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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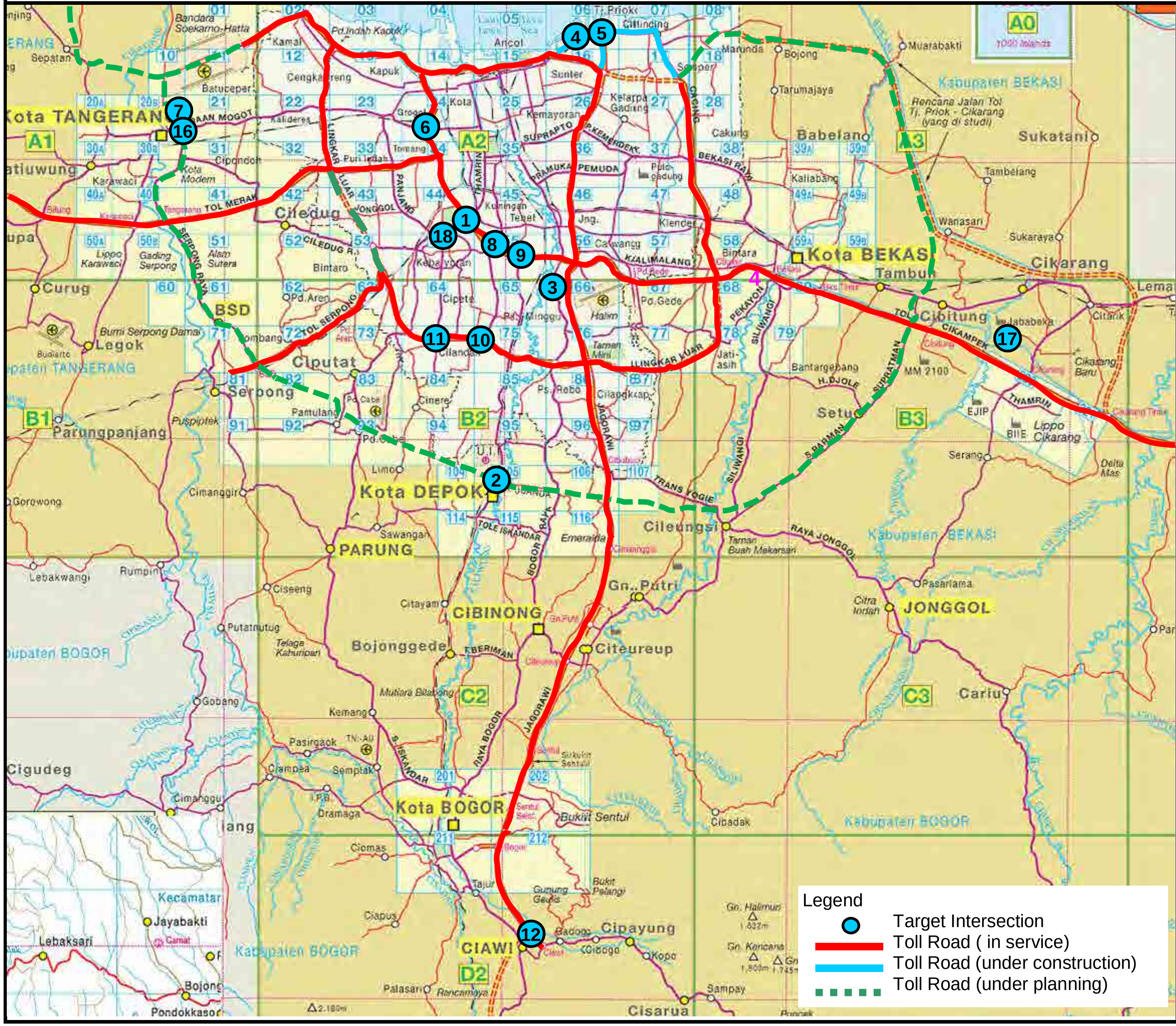
The following foreign exchange rate is applied in the study

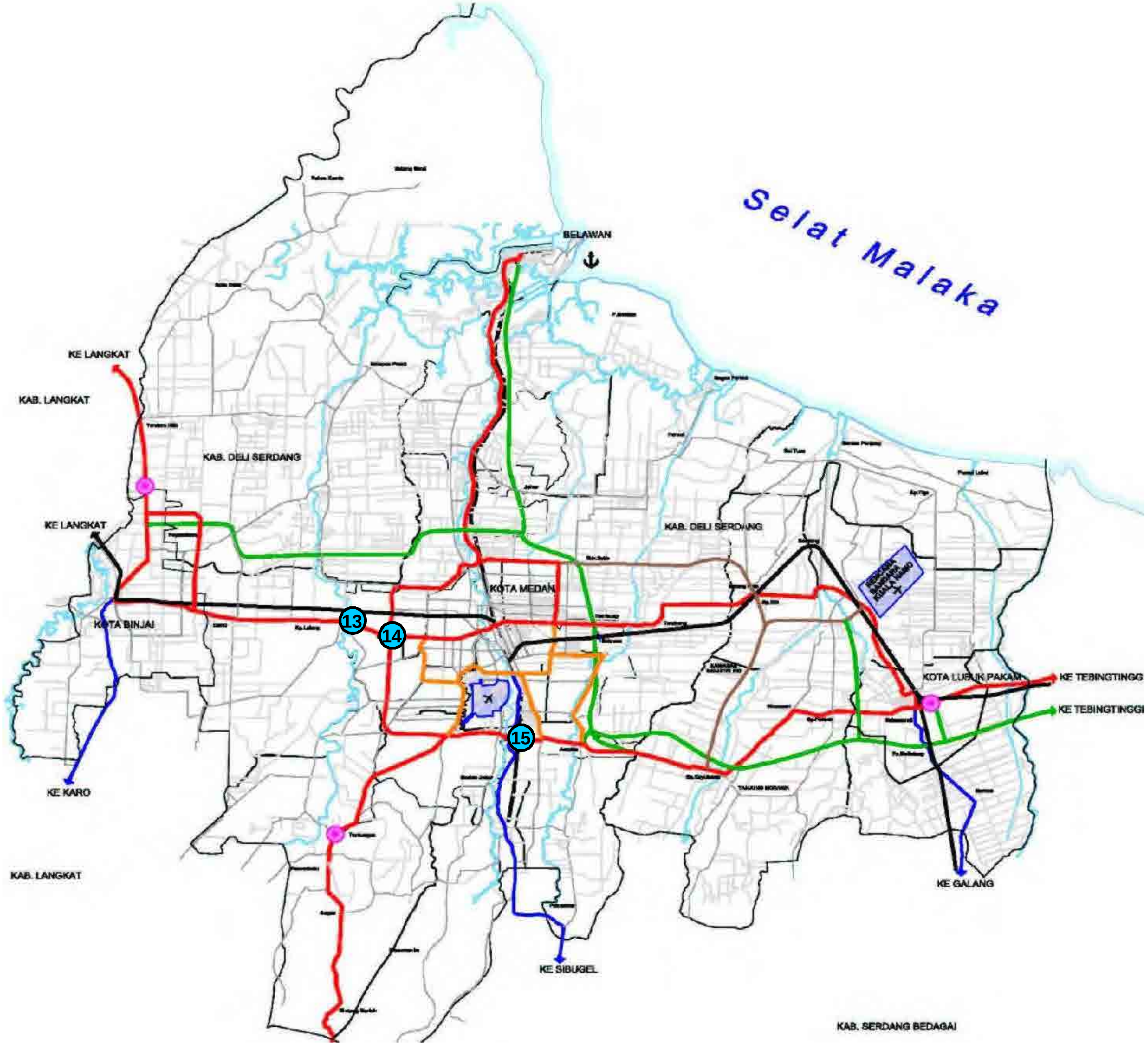
1 US dollar = 8,600 Rp, and 1 JP Yen = 104 Rp (May 2011)

# 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 |

# EXECUTIVE SUMMARY

# 1. Introduction

## 1.1 Background

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.

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 S-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 S-1.1 Major Industrial Parks in JABODETABEK**

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.

## 1.2 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 S-1.2 Flyover and Underpass in UARI Project**

## 1.3 Objective of the Study

The objective and outcome of this study are summarized in Table S-1.1 and new projects which are similar to the past projects are expected for implementation after this study is completed.

**Table S-1.1 Objectives 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<br>Medan (North Sumatra) 2 places<br>Additional potential projects: will be added based on interviews with related entities |
| **Counterpart Agency** | Directorate General of Highways, 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<br>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

## 1.4 Flow of the Study

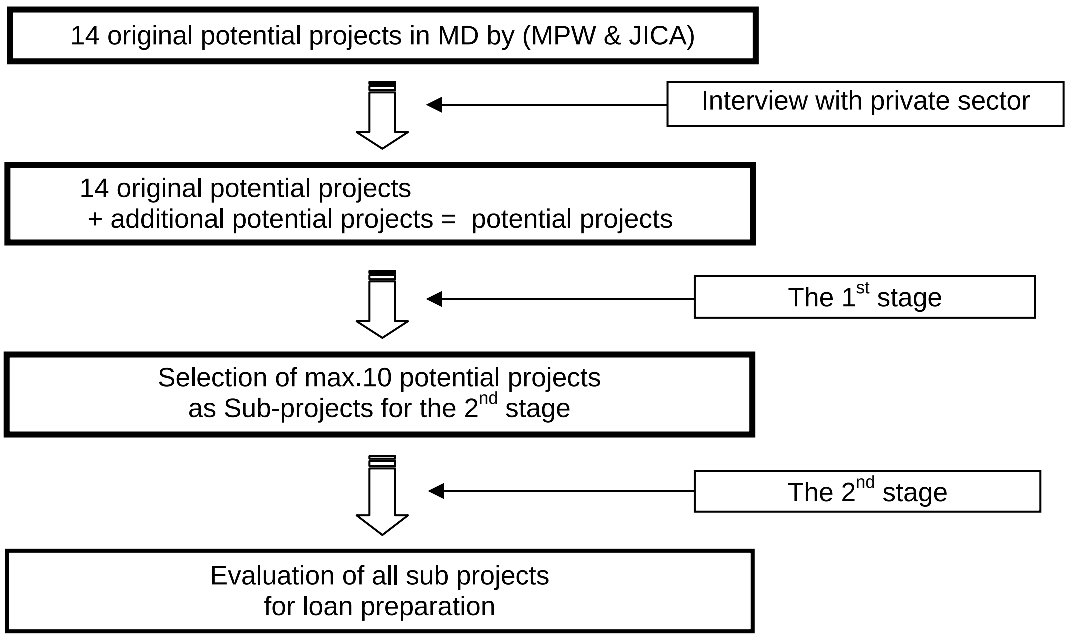
This study generally consists of two stages as shown in Figure S-1.3.

**<u>The 1st stage: Selection of Sub-projects</u>**

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.

**<u>The 2nd stage: Evaluation of Sub-projects</u>**

With the result of surveys 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 S-1.3 Study Flow**

# 2. Selection of Sub-projects

As well as the original 14 potential projects (12 in JABODETABEK and 2 in Medan), through discussions with industrial park personnel and counterparts, newly 4 new potential projects (3 in JABODETABEK and 1 in Medan) were added.

The selection of sub-projects from all 18 potential projects was done with the selection criteria in Table S-2.1 and the selection result is summarized in Table S-2.2. Those selected sub-projects will go into the 2nd stage, on which, surveys and basic design will be conducted.

**Table S-2.1 Selection Criteria of Sub-projects**

| 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 households exceeds 50, **it is not prioritized**.<br>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 a strategic candidate, it is not eliminated.** |

Source: JICA Survey Team

# Table S-2.2 Selection of sub-projects

| Candidate | | | Total '+' score | Selection in 1st-stage | Criteria for selection in 1st-stage | | | | | | | | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Authority | FO, UP, etc. | | | 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 | | |
| 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) | MRTproject 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 "+"

Original Candidate in MD by (PU & JICA)

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 "+"

Source: JICA Survey Team

# 3. Traffic Analysis

## 3.1 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 ("The Study on Integrated Transportation Master Plan for JABODETABEK (Phase II)") (2001 – 2004) and ongoing JUTPI (JABODETABEK Urban Transportation Policy Integration).

SITRAMP developed the transportation demand forecast model based on four step method including trip production/attraction, distribution, modal choice, and trip network assignment models. Although the basic flow of demand forecast procedure is the same as SITRAMP, in JUTPI, each demand forecast model of the process has been revised and updated considering current transition in travel behavior.

For forecast of the future traffic at the eight sub-projects in JABODETABEK, traffic volumes are looked up in 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, and the annual growth is calculated as shown in Table S-3.1.

**Table S-3.1 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 S-3.2.

**Table S-3.2 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)

## 3.2 Traffic Analysis of Sub-Projects

### (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. Therefore, a dynamic simulation analysis was carried out to evaluate several improvement plans by dynamically simulating the traffic. 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 S-3.3.

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 S-3.3 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

### (2) Kuningan Intersection

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 S-3.4. 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 S-3.4 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) Cikarang Area

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 S-3.1.

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 S-3.5 and Table S-3.6, respectively.

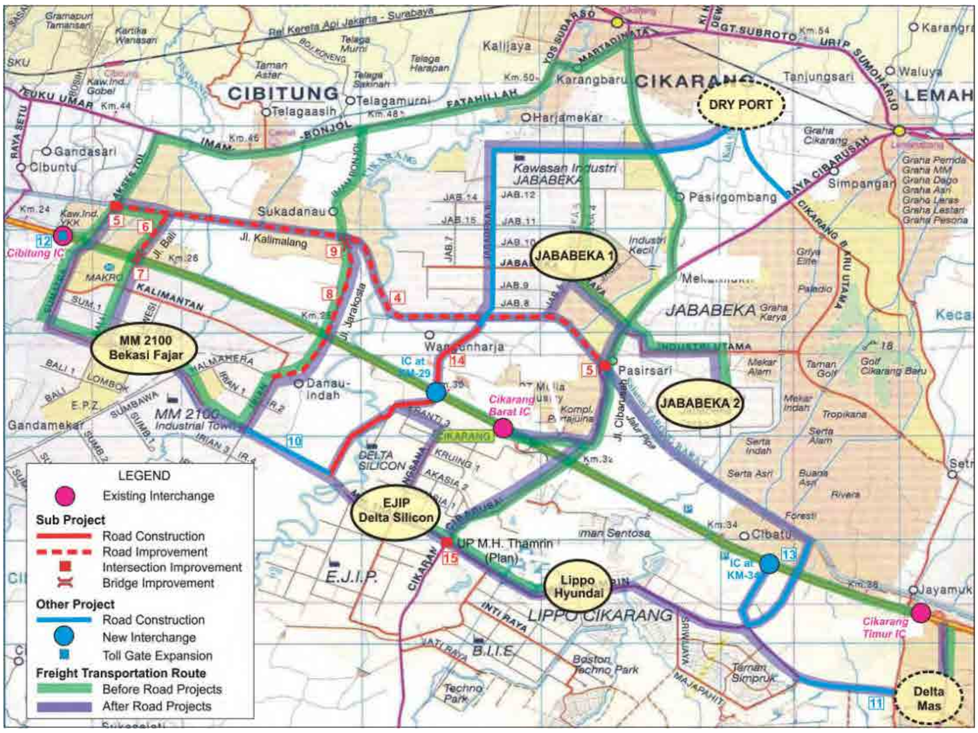
If no JICA sub-projects are implemented, the V/C ratios of all the N-S roads (except for Jl. Sukamantri) are over 1.0. Above all, Jl. Cibarusah will be so heavily congested with a V/C ratio of 1.92, and the V/C ratio of the total traffic on all the N-S roads is forecasted as 1.36, implying serious traffic 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 S-3.1 Major Potential Traffic to be Diverted to Sub-Project Roads in Cikarang**

**Table S-3.5 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 Traffic | 1.36 | 1.09 | 0.92 | 0.90 |

Source: JICA Survey Team

**Table S-3.6 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

### (4) Senayan Roundabout

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

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 S-3.6. EIRR, which is limited to this roundabout, is calculated based on these forecasts.

**Table S-3.7 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

### (5) Other Intersections

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 S-3.7. 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 S-3.8 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

# 4. Road and Structure Design

## 4.1 Preliminary Design

A preliminary design has been carried out for all potential projects to evaluate the feasibility of the projects and select the sub projects which will be analysed in more detail for the 2nd stage. Due to the lack of topographic maps and traffic data as of the 1st stage, the design was conducted based on satellite photos and site reconnaissance. The existing study results such as the feasibility study, basic design and detailed design implemented by the local or international consultants was referred to in the preliminary design.

## 4.2 Basic Design

### (1) Road and intersection

The basic design of roads and intersections was conducted for 10 sub-projects selected in the 1st stage. First of all, the preliminarily designs were reviewed based on the topographic condition, traffic analysis and discussions with the MPW and DKI. The basic design was carried out and the drawings were prepared for the most suitable plan.

The discussions among MPW, JABABEKA and other industrial states for “9.Cikarang の Dry port access road” are still on-going to finalize the project concept and design. In addition, the project scope for “10.Senayan” is not yet determined due to the constraints such as the environmental regulations, replacement of a monument and an MRT Project.

**Table S-4.1 Summary of Road Design**

<table>
<tr><th colspan="2" rowspan="2">Potential projects</th><th rowspan="2">FO/UP</th><th colspan="2">Improvement length</th><th colspan="2">Number of lanes and width</th><th rowspan="2">Railway crossing</th></tr>
<tr><th>Overall</th><th>Structure</th><th>Main road</th><th>Frontage road</th></tr>
<tr><td>1</td><td>Semanggi</td><td>At-grade</td><td>-</td><td>217m-</td><td>-</td><td>-</td><td></td></tr>
<tr><td>2</td><td>R.E. Martadinata</td><td>FO</td><td>725m</td><td>532m</td><td>2x2<br>(8.5mx2)</td><td>2x2</td><td>●</td></tr>
<tr><td>3</td><td>Sulawesi - Tg.PA</td><td>FO</td><td>665m</td><td>318m</td><td>2x2<br>(8.5mx2)</td><td>2x2</td><td>●</td></tr>
<tr><td>4</td><td>Kuningan</td><td>UP</td><td>1,147m</td><td>1,018m</td><td>2x2<br>(18.5m)</td><td>2x2</td><td></td></tr>
<tr><td>5</td><td>Pancoran</td><td>FO</td><td>887m</td><td>634m</td><td>2x1<br>(8.0m)</td><td>2x1</td><td></td></tr>
<tr><td>6</td><td>Pinang Baris</td><td>FO</td><td>886m</td><td>533m</td><td>2x2<br>(17.0m)</td><td>2x2</td><td></td></tr>
<tr><td>7</td><td>Katamso</td><td>UP</td><td>625m</td><td>360m</td><td>2x2<br>(19.0m)</td><td>1x2</td><td></td></tr>
<tr><td>8</td><td>Sudirman II</td><td>FO</td><td>985m</td><td>570m</td><td>2x2<br>(17.0m)</td><td>2x2</td><td>●</td></tr>
<tr><td rowspan="4">9. Cikarang</td><td>Kalimarang</td><td>At-grade<br>(1 FO)</td><td>7,780m</td><td>190m</td><td>1x2<br>(12.5m)</td><td>-</td><td></td></tr>
<tr><td>Bali</td><td>Overpass bridge</td><td>360m</td><td>71m</td><td>1x1<br>(8.5m)</td><td>-</td><td></td></tr>
<tr><td>Iman Bonjol</td><td>At-grade<br>(1 bridge)</td><td>1,750m</td><td>50m</td><td>1x2<br>(7.0m)</td><td>-</td><td></td></tr>
<tr><td>Dry port access road</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td></tr>
<tr><td>10</td><td>Senayan</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td></tr>
</table>

Source: JICA Survey Team

### (2) Selection of Eligible Flyover Structure

In Indonesia, the practical type of bridge is a pre-stressed concrete girder bridge; to be constructed by cranes or erection girder in terms of its advantages on the following points. However it should be considered to apply PC box girders or steel box girders at necessary sections of wide spans and/or curve alignments.

- To ease the quality control at the production in the factory
- To shorten the erection time affecting the existing traffic stream;
- To minimize the effect to the existing adjacent facilities; and
- To minimize the construction cost by minimizing temporary cofferdams, supports and scaffolding works and to achieve the erection of the girders within the limited area.

In Indonesia, a simple girder bridge with separated joints at the pier head is a conventional structural type for the flyover. The simple girder bridge does not require a complicated structural analysis and this facilitates the design process in a timely manner. In this project, the span arrangement and layout of the bridge structure will therefore apply simple structure systems as much as possible unless otherwise restricted by site conditions.

### (3) Selection of Eligible Underpass Structures

For the selection of structure type for the underpasses, it depends on the site conditions, obstacles and other confined limitations at the site. In some potential projects, the proposed underpass structure is to be constructed under the existing flyover. The vertical clearance at the intersection is limited so that the specific piling method under the flyover shall be considered.

As a result, amongst some possible alternatives, using RC cast-in-situ concrete piles (Secant piles) in combination with PC harrow slab can be practically applied taking into account the local practice in Indonesia. The secant piles can be driven under the limited height using the specific machinery and adequately functions as the foundation of the abutment. This method will help also minimize the time for construction without temporary cofferdams. For the approach section other than tunnel sections, PC sheet piles are economically considered as practical for use in Indonesia. Table S-4.2 shows a summary of structure design for each subproject.

**Table S-4.2 Summary of Structure Design**

| Subproject | | Structure Type | Design Feature | | |
|---|---|---|---|---|---|
| | | | Length | Span | Structure Type |
| 1 | Semanggi | UP | 217m | - | PC harrow slab bridge |
| 2 | R.E. Martadinata | FO | 532m | 24 | PC-U girder bridge |
| 3 | Sulawesi - Tg.PA | FO | 318m | 11 | PC-U girder, Steel box girder, PC harrow slab bridge |
| 4 | Kuningan | UP | 1,018m | - | PC harrow slab with pile bent (Secant pile) |
| 5 | Pancoran | FO | 634m | 10 | PC-U 桁橋 |
| 6 | Pinang Baris | FO | 533m | 7 | Steel box, PC-U girder bridge |
| 7 | Katamso | UP | 360m | - | PC harrow slab with pile bent (Secant pile) |
| 8 | Sudirman II | FO | 570m | 8 | PC-U girder bridge |
| 9. Cikarang | Kalimarang | FO | 190m | 7 | Steel box, PC-U girder bridge |
| 9. Cikarang | Bali | Overpass | 71m | 3 | Steel box, PC harrow slab bridge |
| 9. Cikarang | Iman Bonjol | River bridge | 50m | 2 | PC-U girder bridge |
| 9. Cikarang | Dry port access | - | - | - | — |
| 10 | Senayan | - | - | - | — |

Source: JICA Survey Team

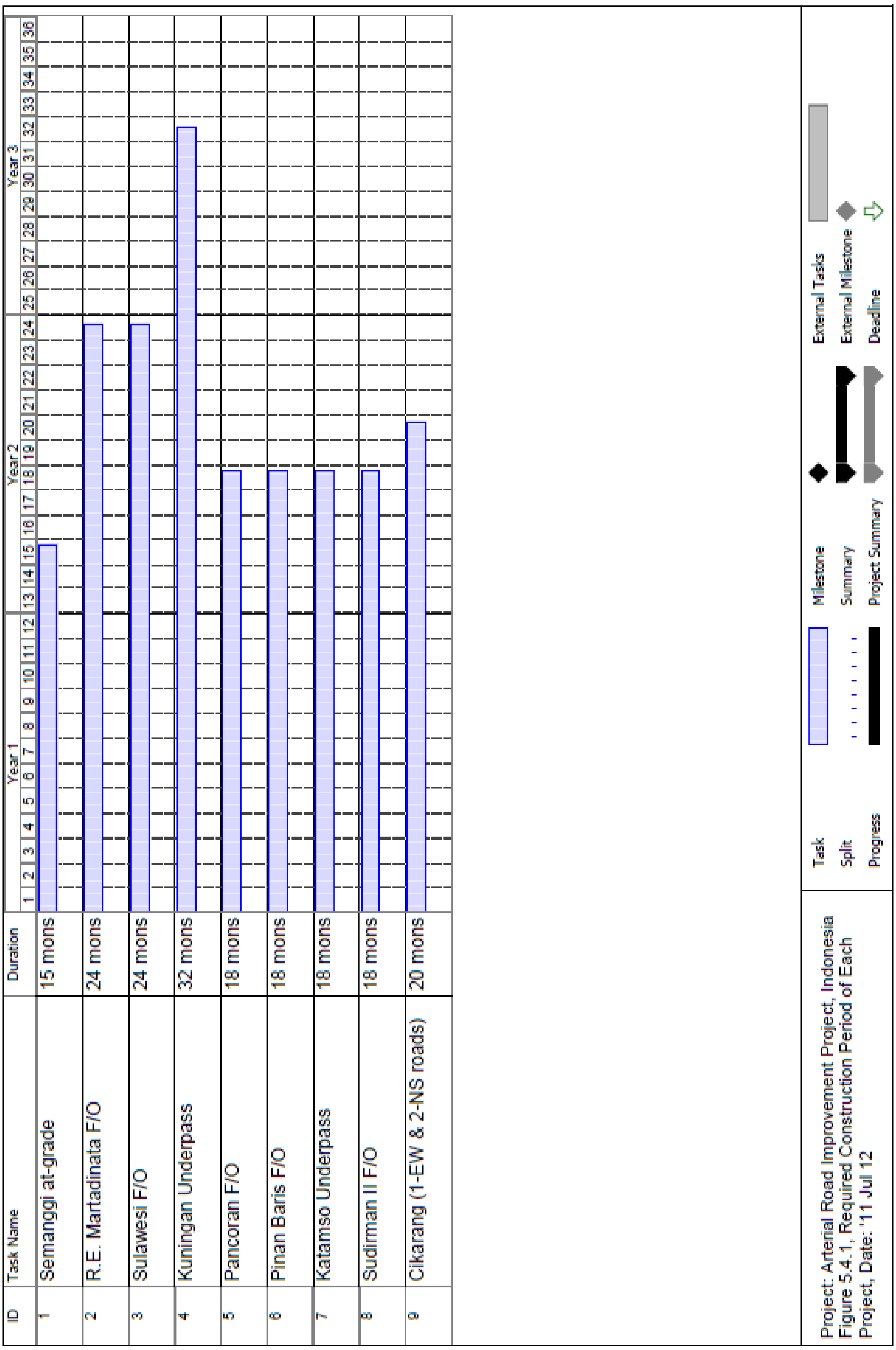
## 5. Construction and Maintenance Plans

Required construction periods of each subproject are calculated, using the reference performance of similar projects (Table S-5.1). The summary is presented in Figure S-5.1. Detailed schedules are included in the Appendix 5.

**Table S-5.1 Reference Performance for Construction Period Calculation**

| No. | Work items | Reference performance (UARI and other projects) |
|---|---|---|
| 1 | Road works | 5,000 sq.m/month |
| 2 | Excavation | 600 cu.m/day |
| 3 | Piling works | 2 Nos./day |
| 4 | Bridge abutment works | 14 days/each |
| 5 | Bridge pier works | 10 days/each |
| 6 | Erection of girders and slabs | 800 sq.m/month |
| 7 | Retaining wall (H=2 m) | 5 m/day |
| 8 | Reinforced earth wall (H=4 m) | 4 m/day |
| 9 | PC sheet piles | 4 each/day/machine |
| 10 | Secant piles | 2 each/day/machine |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure S-5.1 Required Construction Period**

# 6. Project Cost Estimate

## 6.1 Cost Estimate

Summary of construction cost estimate for each subproject is shown in Table S-6.1. The details are included in the Appendix 6. The costs are estimated with the following process:

- At first, major quantities of structures and roads are picked up and calculated, using the Basic designs.
- Second, Construction rates of each pay item are estimated, referring to those of similar previous projects (UARI and other projects) and Engineer's estimate with escalation.
- Third, the construction cost for each subproject is estimated in consideration of other minor costs (structures plus 10% and roads plus 30%).
- Forth, check the final costs in comparison with the square meter average costs.

In addition, the construction costs are all in Rp. because almost all construction materials and equipment for this project are domestically available in Indonesia.

## 6.2 Cost Reduction

In the flyover and underpass designs, following two improvements are made to reduce the construction costs:

**(1) Precast U-girder for side spans (for flyovers)**

Original design for flyover side spans was PC box-girder (cast-in-situ). After value engineering, precast PC U-girders are found more economical and easy to construct, then applied.

**(2) Alignment of road profile (for Kuningan Underpass)**

Profile of Central open cut section is raised to reduce the quantity of the secant wall piles, resulting in cost reduction.

**Table S-6.1 Summary of Construction Cost Estimate (May 2011, Unit: Rp. Mil.)**

| No. | Flyover/ Underpass | Structure | (1) Structure (Major items only) | (2) Road (Major items only) | (3) Others (Structure) (% of (1)) | (4) Other Structure Amount (1)x(3) | (5) Others (Road) (% of (2)) | (6) Other Road Amount (2)x(5) | (7) General (% of (1)+(2)+ (4)+(6)) | (8) General Amount (7)x ((1)+(2)+ (4)+(6)) | Total (1)+(2)+ (4)+(6)+(8) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Semanggi, ALT-2, Ver.2 | At grade improvement+ two bridges | 15,337 | 21,536 | 10% | 1,534 | 30% | 6,461 | 5% | 2,243 | **47,110** | |
| 2 | Martadinata F/O | PC-U | 86,464 | 19,402 | 10% | 8,646 | 30% | 5,821 | 5% | 6,017 | **126,350** | |
| 3 | Sulawesi F/O | PC-U+Steel Box+ PC-H | 95,722 | 15,507 | 10% | 9,572 | 30% | 4,652 | 5% | 6,273 | **131,726** | |
| 4 | Kuningan Underpass | Underpass | 150,407 | 16,600 | 10% | 15,041 | 30% | 4,980 | 5% | 9,351 | **196,379** | |
| 5 | Pancoran F/O | PC-U | 40,129 | 9,481 | 10% | 4,013 | 30% | 2,844 | 5% | 2,823 | **59,290** | |
| 6 | Pinang Baris F/O | PC-U+Steel Box | 62,953 | 18,319 | 10% | 6,295 | 30% | 5,496 | 5% | 4,653 | **97,716** | |
| 7 | Katamso Underpass | Underpass | 51,698 | 6,138 | 10% | 5,170 | 30% | 1,841 | 5% | 3,242 | **68,089** | |
| 8 | Sudirman II F/O | PC-U | 57,904 | 21,729 | 10% | 5,790 | 30% | 6,519 | 5% | 4,597 | **96,539** | |
| 9 | Cikarang Improvement | Two F/Os+ one Bridge | 48,424 | 97,206 | 10% | 4,842 | 30% | 29,162 | 5% | 8,982 | **188,616** | |
| 10 | Senayan | (under study) | - | - | - | - | - | - | - | - | - | Under study |
| | Total | | | | | | | | | | **1,011,815** | |

Note)
F/O: Flyover, PC-U: Precast prestressed U-girder, PC-H: Precast prestressed Hollow girder and Steel box: Steel box girder

Source: JICA Survey Team

# 7. ECONOMIC ANALYSIS

## 7.1 Overview

This chapter evaluates the economic feasibility of the sub-projects for evaluation in the second stage. Economic evaluation examines the economic feasibility of a sub-project through a cost-benefit analysis from a national economic perspective where quantified benefits of the project are compared with its economic costs.

The results of the evaluation show that the Benefit-Cost ratio (B/C) and the Economic Internal Rate of Return (EIRR) of the project are economically justified from a national economic viewpoint, and the values are used as one of the criteria for prioritization of the sub-projects in the second stage.

## 7.2 Assumptions of Economic Evaluation

### (1) "With Project" and "Without Project" Assumptions

In the cost-benefit analysis, two scenarios will be assumed in order to distinguish and compare the benefits and costs arising from project implementation. Two scenarios, i.e. "with project" and "without project," have the following assumptions.

Each sub-project will be implemented and completed by the target year of the Study. In this economic evaluation, implementation of the sub-project is regarded as a "with project" scenario. On the other hand, a "without project" scenario is formulated under the assumption that the sub-project is not implemented and the existing conditions continue.

### (2) Economic Benefits of Project

There are a variety of direct and indirect benefits (quantitative and qualitative) derived from the proposed transportation project.

Among these are the benefits from savings in vehicle operating costs (VOC) and passenger travel time costs (TTC), and the benefits from the avoided costs, which were treated as quantitative benefits in conventional economic analysis of urban transportation. In this economic evaluation, the VOC and TTC cost-savings were estimated as quantitative benefits especially in comparing the "with project scenario" to the "without project" scenario.

### (3) General Assumptions of Economic Evaluation

The following are the assumptions of the general conditions in the economic evaluation:

- Base Year: Year 2011;
- Project Life: 30 years after the project completion, namely from 2016 to 2045 in most cases;
- Discount Rate: Discount rate of 10% is used;
- Inflation: Inflation is not taken into account, it is not considered in benefits or in costs estimated during the evaluation period;
- Growth in traffic volume: Following JUTPI, an increase in traffic volume is forecasted for each sub-project location, ranging from 0.8% to 2.6% per year; and
- Foreign Exchange Rate: The foreign exchange rate is fixed at the following rate as of May 2011 and a shadow exchange rate is not considered, 1 US$= Rp. 8,600, 1JPY=Rp. 104.

## 7.3 Result of Economic Analysis

Based on the above-mentioned premises, economic analysis is conduced. Summary table is first presented in Table S-7.1. Except for certain alternatives for Semanggi junction and Senayan roundabout, the net present values (NPV) of all the alternatives with a 10% discount rate are calculated as positive, meaning that all those are economically viable.

**Table S-7.1 Summary of Economic Analysis of Sub-Projects and Alternatives**

| No. | Sub-Project | Alternative | EIRR [%] | NPV [billion Rp.] | B/C Ratio |
|---|---|---|---|---|---|
| 1 | Semanggi | Alt.1 | 110.2% | 627 | 28.07 |
| | | Alt.2-1 | 57.7% | 228 | 10.23 |
| | | Alt.2-2 | 48.2% | 232 | 8.72 |
| | | Alt.3 | 332.3% | 905 | 139.17 |
| | | Alt.4 | 8.4% | -29 | 1.25 |
| 4 | R.E. Martadinata | | 16.9% | 82 | 2.77 |
| 5 | Sulawesi- Tg. PA | | 21.2% | 140 | 3.74 |
| 8 | Kuningan | N-S continuous UP only | 16.2% | 121 | 3.05 |
| | | with E-W FO[*1] | 14.6% | 107 | 2.68 |
| 9 | Pancoran | | 22.8% | 83 | 3.54 |
| 13 | Pinang Baris | | 17.0% | 56 | 2.74 |
| 15 | Katamso | | 22.4% | 78 | 3.86 |
| 16 | Sudirman II | | 27.5% | 184 | 5.03 |
| 17 | Cikarang | 1 E-W & 2 N-S roads only | 118.5% | 5,436 | 45.62 |
| | | with Dry Port Access[*1] | 106.7% | 14,239 | 43.39 |
| | | with Dry Port Access & Thamrin UP[*1] | 105.0% | 15,687 | 41.79 |
| 18 | Senayan[*2] | Alt.1[*1] | 5.5% | -59 | 0.90 |
| | | Alt.2[*1] | - | -691 | 0.17 |
| | | Alt.3[*1] | 47.8% | 102 | 7.40 |
| | | Alt.4[*1] | 7.2% | -29 | 1.09 |
| | | Alt.5[*1] | 12.0% | 15 | 1.76 |
| All Sub-Projects[*3] | | | 63.2% | 16,023 | 12.80 |

Note: [*1] Based on preliminary cost estimate
[*2] Benefit is limited to Senayan roundabout only.
[*3] Including Alt.2-2 in Semanggi, N-S continuous UP only in Kuningan, 1 E-W & 2 N-S roads with Dry Port [Access] & Thamrin UP in Cikarang, and Alt.2 in Senayan
Source: JICA Survey Team

Result of the economic analysis of all the sub-projects is also presented at the bottom of Table S-7.1. The NPV of the project with a 10% discount rate is calculated as Rp.16 trillion, and the EIRR is 63.2% which is above the project evaluation standard in Indonesia. Thus, the package of all the sub-project is justifiable enough from the national economic point of view.

Apart from the alternatives that are not economically viable, the above sub-projects and alternatives were further analyzed for economic sensitivity analysis. For this, the following cases were analyzed:

- Cases in which total cost increases by 10%, 20%, and 30% (with benefit unchanged);
- Cases in which total benefit decreases by 10%, 20%, and 30% (with cost unchanged); and

- A case in which total cost increases by 20% and total benefit decreases by 20%.

The result indicates that EIRR and NPV are highly dependent on the variations of the expected cost and benefit. However, the sub-projects will be economically feasible in all the cases assumed.

# 8. Environmental and Social Considerations

## 8.1 Environmental Impact Assessment Law and relevant guidelines in Indonesia

According to the EIA laws in Indonesia, construction of a flyover or underpass which is more than 2km in length or requires more than 5ha land acquisition shall complete an AMDAL process. However, the criteria for AMDAL vary with different local governments, the length of 750m is the criteria for flyovers and underpasses in the regulations of DKI.

## 8.2 Project Outline and Screening based on the Law

For the selected Sub-projects from the 1st stage, the project outline and draft screening results regarding EIA are shown in Table S-1.8. All target facilities are required to carry out UKL/UPL, and Kuningan requires an AMDAL in accordance with relevant regulations. Therefore, this preparatory survey has conducted the supporting work for EIA approval of 6-locations UKL/UPL and 1-location AMDAL.

**Table S-8.1 Project Outline and Draft Screening**

| Location | Environmental Authorized Agency | Facility | Length | *EIA Screening* |
|---|---|---|---|---|
| 1. Semanggi | Central Jakarta City | Road, UP | 0.22 km | *UKL+UPL* |
| 2. R.E.Martidinata | North Jakarta City | FO | 0.73 km | *UKL+UPL* |
| 3. Sulawesi (TgPA) | North Jakarta City | FO | 0.32km | *No need (included in TgPA AMDAL)*1* |
| 4. Kuningan | Central Jakarta City | UP | 1.02 km | *AMDAL* |
| 5. Pancoran | South Jakarta City | FO | 0.63km | *UKL+UPL* |
| 6. Pinang Baris | Medan City | FO | 0.53 km | *Expired*2* |
| 7. Katamso | Medan City | UP | 0.36 km | *UKL+UPL* |
| 8. Sudirman II | Tangerang City | FO | 0.57 km | *UKL+UPL* |
| 9. Cikarang | Bekasi Regency | Road , FO/Bridge | 2.3 km | *UKL+UPL* |
| 10. Senayan | South Jakarta City | At-grade, FO/UP | L<0.75km | *No need (not identified the sub-project)* |

Source: JICA Survey Team / Indonesian and DKI EIA laws

*1: Kuningan under pass is one of facilities in the Tanjung Priok Access Road Project, AMDAL approval of the project had been issued in December 2004 and the project is under construction

*2 : UKL/UPL approval for Pinan Baris had been issued in December 2008, however 3 years validity period after approval without construction activities is expired

## 8.3 Current Progress and Schedule of Environmental Approval

In ten selected sub-projects, UKL/UPL for six sub-projects (No.1 Semanggi, No2. R.E. Martidinata, No.5 Pancoran, No.7 Katamso, No.8 Sudirman II and No.9 Cikarang) and one AMDAL for No.4 Kuningan are being carried out by the Ministry of Public Works in cooperation with JICA. It is expected that six approvals for UKL/UPL will be issued from relevant governmental environmental authorities after April 2012.

The approvals for No.3 Sulawesi in DKI and No.6 Pinan Baris in Medan City had been issued, however the approval of Pinan Baris had been expired the validity. On the other hand, a series of environmental process for No.10 Senayan is not started because a concept of design is not concluded at the moment. The process of AMDAL (No.4 Kunnigan) will be carried out after April 2012.

# 9. Involuntary Resettlement

## 9.1 General

The JICA requests borrowers to submit a Land Acquisition and Resettlement Action Plan (LARAP) for the development Projects that contain large scale involuntary resettlements prior to the JICA appraisals for the project.

The framework of the LARAP (FLARAP) for ten (10) subprojects has been developed through discussions with DGH to clarify the basic principles in term of involuntary resettlement to be applied to the MARIP. The ten (10) subprojects were selected based on the multi criteria analysis in the first stage of the Preparatory Survey.

In the second stage, the LARAPs for each subproject were prepared based on the FLARAP. The LARAP preparation was conducted based on a sub-contract under financial assistance of JICA. Note that the LARAPs for three (3) projects i.e. Semanggi、Sulawesi - Tg.PA and Senayan out of the ten (10) sub-projects were not prepared due to the reasons mentioned below.

i) No additional land acquisition will be necessary;

ii) The land acquisition for the project has been conducted as the part of another Project;

iii) The intersection improvement plan has not been finalised.

## 9.2 Summary of the LARAPs

The field survey necessary for LARAP preparation consists of the census, inventory of loss (IOL) survey and socio-economic survey. These surveys were conducted based on the results of the preliminary designs for each sub-project. Note that the surveys were conducted with all project affected households (Ahs). The survey revealed the number of affected households (AHs), the number of project affected persons (PAPs), the areas of affected land and structures. Unit costs for compensation for land and structures were decided based on the replacement cost survey. Table S-9.1 shows the results of the LARAP preparation. Note that LARAP for Kuningan is under preparation.

**Table S-9.1 Summary of the LARAPs**

| No. | Sub-project | No. of AHs | No. of PAPs | Affected Land ($m^2$) | Affected Structures ($m^2$) |
|---|---|---|---|---|---|
| 1 | Semanggi | - | - | - | - |
| 2 | R.E.Martadinata | 38 | 132 | 622 | 662 |
| 3 | Sulawesi - Tg.PA | - | - | - | - |
| 4 | Kuningan | 117 | 184 | 2,096 | 506 |
| 5 | Pancoran | 0 | 0 | 487 | 0 |
| 6 | Pinang Baris | 186 | 320 | 6,157 | 2,763 |
| 7 | Katamso | 41 | 61 | 398 | 217 |
| 8 | Sudirman II | 29 | 73 | 5,644 | 934 |
| 9 | Cikarang | 91 | 292 | 383 | 2,027 |
| 10 | Senayan | - | - | - | - |

Source：JICA Survey Team（2011）

## 9.3 Recommendations and Proposal

- Necessary action for Implementation of land acquisition by Executing Agency
- Appropriate schedule ensuring enough time for LARAP updating
- Appropriate information disclosure and close consultation with PAPs through stakeholders meetings in the process of the LARAP updating

# 10. EVALUATION OF SUB-PROJECTS

## 10.1 Evaluation Method

Multi criteria analysis with a weighted point system was applied for the evaluation of sub projects, and 3 scenarios were set with different weighted points as shown in Table S-10.1.

**Table S-10.1 Multi Criteria**

| | | 1st stage | Pointing System | | Scenario-1 (Necessity) | | | Scenario-2 (Effectiveness) | | | Scenario-3 (Construction) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | + / - | Point | Method | Weight | Score | | Weight | Score | | Weight | Score | |
| Necessity | Planned in Any Master Plan | + | 10 | 10 (if any MP), 0 (nothing) | 2.0 | 20 | | 1.0 | 10 | | 1.0 | 10 | |
| | Existing Study (FS, DD) | + | 10 | 10(up to DD), 5(any Study), 0(nothing) | 1.0 | 10 | 50 | 0.5 | 5 | 25 | 0.5 | 5 | 25 |
| | Railway Crossing | + | 10 | 10 (if railway crossing), 0 (others) | 2.0 | 20 | | 1.0 | 10 | | 1.0 | 10 | |
| Effectiveness | Traffic Volume | | 10 | (Value-min) / (max-min) * 10 | 1.0 | 10 | | 2.0 | 20 | | 1.0 | 10 | |
| | Construction Cost | | 10 | (Value-min) / (max-min) * 10 | 0.5 | 5 | 25 | 1.0 | 10 | 50 | 0.5 | 5 | 25 |
| | EIRR | | 10 | (Value-min) / (max-min) * 10 | 1.0 | 10 | | 2.0 | 20 | | 1.0 | 10 | |
| Construction | Conflict with Other Project | - | - | * if any conflict, not selected to 2nd stage * | | | | | | | | | |
| | Construction Period | | 10 | 10 (<18Mos), 5 (18-24Mos), 0 (24Mos<) | 1.0 | 10 | | 1.0 | 10 | | 2.0 | 20 | |
| | Noise/Vibration, Construction Difficulty | | 10 | 10 (rare), 5(moderate), 0(heavy) | 0.3 | 3 | 25 | 0.3 | 3 | 25 | 0.6 | 6 | 50 |
| | Resettlement Households | | 10 | 10 (<10), 5(10-50), 0 (50<) | 0.5 | 5 | | 0.5 | 5 | | 1.0 | 10 | |
| | Aesthetic Feature | | 10 | 10(road only), 5(underpass), 0(flyover) | 0.3 | 3 | | 0.3 | 3 | | 0.6 | 6 | |
| | Maintenance | | 10 | 10(less maintenance), 5(standard), 0 (need pump) | 0.4 | 4 | | 0.4 | 4 | | 0.8 | 8 | |
| | | | | | | | 100 | | | 100 | | | 100 |

Source：JICA Survey Team

## 10.2 Evaluation Result

The evaluation results for each scenario are summarized in Table S-10.3 and the 3 alternatives of the implementation program. Where 9-, 7-, or 5- sub-projects are to be implemented, the selected sub-projects are summarized in Table S-10.2.

**Table S-10.2 Selection of Sub-projects for each Alternative**

| Evaluation Result | | | Implementation Program | | |
|---|---|---|---|---|---|
| Location | Authority | FO, UP, etc. | Alt.-1 (9 sub-projects) | Alt.-2 (7 sub-projects) | Alt.-3 (5 sub-projects) |
| 1. Semanggi | DKI | at-grade | ● | ● | ● |
| 2. R.E.Martadinata | DKI | FO | ● | ● | |
| 3. Sulawesi - Tg.PA | DKI | FO | ● | ● | ● |
| 4. Kuningan | DKI | UP | ● | | |
| 5. Pancoran | DKI | FO | ● | ● | ● |
| 6. Pinang Baris | Medan | FO | ● | ● | |
| 7. Katamso | Medan | UP | ● | | |
| 8. Sudirman II | Tangerang | FO | ● | ● | ● |
| 9-1 Cikarang-1 (Phase-1) | Kab. Bekasi | 1-EW road, 2-NS road | ● | ● | ● |
| 10-1 Senayan-1 (Phase-1) | DKI | at grade | | | |

Source：JICA Survey Team

## Table S-10.3 Summary of Evaluation Result

| Location | Authority | FO, UP, etc. | Score | | | | Ranking | | | If select 9 sub-project | | | If select 7 sub-project | | | If select 5 sub-project | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Scenario-1 | Scenario-2 | Scenario-3 | Total | Scenario-1 | Scenario-2 | Scenario-3 | Scenario-1 | Scenario-2 | Scenario-3 | Scenario-1 | Scenario-2 | Scenario-3 | Scenario-1 | Scenario-2 | Scenario-3 |
| 1. Semanggi | DKI | at-grade | 53.1 | 58.2 | 61.1 | 172.4 | 3 | 1 | 1 | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 2. R.E.Martadinata | DKI | FO | 45.1 | 33.6 | 41.6 | 120.2 | 4 | 7 | 6 | ● | ● | ● | ● | ● | ● | ● | | |
| 3. Sulawesi - Tg.PA | DKI | FO | 71.7 | 51.5 | 60.7 | 184.0 | 1 | 3 | 2 | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 4. Kuningan | DKI | UP | 38.4 | 36.2 | 28.9 | 103.4 | 9 | 5 | 9 | ● | ● | ● | | ● | | | ● | |
| 5. Pancoran | DKI | FO | 42.6 | 39.8 | 46.6 | 129.0 | 7 | 4 | 4 | ● | ● | ● | ● | ● | ● | | ● | ● |
| 6. Pinang Baris | Medan | FO | 43.3 | 32.5 | 37.3 | 113.0 | 6 | 8 | 8 | ● | ● | ● | ● | | | | | |
| 7. Katamso | Medan | UP | 39.6 | 31.1 | 37.6 | 108.2 | 8 | 9 | 7 | ● | ● | ● | | | ● | | | |
| 8. Sudirman II | Tangerang | FO | 43.3 | 36.1 | 43.8 | 123.1 | 5 | 6 | 5 | ● | ● | ● | ● | ● | ● | ● | | ● |
| 9. Cikarang *1 | Bekasi | 1-EW road, 2-NS road | 53.1 | 57.3 | 52.1 | 162.5 | 2 | 2 | 3 | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 10. Senayan *2 | DKI | at-grade | 0.0 | 0.0 | 0.0 | 0.0 | 10 | 10 | 10 | | | | | | | | | |

note-1 : Cikrang is not include Dryport Access Road with IC, which is only preliminary design done

note-2 : Senayan has not identified the scope

| | If select 9 sub-project | If select 7 sub-project | If select 5 sub-project |
|---|---|---|---|
| not-selected sub-project | seaman (-3) | Senayan,<br>Kuningan (-2), Katamso (-2) | Senayan, Kuningan, Katamso<br>Pinang Baris (-3), Martadinata (-2) |
| Judgment | no other choice | Pinang Baris is the other candidate for elimination, but better not eliminate both Pinang Baris & Katamso in Medan city. Kuningan is OK even eliminated, because adjacent candidates (Pancoran & Semanggi) are implemented. | Other candidates for elimination are Pancoran & Sudirman II. Pancoran is better implemented because adjacent Kuningan is eliminated. Martadinata is OK to be eliminated, because adjacent Selawesi is implemented. |

Source: JICA Survey Team

# 11. Implementation PROGRAM

## 11.1 Possible Loan Scheme

During deep discussions among relevant organizations (MPW, DKI, local governments, industrial parks) in the JICA preparatory survey, the whole scope of civil works for 8 sub-projects have been successfully identified and FS and BD have been completed , but the remaining 2 sub-projects have not yet had their scope identified as explained here.

The scopes were identified for No.9 Cikarang, 1-EW road (JL. Kali Malang) and the 2-NS roads (Jl. Bali, Jl. Bonjol-4) for the implementation program (phase-1), but the scope for the Dry-port Access Road (with IC at Km29 and NS non-toll road) has not yet been identified. It has been given only a conceptual design and will be implemented later (phase-2).

For No.10 Senayan, the final solution has not yet been agreed after 5 possible alternatives have been discussed because of complicated conditions such as DKI's environmental regulations, aesthetic considerations regarding the existing statue, and the start of the MRT project. For Senayan all the relevant organizations understood the importance to implement a quick solution (phase-1) during the time between Antasari-BlockM flyover completion in the middle of 2012 and MRT civil works, which will start in 2013. After the MRT project is completed, a final solution (phase-2) may be required too.

As the identified 8 sub-projects can be implemented by JICA Project Loan, but for the not-identified 2 sub-projects of Cikarang Dry-port access Road (phase-2) and Senayan (phase-1, phase-2), "Sector Loans" may be the effectible loan scheme, where the existing Conceptual design will be justified and BD/FS/DD are conducted to implement tender/civil works as shown in Table S-11.1.

**Table S-11.1 Possible Loan Scheme**

<table>
<tr><th></th><th>Project Loan</th><th>Sector Loan</th><th>Others</th></tr>
<tr><td>Conceptional Design</td><td>exist</td><td>exist</td><td rowspan="5">or Hybrid Loan which combine both Project Loan and Sector Loan</td></tr>
<tr><td>Feasibility Study and Basic Design</td><td>JICA Preparatory Survey</td><td>by Loan</td></tr>
<tr><td>DD or Design Review</td><td>by Loan</td><td>by Loan</td></tr>
<tr><td>Tender</td><td>by Loan</td><td>by Loan</td></tr>
<tr><td>Civil Works</td><td>by Loan</td><td>by Loan</td></tr>
</table>

Source: JICA Survey Team

## 11.2 Alternatives for the Implementation Program

A total of 9 sub-projects will be prepared for Project Loans, which include No.9 Cikarang-phase 1 project (1-EW road and 2-NS roads) but not include No.10 Senayan. Then Cikarang-phase 2 project (Dry-port Access Road), Senayan-phase 1 project (implemented before MRT), and Senayan-phase 2 project (implemented after MRT) will be included in Sector Loans.

For all 12 sub-projects (9 for Project Loans and 3 for Sector Loans) the loan amount is calculated using the same method as in chapter-6, and the loan amount for the 3 alternatives of different sub-projects in the project loans, are summarized in Table S-11.2. The loan period is 7 years for all alternatives because Senayan (phase-2) as a Sector Loan will be implemented after the MRT project is completed in 2016.

For alternative-1 to implement all 12 sub-projects by both Project Loans and Sector Loans, the implementation schedule with a 7 year loan period is shown in Table S-11.3.

**Table S-11.2 Loan Amount for Each Alternative**

| | | | Alt.-1 | Alt.-2 | Alt.-3 |
|---|---|---|---|---|---|
| Number of sub-project | Project Loan | | 9 | 7 | 5 |
| | Sector Loan | | 3 | 3 | 3 |
| Loan Period | years | | 7 | 7 | 7 |
| Loan Amount | Project Loan | mil. Rp | 1,748,518 | 1,291,490 | 904,282 |
| | | or 1000*USD | 203,316 | 150,173 | 105,149 |
| | | or 1000*Yen | 16,812,668 | 12,418,176 | 8,695,018 |
| | Sector Loan | mil. Rp | 1,036,860 | 1,036,860 | 1,036,860 |
| | | or 1000*USD | 120,565 | 120,565 | 120,565 |
| | | or 1000*Yen | 9,969,808 | 9,969,808 | 9,969,808 |
| | Total | mil. Rp | 2,785,378 | 2,328,350 | 1,941,142 |
| | | or 1000*USD | 323,881 | 270,738 | 225,714 |
| | | or 1000*Yen | 26,782,476 | 22,387,984 | 18,664,826 |

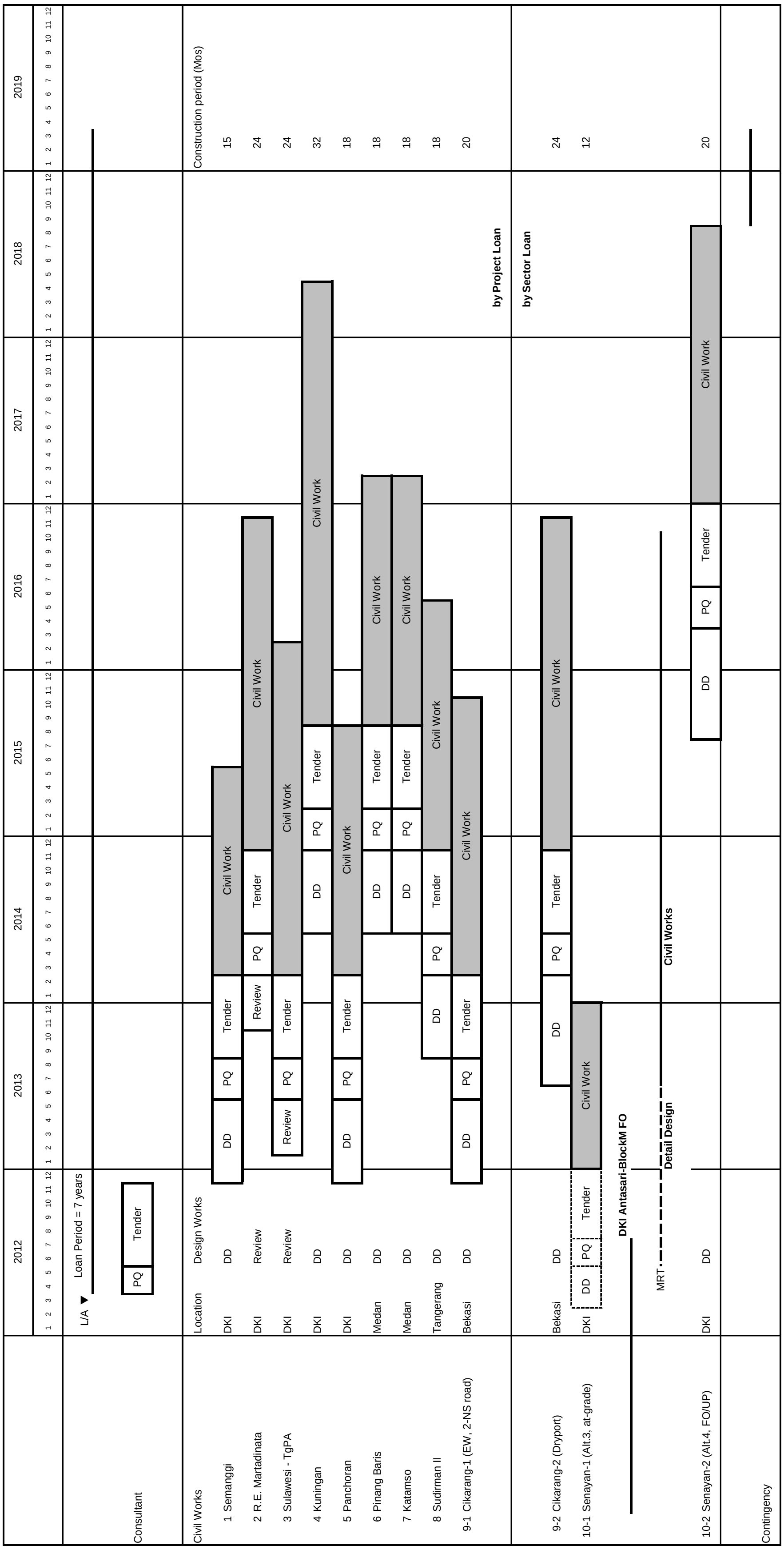
ex. Rate Rp/USD = 8,600

Rp/Yen = 104

note : by 85% as loan provision rate to project cos

Source: JICA Survey Team

**Table S-11.3 Implementation Schedule (Alternative-1)**




Source: JICA Survey Team

# 12. Conclusions and Recommendations

By this “Preparatory Survey for Metropolitan Arterial Road Improvement Projects”, we have arrived at some conclusions. And also we recommend action plans for quick implementation of the projects.

**Conclusions**

1. As potential projects, 18 locations were nominated in JABODETABEK and Medan
2. By 1$^{st}$ stage screening , 10 sub-projects were selected for the 2$^{nd}$ stage (BD and FS)
3. From those 10 sub-projects, the scopes of civil works for 9 sub-projects were identified , but the scope of work for No.10 Senayan has not yet been identified even though it is necessary to implement a definite solution
4. The 9 sub-projects were evaluated and ranked, and are ready to be included in the implementation program (Project Loan)
5. The identification of scope and implementation for No.10 Senayan shall be realized with another loan scheme (Sector Loan)
6. For No.9 Cikarang as a phase-2 project, an additional scope (Dry-port Access Road and etc.) shall be included in a Sector Loan too, and other/new locations may be included also

**Action Plan**

Before Loan

1. Budgetary preparation (Blue Book nomination) in GOI
2. Finalize on-going EIA (UKL/UPL or AMDAL) approval process by GOI
3. Loan preparation between GOJ and GOI

Under Project Loan

4. Detail design or review design, and tender preparation
5. Tender process and civil works with consultant supervision

Under Sector Loan

6. Identification of the scope of civil works and feasibility check
7. Justification and approval to implement identified sub-projects, and detail design
8. (the subsequent process is the same as for a Project Loan)

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## Chapter 11. Implementation PROGRAM



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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 |

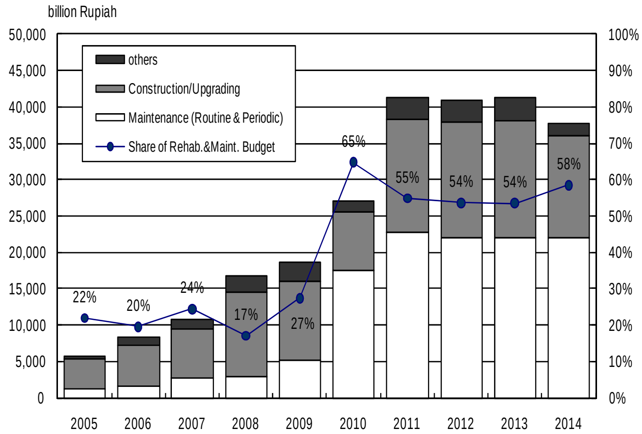
Source: JICA Survey Team

**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 | | Budget (Billion IDR) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Total 2010-2014 | 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<br>Medan (North Sumatra) 2 places<br>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<br>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

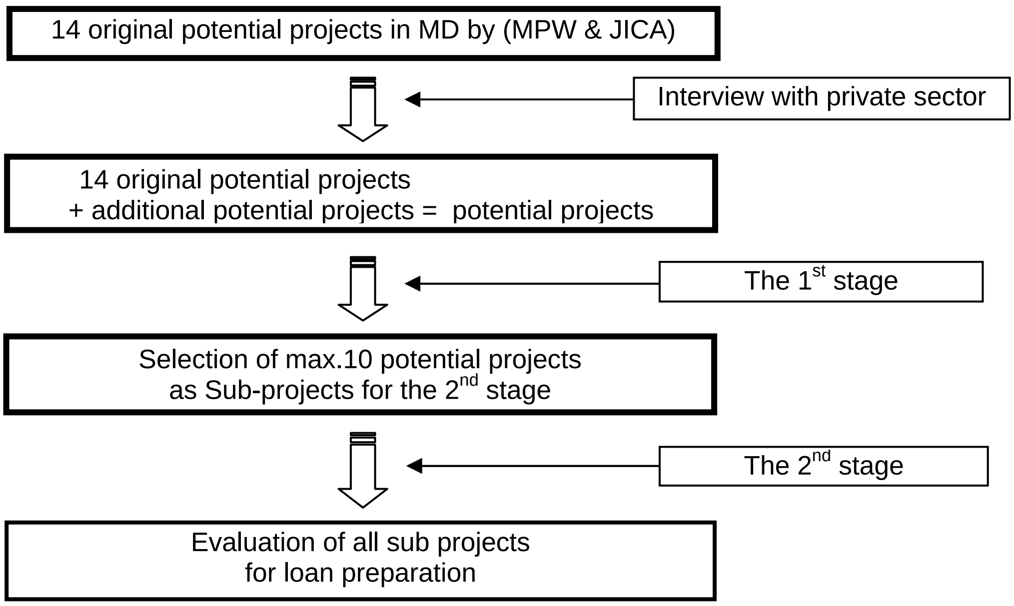
This study generally consists of two stages as shown in Figure 1.3.1., and the detail of each stage is summarized in Figure 1.3.3-Figure 1.3.4.

<u>The 1st stage: Selection of Sub-projects</u>

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 $2^{nd}$ stage.

<u>The 2nd stage: Evaluation of Sub-projects</u>

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 $1^{st}$ 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

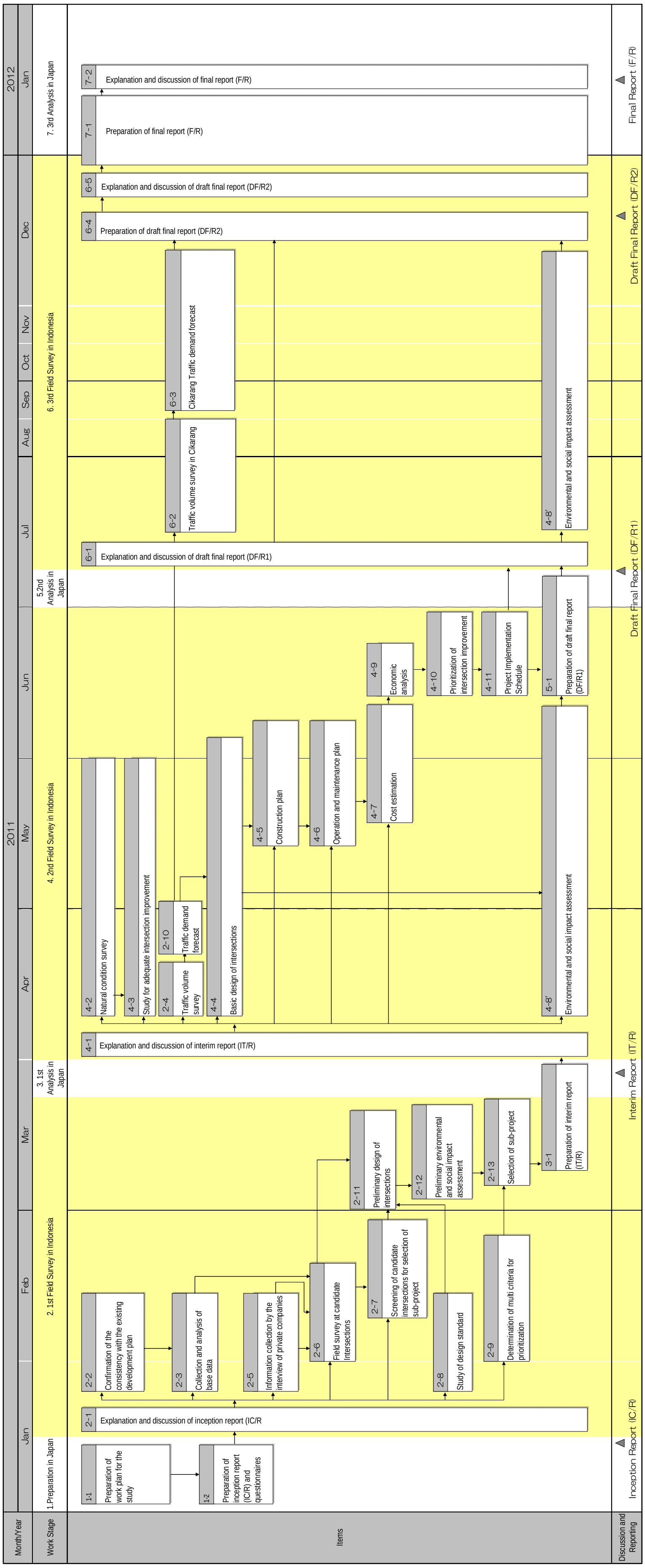



**Figure 1.3.2 General Study Flow**

Source: JICA Survey Team

### 1.3.3 Selection of Sub-projects in the 1st Stage

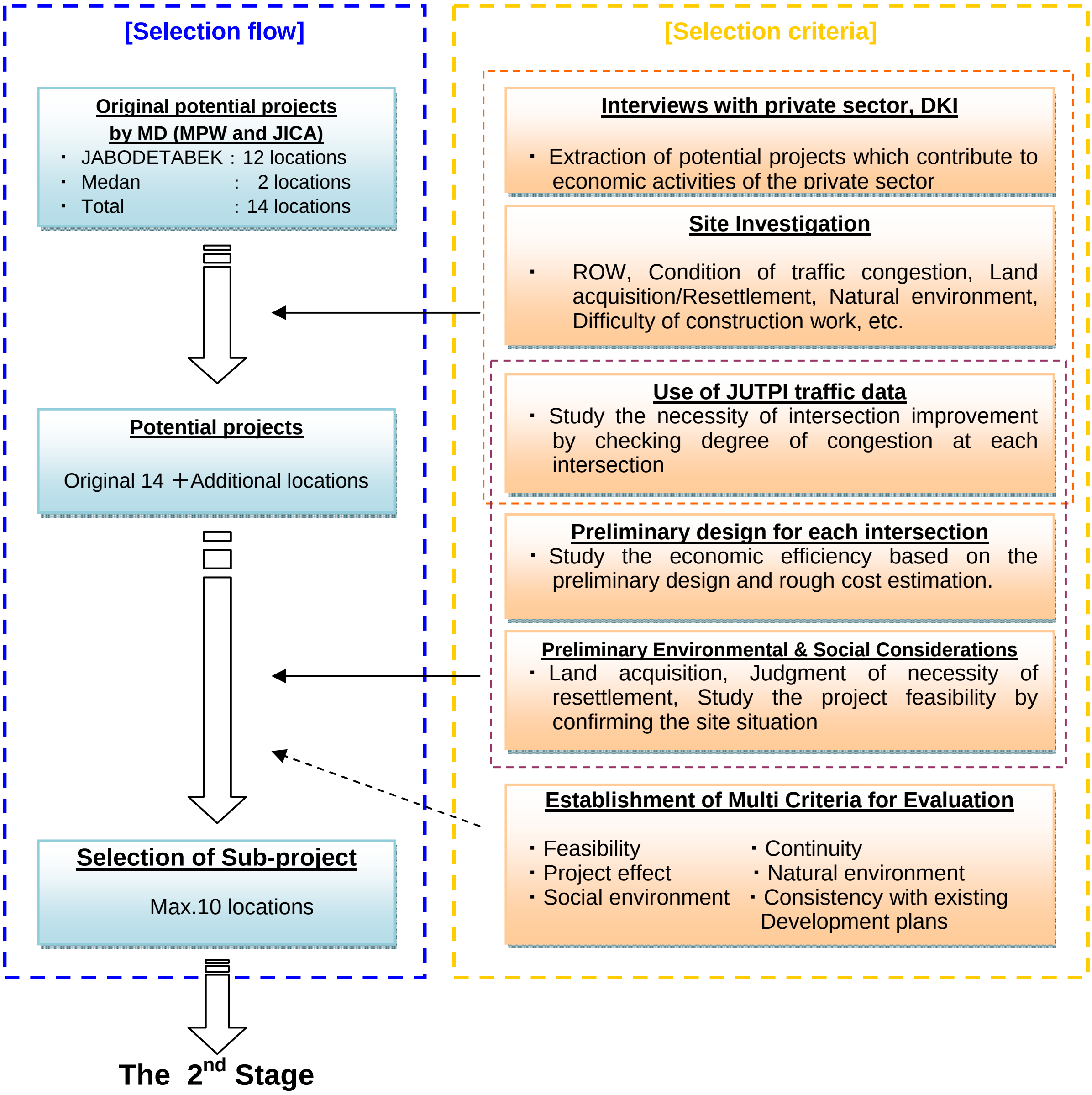
In the 1st stage, the Study Team will carry out interviews with representatives of the private sectors, DKI and other related entities, and conduct a field survey and utilization of existing traffic data of JUTPI in order to add potential projects to the original 14 potential projects by MD (MPW and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



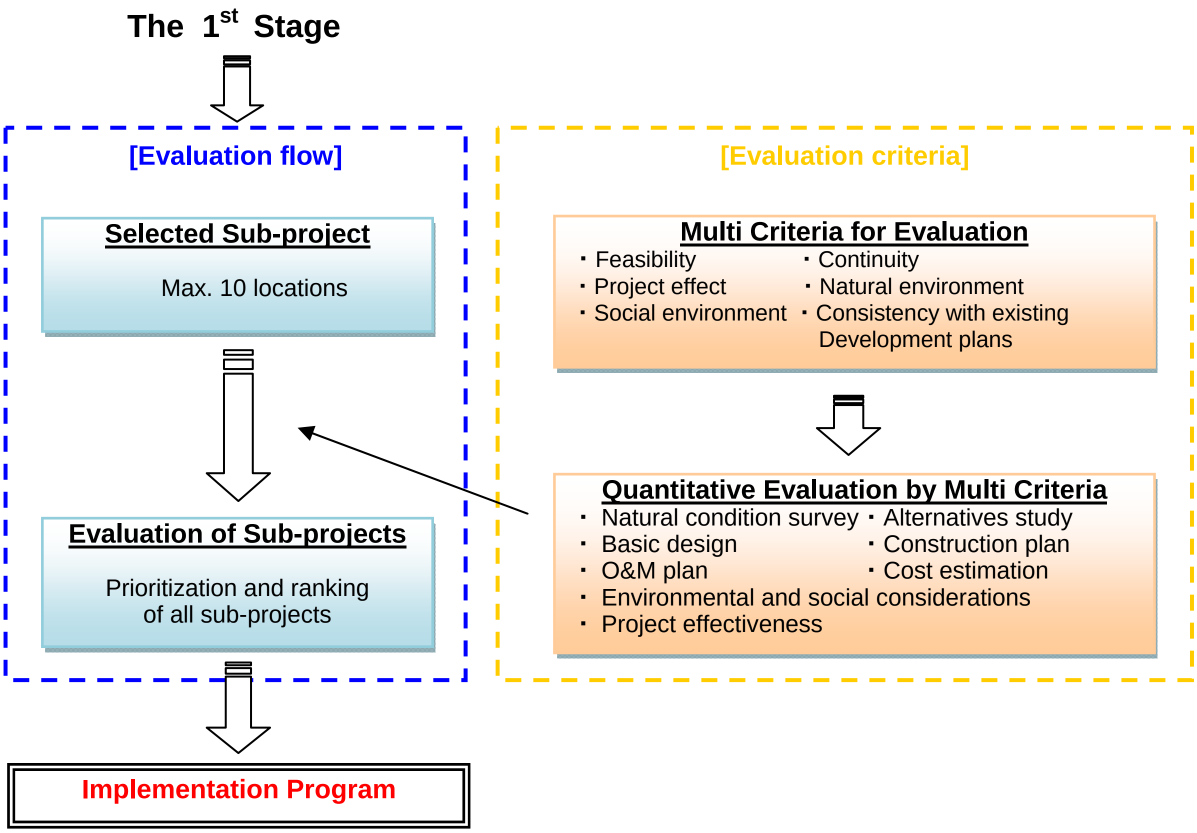

Source: JICA Survey Team

**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.<br>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 .<br>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.<br>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**.

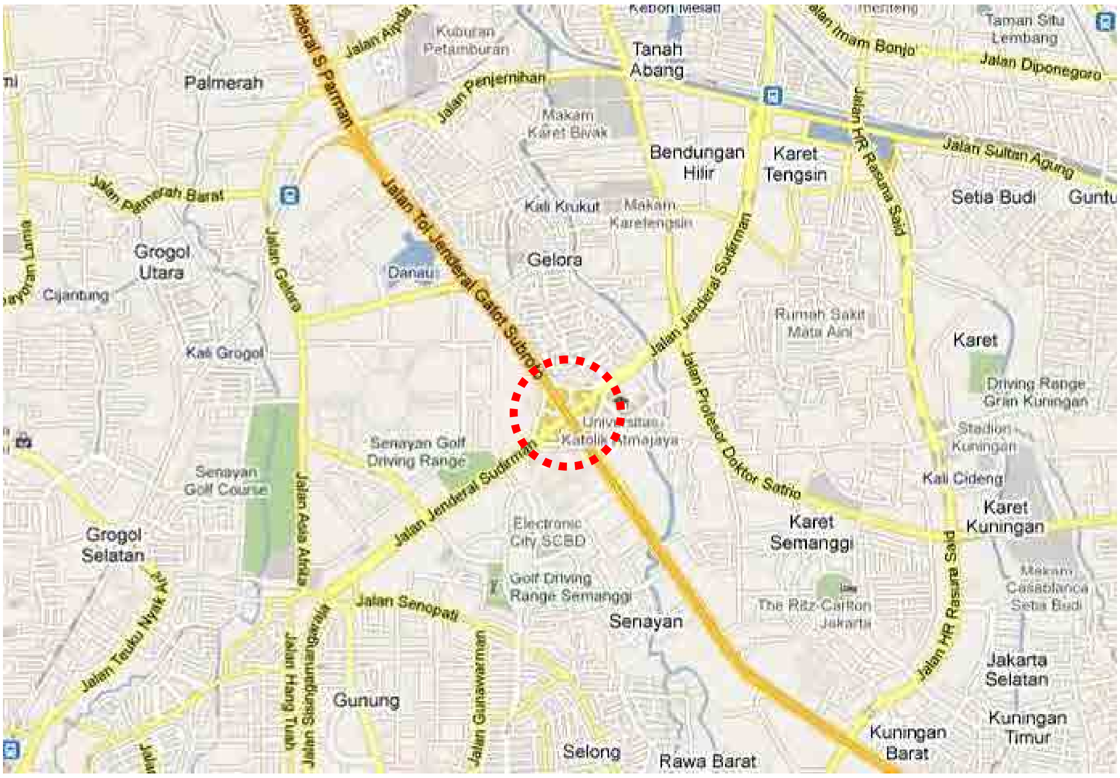
- Investigation viewpoints
- Configuration of road and intersection
- Type of existing structures
- Control points (Houses, shops, public facilities, religious facilities, Bus ways shelters, railways, utilities, rivers, etc.)
- Traffic flow
- Condition of traffic congestion

(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.

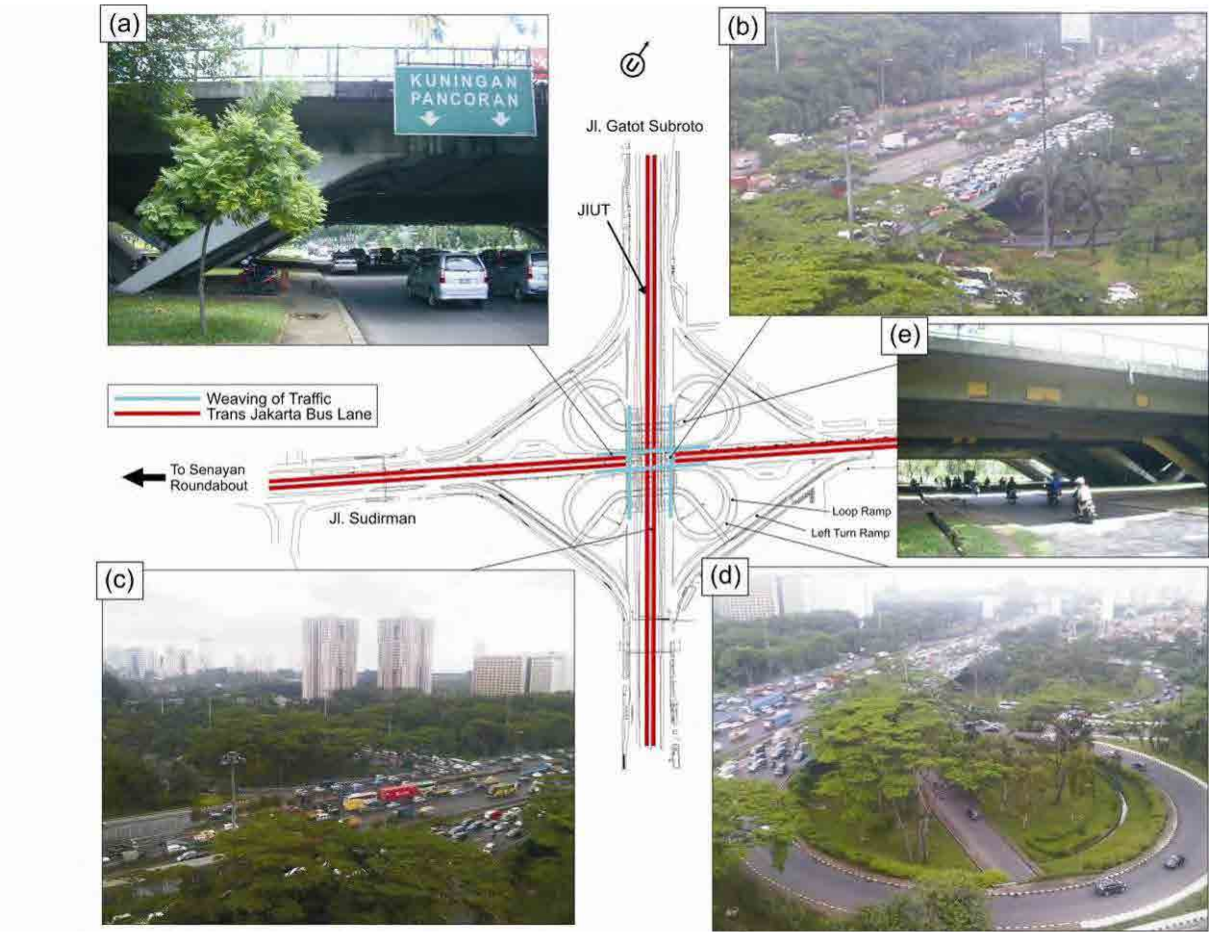
The junction is located in an urban area and surrounded by high-rise buildings, such as Seltan Hotel on the west side and Semanggi Plaza on the east side. MRT is planned to open underneath Jl. Sudirman.




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

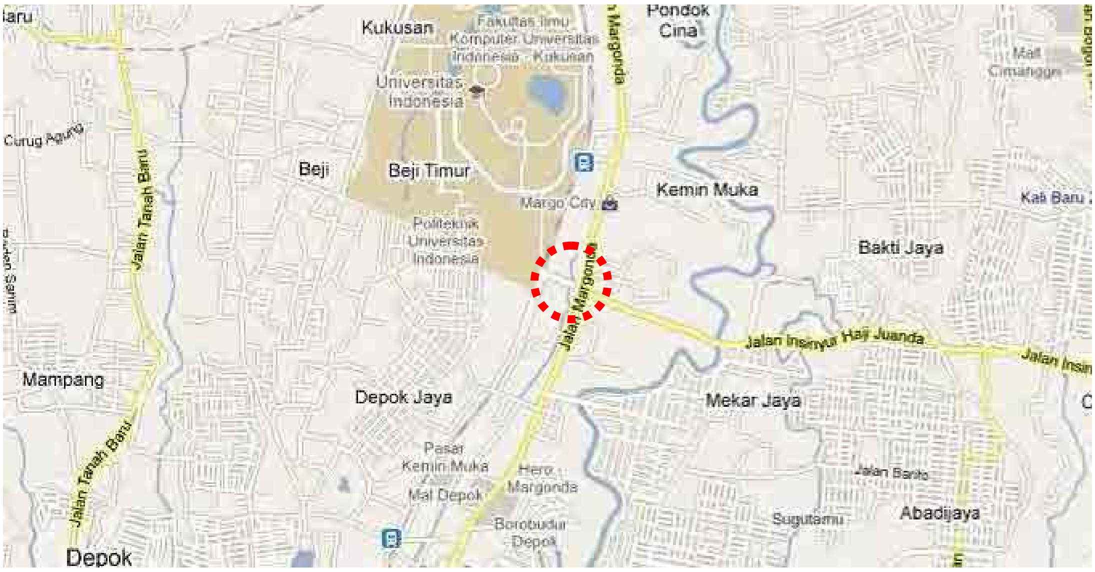
**Figure 2.2.2 Photos of Semanggi Intersection**

(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.

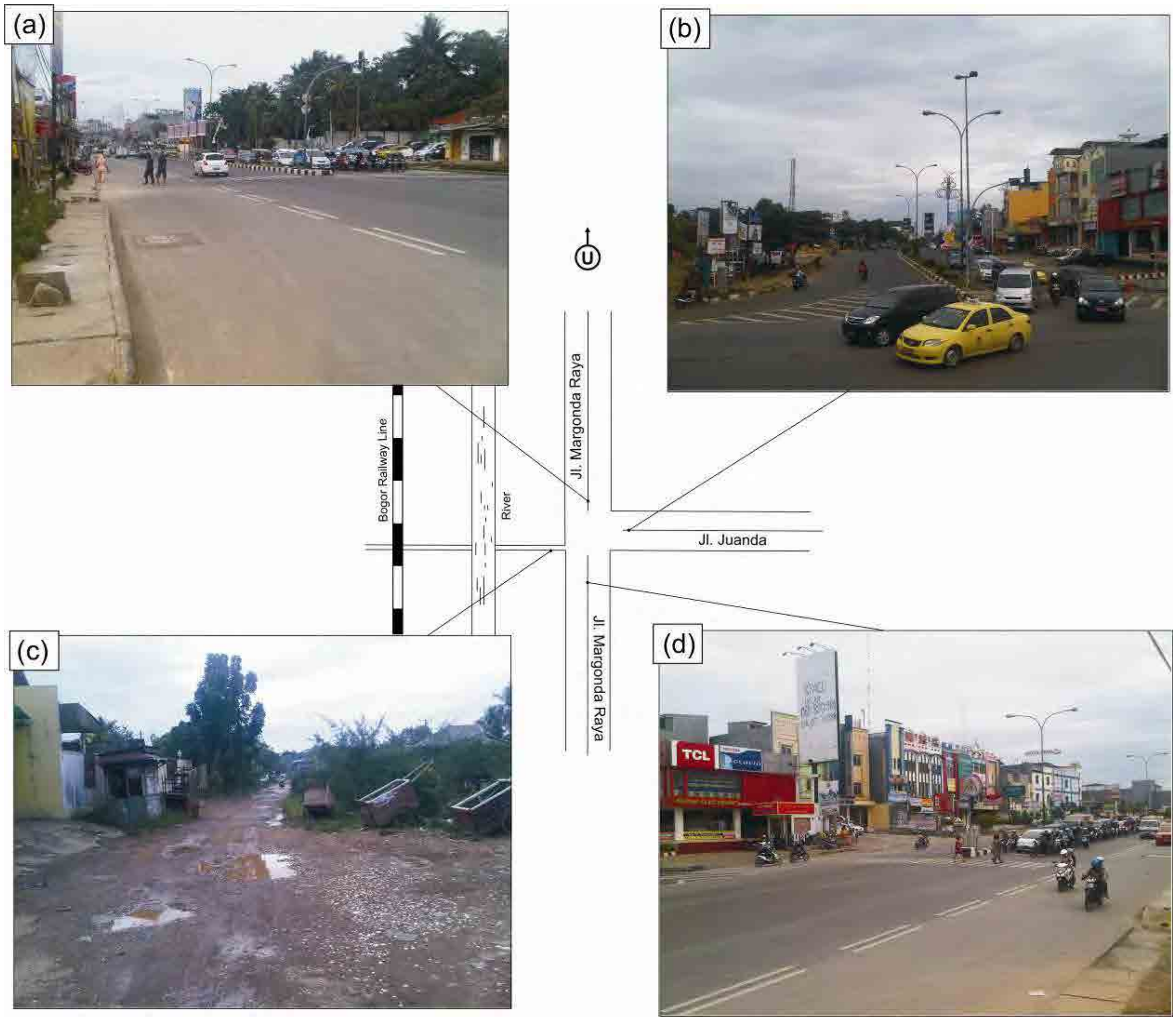
MPW has a plan for JORR2 and the interchange for an underpass adjacent to the intersection. The land use and traffic flow is expected to change after JORR2 opens.




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

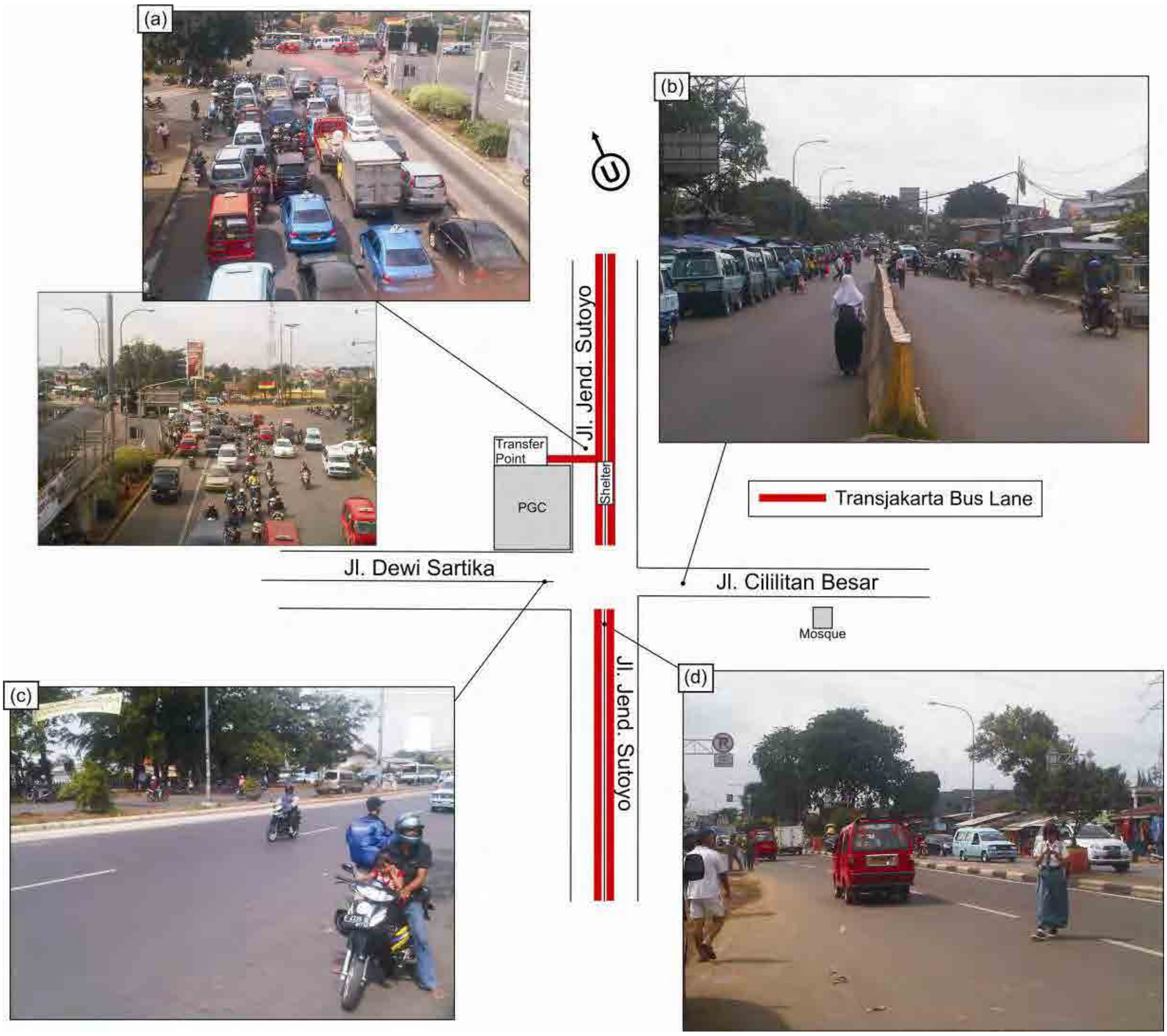
The intersection is the crossing point of national roads with 6-lanes in the north-south direction, Jl. Jend Sutoyo and Jl. Raya Bogor, and provincial roads in the east-west direction, Jl Cililitan Besar and Jl. Dewi Sartika. The height around the intersection is a little higher comparing to the surrounding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

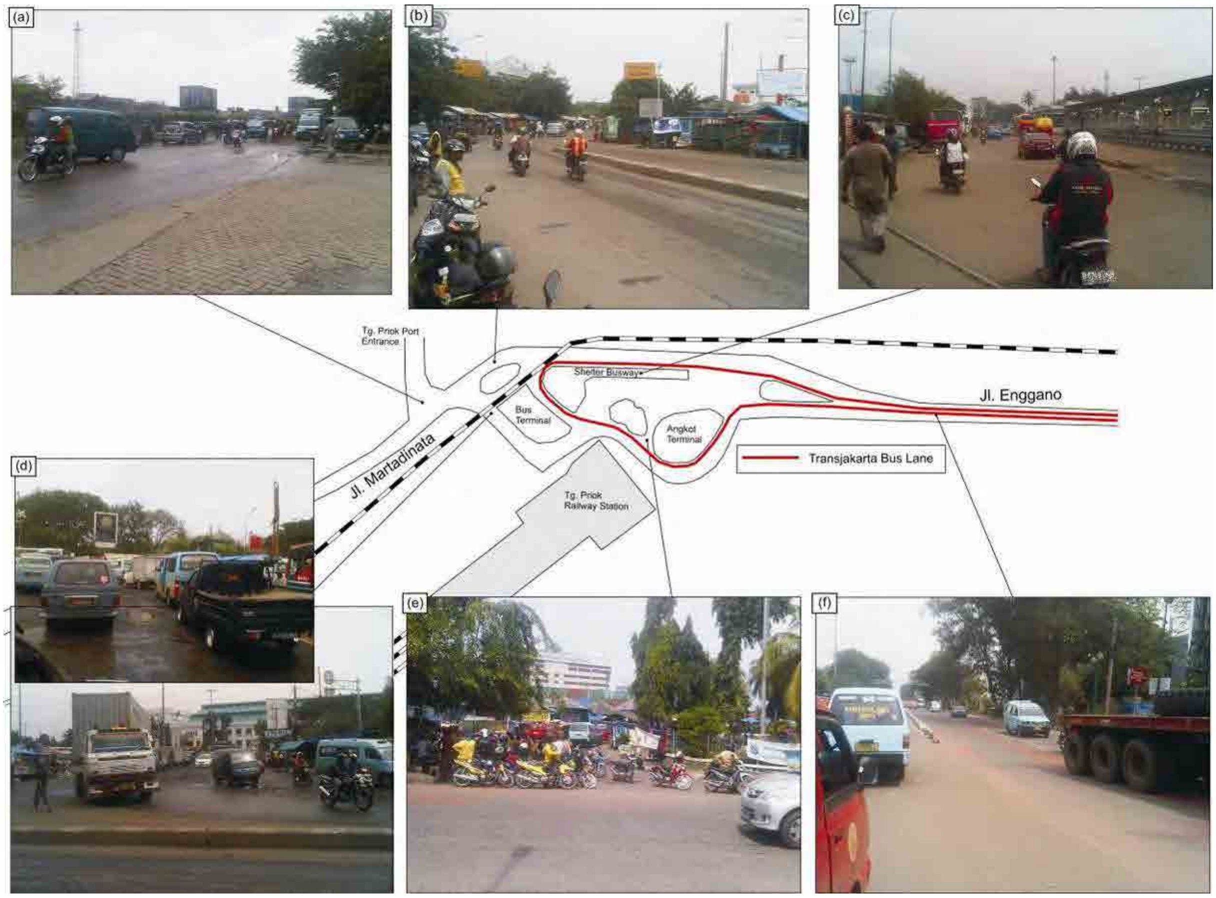
R.E. Martadinata is located on Jl. Enggano and Jl. Martadinata in front of Tanjung Priok Port north of Jakarta. Both roads have 4-lanes but the width of Jl. Martadinata is narrower. The bus terminal for long distance transportation and the Tanjung Priok railway station are placed at this point. The east 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

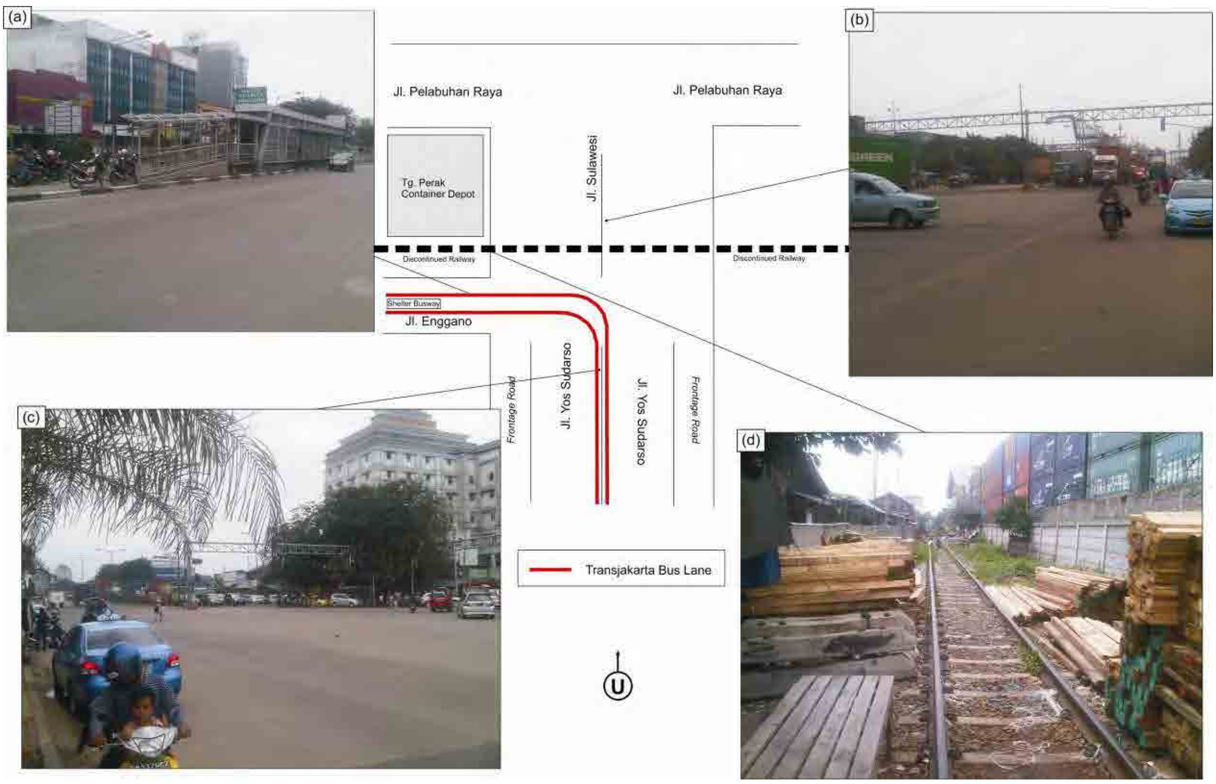
Sulawesi - Tg.PA intersection is approximately 1.2 km from the intersection of R.E. Martadinata. Jl. Yosudarso in the north-south direction and it has 8-lanes with a slow lane on both sides and is to be realigned when the Tanjung Priok Access Road (TgPA) is constructed above the existing road. Jl. Enggano 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.



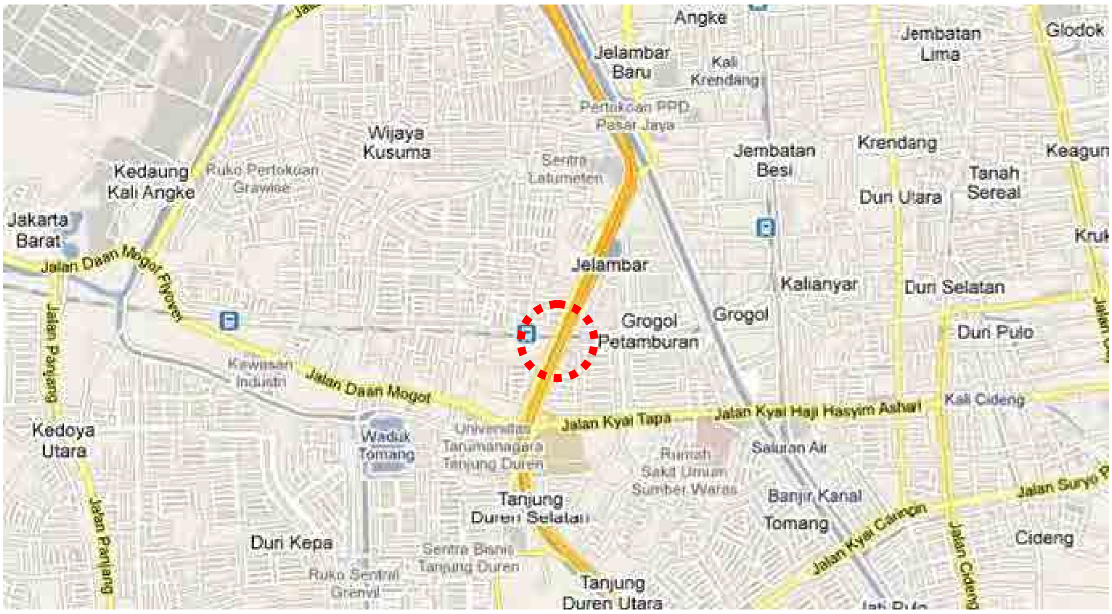

Source: JICA Survey Team

**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.

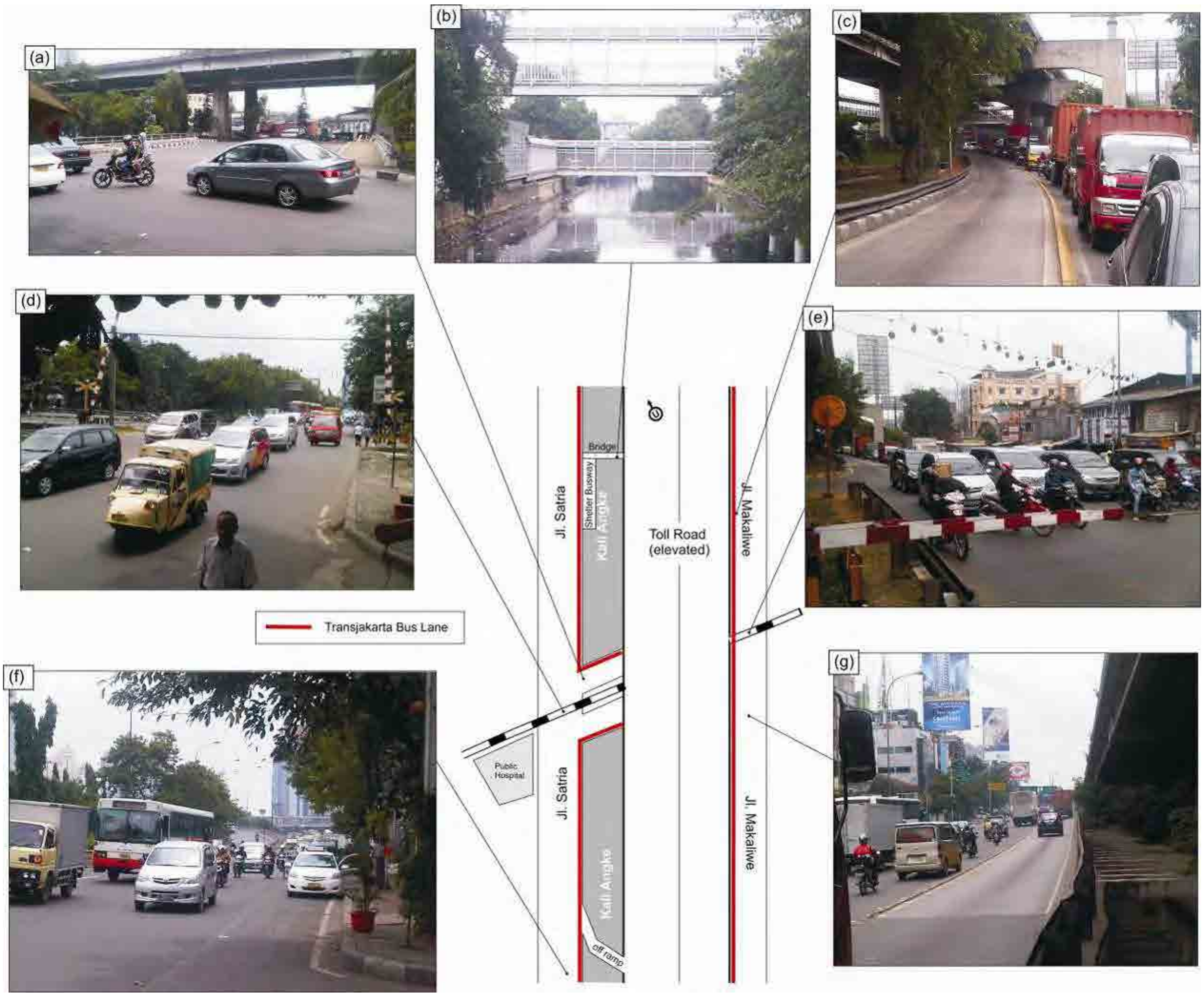
Many houses are settled along the road and the public hospital is located beside Jl. Satria.




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.



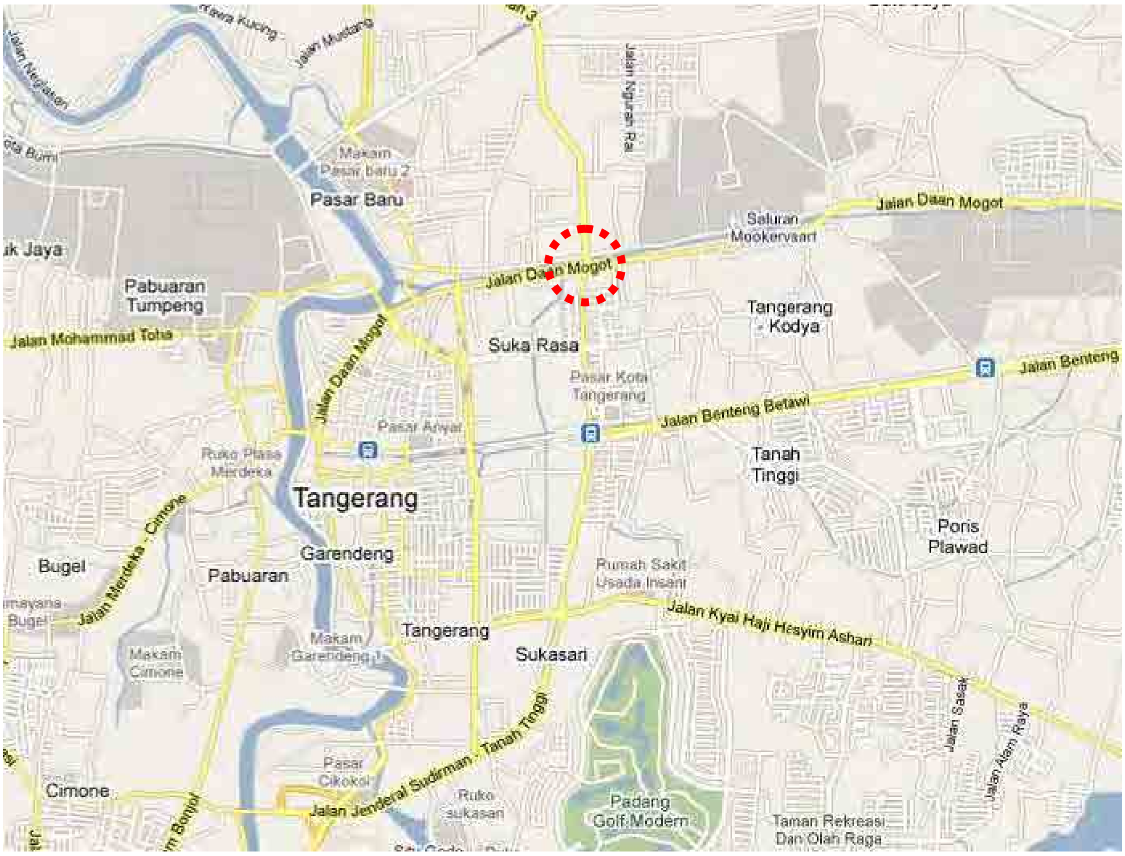

Source: JICA Survey Team

**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.

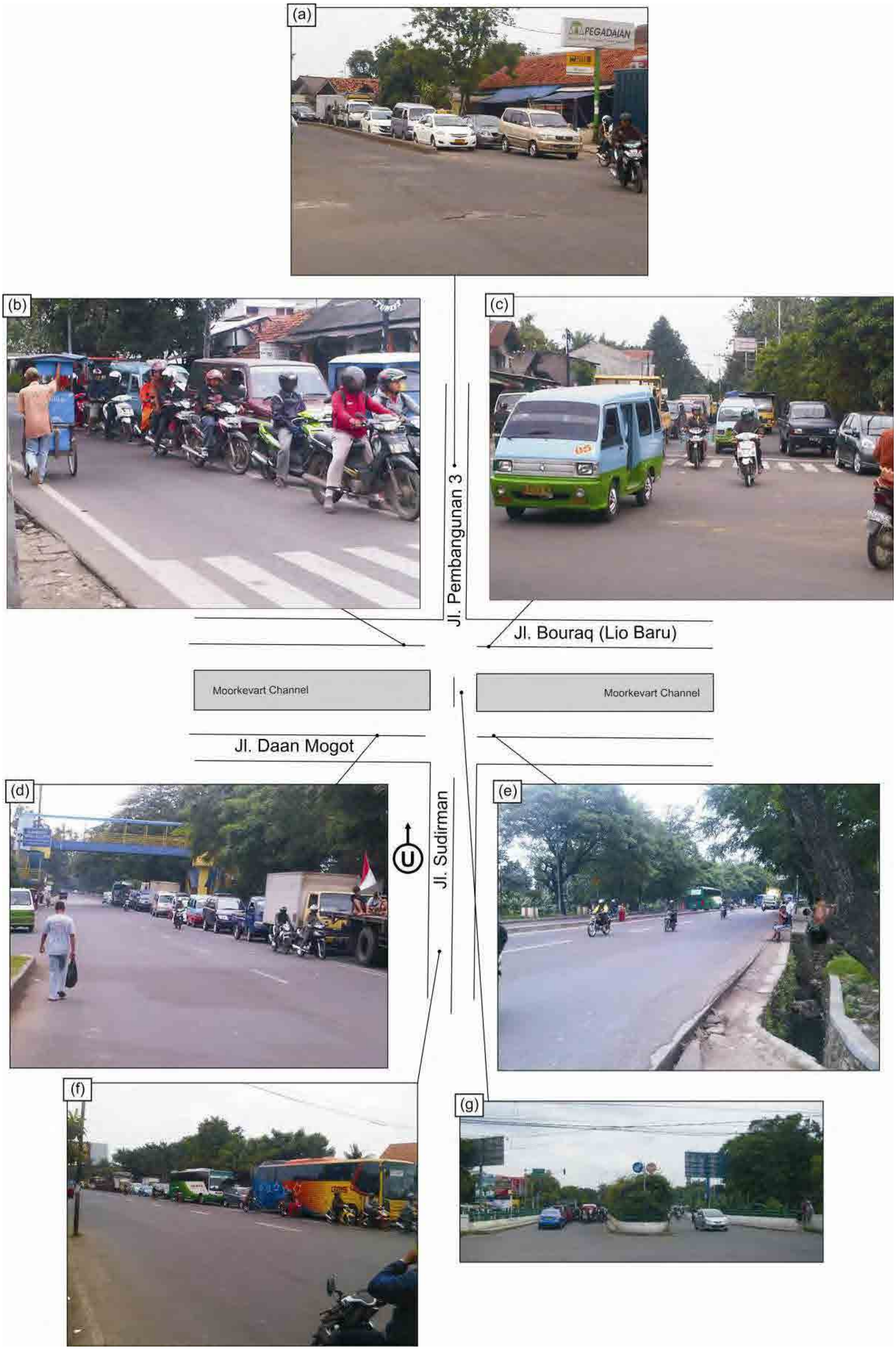
This is a high class residence area on the south side and the factories and small houses are settled along the road on the north side. The primary school and junior high school are located at the corner of the intersection.




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

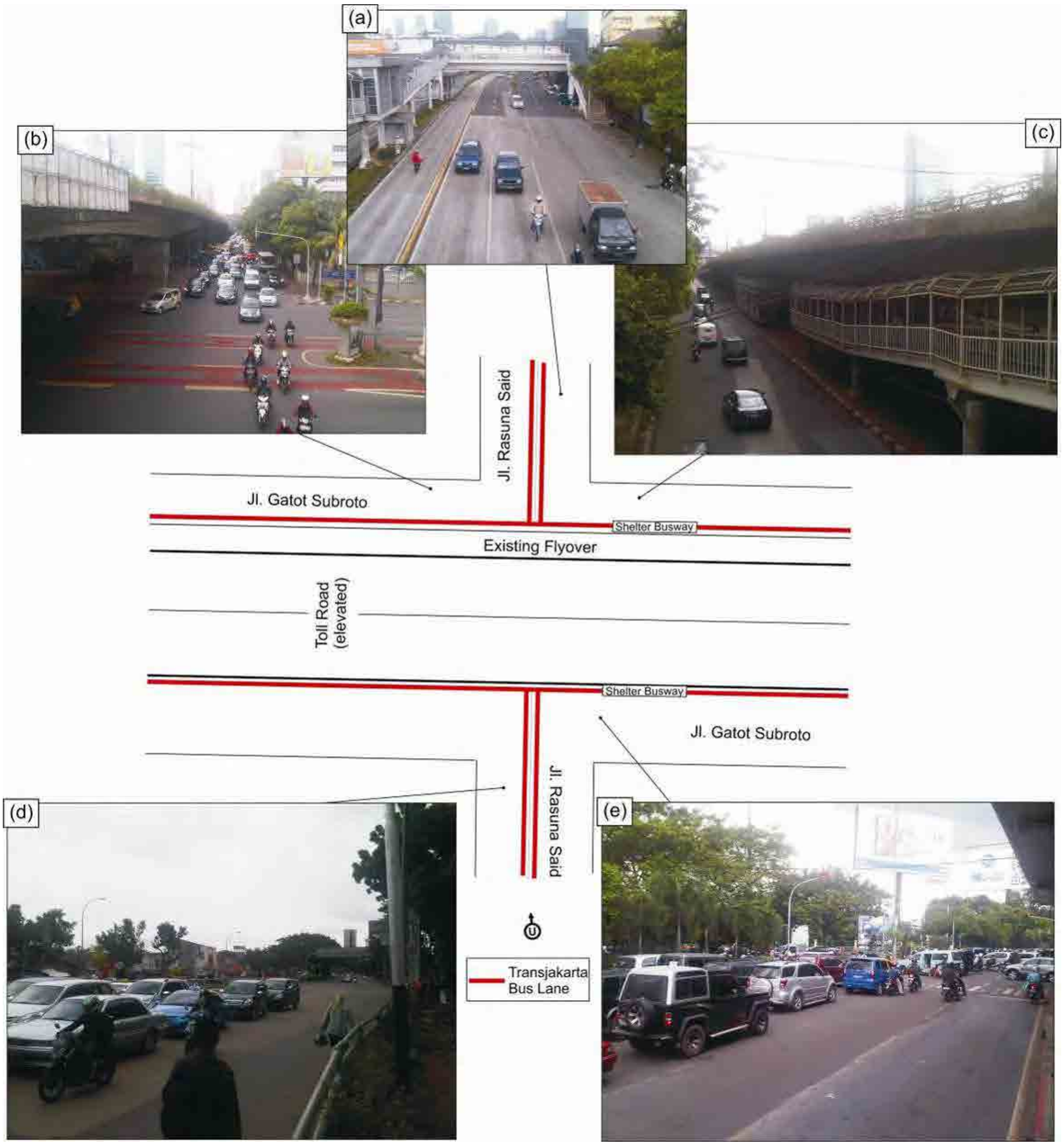
The Kumingan intersection is located about 2.5km away along JIUT to the south-east from Semanggi junction. Under the bridge of JIUT, Jl. Rasuna Said with 6-lanes and Jl. Gatot Subroto with 3-lanes per direction form a cross intersection. The other intersection with 6-lanes of Jl. Kapten Tendean is located 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.



