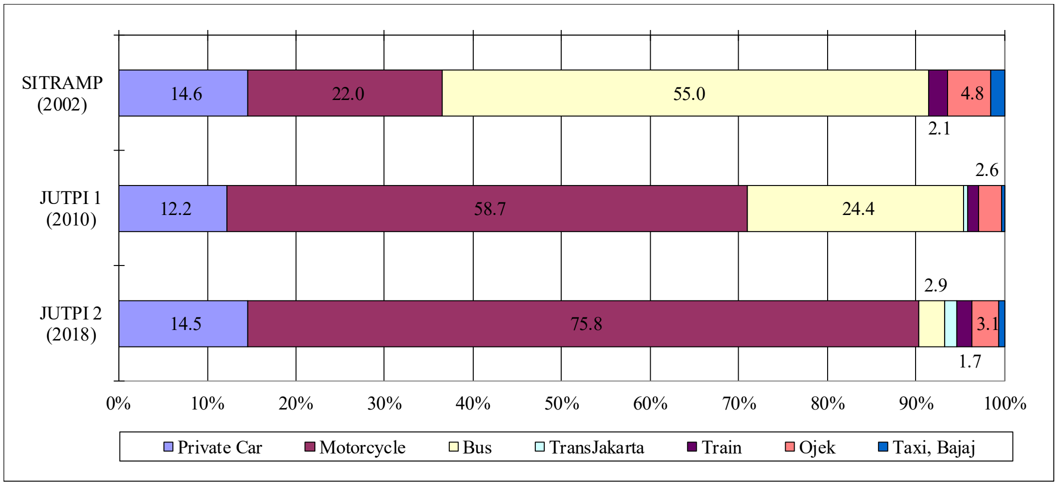
Such preference may be also derived from the consideration of more convenience and security in the private vehicle than in the public transport. The trend of vehicle ownership can be seen in Figure iii. It should be noted that the number of registered private vehicles is climbing up and motorcycle is exponentially increasing over nine times in the last two decades.



Source: Metro Jaya Police, Banten Police, and West Java Police

Figure iii Registered Vehicle in JABODETABEK

The significant increase of private vehicle ownership over the years has impacted the mode share of JABODETABEK itself. While mode share was dominated by public transport in 2002 (more than 50%), the tendency shows decreasing trend up to the recent year (see Figure iv). More detailed discussion is provided in Section 2.5 and it depicts the use of private vehicle (car and motorcycle) increases along with the increase of household income level. However, the share of public transport is indifferent throughout range of household income groups.

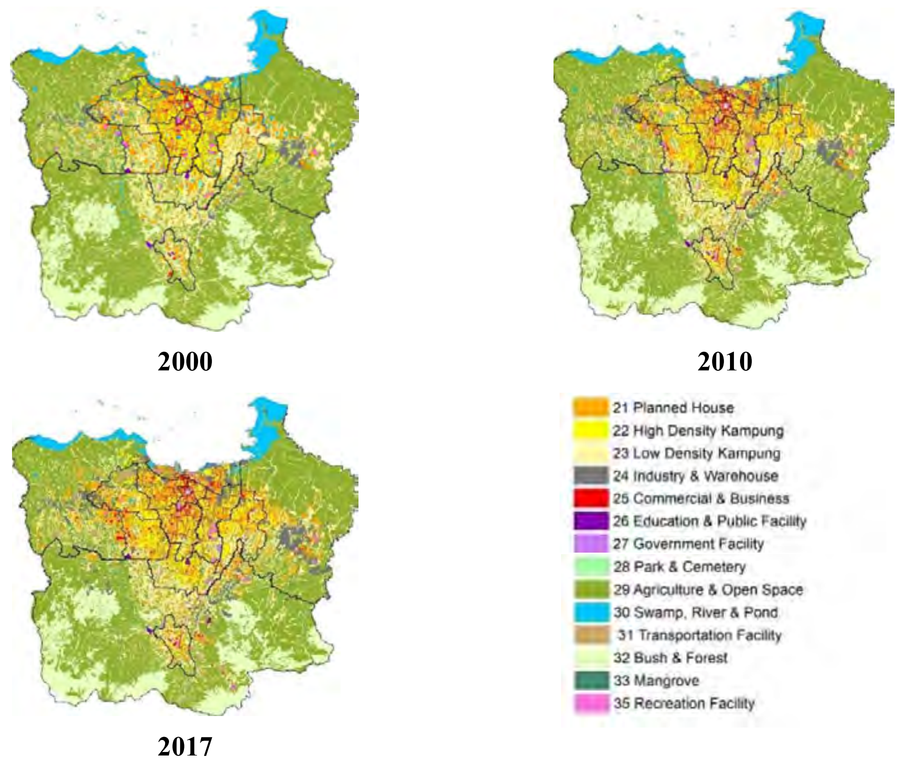


Source: JUTPI 2

Figure iv Modal Share in JABODETABEK (Excluding NMT)

JABODETABEK Urban Transportation Policy Integration Phase 2 (hereinafter referred to JUTPI 2) survey also infers lifestyle that reflects individual activities across places of activity conduct, time of day, and income groups. While bigger picture of Section 2.4 may indicate high cumulative frequency of out-of-home activity such as work, school, and other private activities, the at-home activity is dominated by "sleep" and "home activity". When the activity/lifestyle is cross-tabulated to income groups, it can be inferred that lower-income group conducts at-home activity longer than those who have higher income. This may indicate that higher income group has access to go to places better than the lower income.

Furthermore, the current lifestyle mentioned above is related to the land use change as more people conduct more activities. JABODETABEK metropolitan area is an urban area that has functional interconnections that are connected with an integrated regional infrastructure network system. The land use pattern of urban activities in 2000 was still concentrated in DKI Jakarta, over time the concentration of urban activities began to spread to the areas around DKI Jakarta, this is evidenced by the existence of a new expansion region in 2008, which was previously part of Kabupaten Tangerang administrative area bordering the DKI Jakarta province, and has become a new administrative region named Kota Tangerang Selatan. Land-use changes during year 2000 – 2017 are illustrated in Figure v.

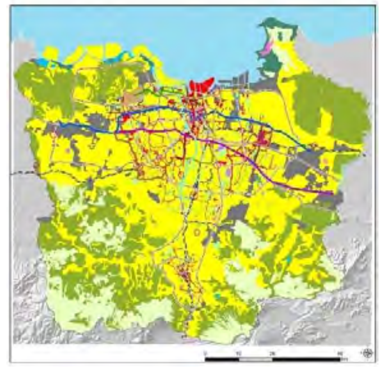


Source: JUTPI 2

Figure v Land-use Change in JABODETABEK during Year 2000 – 2017

As shown in Figure v, land use is divided into 2 functions, which are; urban land use and natural land use. In addition, land use function has several categories that consist of: Urban land use (Planned House, High Density *Kampung*, Low Density *Kampung*, Industry & Warehouse, Commercial & Business, Education & Public Facility, Government Facility, Park & Cemetery, Recreation Facility, and Transportation Facility) and Natural land use (Agriculture and Open Space, Swamp, River & Pond, Bush & Forest, Mangrove, Rocky Ground). Following regional spatial plan of each *kota* and *kabupaten*, in 2035 land use condition forecasted a significant change in urban and natural function, most of the change is in residential area and agriculture area. Some factors that increase the number of housing areas are triggered by the necessity of dwelling area to support industry, business and commercial activities. Meanwhile, from those factors, the agriculture area is decreasing with an effect on the land use shifting from green area to urban land use function. It is interpreted in Figure vi.

2017



2035

Source: JUTPI 2

Figure vi JABODETABEK Land-use Comparation Year 2017 and 2035

For further information regarding JABODETABEK land-use information, explained in Section 2.6.

Above-mentioned facts triggered the needs of MP update, hence JUTPI 2 comes along. The initial steps of JUTPI 2 is to update MP based on the understanding of the most recent situation in JABODETABEK by collecting necessary data and acknowledgement of policies being implemented. In addition, the vision and mission in terms of each *kota*/*kabupaten*'s future plan needs to be integrated as well. The railway and BRT passenger data are gained from each operator and it can be understood that yearly railway passenger is 316 million and is 145 million for BRT passenger, both as of 2017. The highest demand for the railway line is Bogor line and the highest demand of BRT corridor is Corridor 1 that is now overlapping with MRT (more detailed discussion is provided in Section 3.1). While these data and information are considered secondary data, JUTPI 2 also conducted primary database collection by doing necessary transportation surveys (Section 3.2), they are:

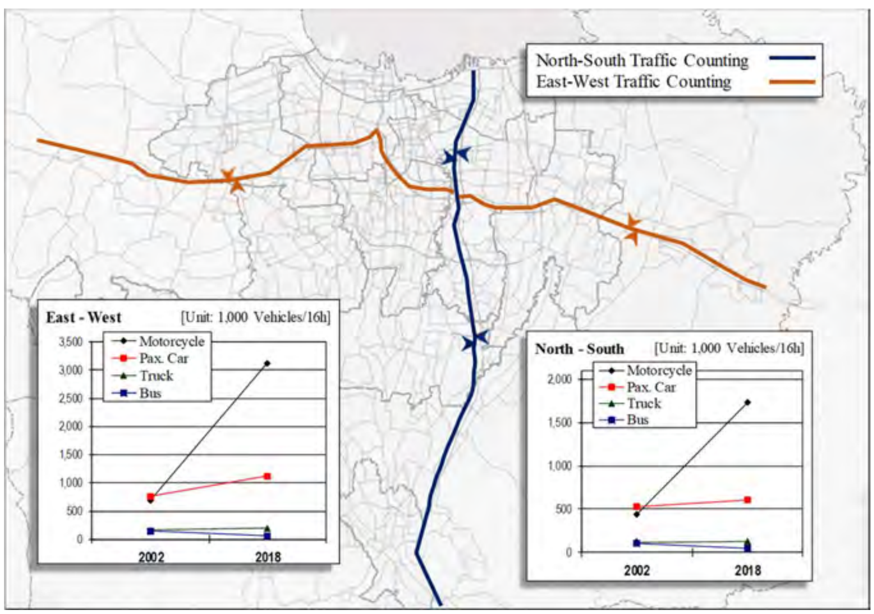
1. Passenger Transfer Bottleneck Survey
   The objective of passenger transfer bottleneck survey is to identify current bottleneck location in transfer point, to obtain transfer time, and to obtain passenger's opinion. This survey produced interesting results, such as such as 13 to 21 minutes transfer time and 14 to 23 minutes of waiting time during peak hour. Both transfer and waiting time are less than 10 minutes during off-peak hour. Most of the passengers have a lot more access to motorcycle than car which indicates their socioeconomic status. Further detail discussion is located in Section 3.2.1.

2. Travel Speed Survey
   The objective of travel speed survey is to obtain travel speed data in JABODETABEK. With quite unique method of analyzing GPS point log data, the survey successfully produced the speed data for two timelines of the year that were caused by the extension of operation hours of the odd-even number plate regulation. Travel speed survey result shows that lower speed is observed in all *kota* and *kabupaten* in JABODETABEK during both morning and evening peak hours. After the

extension of operation hours of the odd-even number plate regulation, more increase of travel speeds is clearly observed on both target roads and other sections of DKI Jakarta. In JABODETABEK, 1 km/hour increase in travel speed is observed on average during peak hours. Further detailed discussion is located in Section 3.2.2.

3. Screenline and Classified Vehicle Counting Survey

   Screenline and classified vehicle counting survey consists of full-scale screenline and additional vehicle counting. The main objective of the survey is to verify the current OD matrices which shall be estimated by the travel demand forecast model. In addition, the survey aims at understanding the annual growth rate of traffic volume at the same observed location as SITRAMP and to see the effect of odd-even number plate regulation expansion. There are 91 observed locations in which 55 locations are in DKI Jakarta, 36 locations are in BODETABEK with additional 26 locations of target roads. The growth can be seen in Figure vii and noteworthy fact of increase of motorcycle among all types of vehicle is seen significantly. Private vehicles share the biggest modal composition while public transport is considered as relatively minor components. However, implementation of odd-even number plate regulation affects to the increase of public transport despite the impact is smaller than expected. Further detail discussion is located in Section 3.2.3.



Source: JUTPI 2

Figure vii Traffic Growth from 2002 to 2018

4. Truck OD Interview Survey

   The objective of truck OD interview survey is to understand the travel characteristics of truck vehicular trips and goods movement generated or attracted to/from major origin and destination such as ports and industrial estates. As a result, 2-axle trucks have the highest share of 37%, followed by containers, pick up, 3-axle trucks, and articulated trucks of which shares were 35%, 18%, 10%, and 0.04%, respectively. Hourly traffic fluctuation can be seen throughout the day and it differs in each type of industry depending on the business scale. The movement of freight transport observed mostly in industrial-based area, carrying commodities of machinery and wheeled vehicles, and metal product. Further detail discussion is located in Section 3.2.4.

5. Cordon Line Survey
   The objective of the survey is to obtain passenger information and trip pattern data from passengers who are crossing the boundary of the JABODETABEK region using the intercity bus, railway, airplane, ordinary road, and toll road. Result of the survey shows that the highest mode share of external trips is from private car (24%), and is followed by airplane (23%), motorcycle (21%), bus (21%), railway (7%) and minibus (4%). Here are some findings in each cordon line survey.

   A. Inter-regional Toll Road OD Survey
      1) The survey was carried out in Jakarta – Cikampek Toll Road and Tangerang – Merak Toll Road across at ten toll gates on both toll roads.
      2) Truck represents the most significant component of the traffic stream based on PCU, followed by private car and bus, both toll roads have the same pattern.
      3) Trip purpose on toll-road are mostly related to economic activity with business and work become the largest component significant to other matters.

   B. Roadside OD Survey at Ordinary Road
      1) The survey was carried out at six locations along the borderline of JABODETABEK as shown below.

Source: JUTPI 2

Figure viii Roadside OD Interview Survey Locations

2) The highest traffic volume is in Jl. Tanjung Pura that acts as the primary access for the arterial road to go in and out of eastward JABODETABEK, followed by Jl. Sukabumi (southward), and Jl. Raya Serang (westward).
3) Truck represents the most significant component of the traffic stream based on PCU followed by motor cylce, private car, and bus, respectively.
4) The largest share of the trip purpose is business (34%) followed by work (31%), showing that arterial road is indispensable for economic activities especially for logistics purpose.

C. Railway Passengers OD Interview Survey

1) Railway Passenger OD Interview Survey was carried out for departing passengers at eleven stations that are categorized by type of service and distance as follows: Medium-long Distance Railway (Pasar Senen, Gambir, Bekasi, and Bogor Stations), Local Railway (Tanjung Priok, Kemayoran, Tambun, and Cikarang Stations), and Commuter line (Maja, Citeras, and Rangkas Bitung Stations).
2) Most of the passengers have the trip purpose of family matters in most lines. The survey also showed that most of the passengers ride online motorcycle taxi in East Line – Local Railway and West Line – Commuterline, taxi, and online taxi in East Line Medium – Long Distance Railway, and train in South Line – Local Railway to travel to the departure station.

D. Airport Passengers OD Interview Survey

1) The survey was carried out at two airports: Soekarno-Hatta Airport and Halim Perdanakusuma Airport.
2) The majority of the airplane passengers of Soekarno-Hatta and Halim Perdanakusuma Airport have a work-related trip purpose (≥45%).
3) The largest share for access mode to Soekarno-Hatta Airport is taxi and online taxi and is followed by car, omprengan, and large bus. Similar pattern is shown in Halim Perdanakusuma Airport where the largest share for access mode is online taxi followed by car, omprengan, and online motorcycle taxi. Airport distance from the city center for both airports has an effect on the access mode choice by airplane passenger.

E. Intercity Bus Passengers OD Interview Survey

1) The survey locations are at the origin bus terminals inside the JABODETABEK area. The bus terminals within the scope of the intercity bus passenger OD interview survey are listed as follows: Kampung Rambutan (DKI Jakarta), Kalideres (DKI Jakarta), Lebak Bulus (DKI Jakarta), Pulo Gebang (DKI Jakarta), Tanjung Priok (DKI Jakarta),

Baranangsiang (Kota Bogor), Bekasi (Kota Bekasi), Cikarang (Kab. Bekasi), Poris Plawad (Kota Tangerang), and Ciledug/Pasar Lembang (Kota Tangerang).

2) Based on the survey result, online motorcycle taxi and small/medium bus hold the largest share for access mode used to the most bus terminals.

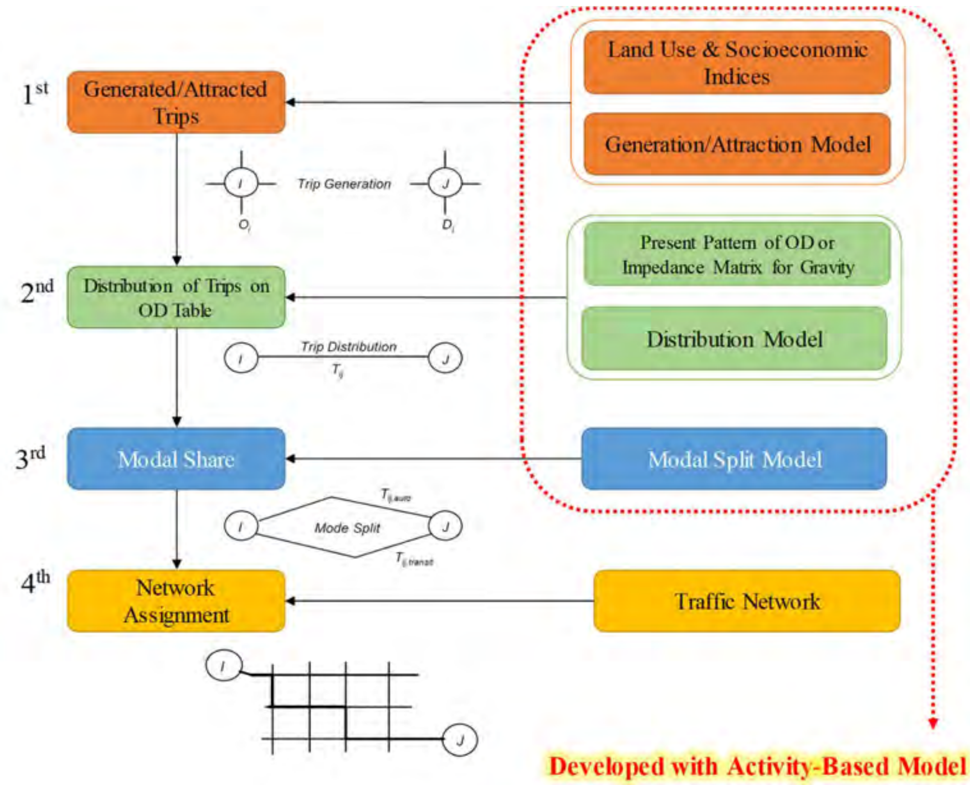
3) Related to the trip purpose for JABODETABEK residence, most of the intercity bus passengers have the trip purpose of family matters in all surveyed bus terminals.

6. Activity-Travel Diary Survey (Paper-based and Smartphone Application)

   As the key transport survey, objective of Activity-Travel Diary Survey (ADS) is to obtain data of daily activity-travel from each respondent within JABODETABEK. ADS was conducted in two methods, namely ADS using Paper-based Diary (ADS Paper-based) and Smartphone Application (ADS MEILI). Using the survey result and based on the combined database with JUTPI 1 Commuter Travel Survey, many attributes of socioeconomic, demographic, and newly updated trip/travel data are gained. While details about this survey conduct can be seen in Section 3.2.6, some noteworthy findings are: average household size in JABODETABEK from ADS MEILI is 3.09 and average household size from ADS Paper-based is 3.7, average gross trip rate from the ADS MEILI is 3.22, and average gross trip rate from the ADS Paper-based is 1.89.

All the survey results shall be then included as input of the travel demand model. A conventional four-step travel demand model is commonly used to estimate traffic volume in each link of the transportation network, in order to estimate travel patterns, congestion, and vehicle emission. However, it is said that the conventional four-step travel demand model has limitations due to its trip-based sequential structure and lack of behavioural responses. A conventional four-step travel demand model also mainly focuses on commuter trips rather than trips generated by daily activity; thus, many actual trips cannot be captured by the model and reflect the real traffic condition for the whole day.

In JUTPI 2, Activity-Based Model (ABM) is chosen as the most appropriate model to counter the above issues. ABM can more accurately estimate travel pattern, including intra-household interaction rules, and it can also predict choice of when to travel by the exact time of day. Therefore, in JUTPI 2, ABM is utilized to substitute the first three steps of conventional four-step demand model (see Figure ix).

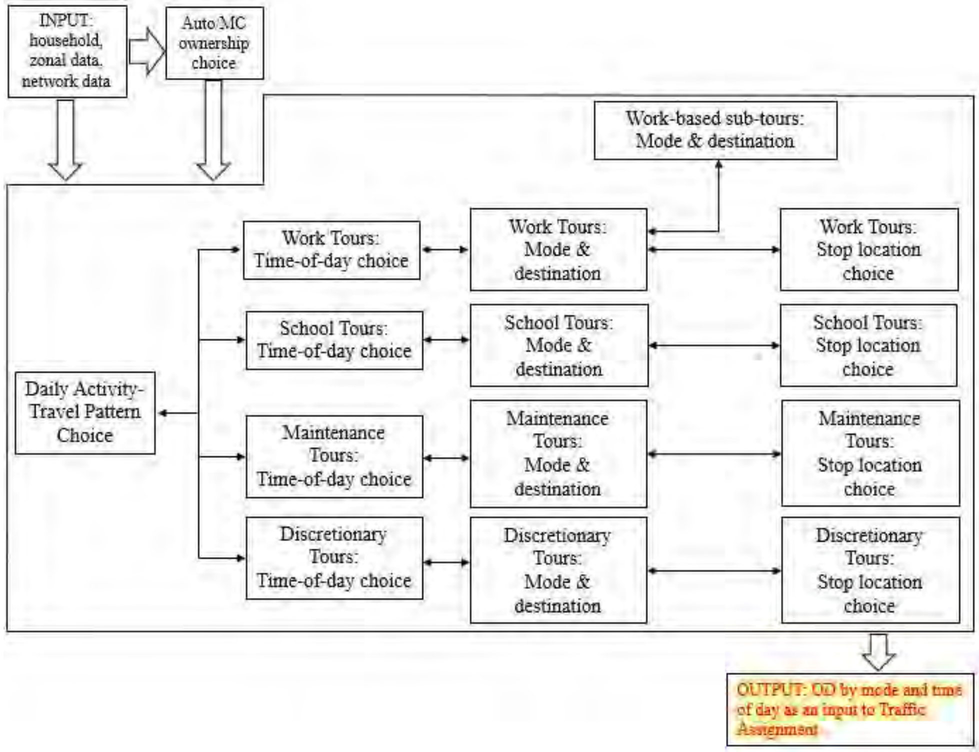


Source: JUTPI 2

Figure ix Four-Step Demand Model and Activity-Based Model

Activity-Based Model (ABM) is an alternative method of travel demand model which can present a suitable framework in which travel is viewed in the context of traveler's behavior and activity pattern. The activity-based modeling system simulates the way individuals schedule their daily activities and travel in study area (JABODETABEK) and provides accurate estimates which are expected to serve as better inputs for evaluation of different transportation policy scenarios. By utilizing the updated CTS (Commuter Travel Survey in JUTPI 1) and ADS (Activity-Travel Diary Survey in JUTPI 2) dataset of individuals and policy scenario that needs to be tested, population synthesis is conducted. The result of population synthesis is utilized as an input to the activity-based modeling system. Part of the task of input preparation, applying activity-based models, and the intra-household interaction rules is called microsimulation. This process is repeated for every household.

Activity-based models are based on behavioral theories about the way in which people make decisions about activity participation in the presence of constraints, including decisions about where to participate in activities, when to participate in activities, and how to get to these activities. Because they represent decisions and the resulting behaviors are more realistic, activity-based models are often better at representing how investments, policies, or other changes will affect people's travel behavior.



Source: JUTPI 2

Figure x Activity-Based Modeling System

To estimate disaggregated travel behavior of each household and person in the study area for microsimulation modeling, synthetic population whose attribute distribution matches those of the general population by traffic analysis zone (TAZ) and region (*kabupaten/kota*) is required. Thus, population synthesis is conducted to generate population as an input for microsimulation process. The population synthesis process was implemented in several steps.

Microsimulation is a repeating process of calculating travel demand by simulating trips of individual household members based on Activity-Based Travel Demand models for each household. Microsimulation needs several inputs to start the process, such as synthetized population, Activity-Base Model, and auto/motorcycle ownership choice model.

The process starts with the approach to expand the identified sample patterns to the population level. Microsimulation estimates the number of auto/ motorcycles for each household from the synthesized population. Then, using the data from the synthesized population, the Activity-Based Modeling system started, from the upper model first followed by the lower model. An initial activity, mode, and start time are drawn from the distribution associated with the target patterns.

The modelling work enables the projection of the future years of 2024, 2029/30, and 2035. Despite the result of JUTPI 2, the government of Indonesia has conducted several efforts to develop a comprehensive future transportation system through JABODETABEK Transportation Master Plan

(RITJ or *Rencana Induk Transportasi JABODETABEK*). However, this plan is still based on the old version of database and actual quantification over this plan has never been done. Therefore, the current socioeconomic and land use condition should be observed to project future socioeconomic perspective by considering transportation development scenarios to evaluate and improve the current RITJ.

Quantifying future socioeconomic condition and impact of development plans should be done by thorough examination involving current data of population, employment, and students. In addition, spatial analysis concerning current land use and urban development direction are considered to anticipate the dynamic changes and enrich the demand forecast model. Based on the analysis, it is projected that the population growth will keep on increasing especially in the outskirt of DKI Jakarta. By utilizing cohort-component which divides the age group population based on 5-year intervals and splits between males and females considering survival rate projection including migration, fertility, and mortality, the population projection is estimated in Table ii.

Table ii Population Projection by Gender and Age Group (JABODETABEK)

Age	2017	2020	2025	2029	2030	2035
Male						
0-4	1,591,605	1,595,054	1,609,482	1,621,129	1,624,041	1,638,732
5-9	1,517,897	1,598,279	1,612,737	1,624,407	1,627,325	1,642,045
10-14	1,331,091	1,436,432	1,599,725	1,611,301	1,614,195	1,628,797
15-19	1,335,703	1,395,891	1,563,260	1,705,428	1,740,970	1,756,718
20-24	1,475,111	1,503,851	1,607,216	1,761,381	1,799,923	2,004,537
25-29	1,563,403	1,554,150	1,598,246	1,686,129	1,708,099	1,912,902
30-34	1,574,851	1,616,224	1,613,091	1,649,706	1,658,859	1,772,878
35-39	1,479,082	1,551,654	1,627,233	1,624,709	1,624,079	1,670,159
40-44	1,315,490	1,422,076	1,549,528	1,609,909	1,625,004	1,621,853
45-49	1,089,547	1,207,394	1,386,495	1,485,905	1,510,758	1,584,345
50-54	860,963	987,153	1,185,203	1,325,850	1,361,012	1,482,991
55-59	645,533	751,471	947,516	1,099,594	1,137,613	1,306,363
60-64	439,997	527,147	682,850	825,365	860,993	1,033,732
65-69	265,994	334,331	460,107	568,828	596,008	751,496
70-74	153,857	190,040	276,265	359,410	380,196	492,495
75+	131,803	157,763	213,225	273,194	288,186	389,499
Total	16,771,927	17,828,910	19,532,178	20,832,245	21,157,262	22,689,543
Female						
0-4	1,527,701	1,531,198	1,545,072	1,556,271	1,559,071	1,573,197
5-9	1,449,789	1,543,659	1,557,645	1,568,936	1,571,759	1,586,000
10-14	1,266,332	1,365,355	1,553,439	1,564,699	1,567,514	1,581,717
15-19	1,334,811	1,382,757	1,541,489	1,711,367	1,753,837	1,769,727
20-24	1,507,893	1,507,439	1,581,747	1,727,007	1,763,322	2,006,228
25-29	1,573,938	1,593,733	1,601,511	1,664,667	1,680,456	1,873,363
30-34	1,552,635	1,604,704	1,653,628	1,660,084	1,661,698	1,743,611
35-39	1,441,795	1,517,521	1,601,555	1,640,617	1,650,383	1,658,437
40-44	1,241,440	1,365,789	1,506,938	1,573,696	1,590,385	1,638,873
45-49	1,019,323	1,141,988	1,347,949	1,459,393	1,487,254	1,569,612
50-54	812,548	930,263	1,132,843	1,296,292	1,337,154	1,475,344
55-59	610,351	716,346	901,276	1,058,290	1,097,544	1,295,489
60-64	410,141	506,247	672,613	811,525	846,253	1,030,538
65-69	261,690	325,746	465,654	588,074	618,679	778,396

Age	2017	2020	2025	2029	2030	2035
70-74	170,298	204,247	289,359	388,783	413,639	549,571
75+	177,470	210,850	281,195	356,245	375,008	500,120
Total	16,358,155	17,447,842	19,233,912	20,625,948	20,973,957	22,630,223
Grand Total	33,130,082	35,276,752	38,766,091	41,458,193	42,131,218	45,319,765

Source: JUTPI 2

Population projection is also based on estimation of the number of employments and students. The number of workers and students was calculated with population structure and composition population. In the future, two things affect the number of workers; one is the share of work sector and the other is the growth rate.

To forecast demand in transport planning, socioeconomic framework data is profoundly important for transport modelling exercise to obtain reliable forecast result. The projected socioeconomic framework data in JUTPI 2 is prepared in *kabupaten*/*kota* level, so these framework data need to be distributed in a spatial manner linked to the traffic analysis zone (TAZ). For the distribution of framework data, multi-regression analysis and GIS-based “development potential model” were utilized with various statistical and spatial data. By using these methods, future population and other necessary socioeconomic indicators are distributed spatially. For further information on future population and other necessary socioeconomic distribution, thorough explanation is available in Section 5.1.2.

A transportation development scenario, called Do-Minimum case, is made to evaluate the current transportation master plan or RITJ. Do-Minimum case is a baseline scenario when no-investment situation occurs after all projects currently under construction have been completed (toll road and rail-based project). This scenario explains what will happen in the future if government does nothing to improve transportation system. This scenario is used as a benchmark to evaluate alternative development scenarios. In RITJ, a master plan based on Presidential Decree No. 55/2018, there are expressway corridor developments to support people’s movements using private vehicles. Types of expressway development are looping, bypass, and radial support. Besides expressway development in RITJ, there are also MRT corridor development in a radial direction, LRT corridor development with radial, looping at city canter, and bypass types, and other rail corridor development that will be expanded using loopline. However, based on Table iii, it can be concluded that, not to speak of Do-Minimum scenario, RITJ’s scenario is still insufficient to accommodate the future projected demand. Therefore, scenarios in JUTPI 2 considered adding more mass transit corridors, applying TDM policies, and upgrading the planned platform from RITJ.

Table iii Transit Trips V/C of Scenarios

Year	Demand/Capacity		
	Bekasi	Tangerang	Depok+Bogor
2018	3.28	2.08	1.84
2029 (DoMin)	7.73	4.26	3.09
2035 (DoMin)	8.56	4.68	3.43
2035 (RITJ)	1.47	1.36	1.75
2035 (JUTPI 2)	0.89	0.83	0.81

Source: JUTPI 2

It is understandable that effort to project the appropriate condition has faced many challenges since there are some tendencies that previous plans were not properly recorded in master plan. Therefore, a progressive action must be taken with emphasis on restoration of master plan through systematic steps of planning and appropriate methods by following direction of national policies. Reflecting the purpose of BPTJ for integrating policy related to development and management in JABODETABEK area, integration for urban transportation planning, construction, and operation should be a primary attention from the central and local government. Particular approaches in accordance with the PPP Toolkit for Urban Transportation Sector (Bappenas, 2016) are adopted as part of the master plan, which are increasing the role of public transport, traffic engineering and management, decreasing air and sound pollution, transportation demand management, and NMT development.

While role of public transportation is the priority of the five above, JUTPI 2 had provided opportunities for each Local Government in pilot project activities as tools for promoting policy in public transportation usage. Construction of several public facilities such as shelters, pedestrian path and pedestrian-crossing bridge are expected to improve the accessibility, comfort and safety which lead to the willingness to use public transportation. More importantly, comprehension of basic concept of transit-oriented development (TOD) that promotes sustainable transportation will enable the integration among modes and reduce vehicle usage as well as leveraging urban development. Since it is important for the implementing agency to understand the concept of TOD, JUTPI 2 came up with a study of TOD Model Project which served as guidance for the formulation of TOD master plan in each *kota* and *kabupaten*.

In regard to traffic congestion in JABODETABEK, “pull” and “push” policy will strengthen the TDM and reduce congestion load. The “push” policy (ERP) will be specifically discussed in Chapter 9.3 and the “pull” policy (Development of MRT, LRT and BRT) will be explained in the Chapter 7. In addition, traffic congestion reduction will alleviate the air and noise pollution which affects improvement of city’s liveability. To support the NMT development, safety and security are crucial for people who use transportation services. The concern of this aspect also delivered both in pilot projects and TOD guidelines which highlighted the importance of barrier-free design. Hence, several safety and security improvement projects have been included in the master plan to ensure a high-quality public open space to meet the decent standard of living.

JUTPI 2 proposed a new transportation master plan, which is produced by considering the current socioeconomic and traffic condition, existing policy and regulation, and updated activity and travel demand forecasts that are processed and examined scientifically using the activity-based models. This plan is considerably evaluated as more reflective and appropriate to answer the needs of mobility in the future. To accommodate the future demand, schedules of some development projects are divided into three timelines, which are years 2024, 2029/30, and 2035. Since development of public infrastructure needs a comprehensive planning and consideration of budget constraints, it is necessary to categorize which project is the most prioritized from the point of demand forecast result. For year 2024, infrastructure development scenario did not use prioritized development from the demand forecast result, but this scenario only followed the current on-going development and projects under construction, due to time limitation from the base year. Those corridors were served by several MRT lines and LRT Lines, which are shown in Table iv and Figure xi.

Future Mass Transit Network 2024

Future Mass Transit Network 2029/30

Future Mass Transit 2035

Source: JUTPI 2

Figure xi Future Transportation Network 2024 – 2035

In JUTPI 2, the master plan focuses on the development of future mass transit network, but also on the improvement of future highway network. Toll road development is necessary to accommodate freight trips and relatively long passenger trips. The staging of toll road development is determined from the forecast of volume density and V/C ratio. Corridors with a higher V/C ratio are prioritized in the development plan. Similar to the future mass transit, 2024 network is formed based on the ongoing projects or projects under construction. The toll road development for each target year is shown in Figure xii.

Future Highway Network 2024

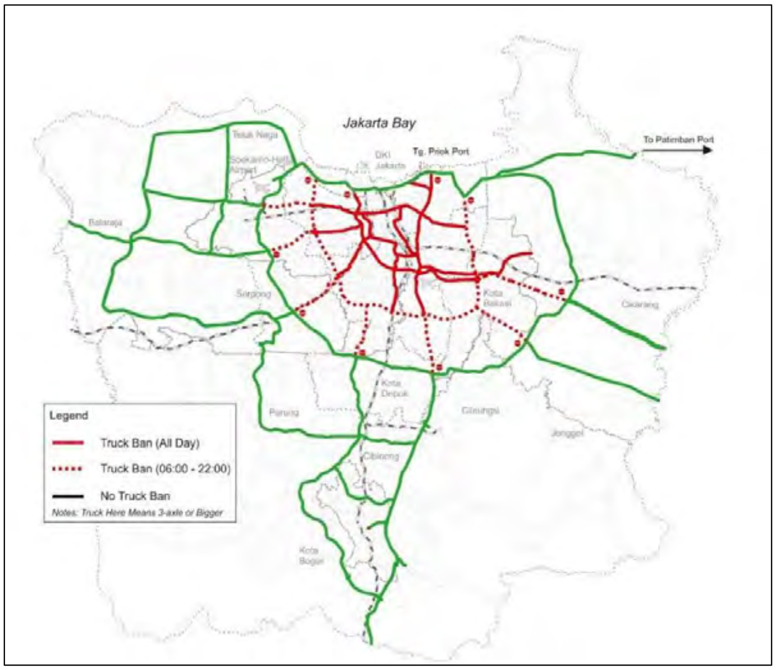
Future Highway Network 2029/30

Future Highway Network 2035

Source: JUTPI 2

Figure xii Future Highway Network 2024 – 2035

In the future highway network, freight movement was also determined based on the V/C ratio in each toll road. In 2024 until 2035, the truck ban will still be applied in the city center inside the intra-urban toll road and also will be expanded to the area inside JORR II, either for fully or partially (from 6 AM to 10 PM). In addition to what was implemented in 2024 and 2029, trucks are prohibited from passing toll road sections inside DKI Jakarta while new toll roads outside DKI Jakarta have no truck ban. Further information can be seen in Section 8.5.



Source: JUTPI 2

Figure xiii Truck Ban in 2024 - 2035

Apart from the major project (i.e., MRT, LRT, and highway development), local Governments are expected to support the connectivity in their respective regions from their respective authorities. Local Governments are expected to have further coordination with the related agencies for the implementation phase. The master plan components are divided into ten sectors, which are road network development, railway network development, improvement of traffic control system and demand management, improvement of transportation safety and security, bus transportation system and intermodal facility development, measures in urban planning, freight transportation system, financial arrangement, institutional setup and reform and last but not least the environment betterment.

Some projects in road and railway sector are being considered from regional spatial planning. The railway projects are not limited to MRT and LRT projects but also Commuter Line, AGT, etc. Total cost from those two sectors take 76.91% from total of master plan cost with the biggest percentage from railway sector (71.19%). While ERP implementation is listed for the improvement of traffic control system and demand management, provisioning of pedestrian facilities (e.g., traffic lighting, zebra cross, pedestrian path) are considered crucial for the betterment of transportation safety and security.

In the master plan scenario, a project named bus transportation system rationalization will be applied to create comprehensive system with buses that act as a feeder to higher-capacity mass transit such as MRT and LRT. The details of the remaining projects are intensively described in Chapter 9.

Table iv Traffic Demand in 2024 – 2035

Year	Plan		MRT	LRT	Commuter Line	BRT	Feeder	Toll
2035	Total Line		10	11	11	44	490	27
	Total Length (km)		425	216	484	709	10,182	513
	Total Volume (per day)	Vol.	4,389,900	1,364,600	911,000	564,500	5,652,700	14,326,000
		Unit	Pax	Pax	Pax	Pax	Pax	PCU
2029	Total Line		5	7	6	100	480	21
	Total Length (km)		124	116	254	1,311	8,059	399
	Total Volume (per day)	Vol.	1,453,500	780,900	770,000	783,600	6,006,600	9,784,500
		Unit	Pax	Pax	Pax	Pax	Pax	PCU
2024	Total Line		1	4	6	124	495	18
	Total Length (km)		23	60	254	3,684	8,448	345
	Total Volume (per day)	Vol.	204,500	301,100	530,400	1,147,000	5,337,300	5,657,800
		Unit	Pax	Pax	Pax	Pax	Pax	PCU

Source: JUTPI 2

Rapid dissemination of private cars and motorcycles has occurred, and the trend keeps on increasing. Moreover, significant change in transportation mode has emerged as online dispatch services like online motorcycle taxi spread throughout the area. Unclear regulations of online motorcycle taxis create irregularities or chaotic traffic while bus and minibus are declined which is shown by the omission of some routes and rationalization of fleet. Furthermore, TDM policy regarding the odd-even number plate regulation has currently been implemented in several roads in DKI Jakarta as the “push” policy. “Push” policy regarding TDM has been changed from 3-in-1 (three or more boarding restrictions) to odd-even number plate regulation. For this, changing of the target roads and times occurred frequently. In addition, there is a plan to introduce ERP (Electronic Road Charge) in the future. However, JUTPI 2 survey results indicate ineffective implementation of this policy for a long-term period as the number of cars keep increasing even after this policy has been applied, which also implies increasing number of cars in the future.

The key performance indicators are measured in Chapter 10 and comparison between JUTPI 1, RITJ, and JUTPI 2 proposals are made. The projection of mode share, travel time reduction, availability of public transport network, convenience, safety, and environmental betterment (emission-related improvement) are measured for target years of 2024, 2029, and 2035. Along with expected improvement, the significant amount of investment for implementation of MP projects is also expected. In total, JUTPI 2 MP proposed projects are estimated at IDR 1,734.60 trillion or around USD 128 billion, and 71% of it comes from the railway investment. It should be noted that the estimated value excludes the cost of land acquisition and yearly price escalation. EIRRs of proposed MRT lines are proven viable with over 10%, and B/C ratios are from 1.10 to 5.44. The whole project implementation has a FIRR of 18.6% and a B/C ratio of 1.53.

JUTPI 2 MP also briefly discussed possible alternatives of funding sources and schemes other than from the state budget, among others; PPP, PINA, local government bond, and limited concession scheme. All these alternatives are considered necessary to be done in order to meet the required budget. Not only the alternatives but also the institutional improvement is considered necessary to support MP implementation work; that is so-called a program of "empowering BPTJ."

Chapter 1 REVIEW ON DEVELOPMENT PROGRESS OF TRANSPORTATION PROJECT IN JABODETABEK

1.1 Review on Development Progress of JUTPI 1 Proposed Projects

The central and local governments in the JABODETABEK region have been making efforts for the development of transportation system that has the main purpose of traffic congestion alleviation. In 2011, the JABODETABEK Urban Transportation Policy Integration Phase 1 (hereinafter referred to as JUTPI 1) prepared the urban transportation master plan for the target year of 2030. JUTPI 1 recommended various policy measures for both transportation infrastructure development and regulatory framework as approaches to the transportation problem, financial capability, and institutional setup. For further planning, it is important to review the progress of implementation and assess necessary countermeasure. By reviewing such progress, lessons learned over the experiences after JUTPI 1 shall provide good insight for the next steps.

The comprehensive transportation master plan for JABODETABEK in JUTPI 1 was based on the SITRAMP that was done in the early 2000s. Taking into account the updated urban transport demand and both central and local governments plan such as RTRW, JUTPI 1 aimed at alleviating traffic congestion in JABODETABEK and developing urban activities by 1) revising SITRAMP; 2) building the capacity of the technical team which consisted of CMEA, BAPPENAS, MoT, Ministry of Public Works, BPPT, and municipality-level agencies in JABODETABEK area; and 3) establishing the regulatory and institutional framework for region-wide planning. Those three goals were setup so that the purpose of enhancement of governance for implementing JABODETABEK urban transportation projects and improvement of capability and technical strength of target group on urban transportation planning would be achieved.

Signature transportation projects were proposed in JUTPI 1 including the rail- and road-based transportation development plans. Below is the discussion of the projects.

1.1.1 JUTPI 1 Proposed Projects by Sector

Progress review of the proposed projects/programs from JUTPI 1 that is based on condition of 2018 could only be fair to be applied to the short-term timeline which is the year of 2015. Thus, the review is categorized by three types of rank; Rank A:

implemented as scheduled, Rank B: partially implemented/implemented with delay, Rank C: has not been implemented. Table 1 displays the result in which only 28% of all projects/programs that were proposed by JUTPI 1 were implemented on schedule, 44% of them are Rank B, and the rest is Rank C. While the detailed analysis of the changes of socioeconomic activities and externalities that may have occurred throughout the years is necessary, the tendency of slow transportation master plan implementation is proven. Further review would suggest that financial matter and lack of funding sources are the main causes. Such insights are important to be considered, and they will provide solution to further make new/update the transportation master plan.

Table 1 Progress of JUTPI 1 MP by Sectors

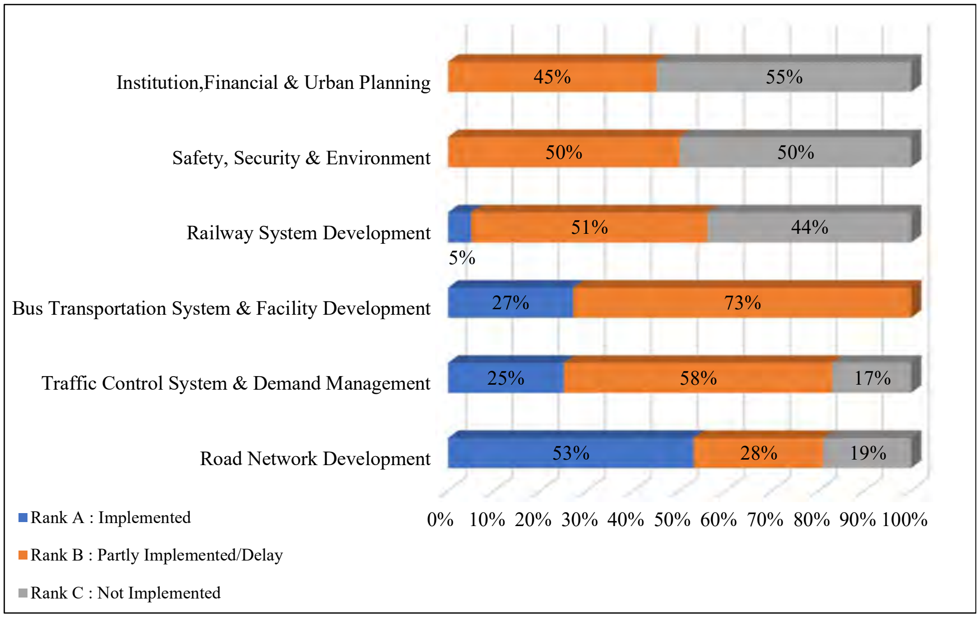
Transportation Sector	A	B	C	Total
Road Network Development	23	12	8	43
Improvement of Traffic Control System & Traffic Demand Management	3	7	2	11
Bus transportation System & Interchange Facility Development	3	8	0	11
Railway System Development	2	19	16	37
Improvement of Transportation Safety & Security	0	2	0	2
Environment Betterment	3	1	0	4
Measures in Urban Planning	0	2	1	3
Institutional Setup & Reform	0	2	2	4
Financial Arrangement	0	1	3	4
TOTAL	**34**	**54**	**32**	**120**
%	**28%**	**44%**	**27%**	**100%**

Note: **A**: Project Implemented, **B**: Project Partly Implemented/Delay, **C**: Project Not Implemented.
Source: JUTPI 2

By aggregating related sectors, the lowest progress can be observed at the "institution, financial & urban planning" category, followed by the "railway system development" as illustrated in Figure 1. This condition confirms above-mentioned statement regarding the limitation of financial capability and lack of funding sources – both are related. While the "institution, financial & urban planning" has not been fully established, notoriously known as not-so-promising and not-profitable sector of development, the railway investment always requires so called financial guarantee from the government.

The tendency, however, is different for the case of road development. The road development (especially toll road) is relatively easier to implement for the consideration of more profitable investment.

Figure 1 also includes the bus-related plan that has been both thoroughly and partially implemented. Regarding the institutional-related project, half of the share is marked Rank A for establishment the Greater Jakarta Transportation Authority (BPTJ) that had been proposed since early 2000s under the name of JTA (JABODETABEK Transportation Authority). Furthermore, the financial setup shares the biggest chunk of Rank C since many of the projects still rely on the conventional setup/arrangement of finance, that is, from either APBD or APBN. While APBD and APBN have limitation, project implementation schedule is compromised.



Source: JUTPI 2

Figure 1 Progress of JUTPI 1 MP by Compiled Sectors

The completed projects and programs during the period of 2011 to 2018 are listed below:

- Jakarta Outer Ring Road (W2 Section)
- Depok - Antasari Toll Road (JORR - 2nd JORR)
- One of the Four Non-Toll Elevated Roads from Kampung Melayu to Tanah Abang
- One of the Four Non-Toll Elevated Roads from Pangeran Antasari to Kebayoran
- One of the Four Non-Toll Elevated Roads from Ciledug to Tendean
- Road widening for the busway system (Perintis Kemerdekaan - Bekasi Raya)
- Road widening for the busway system (Bekasi Raya)
- Road widening for the busway system (Bogor Raya (1))
- Road widening for the busway system (Bogor Raya (2))
- Road widening for the busway system (Ciledug Raya)
- Road widening for the busway system (Daan Mogot (1))
- Road widening for the busway system (Daan Mogot (2))
- Road widening for the busway system (Serpong Raya)

- Road widening for the busway system (West Side of Pulogadung)
- Toll Road Information System
- Electronic Toll Collection (ETC)
- Repair and installation of traffic signals
- CNG station development
- Serpong line double-track rail lines between Serpong and Tanah Abang
- Construction of workshop at Depok station
- Promotion of low Sulphur diesel
- Promotion of biofuel

The status of "complete" does not necessarily mean "stop doing". Most of the soft projects and programs require sustainable development and continuity. However, assessment towards the further transportation master plan establishment is necessary. Some of them may no longer be needed and need changes.

1.1.2 Bus Rapid Transit (BRT) System

Transjakarta, which commenced operation in 2004, is the first BRT transportation system ever applied in southeast and south Asian countries. This system was designed by referring to the TransMilenio of Bogota, Colombia that was priorly applied. Transjakarta was designed as an intermediate-mass transportation mode to support the demand of mobility and was supposed to be developed integrating the rail-based development by JUTPI 1. However, BRT development seems to outrun the railway development plan in reality and creates stigma of only BRT that is the main transportation in JABODETABEK. The plan of bus priority lane and dedicated bus lane in JUTPI 1 are particularly realized as BRT corridor expansion. Table 2 depicts the corridor of BRT that has been added extensively towards the outskirt municipalities, and Transjakarta now has the longest BRT track in the world (251.2 km, with 234 stations or so-called bus shelters spread over 13 corridors[1]).

[1] www.transjakarta.co.id

Table 2 Existing Transjakarta Main Corridor

Corridor	Route	# Shelter	Length (km)	Remarks
1	Blok M - Stasiun Kota	19	12.9	At Grade
2	Harmoni Sentral - Pulogadung 1	24	14	At Grade
3	Kalideres - Pasar Baru	16	19	At Grade
4	Pulogadung 2 - Dukuh Atas 2	17	11.9	At Grade
5	Ancol - Kampung Melayu	18	13.5	At Grade
6	Ragunan - Dukuh Atas 2	20	13.3	At Grade
7	Kampung Rambutan - Kampung Melayu	14	12.8	At Grade
8	Lebak Bulus - Harmoni Sentral	22	26	At Grade
9	Pinang Ranti – Pluit	27	28.8	At Grade
10	Tanjung Priuk - PGC 2 (Cililitan)	22	19.4	At Grade
11	Kampung Melayu - Pulo Gebang	16	11.8	At Grade
12	Penjaringan - Sunter Kelapa Gading	20	18.9	At Grade
13	CBD Ciledug – Tendean	14	9.4	Elevated

Source: www.transjakarta.co.id

Corridor number 13 was originally planned as the non-toll elevated road in JUTPI 1. While the construction remains at elevated level, the use is limited only for BRT system. When Transjakarta was commenced in 2004, 15 main corridors were planned to be developed. Corridors 14 (Pondok Kelapa - Blok M) and 15 (Manggarai - Universitas Indonesia) were planned to be elevated BRT lines. At present, the plan to develop those two corridors has not been initiated though it has been included in the DKI Jakarta's RPJMD for the years of 2012-2017. The main cause is related to the overlapping service alignment with the existing commuter train. Thus, adjustment shall be made. In line with the corridor expansion and procurement of articulated bus to increase the capacity, the number of Transjakarta passengers has also been increased (see Figure 2).

Source: DKI Jakarta's Transportation Statistics, 2009, 2010, 2015/2016, DKI Jakarta in Figures, BPS, 2018, 2019

Figure 2 Number of Transjakarta Passengers 2004-2018

The increase of BRT passenger throughout the years derives crucial aspects that shall be addressed accordingly. The fleet size and infrastructure such as parking space, non-motorized accessibility, and intermodal facility are the keys as predicted by JUTPI 1. The procurement plan of total of 3,500 bus units by the end of 2019 failed to realize for various reasons including the unavailability of the supporting infrastructure development such as additional number of fuel station and garages.

Transjakarta was established as public service agency (under transportation agency of DKI Jakarta) in 2006 and became regional-owned enterprise that belongs to the city of DKI Jakarta in 2014. While the routes and corridors are planned at DKI Jakarta's discretion, bus operation is tendered to both private and state-owned companies. Standard of the level of service as well as the financing scheme are regulated by the DKI Jakarta's governor regulation. Towards the future years, Transjakarta is also aiming at contributing to the reduction of emission and air pollution in JABODETABEK. Therefore, it has decided to further develop the technology of electrical bus and utilization of compressed natural gas rather than diesel or gasoline. Table 3 provides the information on the existing fleet size, type of fuel, and the name of the operator.

Table 3 Number of Transjakarta Bus by Name of Company and Type of Fuel, 2018

No	Bus Operator	Status	Type of Fuel			Fleet Size
			Diesel	Gasoline	CNG	
1	PT. Eka Sari Lorena Transport	Private	-	-	47	47
2	PT. Bianglala Metropolitan	Private	75	-	-	75
3	PT. Mayasari Bakti	Private	202	-	56	258
4	Trans Swadaya	State-owned	48	-	-	48
5	PT. Steady Safe	Private	101	-	-	101
6	PT. BPW Pahala Kencana	Private	15	-	-	15
7	PT. Transportasi Jakarta	State-owned	585	-	238	823
8	DAMRI	State-owned	-	-	87	87
9	Perum PPD	State-owned	494	-	-	494
10	Kopaja	State-owned	310	-	-	310
11	Kolamas	State-owned	28	-	-	28
12	Komika	State-owned	19	-	-	19
13	Komilet	State-owned	6	-	-	6
14	Koperasi Budi Luhur	State-owned	60	-	-	60
15	Koperasi Wahana Kalpika	State-owned	407	-	-	407
16	LSG	Private	20	-	-	20
17	Puskopau	State-owned	40	-	-	40
TOTAL			**2,410**	**-**	**428**	**2,838**

Source: DKI Jakarta in Figures, BPS, 2019

1.1.3 Mass Rapid Transit (MRT) System

MRT concept was brought into Jabodetabak in the 1980s and had been included in the master plan of JABODETABEK transportation since then. Despite the status of on and off project in the master plan, MRT alignment was again included in SITRAMP based on quite extensive study that was made in the 1990s. Up until JUTPI 1 was completed, there was no significant positive sign of MRT realization until October 2013, that is, the construction of the first MRT Jakarta line. Loan agreement between the Indonesian and Japanese governments was finally met and construction was immediately started. The alignment in Figure 3 was adopted from JUTPI 1 (and previous studies) as phase 1 of the north-south line that connects Ancol to Lebak Bulus areas. Phase 1 that connects Lebak Bulus and Bundaran HI has been fully in operation since March 2019. The first phase lays out 15.7 km railway line (10 km is elevated track and 5.7 km is underground track) with 13 MRT stations (7 stations are elevated and 6 stations are underground).

Source: PT MRT Jakarta

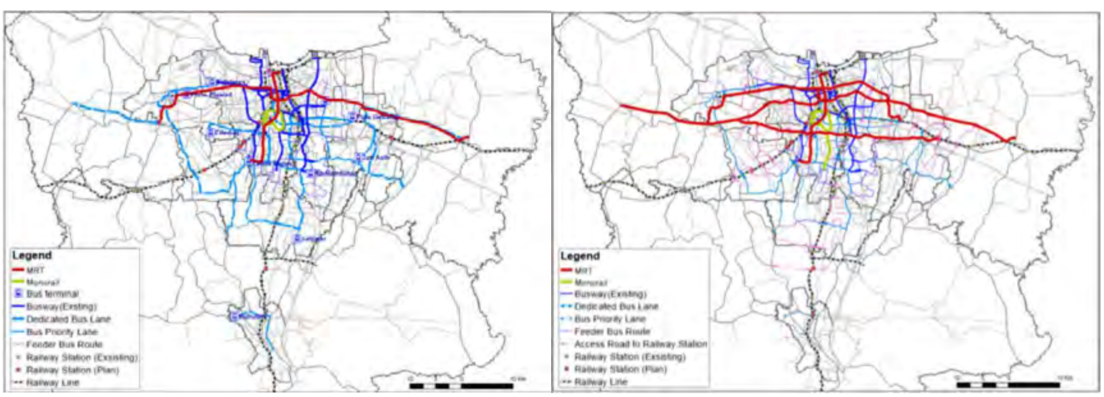
Figure 3 MRT Jakarta Phase 1

Prior to the official grand opening, a limited public trial run was conducted from 12 March 2019 to 23 March 2019. Thus, the official grand opening ceremony was held on 24 March 2019 by the President Joko Widodo. Meanwhile, the second phase of the north-south line that extends 13.3 km railway line northward (Bundaran HI to Ancol area in North DKI Jakarta) is still being prepared (see Figure 4). This line shall lay out seven underground stations and one at-grade level station. Underground structure is applied to many stations because of the reasons of limited land availability and terrain difficulties across densely populated settlements in addition to the existence of water canals around Harmoni area. The plan of seven underground stations is along 7.8 km and targeted to complete by 2024. The train depot at the north end line, however, was moved from previous location in Kampung Bandan to Ancol Barat area for the reason of land availability. The second phase is planned to be fully in operation in 2025.

Source: PT MRT Jakarta

Figure 4 MRT Jakarta Phase 1 and Phase 2

JUTPI 1 (under the scenario of “moderate public transport system development”) also projected the needs of MRT corridor development along the east-west, that is, from Balaraja in Banten Province to Cikarang in West Java Province through DKI Jakarta.



Source: JUTPI 1

Figure 5 JUTPI 1 Moderate (left) and Intensive (right) Public Transportation System Development Scenarios

Several alternatives of east-west corridors alignments were also provided for the year of 2030 by JUTPI 1 under the scenario of “intensive public transport system development.” They were also meant to be potential additional lines to the planned east-west line under the scenario of "moderate public transport system development" in exchange for the development of the extensive dedicated bus lanes along east-west corridor (see Figure 5).

1.1.4 Toll Road Development

The first structured road network in JABODETABEK area was developed in the beginning of 19th century as part of the "Java Great Post Road" by the Dutch Colonial Government. During the following decades, the road network was expanded to a great extent although it has been outrun by the rapid increase of motorized vehicles and congestion occurred as the result, particularly in the city center area.

Originally, there are three radial toll road corridors with DKI Jakarta as the core. First corridor is a core to southward: Jakarta – Bogor – Ciawi (abbreviation is Jagorawi) toll road. Second is a core to eastward: Jakarta – Cikampek (abbreviation is Japek) toll road. Third is a core to westward: Jakarta – Tangerang toll road. JUTPI 1 suggested additional radial lines to alleviate traffic congestion on the previously built toll road; some sections are under construction or partially in operation. The toll road is distinctively operated by either state-owned enterprise or private companies under close supervision of BPJT. The toll road operation is tendered by section every time the construction is completed. Table 4 lists up current toll road sections in JABODETABEK by operator and start year of operation.

Table 4 List of Operated Toll Road Sections in JABODETABEK

No	Toll Road Section	Length (km)	Operator	Start of Operation
1	Jakarta - Bogor – Ciawi	50.00	PT. Jasa Marga (Persero) Tbk	1978
2	Jakarta - Tangerang	27.00	PT. Jasa Marga (Persero) Tbk	1984
3	Prof. Dr. Ir. Soedijatmo	14.30	PT. Jasa Marga (Persero) Tbk	1985
4	Cawang - Tomang – Pluit	23.55	PT. Jasa Marga (Persero) Tbk	1997
5	Jakarta – Cikampek	72.00	PT. Jasa Marga (Persero) Tbk	1988
6	Pondok Aren - Bintaro - Ulujami	5.55	PT. Jasa Marga (Persero) Tbk	1999
7	JORR E1U (Hankam - Cikunir)	8.10	PT. Jasa Marga (Persero) Tbk	2007
	JORR E1S (TMII IC - Hankam Raya)	4.00	PT. Jasa Marga (Persero) Tbk	2007
	JORR E2 (Cikunir - Cakung)	9.07	PT. Jasa Marga (Persero) Tbk	2007
	JORR E3 (Cakung - Cilincing)	3.75	PT. Jasa Marga (Persero) Tbk	2007
	JORR W2S (Pondok Pinang - Ulujami)	5.72	PT. Jasa Marga (Persero) Tbk	2005
8	Cawang - Tj. Priok - Ancol Timur - Jembatan Tiga (Wiyoto Wiyono)	27.05	PT. Citra Marga Nusaphala Persada, Tbk	1989
9	JORR S (Pondok Pinang - Jagorawi)	14.83	PT. Hutama Karya	1995
10	Pondok Aren – Serpong	7.25	PT. Bintaro Serpong Damai	1999
11	Tangerang – Merak	72.29	PT. Marga Mandala Sakti	1992
12	JORR W1 (Kebon Jeruk - Penjaringan)	9.85	PT. Jakarta Lingkar Barat Satu	2010
13	Bogor Ring Road Sections I, IIA & IIB	7.85	PT. Marga Sarana Jabar	2009, 2014, 2018
14	Cinere - Jagorawi (Jagorawi - Raya Bogor)	3.50	PT. Translingkar Kita Jaya	2012
15	JORR W2 North (Kebon Jeruk - Ulujami)	7.87	PT. Marga Lingkar Jakarta	2013, 2014
16	Tanjung Priok Access	11.40	Satker Tanjung Priok	2017
17	Bekasi - Cawang - Kampung Melayu (Becakayu) Section 1B & 1C	8.40	PT. Kresna Kusuma Dyandra Marga	2017
18	Depok – Antasari (Antasari - Brigif/Cinere)	5.80	PT. Citra Waspphutowa	2018
19	Kunciran – Serpong	11.14	PT. Marga Trans Nusantara	Dec 2019

Source: Indonesia Toll Road Authority (BPJT)

Once the radial toll road corridors are completed, the circular (so-called ring road) lines are built. Such signature principle of toll road development was adopted by JUTPI 1 and the (toll) ring road to this day has composed one inner ring road and two outer ring roads (so-called Jakarta Outer Ring Road/ JORR and Jakarta Outer Ring Road 2/ JORR 2). Both radial and ring roads comprise comprehensive network that provides extensive connections within JABODETABEK.

JORR became full circle operation as late as in 2014 for the reason of problematic land acquisition along sections W1 and W2 (numbers 12 and 15 in Table 4) while the rest of the JORR network (number 7 in Table 4) had been completed in 2007. The existence of JORR toll road is expected to reduce the density of toll roads along the inner ring road (city center) and to improve accessibility from/to the airport as well as the port.

Parallel with JORR, JORR 2 encircles JABODETABEK area (see Figure 6) along Cengkareng - Kunciran - Serpong - Cinere - Cimanggis - Cibitung - Cilincing areas and the progress of each section can be seen in Table 5.

Source: koran.tempo.co

Figure 6 JORR 2 Development Plan

Table 5 Progress of JORR 2 Toll Road Sections Development (by October 2019)

Section	Length (km)	Land acquisition	Construction	Target of Partial Operation
Cengkareng - Batu Ceper - Kunciran	14.19	80.8%	53.1%	2020
Kunciran - Serpong (no. 19 in Table 4)	11.14	97.8%	97.5%	2020
Serpong - Cinere	10.14	84.4%	68.3%	2020
Cibitung - Cilincing	34.01	80.2%	61.2%	2020
Cimanggis - Cibitung	25.21	79.7%	53.8%	2020
Cinere - Jagorawi (no. 14 in Table 4)	14.07	73.2%	61.6%	2020

Source: Indonesia Toll Road Authority (BPJT).

Other toll road plans of JUTPI 1 that are either partially or fully completed toll road plans of JUTPI 1 are (also refer to Table 4):

- No. 13 (Bogor Ring Road Section IIB)

  This toll road section is part of the full circle of Bogor ring road which is planned to be completed by 2020 by JUTPI 1. Despite the delay to this day, the ring road is still proposed by the city-level government to the central government to be part of national strategic plan since it connects to existing Jagorawi toll road which is also national strategic project and the fact that the toll road cross-boundary (Kota and Kabupaten Bogor).

- No. 17 (Bekasi – Cawang – Kp. Melayu)

  This toll road is abbreviated as Becakayu and was originally planned to alleviate traffic volume on Japek toll road from Bekasi directly to Kp. Melayu area. However, the interchange location in Bekasi is being reconsidered by BPJT since Japek 2 (will be discussed in Section 1.3) exists. There is rumour that the interchange will be located at city center of Kota Bekasi.

- No. 18 (Depok – Antasari)

  This is part of the toll road that connects Antasari to Bojong Gedee in JUTPI 1. However, the plan has been changed nowadays and shall be extended southward to meet the interchange with Bogor Ring Road.

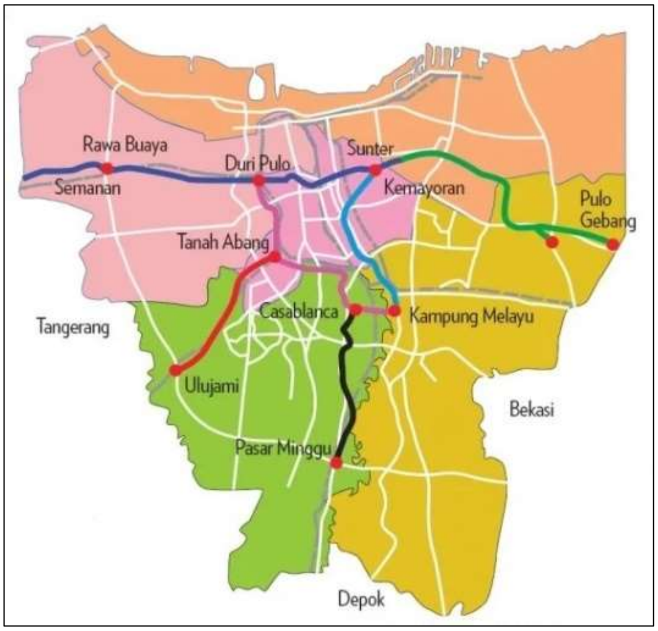
- Six-Inner Toll Roads

  JUTPI 1 six-inner toll road plan is the toll road plan that is elevated construction and integrates the mass transit corridor (see Figure 7) with total length of nearly 70 km. DKI Jakarta decided that the development is broken down into three stages. The first stage is currently under construction and both second and third stages will be constructed in parallel right after completion of first stage. The first stage of the construction (divided into three sections) was started in February 2017 and the project construction is ultimately set to complete by 2021 (see Table 6). The second stage of the construction is Duri Pulo – Kampung Melayu (12.65 km) and Kemayoran – Kampung Melayu (9.6 km) and the third stage of the construction is Ulujami – Tanah Abang (8.7 km) and Pasar Minggu – Kasablanka (9.16 km).

Table 6 First Stage Progress of Six-Inner Toll Road (by October 2019)

First Stage Development	Length (km)	Land Acquisition	Construction	Target of Operation
Kelapa Gading - Pulo Gebang	9.3	100%	53.4%	March 2020
Semanan - Grogol	9.5	0%	0%	December 2020
Grogol - Kelapa Gading	12.4	0%	0%	September 2021

Source: Indonesia Toll Road Authority (BPJT).



Source: PT. Jakarta Toll Road Development

Figure 7 DKI Jakarta's Six-Inner Toll Roads

1.1.5 Other JUTPI 1 Proposed Projects

This section briefly discusses other JUTPI 1 proposed projects that may be no longer considered feasible to coexist with current plans by the government of Indonesia but are still worth mentioning.

While most of toll road plans are still considered for future plans and/or under ongoing construction despite of the delay, the non-toll elevated road plan of section of Manggarai – Pasar Minggu is considered no longer needed and the section shall be served by one of the six-inner toll roads instead.

The arterial road development plan shows quite significant improvement within the city centers and in contradictory to those that are located toward outer skirts. However, one section of arterial road development plan in JUTPI 1 has been changed to toll road development plan to accommodate the freight traffic from/to the new seaport of Patimban. The section is located at northern part of Kabupaten Bekasi.

For public transport development, the plan of monorail is no longer kept though the supporting piles were constructed. Such decision occurred after various studies suggested that the financial aspect of the project is far from feasible. In addition, the alignment of monorail has been replaced by LRT which was not included in JUTPI 1 at all but somehow and somewhat is prioritized.

1.2 Causes of Delay in Project and Program Implementation Proposed in JUTPI 1

Various causes of delay occurred and worth elaborating for improvement in the future. Causes of delays of project and program implementation proposed by JUTPI 1 are classified into the following four categories:

1) Regulatory Aspect

The presidential decree number 55 of year of 2018 regarding JABODETABEK Transportation Master Plan is considered powerful. However, most of the projects required more detail derived regulation in local level so that implementation is doable. It is also expected to establish the financial-related regulation soon to gain flexibility of project implementation.

2) Shortage of Financial Resources

As previously discussed, the conventional project financing method – solely on APBN and APBD – meets immediate limit and impacts on the delay. Furthermore, the budget allocation for transportation sector is considerably low. While creative financing schemes such as Public Private Partnership, PINA or Non-Government Budget Investment Financing and Local Government Bond have been introduced, the government requires assurance and trial perhaps in a small-scale project.

3) Causes of Delay in Difficulty in Land Acquisition

Universally known cause of delay, that is, land acquiring process is exposed to JABODETABEK as well. The long-awaited dispute of land compensation price and change of the land use have always occurred especially at high-density area like in DKI Jakarta. Many efforts have been made to reduce the scale of land acquisition in certain projects.

4) Causes of Delay in Institutional/Organizational Aspect

Up until the establishment of BPTJ in 2015 and the transportation master plan of JABODETABEK in 2018, there had been shortage of integration of plan among the municipalities comprising JABODETABEK just because there was no one body that plays the role of authority. Furthermore, each municipality arranged the transportation plan focusing only to their jurisdiction and less considered the integration to other municipalities. Thus, cross boundary projects might have been left untouched.

1.3 Review on Development Progress of Other Transportation Projects

1.3.1 Toll Road Development Projects and Plans

In addition to what JUTPI 1 planned, BPJT has been also planning and implementing other toll road development projects. One of the signature toll road projects is the Jakarta-

Cikampek elevated toll road (Japek 2). Despite this toll road plan was not mentioned in JUTPI 1, highly congested Japek toll road through the years pushed the government to increase the capacity of Japek toll road.

Japek 2 is a 36.4 km long elevated toll road that extends from Cikunir to Karawang Barat. It passes over the existing at-grade Japek toll road and is designed for private vehicles only. The development of Jakarta-Cikampek elevated toll road was divided into the following nine sections (see Figure 8):

- Section 1: Cikunir – Bekasi Barat;
- Section 2: Bekasi Barat – Bekasi Timur;
- Section 3: Bekasi Timur – Tambun;
- Section 4: Tambun – Cibitung;
- Section 5: Cibitung – Cikarang Utama;
- Section 6: Cikarang Utama – Cikarang Barat;
- Section 7: Cikarang Barat – Cibatu;
- Section 8: Cibatu – Karawang Timur;
- Section 9: Karawang Timur – Karawang Barat.

Source: Indonesia Toll Road Authority (BPJT).

Figure 8 Jakarta-Cikampek Elevated Toll Road (Japek 2)

After the Japek 2 toll road is completed, BPJT will continue to develop the plan of Jakarta-Cikampek southern toll road. This plan is actually included in the scenario of "Intensive Highway Development" of JUTPI 1 and is layout across 64 km toll road which will be built from Jatiasih to Sadang across six sections of development; Jatiasih - Bantar Gebang (5.75 km), Bantar Gebang - Setu (3.55 km), Setu - Sukaragam (9.55 km), Sukaragam - Taman Mekar (15.7 km), Taman Mekar - Kutanegara (19.3 km), Kutanegara - Sadang (10.55 km).

This toll road is to significantly cut travel time from Jakarta to Cikampek via the southern side. In addition, the toll road is also connected to JORR, JORR 2 and Cipularang toll roads to reduce. PT. Jasamarga Japek Selatan (JJS) of PT. Jasa Marga (Persero) Tbk business group, which manages the development of the toll road, is accelerating the toll road construction since May 2019. Land acquisition is targeted to be done by end of 2020.

1.3.2 Road Development Projects and Plans

Throughout the years, several attempts have been made to reduce traffic congestion on DKI Jakarta's main arterial road. Many policy instruments have been developed and implemented to encourage people to change their travel behavior. Transportation Demand Management (TDM) is a policy strategy often used to promote change in transport mode choice.

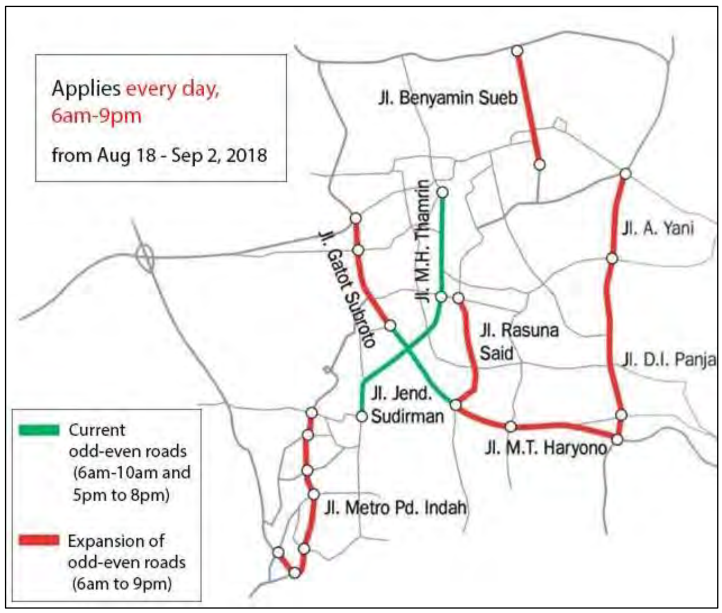
Implemented solutions including "three-in-one" policy were made as an effort to reduce the private vehicle usage. In 2016, the odd-even number plate regulation was introduced, which only allows cars with license plates ending with an even number to be used on the target road on even calendar dates and vice-versa for odd dates. When it was first implemented in 2016, the odd-even number plate regulation was meant to be an intermediate solution for DKI Jakarta's terrible traffic condition by replacing the "three-in-one" regulation temporarily until better solutions such as Electronic Road Pricing (ERP) are implemented. However, with the ERP still nowhere in sight, it looks like the odd-even number plate regulation will be remaining for the foreseeable future.

The application of the odd-even number plate regulation was first carried out with trials that began between July and August 2016 and was fully applied since August 30, 2016 till now for Jalan Medan Merdeka Barat, Jalan M.H Thamrin, Jalan Jenderal Sudirman, Jalan Sisingamangaraja and part of Jalan Gatot Subroto between intersection of Jalan Gatot Subroto start from Gerbang Pemuda Senayan up to the intersection of Jalan H.R Rasuna Said (applied from Monday to Friday, 7 AM - 10 AM and 4 PM - 8 PM).

To assure the 2018 Asian Games' target travel time for the participating athletes movement, DKI Jakarta Government expanded the odd-even number plate regulation areas. Roads that were included in the odd-even number plate regulation extension during Asian Games are:

- Jalan Medan Merdeka Barat;
- Jalan M.H Thamrin;
- Jalan Jenderal Sudirman;
- Jalan Sisingamangaraja;

- Jalan Gatot Subroto;
- Jalan S. Parman (from Tomang intersection up to Slipi intersection);
- Jalan M.T Haryono;
- Jl. H.R Rasuna Said;
- Jalan Jenderal Ahmad Yani;
- Jalan Benyamin Suaeb (from Bundaran Angkasa up to Kupingan Ancol);
- Jalan Metro Pondok Indah (from Kartini intersection up to Pondok Indah Mall intersection); and
- Jalan R.A Kartini (from Ciputat Raya intersection up to Kartini intersection).



Source: The Jakarta Post

Figure 9 Odd-even Number Plate Regulation Extension during Asian Games

The odd-even number plate regulation extension was applied from August 1, 2018 until September 2, 2018[2] and was applied from Monday to Sunday, 6 AM - 9 PM (15 consecutive hours) (see Figure 9).

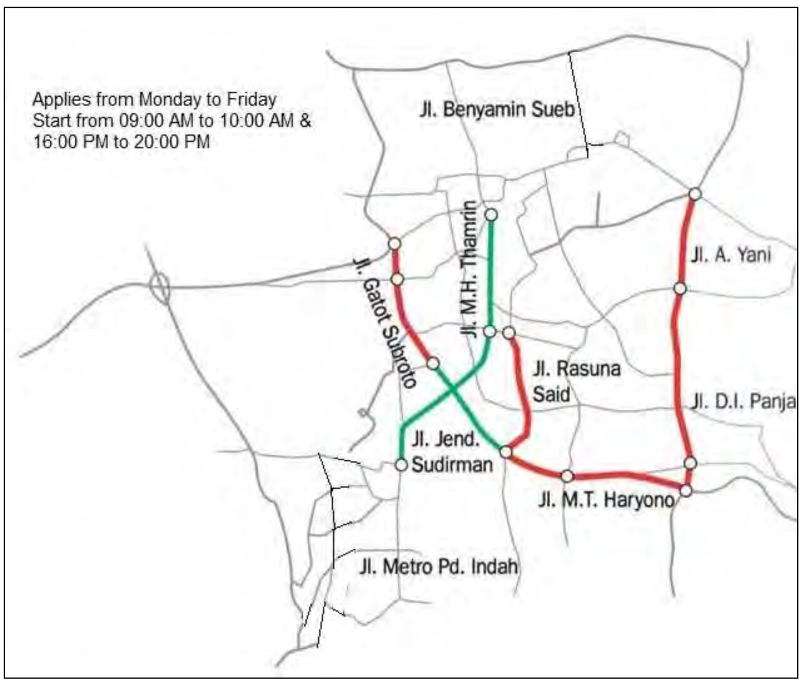
The odd-even number plate regulation was then changed by the Governor of DKI Jakarta Regulation No. 106 Year 2018 regarding the Traffic Restriction by using Odd-Even System to support the implementation of Asian Para Games event. Roads that included in the odd-even number plate regulation extension during Asian Para Games are:

- Jalan Medan Merdeka Barat;

[2] Governor of DKI Jakarta Regulation No. 77 Year 2018 regarding Traffic Restriction during the Implementation of Asian Games 2018.

- Jalan M.H Thamrin;
- Jalan Jenderal Sudirman;
- Part of Jalan S. Parman (start from Jalan Tomang Raya intersection up to Jalan KS Tubun intersection);
- Jalan Gatot Subroto;
- Jalan H.R Rasuna Said;
- Jalan M.T Haryono;
- Jalan D.I Panjaitan; and
- Jalan Jenderal Ahmad Yani.

The odd-even number plate regulation to support Asian Para Games was applied from October 15, 2018 until December 31, 2018 and applied from Monday to Friday, 7 AM - 10 AM and 4 PM - 8 PM.



Source: The Jakarta Post

Figure 10 Odd-even Number Plate Regulation Extension during Asian Para Games

Based on the evaluation result of the odd-even number plate regulation extension trial that showed positive impact on the improvement of efficiency and effectiveness of road space usage as well as air quality, the Governor of DKI Jakarta issued the Governor Regulation No. 88 Year 2019 regarding Traffic Restriction by using Odd-Even System. In principle, the regulation extends the coverage area with additional of 28 locations of toll road on-off ramp locations.

Table 7 Road Section & Road Section with Exit Toll Affected by Odd-even Number Plate Regulation

Road Section	Remarks
Jalan Pintu Besar Selatan	Road section
Jalan Gajah Mada	Road section
Jalan Hayam Wuruk	Road section
Jalan Majapahit	Road section
Jalan Medan Merdeka Barat	Road section
Jalan M.H Thamrin	Road section
Jalan Jenderal Sudirman	Road section
Jalan Sisingamangaraja	Road section
Jalan Panglima Polim	Road section
Jalan Fatmawati start from Jalan Ketimun 1 intersection up to Jalan TB Simatupang intersection	Road section
Jalan Suryopranoto	Road section
Jalan Balikpapan	Road section
Jalan Kyai Caringin	Road section
Jalan Tomang Raya	Road section
Jalan S. Parman start from Jalan Tomang Raya intersection up to Jalan Gatot Subroto	Road section
Jalan Gatot Subroto	Road section
Jalan M.T Haryono	Road section
Jalan H.R Rasuna Said	Road section
Jalan D.I Panjaitan	Road section
Jalan Jenderal Ahmad Yani start from the Jalan Bekasi Timur Raya intersection up to Jalan Perintis Kemerdekaan intersection	Road section
Jalan Pramuka	Road section
West side of Jalan Salemba Raya	Road section
East side of Jalan Salemba Raya start from Jalan Paseban Raya intersection up to Jalan Diponegoro intersection	Road section
Jalan Kramat Raya	Road section
Jalan Stasiun Senen	Road section
Jalan Gunung Sahari	Road section
Jalan Anggrek Neli Murni up to entrance access of Jakarta - Tangerang Toll Road	Road section with toll road access
Slipi/Palmerah/Tanah Abang toll off ramp up to Jalan Brigjen Katamso	Road section with toll road access
Jalan Brigjen Katamso up to Slipi 2 toll gate	Road section with toll road access
Tomang/Grogol toll off ramp up to Jalan Kemanggisan Utama	Road section with toll road access
Intersection of Jalan Palmerah Utara-Jalan KS Tubun up to Slipi 1 toll gate	Road section with toll road access
Jalan Pejompongan Raya up to Pejompongan toll road	Road section with toll road access
Slipi/Palmerah/Tanah Abang toll off ramp up to entrance access of Jalan Tentara Pelajar	Road section with toll road access
Benhil/Senayan/Kebayoran toll off ramp up to entrance access of Jalan Gerbang Pemuda	Road section with toll road access
Kuningan/Mampang/Menteng toll off ramp up to Kuningan intersection	Road section with toll road access
Jalan Taman Patra up to Kuningan 2 toll gate	Road section with toll road access

Road Section	Remarks
Tebet/Manggarai/Pasar Minggu toll off ramp up to Pancoran intersection	Road section with toll road access
Pancoran intersection up to Tebet 1 toll gate	Road section with toll road access
Jalan Tebet Barat Dalam Raya up to Tebet 2 toll gate	Road section with toll road access
Tebet/Manggarai/Pasar Minggu toll off ramp up to Jalan Pancoran Timur II	Road section with toll road access
Cawang/Halim/Kampung Melayu toll off ramp up to Jalan Otto Iskandardinata-Jalan Dewi Sartika	Road section with toll road access
Intersection of Jalan Dewi Sartika-Jalan Otto Iskandardinata up to Cawang toll gate	Road section with toll road access
Halim/Kalimalang toll off ramp up to Jalan Inspeksi Saluran Kalimalang	Road section with toll road access
Jalan Cipinang Cempedak IV up to Kebon Nanas toll gate	Road section with toll road access
Jalan Bekasi Timur Raya up to Pedati toll road	Road section with toll road access
Pisangan/Jatinegara toll road off ramp up to Jalan Bekasi Barat	Road section with toll road access
Jatinegara/Klender/Buaran toll off ramp up to Jalan Bekasi Timur Raya	Road section with toll road access
Jalan Bekasi Barat up to Jatinegara toll gate	Road section with toll road access
Intersection of Jalan Rawamangun Muka Raya-Jalan Utan Kayu Raya up to Rawamangun toll road	Road section with toll road access
Rawamangun/Salemba/Pulogadung toll off ramp up to intersection of Jalan Utan Kayu Raya-Jalan Rawamangun Muka Raya	Road section with toll road access
Rawamangun/Salemba/Pulogadung toll off ramp up to intersection of Jalan H Ten Raya-Jalan Rawasari Selatan	Road section with toll road access
Intersection of Jalan Rawasari Selatan-Jalan H Ten Raya up to Pulomas toll gate	Road section with toll road access
Cempaka Putih/Senen/Pulogadung toll off ramp up to intersection of Jalan Letjend Suprapto-Jalan Perintis Kemerdekaan	Road section with toll road access
Intersection of Jalan Pulomas up to Cempaka Putih toll gate	Road section with toll road access

Source: Governor Regulation No. 88 Year 2019 regarding Traffic Restriction by using Odd-Even System

1.3.3 Public Transport Development Project

As traffic congestion problem continues growing in urban areas, more cities have realized that the priority for urban transportation development should be given to the public transport development, such as Bus Rapid Transit (BRT), Light Rail Transit (LRT), Mass Rapid Transit (MRT) system. Public transportation development is proposed to facilitate people's movement with manner of environmentally friendly, safe, efficient and affordable. This section discusses only the "other plans" that were not included in JUTPI 1, hence MRT is not part of it.

1) Light Rail Transit (LRT) System Development

The urban transportation experienced significant facelift in 2019 with the new modern rail-based transportation Light Rail Transit (LRT). There are two LRT lines that support population mobility particularly within DKI Jakarta, Depok, Bogor, and Bekasi areas, namely; DKI Jakarta LRT and Jabodebek LRT.

Source: lrtjakarta.co.id

Figure 11 Phase 1 of DKI Jakarta LRT

The DKI Jakarta LRT project was commenced in June 2016 based on the Regulation of the Governor of DKI Jakarta No. 213 Year 2015 regarding Acceleration of the Development of LRT Infrastructure. Phase 1 of DKI Jakarta LRT has six stations, namely Pegangsaan Dua Kelapa Gading Depo, Boulevard Utara, Boulevard Selatan, Pulomas, Equestrian and Velodrome Stations. Phase 1 of DKI Jakarta LRT route is from Kelapa Gading to Velodrome with a length of 5.8 km and was already completed in July 2019 and planned to be in operation in December 2019 (see Figure 11). The development of Phase 2 from Kelapa Gading to Dukuh Atas with a length of 17.3 km is in the preparation stage.

The Jabodebek LRT, which is currently under construction, is planned to connect Jakarta to Bogor via Depok and to Bekasi, hence its acronym “Jabodebek”. Jabodebek LRT is divided into several lines:

1. LRT Line 1 (Senayan – Baranangsiang) that consists of 18 stations, namely: Senayan - Gelora - Palmerah - Dukuh Atas - Setiabudi - Rasuna Said - Kuningan - Cikoko - Ciliwung - Cawang - Taman Mini - Kampung Rambutan - Ciracas - Harjamukti - Cimanggis - Sirkuit Sentul - Sentul City - Baranangsiang.

2. LRT Line 2 (Cawang – Bekasi Timur), that consists of 6 stations, namely: Cawang - Jati Cempaka - Cikunir 1 - Cikunir 2 - Bekasi Barat - Bekasi Timur.
3. LRT Line 3 (Palmerah – Grogol), that consists of 3 stations, namely: Palmerah - Tomang - Grogol.

In Figure 12, the three lines are depicted with additional extension part from Grogol to the airport (green-dotted line). However, such extension was not mentioned in the Presidential Regulation No. 98 Year 2015 regarding Acceleration of the LRT Implementation and is debatable.

The development progress of Jabodebek LRT Phase 1 by November 2019 reaches 67.3% on average in which: Cawang - Cibubur segment reached 86.2%, Cawang - Kuningan - Dukuh Atas reached 58.3% and Cawang - Bekasi Timur reached 60.5%. Phase 2 segment (Cibubur - Kota Bogor) is now feasibility studied.

Source: www.lrtjabodebek.com

Figure 12 Proposed Lines of Jabodebek LRT

2) Light Rail Transit (LRT) System Development

The unreliability of the existing urban public transport has become one of the causes of the growth of public transportation that is serving individuals in paratransit manner, such as *ojek* or motorcycle taxi and has been more popularized by the attributes of online booking (or so-called online-based taxi or motorcycle taxi/*ojek*).

Online-based taxi or motorcycle taxi/*ojek* began to develop in 2015 in Indonesia and has been expanding rapidly since then. Consumers may fond of the online-based transport despite the regulation of it is not clear. This is certainly the duty of the government to regulate the existence of online-based transportation.

1.4 Examination of Proposed Plans

Through review and understanding of the progress and changes, it can be confirmed that the goals for urban transportation system development in JUTPI 1 need to be adjusted since situation has changed by the unprecedented causes as mentioned before. To achieve policy integration of urban transportation system development in the future, the following urban transportation sectors will be considered and adjusted by JUTPI 2:

1. Road Network Development;
2. Railway System Development;
3. Improvement of Traffic Control System and Demand Management;
4. Improvement of Transportation Safety and Security;
5. Bus Transportation System and Intermodal Facility Development;
6. Measures in Urban Planning;
7. Freight Transportation System;
8. Institutional Setup and Reform;
9. Financial Arrangement; and
10. Environmental Betterment.

The proposed projects by JUTPI 2 are the result of integration of collective information from the governments (local, regional, and national), planning documents (i.e.: RTRW, RITJ, RPJMN, and so on), regulations, and agreed upon adjustment based on strong assessment and evaluation that is based on various transportation surveys and demand.

The condition of urban road transport services throughout urban areas in BODETABEK is still dominated by conventional road transport services. Types of transit service are provided with a fleet of various sizes, ranging from small to medium buses. Operation point sometimes still overlaps. System “buy the service” has not been implemented at all, so that the orientation has not come to an effort to provide a sense of comfort and safety to passengers. These issues must be addressed, among others, by making systematic, massive, and structured efforts to upgrade the public transport system from the conventional to the modern system.

Chapter 2 SOCIOECONOMIC CHANGE IN LAST TWO DECADES AND ITS IMPLICATION IN ACTIVITY-TRAVEL

2.1 Population and GRDP

Population and GRDP are two of basic parameters to understand socioeconomic condition in certain area for particular period of time. For the last two decades, the vast economic development of JABODETABEK has been influencing the increase of population and types of activities that are also marked by significant improvement of infrastructure being constructed.

Such changes, however, have different impacts on each municipality and leaves DKI Jakarta as core of economic activities with quite significant gaps to other municipalities.

2.1.1 Population

The population of JABODETABEK is approximately 33.13 million in 2017; 10.35 million in DKI Jakarta and 22.78 million in BODETABEK (see Table 8).

Table 8 Population of JABODETABEK by Region Year 2017

Region	Population	Area size (km^2)	Population Density (persons/km^2)
DKI Jakarta	10,350,338	662	15,627
Kota Tangerang	2,139,891	165	13,005
Kota Tangerang Selatan	1,644,899	147	11,175
Kab. Tangerang	3,584,770	960	3,736
Kota Bogor	1,081,009	119	9,122
Kab. Bogor	5,715,009	2,664	2,145
Kota Depok	2,254,513	200	11,256
Kota Bekasi	2,859,630	210	13,586
Kab. Bekasi	3,500,023	1274	2,748
BODETABEK	22,779,744	5,738	3,970
JABODETABEK	**33,130,082**	**6,401**	**5,176**

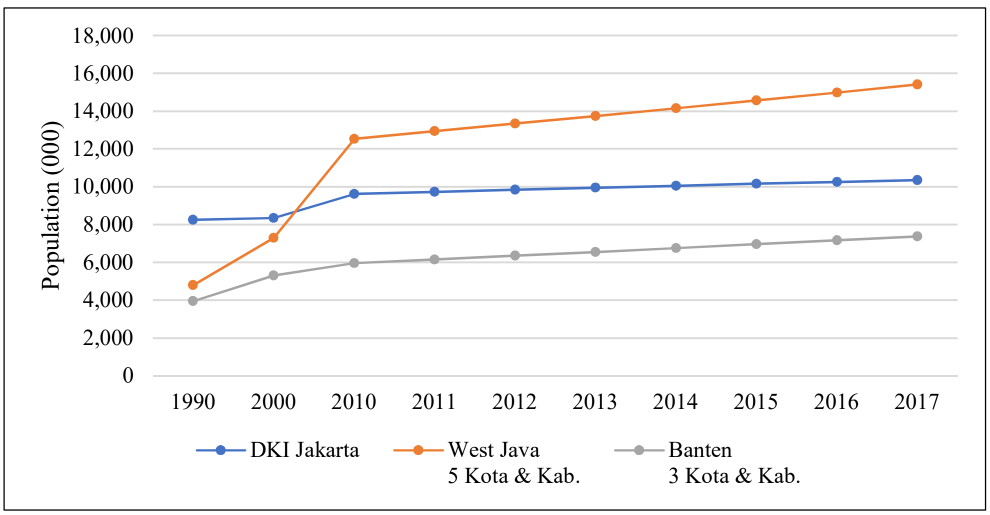
Source: BPS, 2018

While DKI Jakarta is the most populated and most dense one, Kota Bekasi is the second-largest in population. This may be affected by significantly high-scale development towards east which consists of both commercial and residential use. Approximately, JABODETABEK's population has been doubled in the last 3 decades (from 1990-2017) with average annual growth of 3.6%. The notable increase occurred after 2000 and has impacted the population increase by more than 40%. Population growth rate of BODETABEK area has continuously increased throughout the period and is currently higher than that of DKI Jakarta (see Table 9 and Figure 13).

Table 9 Time-series Population in JABODETABEK

Region	Population (unit: 1,000 persons)									
	1990	2000	2010	2011	2012	2013	2014	2015	2016	2017
DKI Jakarta	8,254	8,347	9,618	9,730	9,839	9,947	10,052	10,154	10,254	10,350
Kota&Kab. Bekasi, Kota&Kab. Bogor, Kota Depok	4,797	7,300	12,540	12,939	13,343	13,749	14,160	14,574	14,990	15,410
Kota&Kab. Tangerang, Kota Tangerang Selatan	3,949	5,300	5,959	6,155	6,354	6,553	6,757	6,960	7,165	7,369
JABODETABEK	**16,956**	**20,964**	**28,117**	**28,824**	**29,536**	**30,249**	**30,969**	**31,688**	**32,409**	**33,129**

Source: Projected Population of Kabupaten/Kota of DKI Jakarta, West Java and Banten Provinces 2010 - 2020 (by BPS, UNFPA, 2015)



Source: Projected Population of Kabupaten/Kota of DKI Jakarta, West Java and Banten Provinces 2010 - 2020 (by BPS, UNFPA, 2015)

Figure 13 Population Trend in JABODETABEK

It can be inferred from these figures that the population growth in DKI Jakarta has slowed down while more growth occurred towards outskirt areas throughout the years. It may be the nature of metropolitan cities around the world in which development expands from city center towards the outskirt and people live more toward the outskirt areas for the reasons of land price affordability as a trade-off with commuting expenses.

Regarding the demography of the population, JABODETABEK may be true reflection of metropolitan city in mature developing country in which most of the population comes from a productive age (15-64) which contributes 70% of the total population and the two highest percentages of all come from age 25-29 and 29-34 with total of 18.91%. In addition, the range of school age (5-24) is quite significant, that is more than 32%, and shall be even more contributive to the productive age in near future.

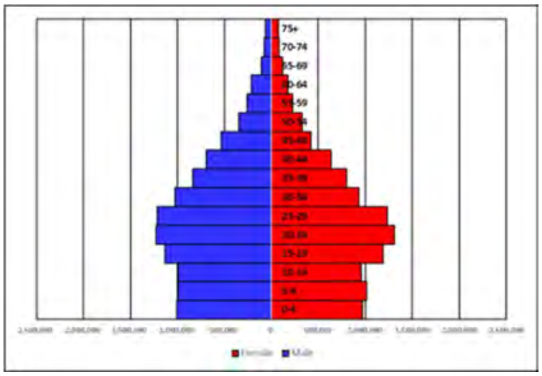
Table 10 Population by Gender and Age in JABODETABEK (2017)

Age Group	Male	Female	Total	Percentage	Sex Ratio
0-4	1,591,605	1,527,701	3,119,306	9.42%	104
5-9	1,517,897	1,449,789	2,967,686	8.96%	105
10-14	1,331,091	1,266,332	2,597,423	7.84%	105
15-19	1,335,703	1,334,811	2,670,514	8.06%	100
20-24	1,475,111	1,507,893	2,983,004	9.00%	98
25-29	1,563,403	1,573,938	3,137,341	9.47%	99
30-34	1,574,851	1,552,635	3,127,486	9.44%	101
35-39	1,479,082	1,441,795	2,920,877	8.82%	103
40-44	1,315,490	1,241,440	2,556,930	7.72%	106
45-49	1,089,547	1,019,323	2,108,870	6.37%	107
50-54	860,963	812,548	1,673,511	5.05%	106
55-59	645,533	610,351	1,255,884	3.79%	106
60-64	439,997	410,141	850,138	2.57%	107
65-69	265,994	261,690	527,684	1.59%	102
70-74	153,857	170,298	324,155	0.98%	90
75+	131,803	177,470	309,273	0.93%	74
TOTAL	**16,771,927**	**16,358,155**	**33,130,082**	**100%**	**103**

Source: Projected Population of Kabupaten/Kota of DKI Jakarta, West Java and Banten Provinces 2010 - 2020 (by BPS, UNFPA, 2015)

The overall sex ratio is 1.03; that means from 103 males exist over 100 females. The highest populous male to female ratio is at the range of age of 45-49 (sex ratio is 107) and lowest populous male to female ratio is at the range of age of 75+ (sex ratio is 74). This may infer that male population is slightly higher than that of female and life expectancy of male is lower than that of female, especially at the age of 70+ years old.

Figure 14 depicts the changes in the population in JABODETABEK throughout the two decades. The notable growing natality and the trend of age progressing society occur. Swollen section of the age range of 25 to 60 years old (the productive age) may indicate the most important parameter of the economic growth over the decades, thus, also impact the increase of demand in various sectors of life, one of which is transportation.



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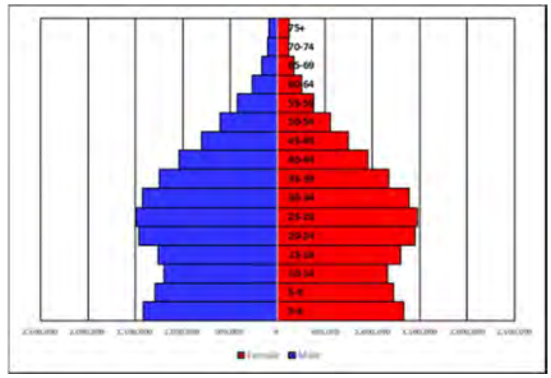

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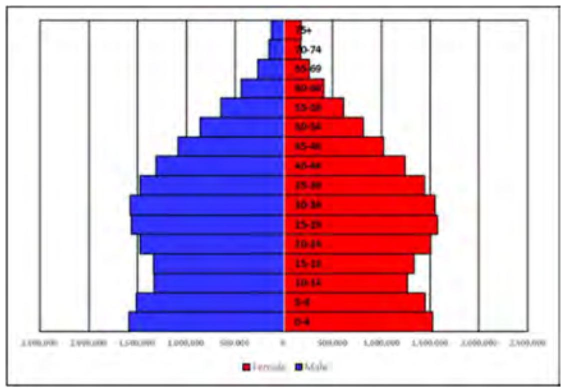


(2017)

Source: JUTPI 2

Figure 14 Series of Population by Sex and Age in JABODETABEK

2.1.2 Employment and School Enrollment

(1) Number of Workers

Difference of definition of "worker" between SITRAMP/JUTPI and BPS has been defined to create comparable figures. Number of workers by sector from 2002 to 2017 is shown in Table 11.

Table 11 Trend of Worker Growth by Sector and by Area

Sector	City	2002 (SITRAMP)	2010 (JUTPI 1)	BPS Data 2014	BPS Data 2015	BPS Data 2017	2002	2010	2014	2015	2017	Average share
	DKI Jakarta	69,400	60,300	37,983	45,806	29,060	2%	2%	1%	1%	1%	1%
	Kab. Tangerang	104,800	56,900	83,355	63,997	123,067	12%	8%	6%	5%	8%	8%
	Kota Tangerang	10,700	9,000	7,913	7,085	9,373	2%	2%	1%	1%	1%	1%
	Kota Tangerang Selatan	-	10,700	3,136	3,676	6,117	-	3%	0%	1%	1%	1%
Primary	Kab. Bogor	208,400	234,900	260,204	187,910	194,562	18%	17%	12%	9%	8%	13%
	Kab. Bekasi	126,600	116,300	135,352	58,990	58,410	21%	15%	10%	4%	4%	11%
	Kota Bogor	17,000	12,300	6,606	4,981	3,219	6%	5%	2%	1%	1%	3%
	Kota Bekasi	20,700	19,000	5,099	5,617	12,722	3%	2%	0%	1%	1%	1%
	Kota Depok	18,000	12,100	15,315	7,760	12,885	4%	3%	2%	1%	1%	2%
	Total	575,600	531,500	554,963	385,822	449,415	8%	6%	4%	3%	3%	5%
	DKI Jakarta	613,400	523,700	904,691	910,573	828,942	19%	17%	20%	19%	18%	19%
	Kab. Tangerang	261,100	274,400	630,316	546,813	683,936	29%	40%	47%	40%	46%	40%
	Kota Tangerang	171,600	167,500	316,875	264,599	245,492	34%	29%	34%	29%	33%	32%
	Kota Tangerang Selatan	-	57,300	47,002	55,886	67,372	-	14%	7%	9%	15%	11%
Secondary	Kab. Bogor	303,500	381,100	553,347	503,487	456,020	26%	28%	26%	24%	19%	25%
	Kab. Bekasi	191,700	297,900	468,883	517,312	497,727	32%	38%	36%	38%	36%	36%
	Kota Bogor	63,100	57,200	54,485	58,416	71,825	24%	21%	13%	15%	16%	18%
	Kota Bekasi	164,000	273,200	284,672	287,175	243,032	27%	29%	25%	27%	19%	25%
	Kota Depok	87,500	92,700	106,355	107,319	134,289	21%	21%	12%	12%	13%	16%
	Total	1,855,900	2,125,000	3,366,626	3,251,580	3,228,635	24%	25%	25%	24%	24%	24%
	DKI Jakarta	2,471,900	2,504,000	3,681,728	3,758,240	3,679,463	78%	81%	80%	80%	81%	80%
	Kab. Tangerang	538,700	350,900	629,658	766,414	670,204	60%	51%	47%	56%	45%	52%
	Kota Tangerang	317,800	403,800	598,193	641,039	497,571	64%	70%	65%	70%	66%	67%
	Kota Tangerang Selatan	-	346,200	606,360	584,132	377,932	-	84%	92%	91%	84%	88%
Tertiary	Kab. Bogor	640,400	726,300	1,324,403	1,391,837	1,701,171	56%	54%	62%	67%	72%	62%
	Kab. Bekasi	285,400	372,300	691,287	768,519	843,606	47%	47%	53%	57%	60%	53%
	Kota Bogor	182,300	197,000	354,071	337,586	373,342	69%	74%	85%	84%	83%	79%
	Kota Bekasi	418,200	651,500	830,700	789,144	1,010,938	69%	69%	74%	73%	80%	73%
	Kota Depok	305,800	336,600	756,014	781,902	862,227	74%	76%	86%	87%	85%	82%
	Total	5,160,500	5,888,600	9,472,414	9,818,813	10,016,454	68%	69%	71%	73%	73%	71%
	DKI Jakarta	3,154,700	3,088,000	4,624,402	4,714,619	4,537,465	100%	100%	100%	100%	100%	100%
	Kab Tangerang	904,600	682,200	1,343,329	1,377,224	1,477,207	100%	100%	100%	100%	100%	100%
	Kota Tangerang	500,100	580,300	922,981	912,723	752,436	100%	100%	100%	100%	100%	100%
	Kota Tangerang Selatan	-	414,200	656,498	643,694	451,421	-	100%	100%	100%	100%	100%
Total	Kab. Bogor	1,152,300	1,342,300	2,137,954	2,083,234	2,351,753	100%	100%	100%	100%	100%	100%
	Kab. Bekasi	603,700	786,500	1,295,522	1,344,821	1,399,743	100%	100%	100%	100%	100%	100%
	Kota Bogor	262,400	266,500	415,162	400,983	448,386	100%	100%	100%	100%	100%	100%
	Kota Bekasi	602,900	943,700	1,120,471	1,081,936	1,266,692	100%	100%	100%	100%	100%	100%
	Kota Depok	411,300	441,400	877,684	896,981	1,009,401	100%	100%	100%	100%	100%	100%
	Total	7,592,000	8,545,100	13,394,003	13,456,215	13,694,504	100%	100%	100%	100%	100%	100%

Source: JUTPI 2 and BPS

Table 12 indicates the number of primary sectors that fluctuates throughout the years. The share in 2002 is the highest (8%) and after 2002, the share of primary workers decreases to 3% in 2017 and the share of secondary sector has been quite the same trend from 2002 to 2017 although the numbers by provincial- and city- levels do not indicate the same trend. Tertiary sector increases from 68% in 2002 to 73% in 2017.

Table 12 Trend of Worker Growth Rate by Sector

Sector	2002 (SITRAMP)	2010 (JUTPI 1)	BPS Data 2014	BPS Data 2015	BPS Data 2017	'10/'02	'15/'14	'17/'15	Average growth
Primary	575,600	531,500	554,963	385,822	449,415	-1.0%	-30.5%	16.5%	-5.0%
Secondary	1,855,900	2,125,000	3,366,626	3,251,580	3,228,635	1.8%	-3.4%	-0.7%	-0.8%
Tertiary	5,160,500	5,888,600	9,472,414	9,818,813	10,016,454	1.8%	3.7%	2.0%	2.5%

Source: JUTPI 2 and BPS

The number of primary sector workers by workplace in Table 13 shows decrease from 2002 to 2010 while that of secondary and tertiary sectors show increase. The tertiary sector made a significant increase in 2018 compared to 2010. Moreover, DKI Jakarta workers' portion shows the trend of decreasing from 2002 to 2018 while trend of increasing is shown in Kabupaten Bogor and Kabupaten Bekasi.

Table 13 Worker at Workplace

	SITRAMP (2002)							
	Primary		Secondary		Tertiary		Total	
	No. ('000)	%	No. ('000)	%	No. ('000)	%	No. ('000)	%
DKI Jakarta	90	2.5%	627	17.6%	2,849	79.9%	3,565	46.8%
Kota Tangerang	336	46.7%	166	23.1%	218	30.3%	719	9.4%
Kab. Tangerang	108	15.5%	209	30.0%	379	54.5%	696	9.1%
Kota Tangerang Selatan	-	-	-	-	-	-	-	-
Kota Depok	181	46.8%	49	12.7%	157	40.6%	387	5.1%
Kota Bogor	219	49.1%	50	11.2%	177	39.7%	446	5.9%
Kab. Bogor	187	20.1%	256	27.6%	486	52.3%	929	12.2%
Kota Bekasi	132	38.8%	142	41.8%	66	19.4%	340	4.5%
Kab. Bekasi	201	37.6%	133	24.9%	200	37.5%	534	7.0%
Total	1,454	19.1%	1,631	21.4%	4,532	59.5%	7,617	100.0%
	JUTPI 1 (2010)							
	Primary		Secondary		Tertiary		Total	
	No. ('000)	%	No. ('000)	%	No. ('000)	%	No. ('000)	%
DKI Jakarta	86	3.0%	818	28.5%	1,969	68.5%	2,873	40.7%
Kota Tangerang	10	1.7%	146	24.6%	438	73.9%	593	8.4%
Kab. Tangerang	18	3.0%	154	25.7%	428	71.5%	599	8.5%
Kota Tangerang Selatan	23	13.0%	37	20.9%	117	66.1%	177	2.5%
Kota Depok	54	13.1%	135	32.7%	224	54.2%	413	5.8%
Kota Bogor	22	14.0%	78	49.7%	57	36.3%	157	2.2%
Kab. Bogor	85	7.9%	500	46.4%	492	45.6%	1,078	15.3%
Kota Bekasi	20	6.8%	89	30.1%	187	63.2%	296	4.2%
Kab. Bekasi	48	5.5%	281	32.2%	545	62.4%	873	12.4%
Total	365	5.2%	2,238	31.7%	4,457	63.1%	7,060	100.0%
	JUTPI 2 (2018)							
	Primary		Secondary		Tertiary		Total	
	No. ('000)	%	No. ('000)	%	No. ('000)	%	No. ('000)	%
DKI Jakarta	72	1.9%	701	18.7%	2,973	79.3%	3,747	41.1%
Kota Tangerang	8	1.3%	227	37.0%	378	61.6%	614	6.7%
Kab. Tangerang	48	6.4%	346	46.1%	355	47.3%	751	8.2%
Kota Tangerang Selatan	7	1.9%	62	16.5%	306	81.4%	376	4.1%
Kota Depok	9	2.4%	92	24.1%	280	73.5%	381	4.2%
Kota Bogor	13	4.1%	66	21.0%	235	74.6%	315	3.5%
Kab. Bogor	279	19.7%	437	30.9%	696	49.2%	1414	15.5%
Kota Bekasi	9	1.5%	170	28.1%	424	70.1%	605	6.6%
Kab. Bekasi	78	8.6%	461	51.0%	364	40.3%	904	9.9%
Total	528	5.8%	2,566	28.2%	6,015	66.0%	9,110	100.0%

Source: JUTPI 2

(2) Number of Students

The number of students in residential place is shown in Table 14 below. For almost a decade apart, the number of students increased from 5.6 million to 6.5 million. In 2018, the number of students has been increased by 1.1 million to 7.6 million students, showing a growth direction that varies in urban area. Especially inside DKI Jakarta, the tendency of increase occurs only in the central and south of the city while other parts of the city show the opposite tendency. This may be related to the fact the development of residential areas that are mostly vertical in structure across both areas has been contributing to the resettlement of family at city centers.

Table 14 Number of Students at Residential Place

Students	SITRAMP (2002)		JUTPI 1 (2010)		JUTPI 2 (2018)	
	No.	%	No.	%	No.	%
Jakarta Selatan	453,710	8%	879,795	13%	458,931	6%
Jakarta Timur	641,996	11%	570,077	9%	615,988	8%
Jakarta Pusat	195,122	3%	483,284	7%	196,053	3%
Jakarta Barat	498,306	9%	432,762	7%	574,019	7%
Jakarta Utara	380,378	7%	234,194	4%	405,337	5%
Kota Tangerang	388,868	7%	529,635	8%	886,997	12%
Kota Tangerang Selatan	-	-	198,916	3%	477,671	6%
Kabupaten Tangerang	758,914	13%	602,789	9%	333,678	4%
Kota Depok	321,247	6%	432,165	7%	1,515,897	20%
Kota Bogor	196,473	3%	146,434	2%	814,407	11%
Kabupaten Bogor	870,056	16%	951,996	15%	243,010	3%
Kota Bekasi	518,130	9%	349,265	5%	639,786	8%
Kabupaten Bekasi	420,092	8%	733,904	11%	502,480	7%
Total	5,643,292	100%	6,545,217	100%	7,664,255	100%

Source: JUTPI 2

The number of students at school place is shown in Table 15. While the data of 2016 and 2017 shows similarity in yearly percentage distribution across the area, the data of 2002 and 2010 shows fluctuating yearly percentage distribution. In 2018, the number of students at school place is around 7.6 million or increases by nearly 20% in 8 years. This may be caused by the number of years apart between the two comparisons and may be related to the more uniformly distributed school infrastructure across JABODETABEK. The highest share is from Kabupaten Bogor and Kabupaten Tangerang while the least share is from Jakarta Pusat and Kota Bogor.

