No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

REPUBLIC OF INDONESIA

MINISTRY OF PUBLIC WORKS

DIRECTORATE GENERAL OF HIGHWAYS

PREPARATORY SURVEY
FOR
BANDUNG INTRA URBAN TOLL ROAD PROJECT

FINAL REPORT

JULY 2009

NIPPON KOEI CO., LTD.

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CURRENCY EXCHANGE RATE

Following currency exchange rates were adopted in this report unless otherwise stipulated.

(1) Indonesia Rupiah vs. US Dollar
Selling rate of Bank Indonesia on May, 15 2009
USD 1= IDR 11,380

(2) Indonesia Rupiah vs. Japanese Yen
Selling rate of Bank Indonesia on May, 15 2009
JPY 1 = IDR 115.32

SYNOPSIS

1. Country	Republic of Indonesia
2. Name of Study	Preparatory Survey of Bandung Intra Urban Toll Road Project
3. Counterpart Agency	Directorate General of Highways (Bina Marga), Ministry of Public Works
4. Objectives of Study	1. Review the existing Feasibility Study 2. Prepare the project implementation program 3. Recommend the traffic management policy in the vicinity of project road
5. Study Area	Bandung Metropolitan Area, primarily Bandung City

6. Scope of Study

1) Confirmation of project necessity and backgrounds, including review of traffic demand forecast
2) Identification of project scope —— components, cost, schedule, O&M plan including traffic management policy near the project road, and implementation institutions
3) Review of environmental and social considerations
4) Recommendation of cooperation with other organizations
5) Assessment of project effects

7. Major Findings

The project necessity was ascertained by confirming the conformity with national and regional master plans and reviewing the traffic demand on the project road, based on the actual traffic survey and the future demand forecast model.

Through the review of the Preliminary Design in the F/S, some design changes are proposed, —— i.e. modification of the ramp profile at the Ujunberung Interchange, modification of frontage road alignment at seven locations near the end points of the viaduct, relocation of a toll gate, and relocation of two ramps to comply with the domestic standard. Thus, the project road will have the quantities of major components as the total length of 27.257 km, total number of ramps of 16, total number of interchanges of 2, and total number of toll gates of 11.

Phase 1 of the Project will be implemented as a Japanese ODA loan project for FY 2009, presumably signing the L/A in March, 2010, spending 33 months for pre-construction procedures in parallel with the land acquisition and resettlement, and starting the construction in January, 2013 and completing it by the end of 2014. Implementation program for Phase 2 has not been finalized yet, but if another loan is signed in 2010 the construction for Phase 2 is supposed to be completed by mid-2017 at earliest.

An O&M company will be procured for O&M of the finally completed network after Phase 2 with one O&M station and 11 toll gates. But, for O&M of the partial network after Phase 1 only, the Survey Team recommends that Jasa Marga which operates the Jakarta-Bandung Toll Road and Padalarang-Cileunyi Toll Road be in charge of it temporarily. The project toll road is planned to have such a feature as flat toll by vehicle class, entry toll collection and the levy-every-user system.

Traffic management measures along the project road includes intersection widening and improvement, access road improvement, signalization, and traffic operation near the ramp, especially that on the Paspati Bridge.

The Survey Team found out that the total required number of properties to be resettled and the total required area of land to be acquired are 2,595 and 66.8 ha, respectively, with the total cost for land acquisition and compensation of Rp 1,317 Billion. From the review of the approved EIA and results of several supplementary PCM in which arguments were made over LARF, some environmental and socio environmental issues have been identified. Those will be incorporated in LARAP to be produced subsequently, together with the proper mitigation measures.

The economic evaluation showed that the Project as a whole is economically viable with an EIRR of 20.5%, while financially it turned out to be critically feasible at a reasonable flat toll rate. As a result of financial plan and examination of PPP options for Phase 2, the breakeven tariff for the reasonable private sector contribution turned out to be too high, leading to the recommendation that PPP options are not applicable even for Phase 2.

It is noted that cooperation with other organizations and programs are quite important, particularly with the ongoing Technical Cooperation Program offered to BPJT by JICA.

8. Conclusions and Recommendations

1) Construction of BIUTR is viable from macroeconomic perspective, contributing to mitigation of traffic congestion and development of regional economy.
2) Phase 1, in length of 9.5km with a project cost of IDR 1,816 Billion (in 2009 price), is expected to be implemented by the finance of a Japanese ODA loan.
3) Pursuing a PPP option for Phase 2 is not appropriate, and the traditional funding system (GOI funding with ODA loans) is recommended.
4) The success of the Project completely depends on whether smooth and timely land acquisition and resettlement will be done or not. LARAP is critical to safeguard the rights of PAPs.
5) The LARAP framework must be established by the time of the Loan Appraisal by JICA. As well, the EIA

reports are to be opened to the public 120 days prior to the Loan Agreement.

6) The construction for Phase 1 will start in January, 2013, and that for Phase 2 is supposed to be completed in 2020.

EXECUTIVE SUMMARY

1. PROJECT BACKGROUND AND NECESSITY

Presently, the regional spatial plans at the national level (RTRWN No. 26, 2008) and the National Long-term Development Plan (BPJP 2005-2025) are in effect, as well as the Bandung City RTRW No. 3, 2006 intended for said city. As for the National Mid-term Development Plan (PPJM) set-up every five years under BPJP, PPJM-I (2005-2009) is currently underway.

The Ministry of Public Works (MOPW) has a five-year program (Renstra 2005-2009) involving the vision, mission, and overall and sectoral targets for road development, along with the above PPJM-I. In 2006, it also formulated the National Toll Road Development Plan. Prior to said plans, the City conducted the Bandung Intra-City Toll Road Network Plan (BITL) in 1996. The Project road is listed in these national and local master plans as well as in the above Bandung City RTRW No. 3, 2006.

The recent remarkable increase in population and progress of urbanization in Bandung City (the City) caused rapid increase in road traffic demands, causing heavy traffic congestions on many sections of the road network in the city, particularly during week-ends in the vicinity of the east-west arterials. By connecting the Pasupati Bridge and Viaduct to the Jakarta-Bandung Toll Road and further extending the elevated road in the eastern direction, traffic congestion mitigation and improvement in the accessibility in said direction can be expected.

To further attract more private investments to the Gedebage Development, improved accessibility to the development area is realized to be an effective means. This shall be facilitated by constructing high-grade highways connected to both the Padalarang-Cileunyi Toll Road and the central area of Bandung City.. Hence, the construction of the Bandung Intra Urban Toll Road (hereinafter referred to as “BIUT” Road) is justified considering the above objective.

2. PROJECT OUTLINES

2.1 PROJECT OBJECTIVES

In the Bandung City Long-term Spatial Plan 2004, the east-west toll road connected to the Pasteur Toll Gate of the Jakarta-Bandung Toll Road is given the highest priority. In 2006, Bina Marga conducted the Feasibility Study on the Bandung Intra City Toll Road Project (F/S) and its corresponding Environmental Impact Assessment (EIA). The provincial government in West Java approved its AMDAL (EIS). In the meantime, the Government of Indonesia (GOI) decided to request for a Japanese ODA Loan for a part of the project cost and started negotiations with the former JBIC in 2008. Meanwhile, BAPPENAS listed the Project in the Blue Book with a loan amount of US$ 150 million. Consequently, the defined objective of the Project is to construct a toll road in the Bandung Metropolitan Area, with full control of access to a total length of about 28 km. This shall be initiated through combined financing from the Japanese ODA loan, and other possible sources, including private investors.

2.2 PROJECT OUTLINES

The Bandung Intra Urban Toll Road with a total length of 27.257 km is planned to consist of two segments, as follows:

- The east-west direction from Pasteur to Cileunyi with a length of 20.6 km, and with 2 x 2 separated 4 lanes of 36 m width. Almost all sections in this segment are elevated.
- The north-south direction from Ujung Berung to Gedebage with a length of 6.7 km and with 2 x 2 separated 4 lanes of 40 m width. Sections in this segment are mostly at grade,

but with full access control.

Based on survey conducted after reviewing and partially revising the Project road design and the phasing of its implementation, the costs for Phase 1 and Phase 2 of the Project were re-estimated to be Rp 2,544 Billion (US$ 224 Million) and Rp 8,920 Billion (US$ 784 Million), respectively. This leads to a total Project cost of Rp 11,464 Billion (US$ 1,008 Million).

In this revised phasing, Phase 1 is for the sections with a total length of 9.5 km, which the Japanese ODA loan for FY 2009 is expected to be utilized. The subsequent Phase 2 meanwhile is for all the remaining sections to be implemented through a combination of financing sources yet to be determined.

To cope with increasing traffic demand and mitigate the traffic congestion in the City's road network, implementation of the Project is realized to be vital. Moreover, construction of some arterial access roads are necessary to distribute the traffic flows between the Gedebage Development area and other places within and around the City, as well as to regulate traffic demands along the Padalarang-Cileunyi Toll Road,. The Project is therefore expected to function effectively in this regard.

In this JICA Survey, after the components and cost for the Project were reviewed, arrangement was made for the demarcation between Phase 1 (Japanese ODA Loan portion) and subsequent phases under other funding sources. As a result, Phase 1 was determined to be for the 5.5 km section from Pasteur to Gasibu, and for 4.0 km section comprising 3.1 km from the Gedebage Interchange to a point in the Gedebage Development area and 0.9 km long temporary access to the Soekarno Hatta Bypass. This was determined considering the Japanese ODA loan amount to be requested by GOI as listed in the current Blue Book, the budgetary constraint of GOI and anticipated difficulties in land acquisition and resettlement for affected households and properties. The rest of the Project sections are all demarcated to subsequent phases.

Construction works for the Phase 1 implemented through Japanese ODA, are summarized in Table-2.1.

Table-2.1 Summary of Construction Works for the Phase 1

	Classification	Item	Quantity	Remarks
1	Total Length	Bridge/Viaduct, New Provision	2,150 m	
		Bridge/Viaduct, Existing	2,215 m	
		Bridge/Viaduct, Subtotal	4,365 m	
		Embankment & Others	4,275 m	
		Total	8,640 m	Excluding 900 m long temporary access
2	Access Facilities	On-Ramp	2 Nos.	Tamansari, Gedebage
		Off-Ramp	2 Nos.	Tamansari, Gedebage
		Total for Ramps	4 Nos.	
		Interchange	1 Nos.	Gedebage IC
3	O&M Facilities	Toll Gate, New Provision	1 Nos.	Gedebage IC
		Toll Gate, Existing	1 Nos.	Pasteur
		Total for Toll Gates	2 Nos.	
		O/M Station	0 Nos.	

2.3 REVIEW OF TRAFFIC DEMAND FORECAST

The traffic demand forecast for years 2015, 2020, 2025 and 2030 have been carried out under the following conditions

- Tariff system is a flat tariff (in the original F/S, distance proportional tariff system was applied)
- The toll road system is to be realized by phasing (Phase 1, Phase 2).

Table-2.2 On-Off Ramp Traffic Volume

(unit : Veh/day)

No.	IC Volume		2015	2020	2025	2030
1	Pasteur	On Ramp	9,830	11,284	17,453	25,750
		Off Ramp	10,728	14,690	21,132	29,597
2	Djundjunan	On Ramp	0	518	1,247	2,363
		Off Ramp	0	1,530	2,604	4,731
3	Gasibu	On Ramp	10,728	16,222	23,736	34,327
		Off Ramp	9,830	11,802	18,700	28,114
4	Sukaluyu	On Ramp		8,610	13,580	18,813
		On Ramp		4,084	4,279	4,451
5	Cicaheum	On Ramp		2,808	3,590	5,717
		Off Ramp		5,003	6,267	8,247
6	Soekarno Hatta	On Ramp	10,982	18,105	23,126	26,691
		Off Ramp	11,535	13,953	15,444	18,291
7	Gede Bage	On Ramp	10,215	11,310	15,926	18,248
		Off Ramp	6,372	6,224	5,650	9,236
8	Gede Bage INTC	On Ramp	11,391	14,462	16,061	19,508
		Off Ramp	14,681	23,698	34,019	36,919
9	Cibiru	On Ramp		6,282	23,552	26,432
		Off Ramp		1,423	14,752	17,048

Table-2.3 Projected Traffic Volume in the BIUT Road

(Unit: Veh/day)

No.	Section	Class I	Class II	Class III	Class IV	Class V	Total
I	Year 2015						
	a. Pasteur - Djundjunan	19,708	764	84	0	2	20,558
	b. Djundjunan - Gasibu	19,708	764	84	0	2	20,558
	c. Soekarno Hatta - Gede Bage	23,786	2,541	342	62	55	26,786
	d. Gede Bage - Gede Bage INTC	20,542	2,195	295	54	47	23,133
II	Year 2020						
	a. Pasteur - Djundjunan	25,151	975	106	1	2	26,235
	b. Djundjunan - Gasibu	27,130	1,052	115	1	2	28,300
	c. Gasibu - Sukaluyu	19,923	772	85	1	2	20,783
	d. Sukaluyu - Cicaheum	16,194	628	69	0	2	16,893
	e Cicaheum - Ujung Berung	8,714	338	37	0	0	9,089
	f Ujung Berung - Soekarno Hatta	3,679	143	16	0	0	3,838
	g Soeta - Gede Bage	34,327	3,668	494	90	79	38,658
	h Gede Bage - Gede Bage INTC	28,832	3,081	414	76	66	32,469
	i Ujung Berung - Cibiru	14,554	565	62	0	1	15,182
III	Year 2025						
	a. Pasteur - Djundjunan	37,356	1,448	159	2	3	38,968
	b. Djundjunan - Gasibu	41,074	1,592	174	2	4	42,846
	c. Gasibu - Sukaluyu	25,407	985	108	1	2	26,503
	d. Sukaluyu - Cicaheum	23,634	916	100	1	2	24,653
	e Cicaheum - Ujung Berung	14,180	549	60	0	2	14,791
	f Ujung Berung - Soekarno Hatta	36,938	1,432	157	2	3	38,532
	g Soeta - Gede Bage	45,066	4,815	648	119	103	50,751
	h Gede Bage - Gede Bage INTC	34,692	3,707	499	92	80	39,070
	i Ujung Berung - Cibiru	35,786	1,388	152	2	3	37,331
IV	Year 2030						
	a. Pasteur - Djundjunan	53,575	2,077	228	2	4	55,886
	b. Djundjunan - Gasibu	60,423	2,343	256	2	5	63,029
	c. Gasibu - Sukaluyu	33,145	1,285	141	2	3	34,576
	d. Sukaluyu - Cicaheum	33,337	1,293	142	2	3	34,777
	e Cicaheum - Ujung Berung	19,930	773	84	0	2	20,789
	f Ujung Berung - Soekarno Hatta	43,380	1,682	184	2	3	45,251
	g Soeta - Gede Bage	50,768	5,425	730	133	116	57,172
	h Gede Bage - Gede Bage INTC	40,440	4,321	581	106	93	45,541
	i Ujung Berung - Cibiru	40,650	1,576	172	2	3	42,403

Source : Survey Team

2.4 PROJECT COST AND FUNDING PLAN

As a result of the review conducted by the JICA Survey Team, the difference in the unit construction cost by type of structure between the I/P by Bina Marga in July 2007, and similar projects in Indonesia (TgPA, UARI, etc), was determined as shown in Table-2.4;

Table-2.4 Unit Construction Cost by Type of Structure

Type of Structure	Unit Price of BIUT (I/P) (million Rp/m^2)	Unit Price of Similar Projects in Indonesia (million Rp/m^2)
At-grade (earth works and pavement works)	0.57 – 1.01	1.00 – 3.00
PC-I Girder Bridge (with nominal piers)	6.93	7.00 – 9.00
PC-Box Girder Bridge	7.27 – 9.59	15.00 - 18.00
Steel Box Girder Bridge	9.93	21.00 – 26.00
Underpass	5.93	-

Source: JICA Survey Team

The JICA Survey Team updated the cost estimate using the cost breakdown in the F/S.

The proposed type of the structure for the Project is commonly constructed in Indonesia by the local contractors. It is also noted that the required construction materials and equipment are available in the construction market in Indonesia. Therefore, all of the costs were estimated in Rupiah currency in the same way as in the F/S. The unit construction costs in the F/S were reviewed and re-calculated using the latest base price in 2009. The updated construction costs for Phases 1 and 2 are Rp 1,201 billion and Rp 4,985 billion, respectively.

Consequently, the project costs for Phases 1 and 2 turned out to be Rp 2,544 billion and Rp 8,920 billion, respectively.
Two funding options, namely, the traditional government funding and PPP funding are conceived.
As for funding plan for the former option, Phase 1 requires a capital investment of Rp. 2,434 Billion, of which Rp. 1,694 billion will come from Japanese ODA and Rp. 740 billion from the GOI. Phase 2 meanwhile requires a capital investment of Rp. 5,865 Billion of which Rp. 4,475 billion is from Japanese ODA and Rp. 1,390 billion from the GOI.

Considering the initial flat tariff for type I vehicle of Rp. 5,500 obtained from traffic analysis, the debt-service coverage ration (DSCR) is determined to be 1.59 or more. This implies that the Japanese ODA loan can be repaid easily.

It is likewise examined whether the PPP scheme is feasible and if so, what options are appropriate. The PPP options assumed are for Phase 2, shared between GOI and the private sector. The maximum possible share of construction cost by the private sector is calculated at only 20% in order for the loan to be repayable under the socially acceptable flat tariff rate of Rp. 5,500 for type I.

In the toll road sector in Indonesia, the PPP scheme usually calls for a private sector contribution of 50% or more in the cost sharing. Considering high transaction and coordination costs required for PPP deals, such low private sector cost sharing is not justified. Thus, pursuing PPP options should not be taken into further consideration.

In conclusion, the GOI funding using ODA loans is recommended to execute both Phase 1 and Phase 2.

2.5 IMPLEMENTATION STRUCTURE AND PROGRAM

The designated executing agency is the Directorate General of Highways (Bina Marga), which is one of the four directorates under the MOPW. It is responsible for implementing the main duties of the MOPW in terms of standardization of road techniques and policy implementation.

The Project will be implemented under two phases: Phase 1 initially funded by a Japanese ODA loan, and Phase 2 for the remaining portion which will possibly commence at a later period. For Phase 1, Bina Marga, acting as the employer, will procure a consultant to implement the detailed design, tender

assistance and construction supervision. The contractors procured through ICB process will undertake the construction. The completed toll road will be opened to traffic under the operation and maintenance (O&M) by a concessionaire entrusted by Bina Marga. For Phase 2, another consultant will be employed for the same purpose and the same process will follow, unless a different funding scheme such as the PPP is adopted.

Phase 1 of the Project is to be executed through a Japanese ODA Loan for the Fiscal Year 2009. After the appraisal of JICA in October 2009, the loan agreement will be signed between JICA and GOI in March 2010. According to these schedules, the construction works for Phase 1 will start in January 2013 and will be completed in three years, in December 2025.

As for Phase 2, as the funding scheme and, consequently, the implementation process have not been finalized, implementation program could not be assessed at this stage.

2.6 OPERATION AND MAINTENANCE (O&M) STRUCTURE

The toll collection system for the Project road is planned to be 1) Flat toll as the toll type, 2) Entry collection as the toll collection method, 3) Tolls to be charged to all users as the extent of toll charging, and 4) Through the toll gate allocation of ten toll gates consisting of eight on-ramp toll gates, and three barrier-type toll gates for the finally completed network.

An O&M company who has gained advantage on O&M investment in Bandung shall be procured to maintain the financial soundness of the enterprise, and to provide excellent service to road users.

2.7 ENVIRONMENTAL AND SOCIAL CONSIDERATION

(1) Review of EIA and Confirmation

The construction of the BIUT Road Project was approved by the West Java Provincial government through the process of EIA (AMDAL) in March 2007, completing the Indonesia domestic regulatory procedure.

The BIUT Road Project will be categorized as Category A under the JBIC Guidelines. Therefore, GOI and related parties must submit EIA reports and the basic resettlement plans.

The AMDAL almost satisfies the JBIC Guidelines' environmental aspects. However, from the social-environmental aspects, examinations are not enough. Particularly, the basic resettlement plans must be prepared by the project proponents and submitted through the borrower.

(2) Review of Environmental Consideration

The review of EIA report, taking into account recent studies, focuses on: (a) approval status of the EIA and the status of permitting issues other than EIA; (b) environmental issues including air quality, noise, hydrology of river and drainage, consideration and landscape; and (c) public consultation. JICA in principle confirms through the borrower over a certain period of time, the results of monitoring and evaluating the significant environmental impact items.

The JICA Survey Team recommends that some items such as PM10 and Pb density be added to the air quality parameter. It is also recommended that the parameter Leq be surveyed points near the schools and hospitals selected for sampling during construction phase, while vibration survey be implemented during construction and post-construction phases.

Environmental Management Plan (RKL) of the Project is one of the most important documents requested by the GOI and the JBIC Guidelines. The RKL of the Project is already approved by West Java Province, in March 2007.

The land acquisition and resettlement program are coordinated and supervised by West Java Provincial Government, and Bandung City. Bandung Regency meanwhile will be in charge of implementing the specific activities for land acquisition and resettlement.

The term of land acquisition process depends on the number of PAPs, houses and buildings However, if the condemnation step is not avoided, a term of about three years will be needed.

According to the basic concept of the JBIC Guidelines, a Land Acquisition and Resettlement Action Plan (LARAP) is required to ensure that incomes and living standards of PAPs are restored to at least not worst than the pre-project levels.

Total affected houses and buildings due to the implementation of the Project road is estimated to be about 2,595. This includes an estimated 771 residential buildings, 1,567 business and commercial buildings, 257 public facility buildings.

The JICA Survey Team proposed a supplementary Public Consultation Meeting (PCM), because it was judged that the attendance in the PCM during the AMDAL study stage was not applicable to the JBIC Guidelines.

Summary of main issues raised by participants during the public consultation are a) traffic condition, b) environmental aspects such as air quality, noise, flood, drainage and garbage, c) socio-economic aspects such as land price (acquisition), resettlement (relocation), local economy, business activities, and local communities, and d) local government policy and basic frameworks.

The LARAP Framework consists of the policy and concept of land acquisition and resettlement plan for the PAPs.

The LARAP will be established by local governments (Bandung City and Bandung Regency) based on these information and data on PAPs, local economic and physical condition, etc. After the approval of Bina Marga and West Java Province, it is anticipated that local governments will publish LARAP for PAPs and residents along the Project road. The policy of land acquisition program and relocation program are expected to be included in LARAP document.

2.8 TRAFFIC MANAGEMENT IN THE PROJECT AREA

(1) Mitigation of Traffic Congestion near the Project Road

The capacity of Jl. Alibasa, Jl. Pusdai Jl. Surapati near Gasibu area should be increased. Corresponding measures would be to widen related roadways, initiate appropriate one-way system to improve traffic flow, implement exclusive left-turn lane at the intersection and introduction of demand-activated traffic signal. Once elevated toll highway is constructed, the traffic volume of frontage road will decrease between Pasir Kaliki and Cihampelas, and Ir.H. Juanda. The congestion of such roads will be lessened.

It appears necessary to widen the road from the existing four lanes to six lanes in both directions, up to at least the Jl. Pusdai. This is to avoid congestion at the exit and entrance of the toll highway. Exclusive right turn lane should be constructed at the Pusdai intersection as well as a right turn signal phasing for traffic, coming from the underpass to the city center, through Jl. Diponegoro or W.R. Supratman.

According to intersection analysis, there are nine intersections, out of the twelve surveyed, that have one or more legs with saturated flow. Physical mitigation measures of these intersections are limited to widening of each leg especially in the saturated direction.

Separation between toll road users and local traffic using physical barriers, with access to and from

Tamansari Road, is secured by providing deceleration-acceleration lanes on the bridge. In order to adopt both local lane and deceleration-acceleration lanes on the bridge, exceptional lane allocations will be necessary. This includes a lane width of 2 - 3.25 m, deceleration-acceleration lanes of 3.0 m and local lane of 3.0 m.
As long as the local traffic could utilize the Pasupati Bridge when the new toll road is completed, no serious traffic problems in town are anticipated except for the inconvenience to the local traffic that are used to enter the elevated road from the Cihampelas Road.

Ramp and interchange locations have been reviewed based on the traffic demand. Moreover, specified spacing is determined based on domestic standards.

The Djunjunan Ramp will be operational when Phase 2 is completed. The Tamansari exit-entry access will be devoted to the traffic to the north of the City. It is noted that the Sukaluyu Ramp has replaced the previous exit-entry near Gasibu, to avoid traffic congestion.

(2) Suggestions for Area-Wide Traffic Management in Bandung City

The road construction alone would not improve the traffic situation in the City. There are many components which need to be developed as well. These include grade separated structures of major intersections along east-west and north-south arterials and rail-road crossings, widening of existing roads, intersection improvement, signalization of intersections (including demand actuated signals and/or area signal control), removing roundabouts that cause traffic congestion, and introduction of left turning on red system with exclusive left lanes at specific intersections, particularly where left turning vehicles prevail.

For better traffic control with modern control devices and computerized traffic control system, it is recommended to establish and organize a "Traffic Control Center (TCC)" in the City. The TCC controls traffic as a centralized function that collects processes and disseminates traffic information. Although the City already established a TCC, operated by police and city government officials, its equipment were found to be outdated.

Apart from road development and improvement, balance between private and public transportation mode is considered important to solve the City's current traffic situation. Similarly, the balance between traffic demand and supply of transportation facility is crucial. It is therefore recommended to actively introduce Transportation Demand Management (TDM) methods as well as road infrastructure development with new and existing facilities, under a limited budget.

3. PROJECT EVALUATION

(1) Economic Evaluation

For the purpose of economic evaluation, the benefit-cost (B/C) ratio with 15%, 20% and 25% discount rates per annum are computed for the alternatives of schedule scenarios, for the period up to 2035, (21 years for Phase 1) and 2040 (26 years for Phase 1).

Quantitative economic benefits are classified into three categories such as;

- Economic Direct User's Saving Benefit (The savings of vehicle operating cost and time cost of the toll road user are computed,
- Network Costs Saving Benefit (By the construction of the toll road, the whole road network also gets saving of total vehicle operation costs and total time costs compared to the condition without this toll road), and
- Multiplier Effects of Toll road Construction (The multiplier effects of construction of the toll road are based on the assumptions that 30% of costs are to be reinvested in the region

and 25% of this value would be economical effects of the project. These effects continue for 3 years.

The construction costs consist of land acquisition, engineering cost and construction cost. About 85% of these costs are considered part of economic costs.

The economic construction costs are Rp. 7,992.4 billion based on 2009 prices.

The O&M costs are computed for a project life considering an assumed one percent construction cost for each year, and five percent for every five years.

As a result, the B/C ratios for the discounted rates of 15%, 20%, and 25% per annum have been calculated as 1.389, 1.032, and 0.802, respectively. This was considering a project span of 26 years from 2015 to 2040, as well as EIRR of 20.5%. This project is therefore evaluated to be economically feasible.

(2) Financial Evaluation

The results of financial evaluation for the whole project produced an FIRR of 3.5% for a flat toll rate for the Vehicle Type 1 of Rp. 5,500.

(3) Qualitative Effects

As for the qualitative effects, several points of view are expected. First are the effects to urban planning or urban development, since the Project road would work as a back-bone to the central region of the City, and also as a distributor. Consequently, the dispersed development of the roads in the CBDs roads will be realigned to mitigate the present concentration of traffic in the area. Furthermore, the area would be eventually consolidated with the implementation of this symbolic toll road. Besides these effects, decrease in traffic accidents and overall reduction of the congestion of urban road network are expected.

4. NOTES ON PROJECT IMPLEMENTATION AND SUPERVISION

To implement Phase 1 of the Project, the following issues identified in this survey should be noted.

(1) Implementation of First Phase of Multi-Phased Project

Under the circumstances that the BIUT Road is planned as a multiple phase project, a Japanese ODA loan will finance Phase 1 only. It should be noted that in many aspects, adjustment and coordination with the perspective succeeding the phase components will be required in implementing the preceding Phase 1.

(2) Existence of Ceiling of Project Cost

In the list of foreign assistance projects (Blue Book) of 2008 by the National Development Planning Agency (BAPPENAS), the amount of loan for the Project is formalized as US$ 150 Million. Throughout the implementation of Phase 1, this amount should be realized as the ceiling project cost, unless the Blue Book is amended.

(3) Coordination with Prospective Development Projects

A major multiple facility development project, the Gedebage Area Development Project, with an area of about 600 ha in the southeastern region of Bandung City, is in progress. The impact of this development should be flexibly reflected to the Project throughout the implementation.

(4) Toll Road O&M Policy

After completion of construction of the entire network, the Project road will be operated and maintained by a duly selected O&M company, as one of the nationwide toll roads. However, if only a partial portion of the network is temporarily opened to traffic after the completion of Phase 1, a temporary O&M system, (for example, entrusting to Jasa Marga) should be considered from the viewpoints of economics and efficiency.

(5) Issues in Social and Environmental Considerations

The requirement by the JBIC Guidelines for Social and Environmental Considerations (April 2002), which classifies the Project as A Category, is not sufficiently met. The perspective for smooth and timely land acquisition and resettlement is not clear. As usual, this matter will be one of the most serious concerns for the Project implementation.

5. CONCLUSIONS AND RECOMMENDATIONS

1) Construction of BIUT Road is viable from the macro-economic perspective. It will contribute to the mitigation of traffic congestion in the urban area of the City and to the development of the regional economy. At the same time, the construction of this toll road would work as a back-bone to the central region of the City and work as a distributor from the viewpoint of urban planning or urban development. Thus, the dispersed development of CBDs will become possible and may also solve the presently concentrated CBD being dispersed.

2) Financing of Phase 1 of BIUT Road is expected to be through the Japanese ODA. Two road sections formulate Phase 1, that is, Phase 1-1: Pasupati Access-Gasibu Underpass (L=5.5km), Phase 1-2: Seokarno Hatta-Gedebage IC (L=3.1km+0.9km).The project cost of Phase 1 is estimated as Rp 1,816 billion (2009 price), which is approximately close to US$150 million mentioned in the Blue Book.

3) As for the financing option for Phase 2 implementation, PPP option was examined. In the toll road section in Indonesia the PPP scheme usually calls for a private sector contribution of 50% or more in the cost sharing. However, the examination reveals that only 15% contribution from the private sector makes it viable for both GOI and the private entity, under the consideration of the maximum allowable tariff level (Rp. 5,500). Therefore, utilizing PPP option is not appropriate. The traditional funding system, the GOI funding using ODA loans, is recommended to be adopted in Phase 2.

4) The success of the BIUT Road Project completely depends on whether smooth and timely land acquisition and relocation of affected people will be implemented. In order to attain this goal, project execution agency should refer to Chapter 3.7.3 of this report, together with resettlement experience of Pasupati Bridge in taking appropriate measures during detailed design and implementation stages. For example, a LARAP is critical to safeguard the rights of the affected people, such as replacement value of their assets, resettlement, livelihood restoration, and additional assistance to marginal and vulnerable groups.

5) The executing agency shall take the necessary actions to the timely realization of Japanese ODA. At first, the LARAP Framework for BIUT Road Project is necessary to be established at the time of Loan Appraisal by JICA. Simultaneously, EIA reports are to be opened to the public within 120 days prior to the Loan Agreement. Moreover, it must be noted by all concerned parties that an effective period of EIA is three years from its approval by the West Java Provincial Government. This means that the EIA is effective only until March 2010.

6) If the Loan Agreement will be signed in March 2010, the executing agency can immediately start to procurement process of consultants. According to the proposed implementation schedule, the construction works for Phase 1 will start in January 2013. As for Phase 2, the funding scheme is not decided yet. However, Phase 2 (excluding Udung Berung-Cileunyi

section) is suggested to be open to traffic in 2020 based on the results of economic evaluation.

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Bandung, with a population of 2.3 million persons as of 2007, is the capital city of West Java Province of the Republic of Indonesia. Bundung and its surrounding areas is formed into the so-called Bandung Metropolitan Area, which has a population of 7.9 million persons.

Bandung is the third biggest city in Indonesia following Jakarta and Surabaya, however, if combining population of Cimahi which is city adjacent to west of Bandung, the combined population of Bandung surpasses that of Surabaya. Recent population growth of Jakarta, Surabaya and Bandung is 1.11%, 1.63% and 2.04%, respectively. When comparing the road density of 3 major cities, Bandung is 5.4km/km2, while Jakarta is 10.0km/km2 and Surabaya is 7.5km/km2. In May 2005, intercity toll highway connecting Jakarta and Bandung was commissioned and driving time from Jakarta to Bandung is now shortened to 1.5 hours on average.

With the increase in population and rapid economic growth of the Bandung Metropolitan Area, the demand for the road transportation has been increasing, resulting in serious and chronic traffic jams. More particularly, heavy traffic congestion now occurs and is very serious along the East-West Corridor, starting from the exit of Jakarta-Bandung Toll Road located in the northwest part of Bundung, leading to existing Paspati Bridge and to the east connecting Soekaruno-Hatta National Highway at CIieunyi. During weekends, tourist traffic coupled with commuter traffic from Jakarta have resulted in worsening traffic conditions.

Because of deep concerns about the negative impact that worsening traffic conditions have on the economy and environment, the Bandung Intra Urban Toll Road Project (hereinafter referred to as BIUT Road Project) was contemplated and has been expected to mitigate traffic congestion. At the same time, a part of the Project is expected to be a fundamental infrastructure of the Gedebage Development Project, a new commercial, residential, and cultural complex which is being considered for development under a Public-Private Partnership (PPP) scheme in the southeastern part of Bandung.

The Government of Indonesia (hereinafter referred to as "GOI") conducted the feasibility study of the Project and its Environment Impact Assessment (EIA) in 2006, and the West Java Provincial Government approved the EIA Report in 2007. GOI has requested the former Japan Bank for International Cooperation (JBIC) to conduct Special Assistance for Project Formation (SAPROF) in January 2008. The JBIC mission and GOI's Bina Marga of Ministry of Public Works discussed and agreed with the contents of the Survey which is contained in an "Aide Memoire".

The Project is listed in the revised Indonesian Blue Book 2006-2007.

1.2 OBJECTIVES OF THE SURVEY

Based on the abovementioned background, the objectives of the survey are the following:

- Review, update, and confirm the contents of the existing Feasibility Study (FS) of the project;
- Establish an implementation schedule of the project; and
- Propose a traffic management policy for existing roads related to the project.

After the completion of the survey, the project is expected to be financed by a loan to be provided by the Japanese Government. Bina Marga of the Ministry of Public Works is the executing agency of the survey.

1.3 STUDY AREA

The main study area is the alignment corridor of the project and its surrounding areas. The alignment starts from the exit of the Pasteur toll gate of the Jakarta-Bandung Toll Road and Pasupati Bridge (2.3 km) already completed in 2005 with assistance from Kuwait Fund which will be a part of all sections of the project (27.257 km) and extending further to the eastern areas for easier access. The alignment of the access road to Gedebage development area is also part of the project. A related study area is the Bandung Metropolitan Area.

CHAPTER 2 PROJECT BACKGROUND AND NECESSITY

2.1 PRESENT CONDITIONS AND ISSUES IN THE TRANSPORT SECTOR IN INDONESIA

In Indonesia, road transportation is still the most favored option in the distribution of commodities for trading and industry. The 2001 National OD (Origin-Destination) survey shows that road transportation dominates 80% to 90% of all travels in Sumatra and Java, while railway transportation provides 10.5% of travels in Java. At Kalimantan and Sulawesi, the figures were relatively balanced in the sense that road transportation was not dominating the travel modes. In Nusa Tenggara, Maluku, and Papua, the sea transportation was relatively more dominant than road transportation.

2.1.1 DEGRADATION OF ROAD NETWORK CONDITION

Up to the end of 2005, the condition of road infrastructure in Indonesia showed a relatively moderate performance. Of the total 391,009 km road network, of about two-third (67.7%) of the total length was in good and moderate condition whilst the other 32.2% was in poor and very poor condition (see table 2.1.1). In terms of the total figure, most of road types were dominantly in the good condition (39.3%).

Table 2.1.1 Road Condition (2005)

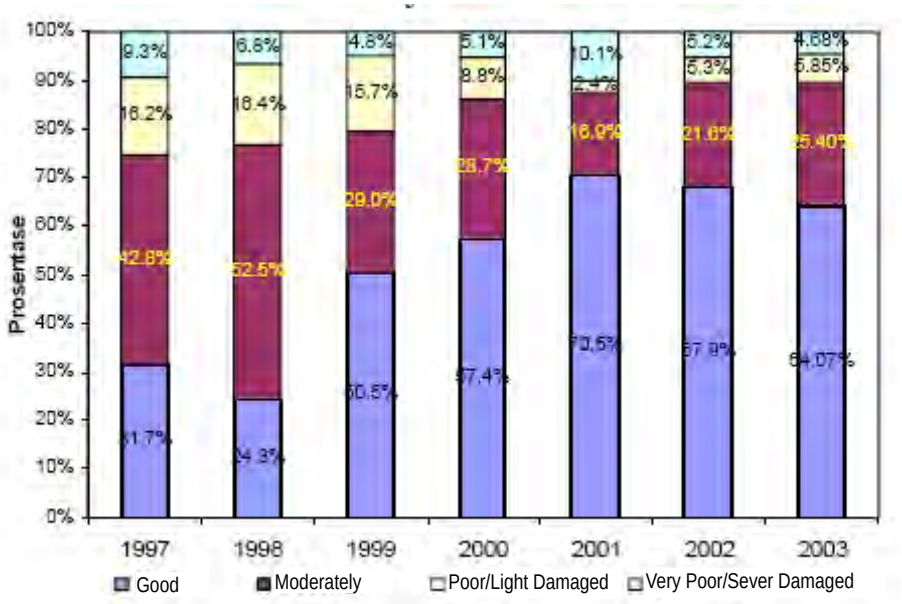
Road Types	Length (km)	Road Condition			
		Good	Moderate	Poor (Slightly damage)	Very Poor (Severe damage)
National Road	34,629	16,958	10,526	2,968	4,177
		49.0%	30.4%	8.6%	12.1%
Y-2002	*26,866*	*64.3%*	*24.0%*	*6.9%*	*4.8%*
Provincial Road	40,125	10,157	14,506	5,850	9,612
		25.3%	36.2%	14.6%	24.0%
Y-2002	*37,164*	*34.1%*	*32.1%*	*16.9%*	*16.9%*
District/ Municipal Road	316,255	126,540	86,143	62,483	41,089
		40.0%	27.2%	19.8%	13.0%
Y-2002	*266,464*	*18.0%*	*39.1%*	*26.2%*	*16.7%*
Total (2005)	391,009	153,655	111,175	71,301	54,878
		39.3%	28.4%	18.2%	14.0%
Total (2002)	*330,495*	*23.6%*	*37.1%*	*23.6%*	*15.8%*

Source: Calculated from Transportation and Communication Statistics 2005, Central Bureau of Statistics

Among the road types, Provincial roads showed a lowest performance. Their proportion of good and moderate road condition was only 61.5%. District/ Municipal roads were the second lowest with 67.2% of good and moderate road condition. National roads were relatively better with a proportion of good and moderate condition of road at about 79.4%.

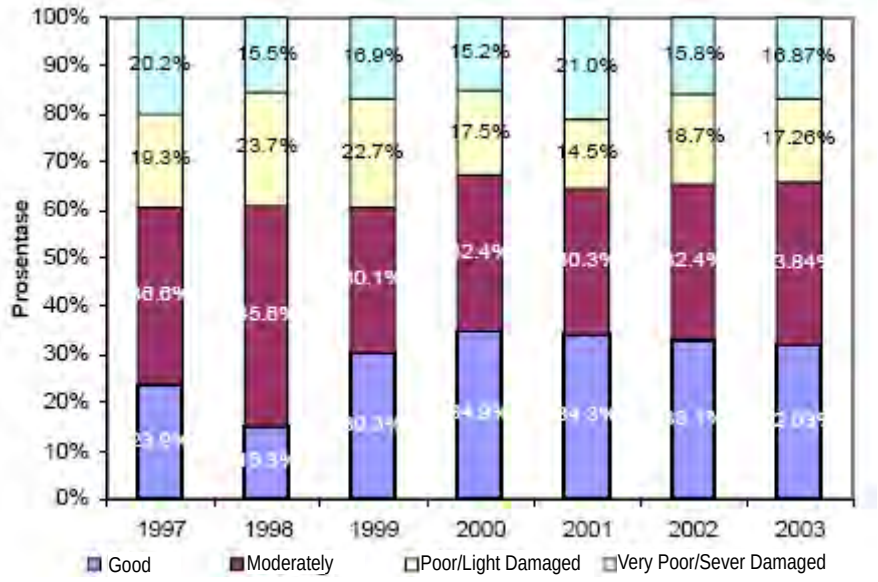
Comparing to the year 2002 figure, the total composition shows improvement condition indicated by the shifting from moderate-dominant condition (37.1%) to good-dominant condition (39.3%). However, the trend of improvement was likely occurring on District/ Municipal road only where the proportion of good road condition increased from 18.0% to 40.0%. At provincial road level, the proportion of good road condition decreased from 34.1% to 25.3%. Similar trend occurred to national road which experienced decreasing proportion of good road condition from 64.3% to 49.0%. This trend indicates the process of road degradation which leads to shift to poor condition.

Unlike the period of 2002-2005, the condition of national road showed an improvement from 1997 to 2003 (see Figure 2.1.1). The proportion of good and moderate road condition have increased from 74.5% in 1997 to 86% in 2003.



Source: National Mid-Term Development Plan 2004-2009, Chapter 33 – Infrastructure Development Acceleration

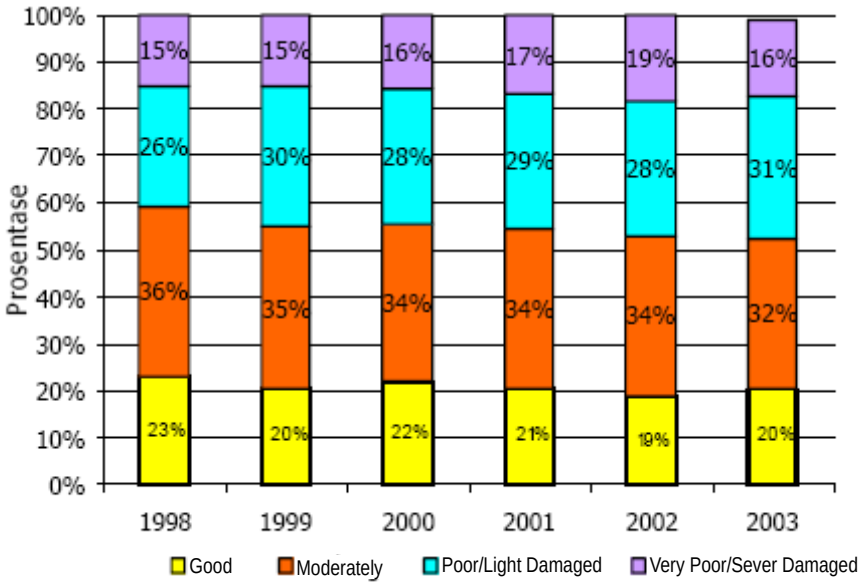
Figure 2.1.1 National Road Condition, 1997- 2003



Source: National Mid-Term Development Plan 2004-2009, Chapter 33 – Infrastructure Development Acceleration

Figure 2.1.2 Provincial Road Condition, 1997- 2003

In the same period, the proportion of good and moderate conditions of provincial roads was increasing slightly only from 60.5% to 65.8% (see Figure 2.1.2).



Source: National Mid-Term Development Plan 2004-2009, Chapter 33 – Infrastructure Development Acceleration

Figure 2.1.3 Kabupaten Road Condition, 1998- 2003

On the contrary, kabupaten roads experienced poor performance and degradation of condition during the same period. Their proportion of good and moderate road condition decreased from 56% to 53% (see Figure 2.1.3). As shown in Table 2.1.1, about 47% of kabupaten roads was in a poor and very poor condition. These poor conditions were almost equally distributed throughout the country.

In terms of road length, the poor and very poor condition of national and provincial roads in 2004 was about 7,863 km in Sumatra; 13,487 km in Java, Bali, and Nusa Tenggara; 2,691 km in Kalimantan; 1,702 km in Sulawesi; and 238 km in Maluku and Irian Jaya. The study conducted by Bapekin Kimpraswil (Ministry of Settlement and Regional Infrastructure, former Ministry of Public Works) indicated the need of budgetary funds of about Rp 6-8 trillion per year for road rehabilitation to achieve the same road condition as in pre-crisis time (or prior to 1998). As those budgets were never realized and implemented, a big backlog in maintenance occurred and aggravated the whole national road network.

2.1.2 ROAD SERVICE PERFORMANCE

Road service performance in 2002 (measured by travel speed) showed the average performance of most national and provincial roads was still adequate to facilitate travel speed close to design speed. In Java Island, however, the travel speed was relatively slower than in other islands.

At the Pantura (Pantai Utara=North shore) cross road, for instance, the average travel speed was 54.10 kph. Based on a 2003 survey of about 890 km, Java experienced a volume/capacity (V/C) ratio greater than 0.60. This particularly occurred at Pantura (Banten, West Java, and Central Java) and at the central line/ strip (Central Java and East Java). Furthermore, the Java Arterial Road Network Study (JARN) in 2001 mentioned that about 52% of arterial roads in Java was free from traffic congestions. However, this figure was estimated to decrease to 7% in 2010.

Table 2.1.2 V/C Ratio and Travel Speed

No.	Road Classification	V / C	Light Vehicle Speed (kph)	Heavy Vehicle Speed (kph)
1	**The whole road network**			
	National road (N)	0.17	59.37	51.72
	Provincial road (P)	0.07	60.73	50.98
	All road (N + P + Non status)	0.10	59.37	51.72
2	**Sumatra**			
	National road (N)	0.12	60.76	51.49
	Provincial road (P)	0.11	58.72	49.09
	All road (N + P + Non status)	0.11	60.57	51.26
3	**Java**			
	National road (N)	0.39	56.76	51.57
	Provincial road (P)	0.14	62.03	52.79
	All road (N + P + Non status)	0.16	58.6	51.82
4	**Other islands**			
	National road (N)	0.09	60.53	49.59
	Provincial road (P)	0.04	59.73	49.59
	All road (N + P + Non status)	0.07	59.94	52.29

Source: DG of Regional Infrastructure, Ministry of Settlement and Regional Infrastructure, 2002

Table 2.1.2 shows V/C ratios for national roads in Java, which is significantly higher than for other roads. Despite its high V/C ratio, the travel speed in national roads is not significantly different as in other roads in Indonesia.

Overloading is one of the serious problems causing the poor performance of the road network in Indonesia. The high rates of road damage due to overloading have significantly shortened the life span of the roads. Many road segments have suffered damages before achieving their design lifetime, and as a consequence, they create higher additional budgetary demands for road rehabilitation. This of course influences the budget plan of the entire road network in Indonesia.

On the other hand, the high incidence of road damage creates additional travel costs that burden road users. Vehicle operational costs (BOK= Biaya Operasional Kendaraan) and travel time costs are directly impacted by the incidence of road damage. This increase of road user costs then increases the transportation cost of goods and services, leading to increases in the prices of commodities.

Table 2.1.3 Daily Road User Costs

No.	Road Classification	VOC* (in billion Rp)	T-Time Cost (in billion Rp)	Road User Cost (in billion Rp)
1	**The whole road network**			
	Sumatra island	424.72	53.82	478.54
	Java island	641.09	80.84	721.93
	Other islands	312.16	33.67	345.82
	Total Indonesia	1377.96	168.33	1546.28
2	**Cross island road**			
	Sumatra island	204.33	29.32	233.65
	Java island	240.36	33.86	274.21
	Other islands	156.37	18.16	174.53
	Total Indonesia	601.06	81.34	682.39

*VOC= Vehicle Operational Cost
Source: IRMS, 2002

Table 2.1.3 shows a prediction of daily road user costs for all types of roads provided by IRMS for the year 2002. The total daily road user costs in Indonesia were Rp 1.546 trillion, and almost half of this amount was spent for Java Island alone. In Indonesia, road user costs for Sumatra and Java dominate 80% of the total figure. For cross island roads, the total road user costs for Indonesia were Rp 682 billion. Of that figure, almost 40% of road user costs is in Java, and 35% in Sumatra. These figures show the vital role of road transportation both in Java and in Sumatra Island.

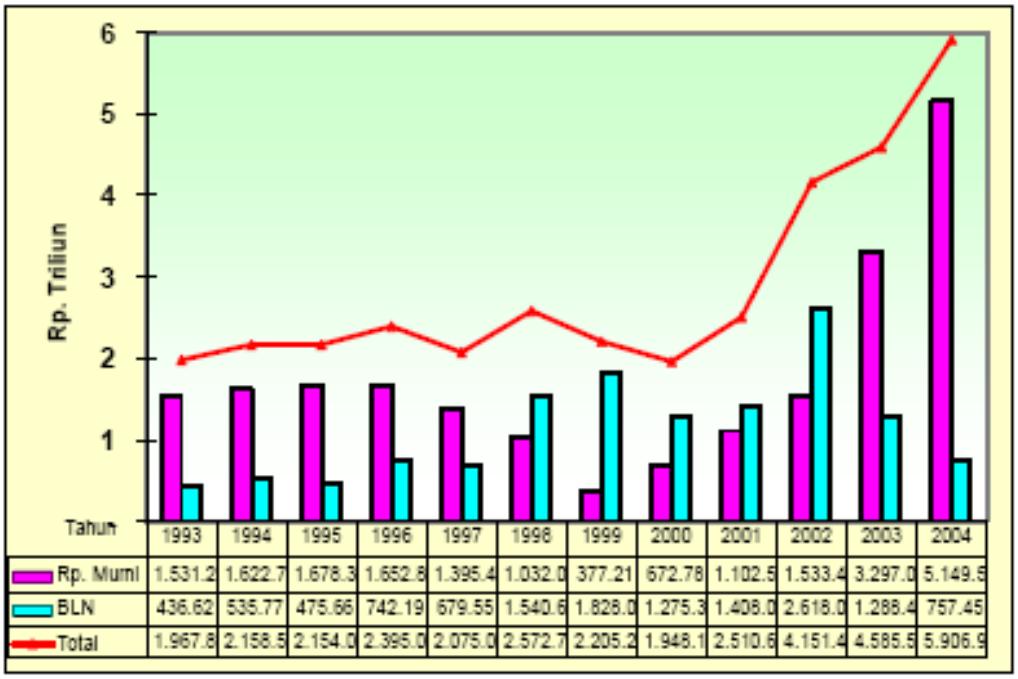
The figure of road user cost is determined based on complex variables of car/ vehicle operating cost (VOC) and time- travel cost. Due to geographical condition of Indonesian archipelago, the costs were tending to vary across the regions. Therefore, it is difficult to evaluate road user cost in terms of their nominal values.

Table 2.1.2 also shows the proportion of cost which tend to vary among the regions. For the whole road network, proportion of VOC at Sumatera Island was 88.8% which was similar to Jawa Island. The proportion was relatively lower in compare to other Island. Based on this figure we can say that travel time cost was appreciated in higher portion by people in Jawa and Sumatera Island.

