The Republic of Indonesia
Ministry of Public Works
Directorate General of Highways

Preparatory Survey for Metropolitan Arterial Road Improvement Project

Final Report

(Vol. 1 Main Report)

March 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.

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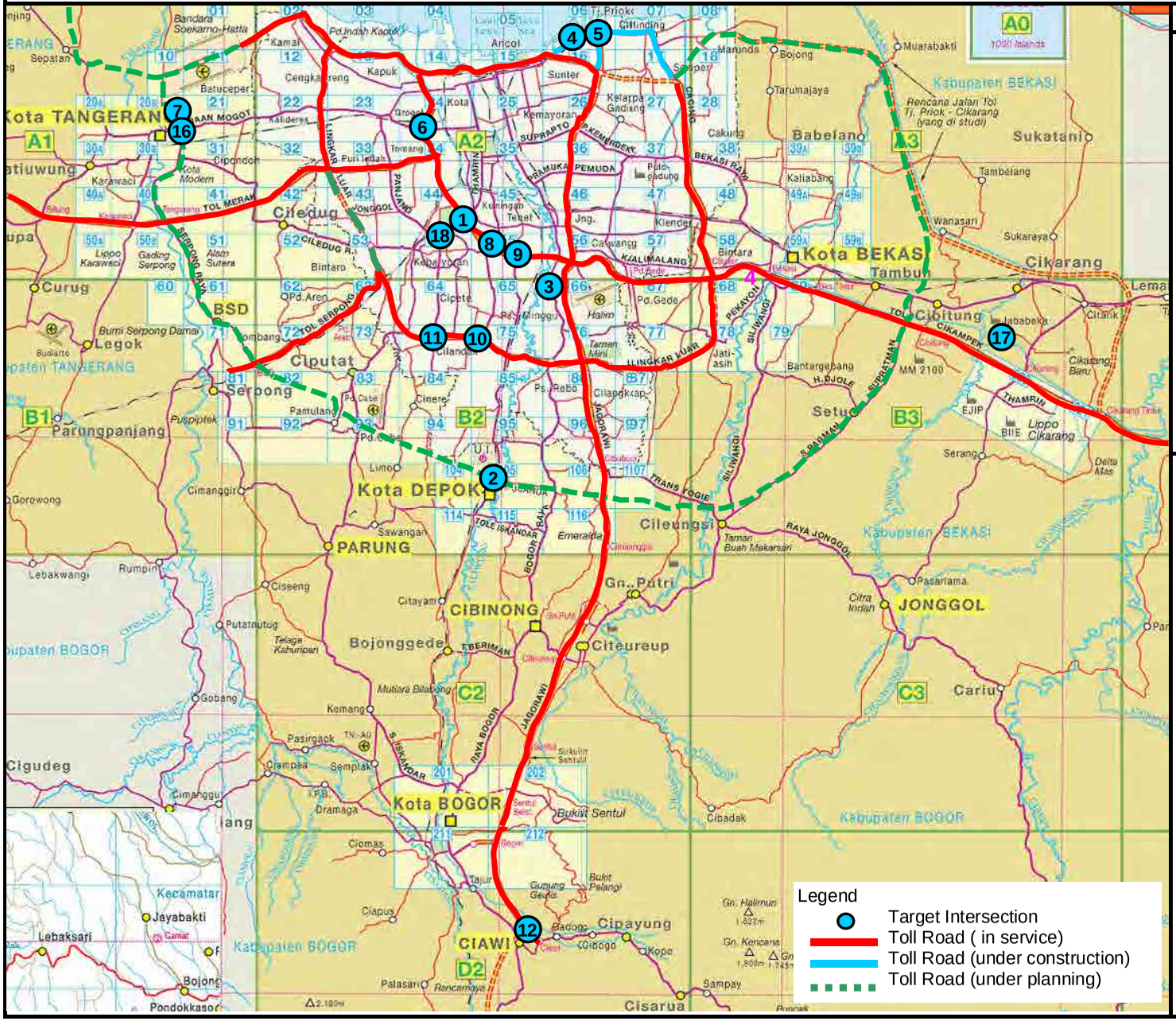
The following foreign exchange rate is applied in the study

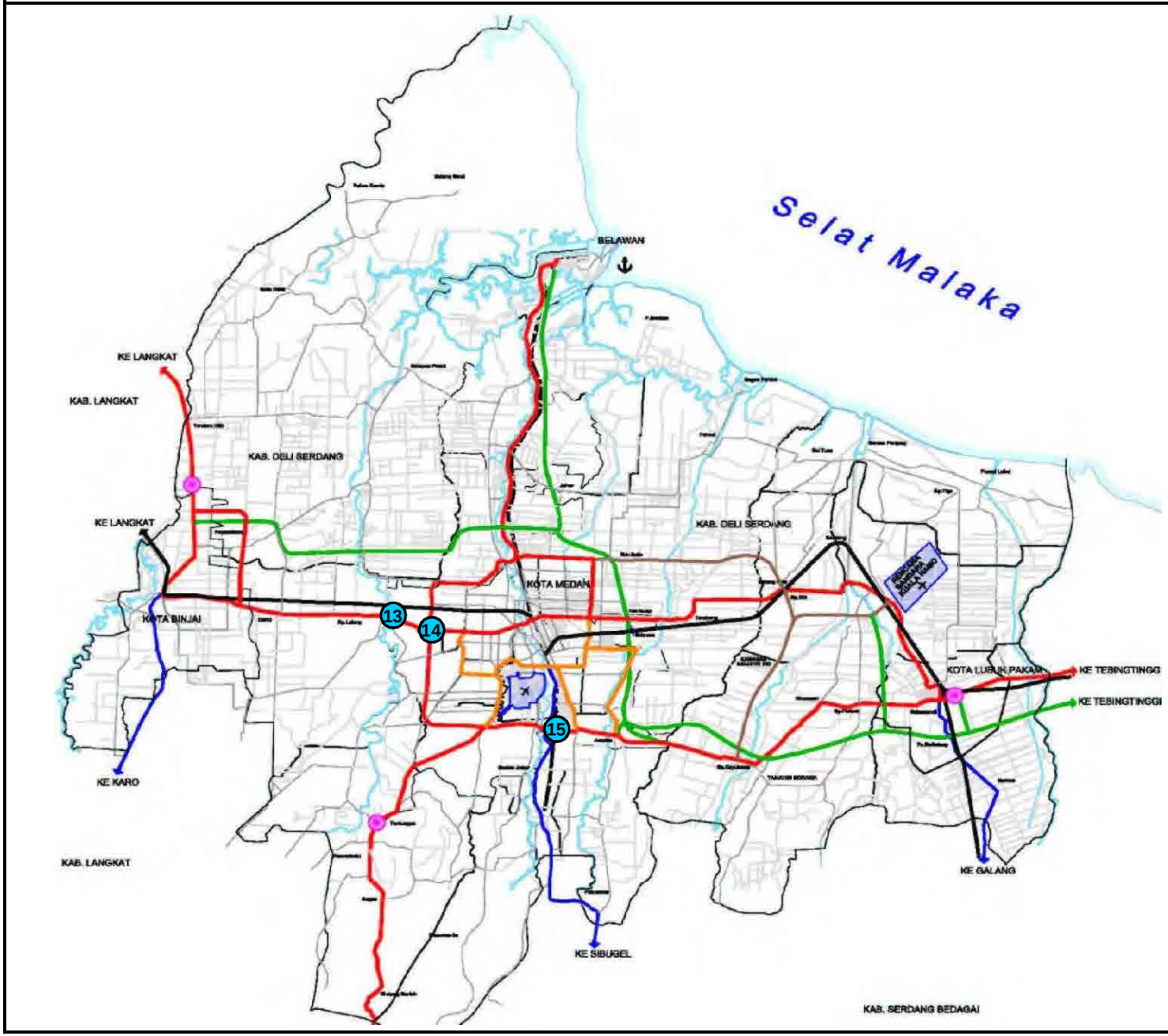
1 US dollar = 8,600 Rp, and 1 JP Yen = 104 Rp (May 2011)

Project Location Map (Jakarta Metropolitan Area)



No.	Project	Location
1.	Semanggi	DKI JKT
2.	Margonda Cinere	Depok City
3.	Cililitan	DKI JKT
4.	RE. Martadinata	DKI JKT
5.	Sulawesi	DKI JKT
6.	Latumenten	DKI JKT
7.	Sudirman Daan Mogot	Tangerang City
8.	Kuningan	DKI JKT
9.	Pancoran	DKI JKT
10.	Cilandak	DKI JKT
11.	Fatmawati	DKI JKT
12.	Ciawai-Bogor	Bogor City
16.	Sudirman-2	Tangerang City
17.	Cikarang	Bekasi Regency
18.	Senayan	DKI JKT

Project Location Map (Medan)



No.	Project
13.	Pinang Baris
14.	Asrama - Gatot Subroto
15.	Katamso

Target Intersection

Abbreviation

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transport Officials
ADB	Asian Development Bank
ADT	Average Daily Traffic
AMDAL	Analisis Mengenai DAmpak Lingkungan (Environmental Impact Assessment)
ANDAL	ANalisis DAmpak Lingkungan (Environmental and Social Impacts Assessment Report)
B/C	Benefit-Cost ratio
B/D	Basic Design
BOO	Build Own Operate
BOT	Build Operate Transfer
BOOT	Build Own Operate and Transfer
BPN	Badan Pertanahan Nasional (the National Land Board Agency)
CBR	California Bearing Ratio
DCP	Dynamic Cone Penetration
D/D	Detail Design
DGH	Directorate General of Highways
DGLT	Directorate General of Land Transportation
DGST	Directorate General of Sea Transportation
DGR	Directorate General of Railway
DKI	Daerah Khusus Igukota (Special Capital District)
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
FC	Foreign Currency
FLARAP	the Framework of Land Acquisition and Resettlement Acton Plan
FO	FlyOver
F/S	Feasibility Study
GDP	Gross Domestic Product
GNI	Gross National Income
GOI	Government Of Indonesia
GOJ	Government Of Japan
GPRS	General Packet Radio Service
GPS	Global Positioning System
H.W.L	High Water Level
IC	Interchange
ICB	International Competitive Bidding
IRI	International Roughness Index
IRR	Internal Rate of Return
JABODETABEK	JAkarta, BOgor, DEpok, TAngerang BEKasi

JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JIUT	Jakarta Inner Urban Toll road
JORR	Jakarta Outer Ring Road
JORR2	2nd Jakarta Outer Ring Road
JST	JICA Survey Team
JUTPI	Jabodetabek Urban Transportation Policy Integration
LARAP	Land Acquisition and Resettlement Acton Plan
LC	Local Currency
LPC	Land Procurement Committee
LRP	Livelihood Restoration Program
MARIP	Metropolitan Arterial Road Improvement Project
M/D	Minutes of Discussion
MOF	Ministry of Finance
MOU	Minutes of Understanding
MPW	Ministry of Public Works
MRT	Mass Rapid Transit
NGO	Non-Governmental Organization
NPV	Net Present Value
NSPM	Norma Standr Pedoman Manual (Design Standards for Structures)
OD	Origin and Destination
ODA	Official Development Assistance
OM	Operation and Maintenance
PC	Prestressed Concrete
PCU	Passenger Car Unit
PELINDO	PELabuhan INDOnesia (Indonesian Port)
PPP	Public-Private Partnership
PU	Ministry of Public Works (Pekerjaan Umum)
LARAP	Land Acquisition and Resettlement Action Plan
RC	Reinforced Concrete
RENSTRA	RENcana STRAtegis (Strategic Plan)
RKL	Rencana Pengelolaan Lingkungan hidup (Environmental Management Plan)
ROW	Right of Way
RPJM	Rencana Pembangunan Jangka Menengah (GOI's Midterm Development Plan)
RPL	Rencana Pemantauan Lingkungan hidup (Environmental Monitoring Plan)
SITRAMP	Study on Integrated Transportation Master Plan for Jabodetabek
SPT	Standard Penetration Test
TgPA	TanjunG Priok Access road
TgPP	TanjunG Priok international Port
TOR	Terms of Reference
TTC	Travel Time Cost

UARI	Urban Arterial Roads Improvement in metropolitan and large cites project
UKL	Upaya Pengelolaan Lingkungan hidup (Environmental Management)
UP	UnderPass
UPL	Upaya Pemantauan Lingkungan hidup (Environmental Monitoring)
VOC	Vehicle Operation Cost

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CHAPTER 1. INTRODUCTION

1.1 Background

1.1.1 Status of Study Area

The population of JABODETABEK increased l.4 times over the past 15 years, from approximately 17 million in 1990 to 24 million in 2005 (an average of approx. 2% per year). The population of JABODETABEK and Medan has significantly increased. Along with this increase in population, the volume of traffic from the areas around JABODETABEK has been growing steadily, and a further increase in the volume of traffic is being predicted. The volume of movement in JABODETABEK is already significant, and it is highly dependent on road transportation (98%). The number of registered motor vehicles in JABODETABEK increased approx. 2.4 times from approx. 3.26 million in 2000 to 7.97 million in 2006, which raised concerns about further traffic congestion.

Recently, countermeasures for traffic congestion have been conducted such as Jakarta Outer Ring Road, enhancement of road capacity, and a traffic demand management policy, but traffic congestion in this area is still a serious issue and causes significant economic and natural/social environmental losses through the deterioration of the investment environment or the delay of access to the port, airport and railway. To improve the above issues at candidate subprojects described detail in chapter-2, the improvement of bottleneck is required.

On the other hand, Medan is the fourth largest city in Indonesia with a population of approximately 2.1 million in 2009, and it is the largest in Sumatra Island. It is highly dependent on road transportation, and the number of registered motor vehicles in Medan is about 2.7 million in 2009, of which 85% is motorcycle. Thus, the number of registered motor vehicles is larger than the population, and it is further increasing at a rate of 11% per year. In major intersections such as Katamso, Pinang Baris, Pos, Sisingamangaraja, Amplas, Juanda, Aksara, and Setiabudi, the average volume-to-capacity (V/C) ratio reaches 0.8 on weekdays. Traffic congestion is unavoidable in Medan, and it has become a serious issue on the arterial roads in the city.

According to the GOI's Midterm Development Plan PPJM (2010-2014), the increase of transportation capacity is required and this project, for improving the road capacity in JABODETABEK and Medan is highly prioritized.

1.1.2 Economic Activities

There are many bottlenecks in JABODETABEK because serious traffic congestion occurs at large-scale intersections and expressway ramps due to booming economic activities. Also major logistics in JABODETABEK occur from/to industrial zones which are located at Jakarta port and the along the toll road from Jakarta to the suburban areas, therefore, congestion tends to take place at major intersections on the logistic route. Major industrial parks in JABODETABEK are shown in Figure 1.1.1.

1	Jakarta Industrial Estate Pulogadung	JIEP
2	Kawasan Bonded Zone (Cakung)	KBN
3	Kawasan Bonded Zone (Tanjung Priok)	KBN
4	Kawasan Bonded Zone (Marunda)	KBN
5	Cilandak Commercial Estate	CCE
6	CCM Balaraja Industrial Estate	CCME
7	Jababeka Industrial Park	JIEC
8	MM2100 Industrial Town	MM2100
9	Bekasi International Industrial Estate(BIIE)	BIIE
10	Bekasi International Industrial Estate	LC
11	East Jakarta Industrial Park(EJIP)	EJIP
12	Karawang International Industrial City	KIIC
13	Suryacipta City of Industry	SCI
14	Bukit Indah Industrial Park	BIIP
15	Kawasan Industri Mitrakarawang	KIM
16	Cibinong Center Industrial Estate	CCIE
17	Greenland International Industrial Center	
18	Lippo Cikarang Industrial Park	
19	Kawasan Industri Kujang Cikampek	
20	Kawasan Industri Sentul	KIS
21	Pasar Kemis Industrial Estate	
22	Millennium Industrial Estate	MIE
23	Kawasan Industri & Pergudangn Cikupamas	KIPC
24	CCM Balaraja Industrial Estate	CCMIE
25	Taman Tekno Bumi Serpong Damai	TTBSD

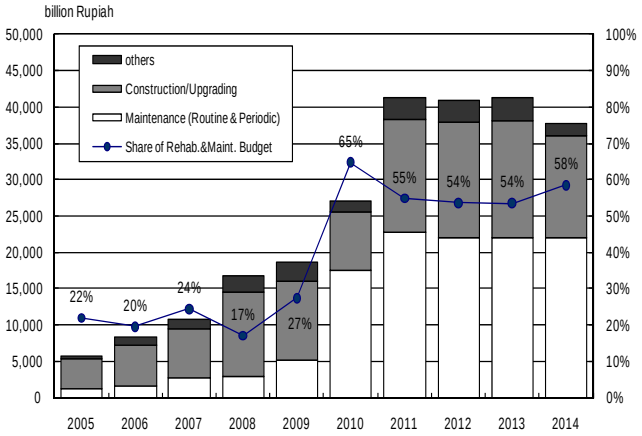
Source: JICA Survey Team

Figure 1.1.1 Major Industrial Parks in JABODETABEK

1.1.3 Road Sector Budget

According to the last GOI's Midterm Development Plan RPJM (2005-2009) and the current RPJM (2010-2014), the changes in the annual road sector budget (RENSTRA) are shown in Figure 1.1.2.

The road sector budget will be increased in the next five years mainly by the large jump in maintenance and rehabilitation budget. But the budget for new construction and road widening is also increased, and therefore road development will surely support the booming economic activities of Indonesia.



Source: DGH, MPW

Figure 1.1.2 Annual Road Sector Budget

The component of the road sector budget (RENSTRA: 2010-2014) in Table 1.1.1, for construction of flyovers and underpasses (item 2-2) over the next five years totals Rp 7,861 bil. (USD 800 mil) including foreign loans, and therefore traffic congestion in metropolitan areas have a planned solution. An especially large budget is requested in 2012-2013, and new flyover/underpass projects may be expected for implementation by foreign loan after this study is completed.

Table 1.1.1 Component of Road Sector Budget (RENSTRA: 2010-2014)

Program		Total 2010-2014	Budget (Billion IDR) 2010	2011	2012	2013	2014
Total (A+B+C) (Preservation + Construction)		***188,339.37***	***27,097.35***	***41,384.45***	***39,210.15***	***41,210.84***	***37,787.25***
A. *Kegiatan Preservasi/* Preservation		*106,292.72*	*17,541.34*	*22,692.93*	*21,919.36*	*22,051.16*	*22,087.93*
1	*Presevasi Jalan/* Road Preservation	*78,393.47*	*12,567.54*	*16,961.57*	*16,188.00*	*16,319.79*	*16,356.57*
1-1	*Pemeliharaan Jalan* Maintenance[1]	6,920.75	1,336.14	1,398.89	1,392.74	1,391.97	1,401.02
1-2	*Rehabilitasi/ Berkala Jalan* Rehabilitation/ Periodic	36,756.28	6,146.58	7,589.07	7,673.54	7,673.54	7,673.54
1-3	*Rekonstruksi/ Peningkatan Struktur Jalan* Reconstruction/ Improvement (incl. loan)	32,716.44	4,784.82	7,623.61	6,721.72	6,804.28	6,782.01
1-4	*Pananganan Tanggap Darurat* Emergency Response	2,000.00	300.00	350.00	400.00	450.00	500.00
2	*Preservasi Jembatan/* Bridge Preservation	27,899.25	4,973.80	5,731.36	5,731.36	5,731.36	5,731.36
2-1	*Pemeliharaan Jembatan* Maintenance	6,687.82	1,222.91	1,366.23	1,366.23	1,366.23	1,366.23
2-2	*Rehabilitasi/ Berkala Jembatan* Rehabilitation/ Periodic	9,091.37	1,572.58	1,879.70	1,879.70	1,879.70	1,879.70
2-3	*Penggantian Jembatan* Replacement	12,120.06	2,178.32	2,485.44	2,485.44	2,485.44	2,485.44
B. *Pembangunan/* Construction		*74,178.94*	*8,285.60*	*17,042.20*	*17,290.78*	*17,510.36*	*14,050.00*
1	*Pembangunan Jalan/* Road Development	*48,827.66*	*5,147.74*	*11,252.01*	*11,342.67*	*11,168.37*	*9,916.87*
1-1	*Pelebaran Jalan* Widening (incl. Loan)	43,159.47	3,354.61	9,498.19	10,184.56	10,526.03	9,596.07
1-2	*Jalan Lingkar/ Bypass* Ring Road/ Bypass	1,107.00	32.00	135.00	324.40	378.80	236.80
1-3	*Pembangunan Jalan* Construction (incl. Loan)	4,561.19	1,761.13.	1,618.81	833.71	263.54	84.00
2	*Pembangunan Jembatan/* Bridge Construction	*11,208.28*	*1,442.368*	*2,335.33*	*2,594.79*	*2,800.47*	*2,035.00*
2-1	*Pembangunan Jembatan* Construction (incl. Loan)	3,147.25	467.25	675.23	676.29	671.47	657.00
2-2	*Pembangunan Flyover/ Underpass* Flyover/ Underpass (incl. Loan)	7,861.03	875.43	1,560.10	1,918.50	2,129.00	1,378.00
2-3	*Pembangunan Terowongan* Tunnel	200.00	100.00	100.00	-	-	-
2	*Jalan/ Jembatan Strategis/* Road/ Bridge Strategic	*9,813.50*	*1,421.00*	*2,098.13*	*2,098.13*	*2,098.13*	*2,098.13*
3	*Non Fisik (Konsultan, Alat, Training DLL) /* Consultant, Equipment, Training	*4,329.51*	*274.18*	*1,356.73*	*1,255.20*	*1,443.40*	-
C. *Pembinaan/* Administration		*7,867.70*	*1,270.41*	*1,649.32*	*1,649.32*	*1,649.32*	*1,649.32*

Source: RENSTRA: 2010-2014

1.2 Objective

1.2.1 The Past Projects

As mentioned in the section on the background, road traffic congestion in JABODETABEK has continued for more than a decade. Therefore the Urban Arterial Road Improvement Project (UARI, 1998-2008) was implemented under JBIC Loan to construct flyovers and underpasses at 12 intersections and railway crossings in this area.

Source: JICA Survey Team

Figure 1.2.1 Flyover and Underpass in UARI Project

1.2.2 Objective of the Study

The objective and outcome of this study are summarized in Table 1.2.1 and new projects which are similar to the past projects are expected for implementation after this study is completed.

Table 1.2.1 Objective of the Study

Overall Goal	Sustainable growth through private sector initiative can be realized by the expansion of investment opportunities, and economic growth can be generated from the improvement of road traffic infrastructure.
Project Goal	Alleviation of the traffic congestion at heavily congested intersections and railway crossings on major road networks in JABODETABEK and Medan can be realized by construction of grade separated intersections and other countermeasures.
Project Area	Original potential projects : JABODETABEK 12 places Medan (North Sumatra) 2 places Additional potential projects : will be added based on the interviews with related entities
Counterpart Agency	Directorate General of Highway, Ministry of Public Works : DGH, MPW
Study Objective	To conduct Feasibility Studies on grade separation and other countermeasures at congested intersections and railway crossings on major road networks in JABODETABEK and Medan To confirm the necessity and reasonability of loan projects and to prepare several project implementations from the technical, economic/financial, environmental/social view points
Expected Outcome	Based on the implementation program prepared in this study, new projects similar to the past projects will be realized and bottlenecks of major road networks in JABODETABEK and Medan will be alleviated.

Source: JICA Survey Team

1.3 Methodology

1.3.1 Study Flow

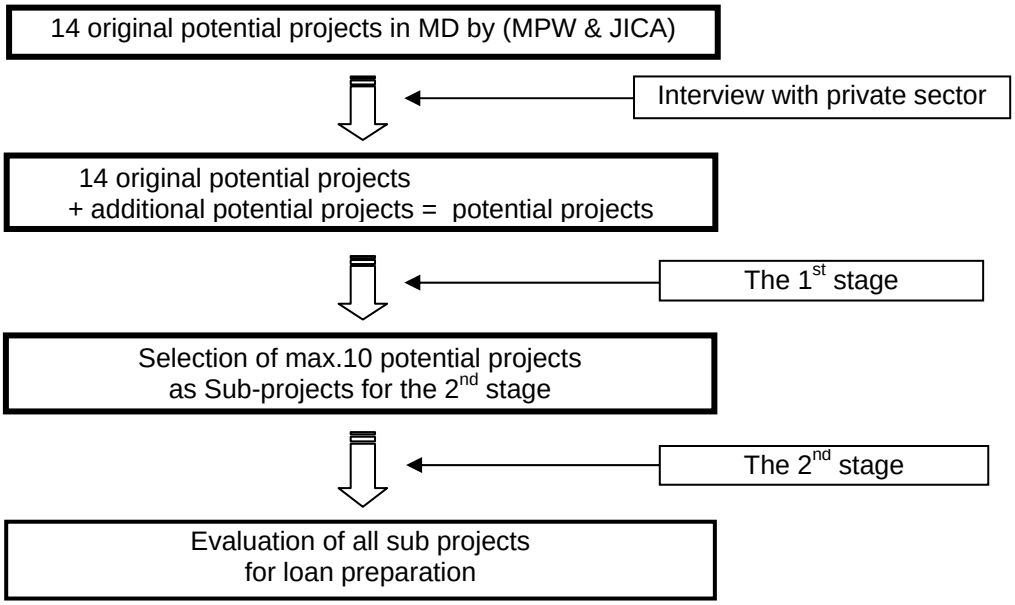
This study generally consists of two stages as shown in Figure 1.3.1., and the detail of each stage is summarized in Figure 1.3.3-Figure 1.3.4.

The 1st stage: Selection of Sub-projects

From all potential projects, 14 original potential projects in MD and additional potential projects based on interviews with the private sector, the study team will select a maximum of 10 potential projects as Sub-projects which go into the 2nd stage.

The 2nd stage: Evaluation of Sub-projects

With the result of surveys (topo-, geo-, traffic) for selected Sub-projects, the study team conducts basic design, cost estimation and EIRR for each sub-project. Then all sub-projects are evaluated and ranked by using multi criteria analysis which was set in the 1st stage.



Source: JICA Survey Team

Figure 1.3.1 General Study Flow

1.3.2 Study Members and Flow Chart

The study members and assignments are listed in Table 1.3.1, and the study flow chart is summarized in Figure 1.3.2.

Table 1.3.1 Members of the Study Team

Name	Assignment
Mr. Yuichi WAKITA	Team Leader
Dr. Sadayuki YAGI	Transportation Planner (1)
Mr. Takayoshi ITO	Transportation Planner (2)
Mr. Tsuyoshi NAKAJIMA	Highways and Intersections
Mr. Masataka FUJIKUMA	Bridges and Structures (1)
Mr. Yusuke SUZUKI	Bridges and Structures (2)
Mr. Haruo TAKEDA	Project Cost Estimation
Mr. Hironori KUROKI	Natural Environment
Mr. Shigeru SAI	Social Environment

Source: JICA Survey Team

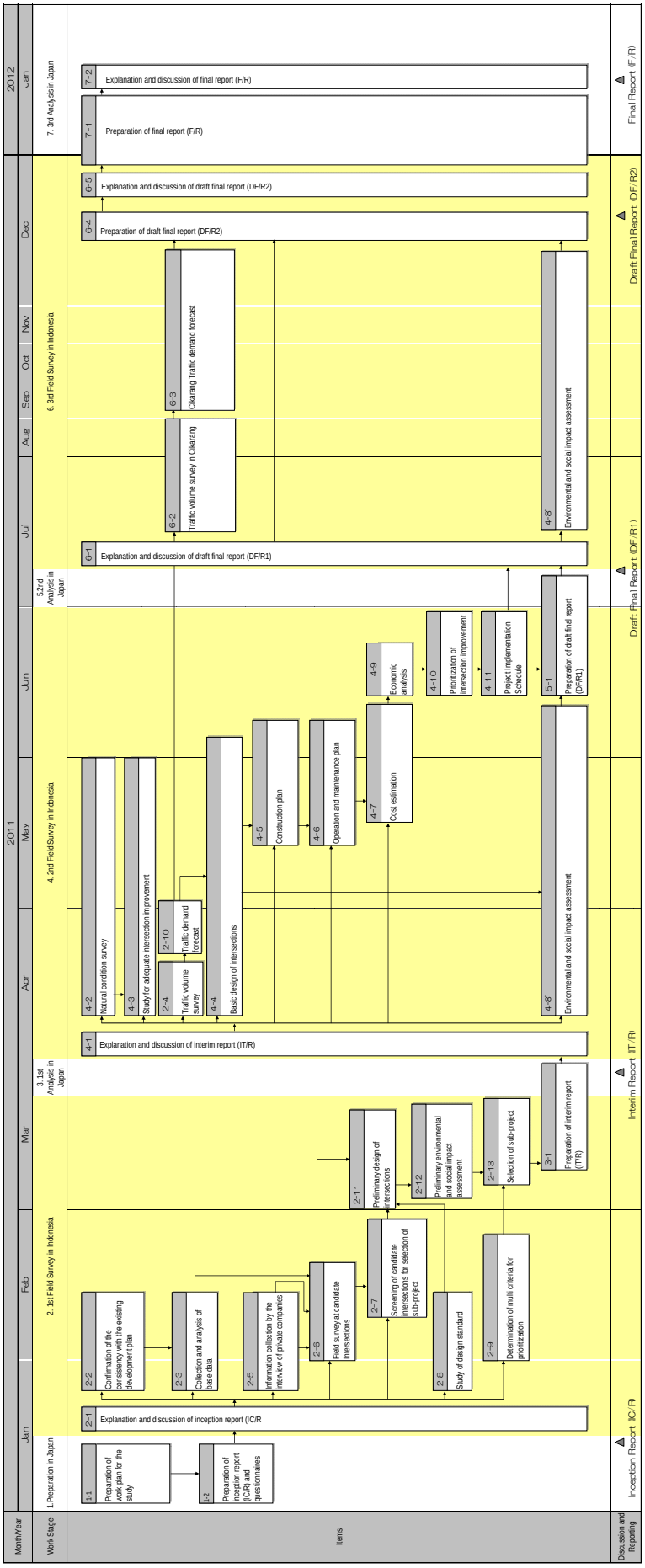


Figure 1.3.2 General Study Flow

Source: JICA Survey Team

1.3.3 Selection of Sub-projects in the 1st Stage

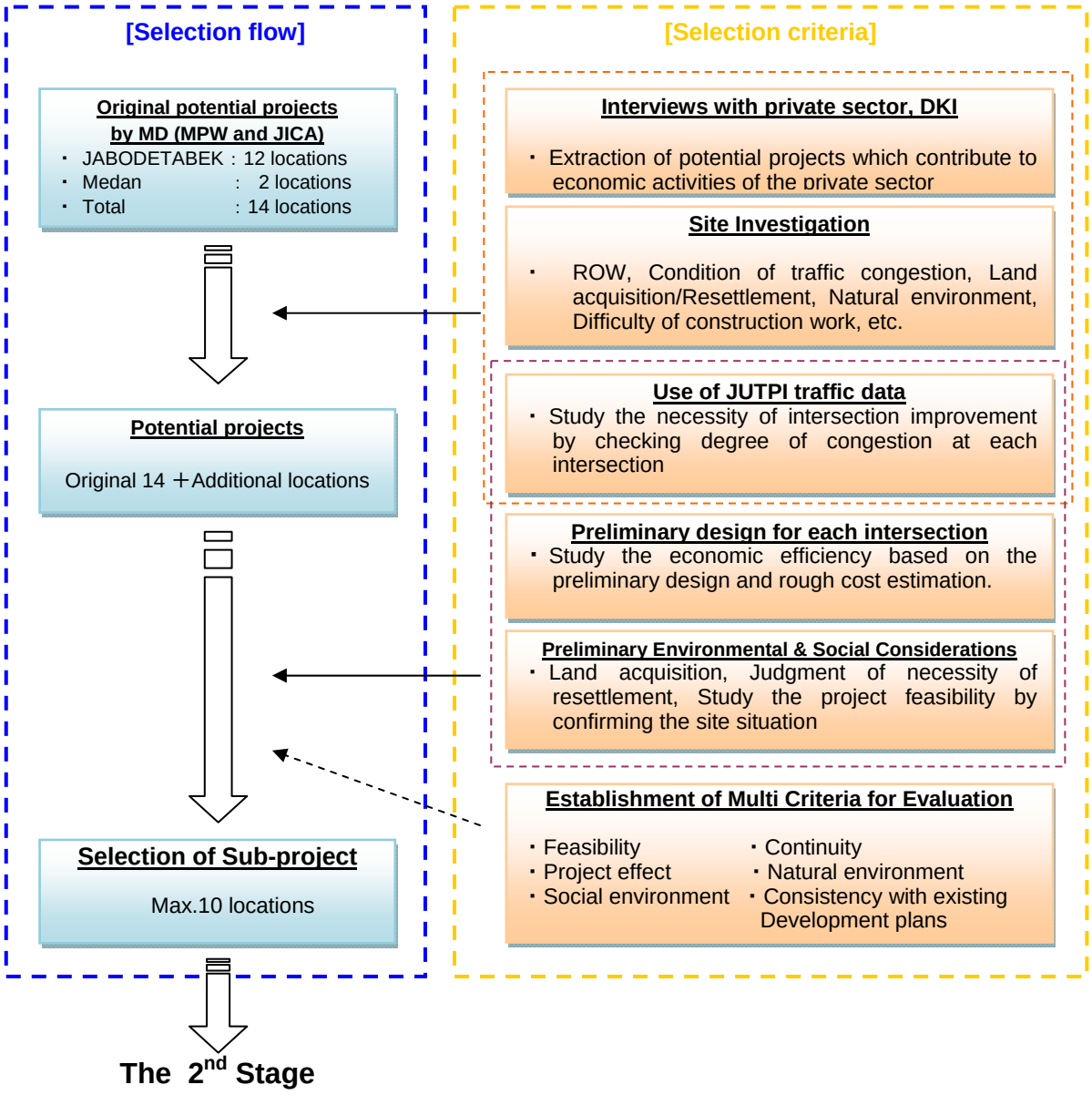
In the 1st stage, the Study Team will carry out interviews with representatives of the private sectors, DKI and other related entities, and conduct a field survey and utilization of existing traffic data of JUTPI in order to add potential projects to the original 14 potential projects by MD (MPW and JICA).

Next the Study Team will establish Multi Criteria which will be used for the evaluation of sub-projects in the 2nd stage, and the Multi Criteria will be adopted as much as possible in the selection of sub-projects in the 1st stage.

Finally, potential projects will be selected as Sub-projects mainly from the following viewpoints utilizing the Multi Criteria.

- Necessity : Necessity of intersection improvement using JUTPI traffic data
- Economy: Economic efficiency based on preliminary design and rough cost estimates
- Feasibility: Project feasibility based on preliminary environmental and social considerations

Selection flow and selection criteria in the 1st stage are shown in Figure 1.3.3.