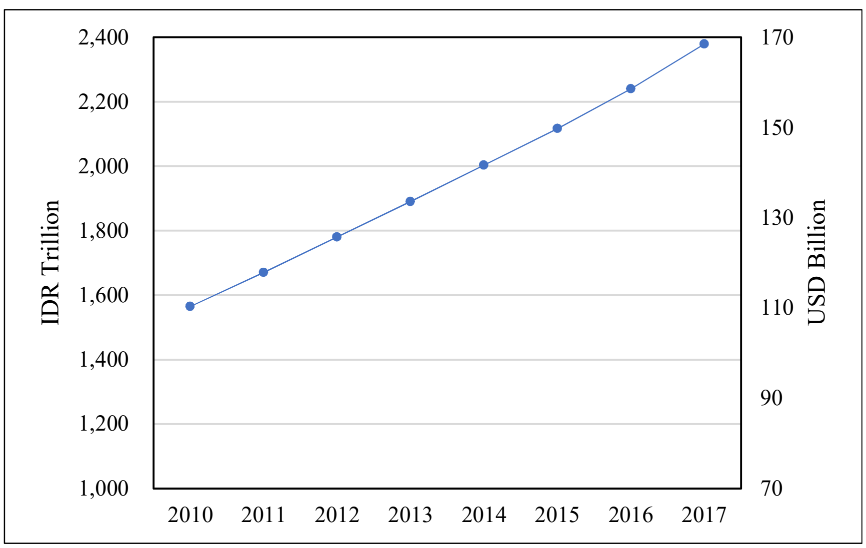
Table 15 Number of Students at School Place

Students	SITRAMP (2002)		JUTPI 1 (2010)		2016 (BPS)		2017 (BPS)		JUTPI2 (2018)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Jakarta Selatan	575,636	10%	754,701	12%	621,553	9%	617,408	8%	445,539	6%
Jakarta Timur	684,215	12%	579,113	9%	640,577	10%	626,807	9%	627,702	8%
Jakarta Pusat	287,229	5%	545,166	8%	278,415	4%	279,539	4%	196,824	3%
Jakarta Barat	525,381	9%	426,297	7%	488,067	7%	488,690	7%	536,680	7%
Jakarta Utara	313,257	6%	271,855	4%	277,907	4%	275,445	4%	406,890	5%
Kota Tangerang	338,149	6%	534,955	8%	411,228	6%	402,887	5%	483,235	6%
Kota Tang Sel	-	-	236,282	4%	742,659	11%	809,229	11%	400,785	5%
Kabupaten Tangerang	707,277	13%	659,881	10%	699,218	10%	699,894	10%	916,837	12%
Kota Depok	311,828	6%	368,902	6%	301,989	5%	384,399	5%	488,864	6%
Kota Bogor	232,185	4%	135,171	2%	219,605	3%	513,096	7%	237,164	3%
Kabupaten Bogor	834,177	15%	886,354	14%	1,151,545	17%	1,133,870	15%	1,453,835	19%
Kota Bekasi	412,285	7%	324,447	5%	368,937	6%	523,912	7%	632,247	8%
Kabupaten Bekasi	405,912	7%	753,780	11%	543,897	8%	609,580	8%	806,381	11%
Total	5,627,531	100%	6,383,007	100%	6,745,597	100%	7,364,756	100%	7,632,981	100%

Source: JUTPI 2

2.1.3 GRDP

The most recently calculated Gross Regional Domestic Product (GRDP) was done in 2017 by BPS. Total GRDP of JABODETABEK at current price in 2017 is IDR 3,412 trillion and IDR 2,379 trillion at 2010 constant price. GRDP has grown up gradually with average growth rate of 6.2% from 2010 to 2017 and the largest increase occurred in 2011-2012 with a growth rate of 6.7%.



Note: 1 USD = IDR 14,182 (2019)
Source: BPS, 2018

Figure 15 JABODETABEK GRDP from 2010 to 2017

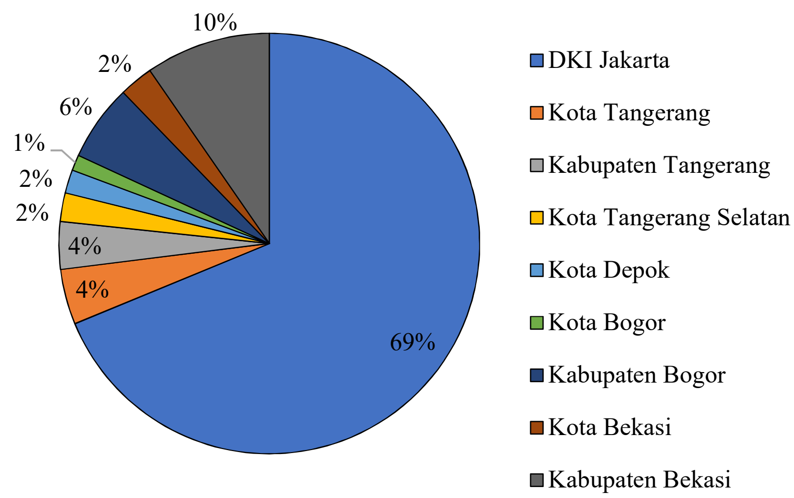
GRDP of JABODETABEK contributes to 25% of the total GDP of Indonesia. Within JABODETABEK, in 2017, DKI Jakarta has the largest GRDP that valued at IDR 1,636 trillion followed by Kabupaten Bekasi (IDR 229 trillion), while Kota Bogor has the least share IDR 29 trillion) based on 2010 constant price as depicted in the following table.

Table 16 GRDP at 2010 Constant Market Price by *Kabupaten/Kota*

No	Kabupaten/ Kota	2010	2011	2012	2013	2014	2015	2016	2017
1	DKI Jakarta	1,075.2/ 75.8	1,147.6/ 80.9	1,222.5/ 86.2	1,297.2/ 91.5	1,374.3/ 96.9	1,454.1/ 102.5	1,539.4/ 108.5	1,635.9/ 115.3
2	Kabupaten Tangerang	58.1/ 4.1	62.0/ 4.4	65.8/ 4.6	70.1/ 4.9	73.8/ 5.2	77.8/ 5.5	81.9/ 5.8	86.9/ 6.1
3	Kota Tangerang	66.9/ 4.7	71.9/ 5.1	76.9/ 5.4	82.0/ 5.8	86.2/ 6.1	90.8/ 6.4	95.6/ 6.7	101.3/ 7.1
4	Kota Tangerang Selatan	30.5/ 2.2	33.2/ 2.3	36.1/ 2.5	39.3/ 2.8	42.4/ 3.0	45.5/ 3.2	48.6/ 3.4	52.2/ 3.7
5	Kota Bekasi	41.3/ 2.9	43.9/ 3.1	46.9/ 3.3	49.7/ 3.5	52.5/ 3.7	55.5/ 3.9	58.8/ 4.1	62.2/ 4.4
6	Kabupaten Bekasi	154.3/ 10.9	164.5/ 11.6	175.3/ 12.4	186.2/ 13.1	197.2/ 13.9	206.0/ 14.5	216.0/ 15.2	228.7/ 16.1
7	Kota Bogor	18.8/ 1.3	19.9/ 1.4	21.2/ 1.5	22.5/ 1.6	23.8/ 1.7	25.3/ 1.8	27.0/ 1.9	28.7/ 2.0
8	Kabupaten Bogor	92.9/ 6.6	98.4/ 6.9	104.3/ 7.4	110.7/ 7.8	117.3/ 8.3	124.5/ 8.8	132.4/ 9.3	140.0/ 9.9
9	Kota Depok	26.6/ 1.9	28.4/ 2.0	30.7/ 2.2	32.8/ 2.3	35.2/ 2.5	37.5/ 2.6	40.3/ 2.8	42.9/ 3.0
Total		1,565/ 110.3	1,670/ 117.7	1,780/ 125.5	1,890/ 133.3	2,003/ 141.2	2,117/ 149.3	2,240/ 157.9	2,379/ 167.7

Unit: Trillion IDR/Billion USD
Note: 1 USD = IDR 14,182 (2019)
Source: JUTPI 2 based on BPS data

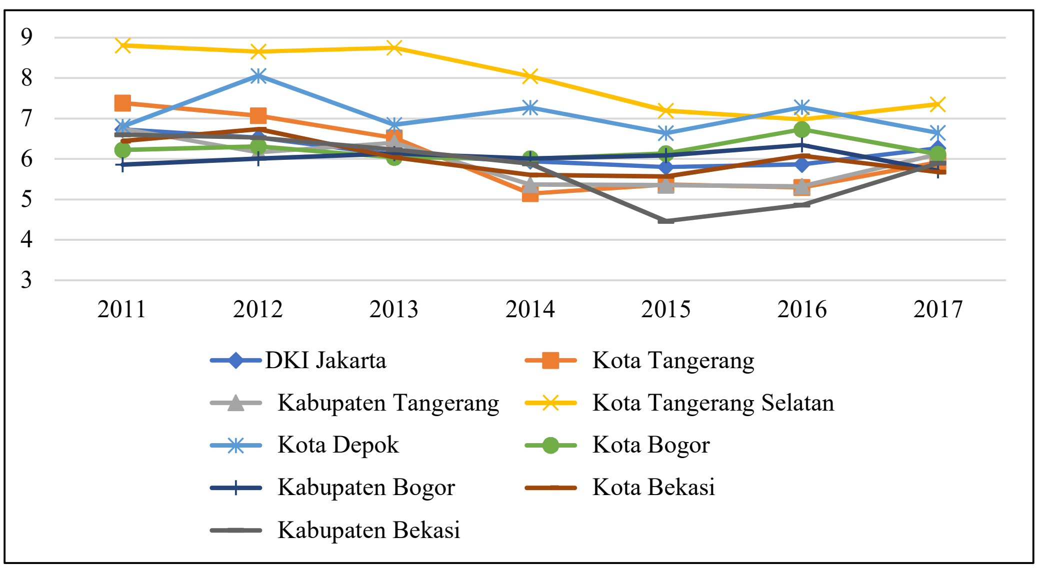
As the largest economy in JABODETABEK, DKI Jakarta takes 69% of total JABODETABEK GRDP, followed by Kabupaten Bekasi (10%) and Kabupaten Bogor (6%). The least share comes from Kota Bogor with 1% as illustrated in the following figure.



Source: JUTPI 2 based on BPS data

Figure 16 Share of Each *Kota* and *Kabupaten* to JABODETABEK GRDP

Figure 17 presents GRDP growth in each *kota* and *kabupaten*. In terms of economic growth, Kota Tangerang Selatan is the most growing region with the highest GRDP growth rate of all *kota* and *kabupaten* with an average of 7.97%, followed by Kota Depok and Kota Bogor.



Source: JUTPI 2 based on BPS data

Figure 17 GRDP Growth Rate by Kota/Kabupaten

All regencies, Kota Bekasi, Kota Depok, and Kota Tangerang have manufacturing industry as their leading sector. Industrial sector growth in BODETABEK is more developed in areas with administrative levels of the city, and the impact of development in DKI Jakarta is more influential on the city's administrative level.

DKI Jakarta and Kota Bogor have wholesale and retail as their main sector, and Kota Tangerang Selatan has real estate as its prominent sector. The tertiary sector especially information and communication and financial have profound contribution in some areas of BODETABEK of which development is higher than the trade sector. On the contrary, primary sectors like agriculture and mining have quite small contribution which mostly exists in regencies as shown in the table below.

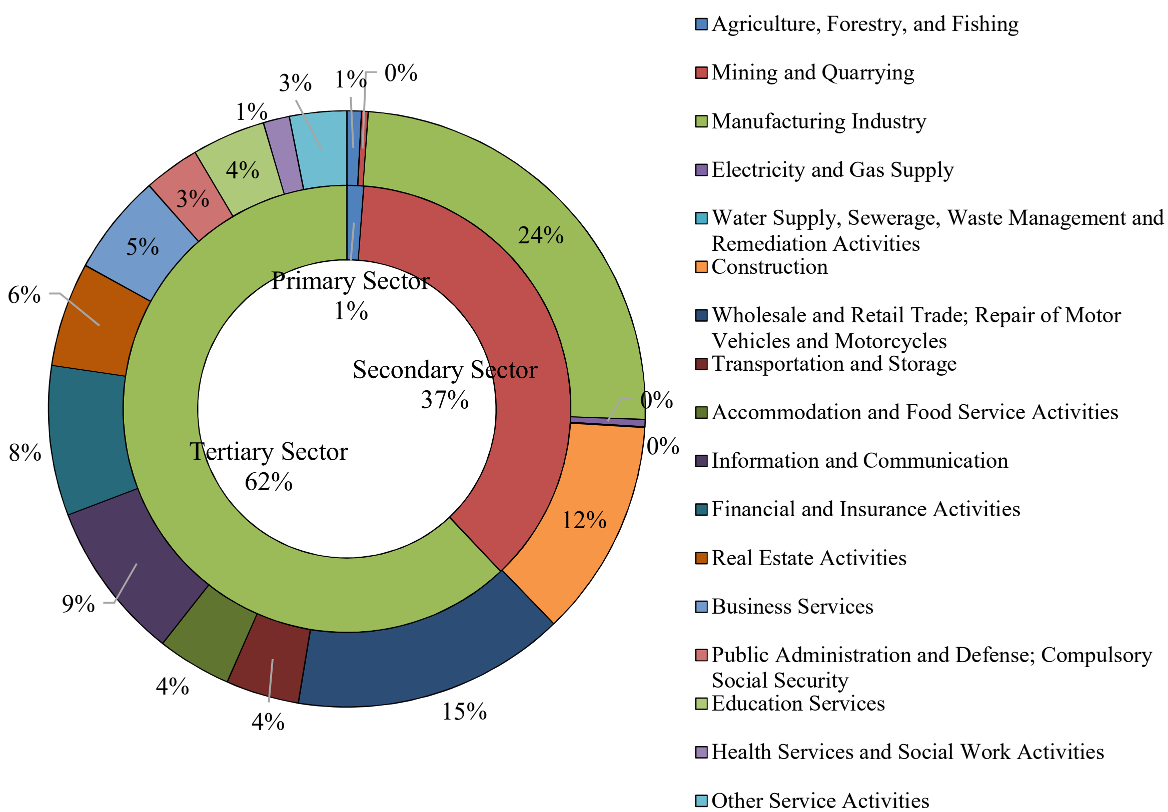
Table 17 GRDP by Sector in JABODETABEK as of 2017

Industrial Origin	DKI Jakarta	Kota Bekasi	Kab. Bekasi	Kota Depok	Kota Bogor	Kab. Bogor	Kab. Tangerang	Kota Tangerang	Kota Tangerang Selatan	Total	Share (%)
Agriculture, Forestry, and Fishing	1.4/ 0.1	0.3/ 0.0	2.3/ 0.2	0.5/ 0.0	0.2/ 0.0	6.9/ 0.5	5.3/ 0.4	1.5/ 0.1	0.1/ 0.0	18.5/ 1.3	0.8
Mining and Quarrying	2.9/ 0.2	-	2.4/ 0.2	-	-	3.5/ 0.2	0.0/ 0.0	-	-	8.8/ 0.6	0.4
Manufacturing Industry	208.0/ 14.7	21.4/ 1.5	180.2/ 12.7	13.3/ 0.9	5.4/ 0.4	76.2/ 5.4	33.9/ 2.4	37.4/ 2.6	5.0/ 0.4	580.7/ 40.9	24.4
Electricity and Gas Supply	4.3/ 0.3	0.8/ 0.1	1.2/ 0.1	0.1/ 0.0	0.8/ 0.1	0.2/ 0.0	1.4/ 0.1	0.2/ 0.0	0.1/ 0.0	9.3/ 0.7	0.4
Water Supply, Sewerage, Waste Management and Remediation Activities	0.7/ 0.0	0.1/ 0.0	0.1/ 0.0	0.0/ 0.0	0.0/ 0.0	0.2/ 0.0	0.1/ 0.0	0.1/ 0.0	0.0/ 0.0	1.2/ 0.1	0.1
Construction	209.0/ 14.7	7.0/ 0.5	14.7/ 1.0	8.7/ 0.6	3.2/ 0.2	13.1/ 0.9	10.9/ 0.8	7.3/ 0.5	7.0/ 0.5	281.0/ 19.8	11.8
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	259.3/ 18.3	14.3/ 1.0	13.2/ 0.9	9.2/ 0.6	6.3/ 0.4	17.8/ 1.3	9.9/ 0.7	12.9/ 0.9	8.8/ 0.6	351.8/ 24.8	14.8
Transportation and Storage	56.3/ 4.0	5.8/ 0.4	2.4/ 0.2	1.5/ 0.1	3.4/ 0.2	4.5/ 0.3	2.5/ 0.2	16.6/ 1.2	1.6/ 0.1	94.4/ 6.7	4.0
Accommodation and Food Service Activities	81.3/ 5.7	2.5/ 0.2	1.1/ 0.1	1.4/ 0.1	1.3/ 0.1	3.6/ 0.3	1.3/ 0.1	1.5/ 0.1	1.6/ 0.1	95.6/ 6.7	4.0
Information and Communication	173.5/ 12.2	1.7/ 0.1	2.7/ 0.2	1.1/ 0.1	1.9/ 0.1	3.6/ 0.3	4.4/ 0.3	7.9/ 0.6	8.3/ 0.6	205.1/ 14.5	8.6
Financial and Insurance Activities	177.3/ 12.5	1.8/ 0.1	2.0/ 0.1	1.7/ 0.1	2.0/ 0.1	0.7/ 0.1	4.3/ 0.3	2.8/ 0.2	0.6/ 0.0	193.2/ 13.6	8.1

Industrial Origin	DKI Jakarta	Kota Bekasi	Kab. Bekasi	Kota Depok	Kota Bogor	Kab. Bogor	Kab. Tangerang	Kota Tangerang	Kota Tangerang Selatan	Total	Share (%)
Real Estate Activities	106.8/ 7.5	1.1/ 0.1	1.0/ 0.1	0.7/ 0.1	0.6/ 0.0	1.2/ 0.1	7.0/ 0.5	6.5/ 0.5	9.6/ 0.7	134.6/ 9.5	5.7
Business Services	125.1/ 8.8	0.3/ 0.0	0.3/ 0.0	0.1/ 0.0	0.6/ 0.0	0.3/ 0.0	0.8/ 0.1	1.0/ 0.1	1.8/ 0.1	130.3/ 9.2	5.5
Public Administration and Defense; Compulsory Social Security	63.1/ 4.4	1.1/ 0.1	1.4/ 0.1	1.0/ 0.1	0.4/ 0.0	2.1/ 0.2	1.2/ 0.1	1.1/ 0.1	0.5/ 0.0	72.0/ 5.1	3.0
Education Services	78.8/ 5.6	1.4/ 0.1	2.0/ 0.1	1.2/ 0.1	0.7/ 0.0	2.8/ 0.2	2.0/ 0.1	2.2/ 0.2	3.8/ 0.3	94.8/ 6.7	4.0
Health Services and Social Work Activities	27.0/ 1.9	0.7/ 0,1	0.5/ 0.0	0.5/ 0.0	0.8/ 0.1	0.8/ 0.1	0.4/ 0.0	0.9/ 0.1	2.1/ 0.1	33.8/ 2.4	1.4
Other Service Activities	61.1/ 4.3	1.8/ 0,1	1.3/ 0.1	1.7/ 0.1	1.0/ 0.1	2.6/ 0.2	1.2/ 0.1	1.3/ 0.1	1.4/ 0.1	73.6/ 5.2	3.1
Total	1,635.9/ 115.3	62.2/ 4.4	228.7/ 16.1	42.9/ 3.0	28.7/ 2.0	140.0/ 9.9	86.9/ 6.1	101.3/ 7.1	52.2/ 3.7	2,378.7/ 167.7	100.0

Unit: Trillion IDR/Billion USD
Note: 1 USD = IDR 14,182 (2019)
Source: JUTPI 2 based on BPS data

The biggest contributor for JABODETABEK economy is manufacturing industry which gives 24% share to the regional economy, followed by wholesale and retail (15%) and construction (12%) in 2017, as presented in Figure 18. Other sectors that have large shares are service sectors especially financial and information and communication sector. On the contrary, primary sector (agriculture and mining) has a small share of only 1%.



Source: JUTPI 2

Figure 18 Economic Structure of JABODETABEK in 2017

Average GRDP per capita of JABODETABEK in 2017 is IDR 71.80 million. DKI Jakarta has the highest GRDP per capita with IDR 158 million, followed by Kabupaten Bekasi and Kota Tangerang. DKI Jakarta has more than double GRDP per capita of Kabupaten Bekasi and almost 10 times larger than Kota Depok as presented in the following table.

Table 18 GRDP Per Capita of JABODETABEK Area in 2017

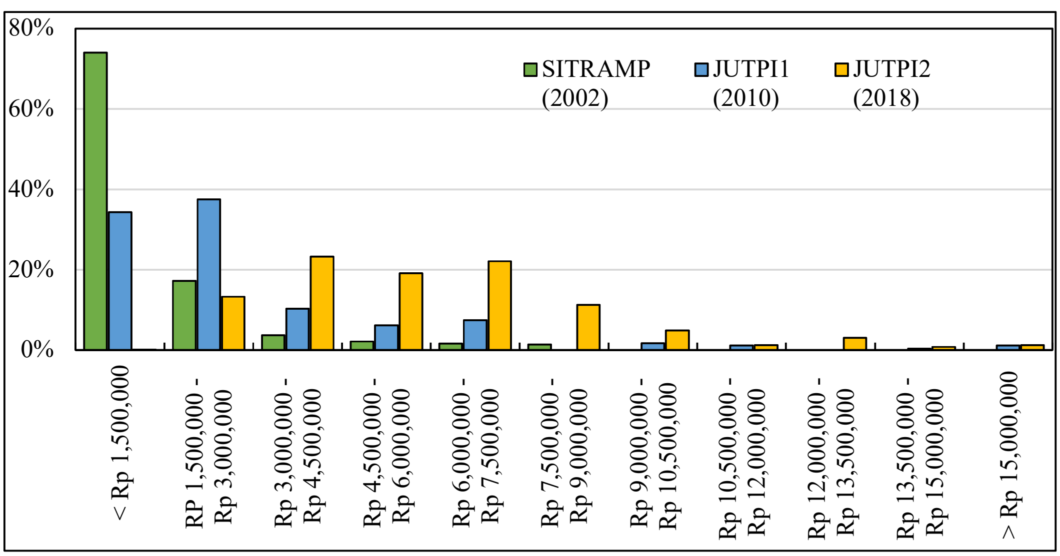
No	Region	GRDP Per Capita (in million IDR)	GRDP Per Capita (in USD)*
1	DKI Jakarta	158.1	11,144
2	Kota Tangerang	47.3	3,337
3	Kabupaten Tangerang	24.3	1,710
4	Kota Tangerang Selatan	31.7	2,238
5	Kota Depok	19.1	1,343
6	Kota Bogor	26.5	1,869
7	Kabupaten Bogor	24.5	1,727
8	Kota Bekasi	21.7	1,533
9	Kabupaten Bekasi	65.4	4,608
10	JABODETABEK	71.8	5,063

Note: 1 USD = 14,182 IDR (2019)
Source: BPS, 2018

2.2 Household Income

To understand the characteristics of daily activity-travel from each respondent and to update socioeconomic data collected from the older large-scale Commuter Trip Survey (CTS) that was conducted in JUTPI 1 in 2010, the Activity-Travel Diary Survey was conducted in 2018. The data was obtained by collecting the comprehensive socioeconomic information of the household and one household member for each household in the study area.

Before JUTPI 1, Person Trip Survey was conducted in SITRAMP in 2002. By comparing the survey results of Person Trip Survey, Commuter Trip Survey, and Activity-Travel Diary Survey which was conducted in this study, the change of household income can be illustrated in Figure 19.



Source: JUTPI 2

Figure 19 Changing Household Income Distribution in JABODETABEK (in 2002, 2010, and 2018)

The household income value is growing over the years and depicts overall growth of economic condition in JABODETABEK. In the early 2000s, most of the households' monthly income was less than IDR 3 million, and even more than 70% of households were within "less than IDR 1.5 million." In 2010, the highest share of households was within the range of "IDR 1.5 to 3 million" (37.5%) and is followed by 34% of households in "less than IDR 1.5 million." On the other hand, almost 90% of households in 2018 are fairly grouped in the income range of "IDR 1.5 – 9 million" and the largest share of 64% is in "IDR 3 to 7.5 million."

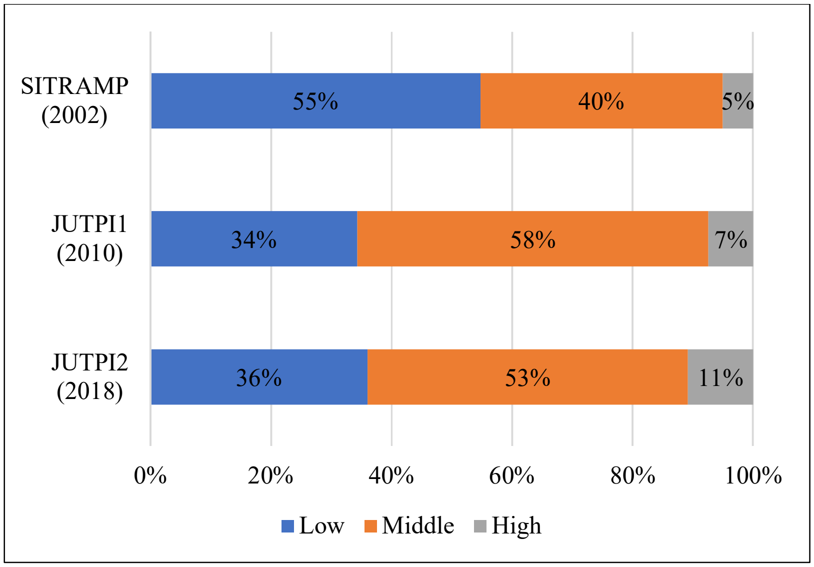
For further analysis, household income is classified into three income groups: low-, middle-, and high-income groups. Definition of income range has been adjusted by considering the income distribution of respondents in each survey period (SITRAMP, JUTPI 1, and JUTPI 2), the regional economic condition, and the Consumer Price Index (CPI) throughout the years. Below table shows the changing of household income group and average household income in the year of 2002, 2010, and 2018.

Table 19 Changing Household Income Group (Year 2002, 2010, and 2018)

SITRAMP (2002) - Avg. Income: 1.30 Mill IDR/month -	
INCOME GROUP:	
Low	: < Rp 1,000,000
Middle	: Rp 1,000,000 – Rp 4,000,000
High	: > Rp 4,000,000
JUTPI 1 (2010) – Avg. Income: 2.75 Mill DR/month -	
INCOME GROUP:	
Low	: < Rp 1,500,000
Middle	: Rp 1,500,000 – Rp 6,000,000
High	: > Rp 6,000,000
JUTPI 2 (2018) - Avg. Income: 6.15 Mill IDR/month -	
INCOME GROUP:	
Low	: < Rp 4,000,000
Middle	: Rp 4,000,000 – Rp 10,000,000
High	: > Rp 10,000,000

Source: JUTPI 2

Based on the above range, changing household compositions by income group can be calculated as shown in Table 18. With increase in average income over the years, high-income household share increases for more than double, from only 5% in 2002 to 11% in 2018. On the other hand, low-income household share decreases from 55% to 36% and middle-income household share increases from 40% in 2002 to 53% in 2018, as shown in the following figure.

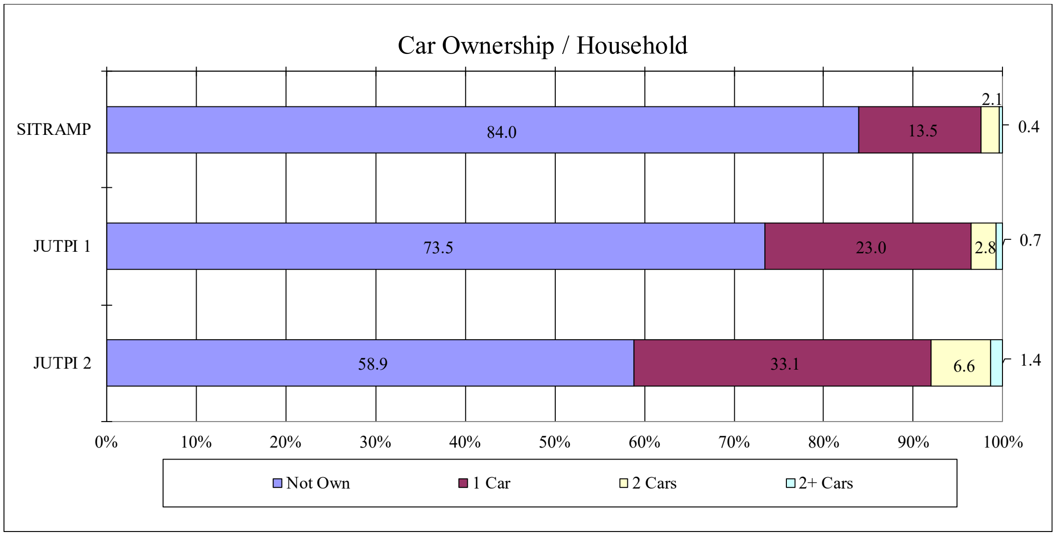


Source: JUTPI 2

Figure 20 Changing Household Compositions by Income Group (Year 2002, 2010, and 2018)

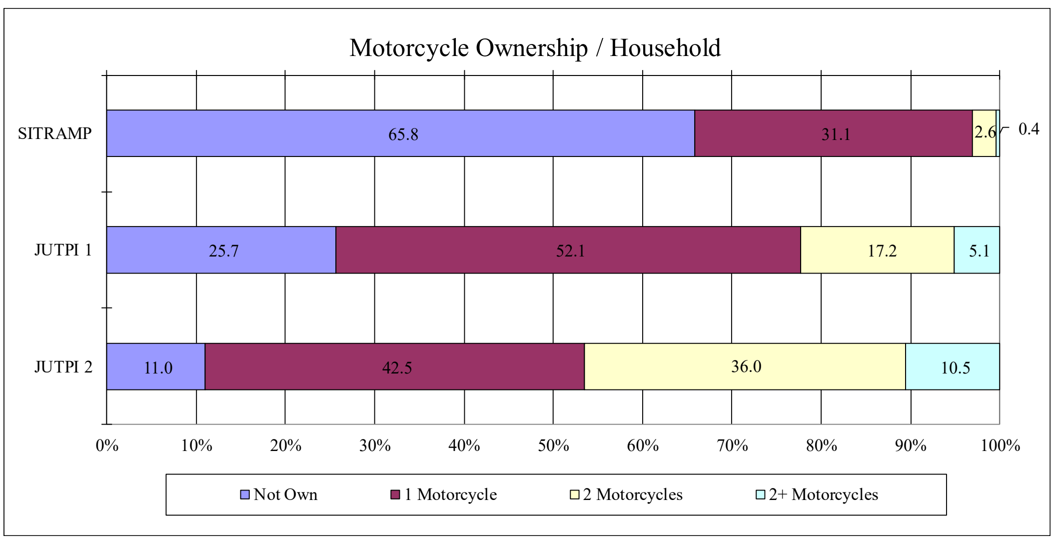
2.3 Vehicle Ownership

In addition to the changes in household income, the trend of vehicle ownership over the years can also be observed from 2002 until 2018. Figure 21 and Figure 22 depict the share of households who own vehicles increases steadily and the idea of having more than one vehicle is becoming popular. Both car-owning and motorcycle-owning households increase significantly for nearly two decades. Increase of 25.1% and 54.8% can be observed in car- and motorcycle-owning households, respectively. It is also worth mentioning that the increase of the share of households owning two or more motorcycles is tremendous (from 2.5% in 2002 to 46.5% in 2018).



Note: 2002 - SITRAMP, 2010 - JUTPI 1, 2018 - JUTPI 2
Source: JUTPI 2

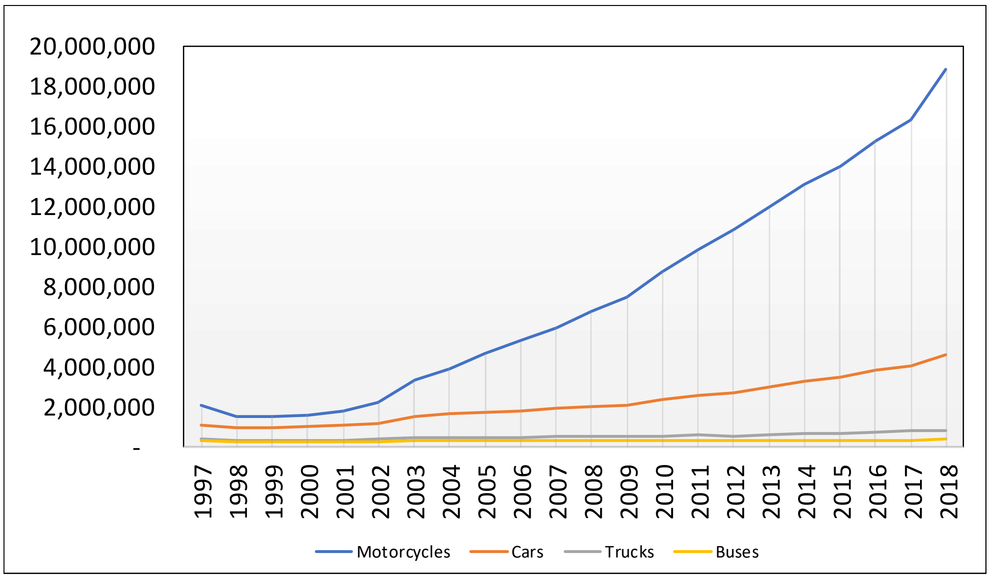
Figure 21 Trend of Car Ownership Over The Years (2002, 2010, and 2018)



Note: 2002 - SITRAMP, 2010 - JUTPI 1, 2018 - JUTPI 2
Source: JUTPI 2

Figure 22 Trend of Motorcycle Ownership Over The Years (2002, 2010, and 2018)

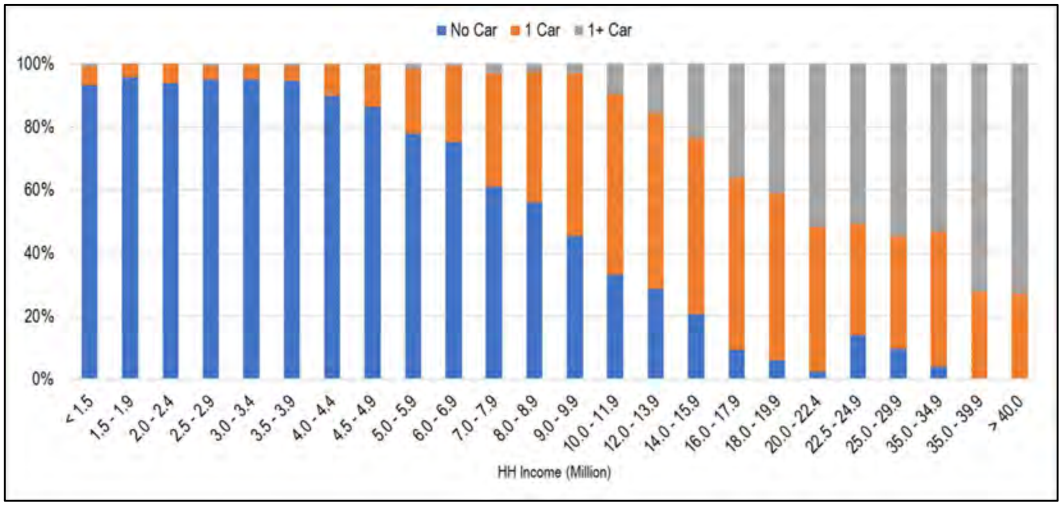
The trend of vehicle ownership can also be validated with the statistics of registered vehicle in JABODETABEK from Metro Jaya Police, Banten Police, and West Java Police. The number of registered vehicles is climbing up over the years and exponentially increases for motorcycle that is over nine times in the last two decades (see Figure 23). The value of registered vehicle is calculated by updating vehicle tax payment from the previous year in addition to the additional purchase made within an observed year. Therefore, vehicles of late tax payers are deducted from the yearly figure and may be added to the figure in the next year(s) again once the payment of the late fee is made. There has been no specific method to count the inactive vehicle regardless the reasons (destroyed, sold to outside of the area, or simply reluctant to pay the yearly tax), but the figure of registered vehicle may give the broad image of the number of vehicles that do exist in JABODETABEK. In addition, the Law of Republic of Indonesia number 22 article 74 year of 2009 mentions that late taxpayers for two consecutive years shall lawfully be impeached and have their vehicle registrations revoked though specific process to regain the registration is provided.



Source: Metro Jaya Police, Banten Police, and West Java Police

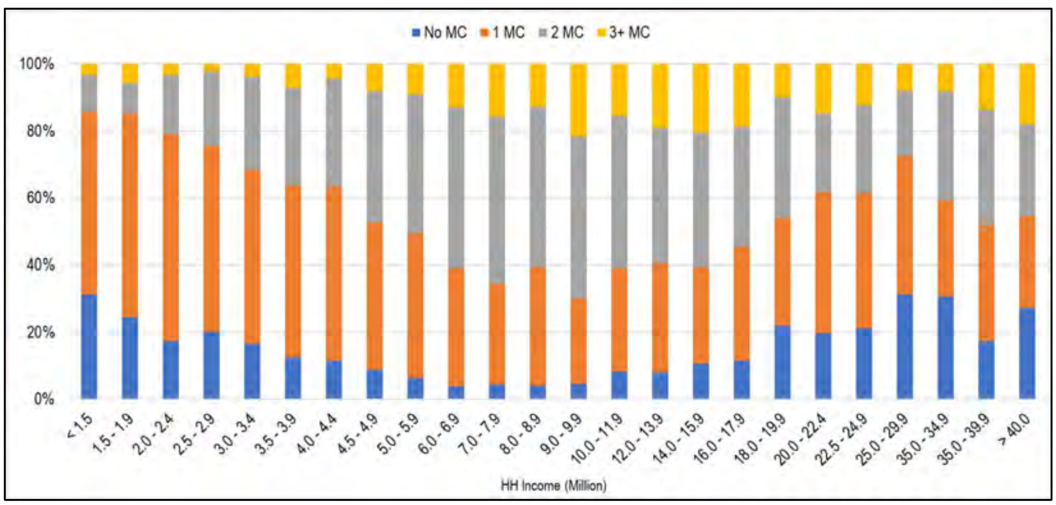
Figure 23 Registered Vehicle in JABODETABEK

The relation between vehicle ownership with household income is visualized for each income level in Figure 24 and Figure 25. It can be seen that car ownership is increasing as the household income increases. However, such trend does not apply to motorcycle ownership which is rather evenly distributed across household income levels, and the share of non-motorcycle-owning households becomes irregular for both low-and high-income groups.



Source: JUTPI 2

Figure 24 Trend of Car Ownership by Income Level in 2018



Source: JUTPI 2

Figure 25 Trend of Motorcycle Ownership by Income Level in 2018

2.4 Lifestyles

This section generally describes the results of data analysis on lifestyles or activities of citizen in JABODETABEK (taken from the Paper-based Activity-Travel Diary Survey result).

2.4.1 Basic Approach

Each activity is observed with the basis of every 15-minute time period for the whole 72 hours or three days straight. Observation days were three consecutive weekdays and a small number of records were on weekends.

The terms of activities are defined as:

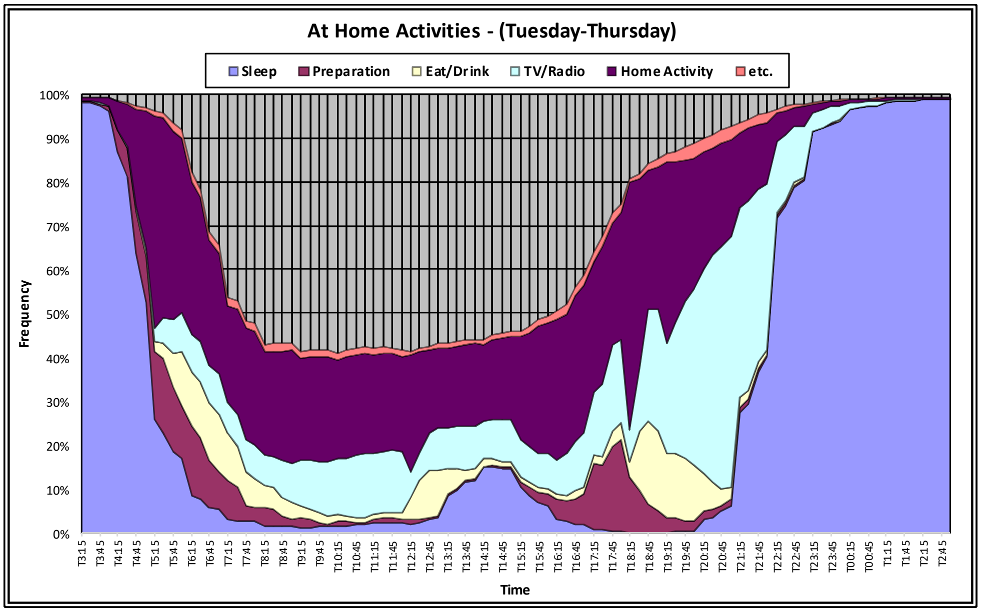
- In-home activities e.g., sleeping, preparation, eating/drinking, watching TV/listening to radio, house chores, etc.
- Out-of-home activities e.g., working in the office, working for sales/delivery/purchase, working for a meeting, etc, school, shopping, going to hospital, visiting friends/family, going to restaurant to eat/drink, sport/pleasure, holiday, to carry/ to pick up things, and other private activity.

The variation of activities, which is represented by frequency of each activity by time over one day period are summarized for each of the observation day. Observation days, which were conducted for three consecutive weekdays, are adjusted to the availability of respondents. From the survey result, most of the respondents record their information on Tuesday, Wednesday, Thursday, and Friday. Activity data on Tuesday to Thursday shows similar pattern; thus, the variation of activities (in-home and out-of-home activities) are presented in two groups of activities: Tuesday-Thursday and Friday.

Sleep and work are considered as important and are worth noticing over the other activities. The following figures are represented to depict the general lifestyle of citizen of JABODETABEK.

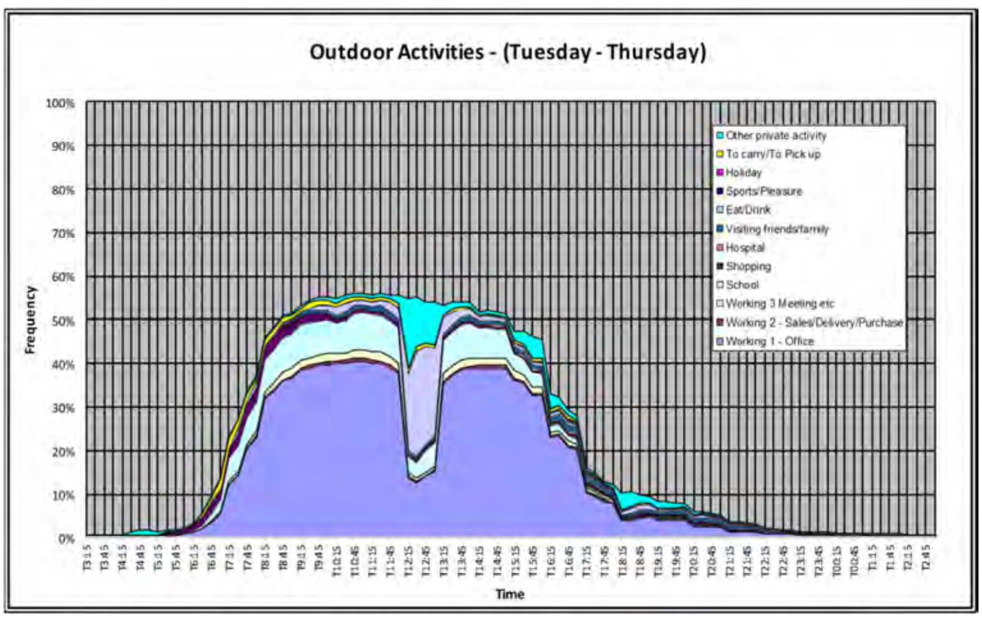
From Figure 26, it is noticeable that many people starting their daily preparation at home in earlier hour on Tuesday-Thursday, though many more activities emerge after 5 a.m., where most people start their day. Moreover, person’s habit to spend time on TV/ Radio/ Internet is observed during all day. Meanwhile, rest, sleep, and eat/ drink at home are less common nowadays.

On the other hand, as illustrated in Figure 27, most individuals spend their time outside mainly for working or school. Furthermore, many people stay outside for whole day, even at noon to eat/drink or any other private activities.



Source: JUTPI 2

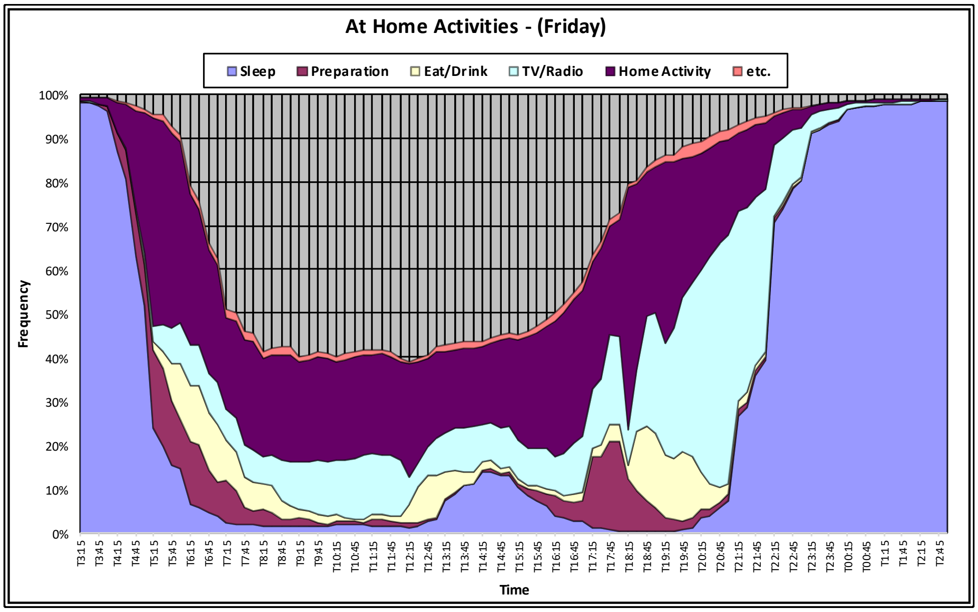
Figure 26 In-home Activities on Tuesday-Thursday in JABODETABEK



Source: JUTPI 2

Figure 27 Out-of-home Activities on Tuesday-Thursday in JABODETABEK

The activity pattern on Friday is quite similar to the pattern on Tuesday-Thursday. It can be inferred from Figure 28 that many people starting their daily preparation at home in earlier hour or around 5 AM in the morning. The habit to spend time on TV/Radio/ Internet can also be observed during the day, and even more in the afternoon.

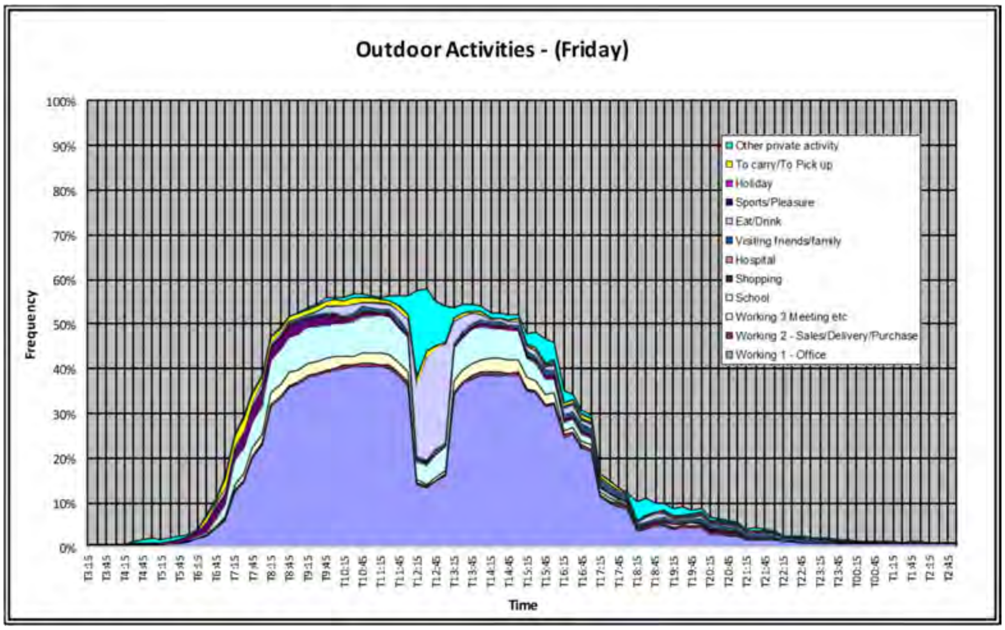


Source: JUTPI 2

Figure 28 In-home Activities on Friday in JABODETABEK

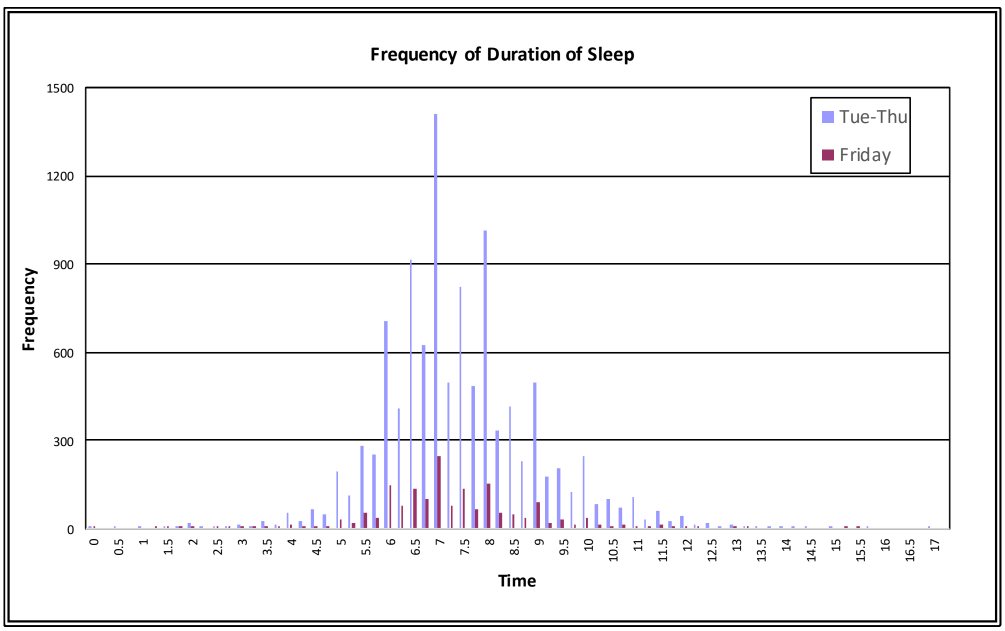
In Figure 29 most individuals spend their time outside mainly for working or school. The time spent for work is quite long, from around 7 AM in the morning until 8 PM in the evening. The frequency of eat/drink outside is also high, especially at noon. It is also noticeable that people have activity, even during resting time at noon.

Sleep and work are considered as important and are worth noticing over the other activities. The following figures are presented to depict the general lifestyle of citizen of JABODETABEK. As can be inferred from Figure 30 and Figure 31, the average hour of sleep of most people is around 7 hours while the average working hour is about 7.5 hours.



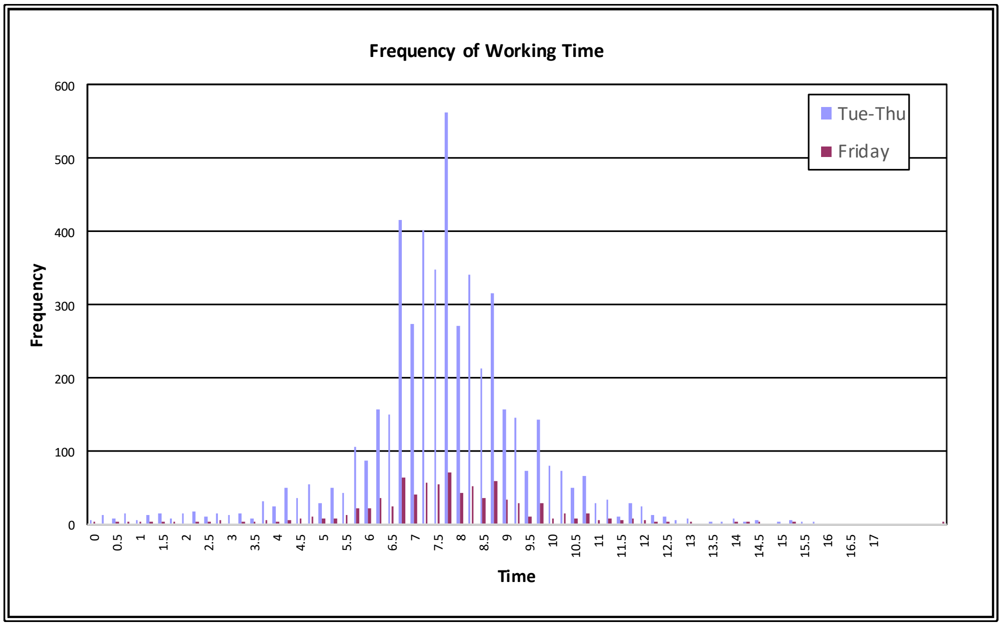
Source: JUTPI 2

Figure 29 Out-of-home Activities on Friday in JABODETABEK



Source: JUTPI 2

Figure 30 Duration of Sleep



Source: JUTPI 2

Figure 31 Duration of Working

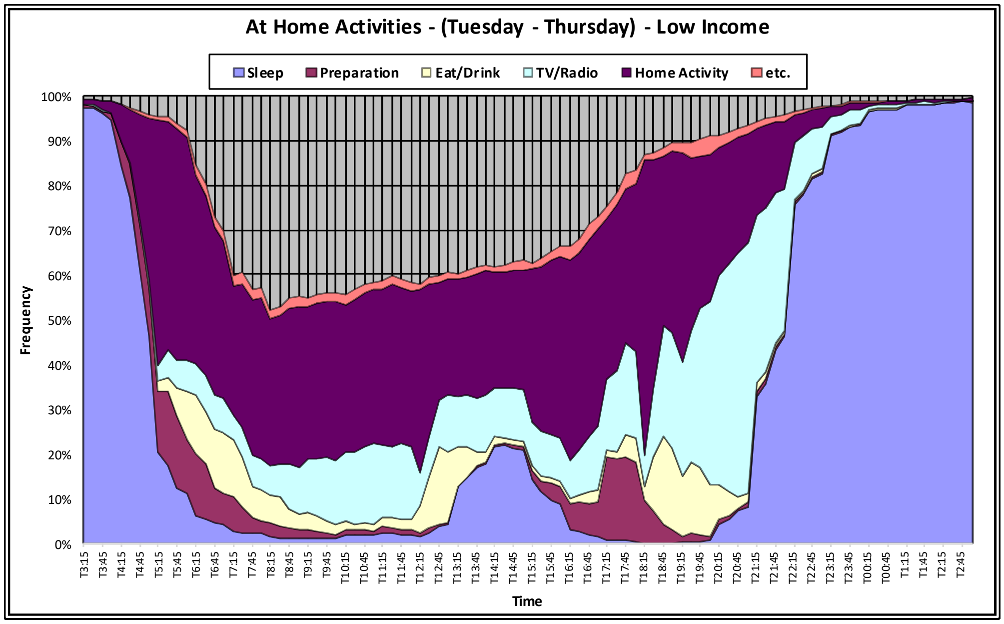
2.4.2 Activities in JABODETABEK by Household Income Group

Income as one of the socioeconomic attributes reflects the status of households and, thus, becomes the main focus in analyzing the lifestyles of respondents. Based on the collected data, analysis involves household income characteristics such as variation of in-home activity and out-of-home activity.

The variation of activities based on household income is summarized in two categories, which are Tuesday-Thursday and Friday. Those are represented by frequency of each activity within one day. The following figures present the variation of activity by income level in JABODETABEK.

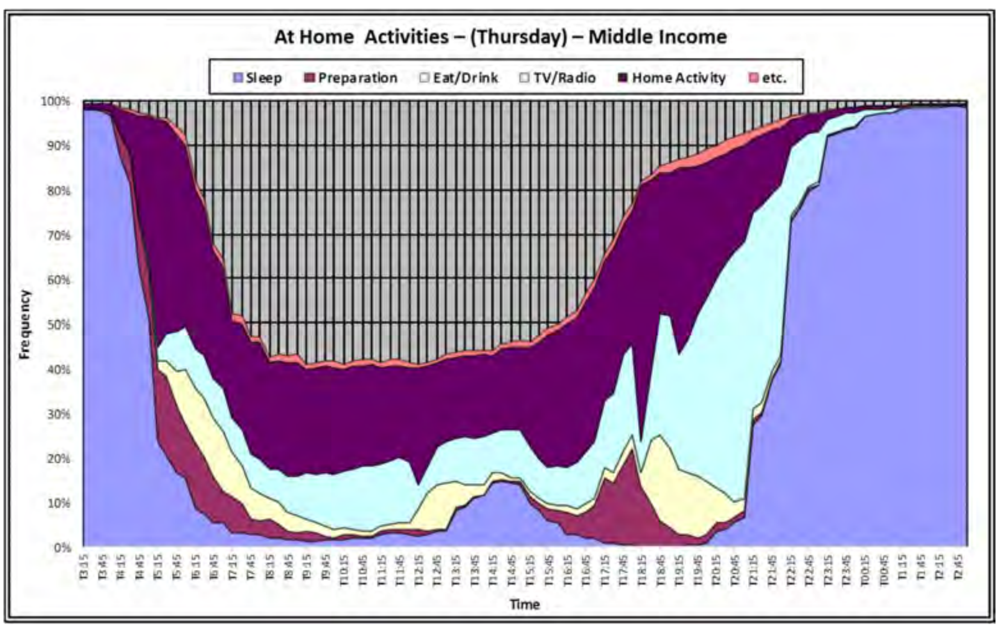
People in lower income tend to have more in-home activity as illustrated in Figure 32. It is observed that more individuals choose to eat and drink at home, rather than spending money outside. This group also has more people resting/ sleeping at home during noon, compared to higher income group.

In Figure 33, there are quite many people that have in-home activities. Similar to the overall pattern, from Tuesday to Thursday, a majority of persons start their activity at around 5 AM in the morning. Some individuals choose to eat/drink at home while some others prefer eating out. There are not many differences in the trend of spending time for TV/ Radio/ or Internet among all income levels.



Source: JUTPI 2

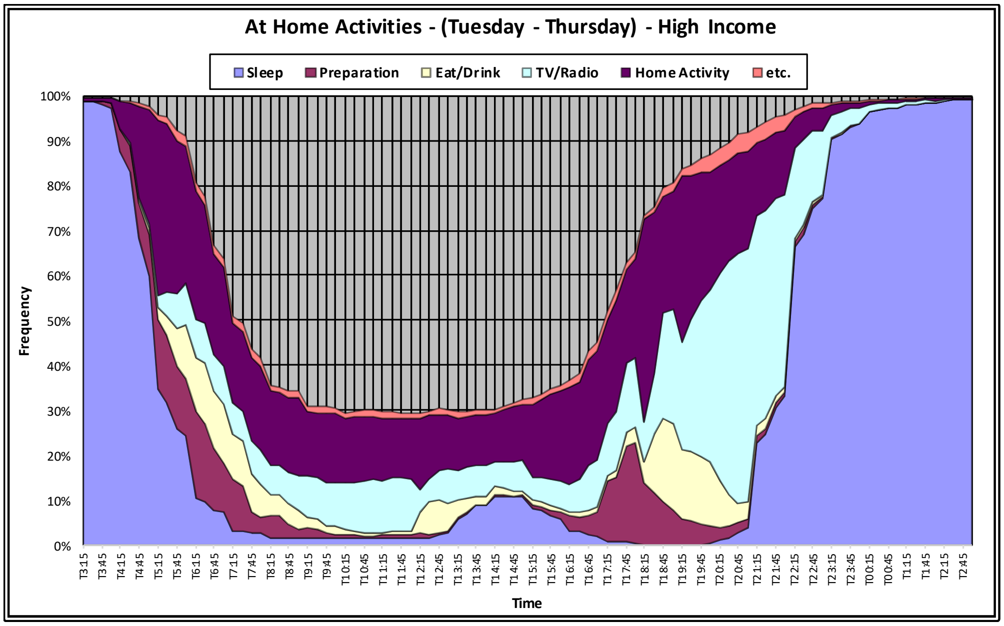
Figure 32 In-home Activities of Low-Income Group on Tuesday-Thursday



Source: JUTPI 2

Figure 33 In-home Activities of Middle-Income Group on Tuesday-Thursday

In-home activities of respondents from high-income level on Tuesday to Thursday are depicted in Figure 34. In this group, the frequency of having in-home activities is much lower than that in the lower income group. Moreover, it is observed that individuals in higher income group tend to start their daily preparation earlier than those in lower income group. In addition, fewer people choose to rest at home during noon, compared to other income levels.

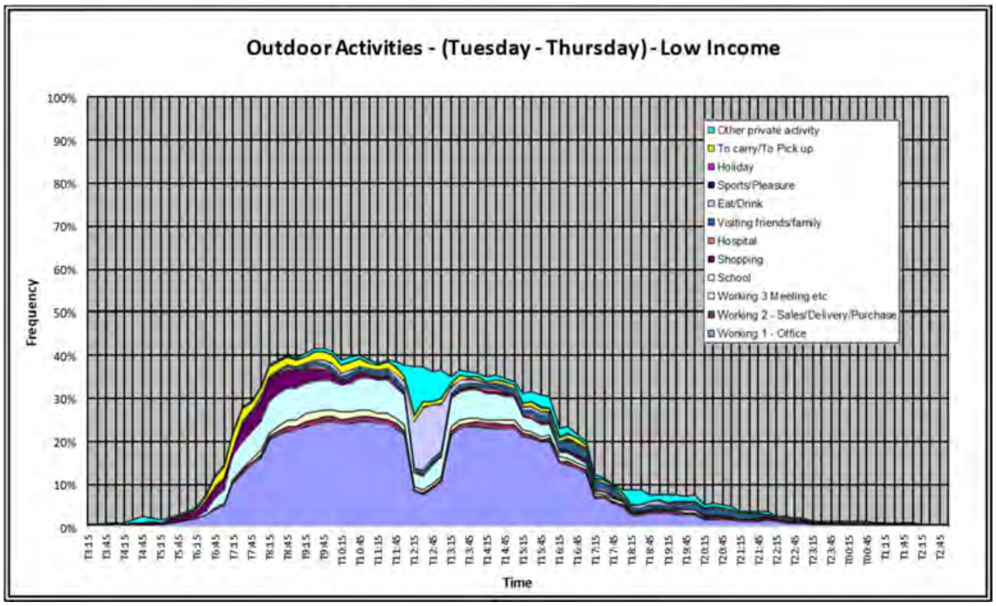


Source: JUTPI 2

Figure 34 In-home Activities of High-Income Group on Tuesday-Thursday

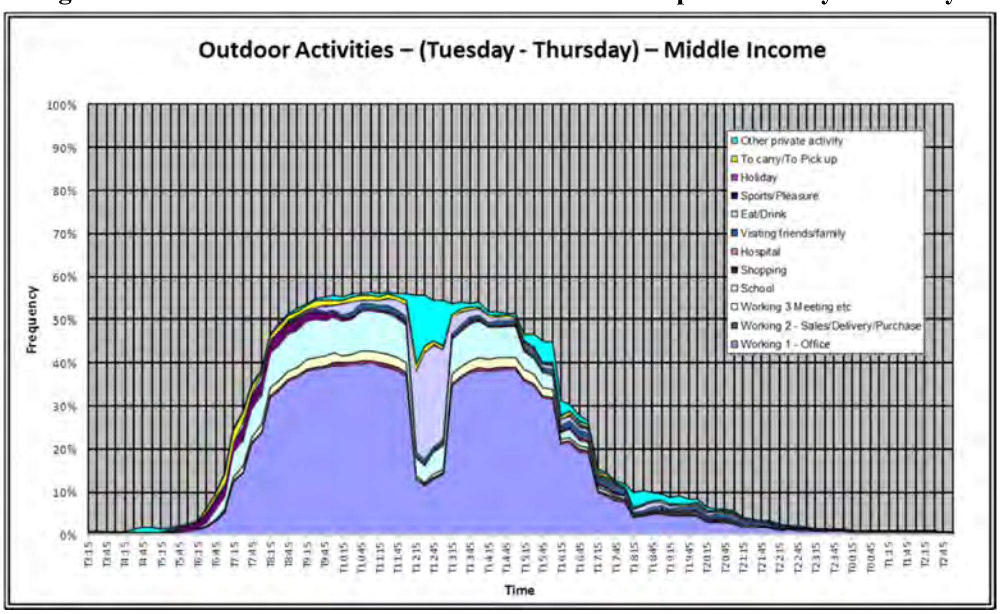
In Figure 35, it is notable that the frequency of out-of-home activities of low-income group on Tuesday-Thursday is much smaller among the other groups. Nevertheless, the majority of out-of-home activities are for work and school. Moreover, it is noticeable that quite many people in lower income group choose to go shopping in the morning.

On Tuesday-Thursday, the frequency of out-of-home activities of middle-income group is considered high, though it is still lower than those in the higher income group. As shown in Figure 36, most of the out-of-home activities are for work and school, which is same as the other groups.



Source: JUTPI 2

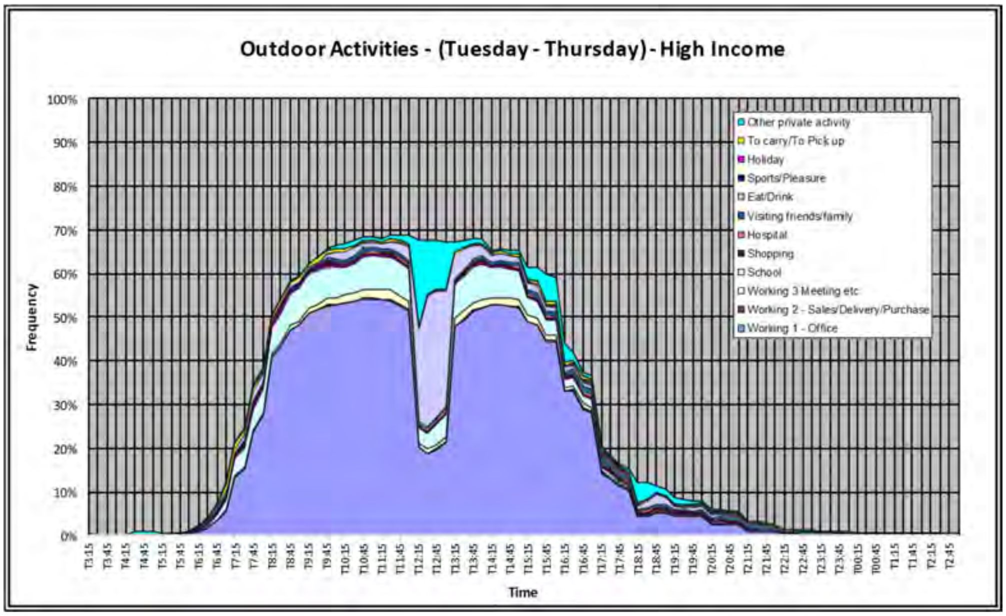
Figure 35 Out-of-home Activities of Low-Income Group on Tuesday-Thursday



Source: JUTPI 2

Figure 36 Out-of-home Activities of Middle-Income Group on Tuesday-Thursday

As illustrated in Figure 37, individuals of the higher income group have many more activities than those in the lower income groups whose time is mostly spent on working and studying at school. Furthermore, eating out habit is easily found in this group among the other levels. People in this group also have more other private activities, especially at noon.



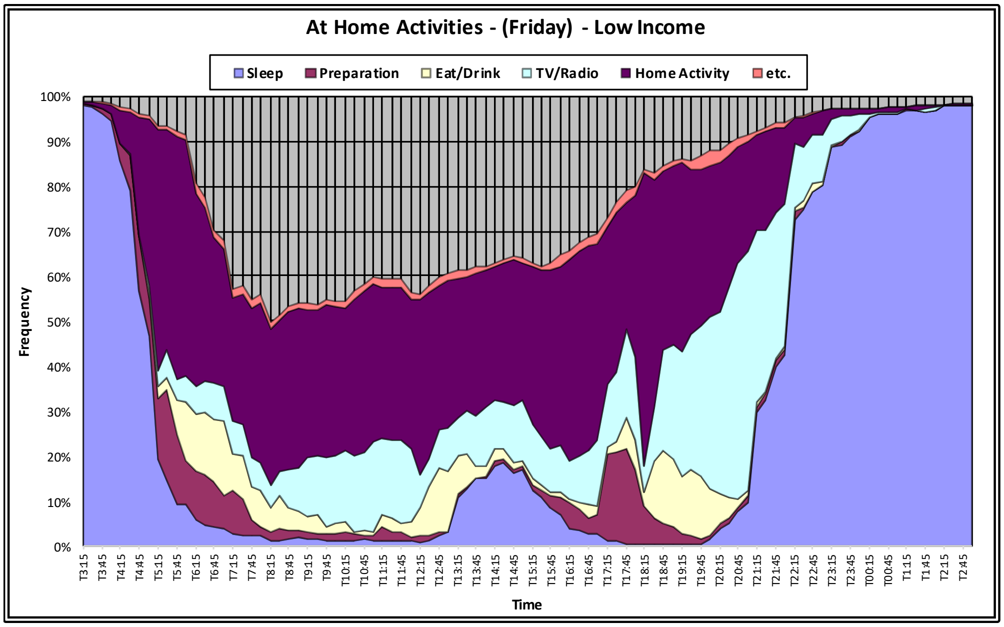
Source: JUTPI 2

Figure 37 Out-of-home Activities of High-Income Group on Tuesday-Thursday

Despite the day, there are more people in lower income level that have more in-home activity as illustrated in Figure 38. In this group, only a small group of people that prefer to eat/ drink and sleep/rest outside which is the opposite of those in higher income level. Moreover, the trend of spending time for TV/ Radio/ or Internet throughout the day is also found for all income categories on Friday.

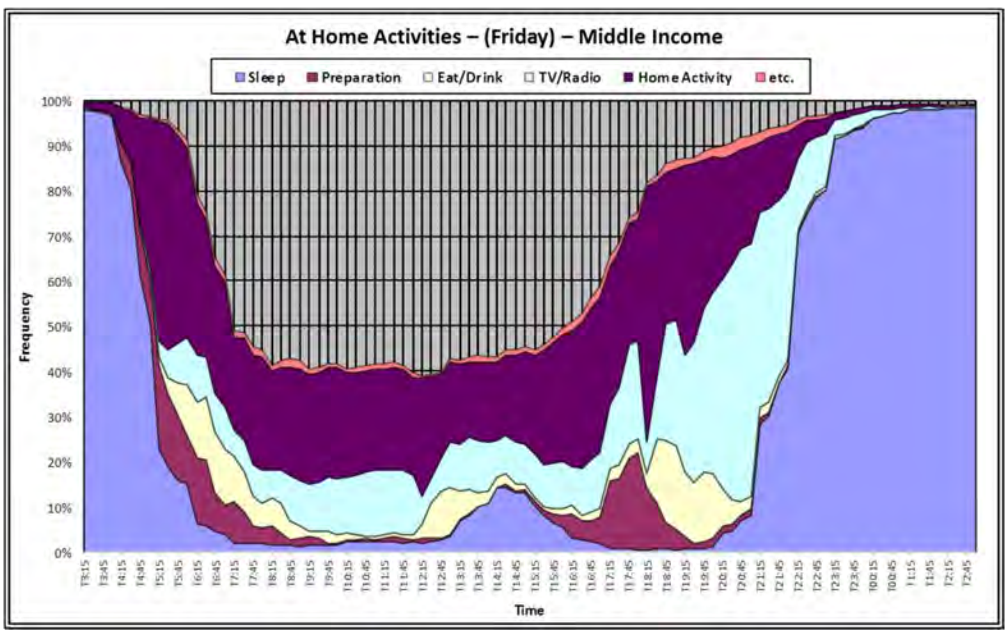
In Figure 39, there are quite many people in middle-income level that also have in-home activities. On Friday, most individuals start their activity at around 5 AM., which is similar to the general pattern.

It is noticeable that the lowest in-home activities are found in high-income level like shown in Figure 40. The frequency of each activity in-home is smaller than other income level, such as eat/drink, sleeping/resting, and for TV/ Radio/ Internet.



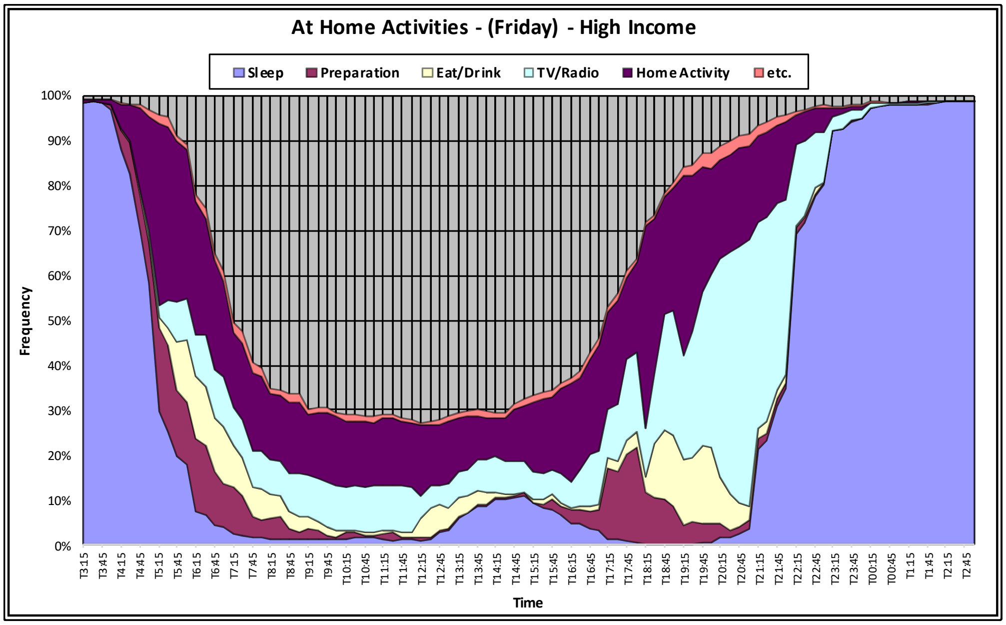
Source: JUTPI 2

Figure 38 In-home Activities of Low-Income Group on Friday



Source: JUTPI 2

Figure 39 In-home Activities of Middle-Income Group on Friday



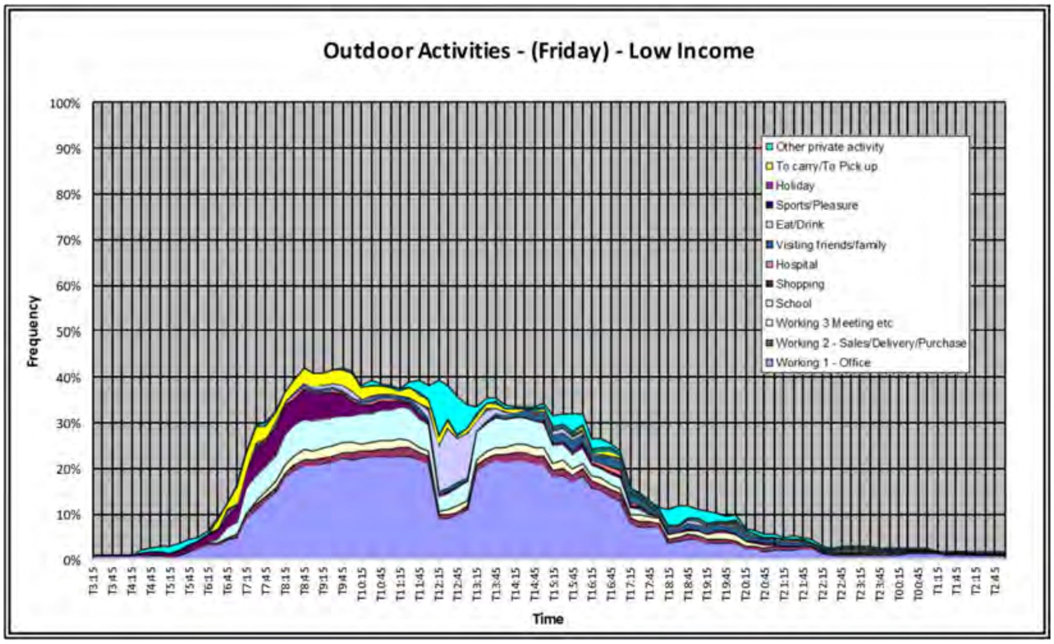
Source: JUTPI 2

Figure 40 In-home Activities of High-Income Group on Friday

On the other hand, the out-of-home activities of low-income group on Friday are remarkably smaller among the other levels (see Figure 41). The highest frequency of out-of-home activities is for working, followed by going to school for student. Same as the previous category (Tuesday-Thursday), some people in lower income group do shopping in the morning as well. Furthermore, a minority group of people also prefer to eat/drink outside at noon.

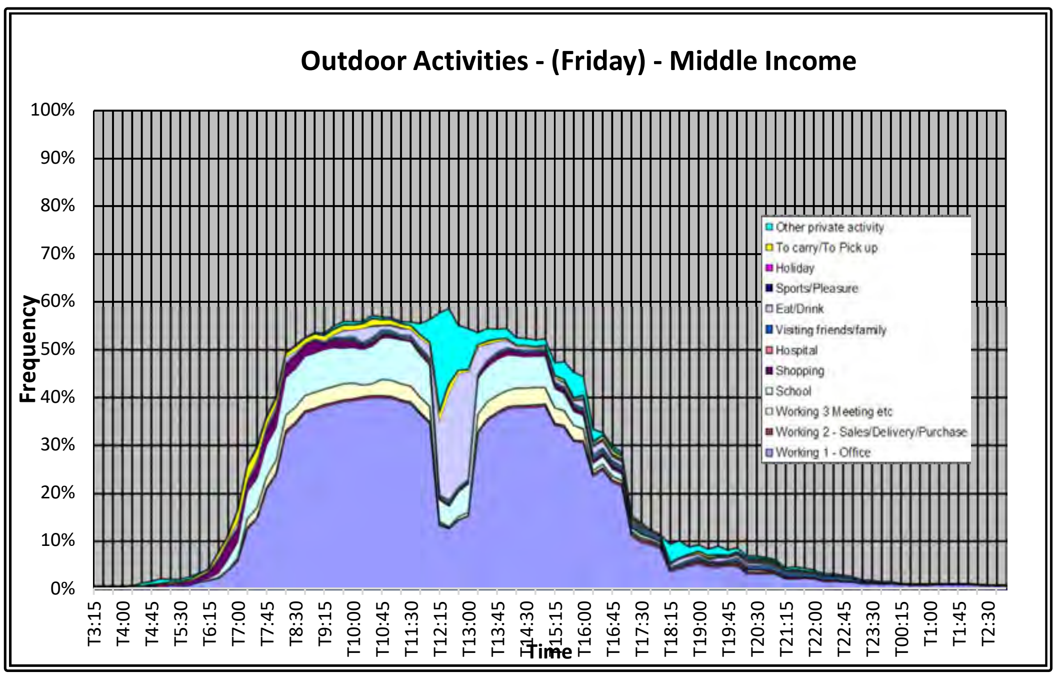
For middle-income group (see Figure 42), the frequency of out-of-home activities is considerably high, especially for working and school. The habit of eating out and having other private activities at noon is also quite high in this group.

The highest frequency of out-of-home activities is observed in high-income category with working and school as the majority of activities as depicted in Figure 43. Many more people also prefer to eat/ drink outside than other income levels.



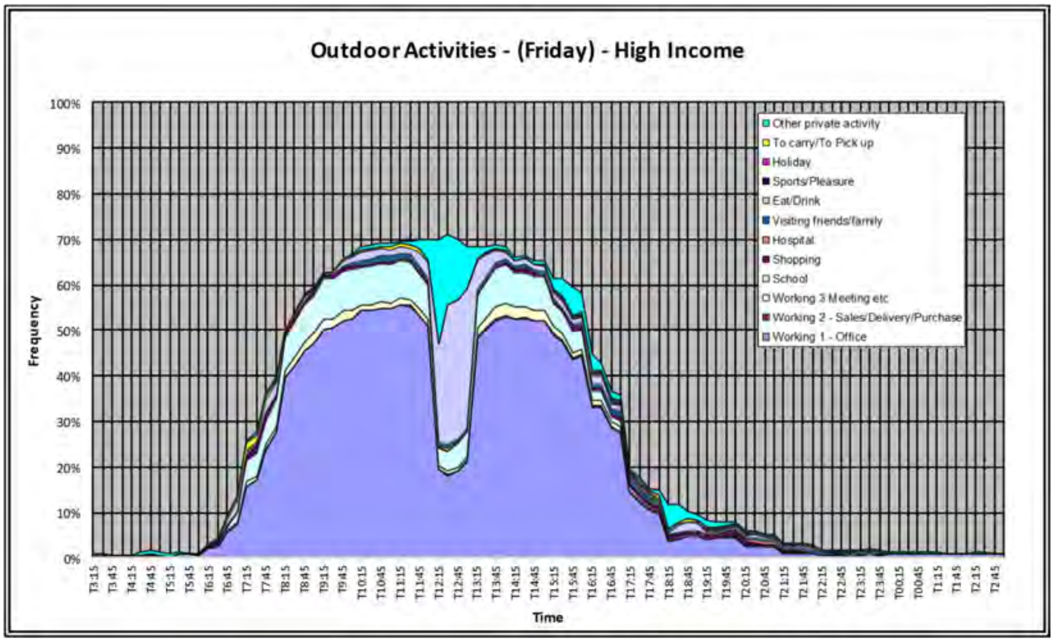
Source: JUTPI 2

Figure 41 Out-of-home Activities of Low-Income Group on Friday



Source: JUTPI 2

Figure 42 Out-of-home Activities of Middle-Income Group on Friday



Source: JUTPI 2

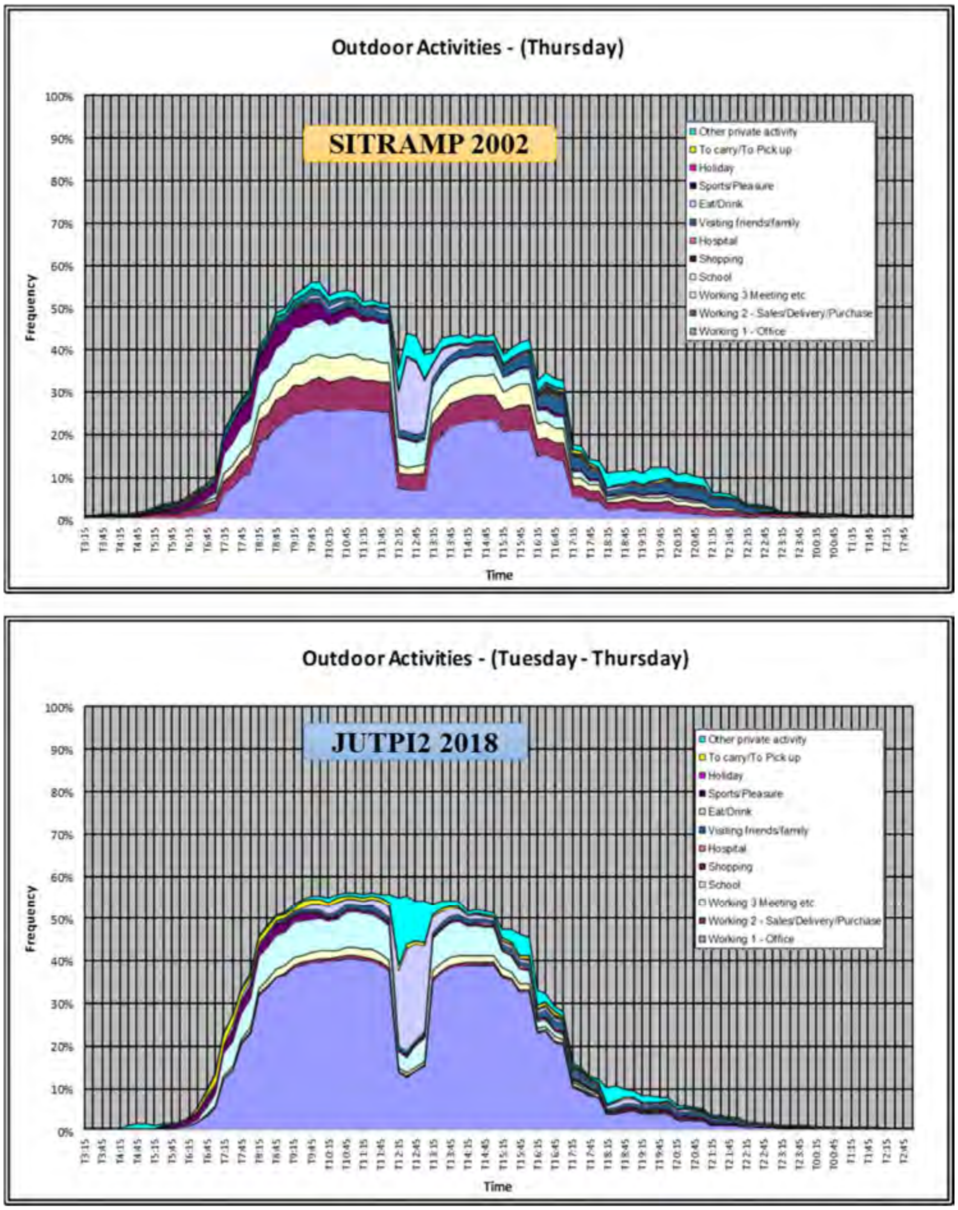
Figure 43 Out-of-home Activities of High-Income Group on Friday

2.4.3 Comparison of Lifestyle

Based on the comparative analysis of ADS in 2018 and 2002 that was conducted in almost two decades apart, notable changes are listed below.

1) Out-of-home Activity

Time of day to start the activity in general household tends to be earlier in 2018. This may be caused by the reason of general traffic situation that is more and more congested with longer travel time. In addition, the urban development expansion towards outskirt areas of DKI Jakarta and BODETABEK has created longer distance to commute. This condition also significantly impacts the change of midday at-home recess activity that was quite common in 2002 but was no longer popular these days. Nowadays, people tend to stay out of home as long as it is needed; even eating/drinking outside has become more popular as seen in the figure below.



Source: JUTPI 2

Figure 44 Comparison of Out-of-home Activities on Weekdays in SITRAMP (2002) and JUTPI 2 (2018)

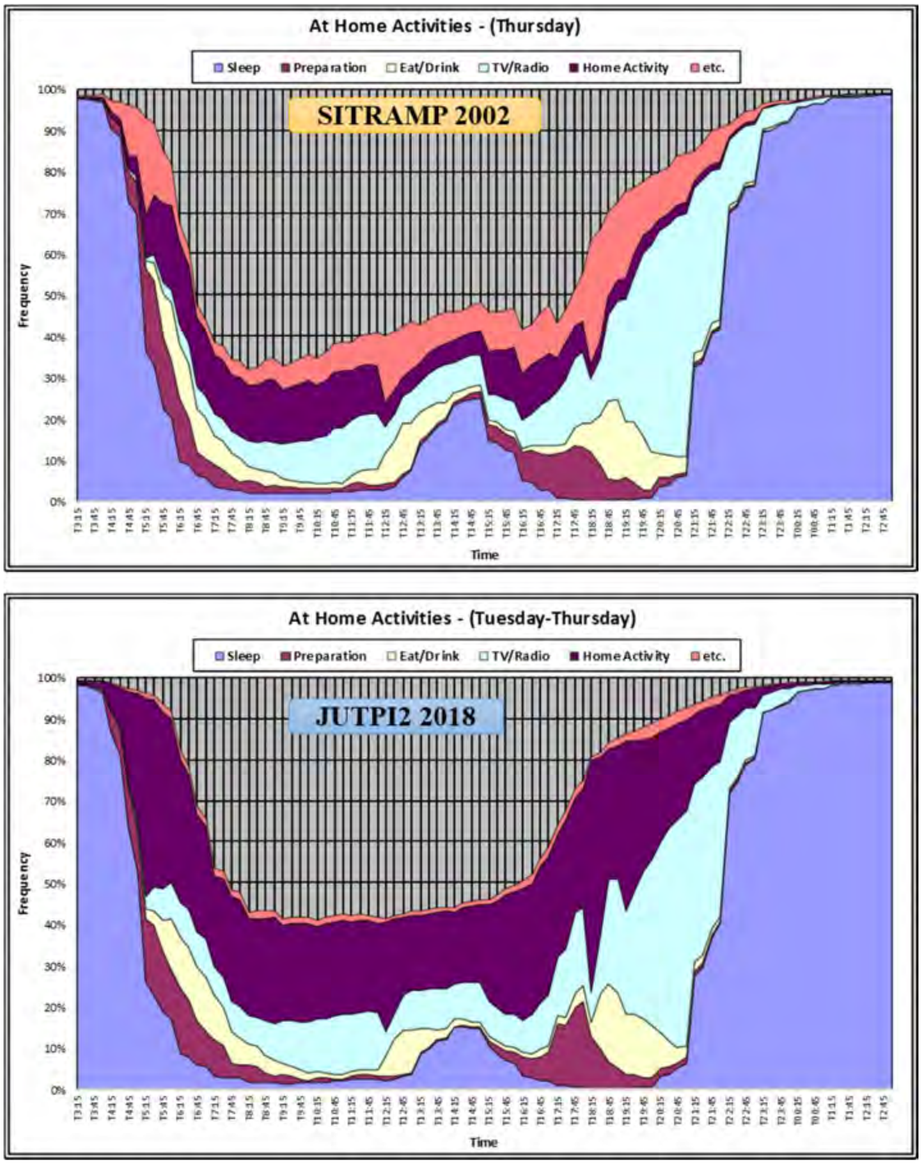
In regard to the income level, the tendency of people in low-income households making less frequent out-of-home activities than those in higher-income households is consistent. Working in offices has also become more popular nowadays taking more share among middle- to high-income people. Working in the field such as sales and delivery is rather distributed towards people in lower-income households though lower frequencies are found in 2018 than in 2002.

While out-of-home activities are made by spending more time throughout the day, activities of visiting friends and families are decreasing. This may be caused by communication technology that has been more advanced nowadays than in 2002. Overall, out-of-home activities are rather longer for work and school nowadays.

2) In-home Activity

The in-home activities such as house chores, study, pray, rest, and TV/Radio/Internet are distributed more evenly throughout the day in 2018 than in 2002 although the frequency is lower in 2018. In 2002, those activities are rather narrowed down to afternoon and nighttime only and are popular for lower-income households. Sleeping time has also shown changes in duration; it is shorter in 2018 as a result of natural compensation of the above-mentioned facts.

Regarding income level, people in low-income households have more in-home activities than out-of-activities. As income becomes higher, people have fewer home activities, spending less time at home and less for sleeping as well.

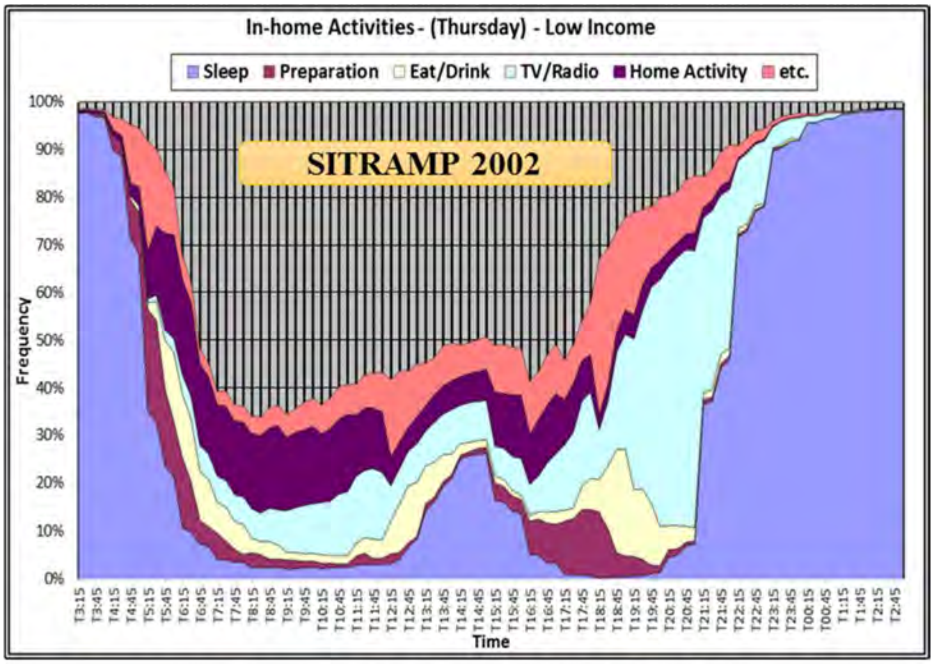


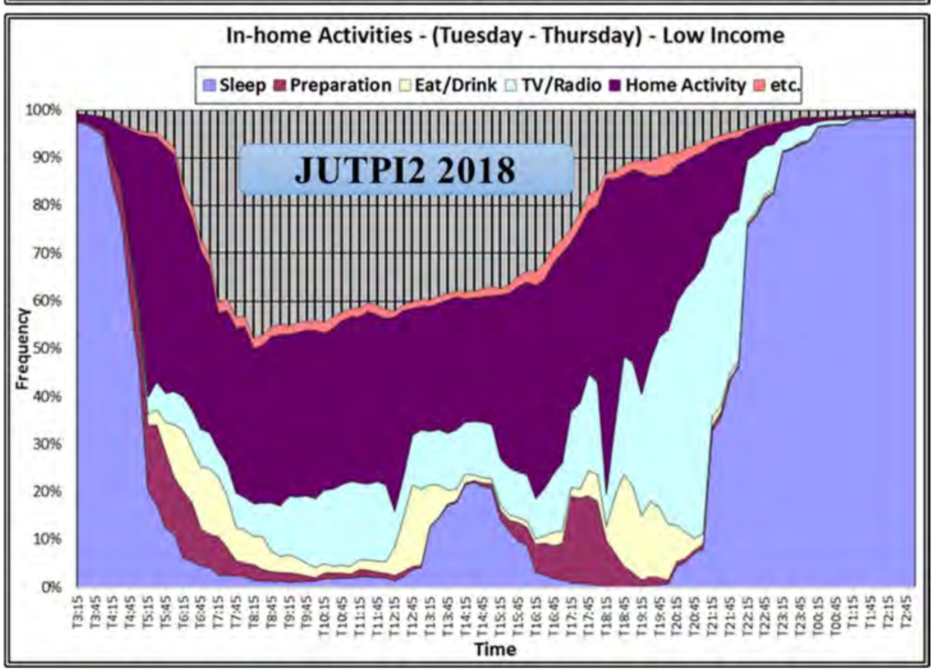
Source: JUTPI 2

Figure 45 Comparison of In-home Activities on Weekdays in SITRAMP (2002) and JUTPI 2 (2018)

3) Low Income

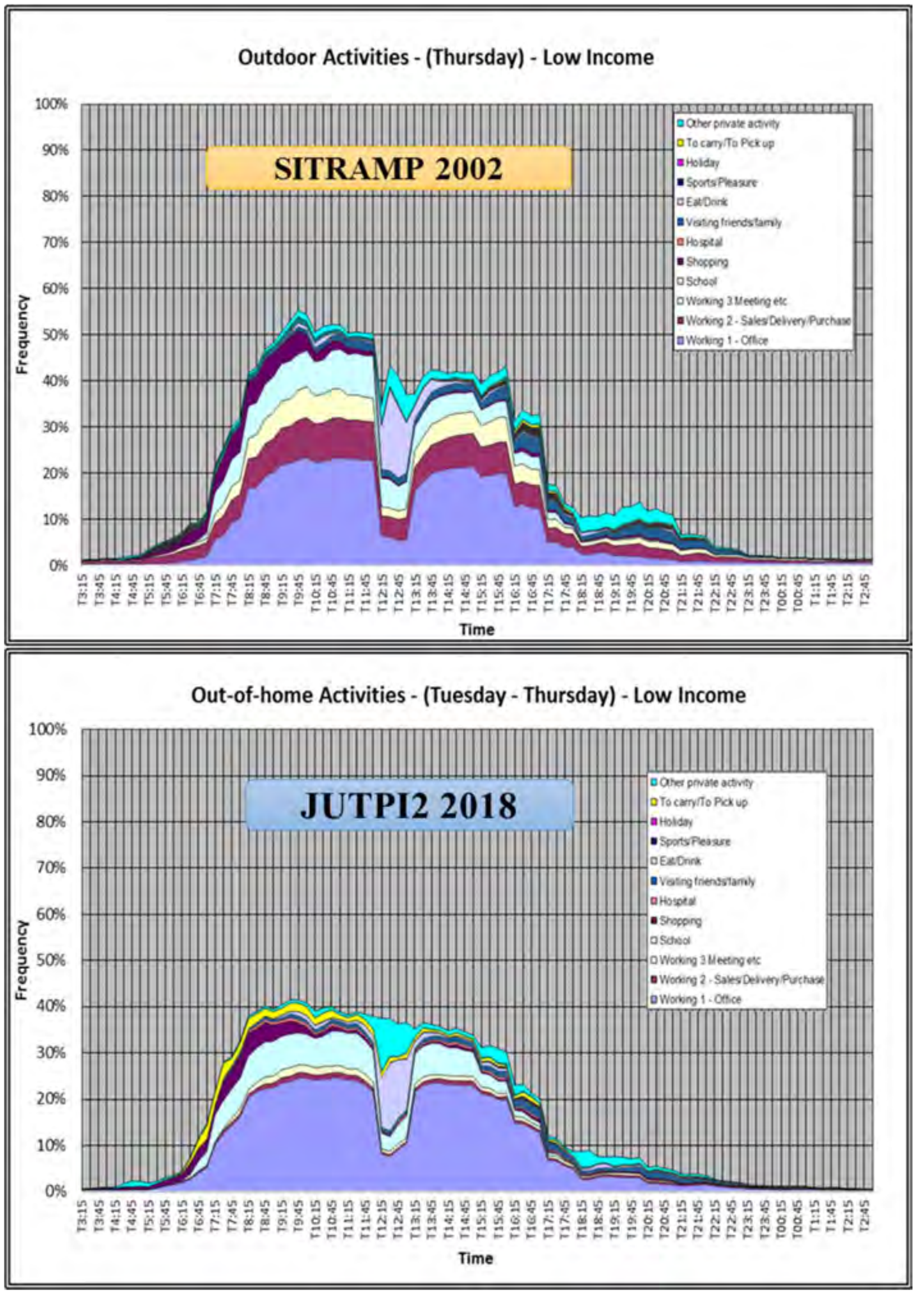
Trend of in-home activities remains similar to 2002 when people in low-income households tend to have more in-home activities. Meanwhile, the trend of having fewer outdoor activities including grocery shopping in the morning can be seen more clearly in 2018. Compared to 2002, more people have working in the activity of carry/pick up, sales, and delivery which are flexible compared to office-based work by higher-income people. Frequency of in-home activities becomes less as the income becomes higher, including midday nap and eating/drinking at home. This trend can be seen in both years.





Source: JUTPI 2

Figure 46 Comparison of In-home Activities by Low-Income People on Weekdays in SITRAMP (2002) and JUTPI 2 (2018)

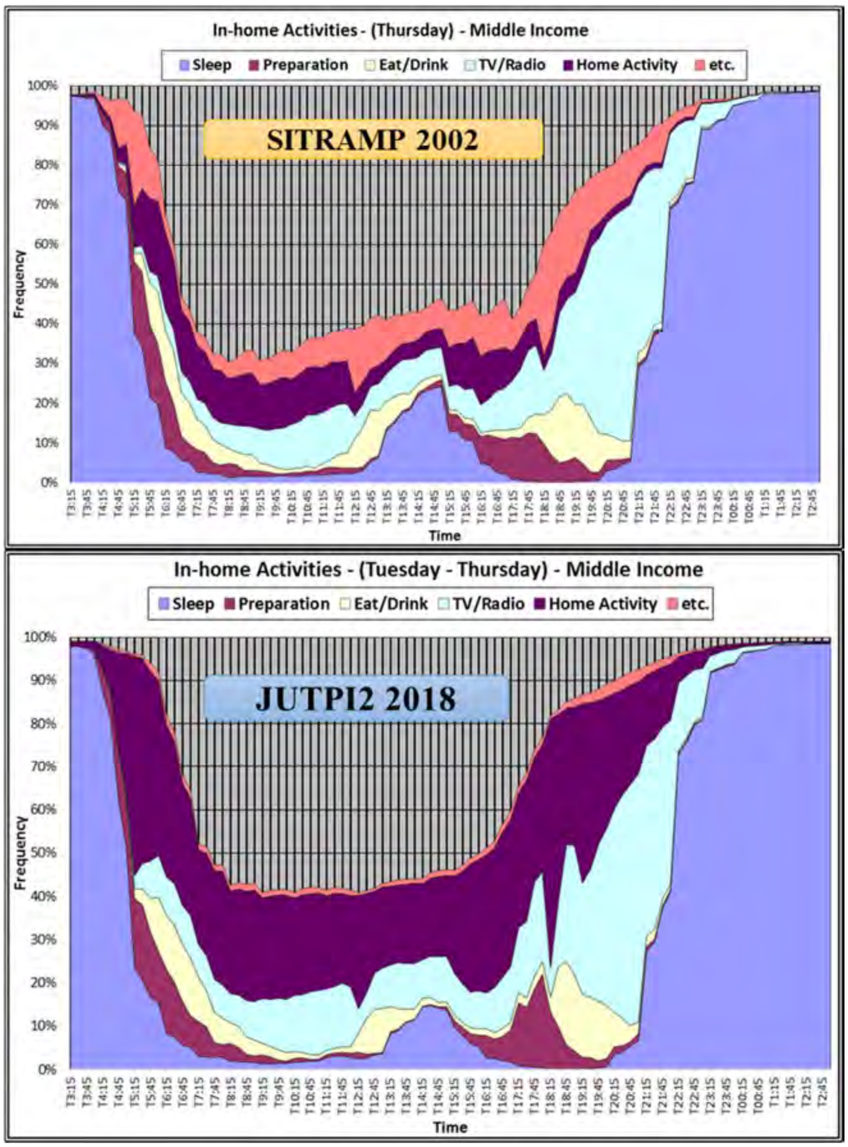


Source: JUTPI 2

Figure 47 Comparison of Out-of-home Activities by Low-Income People on Weekdays in SITRAMP (2002) and JUTPI 2 (2018)

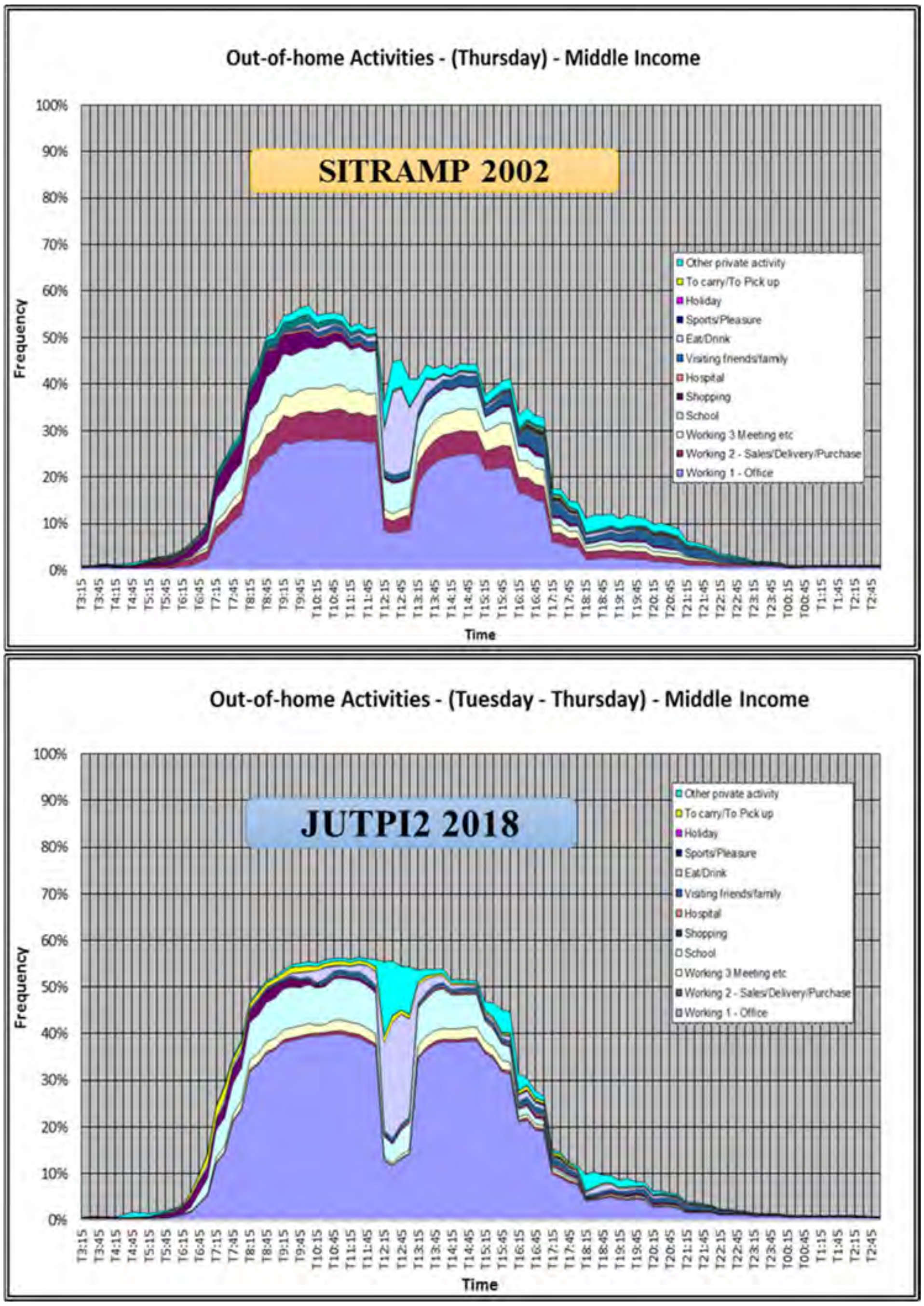
4) Middle Income

Compared to 2002, majority of middle-income group start their activity earlier at around 5 AM in the morning. They spend more time working in the office with less variety of activities. In 2002, out-of-home activity is dominated by working in office while other supporting activities were worth noticing such as sales/delivery, meeting, and studying at school. A difference is that, in 2018, working at office is much more dominant than other outdoor activities. For in-home activities, middle-income people spend more time on home activity in 2018 rather than 2002 while home entertainment (TV/radio) remains the same as that of 2002.