Since the V/C ratios of roads in Java tend to increase continuously, it will bring an impact on increasing road user costs. In this regard, demands on the toll road must be anticipated to maintain acceptable service levels of the roads and to reduce inefficiencies caused by traffic congestions.

2.1.3 ROAD FINANCING AND LIMITED FUNDS CAPACITY OF LOCAL GOVERNMENT

The financing scheme of national roads was provided through a combination of APBN and loan schemes. From 1998 to 2004 these financing schemes increased consistently, but the composition has been shifting from largely loan financing to more local funding (APBN) (see Figure 2.1.4). The loan scheme funding was dominant during the time of economic crisis and the recovery period, from 1998 to 2002.



Tahun	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Rp. Murni	1.531.2	1.622.7	1.678.3	1.652.8	1.395.4	1.032.0	377.21	672.78	1.102.5	1.533.4	3.297.0	5.149.5
BLN	436.62	535.77	475.66	742.19	679.55	1.540.6	1.828.0	1.275.3	1.408.0	2.618.0	1.288.4	757.45
Total	1.967.8	2.158.5	2.154.0	2.395.0	2.075.0	2.572.7	2.205.2	1.948.1	2.510.6	4.151.4	4.585.5	5.906.9

Note; Rp. Murni = Rupiah Murni= Road Project Financed by Government of Indonesia
BLN = Bantuan Luar Negeri = Road Project Financed by Loan Scheme
Source: DG of Regional Infrastructure

Figure 2.1.4 Road Infrastructure Financing

The financing mechanism of road development and maintenance for toll roads, national roads, provincial roads, kabupaten roads, municipal roads, and village roads has experienced dramatic changes since the implementation of Law No. 22 of local government autonomy. However, the changes are still on-going, and the process is not yet finished. Since many provinces and kabupatens rely heavily on the APBD and APBN mechanisms, their budgets for road development and maintenance are limited and sometimes are not planned consistently. Alternative financing schemes have not yet been explored due to unclear regulations that could involve private investors in road development and maintenance. Furthermore, road maintenance is becoming partially addressed by local government administrations in Indonesia by virtue of definition made regarding road boundary. An integrated road network treatment and intermodal transportation networks are needed to implement a borderless approach; on the other hand, a breakthrough in financing schemes should be introduced to prevent the degradation of road conditions.

2.1.4 PROBLEMS OF ROAD TRAFFIC SERVICES

The growth rate of road infrastructure development is usually slower than the growth of traffic vehicles volume. One of the reasons is due to limited budget available for new road development. The longer road built by the government the more budget needed for road maintenance which in turn limiting the budget allocated for new road development. Another reason is the fast growing of land price that particularly occurs in city areas which creating high cost road development. As a consequence, the growth of traffic vehicle particularly in city tends to be faster than the growth of road construction. This imbalance condition leads to insufficient capacity and increases the V/C ratio which in turn creates a potential of traffic congestion. On the other hand, the combination of poor infrastructure and the high incidence of local retributions create inefficiency of transportation cost.

The registered vehicle in Indonesia is extremely increasing. In year 2002, the number registered vehicle in Indonesia around 22.98 million vehicles. Annual increment of vehicle number from 2002 to 2003 is 16.2%, and the registered vehicle number becomes 26.71 million vehicles. This growth condition has been maintained up to year 2006 and the growth figure is still two digits.

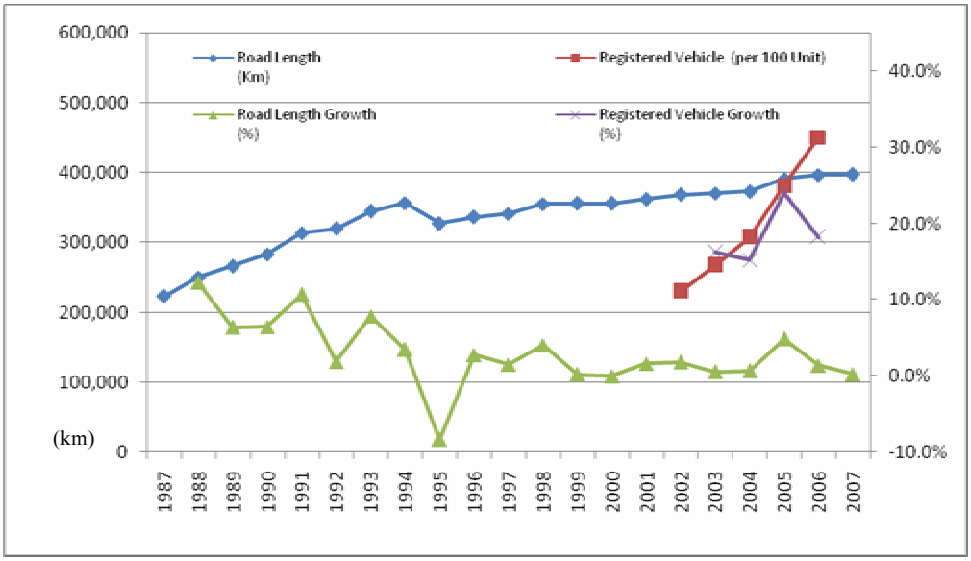
In year 2006, the registered number in Indonesia is around 45.08 million vehicles. Meanwhile increment of the road length is low. In the year 2002-2003, growth of the road length is only 0.6% per annum. The highest road length growth is 4.8% per annum in year 2005. The road length in year 2002 is 368,362 km, and 370,516 km in year 2003, respectively.

Table 2.1.4 Number of Registered Vehicle in Indonesia

Year	Road Length (Km)	Registered Vehicle (per 100 Unit)	Road Length Growth (%)	Registered Vehicle Growth (%)
1987	222,924			
1988	250,314		12.3%	
1989	266,326		6.4%	
1990	283,516		6.5%	
1991	313,897		10.7%	
1992	319,758		1.9%	
1993	344,892		7.9%	
1994	356,878		3.5%	
1995	327,227		-8.3%	
1996	336,377		2.8%	
1997	341,467		1.5%	
1998	355,363		4.1%	
1999	355,951		0.2%	
2000	355,951		0.0%	
2001	361,782		1.6%	
2002	368,362	229,852	1.8%	
2003	370,516	267,067	0.6%	16.2%
2004	372,929	307,691	0.7%	15.2%
2005	391,009	381,563	4.8%	24.0%
2006	396,467	450,823	1.4%	18.2%
2007	397,411		0.2%	

Source ; Statistical book of Indonesia, Year 2008.

Figure 2.1.5 shows the trend of road length growth and registered vehicle growth in Indonesia. The road length growth is below than registered vehicle growth.



Source ; Statistical book of Indonesia, Year 2008.

Figure 2.1.5 Trend of Registered Vehicle in Indonesia

The low quality of public transportation service, high incidence of traffic accidents, tight competition, and lack of discipline are some problems of public transport which need to be solved effectively.

2.2 PRESENT CONDITION AND ISSUES IN THE TRANSPORTATION SECTOR IN BANDUNG

Bandung Metropolitan Area consists of four municipalities/districts and three sub-districts in Sumedang District. The newest district established in Bandung Metropolitan Area is West Bandung District which has 15 sub-districts. This new district was formerly a part of Bandung District.

Table 2.2.1 Population and Density in Bandung Metropolitan

Bandung Metropolitan Area	Area (ha)	Population (persons)	Density (persons/ha)	Population Growth (%)
Bandung Municipality	16,729.65	2,329,929	139.3	1.44%
Bandung District	175,508.27	3,349,478	19.1	2.06%
West Bandung District	131,861.73	1,485,616	11.3	2.06%
Cimahi Municipality	4,036.73	536,743	133.0	2.68%
Tanjungsari Sub-district	3,562.00	69,332	19.5	1.97%
Cimanggung Sub-district	4,076.00	75,500	18.5	2.00%
Jatinangor Sub-district	2,620.00	97,467	37.2	2.04%
Total	338,394.38	7,944,064	23.5	2.04%

Source : Statistical Central Board, 2008.

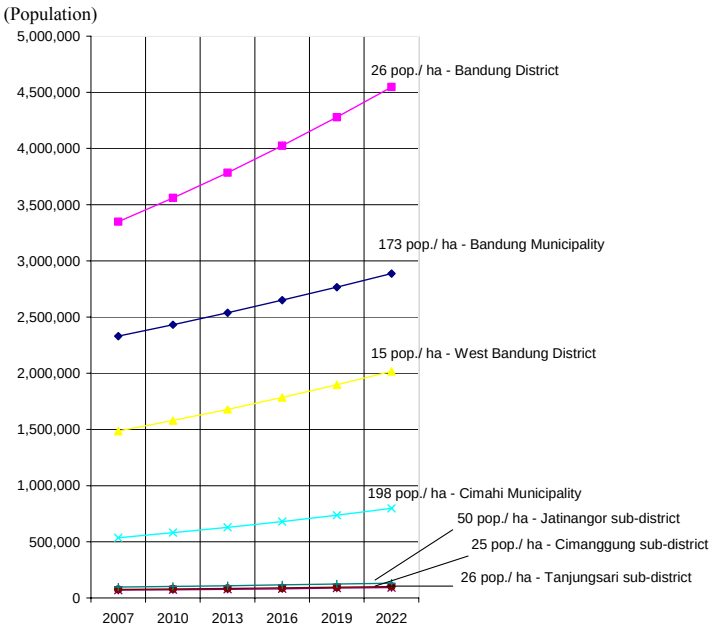
Table 2.2.2 Comparison of Population and Density

Year 2006	Area (ha)	Population (persons)	Density (persons/ha)	Pop. Annual Growth (%)
South Jakarta	14,573	2,053,684	140.9	2.33
East Jakarta	18,773	2,413,875	128.6	0.43
Central Jakarta	4,790	891,778	186.2	-0.03
West Jakarta	12,615	2,130,696	168.9	1.87
North Jakarta	14,220	1,452,285	102.1	0.32
Kepulauan Seribu	1,181	19,362	16.4	0.32
DKI Jakarta	66,152	8,961,680	135.5	1.11
Surabaya City	32,637	2,784,196	85.3	1.63

Source : Jakarta City Dalam Angka, 2007 and Surabaya City Dalam Angka, 2007.

In 2007, the population in Bandung Metropolitan Area was approximately 7.9 million. The highest number of population is in Bandung District with 3.3 million. The population in Bandung municipality was 2.3 million, while West Bandung District had 1.5 million citizens. Cimahi municipality had a smaller population with around 0.5 million citizen, while the three sub districts in Sumedang District have a total population of only 0.2 million.

The total area of Bandung Metropolitan Area is 338,394.38 ha, which means its population density is approximately 23.5 citizens/ha. Bandung municipality has the highest population density in the Bandung Metropolitan Area with about 139.3 persons/ha. Cimahi municipality's population density is also high with 133.0 persons/ha. The lowest density is in West Bandung District with around 11.3 persons/ha.

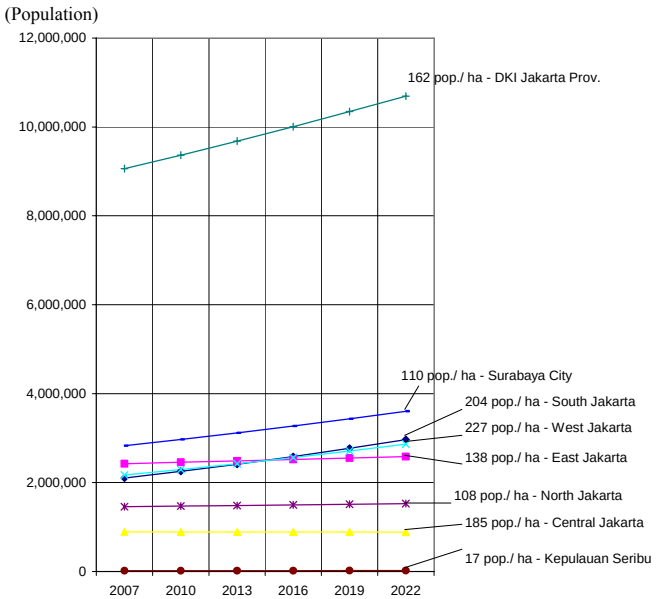


Source ; Statistics Indonesia

Figure 2.2.1 Projection of Population in Bandung Metropolitan Area, 2007 – 2022

The population growth in Bandung Metropolitan Area was estimated to be 2.04% per annum. Bandung municipality has the lowest population growth at 1.44% per annum. The highest population growth is in Cimahi municipality, with around 2.68% per annum.

Figure 2.2.3 shows the distribution of households in Bandung Metropolitan Area. The dark color (brown) means there are more than 10,000 households. Bandung and Cimahi municipalities have more than 10,000 households in each sub-municipality. The regions outside of Bandung and West Bandung Districts have a lesser number of households. For a comparison, Table 2.2.2 and Figure 2.2.2 show the population distribution and population growth 2007 – 2022 at DKI Jakarta province and Surabaya City



Source ; Statistics Indonesia

Figure 2.2.2 Projection of Population in DKI Jakarta and Surabaya City, 2007 – 2022

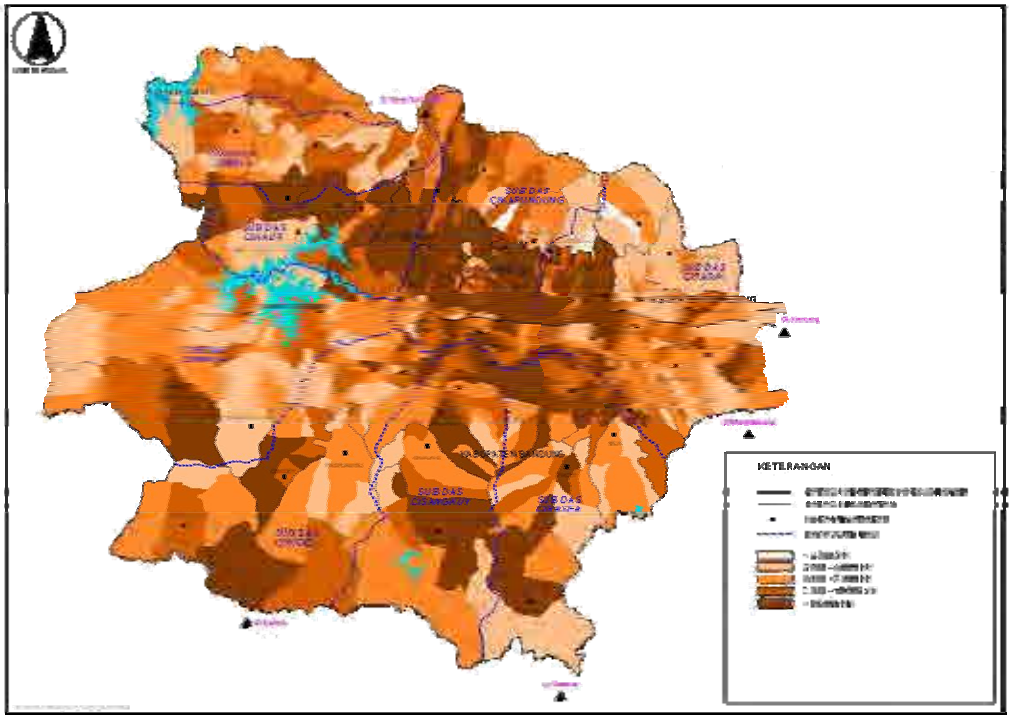


Figure 2.2.3 The Number of Households in Bandung Metropolitan Area

The developed area in Bandung Metropolitan Area is concentrated in the municipalities. There are two municipalities in Bandung Metropolitan Area namely, Bandung and Cimahi municipalities. Figure 2.2.4 shows the developed areas in Bandung Metropolitan Area. The main corridor of developed road network lies in the east-west directions connecting to Jatinangor of Sumedang District, where there are some education centers such as home affair, high school, Pajajaran University, and others.

The road corridor in the south-east direction goes to Garut District, which is an industrial area located near the main road. The road corridor goes in a southerly direction and connects to Soreang, which is the capital city of Bandung District.

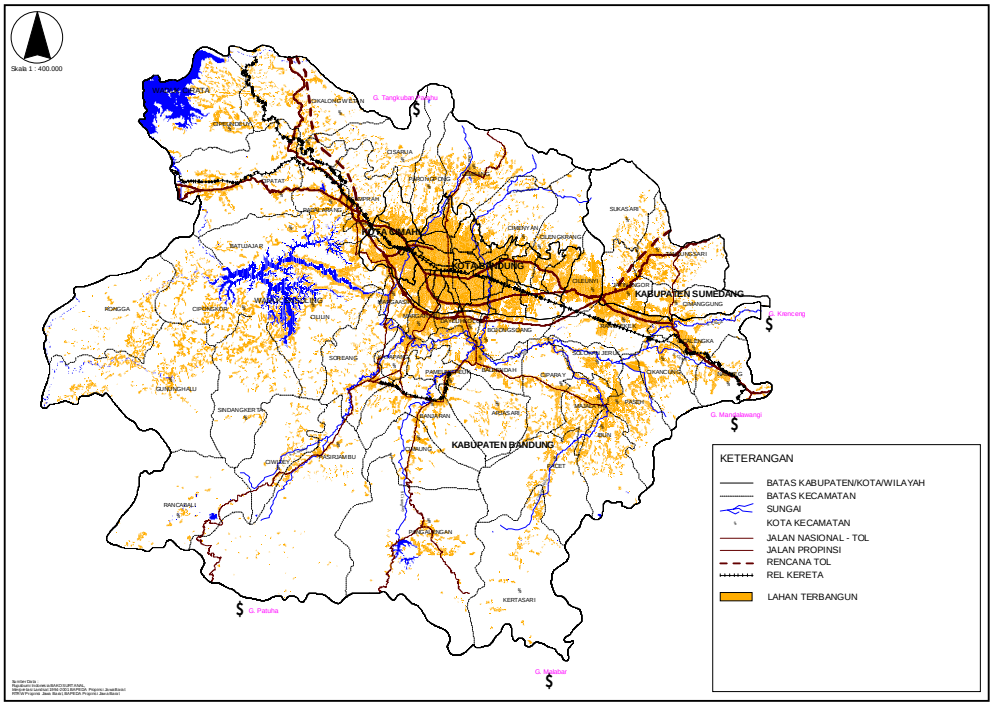


Figure 2.2.4 The Developed Area in Bandung Metropolitan Area

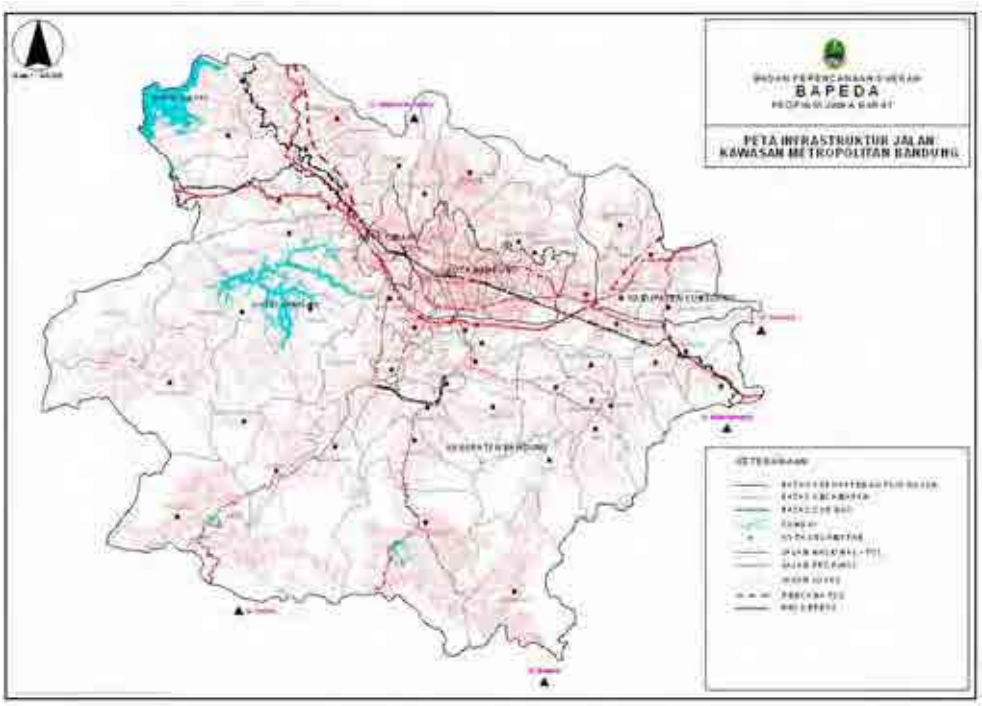


Figure 2.2.5 Road Infrastructure in Bandung Metropolitan Area

The road infrastructure is quite developed in Bandung Metropolitan Area, and there is a main corridor of roads connecting to each sub-district. The southern part of Bandung Metropolitan Area is not developed yet. In this area, there are some destinations for tourism activities.

2.3 TRANSPORT POLICY OF INDONESIA

The aim of transportation development policy in Indonesia is to enhance transportation services in an efficient, reliable, quality-based, safe, and affordable manner. Moreover, the policy aims to form a national transportation system that is intermodal and integrated with Indonesia's regional development thrusts and become a part of a distribution system that provides widespread services and benefits to the public, including the enhancement of an adequate rural-urban network.

The general objective of road infrastructure development is to improve road capacity and the quality of the road infrastructure to enhance the rapid growth of an area, and to increase regional accessibility. As a support service, road infrastructure must grow with transportation demand in terms of speed and comfort particularly along the main corridors of each island, the KAPET region, border and remote areas, and small islands.

2.3.1 POLICY DIRECTIONS

The policy directions in the road transportation sector in Indonesia consist of the following:

a. Harmonizing the integration of road network system with the national spatial plan policy and integrated with other infrastructure systems;
b. Intermodal services context and SISTRANAS (National Transportation System) that ensure efficiency of transportation service;
c. Development of island-based of road infrastructure network system in Java, Bali, Sumatra, Kalimantan, Sulawesi and Papua;
d. Maintaining existing road infrastructure services performance by optimizing road infrastructure utilization using the results of road technology research and development;
e. Capacity-building on road infrastructure management;
f. Stimulation of private and community involvement in providing and managing road infrastructure.

2.3.2 PROGRAMS FOR 2005-2009

Indonesia's road development programs for the period 2005 to 2009 are spelled out as follows:

a. Rehabilitation/ maintenance of roads and bridges particularly at major economical corridors, providing higher priority to:
   - Routine and periodical rehabilitation/ maintenance for national roads 151,267 km;
   - Routine and periodical rehabilitation/ maintenance for provincial roads 180,291 km;
   - Routine and periodical rehabilitation/ maintenance for kabupaten roads 721,696 km;

b. Development program for roads and bridges of the national road network system, including toll and non-toll roads:
   - Improvement/ development of 33,538 km primary arterial roads and 88,950 m bridges at the main line/ major economic corridors: North Line Java; South Line Java; Central Line Java; East Line Sumatra; Central Line Sumatra; West Line Sumatra; South Line Kalimantan; Central Line Kalimantan; North Line Kalimantan; West Line Sulawesi; East Line Sulawesi; Central Line Sulawesi; and strategic road segments connecting these lines;
   - Improvement/ development of primary and strategic arterial roads in urban areas particularly to reduce traffic congestion at road crossings and railway crossings through the

development of a flyover in Jabodetabek region: Jl. Pramuka crossing, Jl. Tanjung Barat, Jl. Raya Bogor, and Bekasi; and preparation of flyover development at several cities at the main line of Pantura: Merak, Balaraja, Nagrek, Gebang, Tanggulangin, Peterongan, Palimanan, and Mangkang;

- Road handling of about 300 km at border areas in West Kalimantan, East Kalimantan, Nusa Tenggara Timur, and Papua;
- Road handling of about 200 km for isolated areas such as West Line of Sumatra, East Line of Sulawesi, Flores Cross Road, Seram Cross Road, Halmahera Cross Road, and strategic road segments at Papua, KAPET areas, access to rural areas, and isolated areas including small islands, seashores along Simeuleu, Nias, Alor, Wetar, etc.; and
- Improvement/ development of the provincial road network of about 2,390 km and kabupaten roads of about 81,742 km.
- Development of 1,593 km toll roads to support arterial roads:
  - Development of toll roads at Jabodetabek region for about 257.5 km: completion of Jakarta Outer Ring Road (JORR) Section W1, W2, E1, E2, and E3; access to Tanjung Priok Port; initial stage development of Jakarta Outer Outer Ring Road (JOORR); Bekasi- Cawang- Kampung Melayu Toll Road; Bogor Ring Road, etc.;
  - Completion of the bridge development at Suramadu (5.4 km), and the toll road segment Cikampek-Purwakarta-Padalarang for about 40 km;
  - Development of high-grade road/ Toll Trans Java and several road segments in Sumatra and Sulawesi of about 1,290 km;
  - Preparation of regulations, management assistance, planning, designing, road and bridge engineering supervision; and
  - Implementation of study and preparation of development for high-grade road/ Toll Trans Java and Sumatra.

2.4 TRANSPORTATION POLICY OF BANDUNG

2.4.1 TRANSPORTATION POLICY OF INDONESIA

Road infrastructure development in Indonesia needs high capital investments. The government needs a huge budget to maintain the existing road network. However, only a very limited budget is allocated for the transportation sector. Sectoral priority programs have been spelled out, with education being given the highest priority for future development. Twenty percent of the National Budget (APBN) is allocated to the education sector.

In this situation, other sectors were given low priority in terms of budgetary allocations. The same situation is true for the transportation sector, which is also budget-deficient.

The Government of Indonesia has invited investors to participate in road network development, especially in toll road development. There are some main trunk toll roads being developed by these investors such as Cikampek-Palimanan, Bogor Ring Road, and the Second JORR in DKI Jakarta. The toll roads developed by investors should be financially viable. A toll road project which is not financially viable will, however, be offered through other schemes such as PPP program.

2.4.2 TRANSPORTATION POLICY OF BANDUNG

The existing condition of the road network in the Bandung Metropolitan Area is shown in Table 2.4.1 below.

Table 2.4.1 Road Condition in Bandung Metropilitan Area

Condition	Length (km)			
	Bandung Municipality	%	Bandung District	%
Good	245.732	28.2	888.21	28.5
Fair	175.138	20.0	1,236.49	39.7
Bad	301.882	34.6	774.13	24.8
Very Bad	150.179	17.2	218.81	7.0

The road network system in Bandung City is shown in Figure 2.4.1. This road network connects radially to nearby areas of Bandung City. To the east direction, the network connects to Sumedang, Garut, and other cities. Meanwhile, in the southern direction, it connects to the capital city of Bandung District, while to the west side, it connects to the West Bandung District, and to the north it connects with West Bandung District.

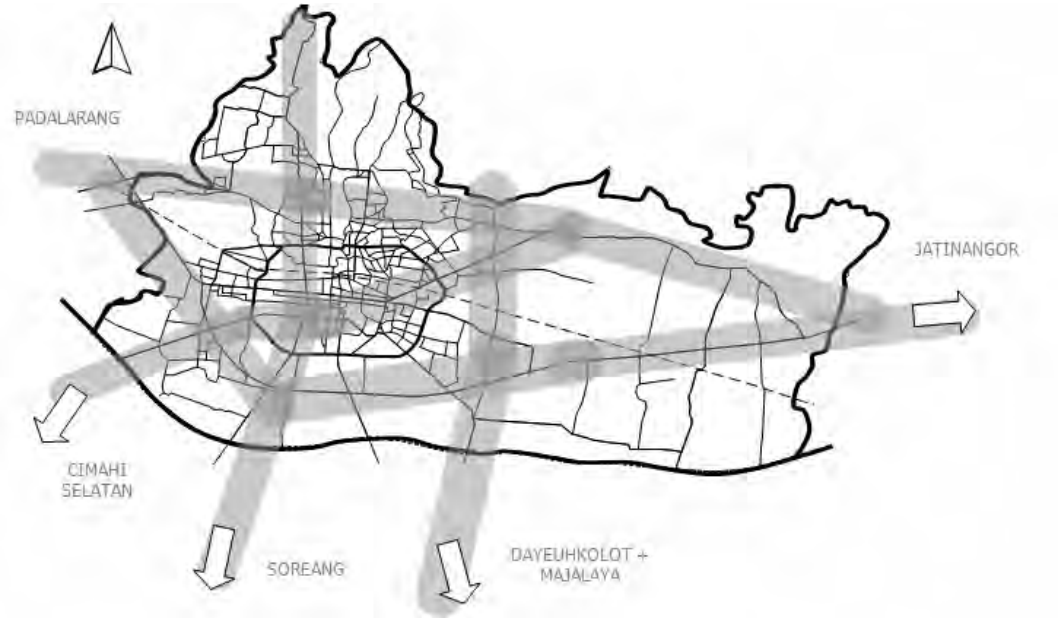


Figure 2.4.1 Road Corridors in Bandung Metropolitan Area

Bandung Metropolitan Area needs ring roads in the south side and north side (Ring Road I and Ring Road II). The ring roads will surround Bandung and Cimahi municipalities. Figure 2.4.2 shows the Ring Road conceptual plan in the Bandung Metropolitan Area.

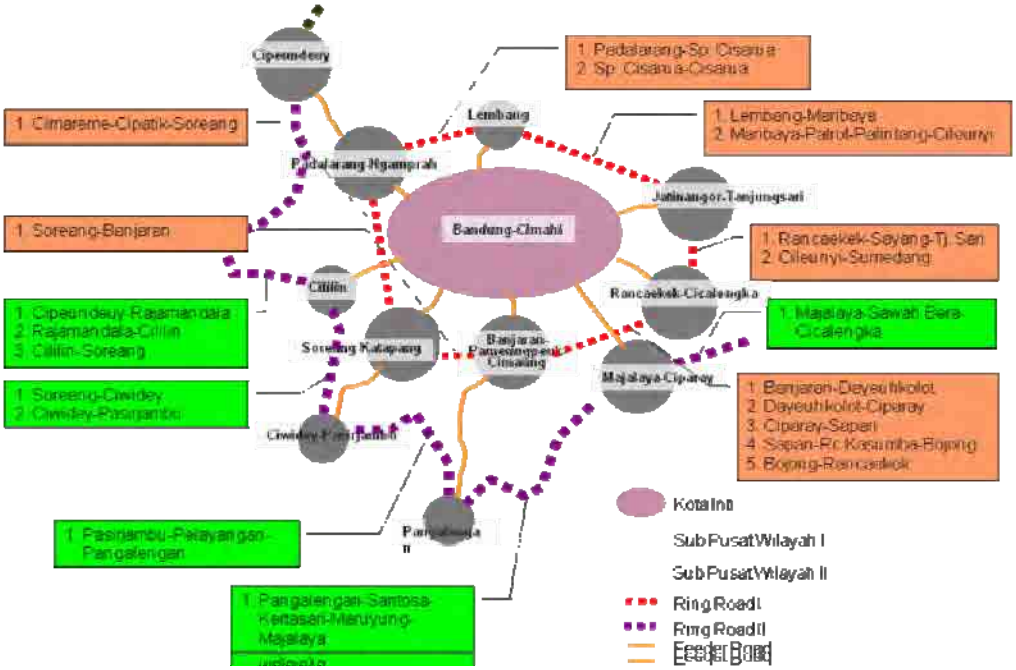


Figure 2.4.2 Bandung Metropolitan Ring Roads

Other alternative land transportation developments, such as railway development, will help the land transportation movements. Meanwhile, the mass rapid transport must be considered in the development of public transportation. Other public transport development alternatives include a bus way program for roads having spare capacity, but consideration must be made with respect to providing for special bus services. For roads with limited capacity, Light Rail Transit (LRT) can be considered.

Figure 2.4.3 Alternative Land Transport Developments

The above public transport developments can be expected to reduce private car traffic on the roads. Figure 2.4.3 shows the public transport development in Bandung City.

The four main routes of public transport priorities to be developed in Bandung city are shown in Figure 2.4.4 below.

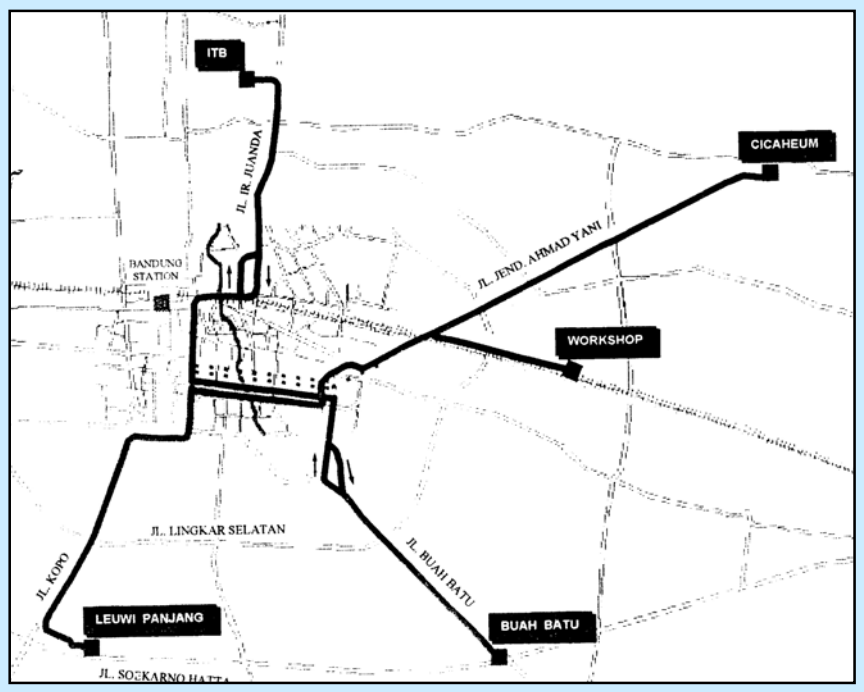


Figure 2.4.4 LRT Development Plan in Bandung City

2.5 OTHER DONORS' ACTIVITIES IN TRANSPORT SECTOR

For Bandung Metropolitan Area, other donors' commitments or intentions in the transport sector are as follows:

The French Government had shown interest in the railway and public transport sectors, and some projects are already in progress.

c. Railway Sector

- Double Tracking for the section between Kiaracondong and Cicalengka (22 km)
- Electrification for the section between Padalarang – Kiaracondong – Cicalengka (42 km)

Targeted to be completed by end of 2014 only 50% (20 km from Padalarang to Kiaracondong) is being implemented; the remaining portion has no schedule yet.

d. Public Transport Sector

The master plan study for the Integrated Bandung Metropolitan Transportation Project starts in May 2009, with technical assistance by the French Government.

For the road sector, no donors have shown any intention yet. In fact, in the "2009 Strategic Road-Building" program, no road section in the Bandung area is included. However, for the tollroad sector, the following sections are in the process of tendering for investors:

- Pasir Koja – Soreang Tollroad (8,3 km)
- Cilenyi – Sumedang – Dawuan Tollroad (28,0 km)
- Sukabumi – Ciranjang Tollroad (28,0 km) (The Ciawi – Sukabumi and Ciranjang – Padalarang sections already have investors)

For the airport sector, the government has allocated Rp.50 billion for the maintenance of the present Bandung Airport to continue its operation; on other hand, the programmed West Java

Airport in Dawuan seems to be postponed because of financing difficulties.

2.6 CONFORMITY WITH NATIONAL/REGIONAL DEVELOPMENT PLANS

The GOI shows the basic national policy and strategy for infrastructure including the transport sector in the National Long-Term Development Plan (BPJP). Corresponding to it, regional spatial plans at national (RTRWN), provincial, and municipal (RTRW) levels are regularly formulated. Presently, BPJP 2005-2025 and RTRWN No. 26, 2008 are in effect, as well as Bandung City RTRW No. 3, 2006 for the City of Bandung. As for BPJP, the National Mid-Term Development Plan (PPJM) is set up every five years examples of which are PPJM-I (2005-2009), PPJM- II (2010-2014), PPJM- III (2015-2019), and PPJM- IV (2020-2024).

As the supreme plan for the transport sector, the National Transport System Plan (SISTRANAS), 2005 by MOT aims for a regionally and modally harmonious nationwide transport system.

MOPW has a five-year program (Renstra 2005-2009) involving the vision, mission, and overall and sectoral targets for road development along the above PPJM-I (2005-2009). In 2006, it also formulated the National Toll Road Development Plan. Long before this time, the City of Bandung conducted the Bandung Intra-City Toll Road Network Plan (BITL) in 1996. The Bandung Intra Urban Toll (BIUT) Road Project is listed in these national and local master plans as well as the above Bandung City RTRW No. 3, 2006.

2.7 GEDEBAGE DEVELOPMENT PROJECT

Gedebage area is planed to develop as sub urban center of Bandung City where has been reached maximal capacities. The concept and maturity to develop this area is stated in the Planning Area as East Primary Center in Regional Plan Planology of Bandung City 2004-2013. Major activities of the Gedebage Development Project are as follows;

a. Education (College And Library)
b. Health (Hospital Type B and Hospital emergency serious condition)
c. Observance (Mosque And other House observance)
d. Social Facilities (Public Meeting House)
e. Athletic complex with athletic court, folk art building, town garden
f. Governmental service, covering business center and office for private sector, governmental office, regional Electricity and Power (PLN) office, regional Water and Power (PDAM) office, religion business office, fire station.
g. Service and commerce cover mall draught hotel, commercial building, shop, expense center, bank, private enterprise and other services.
h. Transportation, covering railway station, terminal and Public Parking.

The “Block Plan” is shown in the Figure 2.7.1. Functions of the Gedebage Development Area are settlement area, industrial area, commerce and service, offices, and center of export-import activities with form of Container Terminal.

The plan and program of Gedebage area development is summarized in the Table 2.7.1.

Table 2.7.1 Spatial Program and Component of Gedebage Primary Center

Development Component	SUB-COMPONENT	TOTAL AREA	PRECENTAGE (%)
Transportation	Inwrought terminal + its supporter facility and railway station + its supporter facility	± 32.58 Ha	4.6
Health Facility	Type B hospital and emergency serious condition hospital with its supporter	± 16.55 Ha	2.3
Sport and Recreation	Sport Complex with main stadium, swimming pool, tennis field, badminton field, basketball fields, football fields, volley ball fields, driving range, soft ball, sport club and another supported facilities.	± 45 Ha	6.3
Educational Facilities	Inwrought campus for the management of higher education.	± 24.23 Ha	3.4
Commercial Facility and Service	Shopping centre , market, shop, expense center, bank	± 81.6 Ha	21.8
	Private sector company and other services	± 62.3 Ha	
Industry	Oil Industry, Shoes	± 27.61 Ha	8.7
Observance Facilities	Great mosque	± 5.32 Ha	0.7
Housing	Housing area which have built and will be built in planning area	± 196.6 Ha	27.6
	Hotel and Apartment	± 11 Ha	1.5
Infrastructure	Retention pool	± 123 Ha	25.1
	Toll Road and Toll Access	± 55.57 Ha	
Green Air-Gap (including zone buffer)	environmental Facility air-gap Border river air-gap Border SUTT air-gap Air-Gap Border turnpike Area garden Theme Park	± 31 Ha	4.4
Total Area to be developed		712.3 Ha	100

Figure 2.7.1 Block and Area Division of Gedebage Primary Center

Table 2.7.2 Spatial Usage Plan and Block-Sub Block Activity

BLOCK	Area (Ha)	SUB BLOCK	FUNCTIONAL LAND	COMPONENT Area (Ha)
A	86.81	AI	Industry	21.68
		A2	Service	21.16
		A3	Service	7.16
		A4	Service	6.40
		A5	Housing	12.86
		A6	Shops Complex	17.55
B	46.67	B1	Shops Complex	2.59
		B2	Train Station	17.58
		B3	Bus Terminal (A class)	15.00
		B4	Shopping Center/Mall	11.50
C	27.73	C1	Hospital (B class)	16.55
		C2	Shops Complex	11.18
D	29.72	D	Dry pond	36.02
E	42.07	E1	Housing	15.52
		E2	Housing	31.19
F	56	F1	Dry pond	42.60
		F2	Shops Complex	5.73
		F3	Shops Complex	6.82
G	45.05	G1	Sport Medium Complex and its supporter	45.05
H	23.55	H	Housing	27.33
I	67.29	I1	Shopping Center/Mall	13.49
		I2	Hotel and Apartment	10.92
		I3	Business and Offices	9.76
		I4	Shopping Center/Mall	8.94
		I5	Observance (Mosque,Church,Pura,Wihara)	5.32
		I6	Convention Hall and Traditional Art Building	9.19
		I7	College (University)	9.68
J	42.56	J1	Housing	8.72
		J2	Housing	19.86
		J3	Mansions and Apartment	13.98
K	112.02	K1	College (University)	14.55
		K2	West Pond	14.59
		K3	Housing	59.35
		K4	Housing	6.33
		K5	West Pond	30.07

Socio-economic frames in the Gedebage development area are forecasted based on above block land use planning as follows;

Table 2.7.3 Population Projection in Gedebage Area

Zone	Population					
	2006	2009	2015	2020	2025	2028
Mekar Jaya	10,402	12,605	18,508	25,490	35,107	42,541
Rancabolang	16,810	21,330	34,341	51,071	75,951	96,372
Ranca Numpang	9,753	12,375	19,924	29,631	44,066	55,914
Cisaranten Kidul	22,171	28,132	45,293	67,358	100,173	127,106
Cimenerang	9,753	12,375	19,924	29,631	44,066	55,914

Table 2.7.4 Per-Capita Income Projection in Gedebage Area

Zone	per-capita income					
	2005	2009	2015	2020	2025	2028
Mekar Jaya	25,540,000	32,286,269	43,277,689	58,010,988	77,760,038	104,232,384
Rancabolang	15,350,000	18,820,250	24,281,284	31,326,936	40,417,010	52,144,732
Ranca numpang	15,350,000	18,820,250	24,281,284	31,326,936	40,417,010	52,144,732
Cisaranten Kidul	15,350,000	18,820,250	24,281,284	31,326,936	40,417,010	52,144,732
Cimenerang	15,350,000	18,820,250	24,281,284	31,326,936	40,417,010	52,144,732

The urban tollroad from Ujung Berung – Gedebage – Majalaya section where is located in the Gedebage development area is listed in the National Development Plan by the Government Regulation No. 26/2008, and this section forms a part of Bandung Intra Urban Tollroad Project.

2.8 NECESSITY OF THE PROJECT

The recent remarkable increase in population and progress of urbanization in Bandung City have brought about a rapid increase in road traffic demand and caused heavy traffic congestion in many sections of Bandung City's road network. The most serious is the traffic congestion, particularly during weekends in the vicinity of the east-west arterials connecting to Pasteur toll gate of the Jakarta-Bandung Toll Road, which have brought concerns as to its negative impacts to the environment and economy.

To partially cope with the traffic congestion in the east-west direction, the Pasupati Bridge together with the adjacent connected viaducts with a total length of 2.3 km has been completed in 2005, assisted by the Kuwait Fund. By connecting it to the Jakarta-Bandung Toll Road and further extending it in the eastern direction, it can be expected that it can mitigate traffic congestion and improve accessibility in that direction.

In the southeastern area of Bandung City, the Gedebage development project involving a housing and commercial complex is in progress. To attract more private investments to this project, provision of basic infrastructure will be a big support to its success. In this regard, improving the accessibility of motor vehicles to the development area through the construction of high-grade highways connecting both the Padalarang-Cileunyi Toll Road and the central area of Bandung City will be a very effective marketing tool.

The construction of the BIUT Road, for which the plan has already been authorized in the national, provincial, and municipal master plans, is sufficiently justified for the above reasons.

CHAPTER 3 PROJECT OUTLINES

3.1 PROJECT OBJECTIVES

In the Bandung Metropolitan Area with a population of 7.5 million, including Bandung City's population of 2.7 million, the increase in population and expansion of its economy have been accelerating the increase in the road traffic amid insufficient and poor road infrastructure, which has resulted in ceaseless and serious traffic congestion in many road sections.

The city of Bandung formulated the Intra City Toll Road Master Plan, BITL, in 1996, which includes an east-west northern corridor and a north-south eastern corridor among five planned corridors in the city.

In Indonesia, corresponding to RPJP, the National Long-Term Development Plan, (currently for 2005-2025), the three-layer spatial development plans are drawn out. These are the national (currently RTRWN 2007), provincial, and municipal which covers the development plans for the transport sector, including highways, railways, ports and airports, In Bandung City's Long-Term Spatial Plan 2004, the east-west toll road connected to the Pasteur Toll Gate of the Jakarta-Bandung Toll Road was given the highest priority.

In 2006, the Bina Marga conducted the Feasibility Study of the Bandung Intra City Toll Road Project (F/S) and its Environmental Impact Assessment (EIA), and the Province of West Java approved its AMDAL (EIS). In the meantime, the GOI decided to request for a Japanese ODA loan for a part of the project cost and started negotiations with the former JBIC in 2008, while BAPPENAS listed this project with the loan amount of US$150 million in the Blue Book.

Thus, the objective of the BIUT Road Project is to construct a toll road with full access control that will have a total length of 27.273 km in the Bandung Metropolitan Area between Pasteur and Cileunyi through Ujung Berung, and between Ujung Berung and the Gedebage Interchange that will be constructed on the Padalarang-Cileunyi Toll Road. Prospectively, financing for this project can come from a combined Japanese ODA loan and some other possible sources, including private investment.

3.2 PROJECT OUTLINES

3.2.1 OVERVIEW OF THE PROJECT

The Bandung Intra Urban Toll (BIUT) Road Project with a total length of 27.273 km is planned to have two segments. The first segment is in the east-west direction from Pasteur to Cileunyi, with a total length of 20.6 km, with 2 x 2 separated 4 lanes, width of 36 m, most of which will be elevated, while the second segment is in the north-south direction from Ujung Berung to Gedebage, with a total length of 6.7 km, with 2 x 2 separated 4 lanes, width of 40 m, mostly at grade but with full access control.

In July 2007, Bina Marga (Directorate General of Highways, Ministry of Public Works) prepared the Implementation Program (I/P) for BIUT, in which the cost as reviewed and estimated in the project's F/S in 2006 by Bina Marga was Rp 6,920 billion (US$770 million) in total, divided into two phases. In the JICA Study Team's survey, after reviewing and partially revising BIUT's design in the F/S and phasing its implementation in the I/P, the project costs for Phase 1, Phase 2, and the entire project were re-estimated as Rp 2,544 billion (US$224 million), Rp 8,920 billion (US$784 million), and Rp 11,464 billion (US$1,008 million), respectively.

In the revised phasing, Phase 1 is for the sections from Pasteur to Gasibu and from Gedebage to the Gedebage Interchange with a total length of 9.5 km, for which a Japanese ODA loan for FY 2009 is expected to be offered, while the subsequent Phase 2 is for all remaining sections of the entire project

for which a combination of financing sources, including GOI's own capital, foreign assistance including another Japanese ODA loan, and private investment, could be considered.

Within the Bandung Metropolitan Area (population of 7.5 million and an area of 3,580 km^2) consisting of Bandung City and some surrounding cities and regencies of West Java Province (population of 40 million and an area of 55,400 km^2), the project area is located mostly in Bandung City and a small portion of Bandung Regency. Bandung City (population of 2.7 million and area of 167 km^2) is the capital of West Java Province, and is well known as an education center with about 30 universities, a residential resort, and its light industry (garment production). Recently, the progress of urbanization with the significant increase in population has been quite remarkable, but has caused many social and economic problems. One of the most serious is the traffic congestion in many road sections in the city. The road infrastructure in the city is insufficient and poorly maintained. In addition to the overloading of city roads and streets as a whole, a distinctive feature of the urban traffic in Bandung City is the additional congestion brought about by the significant increase in traffic volumes particularly in the western part of the city leading to the direction of Jakarta during weekends.

To cope with such increasing traffic demand and to mitigate traffic congestion in the road network of the city, construction of the BIUT Road Project is recognized as of utmost importance and has been included in plans at the national, provincial, and municipal levels, including the National Toll Road Development Plan 2008 by MOPW, the Provincial Spatial Plan 2004 by the Province of West Java, and the Municipal Spatial Plan 2004 by the city of Bandung.

In the southeast area of Bandung, there is a 600-hectare development project in progress involving residential, commercial, and a cultural facility complex named the Gedebage Development, which is the only remaining major development project in Bandung. In this development area, the Cicaheum Bus Terminal, which presently causes serious traffic congestion in the downtown area, is planned to be relocated and directly connected with the Gedebage Railway Station. To distribute the traffic flows between the Gedebage development area and other places within and around Bandung, as well as the Padalarang-Cileunyi Toll Road, some arterial access roads have become necessary. The BIUT Road Project is one such access road that is expected to function effectively in this regard.

The project is a typical tolled urban expressway to be constructed mostly within the urbanized area, elevated over the existing roads, with full access control with directionally separated 2 x 2 lanes and allows vehicles to enter and exit at the ramp or interchange only. It starts at the Pasteur Toll Gate, directly connects with the Jakarta-Bandung Toll Road, goes east over the Dr. Junjunan Street for about 2.6 km and then reaches the western end of the existing Pasupati Viaduct, which is a 2.3 km long elevated toll-free road. The Pasupati Viaduct includes the cable-stayed, 350-meter long Pasupati Bridge crossing the Kapundung River; it was constructed by a Kuwait fund and opened to traffic in 2005. The Pasupati Viaduct is to be incorporated as part of the Project, separating physically the local traffic using the Pasupati Bridge between the immediate upstream on-ramp and downstream off-ramp from the tolled traffic over the bridge. This means one outer lane will be for toll-free local traffic, one deceleration/acceleration lane for tolled exiting/entering traffic at the Tamansari Ramp, and two center lanes for tolled through traffic in one direction. Merging will not be allowed between the through traffic and the local traffic.

At the eastern end of the Pasupati Viaduct, the BIUT Road Project goes down at ground level and passes through the Gasibu area in a covered, 540-meter underground structure, including the approaches at both ends. For a total of 325 m, the project is covered by ceiling slabs to comply with the demand of the local governments to maintain the area as a heritage place and people's plaza.

After emerging from the underground section at Gasibu, the toll road goes eastbound, taking the elevated structure over the Surapati, Hassan Mustofa, J. A. Yani, and A. H. Nasution Streets with some intermediate on- and off-ramps, and gets to the Ujungberung Interchange after 8.8 km.

At the Ujung Berung Interchange, the toll road branches into two directions, one going eastbound for 6.3 km to Cileunyi, one of its end points, and the other heading 6.7 km southward, partially with low embankments and partially elevated, to the other end point at the Gedebage Interchange.