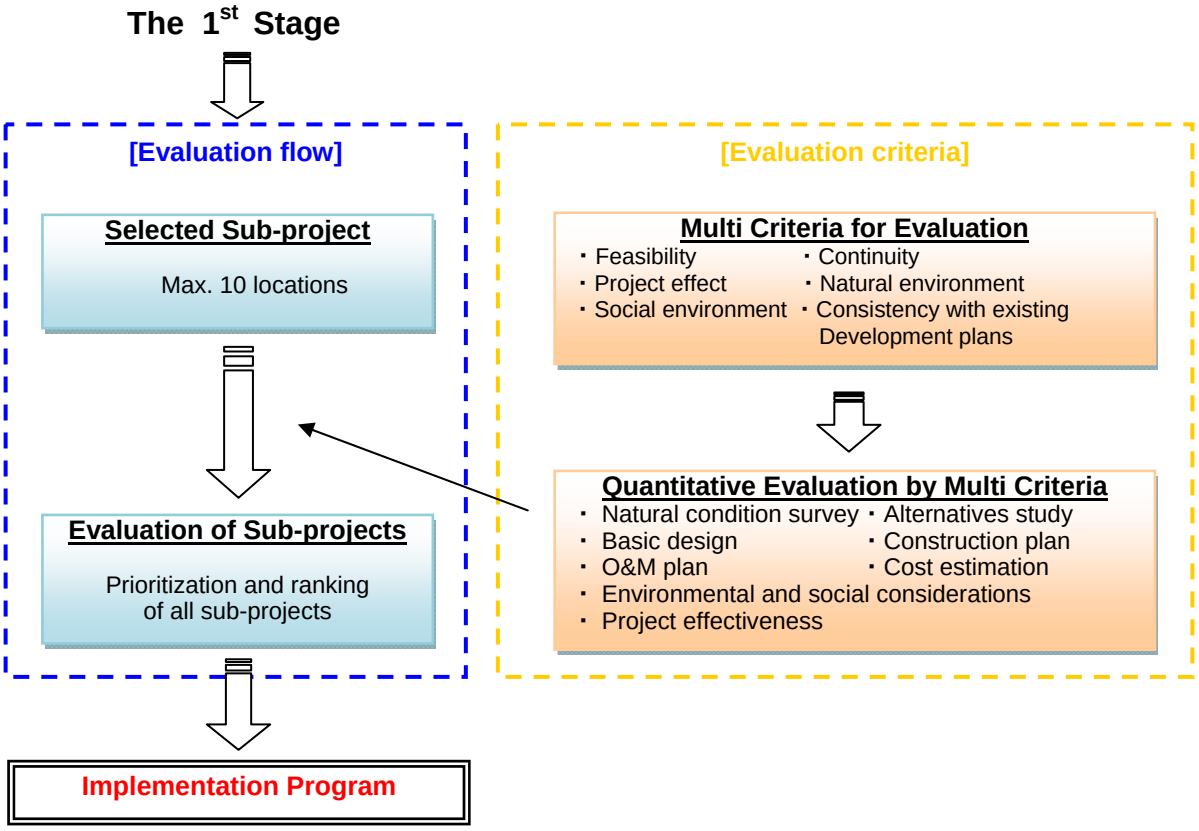
Source: JICA Survey Team

Figure 1.3.3 Selection Flow in the 1st Stage

1.3.4 Evaluation of Sub-projects in the 2nd Stage

In the 2nd stage, the multi criteria analysis will be applied on the sub-projects which were selected in the 1st stage, and evaluation of each Sub-project will be done. In this stage, a natural condition survey, intersection alternative comparison study, basic design, cost estimates, EIRR calculation and environmental/social considerations will be conducted.

For the goal of this study, the several scenarios of the implementation program will be prepared for loan preparation. In each scenario, Sub projects will be chosen from the high-prioritized sub-projects and also by GOI's budget request (Blue Book by MOF). The evaluation flow and evaluation criteria in the 2nd stage are shown in Figure 1.3.4.



Source: JICA Survey Team

Figure 1.3.4 Evaluation Flow in the 2nd Stage

CHAPTER 2. SELECTION OF SUB-PROJECTS

2.1 Nomination of Potential Projects

According to the Minutes of Discussion (M/D) between JICA and MPW, 14 original potential projects were nominated in JABODETABEK and Medan in Sumatra.

In addition, the JICA Survey Team has conducted interviews with the related entities to correct the specific needs for road improvement by the grade separation. The interviewed entities are as follows.

Table 2.1.1 Interview List

Interviewee	Purpose of interview
Directorate General of Railway (DGR)	The grade separation for the railway crossings with the roads is currently one of the highest priorities in terms of the infrastructural development in Indonesia. The interview was conducted to confirm the necessity of grade separation, the location of prioritized railway crossing points and the future development plan of the railway.
DKI	The traffic congestion occurs not only on the national road but also on the provincial roads administrated by DKI in JABODETABEK . The interview was conducted to confirm the location of congested intersections and road development plans.
Cikarang Industrial Park	The development and expansion of Cikarang industrial area in Bekasi Regency is rapidly progressing by Indonesian, Japanese and Korean investments in these days. Consequently, the traffic congestion at the interchange, arterial road and even minor local roads has been one of the significant issues which has become an obstacle to economic activities. The interview was conducted with the directors of the industrial park to confirm the further bottleneck points or sections on the road network. Therefore, the road development plan and contents of MOU regarding the road improvement concluded with MPW in 2006.

Source: JICA Survey Team

Based on the above interviews, the following 4 additional potential projects are nominated.

- Katamso (Medan City)

  According to the meeting with the chief of MPW in Medan, Katamso intersection has the highest priority within Medan City. As the necessity based on the development plan and the site investigation is confirmed, this project is nominated as one of the potential projects.

- Sudirman II (Tangerang City)

  Sudirman II is located on the trunk road to access to the international airport. MPW explains that this road needs to be upgraded to improve the accessibility for the airport and remove the railway crossing. Two nearby intersections on the same road are already grade-separated by flyovers in UARI project under JBIC fund in 2007.

- Cikarang (Bekasi Regency)

  The traffic congestion in Cikarang Industrial Area is severe due to the booming industrial activities. The mitigation of congestion is strongly requested from both the Indonesian and Japanese governments. In the site investigation, the huge traffic volume beyond the road capacity and the deterioration of road pavement by heavy trucks were confirmed. Uncompleted section by MOU (2006) is selected as the potential project.

- Senayan (DKI)

  The project for flyover and underpass construction on Blok M and Antasari road by DKI started at the end of 2010. When the new flyover is constructed, it is expected that traffic congestion will occur at the end point of the new underpass on Jl. Patimura near Senayan intersection which is already congested.

  Table 2.1.2 shows the list of 18 potential projects.

Table 2.1.2 List of Potential Projects

Project	Location	Remarks
1. Semanggi	DKI	M/D
2. Margonda Cinere	Depok City	M/D
3. Cililitan	DKI	M/D
4. R.E.Martadinata	DKI	M/D
5. Sulawesi - Tg.PA	DKI	M/D
6. Latumenten	DKI	M/D
7. Sudirman-Daan Mogot	Tangerang City	M/D
8. Kuningan	DKI	M/D
9. Pancoran	DKI	M/D
10. Cilandak	DKI	M/D
11. Fatmawati	DKI	M/D
12. Ciawi-Bogor	Bogor Regency	M/D
13. Pinang Baris	Medan City	M/D
14. Asrama-Gatot Subroto	Medan City	M/D
15. Katamso	Medan City	Request from DGH and Medan
16. Sudirman II	Tangerang City	Request from DGH
17. Cikarang	Bekasi Regency	Request from DGH and Cikarang Industrial Estates
18. Senayan	DKI	Request from DGH and DKI

Source: JICA Survey Team

2.2 Site Conditions of Potential Projects

The JICA Survey Team conducted the site investigations for all potential project sites in January and February, 2011. The investigation viewpoints and the site condition of each potential project are described as follows. The site descriptions of each potential project with photos are attached in **Appendix 2**.

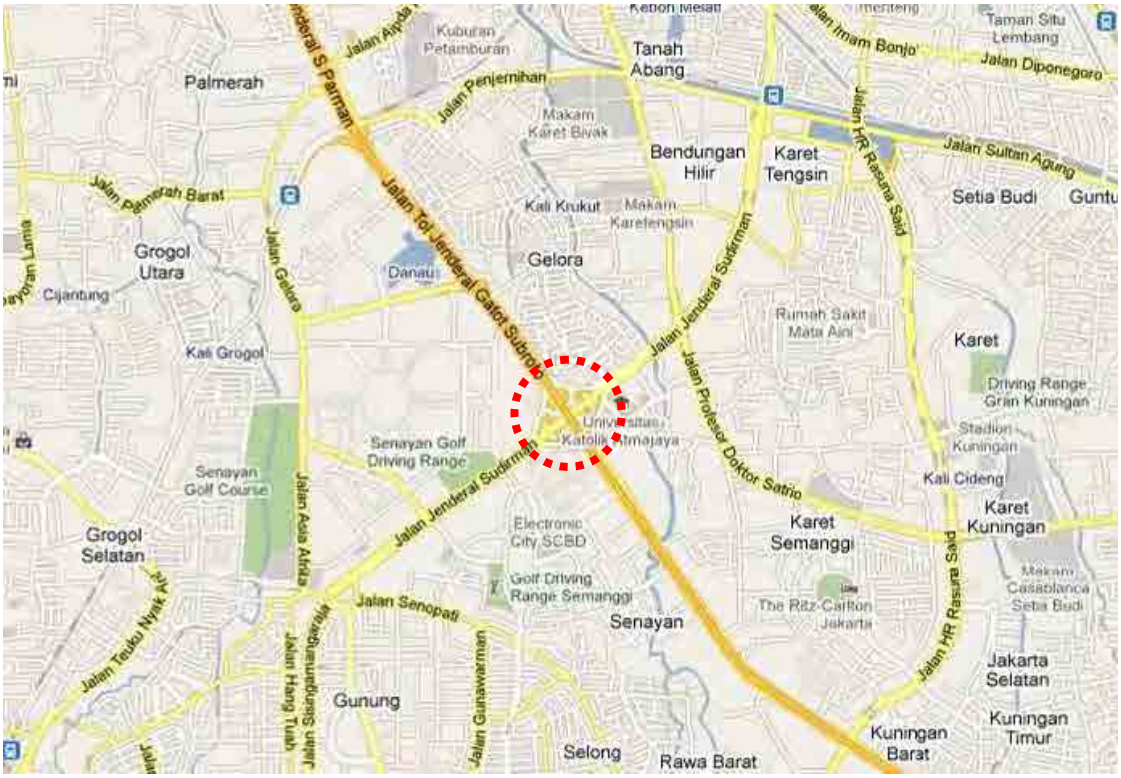
- Investigation viewpoints
- Configuration of road and intersection
- Type of existing structures
- Control points (Houses, shops, public facilities, religious facilities, Bus ways shelters, railways, utilities, rivers, etc.)
- Traffic flow
- Condition of traffic congestion

(1) Semanggi

Semanggi junction is formed by the main trunk road, Jl. Sudirman, and Jl. Gatot Subroto parallel to Jakarta Inner Urban Toll Road (JIUT) which crosses perpendicularly above Jl. Sudirman. It is the clover leaf type junction and a symbolic landmark in JABODETABEK.

Jl. Sudirman, a provincial road, has an 8-lane carriageway with the frontage road on both sides isolated by the buffer and the center lane is used exclusively as a bus way, Trans Jakarta. JIUT is a 6-lane toll road and Jl. Gatot Subroto, a national road, has 3-lanes on each side. On and off ramps are placed at both ends of the junction and the bus way was opened on Jl. Gatot Subroto at the end of 2010. The junction is composed of the arterial roads and ramps while the diverted roads pass through the side and under the ramp.

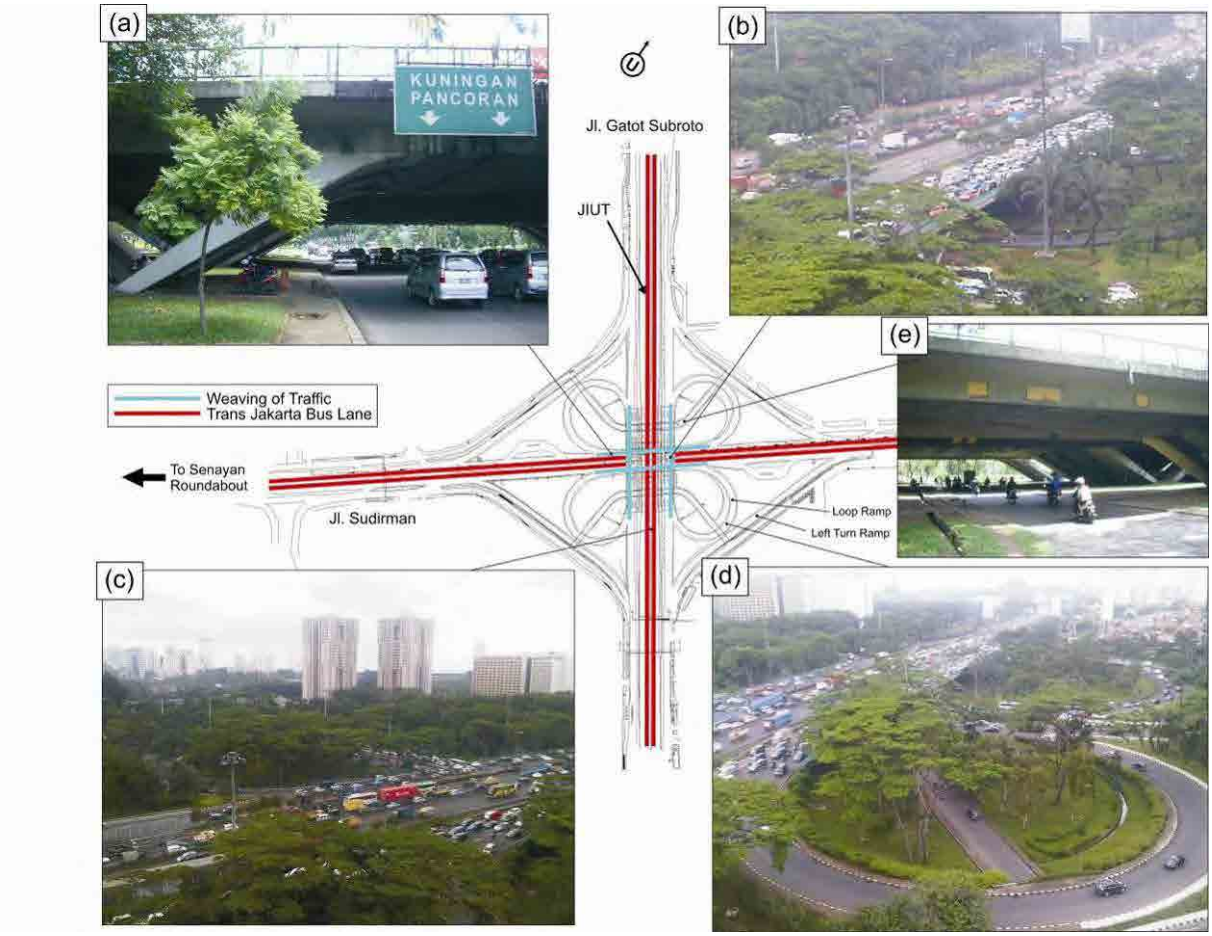
The junction is located in an urban area and surrounded by high-rise buildings, such as Seltan Hotel on the west side and Semanggi Plaza on the east side. MRT is planned to open underneath Jl. Sudirman.



Source: Google Map

Figure 2.2.1 Location Map of Semanggi Intersection

- It is a clover-leaf type intersection (see photo (d)). Intervals between the loop ramps are short, and weaving of traffic to/from the loop ramps causes traffic congestion on both Jl. Sudirman and Jl. Gatot Subroto (see photo (b)).
- Capacity of Jl. Sudirman is short since the centermost traffic lanes have been used as dedicated bus lanes (two ways). However, these bus lanes will be available again after the current MRT project is completed in November, 2016.
- Traffic flow may change and traffic congestion may be alleviated after the currently ongoing elevated non-toll road project has been completed on Jl. Casablanca.
- Even if the traffic congestion in Semanggi is alleviated, another bottleneck may occur around Senayan roundabout. Additional traffic may be generated after the currently ongoing elevated non-toll road project has been completed on Jl. Antasari.



Source: JICA Survey Team

Figure 2.2.2 Photos of Semanggi Intersection

(2) Margonda Cinere

The project site of Margonda Cinere is located in the south of DKI. Jl. Margonda with 6-lanes is connected with the 6-lanes of Jl. Ir. H. Juanda by a T-shape intersection and both roads are designated as National roads. Bogor railway line passes through about 250m to the west. There is only an unpaved alley between the intersection and the railway crossing but the road on the east side of the railway line is not available for vehicles. A gas pipeline is laid along the railway line.

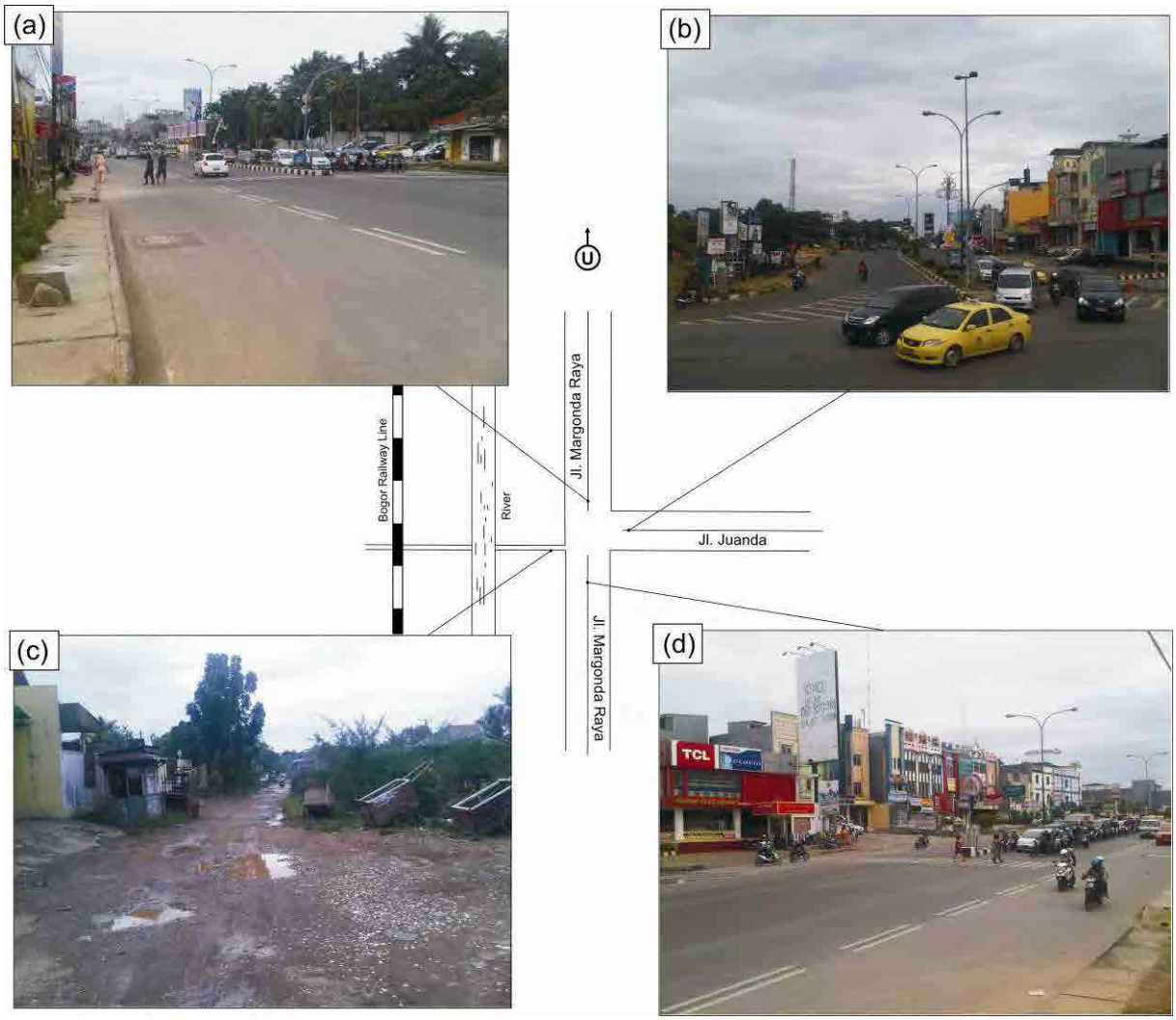
The intersection is located in the commercial and residential area and Indonesia University is next to the railway line. As Jl. Margonda is used as the main commuter road from Bogor, the intersection is congested in peak hours.

MPW has a plan for JORR2 and the interchange for an underpass adjacent to the intersection. The land use and traffic flow is expected to change after JORR2 opens.

Source: Google Map

Figure 2.2.3 Location Map of Margonda Cinere Intersection

- There is lack of access road in the west side of the T-intersection (see photo (c)), that is, the missing link, which currently is an unpaved local road. If this road is to be developed, an east-west corridor underpass should be necessary to avoid the railway crossing.
- Traffic jam is currently generated on the T-intersection (Jl. Margonda Raya - Jl. Juanda) (see photos (a), (b), and (d)). Right-turn movement from east to north (photo (b)) and straight movement from south to north (photo (d)) are dominant in the morning peak hours.
- Flyover or Underpass along either north-south or east-west corridor has not been decided yet. Since Jl. Margonda Raya is a national road, demand on the north-south traffic should also be examined.
- The plan needs the coordination with the JORR (Jakarta Outer Ring Road) II (Cinere – Depok section) project (east-west) that is currently under construction. Traffic condition after this project has been completed is not clear yet.
- There is a small north-south river (width: 4 m) 80 m away from the intersection that needs attention at the time of planning of the underpass.
- Since the frontage road will be widened, large-scale land acquisition will be required on both north and south sides.



Source: JICA Survey Team

Figure 2.2.4 Photos of Margonda-Cinere Intersection

(3) Cililitan

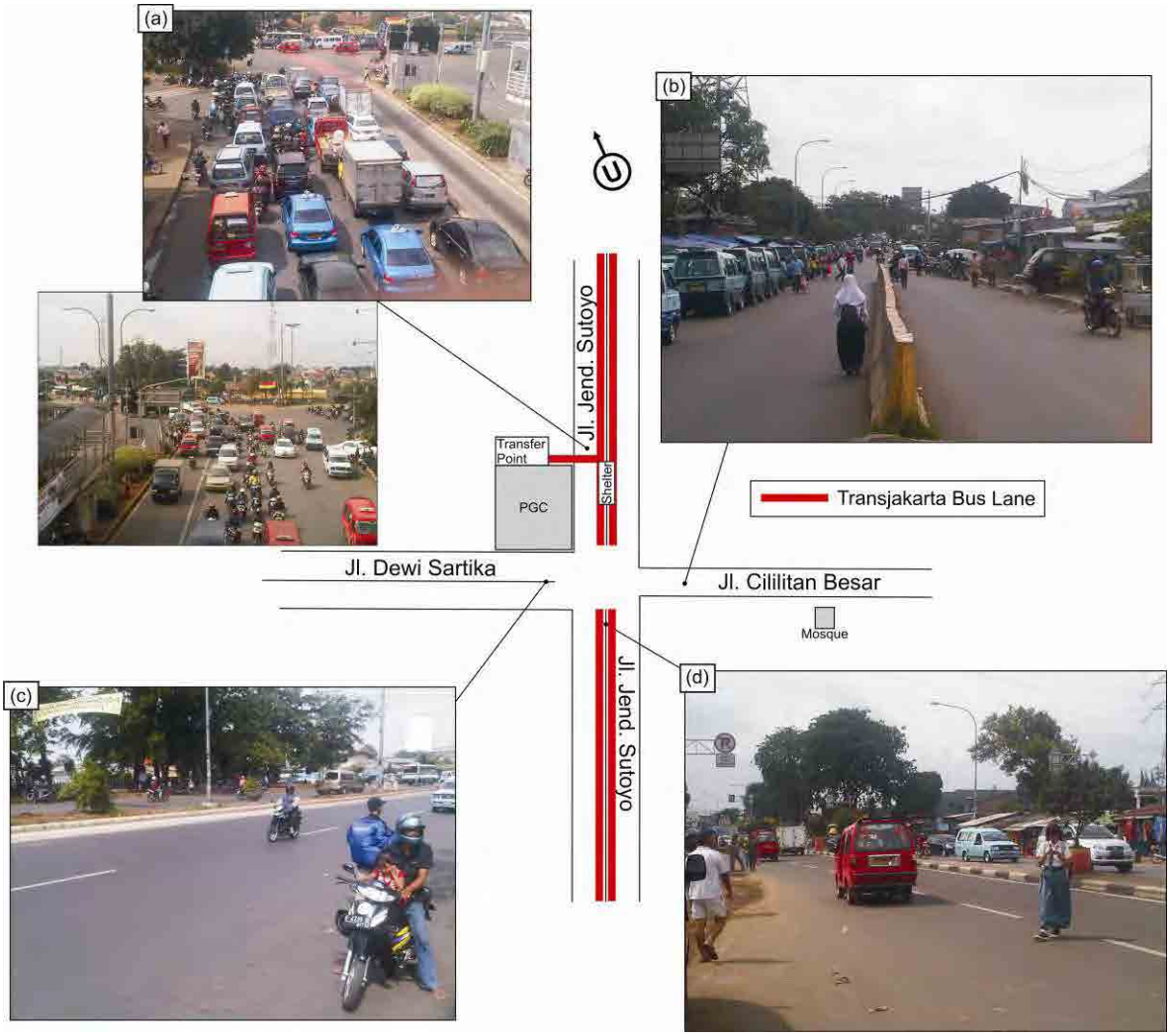
The intersection is the crossing point of national roads with 6-lanes in the north-south direction, Jl. Jend Sutoyo and Jl. Raya Bogor, and provincial roads in the east-west direction, Jl Cililitan Besar and Jl. Dewi Sartika. The height around the intersection is a little higher comparing to the surrounding area.

Many houses and public facilities are settled beside the roads such as a Transformer substation at the northeast, a shopping mall at the northwest and the market and mosque at the southeast. In addition, a canal flows along the Jl. Raya Bogor and Jl. Dewi Sartika.

Source: Google Map

Figure 2.2.5 Location Map of Cililitan Intersection

- Cars, buses, and trucks are mixed, and traffic jams occur.
- The number of the lanes is decreased for the N-S dedicated bus lanes, and the capacity is short (see photo (a)).
- Along with newly opened busway Corridor 10, there is an intermodal transfer station in the mall (PGC: Pusat Grosir Cililitan), located in the north-west corner of the intersection.
- The problem of small buses waiting for passengers are observed on all the streets around the intersection (see photo (b)) hampering traffic, through it seemed not so serious at the time of the site survey.
- Since Jl. Cililitan Besar is rather narrow with only 2 lanes, it may become another bottleneck even if the underpass is constructed (see photo (b)) unless the road is widened.
- The travel speed survey in this location indicates that east-west corridor travel speed is lower than the north-south corridor, whereas the traffic volume from site visit is higher along north-south corridor (compare photos (c) and (b) to photo (a)).
- Without considering constraint of other factors such as Transjakarta busway and environment, north-south corridor might be the best location to implement flyover/underpass based on the traffic count survey result.



Source: JICA Survey Team

Figure 2.2.6 Photos of Cililitan Intersection

(4) R.E. Martadinata

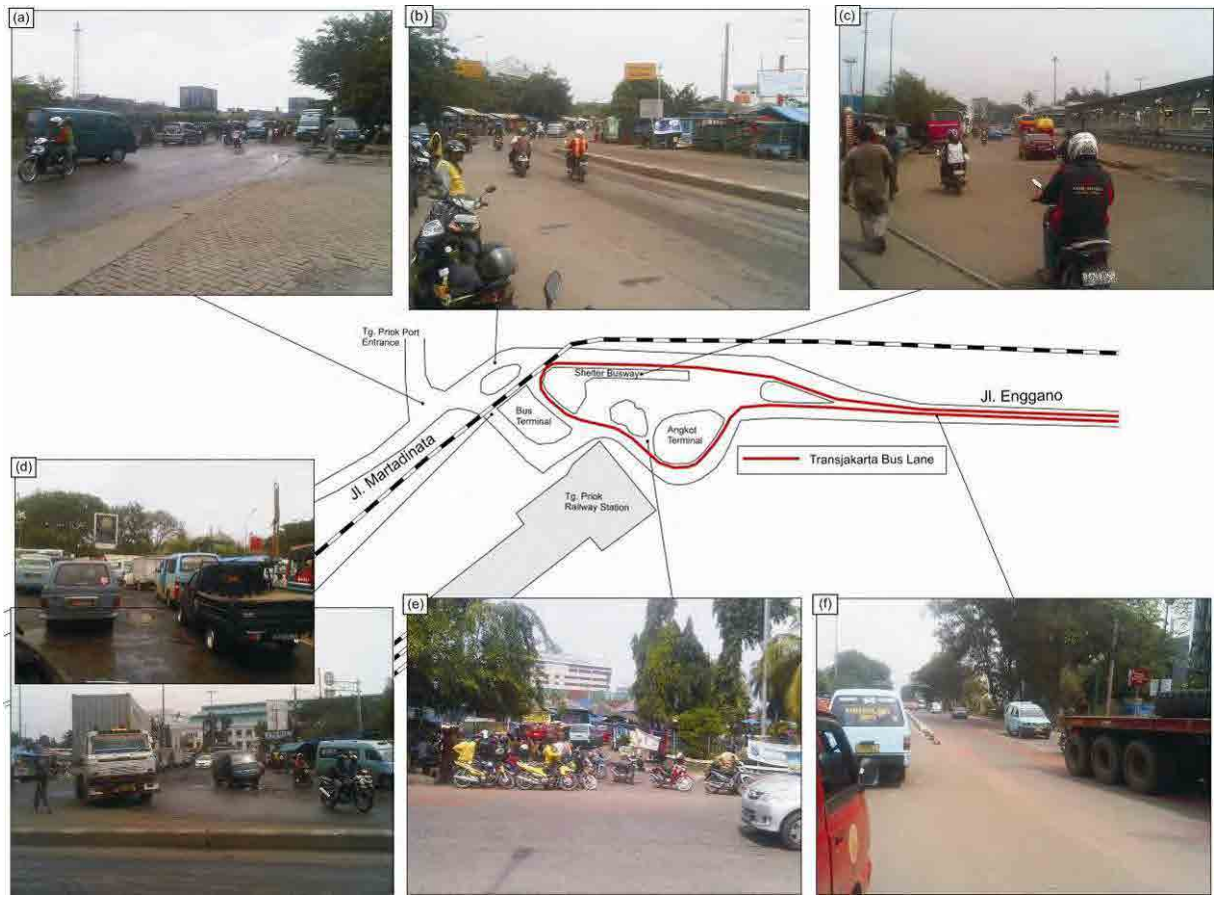
R.E. Martadinata is located on Jl. Enggano and Jl. Martadinata in front of Tanjung Priok Port north of Jakarta. Both roads have 4-lanes but the width of Jl. Martadinata is narrower. The bus terminal for long distance transportation and the Tanjung Priok railway station are placed at this point. The east and west bound road is split by the bus terminal and the alignment of the west bound road curves between the bus terminal and railway station. As ground subsidence has occurred around this area, the road surface is undulated and inundation appears everywhere. The single track of the railway diverges toward Pasoso station and 3 or 4 cargo trains are randomly operated per day.

The area on the north side of the road is the property of the port authority. The land on the south side is occupied by the container depot, bus terminal and railway station. The bank and mosque are located on the east side. Many small shops, some of which are illegal occupants are in business around the bus terminal.

Source: Google Map

Figure 2.2.7 Location Map of R.E. Martadinata Intersection

- The eastbound and westbound roads are separated by Tg. Priok Bus Terminal and the Transjakarta bus shelter.
- The railway station (Tg. Priok) has been recently renovated and is expected to become an intermodal transfer point with the bus terminal and the port (photo (c)). It should properly be arranged if the flyover is to be constructed.
- The road is badly damaged especially around the railway crossing (photo (d)), and it is the main bottleneck of traffic in this area.
- Westbound vehicles may not be able to turn directly right to enter the port (photo (a)), if the flyover is constructed.



Source: JICA Survey Team

Figure 2.2.8 Photos of R.E Martadinata Intersection

(5) Sulawesi - Tg.PA

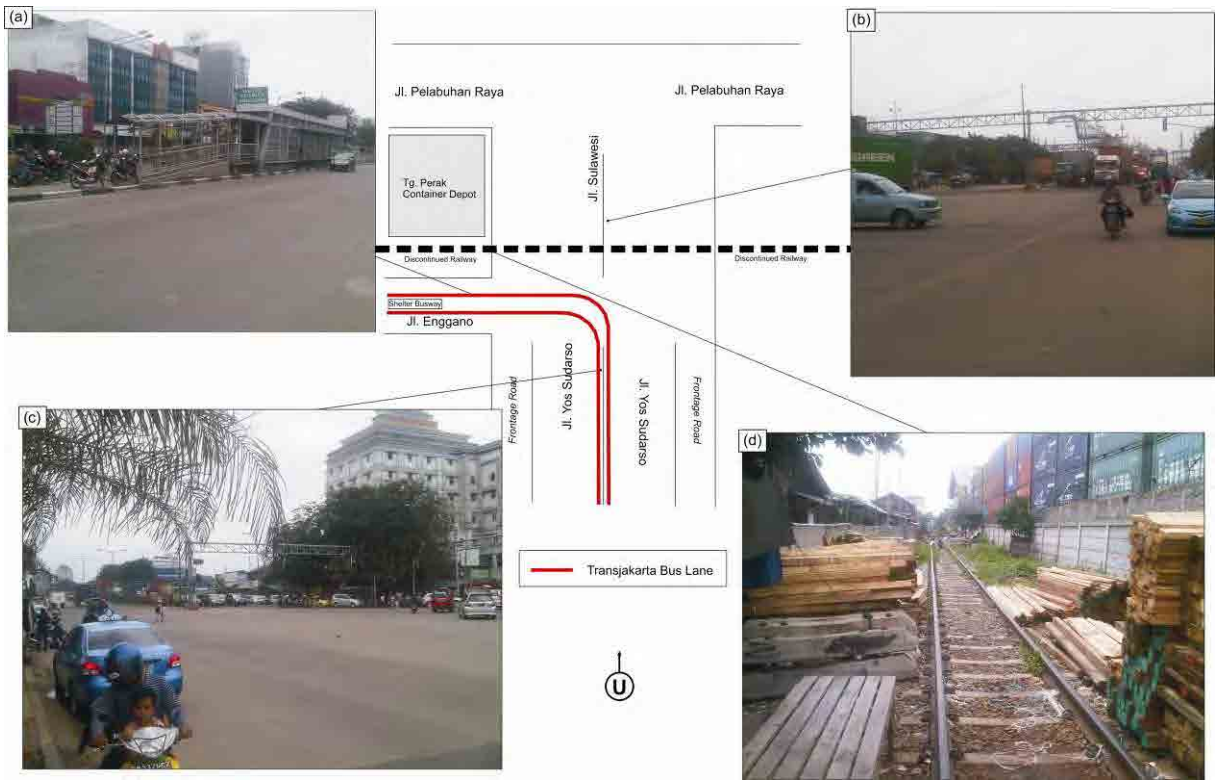
Sulawesi - Tg.PA intersection is approximately 1.2 km from the intersection of R.E. Martadinata. Jl. Yosudarso in the north-south direction and it has 8-lanes with a slow lane on both sides and is to be realigned when the Tanjung Priok Access Road (TgPA) is constructed above the existing road. Jl. Enggano has 6-lanes and the center lane is mainly used as a bus way. A bus way shelter is placed near the intersection. The road surface is damaged by the heavy weight vehicles. The single railway track which is currently covered by pavement and not in operation is laid about 50m to north. The canal passes across about 150m south from the intersection.

The intersection is surrounded by many small houses, shops and a container depot. As there are many heavy trucks running, the air is polluted by the dust.

Source: Google Map

Figure 2.2.9 Location Map of Sulawesi - Tg.PA Intersection

- A flyover is planned along Tg. Priok access road north-south section (elevated structure) which is under preparation for construction. Since the frontage road will be widened, land acquisition will be required on both east and west sides.
- The main problem/bottleneck is the right turn traffic of many heavy vehicles from north to west followed by the straight traffic from north to south. However, benefit of this straight flyover is still unclear because the traffic condition may change and the traffic congestion may be solved after Tg. Priok access road north-south section (elevated structure) has been constructed.
- If the existing at-grade discontinued railway (photo (d)) is to be rehabilitated, the flyover may become necessary. From the previous traffic count survey conducted in January 2010, the traffic volume along the corridor north-south is considerably high, that is (in total) 55,000 PCU per 16 hours.