Source: JUTPI 2

Figure 48 Comparison of In-home Activities of Middle-Income on Weekdays in SITRAMP (2002) and JUTPI 2 (2018)

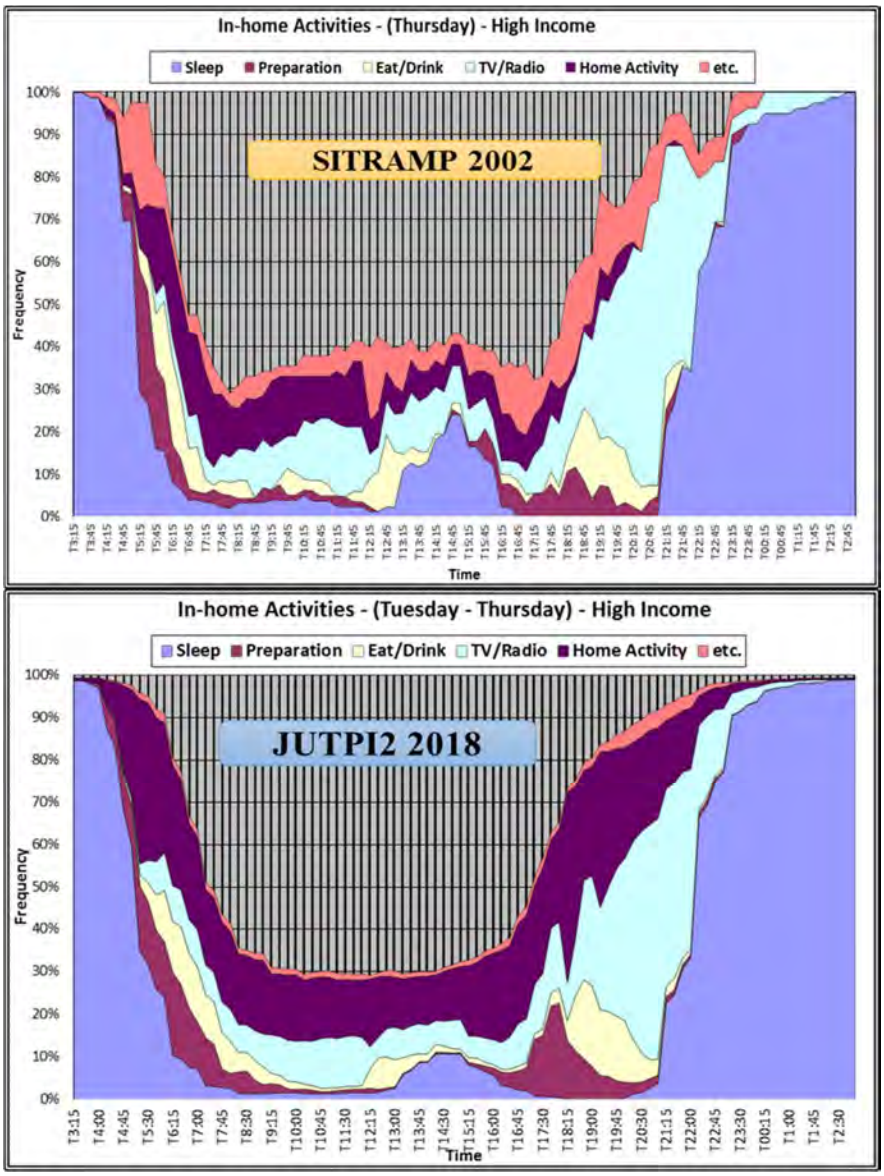


Source: JUTPI 2

Figure 49 Comparison of Out-of-home Activities of Middle-Income on Weekdays in SITRAMP (2002) and JUTPI 2 (2018)

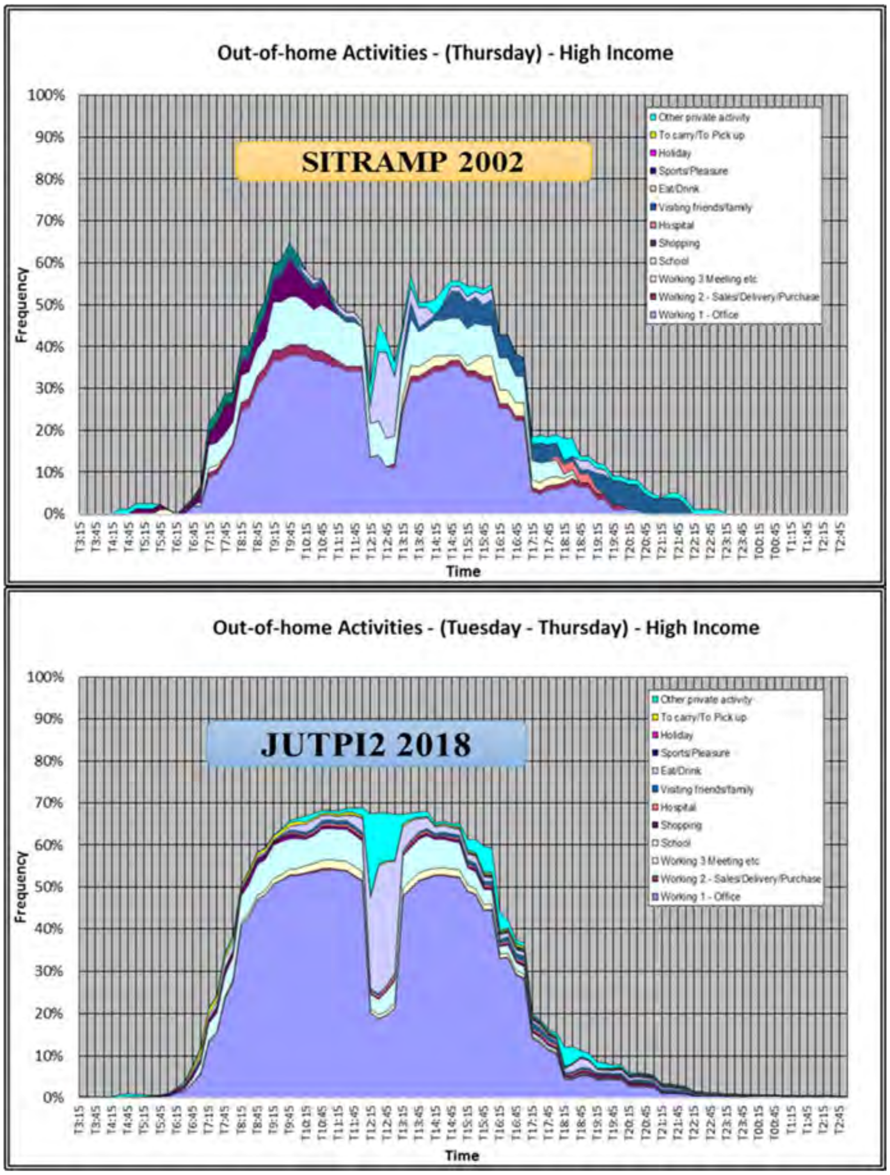
5) High Income

High-income group has the lowest frequency of in-home activities. As the income becomes higher, people start the day earlier but rarely sleep at noon and eat at home. Compared to 2002, people spend much more time working at the office. In 2018, more people eat/drink outside home but they have very few shopping activities throughout the day, which shows a different tendency from 2002 when people shopped in the morning. The trend of having out-of-home activities and midday private activities becomes much more common in 2018 than that of 2002.



Source: JUTPI 2

Figure 50 Comparison of In-home Activities of High-Income People on Weekdays in SITRAMP (2002) and JUTPI 2 (2018)



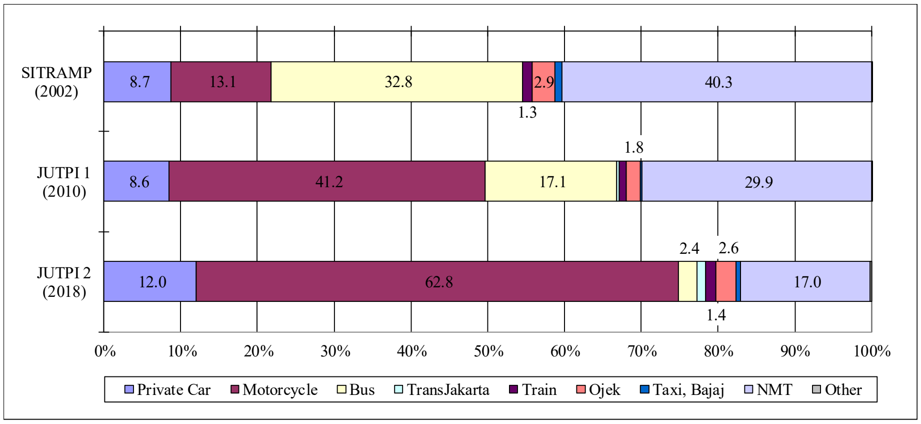
Source: JUTPI 2

Figure 51 Comparison of Out-of-home Activities of High-Income People on Weekdays in SITRAMP (2002) and JUTPI 2 (2018)

2.5 Travel Modes

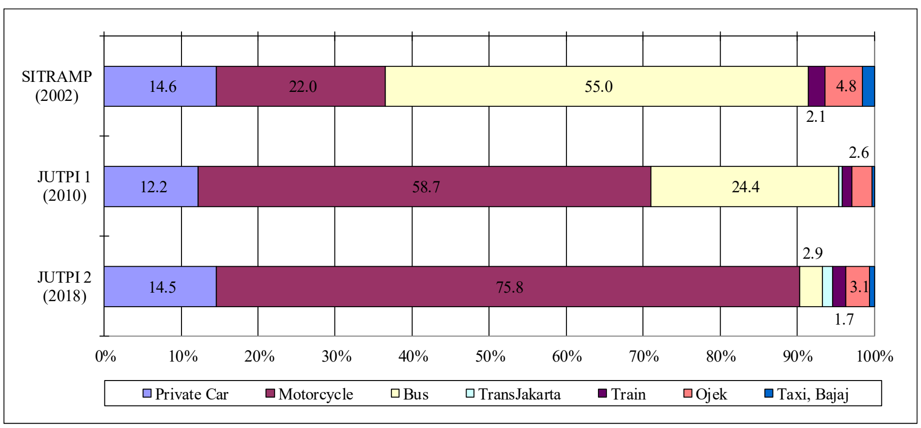
In 2002, modal share of JABODETABEK is dominated by non-motorized transport, including walking, bicycle, and *becak*, accounting for 40.3% from whole trips. The second-largest share is bus for 32.8%, followed by private vehicle which is around 20%. However, in 2010, it is known that the modal share in JABODETABEK changes to the increasing of private vehicle to almost 50% and dominated by the share of motorcycle of 41.2%.

JUTPI 2 estimated 2018 modal share in JABODETABEK by using the representative mode used by the respondents for every tour. Excluding NMT, private vehicle share has been rocketing and now dominating the mode share of JABODETABEK with over 90% in total (especially the share of motorcycle for 75.8%), while the share of public transport (Conventional Bus, TransJakarta, Commuterline (Train), *Ojek*, Taxi, *Bajaj*) is drastically decreasing over the years.



Source: JUTPI 2

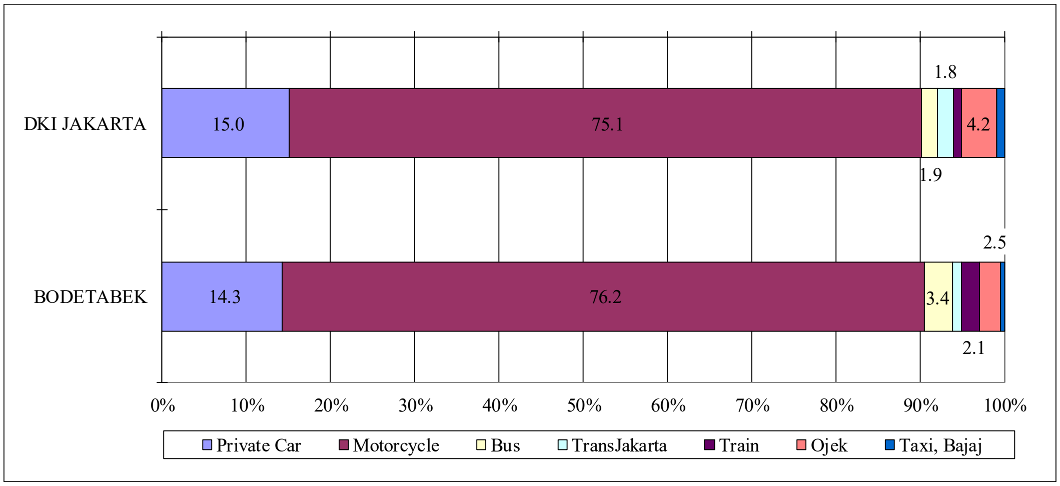
Figure 52 Modal Share in JABODETABEK



Source: JUTPI 2

Figure 53 Modal Share in JABODETABEK (Excluding NMT)

Figure 54 shows a comparison of modal share in DKI Jakarta and BODETABEK area. In general, modal share in DKI Jakarta and BODETABEK is showing similar trend. However, the share of o*jek* in DKI Jakarta dominates the modal share among all types of public transport. Unlike DKI Jakarta, the use of conventional bus has the largest share among the other public transport modes in the BODETABEK. It may be caused by the operation of *angkot* that still can be found in some areas in BODETABEK and is considered more efficient and affordable for short trip. The share of train for BODETABEK is also larger than in DKI Jakarta due to the services of Commuterline that serves and connects commuters from BODETABEK to DKI Jakarta area.



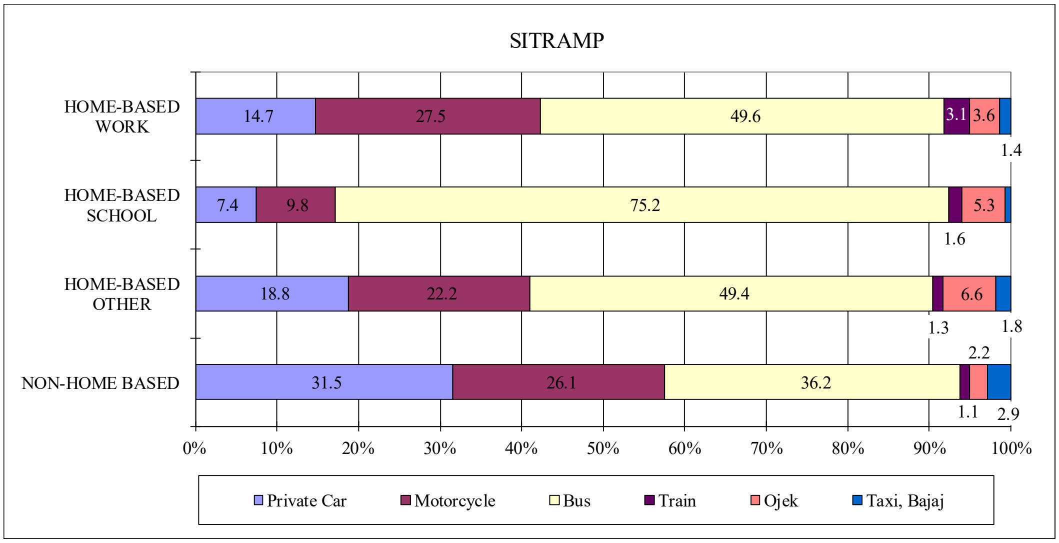
Source: JUTPI 2

Figure 54 Modal Share Comparison in DKI Jakarta and BODETABEK

2.5.1 Modal Share by Trip Purpose

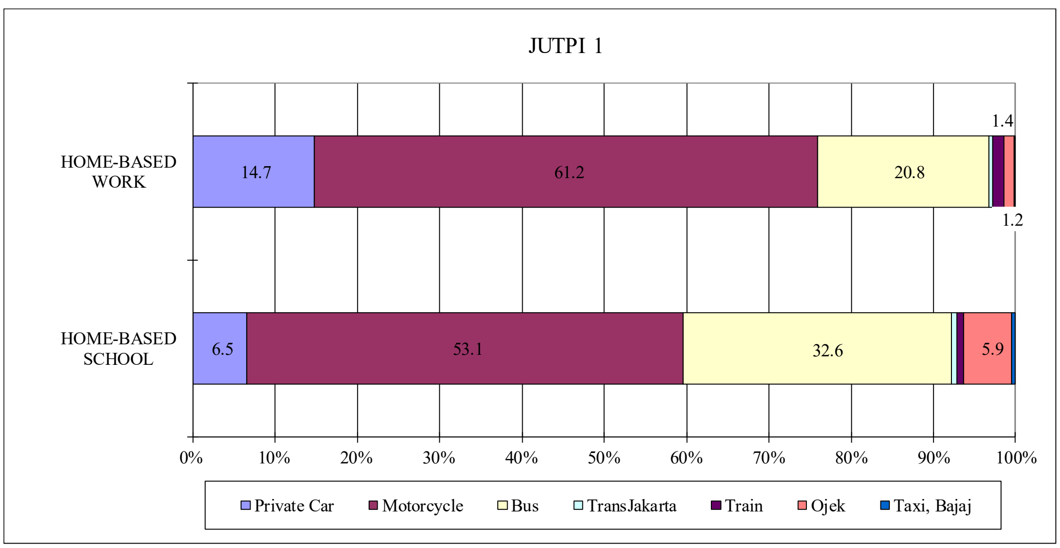
Home-based Work (HBW), Home-based School (HBS), Home-based Other (HBO), and Non-Home-based (NHB) tour have their own characteristics of modal share. In 2002, modal share of private vehicle and public transport for HBW, HBO, and NHB are similar, though public transport share is higher for HBW and HBO while it is lower for NHB tour. For HBS tour, it is served by public transport rather than private vehicle.

Moving to 2010, the modal share for both purposes, HBW and HBS are dominated by private vehicle. Even more in 2018, modal share of all purposes is served by the use of private vehicle. Among those purposes, the largest public transport share is only around 14% which is for HBS tour.



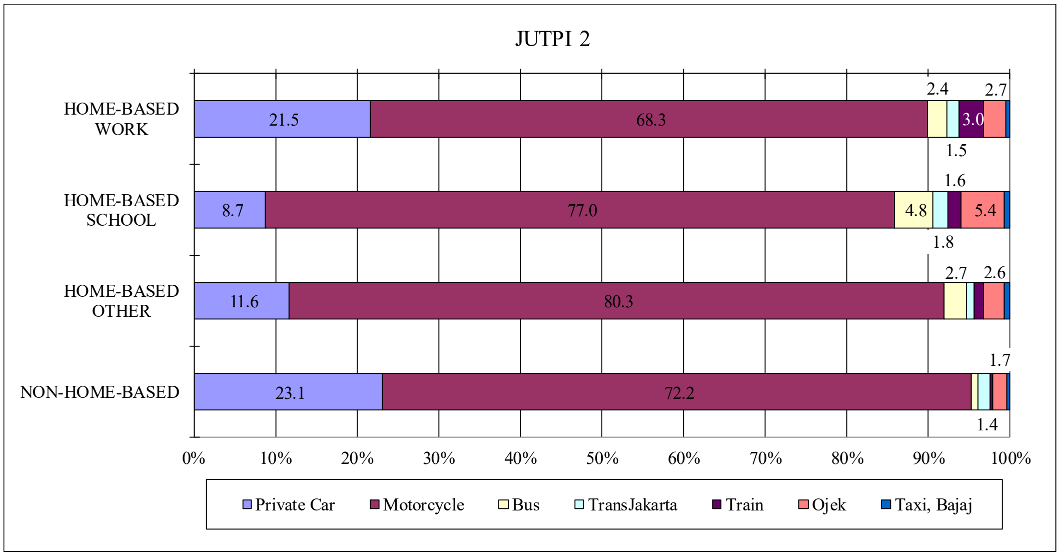
Source: JUTPI 2

Figure 55 Modal Share by Trip Purpose (SITRAMP, 2002)



Source: JUTPI 2

Figure 56 Modal Share by Trip Purpose (JUTPI 1, 2010)



Source: JUTPI 2

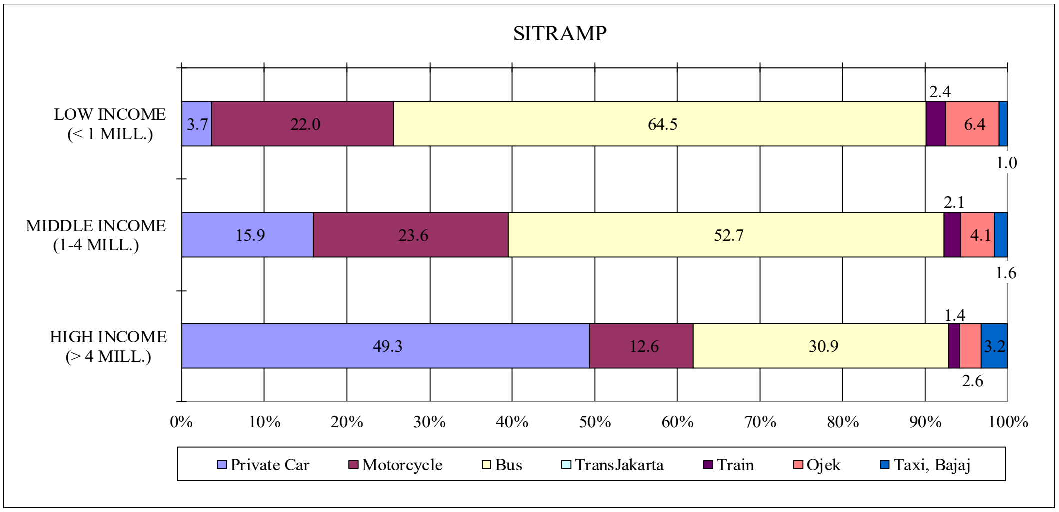
Figure 57 Modal Share by Trip Purpose (JUTPI 2, 2018)

2.5.2 Modal Share by Income

In 2002, public transport (especially conventional bus) dominates the mode share, except for high-income households which are dominated by private car (49.3%). The share of train is low throughout all household income groups due to poor quality of service, as shown in Figure 58.

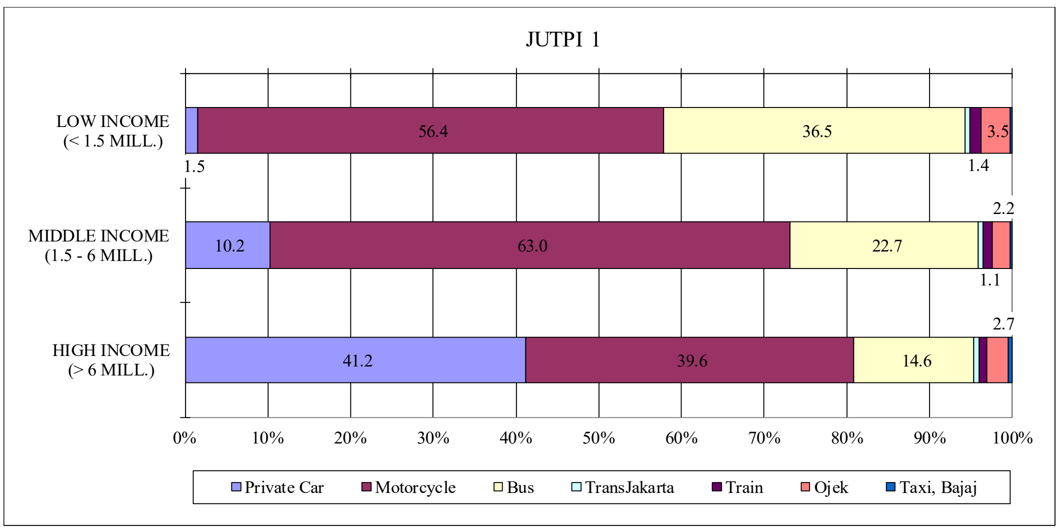
Compared to 2002, mode share in 2010 drastically changes into the domination of private vehicle, motorcycle (all household income groups) and car (high-income group). However, conventional bus is still preferable among other type of public transport, while train share keeps decreasing, as shown in Figure 59.

Private vehicle mode share in 2018 is increasing even more (to over 80%) compared to 2010. Motorcycle share also dominates the high-income households, though the car share is higher compared to other household income class, as shown in Figure 60.



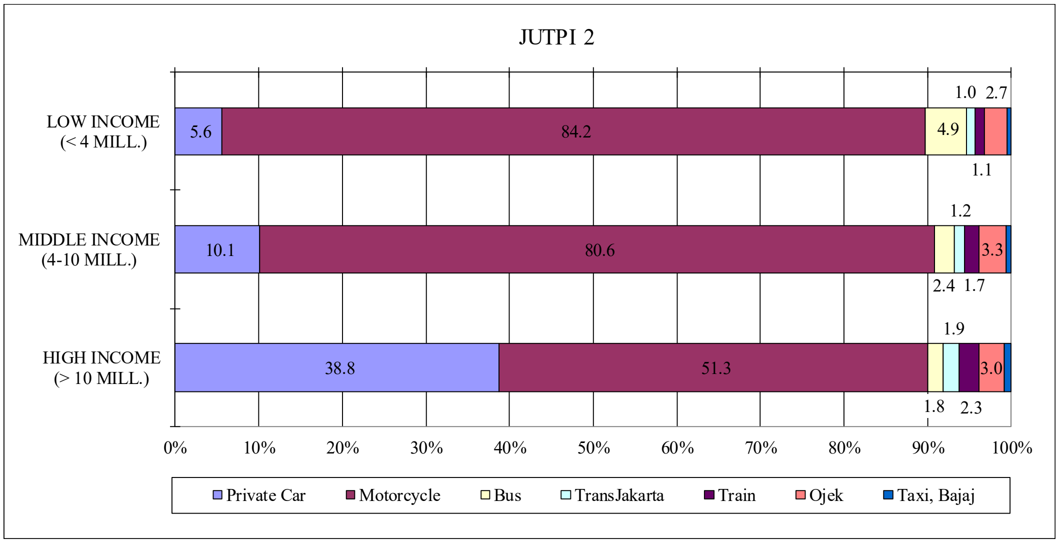
Source: JUTPI 2

Figure 58 Modal Share by Income (SITRAMP, 2002)



Source: JUTPI 2

Figure 59 Modal Share by Income (JUTPI 1, 2010)



Source: JUTPI 2

Figure 60 Modal Share by Income (JUTPI 2, 2018)

In conclusion, public transport share is drastically decreasing from 2002 to 2018. In 2002, mode share is dominated by public transport (mostly over 50%), decreases by less than half in 2010, and completely changes to the domination of private mode (over 80%) in 2018. Compared to private car, motorcycle share has been rocketing and it may be caused by:

- Simple motorcycle purchase scheme and affordable price, which has rapidly accelerated the sales of motorcycles (i.e. low advance payment, low operational and maintenance cost and long-period of installment); and
- "Consideration" of convenience (i.e. ability to thread through vehicles in a traffic jam).

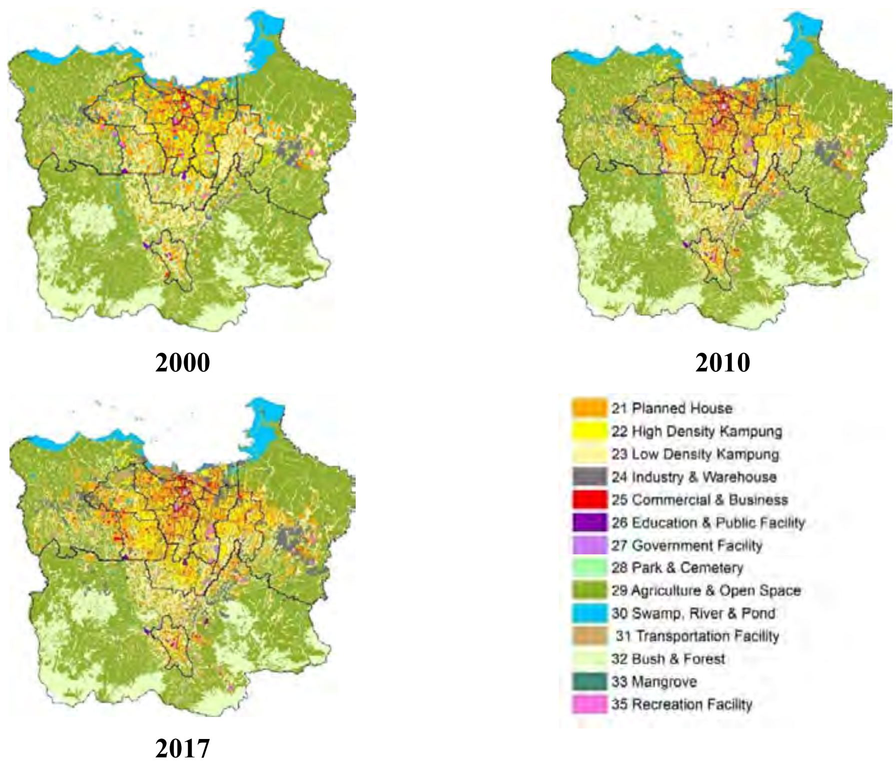
2.6 Land Use

2.6.1 Past and Present Condition

JABODETABEK metropolitan area is an urban area that has functional interconnections with an integrated regional infrastructure network system with a population of approximately 34 million in 2018. Referring to Law Number 26 Year 2007 regarding Spatial Planning, the term "urban area" means an area that has main non-agricultural activities with an arrangement of regional functions as a place for urban settlements, distribution of government services, social services, and economic activities. [3] JABODETABEK area is developing rapidly and greatly influenced by level of population growth and socioeconomic activities. The land use pattern of urban activities in 2000 was

[3] Law no. 26 year 2007 regarding spatial plan

still concentrated in DKI Jakarta. However, over the time the concentration of urban activities began to spread to the areas around DKI Jakarta. This is evidenced by the existence of a new expansion region in 2008, which was previously some area in Kabupaten Tangerang administrative area bordering the DKI Jakarta province. Part of its territory has become a new administrative region named Kota Tangerang Selatan. It is in accordance with the function of the city which has mainly non-agricultural activity and has a high density of population. Land use changes during 2000 – 2017 are illustrated in Figure 61.



Source: JUTPI 2

Figure 61 Land-Use Change in JABODETABEK during 2000 - 2017

Based on functions, land use is divided into urban land use and natural land use. In addition, land use function has several land use categories that consist of:

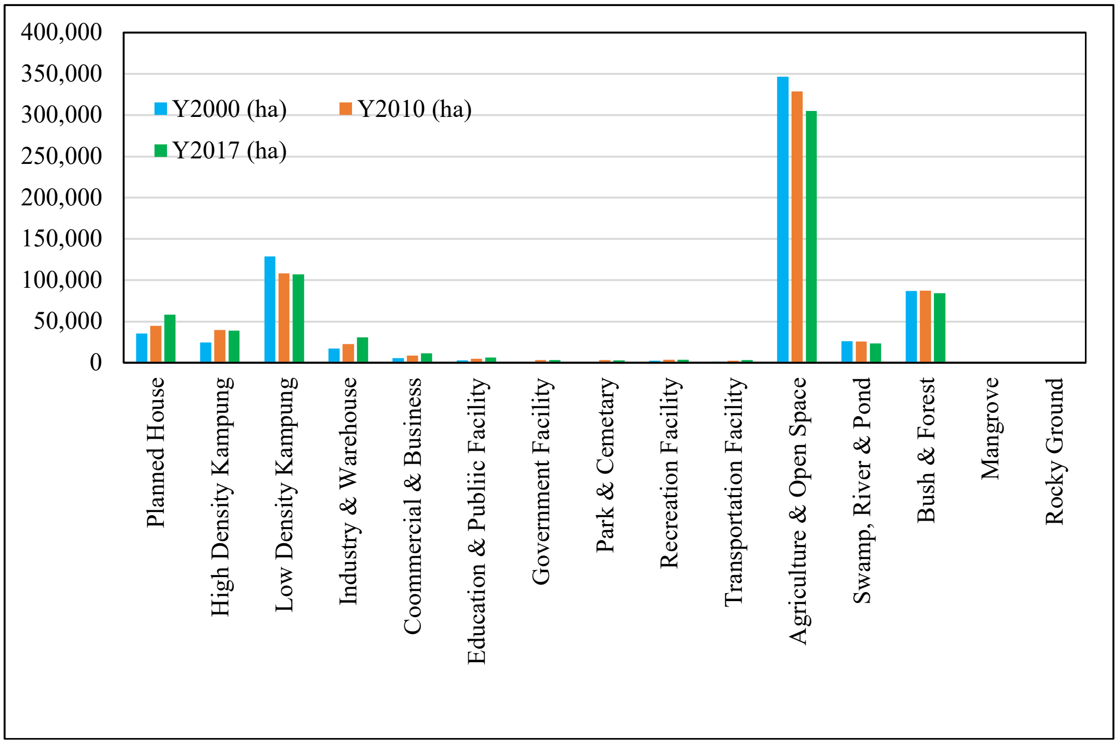
- Urban land use: Planned House, High Density *Kampung*, Low Density *Kampung*, Industry & Warehouse, Commercial & Business, Education & Public Facility, Government Facility, Park & Cemetery, Recreation Facility, and Transportation Facility; and
- Natural land use: Agriculture and Open Space, Swamp, River & Pond, Bush & Forest, Mangrove, Rocky Ground.

As shown in Table 20, from 2000 to 2017, most of the increment in land use utilization was in the form of urban land use function, which includes land use categories of planned house, high-density *kampung*, industry and warehouse, commercial and business, education and public facility, government facility, park and cemetery, and recreation facility. It was relatively a positive change followed by the reduction in the area of low-density *kampung* by 21,897 ha. However, it should be noted that the changes also occur in the increment of high-density *kampung* by 14,207 ha which is some problem of the urban area, even though the total area is not as large as the decreasing area of low density *kampung*.

Table 20 Land Use Changes Comparison for Years 2000, 2010, and 2017

LU_CD	Urban/ Natural	Land Use Category Name	2000 (ha)	2010 (ha)	2017 (ha)	Comparison 2000-2017
21	U	Planned House	35,327	44,902	58,069	22,742
22	U	High Density Kampung	24,745	39,572	38,952	14,207
23	U	Low Density Kampung	128,826	108,014	106,929	-21,897
24	U	Industry and Warehouse	17,118	22,634	31,090	13,972
25	U	Commercial and Business	5,292	8,598	11,072	5,780
26	U	Education and Public Facility	2,786	4,703	5,967	3,181
27	U	Government Facility	769	3,316	3,169	2,400
28	U	Park and Cemetery	961	3,098	2,921	1,960
35	U	Recreation Facility	2,669	3,475	3,644	975
31	U	Transportation Facility	1,495	2,673	3,173	1,678
29	N	Agriculture & Open Space	346,850	328,946	305,254	-41,596
30	N	Swamp, River & Pond	26,182	25,671	23,217	-2,965
32	N	Bush & Forest	87,034	87,225	84,000	-3,034
33	N	Mangrove	235	235	208	-27
34	N	Rocky Ground	0	0	0	0

Source: JUTPI 2

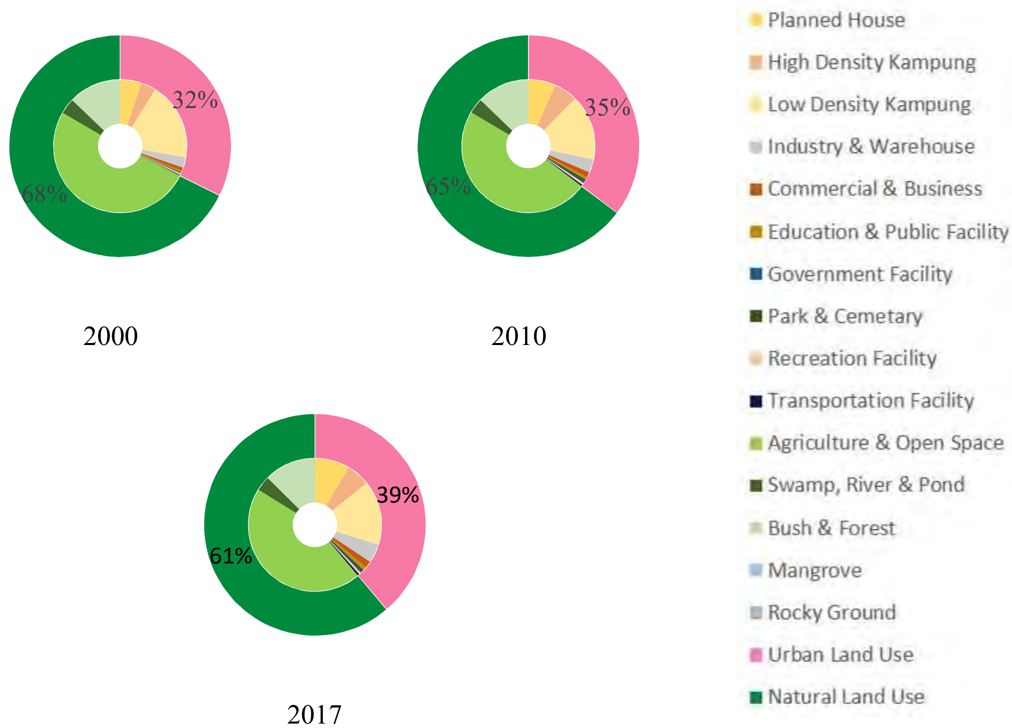


Source: JUTPI 2

Figure 62 Land Use Changes Comparison for Years 2000, 2010, and 2017

Some factors that increase the number of planned house and high-density *kampung* are triggered by necessities of dwellings area to support industry and warehousing, business, and commercial activities. Meanwhile, most of the natural land use categories have decreased, especially the agriculture and open space significantly decrease due to the increment of urban land use activities.

As shown in Figure 63 and Table 21, natural land use area in JABODETABEK in year 2000 was 68%, most of which were located in *kabupaten* area. To put it the other way around, 32% was in urban areas. Both from year 2000 to 2010 and from 2010 to 2017 there were changes in urban and natural land use by 3% for each. This means that, overall, there has been a change in the increase of urban land use by 6% and a decrease in natural land use by 6% in a period of 17 years. This 6% increase in land use is larger than the size of two cities in JABODETABEK area, namely Kota Bekasi and Kota Tangerang, of which combined total is approximately 36,000 ha.



Source: JUTPI 2

Figure 63 Urbanization in JABODETABEK by Land Use Category

Table 21 Urbanization in JABODETABEK for Years 2000, 2010, and 2017

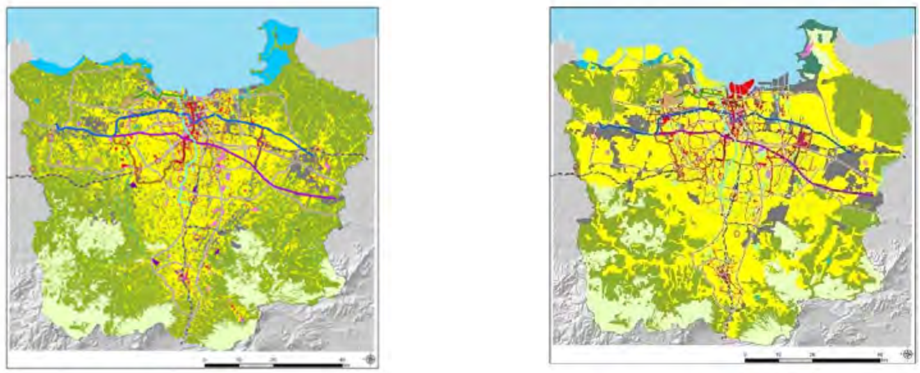
Urban Land Use	Y2000	Y2010	Y2017	Comparison 00 – 17	Growth %
Urban Land Use	219,988	240,985	264,985	44,997	6%
	32%	35%	38%		
Natural Land Use	460,301	442,077	412,679	-47,622	-6%
	68%	65%	61%		

Source: JUTPI 2

2.6.2 Forecasted Condition in 2035

By following the regional spatial plan of each *kota* and *kabupaten* in JABODETABEK which has a planning period of 20 years, even though each *kota* and *kabupaten* has a different planning year, the result of spatial forecast in 2035 still can be obtained. From each spatial plan of *kota* and *kabupaten*, land use category is interpreted.

In 2035 it is forecasted a significant change in urban and natural land use function. For the urban land use function, residential area category has the most significant increase in area, while, for the natural land use function, agriculture and open space category has the most significant decrease in area. Both residential area and agriculture and open space categories reach nearly 50% of change in area. Figure 64 and Figure 65 show that the land use utilization in *kabupaten* area is dominated by agriculture and open space up to now, but a large portion will be converted into residential area category.



2017 **2035**

Source: JUTPI 2

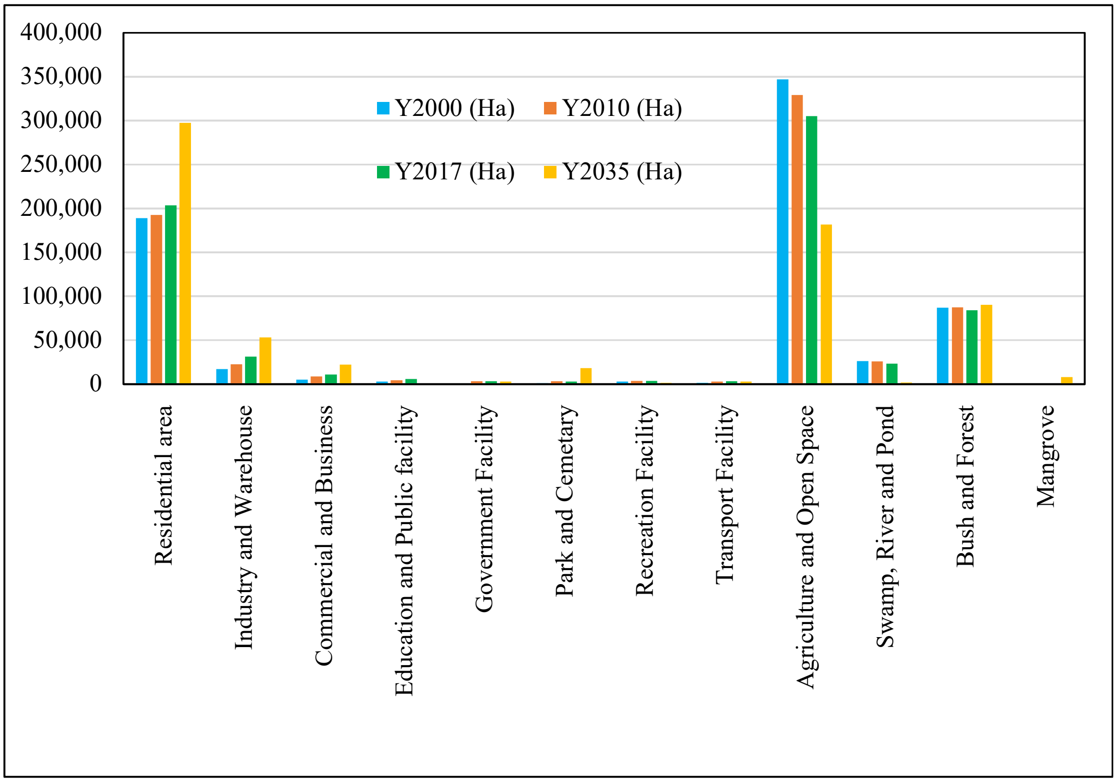
Figure 64 Land Use Change in JABODETABEK from 2017 to 2035

By comparing land use between years 2017 and 2035 as shown in Table 22 and Figure 65, it shows a constant increasing trend that will occur in land use category of residential area, industry and warehouse, and commercial and business, while agriculture and open space, and swamp river and pond show a constant decreasing trend. Those dramatic land use area changes influenced by the development of DKI Jakarta as a central area will indirectly encourage urban development not only in the adjacent area of DKI Jakarta province but also in JABODETABEK.

Table 22 Land Use Changes Comparison from 2017 to 2035

Urban/Natural	Land Use Category Name	Y2017 (Ha)	Y2035 (Ha)
U	Residential Area	203,386	297,612
U	Industry and Warehouse	31,090	53,278
U	Commercial and Business	11,072	22,444
U	Education and Public Facility	5,967	671
U	Government Facility	3,169	2,804
U	Park and Cemetery	2,915	18,206
U	Recreation Facility	3,644	1,460
U	Transport Facility	3,173	2,656
N	Agriculture and Open Space	305,254	181,478
N	Swamp, River and Pond	23,217	1,667
N	Bush and Forest	84,000	90,379
N	Mangrove	208	8,100

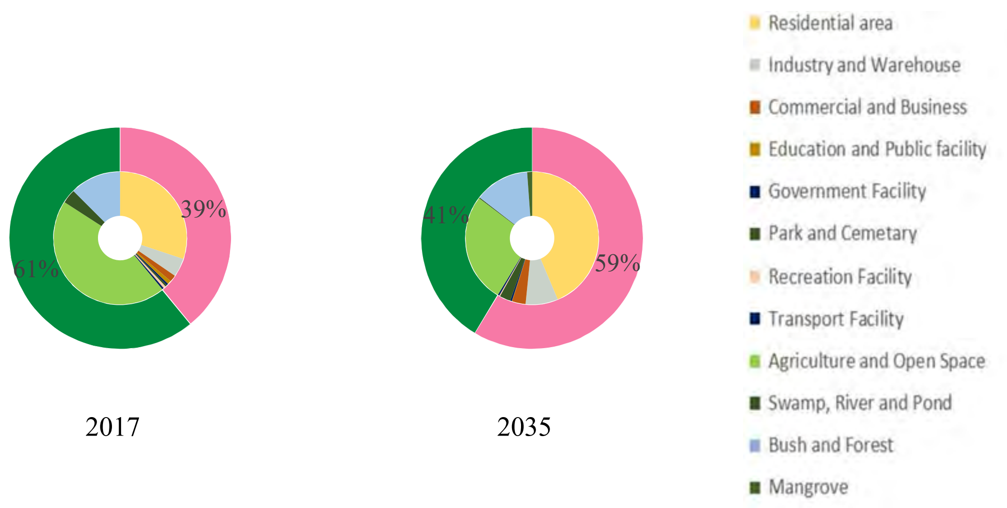
Source: JUTPI 2



Source: JUTPI 2

Figure 65 Land Use Changes Comparison for Years 2000, 2010, 2017, and 2035

By comparing 2017 and 2035 as shown in Figure 66 and Table 23, it is predicted that there will be changes in urban land use function reaching a growth rate of 20%, as well as a decrease in natural land use function at the same rate of 20%, making the urban land use function more dominant compared to the natural land use. This change is much more rapid than the land use change from 2000 to 2017 which recorded a growth of 6% of urbanization.



Source: JUTPI 2

Figure 66 Urbanization in JABODETABEK by Land Use Category from 2017 to 2035

Table 23 Urbanization in JABODETABEK by Area Size from 2017 to 2035

Urban Land Use	Y2017	Y2035	Comparison 17 – 35	Growth %
Urban Land Use	264,985 39%	399,132 59%	134,147	20%
Natural Land Use	412,679 61%	281,625 41%	-131,054	-20%

Source: JUTPI 2

Chapter 3 CURRENT SITUATION OF TRANSPORTATION IN JABODETABEK

3.1 Secondary Data of Commuterline and BRT Transjakarta

Up to early 2019, there are two complementary mass transit modes that are operated within JABODETABEK, namely Commuterline managed by Kereta Commuter Indonesia (PT. KCI) and BRT Transjakarta by PT. Transportasi Jakarta. Followings are several data related to Commuterline and TransJakarta.

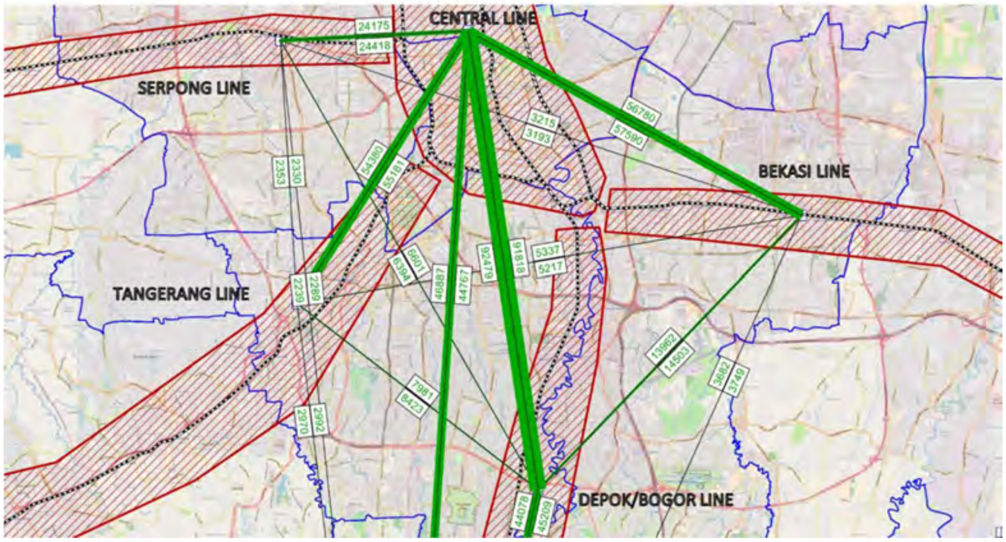
3.1.1 KRL Commuterline

Based on PT. KCI Annual Report 2017 and 2018, until 2017, with the total route length more than 400 km, Commuterline serves seven services lines, they are:

- Central line: Bogor – Depok – Jakarta Kota
- Loop Line: Bogor – Depok – Tanah Abang – Kampung Badan – Jatinegara
- Cikarang[4]/Bekasi Line: Cikarang – Bekasi – Jatinegara – Jakarta Kota
- Rangkas Bitung/Maja/Serpong Line: Rangkas Bitung – Maja – Serpong – Tanah Abang
- Tangerang Line: Tangerang – Duri
- Nambo Line: Angke – Tanah Abang – Nambo
- Tanjung Priok Line: Jakarta Kota – Tanjung Priok

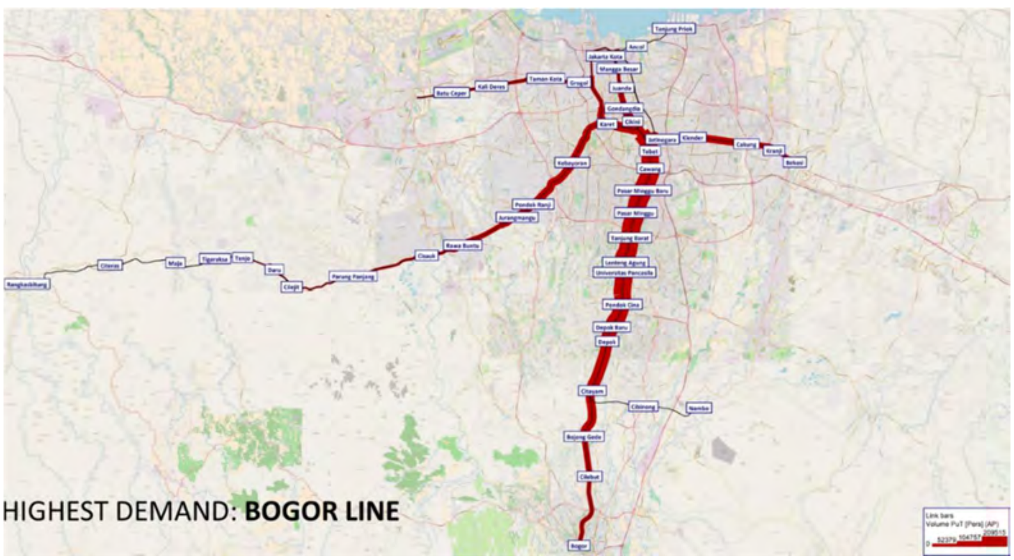
With continuous improvements being made (ticketing system, number and quality of the train, platform extension, etc.), in 2017, total yearly passengers of Commuterline is nearly 316 million and the average daily passenger volume is nearly 1 million pax/day. The highest daily passenger record in 2017 hit 1,076,274 in one day. In 2018, with the average daily passenger volume of 922,736/day, the total yearly number of passenger increased by 7% to 337 million and highest daily passenger record in 2018 hit 1,154,080 passengers. Based on the data from PT. KCI as of May 2017, the line which carries the largest passengers demand appears to be the Bogor Line (see Figure 67 and Figure 68).

[4] In early October 2018, new stations (extended of Bekasi Line) operated: Bekasi Timur – Tambun – Cibitung - Cikarang



Source: JUTPI 2 based on PT. KCI

Figure 67 Desire Line by Railway Station on Commuterline (May 2017)



Source: JUTPI 2 based on PT. KCI

Figure 68 Daily Bandwidth on Commuterline (May 2017)

The transportation capacity of the JABODETABEK railway has been outrun by the increasing demand. The passenger demand and transportation capacity in the morning and evening peak in 2017 are shown in Table 24. Load factor of all the lines is equal to or more than 150% in morning peak. Although Bogor line has the largest demand, Bekasi and Serpong Line suffer more in morning peak because of the lower services.

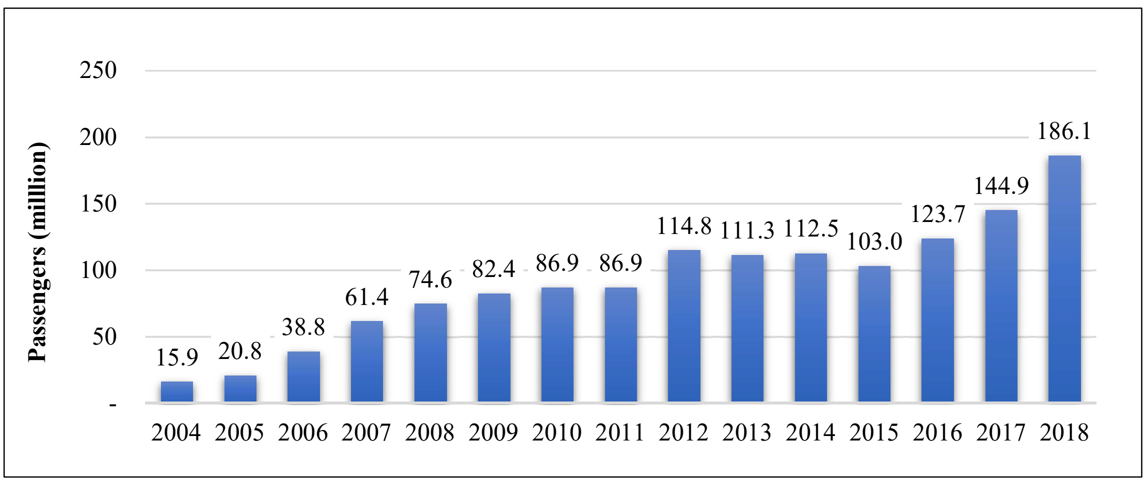
Table 24 Commuter Line Passenger Demand and Capacity in Peak Hour (as of May 23, 2017)

Morning Peak (05:00-06:00)					
Line	**Section***	**No. of Trains****	**Capacity*** (passenger)**	**Passenger Volume**	**Load Factor**
Bogor Line	Pasar Minggu-Pasar Minggu Baru	12	19,200	38,378	200%
Bekasi Line	Buaran-Klender	4	6,400	17,381	272%
Serpong Line	Pondok Ranji-Kebayoran	5	8,000	18,536	232%
Tangerang Line	Pesing-Grogol	2.5	4,000	6,999	175%
Evening Peak (17:00-18:00)					
Line	**Section***	**No. of Trains****	**Capacity*** (passenger)**	**Passenger Volume**	**Load Factor**
Bogor Line	Tanjung Barat-Lenteng Agung	10.5	16,800	23,855	142%
Bekasi Line	Jatinegara-Klender	5.5	8,800	10,451	119%
Serpong Line	Kebayoran-Pondok Ranji	5.5	8,800	10,593	120%
Tangerang Line	Taman Kota-Bojong Indah	3	4,800	4,759	99%

Note: * Section with the maximum number of railway passenger on the line
** Average hourly trains in two hours (4:00-6:00 for morning and 16:00-18:00 for evening)
*** Number of trains x Number of cars (10) x Capacity per cars (160)
Source: JUTPI 2

3.1.2 Transjakarta

Transjakarta service was commenced in 2004. As of the end of 2017, there have been 13 corridors in operation together with other services outside the main corridors. Transjakarta is operated with more than 1,300 buses in total. The total number of Transjakarta passengers is also increasing along with the system improvement, including ticketing system, integration with other public transportation, corridors, and routes expansion. Number of Transjakarta passengers from 2014 to 2018 can be seen in Figure 69.



Source:
- Transportasi Provinsi DKI Jakarta 2009, 2010, 2015/2016, 2016, BPS
- Provinsi DKI Jakarta Dalam Angka 2018, 2019, BPS

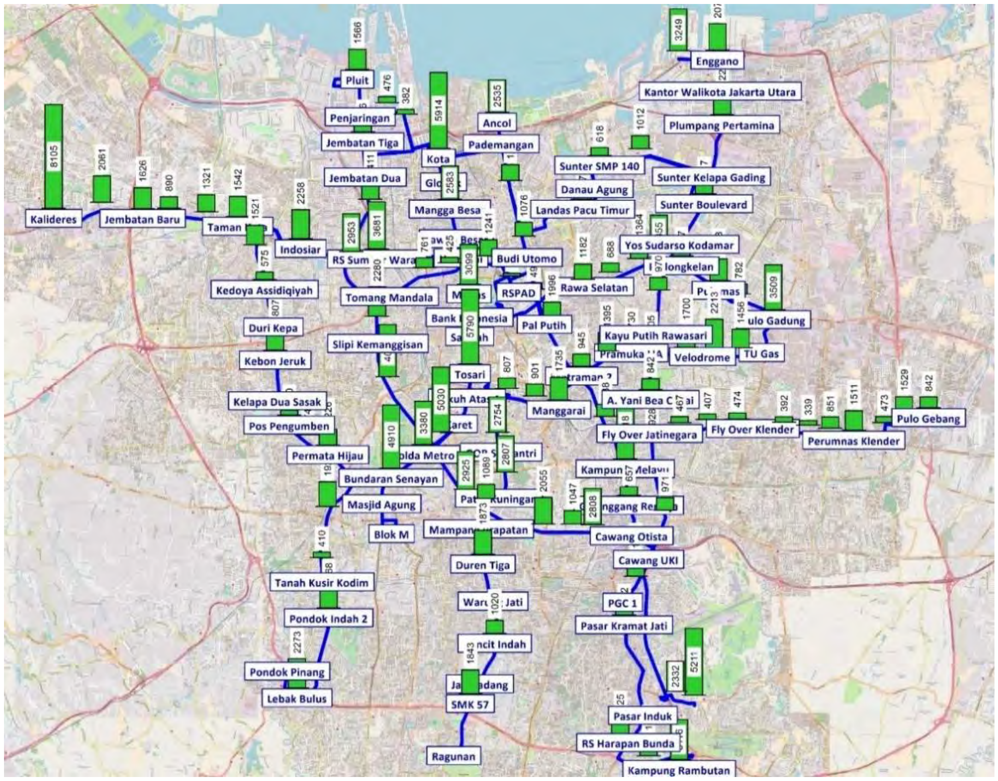
Figure 69 TransJakarta Annual Passengers 2004-2018

Tap-in and tap-out data are valuable data to analyze OD pattern by shelter, average travel time, average trip length, and so on. Unfortunately, tap-in and tap-out data cannot be fully utilized because: some passengers omit tapping out at some shelters; tap-in and tap-out data are only available at shelters on the main corridors (some feeder route passengers pay on board); multiple passengers use only one tap-in or tap-out card (used by their family members or friends); or a single passenger uses different tap-in and tap-out cards. Thus, Table 25 and Figure 70 only utilize tap-in data from each shelter.

Table 25 Top 15 Transjakarta Shelter (as of May 23, 2017)

No.	Tap-In Shelter	Passenger
1	Kalideres	8,105
2	Blok M	8,000
3	Ragunan	6,858
4	Central Park	5,954
5	Karet	5,924
6	Stasiun Kota	5,914
7	Tosari	5,790
8	Harmoni	5,708
9	Sarinah	5,429
10	Pinang Ranti	5,211
11	Bendungan Hilir	5,030
12	Kampung Melayu	5,018
13	Bundaran Senayan	4,910
14	Cawang UKI	4,749
15	PGC 2	4,680

Note: Dukuh Atas 1 + Dukuh Atas 2 = 7,993
Bendungan Hilir + Semanggi = 7,687
Grogol 1 + Grogol 2 = 5,651
Source: JUTPI 2 based on PT TransJakarta



Source: JUTPI 2 based on PT TransJakarta

Figure 70 Transjakarta Daily Passenger Demand by Shelter (as of May 23, 2017)

In 2017, 15 shelters with the highest demand were dominated by shelters on the first corridor of Transjakarta. This corridor also partially became MRT corridor that was officially opened in March 2019. With several conditions that occurred with respect to the BRT corridor, such as special motorcycle lanes designed exclusively for Transjakarta buses, long bus queues at the shelters, congestion, and consideration of future demand, it is expected that, in the future, high demand Transjakarta corridors will be upgraded and served by rail-based modes with higher capacity and minimum obstacles.

3.2 Transportation Survey Result

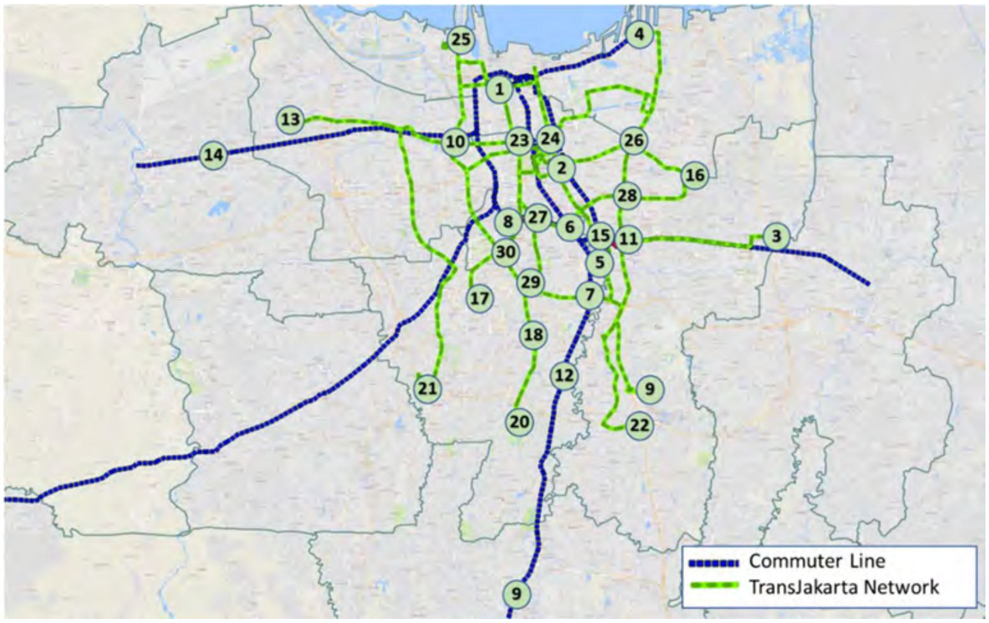
3.2.1 Passenger Transfer Bottleneck Survey

The objective of this survey is to identify current bottleneck location at transfer point, obtain transfer time from one transfer node to another transfer node (interchange of conventional bus, BRT, or railway), and to obtain passenger's perception about transfer facilities and opinion on how to improve the facilities. The survey was conducted at 30 major transfer points around JABODETABEK as shown in Table 26.

Table 26 Survey Locations of Passenger Transfer Bottleneck Surveys

No	Location	Integration		
		BRT	Conventional Bus	Railway
1	Kalideres	v	v	v
2	Poris Plawad		v	v
3	Lebak Bulus	v	v	
4	Pasar Minggu		v	v
5	Blok M	v	v	
6	Cawang	v		v
7	Kampung Melayu	v	v	v
8	Manggarai	v	v	v
9	Dukuh Atas	v		v
10	Senen	v	v	v
11	Kota	v		v
12	Tanjung Priok	v	v	v
13	Pulogadung	v	v	
14	Pulogebang	v	v	Cakung Station
15	Depok		v	v
16	Harmoni	v		
17	Halimun - Latuharhari	v		
18	Semanggi - Bendungan Hilir	v		
19	Kuningan Timur - Kuningan Barat	v		
20	Pramuka BPKP - Pemuda Pramuka	v		
21	Cempaka Mas 2 - Cempaka Timur	v		
22	Grogol 1 - Grogol 2	v	v	v
23	Flyover Jatinegara - St. Jatinegara	v		v
24	Pasar Jatinegara - St. Jatinegara 2	v		v
25	Pinang Ranti	v	v	
26	Ragunan	v	v	
27	Kampung Rambutan	v	v	
28	PGC	v	v	
29	Pluit	v		
30	Pasar Baru	v		

Source: JUTPI 2



Source: JUTPI 2

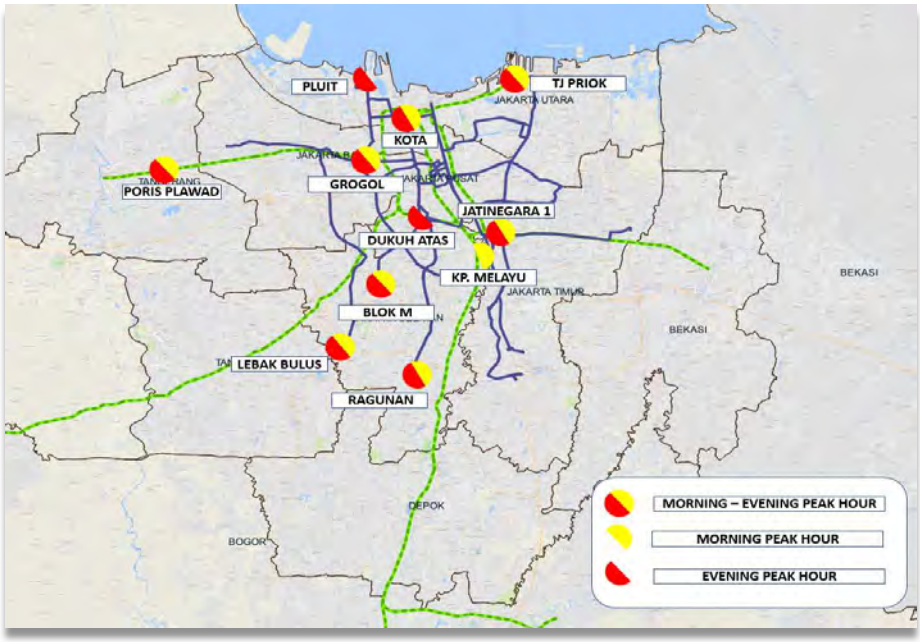
Figure 71 Survey Locations of Passenger Transfer Bottleneck Surveys

The result of survey is mentioned below:

1) Transfer Time

Bottleneck locations in terms of transfer time in the morning and evening peak hours are presented in the figure below. Transfer time during morning peak hour in Grogol, Lebak Bulus, Tanjung Priok, and Jatinegara 1 are the four worst transfer time locations among 30 survey locations. Transfer time at those four locations is about 13 to 18 minutes during morning peak hour while it is less than 10 minutes during off-peak hour.

On the other hand, Grogol, Lebak Bulus, Tanjung Priok, and Jatinegara are also the four worst transfer time locations in the evening peak hour. Transfer time at those four locations is about 15 to 21 minutes during evening peak hour and is less than 10 minutes during off-peak hour.



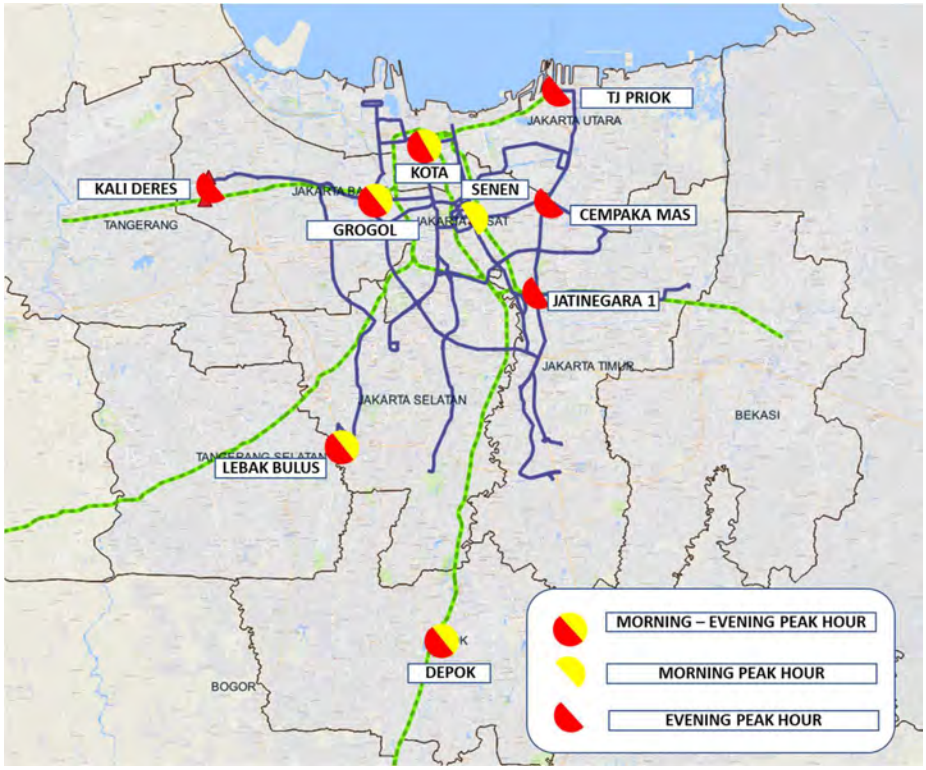
Source: JUTPI 2

Figure 72 Bottleneck Transfer Locations with Additional Transfer Time over 5 Minutes

2) Wait Time

Bottleneck locations in terms of wait time in the morning and evening peak hours are presented in the figure below. In the morning peak hour, Grogol, Lebak Bulus, and Senen are the three longest wait time locations among 30 survey locations. Wait time at those three locations is about 14 to 23 minutes during morning peak hour and is about 10 minutes or less during off-peak hour.

On the other hand, Grogol and Lebak Bulus are the two longest wait time locations among 30 survey locations during evening peak hour. Wait time at those two locations is about 18 to 21 minutes during evening peak hour and is less than 10 minutes.

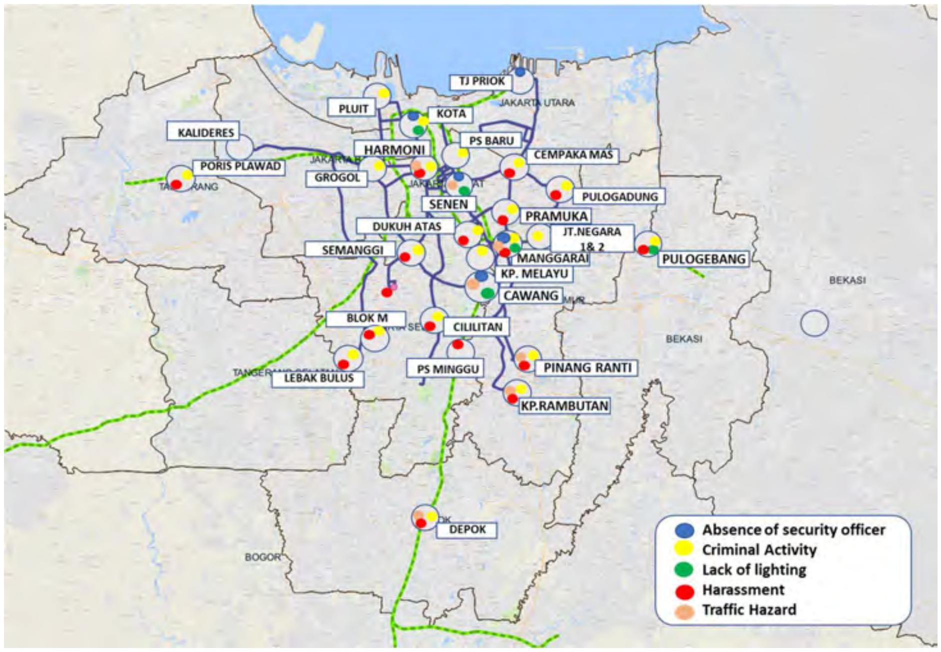


Source: JUTPI 2

Figure 73 Bottleneck Transfer Locations with Additional Waiting Timeover 5 Minutes

3) Opinion on Unsafe Location at Transfer Locations

Based on the result of the survey, most respondents have opinions that area around Manggarai Station was the most unsafe location for passengers. It was because of five aspects that are highly concerned by the respondents: namely, absence of the security officers, criminal action, lack of lighting, harassment, and traffic hazard.

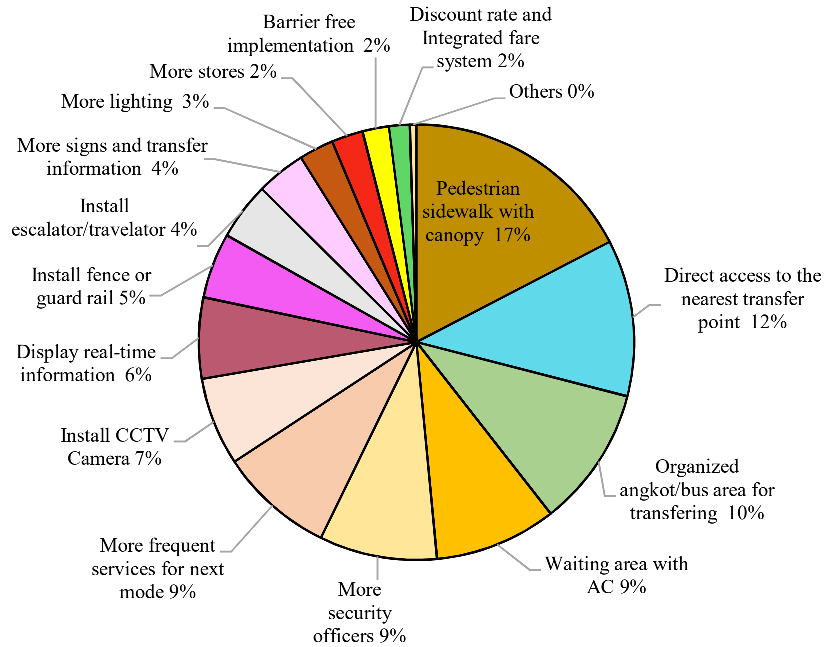


Source: JUTPI 2

Figure 74 Transfer Locations with Unsafe Situation Experienced by Respondents

4) Opinion for Improvement of Public Facilities

The survey asked opinions of the respondents in regard to the most expected improvement to be applied. In general, the improvements that were suggested by the respondents are related to the comfort and safety of the passengers in using public transportation especially when walking to the transfer point. For example, the most suggested one was about pedestrian path with a canopy which protects the passengers when walking to the nearest transfer point.



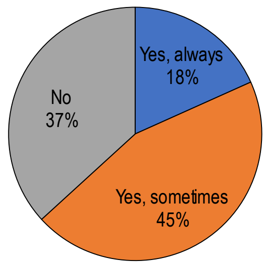
Source: JUTPI 2

Figure 75 Passengers' Opinion for Public Transportation Improvement

5) Motorcycle and Car Availability

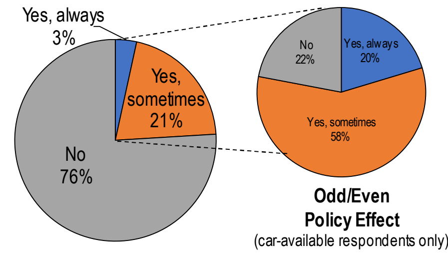
The survey indicates that 63% of respondents have either partial or full access to motorcycle and 37% of them do not have access to motorcycle as seen in the figure below. This may indicate that, even though motorcycles are available at home, respondents still use public transport. However, the access to motorcycle here may also mean share use and/or park-and-ride.

Meanwhile, most of the respondents (76%) do not have access to car and only 3% of respondents have access to car. This may indicate socioeconomic status of the public transport users is mainly from middle-to-low income group. The remaining 24% respondents that have either partial or full access to car have specific personal preference in regard to the odd/even plate number policy in JABODETABEK. If the policy affects their commuting route of preference, 22% of them would prefer not to use the car at all and 78% would still consider using the car depending on their flexibility and time travel.



Source: JUTPI 2

Figure 76 Motorcycle Availability



Source: JUTPI 2

Figure 77 Car Availability

3.2.2 Travel Speed Survey

The objective of this survey is to obtain vehicle speed data in JABODETABEK, by purchasing 350 million GPS point log data of approximately 7,000 vehicles, in September and October 2017 and by analyzing travel speeds which are attached to the GIS road network of roughly 5,000 links in JABODETABEK.

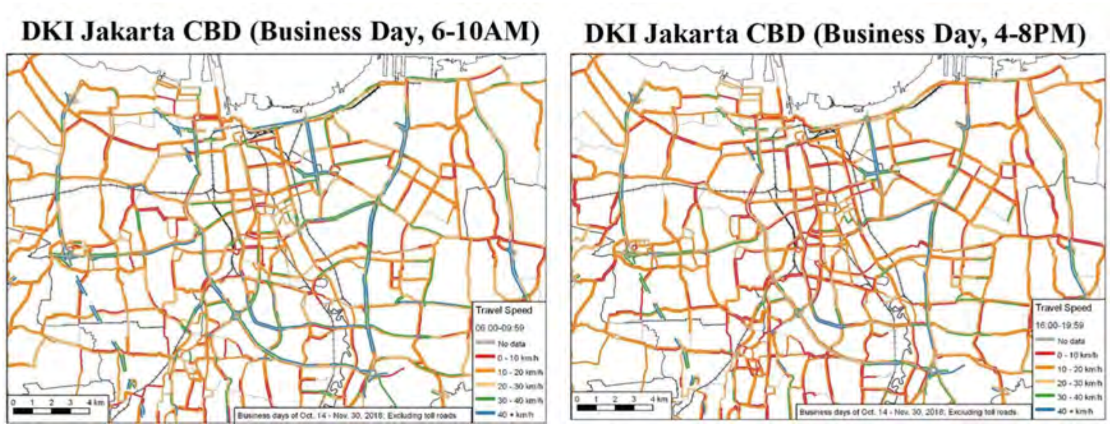
This survey is also conducted after the expansion of the odd-even number plate regulation to see the impact of the policy on the travel speed in DKI Jakarta area by purchasing additional GPS point log data in October-November 2018 which is divided into two databases, namely, one during Asian Para Games and the other after Asian Para Games (after 13 October 2018). This division is made to analyze the change in travel behavior in response to particular TDM during Asian Para Games.

Result of Travel Speed Survey is explained as follows.

- Arterial Roads:

    1. Low speed is observed in all *kota* and *kabupaten* in JABODETABEK during both morning and evening peak hours. Evening-peak travel speeds are relatively lower than those of the morning peak.
    2. Many bottleneck intersections which are inter-connected with each other are observed. Further detailed study in each *kota* and *kabupaten* is awaited. JUTPI 2 travel speed survey results can be powerful tool for detail study.
    3. After expansion of the odd-even number plate regulation, increase in travel speed is clearly observed on the target roads, but the increase is also observed in other sections in DKI Jakarta.
    4. Decrease in travel speed is observed mainly at connecting sections of the target roads while there is no change for most sections of the roads.

5. In JABODETABEK, 1km/hour increase in travel speed is observed on average during peak hours.



Source: JUTPI 2, Travel Speed Survey October 14 – November 30, 2018

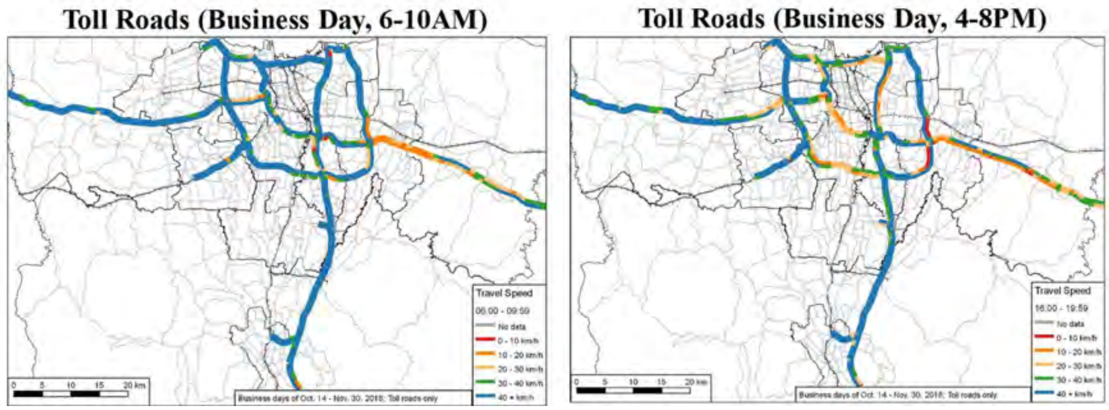
Figure 78 Travel Speed Survey Result of Jakarta CBD in Peak Hours

Source: JUTPI 2, Travel Speed Survey October 14 – November 30, 2018 and September 1 – October 31, 2017

Figure 79 Travel Speed Change in Jakarta CBD in Peak Hours after Expansion of Odd-Even Number Plate Regulation

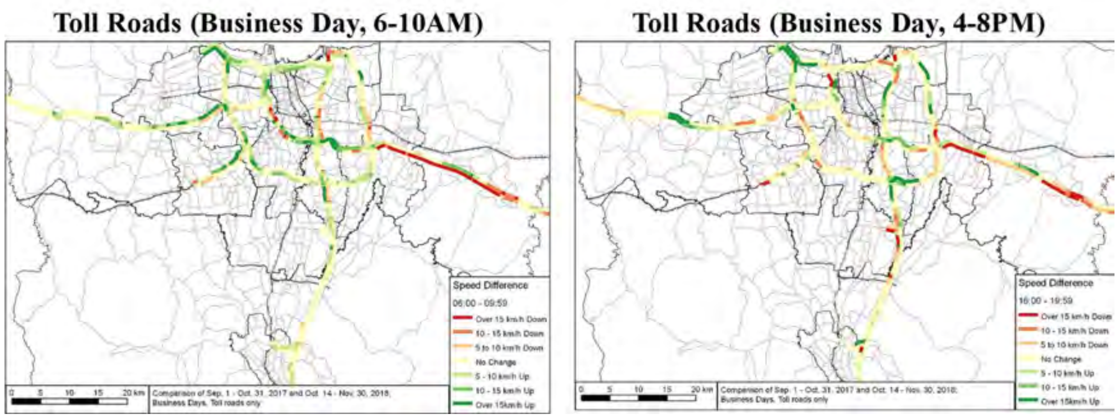
- Toll Roads:
  1. Low speed is observed in Jakarta-Cikampek Toll Toad and Intra-Urban Toll Road during morning peak hour.
  2. Low speed is observed in many sections in JABODETABEK during evening peak such as Jakarta-Cikampek Toll Road, Intra-Urban Toll Road, and south and east sections of Outer-Ring Road.
  3. Increase in travel speed on toll roads is seen during evening peak hours.
  4. Decrease in travel speed on toll roads is seen at sections close to the target roads.

5. Significant decrease in travel speed is observed at inbound direction of Jakarta-Cikampek Toll Road. This might be affected by construction works.



Source: JUTPI 2, Travel Speed Survey October 14 – November 30, 2018

Figure 80 Travel Speed Survey Result of Toll Roads in Peak Hours

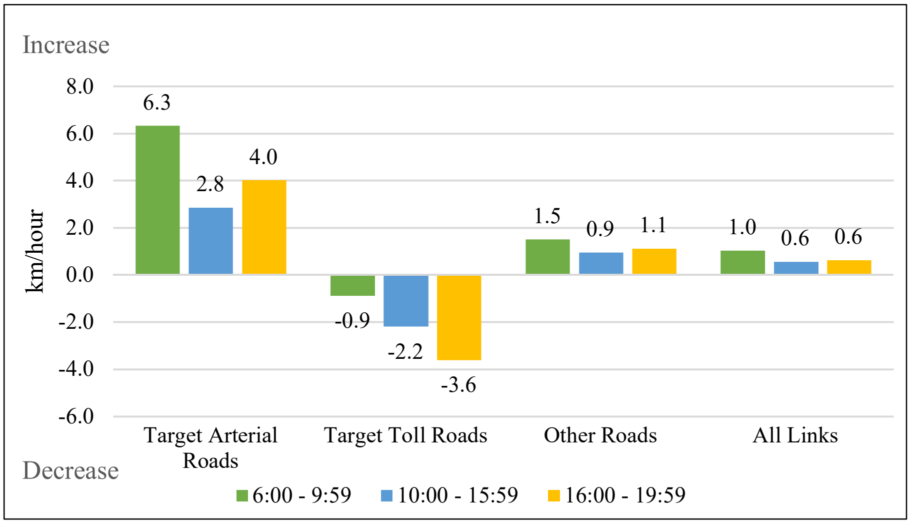


Source: JUTPI 2, Travel Speed Survey October 14 – November 30, 2018 and September 1 – October 31, 2017

Figure 81 Travel Speed Change on Toll Roads in Peak Hours after Expansion of Odd-Even Number Plate Regulation

In conclusion, on average, roughly 1 km/h increase in travel speed is observed for all links. Increase of travel speed is evident at target roads especially during morning peak hours. On the other hand, travel speed decreased at target toll roads probably due to construction works.

Another conclusion is that expansion of the odd-even number plate regulation showed that daily average number of cars increased on the target roads along with trucks and buses. The traffic impact analysis also showed the same tendency of cars, trucks, and buses increasing and motorcycles and taxis decreasing in number. Meanwhile, on the supply side, it was found that the number of car sales increased, indicating that people were still using cars rather than public transport. In conclusion, this policy is not effective to be applied for a long-term plan as the number of cars keeps increasing, more online taxis which were indistinguishable.



Source: JUTPI 2, Travel Speed Survey October 14 – November 30, 2018 and September 1 – October 31, 2017

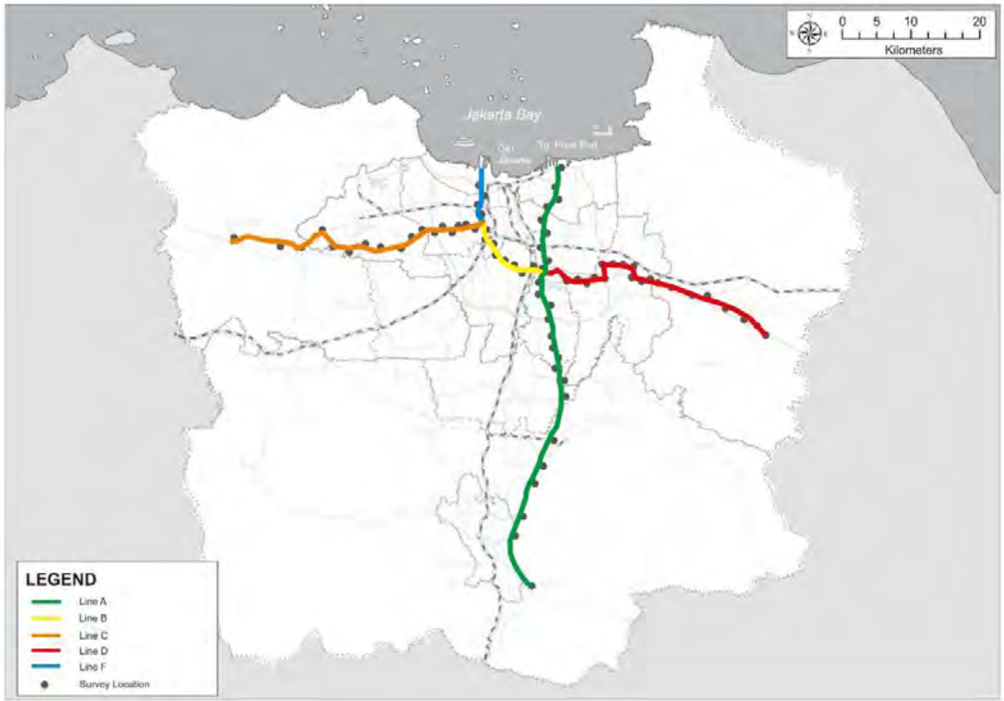
Figure 82 Travel Speed Difference before and after Odd-Even Number Plate Regulation Expansion

3.2.3 Screenline and Classified Vehicle Counting Survey

Screenline and classified vehicle counting survey is divided into two parts, namely full-scale screenline conducted in May 2018 and vehicle counting and additional vehicle counting for comparison carried out in December 2018 to see the effect of extension of the odd-even number plate regulation.

1) Full-scale Screenline and Vehicle Counting

The main objective of the survey is to verify the present OD matrices which are estimated based on the results of the Activity-Travel Diary Survey and to understand the annual growth rate by observing the traffic volume at some of the previous survey locations in JABODETABEK. There are 91 locations observed, where 55 locations are within DKI Jakarta and 36 locations are in BODETABEK. Locations were set on the line where the project area is adequately divided into parts such as river, canal, railway line, and toll road. Individual Lines of screenline survey (Line A-F) can be shown in the map below.

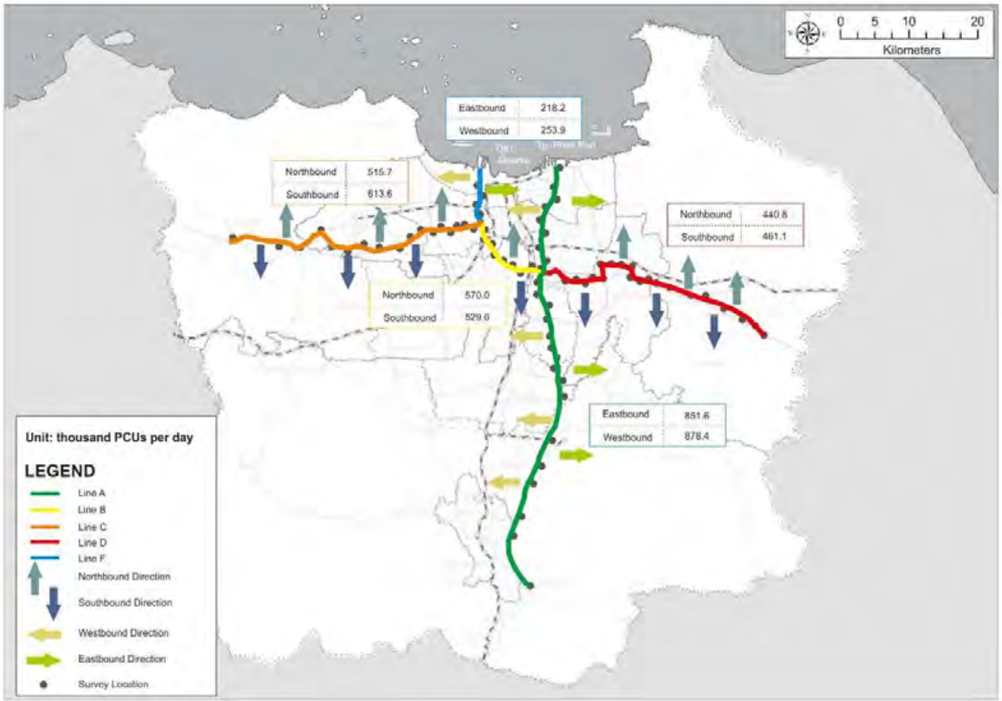


Source: JUTPI 2

Figure 83 Screenline Survey Location

There are two main items in this survey: counting survey and occupancy survey. Number of vehicles per hour was recorded for the counting survey, followed by calculation of number of passengers in each vehicle for the occupancy survey. The survey was conducted for one weekday (Tuesday, Wednesday, or Thursday). The vehicle counting survey was conducted by looking at the video data that were taken for either 16 or 24 hours starting from 6 AM while the occupancy survey was conducted for 16 hours.

The aggregated volume by screenline shows that those who traverse Screenline A to and from the west are 878,364 PCU and 851,569 PCU, respectively. Screenlines B, C, and D capture north-south traffic. Total 24-hour traffic traversing Screenlines B, C, and D to and from the north are 1,526,439 PCU and 1,604,391 PCU, respectively. More traffic stream is observed in the north-south direction rather than in the east-west direction as far as the two screenlines in JABODETABEK are concerned.



Source: JUTPI 2

Figure 84 Traffic Volume Flow at Screenline Locations

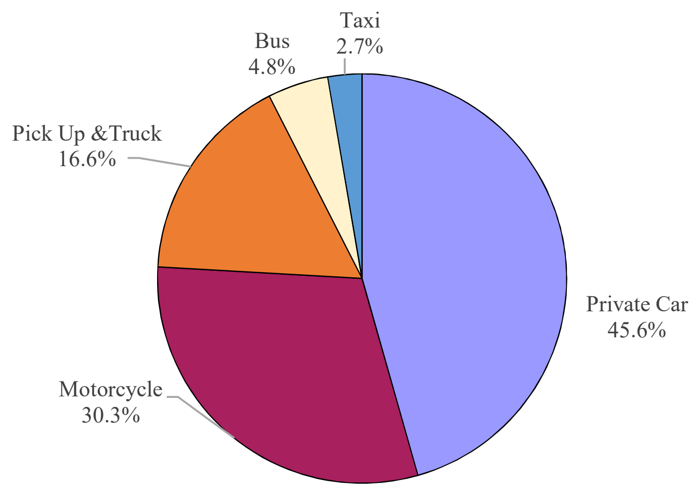
Vehicle occupancy of motorcycle, car, and taxi throughout JABODETABEK is practically uniform with average vehicle occupancy of 1.4, 1.6, and 1.5 respectively. For bus, the average capacities are 14 passengers for a small bus, 25 for a medium bus, and 45 for a large bus. Thus, with the current average occupancy from all type of bus, it can be inferred that the load factor of bus is less than half of its capacity in screenline location and is showing inefficiency in transportation.

Table 27 Average Vehicle Occupancy on Screenlines

Screen Line	Passenger Vehicle			Truck				Bus		
	1	2	3	4	5	6	7	8	9	10
	Motor Cycle	Private Car	Taxi	Pick Up	Small Truck	Medium Truck	Large Truck	Mini Bus	Medium Bus	Large Bus
A	1.4	1.6	1.5	1.7	1.7	1.6	1.6	5.2	10.6	25.5
B	1.4	1.6	1.6	1.7	1.8	1.7	1.6	4.2	9.0	31.5
C	1.4	1.7	1.5	1.7	1.7	1.6	1.5	4.3	9.4	22.0
D	1.4	1.6	1.6	1.6	1.7	1.5	1.5	4.0	8.8	19.2
F	1.4	1.6	1.4	1.7	1.7	1.5	1.4	4.2	9.9	26.5
Average	1.4	1.6	1.6	1.7	1.7	1.6	1.5	4.4	9.5	24.9

Unit: persons per vehicle
Source: JUTPI 2

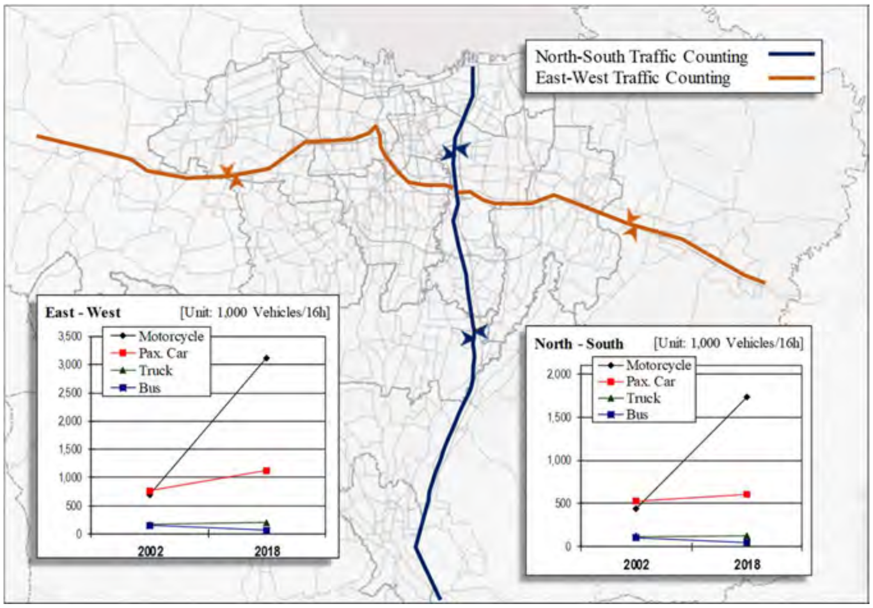
From the perspective of quantity, motorcycle represents the largest component of the passenger trip, but based on the PCU, car accounts for almost half of the share (46%). On the contrary, public transport such as bus and taxi are considered as relatively minor components. Flow of traffic crossing the screenlines are still dominated by private vehicles as depicted in the figure below.



Source: JUTPI 2

Figure 85 Average Modal Composition in Screenline Survey

Besides being the largest component of the traffic flow, motorcycle has the highest growth among other vehicle types as illustrated in the figure below. For nearly two decades, motorcycle has grown significantly around four times. This condition happens because people have shifted from non-motorized transport and public transport to motorcycle that is more efficient, cheaper, and faster. It is in line with the results of the travel modes described in section 2.5 of this report, where the share of motorcycle is very high compared to other modes. Meanwhile, trend of passenger car growth remains stable from 2002 to present.



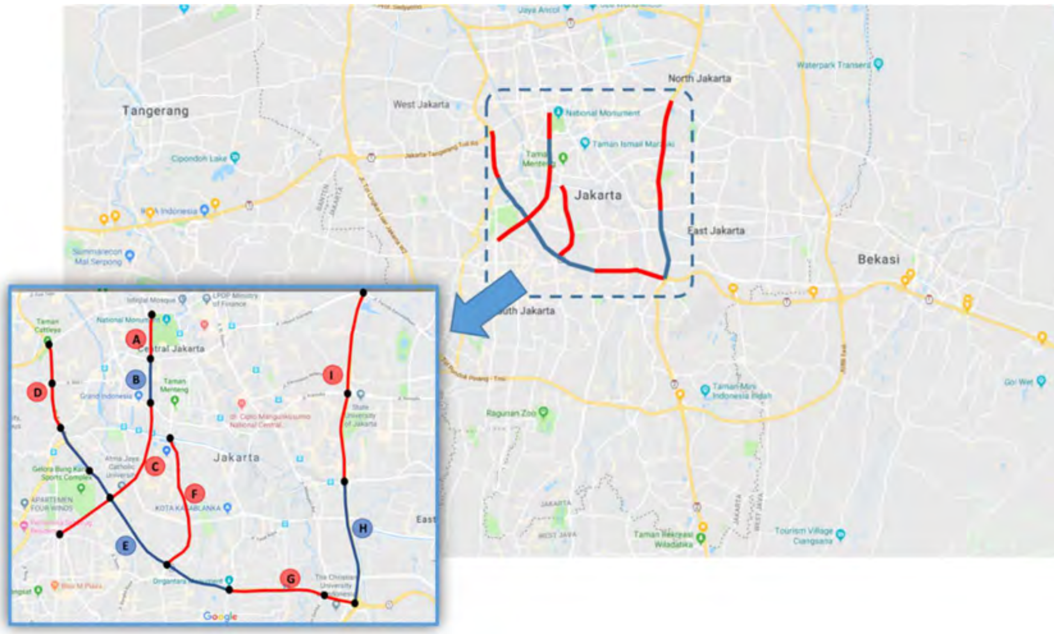
Source: JUTPI 2

Figure 86 Traffic Growth from 2002 to 2018

2) Additional Vehicle Counting for Comparison

a. Location Map

Odd-even number plate regulation has been implemented to replace the 3-in-1 policy since May 2016. This regulation prohibits private cars from using designated roads in accordance with their license plate numbers, with several exceptions such as logistic trucks and public transportation. Odd-even number plate regulation was originally applied on Jl. Jenderal Sudirman and Jl. MH Thamrin. In order to accommodate Asian Games and Asian Para Games, several modifications were made. The figure below shows the location map of target roads of odd-even number plate regulation after Asian Para Games based on Governor Decree (*Pergub*) Number 155 Year 2018.

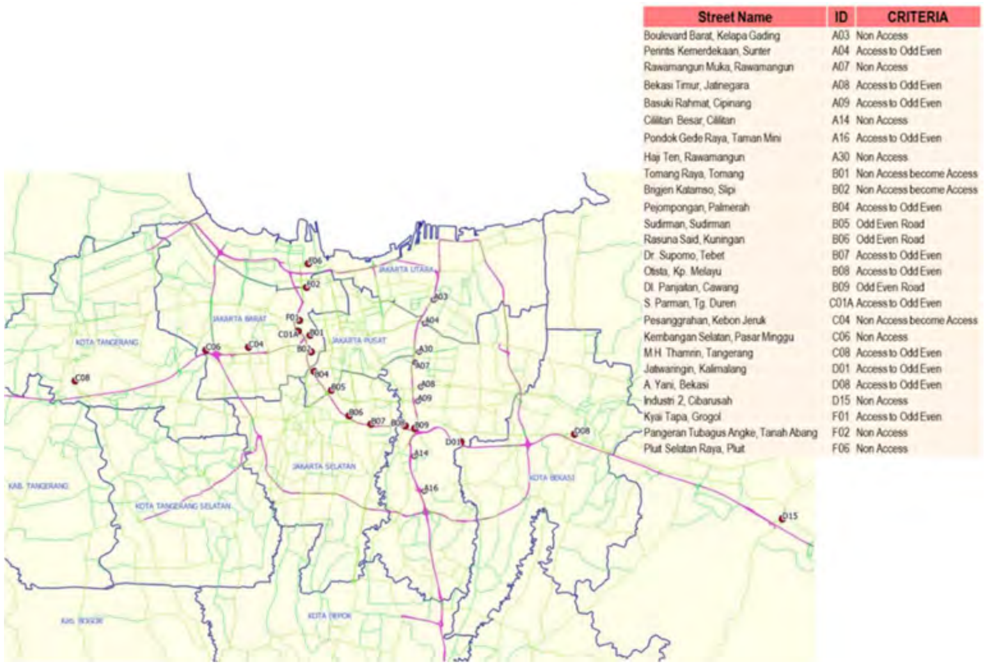


*note: A: Jl. Medan Merdeka Barat
B: Jl. M.H. Thamrin
C: Jl Jenderal Sudirman
D: Jl S. Parman
E: Jl. Gatot Subroto
F: Jl. H.R. Rasuna Said
G: Jl. MT. Haryono
H. Jl. D.I Panjaitan
I. Jl. Jenderal Ahmad Yani

Source: JUTPI 2

Figure 87 Location Map of Target Roads of Odd-Even Number Plate Regulation after Asian Para Games

There are 26 screen line survey locations that are affected by the expansion of odd-even number plate regulation (target roads). Therefore, to observe the gap of traffic flow before Asian games and after Asian Para Games, additional traffic count survey was conducted. Locations of additional traffic count survey are shown in the following figure.



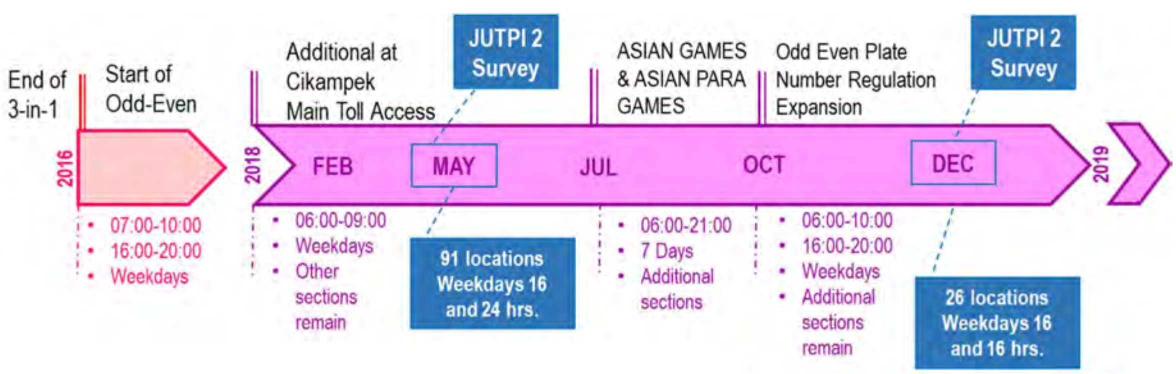
Street Name	ID	CRITERIA
Boulevard Barat, Kelapa Gading	A03	Non Access
Perintis Kemerdekaan, Sunter	A04	Access to Odd Even
Rawamangun Muka, Rawamangun	A07	Non Access
Bekasi Timur, Jatinegara	A08	Access to Odd Even
Basuki Rahmat, Cipinang	A09	Access to Odd Even
Cililitan Besar, Cililitan	A14	Non Access
Pondok Gede Raya, Taman Mini	A16	Access to Odd Even
Haji Ten, Rawamangun	A30	Non Access
Tomang Raya, Tomang	B01	Non Access become Access
Brigjen Katamso, Slipi	B02	Non Access become Access
Pejompongan, Palmerah	B04	Access to Odd Even
Sudirman, Sudirman	B05	Odd Even Road
Rasuna Said, Kuningan	B06	Odd Even Road
Dr. Supomo, Tebet	B07	Access to Odd Even
Otista, Kp. Melayu	B08	Access to Odd Even
DI. Panjaitan, Cawang	B09	Odd Even Road
S. Parman, Tg. Duren	C01A	Access to Odd Even
Pesanggrahan, Kebon Jeruk	C04	Non Access become Access
Kembangan Selatan, Pasar Minggu	C06	Non Access
M.H. Thamrin, Tangerang	C08	Access to Odd Even
Jatiwaringin, Kalimalang	D01	Access to Odd Even
A. Yani, Bekasi	D08	Access to Odd Even
Industri 2, Cibarusah	D15	Non Access
Kyai Tapa, Grogol	F01	Access to Odd Even
Pangeran Tubagus Angke, Tanah Abang	F02	Non Access
Pluit Selatan Raya, Pluit	F06	Non Access

Source: JUTPI 2

Figure 88 Additional Traffic Counting Survey Location

b. Odd-Even Number Plate Regulation Timeline

Screenline survey is conducted in May 2018 and due to Asian Games from mid-August to early September 2018, odd-even number plate regulation was extended from July until December 2018. Therefore, additional traffic counting survey was conducted in December 2018 to see the effect of expansion of odd-even number plate regulation. The figure below shows the timeline of screenline survey.



Source: JUTPI 2

Figure 89 Timeline of JUTPI 2 Screen Line and Additional Traffic Counting Survey

c. Traffic Impact (Comparison of JUTPI 2 Surveys)

1. Daily Traffic Impact

The locations where odd-even number plate regulation applied (target roads) show that most of motorcycle and car traffic decrease happened in access to the target road. On the other hand, the increasing trend shows in the traffic of public transport which increases mostly in non-access road to target road as shown in the following table.

Table 28 Daily Traffic Impact in Additional Traffic Counting Locations

	Motorcycle	Car	Taxi	Truck	Bus
Target Road	462,241 ↓ **5%**	218,708 ↑ **22%**	25,135 ↓ **14%**	7,737 ↑ **126%**	21,589 ↑ **8%**
Access to Target Road	1,434,520 ↓ **10%**	427,843 ↓ **8%**	29,552 ↑ **23%**	46,839 ↑ **87%**	93,955 ↑ **29%**
Non-Access to Target Road	560,946 ↓ **8%**	138,106 ↓ **1%**	9,473 ↑ **79%**	26,323 ↑ **111%**	43,245 ↑ **41%**

Source: JUTPI 2

2. Target Hour Traffic Impact

Traffic in the target hour shows that the motorcycle traffic tends to decrease in the access to the target roads, while car is reduced mostly on the target roads. On the contrary, all public transport modes (taxi and bus) tend to increase especially in the non-access to the target roads.

Table 29 Target Hour Traffic Impact in Additional Traffic Counting Locations

	Motorcycle	Car	Taxi	Truck	Bus
Target Road	227,391 ↓ **10%**	95,171 ↑ **20%**	12,011 ↓ **12%**	2,786 ↑ **127%**	6,402 ↑ **4%**
Access to Target Road	660,003 ↓ **18%**	200,715 ↓ **3%**	13,626 ↑ **36%**	19,031 ↑ **104%**	17,720 ↑ **7%**
Non-Access to Target Road	397,906 ↑ **30%**	91,930 ↑ **43%**	4,768 ↑ **105%**	12,403 ↑ **150%**	11,386 ↑ **104%**

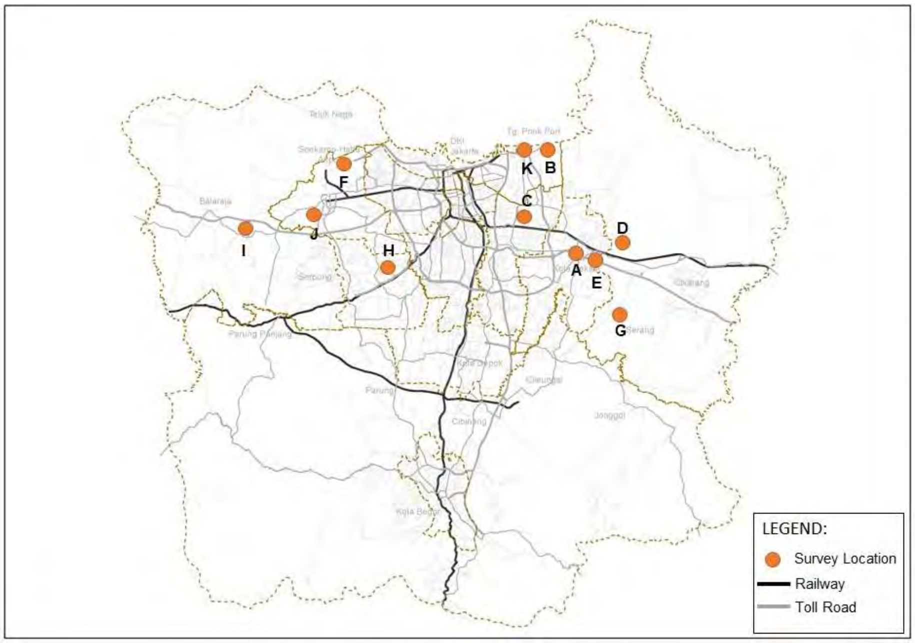
Source: JUTPI 2

The implementation of odd-even number plate regulation shows an increase in public transport vehicles on the target roads while private vehicles tend to decrease. However, the result is sensitive to some factors such as target road, time, and day of the week that are rather dynamic. Moreover, the impact of this policy was smaller than expected. As a side effect, traffic diversion occurs which makes the traffic worse on the other roads.

3.2.4 Truck OD Interview Survey

The main objective of Truck OD Interview Survey is to understand the travel characteristics of truck vehicular trips and goods movement generated from or attracted to major origins and destinations such as ports and industrial estates.

For this survey, five types of truck vehicle were surveyed: pick-up truck, small (2-axle) truck, medium (3-axle) truck, connected truck, and trailer/container (large truck). The survey is conducted in 11 industrial estates as shown in Figure 90 and Table 30. Industrial areas are divided into three groups based on the size of the area and business. This survey consisted of two survey activities: truck vehicle count and OD interview. The survey was conducted for 16 hours on a weekday (Tuesday, Wednesday, or Thursday), which are adjusted to the operational hours of industrial estate.



Source: JUTPI 2

Figure 90 Survey Locations of Truck OD Interview Survey

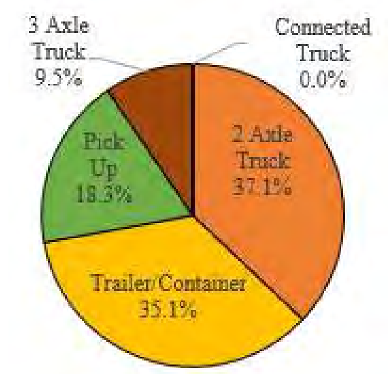
Table 30 Industrial and Area Information

Group	Code	Name of Industrial Estate	Area (Ha)	Tenants
Large-scale Industrial Estate	A	MM2100 (BFIE and MMID)	805	188
	B	Kawasan Berikat Marunda	540	550
	C	PT. Jakarta Industrial Estate Pulogadung (JIEP)	500	359
	D	Jababeka	1,840	1,650
Medium-scale Industrial Estate	E	East Jakarta Industrial Park (EJIP)	320	102
	F	Soetta-Cargo Terminal	30	
	G	Greenland International Industrial Center	1,430	80
Small-scale Industrial Estate	H	Taman Tekno BSD	200	
	I	Kawasan Industri & Pergudangan Cikupamas	250	136
	J	Kawasan Industri Pasar Baru	90	
Tg. Priok	K	Tanjung Priok Gate	1,028	-

Source: JUTPI 2

Based on the survey, the largest vehicle composition is by 2-axle truck, followed by truck/container, as shown in Figure 91. Meanwhile, connected truck has the lowest share, and was rarely seen in the industrial area during the survey.

As shown in Figure 92, traffic volume in the morning dominant peak hours are at 9 AM - 10 AM followed by 10 AM – 11 AM. In the afternoon, the dominant peak hours are at 1 PM – 2 PM followed by 2 PM – 3 PM. Some decrease in truck traffic volume is observed at 12 PM and 6 PM due to the peak hour of paper/administrative-related work.