The major components for the entire BIUT Road Project are shown in Table 3.2.1 below:

Table 3.2.1 Quantities of Major Components for Whole Project

	Classification	Item	Quantity	Remarks
1	Total length, in meters	Bridge/ viaduct, new construction Bridge/ viaduct, existing Bridge/ viaduct, subtotal Embankment and others Total	17,680 2,215 19,895 7,362 27,257	
2	Access facilities, in nos.	On-ramp Off-ramp Total for ramps Interchange	8 8 16 2	 Ujung Berung IC & Gedebage IC
3	O&M facilities, in nos.	Toll gate, new provision Toll gate, existing Total for toll gates O&M station	10 1 11 1	 Pasteur

According to the above IP, the BIUT Road Project is scheduled to start simultaneously for Phases 1 and 2 in late 2010, with the detailed design, land acquisition, resettlement of affected households, and construction works; be completed by the end of 2015; and begin the O&M from 2016. However, except for Phase 1 for which a Japanese ODA loan is expected, the subsequent implementation schedule for Phase 2 is still uncertain because its financing scheme has not yet been determined, and difficulties in land acquisition and resettlement of many shops and stalls that will be affected along some roads are anticipated.

3.2.2 PHASING OF THE PROJECT

Considering its scale and site conditions and the budgetary constraint of GOI, the entire project will be implemented in multiple phases. In the IP of July 2007 prepared by Bina Marga, the project consists of two phases as follows:

Phase 1 for the Pasteur to Gasibu section, excluding the existing Pasutur Bridge and the Ujung Berung IC to Gedebage IC section with a total length of 10.2 km and project cost of Rp 2,850 billion (US$320 million); and

Phase 2 for the Gasibu to Cileunyi section with a total length of 15.1 km and project cost of Rp 4,070 billion (US$450 million).

On the other hand, the current Blue Book by BAPPENAS lists the amount of the Japanese ODA loan for the Project as US$150 million, which amount will be unable to cover even the abovementioned Phase 1.

Therefore, in this survey, after the components and cost for the entire project were reviewed, an arrangement was made demarcating Phase 1 for the Japanese ODA loan portion from subsequent phases of the project that could be financed by other funding sources. As a result, Phase 1 was determined as the sections covering 5.5 km from Pasteur to Gasibu and 4.0 km comprising 3.1 km from the Gedebage Interchange to a point in the Gedebage development area and 0.9 km of temporary access to the Soekarno Hatta Bypass. This repackaged Phase 1 took into consideration the amount of the Japanese ODA loan to be requested by GOI as listed in the current Blue Book, the budgetary constraints facing GOI, and anticipated difficulties in land acquisition and resettlement of affected

households and properties. The rest of the project's sections are all demarcated to subsequent phases after Phase 1. The components for the resulting Phase 1 are shown in the Table 3.2.2. Phase 2, on the other hand, covers the rest of the entire project components.

Table 3.2.2 Quantities of Major Components for Phase 1

	Classification	Item	Quantity
1	Total length, in meters	Bridge/ viaduct, new provision	2,150 m
		Bridge/ viaduct, existing	2,215 m
		Bridge/ viaduct, subtotal	4,365 m
		Embankment and others	4,275 m
		Total	8,640 m
2	Access facilities, in nos.	On-ramp	2 Nos.
		Off-ramp	2 Nos.
		Total for ramps	4 Nos.
		Interchange	1 Nos.
3	O&M facilities, in nos.	Toll gate, new provision	1 Nos.
		Toll gate, existing	1 Nos.
		Total for toll gates	2 Nos.
		O&M station	0 Nos.

3.2.3 SUMMARY OF CONSTRUCTION WORKS FOR JAPANESE ODA PORTION

Phase 1 of the BIUT Road Project is expected to be implemented with Japanese ODA loan as mentioned in chapter 3.2.2. Two road sections form part of Phase 1 as shown below:

- Phase 1-1: Pasupati Access – Gasibu Underpass (L=5.5 km)
- Phase 1-2: Soekarno Hatta – Gedebage IC (L=3.1 km)

Construction works for Phase 1 are summarized in Table 3.2.3 below.

Table 3.2.3 Summary of Construction Works

WORK ITEMS	DESCRIPTION	UNITS	TOTAL
EARTH WORK	Common Excavation for Embankment	m3	31,369
	Excavation for Dump	m3	150,729
	Borrow Material	m3	715,005
AGGREGATE SUB BASE	Aggregate Sub base Class A	m3	40,562
	Aggregate Sub base Class B	m3	27,427
PAVEMENT	Asphalt Concrete Binder Course	ton	19,325
	Asphalt Concrete Wearing Course	ton	56,989
	Concrete Pavement (t = 27 cm)	m2	149,901
CONCRETE STRUCTURE	Concrete Class A-1	m3	181,279
	Concrete Class B-1	m3	284,359
	Concrete Class B-2	m3	104,920
	Concrete Class C-1	m3	42,930
	Concrete Class C-2	m3	716
	Concrete Class E	m3	6,205
STRUCTURAL STEEL WORI	Procurement of Steel Bridge materials.	ton	10,545

Source: JICA Survey Team

(1) Classification of Project Highway

Based on the Standard Specification for Geometric Design of Urban Roads, 1992, full access controlled highway and partial or non access controlled highway are categorized as Type I and Type II respectively. As for the Class of Type I, Inter-Region or Inter-City highway is categorized as Class 1,

and Inter-Region or Intra-Metropolitan is categorized as Class 2. The BIUT Road Project is categorized as a Type-I, Class 2. 60km/h design speed is selected due to land constraint based on alignment examination results in chapter 6.4.8 of F/S.

Table 3.2.4 Design Speed applied in the BIUT Project

Type	Class	Design Speed (kph)
Type I	Class 1	100, 80
	Class 2	100, **60**
Type II	Class 1	60
	Class 2	60,50
	Class 3	40,30
	Class 4	30,20

(2) Geometric Design Criteria

The Feasibility Study applied the following design criteria for the highway design:

- Standard Specification for Roads Geometric Design, No.13/1970;
- Standard Specification for Geometric Design of Urban Roads, 1992; and
- Standard Specification of Freeways Design, 1976.

Table 3.2.5 Geometric Design Criteria Applied in the Feasibility Study (Main Road)

Geometric parameters	units	Design Criterion Preliminary Design
Design speed	kph	60
Parameter of cross section		
▪ Width of carriageway	m	3.50
▪ Width of outer shoulder	m	2.50
▪ Width of inner shoulder	m	0.75
▪ Width of median (include inner shoulder)	m	3.00
▪ Inclination of normal crown	%	2
▪ Inclination of normal outer shoulder	%	4
▪ Minimum vertical clearance	m	5.10
Sight distance		
▪ Minimum stopping sight distance	m	75
▪ Minimum passing sight distance (*undivided*)	m	250
Parameter of horizontal alignment		
▪ Minimum radius	m	200
▪ Minimum radius with normal crown	m	2000
▪ Minimum length of curve	m	700/ θ or 100
▪ Maximum super elevation	%	8
▪ Minimum transition length	m	50
▪ Parameter clothoid minimum	m	70
▪ Minimum radius without transition	m	600
▪ Inclination of surface relative maximum	-	1/175
Parameter of vertical alignment :		
▪ Maximum grade	%	5
▪ Minimum radius of vertical alignment :		
- Crest	m	2000
- Sag	m	1500
▪ Minimum length of vertical curve	m	50

Source: Feasibility Study

Table 3.2.6 Geometric Design Criteria Applied in the Feasibility Study (Frontage Road)

Geometric Parameters	Units	Artery Road	Kabupaten Road	Local Road
Design speed	kph	60	40	20
Parameter of cross section				
▪ Width of carriageway	m	2 x 3.50	2 x 3.00	3.00/4.50
▪ Width of outer shoulder	m	1.00	1.00	1.00
▪ Inclination of normal crown	%	2	2	2
▪ Inclination of normal outer shoulder	%	4	4	4
▪ Minimum vertical clearance	m	5.10	5.10	4.60
Sight distance				
▪ Minimum stopping sight distance	m	75	40	20
▪ Minimum passing sight distance (*undivided*)	m	350	200	100
Parameter of horizontal alignment				
▪ Minimum radius	m	135	45	15
▪ Minimum radius with normal crown	m	2000	800	200
▪ Minimum length of curve	m	700/θ and/or100	500/ θ and/or 70	280/ θ and/or40
▪ Maximum super elevation	%	8	10	10
▪ Minimum transition length	m	50	35	20
▪ Minimum radius without transition	m	600	250	60
▪ Inclination of surface relative maximum	-	1/175	1/125	1/75
Parameter of vertical alignment :				
▪ Maximum grade	%	6	8	10
▪ Minimum radius of vertical alignment :				
- Crest	m	4.500	700	200
- Sag	m	3.000	700	200
▪ Minimum length of vertical curve	m	50	35	20

Source: Feasibility Study

For reference purposes, the geometric design criteria for design speeds of 60 kph recommended by the JRSO is listed in Table 3.2.7.

Most of the design criteria at the design speed of 60 kph between Indonesian and Japanese standards are the same. However, the Indonesian standard does not adopt stringent values on maximum grade compared to the Japanese standard. It is also noted that the Japanese standard specifies the limitation of slope length for sections of steeper grade than the desirable maximum grade, while Indonesian standards do not specify it clearly.

Table 3.2.7 Geometric Design Criteria of Japanese Road Structure Ordinance

Design Speed (kph)	60
Radius of curve (m)	
Desirable minimum	200
Absolute minimum	
Maximum super elevation=6%)	150
Maximum super elevation=8%)	140
Maximum super elevation=10%)	120
Transition curve	
Minimum length (m)	50
Minimum radius to omit transition curve (m)	1,000
Maximum grade (%)	
Desirable maximum	5.0
Absolute maximum	8.0
Slope length limit	
Grade (%)	6 7 8
Limit length (m)	500 400 300
Minimum vertical curve radius (m)	
Crest	
Desirable minimum	2,000
Absolute minimum	1,400
Sag	
Desirable minimum	1,500
Absolute minimum	1,000
Minimum vertical curve length (m)	50
Minimum radius to omit super elevation (m)	2,000
Minimum stopping sight distance (m)	75

Source: Japanese Road Structure Ordinance

(3) Horizontal Alignment of the BIUT Road

The applied elements of the horizontal alignment design from km 0+000 to km 5+500 (Phase 1-1), and from km 3+500 to km 6+700 were listed in Table 3.2.8. The applied values satisfy the proposed design criteria. Further, it was judged that the proposed project route is traversing appropriate locations.

Table 3.2.8 List of Applied Elements for Horizontal Alignment of Phase 1

Phase 1-1: Pasupati Access – Gasibu Underpass (L=5.5 km)

	Transition Curve Length	Element of Alignment	Transition Curve Length
1.	L=68.26	R= 775 (L=118.76)	L=68.26
2.			
3.	L=69.14	R= 550 (L=187.9)	L=69.14
4.			
5.	L=84.05	R= 500 (L=257.04)	L=84.05
6.		Straight line (L=362.59)	
7.		R=1000 (L=175.52)	
8.		Straight line (L=133.85)	
9.		R= 925 (L=254.17)	
10.		Existing Pasu Pati Bridge	
11.	L=68.18	R= 575 (L=21.43)	L=68.18
12.			
13.	L=69.13	R= 550 (L=32.00)	L=69.13

Phase 1-2: Soekarno Hatta – Gedebage IC (L=3.1 km)

	Transition Curve Length	Element of Alignment	Transition Curve Length
1.		R=1000 (L=173.91)	
2.		Straight line (L=471.07)	
3.		R=1500 (L=197.85)	
4.		Straight line (L=210.07)	
5.		R= 650 (L=104.97)	
6.		Straight line (L=313.42)	
7.		R=1000 (L=123.85)	
8.		Straight line (L=388.86)	
9.	L=82.05	R= 440 (L=276.22)	L=82.05
10.		Straight line (L=197.28)	
11.	L=82.05	R= 305 (L=114.35)	L=100.41

(4) Vertical Alignment of the Project

In general, the applied gradient values are gentle and satisfy the proposed design criteria, except the 5.5% gradient applied in the section starting at km 4+800 up to km 5+000. This gradient is necessary if one takes into consideration the clearance for road level crossing. The vertical design of such locations shall be amended to satisfy the design criteria during the detailed design stage.

(5) Pavement Design

There are three kinds of pavement structures proposed for the project's sections namely, at grade section, viaduct section, and underpass section.

Flexible pavement was proposed for the at-grade section and viaduct section. However, the strength of the sub-grade was not assessed by any geological survey. Therefore, the pavement design for the at-grade section shall be considered during the detailed design stage with the conduct of a geological survey.

The cement concrete pavement structure was proposed to be applied in the underpass section. The installation of the concrete pavement for the underpass was deemed necessary due to maintenance

reasons.

(6) Typical Cross Section

Typical cross sections for different structural sections are proposed as follows:

- Type 1: At-grade section;
- Type 2: Viaduct section (Pasupati Bridge section);
- Type 3: Ramp section; and
- Type 4: Underpass section.

Figure 3.2.1 to Figure 3.2.4 show the proposed typical cross sections for Phase 1. "ROW" in the figure represents the land boundary required for the BIUT Road Project. It is noted that each section applied different typical cross section types and shall be connected with transition section of appropriate length.

As shown in the figures, the number of driving lanes was proposed as a dual 2-lane. The BIUT Road of 60 kph design speed corresponds to the Type 1-Class 2 Road of Indonesian road classification. The number of lanes has been planned with due consideration to future traffic demand and to the price of land.

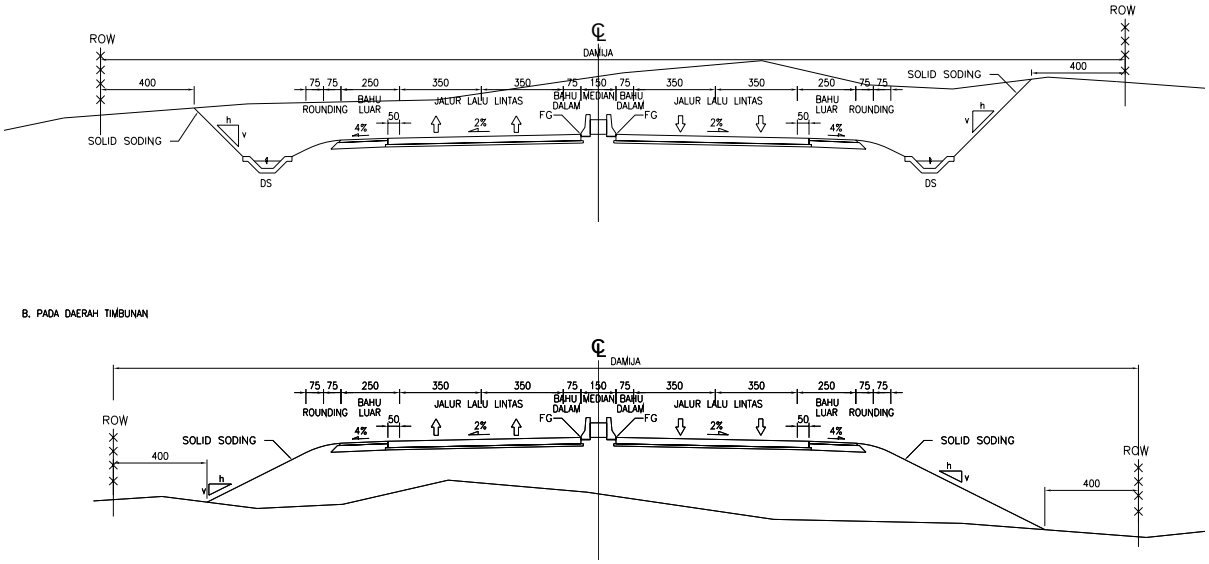


Figure 3.2.1 Typical Cross Section (At-Grade Section)

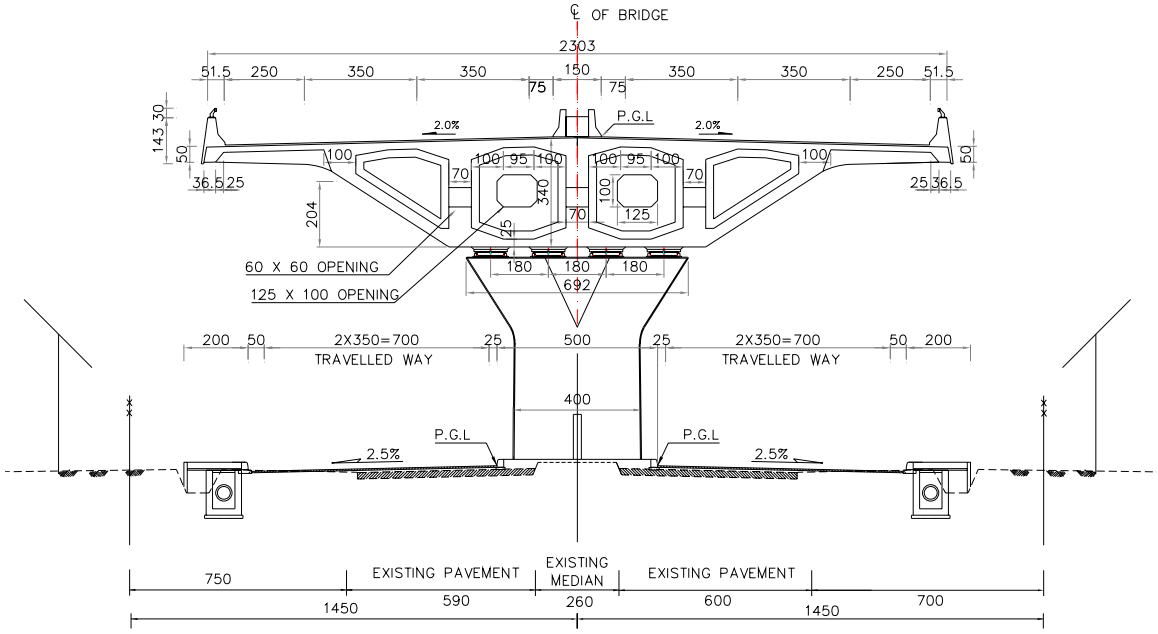


Figure 3.2.2 Typical Cross Section (Viaduct Section)

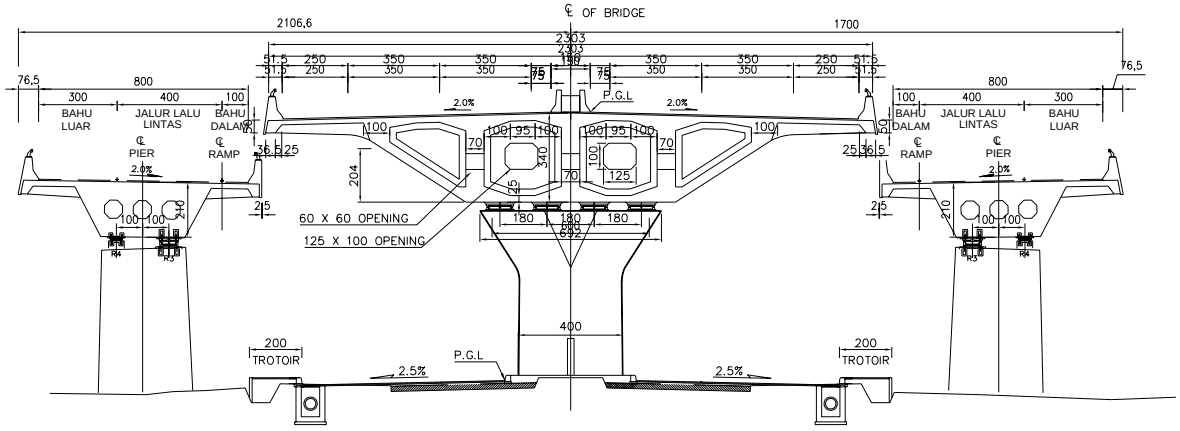


Figure 3.2.3 Typical Cross Section (Existing Pasupati Bridge Section)

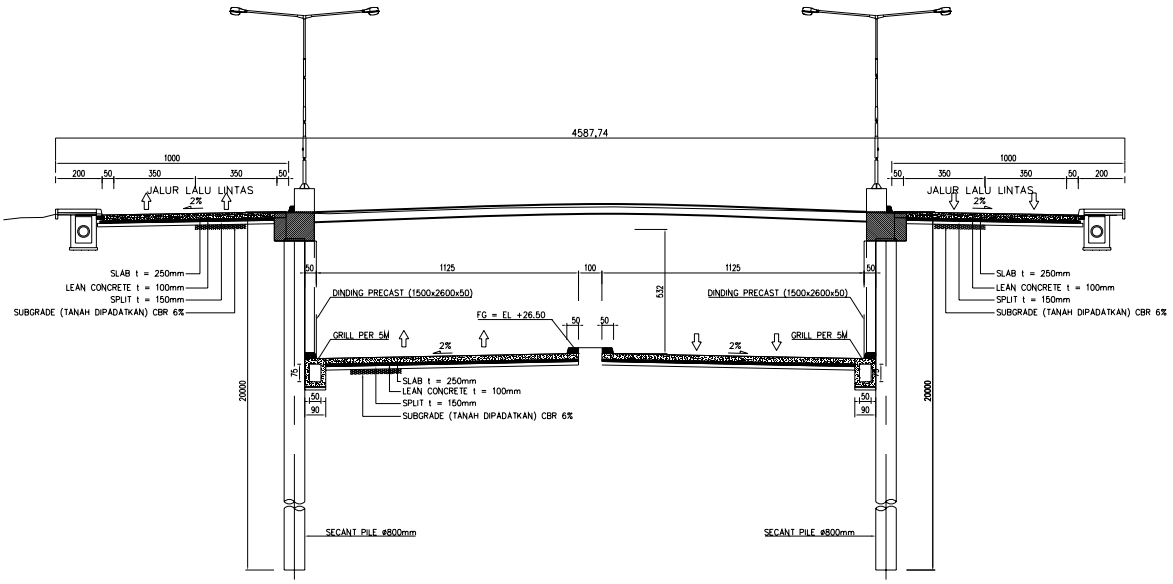


Figure 3.2.4 Typical Cross Section (Underpass Section)

(7) Geometric Design Criteria for Ramps

The geometric design criteria for the ramps and interchange design applied in the Feasibility Study are given in Table 3.2.9.

Table 3.2.9 Geometric Design Criteria Applied in the F/S (Ramp and Interchange)

Geometric Parameters	Units	Design Criterion Preliminary Design
Design speed	kph	40
Parameter of cross section		
▪ Width of carriageway	m	4.00
▪ Width of outer shoulder	m	2.50
▪ Width of inner shoulder	m	1.00
▪ Width of median (including inner shoulder)	m	2.80
▪ Inclination of normal crown	%	2
▪ Minimum vertical clearance	m	5.10
Sight distance		
▪ Minimum stopping sight distance	m	40
Parameter of horizontal alignment		
▪ Minimum radius	m	50
▪ Minimum radius with normal crown	m	800
▪ Minimum length of curve	m	500/ θ or 70
▪ Maximum super elevation	%	8
▪ Minimum transition length	m	35
▪ Parameter clothoid minimum	m	35
▪ Minimum radius without transition	m	250
▪ Inclination of surface relative maximum	-	1/125
Parameter of vertical alignment		
▪ Maximum grade	%	5
▪ Minimum radius of vertical alignment:		
- Crest	m	450
- Sag	m	450
▪ Minimum length of vertical curve	m	35

Source: Feasibility Study

(8) Typical Cross Section of Interchange Ramp

The ramps at the Phase 1 section were designed as one-lane ramps as shown in Figure 3.2.5.

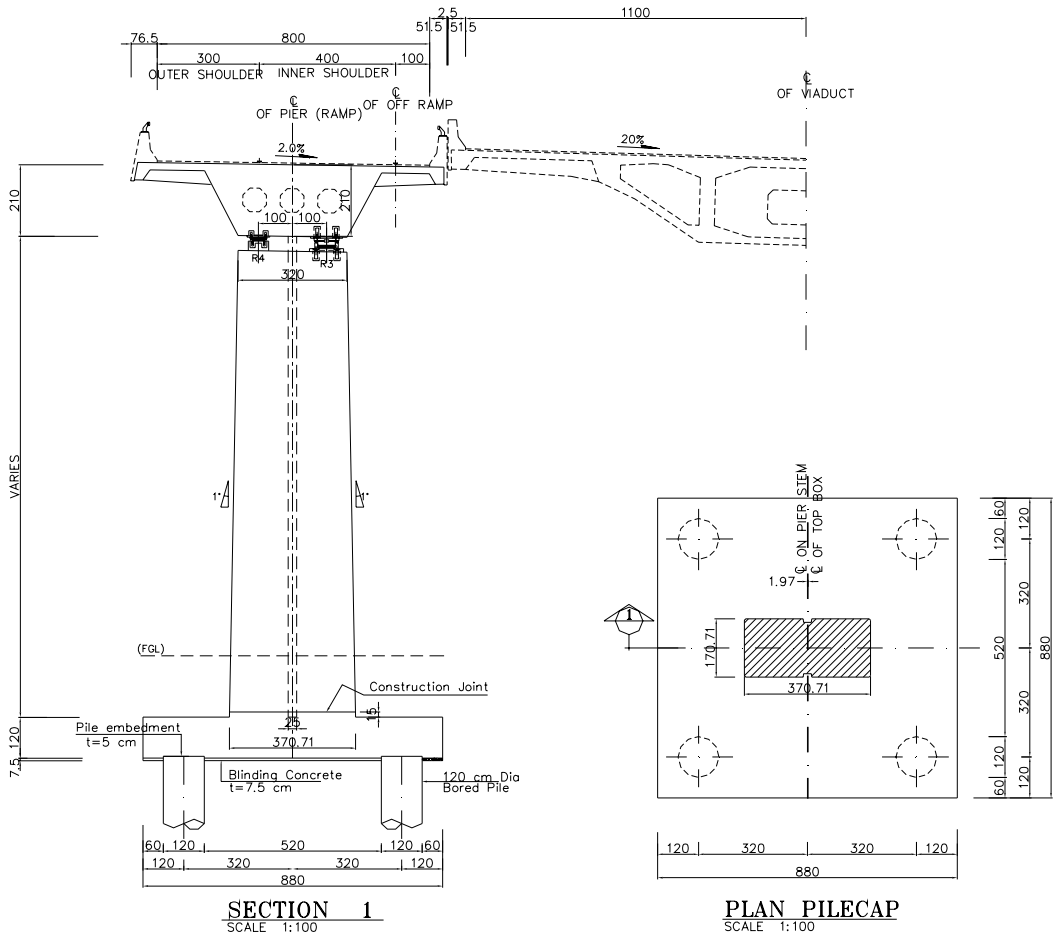


Figure 3.2.5 Typical Cross Section (Ramp Section)

3.3 REVIEW OF TRAFFIC DEMAND FORECAST

3.3.1 REVIEW OF EXISTING TRAFFIC DEMAND FORECAST

(1) Methodology Overview

The methodology for traffic demand forecasting is shown in the previous Feasibility Study report as presented in Figure 3.3.1. The first step was to review previous studies and available data. Included in the review were the Feasibility and Environmental Impact Assessment (AMDAL) Studies for Construction of Freeway and Toll Road for Pasteur-Cileunyi and Cibiru-Gedebage, Bandung Segments (2006), Bandung O-D (2002) and other sources such as BPS.

The model for traffic demand forecasting involves establishment of the zoning system for the study area, travel demand model, highway network model and traffic assignment model. Zoning system was established, with Kelurahan and some sub-district areas as the basis. This zoning system was the basis of data aggregation in the travel demand model development, where demand parameters such as socio-economic parameter, trip generation and O-D matrices were forecasted. In addition, the network model consists of links and nodes, which is developed particularly for highway network. The link attributes of the highway model were mainly taken from IRMS, URMS, previous study, and from field survey and involved road width, length, capacity and speed. The socio-economic parameters such as population, GRDP, employment, etc were assumed to have strong correlation with trip ends, and thus they were the basis for the development of the trip generation model.

The critical step in the methodology was the calibration process to estimate the existing O-D matrix.

The validity of the calibrated O-D matrix depends upon the availability of data sources. In order to support the process, traffic surveys were conducted, including Traffic Count (TC) and Road Side Interview (RSI) surveys, which covered most of the study area.

Demand forecasting were developed based on socio-economic development scenarios where forecasted socio-economic parameters such as population, GRDP, employment, etc. are important factors influencing the estimated number of trips in the future. In order to control the growth of future travel demand more realistic, a future trend of the number of registered vehicles was also forecast as the control growth factors.

Finally, the traffic assignment model forecast the daily traffic volume on the road network, in which further analysis of highway network performance resulted in the need for highway improvement, especially for the Bandung Metropolitan Area Network. This future traffic assignment involved road network development plans.

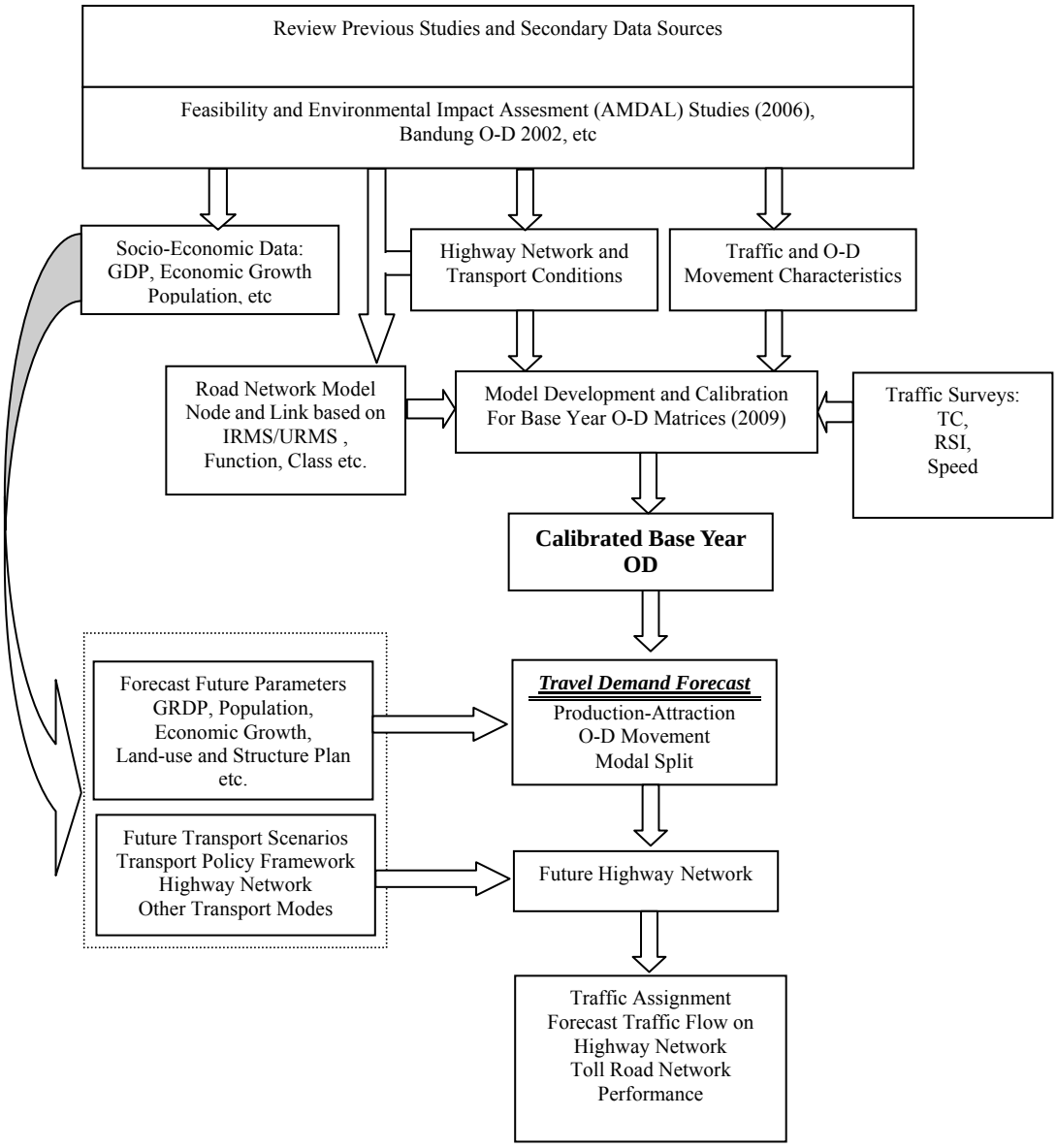


Figure 3.3.1 Methodology for Forecasting Future Traffic Demand

(2) Future Socio Economic Framework

1) Model Parameters

Travel demand forecasting follows the rule that travel demand is derived mainly from social and economic activities in a specific area. With this assumption, zonal parameters were considered as variables influencing the number of trip generation. The trip generation model was developed based on regression models that involve a set of zonal parameters. The selected zonal parameters were mainly socio-economic parameters such as population, population density, GRDP, per capita GRDP, etc. BPS is the main reliable data source for these parameters. For the purpose of demand forecasting, these parameters were aggregated to the traffic zoning system.

The main constraint in forecasting the socio-economic parameters was the emergence of new districts wherein Official Guidelines /Master Plan /Spatial Development Plan are not yet available. Therefore, these new districts were considered to remain as part of their former districts, where most data are available. Moreover, the parameter forecast for these districts were mainly based on trend analysis.

2) Future Socio-Economic Framework

The first step in forecasting model parameters is to establish an appropriate future socio-economic scenario. The main concern on the economic scenario is the future economic growth. In 1997, Indonesia faced an economic crisis. In 2008-2009, again Indonesia is affected by the global economic crisis. Some manufacturing industries closed, such as textile segments and secondary products. It is assumed that Indonesia will recover in 2010.

a. National GDP and economic growth

The average GDP growth (at 2000 constant prices) during 2005 to 2007 is about 6.2% p.a. while per capita GDP growth is at 4.2% p.a. The real GDP and per capita income growth in 2005 slowed down to 5.5% and 5.0%, respectively. The 2009 financial crisis resulted in a full blown recession in 2008 with GDP (with oil and gas) contracting by -18.5% (GDP without oil and gas by -19.3%) and real per capita income contracting by -14.5%.

Under the current socio-economic condition and in the light of recent political events, current financial crisis and recent terrorists attack in the US, as the impact of the global economy, the economy of Indonesia might slow down its recovery during the next few years same as other countries in the world.

The current issues of the national economy are high debt, high inflation and limited budget for development, whilst the global economy is likely under recession. Under these uncertain conditions, it is assumed that the period of 2009-2011 is the economic recovery period with economic growth not to exceed 5%. It is also assumed that in this context, alternative predictions of economic growth are made towards the target year of 2028 as well as other socio-economic frameworks such as population and employment population.

b. Economic Development Scheme

In order to predict the macro-economic framework over the planned time horizon, GDP was selected as the essential economic indicator for the Study. The projection process was made from the regional down to the local levels. The regional GDP without oil/gas was first predicted and then, the GRDP for West Java province as a whole, considering the local growth potential, comparative advantages, and constraints in the whole context of the national settings. Afterwards, the GRDP for the West Java province (without oil/gas) was broken down into the related district/municipality levels.

As for the economic forecast, there exist very few long-run projections because of high uncertainty in the international and domestic economies. The government of Indonesia has no long term development plan for economic development yet and it is still under process and unavailable so far.

c. Forecasted GRDP by Zone in Study Area Zoning System

The GRDP by Sub-District was projected using the 2005 database. The average forecasted growth rate of GRDP in Bandung and Cimahi Municipalities are in the range of 4.5-5.9% per annum in the period of 2009-2015, while the average projected growth rate of GRDP in Bandung and Sumedang districts are in the range of 5.6% per annum.

Table 3.3.1 GRDP/Capita in Bandung Metropolitan Area

(Unit : Rupiah/month)

No.	District / Municipality	2009	2015	2020	2025	2028
1	Bandung City	21,331,789	28,601,159	38,375,577	51,528,328	69,240,764
2	Cimahi City	9,594,134	11,967,482	14,927,937	18,620,735	23,227,037
3	Bandung District	6,779,827	8,903,218	11,691,640	15,353,375	20,161,939
4	West Bandung District	6,779,827	8,903,218	11,691,640	15,353,375	20,161,939
5	Sumedang District	9,534,287	12,520,355	16,441,637	21,591,036	28,353,189

Source: JICA Survey Team

Table 3.3.2 shows past trend of the Gross Domestic Product in Bandung Metropolitan Area at current price.

Tabel 3.3.2 Gross Domestic Product in Bandung Metropolitan Area at Current Price

(Unit : Million Rupiah)

Regency/Cities	2002	2003	2004	2005	2006	2007
Bandung City	20,690,502.0	23,420,126.0	27,422,419.0	34,792,185.0	43,491,380.0	52,066,112.0
Bandung District	21,301,942.7	23,833,127.4	27,069,312.6	32,161,720.7	40,147,744.9	n.a
Cimahi City	4,648,150.5	5,182,892.8	7,132,099.9	7,227,777.5	8,399,784.4	9,356,230.5
Sumedang District	4,863,811.4	5,338,800.0	5,943,300.0	7,048,210.0	8,066,640.0	9,034,570.0

Source: Bandung in Figures 2008, BAPPEDA Bandung City

(3) Population Forecast

Initially, the provincial population was projected as the basis of the entire population framework in the planning period of the Study. The projection on SUPAS 2005 made by the consultants and BPS were reviewed because there was a discrepancy between the 2000 population projection and 2000 population census data. Population figures given in 2000 Population Census were set as the base population for future projection.

Projection process was made from the provincial down to district/municipality levels based on the trend of growth rates in the past census during 2000 to 2005 taking into account local share of population, regional development policy specified in the national and provincial development plans, and the regional advantages and constraints. The population projected by district/municipality was used as control totals for projection of the related study area. Further, the projected provincial population was used as the control total of the relevant Kabupatens/Kotamadyas population projection.

Table 3.3.3 Forecast Number of Population 2015 – 2028

(Unit : In thousands)

No.	District / Municipality	Population Growth (%)	2009	2015	2020	2025	2028
1	Bandung City	1.4%	2,691	2,932	3,149	3,383	3,634
2	Cimahi City	2.7%	580	680	776	886	1,011
3	Bandung District	2.1%	3,314	3,745	4,147	4,593	5,086
4	West Bandung District	2.1%	2,231	2,521	2,792	3,092	3,424
5	Sumedang District	2.0%	229	258	285	314	347
Total			9,045	10,137	11,150	12,267	13,501

Source: Statistic Regional Office, 2008

3.3.2 STUDY ON THE GENERATED TRAFFIC DEMAND BY NEW DEVELOPMENT

There are some new developments in the Bandung Metropolitan Area based on the master plan that will build the new stadium in Gedebage sub district scheduled in year 2012. The Cicaheum and Leuwipanjang bus terminals will be combined into a new bus terminal in Gedebage.

3.3.3 SUPPLEMENTARY TRAFFIC SURVEY

The traffic count survey was conducted to review the existing traffic situation. It was a one day survey conducted each in the weekday and weekend period .The week day survey was conducted on Tuesday, 17 February 2009, and the weekend survey was conducted on Saturday, 21 February 2009. The screen line location is divided by the railway corridor, in line with the BIUT road corridor.

The existing characteristic of transport mode in Bandung Metropolitan Area is shown in Table 3.3.4 below. The composition shows that motorcycle has the highest share with 67.2% while the small public transport called “Angkot” has a share of 7.4%. Thus, the total non-potential toll road users are around 74.6% of the utilized transport mode.

Table 3.3.4 The Composition of Traffic in Bandung Metropolitan Area

No.	Vehicle Type	Direction A	Direction B	Total	Percentage
1	Motorcycle, Scooter 3 wheeled (Bajaj)	1,120,642	987,514	2,108,157	67.2%
2	Sedan, Jeep, Station Wagon, Taxi	352,085	280,507	632,592	20.2%
3	Mini Bus (Microlet), Mini Public Bus (Angkot), ELF	126,748	104,282	231,030	7.4%
4	Pick-Up, Box-truck	46,727	44,380	91,106	2.9%
5	Small Bus	4,328	7,750	12,078	0.4%
6	Large Bus	5,116	8,135	13,251	0.4%
7	2 Axis Truck (with rear side 2 wheels)	12,042	14,992	27,034	0.9%
8	2 Axis Truck (with rear side 4 wheels)	7,351	8,186	15,537	0.5%
9	3 Axis Truck	1,386	2,809	4,195	0.1%
10	4 Axis Truck, 5 Axis Truck (Semi Trailer)	397	946	1,343	0.0%
11	Trailer	169	526	695	0.0%
	All Motor Vehicle	1,676,991	1,460,028	3,137,020	100.0%
	4 Wheel Vehicle	556,349	472,514	1,028,863	

Note; Direction A : From West to East Direction Flow, Direction B : From East to West Direction Flow
Source: JICA Survey Team

Private car has a share of around 20.2% while cargo vehicle (truck) has a share of around 1.5%. It means that the potential toll road users are only around 21.7%. The traffic volume in the screen line for weekend and weekday are shown in Figure 3.3.2 and 3.3.3 below.

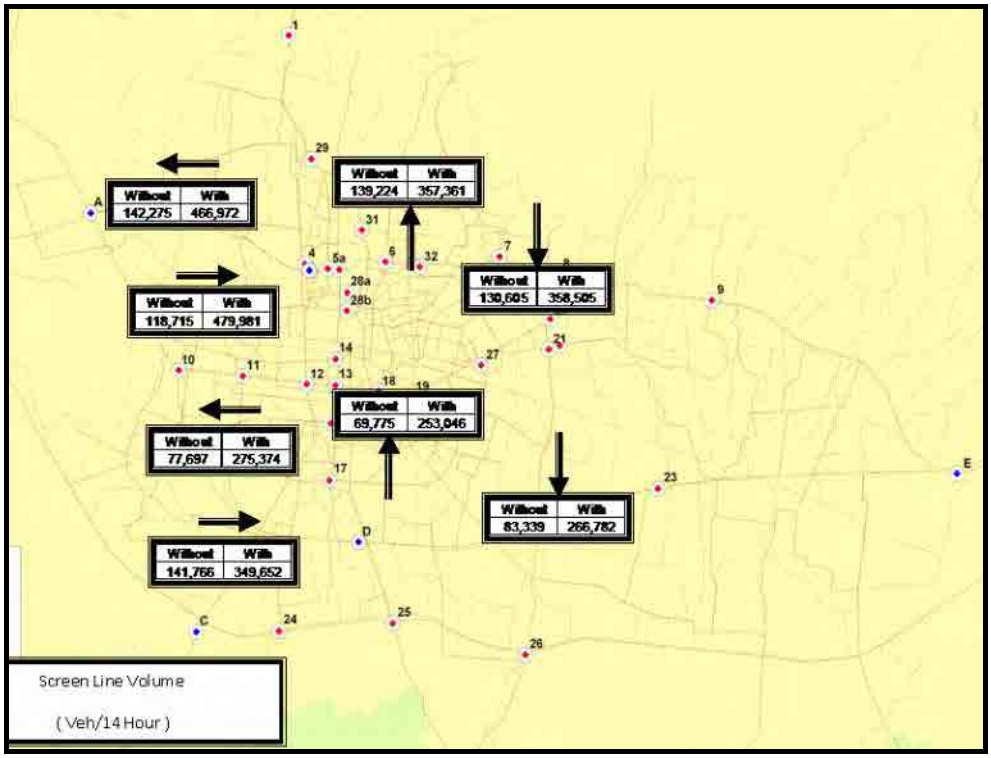
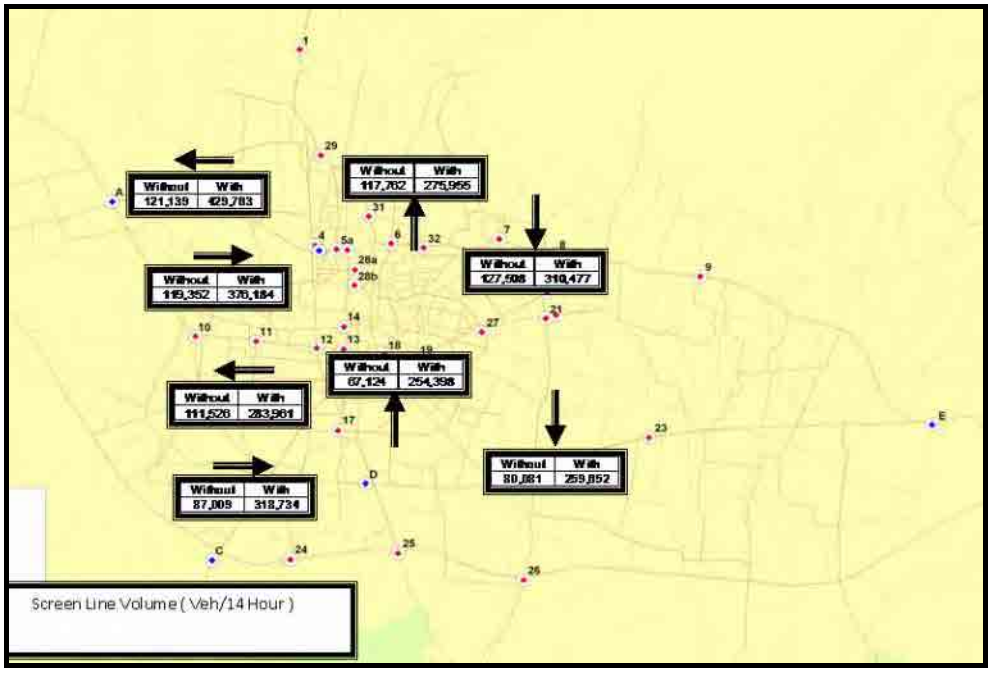


Figure 3.3.2 The Existing Traffic Volume in the Screen Line (Weekday)



Note; "With" : "Including Motorcycle", "Without" : "Excluding Motorcycle"

Figure 3.3.3 The Existing Traffic Volume in the Screen Line (Weekend)

The traffic volume in the toll road corridor, which is in the existing road in Pasteur for both elevated road and at-grade road, has a total traffic volume of 115,576 vehicle/day (including motorcycles). The

four-wheel vehicle volume is 47,113 vehicle/day while the small public transport mode ("angkot") is around 3037 vehicles/day. It means that the potential traffic volume in the existing road corridor is 44,076 vehicles/day.

3.3.4 UPDATE OF FORECAST TRAFFIC DEMAND ON BIUT ROAD PROJECT

The present data in base year 2009 is used by the consultant in the simulation for traffic demand forecasting. The calibration has been simulated to represent the existing movement pattern based on traffic volume in the screen line year 2009. The simulation is based on the scenario that in year 2015 a partial section of the road project will be constructed such as the Pasteur-Gasibu and Gedebage INTC-Soekarno Hatta sections. There are four sections: [i] Pasteur-Djundjunan, [ii] Djundjunan-Gasibu, [iii] Gedebage INTC-Gedebage, and [iv] Gedebage-Soekarno Hatta. The traffic forecast on the road project is shown in Table 3.3.5.

The predicted traffic volume in Phase 1 of section Pasteur-Djundjunan is 20,558 vehicle/day and the section of Djundjunan-Gasibu has the same figure with the previous section. It means that there is no traffic entering in between these sections because this segment is too short. Meanwhile, the predicted traffic volume in the section Gedebage INTC-Gedebage is 23,133 vehicle/day while that on the second section to Soekarno Hatta-Gede Bage is 26,786 vehicle/day.

In 2020, it is assumed that all four sections will be operational. In this phase, the traffic volume in section Pasteur-Gasibu is predicted at around 26,000-28,000 vehicles/day while the Gedebage INTC-Soekarno Hatta, Gasibu-Ujung Berung and Ujung Berung-Soekarno Hatta sections are predicted at around 32,000-38,000 vehicles/day, 9000-20,000 vehicles/day and 4000 vehicles/day, respectively.

The traffic volume in the toll road corridor in 2025 and 2030 are predicted at around 15,000-50,000 vehicles/day and 20,000-63,000 vehicles/day, respectively.

The comparison of projected traffic volume between the review study and the F/S is shown in Table 3.3.6 below. In 2015, the projected traffic volume in the F/S is 51,765 vehicles/day which is more than 2.5 times the projected traffic volume in the present study at around 20,000 vehicles/day.

The same condition occurs in the year 2020-2030 wherein the F/S has projected high traffic volume.

Table 3.3.5 The Projected Traffic Volume in the BIUT Road Project

(Veh/day)

No.	Section	Class I	Class II	Class III	Class IV	Class V	Total
I	Year 2015						
a.	Pasteur - Djundjunan	19,708	764	84	0	2	20,558
b.	Djundjunan - Gasibu	19,708	764	84	0	2	20,558
c.	Soekarno Hatta - Gede Bage	23,786	2,541	342	62	55	26,786
d.	Gede Bage - Gede Bage INTC	20,542	2,195	295	54	47	23,133
II	Year 2020						
a.	Pasteur - Djundjunan	25,151	975	106	1	2	26,235
b.	Djundjunan - Gasibu	27,130	1,052	115	1	2	28,300
c.	Gasibu - Sukaluyu	19,923	772	85	1	2	20,783
d.	Sukaluyu - Cicaheum	16,194	628	69	0	2	16,893
e	Cicaheum - Ujung Berung	8,714	338	37	0	0	9,089
f	Ujung Berung - Soekarno Hatta	3,679	143	16	0	0	3,838
g	Soeta - Gede Bage	34,327	3,668	494	90	79	38,658
h	Gede Bage - Gede Bage INTC	28,832	3,081	414	76	66	32,469
i	Ujung Berung - Cibiru	14,554	565	62	0	1	15,182
III	Year 2025						
a.	Pasteur - Djundjunan	37,356	1,448	159	2	3	38,968
b.	Djundjunan - Gasibu	41,074	1,592	174	2	4	42,846
c.	Gasibu - Sukaluyu	25,407	985	108	1	2	26,503
d.	Sukaluyu - Cicaheum	23,634	916	100	1	2	24,653
e	Cicaheum - Ujung Berung	14,180	549	60	0	2	14,791
f	Ujung Berung - Soekarno Hatta	36,938	1,432	157	2	3	38,532
g	Soeta - Gede Bage	45,066	4,815	648	119	103	50,751
h	Gede Bage - Gede Bage INTC	34,692	3,707	499	92	80	39,070
i	Ujung Berung - Cibiru	35,786	1,388	152	2	3	37,331
IV	Year 2030						
a.	Pasteur - Djundjunan	53,575	2,077	228	2	4	55,886
b.	Djundjunan - Gasibu	60,423	2,343	256	2	5	63,029
c.	Gasibu - Sukaluyu	33,145	1,285	141	2	3	34,576
d.	Sukaluyu - Cicaheum	33,337	1,293	142	2	3	34,777
e	Cicaheum - Ujung Berung	19,930	773	84	0	2	20,789
f	Ujung Berung - Soekarno Hatta	43,380	1,682	184	2	3	45,251
g	Soeta - Gede Bage	50,768	5,425	730	133	116	57,172
h	Gede Bage - Gede Bage INTC	40,440	4,321	581	106	93	45,541
i	Ujung Berung - Cibiru	40,650	1,576	172	2	3	42,403

Source : JICA Survey Team

Table 3.3.6 Comparison of Projected Traffic Volumes

No.	Section	Review Study	Feasibility Study
I	Year 2015		
	a. Pasteur - Djundjunan	20,558	51,765
	b. Djundjunan - Gasibu	20,558	
	c. Soekarno Hatta - Gede Bage	26,786	
	d. Gede Bage - Gede Bage INTC	23,133	
II	Year 2020		
	a. Pasteur - Djundjunan	26,235	61,618
	b. Djundjunan - Gasibu	28,300	
	c. Gasibu - Sukaluyu	20,783	
	d. Sukaluyu - Cicaheum	16,893	
	e Cicaheum - Ujung Berung	9,089	
	f Ujung Berung - Soekarno Hatta	3,838	
	g Soeta - Gede Bage	38,658	
	h Gede Bage - Gede Bage INTC	39,617	
	i Ujung Berung - Cibiru	15,182	
III	Year 2025		
	a. Pasteur - Djundjunan	38,968	75,177
	b. Djundjunan - Gasibu	42,846	
	c. Gasibu - Sukaluyu	26,503	
	d. Sukaluyu - Cicaheum	24,653	
	e Cicaheum - Ujung Berung	14,791	
	f Ujung Berung - Soekarno Hatta	38,532	
	g Soeta - Gede Bage	50,751	
	h Gede Bage - Gede Bage INTC	39,070	
	i Ujung Berung - Cibiru	37,331	
IV	Year 2030		
	a. Pasteur - Djundjunan	55,886	93,237
	b. Djundjunan - Gasibu	63,029	
	c. Gasibu - Sukaluyu	34,576	
	d. Sukaluyu - Cicaheum	34,777	
	e Cicaheum - Ujung Berung	20,789	
	f Ujung Berung - Soekarno Hatta	45,251	
	g Soeta - Gede Bage	57,172	
	h Gede Bage - Gede Bage INTC	45,541	
	i Ujung Berung - Cibiru	42,403	

Source : JICA Survey Team

The IC traffic volume on the on- and off-ramps are indicated in Table 3.3.7 below. The volume of traffic entering the toll road is quite low because Pasteur itself is already inside the city. The toll tariff that will be implemented in this section is Rp 3000 per transaction (Rp 550/km), meanwhile the toll tariff for Padaleunyi is around Rp 333/km. The difference of toll tariff will be considered for toll road user.