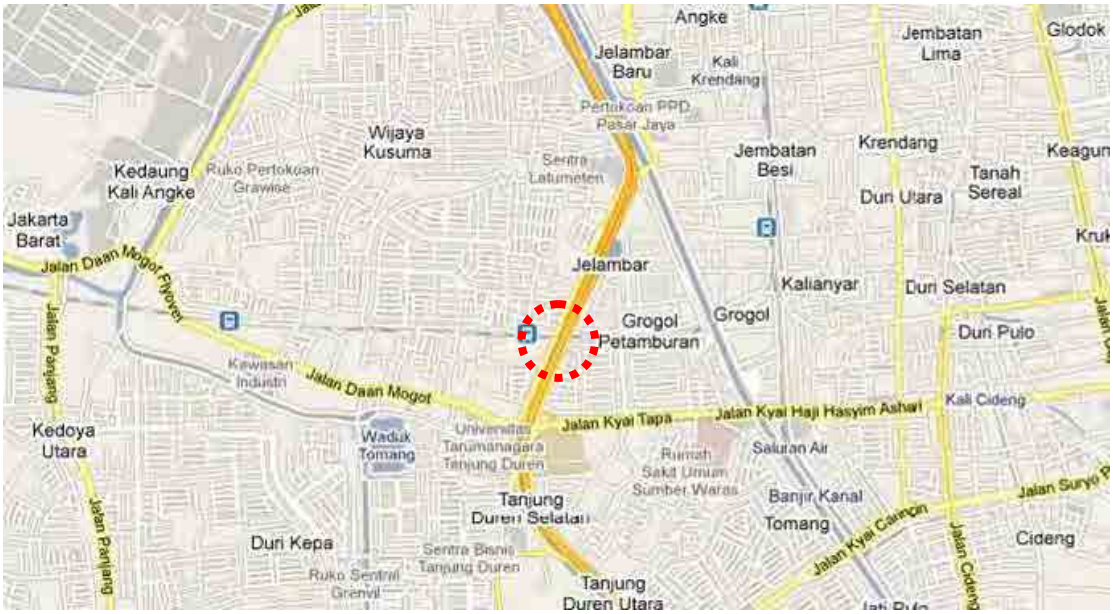
Source: JICA Survey Team

Figure 2.2.10 Photos of Sulawesi – Tg. Priok Access Intersection

(6) Latumentan

Latumenten is the railway crossing point beside JIUT in the east of Jakarta. JIUT and a canal cross above and under the railway line respectively. Two 3-lane roads, Jl Satria and Jl. Makaliwe pass through parallel to the canal on both sides and cross the single track of the Tangerang line at-grade. The center lane of both roads is exclusively used for the bus way and a bus way shelter with a pedestrian access bridge is placed on the north of the railway line. Jl. Makaliwe crosses under JIUT supported by rigid-frame piers from inside to outside of JIUT before the railway crossing point. The interchange for JIUT is placed both north and south near this point. A U-turn way is also provided at both the north and south sides. There is a bridge section 400m to the north on the pond. The Tangerang line railway is operated on average every half hour.

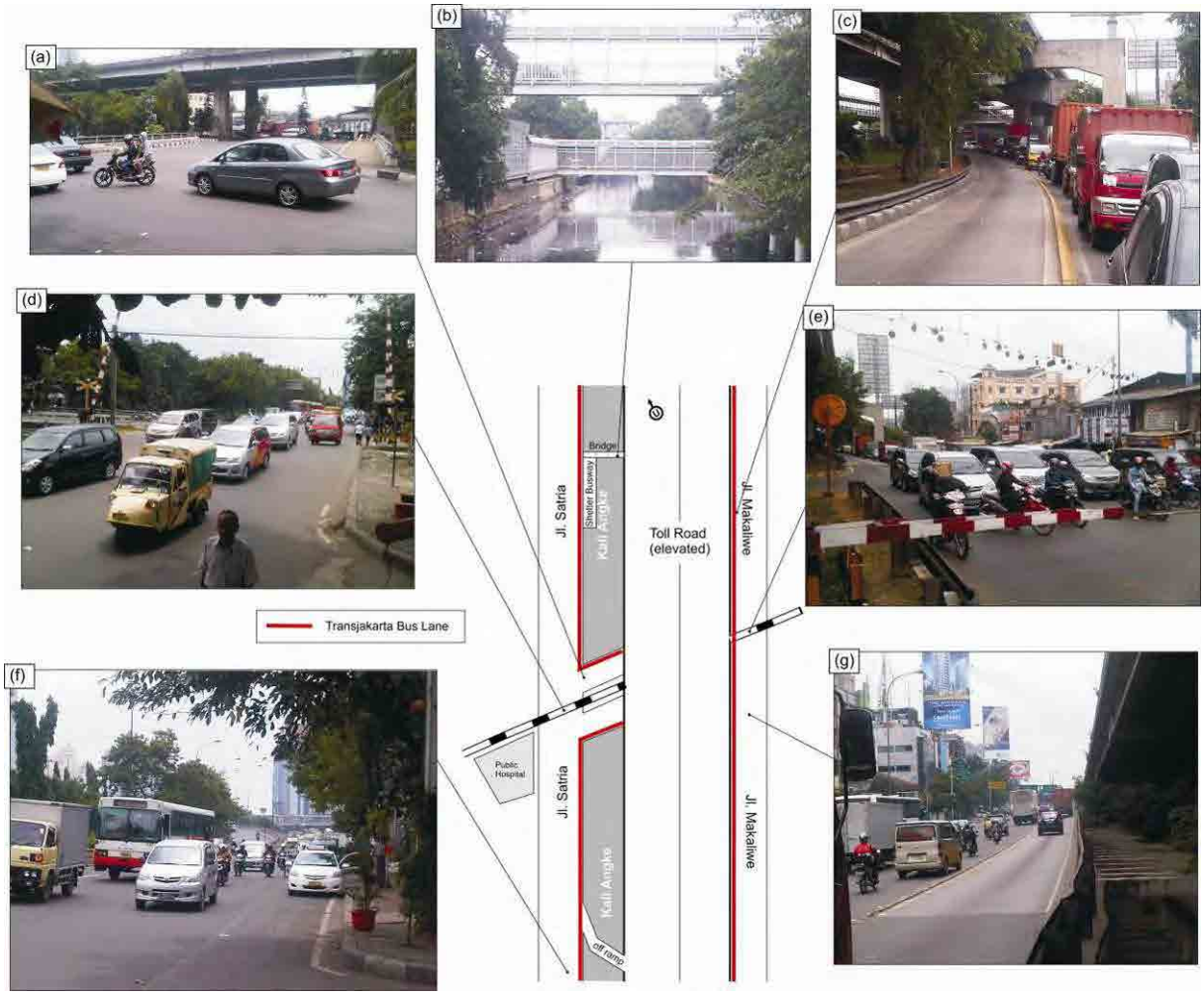
Many houses are settled along the road and the public hospital is located beside Jl. Satria.



Source: Google Map

Figure 2.2.11 Location Map of Latumentan Intersection

- The frontage road of the toll road is congested by the at-grade railway crossing (photos (d) and (e)). While the frequency of the railway is currently low, there is a plan to improve the train service with a higher frequency and the flyover will become necessary.
- It is also a cause of the traffic congestion that the on-off ramps of the toll road and the U-turn lanes are located near the intersection (photo (f)). (There is no off-ramp from the north to the south.)
- There is a busway shelter near the railway crossing (to the north), and it needs to be relocated along with the construction or the flyover (see photo (b)).
- There is another bottleneck of traffic at the north adjacent intersection, and it also needs to be improved if the flyover is to be constructed.



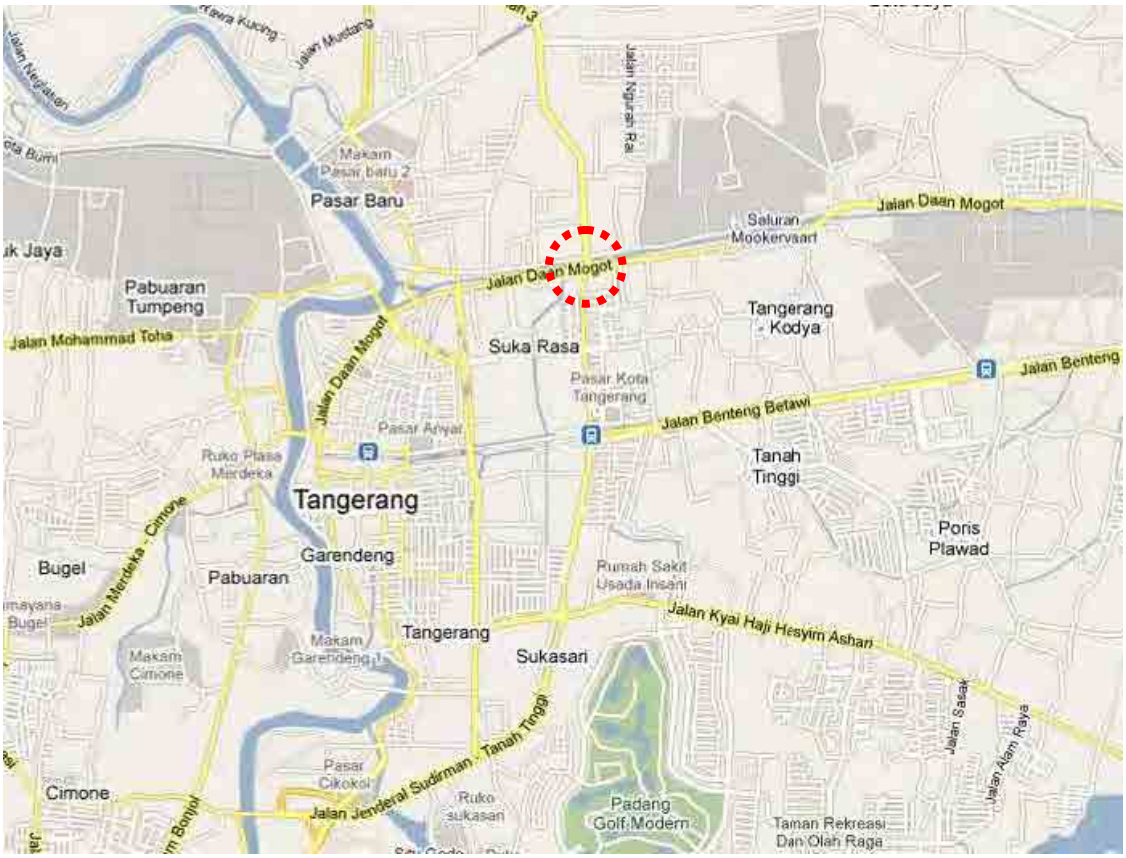
Source: JICA Survey Team

Figure 2.2.12 Photos of Latumenten Intersection

(7) Sudirman - Daan Mogot

The intersection of Sudirman - Daan Mogot is located in Kota Tangerang. A 4-lane bridge connecting two roads, Jl. Daan Mogot with 4-lanes and Jl. Bouraq with 2-lanes, crosses the river. Jl. Sudriman on the south side has enough width with 7-lanes plus 1-lane for a slow lane while there is only a narrow 2-lane on Jl. Pembangunan3 on Jl. Pembangunan3.

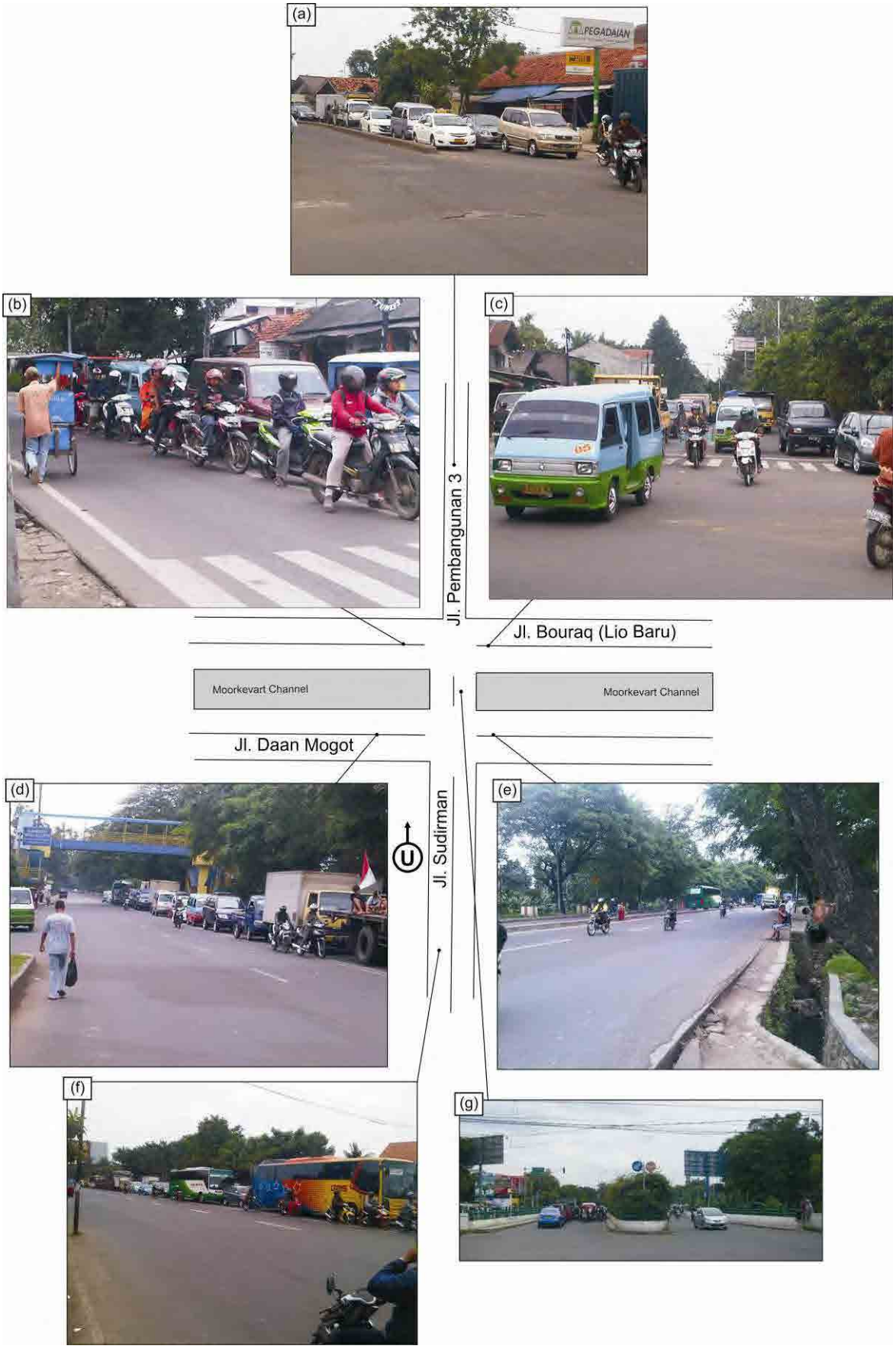
This is a high class residence area on the south side and the factories and small houses are settled along the road on the north side. The primary school and junior high school are located at the corner of the intersection.



Source: Google Map

Figure 2.2.13 Location Map of Sudirman - Daan Mogot Intersection

- Traffic jams occur at the narrow river bridge and the intersection, especially from the south to the north on Jl. Jendral Sudirman (see photos (f) and (g)). Another adjacent intersection with Jl. Bouraq (Lio Baru), which runs on the north of the river, is making the traffic flow more complicated though the traffic signals at these two intersections are coordinated (photos (b) and (c)).
- A long queue of traffic, especially heavy vehicles, is observed on Jl. Pembangunan 3, which is currently narrow with only two lanes (photo (a)). This traffic volume has grown since it serves as the road connecting with the airport. While land acquisition will be required for the widening of this road, benefit of the flyover will be great if it is widened.
- Kota Tangerang also regards this improvement as urgent. Though, it is planned to implement north-south flyover along this location, from the previous traffic count (January 2010), the number of traffic volume along east-west corridor is considerably higher (45,000 PCU/16 hrs) compared to traffic along north-south corridor (17,000 PCU/16 hrs). Without any other constraints, these preliminary findings might affect the flyover direction from north-south to east-west.



Source: JICA Survey Team

Figure 2.2.14 Photos of Sudirman – Daan Mogot Intersection

(8) Kuningan

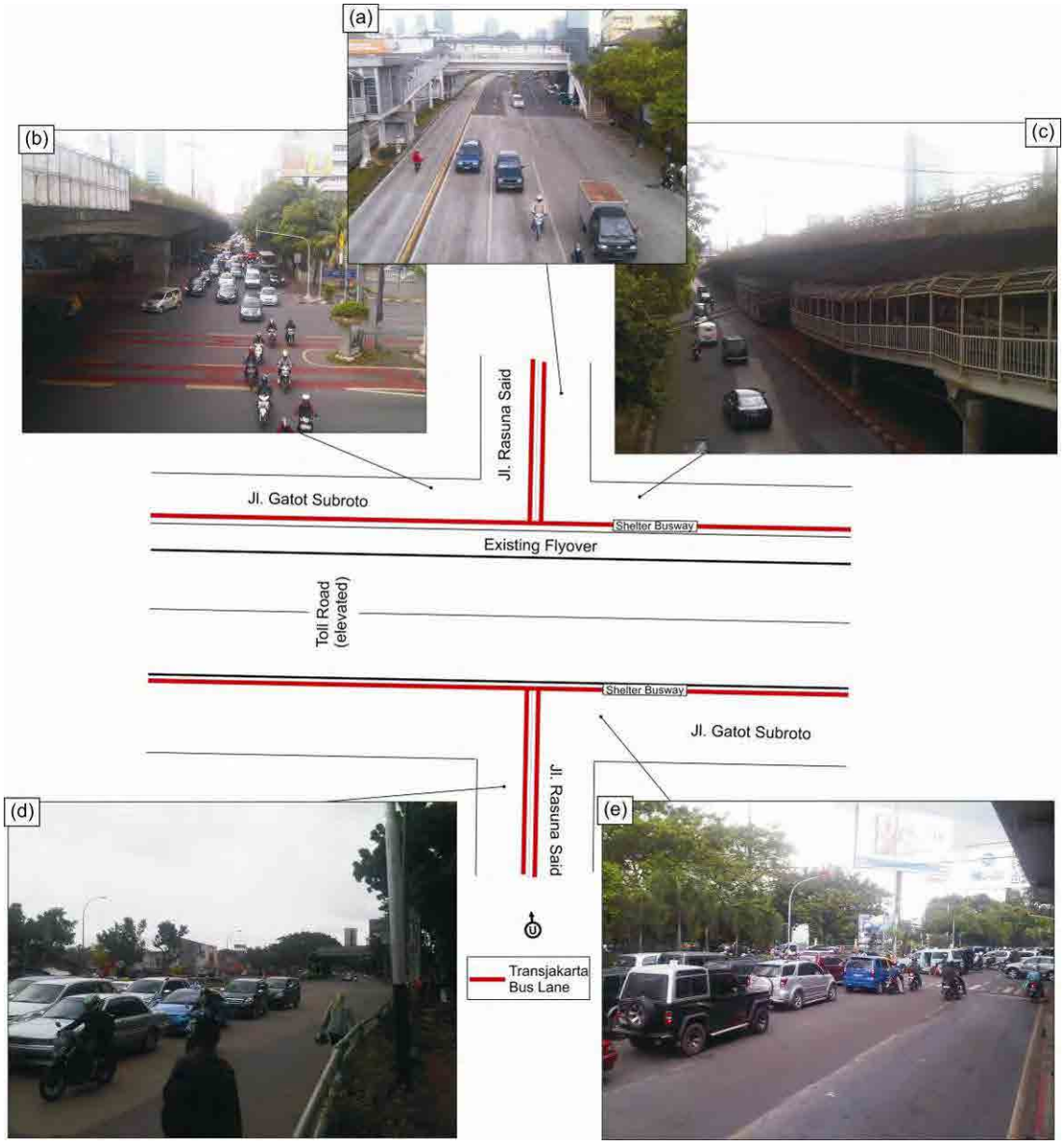
The Kumingan intersection is located about 2.5km away along JIUT to the south-east from Semanggi junction. Under the bridge of JIUT, Jl. Rasuna Said with 6-lanes and Jl. Gatot Subroto with 3-lanes per direction form a cross intersection. The other intersection with 6-lanes of Jl. Kapten Tendean is located about 400m to the north along Jl. Rasuna Said. The center lanes of Jl. Rasuna Said and Jl. Gatot Subroto are exclusively used for the bus way. Two bus way shelter are placed near each intersection on Jl. Rasuna Said.

Many houses, commercial buildings and hotels are settled around the road. Trees are planted along the sidewalk and in the median between the two intersections.

Source: Google Map

Figure 2.2.15 Location Map of Kuningan Intersection

- A one-way flyover bridge (2 traffic lanes, eastbound) has been completed on the north side of the elevated toll road (photos (b) and (c)).
- Another flyover bridge may be constructed to alleviate the westbound traffic congestion. The share of right-turn traffic (from the east to the north) is also large at this intersection. The existing westbound busway shelter needs to be relocated on the flyover just like in the eastbound direction, if the westbound flyover is constructed.
- The north-south traffic volume on Jl. Rasuna Said is also very large and needs to be improved together with the south adjacent intersection (Jl. Kapten Tendean) (photo (d)).
- The flyover along the east-west corridor is considered as second priority compared to the north-south underpass planned (and already feasibility-studied) by the MPW and DKI.
- Traffic volume among those two corridors (north-south and east-west) is more or less equal, around 85,000 – 90,000 PCU/16 hr. Thus, the intersection improvement by constructing the underpass along north-south corridor is preferred.



Source: JICA Survey Team

Figure 2.2.16 Photos of Kuningan Intersection

(9) Pancoran

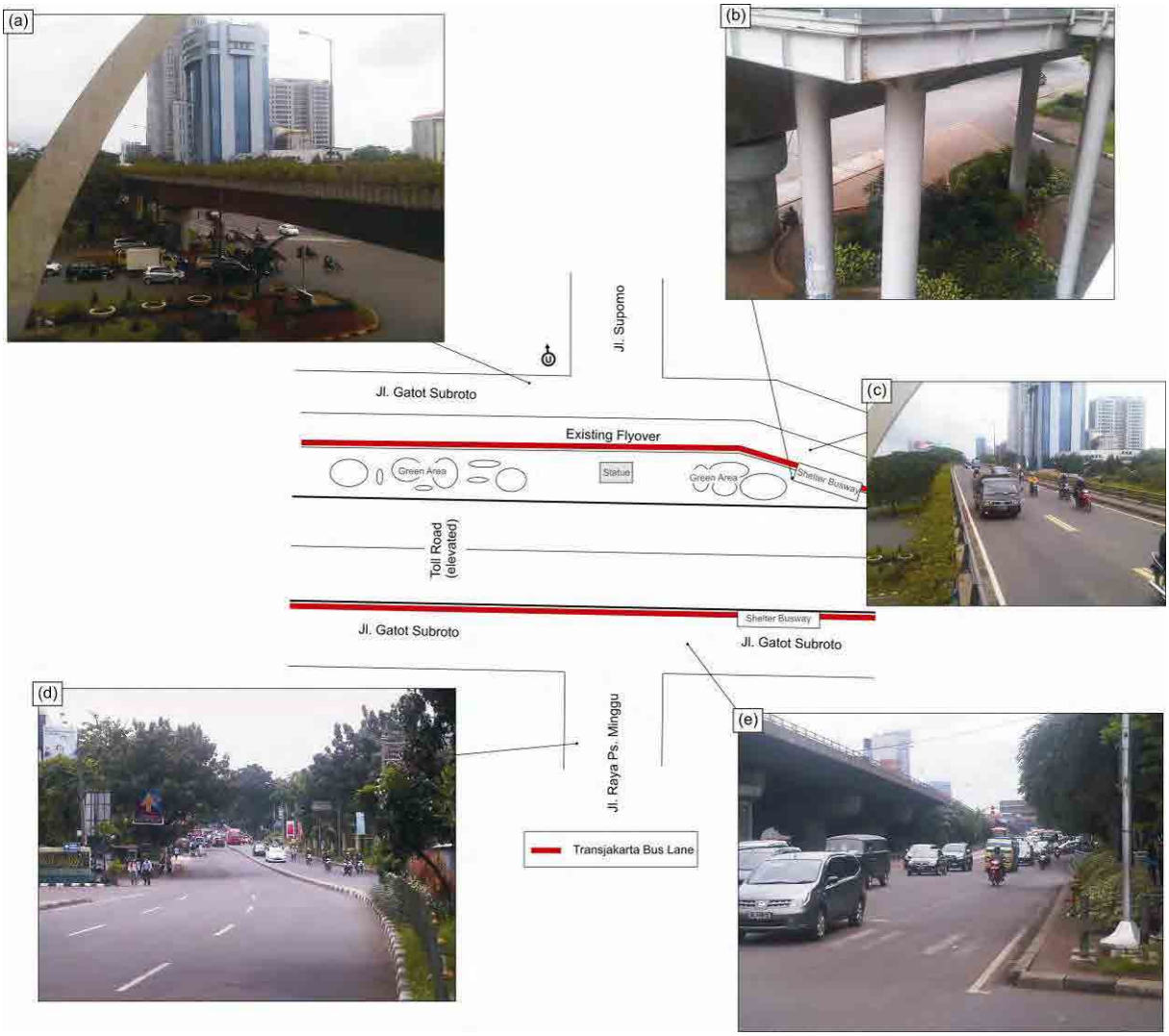
The Pancoran intersection is located about 2.0km away to the east along JIUT from Kuningan junction. Jl. Rasuna Said with 6-lanes and Jl. Raya Pasar Minngu with 4-lanes form the intersection. The 2-lane flyover for east bound is already constructed 20m from JIUT to keep out the statue. The center lane of Jl. Gatot Subroto is exclusively used for the bus way. A bus way shelter is placed at the same level as the flyover on the east bound side and under the bridge of JIUT on the west bound.

Many houses and commercial buildings are settled around the road. A commercial building is situated close to Jl. Gatot Subroto on the south side.

Source: Google Map

Figure 2.2.17 Location Map of Pancoran Intersection

- A one-way flyover bridge (2 traffic lanes, eastbound) has been completed on the north side of the elevated toll road (photo (a)).
- Another flyover bridge will be constructed to alleviate the westbound traffic congestion. At this intersection, straight movement of traffic (from the east to the west) takes the majority (photo (e)), causing the congestion. Hence, construction of the flyover is expected to bring about a great benefit. The existing westbound busway shelter needs to be relocated on the flyover just like in the eastbound direction (photo (b)), if the westbound is constructed.



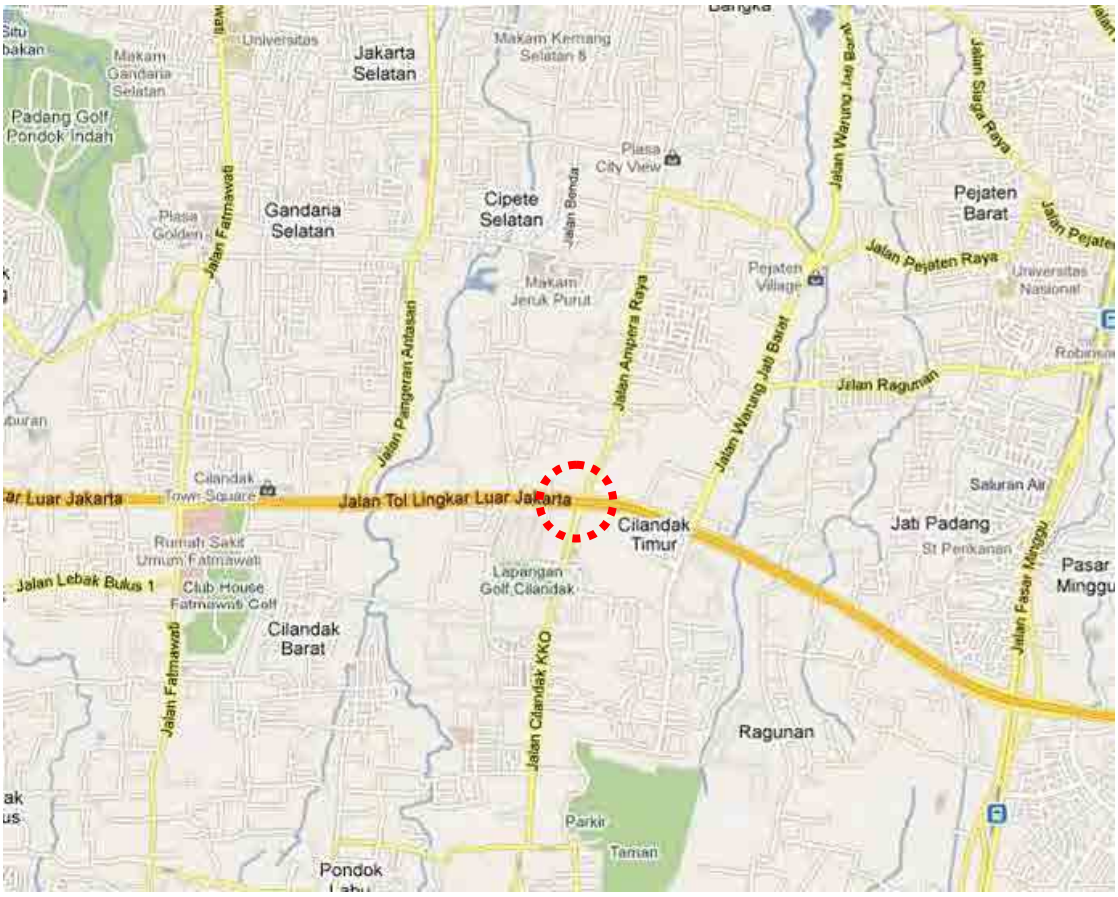
Source: JICA Survey Team

Figure 2.2.18 Photos of Pancoran Intersection

(10) Cilandak

Cilandak intersection is formed by Jl. Simatupang along with JORR, Jl. Antasari and Jl. Cilandak in the south of Jakarta. As the terrain around the intersection is higher than the neighbouring land, JORR passes under Jl. Antasari with 6-lanes and Jl. Simatupang is split by the retaining wall from JORR. Jl. TB Simtupang has 4-lanes per direction at the intersection and a U-turn lane is also provided at both sides of the intersection. On and Off ramps are placed about 300m from the intersection to the east and west.

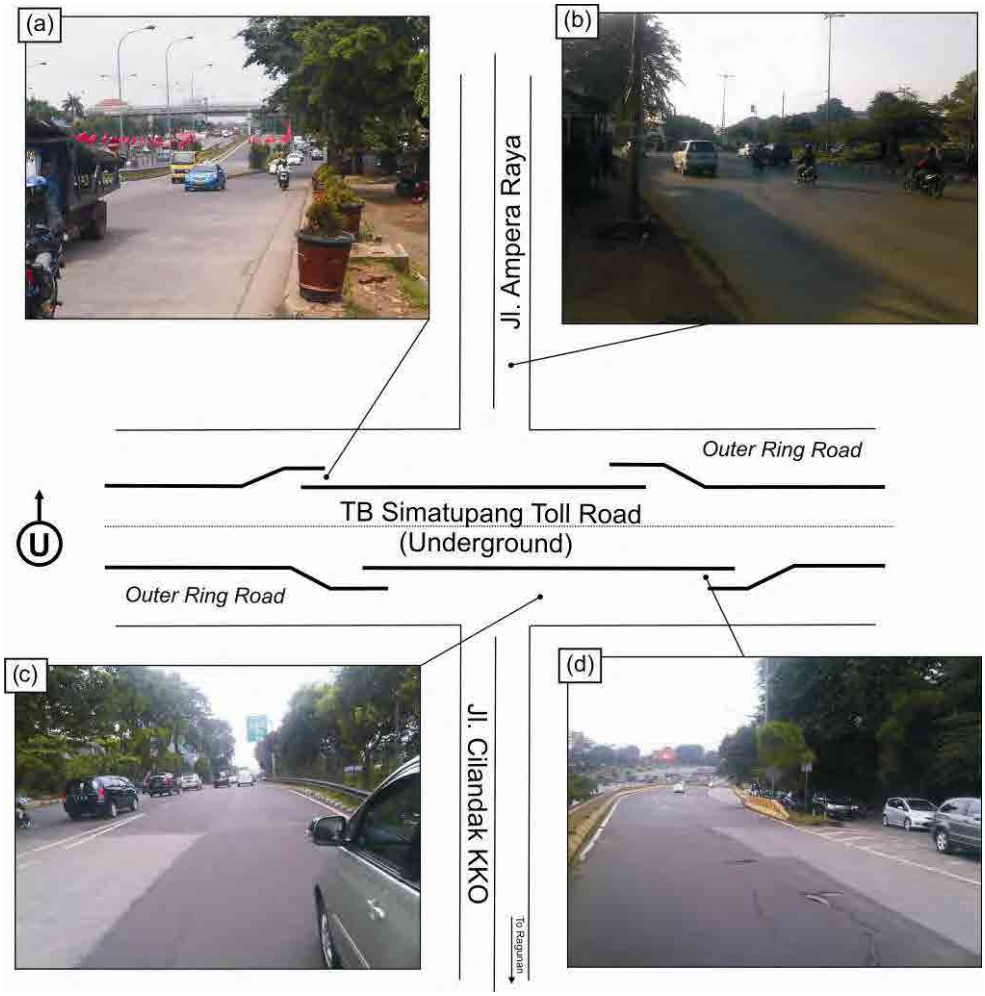
The intersection is surrounded by a residential area to the north-west and industrial areas at the corners. Large buildings are concentrated in Cilandak industrial area to the south-west.



Source: Google Map

Figure 2.2.19 Location Map of Cilandak Intersection

- An underpass is planned on both north and south sides.
- Due to the upslope topography, flyover construction is difficult to be implemented, and an underpass is left as the only option while large-scale land acquisition for UP may cost much.
- Traffic jams are caused by the (on and) off ramps of the toll road around the intersection.
- Frontage roads are relatively wider than the adjacent flyover Fatmawati, so flyover Fatmawati may have higher priority for improvement.



Source: JICA Survey Team

Figure 2.2.20 Photos of Cilandak Intersection

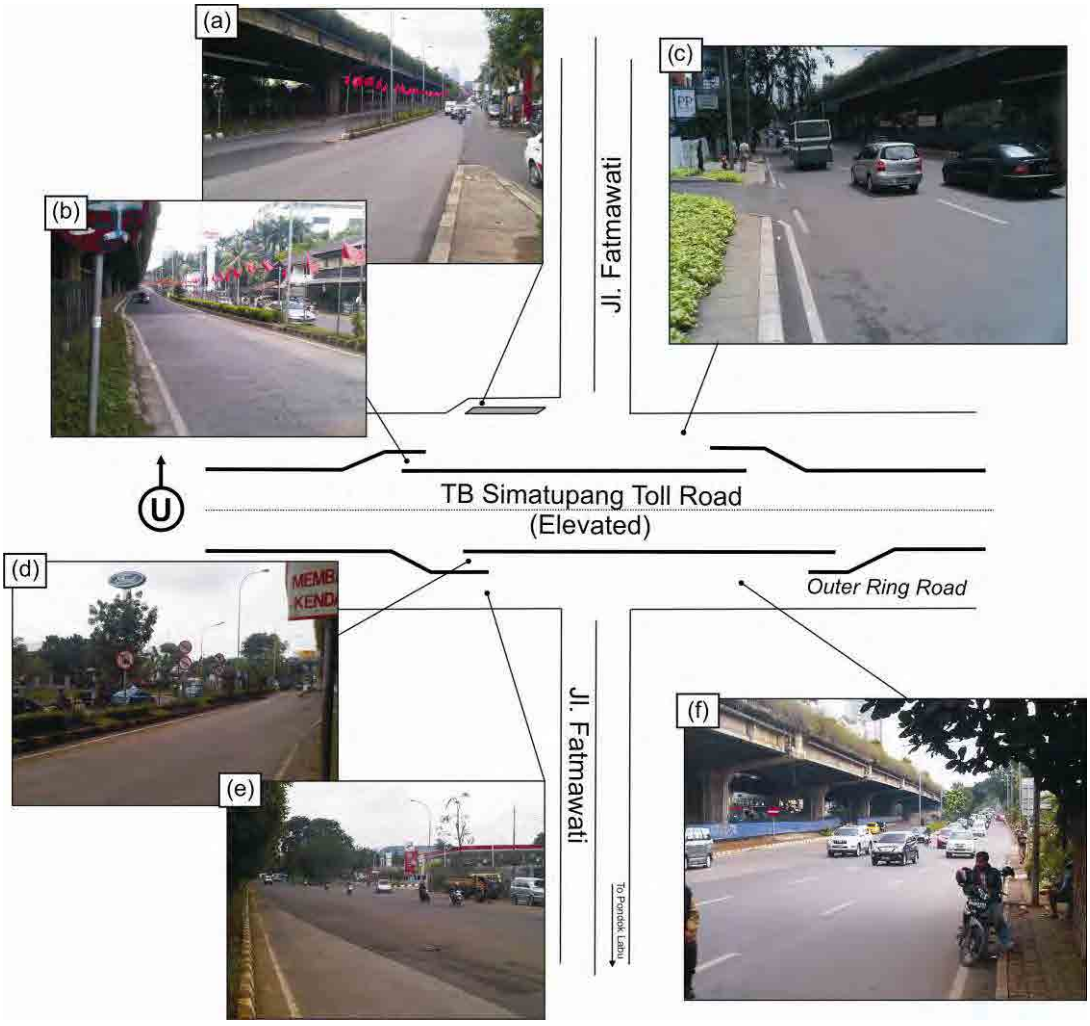
(11) Fatmawati

Fatmawati intersection is 2.4km to the west of Cilandak intersection. JORR passes over Jl. Fatmawati with 4-lanes which is connected with Jl. Simatupang at both sides of the JORR at-grade. U-turn lanes are also provided at both sides of the intersection. On and Off ramps are placed about 300m from the intersection to the east and west. The intersection is surrounded by a residential area to the north-west and some commercial buildings. A gas station is located to the south-west.