Source: JUTPI 2

Figure 91 Average Vehicle Composition

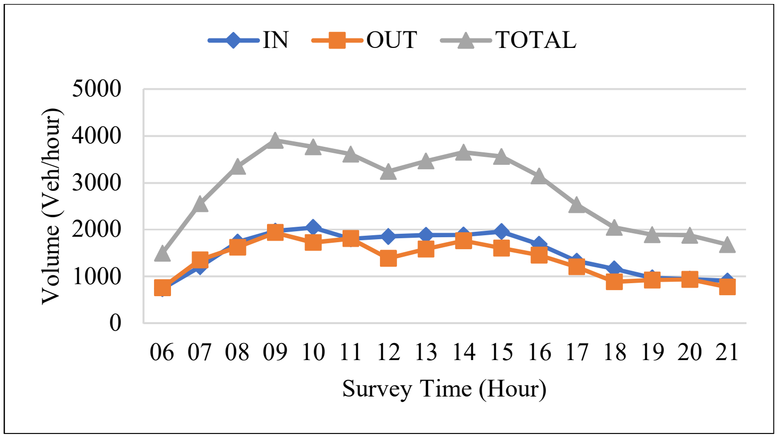
Source: JUTPI 2

Figure 92 Traffic Volume at Survey Hours

Hourly traffic fluctuation can be seen throughout the day. Peak hour for the large-scale and medium-scale industry is observed in the morning around 9 AM – 10 AM to hasten shipment to Tanjung Priok Port and other destinations outside JABODETABEK area as shown in Figure 93 and Figure 94.

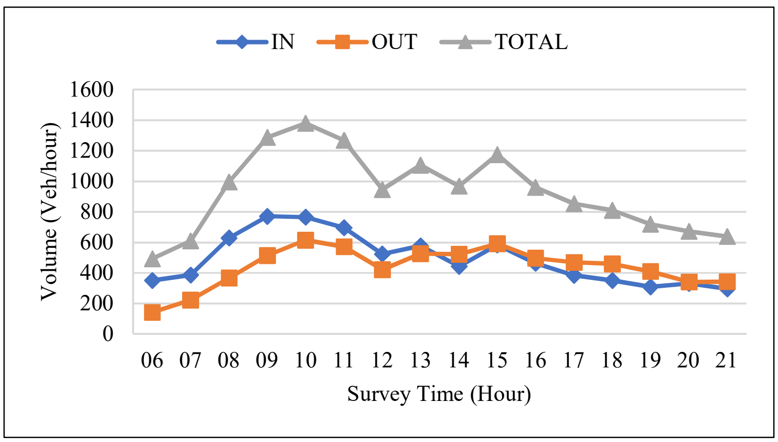
Meanwhile, peak hour for the small-scale industry is observed in the afternoon around 2 PM – 3 PM for receiving the product shipment from Tanjung Priok port and other industrial areas that processed earlier in the day as depicted in Figure 95.

Peak hour in Tanjung Priok Port occurs twice a day between 2 PM – 3 PM and 8 PM – 9 PM due to goods transportation from the industrial area as seen in Figure 96. In summary, the flow of vehicles is varied in each group of industrial estates depending on the business scale.



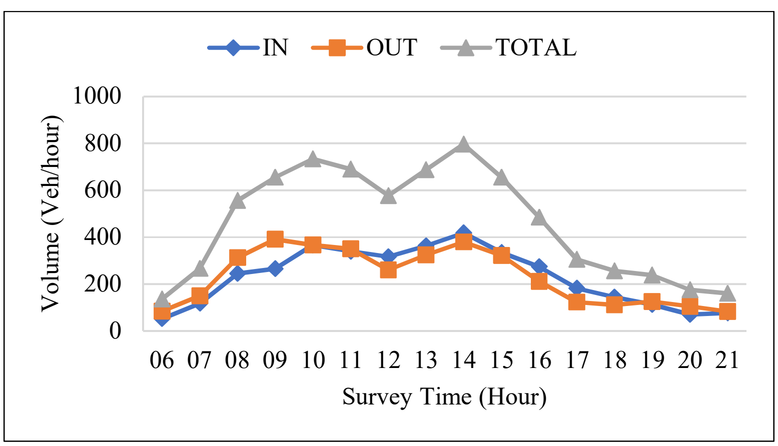
Source: JUTPI 2

Figure 93 Hourly Traffic Fluctuation - Large Scale Industrial Estate



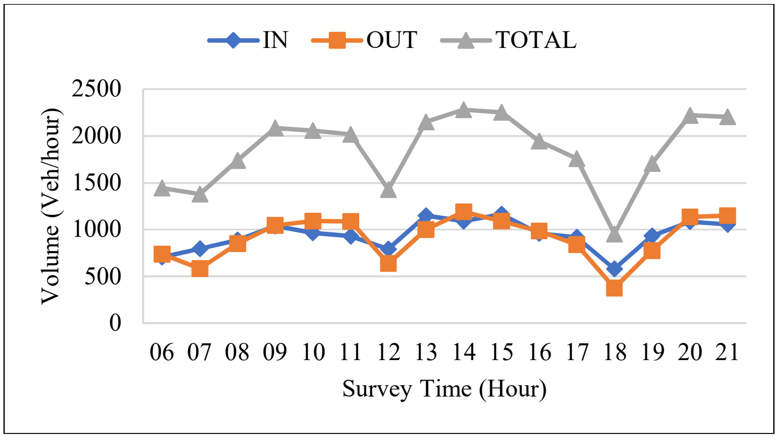
Source: JUTPI 2

Figure 94 Hourly Traffic Fluctuation – Medium Scale Industrial Estate



Source: JUTPI 2

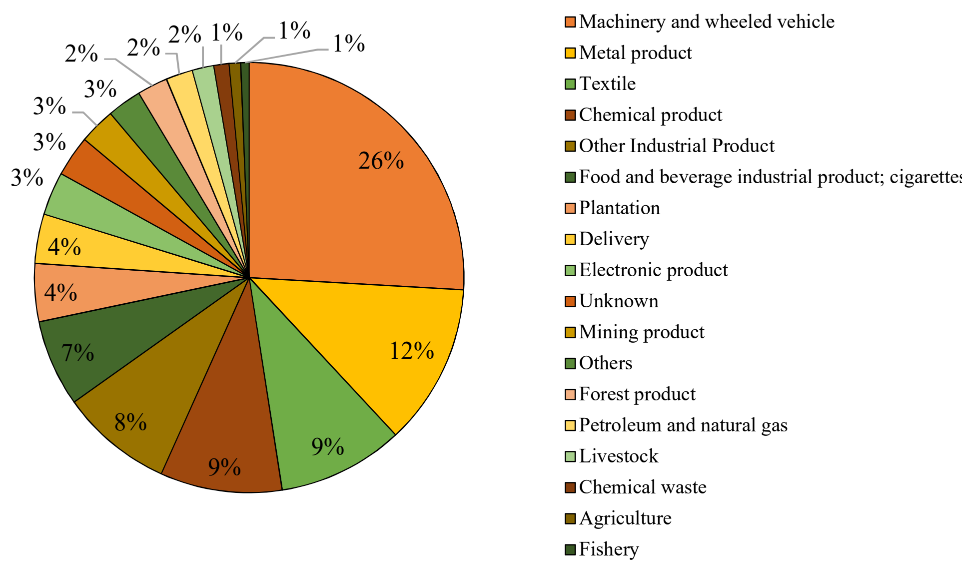
Figure 95 Hourly Traffic Fluctuation – Small Scale Industrial Estate



Source: JUTPI 2

Figure 96 Hourly Traffic Fluctuation - Tanjung Priok

Regarding types of commodity, as shown in Figure 97, machinery and wheeled vehicle has the highest share among the other transported commodity followed by metal product. It is related to a large number of existing manufacturing industries. The commodities of machinery and wheeled vehicles, and metal product are the most widely transported. On the other hand, about half of trucks are carrying empty cargo. That condition makes truck movement in JABODETABEK not effective in an economic sense and relatively increases traffic volume causing congestion in some areas with many empty trucks.

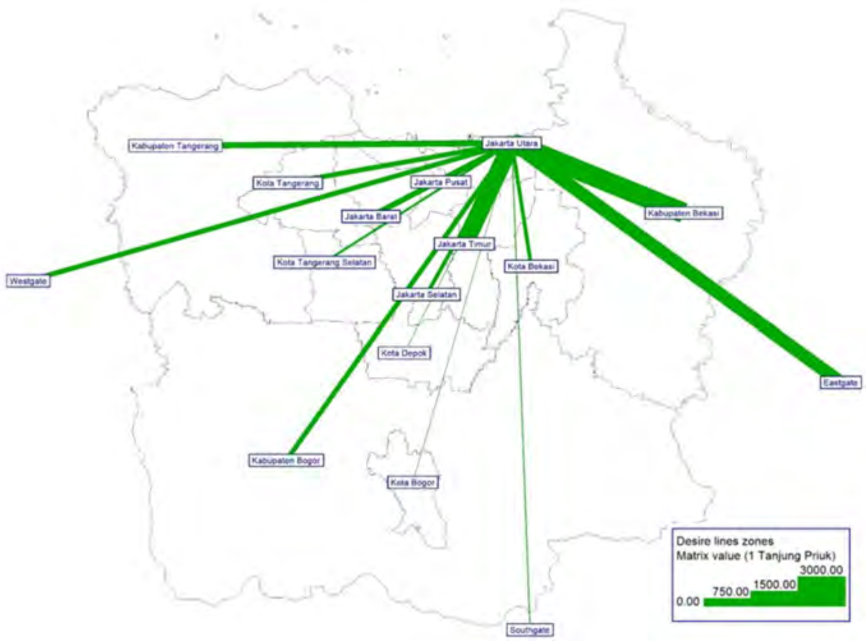


Source: JUTPI 2

Figure 97 Composition of Commodity Type

Based on the collected data, OD matrices are estimated based on each type of truck and expanded by traffic counting result in survey location. The OD matrices for freight movement were formed based on expansion factor and aggregated by departure time from origin location. For OD matrix calibration, two types of survey results were used: truck counts conducted at each survey location, and truck volume observed at the screenlines. The OD table is presented in the form of desire lines in the subsequent figures.

The desire lines in Figure 98 show that the trips between Tanjung Priok port (defined as from *Jakarta Utara*) and east side of JABODETABEK, particularly for Kabupaten Bekasi and eastward, have quite large volume. Truck movement within Jakarta is dominated by the container depot-related trips between *Jakarta Utara* to Tanjung Priok that comprise as many as 70% of total trips.

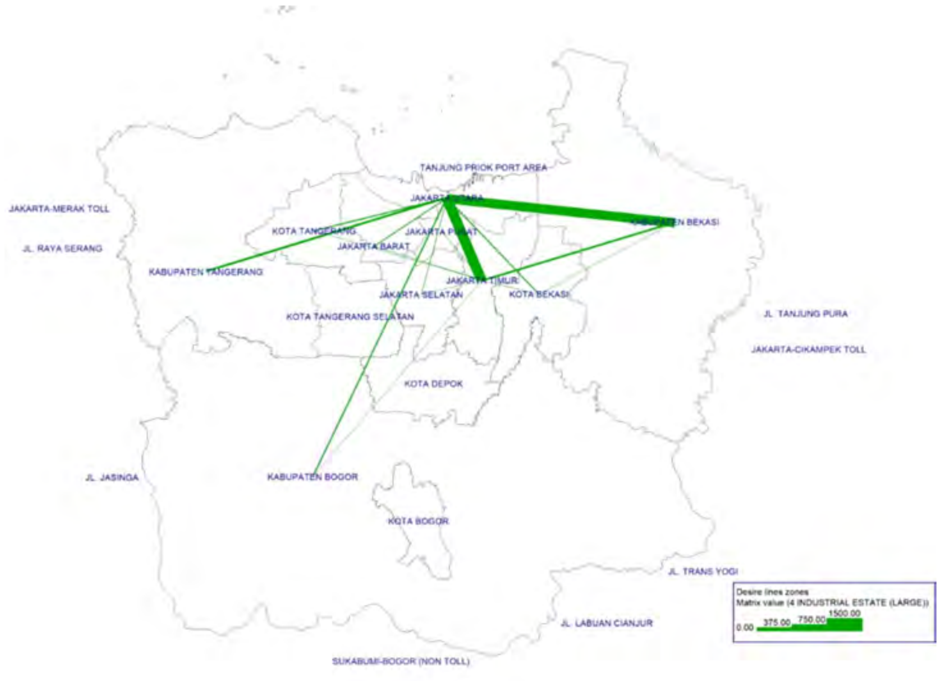


Source: JUTPI 2

Figure 98 Desire Line Trips to/from Tanjung Priok Port

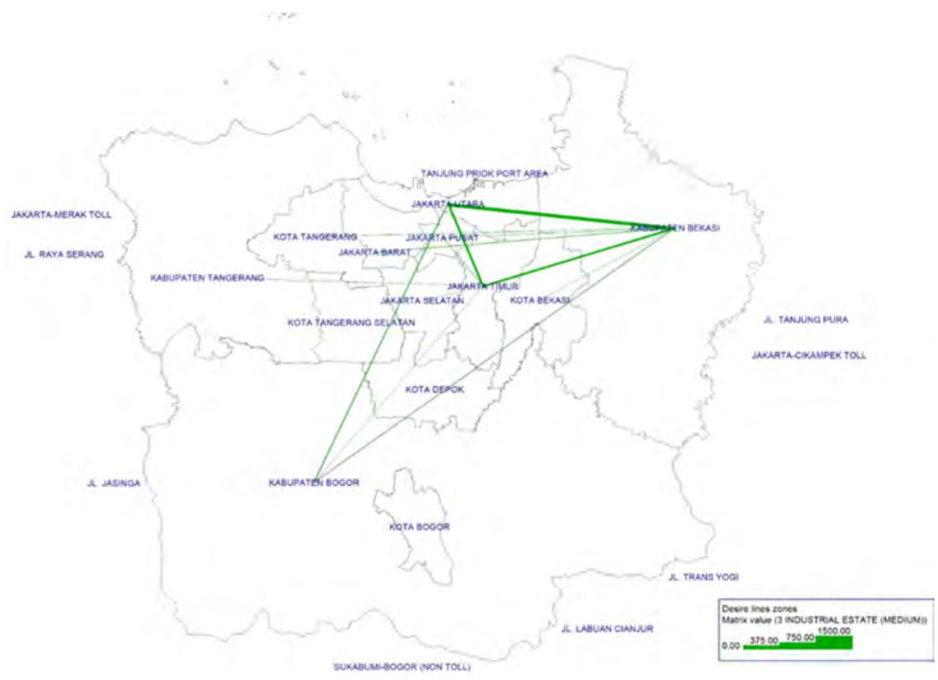
The movement of large truck is observed mainly in Jakarta and Kabupaten Bekasi where large-scale industrial estates exist. Furthermore, the large-truck flow is also observed in other industrial-based areas such as Kota Tangerang, Kabupaten Tangerang, and Kabupaten Bogor, but the trip volume is not so significant as shown in Figure 99.

Compared to large truck, volume of medium truck is smaller, and the traffic is mainly shown in Kabupaten Bekasi, Jakarta, and Kabupaten Bogor. On the other hand, movement in some Kota and Kabupaten in the west side is insignificant as shown in Figure 100.



Source: JUTPI 2

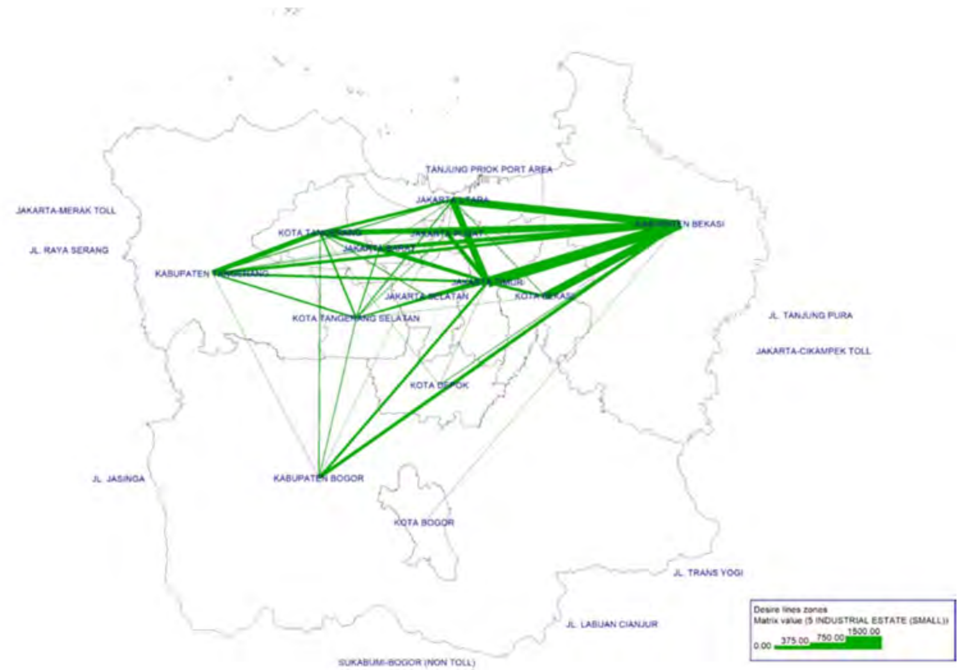
Figure 99 Desire Line Intra-JABODETABEK Movement by Large Truck



Source: JUTPI 2

Figure 100 Desire Line Intra-JABODETABEK Movement by Medium Truck

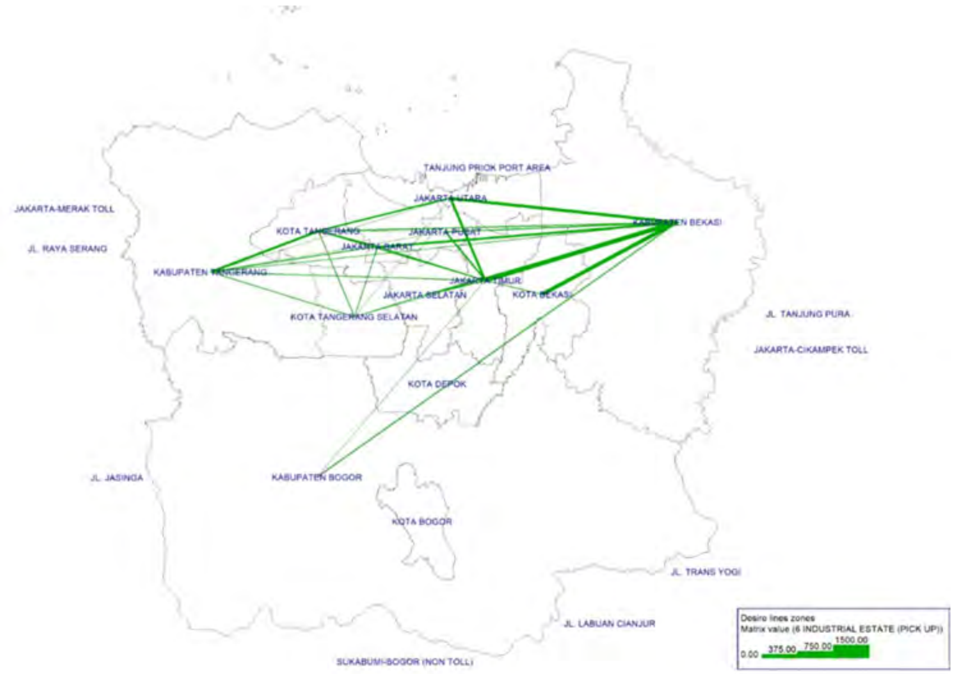
Small truck is the most frequently used for transporting goods. It has some advantages in terms of mobility and dimension among other trucks due to its flexibility in maneuvering at any road. Overall, movement of small trucks is observed from all directions as shown in the desire lines for small trucks in Figure 101.



Source: JUTPI 2

Figure 101 Desire Line Intra-JABODETABEK Movement by Small Truck

Similar to small trucks, pickup is also preferred for transporting goods with a mobility advantage. It is observed that pick up is mainly used to distribute goods to Jakarta as the center of activity. In addition, Kota Tangerang, Kota Bekasi, and Kabupaten Bekasi have a decent magnitude of pickup movement as shown in the desire lines for pickups in Figure 102.



Source: JUTPI 2

Figure 102 Desire Line Intra-JABODETABEK Movement by Pickup

3.2.5 Cordon Line Survey

The objective of the survey is to obtain passenger information and trip pattern data from passengers who are crossing the boundary of JABODETABEK region using intercity bus, railway, airplane, ordinary road, and toll road.

Result of the survey shows that the highest mode share of external JABODETABEK trips is from private car (arterial and toll road) followed by airplane, motorcycle, bus, railway, and minibus.

Table 31 Mode Share of JABODETABEK External Trips

Mode	Gate	Passenger Flow				2 Ways	%
		Outbound		Inbound			
Bus	West Gate	34,957	101,946	31,522	117,415	219,361	21.1%
	East Gate	64,584		80,075			
	South Gate	2,405		5,818			
Minibus	West Gate	5,498	25,855	4,752	18,178	44,033	4.2%
	East Gate	7,741		390			
	South Gate	12,615		13,036			
Train	West Gate	8,295	37,589	8,295	37,589	75,179	7.2%
	East Gate	28,208		28,208			
	South Gate	1,086		1,086			
Airplane	Soekarno Hatta	103,099	114,799	102,968	113,891	228,690	22.0%
	Halim	11,700		10,923			
Private Car	West Gate	40,645	125,854	31,756	125,408	251,263	24.2%
	East Gate	63,917		74,831			
	South Gate	21,292		18,822			
Motorcycle	West Gate	26,568	111,168	24,460	110,141	221,308	21.3%
	East Gate	41,528		44,160			
	South Gate	43,071		41,520			
Total			517,211		522,623	1,039,834	100%

Source: JUTPI 2

External trips that were made by JABODETABEK residents and non-residents could also be calculated, and the result is shown below. Trip rate of JABODETABEK residents who cross the JABODETABEK boundary on a weekday daily basis could be calculated. The trip rate is only calculated by JABODETABEK residents aged over 15 years old.

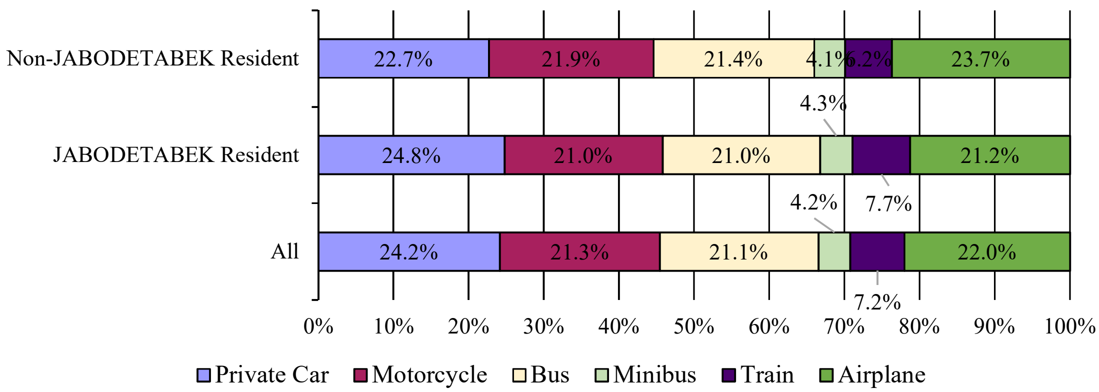
Table 32 Daily External Trips Made by JABODETABEK Residents and Non-Residents

Mode	Passenger Flow - Outbound		Passenger Flow - Inbound	
	JABODETABEK Residents	Non-Residents	JABODETABEK Residents	Non-Residents
Bus	70,265	31,681	81,311	36,104
Minibus	23,643	2,211	7,320	10,859
Train	27,781	9,808	27,781	9,808
Airplane	78,820	35,979	74,725	39,166
Private Car	82,972	42,882	96,248	29,161
Motorcycle	101,822	9,346	50,000	60,141
Total	385,303	131,908	337,384	185,239

Source: JUTPI 2

External trip rate per JABODETABEK resident is calculated as 0.03. The mode shares of external trips made by JABODETABEK residents and non-JABODETABEK residents can be seen below.

Figure 102 shows a slight difference in mode share composition between JABODETABEK and non-JABODETABEK residents. Private car takes the highest share of external trips by JABODETABEK and non-JABODETABEK residents. Most of the non-JABODETABEK residents use motorcycle and bus for short and medium distances, so motorcycle and bus have a higher share for the non-JABODETABEK residents. Meanwhile, JABODETABEK residents use train to commute rather than non-JABODETABEK residents, so train has a higher share for JABODETABEK residents. Both JABODETABEK and non-JABODETABEK residents have almost the same share of airplane.



Source: JUTPI 2

Figure 103 Mode Share of JABODETABEK Residents' and Others' External Trips

- Inter-regional Toll Road OD Survey

  The survey was carried out on two toll roads crossing JABODETABEK border, namely, Jakarta – Cikampek and Tangerang – Merak toll roads. It was conducted at ten toll gates on both toll roads as shown in Figure 104. Jakarta-Bogor toll road was not surveyed because it does not go through the border of JABODETABEK.

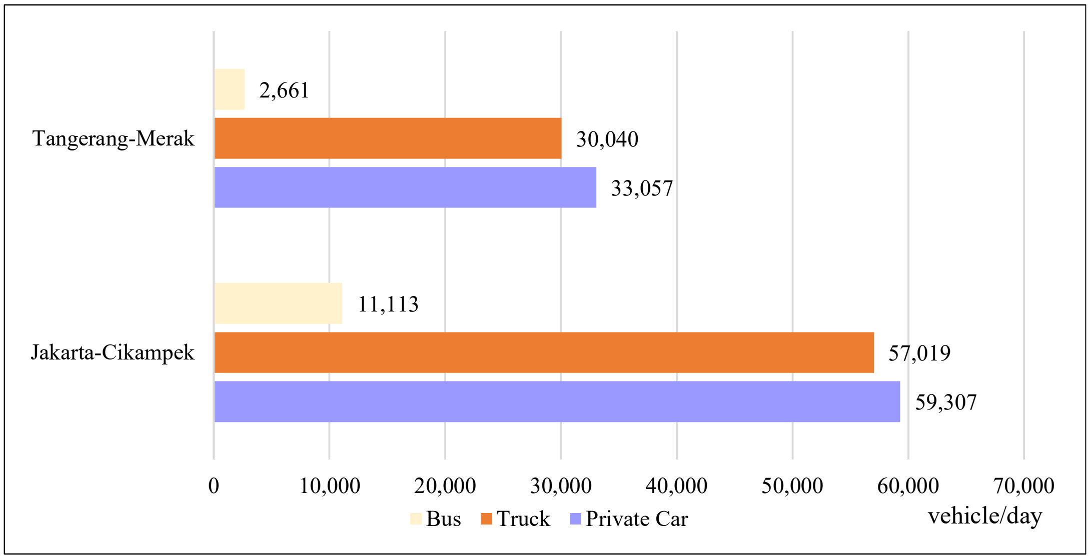
Source: JUTPI 2

Figure 104 Cordon Line (Toll Road) Survey Locations

Tangerang – Merak toll road survey consisted of three main survey locations, namely, Cikupa, Cikupa Satellite, and Balaraja Barat with a total of 29 toll booths. Jakarta – Cikampek toll road survey consisted of seven main survey locations, namely, Cikarang Utama 1 to 3, Cikarang Barat 1 and 2, Cibatu, and Cikarang Timur with a total of 58 toll booths. Both directions (inbound and outbound) were surveyed. In addition, rest areas of KM 43 dan KM 45 of Tangerang - Merak toll road and KM 39 and KM 42 of Jakarta Cikampek toll road were also surveyed since the original web-based interview method received small response rate. The result of survey is summarized below.

1. Traffic count

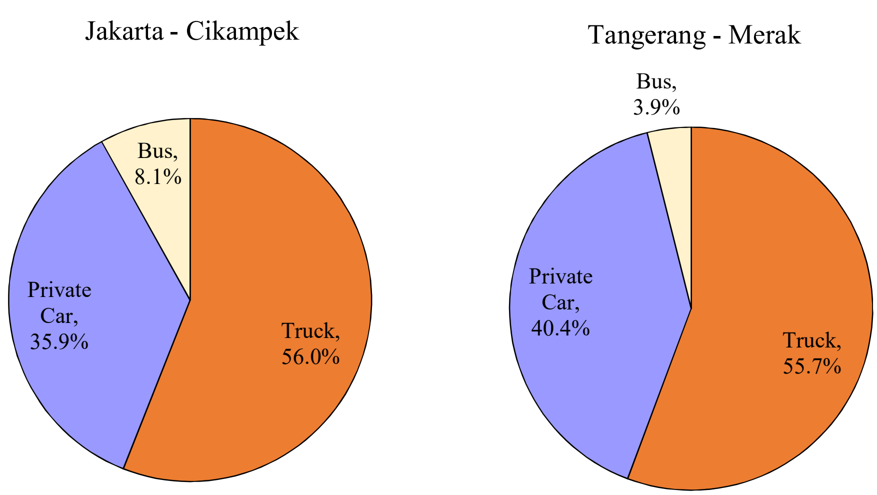
The traffic count survey collected data for 24 hours in the entrance/exit ramps with 12 vehicle classifications as designated by each direction. The traffic count result shows the private car has the largest volume of traffic passing through the toll gates, followed by truck and bus. Also, the result shows that bus volume on Jakarta - Cikampek is five times larger compared to that on Tangerang - Merak. This may imply that public transport use for eastbound trips is more widely spread than that of westbound trips. For further details, traffic volume by each vehicle type is presented in Figure 105.



Source: JUTPI 2

Figure 105 Traffic Volume by Vehicle Type at Cordon Line (Toll Road) Survey Locations

As shown in the figure below, in terms of PCU, both Jakarta-Cikampek and Tangerang- Merak have a similar composition, and both toll roads are dominated by truck with more than half of the share followed by private car and bus. The percentage bus volume in Jakarta – Cikampek is larger than that in Tangerang – Merak. This may indicate that public transport use toward east is more widely used than that toward west.



Source: JUTPI 2

Figure 106 Vehicle Composition by PCU at Cordon Line (Toll Road) Survey Locations

The traffic on roads generally has two peak periods, in the morning and in the evening. The morning peak hour in Jakarta - Cikampek toll road starts at 10 AM and in the morning peak hour in Tangerang - Merak toll road at 10 AM. The evening peak hour in Jakarta - Cikampek toll road starts at 4 PM and the evening peak hour in Tangerang - Merak toll road starts at 3 PM. This pattern is also influenced by the truck ban regulation within inner-city toll road and at some arterial roads in JABODETABEK.

Table 33 Peak Traffic Profile of Cordon Line (Toll Road) Survey Locations

<table>
<tr><th>Survey Location</th><th>2-way Volume (PCU/day)</th><th>Peak Period</th><th>Peak Time</th><th>2-way Peak Volume (PCU/hour)</th><th>Peak Direction</th><th>Directional Rate (%)</th><th>Peak Hour Factor</th></tr>
<tr><td rowspan="2">Jakarta – Cikampek Toll Road</td><td rowspan="2">183,271</td><td>AM</td><td>10:00</td><td>10,638</td><td>Outbound</td><td>58 : 42</td><td>0.88</td></tr>
<tr><td>PM</td><td>16:00</td><td>10,997</td><td>Inbound</td><td>54 : 46</td><td>0.91</td></tr>
<tr><td rowspan="2">Tangerang – Merak Toll Road</td><td rowspan="2">93,851</td><td>AM</td><td>10:00</td><td>5,455</td><td>Outbound</td><td>52 : 48</td><td>0.93</td></tr>
<tr><td>PM</td><td>15:00</td><td>4,943</td><td>Inbound</td><td>51 : 49</td><td>0.85</td></tr>
</table>

Source: JUTPI 2

2. Vehicle Occupancy survey

For the bus occupancy estimation, the standard of capacity of buses are about 14 passengers for a small bus, 25 passengers for a medium bus, and 45 passengers for a large bus. By referring to the standard, the survey result for bus occupancy in Tangerang – Merak toll road is around 70% - 80%. Though the traffic volume of bus is larger in Jakarta – Cikampek toll road than that of Tangerang – Merak toll road, the occupancy level in Jakarta – Cikampek toll road is lower, that is, around 55% - 64%. Detail passenger occupancy information can be seen in the table below.

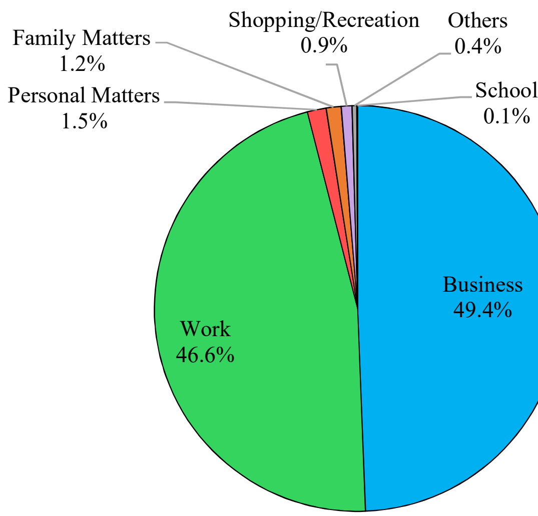
Table 34 Average Vehicle Occupancy at Cordon Line (Toll Road) Survey Locations

Toll Road	Private Car	Pick up	Small Truck 2-Axle	Medium Truck 3 Axle	Large Truck >3 -Axle	Minibus (Angkot, Mikrolet)	Medium Bus	Large Bus
	1	2	3	4	5	6	7	8
Tangerang-Merak Toll Road	1.9	1.7	1.5	1.5	1.4	11.1	20.6	34.8
Jakarta-Cikampek Toll Road	1.9	1.7	1.5	1.4	1.5	7.8	16.7	23.8

Unit: persons per vehicle
Source: JUTPI 2

3. OD Interview Survey

The survey indicates that the highest share of trip purpose is business followed by work. Meanwhile, the other trip purpose such as personal matters, family matters, shopping/leisure/tourism, school (study-related), and others take very small shares. It implies that the trip purpose on Jakarta – Merak and Tangerang - Merak toll roads are related to economic activities. Further information can be seen in the figure below.

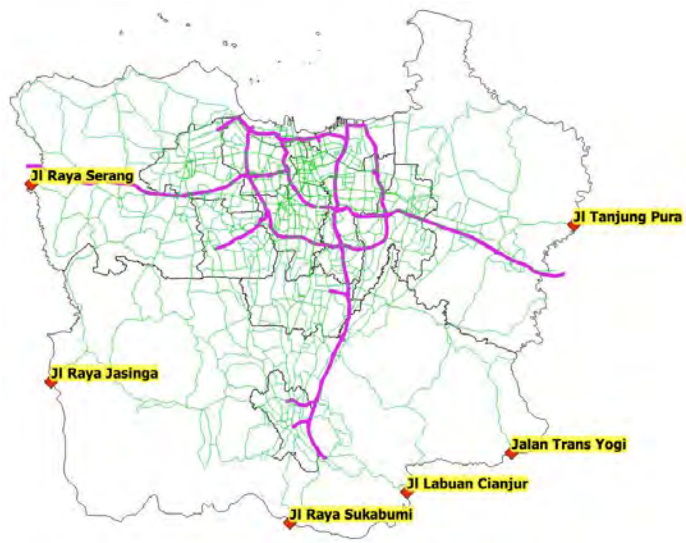


Source: JUTPI 2

Figure 107 Trip Purpose Shares in Cordon Line (Toll Road) Survey

- Roadside OD Survey at Ordinary Road

The survey was carried out at six locations along the borderline of JABODETABEK and was conducted on weekdays excluding Monday and Friday (Tuesday, Wednesday, or Thursday). Traffic count was conducted for 24 hours. OD interview and the vehicle occupancy survey were conducted for 17 hours (5 AM – 10 PM). Survey locations are shown in the following figure with all locations have two lanes except for Jalan Tanjung Pura that has four lanes.



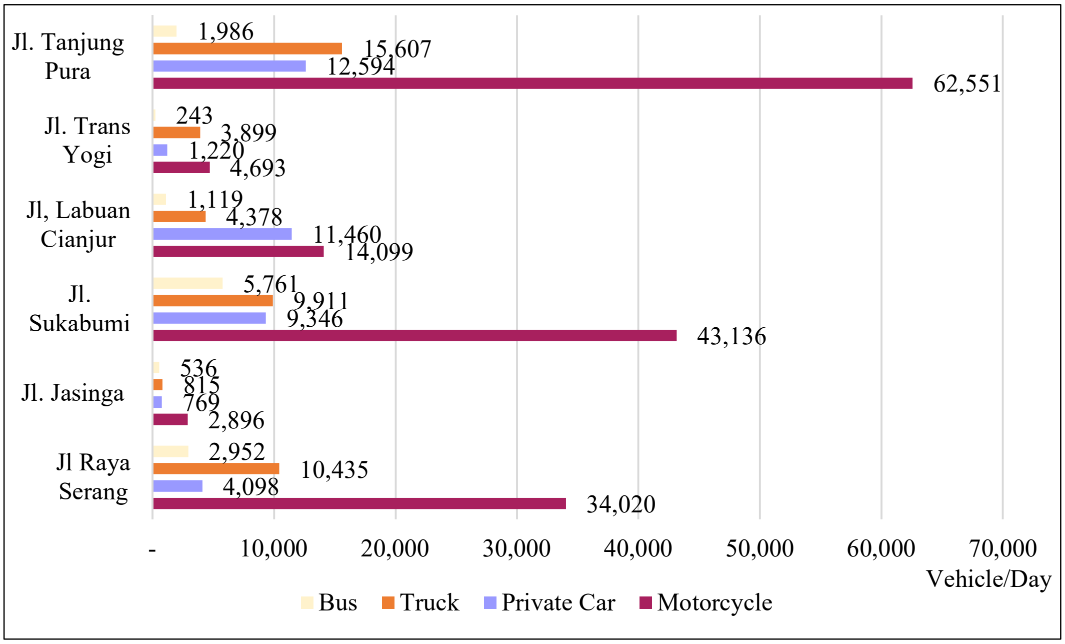
Source: JUTPI 2

Figure 108 Cordon Line (Ordinary Road) Survey Locations

The result of roadside OD interview survey can be summarized as follows.

1. Traffic Count

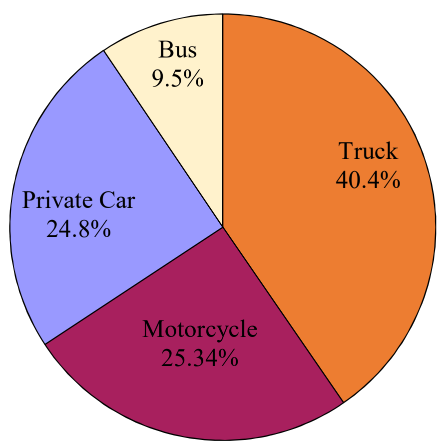
The largest traffic volume is observed at Jl Tanjung Pura, which is an arterial road and main JABODETABEK access on the east side. The largest traffic volume on the south side of JABODETABEK is at Jl Sukabumi and the one on the west is Jl Raya Serang. Motorcycle has the largest volume at all locations, followed by truck. Truck has the second-largest volume at all locations except for Jalan Labuan Cianjur. The number of vehicles by vehicle type is presented in Figure 109.



Source: JUTPI 2

Figure 109 Traffic Volume by Vehicle Type at Cordon Line (Ordinary Road) Survey Locations

PCU composition by vehicle type as a total at all locations is presented in the figure below. Motorcycle represents the most significant component for traffic volume at all locations; however, in terms of PCU, truck has the largest composition. This may imply the intensity of truck flow used for commodity transport which crosses the boundaries of JABODETABEK as depicted in the figure below.



Source: JUTPI 2

Figure 110 Vehicle Composition by PCU at Cordon Line (Ordinary Road) Survey Locations

Based on table below, it can be inferred that AM peak hour varies from 6 AM to 12 AM with major direction of JABODETABEK outbound and PM peak varies from 2 PM to 5 PM with major direction of JABODETABEK inbound. The peak hour profile at ordinary road can be seen in the table below.

Table 35 Peak Traffic Profile at Cordon Line (Ordinary Road) Survey Locations

Road Name	2-Way Volume (PCU/day)	Peak Period	Peak Time	2-Way Peak Volume (PCU/hour)	Peak Direction	Directional Rate (%)	Peak Hour Factor
Jl. Raya Serang	33,304	AM	06:00	2,231	Outbound	57:43	0.85
		PM	17:00	1,941	Inbound	53:47	0.87
Jl. Jasinga	3,812	AM	10:00	203	Outbound	62:38	0.79
		PM	16:00	214	Inbound	53:47	0.74
Jl. Raya Sukabumi	42,059	AM	06:00	2,746	Outbound	63:37	0.95
		PM	15:00	3,010	Inbound	67:33	0.74
Jl.Labuan Cianjur	21,551	AM	12:00	1,314	Outbound	67:33	0.63
		PM	16:00	1,401	Inbound	56:44	0.85
Jl. Trans Yogi	8,578	AM	12:00	472	Outbound	54:46	0.81
		PM	14:00	581	Inbound	52:48	0.89
Jl. Tanjung Pura	56,436	AM	07:00	3,312	Inbound	52:48	0.68
		PM	17:00	3,166	Inbound	52:48	0.93

Source: JUTPI 2

2. Vehicle Occupancy Survey

Average vehicle occupancy by type of vehicle is calculated. For the average occupancy among public transport, large bus has the highest occupancy of 26 persons per vehicle and minibus (angkot and mikrolet) has the lowest occupancy of 5 persons. The standard capacity of the bus is about 14 passengers for a small bus, 25 for a medium bus, and 45 for a large bus. Therefore, it can be inferred that the occupancy level of public transport is only around 40%-60% which is considered to be low. Detail information of average vehicle occupancy can be seen in Table 36.

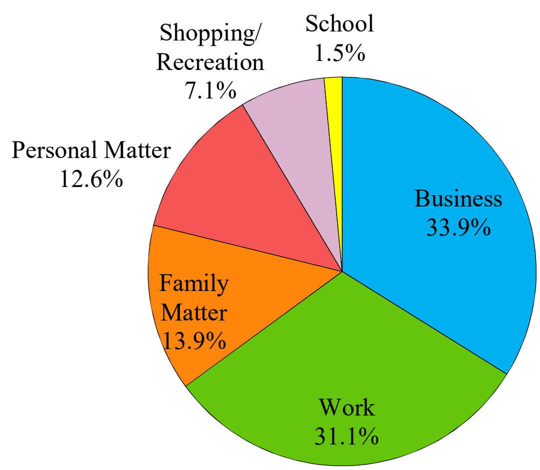
Table 36 Average Vehicle Occupancy at Cordon Line (Ordinary Road) Survey Locations

Location	Direction	Motor-cycle	Private Car	Pick up	Small Truck 2-Axle	Medium Truck 3-Axle	Large Truck >3-Axle	Minibus (Angkot, Mikrolet)	Medium Bus	Large Bus
Jl Raya Serang	A	1.4	2.1	1.6	1.5	1.5	1.5	3.7	8.1	17.1
	B	1.4	2.0	1.5	1.6	1.6	1.5	3.5	11.0	14.1
Jl Jasinga	A	1.5	2.9	1.8	1.7	1.0	-	4.0	25.0	-
	B	1.5	2.4	1.9	1.8	1.0	-	3.6	25.3	-
Jl ukabumi	A	1.5	2.5	1.6	1.6	1.5	1.6	11.9	16.6	28.4
	B	1.4	1.6	1.6	1.7	1.8	1.8	8.1	13.2	22.6
Jl Labuan Cianjur	A	1.5	2.1	1.7	1.6	-	-	9.4	-	-
	B	1.5	2.3	1.9	1.9	-	-	8.1	18.8	45.0
Jl Trans Yogi	A	1.4	2.3	1.8	1.6	1.4	1.0	11.5	16.8	35.3
	B	1.4	1.8	1.7	1.8	1.7	1.6	9.0	13.0	24.0
Jl Tanjung Pura	A	1.3	1.5	1.6	1.7	1.6	1.3	4.7	11.1	17.1
	B	1.3	1.8	1.6	1.6	1.5	1.4	5.9	10.7	19.3
Average		1.4	2.2	1.7	1.7	1.5	1.4	8.4	13.7	23.5

Unit: persons per vehicle
Note: Direction A: Inbound, Direction B: Outbound
Source: JUTPI 2

3. OD Interview

Based on the survey, the largest share of the trip purpose is business with 33.9% followed by work. The notable portion of business and work among other purposes shows that the access roads to JABODETABEK is essential to economic activities especially for logistics purpose. Meanwhile, other activities like shopping and school shares take less than 6% as shown in the figure below.



Source: JUTPI 2

Figure 111 Trip Purpose Shares of Cordon Line (Ordinary Road) Survey

- Railway Passengers OD Interview Survey

  Railway Passenger OD Interview Survey was carried out for departing passengers at eleven stations is listed and depicted in Figure 112.

Source: JUTPI 2

Figure 112 Cordon Line (Railway Passengers) Survey Locations

Surveyed stations were categorized based on direction and type of railway service. They are as follows:

- East Line

  This line is divided into two categories; medium-long distance railway and local railway. Medium-long distance railway serves cross-border trips for medium distance (i.e. within West Java but outside JABODETABEK) and long distance (i.e.: Central Java, Yogyakarta, and East Java). Surveyed stations are Pasar Senen, Gambir, and Bekasi Stations.

  Local railway serves cross-border travel of JABODETABEK eastbound to Cikampek and Purwakarta. Both destinations are outside JABODETABEK and are not included in the medium distance category since they are served by local railway service. Surveyed stations are Tanjung Priok, Kemayoran, Tambun, and Cikarang Stations.

- South Line

  This line serves cross-border travel of JABODETABEK southbound for medium distance (i.e., Sukabumi). Surveyed station is Bogor Station.

➢ West Line

This line serves cross-border travel of JABODETABEK westbound that is served by the commuter railway service. Surveyed stations are Maja, Citeras, and Rangkas Bitung Stations.

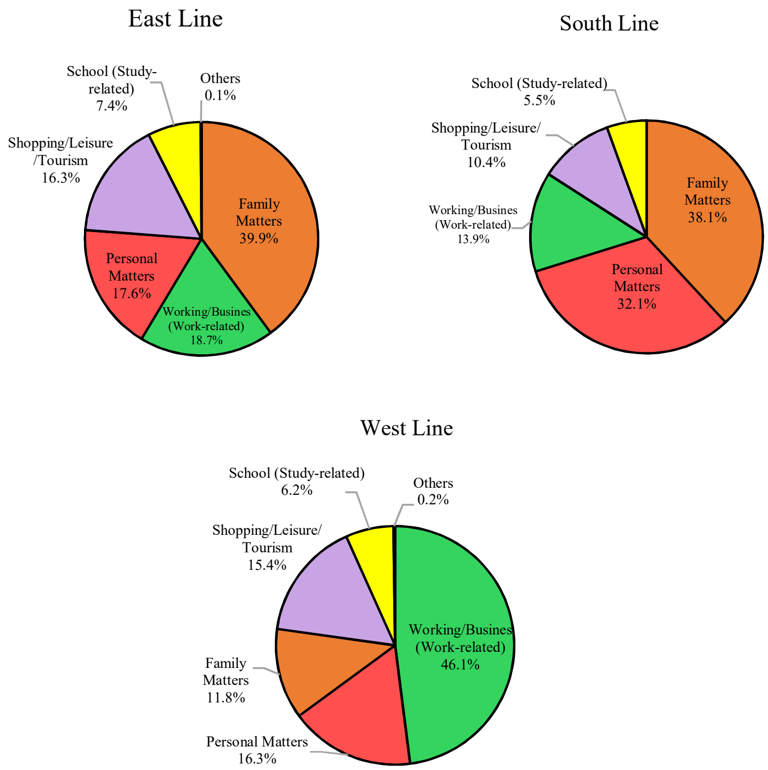
The result of the survey shows that the largest passenger trip (one-way) for external railways in JABODETABEK is at the east line as shown in Table 37.

Table 37 Total External Trips of Railway Passengers

Line		Stations	Passenger Trip	
East Line	Medium – long distance	Pasar Senen	12,409	24,109
		Gambir	10,729	
		Bekasi	971	
	Local Railways	Tanjung Priok	997	4,099
		Kemayoran	2,479	
		Tambun	434	
		Cikarang	189	
South Line		Bogor	1,086	1,086
West Line		Maja	2,006	8,295
		Citeras	428	
		Rangkas Bitung	5,862	
			Total	37,589

Source: JUTPI 2

Across all the lines, the top three of trip purposes are family matter, personal matter, and working/business. However, the highest percentage of trip purpose at the east and south lines is family matters while working/business (work-related) is the highest share for the west line (Figure 113). It may be related to the characters of industrial and commercial development toward west of JABODETABEK and the fact that survey on the west line was applied to commuter railway service. Significant difference in the early 2000s, when western JABODETABEK was not so developed as today, is that most passengers used to go there for personal matters.

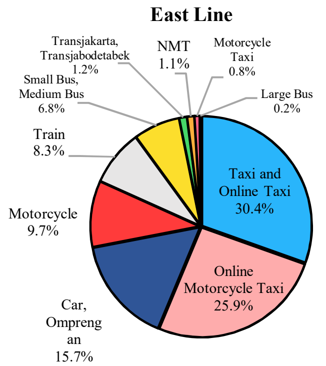


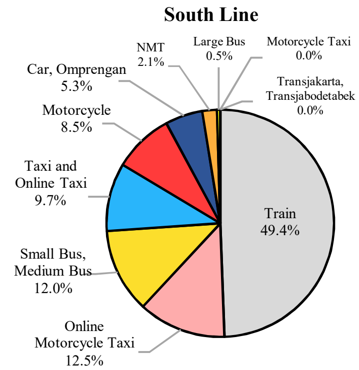
Source: JUTPI 2

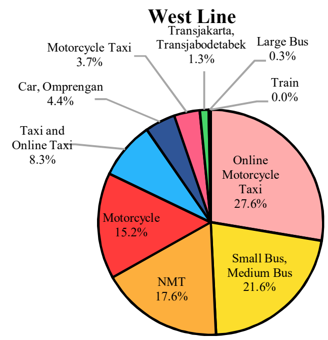
Figure 113 Trip Purpose Shares of Cordon Line (Railway Passengers) Survey

In early 2000s, the most frequently used mode to access the stations was categorized as bus (large bus, medium bus, *angkot* or *mikrolet*, and *omprengan*) when it was popular and easy to access at that time.

Based on the current study, most passengers do not take private vehicle to access the railway station (Figure 114). Most passengers chose taxi or online taxi to access the station on the east line. This may be related to the trip purpose that is dominated by family matter purpose and the distance scale of railway trips (medium-long) in which luggage and heavy personal belongings are carried. In west line, people tend to use online motorcycle taxi since the type of railway service is commuter railway and the railway locations at Maja, Citeras, and Rangkas Bitung are more accessible by motorcycle (narrow road and limited designated parking space). On the other hand, departure station on the south line (Bogor Paledang Station) is located 3 minutes away by walk from Bogor Station. Therefore, half of the passengers took commuter train up to Bogor Station and made transfer to Bogor Paledang Station.







Source: JUTPI 2

Figure 114 Access Modes to the Departure Railway Stations of Cordon Line (Railway Passengers) Survey

- Airport Passengers OD Interview Survey

  The survey was carried out at two airports: Soekarno-Hatta Airport and Halim Perdanakusuma Airport, at the waiting room/boarding lounges inside each departure terminal building.

  a. In Soekarno-Hatta Airport, the survey was implemented at the waiting room/boarding lounge of each departure terminal as follows:
     - ➢ Terminal 1A: Gates A1, A2, A3, A4, A5, A6, A7 (domestic),
     - ➢ Terminal 1B: Gates B1, B2, B3, B4, B5, B6, B7 (domestic),
     - ➢ Terminal 1C: Gates C1, C2, C3, C4, C5, C6, C7 (domestic),
     - ➢ Terminal 2D: Gates D1, D2, D3, D4, D5, D6, D7 (international),
     - ➢ Terminal 2E: Gates E1, E2, E3, E4, E5, E6, E7 (domestic),
     - ➢ Terminal 2F: Gates F1, F2, F3, F4, F5, F6, F7 (domestic),
     - ➢ Terminal 3: Gate 1 to Gate 10 (international), and
     - ➢ Terminal 3: Gate 11 to Gate 28 (domestic).

Source: Google Maps

Figure 115 Terminals and Gates Location in Soekarno-Hatta Airport

b. In Halim Perdanakusuma Airport, the survey implemented at the waiting room/boarding lounge of Batik Air and Citilink (two waiting rooms/boarding lounges for both airliners).

Secondary data from PT Angkasa Pura II as the airport management company for the two airports shows a larger volume of passenger trips made by domestic flights than that by international flights, as shown in the table below. Domestic flights are served by both airports and international flights are served by Soekarno-Hatta Airport only.

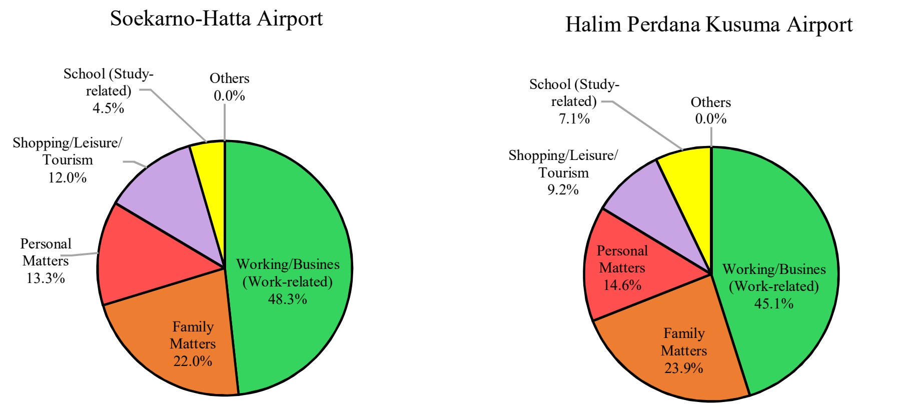
Table 38 Domestic and International Departure (as of July 19, 2018)

Airport	Departure Passengers	
	Domestic	International
Soekarno-Hatta	80,123	22,976
Halim Perdanakusuma	11,703	-
Total	91,625	22,976

Source: PT Angkasa Pura II

While the airplane used to be considered as a luxurious mode to travel, the passenger number of air passengers has increased over the years. The survey shows that passengers at both airports have a similar share of purposes (see figure below). In the SITRAMP (2002), personal matter took the largest purpose share. However, now working/business is taking the largest purpose share for air passengers because of the consideration of time efficiency compared to other transportation modes.

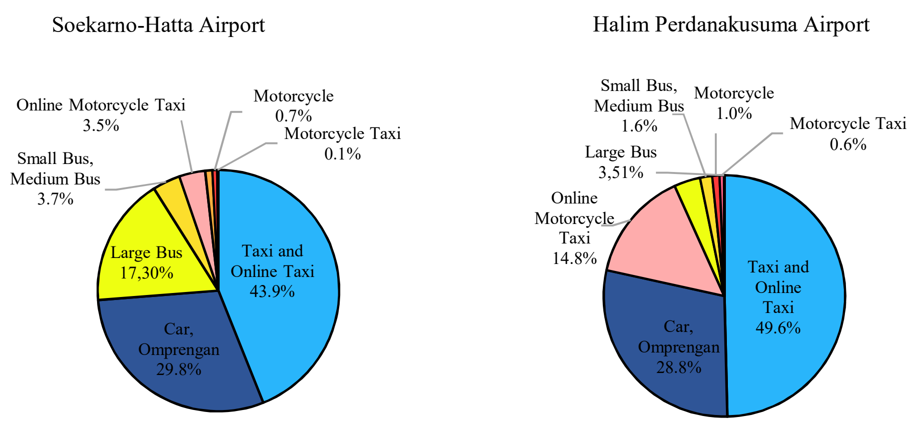
Shopping/leisure/tourism and school purposes are also significant due to the availability of Low-Cost Carriers (LCCs). For example, the share in Soekarno-Hatta airport for shopping/leisure has increased from 1.6% in SITRAMP (2002) to 12.0%.



Source: JUTPI 2

Figure 116 Trip Purpose Shares of Cordon Line (Airport Passengers) Survey

In terms of access mode to the airport, the car-based mode is the most frequently used mode by air passengers to access the airport in comparison to the motorcycle. Naturally, more space is needed for air passengers' luggage and belongings. In 2002, when Soekarno-Hatta Airport was the only commercial airport in JABODETABEK, most passengers accessed the airport by private car and taxi. In 2018, the car-based mode is still the most frequent mode including taxi/online taxi and car/omprengan. Below are the mode shares by air passengers to access the airport.

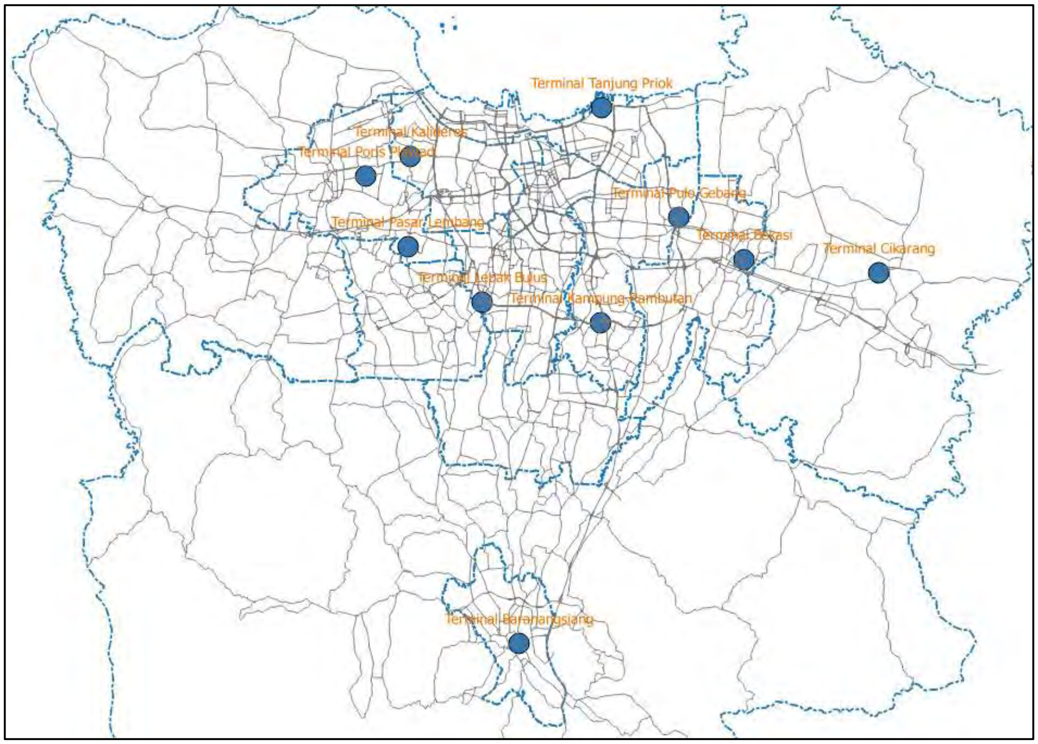


Source: JUTPI 2

Figure 117 Access Modes to the Departure Airports of Cordon Line (Airport Passengers) Survey

- Intercity Bus Passengers OD Interview Survey

The survey locations are located at the origin bus terminals inside JABODETABEK. The bus terminals within the scope of the survey are shown in the figure below.



Source: JUTPI 2

Figure 118 Cordon Line (Intercity Bus Passengers) Survey Locations

The destination of the intercity bus was categorized into three groups of destinations:

1. Westbound destination
   Westbound destination includes buses that originate from inside JABODETABEK and travel across the western boundary of JABODETABEK. The destinations are located in Banten Province such as Kota Serang, Kabupaten Serang, Kota Cilegon, Kabupaten Lebak, Kabupaten Pandeglang, and towards Sumatera Island.
2. Eastbound destination
   Eastbound destination includes buses that originate from inside JABODETABEK and travel across the eastern boundary of JABODETABEK. The destinations are located in West Java (Kabupaten Subang, Kabupaten Tasikmalaya, Kota Cirebon, and Kabupaten Karawang), Central Java, Yogyakarta, East Java, and towards Bali Island.

3. Southbound destination

   Southbound destination includes buses that originate from inside JABODETABEK and travel across the southern boundary of JABODETABEK. The destinations are located in West Java only such us Kota Sukabumi, Kabupaten Sukabumi, and Kabupaten Cianjur.

Volumes of daily intercity bus passengers based on the directions across JABODETABEK boundary are listed in the table below. It can be noted that the main direction of intercity bus passengers is eastbound.

Table 39 Daily Intercity Bus Passenger Trips across JABODETABEK Boundary

Gate	Total Trips
Westbound	34,957
Eastbound	64,584
Southbound	2,405
Total	101,946

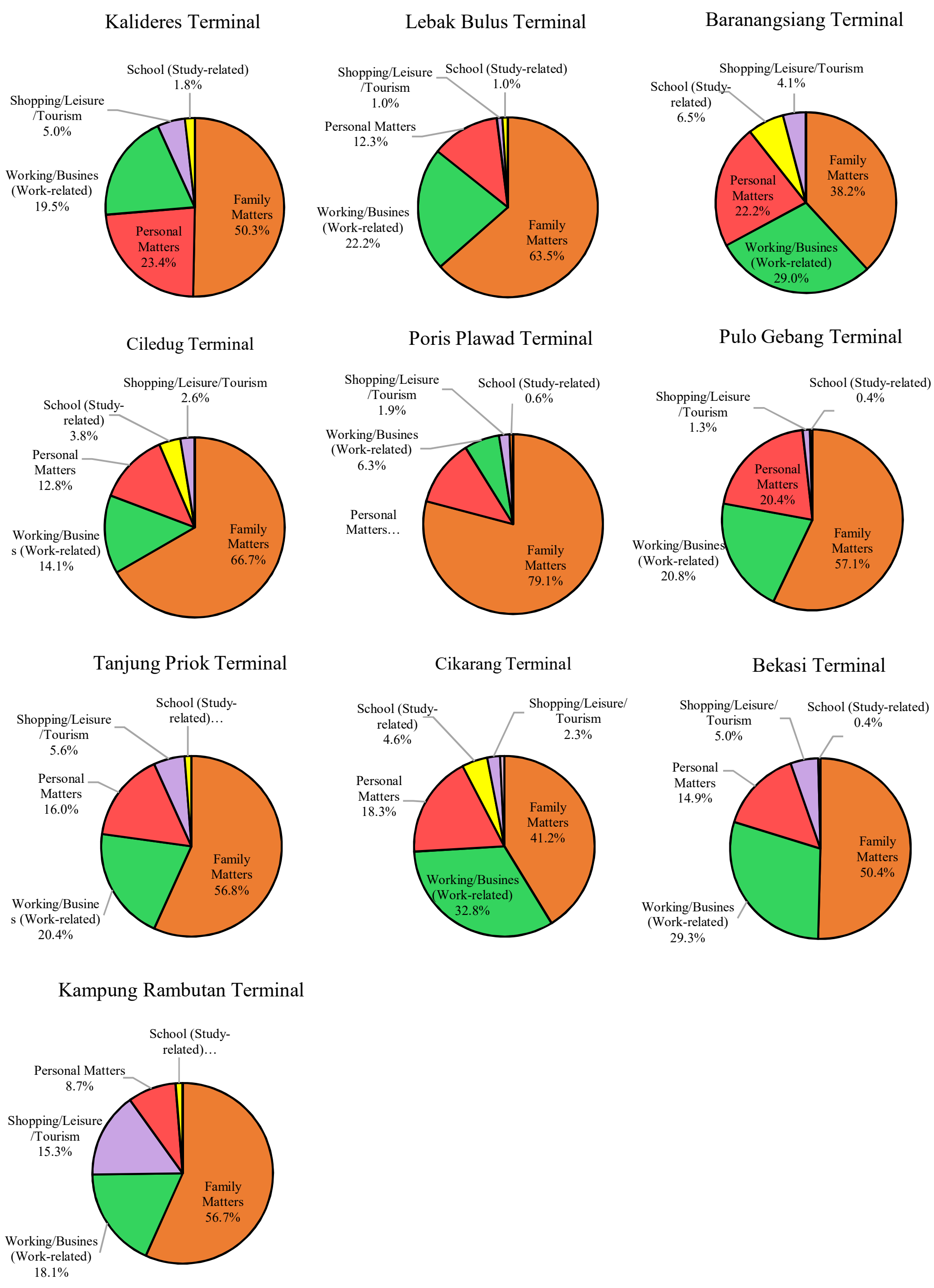
Source: JUTPI 2

For the last decade, bus operators have improved their services, facilities, and maintain the affordable price to attract more passengers due to ticket fare competition amongst railway, airplane, and intercity bus. It may be one of the reasons that intercity bus is popular for travelling for some distances even now.

Based on the survey, most of the intercity bus passengers have the trip purpose of family matters at all the surveyed bus terminals as shown in Figure 119. This condition can be interpreted as lower priority of the time urgency for the intercity bus passenger occurs. The second-largest purpose share in eight terminals (excluding Kalideres and Poris Plawad terminal) is for work-related purposes maybe because of accessibility and availability of the access modes. For instance, workers of manufacturing companies going to the west of JABODETABEK (Kota Cilegon and Kabupaten Serang), which are industrial areas, may prefer bus to train due to the service frequency.

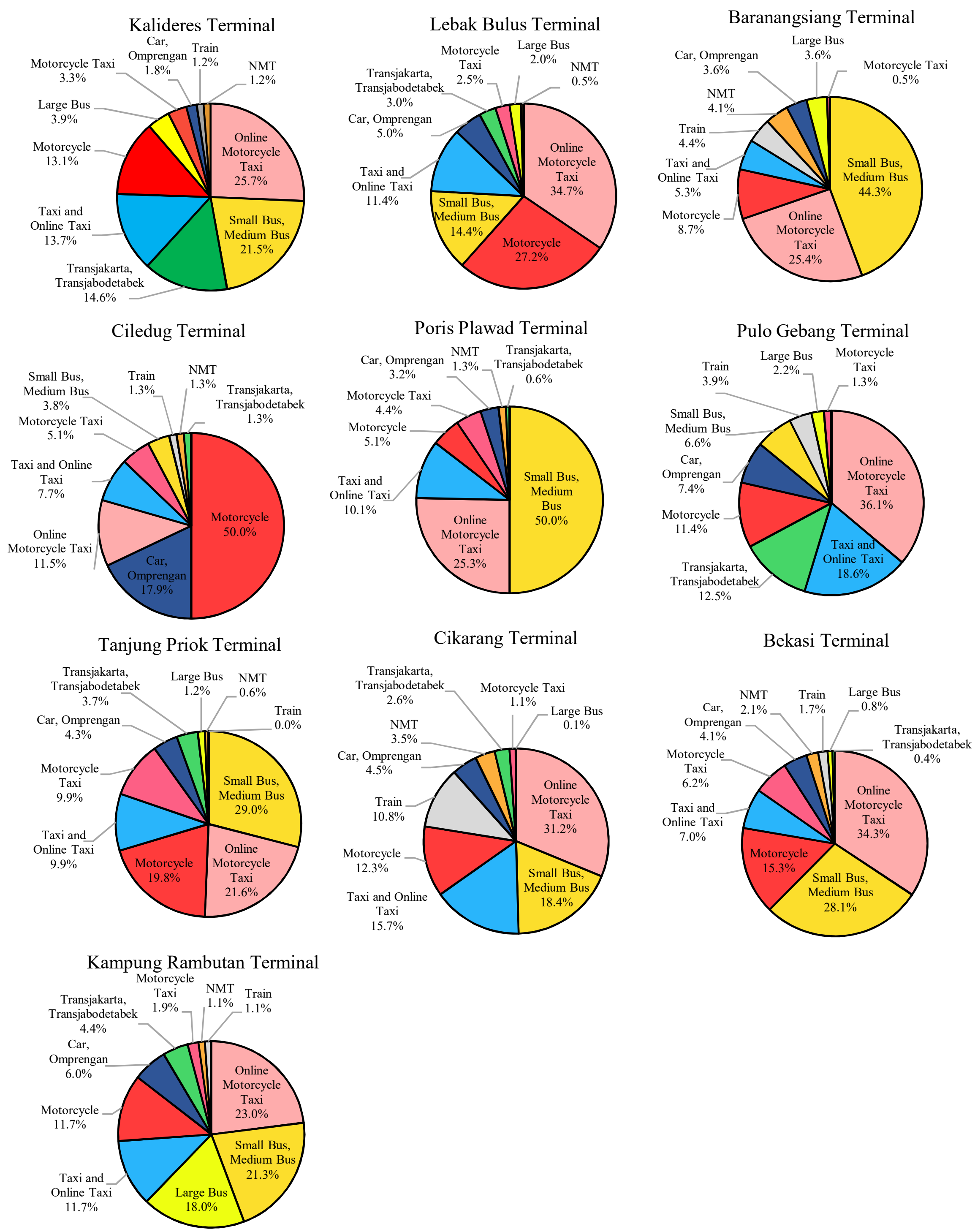
Metromini and *angkot* were the most reliable access mode back in early 2000s. Nowadays, access modes to the bus terminals are more varied including online motorcycle taxi that is new in the past five years. Online motorcycle taxi and small/medium bus hold the largest share for access mode to the bus terminal, except for Ciledug bus terminal as shown in Figure 120. Ciledug bus terminal, which is actually an unofficial intercity bus terminal, is relatively smaller in size and serves small number of bus routes.

In terms of public transportation, the survey found that passengers in three locations (Baranangsiang, Tanjung Priok and Poris Plawad Terminals) chose small or medium bus to reach the departure terminal. On the other hand, there are seven locations from the surveyed terminals in which the majority of access modes are either online motorcycle taxi or motorcycle. Passengers may consider the time efficiency and easy access of especially online motorcycle taxi.



Source: JUTPI 2

Figure 119 Trip Purpose Shares of Cordon Line (Intercity Bus Passengers) Survey



Source: JUTPI 2

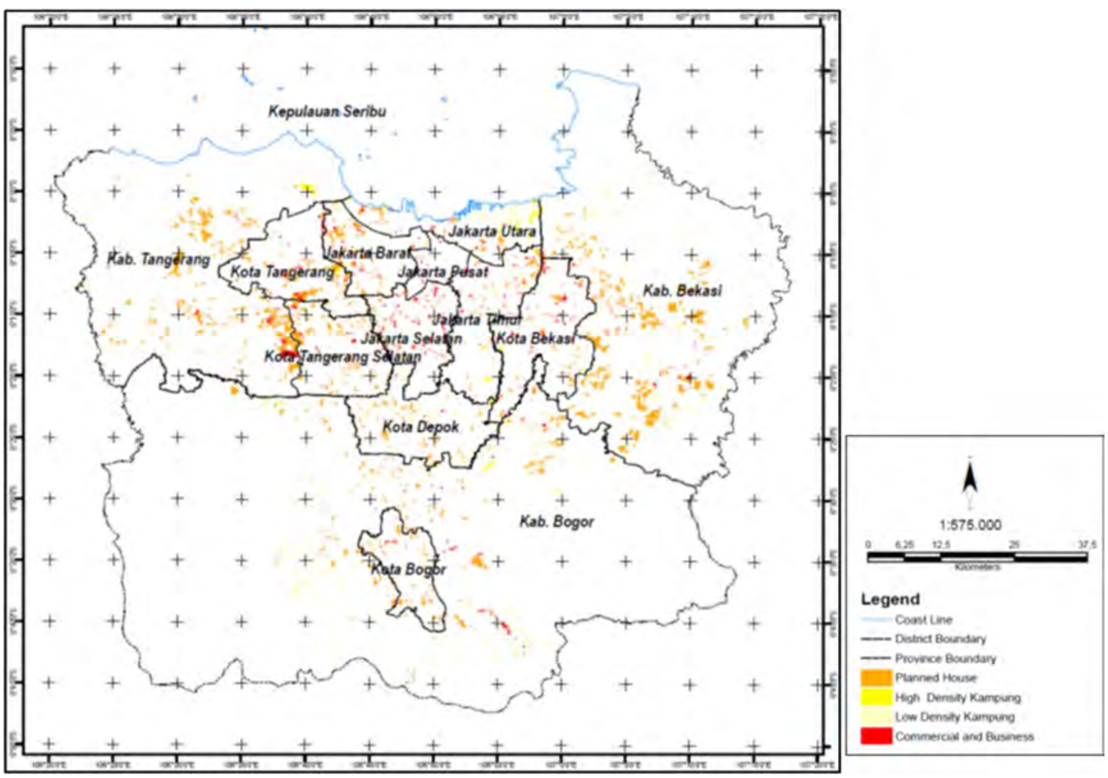
Figure 120 Access Modes to the Departure Bus Terminals of Cordon Line (Intercity Bus Passengers) Survey

3.2.6 Activity-Travel Diary Survey (Using Paper-based Diary and Smartphone Application)

As the key transport survey, the objective of the Activity-Travel Diary Survey (ADS) is to obtain data of daily activity-travel from each respondent within JABODETABEK. This survey is conducted to understand the characteristics of daily trips (e.g., destination, mode, travel time, cost, etc.) by collecting the comprehensive socioeconomic information of each household. Data should include the respondent's travel pattern and behavior through daily activity-travel reporting also socioeconomic data for household and representative of household members.

1. ADS Paper-based

   The main objective of ADS Paper-based is to obtain data of daily activity-travel from each respondent within JABODETABEK, especially in the newly developed area which has been developed since JUTPI 1 transportation survey in 2010 (see the figure below). This survey aimed at accommodating respondents who may not have smartphones and/or have the preference of being tracked by the paper-and-pencil method.



Source: JUTPI 2

Figure 121 Newly Developed Areas since JUTPI 1 (2010)

ADS Paper-based is conducted for the newly developed area in JABODETABEK. The targeted number of samples to be collected is effective 5,000 respondents from 5,000 households – one respondent for each household within JABODETABEK.

Population characteristic according to ADS paper-based shows that average household size of JABODETABEK is 3.66 where most of the households come from BODETABEK with average household size of 3.70 while DKI Jakarta's average household size is 3.48. About the main activity of the respondents, the share of workers is dominant, and the largest portion of their work field comes from the tertiary sector.

ADS paper-based result shows that *Work* is the major tour in JABODETABEK. It is estimated that an average trip gross rate of ADS paper-based based on tour types is 1.89 which is shown in the table below.

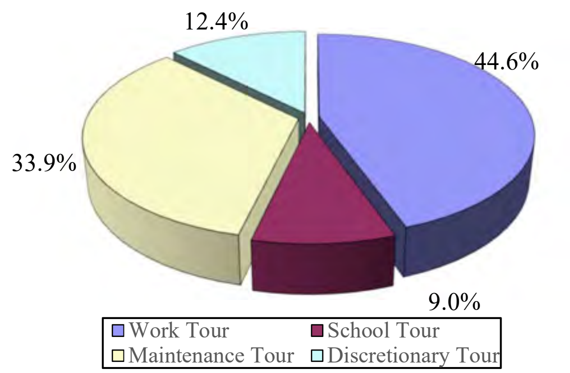
Table 40 ADS Paper-based Trip Rate Estimation Based on Tour Types

Tour Type	#Trips	Average Weekdays		Frequency Weekdays	
		Primary	Secondary	Primary	Secondary
H	0	0	0	3,417	0
HWH	2	11,792	0	5,896	0
HOWH	3	294	0	98	0
HWOH	3	462	0	154	0
HOWOH	4	156	0	39	0
HWOWH	4	440	0	110	0
HOWOWH	5	25	0	5	0
HWOWOH	5	175	0	35	0
HOWOWOH	6	36	0	6	0
HWHWH	4	464	0	116	0
HOWHWH	5	60	0	12	0
HWHWOH	5	5	0	1	0
HOWHWOH	6	6	0	1	0
HSH	2	2,452	0	1,226	0
HOSH	3	12	0	4	0
HSOH	3	231	0	77	0
HOSOH	4	16	0	4	0
HMH	2	5,034	2,530	2,517	1,265
HOMH	3	81	48	27	16
HMOH	3	516	198	172	66
HOMOH	4	8	32	2	8
HDH	2	2,140	1,076	1,070	538
HODH	3	0	0	0	0
HDOH	3	30	15	10	5
HODOH	4	4	0	1	0
Total		24,439	3,899	15,000	1,898
Trip Rate		**1.89**			

Work Tour
School Tour
Maintenance Tour
Discretionary Tour

Source: JUTPI 2

ADS paper-based mostly recorded simple tours such as home-work-home, home-school-home, home-maintenance-home, and home-discretionary-home (see Table 40) because of the nature of the method of using paper-and-pencil. The respondent was prone to record their main purpose tour like going to the office and tended to forget to mention their detailed tours in between. The figure below shows tour purpose composition in which work tour has the largest share followed by maintenance tour. School tour has a relatively small share due to the smaller number of student respondents in the ADS paper-based.



Source: JUTPI 2

Figure 122 Tour Purpose Composition of ADS Paper-Based

2. ADS Smartphone Based (ADS MEILI)

ADS smartphone-based is conducted as a digital platform for travel data accuracy improvement and user-friendliness. The main objective of ADS MEILI is to obtain data of daily activity-travel from each respondent within the JABODETABEK area.

ADS MEILI is conducted within the JABODETABEK area with a targeted number of samples of 5,000 respondents from 5,000 households. Collected data from ADS MEILI is similar to ADS Paper-based, and it mainly consists of socioeconomic data of households and household members and respondents' travel patterns and behavior through daily activity-travel reporting for seven consecutive days. During the survey, attributes related to the cost, transport mode, and characteristics of the day also were recorded.

Population characteristic according to ADS MEILI shows that the average household size in JABODETABEK is 3.09 where most of the households come from DKI Jakarta with average size of 3.07 while BODETABEK's average household size is 3.13. Share of worker's population is dominant which works on tertiary sector found in several kota especially Kota Tangerang Selatan and Kota Bogor.

Different from ADS Paper-Based, result of ADS MEILI shows that *Maintenance* is the major tour in JABODETABEK. On average, ADS MEILI trip gross rate based on tour types is 3.22 which is shown in the table below.

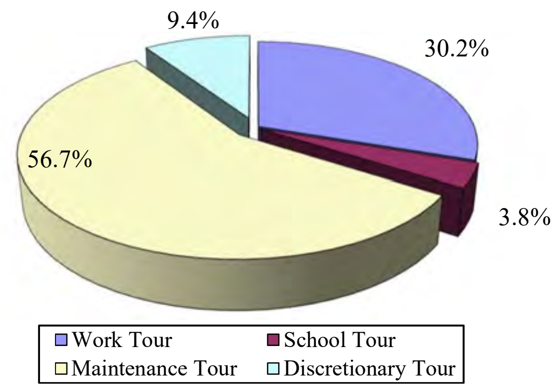
Table 41 ADS MEILI Trip Rate Estimation Based on Tour Types

Tour Type	#Trips	Average Weekdays		Frequency Weekdays	
		Primary	Secondary	Primary	Secondary
H	0	0	-	115	0
HWH	2	1,154	-	577	0
HOWH	3	323	-	108	0
HWOH	3	1,075	-	358	0
HOWOH	4	394	-	99	0
HWOWH	4	156	-	39	0
HOWOWH	5	50	-	10	0
HWOWOH	5	276	-	55	0
HOWOWOH	6	104	-	17	0
HWHWH	4	273	-	68	0
HOWHWH	5	25	-	5	0
HWHWOH	5	82	-	16	0
HOWHWOH	6	10	-	2	0
HSH	2	198	-	99	0
HOSH	3	39	-	13	0
HSOH	3	167	-	56	0
HOSOH	4	40	-	10	0
HMH	2	2,233	1,277	1116	639
HOMH	3	246	147	82	49
HMOH	3	1,829	616	610	205
HOMOH	4	272	105	68	26
HDH	2	582	441	291	221
HODH	3	-	-	0	0
HDOH	3	120	67	40	22
HODOH	4	56	22	14	5
Total		9,704	2,675	3,848	1,167
Trip Rate		**3.22**			

Work Tour
School Tour
Maintenance Tour
Discretionary Tour

Source: JUTPI 2

Different from ADS paper-based, the table above shows that ADS MEILI is more detailed in capturing complex tours with more stops besides simple tours. Tours with more stops are recorded because the MEILI application detected all trips in a day that could compose complex tours. Figure 123 shows tour purpose composition from ADS MEILI. Most of the tours are dominated by maintenance tour followed by work tour. Maintenance tour share is larger than work tour share because more tours were detected and recorded and those are mostly maintenance activities.



Source: JUTPI 2

Figure 123 Tour Purpose Composition of ADS MEILI

In order to model the time-of-day (ToD) choice, a day is divided into five time-period by considering the characteristic of hourly traffic volume and the operation of DKI Jakarta's odd-even number plate regulation, as shown in the table below.

Table 42 Five Time Periods in a Day

Time of Day	Time Code	Time Period
Early morning	EM	03:00 – 05:59
AM peak	AM	06:00 – 09:59
Midday	MD	10:00 – 15:59
PM peak	PM	16:00 – 19:59
Late night	LN	20:00 – 02:59

Source: JUTPI 2

Frequencies of activities starting in AM peak are relatively high in JABODETABEK, especially for work purpose and school purpose. A worker tends to go back home in PM peak meanwhile students are in the midday time period. Maintenance and discretionary activities mostly start in the morning and end in the nighttime. The time-of-day composition by purpose can be seen in Table 43.

Table 43 Time-of-Day Shares by Purpose

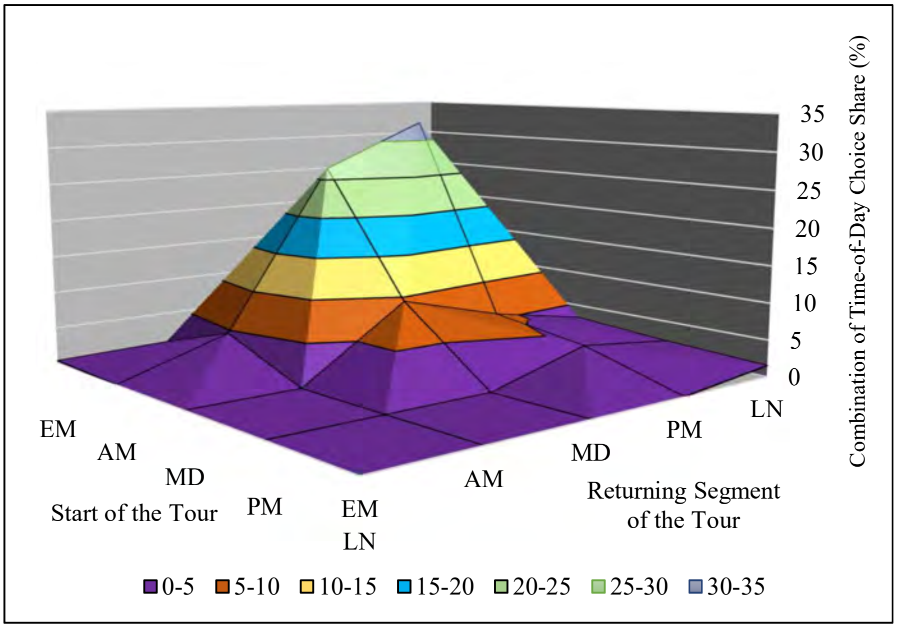
Purpose	EM	AM	MD	PM	LN	Total
Start of the Tour						
Work	7.3%	67.0%	18.2%	5.9%	1.5%	100.0%
School	6.3%	73.9%	14.9%	4.1%	0.8%	100.0%
Maintenance	6.1%	31.4%	35.3%	20.2%	6.9%	100.0%
Discretionary	6.9%	28.5%	27.2%	25.2%	12.1%	100.0%
All Purpose	6.7%	47.0%	26.8%	14.4%	5.1%	100.0%
Start of the Returning Segment of the Tour						
Work	0.3%	5.3%	38.9%	45.2%	10.3%	100.0%
School	0.2%	1.7%	70.8%	22.8%	4.5%	100.0%
Maintenance	3.0%	22.5%	34.2%	25.3%	15.1%	100.0%
Discretionary	0.5%	7.6%	30.1%	36.3%	25.6%	100.0%
All Purpose	1.5%	13.2%	37.8%	33.7%	13.8%	100.0%

Source: JUTPI 2

Alternatives are created by combining the time period to leave home to start the tour and the time period to leave the destination of the main activity to start the returning segment of the tour by purpose. Assuming for simplicity that there are no tours that last overnight so 15 ToD combinations can be identified.

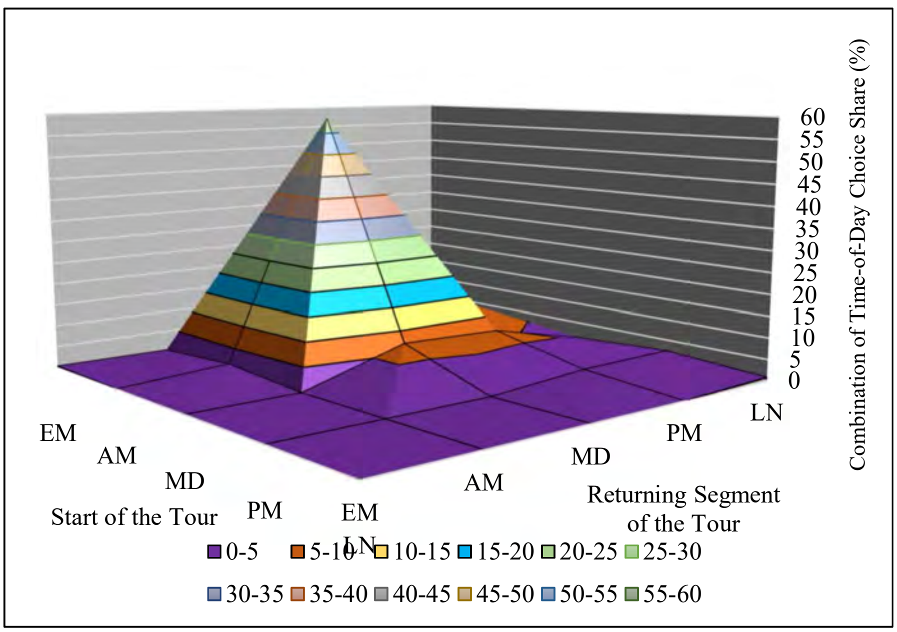
Combinations of time-of-day frequency from ADS MEILI can be seen in the figures below. The result shows that most of the tours started in AM peak and finished at midday especially for school purposes, while, for work tours, the activity usually ends in PM peak. Maintenance tours are mostly made in a short period of time either in the morning, midday, or at night. Meanwhile, discretionary tours are starting in midday and take place until late at night as illustrated in Figure 124 to Figure 127.

Detail information regarding JUTPI 2 surveys and results can be found in Annex 5: Working Paper on Transportation Surveys.



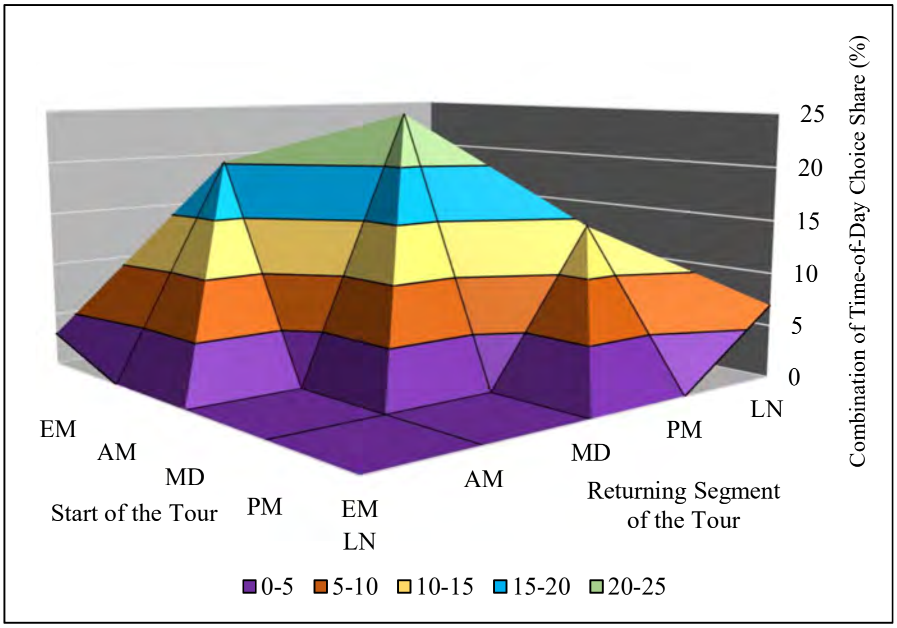
Source: JUTPI 2

Figure 124 Combination of Time-of-Day Choice Frequency: Start of the Tour and Returning Segment of the Tour (Work Tour)



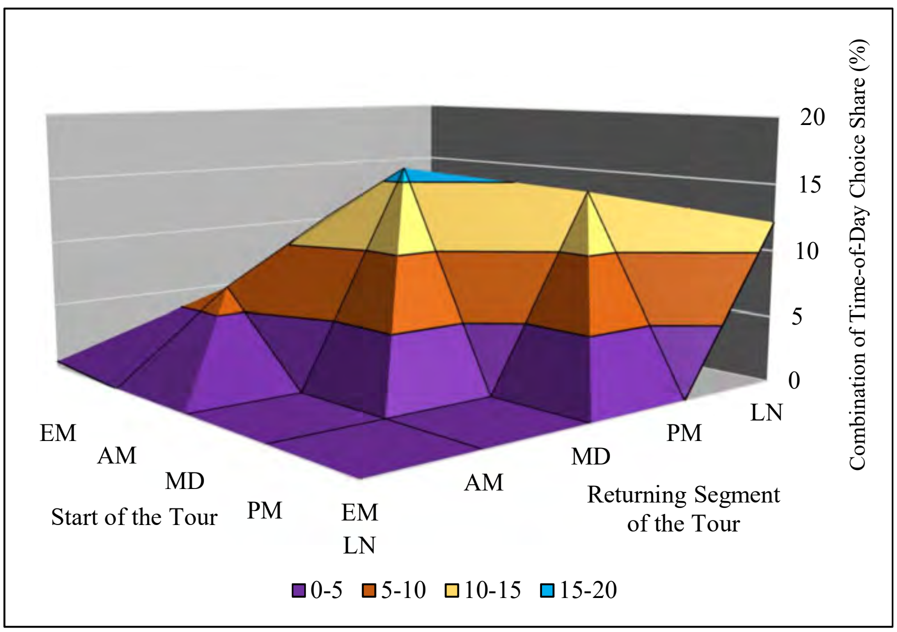
Source: JUTPI 2

Figure 125 Combination of Time-of-Day Choice Frequency: Start of the Tour and Returning Segment of the Tour (School Tour)



Source: JUTPI 2

Figure 126 Combination of Time-of-Day Choice Frequency: Start of the Tour and Returning Segment of the Tour (Maintenance Tour)



Source: JUTPI 2

Figure 127 Combination of Time-of-Day Choice Frequency: Start of the Tour and Returning Segment of the Tour (Discretionary Tour)

3.3 Challenges and Issues of Current Transportation

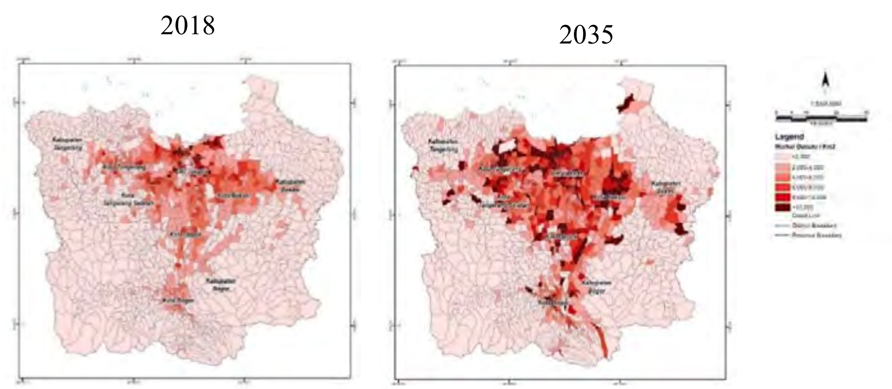
Challenges and issues of current transportation in JABODETABEK area vary from transition of traffic behavior to traffic policy and accountability. In terms of regional development context, issues and problems occur during the years of development of the transportation sector.

1) **Issues and problems in the regional development context**

a. Economic concentration in DKI Jakarta

The trend up to 2018 indicates that concentration of work-related activities has been spread across cities in JABODETABEK especially area with central business district such as Jl. Jendral Sudirman, Jl. Gatot Subroto in DKI Jakarta, and main streets in other cities.

By 2035, it is predicted that the main concentration of work-related activities will expand towards the outskirts while more density is observed within DKI Jakarta. Such a condition will cause a rise in transportation demand. Tendency of people's movement to those activity centers should be well planned and foreseen; thus, the provision of sufficient public transport is needed to prevent any rocketing trend of private vehicle usage and help to solve social problems. Forecasted change in workers' distribution is illustrated in the figure below.

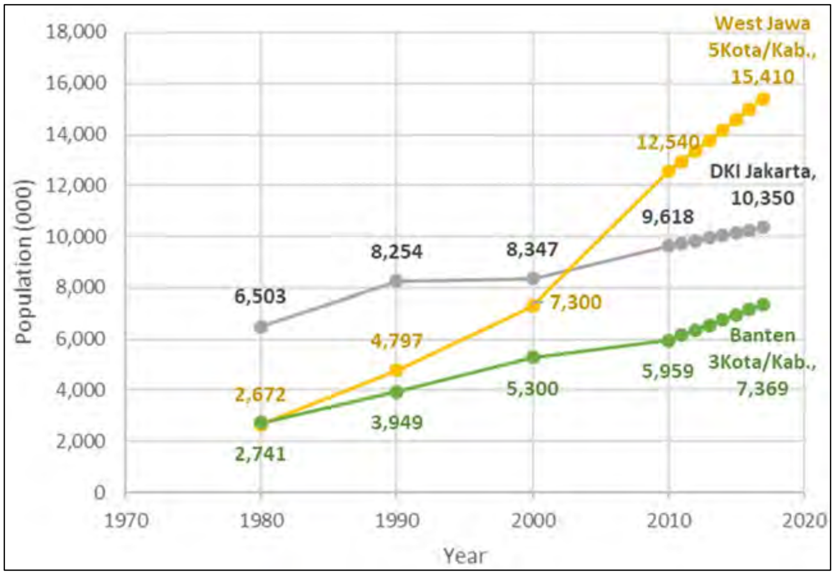


Source: JUTPI 2

Figure 128 Workers Density Distribution at Workplace by Kelurahan in 2018 and 2035

b. Population growth around DKI Jakarta

In accordance with the BPS population projection around DKI Jakarta, it is shown that the population in West Java has grown significantly as shown in Figure 129.



Source: Projected Population of Kabupaten/Kota Province of DKI Jakarta, West Java and Banten 2010-2020 (by BPS, UNFPA, 2015)

Figure 129 JABODETABEK Population Trend

By 2035, DKI Jakarta is projected to reach a saturation point in which less than 1% of population growth is expected. In contrast, Kota/Kabupaten around DKI Jakarta will have more than 1% growth as seen in Table 44. The population growth around DKI Jakarta will be affecting land use, accessibility to transport facilities, and development constraint.

Table 44 Population Projection around DKI Jakarta

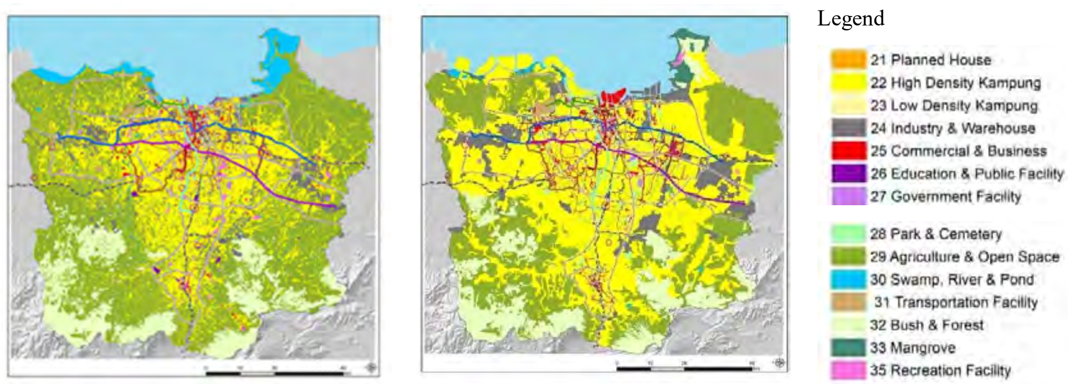
Kota/Kabupaten	Average growth/year (2017 – 2035)	Population (2017)	Projected population (2035)
DKI Jakarta	Less than 1%	10,350,338	11,198,754
Kota Bogor	1.1%	1,081,009	1,344,529
Kabupaten Bogor	2.4%	5,715,009	8,186,711
Kota Depok	4.0%	2,254,513	3,818,037
Kota Bekasi	2.8%	2,859,630	4,278,123
Kabupaten Bekasi	4.9%	3,500,023	6,383,076
Kota Tangerang	1.9%	2,139,891	2,868,245
Kota Tangerang Selatan	3.2%	1,644,899	2,606,355
Kabupaten Tangerang	1.9%	3,584,770	5,635,723

Source: JUTPI 2

c. Change of land use development in JABODETABEK

Future land use also forecasted significant changes from vacant land to housing areas across many locations within JABODETABEK. Particularly, in the northern part of JABODETABEK, the reclamation area is planned to be housing and business area.

In the future, the urban land use change will be more influential and much more rapid than that of 2000 to 2017, making the urban land use function more dominant compared to the natural land use. The changes in land use in the figure below should be noticed in advance by the authority so that public transportation infrastructure could develop proportionally and meet the demands.



2017 **2035**

Figure 130 Changes in Land Use in JABODETABEK from 2017 to 2035

2) Issues and problems in urban transportation context

a. Traffic congestion and urban structure

The growth of urban structure in JABODETABEK area has created many new centers of activities, which can be seen by agglomerated and compact areas such as new town (BSD, Summarecon, Jababeka) and new business districts in Serpong, Kota Tangerang Selatan. This rapid growth should be considered for future planning since it will generate trips. The uncontrollable trip generation will lead to traffic congestion.

Local traffic congestion can be caused by various factors in terms of road infrastructure, traffic volume, and social phenomena. Furthermore, the rocketing trend of the number of motorcycles caused by the simple purchase scheme with affordable price has led to an increase in traffic volume, especially in the fringe area. Some causes of traffic congestion in many areas in JABODETABEK are as follows:

- Inconsistent existing road width,
- Illegal food street vendor on the roadside,
- Broken pavement, at-grade railway crossing, intersection, and
- Slow road development against increasing traffic demand.

b. Ineffective policy related to TDM

Dissemination of private cars and motorcycles has caused low travel speed and a high V/C ratio of the road. Since widening the existing roads and/or adding new roads is not essentially considered as a solution to this problem, TDM policies need to be implemented. Currently, the odd-even number plate regulation has been implemented on several roads in DKI Jakarta as the "push" policy.

"Push" policy regarding TDM has been changed from 3-in-1 (requirement of three or more occupants in a passenger car) to the odd-even number plate regulation. However, the application of current odd-even number plate regulation is sensitive to factors of the target road, time, day of the week that are rather dynamic and its benefit cannot be well appreciated. In fact, the impact of this policy was smaller than expected and at some point, the side effect occurs on other roads which makes the traffic worse. An ultimate TDM is necessary to be applied and plan to introduce ERP (Electronic Road Charge) in the future is considered necessary.

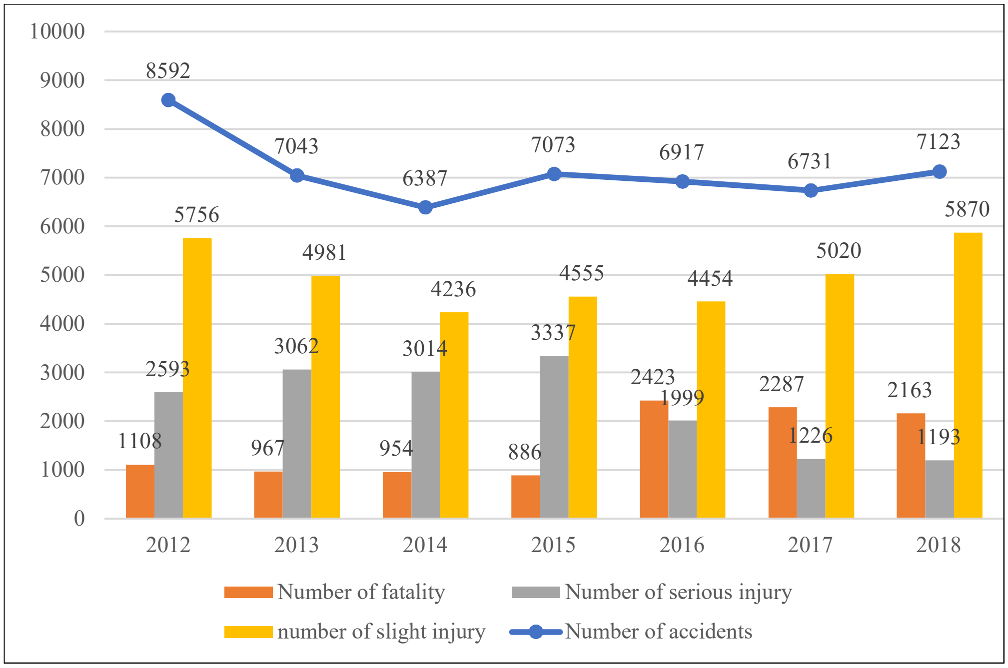
c. Environmental deterioration

Improvement of the air quality is required for improvement of the living quality. However, the current emission of PM-10 from massive private vehicle use is proven to deteriorate the air quality. It is even forecasted larger over the years if no action is taken.

Based on JUTPI 2 study, car and motorcycle are the highest contributor of CO and CO_2. It is expected the implication of TDM policies and fuel-related regulations will bring significant impact on pollution reduction. Thus, proper policy and well-planned infrastructure development (mainly for public transport) is expected to gradually decrease the use of private vehicles within JABODETABEK. For example, the motorcycle ban and high parking tariff will encourage the use of mass transit and decrease the number of motorcycles. Eventually, this will lead to the reduction of CO, CO2, and other pollutants as well as improvement of air quality. The detail of the emission model result will be provided in Section 10.4.

d. Road accidents

Traffic safety is one the biggest issues in JABODETABEK. The number of accidents fluctuated for seven years from 2012 to 2018 with an average fatality rate of 13% as shown in the figure below. Most accidents occurred in motorcycles and buses. This infers that motorcycle users' driving behaviour is unsafe. Same thing happens in public transport. Besides the drivers' problems, the fleet is rather old and not well-maintained.



Source: Korlantas POLRI

Figure 131 Road Accidents during the Period 2012 – 2018 in JABODETABEK

In terms of infrastructure, traffic accident occurred because of unperformance of road network. This cause can be alleviated by building flyover/underpass, widening the lane, adding median, and putting road marks. While the improvement of the aforementioned issues would indirectly decrease the accidents, improvement of road safety, drivers' safety, and related factors should be highly considered by the policymaker.

e. Barrier-free access implementation

In terms of accessibility for all passengers, the implementation of barrier-free access is a must. It will help people with limited mobility, especially disabled people to access all public facilities including public transportation independently and without hesitation. Barrier-free concept can be applied to the shelter, bus, ramp, etc. It should have a certain standard so that it could be applied uniformly.

On the other hand, to promote public transport use, improvement of pedestrian access is essential. The average acceptable walking distance which is below 200 meters is considered low. This may due to uncomfortable pedestrian facilities with limited integration facilities of transportation modes. However, improvements of pedestrian facilities and efforts to promote integration among all public transport modes have been and will continue to be carried out by the government (i.e., pedestrian path in Jl.Sudirman in the figure below and pedestrian tunnel in Jl. Kendal, both in Dukuh Atas).

Source: www.tribunnews.com

Figure 132 Pedestrian Path Improvement in Dukuh Atas (Jl. Sudirman)

In the future, traffic policy shall be in line with urban development that encourages public transport usage by promoting concept and policy of transit-oriented development (TOD). TOD policy has been regulated by some agencies that aim at promoting living close to mass urban transit corridors with an emphasis on a mixed-use development around a transit stop. Dissemination and implementation of the TOD policy will encounter many challenges from the institutional and financial arrangements.

f. Massive growth of online motorcycle taxi

The significant change in transportation mode availability has been made by online dispatch services like online motorcycle taxi spreading throughout the area. However, the unclear regulations may create irregularities or chaotic traffic, especially near the train station or Transjakarta bus shelters. On the contrary, bus and minibus services are declining as shown by the omission of some routes and rationalization of the fleet.

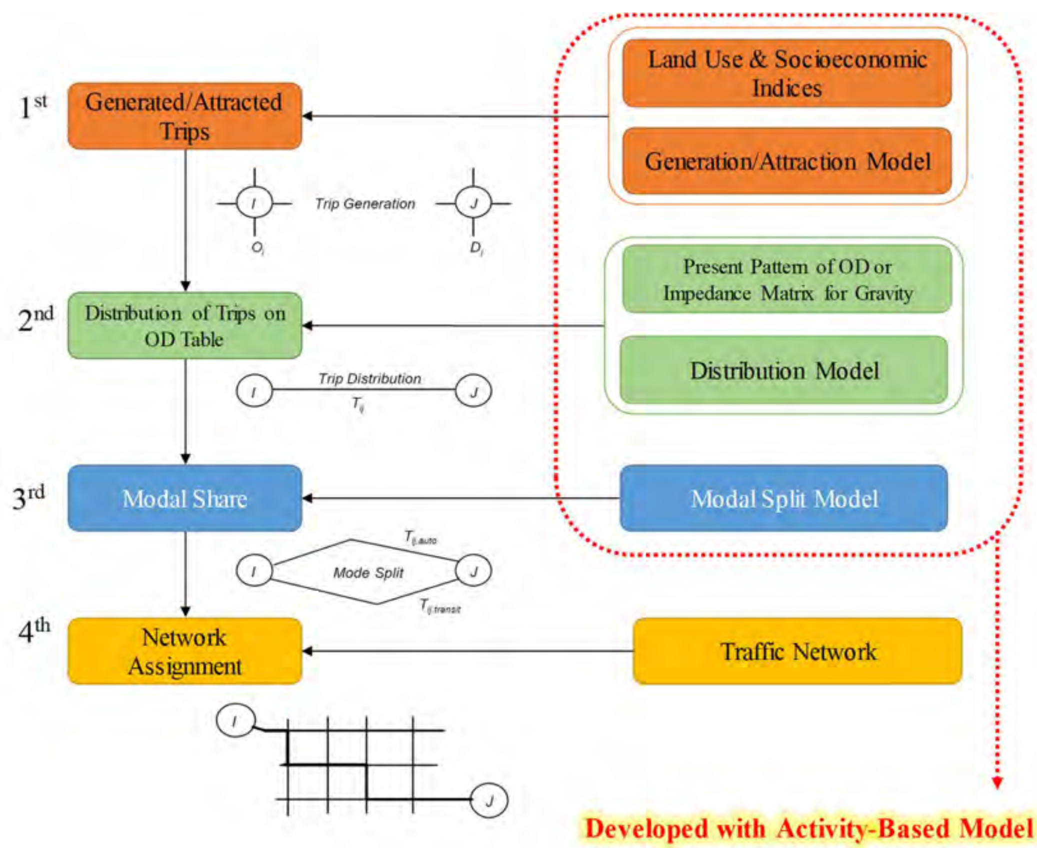
g. Problem in coordination on planning and project implementation

Transportation institution is important for leading the planning and implementation of the transportation policy. Clear direction for the decided policy should be from the in-depth analysis to present the optimal result. The detailed problem breakdown will be described in Sections 11.1 and 11.2.

Chapter 4 TRAVEL DEMAND MODEL

4.1 Activity-Based Model (ABM), Population Synthesis, Microsimulation

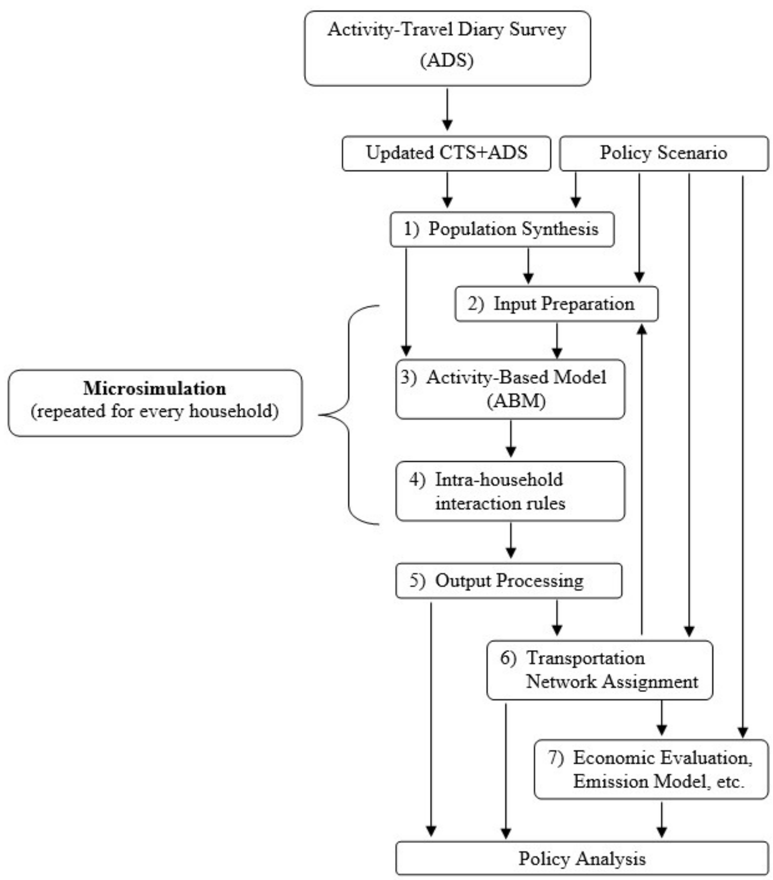
A conventional four-step travel demand model is commonly used to estimate traffic volume in each link of the transportation network, in order to estimate travel patterns, congestion, and vehicle emission. However, it has been shown that the conventional four-step travel demand model has limitations due to its trip-based sequential structure and lack of behavioral responses. Since Activity-Based Model (ABM) is able to estimate travel pattern in more accurate, including intra-household interaction rules, and also to predict choice of when to travel by exact time of day. Therefore, in this project, ABM is utilized to substitute the first three steps of conventional four-step demand model (see Figure 133).