Table 3.3.7 On-Off Ramp Traffic Volume

(unit : Vehicle/day)

No.	IC Volume		2015	2020	2025	2030
1	Pasteur	On Ramp	9,830	11,284	17,453	25,750
		Off Ramp	10,728	14,690	21,132	29,597
2	Djundjunan	On Ramp	0	518	1,247	2,363
		Off Ramp	0	1,530	2,604	4,731
3	Gasibu	On Ramp	10,728	16,222	23,736	34,327
		Off Ramp	9,830	11,802	18,700	28,114
4	Sukaluyu	On Ramp		8,610	13,580	18,813
		On Ramp		4,084	4,279	4,451
5	Cicaheum	On Ramp		2,808	3,590	5,717
		Off Ramp		5,003	6,267	8,247
6	Soekarno Hatta	On Ramp	10,982	18,105	23,126	26,691
		Off Ramp	11,535	13,953	15,444	18,291
7	Gede Bage	On Ramp	10,215	11,310	15,926	18,248
		Off Ramp	6,372	6,224	5,650	9,236
8	Gede Bage INTC	On Ramp	11,391	14,462	16,061	19,508
		Off Ramp	14,681	23,698	34,019	36,919
9	Cibiru	On Ramp		6,282	23,552	26,432
		Off Ramp		1,423	14,752	17,048

Source : JICA Survey Team

3.3.5 TOLL TARIFF SENSITIVITY

Traffic simulation has been done for different toll tariffs. The analysis is conducted to find the sensitivity of toll tariff on how increasing the toll tariff will affect the traffic volume. It means that the number of toll road users is dependent on the toll tariff being implemented.

Table 3.3.8 Toll Tariff Sensitivity for Bandung Intra-Urban Toll Road

No.	Toll Tariff (Rp./Km)	Traffic Volume (Veh/day)	Revenue (Rp. Billion/Year)
1	500	20,558	24.40
2	600	17,450	28.66
3	700	15,450	31.02
4	750	13,250	29.02

In the average toll tariff of Rp 500/km, the traffic volume predicted is around 20,558 vehicles/day and the revenue is around Rp 24.40 billion/year. Increasing the toll tariff by 20% will decrease the traffic volume by 15.1% while revenue will increase by 17.5%. Likewise, increasing the toll tariff by 40% will decrease the traffic volume by 24.8% while the revenue will increase by 27.1%. Figure 3.3.4 shows the sensitivity of toll tariff for BIUT Road Project. The maximum toll tariff shown in Figure 3.3.4 is around Rp 700-750/km. This maximum toll tariff resulted to the maximum economic benefit from toll road to arterial road.

Even the maximum toll tariff may not be applied by the investor, because more important factors such as users' approval/ not too high compared to surrounding toll roads tariff.

In order to convince, Toll road Administration Agency (BPJT) and users, investor must show the average preference of users by WTP survey and others for negotiation materials.

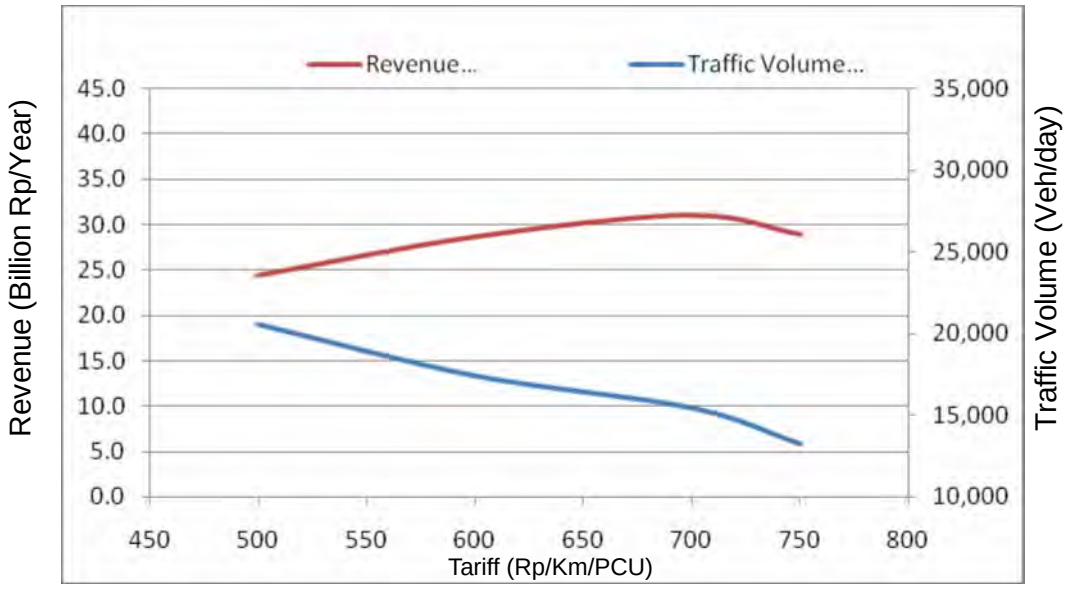


Figure 3.3.4 Toll Tariff Sensitivity

The maximum tariff in 2009 prices is computed from 70% of financial unit benefit, as follows:

Unit : Rp./PCU

	Section		
	Ph-1-1	**Ph-1-2**	**Ph (1+2-1+2-2) (Ph 2-3)**
Maximum Tariff Rate (per Km)	884.8	2,031.1	1,076.6
Maximum Tariff	4,866	6,296	12,919

Regarding the initial tariff for phase 1-1, Rp. 3,000/PCU equivalent to Rp. 545/Km/PCU is applied as reasonable and moderate rate considering the tariff system being a flat tariff one. Reasons are as follows:

a. Even the highest revenue rate is simulated approximately Rp. 7000/Km/PCU, the surrounding toll roads rate are approximately Rp. 200/Km/PCU.

b. The former FS utilized Rp. 402/Km/PCU for kilometer-proportional tariff system for full stretch.

c. In general, results of willingness to pay (WTP) survey shows low figure.

Financial plan and examination of PPP option was carried out based on tariff analysis results.

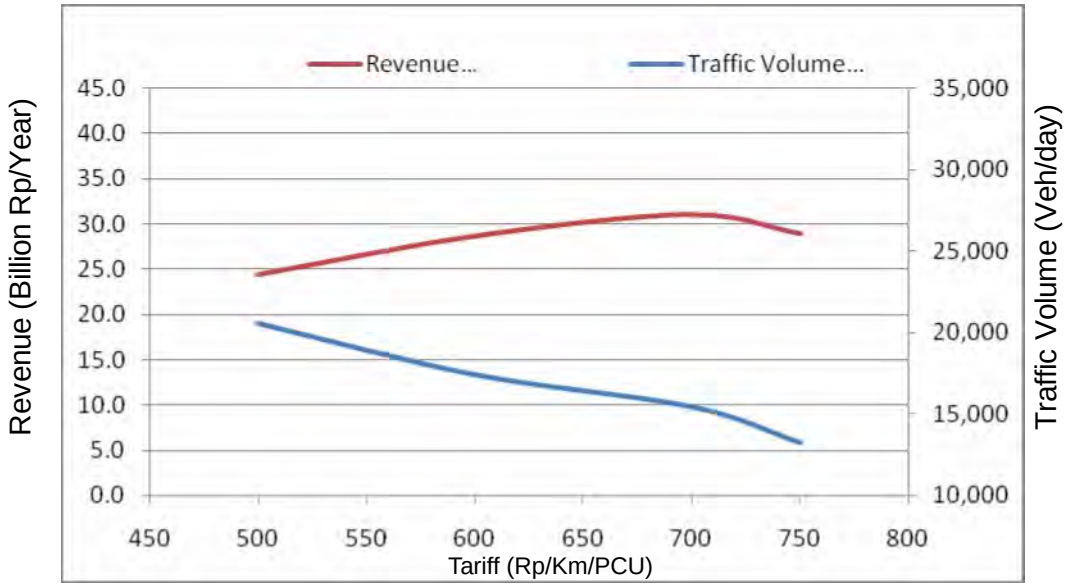


Figure 3.3.4 Toll Tariff Sensitivity

The maximum tariff in 2009 prices is computed from 70% of financial unit benefit, as follows:

Unit : Rp./PCU

	Section		
	Ph-1-1	**Ph-1-2**	**Ph (1+2-1+2-2) (Ph 2-3)**
Maximum Tariff Rate (per Km)	884.8	2,031.1	1,076.6
Maximum Tariff	4,866	6,296	12,919

3.4 PROJECT COST AND FUNDING PLAN

3.4.1 REVIEW OF EXISTING DESIGN OF THE BIUT ROAD PROJECT

(1) General

The preliminary design for the BIUT Road Project was reviewed by the JICA Survey Team based on the following design guidelines and on the results of site reconnaissance.

- Standard Specification for Roads Geometric Design, No.13/1970
- Standard Specification for Geometric Design of Urban Roads, 1992,
- Standard Specification of Freeways Design, 1976

The JICA Survey Team classified the result of design review as follows:

- Revised/Alternative Design
- Additional Drawing
- Estimate Quantities change

a. Revised/Alternative Design: Revision of vertical alignment is necessary on Ujungberung IC due to insufficient clearance at crossing point between the main road and ramps. Alternative design is proposed for:

- Ujungberung IC
- Crossing with planned local road at STA. 5+650: Gedebage – Ujungberung Section

- North end point of Phase 1-2

b. Modification of R.O.W.: Additional R.O.W. has to be acquired due to the revisions made, as shown in the attached figures.

c. Change in Major Design Quantities: Estimate changes in quantities; calculations are indicated in the attached sheets.

(2) Revised/Alternative Design

1) Ujungberung IC

Alternative design is proposed to change portions of the outer ramps from elevated into embankment type of road.

Ramp-3: Reduce four spans of bridge approximately 200 m length and change to embankment with maximum height of 3.40 m.

Ramp-4: Reduce five spans of bridge approximately 250 m length and change to embankment with maximum height of 3.60 m.

These changes will reduce the construction cost and shorten the construction schedule but on the other hand, the R.O.W. has to be widened 10.00 m on both sides about 400 m length.

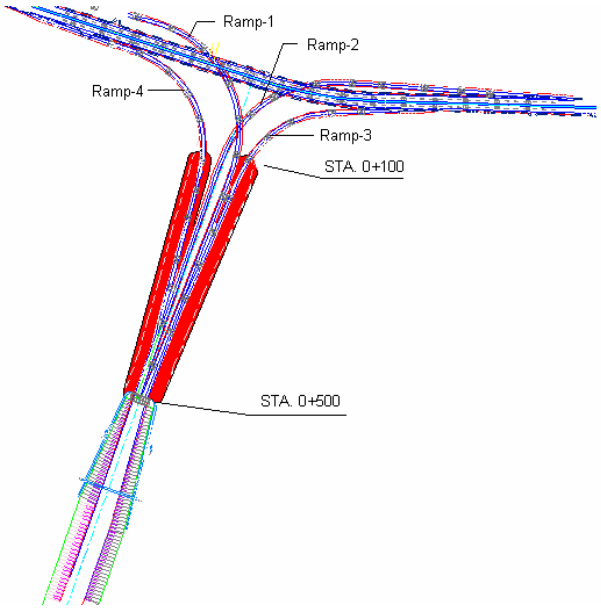


Figure 3.4.1 Revised Ujungberung IC

2) Gedebage IC – Northern End

The start point of Gedebage IC at northern end section will be at Gedebage IC (STA. 6+662.09) and the proposed end at railway crossing is either at (Alt.-1), STA. 3+430 or at crossing of Jl. Soekarno-Hatta Intersection (Alt.-2), STA. 2+955.

This section is mostly at grade. No frontage roads are utilized in this section. Toll gate will be provided just after Gedebage IC; on-ramp at STA. 5+200 and off-ramp at STA. 3+950.

A flyover structure will be constructed at STA. 4+900 with approximate length of 350 m to accommodate Gedebage area development. Side drainage will be constructed along the route and cross drainage (RCP) will be provided at several locations.

a. Crossing with Planned Local Road at STA. 5+650: (Gedebage-Ujungberung Section)

The original design applied at the location of crossing with planned local road at STA. 5+650 (Gedebage-Ujungberung Section) is double box culvert. This box culvert, 6.00 m in height, has to be constructed and fitted into finish level of the main road which is approximately 3.50 m higher than the existing ground level. Technically, the bottom elevation of the box culvert should be 3.00 m below the existing ground level. However, this location is a flood prone area; therefore, water pump has to be provided.

The proposed alternative design is to change the box culvert into a 60 m single span of bridge. The finished grade needs to be risen-up in the revised design.

The comparison between Box Culvert and Bridge is shown in the following table.

Table 3.4.1 Alternative for Gedebage IC – Northern End

No.	Aspect	Original (Box Culvert)	Alternative (Bridge)
1.	Cost	Low cost	High cost
2.	Traffic	Smooth traffic	Not good approach to the Toll gate. The distance is too short.
3.	Social - Environment	Water pump should be provided at the local road due to flood area	Local road is not constructed yet, there is possibility to change the route.
Conclusion		Recommended	Not recommended

b. Northern End Point of Phase 1-2

Gedebage - Northern Section: The flyover structure, crossing above Jl. Soekarno-Hatta and Railway, has been originally designed for approximately 870 m in length. The alternative design made, in order to reduce the construction cost, is to change the flyover into at-grade crossing type (Intersection). The revised design of vertical alignment has been made. The comparative table between original and alternative design is as follows.

Table 3.4.2 Alternative for Northern End Point of Phase 1-2

No.	Aspect	Original (Flyover)	Alternative (At grade)
1.	Cost	High cost	Low cost
2.	Traffic	No disturbance	Disturbed, cause of conflict at intersection and railway
3.	Social - Environment	Construction will be implemented at once and no more construction activities in the next phase.	Construction has to be implemented in two phases. It will be better to avoid unpredictable problems in the future (Phase-2). However, if in case that the highway section development is implemented as access road of toll way, most of problems will be solved. Against the regulation of Tollways regarding level railway crossing.
Conclusion		Not recommended	Recommended

(3) Modification of ROW

The necessary modifications of ROW in the design are recommended based on design review. The major modifications are located in the following sections:

- Pasteur – Paspati : STA. 2+000 – 2+400
- Ujungberung Junction : STA 0+100 – 0+500

- Toll Plaza Gedebage : STA. 6+020

a. Pasteur – Paspati : STA. 2+000 – 2+400

b. Widening of frontage arterial road is necessary at beginning points of viaduct as shown in Figure 3.4.2. Plan for these locations shall be amended to satisfy the design criteria during the detailed design stage.

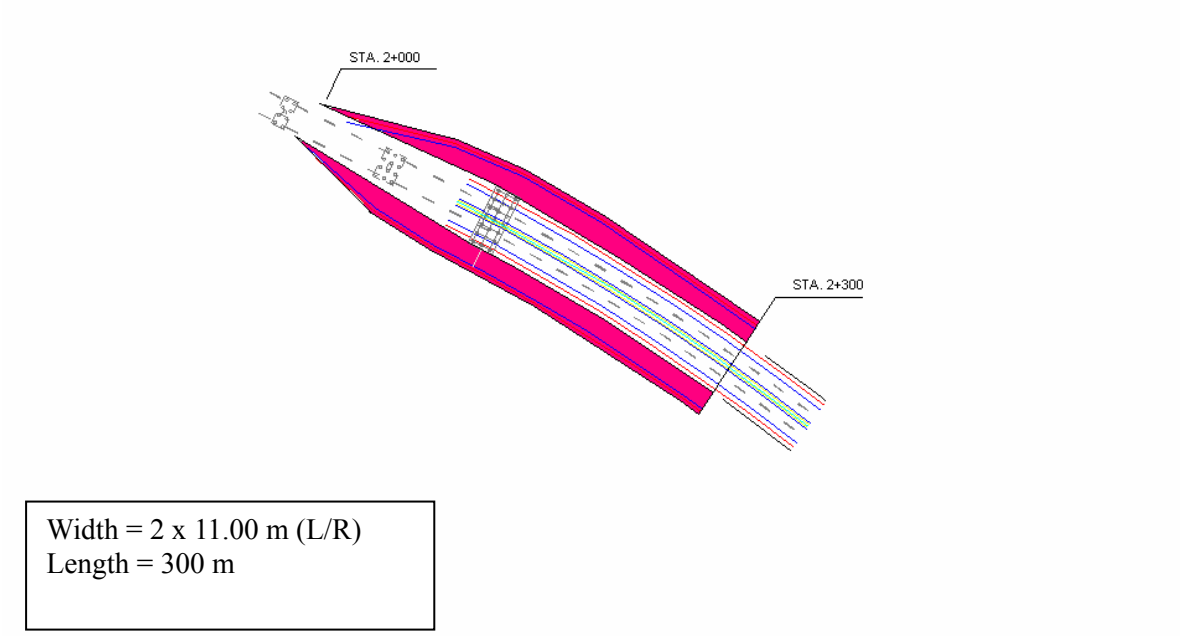


Figure 3.4.2 Modification of ROW (Pasteur – Paspati)

c. Ujungberung IC : STA 0+100 – 0+500

As mentioned above, the structural modification together with modification of ROW is necessary as shown in Figure 3.4.3. Further design considerations shall be executed during the detailed design stage.

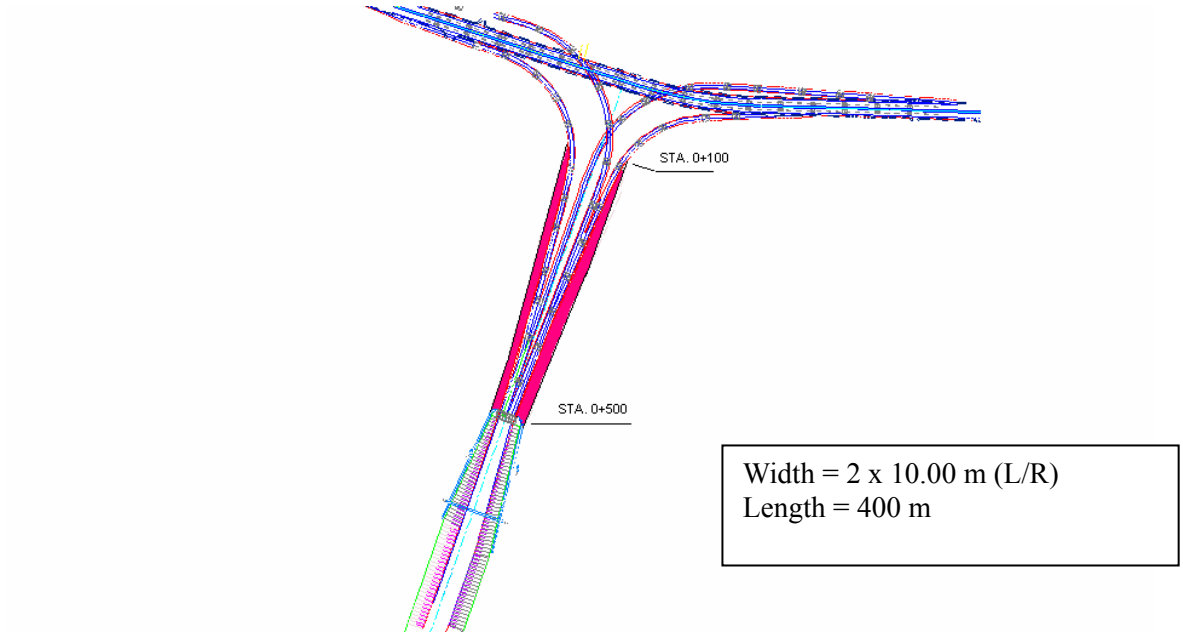


Figure 3.4.3 Modification of ROW (Ujungberung IC)

d. Toll Plaza Gedebage : STA. 6+020

The toll plaza was recommended to shift from Ujungberung IC to Sta. 6+020 near Gedebage IC as shown in Figure 3.4.4 due to operational reason for toll collection.

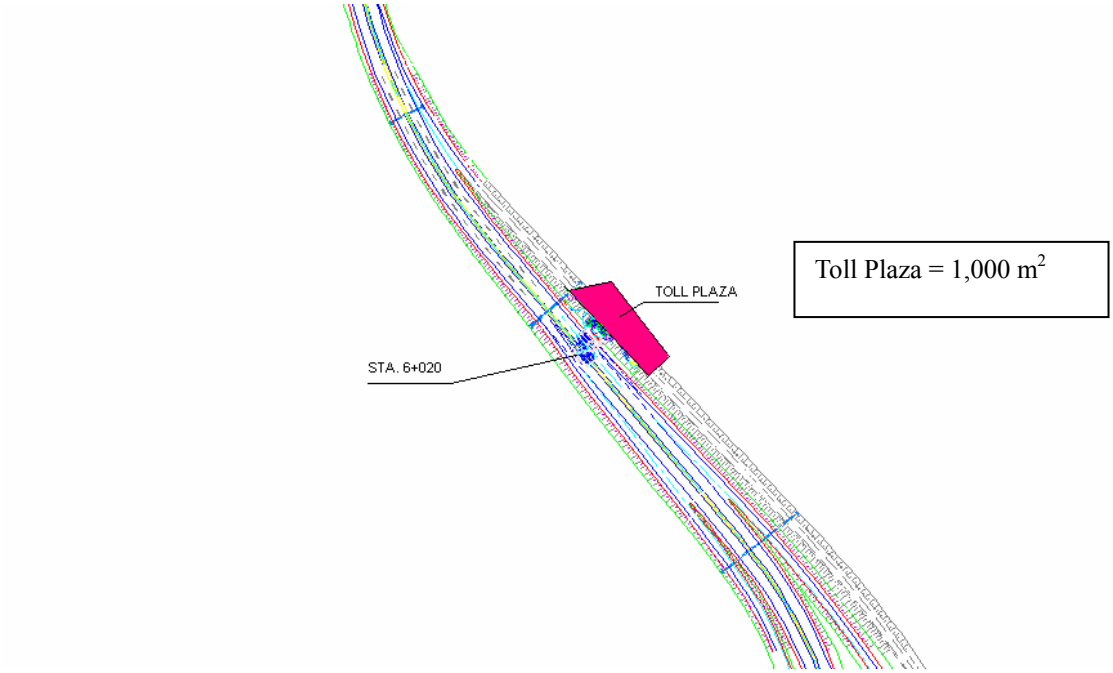


Figure 3.4.4 Modification of ROW (Toll Plaza Gedebage)

(4) Major design quantity change

Changes in design quantity based on the design review are summarized as follows:

- Lane Separator / Barrier
- Deletion of Toll Gate
- Additional Box Culvert / Bridge at STA. 5+650 Ujungberung IC – Gedebage IC
- Ujungberung IC
- Gedebage IC

a. Lane Separator / Barrier

Lane separator and barrier is necessary based on traffic management measure for the Pasupati Bridge proposed in Chapter 3.9.2 (3).

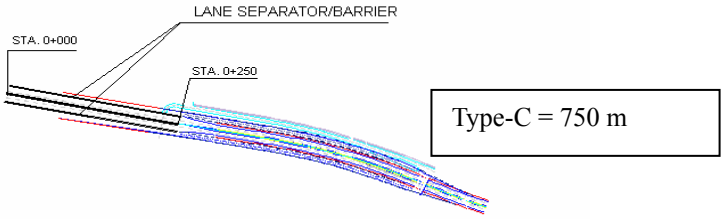


Figure 3.4.5 Beginning (Pasteur) Section

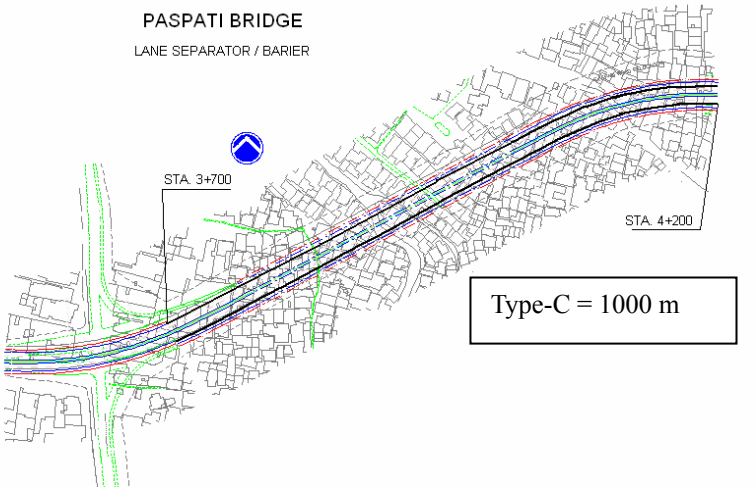
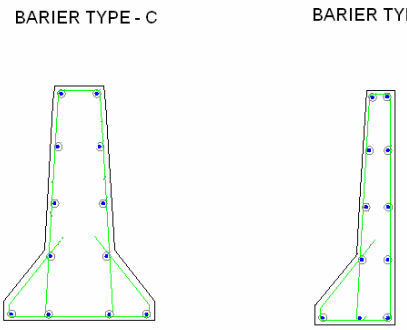
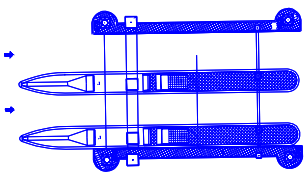


Figure 3.4.6 Pasupati Bridge



Total Length: Type-C = 1750 m

Figure 3.4.7 Type of Separator / Barrier:



Pasteur – Gasibu :
STA. 3+600 – Jl. Cihampelas (N+S) = 2 ea.
STA. 4+250 – Jl. Tamansari (N+S) = 2 ea.
Ujungberung – Gedebage:
STA. 5+200 (On Ramp to Gedebage) = 1 ea.
Gedebage Interchange:
Ramp-3 STA. 0+450 = 1 ea.
Ramp-8 STA. 0+200 = 1 ea.
TOTAL = 7 ea.

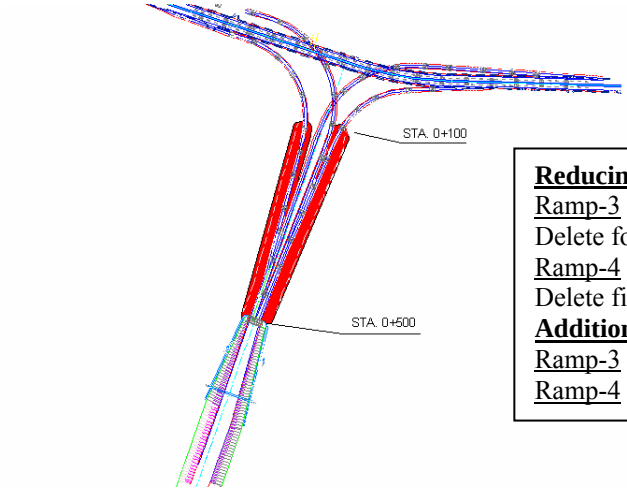
Figure 3.4.8 Deletion of Toll Gates

b. Additional Box Culvert / Bridge at STA. 5+650 Ujungberung-Gedebage:

* Alternative-1: Additional Box Culvert (Double):
W = 11.25 m x H = 6.00 m, Length = 23.00 m

* Alternative-2: Additional Bridge (I-Girder); Length = 60.00 m (1 Span only)
Embankment of bridge approaches 9.00 m of maximum height and 640 m long.

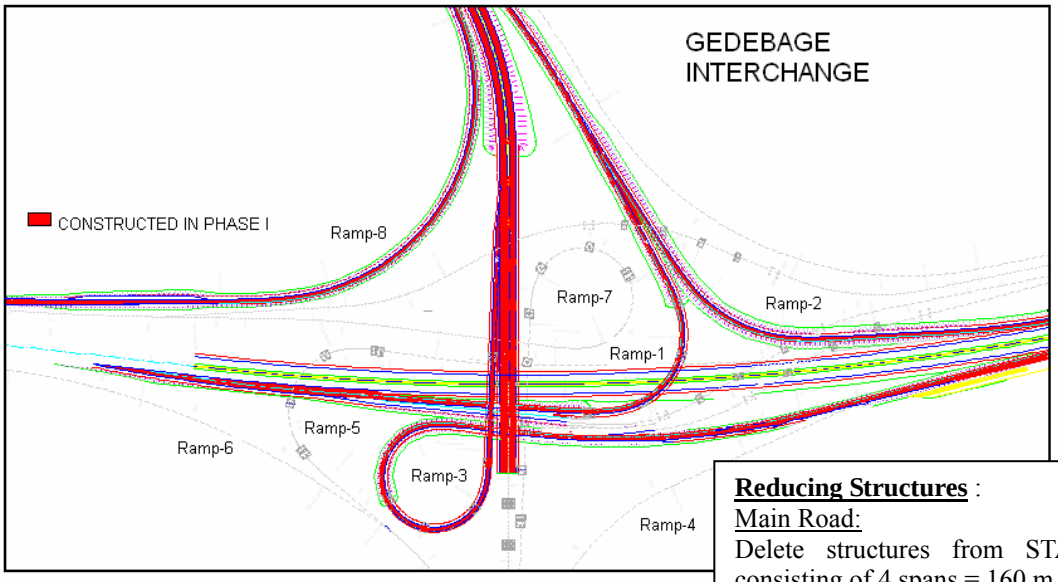
c. Ujungberung IC:



Reducing Structures :
Ramp-3 :
Delete four spans of bridge = 200 m long
Ramp-4 :
Delete five spans of bridge = 250 m long
Additional Embankment :
Ramp-3 : Emb. = 200 m long, max. height = 3.40 m
Ramp-4 : Emb. = 250 m long, max. height = 3.60 m

Figure 3.4.9 Ujungberung IC

d. Gedebage IC:



Reducing Structures :
Main Road:
Delete structures from STA. 6+750 consisting of 4 spans = 160 m long.
Deletion of Ramp-4, Ramp-5, Ramp-6 and Ramp-7 completely.

Figure 3.4.10 Gedebage IC

(5) Other Design Review Results

Table 3.4.3 Design Speed applied in the BIUT Road Project

No.	Drawing Nos.	Drawing Name & STA.	Description
I. Revision Drawings:			
Pasteur - Cileunyi Section :			
1	D0-01	Plan & Profile STA.0+000 - 0+700	Retaining Wall was not shown. Starting of bridge not same between Plan & Profile of Main Road vs. Local Road.
2	D0-03	Plan & Profile STA.1+400 - 2+100	To add Toll Gate Legend and widen ROW
3	D0-04	Plan & Profile STA.2+100 - 2+800	Retaining Wall was not shown & Widen ROW. Starting point of the existing Paspati bridge to be shifted.
4	D0-05	Plan & Profile STA.2+800 - 3+500	On Ramp Toll Gate to be located on the ground, not at the elevated.
5	D0-06	Plan & Profile STA.3+500 - 4+200	The existing Cable Stay Bridge has 6 lanes wide.
6	D0-07	Plan & Profile STA.4+200 - 4+900	Retaining Wall was not shown.
7	D0-08	Plan & Profile STA.4+900 - 5+600	Retaining Wall was not shown. To notify beginning and ending point of underground structure.
8	D0-29	Plan & Profile STA.19+600 - 20+300	To revise toll gate at Cileunyi, for entrance only.
Ujungberung - Gedebage Section :			
9	D1-02	Plan & Profile STA.0+700 - 1+400	To remove toll plaza to Gedebage.
10	D1-03	Plan & Profile STA.1+400 - 2+100	To notify ending point of bridge.
11	D1-04	Plan & Profile STA.2+100 - 2+800	To notify beginning point of bridge. Plan vs. profile should be same.
12	D1-06	Plan & Profile STA.3+500 - 4+200	To notify ending point of bridge.
13	D1-07	Plan & Profile STA.4+200 - 4+900	To notify beginning point of bridge.
On Off Ramp :			
14	D3-01	Plan On Off Ramp Pasteur	To provide lanes divider (curb/barrier)
II.	**Revised/Alternative Design:**		
Ujungberung - Gedebage Section :			
15	D1-01	Plan & Profile STA.0+000 - 0+700	To remove toll plaza to Gedebage. Change outer ramps to embankment, need widening of ROW.
16	D1-04 (Phase-1)	Plan & Profile STA.2+100 - 2+800	To revise profile : at grade toll road
17	D1-05 (Phase-1)	Plan & Profile STA.2+800 - 3+500	To revise profile : at grade toll road
18	D1-06 (Phase-1)	Plan & Profile STA.3+500 - 4+200	To revise profile : at grade toll road
19	D1-08	Plan & Profile STA.4+900 - 5+600	To delete on-Ramp Toll Gate and to notify ending point of bridge.
20	D1-09 (ALT.-1 & ALT.-2)	Plan & Profile STA.5+600 - 6+300	To provide Toll Plaza and revision of vertical alignment for new bridge (Alt.2).
21	D1-10	Plan & Profile STA.6+300 - 7+000	Deletes access road & ramps to South
Interchanges :			
22	D2-01	Plan of Ujungberung JC	To provide number of Ramps and change outer ramps to embankment.
23	D2-02-03	Profile of Ujungberung JC	To revise profile of ramps
24	D2-04-05-06	Plan of Gedebage IC	To delete access road & ramps to South.
III. Additional Drawing :			
Typical Cross Section			
25			Typical Cross Section w - Retaining Wall

3.4.2 PREVIOUS AND UPDATED COST ESTIMATES

(1) Procedure of Cost Estimate

The JICA Survey Team has updated the cost estimates of the F/S based on the procedures shown in Figure 3.4.11.

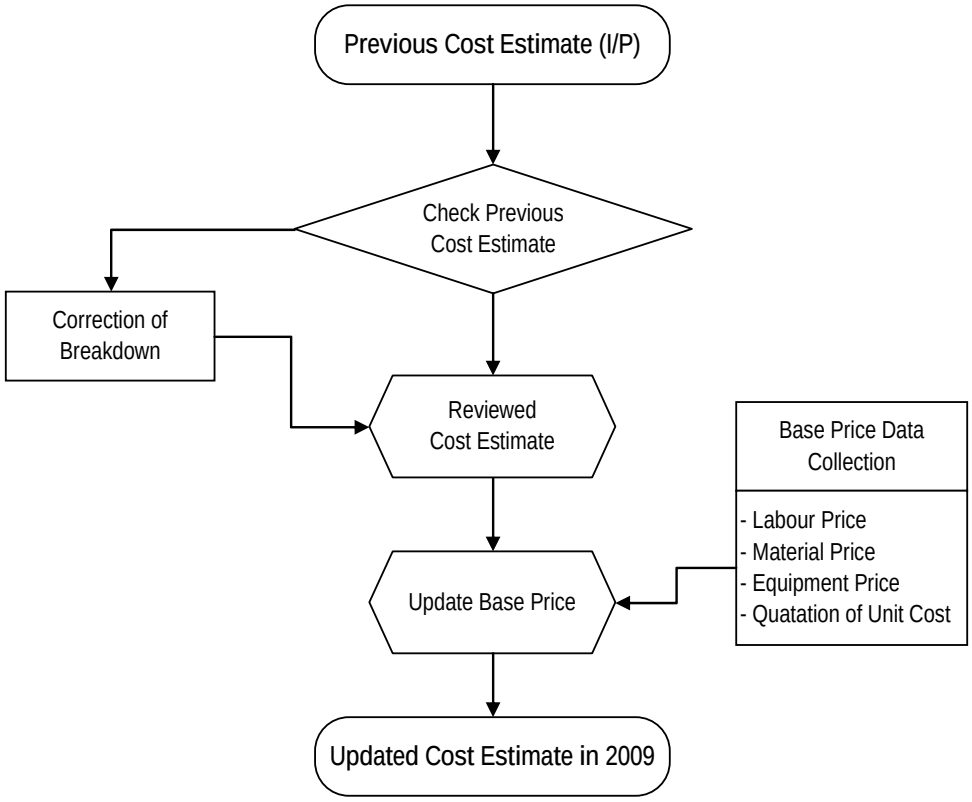


Figure 3.4.11 Cost Estimate Review Procedure

(2) Previous Cost Estimate

The previous cost estimate was established in F/S in FY2006 and updated in the Implementation Program (hereinafter "I/P") in July 2007. The summary of the cost estimates of I/P was provided by DGH but the breakdown of the cost estimates is not available in DGH.

Prior to the review, the summary of the cost estimates of I/P was converted to unit cost per square meter (Rp/m2) as shown in Table 3.4.4.

Table 3.4.4 Estimation of Construction Cost (I/P in 2007)

SECTION	Phase	Station		Length	Width	Area	Unit Price		Construction Cost (million Rp)		
		from	to	(m)	(m)	(m2)	(Rp/m2)	Remarks	Phase 1	Phase 2	Phase 3
1 Pasteur - Surya Sumantri											
1.1 Widening of Arterial Roads	1	0+000	0+600	600	17.5	10,500	1,016,132	at-grade	10,669		
2 Surya Sumantri F.O.											
2.1 Toll	1	0+600	2+100	1,500	23.0	34,500	8,136,427	PC-Box	280,707		
2.2 Arterial	1	0+600	2+100	1,500	15.5	23,250			0		
3 Surya Sumantri - Paspati Br											
3.1 Toll	1	2+100	2+500	400	23.0	9,200	2,316,789	at-grade	21,314		
3.2 Arterial	1	2+100	2+500	400	15.5	6,200		at-grade	0		
4 Paspati Br	1			0		0			0		
5 Paspati Br - Gazibu											
5.1 Toll	1	4+970	5+505	535	23.0	12,305	5,933,420	underpass	73,011		
5.2 Arterial	1	4+970	5+505	535	15.5	8,293			0		
6 Gazibu - Ujungburung											
6.1 Toll	2	5+505	14+100	8,595	23.0	197,685	7,267,987	PC-Box		1,436,772	
6.2 Arterial	2	5+505	14+100	8,595	15.5	133,223				0	
7 Ujungburung JCT											
7.1 eastside	2			1,379	9.0	12,411	9,937,754	Steel		123,337	
7.2 westside	3			1,117	9.0	10,053	9,937,754	Steel			99,904
8 Ujungburung - Cileunyi											
8.1 Toll	3	14+100	19+340	5,240	23.0	120,520	7,267,987	PC-Box			875,938
8.2 Arterial	3	14+100	19+340	5,240	15.5	81,220					0
9 Ujungburung - Bus Terminal				2,542							
9.1 Embanked	2	0+000	1+244	1,244	23.0	28,612	570,440	embankment		16,321	
9.2 Cisaranten Elevated Slab	2	1+244	1+662	418	23.0	9,614	6,937,048	PC-I		66,693	
9.3 Gedebage Wetan Elevated Slab 1	2	2+680	3+560	880	23.0	20,240	9,598,676	PC-Box		194,277	
10 Bus Terminal - Gedebage				3,431							
10.1 Embanked	1	3+560	6+414	2,854	23.0	65,642	570,440	embankment	37,445		
10.2 Gedebage Elevated Slab 2	1	6+414	6+991	577	23.0	13,271	6,937,048	PC-I	92,062		
11 Gedebage JCT	1								168,400		194,351
12 ON/OFF (total 16 nos)						(nos)					
ON/OFF	1					10	10,415,926,192		104,159		
ON/OFF	2					4	10,415,926,192			41,664	
ON/OFF	3					2	10,415,926,192				20,832
Total									**683,608**	**1,837,401**	**1,170,193**
										3,691,202	

Table 3.4.5 shows the comparison of the unit construction cost by type of structure between the I/P and other similar projects in Indonesia such as the TgPA and UARI.

Table 3.4.5 Unit Construction Cost by Type of Structure

Type of Structure	Unit Price of BIUT (I/P) (million Rp/m^2)	Unit Price of Similar Projects in Indonesia (million Rp/m^2)
At-grade (earth works and pavement works)	0.57 – 1.01	1.00 – 3.00
PC-I Girder Bridge (with nominal piers)	6.93	7.00 – 9.00
PC-Box Girder Bridge	7.27 – 9.59	15.00 - 18.00
Steel Box Girder Bridge	9.93	21.00 – 26.00
Underpass	5.93	-

Source: JICA Survey Team

Comparing the unit prices above, the JICA Survey Team has concluded the following findings.

1) PC-Box Girder Bridge

The construction unit cost of PC-Box girder bridge in I/P (7.1 – 8.1 million Rp/m2) seems to be a low estimate. Upon reviewing the cost breakdown in the I/P, it was found that the construction method of cast-in-situ with all-staging was applied although PC-Box girder bridge was designed along the arterial roads in Bandung City. The JICA Survey Team has assessed that it will be quite difficult to apply the all-staging method on the heavy congested arterial roads. Therefore, the pre-cast segmental PC-Box girder method is recommended and the breakdown of the construction cost has been modified in consideration of the required facilities to construct the pre-cast segmental PC-Box girder such as jointing, erection of girder, etc.

2) Steel Box Girder Bridge

The construction unit cost of steel box girder bridge in I/P (Rp 9.9 million/m^2) also seems to be a very low estimate. Thus, the cost breakdown of the steel box girder has been modified using the latest unit prices of construction materials.

3) Underpass Structure

The proposed structure of Gazibu underpass comprises of "secant pile" and "bridge across the underpass section". The construction unit cost of underpass structure in I/P is only Rp 5.9 million/m^2 which seems to be the cost of secant pile only. Therefore, the cost breakdown of the underpass has been modified to include the construction cost of bridge structure on the underpass.

(3) Update of Base Price

The breakdown of the cost estimate of I/P is not available in DGH. Therefore, the base price such as labor price and construction material price of the F/S was used for reviewing the cost estimate. Significant increase in unit prices of labor and materials has been noted in comparing the prices in the F/S and 2009 estimates. Table 3.4.6 and 3.4.7 show the price increase of labor and major construction materials, respectively as of 2009.

Table 3.4.6 Labor Price

Item	Unit	Price in F/S (Rp)	2009 Price (Rp)
Labor	day	17,000 (**100%**)	37,070 (**218%**)
Skilled Labor	day	20,000 (**100%**)	40,700 (**204%**)
Foreman	day	28,000 (**100%**)	60,940 (**218%**)
Operator	day	30,360 (**100%**)	42,240 (**139%**)
Mechanic	day	25,000 (**100%**)	36,630 (**147%**)

Source: JICA Survey Team (F/S, Journal Harga Satuan Bahan Bangunan Konstruksi dan Interior 2008/2009)

Table 3.4.7 Construction Materials Unit Price

Item	Unit	Price in F/S (Rp)	2009 Price (Rp)
Fine Aggregate	m3	140,000 (**100%**)	151,250 (**138%**)
Coarse Aggregate	m3	132,000 (**100%**)	143,000 (**108%**)
Boulder	m3	75,000 (**100%**)	104,500 (**139%**)
Crushed Stone	m3	75,000 (**100%**)	112,200 (**150%**)
Cement	kg	763 (**100%**)	924 (**121%**)
Asphalt (Pertamina)	kg	3,200 (**100%**)	4,620 (**144%**)
Re-bar	kg	5,500 (**100%**)	6.600 (**120%**)
Concrete (Class A, K=415kg/cm2))	m3	633,600 (**100%**)	684,707 (**108%**)
Concrete (Class B, K=290kg/cm2))	m3	617,700 (**100%**)	627,000 (**102%**)
Concrete (Class C, K=210kg/cm2))	m3	528,800 (**100%**)	605,000 (**114%**)
Concrete (Class D, K=145kg/cm2))	m3	496,400 (**100%**)	577,500 (**116%**)
Pipe Culvert (Dia 1,000)	m	900,000 (**100%**)	1,141,272 (**127%**)
Pipe Culvert (Dia 600)	m	350,000 (**100%**)	559,152 (**160%**)
PC Cable (Dia 12.7 mm)	kg	24,900 (**100%**)	36,813 (**148%**)
Gasoline	ltr	5,034 (**100%**)	5,034 (**100%**)
Diesel	ltr	5,342 (**100%**)	5,342 (**100%**)
Kerosene	ltr	5,507 (**100%**)	6,058 (**110%**)

Source: JICA Survey Team (F/S, Journal Harga Satuan Bahan Bangunan Konstruksi dan Interior 2008/2009)

(4) Updated Cost Estimate

The JICA Survey Team updated the cost estimates using the cost breakdown of F/S.

1) Construction Cost

The proposed type of structures for the Project is commonly constructed in Indonesia by Indonesian contractors and the required construction materials and equipment for the Project are available in Indonesia. Therefore, all costs are estimated in Rupiah currency as well as the cost estimate of F/S. The unit construction cost of F/S was reviewed and re-calculated using the latest base prices in 2009. The updated construction cost is summarized in Table 3.4.8.

Table 3.4.8 Updated Construction Cost

SECTION	Phase	Station		Length	Width	Area	Unit Price		Construction Cost (million Rp)	
		from	to	(m)	(m)	(m2)	(Rp/m2)	Remarks	Phase 1	Phase 2
1 Pasteur - Surya Sumantri										
1.1 Widening of Arterial Roads	1	0+000	0+600	600	17.5	10,500	1,502,075	at-grade	15,772	
2 Surya Sumantri F.O.										
2.1 Toll	1	0+600	2+100	1,500	22.0	33,000	15,419,814	PC-Box	508,854	
3 Surya Sumantri - Paspati Br										
3.1 Toll	1	2+100	2+500	400	22.0	8,800	3,671,320	at-grade/PC-Box	32,308	
4 Paspati Br - Gazibu										
5.1 Toll	1	4+970	5+505	535	22.0	11,770	15,000,000	underpass	176,550	
5 Gazibu - Sukaluyu										
5.1 Widening of Arterial Roads	1	5+500	6+200	700	10.0	7,000	1,502,075	at-grade	10,515	
6 Gazibu - Ujungburung										
6.1 Toll	2	5+505	14+100	8,595	22.0	189,090	12,272,652	PC-Box		2,320,636
7 Ujungburung JCT										
7.1 eastside	2			1,379	8.0	11,032	19,053,359	Steel		210,197
7.2 westside	2			1,117	8.0	8,936	19,053,359	Steel		170,261
8 Ujungburung - Cileunyi										
8.1 Elevated Slab 2	2	14+100	19+340	5,240	22.0	115,280	12,272,652	PC-Box		1,414,791
9 Ujungburung - Cileunyi										
8.1 Embanked	2	19+340	20+557	1,217	23.0	27,984	3,073,338	at-grade		86,003
10 Ujungburung - Jl. Soekarno Hatta				3,560						
10.1 Embanked	2	0+000	1+244	1,244	23.0	28,612	941,427	embankment		26,936
10.2 Cisaranten Elevated Slab	2	1+244	1+662	418	22.0	9,196	11,377,407	PC-I		104,627
10.3 Embanked	2	1+662	2+680	1,018	23.0	23,414	941,427	embankment		22,043
10.4 Gedebage Wetan Elevated Slab 1	2	2+680	3+560	880	22.0	19,360	17,799,142	PC-Box		344,591
11 Jl. Soekarno Hatta - Bus Terminal										
11.1 Embanked	1	2+950	3+560	610	23.0	14,030	941,427	embankment	13,208	
12 Bus Terminal - Gedebage										
12.1 Embanked	1	3+560	6+414	2,854	23.0	65,642	941,427	embankment	61,797	
12.2 Gedebage Elevated Slab 2	1	6+414	6+991	577	22.0	12,694	15,946,202	PC-I/PC-Box	202,421	
13 Gedebage JCT									68,947	135,899
14 ON/OFF (total 14 nos)									111,599	148,799
Total									**1,201,970**	**4,984,781**
									6,186,752	

2) Project Cost

The construction costs and the consulting services costs of Phase 1 and Phase 2 are shown in Table 3.4.9 and Table 3.4.10, respectively.

Table 3.4.9 Updated Project Cost (Phase 1)

	Estimated Cost (million IDR)	Remarks
Procurement/Construction	**1,622,661**	
Base Cost	1,201,970	
Price Escalation	300,493	25% of Base Cost
Physical Contingency	120,198	10% of Base Cost
Consulting Services	**190,132**	
Base Cost	181,078	DD (Phase 1*2.6%+Phase 2*1.8%), CS (Phase 1*5.0%)
Price Escalation		
Physical Contingency	9,054	5% of Base Cost
Total	**1,812,793**	

Table 3.4.10 Updated Project Cost (Phase 2)

	Estimated Cost (million IDR)	Remarks
Procurement/Construction	**6,729,456**	
Base Cost	4,984,781	
Price Escalation	1,246,196	25% of Base Cost
Physical Contingency	498,479	10% of Base Cost
Consulting Services	**261,702**	
Base Cost	249,240	CS (Phase 2*5.0%)
Price Escalation		
Physical Contingency	12,462	5% of Base Cost
Total	**6,991,158**	

As a results of the construction cost and the consulting services cost estimate as well as estimate of other cost items such as land acquisition, administration cost, tax, and etc. , the project costs of Phase 1 and Phase 2 are estimated as shown in Table 3.4.10 and Table 3.4.11, respectively. Detail of the project cost estimates is shown in Appendix 17.

The major assumptions used in the project costs estimate are as follows:

- Physical contingency of the construction cost is assumed at 10% of the construction cost in reference to example of TgPA project.
- Price escalation of the construction cost is assumed at 25% of the construction cost in reference to I/P report of the BIUT road project.
- Physical contingency of the consulting services is assumed at 5% of the consulting services cost.
- Interest rate for the interest during construction is assumed at 1.4% in reference to recent interest rate of the Japanese ODA loan.
- Rate for the commitment charge is assumed at 0.1%.
- Cost of land acquisition is applied estimation results showing in Figure 3.7.4.
- Rate for the administration cost is assumed at 5.0%.
- Rate for the tax is assumed at 10.0%.