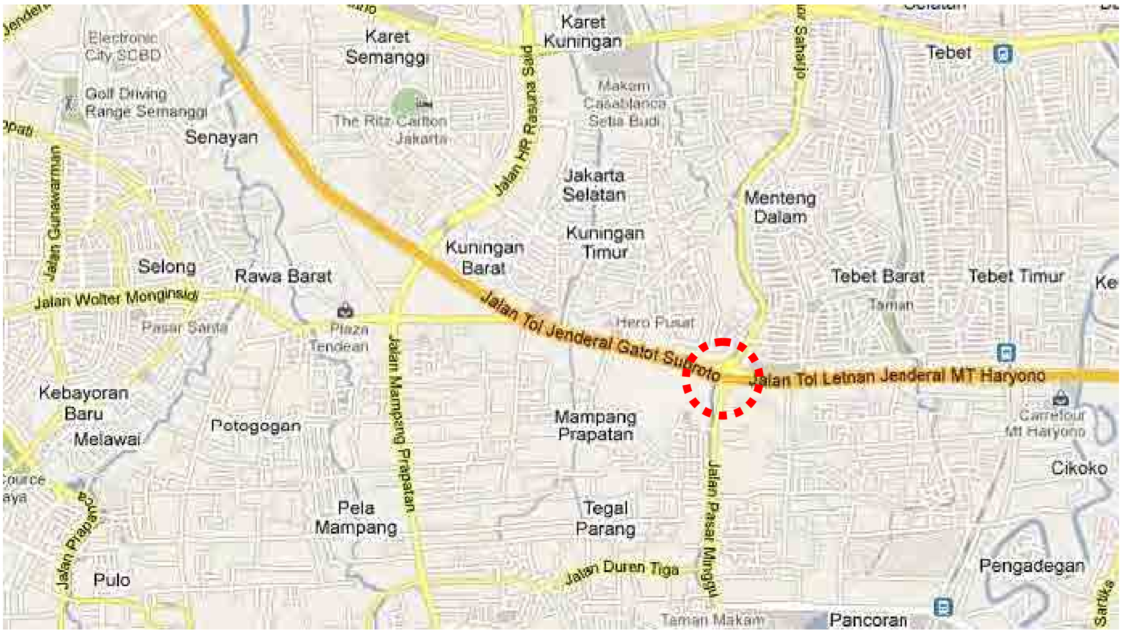

Source: JICA Survey Team

**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.

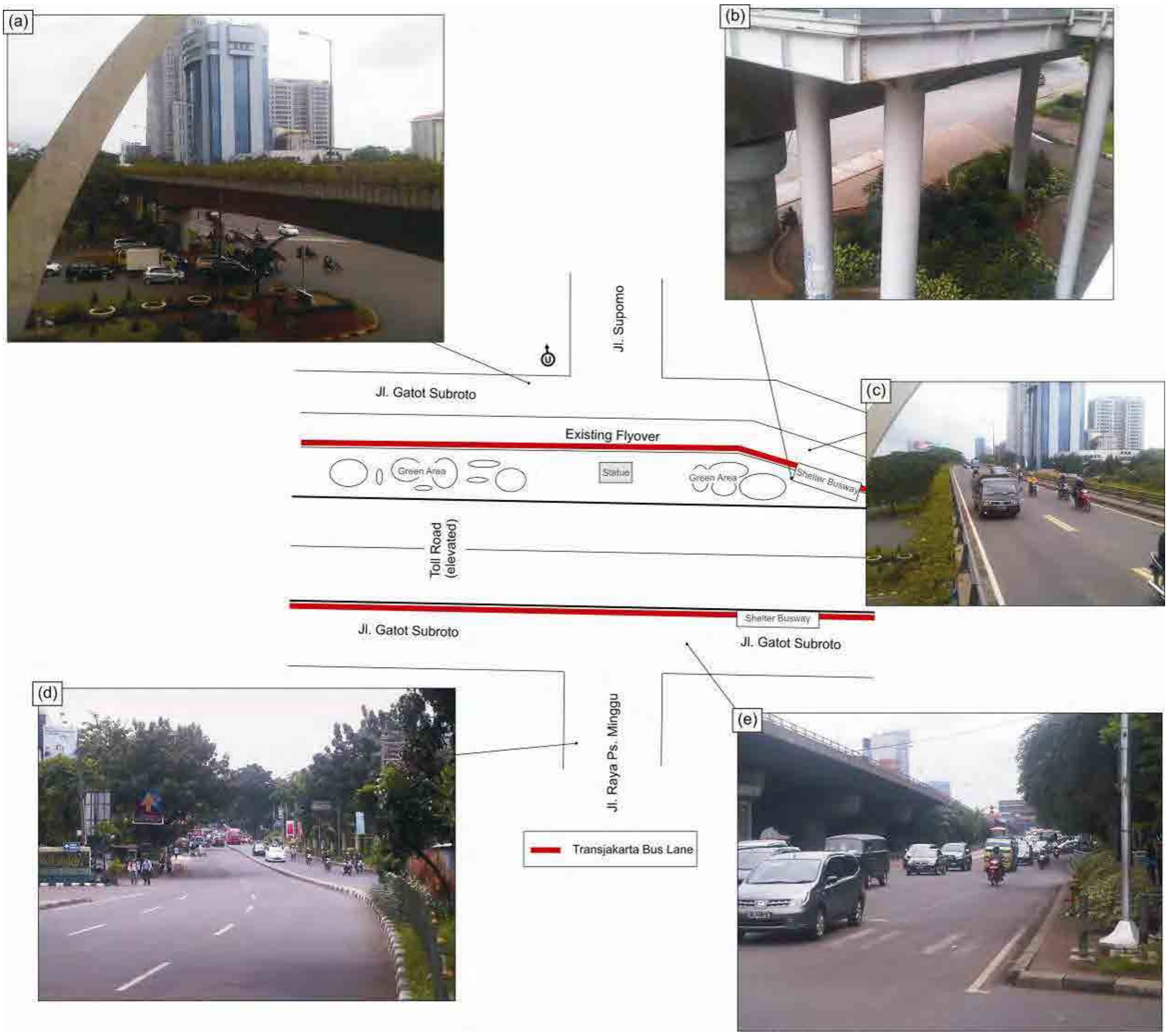
Many houses and commercial buildings are settled around the road. A commercial building is situated close to Jl. Gatot Subroto on the south side.




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.



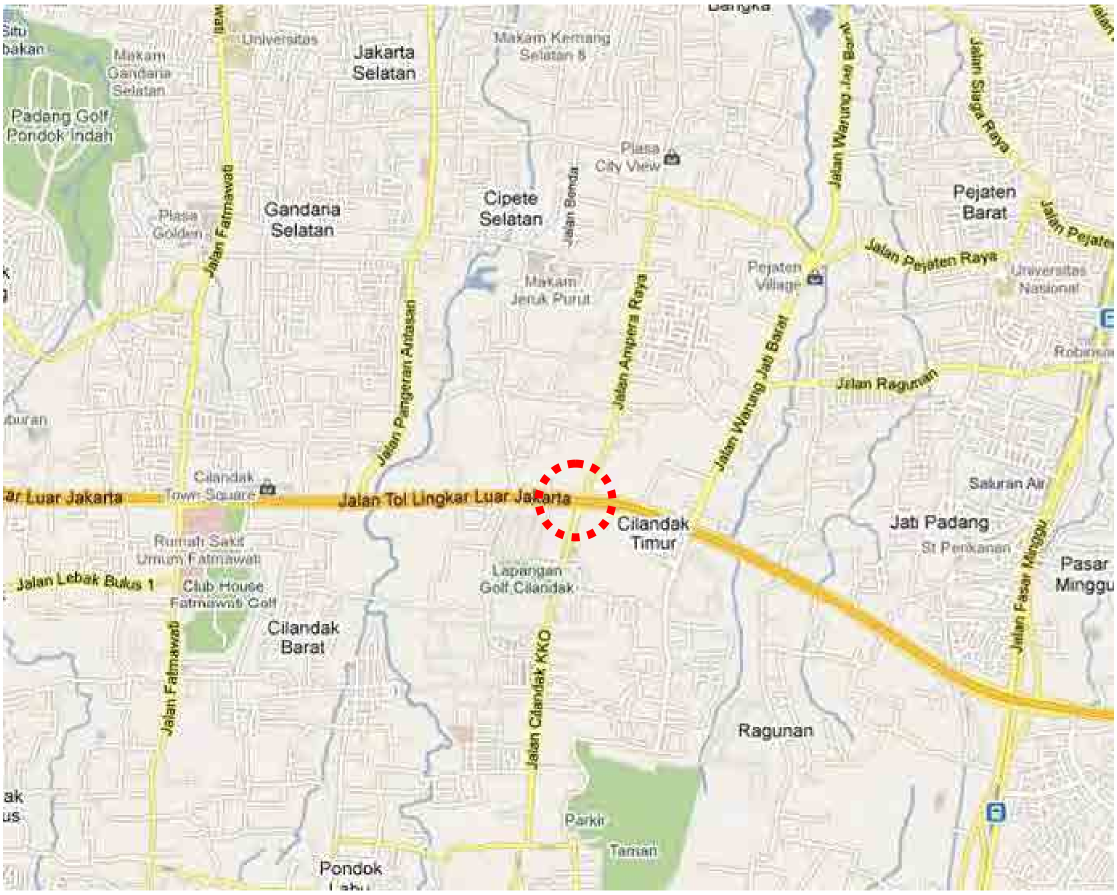

Source: JICA Survey Team

**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.

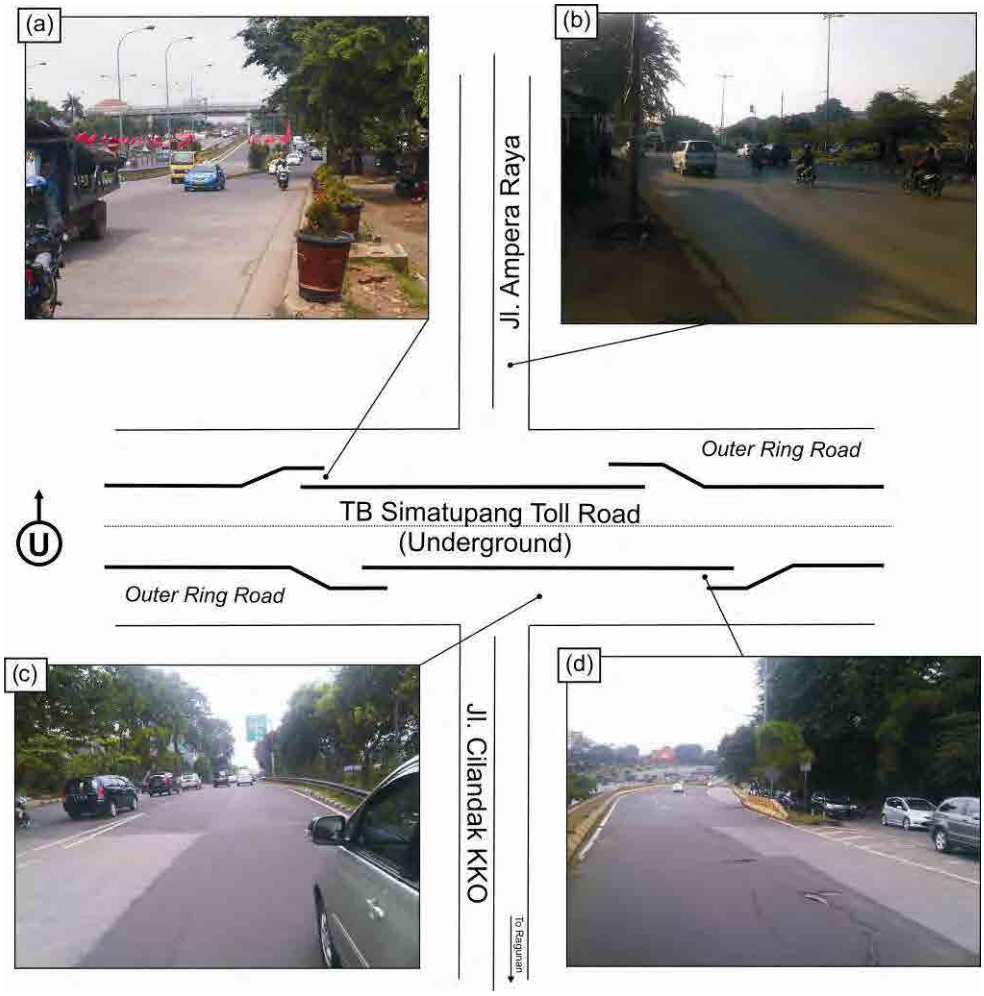
The intersection is surrounded by a residential area to the north-west and industrial areas at the corners. Large buildings are concentrated in Cilandak industrial area to the south-west.




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**

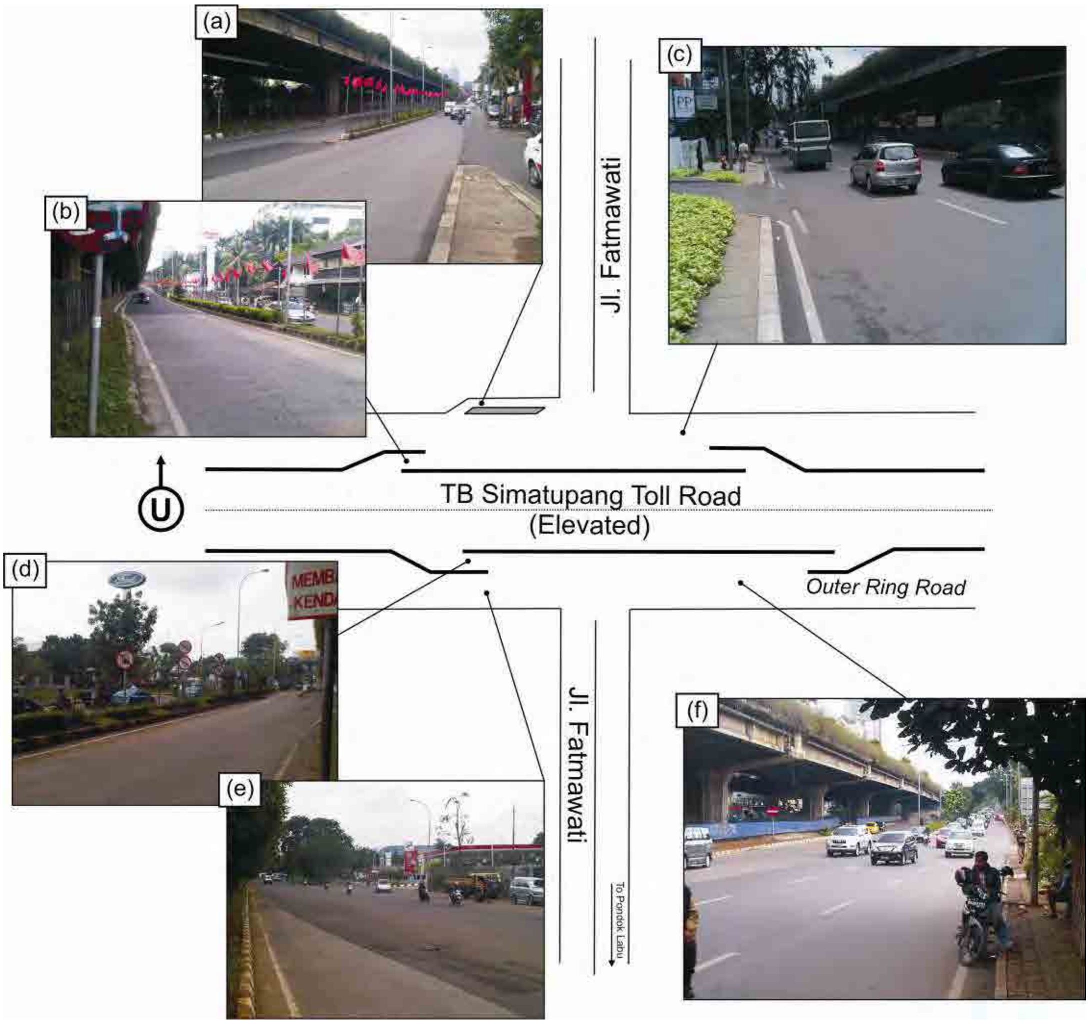
(11) Fatmawati

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

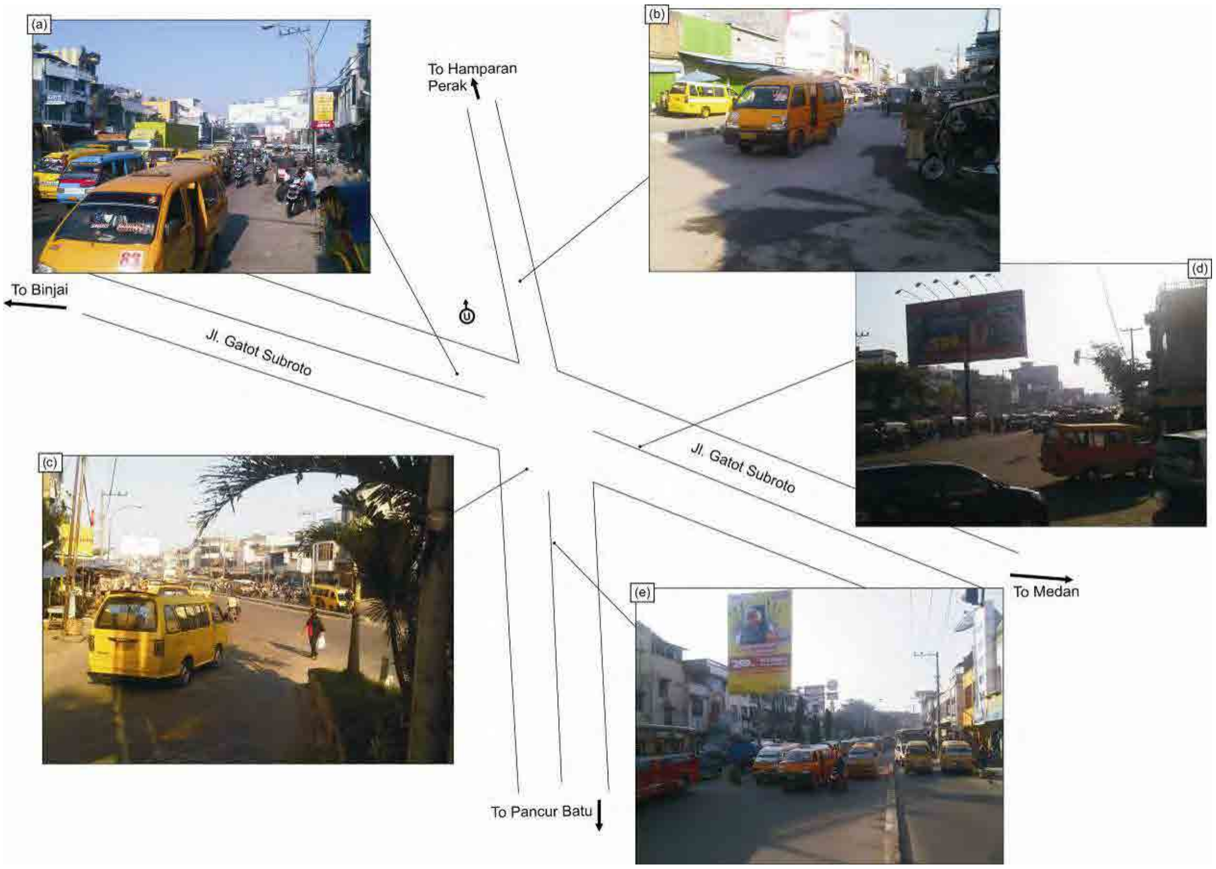
Pinang Baris intersection is located to the west of Medan city and is composed of Jl. Gatot Subroto, Jl. Pinang Baris and J. Klambir5. 6-lanes plus 1 slow lane of Jl. Gatot Subroto, which is split by a concrete median, is the trunk road to Ache while the crossing roads have 4 lanes. As two roads cross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

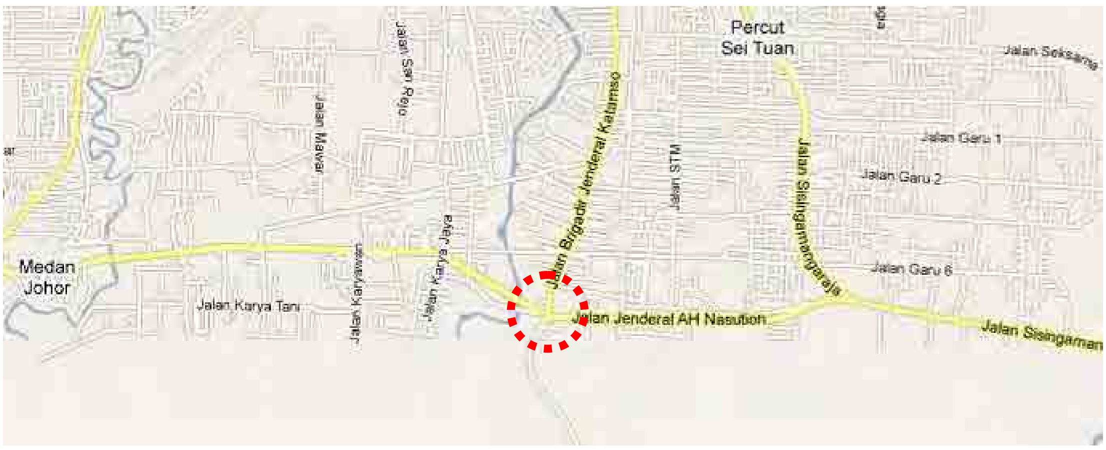

Source: JICA Survey Team

**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.

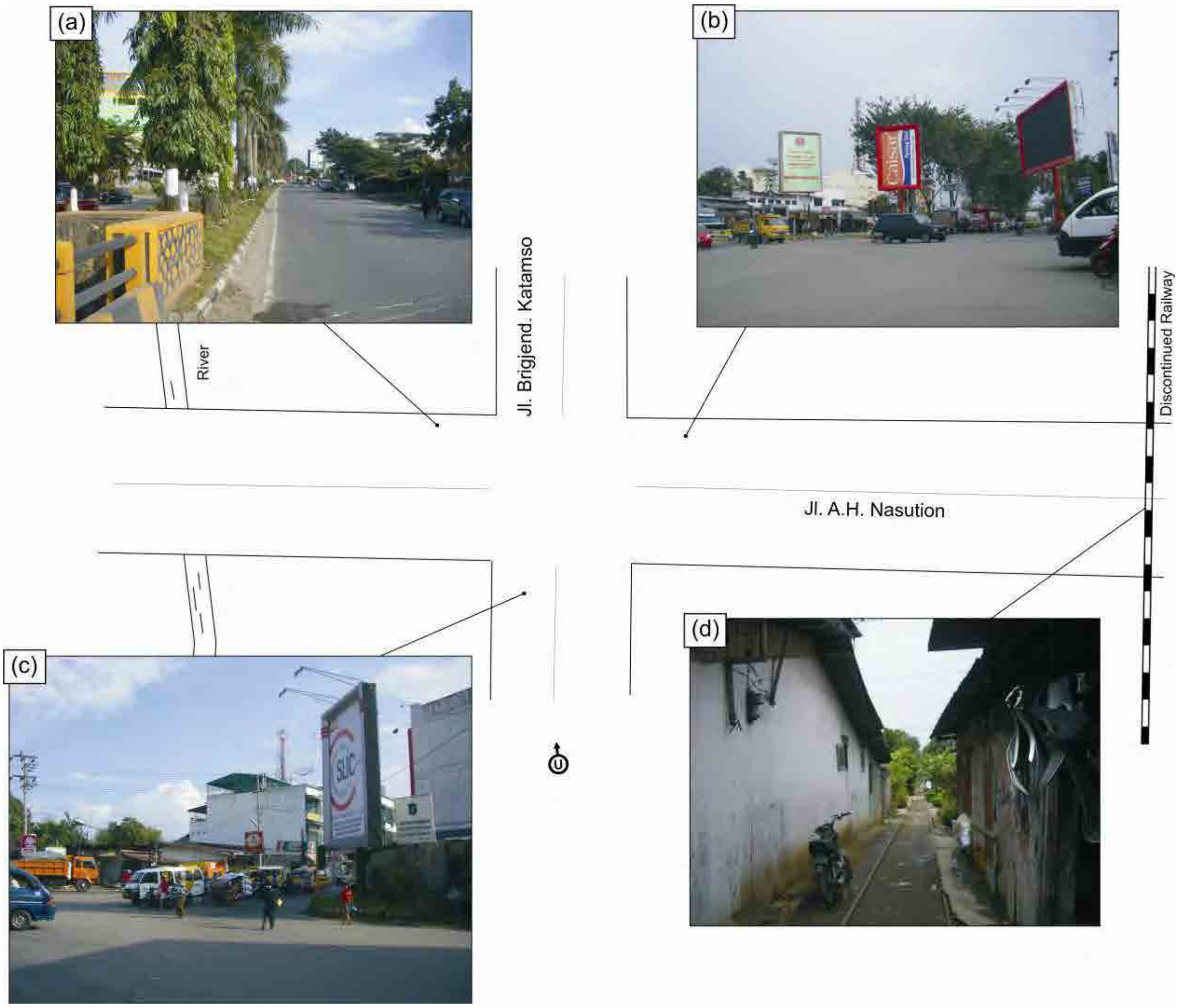
Many houses are concentrated along the intersection. The hospital is located about 500m to east of the intersection.




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.

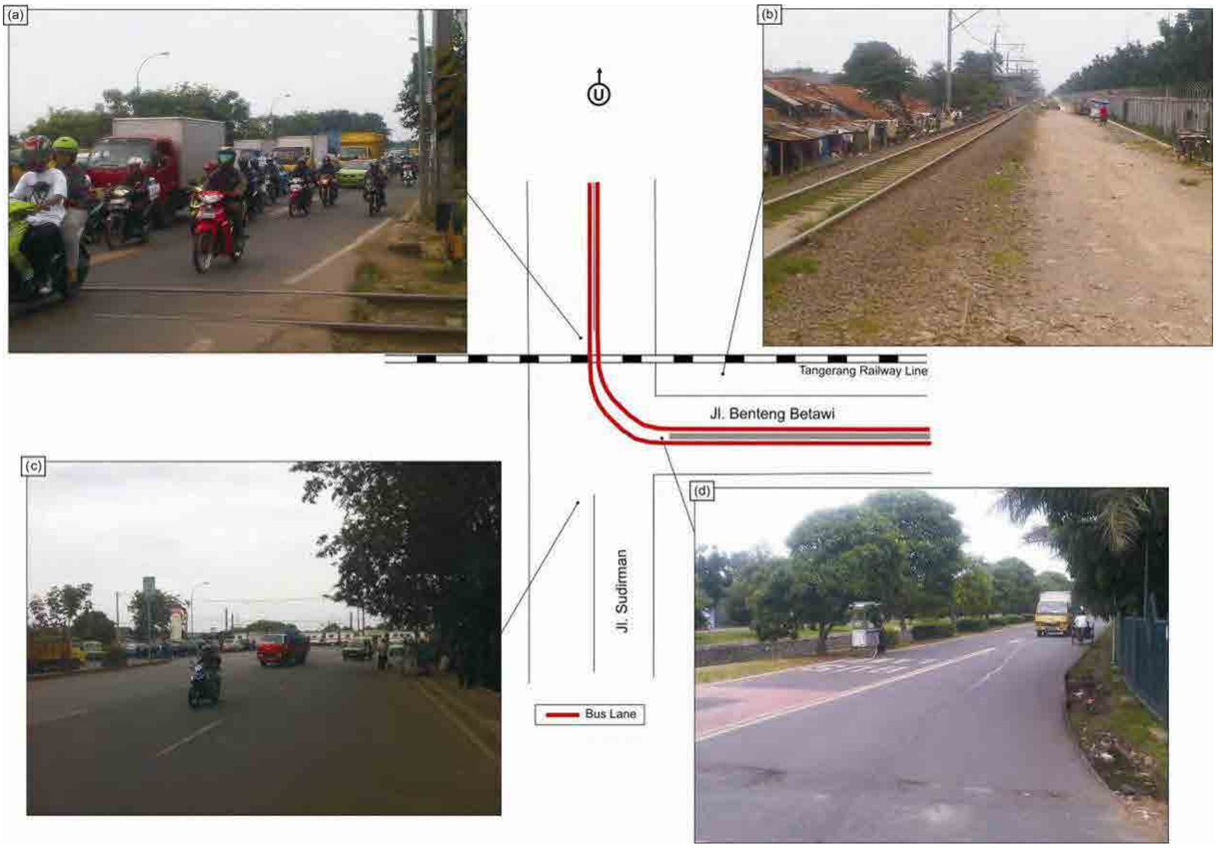
There is a residential area south-east of Jl. Sudirman and a paddy field on the opposite side. A rice mill factory and fruit market are located west and east of Jl. Sudiriman respectively.

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**

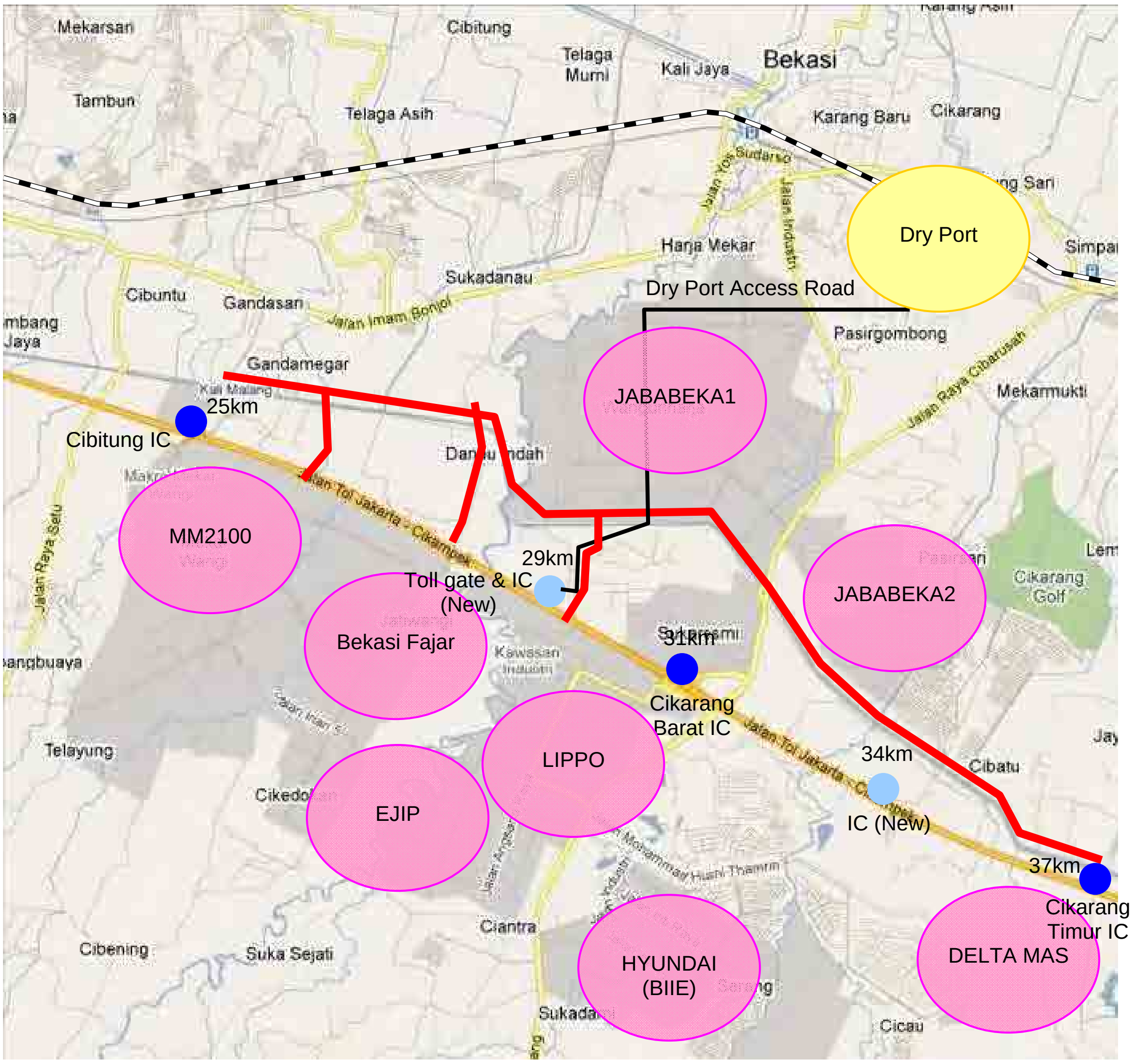
(17) Cikarang

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.

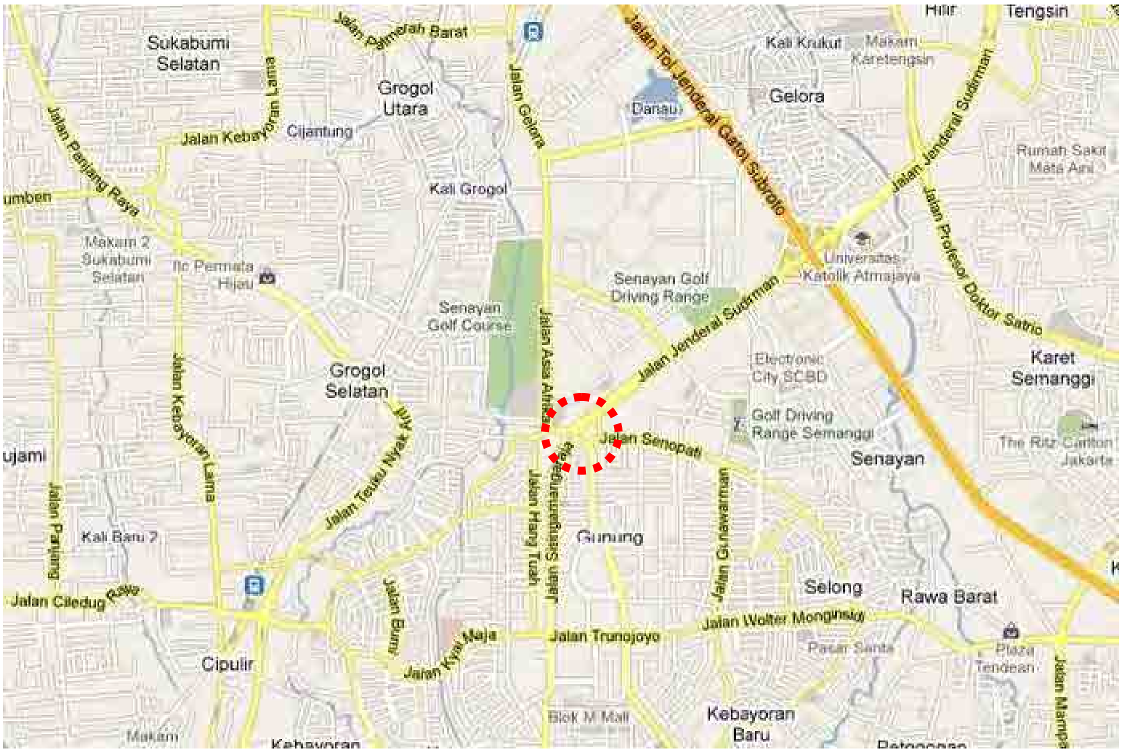

Source: JICA Survey Team

**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.

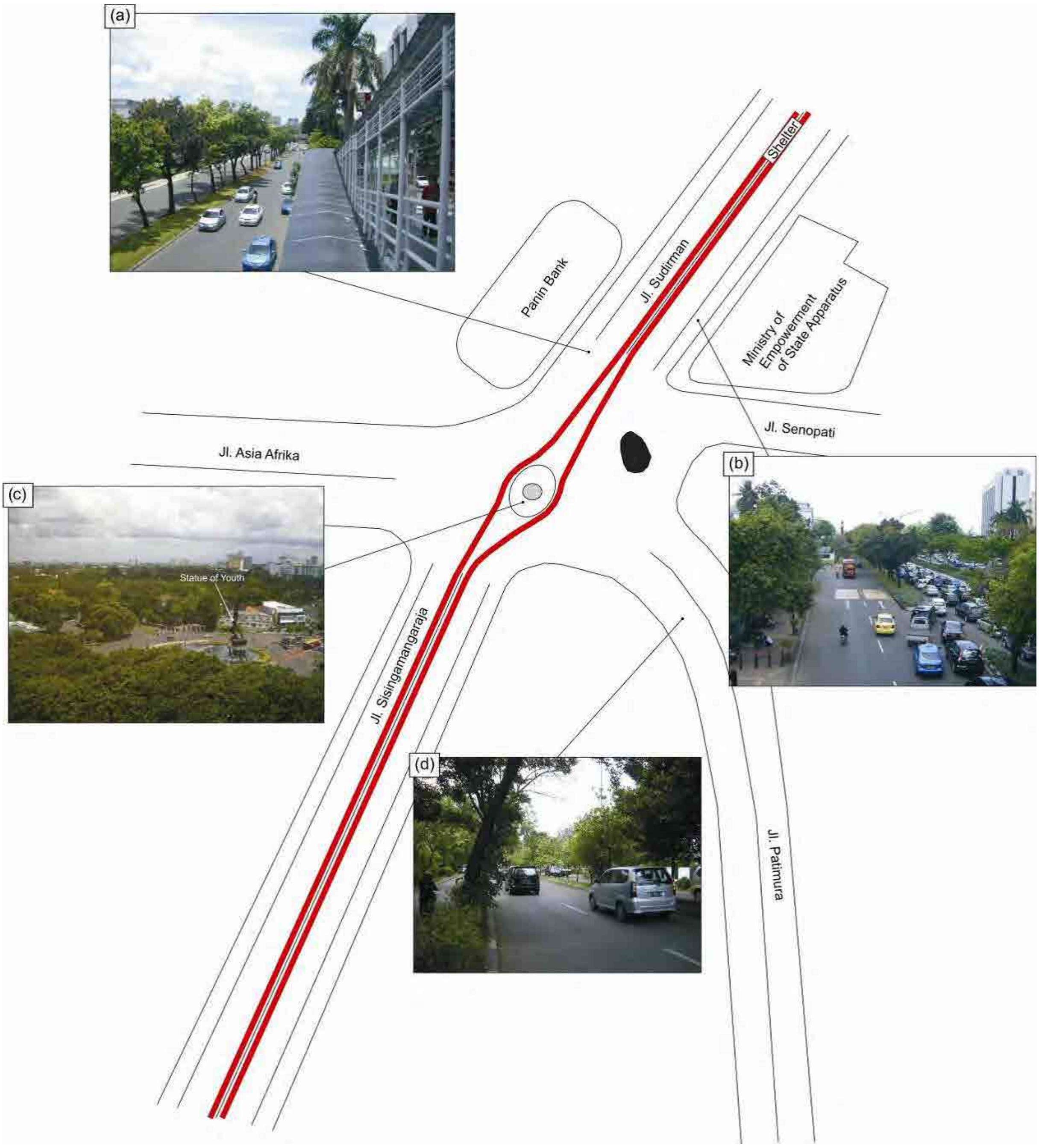
The roundabout is surrounded by commercial and public buildings such as a bank, ministry office, shopping mall and British school. In the roundabout, there is a pond and statue of youth. A police booth is placed at the south of the roundabout.




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**.<br>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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Authority | FO, UP, etc. | | | 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 | | | |
| 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) | | MRTproject 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 "+"

Original Candidate in MD by (PU & JICA)

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 "+"

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**

| No. | Location | FO Direction | Morning Peak Period | | | | Midday Period | | | | Evening Peak Period | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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: *1North-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

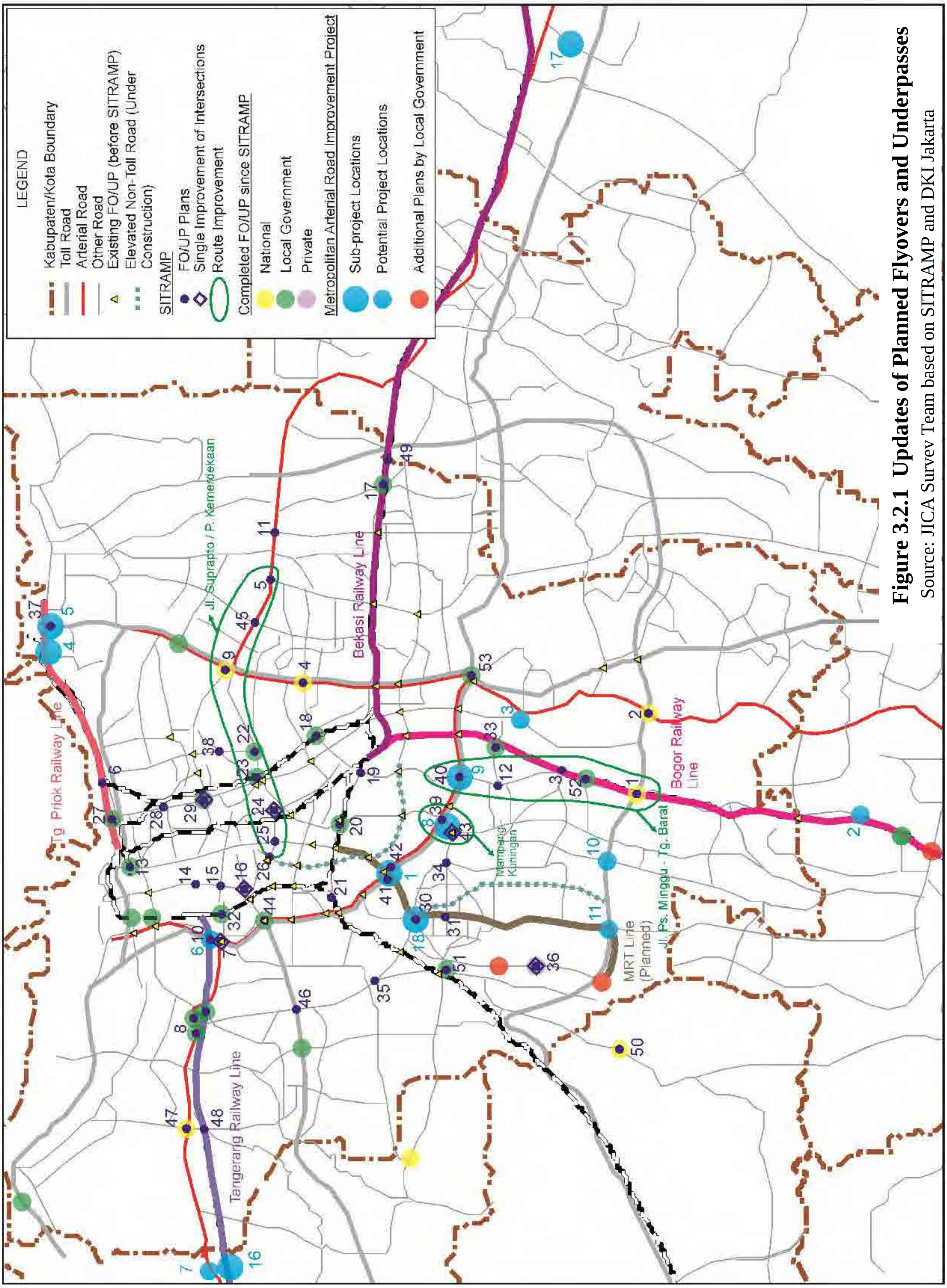


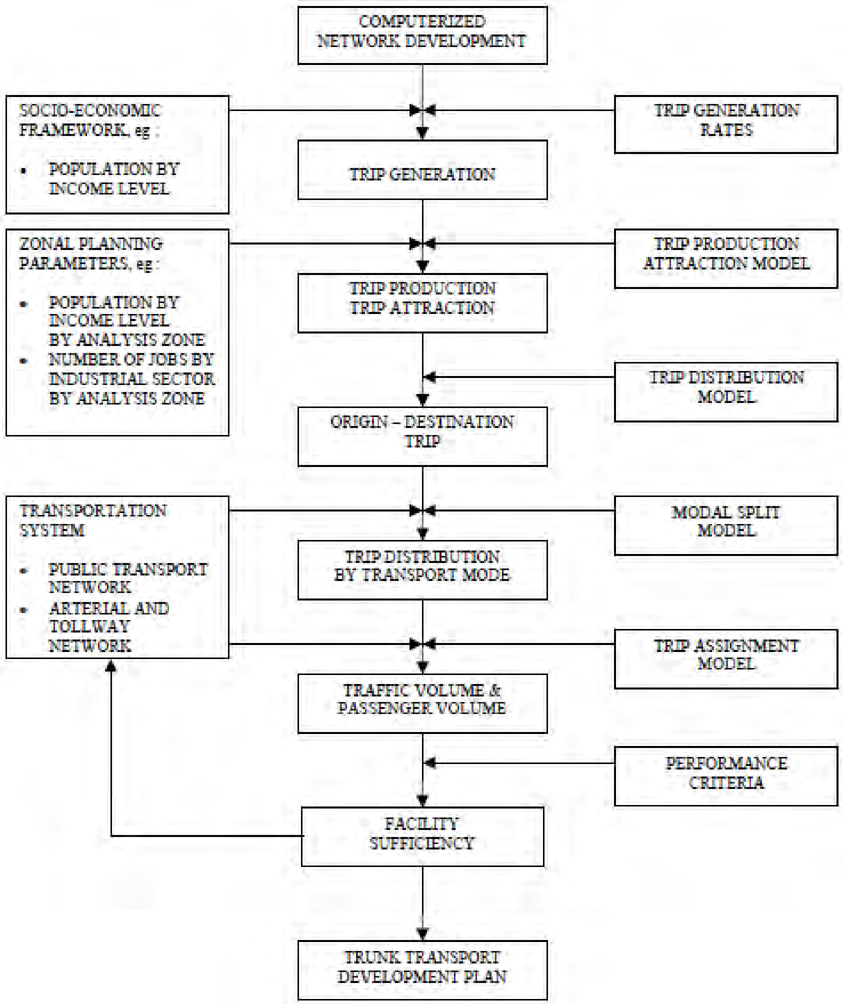

**Figure 3.2.1 Updates of Planned Flyovers and Underpasses**

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.



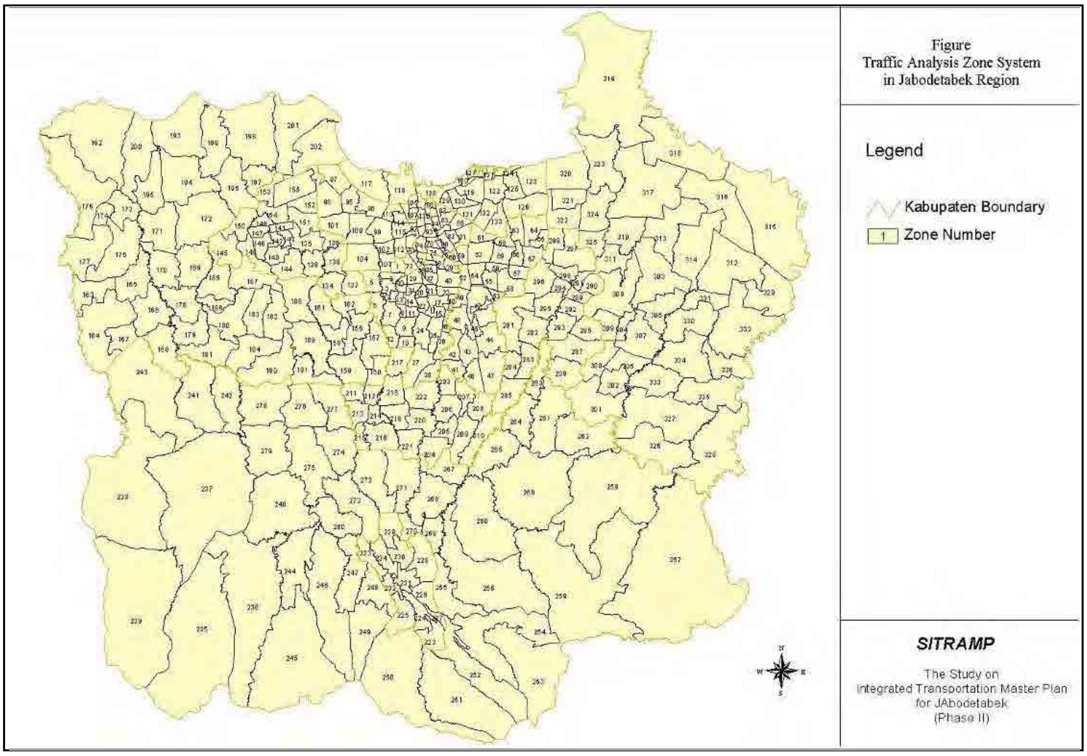

Source: SITRAMP, 2004

**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.

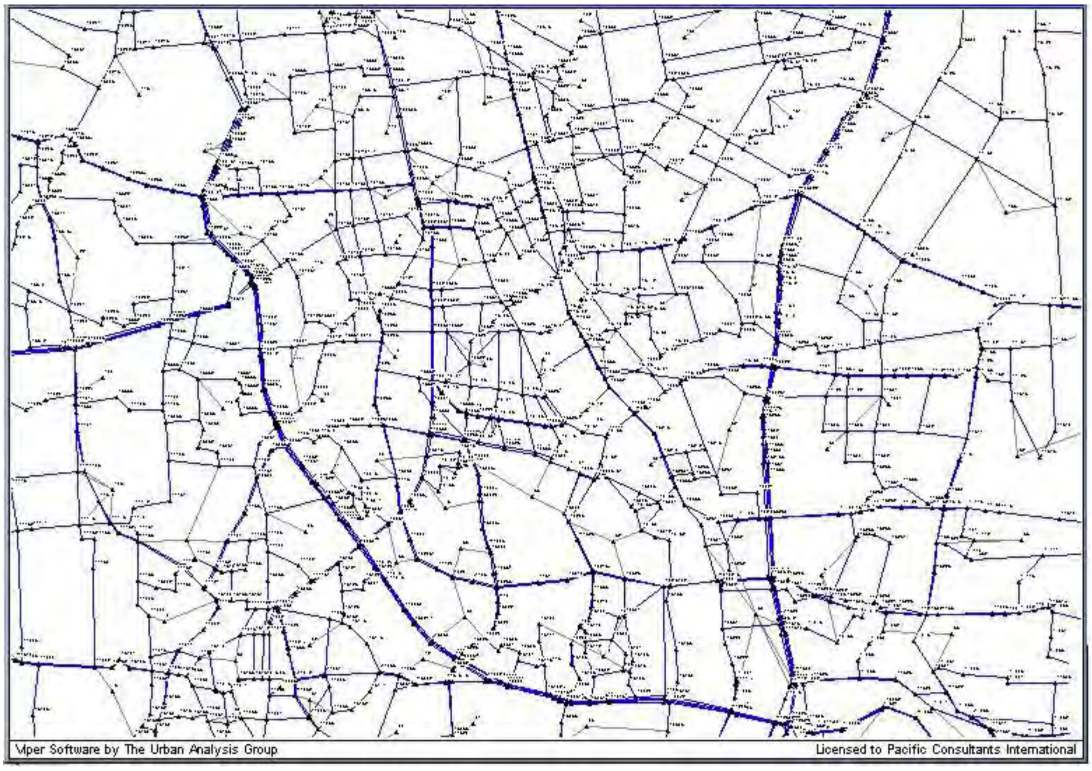
(1) Zone system

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

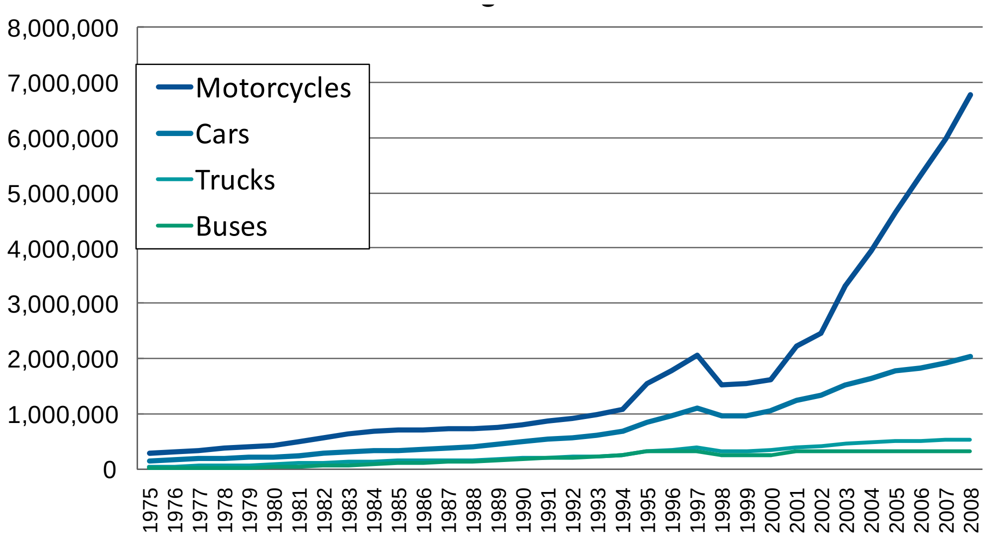
SITRAMP has developed production/attraction model by trip purpose, by area type (urban/rural) by income level for JABODETABEK region and this model was employed for this project as well. Explaining variables of these models are socio-economic indices such as population by income level, the number of 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

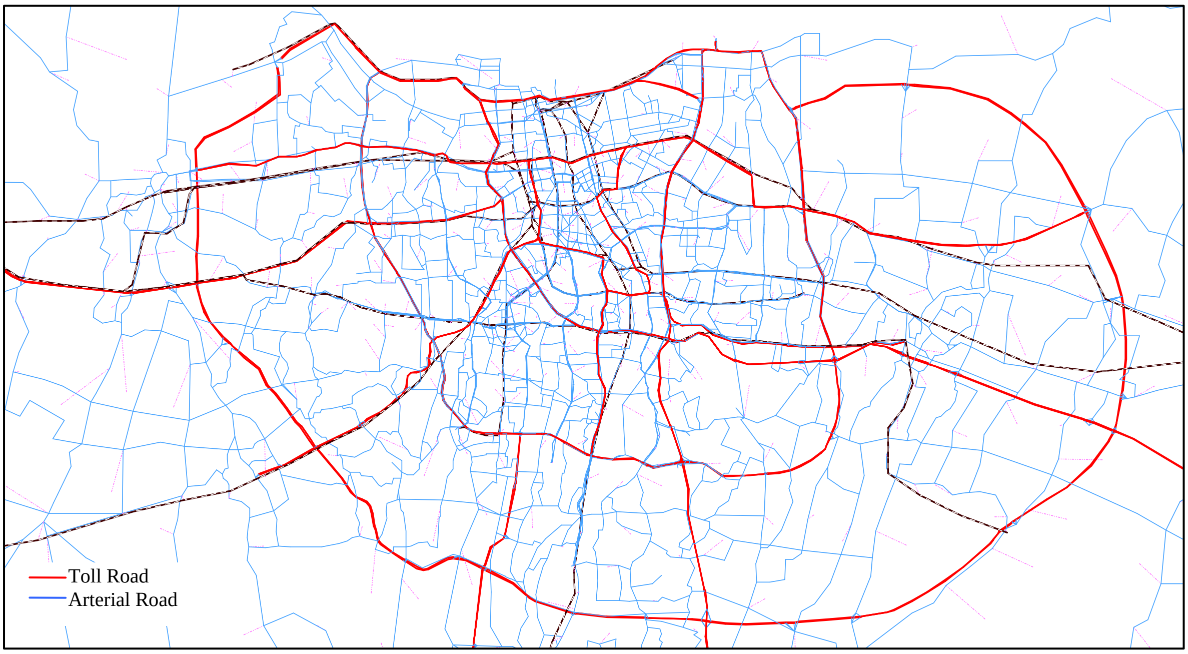
Transit and road traffic assignment was conducted by an incremental assignment method. There were a total of 40 stages of assignment by income level and transportation mode.

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**

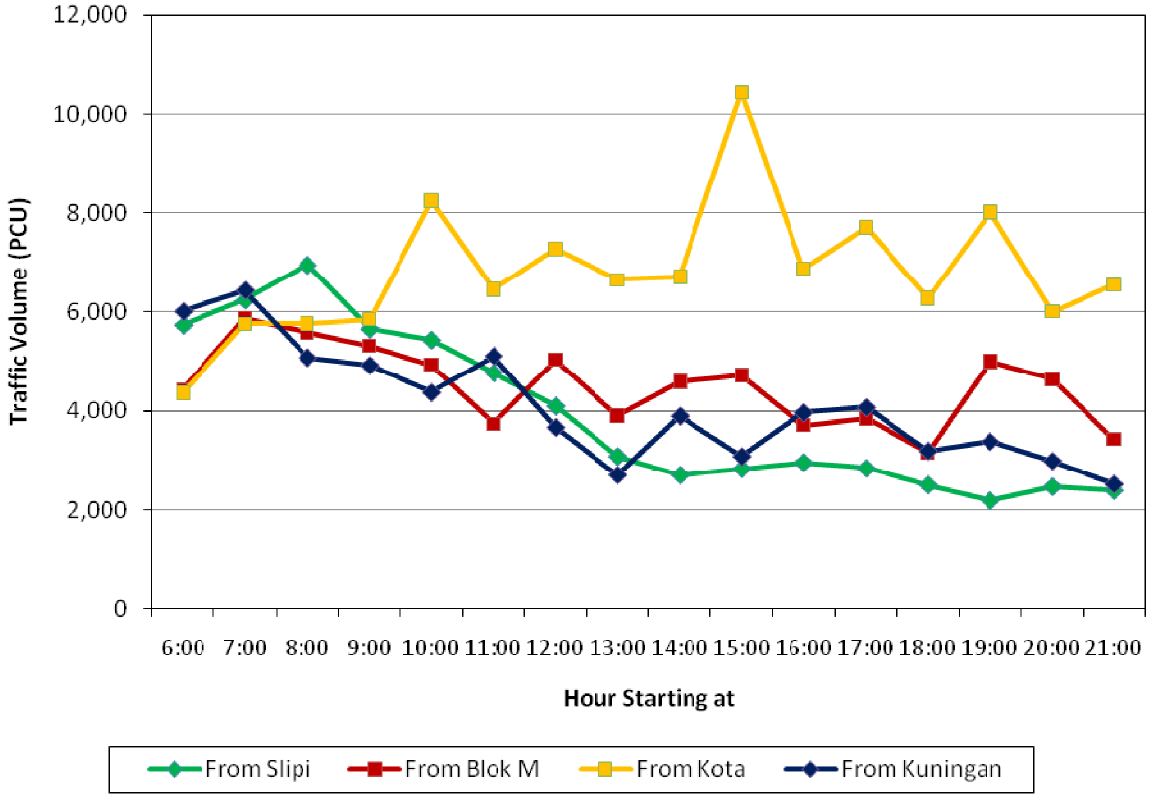
| No. | Location | FO/UP Direction | Years for Comparison | Growth | Annual Growth |
|---|---|---|---|---|---|
| 13 | Pinang Baris | E-W | 2011-2026 | 1.22 | 1.3% |
| 15 | Katamso | E-W | 2015-2040 | 1.69 | 2.1% |

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.

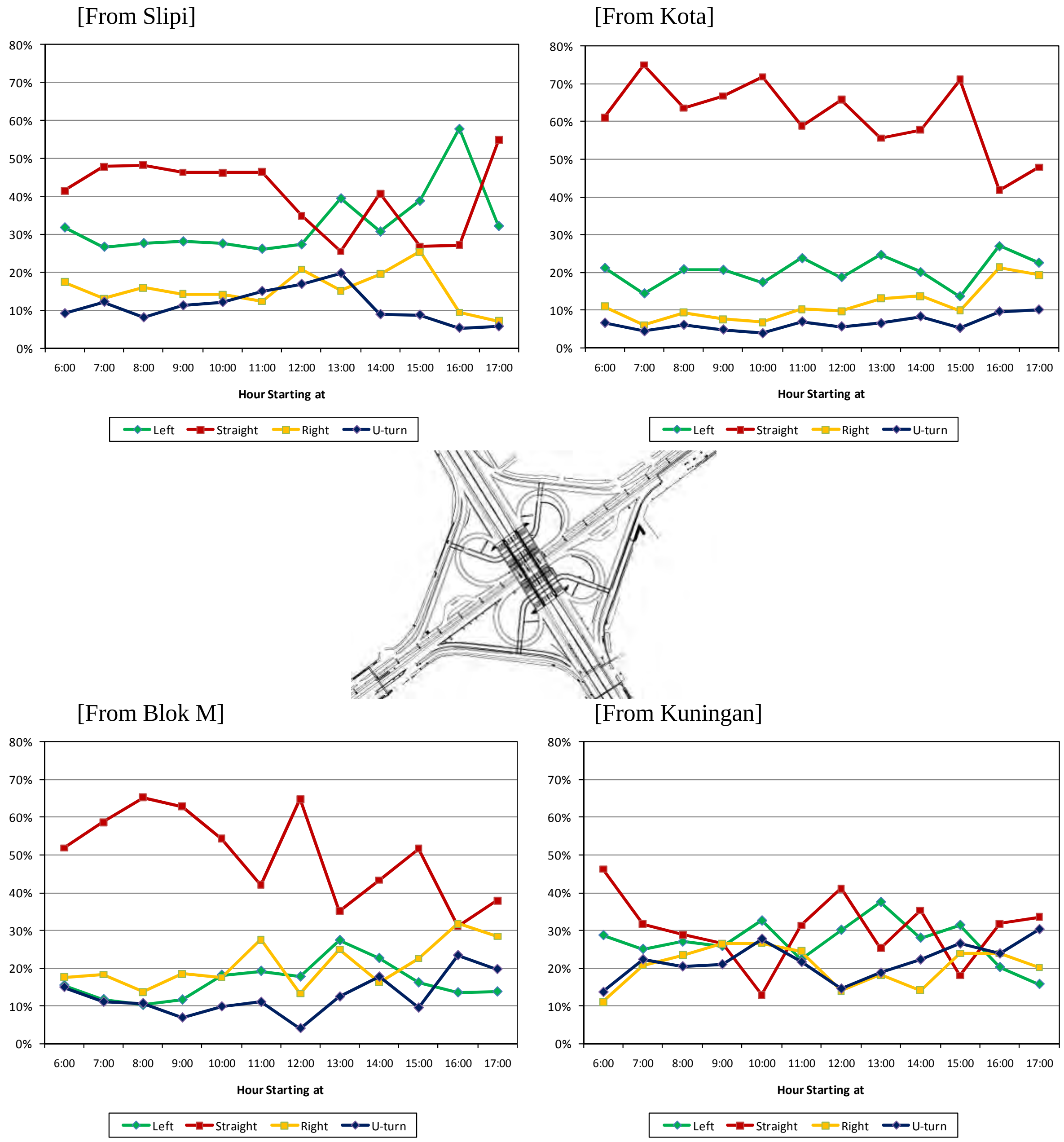



Source: JICA Survey Team

**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.

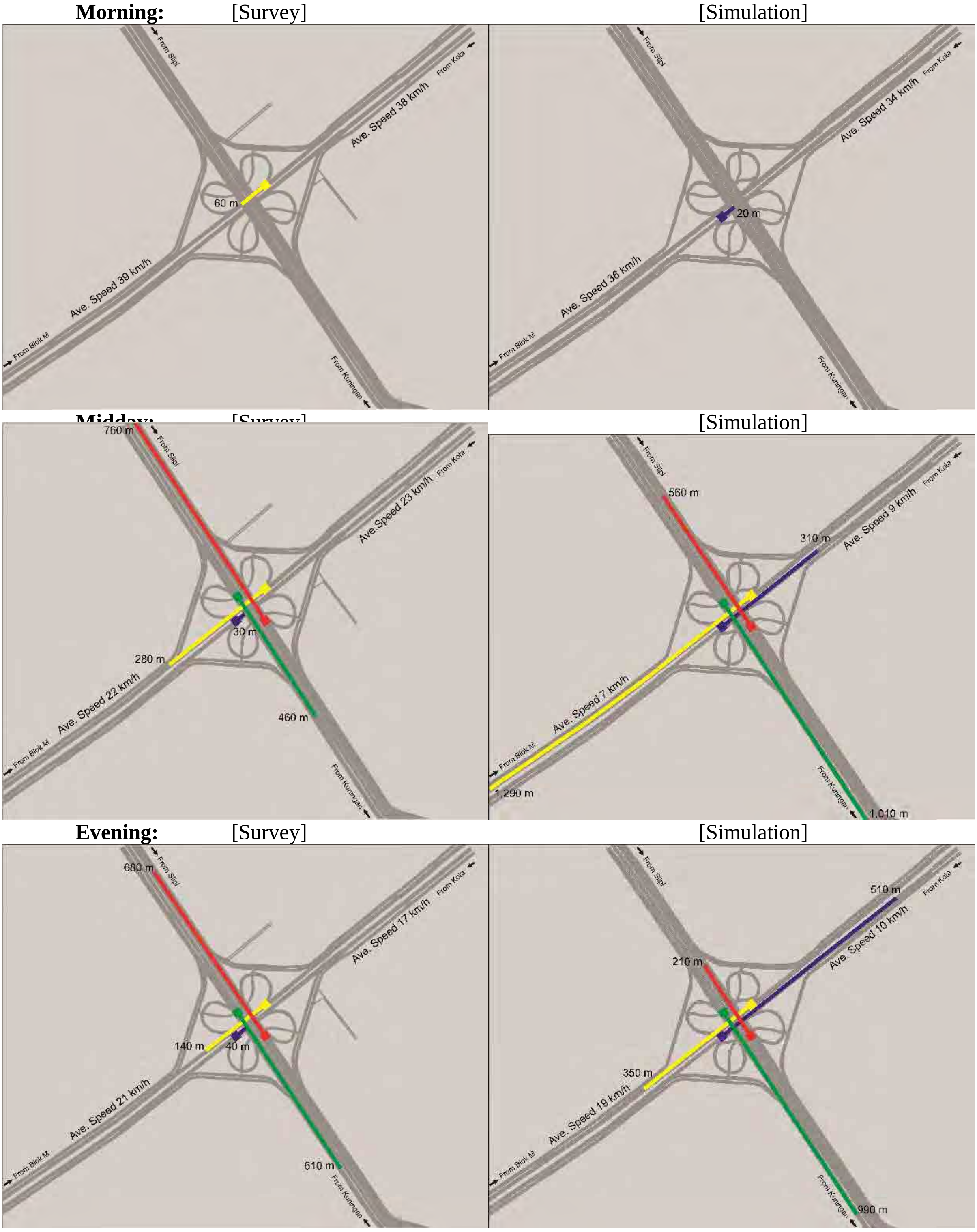



Source: JICA Survey Team

**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.

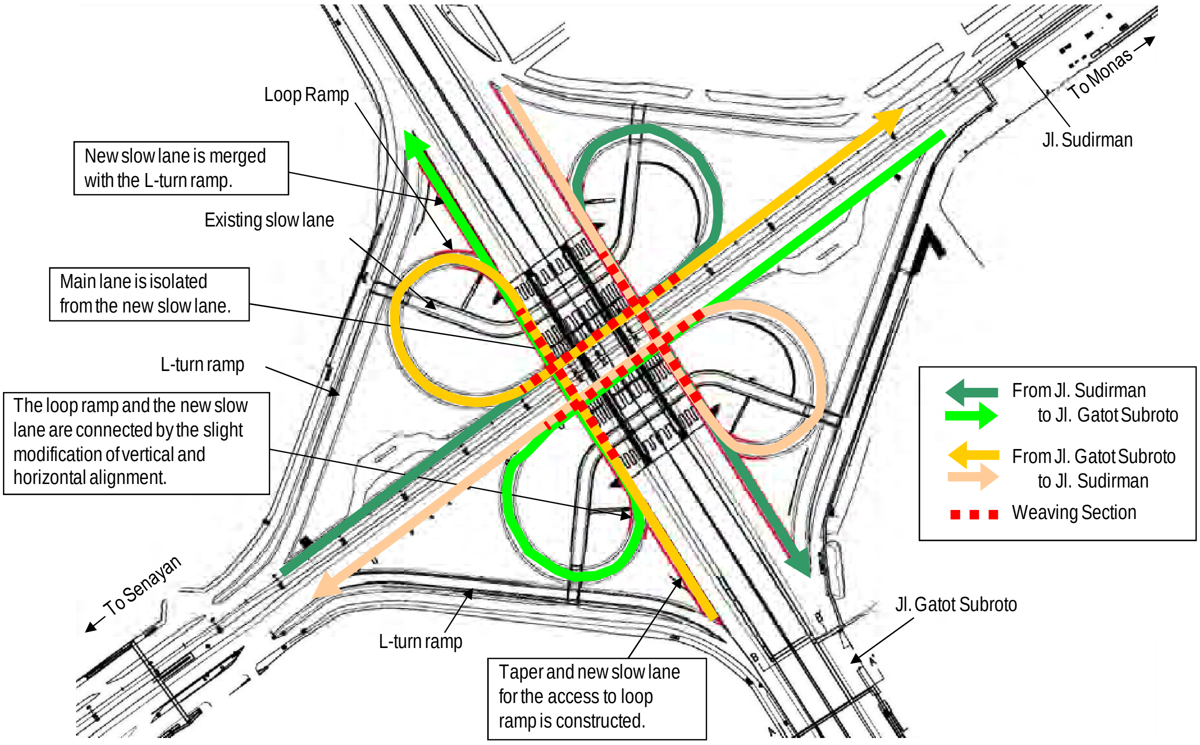



Source: JICA Survey Team

**Figure 3.4.3 Comparison of Survey and Simulation Results**

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

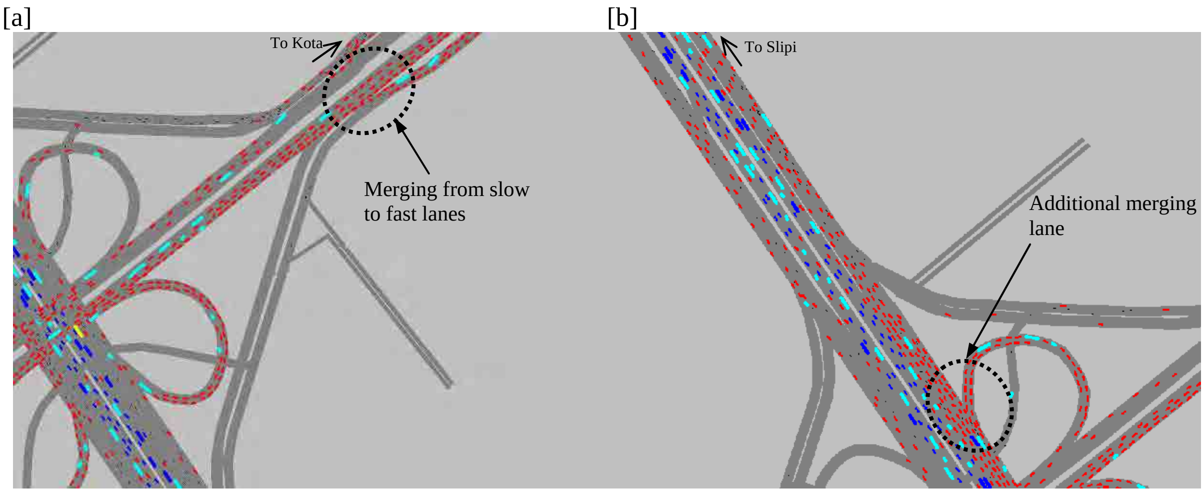
Alternative 1 to be evaluated involves new construction of a flyover with two lanes/directions on Jl. Gatot Subroto to provide additional space for merging to/from Jl. Sudirman as presented in Figure 3.4.4.




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.

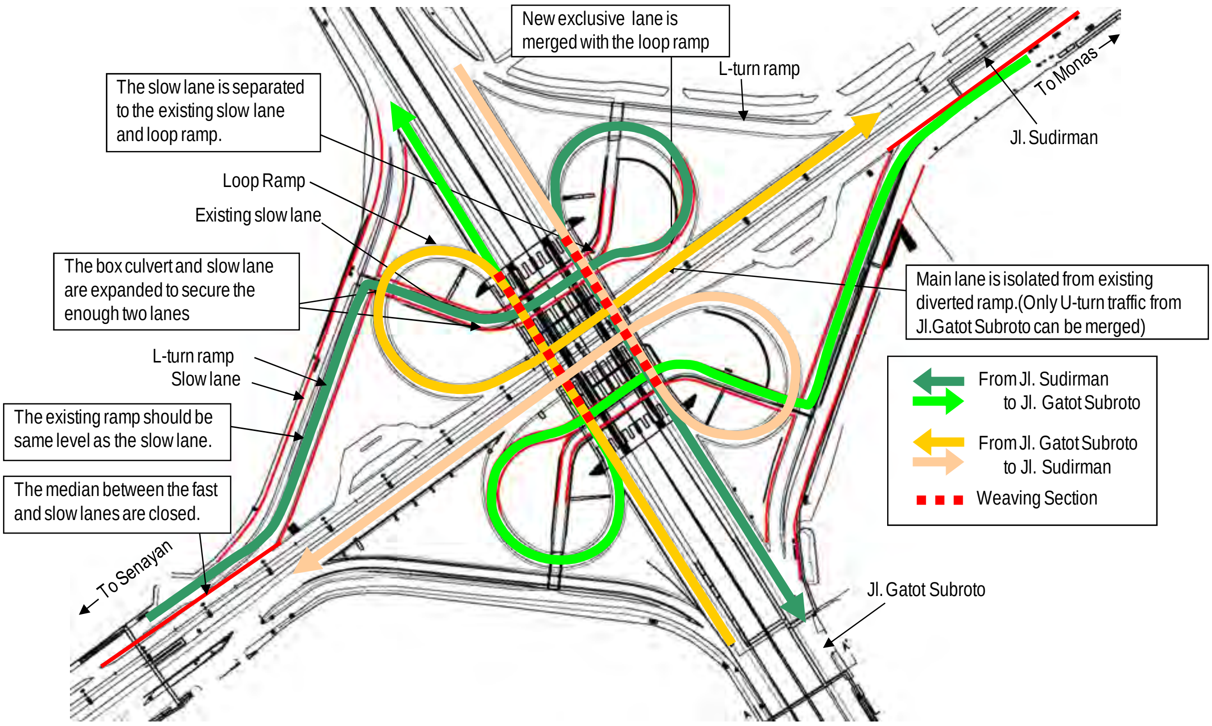



Source: JICA Survey Team

**Figure 3.4.5 Screenshots of Dynamic Simulation: Alternative 1**

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

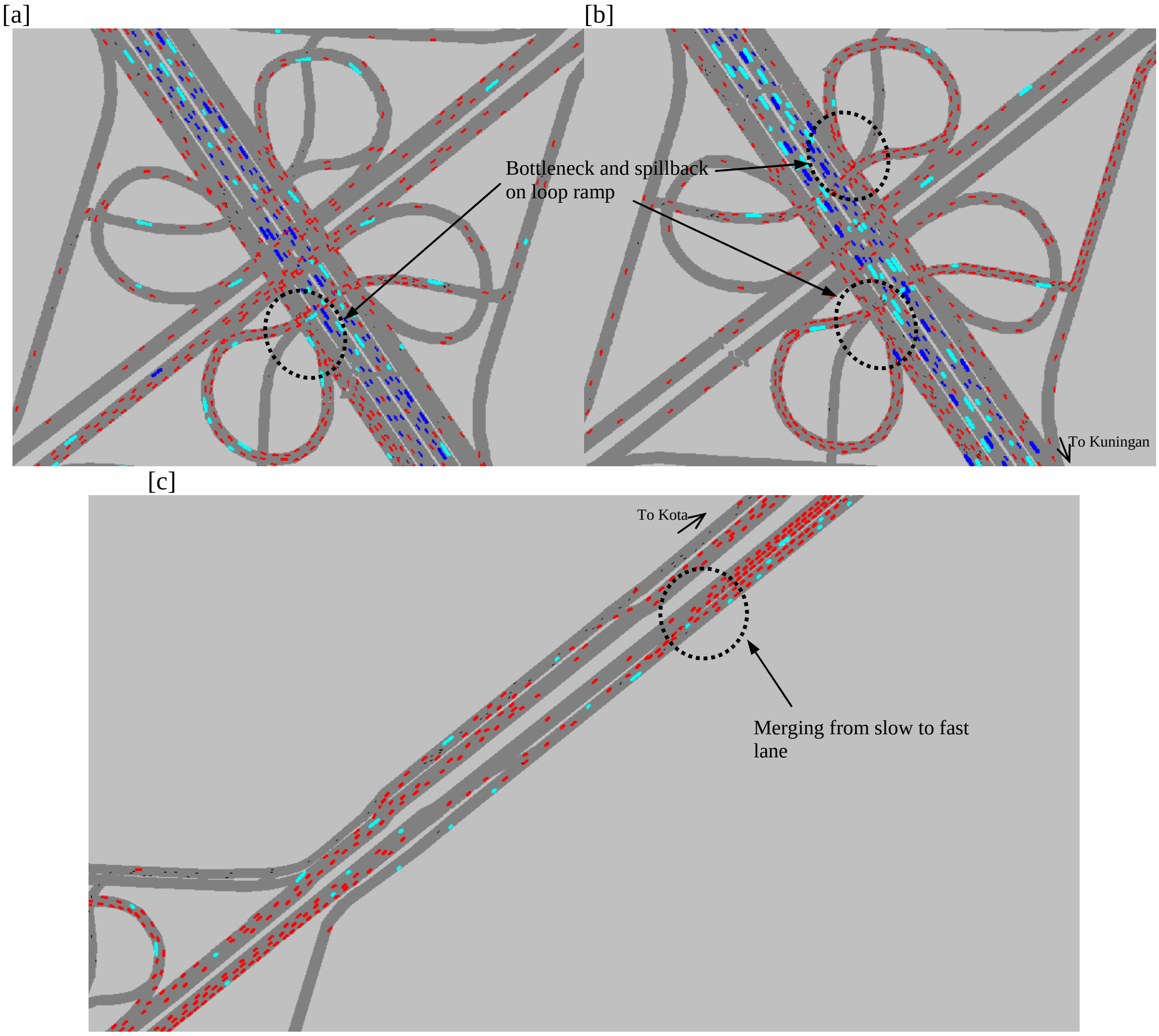
Alternative 2-1 to be evaluated involves new construction of a new exclusive lane on the slow lane of Jl. Sudirman, connecting from the left turn (slow) lane to the on-loop ramp to Jl. Gatot Subroto, as presented in Figure 3.4.6.




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).

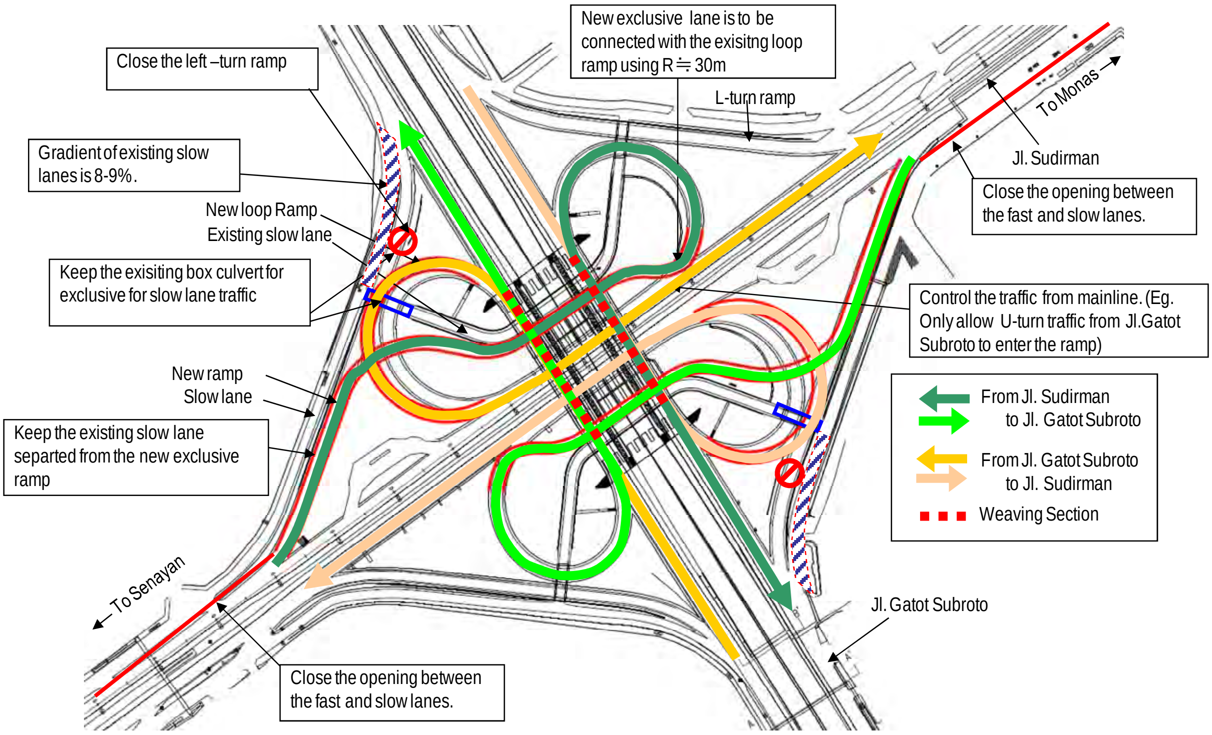



Source: JICA Survey Team

**Figure 3.4.7 Screenshots of Dynamic Simulation: Alternative 2-1**

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

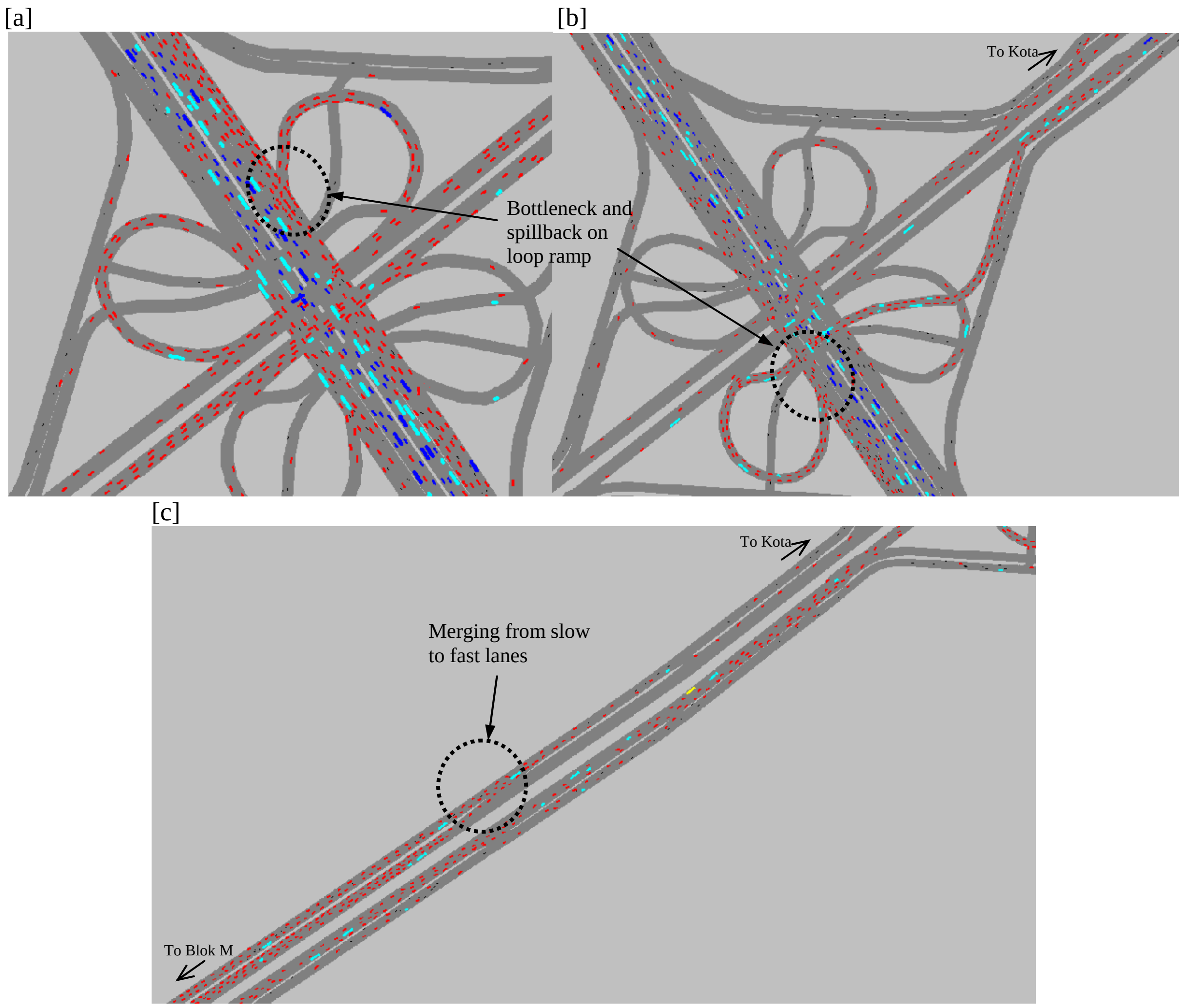
Alternative 2-2 to be evaluated involves new construction of a new exclusive lane connecting to the on-loop ramp to Jl. Gatot Subroto, but it starts from the fast lane of Jl. Sudirman, as presented in Figure 3.4.8. Direct left turn from the fast lane of Jl. Sudirman will be closed.




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.

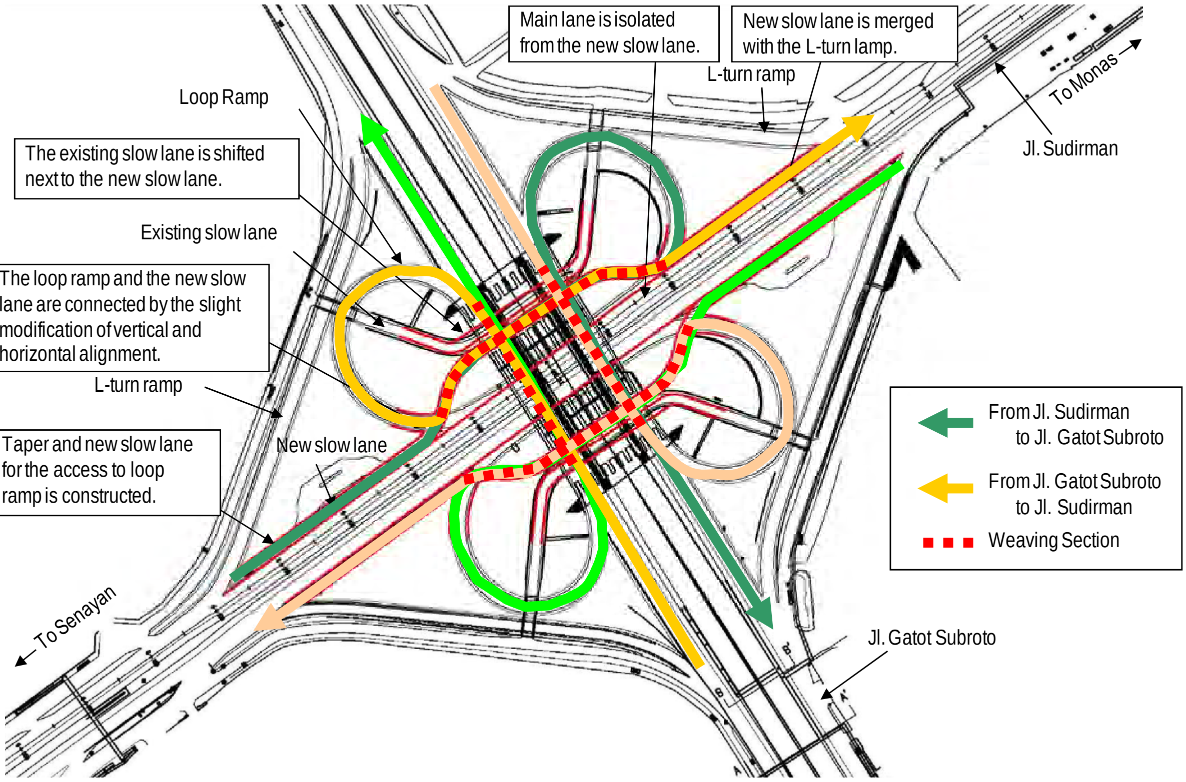



Source: JICA Survey Team

**Figure 3.4.9 Screenshots of Dynamic Simulation: Alternative 2-2**

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

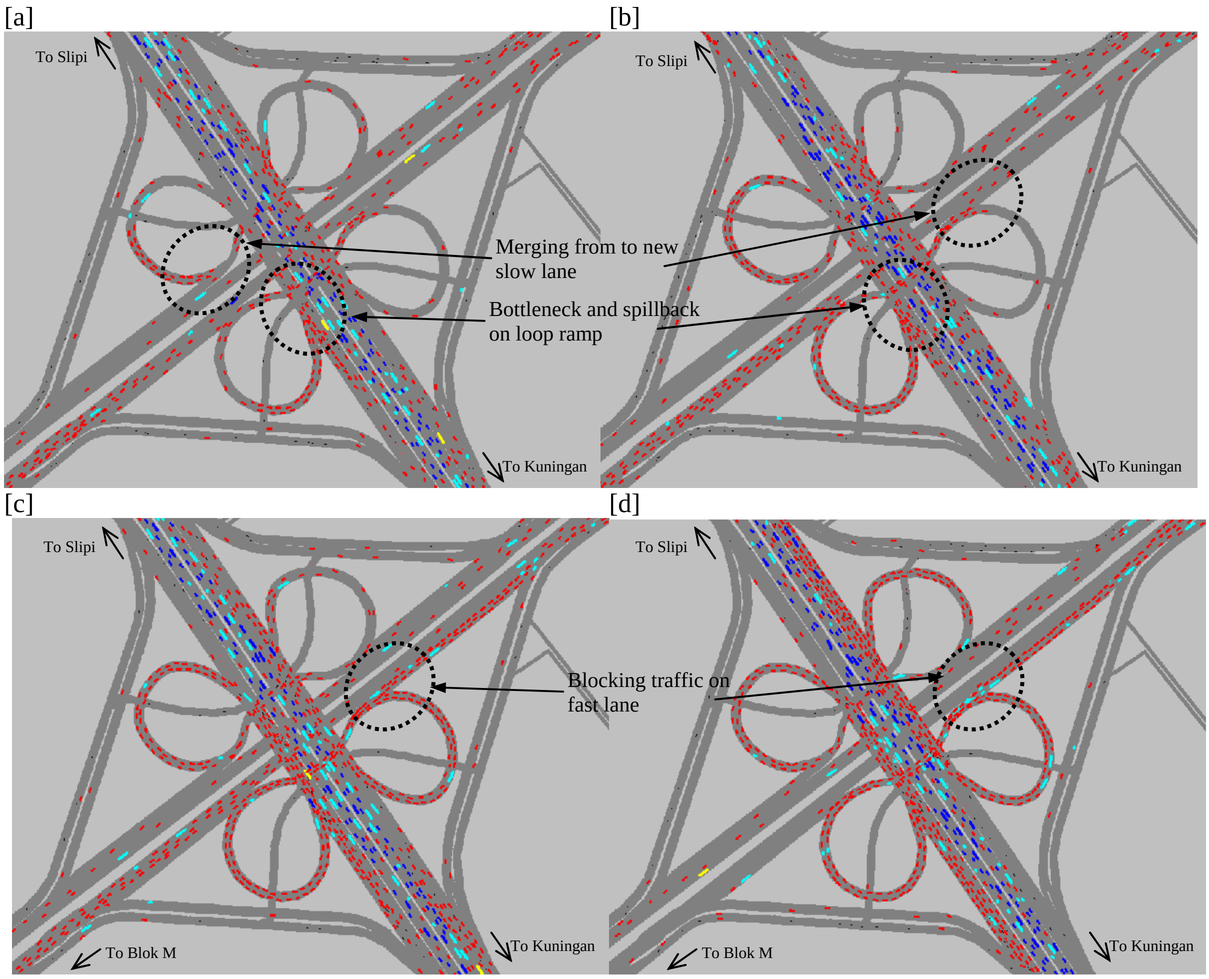
Alternative 3 to be evaluated involves new construction of an additional slow lane on Jl. Sudirman, which is shifted beside the fast lane but physically separated, serving only the traffic merging to/from the on-/off-loop ramps, as presented in Figure 3.4.10.




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).

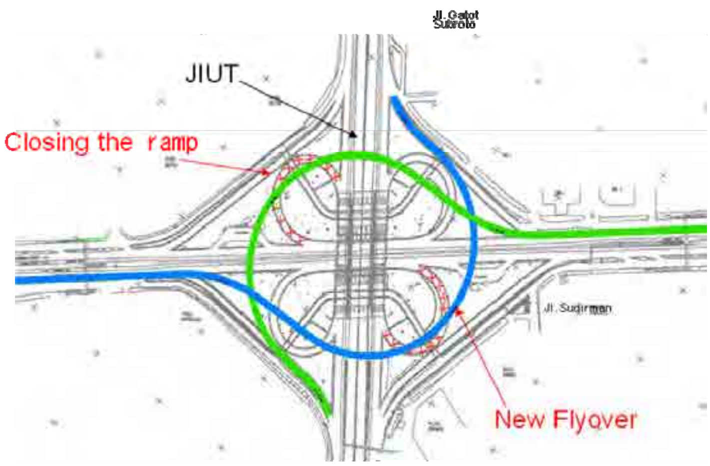



Source: JICA Survey Team

**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.



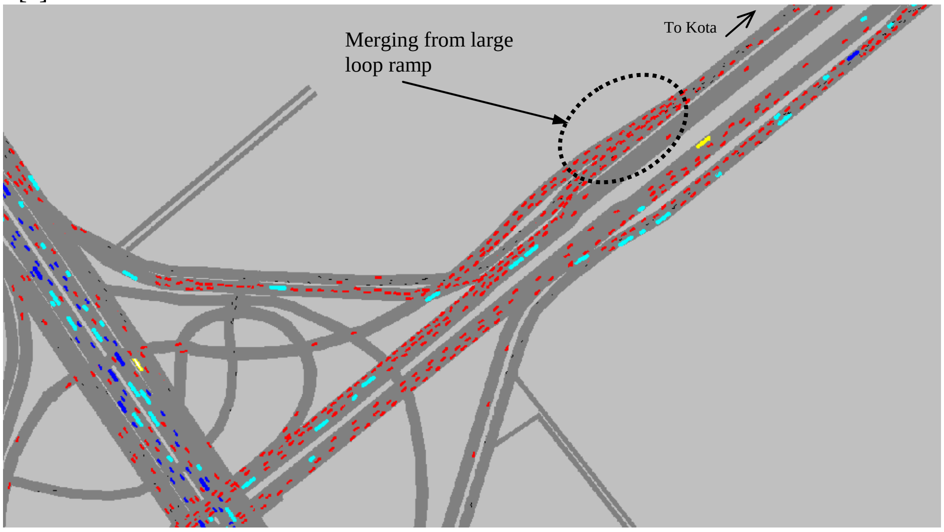

Source: JICA Survey Team

**Figure 3.4.12 Alternative 4: New Flyover Ramps**

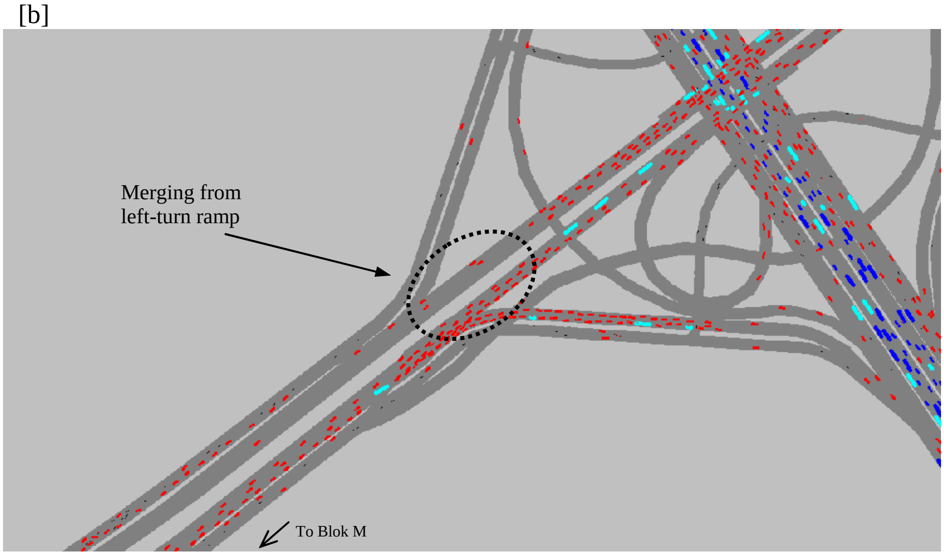
Congestion on the straight through lane will be alleviated because the short weaving caused by two contiguous loop ramps which cause congestion of Jl. Gatot Subroto will be solved. In

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 (yellow); Best Case for Each Direction (light orange); Least Improved Case (red)

Source: JICA Survey Team

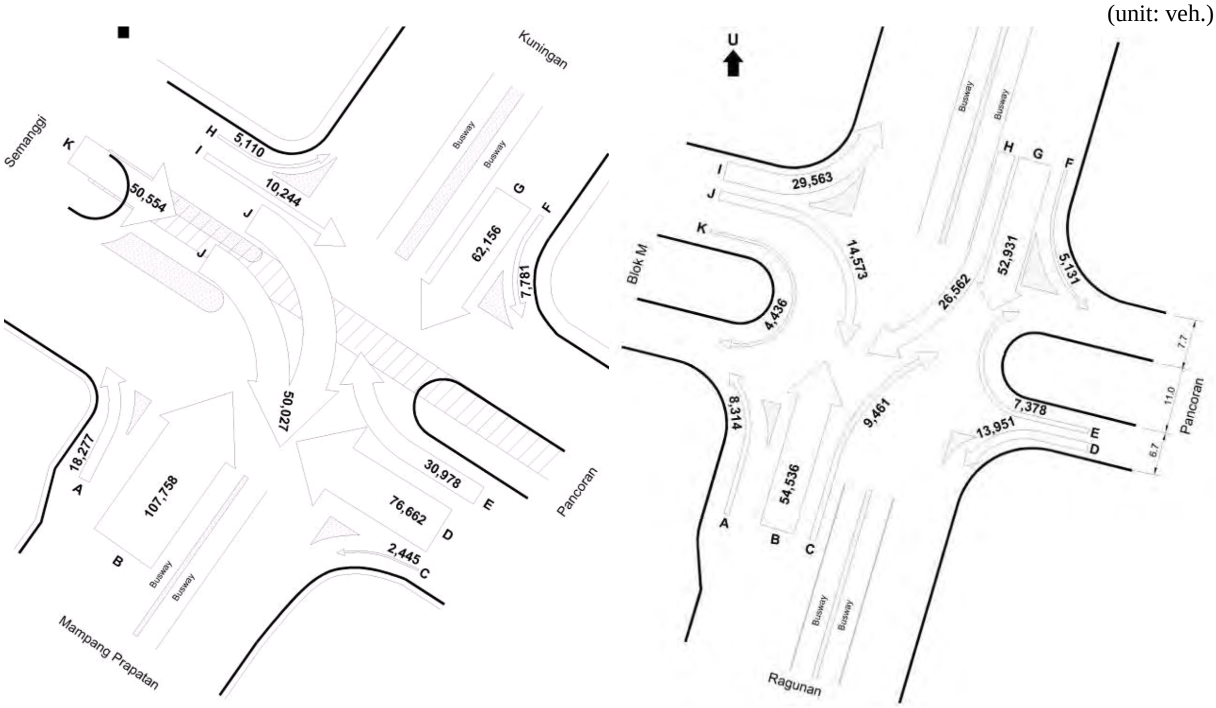
## 3.4.2 Kuningan Intersection

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 (7:00-9:00) | Kuningan | 70 | 330 | 230 | 340 | 970 |
| | Mampang | 160 | 1,420 | 40 | 210 | 1,830 |
| Midday (12:00-14:00) | Kuningan | 100 | 110 | 360 | 460 | 1,030 |
| | Mampang | 220 | 290 | 50 | 40 | 600 |
| Evening (16:00-18:00) | Kuningan | 380 | 240 | 190 | 260 | 1,070 |
| | 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

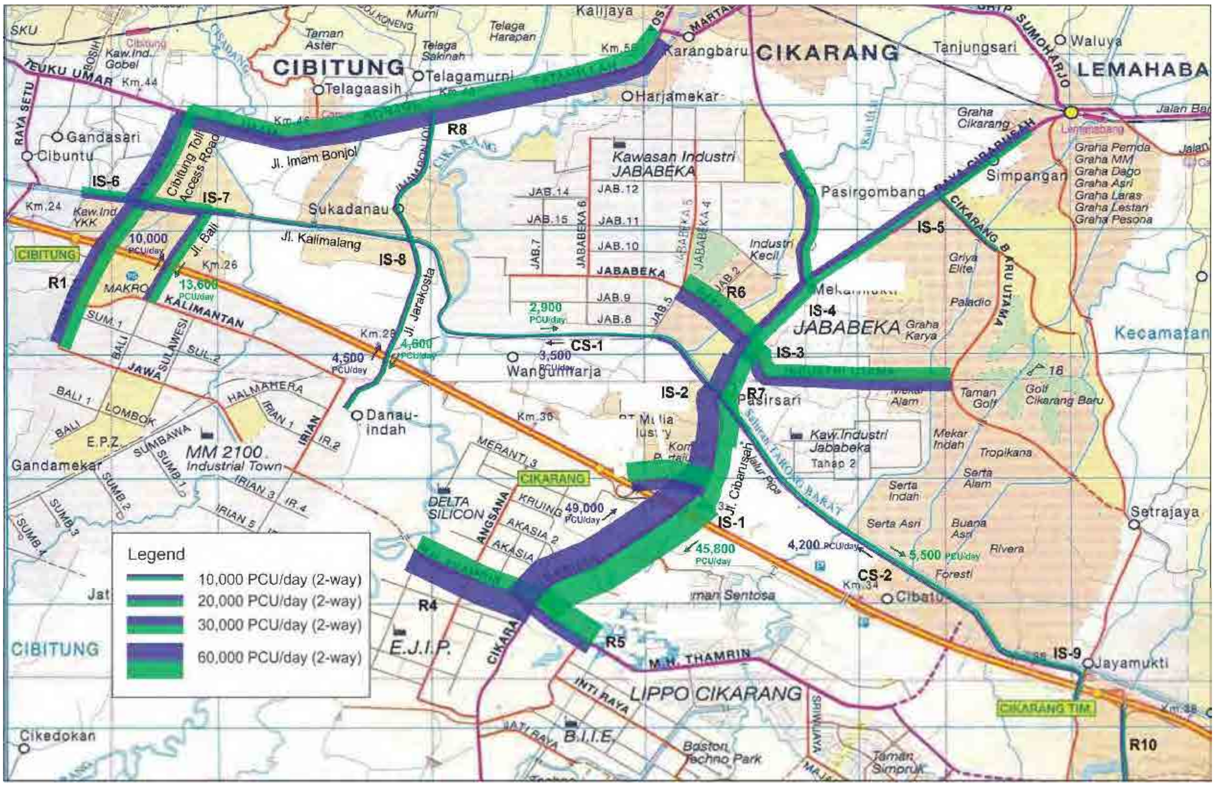
Since the sub-project for Cikarang involves improvement of existing Kalimalang road and its connecting roads that are relatively long (5 – 10 km), traffic survey was conducted at several locations in Cikarang industrial area. The traffic survey locations and the current major traffic flow bandwidths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

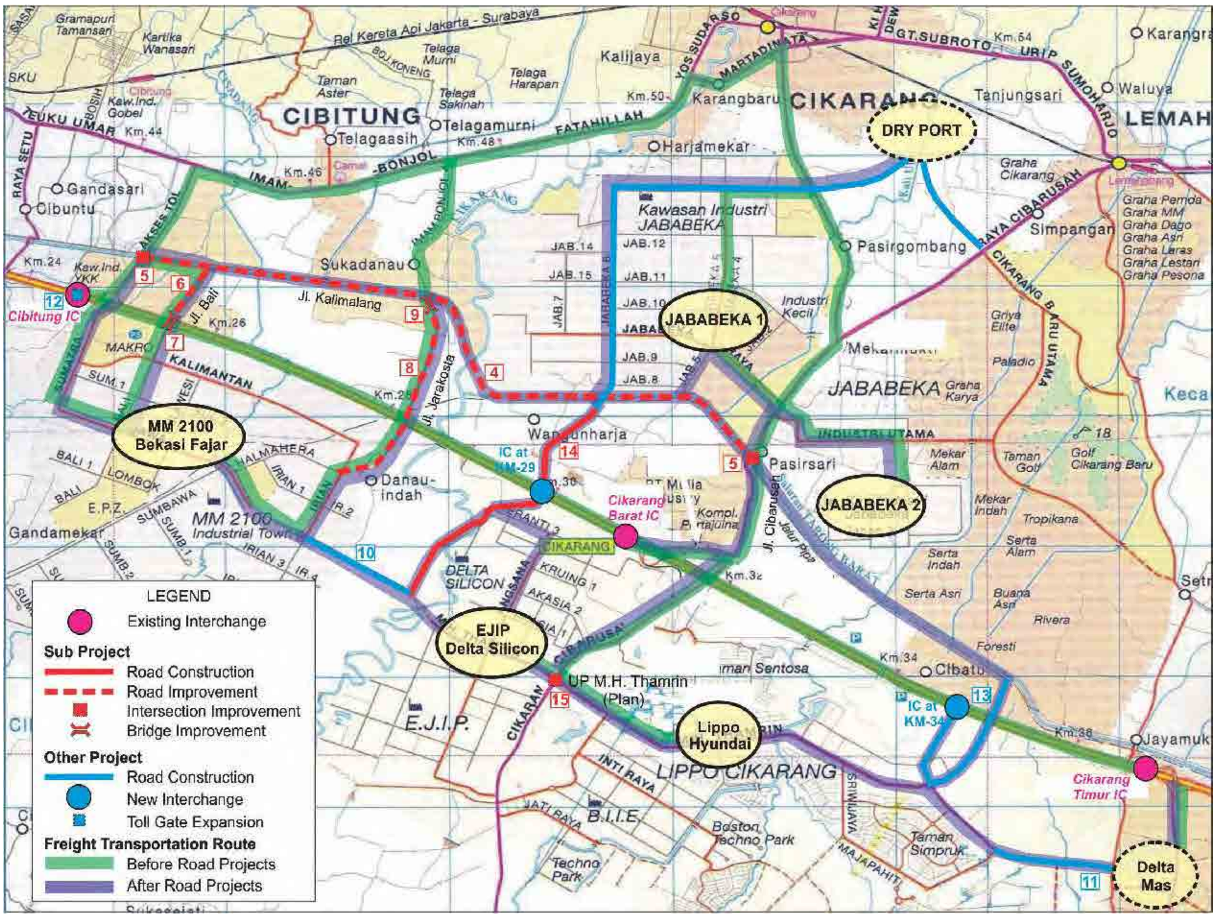
If no JICA sub-projects are implemented, the V/C ratios of all the N-S roads (except for Jl. Sukamantri) are over 1.0. Above all, Jl. Cibarusah will be so heavily congested with a V/C ratio of 1.92, and the V/C ratio of the total traffic on all the N-S roads is forecasted as 1.36, implying serious traffic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

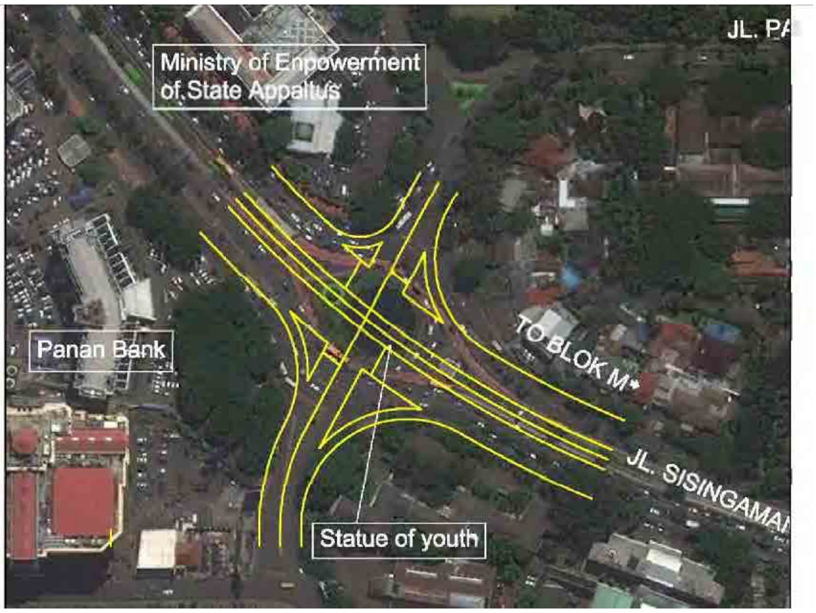
Alternatives 1 and 2 are construction of a flyover (Alternative 1) or an underpass (Alternative 2) connecting from Jl. Pattimura to the slow lane of Jl. Sudirman (one way).


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.

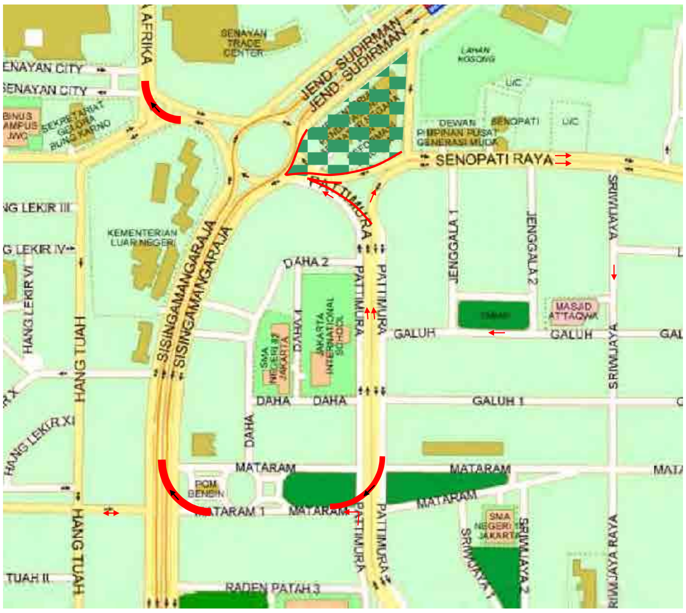



Source: JICA Survey Team

**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. |

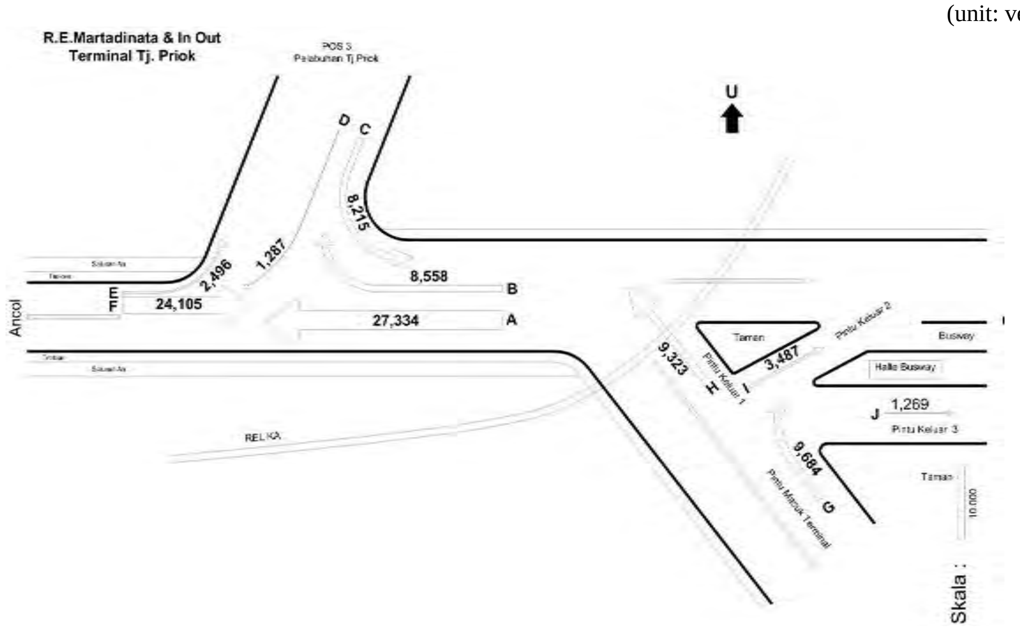
Source: JICA Survey Team

### 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.)



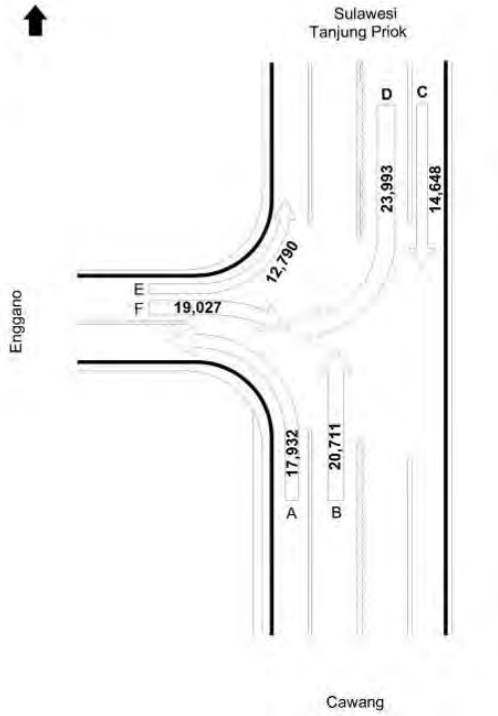

Source: Traffic Survey, JICA Survey Team

**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

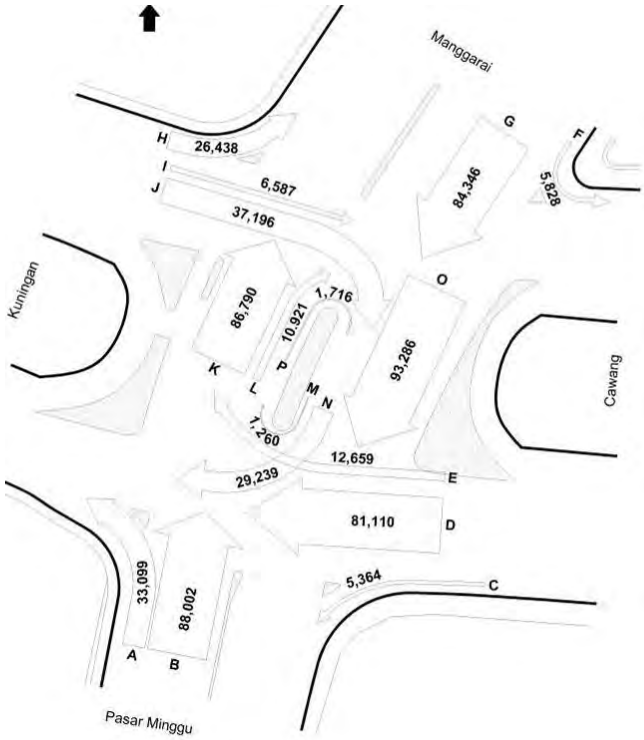
**Figure 3.4.22 Traffic Flow and Daily Volume at Sulawesi - Tg.PA Intersection**

(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.)