Source: JUTPI 2

Figure 133 Four-Step Demand Model and Activity-Based Model

Activity-Based Model (ABM) is an alternative method of travel demand model that can present a suitable framework in which travel is viewed in the context of traveler's behavior and activity pattern. The activity-based modeling system simulates the way individuals schedule their daily activities and travel in the study area (JABODETABEK) and provide accurate estimates which are expected to serve as better inputs for evaluation of different transportation policy scenarios. By utilizing the updated CTS and ADS dataset and policy scenario that wants to be tested, population synthesis is made. The result of population synthesis is utilized as an input to the activity-based modeling system. Part of the task of input preparation, applying activity-based models, and the intra-household interaction rules is called microsimulation and it is repeated for every household (Figure 134).



Source: (Yagi, 2006)[5]

Figure 134 Overall System for Microsimulation and Related Tasks for Policy Analysis

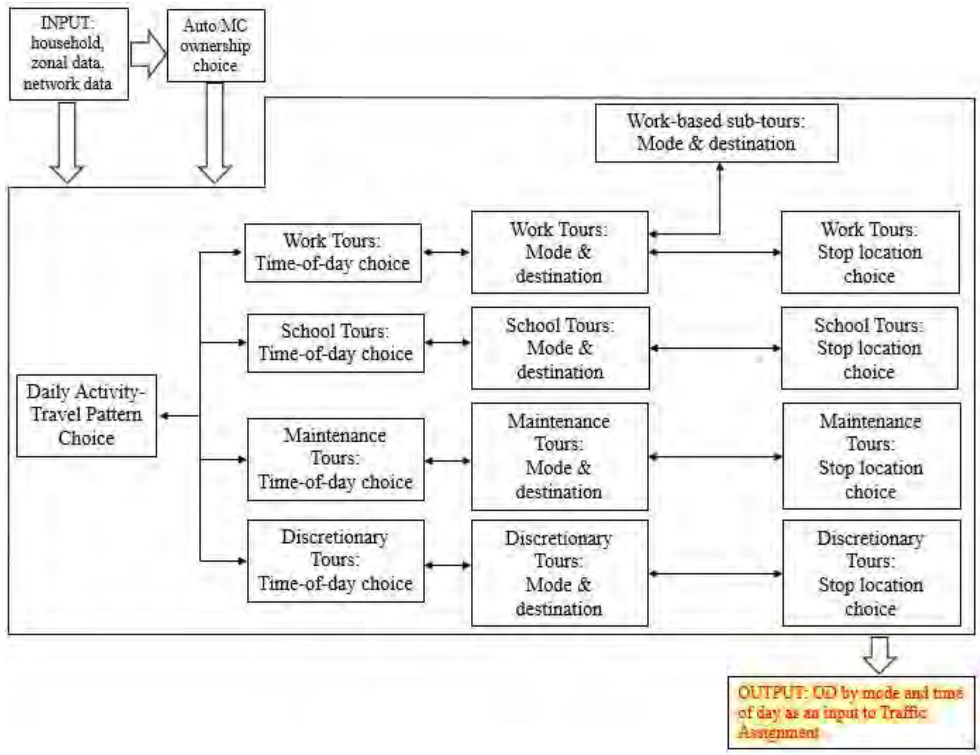
4.1.1 Activity-Based Model (ABM)

Activity-based models are based on behavioral theories about how people make decisions about activity participation in the presence of constraints, including decisions about where to participate in activities, when to participate in activities, and how to get to these activities. Because they represent decisions and the resulting behavior more realistically, activity-based models are often better at representing how investments, policies, or other changes will affect people's travel behavior.

Activity-based models have become more widely used in practice. Activity-based models share some similarities to traditional four-step models: activities are generated, destinations for the activities are identified, travel modes are determined, and the specific network facilities or routes used for each trip are predicted. However, activity-based models incorporate some significant advances over four-step trip-based models, such as the explicit representation of realistic constraints of time and space and the linkages among activities and travel, for a person as well as across multiple persons in a household. These linkages enable them to more realistically represent the effect of travel conditions on activity and travel choices. Activity-based models also can incorporate the influence of very detailed person-level and household-level attributes and the ability to produce detailed information across a broader set of performance metrics. These capabilities are possible because activity-based models work at a disaggregate person-level rather than a more aggregate zone-level like most trip-based models.

Activity-based models can be used to evaluate alternative investments and policies that are difficult to test using traditional trip-based or sketch-planning models. For example, activity-based models often provide much more robust capabilities and sensitivities for evaluating pricing scenarios. Because activity-based models typically function at the level of individual persons and represent how these persons travel across the entire day, the model is more sensitive to pricing policies that may vary by time of day, which involve more complex tolling schemes. Another critical advantage of activity-based models is that they produce more detailed performance metrics, such as how travel benefits (or disbenefits) accrue to different populations, which can be used to support equity analyses. In addition, activity-based models can produce all of the trip-based model measures used to support regional planning, regional air quality, transit, and transportation demand management forecasting

Different from the conventional four-step travel demand model which the trip is used as the unit of modeling travel, Activity-Based Model (ABM) has a tour-based structure in which the tour preserving consistency in destination, mode, and time of day across trips. The entire activity-based modeling structure is depicted in Figure 135. All models are from home-based tours unless otherwise specified (Work-based sub-tours).



Source: JUTPI 2

Figure 135 Activity-Based Modeling System

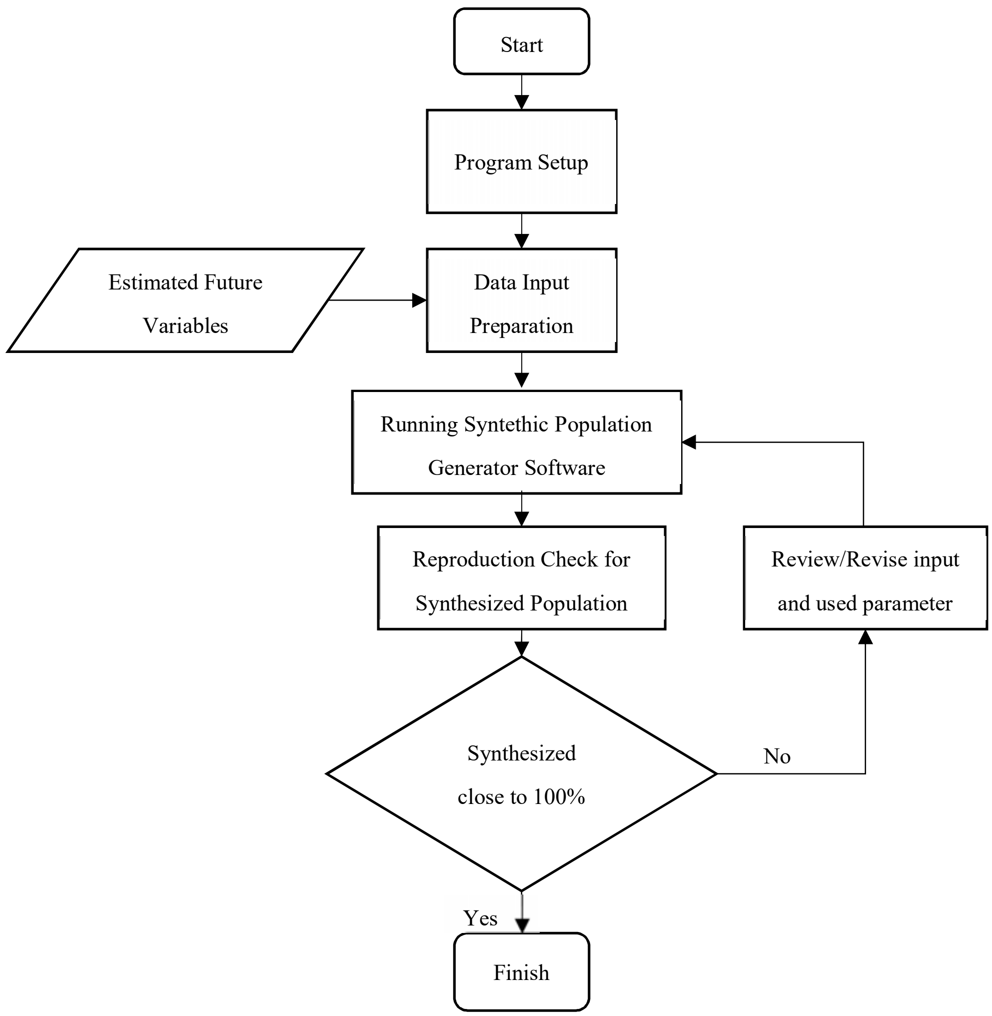
As a basic input to the proposed activity-based modeling system, various household and household member information, zone-based socioeconomic and land use data, highway and transit network-based data are prepared, and the modeling system will generate people's daily activity-travel patterns, tours, and trips that can be integrated into OD trips by mode and by the time of day for full network assignment. The base year is set as 2018 and all the models are estimated based on the input as of 2018. For future years, the population is updated first to prepare for household and household member information; especially, a household auto/motorcycle ownership choice model is adopted to set the number of autos and motorcycles owned by each household.

4.1.2 Population Synthesis

Population synthesis is utilized to generate population as an input for the microsimulation process. To estimate disaggregated travel behavior of each household and person in the Study Area for microsimulation modelling, a synthetic population whose attribute distribution matches those of the general population by traffic analysis zone (TAZ) and region (*kabupaten/kota*) is required. As a syntethic population generator software developed by Arizona State University and widely utilized for population synthesis in the

United States and other countries, was used in JUTPI 2. It utilizes typical Iterative Proportional Fitting (IPF) as a way for matching person and household based on their control total by TAZ. For household and person samples, the combined result of Commuter Survey in JUTPI 1 and Activity – Travel Diary Survey in JUTPI 2 was utilized as it contains fundamental household and personal attributes that affect the estimation of travel behavior. There are 10 attributes used in this population synthesis: household size, household income, the distance to the nearest railway station, gender, age, social status, type of work, allowance, toll allowance, and parking allowance.

The population synthesis process was implemented in several steps as described in Figure 136.



Source: JUTPI 2

Figure 136 Methodology of Population Synthesis

In this study, the population is synthesized for seven cases as follows:

1. Present case in 2018
2. Master Plan Case in 2024
3. Master Plan Case in 2029
4. Master Plan Case in 2035
5. Do Minimum Case in 2024
6. Do Minimum Case in 2029
7. Do Minimum Case in 2035

Even though the population is synthesized, the result should be validated in TAZ/ individual level because this method is controlled with just only macroscopic indices. Validation data means checking whether all targeted values in each variable and synthesized result are matched closely to each other. A good result will show nearly 100% match; therefore, the synthesized population result can be utilized as input preparation for the microsimulation process. In this step, only 5% of the total synthesized population that is systematically selected will be used as an input for the next process.

4.1.3 Microsimulation

Microsimulation is a repeated process of calculating travel demand by simulating trips of individual household members based on Activity-Based Travel Demand models for each household (Figure 134). Microsimulation needs several inputs to start the process such as synthetized population, Activity-Based Models, and auto/motorcycle ownership choice model.

The process starts with the approach to expand the identified sample patterns to the population level. Microsimulation estimates the number of autos/motorcycles for each household from the synthetized population. Then, using the data from the synthetized population, the Activity-Based Modeling system started, from the upper model first followed by the lower model. An initial activity, mode, and start time are drawn from the selected synthetized household. With these initial parameters on selected synthetized household, the trip is then simulated based on the Monte Carlo approach of potential activity-specific destinations within a range of travel times from home locations[5].

[5] McNally, M. G. (1996). An Activity-Based Microsimulation Model for Travel Demand Forecasting. UC Irvine: Center for Activity Systems Analysis.

Individuals of the same household are processed through microsimulation at the same time following the intra-household interaction rules. When microsimulation is finished for one household activity patterns, tours, and trips made by all the members of the household are recorded in output files. Then microsimulation task is repeated for the next household. The next process is the output that is to be utilized by the network assignment model to estimate network paths, estimates of the link volumes and speeds, and OD travel times and cost by travel mode, time of day, and user income class.

One main focus of microsimulation is how it is on the systematic and iterative exchange of information implemented between the microsimulation process and the network assignment model to converge a stable solution[6]. Relatively long run times are required to reach acceptable levels of convergence and equilibrium. Because the activity-based model is implemented in disaggregate Monte Carlo simulation framework, it is possible to run the model using only sub-samples of the population; this option can significantly reduce model run times[7]. This microsimulation is only using 5% of the population that is picked randomly by the system in population synthesis.

4.2 Network Assignment and Model Validation

Link volumes that can be estimated using an assignment result on the base year road network are compared with traffic volumes that were observed in the transport surveys conducted by JUTPI 2 study team. Comparison with the screenline survey is presented in Table 45, showing a good model fit.

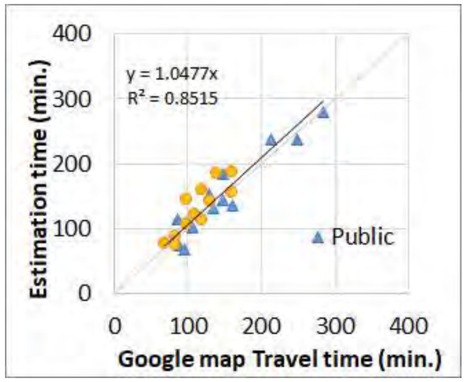
Table 45 Comparison between Model and Screenline Survey

Mode	Model	Survey	Gap (%)
Car	4,073,633	3.908,574	4
Motorcycle	8,216,273	8,309,800	-1
Public Transport	2,158,512	2,119,078	2

Source: JUTPI 2

Validation was also done to compare travel time and travel speed between model and survey result or other secondary data sources. Comparison of travel time between major City or Region was conducted by comparing travel time in the model (between TAZ) and travel time in web mapping service between the same origin-destination pairs as shown in Figure 137.

[6] National Academies of Sciences, Engineering, and Medicine (2014). Activity-Based Travel Demand Models: A Primer. Washington, DC: The National Academies Press.



Source: JUTPI 2

Figure 137 Comparison of Travel Time between Major Points

Travel time also can be validated from the comparison of the model result with ADS MEILI by calculating the average for private vehicle and public transport modes.

Table 46 Comparison of Private Vehicle Travel Speed

	Model	Survey
AM Peak	15.2 kph	16.7 kph
Midday	16.7 kph	15.4 kph
PM Peak	14.1 kph	15.0 kph

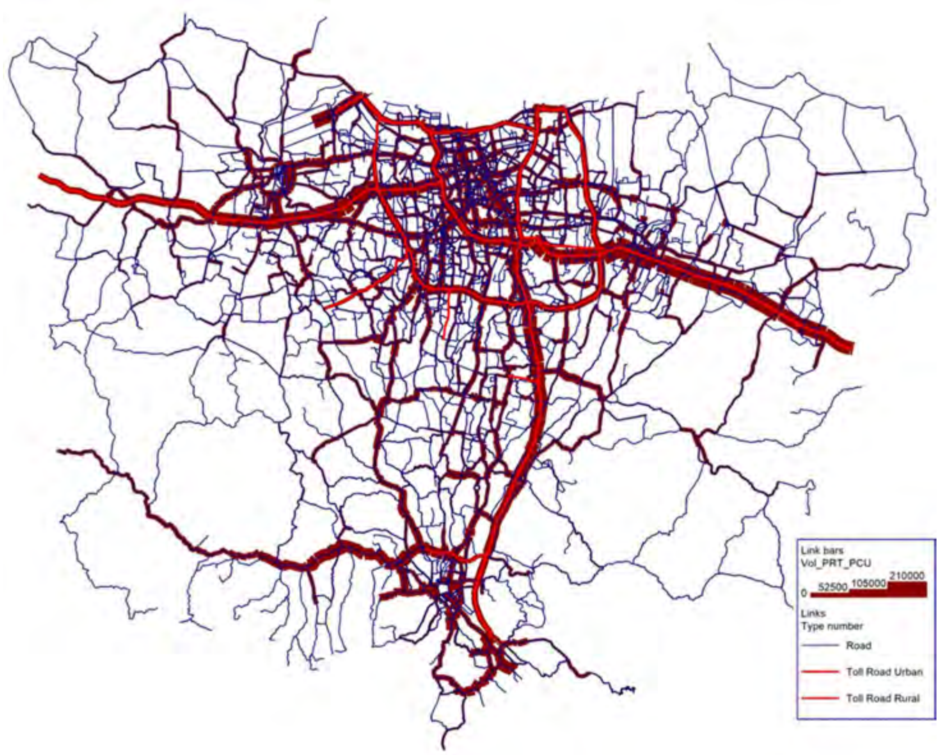
Source: JUTPI 2

Table 47 Comparison of Public Transport Travel Speed

	Model	Survey
AM Peak	14.6 kph	13.8 kph
Midday	16.0 kph	15.6 kph
PM Peak	13.4 kph	12.7 kph

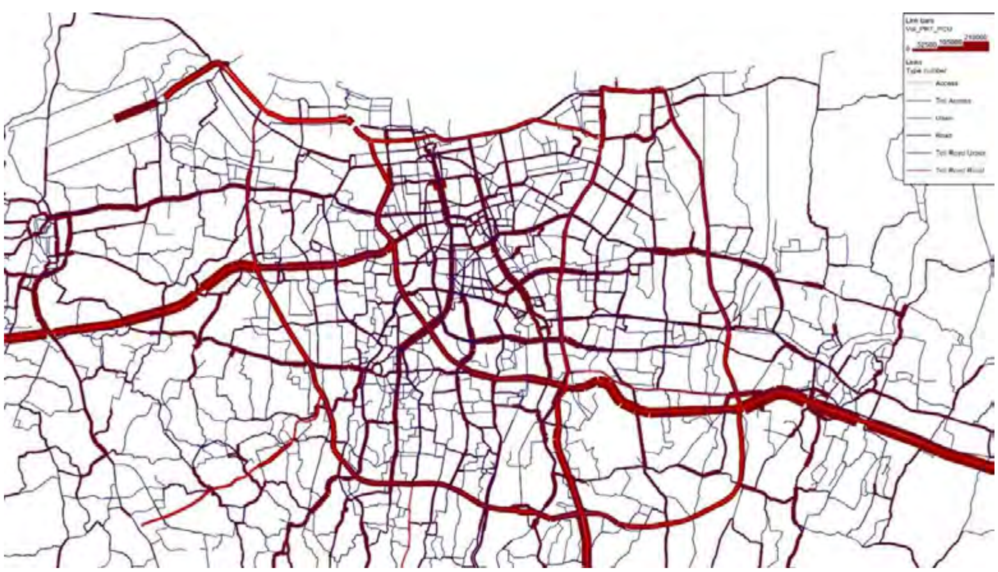
Source: JUTPI 2

Network assignment results for vehicular demand on the road network and passenger demand on the public transportation network for base year network are shown in Figure 138 to Figure 141.



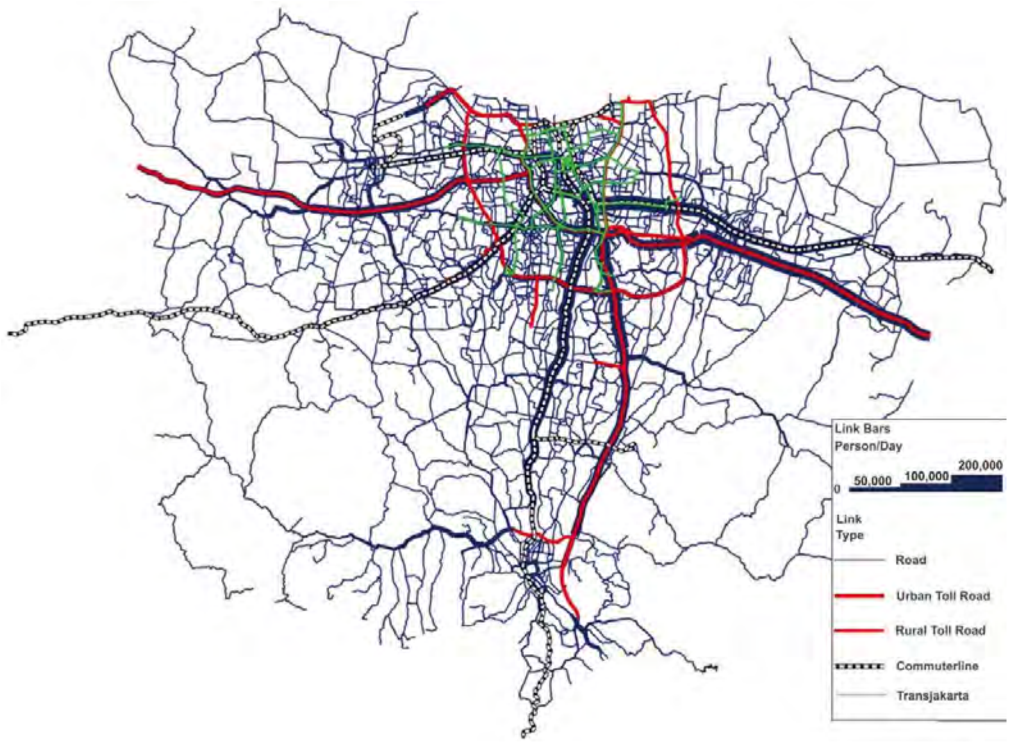
Source: JUTPI 2

Figure 138 Present Case Private Vehicle Assignment Result (JABODETABEK)



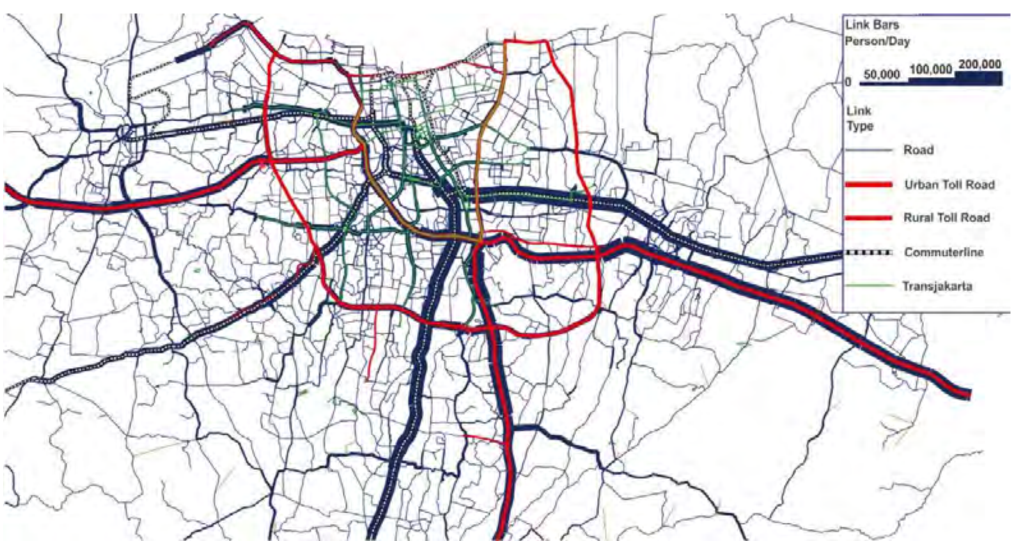
Source: JUTPI 2

Figure 139 Present Case Private Vehicle Assignment Result (DKI Jakarta)



Source: JUTPI 2

Figure 140 Present Case Public Transport Passenger Assignment Result (JABODETABEK)

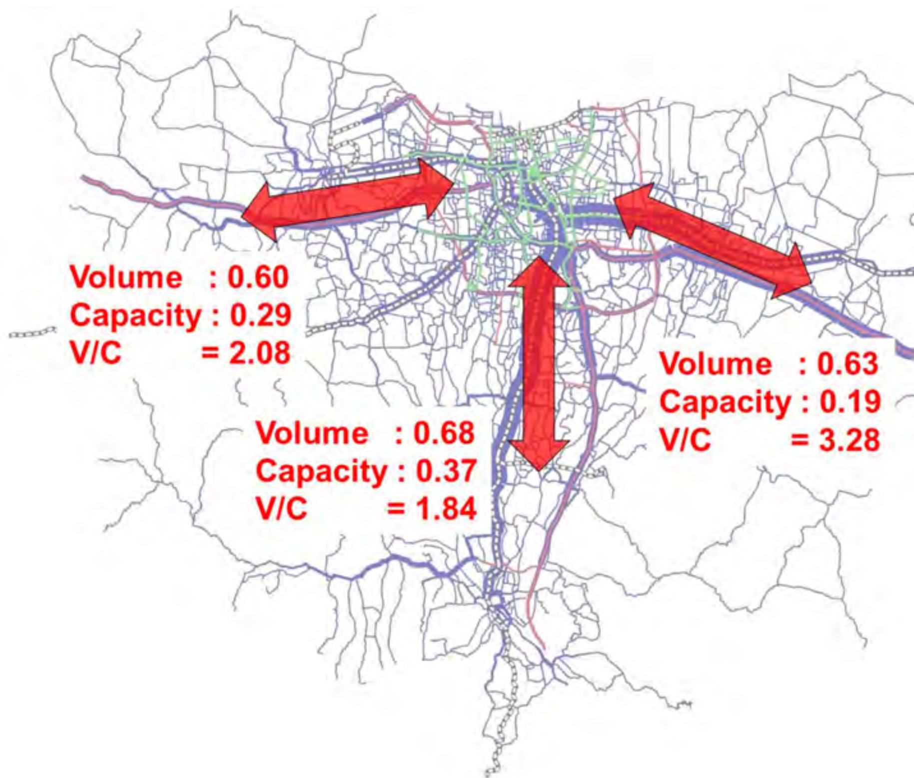


Source: JUTPI 2

Figure 141 Present Case Public Transport Passenger Assignment Result (DKI Jakarta)

4.3 Transit Trips V/C Assessment

Analysis of transit trips was made based on the assignment result in Section 4.2. The existing network is suffering from unbalancing demand and supply. Therefore, more mass transit corridors with higher capacity are needed by upgrading the planned platform, for example: from BRT to LRT and LRT to MRT, with TDM policies applied.



Unit: Mil. Pax/day/2 ways
Source: JUTPI 2

Figure 142 Present Case Volume/Capacity Major Public Transport Corridors

Future transit network master plan that can accommodate future demand is determined by considering the capacity of mass transit modes such as Commuterline, BRT, LRT, and MRT. If the demand divided by the capacity of the planned mass transit corridor is more than 1, it means that the mass transit corridor still needs to be expanded more.

Table 48 Passenger Demand & Capacity of Mass Transit Mode (JABODETABEK)

Year	Direction	No. of Lines				Capacity (PAX/Peak hour/Direction)					Capacity (PAX/day/2 ways)	PT. Pasesenger Demand (PAX/day/ 2ways)	Demad/ Capacity
		CL	BRT*	LRT	MRT	CL	BRT*	LRT	MRT	Total			
2018	Bekasi	1	2			10,000	7,200			17,200	191,000	626,530	3.28
	Tangerang	2	3			15,000	10,800			25,800	287,000	597,730	2.08
	Depok+Bogor	1	1			30,000	3,600			33,600	373,000	684,900	1.84
2029 (DoMin)	Bekasi	1	2	1		8,000	6,000	-	-	14,000	140,000	1,082,520	7.73
	Tangerang	2	3			12,000	9,000	-	-	21,000	210,000	893,720	4.26
	Depok+Bogor	1	1	1		24,000	3,000	-	-	27,000	270,000	835,500	3.09
2035 (DoMin)	Bekasi	1	2	1		8,000	6,000	-	-	14,000	140,000	1,198,880	8.56
	Tangerang	2	3			12,000	9,000	-	-	21,000	210,000	982,182	4.68
	Depok+Bogor	1	1	1		24,000	3,000	-	-	27,000	270,000	925,900	3.43
2035 (RITJ)	Bekasi	1	2	1	1	8,000	6,000	13,080	50,000	77,080	771,000	1,137,220	1.47
	Tangerang	2	6	2	1	12,000	18,000	4,629	50,000	84,629	846,000	1,151,620	1.36
	Depok+Bogor	1	1	1		48,000	3,000	13,080	-	64,080	641,000	1,121,400	1.75
2035 (JUTPI 2)	Bekasi	2	0	1	2	16,000	-	13,080	100,000	129,080	1,291,000	1,144,635	0.89
	Tangerang	2	2	1	3	12,000	6,000	2,314	150,000	170,314	1,703,000	1,409,235	0.83
	Depok+Bogor	2	1	2	1	57,600	3,000	26,160	50,000	136,760	1,368,000	1,104,200	0.81

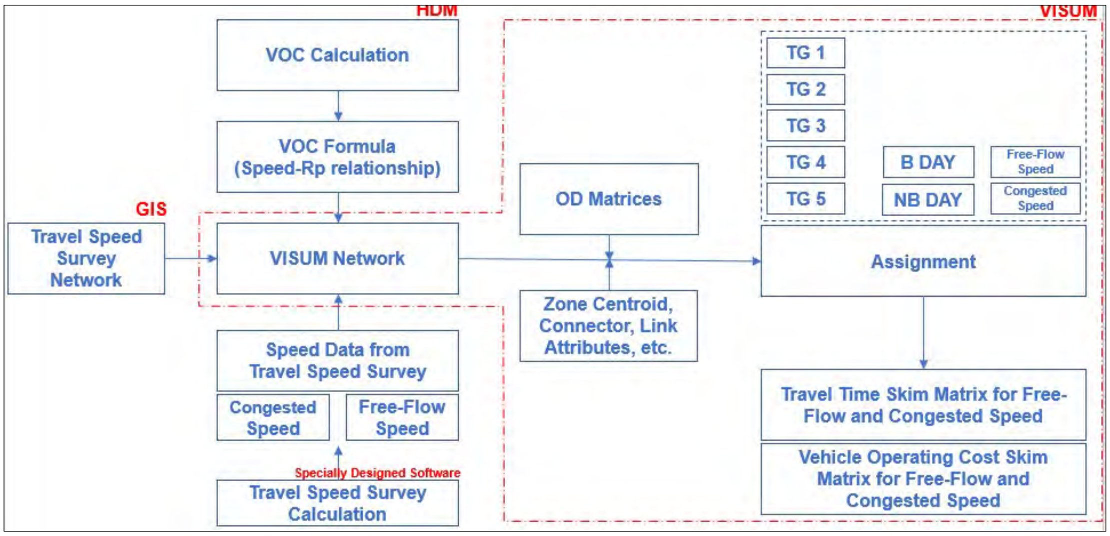
*BRT routes passing same road are counted as single line
Source: JUTPI 2

4.4 Economic Loss from Traffic Congestion

As a result of the increasing traffic demand, JABODETABEK, especially DKI Jakarta, is suffering from severe traffic congestion resulting in longer travel times on roads. According to the Asian Development Bank (ADB), road congestion already costs Asian economies an estimated 2%–5% of gross domestic product (GDP) every year due to lost time and higher transport costs.

SITRAMP (2002) predicted the annual economic loss caused by traffic congestion in the region could be as much as IDR 3,000 billion for operating costs and IDR 2,500 billion for travel time.

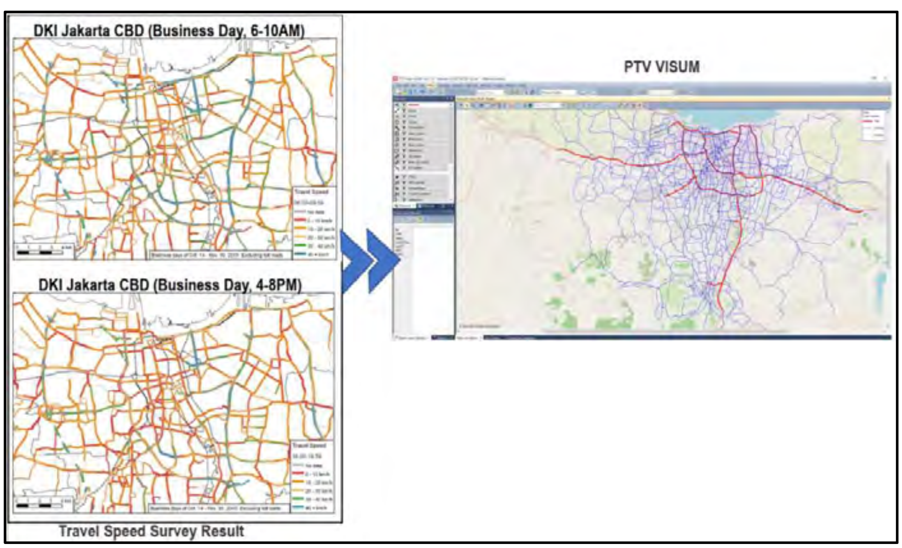
There are several variables that can be included in the congestion cost analysis. This study only considers two main variables for congestion cost, delay (Value of Time) and Vehicle Operating Cost (VOC).



Source: JUTPI 2

Figure 143 Methodology of Congestion Cost Analysis

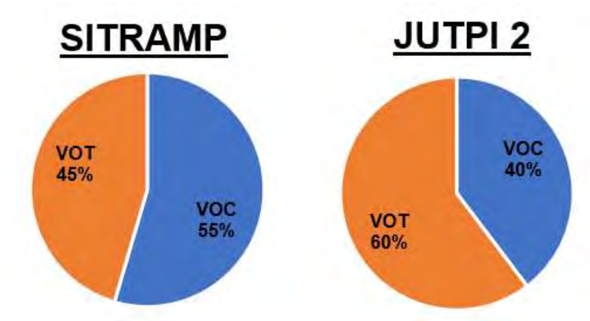
Travel speed data was utilized to get real speed data in the network. By using the real speed as an assumption of free-flow speed in the all-or-nothing assignment (which assumes that there are no congestion effects, that all drivers consider the same attributes for route choice, and that they perceive and weight them in the same way), travel time shortest path search for each OD pair can be achieved. The assignment was done in VISUM to get skim matrix (travel time and VOC) based on the shortest travel time for each OD pair for all (five) time groups.



Source: JUTPI 2

Figure 144 Process of Converting from Travel Speed Data (GIS) to PTV Visum

With the calculation mentioned above, the annual economic loss caused by traffic congestion in JABODETABEK reached IDR 40 trillion for vehicle operating costs and IDR 60 trillion for travel time. This value is equal to 4% of JABODETABEK GRDP or equal to the cost of development of two or three MRT lines. This value also means that each person in JABODETABEK loses IDR 3 million every year unwittingly.



Source: JUTPI 2

Figure 145 Comparison Congestion Cost Component in SITRAMP and JUTPI 2

Table 49 Comparison Congestion Cost with Other Countries

Area	Costs Included	Cost (Million USD)	Cost (Trillion IDR)	Cost Per Capita (USD)
Tokyo (2005)	Fuel and other VOC, delay	10909		867
Tokyo Metropolitan (2005)	Fuel and other VOC, delay	25455		715
Lost Angeles-Long Beach-Santa Ana (2010)	Fuel, delay	11000		618
New York-Newark, NY-NJ-CT (2010)	Fuel, delay	9800		527
Chicago Area (2010)	Fuel, delay	8200		921
JABODETABEK (2002)-SITRAMP	Fuel and other VOC, delay	617	6	29
Jakarta (2010)-Dishub	Fuel and other VOC, delay	5200	46	542
JABODETABEK (2018)-Bappenas		7051	100	208
JABODETABEK (2018)-JUTPI 2	Fuel and other VOC, delay	7020	100	207

Note:
2019 1 USD = 14,182 IDR
2005 1 USD = 110 JPY

Source:
- Cairo Traffic Congestion Study. World Bank
- http://www.thejakartapost.com/news/2011/03/16/congestion-costs-jakarta-rp-46-trillion.html
- 2011 Urban Mobility Report, Texas Transportation Institute, 2011.
- https://megapolitan.kompas.com/read/2019/01/09/17515841/anies-sebut-kerugian-kemacetan-di-JABODETABEK-capai-rp-100-triliun
- http://www.tokyo23city-kuchokai.jp/katsudo/jichi/pdf/240731/data03_02.pdf
- JUTPI 2

Chapter 5 FUTURE PERSPECTIVE AND TRANSPORTATION DEVELOPMENT SCENARIOS

5.1 Future Perspective of JABODETABEK

Development area in JABODETABEK has been grown rapidly in the last decade which triggered economic expansion and population increase. In the future, the population growth will keep on increasing especially in the outskirt of DKI Jakarta as a result of industrial area extension and new center development. Future perspective of the JABODETABEK economy will be characterized by the service and manufacturing industry as the leading sector.

5.1.1 Socioeconomic Framework

(1) Future Population

The projections utilize the cohort-component method which divides the age group population-based into 5-year intervals. The cohort component method includes the component of demographic change to project population growth. The technique projected the population by age group, age of cohort typically split between males and females considering survival rate projection including migration, fertility, and mortality. Through this methodology, the population projection is estimated as shown in Table 50.

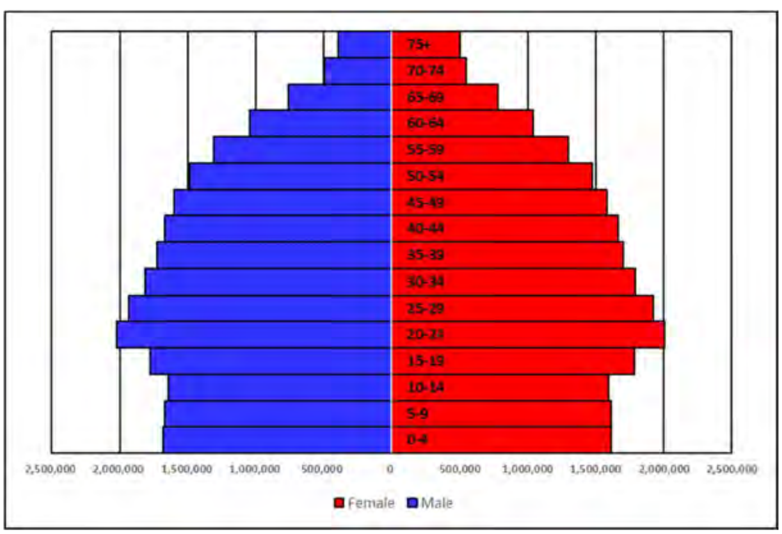
Table 50 Population Projection by Gender and Age Group (JABODETABEK)

Age	2017	2020	2025	2029	2030	2035
Male						
0-4	1,591,605	1,595,054	1,609,482	1,621,129	1,624,041	1,638,732
5-9	1,517,897	1,598,279	1,612,737	1,624,407	1,627,325	1,642,045
10-14	1,331,091	1,436,432	1,599,725	1,611,301	1,614,195	1,628,797
15-19	1,335,703	1,395,891	1,563,260	1,705,428	1,740,970	1,756,718
20-24	1,475,111	1,503,851	1,607,216	1,761,381	1,799,923	2,004,537
25-29	1,563,403	1,554,150	1,598,246	1,686,129	1,708,099	1,912,902
30-34	1,574,851	1,616,224	1,613,091	1,649,706	1,658,859	1,772,878
35-39	1,479,082	1,551,654	1,627,233	1,624,709	1,624,079	1,670,159
40-44	1,315,490	1,422,076	1,549,528	1,609,909	1,625,004	1,621,853
45-49	1,089,547	1,207,394	1,386,495	1,485,905	1,510,758	1,584,345
50-54	860,963	987,153	1,185,203	1,325,850	1,361,012	1,482,991
55-59	645,533	751,471	947,516	1,099,594	1,137,613	1,306,363
60-64	439,997	527,147	682,850	825,365	860,993	1,033,732
65-69	265,994	334,331	460,107	568,828	596,008	751,496
70-74	153,857	190,040	276,265	359,410	380,196	492,495

Age	2017	2020	2025	2029	2030	2035
75+	131,803	157,763	213,225	273,194	288,186	389,499
Total	16,771,927	17,828,910	19,532,178	20,832,245	21,157,262	22,689,543
Female						
0-4	1,527,701	1,531,198	1,545,072	1,556,271	1,559,071	1,573,197
5-9	1,449,789	1,543,659	1,557,645	1,568,936	1,571,759	1,586,000
10-14	1,266,332	1,365,355	1,553,439	1,564,699	1,567,514	1,581,717
15-19	1,334,811	1,382,757	1,541,489	1,711,367	1,753,837	1,769,727
20-24	1,507,893	1,507,439	1,581,747	1,727,007	1,763,322	2,006,228
25-29	1,573,938	1,593,733	1,601,511	1,664,667	1,680,456	1,873,363
30-34	1,552,635	1,604,704	1,653,628	1,660,084	1,661,698	1,743,611
35-39	1,441,795	1,517,521	1,601,555	1,640,617	1,650,383	1,658,437
40-44	1,241,440	1,365,789	1,506,938	1,573,696	1,590,385	1,638,873
45-49	1,019,323	1,141,988	1,347,949	1,459,393	1,487,254	1,569,612
50-54	812,548	930,263	1,132,843	1,296,292	1,337,154	1,475,344
55-59	610,351	716,346	901,276	1,058,290	1,097,544	1,295,489
60-64	410,141	506,247	672,613	811,525	846,253	1,030,538
65-69	261,690	325,746	465,654	588,074	618,679	778,396
70-74	170,298	204,247	289,359	388,783	413,639	549,571
75+	177,470	210,850	281,195	356,245	375,008	500,120
Total	16,358,155	17,447,842	19,233,912	20,625,948	20,973,957	22,630,223
Grand Total	33,130,082	35,276,752	38,766,091	41,458,193	42,131,218	45,319,765

Source: JUTPI 2

It is estimated that in 2035, the population in JABODETABEK is 45 million, increasing 34% from 2017 with an equal ratio of male and female (Sex ratio = 1). The highest percentage comes from group 20-24 and 25-29, exceeding 8%. The lowest age group percentage comes from 75+ with less than 2% of the total population.



Source: JUTPI 2

Figure 146 JABODETABEK Population Structure in 2035

(2) Employment and School Enrollment

The number of workers and students that were calculated with population structure and composition population is shown below. The number of workers increases from 7 million in 2010 to 18 million in 2035, and the number of students increases from 6.5 million in 2010 to 10.3 million in 2035.

Table 51 Number of Workers and Student in the Future

	City	2010 (JUTPI 1)	2017	2020	2025	2029	2030	2035
Workers	Jakarta Selatan	793,718	739,291	767,568	810,650	849,082	859,307	911,331
	Jakarta Timur	621,130	998,658	1,034,123	1,085,501	1,131,510	1,143,753	1,208,710
	Jakarta Pusat	569,240	322,923	331,056	341,749	350,693	353,109	364,116
	Jakarta Barat	452,765	919,331	960,303	1,024,625	1,085,498	1,101,588	1,193,096
	Jakarta Utara	228,131	626,674	647,543	677,473	706,779	714,511	757,324
	Kab. Tangerang	627,535	1,165,698	1,308,024	1,560,718	1,791,881	1,851,984	2,187,043
	Kota Tangerang	535,747	784,933	859,364	983,830	1,089,869	1,117,422	1,261,719
	Kota Tangerang Selatan	214,545	566,257	637,985	765,267	879,925	909,770	1,071,364
	Kab. Bogor	1,220,515	1,746,354	1,928,345	2,249,601	2,525,336	2,596,971	2,976,259
	Kab. Bekasi	806,839	1,166,030	1,342,142	1,678,670	1,997,145	2,079,812	2,560,338
	Kota Bogor	179,923	334,755	362,867	410,215	448,279	458,159	506,982
	Kota Bekasi	344,067	946,856	1,052,469	1,238,606	1,397,474	1,438,641	1,656,802
	Kota Depok	569,871	751,719	854,830	1,046,587	1,220,625	1,265,766	1,518,497
	Total	7,164,025	11,069,479	12,086,620	13,873,492	15,474,097	15,890,794	18,173,582
Students	Jakarta Selatan	879,795	458,931	483,726	513,866	515,268	515,678	493,223
	Jakarta Timur	570,077	615,988	648,840	686,422	685,544	685,376	651,861
	Jakarta Pusat	483,284	196,053	201,218	204,886	199,362	197,978	182,398
	Jakarta Barat	432,762	574,019	607,733	658,973	677,417	682,143	669,879
	Jakarta Utara	234,194	405,337	424,272	450,496	455,123	456,308	440,250
	Kab. Tangerang	602,789	886,997	967,310	1,109,321	1,205,967	1,230,636	1,320,291
	Kota Tangerang	529,635	477,671	505,595	550,578	576,979	583,697	600,220
	Kota Tangerang Selatan	198,916	333,678	365,470	419,817	455,808	465,047	500,030
	Kab. Bogor	951,996	1,515,897	1,604,785	1,754,017	1,862,754	1,890,489	2,009,422
	Kab. Bekasi	733,904	814,407	902,110	1,062,817	1,201,414	1,236,750	1,420,063
	Kota Bogor	146,434	243,010	252,458	267,384	276,727	279,106	286,741
	Kota Bekasi	349,265	639,786	681,237	752,767	808,190	822,320	884,359
	Kota Depok	432,165	502,480	549,008	631,675	700,401	717,961	804,608
	Total	6,545,217	7,664,255	8,193,763	9,063,020	9,620,953	9,763,488	10,263,343

Source: JUTPI 2

In the future, two things affect the number of workers; one is the share of the work sector, and another is the growth rate. Thus, the number of workers is estimated considering these two factors.

Because the trend is not the same between kabupaten/kota levels, the share of the work sector should be considered by averaging the number of shares in kabupaten/kota. Thus, the whole growth rate should be considered towards the direction of low increment in the primary and secondary sectors and higher increment for the tertiary sector.

As a result, the share of the work sector is shown below. The estimation of the number of workers by sector is calculated using Table 52

Table 52 Future Share of Worker by Sector in 2035

Sector	City	2002 (SITRAMP)	2010 (JUTPI 1)	Average share	2035 Assumption
Primary	DKI Jakarta	2%	2%	1%	0.4%
	Kab. Tangerang	12%	8%	8%	3%
	Kota Tangerang	2%	2%	1%	0.4%
	Kota Tangerang Selatan	-	3%	1%	0.4%
	Kab. Bogor	18%	17%	13%	4%
	Kab. Bekasi	21%	15%	11%	4%
	Kota Bogor	6%	5%	3%	1%
	Kota Bekasi	3%	2%	1%	0.5%
	Kota Depok	4%	3%	2%	1%
	Total	8%	6%	5%	2%
Secondary	DKI Jakarta	19%	17%	19%	11%
	Kab. Tangerang	29%	40%	40%	29%
	Kota Tangerang	34%	29%	32%	20%
	Kota Tangerang Selatan	-	14%	11%	6%
	Kab. Bogor	26%	28%	25%	17%
	Kab. Bekasi	32%	38%	36%	26%
	Kota Bogor	24%	21%	18%	11%
	Kota Bekasi	27%	29%	25%	16%
	Kota Depok	21%	21%	16%	9%
	Total	24%	25%	24%	16%
Tertiary	DKI Jakarta	78%	81%	80%	89%
	Kab. Tangerang	60%	51%	52%	68%
	Kota Tangerang	64%	70%	67%	79%
	Kota Tangerang Selatan	-	84%	88%	93%
	Kab. Bogor	56%	54%	62%	79%
	Kab. Bekasi	47%	47%	53%	70%
	Kota Bogor	69%	74%	79%	88%
	Kota Bekasi	69%	69%	73%	84%
	Kota Depok	74%	76%	82%	90%
	Total	68%	69%	71%	82%
Total	DKI Jakarta	100%	100%	100%	100%
	Kab Tangerang	100%	100%	100%	100%
	Kota Tangerang	100%	100%	100%	100%
	Kota Tangerang Selatan	-	100%	100%	100%
	Kab. Bogor	100%	100%	100%	100%
	Kab. Bekasi	100%	100%	100%	100%
	Kota Bogor	100%	100%	100%	100%
	Kota Bekasi	100%	100%	100%	100%
	Kota Depok	100%	100%	100%	100%
	Total	100%	100%	100%	-

Source: JUTPI 2

According from population structure and the assumption of worker by sector, the number of workers in 2035 was estimated in Table 53.

Table 53 Future Number of Workers in Residential Place

	JUTPI 1								2035 Assumption							
	Primary		Secondary		Tertiary		Total		Primary		Secondary		Tertiary		Total	
	No .('000)	%	No .('000)	%	No .('000)	%	No .('000)	%	No. ('000)	%	No. ('000)	%	No. ('000)	%	No .('000)	%
DKI Jakarta	60	11.3%	524	24.6%	2,504	42.5%	3,088	36.1%	22	4.9%	459	15.6%	3,954	26.7%	4,435	24.4%
Kota Tangerang	9	1.7%	168	7.9%	404	6.9%	580	6.8%	6	1.4%	246	8.4%	1,009	6.8%	1,262	6.9%
Kab. Tangerang	57	10.7%	274	12.9%	351	6.0%	682	8.0%	76	17.1%	605	20.6%	1,507	10.2%	2,187	12.0%
Kota Tangerang - Selatan	11	2.0%	57	2.7%	346	5.9%	414	4.8%	5	1.1%	66	2.2%	1,001	6.8%	1,071	5.9%
Kota Depok	12	2.3%	93	4.4%	337	5.7%	441	5.2%	12	2.8%	134	4.5%	1,372	9.4%	1,518	8.4%
Kota Bogor	12	2.3%	57	2.7%	197	3.3%	267	3.1%	7	1.6%	57	1.9%	443	3.0%	507	2.8%
Kab. Bogor	235	44.2%	381	17.9%	726	12.3%	1,342	15.7%	187	42.1%	486	16.5%	2,303	15.6%	2,976	16.4%
Kota Bekasi	19	3.6%	273	12.9%	652	11.1%	944	11.0%	10	2.2%	249	8.5%	1,398	9.5%	1,657	9.1%
Kab. Bekasi	116	21.9%	298	14.0%	372	6.3%	787	9.2%	119	26.8%	641	21.8%	1,801	12.2%	2,560	14.1%
Total	532	100.0%	2,125	100.0%	5,889	100.0%	8,545	100.0%	305	100.0%	2,896	100.0%	14,973	100.0%	18,174	100.0%

Source: JUTPI 2

Estimated number of the workers at the workplace is shown below. Because the number of workers at the workplace is affected by regional industrial development plans, in the future, workers at the workplace in the primary and secondary sectors concentrating in DKI Jakarta will change to the tertiary sector from 1,969 (44.2%) in 2010 to 6,788 (45.3%) while the share of tertiary is almost the same as JUTPI 1.

Table 54 Number of Workers on Workplace

	JUTPI (2010)							
	Primary		**Secondary**		**Tertiary**		**Total**	
	No.('000)	**%**	**No.('000)**	**%**	**No.('000)**	**%**	**No.('000)**	**%**
DKI Jakarta	86	23.6%	818	36.6%	1,969	44.2%	2,873	40.7%
Kota Tangerang	10	2.6%	146	6.5%	438	9.8%	593	8.4%
Kab. Tangerang	18	4.8%	154	6.9%	428	9.6%	599	8.5%
Kota Tangerang - Selatan	23	6.3%	37	1.6%	117	2.6%	177	2.5%
Kota Depok	54	14.8%	135	6.0%	224	5.0%	413	5.8%
Kota Bogor	22	5.9%	78	3.5%	57	1.3%	157	2.2%
Kab. Bogor	85	23.4%	500	22.4%	492	11.0%	1,078	15.3%
Kota Bekasi	20	5.5%	89	4.0%	187	4.2%	296	4.2%
Kab. Bekasi	48	13.0%	281	12.5%	545	12.2%	873	12.4%
Total	365	100.0%	2,238	100.0%	4,457	100.0%	7,060	100.0%
	(2018)							
	Primary		**Secondary**		**Tertiary**		**Total**	
	No.('000)	**%**	**No.('000)**	**%**	**No.('000)**	**%**	**No.('000)**	**%**
DKI Jakarta	72	13.7%	701	27.3%	2,973	49.4%	3,747	41.1%
Kota Tangerang	8	1.6%	227	8.8%	378	6.3%	614	6.7%
Kab. Tangerang	48	9.2%	346	13.5%	355	5.9%	751	8.2%
Kota Tangerang - Selatan	7	1.5%	62	2.4%	306	5.1%	376	4.1%
Kota Depok	9	1.7%	92	3.6%	280	4.6%	381	4.2%
Kota Bogor	13	2.6%	66	2.6%	235	3.9%	315	3.5%
Kab. Bogor	279	52.9%	437	17.0%	696	11.6%	1414	15.5%
Kota Bekasi	9	1.8%	170	6.6%	424	7%	605	6.6%
Kab. Bekasi	78	14.8%	461	18%	364	6%	904	9.9%
Total	528	100.0%	2,566	100.0%	6,015	100.0%	9,110	100.0%
	2035 Assumption							
	Primary		**Secondary**		**Tertiary**		**Total**	
	No.('000)	**%**	**No.('000)**	**%**	**No.('000)**	**%**	**No.('000)**	**%**
DKI Jakarta	62	22.8%	791	19.3%	6,788	45.3%	7,642	39.5%
Kota Tangerang	6	2.3%	103	2.5%	1,490	9.9%	1,600	8.3%
Kab. Tangerang	13	4.9%	615	15.0%	1,525	10.2%	2,154	11.1%
Kota Tangerang - Selatan	17	6.4%	26	0.6%	398	2.7%	442	2.3%
Kota Depok	41	15.2%	96	2.3%	665	4.4%	802	4.1%
Kota Bogor	17	6.2%	168	4.1%	135	0.9%	320	1.7%
Kab. Bogor	65	23.7%	358	8.7%	1,479	9.9%	1,901	9.8%
Kota Bekasi	14	5.3%	1,746	42.5%	645	4.3%	2,406	12.4%
Kab. Bekasi	36	13.2%	200	4.9%	1,858	12.4%	2,094	10.8%
Total	273	100.0%	4,105	100.0%	14,983	100.0%	19,362	100.0%

Source: JUTPI 2 and JUTPI 1

The estimated number of students in the school/residential place is shown below. The trend for the number of students will be increasing from approximately 6.5 million in 2010 to approximately 10 million in 2035. The number of students at school place is almost the same as the value of the residential place.

Table 55 Number of Students on School/Residential Place

Students	JUTPI 1 (2010)				2018				2035 Assumption			
	School Place	%	Residential Place	%	School Place	%	Residential Place	%	School Place	%	Residential Place	%
Jakarta Selatan	754,701	12%	879,795	13%	617,408	8%	357,281	6%	474,792	5%	493,223	5%
Jakarta Timur	579,113	9%	570,077	9%	626,807	9%	522,754	8%	666,577	7%	651,861	6%
Jakarta Pusat	545,166	8%	483,284	7%	279,539	4%	181,783	3%	185,910	2%	182,398	2%
Jakarta Barat	426,297	7%	432,762	7%	488,690	7%	418,650	7%	627,453	6%	669,879	7%
Jakarta Utara	271,855	4%	234,194	4%	275,445	4%	322,807	5%	449,738	4%	440,250	4%
Kota Tangerang	534,955	8%	529,635	8%	402,887	5%	373,986	6%	608,510	6%	600,220	6%
Kab. Tangerang	659,881	10%	602,789	9%	809,229	11%	318,518	5%	1,361,412	13%	1,320,291	13%
Kota Tangerang Selatan	236,282	4%	198,916	3%	699,894	10%	668,886	11%	611,221	6%	500,030	5%
Kota Depok	368,902	6%	432,165	7%	384,399	5%	373,986	6%	786,581	8%	804,608	8%
Kota Bogor	135,171	2%	146,434	2%	513,096	7%	220,772	4%	280,085	3%	286,741	3%
Kab. Bogor	886,354	14%	951,996	15%	1,133,870	15%	1,123,684	18%	1,911,548	19%	2,009,422	20%
Kota Bekasi	324,447	5%	349,265	5%	523,912	7%	655,809	11%	865,559	8%	884,359	9%
Kab. Bekasi	753,780	12%	733,904	11%	609,580	8%	602,990	10%	1,405,071	14%	1,420,063	14%
Total	6,476,905	100%	6,545,217	100%	7,364,756	100%	6,144,473	100%	10,234,458	100%	10,263,343	100%

Source: JUTPI 2

As a result of the assumption, school enrollment will be further promoted in the 5-24-year-old segment of both males and females. Young inhabitants will be forecasted. However, the number of students will account for 25.8%, with an increase of 1.9 points, between 2017 and 2035. The increasing number of students between 2017 – 2035 has a similar growth between 2010 – 2017. It is forecasted that the number of students will increase by around 3 million between 2017 and 2035.

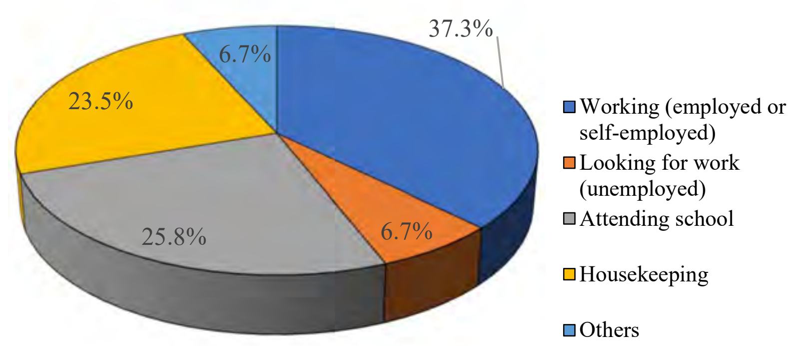
Other non-economically active populations such as students, housewives, and retirees will decrease its share from 56.0% in 2002 to 54.0% mainly due to the decrease of housewives and others (aged inhabitants). As a result, the labor force population share will slightly increase from 44.0% in 2017 to 46.0% in 2035. It is expected that the existing unemployment rate of 6.7% will be improved to 3.0% on the conditions of steady economic growth and moderate migration. The absolute working population will thus increase from 13 million in 2035 to 20 million in 2035.

Table 56 Forecasted Socioeconomic Data of JABODETABEK Residents, 2017 and 2035

Category	2017			2035		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Labor Force	64.4	23.0	44.0	66.5	26.2	46.0
Working (employed or self-employed)	56.3	17.7	37.3	62.1	23.3	43.0
Looking for work (unemployed)	8.1	5.2	6.7	4.4	3.0	3.0
Non-economically Active Population	35.6	77.0	56.0	34.9	73.8	54.0
Attending school	25.9	25.8	25.8	27.7	27.6	27.7
Housekeeping	0.4	47.2	23.5	0.1	42.8	21.1
Others	9.3	4.0	6.7	7.2	3.3	5.3

Source: JUTPI 2

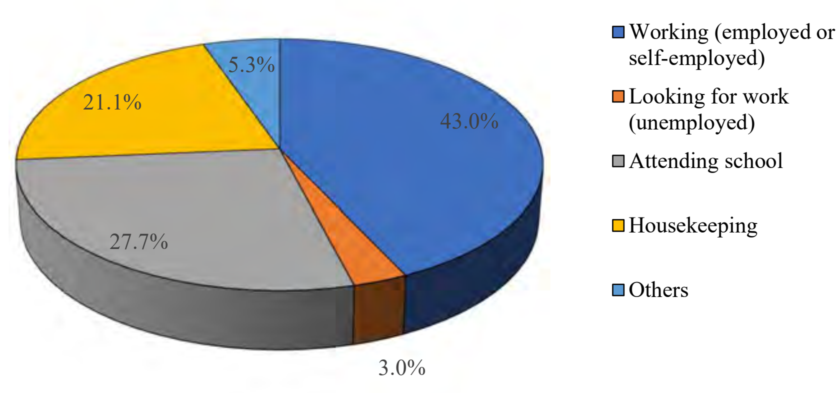
As of 2017, the largest share for labor force category is classified as working, either employed or self-employed while unemployment composition is considerably high at around 7%. For the non-economically active population, attending school is fairly distributed with housekeeping.



Source: JUTPI 2

Figure 147 Types of Economic Activity among JABODETABEK Inhabitants in 2017

Economic activity composition in 2035 shows an increase of working population (employed or self-employed) compare to 2017. However, composition of labor force and a non-economically active remains similar. Group of attending school remains similar that is fairly distributed with housekeeping.



Source: JUTPI 2

Figure 148 Types of Economic Activity among JABODETABEK Inhabitants in 2035

(3) Future GRDP

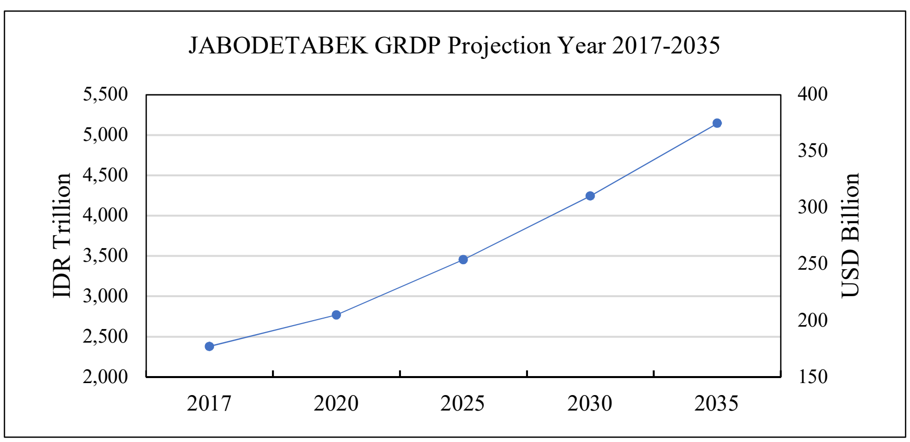
JABODETABEK economy has grown more rapidly compared to the national economy which growth, surpassing the national GDP with 0.66% margin. Following the forecast of GDP, JUTPI 2 assumed that GRDP growth rate of JABODETABEK will be stable around 5% for a couple of years to come by considering the recent trend of GRDP.

Table 57 Projected GRDP and GRDP Per Capita

	2017	2020	2025	2030	2035
GRDP (trillion IDR)	2,379	2,770	3,457	4,245	5,147
GRDP (billion USD)	168	195	244	299	363
Population (million persons)	33.1	35.3	38.8	42.1	45.3
GRDP Per Capita (million IDR)	71.8	84.5	105.5	129.5	157
GRDP Per Capita (USD)	5,063	5,958	7,439	9,131	11,070

Note: Value at 2010 Constant Price
1 USD = IDR 14,182 (2019)
Source: JUTPI 2

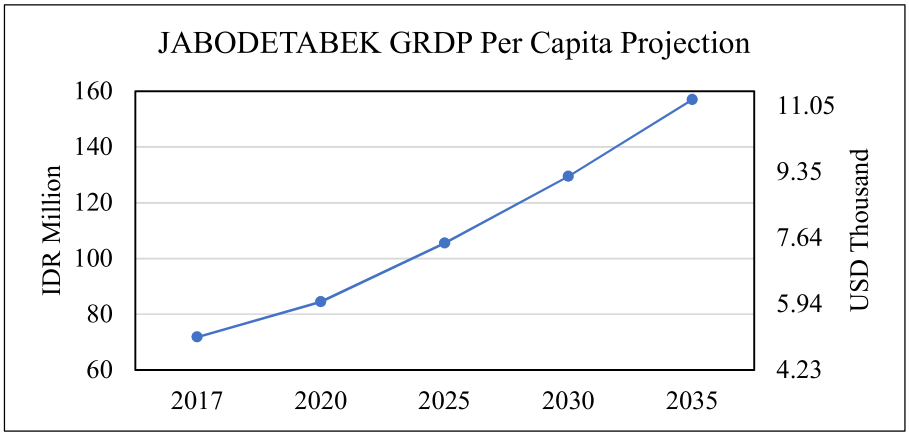
For the long-term period, GRDP growth trend will follow the national economy with a growth range of 4%-5%. The stable growth is based on some factors including consumption, investment, and inflation. Based on the macroeconomic assumption from "Economic Outlook of APBN 2018," it is shown that the economy was in a good condition with some positive trends in the prior years which generated by domestic (household) consumption which grew at 4.9% and investment grew at 5.8% with an interest rate of 4.25% on the other hand, inflation rate is targeted to be controlled at 3.0 – 4.0%.



Note: 1 USD = IDR 14,182 (2019)
Source: JUTPI 2

Figure 149 GRDP Projection of JABODETABEK Year 2017 – 2035

Using the GDP projection, it is assumed that the economic growth period will continue until the next 5 years before starting to slow down in the next few years. Therefore, JABODETABEK GRDP in 2035 is calculated at constant price and is projected for IDR 5,147 trillion or increases twice than the amount in 2017.



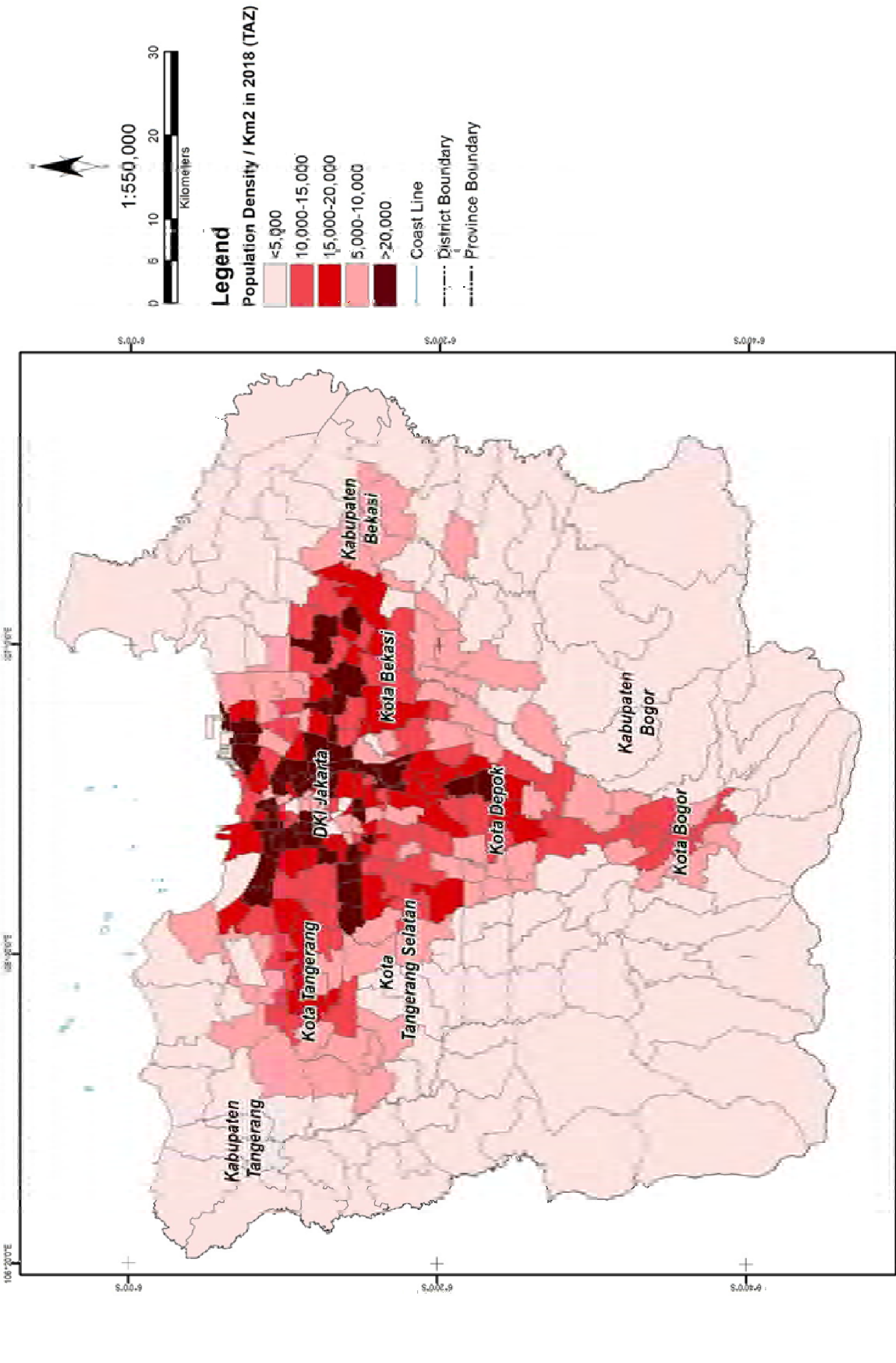
Note: 1 USD = IDR 14,182 (2019)
Source: JUTPI 2

Figure 150 GRDP Per Capita Projection of JABODETABEK Year 2017 - 2035

GRDP per capita also shows a significant increase that improves to IDR 157 million in 2035. Therefore, it is concluded that GRDP and GRDP per capita projection will grow positively due to the completion of some infrastructure projects as well as RITJ that leads to an improvement in the transportation system.

5.1.2 Land Development Potential

It is essential that the appropriate traffic demand forecast for transport planning. Socioeconomic framework data is fundamental for transport modeling exercises to obtain reliable forecast results. The projected socioeconomic framework data in JUTPI 2 is prepared in *kabupaten/kota* level, so this framework data needs to distribute in a spatial manner linked to the traffic analysis zone (TAZ). For the distribution of framework data, multi-regression analysis and GIS-based "development potential model" were utilized with various statistical and spatial data. By using these methods, future population and other necessary socioeconomic indicators are distributed spatially. By using these methods, future population and other necessary socioeconomic indicators are properly distributed. Population distribution in 2018 can be seen in the following figure.



Source: JUTPI 2

Figure 151 Population Density Distribution by TAZ 2018

(1) Overall of Distribution Methodology

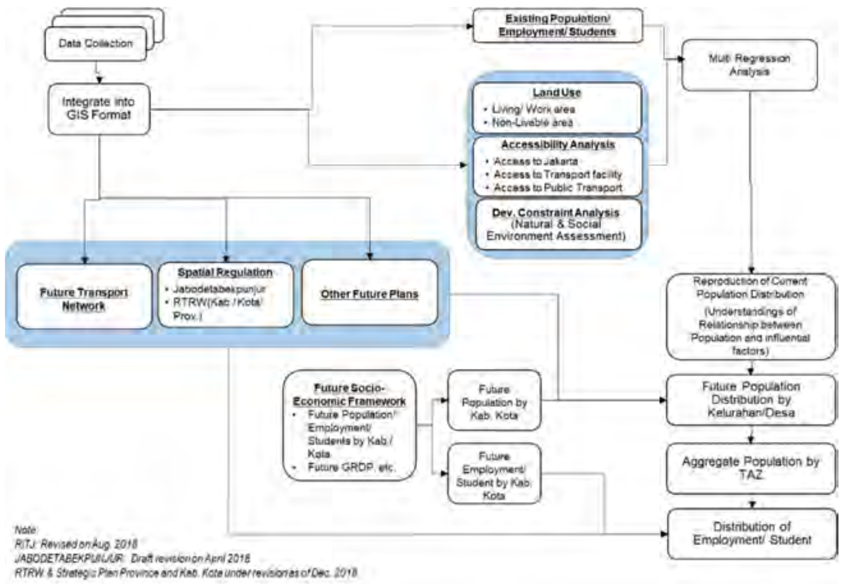
The overall methodology of population and employment distribution for Master Plan case (target year 2035) is explained as follows:

1) Data collection and integration into GIS dataset;
2) Development of population/employment distribution model is prepared to reproduce base year population distribution, using multi-regression analysis with population, current land use, and accessibility to transport facilities and natural conditions;
3) Based on the base-year model, future socioeconomic indicators are distributed in *kelurahan*/*desa* level with given future transport network and other future development plans such as spatial plans;
4) Aggregate *kelurahan*/*desa* level population into TAZ; and
5) Based on the TAZ population, estimate the number of employments and students based on the total population in 2035 and target year land use.

On the other hand, intermediate years of 2024 and 2029 are estimated using a different method from the development potential model, because of no data of each intermediate year land use plan. Summary of estimation of intermediate year population is as follows:

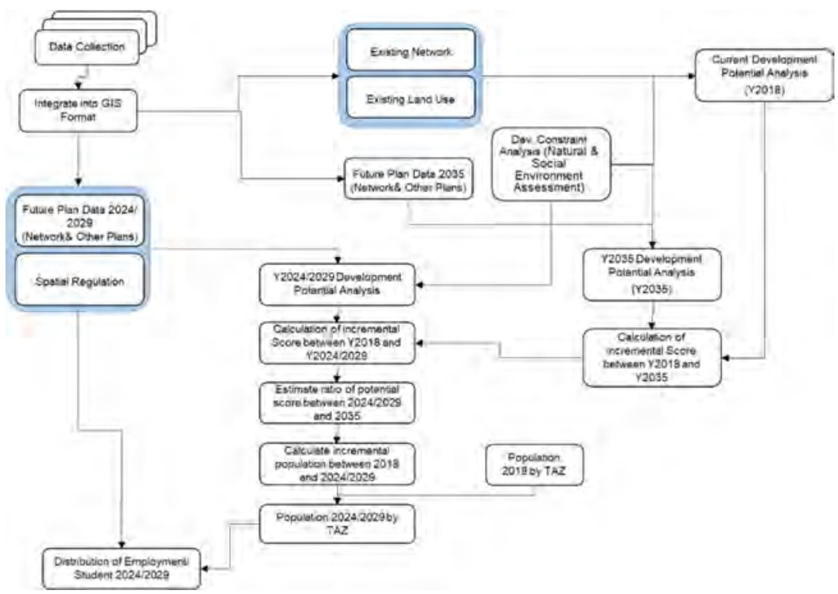
1) Calculate development potential score of the base year 2018 and target year 2035 by TAZ;
2) Based on the given transport network data of each intermediate year and other development potential data such as TOD development plans, estimate development potential score of intermediate year by TAZ. (This part uses "Development Potential Model" explained in Section 5.1.2(7))
3) Set target year potential score as 100 and base year potential as zero, calculate a ratio of intermediate year potential score (=achievement ratio of development potential)
4) Based on base year population and target year population, achievement ratio of development potential estimates increments population of intermediate year population by TAZ (Calculation of incremental population between base year to intermediate year);
5) Add increment population into base year population by TAZ; and

6) Based on TAZ population, estimate the number of employees and students based on the total population of intermediate year and target year land use.



Source: JUTPI 2

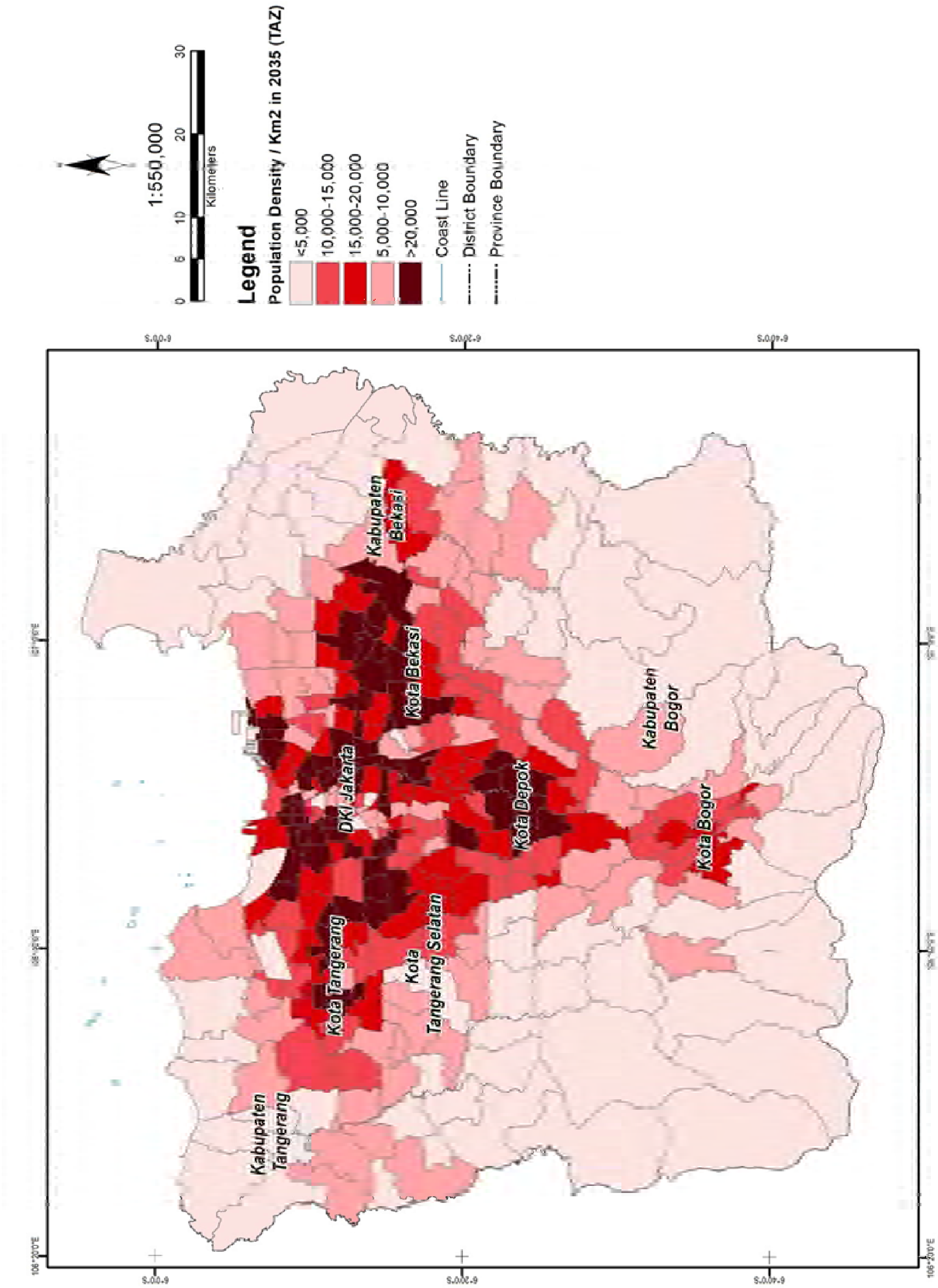
Figure 152 Overall Methodology of Population Distribution 2035



Source: JUTPI 2

Figure 153 Overall Methodology of Population Distribution 2024 and 2029

By following the methodology as explained in Figure 153, the forecasted population distribution in 2035 is more likely to be as shown in Figure 154.



Source: JUTPI 2

Figure 154 Population Density Distribution Projection by TAZ 2035

(2) Data Collection and Preparation

There are various data that are collected from various entities. These data are examined and integrated as a GIS format for further various analyses including population distribution. Especially spatial plan data prepared by each *kota* and *kabupaten*, Transport plan (Rencana Induk Transportasi JABODETABEK) prepared by BPTJ and JABODETABEKPUNJUR plan prepared by BPN (*Badan Pertanahan Nasional*: National Land Agency)) are well-considered for population distribution as fundamental information.

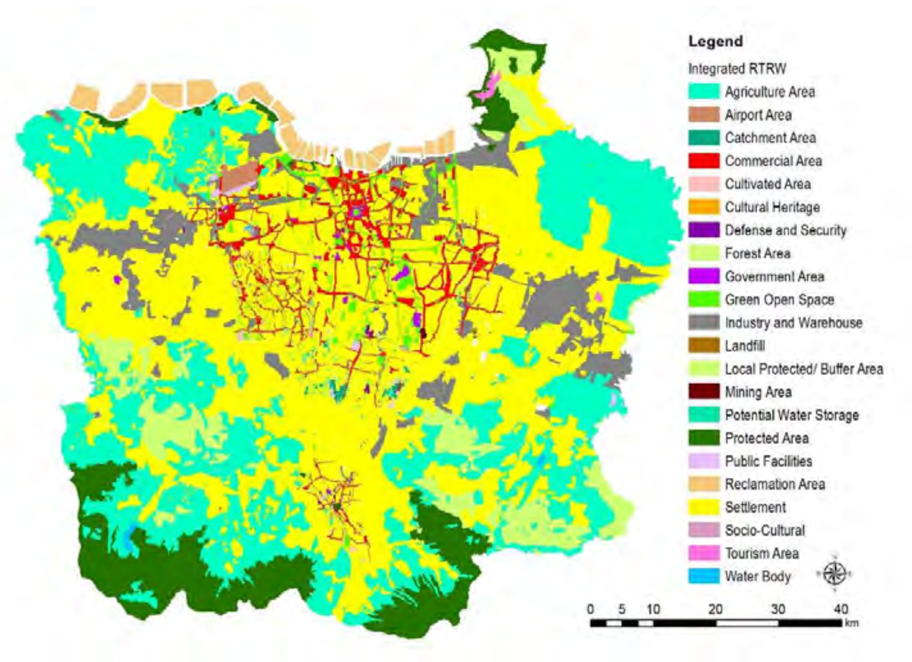
Each *kabupaten/kota* had formulated its spatial plan using its own category or land use type. In this project, in order to integrate and utilize these data as a unified form, their categories were interpreted. This integrated RTRW data also considered the target year land use plan in the Study.

Table 58 shows a list of main collected data that were integrated into GIS database for socioeconomic framework distribution.

Table 58 Collected Data for Population and Employment Distribution

Base year data	Future year
<GIS data> • Base year road network • Base year public transport network • Base year public transport facilities • Base year land use • Socioeconomic indicators • Administrative boundary • Protected/ Conservation area • JUTPI 1 GIS database • Satellite imagery for DKI Jakarta <non-GIS data> • Socioeconomic framework	<GIS data> • Spatial plan by *kabupaten/kota* (For target year) • Strategic plan by *kabupaten/kota* (For target year) • Spatial plan for JABODETABEKPUNJUR • RITJ (JABODETABEK Urban Transportation Master Plan) • Future transport network by JUTPI 2 • Other development plans (industrial area, TOD, etc) • Protected/ Conservation area <non-GIS data> • Socioeconomic framework

Source: JUTPI 2



Source: RTRW by each *Kabupaten*/ *Kota* and JUTPI 2

Figure 155 Integrated Spatial Plan Prepared by *Kabupaten/Kota*

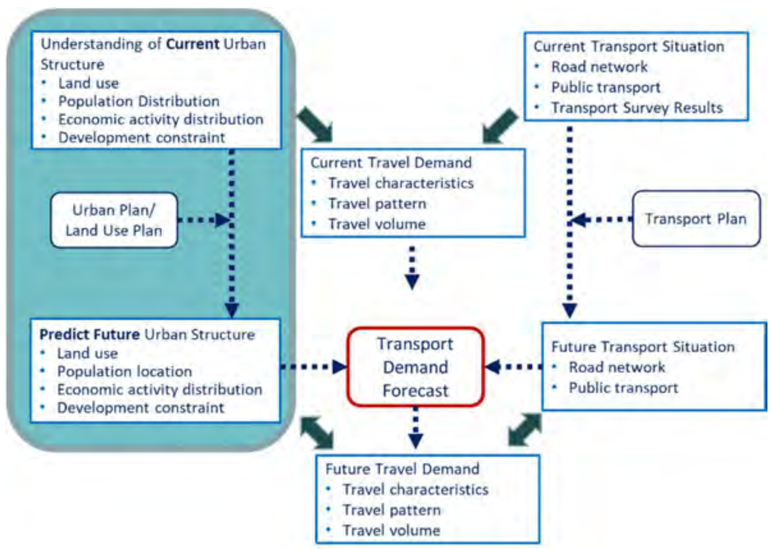
(3) Utilization of GIS

A variety of data/information has been collected from government agencies and relevant agencies in addition to various surveys conducted by JUTPI 2. These collected data were compiled and integrated into the numerical format or in the format of geographical data, so-called GIS format, for further analysis. In JUTPI 2, these collected GIS data are used not only for mapping or visualizing purposes but also as a planning tool. For population and other socioeconomic framework distribution, GIS is also utilized in various ways, and advantages of utilization of GIS in transport planning work are the followings:

- Integrate various data/ information into GIS format and visualize data,
- Multiple data analysis in a spatial manner,
- Manage various types of data easily in GIS format, and
- Good communication with transport planning software.

(4) Relation of Socioeconomic Framework and Transport Demand Forecast

The purpose of socioeconomic framework distribution is a part of preparation work of input parameters for traffic demand forecast model. To distribute various socioeconomic indicators in the base year, at first, total population by *kelurahan/desa* is estimated by the population of *kabupaten/kota* multiplied by percentage of the population of each *kelurahan/desa* from the trend of the previous years. As a next step, other variables such as employments by sector and the number of students are estimated based on the total population in *kelurahan/desa* and land use as explained in the following tables. To prepare socioeconomic indicators for the transport model, these socioeconomic indicators need to be distributed by TAZ level.



Source: JUTPI 2

Figure 156 Relation of Socioeconomic Framework and Demand Forecast Model

In this section, it is described that the methodology of distribution data by *kabupaten/kota* to village. Once population is distributed by *kelurahan/desa* level, then this *kelurahan/desa* population is aggregated into TAZ. As a next step, based on the estimated population by TAZ, the numbers of employees and students are distributed. To estimate the number of employment both residential place and working place, it is necessary to estimate not only the total number of employees, but also the number of employments by industrial sectors, namely primary, secondary and tertiary sectors. To distribute employment by sector, land use information and total population size by TAZ are utilized.

Table 59 Methodology of Employment and Student Distribution at Residential Place

	Methodology to distribute by TAZ from by Kab./Kota
Primary Sector	• Identify agriculture land area distribution by TAZ • 50% of primary sector employment estimates based on total population size • 50% of primary sector employment estimates based on agriculture land size
Secondary Sector	• Identify industrial area distribution by TAZ • 50% of secondary sector employment estimates based on total population size • 50% of secondary sector employment estimates based on agriculture land size
Tertiary Sector	• Identify Commercial/ Education/ Public facility/ Mix use area distribution by TAZ • 50% of tertiary sector employment estimates based on total population size • 50% of tertiary sector employment estimates based on agriculture land size
Students	• Based on population size by TAZ

Source: JUTPI 2

Table 60 Methodology of Workers and Student Distribution at Working/School Place

	Methodology to distribute by TAZ from by Kab./Kota
Primary Sector	• Identify agriculture land area distribution by TAZ • 20% of primary sector employment estimates based on total population size • 80% of primary sector employment estimates based on agriculture land size
Secondary Sector	• Identify industrial area distribution by TAZ • 30% of secondary sector employment estimates based on total population size • 70% of secondary sector employment estimates based on agriculture land size
Tertiary Sector	• Identify Commercial/ Education/ Public facility/ Mix use area distribution by TAZ • 20% of tertiary sector employment estimates based on total population size • 80% of tertiary sector employment estimates based on agriculture land size
Students	• Identify Education distribution by TAZ • 25% of the number of students estimates based on total population size • 75% of the number of students estimates based on agriculture land size

Source: JUTPI 2

(5) Base Year Socioeconomic Indicators

The Base year population was collected by *kelurahan/desa* for the entire JABODETABEK area, so TAZ population is calculated to integrate based on the corresponding table between *kelurahan/desa* and TAZ. Other socioeconomic indicators, such as employment and students, are estimated based on ADS survey and other referential data.

(6) Target Year 2035 Population and Employment Distribution

1. **Multiple Linear Regression Analysis for Population Distribution 2035**

Using base year population data, multiple linear regression analysis is adopted to identify the relationship between land use, accessibility to transport facilities, development constraints, and population. As a result, relationship among number of populations, land use, accessibility to transport facilities, and spatial regulations are identified. The population for each *kelurahan/desa* is estimated as shown in the following formula.

$$
\begin{aligned}
Pop_{i=} \\
&0.01401 \times Residential\ area + \\
&0.006821 \times Industry\ \&\ Warehouse + \\
&0.007292 \times Commercial, Education\ \&\ Pub. Facility\ area + \\
&0.005291 \times Agriculture\ area + \\
&0.005992 \times Swamp, River\ \&\ Pond\ area + \\
&0.006163 \times Bush\ \&\ Forest\ area + \\
&-0.00838 \times Dev.\ Constraint\ score\ (Natural\ Condition) + \\
&0.000404 \times Dev. Constraint\ score(Regulation) + \\
&0.002002 \times Access\ to\ JKT\ score + \\
&0.000957 \times Access\ to\ Pub. Transport\ score + \\
&2452.762 \times Access\ to\ Road\ score
\end{aligned}
$$

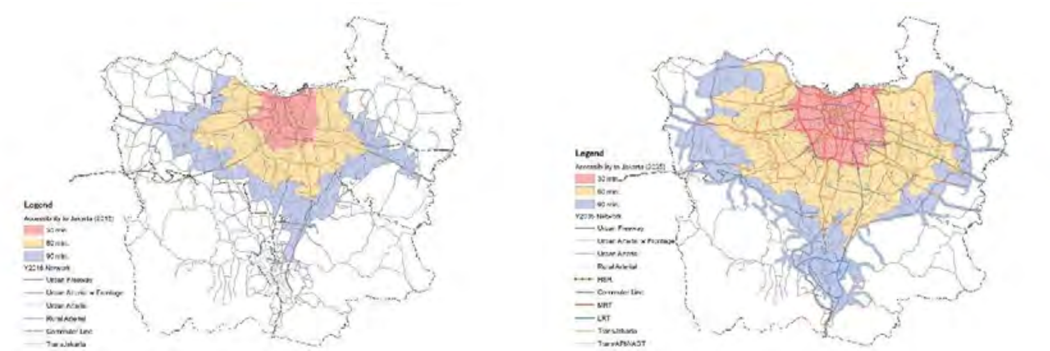
Based on the formula above, target year 2035 population by *kelurahan/desa* are estimated with transport network 2035 and spatial plan data.

Table 61 mentioned that three types of accessibility parameters were included as explanatory variables, which are "Access to JKT (DKI Jakarta)", Access to Public Transport," and "Access to Road". These parameters are results of accessibility analysis also using GIS techniques. For "Access to JKT (DKI Jakarta)" analysis, GIS Network Analyst extension is utilized. Using GIS Network Analyst extension, it is possible to obtain travel distance from a particular location referring to given network data and travel speed. Other variables related to accessibilities, such as accessibility to public transport and accessibility to roads are calculated using simple buffer analysis which calculates a particular distance from railway stations, bus stops, and road networks.

Table 61 Estimated Factors of Development Potential Model

	Explanatory variables	Coefficients	t -value	P-value	R Square	Observation
Land use	Residential area	0.01401	15.19636	1.35E-48	0.831	1501
	Industry & Warehouse	0.006821	6.515418	9.89E-11		
	Commercial, Education & Pub. Facility	0.007292	3.391975	0.000712		
	Agriculture	0.005291	5.927388	3.82E-09		
	Swamp, River & Pond	0.005992	5.979235	2.8E-09		
	Bush & Forest	0.006163	6.392709	2.17E-10		
Dev. Constraint (Natural Condition)	Waterbody, Slope, Elevation	-0.00838	-8.77062	4.76E-18		
Dev. Constraint (Regulation)	Airport, Protected area, Low Capacity area, Technical Irrigation, Buffer for Protected area & Low capacity area, Security area	0.000404	1.956395	0.050605		
Accessibility	Access to Jakarta	0.002002	10.9289	8.46E-27		
	Access to Pub. Transport	0.000957	6.233614	5.92E-10		
	Access to Road	2452.762	11.65018	4.41E-30		

Source: JUTPI 2



2018 **2035**

Source: JUTPI 2

Figure 157 Result of Network Analysis for Accessibility to DKI Jakarta (2018/2035)

2. **Future Population Distribution for Target year 2035**

For the future socioeconomic indicator distribution, at first, total population by *kelurahan/desa* are estimated based on the multiple linear regression analysis as explained in the previous section.

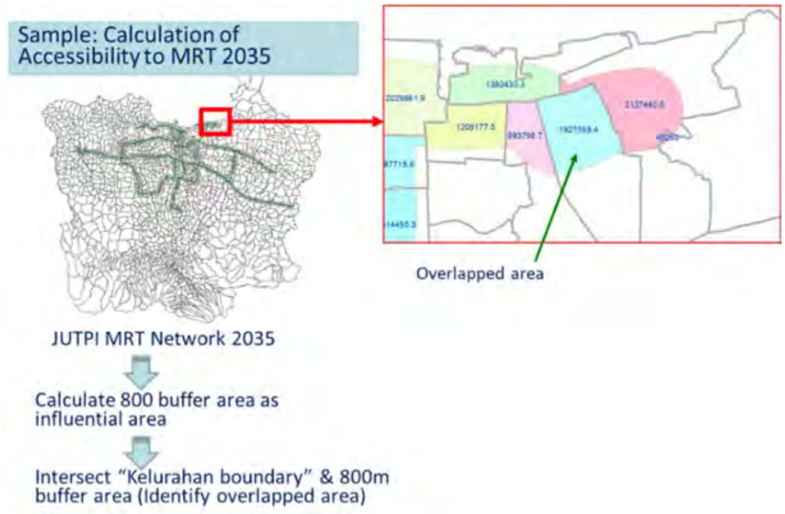
To estimate 2035 population, variables such as network data and land use data are replaced from existing condition data to future plan data, on the other hand, variables related to development constraints use the same data with the existing condition. List of data used is shown in Table 62.

Table 62 Data Source of Explanatory Variables

	Explanatory variables	Data source	
		Base year	Target year
Land use	Residential area	Existing land use data prepared by JUTPI 2	RTRW prepared by *Kabupaten/ Kota*, and Existing land use data
	Industry & Warehouse		
	Commercial, Education & Pub. Facility		
	Agriculture		
	Swamp, River & Pond		
	Bush & Forest		
Dev. Constraint (Natural Condition)	Waterbody, Slope, Elevation	JABODETABEKPUNJUR plan and RTRW prepared by *Kabupaten/Kota*	Use same data with base year
Dev. Constraint (Regulation)	Airport, Protected area, Low Capacity area, Technical Irrigation, Buffer for Protected area & Low capacity area, Security area	JABODETABEKPUNJUR plan and RTRW prepared by *Kabupaten/Kota*	Use same data with base year
Accessibility	Access to JKT	Base year network data	Target year network data
	Access to Pub. Transport		
	Access to Road		

Source: JUTPI 2

These variables are prepared using overlay operation with GIS software between *kelurahan/ desa* boundary and the variable. The result of overlay operation, overlapped area of each variable, and *kelurahan/desa* area is obtained. Using obtained areas, necessary explanatory variables are prepared as a table. Figure 158 shows sample image of variables table to apply to the formula to estimate the target year population.



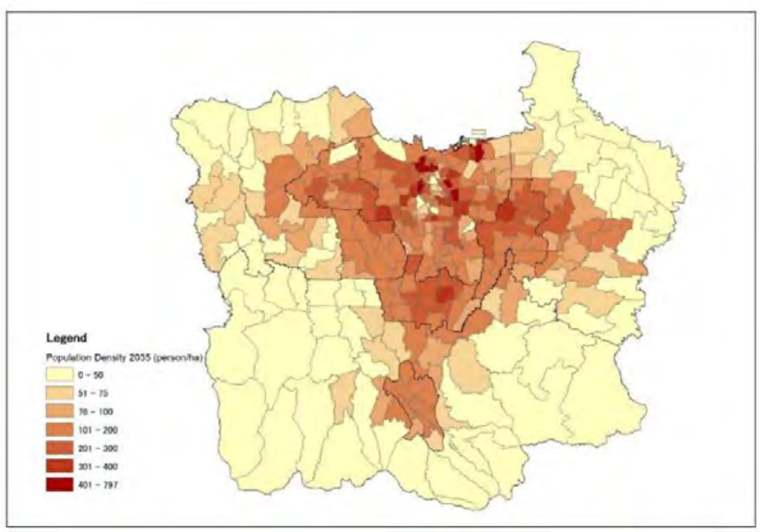
Source: JUTPI 2

Figure 158 Preparation of Explanatory Variables for Target Year

Kelurahan / Desa Code	Total area Kel/Desa	Waterbody score	......	Protected area	Low Capacity area	......	Access to Road	Access to Pub. Transport	......	Residential area
3171010001	4110714.3	101123.3	......	258098.4	52809.1	......	4001350.8	2101350.8	......	3538902.1
3171010002	3322110	221133.4	......	112233.4	0	......	334455.6	1234.1	......	45678.9
......										

Source: JUTPI 2

Figure 159 Image of Input Data for Target Year Population Estimation



Source: JUTPI 2

Figure 160 Estimated 2035 Population Density by TAZ

(7) Intermediate Year Socioeconomic Framework Distribution (Year 2024/2029)

In the final stage of the JUTPI 2, it is requested to formulate intermediate year transport plans in 2024 and 2029. To formulate intermediate plans, it is necessary to run the transport demand forecast model of intermediate years, in parallel intermediate year socioeconomic indicators were also prepared.

However intermediate year land use plan data is not available, so different method of population estimation is applied using development potential model.

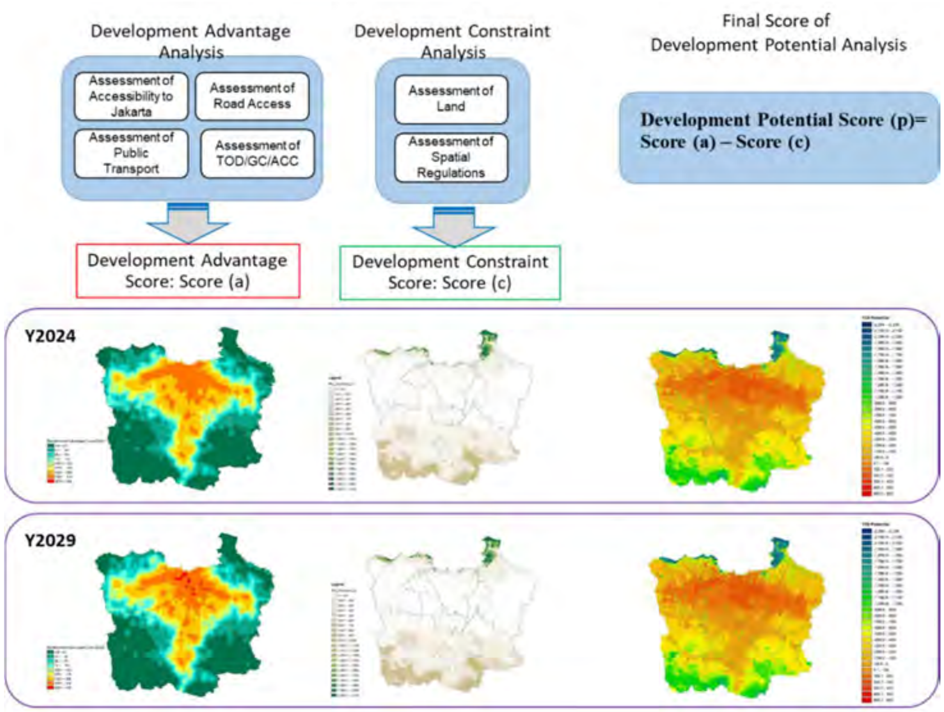
As an initial step, the development potential scores of base year and target year are calculated. The following potential scores of the intermediate year are also calculated. As explained in the previous section, base year and target year population were prepared in advance, using these population data and potential scores of base years, target year and intermediate year, intermediate year total population is estimated without land use plan data. Figure 161 shows the concept of intermediate year population estimation

1. **Development Potential Model**

   Development potential model is prepared to distribute total population by *kabupaten/kota* to *kelurahan/desa* level of intermediate year, 2024 and 2029 because these intermediate year land use plans are not available.

   As explained in Section 5.1.2(6), population agglomerations have relationship with land use, accessibility to transport facilities and development constraints. Considering these relationships, it is estimated future population distribution patterns for intermediate years together with base year and 2035 potentials as benchmark.

   This development potential model is a multi-criteria spatial analysis with population, land use, accessibility (road, railway station, Urban centers, etc.), and development constraint area to calculate development potential score by 200m cell basis in raster format. Calculated total development potential scores by 200m cell basis are aggregated into TAZ basis.



Source: JUTPI 2

Figure 161 Image of Development Potential Model

Table 63 Input Parameters for Development Potential Model

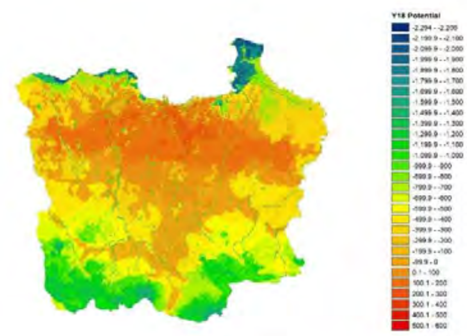
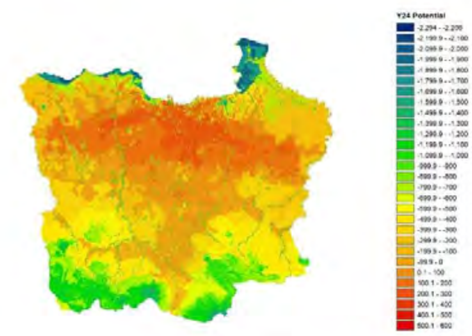
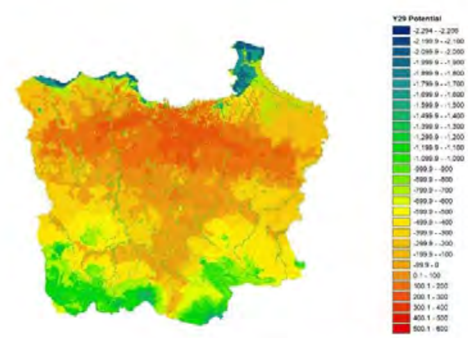
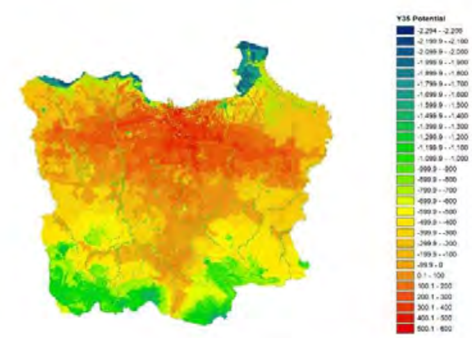
	Base year	Target year	Intermediate year	Remarks
Accessibility to Jakarta	• JKT Access (30/60/90 min.) travel time • Distance from JKT central area (10km area)	• JKT Access (30/60/90 min.) travel time • Distance from JKT central area (10km area)	• JKT Access (30/60/90 min.) travel time • Distance from JKT central area (10km area)	Base year uses base year network data, target year and intermediate year uses particular year network data for transport demand forecast model
Road Access	• Access to Urban Freeway • Access to Urban Arterial • Access to Rural Arterial	• Access to Urban Freeway • Access to Urban Arterial • Access to Rural Arterial	• Access to Urban Freeway • Access to Urban Arterial • Access to Rural Arterial	
Public Transport Access	• Access to Commuter rail station • Access to TransJakarta station	• Access to Commuter rail station • Access to TransJakarta station	• Access to Commuter rail station • Access to TransJakarta station	

	Base year	**Target year**	**Intermediate year**	**Remarks**
		• Access to Tram/APM/AGT station • Access to MRT station • Access to LRT station • Access to TransJakarta station	• Access to Tram/APM/AGT station • Access to MRT station • Access to LRT station • Access to TransJakarta station	
Land use	• Residential area (Planned house, High density *Kampung*, Low density *kampung*) • Industrial area • Commercial, Education & Pub. Facility • Agriculture area • Waterbody (Swamp, River & Pond) • Bush & Forest	• Residential area (Planned house, High density *Kampung*, Low density *kampung*) • Industrial area • Commercial, Education & Pub. Facility • Agriculture area • Waterbody (Swamp, River & Pond) Bush & Forest • New Development areas based on RTRW	• Not available	
Other Development Plan		• TOD • Growth Center • Activity Center	• TOD • Growth Center • Activity Center	Collected and Prepared by JUTPI 2 for each case
Development Constraint (Natural Condition)	• Airport • Slope condition • Elevation	• Airport • Slope condition • Elevation	• Airport • Slope condition • Elevation	Base year, target year and intermediate year use the same data
Development Constraint (Spatial Regulation: JABODETABEKPUNJUR plan)	• Protected area and areas to protect protected area (L1, P1, P2) • Low environment capacity (B3, B4)	• Protected area and areas to protect protected area (L1, P1, P2) • Low environment capacity (B3, B4)	• Protected area and areas to protect protected area (L1, P1, P2) • Low environment capacity (B3, B4)	

	Base year	Target year	Intermediate year	Remarks
	• Tech. Irrigation (B5) • Buffer zone for protected area (B7)	• Tech. Irrigation (B5) • Buffer zone for protected area (B7)	• Tech. Irrigation (B5) • Buffer zone for protected area (B7)	
Development Constraint (Spatial Regulation: RTRW by Kab./Kota)	• Military/ Security area	• Military/ Security area	• Military/ Security area	

Source: JUTPI 2

For the development potential model, all of the GIS data are converted into raster format which is a cell size of 200 meters square, after calculating potential score on the cell basis, the total potential score by kelurahan/desa are aggregated as a result of the model. Figure 162 shows the results of the model for the base year, both intermediate year (2024 and 2029) and target year 2035.

Base year	Intermediate year 2024
	
Intermediate year 2029	Target year 2035
	

Source: JUTPI 2

Figure 162 Result of Development Potential Model

2. **Estimation of Intermediate Year Population by TAZ**

   Based on the result score of the development potential model, the following procedure is applied to estimate the population by TAZ.

   1) Set the target year 2035 potential score as 100 and base year potential as zero, calculate the ratio of intermediate year potential score (achievement ratio of development potential)

   2) Based on the base year population, target year population and achievement ratio of development potential estimates increment population of intermediate year population by TAZ

   3) Add increment population into base year population by TAZ

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
	Base Year Pop	**Target Year Pop**	**Base Year Score**	**Target Year Score**	**Score Balance (Target-Base year)**	**Increment population (target year Pop. - base year Pop.)**	**Intermediate year score 2024**	**Achievement of score to target year**	**Incremental population between base year to 2024**	**Population 2024**
Village A	10,000	11,000	1,000	2,000	1,000	1,000	1,050	5%	50	10,050
Village B	15,000	20,000	500	900	400	5,000	600	25%	1250	16,250
Village C	20,000	30,000	1,000	2,000	1,000	10,000	1,100	10%	1000	21,000
Village D	30,000	33,000	1,200	1,400	200	3,000	1,300	50%	1500	31,500

① base year population by *kelurahan*/*desa* are collected by JUTPI 2
② target year population was estimated using multiple linear regression analysis with base year population, land use, accessibility and development constraint
③ base year development potential score calculated using the development potential model
④ target year development potential score calculated using the development potential model
⑤ calculate an incremental score between base year and target year
⑥ calculate an incremental number of populations between base year and target year
⑦ intermediate year development potential score calculated using development potential model
⑧ calculate the ratio of intermediate year score with incremental score between base year and target year: = (⑦-③)/⑤
⑨ estimated incremental population between base year and intermediate year: =⑥*⑧
⑩ the estimated total population in intermediate year: =①＋⑨

Source: JUTPI 2

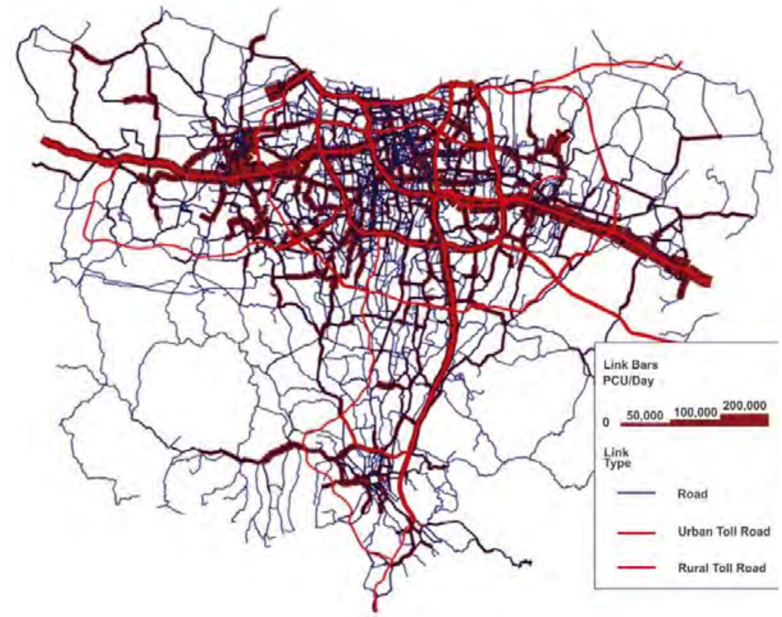
Figure 163 Concept of Intermediate Year Population Estimation

5.2 Transportation Development Scenarios

Several scenarios are made to determine the best scenario to accommodate the future demand. Do-Minimum case scenario is used to see what will happen in the future if there is no investment for transportation, and RITJ scenario is used to check if the scenario will be able to accommodate the future demand.

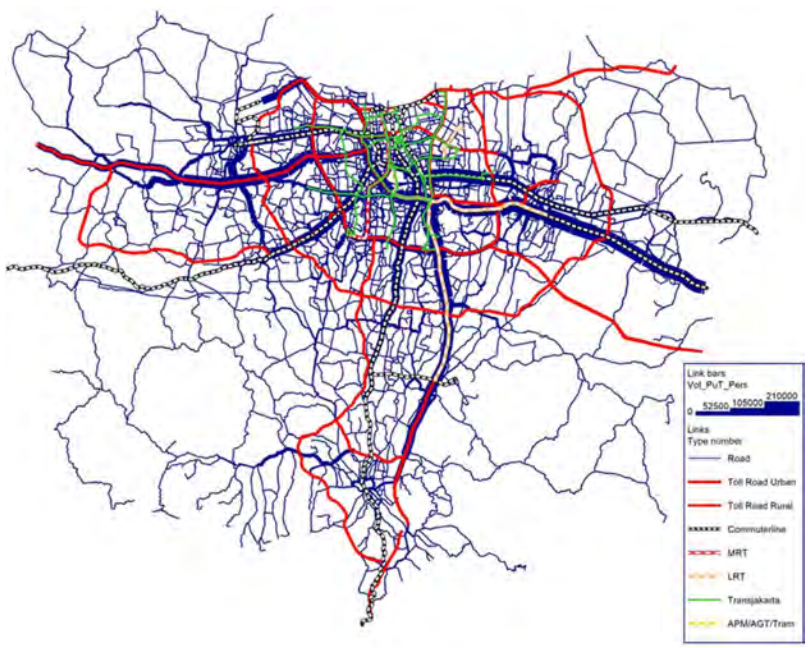
5.2.1 Do-Minimum Case

Do-Minimum case is a baseline scenario when a no-investment situation occurs after only the existing under-construction projects like toll road and rail-based public transport projects (including MRT North-South and LRT Jabodebek) have been completed. This scenario explains what will happen in the future if government do-nothing to further improve the transportation system. This scenario is used as a benchmark to evaluate alternative development scenarios. Figure 164 until Figure 167 shows the assignment results for years 2029 and 2035, respectively.