Table 3.4.11 Project Cost (Phase 1)

	Item	FC		LC		Total		
		Total (000' Yen)	Loan Eligible Portion (000' Yen)	Total (million IDR)	Loan Eligible Portion (000' Yen)	Total (million IDR)	Total (000' Yen)	Loan Eligible Portion (000' Yen)
1	Construction	2,415,768	2,415,768	923,384	8,007,143	1,201,970	10,422,911	10,422,911
2	Procurement							
3	Physical contingency (Const')	241,577	241,577	92,338	800,714	120,197	1,042,291	1,042,291
4	Price escalation (Const')	603,942	603,942	230,846	2,001,786	300,493	2,605,728	2,605,728
5	Consulting services	905,120	905,120	76,699	665,101	181,078	1,570,221	1,570,221
6	Physical contingency (Cosul)	45,256	45,256	3,835	33,255	9,054	78,511	78,511
7	Interest during construction	18,457	18,457			2,128	18,457	18,457
8	Commitment Charge	5,933	5,933			684	5,933	5,933
9	Land Acquisition			456,000		456,000	3,954,214	
10	Administration cost	210,583		66,355		90,640	785,983	
11	Tax (VAT)	421,166		132,710		181,279	1,571,966	
	Total	4,867,802	4,236,053	1,982,168	11,507,998	2,543,523	22,056,215	15,744,051

Table 3.4.12 Project Cost (Phase 2)

	Item	FC		LC		Total		
		Total (000' Yen)	Loan Eligible Portion (000' Yen)	Total (million IDR)	Loan Eligible Portion (000' Yen)	Total (million IDR)	Total (000' Yen)	Loan Eligible Portion (000' Yen)
1	Construction	12,138,278	12,138,278	3,584,995	31,087,368	4,984,781	43,225,646	43,225,646
2	Procurement							
3	Physical contingency (Const')	1,213,828	1,213,828	358,500	3,108,737	498,478	4,322,565	4,322,565
4	Price escalation (Const')	3,034,569	3,034,569	896,249	7,771,842	1,246,195	10,806,411	10,806,411
5	Consulting services	1,343,699	1,343,699	94,285	817,593	249,240	2,161,292	2,161,292
6	Physical contingency (Cosul)	67,185	67,185	4,714	40,880	12,462	108,065	108,065
7	Interest during construction	154,142	154,142			17,776	154,142	154,142
8	Commitment Charge	23,946	23,946			2,761	23,946	23,946
9	Land Acquisition			860,000		860,000	7,457,510	
10	Administration cost	889,878		246,937		349,558	3,031,199	
11	Tax (VAT)	1,779,756		493,874		699,116	6,062,398	
	Total	20,645,281	17,975,647	6,539,554	42,826,419	8,920,368	77,353,172	60,802,066

(5) Review of Operation and Maintenance (O&M) Cost

The O&M cost is generally assumed at 5% per year (routine) and 15% per 5 years (periodic) of toll road revenue in reference to chapter 8.7.3 of the F/S, and the O&M cost is inflated using a rate of 7% after toll road operation.

Table 3.4.13 shows the O&M cost for 10 years during the project operation.

Table 3.4.13 Anticipated O&M Expenditure in Financial Analysis (Toll Revenue Base 5%/Y, 15%/5y)

Billion Rp.

Section	FIRR (%)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total
Phase 1	9.7	4.0	19.7	5.2	6.4	6.8	8.1	33.9	10.1	10.6	12.6	127.2
Phase 2 (Gasibu – Ujung berung – Soekarno Hatta)	6.5	6.6	6.9	33.0	8.6	10.3	10.8	13.0	54.2	16.0	16.4	182.4
Phase 2 (Ujung berung – Cileunyi)	6.6	3.7	3.9	4.6	4.8	23.1	6.0	7.2	7.6	9.1	38.0	114.6
Total		14.3	30.5	42.9	19.8	40.2	25.0	54.1	71.9	35.6	67.0	**401.4**

Table 3.4.14 shows the O&M expenditure estimated by the F/S. In case the inflated rate of 7% is applied on the O&M expenditure, the total O&M cost is almost same between Table 3.4.13 and Table 3.4.14. Therefore, the O&M cost applying 5% per year and 15% per 5 years of the toll road revenue is appropriate.

Table 3.4.14 Estimated O&M Expenditure by F/S

Billion Rp.

Section	Price Escalation (%)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total
Operation	7	4.8	5.1	5.5	5.9	6.3	6.7	7.2	7.7	8.2	8.8	73.3
Maintenance (Asset Routine)	7	15.4	16.5	17.6	18.9	20.2	21.6	23.1	24.7	26.5	28.3	219.8
Maintenance (Asset Periodic)	7	8.6	9.2	9.8	10.5	11.3	12.1	12.9	13.8	14.8	15.8	125.8
Total		28.8	30.8	33.0	35.3	37.8	40.4	43.2	46.2	49.5	52.9	**397.9**

Table 3.4.15 to Table 3.4.17 below show the details of O&M expenditure by the F/S.

Table 3.4.15 Estimated Routine Maintenance Cost by F/S

Items	Cost (Rp million)
Road & Bridge	13,434
Building and Toll Facilities	185
Environment	1,745
Equipment and Traffic Lighting	58
Fuel For Inspection Vehicle	4
Total	15,428

Table 3.4.16 Estimated Periodic Maintenance Cost by F/S

Items	Cost (Rp million)
Sealent Replacement	682
Overlay for Outer/Inner Shoulder	2,869
Overlay for Main road (Thin Layer)	5,115
Total	8,666

Table 3.4.17 Estimated Operational Cost by F/S

Items	Cost (Rp million)	Items	Cost (Rp million)
Salary/ Personal Fee	1998	Cost for Society Nurture & Security	137
Cost for Car Rental	450	Cost for Coordination Meeting of Society Security.	24
Operational Cost / Vehicle Maintenance	148	Security Acts by POLICE/ POLRI(Linking Institution)	192
Cost for Work Safety	53	Cost for Reporting/ Printing of Forms	7
Maintenance of Vehicle Completeness and Officer Tool	64	Cost for Communication System	369
Equipment and Furniture Completeness of Officer Room Service.	18	External Communication System	25
Cost for OM	222	Traffic Information System	(2,700)
Cost for Complaint Service	6	Traffic Signs	1,031
Cost for Information System Service	36	Total	4,795
Documentation Cost	15		

3.4.3 FINANCING PLAN AND EXAMINATION OF PPP OPTIONS

(1) Financing Options and Basic Assumptions

The Indonesian toll road system consists of the following three types or models depending on the project viability: (i) BOT model (100% of construction cost financed by the private sector) for financially viable projects; (ii) PPP model (government-private mixed financing or segment separation scheme consisting of private work portion and government work portion) for marginally viable projects; and (iii) Government Financing model (constructed by 100% government financing and operated by the private sector on lease basis) for unviable projects.

Type	Viability	Responsible Entity		Financial Model
		Construction	Operation	
1	Viable	Private	Private	BOT
2	Marginal	Shared by Government & Private	Private	PPP
3	Unviable	Government	Private	Gov't Financing

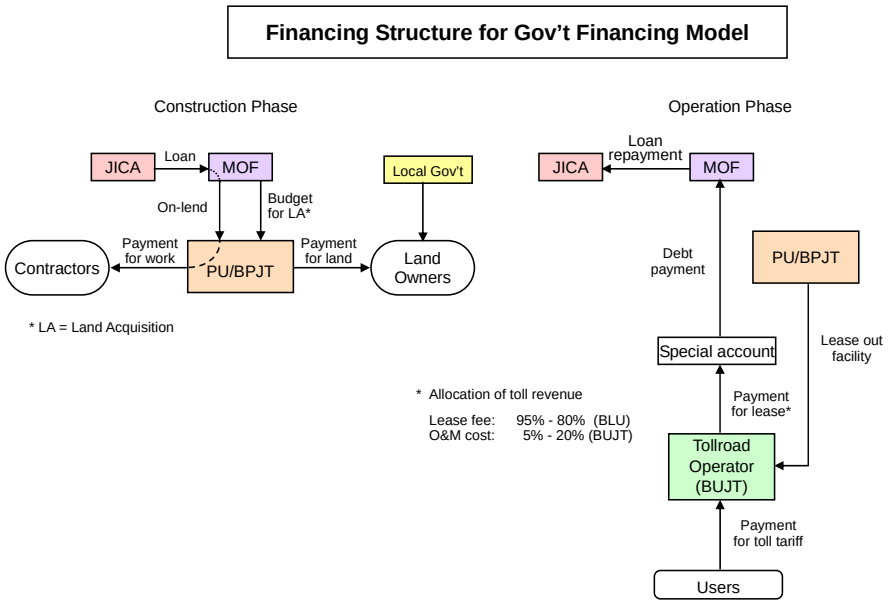
(Source) Bina Manga/BPJT

This 3-type scheme is adopted by Bina Marga/BPJT as its toll road implementation policy which is mentioned clearly in various documents, including BPJT Annual Report 2008 (Investment Scheme, at page 18). Actual toll road projects being implemented as per this policy include: Tanjung Priok toll road for new BLU model; Solo-Kertosono toll road for PPP model; but there are no projects realized yet for BOT model (as of March 2009).

According to the Aide Memoire for the BIUT Road Project, Bina Marga has the intention of implementing the project using a PPP model in that (i) Phase 1 would be financed in a traditional way by the GoI using Japan's ODA loan; (ii) Phase 2 was suggested to explore the possibility of PPP

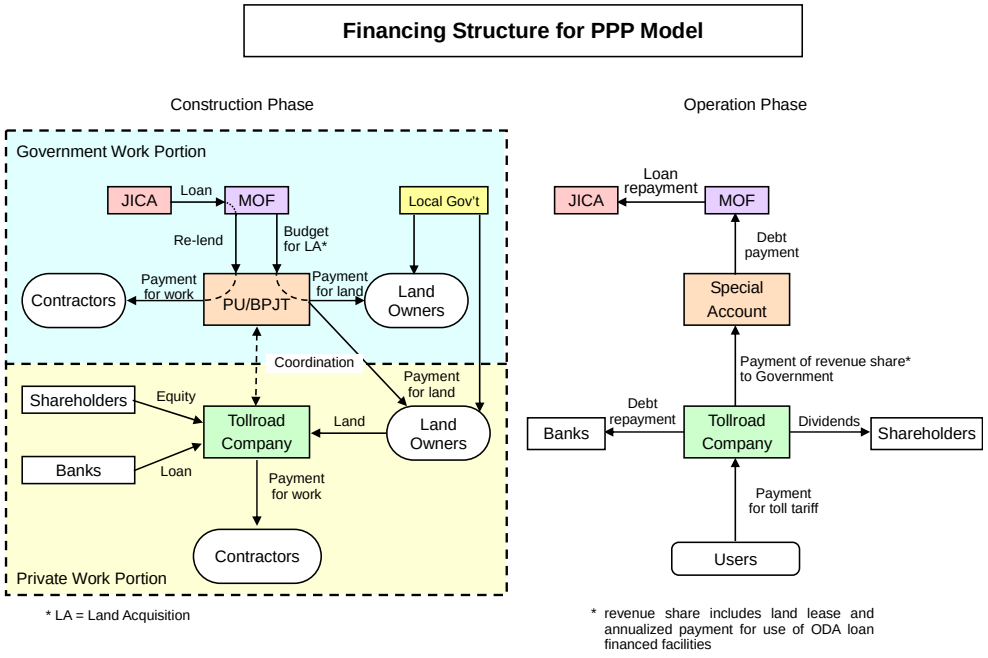
options involving the private sector investment; and (iii) the whole section would be operated and maintained by the private sector.

The financing scheme for Phase 1 is called "New BLU model" as shown below.



In the Government Financing model, the construction cost will be financed by the ODA loan and the government budget. After completion, the road will be managed by a private operator under lease method. The government will lease out the road facility to the private operator and the operator will pay lease to the Special Account to be provided in the PU. The ODA loan and land cost would be repaid by this lease fee. The current BLU (Public Service Body) is working as a land acquisition support. In this model, a new function of managing the lease fees is included. This is why it is called the new BLU.

Regarding the financing scheme for Phase 2, the BOT model is out of the question and the only possible scheme is the PPP model judging from the value of FIRR for Phase 2 which is as low as 5.5% as will be discussed in Chapter 4. The financing scheme for the PPP model is shown below.



The PPP model consists of two components: the private work portion and the government work portion. The construction cost of the private work portion is financed by equity capital and bank loans, and that of the government work portion is financed by the government budget and Japanese Yen loan. The land cost for both work portions is funded by the government. After construction is completed, the whole road will be operated by a private operator under revenue sharing method. In this model, all investment costs will be repaid by the toll revenue shared by the private investor and the government.

The major assumptions used in the financial analysis are as follows:

1) Implementation schedule

Phase	Land Acquisition	Construction Work
1	2011-12	2013-14
2	2012-13	2014-15

2) Capital costs and disbursement schedule

- The project cost is categorized into four components: (i) land acquisition, (ii) construction work, (iii) detailed design, and (iv) supervision & management.
- The base costs (2009/10 price) for (i) land acquisition and (ii) construction are estimated independently.
- The costs for (iii) design are assumed at 2.6% of Phase 1 construction cost and 1.8% of Phase 2 construction cost, and the design for both phases is assumed to be conducted in Phase 1.
- The cost for (iv) supervision and management are assumed at 4% of construction cost.
- The land acquisition cost (i) above is 100% funded by GoI and the remaining costs (ii) to (iv) are funded by either GoI or private sector depending on the financing scheme.
- Disbursement of each cost component are assumed at (i) 50% for the first year and 50% for the second year for land acquisition; (ii) 50% for the third year and 50% for the fourth year for construction cost; (iii) 100% for the first year for design; and (iv) 50% for the third year and 50% for the fourth year for supervision and management.
- The annual investment is spread out in nominal terms using an annual inflation rate of 7[1]%.

3) Operation and Maintenance (O&M) Cost

- The O&M cost is assumed at 5% of the toll revenue for annual routine operating cost and 15% of the toll revenue every 5 years for periodical maintenance cost.

4) Toll revenue estimate

- The future traffic volume estimate is obtained from the results of traffic demand study.
- The total traffic volume is capped at ADT 77,000 which is the capacity of 4-lane divided road.
- The vehicles are categorized into five types (I, II, III, IV and V).
- The toll rates for Types II, III, IV and V are assumed at 150%, 200%, 250% and 300% of that for Type I, respectively.
- The toll rate is assumed to be adjusted every two years using the inflation rate (assumed at

[1] The inflation rate (CPI base) looks like stabilized at 7-8% level in 2009 and onward after high rates of 14% for 2008. We use an inflation rate of 7% in our financial analysis.

7%).

- The flat tariff system is used for the Phase 1 & 2 segments after Phase 2 is completed.

5) Funding for government work

- Equity (GOI budget) covers land acquisition cost, VAT and interest during construction (IDC)
- Japan's ODA loan covers design, construction and supervision & management
- Loan interest rate: 1.4% (ordinary loans)
- Loan tenure: grace period of 10 years and loan repayment period of 20 years
- Repayment structure: even annuity basis

6) Funding for private work portion

- Equity: 30% of project cost
- Debt: 70% of project cost
- Loan interest rate: 13% during construction and 12% during operation
- Loan tenure: grace period of 3 years and loan repayment period of 10 years
- Repayment structure: even annuity basis

7) Depreciation

- Depreciation method: linear
- Annual depreciation coefficient: 0.33 (30 years) for main construction work and 0.10 (10 years) for design, supervision and IDC.

8) Taxation

- VAT: 10%
- Corporation tax rate: 30%
- Tax exemption period: none (taxed after first profit year)

9) Financial indicators

- Internal rate of return (IRR) is used to measure financial feasibility. Two types of IRR are used: Project IRR (or FIRR) and Equity IRR.
- The project is considered to be profitable in case (i) the Project IRR or FIRR is higher than the cost of capital; and (ii) the Equity IRR is higher than the return on equity requested by shareholders.
- Debt Service Cover Ratio (DSCR) is used to evaluate the capability of loan repayment from commercial banks for the private work portion. DSCR is defined as the cash available for debt service (toll revenue minus O&M costs) divided by the debt service at a certain year. The DSCR needs to be 1.0 or more during the loan repayment period.

(2) Funding Plan for Traditional Option

The traditional option is the base case of Phases 1 and 2 being funded by the government (GoI) using Japan's ODA loan. The funding plan for each phase is summarized in the tables below.

Table 3.4.18 Funding Plan for Phase 1

Unit : Rp billion

Item	2011	2012	2013	2014	2015	Total
Uses						
1. Land aqusition	244.0	261.0				505.0
2. Main construction work			736.3	787.8		1,524.0
3. Design	93.9					93.9
4. Supervision and management			36.8	39.4		76.2
5. VAT (10%)	33.8	26.1	77.3	82.7		219.9
6. Interest during construction (IDC)		1.3	1.3	12.1		14.8
Total	371.7	288.5	851.7	922.0		2,433.9
Sources						
Equity (Gov't budget)	277.7	288.5	78.6	94.9		739.7
ODA loan	93.9	0.0	773.1	827.2		1,694.2
Total	371.7	288.5	851.7	922.0		2,433.9
Budget-loan ratio						
Gov't budget	30.4%	(land acquisition, VAT and IDC)				
ODA loan	69.6%	(design, construction, supervision)				

Source: JICA Survey Team

Table 3.4.19 Funding Plan for Phase 2

Unit : Rp billion

Item	2011	2012	2013	2014	2015	Total
Uses						
1. Land aqusition		373.2	399.4			772.6
2. Main construction work				2,058.6	2,202.7	4,261.3
3. Design		0.0				0.0
4. Supervision and management				102.9	110.1	213.1
5. VAT (10%)		37.3	39.9	216.2	231.3	524.7
6. Interest during construction (IDC)			0.0	30.3	62.6	92.9
Total		410.6	439.3	2,408.0	2,606.8	5,864.6
Sources						
Equity (Gov't budget)		410.6	439.3	246.4	293.9	1,390.2
ODA loan		0.0	0.0	2,161.5	2,312.8	4,474.4
Total		410.6	439.3	2,408.0	2,606.8	5,864.6
Budget-loan ratio						
Gov't budget	23.7%	(land acquisition, VAT and IDC)				
ODA loan	76.3%	(design, construction, supervision)				

Source: JICA Survey Team

Phase 1 requires a capital investment of Rp 2434 Billion, of which Rp 1694 billion will come from Japan's ODA and Rp 740 billion from the GoI. It must be noted that Japan's ODA loan amount is almost equal to the US$150 million mentioned in the Blue Book.

Phase 2 requires a capital investment of Rp 5865 Billion, of which Rp 4475 Billion come from Japan's ODA and Rp 1390 Billion from the GoI.

The results of financial analysis for the traditional option (base case) are summarized below.

Table 3.4.20 Summary of Financial Analysis for Base Case

Cost sharing	
GoI	100%
Private sector	None

Project cost (B.Rp)	**Phase 1**	**Phase 2**
2,433.9	2,433.9	5,864.6

Fund source (B.Rp)	**Phase 1**	**Phase 2**
Private	None	None
ODA loan	1,694.2	4,474.4
GoI	739.7	1,390.2
Total	2,433.9	5,864.6

Revenue share	
Private sector	None
Government	100%

Acceptable tariff	
Flat tariff for Type I	Rp. 5,500

Financial indicators

Indicator	Private Work Portion	Gov't Work Portion
Project IRR (before tax)	-	6.8%
Project IRR (after tax)	-	5.9%
Equity IRR (after tax)	-	491.5%
DSCR (Average)	-	3.33
DSCR (Minimun)	-	1.59

Source: JICA Survey Team

Using the initial flat tariff for Type I vehicle of Rp 5500 which is obtained as the optimum tariff as the result of the traffic analysis, the DSCR is 1.59 or more, so that Japan's ODA loan will be able to be repaid easily with a large margin.

The cash flow projection for the base case scenario is shown below.

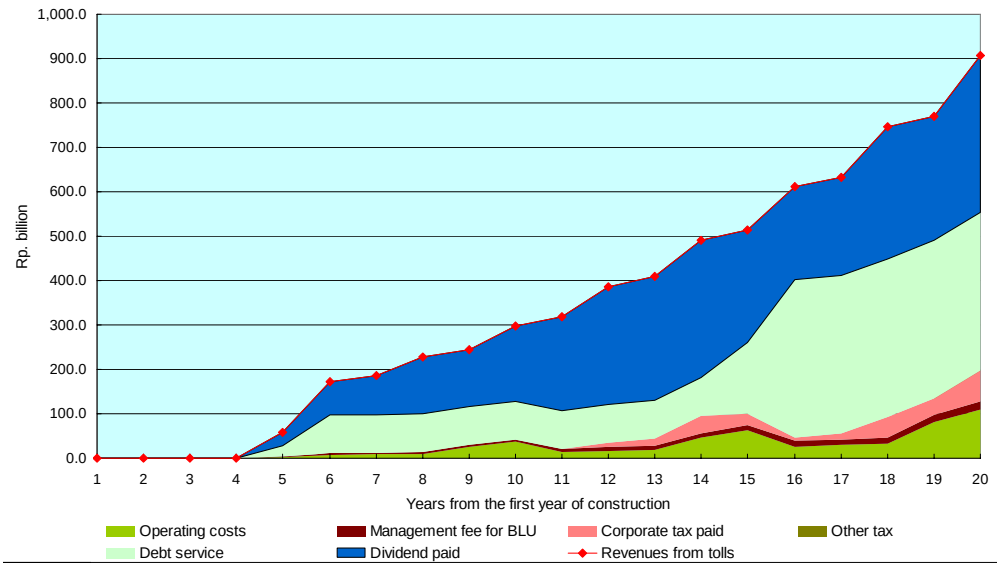


Figure 3.4.12 Cash-Flows Cascade in the Opening Period for Base Case Scenario

(3) Examination of PPP Options

1) Methodology of Examination

The possibility of the PPP scheme is examined in this section and the appropriate options available. The PPP options assumed are that Phase 1 has to be funded by GoI and Phase 2 to be shared by GoI and the private sector. The maximum possible percent share of construction cost by the private sector is calculated to make it able to repay the loan under the socially acceptable flat tariff rate of Rp 5500 for Type I. Then, the result is compared to benchmark share of private sector which is 50% or more.

2) Results of Examination

The results of examination for PPP options are summarized below.

Case 1 (19.5% contribution by Private)

Const. cost sharing	Phase 1	Phase 2
GoI	100%	**80.5%**
Private sector	0%	**19.5%**

	Phase 1	Phase 2
Project cost (B.Rp)	2,433.9	5,890.3

Fund source (B.Rp)	Phase 1	Phase 2
Private	0.0	1,003.6
ODA loan	1,694.2	3,601.9
GoI	739.7	1,284.8
Total	2,433.9	5,890.3

Revenue share	
Private sector	Tariff revenue minus ODA debt service
Government	ODA debt service

Acceptable tariff	
Flat tariff for Type I	Rp. 5,500

Financial indicators		
Indicator	Private Work Portion	Gov't Work Portion
Project IRR (before tax)	20.8%	2.8%
Project IRR (after tax)	19.0%	2.8%
Equity IRR (after tax)	24.1%	5.0%
DSCR (Average)	1.70	1.88
DSCR (Minimun)	1.00	1.00

Case 2 (25% contribution by Private)

Const. cost sharing	Phase 1	Phase 2
GoI	100%	75%
Private sector	0%	25%

	Phase 1	Phase 2
Project cost (B.Rp)	2,433.9	5,897.6

Fund source (B.Rp)	Phase 1	Phase 2
Private	0.0	1,286.7
ODA loan	1,694.2	3,355.8
GoI	739.7	1,255.1
Total	2,433.9	5,897.6

Revenue share	
Private sector	Tariff revenue minus ODA debt service
Government	ODA debt service

Breakeven tariff	
Flat tariff for Type I	**Rp. 6,220**

Financial indicators		
Indicator	Private Work Portion	Gov't Work Portion
Project IRR (before tax)	20.1%	3.3%
Project IRR (after tax)	18.4%	3.3%
Equity IRR (after tax)	23.2%	5.7%
DSCR (Average)	1.63	2.06
DSCR (Minimun)	1.00	1.00

(Source) JICA Survey Team

The table indicates that the maximum allowable private sector contribution is only about 20%. Increasing the contribution to 25% requires a breakeven tariff of Rp 6220 which is not socially acceptable.

3) Conclusion and Recommendation

In the toll road sector in Indonesia, the PPP scheme usually calls for the private sector contribution of 50% or more. However, the JICA Survey Team examination indicates that only 20% contribution from the private sector makes it viable for both GoI and the private under the maximum allowable tariff level (Rp 5500). Considering high transaction and coordination costs required for PPP deals, such low private sector cost sharing is not worthwhile doing. Therefore, pursuing PPP option does not make sense and should not be taken into further consideration.

In conclusion, the GoI funding using ODA loan is recommended to be pursued for Phase 1 as well as for Phase 2.

3.4.4 PROCUREMENT METHOD

(1) Construction Work

The procurement of contractors shall be on the basis of International Competitive Bidding (ICB), in accordance with guidelines of Japanese ODA Loans. Major work quantities of the project are as listed in Table 3.4.21.

1) Phase 1

It is recommended that the Project be implemented with the following two contract packages in Phase 1.

Package 1:Civil works package from Pasupati Access – Gasibu Underpass (L=5.5km)

Package 2:Civil works package from Soekarno Hatta – Gedebage IC (L=3.1km)

2) Phase 2

It is recommended that the Project be implemented with the following three contract packages in the Phase 2.

Package 1:Civil works package from Gasibu – Ujung Berung IC (L=8.8km)

Package 2:Civil works package from Ujung Berung IC – Soekarno Hatta (L=3.6km)

Package 3:Civil works package from Ujung Berung IC – Cileunyi (L=6.3km)

(2) Consulting Services

1) Phase 1

The selection and employment of the consultant for the consulting services in Phase 1 shall be conducted using the short-list method in accordance with guidelines of Japanese ODA Loans for the Employment of Consultants.

2) Phase 2

The selection and employment of the consultant for the consulting services in Phase 2 shall be conducted also using the short-list method, in accordance with appropriate guidelines for employment of Consultants.

Table 3.4.21 Major Work Quantities

WORK ITEMS	DESCRIPTION	UNITS	TOTAL
SITE CLEARING	Site Clearing	m2	787,344
DEMOLITION	Stone Masonry & Concrete Demolition	m3	700
	Curb Demolition	m	27,520
	Asphalt & Concrete Pavement Demolition	m2	42,233
	Traffic Sign demolition	nos	28
	Guardrail Demolition	m	0
EARTH WORK	Common Excavation for Embankment	m3	31,369
	Excavation for Dump	m3	150,729
	Borrow Material	m3	715,005
	Borrow Material for Median Filler	m3	16,552
	Granular Backfill	m3	38,904
DRAINAGE	Structure Excav for depth less than 2m	m3	98,223
	Structure Excav for depth in between 2m-4m	m3	54,600
	Structure Excav for depth More than 4m	m3	22,556
STRUCTURE EXCAVATION	Plain Concrete Pipe Culvert, dia. 40 cm	m	17,589
	Reinforcement Concrete Pipe Culvert, dia. 60 cm, Type A	m	1,044
	Reinforcement Concrete Pipe Culvert, dia.100 cm, Type A	m	672
	Reinforcement Concrete Pipe Culvert,, 2 dia. 100 cm, Type C	m	75
	Ditch, Type DS - 3A	m	2,258
	Concrete Ditch with Cover, Type DC - 1	nos	7
	Inlet Drain, Type DI-3	nos	92
	Outlet Drain, Type DO-3	nos	78
	Mortared Rubble, Type DS-5	m	20,420
	Drainage Pipe , dia. 15 cm, Connection Accessories and Support	m	1,029
	Drainage Pipe , dia. 20 cm, Connection Accessories and Support	m	21,000
	Deck Drain and Accessories, Type 1	nos	8,635
SUB GRADE	Sub grade Preparation	m2	318,391
AGGREGATE SUB BASE	Aggregate Sub base Class A	m3	40,562
	Aggregate Sub base Class B	m3	27,427
PAVEMENT	Prime Coat	kg	290,100
	Tack Coat	kg	233,755
	Asphalt Treated Base Course	ton	34,192
	Asphalt Concrete Binder Course	ton	19,325
	Asphalt Concrete Wearing Course	ton	56,989
	Asphalt Cement	ton	6,910
	Concrete Pavement (t = 27 cm)	m2	149,901
	Lean Concrete (t = 10 cm)	m2	153,626
CONCRETE STRUCTURE	Concrete Class A-1	m3	181,279
	Concrete Class B-1	m3	284,359
	Concrete Class B-2	m3	104,920
	Concrete Class C-1	m3	42,930
	Concrete Class C-2	m3	716
	Concrete Class E	m3	6,205
	Steel Strand	m3	23,799,082
	Deformed Rebar	kg	75,846,479
	Anchor bar	nos	246
	Live Anchor	nos	4,806
	Dead Anchor	nos	4,806
	Duct (Sheath)	m	765,080
	Pre stress Cable Installation	m	798,830
	Stressing	point	5,017
	Grouting	m	798,830
	Furnished & Installed PCI Girder 40.0m Span	nos	3,810
	Concrete Pre cast Plate	m2	167,640
	Furnished Pretension Round Concrete Pile,Dia 50cm	m	20,850
	Driven Pretension Round Concrete Pile,Dia 50 cm	m	20,850
	Furnished Pretension Round Concrete Pile,Dia 60cm	m	211,987
	Driven Pretension Round Concrete Pile,Dia 60 cm	m	211,987
	Furnished & Driven Pretension Round Concrete Pile, Pile Test Dia	m	101
	Bored pile, Cast in Place,Dia 100cm	m	30,000
	Bored pile, Cast in Place,Dia 120cm	m	42,084
	Static Loading Test,2 times Nominal design load	nos	15
	Expansion Joint, type A	m	15,001
	Modular Expansion Joint 3 Seals	m	12,167
	Metal Bearing Shoe (Pot Bearing 2500KN), type Move	nos	1,329
	Metal Bearing Shoe (Pot Bearing 2500KN), type Fixed	nos	257
	Bearing Pad with its accessories (400 x 400 x 40 mm)	nos	7,740
STRUCTURAL STEEL WOR	Procurement of Steel Bridge materials.	ton	10,545
	Bridge Steel materials Fabrication	ton	10,545
	Bridge Steel materials Installation	ton	10,545
MISCELLANEOUS	Solid Sodding	m2	167,565
	Stone Masonry for Retaining Wall	m3	1,200
	Guardrail, tipe A	m	8,666
	End Section Guardrail	nos	26
	Railing fence	m	30,528
	Road Marking Type 1	m2	48,886
	Guide Post, Tipe A	nos	863
	Guide Post, Tipe B	nos	1,516
	Kilometer Post	nos	118
	Concrete Barrier, tipe-A	m	2,112
	Concrete Barrier, tipe-D	m	50,608

3.5 IMPLEMENTATION STRUCTURE AND PROGRAM

3.5.1 EXECUTING AGENCY

The executing agency is the Directorate General of Highways (Bina Marga), one of the four Directorates General of Spatial Planning, Water Resources, Human Settlements, and Highways under the Ministry of Public Works. Their duties and functions are quoted from their publication, "National Road Network in Indonesia 2007", as follows:

(1) Main Duties and Functions of Bina Marga

Bina Marga is responsible for implementing the main duties of the Ministry of Public Works in the standardization of road techniques and policy implementation. To perform the tasks, Bina Marga holds the following functions:

- Formulating technical road regulation in accordance with the law;
- Organizing programs, budgets, and evaluating implementation of road policies;
- Accomplishing national road technical policy including national roads, freeways, and some urban roads;
- Administering road technical operation in the province/regency/city;
- Developing a budgeting system and investment model;
- Formulating norms, standards, and guidance and road manuals; and
- Accomplishing the administrative work of the Directorate General.

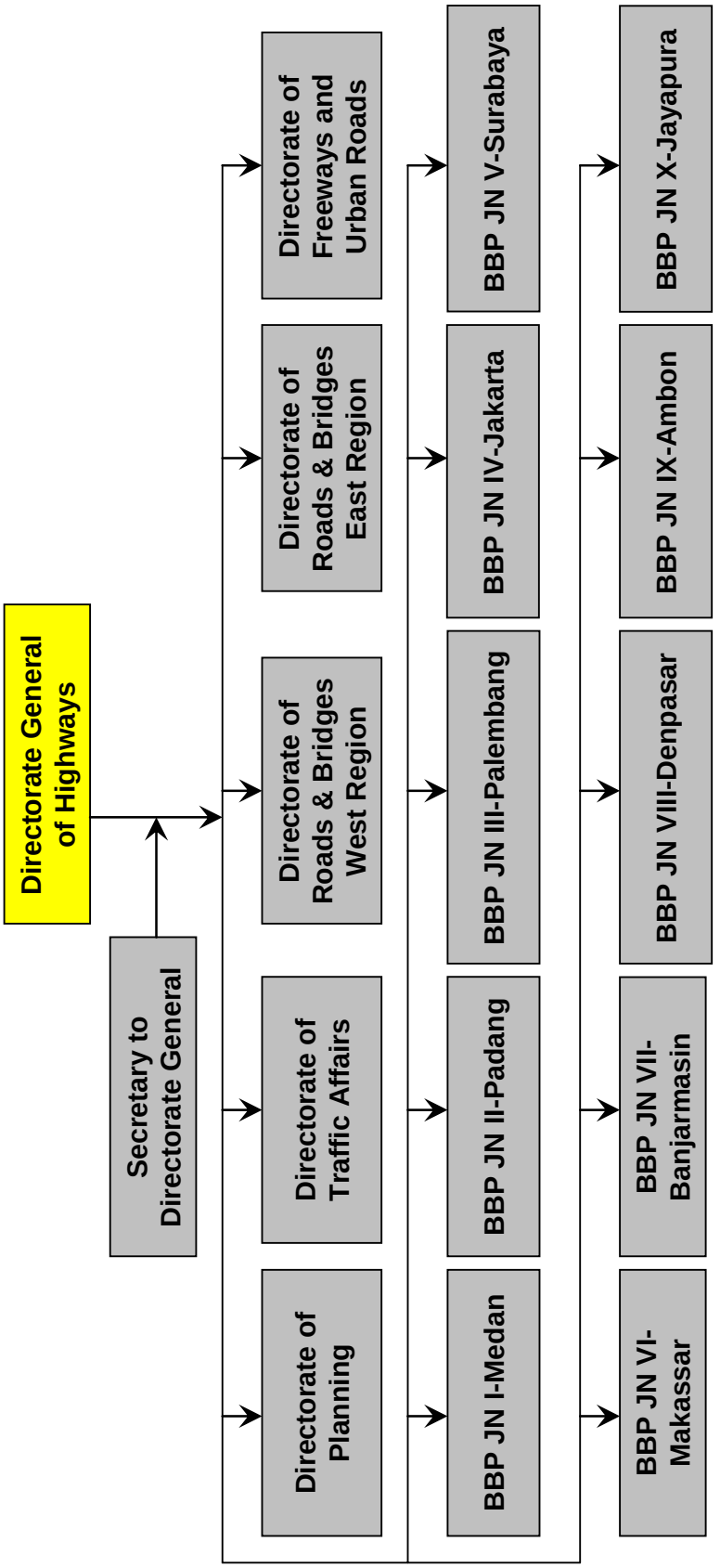
(2) Organization of Bina Marga

For purposes of national road development, which consists of roads and bridges planning, implementation, and technical supervision, Bina Marga formed BBPJN (National Roads Implementation Center) and BPJN (National Roads Implementation Center at the lower level), as shown in Figure 3.5.1. BBPJN and BPJN are technical implementation units that report to Bina Marga and are technically under the guidance of the related Directors. BBPJN is led by officials of echelon II-b, while BPJN is led by officials of echelon III-a.

The tasks of BBPJN and BPJN are to conduct planning and technical supervision, construction implementation, operational control and maintenance, quality control and materials management, and equipment provision and administration of Balai.

In performing the above tasks, BBPJN and BPJN carry out several activities as follows:

a. Preparation of data and information needed for the materials to formulate the national road network program along with planning, implementation, and technical supervision of roads and bridges;
b. Construction implementation, operation control, and maintenance of roads and bridges;
c. Implementation of a quality management system in road and bridge construction;
d. Provision, utilization, storage, and maintenance of materials along with equipment of roads and bridges, and construction quality evaluation; and
e. Administration of personnel, organization and work procedure, finance, goods, state properties/assets and domestic affairs, and coordination with related institutions.



Source: National Road Network in Indonesia 2007, Bina Marga

Figure 3.5.1 Organization Structure of Bina Marga

The functional and administrative classifications of roads in Indonesia, with development and maintenance responsibilities, are shown in Table 3.5.1. The relationship between the classes of roads by function and by administrative responsibility is very definite and clear that the classification system of roads in Indonesia is well-organized and advanced.

Bina Marga is responsible for the development and maintenance of national roads having a total length of 34,928 km, which is about 8.9% of all roads in Indonesia. The national roads under Bina Marga are either arterial in the urban or rural areas, or collector class 1 in the urban area, both of which are primary.

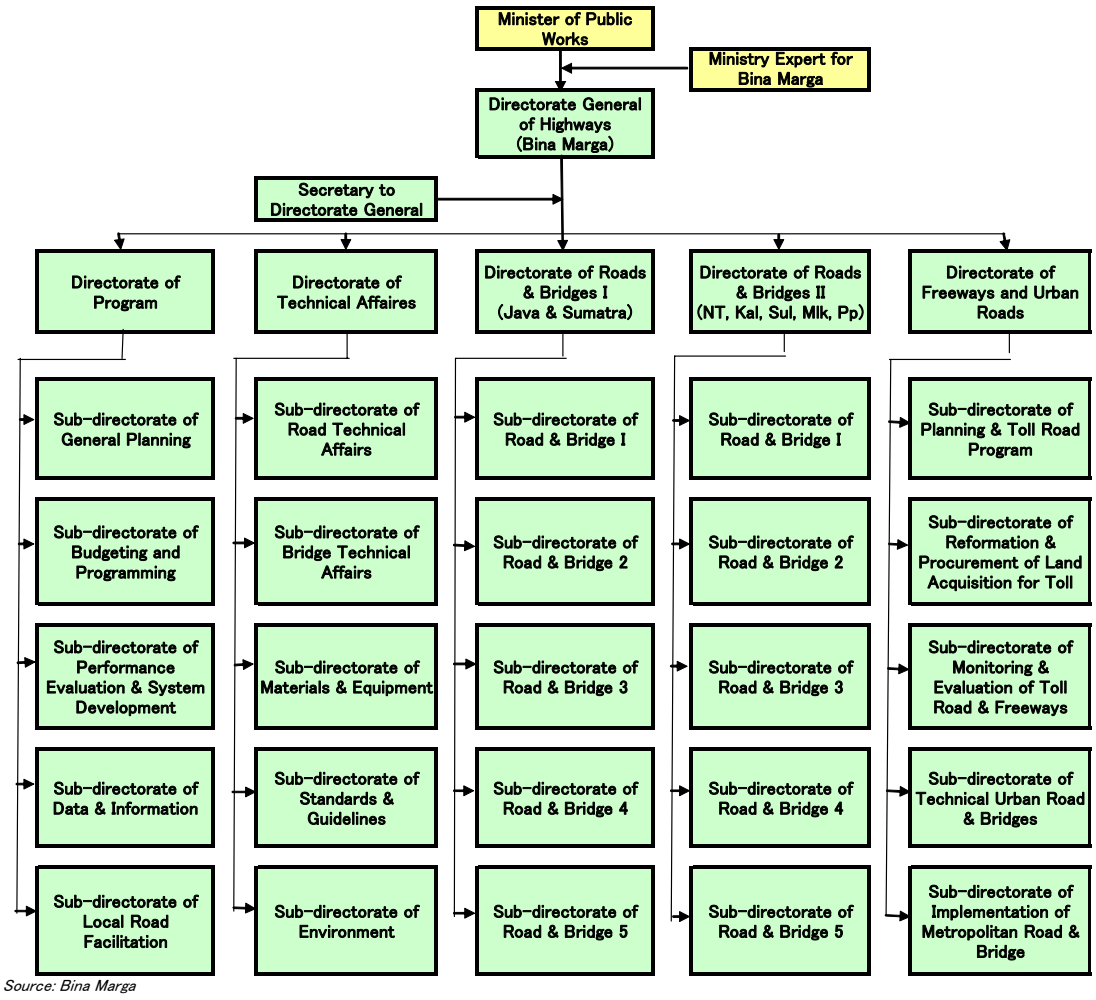
Table 3.5.1 Functional and Administrative Classifications of Roads in Indonesia

<table>
<tr><th colspan="3">Functional Classification</th><th>Administrative Classification</th><th>Administrative Responsibility</th><th>Total Length (km) as of 2006</th></tr>
<tr><td rowspan="5">Primary</td><td colspan="2">Arterial</td><td rowspan="2">National Road</td><td rowspan="2">Bina Marga</td><td rowspan="2">34,628</td></tr>
<tr><td rowspan="3">Collector</td><td>Class 1</td></tr>
<tr><td>Class 2</td><td rowspan="2">Provincial Road</td><td rowspan="2">Province</td><td rowspan="2">40,125</td></tr>
<tr><td>Class 3</td></tr>
<tr><td>Class 4</td><td rowspan="2">Kabupaten Road</td><td rowspan="2">Kabupaten</td><td rowspan="3">319,041</td></tr>
<tr><td colspan="2">Local</td></tr>
<tr><td rowspan="2">Secondary</td><td colspan="2">Arterial/Collector/Local</td><td>Kota Road</td><td>Kota</td></tr>
<tr><td colspan="2">Local</td><td>Village Road</td><td>Kota/Kabupaten</td></tr>
<tr><td colspan="5">Total</td><td>393,794</td></tr>
</table>

Source: Sector Study for Road Sector in Indonesia Final Report, March 2004, JBIC, and Statistical Year Book of Indonesia 2008

The organization of Bina Marga headquarters has five directorates under the Director General, as shown in Figure 3.5.2 namely, Program, Technical Affairs, Road and Bridge I, Road and Bridge II, and Toll Road and Urban Road. Each directorate has five sub-directorates, respectively, the total number being 25.

The sub-directorates closely concerned with a toll road project like the Bandung Intra Urban Toll Road Project are the Sub-directorate of Planning and Toll Road Program under the Directorate of Toll Road and Urban Road, Sub-directorate of General Planning under the Directorate of Program, and Sub-directorates of Environment under the Directorate of Technical Affairs.



Source: Bina Marga

Figure 3.5.2 Organization Chart of Bina Marga Headquarters

3.5.2 IMPLEMENTATION STRUCTURE

The BIUT Road Project will be implemented in two phases: Phase 1 to be funded by a Japanese ODA loan, and Phase 2 for the remaining portions starting possibly at some future time. For Phase 1, Bina Marga, as the employer, will procure a consultant to implement the detailed design, tender assistance, and construction supervision. The contractors procured through ICB process will undertake the construction, and the completed toll road will be opened to traffic under an O&M concession contract to be entrusted by Bina Marga. For Phase 2, another consultant will be employed for the same purpose, and the same process will be followed, unless a different kind of funding scheme such as PPP is adopted. The implementation structure in this case is as shown in Figure 3.5.3.

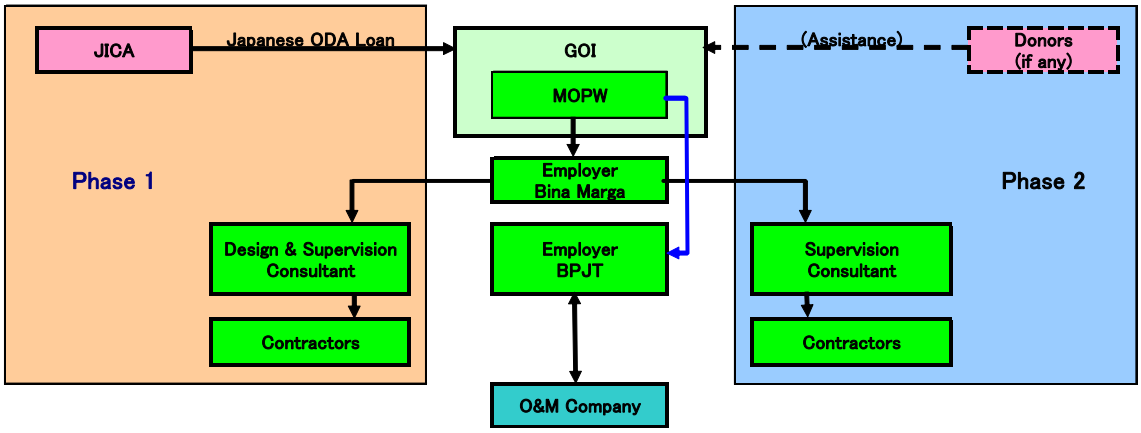


Figure 3.5.3 Implementation Structure under Conventional Scheme

However, as the funding scheme for Phase 2 is uncertain as yet, its implementation structure can not be clearly described. If PPP is adopted for Phase 2 implementation, a typical implementation structure would be as shown in Figure 3.5.4.

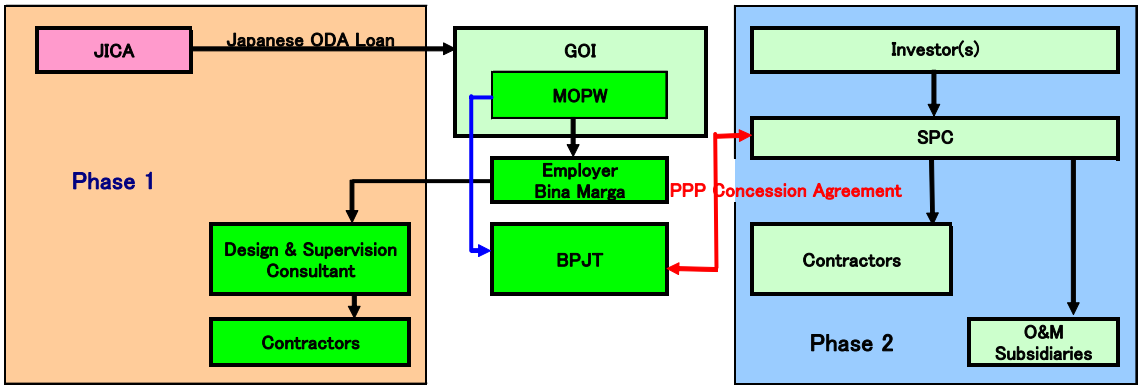


Figure 3.5.4 Typical Implementation Structure in case of PPP

3.5.3 IMPLEMENTATION PROGRAM

Phase 1 of the project is to be adopted as a Japanese ODA loan for Fiscal Year 2009. After the appraisal of JICA in October 2009, the loan agreement will be signed between JICA and GOI in March 2010. The proposed implementation schedule for Phase 1 is shown in Figure 3.5.5.

A consulting firm in charge of the detailed design, tender assistance, and construction supervision for the Phase 1 portion will be selected by Bina Marga by December 2010. Tentatively, the detailed design for Phase 2 is supposed to be undertaken also together with Phase 1 by the same consultant. The total time for the detailed design is anticipated to last for 12 months, starting from January 2011, while that for tender assistance for the procurement of contractors is also assumed to last for another 12 months ending in December 2012.

Bina Marga together with the Bandung City Government must initiate the work for land acquisition and resettlement of affected people/households/properties around the middle of the progress of the detailed design of the road facilities, or in October 2011, and complete its work one year and half later, or by the end of 2012.

The process for the procurement of contractors will start in parallel with the detailed design of the final stage, or around October 2011. As in all Japanese ODA loans, the procurement will be implemented on an ICB basis and comprises prequalification and JICA concurrence within a four-month period; bidding, three months; bid evaluation and JICA concurrence, two months and a

half; contract negotiation and JICA concurrence, three months; and opening of the letter of credit and issuance of the letter of commitment, one month. All of these activities will total approximately 15 months, or up to the end of 2012.

Based on these schedules, the construction works for Phase 1 will start in January 2013 and will be completed in three years, or by December 2014.

As for Phase 2 of the project, because the funding scheme and consequently, the implementation process have not been finalized as yet, it is difficult to assess the implementation program with certainty at this stage. However, if it is assumed that Phase 2 is also implemented as one of the public works with some international assistance including another Japanese ODA loan similar to Phase 1, procurement of a supervising consultant will be completed sometime during 2011. Land acquisition and resettlement of affected persons for Phase 2 can possibly start at the same time as for Phase 1, but are anticipated to require at least double the period for Phase 1, resulting in the completion of land acquisition and resettlement by the middle of 2014. If the construction period for Phase 2 is assumed to be three years, similar to Phase 1, completion of the construction will be in the middle of 2017, or one and a half years after Phase 1. The assumed implementation schedule for Phase 2 is also presented in Figure 3.6.3.