Source: Google Map

Figure 2.2.21 Location Map of Fatmawati Intersection

- There are (on and) off ramps of the toll road on the east and west sides of the intersection, causing traffic jams in the morning and evening (see photos (d) and (f)).
- A flyover is planned in parallel with the highway on both north and south sides.
- Near the eastbound off-ramp, the frontage road is relatively narrow with only one lane, causing traffic congestion (photos (a) and (b)).



Source: JICA Survey Team

Figure 2.2.22 Photos of Fatmawati Intersection

(12) Ciawi - Bogor

The intersection of Ciawi - Bogor is located at the end point of Jagorawi Toll Road in Ciawi. The road to Jl. Raya sukabumi and Jl. Raya Ciawi crosses at a skew angle and forms the intersection. There are 4 lanes on the road toward the Toll Road while Jl. Raya Sukabumi has only 2-lanes. Jl. Raya Ciawi with 4-lanes has a gradient as the east side is higher than the west side. A lane of Jl. Raya Ciawi on the east bound near the intersection is split by a movable barrier and is used for a local bus stop.

The intersection is surrounding by residential and commercial areas. At the corner on the south-east corner of the intersection, a 4-story shopping mall is located.

Source: Google Map

Figure 2.2.23 Photos of Location Map of Ciawi - Bogor Intersection

- Heavy traffic jams occur all the time, mainly caused by minibus waiting for passengers and street vendors decreasing the capacity of the intersection (photos (a) and (d)). In particular, the traffic from the toll road exit to the east mountain area and the south shore area makes the situation worse on the weekend.
- Since the southbound road (Jl. Raya Sukabumi) narrows after the intersection (photo (c)), the southbound traffic is also congested. Spillback of the queue also blocks the traffic flow around the intersection.
- It is an intersection of the two national roads. Straight movement from the west (Jl. Raya Tajur) is currently blocked. For planning the flyover, it is necessary to consider the future toll road extension and Bogor ring road as well as the direction of the flyover.

Source: JICA Survey Team

Figure 2.2.24 Photos of Ciawi –Bogor Intersection

(13) Pinang Baris

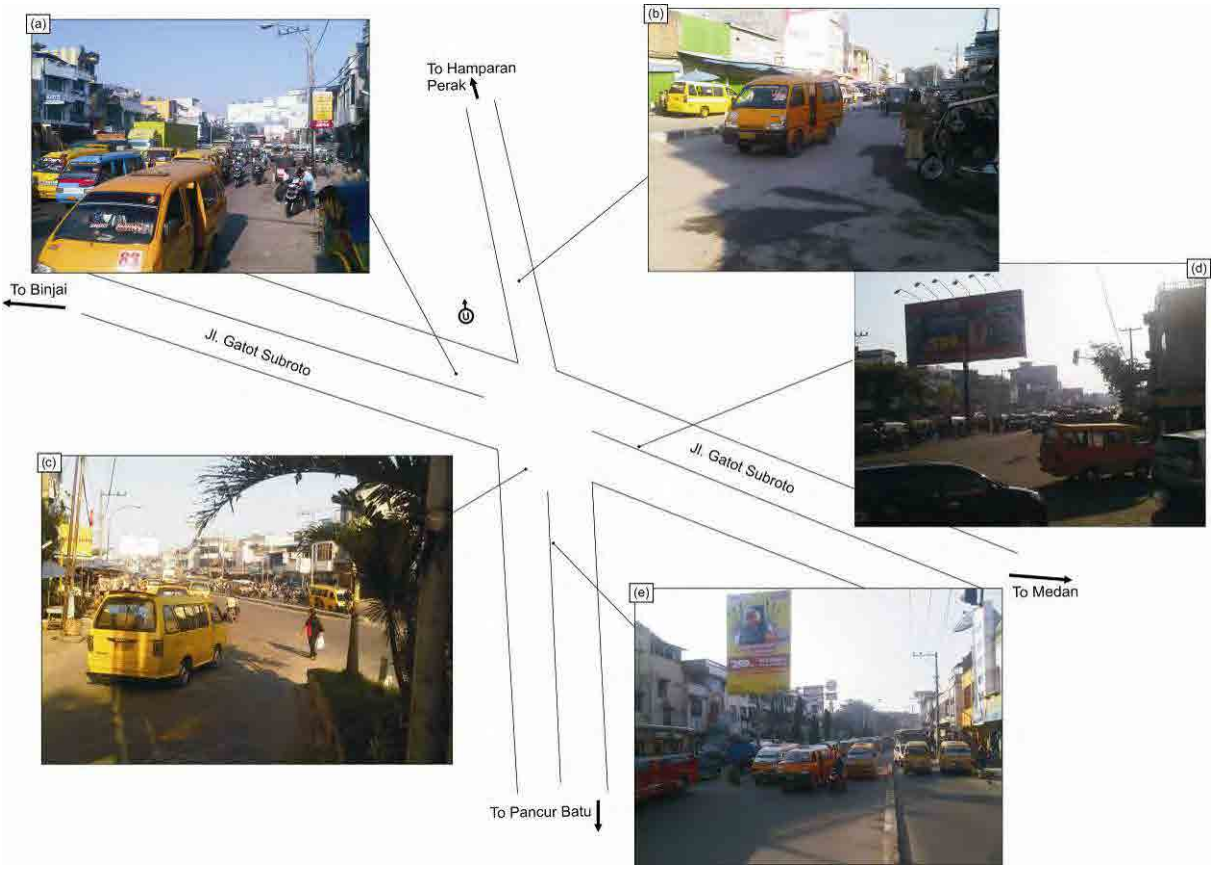
Pinang Baris intersection is located to the west of Medan city and is composed of Jl. Gatot Subroto, Jl. Pinang Baris and J. Klambir5. 6-lanes plus 1 slow lane of Jl. Gatot Subroto, which is split by a concrete median, is the trunk road to Ache while the crossing roads have 4 lanes. As two roads cross at a skew angle, the area of the intersection is comparatively large.

The area around the intersection has high density occupancy. Many houses and shops are settled along the road side and the vendors open the market within the road property especially to the north-west of the intersection. A river flows near the intersection and crosses about 380m to the west. A clock tower is built next to the river bridge.

Source: Google Map

Figure 2.2.25 Location Map of Pinang Baris Intersection

- Near this intersection, there is a Pinang Baris bus terminal to/from the west region. Traffic jams occur especially because of minibuses and other vehicles waiting and stopping around the intersection (photo (e)). Traffic congestion becomes worse on weekends, especially from the west (Binjai) to the east and from the west to the south (photo (a)).
- The road in the north of the intersection is small, and only small traffic volume is observed (photo (b)).
- Improvement of the traffic management may be a solution. It is also necessary to consider the plan of Binjai toll road, which is soon to be constructed (currently at the tendering stage).



Source: JICA Survey Team

Figure 2.2.26 Photos of Pinang Baris Intersection

(14) Asrama - Gatot Subroto

Asrama - Gatot Subroto is a simple cross intersection and is located to the west of Medan city on Medan ring road. Both Jl. Gatot Subroto and Jl. Gagak Hitam, national roads, have 6-lanes split by a median. An exclusive left-turn lane is provided for all directions. Paved sidewalks are provided for both roads. There is a railway crossing about 1.2km north of the intersection.

Houses and commercial buildings are settled along both roads. Jl. Gatot Subroto is planted with vegetation along the sidewalk.

Source: Google Map

Figure 2.2.27 Location Map of Asrama - Gatot Subroto Intersection

- Traffic jams occur at the intersection on two national roads, namely, Jl. Bypass (ring road, 6 lanes – photos (b) and (c)) and Jl. Gatot Subroto (4 lanes – photo (d)).
- In order to serve the freight traffic on the ring road along with several other flyovers, a north-south flyover is planned. Composition of heavy vehicles is relatively high.
- Although there is already a 2-3m setback, land acquisition will be required on both sides. Right-of-way (ROW) is 33m in north-south, and 26m in east-west.
- The east-west traffic may be reduced after the completion of Binjai toll road.

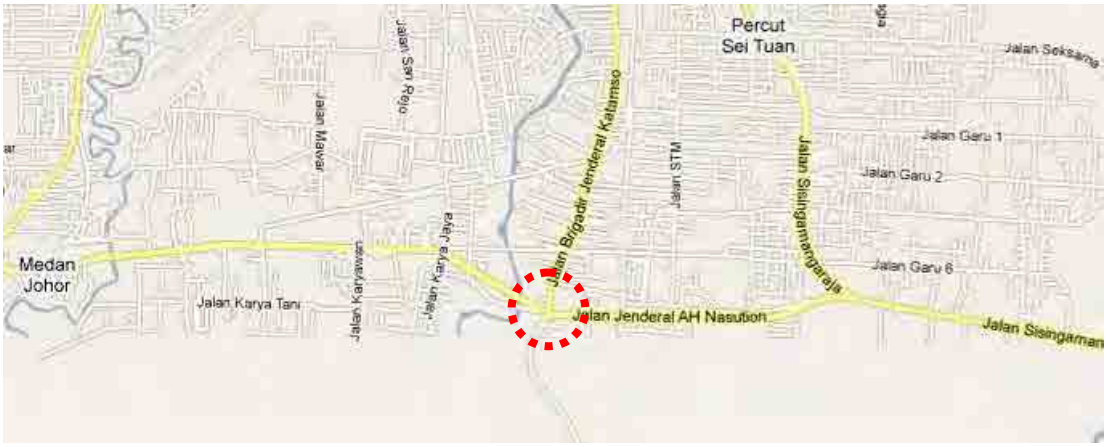
Source: JICA Survey Team

Figure 2.2.28 Photos of Asrama-Gatot Subroto Intersection

(15) Katamso

Katamso intersection is a part of the Medan ring road and is located south of Medan city. The two lane roads, Jl. AH Nasution, Jl Katamso and Jl. Biru Biru form the intersection. Jl. AH Nasution is split by a median with plants and drops lower to the west with a gentle slope. The river flows 150m to the west. The single railway line which is currently not in operation is 350m to east. An exclusive lane is provided between Jl. AH Nasution and Jl. Katamso.

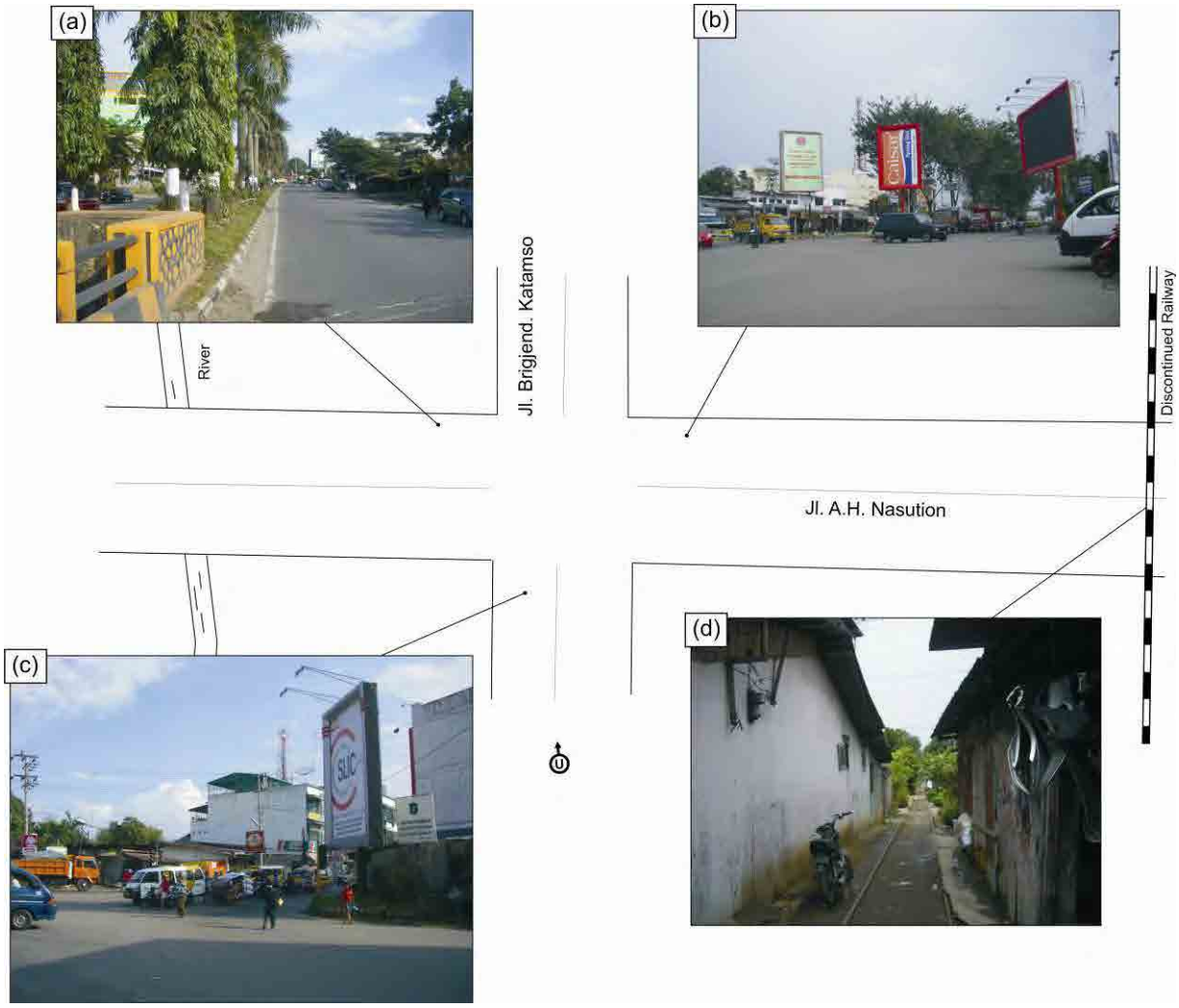
Many houses are concentrated along the intersection. The hospital is located about 500m to east of the intersection.



Source: Google Map

Figure 2.2.29 Location Map of Katamso Intersection

- This intersection is congested not only because of the large traffic volume that is observed throughout the day, but also because of the land use and activities around the intersection.
- Crossing of pedestrians and drivers' bad driving manners (ignoring the red light) are making the situation even worse.
- In order to serve the traffic on the ring road (Jl. A.H. Nasution) with several other flyovers planned along the ring road, an east-west underpass is planned. Due to the upslope, underpass is designed at the intersection of Jl. Brigjend. Katamso – A.H. Nasution.



Source: JICA Survey Team

Figure 2.2.30 Photos of Katamso Intersection

(16) Sudirman II

The intersection of Sudirman II is located 1.0km to the south of Daan Mogot along the Jl. Sudirman with 8-lanes. There is a railway crossing with a single track on Tangerang line at the intersection. The railway station is near the intersection and a bus shelter is on the opposite side on Jl. Benteng Betawi.

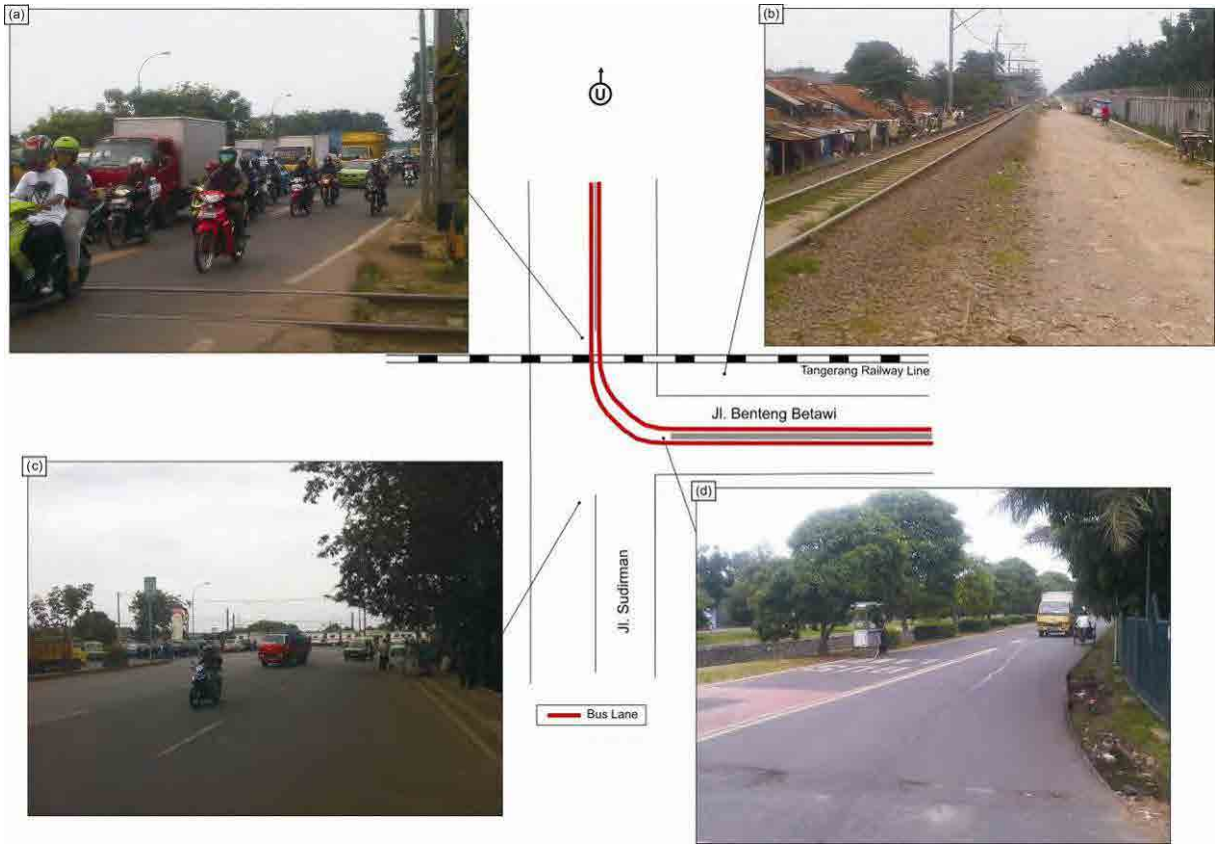
There is a residential area south-east of Jl. Sudirman and a paddy field on the opposite side. A rice mill factory and fruit market are located west and east of Jl. Sudiriman respectively.

Trains pass on the railway every half hour.

Source: Google Map

Figure 2.2.31 Location Map of Sudirman II Intersection

- Traffic jams occur at the at-grade railway crossing as well as at the T-intersection (Jl. Benteng Betawi) that is located just south beside the railway crossing (see photos (b) and (d)). Though the railway crossing is closed not so frequently, many heavy vehicles pass the crossing at very low speed.
- As for the traffic to/from Tanah Tinggi Bus Terminal, it is not a major problem since it is located away from the location.
- Combined with the adjacent flyover (No. 7: Sudirman – Daan Mogot) which is located 1km north, multiplier effect may be expected.



Source: JICA Survey Team

Figure 2.2.32 Photos of Sudirman II Intersection

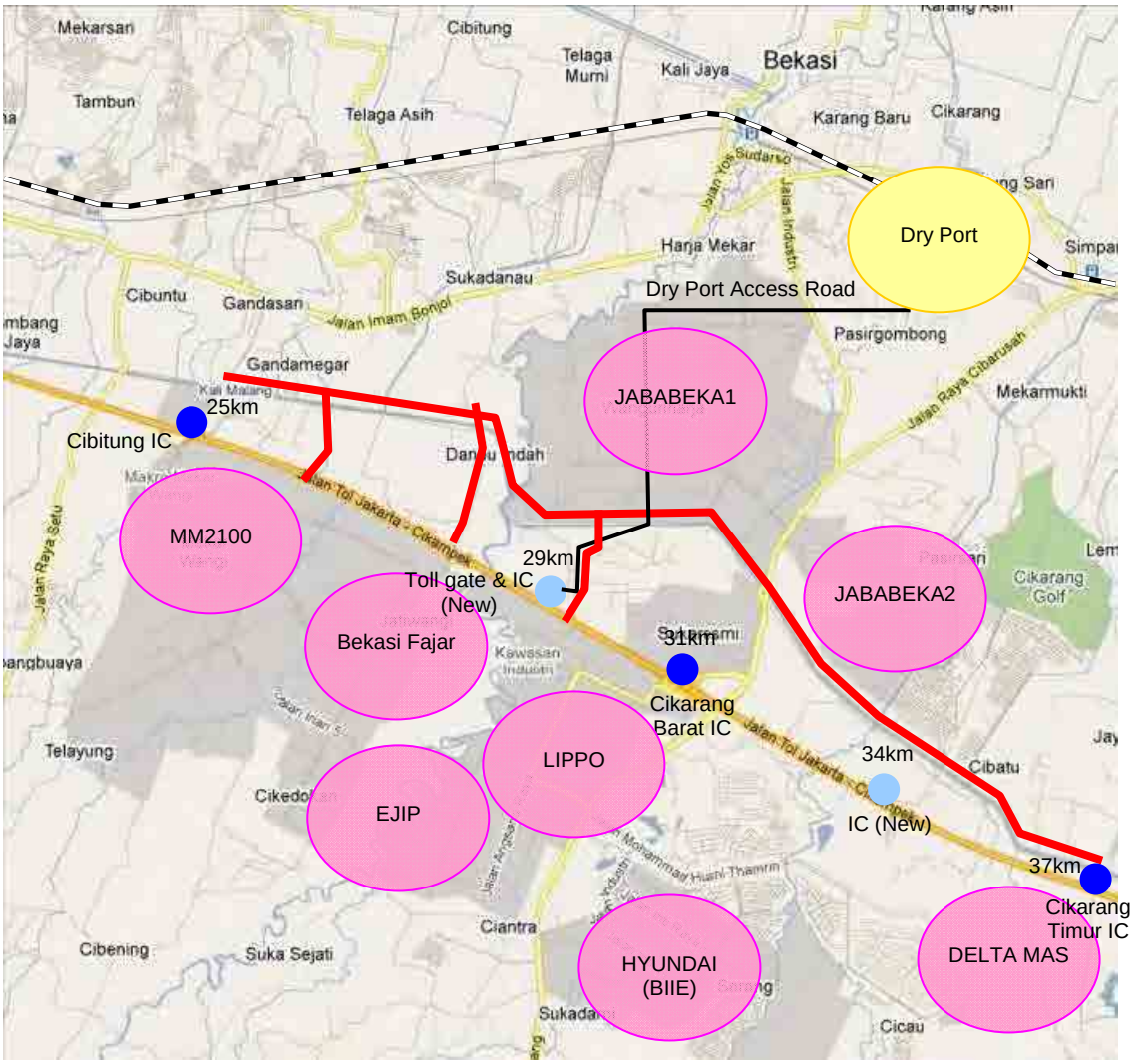
(17) Cikarang

Cikarang project is located in an industrial area in Bekasi Regency and is composed of a 7.3km length of Jl. Raya Karimalang and 3 of local roads crossing Cikampek Toll Road in the north-south direction. The unpaved surface of Jl. Raya Karimalang with 2-lanes which passes parallel to Karimalang River is significantly damaged by heavy trucks. As the river height is controlled for irrigation, the road has never been flooded. There are 2 bridges on the river at middle of the section. The bridge for the Dry Port Access Road is already constructed above the Jl. Raya kalimalang.

Jl. Bali-Cibitung is 2-lane with concrete pavement. The bridge on Cikampek Toll Road has 1.5-lanes so two large vehicles can not pass each other at the same time. The road surface on Jl. Imam Bonjol 4 is damaged near the river. The bridge on the Toll Road has 2-lanes. The construction of the Dry Port Access Road is now under construction.

Factories and some houses are settled along the road on the north side. In some sections, private land has been acquired to widen the right of way.

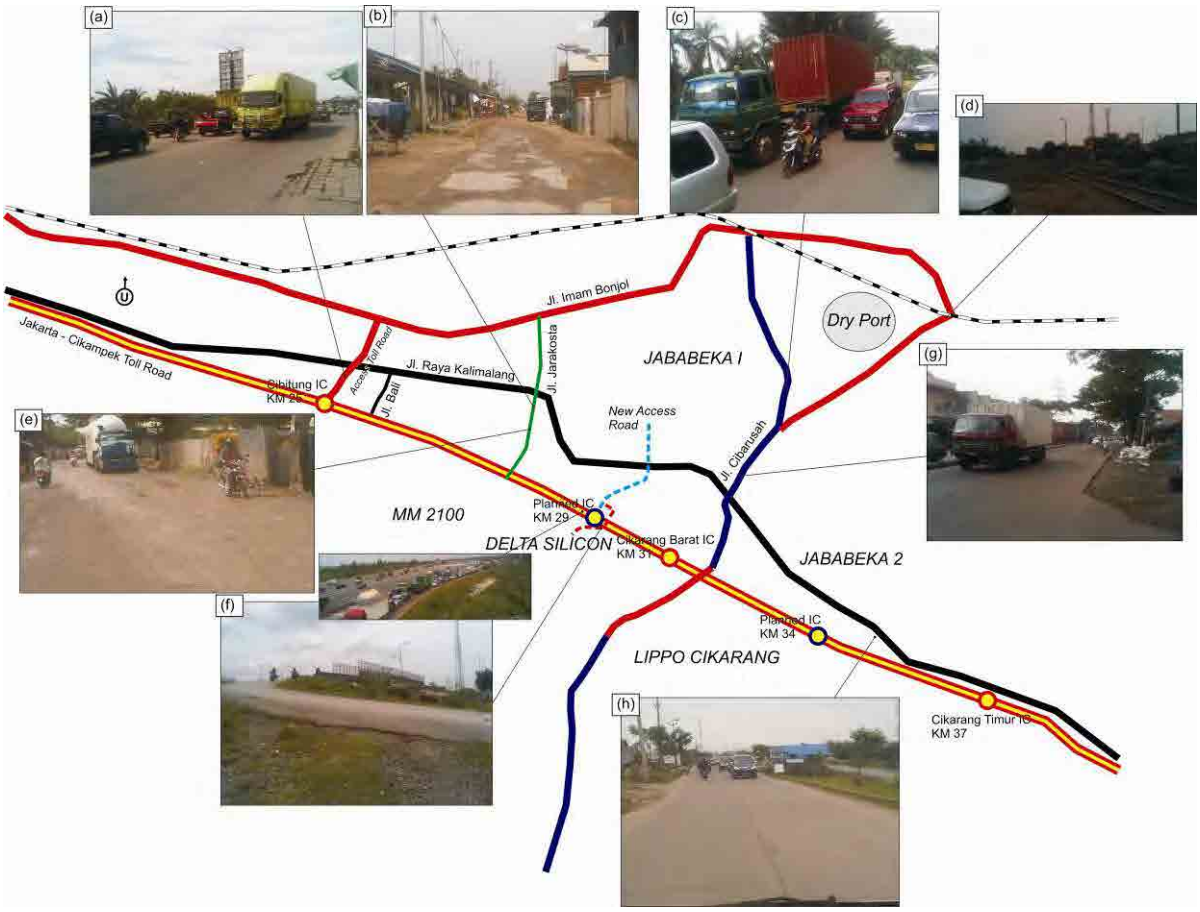
The intersections at both the beginning and end points are congested with traffic on the cross road. The distance between the interchange gate and intersection is about 250m.



Source: Google Map

Figure 2.2.33 Location Map of Cikarang Area

- Cikarang industrial area is the largest industrial estate in Jabodetabek, and around 450 Japanese manufacturing companies concentrate in this area consisting of MM2100, Delta Mas, and so on. Those are located on both north and south sides of Jakarta – Cikampek Toll Road (between 25km – 37km posts). Most employees of the industrial estates live in the existing villages on the north side and commute to the factories. Furthermore, since there are many factories that are closely related to each other for supplying parts, a considerable volume of traffic is occurring within the industrial estates, causing traffic congestion in this area, especially on the limited number of north-south access roads such as Jl. Cibarusah (photo (c)) and Jl. Jarakosta.
- A new IC is planned at 29.2km post on Jakarta – Cikampek Toll Road, and the construction work is currently in progress. The new IC will be connected by a new access road that consists of a new overpass over the toll road, a new bridge over the river (Kalimalang River), and a new dry port access road through Jababeka I. This access road will be designed as a north-south through access road by Jababeka and so on.
- There is a large volume of traffic to and from Cibitung IC on the access road, which cannot be utilized as a north-south through access road, either.
- Although there is a large volume of traffic traveling north-south in Cikarang industrial area, the number of overpasses over the toll road is limited, and all the north-south roads are congested.
- Development of an east-west trunk road is necessary on the existing road along the Kalimalang River in order to divert the traffic in Cikarang industrial area. It should also support the north-south traffic flow by reinforcing the connection with the existing north-south access roads such as Jl. Bali and Jl. Jarakosta.



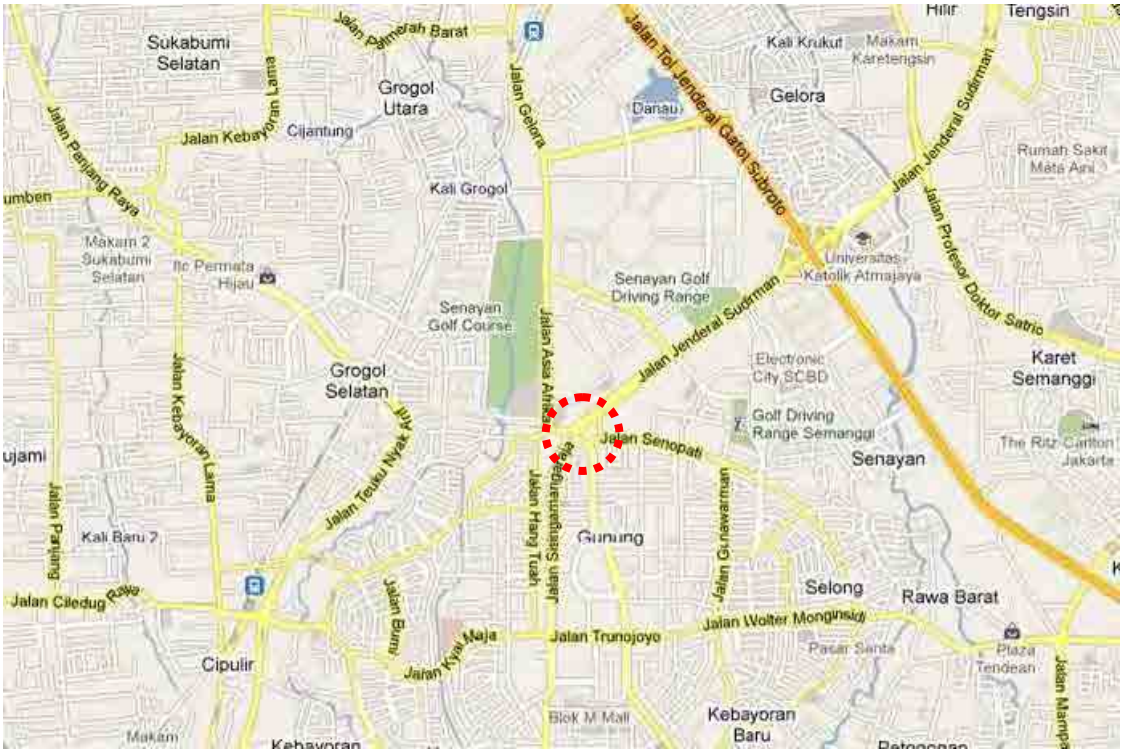
Source: JICA Survey Team

Figure 2.2.34 Photos of Cikarang Area

(18) Senayan

Senayan intersection is located about 2km from Semanggi Junction to the southwest along Jl. Sudriman and has a roundabout intersection connecting with 4 roads, Jl. Sudirman, Jl. Patimura, Jl. Asia Africa and Jl. Sisingamanngaraja. Jl. Sudirman, a provincial road, has an 8-lane carriageway with a frontage road on the both sides isolated by a buffer and the center lane is used exclusively as a bus way, Trans Jakarta. The bus stop for Trans Jakarta is 250m away on Jl. Sudirman. The bus way continues to Jl. Sisingamanngaraja with 6-lanes. Jl. Patimura has 4-lanes with a slow lane connecting with Jl. Senopati near the roundabout.

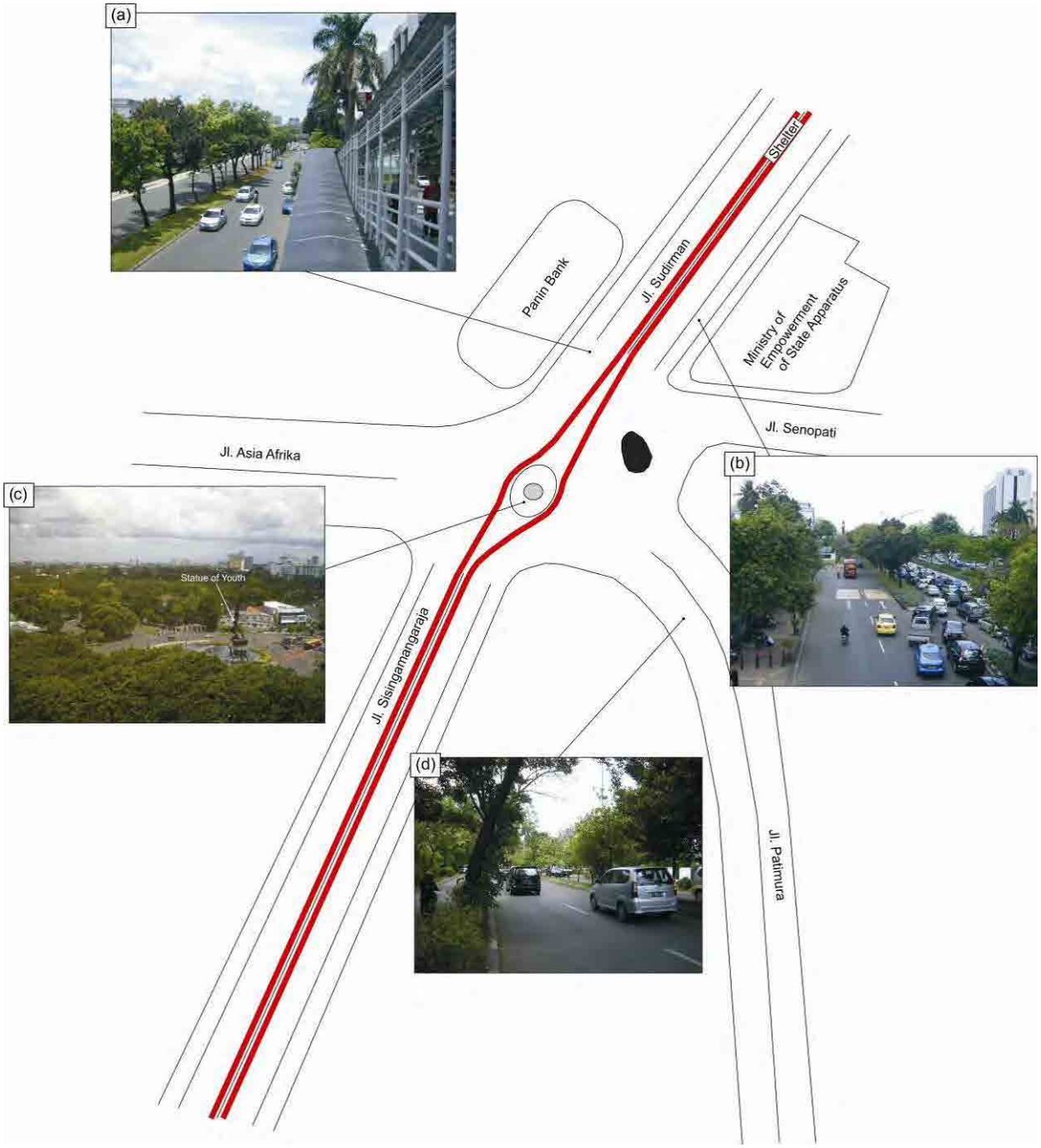
The roundabout is surrounded by commercial and public buildings such as a bank, ministry office, shopping mall and British school. In the roundabout, there is a pond and statue of youth. A police booth is placed at the south of the roundabout.