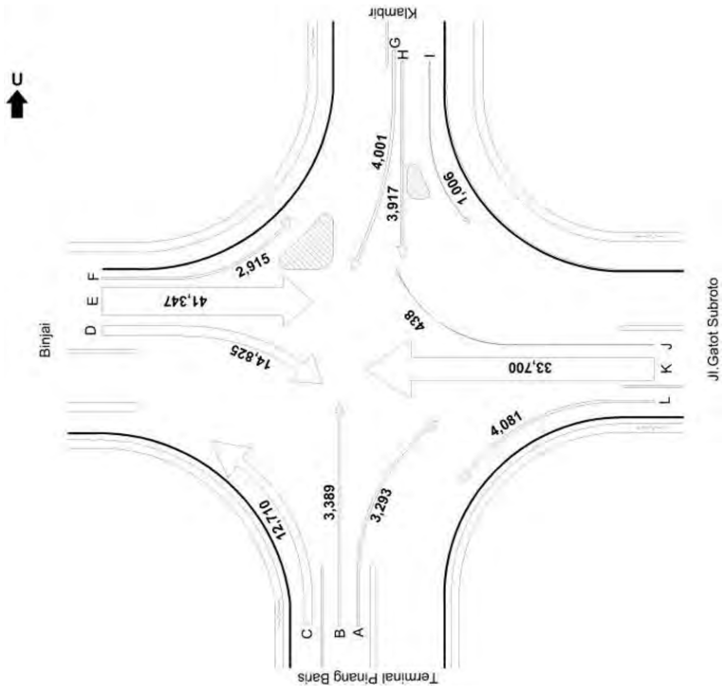

Source: Traffic Survey, JICA Survey Team

**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.)



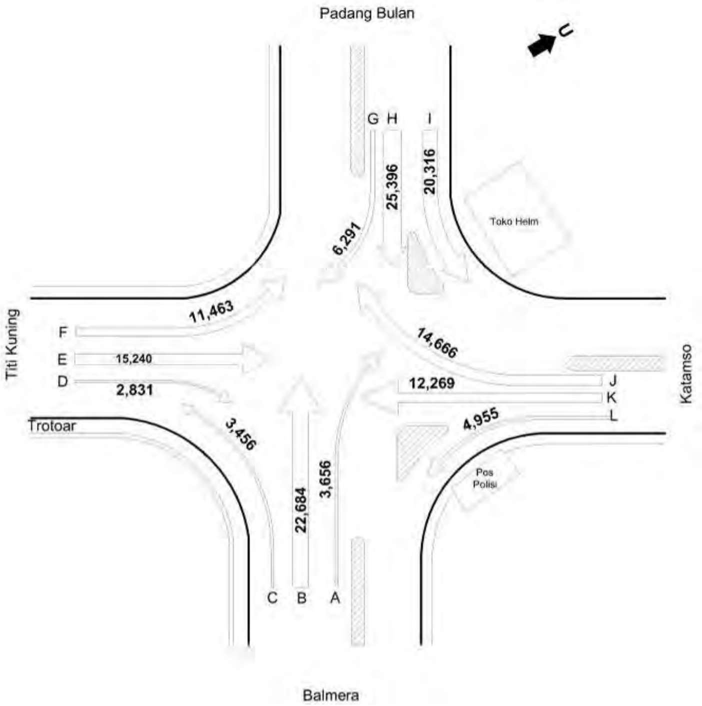

Source: Traffic Survey, JICA Survey Team

**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

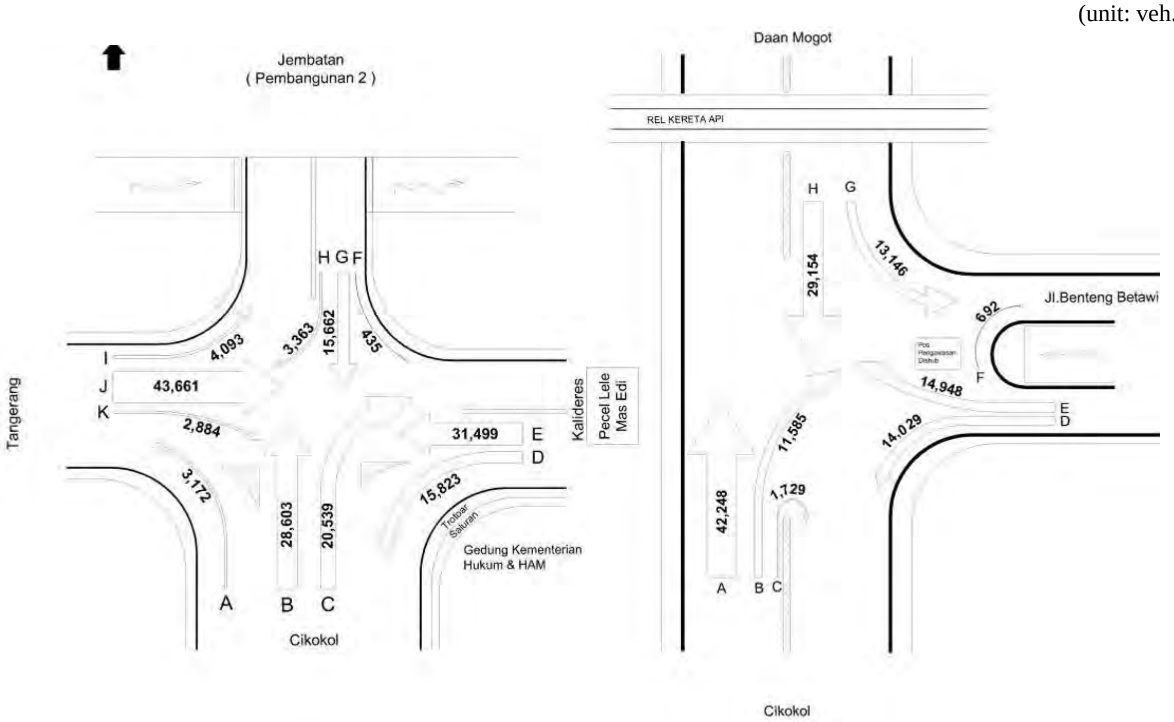
Sudirman II intersection is located 1 km to the south of Daan Mogot along Jl. Sudirman. There is a railway crossing with a single track on Tangerang line at the intersection. Directional traffic flows and the daily volumes at Sudirman II intersection as well as north adjacent Sudirman – Daan Mogot intersection 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

# CHAPTER 4. ROAD AND STRUCTURE DESIGN

## 4.1 Road and Intersection Design

### 4.1.1 Design Criteria

(1) Applicable Design Standards

"Standard Specifications for geometric design of urban roads" published by the Directorate General of Highways of the Ministry of Public Works (MPW) in March 1992 is used as the main design standards for the road design.

(2) Road Classification

Roads in urban areas shall be classified into two types according to the kind of access control as follows. All roads in this project are defined as Type II.

- Type I : full access control
- Type II: partial access control or no access control

Type II roads are classified into 4 classes according to their functional classification and design traffic volume. The design classes of Type II are shown in Table 4.1.1.

**Table 4.1.1 Design Classes of Type II**

<table>
<tr><th colspan="2">Function</th><th>Design traffic volume (PCU/day)</th><th>Class</th></tr>
<tr><td rowspan="3">Primary</td><td>Arterial</td><td></td><td>I</td></tr>
<tr><td rowspan="2">Collector</td><td>10,000 or more</td><td>I</td></tr>
<tr><td>Less than 10,000</td><td>II</td></tr>
<tr><td rowspan="6">Secondary</td><td rowspan="2">Arterial</td><td>20,000 or more</td><td>I</td></tr>
<tr><td>Less than 20,000</td><td>II</td></tr>
<tr><td rowspan="2">Collector</td><td>6,000 or more</td><td>II</td></tr>
<tr><td>Less than 6,000</td><td>III</td></tr>
<tr><td rowspan="2">Local</td><td>500 or more</td><td>III</td></tr>
<tr><td>Less than 500</td><td>IV</td></tr>
</table>

Source: Standard specifications for geometric design of urban roads, DGH

- Class I :The highest standard streets of 4 or more lanes to serve inter-city or intra-city, high speed, through traffic with partial access control
- Class II :High standard streets of 2 or more lanes to serve inter-city or intra-city, high speed, through traffic with/without partial access control
- Class III :Intermediate standard streets of 2 or more lanes to serve inter-district, moderate speed, through or access traffic without access control
- Class IV :Low standard streets of 1 travel way to serve access to the road side land lots

(3) Design Speed

The design speed of Type II shall be the value according to the class as follows.

- Class I : 60 km/h
- Class II : 60 or 50 km/h
- Class III : 40 or 30 km/h
- Class IV : 30 or 20 km/h

(4) Geometric Design Criteria

Table 4.1.2 shows the geometric design criteria for each design speed.

**Table 4.1.2 Geometric Design Criteria (Main road)**

| Item | Unit | Design Standard | | | |
|---|---|---|---|---|---|
| Design speed | km/h | 60 | 50 | 40 | 30 |
| Road class | | I, II | II | III | III, IV |
| | | | | | |
| 1. Cross Section | | | | | |
| Lane Width | m | 3.5 | 3.25 | 3.25 (3.0) | 3.25 (3.0) |
| Median Width | m | 2.0 (1.0) | 1.5 (1.0) | 1.5 (1.0) | 1.5 (1.0) |
| Marginal Strip of Medians Width | m | 0.5 | 0.25 | 0.25 | 0.25 |
| Left Shoulder Width | m | 2.0 (1.5) | 2.0 (1.5) | 2.0 (1.5) | 0.5 |
| Right Shoulder Width | m | 0.5 | 0.5 | 0.5 | 0.5 |
| Planted Strip | m | 1.5 | 1.5 | 1.5 | 1.5 |
| Frontage road | m | 4.0 | 4.0 | 4.0 | 4.0 |
| Sidewalk | m | 3.0 (1.5) | 3.0 (1.5) | 1.5 (1.0) | 1.5 (1.0) |
| Cross Fall | % | 2 | | 2 | |
| | | | | | |
| 2. Horizontal Alignment | | | | | |
| Minimum Curve Radius | m | 400 (150) | 150 (100) | 100 (60) | 65 (30) |
| Minimum Radius at Normal Cross fall | m | 2,000 (220) | 1,300 (150) | 800 (100) | 500 (55) |
| Minimum Curve Length | m | 700/θ (100) | 600/θ (80) | 500/θ (70) | 350/θ (50) |
| Minimum Transition Curve Length | m | 50 | 40 | 35 | 25 |
| Minimum Radius Without Transition Curve | m | 600 | 400 | 250 | 150 |
| Minimum Stopping Sight Distance | m | 75 | 55 | 40 | 30 |
| | | | | | |
| 3. Vertical Alignment | | | | | |
| Maximum Grade | % | 5 | 6 | 7 | 8 |
| Critical Vertical Curve Length | m | 300 (8%) | 300 (9%) | 200 (10%) | - |
| Minimum Crest Radius | m | 2,000 (1,400) | 1,200 (800) | 700 (450) | 400 (250) |
| Minimum Sag Radius | m | 1,500 (1,000) | 1,000 (700) | 700 (450) | 400 (250) |
| Minimum Curve Length | m | 50 | 40 | 35 | 25 |

Source: Standard specifications for geometric design of urban roads, DGH

**Table 4.1.3 Geometric Design Criteria for At-grade Intersection**

| Item | Unit | Design Standard | | | |
|---|---|---|---|---|---|
| Design speed | km/h | 60 | 50 | 40 | 30 |
| Road class | | I, II | II | III | III, IV |
| | | | | | |
| Minimum grade | % | 2 | 2 | 2 | 2 |
| Minimum length of low grade | m | 40, 35 | 35 | 15 | 15, 6 |
| Lane width of tangent section | m | 3.5, 3.25 | 3.25 | 3.25, 3.0 | 3.25, 3.0 |
| Lane width of thru traffic lane | m | 3.25, 3.0 | 3.0, 2.75 | 3.0, 2.75 | 3.0, 2.75 |
| Lane width of auxiliary lane | m | 3.25, 3.0, 2.75 | 3.25, 3.0, 2.75 | | |
| Taper of lane shift | | 1/30 (40) | 1/25 (35) | 1/20 (30) | 1/15 (25) |
| Minimum length by deceleration | m | 30 | 20 | 15 | 10 |
| Minimum length by shift | m | 30 | 25 | 20 | 15 |

Source: Standard specifications for geometric design of urban roads, DGH

**Table 4.1.4 Geometric Design Criteria for Interchange**

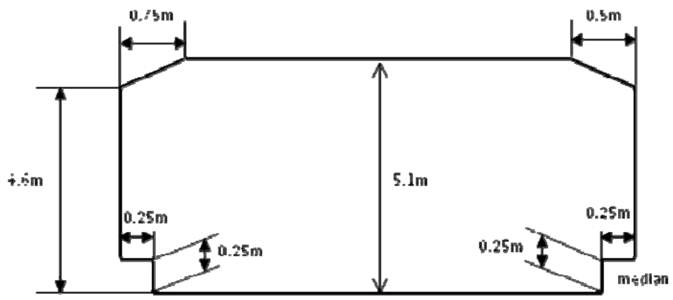
| Item | Unit | Design Standard | | | |
|---|---|---|---|---|---|
| Design speed | km/h | 60 | 50 | 40 | 30 |
| Road class | | I, II | II | III | III, IV |
| | | | | | |
| | | | | | |
| 1. Cross Section | | | | | |
| Lane Width | m | 3.5 | 3.5 | 3.5 | 3.5 |
| Median Width | m | 2.0 | 2.0 | 2.0 | 2.0 |
| Marginal Strip of Median Width | m | 0.5 | 0.5 | 0.5 | 0.5 |
| Left Shoulder Width | m | 2.5 (0.75) | 2.5 (0.75) | 2.5 (0.75) | 2.5 (0.75) |
| Right Shoulder Width | m | 1.0 (0.75) | 1.0 (0.75) | 1.0 (0.75) | 1.0 (0.75) |
| | | | | | |
| 2. Horizontal Alignment | | | | | |
| Minimum Curve Radius | m | 140 (110) | 90 (70) | 50 (40) | 40 (30) |
| Minimum Parameter of Transition Curve | m | 70 | 50 | 35 | 20 |
| Minimum Transition Curve Radius | m | 350 | 220 | 140 | 140 |
| Minimum Stopping Sight Distance | m | 75 | 55 | 40 | 35 |
| | | | | | |
| 3. Vertical Alignment | | | | | |
| Maximum Grade | % | 5 (up to 10) | 5 (up to 10) | 5 (up to 10) | 5 (up to 10) |
| Minimum Crest Radius | m | 1,400 | 800 | 450 | 250 |
| Minimum Sag Radius | m | 1,000 | 700 | 450 | 250 |
| Minimum Curve Length | m | 50 | 40 | 35 | 30 |
| | | | | | |
| 4. Deceleration Lane | | | | | |
| Standard Length of Deceleration Lane | m | 70 | 50 | 30 | - |
| Standard Taper Length in Parallel Type | m | 45 | 40 | 40 | - |
| | | | | | |
| 5. Acceleration Lane | | | | | |
| Standard Length of Acceleration Lane | m | 120 | 90 | 50 | - |
| Standard Taper Length in Parallel Type | m | 45 | 40 | 40 | - |

Source: Standard specifications for geometric design of urban roads, DGH

(5) Clearance

1) Road

The road clearance shall be provided according to the design of the cross section. No structure, facilities, trees or other unmovable objects can be placed within the clearance. The vertical and horizontal clearance is shown in Figure 4.1.1.




Source: Standard specifications for geometric design of urban roads, DGH

**Figure 4.1.1 Vertical and Horizontal Clearance for Roads**

2) Railways

The design criteria for railway crossings with roads is stipulated in the "Crossing and intersection of railway track construction (KM 53 OF 2000)" issued by the Ministry of transportation. The basic requirements for design of railway crossings are as follows.

- At least 6.50 meters should be secured from the rail head.
- The distance between the pier foundation and the center line of the rail track (single track) shall be at least 10 meters.
- The pier foundation should be buried at least 1.50 meters below the ground surface.

### 4.1.2 Preliminary Design of Roads and Intersections

The preliminary design has been carried out for all potential projects to evaluate the feasibility of the projects and select the sub projects which will be analysed in more detail for the 2nd stage. Due to the lack of topographic maps and traffic data as of the 1st stage, the design is conducted based on satellite photos and site reconnaissance. In the existing investigations such as the feasibility study, basic design and detailed design implemented by the local or international consultants is referred to in the preliminary design.

After the sub projects are selected in the 1st stage, the design for sub projects will be revised and updated in accordance with the topographic and geographic surveys and the result of traffic analysis. The preliminary design of each potential project is described below.

(1) Semanggi

Semanggi is a clover-leaf type junction being composed of the following roads.

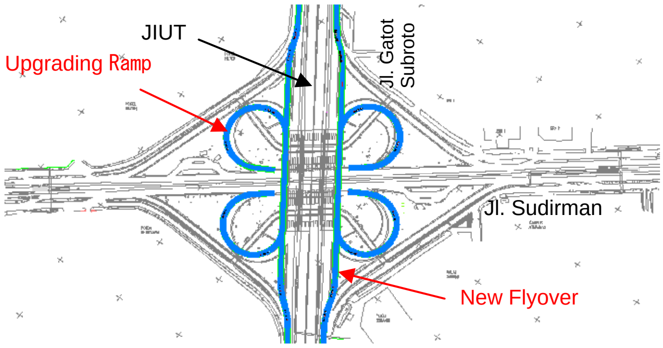
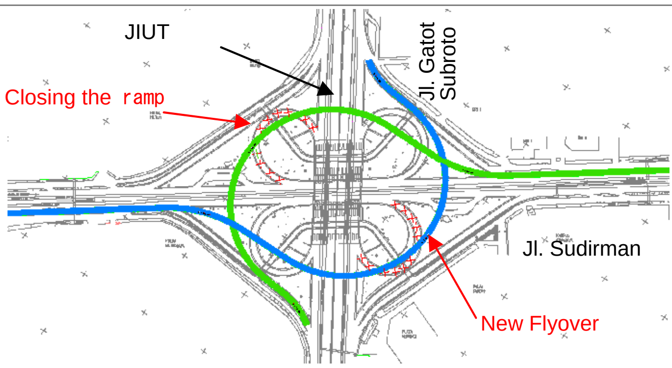
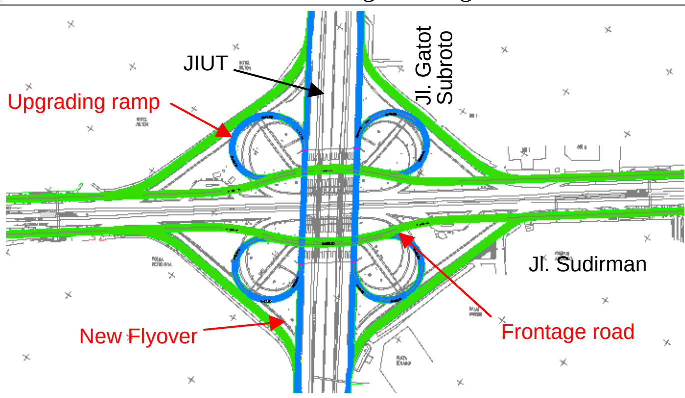
**Table 4.1.5 Relevant Roads of Semanggi Intersection**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Sudirman | Type-II/Class-I | 3x2 | 60km/h | Provincial road (DKI) |
| Jl. Gatot Subroto | Type-II/Class-I | 3x2 | 60km/h | National road (DGH) |
| JIUT | Type-I/Class-I | 3x2 | 80km/h | Toll road (Jasa Marga.) |

Source: DGH

Several kinds of countermeasures can be considered for improvement of the junction. However, many difficulties are also expected in terms of the structure, traffic control and construction. Based on the site investigation, three alternatives are proposed as the structural improvement as shown in Table 4.1.6.

**Table 4.1.6 Alternatives for the Improvement Plan of Semanggi Intersection**

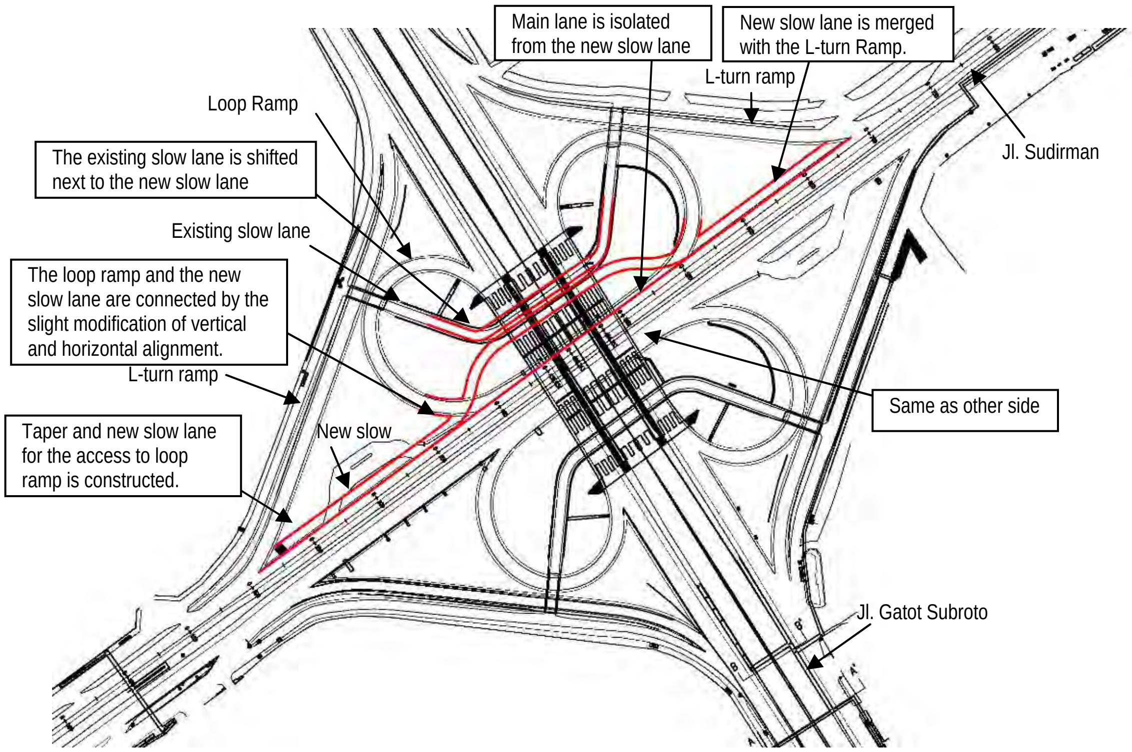
<table>
<tr><th>Alternatives</th><th>Outline</th></tr>
<tr><td rowspan="2">1. Flyover on merging lane of Jl. Gatot Subroto</td><td>• New construction of a flyover with 2 lanes in each direction outside Jl. Gatot Subroto for the merging lane to Jl. Sudirman<br>• Congestion of the straight through lane will be eased because the straight through lane of Jl. Gatot Subroto can be separated from the merging lane.</td></tr>
<tr><td>
</td></tr>
<tr><td rowspan="2">2. Installation of direct ramps</td><td>• Removal of two out of the four existing loop ramps and construction of two direct ramps (Flyover) instead<br>• Congestion of the straight through lane will be eased because the short weaving caused by two contiguous loop ramps which causes congestion of Jl. Gatot Subroto will be solved.</td></tr>
<tr><td>
</td></tr>
<tr><td rowspan="2">3. Extension of frontage road of Jl. Sudirman</td><td>• Construction of a straight through lane on the frontage road of Jl. Sudirman (It is impossible to go straight on the existing frontage road because it is divided by a junction.)<br>• Connection between the merging lane of Jl. Gatot Subroto and Jl. Sudirman frontage road with a loop ramp<br>• Congestion of the straight through lane will be eased because the merging ramp will not be connected to the straight through lanes of both roads.</td></tr>
<tr><td>
</td></tr>
</table>

Source: JICA Survey Team

For alternative 1 and 2, it is expected that the construction cost would be considerably high and take a long time for construction. On the other hand, the construction in alternative 3 is comparatively easy and the construction cost will be low. The image of alternatives 2 and 3 are as follows.


Source: JICA Survey Team

**Figure 4.1.2 Image of Improvement for Semanggi Intersection Alternative 2**




Source: JICA Survey Team

**Figure 4.1.3 Image of Improvement for Semanggi Intersection Alternative 3**

The method of improvement for Semanggi intersection needs to be studied based on not only the structural aspect but also the traffic analysis and environmental factors.

(2) Margonda Cinere

No specific study or design work has been conducted for this intersection. An underpass for both Jl. Margonda and Bogor railway line is proposed in the east-west direction next to JORR2. This design can achieve the grade separation not only at the intersection but also at the railway crossing point which is a request from DGR. It is difficult to propose the grade separation on Jl. Margonda because of planed JORR2.

However there are some issues raised with this design. The underpass will not function without road improvement on the west side where there is no existing road at present.

In addition, the output from the underpass construction will be affected as the traffic flow will be drastically changed by JORR2. However, even through JORR2 was proposed more than 10 years ago, the implementation schedule is still uncertain due to the land acquisition issue. Considering the construction method as well, it is desirable that the construction of the underpass will be implemented simultaneously or after the JORR2 construction.

**Table 4.1.7 Relevant Roads of Margonda Cinere**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Margonda | Type-II/Class-I | 3x2 | 60km/h | National road (DGH) |
| Jl. Ir H. Juanda | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |

Source: DGH

**Table 4.1.8 Project Condition of Margonda Cinere**

| | | |
|---|---|---|
| Structure type | | Underpass (Jl. Juanda and railway line) |
| Approximate length of structure | | 760m |
| Number of lanes | Main road | 2 lanes each way with median (W=22.0m) |
| | Frontage road | 1 lane each way |
| Existing study | | None |
| Railway crossing | | Bogor railway line |
| Issues | | Conflict with other project (JORR2) |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.4 Plan of Improvement for Margonda Cinere**

(3) Cililitan

The detailed design for an underpass in the east-west direction was already conducted by DGH in 2007. As the elevation around the intersection is higher than the surrounding area, an underpass is more suitable than an overpass. A pumping system for drainage must be provided for the underpass structure. The road on the east side, Jl. Cililitan Besar, which has only two narrow lanes needs to be improved for functioning in the trunk road network. The clearance with the canal to the west should be considered.

In terms of the underpass in the north-south direction, buried cables are an obstacle for construction. The replacement of existing bus way shelters and the pedestrian deck near the intersection is also necessary.

**Table 4.1.9 Relevant Roads of Cililitan**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Jend Sutoyo | Type-II/Class-I | 3x2 | 60km/h | National road (DGH) |
| Jl. Raya Bogor | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |
| Jl. Cililitan Besar | Type-II/Class-II | 1x2 | 40km/h | Provincial road (DKI) |
| Jl. Dewi Saritika | Type-II/Class-II | 2x2 | 60km/h | Provincial road (DKI) |

Source: DGH

**Table 4.1.10 Project Condition of Cililitan**

| | | |
|---|---|---|
| Structure type | | Underpass (Jl. Dewi Sartika and Jl. Cililitan Besar) |
| Approximate length of structure | | 430m |
| Number of lanes | Main road | 1 lane each way (W=13.0m) |
| | Frontage road | 1 lane each way |
| Existing study | | D/D (DGH:2007) |
| Railway crossing | | None |
| Issues | | Widening the Jl. Cililitan Besar |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.5 Plan of Improvement for Cililitan**

(4) R.E. Martadinata

The detailed design was conducted in the scheme of the project for Tanjung Priok Access Road (TgPA) in 2007. However, the construction of section W1 for TgPA is not yet started because of the escalated project cost. Therefore, the construction of the flyover was also cancelled for the same reason.

The 4-lane flyover over the bus terminal and railway track was proposed in the detailed design. The clearance for the railway track was secured according to the railway regulation but it is necessary to review the design since DGR has a plan to develop and extend the railway track. The bus terminal, which is severely congested by the conflict between through traffic and long-distance buses, needs to be developed in accordance with the flyover construction. Compatibility with the port access flyover proposed by PERIND2 was already coordinated in the detailed design.

It is anticipated that the construction will be quite difficult because the road is congested all the time and there are many illegally occupied shops around the bus terminal. Also, a countermeasure for the ground subsidence needs to be considered because subsidence has caused the road in front of the port to become undulated. The port gate at the west side of the bus terminal will be closed after the construction of the flyover.

**Table 4.1.11 Relevant Roads of R.E. Martadinata**

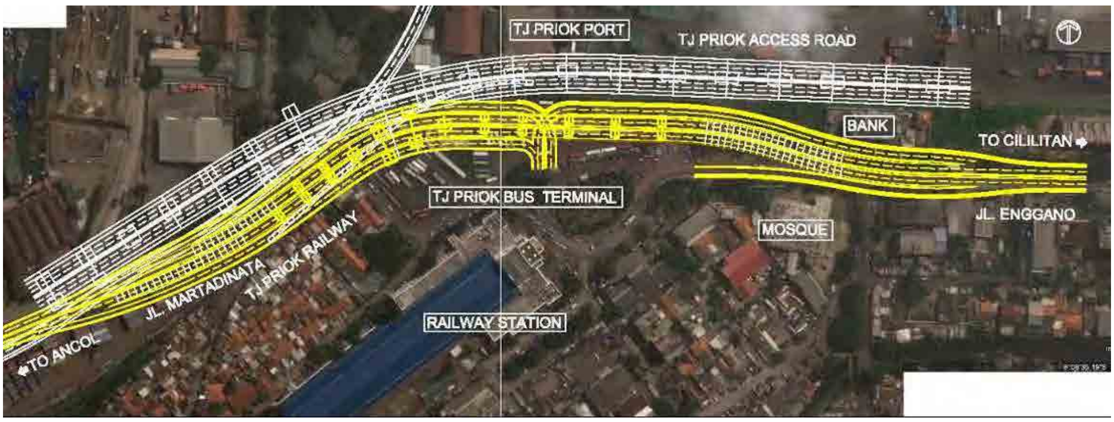
| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Enggano | Type-II/Class-II | 2x2 | 60km/h | National road (DGH) |
| Jl. Martadinata | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |

Source: DGH

**Table 4.1.12 Project Condition of R.E. Martadinata**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Martadinata) |
| Approximate length of structure | | 810m |
| Number of lanes | Main road | 2 lanes each way (W=9.5m x 2) |
| | Frontage road | 1 lane each way |
| Existing study | | D/D (2007: DGH) |
| Railway crossing | | Tanjung Priok railway line |
| Issues | | Coordination with bus terminal and railway station |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure 4.1.6 Plan of Improvement for R.E. Martadinata**

(5) Sulawesi - Tg.PA

The same as Martadinata, the detailed design was conducted in the scheme of the project for Tanjung Priok Access Road (TgPA) in 2007 and the construction of the flyover was removed from the loan package. The construction of TgPA N-S section above this intersection will be commenced within 2011.

A 2-lane flyover and frontage road parallel to TgPA was proposed. The length of the flyover will be long due to providing a U-turn lane. The right of way for the flyover and frontage road was secured within the scheme of the TgPA project.

As the arterial road will be cut at the railway crossing point, the vehicles from Jl. Enggano have to be diverted using a U-turn.

**Table 4.1.13 Relevant Roads of Sulawesi - Tg.PA**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Sulawesi | Type-II/Class-I | 3x2 | 60km/h | National road (DGH) |
| Jl. Yos Sudarso | Type-II/Class-I | 3x2 | 60km/h | National road (DGH) |
| Jl. Enggano | Type-II/Class-II | 2x2 | 40km/h | National road (DGH) |
| Jl. Pelabuhan Raya | Type-II/Class-I | 3x2 | 60km/h | National road (DGH) |

Source: DGH

**Table 4.1.14 Project Condition of Sulawesi - Tg.PA**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Yos Sudarso and Jl. Sulawesi) |
| Approximate length of structure | | 740m |
| Number of lanes | Main road | 2 lanes each way (W=9.5m x 2) |
| | Frontage road | 2 lanes each way |
| Existing study | | D/D (2007: DGH) |
| Railway crossing | | Tanjung Priok railway line |
| Issues | | |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.7 Plan of Improvement for Sulawesi - Tg.PA**

(6) Latumentan

No study or design work has been conducted for this intersection. Two lane flyovers and frontage road with 1-lane for each direction are proposed as the grade separation for the railway crossing. The existing road on Jl. Makaliwe from the north passes between the piers of the bridge of JIUT so that the vertical and horizontal clearance needs to be carefully confirmed. The busway shelter will be relocated to the outside of the flyover section. According to DGR, as the improvement for double track to north side at this point will be started within 2011, the design must consider the clearance to provide enough width.

An underpass has also been considered but there are many difficulties for construction because of the underground foundations of the pier for JIUT.

In addition, there is a plan to underpass the railway in the future in accordance with the development of the MRT East-West line. If it is implemented, the flyover will be useless.

**Table 4.1.15 Relevant Roads of Latumentan**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Dr Makaliwe | Type-II/Class-I | 2x1 | 60km/h | Provincial road (DKI) |
| Jl. Satria | Type-II/Class-I | 2x1 | 60km/h | Provincial road (DKI) |
| Jl. Latumenten | Type-II/Class-I | 2x1 | 60km/h | National road (DGH) |
| JIUT | Type-I/Class-I | 3x2 | 80km/h | Toll road (Jasa Marga) |

Source: DGH

**Table 4.1.16 Project Condition of Latumentan**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Makaliwe and Jl. Satria) |
| Approximate length of structure | | 500m |
| Number of lanes | Main road | 2 lanes each way (W=9.5m x 2) |
| | Frontage road | 1 lane each way |
| Existing study | | None |
| Railway crossing | | Tangerang railway line |
| Issues | | Conflict with other project (MRT)<br>Replacement of bus shelter |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.8 Plan of Improvement for Latumentan**

(7) Sudirman - Daan Mogot

A 4-lane flyover with 2-lane frontage roads is proposed over 2 existing roads in the east-west direction with the river bridge on Jl. Sudirman and Jl. Pembangunan 3. It would be difficult to construct an underpass due to the river crossing. The existing bridge will be replaced based on the alignment of the frontage road. Both of the schools located near Jl. Sudirman will be control points for setting the alignment.

It is necessary to widen Jl. Pembangunan 3, which is currently a narrow 2-lane up to the international airport to avoid its becoming a bottleneck.

**Table 4.1.17 Relevant Roads of Sudirman - Daan Mogot**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl.Pembangunan3 | Type-II/Class-II | 2x2 | 60km/h | Provincial road (Tangerang) |
| Jl. Sudirman | Type-II/Class-I | 4x2 | 60km/h | National road (DGH) |
| Jl. Boraq | Type-II/Class-I | 2x1 | 60km/h | Provincial road (Tangerang) |
| Jl. Daan Mogot | Type-II/Class-I | 2x1 | 60km/h | National road (DGH) |

Source: DGH

**Table 4.1.18 Project Condition of Sudirman - Daan Mogot**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Sudirman and Jl. Pembangunan 3) |
| Approximate length of structure | | 550m |
| Number of lanes | Main road | 2 lanes each way with median (W=17.6m) |
| | Frontage road | 1 lane each way |
| Existing study | | D/D (2008: Banten Province) |
| Railway crossing | | None |
| Issues | | Widening of Jl. Pembangunan 3 |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.9 Plan of Improvement for Sudirman - Daan Mogot**

(8) Kuningan

A feasibility study was conducted by DGH and an underpass on Jl. Rasuna Side was selected as the best alternative. It is impossible to apply a flyover because of the elevated toll road.

The total length of the underpass will reach about 650m to cover Jl. Gatot Subroto. The main road will consist of three lanes each way, plus a busway, additionally, 2 lane frontage roads will be provided on each side for the entire section. As the underpass will be constructed under the elevated structures of JIUT and Jl. Kapten Tendean, it is necessary to consider the construction method for safety.

The busway shelters and the pedestrian decks presently located near both intersections need to be relocated to the outside of the underpass section.

**Table 4.1.19 Relevant Roads of Kuningan**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Gatot Subroto | Type-II/Class-I | 3x2 | 60km/h | National road (DGH) |
| Jl. Rasuna Said | Type-II/Class-II | 3x2 | 60km/h | Provincial road (DKI) |
| Jl. Kapten Tendean | Type-II/Class-II | 2x2 | 60km/h | Provincial road (DKI) |
| Jl. Mampang Praratan | Type-II/Class-II | 3x2 | 60km/h | Provincial road (DKI) |
| JIUT | Type-I/Class-I | 3x2 | 80km/h | Toll road (Jasa Marga) |

Source: DGH

**Table 4.1.20 Project Condition of Kuningan**

| | | |
|---|---|---|
| Structure type | | Underpass (Jl. Rasuna Said and Jl. Mampang Praratan) |
| Approximate length of structure | | 940m |
| Number of lanes | Main road | 2 lanes each way plus a busway with median (W=29.0m) |
| | Frontage road | 2 lanes each way |
| Existing study | | F/S (2006: DGH) |
| Railway crossing | | None |
| Issues | | Relocation of bus shelter |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.10 Plan of Improvement for Kuningan**

(9) Pancoran

No study or design work has been conducted for Pancoran intersection. A flyover with 2-lanes and a 2-lane frontage road on the west bound side of the same type as on the opposite side is proposed. As a high-rise building is near the existing road, the alignment and road width will be carefully designed for avoiding compensation. The On ramp for JIUT, 300m to the west of the intersection, is also a control point.

The busway shelter must be relocated when the flyover is constructed. If the shelter is shifted to under the new flyover, the bus way will pass on the frontage road. It is almost impossible to raise the busway shelter to the same level as flyover due to the restriction of the alignment of JIUT.

**Table 4.1.21 Relevant Roads of Pancoran**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Gatot Subroto | Type-II/Class-I | 3x2 | 60km/h | National road (DGH) |
| Jl. Raya Pasar Minggu | Type-II/Class-II | 2x2 | 60km/h | Provincial road (DKI) |
| Jl. Supomo | Type-II/Class-II | 2x2 | 60km/h | Provincial road (DKI) |
| JIUT | Type-I/Class-I | 3x2 | 80km/h | Toll road (Jasa Marga) |

Source: DGH

**Table 4.1.22 Project Condition of Pancoran**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Gatot Subroto) |
| Approximate length of structure | | 530m |
| Number of lanes | Main road | 2 lanes for 1 direction (East to West) (W=9.5m) |
| | Frontage road | 1 lane |
| Existing study | | None |
| Railway crossing | | None |
| Issues | | Land acquisition |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.11 Plan of Improvement for Pancoran**

(10) Cilandak

No study or design work has been conducted for Cilandak intersection. Considering the terrain condition, an underpass with 2 lanes each way at the same level as JORR and a frontage road with 1-lane in each direction are proposed. The specific geometric issues are not known but the construction of the underpass and box culverts adjacent to the existing retaining wall for JORR seems as though it would be difficult.

**Table 4.1.23 Relevant Roads of Cilandak**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Cilandak KKO | Type-II/Class-II | 2x2 | 60km/h | Provincial road (DKI) |
| Jl. Ampera Raya | Type-II/Class-II | 1x2 | 60km/h | Provincial road (DKI) |
| Jl. TB Simatupang | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |
| JORR | Type-I/Class-I | 3x2 | 80km/h | Toll road<br>(Jalan Lingrar luar Jakarta) |

Source: DGH

**Table 4.1.24 Project Condition of Cilandak**

| Structure type | | Underpass (Jl. TB Simatupang) |
|---|---|---|
| Approximate length of structure | | 370m |
| Number of lanes | Main road | 2 lanes each way (W=10.5m x 2) |
| | Frontage road | 1 lane each way |
| Existing study | | None |
| Railway crossing | | None |
| Issues | | Construction difficulty |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.12 Plan of Improvement for Cilandak**

(11) Fatmawati

No study or design work has been conducted for Fatmawati intersection. A flyover with 2 lanes each way and frontage road with 1-lane each way are proposed for Jl. TB Simatupang. It is necessary to consider the clearance with the houses, buildings and the gas station at the south side of the road.

The specific geometric issues are not known. But the most significant issue is the MRT which is planned to pass over the JORR. The basic design was completed and the detailed design will start in 2011 after the tender evaluation.

It is better to postpone the construction of the flyover until the MRT opens because the adjustment with the MRT will be difficult and the traffic flow is expected to change due to the transportation development.

**Table 4.1.25 Relevant Roads of Fatmawati**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Fatumawati | Type-II/Class-II | 2x2 | 60km/h | Provincial road (DKI) |
| Jl. TB Simatupang | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |
| JORR | Type-I/Class-I | 3x2 | 80km/h | Toll road<br>(Jalan Lingrar luar Jakarta) |

Source: DGH

**Table 4.1.26 Project Condition of Fatmawati**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl.TB Simatupang) |
| Approximate length of structure | | 450m |
| Number of lanes | Main road | 2 lanes each way (W=9.5m x 2) |
| | Frontage Road | 1 lane each way |
| Existing study | | None |
| Railway crossing | | None |
| Issues | | Conflict with other project (MRT) |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.13 Plan of Improvement for Fatmawati**

(12) Ciawi - Bogor

No study or design work has been conducted for Ciawi-Bogor intersection. A flyover with 2-lanes and frontage road on Jl. Raya Sukabumi is proposed. The alignment of the flyover is curved following along the existing road. Jl. Raya Sukabumi on the south side of the intersection is a narrow 2-lane so it could be a bottleneck.

There are two development plans in the area, the Rencana Jalan Toll (extension of Jagorawi Toll Road) and Bogor Ring Road. Much traffic will be diverted to them and the traffic condition will be changed after the construction of both roads.

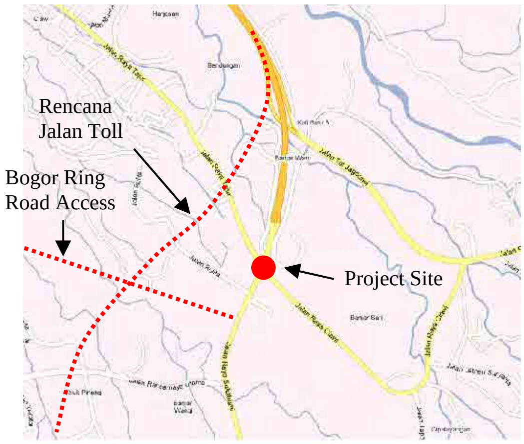



**Figure 4.1.14 Road Development Plan (Ciawi)**

**Table 4.1.27 Relevant Roads of Ciawi - Bogor**

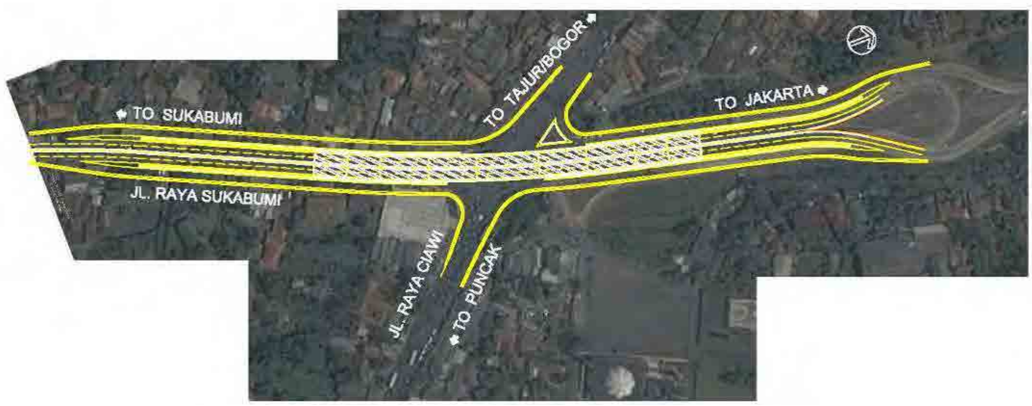
| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Raya sukabumi | Type-II/Class-I | 1x2 | 60km/h | National road (DGH) |
| Jl. Raya Ciawi | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |
| Jagorawi Toll Road | Type-I/Class-I | 3x2 | 80km/h | Toll road (Jasa Marga) |

Source: DGH

**Table 4.1.28 Project Condition of Ciawi - Bogor**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl.Raya Sukabumi) |
| Approximate length of structure | | 540m |
| Number of lanes | Main road | 2 lanes each way with median (W=17.6m) |
| | Frontage road | 1 lane each way |
| Existing study | | None |
| Railway crossing | | None |
| Issues | | Conflict with other projects<br>(Jagorawi Toll road and Bogor Ring Road) |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure 4.1.15 Plan of Improvement for Ciawi – Bogor**

(13) Pinang Baris

The detailed design of a 4-lane flyover with a 2-lane frontage road on the each side on Jl. Gatot Subroto was completed for Pinang Baris intersection by DGH. The road width and alignment should be designed taking into consideration the right of way because many houses and buildings are settled along the existing road. The bridge and clock tower at the west side of the intersection are control points for the road design.

**Table 4.1.29 Relevant Roads of Pinang Baris**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Gatot Subroto | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |
| Jl. Klambir 5 | Type-II/Class-II | 1x2 | 60km/h | Provincial road (Medan) |
| Jl. Pinang Baris | Type-II/Class-II | 3x2 | 60km/h | Provincial road (Medan) |

Source: DGH

**Table 4.1.30 Project Condition of Pinang Baris**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Gatot Subroto) |
| Approximate length of structure | | 540m |
| Number of lanes | Main road | 2 lanes each way with median (W=17.6m) |
| | Frontage road | 1 lane each way |
| Existing study | | D/D (2007: DGH) |
| Railway crossing | | None |
| Issues | | Land acquisition |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.16 Plan of Improvement for Pinang Baris**

(14) Asrama - Gatot Subroto

No study or design work has been conducted for Asrama-Gatot Subroto intersection. A 4-lane flyover with 2-lane frontage road for Jl. Gagak Hitam, Medan Ring Road, is proposed. The intersection is already improved with an exclusive left-turn lane split by a traffic island.

The specific geometric issues are not known as it is a simple cross intersection. The grade separation on Medan Ring Road is the strategy for Medan development.

**Table 4.1.31 Relevant Roads of Asrama - Gatot Subroto**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Gatot Subrot | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |
| Jl. Asrama | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |
| Jl. Gagak Hitam | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |

Source: DGH

**Table 4.1.32 Project Condition of Asrama - Gatot Subroto**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Gagak Hitam) |
| Approximate length of structure | | 530m |
| Number of lanes | Main road | 2 lanes each way with median (W=17.6m) |
| | Frontage road | 1 lane each way |
| Existing study | | None |
| Railway crossing | | None |
| Issues | | |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.17 Plan of Improvement for Asrama - Gatot Subroto**

(15) Katamso

A 4-lane underpass on Jl. AH Nasution is proposed in the feasibility study conducted by DGH. In the F/S, the total length of the underpass reaches 1.0km due to covering both intersections and the single track railway which is about 400m to the east.

According to the site investigation, the underpass is proposed only for the intersection because the railway is currently not in operation and the reactivation schedule is uncertain. It is possible to extend the underpass structure for the railway in the future.

The distance between the river and the intersection is critical for vertical alignment because it is only about 140m which is short to secure the required gradient.

**Table 4.1.33 Relevant Roads of Katamso**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. AH Nasution | Type-II/Class-I | 2x2 | 60km/h | National road (DGH) |
| Jl. Biru-Biru | Type-II/Class-I | 2x2 | 60km/h | Provincial road (Medan) |
| Jl. Katamso | Type-II/Class-I | 2x2 | 60km/h | Provincial road (Medan) |

Source: DGH

**Table 4.1.34 Project Condition of Katamso**

| | | |
|---|---|---|
| Structure type | | Underpass (Jl. AH Nasution) |
| Approximate length of structure | | 280m |
| Number of lanes | Main road | 2 lanes each way with median (W=22.0m) |
| | Frontage road | 1 lane each way |
| Existing study | | F/S (2010: DGH) |
| Railway crossing | | None (400m from Non-operation railway on East) |
| Issues | | Distance to the river (East) |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.18 Plan of Improvement for Katamso**

(16) Sudirman II

No study or design work has been conducted for Sudirman II intersection. A 4-lane flyover with 2-lane frontage roads is proposed over the T-shaped intersection and railway crossing. As the Tangerang railway will be developed for double tracks to the south side, the vertical alignment will be decided considering the clearance.

After the flyover is constructed, the frontage road ends at the railway crossing and will be provided with a U-turn lane. The bus way and shelter around the flyover will also be changed.

**Table 4.1.35 Relevant Roads of Sudirman II**

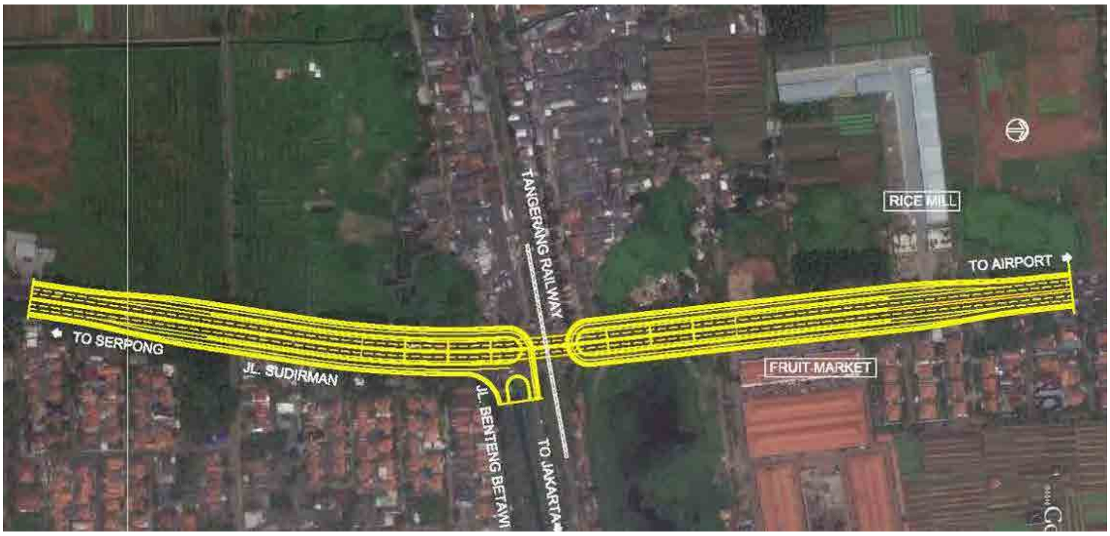
| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Sudirman | Type-II/Class-I | 4x2 | 60km/h | National road (DGH) |
| Jl. Benteng Betawi | Type-II/Class-II | 2x2 | 40km/h | Provincial road (Tangerang) |

Source: DGH

**Table 4.1.36 Project Condition of Sudirman II**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Sudirman) |
| Approximate length of structure | | 550m |
| Number of lanes | Main road | 2 lanes each way with median (W=17.6m) |
| | Frontage road | 1 lane each way |
| Existing study | | None |
| Railway crossing | | Tangerang railway line |
| Issues | | |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure 4.1.19 Plan of Improvement for Sudirman II**

(17) Cikarang

Cikarang project is composed of improvement of Jl. Raya Kalimalang and 3 local roads crossing Cikampek Toll Road in the north-south direction.

1) Jl. Raya Kalimalang

According to the site investigation, the proposed upgrade is for rigid pavement for the 2-lane, 7.3km long Jl. Raya Kalimalang from the intersection with Jl. Access from Toll Cibitung to Jl. Cibarusah is preferable for prompt implementation because there are pipelines along the road for the entire section and some houses remain adjacent to the road. The intersection for

Jl Cibarusah will be improved with grade separation by the application of a 2-lane flyover on Jl. Kalimalang.

The widening to 4-lanes for 13km of Jl. Kalimalang from Jl. Access from Toll Cibitung to Jl. Tegal Cadas is proposed as a future development. At that time, it will be necessary to acquire additional land, replace the pipeline, improve the intersection, widen the flyover on Jl. Cibarusah and expand the existing bridge on Cikarang River.

2) Jl. Bari-Cibitung

The scope of this project is about 1.3km of road improvement and bridge construction on the toll road. As the 2-lane road surface is damaged in some parts, repair with rigid pavement is required. The bridge with 1.5-lanes above Cikampek Toll Road will be widened to 2-lanes by the construction of a new bridge to avoid the bottleneck on the current bridge.

3) Jl. Imam Bonjol 4

The scope of the project is about 1.6km of road improvement and bridge construction over Kalimalang River. The existing bridge of Jl. Imam Bonjol 4 over the river is old and not wide enough. In addition, as the road alignment is not smooth enough for a trunk road, the alignment is to be modified and a new bridge is to be constructed on the new alignment. A part of the road surface on Jl. Imam Bonjol 4 needs to be improved. The bridge on Cikampek Toll Road will remain so that it has 2 adequate lanes.

4) Dry Port Access Road

The construction of a dedicated road, the Dry Port Access Road, connecting the new interchange around the 29km post on Cikampek Toll Road and the Dry Port is on-going. This road is scheduled to open in the beginning of 2012.

A new road is proposed to connect this road with the industrial area to the south of Cikampek Toll Road. According to Jababeka, which designed and constructed the Dry Port Access Road, this road is dedicated for the cargo trucks and is not considered as access to the southern area of the industrial area as of now. The intersection for the Dry Port Access Road with the new road to the southern area should be located outside of the new toll gate to control the traffic. As there are many issues for the road and bridge construction, traffic management and land acquisition, a solution should be found based on the discussions by the stakeholders, such as DGH, each industrial park and Bekasi Regency.

The plan of the Dry Port Access Road and candidate new road is shown in Figure 4.1.23.

**Table 4.1.37 Relevant Roads of Cikarang**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Raya Kalimalang | Type-II/Class-III | 2x1 | 40km/h | Provincial road (Bekasi) |
| Jl. Bali-Cibitung | Type-II/Class-III | 2x1 | 40km/h | Provincial road (Bekasi) |
| Jl. Imam Bonjol 4 | Type-II/Class-III | 2x1 | 40km/h | Provincial road (Bekasi) |
| Road for Dry Port Access Road | Type-II/Class-III | 1x1 | 40km/h | Provincial road (Bekasi) |

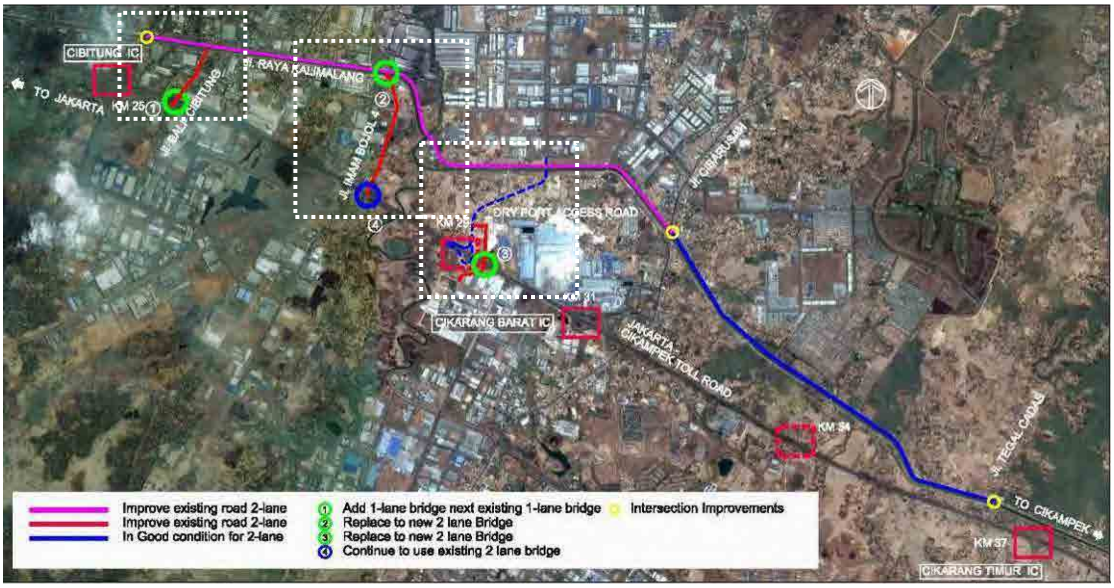
Source: DGH

**Table 4.1.38 Project Condition of Cikarang**

| Structure type | | Road improvement (Jl. Karimalan) and 3 bridges |
|---|---|---|
| Approximate length of improvement | | Jl. Kalimalang: 7.3km (Road improvement)<br>Jl. Bali-Cibitung: Road rehabilitation + 1 bridge<br>Jl. Imam Bonjol 4: 1.6km<br>New road connecting to Jababeka road: N/A |
| Number of lanes | Main road | Jl. Kalimalang: 1 lane each way (W=14.0m)<br>Other roads: 1 lane each way (W=8.0m) |
| | Frontage road | - |

| | |
|---|---|
| Existing study | None |
| Railway crossing | None |
| Issues | Land acquisition<br>Coordination with Dry Port Access Road plan |

Source: JICA Survey Team




Source: JICA Survey Team

**Figure 4.1.20 Plan of Improvement for Cikarang**


Source: JICA Survey Team

**Figure 4.1.21 Plan of Improvement for Jl. Bali-Cibitung**


Source: JICA Survey Team

**Figure 4.1.22 Plan of Improvement for Jl. Imam Bonjol 4**


Source: JICA Survey Team

**Figure 4.1.23 Plan of Improvement Dry Port Access Road**

(18) Senayan

No study or design work has been conducted for Senayan intersection. In order to separate the traffic from Jl. Patimura to Jl. Sudirman away from the roundabout, a 2-lane flyover in one direction is proposed above the roundabout. The flyover passes over within the area of road property to avoid land acquisition and the distance between the flyover and the statue next to the pond is about 40m.

As Jl. Patimura is narrow to accommodate the flyover and 1-lane frontage road, the width of the flyover with frontage needs to be diminished as much as possible. The frontage road of Jl. Sudirman is shifted to the outside because the flyover merges next to the left side of the fast lane.

The busway shelter needs to be shifted depending on the alignment of the flyover.

**Table 4.1.39 Relevant Roads of Senayan**

| Road name | Road class | Lanes | Design speed | Administration |
|---|---|---|---|---|
| Jl. Asia-Africa | Type-II/Class-I | 2x2 | 60km/h | Provincial road (DKI) |
| Jl. Senopati | Type-II/Class-I | 2x2 | 60km/h | Provincial road (DKI) |
| Jl. Sisingmangaraja | Type-II/Class-I | 2x2 | 60km/h | Provincial road (DKI) |
| Jl. Patimura | Type-II/Class-I | 2x2 | 60km/h | Provincial road (DKI) |
| Jl. Sudirman | Type-II/Class-I | 3x2 | 60km/h | Provincial road (DKI) |

Source: DGH

**Table 4.1.40 Project Condition of Senayan**

| | | |
|---|---|---|
| Structure type | | Overpass (Jl. Sudirman to Jl. Patimura) |
| Approximate length of structure | | 730m |
| Number of lanes | Main road | 2 lanes for 1 direction (W=9.5m) |
| | Frontage road | 1 lane |
| Existing study | | None |
| Railway crossing | | None |
| Issues | | Land acquisition<br>Clearance with the statue |

Source: JICA Survey Team


Source: JICA Survey Team

**Figure 4.1.24 Plan of Improvement for Senayan**

### 4.1.3 Summary of Preliminary Design

The summary of preliminary design is shown in Table 4.1.41.

Note that the information will be revised by the result of the study in the 2nd stage. Especially, the improvement method for Semanggi will be determined based on the traffic analysis and the structure length will be varied after setting of the vertical alignment and the bridge design.

**Table 4.1.41 Summary of Preliminary Design**

| Potential projects | FO/UP | Approx. structure length | | Number of lanes and width | | Existing study | Railway Crossing |
|---|---|---|---|---|---|---|---|
| | | Overall | Bridge | Main road | Frontage road | | |
| 1 Semanggi | - | - | - | - | - | | |
| 2 Margonda Cinere | UP | 760m | - | 2x2 (22.0m) | 1 | | ● |
| 3 Cililitan | UP | 430m | - | 1x2 (13.0m) | 1 | D/D (2007) | |
| 4 R.E. Martadinata | FO | 570m | 370m | 2x2 (19.0m) | 1 | D/D (2007) | ● |
| 5 Sulawesi - Tg.PA | FO | 550m | 350m | 2x2 (19.0m) | 2 | D/D (2007) | ● |
| 6 Latumenten | FO | 500m | 270m | 2x2 (19.0m) | 1 | | ● |
| 7 Sudirman-Daan Mogot | FO | 550m | 300m | 2x2 (17.6m) | 2 | D/D (2008) | |
| 8 Kuningan | UP | 940m | - | 2x2 (22.0m) | 1 | F/S (2006) | |
| 9 Pancoran | FO | 530m | 270m | 2x1 (9.5m) | 1 | | |
| 10 Cilandak | UP | 370m | - | 2x2 (21.0m) | 1 | | |
| 11 Fatmawati | FO | 450m | 250m | 2x2 (19.0m) | 1 | | |
| 12 Ciawi-Bogor | FO | 540m | 290m | 2x2 (17.6m) | 1 | | |
| 13 Pinang Baris | FO | 540m | 220m | 2x2 (17.6m) | 1 | D/D (2007) | |
| 14 Asrama-Gatot Subroto | FO | 530m | 280m | 2x2 (17.6m) | 1 | | |
| 15 Katamso | UP | 280m | - | 2x2 (22.0m) | 1 | F/S (2010) | |
| 16 Sudirman II | FO | 550m | 300m | 2x2 (17.6m) | 1 | | ● |
| 17 Cikarang | 1 EW road 3 NS road | 7.3km | 450m | 1x2 (14.0m) | - | | |
| 18 Senayan | FO | 730m | 380m | 2x1 (9.5m) | 1 | | |

Source: JICA Survey Team

Note: The figure in the “number of lanes on main road” shows the number of lanes and directions

### 4.1.4 Basic Design of Roads and Intersections

The basic design of roads and intersections is conducted for 10 sub-projects selected in the 1st stage. First of all, the preliminarily designs are reviewed based on the topographic condition, traffic analysis and discussion with the MPW and DKI. The basic design is carried out and the drawings are prepared for the most suitable plan. The list of sub-projects is shown in Table 4.1.42.

**Table 4.1.42 List of Sub-projects**

| Sub-projects | | Location | Existing study | Railway crossing |
|---|---|---|---|---|
| 1 | Semanggi | DKI | | |
| 4 | R.E. Martadinata | DKI | D/D (2007) | ● |
| 5 | Sulawesi - Tg.PA | DKI | D/D (2007) | ● |
| 8 | Kuningan | DKI | F/S (2006) | |
| 9 | Pancoran | DKI | | |
| 13 | Pinang Baris | Medan | D/D (2007) | |
| 15 | Katamso | Medan | F/S (2010) | |
| 16 | Sudirman II | Tangerang City | | ● |
| 17 | Cikarang | Bekasi Regency | | |
| 18 | Senayan | DKI | | |

Source: JICA Survey Team

The design concept for each sub-project including the improvement method, the control points, the alignment and the number of lanes and the structure type which are determined after a series of discussions with the MPW and local governments are described as follows. A set of drawings are attached in the Appendix.

The design criteria for the preliminary design described in 4.1.1 is applied on the basic design as well.

(1) Semanggi

1) Study of suitable improvement

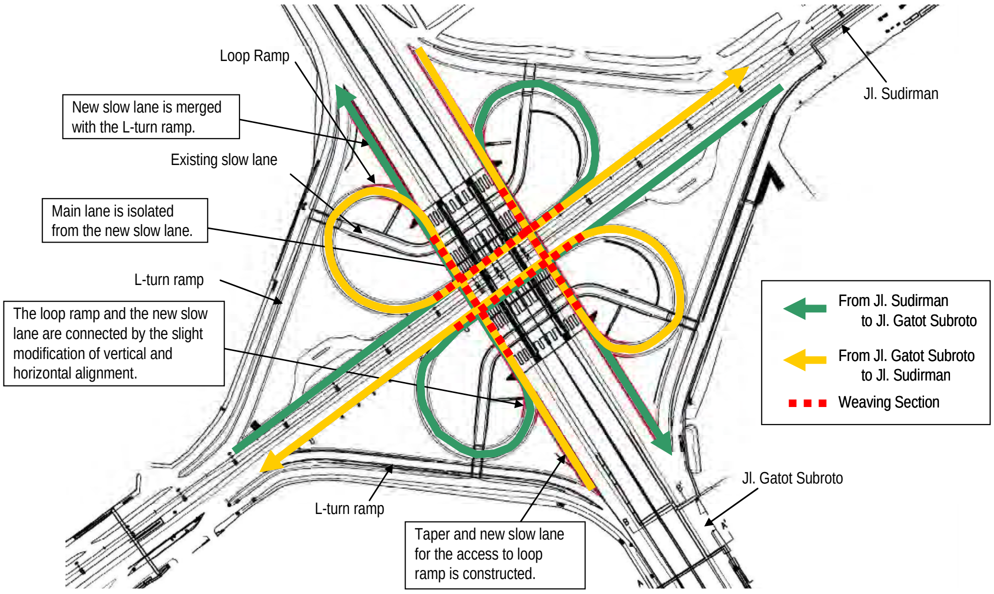
a) Alternatives

As Semanggi intersection is located in the midst of a metropolitan area, the improvement needs to be basically conducted in the area of the road and intersection property to avoid land acquisition. According to the site investigation, the following 5 alternatives are proposed.

- <u>Alternative 1: Construction of additional lanes along Jl. Gatot Subroto (Bridge)</u>

  Main point of alternative 1 is to provide a new lane along and outside of Jl. Gatot Subroto which is constructed with a bridge and high embankment. The plan is shown in Figure 4.1.25.

  Traffic capacity of Jl. Gatot Subroto will increase and the weaving section for the loop ramps could be isolated from the main traffic, which are the positive impacts. On the other hand, as it is difficult to make the elevation of the existing and new lane the same level because of the rigid structure of the existing bridge, traffic congestion may occur on the new lane with the 1-lane split from the existing lane. Furthermore, the radius of the loop ramp will be smaller which threatens the traffic safety.



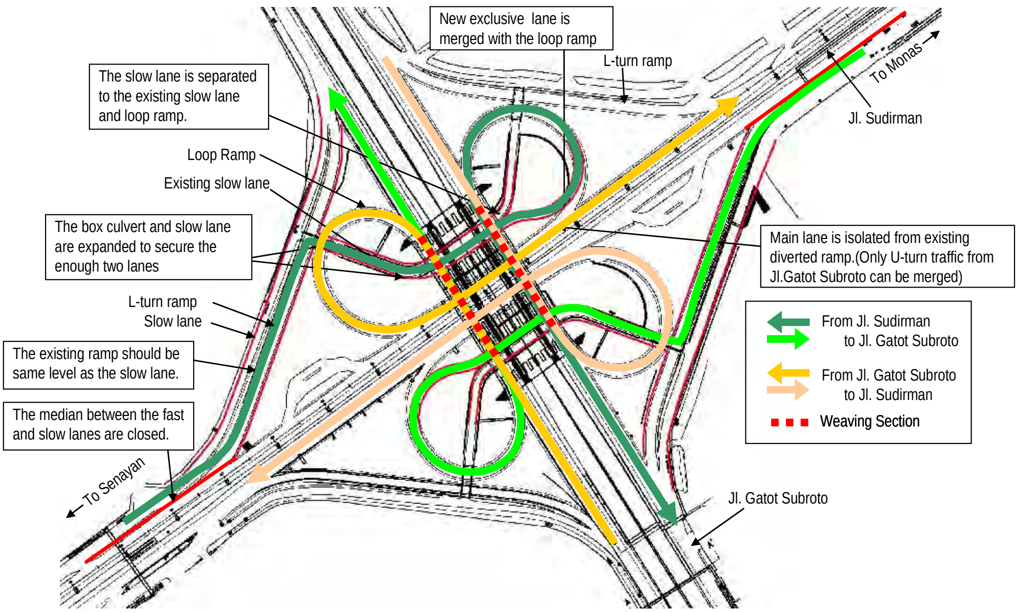

Source: JICA Survey Team

**Figure 4.1.25 Plan of Alternative 1**

- <u>Alternative 2-1: Improvement of slow lane and loop ramp (At-grade)</u>

  In contrast to Alternative 1, Alternative 2-1 is the plan to resolve the weaving section on Jl. Sudirman as shown in Figure 4.1.26. The main point is that the slow lane and left turn ramp from Jl. Sudirman to Jl. Gatot Subroto are merged and the slow lane in the junction connects directly to the existing loop ramp. The right turn traffic from Jl. Sudirman to Jl. Gatot Subroto passes through the slow lane and the loop ramp. The existing traffic flow from the main lane of Jl. Sudirman to the loop ramp will be closed but U-turn traffic from Jl.Gatot Subroto could still use the same route as now.

  By this improvement, the weaving section on Jl. Sudriman disappears which seems to be a significant improvement to mitigate the congestion. On the other hand, it will be a main concern that the turning traffic from Jl. Sudirman is mixed with the motorbike and local bus traffic on the same route.



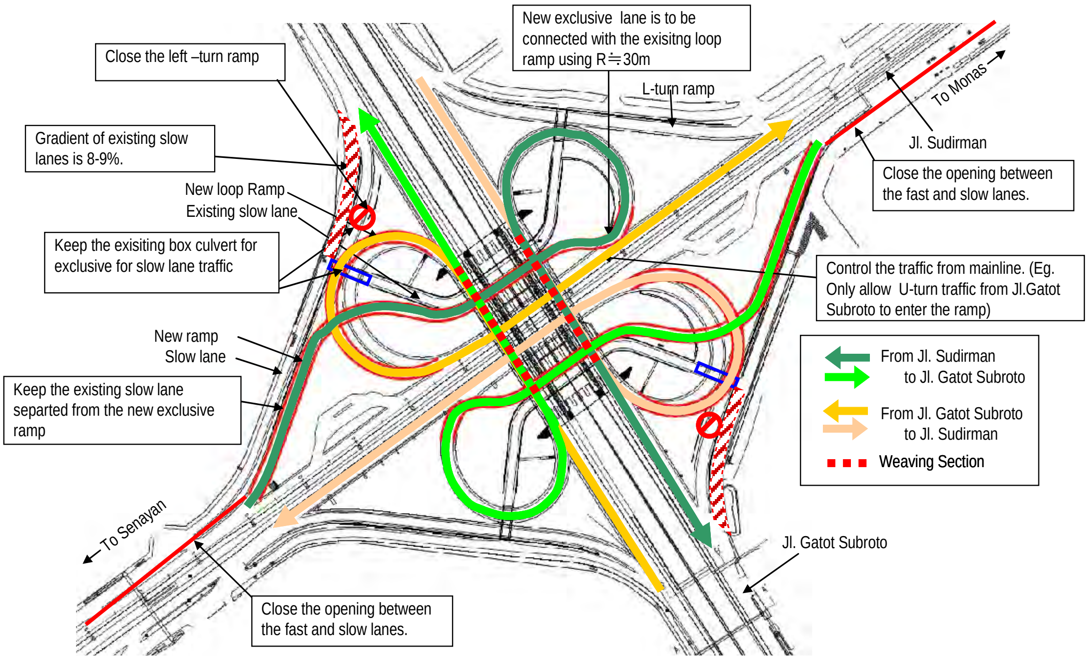

Source: JICA Survey Team

**Figure 4.1.26 Plan of Alternative 2-1**

- Alternative 2-2: Improvement of slow lane and loop ramp (At-grade)

  This plan is modified from Alternative 2-1. The left turn ramp from Jl.Sudirman to Jl. Gatot Subroto is closed and changed to a ramp for right turns which connects to the loop ramp. To secure the vertical clearance of the new ramp with the existing loop ramp, the radius of the loop ramp is made bigger and the new ramp is located lower than the ground level.

  In this improvement, the left turn ramp is merged into the slow lane. To utilize the existing box culvert, the gradient of the slow lane remains about 8% which is very steep for the left turn ramp. As the elevation of the new ramp is lower than the ground level, it is necessary to provide a water pump to drain the rain water.



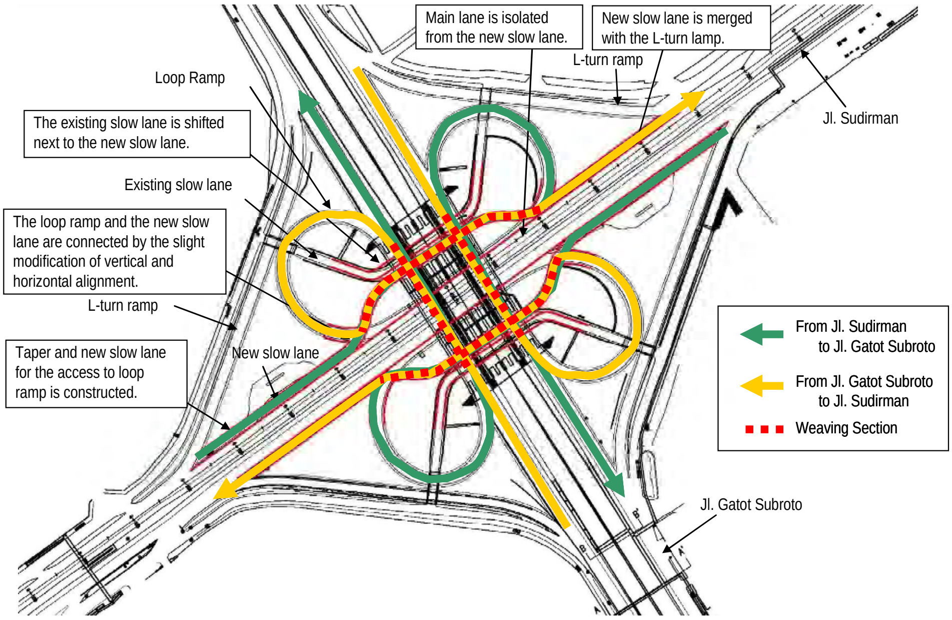

Source: JICA Survey Team

**Figure 4.1.27 Plan of Alternative 2-2**

- Alternative 3: Construction of additional lanes along Jl. Sudirman (At-grade)

  Like Alternative 2-2, a new lane for Jl. Sudirman is provided. The new lane is completely isolated from the existing main lane and passes under the next span of Jl. Gatot Subroto from the main lane due to the V-shape of the existing pier.

  The weaving section which is one of the reasons of traffic congestion is shifted on to the new lane. Therefore, the congestion on Jl. Sudirman for through traffic will be alleviated. However, it is expected that the traffic lane from the weaving section on the new lane will continue to the main lane. In addition, the connection of the loop ramp and the new lane needs to be changed to a smaller curve. The existing slow lane under the bridge will be shifted to make the space for the 2 new lanes.




Source: JICA Survey Team

**Figure 4.1.28 Plan of Alternative 3**

- <u>Alternative 4: Construction of new loop ramps (Flyover)</u>

  Unlike the other alternatives, this is a dynamic improvement plan. A new loop ramp on a flyover from Jl. Gatot Subroto to Jl. Sudirman will be constructed above the intersection. The plan is shown in Figure 4.1.29.

  The capacity of the interchange will be increased and the weaving section on Jl. Gatot Subroto and Jl. Sudirman will disappear with the addition of the additional ramps. However, it is difficult to secure the vertical clearance for the existing ramp. The construction cost is much higher and construction period much longer comparing with the other alternatives. In addition, the construction of elevated structures will damage the aesthetics of the clover-leaf junction which is a violation of environmental regulations of Indonesia.


Source: JICA Survey Team

**Figure 4.1.29 Plan of Alternative 4**

b) Comparison of alternatives

All alternatives are compared and evaluated based on several factors. As a result of the discussion with MPW and local governments, Alternative 2-2 was selected as the most suitable improvement for Semanggi Intersection.

The comparison table for alternatives is shown in Table 4.1.43. The features of the selected alternative plan are stipulated after the comparison.

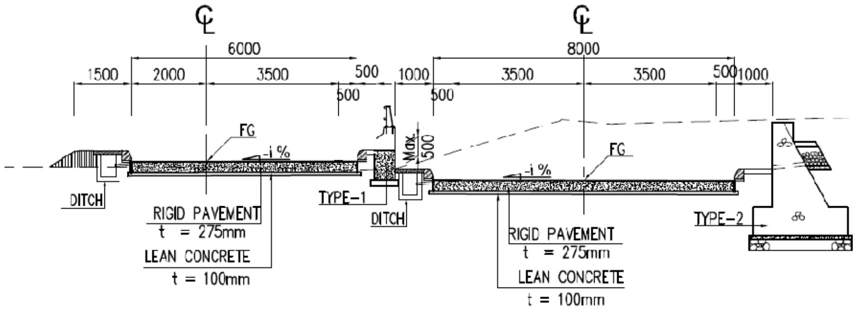
**Table 4.1.43 Comparison of Alternatives for Semanggi Intersection**

| | Alt.1 | Alt.2-1 | Alt.2-2 | Alt.3 | Alt.4 |
|---|---|---|---|---|---|
| Outline | Construction of additional lanes on Jl. Gatot Subroto | Improvement of slow lane and loop ramp | Ditto to left | Construction of additional lanes on Jl. Sudirman | Construction of new loop ramps |
| Structure | Widening by bridge | Grade separated | Ditto to left | At-grade | Grade spearted |
| Positive impacts | •The capacity of Jl.Gatot Subroto is increased.<br>•The weaving section is isolated from the main lane. | •The traffic going to Jl Gatot Subroto and for U-turn could be removed from the main lane of Jl. Sudirman to the slow lane.<br>•It will be no weaving section on Jl. Sudirman. | Ditto to left | •The capacity of Jl.Sudirman is increased.<br>•The weaving section is isolated from the main lane. | •The capacity of ramps is increased.<br>•The diverted ramp is isolated from Jl. Gatot Subroto.<br>•It will be no weaving section on Jl. Gatot Subroto. |
| Negative Impacts | •The weaving section is only independent 1 lane which may cause of traffic congestion.<br>•The curve radius of loop ramp becomes smaller. | •The traffic on the slow lane will be increased.<br>•The crossing under ramp and the slow lane need to be widened to secure the necessary lanes. | •The ramp for left turning will be merge with the slow lane. | •The weaving section becomes only independent 2 lanes which may cause of traffic congestion.<br>•The curve radius of new lane, especially at point of connection with new lane, is small. | •The steep slope is applied on ramp to secure the vertical clearance.<br>•The enormous structure may obstruct the aesthetic of symbolic intersection in the commercial area. |
| Cost (x100 mill yen) | 3.5 | 2.5 | 2.7 | 0.5 | 21.8 |
| Constructability | Difficult | Not difficult | | Easy | Very difficult |
| Traffic Control during Construction | •All the loop ramps are temporally closed when the alignment of ramp is changed. | •The loop ramps from Jl. Sudirman and the slow lane are temporally closed when the alignment of ramp is changed. | Add to left, the enlarge the radius of ramp needs temporarily closing. | •All loop ramps are temporally closed when the alignment of ramp is changed. | •The loop ramps are temporally closed when the alignment of ramp is changed. |
| Evaluation | + | ++ | +++ | ++ | + |

Source: JICA Survey Team

2) Cross section

The width of the 2-lanes for new ramp in 1 direction is 8.0m. The typical cross section is shown in Figure 4.1.30.




Source: JICA Survey Team

**Figure 4.1.30 Typical Cross Section of New Ramp of Semanggi Intersection**

3) Plan and profile

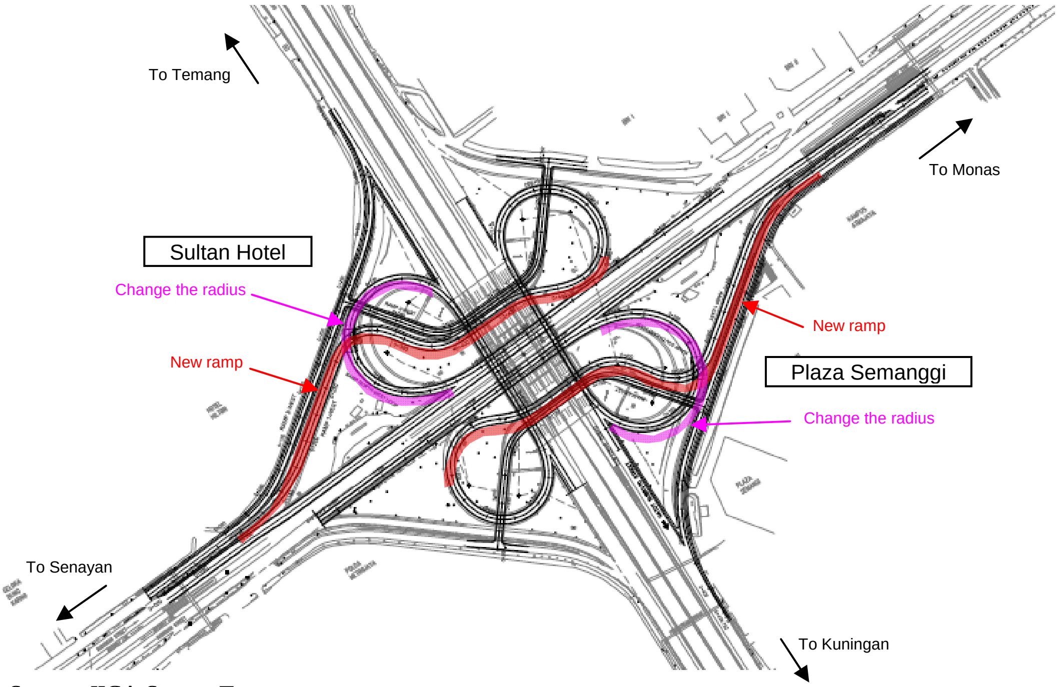
The characteristics and issues for the horizontal and vertical alignment are as follows.

a) Horizontal alignment

A new ramp starting from the existing left turn ramp and passing under the revised loop ramp with a small curve is newly constructed. Then, it is going to pass under the bridge of Jl. Gatot Subroto and connect the loop ramp with a small curve. The existing loop ramp from Jl. Gatot Subroto to Jl.Sudirman which will pass above the existing left-turn ramp is modified to enlarge the radius.

b) Vertical alignment

The gradient of the new ramp should be 2% parallel to the existing slow lane to secure the vertical clearance with the loop ramp. After crossing the loop ramp, the gradient is also 2% to return to the ground level. The gradient of the slow lane, which is also used as the left turn ramp, remains 8% to keep the existing box culvert available.




Source: JICA Survey Team

**Figure 4.1.31 Plan of Semanggi Intersection**

4) Other considerations

a) Traffic management

As traffic movement is changed after the modification of an intersection, it is necessary to conduct traffic management using traffic signs and/or police to avoid the confusion of the driver. Especially, the diverging point for the slow lane and turn ramp from Jl. Sudirman needs to be controlled to eliminate the misunderstanding of the drivers and the subsequent congestion.

b) Slow lane

The existing slow lane passing under the bridge of Jl.Gatot Subroto needs to be shifted to the opposite side of Jl. Sudirman about 5m to make space for the new ramp.

c) Utilities

It is required to relocate the utilities buried underground for the construction of the new ramp.

d) Drainage

The sag point of the new ramp is located underground to secure the vertical clearance. Consequently, it is necessary to install a water pump to drain the rain water properly.

(2) R.E. Martadinata

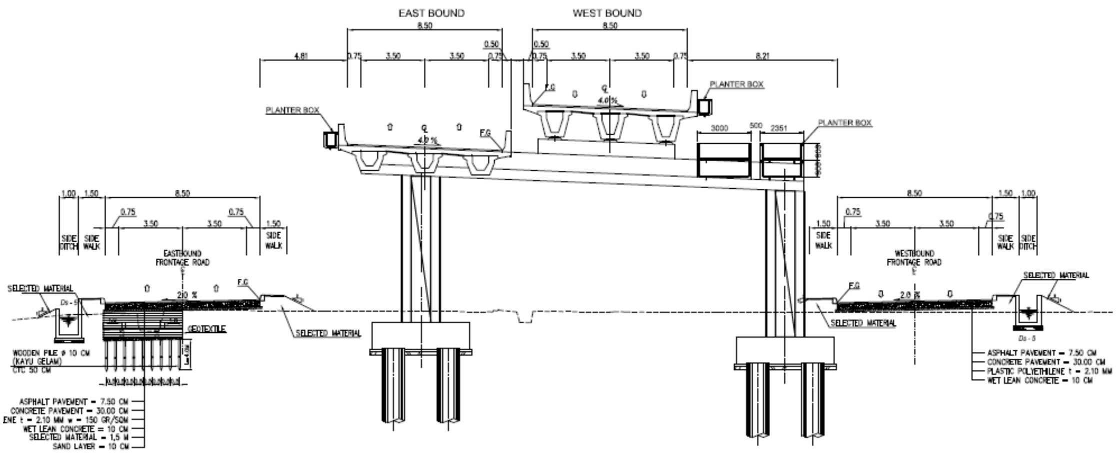
1) Concept of suitable improvement

As the project area is complicated and significantly congested, at-grade improvement is difficult. An underpass is also almost impossible due to the low land area and the soft ground referred as Table 4.1.44.

The detailed design of the arterial road with a flyover beyond the railway line and bus terminal was already carried out by the Tanjung Priok Access Road (TgPA) project. As the design result was coordinated with the other projects such as TgPA and Pasoso Flyover for the port, a flyover is selected as the suitable improvement.

2) Cross section

The flyover is composed of two separated directions and each direction has 2-lanes. In addition, frontage roads on both sides are provided to access the surrounding area at-grade level. The typical cross section is shown in Figure 4.1.32.

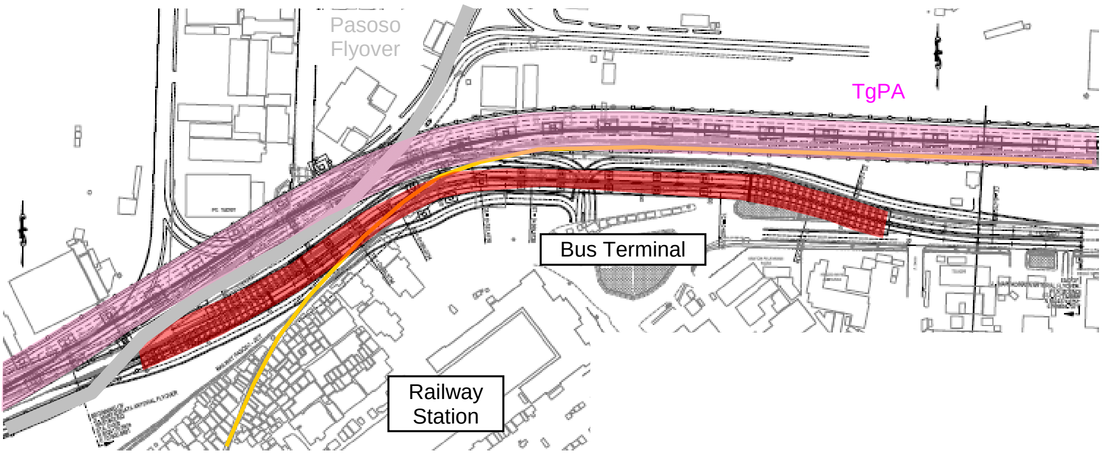



Source: Drawing of Tanjung Priok Access Road

**Figure 4.1.32 Typical Cross Section of R.E.Martadinata Flyover**

3) Plan and profile

A separated flyover connecting Jl. Martadinata with Jl. Enggano is planed above the railway line and the present bus terminal area. Frontage roads are provided on both sides of the flyover at-grade level and they cross the railway line.




Source: Drawing of Tanjung Priok Access Road

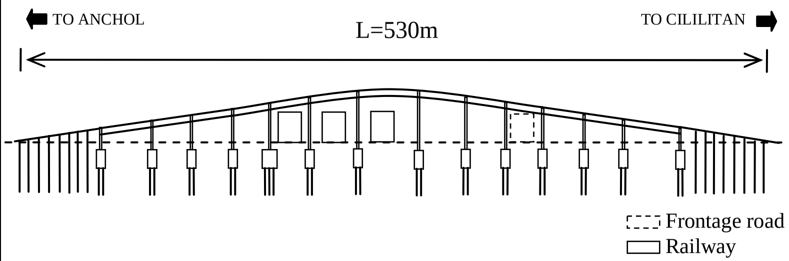
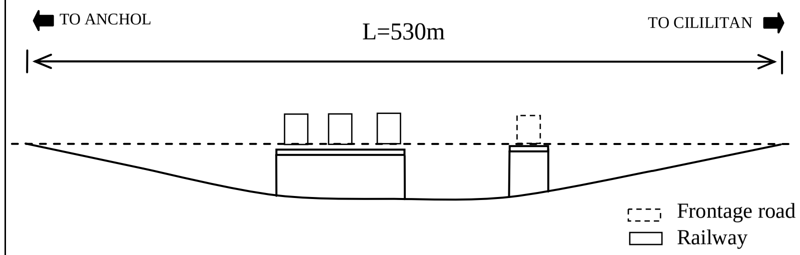
**Figure 4.1.33 Plan of R.E.Martadinata Flyover**

4) Other consideration

The road alignment of the flyover and frontage roads could be modified to adjust with the integrated bus terminal development plan currently being prepared by DKI.

For the local access and pedestrian movements, it will not be significantly changed after the improvement. Above all, the crossing conditions will be improved in terms of safety by using the space under the structure of flyover. The number of the crossing traffic at grade will also be reduced that would be safer than that of current conditions. Table 4.1.45 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

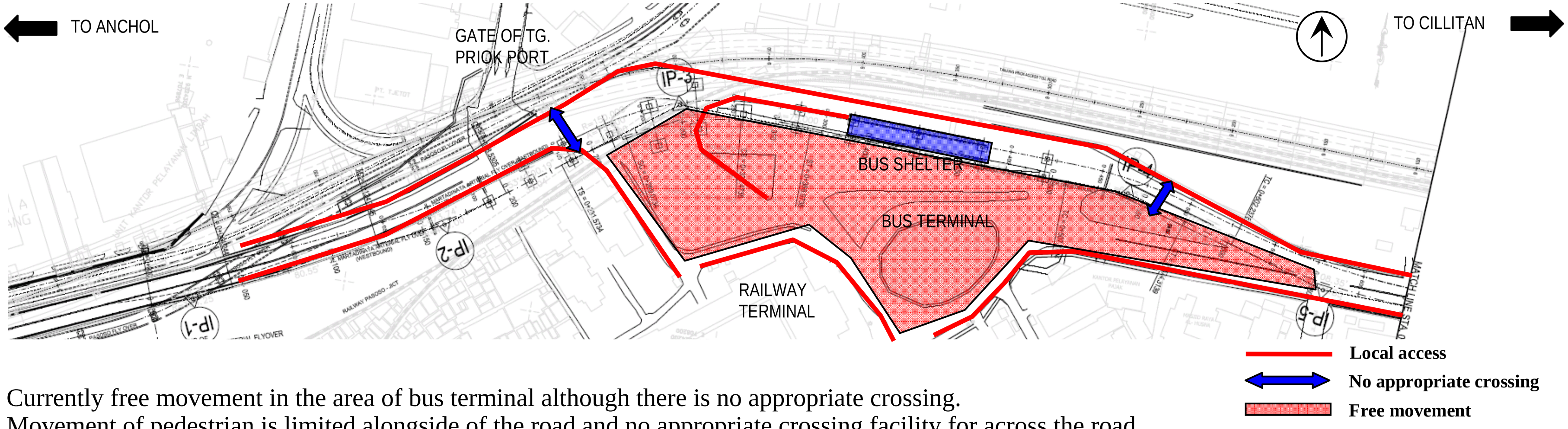
**Table 4.1.44 Comparison of Alternatives for R.E Martadinata Intersection**

| | Alt.1: Flyover | Alt.2: Underpass |
|---|---|---|
| Side view |  |  |
| Structure/Lane | Flyover (530m) , W=9.5m x 2 | Underpass (530m), W=10.5m x 2 |
| Existing Study | • Recommended by D/D (+) | |
| Conflict with other projects | • None | • None |
| Technical aspects (Site conditions) | • Flyover is suitable to the site condition because the application of underpass structure is negative due to the soft soil ground area near the sea shore. (+) | • Underpass is unsuitable to the site condition taking into account the high ground water level in the soft soil area near the sea shore.<br>• High maintenance cost increase the lifecycle cost. |
| Construction Cost | 126,000 Mil. Rp. (1.00) (+) | 169,000 Mil. Rp. (1.34) |
| Construction Period | 24months (+) | 27months |
| Environmental Impacts | • Safe crossing will be secured by using the space under the flyover (+).<br>• Smaller space for local access and bus terminal.<br>• Lower impact due to shorter construction period (+). | • Larger space for local access and bus terminal (+).<br>• Good landscaping due to all the structure located underground (+).<br>• Higher impact due to longer construction period. |
| Land Acquisition | A few | Ditto to left |
| Evaluation | ++++++ | ++ |

Source: JICA Survey Team

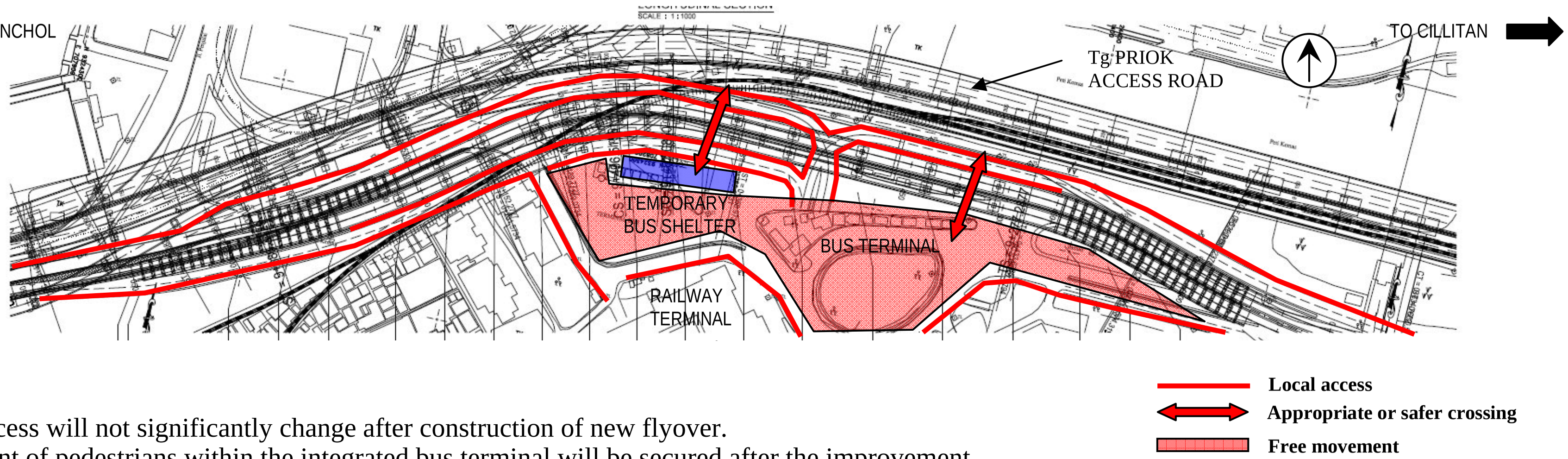
**Table 4.1.45 Consideration for local access of R.E.Martadinata Flyover**

**(1) Local access at current condition**




- Currently free movement in the area of bus terminal although there is no appropriate crossing.
- Movement of pedestrian is limited alongside of the road and no appropriate crossing facility for across the road.

**(2) Local access after improvement**




- Local access will not significantly change after construction of new flyover.
- Movement of pedestrians within the integrated bus terminal will be secured after the improvement.
- Safe crossing will be secured under the flyover after the imporvement.

Source: JICA Survey Team

(3) Sulawesi

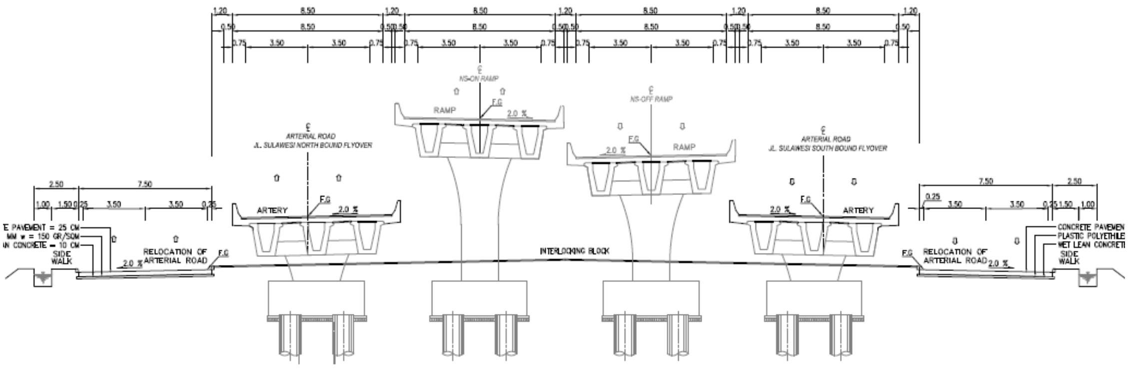
1) Concept of suitable improvement

Like R.E. Martadinata, a flyover, which is the result of detailed design, is adopted as the suitable improvement upon the result of comparative study as shown in Table 4.1.46

Note that the construction of NS link of TgPA parallel to the flyover has already started this year.

2) Cross section

The flyover between TgPA and the frontage road has 2 lanes on each bound. The typical cross section is shown in Figure 4.1.34.

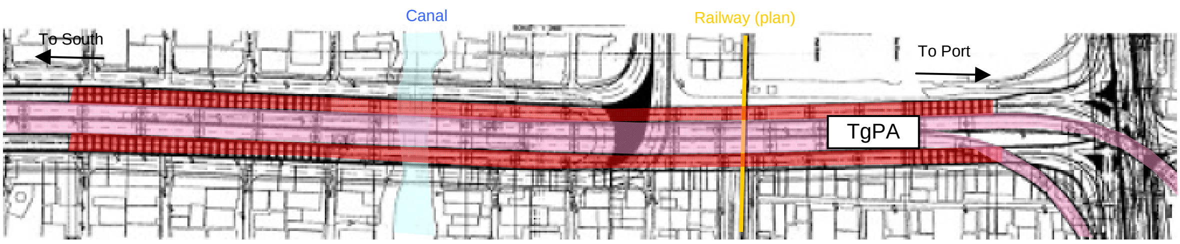


Source: Drawing of Tanjung Priok Access Road

**Figure 4.1.34 Typical Cross Section of Sulawesi Flyover**

3) Plan and profile

The flyover is located between the TgPA and frontage road in parallel and overpasses the existing intersection and proposed railway line to Tanjung Priok Port. The land for the flyover has already been acquired by the TgPA Project.




Source: Drawing of Tanjung Priok Access Road

**Figure 4.1.35 Plan of Sulawesi Flyover**

4) Other consideration

The construction of the NS link of TgPA except for the flyover has already started in 2011. The design of the flyover needs to be adjusted with the design of TgPA if there are any changes.

For the local access and pedestrian movements, it will not be significantly changed after the improvement. Above all, the crossing conditions will be improved in terms of safety by using the space under the structure of flyover. The number of the crossing traffic at grade will also be reduced that would be safer than that of current conditions. Table 4.1.47 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

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**Table 4.1.46 Comparison of Alternatives for Sulawesi Intersection**

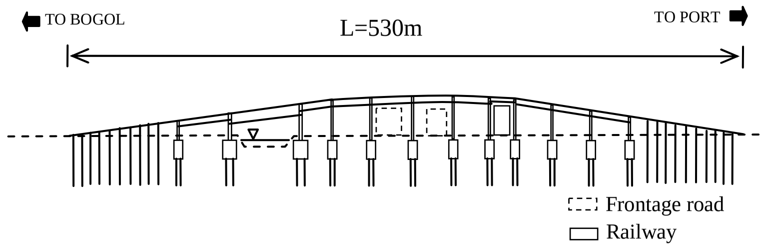
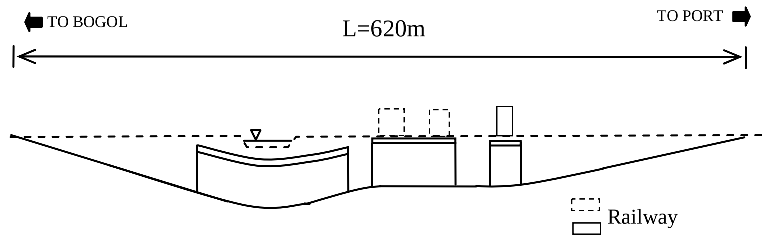
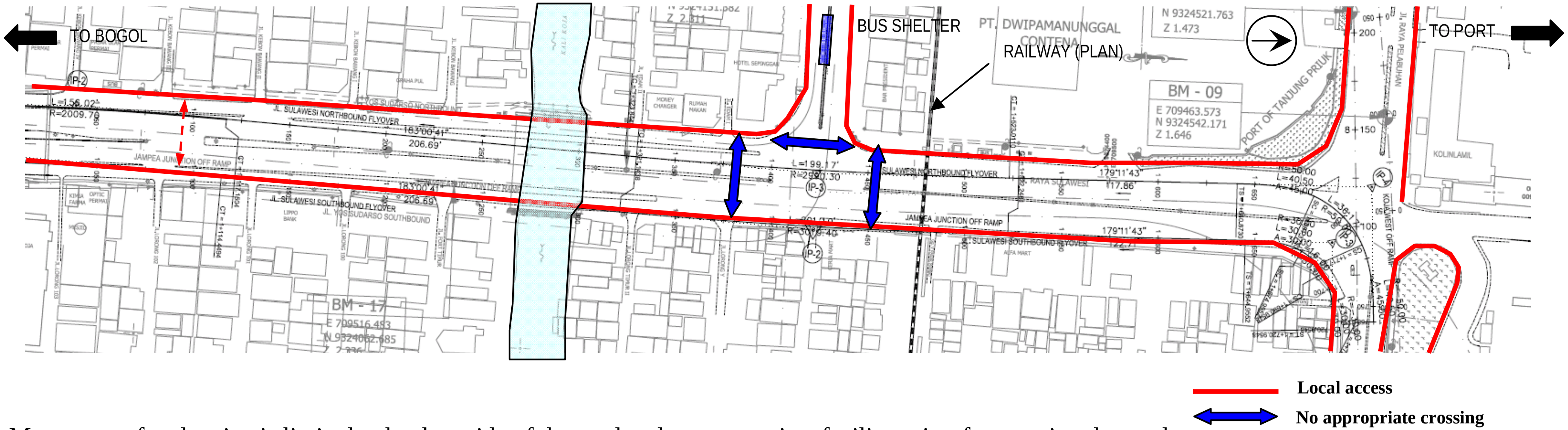
| | Alt.1: Flyover | Alt.2: Underpass |
|---|---|---|
| Side view |  |  |
| Structure/Lane | Flyover (500m), W=9.5m x 2 | Underpass (620m), W=10.5m x 2 |
| Existing Study | • Recommended by D/D (+) | |
| Conflict with other projects | • None | • None |
| Technical aspects (Site conditions) | • Flyover is suitable to the site condition because the application of underpass structure is negative due to the soft soil ground area near the sea shore. (+) | • Underpass is unsuitable to the site condition taking into account the high ground water level in the soft soil area near the sea shore.<br>• Difficult for the construction of underpass near the River.<br>• High maintenance cost increase the lifecycle cost |
| Construction Cost | 132,000 Mil. Rp. (1.00) (+) | 147,000 Mil. Rp. (1.11) |
| Construction Period | 24months (+) | 29months |
| Environmental Impacts | • Safe crossing will be secured by using the space under the flyover (+).<br>• Lower impact due to shorter construction period (+). | • Local access will be the same as the current condition.<br>• Good landscaping due to all the structure located underground (+).<br>• Higher impact due to longer construction period. |
| Land Acquisition | Necessary land acquisition be done by TgPA project | Ditto to left |
| Evaluation | ++++++ | + |

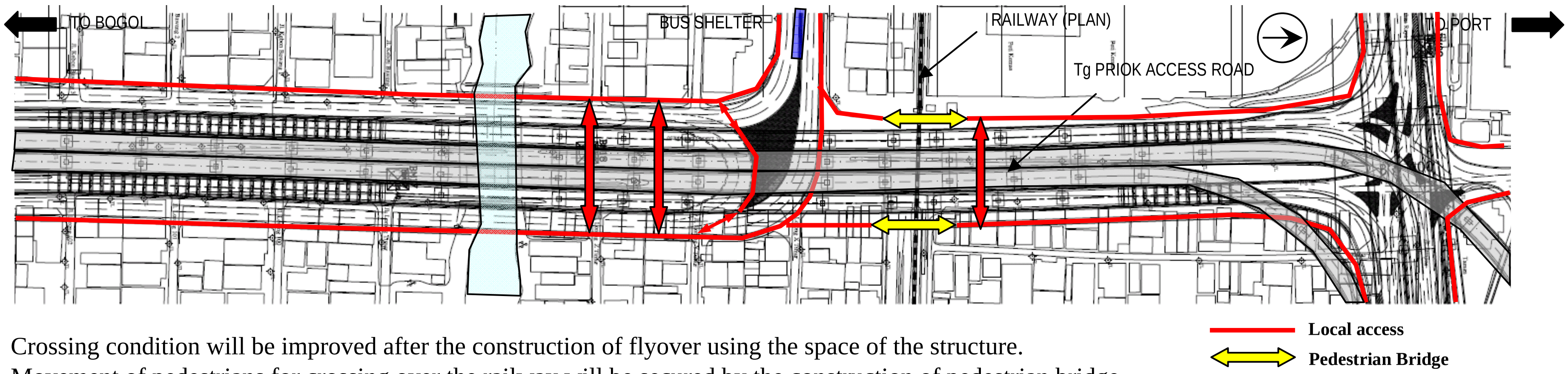
**Table 4.1.47 Consideration for local access of Sulawesi Flyover**

**(1) Local access at current condition**




- Movement of pedestrian is limited only alongside of the road and no appropriate facility exists for crossing the road.
- Pedestrian is in danger freely crossing the road without facility.

**(2) Local access after improvement**




- Crossing condition will be improved after the construction of flyover using the space of the structure.
- Movement of pedestrians for crossing over the railway will be secured by the construction of pedestrian bridge.

Source: JICA Survey Team

(4) Kuningan

1) Concept of suitable improvement

The comparative study was conducted to select the suitable improvement whether to adopt flyover or underpass as shown in Table 4.1.49. As the result, a continuous underpass along Jl. Rasuna Said which was recommended by Feasibility Study was selected to mitigate the traffic congestion at two intersections, Kuningan and Mampang (See Table 4.1.48). The section of at-grade intersections are covered by slab deck while the top of section between the intersections keeps to be open for the reduction of the construction cost.

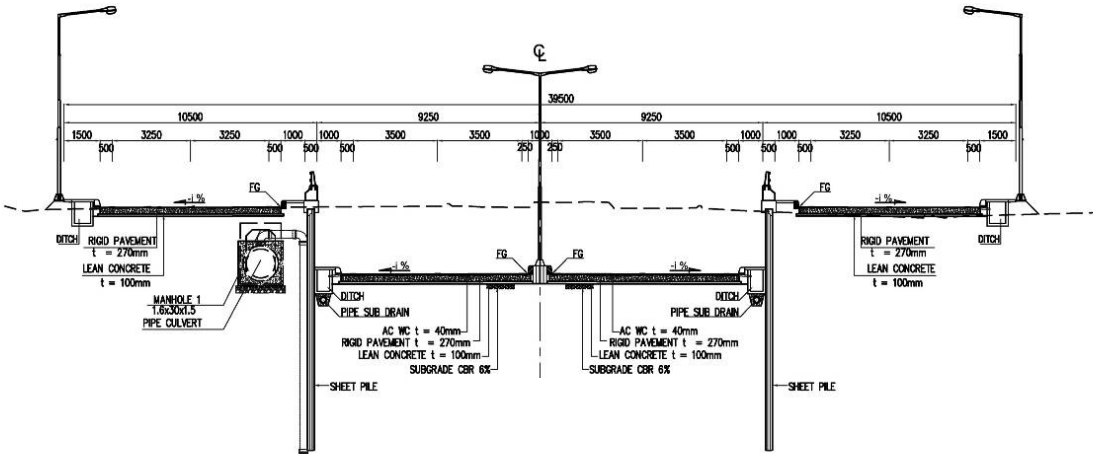
**Table 4.1.48 Comparison of Alternatives for Kuningan Intersection**

| | Alt.1 | Alt.2 |
|---|---|---|
| Outline | Single underpass for 1 intersection (Jl. Gatot Subroto) | Continuous underpass for both intersections |
| Structure | Underpass (650m) | Underpass (1km) |
| Positive Impacts | • The through traffic on Jl.Rasuna Said is isolated from the intersection of Jl. Gatot Subroto by the underpass. | • The through traffic on Jl.Rasuna Said is isolated from 2 intersections by the underpass. |
| Negative Impacts | • It is too short (less than 100m) to accommodate the turn traffic between the end of underpass and Mampang Intersection. | • Enough capacity on the frontage road between 2 intersections needs to be secured due to many traffic demands for turning at Mampang Intersection. |
| Existing study result | | Recommended (F/S) |
| Construction Cost | Low | High |
| Construction Period | Short | Long |
| EIA Scheme | UKL/UPL | AMDAL |
| Land Acquisition | A few | More than Alt.1 (Along Jl. Mampang Prapatan) |
| Evaluation | | + |

Source: JICA Survey Team

2) Cross section

In order to minimize the land acquisition along the road, 4 lanes should be applied for the underpass section. The frontage roads have 2 lanes both sides. The typical cross section is shown in Figure 4.1.36.

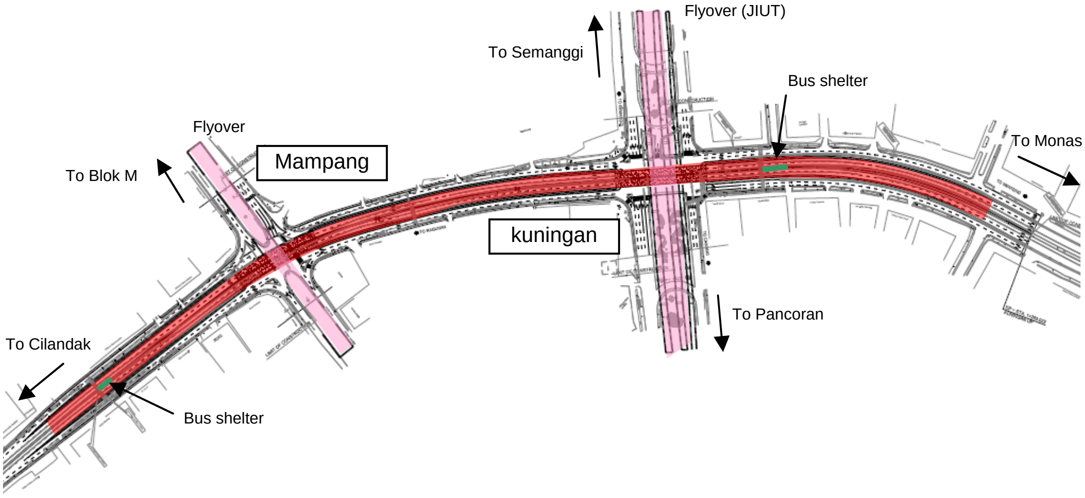



Source: JICA Survey Team

**Figure 4.1.36 Typical Cross Section of Kuningan**

3) Plan and profile

The horizontal alignment basically follows the existing road. For the vertical alignment, a 5% gradient is applied on both ends of the underpass section to minimize the structure length. Land acquisition is necessary for the entire section along Jl. Rasuna Said.