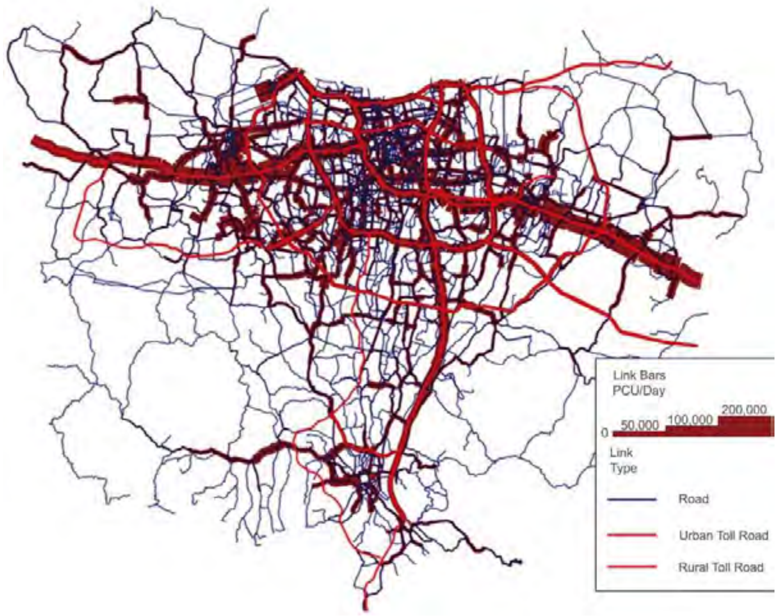
Source: JUTPI 2

Figure 164 Do-Minimum Case (2029) Private Vehicle Assignment Result



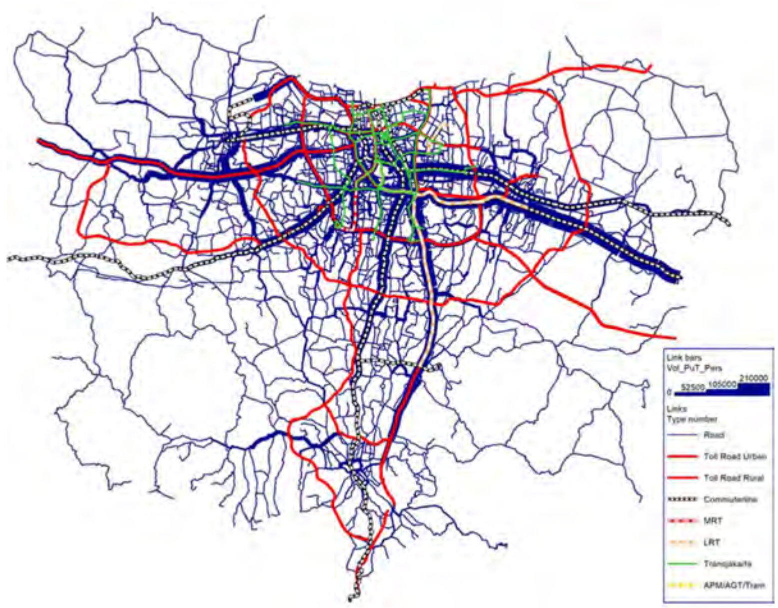
Source: JUTPI 2

Figure 165 Do-Minimum Case (2029) Public Transport Assignment Result



Source: JUTPI 2

Figure 166 Do-Minimum Case (2035) Private Vehicle Assignment Result



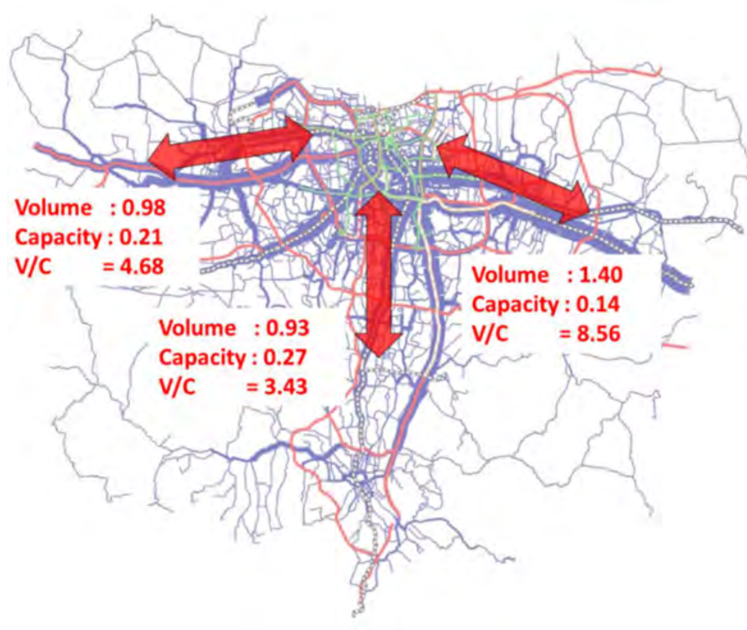
Source: JUTPI 2

Figure 167 Do-Minimum Case (2035) Public Transport Assignment Result

Based on the assignment results, it can be observed that if the government does not invest for any transport infrastructure project or any TDM, traffic congestion will become worse than before. Furthermore, under-construction rail-based public transport (including MRT N-S and LRT Jabodebek) cannot accommodate the future demand of public transport passenger.

Source: JUTPI 2

Figure 168 Do-Minimum Case (2035) Private Vehicle Speed on the Road Network



Unit: Mil. Pax/day/2 ways
Source: JUTPI 2

Figure 169 Do-Minimum Case (2035) Volume/Capacity on Major Public Transport Corridors

Table 64 Volume-Capacity Ratio of Transit Trips in Do-Minimum Case

Year	Volume/Capacity		
	Bekasi	Tangerang	Depok+Bogor
2018	3.28	2.08	1.84
2029 (DoMin)	7.73	4.26	3.09
2035 (DoMin)	8.56	4.68	3.43

Source: JUTPI 2

5.2.2 JABODETABEK Transportation Master Plan (RITJ) Case

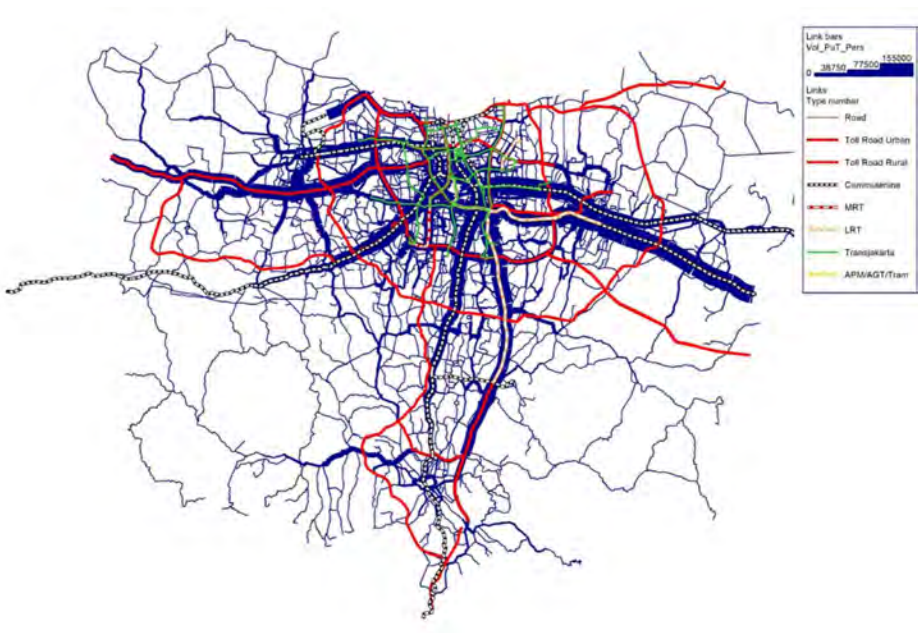
JABODETABEK Transportation Master Plan (RITJ) is a master plan based on Presidential Decree No. 55/2018. In RITJ, there are expressway corridor developments to support people's movement using private vehicle. Types of expressway development are loops, bypasses, and radial roads. Besides expressway development in RITJ, there are mass rail corridor developments with radial development, light rail corridor development with types of radial, looping at city center, and bypass lines, and other rail corridor development with an expanded loopline.

RITJ case is a scenario where all RITJ network plans are realized. Based on the assignment result, RITJ's comprehensive network plan is still insufficient to accommodate the future demand, as indicated by the volume-capacity ratios over 1.0 in

Table 65. Therefore, more mass transit corridors are needed, by upgrading the planned platform (for example, from BRT to LRT and LRT to MRT) and applying TDM policies.

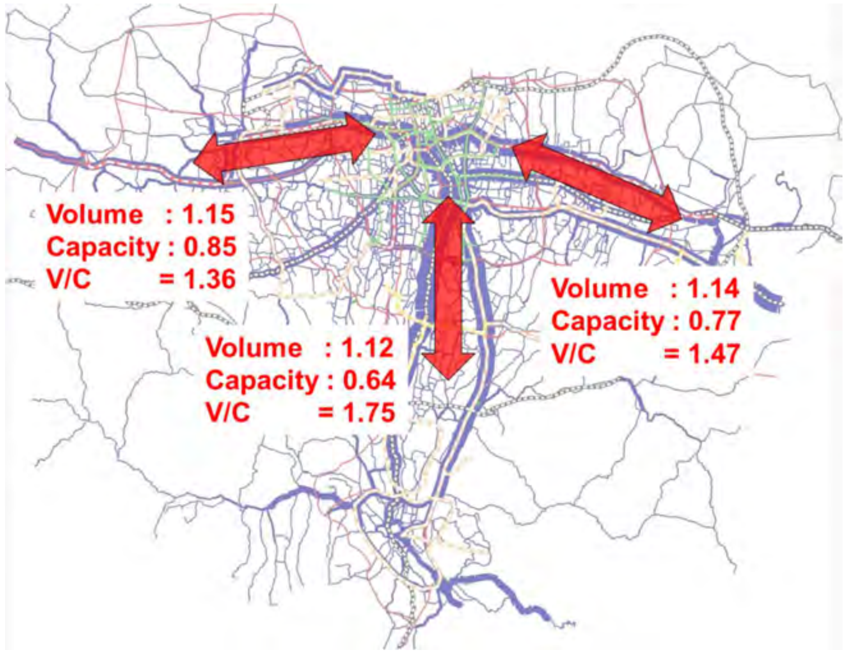
Source: JUTPI 2

Figure 170 RITJ Case (2035) Private Vehicle Assignment Result



Source: JUTPI 2

Figure 171 RITJ Case (2035) Public Transport Assignment Result



Unit: Mil. Pax/day/2 ways
Source: JUTPI 2

Figure 172 RITJ Case (2035) Volume/Capacity on Major Public Transport Corridors

Table 65 Volume-Capacity Ratio of Transit Trips in RITJ Case

Year	Volume/Capacity		
	Bekasi	Tangerang	Depok+Bogor
2035 (RITJ)	1.47	1.36	1.75
2035 (JUTPI 2)	0.89	0.83	0.81

Source: JUTPI 2

Chapter 6 FUNDAMENTALS OF TRANSPORTATION MASTER PLAN FOR JABODETABEK

6.1 Goals for Urban Transportation System Development

The previously established KPIs in the Presidential Decree number 55 of the year of 2018 are the basic indicators of future urban transportation system in JABODETABEK that is expected in RITJ. Listed original projects and programs in RITJ are presumed to comprise the utopia. In regard to the aim of detailing RITJ, original projects and programs were tested and assessed. The future case over a significant number of testing suggested values that are far beyond what were listed in the KPI. The cause may be related to the fact that the exponential increase of trips, as well as the socioeconomic framework, were not projected accurately, while the metropolitan area has an expansion that is rather dynamic than static compared to the previous years.

The causes of dynamism may be also various. Though such discussion is not contemplated in this report, several main issues are believed to be the causes. They are unsolicited plans which are far from what was formulated in the master plan being implemented, and quite far yet significant changes of policy and development direction. Like many other developing countries, these two cases are inseparable regardless of the existence of prior master plan formulation. While such condition is indifferent and affects positively the current transportation situation, the master plan, or at least the modeling part, should be updated immediately and accordingly.

The quick assessment of public transport assignment for the ultimate year of 2035 also suggests the volume-capacity ratio that is far from sufficient over three main corridors with DKI Jakarta as the core of the movement.

Scientifically proven, current established network in RITJ requires quite significant improvement to comprehend future transportation demand. As a basic concept of improvement-making process, JUTPI 2 assessed and evaluated both RITJ scenario and necessary improvement towards the future demand macroscopically and proposed what is called necessary corridors to improve, which shall be discussed in more detail in Chapters 7 and 8.

6.2 Regional Trunk Transportation System Development Strategy

Goods movement is important for economic growth of the region. Demand and supply of the commodities as daily needs and export-import purposes are also increasing despite the movement itself is outrun by priority of people's movement. Thus, freight movement punctuality is always challenged and costly.

In the period 2010 to 2014, the completion of a perfectly round shape of the ring road occurred/was being implemented. Trucks were banned in several points, namely: from entering the road section in city center that has the volume-capacity ratio of 0.8 or worse, from entering the road section in the city center that has average speed of 30 kilometer per hour or less, from entering the road section that has no alternative routes in case unlikely situation happens. During these years, there was also truck ban period to enter the toll road from 5 AM – 8 PM.

During this period, local agencies made an adjustment to the regulation of the existing freight movement upon the onsite decision-making process. For example; some industrial estates opened their main gates only at a certain period of timeline in a day, transportation agencies also applied truck route detour during a certain period of time to avoid over congested road sections. Such decision was made locally and coordination to higher level (regional or central government) was not necessary.

The demand management of general traffic in the city center was regulated by "3-in-1" regulation until 2016. This regulation mainly required the ridership of private car with minimum of three passengers along the specific road sections. Although the regulation was applied only to private cars during peak period of morning and evening, trucks were prohibited to enter the same road sections from 6 AM – 8 PM on weekdays.

The odd-even number plate regulation to enter the toll road from 2016 to 2018 has been proven effective to reduce the load of trucks (and passenger cars) on the trunk road. The regulation was initiated by BPTJ to smoothen the traffic in general in the city center. The regulation was also complemented by the regulation of container ban to enter the toll road from 5 AM – 10 PM. The limited-time for container service created the truck traffic concentration in the nighttime period. On the other hand, since 2018, truck ban regulation is also implemented in several road sections in the city center of Kabupaten Tangerang from 5 AM – 10 PM.

The trunk line of freight transportation relies on the network of arterial and toll roads while rail-based freight transportation is planned to be circular to prevent freight trains from entering city centers and DKI Jakarta in the ultimate year of planning of 2035.

Freight movement along arterial and toll road network shall also be in line with the policy of truck ban, especially during the intermediate years of 2024 and 2029/30. Road sections, including toll roads, are projected and planned to be more for passenger service rather than the freight service despite shorter distance might be the case of origin-and-destination wise. Therefore, it is considered that the truck ban policy is essentially set up for two types of regulatory function:

(1) All-Day Ban

Toll and arterial road sections that are currently usable for freight movement shall be decreased especially within the city center areas. It is projected that commercial and residential (and mixed) developments are extensively improving within the range of city center and thereby truck assignment onto within would add risk to the safety factor towards area in which high intensity of traffic and high density of the population exist. In such a case, the all-day ban is necessary to be applied.

(2) Partial Ban

Different from the all-day ban policy, the partial ban is applied to the outskirt areas in which traffic intensity and population are less high and less dense. Locations, where most of the partial ban is to be applied, are within the area of inlet and outlet of toll road ramps in the outskirt residential area.

6.3 Urban Transportation Policy and Strategy

JABODETABEK is an official and administrative definition of the urban area surrounding Jakarta as a capital city of Indonesia. JABODETABEK has developed from small and separated city-regions into a unified agglomeration area. Nowadays, JABODETABEK has become the largest megacity in Indonesia and plays the most important role in the socioeconomic and political aspects. However, lack of planning capacity to deal with the growing complexities in managing this area should be seriously remarked, otherwise, this will become a major obstacle in accommodating the growth of the region.

According to the mandate of the Presidential Regulation No. 103 Year 2015 regarding Greater Jakarta Transport Authority (BPTJ), the policy of the development and management for urban transportation in JABODETABEK area are directed to the following:

- Integration in the construction and development of transportation infrastructure network system and transportation services network, both intra- and inter-regional modes;
- Integration in the construction and development of urban transportation between regions in JABODETABEK in one single urban area;
- Integration in the operation of urban transportation; and
- Integration in the urban transportation financing plan.

Different strategies and measures can be adopted to improve efficiency of urban transportation system. To accelerate urban transportation development, Government of Indonesia give special attention to the five issues which handled the following strategies:[7]

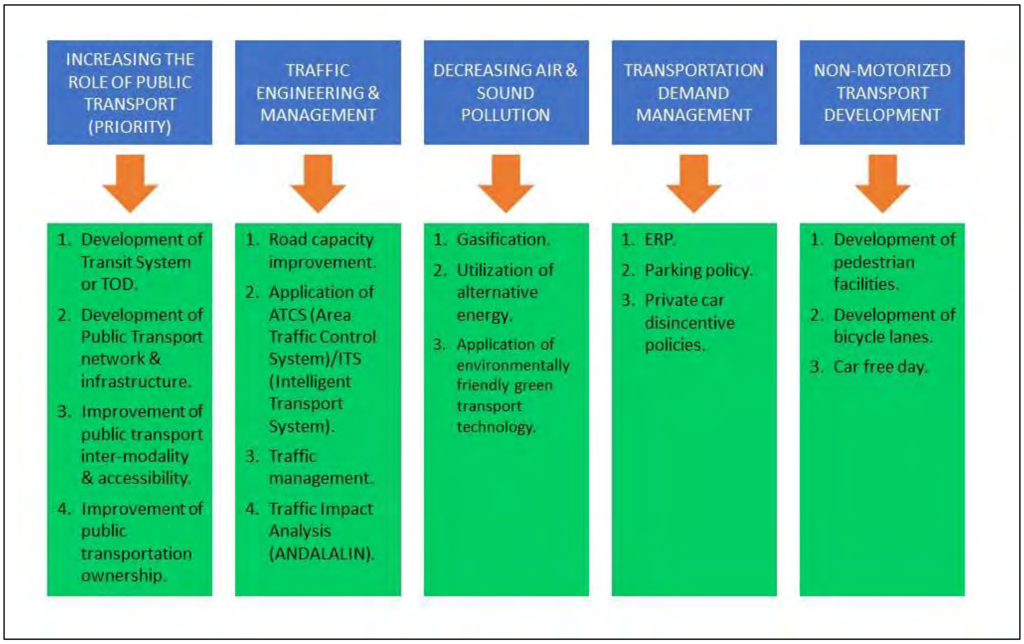
- Transportation and land use interaction strategy with the objective to improve the role of transportation to support land use development through park and ride facility, Transit-Oriented Development (TOD), Transportation Impact Control (TIC) and accessibility improvement up to the endpoint in the urban area;
- Strategy to improve urban mobility with the objective to optimize public transport role through urban facility improvement (road and multimodal facility), urban public transport improvement and logistic services;
- Strategy to reduce traffic congestion with the intention to reduce congestion load in urban area by strengthening the Transportation Demand Management (TDM) through the "push" policy (such as Electronic Road Pricing/ERP, and parking system) and "pull" policy (such as the development of BRT, LRT and MRT) and improving Traffic Supply Management (TSM) through the development of Intelligent Transport System (ITS) to arrange the capacity and priority management;
- Strategy to reduce air pollution with the intention to reduce urban pollution load by reducing greenhouse emission, air pollution and noise; and
- Strategy to improve safety with the intention to improve road transportation safety by improving citizen's awareness and to improve and develop facilities that supporting road transportation safety in accordance with the National Safety Plan and Decade of Action for Road Safety.

6.3.1 Public Transportation Use Promotion Policy

Rising growth of population in the urban area causes an increase in the number of passenger cars, which resulted in insufficient capacity in the road network. One of the important steps towards alleviating traffic congestion problem is to increase the number of public transportation users. To ensure the effectiveness of its implementation, it is necessary to present the benefits of public transportation effectively and promote its services sufficiently to influence the modal split in favor of public transportation usage.

The government's strategy to accelerate urban transportation development then elaborated into the five pillars of urban transportation policies, one of which is mentioning the improvement of public transport role as a priority.

[7] PPP Toolkit for Urban Transport Sector, Book 2, Bappenas, 2016



Source: PPP Toolkit for Urban Transport Sector, Book 2, Bappenas, 2016

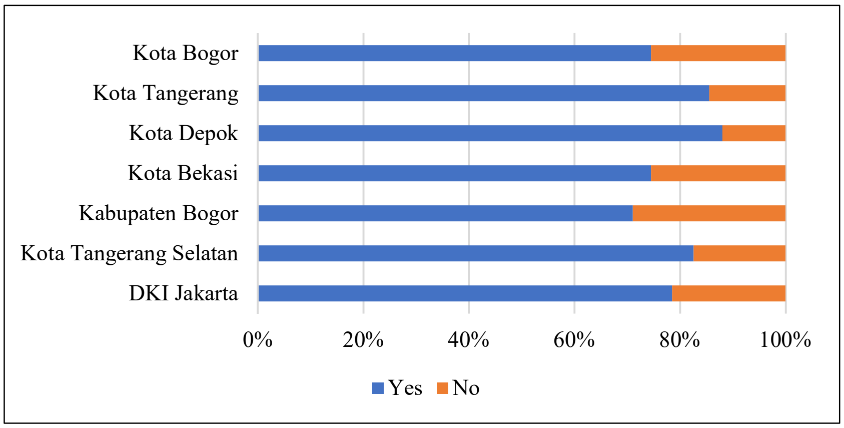
Figure 173 Five Pillars of Urban Transportation Policy

In the pilot project activities, JUTPI 2 provides an opportunity for each local government to submit a proposal of activities with the objective of encouraging the community to use public transportation. In one of the pillars of urban transportation policies, there are four strategies to increase the role of public transport, where strategies to develop public transport network and infrastructure and to improve public transport inter-modality and accessibility are used to promote public transport usage. With the facilities developed through the pilot project activity, it is expected the accessibility, comfort, and safety of the public transport-related facilities will be improved.

Selected proposals from *kabupaten/kota* consist of proposals for the construction of facilities that support the public transportation usage, such as development of bus shelter facility (Kota Bekasi, Kabupaten Bogor, Kota Depok, Kota Tangerang Selatan), pedestrian path improvement (Kota Bogor, Kota Tangerang), pelican crossing facility (Kota Depok, Kota Tangerang), pedestrian crossing bridge over the canal (Kota Tangerang), and wayfinding boards (DKI Jakarta).

Pilot project facilities such as bus shelters are located in the place of transfer between public transportation modes, such as in Kota Bekasi (bus shelter in front of Bekasi Timur Station), Kota Tangerang Selatan (bus shelter near Jurang Mangu Station), and Kabupaten Bogor (bus shelter near Cibinong Station). As another pilot project facility, the pedestrian bridge over the canal in Kota Tangerang is also developed near Tanah Tinggi Station. In Kota Bogor, pilot project activity (improvement of pedestrian path facility) is located in Jl. Pajajaran near Baranangsiang Bus Terminal and Airport Bus Terminal on the other side of Jl. Pajajaran.

In the pilot project activity, post-implementation survey was conducted for the evaluation to capture feedback from the respondents, in order to evaluate the impact as well as effectiveness of the newly developed facility. In terms of the willingness to use public transportation, based on the result of post-implementation survey, in overall, more than 70% of the respondents are willing to use public transportation due to the improvement of accessibility, comfort, and safety.



Source: Result of Post-Implementation Survey, Pilot Project, JUTPI2

Figure 174 Willingness to Use Public Transportation

Modernizing the public transport supporting infrastructure, such as installing proper waiting facilities and easing accessibility can make public transport services more attractive. By implementing these measures, public transport services become more convenient, accessible, and understandable for everyone.

Development of economic activities in JABODETABEK led to the changes in socioeconomic patterns where living standards, income, and car ownership have increased throughout the years. As the center of economic activities, JABODETABEK area faces severe transport problems. The number of vehicles keeps growing at up to 10% per year and number of vehicle trips increases to 1.5 million per day in 2017. On the other hand, road network and public transport capacity did not go in line with the rapid changes, making it insufficient to accommodate people's mobility and leading to economic loss and environmental issues in the city.

One of the important steps towards improving this situation is to increase the number of public transport users. Public transport use is the key for sustainable transportation. Using public transport is often considered quicker and cheaper than private vehicles and useful in congested area where parking is limited. Greater use of public transport also has benefits for environment and communities too, in the sense of less pollution and congestion for a more active community.

To encourage the use of public transport in the city, it is necessary to present the benefits of public transport effectively and improve its services sufficiently to influence the modal split in favor of public transportation. Policy in public transport use aims at attracting passengers, increasing its ridership, and strengthening its usage.

The basic objectives of public transport promotion included:

- Highlighting advantages of public transport compared to private motorized transport;
- Attracting new passengers while keeping the existing ones;
- Improving provision of information about transport services;
- Increasing awareness about public transport and ITS;
- Improving accessibility of services by providing targeted information to passengers; and
- Supplying favourable services, such as single payment and convenient shelters.

One approach to achieve the basic objective of public transport promotion is through transit-oriented development (TOD). TOD is a sustainable transportation approach seen from the principle of providing accessibility and alternative modes, promoting the city's economic growth, and environmentally friendly transport. Practice of TOD in the world is getting popular because it can improve access and sufficient space utilization for urban development. Currently, the TOD approach is being pursued by the central and regional governments to solve the congestion problem in cities with complex transportation problems such as JABODETABEK area.

TOD is not only a project, but also a planning concept integrated with urban and transport sectors. This concept can be implemented in the area within walking distance area of about 400 - 800 meters around a central transit stop, through several projects which included station, intermodal transfer facilities, and urban development which centralizes around the station, aiming to improve accessibility and to promote socioeconomic activities. Since the purpose of TOD is transit-oriented, then transportation enhancement is more prioritized. Land use and building design are also being promoted to support public transport use, cyclist, and pedestrian as well as to minimize the use of private motorized transport.

TOD can contribute in improving urban investments for rail and bus systems by encouraging the use of public transport, initiating higher-density development, and promoting mixed-use development. Thus, residents living near stations are five to six times more likely to commute via transit than are any other residents in a region,[8] proving the effectiveness of the TOD area in people's mobility.

On a broader scale, TOD can accelerate reverse-flow movement in the public transport system by encouraging commuting from city centers to employment hubs located in outer city centers.

6.3.2 Traffic Congestion Alleviation Policy

Over the years, the government (local, provincial, and national levels) has been applying quite various regulations that aim at congestion alleviation. One of the most impeccable ones would be the transportation demand management (TDM) that is applied at a certain location of the busiest area and at a certain time of the day.

The following explanations are elaboration of historical policies implemented to this day.

Years of 2016-now

In recent years, the odd-even number plate regulation to enter toll road has been proven effective to reduce the load of truck on the trunk road. The regulation was initiated by BPTJ to smoothen the traffic in general in the city center. The regulation was also complemented by the regulation of container ban from entering the toll road from 5 AM - 10 PM. The limited-time for container service created the truck traffic concentration in the nighttime period.

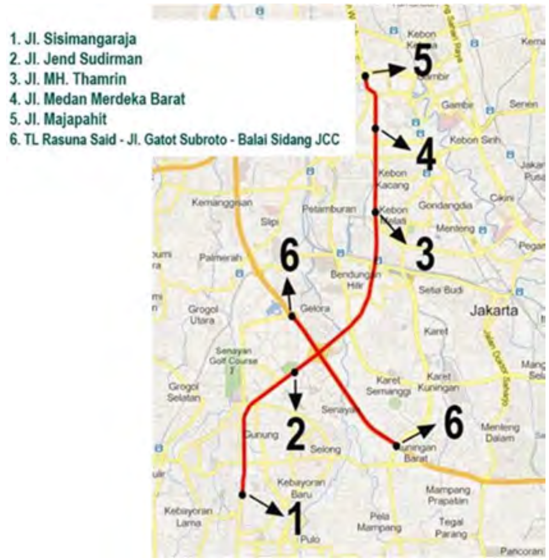
[8] Department of Infrastructure and Planning (2010). Transit-Oriented Development: Guide for Practitioners. Queensland Department of Infrastructure and Planning, Queensland.

Source: www.bptj.dephub.go.id.2017

Figure 175 Target Roads for Odd-Even Number Plate Regulation

Years of 2003-2016

The demand management of general traffic in the city center was regulated by "3-in-1" regulation. This regulation mainly required private cars to be ridden by a minimum of three passengers along a specific road section (see Figure 176). Although the regulation was applied only to private cars during peak period of morning and evening, trucks were prohibited from entering the target road sections during 6 AM – 8 PM on weekdays.



Source: www.jakarta.go.id

Figure 176 Target Roads for 3-in-1 Regulation

Finally, it is assessed by the model that TDM policies would still be required in the implementation year of the transportation master plan. The TDM policy that is proposed in this master plan is ERP (that shall be further discussed in section 9.3) with main reasons of: *first*, to alleviate traffic in designated area, and *second*, to receive revenue that is necessary to fund other transportation-related projects (mainly for the public transportation system improvement). In this sense, ERP is one of the approaches to create financial independency across JABODETABEK area.

In order to explore the policy for traffic congestion alleviation, TOD concept can be considered. TOD concept encourages land-use planning strategy in delivering demand management since it will maximize the efficient use of land and existing infrastructure, making it more integrated and efficient. As a result, distance that was taken to access goods, services, and workplaces will be reduced, eventually helping to tackle the traffic congestion. In terms of economic benefit, TOD is responding to livability and sustainability in reducing private vehicle use that leads to lower cost of urban congestion.

6.3.3 Environmental Betterment Policy

JABODETABEK (especially DKI Jakarta) notorious as the city with a high congestion level is burdened with air pollution and noise disturbance quite extensively. While the current transportation condition is inevitably one of the main causes for both issues, existing enforcement policy may not be able to bring significant reduction/ betterment.

JUTPI 2 would like to propose no additional item of regulation but to make the enforcement stronger and stricter. Principally, the following keys are necessary to be fully considered along with implementation of the proposed transportation master plan:

- Public transportation fleet should not exceed 10-year service period and must pass the regular emission test. Thus, fleet rejuvenation needs to be highly monitored;
- Implementation of TDM that is extensive;
- Improvement of emission test standard passing grade in future years;
- Improvement of non-motorized infrastructure and transit facility;
- Allocation of green space to any transportation infrastructure and application of incentive/disincentive towards the green implementation scheme; and
- Change from fuel-based transit to electricity-based transit especially for mass-transit corridors.

By reducing car dependence and transport-related greenhouse gas emissions, TOD plays an important role in energy conservation, mitigation of climate change, and air-quality improvement. TOD can encourage a much smaller carbon footprint through reduced dependence on private motor vehicles by providing easy access to high-quality public transport services and reducing the need to travel long distances for mandatory, maintenance, and discretionary activities.

TOD will help preserve land on the urban fringe by promoting a more compact form of urban development and preserving open space, greenery, and biodiversity. The existence of the plants and vegetation will be measured as a buffer to the noise and carbon footprint produced by transportation and other activities.

6.3.4 Safety and Security Improvement Policy

Safety and security are essentials for people who use transportation services. In the pilot project activity, facilities that support public transportation usage, for instance, bus shelters, are designed and built to follow the aspects of safety and security requirements. Bus shelter is the first point of contact between the passenger and the bus and/or angkot services. Bus shelter should provide required facilities for safe boarding and alighting of passengers. Accessibility to a bus shelter is a critical element for bus transport ridership. Bus shelter layout should enable a safe and smooth flow of buses and passengers.

Other facilities built or improved in the pilot project activity such as pedestrian path and pelican crossing also supports improvement of safety and security policy. A well-designed layout of transportation-related facilities such as bus shelter, pedestrian path, and pedestrian cross-bridge can allow public transport users to access, board, and alight safely.

Bus stop facilities which were developed in the pilot projects such as railing as a partition between passenger's waiting area and road, proper lighting, equipping bus shelters with panel cover facing the road, and improving passenger's accessibility to the pedestrian path as well as installing pelican crossing facilities are efforts and strategies could be implemented for safety and security policy.

In terms of safety and accessibility, one of the TOD components is to ensure a high-quality public open space to meet the needs of surrounding community, by providing convenience and safety of travel via public transport through barrier-free design including open space. TOD will guarantee to promote a high sense of personal and community safety and equitable access to all public areas. The concept of integration will ensure a design that is seamless and integrated with transit nodes and community.

Safety and security of travel should be improved for people including the elderly, the disabled, and pregnant women when they are using public transportation. Those people will find difficulty in accessing public facilities to some extent, which are narrow sidewalks, steep ramps, an uncompleted system of pelican crossing (e.g., speaker malfunction), etc. For TOD conceptual planning, identification of barriers (physical constraints) and main routes to access to public facilities should be done in the initial phase. Subsequently, public transport operators and local governments must ensure implementation of barrier-free facilities based on the initial study by providing elevators, slopes, signboards, sidewalks with minimum 2-m width, supporting facilities, and so forth. As a result, it will enhance safety and security in public transportation.

Chapter 7 FUTURE MASS TRANSIT NETWORK

7.1 Strategy to Promote Public Transportation Use

JABODETABEK public transportation development has been significantly improved over the years. However, such improvement has not been able to fulfill the actual growth of demand. As targeted in RITJ's KPI, the needs of future public transportation development, the use, and promotion are expected to deliver benefits for transportation efficiency (traffic congestion and parking demand reduction), pollution reduction, and increase social benefit. As mentioned in Section 6.3.1 regarding the basic objectives of public transport promotion, the following strategies need to be implemented.

1) Increase of Railway Transportation Capacity and Improvement of Services

JABODETABEK mass transit has been developed with the core of railway-based despite limited in capacity. It is important to develop the railway-based transportation system extensively and integrate them to road-based transport. Therefore, projected high demand corridor shall be served by railway-based transport. Improvement of existing railway lines and construction of new transportation railway-based system will significantly increase public transport passenger capacity, and by applying proper policy, mode shift from private to public transportation shall be expected.

2) Enhancement of Intermodal Transfer Facility

A smooth transfer is still a problem in JABODETABEK area. Inadequate interchange facilities make passengers difficult to access, thus, it makes people often reluctant to use public transport. A smooth transfer from one mode to another would increase passengers' convenience of public transport. An intermodal transfer facility should be developed by considering the coordination of modes, physical location, design, safety, service reliability, accessibility for all persons including those with physical disabilities, physical attractiveness, and cost. In addition, feeder services such as bus-based transport will be provided for railway passengers within a 5-kilometer radius from the station. Facility for park and ride should be also taken into consideration.

3) Provision of Extensive Public Transportation Network

In the present condition, public transportation service and capacity has not fully met the travel demand. Public transport at higher level of service should be developed in the form of integrated network in order for people to reach destinations within the transportation system. Therefore, line of public transportation network should consist of several trunk lines with feeder services and should cover wide area (including first and last miles). An extensive public transportation network with feeder services such as bus-based transport should be provided for railway passengers within a 5-kilometer radius from the station. Thus, affordable means of transportation are available for low-income households so that it could allow them to live in an area that is far from the center of activity.

4) High-Intensity Land Development in the Surrounding Area of Railway Stations

The integration of the transportation system with land use is very important. It would be convenient for the community to use public transportation that is within a considerable range from their place of living. To realize this, building density in the surrounding area of transportation nodes (such as station and terminal) should be planned appropriately. The type of development within a certain radius from the node is mixed-use (commercial, business, and residential) buildings within a smaller distance from the node and development of landed house within further distance from the node. In general, the development concept can be similar to the TOD concept plan with several adjustments especially in the radius of the development area. The scope of area development can be reduced according to the characteristics and carrying capacity of the area. Thus, the development of the area surrounding each transportation node can be achieved.

5) Implementation of Transportation Demand Management (TDM)

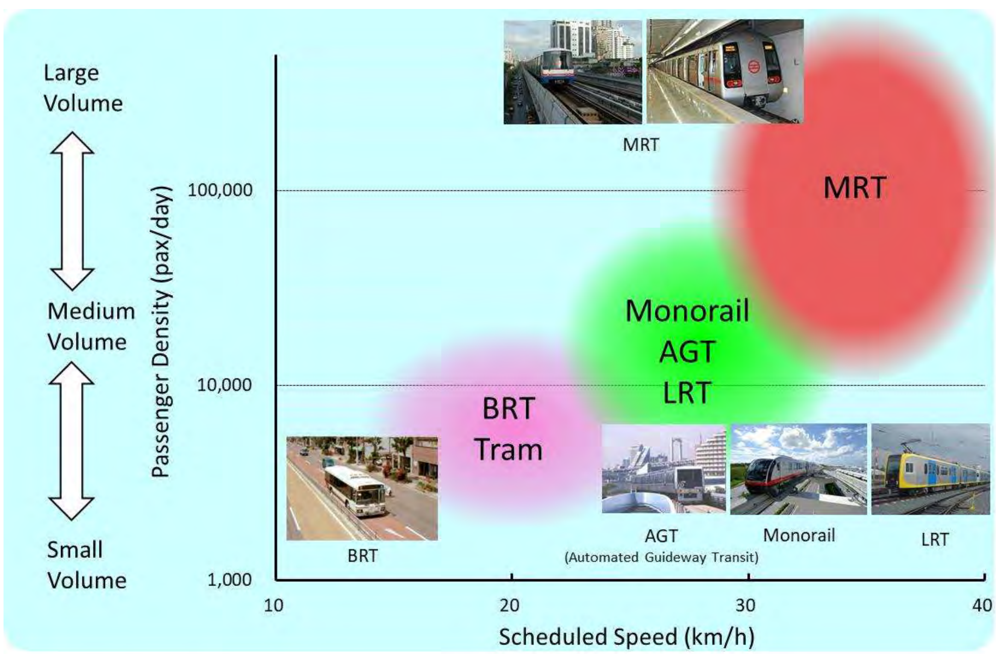
The formulation of TDM strategy is to increase transit ridership, improve the efficiency of existing services, and identify potential new services to publicly provide alternatives for single-occupancy vehicle travel, including services and facilities that encourage and support other travel modes. In addition, it persuades car users to be less dependent on their cars and to raise awareness of the environmental and social impact of car use. The TDM policy that is proposed in the master plan is ERP with main reasons: first, to alleviate traffic in the designated area, and second, to receive revenue that is necessary to fund other transportation-related projects (mainly for the public transportation system improvement).

Interpretation of the strategies mentioned above is that the adequate future mass transit network is essential to be developed to solve the existing problem in public transport and as an anticipation of a growing number of public transport trips in the future. Thus, development of mass transit network is proposed based on the following considerations:

1. To propose new lines and set the alignment of public transport based on scientific analysis through the travel demand forecast model;

2. To maximize the efficiency of the public transport network;
3. To select a proper public transport mode format that can accommodate the travel demand from a neutral and scientific point of view. It is important to introduce optimum transportation systems in each place, with due consideration for city size, future passenger demand, conditions of use, and topographical conditions;
4. To avoid overlapping of many corridors of different public transport modes;
5. To cover 30 activity centers of DKI Jakarta and TOD locations which generate traffic demand; and
6. To consider the staging of 2024, 2029/2030, and 2035 (and after) in accordance with the demand growth.

Based on the considerations mentioned above, the type of mode selection in this master plan follows the standard passenger capacity and travel speed as shown in the figure below.



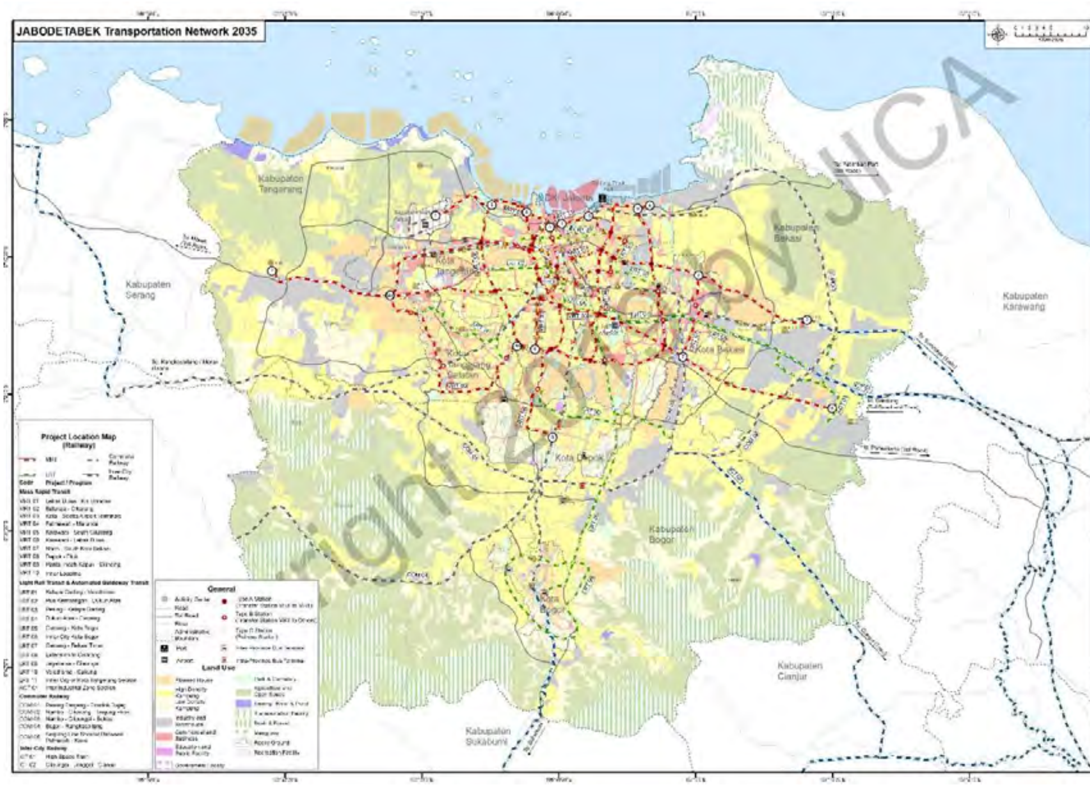
Source: Various References and JUTPI 2

Figure 177 Mass Transit Corridors Capacity and Travel Speed

7.2 Future Mass Transit Network (2035)

JUTPI 2 master plan is a revised RITJ based on the demand forecast measurement that suggests necessity to increase the capacity even more. By using the result of network assignment of JABODETABEK Transportation Master Plan (RITJ) in ultimate years, development of more extensive transit corridors and upgrading planned platforms such as from previousy planned

LRT corridor into MRT and from existing/planned BRT corridor into LRT are needed. Based on that modification, 10 lines of MRT and 11 lines of LRT are proposed.

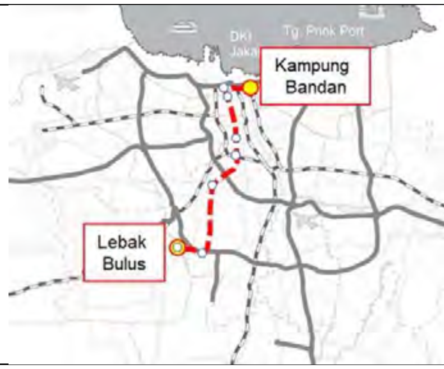


Source: JUTPI 2

Figure 178 JABODETABEK Transportation Network in 2035

7.2.1 MRT Project

While the alignment is planned to be completed in 2024, this line is forecasted in 2035 to handle daily passenger of 791,000 pax/day with passenger density of 150,200 pax/day. There shall be transfer stations from MRT 01 to: MRT 02 at Sarinah, MRT 03 at Kota, MRT 04 at Fatmawati, MRT 05 at Senayan, MRT 06 at Lebak Bulus, MRT 09 at Pondok Indah, LRT 02 and 04 at Dukuh Atas, and LRT 03 at Mangga Besar. These transfer stations shall be developed with TOD concept.



Name	MRT 01
Length	23 km
Section	Kampung Bandan-Lebak Bulus
Daily Pax	791,000 Pax/day
Pax Density JABODETABEK	150,200 Pax/day
Pax Density Jakarta	150,200 Pax/day

Source: JUTPI 2

Figure 179 Detail of MRT 01 Lebak Bulus – Kampung Bandan in 2035

The full alignment of MRT 02 connects Balaraja in Kabupaten Tangerang and Cikarang in Kabupaten Bekasi with total length of around 87 km. MRT 02 passes through Karawaci, Tangerang, National Monument, Cempaka Putih, Cikarang and is forecasted to handle daily passenger of 816,100 pax/day with passenger density of 164,500 pax/day within DKI Jakarta and 114,500 pax/day in JABODETABEK. The alignment is proposed by the previous master plan. MRT 02 is planned to accommodate future demand for radial movement along east-west. Feasibility study of MRT 02 is planned to be done by DGR (Directorate General of Railway) in 2020. Eight transfer station from MRT 02 to another MRT lines are proposed at Karawaci, Rawabuaya, Grogol, National Monument, Sumur Batu, Kelapa Gading Timur, Cakung Barat, and Harapan Jaya. Along with construction of MRT Station, there will be development of TOD area at Palem Semi, Tangerang Station, Poris Plawad, Rawa Buaya, Grogol, Pasar Senen, Bekasi Timur, Bekasi Station, Tambun and Cikarang.

Name	MRT 02
Length	87 km
Section	Cikarang- Balaraja
Daily Pax	816,100 Pax/day
Pax Density JABODETABEK	114,500 Pax/day
Pax Density Jakarta	164,500 Pax/day
Pax Density BODETABEK	87,200 Pax/day

Source: JUTPI 2

Figure 180 Detail of MRT 02 Cikarang – Balaraja in 2035

The full alignment of MRT 03 connects Kota in DKI Jakarta and Soekarno Hatta international airport in Tangerang city with a total length of around 23 km. MRT 03 passes through Pluit, Pantai Indah Kapuk and is forecasted to handle daily passenger of

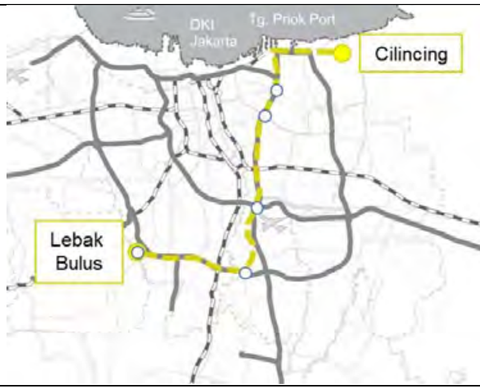
213,800 pax/day with passenger density of 108,100 pax/day within DKI Jakarta and 97,100 pax/day in JABODETABEK. This alignment is proposed in RITJ with the original idea of Airport train; however, with the high number of daily passengers, JUTPI2 proposed this line to be upgraded into MRT. MRT 03 is planned to accommodate future demand for radial movement from the city center to the airport. Located in Jakarta Kota area in DKI Jakarta, MRT 03 will connect with MRT 01 Lebak Bulus – Kampung Bandan and commuter line Jakarta - Bogor and Jakarta - Bekasi. As mentioned in RITJ, Jakarta Kota proposed to be TOD location, through MRT 01, 03, and commuter line, Jakarta Kota will grow to be a large-scale activity center.

Name	MRT 03
Length	23 km
Section	Soetta Airport - Kota
Daily Pax	213,800 Pax/day
Pax Density JABODETABEK	103,300 Pax/day
Pax Density Jakarta	108,100 Pax/day
Pax Density BODETABEK	97,100 Pax/day

Source: JUTPI 2

Figure 181 Detail of MRT 03 Soekarno Hatta International Airport – Kota in 2035

The full alignment of MRT 04 connects Lebak Bulus and Cilincing in DKI Jakarta with a total length of around 38 km. MRT 04 passes through Fatmawati Hospital, Taman Mini, and Cawang, and is forecasted to handle daily passenger of 363,600 pax/day in DKI Jakarta with passenger density of 67,100 pax/day within DKI Jakarta. This alignment is proposed by JUTPI2 based on the future demand forecast. MRT 04 is planned to accommodate future demand for radial movement along north-south within DKI Jakarta. There will be 7 transfer stations from MRT 04 to other MRT lines (MRT 02, 05, 09, and 10). In line with TOD proposal in RITJ, MRT 04 will accommodate Fatmawati and Tanjung Barat TOD.



Name	MRT 04
Length	38 km
Section	Cilincing-Cawang - Lebak Bulus
Daily Pax	363,600 Pax/day
Pax Density JABODETABEK	67,100 Pax/day
Pax Density Jakarta	67,100 Pax/day

Source: JUTPI 2

Figure 182 Detail of MRT 04 Cilincing – Cawang – Lebak Bulus in 2035

The full alignment of MRT 05 connects Karawaci in Kota Tangerang and South Cikarang in Kab. Bekasi with a total length of around 67 km. MRT 05 passes through Joglo cemetery, Senayan, and Halim airport, and is forecasted to handle daily passenger of 348,800 pax/day with passenger density of 76,900 pax/day within DKI Jakarta and 43,500 pax/day in JABODETABEK. This alignment is proposed by JUTPI2 based on the future demand forecast. MRT 05 is planned to accommodate future demand for radial movement along east-west JABODETABEK area. MRT 05 connects with MRT 02 Cikarang – Balaraja and MRT 06 Lebak Bulus – Karawaci, and Karawaci will be a big transit station for those three MRT lines, and it is possible to become like Dukuh Atas in DKI Jakarta.

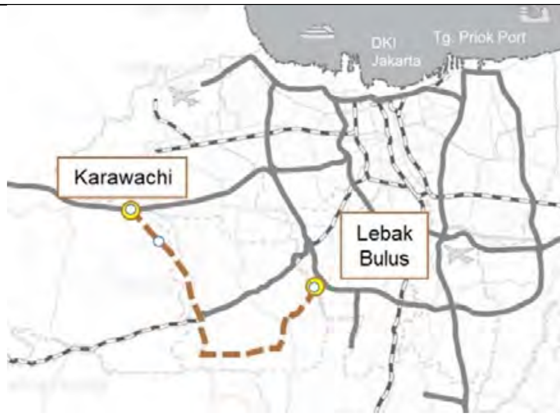
Name	MRT 05
Length	67 km
Section	Karawaci - Senayan-Cawang-South Cikarang
Daily Pax	348,800 Pax/day
Pax Density JABODETABEK	54,500 Pax/day
Pax Density Jakarta	76,900 Pax/day
Pax Density BODETABEK	43,500 Pax/day

Source: JUTPI 2

Figure 183 Detail of MRT 05 Karawaci – Senayan – Cawang – South Cikarang in 2035

The full alignment of MRT 06 connects Lebak Bulus in DKI Jakarta and Karawaci in Kota Tangerang with a total length of around 34 km. MRT 06 passes through Ciputat, Pamulang, Rawa Buntu Station, and Serpong, and is forecasted to handle daily passenger of 288,200 pax/day with passenger density of 65,500 pax/day in JABODETABEK. This alignment is proposed in RITJ with the original idea of LRT; however, with the high number of daily passengers, JUTPI2 proposed this line to be upgraded into MRT. MRT

06 is planned to accommodate future demand for radial movement within Tangerang Selatan and Kota Tangerang. MRT 06 connects with MRT 02 Cikarang - Balaraja and MRT 05 South Cikarang – Balaraja, and Karawaci will be a big transit station for those three MRT lines, and it is possible to become like Dukuh Atas in DKI Jakarta. Pre-feasibility study of MRT 06 with almost similar alignment has been done by Kota Tangerang Selatan in 2019, as a proposal to be stated in the national strategic program.



Name	MRT 06
Length	34 km
Section	Lebak Bulus-Rawa Buntu-Karawaci
Daily Pax	288,200 Pax/day
Pax Density JABODETABEK	65,500 Pax/day
Pax Density BODETABEK	65,500 Pax/day

Source: JUTPI 2

Figure 184 Detail of MRT 06 Lebak Bulus – Rawa Buntu – Karawaci in 2035

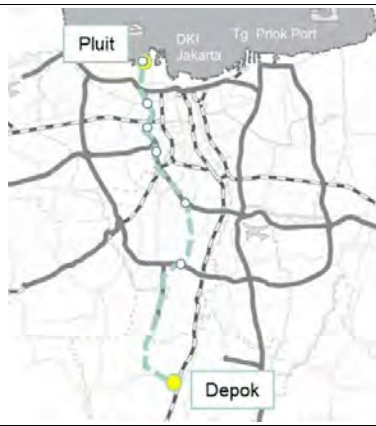
MRT 07 is an inner line that spanned from the south side of Kota Bekasi to the north side of Kota Bekasi with total length of around 13 km. MRT 07 passes through some big scale development area, government offices and existing hubs. It is forecasted to handle daily passenger of 177,700 pax/day with passenger density of 75,800 pax/day in JABODETABEK. The alignment is proposed by RITJ. MRT 07 is planned to accommodate future demand for radial movement along north-south. With thorough development planned for 2035, significant station development (with TOD concept) shall be applied in areas of Summarecon, Bekasi Utara, and Bekasi Selatan.

Name	MRT 07
Length	13 km
Section	North - South Kota Bekasi
Daily Pax	177,700 Pax/day
Pax Density JABODETABEK	75,800 Pax/day
Pax Density BODETABEK	75,800 Pax/day

Source: JUTPI 2

Figure 185 Detail of MRT 07 North – South Bekasi in 2035

The full alignment of MRT 08 connects Pluit in the northern part of DKI Jakarta and Kota Depok with a total length of around 39 km. MRT 08 passes through Pluit, Grogol, and Kuningan, and is forecasted to handle daily passenger of 347,000 pax/day with passenger density of 82,200 pax/day within DKI Jakarta and 51,700 pax/day in BODETABEK. The alignment is proposed by JUTPI 2. MRT 08 is planned to accommodate future demand for radial movement along north-south towards the outskirts of Jakarta. With thorough development planned for 2035, significant station development (with TOD concept) shall be applied in areas of Grogol, Dukuh Atas, and Depok Baru.



Name	MRT 08
Length	39 km
Section	Pluit-Grogol-Kuningan- Depok
Daily Pax	347,000 Pax/day
Pax Density JABODETABEK	72,100 Pax/day
Pax Density Jakarta	82,200 Pax/day
Pax Density BODETABEK	51,700 Pax/day

Source: JUTPI 2

Figure 186 Detail of MRT 08 Pluit – Grogol – Kuningan – Depok in 2035

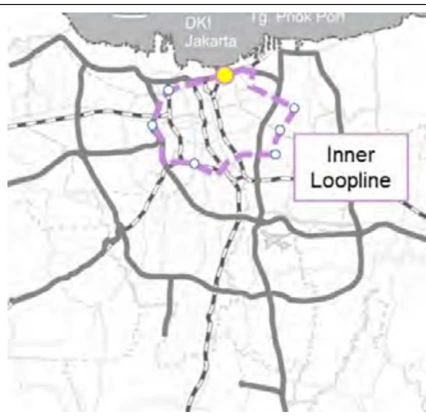
MRT 09 is a circular line that spanned towards the JORR from Kamal in the west to Cilincing in the east. With total length of 63 km, MRT 09 passes through the airport access road, logistic storages, Bintaro area, Kampung Rambutan bus terminal, and Cilincing. It is forecasted to handle daily passenger of 507,500 pax/day with passenger density of 80,700 pax/day within DKI Jakarta and 80,100 pax/day in JABODETABEK. The alignment is proposed by TGUPP to develop a new outer loop MRT line that crosses DKI Jakarta and Kota Bekasi to reduce the traffic volume in the city center. With thorough development planned for 2035, significant station development (with TOD concept) shall be applied in areas of Jurangmangu, Kampung Rambutan, and TOD at the station areas in Kota Bekasi.

Name	MRT 09
Length	63 km
Section	Outer Loopline
Daily Pax	507,500 Pax/day
Pax Density JABODETABEK	80,100 Pax/day
Pax Density Jakarta	80,700 Pax/day
Pax Density BODETABEK	72,000 Pax/day

Source: JUTPI 2

Figure 187 Detail of MRT 09 Outer Loopline in 2035

MRT 10 is an inner loop line that serves the circular movement around the city. The alignment is proposed bu TGUPP to develop a new inner loop line of MRT within DKI Jakarta. With the total length around of 38 km, MRT 10 passes through Tanah Abang, Duri, Angke, Kampung Bandan, Kemayoran, and Manggarai. It is forecasted to accommodate daily passenger of 536,200 pax/day with passenger density of 72,800 pax/day within DKI Jakarta. With thorough development, significant station development (with TOD concept) shall be applied in areas of Tanah Abang, Mangga Dua, and Manggarai.



Name	MRT 10
Length	38 km
Section	Inner Loopline
Daily Pax	536,200 Pax/day
Pax Density JABODETABEK	72,800 Pax/day
Pax Density Jakarta	72,800 Pax/day

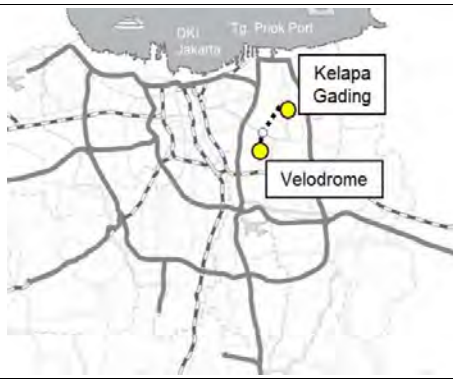
Source: JUTPI 2

Figure 188 Detail of MRT 10 Inner Loopline in 2035

7.2.2 LRT Project

The new LRT lines are expected to accommodate the JABODETABEK future demand in 2035. These new lines will be using as a feeder to MRT to connect from density area and MRT as the main transportation mode.

While the alignment is planned to be completed in 2024, this line is forecasted in 2035 to handle daily handle daily passenger of 30,300 pax/day with passenger density of 11,200 pax/day. There shall be transfer stations from LRT 01 to; MRT 02 at Pulomas, MRT 10 along the line, LRT 03 at Kelapa Gading, and LRT 10 at Velodrome. It should be noted that alignment of LRT 01 is similar to part of MRT 10. The two lines may be able to coexist although the railway infrastructure cannot be shared considering the dimension required.



Name	LRT 01
Length	6 km
Section	Kelapa Gading-Velodrome
Daily Pax	30,300 Pax/day
Pax Density JABODETABEK	11,200 Pax/day
Pax Density Jakarta	11,200 Pax/day

Source: JUTPI 2

Figure 189 Detail of LRT 01 Kelapa Gading – Velodrome in 2035

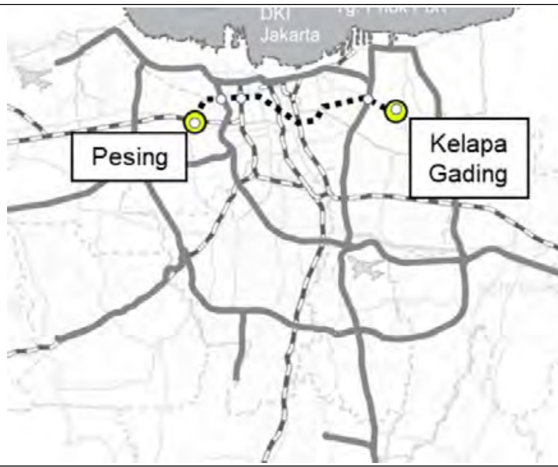
The full alignment of LRT 02 connects Dukuh Atas and Puri Kembangan in DKI Jakarta with a total length of around 12 km. LRT 02 passes through Dukuh Atas, Kemanggisan, and Walikota Jakarta office and is forecasted to handle daily passenger of 63,800 pax/day with passenger density of 63,800 pax/day in DKI Jakarta. This alignment is proposed by previous master plan. LRT 02 is planned to accommodate future demand for radial movement in Jakarta Pusat and Jakarta Barat. LRT 02 Dukuh Atas – Puri Kembang is a proposal under Adhi karya, as an extension for Cawang – Dukuh Atas LRT. Even though the area is in DKI Jakarta, the funding source for LRT 02 comes from national budget.

Name	LRT 02
Length	12 km
Section	Puri Kembangan-Tanah Abang-Dukuh Atas
Daily Pax	63,800 Pax/day
Pax Density JABODETABEK	21,000 Pax/day
Pax Density Jakarta	21,000 Pax/day

Source: JUTPI 2

Figure 190 Detail of LRT 02 Puri Kembangan – Tanah Abang – Dukuh Atas in 2035

The full alignment of LRT 03 connects Kelapa Gading and Pesing with a total length of around 17 km. LRT 03 passes through Mega Glodok, Mangga Besar, and Jelambar, and is forecasted to handle daily passenger of 369,100 pax/day with passenger density of 65,600 in DKI Jakarta. This alignment is proposed by the previous master plan. LRT 03 is planned to accommodate future demand for radial movement for Jakarta Utara, Jakarta Pusat, and Jakarta Barat. As an extension from LRT 01 Velodrome – Kelapa Gading, LRT 03 will be connected with Stasiun Commuter Line Pesing in Jakarta Barat. Since LRT 03 is connected with LRT 01, the operator will be the same, that is, Jakpro.



Name	LRT 03
Length	17 km
Section	Pesing- Kelapa Gading via Kemayoran
Daily Pax	369,100 Pax/day
Pax Density JABODETABEK	65,600 Pax/day
Pax Density Jakarta	65,600 Pax/day

Source: JUTPI 2

Figure 191 Detail of LRT 03 Pesing - Kelapa Gading via Kemayoran in 2035

While the alignment is planned to be completed in 2024, this line is forecasted for 2035 to handle daily passenger of 94,900 pax/day with passenger density of 37,300 pax/day. Same transfer stations as in 2029/30 shall be developed with TOD concept.

Name	LRT 04
Length	10 km
Section	Cawang-Kuningan-Dukuh Atas
Daily Pax	94,900 Pax/day
Pax Density JABODETABEK	37,300 Pax/day
Pax Density Jakarta	37,300 Pax/day

Source: JUTPI 2

Figure 192 Detail of LRT 04 Cawang - Kuningan – Dukuh Atas in 2035

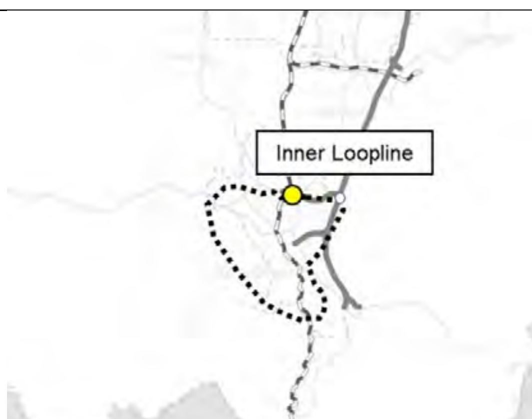
The full alignment of LRT 05 connects Cawang in DKI Jakarta and Baranangsiang in Kota Bogor with a total length of around 44 km. LRT 05 passes through Kampung Rambutan, Cibubur, and Sentul, and is forecasted to handle daily passenger of 161,600 pax/day with passenger density of 77,000 pax/day within DKI Jakarta and 61,300 pax/day in JABODETABEK. The alignment is proposed by the previous Master Plan. LRT 05 is planned to accommodate future demand for radial movement along north-south. As a start point, LRT 05 is proposed to start at transfer station of MRT 05 and end at Baranangsiang Terminal in Kota Bogor.

Name	LRT 05
Length	44 km
Section	Cawang- Cibubur- Kota Bogor
Daily Pax	161,600 Pax/day
Pax Density JABODETABEK	61,300 Pax/day
Pax Density Jakarta	77,000 Pax/day
Pax Density BODETABEK	54,100 Pax/day

Source: JUTPI 2

Figure 193 Detail of LRT 05 Cawang – Cibubur – Kota Bogor in 2035

The full alignment of LRT 06 creates a loop line to connect inner city of Kota Bogor and Kabupaten Bogor with a total length of around 40 km. LRT 06 passes through Rancamaya, Bubulak, Sentul, and Cikeas, and is forecasted to handle daily passenger of 89,800 pax/day with passenger density of 16,800 pax/day in JABODETABEK. The alignment is proposed by previous Master Plan. LRT 06 is planned to accommodate future demand for circular movement within Kota Bogor and Kabupaten Bogor.

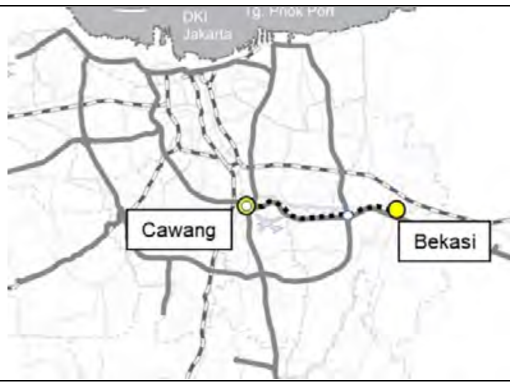


Name	LRT 06
Length	40 km
Section	Inner Loopline of Kota&Kabupaten Bogor
Daily Pax	89,800 Pax/day
Pax Density JABODETABEK	16,800 Pax/day
Pax Density BODETABEK	16,800 Pax/day

Source: JUTPI 2

Figure 194 Detail of LRT 06 Inner Loopline of Kota Bogor and Kabupeten Bogor in 2035

The full alignment of LRT 07 connects Cawang in the eastern part of DKI Jakarta and Kota Bekasi in the eastern part (Bekasi Timur) with a total length of around 19 km. LRT 07 passes through Halim into Bekasi Barat and is forecasted to handle daily passenger of 210,200 pax/day with passenger density of 77,500 pax/day within DKI Jakarta and 80,100 pax/day within BODETABEK. The alignment is proposed by RITJ in compliance with national strategic project. LRT 07 is planned to accommodate future demand for railway-based transport towards Kota Bekasi. Considering the development plan in 2035, significant station developments with TOD concept shall be applied in areas of LRT stations in Cawang – Cikoko and Kota Bekasi (Jati Cempaka and Bekasi Timur).



Name	LRT 07
Length	19 km
Section	Cawang- Bekasi Timur
Daily Pax	210,200 Pax/day
Pax Density JABODETABEK	79,700 Pax/day
Pax Density Jakarta	77,500 Pax/day
Pax Density BODETABEK	80,100 Pax/day

Source: JUTPI 2

Figure 195 Detail of LRT 07 Cawang – Bekasi Timur in 2035

The full alignment of LRT 08 connects Bekasi Timur and Cikarang with a total length of around 15 km. LRT 08 passes through Bekasi Timur into Cikarang and is forecasted to handle daily passenger of 42,700 pax/day with passenger density of 21,000 pax/day within JABODETABEK. The alignment is proposed by RITJ. LRT 08 is planned to accommodate radial movement towards Cikarang of Kabupaten Bekasi which is a core of industrial estate in JABODETABEK. Considering the development plan in 2035, significant station developments with TOD concept shall be applied in areas of Tambun, Cikarang – Jababeka, Cikarang Station, and Cikarang Selatan.

Name	LRT 08
Length	15 km
Section	Extension Route up to Cikarang
Daily Pax	42,700 Pax/day
Pax Density JABODETABEK	21,000 Pax/day
Pax Density Jakarta	- Pax/day
Pax Density BODETABEK	21,000 Pax/day

Source: JUTPI 2

Figure 196 Detail of LRT 08 Extension Route up to Cikarang in 2035

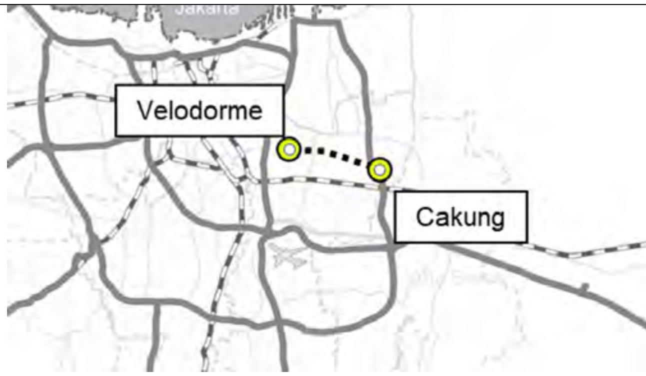
The full alignment of LRT 09 connects Jagakarsa in Jakarta Selatan and Cileungsi in Kabupaten Bekasi with a total length of around 25 km. LRT 09 passes through some office districts and tourism objects like Taman Mini Indonesia Indah and Taman Buah Mekarsari. It is forecasted to handle daily passenger of 141,100 pax/day with passenger density of 32,100 pax/day within Jakarta. The alignment is proposed by RITJ. LRT 09 is planned to accommodate radial movement outskirt of Jakarta for the commuters towards Kabupaten Bogor. With significant station developments with TOD concept shall be applied in areas of Kampung Rambutan and Cibubur.

Name	LRT 09
Length	25 km
Section	Jagakarsa-Cibubur-Cileungsi
Daily Pax	141,100 Pax/day
Pax Density JABODETABEK	34,300 Pax/day
Pax Density Jakarta	32,100 Pax/day
Pax Density BODETABEK	34,400 Pax/day

Source: JUTPI 2

Figure 197 Detail of LRT 09 Jagakarsa – Cibubur – Ciluengsi in 2035

The full alignment of LRT 10 connects Velodrome (Rawamangun) and Cakung with a total length of around 8 km. LRT 10 passes through Rawamangun and Jakarta Industrial Estate Pulogadung (JIEP). It is forecasted to handle daily passenger of 54,400 pax/day with passenger density of 31,700 pax/day within Jakarta. The alignment is proposed by JUTPI 2. LRT 10 is planned to develop new line Velodrome to Cakung and to accommodate the movement in the industrial estates of Pulo Gadung, East Jakarta. With thorough development planned for 2035, significant station development (with TOD concept) shall be applied in areas of Pulomas.

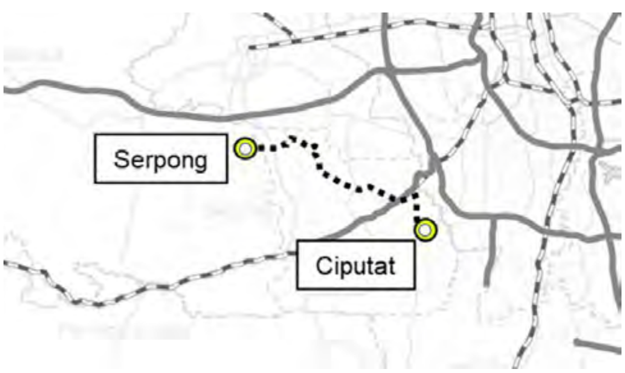


Name	LRT 10
Length	8 km
Section	Velodrome-JIEP-Cakung
Daily Pax	54,400 Pax/day
Pax Density JABODETABEK	31,700 Pax/day
Pax Density Jakarta	31,700 Pax/day
Pax Density BODETABEK	- Pax/day

Source: JUTPI 2

Figure 198 Detail of LRT 10 Velodrome – JIEP – Cakung in 2035

LRT 11 is an inner line that spanned from Serpong to Ciputat with a total length of around 20 km. LRT 11 passes through some big scale development area in Tangerang Selatan, commercial areas and vernment offices. It is forecasted to serve daily passenger of 106,700 pax/day with passenger density of 27,600 pax/day in JABODETABEK. The alignment is proposed by Kota Tangerang Selatan. LRT 11 is planned to accommodate future demand for radial movement along east to west side of Tangerang Selatan. With thorough development, significant station development (with TOD concept) shall be applied in areas of Jurangmangu and Rawabuntu.



Name	LRT 11
Length	20 km
Section	Inner City Kota Tangeran Selatan
Daily Pax	106,700 Pax/day
Pax Density JABODETABEK	27,600 Pax/day
Pax Density Jakarta	- Pax/day
Pax Density BODETABEK	27,600 Pax/day

Source: JUTPI 2

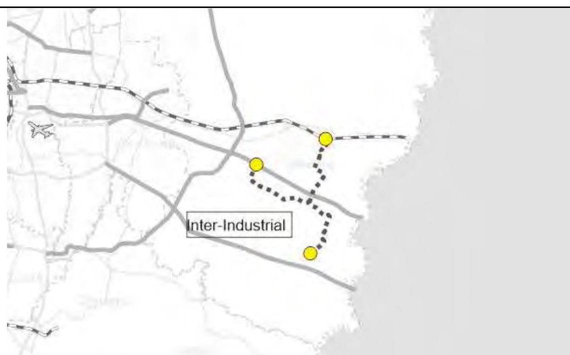
Figure 199 Detail of LRT 11 Inner City Kota Tangerang Selatan in 2035

7.2.3 Bus-based Project

Through the rationalization concept, BRT will be functioned as feeder transport for the rail-based transport system. To alleviate competing alignment, existing route of BRT shall be reorganized and once the rail development is completed in the target year of 2035, the bus-based transport in uniform format shall replace the existing “angkot” format theoughout JABODETABEK. Designated BRT system shall be done along the corridor that is not served by the railway system.

7.2.4 Others Railway Project

The full alignment of AGT 01 connects Cikarang and Karawang in Kabupaten Bekasi with a total length of 27 km. AGT 01 passes through Cikarang Station, Jababeka, Lippo Cikarang, and East Jakarta Industrial Park. The alignment is proposed in RITJ and is planned to accommodate future demand for intra trips movement within the industrial areas in Kabuten Bekasi. Feasibility study of AGT 01 has conducted by JICA in 2013.



Name	AGT 01
Length	27 km
Section	Inter-Industrial Estate

Source: JUTPI 2

Figure 200 Detail of AGT 01 Inter-Industrial Zone in 2035

The full alignment of COM 01 connects Pondok Rajeg in Kabupaten Bogor and Parung Panjang in Kabupaten Tangerang with a total length of 30 km. COM 01 passes through Citayam into Gunung Sindur. This alignment is proposed by RTRW of Kabupaten Bogor. COM 01 is planned to accommodate future demand for circular movement within Kabupaten Bogor and Kabupaten Tangerang. In the existing condition, travel by train from Kabupaten Bogor to Kabupaten Tangerang has to go through DKI Jakarta and Kota Tangerang Selatan. With the coordination between DGR, Kabupaten Bogor, and Kabupaten Tangerang, as well other related institutions the travel will be shortened by the existence of COM 01.

Name	COM 01
Length	30 km
Section	Pondok Rajeg – Parung Panjang

Source: JUTPI 2

Figure 201 Detail of COM 01 Pondok Rajeg – Parung Panjang in 2035

COM 02 is proposed to have full alignment from Tanjung Priok in DKI Jakarta into Nambo in Kabupaten Bogor with a total length of 92 km. COM 02 passes through Tanjung Priok, Cikarang, and Nambo. The alignment is proposed in RITJ and is planned to accommodate future demand for circular freight movement.

Name	COM 02
Length	92 km
Section	Tanjung Priok - Nambo

Source: JUTPI 2

Figure 202 Detail of COM 02 Tanjung Priok – Nambo in 2035

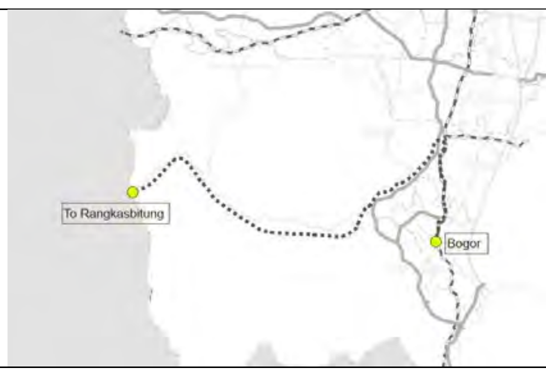
The full alignment of COM 03 connects existing Bekasi Railway (Kranji Station) in Kota Bekasi into Nambo in Kabupaten Bogor with a total length of 21 km. COM 03 passes through Cikunir, Bojong Menteng. The alignment is proposed in RTRW Kabupaten Bogor and Kabupaten Bekasi and is planned to accommodate future demand for circular movement. Along this alignment, COM 03 connects with MRT 05 in Bojong Menteng.

	Name	COM 03
	Length	21 km
	Section	Bekasi - Nambo

Source: JUTPI 2

Figure 203 Detail of COM 03 Bekasi – Nambo in 2035

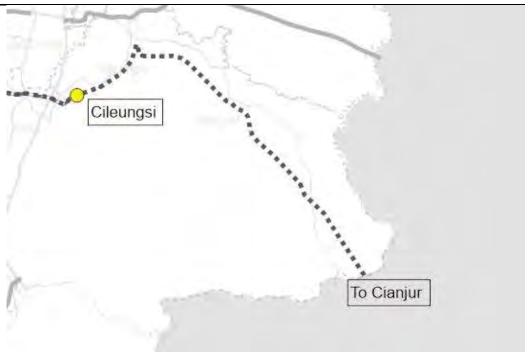
Commuter line 04 spanned from Bogor to Rangkasbitung with a total length of around 59 km. This line passes through Tanah Abang, Palmerah, Kebayoran (DKI Jakarta), Jurangmangu, Rawabuntu, Serpong (Tangerang Selatan), Parung Panjang (Kabupaten Bogor), and Tigaraksa, and Cikoya (Kabupaten Tangerang) towards JABODETABEK border with Kabupaten Lebak in Station Maja, ending the route in Rangkasbitung Station. COM 04 is planned to accommodate radial movement outskirt of Jakarta for the commuters from Tangerang Selatan, Kabupaten Bogor, and Kabupaten Tangerang. With significant station developments with TOD concept shall be applied in areas of Jurangmangu, Rawa Buntu, Cisauk, Cikoya, and Tigaraksa.

	Name	COM 04
	Length	59 km
	Section	Bogor - Rangkasbitung

Source: JUTPI 2

Figure 204 Detail of COM 04 Bogor – Rangkasbitung in 2035

The full alignment of Inter City Train (02) connects Cileungsi and Cianjur. With a total length of around 32 km within JABODETABEK area, ICT 02 passes through tourism objects and newly developed area in both Kabupaten Bogort (Cileungsi and Jonggol) and Kabupaten Cianjur. The alignment is proposed in RITJ and spatial plan of Kabupaten Bogor to develop new line of commuter line and serve the movement along Bogor and Cianjur. With thorough development planned for 2035, significant station development (with TOD concept) shall be applied in areas around Cileungsi and Jonggol.

	Name	ICT 02
	Length	32 km
	Section	Cianjur - Cileungsi

Source: JUTPI 2

Figure 205 Detail of ICT 02 Cileungsi – Cianjur in 2035

7.3 Future Mass Transit Network (2029)

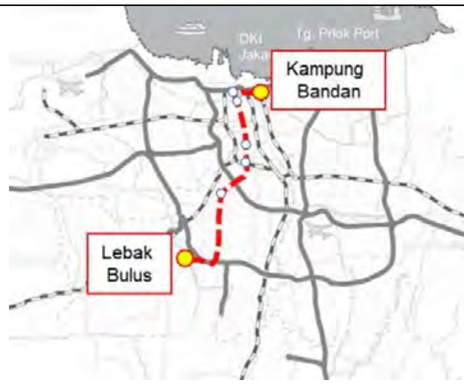
Mass transit network development in 2029 is decided by considering forecasted passenger demand and financial capacity of Kota/Kabupaten. The presumption of only DKI Jakarta that shall have sufficient budget to develop mass transit network is considered, thus, mass transit network development is limited within DKI Jakarta.

Source: JUTPI 2

Figure 206 JABODETABEK Transportation Network in 2029/30

7.3.1 MRT Project

While the alignment is planned to be completed in 2024, this line is forecasted in 2029/30 to handle daily passenger of 489,000 pax/day with passenger density of 111,000 pax/day. There shall be transfer stations from MRT 01 to: MRT 02 at Sarinah, MRT 03 at Kota, MRT 05 at Senayan, LRT 02 and 04 at Dukuh Atas, and LRT 03 at Mangga Besar. These transfer stations shall be developed with TOD concept.



Name	MRT 01
Length	23 km
Section	Kampung Bandan-Lebak Bulus
Daily Pax	489,600 Pax/day
Pax Density JABODETABEK	111,000 Pax/day
Pax Density Jakarta	111,000 Pax/day

Source: JUTPI 2

Figure 207 Detail of MRT 01 Lebak Bulus – Kampung Bandan Project in 2029/30

The intermediate alignment of MRT 02 connects Ujung Menteng and Kalideres in DKI Jakarta with a total length of around 33 km. MRT 02 passes through Pulomas, National Monument, and Grogol, and is forecasted to handle daily passenger of 368,400 pax/day with passenger density of 95,700 pax/day in DKI Jakarta. The alignment is proposed in previous master plan. MRT 02 is planned to accommodate future demand for radial movement along east-west. Feasibility study of MRT 02 is planned to be done by DGR (Directorate General of Railway) in 2020. There shall be transfer stations from MRT 02 to: MRT 01 at Sarinah, MRT 08 at Daan Mogot, MRT 10 and LRT 01 at Pulomas. These transfer stations shall be developed with TOD concept.

Name	MRT 02
Length	33 km
Section	Kalideres-Ujung Menteng
Daily Pax	368,400 Pax/day
Pax Density JABODETABEK	95,700 Pax/day
Pax Density Jakarta	95,700 Pax/day

Source: JUTPI 2

Figure 208 Detail of MRT 02 Ujung Menteng - Kalideres Project in 2029/30

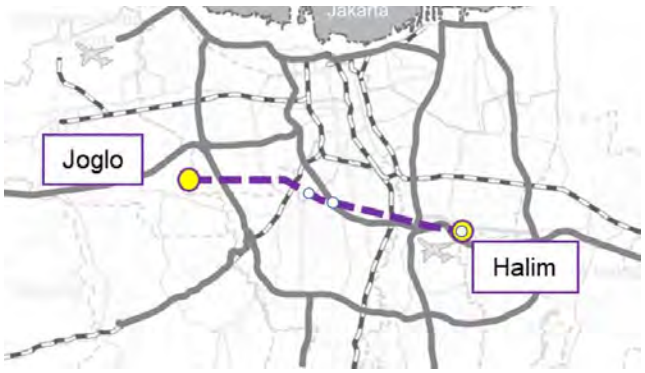
The full alignment of MRT 03 connects Kota in DKI Jakarta and Soekarno Hatta international airport in Kota Tangerang with a total length of around 23 km. MRT 03 passes through Pluit, and Pantai Indah Kapuk, and in 2029/30 it is forecasted to handle daily passenger of 165,800 pax/day with passenger density of 92,900 pax/day. This alignment is proposed in RITJ in the format of LRT. However, forecast demand suggested immediate high demand; thus, it is now proposed as MRT. MRT 03 is planned to accommodate future demand for radial movement from city center to airport. There shall be transfer stations from MRT 03 to: MRT 01 at Kota and MRT 08 at Pluit. Transfer station at Kota also connects MRT 03 with railway commuter lines (Bogor and Bekasi lines). These transfer stations shall be developed with TOD concept.

Name	MRT 03
Length	23 km
Section	Soetta Airport - Kota
Daily Pax	165,800 Pax/day
Pax Density JABODETABEK	92,900 Pax/day
Pax Density Jakarta	92,900 Pax/day

Source: JUTPI 2

Figure 209 Detail of MRT 03 Soekarno Hatta International Airport - Kota Project in 2029/30

The intermediate alignment of MRT 05 connects Halim and Joglo in DKI Jakarta with a total length of around 22 km. MRT 05 passes through Joglo, Senayan, and Halim airport, and in 2029/30 it is forecasted to handle daily passenger of 154,400 pax/day with passenger density of 39,400 pax/day. This alignment is proposed by JUTPI2 based on the future demand forecast. MRT 05 is planned to accommodate future demand for radial movement along east-west. There shall be transfer stations from MRT 05 to; MRT 01 at Senayan, MRT 08 and LRT 04 at Kuningan, and LRT 05 at Cawang. These transfer stations shall be developed with TOD concept.



Name	MRT 05
Length	22 km
Section	Joglo-Halim
Daily Pax	154,400 Pax/day
Pax Density JABODETABEK	39,400 Pax/day
Pax Density Jakarta	39,400 Pax/day

Source: JUTPI 2

Figure 210 Detail of MRT 05 Halim - Joglo in 2029/30

The intermediate alignment of MRT 08 connects Pluit to Cilandak in DKI Jakarta proposed with a total length of 23 km in 2029/30. MRT 08 passes through Pluit, Grogol, and Kuningan, and is forecasted to handle daily passenger of 275,300 pax/day with passenger density of 72,300 pax/day. This alignment is proposed by JUTPI2 based on the future demand forecast. MRT 08 is planned to accommodate future demand for radial movement along north-south. There shall be transfer stations from MRT 08 to: MRT 02 and LRT 03 at Daan Mogot, MRT 03 at Pluit, MRT 05 and LRT 04 at Kuningan, and LRT 02 at Kemanggisan. These transfer stations shall be developed with TOD concept.

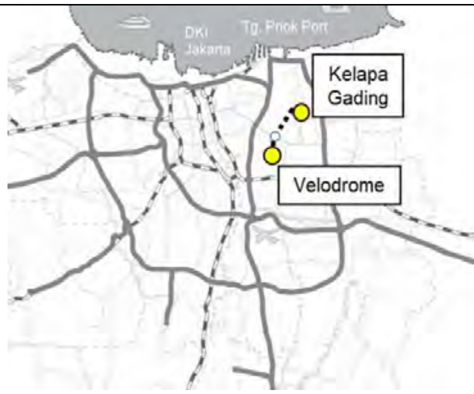
Name	MRT 08
Length	23 km
Section	Pluit-Grogol-Kuningan-Cilandak
Daily Pax	275,300 Pax/day
Pax Density JABODETABEK	72,300 Pax/day
Pax Density Jakarta	72,300 Pax/day

Source: JUTPI 2

Figure 211 Detail of MRT 08 Pluit – Grogol – Kuningan – Cilandak Project in 2029/30

7.3.2 LRT Project

While the alignment is planned to be completed in 2024, this line is forecasted in 2029/30 to handle daily passenger of 97,100 pax/day with passenger density of 46,500 pax/day. There shall be transfer stations from LRT 01 to: MRT 02 at Pulomas, LRT 03 at Kelapa Gading, and LRT 10 at Velodrome. Although it is not decided in this M/P, direct operation service of LRT 01, 03, and 10 may be applicable.

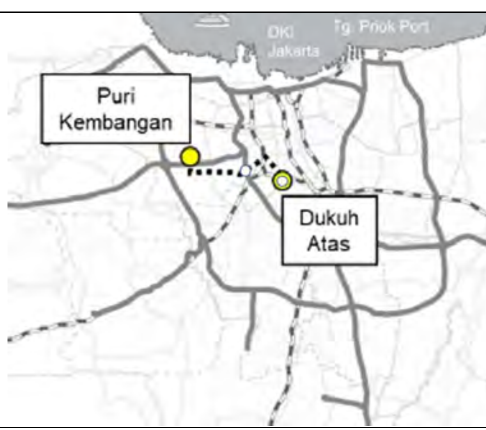


Name	LRT 01
Length	6 km
Section	Kelapa Gading-Velodrome
Daily Pax	97,100 Pax/day
Pax Density JABODETABEK	46,500 Pax/day
Pax Density Jakarta	46,500 Pax/day

Source: JUTPI 2

Figure 212 Detail of LRT 01 Kelapa Gading – Velodrome Project in 2029/30

The full alignment of LRT 02 connects Dukuh Atas and Puri Kembangan in DKI Jakarta with a total length of around 12 km. LRT 02 passes through Dukuh Atas, Kemanggisan, and Walikota Jakarta office, and in 2029/30 it is forecasted to handle daily passenger of 76,500 pax/day with passenger density of 32,000 pax/day in DKI Jakarta. This alignment is proposed in RITJ. LRT 02 is planned to accommodate future demand for radial movement in Jakarta Pusat and Jakarta Barat. LRT 02 Dukuh Atas – Puri Kembang is a proposal of extension LRT 04.

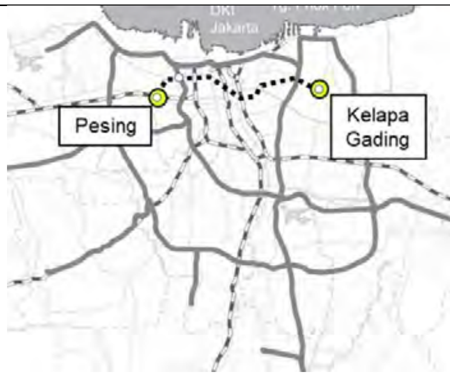


Name	LRT 02
Length	12 km
Section	Puri Kembangan-Tanah Abang-Dukuh Atas
Daily Pax	76,500 Pax/day
Pax Density JABODETABEK	32,000 Pax/day
Pax Density Jakarta	32,000 Pax/day

Source: JUTPI 2

Figure 213 Detail of LRT 02 Puri Kembangan – Tanah Abang – Dukuh Atas in 2029/30

The full alignment of LRT 03 connects Kelapa Gading and Pesing with a total length of around 17 km. LRT 03 passes through Mega Glodok, Mangga Besar, and Jelambar and in 2029/30 is forecasted to handle daily passenger of 224,100 pax/day with passenger density of 49,200 in DKI Jakarta. This alignment is proposed in the previous master plan. LRT 03 is planned to accommodate future demand for radial movement within Jakarta Utara, Jakarta Pusat and Jakarta Barat. As an extension from LRT 01, LRT 03 will connect to Tangerang line (commuter railway) at Pesing.

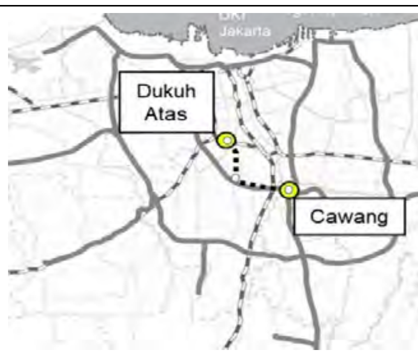


Name	LRT 03
Length	17 km
Section	Pesing- Kelapa Gading via Kemayoran
Daily Pax	224,100 Pax/day
Pax Density JABODETABEK	49,200 Pax/day
Pax Density Jakarta	49,200 Pax/day

Source: JUTPI 2

Figure 214 Detail of LRT 03 Pesing - Kelapa Gading via Kemayoran in 2029/30

While the alignment is planned to be completed in 2024, this line is forecasted in 2029/30 to handle daily passenger of 82,700 pax/day with passenger density of 36,000 pax/day. There shall be transfer stations from LRT 04 to; MRT 08 at Kuningan Timur, and LRT 05 and 07 at Cawang. Although it is not decided in this M/P, direct operation service of LRT 04, 05, and 07 may be applicable. It should be noted that part of the alignment of LRT 04 is similar to part of MRT 05. The two lines may be able to coexist although the railway infrastructure cannot be shared considering the dimension required.



Name	LRT 04
Length	10 km
Section	Cawang-Kuningan-Dukuh Atas
Daily Pax	82,700 Pax/day
Pax Density JABODETABEK	36,000 Pax/day
Pax Density Jakarta	36,000 Pax/day

Source: JUTPI 2

Figure 215 Detail of LRT 04 Cawang - Kuningan – Dukuh Atas in 2029/30

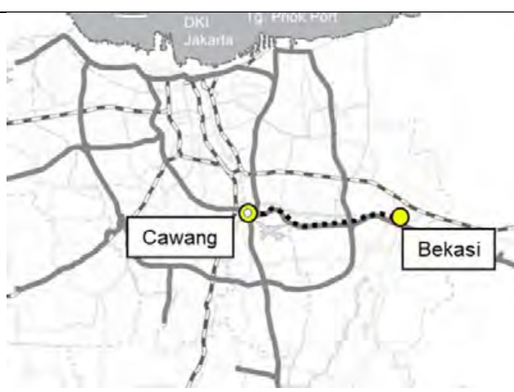
The full alignment of LRT 05 connects Cawang in DKI Jakarta and Baranangsiang in Bogor City with a total length of around 44 km. LRT 05 passes through Kampung Rambutan, Cibubur, and Sentul, and in 2029/30 it is forecasted to handle daily passenger of 112,200 pax/day with passenger density of 34,500 pax/day in JABODETABEK. This alignment is proposed by unsolicited plan made by MoT. LRT 05 is planned to accommodate future demand for radial movement along north-south. There shall be transfer stations from LRT 05 to: MRT 05 at Cawang and to bus terminal at Baranangsiang in Kota Bogor.

Name	LRT 05
Length	44 km
Section	Cawang- Cibubur-Kota Bogor
Daily Pax	112,200 Pax/day
Pax Density JABODETABEK	34,500 Pax/day

Source: JUTPI 2

Figure 216 Detail of LRT 05 Cawang – Cibubur – Kota Bogor in 2029/30

While the alignment is planned to be completed in 2024, this line is forecasted in 2029/30 to handle daily passenger of 154,500 pax/day with passenger density of LRT 07 of 79,800 pax/day in JABODETABEK. Considering the development plan in 2035, significant station developments with TOD concept shall be applied in areas of LRT stations in Cawang – Cikoko and Kota Bekasi (Jati Cempaka and Bekasi Timur).



Name	LRT 07
Length	19 km
Section	Cawang-Bekasi Timur
Daily Pax	154,500 Pax/day
Pax Density JABODETABEK	79,800 Pax/day

Source: JUTPI 2

Figure 217 Detail of LRT 07 Cawang – Bekasi Timur in 2029/30

LRT 10 connects Velodrome (Rawamangun) and Cakung with total length of around 8 km. LRT 10 passes through Rawamangun and Jakarta Industrial Estate Pulogadung (JIEP). It is forecasted to handle daily passenger of 33,800 pax/day with passenger density of 20,000 pax/day within Jakarta. The alignment is proposed by JUTPI 2. LRT 10 is planned to develop new line Velodrome to Cakung and to accommodate the movement in the industrial estates of Pulo Gadung, East Jakarta. With significant station developments, TOD concept shall be applied in areas of Pulomas.

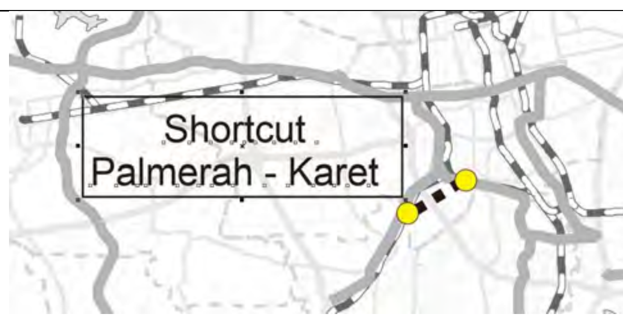
Name	LRT 10
Length	8 km
Section	Velodrome-JIEP-Cakung
Daily Pax	33,800 Pax/day
Pax Density JABODETABEK	20,000 Pax/day
Pax Density Jakarta	20,000 Pax/day
Pax Density BODETABEK	- Pax/day

Source: JUTPI 2

Figure 218 Detail of LRT 10 Velodrome – JIEP – Cakung in 2029/30

7.3.3 Others Railway Project

COM 05 is code for shortcut of Serpong Line between Palmerah and Karet with a total length of around 5 km. COM 05 passes through business corridor in Sudirman Street, Pejompongan, and Sport Area of Gelora Bung Karno. The alignment is proposed by JUTPI 1 and is planned to shorten the distance from Palmerah to Karet to make a more efficient movement.



Name	COM 05
Length	5 km
Section	Shortcut connection between Palmerah - Karet

Source: JUTPI 2

Figure 219 Detail of COM 05 Serpong Line Shortcut Between Palmerah – Karet in 2029/30

7.4 Future Mass Transit Network (2024)

Mass transit network development in 2024 is limited to those which are currently under-construction.

Source: JUTPI 2

Figure 220 JABODETABEK Transportation Network in 2024

7.4.1 MRT Project

The full alignment of MRT 01 connects Lebak Bulus in the southern of DKI Jakarta and Kampung Bandan in the northern of DKI Jakarta with a total length of around 23 km. MRT 01 passes through Kampung Bandan, National Monument, Sudirman Road, and Lebak Bulus, and in 2024 it is forecasted to handle daily passenger of 204,500 pax/day with passenger density of 53,100 pax/day. The alignment is proposed in the previous master plan. MRT 01 is planned to accommodate future demand for radial movement along north-south.

Name	MRT 01
Length	23 km
Section	Kampung Bandan-Lebak Bulus
Daily Pax	204,500 Pax/day
Pax Density JABODETABEK	53,100 Pax/day
Pax Density Jakarta	53,100 Pax/day
Pax Density BODETABEK	-

Source: JUTPI 2

Figure 221 Detail of MRT 01 Lebak Bulus – Kampung Bandan Project in 2024

7.4.2 LRT Project

The full alignment of LRT 01 connects Kelapa gading and Velodrome in DKI Jakarta with a total length of around 6 km. LRT 01 passes through Kelapa Gading Mall and Velodrome Stadium, and in 2024 it is forecasted to handle daily passenger of 52,800 pax/day with passenger density of 28,200 pax/day. This alignment is proposed by unsolicited plan made by DKI Jakarta. LRT 01 is planned to accommodate future demand for internal trip within DKI Jakarta. LRT 01 is operated by JakPro, the city-owned enterprise. As the first LRT to operate in DKI Jakarta, LRT 01 is expected to be the example for others LRT development in JABODETABEK.

Name	LRT 01
Length	6 km
Section	Kelapa Gading-Velodrome
Daily Pax	52,800 Pax/day
Pax Density JABODETABEK	28,200 Pax/day
Pax Density Jakarta	28,200 Pax/day
Pax Density BODETABEK	- Pax/day

Source: JUTPI 2

Figure 222 Detail of LRT 01 Kelapa Gading – Velodrome Project in 2024

The full alignment of LRT 04 connects Cawang and Dukuh Atas with a total length of around 10 km. LRT 02 passes through Cawang, Pancoran, Kuningan, and Dukuh Atas, and in 2024 it is predicted to handle 63,600 pax/day with passenger density of 34,200 pax/day. This alignment is proposed by unsolicited plan made by MoT. LRT 04 is planned to accommodate future demand for radial movement within DKI Jakarta.

Name	LRT 04
Length	10 km
Section	Cawang-Kuningan-Dukuh Atas
Daily Pax	63,600 Pax/day
Pax Density JABODETABEK	34,200 Pax/day
Pax Density Jakarta	34,200 Pax/day
Pax Density BODETABEK	- Pax/day

Source: JUTPI 2

Figure 223 Detail of LRT 04 Cawang – Kuningan – Dukuh Atas in 2024

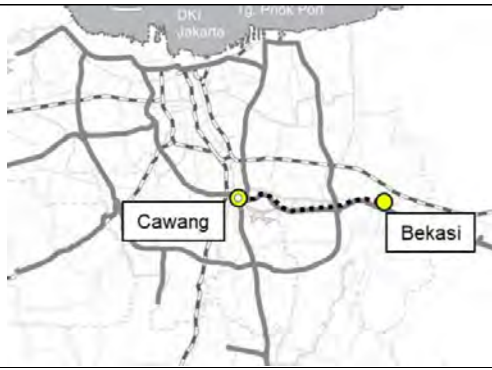
The intermediate alignment of LRT 05 connects Cawang in DKI Jakarta and Gunung Putri in Kota Bogor with a total length of around 25 km. LRT 05 passes through Kampung Rambutan, Cibubur, and Sentul, and in 2024 it is forecasted to handle daily passenger of 57,500 pax/day with passenger density of 55,700 pax/day in DKI Jakarta and 21,300 pax/day in JABODETABEK. This alignment is proposed by unsolicited plan made by MoT. LRT 05 is planned to accommodate future demand for radial movement along north-south.

Name	LRT 05
Length	25 km
Section	Cawang- Cibubur-Gn. Putri
Daily Pax	57,500 Pax/day
Pax Density JABODETABEK	21,300 Pax/day
Pax Density Jakarta	55,700 Pax/day
Pax Density BODETABEK	- Pax/day

Source: JUTPI 2

Figure 224 Detail of LRT 05 Cawang – Cibubur – Kota Bogor in 2024

The full alignment of LRT 07 connects Cawang in the eastern part of DKI Jakarta and Kota Bekasi in the eastern part (Bekasi Timur) with a total length of around 19 km. LRT 07 passes through Halim and Bekasi Barat, and in 2024 it is forecasted to handle daily passenger of 127,200 pax/day with passenger density of 55,700 pax/day in JABODETABEK. This alignment is proposed by unsolicited plan made by MoT. LRT 05 is planned to accommodate future demand for radial movement along east-west.



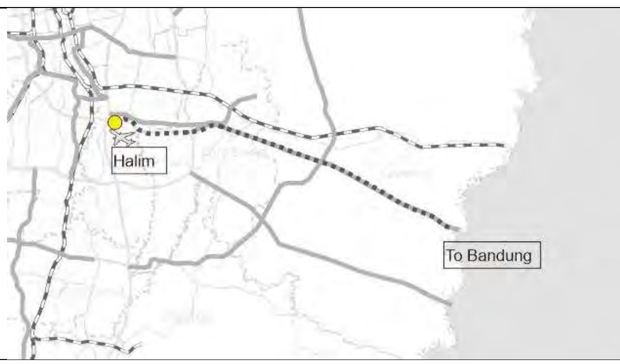
Name	LRT 07
Length	19 km
Section	Cawang-Bekasi Timur
Daily Pax	127,200 Pax/day
Pax Density JABODETABEK	55,700 Pax/day
Pax Density Jakarta	- Pax/day
Pax Density BODETABEK	- Pax/day

Source: JUTPI 2

Figure 225 Detail of LRT 07 Cawang – Bekasi Timur in 2024

7.4.3 Others Railway Project

The full alignment of ICT 01 connects Jakarta and Bandung with a total length of 41 km within JABODETABEK. ICT 01 passes through Jakarta – Cikampek Toll Road. The alignment is proposed in RITJ Plan and is planned to accommodate future demand for inter-regional railway passenger train. ICT 01 will be developed with fours stations in Halim Perdanakusuma, Karawang, Walini and Tegal Luar.



Name	ICT 01
Length	41 km
Section	High-spedd Train Jakarta – Bandung

Source: JUTPI 2

Figure 226 Detail of ICT 01 High-Speed Train Jakarta – Bandung in 2024

Chapter 8 FUTURE HIGHWAY NETWORK

8.1 Strategy to Improve Highway Network Development

The development of highway network is subjected to accessibility improvement for commodity and private vehicle vehicular movement in the future. Vehicular demand on the planned road network has been forecasted by the transportation development scenario for years 2024, 2029/2030, and 2035, respectively. Several strategies are considered for the planning as follows:

1) Efficiency in Transportation System to Support Economic Activities

One of the keys to economic development is a well-connected infrastructure that bypasses the cost and time consumption. Therefore, the development of highway which is aligned with the future spatial planning JABODETABEK will support the development of the transportation system in the future. Highway development is expected to alleviate traffic congestion. The operator also can utilize the traffic control system and provide traffic information to optimize the existing road.

2) Development of Transportation System to Support Inter-Regional Cargo and Passenger Transport Demand

Inter-regional cargo is one of the transportation systems which gives incentive for the economic growth through goods distribution. Well planned road development which supports the movement of inter-regional cargo should be implemented to meet the increasing demand for goods. It will also improve smooth access to important seaports which are located within JABODETABEK.

3) Coordination inter/intra organizational structure in JABODETABEK.

Coordination within nine local governments in JABODETABEK is one of the big challenges especially coordination that is related to the transportation policy. Therefore, the nine local governments should create effective communication to overcome cross-boundary issues that occures in the context of highway development, especially when it comes to land acquisition, traffic impact management, and permission. In that case, BPJT is one of the leading institutions for improving the coordination among local government.

4) Adjustment to the current/plan regulation in Kota/Kab in JABODETABEK.

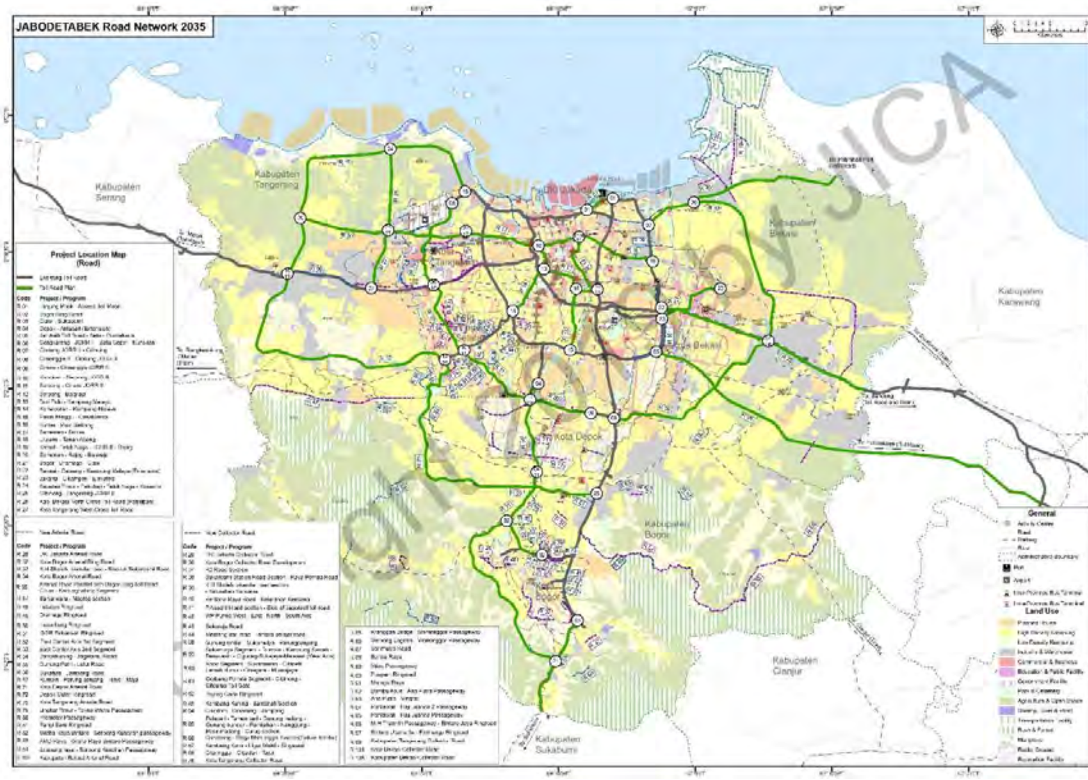
   "Push" policy regarding private car limitation is one of the options for optimizing the road capacity. Currently, DKI Jakarta implements the odd/even plate number regulation as the "push" policy and it is planned to be expanded to more roads. Moreover, other Kota/Kabupaten are planning to apply similar policy such as Kota Bekasi and Kota Depok. This policy is expected to increase the travel speed and lower the V/C ratio of the existing road. It is also being discussed about the introduction of ERP in the primary road. The implementation of proper regulation will reduce existing traffic congestion. In terms of "pull" policy, traffic management is essential to control the flow by improving technology (for instance, Variable Message Sign (VMS)) .

5) Consideration of the stage for construction in 2024, 2029/2030, and 2035 (and after) in accordance with the local government policy and demand growth.

   Good planning and implementation of road infrastructure are highly required to achieve a better transportation system. Yearly construction planning for the highway network has been stipulated and deliver for up to 2035, and it will be discussed further in the following sections.

8.2 Future Highway Network (2035)

In future highway network there are 27 new toll road sections to be developed. These new toll roads will be used to support person and freight trips along the JABODETABEK area. Tanjung Priok Access toll road, JORR II, and North Cross Toll Road (Patimban) are planned to be developed to help the freight movement. To determine the staging of the 2029 network plan V/C ratios in 2035 are considered.



Source: JUTPI 2

Figure 227 JABODETABEK Highway Network in 2035

The full alignment of R 01 connects Jampea and Tanjung Priok in DKI Jakarta with a total length of around 4 km. R 01 passes through Jampea, Waduk Sunter, Kampung Bahari, and Tanjung Priok, and is forecasted to have volume 45,000 PCU/day with a V/C ratio of 0.54. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 01 is planned to accommodate future demand for circular movement along east – west.

Project Code	R 01
Length	3.87 km
Section	Tanjung Priok Access Toll Road
Vol-Density	45,000 PCU/day
V/C Ratio	0.54

Source: JUTPI 2

Figure 228 Detail of R 01 Tanjung Priok Access Toll Road Project in 2035

The full alignment of R 02 connects Simpang Yasmin and Salabenda in Kota Bogor with a total length of around 5 km. R 02 passes through Simpang Yasmin, Kayu Manis, and Salabenda, and is forecasted to have volume 21,700 PCU/day with a V/C Ratio of 0.39. The alignment is included in RITJ, Toll Road Master Plan by BPJT, and RTRW Kota Bogor 2011 – 2031. R 02 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 02
Length	5.09 km
Section	Bogor Ring Road
Vol-Density	21,700 PCU/day
V/C Ratio	0.39

Source: JUTPI 2

Figure 229 Detail of R 02 Bogor Ring Road project in 2035

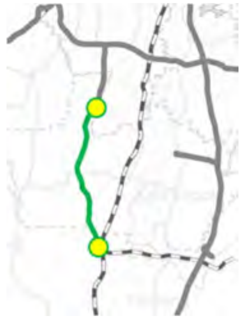
The full alignment of R 03 connects Ciawi in Kabupaten Bogor and Sukabumi with a total length of around 15 km. R 03 passes through Cigombong, Cibadak, Sukabumi Barat, and Sukabumi Timur, and is forecasted to have volume 14,100 PCU/day with a V/C Ratio of 0.25. The alignment is included in RITJ, Toll Road Master Plan by BPJT, and RTRW Kabupaten Bogor 2016 -2036. R 03 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 03
Length	15.04 km
Section	Ciawi-Sukabumi
Vol-Density	14,100 PCU/day
V/C Ratio	0.25

Source: JUTPI 2

Figure 230 Detail of R 03 Ciawi – Sukabumi Toll Road Project in 2035

The full alignment of R 04 connects Cinere in Kota Depok and Bojonggede in Kabupaten Bogor with a total length of around 13 km. R 04 passes through Cinere, Sawangan, Krukut, and Bojonggede, and is forecasted to have volume 14,800 PCU/day with a V/C Ratio of 0.27. The alignment is included in RITJ, Toll Road Master Plan by RIJT and RTRW Kota Depok 2012 – 2032. R 04 is planned to accommodate future demand for circular movement with north – south.