Source: Google Map

Figure 2.2.35 Location Map of Senayan Intersection

- The intersection has a roundabout structure, but it is signalized and inflow traffic is controlled in each direction.
- Due to the shortage of the green time, each road is congested. The traffic congestion on Jl. Pattimura is especially heavy (photo (d)). Additional traffic from Antasari non-toll elevated road is predicted to worsen the situation in future.
- From Jl. Sudirman, the ratios of right-turn traffic to Jl. Asia-Afrika and U-turn traffic back to Jl. Sudirman are high, and it may be one of the causes of congestion.



Source: JICA Survey Team

Figure 2.2.36 Photos of Senayan Intersection

2.3 Selection of Sub-projects

2.3.1 Selection Criteria

The procedures for selection of sub-projects in the 1st stage and evaluation of sub-projects in the 2nd stage are explained in "1.3 Methodology". And the Multi Criteria, which is used in the 2nd stage, is set as a draft in "10.1.2 Multi Criteria".

The selection of sub-projects will be done by non-quantitative measures, and the evaluation of sub-projects will be done by quantitative measures by multi criteria analysis.

The selection criteria in the 1st stage shall be related to the multi criteria to maintain similar judgement in both stages. Therefore the selection criteria are set forth in Table 2.3.1.

Table 2.3.1 Selection Criteria in the 1st Stage

Selection Criteria	Note
Planned in Any Master Plan	If the project is stipulated in any master plan or equivalent plan, **it is prioritized**
Existing Study	If a study (F/S, B/D or D/D) for the project has been conducted, **it is prioritized**
Railway Crossing	The grade separation at railway crossings is the highest priority for the safety and ease of congestion, therefore **it is prioritized**
Traffic Volume	If the current traffic volume exceeds 100,000 (PCU/16hrs, 4-direction total), **it is prioritized**.
Resettlement UKL/UPL	If the number of resettlement household exceeds 50, **it is not prioritized**. If UKL/UPL or AMDAL is approved or documented, **it is prioritized**.
Conflict with Other Projects	If there is another project (MRT, Toll Road, etc.) on going around the project site, it may affect traffic flow, design, and construction of the project implementation. **Therefore it shall not be selected. But for Senayan as strategic candidate, it is not eliminated.**

Source: JICA Survey Team

2.3.2 Selection of Sub-projects

The selection of sub-projects from all 18 potential projects is done with the selection criteria in Table 2.3.1, and the selection result is summarized in Table 2.3.2. Those selected sub-projects will go into the 2nd stage, on which survey and basic design will be conducted.

Table 2.3.2 Selection of sub-project

Candidate			Total '+' score	Selection in 1st-stage	Criteria for selection in 1st-stage													Note
					Planned in any Master Plan		Existing study (F/S, D/D)		Railway crossing		Traffic Volume [pcu/16 hrs]		Resettlement house hold, and UKL/UPL status			Conflict with other project		
Location	Authority	FO, UP, etc.																
1. Semanggi	DKI Jakarta	To be studied in 2nd-stage	2	●	+	SITRAMP					+	265,000		0				The most strikingly congested site in Jakarta
2. Margonda Cinere	Kota Depok	UP	–		+	Kota Depok Regional Spatial Plan			+	Bogor	+	125,000	–	100		–	JORR2 (PU)	Traffic flow will be drastically changed when on-going JORR2 construction is completed at this location, and now there is no existing road west of this location.
3. Cililitan	DKI Jakarta	UP	1				+	D/D				72,000		50				The N-S traffic volume is considerably higher (54,000 PCU/16 hrs) compared to E-W (18,000 PCU/16 hrs), and the FO direction should be studied again.
4. R.E.Martadinata	DKI Jakarta	FO	3	●			+	D/D	+	Ta Priok extension		37,000	+	10	approved			
5. Sulawesi - Tg.PA	DKI Jakarta	FO	4	●	+	SITRAMP	+	D/D	+	Ta Priok extension		77,000	+	50	approved			
6. Latumenten	DKI Jakarta	FO	–		+	SITRAMP			+	Tangerang		78,000		30		–	MRT (DGR)	Better to wait for the improvement of Tangerang railway, which may be improved as the underpass at this location when MRT E-W line project starts
7. Sudirman-Daan Mogot	Kota Tangerang	FO	1		+	Kota Tang. Regional Spatial Plan	+	F/S				59,000	–	70				The E-W traffic volume is considerably higher (45,000 PCU/16 hrs) compared to N-S (17,000 PCU/16 hrs), and the FO direction should be studied again.
8. Kuningan	DKI Jakarta	UP	3	●	+	SITRAMP priority improvement	+	F/S			+	180,000		10				
9. Pancoran	DKI Jakarta	FO	2	●	+	SITRAMP priority improvement					+	200,000		0				
10. Cilandak	DKI Jakarta	UP	1								+	107,000		10				Traffic flow will be drastically changed when on-going Antasari - Block M elevated non-toll project is completed near this location.
11. Fatmawati	DKI Jakarta	FO	–								+	103,000		10		–	MRT (DGR)	MRT project can conflict with the flyover design and construction
12. Ciawi-Bogor	Kab. Bogor	FO	–									72,000	–	70		–	Toll extension, Bogor RR (PU)	Traffic flow will be drastically changed after both Jagorawi toll road extension and Bogor ring road projects are completed.
13. Pinang Baris	Kota Medan	FO	2	●	+	Provincial Strategic Plan 2014	+	DD/EIA				94,000	+ –	80	documented			The most congested site of the three locations in Medan according to PU Medan (Balai Besar)
14. Asrama-Gatot Subroto	Kota Medan	FO	0								+	134,000	–	80				Decision as to whether E-W (by central govn't) or N-S (by local govn't) flyover is not clear yet.
15. Katamso	Kota Medan	UP	2	●			+	F/S	+	North Sumatera		76,000		50				
16. Sudirman II	Kota Tangerang	FO	2	●			+	F/S	+	Tangerang		47,000		10				Tangerang railway line improvement with higher-frequency commuter train service is planned.
17. Cikarang	Kab. Bekasi	1 E-W road 3 N-S road	2	●	+	MOU (6 Dec. 2006)	+	F/S				61,000		20				
18. Senayan	DKI Jakarta	FO	2	●	+	SITRAMP					+	127,000		10				Consensus is necessary with the local gov't on FO. If FO is not agreed, at-grade intersection improvement (non-structure type) to be studied and proposed (UP conflicts with MRT)

If include "-", deduct from number of "+"

get "+" if traffic volume > 100,000

Candidate with conflict shall not be selected

if # of resettlement household > 50, then get "-" AND, if UKL/UPL or AMDAL approved or documented, then get "+"

Original Candidate in MD by (PU & JICA)

Source: JICA Survey Team

CHAPTER 3. TRAFFIC ANALYSIS

3.1 Traffic Survey Result

For this project, traffic survey was conducted at the 10 sub-project locations for arterial road improvement in the metropolitan regions of Jakarta and Medan in order to obtain information on the characteristics of the traffic flow. This traffic survey includes four surveys: (1) directional traffic count survey, (2) traffic signal phasing survey, (3) travel speed survey, and (4) traffic queue length survey.

The main objective of the survey is to obtain information on the characteristics of traffic flow on major roads around the sub-project locations as base data to quantitatively evaluate the benefits of road improvement such as savings in travel time and vehicle operation cost (VOC) as well as to perform the economic analysis. The data is also used to develop dynamic traffic simulation especially for analysis of some sub-project locations with complicated road structure, that is, Semanggi junction.

3.1.1 Directional Traffic Count Survey

(1) Survey Period

Directional traffic count survey was carried out for each turning direction (including U-turns) for 16 hours from 6:00 to 22:00 on one weekday excluding Monday and Friday.

(2) Type of Vehicles

The types of vehicles for this survey are classified into the following 10 categories:

- Motorcycle, bajaj, becak motor
- Private cars (sedan, jeep, kijang, etc.), taxi,
- Small bus (bemo, mikrolet, angkutan kota),
- Medium bus (Metromini, Kopaja),
- Large bus (including city bus, school bus, tourist bus),
- Pickup, small truck (2 axis)
- Truck 2 axis 3/4 ton (Colt, Diesel), large truck (2 axis),
- Truck 3 axis,
- Truck 4 axis, and
- Truck 5 axis or more.

(3) Number Plate Survey for Semanggi

For Semanggi junction, a number plate survey was conducted in order to more accurately estimate the volume of directional traffic flow which passes the intersection including U-turn traffic and to evaluate several improvement plans by dynamic traffic simulation. In the number plate survey, local OD pattern data to/from the four directions was determined by manually recording the number plates of all vehicles passing the survey points in the above survey period. The analysis result is presented later in the Semanggi section.

(4) Survey Result

By making use of the counting survey data, traffic volumes for 16 hours are summarized in Table 3.1.1. Among the 10 sub-projects, locations of (1) Semanggi, (8) Kuningan, (9) Pancoran, and (18) Senayan are relatively large-scale intersections with daily (16-hour)

traffic volume of over 100,000 pcu. In terms of scale of traffic volume, major traffic flow matches with the flyover/underpass direction to be improved at all the locations.

Table 3.1.1 Traffic Volume at 10 Sub-Project Locations

No.	Location	FO/UP Direction	Traffic Volume [pcu/16 hrs]				
			From North	From South	From East	From West	Total
1	Semanggi[*1]		108,994	71,949	62,987	65,505	309,435
4	R.E. Martadinata	E-W	3,786	-	16,375	13,509	33,670
5	Sulawesi- Tg. PA	N-S	23,504	16,723	-	18,207	58,435
8	Kuningan	N-S	37,545	57,873	53,700	32,331	181,448
9	Pancoran	E-W	38,789	49,003	48,509	38,670	174,972
13	Pinang Baris	E-W	4,235	15,806	29,338	37,774	87,154
15	Katamso	E-W	18,035	14,149	22,415	30,345	84,944
16	Sudirman II	N-S	27,106	33,724	16,495	-	77,325
17	Cikarang[*2]		28,155	35,622	8,203	12,737	84,716
18	Senayan		53,747	32,902	22,065	5,568	114,282

Note: [*1]North-south direction is Jl. Sudirman while east-west direction is Jl. Gatot Subroto.
[*2]North-south direction is Jl. Cibarusah while east-west direction is Jl. Kalimalang.
Yellow cells show main directions for flyovers/underpasses.
Source: Traffic Survey, JICA Survey Team

3.1.2 Signal Phasing Survey

Traffic signal phasing patterns and times were recorded to obtain the basic data for analysis of the intersections. The survey was performed on the same day as the directional traffic count survey. Signal phasing was recorded for two hours of morning peak period (7:00-9:00), midday period (12:00-14:00), and evening peak period (16:00-18:00), respectively.

As a result of the signal phasing survey, cycle times at the seven sub-projects with traffic signals are summarized in Table 3.1.2. Overall, average cycle times are over three minutes or even longer, causing tremendous travel time delay. In developed countries, however, cycle times generally should be around 60 to 90 seconds even at large-scale intersections. Such too long cycle times of intersections will not only increase the travel time delay and irritate the drivers but also tend to cause dangerous driving behaviors such as rushing into the intersections. Along with the intersection improvement in this project, cycle times will be limited to 120 seconds at the maximum.

Table 3.1.2 Average Cycle Times at Signalized Sub-Project Locations

No.	Intersection	FO/UP Direction	Cycle Time [sec.]		
			Morning (7:00-9:00)	Midday (12:00-14:00)	Evening (16:00-18:00)
5	Sulawesi- Tg. PA	N-S	138	136	138
8	Kuningan	N-S	254	204	219
	Mampang	N-S	271	273	278
9	Pancoran	E-W	228	185	225
13	Pinang Baris	E-W	303	343	368
15	Katamso	E-W	205	191	186
16	Sudirman II	N-S	113	189	184
	Sudirman - Daan Mogot		165	184	246
18	Senayan		225	303	382

Source: Traffic Survey, JICA Survey Team

3.1.3 Travel Speed Survey

(1) Survey Location

Travel time for passing each road section approaching the sub-project intersection was recorded to analyze the average travel speed and to understand the traffic congestion situation around the intersections. Road sections for travel speed survey were surveyed maximum 2 km long or up to the adjacent intersection. Road directions were the same as the main traffic directions that are to be improved in this project.

(2) Survey Period

The survey was performed on the same day as the directional traffic count survey. Travel time for passing each road section was recorded for two hours of morning peak period, midday period and evening peak period, respectively. During the two-hour survey period, the survey car made several trips, and actual travel time was recorded automatically by the GPS device installed on board.

(3) Survey Result

Average travel speeds around the sub-project locations in the morning peak hours (7:00 – 9:00), midday hours (12:00 – 14:00), and the evening peak hours (16:00 – 18:00) on weekdays (i.e., Tuesdays, Wednesdays, and Thursdays) are shown in Table 3.1.3.

Overall, average travel speed is quite low especially in the morning and evening peak hours. Low speeds in the peak hours are observed in most of the sub-project locations. Above all, in (8) Kuningan and (9) Pancoran intersections and in (17) Cikarang area, the traffic is heavily congested at a speed of less than 10 km/h in some directions in the morning and evening peak hours.

Table 3.1.3 Average Travel Speed at 10 Sub-Project Locations

			Morning Peak Period				Midday Period				Evening Peak Period			
No.	Location	FO Direction	From North	From South	From East	From West	From North	From South	From East	From West	From North	From South	From East	From West
1	Semanggi[*1]		44.6	37.5	-	-	28.8	14.1	-	-	20.5	26.8	-	-
4	R.E. Martadinata	E-W	-	-	26.8	18.6	-	-	26.1	13.8	-	-	13.5	8.9
5	Sulawesi- Tg. PA	N-S	21.8	22.0	-	-	19.3	20.6	-	-	16.6	8.5	-	-
8	Kuningan	N-S	14.1	6.5	-	-	16.5	21.3	-	-	9.0	12.5	-	-
9	Pancoran	E-W	8.8	8.5	-	-	14.0	16.3	-	-	7.9	18.8	-	-
13	Pinang Baris	E-W	-	-	23.9	17.1	-	-	18.8	21.1	-	-	19.5	19.5
15	Katamso	E-W	-	-	17.5	18.5	-	-	15.4	18.6	-	-	9.3	12.2
16	Sudirman II	N-S	17.6	21.8	-	-	23.4	12.6	-	-	20.6	5.3	-	-
17	Cikarang[*2]		24.1	19.7	27.5	9.5	15.8	23.2	19.3	18.4	14.4	16.5	17.1	3.3
18	Senayan		24.5	19.0	-	-	17.2	8.9	-	-	28.0	25.3	-	-

Note: [*1]North-south direction is Jl. Sudirman while east-west direction is Jl. Gatot Subroto.
[*2]North-south direction is Jl. Cibarusah while east-west direction is Cibitung toll access road connecting to Jl. Kalimalang.
Yellow cells show low speed below 10 km/h.
Source: Traffic Survey, JICA Survey Team

3.1.4 Traffic Queue Length Survey

Traffic queue is defined as a line of vehicles which are stopping or going at less than a walking speed (i.e., 4km/h). If all the queue has not been cleared within the green time of one signal cycle, it is considered as traffic congestion.

(1) Survey Location

Traffic queue length on each road section approaching the sub-project intersection was recorded to understand the traffic congestion situation around the intersections. Road

sections for queue length survey were surveyed maximum 2 km long or up to the adjacent intersection.

(2) Survey Period

The survey was performed on the same day as the directional traffic count survey. Traffic queue length was recorded by observing the start and end points of the queue at every 5 minutes for two hours of morning peak period, evening peak period and daytime off-peak period, respectively.

(3) Survey Result

Average queue lengths around the sub-project locations in the morning peak hours (7:00 – 9:00), midday hours (12:00 – 14:00), and the evening peak hours (16:00 – 18:00) on weekdays (i.e., Tuesdays, Wednesdays, and Thursdays) are shown in Table 3.1.4. Long queues over 500 meters are observed in many sub-project locations. Among others, in (1) Semanggi, (9) Pancoran, and (17) Cikarang, long traffic queues are observed for most of the day.

Table 3.1.4 Average Queue Length at 10 Sub-Project Locations

			Morning Peak Period (7:00-9:00)[m]				Midday Period (12:00-14:00)[m]				Evening Peak Period (16:00-18:00)[m]			
No.	Location	FO Direction	From North	From South	From East	From West	From North	From South	From East	From West	From North	From South	From East	From West
1	Semanggi[*1]		0	60	0	0	30	280	460	760	40	140	610	680
5	Sulawesi- Tg. PA	N-S	60	60	-	30	40	120	-	40	190	250	-	220
8	Kuningan	N-S	70	330	230	340	100	110	360	460	380	240	190	260
	Mampang		160	1,420	40	210	220	290	50	40	320	390	40	710
9	Pancoran	E-W	770	590	1,000	40	210	220	1,080	30	640	200	920	50
13	Pinang Baris	E-W	30	60	50	260	40	90	140	180	40	100	110	100
15	Katamso	E-W	80	70	60	70	90	50	110	50	100	50	370	190
16	Sudirman II	N-S	70	60	40	-	110	50	30	-	200	70	30	-
	Sudirman - Daan Mogot		140	140	50	90	370	150	40	170	1,190	170	120	220
17	Jl. Cibarusah (Toll Entrance)		1,070	20	-	140	510	50	-	60	960	70	-	300
	Jl. Cibarusah & Jl. Kalimalang		20	20	-	-	70	0	-	-	340	10	-	-
	Jl. Cibarusah & Jl. Jababeka Raya		20	100	-	30	20	50	-	50	50	10	-	10
	Cibitung Toll Access		540	110	-	-	70	20	-	-	690	130	-	-
18	Senayan[*2]		110	310	50	0	230	430	80	0	750	150	30	10

Note: [*1] North-south direction is Jl. Sudirman while east-west direction is Jl. Gatot Subroto.
[*2] Direction from east is Jl. Pattimura.
Yellow cells show long queues over 500 m.
Source: Traffic Survey, JICA Survey Team

3.2 Updates of Existing Plans of Flyovers/Underpasses

(1) Progress of Following Up on SITRAMP

Since 2003, in which a JICA study called SITRAMP ("The Study on Integrated Transportation Master Plan for JABODETABEK (Phase II)") (2001 – 2004) was in progress, DKI has had a plan of totally designated 53 intersections for future development including construction of flyovers/underpasses. Some were under construction at that time, and some are expected to be improved in near future based on a five year development program.

Those planned intersections in DKI are listed in Table 3.2.1 and plotted in Figure 3.2.1. In SITRAMP, some of those intersections were prioritized as "Single Improvement of Intersections" and as "Route Improvement". As of 2011, out of those 53 planned intersections, there are 21 intersections where flyovers/underpasses have already been constructed with a national, local government, or private fund. There are also some other intersection improvements that have been added and planned/implemented by local government including DKI.

The 15 potential project and 8 sub-project locations in JABODETABEK are also plotted in Figure 3.2.1. There are five sub-projects that match with the improvement plans proposed in SITRAMP; namely, (1) Semanggi, (5) Sulawesi – Tg. Priok Access, (8) Kuningan, and (9) Pancoran. Among others, (8) Kuningan and (9) Pancoran have been proposed as intersections for route improvement, that is, for Mampang – Kuningan corridor and Jl. Pasar Minggu – Tg. Barat corridor, respectively. For currently ongoing JABODETABEK Urban Transportation Policy Integration (JUTPI) Project, those 15 potential projects as well as the selected 8 sub-projects will be incorporated into the revised transportation master plan.

(2) Projects for Railway Development

On the other hand, it should be noted that, since urban railway development is planned in JABODETABEK including double tracking and increase of train services, improvements involving grade separation at railway crossings are given priority for safety and ease of congestion of the roads. Such railway developments that are related to the above-mentioned flyover/underpass plans in DKI are presented in Figure 3.2.1. Of the eight potential project locations in JABODETABEK:

- (4) R.E. Martadinata and (5) Sulawesi – Tg. Priok Access are located on Tg. Priok railway line, which is to be double-tracked (at grade) and partially to be reactivated (for (5));
- (16) Sudirman II is located on Tangerang railway line, which is to be double-tracked (at grade); and

As for (1) Semanggi and (18) Senayan, they are located on the planned MRT (mass rapid transit) line, which is to be developed underground (for (1) and (18)) while the section south of Blok M is to be elevated. Though the MRT line is not planned to be developed at grade, the structure must be considered when designing flyovers/ underpasses in these locations.

Table 3.2.1 Intersections for Future Improvement in DKI Proposed in SITRAMP

No.	Location	Remarks	Type	Status
1	T.B Simatupang / Tanjung Barat	JORR / Pasar Minggu Raya	Flyover	Completed
2	T.B Simatupang / Jl. Raya Bogor	JORR / Raya Bogor	Flyover	Completed
3	Ps. Minggu / Volvo		Flyover	
4	A. Yani / Pemuda	Cawang-Tanjung Priok	Flyover	Completed
5	P. Kemerdekaan / P. Gadung		Flyover	
6	Akses Utara Kemayoran		Flyover	
7	S. Parman / Grogol (Citra Land)	North - South	Flyover	
8	D. Mogot / Rute D / Angke / Rel KA		Flyover	Completed
9	A.Yani / Suparto / P. Kemerdekaan	Cawang -Tanjung Priok	Flyover	Completed
10	Latumentten (Rel KA)	Tangerang Line (Railway)	Flyover	
11	Bekasi - Dr. Rajiman		Flyover	
12	Ps. Minggu / Kalibata		Flyover	
13	Extension Pasar Pagi		Flyover	Completed
14	Cideng / Moh. Zainul Arifin		Flyover	
15	Cideng / Hasyim Ashari		Flyover	
16	Cideng / Caringgin		Flyover	
17	Penggilingan / Ngurah Rai	Close to JORR Pd. Pinang	Flyover	Completed
18	Pramuka / Rel KA	Eastern Line	Underpass	Completed
19	Sultan Agung / Minangkabau	Manggarai	Flyover	
20	Penyempurnaan Jbt. Latuharhary / Rasuna Said	Dukuh Atas Line	Widening	Completed
21	Administrasi / Pejompongan		Flyover	
22	Suproto / Galur		Flyover	Completed
23	Suproto / Rel KA	Eastern Line	Underpass	Completed
24	Patung Tani	Kebon Sirih	Flyover	
25	Kebon Sirih / Thamrin		Underpass	
26	Kebon Sirih / Abdul Muis		Flyover	
27	Martadinata / Gunung Sahari	Near harbor toll road	Flyover	Completed
28	Gunung Sahari / Industri / P. Jayakarta		Flyover	
29	Gunung Sahari / Samanhudi / Angkasa		Flyover	Completed
30	Sudirman / Sisingamangaraja		Underpass	
31	Sisingamanganraja / Trunojoyo (cws)		Flyover	
32	Hasyim Ashari / Rel KA	ITC Roxy Mas	Flyover	Completed
33	Kalibata / Rel KA	Bogor Line	Flyover	Completed
34	Santa / Wijaya II		Underpass	
35	Suharso / Kebayoran Lama		Flyover	
36	Pondok Indah	Metro Pondok Indah	Underpass	Completed
37	Enggano / Yos Sudarso	Tanjung Priok	Flyover	
38	Utan Panjang / Kemayoran Gempol	Kemayoran	Flyover	
39	Gatot Subroto / Kuningan		Flyover	
40	Gatot Subroto / Pancoran		Flyover	
41	Sudirman CBD		Underpass	
42	CBD - Gatot Subroto		Flyover	
43	Mampang - Kuningan	North - South	Underpass	
44	S. Parman Tomang (Grogol) - Slipi		Underpass	Completed
45	Kelapa Gading - Printis Kemerdekaan		Flyover	
46	Pelebaran Jbt, Perjuangan (Tol)		Widening	
47	Daan Mogot / Outer Ring Road			
48	Outer Ring Road / Rail Crossing			
49	Stasiun Cakung			
50	Juanda		Underpass	Completed
51	Sultan Iskandar Muda		Underpass	Completed
52	Pasar Minggu		Underpass	Completed
53	Cawang		Underpass	Completed

Source: SITRAMP, 2004

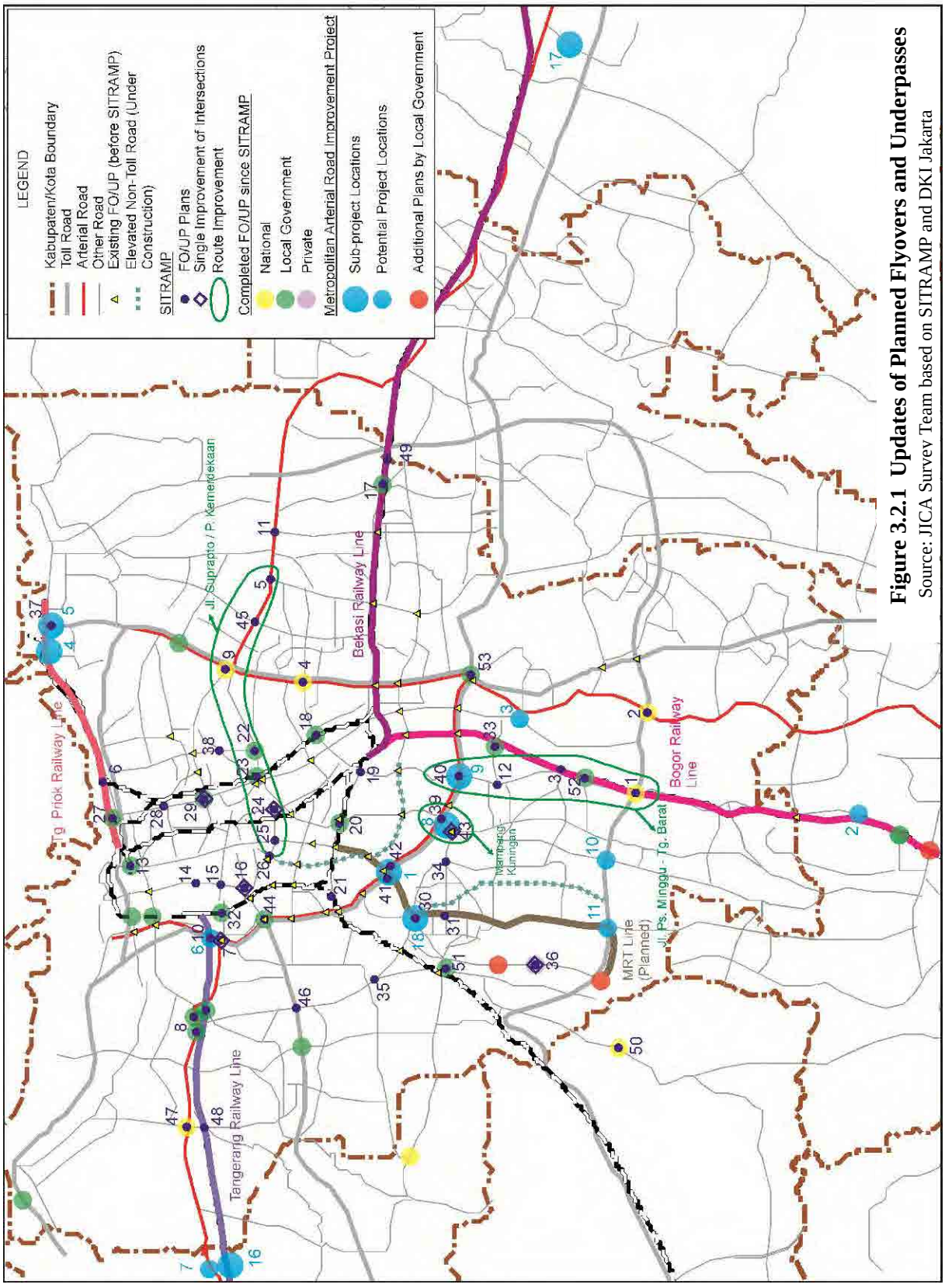
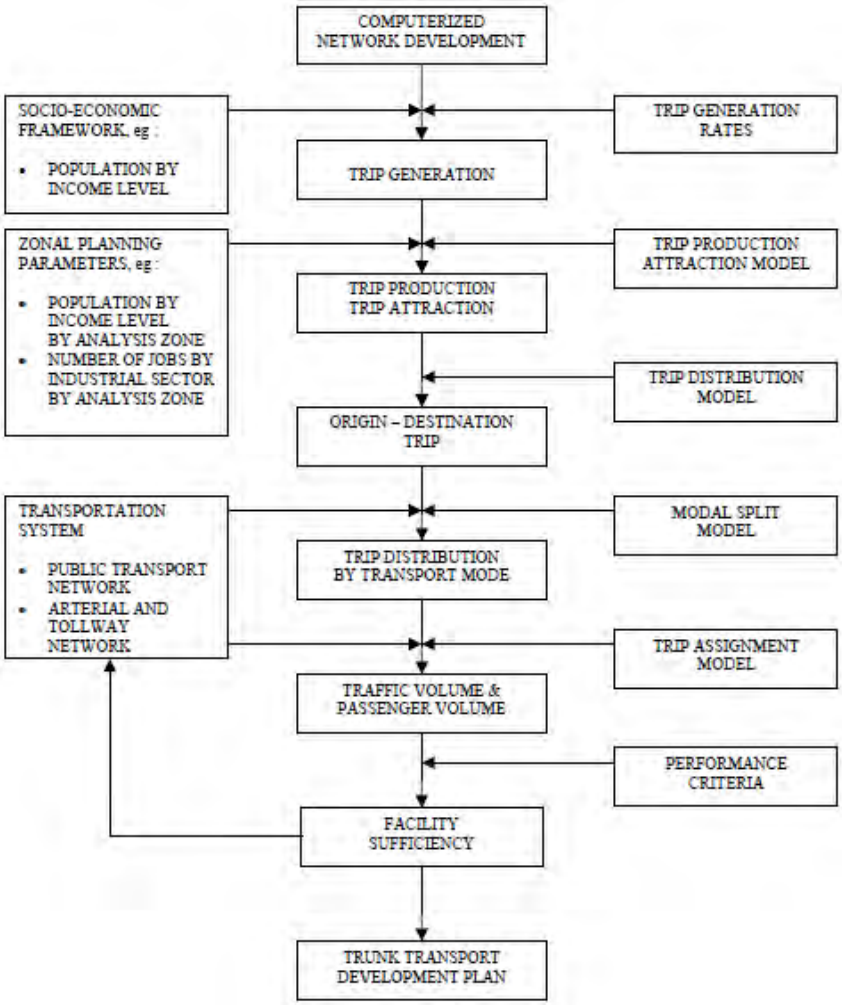


Figure 3.2.1 Updates of Planned Flyovers and Underpasses
Source: JICA Survey Team based on SITRAMP and DKI Jakarta

3.3 Travel Demand Forecast

For the ten sub-project locations, traffic demand forecast at each intersection is conducted based on the results of the above-mentioned traffic survey and the existing traffic demand forecast model available in SITRAMP and JUTPI.

SITRAMP developed the transportation demand forecast model based on four step method as outlined below. Since reliability of this methodology has been empirically proven and has been applied to demand forecast of many road and public transportation projects including JUTPI, this methodology is also applied to project.



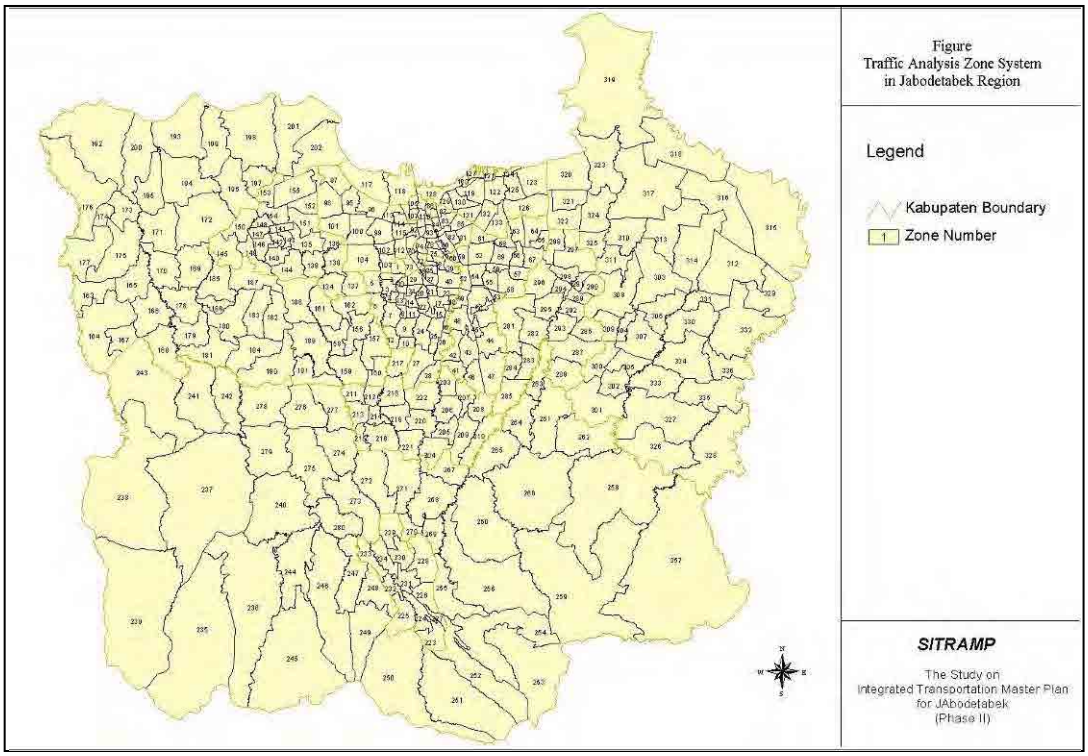
Source: SITRAMP, 2004

Figure 3.3.1 SITRAMP Demand Forecast Flow

Although the basic flow of demand forecast procedure is the same as SITRAMP shown above, in JUTPI, each demand forecast model of the process such as production/attraction, distribution and modal choice has been revised and updated considering current transition in travel behavior.

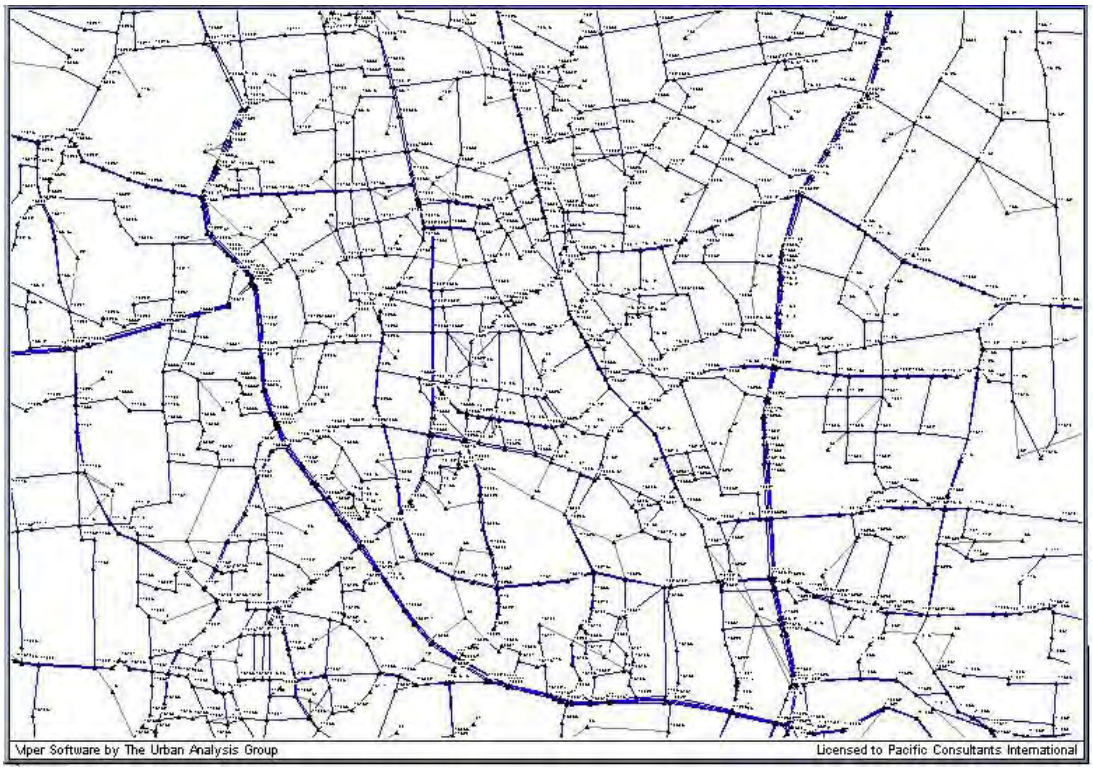
(1) Zone system

The traffic analysis for demand forecast is based on the SITRAMP 336 zone system and the transportation network that has been recently updated in JUTPI.