Source: JICA Survey Team

**Figure 4.1.37 Plan of Kuninagan Underpass**

4) Other considerations

a) Busway and shelter

The busway will remain on the inside lanes of the underpass but it will not be an exclusive lane because there are only a total of 4-lanes. It is necessary to relocate two bus shelters which are currently located on the north of Kuningan Intersection and on the south of Mampang Intersection.

b) Intersection

The configuration and the number of lanes are to be studied and decided to secure the necessary traffic movement after the construction of the underpass.

c) Drainage

To drain the water from the underpass, tank reservoirs and pump facilities should be provided near the sag points.

d) Local access and pedestrian movements

The comparative study has been carried out to examine the change of local access and pedestrian movements after the improvement as shown in Table 4.1.50.

**Table 4.1.49 Comparison of Alternatives for Kuningan and Manpang Intersections**

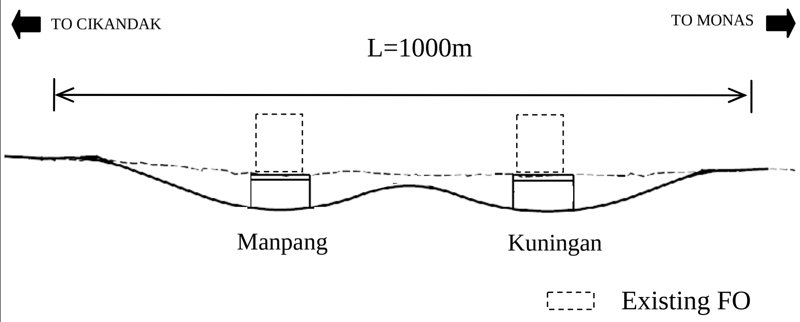
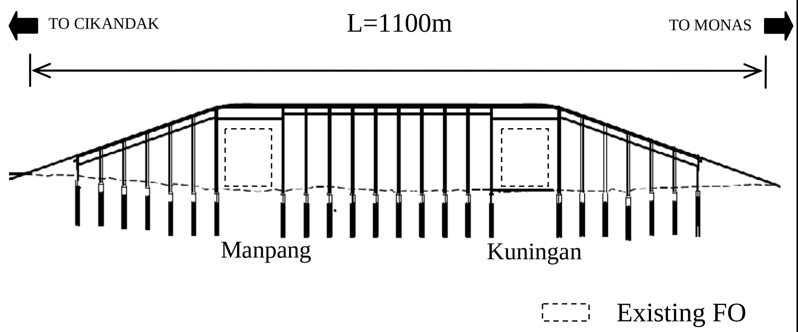
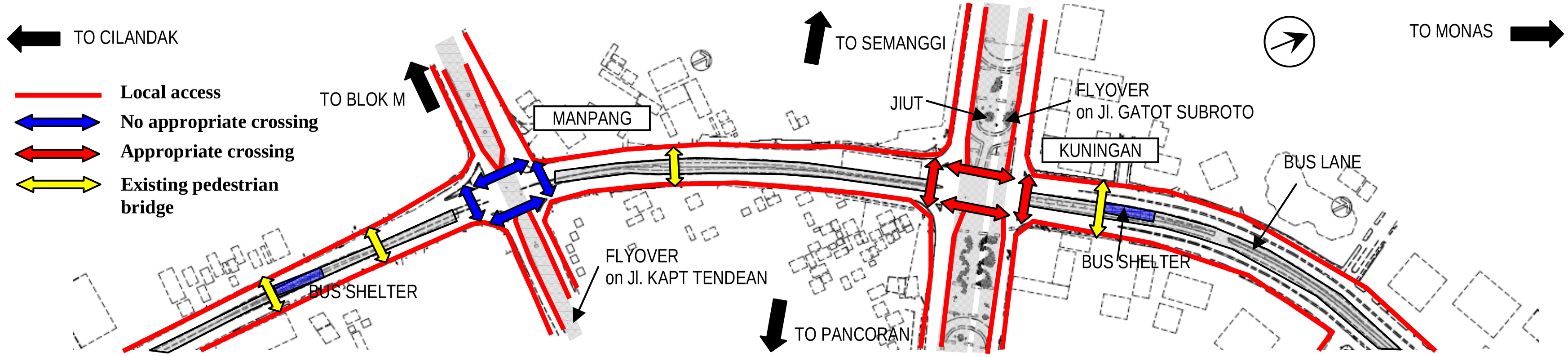
| | Alt.1: Continuous underpass | Alt.2: Continuous flyover for 2 intersections |
|---|---|---|
| Side view |  |  |
| Structure | Underpass (1,000m), W=18.5m | Flyover (1,100m), W=18.0m |
| Conflicts with other projects | • None (+) | • Monorail project |
| Existing Study Result | Recommended by F/S (+) | |
| Site Condition | • Underpass is suitable to the site condition because the flyovers exist at the Kuningan and Manpang intersections (+). | • Flyover is unsuitable to the site condition because the flyovers exist at the both intersections of Manpang and Kuningan. |
| Construction Cost | 196,000 Mil. Rp. (1.00) (+) | 324,000 Mil. Rp. (1.65) |
| Construction Period | 32months (+) | 38months |
| Environmental Impact | Moderate (+)<br>AMDAL | Higher<br>AMDAL |
| Land Acquisition | Tolerable<br>(Along Jl. Mampang Prapatan) | Tolerable<br>(Along Jl. Mampang Prapatan) |
| Evaluation | ++++++ | Not feasible due to a conflict with the Monorail project |

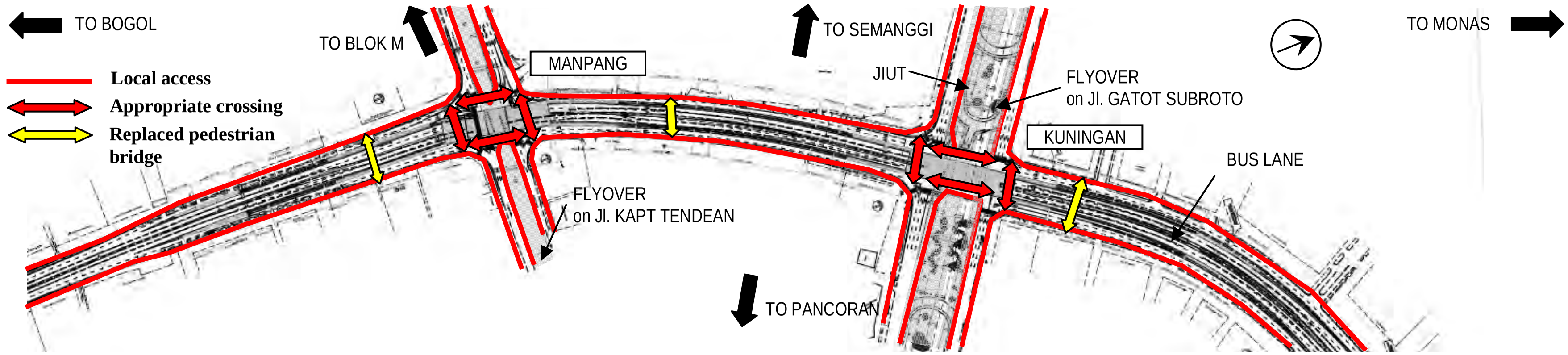
**Table 4.1.50 Consideration for local access of Kuningan Underpass**

**(1) Local access at current condition**




- Movement of pedestrians are almost along the existing road.
- Possible crossing are limited at several existing pedestrian bridges and the zebra zone at the intersections.

**(2) Local access after improvement**




- The road will be divided by the continuous underpass however the possible crossing will be secured at the area of intersections and pedestrian bridges as same as the current conditions.
- Existing pedestrian bridges will be replaced or extended to cross over the full width of new underpass including the frontage road.
- Bus lane will be shifted into the underpass and the bus shelter near intersection should be replaced to the outside of underpass.

Source: JICA Survey Team

(5) Pancoran

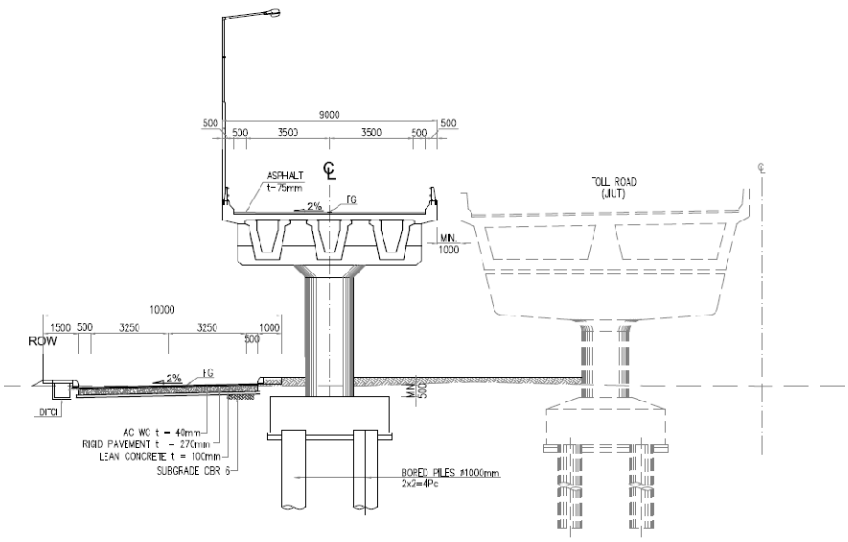
1) Concept of suitable improvement

The comparative study was conducted to select the suitable improvement whether to adopt the flyover or the underpass as shown in Table 4.1.51. As the results, a 2-lane flyover for east bound along Jl. Gatot Subroto on the south side is suitable. Alternatively, the underpass on Jl. Gatot Subroto is envisaged however it is more costly and needs longer construction period than flyover because of the existing channel across near the intersection, which makes the length of underpass longer.

To secure the accessibility to the Toll Road, a two lane on-ramp way is provided from the intersection between the flyover and Jl. Gatot Subroto. The frontage road on the east side of the intersection would be located under the flyover to avoid land acquisition.

2) Cross section

The flyover has 2-lanes one way for the west bound. To avoid land acquisition, the frontage road should be located under the flyover. The typical cross section is shown in Figure 4.1.38.




Source: JICA Survey Team

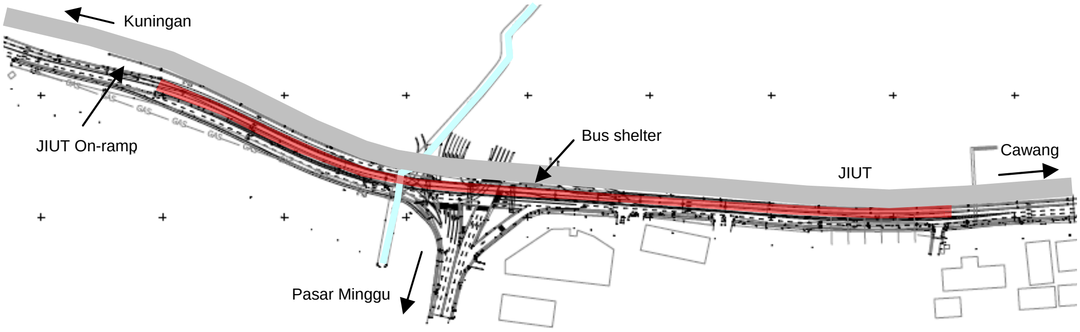
**Figure 4.1.38 Typical Cross Section of Pancoran Flyover**

3) Plan and profile

The horizontal alignment of the flyover is set along the JIUT on the south side. The at-grade road for the toll gate is provided between the flyover and JIUT on the west side of the intersection to keep the accessibility from the intersection to the toll gate as the traffic on the flyover can not enter the toll gate directly.

The frontage road is located under the flyover on the east side of the intersection to avoid land acquisition of commercial buildings near the intersection. Therefore, the flyover length reaches about 630m.

In order to secure the vertical clearance for the frontage road on the east side of the intersection, a gentle slope is applied on the flyover.




Source: JICA Survey Team

**Figure 4.1.39 Plan of Pancoran Flyover**

4) Other considerations

a) Bus way

The bus shelter currently located under JIUT needs to be relocated in accordance with the new flyover. It needs to be considered to lift the busway and shelter onto the flyover if it is not suitable to shift them at grade level.

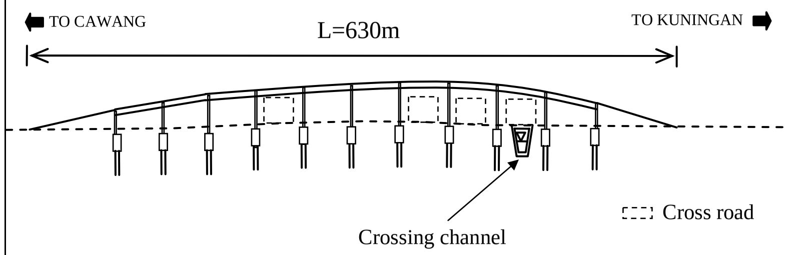
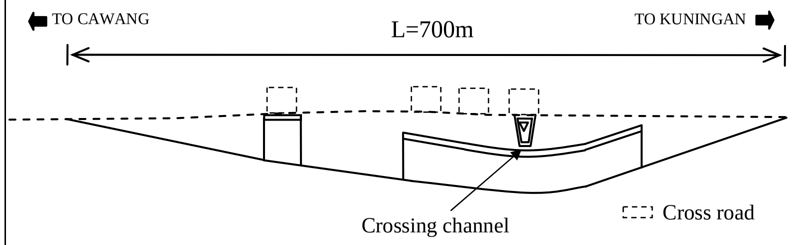
b) Toll road

A part of the 6 inner toll roads planned by DKI is designed to pass near Pancoran intersection. It is necessary to coordinate with the plan of this road to avoid structural and operational conflicts.

c) Local access and pedestrian movements

The comparative study has been carried out to examine the change of local access and pedestrian movements after the improvement as shown in Table 4.1.52.

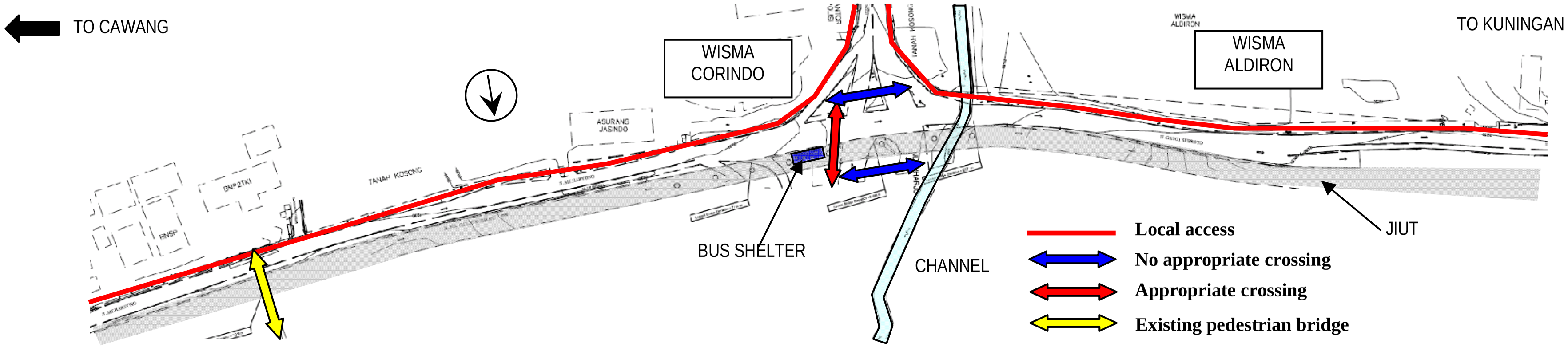
**Table 4.1.51 Comparison of Alternatives for Pacoran Intersection**

| | Alt.1: Flyover | Alt.2: Underpass |
|---|---|---|
| Side view |  |  |
| Structure/Lane | Flyover (630m), W=9.0m | Underpass (700m), W=10.0m |
| Existing Study | • None | • None |
| Conflict with other projects | • None | • None |
| Technical aspects (Site conditions) | • Flyover is suitable because of the negative result for the application of underpass (+). | • Underpass is unsuitable because of the existing channel across under the road near the intersection. |
| Construction Cost | 59,000 Mil. Rp. (1.00) (+) | 85,000 Mil. Rp. (1.44) |
| Construction Period | 18 months (+) | 22 months |
| Environmental Impacts | • Safe crossing will be secured by using the space under the flyover (+).<br>• Tolerable landscaping harmonized with the existing flyover (+).<br>• Lower impact due to shorter construction period (+). | • Local access will be the same as the current condition.<br>• Bus shelter shall be replaced to the outside of underpass (away from the intersection).<br>• Higher impact during construction due to longer construction period. |
| Land Acquisition | • Smaller land acquisition for frontage road with 2lanes by accommodating a turning right lane under the flyover (+). | • Larger land acquisition for a full width of 4lanes including the frontage road plus the right turning lane. |
| Evaluation | ++++++++ | |

Source: JICA Survey Team

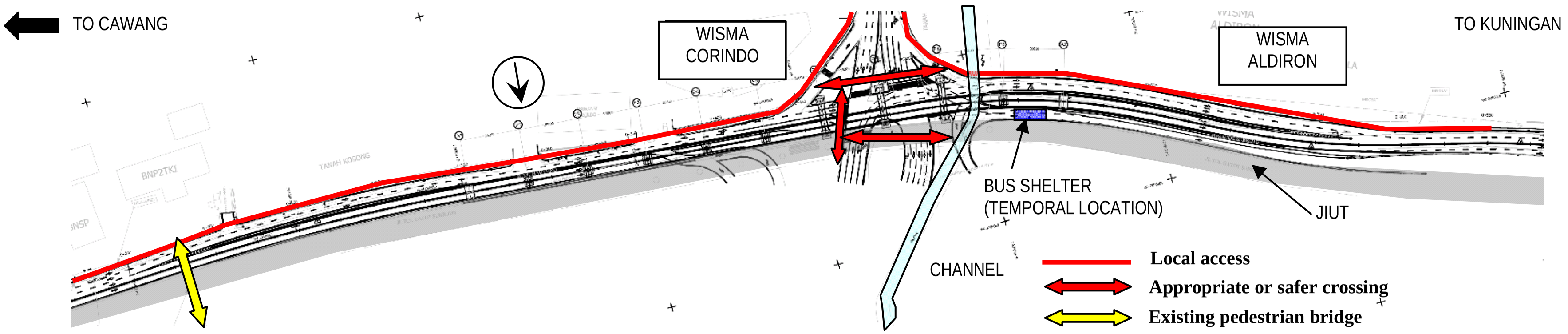
**Table 4.1.52 Consideration for local access of Pancoran Flyover**

**(1) Local access at current condition**




- Movement of pedestrians is almost along the existing road.
- Possible crossing are limited at an existing pedestrian bridge and the zebra zone at the intersections.

**(2) Local access after improvement**




- Local access will not significantly change after construction of new flyover.
- Crossing condition will be improved after the construction of flyover using the space of the structure.
- Bus shelter and bus lane should be alternatively shifted onto new flyover.

Source: JICA Survey Team

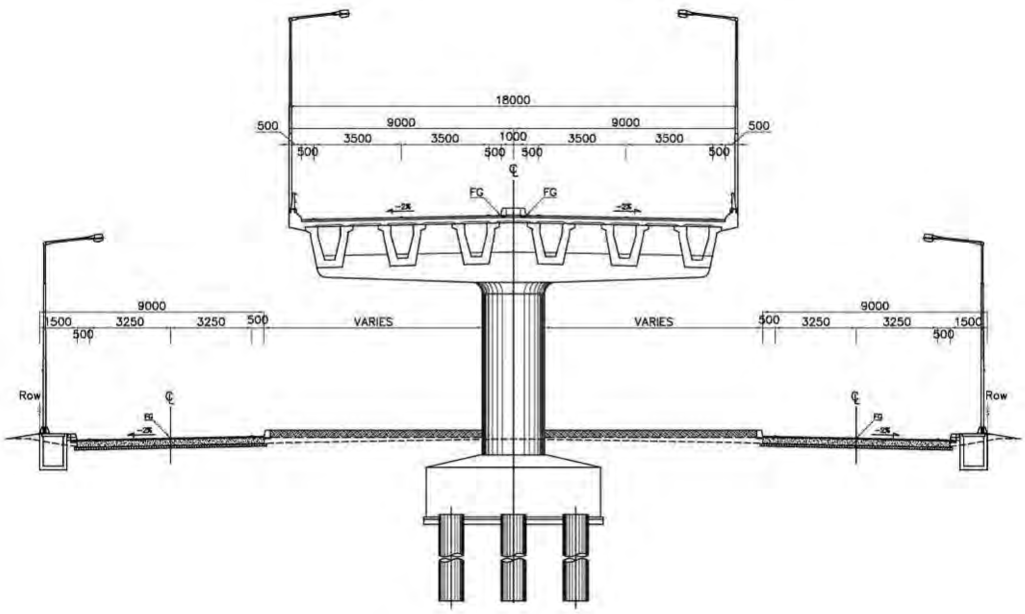
(6) Pinang Baris

1) Concept of suitable improvement

The comparative study was conducted to select the suitable improvement whether to adopt the flyover or the underpass as shown in Table 4.1.53. As the results, a 4-lane flyover is to be constructed along Jl. Sudirman which carries the main traffic.

2) Cross section

The cross section is composed of a 4-lane of flyover and 2-lane frontage roads on both sides. The total width would be 38m. The typical cross section is shown in Figure 4.1.40.

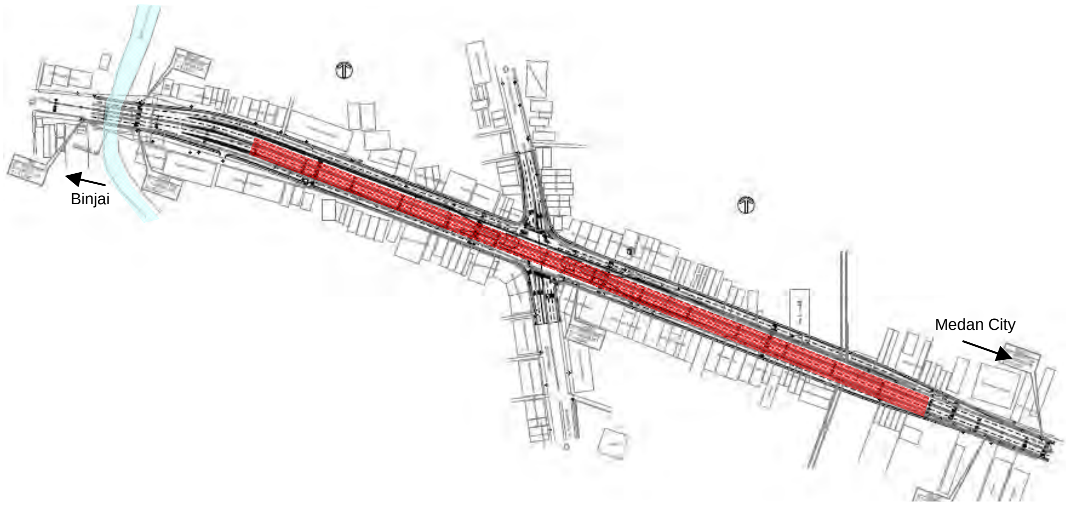



Source: JICA Survey Team

**Figure 4.1.40 Typical Cross Section of Pinang Baris Flyover**

3) Plan and profile

The horizontal alignment of the flyover is straight along Jl. Sudirman. For the vertical alignment, a 5% gradient is applied on both ends of the overpass section to reduce the structure length.




Source: JICA Survey Team

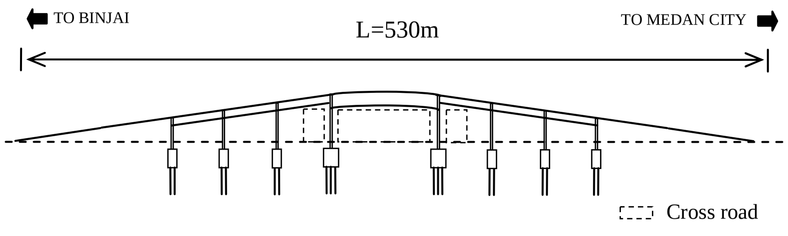
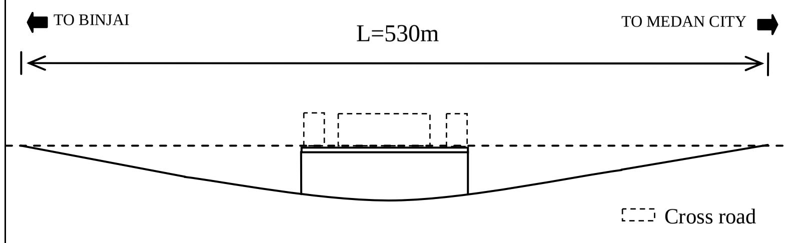
**Figure 4.1.41 Plan of Pinang Baris Flyover**

4) Other considerations

As the proposed road width is wider than the existing road, the land acquisition and resettlement will be required necessarily.

For the local access and pedestrian movements, it will not be significantly changed after the improvement. Above all, the crossing conditions will be improved in terms of safety by using the space under the structure of flyover. The number of the crossing traffic at grade will also be reduced that would be safer than that of current conditions. Table 4.1.54 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

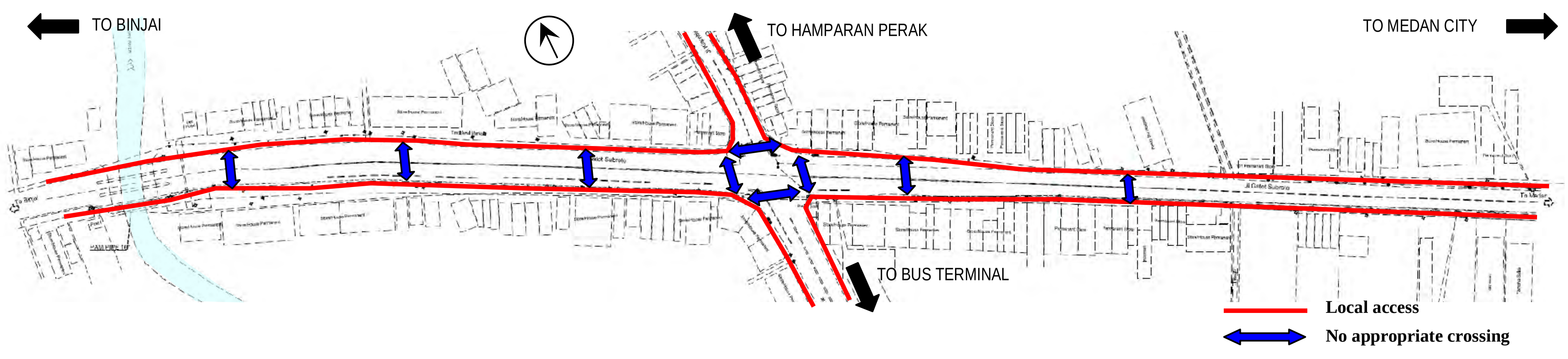
**Table 4.1.53 Comparison of Alternatives for Pinang Baris Intersection**

| | Alt.1 : Flyover | Alt.2: Underpass |
|---|---|---|
| Side view |   |   |
| Structure/Lane | Flyover (530m) , W=18.0m | Underpass (530m) , W=19.0m |
| Existing Study | Recommended by F/S and D/D (+). | |
| Conflict with other projects | • None | • None |
| Technical aspects (Site conditions) | • Flyover is suitable because of negative application of underpass due to high (GL-1.5m) underground water level (+). | • Underpass is unsuitable because of high ground water level (GL-1.5m). |
| Construction Cost | 98,000 Mil. Rp. (1.00) (+) | 109,000 Mil. Rp. (1.11) |
| Construction Period | 18 months (+) | 22months |
| Environmental Impacts | • Safe crossing will be secured by using the space under the flyover (+).<br>• Lower impact due to shorter construction period (+). | • Local access will be almost same as the current condition.<br>• Good landscaping due to all the structure located underground (+).<br>• Higher impact due to longer construction period. |
| Land Acquisition | Less than Alt.2 | Slightly more than Alt.1 |
| Evaluation | ++++++ | + |

Source: JICA Survey Team

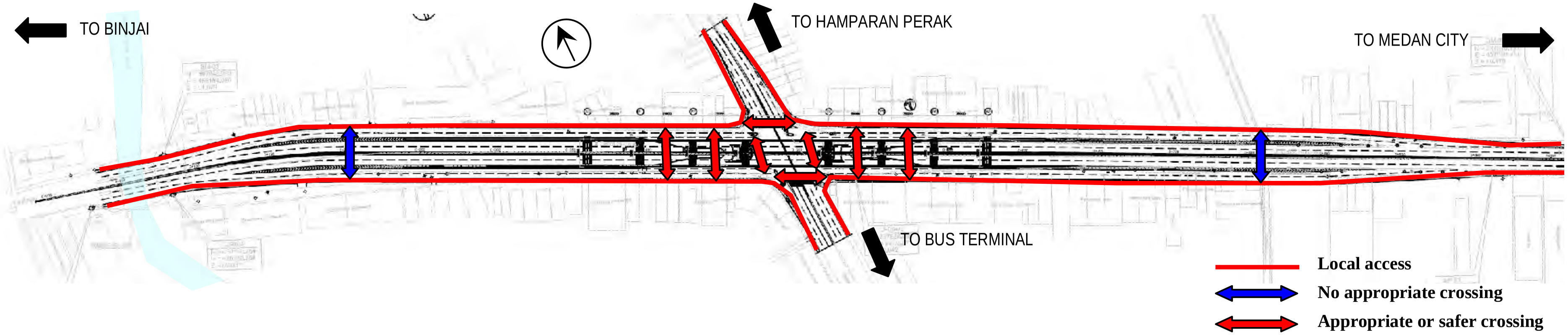
**Table 4.1.54 Consideration for local access of Pinang Baris Flyover**

**(1) Local access at current condition**




- Currently, difficult to across the road safely due to no appropriate crossing facilities.

**(2) Local access after improvement**




- Local access will be almost same as the current condition.
- Safe crossing near intersection will be secured by using the underneath of flyover after the improvement.

Source: JICA Survey Team

(7) Katamso

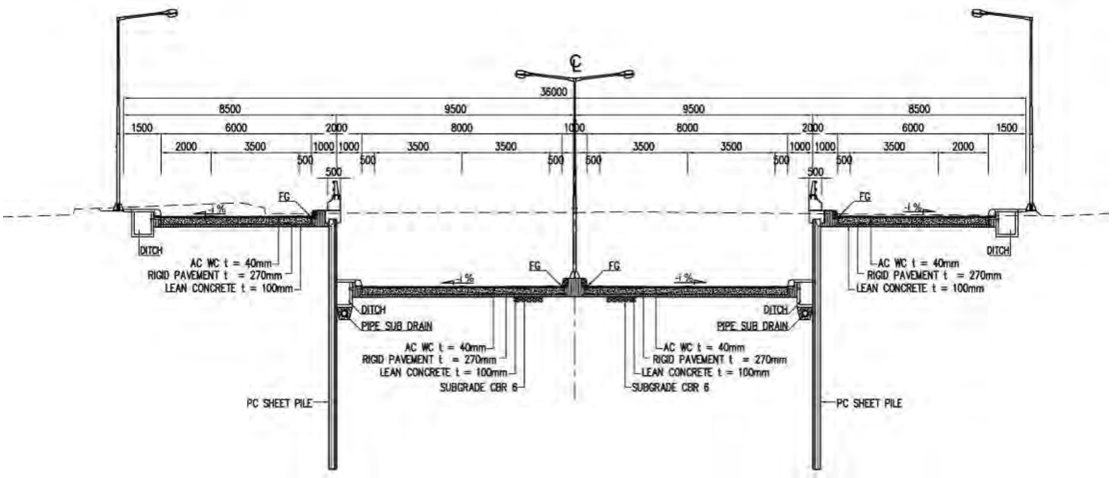
1) Concept of suitable improvement

Jl. AH Nasution is a part of the Medan Ring Road and has more traffic volume than Jl. Katamso. There are 6-lanes on Jl. AH Nasution while only 4-lanes on Jl. Katamso. In addition, the elevation around the intersection is higher, therefore, an underpass is more suitable (See Table 4.1.55).

A continuous underpass for the intersection and railway, about 400m to the east of the intersection, which is proposed in the Feasibility Study, is not regarded as the best improvement since the railway is currently not active and it is not cost effective.

2) Cross section

In order to minimize the land acquisition, 4 lanes should be applied for the main portion of the underpass section. The frontage roads have 2 lanes on both sides. The typical cross section is shown in Figure 4.1.42.

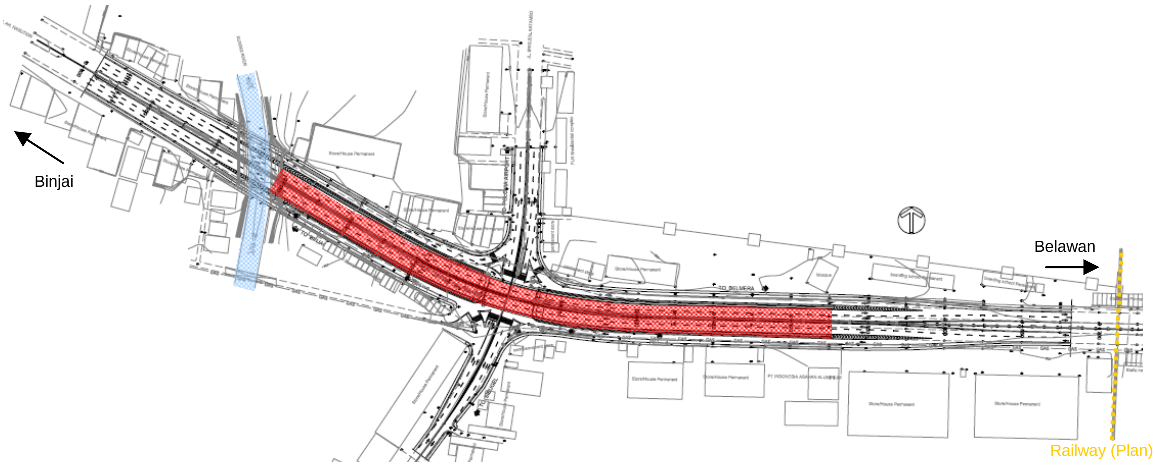



Source: JICA Survey Team

**Figure 4.1.42 Typical Cross Section of Katamso Underpass**

3) Plan and profile

The horizontal alignment basically traces the existing road. For the vertical alignment, a 5% gradient is applied on both ends of underpass section to reduce the structure length.




Source: JICA Survey Team

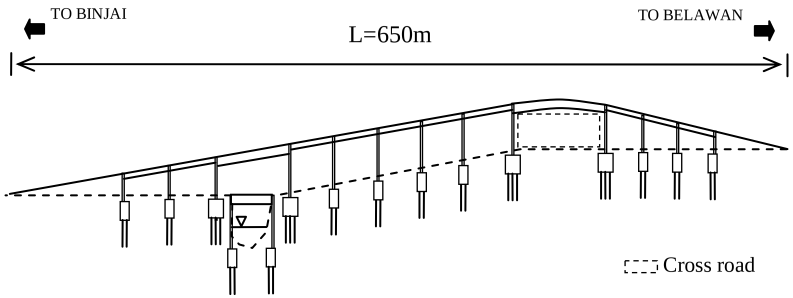
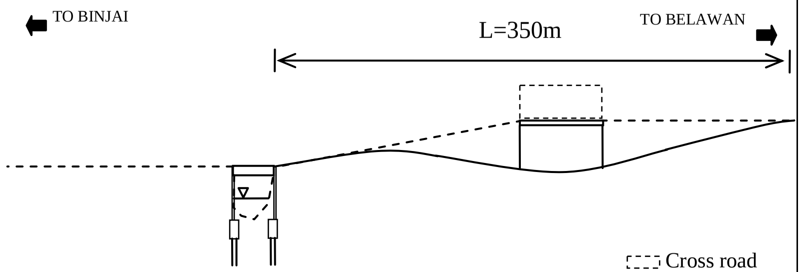
**Figure 4.1.43 Plan of Katamso Underpass**

4) Other consideration

The existing bridge located about 200m to the west needs to be replaced as the road width should be widened to accommodate the taper lanes for the frontage roads.

For the local access and pedestrian movements, it will not be significantly changed after the improvement. Table 4.1.56 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

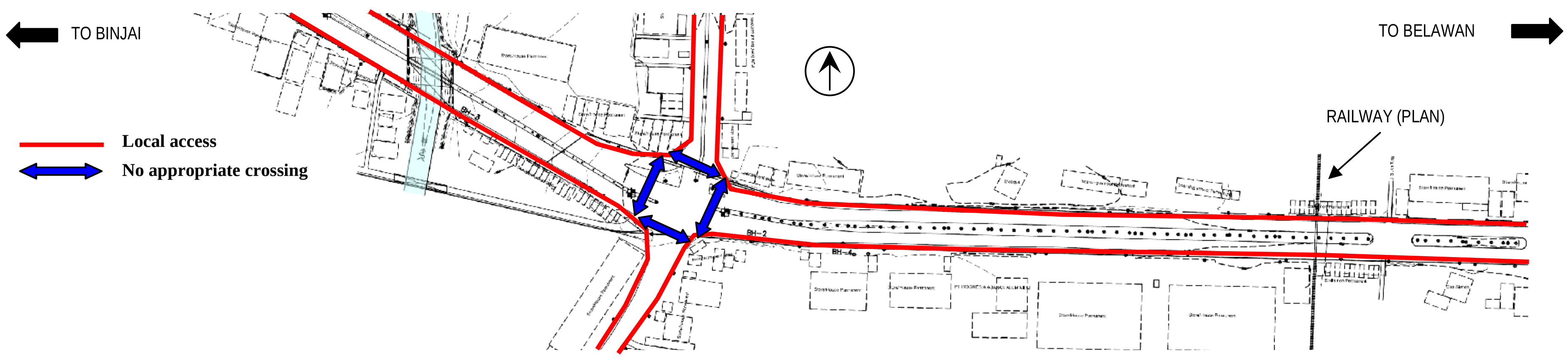
**Table 4.1.55 Comparison of Alternatives for Katamso Intersection**

| | Alt.1: Flyover (Jl. AH Nasution) | Alt.2: Underpass(Jl. AH Nasution) |
|---|---|---|
| Side view |  |  |
| Structure/Lane | Flyover (650m) , W=18.0m | Underpass (350m) , W=19.0m |
| Existing Study | | Recommended by F/S (+) |
| Conflict with other projects | • None | • None |
| Technical aspects (Site conditions) | • Flyover is unsuitable because the intersection is located hilly area.<br>• Length of flyover is longer than underpass because of the terrain. | • Underpass is suitable because the intersection is located hill area (+).<br>• Easy to drain the underground water by natural gravity |
| Construction Cost | 152,000 Mil. Rp.(2.24) | 68,000 Mil. Rp. (1.00) (+) |
| Construction Period | 22months | 18months (+) |
| Environmental Impacts | • Safe crossing will be secured by using the space under the flyover (+).<br>• Higher impact due to longer construction period. | • Local access will be almost same as the current condition.<br>• Good landscaping due to all the structure located underground (+).<br>• Lower impact due to shorter construction period. |
| Land Acquisition | More than Alt.2 | Less than Alt.1 (+) |
| Evaluation | + | ++++++ |

Source: JICA Survey Team

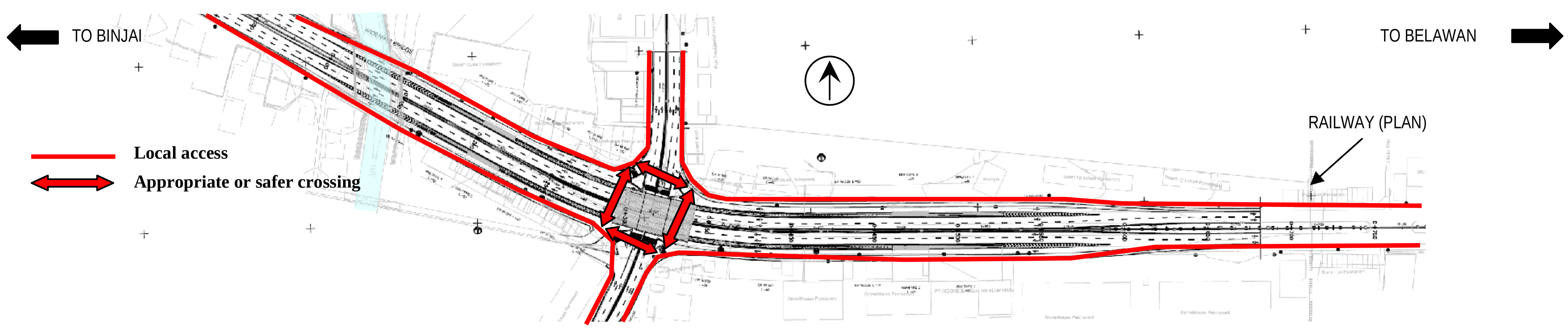
**Table 4.1.56 Consideration for local access of Katamso Underpass**

**(1) Local access at current condition**




- Movements of pedestrians are almost along the existing road.
- Possible crossing is limited for only the zebra zone at the intersections.

**(2) Local access after improvement**




- Local access along the roads will not significantly change after the improvement.
- The road will be divided by the underpass however the possible crossing will be secured at the area of intersections same as the current conditions.
- Crossing condition will be improved at the intersection because of less traffic after completion of underpass.

Source: JICA Survey Team

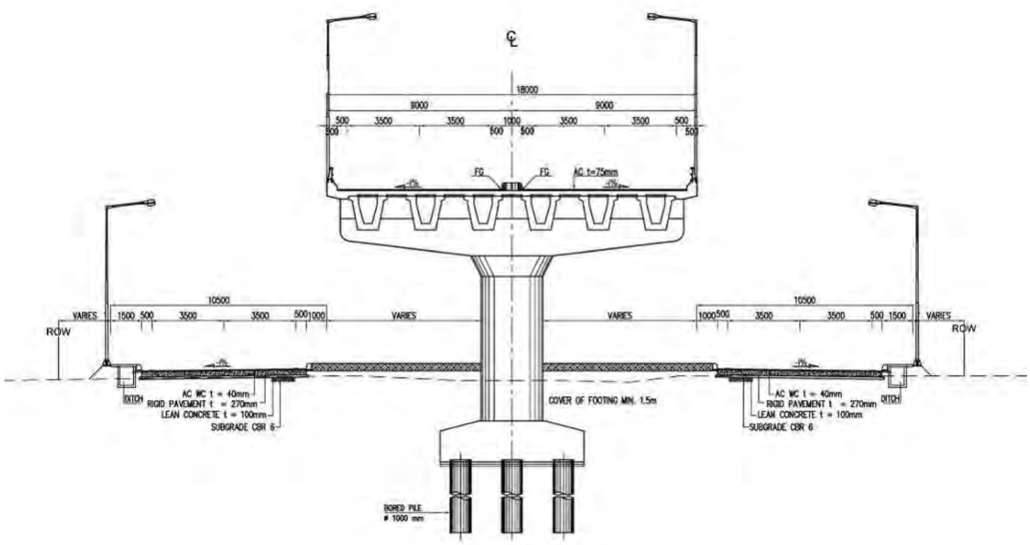
(8) Sudirman II

1) Concept of suitable improvement

A flyover beyond the single track of the Tangerang railway line and T-shape intersection is to be newly constructed along Jl. Sudirman. As the at-grade railway crossing will be closed considering safety, the traffic between the north of Jl.Sudirman and Jl. Benten Betawi needs to be diverted to use the new flyover.

2) Cross section

The cross section is composed of a 4-lane flyover and 2-lane frontage roads on both sides. The typical cross section is shown in Figure 4.1.44.

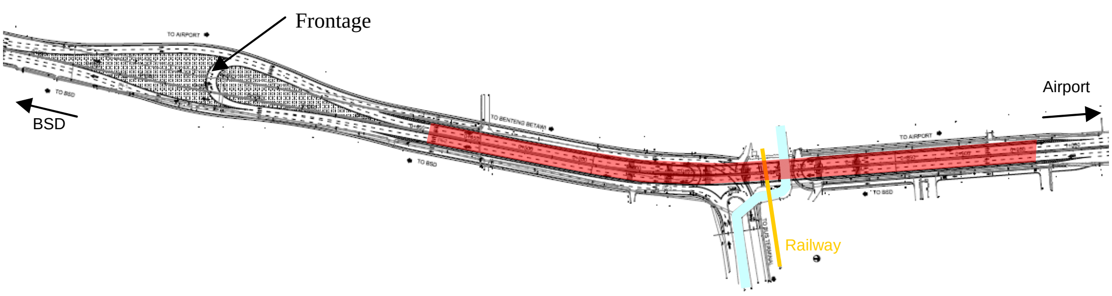


Source: JICA Survey Team

**Figure 4.1.44 Typical Cross Section of Sudirman II Flyover**

3) Plan and profile

The horizontal alignment basically traces the existing road. For the vertical alignment, a 5% gradient is applied on both ends of the overpass section to reduce the structure length.



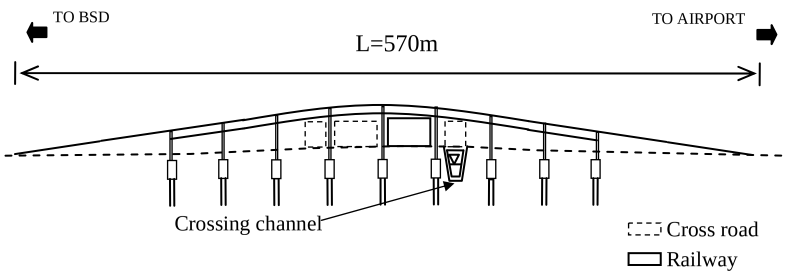
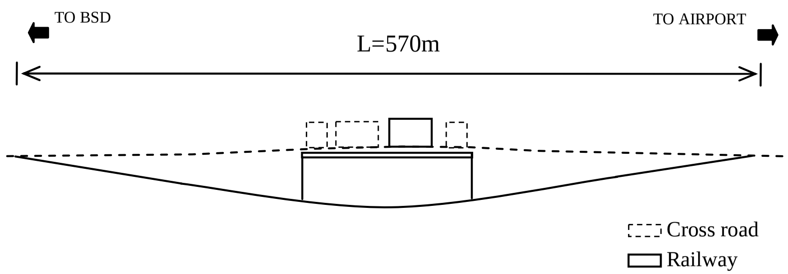

Source: JICA Survey Team

**Figure 4.1.45 Plan of Sudirman II Flyover**

4) Other consideration

As the traffic flow from Jl. Benten Betawi to Jl. Sudirman north and south will be closed after the construction of the flyover, the traffic, including the bus way, needs to be diverted through the next intersection about 1km to the south to use the flyover. Otherwise, it is necessary to construct a U-turn lane as shown in Figure 4.1.45. For the local access and pedestrian movements, Table 4.1.58 shows the results of comparative study to examine the change of local access and pedestrian movements after the improvement.

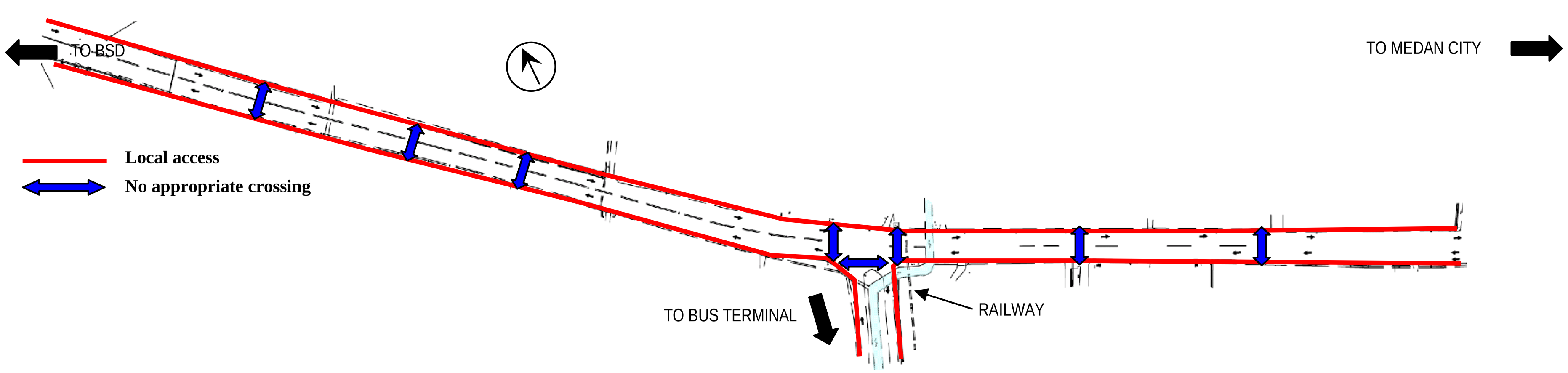
**Table 4.1.57 Comparison of Alternatives for SudirmanII Intersection**

| | Alt.1: Flyover | Alt.2: Underpass |
|---|---|---|
| Side view |  |  |
| Structure/Lane | Flyover (570m) , W=18.0m | Underpass (570m) , W=19.0m |
| Existing Study | Recommended by F/S (+) | |
| Conflict with other projects | • None (+) | • **The forthcoming BRT plan** |
| Technical aspects (Site conditions) | • Flyover is suitable because the application of underpass is negative due to the adjacent existing water channel near intersection (+). | • Underpass is unsuitable because of high ground water level due to the adjacent existing water channel near intersection. |
| Construction Cost | 97,000 Mil. Rp. (1.00) (+) | 119,000 Mil. Rp. (1.23) |
| Construction Period | 18months (+) | 22months |
| Environmental Impacts | • Safe crossing will be secured by using the space under the flyover (+).<br>• Less impact due to shorter construction period. | • Local access will be almost same as the current condition.<br>• Good landscaping due to all the structure located underground (+).<br>• Higher impact due to longer construction period. |
| Land Acquisition | A few | Ditto to left |
| Evaluation | ++++++ | Not feasible due to a conflict with the forthcoming BRT |

Source: JICA Survey Team

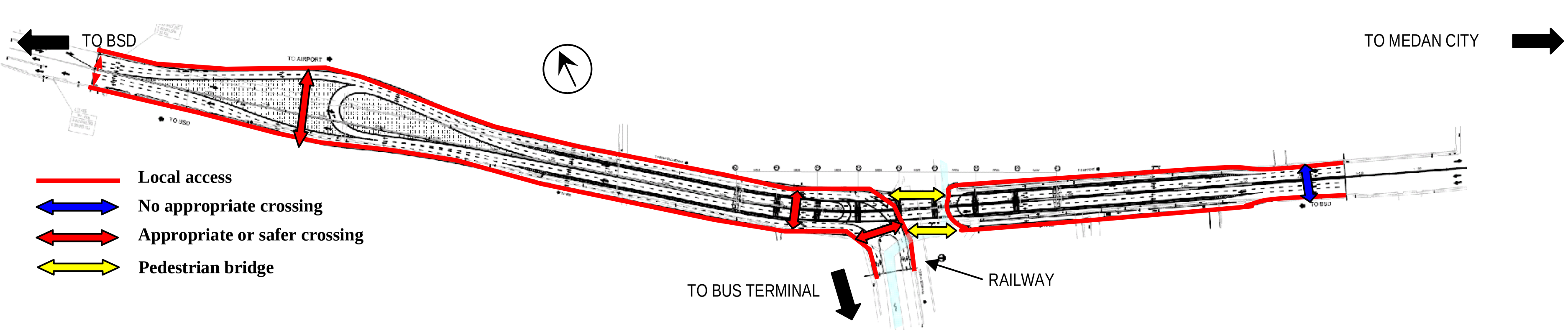
**Table 4.1.58 Consideration for local access of SudrimanII Flyover**

**(1) Local access at current condition**




- Movement of pedestrian is limited only alongside of the road and no appropriate facility exists for crossing the road.
- Pedestrian is in danger freely crossing the road without facility.

**(2) Local access after improvement**




- Local access along the road will not significantly change after the improvement.
- Pedestrian bridge shall be constructed to secure the local access for the railway crossing.
- Crossing condition will be improved after the construction of flyover using the space of the structure.

Source: JICA Survey Team

(9) Cikarang

1) Concept of suitable improvement

The project consists of the improvement of the following 4 roads including some flyovers and bridge around the Kalimalang River. The concept of each road is described as follows and the plan of the target roads is shown in Figure 4.1.46.

a) Jl. Kalimalang

This is a 2-lane 7.8km long road along the Kalimalang River from Jl. Cibitung to Jl. Cibarsah. The entire length of that road section is upgraded to rigid pavement.

While the beginning point will remain at the at-grade intersection, the 2-lanes of the Tegal Gede Flyover, for which the basic design has been completed by the MPW, will be constructed at the end point on Jl. Cibarsah. The intersection with Jl. Iman Bonjol is to be shifted and improved together with the upgrade of Jl. Iman Bonjol.

b) Jl. Bali

The section with damaged pavement from the bridge on Kalimaranlg River to the flyover on the Cikampek Toll Road is to be rehabilitated with rigid pavement within the width of the existing road. The single lane flyover on the Cikampek Toll Road is to be constructed next to the existing flyover to increase the lane capacity for 2-way direction.

c) Jl. Iman Bonjol

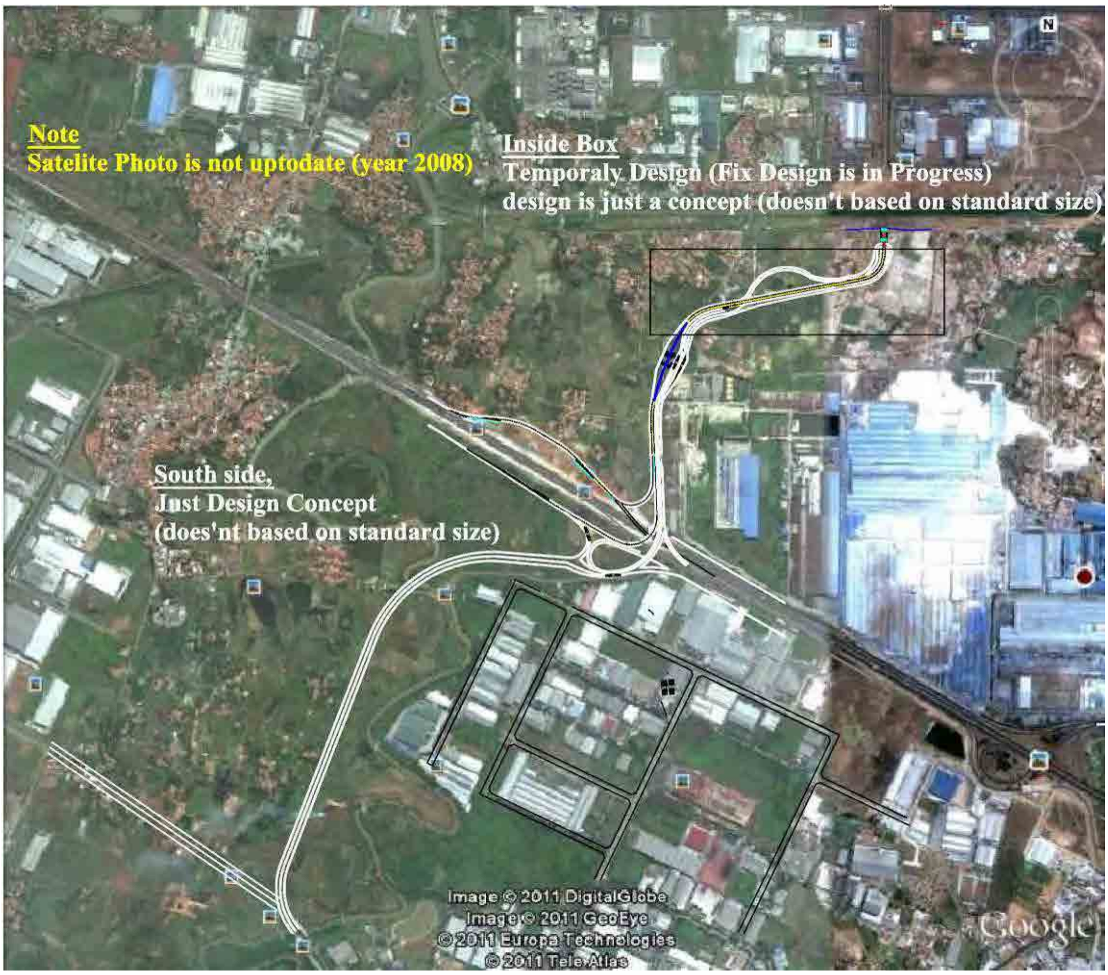
The road alignment around Kalimarang River is to be modified to be straight and the intersection with Jl. Kalimarang is to be improved. A newly constructed skew bridge has 4 lanes while the existing road from Kalimarang River to the overpass bridge on Cikampek Toll Road is to be improved with rigid pavement within the existing width for 2 lanes.

d) Dry port access road

The project is composed of the arterial road, which connects the dry port in JABABEKA with the south of Cikarang industrial area, a new interchange at 29km on Cikampek Toll Road and a toll gate. JABABEKA, the other industrial states and MPW are now coordinating to finalize the project scope, the design concept and the road design. The project image of the dry port access road is shown in Figure 4.1.47.


Source: JICA Survey Team

**Figure 4.1.46 Plan of Cikarang**



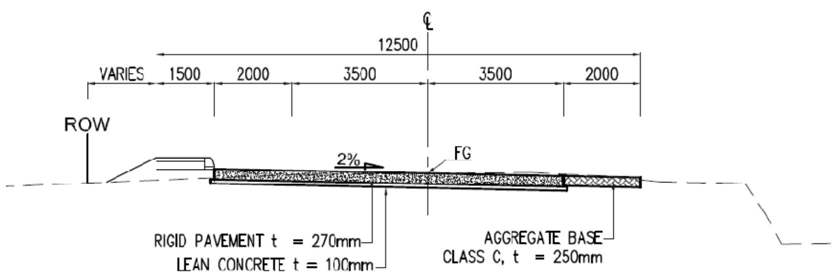

Source: JABABEKA

**Figure 4.1.47 Plan of Dry Port Access Road**

2) Cross section

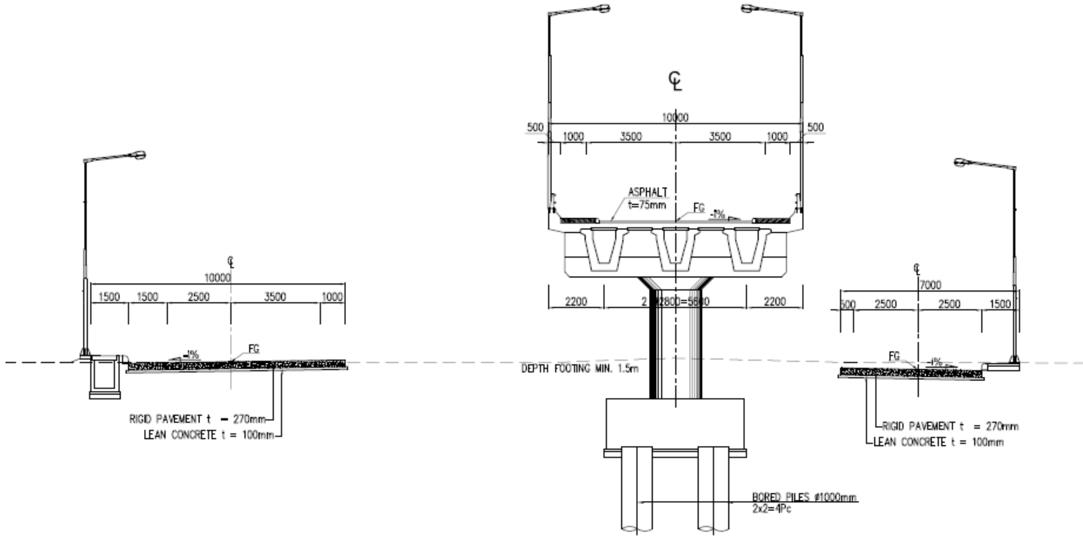
a) Jl. Kalimalang

The road is to be upgraded completed 2-lane road of carriageway with the sidewalk as the same level as the existing road. The 2-lanes of the Tegal Gede flyover and the frontage road at the intersection with Jl. Cibarusah are designed considering the future 4-lanes. The typical cross section is shown in Figure 4.1.48 and Figure 4.1.49.




Source: JICA Survey Team

**Figure 4.1.48 Typical Cross Section of Jl. Kalimarang**

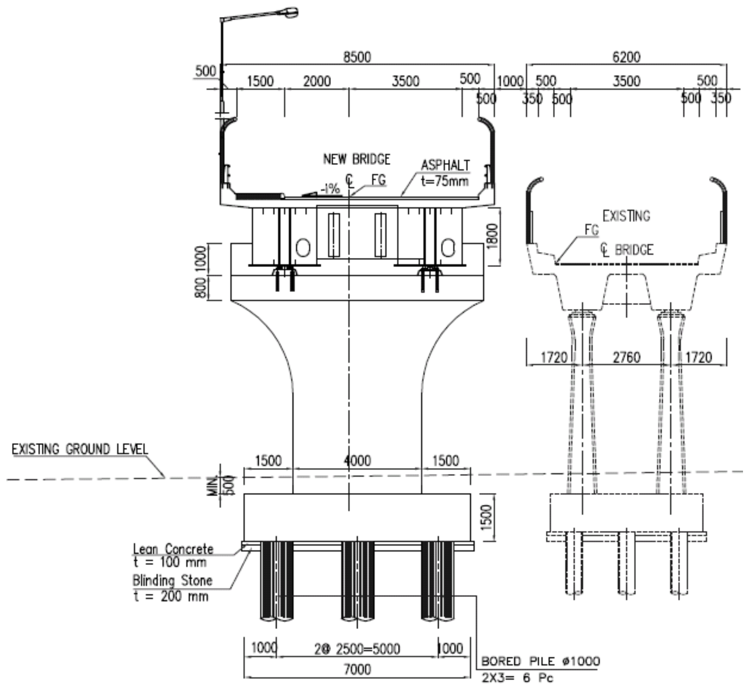



Source: JICA Survey Team

**Figure 4.1.49 Typical Cross Section of Tegal Gede Flyover**

b) Jl. Bali

The total width of the new bridge on Cikampek Toll Road is 7.5m for 1-lane of carriageway, shoulder and sidewalk. The typical cross section is shown in Figure 4.1.50.

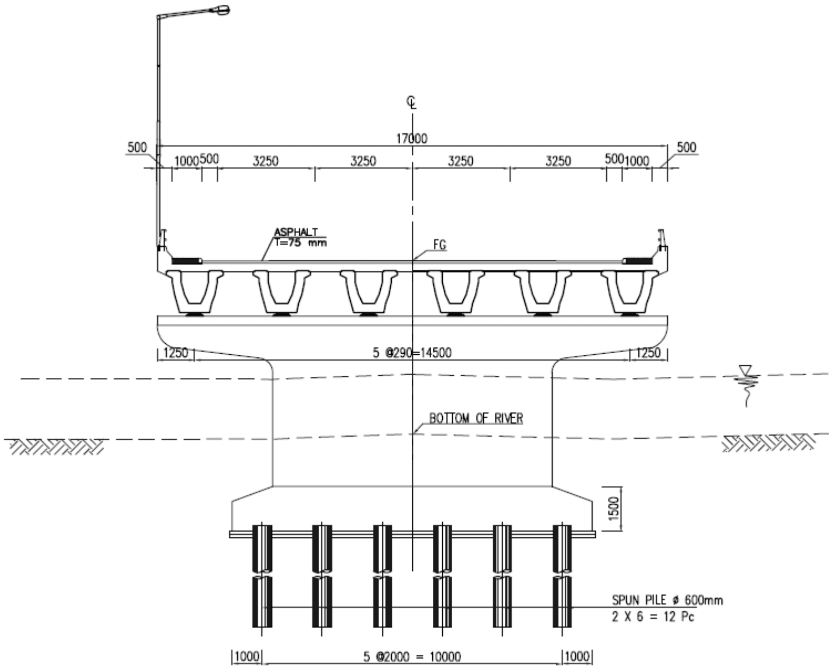



Source: JICA Survey Team

**Figure 4.1.50 Typical Cross Section of Overpass Bridge on Cikampek Toll Road on Jl. Bali**

c) Jl. Iman Bonjol

The width from the bridge on Kalimarang River to the bridge on Cikampek Toll Road should be same as the existing road. The only new bridge on Kalimarang River has 4-lanes which is the same as the concrete arch bridge on Jl. Bali. The typical cross section is shown in Figure 4.1.51.




Source: JICA Survey Team

**Figure 4.1.51 Typical Cross Section of New Bridge on Jl. Iman Bonjol**

3) Plan and profile

a) Jl. Kalimalang

The road alignment basically traces the existing road. At the intersection with Jl. Cibarusah, a 2-lane flyover is to be constructed along Jl. Kalimarang. The frontage road of the intersection is planned considering the future expansion for 4-lanes.

b) Jl. Bali

The overpass bridge on Cikampek Toll Road is to be newly constructed parallel to the existing bridge on the east side. The vertical alignment of the overpass bridge is about 1.5m higher than the existing bridge to secure the vertical clearance of Cikampek Toll Road.

c) Jl. Iman Bonjol

The road alignment basically follows the existing road and the road surface is to be rehabilitated. A new bridge is to be constructed on Kalimarang River on a skew to make the road alignment of Jl. Iman Bonjol straight. Accordingly, the intersection is also improved.

4) Other considerations

a) Jl. Kalimalang

As the existing road is located along the canal, it is necessary to coordinate with the irrigation office regarding the road alignment and the boundary of the river. A retaining wall or sheet piles will be installed where the road facilities invade the irrigation property.

b) Jl. Bali

A slope is applied between the existing and the new bridge to adjust the gap in elevation. A retaining wall is to be installed at the edge of the slope.

(10) Senayan

1) Study of suitable improvement

a) Alternatives

Five alternative plans are proposed for the improvement as follows.

- Alternative 1: Flyover through the roundabout

  To move the traffic from Jl. Patimura to Jl Sudirman, a 2-lane 1 direction flyover will be constructed above the roundabout. As Jl. Patimura currently has a 2-lane carriageway with 1-lane frontage road, the main lane is used as the bridge and the frontage road would be changed to a left-turn lane. Therefore, the traffic flow from Jl. Patimura to the roundabout will be impossible.

  On the other hand, the flyover reaches between the fast lane and slow lane on Jl. Sudirman. The width of the slow lane should be reduced to secure the space for the flyover and avoid land acquisition.

  This alternative is rejected because of the environmental regulations in DKI which stipulate that it is not allowed to construct any structure on Jl. Sudriman.


Source: JICA Survey Team

**Figure 4.1.52 Plan of Alternative 1 and 2**

- Alternative 2: Underpass through the roundabout

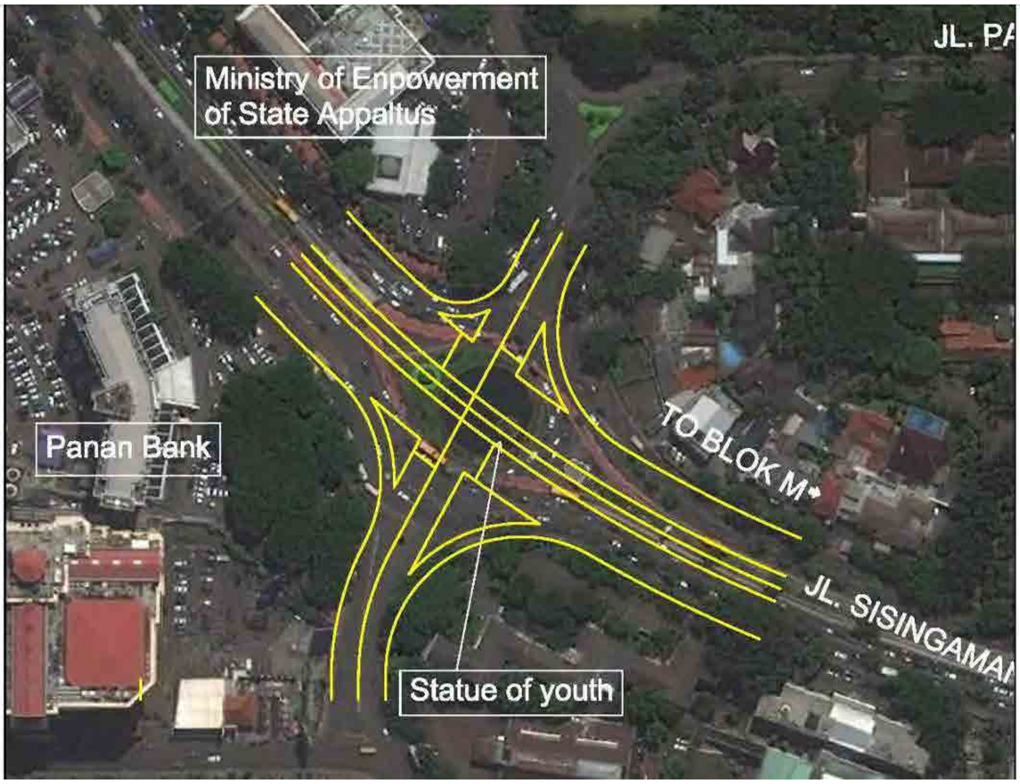
  The alignment is almost the same as Alternative 1 but it is an underpass structure. The main problem is the conflict with the MRT which will be constructed underneath Jl. Sudirman and Jl. Sisingamangaraja. If it is difficult to modify the alignment of MRT, the underpass for the road has to be constructed under the MRT.

  For the above reason, Alternative 2 is significantly difficult to implement.

- Alternative 3: Improvement to signalized intersection

  Different from Alternatives 1 and 2, this is not a structural improvement but an at-grade improvement. Changing from a roundabout type to signalized intersection makes the traffic flow smooth and average travel speed faster. As the affected area of the intersection is decreased, no land acquisition is required.

  This alternative is rejected because it is not allowed to remove the pond and symbolic statue from the roundabout which are to be temporally relocated during the construction of MRT.




Source: JICA Survey Team

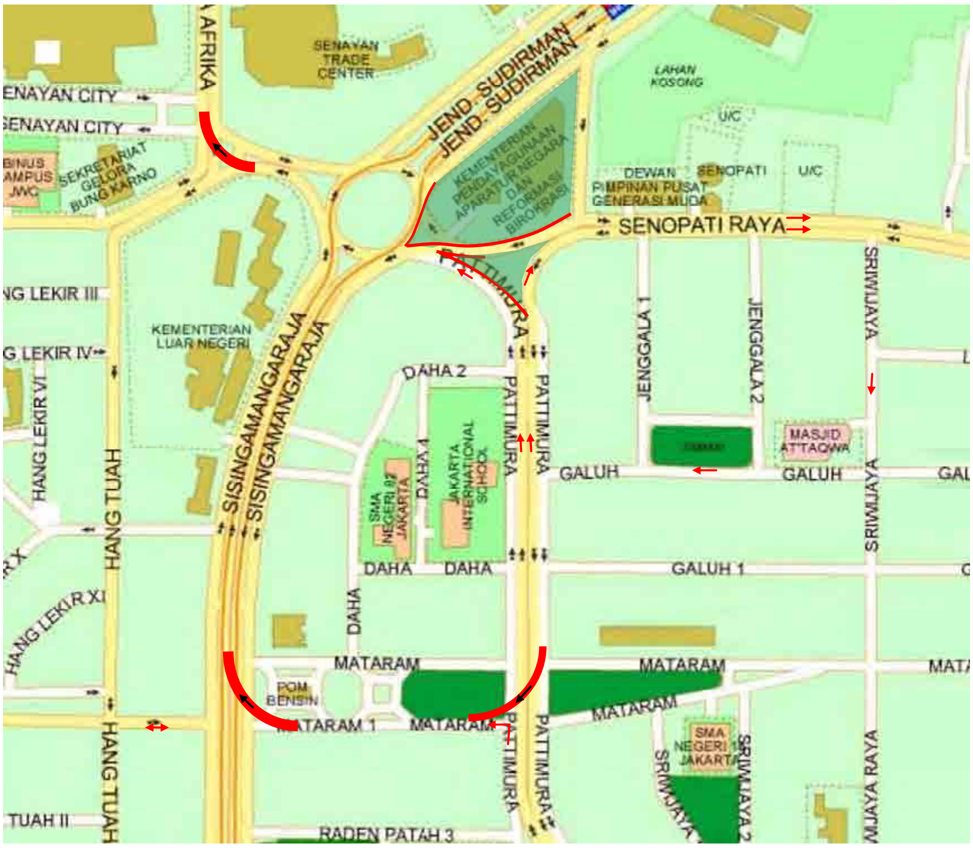
**Figure 4.1.53 Plan of Alternative 3**

- Alternative 4: Flyover and traffic management around the roundabout

  The contents of this alternative are the combination of a structural improvement and traffic management near the roundabout instead of the improvement at the roundabout itself. Some plans are proposed as follows.

  - Flyover on Jl. Patimura and Jl. Sisingamangaraja
  - Underpass on Jl. Asia Africa
  - Traffic management (change the traffic direction)

  To find the best solution, a detailed study will be necessary based on the traffic survey and analysis around the wider area of Senayan.




Source: JICA Survey Team

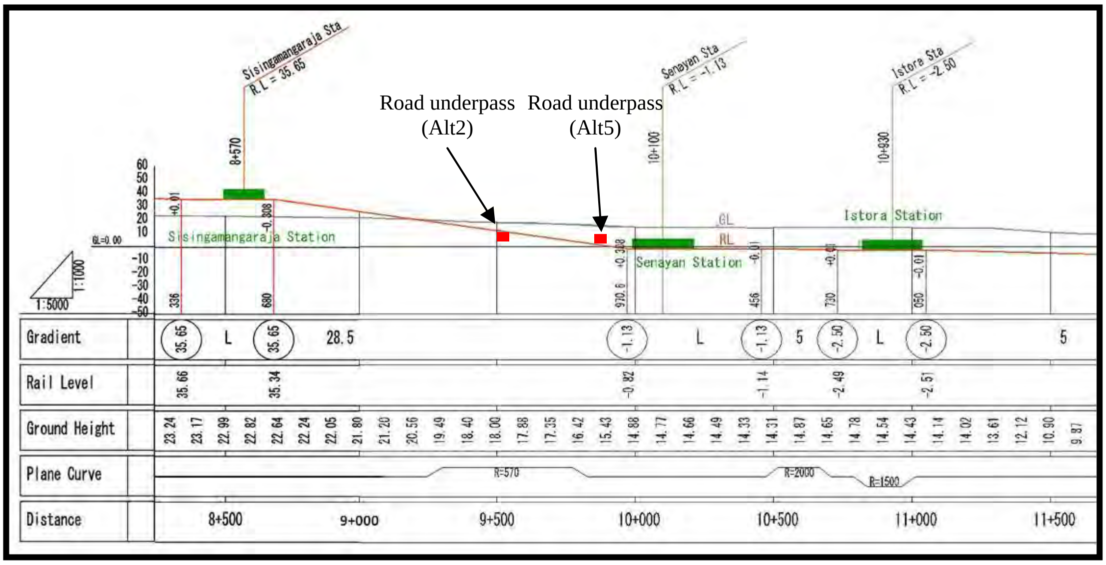
**Figure 4.1.54 Plan of Alternative 4**

- Alternative 5: Underpass through Jl.Patimura

  This is an underpass from Jl. Patimura to Jl. Sudirman along the existing road. The road underpass could be passed above the MRT but modification of the alignment of MRT is still necessary.


Source: JICA Survey Team

**Figure 4.1.55 Plan of Alternative 5**




Source: Ministry of Public Works

**Figure 4.1.56 Profile of MRT**

b) Comparison of alternatives

As it is not allowed and impossible to construct the flyover and underpass through the roundabout, the JICA Survey Team recommended Alternative 3 as an urgent measure until the MRT opens in 2016. However, the consensus among DKI, MPW and the JICA Survey Team has not built yet due to reasons as below;

- As the alignment of MRT is not fixed yet, it is required to coordinate with the MRT project in order to avoid conflict with the project. Therefore careful further study is necessary.
- The removal of the roundabout with the pond and statue is required time-consuming discussion and coordination among relevant organizations.

Also DKI and MPW request further study to find a solution based on Alternative 4. For further study to find the improvement method, an additional traffic survey is necessary.

The comparison table for the alternatives is shown in Table 4.1.59.

**Table 4.1.59 Comparison of Alternatives for Senayan Intersection**

| | Alt.1 | Alt.2 | Alt.3 | Alt.4 | Alt.5 |
|---|---|---|---|---|---|
| Outline | Flyover above the roundabout | Underpass below the roundabout | At-grade at the roundabout | Flyover on Jl. Sisinga-mangaraja and Jl. Patimura | Underpass from Jl.Patimura to Jl.Sudirman |
| Structure | Flyover | Underpass | At-grade | Flyover | Underpass |
| Positive Impacts | ●The traffic from Jl. Patimura to Jl. Sudirman is isolated from the roundabout by flyover. | ●The traffic from Jl. Patimura to Jl. Sudirman is isolated from the roundabout by overpass. | ●The compact signalized intersection make the traffic flow smooth. | ●The traffic signal could be removed from the roundabout as there will no traffic flow from Jl.Patimura and Jl.Senopati | ●The traffic from Jl. Patimura to Jl. Sudirman is isolated from the roundabout by underpass. |
| Negative Impacts | ●It is necessary to construct the flyover above the intersection. | ●The underpass will be considerably deep and long in order to pass across under the planed MRT<br>●The traffic flow on Jl.Sudirman will be controlled during the construction. | ●It is necessary to replace or remove the statue and pond at intersection. | ●All traffic from south will be shifted to Jl. Sisinga-mamgaraja.<br>●The direct traffic from Jl.Patimura and Jl.Senopati to Jl. Sudirman through the roundabout will be closed. | ●It is necessary to revise the vertical alignment of MRT to secure the space for underpass for road.<br>●The traffic flow on Jl.Sudirman will be controlled during the construction. |
| Construction Cost | High | Very high | Low | High | Very high |
| Construction Period | 2 years | 3 years | 1 year | 2 years | 3 years |
| EIA Scheme | UKL/UPL | UKL/UPL | UKL/UPL | UKL/UPL | UKL/UPL |
| Land Acquisition | A little | A little | None | A little | A little |
| Evaluation | ++ | + | +++ | ++ | + |

Source: JICA Survey Team

### 4.1.5 Summary of Basic Design

The summary of basic design is shown in Table 4.1.60.

**Table 4.1.60 Summary of Basic Design**

| Potential projects | | FO/UP | Improvement length | | Number of lanes and width | | Railway crossing |
|---|---|---|---|---|---|---|---|
| | | | Overall | Structure | Main road | Frontage road | |
| 1 | Semanggi | At-grade | - | 217m- | - | - | |
| 2 | R.E. Martadinata | FO | 725m | 532m | 2x2 (8.5mx2) | 2x2 | ● |
| 3 | Sulawesi - Tg.PA | FO | 665m | 318m | 2x2 (8.5mx2) | 2x2 | ● |
| 4 | Kuningan | UP | 1,147m | 1,018m | 2x2 (18.5m) | 2x2 | |
| 5 | Pancoran | FO | 887m | 634m | 2x1 (8.0m) | 2x1 | |
| 6 | Pinang Baris | FO | 886m | 533m | 2x2 (17.0m) | 2x2 | |
| 7 | Katamso | UP | 625m | 360m | 2x2 (19.0m) | 1x2 | |
| 8 | Sudirman II | FO | 985m | 570m | 2x2 (17.0m) | 2x2 | ● |
| 9. Cikarang | Kalimarang | At-grade (1 FO) | 7,780m | 190m | 1x2 (12.5m) | - | |
| | Bali | Overpass bridge | 360m | 71m | 1x1 (8.5m) | - | |
| | Iman Bonjol | At-grade (1 bridge) | 1,750m | 50m | 1x2 (7.0m) | - | |
| | Dry port access road | - | - | - | - | - | |
| 10 | Senayan | - | - | - | - | - | |

Source: JICA Survey Team

Note: The figure in the "number of lanes on main road" shows the number of lanes and directions

# 4.2 Structure Design

## 4.2.1 Design Standards for Structures

(1) Design Standards for Structures

The applicable design standards for structures are available in Volume-9 of NORMA STANDR PEDOMAN MANUAL (NSPM) comprising the following codes and manuals (Peratuan Perncanan Teknik Jembatan);

- Bridge Design Code Volume-1 & 2(1992), Ministry of Public Works
- Bridge Design Manual Volume-2 & 2 (1992), Ministry of Public Works.

These codes and manuals were developed under the programme of the “Bridge Management System” conducted with financial assistance from Australia. In principle, the design for bridge structures will be carried out in accordance with the codes and manuals above, however, for certain items which are not clarified therein, the “AASHTO Standard Specification for Highway Bridges” and “Specification of Highway Bridge in Japan” shall be applied.

(2) Length and Width of Structures

Traffic lanes, shoulders and other cross element facilities composing of the roadway width shall be determined by the Design Classification of the road as given in Table 4.1.2.

For the width of structures, it shall be sufficient for the kerbs to be set back a minimum of 500mm from the edge of the adjacent traffic lane measured to the base of the kerb. The typical cross sections of bridge structures for flyovers are given in Figure 4.2.1 and Figure 4.2.1.

For bridge structures with an overall length less that shown in Table 4.2.1, the roadway width of the bridge shall be sufficient to carry the full width of shoulders and pavement including auxiliary lanes where these are provided. No additional widening or setting back of the kerb is required in this case.

**Table 4.2.1 Length of Bridge Requiring Formation Width Deck**

| Road Design Classification | | Length of Bridge |
|---|---|---|
| Type | Class | |
| I | I | Less than 20m |
| I | II | |
| II | I | |
| II | II | Less than 15m |
| II | III | N/A |
| II | IV | |

Source: Bridge Design Code, MPW

(3) Width of Sidewalks

The minimum clear width of sidewalks between railings or barriers shall be 1.5m. Where there is no inner railing or barrier between the sidewalk and the roadway, the clear width of the sidewalk may be reduced to 1.0m in accordance with Code.

(4) Horizontal Clearance

1) Clearance at Rigid Traffic Barriers

The minimum horizontal clearance of 500mm shall be secured between the inside bottom face of the barrier and the edge of the adjacent traffic lane.

2) Horizontal Clearance over Railways

The minimum horizontal clearance to be provided for bridges over railways shall be 15.00m, or as determined by the railway authority.

(5) Vertical Clearance

1) Operational Vertical Clearance

The design vertical clearance during its design life shall be at least 100mm greater than the operational vertical clearance to allow for settlement and road resurfacing. The specified operational vertical clearance shall apply for the full width of the roadway.

2) Vertical Clearance at Road Bridges

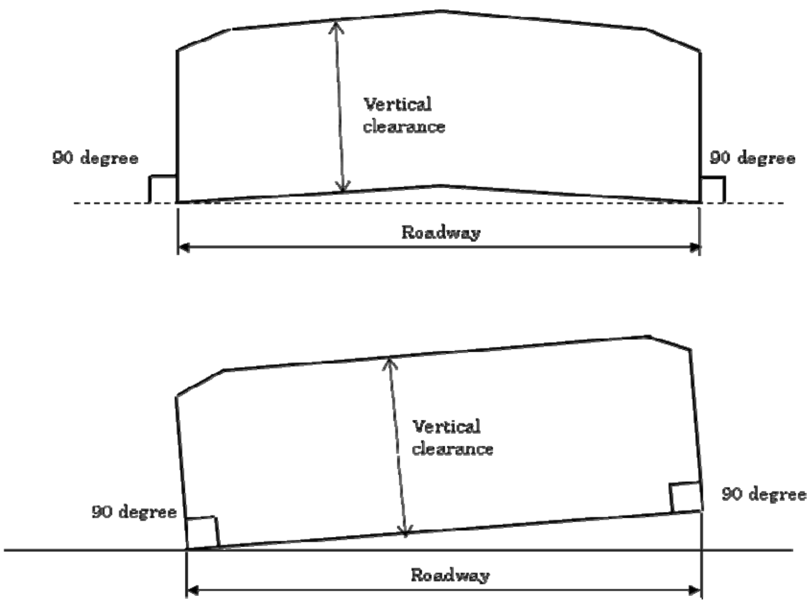
The minimum operational vertical clearance through or under road bridges for each road class is given in Table 4.2.2. The method for determining vertical clearance is given in Figure 4.2.1.

Case-1; parts of a bridge superstructure extending over the bridge roadway (through-type bridges) and Case-2; parts of the superstructure or substructure of a bridge crossing over a road or a railway.

**Table 4.2.2 Vertical Clearance of Bridge by Road Class**

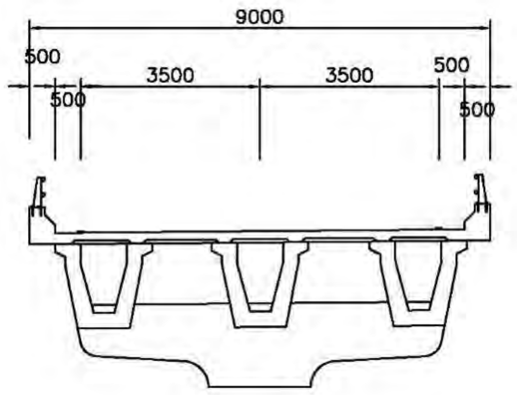
| Road Design Classification | | Case-1 | Case-2 |
|---|---|---|---|
| Type | Class | | |
| I | I | 5.3m | 5.1m |
| | II | | |
| II | I | 5.3m | 5.1m |
| | II | | |
| | III | | |
| | IV | | |

Source: Bridge Design Code, MPW

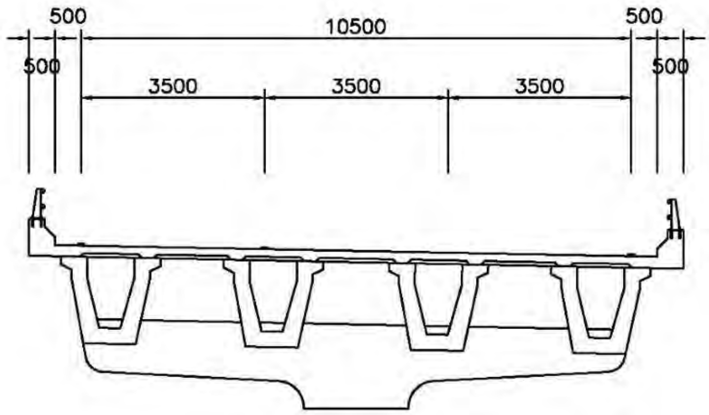



Source: Bridge Design Code, MPW

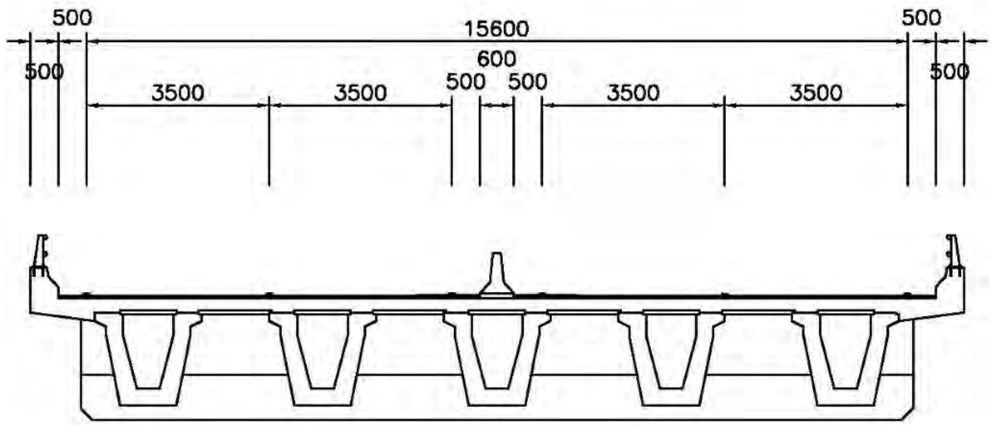
**Figure 4.2.1 Determining Vertical Clearance**




Two (2) Lane (two lanes one direction)



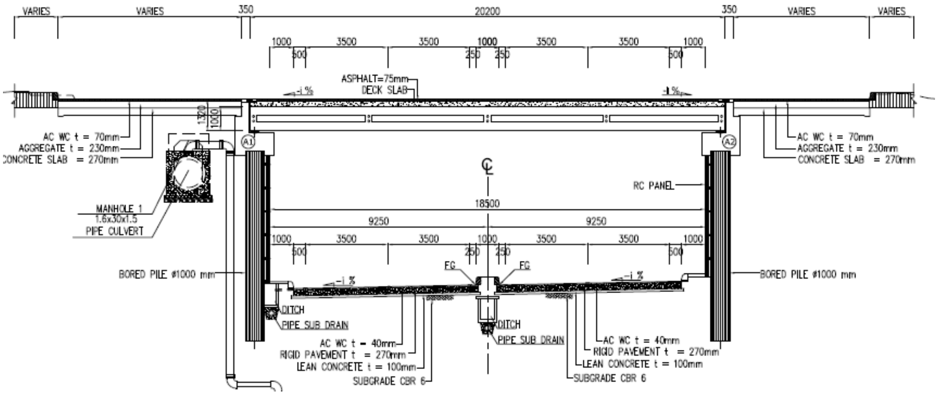

Three (3) Lane (three lanes one direction)



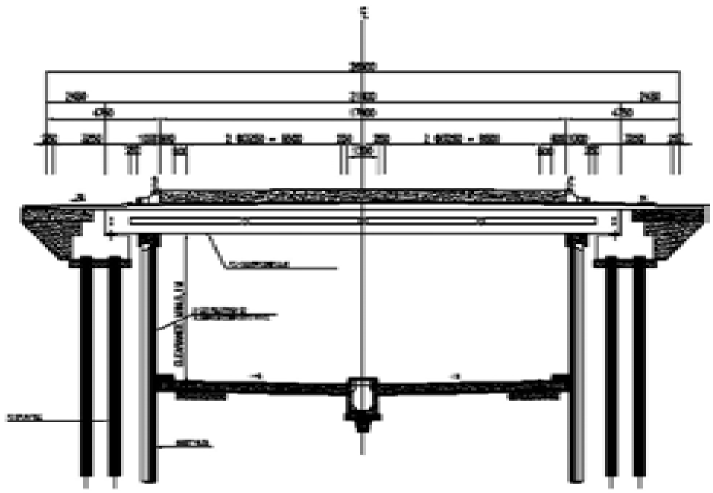

Four (4) Lanes (four lanes two directions, i.e. two lanes each way)

Source: JICA Survey Team

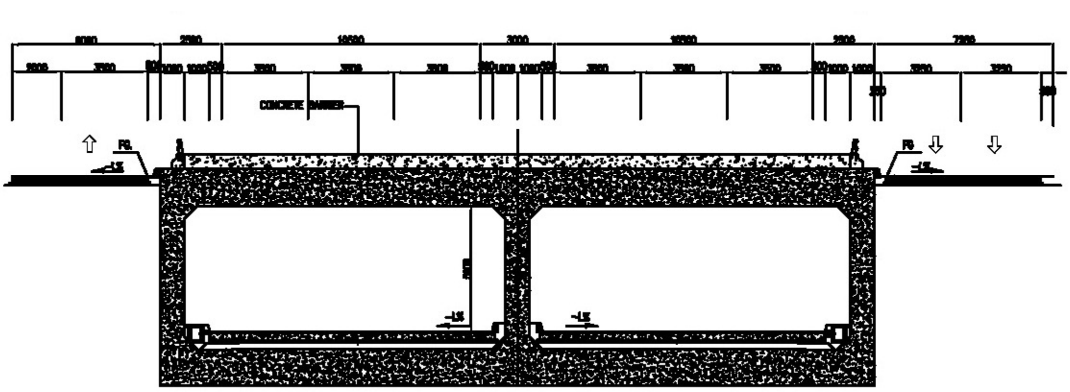
**Figure 4.2.2 Typical Cross Section of Bridge Structure (PC-U Girder)**




Four (4) lanes at approach section (four lanes two directions i.e. two lanes each way)



Four (4) lanes at tunnel section (four lanes two directions i.e. two lanes each way)




Six (6) lanes at tunnel section (six lanes two directions i.e. three lanes each way)

Source: JICA Survey Team

**Figure 4.2.3 Typical Cross Section of Underpass Structure**

### 4.2.2 Flyover (Bridge) Planning

(1) Review of Existing Structure Features

The structural type and standard layout were studied through discussions with relevant government officials, site investigations, review of the related study reports, such as the UARI report, other studies done by MPW and so on. It is considered that the structural type and layout, applied in the UARI project, are generally applicable and acceptable. Using the practices in the previous projects, the bridge planning, such as span arrangement, bridge type, typical cross section, erection methods etc., are considered to be reasonable. The flowchart of overall bridge planning is given in Figure 4.2.5.

(2) General Considerations for Applicable Bridge type, Span Arrangements and Layout

Considering the topographic conditions, adjacent facilities, obstacles and limitation of ROW to be identified at each candidate location, the bridge type and layout will be determined.

1) Bridge Type

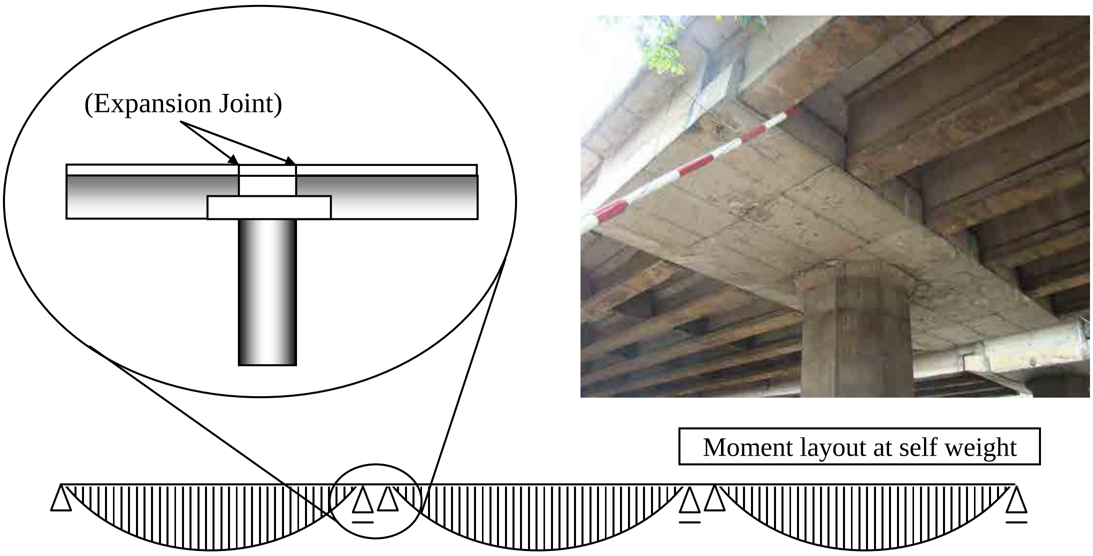
In Indonesia, the practical type of bridge is a pre-stressed concrete girder bridge; to be constructed with cranes or an erection girder in terms of its advantages on the following points, however it should be considered to apply PC box girder or Steel box girder at necessary wide spans and/or curve alignment sections.

- To shorten the erection time affecting the existing traffic stream;
- To minimize the effect to the existing adjacent facilities; and
- To minimize the construction cost by minimizing temporary cofferdams, supports and scaffolding works and to achieve the erection of the girders within the limited area.

As a result of preliminary study, each structural type with its applicable span length is shown in Table 4.2.3.

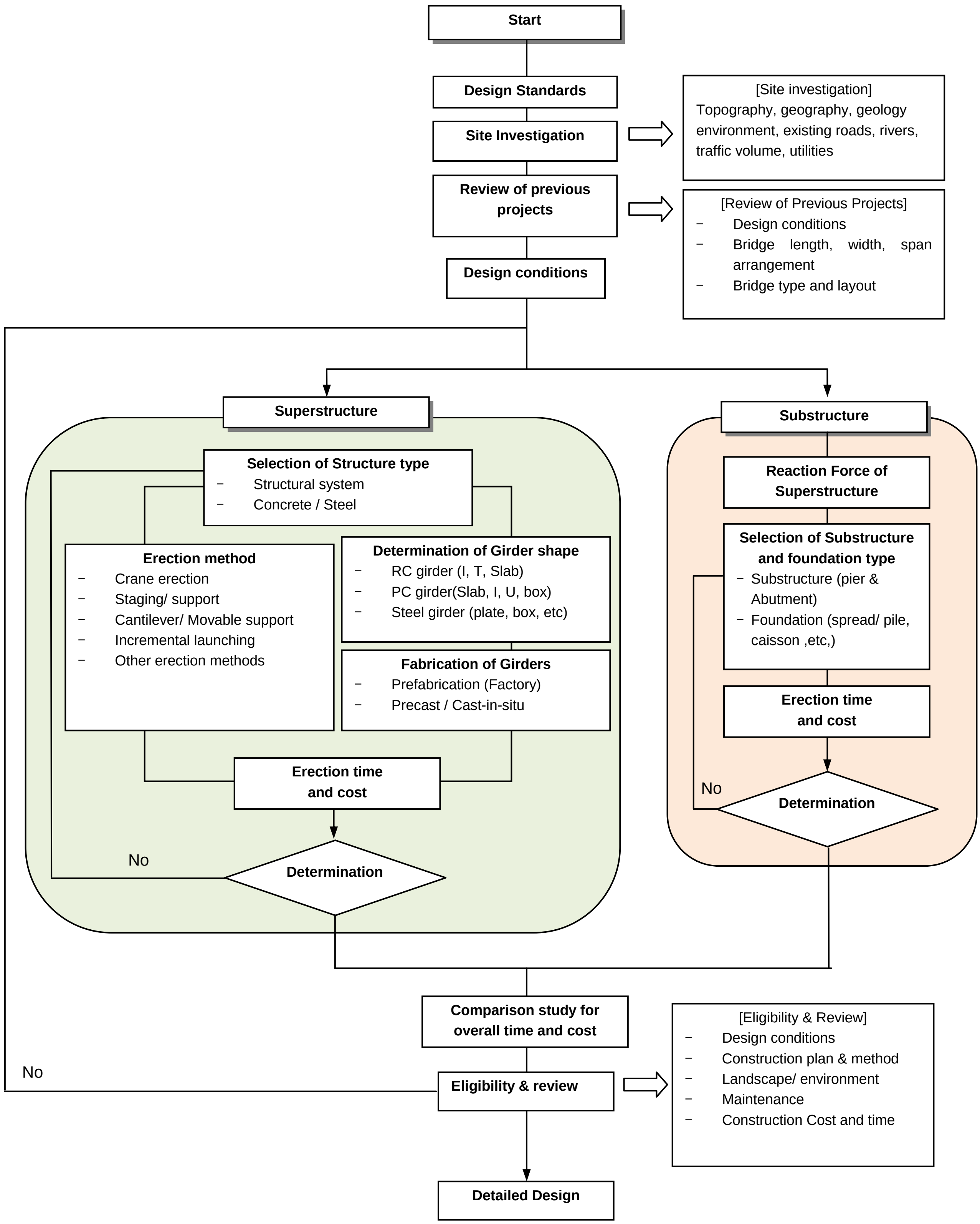
2) Span Arrangement and Layout

In Indonesia, a simple girder bridge with separated joints at the pier head is a conventional structural type for the flyover as given in Figure 4.2.4. The span arrangement and layout of the bridge structure will comply with simple structure systems unless otherwise restricted by site conditions.




Source: JICA Survey Team

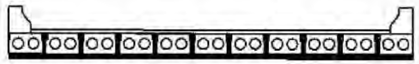
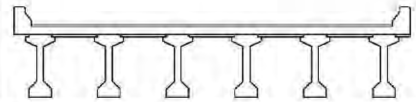
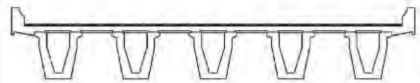
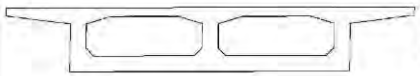
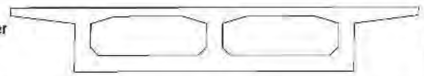
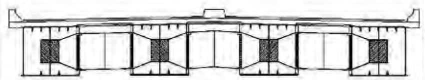
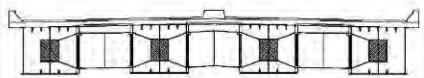
**Figure 4.2.4 Typical Side View of Simple PC Girder Bridge**

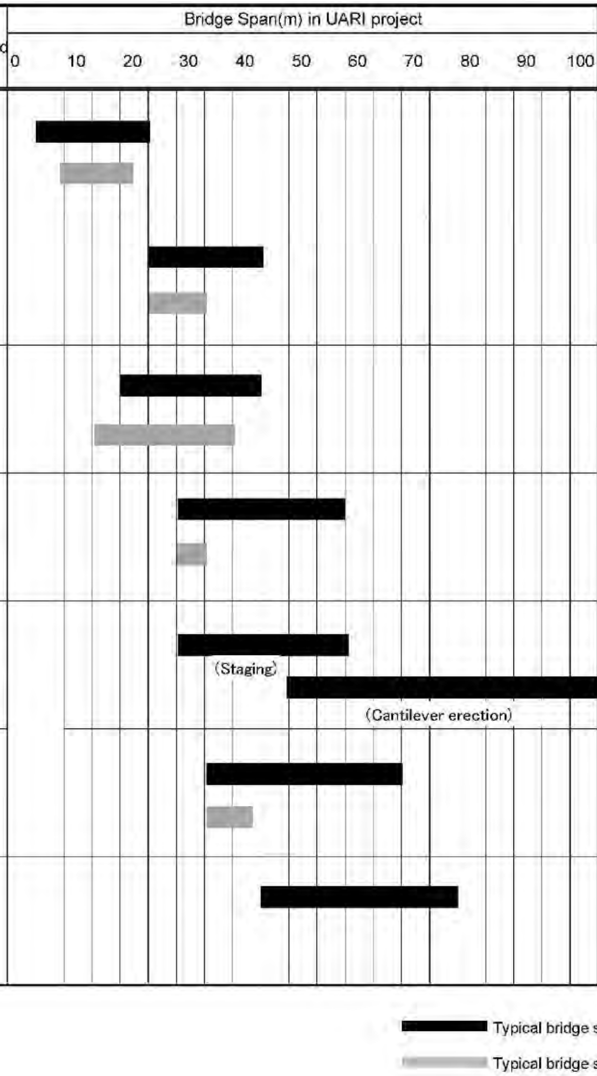



Source: JICA Survey Team

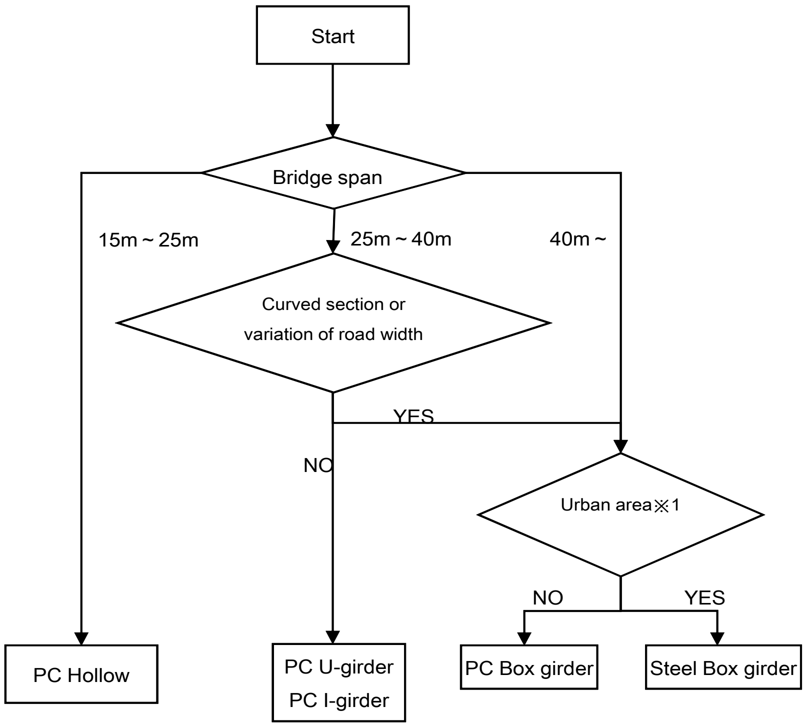
**Figure 4.2.5 Flowchart for Planning of Flyover (Bridge) Structure**

**Table 4.2.3 Bridge Type with Applicable Span Length for Flyover**

| | | Types of girder | Image view of cross section | Typical erection method | Bridge Span(m) in UARI project | Typeical Girder heigh / Span ( ) : UARI project | Practical use In UARI project |
|---|---|---|---|---|---|---|---|
| PC | Prefabricated girder | PC Hollow Slab girder |  | Crane erection | | 1 / 14 ~ 1 / 24<br>(1 / 19 ~ 1 / 22) | 4 |
| | | PC I-Girder (Post-tensioned) |  | Crane erection<br>Erection girder | | 1 / 13 ~ 1 / 17<br>(1 / 17 ~ 1 / 18) | 5 |
| | | PC U-Girder (Post-tensioned) |  | Crane erection<br>Erection girder | | 1 / 14 ~ 1 / 16<br>(1 / 13 ~ 1 / 21) | 14 |
| | | PC Simple Box Girder |  | Staging<br>Erection girder<br>(for precast girder) | | 1 / 17 ~ 1 / 20<br>(1 / 20 ~ 1 / 21) | 2 |
| | Staging girder | PC Continuous Box Girder |  | Staging<br>Cantilever erection | | 1 / 14 ~ 1 / 24 | 0 |
| Steel | Prefabricated girder | Steel Simple Box Girder |  | Crane erection | | 1 / 20 ~ 1 / 30<br>(1 / 20 ~ 1 / 21) | 3 |
| | | Steel Continuous Box Girder |  | Crane erection | | 1 / 20 ~ 1 / 30 | 0 |




Source: JICA Survey Team



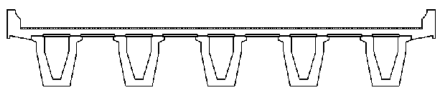
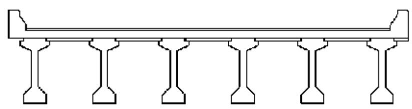

Note;

*1: PC box girder is to be erected by all-staging method which disturbs the current traffic flow therefore its not suitable in view of shortening construction time.

Source: JICA Survey Team

**Figure 4.2.6 Flowchart for Selection of Precast Girder Type**

**Table 4.2.4 Comparison of Typical Precast Girders in Indonesia**

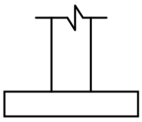
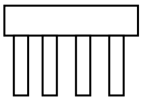
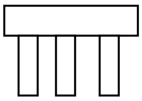
| Type | U-shaped Girder | I-shaped Girder |
|---|---|---|
| Outline | <br>- U-shaped girder is typical and popular in Indonesia<br>- Prefabricated girder<br>- Erection method : Crane erection | <br>- I-shaped girder is typical and popular in the Indonesia but technically out of date.<br>- Prefabricated girder<br>- Erection method : Crane erection |
| Construction period | - Moderate | - Moderate |
| Landscape | - Good<br>- (Superior visibility for U-shape) | - Normal |
| Cost | - Higher<br>- (Need bigger sized crane for erection) | - Moderate |
| Ease and safety of construction | - Ease and safe | - Risky<br>- (Unstable small bottom flange) |
| Evaluation | - Recommendable | - Not recommendable |

Source: JICA Survey Team

(3) Foundation Structures

Because of its advantages in construction, in terms of cost and time saving, a column type structure with reinforced concrete pile foundations is a conventional structural form, refer to the UARI project, and it is also general in JABODETABEK. Table 4.2.5 shows typical foundation types. Sub-soil conditions are assumed to be similar to those of the UARI project due to the potential project sites being located mostly in JABODETABEK. The planning of foundation type can be therefore referred to that project. In addition, the foundation type may vary according to the site conditions and sub-soil conditions, a spread foundation should be reasonably applied if possible bearing sub-stratum is found at shallow depth.

**Table 4.2.5 Comparison of Foundation Types**

| Depth of soil stratum | Foundation Type | Remarks |
|---|---|---|
| Depth varies between 3.0 m to 4.0 m | Spread footing  | - Open cut or cofferdam is required for excavation to the bearing stratum |
| Depth more than 6.0 m | PC spun pile foundation  | - Precast Pile length and diameter should be selected based on the subsoil conditions |
| | Cast-in- situ pile foundation  | - Pile length and diameter should be determined based on the subsoil conditions<br>- Piling method should be properly selected in accordance with water level and construction constraint. |

Source: JICA Survey Team

For the pile type, precast PC Spun pile and Cast-in-site RC pile should be reasonably selected in accordance with the description given in Table 4.2.6.

**Table 4.2.6 Comparison of Pile Types**

| Pile type | Applicable length, dimensions | Procurement of material | Characteristics |
|---|---|---|---|
| PC Spun pile | 5m to 25m<br>φ0.3m toφ1.0m | Available in Indonesia | - Possible mass production at factories<br>- Economical in large numbers<br>- Suitable to small to medium bearing capacities |
| Cast-in-situ RC pile | 10m to 60m<br>φ0.6m toφ1.5m | Available in Indonesia | - Applicable for large bearing forces<br>- No joints and applied for long piles<br>- Common for large bridges in Indonesia<br>- Reasonable cost |
| Steel round pile | 5m to 60m<br>φ0.3m toφ1.5m | Available in Indonesia | - Applicable for large bearing forces<br>- Joints are possible in long piles<br>- Not economical construction cost |

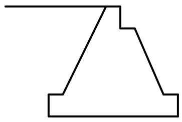
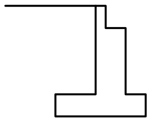
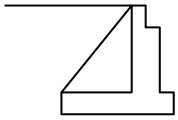
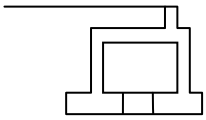
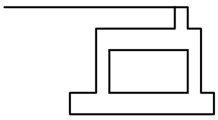
Source: JICA Survey Team

(4) Substructures

1) Abutments

Referring to the UARI project, the abutment type was compared and it was recommended that the Reversed-T type is the most suitable abutment type from the reasons of economy, simple structure and easy construction. In the basic design, Inverted-T Type should be selected as the standard abutment and general formation for initial design is setup from other local practices. But if a very tall, more than 15m, Inverted T-type would be required, a Box type as given in Table 4.2.7 should be chosen.

**Table 4.2.7 Comparison of Abutment Types**

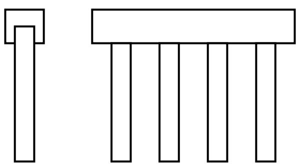
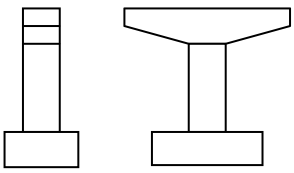
| Type | Sketch | Applicable Height (m) | Characteristics |
|---|---|---|---|
| Gravity-type |  | Less than 5m | - Simple structure<br>- Easy construction<br>- Heavier weight |
| Inverted T type |  | More than 5m and less than 14m | - Economical<br>- Easy construction |
| Counter-forted Buttressed type |  | Less than 10m | - Economical<br>- Intricate construction<br>- Difficulty in back filling |
| Rigid-framed type |  | More than 10m or less than 15m | - Complicated structure<br>- Expensive |
| Box type |  | Less than 15m | - Large scale structure<br>- Complicated structure<br>- Expensive |

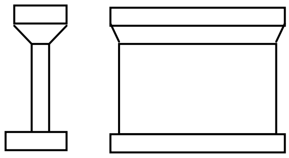
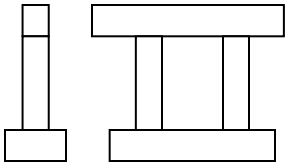
Source: JICA Survey Team

2) Piers

Conventional types of piers are briefly compared as shown in Table 4.2.8. The type of pier should be selected to suite the site condition and working force. In the UARI Project, typical wall and column type piers were selected and these were considered to be applicable and reasonable for this study. Standardising the pier type and simplifying the construction plan for the various practices given from the previous projects would facilitate the bridge planning in a timely manner.

**Table 4.2.8 Comparison of Pier Types**

| Type | Figure | Characteristics |
|---|---|---|
| Pile bent type pier |  | ● Simple structure with capped pile head<br>● Weak horizontal force and flexible structure<br>● Unsuitable for piers in rivers where scouring is expected<br>● relatively light-weight superstructure<br>● Lower cost |
| Column type pier |  | ● Conventional type of substructure in Indonesia<br>● Diameter of column is larger<br>● Large area of river crossing<br>● Reducing thickness of pier head by prestressing |

| | | |
|---|---|---|
| Wall type Pier |  | ● General type of substructure<br>● Rectangular shape inappropriate to visibility<br>● Care must be taken regarding the direction of water flow if constructed in a river<br>● Pier thickness can be minimized |
| Rigid framed pier |  | ● Generally used for wide super structure<br>● Unsuitable piers in rivers due to creation of eddies around the columns |

Source: JICA Survey Team

### 4.2.3 Underpass Planning

The underpass structure was selected based on the comparison study on the possible structural types as given in Table 4.2.9 and Table 4.2.10.

(1) At Intersections (Tunnel Section)

In the optional types of underpass structures, PC sheet piles in combination with a simple girder bridge which was practically applied in the UARI project was considered to be the most economical and appropriate structure. At the intersection, two abutments were located behind the PC sheet piles and the top of the open cut space was covered with simple PC girders. This method will help minimize the construction yards and time needed for construction unless an obstacle exists adjacent to the construction.

However, the structure type depends on the site conditions, obstacles and other limitations at the site. In this project, the proposed underpass structure, for example ("Kuningan intersection"; See photo Figure 4.2.7), must be constructed under the existing flyover. The vertical clearance at the intersection is limited so that the specific piling method under the flyover shall be considered.