Project Code	R 04
Length	13.30 km
Section	Depok Antasari (Extension)
Vol-Density	14,800 PCU/day
V/C Ratio	0.27

Source: JUTPI 2

Figure 231 Detail of R 04 Depok Antasari (Extension) Toll Road Project in 2035

The full alignment of R 05 connects Jatiasih in Kota Bekasi and Sadang in Purwakarta with a total length of around 33 km. R 05 passes through Purbaleunyi and is forecasted to have volume 52,700 PCU/day with a V/C Ratio of 0.48. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kabupaten Bekasi 2011 – 2031. R 05 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 05
Length	32.45 km
Section	Jati Asih Toll Road-Setu-Purwakarta
Vol-Density	52,700 PCU/day
V/C Ratio	0.48

Source: JUTPI 2

Figure 232 Detail of R 05 Jati Asih – Setu - Purwakarta Toll Road Project in 2035

The full alignment of R 06 connects Soekarno – Hatta International Airport and Cikunir in Kota Bekasi with total length of around 15 km. R 06 passes through Kunciran, Tirtayasa, Benteng Betawi, H. Sastranegara, and IC Benda and is forecasted to have volume 56,100 PCU/day with a V/C Ratio of 1.02. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang 2012 – 2032. R 06 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 06
Length	14.51 km
Section	Cengkareng JORR II-Batu Ceper-Kunciran
Vol-Density	56,100 PCU/day
V/C Ratio	1.02

Source: JUTPI 2

Figure 233 Detail of R 06 Cengkareng JORR II – Batu Ceper – Kunciran Toll Road Project in 2035

The full alignment of R 07 connects Cibitung in Kota Bekasi and Cilincing in DKI Jakarta with a total length of around 35 km. R 07 passes through Cibitung, Telaga Asih, Tambun Utara, Tarumajaya, and Cilincing, and is forecasted to have volume 33,000 PCU/day with a V/C Ratio of 0.60. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kabupaten Bekasi 2011 - 2031. R 07 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 07
Length	34.46 km
Section	Cibitung JORR II-Cilincing
Vol-Density	33,000 PCU/day
V/C Ratio	0.60

Source: JUTPI 2

Figure 234 Detail of R 07 Cibitung - JORR II - Cilincing Toll Road Project in 2035

The full alignment of R 08 connects Cibitung in Kota Bekasi and Cimanggis in Kota Depok with a total length of around 27 km. R 08 passes through Cinere – Jagorawi Toll Road, and northern part of Jakarta – Cikampek Toll Road, and is forecasted to have volume 54,000 PCU/day with a V/C Ratio of 0.98. The alignment is included in RITJ, Toll Road Master Plan by BPJT, RTRW Kabupaten Bekasi 2011 – 2031 and RTRW Kota Bekasi 2011 – 2031. R 08 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 08
Length	26.83 km
Section	Cimanggis II- Cibitung JORR II
Vol-Density	54,000 PCU/day
V/C Ratio	0.98

Source: JUTPI 2

Figure 235 Detail of R 08 Cimanggis II – Cibitung – JORR II Toll Road Project in 2035

The full alignment of R 09 connects Cinere and Krukut in Kota Depok with a total length of around 8 km. R 09 passes through Cinere – Jagorawi Toll Road, and Depok - Antasari Toll Road, and is forecasted to have volume 49,000 PCU/day with a V/C Ratio of 0.89. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Depok 2012 – 2032. R 09 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 09
Length	7.84 km
Section	Cinere- Cimaggis JORR II
Vol-Density	49,000 PCU/day
V/C Ratio	0.89

Source: JUTPI 2

Figure 236 Detail of R 09 Cinere – Cimanggis - JORR II Toll Road Project in 2035

The full alignment of R 10 connects Kunciran in Kota Tangerang and Serpong in Kota Tangerang Selatan with a total length of around 11 km. R 10 passes through Kunciran, and Serpong, and is forecasted to have volume 48,600 PCU/day with a V/C Ratio of 0.88. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang Selatan 2011 - 2031. R 10 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 10
Length	11.14 km
Section	Kunciran- Serpong JORR II
Vol-Density	48,600 PCU/day
V/C Ratio	0.88

Source: JUTPI 2

Figure 237 Detail of R 10 Kunciran – Serpong - JORR II Toll Road Project in 2035

The full alignment of R 11 connects Cinere in Kota Depok and Serpong in Kota Tangerang Selatan with a total length of around 13 km. R 11 passes through Kunciran, Serpong, and Cinere – Jagorawi Toll Road, and is forecasted to have volume 52,700 PCU/day with a V/C Ratio of 0.96. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang Selatan 2011 - 2031. R 11 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 11
Length	12.90 km
Section	Serpong- Cinere JORR II
Vol-Density	52,700 PCU/day
V/C Ratio	0.96

Source: JUTPI 2

Figure 238 Detail of R 11 Serpong - Cinere - JORR II Toll Road Project in 2035

The full alignment of R 12 connects Balaraja in Kabupaten Tangerang and Serpong in Kota Tangerang Selatan with a total length of around 39 km. R 12 passes through Serpong, Legok, Tigaraksa Selatan, and Balaraja, and is forecasted to have volume 21,200 PCU/day with a V/C Ratio of 0.38. The alignment is included in RITJ and RTRW Kabupaten Tangerang 2011 – 2031. R 12 is planned to accommodate future demand for circular movement with east – west.

Project Code	R 12
Length	38.85 km
Section	Serpong-Balaraja
Vol-Density	21,200 PCU/day
V/C Ratio	0.38

Source: JUTPI 2

Figure 239 Detail of R 12 Serpong - Balaraja Toll Road Project in 2035

The full alignment of R 13 connects Duri Pulo and Kampung Melayu in DKI Jakarta with a total length of around 13 km. R 13 is part of inner DKI Jakarta Toll Road is forecasted to have volume 28,400 PCU/day with a V/C Ratio of 0.51. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 13 is planned to accommodate future demand for circular movement within DKI Jakarta.

Project Code	R 13
Length	13.24 km
Section	Duri Pulo- Kampung Melayu
Vol-Density	28,400 PCU/day
V/C Ratio	0.51

Source: JUTPI 2

Figure 240 Detail of R 13 Duri Pulo – Kampung Melayu Toll Road Project in 2035

The full alignment of R 14 connects Kemayoran and Kampung Melayu in DKI Jakarta with a total length of around 10 km. R 14 is part of inner DKI Jakarta Toll Road is forecasted to have volume 13,600 PCU/day with a V/C Ratio of 0.25. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 14 is planned to accommodate future demand for circular movement within DKI Jakarta.

Project Code	R 14
Length	9.62 km
Section	Kemayoran- Kampung Melayu
Vol-Density	13,600 PCU/day
V/C Ratio	0.25

Source: JUTPI 2

Figure 241 Detail of R 14 Kemayoran – Kampung Melayu Toll Road Project in 2035

The full alignment of R 15 connects Pasar Minggu and Casablanca in DKI Jakarta with a total length of around 9 km. R 15 is part of inner DKI Jakarta Toll Road and forecasted to have volume 8,300 PCU/day with a V/C Ratio of 0.15. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 15 is planned to accommodate future demand for radial movement within DKI Jakarta.

Project Code	R 15
Length	9.29 km
Section	Pasar Minggu- Casablanca
Vol-Density	8,300 PCU/day
V/C Ratio	0.15

Source: JUTPI 2

Figure 242 Detail of R 15 Pasar Minggu - Casablance Toll Road Project in 2035

The full alignment of R 16 connects Sunter and Pulo Gebang in DKI Jakarta with a total length of around 9 km. R 16 passes through Kelapa Gading, Pulo Gebang, and is forecasted to have volume 27,200 PCU/day with a V/C Ratio of 0.49. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 16 is planned to accommodate future demand for circular movement within DKI Jakarta.

Project Code	R 16
Length	8.79 km
Section	Sunter-Pulo Gebang
Vol-Density	27,200 PCU/day
V/C Ratio	0.49

Source: JUTPI 2

Figure 243 Detail of R 16 Sunter – Pulo Gebang Toll Road Project in 2035

The full alignment of R 17 connects Semanan and Sunter in DKI Jakarta with a total length of around 19 km. R 17 is part of inner DKI Jakarta Toll Road and forecasted to have volume 46,400 PCU/day with a V/C Ratio of 0.84. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 17 is planned to accommodate future demand for circular movement with DKI Jakarta.

Project Code	R 17
Length	18.83 km
Section	Semanan-Sunter
Vol-Density	46,400 PCU/day
V/C Ratio	0.84

Source: JUTPI 2

Figure 244 Detail of R 17 Semanan - Sunter Toll Road Project in 2035

The full alignment of R 18 connects Ulujami and Tanah Abang with a total length of around 8 km. R 18 is part of inner DKI Jakarta Toll Road and forecasted to have volume 41,100 PCU/day with a V/C Ratio of 0.75. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 18 is planned to accommodate future demand for circular movement with DKI Jakarta.

Project Code	R 18
Length	8.30 km
Section	Ulujami-Tanah Abang
Vol-Density	41,100 PCU/day
V/C Ratio	0.75

Source: JUTPI 2

Figure 245 Detail of R 18 Ulujami – Tanah Abang Toll Road Project in 2035

The full alignment of R 19 connects Kamal in Kota Tangerang and Rajeg in Kabupaten Tangerang with a total length of around 35 km. R 19 passes through Cikupa, Rajeg, Mauk, and is forecasted to have volume 10,000 PCU/day with a V/C Ratio of 0.18. The alignment is included in RITJ and RTRW Kabupaten Tangerang 2011 - 2031. R 19 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 19
Length	34.83 km
Section	Kamal-Teluk Naga-JORR II-Rajeg
Vol-Density	10,000 PCU/day
V/C Ratio	0.18

Source: JUTPI 2

Figure 246 Detail of R 19 Kamal – Teluk Naga – JORR II - Rajeg Toll Road Project in 2035

The full alignment of R 20 connects Semanan and Balaraja in Kabupaten Tangerang with a total length of around 33 km. R 20 passes through Semanan, Tangerang – Merak Toll Road, Serpong – Balaraja Toll Road, and is forecasted to have volume 30,700 PCU/day with a V/C Ratio of 0.56. The alignment is included in RITJ and RTRW Kota Tangerang 2012 – 2032. R 20 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 20
Length	32.68 km
Section	Semanan-Rajeg-Balaraja
Vol-Density	30,700 PCU/day
V/C Ratio	0.56

Source: JUTPI 2

Figure 247 Detail of R 20 Kamal – Teluk Naga – JORR II - Rajeg Toll Road Project in 2035

The full alignment of R 21 connects Salabenda and Dramaga in Kabupaten Bogor with a total length of around 38 km. R 21 passes through Bogor – Ciawi - Sukabumi Toll Road and is forecasted to have volume 7,800 PCU/day with a V/C Ratio of 0.14. The alignment is included in RITJ and RTRW Kabupaten Bogor 2016 - 2036. R 21 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 21
Length	38.30 km
Section	Bogor-Dramaga-Ciawi
Vol-Density	7,800 PCU/day
V/C Ratio	0.14

Source: JUTPI 2

Figure 248 Detail of R 21 Bogor – Dramaga - Ciawi Toll Road Project in 2035

The full alignment of R 22 connects Bekasi Timur in Kota Bekasi and Bekasi – Cawang – Kampung Melayu (Becakayu) with a total length of around 10 km. R 22 passes through Tambun Area and is forecasted to have volume 30,400 PCU/day with a V/C Ratio of 0.37. The alignment is included in RITJ and updated RTRW Kota Bekasi 2011 – 2031 though it has not been legalized. R 22 is planned to accommodate future demand for radial movement with east - west.

Project Code	R 22
Length	10.41 km
Section	Bekasi-Cawang-Kampung Melayu (Extension)
Vol-Density	30,400 PCU/day
V/C Ratio	0.37

Source: JUTPI 2

Figure 249 Detail of R 22 Bekasi – Cawang – Kampung Melayu Toll Road Project in 2035

The full alignment of R 23 connects Cikunir in Kota Bekasi and Karawang in Kabupaten Bekasi with a total length of around 31 km. R 23 passes through Cikunir, Bekasi Barat, Bekasi Timur, Tambun, Cibitung, Cikarang Utama, Cikarang Barat, and Cibatu, and is forecasted to have volume 56,800 PCU/day with a V/C Ratio of 0.69. The alignment is included in RITJ, Toll Road Master Plan by BPJT, RTRW DKI Jakarta 2030, RTRW Kota Bekasi 2011 – 2031 and RTRW Kabupaten Bekasi 2011 – 2031. R 23 is planned to accommodate future demand for radial movement with east - west.

Project Code	R 23
Length	31.09 km
Section	Jakarta Cikampek Elevated
Vol-Density	56,800 PCU/day
V/C Ratio	0.69

Source: JUTPI 2

Figure 250 Detail of R 23 Jakarta - Cikampek (Elevated) Toll Road Project in 2035

The full alignment of R 24 connects Sepatan Timur in Kabupaten Tangerang and Soekarno – Hatta Internation Airport in Kota Tangerang with a total length of around 11 km. R 24 passes through Sepatan Timur, Pakuhaji, Teluk Naga, and Kosambi, and is forecasted to have volume 3,300 PCU/day with a V/C Ratio of 0.06. The alignment is included in RITJ and RTRW Kabupaten Tangerang 2011 - 2031. R 24 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 24
Length	10.99 km
Section	Sepatan Timur-Pakuhaji-Teluk Naga-Kosambi
Vol-Density	3,300 PCU/day
V/C Ratio	0.06

Source: JUTPI 2

Figure 251 Detail of R 24 Sepatan Timur – Pakuhaji - Teluk Naga - Kosambi Toll Road Project in 2035

The full alignment of R 25 connects Cibinong in Kabupaten Bogor and Bumi Serpong Damai in Kota Tangerang with a total length of around 40 km. R 25 passes through Bojong Gede, Ciseeng, and is forecasted to have volume 6,000 PCU/day with a V/C Ratio of 0.11. The alignment is included in RTRW Kabupaten Bogor 2016 – 2036 and RTRW Kota Tangerang Selatan 2011 – 2031. R 25 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 25
Length	40.36 km
Section	Cibinong-Tangerang JORR III
Vol-Density	6,000 PCU/day
V/C Ratio	0.11

Source: JUTPI 2

Figure 252 Detail of R 25 Cibinong – Tangerang – JORR III Toll Road Project in 2035

The full alignment of R 26 connects New Patimban Port and Cikopo - Palimanan Toll Road with a total length of around 21 km. R 26 passes through Purwakarta and is forecasted to have volume 40,000 PCU/day with a V/C Ratio of 0.72. The alignment is an unsolicitied project. R 26 accommodates future demand for radial movement with east - west.

Project Code	R 26
Length	21.18 km
Section	North Cross Toll Road (Patimban)
Vol-Density	40,000 PCU/day
V/C Ratio	0.72

Source: JUTPI 2

Figure 253 Detail of R 26 North Cross Toll Road Project in 2035

The full alignment of R 27 connects Pajajaran Road and Moh. Toha Road in Kota Tangerang with a total length of around 9 km. R 27 is forecasted to have volume 10,600 PCU/day with a V/C Ratio of 0.19. The alignment is included in RTRW Kota Tangerang 2012 - 2032. R 27 is planned to accommodate future demand for radial movement with north - south.

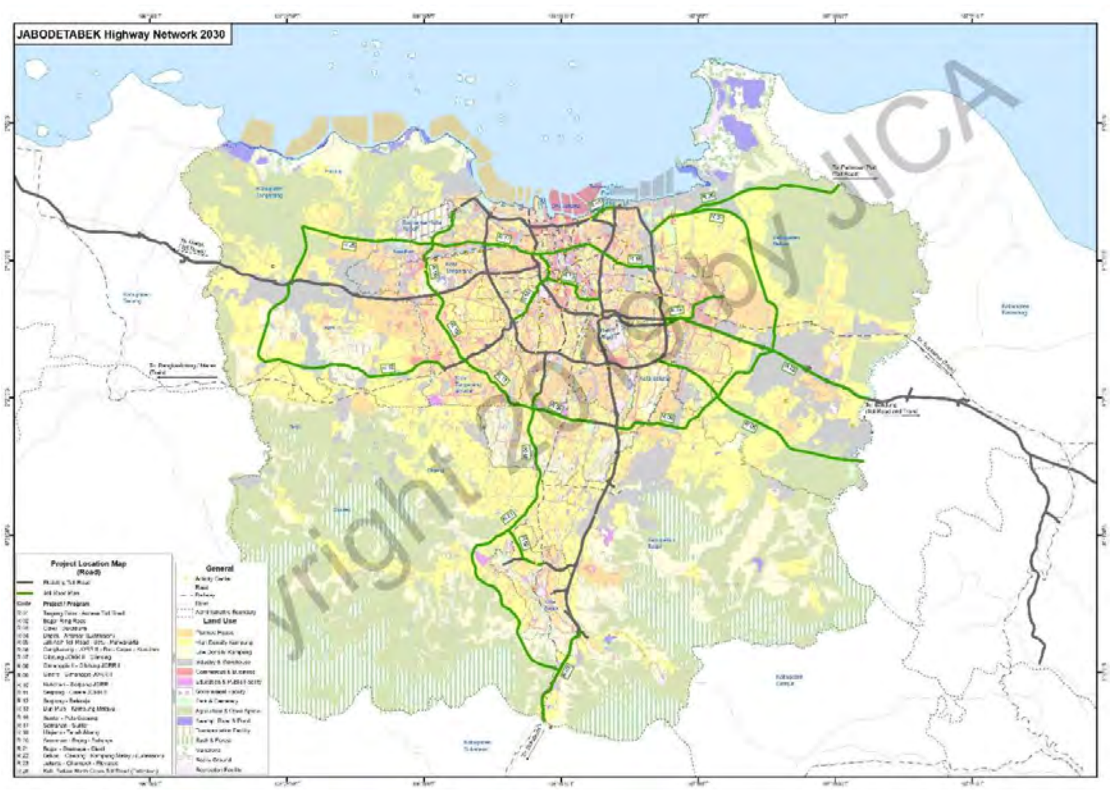
Project Code	R 27
Length	9.23 km
Section	West Cross Toll Road (Jl. Pajajaran-Jl. Moh Toha)
Vol-Density	10,600 PCU/day
V/C Ratio	0.19

Source: JUTPI 2

Figure 254 Detail of R 27 West Cross Toll Road Project in 2035

8.3 Future Highway Network (2029)

The staging of toll road development is determined by looking at volume density and V/C ratio from 2035. In 2029, not only the toll roads that have already been implemented but also those of which V/C ratios from 2035 assignment result are over 0.5 are proposed to be developed.



Source: JUTPI 2

Figure 255 JABODETABEK Highway Network in 2029/30

The intermediate alignment of R 01 connects Jampea and Tanjung Priok in DKI Jakarta with length of around 4 km. R 01 passes through Jampea, Waduk Sunter, Kampung Bahari, and Tanjung Priok, and is forecasted to have volume 36,300 PCU/day with a V/C Ratio of 0.44 in 2029/30. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 01 is planned to accommodate future demand for circular movement along east – west.

Project Code	R 01
Length	3.87 km
Section	Tanjung Priok Access Toll Road
Vol-Density	36,300 PCU/day
V/C Ratio	0.44

Source: JUTPI 2

Figure 256 Detail of R 01 Tanjung Priok Access Toll Road project in 2029/30

The intermediate alignment of R 02 connects Simpang Yasmin and Salabenda in Kota Bogor with length of around 5 km. R 02 passes through Simpang Yasmin, Kayu Manis, and Salabenda, and is forecasted to have volume 25,900 PCU/day with a V/C Ratio of 0.47 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT, and RTRW Kota Bogor 2011 – 2031. R 02 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 02
Length	5.09 km
Section	Bogor Ring Road
Vol-Density	25,900 PCU/day
V/C Ratio	0.47

Source: JUTPI 2

Figure 257 Detail of R 02 Bogor Ring Road project in 2029/30

The intermdediate alignment of R 03 connects Ciawi in Kabupaten Bogor and Sukabumi with length of around 15 km. R 03 passes through Cigombong, Cibadak, Sukabumi Barat, and Sukabumi Timur, and is forecasted to have volume 12,500 PCU/day with a V/C Ratio of 0.23 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT, and RTRW Kabupaten Bogor 2016 -2036. R 03 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 03
Length	15.04 km
Section	Ciawi-Sukabumi
Vol-Density	12,500 PCU/day
V/C Ratio	0.23

Source: JUTPI 2

Figure 258 Detail of R 03 Ciawi – Sukabumi Toll Road Project in 2029/30

The intermediate alignment of R 04 connects Cinere in Kota Depok and Bojonggede in Kabupaten Bogor with length of around 13 km. R 04 passes through Cinere, Sawangan, Krukut, and Bojonggede, and is forecasted to have volume 9,800 PCU/day with a V/C Ratio of 0.18 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by RIJT and RTRW Kota Depok 2012 – 2032. R 04 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 04
Length	13.30 km
Section	Depok Antasari (Extension)
Vol-Density	9,800 PCU/day
V/C Ratio	0.18

Source: JUTPI 2

Figure 259 Detail of R 04 Depok Antasari (Extension) Toll Road Project in 2029/30

The intermediate alignment of R 05 connects Jatiasih in Kota Bekasi and Sadang in Purwakarta with length of around 33 km. R 05 passes through Purbaleunyi and is forecasted to have volume 47,800 PCU/day with a V/C Ratio of 0.43 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kabupaten Bekasi 2011 – 2031. R 05 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 05
Length	32.45 km
Section	Jati Asih Toll Road-Setu-Purwakarta
Vol-Density	47,800 PCU/day
V/C Ratio	0.43

Source: JUTPI 2

Figure 260 Detail of R 05 Jati Asih – Setu - Purwakarta Toll Road Project in 2029/30

The intermediate alignment of R 06 connects Soekarno – Hatta International Airport and Cikunir in Kota Bekasi with length of around 15 km. R 06 passes through Kunciran, Tirtayasa, Benteng Betawi, H. Sastranegara, and IC Benda, and is forecasted to have volume 45,600 PCU/day with a V/C Ratio of 0.83 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang 2012 – 2032. R 06 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 06
Length	14.51 km
Section	Cengkareng JORR II-Batu Ceper-Kunciran
Vol-Density	45,600 PCU/day
V/C Ratio	0.83

Source: JUTPI 2

Figure 261 Detail of R 06 Cengkareng JORR II – Batu Ceper – Kunciran Toll Road Project in 2029/30

The intermediate alignment of R 07 connects Cibitung in Kota Bekasi and Cilincing in DKI Jakarta with length of around 35 km. R 07 passes through Cibitung, Telaga Asih, Tambun Utara, Tarumajaya, and Cilincing, and is forecasted to have volume 23,600 PCU/day with a V/C Ratio of 0.43 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kabupaten Bekasi 2011 - 2031. R 07 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 07
Length	34.46 km
Section	Cibitung JORR II-Cilincing
Vol-Density	23,600 PCU/day
V/C Ratio	0.43

Source: JUTPI 2

Figure 262 Detail of R 07 Cibitung - JORR II - Cilincing Toll Road Project in 2029/30

The intermediate alignment of R 08 connects Cibitung in Kota Bekasi and Cimanggis in Kota Depok with length of around 27 km. R 08 passes through Cinere – Jagorawi Toll Road, and northern part of Jakarta – Cikampek Toll Road, and is forecasted to have volume 38,200 PCU/day with a V/C Ratio of 0.69 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT, RTRW Kabupaten Bekasi 2011 – 2031 and RTRW Kota Bekasi 2011 – 2031. R 08 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 08
Length	26.83 km
Section	Cimanggis II- Cibitung JORR II
Vol-Density	38,200 PCU/day
V/C Ratio	0.69

Source: JUTPI 2

Figure 263 Detail of R 08 Cimanggis II – Cibitung – JORR II Toll Road Project in 2029/30

The intermediate alignment of R 09 connects Cinere and Krukut in Kota Depok with a total length of around 8 km. R 09 passes through Cinere – Jagorawi Toll Road, and Depok - Antasari Toll Road, and is forecasted to have volume 35,800 PCU/day with a V/C Ratio of 0.65 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Depok 2012 – 2032. R 09 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 09
Length	7.84 km
Section	Cinere- Cimaggis JORR II
Vol-Density	35,800 PCU/day
V/C Ratio	0.65

Source: JUTPI 2

Figure 264 Detail of R 09 Cinere – Cimanggis - JORR II Toll Road Project in 2029/30

The intermediate alignment of R 10 connects Kunciran in Kota Tangerang and Serpong in Kota Tangerang Selatan with length of around 11 km. R 10 passes through Kunciran, and Serpong, and is forecasted to have volume 39,500 PCU/day with a V/C Ratio of 0.72 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang Selatan 2011 - 2031. R 10 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 10
Length	11.14 km
Section	Kunciran- Serpong JORR II
Vol-Density	39,500 PCU/day
V/C Ratio	0.72

Source: JUTPI 2

Figure 265 Detail of R 10 Kunciran – Serpong - JORR II Toll Road Project in 2029/30

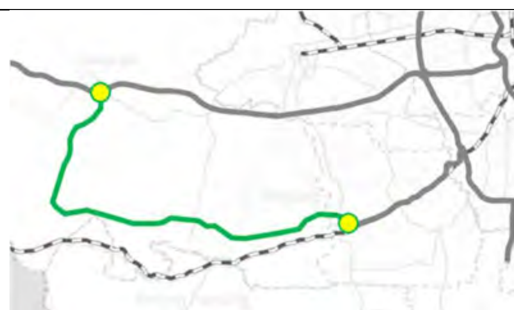
The intermediate alignment of R 11 connects Cinere in Kota Depok and Serpong in Kota Tangerang Selatan with length of around 13 km. R 11 passes through Kunciran, Serpong, and Cinere – Jagorawi Toll Road, and is forecasted to have volume 46,600 PCU/day with a V/C Ratio of 0.74 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang Selatan 2011 - 2031. R 11 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 11
Length	12.90 km
Section	Serpong- Cinere JORR II
Vol-Density	46,600 PCU/day
V/C Ratio	0.74

Source: JUTPI 2

Figure 266 Detail of R 11 Serpong - Cinere - JORR II Toll Road Project in 2029/30

The intermediate alignment of R 12 connects Balaraja in Kabupaten Tangerang and Serpong in Kota Tangerang Selatan with length of around 39 km. R 12 passes through Serpong, Legok, Tigaraksa Selatan, and Balaraja, and is forecasted to have volume 16,200 PCU/day with a V/C Ratio of 0.29 in 2029/30. The alignment is included in RITJ and RTRW Kabupaten Tangerang 2011 - 2031. R 12 is planned to accommodate future demand for circular movement with east – west.



Project Code	R 12
Length	38.85 km
Section	Serpong-Balaraja
Vol-Density	16,200 PCU/day
V/C Ratio	0.29

Source: JUTPI 2

Figure 267 Detail of R 12 Serpong - Balaraja Toll Road Project in 2029/30

The intermediate alignment of R 13 connects Duri Pulo and Kampung Melayu in DKI Jakarta with length of around 13 km. R 13 is part of inner DKI Jakarta Toll Road and is forecasted to have volume 15,700 PCU/day with a V/C Ratio of 0.28 in 2029/30. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 13 is planned to accommodate future demand for circular movement within DKI Jakarta.

Project Code	R 13
Length	13.24 km
Section	Duri Pulo- Kampung Melayu
Vol-Density	15,700 PCU/day
V/C Ratio	0.28

Source: JUTPI 2

Figure 268 Detail of R 13 Duri Pulo – Kampung Melayu Toll Road Project in 2029/30

The intermediate alignment of R 16 connects Sunter and Pulo Gebang in DKI Jakarta with length of around 9 km. R 16 passes through Kelapa Gading, and Pulo Gebang, and is forecasted to have volume 21,300 PCU/day with a V/C Ratio of 0.39 in 2029/30. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 16 is planned to accommodate future demand for circular movement within DKI Jakarta.

Project Code	R 16
Length	8.79 km
Section	Sunter-Pulo Gebang
Vol-Density	21,300 PCU/day
V/C Ratio	0.39

Source: JUTPI 2

Figure 269 Detail of R 16 Sunter – Pulo Gebang Toll Road Project in 2029/30

The intermediate alignment of R 17 connects Semanan and Sunter in DKI Jakarta with length of around 19 km. R 17 is part of inner DKI Jakarta Toll Road and is forecasted to have volume 31,100 PCU/day with a V/C Ratio of 0.56 in 2029/30. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 17 is planned to accommodate future demand for circular movement with DKI Jakarta.

Project Code	R 17
Length	18.83 km
Section	Semanan-Sunter
Vol-Density	31,100 PCU/day
V/C Ratio	0.56

Source: JUTPI 2

Figure 270 Detail of R 17 Semanan - Sunter Toll Road Project in 2029/30

The intermediate alignment of R 18 connects Ulujami and Tanah Abang with length of around 8 km. R 18 is part of inner DKI Jakarta Toll Road and is forecasted to have volume 28,900 PCU/day with a V/C Ratio of 0.52 in 2029/30. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 18 is planned to accommodate future demand for circular movement with DKI Jakarta.

Project Code	R 18
Length	8.30 km
Section	Ulujami-Tanah Abang
Vol-Density	28,900 PCU/day
V/C Ratio	0.52

Source: JUTPI 2

Figure 271 Detail of R 18 Ulujami – Tanah Abang Toll Road Project in 2029/30

The intermediate alignment of R 20 connects Semanan and Balaraja in Kabupaten Tangerang with length of around 33 km. R 20 passes through Semanan, Tangerang – Merak Toll Road, and Serpong – Balaraja Toll Road, and is forecasted to have volume 24,000 PCU/day with a V/C Ratio of 0.43 in 2029/30. The alignment is included in RITJ and RTRW Kota Tangerang 2012 – 2032. R 20 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 20
Length	32.68 km
Section	Semanan-Rajeg-Balaraja
Vol-Density	24,000 PCU/day
V/C Ratio	0.43

Source: JUTPI 2

Figure 272 Detail of R 20 Kamal – Teluk Naga – JORR II - Rajeg Toll Road Project in 2029/30

The intermediate alignment of R 21 connects Salabenda and Dramaga in Kabupaten Bogor with length of around 38 km. R 21 passes through Bogor – Ciawi - Sukabumi Toll Road and is forecasted to have volume 6,600 PCU/day with a V/C Ratio of 0.12 in 2029/30. The alignment is included in RITJ and RTRW Kabupaten Bogor 2016 - 2036. R 21 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 21
Length	38.30 km
Section	Bogor-Dramaga-Ciawi
Vol-Density	6,600 PCU/day
V/C Ratio	0.12

Source: JUTPI 2

Figure 273 Detail of R 21 Bogor – Dramaga - Ciawi Toll Road Project in 2029/30

The intermediate alignment of R 22 connects Bekasi Timur in Kota Bekasi and Bekasi – Cawang – Kampung Melayu (Becakayu) with length of around 10 km. R 22 passes through Tambun Area and is forecasted to have volume 24,800 PCU/day with a V/C Ratio of 0.30 in 2029/30. The alignment is included in RITJ and updated RTRW Kota Bekasi 2011 – 2031 though it has not been legalized. R 22 is planned to accommodate future demand for radial movement with east - west.

Project Code	R 22
Length	10.41 km
Section	Bekasi-Cawang-Kampung Melayu (Extension)
Vol-Density	24,800 PCU/day
V/C Ratio	0.30

Source: JUTPI 2

Figure 274 Detail of R 22 Bekasi – Cawang – Kampung Melayu Toll Road Project in 2029/30

The intermediate alignment of R 23 connects Cikunir in Kota Bekasi and Karawang in Kabupaten Bekasi with length of around 31 km. R 23 passes through Cikunir, Bekasi Barat, Bekasi Timur, Tambun, Cibitung, Cikarang Utama, Cikarang Barat, and Cibatu, and is forecasted to have volume 42,800 PCU/day with a V/C Ratio of 0.52 in 2029/30. The alignment is included in RITJ, Toll Road Master Plan by BPJT, RTRW DKI Jakarta 2030, RTRW Kota Bekasi 2011 – 2031 and RTRW Kabupaten Bekasi 2011 – 2031. R 23 is planned to accommodate future demand for radial movement with east - west.

Project Code	R 23
Length	31.09 km
Section	Jakarta Cikampek Elevated
Vol-Density	42,800 PCU/day
V/C Ratio	0.52

Source: JUTPI 2

Figure 275 Detail of R 23 Jakarta - Cikampek (Elevated) Toll Road Project in 2029/30

The intermediate alignment of R 26 connects New Patimban Port and Cikopo - Palimanan Toll Road with length of around 21 km. R 26 passes through Purwakarta and is forecasted to have volume 35,800 PCU/day with a V/C Ratio of 0.65 in 2029/30. The alignment is an unsolicitied project. R 26 is planned to accommodate future demand for radial movement with east - west.

Project Code	R 26
Length	21.18 km
Section	North Cross Toll Road (Patimban)
Vol-Density	35,800 PCU/day
V/C Ratio	0.65

Source: JUTPI 2

Figure 276 Detail of R 26 North Cross Toll Road Project in 2029/30

8.4 Future Highway Network (2024)

The concept for future highway network is the same as that for mass transit network in 2024 because of the short time of only six years from the base year. That is, only the toll roads that are under construction will be developed in 2024.

Source: JUTPI 2

Figure 277 JABODETABEK Highway Network in 2024

The intermediate alignment of R 01 connects Jampea and Tanjung Priok in DKI Jakarta with length of around 4 km. R 01 passes through Jampea, Waduk Sunter, Kampung Bahari, and Tanjung Priok, and is forecasted to have volume 29,200 PCU/day with a V/C Ratio of 0.35 in 2024. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 01 is planned to accommodate future demand for radial movement along east – west.

Project Code	R 01
Length	3.87 km
Section	Tanjung Priok Access Toll Road
Vol-Density	29,200 PCU/day
V/C Ratio	0.35

Source: JUTPI 2

Figure 278 Detail of R 01 Tanjung Priok Access Toll Road project in 2024

The intermediate alignment of R 02 connects Simpang Yasmin and Salabenda in Kota Bogor with length of around 5 km. R 02 passes through Simpang Yasmin, Kayu Manis, and Salabenda, and is forecasted to have volume 29,700 PCU/day with a V/C Ratio of 0.54 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT, and RTRW Kota Bogor 2011 – 2031. R 02 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 02
Length	5.09 km
Section	Bogor Ring Road
Vol-Density	29,700 PCU/day
V/C Ratio	0.54

Source: JUTPI 2

Figure 279 Detail of R 02 Bogor Ring Road project in 2024

The intermediate alignment of R 03 connects Cigembong and Sukabumi Timur in Kota Bogor with length of around 15 km. R 03 passes through Cigombong, Cibadak, Sukabumi Barat, and Sukabumi Timur, and is forecasted to have volume 14,400 PCU/day with a V/C Ratio of 0.26 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT, and RTRW Kabupaten Bogor 2016 - 2036. R 03 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 03
Length	15.04 km
Section	Ciawi-Sukabumi
Vol-Density	14,400 PCU/day
V/C Ratio	0.26

Source: JUTPI 2

Figure 280 Detail of R 03 Ciawi – Sukabumi Toll Road Project in 2024

The intermediate alignment of R 04 connects Cinere in Kota Depok and Bojonggede in Kabupaten Bogor with length of around 13 km. R 04 passes through Cinere, Sawangan, Krukut, and Bojonggede, and is forecasted to have volume 10,400 PCU/day with a V/C Ratio of 0.19 in 2024. The alignment is included in RITJ, Toll Road Master Plan by RIJT and RTRW Kota Depok 2012 – 2032. R 04 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 04
Length	13.30 km
Section	Depok Antasari (Extension)
Vol-Density	10,400 PCU/day
V/C Ratio	0.19

Source: JUTPI 2

Figure 281 Detail of R 04 Depok Antasari (Extension) Toll Road Project in 2024

The intermediate alignment of R 05 connects Jatiasih in Kota Bekasi and Sadang in Purwakarta with length of around 33 km. R 05 passes through Purbaleunyi and is forecasted to have volume 42,700 PCU/day with a V/C Ratio of 0.39 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kabupaten Bekasi 2011 – 2031. R 05 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 05
Length	32.45 km
Section	Jati Asih Toll Road-Setu-Purwakarta
Vol-Density	42,700 PCU/day
V/C Ratio	0.39

Source: JUTPI 2

Figure 282 Detail of R 05 Jati Asih – Setu - Purwakarta Toll Road Project in 2024

The intermediate alignment of R 06 connects Soekarno – Hatta International Airport and Cikunir in Kota Bekasi with length of around 15 km. R 06 passes through Kunciran, Tirtayasa, Benteng Betawi, H. Sastranegara, and IC Benda, and is forecasted to have volume 36,400 PCU/day with a V/C Ratio of 0.66 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang 2012 – 2032. R 06 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 06
Length	14.51 km
Section	Cengkareng JORR II-Batu Ceper-Kunciran
Vol-Density	36,400 PCU/day
V/C Ratio	0.66

Source: JUTPI 2

Figure 283 Detail of R 06 Cengkareng JORR II – Batu Ceper – Kunciran Toll Road Project in 2024

The intermediate alignment of R 07 connects Cibitung in Kota Bekasi and Cilincing in DKI Jakarta with length of around 35 km. R 07 passes through Cibitung, Telaga Asih, Tambun Utara, Tarumajaya, and Cilincing, and is forecasted to have volume 17,900 PCU/day with a V/C Ratio of 0.32 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kabupaten Bekasi 2011 - 2031. R 07 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 07
Length	34.46 km
Section	Cibitung JORR II-Cilincing
Vol-Density	17,900 PCU/day
V/C Ratio	0.32

Source: JUTPI 2

Figure 284 Detail of R 07 Cibitung - JORR II - Cilincing Toll Road Project in 2024

The intermediate alignment of R 08 connects Cibitung in Kota Bekasi and Cimanggis in Kota Depok with length of around 27 km. R 08 passes through Cinere – Jagorawi Toll Road, and northern part of Jakarta – Cikampek Toll Road, and is forecasted to have volume 27,200 PCU/day with a V/C Ratio of 0.49 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT, RTRW Kabupaten Bekasi 2011 – 2031 and RTRW Kota Bekasi 2011 – 2031. R 08 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 08
Length	26.83 km
Section	Cimanggis II-Cibitung JORR II
Vol-Density	27,200 PCU/day
V/C Ratio	0.49

Source: JUTPI 2

Figure 285 Detail of R 08 Cimanggis II – Cibitung – JORR II Toll Road Project in 2024

The intermediate alignment of R 09 connects Cinere and Krukut in Kota Depok with length of around 8 km. R 09 passes through Cinere – Jagorawi Toll Road, and Depok - Antasari Toll Road, and is forecasted to have volume 35,800 PCU/day with a V/C Ratio of 0.47 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Depok 2012 – 2032. R 09 is planned to accommodate future demand for radial movement with east – west.

Project Code	R 09
Length	7.84 km
Section	Cinere- Cimaggis JORR II
Vol-Density	35,800 PCU/day
V/C Ratio	0.47

Source: JUTPI 2

Figure 286 Detail of R 09 Cinere – Cimanggis - JORR II Toll Road Project in 2024

The intermediate alignment of R 10 connects Kunciran in Kota Tangerang and Serpong in Kota Tangerang Selatan with length of around 11 km. R 10 passes through Kunciran, and Serpong, and is forecasted to have volume 27,600 PCU/day with a V/C Ratio of 0.50 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang Selatan 2011 - 2031. R 10 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 10
Length	11.14 km
Section	Kunciran- Serpong JORR II
Vol-Density	27,600 PCU/day
V/C Ratio	0.50

Source: JUTPI 2

Figure 287 Detail of R 10 Kunciran – Serpong - JORR II Toll Road Project in 2024

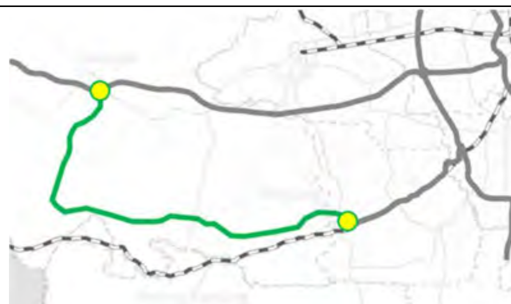
The intermediate alignment of R 11 connects Cinere in Kota Depok and Serpong in Kota Tangerang Selatan with length of around 13 km. R 11 passes through Kunciran, Serpong, and Cinere – Jagorawi Toll Road, and is forecasted to have volume 31,000 PCU/day with a V/C Ratio of 0.56 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT and RTRW Kota Tangerang Selatan 2011 - 2031. R 11 is planned to accommodate future demand for circular movement with north – south.

Project Code	R 11
Length	12.90 km
Section	Serpong-Cinere JORR II
Vol-Density	31,000 PCU/day
V/C Ratio	0.56

Source: JUTPI 2

Figure 288 Detail of R 11 Serpong - Cinere - JORR II Toll Road Project in 2024

The intermediate alignment of R 12 connects Balaraja in Kabupaten Tangerang and Serpong in Kota Tangerang Selatan with length of around 39 km. R 12 passes through Serpong, Legok, Tigaraksa Selatan, and Balaraja, and is forecasted to have volume 13,400 PCU/day with a V/C Ratio of 0.24 in 2024. The alignment is included in RITJ and RTRW Kabupaten Tangerang 2011 - 2031. R 12 is planned to accommodate future demand for circular movement with east – west.



Project Code	R 12
Length	38.85 km
Section	Serpong-Balaraja
Vol-Density	13,400 PCU/day
V/C Ratio	0.24

Source: JUTPI 2

Figure 289 Detail of R 12 Serpong - Balaraja Toll Road Project in 2024

The intermediate alignment of R 16 connects Sunter and Pulo Gebang in DKI Jakarta with a total length of around 9 km. R 16 passes through Kelapa Gading, and Pulo Gebang, and is forecasted to have volume 11,700 PCU/day with a V/C Ratio of 0.21 in 2024. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 16 is planned to accommodate future demand for circular movement within DKI Jakarta.

Project Code	R 16
Length	8.79 km
Section	Sunter-Pulo Gebang
Vol-Density	11,700 PCU/day
V/C Ratio	0.21

Source: JUTPI 2

Figure 290 Detail of R 16 Sunter – Pulo Gebang Toll Road Project in 2024

The intermediate alignment of R 17 connects Semanan and Sunter in DKI Jakarta with length of around 19 km. R 17 is part of inner DKI Jakarta Toll Road and forecasted to have volume 11,800 PCU/day with a V/C Ratio of 0.21 in 2024. The alignment is included in RITJ and RTRW DKI Jakarta 2030. R 17 is planned to accommodate future demand for circular movement with DKI Jakarta.

Project Code	R 17
Length	18.83 km
Section	Semanan-Sunter
Vol-Density	11,800 PCU/day
V/C Ratio	0.21

Source: JUTPI 2

Figure 291 Detail of R 17 Semanan - Sunter Toll Road Project in 2024

The intermediate alignment of R 21 connects Salabenda and Dramaga in Kabupaten Bogor with length of around 38 km. R 21 passes through Bogor – Ciawi – Sukabumi Toll Road and is forecasted to have volume 8,600 PCU/day with a V/C Ratio of 0.15 in 2024. The alignment is included in RITJ and RTRW Kabupaten Bogor 2016 - 2036. R 21 is planned to accommodate future demand for radial movement with north – south.

Project Code	R 21
Length	38.30 km
Section	Bogor-Dramaga-Ciawi
Vol-Density	8,600 PCU/day
V/C Ratio	0.15

Source: JUTPI 2

Figure 292 Detail of R 21 Bogor – Dramaga - Ciawi Toll Road Project in 2024

The interemediate alignment of R 22 connects Bekasi Timur in Kota Bekasi and Bekasi – Cawang – Kampung Melayu (Becakayu) with length of around 10 km. R 22 passes through Tambun Area and is forecasted to have volume 19,400 PCU/day with a V/C Ratio of 0.23 in 2024. The alignment is included in RITJ and updated RTRW Kota Bekasi 2011 – 2031 though it has not been legalized. R 22 is planned to accommodate future demand for radial movement with east - west.

Project Code	R 22
Length	10.41 km
Section	Bekasi-Cawang-Kampung Melayu (Extension)
Vol-Density	19,400 PCU/day
V/C Ratio	0.23

Source: JUTPI 2

Figure 293 Detail of R 22 Bekasi – Cawang – Kampung Melayu Toll Road Project in 2024

The intermediate alignment of R 23 connects Cikunir in Kota Bekasi and Karawang in Kabupaten Bekasi with length of around 31 km. R 23 passes through Cikunir, Bekasi Barat, Bekasi Timur, Tambun, Cibitung, Cikarang Utama, Cikarang Barat, and Cibatu, and is forecasted to have volume 31,700 PCU/day with a V/C Ratio of 0.38 in 2024. The alignment is included in RITJ, Toll Road Master Plan by BPJT, RTRW DKI Jakarta 2030, RTRW Kota Bekasi 2011 – 2031 and RTRW Kabupaten Bekasi 2011 – 2031. R 23 is planned to accommodate future demand for radial movement with east - west.

Project Code	R 23
Length	31.09 km
Section	Jakarta Cikampek Elevated
Vol-Density	31,700 PCU/day
V/C Ratio	0.38

Source: JUTPI 2

Figure 294 Detail of R 23 Jakarta - Cikampek (Elevated) Toll Road Project in 2024

The intermediate alignment of R 26 connects New Patimban Port and Cikopo - Palimanan Toll Road with length of around 21 km. R 26 passes through Purwakarta and is forecasted to have volume 27,200 PCU/day with a V/C Ratio of 0.49 in 2024. The alignment is an unsolicitied project. R 26 is planned to accommodate future demand for radial movement with east - west.

Project Code	R 26
Length	21.18 km
Section	North Cross Toll Road (Patimban)
Vol-Density	27,200 PCU/day
V/C Ratio	0.49

Source: JUTPI 2

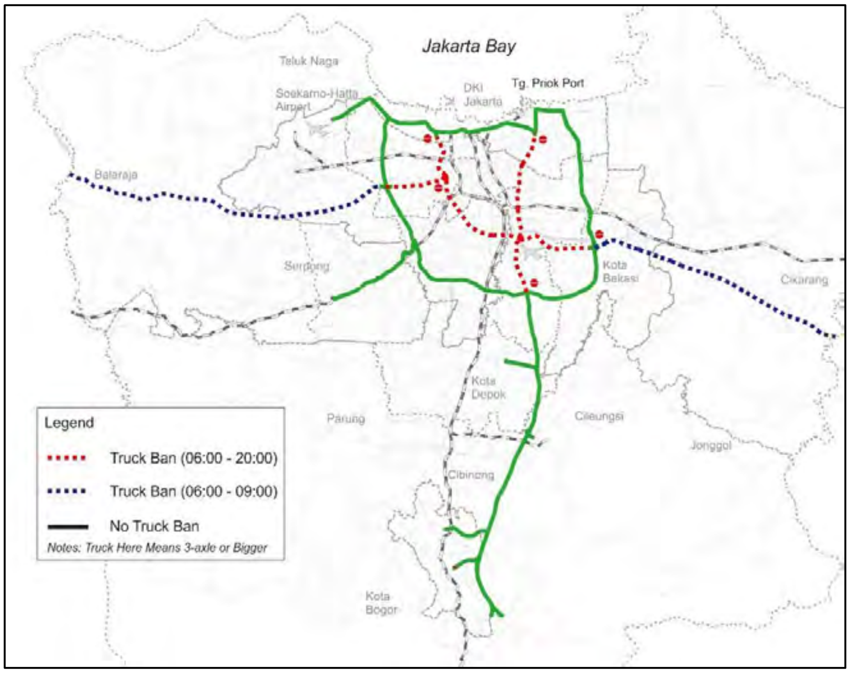
Figure 295 Detail of R 26 North Cross Toll Road Project in 2024

8.5 Freight Transportation

Industrial developments in JABODETABEK are now expanding in the Kabupaten areas over the decades since the cities in JABODETABEK are now being overwhelmed with the massive growth of business and others related to economic sectors. To support the freight transportation movement within JABODETABEK from those industrial areas, highway networks are being planned and some of the construction of the highways are currently in progress.

There are developments of JORR II and North Cross Toll Road (Patimban) that will be connected to Tanjung Priok Access Toll Road. One section in JORR II (Kunciran – Serpong Toll Road) is to be finished by the end of 2019, while five remaining sections are in different stages: either under construction or under planning. North Cross Toll Road (Patimban) will connect new developments of Patimban Port, Purwakarta and JABODETABEK.

In future highway network freight movement also determines the V/C ratio in each toll road. Thus, in the future network truck ban should still be applied for the city center. In 2018 truck ban is only applied in the city center and the intra-urban toll road from 6 AM to 8 PM, as well as Jakarta-Cikampek Toll Road from 6 AM to 9 AM due to the ongoing construction of Jakarta-Cikampek elevated toll road, and Jakarta-Merak Toll Road from 6 AM to 9 AM.

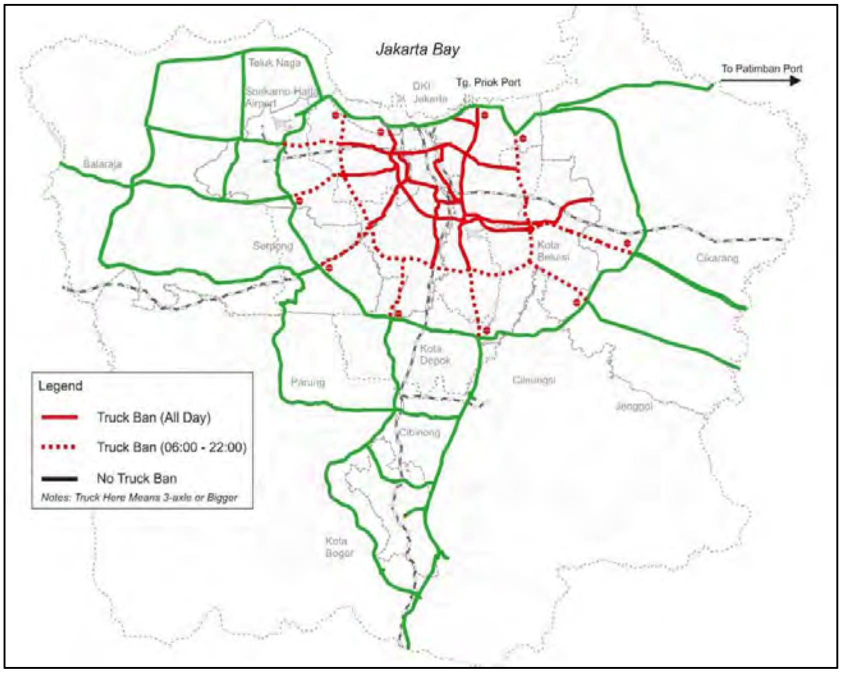


Source: JUTPI 2

Figure 296 Truck Ban in 2018

In 2024 until 2035 the truck ban should still be applied in the city center and the intra-urban toll road and will be expanded to JORR II either for all day or from 6 AM to 10 PM. In addition to what was implemented in 2024 and 2029, use of the toll road section in DKI Jakarta is restricted for trucks while the new toll road outside DKI Jakarta has no truck ban.

In 2035, freight movement from north-south and east-west is not fully concentrated within JORR II. For example, freight movement from Kabupaten Bogor to Kabupaten Tangerang can utilize Serpong – Cinere Toll Road and Serpong – Balaraja Toll Road without crossing JORR II.



Source: JUTPI 2

Figure 297 Truck Ban in 2024 - 2035

Chapter 9 MASTER PLAN COMPONENTS: DETAILED JABODETABEK URBAN TRANSPORTATION MASTER PLAN (RITJ) – JUTPI 2

The transportation master plan in JUTPI 2 is grouped into 10 development sectors. The component of master plan is ranging from road and railway network development, bus transportation system, and intermodal facility development, to transportation safety and security, as well as improvement of traffic control system and demand management. In addition, development of freight transportation system, measures in urban planning, and proposal for environment betterment are also included in the master plan. Furthermore, financial arrangement and institutional setup/reform are considered essential in supporting the implementation of the program itself. The list of projects and programs in each sector will be further elaborated in the following sections.

Source: JUTPI 2

Figure 298 Master Plan Components of JUTPI 2

The projects and programs do not merely come from JUTPI 2, but proposals of project development by related and local government/agencies/authorities from each *kota* and *kabupaten* are also profoundly taken into consideration. The programs which are classified parallel with the direction of JUTPI 2 master plan will be accommodated and included as part of master plan components.

9.1 Projects and Programs for Policy 1: Road Network Development

The development of road infrastructure is essential to meet the future movement of people and goods that keep growing every day. Road network development consists of development of toll roads, arterial roads, and collector roads, and improvement of existing roads. The cost of toll road development is estimated to be IDR 53.72 trillion for 513.42 km. Meanwhile, the cost for arterial and collector road amounts to IDR 18.55 trillion for 488.02 km and IDR 16.60 trillion for 964.05 km, respectively. The total road network development cost amounts to IDR 88.88 trillion or 5.12% of the total master plan cost. The list program of road network development is as follows.

Table 66 Programs for Road Network Development

Code	Project/Program	Project Category	Schedule			Length (Km)	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
R 01	Tanjung Priok Access Toll Road	Toll Road	✓			3.9	387.13
R 02	Bogor Outer Ring Road	Toll Road	✓			5.1	508.90
R 03	Ciawi – Sukabumi	Toll Road	✓			15.0	1,504.47
R 04	Depok Antasari (Extension)	Toll Road	✓			13.3	1,329.81
R 05	Jati Asih Toll Road - Setu - Purwakarta	Toll Road	✓			32.5	3,245.47
R 06	Cengkareng JORR II - Batu Ceper - Kunciran	Toll Road	✓			14.5	1,451.14
R 07	Cibitung JORR II – Cilincing	Toll Road	✓			34.5	3,446.29
R 08	Cimanggis II - Cibitung JORR II	Toll Road	✓			26.8	2,682.55
R 09	Cinere - Cimanggis JORR II	Toll Road	✓			7.8	783.69
R 10	Kunciran - Serpong JORR II	Toll Road	✓			11.1	1,113.52
R 11	Serpong - Ciinere JORR II	Toll Road	✓			12.9	1,290.16
R 12	Serpong – Balaraja	Toll Road	✓			38.8	3,884.74
R 13	Duri Pulo - Kampung Melayu	Toll Road		✓		13.2	1,323.91
R 14	Kemayoran - Kampung Melayu	Toll Road			✓	9.6	962.28
R 15	Pasar Minggu - Casablanca	Toll Road			✓	9.3	928.57
R 16	Sunter - Pulo Gebang	Toll Road	✓			8.8	878.56
R 17	Semanan – Sunter	Toll Road	✓			18.8	1,883.33
R 18	Ulujami - Tanah Abang	Toll Road		✓		8.3	829.63
R 19	Kamal - Teluk Naga - JORR II - Rajeg	Toll Road			✓	34.8	3,483.36
R 20	Semanan - Rajeg - Balaraja	Toll Road		✓		32.7	3,268.35
R 21	Bogor - Dramaga - Ciawi	Toll Road	✓			38.3	3,830.48
R 22	Bekasi - Cawang - Kampung Melayu (Extension)	Toll Road	✓			10.4	1,041.00
R 23	Jakarta Cikampek Elevated	Toll Road	✓			31.1	3,109.00
R 24	Sepatan Timur - Pakuhaji - Teluk Naga - Kosambi	Toll Road			✓	11.0	3,483.36
R 25	Cibinong - Tangerang JORR III	Toll Road			✓	40.4	4,036.00
R 26	North Cross Toll Road (Patimban)	Toll Road	✓			21.2	2,118.00

Code	Project/Program	Project Category	Schedule			Length (Km)	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
R 27	West Cross Toll Road (Jl. Pajajaran - Jl. Moh Toha)	Toll Road			✓	9.2	923.00
R 28	Development of Arterial Road DKI Jakarta	Arterial Road			✓	3.2	189.60
R 29	Development of Collector Road in DKI Jakarta	Collector road		✓	✓	30.7	920.70
R 30	Arterial road capacity improvement in DKI Jakarta (road widening)	Arterial Road	✓			50.0	590.43
R 31	Collector road capacity improvement in DKI Jakarta (road widening)	Collector Road		✓		275.0	3,247.35
R 32	Development of Arterial Ring Road in Kota Bogor	Arterial Road		✓		13.9	834.00
R 33	K.H Sholeh Iskandar road - Stasiun sukaresmi road	Arterial Road		✓		2.2	132.00
R 34	Development of arterial road in Kota Bogor	Arterial Road		✓		1.1	64.80
R 35	Development of arterial road parallel with Bogor Outer Ring Road, Ciluar - Kedunghalang segment	Arterial Road		✓		1.1	64.80
R 36	Development of collector road in Kota Bogor	Collector road		✓		4.2	126.90
R 37	Development of R3 road section	Collector road		✓		3.3	100.20
R 38	Development of Sukaresmi Station road section - Raya Pemda Road	Collector road		✓		0.8	23.70
R 39	Development of K.H Sholeh Iskandar road section - Kelurahan Kencana Jambu	Collector road		✓		2.8	84.60
R 40	Development of Perdana Raya road - Kelurahan Kencana	Collector road		✓		2.4	70.80
R 41	Development of P.Asoghiri road section - Side of Jagorawi toll road	Collector road		✓		1.7	50.40
R 42	Development of WP Purwa West - East - North - South axis	Collector road		✓		3.0	90.00
R 43	Development of Sukaraja road	Collector road		✓		0.4	10.50
R 44	Development of Menteng Asri road - Tentara Pelajar road	Collector road		✓		0.1	2.10
R 45	Arterial road capacity improvement in Kota Bogor (road widening)	Arterial Road	✓			20.0	236.17
R 46	Collector road capacity improvement in Kota Bogor (road widening)	Collector Road		✓		30.0	354.26
R 47	Development of Banjarwaru - Nagrog section	Arterial Road			✓	2.2	133.80
R 48	Development of Laladon Ring Road	Arterial Road			✓	3.3	196.20
R 49	Development of Dramaga Ring Road	Arterial Road			✓	3.4	202.80
R 50	Development of Leuwiliang Ring Road	Arterial Road			✓	3.8	228.00

Code	Project/Program	Project Category	Schedule			Length (Km)	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
R 51	Development of GOR Pakansari Ring Road	Arterial Road			✓	2.9	173.40
R 52	Development of East center axis 1st segment	Arterial Road			✓	31.6	1,898.40
R 53	Development of East center axis 2nd segment	Arterial Road			✓	18.5	1,107.00
R 54	Development of Bantarkuning - Jagatamu road section	Arterial Road			✓	6.4	383.40
R 55	Development of Gunung putri - Lulut road section	Arterial Road			✓	2.5	150.00
R 56	Development of Sukahati - Jampang road section	Arterial Road			✓	10.0	598.80
R 57	Development of Rumpin - Parung Panjang - Tenjo - Maja road section	Arterial Road	✓			24.4	1,462.20
R 58	Development of Gunung Sindur - Sukamulya - Parung Panjang road section	Collector road	✓			3.3	97.80
R 59	Development of Sukamulya - Rumpin - Kampung Sawah - Banyuasih - Cigudeg - Sukajaya - Malasari road section (West Axis)	Collector road	✓			10.3	308.40
R 60	Development of Kopo - Sukamanah - Citapeh - Lemah Duhur - Cinagara - Muarajaya road section	Collector road	✓			4.0	119.10
R 61	Development of Gerbang Pemda - Cibinong - Gerbang Tol Citeurup road section	Collector road			✓	3.2	95.40
R 62	Development of Bojonggede Ring Road	Collector road	✓			1.3	38.40
R 63	Development of Kembang kuning - Bantarjati section	Collector road			✓	0.7	20.40
R 64	Development of Cikodom - Cibadung - Jampang road section	Collector road	✓			7.8	234.90
R 65	Development of Palasari - Taman sari - Gunung malang - Gunung bunder - Pamijahan - Nanggung - Pasir madang - Curug section	Collector road			✓	23.1	693.30
R 66	Development of Gandoang - Raga Manunggal section (Bekasi border)	Collector road	✓			1.7	49.80
R 67	Development of Kembang Kunir - Ligar Mukti - Singasari road section	Collector road			✓	2.4	72.60
R 68	Development of Citaringgul - Cibadak - Tajur road section	Collector road	✓			1.8	53.70
R 69	Road capacity improvement in Kabupaten Bogor (road widening)	Arterial Road		✓		51.6	614.04
R 70	Road capacity improvement in Kabupaten Bogor (road widening)	Collector road	✓			82.0	968.30
R 71	Development of Arterial Road in Kota Depok	Arterial Road		✓		6.9	416.40

Code	Project/Program	Project Category	Schedule			Length (Km)	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
R 72	Development of Depok Outer Ring Road	Arterial Road		✓		29.9	1,791.00
R 73	Arterial road capacity improvement in Kota Depok (road widening)	Arterial Road		✓		15.0	177.13
R 74	Collector road capacity improvement in Kota Depok (road widening)	Collector road	✓			8.0	94.47
R 75	Development of Arterial Road in Kota Tangerang	Arterial Road			✓	36.1	2,160.00
R 76	Development of Collector Road in Kota Tangerang	Collector road			✓	60.7	1,822.20
R 77	Arterial road capacity improvement in Kota Tangerang (road widening)	Arterial Road	✓			36.0	425.11
R 78	Collector road capacity improvement in Kota Tangerang (road widening)	Collector road	✓			62.0	732.13
R 79	Development of Lingkar Timur - Tekno Widya passageway	Arterial Road		✓		2.3	135.00
R 80	Development of Promotor passageway	Arterial Road		✓		0.9	54.60
R 81	Development of Parigi Baru Ring Road	Arterial Road		✓		1.3	76.20
R 82	Development of Graha Raya Bintaro - Serpong Kunciran passageway	Arterial Road		✓		0.6	37.80
R 83	Development of AMD Raya - Graha Raya Bintaro passageway	Arterial Road		✓		3.5	208.80
R 84	Development of Jelupang Raya - Serpong - Kunciran passageway	Arterial Road		✓		0.7	40.20
R 85	Development of Kranggan Bridge - Momonggor passageway	Collector road		✓		2.4	70.80
R 86	Development of Serpong Lagoon - Momonggor passageway	Collector road		✓		0.3	9.60
R 87	Development of Sarimulya road	Collector road		✓		1.5	44.10
R 88	Development of Benda Raya	Collector road		✓		0.7	21.00
R 89	Development of Waru passageway	Collector road		✓		1.0	29.40
R 90	Development of Puspem Ring Road	Collector road		✓		0.6	18.60
R 91	Development of Maruga Raya	Collector road		✓		0.4	10.50
R 92	Development of Bambu Apus - Aria Putra passageway	Collector road		✓		1.4	41.40
R 93	Development of Aria Putra - Merpati road section	Collector road		✓		1.2	34.50
R 94	Development of Pahlawan - Haji Juanda 2 passageway	Collector road		✓		0.8	23.10
R 95	Development of Pahlawan - Haji Juanda passageway	Collector road		✓		0.9	27.60

Code	Project/Program	Project Category	Schedule			Length (Km)	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
R 96	Development of M.H Thamrin passageway - Bintaro Jaya Ring Road	Collector road		✓		0.2	6.00
R 97	Development of Bintaro Utama 3a - Exchange Ring Road	Collector road		✓		1.9	57.60
R 98	Road capacity improvement in Kota Tangerang Selatan (road widening)	Arterial Road	✓			10.0	118.09
R 99	Development of Collector Road in Kabupaten Tangerang	Collector road		✓		9.5	283.80
R 100	Collector road improvement in Kabupaten Tangerang	Collector road		✓		120.0	1,417.02
R 101	Development of collector road in Kota Bekasi	Collector road	✓			26.7	801.00
R 102	Arterial road capacity improvement in Kota Bekasi (road widening)	Arterial road	✓	✓		25.0	295.21
R 103	Collector road capacity improvement in Kota Bekasi (road widening)	Collector road	✓	✓		95.0	1,121.81
R 104	Development of Arterial Road in Kabupaten Bekasi	Arterial Road		✓		53.0	3,181.80
R 105	Development of Collector Road in Kabupaten Bekasi	Collector road			✓	68.2	2,046.60
R 106	Arterial road capacity improvement in Kabupaten Bekasi (road widening)	Arterial Road	✓			15.0	177.13
R 107	Collector road capacity improvement in Kabupaten Bekasi (road widening)	Collector Road	✓	✓		5.0	59.04

Source: JUTPI 2

9.2 Projects and Programs for Policy 2: Railway Network Development

Public transport system at higher level of network and service should be developed to accommodate future travel demand. Improvement of the existing railway lines and construction of new mass transit such as MRT or LRT lines will significantly increase passenger capacity and service and hence, will eventually increase the usage of public transportation. There are 425.63 km of MRT lines, 213.31 km of LRT lines, and a total of 423.44 km of new development or improvement of other railway (Commuter Line, Inter City Train, etc.) included in the master plan, as well as development of railway station. From all sectors, the highest cost is required for railway network development, which accounted for IDR 1,234.98 trillion or 71.19% of the total master plan cost. The detailed list of programs can be seen in Table 67.

Table 67 Programs for Railway Network Development

Code	Project/Program	Project Category	Schedule			Length (Km) /Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
MRT 01	MRT North - South (Lebak Bulus - Kampung Bandan)	MRT	✓			23.0	38,500.00
MRT 02	MRT East - West (Cikarang - Balaraja)	MRT		✓	✓	87.3	169,364.52
MRT 03	MRT Kota - Soekarno Hatta Airport Terminal	MRT		✓		24.4	51,625.93
MRT 04	MRT Fatmawati - Marunda	MRT			✓	37.8	99,595.75
MRT 05	MRT Karawaci - South Cikarang	MRT		✓	✓	66.7	121,593.60
MRT 06	MRT Lebak Bulus - Karawaci	MRT			✓	33.6	62,803.61
MRT 07	MRT North - South Kota Bekasi	MRT			✓	13.6	24,350.32
MRT 08	MRT Pluit – Depok	MRT		✓	✓	38.3	72,900.86
MRT 09	MRT Outer Loop Line	MRT			✓	63.1	118,180.45
MRT 10	MRT Inner Loop Line	MRT			✓	37.9	120,609.95
LRT 01	Kelapa Gading - Velodrome	LRT	✓			5.6	6,119.32
LRT 02	Puri Kembangan - Tanah Abang - Dukuh Atas	LRT		✓		11.8	12,938.08
LRT 03	Pesing - Kelapa Gading via Kemayoran	LRT		✓		16.7	18,343.03
LRT 04	Cawang - Kuningan - Dukuh Atas	LRT	✓			10.0	10,942.26
LRT 05	Cawang - Cibubur - Kota Bogor	LRT	✓	✓		43.5	47,892.53
LRT 06	Inner City of Kota Bogor/Kab. Bogor (Sentul City - Tanah Baru - Kedung Halang - Sukaresmi - Bubulak - Laladon - Rancamaya - Cibanon - Sentul City)	LRT			✓	40.1	44,033.26
LRT 07	Cawang - Bekasi Timur	LRT	✓			18.6	20,426.92
LRT 08	Route up to Cikarang integrated with Automated Guideway Transit (AGT) and Jakarta – Bandung High-Speed Train (HST)	LRT			✓	14.6	16,000.06
LRT 09	Jagakarsa - Cibubur - Cileungsi	LRT			✓	24.6	27,079.32
LRT 10	Velodrome - JIEP - Cakung	LRT		✓		7.9	8,658.01
LRT 11	Inner City Kota Tangerang Selatan	LRT			✓	20.0	21,992.16
AGT 01	Inter Industrial Zone Section	AGT			✓	26.7	20,174.00
COM 01	Parung Panjang - Pondok Rajeg	Commuter Line			✓	30.2	1,057.00
COM 02	Nambo - Cikarang - Tj. Priok	Commuter Line			✓	92.5	3,236.45

Code	Project/Program	Project Category	Schedule			Length (Km) /Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
COM 03	Nambo - Cileungsi - Bekasi	Commuter Line			✓	21.4	748.20
COM 04	Bogor - Rangkasbitung	Commuter Line			✓	59.2	2,073.40
COM 05	Serpong Line shortcut between Palmerah – Karet	Commuter Line		✓		0.8	28.00
ICT 01	Jakarta - Bandung	Inter-city Train	✓			40.8	80,000.00
ICT 02	Cileungsi - Jonggol - Cianjur	Inter-city Train			✓	31.9	1,115.07
PR 01	Development of new station type A for MRT and LRT in DKI Jakarta	Railway Station		✓	✓	27.0	2,025.00
PR 02	Development of new station type B for MRT and LRT in DKI Jakarta	Railway Station		✓	✓	4.0	160.00
PR 03	Development of new station type C for MRT and LRT in DKI Jakarta	Railway Station		✓	✓	223.0	3,345.00
PR 04	Development of new station type C for MRT and LRT in Kota Bogor	Railway Station		✓	✓	12.0	180.00
PR 05	Development of new station type C for MRT and LRT in Kabupaten Bogor	Railway Station		✓	✓	51.0	765.00
PR 06	Improvement of railway Jakarta - Bogor	Railway		✓	✓	20.0	560.00
PR 07	Improvement of railway Citayam - Cibinong - Nambo	Railway		✓	✓	14.0	392.00
PR 08	Improvement of railway Parung Panjang - Tenjo (double track)	Railway		✓	✓	14.0	392.00
PR 09	Improvement of railway Bogor - Cigombong - Sukabumi	Railway		✓	✓	10.0	280.00
PR 10	Development of new station type C for MRT and LRT in Kota Tangerang	Railway Station		✓	✓	21.0	315.00
PR 11	Improvement of railway Tangerang - Jakarta (double track)	Railway		✓	✓	7.0	196.00
PR 12	Development of new station type B for MRT and LRT in Kota Depok	Railway Station		✓	✓	2.0	80.00
PR 13	Development of new station type C for MRT and LRT in Kota Depok	Railway Station		✓	✓	16.0	240.00
PR 14	Development of new station type B for MRT and LRT in Kota Tangerang Selatan	Railway Station		✓	✓	1.0	40.00
PR 15	Development of new station type C for MRT and LRT in Kota Tangerang Selatan	Railway Station		✓	✓	26.0	390.00
PR 16	Improvement of railway Serpong - Merak (double track)	Railway			✓	45.0	1,260.00
PR 17	Development of new station type A for MRT and LRT in Kabupaten Tangerang	Railway Station		✓	✓	1.0	75.00

Code	Project/Program	Project Category	Schedule			Length (Km) /Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
PR 18	Development of new station type B for MRT and LRT in Kabupaten Tangerang	Railway Station		✓	✓	1.0	40.00
PR 19	Development of new station type C for MRT and LRT in Kabupaten Tangerang	Railway Station		✓	✓	10.0	150.00
PR 20	Development of new station type A for MRT and LRT in Kota Bekasi	Railway Station		✓	✓	3.0	225.00
PR 21	Development of new station type B for MRT and LRT in Kota Bekasi	Railway Station		✓	✓	1.0	40.00
PR 22	Development of new station type C for MRT and LRT in Kota Bekasi	Railway Station		✓	✓	34.0	510.00
PR 23	Improvement of railway in Kota Bekasi	Railway		✓	✓	10.0	280.00
PR 24	Development of new station type C for MRT and LRT in Kabupaten Bekasi	Railway Station		✓	✓	44.0	660.00

Source: JUTPI 2

9.3 Projects and Programs for Policy 3: Improvement of Traffic Control System and Demand Management

One of the major improvements of traffic control system and demand management proposed by JUTPI 2 is the development of Electronic Road Pricing (ERP), which also includes the application of Parking Pricing System, in the center of JABODETABEK. All tours by private car, motorcycle, and truck that go from/to/through ERP area will be charged IDR 100,000 (normally IDR 50,000 for a going trip and IDR 50,000 for a returning trip) during 6 AM - 8 PM. Moreover, all private car, motorcycle, and truck tours to ERP area will be charged maximum IDR 100,000 for a parking fee per day during 6 AM - 8 PM. It is estimated that IDR 2 trillion is required to implement this ERP system.

Table 68 Programs for Improvement of Traffic Control System and Demand Management

Code	Project/Program	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
C 01	Development of Electronic Road Pricing (including Parking Pricing System)	Road Pricing	✓			1	2,000

Source: JUTPI 2

9.4 Projects and Programs for Policy 4: Improvement of Transportation Safety and Security

Another component in the master plan focuses on the improvement of transportation safety and security. The programs are the provision of pedestrian infrastructure and signage, traffic light and street lighting facility, as well as road signage and zebra crossing.

Table 69 Programs for Improvement of Transportation Safety and Security

Code	Project/Program	Project Category	Schedule			Length (Km) /Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
S 01	Provisioning of pedestrian infrastructure in DKI Jakarta	Pedestrian Infrastructure	✓	✓	✓	503.0	3,269.50
S 02	Provisioning of traffic light facility in DKI Jakarta	Traffic light		✓	✓	235.0	82.25
S 03	Provisioning of street lighting facility in DKI Jakarta	Street lighting		✓	✓	9,400.0	30.08
S 04	Provisioning of road signage facility in DKI Jakarta	Road signage		✓	✓	470.0	0.33
S 05	Provisioning of zebra crossing facility in DKI Jakarta	Zebra Crossing		✓	✓	470.0	0.94
S 06	Provisioning of infrastructure for pedestrian in Kota Bogor	Pedestrian Infrastructure	✓	✓	✓	83.0	539.50
S 07	Provisioning of traffic light facility in Kota Bogor	Traffic light		✓	✓	22.5	7.88
S 08	Provisioning of street lighting facility in Kota Bogor	Street lighting		✓	✓	900.0	2.88
S 09	Provisioning of road signage facility in Kota Bogor	Road signage		✓	✓	45.0	0.03
S 10	Provisioning of zebra crossing facility in Kota Bogor	Zebra Crossing		✓	✓	45.0	0.09
S 11	Provisioning of infrastructure for pedestrian	Pedestrian Infrastructure	✓	✓	✓	60.7	394.55
S 12	Provisioning of intersection traffic light in Kabupaten Bogor	Traffic light		✓	✓	21.9	7.67
S 13	Provisioning of pedestrian lighting facility in Kabupaten Bogor	Street lighting		✓	✓	876.0	2.80
S 14	Provisioning of pedestrian signage facility in Kabupaten Bogor	Road signage		✓	✓	43.8	0.03
S 15	Provisioning of zebra crossing facility in Kabupaten Bogor	Zebra Crossing		✓	✓	43.8	0.09
S 16	Provisioning of infrastructure for pedestrian	Pedestrian Infrastructure	✓	✓	✓	197.0	1,280.50
S 17	Provisioning of intersection traffic light in Kota Depok	Traffic light		✓	✓	80.0	28.00
S 18	Provisioning of street lighting facility in Kota Depok	Street lighting		✓	✓	3,200.0	10.24
S 19	Provisioning of road signage facility in Kota Depok	Road signage		✓	✓	160.0	0.11
S 20	Provisioning of zebra crossing facility in Kota Depok	Zebra Crossing		✓	✓	160.0	0.32
S 21	Provisioning of pedestrian crossing bridge in Kota Depok	Pedestrian Crossing Bridge	✓			2.0	6.00
S 22	Provisioning of infrastructure for pedestrian	Pedestrian Infrastructure	✓	✓	✓	139.0	903.50

Code	Project/Program	Project Category	Schedule			Length (Km) /Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
S 23	Provisioning of traffic light facility in Kota Tangerang	Traffic light		✓	✓	57.5	20.13
S 24	Provisioning of street lighting facility in Kota Tangerang	Street lighting		✓	✓	2,300.0	7.36
S 25	Provisioning of road signage facility in Kota Tangerang	Road signage		✓	✓	115.0	0.08
S 26	Provisioning of zebra crossing facility in Kota Tangerang	Zebra Crossing		✓	✓	115.0	0.23
S 27	Provisioning of infrastructure for pedestrian	Pedestrian Infrastructure	✓	✓	✓	98.0	637.00
S 28	Provisioning of traffic light facility in Kota Tangerang Selatan	Traffic light		✓	✓	58.5	20.48
S 29	Provisioning of street lighting facility in Kota Tangerang Selatan	Street lighting		✓	✓	2,340.0	7.49
S 30	Provisioning of road signage facility in Kota Tangerang Selatan	Road signage		✓	✓	117.0	0.08
S 31	Provisioning of zebra crossing facility in Kota Tangerang Selatan	Zebra Crossing		✓	✓	117.0	0.23
S 32	Provisioning of infrastructure for pedestrian	Pedestrian Infrastructure	✓	✓	✓	251.0	1,631.50
S 33	Provisioning of intersection traffic light in Kabupaten Tangerang	Traffic light		✓	✓	120.5	42.18
S 34	Provisioning of pedestrian lighting facility in Kabupaten Tangerang	Street lighting		✓	✓	4,820.0	15.42
S 35	Provisioning of pedestrian signage facility in Kabupaten Tangerang	Road signage		✓	✓	241.0	0.17
S 36	Provisioning of zebra crossing facility in Kabupaten Tangerang	Zebra Crossing		✓	✓	241.0	0.48
S 37	Provisioning of infrastructure for pedestrian	Pedestrian Infrastructure	✓	✓	✓	179.0	1,163.50
S 38	Provisioning of traffic light facility in Kota Bekasi	Traffic light		✓	✓	76.0	26.60
S 39	Provisioning of street lighting facility in Kota Bekasi	Street lighting		✓	✓	3,040.0	9.73
S 40	Provisioning of road signage facility in Kota Bekasi	Road signage		✓	✓	152.0	0.11
S 41	Provisioning of zebra crossing facility in Kota Bekasi	Zebra Crossing		✓	✓	152.0	0.30
S 42	Provisioning of infrastructure for pedestrian	Pedestrian Infrastructure	✓	✓	✓	313.0	2,034.50
S 43	Provisioning of traffic light facility in Kabupaten Bekasi	Traffic light		✓	✓	95.0	33.25
S 44	Provisioning of street lighting facility in Kabupaten Bekasi	Street lighting		✓	✓	3,800.0	12.16
S 45	Provisioning of road signage facility in Kabupaten Bekasi	Road signage		✓	✓	190.0	0.13
S 46	Provisioning of zebra crossing facility in Kabupaten Bekasi	Zebra Crossing		✓	✓	190.0	0.38

Source: JUTPI 2

9.5 Projects and Programs for Policy 5: Bus Transportation System and Intermodal Facility Development

Master plan of JUTPI 2 also aims at developing the bus transportation system and intermodal facility, as it is viewed as one of the most substantial development sectors. One of the projects is the rationalization of bus transportation system, which is the establishment of a comprehensive system with buses that serve higher-capacity mass transit such as MRT or LRT as feeders. This sector also includes the development of new development and improvement of passenger terminals and shelters.

Table 70 Programs for Bus Transportation System and Intermodal Facility Development

Code	Project/Program	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
PB 01	Existing bus transportation system reorganization in DKI Jakarta	Bus transportation system	✓	✓	✓	4	4.00
PB 02	Bus transportation system development in DKI Jakarta	Bus transportation system Rationalization		✓	✓	470	70.50
PB 03	Shelter development in DKI Jakarta	Shelter		✓	✓	470	103.40
PB 04	Bus transportation system development in Kota Bogor	Bus transportation system Rationalization		✓	✓	45	6.75
PB 05	Shelter development in Kota Bogor	Shelter		✓	✓	45	9.90
PB 06	Optimization of type A Terminal (Baranangsiang)	Passenger Terminal	✓			1	40.00
PB 07	Development of type A terminal in Kelurahan Tanah Baru	Passenger Terminal	✓			1	140.00
PB 08	Shelter development in Kabupaten Bogor	Shelter		✓	✓	44	9.68
PB 09	Bus transportation system development in Kabupaten Bogor	Bus transportation system Rationalization		✓	✓	44	6.60
PB 10	Development of type A terminal in Cibinong	Passenger Terminal			✓	1.0	140.00
PB 11	Development of type B terminal in Cileungsi, Leuwiliang, Parung, Ciawi, and Dramaga	Passenger Terminal			✓	5	500.00
PB 12	Development of type C terminal in Bojonggede, Laladon, Jonggol, Citereup, Jasinga, Parung Panjang, Tenjo, and Cariu	Passenger Terminal			✓	8	480.00
PB 13	Shelter development in Kota Depok	Shelter		✓	✓	160	35.20
PB 14	Bus transportation system development in Kota Depok	Bus transportation system Rationalization		✓	✓	160	24.00
PB 15	Development of type C terminal in Kota Depok	Passenger Terminal		✓	✓	5	300.00

Code	Project/Program	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
PB 01	Existing bus transportation system reorganization in DKI Jakarta	Bus transportation system	✓	✓	✓	4	4.00
PB 16	Shelter development in Kota Tangerang	Shelter		✓	✓	115	25.30
PB 17	Bus transportation system development in Kota Tangerang	Bus transportation system Rationalization		✓	✓	115	17.25
PB 18	Development of new type A terminal in Jatiuwung	Passenger Terminal	✓			1	140.00
PB 19	Development of new type B terminal in Ciledug or Larangan, Periuk, Imam Bonjol	Passenger Terminal	✓			3	300.00
PB 20	Development of new type C terminal in Kota Tangerang	Passenger Terminal	✓			1	60.00
PB 21	Shelter development in Kota Tangerang Selatan	Shelter		✓	✓	117	25.74
PB 22	Bus transportation system development in Kota Tangerang Selatan	Bus transportation system Rationalization		✓	✓	117	17.55
PB 23	Improvement of type A terminal in Kecamatan Pamulang	Passenger Terminal	✓			1	40.00
PB 24	Improvement of type B terminal in Kecamatan Ciputat	Passenger Terminal	✓			1	27.00
PB 25	Improvement of type C terminal in Kecamatan Serpong, Kecamatan Setu, dan Kecamatan Pondok Aren;	Passenger Terminal	✓			3.0	48.00
PB 26	Shelter development in Kabupaten Tangerang	Shelter		✓	✓	241	53.02
PB 27	Bus transportation system development in Kabupaten Tangerang	Bus transportation system Rationalization		✓	✓	241	36.15
PB 28	Development of type A terminal in Kecamatan Curug	Passenger Terminal	✓			1	140.00
PB 29	Development of type B terminal in Kecamatan Teluknaga, Kecamatan Pakuhaji, and Kecamatan Cisauk	Passenger Terminal	✓			3	300.00
PB 30	Improvement of type B terminal in Kecamatan Balaraja	Passenger Terminal	✓			1	27.00
PB 31	Improvement of type B terminal in Cisoka	Passenger Terminal	✓			1	27.00
PB 32	Bus transportation system development in Kota Bekasi	Bus transportation system Rationalization		✓	✓	152	22.80
PB 33	Shelter development in Kota Bekasi	Shelter		✓	✓	152	33.44
PB 34	Development of type A terminal in Kota Bekasi	Passenger Terminal		✓		1	140.00
PB 35	Improvement of type B terminal in Kecamatan Pondokgede	Passenger Terminal		✓		1	27.00
PB 36	Improvement of type C terminal in Teluk Pucung, Sumber Arta, Kec. Jatisampurna	Passenger Terminal		✓		3	48.00

Code	Project/Program	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
PB 01	Existing bus transportation system reorganization in DKI Jakarta	Bus transportation system	✓	✓	✓	4	4.00
PB 37	Bus transportation system development in Kabupaten Bekasi	Bus transportation system Rationalization		✓	✓	190	28.50
PB 38	Shelter development in Kabupaten Bekasi	Shelter		✓	✓	190	41.80
PB 39	Development of new type A terminal in Cikarang Utara and Cikarang Barat	Passenger Terminal	✓			2	280.00
PB 40	Development of new type C terminal in Kecamatan Tambun Utara, Tarumajaya, Sukatani, and Cibarusah	Passenger Terminal	✓			4	240.00

Source: JUTPI 2

9.6 Projects and Programs for Policy 6: Measures in Urban Planning

Development of park and ride in the station as well as TOD for the support system in creating transportation network which have effects on social and economic activities. The change of urban structure or arrangement of building, streets, and other urban areas as a big concept in TOD are also included in master plan components. The measure in urban planning has two project categories, which are development of park and ride facility and TOD. The park and ride facility will be located on each development of future station.

Table 71 Program for Measures in Urban Planning

Code	Project/Program	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
UP 01	Development of park and ride facility in DKI Jakarta	Parking building facility		✓	✓	254	1,270
UP 02	Development of park and ride facility in Kota Bogor	Parking building facility		✓	✓	12	60
UP 03	Development of park and ride in Kabupaten Bogor	Parking building facility		✓	✓	51	255
UP 04	Development of TOD-based, inter and intra-mode services integration in Kabupaten Bogor: Bojonggede, Cibinong, and Cileungsi	TOD			✓	3	105,000
UP 05	Development of park and ride in Kota Depok	Parking building facility		✓	✓	18	90
UP 06	Development of TOD-based, inter and intra-mode services integration in Kota Depok	TOD			✓	6	210,000
UP 07	Development of park and ride facility in Kota Tangerang	Parking building facility		✓	✓	21	105
UP 08	Development of park and ride facility in Kota Tangerang Selatan	Parking building facility		✓	✓	27	135

Code	Project/Program	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
UP 09	Development of park and ride in Kabupaten Tangerang	Parking building facility		✓	✓	12	60
UP 10	Development of park and ride in Kabupaten Bekasi	Parking building facility			✓	38	190
UP 11	Development of TOD-based, inter and intra-mode services integration in Bekasi and Bekasi Timur	TOD			✓	2	70,000
UP 12	Development of park and ride in Kabupaten Bekasi	Parking building facility		✓	✓	44	220

Source: JUTPI 2

9.7 Projects and Programs for Policy 7: Freight Transportation System

Freight transportation system plays an important role in planning a transportation system because the necessity of mobility is not only for people but also for goods. Consideration of having different infrastructures for freight and people is to avoid aggravating the conflicts with passenger traffic and causing massive traffic congestion. Efficiency of travel time and fuel consumprtion is a benefit for separating the systems.

Table 72 Program for Freight Transportation System

Code	Project/Program	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
FR 01	Development of freight terminal in Kelurahan Cibadak and Kelurahan Cibuluh	Freight terminal		✓	✓	2	1,700
FR 02	Development of freight terminal in Desa Nambo, Kecamatan Klapanunggal	Freight terminal		✓	✓	1	850
FR 03	Development of new freight terminal in Jatiuwung	Freight terminal		✓	✓	1	850
FR 04	Development of freight terminal in Kecamatan Jambe	Freight terminal		✓	✓	1	850
FR 05	Development of new freight terminal in Kecamatan Tarumajaya	Freight terminal		✓	✓	1	850

Source: JUTPI 2

9.8 Projects and Programs for Policy 8: Financial Arrangement

Policy related to the financing and revenue scheme is important to have sustainable infrastructure including another new construction project and operation period.

Table 73 Program for Financial Arrangement

Code	Project/Program	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
F 01	Re-arrangement of revenue sharing among different levels of governments (Central Govt., Provincial Govt., and Local Govt.)	Finance	✓	✓		1	-
F 02	Introduction of Road Fund	Finance	✓	✓		1	-
F 03	Expand tax base	Finance	✓	✓		1	-
F 04	Reduction of fuel subsidy and gradual increase of fuel tax	Finance	✓	✓		1	-

Source: JUTPI 2

9.9 Projects and Programs for Policy 9: Institutional Setup & Reform

Development for human resources in a formal organizational structure for the master plan implementation is also included. In this case, the reformation is not only for local government officers but also for public transportation operators. It is because the master plan includes the development of road, railways, bus, and supporting system including TOD, freight transportation system, traffic control system, and so on.

Table 74 Program for Institutional Setup & Reform

Code	Project	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
I 01	Integrated Training Program on Transportation Planning for Local Government Officers	Institution	✓	✓		1	-
I 02	Integrated Management of Public Transportation Operators	Institution	✓	✓		1	-

Source: JUTPI 2

9.10 Projects and Programs for Policy 10: Environment Betterment

Environment betterment includes promotion of low-sulfur diesel and introduction of environment-friendly fuels.

Table 75 Program for Environment Betterment

Code	Project	Project Category	Schedule			Unit	Project Cost (Billion Rp.)
			2024	2029/ 2030	2035		
E 01	Promotion of Low Sulfur Diesel	Environment	✓	✓	✓	1	-
E 02	Promotion of Biofuel	Environment	✓	✓	✓	1	-

Source: JUTPI 2

The projects of above-mentioned ten sectors are scheduled for the three target years. While original proposal from each local government may consider earlier or later stage of implementation, JUTPI 2 considers the necessity to integrate and, thus, readjust the timeline organization so that a bigger picture of sustainable planning as well as implementation can be achieved. Three target years are short term (2024), medium term (2029/30), and long term (2035). Short-term development goals start from DKI Jakarta in the form of ERP, MRT 01, LRT (01, 04, 05, and 07), supported by bus feeder rationalization. For the medium goal, railway network development is conducted by adding new MRT (02, 05, and 08) in DKI Jakarta, and LRT (02, 03, and 10) which expanded to BODETABEK area. Long-term projects to be implemented in 2035 will see the extension of railway network crossing the border of DKI Jakarta in terms of MRT (02, 05, and 08) and development of new lines namely MRT (03, 04, 06, 07, 09, and 10) and LRT (06, 08, 09, and 11). The programs are followed by the provision of park and ride facility and feeder bus extension to connect people from their origin to the nearest station. In line with these plans, TOD area will be developed in BODETABEK to promote people's mobilization from BODETABEK to DKI Jakarta by public transport.

Other than passenger's transport, the freight movement will also be developed by new freight terminals in BODETABEK which are supported by the toll road network development in JABODETABEK. In the meantime, to reduce the air pollution, public transport development will be implemented in line with environmental betterment related programs by using environment-friendly fuel for motorized vehicles (E 01 and E 02).

Those programs could be well implemented with the support of financial planning and the establishment of institution that focused on the realization of transportation program and management integration among related agencies.

Chapter 10 MASTER PLAN EVALUATION

10.1 Key Performance Indicators

Key Performance Indicator (KPI) is a visual quantification of performance to measure the effectiveness of an organization and its progress towards achieving its goals. JUTPI 1 (2010) formulated its indicators of progress toward an intended result of urban transportation system development goals for each target year. Meanwhile, RITJ also has a different way and analytical basis for measuring the performance of its program and the level of achievement of its goals. Both JUTPI 1 and RITJ indicators to measure its program performance are listed below.

Table 76 JUTPI 1 KPI Recommendation and RITJ KPI

JUTPI 1 KPI Recommendation	RITJ KPI
Average travel speed from suburb to CBD in morning peak period	People movement using urban public transport must reach 60% of the total movement of people
Coverage of railway and busway in urbanized area	Average person travel time in public transport vehicle is 1 hour 30 minutes at peak hour from origin to destination
% Adoption of universal design at public transport facilities	Average speed of urban public transport vehicles at peak hours across the road network is at least 30 km/h
Number of fatality in traffic accidents	Coverage of urban public transport services reaches 80% of the road length
Number of severe injuries in traffic accidents	Access pedestrian to public transport maximum of 500 m
CO2 emission per capita	Each region must have a local service network feeder that is integrated with the main network (trunk) through an urban transport node
PM10 emission per capita	Urban transport nodes shall have pedestrian facility and park and ride facilities, with intermodal transport distance not exceeding 500 m
	Transfer modes in single trip maximum of 3 times

Source: JUTPI 1 (2010) and RITJ

Taking the present situation into consideration and referring to the previous studies and original RITJ KPI, the KPI targets of urban transportation system development in JABODETABEK by objective are set by JUTPI 2 and listed in Table 77.

Table 77 KPI recommendation for detailed RITJ

Objective	Indicator	Target			
		2018	2024	2029	2035
Mode Share	Mode share in ERP area during ERP operation time	6%	30%	40%	50%
Efficiency	Average person travel time in public transport modes at peak hour	81’	60’	50’	45’
Availability	Coverage of BRT and rail-based public transport in Urbanized Area (%)	23%	23%	25%	40%
Convenience	Average number of transfers for public transport passenger	1.0	1.0	0.9	0.8
Safety	Number of fatalities	2,163	1,082 (-50%)	757 (-65%)	433 (-80%)
	Number of severe injuries	1,193	597 (-50%)	418 (-65%)	239 (-80%)
	Number of accidents	7,123	3,562 (-50%)	2,493 (-65%)	1,425 (-80%)
Environmental Betterment	CO_2 emission (kg/day/person)	0.95	0.90	0.85	0.80
	CO emission (kg/day/person)	1.10	1.00	0.80	0.70
	VOC(HC) emission (kg/day/person)	0.35	0.30	0.25	0.20
	NO_x emission (kg/day/person)	4.00×10^{-3}	3.50×10^{-3}	3.00×10^{-3}	2.50×10^{-3}
	PM10 emission (kg/day/person)	4.25×10^{-4}	4.00×10^{-4}	3.50×10^{-4}	3.00×10^{-4}

Source: JUTPI 2

- Mode share

  People’s movement using urban public transport should reach 50% of the total movements of people inside the ERP area during ERP operation. These movements are included in all motorized person trips on a normal business day.

- Efficiency

  The average person travel time in public transport vehicles is 45 minutes at peak hour from origin to destination. This time value is calculated from weighted average from the OD Matrix and Skim Matrix of travel time in the master plan case for all public transport in the morning peak (6:00-10:00) and evening peak (16:00-20:00) hours on a normal business day.

- Availability

  Coverage of BRT and rail-based public transport in the urbanized area should reach 40%. This value is calculated by dividing the population in the coverage area by the total population in the urbanized area. Urbanized area in this case is the area with more than or equal to 50 residents/ha. Coverage is defined as buffer area assumed for BRT (500m from the shelter) and rail-based public transport (1 km from the station).

- Convenience

  Average number of transfers for public transport passenger in a single trip is 0.8 times. This value is calculated from the weighted average from the OD Matrix and the skim matrix of the number of transfers (excluding walking) in the master plan case. Transfer in the same system with different line routes is also counted as transfer.

- Safety

  The number of traffic accidents, fatalities, and severe injuries should be reduced to 80% in 2035 compared to 2018.

- Environmental Betterment

  KPIs of transportation emissions of the major pollutants and greenhouse gases (kg/day/person) should be reduced. This emission value is calculated using the master plan case scenario and using Mobile 6 software. Input for this calculation is obtained from the demand forecast output in the master plan case.

10.2 Master Plan Cost

10.2.1 Assumptions

The costs for each proposed program in the Master Plan, which include the capital investment cost and operation and maintenance cost, are estimated under the following assumptions:

- All costs are estimated at the market prices in September 2019 in the JABODETABEK region.
- Exchange Rate: IDR/USD 14,181.97; IDR/JPY = 131.69 (as of September 2019).
- Construction costs are estimated based on unit costs, which are determined mainly based on the past construction costs in the study area collected by JUTPI 2. In the case of MRT construction, the estimated unit costs are based on the Japanese unit price.

- Land acquisition cost is not included in the total cost. Total cost of each program is only the accumulation of investment cost and operation and maintenance (O&M) cost.
- Project cost is assumed to be 1.5 times of construction cost. Whereas, annual operation and maintenance cost up to the year of 2075 is assumed to be 7% of the project cost and price escalation is not included in the estimation.

10.2.2 Cost Estimation

Table 78 summarizes the estimated investment cost by sectors. The total cost of all projects in all sectors is IDR 1,734.60 trillion (excluding land acquisition cost and price escalation cost). To answer the huge travel demand in the future, it is desirable to develop a rail-based transportation system. However, the highest cost is required for railway system development, which accounted for 71% of the total estimated cost or IDR 1,234.98 trillion. Meanwhile, the last three sectors, namely, Financial Arrangement, Institutional Setup & Reform, and Environment Betterment, do not have preliminary cost estimate because they are assumed to be part of the policy-making process in the future.

Table 78 Estimated Investment Cost by Sectors

No	Sector	Program	Qty	Unit	Preliminary Cost (Bil.IDR)	Total Preliminary Cost (Bil.IDR)
1	Road Network Development	New Construction/Program: Toll Road	513	km	53,726.70	88,886.88
		New Construction/Program: Arterial Road	265	km	15,921.00	
		Improvement Program: Arterial Road	223	km	2,633.30	
		New Construction/Program: Collector Road	287	km	8,611.50	
		Improvement Program: Collector Road	677	km	7,994.37	
2	Railway System Development	New Construction/Program: Railway	303	km	108,432.11	121,032.11
		Improvement Program: Railway	120	km	3,360.00	
		New Construction/Program: Railway Station Type A	31	locations	2,325.00	
		New Construction/Program: Railway Station Type B	9	locations	360.00	
		New Construction/Program: Railway Station Type C	437	locations	6,555.00	
3	Improvement of Traffic Control System and	Electronic Road Pricing (Including parking system)	1	units	2,000.00	2,000.00

No	Sector	Program	Qty	Unit	Preliminary Cost (Bil.IDR)	Total Preliminary Cost (Bil.IDR)
	Demand Management					
4	Improvement of Transportation Safety and Security	Pedestrian Lighting	30676	units	98.16	12,230.77
		Pedestrian	1824	units	11,854.05	
		Traffic light	767	units	268.42	
		Pedestrian signage	1534	units	1.07	
		Road and Pedestrian Design	2	units	6.00	
		Zebra Crossing	1534	units	3.07	
5	Bus Transportation System and Intermodal Facility Development	Existing BRT reorganization	4	units	4.00	4,015.58
		Feeder Bus Rationalization	1534	km	230.10	
		New Construction/Program: Passenger Terminal A	7	locations	980.00	
		Improvement Program: Passenger Terminal A	2	locations	80.00	
		New Construction/Program: Passenger Terminal B	11	locations	1,100.00	
		Improvement Program: Passenger Terminal B	4	locations	108.00	
		New Construction/Program: Passenger Terminal C	18	locations	1,080.00	
		Improvement Program: Passenger Terminal C	6	locations	96.00	
		New Shelter Development Program	1534	locations	337.48	
6	Measures in Urban Planning	Parking building facility	477	locations	2,385.00	387,385.00
		TOD	11	locations	385,000.00	
7	Freight Transportation System	Freight Terminal	6	locations	5,100.00	5,100.00
8	Financial Arrangement	Re-arrangement of revenue sharing among different levels of governments (Central Govt., Provincial Govt., and Local Govt.)	N/A			
		Introduction of Road Fund				
		Expand tax base				
		Reduction of fuel subsidy and gradual increase of fuel tax				
9	Institutional Setup & Reform	Integrated Training Program on Transportation Planning for Local Government Officers	N/A			
		Integrated Management of Public Transportation Operators				

No	Sector	Program	Qty	Unit	Preliminary Cost (Bil.IDR)	Total Preliminary Cost (Bil.IDR)
10	Environment Betterment	Promotion of Low Sulfur Diesel	N/A			
		Promotion of Bio-Fuel				
Total Cost (All programs excluding MRT & LRT)					**620,650.34**	**620,650.34**
Total Cost					**1,734,600.29**	**1,734,600.29**

Source: JUTPI 2

Table 79 Estimated Investment Cost Share by Sectors

No	Sectors	Investment Cost (Bil.IDR)	Share
1	Road Network Development	88,886.88	5.12%
2	Railway System Development	1,234,982.06	71.20%
3	Improvement of Traffic Control System and Demand Management	2,000.00	0.12%
4	Improvement of Transportation Safety and Security	12,230.77	0.71%
5	Bus Transportation System and Intermodal Facility Development	4,015.58	0.23%
6	Measures in Urban Planning	387,385.00	22.33%
7	Freight Transportation System	5,100.00	0.29%
8	Financial Arrangement	N/A	
9	Institutional Setup & Reform	N/A	
10	Environment Betterment	N/A	
	Total	**1,734,600.29**	**100.00%**

Source: JUTPI 2

In addition to investment cost, the annual operation & maintenance (O&M) cost will be accumulated as the total cost. The yearly cost of O&M of each program is assumed to be 7% of the total project cost without price escalation.

For the purpose of economic and financial analysis, these programs will have an evaluation period for over 35 years (up to 2075). Table 80 shows the estimated total cost, which includes both investment and O&M cost up to the year of 2075. Table 80 summarizes the total cost of investment and O&M, which amounts to IDR 1,734.60 trillion and IDR 5,267.19 trillion, respectively.

Table 80 Estimated Investment Cost and Operation & Maintenance (O&M) Cost up to the Year of 2075 by Sectors

No	Sector	Program	Preliminary Investment Cost (Bil.IDR)		Preliminary O&M Cost (Bil.IDR) (*up to 2075)		Preliminary Total Cost (Bil.IDR)	
1	Road Network Development	New Construction/Program: Toll Road	53,726.70	88,886.88	183,672.85	292,652.37	237,399.55	381,539.25
		New Construction/Program: Arterial Road	15,921.00		48,167.78		64,088.78	
		Improvement Program: Arterial Road	2,633.30		9,019.00		11,652.30	
		New Construction/Program: Collector Road	8,611.50		25,856.61		34,468.11	
		Improvement Program: Collector Road	7,994.37		25,936.13		33,930.51	
2	Railway System Development	New Construction/Program: Railway	108,432.11	121,032.11	365,209.91	400,489.91	473,642.02	521,522.02
		Improvement Program: Railway	3,360.00		9,408.00		12,768.00	
		New Construction/Program: Railway Station Type A	2,325.00		6,510.00		8,835.00	
		New Construction/Program: Railway Station Type B	360.00		1,008.00		1,368.00	
		New Construction/Program: Railway Station Type C	6,555.00		18,354.00		24,909.00	
3	Improvement of Traffic Control System and Demand Management	Electronic Road Pricing (Including parking system)	2,000.00	2,000.00	7,140.00	7,140.00	9,140.00	9,140.00
4	Improvement of Transportation Safety and Security	Pedestrian Lighting	98.16	12,230.77	274.86	34,250.78	373.02	46,481.55
		Pedestrian	11,854.05		33,191.34		45,045.39	
		Traffic light	268.42		751.56		1,019.98	
		Pedestrian signage	1.07		3.01		4.08	
		Road and Pedestrian Design	6.00		21.42		27.42	
		Zebra Crossing	3.07		8.59		11.66	
5	Bus Transportation System and Intermodal Facility Development	Existing BRT reorganization	4.00	4,015.58	11.20	12,390.92	15.20	16,406.50
		Feeder Bus Rationalization	230.10		644.28		874.38	
		New Construction/Program: Passenger Terminal A	980.00		3,155.60		4,135.60	

No	Sector	Program	Preliminary Investment Cost (Bil.IDR)		Preliminary O&M Cost (Bil.IDR) (*up to 2075)		Preliminary Total Cost (Bil.IDR)	
		Improvement Program: Passenger Terminal A	80.00		285.60		365.60	
		New Construction/Program: Passenger Terminal B	1,100.00		3,416.00		4,516.00	
		Improvement Program: Passenger Terminal B	108.00		351.54		459.54	
		New Construction/Program: Passenger Terminal C	1,080.00		3,259.20		4,339.20	
		Improvement Program: Passenger Terminal C	96.00		322.56		418.56	
		New Shelter Development Program	337.48		944.94		1,282.42	
6	Measures in Urban Planning	Parking building facility	2,385.00	387,385.00	6,678.00	1,084,678.00	9,063.00	1,472,063.00
		TOD	385,000.00		1,078,000.00		1,463,000.00	
7	Freight Transportation System	Freight Terminal	5,100.00	5,100.00	14,280.00	14,280.00	19,380.00	19,380.00
8	Financial Arrangement	Re-arrangement of revenue sharing among different levels of governments (Central Govt., Provincial Govt., and Local Govt.)	N/A					
		Introduction of Road Fund						
		Expand tax base						
		Reduction of fuel subsidy and gradual increase of fuel tax						
9	Institutional Setup & Reform	Integrated Training Program on Transportation Planning for Local Government Officers	N/A					
		Integrated Management of Public Transportation Operators						
10	Environment Betterment	Promotion of Low Sulfur Diesel	N/A					
		Promotion of Bio-Fuel						
Total Cost (All programs excluding MRT & LRT)			620,650.34		1,845,881.98		2,466,532.32	
Total Cost			1,734,600.29		5,267,196.70		7,001,796.98	

Source: JUTPI 2

10.3 Economic and Financial Analysis

Economic and financial analyses are two types of benefit-cost (B/C) analysis that are commonly used to evaluate feasibility of an investment project. Economic analysis aims to figure the national benefit that government needs to seek even in the case of low financial profitability. Financial analysis, on the other hand, is directed for profit (return) expected by the investors from their investment project.

10.3.1 Economic Analysis

Economic analysis is made by estimating economic benefit or in other words, difference (saving) of costs between two conditions which are commonly called as “With Project” and “Without Project”. Methodologies for project analysis can be distinguished as discounted cash flow (DCF), benefit-cost ratio (B/C), financial or economic internal rate of return (FIRR/EIRR), and net present value (NPV).

DCF is a valuation of method used to estimate the value of an investment based on its future cash flow which aimed at estimating the money received from an investment adjusted for the time value of money. In economic analysis, DCF attempts to calculate the value of project in the present based on the projection of money that will be generated in the future. NPV is the value of all future cash flows over the entire life of an investment discounted to the present, aimed at analyzing the profitability of a project or investment. It shows the difference between the present value of cash inflows and the present value of cash outflows over a period of time and used for capital budgeting and investment planning to analyze the profitability of a project.

Economic internal rate of return (EIRR) is an indicator to assess the economic viability of project or investment by comparing “with-project” and “without-project” scenarios. It is a social discount rate that reflects the social marginal rate of time preference. Financial Rate of Return (FIRR) is an indicator to measure the financial return on investment of an income generation project by calculating the present value of investment costs (as cash out-flows) and the present value of net incomes (as cash in-flows). EIRR is referred to as social discount rate that reflects the social rate of time preference and carried out by public sector. Meanwhile, FIRR is conducted by private sector and incorporated both tax and subsidies.

In this case of evaluation, “With Project” is a condition where all the proposed projects in JUTPI 2 Master Plan are developed (excluding TOD development and land acquisition), while “Without Project” is a condition where the project is omitted so that there would be no economic impact from its development.

There are two types of benefits in the case of an MRT Project, namely:

1) Direct Benefit
    a. Savings in Travel Time Cost (TTC) and Vehicle Operating Cost (VOC)
    b. (time saving by using MRT & congestion relief)
    c. Savings in capital and operational expenses
    d. Reduction of traffic accident
    e. Reduction of pollution (Environment)
2) Indirect Benefit
    a. Land productivity improvement
    b. Railway-related business
    c. Contribution to station influence area (TOD)
    d. Contribution to the sightseeing and landscape (TOD)
    e. Creation of additional short-term employment in the construction period

The estimation and analysis made in this report consider direct benefit from saving in TTC (both private vehicle and public transport) and VOC only.

(1) Saving in Travel Time Cost

Saving in travel time cost is calculated based on network assignment result, such as daily vehicle-hours (for private vehicle) and passenger-hours (public transport), multiplied by the travel time value or value of time (VOT) for each type of vehicle and expansion factor of operation days in a year (from one day to one year). Since economic analysis considers all economic aspect of whole JABODETABEK, estimation of VOT using only household income may be inadequate. Therefore, VOT for economic analysis (except for truck) is estimated using GRDP of JABODETABEK.

This method starts by categorizing income into several income classes and calculate nominal GRDP per capita for each income class. To calculate nominal GRDP per capita for each income class, first, the total income-persons are calculated using JUTPI 2 database that has been expanded to the population of JABODETABEK. The income-persons of expanded database are then adjusted with adjustment factor, 1.000005, in order to bridge the gap between the total income and GRDP of JABODETABEK residents. This adjusted income-person then divided by the population (number of person) for each income classes and by the average working hours per month, which is 160 hours. Then, tour data from JUTPI 2 database is utilized to identify the mode used (private car, motorcycle, and public transport) by income classes.

Table 81 Value of Time for Economic Analysis

Type of Vehicle	Occupancy Rate	Passenger Time Value (IDR./hr)	Time value of Each Vehicle Unit (IDR./hr)
Passenger Car	1.6	52,478	85,500
Motorcycle	1.4	31,692	43,100
Public Transport: - Small, medium, large Bus (including TransJakarta and its feeder) - MRT - Train (including Commuterline, LRT, AGT)	-	35,292	-
Truck*	-	-	103,100

Note: *Time value of truck refers to VOT of large truck (see Annex 06: Travel Demand Forecast Report)
Source: JUTPI 2

(2) Saving in Vehicle Operating Cost

Saving in vehicle operating cost is calculated based on network assignment result, such as daily vehicle-km travelled of private vehicle and multiplied by the VOC for each type of vehicle by speed and expansion factor of operation days in a year (from one day to one year). Vehicle operating cost by speed is explained in Annex 06: Travel Demand Forecast Report.

(3) Result

Utilizing the detail of JUTPI 2 Master Plan cost including investment, operation and maintenance (O&M) costs as mentioned in Chapter 10.2, the result of each case is shown in Table 82.

Table 82 Economic Analysis Result

Cases	EIRR (%)	NPV (mill. IDR)	B/C
JUTPI 2 Master Plan (MP)	90.9	2,073,295,891	5.44
MRT02	11.9	33,481,136	1.42
MRT03	12.7	19,803,742	1.65
MRT04	11.3	6,953,156	1.21
MRT05	12.2	29,260,939	1.53
MRT06	16.3	27,332,587	2.30
MRT07	24.1	31,229,050	4.84
MRT08	15.5	101,431,291	3.75
MRT09	11.0	6,435,009	1.16
MRT10	10.7	4,409,557	1.11

Note (Assumption):

- Total cost excludes TOD implementation cost and land acquisition
- Evaluation Period: over 35 years (2075)
- Discount Rate: 10%
- Operation time: 16 hours/day
- Operation day: 250 days/year (private); 363 days/year* (public)
- (*expansion of benefit from day to year: based on result from ADS MEILI)
- Exchange Rate: USD to IDR 14,181.97; JPY to IDR: 131.69 (as of September 2019)

Source: JUTPI 2

From this result that is shown in Table 82, all proposed MRT project in JUTPI 2 are economically viable with EIRR above 10% and range of B/C from 1.1 to 5.44. This result is surely can be refined by adding other factors as mentioned in the beginning of this section.

10.3.2 Financial Analysis

Financial analysis, also usually mentioned as profitability analysis, is made by calculating the profit (return) from investment of the project.

In this report, financial analysis made by calculating the investment, operations and maintenance (O&M) costs mentioned in Chapter 10.2 as an outflow, and revenue from public transport, revenue from ERP implementation for car and motorcycle as an inflow.