Source: SITRAMP, 2004

Figure 3.3.2 Traffic Analysis Zone System



Source: JUTPI, 2011

Figure 3.3.3 Computerized Transportation Network (Example of Central Jakarta)

(2) Production/Attraction

SITRAMP has developed production/attraction model by trip purpose, by area type (urban/rural) by income level for JABODETABEK region and this model was employed for

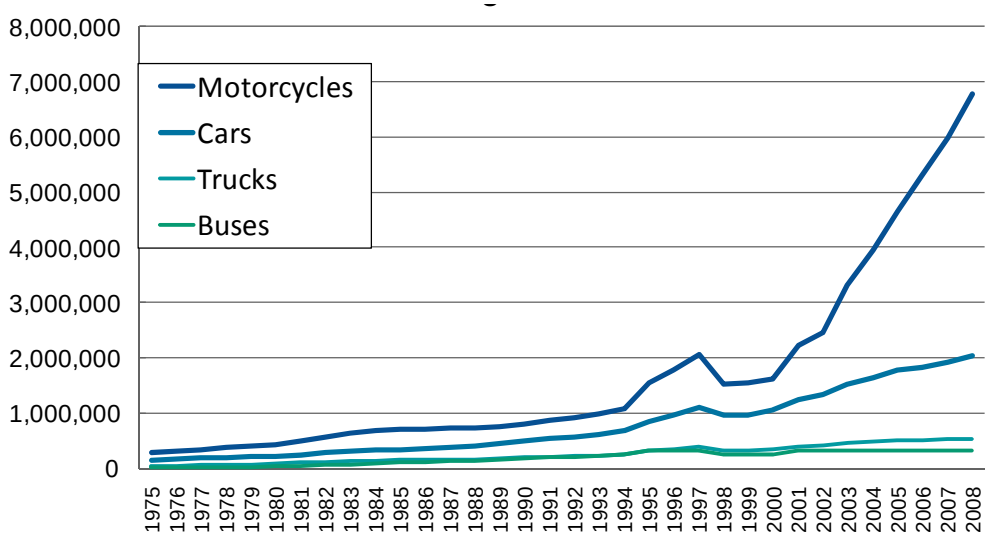
this project as well. Explaining variables of these models are socio-economic indices such as population by income level, the number of students by school type, the number of workers by industry, and so forth. For each explanatory variable, the aggregation data from the JUTPI commuter survey was utilized.

(3) Distribution

Taking the above-mentioned production/attraction volume as input, Fratar method was utilized to estimate distribution of trips by purpose in 2020 and 2030 cases. The urban development scenario recommended in JUTPI is the case with urban sub-center development and moderate development along railway and busway corridor development with traffic demand management (TDM) policy. For the existing case, person trip distribution pattern based on the commuter survey and the person tracking survey in JUTPI was utilized for development of the distribution model.

(4) Modal Choice

There has been a significant change in modal share since SITRAMP was formulated in 2004. According to the vehicle registration statistics, the number of motorcycles almost doubled in the five years while the increase in the number of registered passenger cars and trucks was relatively moderate. With development of financial load for comparatively lower income people as well as the worsening traffic congestion, motorcycles have increased popularity.



Source: Polda Metro Jaya

Figure 3.3.4 Number of Regitered Vehicles in Jakarta, Depok, Tangerang and Bekasi

Based on the aforementioned commuter survey and the person tracking survey in JUTPI, a modal choice model for motorized transportation was developed which can take current mode choice behavior into account. A disaggregate behavioral model (or individual choice model) was employed for JUTPI while SITRAMP employed diversion curve model. It is a relatively stable modeling method in terms of space and time difference. Even though spatial location or time is not equal, individual choice of a certain group of people in specific condition such as travel time and fare is empirically stable.

With regard to mathematical structure, a prevalent “multi-nominal logit model”, which can represent unique characteristics of each choice such as transportation mode, was employed for JUTPI as well as for this project.

(5) Traffic Assignment

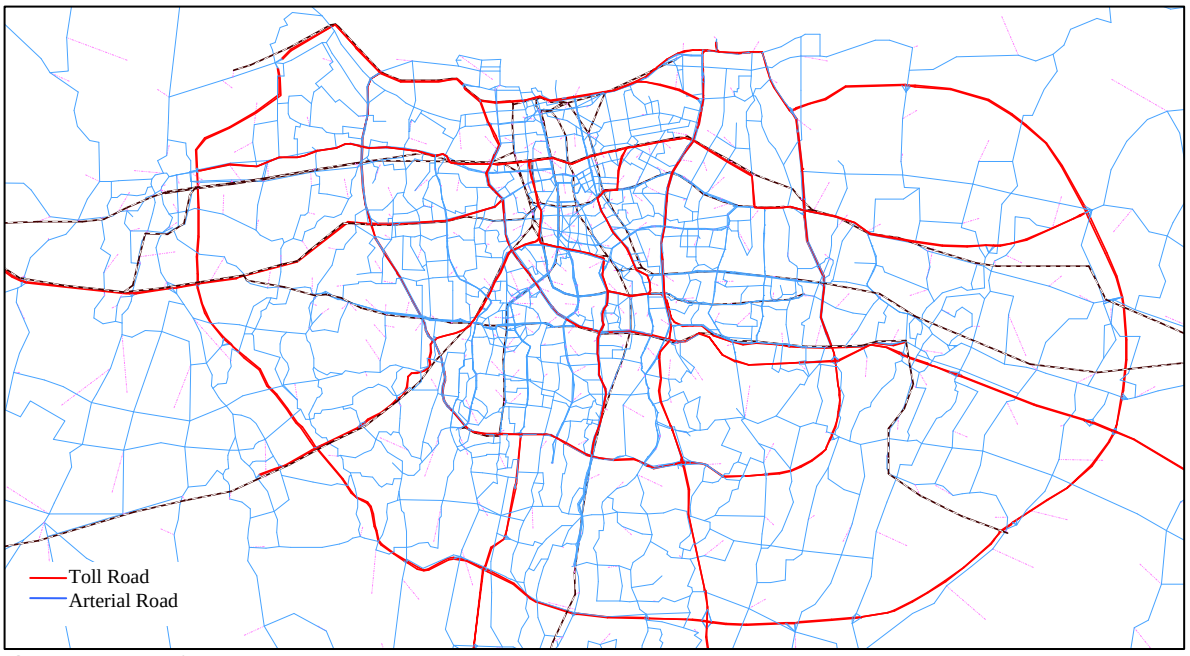
Transit and road traffic assignment was conducted by an incremental assignment method. There were a total of 40 stages of assignment by income level and transportation mode.

The SITRAMP computerized transportation network has been revised in JUTPI to reflect accomplishment of the road network development and public transportation network in JABODETABEK after year 2004 when SITRAMP was completed. Highway networks including existing toll roads, arterial roads and future development plan have been inputted into computer files for traffic assignment. The developed road network has roughly 16,200 road links. The modified and added highway network from SITRAMP data is shown below. Electronic road pricing and urban development with transit-oriented development (TOD) concept are also included as optional plans.

Table 3.3.1 Major Road Development Plans in Assignment Network of 2020 and 2030

Major Road Development Plans	Remarks
Toll Road Network	
Jakarta Tangerang	Modification of Barier Gate to Karang Tengah
Jakarta Cikampek	Modify Toll Road Capacity
Jagorawi	Modify Barrier Gate to Cibubur
1st Jakarta Outer Ring Road	Modification of On-Off Ramp
Future Toll Road Network	
Tanjung Priok Access Road	Revision of alignment
2nd Jakarta Outer Ring Road	Revision of Alignment Section Cengkareng – Kunciran and Cikarang - Tanjung Priok
Depok - Antasari Toll Road	Addition of New Alignment
Becakayu Toll Road	Alignment Revision
DKI Six Inner Toll Road	Addition of New Alignment
Arterial Road Network	
Four Non toll Elevated Road	Addition of New Alignment
Frontage Arterial for 1st JORR	Modification and Addition of New Alignment
CBD Road Network	Addition of Code for ERP Implementation

Source: JUTPI, 2011



Source: JUTPI, 2011

Figure 3.3.5 Road Network for Traffic Assignment (2030 Case2)

As the road network assignment result from JUTPI, 2010 Case 0, which is a base case, and 2030 Case 2, which is a road moderate and public transport intensive case recommended by JUTPI, are presented in Figure 3.3.6 and Figure 3.3.7, respectively. For forecast of the future traffic at the eight sub-projects in JABODETABEK, traffic volumes are looked up in the network assignment result, and the annual growth is calculated as shown in Table 3.3.2.

Source: JUTPI, 2011

Figure 3.3.6 Road Network Assignment Result (2010 Case 0)

Source: JUTPI, 2011

Figure 3.3.7 Road Network Assignment Result (2030 Case2)

Table 3.3.2 Traffic Demand Forecast at Eight Sub-Project Locations in JABODETABEK

No.	Location	FO/UP Direction	Daily Traffic Volume [PCU]		Growth from 2010 to 2030	Annual Growth
			2010 Existing	2030 Forecast		
1	Semanggi		285,838	464,407	1.62	2.5%
4	R.E. Martadinata	E-W	38,912	45,754	1.18	0.8%
5	Sulawesi- Tg. PA	N-S	75,770	127,716	1.69	2.6%
8	Kuningan	N-S	230,903	271,695	1.18	0.8%
9	Pancoran	E-W	199,126	264,916	1.33	1.4%
16	Sudirman II	N-S	72,116	105,881	1.47	1.9%
17	Cikarang		57,488	77,175	1.34	1.5%
18	Senayan		233,976	371,811	1.59	2.3%

Source: JICA Survey Team's estimate based on JUTPI, 2011

For forecast of the future traffic at the two sub-projects in Medan, traffic volumes are taken from the recent studies in which the demand was forecasted based on a similar four step method, and the annual growth is calculated as shown in Table 3.3.3.

Table 3.3.3 Traffic Demand Forecast at Two Sub-Project Locations in Medan

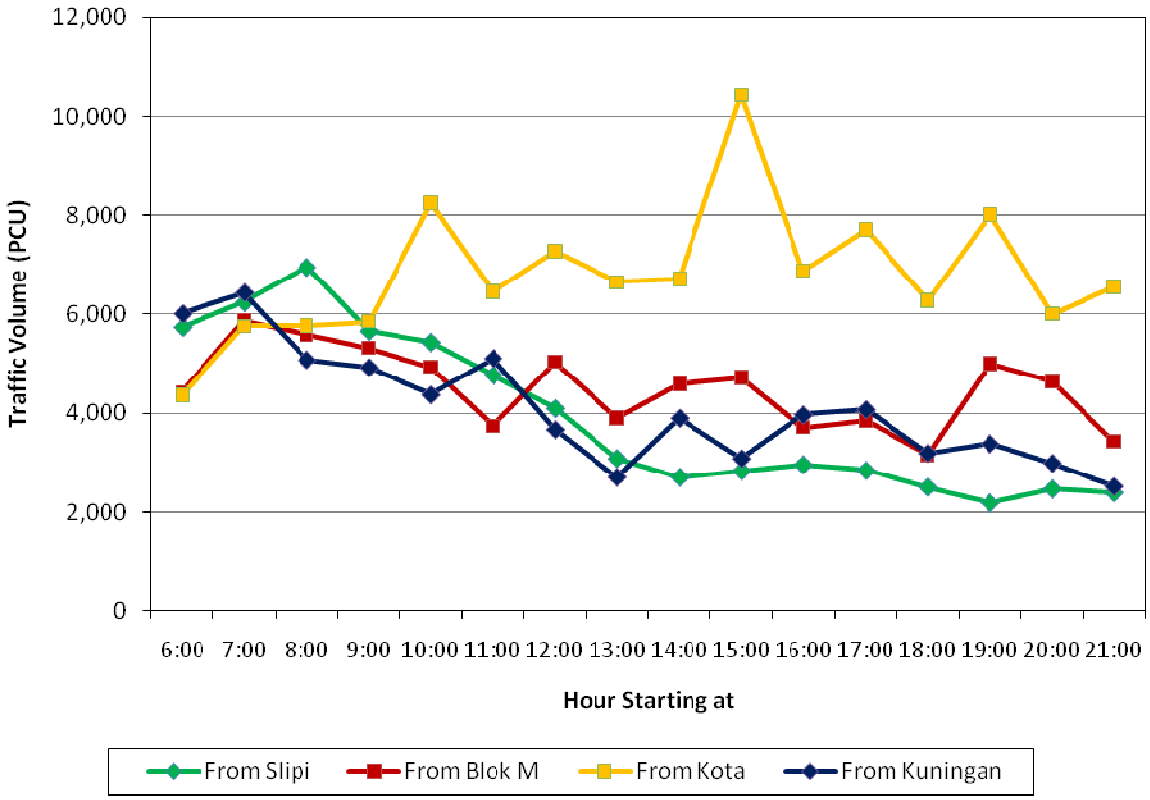
No.	Location	FO/UP Direction	Years for Comparison	Growth	Annual Growth
13	Pinang Baris	E-W	2011-2026	1.22	1.3%
15	Katamso	E-W	2015-2040	1.69	2.1%

Source: JICA Survey Team's estimate based on "FS Grade Separated Intersection Pinang Baris Medan" (2006) and "Studi Kelayakan Simpang Tak Sebidang Brigjend. Katamso – AH Nasution Medan" (2010)

3.4 Traffic Analysis of Sub-Projects

3.4.1 Semanggi Junction

Regarding Semanggi junction, it has a complicated structure with many inflows and outflows and it is difficult to evaluate the project benefit by forecasting the travel speed and travel time delay. As shown in Table 3.4.1, which is made based on the traffic count survey conducted for this project, inflow volumes from the four directions vary and fluctuate depending on the hours of the day. While the inflow traffic volumes are about the same in all the four directions in the morning hours (7:00 – 10:00), the largest inflow volume is observed in the direction from Kota in the midday and evening hours.

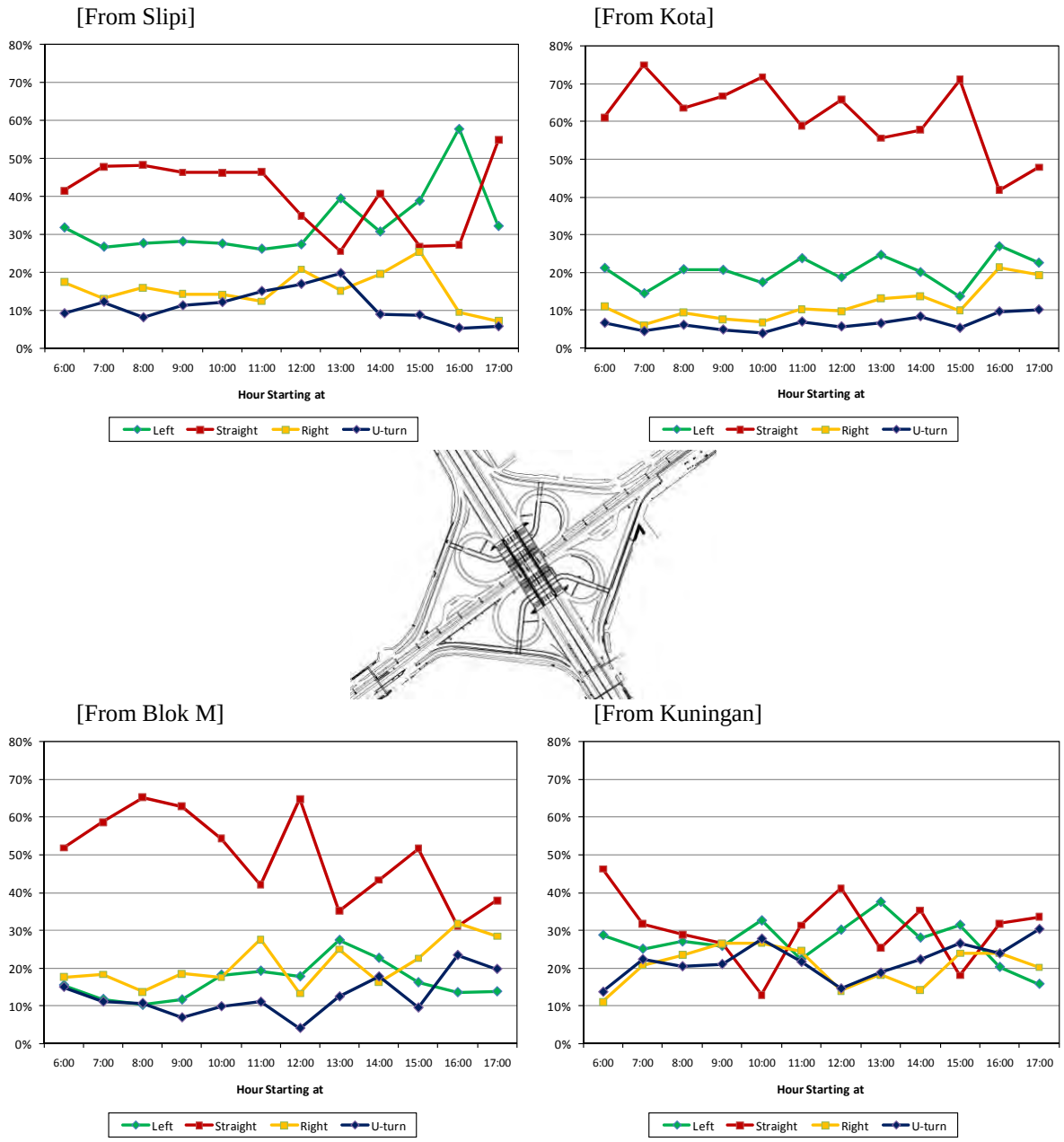


Source: JICA Survey Team

Figure 3.4.1 Hourly Traffic Volume at Semanggi

Therefore, a dynamic simulation analysis was carried out to evaluate several improvement plans by dynamically simulating the traffic. For this, the above-mentioned number plate survey was conducted at the inflow and outflow survey points in order to more accurately estimate the volume of directional traffic flow which passes the intersection including U-turn traffic. In the number plate survey, local OD pattern data to/from the four directions was determined by manually recording the number plates of all vehicles passing the survey points.

Hourly turning movement (i.e., left, straight, right, and U-turns) compositions from the four directions are presented in Figure 3.4.2. Overall, larger compositions of left, right, and U-turns are observed on Jl. Gatot Subroto, while majority of straight traffic is observed on Jl. Sudirman for most of the day. Relatively high U-turn ratios are also observed on Jl. Gatot Subroto. From Kuningan, among others, there are more U-turns than right turns from midday to evening hours, implying that U-turns are so important in this intersection.

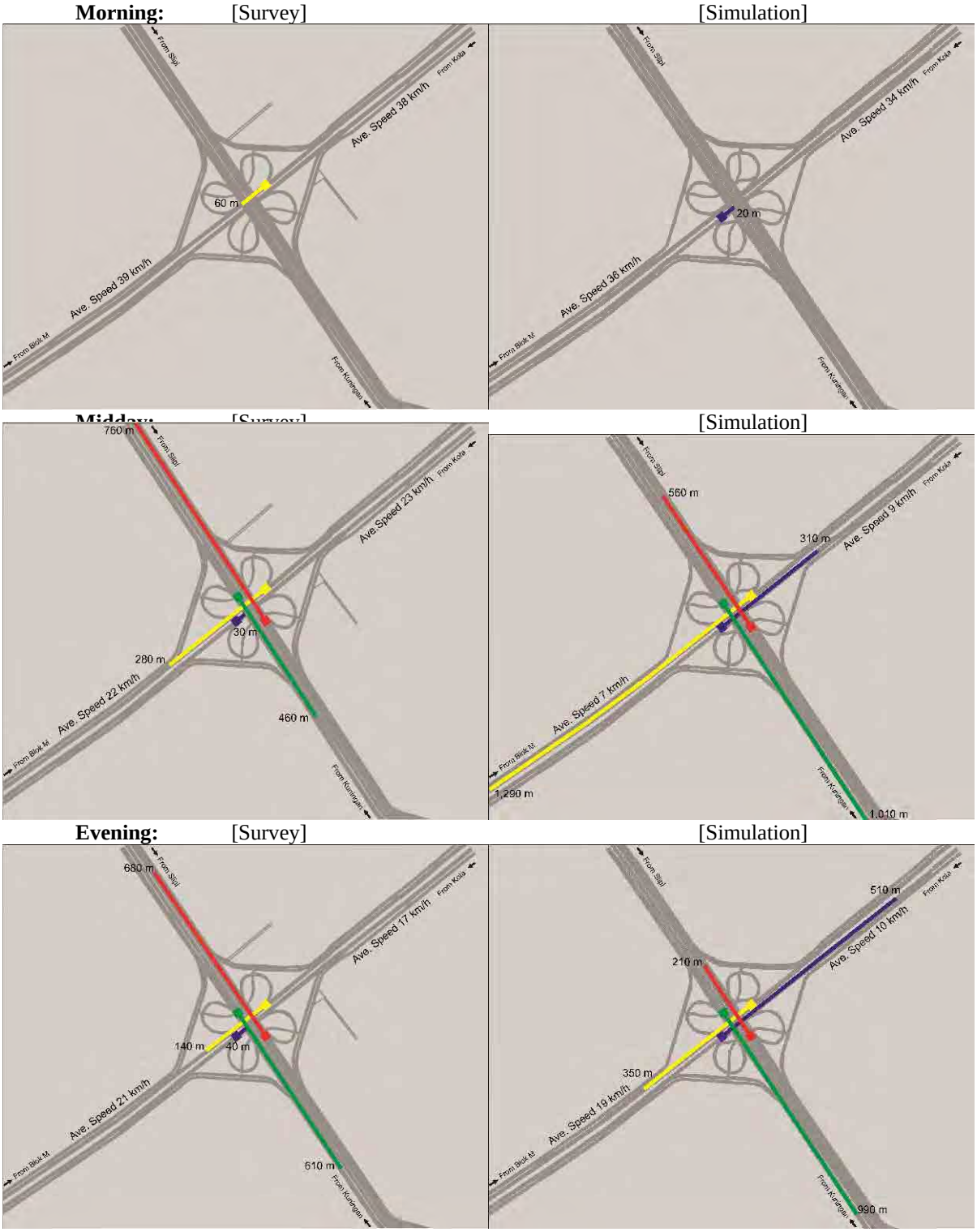


Source: JICA Survey Team

Figure 3.4.2 Hourly Turning Movements at Semanggi

(1) Simulation of Present Condition

Travel speeds (on Jl. Sudirman only) and traffic congestion queue lengths from the traffic survey and from the dynamic simulation result are compared for morning peak, midday, and evening peak hours, as shown in Figure 3.4.3. From the viewpoint of the scale of the queue lengths and average speeds as well as their daily variations, it may be concluded that the dynamic simulation can regenerate the traffic situation in Semanggi well. Though differences from the survey result may exist in some directions, result of the dynamic simulation of the existing situation can be utilized as a base case to evaluate the benefit of each improvement alternative by forecasting the travel speed and travel time delay.

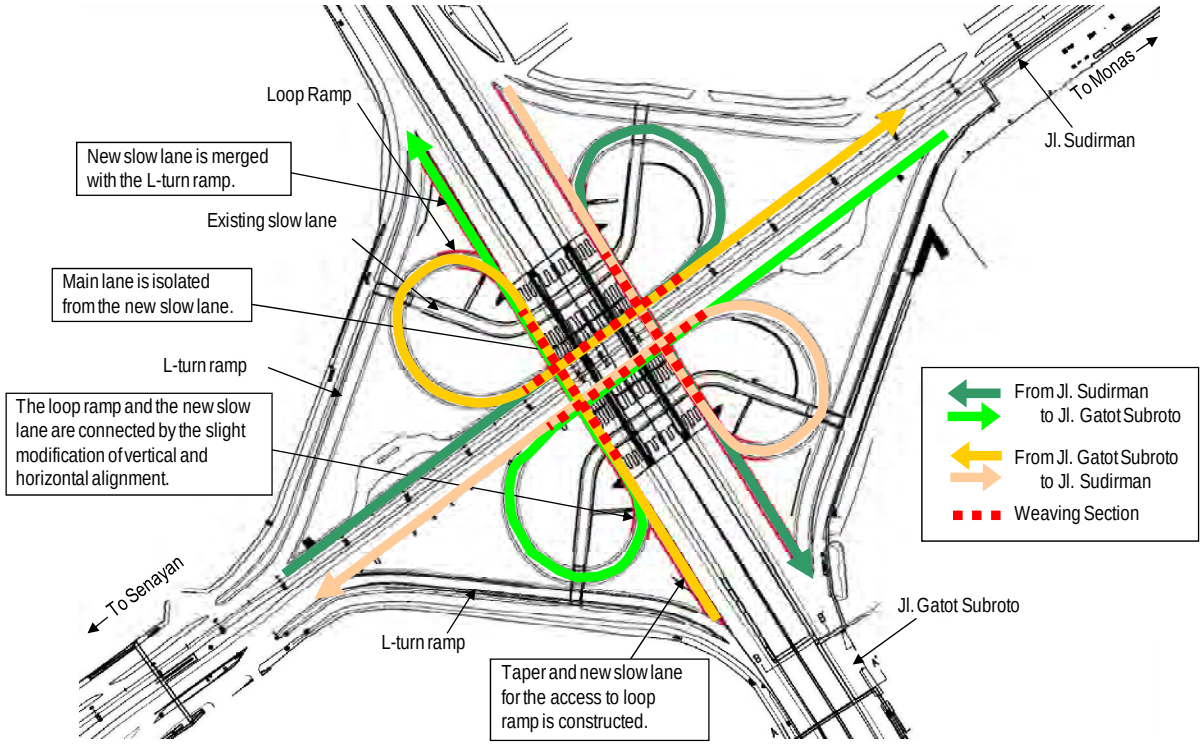


Source: JICA Survey Team

Figure 3.4.3 Comparison of Survey and Simulation Results

(2) Simulation of Alternative 1: Flyover on Jl. Gatot Subroto

Alternative 1 to be evaluated involves new construction of a flyover with two lanes/directions on Jl. Gatot Subroto to provide additional space for merging to/from Jl. Sudirman as presented in Figure 3.4.4.

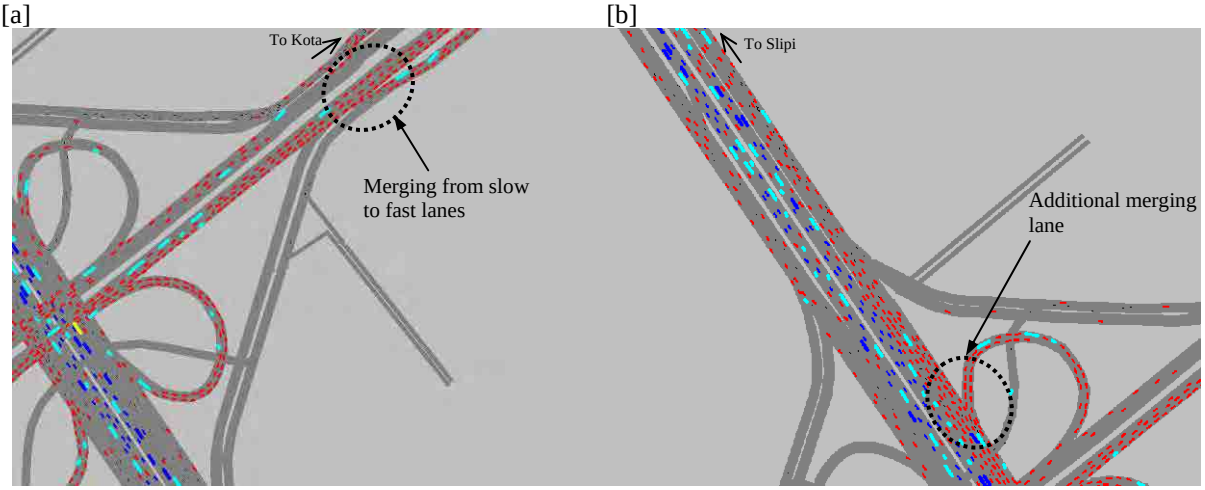


Source: JICA Survey Team

Figure 3.4.4 Alternative 1: Flyover on Jl. Gatot Subroto

In Alternative 1, while the inflow traffic volume Jl. Gatot Subroto is as large as in the present case, congestion on the straight through lane will be eased because of an additional merging lane on Jl. Gatot Subroto (Figure 3.4.5b). However, except for the above improvement, other problems will remain the same such as merging from the slow lane to the fast lane on Jl. Sudirman (Figure 3.4.5a) and weaving from/to the on-/off-loop ramps.

[a] [b]

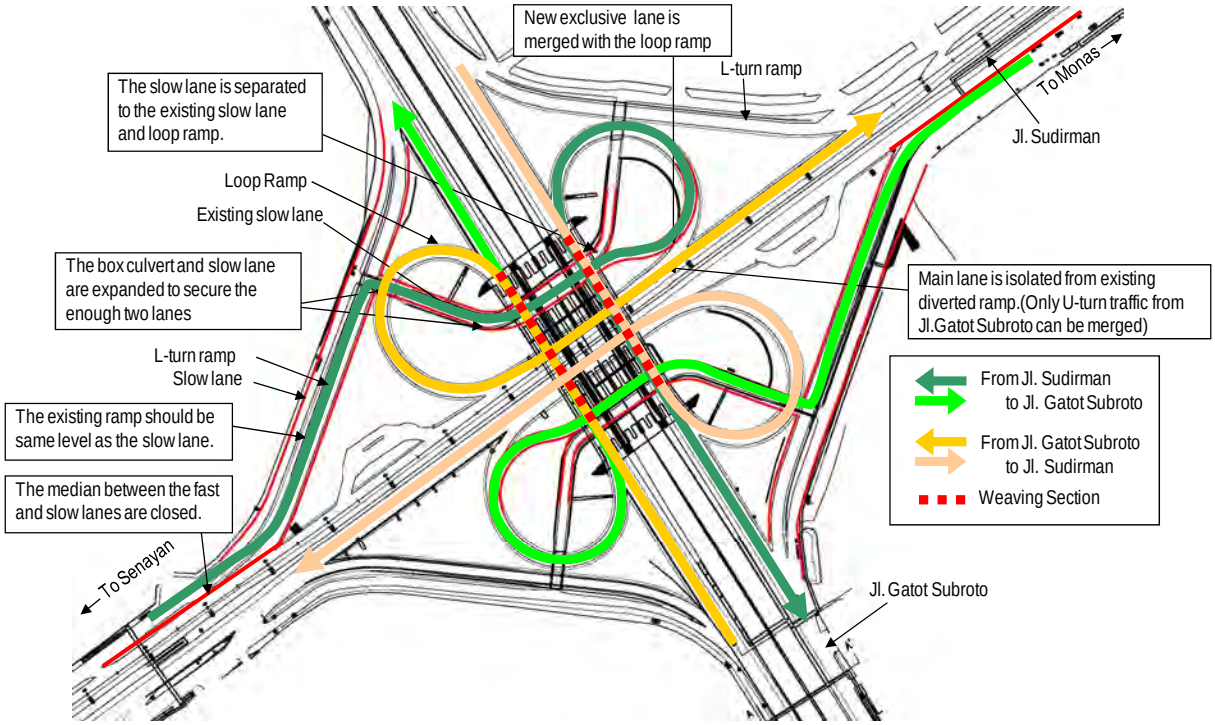


Source: JICA Survey Team

Figure 3.4.5 Screenshots of Dynamic Simulation: Alternative 1

(3) Simulation of Alternative 2-1: New Exclusive Lane on Jl. Sudirman

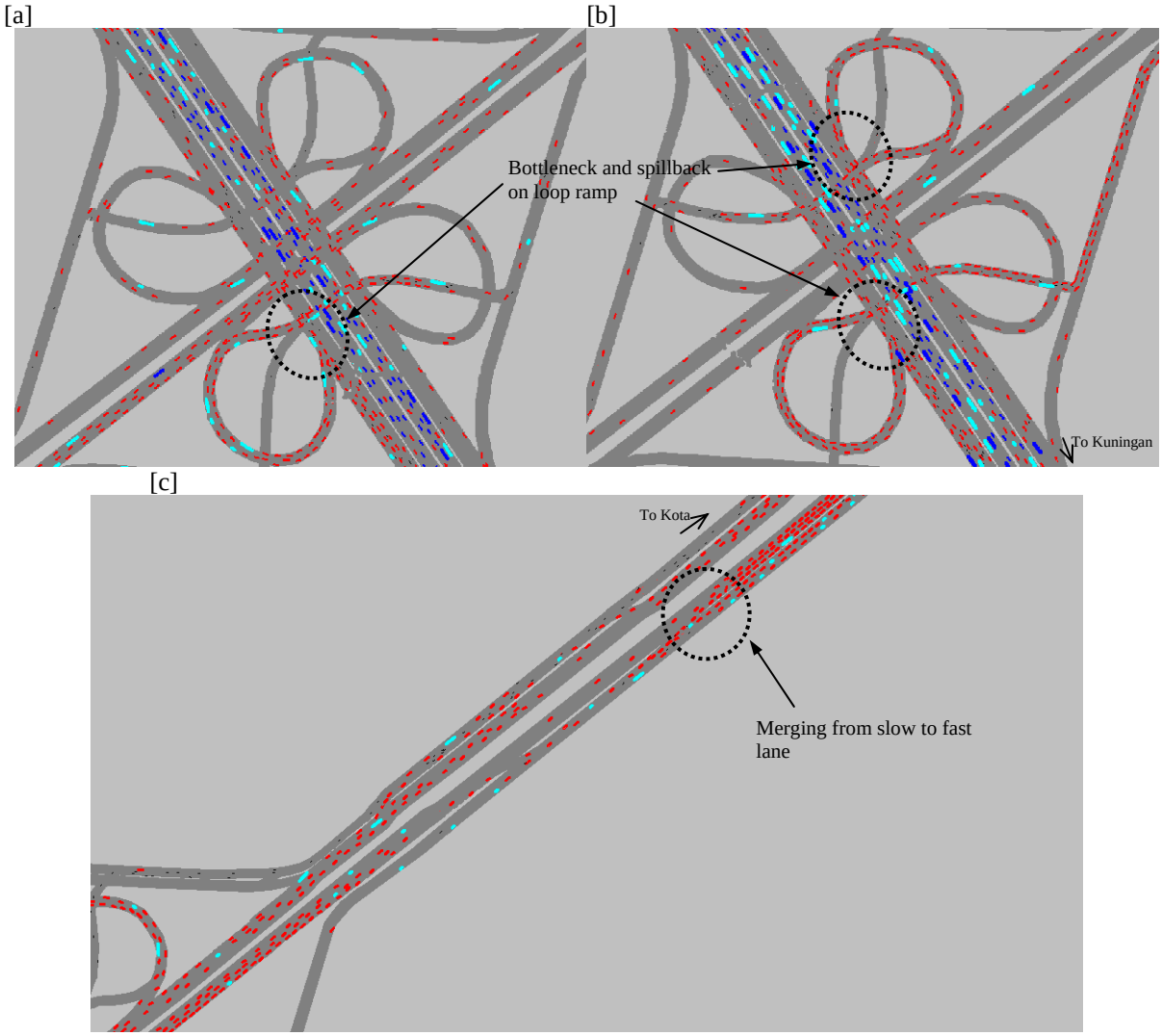
Alternative 2-1 to be evaluated involves new construction of a new exclusive lane on the slow lane of Jl. Sudirman, connecting from the left turn (slow) lane to the on-loop ramp to Jl. Gatot Subroto, as presented in Figure 3.4.6.



Source: JICA Survey Team

Figure 3.4.6 Alternative 2-1: New Exclusive Lane on Jl. Sudirman

Congestion on the fast lane on Jl. Sudirman will be alleviated because the merging will not occur except for the U-turn traffic coming from the off-loop ramp and going into the on-loop ramp. However, merging on Jl. Gatot Subroto may become a bottleneck (Figure 3.4.7a) and the slow traffic may spill back on the loop ramp and the new exclusive lane, and further back to the slow lane of Jl. Sudirman (Figure 3.4.7b). Another potential problem is the left, right, and U-turn traffic from the fast lane of Jl. Sudirman trying to go into the slow lane, causing bottleneck upstream on Jl. Sudirman (Figure 3.4.7c).