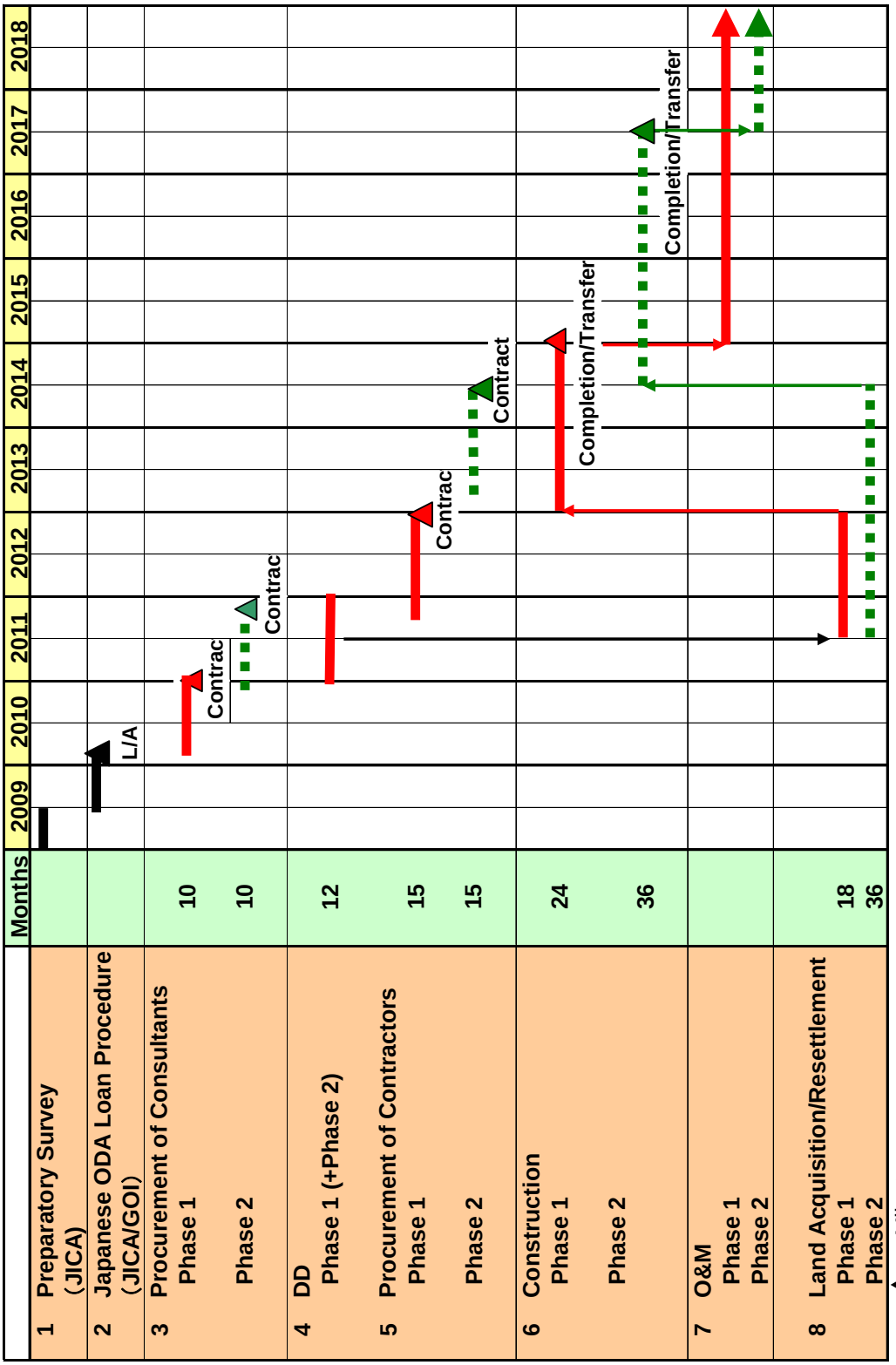


Figure 3.5.5 Proposed Implementation Schedule

3.6 OPERATION AND MAINTENANCE STRUCTURES

3.6.1 TOLL COLLECTION PLAN

The toll collection system for the BIUT Road Project is planned as follows:

1) Toll Type

Flat Toll ——— Uniform tolls by vehicle class per entry, regardless of the traveled distance on the toll road.

2) Toll Collection Method

Entry Collection ——— Tolls are collected at the toll gate entrance, mostly at on-ramps or some at main-line barrier-type toll gates.

3) Extent of Toll Charging

Closed Toll System ——— Tolls are charged to all users. The toll road is physically designed so that no users may escape from paying the toll.

4) Toll Gate Allocation

f. For the finally completed network, eleven toll gates will be constructed as shown in Figure 3.6.1 consisting of eight on-ramp toll gates at:

Djund Junan (eastbound), **Sukaluyu** (eastbound), **Cicaheum**(westbound), **Cibiru** (westbound), **Tamansari** (westbound), **Soekarno Hatta** (northbound), and **Gedebage I and II** (north- and south-bound), and

three barrier-type toll gates at:

Existing **Pasteur TB** (eastbound for the Project road, separated from the exiting traffic from the Jakarta-Bandung Toll Road), **Gedebage IC TB** (northbound for the Project road), and **Cileunyi TB** (westbound only).

g. For the transitional network after Phase 1 is completed, two toll gates will be constructed as shown in Figure 3.6.2 at:

Existing **Pasteur TB** (east- and west-bound, separated from the entering/exiting traffic of Jakarta-Bandung Toll Road), and **Gedebage IC TB** (north- and south-bound).

5) Tolled Vehicle Classification and Toll Rates

The toll rates for each tolled vehicle class will be determined, primarily based on the domestic regulations and also on the business policy of the O&M concessionaire which will be selected by GoI if the O&M is implemented on a concession basis.

6) Notes

The local traffic using the Pasupati Bridge between the immediate upstream on-ramp and downstream off-ramp must be separated physically from the tolled traffic over the bridge. Also, a toll gate for the westbound traffic entering the project toll road at the Tamansari on-ramp must be provided, separated from the local traffic using the Pasupati Bridge.

Based on the Government Regulation No. 15 of 2006 concerning Toll Roads which specifies the minimum spacing between ramps on a toll road to be 2 km, the existing eastbound Pasir Kaliki on-ramp is planned to be closed.

The on- and off-ramps at Djund Junan should not be built in Phase 1 even though the main line of this section of the Project road is constructed, because from the aspect of toll collection these ramps should not be opened to traffic before the completion of the whole network of the project road. For the same reason, the northbound on-ramp and southbound off-ramp at Gedebage should not be built in Phase 1 either.

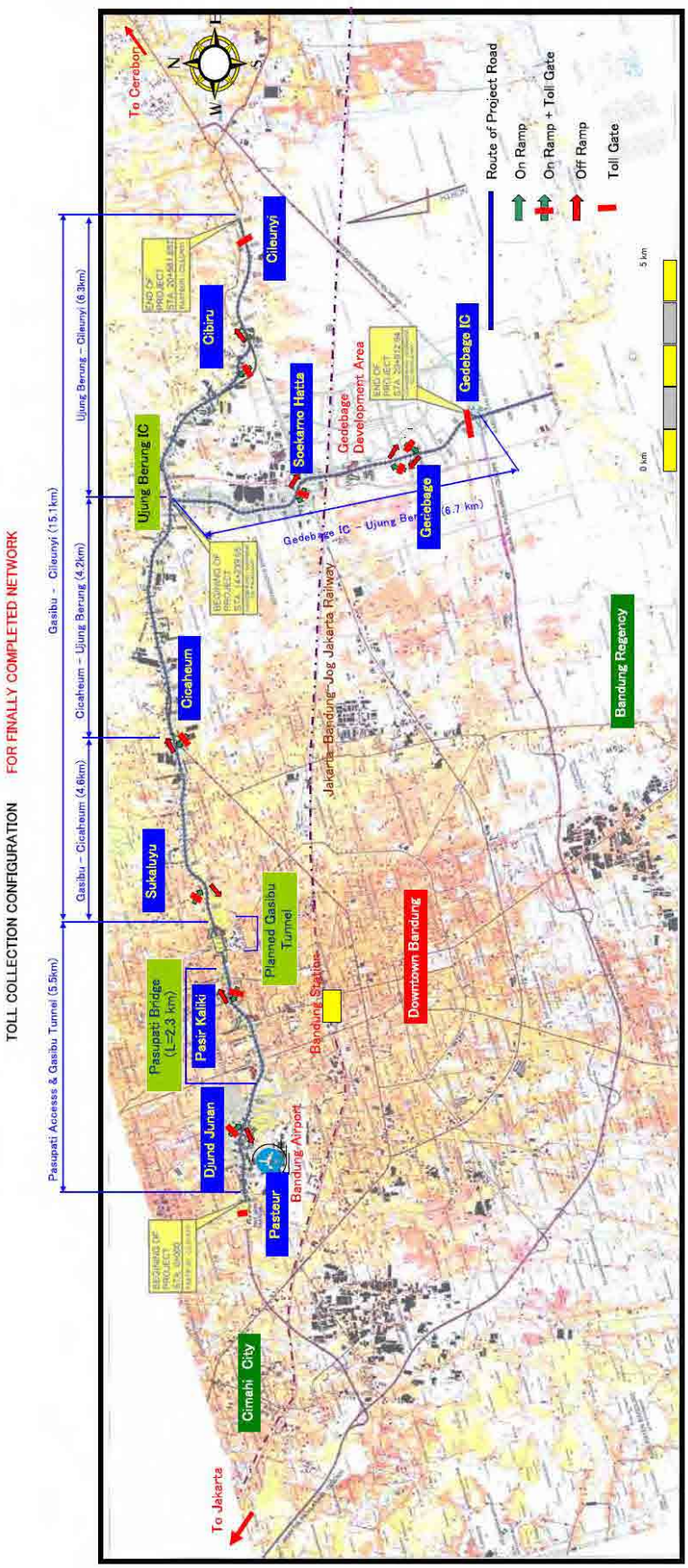


Figure 3.6.1 Toll Gate Allocation for Finally Completed Network

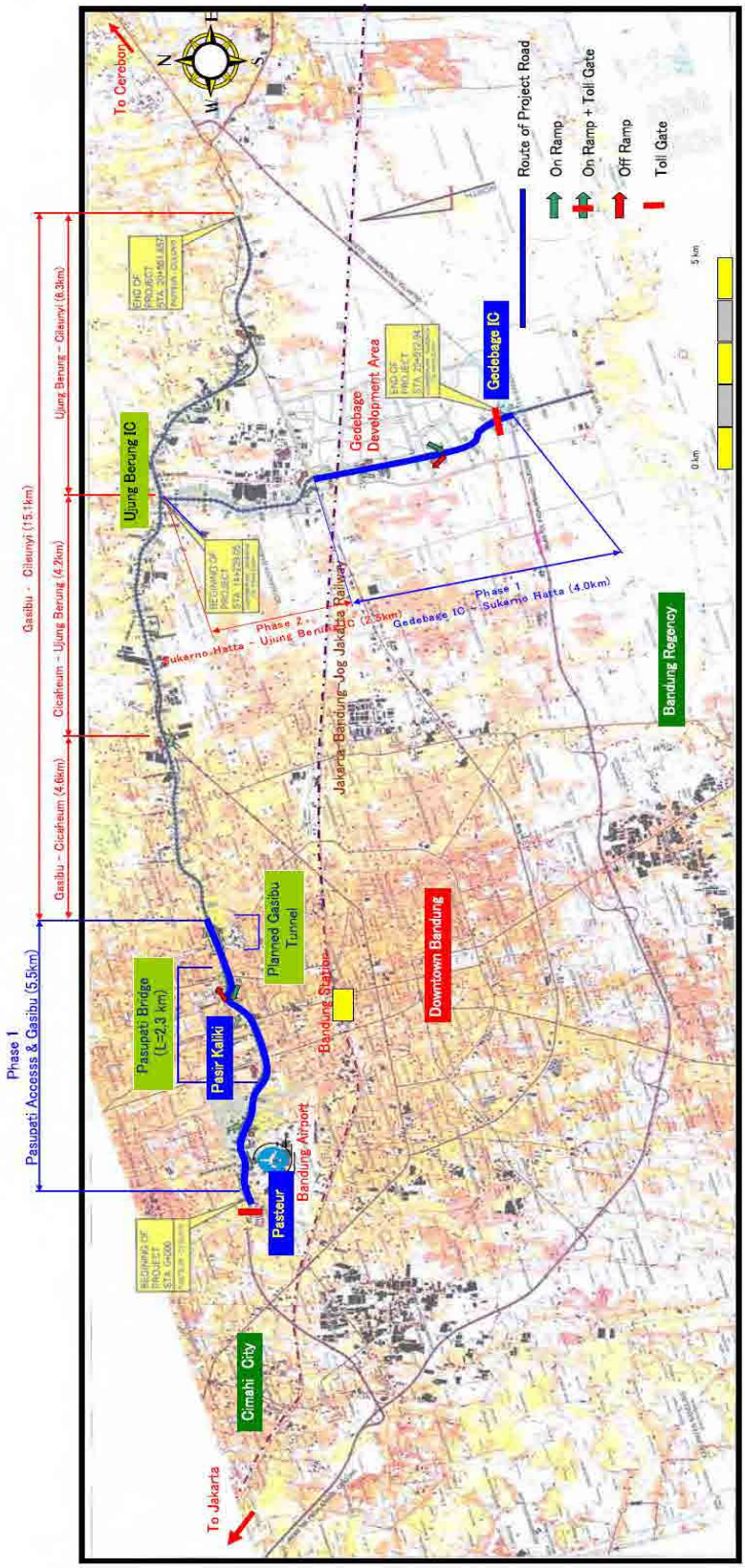


Figure 3.6.2 Toll Gate Allocation for Transitional Network after Phase 1 is Completed

3.6.2 INSTITUTIONAL STRUCTURE AND CAPACITY FOR O&M

The BIUT Road formulates intra urban toll road for the Bandung Metropolitan Area with approximately 27km road length, and the BIUT connects the inter-city toll road of Padalarang – Cileunyi. Appropriate and practical O&M institutional plan shall be proposed to ensure smooth implementation of the BIUT Road Project.

In this chapter, the necessary institutional and administrative procedures for the BIUT Road Project implementation are summarized, and issues are discussed to examine most appropriate O&M plan for the BIUT Road Project.

(1) Institutional Background

The GOI offered 38 toll road sections to investors in 2005, with following intentions:

- Strategic partnering with the existing investor
- Financial support
- New investment through investment tender

Then, GOI reformed the previous laws and regulations related to toll road development in order to ensure investment confidence.

The following laws and regulations were set and policies for toll road operation and maintenance were stipulated:

- Road Law No. 38/2004
- Government Regulation No. 15/2005 on Toll Road (Minimal Service Standard for Toll Road 392/2005)
- Presidential Regulation No. 36/2005 on Land Acquisition

(2) Outlines of Institutional Reform

Road Law No.38/2004 and Governmental Regulation No.15/2005 were established to facilitate following reforms:

- Policy on the planning of toll roads is established by the Government;
- The toll road development program is established with due regard to regional and economic development;
- Separation of regulatory role through the formation of the BPJT;
- Toll tariff is calculated based on the components of (1) the affordability of the user, (2) VOC savings, and (3) viability of investment;
- The development of toll roads can be undertaken by a state-owned enterprise (SOE), the private sector or government, or by joint venture/cooperation between these actors;
- Toll tariff is a bid parameter, and have to be bound with the business plan and stated on concession agreement. Unlike the old road law, the new road law states that the Minister of Public Works has the right to decide the toll road tariff and its adjustment, which will be reevaluated periodically every two years based on the Consumer Price Index (CPI);
- The concession for the operation of toll roads is granted for a certain period of time to meet an appropriate return on investment;

- The right to operate a toll road granted by GOI is to be carried out in an open and transparent manner; and
- GOI will execute land acquisition for the toll roads, although the investors have to provide the land acquisition fund. However, there is a possibility for GOI to provide land acquisition cost.

The Minimal Service Standard for Toll Road 392 published in 2005 stipulated the service level of toll road operation and maintenance as shown in Table 3.6.1. The O&M company needs to implement the services in accordance with a "minimum service standard" and the toll road enterprise also needs to entitle government acknowledgement for the enterprise fulfilling the "minimum service standard".

(3) Toll Road Regulatory Board

In accordance with Road Law No. 38/2004, a toll road authority (BPJT) was established as the toll road regulatory body in Indonesia on 29 June, 2005. The tasks and functions of BPJT are the following:

- To recommend the initial tariff and tariff adjustment of toll to the Minister of Public Works
- To take over toll road development rights following the expiry of the concession period, and to recommend further operation thereof to the Minister of Public Works
- To temporarily take over toll road development rights that have failed starting with the concession, for re-tendering of the development
- To make preparations for the toll road development rights, which include analysis of financial viability, feasibility study, and preparation of environment impact assessment
- To seek investment in toll roads through transparent and open tenders
- To assist in the land acquisition process if there is a guarantee of availability of fund from the enterprise and to prepare the mechanism of the use thereof
- To monitor the activities of planning and execution of construction works as well as the operation and maintenance of toll roads by the enterprise
- To supervise the enterprise of the fulfillment of all the obligations under the toll road development agreements and to report the results thereof periodically to the Minister of Public Works.

Table 3.6.1 Minimal Service Standard for Toll Road 392

NO.	SERVICE SUBSTANCE	MINIMUM SERVICE STANDARD		
		INDICATOR	SCOPE	STANDARD
1	2	3	4	5
1.	- Toll Road Condition	- Coarseness	- All toll road sections	- > 0.33 µm
		- Roughness	- All toll road sections	- IRI ≤ 4 m/km
		- No pot holes	- All toll road sections	- 100%
2.	- Average covering speed	- Average covering speed	- Urban Toll road	- ≥ 1.6 times of the average Non Toll Road covering speed
			- Inter Urban Toll Road	- ≥ 1.8 times of the average Non Toll Road covering speed
3.	- Accessibility	- Average Transaction Speed	- Open System Barrier Gate	- ≤ 8 seconds every vehicle
			- Closed System Barrier Gate	
			• Entrance toll booth	- ≤ 7 seconds every vehicle
			• Exit toll booth	- ≤ 11 seconds every vehicle
		- Total Tollgate	- Open System Capacity	- ≤ 450 vehicles per hour per toll booth
			- Closed System Capacity	
			• Entrance toll booth	- ≤ 500 vehicles per hour
			• Exit toll booth	- ≤ 300 vehicles per hour
4.	- Mobility	- Speed in Dealing with Traffic Jam	- Patrol Observation Area	- 30 minutes per observation cycle
			- Starting from acceptance of information up to the problem location	- ≤ 30 minutes
			- Dealing with problem related with car stall	- Towing to the nearest tollgate/garage by official (free) crane
			- Patrol of Crane Car	- 30 minutes per observation cycle
5.	- Safety	- Traffic Control Facilities		
		• Traffic sign	- Completeness and Clearness of Instruction and Prohibition and Direction	- 100%
		• Road marks	- Function and benefit	- Total 100% and reflectivity ≥ 80%

NO.	SERVICE SUBSTANCE	MINIMUM SERVICE STANDARD		
		INDICATOR	SCOPE	STANDARD
1	2	3	4	5
		• Guide Post/Reflector	- Function and benefit	- Total 100% and reflectivity ≥ 80%
		• Kilometer pole every 1 km interval	- Function and benefit	- 100%
		- Public road light (PJU) in urban area	- Function and benefit	- Road light on 100%
		- ROW Fence	- Function and benefit	- Existence 100%
		- Accident handling	- Victim of accident	- Free of charge evacuation to the referred hospital
			- Broken car by accident	- Free of charge towing to the towing pool (still in the toll road)
		- Safety and Law Enforcement	- Toll Road Section	- Existence of Highway Patrol (PJR) on-call for 24 hours
6.	- Rescue/Safety Unit and Service Aid	- Ambulance	- Toll Road Section	- 1 unit per 25 km or minimum 1 unit (complete with medical aid standard and paramedic)
		- Towing Car	- Toll Road Section:	
			• ADT > 100,000 cars/ day	- 1 unit per 5 km or minimum 1 unit
			• ADT ≤ 100,000 car/ day	- 1 unit per 10 km or minimum 1 unit
		- Highway Patrol (PJR)	- Toll Road Section	
			• ADT > 100,000 car/ day	- 1 unit per 15 km or minimum 1 unit
			• ADT ≤ 100,000 car/ day	- 1 unit per 20 km or minimum 1 unit
		- Toll Road Patrol (Operator)	- Toll Road Section	- 1 unit per 15 km or minimum 2 units
		- Rescue Car	- Toll Road Section	- 1 Unit per toll road section (complete with rescue apparatus)
		- Information System	- Information and Communication of Traffic Condition	- Each entrance toll booth

The BPJT is responsible for toll road investment procedures, including the procurement of investors. A diagram of the bidding process procedure is shown in Figure 3.6.3.

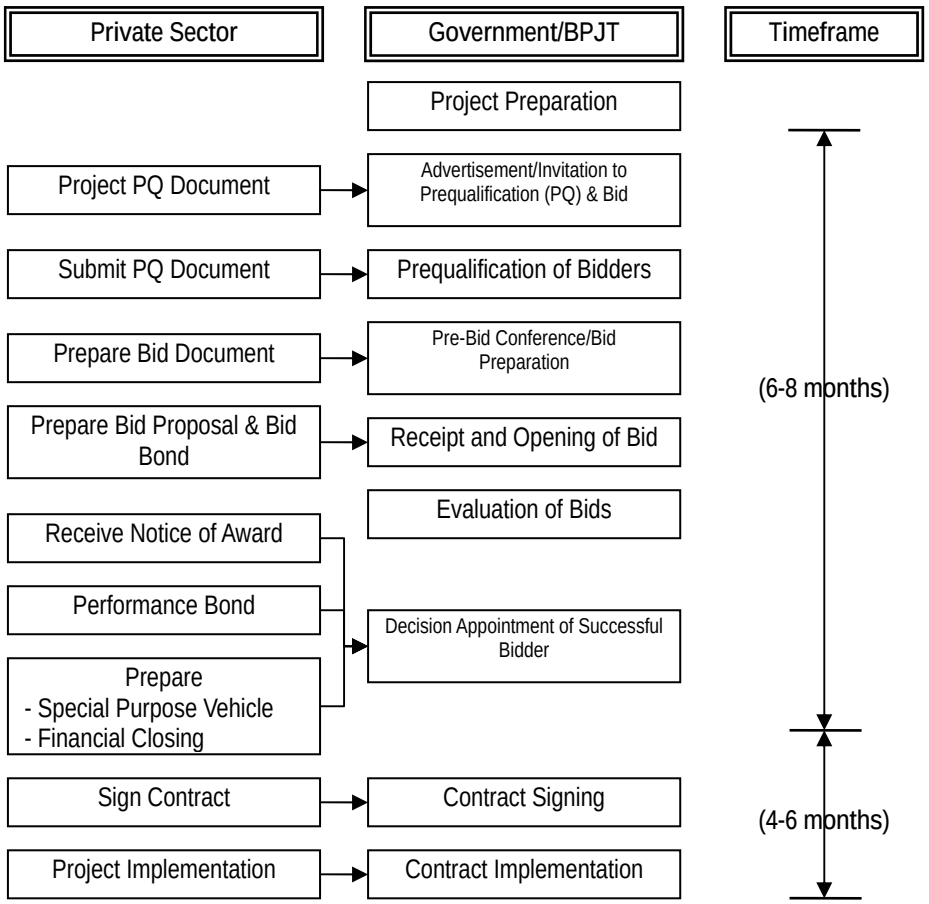


Figure 3.6.3 Bidding Process by BPJT

(4) Institutional Issues on O&M

1) Investment Scale of O&M

Sound financial management is not expected in the Phase 1 period because the 9.5-km operational section length is too short to provide adequate profit against initial investment for O&M.

As a result of the financial analysis mentioned in Chapter 3.4.3, Phase 2 construction is recommended to be implemented by the GOI. However, tariff setting and adjustment is anticipated as a serious risk. Therefore, periodic tariff adjustment based on the CPI should be made. Setting of the initial tariff and subsequent tariff adjustment need to be executed properly.

2) Efficiency of O&M

Since BIUT Road connects the inter-city toll road of Padalarang – Cileunyi, O&M facilities needs to be coordinated efficiently to ensure the comfort of road users.

(5) Recommendation for O&M Company Procurement

Procurement of an O&M company shall be considered based on the financial soundness of the enterprise and its capacity and experience in providing appropriate O&M services. It is especially important that O&M of the BIUT Road be coordinated with the Padalarang – Cileunyi Toll Road, which will be connected with BIUT Road. Installation of compatible operational systems between

Padalarang – Cileunyi Toll Road and BIUT Road is recommended, such that it will contribute to the financial viability of the O&M company and demonstrate sound toll road operation.

(6) Operation and Maintenance (O&M) Plan

1) General

O&M of a toll road is divided roughly into the following nine aspects:

- Asset Management
- Traffic Control & Surveillance
- Information Management
- Emergency Management
- Patrols
- Heavy Loaded Vehicle Regulation
- Breakdown Service
- Equipment Operation
- Toll Collection

The O&M plan for the BIUT Road shall take into consideration the toll road laws and regulations of Indonesia.

2) Toll Road Maintenance

The toll road maintenance function is divided into routine maintenance, periodic maintenance such as repair, rehabilitation and disaster prevention, equipment and building maintenance, and emergency maintenance. Toll road maintenance includes the following tasks and the operator should establish an appropriate unit to cover all of the typical works of routine maintenance as summarized in Table 3.6.2 to Table 3.6.6.

h. Routine Maintenance

Table 3.6.2 Routine Maintenance Work

Type	Work Items	
Routine	Inspection	Routine Inspection Periodic Inspection Special Inspection
	Cleaning	Cleaning of Roadway Surface Cleaning of Associated Facilities Cleaning of Road Accessories
	Vegetation	Tree/Forest Control Lawn Control Slope Vegetation
	Traffic Accident Recovery Works	
	Traffic Regulation	

i. Periodic Maintenance

Table 3.6.3 Periodic Maintenance Work (Repair Work)

Type	Work Items	
Repair	Pavement Renovation	Patching Crack Seal Spot Replacement of the Pavement Correction of Rugged Road Surface Surface Treatment Repainting of Road Markings
	Repair of Bridges and Structures	Repair of Expansion Joints Repainting of Steel Structures Partial Repair of the Bridge Deck Repair of the Guard Wall Re-galvanization of Guardrails

Table 3.6.4 Periodic Maintenance Work (Rehabilitation and Disaster Prevention)

Type	Work Items	
Rehabilitation and Disaster Prevention	Pavement Rehabilitation	・ Pavement Survey ・ Asphalt Pavement Overlay ・ Asphalt Pavement Mill and Overlay ・ Asphalt Surface Regeneration ・ Pavement Resurfacing ・ Concrete Pavement Overlay
	Reinforcement and Improvement of Bridges and Structures	・ Recovery of Fatigue Failures ・ Cross-sectional Reinforcement of Main Girders ・ Continuation of Consecutive Simple Girders ・ Installation of Extra Main Girders ・ Pre-stressing by Post-installed Outer Cables ・ Partial Replacement of Floor Slabs ・ Deck Top Thickening ・ Deck Bottom Thickening ・ Deck Waterproofing ・ Renovation of Shoes ・ Improvement of Drainage
	Restoration of Embankment Settlement	
	Slope Protection	
	Rehabilitation of Traffic Safety and	・ Guard Fences

	Control Facilities	・ Delineators ・ Traffic Signs
	Environmental Improvements	

j. Equipment and Building Maintenance

Table 3.6.5 Equipment and Building Maintenance Work

Type	Work Items
Equipment and Building Maintenance	Inspection and Testing of Equipment
	Maintenance of Equipment
	Maintenance of Buildings
	Vehicle Management

k. Emergency Maintenance

Table 3.6.6 Emergency Maintenance Work

Type	Work Items
Emergency	Removal of debris or obstacles from natural causes
	Repair of damage caused by traffic accidents

3) Institutional Structure of O&M

Considering the above requirements, the O&M company shall provide a 1) traffic control center (TCC), 2) emergency response (ER) team, and 3) general office. For reference, Figure 3.6.4 shows a typical O&M structure in Japan for an expressway operator. Several out-sourcing contracts are commonly accepted in Japan for O&M works.

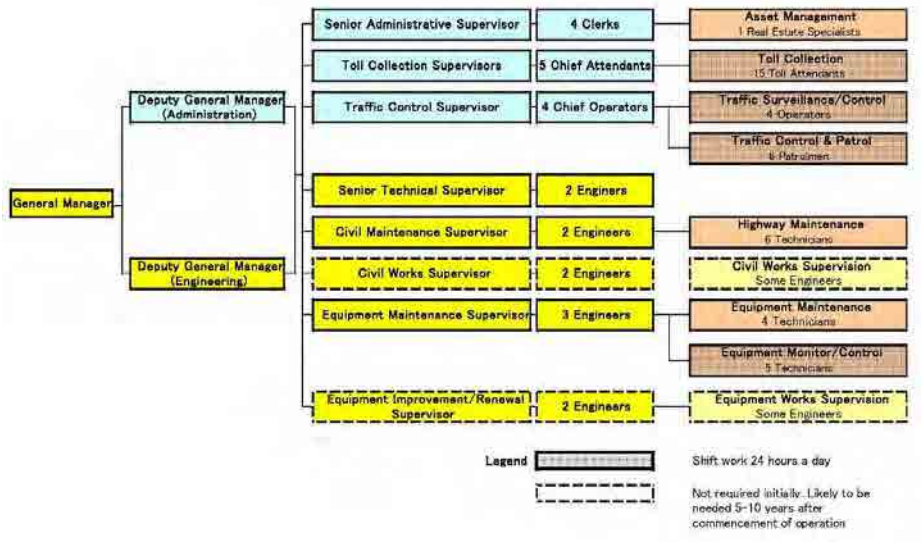


Figure 3.6.4 Sample Organization of an Expressway Operator in Japan

3.6.3 INSTITUTIONAL STRUCTURE AND CAPACITY FOR ENVIRONMENTAL MANAGEMENT

(1) Institution and Capacity Development

Since the BIUT Road Project is national toll road, the project executor is Bina Marga (PU). Bina Marga must submit the management and monitoring reports to BPLHD Province, Bandung City and Bandung Regency regularly. The project management consultant should be responsible for the implementation of environmental management and safety plan during construction. The respective roles and responsibilities of BPLHD (province, city and regency), Bina Marga (PU), contractors and sub-consultants for carrying out the RKL are shown in Table 3.6.7.

The proposed framework to implement the RKL is illustrated in Figure 3.6.5. The role of Bina Marga (Environmental management unit), Project Management Consultant, and the contractor in achieving the set targets is also shown. The BPLHD Province, Bandung City and Bandung Regency, and JICA are responsible for reviewing and making comments/recommendations for the management and monitoring reports. It is expected that the results of management and monitoring reports would be made for the most sustainable and continuous environmental management program for other development projects.

Table 3.6.7 Roles and responsibilities of the organizations for carrying out the RKL

Role	Responsibility
BPLHD (Province, City and Regency)	1) Implement Law and regulations enforcement 2) Implement Environmental policy/program 3) Set up and enforce discharge standards in accordance with Indonesia environmental regulations 4) Provide guidance on environmental matters 5) Review environmental reports (management and monitoring) 6) Handle environmental emergencies
Project Executing Agency (Ministry of Public Work (PU), Bina Marga)	1) Conduct monitoring in accordance with capacity development program 2) Report to BPLHD and JICA 3) Check and review the reports from Consultant 4) Monitoring in operation phase
Project Management Consultant (Environmental specialist)	1) Consulting Service including capacity development of Environmental Management Unit and supervision for monitoring during pre-construction and construction phase 2) Confirmation of compliance to Environmental Code of Practice and Regulations 3) Report to PU, Bina Marga (management and monitoring reports)
Contractor	1) Prepare environment and safety plan 2) Implement mitigation measures 3) Monitoring in construction phase 4) Report to Consultant (monitoring results etc.)

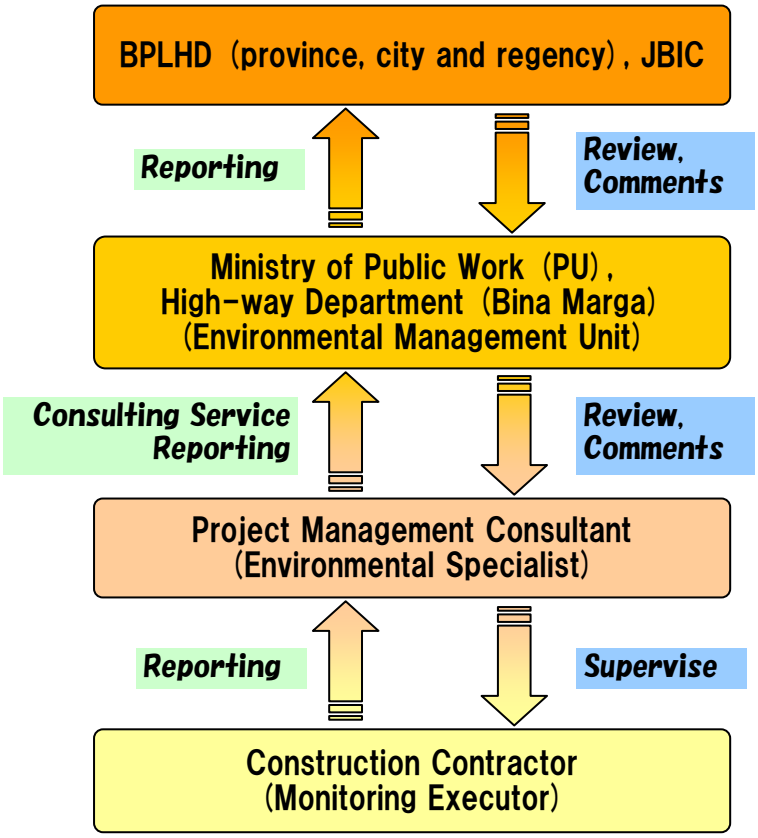


Figure 3.6.5 Roles and Responsibilities of the Organizations for carrying out the RKL

(2) Personnel Training

Personnel training will be provided in different stages of the project implementation. At the construction stage, the leaders and environmental staff from the successful contractors and construction supervision companies will be requested to participate in a mandatory environmental training program. This requirement will be included in the construction tender documents to be issued to the pre-qualified bidders who will be invited to bid. This training program will include, but not be limited to, the following contents:

- Relevant environmental regulations, policies, standards and programs;
- The main findings and recommendations of environmental impact assessments;
- Relevant environmental control technologies, processes and procedures;
- Key contents of the environmental management plan, particularly various mitigation measures for the construction stage and the implementation;
- Daily environmental monitoring requirements, methodology and procedures;
- Environmental reporting requirements; and
- Environmental emergency response and cleanup.

For the operation stage, the environmental staff from the road maintenance and operation company and relevant government organizations will be provided with training and surveying the environmental parameters. The training programs should be primarily provided by professional environmental staff or staff from local universities.

For capacity development, the following equipment will be necessary for field supervision and reporting. It is considered to be included in the cost estimation of the RKL:

- Personal Computers;
- Miscellaneous Office Equipment;
- Digital Camera; and
- Video Camera.

(3) Estimated Costs for Environmental Mitigation Measures

The mitigation measures for socio-environmental consideration should be prepared for the reduction of air contamination and noise level, greening for landscape, communication and social aspects, etc. The setting of green belt and soundproofing wall around sensitive facilities such as schools, hospitals and public meeting halls are very useful in mitigating and holding the impact of traffic flow during the post-construction period. In addition, the green belt and buffer zone are effective in the preservation of good connection with local communities along the project area. A proper buffer zone is proposed around each interchange (Ujungberung and Gedebage).

Table 3.6.8 Estimated Cost for environmental management plan

No	Item	Quantity	Unit Cost	Cost(Rp 1000)
Mitigation Measures				
1	Soundproofing wall	100m x 16 sections	8,000,000	12,800,000
2	Green belt (road-side)	15km	160,000,000	2,400,000
3	Green belt (under viaduct)	15km	74,000,000	1,110,000
4	Buffer zone (around interchange)	3 area	1,400,000,000	4,200,000
Total Cost				20,510,000
Management and Monitoring				
1	Monitoring in two phases	12 times	90,000,000	1,080,000
2	Capacity development and equipment	1 set	800,000,000	800,000
Total Cost				1,880,000

The proposed roadside greening and under viaduct mitigation measure for landscape of viaduct structure are shown in Figure 3.6.6.

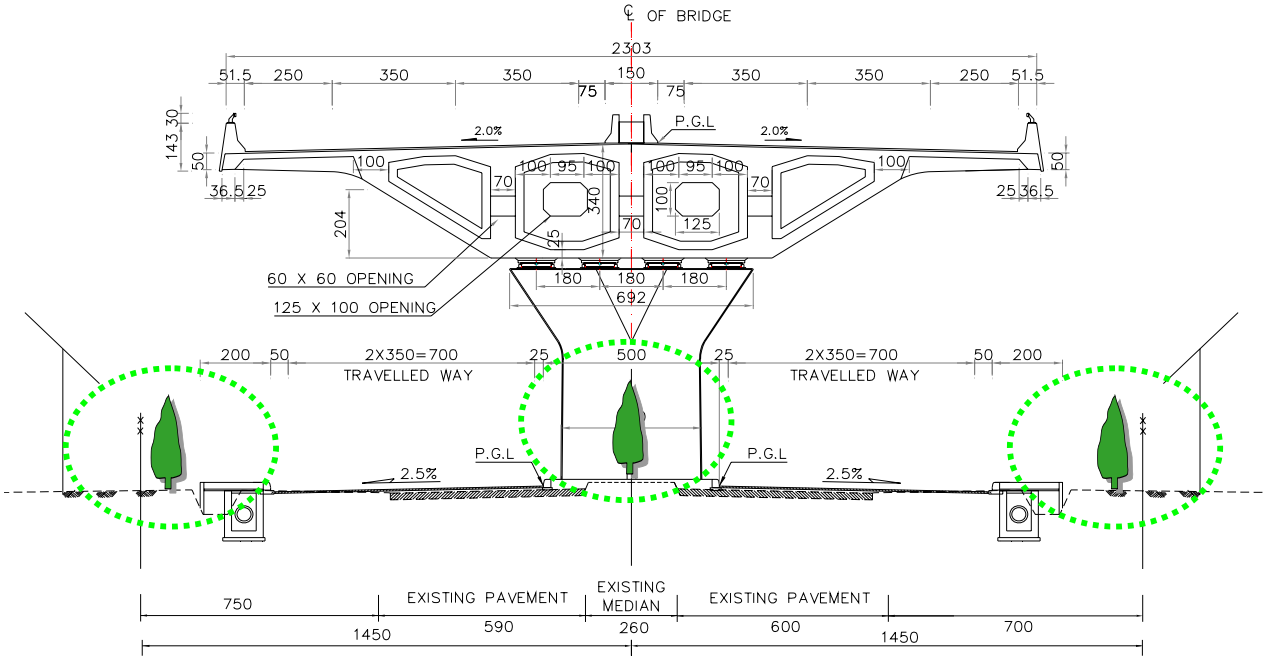


Figure 3.6.6 Proposed Roadside Greening and Mitigation Measure for Landscape

The adoption system is proposed for caring of the green plantation along the project road, especially for the fruit trees plantation. In contracting with local government and communities for maintenance of roadside trees, the local government gets the right of harvesting and selling the fruits under business regulation. The public authority supplies the seedlings of fruit trees, while the local government is responsible for maintenance such as planting, watering and fertilizing.

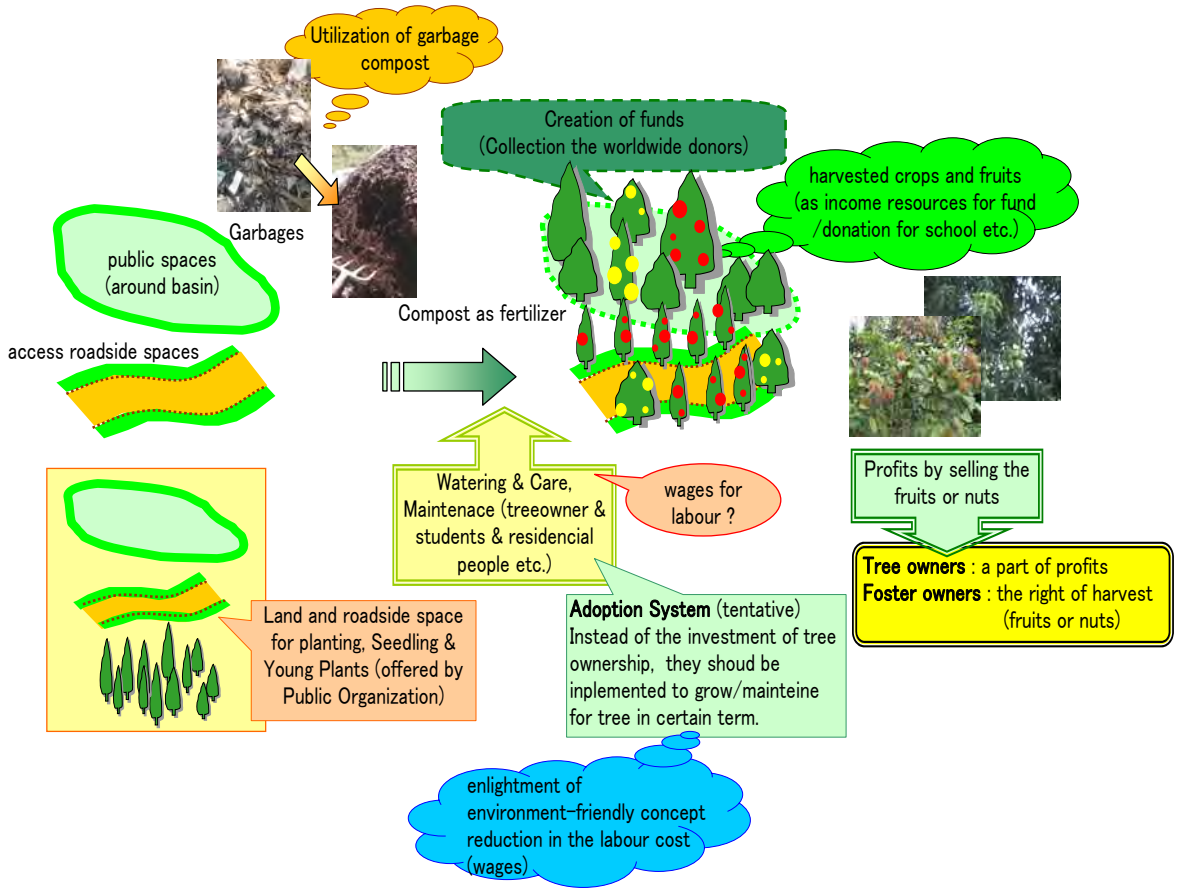


Figure 3.6.7 Proposed Adoption System for Maintenance of Greening

3.7 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

3.7.1 REVIEW AND CONFIRMATION OF EIA

(1) EIA procedure in Indonesia

The construction of the freeway and toll road for Pasteur-Cileunyi and Cibiru-Gedebage was approved by the West Java provincial government through the process of EIA (AMDAL) in 2007 March. These studies are mandatory based on Regulation No. 23, year 1997 on Environmental Management, which is further elaborated through Government Regulation No.27/1999 on Analysis of Environmental Impact, and the Decree of Minister of Environment No.17/2002 regarding the type of activities mandatory to conduct Environmental Impact Analysis. Therefore, the construction plan for the freeway in Pasteur to Cileunyi and Unjungberung IC to Gedebage IC segments must have the AMDAL study, based on Decree of Minister of Environment No.8/2006 regarding Complying Environment Impact Analysis.

The term of validity on the AMDAL procedure is limited for three years, therefore some activities concerning this project should be implemented during this period. If any activities concerning the project were not implemented, it should be necessary to review or restudy the EIA process of this project.

In the process of EIA in Indonesia, public consultation must be held three times, inviting the relevant local governments, local communities, NGOs and so on. Thus, the required public consultation meetings during the EIA process on the BIUT Road Project were conducted in September, October and December 2006.

In the effort to control and mitigate environmental impact, there are a number of regulations, specifically related to construction of toll roads, which needs to be taken into consideration. This list of regulations is shown in Appendix 4.

The EIA was conducted in accordance with the procedures illustrated in Figure 3.7.1. In principle, the procedures meet the Indonesian EIA regulations.

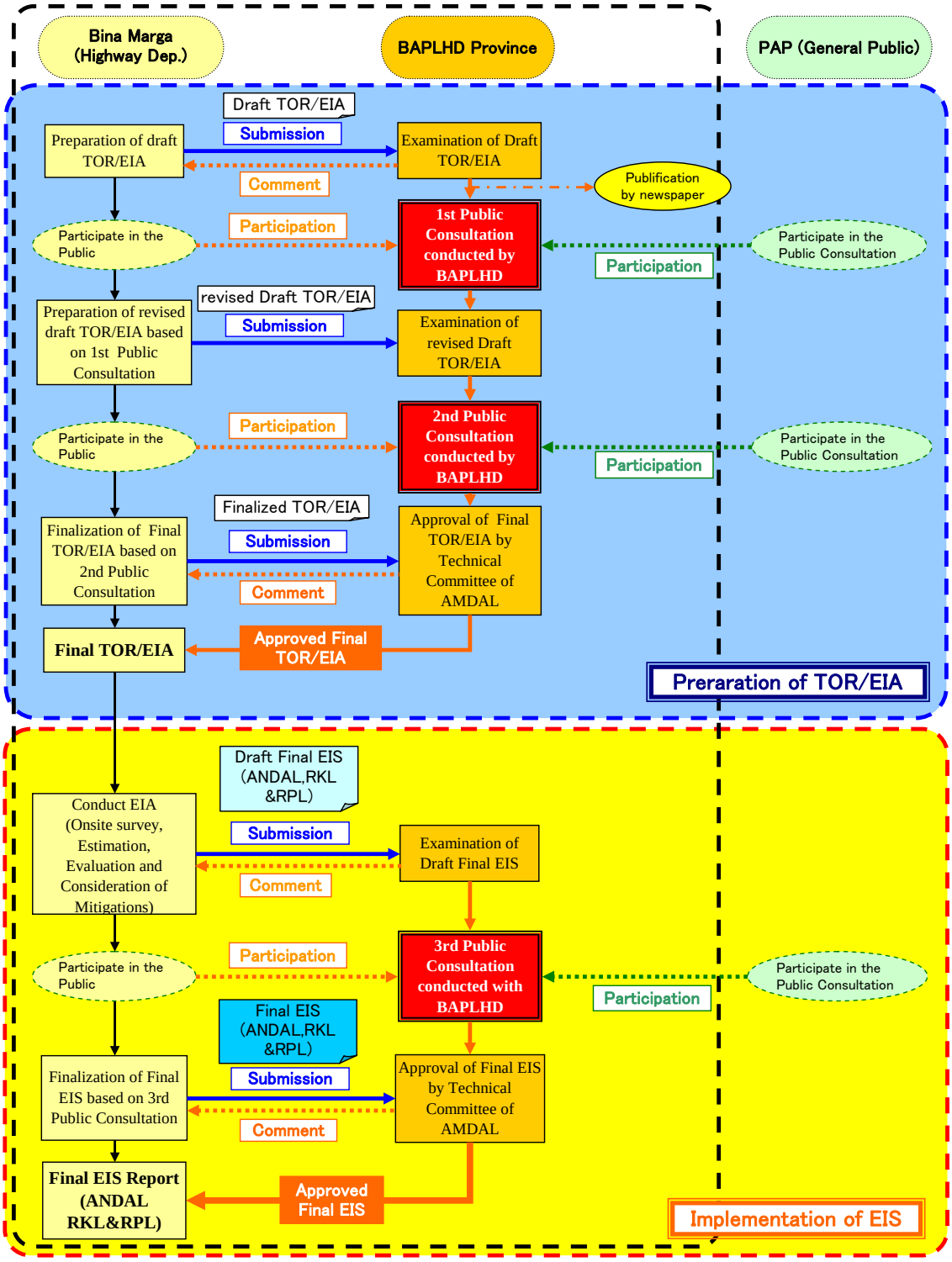


Figure 3.7.1 Procedure of AMDAL in Indonesia

(2) JBIC Guidelines (April 2002)

The objective of the JBIC Guidelines is to encourage project proponents to implement appropriate environmental and social considerations and countermeasures, by making clear its procedures (both before and after funding decisions are made), criteria for decision-making, and requirements which projects subject to funding are to meet. In this way, JICA endeavors to ensure transparency, predictability and accountability in its confirmation of environmental and social considerations.

JICA classifies each project in terms of its potential environmental impact, taking into account such factors as the sector and scale of the project, the substance, degree and uncertainty of its potential environmental impacts, and the environmental and social context of the proposed project site and surrounding areas. A proposed project is classified as Category A if it is likely to have significant adverse impact on the environment.

For the BIUT Road Project, a large-scale involuntary resettlement is anticipated, thus it will be categorized as a Category A project. Environmental reviews for this road project examines the potential negative and positive environmental impact. JICA evaluates measures necessary to prevent, minimize, mitigate or compensate for potential negative impact, and measures to promote positive impact, if any such measures are available. GOI and related parties must submit Environmental Impact Assessment (EIA) reports. For this project that will result in large-scale involuntary resettlement, basic resettlement plans must be submitted. JICA undertakes its environmental reviews based on the EIA and other reports prepared by the project proponents and submitted through the GOI and relevant authorities.

For Category A projects, JICA in principle confirms through the borrower over a certain period of time, the results of monitoring done by the project proponents on items which have significant environmental impact. This is in order to confirm the project proponents' undertaking of environmental and social considerations. Therefore, the monitoring and follow-up processes are essential to confirm and review the environmental and social considerations for this project.

(3) Review of EIA Reports and Confirmation on Conformity with JBIC Guidelines (April 2002)

The EIA reports (AMDAL reports) that GOI and related authorities approved in 2007 are composed of the outline of existing conditions of environmental and social aspects, estimation of important impacts for each phase and evaluation of the same. For environmental aspects, air quality, noise, vibration, physiographic, geologic and geotechnical items, hydrogeology (surface and ground water), space plan, land use and biology components are enumerated, assessed and evaluated. For the social environment aspects, social, economic and cultural components, health of society, transportation are found, the results of interview survey for affected persons are produced. AMDAL reports in Indonesia consisted of ANDAL (Environmental Impact Assessment), RKL (Environmental Management Plan) and RPL (Environmental Monitoring Plan). The mitigation measures are mentioned in the RKL document while specific monitoring items and measurements are described in RPL document.

In the JBIC Guidelines, environmental impact to be investigated and examined includes factors that impact human health and safety as well as the natural environment, such as air, water, soil, waste, accidents, water usage, ecosystems, and biota. Social concerns include involuntary resettlement of the population, the indigenous people, cultural heritage, landscape, gender, children's rights and communicable diseases such as HIV/AIDS and impact that may lead to trans-boundary and global environmental problems. In addition to the direct and immediate impact of projects, derivative, secondary and cumulative impacts are also to be examined and investigated to a reasonable extent. It is also desirable that impacts, which can occur at any time during the duration of the project, be continuously monitored throughout the life cycle of the project.
It is judged that the procedure of AMDAL in Indonesia almost satisfies the JBIC Guidelines for environmental aspects by quantitatively assessing and evaluating to compare with environmental standards and other regulations in air quality, noise, water quality and so on. However, with regard to social environment aspects, such analyses to be conducted on the environmental costs and benefits in as quantitative terms as possible and in close harmony with economic, financial, institutional, social and technical analysis of the project, are not enough to confirm. Particularly, the Land Acquisition and Resettlement Action Plan (LARAP) are also usually prepared at the detailed design stage by the project proponents in Indonesia. The impacts in land acquisition and resettlement through implementation of the project are assessed and evaluated quantitatively in the same project stage. On the other hand, under JBIC Guidelines, in case that large-scale involuntary resettlement is anticipated,

then basic resettlement plans are required to be prepared by the project proponents and submitted through the borrower.

Therefore, since the BIUT Road Project is predicted to have a huge social impact due to the necessary land acquisition and resettlement passing through the high-density area in Bandung City, it shall be required to prepare the basic land acquisition and resettlement plan such as LARAP Framework for approval of the Japan ODA loan as early as the project appraisal stage.

The results in the review of AMDAL reports and confirmation on conformity with the JBIC Guidelines (April 2002) are shown in Appendix 5.

(4) Proposed Additional and Supplemental Survey

1) Environmental Aspects

The JICA Survey Team proposed additional and supplemental surveys for environmental aspects on the basis of the result of review on the AMDAL reports such as existing data of air quality, noise and vibration level, water quality and other affected items through data collection and exploration around the project site. Likewise, the team implemented gathered data and materials on the environmental items which were not included in the AMDAL reports such as sunshine obstruction, radio wave disorder, landscapes and heritage area around project site.