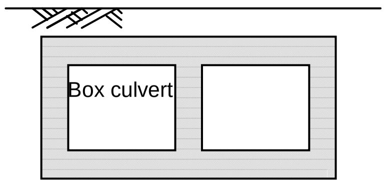
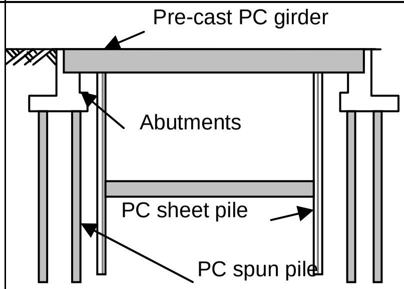
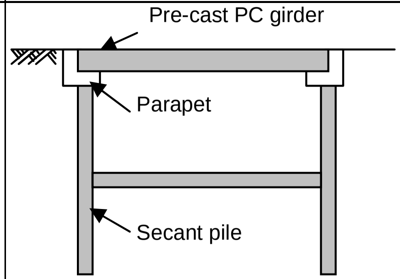
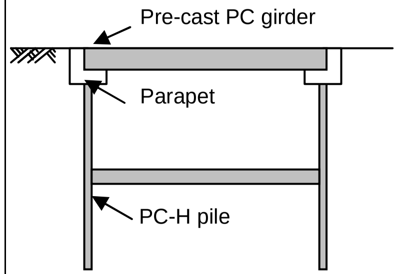
On the other hand, an RC box culvert is considered as a conventional structure for tunnelling under the intersection. However, construction of a temporary cofferdam is required before excavation of the structure which implies similar difficulties under the existing flyover as well as longer construction time. All the potential sites selected are highly congested so that minimizing the construction time which would obstruct existing traffic flow should be considered.

**Figure 4.2.7 Kuningan Intersection**

(2) Approach Section (Open –Cut and Retaining-wall Section)

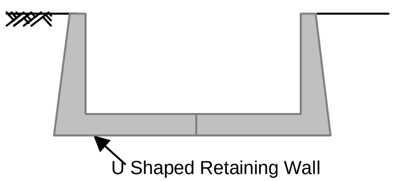
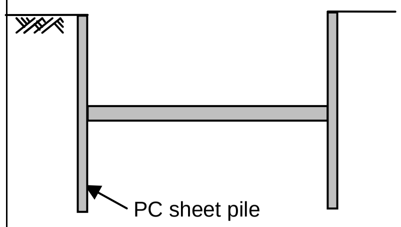
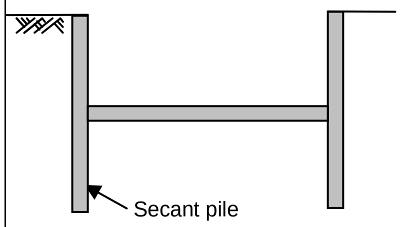
According to the practice in the UARI Project, the PC sheet pile may be a possible type of structure at the approach sections (for open-cut sections) with the advantage of minimizing construction time. Where the approach section is lower than 5m, a retaining wall may be suitable based on the practice in the UARI project.

**Table 4.2.9 Selection of Preferable Underpass Structure at Tunnel Section (at Intersection)**

| | Op - I | Op-II | Op- III | Op- IV |
|---|---|---|---|---|
| Outline | Box Culvert | PC sheet piles with PC girders | Secant piles with slab | PC H piles with PC girders |
| |  |  |  |  |
| | The open - cut method requires temporary cofferdams using sheet piles before the construction of the box culvert | Pre-cast PC sheet piles can be used for both temporary and permanent installations. Abutments behind the PC sheet piles for covering the open-top with PC girders are required. | Cast-in-situ secant piles with covering by PC girders. A cosmetic wall is required to cover the rough surface of the secant pile. | Pre-cast H shaped piles can be used for both temporary and permanent installations. Concrete parapet at the top of PC H piles serves as an abutment for setting PC girders. |
| Necessary width for construction | Widest | Wider | Narrow | Narrowest |
| Effected Length | Longest | Short | Short | Short |
| Construction Period | Longest (15 months) | Shorter (9 months)<br>Including piles and abutments | Middle (12 months)<br>Including piles and abutments | Shortest (8 months)<br>Including piles and abutments |
| Accuracy | High | High | Tolerable | Tolerable |
| Ease of construction under flyover | Difficult | Difficult | Possible | Difficult |
| Affect to existing structure | Significant<br>(due to the excavation using temporary coffer dam, it needs a wide construction area) | Higher<br>(due to necessary piling for the foundation of the girder behind the PC sheet piles) | Moderate | Moderate |
| Cost | Higher | Moderate | Moderate | Moderate |
| Evaluation | Not recommendable | Not recommendable | Recommendable | Not recommendable |

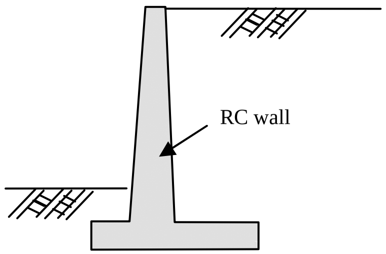
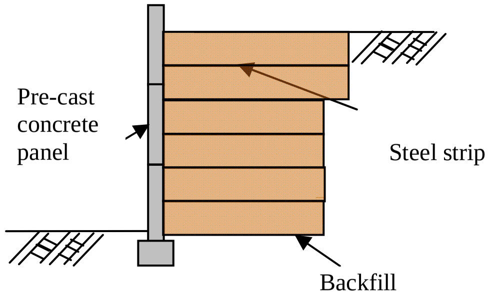
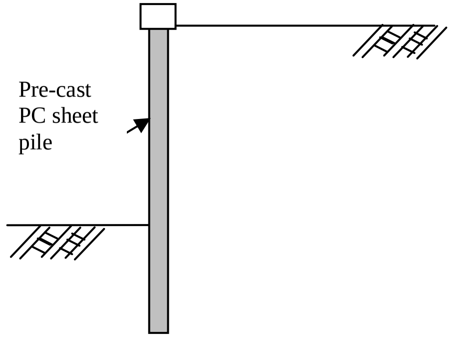
Source: JICA Survey Team

**Table 4.2.10 Selection of Preferable Underpass Structure at Approach Sections**

| Option | Op - I | Op-II | Op- III |
|---|---|---|---|
| Outline | U shaped Retaining Wall | PC sheet piles | Secant piles |
| |  |  |  |
| | The open-cut method requires temporary cofferdams with sheet piles before the construction of the retaining wall | Pre-cast PC sheet piles can be used both for temporary and permanent installations. It is possible to minimize construction time. | Cast-in situ secant piles require more machinery and equipment for casting concrete. A cosmetic wall is required to cover the rough surface of the secant piles. |
| Necessary width for construction | Wider | Narrowest | Wider |
| Construction Period | Longest (15 months) | Shortest (9 months) | Longer (12 months) |
| Accuracy | High | Tolerable | Tolerable |
| Affect to existing structures | Significant (due to wide area for construction and need for temporary cofferdams) | Moderate | Moderate |
| Cost | High | Moderate | Moderate |
| Evaluation | Not recommendable | Recommendable | Not recommendable |

Source: JICA Survey Team

## Table 4.2.11 Comparison of Structure Type at Approach Section

| Option | Op-I | Op-II | Op-III |
|---|---|---|---|
| | Retailing wall | Reinforced earth wall | PC sheet pile wall |
| Outline | <br>• L-shaped RC retaining wall resists the earth pressure as a cantilevered beam.<br>• Necessary structural excavation behind RC wall. | <br>• Reinforced soil by pre-cast concrete panels and steel strips resists the earth pressure.<br>• Construction period can be reduced.<br>• Need careful control for compaction of backfill | <br>• Self standing Pre-cast PC sheet piles resists the earth pressure<br>• Construction period can be reduced.<br>• High construction noise during pile driving. |
| Applicable height | 3m <h < 10m | 3m <h < 18m | 2m <h < 8m |
| Construction space | Narrowest | Widest<br>(Need crane for placing panels) | Narrower<br>(Need crane for piling) |
| Construction period | Longest<br>(Suitable for suburbs) | Shorter<br>(Suitable for urban area) | Shortest<br>(Suitable for urban area) |
| Landscape | Normal<br>(Easy to be attacked with graffiti) | Aesthetic | Normal |
| Cost | Moderate 1.5 Mil.Rp. / m2<br>(1.00) | Higher 2.5 Mil.Rp. / m2<br>(1.67) | Highest 3.5 Mil.Rp. / m2<br>(2.33) |
| Evaluation | Recommendable for suburbs | Recommendable for urban area | Depend on site conditions |

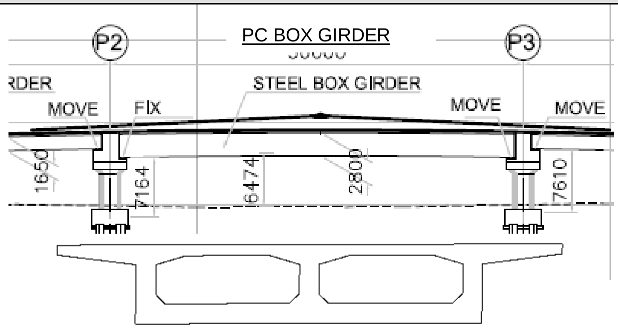
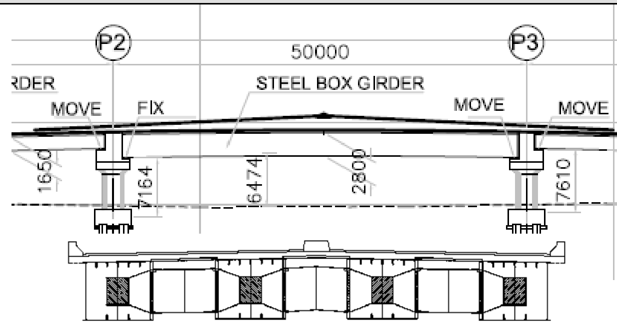
Source : JICA Survey team

### 4.2.4 Structure Design for Each Subproject

(1) Flyover Structure

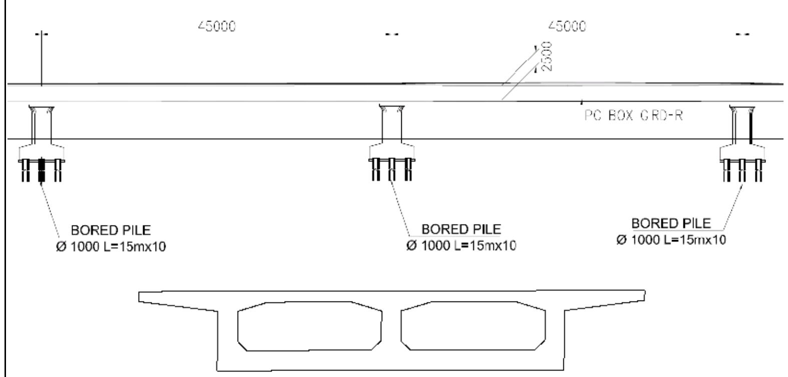
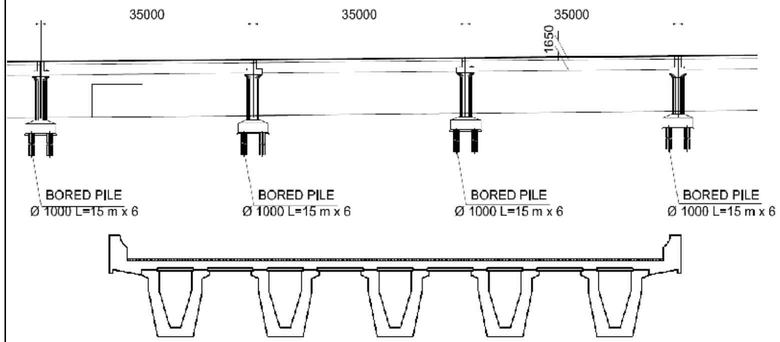
This chapter describes of the design conditions and principles for each flyover structure in the subprojects. The selection of structural types in principle follows the local practice in both engineering and financial aspects except those that were determined by the previous study or other projects. In the detailed design, these conditions and principals should be reviewed in accordance with the site investigation and other factors concerned. Table 4.2.12 and Table 4.2.13 show the comparative study for major structures of flyovers or bridges in the subprojects. The details for each subproject are provided in the drawings (See **Vol.4 Drawings**).

**Table 4.2.12 Comparison of Bridge Structure for Main Span of Flyover (Span length > 50m)**

| Alternative | PC Box Girder Bridge | Steel Box Girder Bridge |
|---|---|---|
| **Sketch** |  |  |
| **Structural characteristics** | - Simple PC box girder bridge;<br>- Applicable span length less than 50m.<br>- Large foundation and substructure due to heavy concrete structure | - Simple steel box girder bridge (Non-composite slab)<br>- Applicable max. span length ;less than 55m<br>- Compact foundation and substructure due to light weight steel structure (+) |
| **Ease of Construction** | - Conventional all staging method is most eligible however the temporary support closes traffic and limits the opening of intersection.<br>- Longer erection time for curing and fabrication of concrete girder which disturbs current traffic flow. | - Crane erection method enables a short erection time after prefabrication of girder in factory that minimizes affects to the current traffic flow (+++) |
| **Maintenance** | - Almost no maintenance for structure except partial replacement; such as expansion joints and bearing devices if necessary (+) | - Needs repaint after 10 years and periodic refurbishment after 30 years |
| **Aesthetics** | - Constant equal girder depth shows an orthodox aesthetic view | - Ditto to left |
| **Construction Cost** | - Life cycle cost less than steel box girder bridge<br>18.00 Mil.Rp. / m2 (1.00) (++) | - Life cycle cost higher than PC box girder bridge<br>25.00 Mil.Rp. / m2 (1.39) |
| **Overall evaluation** | Merit for maintenance and demerit for longer construction time giving higher impact to current traffic flow.<br><br>◆Total Evaluation ; +++ | Merit for shorter construction time giving less impact to current traffic and demerit for higher initial cost and maintenance.<br><br>◆Total Evaluation ; ++++ |

Source: JICA Survey Team

**Table 4.2.13 Comparison of Bridge Structure for Side Span of Flyover**

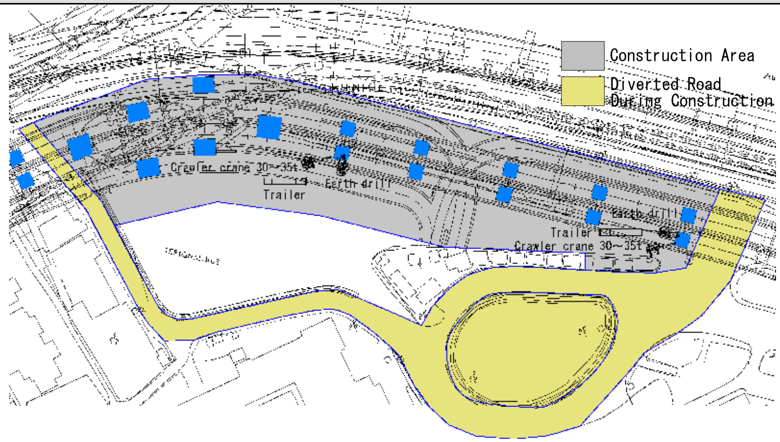
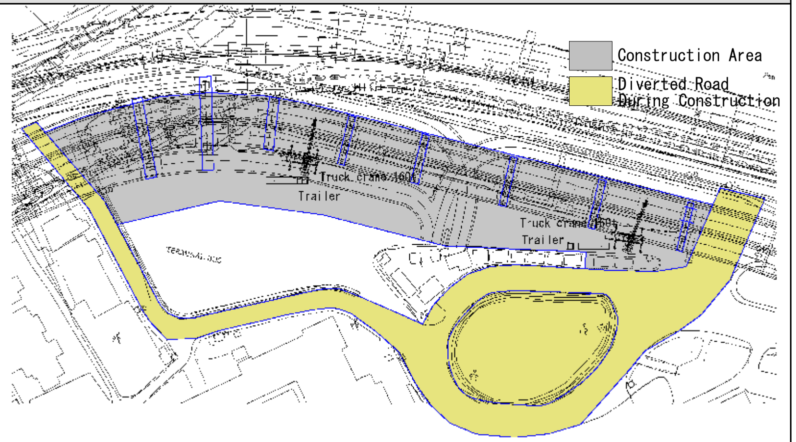
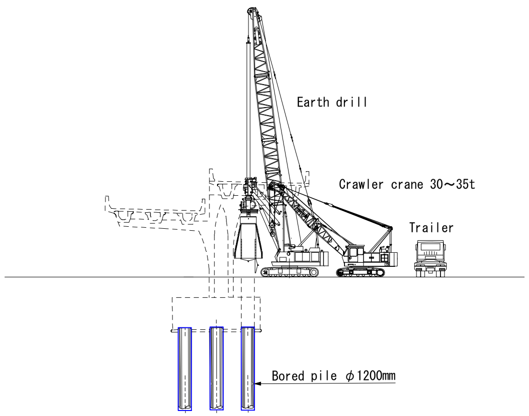
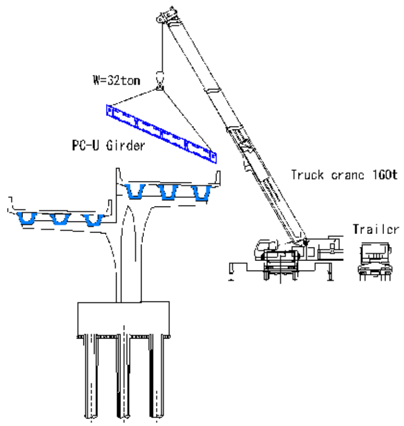
| Alternative | PC Box Girder Bridge | PC-U Girder Bridge |
|---|---|---|
| **Sketch** |  |  |
| **Structural characteristics** | - Simple PC box girder bridge;<br>- Applicable span length less than 50m.<br>- Erection method ; All staging method | - Simple PC U girder bridge;<br>- Applicable max. span length ;less than 40m<br>- Erection method ; Crane erection or Erection girder method |
| **Ease of Construction** | - Conventional all staging method is most eligible however the temporary support limits the traffic flow during the erection of girder.<br>- Longer erection time for curing and fabrication of concrete girder which disturbs current traffic flow | - Crane erection method or Erection girder method enables a short erection time after prefabrication of girder in factory that minimizes affects to the current traffic flow (++) |
| **Maintenance** | - Need partial replacement; such as expansion joints and bearing devices if necessary | - Ditto to left. |
| **Aesthetics** | - Fewer piers show an more aesthetic view (+). | - More piers show an orthodox aesthetic view. |
| **Construction Cost (Ratio)** | - Longer construction time increases construction cost<br>All staging method ;16.13 Mil. Rp. / m2 (1.05) | - Most reasonable<br>Crane erection method ; 13.22 Mil. Rp. / m2 (1.00 ) (+)<br>Erection girder method ; 13.37 Mil. Rp. / m2 (1.01) (+) |
| **Overall evaluation** | Merit for more aesthetic view and maintenance and demerit for longer construction time giving higher impact to current traffic flow.<br><br>◆Total Evaluation ; + | Merit for shorter construction period and cost giving less impact to current traffic and demerit for normal aesthetic view.<br><br>◆Total Evaluation ; +++ |

Source: JICA Survey Team

(1) 2. R.E. Martadinata

| Design Conditions | | |
|---|---|---|
| Bridge type<br>Bridge length Span<br>Cross elements<br>Construction method<br>Alignment<br><br><br><br>Abutment<br>Pier<br>Foundation<br>Bearing Stratum<br>Bearing Support<br>Expansion Joint | 24 span PC Precast U girder bridge<br>24@25-35=720m<br>2x3.5m (carriageway) + 2x1.0m (barrier +marginal strip)=9.5m<br>Pre-cast girders with Crane erection<br>Alignment : Horizontal Alignment R= ∞ - 150m<br>Vertical Alignment Max 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC Reverse T-type Abutment<br>Pier type : RC rectangular column-type with PC pier head<br>, RC portal type<br>Foundation type : ϕ1.2m cast-in-place RC pile foundations<br>Bearing strata : Depth 10 – 16m , Hard silty clay<br>Bearing support : Rubber bearing device<br>Expansion joints : Seamless joint type | |
| Design Features | | |
| Superstructure | a) Main girder<br>The superstructure is mainly formed by three PC-U girders supporting the RC slab.<br>b) Support condition for bridge<br>A simple bridge system composed of one side fixed and the other side movable at each pier. The girders joint and pier heads apply with expansion joints.<br>c) Erection method<br>Prefabricated PC-U girders are procured from a factory and transported to the site. The erection of the girders shall be done by either crane or erection girder. | |
| Foundation/<br>Substructure/<br>Others | d) Pier<br>Most of piers are reinforced concrete rectangular column-type piers with the pile caps supported by ϕ 1.2 m RC bored piles. Some of them are rigid frame piers which they are needed to cross over the railway crossing. The outline of pier shape is tapered and the height of some pier heads is minimized by using prestressed concrete.<br>e) Abutment<br>Conventional RC T-type abutments are proposed at the end of flyover. | |
| | f) Piled Slab<br>Piled RC slab is applied at the approach section behind the abutments for the avoidance of differential settlement in the soft soil ground.<br>g) Pile<br>ϕ 1.2 m RC cast-in-situ bored piles are proposed for the foundation. The construction method should be either reverse circulation method or earth auger method taking into account the height of groundwater level. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.14 | |

**Table 4.2.14 Construction planning for RE. Martadinata Flyover**

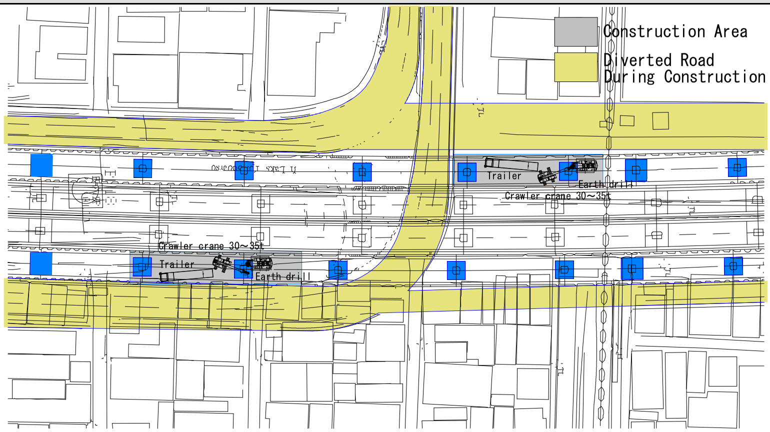
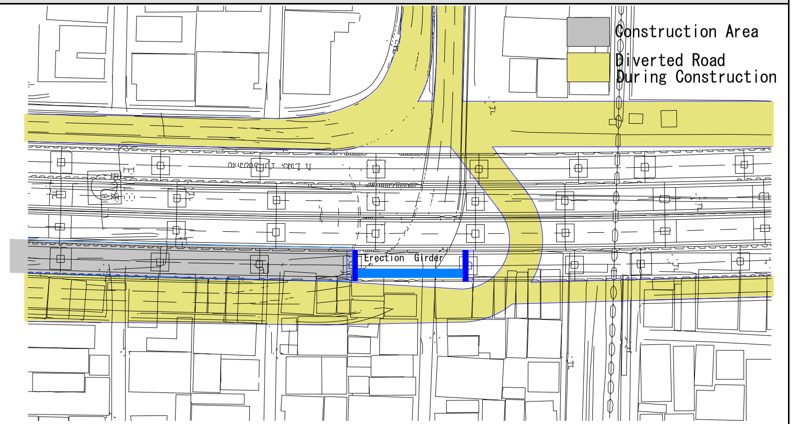
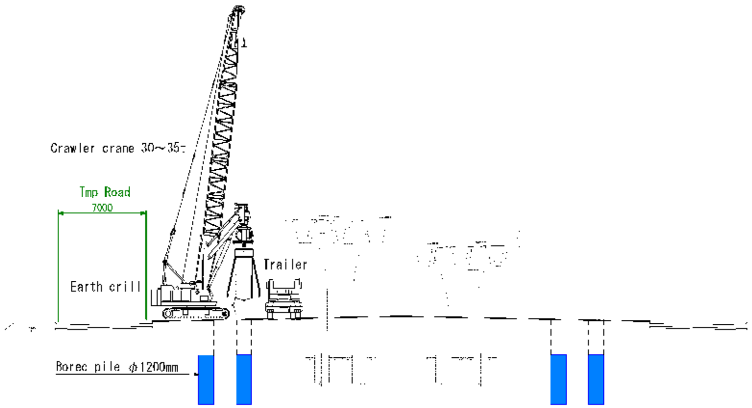
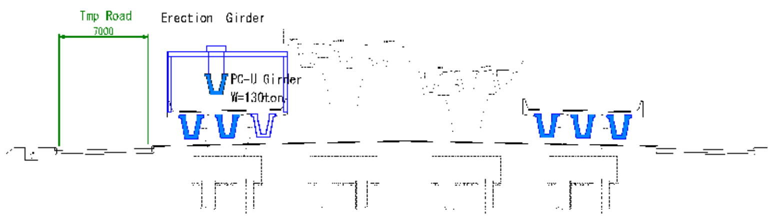
| Items | During the construction of foundation/ substructure | During the erection of girders |
|---|---|---|
| **Plan** |   |   |
| **Side view** |   |   |
| **Traffic control and other notes** | ● Possible construction within the bus terminal and no extra temporary yard required during the construction;<br>● Need temporary removal of bus terminal to use for the construction yard during the construction;<br>● The existing road should be diverted at each phase of construction<br>● Need traffic control for the transport of materials and machinery to the site;<br>● Need temporary facilities to secure the passenger's access to the railway station | |

Source: JICA Survey Team

(2) 3. Sulawesi Flyover

| Design Conditions | | |
|---|---|---|
| Bridge type<br>Bridge length Span<br>Cross elements<br>Construction method<br>Alignment<br><br><br><br>Abutment<br>Pier<br>Foundation<br>Bearing Stratum<br>Bearing Support<br>Expansion Joint | 9 span PC-U simple girders, 1 span steel box (River), 1 span PC hollow slab<br>28.5+55.0+2@30.0+35.0+31.0+30.0+20.0+2@30.0+27.5=347.0m<br>2x4.25m (carriageway) + 2x0.5m (Railing) =9.50m<br>Pre-cast PC girders with Crane erection<br>Alignment : Horizontal Alignment R= 2990m<br>Vertical Alignment Max. 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC reverse T-type abutment<br>Pier type : RC rectangular column-type pier with PC pier head<br>Foundation type : ϕ1.2m cast-in-place piled foundations<br>Bearing strata : Depth 10 – 16m , Hard silt clay<br>Bearing support : Rubber bearing device<br>Expansion joints : Seamless joint type | |
| Design Features | | |
| Superstructure | a) Main girder<br>The superstructure is mainly formed by three(3) PC-U girders supporting the RC slab.<br>b) Support condition for bridge<br>A simple bridge system composed of one side fixed and the other side movable at each pier. The girder joint and pier heads apply with expansion joints.<br>c) Erection method<br>Prefabricated PC-U girders are procured from a factory and transported to the site. The erection of the girders shall be done by either crane or erection girder. | |
| Foundation/<br>Substructure/<br>Others | d) Pier<br>All the piers are reinforced concrete rectangular column-type piers with the pile caps supported by ϕ 1.2 m RC bored piles.<br>e) Abutment<br>Conventional RC T-type abutments are proposed at the end of flyover. | |
| | f) Piled Slab<br>Piled RC slab is applied at the approach section behind the abutments for the avoidance of differential settlement in the soft soil ground.<br>g) Piles<br>ϕ 1.2 m RC cast-in-situ bored piles are proposed for the foundation. The pile driving method should be either reverse circulation method or earth auger method taking into account the height of groundwater level. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.15. | |

**Table 4.2.15 Construction planning for Sulawesi Flyover**

| Items | During the construction of foundation/ substructure | During the erection of girders |
|---|---|---|
| **Plan** |  |  |
| **Side view** |  |  |
| **Traffic control and other notes** | ● Need the land acquisition for the permanent improvement and the extra yard required to secure the railway crossing.<br>● Basically, the existing road can be diverted to the space for frontage road however need temporary diversion during the erection of girder;<br>● Need a temporary diversion of traffic during the erection of girder using the space of underneath of span after the girders were erected;<br>● Need traffic control for the transport of materials and machinery to the site;<br>● Construction planning should be subject to change taking into account the proximity to the structure of TgPA project. | |

Source: JICA Survey Team

## (3) 5. Pancoran Flyover

| Design Conditions | | |
|---|---|---|
| Bridge type<br>Bridge length Span<br>Cross elements<br>Construction method<br>Alignment | 10 span PC-U simple girders bridge<br>10@35.0=350.0m<br>2x3.50m (carriageway) +2x0.5m (Shoulder) +2x0.5m (Railing) =9.00m<br>Pre-cast PC girder with crane erection or erection girder<br>Alignment : Horizontal Alignment R= ∞ - 330m<br>Vertical Alignment Max. 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0% | |
| Abutment<br>Pier<br>Foundation<br>Bearing Stratum<br>Bearing Support<br>Expansion Joint | Abutment type : RC reverse T-type abutment<br>Pier type : RC round column-type pier with PC pier head<br>RC rigid frame pier with PC pier head<br>Foundation type : ϕ1.0m cast-in-place piled foundations<br>Bearing strata : Depth around 20m, hard clay<br>Bearing support : Rubber bearing device<br>Expansion joints : Seamless joint type | |
| Design Features | | |
| Superstructure | a) Main girder<br>The superstructure is formed by three (3) PC-U girders with RC slab. The span arrangement is standardized by allocating 35m length of PC-U girder.<br>b) Support condition for bridge<br>A simple bridge system composed of one side fixed and the other movable at each pier. The girder joint and pier heads use expansion joints.<br>c) Erection method<br>Prefabricated PC-U girders are procured from a factory and transported to the site. The erection of the girders shall be done by either crane or erection girder. | |
| Foundation/<br>Substructure/<br>Others | d) Pier<br>Most of the piers are reinforced concrete round column-type piers with the pile caps supported by ϕ 1.0 m RC bored piles. Some of them are rigid frame piers which they are needed straddling the width of frontage road around the intersection.<br>e) Abutment<br>Conventional RC T-type abutments are proposed at the end of flyover. | |
| | f) Reinforced Earth Wall<br>Reinforced earth wall is applied at the approach section behind the abutments.<br>g) Piles<br>ϕ 1.0 m RC cast-in-situ bored piles are proposed for the foundation. The pile driving method should be either reverse circulation method or earth auger method taking into account the height of groundwater level. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.16 | |

**Table 4.2.16 Construction planning for Pancoran Flyover**

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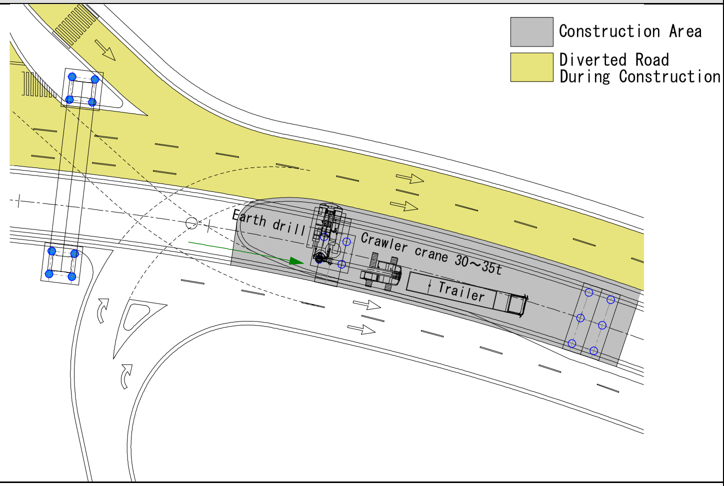
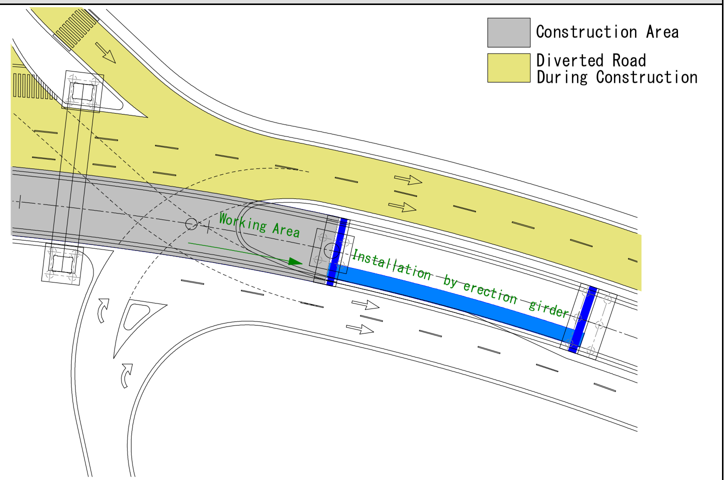
<tr><th>Items</th><th>During the construction of foundation/ substructure</th><th>During the erection of girders</th></tr>
<tr><td>Plan</td><td>
</td><td>
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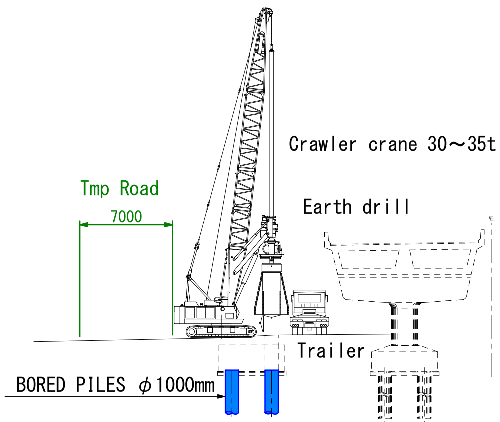
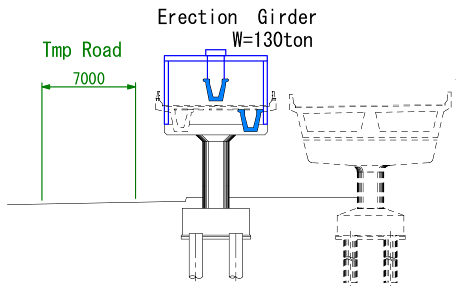
<tr><td>Side view</td><td>
</td><td>
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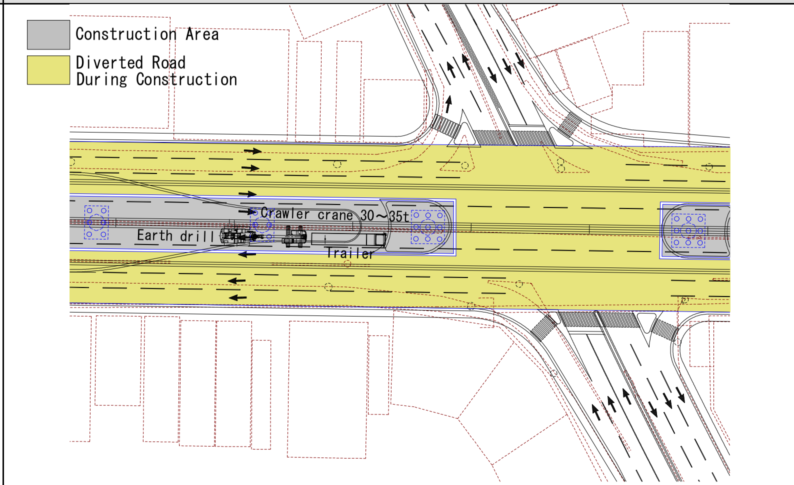
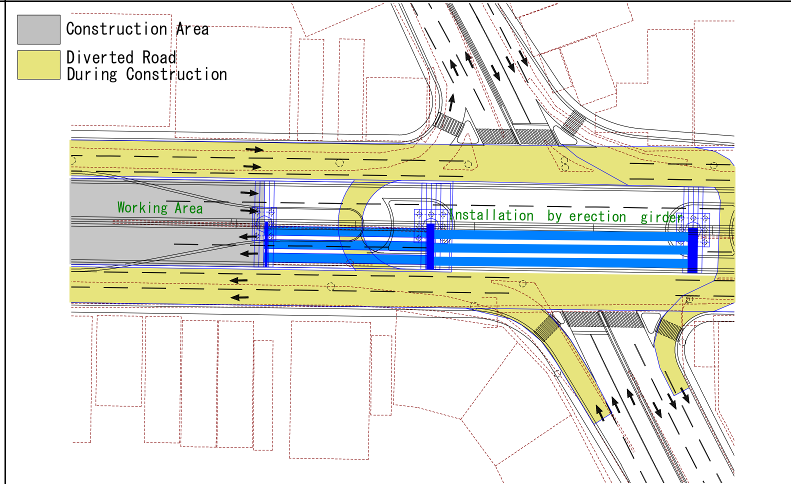
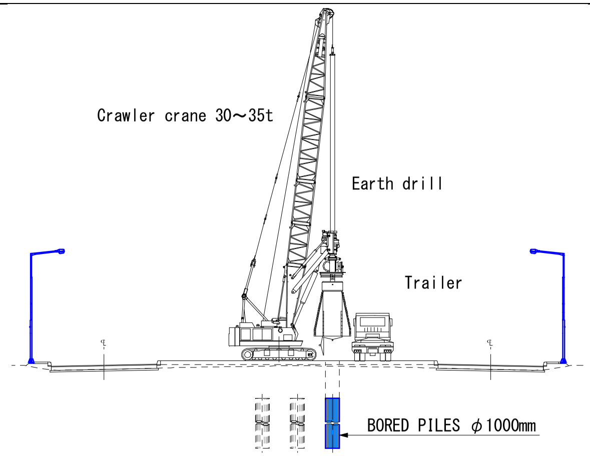
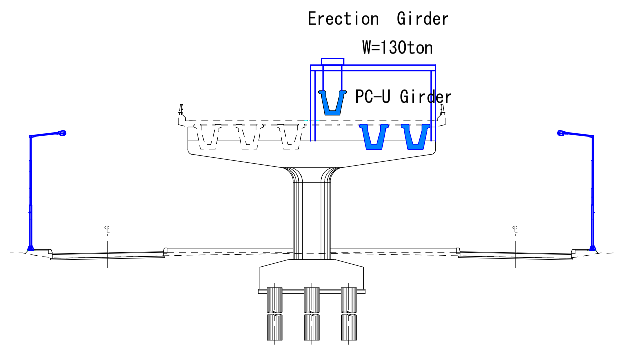
<tr><td>Traffic control and other notes</td><td colspan="2">● Need the land acquisition for the permanent improvement however no extra yard required during the construction<br>● The existing road can be diverted however need a temporary closure for one-lane traffic during the construction;<br>● Need a traffic control for the transport of materials and machinery to the site;<br>● Need the temporary facility to secure the passenger's access for the BRT</td></tr>
</table>

Source: JICA Survey Team

## (4) 6. Pinan Baris Flyover

| Design Conditions | | |
|---|---|---|
| Bridge type<br>Bridge length Span<br>Cross elements<br>Construction method<br>Alignment<br><br><br><br>Abutment<br>Pier<br>Foundation<br>Bearing Stratum<br>Bearing Support<br>Expansion Joint | A steel box girder bridge with 6 span PC-U simple girders bridge<br>3@35.0+55.0+3@35.0=265.0m<br>4x3.5m (carriageway) +1.0m(median)+ 2x1.0m (Railing+Strip) =18.00m<br>Steel box girder and pre-cast PC girder by crane erection<br>Alignment : Horizontal Alignment R= ∞<br>Vertical Alignment Max. 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC reverse T-type abutment<br>Pier type : RC round column-type piers with PC pier heads<br>Foundation type : ϕ1.0m cast-in-place piled foundations<br>Bearing strata : Depth around 11m , hard clay<br>Bearing support : Rubber bearing device<br>Expansion joints : Seamless joint type | |
| Design Features | | |
| Superstructure | a) Main girder<br>A simple steel box girder bridge is applied for the main span over the intersection. The superstructure for the side span is formed by six (6) PC-U girders with RC slab. The span arrangement except the main span is standardized by allocating 35m length of PC-U girder.<br>b) Support condition for bridge<br>A simple bridge system composes of one side fixed and the other side movable at each pier. The girder joint and pier heads use expansion joints.<br>c) Erection method<br>Prefabricated Steel Box girder and PC-U girders are procured from a factory and transported to the site. The erection of the girders shall be done by either crane or erection girder. | |
| Foundation/<br>Substructure/<br>Others | d) Piers<br>All the piers are reinforced concrete round column-type piers with the pile caps supported by ϕ 1.0 m RC bored piles. The height of the pier head is minimized by using prestressed concrete.<br>e) Abutment<br>Conventional RC T-type abutments are proposed at the end of flyover. | |
| | f) Reinforced earth wall<br>Reinforced earth wall is applied at the approach section behind the abutments.<br>g) Piles<br>ϕ 1.0 m RC cast-in-situ bored piles are applied for the foundation. The construction method should be either reverse circulation method or earth auger method taking into account the height of groundwater level. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.17. | |

**Table 4.2.17 Construction planning for Pinang Baris Flyover**

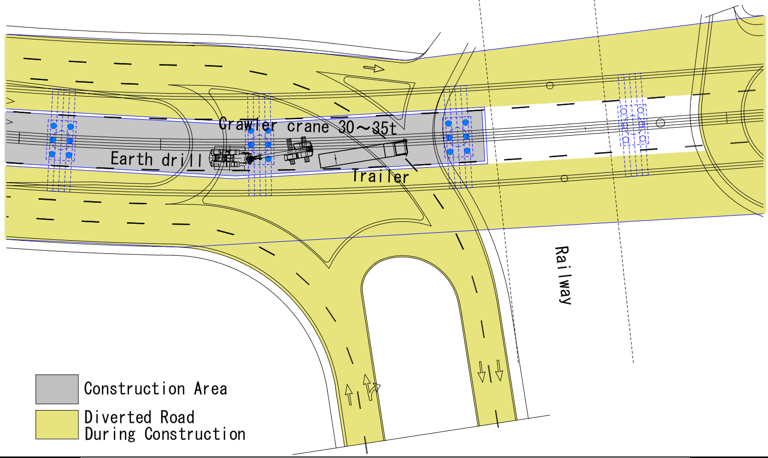
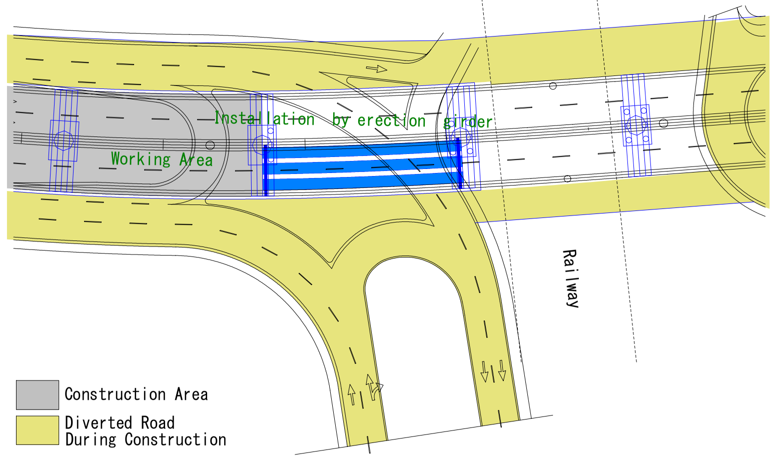
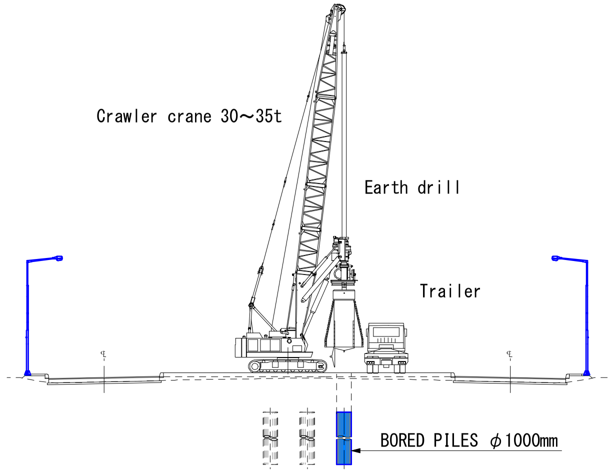
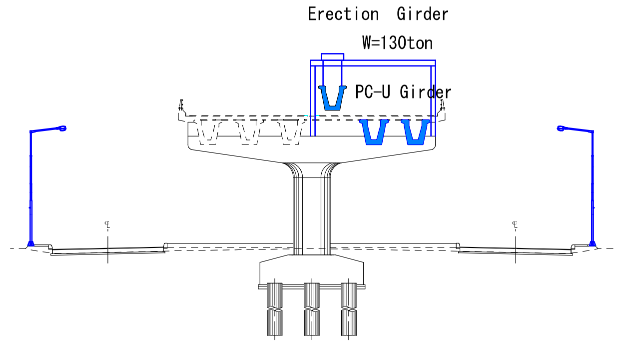
| Items | During the construction of foundation/ substructure | During the erection of girders |
|---|---|---|
| **Plan** |  |  |
| **Side view** |  |  |
| **Traffic control and other notes** | ● Need the land acquisition for the permanent improvement however no extra yard required during the construction<br>● The existing road can be diverted to the outer space for the frontage road during the construction;<br>● Need a traffic control for the transport of materials and machinery to the site;<br>● Need temporary closure for the operation of existing road for two(2) nights as well as to divert the exiting traffic to the space beside the intersection during the erection of main girder (steel box girder); | |

Source: JICA Survey Team

## (5) 8. Sudirman II Flyover

| Design Conditions | | |
|---|---|---|
| Bridge type<br>Bridge length Span<br>Cross elements<br>Construction method<br>Alignment<br><br><br><br>Abutment<br>Pier<br>Foundation<br>Bearing Stratum<br>Bearing Support<br>Expansion Joint | 8 span PC-U simple girder bridge<br>4@35.0+31.0+3@35.0=276.0m<br>4x3.5m (carriageway) + 1X1.0m(Median)+2x1.0m (Railing+ strip) =18.00m<br>Pre-cast PC girder with crane erection or erection girder<br>Alignment : Horizontal Alignment R= ∞<br>Vertical Alignment Max. 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC reverse T-type abutment<br>Pier type : RC round column-type piers with PC pier heads<br>Foundation type : ϕ1.0m cast-in-place piled foundations<br>Bearing strata : Depth 18m, hard silty clay<br>Bearing support : Rubber bearing device<br>Expansion joints : Seamless joint type | |
| Design Features | | |
| Superstructure | a) Main girder<br>The superstructure is formed by six (6) PC-U girders supporting the RC slab. The span is standardized by allocating 35m length of PC-U girder except for the span over the existing railway.<br>b) Support condition for bridge<br>A simple bridge system composed of one side fixed and the other side movable at each pier. The girder joint and pier heads use expansion joints.<br>c) Erection method<br>Prefabricated PC-U girders are procured from a factory and transported to the site. The erection of the girders shall be done by either crane or erection girder. | |
| Foundation/<br>Substructure/<br>Others | d) Piers<br>All the piers are reinforced concrete round column type piers with the pile caps supported by ϕ 1.0 m RC bored piles. The height of pier head is minimized by using prestressed concrete.<br>e) Abutment<br>Conventional RC T-type abutments are proposed at the end of flyover. | |
| | f) Reinforced earth wall<br>Reinforced earth wall is applied at the approach section behind the abutments.<br>g) Piles<br>ϕ 1.0 m RC cast-in-situ bored piles are applied for the foundation. The construction method should be either reverse circulation method or earth auger method taking into account the height of groundwater level. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.18. | |

**Table 4.2.18 Construction planning for Sudirman II Flyover**

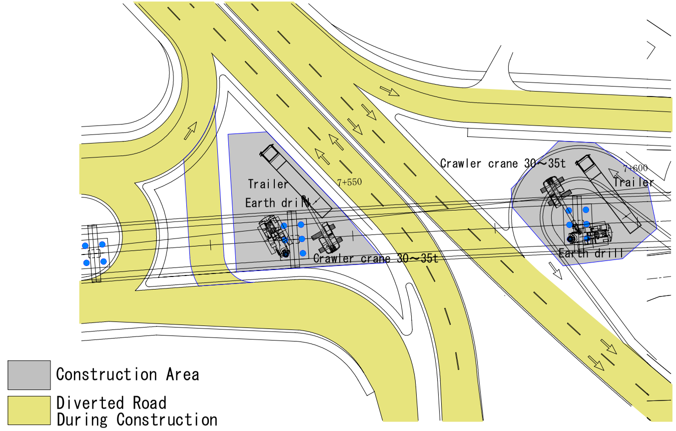
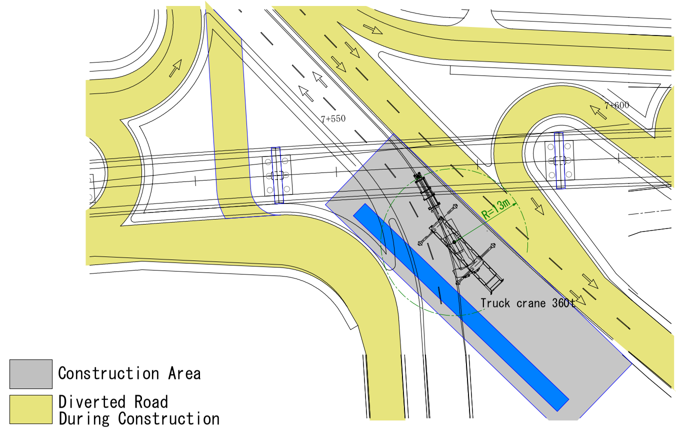
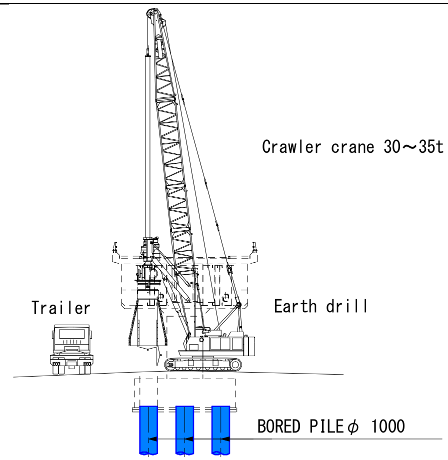
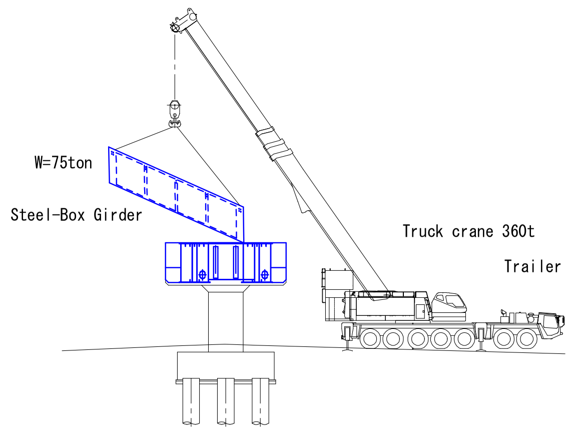
| Items | During the construction of foundation/ substructure | During the erection of girders |
|---|---|---|
| **Plan** |  |  |
| **Side view** |  |  |
| **Traffic control and other notes** | ● Need the land acquisition for the permanent improvement and the extra yard required for closing the railways during the construction<br>● Need the diversion of existing road at each phase of construction using the space for the frontage road;<br>● Need a traffic control for the transport of materials and machinery to the site;<br>● Need a temporary diversion of traffic during the erection of girder using the space of underneath of span after the girders were erected | |

Source: JICA Survey Team

## (6) 9. Cikarang / Tegal Gede Flyover

| Design Conditions | | |
|---|---|---|
| Bridge type<br>Bridge length Span<br>Cross elements<br>Construction method<br>Alignment<br><br><br><br>Abutment<br>Pier<br>Foundation<br>Bearing Stratum<br>Bearing Support<br>Expansion Joint | A steel box girder bridge with 4 span PC-U girders bridge<br>2@35.0+50.0+2@35.0=190.0m<br>2x3.5m (carriageway) + 2x1.5m (Railing+Strip) =10.00m<br>Steel box girder and pre-cast PC girder by crane erection<br>Alignment : Horizontal Alignment R= ∞<br>Vertical Alignment Max. 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC reverse T-type abutment<br>Pier type : RC round column-type piers with PC pier heads<br>Foundation type : ϕ1.0m cast-in-place piled foundations<br>Bearing strata : Depth around 11m , hard clay<br>Bearing support : Rubber bearing device<br>Expansion joints : Seamless joint type | |
| Design Features | | |
| Superstructure | a) Main girder<br>A simple steel box girder bridge is applied for the main span over intersection. The superstructure for the side span is formed by three (3) PC-U girders with RC slab. The span arrangement except the main span is standardized by allocating 35m length of PC-U girder.<br>b) Support condition for bridge<br>A simple bridge system composed of one side fixed and the other side movable at each pier. The girder joint and pier heads use expansion joints.<br>c) Erection method<br>Prefabricated steel box girder and PC-U girders are procured from a factory and transported to the site. The erection of girders shall be done by crane. | |
| Foundation/<br>Substructure/<br><br>Others | d) Piers<br>All the piers are reinforced concrete round column-type pier with piles caps supported by ϕ 1.0 m RC bored piles.<br>e) Abutment<br>Conventional RC T-type abutments are proposed at the end of flyover. | |
| | f) Reinforced earth wall<br>Reinforced earth wall is applied at the approach section behind the abutments.<br>g) Piles<br>ϕ 1.0 m RC cast-in-situ bored piles are applied for the foundation. The construction method should be either reverse circulation method or earth auger method taking into account the height of groundwater level. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.19 | |

**Table 4.2.19 Construction planning for Tegal Gede Flyover**

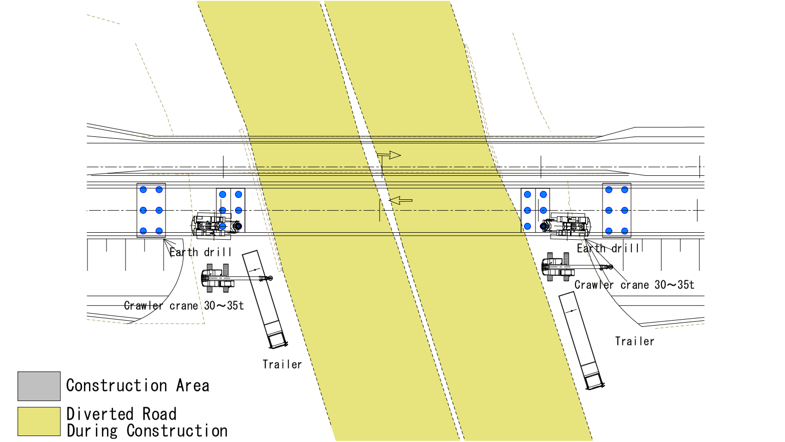
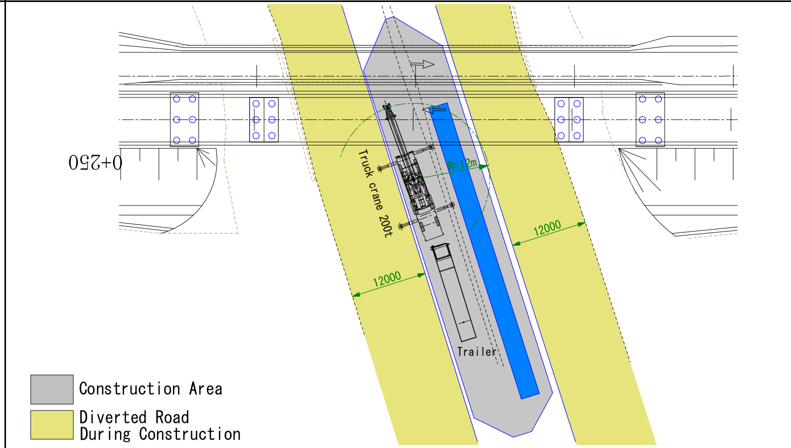
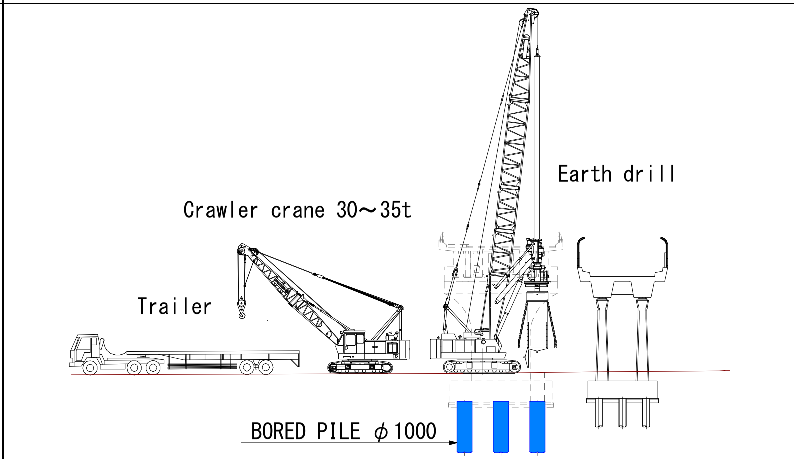
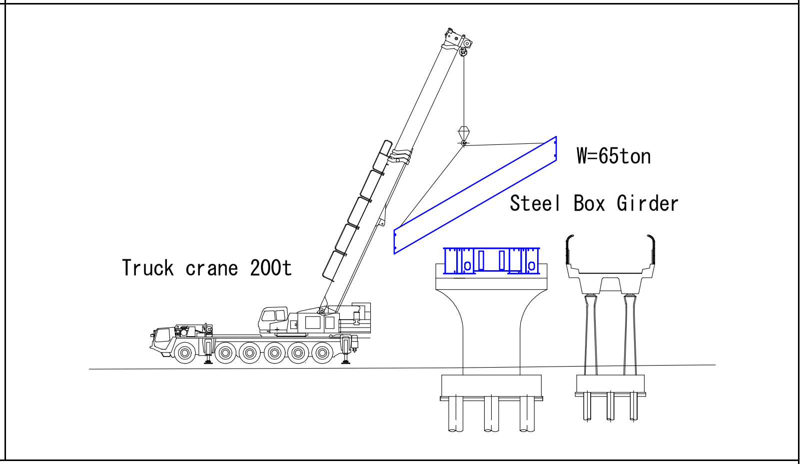
<table>
<tr><th>Items</th><th>During the construction of foundation/ substructure</th><th>During the erection of girders</th></tr>
<tr><td>Plan</td><td>
</td><td>
</td></tr>
<tr><td>Side view</td><td>
</td><td>
</td></tr>
<tr><td>Traffic control and other notes</td><td colspan="2">● Possible construction within the ROW and no extra temporary yard required during the construction;<br>● Possible construction of foundation and substructure using the space for the flyover;<br>● Need a traffic control for the transport of materials and machinery to the site;<br>● Need temporary closure for the operation of existing road for two(2) nights as well as to divert the exiting traffic to the space beside the intersection during the erection of main girder (steel box girder);</td></tr>
</table>

Source: JICA Survey Team

(7) 9. Cikarang / Overpass for Toll Road (JL. Bali)

| Design Conditions | | |
|---|---|---|
| Bridge type<br>Bridge length Span<br>Cross elements<br>Construction method<br>Alignment<br><br><br><br>Abutment<br>Pier<br>Foundation<br>Bearing Stratum<br>Bearing Support<br>Expansion Joint | A steel box girder bridge with 2span PC hollow slab bridge<br>11.55+48.0+11.55=71.10m<br>1x3.50m (carriageway) + 1.50m(shoulder)+2x0.5m (Railing) =8.50m<br>A steel box girder and pre-cast PC girders with crane erection<br>Alignment : Horizontal Alignment R= ∞<br>Vertical Alignment Max. 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC reverse T-type abutment<br>Pier type : RC wall-type pier<br>Foundation type : ϕ1.0m cast-in-place piled foundations<br>Bearing strata : Depth around 6m, hard silty clay<br>Bearing support : Rubber bearing device<br>Expansion joints : Seamless joint type | |
| Design Feature | | |
| Superstructure | a) Main girder<br>A simple steel box girder bridge is applied for the main span over the toll road. The superstructure for the side span is formed by PC hollow beam.<br>b) Support condition for bridge<br>A simple bridge system composed of one side fixed and the other side movable at each pier. The girder joint and pier heads use expansion joints.<br>c) Erection method<br>Prefabricated steel box and PC hollow slab are procured from a factory and transported to the site. Both the erection of the girders shall be done by crane. | |
| Foundation/<br>Substructure/<br>Others | d) Piers<br>The piers are reinforced wall type piers with pile caps supported by ϕ 1.0 m RC bored piles.<br>e) Abutment<br>Conventional RC T-type abutments are proposed at the end of the bridge. | |
| | f) Piles<br>ϕ 1.0 m RC cast-in-situ bored piles are applied for the foundation. The construction method should be the earth auger method. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.20 | |

**Table 4.2.20 Construction planning for Jalan Bali Overpass Bridge**

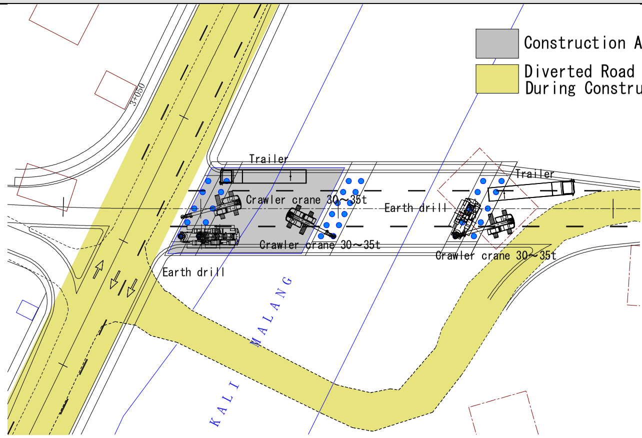
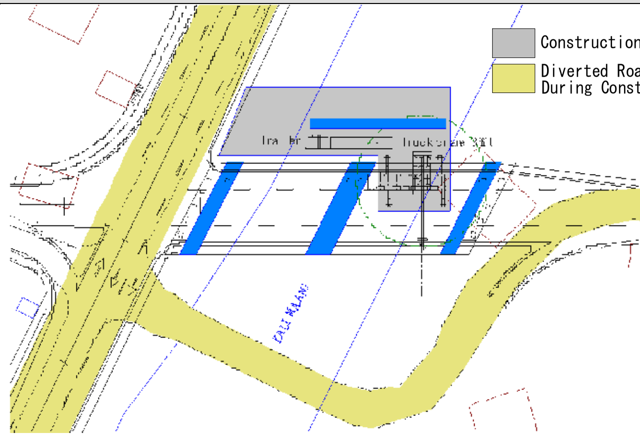
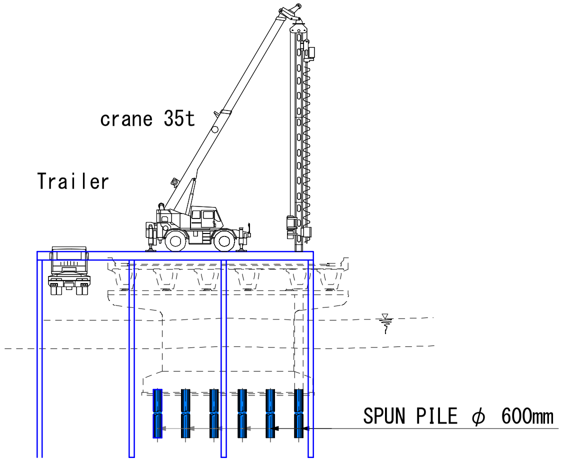
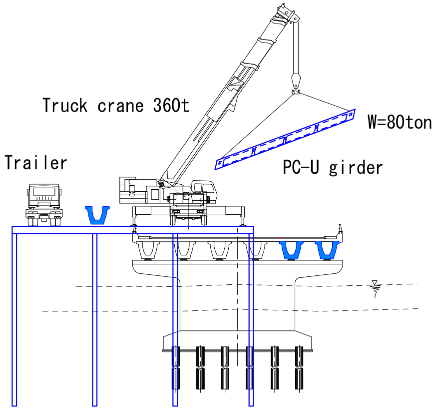
| Items | During the construction of foundation/ substructure | During the erection of girders |
|---|---|---|
| **Plan** |   |   |
| **Side view** |   |   |
| **Traffic control and other notes** | ● Possible construction within the ROW and no extra temporary yard required during the construction;<br>● Possible construction of foundation and substructure using the side space of the toll road;<br>● The existing overpass can be used during construction however need a traffic control for the transport of materials and machinery to the site;<br>● Need temporary closure for the operation of toll road for two(2) nights as well as to use inner one-lane of the toll road for on-site fabrication during the erection of main girder (steel box girder); | |

Source JICA Survey Team

### (8) 9. Cikarang Road / Kalimarang Bridge (JL Imam Bonjol)

| Design Conditions | | |
|---|---|---|
| Bridge type<br>Bridge length Span<br>Cross elements<br>Construction method<br>Alignment<br><br><br><br>Abutment<br>Pier<br>Foundation<br>Bearing Stratum<br>Bearing Support<br>Expansion Joint | 2 span PC-U simple girders<br>2@25.0=50.0m<br>4x3.25m (carriageway) + 2x1.5m (Railing+ sidewalk) =17.00m<br>Pre-cast girder with crane erection<br>Alignment : Horizontal Alignment R= ∞<br>Vertical Alignment Max. 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC reverse T-type abutment<br>Pier type : RC wall-type piers<br>Foundation type : ϕ1.0m cast-in-place piled foundations<br>ϕ 0.6m PC spun piled foundations for Piers<br>Bearing strata : Depth around 13m, hard silty clay<br>Bearing support : rubber bearing device<br>Expansion joints : Seamless joint type | |
| Design Feature | | |
| Superstructure | a) Main girder<br>The superstructure is formed by six (6) PC-U girders with RC slab. The span is equally formed by allocating 35m length of PC-U girder.<br>b) Support condition for bridge<br>A simple bridge system composed of one side fixed and the other side movable at each pier. The girder joint and pier heads use expansion joints.<br>c) Erection method<br>Prefabricated PC-U girders are procured from a factory and transported to the site. The erection of the girders shall be done by crane. | |
| Foundation/<br>Substructure/<br>Others | d) Piers<br>The piers are reinforced concrete wall type piers with pile caps supported by ϕ 0.6 m PC spun piles. The thickness of the wall is selected to reduce the disturbance of water flow.<br>e) Abutment<br>Conventional RC T-type abutments are proposed at the end of the bridge. | |
| | g) Piles<br>ϕ 1.0 m RC cast-in-situ bored piles are applied for the foundation of the abutment. The construction method is the earth auger method.<br>ϕ 0.6 m PC spun piles are applied for the foundation of the piers due to driving the piles over water. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.21. | |

**Table 4.2.21 Construction planning for Jalan Imam Bonjol Bridge**

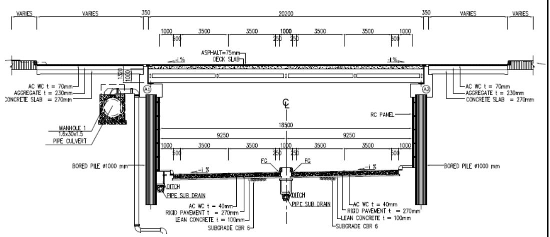
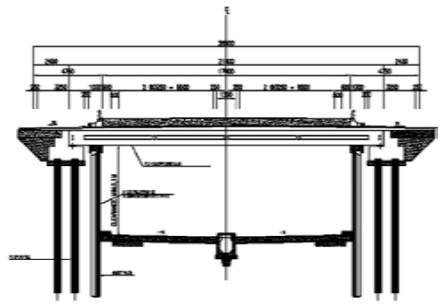
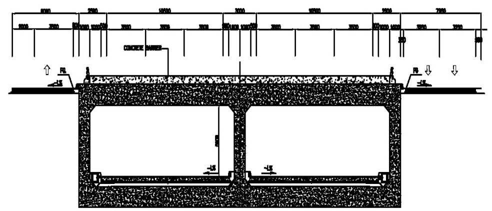
| Items | During the construction of foundation/ substructure | During the erection of girders |
|---|---|---|
| **Plan** |  |  |
| **Side view** |  |  |
| **Traffic control and other notes** | ● Need the land acquisition for the construction of bridge however no extra temporary yard required during the construction;<br>● The existing bridge can be used for the diversion of the existing traffic however need traffic control for the transport of materials and machinery to the site;<br>● Need temporary stage in the river during the construction of bridge. | |

Source: JICA Survey Team

(2) Underpass Structure

This chapter describes the design conditions and principles for each underpass structure in the subprojects. The selection of structural types in principle follows the local practice in both engineering and financial aspects except those that were determined by the previous study or other projects. In the detailed design, the design conditions and principals should be reviewed in accordance with the site investigation and other factors concerned. Table 4.2.22 shows the comparative study for major structures of the underpasses in subprojects. The details for each subproject are provided in the drawings (See **Vol.4 Drawings**).

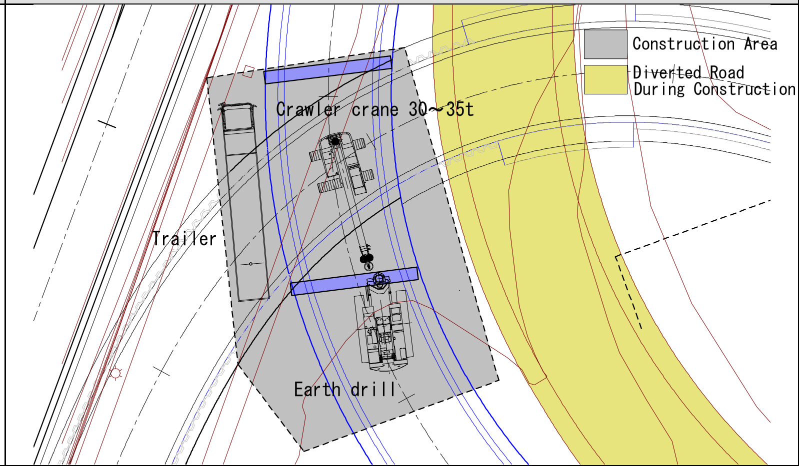
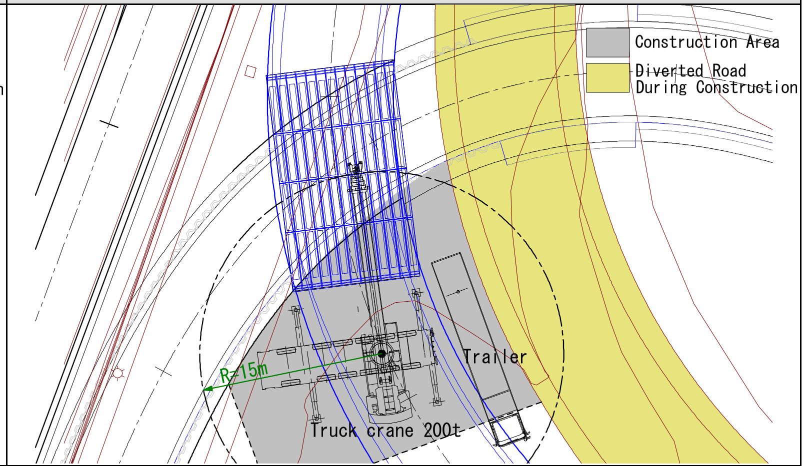
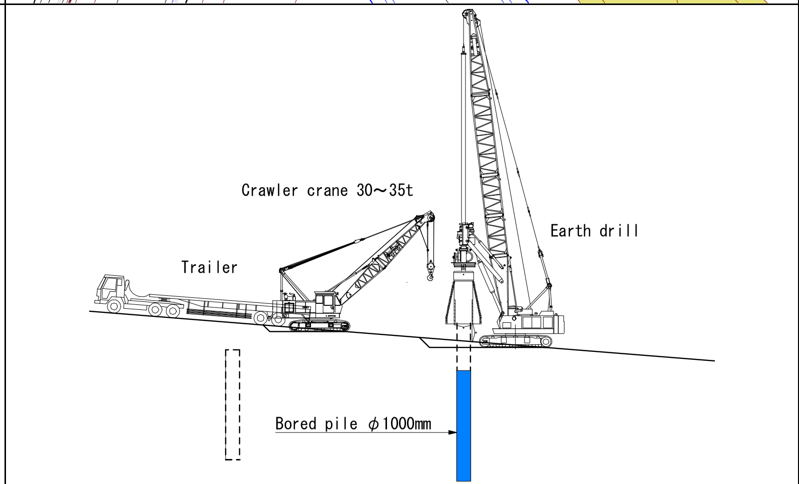
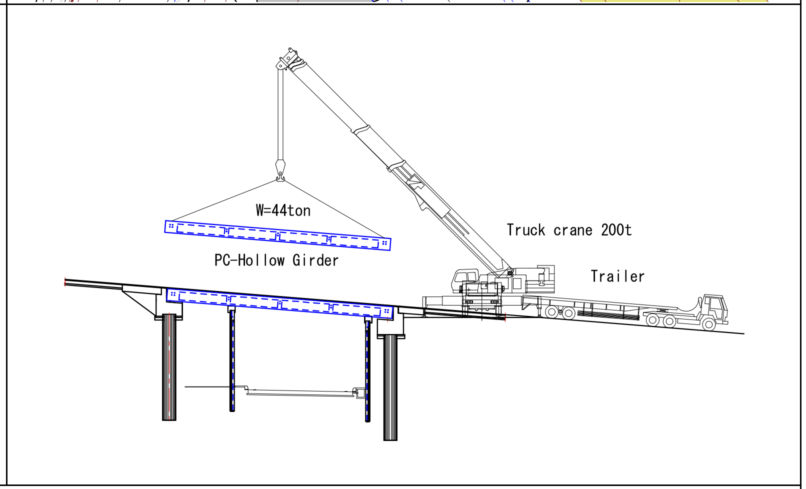
**Table 4.2.22 Comparison of Underpass Structure under Intersection (Semanggi, Kuningan and Katamso )**

| Alternatives | PC Hollow Girder with Piled bent Abutment | PC-U Girder with PC Sheet Pile | RC Box Culvert |
|---|---|---|---|
| **Sketch** |  |  |  |
| **Structural type** | - PC hollow girder bridge with pile bent (Secant piles)<br>- Applicable span length; 15-25m. | - PC-U Girder bridge with PC Sheet Pile<br>- Applicable span length ; 25- 35m | - RC Box Culvert<br>- Applicable span length; 20-25m |
| **Structural characteristics** | - Depth of superstructure:1.0m<br>- Piled foundation supported by RC secant piles | - Depth of superstructure; 1.4m<br>- Piled foundation supported by RC cast-in situ bored piles | - Depth of upper slab: 1.3m<br>- Need ground treatment if the bearing capacity cannot be secured<br>- If the groundwater level is higher, this type has advantage |
| **Construction (Under limited height, etc)** | - No temporary cofferdam works required(+)<br>- Possible to drive RC secant pile under the limited height (++). | - No temporary cofferdam works required(+)<br>- Impossible to drive the PC sheet piles under the limited height | - Need temporary coffer dam before construction of box culvert.<br>- Possible to drive steel sheet pile under the limited height (++) |
| **Maintenance** | - No particular maintenance required except the pump system of underground reservoir for storm water. | - Ditto to left | - Ditto to left |
| **Construction Cost (Ratio)** | - Most economical among the alternatives<br>1.0 (++) | - Additional abutment behind the PC sheet piles increase construction cost and time<br>1.3 (+) | - Necessary temporary cofferdam increase the construction cost and time<br>1.4 |
| **Overall evaluation** | Most reasonable underpass structure taking into account both technical and financial aspects.<br>◆Total Evaluation ; +++++ | ◆Total Evaluation ; ++ | · The whole view is inferior.<br>◆Total Evaluation ; ++ |

## (1) 1. Semanggi Ramp Underpass

| Design Conditions | | |
|---|---|---|
| Underpass Structure<br>Underpass length<br><br>Cross Section elements<br>Construction method<br><br>Alignment<br><br><br>Abutment<br>Foundation<br>Bearing Stratum<br>Expansion Joint | Simple PC hollow slab bridge<br>Underpass for Gato Subroto Ramp (west) : L=14.0m<br>Underpass for JL Gatoto Subroto (east) : L=14.0m<br>2x3.50m (carriageway) + 2x0.5m (shoulder) =8.00m<br>Pre-cast PC hollow girder by crane erection<br>Alignment : Horizontal Alignment R= 40m<br>Vertical Alignment Max. ±5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC pile bent abutment<br>Foundation type : ϕ1.0m RC cast in situ piles<br>Bearing strata : Depth around 13-16m, silty clay<br>Expansion joints : Seamless joint | |
| Design Feature | | |
| Tunnel Section | a) Structure<br>The underpass structure is formed by PC hollow girder supported by pile bent abutment.<br>b) Support condition and expansion joint<br>Simple girder system applies with the one side fixed and the other movable uses seamless joint between the girders and the parapet of the abutment.<br>c) Erection method<br>All the pre-cast PC hollow girders to be erected by crane.<br>d) Landscaping<br>The combined simple structure shows a normal aesthetic view. | |
| Approach section | A retaining wall is to be installed at the approach section. The type of retaining wall should be determined by the proposed height of the wall. If the height is more than 2m, RC L shaped type is selected. If the height is less than 2m, gravity type retaining wall is selected as economically preferable. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.23. | |

**Table 4.2.23 Construction planning for Sumanggi Junction**

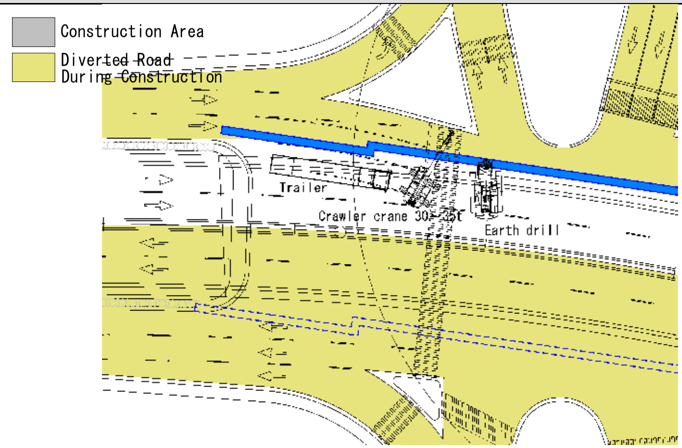
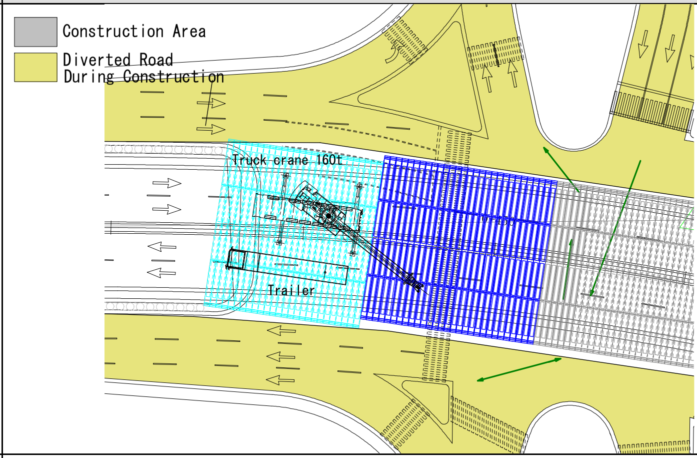
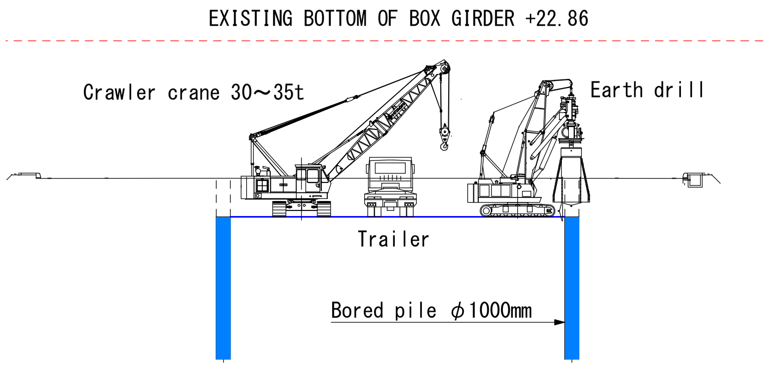
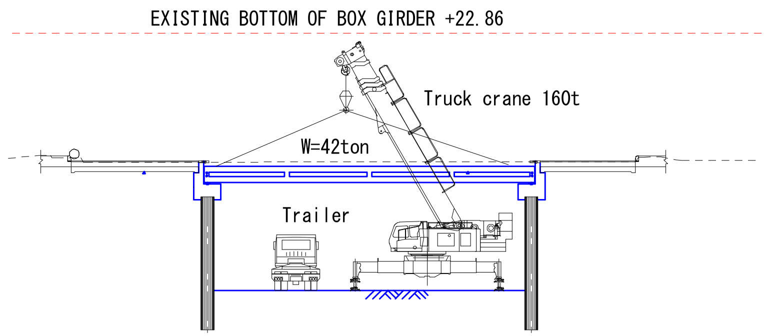
| Items | During the construction of foundation/ substructure | During the erection of girders |
|---|---|---|
| **Plan** |   |   |
| **Side view** |   |   |
| **Traffic control and other notes** | ● Possible construction within the space between the existing loop ramp and the channeled road;<br>● No extra temporary yard required during the construction;<br>● Need a traffic control for the transport of materials and machinery to the site;<br>● Need a slight traffic closure during altering the operation of loop ramps;q | |

Source: JICA Survey Team

## (2) 4. Kuningan Underpass

| | | |
|---|---|---|
| Design Conditions | | |
| Underpass Structure<br>Wall structure<br>Underpass length<br><br>Cross Section elements<br>Construction method<br><br>Alignment | Single PC hollow slab bridge<br>RC secant piles, PC Sheet piles<br>Underpass for Mampang intersection: L=250.0m<br>Underpass for Kuningan intersection: L=280.0m<br>4x3.50m (carriageway) + 1.0m (median)+ 2x0.5m (shoulder)+2x1.0m (sidewalk) =18.50m<br>Pre-cast PC hollow girder by crane erection<br>Alignment : Horizontal Alignment R= ∞<br>Vertical Alignment Max. ±5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0% | |
| Abutment<br>Wall type<br>Foundation<br>Bearing Stratum<br>Expansion Joint | Abutment type : RC pile bent abutment<br>Wall type : ϕ 1.0m RC secant piles and PC sheet piles<br>Foundation type : ϕ 1.0m Secant pile foundations<br>Bearing strata : Depth 14-15m, Silty clay<br>Expansion joints : Seamless joint | |
| Design Feature | | |
| Tunnel Section | a) Structure<br>The underpass structure is formed by PC hollow girder supported by pile bent abutment (secant piles with pile caps).<br>b) Support condition and expansion joint<br>Simple girder system applies with the one side fixed and the other movable uses seamless joint between the girders and the parapet of the abutment.<br>c) Erection method<br>All the pre-cast PC hollow girders to be erected by crane.<br>d) Landscaping<br>The combined simple structure shows a normal aesthetic view. The wall surface of the secant piles shall be decorated with RC panels. | |
| Open and cut section | The structure for the open and cut section was applied using self-standing PC sheet piles. The depth of the PC sheet piles and PC sheet piles was determined in accordance with the structural analysis based on the geotechnical model defined by the boreholes. As a result, the lengths of the PC sheet piles are classified into 4 types, which are:<br>Type-I: is the length of around 16m to be driven for the section of the deepest point near the two intersections around the depth of 7 m.<br>Type-II: is the length of 15 m to be driven around the section of excavation depth between 5 m and 7 m.<br>Type-III: is the length of 12m to be driven for the section of excavation depth between 4 m and 5 m.<br>Type-IV: is the length of 10m to be driven for the section of excavation depth between 2 m and 4 m. | |
| Approach section | A retaining wall is to be installed at the end of the open and cut section. The type of retaining wall should be determined by the proposed height of the wall if less than 2m and more than 0.5m. If the height is less than 0.5m, the gravity type retaining wall is selected as economically preferable. | |
| Construction Features | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.24. | |

**Table 4.2.24 Construction planning for Kuningan Underpass**

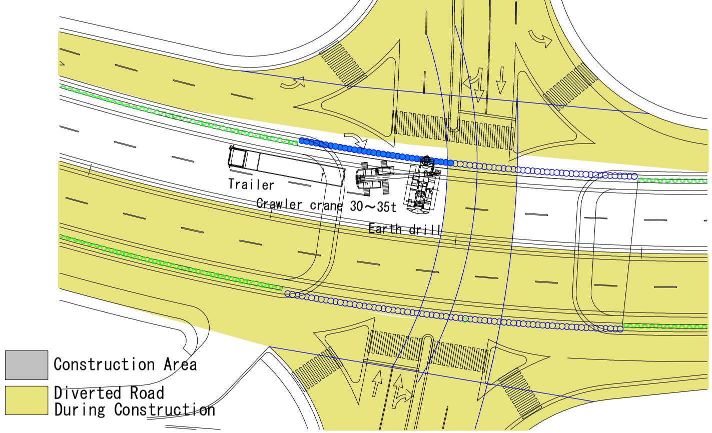
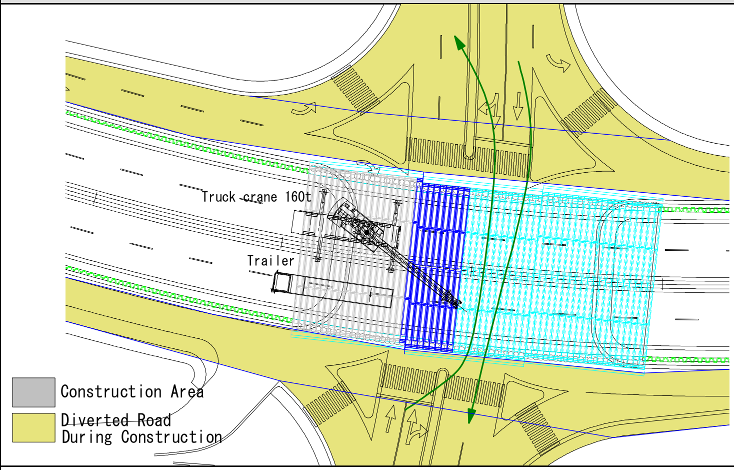
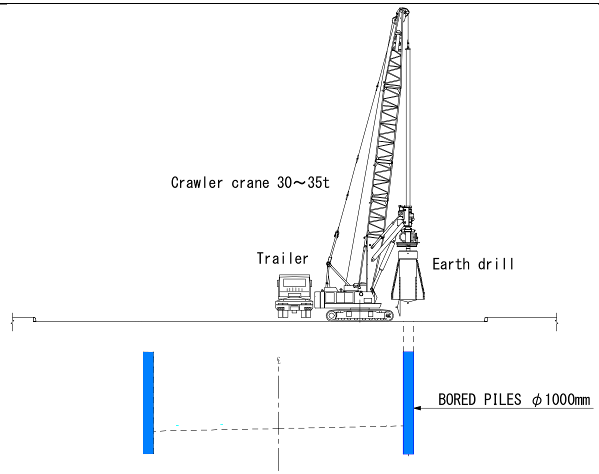
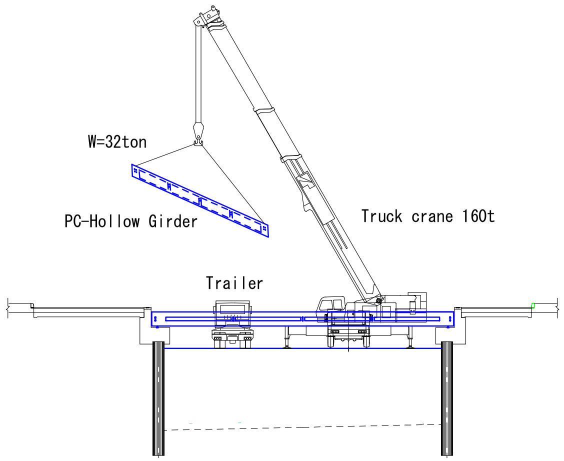
| Items | During the construction of foundation (RC secant pile) | During the erection of girders |
|---|---|---|
| **Plan** |   |   |
| **Side view** |   |   |
| **Traffic control and other notes** | ● Possible construction within the ROW and no extra temporary yard required during the construction of foundation;<br>● Possible erection of girder within the area of underpass;<br>● The existing road can be diverted however need temporary closure for one-lane traffic during the construction of foundation;<br>● Need a traffic control for the transport of materials and machinery to the site;<br>● Need the temporary traffic management for the traffic movement of intersection during the erection of girder. | |

Source: JICA Survey Team

## (3) 7. Katamso Underpass

| Design Conditions | | |
|---|---|---|
| Underpass Structure<br>Wall structure<br>Underpass length<br>Cross Section elements<br>Construction method<br>Alignment<br><br><br><br>Abutment<br>Wall type<br>Foundation<br>Bearing Stratum<br>Expansion Joint<br>Guardrail<br>Lighting Pole | Single span PC-hollow slab with pile-bent abutment<br>PC piles (Secant pile with H beam reinforcement)<br>L=348.0m<br>4x3.5m (carriageway) +1.0m(median)+ 2x1.0m (Railing+Strip) =18.00m<br>Pre-cast PC hollow girder by crane erection (Secant piles)<br>Alignment : Horizontal Alignment R= ∞<br>Vertical Alignment Max. 5.0%<br>Crossfall of the road 2.0%<br>Crossfall of the side walk 2.0%<br>Abutment type : RC pile bent abutment<br>Wall type : PC sheet piles<br>Foundation type : ϕ1.0m RC Secant pile foundations<br>Bearing strata : Depth 14-15m, Silty clay<br>Expansion joints : Seamless joint<br>Guardrail : Concrete barrier<br>Lighting pole : Corner light | |
| **Design Feature** | | |
| Tunnel Section | a) Structure<br>The bridge structure forms an underpass structure accommodating the full width of four traffic lanes plus marginal strip and concrete barrier.<br>b) Support condition and expansion joint<br>Simple girder system applies with the one side fixed and the other movable use seamless joints between the girders and the parapet of the abutment.<br>c) Erection method<br>All the pre-cast PC hollow girders to be erected by crane.<br>d) Landscaping<br>The combined simple structure shows a normal aesthetic view. The surface of the wall formed by the secant piles will be decorated with RC panels. | |
| Open and cut section | The structure for the open and cut section was applied using self-standing PC sheet piles. The depth of the PC sheet piles was determined in accordance with the structural analysis based on the geotechnical model defined by the boreholes. As a result, the lengths of the PC sheet piles are classified into 3 types, which are:<br>Type-I: is the length of 18m to be driven for the section of the deepest point near the intersection and the excavation depth around 5 to 7 m.<br>Type-II: is the length of 15 m to be driven around the excavation depth between 4 m and 5 m.<br>Type-III: is the length of 12m to be driven for the section of excavation depth between 2 m and 4 m. | |
| Approach section | A retaining wall is to be installed at the end of the open and cut section. The type of retaining wall should be determined by the proposed height of the wall less than 2m and more than 0.5m. If the height is less than 0.5m, a gravity type retaining wall is selected as economically preferable. | |
| **Construction Features** | | |
| Construction plan and traffic diversion. | The construction plan at each critical case is given in Table 4.2.25. | |

**Table 4.2.25 Construction planning for Katamso Underpass**

| Items | During the construction of foundation (RC secant pile) | During the erection of girders |
|---|---|---|
| **Plan** |  |  |
| **Side view** |  |  |
| **Traffic control and other notes** | ● Possible construction within the ROW and no extra temporary yard required during the construction of foundation;<br>● The existing road can be diverted however need temporary closure for one-lane traffic during the construction;<br>● Need a traffic control for the transport of materials and machinery to the site;<br>● Need the temporary traffic management for the traffic movement of intersection during the erection of girder. | |

Source: JICA Survey Team

## 4.2.5 Construction Planning for Structures

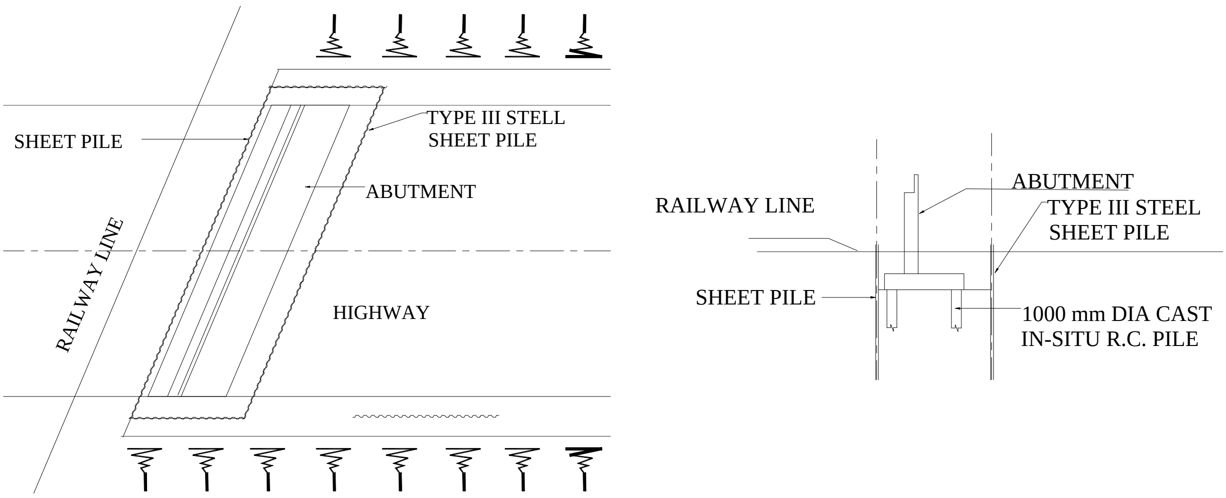
(1) Bridge Construction

Pre-Stressed Concrete (PC) girder bridges are to be selected for the major types of bridge structures in this project. Applicable type of PC bridges are mainly precast PC-I girder and precast PC-U girder (PC or steel box girder bridge may be nominated at the necessary long spans and/or curve sections). The bridge works can generally be subdivided into four components, namely foundations, fabrication of girders (except prefabricated PC girders), substructure and superstructure. The sequence of work varies slightly between the types and/or spans of bridges applied. In this project, the bridge structures are generally of four types of bridges including a single span railway overpass, a single and a double span road overpass and a multi-span flyover. The following provides a description of the construction sequence and the methods proposed for the foundation works, as well as works for the substructures and superstructures.

1) Foundation Works

The foundation works for bridges shall include excavation works down to formation level and the piling works under the pile cap (footing) structures. In the following subsections are descriptions of the work methods employed for excavation, bored pile works and driven PC spun piles.

For foundation works and pile caps/ footings for road bridges and for those crossing over railways and existing roads, where it is required to minimise the size of the excavation due to constraints such as for the maintenance of existing traffic lanes or to ensure the stability of railway tracks in close proximity or for other considerations, the excavation shall make use of sheet pile cofferdams to protect the sides of the excavation as shown in Figure 4.2.8. The use of appropriate type sheet piles shall be determined by examining the depths of excavation and the soil conditions.

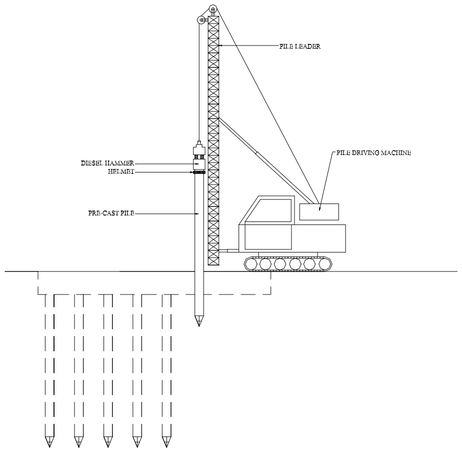
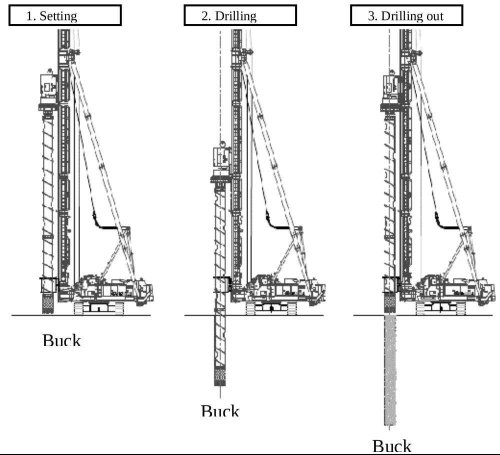
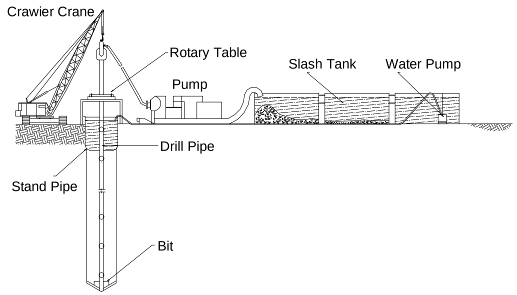



Source: JICA Survey Team

**Figure 4.2.8 Sheet Piled Cofferdams for Substructure for Overpasses**

In consideration of the duration of the site condition and of the geological conditions, either bored piles or precast PC piles will be selected. For the selection of piling method, the influence on adjacent facilities as well as other constrains such as a height limitation should also be carefully considered. The preferable piling method may be recommended among the various local practices as shown in Table 4.2.26.

**Table 4.2.26 Preferable Pilling Method**

| Pile Type | Precast Pile | Cast in Situ Bored Pile | |
|---|---|---|---|
| Method | Driving Method | Earth Auger Method | Reverse Circulation Method |
| Outline |  |   |   |
| | Expect a most stable bearing capacity by using this method, however, noise and vibration may cause damage to adjacent structures. | Using an earth-augur with a drilling bucket to excavate the soil. Difficult in drilling to rock substratum as well as drilling in underground water. | Circulation of water by air-lift system to stabilise the drilling hole and discharge the excavated soil and rock by screening. |
| Applicable diameter | φ 300- 800mm | φ 800- 3000mm | Maximum φ1000-3000mm |
| Applicable depth | Maximum 25 (40m recorded) | Maximum 60m | Maximum 75m (record) |
| Limited height piling | Not possible | Possible | Possible |
| Cost | Low | Moderate | Higher |
| Time | Fast | Moderate | Slow |

Source: JICA Survey Team

2) Substructure Works

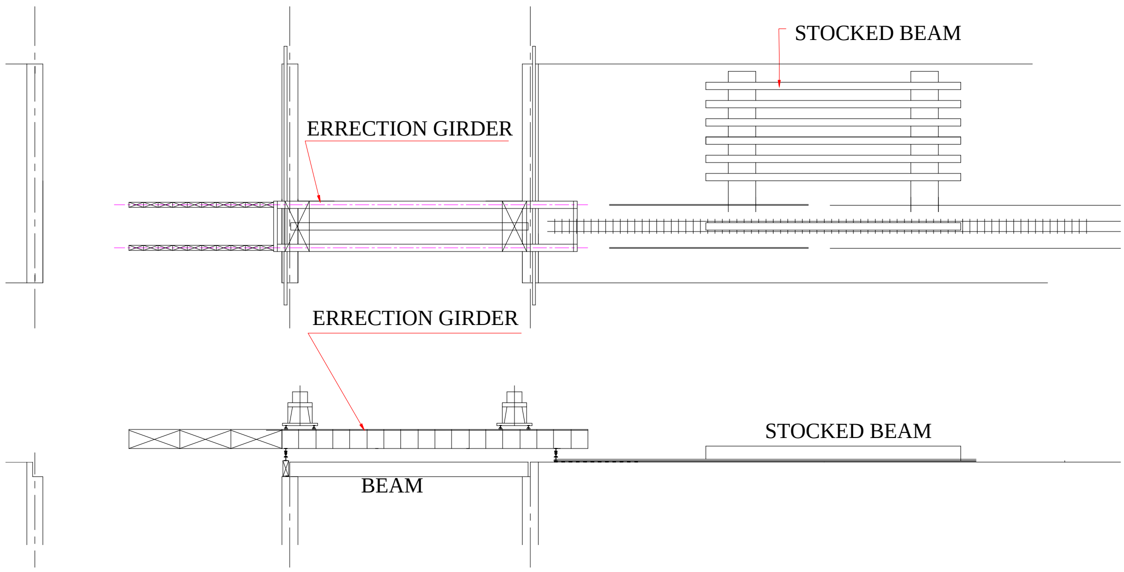
After the completion of the foundation works, substructure works subsequently proceeds with the construction of abutments and pile caps/ footings. The construction of these substructures shall be in conventional reinforced concrete.

3) Girder Erection

i) Pre-cast PC girder bridge (Prefabrication)

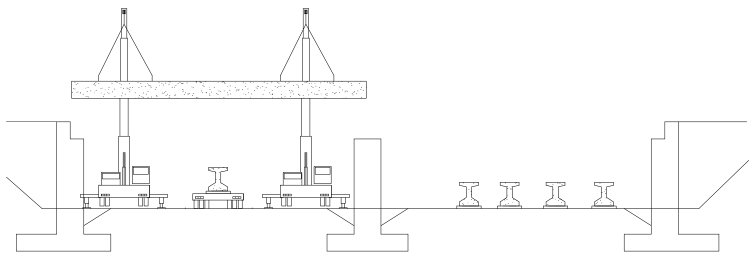
As for the pre-cast post-tensioned bridge available I and U shaped girders, these shall be transported from the manufacturer's factory to the site. In general, the beam is divided into 3-5 segments, which vary from 5 to 7m in length and they will be launched into position by a crane. The tendon inserted into the girder will be tensioned on the temporary launching girder and slide and place the girder on each bearing position at abutment and piers.

Figure 4.2.9 illustrates the arrangement of the temporary girder proposed. Once transported to the span being erected, the beams will be shifted into their final position over the elastomeric bearing pads with the aid of lateral winching system on rollers. Upon completing the erection of the first span the erection girder crane system shall be moved ahead to launch the following spans in series. Once the beams have all been installed the erection girder crane will be dismantled.




Source: JICA Survey Team

**Figure 4.2.9 Erection girder for Precast girders**



Source: JICA Survey Team

**Figure 4.2.10 Erection of Precast PC girders by Mobile Crane**

The transverse diaphragm beams will then be cast in-situ and post-tensioned. The construction of the deck slab shall be placed in between the PC girders.

The slab shall have a broom type finish to enhance adherence between the concrete and the wearing course to follow. Finishing works including the approach slabs, reinforced concrete barrier and other miscellaneous constructions shall be completed following the slab construction. The backfilling will be carried out over the embankment at the abutments, followed by all other miscellaneous finishing works associated with the bridge construction.

Photo-1: Precast PC-U girder

Photo-2: Transport of PC-U girder

Photo-3: Erection of PC-U girder

Photo-4: Form works of Diaphragm beam

Photo-5: Precast PC Sheet Piles


Photo-6: Transport of PC Sheet Piles

Photo-7: Driving PC Sheet Piles

Photo-8: Completion of Driven Piles

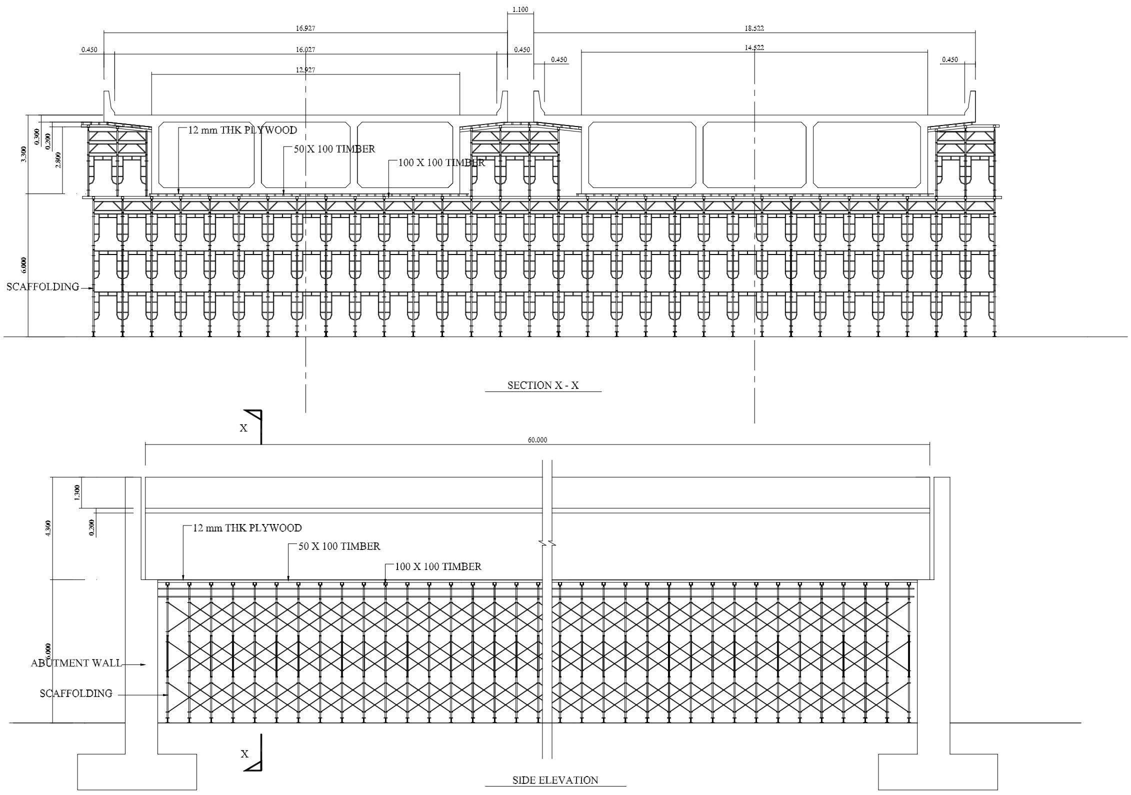
Source: Company profile of KOBE

**Figure 4.2.11 Picture of Construction for PC Sheet pile and PC-U girder**

ii) Cast In-situ PC Box Girder Bridges

For the cast in-situ post-tensioned box girder bridges, the all staging system is a conventional method for the erection of cast-in-situ box girder bridges. This method can minimize the section of box girder compared to other erection methods without the impact associated with a temporary working force during the erection. In this project, where it is possible to divert the existing traffic during the construction, this method will be reasonably applied.

The superstructure is constructed over a working platform as long and wide as the superstructure and required working space around as shown Figure 4.2.12. This platform is supported by a scaffolding system placed underneath and founded on the ground level below.




Source: JICA Survey Team

**Figure 4.2.12 All Staging System for Post-tensioned PC Box Girder**

### 4.2.6 External Conditions

(1) Transportation Facilities

Based on results of the traffic forecast, the number of traffic lanes of the roadway and sidewalks on both sides are considered for public transportation service if necessary.

(2) Public Utilities

As the result of site investigations, several public utilities have been found around the potential sites. The details of each utility have still not been identified. When the layouts of the new facilities are designed, the removal of utilities should be studied and discussed with the concerned authority during the detailed design. The attachment facilities with the bridge and culvert should be appropriately designed for accommodating the utilities. The space and method of attachment shall be given for the facilitation of public utilities inside and/or outside of the bridge, such as communication cables, water supply pipe(s) and power cables etc. This subject however, needs to be discussed more in the course of the detailed design.

**Table 4.2.27 Result of study on obstructive materials**

| Transfer, removal/adjustment of expected obstructive materials | | | |
|---|---|---|---|
| Item | Pertinent agencies | Description | Concerned Subproject |
| BRT | DKI | ■ Removal of bus lane and shelter | (2) RE. Martadinata<br>(3) Surawesi-Tg.PA<br>(4) Kuningan<br>(5) Pancorang<br>(8) Sudirman II |
| Electricity | PLN<br>PGU | ■ High-voltage wire：22kv, Low-voltage wire 220V to be transferred ⇒Removal of poles and raising/changeover of wire necessary<br>■ Transfer of electric lamps<br>■ Transfer of underground electric wire | All subprojects except (10) Senayan |
| Telephone | Indonesia Telkom | ■ Transfer of telephone lines (overhead)<br>■ Relocation of optical fibre cable | All subprojects except (10) Senayan |
| Water supply | PDAM | ■ Transfer or relocation of water main<br>■ temporary diversion for water pipes for local water supply | All subprojects except (10) Senayan |
| Gas | PGN<br>PERTAMINA | ■ Transfer or relocation of gas pipeline<br>■ Temporary diversion for gas pipeline | (1) Semanggi<br>(3) Surawesi-Tg.PA<br>(5) Pancorang<br>(9) Cikarang |

Source: JICA Survey Team

# CHAPTER 5. IMPLEMENTATION, CONSTRUCTION AND MAINTENANCE PLANS

The Consultant prepares following plans for the project:

1) Institutional arrangements,
2) Implementation program,
3) Procurement of Contractors,
4) Construction plan,
5) Operation and maintenance system
6) Technical assistance and transfer

## 5.1 Institutional Arrangements for Implementation

### 5.1.1 Related Institutions

The Consultant identifies how responsibilities are divided and operations are coordinated among the organizations involved in the project.

Organizations involved in project implementation are generally divided into the following groups:

- The Executing Agency directly responsible for implementing and procurement of the project (Directorate General of Highways, DGH in this project);
- Government agencies supervising the Executing Agency (Ministry of Public Works, Indonesia);
- Responsible for City Planning and Master Planning (DKI);
- Environmental Office in each Kotamadya ("city", because project sites are located in different Kotamadya);
- Government agencies or banks involved in disbursement (Ministry of Finance, MOF, Indonesia)

### 5.1.2 DGH (Bina Marga): Executing agency

(1) Main tasks and functions of DGH (from DGH's Home page)

Directorate General of Highways has the task:

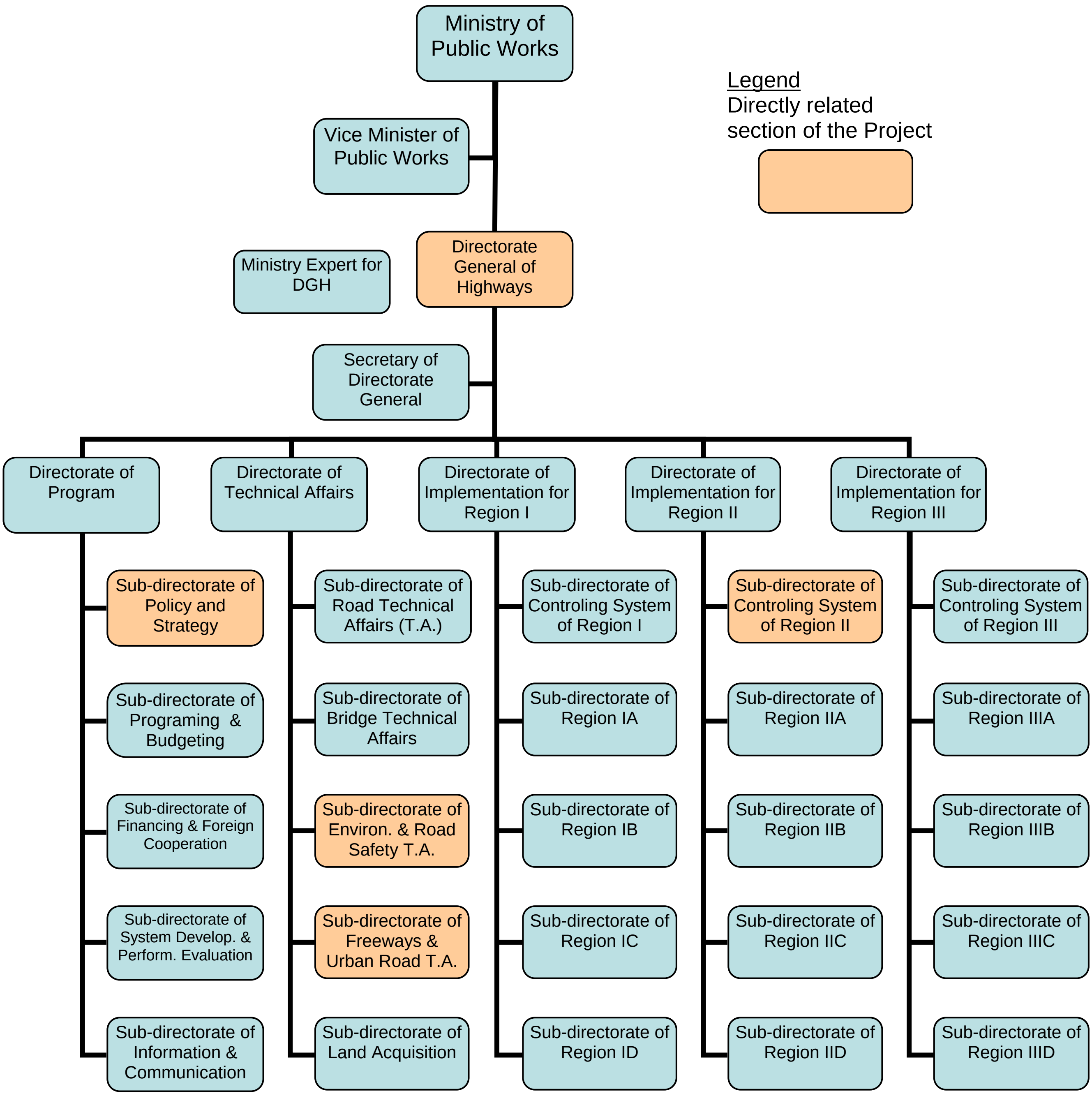
"Formulating and implementing policy and technical standardization in the field of DGH in accordance with the legislation."