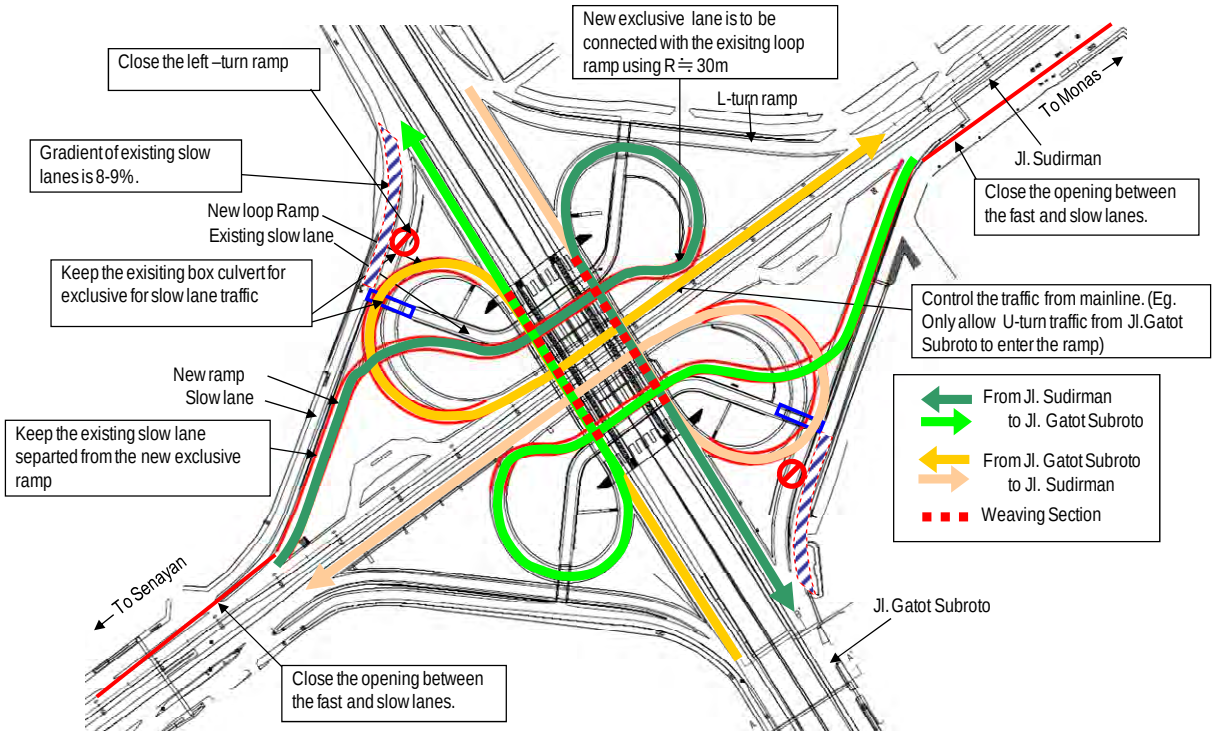


Source: JICA Survey Team

Figure 3.4.7 Screenshots of Dynamic Simulation: Alternative 2-1

(4) Simulation of Alternative 2-2: New Exclusive Lane on Jl. Sudirman

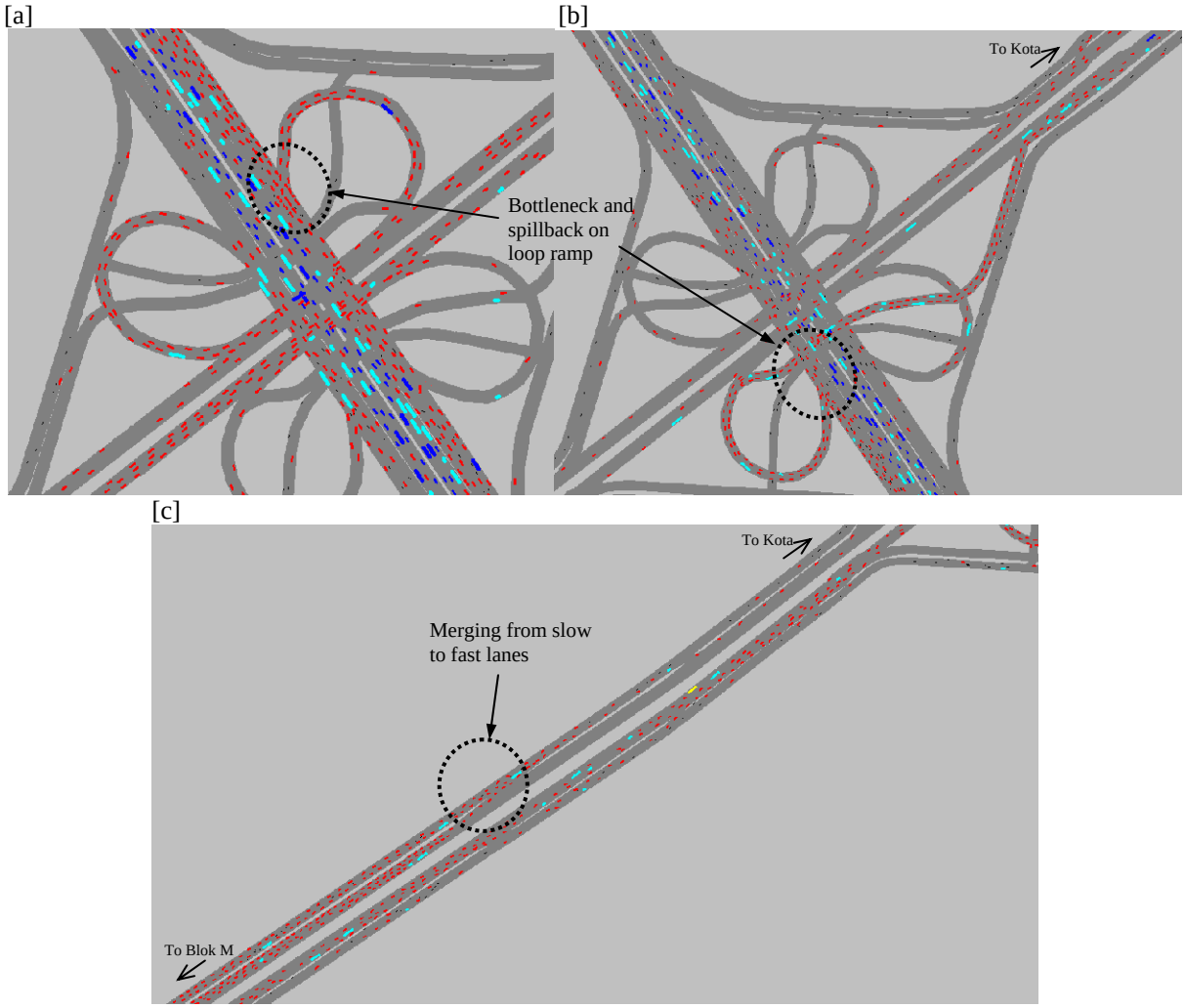
Alternative 2-2 to be evaluated involves new construction of a new exclusive lane connecting to the on-loop ramp to Jl. Gatot Subroto, but it starts from the fast lane of Jl. Sudirman, as presented in Figure 3.4.8. Direct left turn from the fast lane of Jl. Sudirman will be closed.



Source: JICA Survey Team

Figure 3.4.8 Alternative 2-2: New Exclusive Lane on Jl. Sudirman

In Alternative 2-2, congestion on the fast lane on Jl. Sudirman will also be alleviated because the merging will not occur except for the U-turn traffic coming from the off-loop ramp and going into the on-loop ramp. However, merging on Jl. Gatot Subroto may become a bottleneck (Figure 3.4.9a) and the slow traffic may spill back on the loop ramp and the new exclusive lane, and further back to the fast lane of Jl. Sudirman (Figure 3.4.9b). Another potential problem is the left-turn traffic from the fast lane of Jl. Sudirman trying to go into the slow lane due to the left-turn lane closure, causing bottleneck upstream on Jl. Sudirman (Figure 3.4.9c), though the problem is not so critical as in Alternative 2-1, which involves all turning traffic.

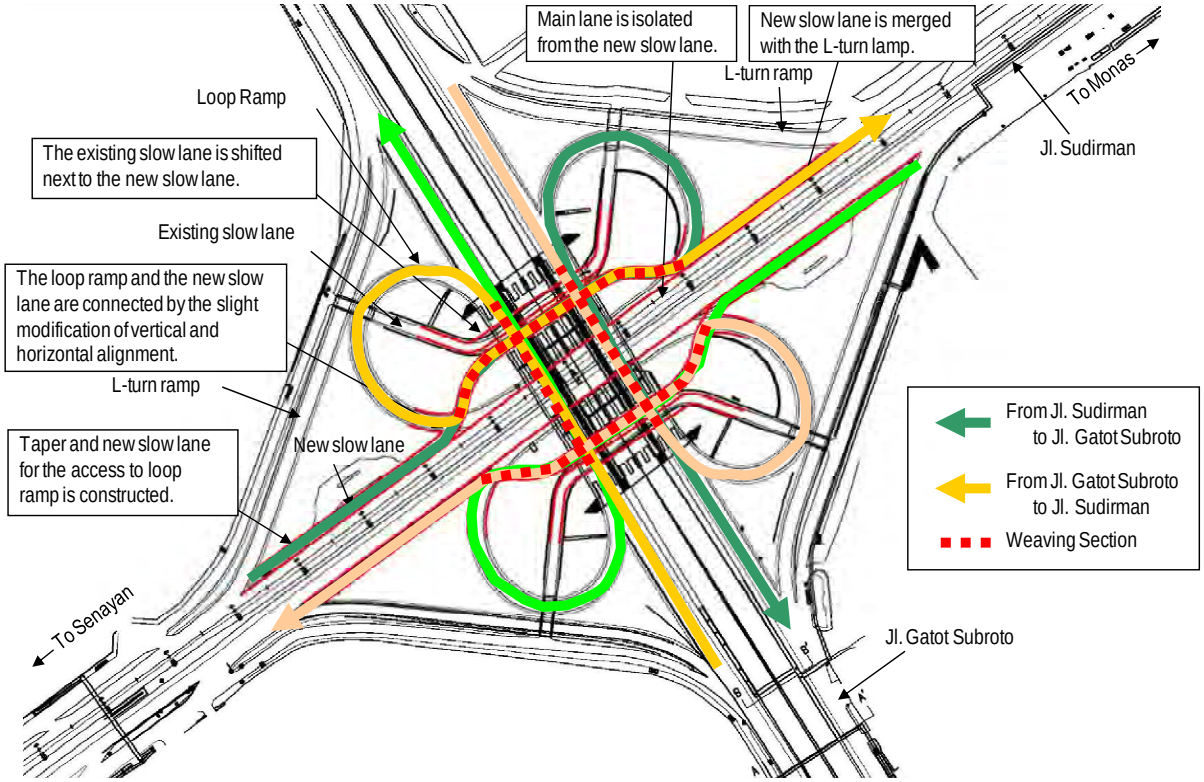


Source: JICA Survey Team

Figure 3.4.9 Screenshots of Dynamic Simulation: Alternative 2-2

(5) Simulation of Alternative 3: New Slow Lane on Jl. Sudirman

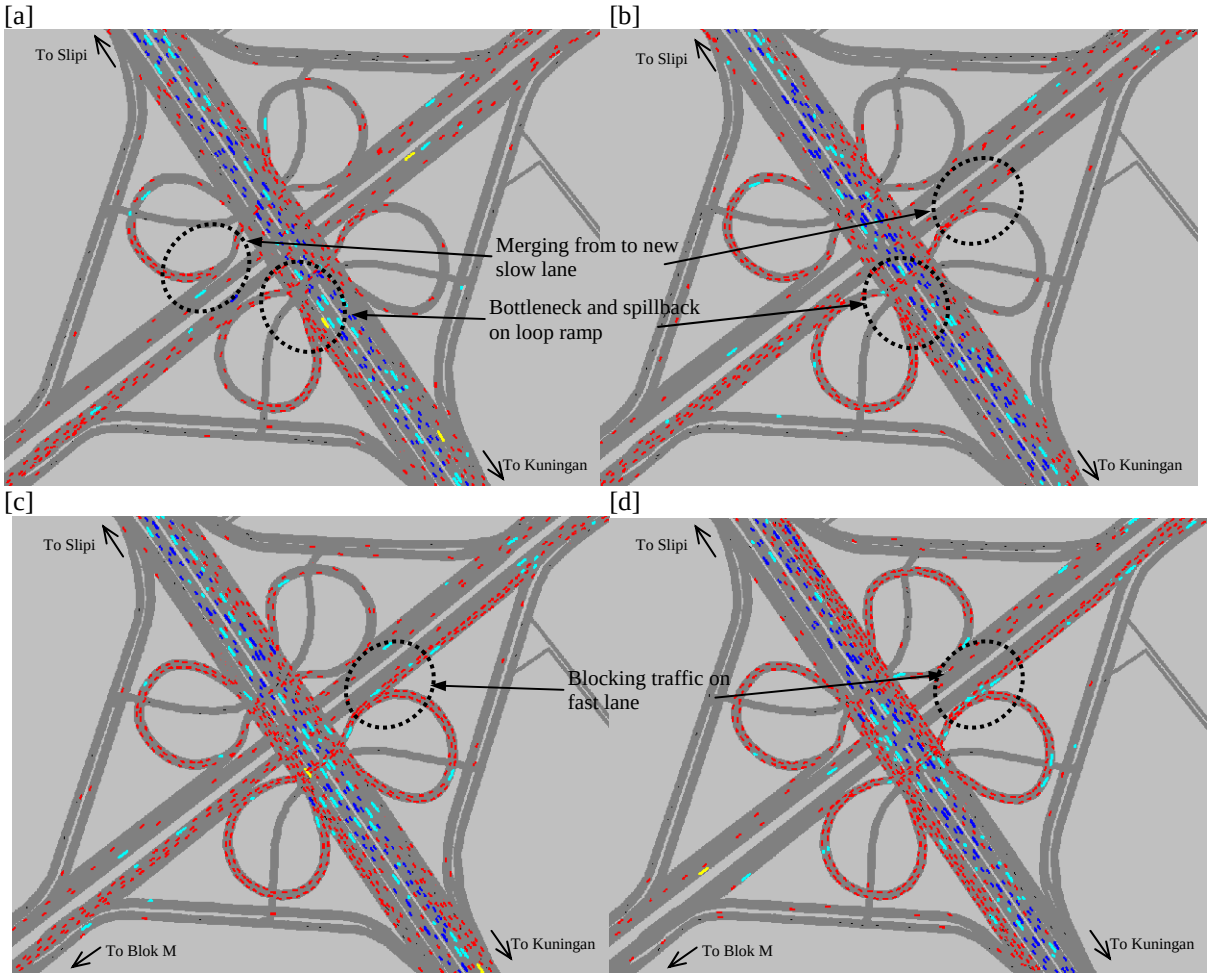
Alternative 3 to be evaluated involves new construction of an additional slow lane on Jl. Sudirman, which is shifted beside the fast lane but physically separated, serving only the traffic merging to/from the on-/off-loop ramps, as presented in Figure 3.4.10.



Source: JICA Survey Team

Figure 3.4.10 Alternative 3: New Slow Lane on Jl. Sudirman

In Alternative 3, merging from the off-loop ramp with the new slow lane on Jl. Sudirman may become a bottleneck causing congestion on the loop ramp (Figure 3.4.11a). Meanwhile, merging on Jl. Gatot Subroto may become a bottleneck and the slow traffic may spill back on the loop ramp and the new slow lane (Figure 3.4.11b), blocking the traffic on the fast lane of Jl. Sudirman (Figure 3.4.11d).

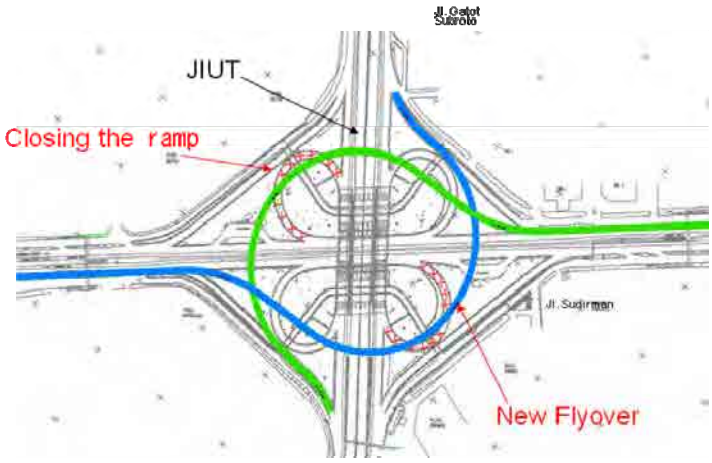


Source: JICA Survey Team

Figure 3.4.11 Screenshots of Dynamic Simulation: Alternative 3

(6) Simulation of Alternative 4: New Flyover Ramps

Alternative 4 to be evaluated involves removal of two out of the four existing loop ramps and construction of two direct ramps (flyover) instead.



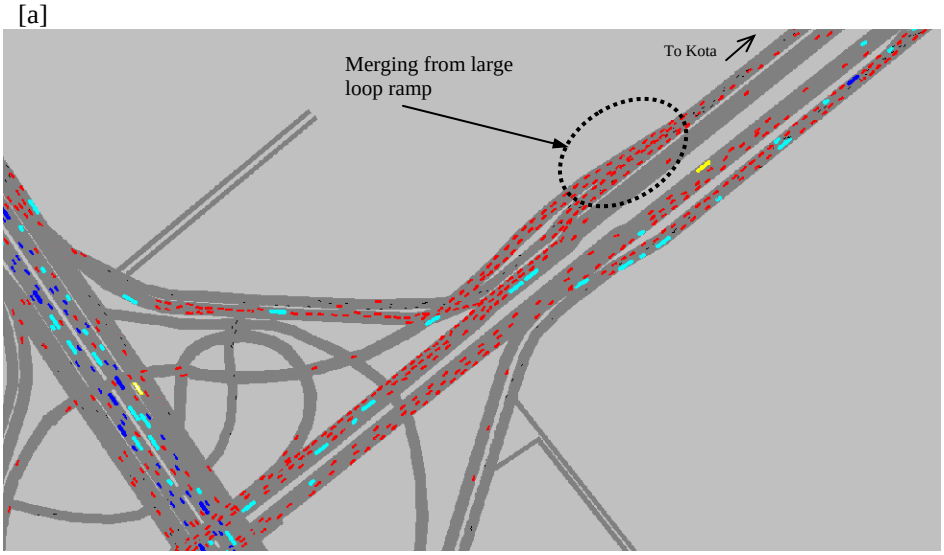
Source: JICA Survey Team

Figure 3.4.12 Alternative 4: New Flyover Ramps

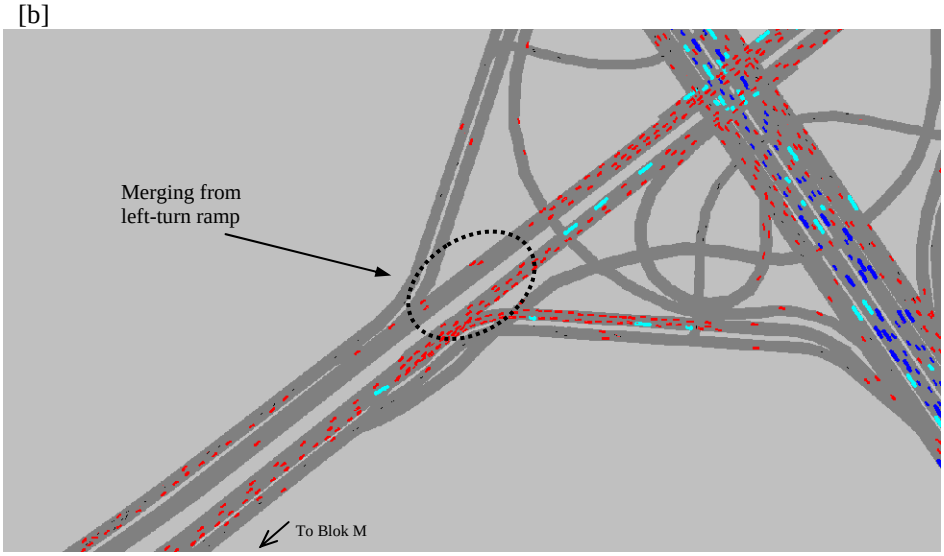
Congestion on the straight through lane will be alleviated because the short weaving caused by two contiguous loop ramps which cause congestion of Jl. Gatot Subroto will be solved. In

Alternative 4, a bottleneck may occur at the merging point of the large loop ramp into the slow lane of Jl. Sudirman (Figure 3.4.13a). Merging traffic from the left-turn ramp from Jl. Gatot Subroto to Jl. Sudirman (fast lane) may also cause congestion (Figure 3.4.13b), because U-turn is impossible in Alternative 4 and the detouring U-turn traffic has been added to Jl. Sudirman and Jl. Gatot Subroto.

[a]



[b]



Source: JICA Survey Team

Figure 3.4.13 Screenshots of Dynamic Simulation: Alternative 4

(7) Overall Comparison

As a summary, five alternative improvement plans for Semanggi junction are compared in terms of the average travel speed and the hourly intersection capacity estimated based on the dynamic simulation, as shown in Table 3.4.1.

Average of the speed of all the directions and sections are compared. For average speed, tendencies may vary by the period, and the best and the "worst" (i.e., improvement is the least expected compared to the existing case) cases for each period are marked in colors. In addition, hourly capacity of the intersection is compared across the alternatives. It is noted that the degree of the benefit is different across the alternative depending on the direction and time of the day. Excluding the "worst" alternatives which may have a negative impact in some period of the day, Alternative 4 followed by Alternative 2-2 may be the best alternative that is expected to bring certain benefit for all periods of the day and hence is recommended from the traffic improvement point of view.

Table 3.4.1 Comparison of Semanggi Improvement Alternatives

Existing	Direction	Travel Speed (km/h)					
		Present	Alt 1	Alt 2-1	Alt 2-2	Alt 3	Alt 4
Morning (7-10)	Blok M - Kota (fast lane)	36.4	35.7	22.1	20.7	38.3	40.6
	Kota - Blok M (fast lane)	33.6	31.7	28.1	30.7	37.6	28.8
	Blok M - Kota (slow lane)	12.4	12.6	13.6	10.3	13.1	15.0
	Kota - Blok M (slow lane)	10.2	9.1	20.1	22.7	11.1	12.0
	Kuningan - Slipi	25.7	28.9	18.4	11.2	31.3	16.7
	Slipi - Kuningan	23.5	26.6	16.1	23.1	28.2	21.4
	Average	**23.6**	**24.1**	**19.7**	**19.8**	**26.6**	**22.4**
Midday (10-13)	Blok M - Kota (fast lane)	7.2	32.6	14.0	14.9	30.4	42.5
	Kota - Blok M (fast lane)	9.4	25.8	15.1	15.5	15.5	16.0
	Blok M - Kota (slow lane)	3.3	15.6	11.2	15.1	15.9	14.9
	Kota - Blok M (slow lane)	4.1	23.2	10.3	17.9	7.4	6.3
	Kuningan - Slipi	3.4	7.2	14.7	23.8	6.8	27.0
	Slipi - Kuningan	7.1	27.4	11.5	15.3	10.7	22.3
	Average	**5.8**	**22.0**	**12.8**	**17.1**	**14.5**	**21.5**
Evening (16-19)	Blok M - Kota (fast lane)	18.8	29.3	19.5	12.4	38.5	43.1
	Kota - Blok M (fast lane)	9.6	15.2	18.7	19.0	17.8	34.6
	Blok M - Kota (slow lane)	5.0	12.5	15.7	14.7	13.1	15.8
	Kota - Blok M (slow lane)	4.3	6.1	20.3	22.3	12.3	11.3
	Kuningan - Slipi	5.0	5.6	18.8	19.0	5.7	33.8
	Slipi - Kuningan	21.1	27.1	20.4	30.5	13.4	22.1
	Average	**10.6**	**16.0**	**18.9**	**19.7**	**16.8**	**26.8**
Hourly Capacity [PCU/hour]		**9,900**	**11,500**	**13,600**	**14,700**	**10,100**	**15,800**

Note: Best Case; Best Case for Each Direction; Least Improved Case

Source: JICA Survey Team

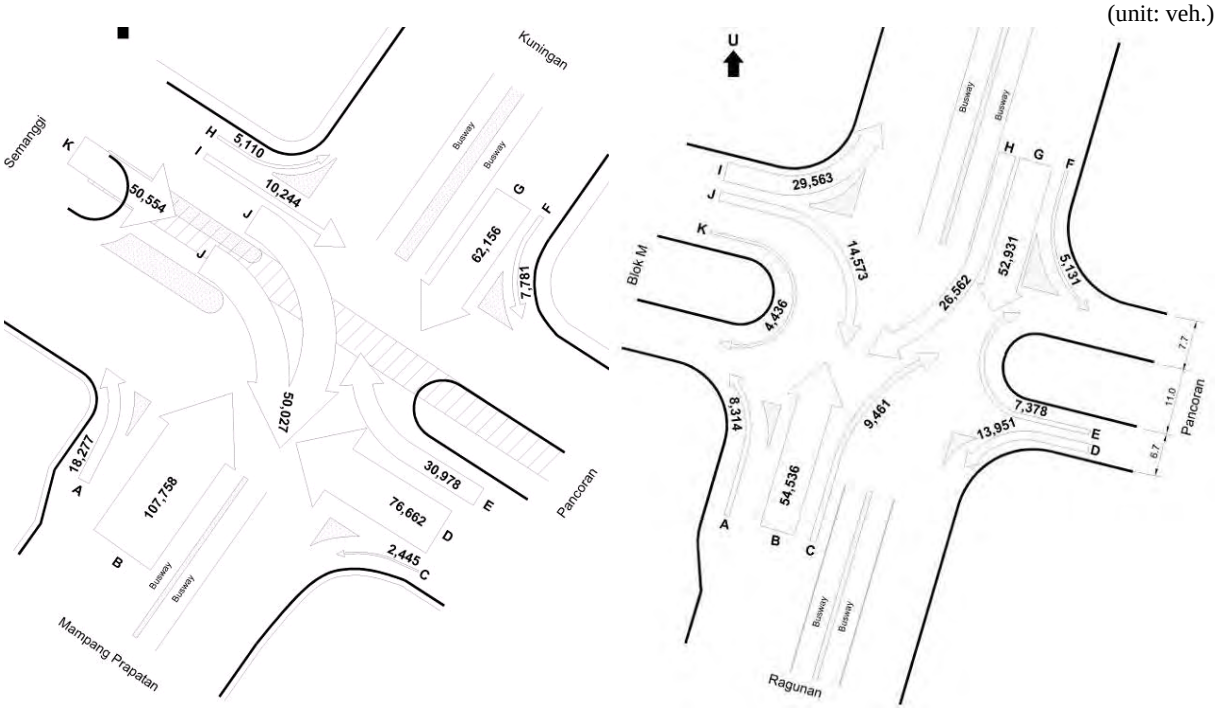
3.4.2 Kuningan Intersection

Directional traffic flows and the daily volumes at the two continuous intersections that have been proposed for route improvement in SITRAMP, i.e., Kuningan and south adjacent Mampang, are presented in Figure 3.4.14. In terms of the magnitude of traffic, Kuningan (181,000 PCU/day) is a larger intersection than Mampang (118,000 PCU/day). Though it has a large volume of traffic in both north-south and east-west directions, straight traffic from south to north (direction B) is observed as the largest of the four directions. While right-turns in the north-south directions are prohibited due to the traffic management, right-turn traffic from west to south (direction J) is also large, and it needs to remain at grade if a continuous grade separation has been constructed. It will also conflict with the straight traffic from east to west (direction D), of which flyover plan has not been realized yet and hence is worth studying.

At south adjacent Mampang intersection, straight and right-turn movements from east and a straight movement from west have already been prohibited due for the traffic management purpose. The largest traffic is observed from north. Among others, right-turn traffic (direction H) accounts for about 30%, which also needs to remain at grade along with left turn traffic from west to north in the case of a continuous grade separation.

[Kuningan] [Mampang] (south adjacent intersection)

(unit: veh.)



Source: Traffic Survey, JICA Survey Team

Figure 3.4.14 Traffic Flow and Daily Volume at Two Continuous Intersections in Kuningan

Average queue lengths observed around the two continuous intersections are presented for each period of the day in Table 3.4.2. It is noted that the area around those two intersections are congested all day. Above all, taking it into account that those two intersections are only about 400 meters apart, the northbound traffic queue at Kuningan intersection in the morning peak extends over Mampang intersection and far upstream (approx. 1,400 m). A similar phenomenon can also be observed for the southbound traffic at Mampang intersection in the evening peak where the section between the two intersections is totally filled with congested traffic. Both intersections are bottlenecks, and traffic management measures such as turn prohibitions have already been applied to those intersections. Therefore, it is necessary to improve the intersections simultaneously with a continuous grade separation.

Table 3.4.2 Average Queue Length around Kuningan and Mampang Intersections

Period	Intersection	Average Queue Length [m]				
		From North	From South	From East	From West	Total
Morning	Kuningan	70	330	230	340	970
(7:00-9:00)	Mampang	160	1,420	40	210	1,830
Midday	Kuningan	100	110	360	460	1,030
(12:00-14:00)	Mampang	220	290	50	40	600
Evening	Kuningan	380	240	190	260	1,070
(16:00-18:00)	Mampang	320	390	40	710	1,450

Source: Traffic Survey, JICA Survey Team

For evaluation of improvement measures for Kuningan, the following two alternatives have been considered:

- Construction of a continuous north-south underpass for Kuningan and Mampang intersections, and
- Construction of a continuous north-south underpass for Kuningan and Mampang intersections and an east-west one-way flyover for Kuningan intersection.

As indicators to evaluate the improvement, a degree of saturation and a cycle time of intersection are forecasted for 2017 (i.e., project completion year), as shown in Table 3.4.3. Note that the degree of saturation of Mampang intersection is below 1.0 even under the existing (Do-Nothing) case due to the traffic management measures that have already been adopted. In 2017, with the north-south continuous underpass, degrees of saturation are expected to decrease at both intersections. Though the value will be still over 1.0 at Kuningan intersection, a great reduction of traffic congestion can be expected. Moreover, the cycle times that are extremely long can be reduced to 120 seconds though part of the north-south straight traffic (approx. 30%) will remain at grade. In addition, if construction of an east-west one-way flyover has been implemented for Kuningan intersection, further reduction of the degree of saturation is expected as well as a shorter cycle time of 90 seconds with rationalized (i.e., reduced) signal phases.

Table 3.4.3 Evaluation of Intersection Improvement at Kuningan in 2017

Intersection	Indicator	Existing	with N-S UP	with N-S UP & E-W FO
Kuningan	Degree of Saturation	1.66	1.35	1.20
	Cycle Time [sec.]	220	120	90
Mampang	Degree of Saturation	0.93	0.73	0.73
	Cycle Time [sec.]	278	120	120

Source: JICA Survey Team

3.4.3 Cikarang Area

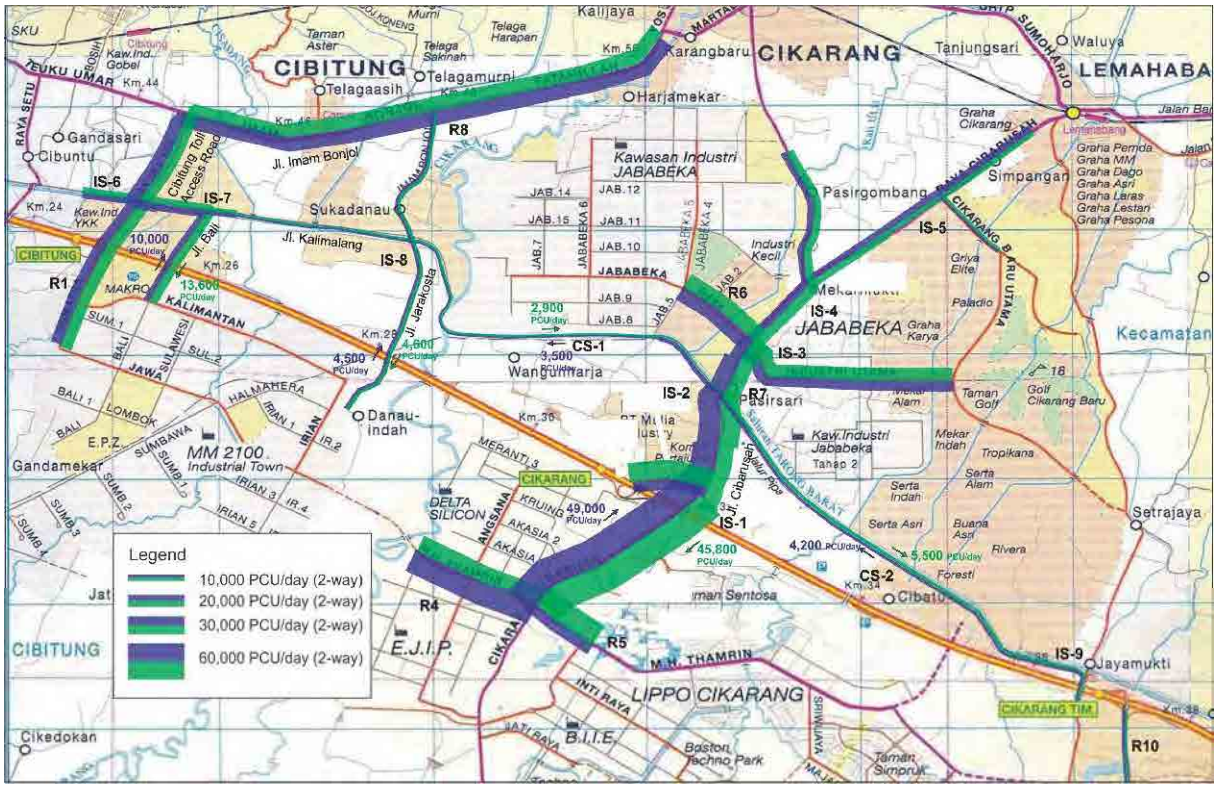
Since the sub-project for Cikarang involves improvement of existing Kalimalang road and its connecting roads that are relatively long (5 – 10 km), traffic survey was conducted at several locations in Cikarang industrial area. The traffic survey locations and the current major traffic flow bandwidths are presented in Figure 3.4.15.

The largest volume of traffic is found on Jl. Cibarusah, namely nearly 100,000 PCU per day in the most congested section. It runs north-south, connecting the major industrial estates such as Jababeka, EJIP, and Lippo Cikarang with the toll road interchange (Cikarang Barat) for traffic of about 50,000 PCU per day. It also connects the north side (i.e., Jababeka) and the south side (i.e., EJIP, Lippo Cikarang, etc.) of Cikarang industrial area.

As for MM2100 and Bekasi Fajar, which are located in the west side of Cikarang, Jl. Bali is the only road available to go to the other industrial estates. Under the currently poor road conditions, most of the traffic headed for other part of Cikarang, detouring via Jl. Bali, Cibitung Toll Access, and Jl. Imam Bonjol may be the actual transport route, as shown in Figure 3.4.16. In addition, Jakarta – Cikampek toll road could be an alternative route to travel between MM2100/Bekasi Fajar and the other industrial estates, especially Delta Mas, though this section of the toll road is often congested with traffic including the on- and off-ramps.

Meanwhile, average traffic queue length was also surveyed and the result is shown in Table 3.4.8 (for non-toll arterial rods) and Table 3.4.5 (for toll gates). On non-toll arterial roads, traffic congestion occurs at the toll road entrance of Cibitung and Cikarang Barat. Above all, on Jl. Cibarusah, southbound traffic congestion queues are observed for over 1km, that is, from the toll entrance (IS-1) to Jl. Kalimalang (IS-2) and further up to Jababeka (IS-3), for most of the day, partly because the southbound flyover over has not been constructed yet. On the toll road, traffic congestion queues are also observed, particularly at the toll gates of

Cibitung IC and Cikarang Barat IC. Furthermore, traffic congestion queues are observed at the toll plaza on the main toll road (Cikarang Utama) as well.