2) Social Environment Aspects

To support preparation of the LARAP Framework, JICA Survey Team also proposed additional and supplemental surveys for social environment aspects on the basis of the result of review on AMDAL reports such as sampling data collection of present conditions of Project Affected Persons (PAPs) along the project road by interview survey, present land use by exploration, counting of the number of affected buildings and houses using satellite photographs and the proposed alignment of toll road, and the collection of opinions, suggestions and requirements through the supplemental Public Consultation Meeting (PCM) for local governments, local communities, NGOs, academic groups and relevant parties.

- Land Use Survey along the project road (total length: 27.3 km, width: 20 m each side)
- Interview Survey of PAPs along the project road (total samples: 250 persons)
- Public Consultation Meeting (PCM) (total times: four times, for Bandung City, three times and Bandung Regency, one time)
- Establishment of the LARAP Framework draft (one official meeting in Bandung City)

3.7.2 REVIEW OF ENVIRONMENTAL CONSIDERATIONS

Within the scope of the Preparatory Survey for Bandung Intra Urban Toll (BIUT) Road Project, the environmental consideration focuses on all the sections that will connect Pasteur-Cileunyi and Ujungberung-Gedebage. Environmental consideration is to:

- Review the EIA, and confirm its compliance with Indonesian EIA regulations as well as the JBIC Guidelines on Environmental Consideration.
- Based on the review, supplementary studies were conducted to meet the requirement of the Regulation and Guidelines. These studies include the Environmental Management Plan (RKL), the Environmental Monitoring Plan (RPL) and public opinion on natural and pollutant issues of the project in order to incorporate the consultation result into the environmental consideration.

(1) Confirmation on Requirements of Environmental Considerations by JBIC Guidelines (April 2002)

The review of the EIA report, taking into account recent studies, focuses on: (a) the approval status of the EIA and status of permitting issues other than the EIA; (b) environmental issues including air quality and noise impact, hydrology of rivers and drainage systems, consideration for landscape along the project site; and (c) public consultation.

The KA-AMDAL report of the BIUT Road Project was prepared in September 2006. After two public consultation meetings on the report and receiving the comments and recommendations by the AMDAL committee and relevant authorities, the draft final AMDAL reports were modified accordingly. The report was finally submitted by Bina Marga to the West Jawa Provincial Government in November 2006.

The AMDAL Committee in West Jawa Province required supplementary studies and consideration of mitigation measures on the environmental issues. In response to the requirement, Bina Marga conducted additional measurements for environmental issues and revised the AMDAL reports. The revised AMDAL reports were resubmitted to the West Jawa Provincial Government in December 2006. The appraisal result was informed to Bina Marga in March 2007 by West Jawa Provincial Government.

Environmental reviews for Category A projects, including highway and toll road construction projects, examine the potential negative and positive environmental impact of the projects. JICA evaluates measures necessary to prevent, minimize, mitigate or compensate for potential negative impacts, and measures to promote positive impacts, if any such measures are available.

In principle, JICA confirms through the borrower the results of monitoring and evaluating by the project proponents of the items which have significant environmental impacts over a certain period of time. This process is in order to confirm and continue the project proponents' undertaking of environmental and social considerations for Category A projects.

1) Natural conditions in the project area

The BIUT Road Project is planned on the existing road through Pasteur to Cileunyi in Bandung City and Bandung Regency, and from Ujungberung to Gedebage without the existing road area in Bandung City. Along the existing road from Pasteur to Cileunyi, the project road almost passes through the high-density area of Bandung City. Especially, the west and central parts of this project are the densest area of business buildings and houses. The eastern part is a relatively rather vacant area, but there are many shops and houses along the existing road in Bandung City. Terrain along the existing road is crossed by several small rivers and drainage flowing through the north to south direction. Regarding the section of Ujungberung to Gedebage, the project road almost passes through paddy fields and the southern part of this section is located in the Gedebage development area.

In the project areas, there is a monsoon-type tropical climate with two seasons: dry season and rainy season. The climate condition is rather stable, with low frequency of climatic disasters, but excluding small floods in limited areas. The monthly average temperature ranges from 22.9oC to 24.0oC. In 2008, the lowest temperature was recorded 18.0oC in August, and the highest temperature was recorded 30.16oC in October. The monthly rainfall range is from 39.2 mm to 282.0 mm. The lowest rainfall is recorded in August, while the highest occurred in February and November. Rainy seasons are from October to May (comprising 85-90% of the total annual rainfall); in contrast, dry seasons are from June to September each year (consisting 10-15% of the total annual rainfall). Annual average rainfall is approximately 2,000 mm/year.

During January to May, the wind direction is dominated by the western wind component. In June, July, August and September, the wind blows to the eastern direction (east, northeast and southeast). Meanwhile in October to December, the blowing wind is dominated by the northern wind direction. In the rainy season, the wind component is mainly in the western direction.

2) Air Quality

a. Present Condition

The project area is located mainly in the urban density areas and along the main line in Bandung City, where the air quality is affected by the exhaust gases of vehicles and some industrial activities. However, along the project road, almost all the factories, such as for textile and T-shirts products, are categorized as the light industries. Based on the measurements of the AMDAL Study data in 2006, all the air quality parameters were lower than the environmental standard, except for the TSP measured at the Pasteur survey point, which was 310 µg/m^3.

Table 3.7.1 Testing Result of Air Quality in AMDAL Study (2006)

No	Parameter	Unit	Survey Point					Environmental Standard
			Pasteur	Surapati Street	Ujungberung	Cibiru Traffic Circle	Gedebage	
I	Environmental Condition							
1	Temperature	^oC	32.55	34.95	35.50	31.72	33.85	-
2	Wind Velocity	m/sec	1.90	1.62	0.65	1.92	1.77	-
3	Dominant Wind Direction	-	South	South	South	Northeast	South	-
4	Humidity	%	25.33	22.83	23.17	26.17	24.50	-
5	Pressure	kPa	93	93	93	93	93	-
II	Chemical Substance							
1	NO_2	µgr/m^3	< 4	< 4	<4	8.42	<4	400
2	SO_2	µgr/m^3	146.6	37.2	52.5	158.0	11.8	900
3	CO	µgr/m^3	4,460	10,530	2,340	1,170	9,360	30,000
4	HC	µgr/m^3	2.34	1.22	1.80	0.44	0.45	160
III	Physical Substance							
1	Pb	µgr/m^3	0.85	0.65	0.65	0.56	0.55	2.0
2	Dust (TSP)	µgr/m^3	310.33	108.00	108.66	46.33	147.42	230

Source : Analysis Result of AMDAL Study, date of 16th – 21st November 2006

: exceeding the Environmental Standard Value

The existing BPLHD survey results of air quality in Bandung City show that the densities of air contamination are decreasing rapidly in recent years except for the density of SO_2 and PM_{10}. However, the parameter that exceeded environmental standards is the PM_{10} only. Thus, it may seem that the ambient air quality in Bandung City has recently improved. Parameters such as NO_2, CO, O_3 and Pb, in particular, have become below the environmental standard due to accommodation of exhaust regulation and fuel improvement by production. It would seem that one of the reasons for the decreasing air contamination level is also the progress of change on new vehicles based on the recent economic growth in Indonesia. See the existing survey result in Appendix 6.

The environmental standard of air quality in Indonesia is shown in Table 3.7.2,

Table 3.7.2 Environmental Standard of Air Quality

Air Quality items		SO_2	CO	NO_2	O_3	HC	PM_{10}	$PM_{2.5}$	TSP	Pb	Dustfall	F	Flour index	Cl/ClO_2	SO_3
unit		$\mu g/Nm^3$	$\mu g/Nm^3$	$\mu g/Nm^3$	$\mu g/Nm^3$	$\mu g/Nm^3$	$\mu g/Nm^3$	$\mu g/Nm^3$	$\mu g/Nm^3$	$\mu g/Nm^3$	ton/km^2	$\mu g/Nm^3$	$\mu g/100cm^2$	$\mu g/Nm^3$	$mg/100cm^3$
National standard for ambient air quality *1)															
measured duration	1 hour	900	30,000	400	235	-	-	-	-	-	-	-	-	-	-
	3 hours	-	-	-	-	160	-	-	-	-	-	-	-	-	-
	24 hours	365	10,000	150	-	-	150	65	230	2	-	3	-	150	-
	30 days	-	-	-	-	-	-	-	-	-	10(residence)/ 20(industry)	-	40	-	1
	90 days	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-
	1 year	60	-	100	50	-	-	15	90	1	-	-	-	-	-

Source:
*1) Government Regulation regarding Control of Air Pollution No.41-1999

b. Construction Phase

The transport of quarry materials for construction will have negative impact particularly around the residential areas and public road. By the execution for long term with huge volume of activity and quite distance of quarry carry over, the air pollution will significantly improve especially in the dense area along either the traffic track or in the residential districts since the environmental changes is not elementary, but not cumulative and reversed.

The prospect method for air quality is still being tried and tested in Indonesia. The exhaust unit volume of vehicles on air quality factors is not ensured yet for the prospect of surrounding areas. In addition, it is difficult to determine adequate meteorological data for the long term in each forecasting point. Therefore, the application of the Atmospheric Dispersion Model (Plume-Puff Model), as popularly applied, is difficult and impossible to adopt into this project study.

In the AMDAL study, the impacts of air pollution caused by the project activities have been estimated using the following equation:

$$E = (Vol \times Pollutant\ Factor) \times Velocity\ factor$$

Where: E : Pollutant Increasing ($\mu g/m^3$)
Vol : Volume of Vehicles (vehicle/hour)
Pollutant Factor : Factor in each pollution item
Velocity Factor : Factor in the speed of the vehicle

As the number of construction vehicles and machineries during the construction phase is limited, it is predicted that the negative impacts on air quality by construction activities will not be so high. However, appropriate countermeasures for impacts mitigation on air quality, such as watering and proper maintenance, should be better implemented by contractors under supervision of the Project Management Unit. It is especially important to implement the mitigation measures to reduce dust, TSP and PM.

c. Post-Construction Phase

In the AMDAL study, air quality was estimated by the same method as in the construction phase. The air quality values have fallen below environmental standards, except dust and PM of which the present values from the field survey and existing data already exceeded the standards.

Therefore, as in the construction phase, it is necessary to mitigate and reduce dust, TSP and PM after construction. The specific mitigation measures for reducing the air quality along project road are suggested in Section 3.7.4 (2). The essential and important points are to keep

the road clean and to reduce the diffusion of dust.

Table 3.7.3 Estimation Result of Air Quality in the AMDAL Study

Parameter	Unit	Location of Air Contamination Level					Environmental Standard
		Pasteur Intersection	Surapati Street	Ujungberung	Cibiru Traffic Circle	Gedebage	
NO_2	µgr/m^3	216.62	216.62	216.62	225.04	216.62	400
SO_2	µgr/m^3	146.6	37.22	52.5	158.7	11.75	900
CO	µgr/m^3	4,846.77	1,439.77	2,726.77	1,556.77	9,746.77	30,000
HC	µgr/m^3	87.37	86.25	86.83	85.47	85.48	160

Source: Analysis Result of the AMDAL Study, dated November 16–21, 2006

3) Noise Level

a. Present Condition

The project area passes through high-density urban districts and along the existing main roads of Bandung City. Therefore, the noise levels at all survey points of the AMDAL Study data exceeded environmental standards (government and public facilities area). It was observed that the high level of noise is an effect of the high density ratio of motorcycles on the traffic volume in Bandung City area.

Table 3.7.4 Test Results of Noise Level in the AMDAL Study (2006)

Parameter	Unit	Survey Point					Environmental Standard
		Pasteur Intersection	Surapati Street	Ujungberung	Cibiru Traffic Circle	Gedebage	
Noise level	dB(A)	66.3-83.6	60.1-82.1	64.9-84.5	68.3– 82.4	59.3-80.5	60.0

Source : Analysis Result of the AMDAL Study, dated November 16th–21, 2006

: exceeding the Environmental Standard Value

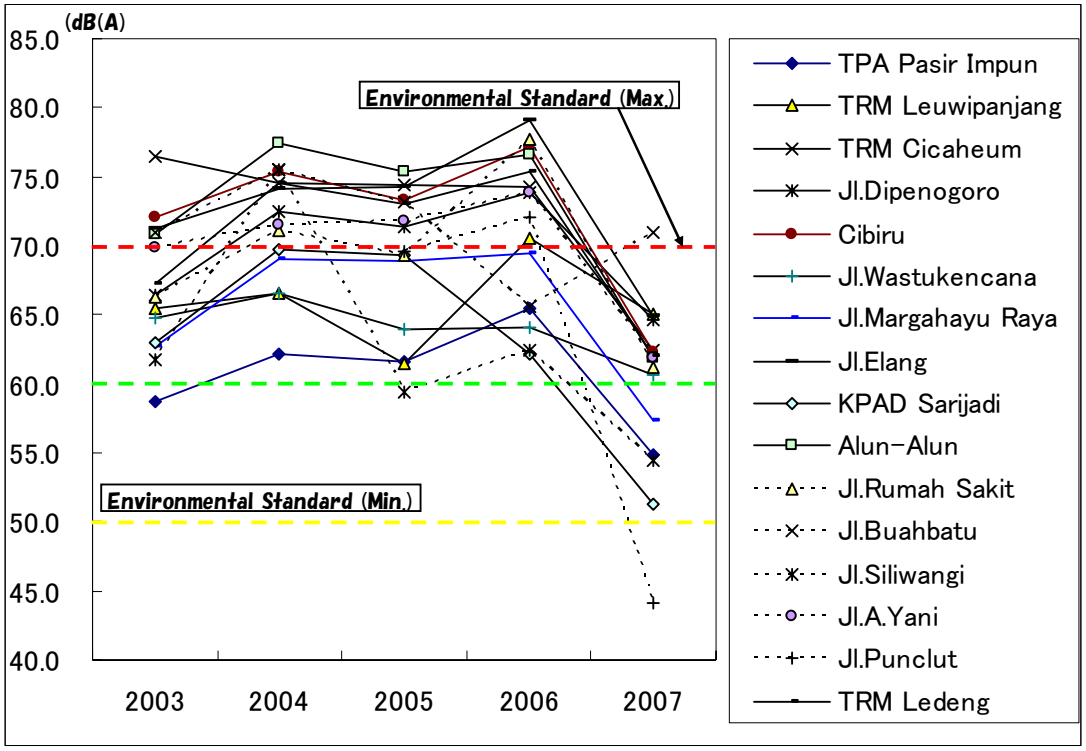
The environmental standard of noise levels in Indonesia is shown in Table 3.7.5.

Table 3.7.5 Environmental Standard of Noise Level

Land Use / Type of Activity	Noise Level dB (A)
	State Decree of Environment Ministry No.48 1996
a. Land Use	
1. Housing and Settlement	55
2. Commercial and Service	70
3. Office Buildings and Commercial	65
4. Green Open Space	50
5. Industry	70
6. Government and Public Facilities	60
7. Recreation	70
8. Special:	
- Airport *)	—
- Railway Station *)	—
- Port	70
- Culture Preserve	60
b. Type of Activity	
1. Hospital or the like	55
2. School or the like	55
3. Worship place or the like	55

Notes: *) adjusted with regulation of Ministry of Transportation Affairs

The existing BPLHD survey results in Bandung City indicate that the noise levels have been decreasing regularly in recent years, but still exceeded the environmental standard at most of the survey points. The noise level results depended on the time of survey, and it seems that the huge volume of motorcycles has affected the levels considerably. The application of environmental standard depends on the existing land use of the affected area. Therefore, in the case of high traffic volume, noise levels at the road side often exceeded the environmental standard.



Source : Analysis Result of BPLHD in Bandung City, 2003 to 2007

Figure 3.7.2 Progress of Noise Level in Bandung City (2003 to 2007)

b. Construction Phase

Noise impacts during the construction phase are caused by materials conveyance activities, actual construction of the road, and piling operations. Based on the AMDAL study data, the noise levels of construction activities range from 72 dB(A) to 90 dB(A) at a 10-m distance away from the noise source.

These noise levels already exceed the maximum values of environmental standards for commercial and service, industry and recreation areas. For this reason, it is important and necessary to consider suitable mitigation measures for noise impact, particularly near and around schools and hospitals. Moreover, the contractor should be encouraged to utilize low-noise equipment and methods of construction. The right and proper operation time in high-density areas along the project road should also be taken into account.

c. Post-Construction Phase

The estimation of noise levels during the operation phase was not undertaken in the AMDAL study. However, noise levels in 2006 and 2007 already exceeded environmental standards at most of the survey points. Therefore, appropriate mitigation measures should be implemented in the surrounding areas of schools, universities and hospitals, which are facilities most sensitive to noise pollution in urban and dense areas. As a possible urban development measure in the future, the setting of buffer zones and green belts should be recommended and proposed to address against noise pollution caused by traffic.

4) Vibration Level

There are no available existing data on vibration level in Bandung City and a vibration survey was not also conducted in the AMDAL study. However, some indications and requirements for the vibration survey along the project road were suggested and recorded in the minutes of the public consultation meeting in the AMDAL study.

Therefore, the JICA Survey Team proposes the conduct of vibration surveys during the pre-construction, construction and post-construction phases. The impact of vibration on this project will be assessed and estimated by comparing the data of vibration levels in the pre-construction and post-construction phases. It is also considered that the vibration data in the construction phase would be the essential materials for account to explain in case of complaints by residents around the project area.

The environmental standard for vibration level in Indonesia is provided by the State Decree of Environment Ministry (No.48, 1996). Each frequency level is divided into four categories of comfort or personal feeling, namely undisturbed, disturbed, discomfort or hurting. The environmental standard is shown in Table 3.7.6.

Table 3.7.6 Environmental Standard of Vibration Level

Rate of Vibration Level in micron (10^{-6} meter)				
Frequency	Undisturbed	Disturbed	Discomfort	Hurting
4	<100	100-500	>500-1,000	>1,000
5	<80	80-350	>350-1,000	>1,000
6.3	<70	70-275	>275-1,000	>1,000
8	<50	50-160	>160-500	>500
10	<37	37-120	>120-300	>300
12.5	<32	32-90	>90-220	>220
16	<25	25-60	>60-120	>120
20	<20	20-40	>40-85	>85
25	<17	17-30	>30-50	>50
31.5	<12	12-20	>20-30	>30
40	<9	9-15	>15-20	>20
50	<8	8-12	>12-15	>15
63	<6	6-9	>9-12	>12

Remarks : State Decree of Environment Ministry (No.48 1996)

5) Water Quality

a. Ground Water

Since excavation work will be limited to the Gasibu underpass construction and the main structures will be viaducts by the pc-box applying the pile foundation and embankment, this project is not expected to affect groundwater quality. The results of the well water quality analysis in the AMDAL Study confirmed that the maximum requirements of clean water values were not exceeded, except for the values of the nitrate and fecal-coliform parameters at the Cimekar well in Cileunyi.

Table 3.7.7 Result of Ground Water Analysis (2006)

No.	PARAMETER	Unit	Maximum Requirement	Sampling Point	
				Ujungberung Well	Cimekar Well in Cileunyi
Physical Factor					
1	Odor	-	Inodorous	Inodorous	Inodorous
2	Color	-	50	43	13
3	Total Dissolved Solids (TDS)	PTCo	1,500	470	93.5
4	Turbidity	NTU	25	3.32	1.36
5	Temperature	^{O}C	Air Temperature $\pm$ 3^{O}C	27.0	26.8
Chemical Factor					
1	Aluminum (AL)	mg/L	0.2	0.017	< 0.008
2	Iron (Fe)	mg/L	1.0	0,39	< 0.02
3	Fluoride (F)	mg/L	1.5	0.12	0.06
4	Calcium Carbonate ($CaCO_3$)	mg/L	500	240	324
5	Chloride (Cl_2)	mg/L	600	13.4	21.84
6	Manganese (Mn)	mg/L	0.5	0.08	< 0.05
7	Nitrate (NO_3-N)	mg/L	10	< 0.1	19.9
8	Nitrite (NO_2-N)	mg/L	1	0,01	0.73
9	pH	-	6.5 – 9.0	7.71	7.81
10	Sulphate (SO_4)	mg/L	400	4.91	6.01
11	Organic matter ($KMnO_4$)	mg/L	10	5.6	4.9
Microbiology Factor					
1	Fecal- Coliforms	MNP/100 ml	50	0	150
2	Total Coliforms	MNP/100 ml	-	0	150

Source : Analysis Result of AMDAL Study, November 2006

: exceeding the Maximum Requirement Value

b. Surface Water

As this project road passes through urban and suburban areas in Bandung City, some rivers in the city cross the alignment of project road. Most of the rivers in Bandung City flow from north to south and merge with the Citarum River at the southern area of the city where flows east to west in Bandung Regency.

Some factors of river water quality are relatively worse than the Class II values of the environmental standard. The results of the river water analysis in the AMDAL study gave an indication of the characteristics of rivers in the city. The values of ammonium (NH_3-N) and nitrite (NO_2 -N) are relatively high, because the river water around the project area is polluted by domestic wastewater from neighboring households, restaurants and factories. In the future, once the sewerage system in Bandung progresses, then river water quality is expected to be better than its present condition.

Table 3.7.8 Result of Surface Water Analysis (2006)

No	PARAMETER	Unit	Sampling Point			Governmental Regulations No.82-2001 Class II	West Jawa Regulations No.39-2000 Category D
			Citepus River	Cicabe River	Cinambo River		
Physical Factor							
1	TSS	mg/L				50	-
2	Color	ICU	192	247	299	-	-
3	EC	µh/cm	1,470	923	933	-	2,250
4	Total Dissolved Solids	mg/L	705	436	442	1,000	1,000
5	Turbidity	NTU	2.63	14.7	12.4	50	-
6	Temperature	°C	26.8	26.8	26.8	Deviation 3	Normal Temp.
Chemical factor							
1	Ammonium (NH_3-N)	mg/L	11.05	13.45	0.7	0.2	-
2	Iron (Fe)	mg/L	-	-	-		-
3	Cadmium (Cd)	mg/L	-	-	-	0.01	0.01
4	Fluorine (F)	mg/L	0.4	0.06	0.26		-
5	Chloride (Cl)	mg/L	30.27	17.37	51.12		-
6	Total Chromium (Cr)	mg/L	< 0.01	0.175	0.2		-
7	Manganese (Mn)	mg/L	0.11	0.34	0.05		2.0
8	Nitrate (NO_3-N)	mg/L	1.7	0.9	<0.1		-
9	Nitrite (NO_2-N)	mg/L	0.17	0.02	0.237	0.06	-
10	pH		7.80	7.65	7.84	6 – 9	6.0 – 9.0
Organic Chemical Factor							
1	Oil/ Grease	mg/L	< 1	<1	< 1		-
2	Dissolved Oxygen (DO)	mg/L	4.09	3.27	3.46		-

Source : Analysis Result of the AMDAL Study, November 2006

: exceeding the Environmental Standard Value

Table 3.7.9 Result of Surface Water Analysis in Bandung City (2007)

River Name	Sampling Point	Electric Conductivity (EC)	Turbidity	Total Dissolved Solids (TDS)	Temp.	Color	Ammonium (NH3-N)	Iron (Fe)	Boron (B)	Fluorine (F-)	Cadmium (Cd)	Chlouride (Cl-)	Chromium (Cr6+)	Manganese (Mn)	Nickel (Ni)	Nitrate (NO3-N)	Nitrite (NO2-N)	pH	Zinc (Zn)	Sulphate (SO4)	Copper (Cu)	Lead (Pb)	BOD5	COD	MBAS (Detergent)	Phenol	Mineral /oil	Disolved Oxigen (DO)	Fecal Coliform
		µh/cm	NTU	mg/l	℃	TCU	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/100ml
1. Cikapundung	Dago Pakar	233	64	108.5	22.7	25	1.43	0.95	< 0.2	0.25	< 0.003	10.5	0.12	1.06	0.01	0.16	0.6	7.85	0.14	15.96	0.2	< 0.01	10	14.98	0.09	tt	< 1	2.95	2.4×10^3
	Jl. Wastukencana	371	6.33	173.7	25.8	13	2.46	0.55	< 0.2	0.42	0.007	28.99	0.18	0.17	< 0.007	0.33	0.54	7.47	0.06	21.24	0.1	< 0.01	100	120.96	0.68	0.01	< 1	2.5	2.4×10^3
2. Archaic Cikapundung	Taman Cibeunying	327	9.11	153.1	24.7	137	0.65	0.19	< 0.2	0.62	0.006	34.99	< 0.01	0.1	0.02	0.21	0.04	7	0.23	19.76	< 0.02	0.08	50	81.84	0.56	0.02	< 1	2.8	4.6×10^4
3. Cicadas	Jl. Sadang Serang	742	18.40	356	22.8	159	1.4	4.47	< 0.2	0.54	< 0.003	23.99	0.07	0.14	0.02	0.22	0.04	7.84	0.35	8.77	0.1	0.06	40	50.15	6.33	0.006	< 1	2.5	2.4×10^5
4. Cidurian	After Cikutra	523	8.80	244	28.3	171	1.31	0.85	< 0.2	0.13	0.009	37.74	0.04	0.16	0.01	0.21	0.06	7	0.04	26.5	0.04	0.02	100	110.46	1.13	0.01	< 1	2.2	2.4×10^5
	Jl. Soekarno Hatta	453	9.18	213	27.0	251	2.29	1.36	< 0.2	0.48	0.01	48.98	0.1	0.08	0.04	0.22	0.03	6.5	0.03	10.5	0.02	0.07	120	151.6	2.2	0.03	< 1	2.7	23
5. Citepus	Jl. Sederhana	703	31.30	333	24.6	1,150	16.6	0.79	< 0.2	0.6	< 0.003	40.74	0.32	0.31	0.01	0.18	0.18	7.23	0.09	44.66	< 0.02	0.09	250	349.12	4.19	< 0.005	< 1	1.95	2.4×10^5
	Jl. Kebon Jati	764	15.50	366	24.8	1,259	21.9	2.13	< 0.2	0.37	0.026	60.88	0.22	0.23	0.21	0.25	0.05	7.52	0.22	14.24	< 0.02	0.25	320	462.4	9.57	0.02	< 1	1.5	2.4×10^5
6. Cicadas Creek	Jl. Karawang	706	31.4	334	28.1	508	2.44	3.42	< 0.2	0.11	0.005	132.21	0.02	0.35	0.01	0.22	0.25	6.5	0.22	56.97	0.27	0.16	85	104.41	1.35	0.002	< 1	0.85	2.4×10^3
	Before Cicadas river	953	21.50	460	29.8	496	1.37	1.91	< 0.2	0.16	0.02	61.98	0.3	0.32	< 0.007	0.22	0.25	6.77	< 0.02	29.6	0.34	0.3	300	467.24	2.2	0.01	< 1	0.9	2.4×10^3
7. Cipamokolan	JL. A. Yani	918	10.5	439	27.6	367	1.71	0.91	< 0.2	0.23	0.03	78.22	< 0.01	0.22	0.03	0.21	0.12	6.5	0.06	96.94	< 0.02	0.07	60	84.66	1.3	0.02	< 1	2.5	2.4×10^5
	Jl. Soekarno Hatta	405	12.60	229	32.0	237	2.03	0.78	< 0.2	0.45	0.01	36.99	< 0.01	0.25	0.12	0.22	0.06	7	0.05	3.58	< 0.02	0.2	300	360.4	3.7	0.02	< 1	2.5	2.4×10^5
8. Cisaranten	Jl. Raya Ujung Berung	219	78.6	88.2	24.7	19	0.43	5.47	< 0.2	0.19	0.003	17.99	0.05	0.05	0.02	0.45	1.27	7.26	0.06	13.85	0.76	< 0.01	80	176.57	< 0.01	tt	< 1	2.7	2,400
	Jl. Soekarno Hatta	342	71.90	13.8	25.3	43	1	7.7	< 0.2	< 0.02	0.01	<0.5	0.69	0.58	0.05	0.25	0.86	7.02	0.07	83.96	5.34	< 0.01	100	193.53	0.2	0.005	< 1	2.5	150
9. Cipanjalu	Intake PDAM	187	53.3	40.4	25.3	17	1.06	5.27	< 0.2	< 0.02	0.006	6.5	0.31	0.17	0.04	0.19	0.04	7.16	< 0.01	11.66	2.93	< 0.01	40	67.73	0.02	0.006	< 1	2.9	43
	Jl. Soekarno Hatta	442	24.90	126.3	25.2	34	1.52	4.1	< 0.2	< 0.02	0.004	61.98	0.02	0.12	0.02	0.38	1.43	7.46	0.13	38.8	0.43	< 0.01	80	146.36	0.55	0.009	< 1	2.1	2,400
10. Cinambo	Arcamanik Golf Yard	129	12.4	25.7	25.4	18	0.61	6.18	< 0.2	0.08	0.005	52.98	< 0.01	0.45	0.04	0.23	0.07	7.13	0.07	76.46	3.8	0.04	190	343.1	1.27	0.01	< 1	1.6	2,400
	Jl. Soekarno Hatta	321	59.10	163	25.3	29	1.41	1.22	< 0.2	0.06	0.008	35.99	< 0.01	0.02	0.03	0.2	0.42	7.65	0.03	37.64	0.09	0.01	1,150	225.4	0.36	0.01	< 1	1.9	2,400
11. Cihalarang	Jl. Suci	285	17	136.1	25.2	5	16.95	0.59	< 0.2	< 0.02	0.005	19.42	0.02	0.06	0.03	0.24	0.46	7.8	0.44	4.88	0.01	< 0.01	5.5	12.5	0.07	0.005	< 1	3.9	2,400
	Jl. Soekarno Hatta	549	13.40	264	25.3	37	0.7	1.24	< 0.2	< 0.02	0.01	42.83	0.03	0.1	0.05	0.23	0.02	7.9	0.1	36.1	0.03	0.03	60.5	97.16	1.67	0.01	< 1	1.8	9.3×10^3
12. Cibiru	Cilengkrang Village	366	8.93	174.9	25.4	< 5	5.6	0.85	< 0.2	< 0.02	0.01	20.42	0.01	< 0.05	0.05	0.22	< 0.01	7.7	0.1	5.04	0.02	< 0.01	10	22.17	0.46	tt	< 1	3.2	9
	Jl. Cibiru	380	16.30	183.4	25.0	19	7.15	1.89	< 0.2	< 0.02	0.008	29.88	0.03	< 0.05	0.03	0.21	< 0.01	7.6	0.09	5.11	< 0.02	< 0.01	42	63.7	1.18	0.01	< 1	2.3	93
13. Ciparungpung	Bumi Asri Kompleks	195	80.4	92.5	25.0	39	1.69	5.45	< 0.2	< 0.02	0.006	12.45	0.03	0.09	0.01	0.47	1.58	7.7	0.23	6.23	0.01	< 0.01	5	6.85	0.11	tt	2.33	3.1	2,400
	Jl. Suci	278	103	132.6	25.2	191	3.7	4.42	< 0.2	< 0.02	0.012	17.43	0.03	0.04	0.05	0.13	0.03	7.9	0.41	4.8	0.11	< 0.01	10	16.12	0.47	0.008	< 1	3.4	2,400
	Jl. Purwakarta	405	58	194.1	25.2	183	17.55	2.23	< 0.2	< 0.02	0.018	21.91	0.03	0.09	0.03	0.18	0.02	8.1	0.39	53.52	0.27	< 0.01	30.5	60.47	1.16	0.01	2.84	2.3	44
14. Cikiley	Behind PT. Indosco	267	7.96	127	25.2	146	0.23	0.54	< 0.2	< 0.02	0.003	13.2	0.03	0.07	0.03	0.74	1.46	7.6	0.18	75.4	< 0.02	< 0.01	20	30.2	0.26	0.006	< 1	2.2	2,400
	Jl. Arcamanik	731	31	353	25.4	184	4.45	4.62	< 0.2	< 0.02	0.008	58.52	0.06	0.05	0.03	0.17	0.04	8.7	0.03	200.15	0.02	0.01	20	34.27	2.13	0.01	< 1	2.2	7×10^3
	Jl. Cingised	1,118	47	549	25.1	313	8	6.02	< 0.2	< 0.02	0.012	69.47	0.11	< 0.05	0.03	0.17	0.05	8.6	0.3	235.17	< 0.02	< 0.01	40.2	65.71	2.69	0.01	1.4	1.88	7×10^3
Environmental Standard (River water class I + well water)		**2,250**	**25**	**1,000**	**±3℃**	**50**	**0.5**	**0.3**	**1.0**	**0.5**	**0.01**	**600**	**0.05**	**0.5**	**-**	**10**	**0.06**	**6-9**	**0.05**	**400**	**0.02**	**0.03**	**2.0**	**10**	**0.2**	**0.001**	**1.0**	**> 6.0**	**2,000**

Remarks; tt : below the limit value of quantitative analysis

Source : Analysis Result of BPLHD in Bandung City, 2007

: exceeding the Environmental Standard Value

6) Physiographic, Geologic and Geotechnical Aspects

Topographically, Bandung is divided into two regions: the mountainous northern region with elevation of around 1,050 m above sea level, and the southern region which is relatively flat with elevation of around 675 m.

Bandung City is in a basin and located on the foot of northern mountainous zone. The project road is planned in the northern part of Bandung City that traverses from west to east (Pasteur to Cileunyi in Bandung Regency) and in eastern part passing through from north to south (Ujungberung to Gedebage).

The project road alignment is almost flat and only part of Cikapundung River that flows down from north to south in Bandung City is like a small valley. The existing Pasupati Bridge completed in 2006 crosses the road at this point. Its morphology is a high land with declivity ranging from 0 to 5%. The segment of Ujungberung to Gedebage New IC will traverse mostly flat paddy fields and wetlands.

Part of this area is covered by sediment soil especially in the rubble part of West Jawa geanticlines. Based on the geology map, the kind of stones in the project site belongs to the tuff rock unit. The lithosphere consists of the repeating of fire mountain reaction and also tuff, where each order becomes smooth upward. The color of fire mountain reaction is grey; its fragment is andesite frozen rock. Tuff, which has color of brownish grey, and also granule of rugged smooth, contains gravel of frozen and float rock.

Most of the Bandung area is formed by a depression; there are some volcanoes located in the north, east and south. The possibility of volcanic earthquake is high, considering these are situated in plate tectonics. Moreover, the Lembang Fault is known to be located between Bandung and Lembang City. It is therefore essential and important to consider earthquake-proof construction in the detailed design stage of the project.

7) Hydrology

The BIUT Road Project introduced mostly viaduct structures, except along the route of Ujungberung to Gedebage IC section. The direct impact of flooding along the project road is therefore not so significant. However, some opinions and suggestions on regional flooding were made during the public consultation meeting of the AMDAL study. Actually, regional floods happen frequently from short heavy rainfall during the rainy season in Bandung City and Bandung Regency, especially at the eastern part of the project area.

The improvement of the drainage system and small rivers in the city and regency area should be programmed and considered at the same time of implementation of this project. Coordination among the Bandung City government, Bandung Regency government and Bina Marga is fundamental to the public consultation and cooperation of local communities and residents in the area.

8) Space, Land and Ground

The big shopping mall, hotels, restaurants, hospitals and offices are scattered along the road in the western part of this project, from Dr. Djunjunan Street to Pasupati Bridge, which is on an elevated road with length of 2.3 km and access to the Gasibu area. There are many public offices around the Gasibu area. From Gasibu to Surapati Street, many small shops, traditional markets, factory outlets, trading and houses are densely located in a row along the street. Along PHA.Mustofa Street, some schools are scattered and the condition is almost the same in Surapati Street. Both Surapati and PHA.Mustofa Streets are narrow for huge traffic volume compared with other streets of Bandung City. Some big factories are found along Sindanlaya Street, and the dense area of houses, shops and factories still continues until Ujungberung

District. After passing through Ujungberung IC point to Cibiru traffic circle, some paddy fields, vacant lands and huge factories are scattered along the Project road. The Project alignment passes through the paddy and residential areas to Cileunyi in Bandung Regency away from the existing road.

The project road passes through mostly paddy fields and swamps from Ujungberung IC to Gedebage IC. The military residential area is located around the Ujungberung IC project site and some houses of the military are affected by this project. As some factories are also close to this route, several of them must be necessarily relocated with the implementation of the project. A flyover is planned to cross the Sukarno Hatta Road and Railway, until the Gedebage IC of the existing Padalarang-Cileunyi Toll Road which passes through paddy and wet lands.

The Ujungberung and Gedebage areas are positioned as the two priority districts among six development areas in Bandung City. Both of these areas are fixed secondary centers, which is an effort to develop Bandung City as it is planned. These fixed secondary centers are particularly meant to reduce the concentration of inhabitants to the center of the city and consequently reduce urban problems such as traffic jams and overpopulation.

A new town development of 3,600 ha in Bandung Regency is planned at the southern area of Gedebage IC. This development plan is proposed in the national spatial plan. The extension of the toll road to the southern part of Gedebage IC is thus expected to contribute towards the development of Bandung Regency.

9) Ecosystem and Endangered Species

a. Terrestrial Flora

Endemic and protected species of terrestrial and aquatic flora and fauna in or around the project area are not mentioned in the AMDAL report and the previous investigation reports. Only common species of flora, vegetation plants and flowers as well as fauna, poultry and usual fishes in small rivers are confirmed through the field reconnaissance of the area. Precious diversity of terrestrial and aquatic biota has not been reported and discovered either.

However, if during the construction phase, some endemic and/or protected species of flora or fauna will be found, it is important to confirm the species existence and to report this to concerned authorities. In addition, proper countermeasures and positive protection programs should be implemented effectually.

b. Fauna

The endemic and protected species of terrestrial and aquatic fauna are not reported in/around Project area. Only common species of fauna, poultry and usual fishes in small rivers are confirmed by field reconnaissance in Project area. The precious diversities of terrestrial and aquatic biota are not reported and discovered too.

However, if during construction phase some endemic and/or protected species of terrestrial and aquatic fauna will be found out, it is important to confirm the existence of species and to report toward concerning authorities. In addition, the proper countermeasures and positive protection programs should be implemented effectually also.

10) Community consultations

The public consultation meeting during the AMDAL study was conducted three times in 2006. Furthermore, a social interview survey of project-affected persons (PAPs) was implemented, and collected 180 samples.

The environmental items taken up in the public consultation meetings are the following:

- Deterioration of the levels of traffic impacts (air pollution, noise, and vibration)
- Consideration for worsening of floods (physical and technical aspects)
- Geology and hydrology (erosion, soil runoff, drainage and river system)
- Traffic condition (congestion, safety for children and the elderly)

The attendance in these public consultation meetings were mainly members of the West Jawa, Bandung City and Bandung Regency district and sub-district governments. Representatives of local communities, business, public services, academe and NGOs were not included.

The environmental problems that were indicated in the results of the social interview survey include traffic jams, air pollution, noise and dirty environment.

11) Environmental Management Plan (RKL)

The RKL proposed a detailed environmental management plan to the executing, supervision and presentation authorities. Components of the RKL consist of the following:

- Impact type
- Source of impact
- Impact parameter
- Target of environmental management
- Environmental management plan
- Location of impact management
- Impact management period
- Defrayal of environmental management
- Environmental management institution

The executing agencies for environmental management are the Department of Public Works and Directorate General of Highways (Bina Marga). These relevant authorities will be responsible for the supervision of environmental management of the impacts. The management report should be submitted properly and timely to the BPLHD Province, BPLHD Bandung City, BPLHD Bandung Regency and other relevant authorities.

The management plans for construction activities such as earthworks, structures, main road works and drainage works have not been prepared in RKL. In addition, a traffic management plan should be prepared for RKL.

12) Environmental Monitoring Plan (RPL)

The RPL report recommended an environmental monitoring program which would be implemented in the three phases of the project: During construction (expected three years for each construction phase); Operation (for three years when the project is operated).

Similar to the environmental management program, the Department of Public Works and Directorate General of Highway (Bina Marga) should execute the monitoring of environmental items. Mainly, the BPLHD (West Jawa Province, Bandung City and Bandung Regency) and relevant authorities should supervise the monitoring programs and the

evaluation of reports.

Table 3.7.10 Environmental Monitoring Items for the Project

Item	Construction phase	Post-construction phase
Air quality		
1. Parameter	CO, NO_2, HC, SO_2, TSP	CO, NO_2, HC, SO_2, TSP
2. Frequency	2 times a year	2 times a year
3. Location	5 points	5 points
Noise		
1. Parameter	L_{10}, L_{90}, L_{50}	L_{10}, L_{90}, L_{50}
2. Frequency	2 times a year 10 minutes/hour during construction operation time for 1 point	Once a year 10 minutes/hour in 24 hours for 1 point
3. Location	5 points	5 points
Surface water		
1. Parameter	TSS, BOD, COD, DO, oil and grease, coliform	―
2. Frequency	Once in 6 months During excavation and embankment works	―
3. Location	River and irrigation channel	―

Source : RPL report of AMDAL Study, November 2006

The JICA Survey Team recommends that some items such as PM_{10} and Pb density be added to the air quality parameters. For noise pollution, it is expected that the parameter of L_{eq} will be surveyed as soon as possible, and some points near the schools and hospitals will be selected for sampling during the construction phase.

The vibration survey that was required in the public consultation meetings of the AMDAL study should be implemented during construction and post-construction phase. The sampling points of vibration are located in the same sites as the noise survey points.

It is important that the reporting procedure and system should be clarified so that information will be sufficiently and promptly disseminated to responsible stakeholders. Moreover, to ensure the preparation of the environmental management plan, the environmental provisions should be prepared separately and incorporated into the bid and contract documents as possible.

(2) Confirmation of the Necessary Supplemental Components for Study Assistance

1) Control and Considerable Points Survey

The Gedung Sate, which is utilized for the office of West Jawa Governor, is the only heritage and monument along the project road. However, the location of the monument is about 300 m from the project road, thus it is judged that the road's direct effect on the building is almost insignificant.

There are no other critical and control points for the design of the road alignment along the existing road and in the Ujungberung and Gedebage areas. However, as this project road

passes through the dense area in Bandung City, many buildings, houses, offices and shops will be subjected to relocation. Some schools, small-scale universities, mosques and hospitals are included in relocated buildings, but these public facilities are not traditional and essential. Therefore, if proper relocation programs are prepared and proposed for relevant stakeholders, land acquisition can be implemented smoothly together with appropriate social development activities by the local government.

Most of the structures to be relocated are houses, offices and shops and therefore, it is important to minimize their number by considering to avoid their locations in the road alignment and design.

2) Air quality

a. Construction Phase

Since the construction plan for this project road is not completed yet, it is difficult to estimate accurately the number of trucks, vehicles for labor movement and construction equipment. However, the number of vehicles and equipment for construction is relatively small compared to the operation vehicles in arterial road.

Therefore, the impact on air quality of the conveyance of materials and construction activities will not be significant. The present densities of air quality satisfy the environmental standard, except the TSP and PM. If the environmental management program will be properly implemented and mitigation measures for construction activities will be steadily and continuously carried out by the contractor, it is predicted that air quality would not extremely deteriorate.

During construction, it is assumed that the number of light vehicles will be 30 vehicles/hour and heavy vehicles will also be the same number, with an assumed average speed of 20 km/h.

The results of the air quality estimation are low compared to the environmental standard, even if the present densities of air quality are supposed to be the background densities for each parameter. However, since the PM_{10} exceeded the environmental standard values at most of the survey points in Bandung City, it is possible that the estimation result for PM_{10} will also be exceeded the environmental standard.

Table 3.7.11 Estimation Result of Air Quality during Construction Phase

Pollutant	Kinds of Vehicles	Volume	Source / Vehicles	Number of Pollution	Velocity Factor	Total	Numbers of Pollutant	Background Pollutant Density	Estimated Pollutant Density
1	2	3	4	5=(3x4)	6	7=(5x6)	Light + Heavy		
CO	Light	30	0.35	10.5	3.05	32.03	43.01	15,383	15,384
	Heavy	30	0.256	7.7	1.43	10.98	(ppm)	(μg/m3)	(μg/m3)
HC	Light	30	68.4	2,052.0	3	6,156.00	8.1	2.34	2.43
	Heavy	30	32.22	966.6	1.98	1,913.87	(ppm)	(μg/m3)	(μg/m3)
NOx	Light	30	138.7	4,161.0	0.77	3,203.97	21.91	138.0	138.9
	Heavy	30	629.7	18,891.0	0.99	18,702.09	(ppm)	(μg/m3)	(μg/m3)
PM	Light	30	4.58	137.4	1.04	142.90	3.68	118.4	122.1
	Heavy	30	124.1	3,723.0	0.95	3,536.85	(μg/m3)	(μg/m3)	(μg/m3)

The background pollutant density of CO, NO2 and PM is hypothesized as the average of each pollutant data record from 2003 to 2007 in Bandung City. The background pollutant density

of HC is applied the survey data of EIA study stage in 2006. The estimated pollutant density is added the background pollutant density to the converted pollutant density of construction vehicles by adopting the equation of state of a classical ideal gas.

b. Post-Construction Phase

The estimation of air quality along the project road during post-construction phase was undertaken by applying the same methodology as the AMDAL study. In this case, the estimation for the arterial road and toll road should be separate, because the average speed of vehicles and traffic volume are considerably different.

The traffic volumes which were utilized for the estimation of air quality are shown in Tables 3.7.12 ~ 3.7.15. Motorcycles were included in light vehicles category.

Table 3.7.12 Traffic Volume for Estimation of Air Quality in 2015 (Arterial Road)

Unit: vehicles/day

Kinds of Vehicles	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
Light	82,224	40,203	24,119	55,972	-
Heavy	604	409	465	1,243	-
Total	82,827	40,612	24,584	57,215	-

Table 3.7.13 Traffic Volume for Estimation of Air Quality in 2015 (Toll Road)

Unit: vehicles/day

Kinds of Vehicles	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
Light	19,865	-	-	-	20,070
Heavy	277	-	-	-	537
Total	20,142	-	-	-	20,607

Table 3.7.14 Traffic Volume for Estimation of Air Quality in 2020 (Arterial Road)

Unit: vehicles/day

Kinds of Vehicles	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
Light	166,654	64,301	38,808	97,117	-
Heavy	1,256	638	652	812	-
Total	167,910	64,939	39,460	97,929	-

Table 3.7.15 Traffic Volume for Estimation of Air Quality in 2020 (Toll Road)

Unit: vehicles/day

Kinds of Vehicles	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
Light	26,858	20,163	8,889	14,973	22,438
Heavy	375	281	122	209	596
Total	27,233	20,444	9,011	15.182	23,034

The estimation factors for the arterial road and toll road are shown in Tables 3.7.16 ~ 3.7.17.

The average speed in the arterial road is assumed to be 30 km/hour while that in the toll road is assumed at 55 km/hour. The peak ratio of traffic volume is presumed to be 9.5%, while the peak traffic volume is calculated for the estimation of air quality parameters.

Table 3.7.16 Estimation Factors for Air Quality (Arterial Road)

Pollutant	Kinds of Vehicles	Average Speed	Source / Vehicles	Velocity Factor
CO	Light	30	0.26	3.05
	Heavy	30	0.19	1.43
HC	Light	30	50.7	3.00
	Heavy	30	23.88	1.98
NOx	Light	30	103.2	0.77
	Heavy	30	468.5	0.99
PM	Light	30	3.44	1.04
	Heavy	30	93.2	0.95

Table 3.7.17 Estimation Factors for Air Quality (Toll Road)

Pollutant	Kinds of Vehicles	Average Speed	Source / Vehicles	Velocity Factor
CO	Light	55	0.134	0.95
	Heavy	55	0.096	1.06
HC	Light	55	26.0	1.10
	Heavy	55	12.25	1.52
NOx	Light	55	53.4	0.79
	Heavy	55	242.4	0.85
PM	Light	55	1.8	0.89
	Heavy	55	48.8	0.82

The estimation of air pollution caused by project activities has been predicted using the following equation:

$$E = (Vol \times Pollutant\ Factor) \times Velocity\ factor$$

Where: E : Pollutant Increasing ($\mu g/m^3$)
Vol : Volume of Vehicles (vehicle/hour)
Pollutant Factor : Factor in each pollution items
Velocity Factor : Factor in the speed of the vehicle

The density of NOx and PM in 2015 and 2020 is predicted to be at a considerably high level, because the background pollutant density of each pollutant parameter is estimated relatively high. Thus, it is possible that NO_2 and PM will exceed the environmental standard values. However, the density of air contamination will be diffused and regulation of exhaust gases from vehicles is reinforced by government. The change to new types of cars will progress rapidly and the improvement of fuel will be developed by production.

For the post-construction phase, air pollution caused by the vehicles needs to be evaluated. The air quality does not deteriorate simply and immediately at the time that the traffic density increases as the main cause of air pollution. It is necessary to investigate the composition of operating vehicles, the kind of fuel, exhaust gas quality and so on for unerring anticipation of air quality.

In the long term, the traffic density will be increasing gradually, therefore, regular monitoring, analysis and evaluation are recommended. Environmental buffer zones along the road should be created beforehand to cope with air quality deterioration in the target area, where the population will be concentrated in the future.

The estimation results of air quality in 2015 and 2020 are shown in following tables.

Table 3.7.18 Estimation Result of Air Quality during Post-Construction Phase in 2015

Pollutant Parameter	Unit	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
CO	ppm	2,903	1,045	632	1,470	786
HC	ppm	555.80	200.14	120.97	281.45	149.96
NOx	ppm	322.23	123.05	82.62	198.88	90.64
PM	µg/m3	19.36	8.39	6.71	16.94	5.93

Table 3.7.18-1 Estimation Result of Air Quality during Post-Construction Phase in 2015

Pollutant Parameter	Unit	Background Pollutant Density	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
CO	µg/m3	15,383	15,442.2	15,409.1	15,398.8	15,419.7	15,389.2
HC	µg/m3	2.34	7.7	4.7	3.7	5.6	3.0
NOx	µg/m3	138.0	151.3	143.0	141.4	146.2	141.7
PM	µg/m3	118.4	137.1	126.8	125.1	135.3	123.5

Table 3.7.19 Estimation Result of Air Quality during Post-Construction Phase in 2020

Pollutant Parameter	Unit	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
CO	ppm	5,363	2,455	1,876	1,923	879
HC	ppm	1,026.91	469.84	359.14	367.78	167.64
NOx	ppm	597.95	278.86	217.77	231.04	101.23
PM	µg/m3	36.32	17.65	14.42	16.36	6.61

Table 3.7.19-1 Estimation Result of Air Quality during Post-Construction Phase in 2020

Pollutant Parameter	Unit	Background Pollutant Density	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
CO	µg/m3	15,383	15,498.9	15,430.8	15,423.9	15,421.0	15,389.9
HC	µg/m3	2.34	12.8	6.7	6.0	5.8	3.1
NOx	µg/m3	138.0	162.6	149.5	147.0	147.5	142.2
PM	µg/m3	118.4	153.8	135.4	132.5	134.2	124.1

The background pollutant density of each parameter is hypothesized as same as the construction phase. The estimated pollutant density is calculated by adopting the equation of state of a classical ideal gas.