In carrying out the task, the Directorate General of DGH has the following functions:

1) Formulation of policy and strategy in DGH, including the implementation of national, provincial, regional, urban, and rural roads;
2) Implementation of DGH's administration policies including programming and budgeting, performance evaluation of the implementation of policies, development financing system and investment patterns as well as emergency response and rehabilitation of road damage caused by natural disasters;
3) Preparation of design codes, standards, guidelines, procedures, and criteria in the fields of DGH;
4) Providing technical guidance and evaluation in DGH, including guidance for road network system in province, districts, urban, and rural areas, as well as capacity building and community empowerment;

5) Development of technical capabilities in DGH, and
6) Administration of Directorate General of Highways.

The organization of the executing agency, DGH, is shown in Figure 5.1.1.




Source: DGH

**Figure 5.1.1 Organization of Directorate General of Highways**

(2) Managerial, technical and financial capabilities of DGH

**Managerial capability**

DGH had annual budget of Rp.16.6 trillion in total in 2010, including:

Rp. 8.8 trillion for new construction/improvement and

Rp. 5.6 trillion for road maintenance.

This project requires about Rp. 2 trillion if all nine subprojects are to be constructed. It consists of 1/4 of the annual budget for new construction. Therefore, a staged construction should be carefully planned.

Recently, DGH has carried out successfully four large Japanese ODA loan road projects as shown in Table 5.1.1. That means DGH has sufficient managerial capacity for this project, too.

**Table 5.1.1 Recent DGH's Large Road Projects (with Japanese ODA Loans)**

| Project | Year | Amount provided (million Yen) | Location |
|---|---|---|---|
| Tanjung Priok Access Road Construction Project (II) | 2006 | 26,620 | DKI |
| Tanjung Priok Access Road Construction Project (I) | 2005 | 26,306 | DKI |
| North Java Corridor Flyover Project (Flyovers at six intersections) | 2005 | 4,287 | Northern Java island |
| Urban Arterial Roads Improvement (UARI) in Metropolitan and Large Cities Project | 1998 | 12,558 | JABODETABEK |

**Technical capability**

Although the national road network is still insufficient, the quality of new or maintained roads is good. The main problems are congestion, delays, high operating costs, poor safety in urban areas and overloading of vehicles.

Many DGH officers have received JICA's technical training in both Japan and Indonesia. DGH is definitely advancing in technical and management fields. DGH is capable to precede the project and will learn much through executing the project.

**Financial capability**

In Indonesia, National arterial roads are in a relatively good condition, but almost half of them are congested, pushing up costs for industry and trade, and the network comprises only about 600 km of high-grade toll roads. Overall, out of the estimated minimum annual funding requirements of Rp.31 trillion (US$ 3.3 billion), only Rp. 12 trillion (US$ 1.3 billion) is currently allocated. This underlines the need for additional domestic and foreign financial resources.

## 5.2 Implementation Schedule

(1) Major activities

The Consultant will prepare the implementation program, in consideration of the following major activities:

- Environmental Impact Assessment period,
- Loan preparation period,

- Selection period of the Consultant for the Design (and supervision),
- Detailed Design (D/D) period,
- Construction tender period,
- Construction period,
- Operation and Maintenance period,

The implementation schedule with the construction plan of the project is discussed in details in Chapter 11.

(2) Implementation Structures

There are three layers of implementation structures, such as PMU, SKS and ULP.

1) PMU (Project Management Unit)

Project Management Unit (PMU) has been established as a permanent office under the Directorate of Program in DGH in accordance with the Director General's decree No.51/KPTS/DD/2009. PMU will coordinate among donors.

2) SKS (Satuan Kerja Sementara, Project Office)

DGH will set up SKS (Project office) for each project in accordance with Law No. 08/PRT/M/2010, under Directorate of Implementation Region II, when the land acquisition is completed. SKS will monitor the project in the following items:

- Progress and quality of the project (in coordination with Directorate of Implementation Region II and Balai (DGH's regional office)),
- Budget and disbursement (in accordance with Directorate of Program),
- Technical matters (in accordance with Directorate of Technical Affairs)

3) ULP (Unit Layanan Pengadaan, Procurement Committee)

ULP has been established since April 2011 and has responsibility of procurement of contractors and consultants in accordance with Presidential Decree No. 54 (2010). ULP consist of at least five persons from all directorates of DGH. The staff should be certified by National Procurement Agency (LKPP) in conducting the procurement.

## 5.3 Procurement of Contractors

The construction of the project will be carried out by contractors pre-qualified and employed, through International Competitive Bidding (ICB) and unit price contracts.

1) Procurement Procedures

Procurement procedures should follow JICA's guidelines and sample documents such as:

- Handbook for Procurement under Japanese ODA Loans, JICA, March, 2009,
- Sample Pre-Qualification Documents under Japanese ODA Loans, JICA, April 2010,
- Sample Bidding Documents under Japanese ODA Loans, JICA, June 2009,
- Evaluation Guide for Prequalification and Bidding under Japanese ODA Loans, JICA, June 2010
- Guidelines for Environmental and Social Considerations, JICA, April 2010

2) Bidding Package

The Consultant will prepare the bidding package not only in the technical aspect, but also in compliance with the above Guidelines.

## 5.4 Construction Plan

1) Construction Methods

The Consultant proposes appropriate construction plans in terms of safety, reliability, technical feasibility and environmental impact.

2) Supervision of the Construction

The Consultant prepares supervision responsibility plan applicable to the Executing Agency, contractors and consultant. The plan should include an appropriate supervision system, including monitoring and inspection.

3) Construction Schedule

The construction schedule could affect the project cost, as well as the annual financing plan and disbursements of the ODA loan. The Consultant prepares the construction schedule using the previous performance of similar projects in Indonesia, in consideration of natural and social conditions. The schedule of each project is usually presented by bar chart as shown in Figure 5.4.1.

For the schedule calculation, performance of UARI and similar projects are used as shown in Table 5.4.1.

4) Land Acquisition, resettlement and compensation

When the project involves land acquisition, resettlement and compensation, the Consultant carefully studies the site conditions and plans the necessary procedure for future EIA and resettlement program.

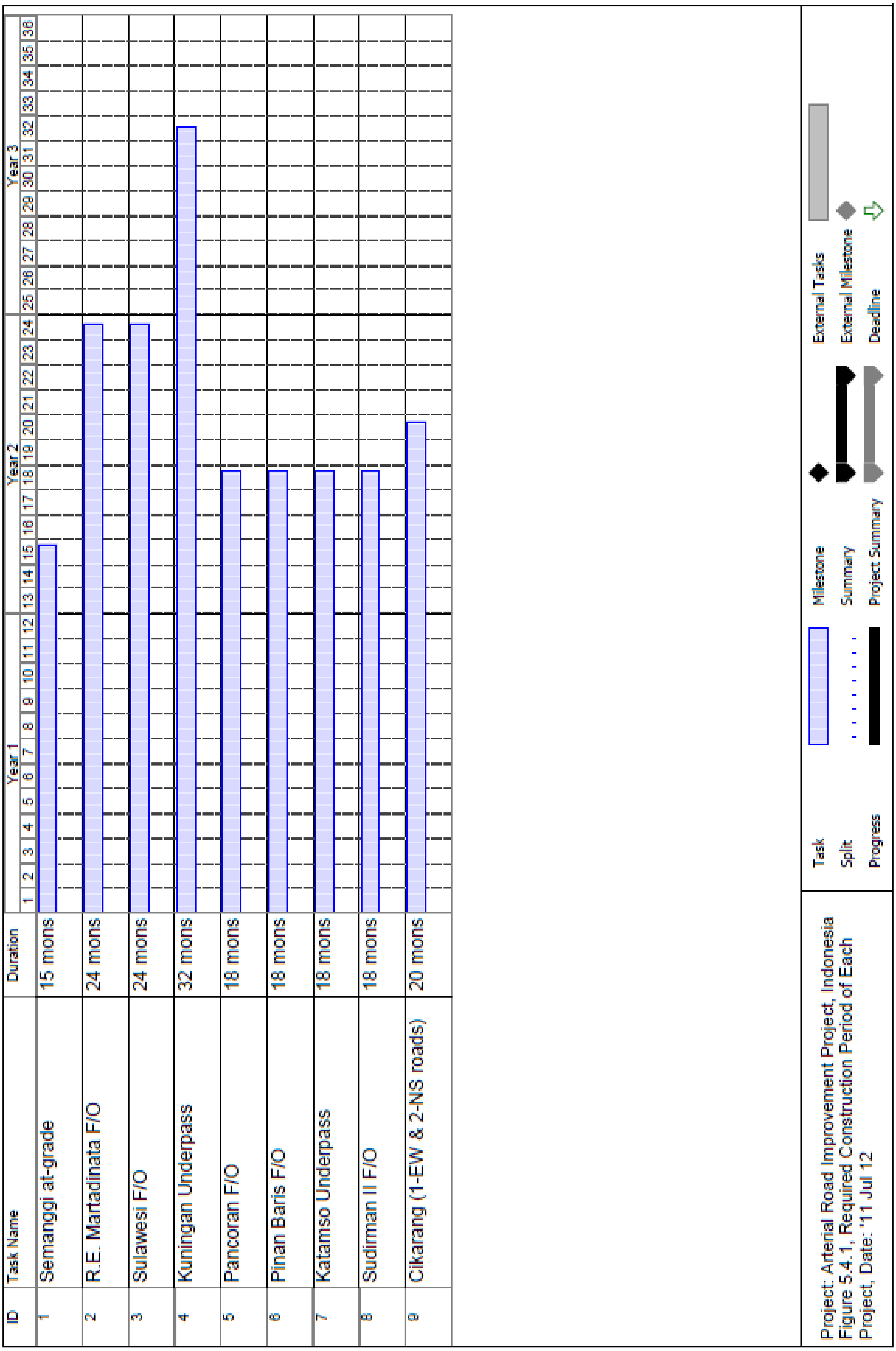



**Figure 5.4.1 Required Construction Period**

Source: JICA Survey Team

**Table 5.4.1 Base Reference Performance for Construction Period Calculation**

| No. | Work items | Reference performance (UARI and other similar projects) |
|---|---|---|
| 1 | Road works | 5,000 sq.m/month |
| 2 | Excavation | 600 cu.m/day |
| 3 | Piling works | 2 Nos./day |
| 4 | Bridge abutment works | 14 days/each |
| 5 | Bridge pier works | 10 days/each |
| 6 | Erection of girders and slabs | 800 sq.m/month |
| 7 | Retaining wall (H=2 m) | 5 m/day |
| 8 | Reinforced earth wall (H=4 m) | 4 m/day |
| 9 | PC sheet piles | 4 each/day/machine |
| 10 | Secant piles | 2 each/day/machine |

The detailed construction schedule of each project is included in Appendix.

## 5.5 Operation and Maintenance System

The Consultant proposes the operation and maintenance methods to ensure:

- Efficient and safe operation of the planned facilities,
- Adequate plan for maintenance,
- The funds necessary for operation and maintenance will be obtained through budgetary allocation or revenues generated from the project.

In the case where the project generates revenues, pricing policy and the tariff collection scheme are analyzed in conjunction with the financial position of the agency responsible for operation and maintenance.

### 5.5.1 Organization for Construction and Maintenance

For constructoon and O/M of national road/bridge, new administaration Balai System ("Balai" is an Indonesian word as "Center") started in January 2007 and currently 10 Balai regional offices cover 33 provinces. Balai is a regional office of the central government which covers several provinces, takes comprehensive charge of planning, implementation and O&M of regional infrastructure financed by the national budget.

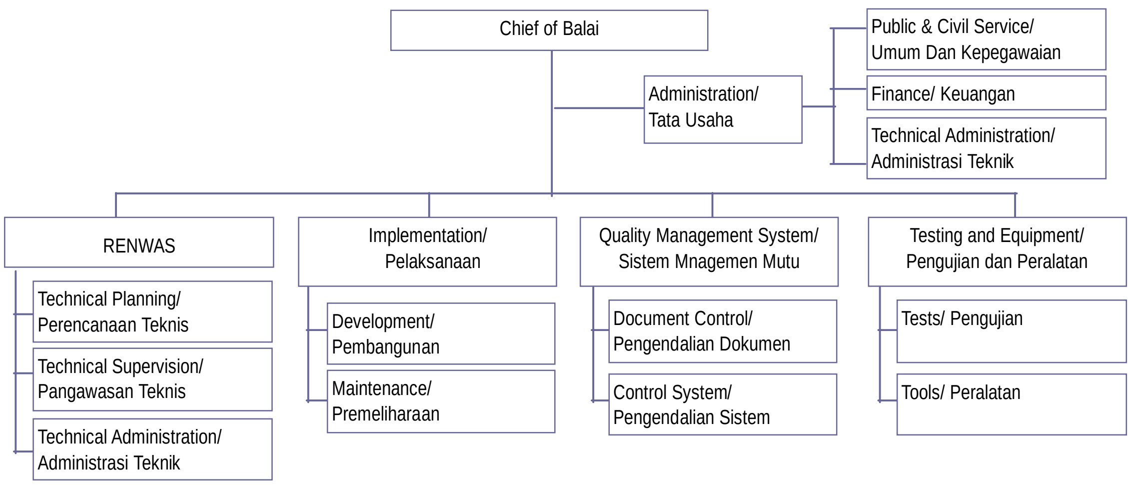



**Figure 5.5.1 Organization Chart for Balai System**

Under Balai, project unit named “SNVT” do each work of planning, design/supervision, new constrcution, improvement, rehabilitation and routine maintenance.

**Table 5.5.1 Responsibility for Each SNVT under Balai**

| SNVT | Responsibility of Works | | | |
|---|---|---|---|---|
| | New Construction | Improvement | Periodic Maintenance / Rehabilitation | Routine Maintenance |
| Planning, Design/Supervision | Design | Design | Design | |
| Development | Road<br>Short Bridges | Road (Large) | Large Bridges | |
| Maintenance | | Road (Small) | All Roads<br>Small Bridges | All Roads (Direct)<br>All Bridges (Direct) |

### 5.5.2 Budget for Construction and Maintenance

Directorate General of Highways (DGH) is responsible for National, Provincial and regional roads in planning, construction and maintenance. The annual budget is shown in Table 5.5.2 and Figure 5.5.2. The maintenance budget is increasing but still insufficient because the road conditions are still “15 % not stable”, even in all National roads as shown in Table 5.5.3.

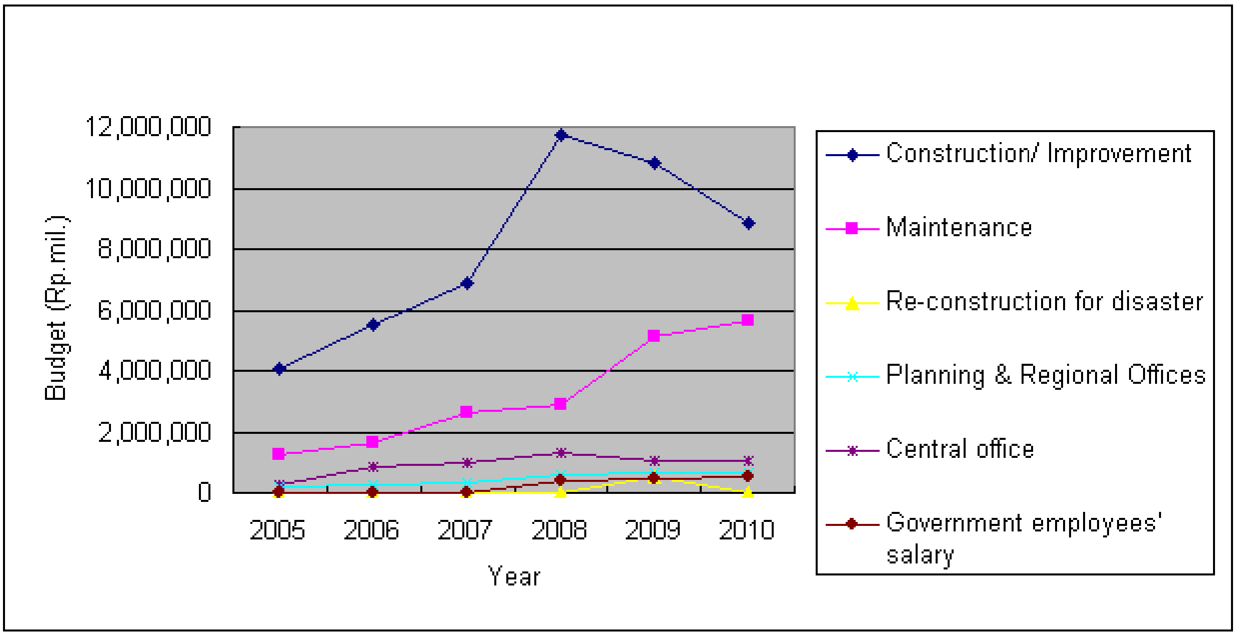
The toll roads maintenance is not included in the DGH budget because it is responsible for the investment company, such as PT. Jasa Marga.

**Table 5.5.2 Budget for Maintenance and Construction**

Unit: Rp. Million

| No. | Description | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| 1 | Construction/ Improvement | 4,037,588 | 5,531,495 | 6,866,413 | 11,712,311 | 10,832,498 | 8,834,539 |
| 2 | Maintenance | 1,260,494 | 1,616,426 | 2,645,326 | 2,875,811 | 5,096,429 | 5,614,939 |
| 3 | Re-construction for disaster | - | - | - | - | 550,497 | 30,989 |
| 4 | Planning & Regional Offices | 171,369 | 266,650 | 311,148 | 569,842 | 628,910 | 636,359 |
| 5 | Central office | 291,506 | 845,133 | 1,001,061 | 1,286,279 | 1,066,427 | 1,032,603 |
| 6 | Government employees' salary | - | - | - | 382,074 | 447,200 | 503,023 |
| | Total | 5,760,957 | 8,259,704 | 10,823,948 | 16,826,317 | 18,621,961 | 16,652,452 |
| | Situation | Actual | Actual | Actual | Actual | Actual | Planned |

Source: DGH




Source: DGH

**Figure 5.5.2 Budget for Construction, Maintenance and Others**

### 5.5.3 Existing National Roads and Bridge Conditions

Existing National road and bridge conditions of DKI and all Indonesia are presented in Table 5.5.3 and Table 5.5.4, Figure 5.5.3 and Figure 5.5.4. DKI is chosen for the analysis because JABODETABEK regional data is not available. Following comments can be made:

1) National Roads Conditions

- In DKI, all National roads are “stable”, well maintained.
- In all Indonesia, 15 % is still in “not stable” conditions.
- In all Indonesia, 11 % is still either gravel or earth roads.

2) National Roads’ Bridge Conditions

- In DKI, 13 Nos. (36 %) of bridges out of 36 Nos. are still “heavily damaged”, that means not sufficiently maintained.

- In all Indonesia, 67 % of bridges are "Very good" or "Good" conditions.

**Table 5.5.3 Road Conditions in National Roads (2009)**

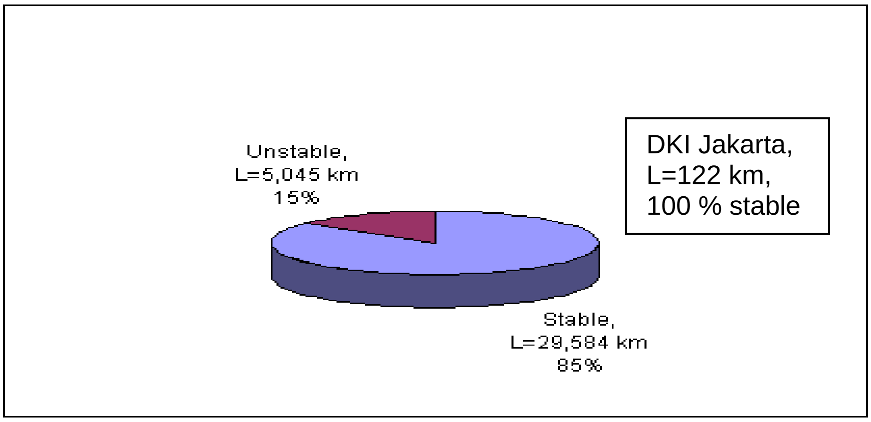
| Area | Total Length (km) | Condition | | Pavement | |
|---|---|---|---|---|---|
| | | Stable (km) | Not Stable (km) | Asphalt or concrete (km) | Gravel or earth (km) |
| **DKI** | 122 | 122 | 0 | 122 | 0 |
| | | 100% | 0% | 100% | 0% |
| Indonesia | 34,629 | 29,584 | 5,045 | 30,938 | 3,690 |
| | | 85% | 15% | 89% | 11% |

Source : Subdit Data dan Informasi, Direktorat Bina Program

**Table 5.5.4 Bridge Conditions in National Roads (as of 5 January 2010)**

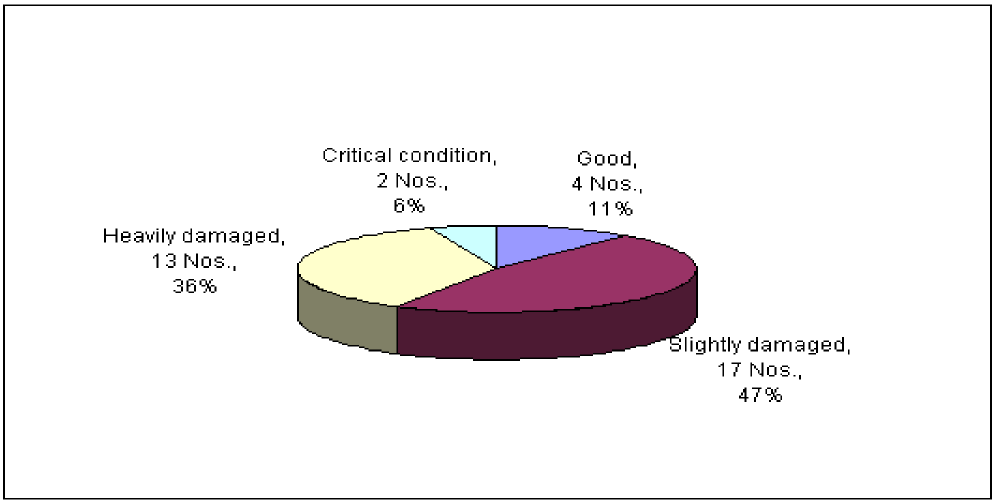
| Area | No. of Bridges | | | | | | |
|---|---|---|---|---|---|---|---|
| | Conditions | | | | | Collapse condition | Total |
| | Very Good | Good | Slightly damaged | Heavily damaged | Critical condition | No bridges exist | |
| **DKI** | 0 | 4 | 17 | 13 | 2 | 0 | 36 |
| | 0% | 11% | 47% | 36% | 6% | 0% | 100% |
| Indonesia | 7,691 | 4,348 | 3,522 | 1,529 | 540 | 344 | 17,964 |
| | 43% | 24% | 20% | 9% | 3% | 2% | 100% |

Source : Subdit Data dan Informasi, Direktorat Bina Program, DGH, Dep. MPW




Source : Bina Narge, website

**Figure 5.5.3 Road Conditions of National Roads**




Source : Bina Narge, website

**Figure 5.5.4 Bridge Conditions of DKI (2010)**

### 5.5.4 Maintenance Cost for this Project

Maintenance cost is important in project appraisal, in particular economic analysis. Furthermore, maintenance costs for roads and structures (flyovers and underpasses) are different. In this Project, major facilities are flyovers and underpasses. Therefore, "structure-oriented" maintenance cost is estimated, using past data. The obtained results are as follows:

**Table 5.5.5 Maintenance Cost Estimate**

| Structure | Maintenance cost per year |
|---|---|
| Flyover (incl. road parts) | 0.5 % of civil work cost |
| Underpass (incl. road parts) | 1 % of civil work cost |

Source: JICA Survey Team

## 5.6 Technical Assistance and Transfer

Technical assistance, usually in the form of providing engineering, financial, operational or development expertise, is useful for ensuring the sustainability of benefits and effects generated by the project.

- The Consultant studies whether it is necessary to provide technical assistance or training for the staff of the facilities related to the project executing or operating agency.
- When such assistance or program is deemed necessary, the Consultant will propose the outline of the assistance program.

# CHAPTER 6. PROJECT COST ESTIMATE

The examination of project costs is one of the most important elements of project appraisal. The project cost estimate provides a basis for the financing plan and for financial and economic evaluation of the project.

## 6.1 Composition of Project Cost

Project cost consists of various items, depending on the type of project, and contains local and foreign currency components. The cost of each item should be carefully estimated based on facility design, services required and appropriate unit price.

The project cost is generally broken down into the following items:

1) Goods and services (excluding consulting services)

Goods and services comprise plant structure, equipment, construction materials, construction machinery, labor, fuel, transportation, etc.

2) Consulting services

The cost of consulting services should be estimated based on the assignment schedule for experts. The cost should be broken down into remunerations and direct costs (equipment, training, etc.).

3) Land acquisition and compensation

The land acquisition and compensation costs should be carefully estimated, especially when the project involves large scale involuntary resettlement. Costs for improving infrastructure at the relocation site and for environmental measures, such as conservation of cultural heritage and protection of wildlife, may also be included.

4) Others

Taxes and duties, initial operation and maintenance costs after project completion, administration expenses of the Executing Agency and interest during construction should be included in the total project cost.

5) Contingencies

There are two types of contingency funds:

- Provision for an increase in prices (price contingency) and
- Provision for increase in physical works due to unforeseen factors (physical contingency).

Price contingency is determined based on the trend of price indices, while physical contingency depends on the nature of the project.

## 6.2 Estimate of Project Cost

The Consultant estimates the project cost, using and checking the following information;

- Items,
- Specifications and Quantities of goods and services required;
- Unit prices used for cost estimate;
- Provisions for contingencies;
- Contract amounts in the similar previous projects in Indonesia, Japan or other countries;

- Local and foreign currency components (in this project, all materials and equipment are available domestically in Indonesia, consequently only local currency of Rp. is used); and
- The applied exchange rate.

The Project cost is estimated as shown in Table 6.2.1 and Table 6.2.2. Cost breakdown of each structure is included in Appendix.

**Table 6.2.1 Project Cost Estimate**

Unit：Rp. Million

| No. | Description | Amount | Remarks |
|---|---|---|---|
| [1] | Civil Works | | Construction period: 2015-2016 |
| | 1.1 Total of 10 structures | 1,011,815 | As of mid. 2011, if 9 structures constructed |
| | 1.2 Contingency | 101,182 | 10% of 1.1 |
| | 1.3 Price escalation | 511,978 | 10%/year, 2011→2015=$1.1^4$=1.46, (1.1+1.2)x0.46 |
| | Sub-total of Civil Works | 1,624,975 | |
| [2] | Consulting Services | | |
| | 2.1 Detailed Design | 40,473 | 4% of 1.1 |
| | 2.2 Construction Supervision | 60,709 | 6% of 1.1 |
| | 2.3 Contingency | 10,118 | 10% of (2.1+2.2) |
| | 2.4 Price escalation | 12,243 | Local portion:1/2, 5%/year, 2011→2015=$1.05^4$=1.22, (2.1+2.2+2.3)x0.5x0.22 |
| | Sub-total of Consulting services | 123,543 | |
| [3] | Administration Cost | 52,456 | 3% of（[1]+[2]） |
| [4] | Land Acquisition | 197,474 | Estimate |
| | 4.1 Land Acquisition | ー | |
| | 4.2 Compensation | ー | |
| [5] | Tax（PPN, 10%) | 174,852 | 10% of（[1]+[2]） |
| **［6］** | **Total Project Cost** | **2,173,299** | **Rp. Million** |
| | % of loan provision | 85% | Maximum |
| | Maximum loan amount | 1,847,304 | Rp. Million, [7]=[6]x85% |
| | Civil works+Consulting S. | 1,748,518 | Rp. Million, [8]=[1]+[2]＜[7] |
| | Exchange rate Yen 1= | 104 | Rp., [9] |
| | Expected loan amount in Yen | 16,813 | Yen Million, =[8]/[9] |

Source: JICA Survey Team

**<u>Cost Reduction</u>**

In the flyover and underpass designs, following two improvements are made to reduce the construction costs:

1) Precast U-girder for side spans (for flyovers)

Original design for flyover side spans was PC box-girder (cast-in-situ). After value engineering, precast PC U-girders are found more economical and easy to construct, then applied.

2) Alignment of road profile (for Kuningan Underpass)

Profile of Central open cut section is raised to reduce the quantity of the secant wall piles, resulting in cost reduction.

**Table 6.2.2 Summary of Construction Cost Estimate (May 2011, Unit: Rp. Mil.)**

| No. | Flyover/ Underpass | Structure | (1) Structure (Major items only) | (2) Road (Major items only) | (3) Others (Structure) (% of (1)) | (4) Other Structure Amount (1)x(3) | (5) Others (Road) (% of (2)) | (6) Other Road Amount (2)x(5) | (7) General (% of (1)+(2)+ (4)+(6)) | (8) General Amount (7)x ((1)+(2)+ (4)+(6)) | Total (1)+(2)+ (4)+(6)+(8) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Semanggi, ALT-2, Ver.2 | At grade improvement+ two bridges | 15,337 | 21,536 | 10% | 1,534 | 30% | 6,461 | 5% | 2,243 | **47,110** | |
| 2 | Martadinata F/O | PC-U | 86,464 | 19,402 | 10% | 8,646 | 30% | 5,821 | 5% | 6,017 | **126,350** | |
| 3 | Sulawesi F/O | PC-U+Steel Box+ PC-H | 95,722 | 15,507 | 10% | 9,572 | 30% | 4,652 | 5% | 6,273 | **131,726** | |
| 4 | Kuningan Underpass | Underpass | 150,407 | 16,600 | 10% | 15,041 | 30% | 4,980 | 5% | 9,351 | **196,379** | |
| 5 | Pancoran F/O | PC-U | 40,129 | 9,481 | 10% | 4,013 | 30% | 2,844 | 5% | 2,823 | **59,290** | |
| 6 | Pinang Baris F/O | PC-U+Steel Box | 62,953 | 18,319 | 10% | 6,295 | 30% | 5,496 | 5% | 4,653 | **97,716** | |
| 7 | Katamso Underpass | Underpass | 51,698 | 6,138 | 10% | 5,170 | 30% | 1,841 | 5% | 3,242 | **68,089** | |
| 8 | Sudirman II F/O | PC-U | 57,904 | 21,729 | 10% | 5,790 | 30% | 6,519 | 5% | 4,597 | **96,539** | |
| 9 | Cikarang Improvement | Two F/Os+ one Bridge | 48,424 | 97,206 | 10% | 4,842 | 30% | 29,162 | 5% | 8,982 | **188,616** | |
| 10 | Senayan | (under study) | - | - | - | - | - | - | - | - | - | Under study |
| | Total | | | | | | | | | | **1,011,815** | |

Note)
F/O: Flyover
PC-U: Precast prestressed U-girder
PC-H: Precast prestressed Hollow girder
Steel box: Steel box girder

Source: JICA Survey Team

## 6.3 Japanese ODA Loan Criteria and the Non-Eligible Items

Developing countries often find it difficult to make public investments due to their domestic budgetary constraints. As a means of financing part of the domestic currency component, Japanese ODA loan introduces fixed-percentage financing criteria.

The criteria set a certain percentage of the total project cost as the upper limit for ODA loan financing regardless of the distinction between foreign and domestic currency components in the total project cost. The percentage depends on per capita GNI and the loan conditions for Indonesia according to the JICA web site are as follows:.

| | |
|---|---|
| 1) % of loan provision: | 85 % limit for Development Loans |
| 2) Indonesia: | Middle Income Countries, 2008 GNI per Capita: US$ 1,856-3,855, |
| 3) Terms: | General Terms, |
| 4) Interest rate: | Standard 1.40 % for Civil works, |
| 5) Repayment period: | 25 years, |
| 6) Grace period: | 7 years, |
| 7) Interest rate: | 0.01 % for Consulting services |

<u>Non-Eligible Items</u>

Non-eligible items for ODA loan financing are as follows:

- Land acquisition and compensation,
- Taxes and duties,
- Administration costs of the Executing Agency

These items, however, can be included in the total project cost based on which the maximum amount of an ODA loan is calculated.

## 6.4 Financing Plan

The Consultant prepares the financial plan for the project, including funding requirements and budgeting, using the project cost and the implementation schedule.

1) Schedule for annual fund requirements

- The Consultant prepares the annual fund requirement schedule, based on:
- The project implementation schedule,
- The estimate of foreign and local currency requirements for each year,
- The contingency allocation plan for each year

2) Budgeting

The Consultant will check that the costs which will not be covered by the Japanese ODA loan will be adequately funded by National or local budget or the Executing Agency's internal funds.

# 6.5 Price Escalation

1) Formula for Escalation

In this section, price escalation from 2011 to 2015 prices is calculated because the middle of the actual construction will take place in 2015. In FIDIC Conditions of Contract, the price escalation shall be determined from formulae for each of the currencies in which the Contract Price is payable. The formulae shall be of the following general type:

$$P_n = a + b\,(L_n/L_0)+c\,(E_n/E_0)+d\,(M_n/M_0)+ \ldots\ldots$$

where

"Pn" is the adjustment multiplier to be applied to the estimated contract value in the relevant currency of the work carried out in period "n", this period is in months;

"a" is a fixed coefficient, representing the non-adjustable portion (overhead, 15 % in this project);

"b", "c", "d", … are coefficients representing the estimated proportion of each cost element related to the execution of the Works such as labour, equipment and materials;

"Ln", "En", "Mn", … are the current cost indices or reference prices for period "n", expressed in the relevant currency of payment on the date 49 days prior to the last day of the invoice; and

"Lo", "Eo", "Mo", … are the base cost indices or reference prices, expressed in the relevant currency of payment, on the Base Date.

2) Price Index in Indonesia

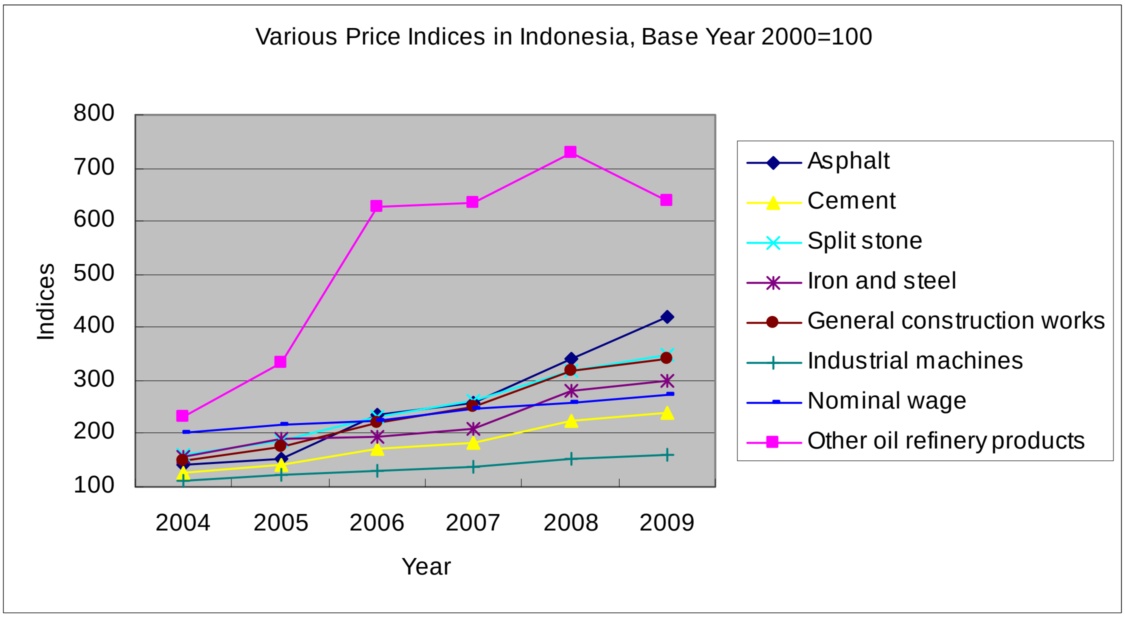
Various indices of construction materials, labor and equipment are picked up from "Economic Indicators" published by Statistic Indonesia and examined as presented in Table 6.5.1 and Figure 6.5.1.

**Table 6.5.1 Price Index in Indonesia**

Base year 2000=100 (against 2006 price)

| Item | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Ave. Increase /year | Item for escalation |
|---|---|---|---|---|---|---|---|---|
| Asphalt | 143 | 152 | 234 | 258 | 340 | 420 | | |
| Cement | 125 | 142 | 173 | 183 | 225 | 241 | | |
| (Increase per year) | | | | 5.8% | 23.0% | 7.1% | **11.9%** | Cement |
| Split stone | 159 | 185 | 233 | 262 | 318 | 348 | | |
| (Increase per year) | | | | 12.4% | 21.4% | 9.4% | **14.4%** | Aggregate |
| Iron and steel | 156 | 191 | 194 | 210 | 282 | 300 | | |
| (Increase per year) | | | | 8.2% | 34.3% | 6.4% | **16.3%** | Steel |
| General construction works | 148 | 176 | 222 | 251 | 317 | 341 | | |
| (Increase per year) | | 18.9% | 26.1% | 13.1% | 26.3% | 7.6% | | |
| Industrial machines | 113 | 122 | 131 | 138 | 153 | 162 | | |
| (Increase per year) | | | | 5.3% | 10.9% | 5.9% | **7.4%** | Equipment |
| Nominal wage | 200 | 218 | 224 | 246 | 258 | 274 | | |
| (Increase per year) | | | | 9.8% | 4.9% | 6.2% | **7.0%** | Labor |
| Other oil refinery products | 233 | 333 | 627 | 633 | 730 | 639 | | |
| (Increase per year) | | | | 1.0% | 15.3% | -12.5% | **1.3%** | Diesel |

Source: Base data: Statistic Indonesia, Increase % by JICA Survey Team




Source: Economic Indicators, Statistic Indonesia

**Figure 6.5.1 Various Price Indices in Indonesia**

Using the above various average increases per year, weighted average increases following FIDIC formula is calculated as indicated in Table 6.5.2.

**Table 6.5.2 Weighted Average Increase/year**

| Item | Assumed Proportion | Weighted average increase/year |
|---|---|---|
| Overhead (no increase) | 0.15 | |
| Labour | 0.10 | 0.7% |
| Cement | 0.20 | 2.4% |
| Aggregate | 0.10 | 1.4% |
| Steel bars | 0.25 | 4.1% |
| Equipment | 0.15 | 1.1% |
| Diesel | 0.05 | 0.1% |
| Total | 1.00 | 9.8% **Say 10 %/year increase** |

Source: JICA Survey Team

From the Table 6.5.2, weighted average increase is estimated as 10 % per year for 2011-2015.

# CHAPTER 7. ECONOMIC ANALYSIS

## 7.1 Overview

This chapter evaluates the economic feasibility of the sub-projects for evaluation in the second stage. Economic evaluation examines the economic feasibility of a sub-project through a cost-benefit analysis from a national economic perspective where quantified benefits of the project are compared with its economic costs.

The results of the evaluation show that the Benefit-Cost ratio (B/C) and the Economic Internal Rate of Return (EIRR) of the project are economically justified from a national economic viewpoint, and the values are used as one of the criteria for prioritization of the sub-projects in the second stage.

## 7.2 Comparison of Benefits and Costs

(1) "With Project" and "Without Project" Assumptions

In the cost-benefit analysis, two scenarios will be assumed in order to distinguish and compare the benefits and costs arising from project implementation. Two scenarios, i.e. "with project" and "without project," have the following assumptions.

Each sub-project will be implemented and completed by the target year of the Study. In this economic evaluation, implementation of the sub-project is regarded as a "with project" scenario. On the other hand, a "without project" scenario is formulated under the assumption that the sub-project is not implemented and the existing conditions continue.

(2) Economic Costs of the Project

Total cost of the sub-project is composed of construction work costs, costs for consulting services, land costs, physical contingencies, and operation and maintenance (OM) cost of the project, as described in Chapter 6. They are estimated in constant February 2010 prices, identified by each category of foreign/local costs for economic evaluation and then converted into economic prices for economic evaluation under the assumptions described below.

(3) Economic Benefits of Project

There are a variety of direct and indirect benefits (quantitative and qualitative) derived from the proposed transportation project.

Among these are the benefits from savings in vehicle operating costs (VOC) and passenger travel time costs (TTC), and the benefits from the avoided costs, which were treated as quantitative benefits in conventional economic analysis of urban transportation. In this economic evaluation, the VOC and TTC cost-savings were estimated as quantitative benefits especially in comparing the "with project scenario" to the "without project" scenario.

## 7.3 Assumptions of Economic Evaluation

### 7.3.1 General Assumptions of Economic Evaluation

The following are the assumptions of the general conditions in the economic evaluation:

- Base Year: Year 2011;
- Project Life: 30 years after the project completion, namely from 2016 to 2045 in most cases;
- Discount Rate: Discount rate of 10% is used;

- Inflation: Inflation is not taken into account, it is not considered in benefits or in costs estimated during the evaluation period;
- Growth in traffic volume: Following JUTPI, an increase in traffic volume is forecasted for each sub-project location, ranging from 0.8% to 2.6% per year.
- Foreign Exchange Rate: The foreign exchange rate is fixed at the following rate as of May 2011 and a shadow exchange rate is not considered,

  1 US$= Rp. 8,600, 1JPY=Rp. 104; and,
- Financial and Economic Costs: Financial costs were converted into economic costs by using the following conversion factors.

**Table 7.3.1 Factors for Converting Financial into Economic Prices**

| Cost Item | Cost Component | Conversion Factor |
|---|---|---|
| Land acquisition | LC | 0.843 |
| Civil works | LC | 0.843 |
| | FC | 0.795 |
| Engineering services | LC | 0.843 |
| | FC | 1.00 |
| Equipment Cost | LC | 0.843 |
| | FC | 0.795 |
| Project overhead | LC | 0.872 |
| O&M | LC & FC | 0.860 |
| Physical contingency | LC | 0.843 |
| | FC | 0.795 |

Source: JICA Survey Team
Note: LC= Local cost, FC=Foreign cost

### 7.3.2 Basic Calculation of Unit Value for Benefit Estimate

(1) Vehicle Operation Cost (VOC)

Unit vehicle operating costs are estimated by the representative vehicles and operating speed in 2009 prices, as shown in Table 7.3.2.

**Table 7.3.2 Vehicle Operating Cost**

(Rp./Vehicle-Km)

| Speed (km/Hour) | Private Passenger Car | Mini Bus | Large Bus | Truck | Motorcycle |
|---|---|---|---|---|---|
| 0-10 | 8,084 | 4,068 | 12,958 | 10,013 | 923 |
| 10-20 | 3,845 | 1,958 | 7,532 | 3,650 | 544 |
| 20-30 | 2,784 | 1,494 | 6,346 | 2,707 | 432 |
| 30-40 | 2,249 | 1,296 | 5,875 | 2,291 | 374 |
| 40-50 | 1,940 | 0 | 0 | 2,079 | 341 |
| 50-60 | 1,765 | 0 | 0 | 1,981 | 321 |
| 60-70 | 1,693 | 0 | 0 | 1,961 | 345 |
| 70-80 | 1,705 | 0 | 0 | 2,002 | 318 |
| 80-90 | 1,793 | 0 | 0 | 2,096 | 331 |

Note: Economic costs in 2011 prices
Source: JICA Survey Team

(2) Travel Time Cost Estimate

Time value of each passenger in car, motorcycle, and bus is estimated through the income approach as shown in Table 7.3.3. The household income is estimated based on the results of the Commuter Survey of JUTPI conducted in 2010. An income per person is Rp. 4,000 per hour including the indirect cost at 10% in 2010. For the economic analysis, time value of the passenger is measured by using the average time value per person for all trips regardless of their trip purposes.

**Table 7.3.3 Time Value of Passenger in 2010**

| | Unit | Average |
|---|---|---|
| Household Income | Rp./month | 2,808,000 |
| Household Size | Persons | 3.79 |
| Per Capita Income | Rp./month | 741,000 |
| Hourly Income | Rp./hour | 3,640 |
| Time Value | Rp./hour | 4,000 |

Note: 1) Weekly working hour is estimated at 48 hours.
2) Indirect cost at 10% is included in time value estimates.
Source: JICA Survey Team Estimate based on JUTPI Commuter Survey

Passenger occupancy rate of each vehicle to be used for economic evaluation is shown in Table 7.3.4, which is provided from the results of the Screen Line Traffic Count Survey of JUTPI. Estimation of time value of each passenger car and motorcycle is made by multiplying the above-mentioned time value per passenger (Rp. 4,000 per hour) by the average passenger occupancy rate of each vehicle. Estimation results of time values of each vehicle unit are shown in Table 7.3.4 .

**Table 7.3.4 Passenger Occupancy Rate and Time Value of Each Vehicle Unit**

| | No. of Passengers per Vehicle | Time value of Each Vehicle Unit (Rp./hr) |
|---|---|---|
| Passenger Car | 1.8 | 7,200 |
| Motorcycle | 1.4 | 5,700 |
| Small Bus | 4.9 | 19,400 |
| Medium Bus | 15.0 | 59,900 |
| Large Bus | 23.8 | 95,000 |

Source: JICA Survey Team Estimate based on JUTPI Screen Line Traffic Count Survey

The time value of each truck is estimated by the average wage rate of its crew as shown in Table 7.3.5. The average monthly wage rate is estimated based on the results of the Commuter Survey of JUTPI conducted in 2010. The average hourly wage rate per person is Rp. 16,000 per hour in 2010. For the economic analysis, time value of the truck is estimated on the assumption of two drivers/conductors in a large truck and one driver in a small truck.

**Table 7.3.5 Time Value of Trucks**

| | Small Truck | Large Truck |
|---|---|---|
| No of Drivers/Conductors per Truck | 1 | 2 |
| Average Monthly Wage Rate (Rp./month) | 2,800,000 | 2,800,000 |
| Average Hourly Wage Rate for Truck (Rp./hour) | 16,000 | 32,000 |

Note: Weekly working hour is estimated at 41 hours.
Source: JICA Survey Team Estimate based on JUTPI Commuter Survey

## 7.4 Result of Economic Analysis

Based on the above-mentioned premises, economic analysis is conduced. Summary table is first presented in Table 7.4.1, and the following subsections explain the result of detailed analysis for each sub-project.

**Table 7.4.1 Summary of Economic Analysis of Sub-Projects and Alternatives**

<table>
<tr><th>No.</th><th>Sub-Project</th><th>Alternative</th><th>EIRR [%]</th><th>NPV [billion Rp.]</th><th>B/C Ratio</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">Semanggi</td><td>Alt.1</td><td>110.2%</td><td>627</td><td>28.07</td></tr>
<tr><td>Alt.2-1</td><td>57.7%</td><td>228</td><td>10.23</td></tr>
<tr><td>Alt.2-2</td><td>48.2%</td><td>232</td><td>8.72</td></tr>
<tr><td>Alt.3</td><td>332.3%</td><td>905</td><td>139.17</td></tr>
<tr><td>Alt.4</td><td>8.4%</td><td>-29</td><td>1.25</td></tr>
<tr><td>4</td><td>R.E. Martadinata</td><td></td><td>16.9%</td><td>82</td><td>2.77</td></tr>
<tr><td>5</td><td>Sulawesi- Tg. PA</td><td></td><td>21.2%</td><td>140</td><td>3.74</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">Kuningan</td><td>N-S continuous UP only</td><td>16.2%</td><td>121</td><td>3.05</td></tr>
<tr><td>with E-W FO*1</td><td>14.6%</td><td>107</td><td>2.68</td></tr>
<tr><td>9</td><td>Pancoran</td><td></td><td>22.8%</td><td>83</td><td>3.54</td></tr>
<tr><td>13</td><td>Pinang Baris</td><td></td><td>17.0%</td><td>56</td><td>2.74</td></tr>
<tr><td>15</td><td>Katamso</td><td></td><td>22.4%</td><td>78</td><td>3.86</td></tr>
<tr><td>16</td><td>Sudirman II</td><td></td><td>27.5%</td><td>184</td><td>5.03</td></tr>
<tr><td rowspan="3">17</td><td rowspan="3">Cikarang</td><td>1 E-W & 2 N-S roads only</td><td>118.5%</td><td>5,436</td><td>45.62</td></tr>
<tr><td>with Dry Port Access*1</td><td>106.7%</td><td>14,239</td><td>43.39</td></tr>
<tr><td>with Dry Port Access & Thamrin UP*1</td><td>105.0%</td><td>15,687</td><td>41.79</td></tr>
<tr><td rowspan="5">18</td><td rowspan="5">Senayan*2</td><td>Alt.1*1</td><td>5.5%</td><td>-59</td><td>0.90</td></tr>
<tr><td>Alt.2*1</td><td>-</td><td>-691</td><td>0.17</td></tr>
<tr><td>Alt.3*1</td><td>47.8%</td><td>102</td><td>7.40</td></tr>
<tr><td>Alt.4*1</td><td>7.2%</td><td>-29</td><td>1.09</td></tr>
<tr><td>Alt.5*1</td><td>12.0%</td><td>15</td><td>1.76</td></tr>
<tr><td colspan="3">All Sub-Projects*3</td><td>63.2%</td><td>16,023</td><td>12.80</td></tr>
</table>

Note: *1 Based on preliminary cost estimate
*2 Benefit is limited to Senayan roundabout only.
*3 Including Alt.2-2 in Semanggi, N-S continuous UP only in Kuningan, 1 E-W & 2 N-S roads with Dry Port Access & Thamrin UP in Cikarang, and Alt.2 in Senayan

Source: JICA Survey Team

Result of the economic analysis of all the sub-projects is also presented at the bottom of Table 7.4.1. The NPV of the project with a 10% discount rate is calculated as Rp.16 trillion, and the EIRR is 63.2% which is above the project evaluation standard in Indonesia. Thus, the package of all the sub-project is justifiable enough from the national economic point of view.

### 7.4.1 Semanggi Junction

Results of the economic analysis of the five alternatives for Semanggi intersection improvement are summarized in Table 7.4.2. Estimated cash flow in the five alternatives for Semanggi is shown in Table 7.4.3 to Table 7.4.6. The net present values (NPV) of all the alternatives with a 10% discount rate are calculated as positive, meaning that all the alternatives are economically viable. In terms of the economic internal rates of return (EIRR), it is the best in Alternative 3 because of its low cost while it is below 10% and is not economically viable in Alternative 4 due to its high cost. Thus, though Alternative 4 is the best recommended case from a traffic point of view, it is not recommended from an economic point of view.

**Table 7.4.2 Summary of Economic Analysis Result for Semanggi Improvement**

| Indicator | Alt. 1 | Alt. 2-1 | Alt. 2-2 | Alt. 3 | Alt. 4 |
|---|---|---|---|---|---|
| Economic Internal Rate of Return (EIRR) | 110.2% | 57.7% | 48.2% | 332.3% | 8.4% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 627 | 228 | 232 | 905 | -29 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 28.07 | 10.23 | 8.72 | 139.17 | 1.25 |

Source: JICA Survey Team

**Table 7.4.3 Cash Flow of Benefit-Cost Analysis for Semanggi Improvement (Alt. 1)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 2,350 | 0 | 2,350 | 0 | 0 | 0 | -2,350 |
| 2013 | 14,099 | 0 | 14,099 | 0 | 0 | 0 | -14,099 |
| 2014 | 18,798 | 0 | 18,798 | 0 | 0 | 0 | -18,798 |
| 2015 | 11,749 | 197 | 11,946 | 19,104 | 36,887 | 55,991 | 44,045 |
| 2016 | 0 | 295 | 295 | 29,372 | 56,714 | 86,086 | 85,791 |
| 2017 | 0 | 295 | 295 | 30,107 | 58,132 | 88,238 | 87,943 |
| 2018 | 0 | 295 | 295 | 30,859 | 59,585 | 90,444 | 90,149 |
| 2019 | 0 | 295 | 295 | 31,631 | 61,075 | 92,705 | 92,410 |
| 2020 | 0 | 295 | 295 | 32,422 | 62,601 | 95,023 | 94,728 |
| 2021 | 0 | 295 | 295 | 33,232 | 64,166 | 97,399 | 97,103 |
| 2022 | 0 | 295 | 295 | 34,063 | 65,771 | 99,834 | 99,538 |
| 2023 | 0 | 295 | 295 | 34,914 | 67,415 | 102,329 | 102,034 |
| 2024 | 0 | 295 | 295 | 35,787 | 69,100 | 104,888 | 104,592 |
| 2025 | 0 | 295 | 295 | 36,682 | 70,828 | 107,510 | 107,214 |
| 2026 | 0 | 295 | 295 | 37,599 | 72,598 | 110,198 | 109,902 |
| 2027 | 0 | 295 | 295 | 38,539 | 74,413 | 112,953 | 112,657 |
| 2028 | 0 | 295 | 295 | 39,503 | 76,274 | 115,776 | 115,481 |
| 2029 | 0 | 295 | 295 | 40,490 | 78,181 | 118,671 | 118,375 |
| 2030 | 0 | 295 | 295 | 41,502 | 80,135 | 121,638 | 121,342 |
| 2031 | 0 | 295 | 295 | 42,540 | 82,139 | 124,678 | 124,383 |
| 2032 | 0 | 295 | 295 | 43,603 | 84,192 | 127,795 | 127,500 |
| 2033 | 0 | 295 | 295 | 44,694 | 86,297 | 130,990 | 130,695 |
| 2034 | 0 | 295 | 295 | 45,811 | 88,454 | 134,265 | 133,970 |
| 2035 | 0 | 295 | 295 | 46,956 | 90,666 | 137,622 | 137,326 |
| 2036 | 0 | 295 | 295 | 48,130 | 92,932 | 141,062 | 140,767 |
| 2037 | 0 | 295 | 295 | 49,333 | 95,256 | 144,589 | 144,293 |
| 2038 | 0 | 295 | 295 | 50,567 | 97,637 | 148,204 | 147,908 |
| 2039 | 0 | 295 | 295 | 51,831 | 100,078 | 151,909 | 151,613 |
| 2040 | 0 | 295 | 295 | 53,127 | 102,580 | 155,706 | 155,411 |
| 2041 | 0 | 295 | 295 | 54,455 | 105,144 | 159,599 | 159,304 |
| 2042 | 0 | 295 | 295 | 55,816 | 107,773 | 163,589 | 163,293 |
| 2043 | 0 | 295 | 295 | 57,211 | 110,467 | 167,679 | 167,383 |
| 2044 | 0 | 295 | 295 | 58,642 | 113,229 | 171,871 | 171,575 |
| 2045 | 0 | 295 | 295 | 60,108 | 116,060 | 176,167 | 175,872 |

Source: JICA Survey Team

**Table 7.4.4 Cash Flow of Benefit-Cost Analysis for Semanggi Improvement (Alt. 2-1)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 2,662 | 0 | 2,662 | 0 | 0 | 0 | -2,662 |
| 2013 | 5,325 | 0 | 5,325 | 0 | 0 | 0 | -5,325 |
| 2014 | 26,624 | 0 | 26,624 | 0 | 0 | 0 | -26,624 |
| 2015 | 18,637 | 223 | 18,860 | 16,572 | 5,916 | 22,488 | 3,628 |
| 2016 | 0 | 335 | 335 | 25,480 | 9,095 | 34,576 | 34,241 |
| 2017 | 0 | 335 | 335 | 26,117 | 9,323 | 35,440 | 35,105 |
| 2018 | 0 | 335 | 335 | 26,770 | 9,556 | 36,326 | 35,991 |
| 2019 | 0 | 335 | 335 | 27,439 | 9,795 | 37,234 | 36,899 |
| 2020 | 0 | 335 | 335 | 28,125 | 10,040 | 38,165 | 37,830 |
| 2021 | 0 | 335 | 335 | 28,828 | 10,291 | 39,119 | 38,784 |
| 2022 | 0 | 335 | 335 | 29,549 | 10,548 | 40,097 | 39,762 |
| 2023 | 0 | 335 | 335 | 30,288 | 10,812 | 41,099 | 40,765 |
| 2024 | 0 | 335 | 335 | 31,045 | 11,082 | 42,127 | 41,792 |
| 2025 | 0 | 335 | 335 | 31,821 | 11,359 | 43,180 | 42,845 |
| 2026 | 0 | 335 | 335 | 32,617 | 11,643 | 44,260 | 43,925 |
| 2027 | 0 | 335 | 335 | 33,432 | 11,934 | 45,366 | 45,031 |
| 2028 | 0 | 335 | 335 | 34,268 | 12,232 | 46,500 | 46,165 |
| 2029 | 0 | 335 | 335 | 35,125 | 12,538 | 47,663 | 47,328 |
| 2030 | 0 | 335 | 335 | 36,003 | 12,852 | 48,854 | 48,520 |
| 2031 | 0 | 335 | 335 | 36,903 | 13,173 | 50,076 | 49,741 |
| 2032 | 0 | 335 | 335 | 37,825 | 13,502 | 51,328 | 50,993 |
| 2033 | 0 | 335 | 335 | 38,771 | 13,840 | 52,611 | 52,276 |
| 2034 | 0 | 335 | 335 | 39,740 | 14,186 | 53,926 | 53,591 |
| 2035 | 0 | 335 | 335 | 40,734 | 14,540 | 55,274 | 54,939 |
| 2036 | 0 | 335 | 335 | 41,752 | 14,904 | 56,656 | 56,321 |
| 2037 | 0 | 335 | 335 | 42,796 | 15,277 | 58,072 | 57,738 |
| 2038 | 0 | 335 | 335 | 43,866 | 15,658 | 59,524 | 59,189 |
| 2039 | 0 | 335 | 335 | 44,962 | 16,050 | 61,012 | 60,678 |
| 2040 | 0 | 335 | 335 | 46,086 | 16,451 | 62,538 | 62,203 |
| 2041 | 0 | 335 | 335 | 47,239 | 16,862 | 64,101 | 63,766 |
| 2042 | 0 | 335 | 335 | 48,420 | 17,284 | 65,704 | 65,369 |
| 2043 | 0 | 335 | 335 | 49,630 | 17,716 | 67,346 | 67,011 |
| 2044 | 0 | 335 | 335 | 50,871 | 18,159 | 69,030 | 68,695 |
| 2045 | 0 | 335 | 335 | 52,143 | 18,613 | 70,756 | 70,421 |

Source: JICA Survey Team

**Table 7.4.5 Cash Flow of Benefit-Cost Analysis for Semanggi Improvement (Alt. 2-2)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 3,222 | 0 | 3,222 | 0 | 0 | 0 | -3,222 |
| 2013 | 9,667 | 0 | 9,667 | 0 | 0 | 0 | -9,667 |
| 2014 | 38,666 | 0 | 38,666 | 0 | 0 | 0 | -38,666 |
| 2015 | 12,889 | 270 | 13,159 | 21,128 | 2,503 | 23,631 | 10,472 |
| 2016 | 0 | 405 | 405 | 32,484 | 3,848 | 36,332 | 35,927 |
| 2017 | 0 | 405 | 405 | 33,296 | 3,944 | 37,240 | 36,835 |
| 2018 | 0 | 405 | 405 | 34,128 | 4,043 | 38,171 | 37,766 |
| 2019 | 0 | 405 | 405 | 34,982 | 4,144 | 39,126 | 38,721 |
| 2020 | 0 | 405 | 405 | 35,856 | 4,248 | 40,104 | 39,699 |
| 2021 | 0 | 405 | 405 | 36,753 | 4,354 | 41,106 | 40,701 |
| 2022 | 0 | 405 | 405 | 37,671 | 4,463 | 42,134 | 41,729 |
| 2023 | 0 | 405 | 405 | 38,613 | 4,574 | 43,187 | 42,782 |
| 2024 | 0 | 405 | 405 | 39,579 | 4,689 | 44,267 | 43,862 |
| 2025 | 0 | 405 | 405 | 40,568 | 4,806 | 45,374 | 44,969 |
| 2026 | 0 | 405 | 405 | 41,582 | 4,926 | 46,508 | 46,103 |
| 2027 | 0 | 405 | 405 | 42,622 | 5,049 | 47,671 | 47,266 |
| 2028 | 0 | 405 | 405 | 43,687 | 5,175 | 48,863 | 48,458 |
| 2029 | 0 | 405 | 405 | 44,780 | 5,305 | 50,084 | 49,679 |
| 2030 | 0 | 405 | 405 | 45,899 | 5,437 | 51,336 | 50,931 |
| 2031 | 0 | 405 | 405 | 47,047 | 5,573 | 52,620 | 52,215 |
| 2032 | 0 | 405 | 405 | 48,223 | 5,713 | 53,935 | 53,530 |
| 2033 | 0 | 405 | 405 | 49,428 | 5,855 | 55,284 | 54,878 |
| 2034 | 0 | 405 | 405 | 50,664 | 6,002 | 56,666 | 56,261 |
| 2035 | 0 | 405 | 405 | 51,931 | 6,152 | 58,082 | 57,677 |
| 2036 | 0 | 405 | 405 | 53,229 | 6,306 | 59,534 | 59,129 |
| 2037 | 0 | 405 | 405 | 54,560 | 6,463 | 61,023 | 60,618 |
| 2038 | 0 | 405 | 405 | 55,924 | 6,625 | 62,548 | 62,143 |
| 2039 | 0 | 405 | 405 | 57,322 | 6,790 | 64,112 | 63,707 |
| 2040 | 0 | 405 | 405 | 58,755 | 6,960 | 65,715 | 65,310 |
| 2041 | 0 | 405 | 405 | 60,224 | 7,134 | 67,358 | 66,953 |
| 2042 | 0 | 405 | 405 | 61,729 | 7,313 | 69,042 | 68,637 |
| 2043 | 0 | 405 | 405 | 63,272 | 7,495 | 70,768 | 70,363 |
| 2044 | 0 | 405 | 405 | 64,854 | 7,683 | 72,537 | 72,132 |
| 2045 | 0 | 405 | 405 | 66,475 | 7,875 | 74,350 | 73,945 |

Source: JICA Survey Team

**Table 7.4.6 Cash Flow of Benefit-Cost Analysis for Semanggi Improvement (Alt. 3)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 673 | 0 | 673 | 0 | 0 | 0 | -673 |
| 2013 | 1,346 | 0 | 1,346 | 0 | 0 | 0 | -1,346 |
| 2014 | 6,729 | 0 | 6,729 | 0 | 0 | 0 | -6,729 |
| 2015 | 4,710 | 56 | 4,767 | 25,901 | 51,447 | 77,348 | 72,582 |
| 2016 | 0 | 85 | 85 | 39,823 | 79,100 | 118,923 | 118,838 |
| 2017 | 0 | 85 | 85 | 40,819 | 81,077 | 121,896 | 121,811 |
| 2018 | 0 | 85 | 85 | 41,839 | 83,104 | 124,943 | 124,859 |
| 2019 | 0 | 85 | 85 | 42,885 | 85,182 | 128,067 | 127,982 |
| 2020 | 0 | 85 | 85 | 43,957 | 87,312 | 131,269 | 131,184 |
| 2021 | 0 | 85 | 85 | 45,056 | 89,494 | 134,550 | 134,466 |
| 2022 | 0 | 85 | 85 | 46,183 | 91,732 | 137,914 | 137,830 |
| 2023 | 0 | 85 | 85 | 47,337 | 94,025 | 141,362 | 141,277 |
| 2024 | 0 | 85 | 85 | 48,520 | 96,376 | 144,896 | 144,812 |
| 2025 | 0 | 85 | 85 | 49,734 | 98,785 | 148,519 | 148,434 |
| 2026 | 0 | 85 | 85 | 50,977 | 101,255 | 152,232 | 152,147 |
| 2027 | 0 | 85 | 85 | 52,251 | 103,786 | 156,037 | 155,953 |
| 2028 | 0 | 85 | 85 | 53,558 | 106,381 | 159,938 | 159,854 |
| 2029 | 0 | 85 | 85 | 54,896 | 109,040 | 163,937 | 163,852 |
| 2030 | 0 | 85 | 85 | 56,269 | 111,766 | 168,035 | 167,950 |
| 2031 | 0 | 85 | 85 | 57,676 | 114,560 | 172,236 | 172,151 |
| 2032 | 0 | 85 | 85 | 59,118 | 117,424 | 176,542 | 176,457 |
| 2033 | 0 | 85 | 85 | 60,595 | 120,360 | 180,955 | 180,871 |
| 2034 | 0 | 85 | 85 | 62,110 | 123,369 | 185,479 | 185,395 |
| 2035 | 0 | 85 | 85 | 63,663 | 126,453 | 190,116 | 190,032 |
| 2036 | 0 | 85 | 85 | 65,255 | 129,615 | 194,869 | 194,785 |
| 2037 | 0 | 85 | 85 | 66,886 | 132,855 | 199,741 | 199,656 |
| 2038 | 0 | 85 | 85 | 68,558 | 136,176 | 204,734 | 204,650 |
| 2039 | 0 | 85 | 85 | 70,272 | 139,581 | 209,853 | 209,768 |
| 2040 | 0 | 85 | 85 | 72,029 | 143,070 | 215,099 | 215,015 |
| 2041 | 0 | 85 | 85 | 73,830 | 146,647 | 220,477 | 220,392 |
| 2042 | 0 | 85 | 85 | 75,675 | 150,313 | 225,989 | 225,904 |
| 2043 | 0 | 85 | 85 | 77,567 | 154,071 | 231,638 | 231,554 |
| 2044 | 0 | 85 | 85 | 79,506 | 157,923 | 237,429 | 237,345 |
| 2045 | 0 | 85 | 85 | 81,494 | 161,871 | 243,365 | 243,280 |

Source: JICA Survey Team

**Table 7.4.7 Cash Flow of Benefit-Cost Analysis for Semanggi Improvement (Alt. 4)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 14,507 | 0 | 14,507 | 0 | 0 | 0 | -14,507 |
| 2013 | 29,014 | 0 | 29,014 | 0 | 0 | 0 | -29,014 |
| 2014 | 72,534 | 0 | 72,534 | 0 | 0 | 0 | -72,534 |
| 2015 | 101,548 | 0 | 101,548 | 0 | 0 | 0 | -101,548 |
| 2016 | 72,534 | 1,824 | 74,358 | 28,603 | -5,415 | 23,188 | -51,170 |
| 2017 | 0 | 1,824 | 1,824 | 29,318 | -5,550 | 23,768 | 21,944 |
| 2018 | 0 | 1,824 | 1,824 | 30,051 | -5,689 | 24,362 | 22,538 |
| 2019 | 0 | 1,824 | 1,824 | 30,803 | -5,831 | 24,971 | 23,147 |
| 2020 | 0 | 1,824 | 1,824 | 31,573 | -5,977 | 25,596 | 23,772 |
| 2021 | 0 | 1,824 | 1,824 | 32,362 | -6,126 | 26,236 | 24,412 |
| 2022 | 0 | 1,824 | 1,824 | 33,171 | -6,280 | 26,891 | 25,067 |
| 2023 | 0 | 1,824 | 1,824 | 34,000 | -6,437 | 27,564 | 25,740 |
| 2024 | 0 | 1,824 | 1,824 | 34,850 | -6,597 | 28,253 | 26,429 |
| 2025 | 0 | 1,824 | 1,824 | 35,722 | -6,762 | 28,959 | 27,135 |
| 2026 | 0 | 1,824 | 1,824 | 36,615 | -6,931 | 29,683 | 27,859 |
| 2027 | 0 | 1,824 | 1,824 | 37,530 | -7,105 | 30,425 | 28,601 |
| 2028 | 0 | 1,824 | 1,824 | 38,468 | -7,282 | 31,186 | 29,362 |
| 2029 | 0 | 1,824 | 1,824 | 39,430 | -7,464 | 31,965 | 30,141 |
| 2030 | 0 | 1,824 | 1,824 | 40,416 | -7,651 | 32,765 | 30,941 |
| 2031 | 0 | 1,824 | 1,824 | 41,426 | -7,842 | 33,584 | 31,760 |
| 2032 | 0 | 1,824 | 1,824 | 42,462 | -8,038 | 34,423 | 32,599 |
| 2033 | 0 | 1,824 | 1,824 | 43,523 | -8,239 | 35,284 | 33,460 |
| 2034 | 0 | 1,824 | 1,824 | 44,611 | -8,445 | 36,166 | 34,342 |
| 2035 | 0 | 1,824 | 1,824 | 45,727 | -8,656 | 37,070 | 35,246 |
| 2036 | 0 | 1,824 | 1,824 | 46,870 | -8,873 | 37,997 | 36,173 |
| 2037 | 0 | 1,824 | 1,824 | 48,041 | -9,095 | 38,947 | 37,123 |
| 2038 | 0 | 1,824 | 1,824 | 49,243 | -9,322 | 39,920 | 38,096 |
| 2039 | 0 | 1,824 | 1,824 | 50,474 | -9,555 | 40,918 | 39,094 |
| 2040 | 0 | 1,824 | 1,824 | 51,735 | -9,794 | 41,941 | 40,117 |
| 2041 | 0 | 1,824 | 1,824 | 53,029 | -10,039 | 42,990 | 41,166 |
| 2042 | 0 | 1,824 | 1,824 | 54,355 | -10,290 | 44,065 | 42,241 |
| 2043 | 0 | 1,824 | 1,824 | 55,713 | -10,547 | 45,166 | 43,342 |
| 2044 | 0 | 1,824 | 1,824 | 57,106 | -10,811 | 46,296 | 44,471 |
| 2045 | 0 | 1,824 | 1,824 | 58,534 | -11,081 | 47,453 | 45,629 |

Source: JICA Survey Team

Apart from Alternative 4 that is not economically viable as mentioned above, only Alternatives 1, 2, 3 and 5 are further analyzed for economic sensitivity analysis. For this, the following cases were analyzed:

- Cases in which total cost increases by 10%, 20%, and 30% (with benefit unchanged);
- Cases in which total benefit decreases by 10%, 20%, and 30% (with cost unchanged); and
- A case in which total cost increases by 20% and total benefit decreases by 20%.

The result presented in the tables indicates that EIRR and the net present value (NPV) are highly dependent on the variations of the expected cost and benefit. However, the project will be economically feasible in all the cases except for Alternative 4, which may not be economically viable.

**Table 7.4.8 Sensitivity Analysis of Economic Analysis for Semanggi Improvement**

[Alternative 1]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 86% | 95% | 103% | 110% | 103% | 97% | 92% | 83% |
| NPV (billion Rp.) | 433 | 500 | 566 | 633 | 630 | 626 | 623 | 493 |

[Alternative 2-1]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 43% | 48% | 53% | 58% | 53% | 49% | 46% | 41% |
| NPV (billion Rp.) | 150 | 176 | 203 | 230 | 226 | 222 | 219 | 169 |

[Alternative 2-2]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 36% | 40% | 44% | 48% | 45% | 41% | 39% | 34% |
| NPV (billion Rp.) | 150 | 179 | 207 | 235 | 230 | 226 | 221 | 169 |

[Alternative 3]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 275% | 296% | 315% | 332% | 316% | 302% | 290% | 268% |
| NPV (billion Rp.) | 636.0 | 728 | 820 | 913 | 912 | 911 | 910 | 726 |

Source: JICA Survey Team

### 7.4.2 R.E. Martadinata Intersection

Results of the economic analysis for R.E. Martadinata FO are summarized in Table 7.4.9. Estimated cash flow is shown in Table 7.4.10. The NPV of the project with a 10% discount rate is calculated as Rp.126 billion, and the EIRR is 20.2% which is above the project evaluation standard in Indonesia. Thus, the project is justifiable enough from the national economic point of view.

**Table 7.4.9 Summary of Economic Analysis Result for R.E. Martadinata FO**

| Indicator | Result |
|---|---|
| Economic Internal Rate of Return (EIRR) | 20.2% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 126 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 3.38 |

Source: JICA Survey Team

**Table 7.4.10 Cash Flow of Benefit-Cost Analysis for R.E. Martadinata FO**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 8,642 | 0 | 8,642 | 0 | 0 | 0 | -8,642 |
| 2014 | 43,210 | 0 | 43,210 | 0 | 0 | 0 | -43,210 |
| 2015 | 69,136 | 0 | 69,136 | 0 | 0 | 0 | -69,136 |
| 2016 | 51,852 | 91 | 51,943 | 1,599 | 1,855 | 3,454 | -48,489 |
| 2017 | 0 | 1,087 | 1,087 | 19,338 | 22,436 | 41,774 | 40,687 |
| 2018 | 0 | 1,087 | 1,087 | 19,493 | 22,615 | 42,108 | 41,021 |
| 2019 | 0 | 1,087 | 1,087 | 19,649 | 22,796 | 42,445 | 41,358 |
| 2020 | 0 | 1,087 | 1,087 | 19,806 | 22,979 | 42,784 | 41,698 |
| 2021 | 0 | 1,087 | 1,087 | 19,964 | 23,162 | 43,127 | 42,040 |
| 2022 | 0 | 1,087 | 1,087 | 20,124 | 23,348 | 43,472 | 42,385 |
| 2023 | 0 | 1,087 | 1,087 | 20,285 | 23,534 | 43,820 | 42,733 |
| 2024 | 0 | 1,087 | 1,087 | 20,447 | 23,723 | 44,170 | 43,083 |
| 2025 | 0 | 1,087 | 1,087 | 20,611 | 23,913 | 44,523 | 43,437 |
| 2026 | 0 | 1,087 | 1,087 | 20,776 | 24,104 | 44,880 | 43,793 |
| 2027 | 0 | 1,087 | 1,087 | 20,942 | 24,297 | 45,239 | 44,152 |
| 2028 | 0 | 1,087 | 1,087 | 21,110 | 24,491 | 45,601 | 44,514 |
| 2029 | 0 | 1,087 | 1,087 | 21,278 | 24,687 | 45,965 | 44,879 |
| 2030 | 0 | 1,087 | 1,087 | 21,449 | 24,884 | 46,333 | 45,247 |
| 2031 | 0 | 1,087 | 1,087 | 21,620 | 25,084 | 46,704 | 45,617 |
| 2032 | 0 | 1,087 | 1,087 | 21,793 | 25,284 | 47,077 | 45,991 |
| 2033 | 0 | 1,087 | 1,087 | 21,968 | 25,486 | 47,454 | 46,367 |
| 2034 | 0 | 1,087 | 1,087 | 22,143 | 25,690 | 47,834 | 46,747 |
| 2035 | 0 | 1,087 | 1,087 | 22,320 | 25,896 | 48,216 | 47,130 |
| 2036 | 0 | 1,087 | 1,087 | 22,499 | 26,103 | 48,602 | 47,515 |
| 2037 | 0 | 1,087 | 1,087 | 22,679 | 26,312 | 48,991 | 47,904 |
| 2038 | 0 | 1,087 | 1,087 | 22,860 | 26,522 | 49,383 | 48,296 |
| 2039 | 0 | 1,087 | 1,087 | 23,043 | 26,735 | 49,778 | 48,691 |
| 2040 | 0 | 1,087 | 1,087 | 23,228 | 26,948 | 50,176 | 49,089 |
| 2041 | 0 | 1,087 | 1,087 | 23,413 | 27,164 | 50,578 | 49,491 |
| 2042 | 0 | 1,087 | 1,087 | 23,601 | 27,381 | 50,982 | 49,896 |
| 2043 | 0 | 1,087 | 1,087 | 23,790 | 27,600 | 51,390 | 50,303 |
| 2044 | 0 | 1,087 | 1,087 | 23,980 | 27,821 | 51,801 | 50,714 |
| 2045 | 0 | 1,087 | 1,087 | 24,172 | 28,044 | 52,216 | 51,129 |
| 2046 | 0 | 1,087 | 1,087 | 24,365 | 28,268 | 52,633 | 51,547 |

Source: JICA Survey Team

The sensitivity analysis result presented in Table 7.4.11 indicates that the sub-project is economically feasible in all the cases. However, it should be noted that EIRR and NPV are subject to change depending on the variations of the expected cost and benefit.

**Table 7.4.11 Sensitivity Analysis of Economic Analysis for R.E. Martadinata FO**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 14.7% | 16.6% | 18.4% | 20.2% | 18.6% | 17.2% | 16.0% | 14.0% |
| NPV (billion Rp.) | 53.7 | 77.6 | 101.6 | 125.6 | 114.2 | 102.8 | 91.4 | 54.8 |

Source: JICA Survey Team

### 7.4.3 Sulawesi - Tg.PA Intersection

Results of the economic analysis for Sulawesi - Tg.PA FO are summarized in Table 7.4.12. Estimated cash flow is shown in Table 7.4.13. The NPV of the project with a 10% discount rate is calculated as Rp.140 billion, and the EIRR is 21.2% which is above the project evaluation standard in Indonesia. Thus, the project is justifiable enough from the national economic point of view.

**Table 7.4.12 Summary of Economic Analysis Result for Sulawesi - Tg.PA FO**

| Indicator | Result |
|---|---|
| Economic Internal Rate of Return (EIRR) | 21.2% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 140 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 3.74 |

Source: JICA Survey Team

**Table 7.4.13 Cash Flow of Benefit-Cost Analysis for Sulawesi - Tg.PA FO**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 30,487 | 0 | 30,487 | 0 | 0 | 0 | -30,487 |
| 2014 | 38,108 | 0 | 38,108 | 0 | 0 | 0 | -38,108 |
| 2015 | 53,351 | 0 | 53,351 | 0 | 0 | 0 | -53,351 |
| 2016 | 30,487 | 944 | 31,431 | 4,265 | 23,649 | 27,913 | -3,517 |
| 2017 | 0 | 1,133 | 1,133 | 5,251 | 29,116 | 34,367 | 33,234 |
| 2018 | 0 | 1,133 | 1,133 | 5,387 | 29,873 | 35,260 | 34,128 |
| 2019 | 0 | 1,133 | 1,133 | 5,527 | 30,650 | 36,177 | 35,044 |
| 2020 | 0 | 1,133 | 1,133 | 5,671 | 31,447 | 37,118 | 35,985 |
| 2021 | 0 | 1,133 | 1,133 | 5,819 | 32,264 | 38,083 | 36,950 |
| 2022 | 0 | 1,133 | 1,133 | 5,970 | 33,103 | 39,073 | 37,940 |
| 2023 | 0 | 1,133 | 1,133 | 6,125 | 33,964 | 40,089 | 38,956 |
| 2024 | 0 | 1,133 | 1,133 | 6,284 | 34,847 | 41,131 | 39,998 |
| 2025 | 0 | 1,133 | 1,133 | 6,448 | 35,753 | 42,201 | 41,068 |
| 2026 | 0 | 1,133 | 1,133 | 6,615 | 36,683 | 43,298 | 42,165 |
| 2027 | 0 | 1,133 | 1,133 | 6,787 | 37,636 | 44,424 | 43,291 |
| 2028 | 0 | 1,133 | 1,133 | 6,964 | 38,615 | 45,579 | 44,446 |
| 2029 | 0 | 1,133 | 1,133 | 7,145 | 39,619 | 46,764 | 45,631 |
| 2030 | 0 | 1,133 | 1,133 | 7,331 | 40,649 | 47,980 | 46,847 |
| 2031 | 0 | 1,133 | 1,133 | 7,521 | 41,706 | 49,227 | 48,094 |
| 2032 | 0 | 1,133 | 1,133 | 7,717 | 42,790 | 50,507 | 49,374 |
| 2033 | 0 | 1,133 | 1,133 | 7,917 | 43,903 | 51,820 | 50,687 |
| 2034 | 0 | 1,133 | 1,133 | 8,123 | 45,044 | 53,167 | 52,035 |
| 2035 | 0 | 1,133 | 1,133 | 8,335 | 46,215 | 54,550 | 53,417 |
| 2036 | 0 | 1,133 | 1,133 | 8,551 | 47,417 | 55,968 | 54,835 |
| 2037 | 0 | 1,133 | 1,133 | 8,774 | 48,650 | 57,423 | 56,290 |
| 2038 | 0 | 1,133 | 1,133 | 9,002 | 49,915 | 58,916 | 57,783 |
| 2039 | 0 | 1,133 | 1,133 | 9,236 | 51,212 | 60,448 | 59,315 |
| 2040 | 0 | 1,133 | 1,133 | 9,476 | 52,544 | 62,020 | 60,887 |
| 2041 | 0 | 1,133 | 1,133 | 9,722 | 53,910 | 63,632 | 62,499 |
| 2042 | 0 | 1,133 | 1,133 | 9,975 | 55,312 | 65,287 | 64,154 |
| 2043 | 0 | 1,133 | 1,133 | 10,234 | 56,750 | 66,984 | 65,851 |
| 2044 | 0 | 1,133 | 1,133 | 10,500 | 58,225 | 68,726 | 67,593 |
| 2045 | 0 | 1,133 | 1,133 | 10,773 | 59,739 | 70,513 | 69,380 |
| 2046 | 0 | 1,133 | 1,133 | 11,054 | 61,292 | 72,346 | 71,213 |

Source: JICA Survey Team

The sensitivity analysis result presented in Table 7.4.14 indicates that the sub-project is economically feasible in all the cases. However, it should be noted that EIRR and NPV are subject to change depending on the variations of the expected cost and benefit.

**Table 7.4.14 Sensitivity Analysis of Economic Analysis for Sulawesi - Tg.PA FO**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 15.7% | 17.6% | 19.4% | 21.2% | 19.6% | 18.2% | 17.0% | 15.0% |
| NPV (billion Rp.) | 66.0 | 90.5 | 115.1 | 139.6 | 129.0 | 118.5 | 107.9 | 69.4 |

Source: JICA Survey Team

### 7.4.4 Kuningan Intersection

Results of the economic analysis for the two cases of Kuningan UP (i.e., the case with the continuous north-south underpass only and the case with an additional east-west one-way flyover) are summarized in Table 7.4.15. Estimated cash flow is shown in Table 7.4.16. The NPV of the project with a 10% discount rate is calculated as about Rp.121 billion in the case with the continuous north-south underpass only. The economic internal rate of return (EIRR) is well over 10% which is used as the project evaluation standard in Indonesia; thus, the project is justifiable enough from the national economic point of view. Meanwhile, for the case with an additional east-west one-way flyover, the obtained NPV and EIRR are also economically sound though the values will decrease compared to the case with the continuous north-south underpass only.

**Table 7.4.15 Summary of Economic Analysis Result for Kuningan UP**

| Indicator | N-S continuous UP only | N-S continuous UP with E-W FO[*1] |
|---|---|---|
| Economic Internal Rate of Return (EIRR) | 16.2% | 14.6% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 121 | 107 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 3.05 | 2.68 |

Note: [*1] Based on preliminary cost estimate.
Source: JICA Survey Team

**Table 7.4.16 Cash Flow of Benefit-Cost Analysis for Kuningan UP**

[N-S continuous UP only]

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 80,591 | 0 | 80,591 | 0 | 0 | 0 | -80,591 |
| 2015 | 53,727 | 0 | 53,727 | 0 | 0 | 0 | -53,727 |
| 2016 | 67,159 | 0 | 67,159 | 0 | 0 | 0 | -67,159 |
| 2017 | 53,727 | 0 | 53,727 | 0 | 0 | 0 | -53,727 |
| 2018 | 13,432 | 1,126 | 14,558 | 10,206 | 28,000 | 38,206 | 23,648 |
| 2019 | 0 | 1,689 | 1,689 | 15,432 | 42,336 | 57,768 | 56,079 |
| 2020 | 0 | 1,689 | 1,689 | 15,555 | 42,675 | 58,230 | 56,541 |
| 2021 | 0 | 1,689 | 1,689 | 15,679 | 43,016 | 58,696 | 57,007 |
| 2022 | 0 | 1,689 | 1,689 | 15,805 | 43,360 | 59,165 | 57,476 |
| 2023 | 0 | 1,689 | 1,689 | 15,931 | 43,707 | 59,638 | 57,950 |
| 2024 | 0 | 1,689 | 1,689 | 16,059 | 44,057 | 60,116 | 58,427 |
| 2025 | 0 | 1,689 | 1,689 | 16,187 | 44,409 | 60,596 | 58,908 |
| 2026 | 0 | 1,689 | 1,689 | 16,317 | 44,764 | 61,081 | 59,392 |
| 2027 | 0 | 1,689 | 1,689 | 16,447 | 45,123 | 61,570 | 59,881 |
| 2028 | 0 | 1,689 | 1,689 | 16,579 | 45,484 | 62,062 | 60,374 |
| 2029 | 0 | 1,689 | 1,689 | 16,712 | 45,847 | 62,559 | 60,870 |
| 2030 | 0 | 1,689 | 1,689 | 16,845 | 46,214 | 63,059 | 61,371 |
| 2031 | 0 | 1,689 | 1,689 | 16,980 | 46,584 | 63,564 | 61,875 |
| 2032 | 0 | 1,689 | 1,689 | 17,116 | 46,957 | 64,072 | 62,384 |
| 2033 | 0 | 1,689 | 1,689 | 17,253 | 47,332 | 64,585 | 62,896 |
| 2034 | 0 | 1,689 | 1,689 | 17,391 | 47,711 | 65,102 | 63,413 |
| 2035 | 0 | 1,689 | 1,689 | 17,530 | 48,093 | 65,622 | 63,934 |
| 2036 | 0 | 1,689 | 1,689 | 17,670 | 48,477 | 66,147 | 64,459 |
| 2037 | 0 | 1,689 | 1,689 | 17,811 | 48,865 | 66,677 | 64,988 |
| 2038 | 0 | 1,689 | 1,689 | 17,954 | 49,256 | 67,210 | 65,521 |
| 2039 | 0 | 1,689 | 1,689 | 18,098 | 49,650 | 67,748 | 66,059 |
| 2040 | 0 | 1,689 | 1,689 | 18,242 | 50,047 | 68,290 | 66,601 |
| 2041 | 0 | 1,689 | 1,689 | 18,388 | 50,448 | 68,836 | 67,147 |
| 2042 | 0 | 1,689 | 1,689 | 18,535 | 50,851 | 69,387 | 67,698 |
| 2043 | 0 | 1,689 | 1,689 | 18,684 | 51,258 | 69,942 | 68,253 |
| 2044 | 0 | 1,689 | 1,689 | 18,833 | 51,668 | 70,501 | 68,812 |
| 2045 | 0 | 1,689 | 1,689 | 18,984 | 52,081 | 71,065 | 69,376 |
| 2046 | 0 | 1,689 | 1,689 | 19,136 | 52,498 | 71,634 | 69,945 |
| 2047 | 0 | 1,689 | 1,689 | 19,289 | 52,918 | 72,207 | 70,518 |
| 2048 | 0 | 1,689 | 1,689 | 19,443 | 53,341 | 72,785 | 71,096 |

Source: JICA Survey Team

[N-S continuous UP with E-W FO]

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 87,430 | 0 | 87,430 | 0 | 0 | 0 | -87,430 |
| 2015 | 70,826 | 0 | 70,826 | 0 | 0 | 0 | -70,826 |
| 2016 | 87,678 | 0 | 87,678 | 0 | 0 | 0 | -87,678 |
| 2017 | 77,666 | 0 | 77,666 | 0 | 0 | 0 | -77,666 |
| 2018 | 13,432 | 1,413 | 14,844 | 11,971 | 29,755 | 41,726 | 26,882 |
| 2019 | 0 | 2,119 | 2,119 | 18,100 | 44,989 | 63,090 | 60,971 |
| 2020 | 0 | 2,119 | 2,119 | 18,245 | 45,349 | 63,594 | 61,476 |
| 2021 | 0 | 2,119 | 2,119 | 18,391 | 45,712 | 64,103 | 61,984 |
| 2022 | 0 | 2,119 | 2,119 | 18,538 | 46,078 | 64,616 | 62,497 |
| 2023 | 0 | 2,119 | 2,119 | 18,687 | 46,446 | 65,133 | 63,014 |
| 2024 | 0 | 2,119 | 2,119 | 18,836 | 46,818 | 65,654 | 63,535 |
| 2025 | 0 | 2,119 | 2,119 | 18,987 | 47,192 | 66,179 | 64,060 |
| 2026 | 0 | 2,119 | 2,119 | 19,139 | 47,570 | 66,709 | 64,590 |
| 2027 | 0 | 2,119 | 2,119 | 19,292 | 47,950 | 67,242 | 65,123 |
| 2028 | 0 | 2,119 | 2,119 | 19,446 | 48,334 | 67,780 | 65,661 |
| 2029 | 0 | 2,119 | 2,119 | 19,602 | 48,721 | 68,323 | 66,204 |
| 2030 | 0 | 2,119 | 2,119 | 19,759 | 49,110 | 68,869 | 66,750 |
| 2031 | 0 | 2,119 | 2,119 | 19,917 | 49,503 | 69,420 | 67,301 |
| 2032 | 0 | 2,119 | 2,119 | 20,076 | 49,899 | 69,975 | 67,857 |
| 2033 | 0 | 2,119 | 2,119 | 20,237 | 50,299 | 70,535 | 68,416 |
| 2034 | 0 | 2,119 | 2,119 | 20,398 | 50,701 | 71,099 | 68,981 |
| 2035 | 0 | 2,119 | 2,119 | 20,562 | 51,107 | 71,668 | 69,549 |
| 2036 | 0 | 2,119 | 2,119 | 20,726 | 51,515 | 72,242 | 70,123 |
| 2037 | 0 | 2,119 | 2,119 | 20,892 | 51,928 | 72,820 | 70,701 |
| 2038 | 0 | 2,119 | 2,119 | 21,059 | 52,343 | 73,402 | 71,283 |
| 2039 | 0 | 2,119 | 2,119 | 21,228 | 52,762 | 73,989 | 71,870 |
| 2040 | 0 | 2,119 | 2,119 | 21,397 | 53,184 | 74,581 | 72,462 |
| 2041 | 0 | 2,119 | 2,119 | 21,569 | 53,609 | 75,178 | 73,059 |
| 2042 | 0 | 2,119 | 2,119 | 21,741 | 54,038 | 75,779 | 73,660 |
| 2043 | 0 | 2,119 | 2,119 | 21,915 | 54,470 | 76,386 | 74,267 |
| 2044 | 0 | 2,119 | 2,119 | 22,090 | 54,906 | 76,997 | 74,878 |
| 2045 | 0 | 2,119 | 2,119 | 22,267 | 55,345 | 77,613 | 75,494 |
| 2046 | 0 | 2,119 | 2,119 | 22,445 | 55,788 | 78,234 | 76,115 |
| 2047 | 0 | 2,119 | 2,119 | 22,625 | 56,235 | 78,859 | 76,741 |
| 2048 | 0 | 2,119 | 2,119 | 22,806 | 56,684 | 79,490 | 77,371 |

Source: JICA Survey Team

The result of the economic sensitivity analysis presented in Table 7.4.17 indicates that EIRR and NPV are highly dependent on the variations of the expected cost and benefit in both cases. For the case with the continuous north-south underpass only, the project will be economically feasible in all the benefit-cost options assumed. On the other hand, it should be noted that EIRR and NPV are subject to change depending on the variations of the expected cost and benefit. The sub-project with an additional east-west one-way flyover may not be economically viable especially if the total cost increases by 20% and the total benefit decreases by 20%, leading to an EIRR that is close to the discount rate of 10%.

**Table 7.4.17 Sensitivity Analysis of Economic Analysis for Kuningan UP**

[N-S continuous UP only]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 11.9% | 13.4% | 14.8% | 16.2% | 15.0% | 13.9% | 13.0% | 11.4% |
| NPV (billion Rp.) | 34.5 | 63.4 | 92.4 | 121.3 | 104.5 | 87.7 | 70.9 | 29.8 |

[N-S continuous UP with E-W FO]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 10.6% | 12.0% | 13.3% | 14.6% | 13.4% | 12.4% | 11.6% | 10.1% |
| NPV (billion Rp.) | 12.0 | 43.6 | 75.2 | 106.8 | 85.9 | 65.0 | 44.0 | 1.7 |

Source: JICA Survey Team

### 7.4.5 Pancoran Intersection

Results of the economic analysis for Pancoran FO are summarized in Table 7.4.18. Estimated cash flow is shown in Table 7.4.19. The NPV of the project with a 10% discount rate is calculated as Rp.83 billion, and the EIRR is 22.8% which is above the project evaluation standard in Indonesia. Thus, the project is justifiable enough from the national economic point of view.

**Table 7.4.18 Summary of Economic Analysis Result for Pancoran FO**

| Indicator | Result |
|---|---|
| Economic Internal Rate of Return (EIRR) | 22.8% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 83 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 3.54 |

Source: JICA Survey Team

**Table 7.4.19 Cash Flow of Benefit-Cost Analysis for Pancoran FO**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 4,055 | 0 | 4,055 | 0 | 0 | 0 | -4,055 |
| 2013 | 12,166 | 0 | 12,166 | 0 | 0 | 0 | -12,166 |
| 2014 | 48,663 | 0 | 48,663 | 0 | 0 | 0 | -48,663 |
| 2015 | 16,221 | 170 | 16,391 | 3,315 | 3,566 | 6,881 | -9,510 |
| 2016 | 0 | 510 | 510 | 10,084 | 10,847 | 20,931 | 20,422 |
| 2017 | 0 | 510 | 510 | 10,225 | 10,999 | 21,224 | 20,715 |
| 2018 | 0 | 510 | 510 | 10,368 | 11,153 | 21,522 | 21,012 |
| 2019 | 0 | 510 | 510 | 10,514 | 11,309 | 21,823 | 21,313 |
| 2020 | 0 | 510 | 510 | 10,661 | 11,468 | 22,128 | 21,619 |
| 2021 | 0 | 510 | 510 | 10,810 | 11,628 | 22,438 | 21,928 |
| 2022 | 0 | 510 | 510 | 10,961 | 11,791 | 22,752 | 22,243 |
| 2023 | 0 | 510 | 510 | 11,115 | 11,956 | 23,071 | 22,561 |
| 2024 | 0 | 510 | 510 | 11,270 | 12,123 | 23,394 | 22,884 |
| 2025 | 0 | 510 | 510 | 11,428 | 12,293 | 23,721 | 23,212 |
| 2026 | 0 | 510 | 510 | 11,588 | 12,465 | 24,054 | 23,544 |
| 2027 | 0 | 510 | 510 | 11,751 | 12,640 | 24,390 | 23,880 |
| 2028 | 0 | 510 | 510 | 11,915 | 12,817 | 24,732 | 24,222 |
| 2029 | 0 | 510 | 510 | 12,082 | 12,996 | 25,078 | 24,568 |
| 2030 | 0 | 510 | 510 | 12,251 | 13,178 | 25,429 | 24,919 |
| 2031 | 0 | 510 | 510 | 12,422 | 13,363 | 25,785 | 25,275 |
| 2032 | 0 | 510 | 510 | 12,596 | 13,550 | 26,146 | 25,636 |
| 2033 | 0 | 510 | 510 | 12,773 | 13,739 | 26,512 | 26,002 |
| 2034 | 0 | 510 | 510 | 12,952 | 13,932 | 26,883 | 26,373 |
| 2035 | 0 | 510 | 510 | 13,133 | 14,127 | 27,260 | 26,750 |
| 2036 | 0 | 510 | 510 | 13,317 | 14,325 | 27,641 | 27,131 |
| 2037 | 0 | 510 | 510 | 13,503 | 14,525 | 28,028 | 27,518 |
| 2038 | 0 | 510 | 510 | 13,692 | 14,728 | 28,421 | 27,911 |
| 2039 | 0 | 510 | 510 | 13,884 | 14,935 | 28,819 | 28,309 |
| 2040 | 0 | 510 | 510 | 14,078 | 15,144 | 29,222 | 28,712 |
| 2041 | 0 | 510 | 510 | 14,275 | 15,356 | 29,631 | 29,121 |
| 2042 | 0 | 510 | 510 | 14,475 | 15,571 | 30,046 | 29,536 |
| 2043 | 0 | 510 | 510 | 14,678 | 15,789 | 30,467 | 29,957 |
| 2044 | 0 | 510 | 510 | 14,883 | 16,010 | 30,893 | 30,383 |
| 2045 | 0 | 510 | 510 | 15,092 | 16,234 | 31,326 | 30,816 |

Source: JICA Survey Team

The sensitivity analysis result presented in Table 7.4.20 indicates that the sub-project is economically feasible in all the cases. However, it should be noted that EIRR and NPV are subject to change depending on the variations of the expected cost and benefit.

**Table 7.4.20 Sensitivity Analysis of Economic Analysis for Pancoran FO**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 16.7% | 18.8% | 20.8% | 22.8% | 21.0% | 19.5% | 18.2% | 16.0% |
| NPV (billion Rp.) | 40.7 | 54.9 | 69.1 | 83.4 | 77.5 | 71.6 | 65.7 | 43.1 |

Source: JICA Survey Team

### 7.4.6 Pinang Baris Intersection

Results of the economic analysis for Pinang Baris FO are summarized in Table 7.4.21. Estimated cash flow is shown in Table 7.4.22. The NPV of the project with a 10% discount rate is calculated as Rp.56 billion, and the EIRR is 17.0% which is above the project evaluation standard in Indonesia. Thus, the project is justifiable enough from the national economic point of view.

**Table 7.4.21 Summary of Economic Analysis Result for Pinang Baris FO**

| Indicator | Result |
|---|---|
| Economic Internal Rate of Return (EIRR) | 17.0% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 56 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 2.74 |

Source: JICA Survey Team

**Table 7.4.22 Cash Flow of Benefit-Cost Analysis for Pinang Baris FO**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 19,433 | 0 | 19,433 | 0 | 0 | 0 | -19,433 |
| 2015 | 32,388 | 0 | 32,388 | 0 | 0 | 0 | -32,388 |
| 2016 | 45,343 | 0 | 45,343 | 0 | 0 | 0 | -45,343 |
| 2017 | 32,388 | 700 | 33,088 | 7,231 | 11,992 | 19,223 | -13,866 |
| 2018 | 0 | 840 | 840 | 8,790 | 14,577 | 23,367 | 22,527 |
| 2019 | 0 | 840 | 840 | 8,904 | 14,767 | 23,671 | 22,830 |
| 2020 | 0 | 840 | 840 | 9,020 | 14,959 | 23,978 | 23,138 |
| 2021 | 0 | 840 | 840 | 9,137 | 15,153 | 24,290 | 23,450 |
| 2022 | 0 | 840 | 840 | 9,256 | 15,350 | 24,606 | 23,766 |
| 2023 | 0 | 840 | 840 | 9,376 | 15,550 | 24,926 | 24,085 |
| 2024 | 0 | 840 | 840 | 9,498 | 15,752 | 25,250 | 24,409 |
| 2025 | 0 | 840 | 840 | 9,622 | 15,957 | 25,578 | 24,738 |
| 2026 | 0 | 840 | 840 | 9,747 | 16,164 | 25,911 | 25,070 |
| 2027 | 0 | 840 | 840 | 9,873 | 16,374 | 26,247 | 25,407 |
| 2028 | 0 | 840 | 840 | 10,002 | 16,587 | 26,589 | 25,748 |
| 2029 | 0 | 840 | 840 | 10,132 | 16,803 | 26,934 | 26,094 |
| 2030 | 0 | 840 | 840 | 10,263 | 17,021 | 27,284 | 26,444 |
| 2031 | 0 | 840 | 840 | 10,397 | 17,242 | 27,639 | 26,799 |
| 2032 | 0 | 840 | 840 | 10,532 | 17,466 | 27,998 | 27,158 |
| 2033 | 0 | 840 | 840 | 10,669 | 17,694 | 28,362 | 27,522 |
| 2034 | 0 | 840 | 840 | 10,808 | 17,924 | 28,731 | 27,891 |
| 2035 | 0 | 840 | 840 | 10,948 | 18,157 | 29,105 | 28,264 |
| 2036 | 0 | 840 | 840 | 11,090 | 18,393 | 29,483 | 28,643 |
| 2037 | 0 | 840 | 840 | 11,235 | 18,632 | 29,866 | 29,026 |
| 2038 | 0 | 840 | 840 | 11,381 | 18,874 | 30,255 | 29,414 |
| 2039 | 0 | 840 | 840 | 11,529 | 19,119 | 30,648 | 29,807 |
| 2040 | 0 | 840 | 840 | 11,678 | 19,368 | 31,046 | 30,206 |
| 2041 | 0 | 840 | 840 | 11,830 | 19,620 | 31,450 | 30,609 |
| 2042 | 0 | 840 | 840 | 11,984 | 19,875 | 31,859 | 31,018 |
| 2043 | 0 | 840 | 840 | 12,140 | 20,133 | 32,273 | 31,432 |
| 2044 | 0 | 840 | 840 | 12,298 | 20,395 | 32,692 | 31,852 |
| 2045 | 0 | 840 | 840 | 12,458 | 20,660 | 33,117 | 32,277 |
| 2046 | 0 | 840 | 840 | 12,619 | 20,928 | 33,548 | 32,708 |
| 2047 | 0 | 840 | 840 | 12,784 | 21,201 | 33,984 | 33,144 |

Source: JICA Survey Team

The sensitivity analysis result presented in Table 7.4.23 indicates that the sub-project is economically feasible in all the cases. However, it should be noted that EIRR and NPV are subject to change depending on the variations of the expected cost and benefit. The sub-project may not be economically viable if the total cost increases by 20% and the total benefit decreases by 20%.

**Table 7.4.23 Sensitivity Analysis of Economic Analysis for Pinang Baris FO**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 12.0% | 13.7% | 15.4% | 17.0% | 15.5% | 14.3% | 13.2% | 11.4% |
| NPV (billion Rp.) | 15.2 | 28.8 | 42.4 | 56.0 | 48.0 | 40.0 | 32.0 | 12.8 |

Source: JICA Survey Team

### 7.4.7 Katamso Intersection

Results of the economic analysis for Katamso UP are summarized in Table 7.4.24. Estimated cash flow is shown in Table 7.4.25. The NPV of the project with a 10% discount rate is calculated as Rp.78 billion, and the EIRR is 22.4% which is above the project evaluation standard in Indonesia. Thus, the project is justifiable enough from the national economic point of view.

**Table 7.4.24 Summary of Economic Analysis Result for Katamso UP**

| Indicator | Result |
|---|---|
| Economic Internal Rate of Return (EIRR) | 22.4% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 78 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 3.86 |

Source: JICA Survey Team

**Table 7.4.25 Cash Flow of Benefit-Cost Analysis for Katamso UP**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 13,541 | 0 | 13,541 | 0 | 0 | 0 | -13,541 |
| 2015 | 22,568 | 0 | 22,568 | 0 | 0 | 0 | -22,568 |
| 2016 | 31,595 | 0 | 31,595 | 0 | 0 | 0 | -31,595 |
| 2017 | 22,568 | 488 | 23,056 | 5,531 | 12,014 | 17,545 | -5,511 |
| 2018 | 0 | 586 | 586 | 6,777 | 14,720 | 21,496 | 20,911 |
| 2019 | 0 | 586 | 586 | 6,919 | 15,029 | 21,948 | 21,362 |
| 2020 | 0 | 586 | 586 | 7,064 | 15,344 | 22,409 | 21,823 |
| 2021 | 0 | 586 | 586 | 7,213 | 15,667 | 22,879 | 22,294 |
| 2022 | 0 | 586 | 586 | 7,364 | 15,996 | 23,360 | 22,774 |
| 2023 | 0 | 586 | 586 | 7,519 | 16,331 | 23,850 | 23,265 |
| 2024 | 0 | 586 | 586 | 7,677 | 16,674 | 24,351 | 23,766 |
| 2025 | 0 | 586 | 586 | 7,838 | 17,025 | 24,863 | 24,277 |
| 2026 | 0 | 586 | 586 | 8,003 | 17,382 | 25,385 | 24,799 |
| 2027 | 0 | 586 | 586 | 8,171 | 17,747 | 25,918 | 25,332 |
| 2028 | 0 | 586 | 586 | 8,342 | 18,120 | 26,462 | 25,876 |
| 2029 | 0 | 586 | 586 | 8,517 | 18,500 | 27,018 | 26,432 |
| 2030 | 0 | 586 | 586 | 8,696 | 18,889 | 27,585 | 26,999 |
| 2031 | 0 | 586 | 586 | 8,879 | 19,286 | 28,164 | 27,579 |
| 2032 | 0 | 586 | 586 | 9,065 | 19,691 | 28,756 | 28,170 |
| 2033 | 0 | 586 | 586 | 9,256 | 20,104 | 29,360 | 28,774 |
| 2034 | 0 | 586 | 586 | 9,450 | 20,526 | 29,976 | 29,391 |
| 2035 | 0 | 586 | 586 | 9,648 | 20,957 | 30,606 | 30,020 |
| 2036 | 0 | 586 | 586 | 9,851 | 21,397 | 31,248 | 30,663 |
| 2037 | 0 | 586 | 586 | 10,058 | 21,847 | 31,905 | 31,319 |
| 2038 | 0 | 586 | 586 | 10,269 | 22,305 | 32,575 | 31,989 |
| 2039 | 0 | 586 | 586 | 10,485 | 22,774 | 33,259 | 32,673 |
| 2040 | 0 | 586 | 586 | 10,705 | 23,252 | 33,957 | 33,372 |
| 2041 | 0 | 586 | 586 | 10,930 | 23,740 | 34,670 | 34,085 |
| 2042 | 0 | 586 | 586 | 11,159 | 24,239 | 35,398 | 34,813 |
| 2043 | 0 | 586 | 586 | 11,394 | 24,748 | 36,142 | 35,556 |
| 2044 | 0 | 586 | 586 | 11,633 | 25,268 | 36,901 | 36,315 |
| 2045 | 0 | 586 | 586 | 11,877 | 25,798 | 37,676 | 37,090 |
| 2046 | 0 | 586 | 586 | 12,127 | 26,340 | 38,467 | 37,881 |
| 2047 | 0 | 586 | 586 | 12,381 | 26,893 | 39,275 | 38,689 |

Source: JICA Survey Team

The sensitivity analysis result presented in Table 7.4.26 indicates that the sub-project is economically feasible in all the cases. However, it should be noted that EIRR and NPV are subject to change depending on the variations of the expected cost and benefit.

**Table 7.4.26 Sensitivity Analysis of Economic Analysis for Katamso UP**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 16.4% | 18.5% | 20.5% | 22.4% | 20.6% | 19.1% | 17.9% | 15.7% |
| NPV (million Rp.) | 37.8 | 51.2 | 64.6 | 77.9 | 72.4 | 66.8 | 61.2 | 40.1 |

Source: JICA Survey Team

### 7.4.8 Sudirman II Intersection

Results of the economic analysis for Sudirman II FO are summarized in Table 7.4.27. Estimated cash flow is shown in Table 7.4.28. The NPV of the project with a 10% discount rate is calculated as Rp.184 billion, and the EIRR is 27.5% which is above the project evaluation standard in Indonesia. Thus, the project is justifiable enough from the national economic point of view.

**Table 7.4.27 Summary of Economic Analysis Result for Sudirman II FO**

| Indicator | Result |
|---|---|
| Economic Internal Rate of Return (EIRR) | 27.5% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 184 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 5.03 |

Source: JICA Survey Team

**Table 7.4.28 Cash Flow of Benefit-Cost Analysis for Sudirman II FO**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 19,199 | 0 | 19,199 | 0 | 0 | 0 | -19,199 |
| 2014 | 31,998 | 0 | 31,998 | 0 | 0 | 0 | -31,998 |
| 2015 | 44,797 | 0 | 44,797 | 0 | 0 | 0 | -44,797 |
| 2016 | 31,998 | 484 | 32,482 | 3,174 | 20,398 | 23,572 | -8,910 |
| 2017 | 0 | 830 | 830 | 5,544 | 35,633 | 41,177 | 40,347 |
| 2018 | 0 | 830 | 830 | 5,649 | 36,310 | 41,959 | 41,129 |
| 2019 | 0 | 830 | 830 | 5,756 | 37,000 | 42,756 | 41,926 |
| 2020 | 0 | 830 | 830 | 5,866 | 37,703 | 43,569 | 42,739 |
| 2021 | 0 | 830 | 830 | 5,977 | 38,419 | 44,397 | 43,566 |
| 2022 | 0 | 830 | 830 | 6,091 | 39,149 | 45,240 | 44,410 |
| 2023 | 0 | 830 | 830 | 6,207 | 39,893 | 46,100 | 45,269 |
| 2024 | 0 | 830 | 830 | 6,325 | 40,651 | 46,976 | 46,145 |
| 2025 | 0 | 830 | 830 | 6,445 | 41,423 | 47,868 | 47,038 |
| 2026 | 0 | 830 | 830 | 6,567 | 42,210 | 48,778 | 47,947 |
| 2027 | 0 | 830 | 830 | 6,692 | 43,012 | 49,704 | 48,874 |
| 2028 | 0 | 830 | 830 | 6,819 | 43,830 | 50,649 | 49,819 |
| 2029 | 0 | 830 | 830 | 6,949 | 44,662 | 51,611 | 50,781 |
| 2030 | 0 | 830 | 830 | 7,081 | 45,511 | 52,592 | 51,761 |
| 2031 | 0 | 830 | 830 | 7,215 | 46,376 | 53,591 | 52,761 |
| 2032 | 0 | 830 | 830 | 7,352 | 47,257 | 54,609 | 53,779 |
| 2033 | 0 | 830 | 830 | 7,492 | 48,155 | 55,647 | 54,817 |
| 2034 | 0 | 830 | 830 | 7,634 | 49,070 | 56,704 | 55,874 |
| 2035 | 0 | 830 | 830 | 7,779 | 50,002 | 57,781 | 56,951 |
| 2036 | 0 | 830 | 830 | 7,927 | 50,952 | 58,879 | 58,049 |
| 2037 | 0 | 830 | 830 | 8,078 | 51,920 | 59,998 | 59,168 |
| 2038 | 0 | 830 | 830 | 8,231 | 52,907 | 61,138 | 60,308 |
| 2039 | 0 | 830 | 830 | 8,388 | 53,912 | 62,300 | 61,469 |
| 2040 | 0 | 830 | 830 | 8,547 | 54,936 | 63,483 | 62,653 |
| 2041 | 0 | 830 | 830 | 8,709 | 55,980 | 64,689 | 63,859 |
| 2042 | 0 | 830 | 830 | 8,875 | 57,044 | 65,919 | 65,088 |
| 2043 | 0 | 830 | 830 | 9,044 | 58,127 | 67,171 | 66,341 |
| 2044 | 0 | 830 | 830 | 9,215 | 59,232 | 68,447 | 67,617 |
| 2045 | 0 | 830 | 830 | 9,390 | 60,357 | 69,748 | 68,917 |
| 2046 | 0 | 830 | 830 | 9,569 | 61,504 | 71,073 | 70,243 |

Source: JICA Survey Team

The sensitivity analysis result presented in Table 7.4.29 indicates that the sub-project is economically feasible in all the cases. However, it should be noted that EIRR and NPV are subject to change depending on the variations of the expected cost and benefit.

**Table 7.4.29 Sensitivity Analysis of Economic Analysis for Sudirman II FO**

| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
|---|---|---|---|---|---|---|---|---|
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 20.5% | 22.9% | 25.2% | 27.5% | 25.4% | 23.7% | 22.2% | 19.7% |
| NPV (billion Rp.) | 103.1 | 130.2 | 157.4 | 184.5 | 175.8 | 167.1 | 158.4 | 112.9 |

Source: JICA Survey Team

### 7.4.9 Cikarang Area

Results of the economic analysis for the following three cases of Cikarang Road Improvement are summarized in Table 7.4.30.

- Improvement of one east-west road (i.e., Jl. Kalimalang) and the connecting two north-south roads (i.e., Jl. Bali and Jl. Jarakosta),
- In addition to the above improvement, development of a north-south dry port access road which will connect with Jl. Kalimalang, and
- In addition to the above improvement, development of an underpass at the intersection of Jl. Cibarusah and Jl. Thamrin.

Estimated cash flow is shown in Table 7.4.31. The NPV of the project with a 10% discount rate is calculated as about Rp.5,436 billion in the case with improvement of one east-west road (i.e., Jl. Kalimalang) and the connecting two north-south roads (i.e., Jl. Bali and Jl. Jarakosta) only. The EIRR is well over 10% which is used as the project evaluation standard in Indonesia; thus, the project is justifiable and so beneficial from the national economic point of view. Meanwhile, for the case with an additional development of a north-south dry port access road as well as the case with an additional development of an underpass at Jl. Thamrin, the obtained NPV and EIRR are also remarkable though the values will decrease compared to the case without the dry port access road.