Note: IS - directional traffic count survey at intersections, CS - cross sectional traffic count survey
Source: JICA Survey Team

Figure 3.4.15 Traffic Survey Location and Daily Major Traffic Flow in Cikarang Area

Table 3.4.4 Average Queue Length on Arterial Roads in Cikarang Area

Period	No.	Location	Average Queue Length [m]				
			From North	From South	From East	From West	Total
Morning (7:00-9:00)	IS-1	Jl. Cibarusah (Toll Entrance)	1,070	20	-	140	1,230
	IS-2	Jl. Cibarusah & Jl. Kalimalang	20	20	-	-	40
	IS-3	Jl. Cibarusah & Jl. Jababeka Raya	20	100	-	30	150
	IS-4	Jl. Cibarusah & Jl. Industri Pasir Gombong	10	0	-	20	30
	IS-5	Jl. Cibarusah (Dry Port Entrance)	10	0	-	-	10
	IS-6	Cibitung Toll Access (Toll Entrance)	540	110	-	-	650
Midday (12:00-14:00)	IS-1	Jl. Cibarusah (Toll Entrance)	510	50	-	60	620
	IS-2	Jl. Cibarusah & Jl. Kalimalang	70	0	-	-	70
	IS-3	Jl. Cibarusah & Jl. Jababeka Raya	20	50	-	50	120
	IS-4	Jl. Cibarusah & Jl. Industri Pasir Gombong	10	0	-	20	30
	IS-5	Jl. Cibarusah (Dry Port Entrance)	0	0	-	-	0
	IS-6	Cibitung Toll Access (Toll Entrance)	70	20	-	-	90
Evening (16:00-18:00)	IS-1	Jl. Cibarusah (Toll Entrance)	960	70	-	300	1,330
	IS-2	Jl. Cibarusah & Jl. Kalimalang	340	10	-	-	350
	IS-3	Jl. Cibarusah & Jl. Jababeka Raya	50	10	-	10	70
	IS-4	Jl. Cibarusah & Jl. Industri Pasir Gombong	20	10	-	30	60
	IS-5	Jl. Cibarusah (Dry Port Entrance)	10	0	-	-	10
	IS-6	Cibitung Toll Access (Toll Entrance)	690	130	-	-	820

Source: Traffic Survey, JICA Survey Team

Table 3.4.5 Average Queue Length at Toll Gates in Cikarang Area

Period	Toll Gate	Average Queue Length [m]			
		From Jakarta	To Jakarta	From Cikampek	To Cikampek
Morning (7:00-9:00)	Cibitung IC (North)	20	10	10	0
	Cibitung IC (South)	230	0	0	20
	Cikarang Main Gate	-	10	-	40
	Cikarang Main (Satellite)	-	30	-	-
	Cikarang Barat IC	150	20	20	10
	Cikarang Barat IC (South)	-	20	-	-
	Cikarang Timur IC	50	10	40	10
Midday (12:00-14:00)	Cibitung IC (North)	20	30	0	0
	Cibitung IC (South)	20	0	0	10
	Cikarang Main Gate	-	30	-	80
	Cikarang Main (Satellite)	-	40	-	-
	Cikarang Barat IC	70	20	30	40
	Cikarang Barat IC (South)	-	20	-	-
	Cikarang Timur IC	10	20	10	10
Evening (16:00-18:00)	Cibitung IC (North)	10	60	0	0
	Cibitung IC (South)	20	0	0	410
	Cikarang Main Gate	-	70	-	160
	Cikarang Main (Satellite)	-	60	-	-
	Cikarang Barat IC	1,210	70	20	20
	Cikarang Barat IC (South)	-	50	-	-
	Cikarang Timur IC	10	10	10	10

Source: JICA Survey Team

The following three alternatives have been assumed for demand forecast and evaluation:

- [1 E-W & 2 N-S Roads Only]: One east-west road (i.e., Jl. Kalimalang) and the connecting two north-south roads (i.e., Jl. Bali and Jl. Jarakosta) are improved;
- [With Dry Port Access]: In addition to the above, a new full IC at KM29 (with on/off ramps in both directions) and the N-S through dry port access road which will connect with Jl. Kalimalang are developed; and
- [With Dry Port Access & Thamrin UP]: In addition to the above, an underpass at the intersection of Jl. Cibarusah and Jl. Thamrin is developed.

With completion of the above road projects, major potential traffic between the industrial areas in Cikarang that is to be diverted via the project roads for shorter and faster routes is depicted in Figure 3.4.16.

Based on the OD matrices obtained from the roadside OD interview survey as well as from JUTPI, road transportation network assignment is conducted for each of the above alternatives. In order to confirm whether the capacities of the N-S access roads and the connecting ICs in Cikarang area will be enough in future, volume-capacity (V/C) ratios are calculated for each alternative, and comparisons of traffic V/C ratios on the N-S roads and the connecting ICs among the alternatives are summarized in Table 3.4.6 and Table 3.4.7, respectively.

If no JICA sub-projects are implemented, the V/C ratios of all the N-S roads (except for Jl. Sukamantri) are over 1.0. Above all, Jl. Cibarusah will be so heavily congested with a V/C ratio of 1.92, and the V/C ratio of the total traffic on all the N-S roads is forecasted as 1.36, implying serious traffic congestion.

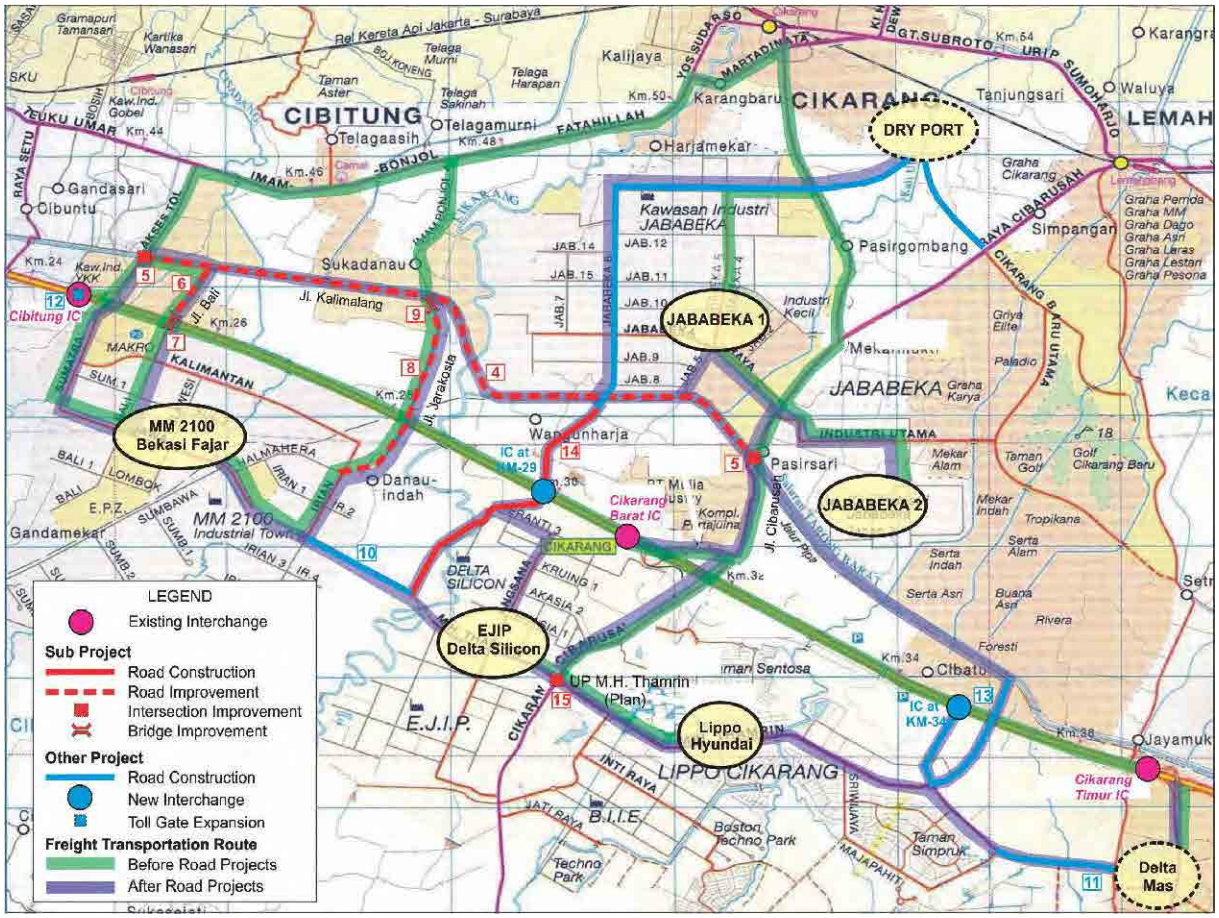
Improvement of one east-west road (i.e., Jl. Kalimalang) and the connecting two north-south roads (i.e., Jl. Bali and Jl. Jarakosta) is expected to greatly reduce this traffic congestion

especially on Jl. Bali and Jl. Jarakosta, of which V/C ratios will become below 0.9. However, the total traffic on all the N-S roads will still be over the capacity.

As for development of the dry port access road connecting with the new IC at KM29, remarkable improvement on the V/C ratios could be expected in the case with construction of the through dry port access road. Also, the V/C ratio of the total traffic on all the N-S roads is expected to become below 1.0.

As for a case in which an underpass at the intersection of Jl. Cibarusah and Jl. Thamrin is developed in addition to the above, the V/C ratio of the total traffic on all the N-S roads is eventually forecasted as 0.9, and that on Jl. Cibarusah is forecasted as 1.2, which may be considered as tolerable though it is over the capacity. While a great reduction of the V/C ratio is expected on Jl. Cibarusah, it should be noted that the traffic on the N-S through dry port access road may also exceed the capacity though the chance of traffic congestion may be small.

As for comparison of traffic volume-capacity ratios on ICs, a drastic reduction is expected with construction of a new IC at KM29 and the connection dry port access road, because the total capacity of ICs will be increased leading to the overall V/C ratio below 1.0. However, it should be noted that capacity of Cibitung IC needs to be expanded about 1.5 times in all the alternatives.



Source: JICA Survey Team

Figure 3.4.16 Major Potential Traffic to be Diverted to Sub-Project Roads in Cikarang

Table 3.4.6 Comparison of Daily Traffic Volume-Capacity Ratios on N-S Roads in 2020

No.	N-S Roads	No JICA Sub-Projects	1 E-W & 2 N-S Roads Only	With Dry Port Access	With Dry Port Access & Thamrin UP
1	Jl. Bali	1.21	0.85	0.71	0.71
2	Jl. Jarakosta	1.47	0.81	0.44	0.48
3	Dry Port Access	-	-	1.04	1.03
4	Jl. Cibarusah	1.92	1.69	1.31	1.23
5	KM34 N-S Access	1.04	0.96	0.89	0.86
6	Jl. Sukamantri	0.93	0.97	0.96	0.95
	Total N-S Trafffic	1.36	1.09	0.92	0.90

Source: JICA Survey Team

Table 3.4.7 Comparison of Daily Traffic Volume-Capacity Ratios on ICs in 2020

No.	Connecting IC	No JICA Sub-Projects	1 E-W & 2 N-S Roads Only	With Dry Port Access	With Dry Port Access & Thamrin UP
1	Cibitung (KM25) with Toll Gate Expansion	1.09	1.10	1.03	1.03
3	KM29	-	-	1.05	1.04
4	Cikarang Barat (KM31)	1.22	1.24	0.98	0.94
5	KM34	0.87	0.87	0.87	0.88
6	Cikarang Timur (KM37)	1.00	1.04	1.03	1.02
	Total	1.07	1.08	0.99	0.98

Source: JICA Survey Team

3.4.4 Senayan Roundabout

There are five improvement alternatives for Senayan roundabout as described below. As of June 2011, final selection is yet to be determined.

(1) Alternatives 1& 2: FO/UP Connecting Jl. Pattimura and Jl. Sudirman

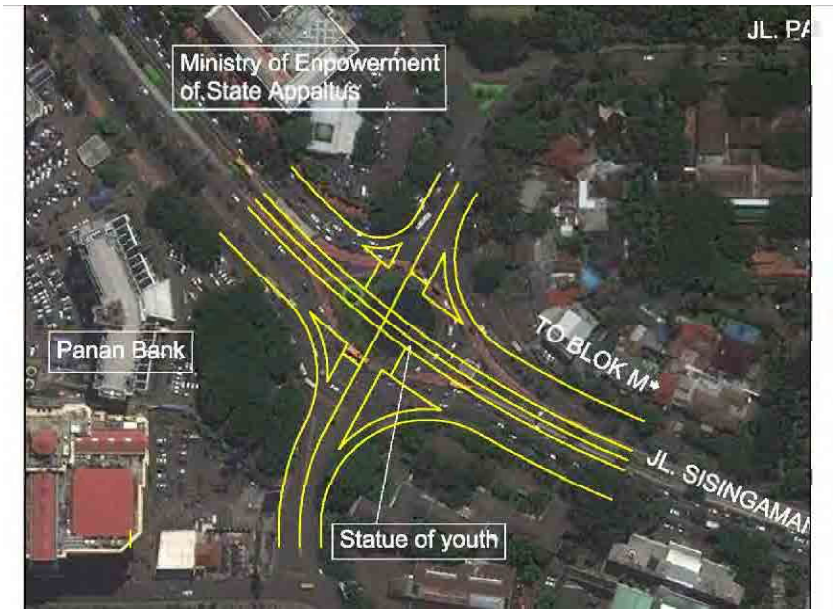
Alternatives 1 and 2 are construction of a flyover (Alternative 1) or an underpass (Alternative 2) connecting from Jl. Pattimura to the slow lane of Jl. Sudirman (one way).

Source: JICA Survey Team

Figure 3.4.17 Alternatives 1 & 2: FO/UP Connecting Jl. Pattimura and Jl. Sudirman

(2) Alternative 3: At-Grade Four-Leg Intersection

In Alternative 3, the roundabout will be modified into an ordinary at-grade four-leg intersection.

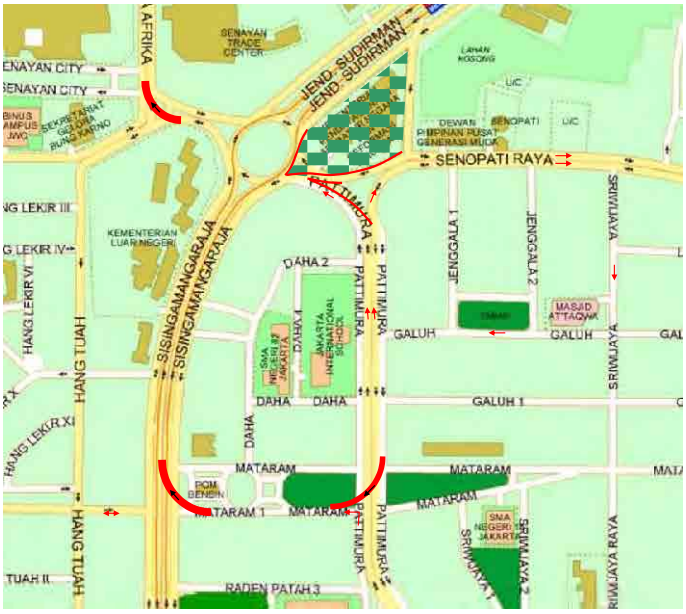


Source: JICA Survey Team

Figure 3.4.18 Alternative 3: At-Grade Four-Leg Intersection

(3) Alternative 4: FO and UP around Roundabout

Alternative 3 is construction of two flyovers and an underpass around the roundabout. Northbound traffic from Jl. Pattimura will be shifted to Jl. Mataram 1 and Jl. Sisingamangaraja, and then to Jl. Sudirman. One-way traffic management (i.e., Jl. Pattimura, Jl. Senopati Raya, Jl. Sriwijaya, Jl. Galuh and back to Jl. Pattimura) will also be applied.



Source: JICA Survey Team

Figure 3.4.19 Alternative 4: FO and UP around Roundabout

(4) Alternative 5: UP Bypassing the Roundabout

Alternative 5 is construction of an underpass (Alternative 2) connecting from Jl. Pattimura to the slow lane of Jl. Sudirman (one way), but bypassing the roundabout.

Source: JICA Survey Team

Figure 3.4.20 Alternative 5: UP Bypassing the Roundabout

While the target area for traffic improvement around the Senayan roundabout is relatively large and the benefit is not limited to around the roundabout, traffic volume by direction is forecasted for each of the above alternatives in 2018 (i.e., project completion year) and presented in Table 3.4.8. EIRR, which is limited to this roundabout, is calculated based on these forecasts.

Table 3.4.8 Traffic Demand Forecast in Each Senayan Improvement Alternative in 2018

Alternative	Traffic Volume [pcu/16 hrs]					Remarks
	From North	From South	From East	From West	Total	
Existing	66,700	37,500	23,700	6,500	134,500	Do-Nothing case
Alt. 1	66,700	37,500	2,400	6,500	113,200	Traffic from Jl. Pattimura will be diverted to FO.
Alt. 2	66,700	37,500	2,400	6,500	113,200	Traffic from Jl. Pattimura will be diverted to UP.
Alt. 3	66,700	37,500	23,700	6,500	134,500	Traffic signal cycle time will be shortened.
Alt. 4	55,500	57,700	14,700	6,500	134,500	Traffic from Jl. Pattimura will be diverted to Jl. Sisingamangaraja via FO.
Alt. 5	66,700	37,500	9,500	6,500	120,300	Traffic from Jl. Pattimura will be diverted to UP.

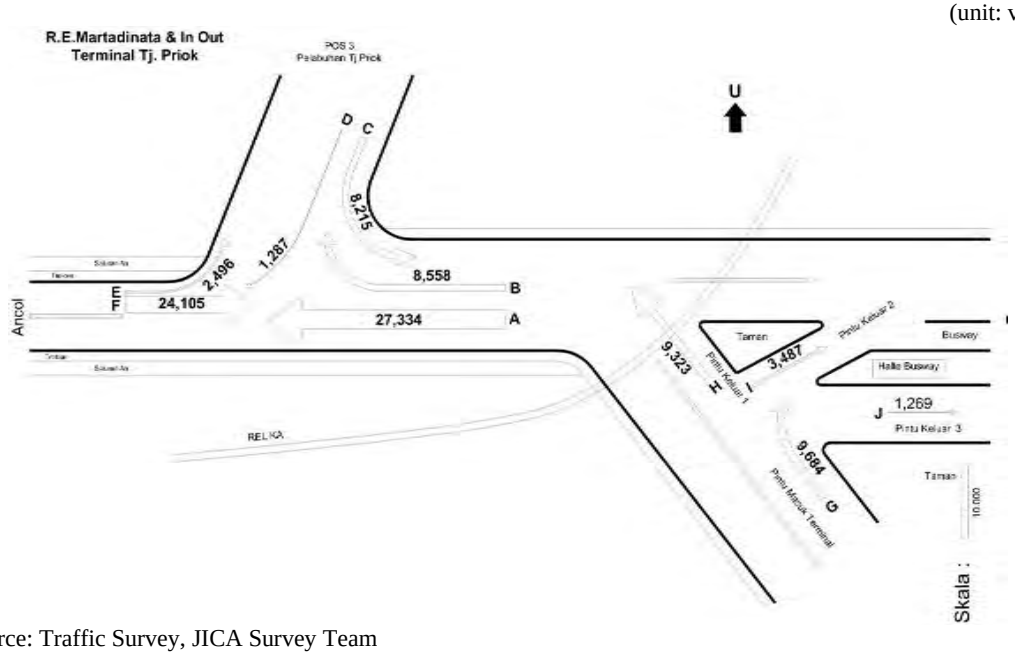
Source: JICA Survey Team

3.4.5 Other Intersections

(1) R.E. Martadinata Intersection

Directional traffic flows and the daily volumes at Martadinata intersection is presented in Figure 3.4.21. Though the intersection is not signalized and it is smaller in terms of the traffic volume compared to other sub-projects, it is located just beside the Tg. Priok port entrance and hence the ratio of heavy vehicles is as large as over 30%. In 2015 (i.e., project completion year), the traffic volume on Jl. Martadinata is expected to grow from current 30,000 PCUs to over 40,000 PCUs per day, most of which are expected to go through the at-grade railway crossing. It is a freight railway track, and thus it is difficult to be elevated. Furthermore, the railway station (Tg. Priok) has been recently renovated and is expected to become an intermodal transfer point with the bus terminal and the port. Therefore, it is desirable to construct a flyover in this location to avoid the at-grade railway crossing and to separate the freight traffic from other traffic including public transport.

(unit: veh.)



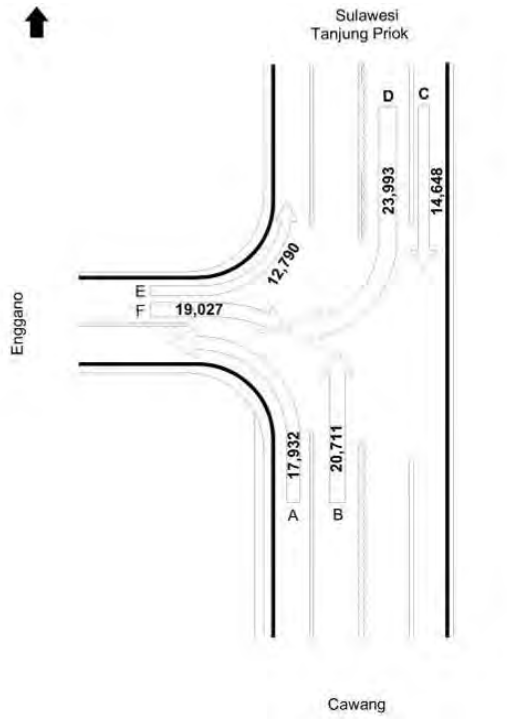
Source: Traffic Survey, JICA Survey Team

Figure 3.4.21 Traffic Flow and Daily Volume at R.E. Martadinata Intersection

(2) Sulawesi - Tg.PA Intersection

Sulawesi - Tg. Priok Access (Tg.PA) intersection is approximately 1.2 km from R.E. Martadinata intersection. Directional traffic flows and the daily volumes at Sulawesi - Tg.PA intersection is presented in Figure 3.4.22. Current volume of the north-south traffic is already about 40,000 PCUs per day (Table 3.1.1), and, as is the case with R.E. Martadinata intersection, the ratio of heavy vehicles is as large as over 30%. According to JUTPI, annual traffic growth is forecasted as 2.6%, which is the highest of all the 10 sub-project locations (Table 3.3.2) in spite of planned construction of Tg. Priok access road north-south section (elevated structure) which is currently under preparation for construction. If the existing at-grade discontinued railway to the port is to be rehabilitated, the flyover will become necessary to avoid the at-grade railway crossing, which will greatly reduce the road capacity as well as the level of safety.

(unit: veh.)



Source: Traffic Survey, JICA Survey Team

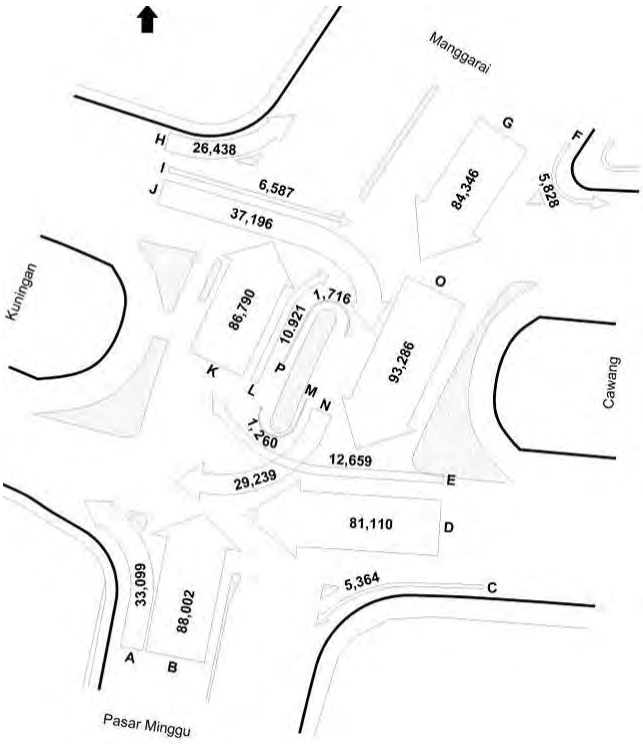
Figure 3.4.22 Traffic Flow and Daily Volume at Sulawesi - Tg.PA Intersection

(3) Pancoran Intersection

Pancoran intersection is located about 2 km away to the east along Jl. Gatot Subroto from Kuningan intersection. Directional traffic flows and the daily volumes at Pancoran intersection is presented in Figure 3.4.23. Pancoran intersection is very large in scale and has a complicated structure, serving as much traffic as Kuningan intersection, that is, nearly 180,000 PCUs per day. At this intersection, straight movement of traffic (from east to west) takes the majority as shown in the figure (direction D), and, consequently about 1 km of traffic congestion is observed throughout the day (Table 3.1.4). Hence, construction of another flyover on the south side in addition to the existing one on the north side of the elevated toll road is expected to bring about a great benefit.

Meanwhile, large volume of north-south straight traffic is also observed at this intersection (directions B and G). Due to this enormous volume of traffic, the degree of saturation after construction of this additional flyover is forecasted to be still over 1.0. However, part of this traffic will be diverted to the planned DKI toll road (Tg. Barat – Pasar Minggu – Manggarai) which will run north-south through this intersection.

(unit: veh.)



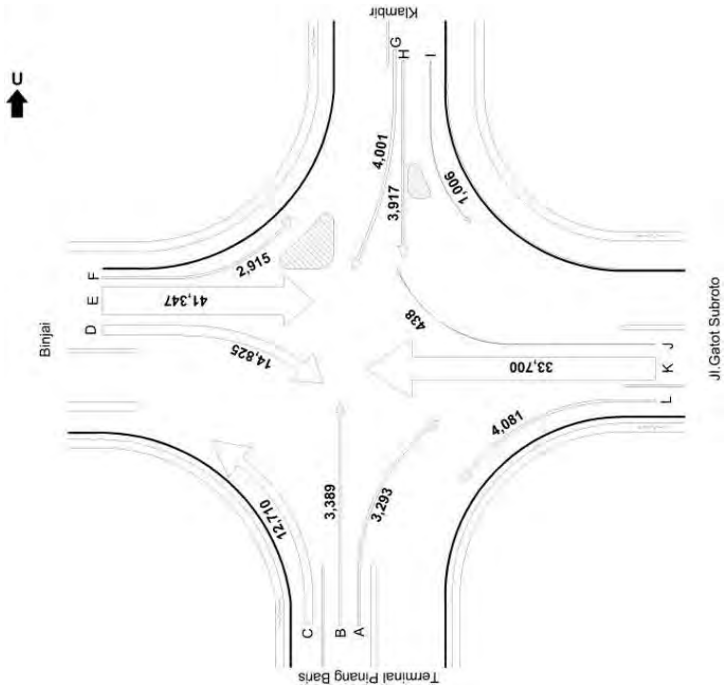
Source: Traffic Survey, JICA Survey Team

Figure 3.4.23 Traffic Flow and Daily Volume at Pancoran Intersection

(4) Pinang Baris Intersection

Pinang Baris intersection is one of the most congested intersections in Medan. Directional traffic flows and the daily volumes at Pinang Baris intersection is presented in Figure 3.4.24. The majority of traffic volume is observed in the east-west straight direction (directions E and K), which matches with the planned flyover direction. Toward the south of this intersection, there is a Pinang Baris bus terminal which serves long-distance buses going to/from the west region, and minibuses and other vehicles are waiting and stopping around the south side of this intersection. Combined with considerable volume of right-turn traffic (from west to south, direction D), traffic congestion queues are observed especially from west. In 2017 (i.e., project completion year), the traffic volume of the four directions of Pinang Baris intersection is expected to grow from current 87,000 PCUs to over 94,000 PCUs per day. Traffic signal cycle time at this intersection is around 300 to 380 seconds, which is tremendously long. Shorter cycle time can also be realized after construction of the flyover.

(unit: veh.)



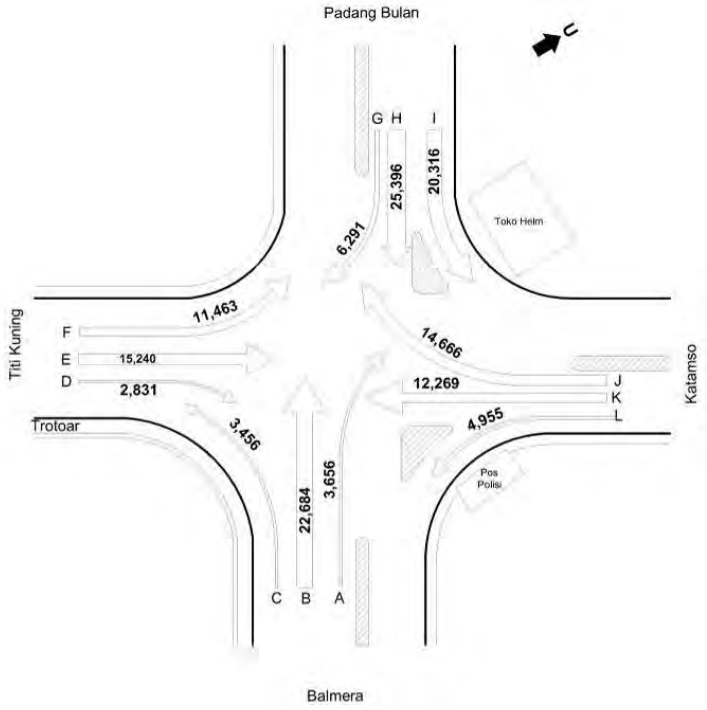
Source: Traffic Survey, JICA Survey Team

Figure 3.4.24 Traffic Flow and Daily Volume at Pinang Baris Intersection

(5) Katamso Intersection

Directional traffic flows and the daily volumes at Katamso intersection is presented in Figure 3.4.25. Katamso intersection is a part of the Medan ring road and is located in the south of Medan city. Thus, the major traffic is north-south traffic on radial Jl. Katamso going to/from the center of Medan (directions B and H). Meanwhile, on the ring road (Jl. A.H. Nasution), the volume of turning traffic to/from the center of Medan (directions F and J) is as much as the volume of the through traffic (directions E and K). Traffic congestion queues are observed especially from east. In order to serve the traffic on the ring road with several other flyovers planned along the ring road, an east-west underpass (due to the upslope) is planned. Since the survey result shows that there is more east-west traffic than the north-south traffic, it matches with the planned underpass direction. In 2017 (i.e., project completion year), with an annual traffic growth of 2.1%, the traffic volume of the four directions of Katamso intersection is expected to grow from current 85,000 PCUs to over 96,000 PCUs per day.

(unit: veh.)



Source: Traffic Survey, JICA Survey Team

Figure 3.4.25 Traffic Flow and Daily Volume at Katamso Intersection

(6) Sudirman II Intersection

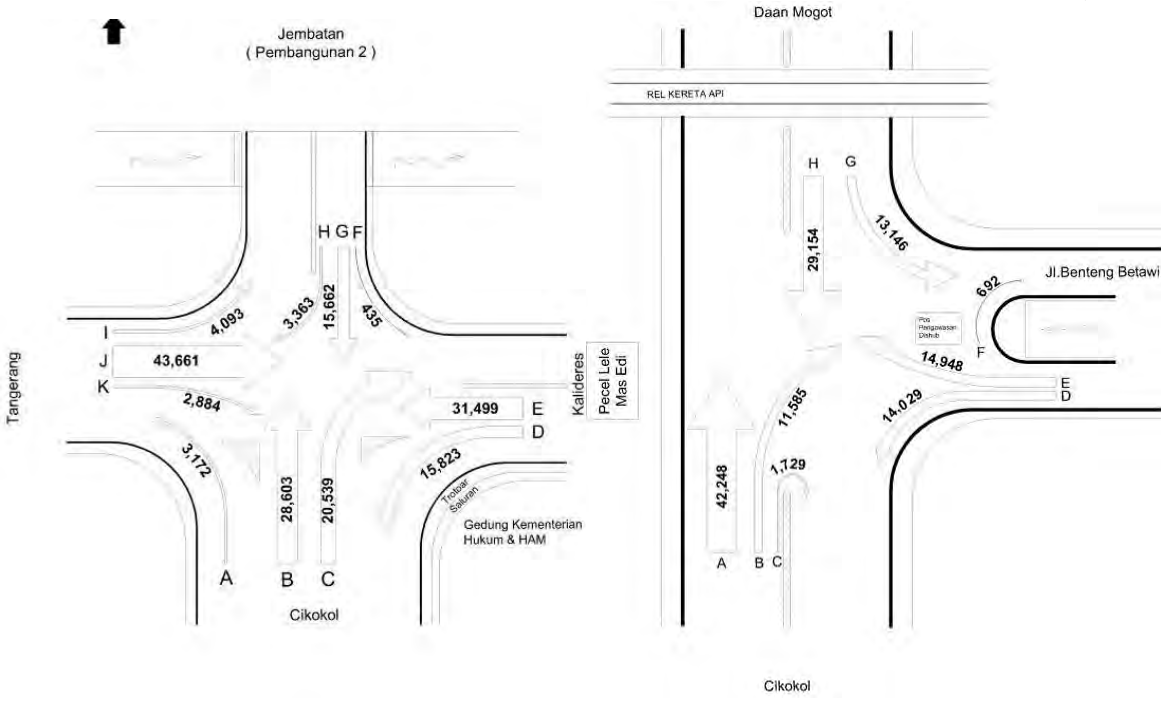
Sudirman II intersection is located 1 km to the south of Daan Mogot along Jl. Sudirman. There is a railway crossing with a single track on Tangerang line at the intersection. Directional traffic flows and the daily volumes at Sudirman II intersection as well as north adjacent Sudirman – Daan Mogot intersection is presented in Figure 3.4.26. Sudirman II intersection is a part of the Tangerang ring road (i.e., Jl. Sudirman) which is expected to serve the freight traffic between the airport and the industrial area. it is located just beside the Tg. Priok port entrance and hence the ratio of heavy vehicles is as large as over 30%.In order to serve the traffic on the ring road with several other existing and planned flyovers along the ring road as well as to avoid the at-grade railway crossing, a north-south flyover is planned. Kota Tangerang also regards this improvement as urgent.

In Sudirman II intersection, traffic jams occur at the at-grade railway crossing as well as at the T-intersection (Jl. Benteng Betawi) that is located just south beside the railway crossing. Though the railway crossing is closed not so frequently, many heavy vehicles pass the crossing at very low speed. In 2017 (i.e., project completion year), the traffic volume of the four directions of Sudirman II intersection is expected to grow from current 77,000 PCUs to around 87,000 PCUs per day.

For Sudirman – Daan Mogot intersection, though it is planned to implement north-south flyover along this location, the number of daily traffic volume along east-west corridor is nearly the same (46,000 PCU) compared to traffic along north-south corridor (44,000 PCU). Without any other constraints, these survey findings might affect the flyover direction from north-south to east-west.

[Sudirman – Daan Mogot] (north adjacent intersection) [Sudirman II – Jl. Benteng Betawi]

(unit: veh.)



Source: Traffic Survey, JICA Survey Team

Figure 3.4.26 Traffic Flow and Daily Volume at Sudirman II Intersection

(7) Evaluation of Other Sub-Projects

As indicators to evaluate other sub-projects, a degree of saturation and a cycle time of intersection are forecasted for each year of project completion, as presented in Table 3.4.9. It is expected that not only the degree of saturation but also the cycle time of each sub-project intersection will be greatly reduced with a grade separation, which will also contribute to savings in travel time and vehicle operating cost.

Table 3.4.9 Evaluation of Intersection Improvement in Other Sub-Project Locations

No.	Location	FO/UP Direction	Year of Completion	Indicator	Before Project	After Project
4	R.E. Martadinata	E-W	2016	Degree of Saturation	1.05	0.73
				Cycle Time [sec.]	-	-
5	Sulawesi- Tg. PA	N-S	2016	Degree of Saturation	1.65	0.41
				Cycle Time [sec.]	137	60
9	Pancoran	E-W	2016	Degree of Saturation	1.78	1.18
				Cycle Time [sec.]	228	120
13	Pinang Baris	E-W	2017	Degree of Saturation	1.74	0.94
				Cycle Time [sec.]	302	120
15	Katamso	E-W	2017	Degree of Saturation	1.29	0.97
				Cycle Time [sec.]	204	120
16	Sudirman II	N-S	2017	Degree of Saturation	1.83	0.87
				Cycle Time [sec.]	112	60

Source: JICA Survey Team