Revenue from public transport is obtained from the network assignment results for 2024, 2029, and 2035, and is estimated as IDR 112,596 million, 132,575 million, and 163,287 million per day, respectively. By using assumptions of 2% annual traffic growth and 365 operation days a year for public transport, revenue from public transport fare per year is obtained.

On the other hand, for revenue from ERP implementation for car and motorcycle, it is calculated by total vehicle-trip in the planned ERP area during the operation hours and fare (see Annex 06: Travel Demand Forecast Report). Revenue from ERP implementation per year is calculated by using assumptions of 2% annual traffic growth and 250 ERP operation days a year for private vehicle (car and motorcycle).

The result of financial analysis is shown in Table 83 :

Table 83 Financial Analysis Result

Cases	FIRR (%)	NPV (mill. IDR)	B/C
JUTPI 2 Master Plan (MP)	18.6	600,366,439	1.53

Note (Assumption):
- Total cost excludes TOD implementation cost and land acquisition
- Evaluation Period: over 35 years (2075)
- Annual Traffic Growth: 2%
- Operation time: 16 hours/day
- Operation day: 250 days/year (private); 365 days/year* (public)
  *(*expansion of benefit from day to year: based on result from ADS MEILI)*
- Exchange Rate: USD to IDR 14,181.97; JPY to IDR: 131.69 (as of September 2019)

Source: JUTPI 2

From the result that is shown in Table 83Table 83, projects in JUTPI 2Master Plan are financially viable with 18.6% of FIRR and 1.53 of B/C. This result is surely can be refined by adding other factors as mentioned in the beginning of this section.

10.4 Emission Analysis

10.4.1 Methodology

The emission model is calculated using vehicle emission modeling software that was issued by the Environmental Protection Agency (EPA) of the United States. Estimated emission rates for each pollutant are in terms of grams per mile, i.e. grams emitted per vehicle mile traveled (VMT). Total emission is then acquired by multiplying emission rates by total VMT for each vehicle type. The emission factors in the vehicle emission modeling software are based upon assumptions about how different factors affect vehicle emission.

VMT acquired from the transportation network assignment was processed to create an input to the vehicle emission modeling software for emission estimates. Some of the emission control measures have been adopted in Indonesia and specifically JABODETABEK. Indonesia had applied EURO2 since 2005, EURO3 since 2013 (motorcycle only), and EURO4 since September 2018 for heavy passenger and freight vehicles, and these are already taken into consideration in the model. EURO6 is also planned to be applied in 2023 but it is not applied in the model. In order to make vehicle emission modeling software suitable for use in JABODETABEK, emission regulation and control measures have been disabled.

Input files for vehicle emission modeling software including road type, predefined speed range and the number of engine starts per day which also can be obtained from transportation network output. Vehicle types are classified by six vehicle types: passenger car, motorcycle, pick-up, small truck, medium truck, large truck and transit, and urban bus. There is an exception that the bus that uses CNG (Compressed Natural Gas) is not included in the model.

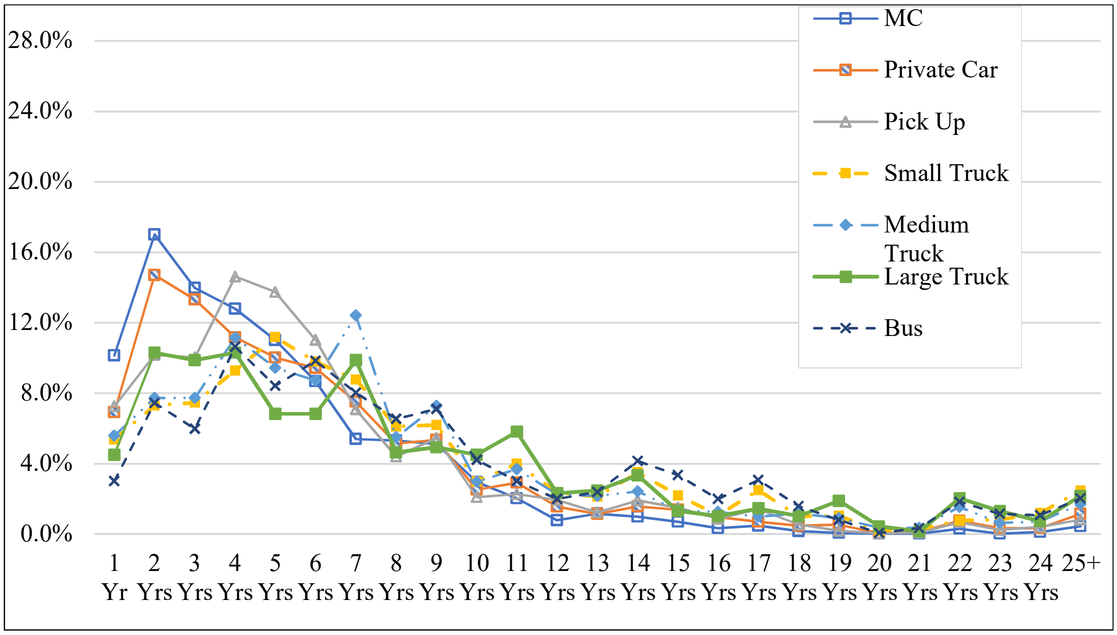
Table 84 Vehicle Classification

	Passenger Car	Motorcycle	Pick-up	Small Truck	Medium Truck	Large Truck	Transit & Urban Bus
GVWR (lbs)	-	-	3,750	10,000	33,000	60,000	-
Fuel Type	Gasoline	Gasoline	Gasoline	Diesel	Diesel	Diesel	Diesel
Vehicle Emission Modeling Software Classification	LDGV	MC	LDGT2	HDGV2B	HDGV7	HDGV8A	HDDBT

Source: JUTPI 2

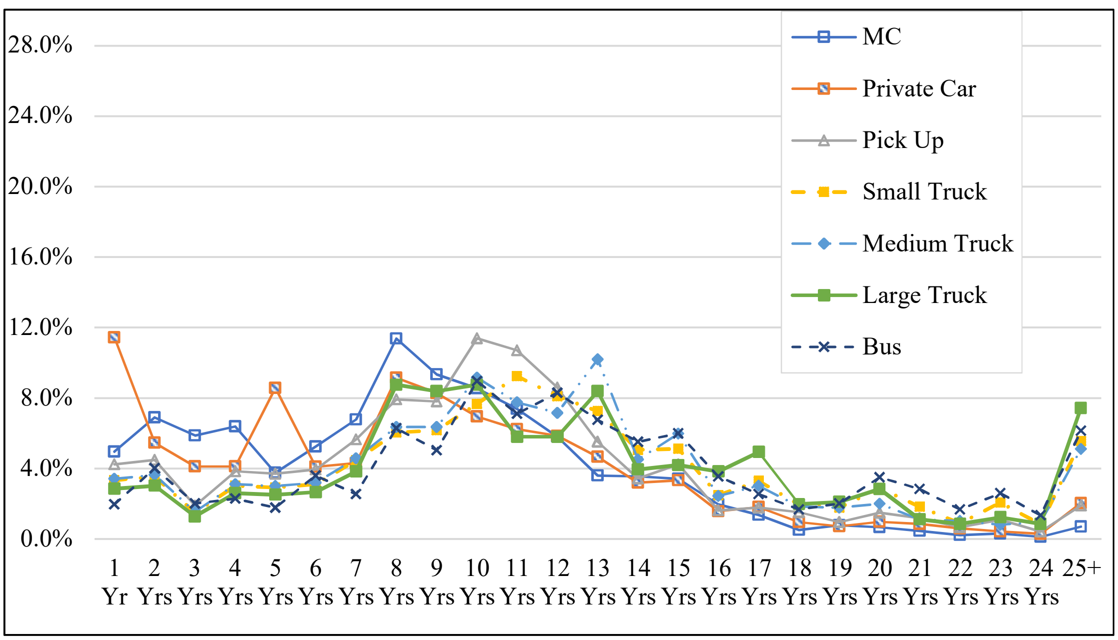
Some assumptions are also used in the model based on the latest data such as fuel parameters (% sulfur, % oxygenates, Reid Vapor Pressure, etc.) and meteorological assumption (humidity, minimum and maximum temperature).

Vehicle registration distribution by age in target year (up to 25 years) is also an important input to vehicle emission modeling software. The vehicle registration data for year 2018 is collected from National Traffic Police and the vehicle age distribution is from JUTPI 2 Cordon Line Survey data. Future vehicle registration distribution by age is forecasted using the time series data of vehicle registration by type from National Traffic Police from 2010 until 2018. Using this historical time series data, the number of vehicle registrations by type for the targeted year was forecasted through extrapolation from the time series data. Figure 299 to Figure 302 below show vehicle registration distribution by vehicle age for years 2018, 2024, 2029, and 2035.



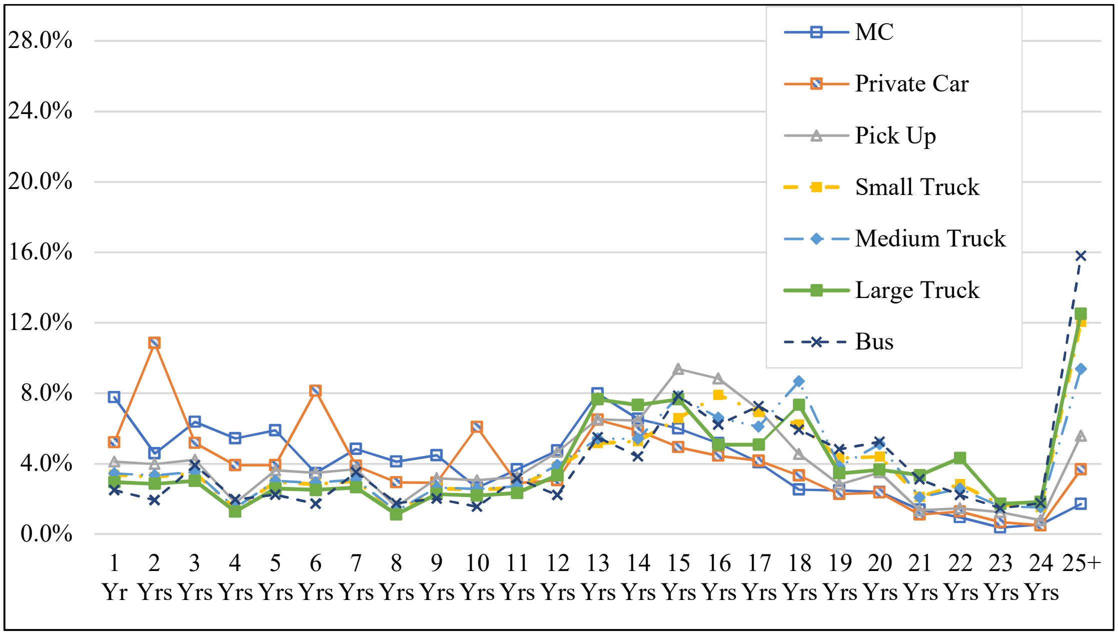
Source: JUTPI 2

Figure 299 Vehicle Registration Distribution by Age in 2018



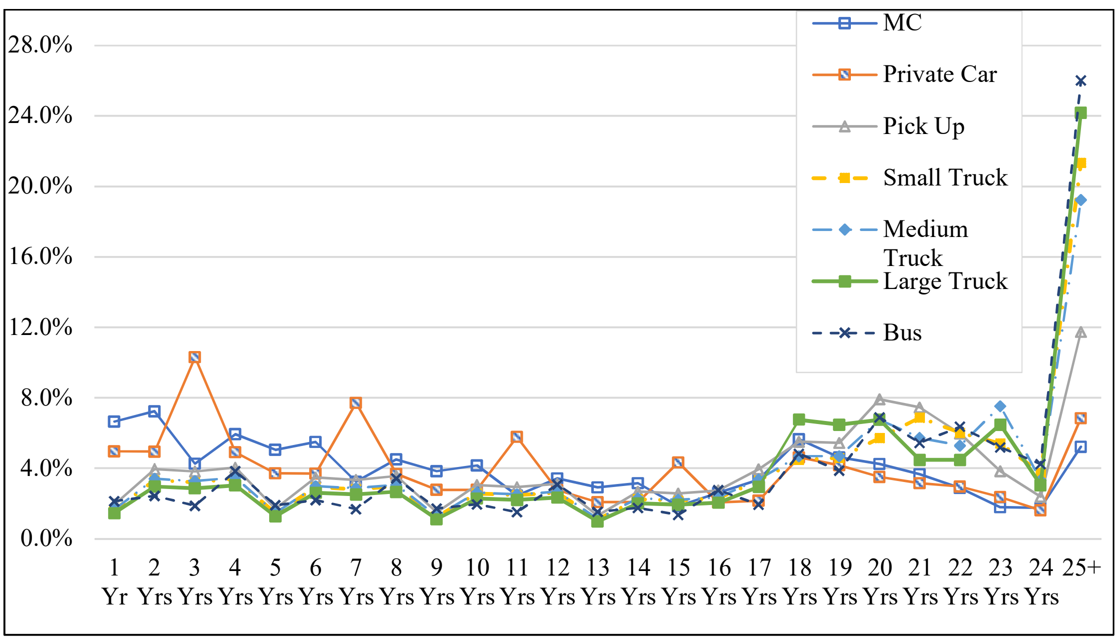
Source: JUTPI 2

Figure 300 Vehicle Registration Distribution by Age in 2024



Source: JUTPI 2

Figure 301 Vehicle Registration Distribution by Age in 2029



Source: JUTPI 2

Figure 302 Vehicle Registration Distribution by Age in 2035

Emission analysis was calculated for two scenarios; the first scenario is the Master Plan case and the second is the Do-Minimum case. Master plan case is a scenario following all the proposed master plan by JUTPI 2 for each target year. Do-Minimum case is a scenario which only includes all the ongoing toll road projects and rail-based public transport (including MRT N-S and LRT 01, 04, 05, 07) projects that are under construction as of 2018.

As mentioned earlier vehicle mile traveled (VMT) is a key input for vehicle emission modeling software simulation. Since Indonesia is using the metric system or standard international unit, VMT is converted to vehicle kilometer traveled. The table below shows vehicle kilometer traveled for each target year by vehicle type based on two scenarios.

Table 85 Vehicle-Kilometers Traveled by Vehicle Type

Vehicle Type	Master Plan Case				Do-Minimum Case		
	Y2018	Y2024	Y2029	Y2035	Y2024	Y2029	Y2035
Car	166,027	159,571	150,192	155,330	162,007	151,012	162,863
Pick Up	10,844	12,861	16,123	20,885	11,609	14,577	18,873
Small Truck	7,905	7,825	9,827	12,724	7,773	9,744	12,642
Medium Truck	2,085	3,938	4,936	6,416	3,907	4,901	6,358
Large Truck	2,302	3,775	4,758	6,142	3,791	4,775	6,180
Motorcycle	399,264	475,131	447,137	414,169	583,613	535,194	588,714
Bus	9,776	9,840	7,950	7,340	9,840	7,950	9,840

Source: JUTPI 2

10.4.2 Emission Model Result

There are eight inputs to be processed (two scenarios and four target years for each) for five types of pollutants. Each input was processed separately in the software and each input produces one output value. The table below shows all the output values that are compiled into one table.

Table 86 Composite Emission Factors

Pollutant/ Vehicle Type	Master Plan Case				Do-Minimum Case		
	Y2018	Y2024	Y2029	Y2035	Y2024	Y2029	Y2035
PM10							
Car	0.017	0.016	0.015	0.015	0.019	0.015	0.015
Pick Up	0.017	0.016	0.015	0.015	0.019	0.015	0.015
Small Truck	0.052	0.022	0.025	0.019	0.034	0.025	0.019
Medium Truck	0.054	0.025	0.027	0.023	0.038	0.027	0.023
Large Truck	0.069	0.042	0.044	0.039	0.054	0.044	0.039
Motorcycle	0.023	0.023	0.023	0.023	0.024	0.023	0.023
Bus	0.298	0.087	0.044	0.041	0.070	0.044	0.041
VOC							
Car	3.951	1.596	3.053	12.802	1.705	2.930	4.550

Pollutant/ Vehicle Type	Master Plan Case				Do-Minimum Case		
	Y2018	Y2024	Y2029	Y2035	Y2024	Y2029	Y2035
Pick Up	4.162	0.930	1.266	1.562	1.068	1.514	1.745
Small Truck	10.786	3.299	3.528	2.883	3.354	4.715	3.165
Medium Truck	14.589	2.441	2.707	2.422	2.492	3.578	2.624
Large Truck	10.839	2.151	2.110	2.010	2.019	2.745	1.942
Motorcycle	5.443	8.556	11.253	4.977	6.282	9.675	10.458
Bus	0.696	0.264	0.268	0.276	0.268	0.265	0.273
CO							
Car	16.454	18.386	18.281	48.156	29.186	16.479	13.726
Pick Up	25.725	12.657	8.507	5.120	19.548	10.091	5.599
Small Truck	8.401	5.027	4.648	4.312	8.500	4.437	4.424
Medium Truck	12.222	7.021	6.444	6.276	12.092	6.102	6.419
Large Truck	13.229	7.593	6.984	6.829	12.850	6.723	7.090
Motorcycle	19.200	38.090	39.420	28.900	31.429	34.362	34.374
Bus	7.679	0.490	0.626	0.449	0.499	0.618	0.444
NOx							
Car	1.681	0.083	0.060	0.100	0.132	0.057	0.041
Pick Up	2.348	0.081	0.060	0.044	0.108	0.064	0.043
Small Truck	2.229	0.214	0.151	0.080	0.293	0.150	0.079
Medium Truck	2.848	0.257	0.185	0.124	0.332	0.183	0.122
Large Truck	3.051	0.368	0.235	0.132	0.452	0.233	0.131
Motorcycle	1.808	2.169	2.461	0.882	1.268	1.734	1.653
Bus	12.057	0.736	0.899	0.560	0.739	0.900	0.561
CO_2							
Car	176.66	168.08	206.36	167.46	211.64	207.60	210.02
Pick Up	391.09	393.95	286.33	290.93	281.67	283.59	289.81
Small Truck	537.49	537.36	537.42	537.49	537.24	537.18	537.61
Medium Truck	729.37	729.49	729.12	729.12	729.68	729.30	729.18
Large Truck	1549.95	1549.70	768.20	768.33	768.33	768.01	768.26
Motorcycle	33.31	20.63	65.49	85.50	82.33	75.81	76.55
Bus	2242.22	2237.87	1448.91	1449.10	1449.04	1448.91	1449.10

Unit: gram/km
Source: JUTPI 2

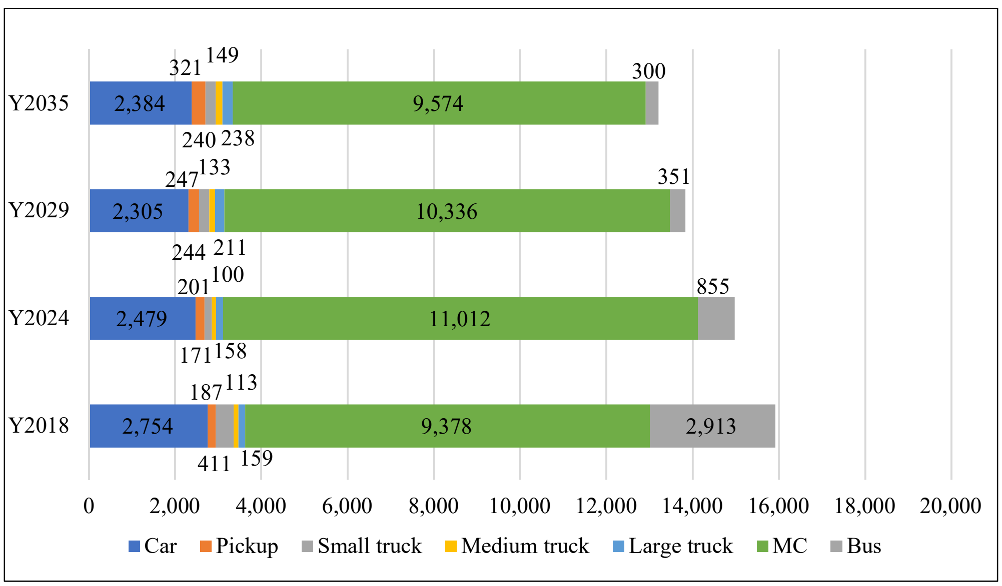
From each result, it can be concluded that without any development of more transit lines, the quality of air in the final target year will be worsened because of the emission from transportation mode. The latest technology can be applied to vehicles to reduce or minimize the emission effect, but, because of a large number of private vehicles including motorcycles that will be still operational, there will not be be significant impact.

In some target year for some mode, the Do-Minimum case gives a better result than the Master Plan case because of the enactment of Transportation Demand Management such as Electronic Road Pricing together with truck and motorcycle bans. Consequently, vehicle speed is higher for the Master Plan case in the morning and evening peak hours compared to the Do-Minimum Case especially in the arterial roads. This increases the emission rates as a result of higher engine combustion and heavier usage of other parts such as brake pad and tire. In addition, the motorcycle ban along the MRT corridor makes motorcycles detour to another further route.

Carbon oxide (CO) emission rates for some modes especially large truck is increasing in the intermediate year 2024 for the Master Plan case because the traffic volume of large trucks traveling JABODETABEK is larger due to the development of new toll roads compared to the Do-Minimum case. Eventually, however, for the final target year 2035, the emission rates in the master Plan case are much better than those in the Do-Minimum case.

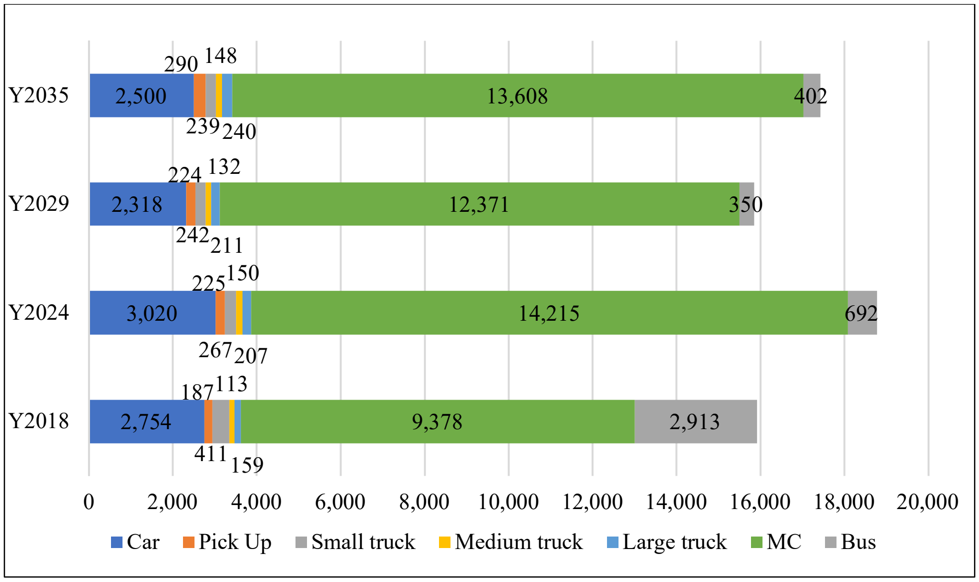
(1) Particulate Matter

Reduction in PM-10 is achieved greatly because of the use of more environment-friendly materials for tire and brake pad, and some improvement in fuel composition of gasoline or diesel. PT TransJakarta had applied a CNG-based fuel source for some of its bus fleet and plan to use electric buses in the future. On the other hand, the emission volume of PM-10 from motorcycles becomes larger due to the increasing volume of motorcycles year by year. Compared with the Do-Minimum case, the Master Plan case is bringing more improvement in the emission condition.



Unit: kg/day
Source: JUTPI 2

Figure 303 PM-10 Emission by Target Year (Master Plan Case)

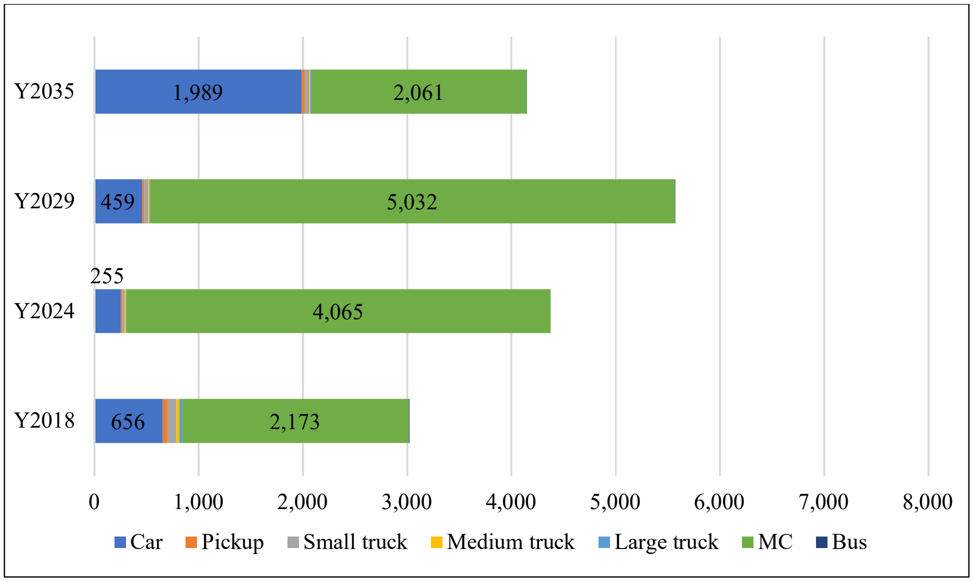


Unit: kg/day
Source: JUTPI 2

Figure 304 PM-10 Emission by Target Year (Do-Minimum Case)

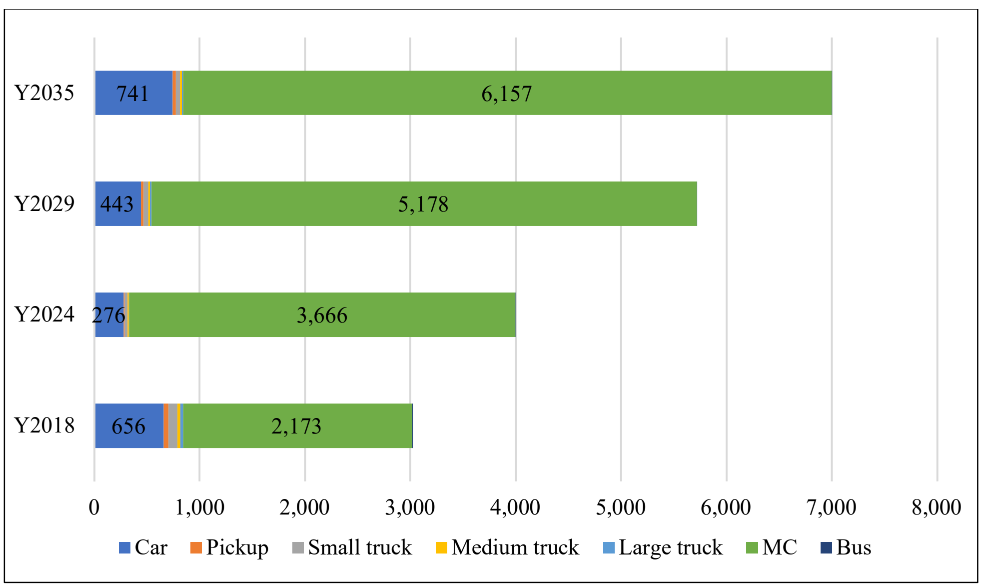
(2) Hydrocarbon

Hydrocarbon emission only included the Volatile Organic Compound (VOC) in the emission estimate, which is shown in Figure 305 and Figure 306. Gasoline based motorcycles and passenger car are the biggest contributors for the VOC emission due to the increasing number of motorcycles and cars year by year. There are several factors that significantly reduce the VOC emission in 2035. First is the establishment of public transportation plan in year 2035 which will make many private motorcycle users switch to public transport though it will not affect car users. Second is the improvement of gasoline composition and vehicle engine that will drastically minimize incomplete combustion of hydrocarbons in the engine.



Unit: kg/day
Source: JUTPI 2

Figure 305 VOC Emission by Target Year (Master Plan Case)

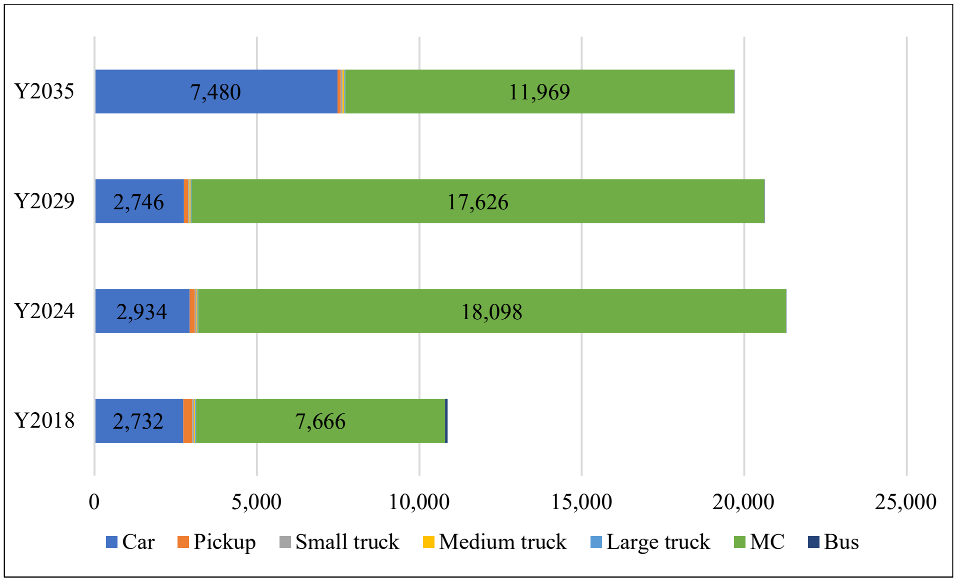


Unit: kg/day
Source: JUTPI 2

Figure 306 VOC Emission by Target Year (Do-Minimum Case)

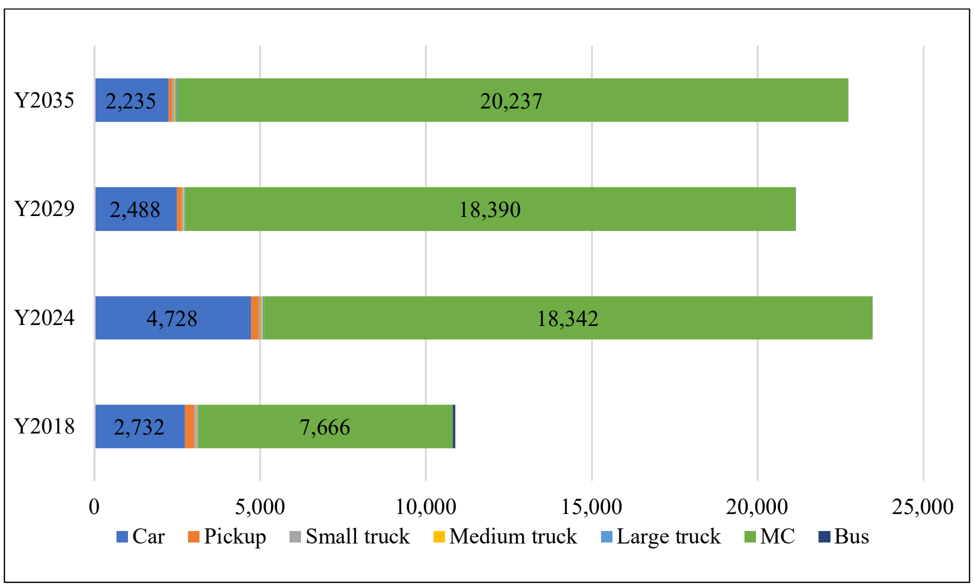
(3) Carbon Monoxide

The trend of emission volume of CO is similar to that of VOC as shown in Figure 307 and Figure 308. In the intermediate years, the emission volume of CO decreased quite significantly because of the fuel regulation that applies in that period. In the year 2035, the volume of car increases that correlate with a large volume of CO emission from cars in the year 2035. For motorcycle, there is a volume reduction of CO emission because of the fully applied motorcycle ban in the corridor along the MRT lines.



Unit: kg/day
Source: JUTPI 2

Figure 307 CO Emission by Target Year (Master Plan Case)

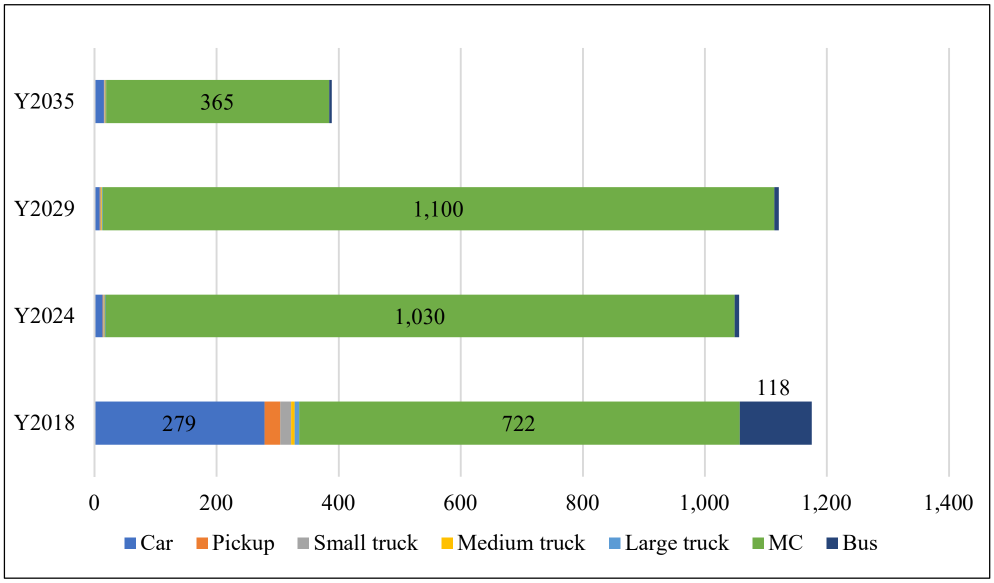


Unit: kg/day
Source: JUTPI 2

Figure 308 CO Emission by Target Year (Do-Minimum Case)

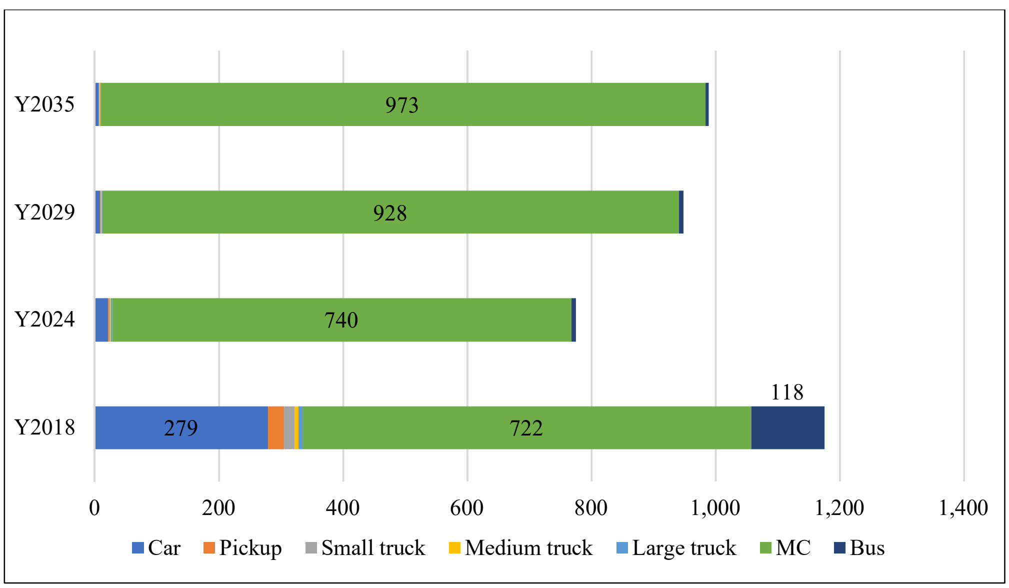
(4) Nitrogen Oxides

In year 2021, the sulfur content in gasoline to be restricted to 500 ppm and along with several TDM measures will have a significant impact on the emission of nitrogen oxides as shown in Figure 309. While many modern motorcycles are currently fuel-injected and equipped with catalytic converters and charcoal canisters to control emissions, motorcycles will still be the largest contributor to the emission of nitrogen oxides.



Unit: kg/day
Source: JUTPI 2

Figure 309 NO_X Emission by Target Year (Master Plan Case)

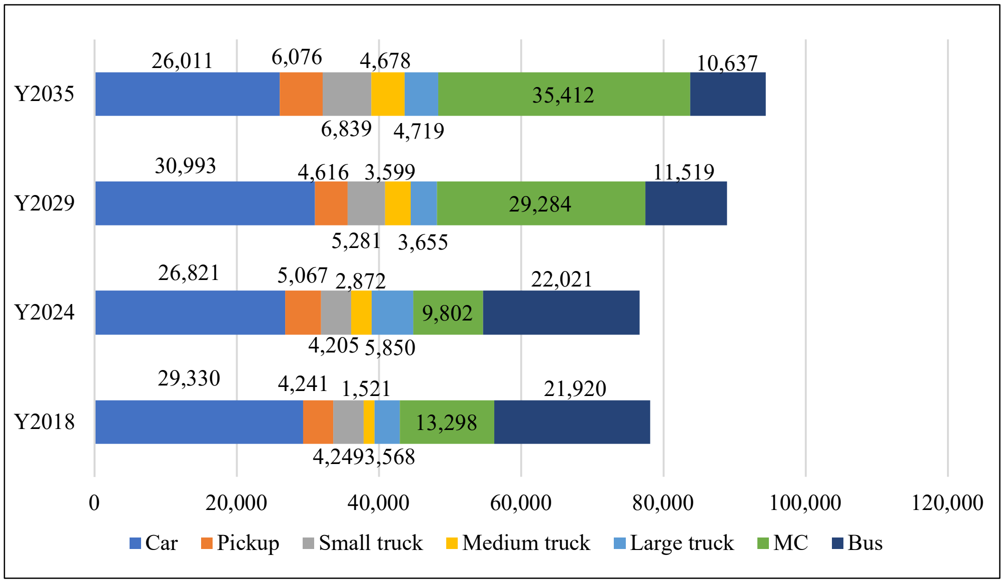


Unit: kg/day
Source: JUTPI 2

Figure 310 NO_X Emission by Target Year (Do-Minimum Case)

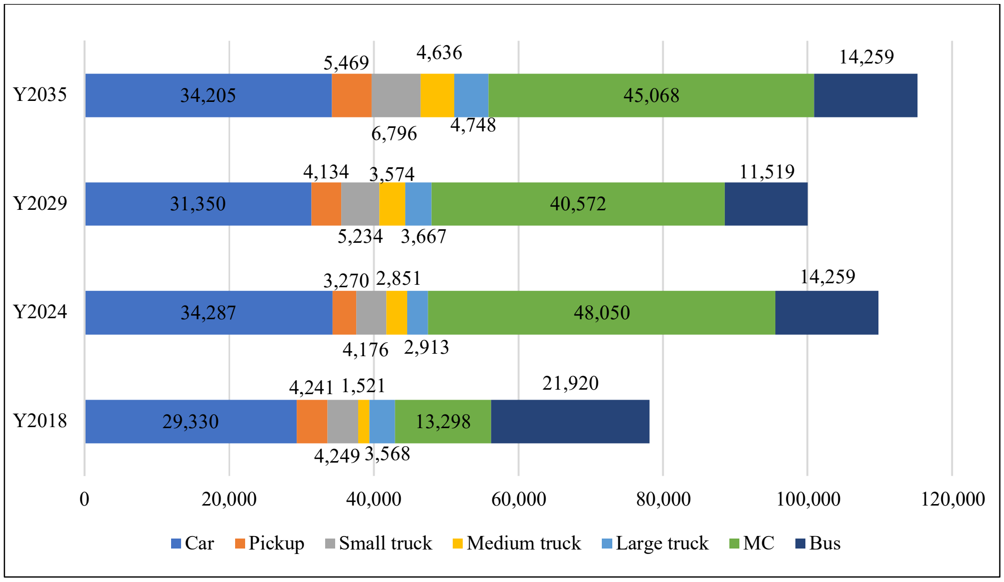
(5) Carbon Dioxide

CO_2 or one of the greenhouse gasses is contributing to global warming and become one of the main concerns of air pollution. Car, motorcycle, and bus are the three highest contributors as shown in Figure 311. Even in the Do-Minimum case, the volume of CO_2 emission is higher than the Master Plan case with a car, motorcycle, and bus are still the largest contributors. President of Indonesia had signed Presidential Decree No. 55 the Year 2019 about Program Acceleration of Battery Electric Vehicle for Road Transport. This regulation purpose is to help the government to regulate fossil fuel-based vehicles in the future.



Unit: kg/day
Source: JUTPI 2

Figure 311 CO_2 Emission by Target Year (Master Plan Case)



Unit: kg/day
Source: JUTPI 2

Figure 312 CO_2 Emission by Target Year (Do-Minimum Case)

Chapter 11 TOWARDS IMPLEMENTATION OF THE MASTER PLAN

11.1 Financial Arrangement

One of the subjects to the Indonesia's socioeconomic development is the lack of supporting infrastructure development. When the infrastructure is weak, it will imply that the economy runs in a highly inefficient manner with high logistics cost, lack of business competitiveness due to the high cost of doing business as well as social inequity due to the insufficient access in some part of the regions.

The main problem of the slow infrastructure development is the financing capability resulting from the shortage of infrastructure development fund from the government, lack of alternative funding sources, poor quality of project preparation, and poor inter-institutional coordination. Therefore, other funding sources to finance infrastructure development need to be considered.

To overcome these problems, the Central Government has systematically implemented a series of initiatives to provide comprehensive government support schemes in the last decade by introducing regulatory and financial instruments for private sector participation to finance the infrastructure development.

11.1.1 Infrastructure Development and Funding Gap

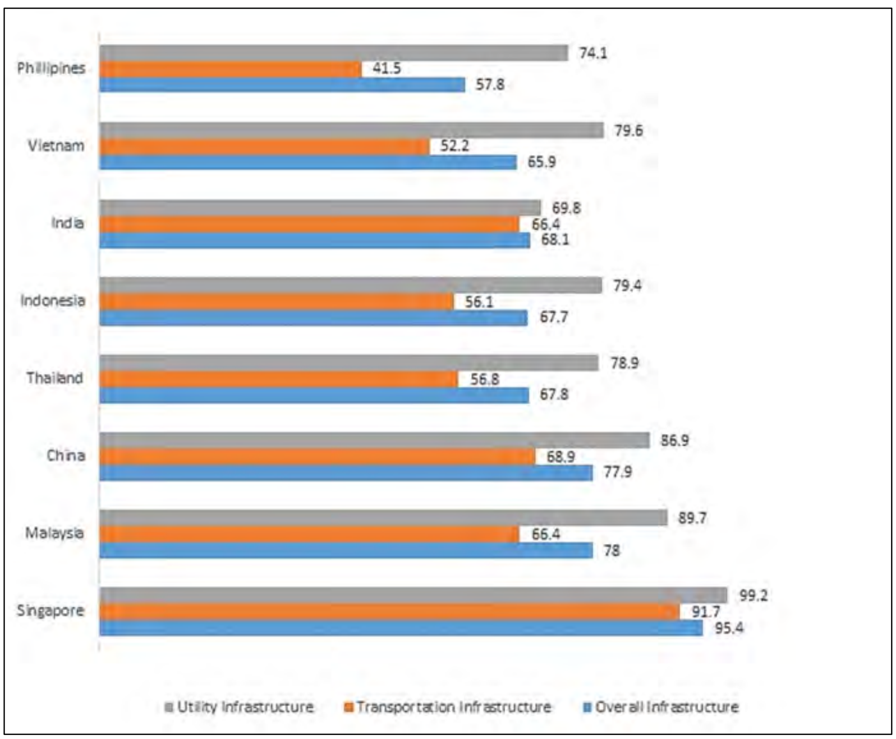
The development of basic infrastructure particularly transportation infrastructure in JABODETABEK has become one of the government's top priority to resolve the JABODETABEK's acute transportation problems, which have seriously hampered economic development. JABODETABEK has been faced with problems in terms of congestion and its chain effect, such as time value loss, inefficient fuel consumption and high emission rates.

Currently, JABODETABEK area has two main public transportation infrastructures as a backbone that connects its core area with its peripheral *kabupaten/kota*. These infrastructures are road-based public transport (BRT System) and rail-based public transport (Commuter Line, MRT and LRT System). Any means of public transportation infrastructure needs to be developed at the highest possible level in order to reduce acute transportation problems, provide more effective and efficient transportation modes to support people's mobility, and deal with the environmental issues.

Slow development of infrastructure will also give impact to the high cost of congestion due to the unbalanced road capacity and traffic volume. The growth rates of private vehicles were not accompanied by the growth of available supporting infrastructure, which is related to the ability of the government to finance all infrastructure development plans that have been planned in the various planning documents such as the transportation master plan.

The annual economic loss caused by traffic congestion in JABODETABEK could be as much as IDR 40 trillion for vehicle operating cost and IDR 60 trillion for travel time, which is equal to 4% the JABODETABEK GRDP, where each person in JABODETABEK loses ± IDR 3 million/year.[9]

About Indonesia's infrastructure competitiveness figures, based on the Global Competitiveness Index (GCI), Indonesia ranks 50th as of 2019, 5 places down from last year, scoring 56.1 in transportation infrastructure competitiveness, 79.4 in utility infrastructure competitiveness, and 67.7 in overall infrastructure competitiveness. In general, it ranks fourth within ASEAN countries, behind Singapore (1st), Malaysia (27th) and Thailand (40th).[10]



Source: The Global Competitiveness Report 2019, World Economic Forum

Figure 313 Infrastructure-Related Scores in Global Competitiveness Index in 2019

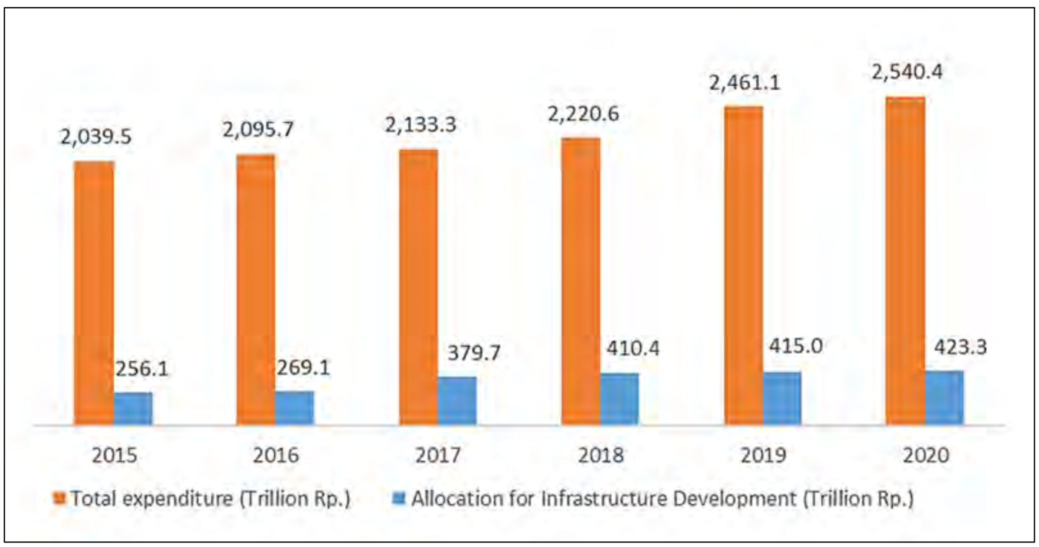
[9] JUTPI 2
[10] The Global Competitiveness Index Report 2019, World Economic Forum

1) Government's Capability to Finance Infrastructure Development

- Regarding the allocation of the state budget (APBN) for infrastructure development, in fiscal year 2020, as presented in Source: APBN Book 2020, Ministry of Finance

  Figure 314, about IDR 423.3 trillion is allocated to finance the infrastructure development from the total expenditure of IDR 2,540.4 trillion, with targets of 486 km for connectivity development, development of 3 new airports, development of 49 dams, development and rehabilitation of bridge with total length of 19,014 m, development and completion of 238.8 km of railway network, and development of 5,348 new houses and 2,000 special houses for low-income people.[11]

  From the financial figures mentioned in Figure 314, it appears that there are gaps in the infrastructure development financing. The average amount of state expenditure is IDR 2,248.4 trillion from 2015 to 2020 and the average amount of budget allocation for infrastructure development which is only IDR 358.9 trillion for the period of 2015 – 2020. As described later, since total infrastructure development financing needs IDR 5,519.4 trillion (2015 - 2019), efforts are needed to fill the gap so that infrastructure development could be carried out in accordance with the plans that have been set.



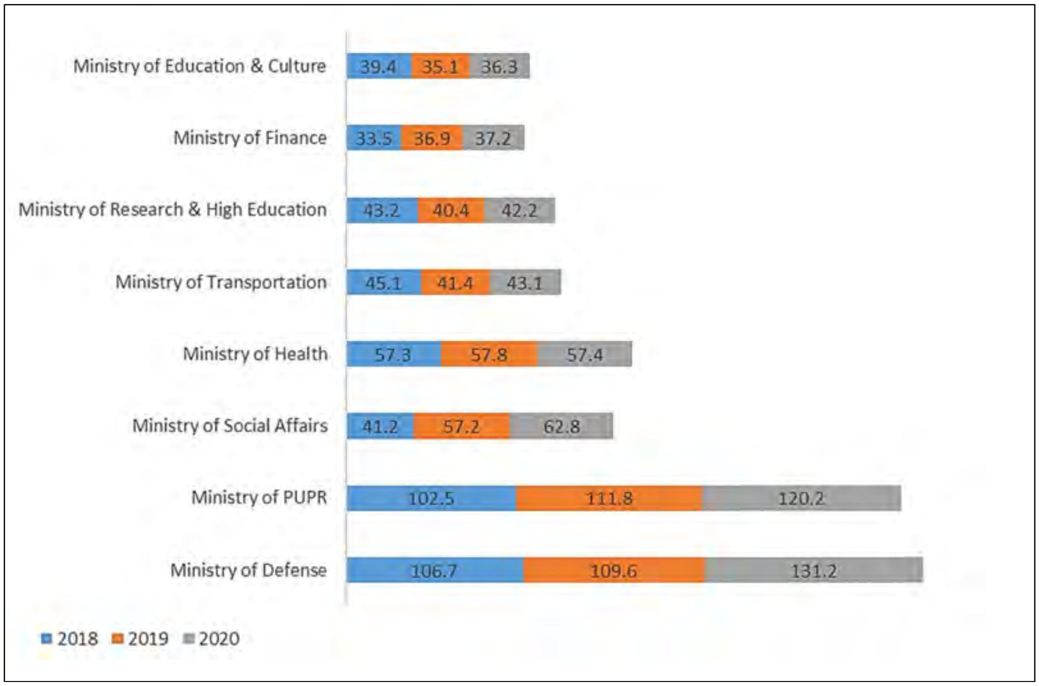
Source: APBN Book 2020, Ministry of Finance

Figure 314 Total Expenditure & Allocation of APBN for Infrastructure Development 2015-2020

As presented in Figure 315, in APBN 2020, the Ministry of Public Works and Public Housing (PUPR) received a budget ceiling of IDR 120.2 trillion. Growing at 4% in average, Ministry of PUPR has become one of the ministries with the biggest budget

[11] https://www.kemenko.go.id/single-page/apbn-2020/

allocation from 2015-2019 after the Ministry of Defense[12]. Ministry of PUPR will continue its priority and strategic activities, especially in the infrastructure development to boost national priority achievement. Furthermore, Ministry of Transportation obtained a budget of IDR 43.1 trillion which will be allocated to continue the priority and strategic activities especially in connectivity (land, air and sea transportation), transport safety, and security improvement, as well as improving transportation services.



Source: APBN Book 2020, Ministry of Finance

Figure 315 APBN Budget Allocation for Ministries 2018-2020

As shown in Table 87, during the period of 2015 to 2019, Indonesia needs around IDR 5,000 trillion for financing infrastructure development. Compared with the budget allocation, APBN can only finance 8.7% of the total of financing needs. Based on the projection of infrastructure financing needs in RPJMN (National Medium-Term Development Plan) Year 2015-2019, from the total of IDR 5,000 trillion, the share of total transportation infrastructure financing needs for the development of land, air and sea transportation is about 46% or equal to IDR 2,300 trillion.[13] Allocation sharing for total infrastructure financing in 2015-2019 for private sector holds 30.66% share, followed by BUMN or SOEs with 19.32% then by APBD with 9.88% ,while APBN takes the largest portion with 40.14% share.

[12] Book of APBN 2020, Ministry of Finance, 2019

[13] "Connectivity of Regional and Inter-Regional Infrastructure", Deputy of Infrastructure, Bappenas, 2014

Table 87 Projection of Infrastructure Financing needs in RPJMN 2015-2019

Sector	APBN (Trillion IDR)	APBD (Trillion IDR)	BUMN (Trillion IDR)	Private (Trillion IDR)	Total (Trillion IDR)
Road	**340.0**	**200.0**	**65.0**	**200.0**	**805.0**
Railway	**150.0**	**-**	**11.0**	**122.0**	**283.0**
Sea Transportation	**498.0**	**-**	**238.2**	**163.8**	**900.0**
Air Transportation	**85.0**	**5.0**	**50.0**	**25.0**	**165.0**
Land Transportation	**50.0**	**-**	**10.0**	**-**	**60.0**
Urban Transportation	**90.0**	**15.0**	**5.0**	**5.0**	**115.0**
Electricity Power	100.0	-	445.0	435.0	980.0
Energy (Oil & Gas)	3.6	-	151.5	351.5	506.6
Communication & IT	12.5	15.3	27.0	223.0	277.8
Water Resource	275.5	68.0	7.0	50.0	400.5
Clean Water & Wastewater	227.0	198.0	44.0	30.0	499.0
Settlement	384.0	44.0	12.5	87.0	527.5
Total Infrastructure Financing	**2,215.6**	**545.3**	**1,066.2**	**1,692.3**	**5,519.4**
Share	**40.14%**	**9.88%**	**19.32%**	**30.66%**	**100.00%**

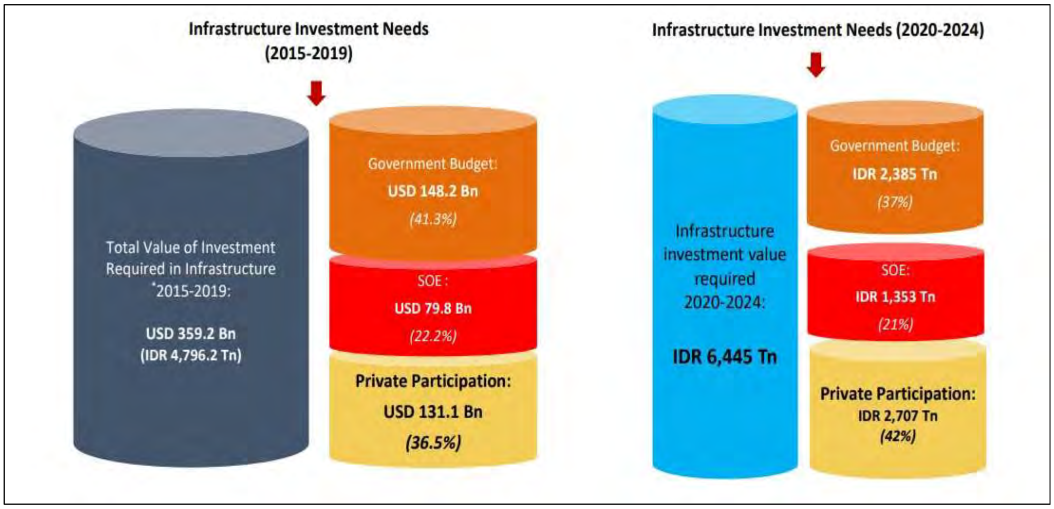
Source: "Connectivity of Regional and Inter-Regional Infrastructure", Deputy of Infrastructure, Bappenas, 2014

The enormous number for financing infrastructure development certainly cannot be funded only by the government budget. Therefore, the Indonesian government is aware of the importance to offer more attractive investment and business climate by improving the nation's infrastructure. A financing distribution scheme for the investment of infrastructure development in Indonesia needs to be carefully designed. Particularly in the transportation sector, infrastructure development has long-term effects to the nation's economy, especially in reducing logistic costs.

- As depicted in Figure 316, from the total investment of IDR 6,445 trillion for infrastructure development during the period of 2020-2024, the financing source derived from the government budget (APBN and/or APBD) only stands at some IDR 2,385 trillion or 37%.[14] For the next period of 2020-2024, it is expected that private sector can cover other IDR 2,707 trillion or 42% of the financing share, while BUMN or SOEs cover the rest of IDR 1,353 trillion or 21%.[15]

[14] https://www.bappenas.go.id/id/berita-dan-siaran-pers/indonesia-infrastructure-development-financing-2019-pentingnya-skema-pembiayaan-alternatif-untuk-percepatan-pembangunan-indonesi/

[15] Indonesia Investment Coordination Board (BKPM), Market Sounding of PPP Project, October 2019



Source: Indonesia Investment Coordination Board (BKPM), 2019

Figure 316 Infrastructure Investment Needs 2015-2019 & 2020-2024

2) The National Strategic Project

Some of the infrastructure development projects have also been included in the "National Strategic Project" (PSN/Proyek Strategis Nasional). The Government of Indonesia takes efforts to accelerate projects considered to be strategic and having great urgency to be realized within a short period of time. In this effort, the Government through the Coordinating Ministry for Economic Affairs initiates mechanism to accelerate infrastructure delivery and issuance of relevant regulation.

To coordinate decision-making processes to encourage settlement of issues arising from the lack of effective coordination between various stakeholders to support the implementation of national strategic projects, the Committee for Acceleration of Priority Infrastructure Delivery (KPPIP/Komite Percepatan Pembangunan Infrastruktur Prioritas) was established.

The National Strategic Projects are regarded as the most important infrastructure projects within the Indonesian Government's ambitious infrastructure development program. Through Presidential Instruction No. 1 Year 2016 regarding acceleration of the implementation of national strategic projects (amended by the Presidential Regulation No. 3 Year 2016, Presidential Regulation No. 58 Year 2017 and Presidential Regulation No. 56 Year 2018), all relevant ministries and institutions are tasked to support the acceleration of Indonesia's national strategic projects.

Based on the latest amended Presidential Regulation No. 56 Year 2018, there are 227 projects on the list, which is categorized into 26 programs including toll roads, non-toll roads, airports, railways, harbors, refineries, gas distribution, irrigation, etc. For toll road projects crossing the regions of DKI Jakarta Province, West Java Province, and Banten

Province, as mentioned in Table 88, there are 19 toll road projects with the total length of 478.2 km included in the National Strategic Projects to support connectivity. Significant amount of funds is also required to finance these projects.

Table 88 National Strategic Toll Road Projects in JABODETABEK Area

Project Name	Length (km)	Location
Ciawi - Sukabumi - Ciranjang - Padalarang Toll Road	115	West Java Province
Cengkareng - Batu Ceper – Kunciran Toll Road	14.2	DKI Jakarta - Banten Province
Kunciran - Serpong Toll Road	11.2	Banten Province
Serpong - Cinere Toll Road	10.1	Banten - West Java Province
Cinere - Jagorawi Toll Road	14.6	West Java Province
Cimanggis - Cibitung Toll Road	25.4	West Java Province
Cibitung - Cilincing Toll Road	34	West Java - DKI Jakarta Province
Depok - Antasari Toll Road	21.5	West Java - DKI Jakarta Province
Bekasi - Cawang - Kampung Melayu Toll Road	21	West Java - DKI Jakarta Province
Bogor Ring Road Toll Road	11	West Java Province
Serpong - Balaraja Toll Road	30	Banten Province
Semanan - Sunter Toll Road	20.2	DKI Jakarta Province
Sunter - Pulo Gebang Toll Road	9.4	DKI Jakarta Province
Duri Pulo - Kampung Melayu Toll Road	12.7	DKI Jakarta Province
Kemayoran - Kampung Melayu Toll Road	9.6	DKI Jakarta Province
Ulujami - Tanah Abang Toll Road	8.7	DKI Jakarta Province
Pasar Minggu - Casablanca Toll Road	9.2	DKI Jakarta Province
Jakarta Cikampek II South Side	64	West Java - DKI Jakarta Province
Jakarta - Cikampek II Elevated	36.4	West Java - DKI Jakarta Province

Source: Presidential Regulation No. 56 Year 2018

3) Regional Financial Capability

As mentioned in Section 4.3, it has been seen that there is an imbalance between infrastructure capacity and traffic volume, so it is necessary to add more mass transit corridors, upgrading planned public transport platform, for instance, from BRT to LRT, LRT to MRT as well as implementing TDM policies, which will require significant amount of funding. In terms of infrastructure financing, up to 2030, DKI Jakarta alone needs IDR 517 trillion for infrastructure development with the breakdown in Table 89.

Table 89 DKI Jakarta Financing Needs for Infrastructure Development up to 2030

Infrastructure Development Program	Sector	Value (trillion IDR)
223 km of MRT network development	Transportation	214
116 km of LRT network development	Transportation	60
2,149 km of BRT Transjakarta route development	Transportation	10
Angkot revitalization (up to 20,000 unit)	Transportation	4
Provision of 600,000 settlement unit	Housing	90
Improvement of wastewater treatment coverage	Waste management	69
Flood management & improvement of clean water supply	Water resource	70
TOTAL		517

Source: DKI Jakarta Musrenbang meeting, 10 April 2019

On the other hand, as for the financing needs of the DKI Jakarta for urban transportation development related programs, to fund the implementation of the JUTPI 2 Master Plan programs up to year 2035, DKI Jakarta requires IDR 727 trillion of funds solely for transportation, as shown in Table 90.

Table 90 DKI Jakarta Financing Needs for JUTPI 2 Master Plan up to 2035

JUTPI 2 Master Plan Program	Value (million USD)	Value (trillion IDR)
424.4 km of MRT network development	40,273	571
113.6 km of LRT network development	11,020	156
Existing BRT re-organization	0.28	0.3
TOTAL	51,293	727

Note: 1 USD = IDR 14,182 (2019)
Source: JUTPI 2

Infrastructure development funding currently still depends on the APBN (State Budget) by the central government and APBD (Regional Budget) by the local government. The limited sources from the government budget have resulted in constrained infrastructure development. In terms of infrastructure development financing at the local government level, it is also constrained by the ability of the regional budget (APBD) to meet financing needs.

Based on the data of total APBD's expenditure in FY 2018, as shown in Table 91, there is a noticeable difference between DKI Jakarta and other regions in JABODETABEK area, where DKI Jakarta took the largest portion of IDR 75 trillion or equal to 66% of the total expenditure of the entire JABODETABEK region which amounted to IDR 114 trillion. This fact shows that there is a gap in the financing capability from APBD in each region, although for example, Kabupaten Bogor has a wider area compared to other regions in JABODETABEK.

Table 91 Expenditure of *Kabupaten/Kota* in JABODETABEK FY 2018

Region	Total Expenditure of APBD FY 2018 (thousand IDR)
DKI Jakarta	75,093,831,260
Kota Bogor	2,533,748,634
Kabupaten Bogor	7,715,348,316
Kota Depok	2,998,429,828
Kota Tangerang	4,420,108,608
Kabupaten Tangerang	5,703,895,309
Kota Tangerang Selatan	3,571,146,581
Kota Bekasi	5,936,109,580
Kabupaten Bekasi	5,946,520,732
TOTAL JABODETABEK	**113,919,138,848**

Source: DJPK (*Direktorat Jenderal Perimbangan Keuangan*/Directorate General of Fiscal Balance) Ministry of Finance

Implementation of the project proposed in the JABODETABEK Urban Transportation Master Plan requires allocation of budget to the transportation sector: the total cost for JUTPI 2 proposed projects which divided by 10 transportation development sectors account for IDR 1,734.60 trillion.[16]

Table 92 JUTPI 2 Master Plan Cost

Transportation Development Sector	Number of Program	Cost (Bil. IDR)
Road Network Development	5	88,886.88
Railway System Development (include MRT & LRT)	5	1,234,982.06
Improvement of Traffic Control System and Demand Management	1	2,000.00
Improvement of Transportation Safety and Security	6	12,230.77
Bus Transportation System and Intermodal Facility Development	9	4,015.58
Measures in Urban Planning	2	387,385.00
Freight Transportation System	1	5,100.00
Institutional Setup and Reform	2	-
Financial Arrangement	4	-
Environmental Betterment	2	-
TOTAL (including cost for LRT & MRT network development)		**1,734,600.29**

Source: JUTPI 2

11.1.2 Paying for Better Transportation

Particularly in the transportation sector, infrastructure development has long-term effect for the country, especially in reducing logistic costs, improving accessibility as well as people's mobility. The financing plan is formulated to promote proposed transportation master plan development. To fill the gap between the current level of revenue and the required cost of development, additional financial sources should be considered using the following steps:

[16] JUTPI 2, USD 1 = Rp. 14,182 as of September 2019

a. Increase of Revenue for Transportation Sector

Revenue could be increased through an increase of rate for gasoline tax and road pricing. Potential of the expected revenue from ERP (around 66 million USD/year) could be used as a strong fund for proposed master plan development. These revenues should be earmarked for stable development of the transportation system.

b. Reduction of Subsidy for Transportation Sector

Provision of affordable public transportation modes for the poor could be achieved through a direct way of delivering subsidy to the target group. Then, subsidy to the people who can afford higher transportation fare could be gradually reduced to reduce the burden of government's expenditure.

c. Inclusion of Private Sector

It is universally recognized that transport is crucial for sustained growth and modernization. Many transportation projects need large amount of investment which cannot be fully borne by the government. However, experience has shown that private capital, expertise, and commercial discipline can make a measurable difference in the delivery of transport services. Therefore, government support to provide sound investment environment for the private sector in transportation business is crucial.

d. Integration with Urban Development

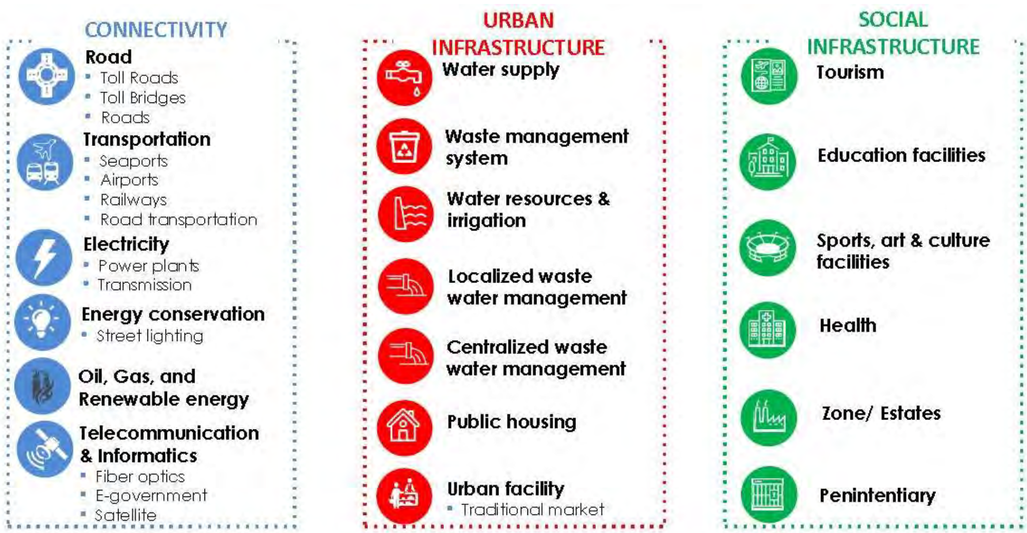
Transportation system development would bring direct and indirect benefits to the society. Indirect benefits such as increase in land value along the transportation corridor, however, cannot be absorbed by the transportation development project. It is expected that provision of controlled land development rights in the surrounding area of railway stations or interchanges of toll road for private investors will make it possible to internalize the development benefits of the transportation system.

11.1.3 Creative Financing

To avoid the widening gap between the need and the availability of adequate infrastructure, anticipatory measures need to be taken. The government should look for alternative financing solutions to fund programs that have not been touched by the APBN and/or APBD. The alternative financing for the shortage of government budget was derived from funds that do not burden the government in the future. By looking at the issue of gap funding, the government is required to find and explore alternative funding schemes beyond what has been usually implemented under the APBN and/or APBD scheme.

1) Public-Private Partnership (PPP)

The investment, however, cannot be funded solely from the government budget. The Ministry of Finance stated that for the next period of 2020-2024, IDR 6,445 trillion will be required for infrastructure development. The government is only able to fulfill 37% of infrastructure funding needs and it is expected that 21% will be fulfilled by BUMN/SOE's. Approximately 42% of the funding gap is expected to be fulfilled through cooperation with private sector by using PPP scheme. The private sector participation will not only fill the funding gap, but also share knowledge and experience in the development, operation, and management of qualified infrastructure service.



Source: PPP Book 2019, Bappenas, 2019

Figure 317 Sectors Covered by PPP Scheme in Indonesia

PPP in infrastructure development sector required private sector with the ability to design, construct, finance, and operate a certain public utility infrastructure, including conducting maintenance services. The intensive and huge amount of capital required to build such infrastructure has made government seek for alternatives due to the insufficient government budget to finance infrastructure development.

According to Government Regulation No. 38 Year 2015, PPP in Indonesia is called Cooperation between Government and Business Entities (Kerjasama Pemerintah dan Badan Usaha) abbreviated as KPBU. The word Government in the Government Regulation No. 38 Year 2015 shall be read as Ministry, government body, local government, state owned enterprises or local government owned enterprises (BUMD).

KPBU itself is defined as cooperation between government and business entities in the provision of infrastructure for public interest with reference to the specifications established by the Ministry/Head of Institution/Head of Local Government/State-Owned Enterprises/Local Government-Owned Enterprises, part or all of which are using the resources of the business entities by taking consideration the division of risk among the parties. The chief or head of this public initiator become Project Cooperation Person in Charge (Penanggung Jawab Proyek Kerjasama) abbreviated as PJPK or GCA (Government Contracting Agency).

KPBU for infrastructure should be initiated by government, either Ministry, Government Body or local government. However, in some event, enterprises such as state-owned or local government-owned enterprises that have related function with certain kind of infrastructure can start to initiate a KPBU infrastructure project. Business entity means the private entity that will cooperate with government to construct the infrastructure.

In order to provide comprehensive supports for streamlining PPP process, the Central Government has established an institutional setting by assigning related institutions with their respective roles. As mentioned in Table 88, each government institution has their own roles with the main objectives to create successful PPP model projects, strengthening PPP institution at all level of government, streamlining PPP process and proper project preparation to reduce unnecessary transaction cost.

Table 93 Institutional Settings of Indonesia's PPP

Item	Institution	Objectives
Project Planning	Bappenas, GCA	Providing initiation of project and early economic assessment, delivering preliminary studies.
Project Preparation	Ministry of Finance, PT. SMI and other SOEs	Assisting GCA to develop OBC to FBC until getting the winning bidder and reach Financial Close. Project Development Funding (PDF) manage by MoF and implemented by SOEs (mainly PT. SMI).
Viability Gap Funding	Ministry of Finance	Increasing project viability and social economic value.
Government Guarantee	IIGF and Ministry of Finance	Improving project bankability and arranging better risk allocation.
Land Acquisition	State Asset Management Agency (LMAN), Ministry of Finance	Providing land financing for National Priority Project (PSN).
Coordination	PPP Joint Office	Coordination forum among PPP stakeholders to assist GCA and monitoring progress of PPP project.
	KPPIP	Debottlenecking PPP projects issues which need coordination among cross sectoral institutions.

Source: Directorate General of Budget Financing & Risk Management, Ministry of Finance

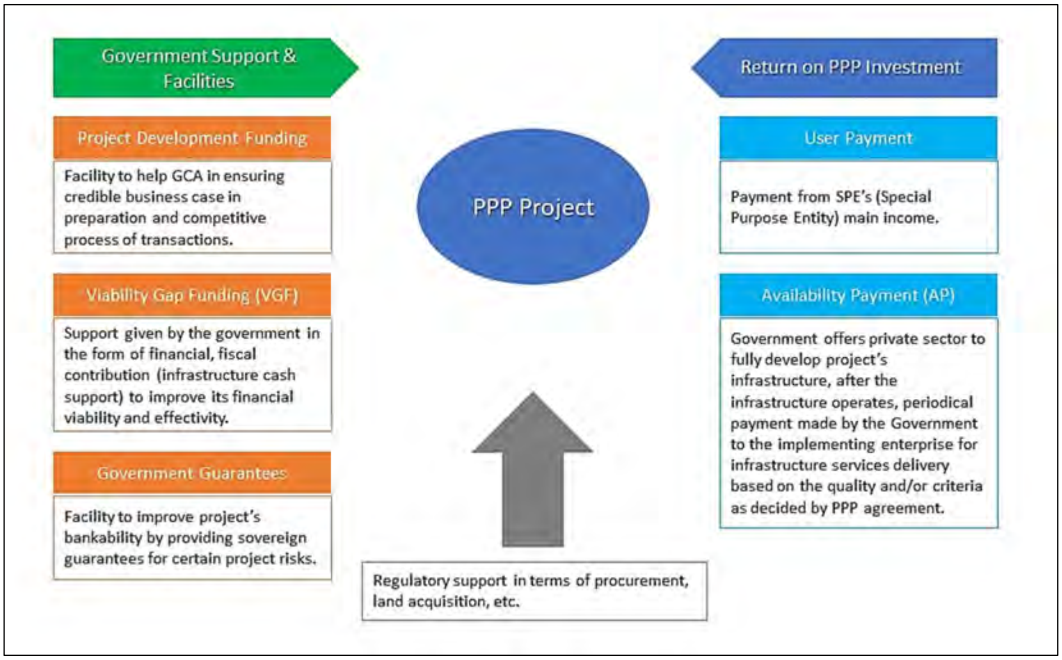
In terms of government support to encourage investors to develop infrastructure projects using the PPP scheme, the central government prepares regulatory framework for government support on PPP projects, such as:

- Minister of Finance Regulation Number 260/2016 as an amendment of Ministry of Finance Regulation Number 190/2015 regarding Availability Payment on PPP scheme in Infrastructure Provision.
- Minister of Home Affair Regulation Number 96/2016 regarding Availability Payment using regional budget (APBD) on PPP scheme in Infrastructure Provision.
- Minister of Finance Regulation Number 170/2018 regarding the amendment to Minister of Finance Regulation Number 223/2012 regarding Viability Gap Funding.

As depicted in Figure 318, the government in this case has prepared its support especially in terms of regulation and funding. The government started to introduce regulatory and financial instruments that specifically addressed each of the challenges:

- A government guarantee scheme for PPP projects that was introduced in 2010 (including the establishment of the Indonesia Infrastructure Guarantee Fund) to address the issue of risk allocation;
- A Viability Gap Fund (VGF) to provide direct contributions for projects with marginal feasibility;
- A Project Development Facility (PDF) or *Fasilitas Penyiapan Proyek* to provide support to Government Contracting Agencies (GCAs) in the project development funding process in preparing projects to ensure that GCA has credible business case in preparation and competitive transaction process; and
- An availability-payment PPP scheme, in addition to the existing user-pays scheme, to address the need for more types of public services.

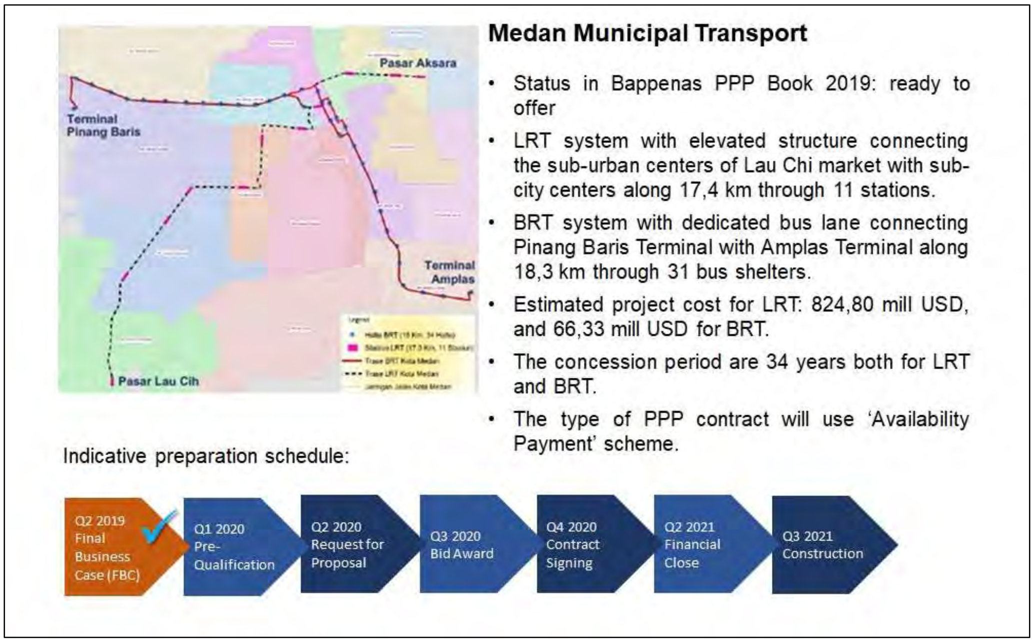
Moreover, the government also established the Directorate of Government Support and Infrastructure Financing Management or *Direktorat Pengelolaan Dukungan Pemerintah dan Pembiayaan Infrastruktur* under the Ministry of Finance in 2015 to provide policy and approvals on government support mechanisms.



Source: Directorate General of Budget Financing & Risk Management, Ministry of Finance

Figure 318 Government Support in terms of Regulation & Funding

In PPP Book 2019, for an urban transportation development project, there are two projects with the status of "ready to offer," namely, Medan Municipal Transport and LRT Semarang projects. In Medan Municipal Transport project, Medan government in Regional Medium-Term Development Plan (RPJMD) 2016-2021 has a plan to develop mass transportation system in the form of Light Rail Transit (LRT) that will be integrated with Bus Rapid Transit (BRT) system.



Source: PPP Book 2019, Bappenas

Figure 319 Project Profile of Medan Municipal Transport

2) PINA (Non-Government Budget Investment Financing)

The Non-Government Budget Investment Financing ("PINA or Pembiayaan Investasi Non-Anggaran Pemerintah) which was introduced on February 2017, is a facilitation scheme which aimed to accelerate the financial close of national priority projects by utilizing funding sources from investors, managed funds, banks, capital markets, insurance, financial institutions, and other legitimate financing sources. Under the PINA scheme, investors fund projects in advance without any government interference.

Bappenas through PINA Center is the coordinator of PINA. They are tasked with bringing together infrastructure project owners who need equity financing with interested and committed business entities to invest their funds in infrastructure projects. The legal basis for undertaking a PINA is a Decree of the Minister of PPN/Head of Bappenas No. 70/M.PPN/HK/12/2016 concerning the establishment of the government facilitation team in non-budget government investment financing.

One of the success story of transportation infrastructure financing through the PINA scheme is financing in the form of equity (equity financing) from PT. SMI (12.76% of share) and PT. Taspen (14.61% of share) to PT. Waskita Toll Road (72.63% of share), which will be used to finance nine toll road sections. Eight toll road sections are located on Java Island with a total length of 408.41 km, of which five are Trans Java Toll Road sections with a total length of 305.27 km.

3) Local Government Bond

Local Government Bonds or Municipal Bonds are issued by the Local Government (organizational units, BUMD, etc.), and they are not guaranteed by the Central Government. These bonds are issued only to finance investment activities in the public sector that generate revenues for Local Government and provide benefits to the community.

Previously there were several government regulations that had been issued related with the Local Government Bond, such as Government Regulation No. 30 Year 2011 regarding regional loans, Ministry of Finance Regulation No. 111/PMK.07 Year 2012 regarding procedures for the issuance and responsibility for local government bond, and Ministry of Finance Regulation No. 180/PMK.07 Year 2015 regarding amendment of the Ministry of Finance Regulation No. 111/PMK.07 Year 2012.

Issuance of Local Government Bond can become an alternative instrument in the infrastructure development financing that can improve regional competitiveness. Regional bonds will also encourage the implementation of good governance by local governments, because they will be listed on the Indonesian Sock Exchange so they must meet strict regulations. In this case the community can also feel the benefits of the issuance of regional bonds, such as being a means of investment, as well as increasing active participation and supervision of regional development.

In FY 2011, 35 prefectures & 12 major cities in Japan issued more than USD 19.2 billion of Local Government Bonds. The case of Detroit city that filed bankruptcy in 2013 can be used as a good example in terms of managing Local Government Bonds.

4) Limited Concession Scheme

Limited Concession Scheme (LCS) applied to the infrastructure is already in operation. The private sector who wants to manage the infrastructure pays upfront funds to obtain the right to manage the assets for a certain time period. Currently the Presidential Regulation that will regulate the implementation of Limited Concession Scheme is still being prepared. The Presidential Regulation will regulate several important mechanisms, including auction procedures, advance payments, and standard management of state assets.

Under the Limited Concession Scheme, existing infrastructure will be offered to investors and granted as operational concessions. The funds raised would be used to finance other infrastructure projects. In other countries such as Turkey, England and Japan, the Limited Concession Scheme is used to finance not only airport construction, but also the construction in other sectors, and the raised funds can be larger than the initial estimate.

After the concession period is over, the operatorship, such as of new airport is returned to the government.

In 2005, Turkey offer Limited Concession Scheme for Istanbul's Ataturk Airport (USD 3 billion of upfront fees for 17.5 years of concession) and followed by other 8 airport using Limited Concession Scheme.

11.2 Institution for Urban Transportation

JABODETABEK should be considered integrated, compact region rather than being managed in a fragmented way by the various local government in the region. Coordination is necessary to harmonize intergovernmental policies with a limited amount of financial and human resources on relatively poor infrastructures with unsound institutional framework under unstable political conditions and largely fluctuating economies.

The necessity of coordination among local government in JABODETABEK is among others, due to complex governance system in metropolitan area and limitation of financial capacity and human resources. Those causes can create unsynchronized developments and unsolvable cross-boundary issues. Therefore, integrated planning involves multiple stakeholders is important in bridging development plans among municipalities and the key to solve the problems.

The ultimate challenge on local governmental coordination is a decentralization policy. Based on Law Number 23 Year 2014 regarding local government, it is stated that each local government has discretion to plan and implement development affecting its own region without consulting neighboring local governments. On the other hand, transportation is a multidimensional issue that crosses administrative boundaries and sectors so that the handling cannot be fragmented.

11.2.1 Issues and Challenges in Transportation Institution

Institutional issues are essential for transportation which determines the success of urban management. Regarding transportation sector, there are at least six issues to be coordinated, namely, institutional framework, coordination with urban planning, infrastructure development, transportation demand management (TDM), funding scheme, and operation of public transport.

1. Institutional Framework

    - Although there is usually an institutional and legal framework for an existing mode of transportation such as railway, bus lines, and roads, the one from a metropolitan point of view is rare.

- Some metropolitan areas in developing countries do not have an institutional framework for new modes of transportation such as BRT or new transportation policies such as TDM.

2. Coordination with Urban Planning

- Transit-oriented development (TOD), which promotes mixed and compact land use around transit stations, is a key policy option to promote environment-friendly and economical transportation systems.
- TOD requires close coordination between public transportation network development and land use plans.
- The walking environment around the transit stations also has to be developed.

3. Infrastructure Development

- Consistency of metropolitan transportation network: If a missing link or a bottleneck exists, the network does not function. The need for consistency of the road network arises at the boundary of local governments.
- Land for transportation: The complex land acquisition and relocation processes make it difficult for the government to acquire land. There would be no other choice than to share lands in some sections among several modes.
- Transit stations and bus terminals: These are key transportation infrastructures for promoting use of public transportation such as access roads to the stations, station plazas, park and ride facilities and terminals.
- Specifications of Public Transportation: If direct through operations by several railway operators are required, technical specifications of public transportation have to be consistent.

4. Transportation Demand Management (TDM)

- While TDM can be an effective and expeditious policy option, several TDM measures such as electronic road pricing, mobility management, and parking fare control require high levels of communication.

5. Funding Scheme

- Due to the limited funding, a variety of financial resources would be necessary. Road pricing or fixed property tax for urbanized areas can be alternatives. These require coordination among governmental agencies as well as revision of the laws and regulations.

6. Operation of Public Transportation

    - In addition to the infrastructure of public transportation, service integration is required for operation and maintenance. Miller et al.[17] categorized transit service integration practice components into schedules, fare payment, information, and special event and emergency in addition to infrastructure. A variety of examples in the United States are described in the paper of Miller et al, these advanced examples are recommended to be applied in developing countries.

11.2.2 Metropolitan Transportation Institution

Transportation in a metropolitan area should be considered as a unity and compact rather than fragmented and administration-based to embody a seamless movement and integrated service. In this case, many organizations should be involved in the transportation system during phases from planning and implementation until evaluation and monitoring.[18] In the case of JABODETABEK, there are many transport infrastructures and transport modes which are managed by different organizations. Generally, some ministries, institutions, local governments, operators, developers, and communities should be involved in the process. Table 94 shows the process, function, and organizations involved in the transportation system.

Table 94 Transport-Related Institutions According to Their Function

Sector	Sub-Sector	Function						
		Planning	Implementation				Licensing	Evaluation/ Monitoring
			Infrastructure Development		Transit Operation			
			Budgeting	Construction Supervision	Financial Arrangement	Train/ Bus Operator		
Rail-based Transport	JABODETABEK Railway	DGR/KCI	DGR	DGR	KCI	KCI	DGR	KCI
	MRT	MRTJ/ *Dishub* DKI	MRTJ /DGR	MRTJ	MRTJ	MRTJ	Minister/ Gov. of DKI	MRTJ
	LRT JABODEBEK	DGR	DGR/ PT.KAI	PT. Adhi Karya/ Other Party Appointed by DGR	PT. KAI	PT. KAI	Minister of Transport and PUPR	DGR
	LRT JakPro	*Dishub* DKI/JakPro	JakPro	JakPro	JakPro	JakPro	Minister/ Gov. of DKI	JakPro
BRT	TransJakarta	*Dishub* DKI/ Transjakarta	*Dishub* DKI	*Dishub* DKI	Trans Jakarta	Transjakarta/ bus operator	Gov. of DKI	*Dishub* DKI
	Trans JABODETABEK	BPTJ	BPTJ/ *Dishub*	*Dishub*	Bus operator	Bus operator	BPTJ	BPTJ

[17] Miller, M. A., Englisher, L., Kaplan, B. and Halvorsen, R. (2011). "Transit Service Integration Practices – A Survey of U.S. Experienced." *Transportation Research Record: Journal of the Transportation Research Board*, No. 1927, Transportation Research Board of the National Academics, Washington D.C., pp.101-111.

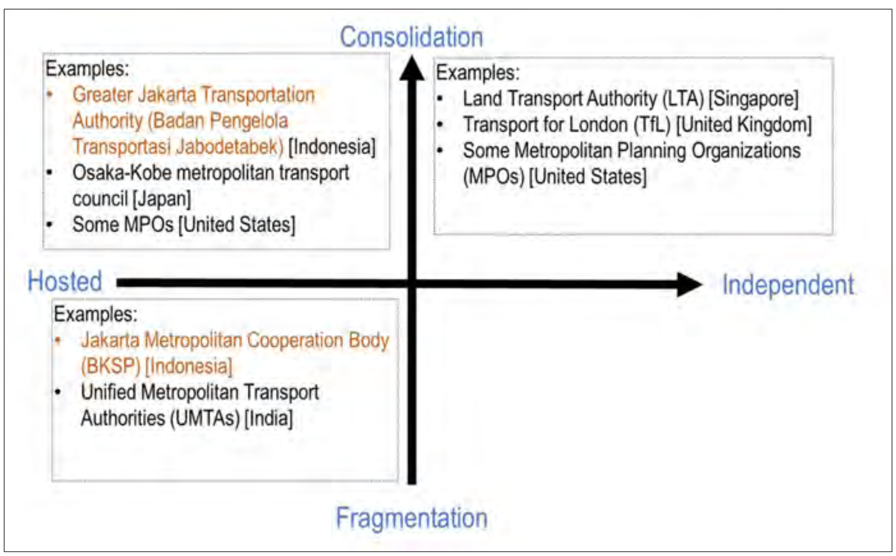
[18] Firman, T. (2014). *The Dynamics of JABODETABEK Development: The Challenge of Urban Governance.* Regional Dynamics in a Decentralized Indonesia: Institute of Southeast Asian Studies, Singapore, pp.368-385.

Sector	**Sub-Sector**	**Function**						
		Planning	**Implementation**				**Licensing**	**Evaluation/ Monitoring**
			Infrastructure Development		**Transit Operation**			
			Budgeting	**Construction Supervision**	**Financial Arrangement**	**Train/ Bus Operator**		
	BRT in *Kab./Kota*	Dishub *Kab./Kota*	*Dishub*/ Operator	*Dishub*	Local Gov. (*Dishub*)	*Dishub*/ Bus operator	*Dishub*	*Dishub Kab./Kota*
Bus	Intercity Bus Services within JABODETABEK	BPTJ/Bus Operator	N/A	N/A	Bus operator	BPTJ/ Bus Operator	BPTJ	BPTJ
	Local bus services	Local Gov./ Organda	N/A	N/A	Bus operator	*Dishub Kab./Kota*	*Dishub Kab.*/Kota	Dishub *Kab./Kota*
Road Network	Toll Road	*Bina Marga* BPJT Toll Operator	*Bina Marga* Toll Operator	BPJT/Toll Operator	Toll Operator	Toll Operator	BPJT	BPJT
	National Road	*Bina Marga*	*Bina Marga*	*Bina Marga*	*Bina Marga*	*Bina Marga*	*Bina Marga*	*Bina Marga*
	Provincial Road	Provincial Gov.	Provincial Gov.	Provincial Gov.	Provincial Gov.	Provincial Gov.	Provincial Gov.	Provincial Gov.
	Kab./Kota Road	PUPR/*Bina Marga Kab./Kota*	PUPR/*Bina Marga Kab./Kota*	PUPR/*Bina Marga Kab./Kota*	PUPR/*Bina Marga Kab./Kota*	PUPR/*Bina* Marga *Kab./Kota*	PUPR/*Bina Marga Kab./Kota*	PUPR/*Bina Marga Kab./Kota*
TDM (DKI Jakarta)	Odd-Even Number Plate Regulation	*Dishub*	N/A	N/A	*Dishub*	*Dishub*, Trfc.police	*Dishub*	*Dishub*/PMJ
	Electronic Road Pricing (ERP)	*Dishub*	*Dishub*	*Dishub*	*Dishub*	*Dishub*	*Dishub*	*Dishub*/PMJ
	Parking Fee	UPP *Dishub*	UPP *Dishub*	UPP *Dishub*	UPP *Dishub*	UPP *Dishub*	UPP *Dishub*	UPP *Dishub*
Urban Development & TOD	Master Plan	Local Gov. Master Dev.	Local Gov/ Master Dev.	Local Gov/ Master Dev.	Master Dev.	Spatial Planning Agency	Governor/ Mayor/ Regent	Master Dev./ Spatial Planning Agcy
	Connectivity (integration facility)	Local Gov/ Operator	Operator	Operator	Operator	Operator	Local Gov.	BPTJ/ Operator
	Access road	Local Gov.	Loc.Gov./Master Dev.	Local Gov.	Local Gov.	Local Gov.	BPTJ/ Local Gov	BPTJ/Local Gov.
	Public Housing	Central/ Local Gov	Central/ Local Gov	Central/ Local Gov	Central/ Local Gov	Central/ Local Gov	Local Gov	Central/ Local Gov
	Commercial area	Master Dev.	Master Dev.	Master Dev.	Master Dev.	Master Dev.	Local Gov.	Master Dev.

Note: DGR = Directorate General of Railway
UPP = Unit Pengelola Parkir (Parking Management Unit)
PMJ = Polda Metro Jaya (Regional Police of DKI Jakarta)
Master Dev.= Master Developer
Source: JUTPI 2

In terms of mass transit, each type of rail-based transport is operated by different providers and in each process from planning to evaluation, various stakeholders could be found. Public sector is responsible with upper planning, implementing, and regulation issues, including license and guidelines. As one of the main actors in TOD, some railways operators will be in charge of area master developer with housing contractors or private sectors.

Based on their form and nature, coordinating body is divided into two axes. The horizontal axis shows hosted and independent body while the vertical axis shows consolidation and fragmentation body. Independent organization is characterized by a self-reliance funding, owning full-time staff, and the body can be impartial. Nonetheless, this form of body can spark a risk of conflict of interest while policies somehow depend on election process. Hosted body, on the other hand is dependent on financial and human resources which can be a metropolitan-wide governance or central/local government with metropolitan jurisdiction. Demerit of this kind of body is a potential of confrontation that may halt the organization of which policies may be affected by sectionalism of hosting agency.



Source: JUTPI 2

Figure 320 Metropolitan Transportation Coordination Scheme

Based on the nature of participants, metropolitan coordinating body is divided into consolidation and fragmentation. Consolidation is indicated by a powerful coordinating body that can be a single government or single coordinating body with a metropolitan-wide viewpoint. This broad viewpoint makes it an efficient form for a metropolitan-wide transport policy making and implementation. Therefore, transportation authority can be large enough to exacerbate sectionalism.

The latter is fragmented agency which is marked by the powerful participants. In this form, high level of autonomy of participating organization can be maintained while coordination is conducted through an ad-hoc meeting. Constraint for this organization is a limited budget and human resources. Nevertheless, fragmented body is applicable for low population and few economic activities.

Figure 320 shows division of axes and the examples of organization. The ideal forms for the metropolitan coordinating body are LTA of Singapore, TfL of United Kingdom, and some of Metropolitan Planning Organizations (MPOs) in United States. LTA in particular is a statutory body under the Ministry of Transport that is responsible for planning, policy making, implementation, operation & maintenance of rail, road and bus. Some projects and policies that have been conducted are MRT lines, High Speed Rail, walk cycle ride, ERP, and intelligent transport system (ITS).

BPTJ, Osaka-Kobe metropolitan transportation council in Japan and some of MPOs in the United States are categorized as a consolidated and hosted agency. Meanwhile, Greater Jakarta Transportation Authority (BPTJ) in Indonesia, and Unified Metropolitan Transport Authorities (UMTAs) in India shared a hosted-fragmentation scheme of coordinating body. UMTA of India is a coordinating body for cities with a population of over a million. It depends on other agencies for project implementation since it does not have the authority to sanction or reject investment, except for Hyderabad.[19]

Coordinating bodies in JABODETABEK can be seen in Table 95, which also shows the difference between BPTJ and the Metropolitan Coordination Body (BKSP). In terms of format, BPTJ is higher than BKSP since it is stipulated by a presidential decree and part of the central government. Meanwhile, BKSP is an inter-municipal authority under each governor of which organization is legalized by presidential instruction. The main task of BPTJ is mainly focused on transportation sector to develop, manage, and improve transportation services and formulate transportation development plan of JABODETABEK. On the other hand, BKSP coordinates development priorities of JABODETABEK through agreements between leaders and formulates development policies, joint development cooperation, monitoring, and evaluation.

[19] Agarwal, O. P., Chauhan, I., (2011). "Toward Coordinated Urban Transport Planning in India." *Transportation Research Record: Journal of the Transportation Research Board*, No. 2239, Transportation Research Board of the National Academics, Washington, D.C., pp.112-116.

Table 95 Coordinating Bodies for JABODETABEK

Aspects	BPTJ	BKSP
Format of Institution	Supra-municipal Authority	Inter-municipal Authority
Law Basis	• Presidential Decree Number 103 Year 2015 • Minister of Transportation Regulation (Permenhub) Number 3 of 2016	• Presidential Instruction (Inpres) Number 13 Year 1976 • Minister of Home Affair Regulation Number 6 Year 2006
Task	• Developing, managing and improving transportation services in JABODETABEK in integrated manner. • Formulate transportation development plan of JABODETABEK.	• Coordinates development priorities of JABODETABEK through agreements between leaders. • Formulized development policies, joint development cooperation, monitoring and evaluation.
Organization	Echelon 1 under the Ministry of Transport (Secretariat and Directorate).	Lead together by three Governors but the daily task is done by "executive secretary" appointed for five year in rotation.

Source: JUTPI 2 based on Oswar Mungkasa (2019)[20]

Some alternatives of the coordinating body in JABODETABEK are categorized based on their functions and scope of authority in undertaking those functions, as presented in the table below. The more functions are undertaken, the greater the authority will be. As the current authority, BPTJ acts as a transportation management body of which role is to organize an integrated system in JABODETABEK. Main functions of BPTJ are covering coordination, synchronization, and technical facilitation regarding master plan and transportation programs. With regard to the above-mentioned functions, the ones that can be conducted by BPTJ are giving license of intercity bus and proposing TDM policies which then will be finalized and implemented by other institutions. BPTJ is not authorized to be involved in the improvement of rail-based transport, development of road network and land use planning, and urban development. In fact, from the viewpoint of metropolitan transportation system, BPTJ takes some part in some of the planning process by synchronizing the transportation plan of each *kota* and *kabupaten* to be in line with RITJ.

[20] Mungkasa, O. (2019). "Jakarta Metropolitan Area: Challenges and Efforts." Paper presented at the *55th ISOCARP World Planning Congress*. Available at https://isocarp2019.isocarp.org/137-presentations. (Accessed: 23 September 2019).

Table 96 Alternatives of Coordinating Bodies in JABODETABEK

Function	JABODETABEK Transportation Management Body	JABODETABEK Transit Authority	JABODETABEK Transportation Authority (A)	JABODETABEK Transportation Authority (B)	JABODETABEK Development Authority
Licensing of Intercity Bus Transport	X	X	X	X	X
Improvement of Rail-based Transport		X	X	X	X
Transportation Demand Management (TDM)			X	X	X
Road Network Development				X	X
Land Use Planning and Urban Development					X

Source: JUTPI 2

In terms of coordination, a good example of an integrated body is Ministry of Land, Infrastructure, Transportation and Tourism (MLIT) of Japan. Established in January 2001, MLIT came from a merge of the Ministry of Transport, the Ministry of Construction, the Hokkaido Development Agency, and the National Land Agency. MLIT is led by a minister who is responsible to the prime minister and is supported by state minister, vice-minister, and private secretary to the minister. There are 13 bureaus in MLIT, such as policy bureau, city bureau, road bureau, rail bureau, and housing bureau. In Japan, MLIT is very effective in arranging inter-sectoral planning related to land and infrastructure. In terms of transportation, MLIT plays an important role for formulation and implementation of urban transportation master plan, including planning the railway lines, setting up the tariff, and synergizing an integrated plan.

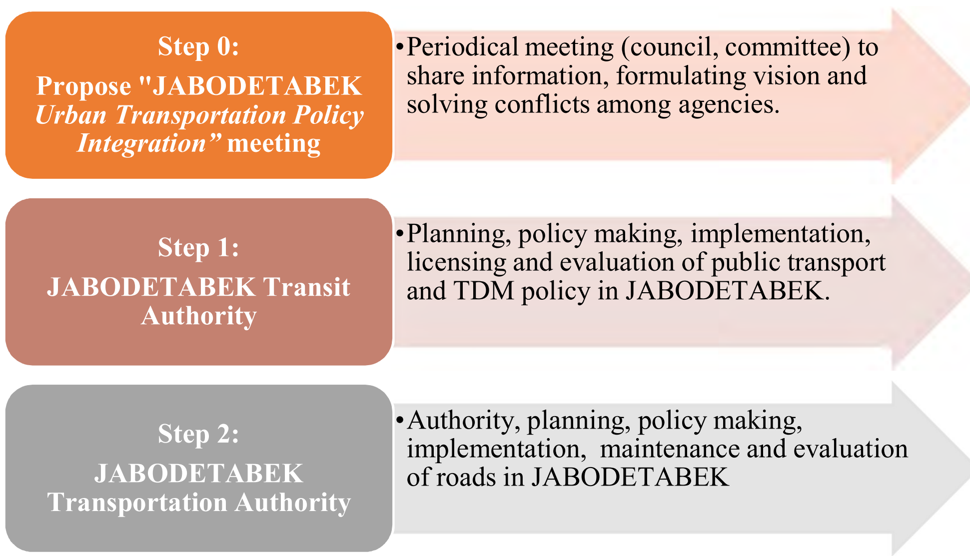
In JABODETABEK, intensity of public transport project plans based on RITJ resulted in a necessity to establish an integrated public transport system in terms of service, tariff, and license. In the future, there are some public transit networks planned by JUTPI 2, namely:

- 10 MRT lines
- 11 LRT lines
- 2 BRT corridors

Considering the complexity of public transport management, the capacity of current coordinating body is insufficient to handle future public transport lines. Therefore, two steps forward are necessary:

- To strengthen and empower BPTJ, and
- To establish JABODETABEK Transit Authority.

For a long-term period, transit authority can be a suggestive input to establish functions to plan, manage, and operate the future linesas well as to conduct evaluation and maintenance work for the transit network. Below is the figure of suggestive steps to enhance and empower BPTJ.

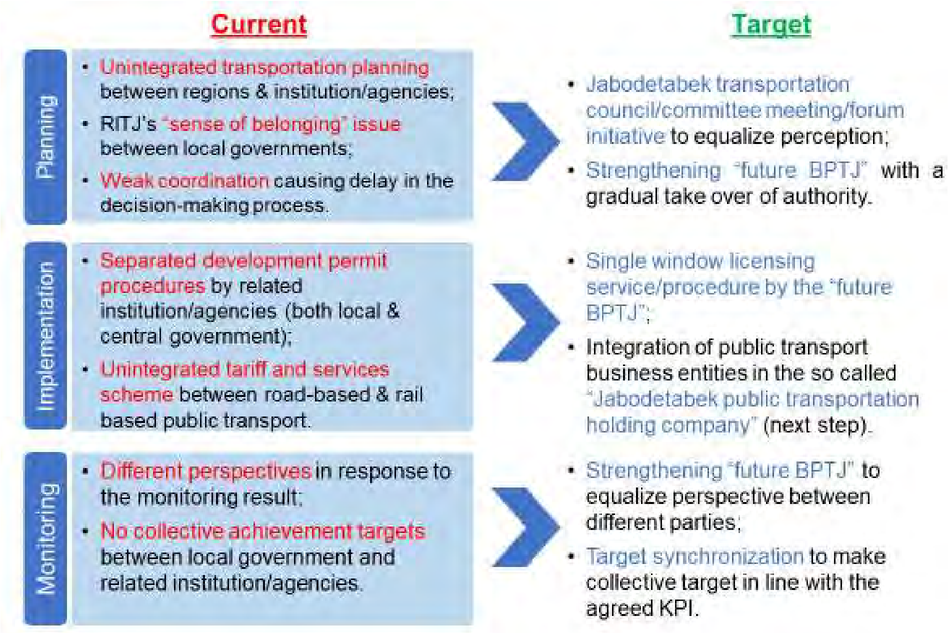


Source: JUTPI 2

Figure 321 Steps of Empowering BPTJ

An alternative body to enhance the capacity of current transportation authority is by establishing JABODETABEK Transit Authority (JTrA). Below is the general information of JTrA. Head of JABODETABEK Transit Authority is responsible to President. Main structure (technical directorate) is focusing on planning, implementation, and monitoring and evaluation process. Funding can be a combination of central government and local government budget. Eventually, this body is projected as an empowered BPTJ with a hosted and consolidated organization scheme.

As the RITJ is being undertaken, there are some ways forward to the integration of planning, implementation, and monitoring as depicted in Figure 322.



Source: JUTPI 2

Figure 322 Steps to Integration

Issues of the current planning process are regarding unintegrated transportation planning between regions and institution/agencies where the planning process is usually fragmented and sectionalized. Since *kota* and *kabupaten* have their own perspective about the spatial plan and transportation structure, RITJ's "sense of belonging" issues between local governments often occur. Moreover, weak coordination is causing delay in the decision-making process. In order to solve those issues, it is necessary to initiate a committee or council meeting for JABODETABEK transportation to equalize the perception. Furthermore, BPTJ will be strengthened in the future by gradually taking over the authority.

As for the implementation process, the current condition shows separation of development permit procedures by related institution/agencies of both local and central governments and unintegrated tariff and services scheme between road-based and rail-based public transport. In the future, it is envisaged that licensing will go to a single window service and that public transportation business entities will be integrated by the so-called JABODETABEK public transportation holding company in the next step.

Issues in monitoring process are bound in the different perspectives in response to the monitoring result. Besides, no collective achievement is targeted between local government and related institution/agencies. Therefore, strengthening the future BPTJ is important to equalize the perspective between different parties and synchronize the target in order to make collective target in line with agreed KPI.

11.3 Annual Monitoring and Evaluation Report (AMER)

During the master plan period, monitoring and evaluation on progress of the proposed projects are essential to achieve the objective of the master plan. The proposed projects should be evaluated in the degree of achievement. The contents and schedule of the master plan components should also be periodically reviewed to accommodate socioeconomic changes.

Analysis on the changes of socioeconomic activities and relevant factors related to transportation during the period from 2018, which is the base year for JUTPI 2 master plan study, to the year 2035 gave insight on the trend of urban transportation phenomena. Through the review and understanding on the progress and changes, it is confirmed that the goals for urban transportation system development identified in the previous JUTPI 1 master plan formulation are still valid for the JUTPI 2 proposed projects. To achieve policy direction of urban transportation system development, the following urban transportation development sectors are covered by JUTPI 2:

1) Road Network Development,
2) Railway System Development,
3) Improvement of Traffic Control System and Demand Management,
4) Improvement of Transportation Safety and Security,
5) Bus Transportation System and Intermodal Facility Development,
6) Measures in Urban Planning,
7) Freight Transportation System,
8) Institutional Setup and Reform,
9) Financial Arrangement, and
10) Environmental Betterment.

Table 97 JUTPI 2 Proposed Transportation Development by Sector and Program

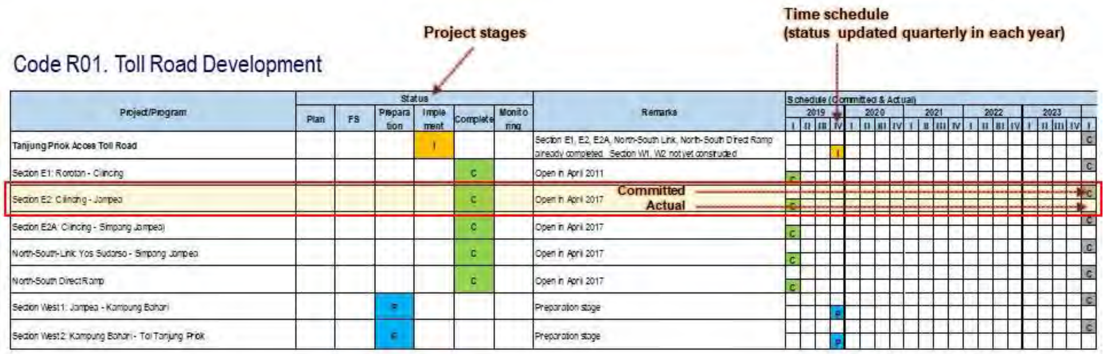
Sector	Program	Remarks
Road Network Development	Toll road development.	513 km
	Arterial road development.	265 km
	Arterial road improvement.	223 km
	Collector road development.	287 km
	Collector road improvement.	677 km
Railway System Development	Railway network development.	303 km
	Railway improvement.	120 km
	Railway station development (Type A).	31 locations
	Railway station development (Type B.)	9 locations
	Railway station development (Type B).	437 locations
Improvement of TCM and TDM	Electronic road pricing (including parking system).	1 program
Improvement of Transportation Safety and Security	Street lighting.	30,676 units
	Pedestrian path facility.	1,824 units
	Traffic light facility.	767 units

Sector	Program	Remarks
	Road signage	1,534 units
	Road and pedestrian design.	2 units
	Zebra crossing facility.	1,534 units
Bus Transportation System and Intermodal Facility Development	Existing BRT reorganization.	4 routes
	Feeder bus rationalization.	1,534 units
	Bus terminal development (Type A).	7 locations
	Bus terminal improvement (Type A).	2 locations
	Bus terminal development (Type B).	11 locations
	Bus terminal improvement (Type B).	4 locations
	Bus terminal development (Type C).	18 locations
	Bus terminal improvement (Type C).	6 locations
	New shelter development.	1,534 locations
Measures in Urban Planning	Parking building facility.	477 locations
	TOD.	11 locations
Freight System	Freight terminal development.	6 locations
Financial Arrangement	Revenue sharing rearrangement across level of governments.	1 program
	Introduction of road fund.	1 program
	Expand tax base.	1 program
	Fuel subsidy reduction and gradual increase of fuel tax.	1 program
Institutional Setup and Arrangement	Integrated training program on transportation planning for local government officers.	1 program
	Integrated management of public transportation operators.	1 program
Environmental Betterment	Promotion of low Sulphur diesel.	1 program
	Promotion of biofuel.	1 program

Source: JUTPI 2

Implementation schedule for the master plan up to year 2035 has been established from the result of 'road show' activity conducted by JUTPI 2 team to each *kabupaten/kota* in JABODETABEK, development plans in the transportation sector from the Spatial Planning (RTRW) documents, as well as the results of transportation modeling carried out based on the inputs from the results of various transportation surveys.

Annual Monitoring and Evaluation Report (AMER) monitors the delivery of the transportation program/project in achieving its objectives, targets, and outputs. The report (through the monitoring sheet) identifies the progress that has been made in order to help related parties to determine next step to achieve the completion target.



Source: JUTPI 2

Figure 323 AMER Monitoring Sheet

In the monitoring sheet of AMER, each transportation program/project is broken down into stages (plan, study/FS, preparation, implementation, complete, monitoring), and monitoring of the status of each transportation program/project will be carried out every quarter of a year. In the timeline, committed target year for each transportation program/project is stated as well as the actual progress by then.

It is expected that the designated institution (i.e., *Bappeda*) of each government will be responsible to complete the monitoring sheet and well aware of the actual condition of each transportation program/project within the region.