**Table 7.4.30 Summary of Economic Analysis Result for Cikarang Road Improvement**

| Indicator | 1 E-W & 2 N-S roads only | With Dry Port Access | With Dry Port Access & Thamrin UP |
|---|---|---|---|
| Economic Internal Rate of Return (EIRR) | 118.5% | 106.7% | 105.0% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | 5,436 | 14,239 | 15,687 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 45.62 | 43.39 | 41.79 |

Source: JICA Survey Team

## Table 7.4.31 Cash Flow of Benefit-Cost Analysis for Cikarang Road Improvement

[1 E-W & 2 N-S roads only]

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 12,503 | 0 | 12,503 | 0 | 0 | 0 | -12,503 |
| 2013 | 50,013 | 0 | 50,013 | 0 | 0 | 0 | -50,013 |
| 2014 | 100,027 | 0 | 100,027 | 0 | 0 | 0 | -100,027 |
| 2015 | 87,523 | 270 | 87,794 | 20,919 | 71,154 | 92,073 | 4,279 |
| 2016 | 0 | 1,622 | 1,622 | 136,695 | 493,168 | 629,863 | 628,241 |
| 2017 | 0 | 1,622 | 1,622 | 147,876 | 559,414 | 707,290 | 705,668 |
| 2018 | 0 | 1,622 | 1,622 | 159,057 | 625,661 | 784,717 | 783,095 |
| 2019 | 0 | 1,622 | 1,622 | 170,238 | 691,907 | 862,145 | 860,522 |
| 2020 | 0 | 1,622 | 1,622 | 181,419 | 758,153 | 939,572 | 937,950 |
| 2021 | 0 | 1,622 | 1,622 | 184,140 | 769,526 | 953,665 | 952,043 |
| 2022 | 0 | 1,622 | 1,622 | 186,902 | 781,068 | 967,970 | 966,348 |
| 2023 | 0 | 1,622 | 1,622 | 189,705 | 792,784 | 982,490 | 980,868 |
| 2024 | 0 | 1,622 | 1,622 | 192,551 | 804,676 | 997,227 | 995,605 |
| 2025 | 0 | 1,622 | 1,622 | 195,439 | 816,746 | 1,012,186 | 1,010,564 |
| 2026 | 0 | 1,622 | 1,622 | 198,371 | 828,998 | 1,027,368 | 1,025,746 |
| 2027 | 0 | 1,622 | 1,622 | 201,346 | 841,432 | 1,042,779 | 1,041,157 |
| 2028 | 0 | 1,622 | 1,622 | 204,367 | 854,054 | 1,058,421 | 1,056,799 |
| 2029 | 0 | 1,622 | 1,622 | 207,432 | 866,865 | 1,074,297 | 1,072,675 |
| 2030 | 0 | 1,622 | 1,622 | 210,544 | 879,868 | 1,090,411 | 1,088,789 |
| 2031 | 0 | 1,622 | 1,622 | 213,702 | 893,066 | 1,106,768 | 1,105,146 |
| 2032 | 0 | 1,622 | 1,622 | 216,907 | 906,462 | 1,123,369 | 1,121,747 |
| 2033 | 0 | 1,622 | 1,622 | 220,161 | 920,059 | 1,140,220 | 1,138,598 |
| 2034 | 0 | 1,622 | 1,622 | 223,463 | 933,860 | 1,157,323 | 1,155,701 |
| 2035 | 0 | 1,622 | 1,622 | 226,815 | 947,867 | 1,174,683 | 1,173,061 |
| 2036 | 0 | 1,622 | 1,622 | 230,218 | 962,085 | 1,192,303 | 1,190,681 |
| 2037 | 0 | 1,622 | 1,622 | 233,671 | 976,517 | 1,210,188 | 1,208,565 |
| 2038 | 0 | 1,622 | 1,622 | 237,176 | 991,165 | 1,228,340 | 1,226,718 |
| 2039 | 0 | 1,622 | 1,622 | 240,734 | 1,006,032 | 1,246,766 | 1,245,143 |
| 2040 | 0 | 1,622 | 1,622 | 244,345 | 1,021,122 | 1,265,467 | 1,263,845 |
| 2041 | 0 | 1,622 | 1,622 | 248,010 | 1,036,439 | 1,284,449 | 1,282,827 |
| 2042 | 0 | 1,622 | 1,622 | 251,730 | 1,051,986 | 1,303,716 | 1,302,094 |
| 2043 | 0 | 1,622 | 1,622 | 255,506 | 1,067,766 | 1,323,271 | 1,321,649 |
| 2044 | 0 | 1,622 | 1,622 | 259,338 | 1,083,782 | 1,343,121 | 1,341,498 |
| 2045 | 0 | 1,622 | 1,622 | 263,228 | 1,100,039 | 1,363,267 | 1,361,645 |

Source: JICA Survey Team

[With Dry Port Access]

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 12,503 | 0 | 12,503 | 0 | 0 | 0 | -12,503 |
| 2013 | 119,618 | 0 | 119,618 | 0 | 0 | 0 | -119,618 |
| 2014 | 216,034 | 0 | 216,034 | 0 | 0 | 0 | -216,034 |
| 2015 | 226,732 | 314 | 227,046 | 13,170 | 62,292 | 75,462 | -151,584 |
| 2016 | 139,209 | 2,178 | 141,386 | 122,027 | 532,262 | 654,289 | 512,903 |
| 2017 | 0 | 5,386 | 5,386 | 407,455 | 1,580,610 | 1,988,064 | 1,982,678 |
| 2018 | 0 | 5,386 | 5,386 | 445,062 | 1,731,052 | 2,176,115 | 2,170,729 |
| 2019 | 0 | 5,386 | 5,386 | 482,670 | 1,881,495 | 2,364,165 | 2,358,779 |
| 2020 | 0 | 5,386 | 5,386 | 520,278 | 2,031,938 | 2,552,215 | 2,546,829 |
| 2021 | 0 | 5,386 | 5,386 | 528,082 | 2,062,417 | 2,590,499 | 2,585,112 |
| 2022 | 0 | 5,386 | 5,386 | 536,003 | 2,093,353 | 2,629,356 | 2,623,970 |
| 2023 | 0 | 5,386 | 5,386 | 544,043 | 2,124,753 | 2,668,796 | 2,663,410 |
| 2024 | 0 | 5,386 | 5,386 | 552,204 | 2,156,625 | 2,708,828 | 2,703,442 |
| 2025 | 0 | 5,386 | 5,386 | 560,487 | 2,188,974 | 2,749,461 | 2,744,075 |
| 2026 | 0 | 5,386 | 5,386 | 568,894 | 2,221,809 | 2,790,703 | 2,785,317 |
| 2027 | 0 | 5,386 | 5,386 | 577,427 | 2,255,136 | 2,832,563 | 2,827,177 |
| 2028 | 0 | 5,386 | 5,386 | 586,089 | 2,288,963 | 2,875,052 | 2,869,666 |
| 2029 | 0 | 5,386 | 5,386 | 594,880 | 2,323,297 | 2,918,178 | 2,912,791 |
| 2030 | 0 | 5,386 | 5,386 | 603,803 | 2,358,147 | 2,961,950 | 2,956,564 |
| 2031 | 0 | 5,386 | 5,386 | 612,860 | 2,393,519 | 3,006,379 | 3,000,993 |
| 2032 | 0 | 5,386 | 5,386 | 622,053 | 2,429,422 | 3,051,475 | 3,046,089 |
| 2033 | 0 | 5,386 | 5,386 | 631,384 | 2,465,863 | 3,097,247 | 3,091,861 |
| 2034 | 0 | 5,386 | 5,386 | 640,855 | 2,502,851 | 3,143,706 | 3,138,320 |
| 2035 | 0 | 5,386 | 5,386 | 650,468 | 2,540,394 | 3,190,862 | 3,185,475 |
| 2036 | 0 | 5,386 | 5,386 | 660,225 | 2,578,500 | 3,238,724 | 3,233,338 |
| 2037 | 0 | 5,386 | 5,386 | 670,128 | 2,617,177 | 3,287,305 | 3,281,919 |
| 2038 | 0 | 5,386 | 5,386 | 680,180 | 2,656,435 | 3,336,615 | 3,331,229 |
| 2039 | 0 | 5,386 | 5,386 | 690,383 | 2,696,281 | 3,386,664 | 3,381,278 |
| 2040 | 0 | 5,386 | 5,386 | 700,738 | 2,736,726 | 3,437,464 | 3,432,078 |
| 2041 | 0 | 5,386 | 5,386 | 711,250 | 2,777,776 | 3,489,026 | 3,483,640 |
| 2042 | 0 | 5,386 | 5,386 | 721,918 | 2,819,443 | 3,541,361 | 3,535,975 |
| 2043 | 0 | 5,386 | 5,386 | 732,747 | 2,861,735 | 3,594,482 | 3,589,096 |
| 2044 | 0 | 5,386 | 5,386 | 743,738 | 2,904,661 | 3,648,399 | 3,643,013 |
| 2045 | 0 | 5,386 | 5,386 | 754,894 | 2,948,231 | 3,703,125 | 3,697,739 |
| 2046 | 0 | 5,386 | 5,386 | 766,218 | 2,992,454 | 3,758,672 | 3,753,286 |

Source: JICA Survey Team

[With Dry Port Access & Thamrin UP]

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 12,503 | 0 | 12,503 | 0 | 0 | 0 | -12,503 |
| 2013 | 135,527 | 0 | 135,527 | 0 | 0 | 0 | -135,527 |
| 2014 | 242,550 | 0 | 242,550 | 0 | 0 | 0 | -242,550 |
| 2015 | 263,854 | 314 | 264,168 | 13,170 | 62,292 | 75,462 | -188,706 |
| 2016 | 165,724 | 2,244 | 167,969 | 125,122 | 550,215 | 675,337 | 507,368 |
| 2017 | 0 | 6,186 | 6,186 | 441,625 | 1,800,823 | 2,242,448 | 2,236,262 |
| 2018 | 0 | 6,186 | 6,186 | 476,269 | 1,956,041 | 2,432,310 | 2,426,124 |
| 2019 | 0 | 6,186 | 6,186 | 510,913 | 2,111,258 | 2,622,172 | 2,615,986 |
| 2020 | 0 | 6,186 | 6,186 | 545,558 | 2,266,476 | 2,812,034 | 2,805,848 |
| 2021 | 0 | 6,186 | 6,186 | 553,741 | 2,300,473 | 2,854,214 | 2,848,028 |
| 2022 | 0 | 6,186 | 6,186 | 562,047 | 2,334,980 | 2,897,027 | 2,890,841 |
| 2023 | 0 | 6,186 | 6,186 | 570,478 | 2,370,005 | 2,940,483 | 2,934,297 |
| 2024 | 0 | 6,186 | 6,186 | 579,035 | 2,405,555 | 2,984,590 | 2,978,404 |
| 2025 | 0 | 6,186 | 6,186 | 587,721 | 2,441,638 | 3,029,359 | 3,023,173 |
| 2026 | 0 | 6,186 | 6,186 | 596,536 | 2,478,263 | 3,074,799 | 3,068,613 |
| 2027 | 0 | 6,186 | 6,186 | 605,484 | 2,515,437 | 3,120,921 | 3,114,735 |
| 2028 | 0 | 6,186 | 6,186 | 614,567 | 2,553,168 | 3,167,735 | 3,161,549 |
| 2029 | 0 | 6,186 | 6,186 | 623,785 | 2,591,466 | 3,215,251 | 3,209,065 |
| 2030 | 0 | 6,186 | 6,186 | 633,142 | 2,630,338 | 3,263,480 | 3,257,294 |
| 2031 | 0 | 6,186 | 6,186 | 642,639 | 2,669,793 | 3,312,432 | 3,306,246 |
| 2032 | 0 | 6,186 | 6,186 | 652,279 | 2,709,840 | 3,362,119 | 3,355,932 |
| 2033 | 0 | 6,186 | 6,186 | 662,063 | 2,750,488 | 3,412,550 | 3,406,364 |
| 2034 | 0 | 6,186 | 6,186 | 671,994 | 2,791,745 | 3,463,739 | 3,457,552 |
| 2035 | 0 | 6,186 | 6,186 | 682,074 | 2,833,621 | 3,515,695 | 3,509,509 |
| 2036 | 0 | 6,186 | 6,186 | 692,305 | 2,876,125 | 3,568,430 | 3,562,244 |
| 2037 | 0 | 6,186 | 6,186 | 702,689 | 2,919,267 | 3,621,957 | 3,615,770 |
| 2038 | 0 | 6,186 | 6,186 | 713,230 | 2,963,056 | 3,676,286 | 3,670,100 |
| 2039 | 0 | 6,186 | 6,186 | 723,928 | 3,007,502 | 3,731,430 | 3,725,244 |
| 2040 | 0 | 6,186 | 6,186 | 734,787 | 3,052,615 | 3,787,402 | 3,781,216 |
| 2041 | 0 | 6,186 | 6,186 | 745,809 | 3,098,404 | 3,844,213 | 3,838,027 |
| 2042 | 0 | 6,186 | 6,186 | 756,996 | 3,144,880 | 3,901,876 | 3,895,690 |
| 2043 | 0 | 6,186 | 6,186 | 768,351 | 3,192,053 | 3,960,404 | 3,954,218 |
| 2044 | 0 | 6,186 | 6,186 | 779,876 | 3,239,934 | 4,019,810 | 4,013,624 |
| 2045 | 0 | 6,186 | 6,186 | 791,574 | 3,288,533 | 4,080,107 | 4,073,921 |
| 2046 | 0 | 6,186 | 6,186 | 803,448 | 3,337,861 | 4,141,309 | 4,135,123 |

Source: JICA Survey Team

The result of the economic sensitivity analysis presented in Table 7.4.32 indicates that EIRR and NPV are highly dependent on the variations of the expected cost and benefit in all the three cases. For the case without the dry port access road, the project will be economically feasible in all the benefit-cost options assumed. Moreover, for the case with an additional development of a north-south dry port access road and the case with an additional underpass at Jl. Thamrin, the EIRRs and NPVs are expected to remain viable under all the variations of cost and benefit.

**Table 7.4.32 Sensitivity Analysis of Economic Analysis for Cikarang Road Improvement**

[1 E-W & 2 N-S roads only]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 97% | 104% | 112% | 118% | 112% | 107% | 102% | 94% |
| NPV (billion Rp.) | 3,751 | 4,313 | 4,874 | 5,436 | 5,418 | 5,400 | 5,382 | 4,277 |

[With Dry Port Access]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 88% | 95% | 101% | 107% | 101% | 97% | 93% | 86% |
| NPV (billion Rp.) | 9,733 | 11,195 | 12,656 | 14,118 | 14,068 | 14,018 | 13,969 | 11,095 |

[With Dry Port Access & Thamrin UP]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 87% | 93% | 99% | 105% | 100% | 95% | 91% | 84% |
| NPV (billion Rp.) | 10,716 | 12,328 | 13,941 | 15,553 | 15,496 | 15,439 | 15,382 | 12,214 |

Source: JICA Survey Team

## 7.4.10 Senayan Roundabout

Results of the economic analysis of the five alternatives for Senayan road improvement are summarized in Table 7.4.33. For fair comparison across the alternatives, benefits are estimated around the existing rotary only. Estimated cash flow in the five alternatives for Senayan is shown in Table 7.4.34 to Table 7.4.38. The NPV of the project with a 10% discount rate is calculated as about Rp.104 billion in the best case (Alternative 3) while it is estimated as a negative value in the worst cases (Alternatives 1, 2, and 4). Although the EIRR in Alternatives 3 and 5 are economically viable, EIRRs in Alternatives 1 and 4 are below 10% which is the project evaluation standard in Indonesia, implying that the project is not justifiable enough from the national economic point of view.

**Table 7.4.33 Summary of Economic Analysis Result for Senayan Road Improvement**

| Indicator | Alt. 1 | Alt. 2 | Alt. 3 | Alt. 4 | Alt. 5 |
|---|---|---|---|---|---|
| Economic Internal Rate of Return (EIRR) | 5.5% | - | 47.8% | 7.2% | 12.0% |
| Net Present Value (NPV) (10% discount rate, unit: billion Rp.) | -59 | -690 | 102 | -29 | 15 |
| Benefit-Cost Ratio (B/C) (10% discount rate) | 0.90 | 0.17 | 7.40 | 1.09 | 1.76 |

Note: Benefit is limited to Senayan roundabout only.
Source: JICA Survey Team

**Table 7.4.34 Cash Flow of Benefit-Cost Analysis for Senayan Road Improvement (Alt. 1)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2015 | 41,038 | 0 | 41,038 | 0 | 0 | 0 | -41,038 |
| 2016 | 68,397 | 0 | 68,397 | 0 | 0 | 0 | -68,397 |
| 2017 | 82,077 | 0 | 82,077 | 0 | 0 | 0 | -82,077 |
| 2018 | 82,077 | 860 | 82,937 | 4,687 | 3,533 | 8,220 | -74,717 |
| 2019 | 0 | 1,720 | 1,720 | 9,590 | 7,228 | 16,818 | 15,098 |
| 2020 | 0 | 1,720 | 1,720 | 9,811 | 7,394 | 17,205 | 15,485 |
| 2021 | 0 | 1,720 | 1,720 | 10,037 | 7,564 | 17,600 | 15,880 |
| 2022 | 0 | 1,720 | 1,720 | 10,267 | 7,738 | 18,005 | 16,285 |
| 2023 | 0 | 1,720 | 1,720 | 10,504 | 7,916 | 18,419 | 16,699 |
| 2024 | 0 | 1,720 | 1,720 | 10,745 | 8,098 | 18,843 | 17,123 |
| 2025 | 0 | 1,720 | 1,720 | 10,992 | 8,284 | 19,276 | 17,556 |
| 2026 | 0 | 1,720 | 1,720 | 11,245 | 8,475 | 19,720 | 18,000 |
| 2027 | 0 | 1,720 | 1,720 | 11,504 | 8,670 | 20,173 | 18,453 |
| 2028 | 0 | 1,720 | 1,720 | 11,768 | 8,869 | 20,637 | 18,917 |
| 2029 | 0 | 1,720 | 1,720 | 12,039 | 9,073 | 21,112 | 19,392 |
| 2030 | 0 | 1,720 | 1,720 | 12,316 | 9,282 | 21,597 | 19,877 |
| 2031 | 0 | 1,720 | 1,720 | 12,599 | 9,495 | 22,094 | 20,374 |
| 2032 | 0 | 1,720 | 1,720 | 12,889 | 9,713 | 22,602 | 20,882 |
| 2033 | 0 | 1,720 | 1,720 | 13,185 | 9,937 | 23,122 | 21,402 |
| 2034 | 0 | 1,720 | 1,720 | 13,489 | 10,165 | 23,654 | 21,934 |
| 2035 | 0 | 1,720 | 1,720 | 13,799 | 10,399 | 24,198 | 22,478 |
| 2036 | 0 | 1,720 | 1,720 | 14,116 | 10,638 | 24,755 | 23,035 |
| 2037 | 0 | 1,720 | 1,720 | 14,441 | 10,883 | 25,324 | 23,604 |
| 2038 | 0 | 1,720 | 1,720 | 14,773 | 11,133 | 25,906 | 24,186 |
| 2039 | 0 | 1,720 | 1,720 | 15,113 | 11,389 | 26,502 | 24,782 |
| 2040 | 0 | 1,720 | 1,720 | 15,460 | 11,651 | 27,112 | 25,392 |
| 2041 | 0 | 1,720 | 1,720 | 15,816 | 11,919 | 27,735 | 26,015 |
| 2042 | 0 | 1,720 | 1,720 | 16,180 | 12,194 | 28,373 | 26,653 |
| 2043 | 0 | 1,720 | 1,720 | 16,552 | 12,474 | 29,026 | 27,306 |
| 2044 | 0 | 1,720 | 1,720 | 16,933 | 12,761 | 29,694 | 27,974 |
| 2045 | 0 | 1,720 | 1,720 | 17,322 | 13,054 | 30,376 | 28,656 |
| 2046 | 0 | 1,720 | 1,720 | 17,721 | 13,355 | 31,075 | 29,355 |
| 2047 | 0 | 1,720 | 1,720 | 18,128 | 13,662 | 31,790 | 30,070 |

Source: JICA Survey Team

**Table 7.4.35 Cash Flow of Benefit-Cost Analysis for Senayan Road Improvement (Alt. 2)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 68,397 | 0 | 68,397 | 0 | 0 | 0 | -68,397 |
| 2015 | 273,589 | 0 | 273,589 | 0 | 0 | 0 | -273,589 |
| 2016 | 273,589 | 0 | 273,589 | 0 | 0 | 0 | -273,589 |
| 2017 | 478,781 | 0 | 478,781 | 0 | 0 | 0 | -478,781 |
| 2018 | 273,589 | 4,300 | 277,889 | 4,687 | 3,533 | 8,220 | -269,669 |
| 2019 | 0 | 8,600 | 8,600 | 9,590 | 7,228 | 16,818 | 8,218 |
| 2020 | 0 | 8,600 | 8,600 | 9,811 | 7,394 | 17,205 | 8,605 |
| 2021 | 0 | 8,600 | 8,600 | 10,037 | 7,564 | 17,600 | 9,000 |
| 2022 | 0 | 8,600 | 8,600 | 10,267 | 7,738 | 18,005 | 9,405 |
| 2023 | 0 | 8,600 | 8,600 | 10,504 | 7,916 | 18,419 | 9,819 |
| 2024 | 0 | 8,600 | 8,600 | 10,745 | 8,098 | 18,843 | 10,243 |
| 2025 | 0 | 8,600 | 8,600 | 10,992 | 8,284 | 19,276 | 10,676 |
| 2026 | 0 | 8,600 | 8,600 | 11,245 | 8,475 | 19,720 | 11,120 |
| 2027 | 0 | 8,600 | 8,600 | 11,504 | 8,670 | 20,173 | 11,573 |
| 2028 | 0 | 8,600 | 8,600 | 11,768 | 8,869 | 20,637 | 12,037 |
| 2029 | 0 | 8,600 | 8,600 | 12,039 | 9,073 | 21,112 | 12,512 |
| 2030 | 0 | 8,600 | 8,600 | 12,316 | 9,282 | 21,597 | 12,997 |
| 2031 | 0 | 8,600 | 8,600 | 12,599 | 9,495 | 22,094 | 13,494 |
| 2032 | 0 | 8,600 | 8,600 | 12,889 | 9,713 | 22,602 | 14,002 |
| 2033 | 0 | 8,600 | 8,600 | 13,185 | 9,937 | 23,122 | 14,522 |
| 2034 | 0 | 8,600 | 8,600 | 13,489 | 10,165 | 23,654 | 15,054 |
| 2035 | 0 | 8,600 | 8,600 | 13,799 | 10,399 | 24,198 | 15,598 |
| 2036 | 0 | 8,600 | 8,600 | 14,116 | 10,638 | 24,755 | 16,155 |
| 2037 | 0 | 8,600 | 8,600 | 14,441 | 10,883 | 25,324 | 16,724 |
| 2038 | 0 | 8,600 | 8,600 | 14,773 | 11,133 | 25,906 | 17,306 |
| 2039 | 0 | 8,600 | 8,600 | 15,113 | 11,389 | 26,502 | 17,902 |
| 2040 | 0 | 8,600 | 8,600 | 15,460 | 11,651 | 27,112 | 18,512 |
| 2041 | 0 | 8,600 | 8,600 | 15,816 | 11,919 | 27,735 | 19,135 |
| 2042 | 0 | 8,600 | 8,600 | 16,180 | 12,194 | 28,373 | 19,773 |
| 2043 | 0 | 8,600 | 8,600 | 16,552 | 12,474 | 29,026 | 20,426 |
| 2044 | 0 | 8,600 | 8,600 | 16,933 | 12,761 | 29,694 | 21,094 |
| 2045 | 0 | 8,600 | 8,600 | 17,322 | 13,054 | 30,376 | 21,776 |
| 2046 | 0 | 8,600 | 8,600 | 17,721 | 13,355 | 31,075 | 22,475 |
| 2047 | 0 | 8,600 | 8,600 | 18,128 | 13,662 | 31,790 | 23,190 |

Source: JICA Survey Team

**Table 7.4.36 Cash Flow of Benefit-Cost Analysis for Senayan Road Improvement (Alt. 3)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 8,208 | 0 | 8,208 | 0 | 0 | 0 | -8,208 |
| 2013 | 19,151 | 0 | 19,151 | 0 | 0 | 0 | -19,151 |
| 2014 | 0 | 172 | 172 | 8,029 | 6,358 | 14,387 | 14,215 |
| 2015 | 0 | 172 | 172 | 8,214 | 6,504 | 14,718 | 14,546 |
| 2016 | 0 | 172 | 172 | 8,403 | 6,654 | 15,057 | 14,885 |
| 2017 | 0 | 172 | 172 | 8,596 | 6,807 | 15,403 | 15,231 |
| 2018 | 0 | 172 | 172 | 8,794 | 6,964 | 15,757 | 15,585 |
| 2019 | 0 | 172 | 172 | 8,996 | 7,124 | 16,120 | 15,948 |
| 2020 | 0 | 172 | 172 | 9,203 | 7,288 | 16,490 | 16,318 |
| 2021 | 0 | 172 | 172 | 9,414 | 7,455 | 16,870 | 16,698 |
| 2022 | 0 | 172 | 172 | 9,631 | 7,627 | 17,258 | 17,086 |
| 2023 | 0 | 172 | 172 | 9,852 | 7,802 | 17,655 | 17,483 |
| 2024 | 0 | 172 | 172 | 10,079 | 7,982 | 18,061 | 17,889 |
| 2025 | 0 | 172 | 172 | 10,311 | 8,165 | 18,476 | 18,304 |
| 2026 | 0 | 172 | 172 | 10,548 | 8,353 | 18,901 | 18,729 |
| 2027 | 0 | 172 | 172 | 10,791 | 8,545 | 19,336 | 19,164 |
| 2028 | 0 | 172 | 172 | 11,039 | 8,742 | 19,780 | 19,608 |
| 2029 | 0 | 172 | 172 | 11,293 | 8,943 | 20,235 | 20,063 |
| 2030 | 0 | 172 | 172 | 11,552 | 9,148 | 20,701 | 20,529 |
| 2031 | 0 | 172 | 172 | 11,818 | 9,359 | 21,177 | 21,005 |
| 2032 | 0 | 172 | 172 | 12,090 | 9,574 | 21,664 | 21,492 |
| 2033 | 0 | 172 | 172 | 12,368 | 9,794 | 22,162 | 21,990 |
| 2034 | 0 | 172 | 172 | 12,653 | 10,019 | 22,672 | 22,500 |
| 2035 | 0 | 172 | 172 | 12,944 | 10,250 | 23,193 | 23,021 |
| 2036 | 0 | 172 | 172 | 13,241 | 10,486 | 23,727 | 23,555 |
| 2037 | 0 | 172 | 172 | 13,546 | 10,727 | 24,273 | 24,101 |
| 2038 | 0 | 172 | 172 | 13,857 | 10,973 | 24,831 | 24,659 |
| 2039 | 0 | 172 | 172 | 14,176 | 11,226 | 25,402 | 25,230 |
| 2040 | 0 | 172 | 172 | 14,502 | 11,484 | 25,986 | 25,814 |
| 2041 | 0 | 172 | 172 | 14,836 | 11,748 | 26,584 | 26,412 |
| 2042 | 0 | 172 | 172 | 15,177 | 12,018 | 27,195 | 27,023 |
| 2043 | 0 | 172 | 172 | 15,526 | 12,295 | 27,821 | 27,649 |
| 2044 | 0 | 172 | 172 | 15,883 | 12,578 | 28,461 | 28,289 |
| 2045 | 0 | 172 | 172 | 16,248 | 12,867 | 29,115 | 28,943 |
| 2046 | 0 | 172 | 172 | 16,622 | 13,163 | 29,785 | 29,613 |

Source: JICA Survey Team

**Table 7.4.37 Cash Flow of Benefit-Cost Analysis for Senayan Road Improvement (Alt. 4)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2015 | 30,779 | 0 | 30,779 | 0 | 0 | 0 | -30,779 |
| 2016 | 51,298 | 0 | 51,298 | 0 | 0 | 0 | -51,298 |
| 2017 | 71,817 | 0 | 71,817 | 0 | 0 | 0 | -71,817 |
| 2018 | 51,298 | 645 | 51,943 | 5,720 | 1,841 | 7,561 | -44,382 |
| 2019 | 0 | 1,290 | 1,290 | 11,703 | 3,767 | 15,470 | 14,180 |
| 2020 | 0 | 1,290 | 1,290 | 11,972 | 3,854 | 15,826 | 14,536 |
| 2021 | 0 | 1,290 | 1,290 | 12,248 | 3,942 | 16,190 | 14,900 |
| 2022 | 0 | 1,290 | 1,290 | 12,530 | 4,033 | 16,563 | 15,273 |
| 2023 | 0 | 1,290 | 1,290 | 12,818 | 4,126 | 16,943 | 15,653 |
| 2024 | 0 | 1,290 | 1,290 | 13,112 | 4,221 | 17,333 | 16,043 |
| 2025 | 0 | 1,290 | 1,290 | 13,414 | 4,318 | 17,732 | 16,442 |
| 2026 | 0 | 1,290 | 1,290 | 13,723 | 4,417 | 18,140 | 16,850 |
| 2027 | 0 | 1,290 | 1,290 | 14,038 | 4,519 | 18,557 | 17,267 |
| 2028 | 0 | 1,290 | 1,290 | 14,361 | 4,623 | 18,984 | 17,694 |
| 2029 | 0 | 1,290 | 1,290 | 14,691 | 4,729 | 19,420 | 18,130 |
| 2030 | 0 | 1,290 | 1,290 | 15,029 | 4,838 | 19,867 | 18,577 |
| 2031 | 0 | 1,290 | 1,290 | 15,375 | 4,949 | 20,324 | 19,034 |
| 2032 | 0 | 1,290 | 1,290 | 15,729 | 5,063 | 20,791 | 19,501 |
| 2033 | 0 | 1,290 | 1,290 | 16,090 | 5,179 | 21,270 | 19,980 |
| 2034 | 0 | 1,290 | 1,290 | 16,460 | 5,298 | 21,759 | 20,469 |
| 2035 | 0 | 1,290 | 1,290 | 16,839 | 5,420 | 22,259 | 20,969 |
| 2036 | 0 | 1,290 | 1,290 | 17,226 | 5,545 | 22,771 | 21,481 |
| 2037 | 0 | 1,290 | 1,290 | 17,623 | 5,672 | 23,295 | 22,005 |
| 2038 | 0 | 1,290 | 1,290 | 18,028 | 5,803 | 23,831 | 22,541 |
| 2039 | 0 | 1,290 | 1,290 | 18,443 | 5,936 | 24,379 | 23,089 |
| 2040 | 0 | 1,290 | 1,290 | 18,867 | 6,073 | 24,939 | 23,649 |
| 2041 | 0 | 1,290 | 1,290 | 19,301 | 6,212 | 25,513 | 24,223 |
| 2042 | 0 | 1,290 | 1,290 | 19,745 | 6,355 | 26,100 | 24,810 |
| 2043 | 0 | 1,290 | 1,290 | 20,199 | 6,502 | 26,700 | 25,410 |
| 2044 | 0 | 1,290 | 1,290 | 20,663 | 6,651 | 27,314 | 26,024 |
| 2045 | 0 | 1,290 | 1,290 | 21,138 | 6,804 | 27,943 | 26,653 |
| 2046 | 0 | 1,290 | 1,290 | 21,625 | 6,961 | 28,585 | 27,295 |
| 2047 | 0 | 1,290 | 1,290 | 22,122 | 7,121 | 29,243 | 27,953 |

Source: JICA Survey Team

**Table 7.4.38 Cash Flow of Benefit-Cost Analysis for Senayan Road Improvement (Alt. 5)**

(unit: million Rp.)

| | Cost | | | Benefit | | | Cash |
|---|---|---|---|---|---|---|---|
| | Construction | O/M | Total | TTS | VOC Saving | Total | Flow |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2015 | 20,519 | 0 | 20,519 | 0 | 0 | 0 | -20,519 |
| 2016 | 34,199 | 0 | 34,199 | 0 | 0 | 0 | -34,199 |
| 2017 | 47,878 | 0 | 47,878 | 0 | 0 | 0 | -47,878 |
| 2018 | 34,199 | 430 | 34,629 | 4,591 | 3,511 | 8,102 | -26,527 |
| 2019 | 0 | 860 | 860 | 9,392 | 7,184 | 16,576 | 15,716 |
| 2020 | 0 | 860 | 860 | 9,608 | 7,349 | 16,957 | 16,097 |
| 2021 | 0 | 860 | 860 | 9,829 | 7,518 | 17,347 | 16,487 |
| 2022 | 0 | 860 | 860 | 10,055 | 7,691 | 17,746 | 16,886 |
| 2023 | 0 | 860 | 860 | 10,287 | 7,868 | 18,155 | 17,295 |
| 2024 | 0 | 860 | 860 | 10,523 | 8,049 | 18,572 | 17,712 |
| 2025 | 0 | 860 | 860 | 10,765 | 8,234 | 18,999 | 18,139 |
| 2026 | 0 | 860 | 860 | 11,013 | 8,424 | 19,436 | 18,576 |
| 2027 | 0 | 860 | 860 | 11,266 | 8,617 | 19,883 | 19,023 |
| 2028 | 0 | 860 | 860 | 11,525 | 8,816 | 20,341 | 19,481 |
| 2029 | 0 | 860 | 860 | 11,790 | 9,018 | 20,809 | 19,949 |
| 2030 | 0 | 860 | 860 | 12,061 | 9,226 | 21,287 | 20,427 |
| 2031 | 0 | 860 | 860 | 12,339 | 9,438 | 21,777 | 20,917 |
| 2032 | 0 | 860 | 860 | 12,623 | 9,655 | 22,278 | 21,418 |
| 2033 | 0 | 860 | 860 | 12,913 | 9,877 | 22,790 | 21,930 |
| 2034 | 0 | 860 | 860 | 13,210 | 10,104 | 23,314 | 22,454 |
| 2035 | 0 | 860 | 860 | 13,514 | 10,337 | 23,850 | 22,990 |
| 2036 | 0 | 860 | 860 | 13,825 | 10,574 | 24,399 | 23,539 |
| 2037 | 0 | 860 | 860 | 14,143 | 10,818 | 24,960 | 24,100 |
| 2038 | 0 | 860 | 860 | 14,468 | 11,066 | 25,534 | 24,674 |
| 2039 | 0 | 860 | 860 | 14,801 | 11,321 | 26,121 | 25,261 |
| 2040 | 0 | 860 | 860 | 15,141 | 11,581 | 26,722 | 25,862 |
| 2041 | 0 | 860 | 860 | 15,489 | 11,848 | 27,337 | 26,477 |
| 2042 | 0 | 860 | 860 | 15,846 | 12,120 | 27,966 | 27,106 |
| 2043 | 0 | 860 | 860 | 16,210 | 12,399 | 28,609 | 27,749 |
| 2044 | 0 | 860 | 860 | 16,583 | 12,684 | 29,267 | 28,407 |
| 2045 | 0 | 860 | 860 | 16,964 | 12,976 | 29,940 | 29,080 |
| 2046 | 0 | 860 | 860 | 17,354 | 13,274 | 30,629 | 29,769 |
| 2047 | 0 | 860 | 860 | 17,754 | 13,580 | 31,333 | 30,473 |

Source: JICA Survey Team

The result of the economic sensitivity analysis presented in Table 7.4.39 indicates that EIRR and the net present value (NPV) are highly dependent on the variations of the expected cost and benefit. Apart from Alternatives 1, 2 and 4 that are not economically viable as mentioned above, only Alternatives 3 and 5 are further analyzed. While Alternative 3 will be economically feasible in all the cases assumed, Alternative 5 may not be economically viable with an increase in the total cost and/or a decrease in the total benefit.

**Table 7.4.39 Sensitivity Analysis of Economic Analysis for Senayan Road Improvement**

[Alternative 3]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 35.1% | 39.4% | 43.6% | 47.8% | 44.0% | 40.8% | 38.1% | 33.6% |
| NPV (billion Rp.) | 64.7 | 77.2 | 89.6 | 102.1 | 99.8 | 97.6 | 95.4 | 72.7 |

[Alternative 5]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cost (original=100) | 100 | 100 | 100 | 100 | 110 | 120 | 130 | 120 |
| Benefit (original=100) | 70 | 80 | 90 | 100 | 100 | 100 | 100 | 80 |
| EIRR | 8.3% | 9.6% | 10.8% | 12.0% | 10.9% | 10.0% | 9.2% | 7.8% |
| NPV (billion Rp.) | -12.2 | -3.0 | 6.2 | 15.4 | 7.8 | 0.1 | -7.5 | -18.3 |

Source: JICA Survey Team

# CHAPTER 8. ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

## 8.1 Environmental Impact Assessment Law and relevant guidelines in Indonesia

### 8.1.1 EIA Legislation

(1) Major Laws and Regulations

Indonesian Laws regarding Environmental Impact Assessment (hereinafter referred to as "AMDAL") have been established in accordance with "Law No.4 of 1986 Concerning Environmental Management" and operated since 1986. Then Government Regulation No.51 of 1993 concerning Environmental Impact Assessment was established and revised in 1999. Furthermore AMDAL is defined as a measure for the environmental protection and management in "Law No.32 of 2009 regarding Environmental Protection and Management". Relevant major laws are shown in the table below.

**Table 8.1.1 Major Laws and Regulations regarding AMDAL**

| Category of Law/ Regulation | Name of Law / Contents |
|---|---|
| Law | Law No. 23 of 1997 Environmental Management (Requirements of AMDAL) |
| | Law No.32 of 2009 regarding Environmental Protection and Management (AMDAL is clarified as one of the measures for environmental protection and management) |
| Decree of State Ministry for the Environment | No.40 of 2000 (Guidelines for Work System of the Evaluator Committee) |
| | No.41 of 2000 (Establishment of Regencial/Municipal Evaluator Committee) |
| | No.42 of 2000 (Establishment of Central Government Evaluator Committee) |
| | No.17 of 2001 (Types of Business and/or Activity Plans that are Required to be Completed with the AMDAL) |
| | No.30 of 2001 (Environmental Audit) |
| | No.11 of 2006 (Types of Business and/or Activity Plans that are Required to be Completed with the AMDAL) |
| Decree of Head of Environment Impact Management Agency | No.12 of 1994 (Guidelines for Environmental Management and Monitoring Process) |
| | No.299 of 1996 (Technical Guidelines for social impacts) |
| | No.105 of 1997 (Guidelines for Environmental Management and Monitoring) |
| | No.2 of 2000 (Guidelines for AMDAL Document Evaluation) |
| | No.8 of 2000 (Community Involvement and Information Openness) |
| | No.9 of 2000 (Guidelines for Preparation of Environment Impacts Assessment) |
| | No.8 of 2006 (Guidelines for Analysis of Environment Impacts Assessment) |
| Local Government | No. 2863 of 2001:(Types of Business and/or Activity Plans that Require an AMDAL), DKI |

Source : Indonesian environmental laws and relevant regulations

Mandatory list of a full EIA (AMDAL) is presented below.

According to the table, construction of a flyover or underpass which is more than 2km in length or requires more than 5ha land acquisition shall complete the AMDAL process in accordance with the decree.

However the criteria for AMDAL varies with different local governments, for instance, 750m is the criteria for flyovers and underpasses in the regulations of DKI. Therefore, the criteria for AMDAL should be confirmed after project selection.

**Table 8.1.2 Mandatory List for AMDAL (Flyover, Underpass and Road improvement)**

| | | |
|---|---|---|
| Regional Infrastructure | a. Toll Road Construction<br>b. **Flyover Road & Underpass Construction** | All scales<br>**≧2km**<br>**(DKI: 750m)*1** |
| | **Construction of Bridge** | **≧500m** |
| | Construction and/or improvement of road with widening to outside of the area belonging to the road<br>**a. Big city/ metropolitan**<br>- Length<br>**- Or extent of areas**<br>b. Medium City<br>- Length<br>- Or extent of area<br>c. Rural<br>- Length | <br><br><br>**≧5km (4km*1)**<br>**≧5ha(2.5ha*1)**<br><br>≧10km<br>≧10ha<br><br>≧30km |

Source: Decree of State Minister for the Environment No.17/2001 on Types of Business and/or Activity Plans that require an Environmental Impact Assessment
Decree of State Ministry for the Environment No.11 of 2006 on Types of Business and/or Activity Plans that Require an Environmental Impact Assessment
*1: Environmental Regulation of DKI (No. 2863 of 2001: Types of Business and/or Activity Plans that Require an AMDAL)

(2) AMDAL Process

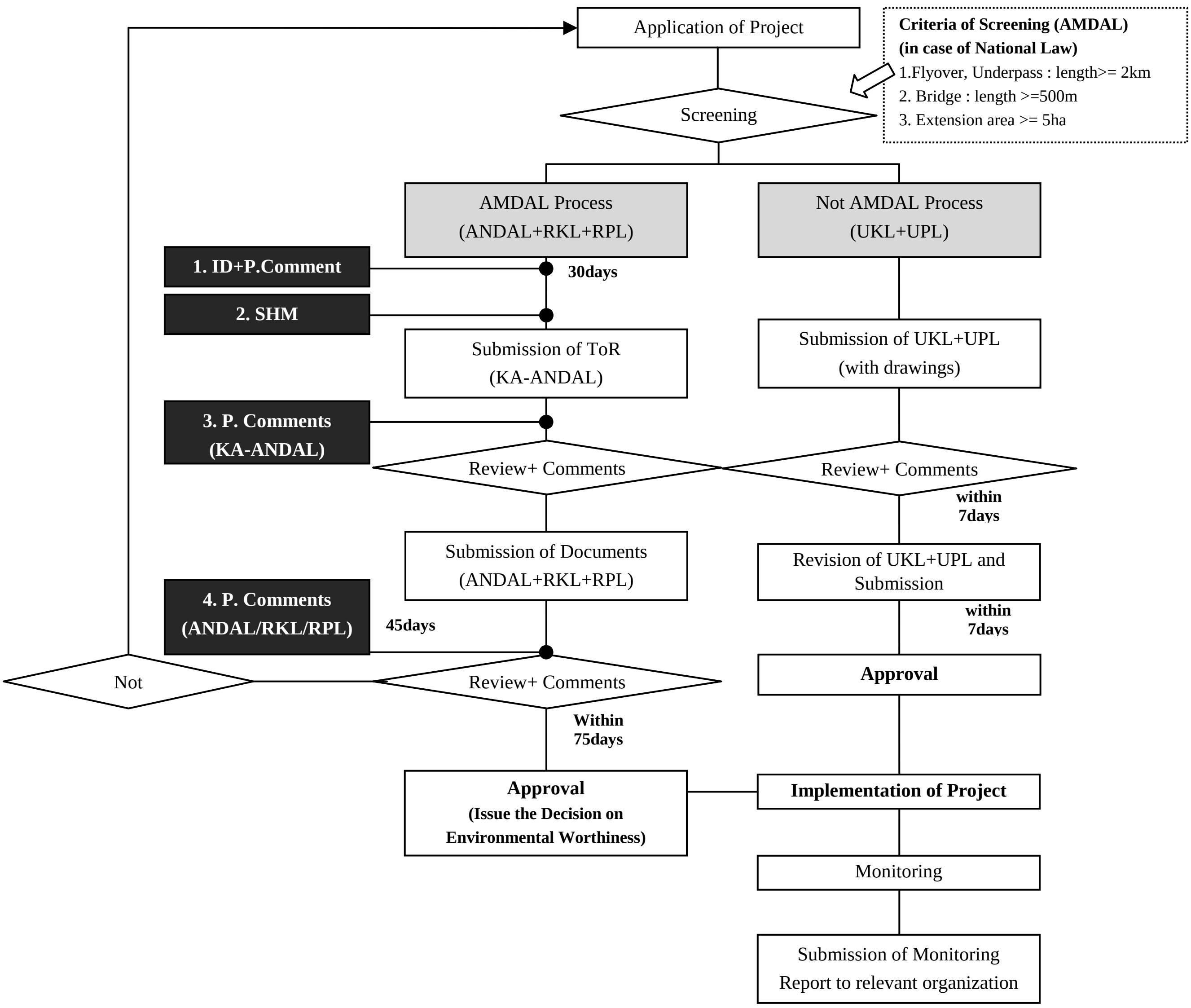
A proponent shall submit a proposal which explains the project outline and forecast impacts such as land acquisition to the Governmental Environmental Authority. The environmental authorized organization will conduct screening in accordance with the mandatory list for AMDAL. In the case of an AMDAL, the proponent shall submit a ToR for EIA (KA-ANDAL) to the AMDAL Committee, and then it will be reviewed and approved. The proponent shall prepare and submit an Environmental and Social Impacts Assessment Report (ANDAL), Environmental Management Plan (RKL), Environmental Monitoring Plan (RPL) and Summary Report. The AMDAL Committee reviews and approves them within 75 days unless significant adverse impacts are predicted.

(3) UKL and UPL Process

The series of UKL and UPL processes are as follows;

- The proponent conducts draft screening based on the relevant laws and submits an application form and project outline to the authorized environmental agency (hereinafter referred to as "The EAA") in City, District or DKI.
- The EAA conducts formal screening based on the documents which were submitted from the proponent and notifies the proponent of the results
- The proponent prepares a draft UKL&UPL report and submits it to the EAA
- The EAA and the evaluation committee reviews the draft UKL&UPL report and makes comments within 7 days
- The proponent finalizes the report in accordance with the comments from the EAA and submits it to the EAA again within 7 days
- The EAA reviews the final report and issues an environmental license

According to interviews with the EAA in Medan and DKI, the duration of the process for UKL/UPL is approximately 2 to 3 months, and 5 to 7 months for an AMDAL.




Source: No.8 of 2000 (Decree of Head of Environmental Impact Management Agency Community Involvement and Information Openness)

1. ID+Public Comments: The proponent shall announce the project outline and schedule through media (newspaper, radio, proponent's and prescribed office and public board prescribed by proponent). The stakeholders (public) have the right to advice, response and send opinions regarding announced business and project for 30days after the announcement
2. SHM: The proponent shall announce a public consultation through media (newspaper, radio, proponent's and prescribed office and public board prescribed by proponent), and hold it. The proponent shall explain project outline, schedule, forecast impacts and items to be surveyed and analyzed.
3. Public Comment: Public comments regarding draft KA-ANDAL shall be submitted to the environmental authorized committee 3 days before the reviewing by the AMDAL Committee
4. Public Comments: Public Comments regarding draft ANDAL/RKL/RPL shall be submitted to the Governmental Environmental Authority within 45 days after receiving draft ANDAL/RKL/RPL

**Figure 8.1.1 Law-Based EIA Approval Procedures**

(4) Gaps with JICA Guidelines for Environmental and Social Considerations (April 2010)

When comparing the content of JICA Guidelines for Environmental and Social Considerations (April 2010) (hereinafter referred to as "JICA's guidelines") and the requirements of Indonesian relevant laws, no significant differences have been identified. However items in the JICA Guidelines are detailed

A full comparison is provided below in the next table:

**Table 8.1.3 Indonesia's and JICA's Guidelines -A Comparison of Requirements-**

| Scope of Impacts for Evaluation in Environmental Assessments | | |
|---|---|---|
| Item | JICA Guidelines | Indonesia |
| Potential | Direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project | Direct/indirect, magnitude and time frame |
| Affected Area | Environmental impacts on a trans-boundary or global scale, e.g. global warming | Project-related impacts |
| Target Items | [Social Environment]<br>Involuntary resettlement, Local economy, employment and livelihood, Land use and local resources utilization, Existing social infrastructures and services, Local communities, Benefit and damage misdistribution, Gender, Children's rights, Cultural heritage, Local conflicts of interests, Public sanitation, Infectious diseases such as HIV/AIDS, Water usage and rights, Traffic accidents | Social<br>(Demographics, Economics, Culture and land acquisition)<br><br>Physical Chemistry<br>(Land use)<br><br>Public Health |
| | [Natural Environment]<br>Global warming, Biota and ecosystems, Geographical features, Soil erosion, Underground water, Hydrological situation, Coastal zone (mangroves, coral reefs, tidal flats, etc.), Climate, Landscape | Biology<br>(Fauna and, Flora)<br><br>Physical Chemistry<br>(Geographical features, Hydrological situation |
| | [Pollution]<br>Air pollution, Water pollution, Soil contamination, Waste, Noise and vibration, Ground subsidence, Offensive odours, Bottom sediment in sea and rivers | Physical Chemistry<br>(air, water, noise and vibration) |

Source: JICA Guidelines for Environmental and Social Considerations （April 2010）
No.9 of 2000 (Decree of Head of Environment Impact Management Agency / Guidelines for Preparation of Environment Impacts Assessment)

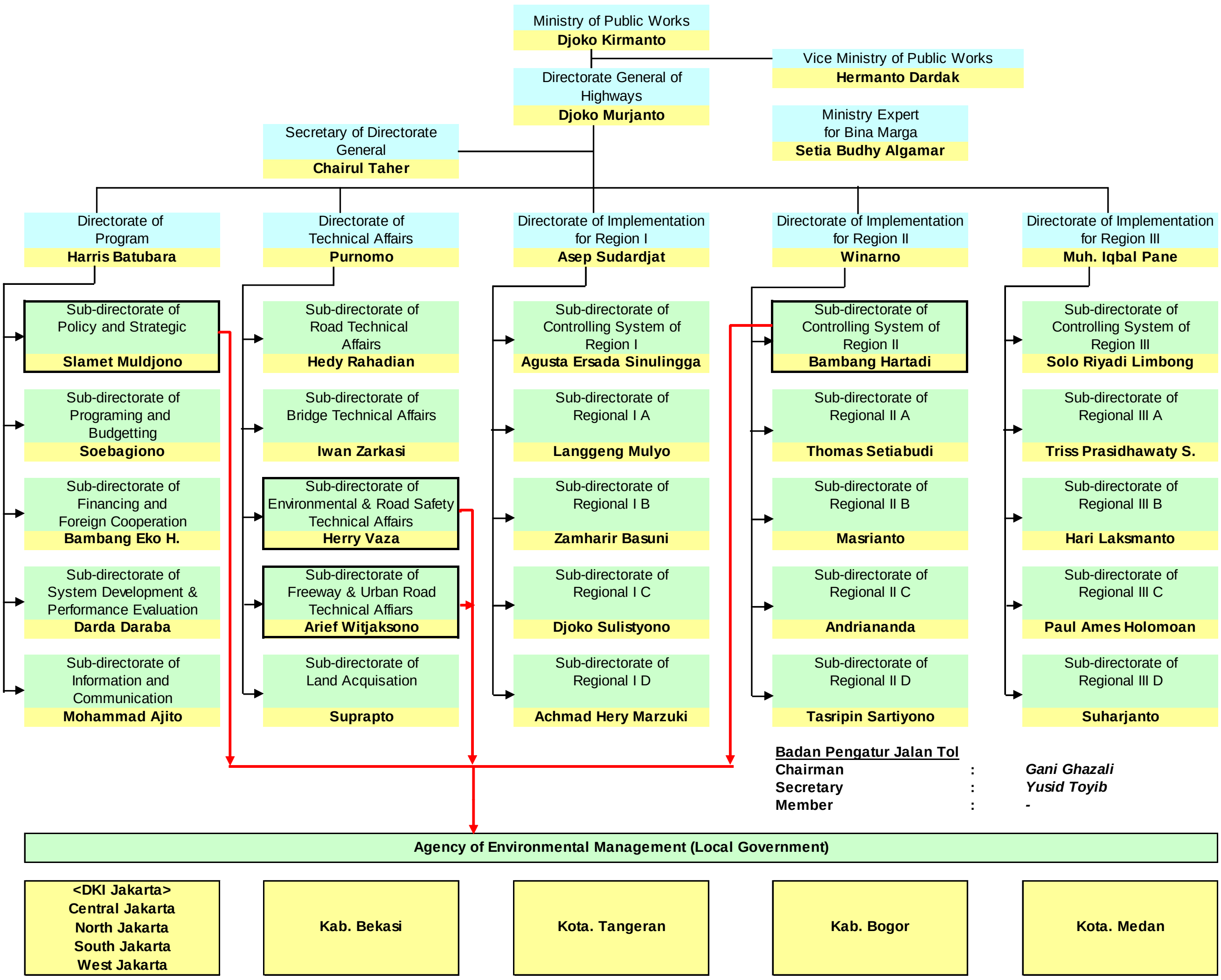
### 8.1.2 Governmental Environmental Authority

In Indonesia, the Governmental Environmental Authority varies according to character of the project, scale and location. With regard to the target sub projects, since each project site is located in single local government, the governmental environmental authority is in the District (Kabupaten), City (Kota) and DKI respectively. The environmental committee will be setup in Central, West, South and North Jakarta City, Bogor regency, Bekasi regency, Tangerang City and Medan City respectively.

**Table 8.1.4 Environmental Authorized Government Agency by Project Type**

| Name of Committee | Project Type / Character | Environmental Authorized Agency |
|---|---|---|
| (a) Central AMDAL Committee | ✓ Strategic project regarding National defence and security<br>✓ Specific project<br>✓ Project which is located in more than two provinces<br>✓ Project which is located in conflict area with another country<br>✓ Project which is located in a marine area (22.2kms range from shoreline) | Minister of Environment |
| (b) Province AMDAL Committee | ✓ Project which has significant environmental impacts to inhabitants over a wide range<br>✓ Project which is located in more than two districts or cities<br>✓ Project which has conditions with the exception of (a) | Provincial Governor |
| (c) District / City AMDAL Committee | ✓ Project which has conditions with the exception of (a) and (b) | District Governor / Mayor / Metropolitan Governor |

Source: Decree of State Ministry for the Environment No. 40 and 41 of 2000 on Establishment of Municipal Evaluator Committee for Environmental Impact Assessment




Source: Ministry of Public Works (as of February, 2011 )

**Figure 8.1.2 Organization Chart regarding Environmental Activities**

# 8.2 Initial Environmental Evaluation for Screening of 10 Projects

## 8.2.1 Expected Facility and Screening based on the Law

The project components are construction of flyovers and underpasses at congested intersections, and improvement of roads.

The candidate sites, project outline and draft screening results are shown below.

**Table 8.2.1 Project Outline and Draft Screening**

| Candidate and Location | | Project Outline | | |
|---|---|---|---|---|
| Location | Governmental Environmental Authority | Facility* | Target Structure Length (app.m) | Adjacent infrastructure |
| 1. Semanggi | Central Jakarta City | Road Imp. | 217m | Toll road |
| 2. Margonda Cinere | South Jakarta City | UP | 730m | - |
| 3. Cililitan | Central Jakarta City | UP | 430m | - |
| 4. R.E.Martadinata (TJ Priuk) | North Jakarta City | FO | 725m | - |
| 5. Sulawesi- Tg.PA | North Jakarta City | FO | 318m | - |
| 6. Latumenten | West Jakarta City | FO | 500m | Toll road |
| 7. Sudirman-Daan Mogot | Tangerang City | FO | 550m | - |
| 8. Kuningan | Central Jakarta City | UP | 1,018m | Toll road |
| 9. Pancoran | South Jakarta City | FO | 634m | Toll road |
| 10. Cilandak | South Jakarta City | UP | 370m | Toll road |
| 11. Fatmawati | South Jakarta City | FO | 450m | Toll road |
| 12. Ciawi-Bogor | Bogor Regency | FO | 540m | - |
| 13. Pinang Baris | Medan City | FO | 533m | - |
| 14. Asrama-Gatot Subroto | Medan City | FO | 530m | - |
| 15. Katamso | Medan City | UP | 360m | - |
| 16. Sudirman II | Tangerang City | FO | 570m | - |
| 17. Cikarang | Bekasi Regency | FO<br>Bridge<br>Road | Road imp.(without widening)<br>app. 2km<br>(FO: 71m and 190m, Bridge: 50m/ Total 311m) | Toll road |
| 18. Senayan | South Jakarta City | At-grade, FO/UP | Design is not fixed at the moment (L<750m) | - |

Source: JICA Survey Team
* FO: Flyover, UP: Underpass

## 8.2.2 Major Environmental and Social Issues at each Candidate Site

Some environmental and social key issues are picked up through initial environmental examinations at each site. Since most candidate sites are located along urbanized area with residential and commercial areas, land acquisition is the most considerable issue from the view of social impacts. Furthermore, public infrastructure such as schools, hospitals and mosques should be considered.

The results of environmental and social evaluations for project screening are shown below.

**Table 8.2.2 Evaluated Index for Project Screening**

| Indicator | | Description |
|---|---|---|
| Social Env. | a) Resettlement | Number of affected structures as shown on satellite images based on the provisional design. |
| | b) Affected Public infrastructure | Affected schools, hospitals, markets and other public facilities |
| | c) Affected Religious facilities | Affected mosques and churches |
| Natural Env. | d) Affected planted area(app.(ha)) | Affected vegetated area as shown on satellite images |
| | e) Impacts regarding Landscape | Magnitude of impacts<br>Significant: Flyover unadjacent to another elevated road or facility<br>Low: Flyover adjacent to an another elevated road<br>Low: Underpass |
| | f) Impact regarding Air Quality, Noise and vibration | Magnitude of impact<br>Positive: decrease of traffic volume, extension of decay distance (noise and vibration) or diffusion distance (air) and increase of traffic speed<br>Negative: increase of traffic volume, shortening of decay distance (noise and vibration) or diffusion distance (air) and decrease of traffic speed |

Source: JICA Survey Team

Quantitative analysis and evaluation was given on resettlement such as affected structures, hospitals and mosques and affected vegetated area through initial environmental examination.

Although other items such as landscape may be affected by the project, it has difficulty to analyze quantitatively since the impact of landscape is sensory. Furthermore, construction of flyover unadjacent to another elevated road may give significant impact on common landscape, however there are not any considerable aesthetic landscape such as natural and cultural heritage in the project area.

Thus the number of affected structures is selected as a major indicator for selection of sub project from 18 candidates.

## Table 8.2.3 Preliminary Environmental and Social Evaluation

| Evaluated Item / Candidate and Environmental Authority | | Social Env. Impact | | | Natural Env. Impact | | Pollution |
|---|---|---|---|---|---|---|---|
| | | **a) Resettlement** *Provisional affected structures and area (as of March 2011) | **b) Affected Public infra.** | **c) Affected Religious facility** | **d) Affected planted area (app.(ha))** | **e) Impact regarding Landscape** | **f) Impact regarding Air Quality Noise, Vib.** |
| 1. Semanggi | Central Jakarta City | 0 | 0 | 0 | 3ha | Low | Positive |
| 2. Margonda Cinere | South Jakarta City | 100 With squatters | 0 | 0 | Negligible | Significant | Positive |
| 3. Cililitan | Central Jakarta City | 50 | 1 Market (compound) | 1 Mosque (compound) | 0.2ha | Significant | Positive |
| 4. R.E.Martadinata (TJ Priuk) | North Jakarta City | 10 (40 fixed stall) | 1 Bus St. | 0 | 0.2ha | Significant | Positive |
| 5. Sulawesi- Tg.PA | North Jakarta City | 50 | 0 | 0 | 0.8ha | Significant | Positive |
| 6. Latumenten | West Jakarta City | 30 | 1 Hospital (compound) | 1 Mosque (compound) | Negligible | Low | Positive |
| 7. Sudirman-Daan Mogot | Tangerang City | 70 | 2 Schools (compound) | 0 | 0.4ha | Significant | Positive |
| 8. Kuningan | Central Jakarta City | 10 | 0 | 0 | 0.3ha | Low | Positive |
| 9. Pancoran | South Jakarta City | 0 | 0 | 0 | 0.4ha | Low | Positive |
| 10. Cilandak | South Jakarta City | 10 | 0 | 0 | 1.2ha | | Positive |
| 11. Fatmawati | South Jakarta City | 10 | 0 | 0 | 0.3ha | | Positive |
| 12. Ciawi-Bogor | Bogor Regency | 70 | 0 | 0 | Negligible | Significant | Positive |
| 13. Pinang Baris | Medan City | 80 | 0 | 0 | 0 | Significant | Positive |
| 14. Asrama-Gatot Subroto | Medan City | 80 | 0 | 0 | 1.2ha | Significant | Positive |
| 15. Katamso | Medan City | 50 | 0 | 0 | Negligible | Significant | Positive |
| 16. Sudirman II | Tangerang City | 10 | 1 Market (compound) | 0 | 0.7ha | Significant | Positive |
| 17. Cikarang | Bekasi Regency | Main Road and Bridge 10 | 0 | 0 | Negligible | Low | Negative |
| | | Connection Road Sub Total : 10 — 1: 0 | 0 | 0 | Negligible | Low | Negative |
| | | 2: 10 | 0 | 0 | Negligible | Low | Negative |
| | | 3: 0 | 0 | 0 | Negligible | Low | Negative |
| | | Flyover: 0 | 0 | 0 | Negligible | Low | Negative |
| | | Total : 20 | 0 | 0 | Negligible | Low | Negative |
| 18. Senayan | South Jakarta City | 10 | 1 (compound) | 0 | Negligible | Significant | Positive |

Note-1: Significant: The target flyover unadjacent to another elevated road or facility, Low: The target flyover adjacent to an another elevated road or target structure is underpass

Note-2: Positive: decrease of traffic volume, extension of decay distance (noise and vibration) or diffusion distance (air) and increase of traffic speed, Negative: increase of traffic volume, shortening of decay distance (noise and vibration) or diffusion distance (air) and decrease of traffic speed

Source: JICA Survey Team

## 8.3 Screening and Scoping for Environmental and Social Considerations

### 8.3.1 Project Outline and Screening based on the Law

The project components are construction of flyovers and underpasses at congested intersections, and improvement of roads.

The selected 10 Sub-projects in the 1st stage and their project outline and draft screening results are shown below.

**Table 8.3.1 Project Outline and Draft Screening**

| Candidate and Location | | Project Outline | | | Draft Screening in accordance with Indonesian law *1 | AMDAL or UKL/UPL Approval |
|---|---|---|---|---|---|---|
| Location | Governmental Environmental Authority | Facility | Target Structure Length (app.km) | Adjacent infrastructure | | |
| 1. Semanggi | Central Jakarta City | Road Imp. | 217m | Toll road | UKL+UPL | - |
| 2. R.E.Martadinata (TJ Priuk) | North Jakarta City | FO | 725 m | - | UKL+UPL | - |
| 3. Sulawesi- Tg.PA | North Jakarta City | FO | 318 m | - | UKL+UPL | Approved (included in TgPA AMDAL)*3 |
| 4. Kuningan | Central Jakarta City | UP | 1,018 m | Toll road | AMDAL | - |
| 5. Pancoran | South Jakarta City | FO | 634 m | Toll road | UKL+UPL | - |
| 6. Pinang Baris | Medan City | FO | 533 m | - | UKL+UPL | Expired*4 |
| 7. Katamso | Medan City | UP | 360 m | - | UKL+UPL | - |
| 8. Sudirman II | Tangerang City | FO | 570 m | - | UKL+UPL | - |
| 9. Cikarang | Bekasi Regency | Road imp. FO Bridge | Road imp.(without widening) app. 2km (FO: 71m and 190m, Bridge: 50m/ Total 311m) | Toll road | UKL+UPL | - |
| 10. Senayan | South Jakarta City | At-grade, FO/UP | Unspecified due to under discussion (L<750m) | - | Expected UKL+UPL | - |

Source: JICA Survey Team

Note ) *1: Refer to Table 8.1.2 Mandatory List for AMDAL (Flyover, Underpass and Road improvement)

*2 : The criteria of AMDAL in DKI is 750m of length for flyovers and underpasses (No. 2863 of 2001: Types of Business and/or Activity Plans that Require an AMDAL, DKI)

*3 : Kuningan under pass is one of facilities in the Tanjung Priok Access Road Project, AMDAL approval of the project had been issued in December 2004 and the project is under construction

*4 : UKL/UPL approval for Pinan Baris had been issued in December 2008, however 3 years validity period after approval without construction activities is expired

All target facilities are required to prepare UKL&UPL except No.8 Kuningan in accordance with relevant regulations at the moment.

Thus implementation of UKL/UPL on the 6 sub-projects and AMDAL on the one sub-project is required.

### 8.3.2 Analysis of Alternatives

1) With Project

The population of JABODETABEK increased l.4 times over the past 15 years, from approximately 1.7 million in 1990 to 2.4 million in 2005. 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 alleviating traffic congestion have been conducted such as the construction of Jakarta Outer Ring Road, enhancement of road capacity, and a traffic demand management policy, however, traffic congestion in JABODETABEK is still a serious issue and causes significant economic loss on Java island through the deterioration of the investment environment or the delay of access to the port, airport and railway.

Therefore to solve the heavy congestion and secure smooth traffic flow at the bottleneck intersections and roads is required.

Generally alternatives to meet such objective are flyovers and underpasses.

An adequate facility is to be adopted in consideration of constraints such as construction space, social and/or natural impacts, ease of construction and costs.

Major indicators for selection of facility type are shown below:

**Table 8.3.2 Project Outline and Draft Screening**

| Indicator | | | Alternatives and negative impacts | |
|---|---|---|---|---|
| | | | Flyover | Underpass |
| Social | a) | Resettlement | Significant | Low |
| | b) | Affected Public infrastructure | Significant | Low |
| | c) | Affected Religious facility | Significant | Low |
| Natural | d) | Affected planted area (app.(ha)) | Significant | Low |
| | e) | Impact regarding Landscape | Significant | Low |
| | f) | Impact regarding Air Quality, Noise and vibration | Positive impact | Significant positive impact |
| Cost | g) | Construction Cost | High | Low |
| | h) | Maintenance Cost | Low | High |
| | i) | Workability of Construction | Advantage | Disadvantage |

Source: JICA Survey Team

2) Without Project

The ‘without project scenario’ will cause heavy congestion, as a result, social losses such as traffic accidents, environmental deterioration and increase of travelling time will be accelerated.

### 8.3.3 Scoping for full scale EIA based on JICA Guidelines

Items for scoping were picked from the JICA guidelines because items which are indicated in JICA Guidelines are detailed and no significant gaps exist between Indonesian and JICA Guidelines.

Affected activities, items and their degree of adverse impacts are shown in the scoping matrix. Ratings were carried out through the initial environmental survey by the Survey Team.

The Survey Team recommended that items which were rated as A, B and C should be analyzed in the environmental activities such as ANDAL/RKL/RPL and UKL/UPL.

Scoping matrix and rating reasons are shown in the next tables.

**Table 8.3.3 Scoping Matrix (No1 Semanggi: FO)**

| | | Affected Activities | | Planning Phase | | Construction Phase | | | | | | | Post Construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Impact Items | Overall Rating | Land acquisition and Loss of properties | Change of Land use plan, Control of various activities by regulations for the construction | Reclamation of Wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of Construction Equipment and Vehicles | Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Traffic Restriction in construction area | Influx of construction workers, construction of base camp | Increase of Through Traffic | Appearance/ Occupancy of Roads and related building structures | Increasing influx of settlers |
| Social Environment | 1 | Resettlement | | | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | | | | | | | | | | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | | | | | | | | | | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | | | | | | | | | | | | | |
| | 7 | Misdistribution of benefits and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | | | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | | | | | | | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | | | | | | | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | B | | | | B | | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | | | | | | | | | | | | | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | | | | | | | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impacts are not expected, but survey and analysis shall be done) No Mark: Few impacts are expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

## Table 8.3.4 Rating Reasons (No1 Semanggi: FO)

| | No | Likely Impacts | **Predicted Impacts and its reason** | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Resettlement is not caused due to no residential area in the construction area | |
| | 2 | Local economy such as employment and livelihood, etc. | This project does not have negative impacts on this item basically | |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | Although lines such as gas, water, power and other cables area running underground along the road, such facilities will be replaced in an appropriate way.<br>There are no considerable facilities such as school, religious places or hospitals in the project area. Thus this project does not have negative impacts on this item basically. | |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | This project does not have negative impacts on this item basically | |
| | 7 | Misdistribution of benefits and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | There are no monuments, graveyards or sacred places in the project area. | |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item due to no resettlement | |
| | 10 | Water Usage or Water Rights and Rights of Common | See " 5. Existing social infrastructures and services" | |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | This project does not have negative impacts on this item because earthwork is limited | |
| | 16 | Hydrological Situation | There are not any rivers in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | Green zone in the space of loop ramp may be cut down by the project | B |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | This project does not have negative impacts on this item basically due to road improvement | |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersections. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may give positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | This project does not have significant negative impacts on this item because earthwork is limited in case of flyover | |
| | 25 | Waste | Waste concrete, soil and cut trees may be generated by clearance work. | B |
| | 26 | Noise and Vibration | During construction, noise from construction area and operation of construction machine will be generated.<br>The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Rating: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown (serious impacts are not expected, but survey and analysis shall be done) No Mark: Few impacts are expected. Detailed quantitative survey is not necessary.

Source: JICA Survey Team

## Table 8.3.5 Scoping Matrix (No2 R.E.Martadinata: FO)

| | No | Affected Activities / Impact Items | Overall Rating | Planning Phase | | Construction Phase | | | | | | | Post Construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and Loss of properties | Change of Land use plan, Control of various activities by regulations for the construction | Reclamation of Wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of Construction Equipment and Vehicles | Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Traffic Restriction in construction area | Influx of construction workers, construction of base camp | Increase of Through Traffic | Appearance/ Occupancy of Roads and related building structures | Increasing influx of settlers |
| Social Environment | 1 | Resettlement | B | B | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | A | B | | | | | | | A | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | B | B | | | | | | | B | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | C | C | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | | | | | | | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | B | | | | B | | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | B | | | | | | | | | | | B | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | | | | | | | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Source: JICA Survey Team

**Table 8.3.6 Rating Reasons (No2 R.E.Martadinata: FO)**

| | No | Likely Impacts | Predicted Impacts and its reason | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: **3 (provisional number)** Major Type of houses: one-storied structures (restaurants & residences) | B |
| | 2 | Local economy such as employment and livelihood, etc. | This project has a certain impact on movable stalls, shops and restaurants along the target road | A |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | Railway and bus station is observed in the affected area. Any other considerable facility such as school and hospital should be identified through interview survey. | B |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | Although no slum or other minority group is observed in reconnaissance, this information should be collected through interview survey | C |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this | |
| | 10 | Water Usage or Water Rights and Rights of Common | Although no water usage in the river or wells is observed in reconnaissance, these location should be identified through interview survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | This project does not have negative impacts on this item because earthwork is limited | |
| | 16 | Hydrological Situation | There are no rivers in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | A small garden in the bus station and street trees along the road may be removed | B |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | Planned flyover will be constructed approximately 10ms above the current road. Thus the project has a certain impact on this item. | B |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | This project does not have significant negative impacts on this item because earthwork is limited in case of flyover | |
| | 25 | Waste | Waste concrete, soil and cut trees may be generated by clearance work. | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated. The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

**Table 8.3.7 Scoping Matrix (No3 Sulawesi- Tg.PA: FO)**

| | No | Affected Activities / Impact Items | Overall Rating | Planning Phase: Land acquisition and Loss of properties | Planning Phase: Change of Land use plan, Control of various activities by regulations for the construction | Construction Phase: Reclamation of Wetland, etc. | Construction Phase: Deforestation | Construction Phase: Alteration to ground by cut land, filling, drilling, tunnel, etc. | Construction Phase: Operation of Construction Equipment and Vehicles | Construction Phase: Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Construction Phase: Traffic Restriction in construction area | Construction Phase: Influx of construction workers, construction of base camp | Post Construction: Increase of Through Traffic | Post Construction: Appearance/ Occupancy of Roads and related building structures | Post Construction: Increasing influx of settlers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Social Environment | 1 | Resettlement | A | A | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | A | A | | | | | | | A | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | C | C | | | | | | | C | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | C | C | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | | | | | | | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | B | | | | B | | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | B | | | | | | | | | | | B | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | | | | | | | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Source: JICA Survey Team

## Table 8.3.8 Rating Reasons (No3 Sulawesi- Tg.PA: FO)

| | No | Likely Impacts | Site Check Item | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: **43 (provisional number)**<br>Major Type of houses: one-storied structures (restaurants & residences) | A |
| | 2 | Local economy such as employment and livelihood, etc. | This project has a certain impact on movable stalls, shops, restaurants and hotel along the target road | A |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | Although no considerable facility such as a school, hospital or mosque is observed, these facilities should be identified through interview survey. | C |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | Although no slum or other minority group is observed in reconnaissance, this information should be collected through interview survey | C |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item | |
| | 10 | Water Usage or Water Rights and Rights of Common | Although no water usage in the river and wells is observed in reconnaissance, these locations should be identified through interview survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | This project does not have negative impacts on this item because earthwork is limited | |
| | 16 | Hydrological Situation | Although a canal is running from west to east, the project does not have negative impacts on the river | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | Some street trees along the road may be removed by widening of the road | B |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | Planned flyover will be constructed approximately 10ms above the current road. Thus the project has a certain impact on this item. | B |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | This project does not have significant negative impacts on this item because earthwork is limited in case of the flyover | |
| | 25 | Waste | Waste concrete, soil and cut trees may be generated by clearance work. | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated.<br>The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

## Table 8.3.9 Scoping Matrix (No4 Kuningan: UP)

| | | Affected Activities | | Planning Phase | | Construction Phase | | | | | | | Post Construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Impact Items | Overall Rating | Land acquisition and Loss of properties | Change of Land use plan, Control of various activities by regulations for the construction | Reclamation of Wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of Construction Equipment and Vehicles | Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Traffic Restriction in construction area | Influx of construction workers, construction of base camp | Increase of Through Traffic | Appearance/ Occupancy of Roads and related building structures | Increasing influx of settlers |
| Social Environment | 1 | Resettlement | B | B | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | | | | | | | | | | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | | | | | | | | | | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | | | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | C | | | | | C | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | B | | | | B | | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | B | | | | | | | | | | | B | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | C | | | | | C | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Source: JICA Survey Team

## Table 8.3.10 Rating Reasons (No4 Kuningan: UP)

| | No | Likely Impacts | Site Check Item | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: **5 (provisional number)**<br>Major Type of buildings: one or two story offices | B |
| | 2 | Local economy such as employment and livelihood, etc. | This project does not have negative impacts on this item basically because most of the affected area is the compound of a private company such as vegetated area | |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | Although no considerable facility such as a school, hospital or mosque is observed in reconnaissance, these facilities should be identified through interview survey. | |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | No slum or other minority group is observed in reconnaissance, thus it is not likely to have a negative impact on this item | |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item | |
| | 10 | Water Usage or Water Rights and Rights of Common | Although no wells are observed in reconnaissance, these locations should be identified through interview survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | Project activities such as excavation may affect existing underground water level, thus used wells should be identified through interview survey | C |
| | 16 | Hydrological Situation | There is no river in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | Vegetated buffer with pathway along the road may be removed by widening of the road | B |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | Planned flyover will be constructed at the same level of current toll road, thus the project does not give significant impact on this item | B |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | Excavated soil in the earthwork may be polluted by hazardous matter, thus history of land use shall be verified through interview survey | C |
| | 25 | Waste | Waste concrete, soil and cut trees may be generated by clearance work. | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated.<br>The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

## Table 8.3.11 Scoping Matrix (No5 Pancoran: FO)

| | No | Impact Items / Affected Activities | Overall Rating | Planning Phase: Land acquisition and Loss of properties | Planning Phase: Change of Land use plan, Control of various activities by regulations for the construction | Construction Phase: Reclamation of Wetland, etc. | Construction Phase: Deforestation | Construction Phase: Alteration to ground by cut land, filling, drilling, tunnel, etc. | Construction Phase: Operation of Construction Equipment and Vehicles | Construction Phase: Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Construction Phase: Traffic Restriction in construction area | Construction Phase: Influx of construction workers, construction of base camp | Post Construction: Increase of Through Traffic | Post Construction: Appearance/ Occupancy of Roads and related building structures | Post Construction: Increasing influx of settlers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Social Environment | 1 | Resettlement | | | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | | | | | | | | | | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | | | | | | | | | | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | | | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | | | | | | | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | B | | | | | B | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | B | | | | | | | | | | | B | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | | | | | | | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odor | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | B | | B |

Source: JICA Survey Team

## Table 8.3.12 Rating Reason (No5 Pancoran: FO)

| | No | Likely Impacts | Site Check Item | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: **0(provisional number)**<br>Major Type of houses: - (compound of private company and GOI) | |
| | 2 | Local economy such as employment and livelihood, etc. | This project does not gives negative impacts on this item basically because most affected area is compound of a private company and GOI | |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | Any considerable facility such as school, hospital and mosque is not observed in reconnaissance, thus it is not likely to give negative impact on this item | |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | No slum or other minority group is observed in reconnaissance, thus it is not likely to have a negative impact on this item | |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item | |
| | 10 | Water Usage or Water Rights and Rights of Common | Although no wells are observed in reconnaissance, these locations should be identified through interview survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | This project does not have negative impacts on this item because earthwork is limited | |
| | 16 | Hydrological Situation | There is no river in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | Vegetated buffer with pathway along the road may be removed by widening of the road | B |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | Planned flyover will be constructed approximately 10ms above the current road. Thus the project has a certain impact on this item. | B |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | This project does not have significant negative impacts on this item because earthwork is limited in case of the flyover | |
| | 25 | Waste | Waste concrete, soil and cut trees may be generated by clearance work. | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated.<br>The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odor | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (inclusive traffic accident) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

## Table 8.3.13 Scoping Matrix (No6 Pinang Baris : FO)

| | | Affected Activities | | Planning Phase | | Construction Phase | | | | | | | Post Construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No | Impact Items | Overall Rating | Land acquisition and Loss of properties | Change of Land use plan, Control of various activities by regulations for the construction | Reclamation of Wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of Construction Equipment and Vehicles | Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Traffic Restriction in construction area | Influx of construction workers, construction of base camp | Increase of Through Traffic | Appearance/ Occupancy of Roads and related building structures | Increasing influx of settlers |
| Social Environment | 1 | Resettlement | A | A | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | A | A | | | | | | | A | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | C | C | | | | | | | | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | C | C | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | | | | | | | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | | | | | | | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | A | | | | | | | | | | | A | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | | | | | | | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Source: JICA Survey Team

## Table 8.3.14 Rating Reasons (No6 Pinang Baris: FO)

| | No | Likely Impacts | Site Check Item | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: **80 (provisional number)** Major Type of houses: two or three story structures (shops & residences) | A |
| | 2 | Local economy such as employment and livelihood, etc. | This project has a certain impact on shops, restaurants, movable stalls and a small market along the target road | A |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | Although no considerable facility such as a school, hospital or mosque is observed in reconnaissance, these facilities should be identified through interview survey. | C |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | Although no slum or other minority group is observed in reconnaissance, this information should be collected through interview survey | C |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item | |
| | 10 | Water Usage or Water Rights and Rights of Common | Although wells are not observed in reconnaissance, these locations should be identified through interview survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | This project does not have negative impacts on this item because earthwork is limited | |
| | 16 | Hydrological Situation | There is no river in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | There is no vegetated area in the project area | |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | Planned flyover will be constructed approximately 10ms above the current road, thus the project has a certain negative impact on inhabitants | A |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | This project does not have significant negative impacts on this item because earthwork is limited in case of flyover | |
| | 25 | Waste | Waste concrete and soil may be generated by clearance work. | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated. The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

## Table 8.3.15 Scoping Matrix (No7 Katamso: UP)

| | No | Impact Items / Affected Activities | Overall Rating | Planning Phase: Land acquisition and Loss of properties | Planning Phase: Change of Land use plan, Control of various activities by regulations for the construction | Construction Phase: Reclamation of Wetland, etc. | Construction Phase: Deforestation | Construction Phase: Alteration to ground by cut land, filling, drilling, tunnel, etc. | Construction Phase: Operation of Construction Equipment and Vehicles | Construction Phase: Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Construction Phase: Traffic Restriction in construction area | Construction Phase: Influx of construction workers, construction of base camp | Post Construction: Increase of Through Traffic | Post Construction: Appearance/ Occupancy of Roads and related building structures | Post Construction: Increasing influx of settlers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Social Environment | 1 | Resettlement | A | A | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | A | A | | | | | | | A | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | | | | | | | | | | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | C | C | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | C | | | | | C | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | | | | | | | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | | | | | | | | | | | | | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | C | | | | | C | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Source: JICA Survey Team

## Table 8.3.16 Rating Reasons (No7 Katamso : UP)

| | No | Likely Impacts | Site Check Item | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: 48 **(provisional number)** Major Type of houses: one-storied structures (shops & residences) | A |
| | 2 | Local economy such as employment and livelihood, etc. | This project has a certain impact on the commercial area along the target road | A |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | Not observed in the affected area | |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | Although no slum or other minority group is observed in reconnaissance, this information should be collected through interview survey | C |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item basically | |
| | 10 | Water Usage or Water Rights and Rights of Common | Although wells are not observed in reconnaissance, these locations should be identified through interview survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | Project activities such as excavation may affect existing underground water level, thus used wells should be identified through interview survey | C |
| | 16 | Hydrological Situation | There is no river in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | There is no vegetated area in the project area | |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | This project does not have negative impacts on this item basically due to underpass | |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | Excavated soil in the earthwork may be polluted by hazardous matter, thus history of land use shall be verified through interview survey | C |
| | 25 | Waste | Waste concrete and soil may be generated by clearance work. | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated.<br>The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

**Table 8.3.17 Scoping Matrix (No8 Sudirman II: FO)**

| | No | Affected Activities / Impact Items | Overall Rating | Planning Phase: Land acquisition and Loss of properties | Planning Phase: Change of Land use plan, Control of various activities by regulations for the construction | Construction Phase: Reclamation of Wetland, etc. | Construction Phase: Deforestation | Construction Phase: Alteration to ground by cut land, filling, drilling, tunnel, etc. | Construction Phase: Operation of Construction Equipment and Vehicles | Construction Phase: Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Construction Phase: Traffic Restriction in construction area | Construction Phase: Influx of construction workers, construction of base camp | Post Construction: Increase of Through Traffic | Post Construction: Appearance/ Occupancy of Roads and related building structures | Post Construction: Increasing influx of settlers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Social Environment | 1 | Resettlement | B | B | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | B | B | | | | | | | B | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | | | | | | | | | | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | C | C | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | | | | | | | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | B | | | | B | | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | A | | | | | | | | | | | A | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | | | | | | | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Source: JICA Survey Team

## Table 8.3.18 Rating Reasons (No8 Sudirman II : FO)

| | No | Likely Impacts | Site Check Item | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: **10 (provisional number)**<br>Major Type of houses: one-storied structures (shops & residences) | B |
| | 2 | Local economy such as employment and livelihood, etc. | This project has a certain impact on shops and restaurants along the target road | B |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | A public fruit market is located in the affected area. Although no other considerable facility such as a hospital or mosque is observed in the reconnaissance, these facilities should be identified through interview survey. | |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | Although no slum or other minority group is observed in reconnaissance, this information should be collected through interview survey | C |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item | |
| | 10 | Water Usage or Water Rights and Rights of Common | Although wells are not observed in reconnaissance, these locations should be identified through interview survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | This project does not have negative impacts on this item because earthwork is limited | |
| | 16 | Hydrological Situation | There is no river in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | Street trees along the road may be removed by widening of the road | B |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | Planned flyover will be constructed approximately 10ms above the current road, thus the project has a certain negative impact on inhabitants | A |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | This project does not have significant negative impacts on this item because earthwork is limited in case of flyover | |
| | 25 | Waste | Waste concrete, soil and cut trees may be generated by clearance work | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated.<br>The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

## Table 8.3.19 Scoping Matrix (No9 Cikarang: FO)

| | | Affected Activities | | Planning Phase | | Construction Phase | | | | | | | Post Construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No | Impact Items | Overall Rating | Land acquisition and Loss of properties | Change of Land use plan, Control of various activities by regulations for the construction | Reclamation of Wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of Construction Equipment and Vehicles | Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Traffic Restriction in construction area | Influx of construction workers, construction of base camp | Increase of Through Traffic | Appearance/ Occupancy of Roads and related building structures | Increasing influx of settlers |
| Social Environment | 1 | Resettlement | B | B | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | B | B | | | | | | | B | | | | |
| | 3 | Land use and utilization of local resources | C | C | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | C | C | | | | | | | | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | C | C | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | | | | | | | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | B | | | | | B | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | B | | | | | | | | | | | B | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | B | | | | | | B | | B | | B | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | | | | | | | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | B | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Source: JICA Survey Team

## Table 8.3.20 Rating Reason (No9 Cikarang : FO)

| | No | Likely Impacts | Site Check Item | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: **20 (provisional number)**<br>Major Type of houses: one storied structures (shops & residences) | B |
| | 2 | Local economy such as employment and livelihood, etc. | This project has a certain impact on shops and restaurants along the target road | B |
| | 3 | Land use and utilization of local resources | Small scale fishing by local people is observed in the main canal along the road. Additionally, irrigation is conducted from the main canal to paddy fields. | C |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | An irrigation system is operated in the project area. Although no other considerable facility such as a hospital, school or mosque are observed in the reconnaissance, these facilities should be identified through interview and site survey | C |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | Although no slum or other minority group is observed in reconnaissance, this information should be collected through interview survey | C |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview and site survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item | |
| | 10 | Water Usage or Water Rights and Rights of Common | Kali Malang canal is located along the target road, and operated as a main irrigation source by the irrigation authority.<br>Although wells are not observed in reconnaissance, these locations should be identified through interview and site survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | This project does not have negative impacts on this item because earthwork is limited | |
| | 16 | Hydrological Situation | There is no river in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | Kali Malang canal provides habitats for fish, amphibian and aquatic plants. Construction activities such as widening or earthwork may have negative impacts to the habitat. | B |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | Planned flyover will be constructed at the same level as the current flyover, thus the project does not have significant impact on this item | |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have a certain negative impacts since traffic volume will increase along the road. | B |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | This project does not have significant negative impacts on this item because earthwork is limited in case of flyover and road improvement | |
| | 25 | Waste | Waste concrete and soil may be generated by clearance work | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated.<br>The project may have certain negative impacts since traffic volume will increase along the road. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

## Table 8.3.21 Scoping Matrix (No10 Senayan: FO)

| | No | Affected Activities / Impact Items | Overall Rating | Planning Phase | | Construction Phase | | | | | | | Post Construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Land acquisition and Loss of properties | Change of Land use plan, Control of various activities by regulations for the construction | Reclamation of Wetland, etc. | Deforestation | Alteration to ground by cut land, filling, drilling, tunnel, etc. | Operation of Construction Equipment and Vehicles | Construction of Roads, tollgates, parking lots, Access roads for bridges and other related facilities | Traffic Restriction in construction area | Influx of construction workers, construction of base camp | Increase of Through Traffic | Appearance/ Occupancy of Roads and related building structures | Increasing influx of settlers |
| Social Environment | 1 | Resettlement | B | B | | | | | | | | | | | |
| | 2 | Local economy such as employment and livelihood, etc. | B | B | | | | | | | B | | | | |
| | 3 | Land use and utilization of local resources | | | | | | | | | | | | | |
| | 4 | Social institutions and local decision-making institutions | | | | | | | | | | | | | |
| | 5 | Existing social infrastructures and services | B | B | | | | | | | | | | | |
| | 6 | The poor, indigenous and ethnic people, gender and children rights | | | | | | | | | | | | | |
| | 7 | Misdistribution of benefit and damage | | | | | | | | | | | | | |
| | 8 | Cultural heritage | C | C | | | | | | | | | | | |
| | 9 | Local conflict of interests | | | | | | | | | | | | | |
| | 10 | Water Usage or Water Rights and Rights of Common | C | C | | | | C | | | | | | | |
| | 11 | Sanitation | | | | | | | | | | | | | |
| | 12 | Hazards (Risk) and Infectious diseases such as HIV/AIDS | | | | | | | | | | | | | |
| Natural Environment | 13 | Topography and Geographical features | | | | | | | | | | | | | |
| | 14 | Soil Erosion | | | | | | | | | | | | | |
| | 15 | Underground water | | | | | | | | | | | | | |
| | 16 | Hydrological Situation | | | | | | | | | | | | | |
| | 17 | Coastal Zone | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 18 | Flora, Fauna and Biodiversity (Street trees) | B | | | | B | | | | | | | | |
| | 19 | Meteorology | | | | | | | | | | | | | |
| | 20 | Landscape | A | | | | | | | | | | | A | |
| | 21 | Global Warming | C | | | | | | | | | | C | | |
| Pollution | 22 | Air Pollution | C | | | | | | | | | | C | | |
| | 23 | Water Pollution | | | | | | | | | | | | | |
| | 24 | Soil Contamination | | | | | | | | | | | | | |
| | 25 | Waste | B | | | | B | B | | | | | | | |
| | 26 | Noise and Vibration | B | | | | | | B | B | | | C | | |
| | 27 | Ground Subsidence | | | | | | | | | | | | | |
| | 28 | Offensive Odour | | | | | | | | | | | | | |
| | 29 | Bottom sediment | | | | | | | | | | | | | |
| | 30 | Accidents | B | | | | | | B | | B | | | | |

Source: JICA Survey Team

**Table 8.3.22 Rating Reason (No10 Senayan: FO)**

| | No | Likely Impacts | Site Check Item | Rating |
|---|---|---|---|---|
| Social Environment: | 1 | Resettlement | Number of relocation structures: 10 **(provisional number)** | B |
| | 2 | Local economy such as employment and livelihood, etc. | This project has a certain impact on commercial areas along the target road during construction | B |
| | 3 | Land use and utilization of local resources | This project does not have negative impacts on this item basically | |
| | 4 | Social institutions and local decision-making institutions | This project does not have negative impacts on this item basically | |
| | 5 | Existing social infrastructures and services | A school compound is located in the affected area. Although no other considerable facility such as a hospital or mosque is observed in the reconnaissance, these facilities should be identified through interview survey. | B |
| | 6 | The poor, indigenous and ethnic people (inclusive gender and right of children) | No slum or other minority group is observed in reconnaissance | |
| | 7 | Misdistribution of benefit and damage | This project does not have negative impacts on this item basically | |
| | 8 | Cultural heritage | Although no monuments, graveyards or sacred places are observed in reconnaissance, this information should be collected through interview survey | C |
| | 9 | Local conflict of interests | This project does not have negative impacts on this item | |
| | 10 | Water Usage or Water Rights and Rights of Common | Although wells are not observed in reconnaissance, these locations should be identified through interview survey | C |
| | 11 | Sanitation | This project does not have negative impacts on this item basically | |
| | 12 | Hazards (Risk)<br>Infectious diseases such as HIV/AIDS | This project does not have negative impacts on this item basically | |
| Natural Environment | 13 | Topography and Geographical features | This project does not have negative impacts on this item basically | |
| | 14 | Soil Erosion | This project does not have negative impacts on this item basically | |
| | 15 | Groundwater | This project does not have negative impacts on this item because earthwork is limited | |
| | 16 | Hydrological Situation | There is no river in the project area | |
| | 17 | Coastal Zone | There is no coastal zone in the project area | |
| | 18 | Flora, Fauna and Biodiversity | Street trees along the road may be removed by widening of the road | B |
| | 19 | Meteorology | This project does not have negative impacts on this item basically | |
| | 20 | Landscape | Planned flyover will be constructed approximately 10ms above the current road, thus the project has a certain negative impact on inhabitants | A |
| | 21 | Global Warming | The project may have positive impacts since driving speed will increase at the target intersection. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| Pollution | 22 | Air Pollution | The project may have positive impacts since driving speed will increase and exhaust gas from vehicles will be diffused at 10m above the ground. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | C |
| | 23 | Water Pollution | This project does not have negative impacts on this item basically | |
| | 24 | Soil Contamination | This project does not have significant negative impacts on this item because earthwork is limited in case of flyover | |
| | 25 | Waste | Waste concrete, soil and cut trees may be generated by clearance work | B |
| | 26 | Noise and Vibration | During construction, noise from the construction area and operation of construction machines will be generated.<br>The project may have positive impacts since driving speed will increase and noise decay distance is extended. However on the other hand, diverted traffic by construction of the facility may give some adverse impacts. | B |
| | 27 | Ground Subsidence | This project does not have negative impacts on this item basically | |
| | 28 | Offensive Odour | This project does not have negative impacts on this item basically | |
| | 29 | Bottom sediment | This project does not have negative impacts on this item basically | |
| | 30 | Accidents (including traffic accidents) | Construction works may cause additional congestion during construction due to reduction of traffic capacity | B |

Source: JICA Survey Team

Following are recommended methodologies for baseline survey and impact forecast.

**Table 8.3.23 Recommended Survey Methodology**

| Area | No | Item | Physical Site Survey Methodology (Draft)<br>✓ UKL/UPL, AMDAL | Forecast Methodology/ Contents to be commented on<br>✓ AMDAL, UKL/UPL |
|---|---|---|---|---|
| Social Environment | 1 | Involuntary Resettlement | ✓ In principle, refer to the survey results regarding LARAP | ✓ In principle, refer to LARAP |
| | 2 | Local economy such as employment and livelihood, etc. | ✓ In principle, refer to the survey results regarding LARAP | ✓ In principle, refer to LARAP |
| | 3 | Land use and utilization of local resources | ✓ Interview with local authority and rough site survey<br>Note) Use GPS | ✓ Describe degree of change of present condition (ex. agricultural area) |
| | 4 | Social institutions infrastructure and local decision-making institutions | ✓ Interview with local authority (traditional/administrative local decision making system) | ✓ Describe degree of change of present condition |
| | 5 | Existing social infrastructures and services | ✓ List all infrastructures and mapping through interview with local authority and site survey (schools, health centres, public meeting places, religious facilities, power lines and etc)<br>note) Use GPS device | ✓ Describe degree of change of present condition (Affected infrastructures such as power, water, gas and access to schools, hospitals and other facilities) |
| | 6 | The poor, indigenous & ethnic people, Gender and Children's rights | ✓ Interview with local authority, community leaders, NGOs and women's group as required | ✓ Describe degree of change of present condition (degree of impacts to ethnic people, women and children) |
| | 7 | Misdistribution of benefits and damage | ✓ Interview from local authority | ✓ Describe degree of change of present condition |
| | 8 | Cultural heritage | ✓ List all infrastructures and mapping through interview with local authority and site survey (cultural heritage, grave yards, sanctuaries, sacred places and etc)<br>note) Use GPS device | ✓ Indicate affected cultural sites such as graveyards, local heritage and sacred places on the map<br>✓ Cost estimation of displacement<br>Note) Indicate affected places on the GPS map |
| | 9 | Local conflict of interests | ✓ Interview with local authority and community leaders | ✓ Describe degree of change of present condition |
| | 10 | Water Usage or Water Rights and Rights of Common | ✓ List all infrastructures and mapping through interview with local authority and site survey (Water sources, wells and water rights if any)<br>note) Use GPS device | ✓ Indicate affected water sources such as wells, public taps, rivers and ponds on the map<br>✓ Cost estimation of displacement<br>Note) Indicate affected place on the GPS map |
| | 11 | Sanitation | ✓ Interview with local authority | ✓ Describe degree of change of present condition |
| | 12 | Hazards (Risk)<br>Infectious diseases such as HIV/AIDS | ✓ Interview with local authority and health centre | ✓ Describe degree of change of present condition (Disease name) |
| Natural Environment | 13 | Topography and Geographical features | ✓ Take pictures if there are any considerable features | ✓ Indicate affected sites on the map (if there are any considerable features) |
| | 14 | Soil Erosion | ✓ Interview with local authority and rough site survey<br>Note) Use GPS device | ✓ Describe degree of change of present condition (pick areas predicted for erosion) |
| | 15 | Groundwater | ✓ Survey ground water level through "Item No.10 Water right" | ✓ Number of wells lost and indicate them on the map<br>✓ Estimation of affected residents |

| Area | No | Item | Physical Site Survey Methodology (Draft)<br>✓ UKL/UPL, AMDAL | Forecast Methodology/ Contents to be commented on<br>✓ AMDAL, UKL/UPL |
|---|---|---|---|---|
| | 16 | Hydrological Situation | ✓ Rough site survey (location of rivers, river flow, flood frequency and etc)<br>Note) Use GPS device | ✓ Describe degree of change of present condition |
| | 17 | Coastal Zone | ✓ Rough site survey (distribution of mangrove and biota in the mangrove area, if any )<br>Note) Use GPS device | ✓ Describe degree of change of present condition |
| | 18 | Flora, Fauna and Biodiversity | ✓ Literature survey and interview survey with specialists and inhabitants<br>(list considerable species and distribution in the project area)<br>✓ Rough site survey in the affected area (count the number of trees along the road in the affected area).<br>Note) Use GPS device<br>Reference) Indonesian list, IUCN, CITES | ✓ Estimate the number of trees along the road in the affected area<br>✓ Calculate area of vegetation loss by types in new developed area, and indicate them on the map<br>✓ Number of considerable species lost and their habitats<br>✓ Predicted ecosystem after construction of the road |
| | 19 | Meteorology | ✓ No need for physical site survey | ✓ Describe degree of change of present condition |
| | 20 | Landscape | ✓ Taking pictures from major viewpoints<br>Note) Use GPS device | ✓ Indicate affected aesthetic landscape on the map<br>✓ Make a composite photograph or computer graphic post construction |
| | 21 | Global Warming | ✓ No need for physical site survey | ✓ Calculate degree of change for volume of greenhouse gases (CO2) |
| | 22 | Air Pollution | ✓ Collect existing measured date<br>✓ Quantitative measurement of NOx, SOx, CO and Suspended Particulate Matters (SPM)<br>(at least 3 points at each site) | ✓ Calculate or estimate air quality at target year (NO2, SO2, CO and SPM) |
| | 23 | Water Pollution | ✓ Measure turbidity, pH and BOD in the nearest rivers and wells which are used by inhabitants for dinking, laundry or bathing | ✓ Describe degree of change of present condition during construction |
| | 24 | Soil Contamination | ✓ Survey histories of land use along the road in interviews with relevant governmental sections and district office. (Biochemical factory, leather factory and hazardous material existence, etc.) | ✓ Describe degree of change of present condition |
| | 25 | Waste | ✓ Survey solid and liquid waste management and system through interview with local authority | ✓ Describe degree of change of present condition |
| | 26 | Noise and Vibration | ✓ Measure vibration, ambient noise level and traffic noise (road side noise) by sound level meter (equivalent noise dB (A), every 10min for 12 hours)<br>(at least 3 points at each site) | ✓ After Construction - Calculate traffic noise level along the road at target year (use estimated traffic volume at the target year) |
| | 27 | Ground Subsidence | ✓ Survey such phenomenon through interview with relevant organization | ✓ Describe degree of change of present condition |
| | 28 | Offensive Odour (bad smell) | ✓ Survey such phenomenon in interview with inhabitants | ✓ Describe degree of change of present condition |
| | 29 | Bottom sediment | ✓ No need for physical site survey | ✓ No need physical site survey |
| | 30 | Accidents | ✓ Survey in interview with police station and relevant governmental section | ✓ Describe degree of change of present condition |

Source: JICA Survey Team

Following are recommended mitigation measures and monitoring plans.

## Table 8.3.24 Recommended Mitigation Measures and Monitoring Plans

| Items | | Proposed Mitigation Measures | | Monitoring Plan |
|---|---|---|---|---|
| | | During Construction | Post Construction | |
| Social Environment | 1. Resettlement | a) Minimization of affected area in the design<br>b) Formation of consensus through a series of stakeholder meetings on the process of EIA and LARAP<br>c) Carry out appropriate Land Acquisition & Resettlement Action Plan (LARAP) | Refer to the LARAP | [During Const.]<br>[Post Const.]<br>Refer to the LARAP |
| | 2. Local economy, employment and livelihood | Refer to the LARAP | Refer to the LARAP | |
| | 3. Land use and local resources utilization | Minimization of affected area in the design | Not required | Not required |
| | 4. Social institutions and local decision-making institutions | Not required | Not required | Not required |
| | 5. Existing social infrastructures and services | Minimization of affected area in the design | Not required | [During Const.]<br>Interview survey from users |
| | 6. The poor, indigenous and ethnic people, gender and children rights | Refer to the LARAP | Refer to the LARAP | Refer to the LARAP |
| | 7. Misdistribution of benefits and damage | Not required | Not required | Not required |
| | 8. Cultural heritage | a) Minimization of affected area in the design<br>b) Formation of consensus through a series of stakeholder meetings on the process of EIA and LARAP | Not required | Not required |
| | 9. Local conflicts of interests | Construction contractor should hire workers from the nearest communities through a fair process | Not required | [During Const.]<br>Confirm worker list once a month<br>[Post Const]<br>Not required |
| | 10. Water usage and rights | New wells shall be set up to replace affected wells | Not required | [During Const.]<br>[Post Const]<br>Periodical check of availability of water in the wells |
| | 11. Public sanitation | Not required | Not required | Not required |
| | 12. Infectious diseases such as HIV/AIDS | a) Healthcare education for workers<br>b) Provide devices such as masks and helmets to construction workers as required | Not required | [During Const.]<br>Periodical health check for construction workers by construction contractor<br>[Post Const]<br>Not required |
| Natural Environment | 13. Topography and Geographical features | Not required | Not required | Not required |
| | 14. Soil erosion | Setting up appropriate slope protection such as covering with grass and gabions on the embankment | Periodical monitoring and maintenance | [During Const.]<br>[Post Const]<br>Periodical visual monitoring |

| Items | | Proposed Mitigation Measures: During Construction | Proposed Mitigation Measures: Post Construction | Monitoring Plan |
|---|---|---|---|---|
| | 15. Underground water | In the case of closing down drinking water supply, the proponent shall set up new wells or prepare new water supply | If prepared new well does not have enough volume, alternative well shall be set up by the proponent | [During Const.]<br>[Post Const]<br>Periodical monitoring of water level |
| | 16. Hydrological situation | In case of major change in hydrological situation, appropriate counter measures shall be carried out | In case of major change in hydrological situation, appropriate counter measures shall be carried out | [During Const.]<br>[Post Const]<br>Periodical visual monitoring and maintenance |
| | 17. Coastal zone (mangroves, coral reefs, tidal flats, etc.) | Not required<br>(no impacts) | Not required<br>(no impacts) | Not required<br>(no impacts) |
| | 18. Flora, Fauna and Biodiversity | a) Minimize cutting trees along the road and replant trees along the road based on the Landscape Regulations<br>b) Implementation of environmental education for construction workers (prohibit cutting trees, development and dumping wastes without permission) | Not required | [During Const.]<br>Count the number of cut trees<br>Confirm developed boundary<br>[Post Const]<br>Not required |
| | 19. Meteorology | Not required | Not required | Not required |
| | 20. Landscape | Plant street trees along the road based on the landscape regulations | Not required | Not required |
| | 21. Global warming | Not required | Not required | Not required |
| Pollution | 22. Air pollution | Spraying water near residential areas to reduce dust level by construction contractor | Periodical cleaning of road surface to remove soil | [During Const.]<br>Measure dust level near residential area once a month<br><br>[Post Const]<br>Measure SOx, SPM, NOx and CO at same current survey points for confirmation of effects |
| | 23. Water pollution | a) Chemical and waste oil shall be managed and stored in an appropriate way, not discharged to river.<br>b) Turbid water from construction area shall be treated by sedimentation tank as required | Not required | [During Const.]<br>Measure turbidity in the nearest rivers<br>[Post Const.]<br>Not required |
| | 24. Soil contamination | Not required | Not required | Not required |
| | 25. Waste | a) Chemical and waste oil shall be managed and stored in an appropriate way, not discharged to river.<br>b) Construction waste shall be managed and disposed of in compliance with the law | Not required | [During Const.]<br>Periodical monitoring once a month<br>[Post Const.]<br>Not required |
| | 26. Noise and vibration | a) Fixing construction work hours (daytime only)<br>b) Consideration for praying times and Sunday<br>c) Setup sound proof barrier on the construction boundary | Not required | [During Const.]<br>Measure sound level near residential area, school and hospital once a month<br>[Post Const]<br>Measure sound level at same current survey points for confirmation of effects |
| | 27. Ground subsidence | Not required | Not required | Not required |
| | 28. Offensive odours | Not required | Not required | Not required |

| Items | | Proposed Mitigation Measures | | Monitoring Plan |
|---|---|---|---|---|
| | | During Construction | Post Construction | |
| | 29. Bottom sediment in sea and rivers | Not required | Not required | Not required |
| | 30. Traffic accidents | a) Education on traffic management control and safety for workers<br>b) Employing staff for traffic control and traffic safety<br>c) Setup diversion for minimization of construction traffic congestion<br>d) Setup of sidewalk along the road<br>e) Contractor shall follow relevant labour law | Installation of traffic safety facilities | [During Const.]<br>Periodical monitoring of accident cases once a month<br>[Post Const.]<br>Not required |

Source: JICA Survey Team

Indonesian side in cooperation with JICA is carrying out a series of EIA activities based on above mentioned scoping, recommended survey and forecast methodology as of December 2011. Resettlement and land acquisition is picked up as a major issue in the social environment and the degree of impact are shown in Chapter 9. According to LARAP, any displace of school, hospital, mosque and wells will not be caused in the project. In natural environmental issues, although turbid water may be discharged from construction area to the nearest river or channel, the impact will be minimized by planned mitigation measures.

A proposed methodology for stakeholder meetings is show below.

**Table 8.3.25 Recommended Methodology for Stakeholder Meetings**

| Item | Description |
|---|---|
| (1) Number of SHMs | Twice a sub project (totally 20 meetings at least)<br>(Number of SHMs is stipulated in JICA's Guidelines) |
| (2) Timing of Implementation | - The 1st SHM: Scoping Stage<br>- The 2nd SHM: Draft ANDAL/RKL/RPL or draft UKL/UPL stage |
| (3) Attendance | In principle, attendance shall be determined base on Indonesian laws. Or it will be determined on discussion with MPW, environmental authorized agency and local government.<br>(ex.: Local stakeholders (project affected persons, NGOs), local government and proponent) |
| (4) Notification of SHMs | Basically the notification shall be done on news paper, radio and other measures, 2 weeks before implementation of SHMs |
| (5) Draft Agenda for SHM | -The 1st SHM<br>Project outline, predicted positive and negative impacts, survey items and methodology, project schedule and exchange opinions<br>- The 2nd SHM<br>Project outline, analyzed positive and negative impacts, mitigation measures and monitoring plan and exchange opinions |
| (6) Record of SHM | Preparation of Minutes of Meeting(MM), attendance list **with signature** and photo |
| (7) Language | All documents shall be prepared in Indonesian and English |

Source: JICA Survey Team

**Table 8.3.26 Schedule of Stakeholder Meeting**

| Site | Governmental Environmental Authority | 1st SHM (Explanation of Project outlines) | 2nd SHM (Explanation of draft AMDALor draft UKL/UPL) |
|---|---|---|---|
| 1. Semanggi | Central Jakarta City | 25th October, 2011 | After April, 2012 |
| 2. R.E.Martadinata | North Jakarta City | 18th October, 2011 | After April, 2012 |
| 3. Sulawesi- Tg.PA | North Jakarta City | Conducted in Approved AMDAL*1 | |
| 4. Kuningan | Central Jakarta City | After April 2012 | |
| 5. Pancoran | South Jakarta City | 18th October, 2011 | After April, 2012 |
| 6. Pinang Baris | Medan City | After April (as required)*2 | |
| 7. Katamso | Medan City | 19th September 2011 | After April, 2012 |
| 8. Sudirman II | Tangerang City | 19th October, 2011 | After April, 2012 |
| 9. Cikarang | Bekasi Regency | 20th October, 2011 | After April, 2012 |
| 10. Senayan | South Jakarta City | After April, 2012 | |

*1: Kuningan under pass is one of facilities in the Tanjung Priok Access Road Project, AMDAL approval of the project had been issued in December 2004 and the project is under construction

*2 : UKL/UPL approval for Pinan Baris had been issued in December 2008, however 3 years validity period after approval without construction activities is expired

## 8.4 Current Progress and Schedule of Environmental Approval

In ten selected sub-projects, UKL/UPL for six sub-projects (No.1 Semanggi, No2. R.E. Martidinata, No.5 Pancoran, No.7 Katamso, No.8 Sudirman II and No.9 Cikarang) and one AMDAL for No.4 Kuningan are being carried out by the Ministry of Public Works in cooperation with JICA. It is expected that six approvals for UKL/UPL will be issued from relevant governmental environmental authorities after April 2012.

The approvals for No.5 Sulawesi in DKI and No.13 Pinan Baris in Medan City had been issued, however the approval of Pinan Baris had been expired the validity.

On the other hand, a series of environmental process for No.10 Senayang is not started because a concept of design is not concluded at the moment.

The process for AMDAL (No.4 Kunnigan) will be carried out after April 2012.

**Table 8.4.1 Current Progress and Expected EIA Schedule (December, 2011)**

| | | 2011 | | | | | | | | | | 2012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov | Dec. | Jan. | After April |
| **Out put of the Survey** | | ITR | | | | DFR(1) | | | | | DFR(2) | FR | |
| Env. Approval Schedule (* : supported by JICA) | | | | | | | | | | | | | |
| *1. Semanggi | UKL/UPL | | | | | | | | | | | | Approved after April |
| *2. R.E. Martidinata | UKL/UPL | | | | | | | | | | | | Approved after April |
| 3. Sulawesi | UKL/UPL | Approved*1 | | | | | | | | | | | |
| *4. Kuningan | AMDAL | | | | | | | | | | | | Approved after April |
| *5. Pancoran | UKL/UPL | | | | | | | | | | | | Approved after April |
| 6. Pinan Baris | UKL/UPL | Expired*2 | | | | | | | | | | | |
| *7. Katamso | UKL/UPL | | | | | | | | | | | | Approved after April |
| *8. Sudirman II | UKL/UPL | | | | | | | | | | | | Approved after April |
| *9. Cikarang | UKL/UPL | | | | | | | | | | | | Approved after April |
| 10. Seneyang | UKL/UPL | A series of environmental processes has not carried out due to no design at the moment | | | | | | | | | | | |
| **Detailed Schedule for UKL/UPL** | | | | | | | | | | | | | |
| Preparation of Draft Report (UKL/UPL) | | | | | | | | | | | ■ | | |
| SHM | | | | | | | | | | 1st | | | 2nd (Approved after April) |
| Review and approval by GAE | | | | | | | | | | | | | Approved after April |
| **Expected Schedule for AMDAL** | | | | | | | | | | | | | |
| Preparation of ToR (KA-ANDAL) | | | | | | | | | | | | | Approved after April |
| Preparation of draft Report (ANDAL, RKL and RPL) | | | | | | | | | | | | | Approved after April |
| SHM | | | | | | | | | | | | | Approved after April |
| Review and approval by GAE | | | | | | | | | | | | | Approved after April |

Source: JICA Survey Team

*1: Kuningan under pass is one of facilities in the Tanjung Priok Access Road Project, AMDAL approval of the project had been issued in December 2004 and the project is under construction

*2: UKL/UPL approval for Pinan Baris had been issued in December 2008, however 3 years validity period after approval without construction activities is expired

# CHAPTER 9. INVOLUNTARY RESETTLEMENT

## 9.1 General

The overall goal of the Metropolitan Arterial Road Improvement Project (MARIP) is that the sustainable growth which the private sector initiates can be realized by the expansion of investment opportunities and the economic growth generated from the improvement of road traffic infrastructure. The construction of grade separated intersections is the project goal to alleviate the traffic congestion at heavily congested intersections on the arterial road network in JABODETABEK and Medan. The Project, which contains road widening for construction of frontage roads would cause involuntary resettlement issues due to land acquisition necessary for the Project.

JICA indicates clearly the basic principle on involuntary Resettlement in the JICA guidelines for Environmental and Social Considerations (April 2010, herein after "JICA Guidelines") that "People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner.".

The JICA requests borrowers to submit the Land Acquisition and Resettlement Action Plan (LARAP) for the development Projects that contain large scale involuntary resettlement prior to the JICA appraisals for the project.

The MARIP consists of ten(10) subprojects. The sub-projects were selected based on the multi criteria analysis in the first stage of the Preparatory Survey. The framework of LARAP (FLARAP) has been developed to clarify the basic principles in term of involuntary resettlement to be applied to the MARIP.

The JICA Preparatory Survey Team (herein after "JST") prepared the draft of the FLARAP which meets the requirements of the JICA Guidelines through discussions with DGH. The draft of FLARAP was submitted to JICA for review in March 2011.

In this chapter, first, the FLARAP prepared in the first stage will be reviewed and then, the LARAPs which were prepared based on the FLARAP for each subproject will be overviewed. It should be note that the LARAP preparation was conducted based on a sub-contract under financial assistance of JICA.

## 9.2 Legal Framework for Involuntary Resettlement in Indonesia

### 9.2.1 Related Regulations

The Indonesian regulations on land procurement for infrastructure projects, which have been provided by the central government of the Republic of Indonesia, are as follows:

1) Presidential Regulation No. 36/2005 on Land Procurement for Implementation of Public Interest

2) Presidential Regulation No. 65/2006 on Amendment of Presidential Regulation No. 36/2005

3) Head of the National Land Board (BPN) Regulation No. 3/2007 on Guidelines for Implementation of Presidential Regulation No. 36/2005 on Land Procurement for Implementation of Public Interest as amended by Presidential Regulation No. 65/2006 .

### 9.2.2 Responsible Agency

The Land Procurement Committee (LPC) and Land Price Appraisal Team conduct land procurement for public facilities construction. The Land Procurement Committee will be established based on the request by the Project Implementer.

(1) Land Procurement Committee

The Land Procurement Committee is the committee for land procurement for public facilities construction established by the Governor/Mayer. The Committee consists of the representatives from the related local government and the National Land Board.

The level of the establishment of the Land Procurement Committee, i.e. district or provincial, will be decided depending on where the land needed for the public facilities is located. The Land Procurement Committee is called Panitia (committee) 9 due to the membership consisting of 9 persons.

(2) Land Price Appraisal Team

Land price appraisal is to be done by a Land Price Appraisal Team based on the request from the LPC.

The Land Price Appraisal Team consists of the following organizations.

a) Agent from the institution responsible for buildings and/or plantations
b) Agent from the central government responsible for National Land
c) Agent from the institution of Land and Building Tax Service
d) Experts or persons with experience in land value appraisal
e) Academic person with the ability to conduct appraisals of land, buildings, plantations and/or other objects built on the land.
f) NGO, if necessary

(3) Compensation System

The kinds of assets to be affected by the Project are stipulated by Presidential Regulation No.65/2006 as follows;

a) Land rights
b) Buildings
c) Crops / Plants
d) Other objects built on the land.

The forms of compensation for the assets affected by the Project are as follows:

a) Cash, and/or
b) Replacement land, and/or
c) Resettlement, and/or
d) Combination of two or more forms of compensation as referred to in 1), 2), and 3)
e) Other forms which are agreed on / approved by the related parties.

Land price appraisal is conducted based on Taxed-Object Selling Value (*NJOP*) or real value by taking into consideration the *NJOP* price of the current year, as well as the following items (Article 28 of BPN Regulation No.3/2007).

a) Location and area of land
b) Land status
c) Land entitlement

d) Synchronization between land and existing spatial planning or city planning

e) Facilities and infrastructure available

Appraisal of building and plantation prices is done by the related government staffs of district government that are responsible for buildings and farming/ landscaping by referring to the price standard, set by laws and regulations (Article 29 of BPN Regulation No.3/2007).

## 9.3 Comparative Analysis with International Practices on Involuntary Resettlement

The comparative analysis between Indonesian Regulations and international practices including JICA on involuntary resettlement was conducted to identify the gaps between them.

### 9.3.1 JICA guidelines on Involuntary Resettlement

Regarding the involuntary resettlement, the JICA guidelines for Environmental and Social Considerations (April 2010) indicates the following principles.

- Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected.
- People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner. Prior compensation, at full replacement cost, must be provided as much as possible. Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.
- Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.
- For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.

Note that the JICA requests that the borrower follows the OP.4.12 of World Bank for addressing individual issues on involuntary resettlement.

The World Bank experience indicates that involuntary resettlement under development projects, if unmitigated, often gives rise to severe economic, social, and environmental risks. The policy includes safeguards to address and mitigate these impoverishment risks. Following are the key principles in the Bank’s policy on involuntary resettlement.

- Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs.
- Displaced persons are to be provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project.

- Resettlement activities should be conceived and executed as sustainable development programs
- Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs.
- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.
- The absence of a formal legal title to land is not a bar to WB policy entitlements.
- Particular attention is paid to the needs of vulnerable groups among those displaced, especially those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities, or other displaced persons who may not be protected through national land compensation legislation.
- The full costs of resettlement activities necessary to achieve the objectives of the project are included in the total costs of the project.

### 9.3.2 Comparative Analysis with International Practices on Involuntary Resettlement

The results of the comparative analysis on Involuntary Resettlement between the Indonesian regulations and Operational policy (OP.4.12) of WB based on the review of them are shown in Table 9.3.1.

**Table 9.3.1 Comparison Analysis on the Gaps between OP.4.12 and Indonesian Regulation in terms of "Involuntary Resettlement"**

| Issue | Operational Policy 4.12 of WB on Involuntary Resettlement | Indonesian Regulation on Involuntary Resettlement |
|---|---|---|
| Preparation of Resettlement Action Plan(RAP) | A resettlement plan or abbreviated resettlement plan is required for all operations that entail involuntary resettlement unless otherwise specified. （OP.4.12 para 17(a)） | No stipulation on the obligation for preparation of RAP is found. |
| Minimization of Involuntary Resettlement | Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs（OP.4.12 para 2） | No stipulation for minimization of Involuntary resettlement is found |
| Impacts Covered | The compensation should cover not only physical aspects such as relocation or loss of shelter and loss of assets or access to assets etc. but also loss of income sources or means of livelihood.OP.4.12 para 3） | The compensation covers Land rights, Buildings, Crops/Plants and Other objects attached to the land （Article 12 of President Regulation No.36/2005） |
| Compensation for Squatters | Those who do not have formal legal rights to land but have a claim to such land or assets --provided that such claims are recognized under the laws of the country are provided compensation for the land they lose, and other assistance. And also those who have no recognizable legal right or claim to the land and occupy the project area prior to a cut-off date are provided resettlement assistance.（OP.4.12 para 15,16） | No stipulation on the Compensation for Squatters is found. |
| Estimation of compensation cost | To provide compensation at full replacement cost for losses of assets without depreciation of structures or assets<br>For agricultural land; based on the market value of the pre-project land or pre-displacement, whichever is higher with the cost of preparing the land, plus the cost of any registration and transfer taxes.<br>For land in urban areas ; based on market value of the land with the cost of any registration and transfer taxes.<br>For houses and other structures, based on the market cost of the materials to build a replacement structure or better than those of the affected structure with the cost of transporting building materials, any labor and contractors' fees and any registration and transfer taxes. （OP.4.12 para 6(a)(ii), O.P 4.12 footnote 11, O.P 4.12 Annex footnote 1） | Land value appraisal is done by the Land Value Appraisal Team. Land value appraisal is based on the Selling Value of the Taxed-Object (NJOP) or real/actual value by taking into consideration the NJOP of the current year, as well as the location and area of the land etc.<br>Appraisal of price of building and/or plantations and/or other objects attached to the land is conducted by the Head of the Agency/Office/Body by referring to the price standard, set by laws and regulations. in city/District level.（Article 28 and 29, Head of National Land Affairs Agency Decree No. 03/2007） |
| Assistance for Restoration of Livelihood and Living Standard | Displaced persons should be supported after displacement for a transition period and provided with development assistance in addition to compensation measures such as land preparation, credit facilities, training, or job opportunities.（OP.4.12 para 6(c)） | No description on assistance for restoration of livelihood and living standard |
| Paying attention to vulnerable groups | Particular attention should be paid to the needs of vulnerable groups such as those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities etc.（OP.4.12 para 8） | No description on consideration of vulnerable groups |

Source: JICA-MARIP Preparatory Survey Team (2011)

# 9.4 Summary of the Framework of LARAP(FLARAP)

## 9.4.1 Discussion and Proposals on the FLARAP

(1) Discussion on the FLARAP

The JST initiated a preliminary meeting with the Sub-directorate of Environment & Road safety Technical Affairs of DGH on 2nd March 2011 to clarify issues related to LARAP preparation which will be conducted on the subprojects in the second stage. Main points in the meeting are as follows. (See **Vol. 3 LARAP**）

- It was confirmed by DGH and the JST that the responsibilities for the preparation of LARAP for the Project are under the DGH. The JST will support DGH for conducting related tasks.
- The Framework of LARAP (FLARAP) must be consistent with JICA Guidelines (World Bank OP.4.12)
- DGH will handle the necessary approval process of the FLARAP.
- The LARAP for each sub-project based on the FLARAP should be approved by the related local government.
- The JST submitted first draft of the FLARAP which contained proposed countermeasures necessary to fill the gaps between Indonesian regulations and JICA requirements. DGH will review it and make response on 9th March 2011.

Note that DGH approved the first Draft and it will be submitted to JICA as Draft of FLARAP. (**Vol. 3 LARAP**）

(2) Proposed Countermeasures for Filling the Gaps

The counter measures for filling the identified gaps in the previous chapter were proposed as follows.

a) Preparation of Resettlement Action Plan (RAP)

According to the Minutes of discussion, the DGH agreed to establish LARAP for the Project.

b) Minimization of Involuntary Resettlement

The JST will make every effort to minimize the involuntary resettlement as much as possible in the basic design stage.

c) Impacts Covered

The FLARAP will contain a provision for compensation on the loss of income sources or means of livelihood as well as land, buildings, crops/plants and other objects attached to the land.

d) Estimation of Compensation Cost

The FLARAP will be prepared based on the principle of providing compensation at full replacement cost (RC) without any depreciation. In case of identifying the gaps between the RC and compensation cost calculated based on the Indonesian regulation, the gaps will be filled by the special livelihood restoration program (LRP). As for the LRP, the mechanism will be explained in 9.4.3.

e) Squatters

The FLARAP will include the principle of compensation for those who do not have formal legal rights to land. Note that the compensation is limited to the affected structures only.

f) Assistance for Restoration of Livelihood and Living Standard

The FLARAP will provide assistance for restoration of livelihood and living standard for the displaced persons through the general livelihood restoration program (LRP).

g) Paying Attention to Vulnerable Groups

The FLARAP will pay attention to vulnerable groups such as those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities etc. through providing the general livelihood restoration program (LRP).

### 9.4.2 Objectives and Principles of the FLARP

(1) Objectives

The LARAP Framework for the MARIP has been prepared to support the executing agency (DGH) for addressing the adverse resettlement-related impacts of the subprojects of the MARIP. The LARAP for each sub-project will be prepared based on the FLARAP.

(2) Principles

The basic principles of the LARAP Framework for the MARIP are as follows.

- Acquisition of land and other assets, and resettlement of people will be avoided or minimized as much as possible by identifying possible alternative project designs and appropriate social, economic, operational and engineering solutions that have the least impact on populations in the project area.
- All affected households(AHs) residing, working, doing business and/or cultivating land within the project impacted areas as of the date of the latest census and inventory of lost assets(IOL), are entitled to compensation for their lost assets (land and/or non-land assets), at replacement cost and restoration of incomes and businesses, and will be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-project living standards, income-earning capacity and production levels.
- All affected people will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing. Lack of legal rights to the assets lost or adversely affected tenure status and social or economic status will not bar the AH from entitlements to such compensation and rehabilitation measures or resettlement objectives.
- AHs will be fully consulted and given the opportunity to participate in matters that will have adverse impacts on their lives during the design, implementation and operation of the Project. Plans for the acquisition of assets will be carried out in consultation with the AHs who will receive prior information of the compensation, relocation and other assistance available to them.
- Payment for land and/or non-land assets will be based on the principle of replacement cost (local regulations, where available and applicable, shall be fully followed in the implementation process).
- Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of AHs, will be completed prior to any construction activities taking place
- There shall be effective mechanisms for hearing and resolving grievances during implementation of the land acquisition and resettlement plans.
- Special measures will be incorporated in the LARAPs and in complementary mitigation and enhancement activities to protect socially and economically vulnerable groups at high risk of impoverishment, such as ethnic minorities, women-headed families,

disabled-headed households, landless households, children and elderly people without support structures, and people living in poverty.

- Adequate resources will be identified and committed during land acquisition and resettlement planning. This includes adequate budgetary support fully committed and made available to cover the costs of land acquisition, compensation, resettlement and rehabilitation within the agreed implementation period for the Project; and, adequate human resources for supervision, liaison and monitoring of land acquisition, resettlement and rehabilitation activities.
- The LARAP summary in the form of a Project Information Booklet (PIB) will be translated into Bahasa and placed in the village offices for the reference of AHs as well as other interested groups. A copy of the LARAP in the local language will be placed in Executing agency (DGH) and district offices.

### 9.4.3 Entitlement Matrix

(1) Entitlement Matrix

The project entitlements developed and presented in the entitlement matrix correspond to the potential impacts identified during the census and inventory of losses. (Refer to Table 9.4.1)

It should be noted that these entitlements may be revised or enhanced, as necessary, following the conduct of a detailed measurement survey (DMS) and consultation with APs to ensure that losses are restored, if not improved. Any revisions/enhancement in the entitlements will be reflected in the updated LARAP for JICA review.

**Table 9.4.1 Entitlement Matrix**

| No | CATEGORY OF IMPACTS/LOSSES | Entitled Persons | PROJECT ENTITLEMENTS | Notes/Implementation Arrangement |
|---|---|---|---|---|
| **A. Impacts on LAND** | | | | |
| 1 | **Permanent loss of residential/commercial land** | Users/Occupants who have formal legal rights (*hak milik*) and customary and traditional rights (*adat* or *ulayat*) and those whose claim over the affected land is under application for full title | Cash or in kind compensation at replacement cost which is based on market value that reflects recent land sales and in the absence of such recent sales, based on productive value (for productive/agricultural) or based on similar location attributes (for residential and commercial land). | Local regulations, where available and applicable, shall be fully followed in the implementation process. |
| 2 | **Temporary loss of residential/commercial land** | Users/Occupants who have formal legal rights (*hak milik*) and customary and traditional rights (*adat* or *ulayat*) and those whose claim over the affected land is under application for full title | • Payment of rent for residential land based on existing or ongoing rental agreement in the area or as per negotiation with AHs. For productive land, rental will be no less than the net income that would have been derived from the affected property during disruption.<br>• Compensation for affected crops at replacement cost for the duration of the impact, and Land will be restored to pre-project condition or better | Contractor will be responsible for returning land to pre-project/better condition Local regulations, where available and applicable, shall be fully followed in the implementation process. |
| 3 | **MARGINAL IMPACTS due Permanent Loss of Land Use** | Users/Occupants who have NO formal legal rights (*hak milik*) nor customary or traditional rights (*adat* or *ulayat*)<br>: Marginal impacts: | • No compensation for land,<br>• Compensation for crops and trees based on replacement cost principle | Local regulations, where available and applicable, shall be fully followed in the implementation process. Not their main source of income |
| **B. Relocation of Ahs** | | | | |
| 1 | **Relocation of Ahs and Shop Owners due to Permanent Loss of Land Use** | Users/Occupants who have formal legal rights (*hak milik*) and customary or traditional rights (*adat* or *ulayat*) and those whose claim over the affected land is under application for full title | • Compensation for crops and trees based on replacement cost principle<br>• Provision of transport allowance based on actual cost of moving to new site (labor, transport cost) or provision of transport assistance will be provided in the form of a program within the LRP.<br>• Provision of transition subsistence allowance will be provided in the form of a program within the LRP.<br>• Entitled to participate in Livelihood restoration program | Local regulations, where available and applicable, shall be fully followed in the implementation process.<br>The LRP allowance shall be based on poverty threshold for an average 5 household members. A single person household will receive 1/5 of said amount. |
| 2 | **Relocation of Ahs and Shop Owners due to Permanent Loss of Land Use** | Informal Dwellers but Have Other Land Outside the Project Area | • No compensation for land,<br>• Compensation for structures based on replacement cost principle<br>• Compensation for crops and trees based on replacement cost principle | Local regulations, where available and applicable, shall be fully followed in the implementation process.<br>The LRP allowance shall be based on poverty threshold for an average 5 household members. A single person household will receive 1/5 of said amount. |

| No | CATEGORY OF IMPACTS/LOSSES | Entitled Persons | PROJECT ENTITLEMENTS | Notes/Implementation Arrangement |
|---|---|---|---|---|
| | | | • Provision of transport allowance based on actual cost of moving to new site (labor, transport cost) or provision of transport assistance will be provided in the form of a program within the LRP.<br>• Provision of Transition subsistence allowance will be provided in the form of program within the LRP.<br>• Entitled to participate in Livelihood restoration program | |
| 3 | **Relocation of Ahs and Shop Owners due to Permanent Loss of Land Use** | Informal Dwellers but Have NO Other Land Outside the Project Area | • No compensation for land<br>• Compensation for structures based on replacement cost principle<br>Compensation for crops and trees based on replacement cost principle<br>• For house and house-cum-shop, the Project will facilitate finding access to a residential plot (and with commercial advantage for house-cum-shops) within the village or nearby, with affordable renewable lease or lease-to-buy agreement. The area will have similar or better conditions as before and have a latrine<br>• For shops, the Project will facilitate finding access to a place/plot to lease/rent with similar commercial advantage either in existing market sites or a plot of land suitable for putting up stalls/shops (new market). Lease arrangement will be with a provision to renew and shall be facilitated by the project.<br>Provision of transport allowance based on actual cost of moving to new site (labor, transport cost) or provision of transport assistance will be provided in the form of the LRP.<br>• Provision of transition subsistence will be provided in the form of the LRP.<br>• Entitled to participate in Livelihood restoration program. | Local regulations, where available and applicable, shall be fully followed in the implementation process.<br>Individual or small group relocation sites as per AHs' final option. AHs have the option to have access to a place to rent outside the residential plot that will be facilitated by the DGH.<br>The Project will assist AHs in the determination of lease amount.<br>For vulnerable Ahs who may not have the ability to generate much income, the LRP will be designed to increase income levels sufficiently to be able to pay the full local market leases.<br>The LRP allowance shall be based on poverty threshold for an average 5 household members. A single person household will receive 1/5 of said amount. |
| **C. NON-LAND ASSETS** | | | | |
| 1a | **Houses/Shops and Secondary Structures** | Owners regardless of whether or not the owner has hak guna bangun (building permit) | • Compensation at replacement cost based on actual current market prices of materials and actual cost of labor for dismantling, transfer and rebuilding | Local regulations, where available and applicable, shall be fully followed in the implementation process. |
| 1b | **Houses/Shops and Secondary Structures** | Renters of Structures (house/shops) | • Assistance to tenants/renters to find a new place to live or do business<br>• Assistance to find new rental property<br>• Entitled to participate in Livelihood restoration program. | Local regulations, where available and applicable, shall be fully followed in the implementation process. |

| No | CATEGORY OF IMPACTS/LOSSES | Entitled Persons | PROJECT ENTITLEMENTS | Notes/Implementation Arrangement |
|---|---|---|---|---|
| 2 | **Public Infrastructure and Facilities** | Owner (Government) | • Rebuild the facilities based on agreement by both parties. | |
| 3 | **Crops and Trees** | Owner | Annual Crops. If standing crops are destroyed or cannot be harvested, compensation based on replacement cost principle<br>• Perennial Crops.<br>Compensation based on replacement cost<br>• Timber Trees.<br>Compensation at current market rates based on type of tree and diameter of trunk at breast height | Local regulations, where available and applicable, shall be fully followed in the implementation process. |
| **D . INCOME LOSS** | | | | |
| 1 | **Significant Impact Due to Relocation of Shops or House-cum-shops** | House-cum-shop and shop-owners whether or not with land outside the Project Area | • Entitled to participate in the Livelihood Restoration Program (LRP) | The LRP allowance shall be based on poverty threshold for an average 5 household members. A single person household will receive 1/5 of said amount. |
| **E . HIGH RISK OF IMPOVERISHMENT /HARDSHIP** | | | | |
| 1 | Due to loss of resource base | Poor and vulnerable Households even if marginally affected | Entitled to participate in the Livelihood Restoration Program and LRP Allowance | "LRP allowance" will be provided to participants using a poverty threshold for an average 5 household members. A single person household will receive 1/5 of said amount.<br>AHs can take part in the program and in the process of restoring their income. |
| **F. IMPACTS DURING CONSTRUCTION** | | | | |
| 1 | Non-Land Assets | Owners of affected non land assets | Compensation at Replacement Cost as indicated above | |

Source: JICA MARIP Preparatory Survey Team(March 2011) referring to the FLARAP for Upper Citarum Basin Tributaries Flood Management Project (August 2010)

(2) Livelihood Restoration Program (LRP)

In the FLARAP, the Livelihood Restoration Program (LRP), which is the Project Resettlement Policy, was proposed for the MARIP specifically. The LRP will apply to fill the gaps in terms of providing compensation at full replacement cost, to assist in restoration of livelihood and living standard and to consider the vulnerable groups including squatters as mentioned above. The basic compensation policies applied in the FLARAP using LRP are as follows; (see Table 9.4.2).

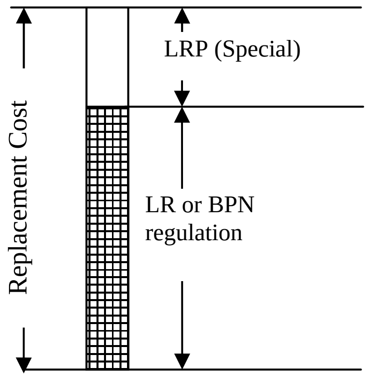
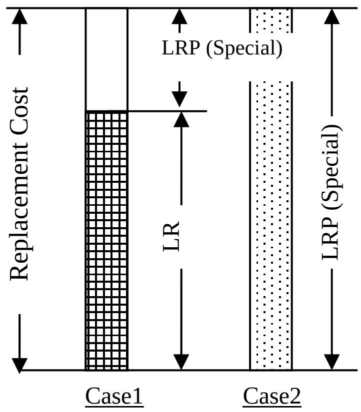
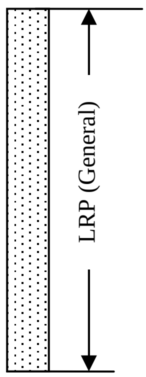
- In the case that there are local regulations available regarding compensation, affected persons (APs) will be entitled to compensation as stipulated in the existing local government regulation available at the time of implementation.
- In the case that there are no local regulations available regarding compensation, APs will be entitled to replacement cost as described in the entitlement matrix.
- In the case that there are any gaps in the compensation cost of local regulations and replacement cost, the gaps will be filled in the form of the special program, the Livelihood Restoration Program (LRP).
- “Assistance for restoration of livelihood and living standard” and “Paying attention to vulnerable groups” will be considered in the form of a general program of the Livelihood Restoration Program (LRP).
- Allowances defined in the entitlement matrix will be provided as cash or in kind or alternatively may be provided in the form stipulated in the LRP.

The concept of the “Livelihood Restoration Program” has been proposed in the Preparatory Survey by JICA for Upper Citarum Basin Tributaries Flood Management Project in Indonesia (2010). Note that the original concept of the LRP came from the “Integral Citarum Water Resources Management Investment Program funded by ADB (2008),

The eligibilities and the contents of the LRP will be decided through consultation with the Aps to be held in the updating of LALAP in the loan implementation stage. The expected contents of the LRP are as follows.

- Training for skills acquisition for job placement
- Micro-finance for small-scale business
- Assistance on land lease agreement for landless Aps who will start small business
- Others

**Table 9.4.2 Basic Compensation Policies Applied in the RAP**

| Compensation Items | Legal Occupant | Squatter |
|---|---|---|
| Land | The compensation cost for land will be basically determined based on the BPN regulation/ mayoral decree with several considerations such as land transaction results in the last 6 months, NJOP as well as market price. Note that the cost will be examined in the process of LARAP updating. | None |
| Property (Crops, Buildings) |  |  |
| Assistance for Restoration of Livelihood and Living Standard |  The eligibility groups and the amount for LRP (General) will be identified in the LARAP preparation Updating. | |
| Paying attention to vulnerable groups | | |

Source: JICA MARIP Preparatory Survey Team (March 2011)

- LR: Local Regulation on compensation
- BPN regulation : Compensation cost based on Indonesian Regulation decided by BPN
- LRP (Special): Special Program for Livelihood Restoration Program:
- LRP (General): General Program for Livelihood Restoration Program:
- Case1: Local Regulations available
- Case2: Local Regulations not available

# 9.5 LARAP Preparation

## 9.5.1 General

LARAPs for each subproject were prepared based on the FLARAP with a sub-contract under financial assistance of JICA. The terms of reference for the LARAP preparation refer to **Vol. 3 LARAP**.

The selected LARAP Preparation team of the local consultant company (herein after "Survey Team") prepared LARAPs under supervision of the member of JST based on the work schedule as shown below. (Table 9.5.1)

**Table 9.5.1 Implementation Schedule for LARAP Preparation**

| | April | | | | May | | | | June | | | | July | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Preparation | | | ■ | | | | | | | | | | | | | |
| Data Collection | | | ■ | ■ | ■ | ■ | | | | | | | | | | |
| Field Survey | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| Data Analysis | | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | |
| Socialization | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | |
| Report Preparation | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | |

Source: JICA Survey Team

The LARAPs for three (3) projects out of ten (10) sub-projects were not prepared due to the reasons mentioned below.

(1) Semanggi

This is an existing clover-leaf type intersection. The final improvement plan has not been established although several alternatives for improvement of the existing intersection have been considered. The LARAP will not be prepared for this sub-project because the intersection improvement under any of the alternatives will not require additional land acquisition due to the improvement activities being completely within existing intersection area.

(2) Sulawesi - Tg.PA

The Sulawesi - Tg.PA is a part of the Tanjung Priok Access Road. The LARAP for the Sulawesi - Tg.PA will not be conducted because the land acquisition for the project will be conducted as s part of x Tanjung Priok Access Road Project.

The JST conducted an interview with the Land Acquisition Office Tanjung Priok Access Road to grasp the current status of land acquisition for the Sulawesi section on 23rd June 2011. The summary of the present condition for the project is as follows.

- The inventory of loss survey at Jl. Sulawesi is being carried out now, therefore the data processing for the section has not been completed.
- The Land Acquisition Team will offer the latest NJOP to AH as compensation cost for land.
- The compensation cost for structures and trees will be calculated based on the latest local government regulations.
- They have no plan to provide a livelihood restoration program to the AH's.

(3) Senayan

The LARAP for Senayan must wait for the final conclusions on the improvement plan. As for the intersection, serious traffic congestion in this intersection is predicted by MPW DGH after completion of the Antasari - Block M elevated non-toll project. There are several discussions among many stakeholders on the improvement plan including improvement through soft components for the intersection. The discussion has not come to a conclusion yet.

### 9.5.2 Project Description for Selected Sub-Projects

The summary of the project component for sub-projects is shown below.

**Table 9.5.2 Summary of the project component for sub-projects**

| No. | Sub-Project | Structure type | Approximately length of structure | Number of lanes | |
|---|---|---|---|---|---|
| | | | | Main road | Frontage road |
| 1 | Semanggi | Road improvement | 217m | - | - |
| 2 | R.E.Martadinata | Overpass | 725m | 2 lanes each way | 2 lane each way |
| 3 | Sulawesi - Tg.PA | Overpass | 318m | 2 lanes each way | 2 lanes each way |
| 4 | Kuningan | Underpass | 1,018m | 2 lanes each way | 2 lanes each way |
| 5 | Pancoran | Overpass | 634m | 2 lanes for 1 direction | 2 lanes for 1 direction |
| 6 | Pinang Baris | Overpass | 533m | 2 lanes each way | 2 lanes each way |
| 7 | Katamso | Underpass | 360m | 2 lanes each way | 2 lanes for 1 direction |
| 8 | Sudirman II | Overpass | 570m | 2 lanes each way | 2 lanes each way |
| 9 | Cikarang | Road improvement (Jl. Karimalan) and 3 bridges | Road improvement 2km<br>FO: 71m<br>Overpass: 190m<br>Bridge: 50m | 1 lane each way | - |
| 10 | Senayan | - | - | - | - |

Source: JICA Survey Team

### 9.5.3 Field Survey

(1) Identification of Project boundaries

In order to identify the project boundaries, the corridor of impact (COI) of the Project has been marked on the preliminary designs for each sub-project prepared by JST. The information regarding the ROW was provided by the related Spatial agencies.

(2) Field Survey

The field survey necessary for LARAP preparation consists of a census, inventory of loss (IOL) survey and socio-economic survey. These surveys were conducted based on the results of the preliminary designs for each sub-project. Note that the surveys were conducted for all project affected households (Ahs)

The data collected during the IOL will constitute the formal basis for determining AP entitlements and levels of compensation. For each AP, the scope of the data will include:

- Total and affected areas of land, by type of land assets;
- Total and affected areas of structures, by type of structure (main or secondary);
- Legal status of affected land and structure assets, and duration of tenure and ownership;
- Quantity and types of affected crops and trees;
- Quantity of other losses, e.g., business or other income, jobs or other productive assets; estimated daily net income from informal shops;
- Quantity/area of affected common property, community or public assets, by type;
- Summary data on AHs, by ethnicity, gender of head of household, household size primary and secondary source of household income vis-à-vis poverty line, income level, whether household is headed by women, elderly, disabled, poor or indigenous peoples;
- Identify whether affected land or source of income is primary source of income; and
- AP knowledge of the subproject and preferences for compensation and, as required, relocation sites and rehabilitation measures.

The purpose of the socioeconomic survey is to provide baseline data on APs to assess resettlement impacts, and to be sure proposed entitlements are appropriate, and to be used for resettlement monitoring. The scope of data to be collected includes:

- Household head: name, sex, age, livelihood or occupation, income, education and ethnicity;
- Household members: number, livelihood or occupation, school age children and school attendance, and literacy, disaggregated by gender;
- Living conditions: access to water, sanitation and energy for cooking and lighting; ownership of durable goods; and
- Access to basic services and facilities.

The interview form that covers all issues mentioned above was developed for the field survey in Bahasa Indonesia (**Vol. 3 LARAP**) The interviews were conducted by survey team members by visiting each PAP.

### 9.5.4 Replacement Cost Survey

The FLARAP of the MARIP stipulated the basic principle for compensation cost that "all compensation for affected land and non-land assets owned by households/shop owners who meet the cut-off date will be based on the principle of replacement cost and existing government regulations for compensation calculations for buildings, crops and trees will be used if available".

Based on the FLARAP policies, the LARAP survey team conducted a replacement cost survey to determine the compensation cost based on the principle of "replacement cost" for affected land and structures. The replacement cost survey consists of data collection from related agencies, comparative analysis and discussion regarding the collected data and decision on compensation cost for MARIP.

(1) Data Collection

a) Existing Local Government Regulations for compensation

As mentioned in the FLARAP, if the local government regulations which stipulate compensation cost for buildings, crops and trees are available, the unit costs will be used as replacement costs.The local governments where the subprojects located are as follows.

**Table 9.5.3 Related Local Governments**

| | local government | subprojects |
|---|---|---|
| 1 | DKI | Semanggi, R.E.Martadinata, Sulawesi - Tg.PA, Kuningan, Pancoran, Senayan |
| 2 | Bekasi regency | Cikarang |
| 3 | Tangerang City | Sudirman II |
| 4 | Medan Cit | Pinang Baris ,Katamso, |

Source: JICA Survey Team for MARIP

As the survey results, all the related local governments have their own compensation regulations for public development. The identified local regulations are shown in Table 9.5.4. Note that those regulations stipulate values only for buildings, crops and trees not for land.

**Table 9.5.4 Local Government Regulations on Compensation Cost**

| | local government | Regulations |
|---|---|---|
| 1 | DKI | "Guidelines for Implementation on valuation of Compensation Rates " :Decision of the Head of Housing Department and Local Government Buildings, Province of DKI No.2/2009 **(Vol. 3 LARAP)** |
| 2 | Bekasi regency | "Standard compensation rates for buildings and crops affected by government projects 2008" Decision of Governor **(Vol. 3 LARAP)** |
| 3 | Tangerang City | "Standard compensation rates for buildings and crops affected by government projects in the 2011 budget year for the city of Tangerang" Decision of Mayor 2011**(Vol. 3 LARAP)** |
| 4 | Medan City | "Determining the value of building prices as a basic assessment of the costs of building inspection and assessment of damages in Kota city" Decision of Mayor 2010 **(Vol. 3 LARAP)** |

Source: JICA Survey Team for MARIP

b) Interviews on the results of the actual transactions on land and houses to each related Kelurahan.

The Kelurahan, which are the administrative bodies under Kecamatan（Sub-district）, hold the records of market prices for transactions on real estate including the land and houses of the communities.

The sub-projects of the MARIP belong to the Kelurahan as shown below.

**Table 9.5.5 List of Related Kelurahan**

| | Sub-Project | Kelurahan etc |
|---|---|---|
| 1 | Semanggi | Karet Semanggi, Gelora |
| 2 | R.E.Martadinata | Tanjung Priok |
| 3 | Sulawesi - Tg.PA | Tanjung Priok ,Kebon Bawang, Koja Utara |
| 4 | Kuningan | Kuningan Timur, Karet Kuningan, Kuningan Barat |
| 5 | Pancoran | Pancoran |
| 6 | Pinang Baris | Cinta Damai,M. Helvitia,.Lalang |
| 7 | Katamso | Titi Kuning, Johor, Pangkalan, Mashyur, Johor |
| 8 | Sudirman II | Buaran Indah |
| 9 | Cikarang | Tanjungsari, Cikarang Kota, Karangbaru, Karangasih, Karangharja, waluya, Kalijaya |
| 10 | Senayan | Gunung,Selong,Senayan, .Gelora |

Source: JICA Survey Team for MARIP

The LARAP Survey team visited all related kelurahan offices to investigate the market prices for land and houses at each kelurahan. The interviews were conducted with the head of the kelurahan. Note that it was not allowed to make photocopies of original data.

The results of the interviews are as shown in Table 9.5.6.

**Table 9.5.6 Market Price for land and House through interviews with related Kelurahan**

| No. | Kelurahan | Land(Rp./m2) | | House( Rp./m2) | |
|---|---|---|---|---|---|
| | | Lowest | Highest | Lowest | Highest |
| **I. DKI** | | | | | |
| South Jakarta | | | | | |
| 1 | Kel.Kuningan Barat | 1,573,000 | 24,625,000 | 700,000 | 5,500,000 |
| 2 | Kel.Karet Kuningan | 5,000,000 | 25,000,000 | 700,000 | 5,500,000 |
| 3 | Kel.Selong | 10,455,000 | 13,125,000 | 700,000 | 5,500,000 |
| 4 | Karet Semanggi | 5,000,000 | 25,000,000 | 700,000 | 5,500,000 |
| 5 | Kuningan Timur | 5,000,000 | 25,000,000 | 700,000 | 5,500,000 |
| 6 | Kel.Senayan | 40,000 | 10,000,000 | 700,000 | 5,500,000 |
| 7 | Kel.Gunung | 1,000,000 | 20,000,000 | 700,000 | 5,500,000 |
| 8 | Kel.Pancoran | 1,000,000 | 20,000,000 | 700,000 | 5,500,000 |
| Central Jakarta | | | | | |
| 1 | Kel.Bendungan Hilir | 4,000,000 | 10,000,000 | 700,000 | 5,500,000 |
| 2 | Kel.Gelora | 1,000,000 | 20,000,000 | 700,000 | 5,500,000 |
| North Jakarta | | | | | |
| 1 | Koja | 1,000,000 | 6,305,000 | 700,000 | 5,500,000 |
| 2 | Tanjung Priok | 1,000,000 | 10,000,000 | 700,000 | 5,500,000 |
| **II. Bekasi regency** | | | | | |
| 1 | Tanjung Sari – Cikarang Utara | 64,000 | 916,000 | 595,000 | 614,000 |
| 2 | Cikarang Kota – Cik Uatara | 64,000 | 916,000 | 595,000 | 614,000 |
| 3 | Wangunharja- Cikarang Utara | 394,000 | 800,000 | 834,000 | 1,200,000 |
| 4 | Pasir Sari – Cikarang Barat | 394,000 | 800,000 | 834,000 | 1,200,000 |
| **III. Tangerang City** | | | | | |
| 1 | Tanah Tinggi – Kec.Tangerang | 200,000 | 1,500,000 | 1,000,000 | 1,200,000 |
| 2 | Buaran Indah | 200,000 | 1,500,000 | 1,000,000 | 1,200,000 |
| **IV. Medan City** | | | | | |
| 1 | Lalang – Kec. Medaan Sunggal | 3,000,000 | 5,000,000 | 600,000 | 1,500,000 |
| 2 | Cinta damai – Kec. Medan Helvitia | 3,000,000 | 5,000,000 | 500,000 | 1,000,000 |
| 3 | Titi Kuning – Kec. Medan Johor | 3,000,000 | 4,000,000 | 900,000 | 1,200,000 |
| 4 | Pangkalan Mashyur – Kec. Medan Johor | 1,500,000 | 3,000,000 | 800,000 | 1,000,000 |

Source: JICA Survey Team for MARIP based on interviews to related Kelurahan offices

c) Investigation on the "NJOP for land and buildings" at each related Tax office

The LARAP Survey team visited all related tax offices to collect NJOP for land and buildings. The team succeeded in obtaining some original copies for NJOP but basically the investigation was conducted through interviews with the persons in charge.

**Table 9.5.7 NJOP for Land and Buildings at subproject location**

| No. | Kelurahan | NJOP(Land) (Rp./m2) | | NJOP(Building) (Rp./m2) | |
|---|---|---|---|---|---|
| | | Lowest | Highest | Lowest | Highest |
| **I. DKI** | | | | | |
| South Jakarta | | | | | |
| 1 | Kel.Kuningan Barat | 11,305,000 | 20,755,000 | 834,000 | 1,200,000 |
| 2 | Kel.Karet Kuningan | 18,375,000 | 24,625,000 | 834,000 | 1,200,000 |
| 3 | Kel.Selong | 8,755,000 | 11,305,000 | 834,000 | 1,200,000 |
| 4 | Karet Semanggi | 11,305,000 | 25,995,000 | 834,000 | 1,200,000 |
| 5 | Kuningan Timur | 8,755,000 | 15,105,000 | 834,000 | 1,200,000 |
| 6 | Kel.Senayan | 11,305,000 | 27,405,000 | 834,000 | 2,200,000 |
| 7 | Kel.Gunung | 8,755,000 | 13,100,000 | 834,000 | 1,200,000 |
| 8 | Kel.Pancoran | 13,100,000 | 18,375,000 | 834,000 | 1,200,000 |
| Central Jakarta | | | | | |
| 1 | Kel.Bendungan Hilir | 3,375,000 | 16,155,000 | 834,000 | 1,200,000 |
| 2 | Kel.Gelora | 2,013,000 | 15,105,000 | 834,000 | 1,200,000 |
| North Jakarta | | | | | |
| 1 | Koja | 1,032,000 | 5,605,000 | 595,000 | 968,000 |
| 2 | Tanjung Priok | 1,032,000 | 6,805,000 | 834,000 | 1,200,000 |
| **II. Bekasi regency** | | | | | |
| 1 | Tanjung Sari – Cikarang Barat | 64,000 | 916,000 | 595,000 | 614,000 |
| 2 | Cikarang Kota – Cik Barat | 64,000 | 916,000 | 595,000 | 614,000 |
| 3 | Wangun Harja – Cikarang Utara | 394,000 | 800,000 | 834,000 | 1,200,000 |
| 4 | Pasir Sari – Cik Utara | 394,000 | 800,000 | 834,000 | 1,200,000 |
| **III. Tangerang City** | | | | | |
| 1 | Tanah Tinggi – Kec.Tangerang | 394,000 | 614,000 | 823,000 | 1,200,000 |
| 2 | Buaran Indah | 394,000 | 614,000 | 823,000 | 1,200,000 |
| **IV. Medan City** | | | | | |
| 1 | Lalang – Kec. Medaan Sunggal | 2,013,000 | 2,508,000 | 595,000 | 1,516,000 |
| 2 | Cinta damai – Kec. Medan Helvitia | 802,000 | 2,352,000 | 429,000 | 968,000 |
| 3 | Titi Kuning – Kec. Medan Johor | 1,274,000 | 1,862,000 | 823,000 | 1,200,000 |
| 4 | Pangkalan Mashyur – Kec. Medan Johor | 1,573,000 | 1,573,000 | 968,000 | 968,000 |

Source: Price tax ( NJOP) land and buildings from the Tax Office of Land and buildings

(2) Analysis and compensation cost

The existing local regulations for compensation cost will be respected in consideration of compensation cost based on the principle of "Replacement Cost". However, the cost contained in the regulations should be examined for appropriateness for the replacement cost. The examination for the replacement cost will be conducted for land and buildings separately because the local regulations don't have compensation cost for land.

The collected data for compensation cost for buildings is summarised as shown in Table 9.5.8.There is no information on the building specifications such as permanent or semi-permanent in the information of market price and NJOP. There are considerable differences in those unit costs depending on the location even in the same Kelurahan. The unit costs of local regulations exceed those of NJOP and show almost the same value as the market prices obtained at related Kelurahan. Therefore, the unit costs of the local regulations are considered as acceptable for replacement costs for buildings.

**Table 9.5.8 Comparative Analysis on Compensation Costs for Buildings (Rp./m$^2$)**

| | DKI JKT | | |
|---|---|---|---|
| | Local Regulation | Market Price | NJOP |
| Permanent | 1,586,000 | 700,000 - 5,500,000 | 834,000 -1,200,000 |
| Semi-Permanent | 684,000 | | |
| | | | |
| | Bekasi | | |
| | L.R | Market Price | NJOP |
| Permanent | 3,685,000 | 500,000 -2,000,000 | 595,000 - 1,200,000 |
| Semi-Permanent | 1,283,000 | | |
| | | | |
| | Tangerang | | |
| | L.R | Market Price | NJOP |
| Permanent | 1,692,000 | 1,000,000 - 1,200,000 | 823,000 -1,200,000 |
| Semi-Permanent | 807,000 | | |
| | | | |
| | Medan | | |
| | L.R | Market Price | NJOP |
| Permanent | 1,685,400 | 600,000 - 1,500,000 | 429,000 - 1,516,000 |
| Semi-Permanent | 746,125 | | |

Source: JICA Survey Team for MARIP

Table 9.5.9 shows the results of analysis of compensation cost for land.

**Table 9.5.9 Results of analysis for compensation cost for land (Rp./m$^2$)**

| DKI JKT | |
|---|---|
| Market Price | NJOP |
| 40,000 - 25,000,000 | 1,032,000 - 25,995,000 |
| | |
| Bekasi Regency | |
| Market Price | NJOP |
| 50,000 -800,000 | 64,000 -916,000 |
| | |
| TangerangnCuty | |
| Market Price | NJOP |
| 200,000 - 1,500,000 | 394,000 -614,000 |
| | |
| Medan City | |
| Market Price | NJOP |
| 1,500,000 - 5,000,000 | 802,000 -2,508,000 |

Source: JICA Survey Team for MARIP

The market prices obtained at related Kelurahan sometimes showed considerable differences depending on the location and other conditions even in the same Kelurahan. However, the prices could be considered as most appropriate costs for replacement costs because the prices reflect the results of actual transactions in terms of land and buildings. The NJOP collected at the same Kelurahan showed lower values than the market prices, excepting special case such as "Semmangi"

The LARAP will be updated after completion of the detailed design for each sub-project. This means that the consideration on the compensation cost at the moment should be based on a conservative attitude. Therefore, the highest unit cost for land and buildings obtained in the related kelurahan will be applied as "replacement cost" in the LARAP preparation. The results of the consideration of the compensation costs based on the replacement costs are shown in Table 9.5.10. Note that the calculation for the budget for implementation of land acquisition in the LARAPs for sub-projects will be conducted based on the unit costs shown below.

**Table 9.5.10 List of Unit costs for each Sub-project (references: NJOP)**

| | Sub-project | Land (Rp./m2) | Building (Rp./m2) | | Land (NJOP) (Rp./m2) | Bld. (NJOP) (Rp./m2) |
|---|---|---|---|---|---|---|
| | | | Permanent | Semi-Permanent | | |
| 1 | Semanggi | 25,000,000 | 1,586,000 | 684,000 | 25,995,000 | 1,200,000 |
| 2 | R.E.Martadinata | 10,000,000 | 1,586,000 | 684,000 | 6,805,000 | 1,200,000 |
| 3 | Sulawesi - Tg.PA | 10,000,000 | 1,586,000 | 684,000 | 6,805,000 | 1,200,000 |
| 4 | Kuningan | 25,000,000 | 1,586,000 | 684,000 | 15,105,000 | 1,200,000 |
| 5 | Pancoran | 20,000,000 | 1,586,000 | 684,000 | 18,375,000 | 1,200,000 |
| 6 | Pinang Baris | 5,000,000 | 1,685,400 | 746,125 | 2,508,000 | 1,516,000 |
| 7 | Katamso | 5,000,000 | 1,685,400 | 746,125 | 2,508,000 | 1,516,000 |
| 8 | Sudirman II | 1,500,000 | 1,692,000 | 807,000 | 614,000 | 614,000 |
| 9 | Cikarang | 800,000 | 3,685,000 | 1,283,000 | 800,000 | 823,000 |
| 10 | Senayan | 20,000,000 | 1,586,000 | 684,000 | 13,100,000 | 1,200,000 |

Source: JICA Survey Team for MARIP

### 9.5.5 Decision on a Full or an Abbreviated LARAP

According to the OP.4.12 of WB, a LARAP is required for all operations that entail involuntary resettlement unless otherwise specified. Note that where impacts on the entire displaced population are minor, or fewer than 200 people are displaced, an Abbreviated LARAP will be agreed with the borrower.

(1) Contents of LARAP

The scope and level of detail of the LARAP vary with the magnitude and complexity of resettlement. The LARAP covers the elements below, as relevant.

- Description of the project (General description of the project and identification of the project area)
- Potential impacts (Identification of the project components or activities, the zone of impact of such components or activities etc.)
- Objectives
- Socioeconomic studies (The findings of socioeconomic studies)
- Legal framework (The findings of an analysis of the legal framework)
- Institutional Framework (The findings of an analysis of the institutional framework)
- Eligibility (Definition of displaced persons and criteria for determining their eligibility for compensation and other resettlement assistance)
- Valuation of and compensation for losses

- Resettlement measures (A description of the packages of compensation and other resettlement measures)
- Site selection, site preparation, and relocation (Alternative relocation sites considered and explanation of those selected)
- Housing, infrastructure, and social services (Plans to provide housing, infrastructure and social services)
- Environmental protection and management
- Community participation (Involvement of resettlers and host communities)
- Integration with host populations (Measures to mitigate the impact of resettlement on any host communities)
- Grievance procedures
- Organizational responsibilities (The organizational framework for implementing resettlement)
- Implementation schedule
- Costs and budget
- Monitoring and evaluation

(2) Abbreviated LARAP

In case of an abbreviated LARAP it covers the following minimum elements.

- A census survey of displaced persons and valuation of assets;
- Description of compensation and other resettlement assistance to be provided;
- Consultations with displaced people about acceptable alternatives;
- Institutional responsibility for implementation and procedures for grievance redress;
- Arrangements for monitoring and implementation; and
- A timetable and budget

### 9.5.6 Summary of LARAP for Sub-projects of MARIP

**Table 9.5.11 Summary of LARAP for Sub-projects of MARIP**

| No. | Sub-project | No. of AHs | No. of PAPs | Affected Land (m2) | Affected Structures (m2) | Remarks |
|---|---|---|---|---|---|---|
| 1 | Semanggi | - | - | - | - | - |
| 2 | R.E.Martadinata | 38 | 132 | 622 | 662 | **Vol. 3 LARAP** |
| 3 | Sulawesi - Tg.PA | - | - | - | - | - |
| 4 | Kuningan | 117 | 184 | 2,096 | 506 | **Vol. 3 LARAP** |
| 5 | Pancoran | 0 | 0 | 487 | 0 | **-ditto-** |
| 6 | Pinang Baris | 186 | 320 | 6,157 | 2,763 | **-ditto-** |
| 7 | Katamso | 41 | 61 | 398 | 217 | **-ditto-** |
| 8 | Sudirman II | 29 | 73 | 5,644 | 934 | **-ditto-** |
| 9 | Cikarang | 91 | 292 | 383 | 2,027 | **-ditto-** |
| 10 | Senayan | - | - | - | - | - |

Source: JICA Survey Team for the MARIP

## 9.6 Implementation Arrangement

(1) Executing and Implementing Agencies

The Directorate General of Highways (DGH) of the Ministry of Public Works will have overall responsibility for ensuring satisfactory implementation of the Project. The implementing agencies, the Project Implementation Unit (PIU) of Balai Basar, together with the Resettlement Working Group (RWG) of each local government, will be responsible for the updating and implementation of the LARAP as per approved FLARAP.

The PIU will assign one (1) senior staff member and 4 assistants who will coordinate with the RWG of the related local governments (DKI, Tangerang City, Bekasi Regency and Medan City).

The functions of the RWG include the following:

a) Carry out the survey investigations for updating of the LARAP;

b) Carry out consultations with the AHs and distribution of the draft and final LARAP document;

c) Update and approve the replacement costs;

d) Prepare relocation plans during LARAP updating and finding relocation areas for AHs with similar or better conditions than before. For affected shops, facilitate finding suitable place/plot to lease/rent (existing/new markets) within/nearby the project site in its villages, with a provision to renew;

e) Provide special attention to poor and vulnerable AHs through consultation and ensure that their concerns and special needs are addressed during LARAP updating and implementation;

f) Design and implement the livelihood restoration program (LRP);

g) Prepare the necessary vouchers and other documentation to facilitate the expeditious processing of the compensation for the AHs and deliver compensation payments to the AHs;

h) Receive complaints, verbal or written, from the AHs and ensure that these are brought to the attention of the Bupati or Walikota for appropriate action;

i) Maintain a record of all public meetings, complaints, and actions taken to address complaints and grievances at the District/City level; and

j) Submit quarterly progress reports on LARAP updating and implementation (payments, relocations, income restoration) to the Sub Directorate Bina Program Directorate General of Highways.

(2) Regency/City/Municipality

The Bupati (Head of Regency) or Walikota (Mayor) will provide the main workforce in the preparation and implementation of the LARAP. The Bupati or Walikota will have the following functions:

a) Issue a Decree for establishing a Land Acquisition Committee

b) Issue a Decree on the unit costs of affected assets based on replacement costs and/or market rates;

c) Manage the funds for paying the compensation to AHs for lost assets; and

d) Assist in the expeditious and judicious resolution of complaints of AHs.

(3) Land Acquisition Committee

Land procurement related to public interest in a Regency/City area is done by the Land Procurement Committee of the Regency/City, which is formed by the Bupati/Mayor.

a) To carry out the survey and inventory of land, buildings, crops and other existing objects, which are attached to the land that will be released or delivered.

b) To conduct the survey regarding the legal status of land that will be released or delivered, and the supporting documents.

c) To estimate and propose the amount of compensation for the land which will be released or delivered.

d) To provide clarification or information disclosure (consultation) to the community that will be affected by the development plan, by means of public consultations, either by meetings, press (print), or electronic media, so that anyone in the community who will be affected by the development plan, will be informed.

e) To deliberate with all landowners and the government and/or local government institutions that need land, in order to stipulate the type and/or amount of compensation.

f) To witness the transferring of compensation implementation to the owners of the land, buildings, crops, and other existing objects on the land.

g) To prepare the minutes of the land rights release or delivery.

h) To file and document all of the land procurement files, and send them to the competent body/institution.

(4) Project Implementation Consultants (PIC)

The PIC will conduct the detailed design and construction supervision. The PIC will assist the executing and implementing agencies to carry out the detailed measurement surveys and replacement costs surveys in the process of the LARAP updating and implementation.

(5) LARAP Updating

The inventory of loss conducted in the preparation of this LARAP is based only on the preliminary design. The information on the concerns, preferences, and suggestions on relocation and rehabilitation options etc. of AHs were collected through initial consultation with AHs in the socio-economic survey. The budget estimated compensation costs based on replacement costs which stands on the safe side.

LARAP updating will be carried out following detailed design during loan implementation so that the LARAP would reflect the final condition of affected land and properties and latest compensation costs based on the replacement costs. The entitlement matrix will be also updated in terms of corresponding entitlements and livelihood restoration programs based on actual impacts to AHs.

Resettlement implementation including disbursement of payment to AHs, land clearance and relocation of AHs can only commence when the updated LARAP has been reviewed and confirmed by JICA.

## 9.7 Tentative Implementing Schedule for Land Acquisition

**Table 9.7.1 Tentative Implementing Schedule for Land Acquisition**

| | 2012 | 2013-2014 | 2016-2018 | 2019 |
|---|---|---|---|---|
| | 1 2 3 4 5 6 7 8 9 10 11 12 | 1 2 3 4 5 6 7 8 9 10 11 12 | 1 2 3 4 5 6 7 8 9 10 11 12 | 1 2 3 4 5 6 7 8 9 10 11 12 |
| Loan | L/A ▼ → | → | → | → 7 years |
| Project | Selection for Consultants; Design | Design; Selection for Contractors | Constructions | Constructions |
| Land Acquisition | | Updating & Implementation LARAP | | |

Source: JICA Survey Team for MARIP

## 9.8 Recommendations and Proposal

(1) Necessary action for Implementation of land acquisition by Executing Agency

In order to commence the land acquisition activities for the MARIP, it is necessary that the Executing Agency （DGH） prepare a proposal 1 year before, at the latest, describing the:

a) Goals and objectives of construction

b) Place and location of construction

c) Required land size/area

d) Financing source

e) Feasibility analysis of the construction planning, also include the construction impact as well as the prevention and controlling efforts towards that impact

(2) Schedule for LARAP Updating

The LARAPs were prepared within a limited time schedule. The landowners or owners of properties were not identified due to their absence in some cases. Therefore, it will be important to ensure enough time for LARAP updating including DMS and replacement cost survey. In order to secure the necessary time for those activities, the selection of the PIC without delay after the loan agreement for the MARIP and the preparation of LARAP updating will be necessary.

(3) Stakeholders Meetings

The appropriate information disclosure and close consultation with the PAPs through stakeholders meetings in the process of the LARAP updating is indispensable. The results of the updated LARAP should be disclosed to PAPs at stakeholders meetings to finalise the appropriate LARAP which incorporate various opinions from PAPs.

# CHAPTER 10. EVALUATION OF SUB-PROJECTS

## 10.1 Evaluation Method

Multi criteria analysis with a weighted point system is applied for the evaluation of sub projects in the 2nd stage. The multi criteria was set and partially used for the selection of sub projects in the 1st stage. For multi criteria analysis, basically these 3 criteria groups shall be considered for the evaluation.

Group-1 Necessity (3 criteria) : Planning, Existing Study, Railway Crossing

Group-2 Effectiveness (3 criteria) : Traffic Volume, Construction Cost, EIRR

Group-3 Construction (5 criteria) : Construction Period, Noise/Vibration, Resettlement, Aesthetic Features, Maintenance

## 10.2 Multi Criteria Analysis

From the 3 groups a total of 11 criteria are used for multi criteria analysis, but the weighted points for each criteria are difficult to decide. Therefore for comparison, 3 scenarios are set with different weighted points as below and detailed in Table 10.2.1.

Scenario-1 : Necessity gets 50 points, and other groups get 25 points each

Scenario-2 : Effectiveness gets 50 points, and other groups get 25 points each

Scenario-3 : Construction gets 50 points, and other groups get 25 points each

**Table 10.2.1 Multi Criteria**

| | | 1st stage | Pointing System | | Scenario-1 (Necessity) | | | Scenario-2 (Effectiveness) | | | Scenario-3 (Construction) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | + / - | Point | Method | Weight | Score | | Weight | Score | | Weight | Score | |
| Necessity | Planned in Any Master Plan | + | 10 | 10 (if any MP), 0 (nothing) | 2.0 | 20 | 50 | 1.0 | 10 | 25 | 1.0 | 10 | 25 |
| | Existing Study (FS, DD) | + | 10 | 10(up to DD), 5(any Study), 0(nothing) | 1.0 | 10 | | 0.5 | 5 | | 0.5 | 5 | |
| | Railway Crossing | + | 10 | 10 (if railway crossing), 0 (others) | 2.0 | 20 | | 1.0 | 10 | | 1.0 | 10 | |
| Effectiveness | Traffic Volume | | 10 | (Value-min) / (max-min) * 10 | 1.0 | 10 | 25 | 2.0 | 20 | 50 | 1.0 | 10 | 25 |
| | Construction Cost | | 10 | (Value-min) / (max-min) * 10 | 0.5 | 5 | | 1.0 | 10 | | 0.5 | 5 | |
| | EIRR | | 10 | (Value-min) / (max-min) * 10 | 1.0 | 10 | | 2.0 | 20 | | 1.0 | 10 | |
| Construction | Conflict with Other Project | - | - | * if any conflict, not selected to 2nd stage * | | | 25 | | | 25 | | | 50 |
| | Construction Period | | 10 | 10 (<18Mos), 5 (18-24Mos), 0 (24Mos<) | 1.0 | 10 | | 1.0 | 10 | | 2.0 | 20 | |
| | Noise/Vibration, Construction Difficulty | | 10 | 10 (rare), 5(moderate), 0(heavy) | 0.3 | 3 | | 0.3 | 3 | | 0.6 | 6 | |
| | Resettlement Households | | 10 | 10 (<10), 5(10-50), 0 (50<) | 0.5 | 5 | | 0.5 | 5 | | 1.0 | 10 | |
| | Aesthetic Feature | | 10 | 10(road only), 5(underpass), 0(flyover) | 0.3 | 3 | | 0.3 | 3 | | 0.6 | 6 | |
| | Maintenance | | 10 | 10(less maintenance), 5(standard), 0 (need pump) | 0.4 | 4 | | 0.4 | 4 | | 0.8 | 8 | |
| | | | | | | | 100 | | | 100 | | | 100 |

Source: JICA Survey Team

## 10.3 Evaluation Result

The evaluation results with each scenario are shown in Table 10.3.1 to Table 10.3.3.

**Table 10.3.1 Evaluation Result (Scenario-1)**

| Multi Criteria | | | Necessity | | | | | | Effectiveness | | | | | | Construction | | | | | | | | | | Evaluation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Authority | FO, UP, etc. | Planned in any Master Plan | | Existing study (FS/DD) | | Railway crossing | | Traffic Volume [PCU/16hrs] | | Construction Cost | | EIRR | | Construction Period | | Noise & Vibration | | Resettlement Households | | Aesthetic Feature | | Maintenance | | Total Score | Ranking |
| | | | Score= | 20 | Score= | 10 | Score= | 20 | Score= | 10 | Score= | 5 | Score= | 10 | Score= | 10 | Score= | 3 | Score= | 5 | Score= | 3 | Score= | 4 | 100 | |
| 1. Semanggi | DKI | at-grade | + | 20 | | | | | 309,435 | 10.0 | 47,110 | 0.8 | 48.2% | 4.3 | 15 | 10 | no resident | 3 | | 5 | | | pump | | 53.1 | 3 |
| 2. R.E.Martadinata | DKI | FO | | | DD | 10 | + | 20 | 33,670 | 0.0 | 126,350 | 3.0 | 20.2% | 0.5 | 24 | 5 | terminal | | 38 | 2.5 | | | | 4 | 45.1 | 4 |
| 3. Sulawesi - Tg.PA | DKI | FO | + | 20 | DD | 10 | + | 20 | 58,435 | 0.9 | 131,726 | 3.2 | 21.2% | 0.7 | 24 | 5 | land acquired | 3 | | 5 | | | | 4 | 71.7 | 1 |
| 4. Kuningan | DKI | UP | + | 20 | FS | 5 | | | 181,448 | 5.4 | 196,379 | 5.0 | 16.2% | 0.0 | 32 | | Sheet Pile | | 65 | | UP | 3 | pump | | 38.4 | 9 |
| 5. Pancoran | DKI | FO | + | 20 | | | | | 174,972 | 5.1 | 59,290 | 1.1 | 22.8% | 0.9 | 18 | 5 | | 1.5 | | 5 | | | | 4 | 42.6 | 7 |
| 6. Pinang Baris | Medan | FO | + | 20 | DD | 10 | | | 87,154 | 1.9 | 97,716 | 2.2 | 17.0% | 0.1 | 18 | 5 | many resident | | 185 | | | | | 4 | 43.3 | 6 |
| 7. Katamso | Medan | UP | | | FS | 5 | + | 20 | 84,944 | 1.9 | 68,089 | 1.4 | 22.4% | 0.8 | 18 | 5 | Sheet Pile | | 41 | 2.5 | UP | 3 | pump | | 39.6 | 8 |
| 8. Sudirman II | Tangerang | FO | | | FS | 5 | + | 20 | 77,325 | 1.6 | 96,539 | 2.2 | 27.5% | 1.5 | 18 | 5 | | 1.5 | 29 | 2.5 | | | | 4 | 43.3 | 5 |
| 9. Cikarang *1 | Bekasi | 1-EW road, 2-NS road | + | 20 | FS | 5 | | | 84,716 | 1.9 | 188,616 | 4.8 | 90.1% | 10.0 | 20 | 5 | | 1.5 | 91 | | road | 3 | long road | 2 | 53.1 | 2 |
| 10. Senayan *2 | DKI | at-grade | + | 20 | | | | | 114,282 | 2.9 | 20,000 | 0.0 | 47.8% | 4.3 | | | busy street | | | | | | | | 0.0 | 10 |

note-1 : Cikrang is not include Dryport Access Road with IC, which is only preliminary design done

note-2 : Senayan has not identified the scope

| | Traffic Volume | Construction Cost | EIRR |
|---|---|---|---|
| max = | 309,435 | 196,379 | 90.1% |
| min = | 33,670 | 20,000 | 16.2% |

Source: JICA Survey Team

# Table 10.3.2 Evaluation Result (Scenario-2)

| Multi Criteria | | | Necessity | | | | | | Effectiveness | | | | | | Construction | | | | | | | | | | Evaluation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Authority | FO, UP, etc. | Planned in any Master Plan | | Existing study (FS/DD) | | Railway crossing | | Traffic Volume [PCU/16hrs] | | Construction Cost | | EIRR | | Construction Period | | Noise & Vibration | | Resettlement Households | | Aesthetic Feature | | Maintenance | | Total Score | Ranking |
| | | | Score= | 10 | Score= | 5 | Score= | 10 | Score= | 20 | Score= | 10 | Score= | 20 | Score= | 10 | Score= | 3 | Score= | 5 | Score= | 3 | Score= | 4 | 100 | |
| 1. Semanggi | DKI | at-grade | + | 10 | | | | | 309,435 | 20.0 | 47,110 | 1.5 | 48.2% | 8.7 | 15 | 10 | no resident | 3 | | 5 | | | pump | | 58.2 | 1 |
| 2. R.E.Martadinata | DKI | FO | | | DD | 5 | + | 10 | 33,670 | 0.0 | 126,350 | 6.0 | 20.2% | 1.1 | 24 | 5 | terminal | | 38 | 2.5 | | | | 4 | 33.6 | 7 |
| 3. Sulawesi - Tg.PA | DKI | FO | + | 10 | DD | 5 | + | 10 | 58,435 | 1.8 | 131,726 | 6.3 | 21.2% | 1.4 | 24 | 5 | land acquired | 3 | | 5 | | | | 4 | 51.5 | 3 |
| 4. Kuningan | DKI | UP | + | 10 | FS | 2.5 | | | 181,448 | 10.7 | 196,379 | 10.0 | 16.2% | 0.0 | 32 | | Sheet Pile | | 65 | | UP | 3 | pump | | 36.2 | 5 |
| 5. Pancoran | DKI | FO | + | 10 | | | | | 174,972 | 10.2 | 59,290 | 2.2 | 22.8% | 1.8 | 18 | 5 | | 1.5 | | 5 | | | | 4 | 39.8 | 4 |
| 6. Pinang Baris | Medan | FO | + | 10 | DD | 5 | | | 87,154 | 3.9 | 97,716 | 4.4 | 17.0% | 0.2 | 18 | 5 | many resident | | 185 | | | | | 4 | 32.5 | 8 |
| 7. Katamso | Medan | UP | | | FS | 2.5 | + | 10 | 84,944 | 3.7 | 68,089 | 2.7 | 22.4% | 1.7 | 18 | 5 | Sheet Pile | | 41 | 2.5 | UP | 3 | pump | | 31.1 | 9 |
| 8. Sudirman II | Tangerang | FO | | | FS | 2.5 | + | 10 | 77,325 | 3.2 | 96,539 | 4.3 | 27.5% | 3.1 | 18 | 5 | | 1.5 | 29 | 2.5 | | | | 4 | 36.1 | 6 |
| 9. Cikarang *1 | Bekasi | 1-EW road, 2-NS road | + | 10 | FS | 2.5 | | | 84,716 | 3.7 | 188,616 | 9.6 | 90.1% | 20.0 | 20 | 5 | | 1.5 | 91 | | road | 3 | long road | 2 | 57.3 | 2 |
| 10. Senayan *2 | DKI | at-grade | + | 10 | | | | | 114,282 | 5.8 | 20,000 | 0.0 | 47.8% | 8.6 | | | busy street | | | | | | | | 0.0 | 10 |
| | | | | | | | | max = | 309,435 | | 196,379 | | 90.1% | | | | | | | | | | | | | |
| | | | | | | | | min = | 33,670 | | 20,000 | | 16.2% | | | | | | | | | | | | | |

note-1 : Cikrang is not include Dryport Access Road with IC, which is only preliminary design done

note-2 : Senayan has not identified the scope

Source: JICA Survey Team

# Table 10.3.3 Evaluation Result (Scenario-3)

| Multi Criteria | | | Necessity | | | | | | Effectiveness | | | | | | Construction | | | | | | | | | | Evaluation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Authority | FO, UP, etc. | Planned in any Master Plan | | Existing study (FS/DD) | | Railway crossing | | Traffic Volume [PCU/16hrs] | | Construction Cost | | EIRR | | Construction Period | | Noise & Vibration | | Resettlement Households | | Aesthetic Feature | | Maintenance | | Total Score | Ranking |
| | | | Score= | 10 | Score= | 5 | Score= | 10 | Score= | 10 | Score= | 5 | Score= | 10 | Score= | 20 | Score= | 6 | Score= | 10 | Score= | 6 | Score= | 8 | 100 | |
| 1. Semanggi | DKI | at-grade | + | 10 | | | | | 309,435 | 10.0 | 47,110 | 0.8 | 48.2% | 4.3 | 15 | 20 | no resident | 6 | | 10 | | | pump | | 61.1 | 1 |
| 2. R.E.Martadinata | DKI | FO | | | DD | 5 | + | 10 | 33,670 | 0.0 | 126,350 | 3.0 | 20.2% | 0.5 | 24 | 10 | terminal | | 38 | 5 | | | | 8 | 41.6 | 6 |
| 3. Sulawesi - Tg.PA | DKI | FO | + | 10 | DD | 5 | + | 10 | 58,435 | 0.9 | 131,726 | 3.2 | 21.2% | 0.7 | 24 | 10 | land acquired | 3 | | 10 | | | | 8 | 60.7 | 2 |
| 4. Kuningan | DKI | UP | + | 10 | FS | 2.5 | | | 181,448 | 5.4 | 196,379 | 5.0 | 16.2% | 0.0 | 32 | | Sheet Pile | | 65 | | UP | 6 | pump | | 28.9 | 9 |
| 5. Pancoran | DKI | FO | + | 10 | | | | | 174,972 | 5.1 | 59,290 | 1.1 | 22.8% | 0.9 | 18 | 10 | | 1.5 | | 10 | | | | 8 | 46.6 | 4 |
| 6. Pinang Baris | Medan | FO | + | 10 | DD | 5 | | | 87,154 | 1.9 | 97,716 | 2.2 | 17.0% | 0.1 | 18 | 10 | many resident | | 185 | | | | | 8 | 37.3 | 8 |
| 7. Katamso | Medan | UP | | | FS | 2.5 | + | 10 | 84,944 | 1.9 | 68,089 | 1.4 | 22.4% | 0.8 | 18 | 10 | Sheet Pile | | 41 | 5 | UP | 6 | pump | | 37.6 | 7 |
| 8. Sudirman II | Tangerang | FO | | | FS | 2.5 | + | 10 | 77,325 | 1.6 | 96,539 | 2.2 | 27.5% | 1.5 | 18 | 10 | | 3 | 29 | 5 | | | | 8 | 43.8 | 5 |
| 9. Cikarang *1 | Bekasi | 1-EW road, 2-NS road | + | 10 | FS | 2.5 | | | 84,716 | 1.9 | 188,616 | 4.8 | 90.1% | 10.0 | 20 | 10 | | 3 | 91 | | road | 6 | long road | 4 | 52.1 | 3 |
| 10. Senayan *2 | DKI | at-grade | + | 10 | | | | | 114,282 | 2.9 | 20,000 | 0.0 | 47.8% | 4.3 | | | busy street | | | | | | | | 0.0 | 10 |
| | | | | | | | | max = | 309,435 | | 196,379 | | 90.1% | | | | | | | | | | | | | |
| | | | | | | | | min = | 33,670 | | 20,000 | | 16.2% | | | | | | | | | | | | | |

note-1 : Cikrang is not include Dryport Access Road with IC, which is only preliminary design done

note-2 : Senayan has not identified the scope

Source: JICA Survey Team

## 10.4 Project Evaluation

From the evaluation result with scenario-1, -2, -3, each score and ranking of the 10 sub-projects are compared in Table 10.4.2.

By the budgetary limitation for the implementation program, some sub-projects shall be eliminated according to the ranking.

As shown in Table 10.4.2 if 9, 7 or 5 sub-projects are selected for the implementation program, the eliminated sub-project shall be decided as below.

If 9 sub-projects are selected : Senayan shall be eliminated

If 7 sub-projects are selected : Senayan, Kuningan and Katamso shall be eliminated

If 5 sub-projects are selected : Senayan, Kuningan, Katamso,
R.E.Matradinata and Pinang Baris shall be eliminated

For the 3 alternatives of the implementation program, where 9-, 7-, or 5- sub-projects are to be implemented, the selected sub-projects are summarized in Table 10.4.1.

**Table 10.4.1 Selection of Sub-projects for each Alternative**

| Evaluation Result | | | Implementation Program | | |
|---|---|---|---|---|---|
| Location | Authority | FO, UP, etc. | Alt.-1 (9 sub-projects) | Alt.-2 (7 sub-projects) | Alt.-3 (5 sub-projects) |
| 1. Semanggi | DKI | at-grade | ● | ● | ● |
| 2. R.E.Martadinata | DKI | FO | ● | ● | |
| 3. Sulawesi - Tg.PA | DKI | FO | ● | ● | ● |
| 4. Kuningan | DKI | UP | ● | | |
| 5. Pancoran | DKI | FO | ● | ● | ● |
| 6. Pinang Baris | Medan | FO | ● | ● | |
| 7. Katamso | Medan | UP | ● | | |
| 8. Sudirman II | Tangerang | FO | ● | ● | ● |
| 9-1 Cikarang-1 (Phase-1) | Kab. Bekasi | 1-EW road, 2-NS road | ● | ● | ● |
| 10-1 Senayan-1 (Phase-1) | DKI | at grade | | | |

Source: JICA Survey Team

# Table 10.4.2 Summary of Evaluation Result

| Location | Authority | FO, UP, etc. | Score | | | | Ranking | | | If select 9 sub-project | | | If select 7 sub-project | | | If select 5 sub-project | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Scenario-1 | Scenario-2 | Scenario-3 | Total | Scenario-1 | Scenario-2 | Scenario-3 | Scenario-1 | Scenario-2 | Scenario-3 | Scenario-1 | Scenario-2 | Scenario-3 | Scenario-1 | Scenario-2 | Scenario-3 |
| 1. Semanggi | DKI | at-grade | 53.1 | 58.2 | 61.1 | 172.4 | 3 | 1 | 1 | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 2. R.E.Martadinata | DKI | FO | 45.1 | 33.6 | 41.6 | 120.2 | 4 | 7 | 6 | ● | ● | ● | ● | ● | ● | ● | | |
| 3. Sulawesi - Tg.PA | DKI | FO | 71.7 | 51.5 | 60.7 | 184.0 | 1 | 3 | 2 | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 4. Kuningan | DKI | UP | 38.4 | 36.2 | 28.9 | 103.4 | 9 | 5 | 9 | ● | ● | ● | | ● | | | ● | |
| 5. Pancoran | DKI | FO | 42.6 | 39.8 | 46.6 | 129.0 | 7 | 4 | 4 | ● | ● | ● | ● | ● | ● | | ● | ● |
| 6. Pinang Baris | Medan | FO | 43.3 | 32.5 | 37.3 | 113.0 | 6 | 8 | 8 | ● | ● | ● | ● | | | | | |
| 7. Katamso | Medan | UP | 39.6 | 31.1 | 37.6 | 108.2 | 8 | 9 | 7 | ● | ● | ● | | | ● | | | |
| 8. Sudirman II | Tangerang | FO | 43.3 | 36.1 | 43.8 | 123.1 | 5 | 6 | 5 | ● | ● | ● | ● | ● | ● | ● | | ● |
| 9. Cikarang *1 | Bekasi | 1-EW road, 2-NS road | 53.1 | 57.3 | 52.1 | 162.5 | 2 | 2 | 3 | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 10. Senayan *2 | DKI | at-grade | 0.0 | 0.0 | 0.0 | 0.0 | 10 | 10 | 10 | | | | | | | | | |
| | | | | | | | not-selected sub-project | | | seaman (-3) | | | Senayan, Kuningan (-2), Katamso (-2) | | | Senayan, Kuningan, Katamso Pinang Baris (-3), Martadinata (-2) | | |
| | | | | | | | Judgment | | | no other choice | | | Pinang Baris is the other candidate for elimination, but better not eliminate both Pinang Baris & Katamso in Medan city. Kuningan is OK even eliminated, because adjacent candidates (Pancoran & Semanggi) are implemented. | | | Other candidates for elimination are Pancoran & Sudirman II. Pancoran is better implemented because adjacent Kuningan is eliminated. Martadinata is OK to be eliminated, because adjacent Selawesi is implemented. | | |

note-1 : Cikrang is not include Dryport Access Road with IC, which is only preliminary design done

note-2 : Senayan has not identified the scope

Source: JICA Survey Team

# CHAPTER 11. IMPLEMENTATION PROGRAM

## 11.1 Possible Loan Scheme

This JICA preparatory survey was intended to conduct a Feasibility Study (or reviewing an existing FS) and Basic Design (or reviewing an existing BD/DD) for 10 sub-projects which were selected in the 1st stage, and assist in preparation of documents for an LARAP and EIA to prepare for a JICA Project Loan. After evaluation of sub-project, some implementation programs have been proposed. However the final selection of sub-project will be conducted throuh loan preparation discussion between GOI and JICA.

During deep discussions among relevant organizations (MPW, DKI, local governments, industrial parks), 8 sub-projects have been successfully identified as the whole scope of civil works and completed FS and BD, but the remaining 2 sub-projects have not yet identified their scope as explained here.

The scopes were identified for No.9 Cikarang, 1-EW road (JL. Kali Malang) and 2-NS roads (Jl. Bali, Jl. Bonjol-4) for the implementation program (phase-1), but the scope for the Dry-port Access Road (with IC at Km29 and NS non-toll road) has not yet been identified, which has been given only a conceptual design and will be implemented later (phase-2).

For No.10 Senayan, the final solution has not yet been agreed after 5 possible alternatives have been discussed, because of complicated conditions such as DKI's environmental regulations, aesthetic considerations for the existing statue, and the start of the MRT project.

For Senayan, all the relevant organizations understood the importance to implement a quick solution (phase-1) during the time between Antasari-BlockM flyover completion in the middle of 2012 and the MRT civil works start in 2013. After the MRT project is completed, the final solution (phase-2) may be required too.

The identified 8 sub-projects can be implemented by JICA Project Loan, but for the not-identified 2 sub-projects of Cikarang Dry-port access Road (phase-2) and Senayan (phase-1, phase-2), a "Sector Loan" may be an effectible loan scheme, where the existing Conceptual design will be justified and BD/FS/DD are conducted to implement tender/civil works as shown in Table 11.1.1.

**Table 11.1.1 Possible Loan Scheme**

| | Project Loan | Sector Loan | Others |
|---|---|---|---|
| Conceptional Design | exist | exist | or Hybrid Loan which combine both Project Loan and Sector Loan |
| Feasibility Study and Basic Design | JICA Preparatory Survey | by Loan | |
| DD or Design Review | by Loan | by Loan | |
| Tender | by Loan | by Loan | |
| Civil Works | by Loan | by Loan | |

Source: JICA Survey Team

## 11.2 Alternatives for the Implementation Program

A total of 9 sub-projects will be prepared for Project Loans, which includes No.9 Cikarang-phase 1 project (1-EW road and 2-NS roads) but does not include No.10 Senayan. Then Cikarang-phase 2 project (Dry-port Access Road), Senayan-phase1 project (implemented before MRT), and Senayan-phase2 project (implemented after MRT) will be included in Sector Loans.

In the multi criteria analysis, the 9 sub-projects have been ranked by the order of importance. By the limitation of GOI budget in the blue book, 9 sub-projects shall be selected again for the implementation program by the ranking set by the multi criteria analysis.

Therefore, 3 alternatives for the implementation program are considered to include 9, 7 or 5 sub-projects for Project Loans as shown in Table 11.2.1, where all Cikarang-phase 2, Senayan-phase 1 and Senayan-phase 2 projects are assumed to be included in Sector Loans. But Kuningan may be included in a Sector Loan, if AMDAL approval is delayed

**Table 11.2.1 Alternatives for the Implementation Program**

| Evaluation Result | | | Implementation Program | | | Loan Scheme |
|---|---|---|---|---|---|---|
| Location | Authority | FO, UP, etc. | Alt.-1 (No.1-9) | Alt.-2 (No.1-7) | Alt.-3 (No.1-5) | |
| 1. Semanggi | DKI | at-grade | ● | ● | ● | Project Loan |
| 2. R.E.Martadinata | DKI | FO | ● | ● | | |
| 3. Sulawesi - Tg.PA | DKI | FO | ● | ● | ● | |
| 4. Kuningan | DKI | UP | ● | | | |
| 5. Pancoran | DKI | FO | ● | ● | ● | |
| 6. Pinang Baris | Medan | FO | ● | ● | | |
| 7. Katamso | Medan | UP | ● | | | |
| 8. Sudirman II | Tangerang | FO | ● | ● | ● | |
| 9-1 Cikarang-1 (Phase-1) | Kab. Bekasi | 1-EW road, 2-NS road | ● | ● | ● | |
| 9-2 Cikarang-2 (Phase-2)) | Kab. Bekasi | Dryport Access | ○ | ○ | ○ | Sector Loan |
| 10-1 Senayan-1 (Phase-1) | DKI | at grade | ○ | ○ | ○ | |
| 10-2 Senayan-2 (Phase-2) | DKI | FO /UP | ○ | ○ | ○ | |

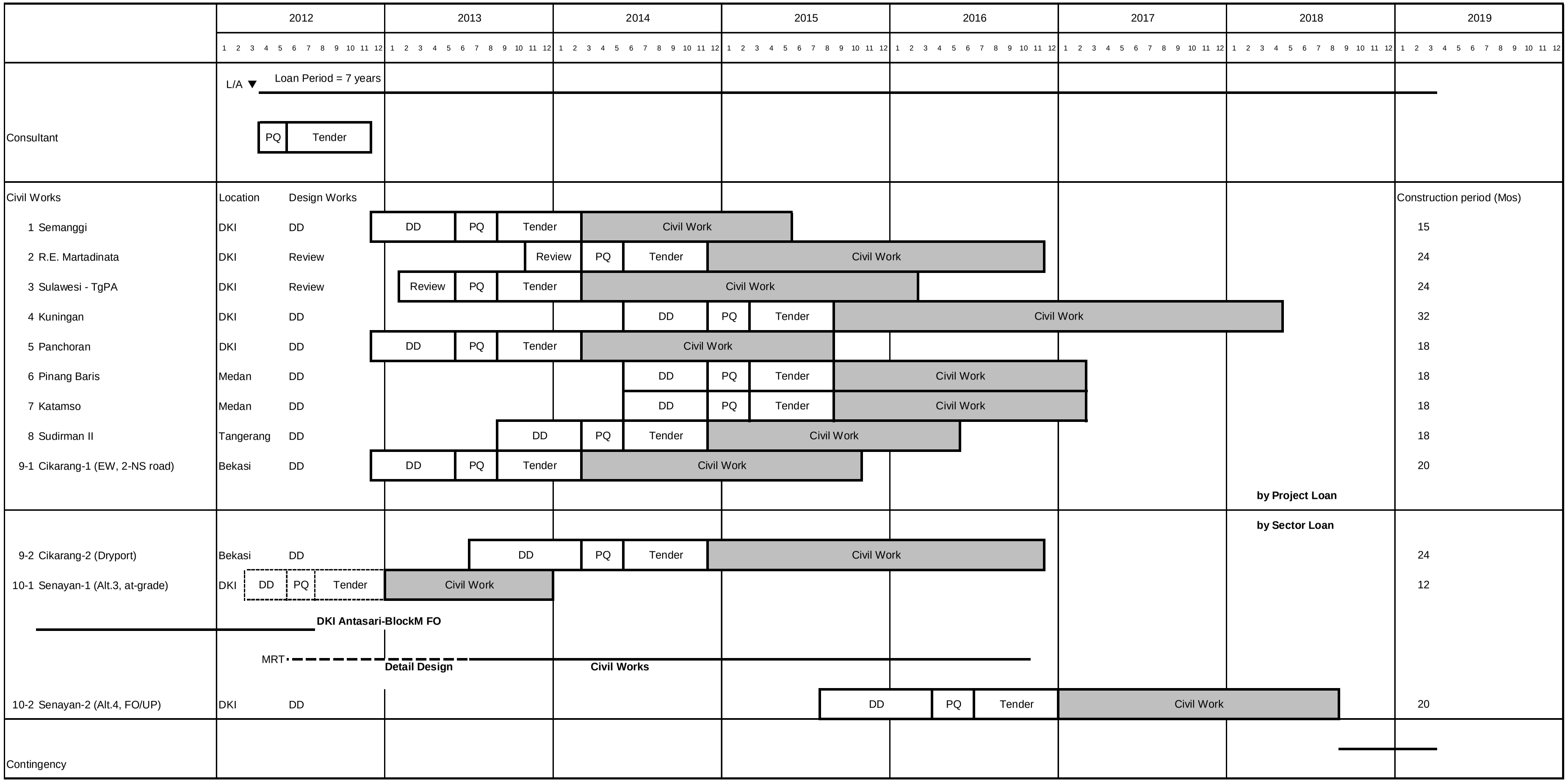
Note : Kuningan may be included in a Sector Loan, if AMDAL approval is delayed

Source: JICA Survey Team

## 11.3 Implementation Schedule

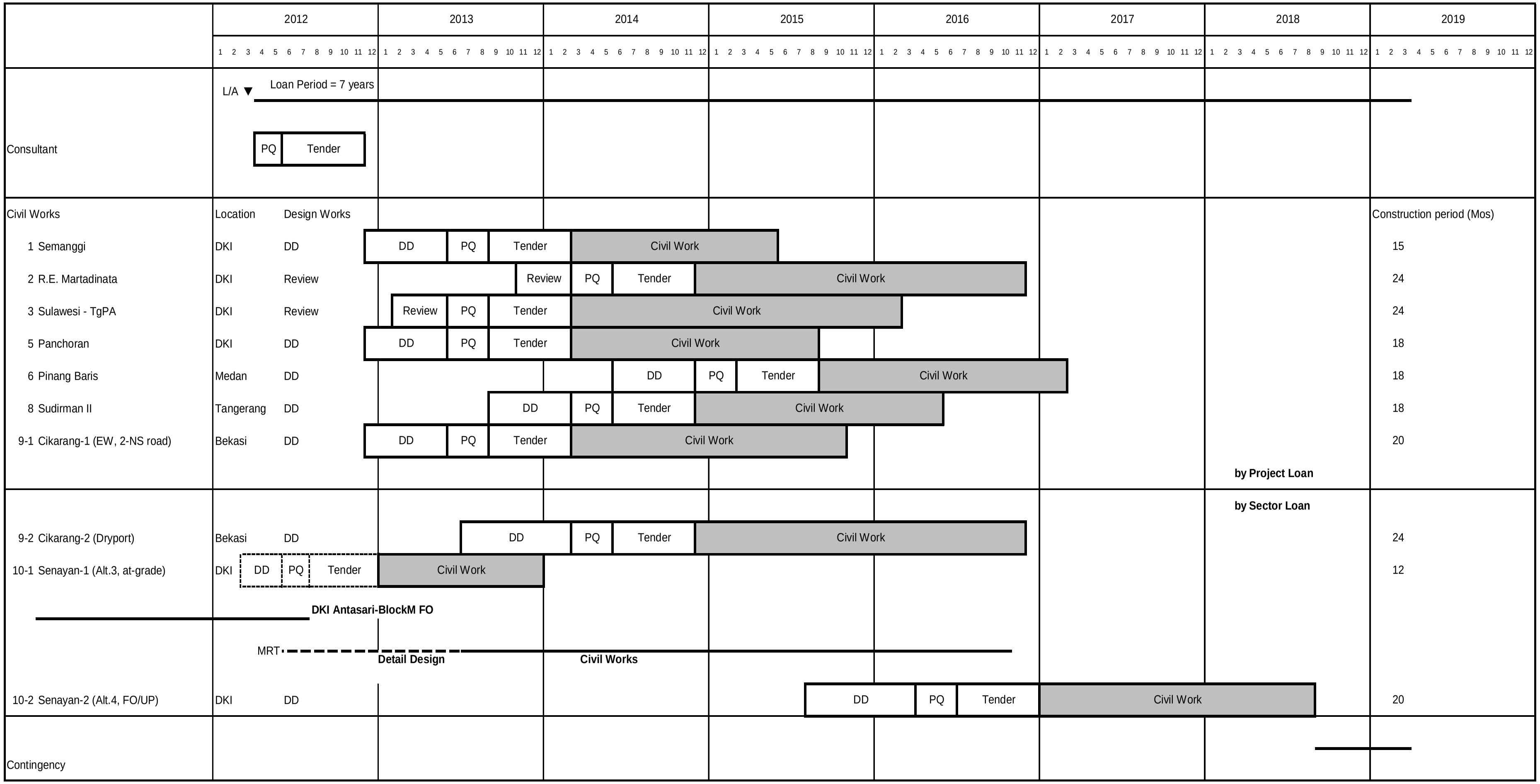
For the 3 alternatives for which 9, 7, 5 sub-projects are selected for Project Loans and 3 sub-projects for Sector Loans, each implementation schedule is prepared in Table 11.3.1 to Table 11.3.3.

# Table 11.3.1 Implementation Schedule (Alternative-1)



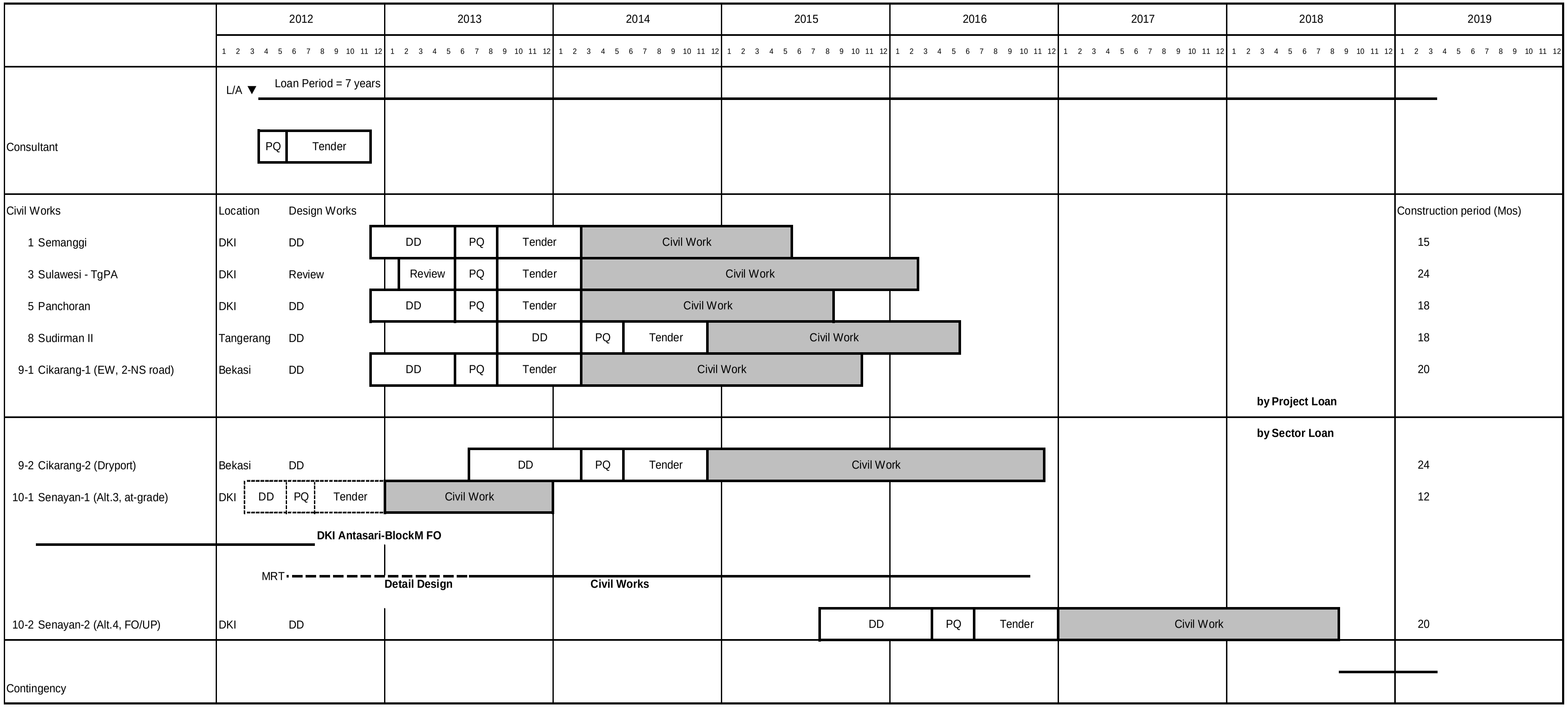

Source: JICA Survey Team

# Table 11.3.2 Implementation Schedule (Alternative-2)




Source: JICA Survey Team

## Table 11.3.3 Implementation Schedule (Alternative-3)




Source: JICA Survey Team

## 11.4 Implementation Program

In chapter-6 Project Cost Estimate, the loan amount for the 9 sub-projects for Project Loans was calculated. The civil works cost of the 3 sub-projects for Sector Loans is also roughly estimated in Table 11.4.1.

Cikarang Phase-2 (Dry-port Access Road) : Rp 350,000 mil.
: Rp 430,000 mil. (including Thamrin UP)
Senayan Phase-1 (assumed Alt.-3, at-grade) : Rp 20,000 mil.
Senayan Phase-2 (assumed Alt.-4, FO/UP) : Rp 150,000 mil.

**Table 11.4.1 Civil works Cost in Sector Loans**

| | | | lane | width | length (m) | | mil.Rp | mil.Rp | mil.Rp | note |
|---|---|---|---|---|---|---|---|---|---|---|
| (Cikarang-2) | | | | | | | 0 | 0 | | |
| Dryport | Ramp | NW | 2-lane | 10.0 | 500 | 0.80 | 4,000 | 4,800 | | |
| Access | | NE | 2-lane | 10.0 | 200 | 15.57 | 31,140 | 37,368 | | |
| | | SW | 2-lane | 10.0 | 500 | 15.57 | 77,850 | 93,420 | | |
| | | SE | 2-lane | 10.0 | 200 | 0.80 | 1,600 | 1,920 | | |
| | | Over-Toll | 6-lane | 30.0 | 100 | 25.00 | 75,000 | 90,000 | | |
| | | S-road | 4-lane | 20.0 | 1,500 | 1.00 | 30,000 | 36,000 | | |
| | Tool Booth | | | | | | | 50,000 | | |
| | | | | | | | | **313,508** | **350,000** | |
| | Thamrin | UP | 4-lane | 16.0 | 450 | 9.19 | 66,168 | 79,402 | **80,000** | additional |
| | Grand Total | | | | | | | | **430,000** | |
| Senayan | Alt-1 | FO | 2-lane | 10.0 | 1,000 | 15.57 | 155,700 | 186,840 | 200,000 | |
| | Alt-2 | Tunnel | 2-lane | 10.0 | 1,000 | | | | 1,000,000 | |
| | Alt-3 | at-grade | | | | | | | **20,000** | for phase-1 |
| | Alt-4 | FO/UP | 2-lane | 10.0 | 750 | 15.57 | 116,775 | 140,130 | **150,000** | for phase-2 |
| | Alt-5 | UP | 2-lane | 10.0 | 750 | 9.19 | 68,925 | 82,710 | 100,000 | |
| Kuningan | New | FO | 2-lane | 10.0 | 260 | 15.57 | 40,482 | 48,578 | **50,000** | reference |

Source: JICA Survey Team

For all 12 sub-projects (9 for Project Loans and 3 for Sector Loans) the loan amount is calculated with the same method as in chapter-6, and the loan amount for the 3 alternatives of different sub-projects in project loans, are summarized in Table 11.4.2, with detail calculations in Table 11.4.3 to Table 11.4.5. The loan period is 7 years for all alternatives because Senayan (phase-2) with a Sector Loan will be implemented after the MRT project is completed in 2016.

**Table 11.4.2 Loan Amount for Each Alternative**

| | | | Alt.-1 | Alt.-2 | Alt.-3 |
|---|---|---|---|---|---|
| Number of sub-project | Project Loan | | 9 | 7 | 5 |
| | Sector Loan | | 3 | 3 | 3 |
| Loan Period | years | | 7 | 7 | 7 |
| Loan Amount | Project Loan | mil. Rp | 1,748,518 | 1,291,490 | 904,282 |
| | | or 1000*USD | 203,316 | 150,173 | 105,149 |
| | | or 1000*Yen | 16,812,668 | 12,418,176 | 8,695,018 |
| | Sector Loan | mil. Rp | 1,036,860 | 1,036,860 | 1,036,860 |
| | | or 1000*USD | 120,565 | 120,565 | 120,565 |
| | | or 1000*Yen | 9,969,808 | 9,969,808 | 9,969,808 |
| | Total | mil. Rp | 2,785,378 | 2,328,350 | 1,941,142 |
| | | or 1000*USD | 323,881 | 270,738 | 225,714 |
| | | or 1000*Yen | 26,782,476 | 22,387,984 | 18,664,826 |

ex. Rate Rp/USD = 8,600
Rp/Yen = 104

note : by 85% as loan provision rate to project cos

Source: JICA Survey Team

# Table 11.4.3 Loan Amount Calculation (Alternative-1)

| | | | Project Cost (mil.Rp) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | Location | Structure | Civil Total | Contingency of Civil | Price Escalation | Civil Total | Consultant | Conti. of Consultant | P. Esc. of Consultant | Consultant Total | Tax & Adm. | Land Acquisition | Total |
| 1. Semanggi | DKI | at-grade | 47,110 | 4,711 | 23,838 | 75,659 | 4,711 | 471 | 570 | 5,752 | 10,583 | 11,778 | 103,772 |
| 2. R.E.Martadinata | DKI | FO | 126,350 | 12,635 | 63,933 | 202,918 | 12,635 | 1,264 | 1,529 | 15,427 | 28,385 | 31,588 | 278,318 |
| 3. Sulawesi - Tg.PA | DKI | FO | 131,726 | 13,173 | 66,653 | 211,552 | 13,173 | 1,317 | 1,594 | 16,084 | 29,593 | 0 | 257,228 |
| 4. Kuningan | DKI | UP | 196,379 | 19,638 | 99,368 | 315,385 | 19,638 | 1,964 | 2,376 | 23,978 | 44,117 | 49,095 | 432,574 |
| 5. Pancoran | DKI | FO | 59,290 | 5,929 | 30,001 | 95,220 | 5,929 | 593 | 717 | 7,239 | 13,320 | 14,823 | 130,601 |
| 6. Pinang Baris | Medan | FO | 97,716 | 9,772 | 49,444 | 156,932 | 9,772 | 977 | 1,182 | 11,931 | 21,952 | 19,543 | 210,358 |
| 7. Katamso | Medan | UP | 68,089 | 6,809 | 34,453 | 109,351 | 6,809 | 681 | 824 | 8,314 | 15,296 | 13,618 | 146,579 |
| 8. Sudirman II | Tangerang | FO | 96,539 | 9,654 | 48,849 | 155,042 | 9,654 | 965 | 1,168 | 11,787 | 21,688 | 19,308 | 207,825 |
| 9-1 Cikarang-1 | Bekasi | 1-EW road, 2-NS road | 188,616 | 18,862 | 95,440 | 302,917 | 18,862 | 1,886 | 2,282 | 23,030 | 42,373 | 37,723 | 406,044 |
| **Sub Total for Project Loan** | | | **1,011,815** | **101,182** | **511,978** | **1,624,975** | **101,182** | **10,118** | **12,243** | **123,543** | **227,307** | **197,474** | **2,173,299** |
| 9-2 Cikarang-2 | Bekasi | Dryport | 430,000 | 43,000 | 217,580 | 690,580 | 43,000 | 4,300 | 5,203 | 52,503 | 96,601 | 86,000 | 925,684 |
| 10-1 Senayan- (Alt.3) | DKI | at-grade | 20,000 | 2,000 | 10,120 | 32,120 | 2,000 | 200 | 242 | 2,442 | 4,493 | 5,000 | 44,055 |
| 10-2 Senayan-2 (Alt.4) | DKI | FO/UP | 150,000 | 15,000 | 75,900 | 240,900 | 15,000 | 1,500 | 1,815 | 18,315 | 33,698 | 37,500 | 330,413 |
| **Sub Total for Sector Loan** | | | **600,000** | **60,000** | **303,600** | **963,600** | **60,000** | **6,000** | **7,260** | **73,260** | **134,792** | **128,500** | **1,300,152** |
| **Grand Total (Project Loan + Sector Loan)** | | | **1,611,815** | **161,182** | **815,578** | **2,588,575** | **161,182** | **16,118** | **19,503** | **196,803** | **362,099** | **325,974** | **3,473,451** |
| | | | | 10% of Civil | (Civil+Conti.) * 0.46 | **(1) Total Civil Works** | 10% of Civil | 10% of Consultant | (Consul +Conti.) * 0.11 | **(2) Total Consultant Works** | 13% of Total (Civil +Consul) | 25%, 20% of Civil | **(3) Project Cost** |

Note : Kuningan may be included in Sector Loan, if AMDAL approval is delayed

| | Project Loan | Sector Loan | Total Loan | |
|---|---|---|---|---|
| (1) Total Civil Works | 1,624,975 | 963,600 | 2,588,575 | |
| (2) Total Consultant Works | 123,543 | 73,260 | 196,803 | |
| (3) = (1) + (2) | 1,748,518 | 1,036,860 | 2,785,378 | = Loan Maount |
| (4) Project Cost | 2,173,299 | 1,300,152 | 3,473,451 | |
| (5) = (4) * 85% | 1,847,304 | 1,105,129 | 2,952,433 | = 85% is loan provision rate to project cos |
| **Loan Amount = Min( (3) , (5) )** | **1,748,518** | **1,036,860** | **2,785,378** | = Loan Maount |

Source: JICA Survey Team

# Table 11.4.4 Loan Amount Calculation (Alternative-2)

| | | | Project Cost (mil.Rp) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | Location | Structure | Civil Total | Contingency of Civil | Price Escalation | Civil Total | Consultant | Conti. of Consultant | P. Esc. of Consultant | Consultant Total | Tax & Adm. | Land Acquisition | Total |
| 1. Semanggi | DKI | at-grade | 47,110 | 4,711 | 23,838 | 75,659 | 4,711 | 471 | 570 | 5,752 | 10,583 | 11,778 | 103,772 |
| 2. R.E.Martadinata | DKI | FO | 126,350 | 12,635 | 63,933 | 202,918 | 12,635 | 1,264 | 1,529 | 15,427 | 28,385 | 31,588 | 278,318 |
| 3. Sulawesi - Tg.PA | DKI | FO | 131,726 | 13,173 | 66,653 | 211,552 | 13,173 | 1,317 | 1,594 | 16,084 | 29,593 | 0 | 257,228 |
| 4. Kuningan | DKI | UP | | | | | | | | | | | |
| 5. Pancoran | DKI | FO | 59,290 | 5,929 | 30,001 | 95,220 | 5,929 | 593 | 717 | 7,239 | 13,320 | 14,823 | 130,601 |
| 6. Pinang Baris | Medan | FO | 97,716 | 9,772 | 49,444 | 156,932 | 9,772 | 977 | 1,182 | 11,931 | 21,952 | 19,543 | 210,358 |
| 7. Katamso | Medan | UP | | | | | | | | | | | |
| 8. Sudirman II | Tangerang | FO | 96,539 | 9,654 | 48,849 | 155,042 | 9,654 | 965 | 1,168 | 11,787 | 21,688 | 19,308 | 207,825 |
| 9-1 Cikarang-1 | Bekasi | 1-EW road, 2-NS road | 188,616 | 18,862 | 95,440 | 302,917 | 18,862 | 1,886 | 2,282 | 23,030 | 42,373 | 37,723 | 406,044 |
| **Sub Total for Project Loan** | | | **747,347** | **74,735** | **378,158** | **1,200,239** | **74,735** | **7,473** | **9,043** | **91,251** | **167,894** | **134,762** | **1,594,146** |
| 9-2 Cikarang-2 | Bekasi | Dryport | 430,000 | 43,000 | 217,580 | 690,580 | 43,000 | 4,300 | 5,203 | 52,503 | 96,601 | 86,000 | 925,684 |
| 10-1 Senayan- (Alt.3) | DKI | at-grade | 20,000 | 2,000 | 10,120 | 32,120 | 2,000 | 200 | 242 | 2,442 | 4,493 | 5,000 | 44,055 |
| 10-2 Senayan-2 (Alt.4) | DKI | FO/UP | 150,000 | 15,000 | 75,900 | 240,900 | 15,000 | 1,500 | 1,815 | 18,315 | 33,698 | 37,500 | 330,413 |
| **Sub Total for Sector Loan** | | | **600,000** | **60,000** | **303,600** | **963,600** | **60,000** | **6,000** | **7,260** | **73,260** | **134,792** | **128,500** | **1,300,152** |
| **Grand Total (Project Loan + Sector Loan)** | | | **1,347,347** | **134,735** | **681,758** | **2,163,839** | **134,735** | **13,473** | **16,303** | **164,511** | **302,686** | **263,262** | **2,894,298** |
| | | | | 10% of Civil | (Civil+Conti.) * 0.46 | **(1) Total Civil Works** | 10% of Civil | 10% of Consultant | (Consul +Conti.) * 0.11 | **(2) Total Consultant Works** | 13% of Total (Civil +Consul) | 25%, 20% of Civil | **(3) Project Cost** |

Note : Kuningan may be included in Sector Loan, if AMDAL approval is delayed

| | Project Loan | Sector Loan | Total Loan | |
|---|---|---|---|---|
| (1) Total Civil Works | 1,200,239 | 963,600 | 2,163,839 | |
| (2) Total Consultant Works | 91,251 | 73,260 | 164,511 | |
| (3) = (1) + (2) | 1,291,490 | 1,036,860 | 2,328,350 | = Loan Maount |
| (4) Project Cost | 1,594,146 | 1,300,152 | 2,894,298 | |
| (5) = (4) * 85% | 1,355,024 | 1,105,129 | 2,460,153 | = 85% is loan provision rate to project cos |
| **Loan Amount = Min( (3) , (5) )** | **1,291,490** | **1,036,860** | **2,328,350** | = Loan Maount |

Source: JICA Survey Team

## Table 11.4.5 Loan Amount Calculation (Alternative-3)

| | | | Project Cost (mil.Rp) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Name | Location | Structure | Civil Total | Contingency of Civil | Price Escalation | Civil Total | Consultant | Conti. of Consultant | P. Esc. of Consultant | Consultant Total | Tax & Adm. | Land Acquisition | Total |
| 1. Semanggi | DKI | at-grade | 47,110 | 4,711 | 23,838 | 75,659 | 4,711 | 471 | 570 | 5,752 | 10,583 | 11,778 | 103,772 |
| 2. R.E.Martadinata | DKI | FO | | | | | | | | | | | |
| 3. Sulawesi - Tg.PA | DKI | FO | 131,726 | 13,173 | 66,653 | 211,552 | 13,173 | 1,317 | 1,594 | 16,084 | 29,593 | 0 | 257,228 |
| 4. Kuningan | DKI | UP | | | | | | | | | | | |
| 5. Pancoran | DKI | FO | 59,290 | 5,929 | 30,001 | 95,220 | 5,929 | 593 | 717 | 7,239 | 13,320 | 14,823 | 130,601 |
| 6. Pinang Baris | Medan | FO | | | | | | | | | | | |
| 7. Katamso | Medan | UP | | | | | | | | | | | |
| 8. Sudirman II | Tangerang | FO | 96,539 | 9,654 | 48,849 | 155,042 | 9,654 | 965 | 1,168 | 11,787 | 21,688 | 19,308 | 207,825 |
| 9-1 Cikarang-1 | Bekasi | 1-EW road, 2-NS road | 188,616 | 18,862 | 95,440 | 302,917 | 18,862 | 1,886 | 2,282 | 23,030 | 42,373 | 37,723 | 406,044 |
| **Sub Total for Project Loan** | | | **523,281** | **52,328** | **264,780** | **840,389** | **52,328** | **5,233** | **6,332** | **63,893** | **117,557** | **83,631** | **1,105,470** |
| 9-2 Cikarang-2 | Bekasi | Dryport | 430,000 | 43,000 | 217,580 | 690,580 | 43,000 | 4,300 | 5,203 | 52,503 | 96,601 | 86,000 | 925,684 |
| 10-1 Senayan- (Alt.3) | DKI | at-grade | 20,000 | 2,000 | 10,120 | 32,120 | 2,000 | 200 | 242 | 2,442 | 4,493 | 5,000 | 44,055 |
| 10-2 Senayan-2 (Alt.4) | DKI | FO/UP | 150,000 | 15,000 | 75,900 | 240,900 | 15,000 | 1,500 | 1,815 | 18,315 | 33,698 | 37,500 | 330,413 |
| **Sub Total for Sector Loan** | | | **600,000** | **60,000** | **303,600** | **963,600** | **60,000** | **6,000** | **7,260** | **73,260** | **134,792** | **128,500** | **1,300,152** |
| **Grand Total (Project Loan + Sector Loan)** | | | **1,123,281** | **112,328** | **568,380** | **1,803,989** | **112,328** | **11,233** | **13,592** | **137,153** | **252,348** | **212,131** | **2,405,621** |
| | | | | 10% of Civil | (Civil+Conti.) * 0.46 | **(1) Total Civil Works** | 10% of Civil | 10% of Consultant | (Consul +Conti.) * 0.11 | **(2) Total Consultant Works** | 13% of Total (Civil +Consul) | 25%, 20% of Civil | **(3) Project Cost** |

Note : Kuningan may be included in Sector Loan, if AMDAL approval is delayed

| | Project Loan | Sector Loan | Total Loan | |
|---|---|---|---|---|
| (1) Total Civil Works | 840,389 | 963,600 | 1,803,989 | |
| (2) Total Consultant Works | 63,893 | 73,260 | 137,153 | |
| (3) = (1) + (2) | 904,282 | 1,036,860 | 1,941,142 | = Loan Maount |
| (4) Project Cost | 1,105,470 | 1,300,152 | 2,405,621 | |
| (5) = (4) * 85% | 939,649 | 1,105,129 | 2,044,778 | = 85% is loan provision rate to project cos |
| **Loan Amount = Min( (3) , (5) )** | **904,282** | **1,036,860** | **1,941,142** | = Loan Maount |

Source: JICA Survey Team

## 11.5 Consulting Works

The scope of consulting services is a standard process for Project Loans and includes FS for the Sector Loans, which is summarized below.

(Sector Loan)

1. Review of previous study and conceptual design
2. Conducting necessary surveys (topo, geo, traffic- surveys) for conducting basic design
3. Checking feasibility for possible sub-projects
4. Conducting detail design for feasible sub-projects
5. Same process as 7-9 for Project Loans

(Project Loans and Sector Loans after identification of feasible sub-projects)

6. Review of existing basic design, and/or Conducting detail design
7. Preparation of tender documents
8. Assistance with the tender process
9. Construction supervision

For the cost of consulting services for the project implementation (alternative-1) with 7 year loan periods, the estimation is summarized in Table 11.5.1.

# Table 11.5.1 Cost Estimation for Consulting Services

ex. Rate = **104** Rp/yen

| | | | | | Unit | Qty. | Foreign Portion (1000*Yen) | | Local Portion (1000*Rp) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Rate | Amount | Rate | Amount |
| A. Remuneration | | Professional (A) | 1 | Team Leader | M/M | 70 | 2,800 | 196,000 | | |
| | | | 2 | Structure Eng. | M/M | 60 | 2,600 | 156,000 | | |
| | | | 3 | Highway Eng. | M/M | 22 | 2,600 | 57,200 | | |
| | | | 4 | Geotechnical Eng. | M/M | 6 | 2,600 | 15,600 | | |
| | | | 5 | Drainage Eng. | M/M | 6 | 2,600 | 15,600 | | |
| | | | 6 | Traffic Eng. | M/M | 6 | 2,600 | 15,600 | | |
| | | | 7 | Cost Estimator | M/M | 6 | 2,500 | 15,000 | | |
| | | | 8 | Document Spe. | M/M | 6 | 2,500 | 15,000 | | |
| | | | 9 | Environmental Spe. | M/M | 6 | 2,500 | 15,000 | | |
| | | | 10 | Supervision Eng. | M/M | 106 | 2,600 | 275,600 | | |
| | | | | Sub-total | | 294 | | 776,600 | | |
| | | | | | | | | | | |
| | | Professional (B) | 1 | Co-Team Leader | M/M | 70 | | | 40,000 | 2,800,000 |
| | | | 2 | Structure Eng. | M/M | 60 | | | 30,000 | 1,800,000 |
| | | | 3 | Highway Eng. | M/M | 22 | | | 30,000 | 660,000 |
| | | | 4 | Geodetic Eng. | M/M | 12 | | | 30,000 | 360,000 |
| | | | 5 | Drainage Eng. | M/M | 12 | | | 30,000 | 360,000 |
| | | | 6 | Traffic Eng. | M/M | 12 | | | 30,000 | 360,000 |
| | | | 7 | Cost Estimator | M/M | 12 | | | 30,000 | 360,000 |
| | | | 8 | Document Spe. | M/M | 12 | | | 30,000 | 360,000 |
| | | | 9 | Environmental Spe. | M/M | 12 | | | 30,000 | 360,000 |
| | | | 10 | Landscape Eng. | M/M | 6 | | | 30,000 | 180,000 |
| | | | 11 | Site Eng. | M/M | 232 | | | 35,000 | 8,120,000 |
| | | | 12 | Quality Eng. | M/M | 232 | | | 30,000 | 6,960,000 |
| | | | 13 | Quantity Chief Eng. | M/M | 232 | | | 30,000 | 6,960,000 |
| | | | 14 | Inspector | M/M | 464 | | | 10,000 | 4,640,000 |
| | | | 15 | Lab Technician | M/M | 232 | | | 10,000 | 2,320,000 |
| | | | 16 | Surveyer | M/M | 232 | | | 10,000 | 2,320,000 |
| | | | | Sub-total | | 1854 | | | | 38,920,000 |
| | | | | | | | | | | |
| | | Supporting Staff | 1 | Office Manager | M/M | 70 | | | 10,000 | 700,000 |
| | | | 2 | Bilingual Secretary | M/M | 70 | | | 7,000 | 490,000 |
| | | | 3 | Secretary | M/M | 232 | | | 5,000 | 1,160,000 |
| | | | 4 | CAD ope./Cpmputer Spe. | M/M | 372 | | | 10,000 | 3,720,000 |
| | | | 5 | Office Boy | M/M | 302 | | | 3,500 | 1,057,000 |
| | | | 6 | Driver | M/M | 549 | | | 3,500 | 1,921,500 |
| | | | | Sub-total | | 1595 | | | | 9,048,500 |
| | | **Sub-total A.** | | | | | | **776,600** | | **47,968,500** |
| | | | | | | | | | | |
| B. Direct Cost | 1 | International Airfare | | | | 28 | 250 | 6,875 | | |
| | 2 | Domestic Airfare | | | | 80 | | | 3,000 | 240,000 |
| | 3 | Domestic Travel | | | | 80 | | | 1,650 | 132,000 |
| | 4 | Accommodation | for | Pro-A | Month | 294 | | | 15,000 | 4,410,000 |
| | 5 | Accommodation | for | Pro-B | Month | 1854 | | | 5,000 | 9,270,000 |
| | 6 | Vehicle Rental | | | | 549 | | | 10,000 | 5,490,000 |
| | 7 | Office Rental | | | Month | 302 | | | 25,000 | 7,550,000 |
| | 8 | International Communications | | | Month | 70 | | | 5,000 | 350,000 |
| | 9 | Domestic Communications | | | Month | 70 | | | 6,000 | 420,000 |
| | 10 | Office Supply | | | Month | 70 | | | 6,000 | 420,000 |
| | 11 | Office Furniture and Equipment | | | Month | 70 | | | 6,000 | 420,000 |
| | 12 | Report Preparation | | | | 70 | | | 6,000 | 420,000 |
| | 13 | Topographic Survey | | | | 10 | | | 90,000 | 900,000 |
| | 14 | Soil survey | | | | 10 | | | 90,000 | 900,000 |
| | 15 | Traffic Survey | | | | 3 | | | 70,000 | 210,000 |
| | 16 | Material Source Survey | | | | 12 | | | 50,000 | 600,000 |
| | | **Sub-total B.** | | | | | | **6,875** | | **31,732,000** |
| | | | | | | | | | | |
| **A+B Grand Total** | | | | | | | | **783,475** | | **79,700,500** |
| | | | | | | | **Combined Cost by 1000*Rp** | **ex. Rate =** | **104** | **161,181,900** |
| | | | | | | | **or, Combined Cost by 1000*Yen** | | | **1,549,826** |

Source: JICA Survey Team

# CHAPTER 12. CONCLUSIONS AND RECOMMENDATIONS

## 12.1 Conclusions

The traffic congestion at major intersection and railway crossings has been worsening in the JABODETABEK area, even though other solutions, including public transportation (JORR, MRT, Trans Jakarta Busway, ERP, etc.), have been started and planned for implementation. Especially along the logistics route from the East Jakarta Industrial area to/from Tanjung Priok port, a quick solution shall be implemented to support the booming economic activities in Indonesia.

By this "Preparatory Survey for Metropolitan Arterial Road Improvement Projects", we have come to some conclusions which are summarized here.

Conclusion

1. As potential projects, 18 locations were nominated in JABODETABEK and Medan
2. By 1st stage screening, 10 sub-projects were selected for the 2nd stage (BD and FS)
3. From the 10 sub-projects, the scope of civil works for 9 sub-projects were identified, but the scope of works has not yet been identified for No.10 Senayan even though it is required to implement a definite solution
4. The 9 sub-projects were evaluated and ranked, and are ready to be included in the implementation program (Project Loan)
5. The identification of scope and implementation for No.10 Senayan shall be realized with another loan scheme (Sector Loan)
6. For No.9 Cikarang as a phase-2 project, an additional scope (Dry-port Access Road and etc.) shall be included in a Sector Loan too, and other/new locations may be included also

## 12.2 Recommendations

According to the proposal by this preparatory study, quick implementations by Project Loans for identified sub-projects is requested. Furthermore, other loan scheme (Sector Loans) is also required for not-identified sub-projects and new/additional sub-projects in the JABODETABEK and East Jakarta Industrial area. To realize quick implementation for these projects, an Action Plan is recommended here.

Action Plan

Before Loan

1. Budgetary preparation (Blue Book nomination) in GOI
2. Finalize on-going EIA (UKL/UPL or AMDAL) approval process by GOI
3. Loan preparation between GOI and JICA (final selection of sub-project)

Under Project Loan

4. Detail design or review design, and tender preparation
5. Tender process and civil works with consultant supervision

Under Sector Loan

6. Identification of the scope of civil works and feasibility check
7. Justification and approval to implement identified sub-projects, and detail design
8. (the subsequent process is the same as the Project Loan)

For the future project evaluation, these indices are proposed to be compared before and after project implementation at sub-project location and major related arterial roads.

1. Increase of traffic volume (%)
2. Hourly traffic volume (PCU/hr)
3. Travel speed (km/hr) and passing time (sec)
4. Directional traffic queue length, including toll road

The indices above are easily compared at sub-project location, but a wider project evaluation in target area combined with other road projects and public transportation policy, these indices will be used together with.

5. Achievement of modal shift from road traffic to public transportation (MRT, railway, new transportation system, etc.)
6. Alleviation of traffic congestion by traffic management policy (Electric Road Pricing: ERP, Traffic Information System: TIS, etc.)

Furthermore, the following qualitative evaluation will be introduced by interviewing to drivers, residents and shop owners.

7. Improvement of traffic congestion
8. Conveniences of regional activities
9. Environmental Impact (Noise, etc.)