3) Noise and vibration

a. Construction Phase

As previously discussed above, the construction plan for this project road is not defined yet, thus it is difficult to estimate accurately the number of trucks, vehicles for labor movement and construction equipment necessary in the same manner as the estimation of air quality. However, the number of construction vehicles and equipment is relatively small. Therefore, it seems that the impact of noise and vibration to be caused by the conveyance of materials and construction activities will not be significant. However, the present noise levels have already exceeded the environmental standard at the maximum noise level along the project road. Thus, even if the environmental management program will be properly implemented and mitigation measures for construction activities will be steadily carried out by the contractor, it is expected that maximum noise levels, especially during the construction phase, will not satisfy environmental standards.

The sites where the contractor must consider to sufficiently mitigate and control the noise levels are near schools, universities and hospitals. Moreover, for the construction activities which include land leveling, piling and concreting, it is necessary to give notice on the operation time and position, number of machineries/equipment, and proper maintenance.

b. Post-construction Phase

The estimation of the noise level along the project road was undertaken by applying the methodology as following equation.

$$\text{Noise Level} = L_{10} + C1 + C2 + C3 + C4$$

Where:

L_{10} = Basic Noise Level
= 42.2 + 10 Log q dB(A)
q : traffic flow (vehicles/hour)

C1 = Correction factor for average speed of heavy vehicles
= 33 log (V + 40 + 500/V) + 10 log (1 + 5P/V)－68.8 dB(A)
V : average speed (km/hour)
P : Percentage of heavy vehicles (%)

C2 = Correction factor for gradient
Gradient %, C2 = 0 dB (A)

C3 = Correction factor for pavement surface
= (4 – 0.03p)
p : efficient value of pavement p = 10 (presumed value)

C4 = Correction factor for condition between noise source and receptor
= －Log (d'/13.5) dB(A)
d' : Distance of noise source (m)

The average speed of heavy vehicles is assumed to be the same as in the estimation of air quality, i.e., 30 km/hour on arterial road and toll road speed is assumed at 55 km/hour. The peak ratio of traffic volume is presumed to also be the same as the air quality parameter.

The efficient value of pavement is presumed 10, and the distance of noise source is assumed 20m for arterial road and 30m for toll road.

The noise levels at arterial roads and toll roads are calculated individually, because each structure is different from the other such as upgrade and viaduct, and the average speed also varies on each road. After each calculation, both of the noise levels are compounded by energy formulation as follows;

$$\text{Noise Level} = 10 \log (10L_1/10 + 10 L_2/10 + \cdots + 10 Ln/10)$$

Ln = Noise Level

The noise levels at the roadside exceed environmental standard at present. In the post-construction phase, the noise levels are estimated to exceed environmental standards at all points along the project road. The estimated results of noise levels in 2015 are shown Table 3.7.20 ~ 3.7.22.

Table 3.7.20 Estimation Result of Noise Level in 2015 (Arterial Road)

Estimation Point	Traffic Volume (vehicles/hour)		L10	C1	C2	C3	C4	Noise dB(A)
	Light	Heavy						
Pasteur	82,224	604	81.16	-4.35	0	3.7	-0.1707	80.34
Surapati Street	40,203	443	78.07	-4.13	0	3.7	-0.1707	77.47
Ujung berung	24,119	465	75.88	-3.66	0	3.7	-0.1707	75.75
Cibiru Traffic Circle	55,972	1,243	79.55	-3.51	0	3.7	-0.1707	79.57
Gedebage	-	-						

Table 3.7.21 Estimation Result of Noise Level in 2015 (Toll Road)

Estimation Point	Traffic Volume (vehicles/hour)		L10	C1	C2	C3	C4	Noise dB(A)
	Light	Heavy						
Pasteur	19,865	277	75.02	-1.71	0	3.7	-0.3468	76.66
Surapati Street	-	-						
Ujung berung	-	-						
Cibiru Traffic Circle	-	-						
Gedebage	20,070	537	75.12	-1.30	0	3.7	-0.3468	77.17

Table 3.7.22 Estimation Result of Noise Level in 2015 (Roadside)

Estimation Point	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
Noise Level dB(A)	81.88	77.47	75.75	79.57	77.17

The estimated results of noise level in 2020 are shown Table 3.7.23 ~ 3.7.25.

Table 3.7.23 Estimation Result of Noise Level in 2020 (Arterial Road)

Estimation Point	Traffic Volume (vehicles/hour)		L10	C1	C2	C3	C4	Noise dB(A)
	Light	Heavy						
Pasteur	166,654	1,256	84.23	-4.34	0	3.7	-0.1707	83.42
Surapati Street	64,301	638	80.10	-4.19	0	3.7	-0.1707	79.44
Ujung berung	38,808	652	77.94	-3.79	0	3.7	-0.1707	77.67
Cibiru Traffic Circle	97,117	812	81.89	-4.29	0	3.7	-0.1707	81.13
Gedebage	-	-						

Table 3.7.24 Estimation Result of Noise Level in 2020 (Toll Road)

Estimation Point	Traffic Volume (vehicles/hour)		L10	C1	C2	C3	C4	Noise dB(A)
	Light	Heavy						
Pasteur	26,858	209	76.30	-1.93	0	3.7	-0.3468	77.72
urapati Street	20,163	281	75.08	-1.71	0	3.7	-0.3468	77.72
Ujung berung	8,889	122	71.52	-1.72	0	3.7	-0.3468	75.16
Cibiru Traffic Circle	14,973	209	73.79	-1.71	0	3.7	-0.3468	78.43
Gedebage	22,438	596	75.60	-1.31	0	3.7	-0.3468	81.65

Table 3.7.25 Estimation Result of Noise Level in 2020 (Roadside)

Estimation Point	Pasteur	Surapati Street	Ujung berung	Cibiru Traffic Circle	Gedebage
Noise Level dB(A)	84.45	81.68	79.61	82.99	81.65

After the completion of the project, noise will be caused by the operating vehicles on the arterial and toll road. In the future, as it is predicted that the traffic density will certainly increase, countermeasures against traffic noise impact are necessary to be planned for the protection of schools and hospitals along the project road.

Noise and vibration generated by operating vehicles need to be studied. However, their levels do not become higher easily and immediately at the time that traffic density increases. It is necessary to investigate the composition of operating vehicles, their noise and vibration levels, and so on for a correct analysis of noise and vibration.

4) Hydrology

a. Ground Water

The underpass structure in the project road at the Gasibu area is planned not to obstruct the view and landscape from Gedung Sate and not to hinder the traffic of people and vehicles. The depth of excavation of the underpass will be about six meters. As the groundwater depth is reported to be about 7 m in the AMDAL study, it would seem that its impact on groundwater flow will not be so significant. However, it is essential to plan the underpass

with due consideration for the groundwater depth and shield piling depth at the detailed design stage.

b. Surface Water

The rivers that cross the project road alignment flow down from the northern mountainous area to the southern part of Bandung City. Most of the rivers are relatively short and generally with small section, and the catchment areas are also small. However, since the river slopes are gradual and their flow capacities are likewise small, the rivers often overflow during the rainy season. In addition, the rivers are located in crowded areas and their storage areas are insufficient.

Therefore, the requirement of consideration and improvement for rivers and the drainage system were produced in the public consultation meetings of the AMDAL study and supplemental survey. Since the roadside drainage system is poor and the river widths in the urban district are small and narrow, the arterial roads in Bandung City actually become like the river during heavy rainfalls in the rainy season.

The project road is basically designed as a viaduct structure, and thus, the river and drainage flow from north to south would be not disturbed directly by the main road. It is important however to consider for the river and drainage system in the improvement of the arterial road and in the substructure design of piers. The proposal for a storage facility plan using the relocation building sites along the project road should be evaluated and recommended in cooperation with the local government.

5) Sunshine Obstruction

A shade will be formed by this project just below the elevated road body, because the alignment of the Pasteur and Cileunyi section is on the west to east direction. As the sun rises in the east and sets in the west almost right above the road body, the impact of sun shading will be negligible. On the other hand, people in Indonesia usually dislike the direct rays of the sun into a room, thus common houses are usually designed to avoid this from happening.

The alignment of the Ujungberung to Gedebage section is on the north to south direction, but most of the structure in this section is embankment. The shade is limited in and around the flyover of Soekarno Hatta Street and the railway. Paddy fields and swamp areas are spread in and around this section, and there are few houses and buildings relatively along the project road.

6) Radio Wave Disturbance

In Bandung City, cable television is also now popular, although the contract fees and charges are expensive. Therefore, most of residents use the antenna system for receiving TV waves. Along the project road, the antenna system is also utilized for getting TV waves in most of the houses.

Since the transmission office is located in the northwest direction of Bandung City, it is estimated that radio interference will occur only on the south side of this project road. However, receptions of TV waves cannot be exactly determined, and the operation and maintenance of receiving facilities such as antenna and cable are not sufficient.

Therefore, in case of complaints on radio interference, it is suggested that countermeasures such as cable TV are advised, if the cause is judged to be by the project road through a survey of the reception of TV waves.


Photograph 3.7.1 Situation of TV Antenna along Project Road

(3) Recommendation on the Methods of Environmental Management and Monitoring

1) Environmental Management Plan (RKL)

The Environmental Impact Assessment of this project shows that it will negatively impact the environmental conditions along the project road. The Environmental Management Plan (RKL) for the project is therefore one of the more important documents requested by the Government of Indonesia and the JBIC Guidelines. The RKL of this project is already approved by West Java Province in March 2007. The RKL document is prepared to ensure:

- The comprehensive implementation and management of all mitigation measures proposed for the project; and
- The setting-up of an environmental management framework structure for the project.

The RKL can be used as a document guide for the implementation of the above-mentioned activities. The RKL responds to the following roles:

- Definition of the environmental mitigation measures for the impacted targets. These mitigation measures have been incorporated into the engineering design of the project to ensure their implementation.
- Providing an environmental guidance document. The RKL will be the environmental document that will be provided to the construction supervision unit, environmental unit and other project-related institutions during the pre-construction, construction and operation phases.
- Definition of roles and responsibilities of relevant institutions. The roles and responsibilities of the relevant functional organizations and administrative institutions are defined. The approaches for communication and coordination among different institutions are also proposed.
- Development of the programs for environmental monitoring in the pre-construction, construction and operation phases so as to guarantee the effective implementation of the environmental mitigation measures, and to handle unpredictable environmental problems or contingencies at the earliest time possible.

It is important to note that, insofar as possible, the RKL is based on avoidance of environmental impacts, rather than amelioration of their adverse consequences. Avoidance of impacts is always the preferred form of mitigation. This RKL is a working document, which will be updated and finalized at the end of detailed design, before project tender. Realization of these recommendations and a sound Environmental Management Program will require:

- Contractual Mitigation and Monitoring Measures: Recommendations must be backed by adoption of enforceable contract provisions. The recommended mitigation measures are summarized in Section 3.8.4 (2). Within the context of the project and to ensure adherence to the contract provisions, contracts for the project will require contractor-prepared Environmental Management Safety and Traffic Control Plans, specifying how the contract requirements will be implemented and the specific locations of environmentally-sensitive activities (e.g. construction camps, staging areas, locations of hazardous and toxic material storage areas). The requirements for the Safety and Traffic Control Plans should be incorporated into the bid and contract documents of this project. Further, it is expected that the Recommended Contract Provisions will be specified in the Safety and Traffic Control Plans. Incorporation of these recommendations is essential to achieving the project's environmental consideration targets.
- Establishment of Environmental Baselines: The environmental measurement surveys of BPLHD Bandung City and Bandung Regency serve as baseline data for AMDAL. It is essential to fix the baseline data before the construction phase.
- Routine Periodic Environmental Monitoring Procedures: Both observational and instrumented (numeric) monitoring is recommended as part of Environmental Management Program in this project.
- Capacity Development and Personal Training Programs. Incorporation of the critical features of the Environmental Management Program will rely heavily on the day-to-day activities of relevant BPLHD with the assistance of their environmental supervision consultants.

2) Public Consultation

It is very important that public consultation and communications with local communities and residents will continue throughout the construction stage. The objective is to inform the public of construction activities to gain their understanding and support, and to listen to any concerns they may have and suggestions for mitigation of environment and economy. For example, contractors will be requested to inform and to have discussions with affected communities prior to construction activities, which could result in high noise levels. Public opinions and concerns shall be taken into full consideration for properly scheduling noisy construction activities.

A bill board will be erected at some construction sites. This board will briefly explain the activities on the site, and indicate specifically that public concerns and opinions on the environment are welcome anytime. To ensure that public concerns, if any, can be received properly and timely, the board will include specific contact information such as telephone numbers, e-mail address where possible, and contact person’s name, which will be the head and environmental staff of the contractors on that particular site.

3) Environmental Monitoring Plan

Environmental monitoring is important to ensure that environmental impacts are prevented and mitigated by the RKL, to ensure that sound engineering practices are followed and to encourage on-the-job behavior conducive to environmental protection. Both observational and instrumented (numeric) monitoring activities are recommended as part of Environmental Monitoring Program in this project. Observational monitoring refers to routine site investigations and reporting procedures by the Environmental Consultant of the project, supervising engineers and others. Observations in regard to environmental parameters should be an integrated part of these activities. In some instances, numerical monitoring is advisable on a routine basis. In other instances, measurements may be warranted only when there is a demonstrated or perceived reason to do so (e.g. when there is reason to believe that environmental standards are being exceeded).

Environmental monitoring programs should be implemented in two phases: during construction and the operation phase of the project.

It is proposed that the existing data surveyed by BPLHD province, city and regency is applied as the baseline data. Monitoring programs in the construction and operation phases aim to collect data to evaluate the impact of the project and the effectiveness of the mitigation measures.

The objective of the environmental monitoring plan is to verify the prediction of the environmental impact assessment, and determine environmental performance and impacts to surrounding areas. The monitoring plan will also provide a basis for the project executing agency and road operator to prepare environmental policies, take additional actions for mitigation as may be necessary, and minimize adverse impacts.

In the construction stage, the monitoring will be done in two levels: daily and regular monitoring, to be carried out by the contractors and construction supervision companies. Environmental staff will be trained prior to the start of construction for the monitoring.

The objective of the daily monitoring program is to identify environmental issues at the same time as the construction activities on these sites, so that appropriate mitigation actions, if needed, can be initiated and implemented in a timely manner to minimize the impacts. This daily monitoring program consists of data collection in construction activities such as the schedule, number of working persons, number and kind of construction vehicles and equipment, condition of labor camps and surroundings, and so on.

A formal environmental monitoring program will also be carried out during the construction as well as the operation phase. The main objective of this professional environmental monitoring program will be to provide official records on the environmental and regulatory compliance status.

Table 3.7.26 Proposed Environmental Monitoring Items

Item	Construction Phase	Post-Construction Phase
Air quality		
1. Parameter	CO,NO_2,HC,SO_2,TSP, Pb,PH_{10}	CO,NO_2,HC,SO_2,TSP, Pb,PH_{10}
2. Frequency	2 times a year	2 times a year
3. Location	5 points	5 points
Noise & Vibration		
1. Parameter	L_{10}, L_{90}, L_{50}, L_{eq} (noise) Vibration for each freqency	L_{10}, L_{90}, L_{50}, L_{eq} (noise) Vibration for each freqency
2. Frequency	2 times a year 10 minutes/hour in operation time of construction for 1 point	2 time a year 10 minutes/hour in 24 hours for 1 point
3. Location	5 points, including some points near and around schools and hospitals	5 points
Surface water		
1. Parameter	TSS, BOD, COD, DO, oil and grease, coliform	―
2. Frequency	Once in 6 months During digging and embankment works	―
3. Location	River and irrigation Channel	―

4) Reporting and Data Management

Environmental monitoring data is highly valuable in environmental management and pollution control. The survey data will demonstrate whether the actual environmental performance and environmental impacts are as predicted by the AMDAL which will also provide a basis for appropriate and necessary actions. The reports and data will help create an environmental database for the whole system and it will be managed by the provincial, city and regency BPLHD.

More specifically, the environmental monitoring reports will contain:

- Raw data (coefficients, monitoring locations, monitoring/sample collection time, statistics, environmental quality analysis) and recommendations for further action where needed;
- Reporting frequency: once every six months for a quarterly report and once a year for comprehensive reports;
- Reporting to: West Java Province, Bandung City, Bandung Regency and JICA

The reports will be reviewed by the environmental staff of BPLHD as well as the regulatory authorities and JICA. It is the responsibility of the BPLHD to respond to the reports, particularly if the reports identify adverse impacts that were not expected by the AMDAL study, or impacts that exceed acceptable levels. The BPLHD and contractors will take prompt actions, including additional mitigation measures, to address the newly identified issues.

3.7.3 REVIEW OF SOCIAL ENVIRONMENT CONSIDERATIONS

Within the scope of the Preparatory Survey for the BIUT Road Project, the social environment considerations focus on all the sections that will connect Pasteur-Cileunyi and Ujungberung-Gedebage. The social environment considerations are to:

- Review the EIA concerning social environment, and confirm its compliance with the Indonesian EIA legislation as well as JBIC Guidelines on social environment considerations.
- Based on the review, supplementary studies were conducted to meet the requirement of the regulation and guidelines. These studies include the Environmental Management Plan (RKL), the Environmental Monitoring Plan (RPL) and public opinion on social and economic issues of the project. The results of the consultation will be incorporated into the social environment considerations.
- Support the preparation of LARAP Framework based on the results of supplemental social environment surveys by the JICA Survey Team, in cooperation with Bina Marga, local government, local communities and relevant authorities.

(1) Confirmation of requirements of social considerations in accordance with government regulations in Indonesia as well as JBIC Guidelines (April 2002) for LARAP

1) GOI Approach to Compensation

Road construction and network extension activities may require acquisition of land for the needed right-of-way (ROW) areas. Following a decentralized system of government, the concerned local government in which the project is located, is generally responsible for the process of acquiring and funding compensation for the ROW areas.

The national Basic Agrarian Law of 1960 (Undang Undang Agraria No. 5, 1960) contains the principle of "eminent domain" under which private land can be expropriated by the government "for the good of the public". However, Presidential Decree Number 55 of 1993 (Keppres 55/1999) and Presidential Regulation Number 36, year 2005 (Perpres 36/2005 was already revised to become the Regulation of President No. 65 of 2006), do not provide formal mechanisms for land acquisition. Previously, land required for "public interest", such as for physical infrastructure development, was through compulsory acquisition. Keppres 55/1993 and Perpres 65/2006, require community consultation and consensus agreement on "fair" compensation for land and other immovable properties expropriated.

Keppres 55/1993 and Perpres 65/2006 revoked previous ministerial decrees, which elaborated the process as per Implementation Directive 1/1994 of the State Minister for Agrarian Affairs/Chairman of the National Land Agency (BPN). Only if the required area is less than 1.0 ha may the developing agency acquire the land directly. The basic procedure is as follows:

- The developing agency submits a request to the governor / mayor to release the land.
- This official issues a decree announcing that the land is to be released for the project, and instructs the Land Acquisition Committee (LAC) through the mayor, and/or bupati, to prepare an inventory of land, buildings, trees and other assets.
- The committee is required to inventory land, building, and crops, investigate legal status, assess and advise amount of compensation, give information on the land- right holders, and the developing agency. This is required to reach an agreement as to the form or amount of compensation, subject to recommendations from governor rates for compensation of various classes of land. These are supposed to be based on current prevailing values.
- The governor issues another decree stating the rates of compensation for various classes of

land and other properties. The proportion of the amounts paid depends on the actual rights held.

- The property owners are offered their compensation, although they may decide not to accept the rates offered. Hence, procedures for grievances will be followed.
- If the owners accept, they are given the time to vacate the property. Farmers may continue to cultivate the land until such time project implementation is already required.

The Project is administered by GoI (directly Bina Marga) and National Toll Road Construction Project. Therefore, the land acquisition and resettlement program should be coordinated and supervised by West Java Provincial Government while Bandung City and Bandung regency will implement the specific activities for land acquisition and resettlement plan.

The procedure for land acquisition in the Project is prepared by Bina Marga as shown in Figure 3.7.3. The process consists of five phases. It is realized that issues and grievances filed during the term of processing, if considered, will take about at least one year. However, the term of land acquisition process depends on the number of PAPs, houses and buildings. In cases where condemnation step can not be avoided, it will be necessary to consider processing term of about three years.

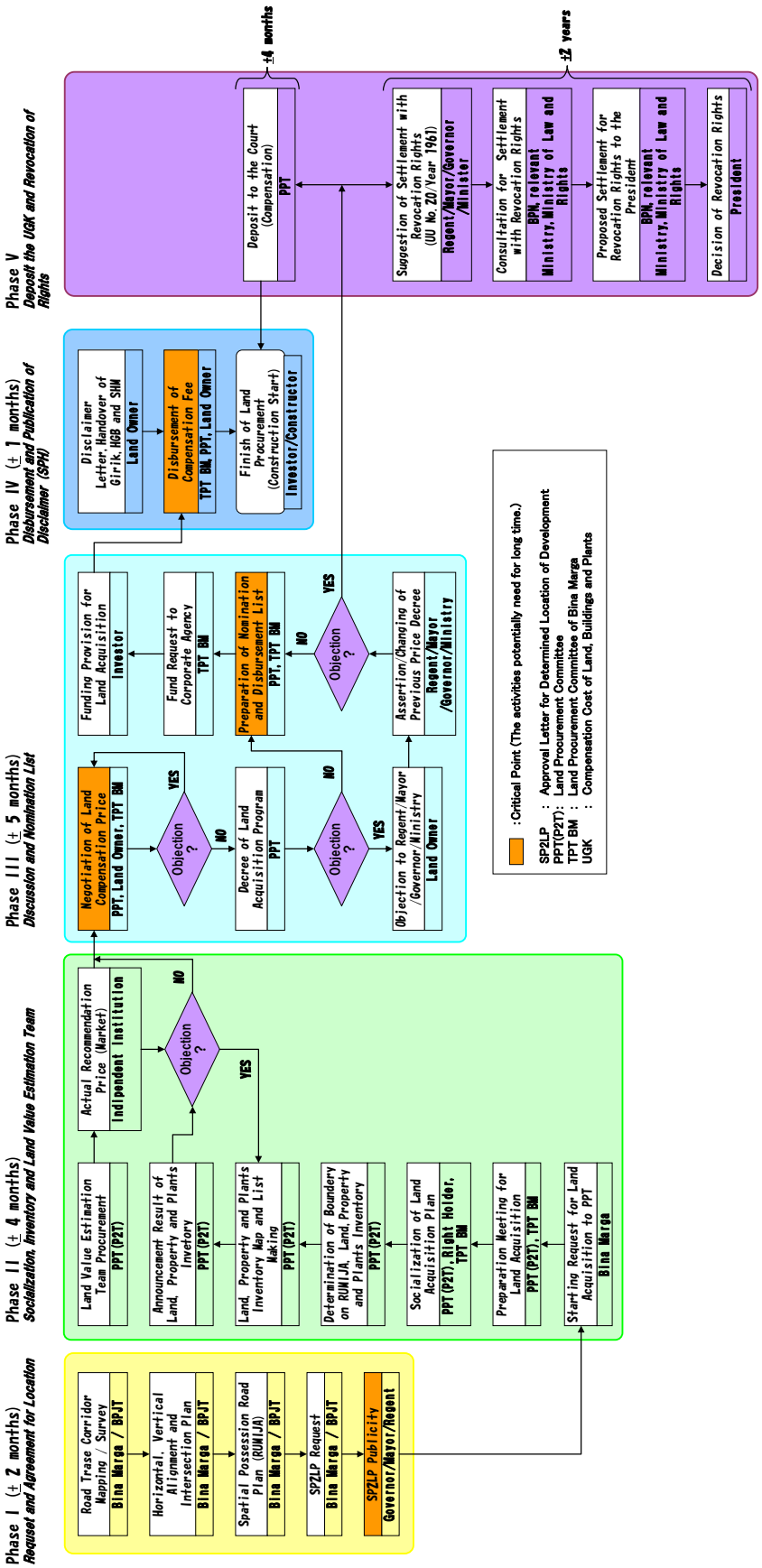


Figure 3.7.3 Procedure of Land Acquisition for Toll Road Project

Source : Material of Perpres No.36/2005 by Bina Marga

2) JBIC Guidelines on Social Consideration

The project must comply with laws, ordinances and standards related to social consideration established by the national and local governments. For a project with a potentially large social environment impacts, sufficient consultations with stakeholders must be conducted via disclosure of information. Appropriate consideration must be given to vulnerable social groups and relevant communities.

For involuntary resettlements, loss of means of livelihood is to be avoided where feasible. If not, effective measures to minimize impact for losses must be agreed upon with PAPs who are supposed to be sufficiently compensated and supported by the project proponents. A program of restoration of PAPs' livelihoods must also be well prepared by the project proponents.

The LARAP is a document required for any project which results in the physical resettlement of people, and must specify the procedures and actions. It should be undertaken in order to properly resettle and compensate PAPs and communities. According to the basic concept of the JBIC Guidelines, LARAP is required to ensure that the incomes and living standards of PAPs be restored to at least pre-project levels and not worse than it would have been if the project is not implemented. More specifically, LARAP should be prepared as a detailed plan for mitigating the land acquisition and resettlement impacts in an attempt:

- to ensure that the social and economic livelihood of PAPs is recovered to at least the pre-project level;
- to provide policy and procedural guidelines for the acquisition of land and other assets, compensation, and resettlement;
- to identify households that will be adversely affected by the Project, where they are located, what compensation and related alleviating measures are to be provided, and how and when these measures will be implemented; and
- to provide a plan for the community participation of the PAPs who could be involved in various stages of the project, including the implementation of the Resettlement Action Plan (RAP).

3) Review of AMDAL reports for social consideration

The project road passes through a densely populated area, and the business and trading centers of Bandung City. The education level around this project road is also relatively high, and most of the residents are employed as industrial laborers, officers or traders. The land price along the road is high in the City. It is also difficult to secure the construction site and to implement land acquisition and resettlement program.

The affected house holders and PAPs were estimated to be about 772 and 3080, respectively, according to AMDAL study. Therefore, a number of land acquisition and resettlement are estimated in the central business area of Surapati Street, and in the residential areas of Mandarajati and Karangpamulang Districts. The acquisition of agricultural land area of about 41.2 ha will affect 226 farmers in Ujungberung and Gedebage Districts. Areas of public services consist of schools, hospitals, mosques, local and central government offices, police office, and others.

To realize the social impacts of the BIUT Road construction to society, the first survey activity has to be properly oriented. This involves providing questionnaires and conducting further interviews with people in the vicinity of the Project road. The survey and interview aimed to gain general idea on the social economic and health conditions of the people living around the Project. In addition, this study also aims to gain people's feedbacks and expectations during the construction of the BIUT Road.

The total respondents consist of 180 persons during the interview survey. The persons whose monthly income ranges from Rp750,000 to Rp1,000,000 are about 32% of the respondents. The second highest ratio is 28% which include persons earning between Rp500,000 to Rp750,000. The third, 26%, belong to those earning about Rp1,000,000. The monthly income of residents along Project road is relatively high. The health condition is also good, considering that 70% of the houses are provided with septic tanks.

On the other hand, based on the result of interview survey, it is acknowledged that 53% of the respondents are aware of the Project plans. Information was obtained from various sources. Most of them relied on responsible information from government-related institutions, sub-districts/village, initiator and society's figures. About half of the respondents state that they do not know about the Project plans. It should be realized that this fact could cause restlessness, in connection with the existence of potentially emerging unhealthy rumors in the society.

Based on the result of interview survey, it was found that major percentage of respondents agrees with the Project plans. This consists of 47% fairly agreeing and 25% completely agreeing (total: 72%). Percentage of respondents who disagreed is only 14%.

In general, the reasons why respondents agree are: they expect that the traffic congestion problems can be solved; they need easy access to transportation, and they are hopeful for opening of job opportunities which will enhance their living conditions.

Respondents who disagreed were worried that the society will suffer losses, particularly during the project construction process. Among other reasons are: land releasing which are not beneficial to the society, construction causing traffic congestions, air and noise pollution, recruitment of workers outside the vicinity and others. Their basic thinking is mostly rooted on the situation of previous projects which were implemented.

Moreover, there are several respondents who are worried about the loss of public and social facilities (such as schools, public markets, service offices, etc.), and interfere in the social interaction during the execution of the Project. They expressed uncertainty whether these impacts were well-anticipated by the initiators of the Project.

The monitoring plan for social consideration in the Project is described in Environmental Monitoring Plan (RPL) for each phase. However, the evaluation system is not proposed in the AMDAL reports. The procedure for formulating said reports was not fully compliant with the JBIC Guidelines.

(2) Confirmation of the Necessary Components to be studied and Assistance for Study and Documentation of LARAP Framework and LARAP

1) Critical and Considerable Point

The critical and consideration points in the social environment aspect are mostly issues concerning land acquisition and resettlement. This Project road will pass through the center of a densely populated Bandung City, where many houses, shops and offices exist. Thus, a lot of building structures are subject evacuation due to the implementation of the project.

As the segment of Pasteur to Pasupati Bridge in the proposed Phase I is a wide existing road, there are no affected buildings except around the Dr. Djundjunan on-off ramp and the part of conjunction to Pasupati Bridge where the four lanes are needed for the traffic volume of the arterial road. In this section, the relocated buildings are relatively few. However, since the land price is high, land acquisition is expected to be costly.

In the part of Pasupati Bridge, the existing elevated road is utilized as a toll road.

The underpass structure is proposed for the Gasibu section. Consequently, part of the junction to Pasupati Bridge, four lanes of arterial road are needed to accommodate the traffic volume. Therefore some places along the existing road will be targets of land acquisition. Since the land price is high, negotiation for land acquisition is vital for the implementation of the Project.

The Gasibu to Cicaheum section is Bandung City's trading center of garments. Many small shops, trader, traditional market and houses are dense, and the width of the existing road is narrow. Hence, most buildings along the existing road of Surapati and KHP Hasan Mustopa Street l must be relocated for the purposes of land acquisition. The land acquisition cost in this section is estimated be significantly due to the volume of existing buildings. Many illegal traders are operating in this area, hence, it seems that the opposition against the Project road is popular. The public socialization for PAPs and local communities around this section should be implemented properly. The suggestion of redevelopment plan and proper relocation program for illegal traders and PAPs will be essential to advance to a favorable negotiation.

The Project Road is planned to pass through densely populated zones in Mandarajati and Karangoamulang sub-districts, as the alignment of toll road can not be curved beyond acceptable standards. High-class houses are also scattered in these area, thus, appropriate public socialization and bargaining of land acquisition price are important. It is vital to explain properly the effective utilization of the residential sites. Similarly, since some big factories also exist along this section, the negotiations for compensation for land acquisition and relocation site are very important to advancE the implementation of the Project.

The number of buildings and houses are fewer from Ujungberung IC site to Cibiru Crossing. Accordingly, the land price at this are is also lesser. However, considering that that more houses and shops stand in a row along the existing narrow road, affected buildings and houses are estimated to be relatively considerable.

The Project road is planned through the paddy and housing areas away from the existing road in Bandung Regency from Cibiru Crossing to Cileunyi Region. The number of affected buildings and houses is relatively small as compared to the Pasteur to Cileunyi section.

The segment of Ujungberung IC to Gedebage IC passes through mostly paddy fields and swampy area in the eastern part of Bandung City. The affected houses are small number, but some factories will be forced to relocate due to the implementation of the Project. The consideration for the loss of agricultural land and the creation of new jobs are essential to advance execution of the Project road.

2) Survey on social-economic status

Survey Team conducted an in-depth interview for 12 districts and 45 sub-districts of Bandung City, supplementing the social environment survey. These interviews were implemented in each district office by gathering the local government officials.

Table 3.7.27 Supplemental In-depth Interview Survey Schedule

Date	District	Sub-district
February 26th 2009	Sukajadi	Sukagalih
	Cicendo	Pamoyanan, Pajajaran, Pasirkaliki, Husein
	Coblong	Lebak Gede, Sadang Serang, Cipaganti
	Cibeunying Kaler	Cihaur, Sukaluyu, Neglasari, Cigadung
	Cibeunying Kidul	Pasir layung, Padasuka, Sukamaju, Sukapada, Cikutra, Cicadas
February 27th 2009	Mandalajati	Karang Pamulang, Jatihandap, Sindang Jaya, Pasir Impun
	Ujungberung	Pasir Endah, Cigending, Pasirjati, Pasanggrahan, Pasirwangi
	Cibiru	Cipadung, Palasari, Cisurupan
March 3rd 2009	Arcamanik	Cisaranten Bina Harapan, Sukamiskin, Cisaranten Kulon, Cisaranten Endah
	Cinabo	Cisaranten Wetan, Pakemitan, Babakan Penghulu, Sukamulya
	Gedebage	Cisaranten Kidul, Rancabolong
	Panyileukan	Mekar Mulya, Cipadun Kulon, Cipadung Wetan, Cipadung Kidul

The district and sub-district officers conclude that the residents around the Project Road are mostly aware of the Project, but do not understand the outline. Therefore, since implementation of this Project needs to be agreed, socialization and discussion meetings should be done in every affected area along the Project road.

a. Problems

- Traffic condition: traffic jam, traffic accidents
- Land acquisition issues: land price (difference of NJOP and market price), dispute on relocation and compensation
- The area has been negotiated for land acquisition three times.
- There are some schools that will be affected by the Project. (The impact is noise during learning sessions, and relocation.)
- If the garment trading centre is relocated, the local income will be affected. (However, it can transfer to a better place in one building in the same district, which has existing shopping malls.)
- The society is aware about the Project but not informed about the affected area.
- The communities have no knowledge about the land acquisition required for the Project Road.

b. Suggestions and Positive Observations

- It seems that local communities prefer the proposed market price for compensation. (half value of NJOP maximum plus market price maximum)
- Most of the societies support the Project and expects to improve the traffic condition to gain social and economic profits.
- Socialization to local communities is important and necessary.
- Project socialization should be implemented in the grassroots community to reduce social

conflicts.

- First socialization should be implemented to RW, RT and community leaders.
- Approach the society according to their level
- Surapati area is one of the cluster businesses in Bandung City, thus, all the program must be referred to Bandung City policy including those related to land.
- Project duration should not be too long or extensive.
- Land acquisition process should be carried out with the citizens.
- Every citizen should be allowed to ask about the price of land and participate in negotiation.
- The most appropriate mechanism for regulations to occur the road widening shall be established. The local government must provide a suitable alternative place to minimize effect on the social and community livelihoods.
- Noise insulations should be installed at universities/schools areas, or adopt other suitable approach.
- Gardens or green open spaces should be installed along the toll road without fences to keep illegal settlers from building their houses.
- The local parties should involve communities to participate.
- Irrigation facilities should not be charged with cost of levies.
- Parks and green gardens should be made along Project Road and in the middle path to reduce the noise and air pollution.
- Water channel should be constructed to avoid erosion. Green gardens should be planted along the channel.

The results and suggestions based on these in-depth interviews of local officers are presented in Appendix 7.

3) Land acquisition of Pasupati Bridge Construction

The Pasupati Bridge which utilized part of the Project road was constructed as a viaduct structure of Bandung City under Kuwait loan. About 800 householders are affected by the implementation of this project and had to evacuate the project site. The evacuation buildings include private schools and many small shops. The school was relocated to the north part of this Pasupati Bridge. Some merchants in this area shifted to a temporary relocation space in PDAM Bandung City and continued their business.

A new shopping mall will be constructed in the site of houses and building near Pasupati Bridge where 300 merchants, including those who temporarily shifted to PDAM, will move in after its completion. According to the leader of the merchant community who were among those who temporarily shifted, the condition of business and revenue in the temporary area are not significantly affected.


Photograph 3.7.2 Construction of New Shopping Mall near Pasupati Bridge


Photograph 3.7.3 Temporally Relocation Shops in PDAM Place

About 300 households were relocated to a new housing complex in Cisaranten Region of Arcamanik District, eastern part of Bandung City. Some apartment buildings (Rumah Susun) were also prepared for the relocated households.

One of the households expressed opinion regarding the change of livelihood and condition of surrounding. Although the environmental condition was evidently better, their income level decreased as compared to their previous earnings. Presently, three households live in the same house purchased from the compensation fee during the Pasupati Bridge construction.


Photograph 3.7.4 Relocation Site of Pasupati Bridge Construction

As the area under Pasupati Bridge is maintained through the cooperation of local communities

and local government, the area was kept clean and free from illegal settlers. The walking path constructed in this area is utilized as recreation space for residents.

Photograph 3.7.5 Present Condition under Pasupati Bridge

Disputes in land acquisition of this project include the dissatisfaction and disagreement of the society to the payment for land and house replacement. There were three cases where disagreement on land bargain and house replacement was experienced. This includes Sukabungah sub-district (2 houses), Pasirkaliki sub-district (2 houses) and Lebak Gede sub-district (4 houses).

Since LARAP was not established for this project, individual dialogues were initiated for the bargaining for land acquisition. Therefore, Bandung City government spent about seven years for the negotiation of land acquisition and resettlement. Nevertheless, the experiences on land acquisition activities in the Pasupati Bridge project are deemed beneficial for future programs of urban development in Bandung City.

4) Social economic condition of project-affected households

The JICA Survey Team proposed an additional interview survey for PAPs along Project road, where 250 samples were collected. In addition, the land use survey was implemented to those occupying the 20 m width at each side of the existing road, determined based on satellite photograph.

a. Interview survey result

- Segment Pasteur – Pasupati Bridge

In general 30% of the respondents are traders and 26% are private sector employees. About more than half of the respondents earn monthly income.

About the compensation, 40% of the respondents prefer cash for land acquisition, while those who prefer alternative land or house is 17%.

It was also found that 52% partially agreed and 9% totally agreed (total: 61%). As for those who disagreed (26%), the socialization for PAPs will be necessary to promote understanding of the purpose of the Project road and the urban development.

It is expected that this Project Road will reduce traffic congestion and accidents, while noise pollution will be controlled.

- Segment Pasupati Bridge – Cicaheum

In general, the respondents consist of 21% private sector employee, 30% traders and 34%

small industry employee. This result shows that the area is the center of business, particular garments and other supporting industries.

About the compensation, 59% of the respondents prefer cash for land acquisition, while 11% prefer alternative land or house.

Based on the result, 68% agreed with the implementation of the Project road. Since there were only 9% who disagreed, it is realized that the purpose is relatively understood by the PAPs.

73% of the respondents expect the reduction of traffic congestion and accidents while 20% have view on the impact to other economic activities.

- Segment Cicaheum – Cibiru – Cileunyi

The interviewees include 27% private sector employee, 33% traders (total 60%). It seems that about 40% of respondents generally have jobs out of business and trade.

About 60% of the respondents prefer cash for land acquisition, while 20% requests for alternative land or house. This result shows that the respondents prefer alternative business and buildings.

Based on the result, 70% agreed with the implementation of the Project Road. For the total 29% who disagreed, socialization for PAPs is necessary to promote understanding of the purpose of the Project road and urban development.

About 83% of respondents expect the reduction of traffic congestion and accidents.

- Segment Ujungberung – Gedebage

Involved in the survey were 50% private sector employees, 25% farmer and 25% farm workers. It is evident that the main revenue of PAPs in this area is production of agriculture.

About 50% of the respondents prefer cash for land acquisition, and 50% requests alternative land or house. This shows that there are other needs to be provided with the replacement of buildings and land even during relocation.

In accordance with this result, all respondents expressed agreement for the Project road. This is because there are a lot of residents in this area who benefited in the improvement of infrastructures and public facilities implemented by the government.

All of the respondents expect the reduction of traffic congestion and accidents in Bandung City.

b. Number of affected houses and building

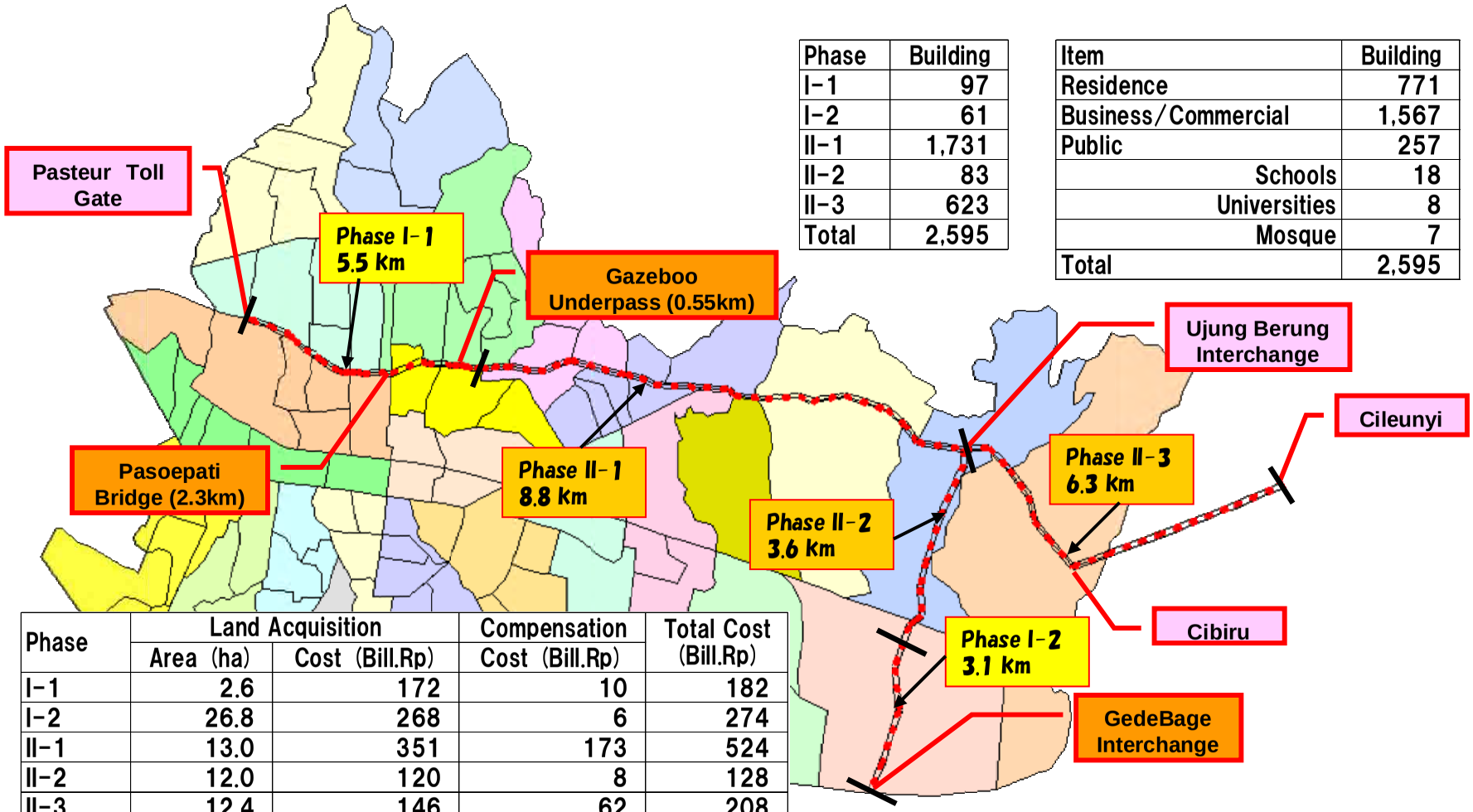
The estimation of affected houses and buildings were implemented by utilizing the results of land use survey along the Project road. The width of this Project Road is set to a minimum of 29 m, and a maximum of 52 m. The total length is about 27.3 km including the Pasupati Brigde of about 2.3 km length.

Total affected houses and building due to the implementation of Project Road is estimated about 2,595, including 771 residential buildings, 1,567 business and commercial buildings and 257 public facility buildings.

Table 3.7.28 Estimated Affected Houses and Buildings

Construction Phase	Residents and houses	Small Shops and Restaurants	Public Facilities	Big Shop and Factories	Total
I-1	20	49	8	20	97
I-2	52	4	2	3	61
II-1	362	938	178	253	1,731
II-2	43	12	24	4	83
II-3	294	236	45	48	623
Total	771	1,239	257	328	2,595

The land acquisition and compensation of buildings was estimated by applying the unit price in the average of the maximum NJOP and market price shown Figure 3.7.4. The total estimated cost of land acquisition and compensation is about Rp 1,317 billion. This resulted from the sum of construction cost of Phase I and Phase II, estimated to be Rp 456 billion and Rp 860 billion, respectively.



Phase	Building
I-1	97
I-2	61
II-1	1,731
II-2	83
II-3	623
Total	2,595

Item	Building
Residence	771
Business/Commercial	1,567
Public	257
Schools	18
Universities	8
Mosque	7
Total	2,595

Phase	Land Acquisition		Compensation	Total Cost (Bill.Rp)
	Area (ha)	Cost (Bill.Rp)	Cost (Bill.Rp)	
I-1	2.6	172	10	182
I-2	26.8	268	6	274
II-1	13.0	351	173	524
II-2	12.0	120	8	128
II-3	12.4	146	62	208
Total	66.8	1,057	260	1,317

Remarks: Unit Price = Maximum NJOP and Maximum Market Price Average

Figure 3.7.4 Estimation Result of Land Acquisition and Compensation Cost

(3) Recommendations on the Monitoring of Land Acquisition and Living Conditions of Affected People after Resettlement

1) Impacts of the project on social environment

a. Direct impacts

- Loss of land, house, building and crops
- Relocation to other places
- Work/business interruptions
- Occupation changes

b. Indirect impacts

- Children's studies are affected
- Familiarization with life in a new community
- Time spent to adopt to new living conditions
- Inability to change occupation due to age

c. Potential impacts

- Unfair compensation leading to grievance
- Jobless youths may resort to bad social practices (drug addition, crime)
- PAPs who inefficiently use compensated money may fall into poverty status
- High demand of workers during toll road construction leads to a transient increase in population. This matter may result to high crime rates, drug additions and possible transmission of HIV/AIDS

2) Mitigation solution

- There should be fair compensation for loss of land, houses and assets attached to lands. Incentives such as assistance/awards shall be given to households who relocate early, under the provisions of current legislation.
- Vacant lands should be found as compensation for PAPs (land for land) who are too old to shift jobs for their livelihood.
- Conduct vocational trainings, promote job creation and introduce PAPs to companies in industrial zones in the regions to acquire new jobs.
- Timing for relocation and resettlement should not interrupt the children's studies. There should be cooperation between the department of education in districts and schools that are near the resettlement sites in relation to accepting students coming from Project Affected Households (PAHs), especially those who are among the spontaneous resettlement persons.
- Compilation of a program to monitor social impacts during and after compensation and resettlement.

3) Monitoring program

Monitoring is a continuous process of assessment of project implementation, in relation to agreed schedules, use of inputs, infrastructure and services by the Project. Monitoring provides all stakeholders with continuous feedback on implementation. It identifies actual or potential accomplishments and problems as early as possible, to facilitate timely solutions during project operation.

Monitoring has two purposes:

- To verify that project activities have been effectively completed including quantity, quality, and timeliness; and
- To assess whether and how well these activities are achieving the stated goal and purpose of the Project.

Regular monitoring of LARAP implementation will be conducted by the implementing agency (Bandung City and Bandung Regency) as well as by an independent external monitoring organization. The monitoring program and evaluation system should be described in LARAP prepared by Bandung City and Bandung Regency, in coordination with the West Java provincial government.

The proposed monitoring program described in Table 3.7.29 provides an indicative list of monitoring indicators to safeguard the social aspect.

Table 3.7.29 Proposed Monitoring Program of Social Aspects (for LARAP)

Category	Indicator	Frequency	Duration	Source of information
Progress of land acquisition, compensation, and resettlement	Number of area extent Person moved Destination to move Payment Assistance Incentive bonus	Once every 6 months	Pre-construction, construction and post-construction	Monthly report by supervising consultant
Livelihood	Income level Health status Social infrastructure at resettlement site Level of satisfaction of PAPs Difficulties	Once every 6 months	Until 3 years after the completion of resettlement	Original survey by Bandung City and regency (Bina Marga)
Participation and consultation	Information about the project Participation to RAP	Bi-monthly	During project preparation	Monthly report by supervision consultant
Grievance	Number of cases of grievance reported	Bi-monthly	Pre-construction, construction and Post-construction	Number report from Bandung city and regency (Bina Marga)
HIV/AIDS	Number of patients of HIV/AIDS reported within the project area	Bi-monthly	During construction	Monthly report from health department
Number of crime cases including female victims	Project-related case within the project area	Bi-monthly	During construction	Monthly report from police office

(4) Assistance for Supplementary Public Consultations for LARAP Framework

The JICA Survey Team proposed supplementary public consultations of BIUT Road, since it was realized that the attendees in the public consultation meeting during the AMDAL study stage do not comply with the JBIC Guidelines.

Public consultation meeting is a technique of data collection through the delivery of aspiration, absorption and opinion by PAPs. The data collection from PAPs has been conducted through survey technique and face-to-face, in depth interview. However, intact descriptions will not be obtained, continuous discussions are required to determine the same and thorough perception.

Group discussion is a forum organized to discuss consideration on formulation and PAPs requirements, which needs to be developed. Said group discussion is attended by parties who are placed equally. They will sit together to identify and discuss the needs and problems concerning this BIUT Road development process.

PAPs involved in this public consultation are classified into five categories, namely, housing, business, public service, informal housing and also empty land and fields.

In order to promote enthusiasm during public consultation, it would be necessary to seek joint participation of other stakeholders coming from both the local government and self-supporting institute and college. Attendance of the stakeholders outside the PAPs is important to balance the activities in public consultations. Besides, attendance of the other stakeholders will more confirm the decisions taken while in public gatherings related to the implementation process of the BIUT Road development.

Results of this group discussion are as follows:

- Identifying in-depth perceptions concerning the social problems faced by PAPs
- Collect relevant PAPs data directly, which is realized as a more effective means of gathering information. Through group discussion, these will be obtained collectively for related to PAPs own category of specific concerns.

The dynamics during group discussion is arranged with due consideration to the following:

- Explaining a problem delivered by group discussion participant
- Comparing and evaluating different opinions through informative discussions
- Making decision or summary description based on various opinions, then reach consensus, if possible

1) Discussion Participant

The stakeholders that will be invited and involved in the public consultation of the BIUT Road plan include:

a. PAPs representatives from each of the following five categories:
   - Housing
   - Business
   - Public service
   - Informal housing
   - Fields and empty land

b. Government officials representing the following institutions:
   - City/Regency Government
   - District Government
   - Sub-district Government

c. Other representatives shall be from:
   - College institutes
   - Self-supporting institutions
   - Transportation observer

2) Activity Details

Group discussion process is conducted through relevant phases, namely, preparatory survey, implementation and follow up phase.

3) Discussion Topics

Discussion topics in the public consultation are as follows:

- Disseminating to the public about the government's plan for the toll road development in Bandung City
- Determine opinions of the community who are directly affected by the development activities of the proposed toll road
- Obtain inputs on land use and exemption criteria from those who are expected to move to another community
- Promoting public participation before, during and after construction of the Project

4) Implementer

The public consultation is conducted by a designated initiator, and official representatives from:

- Bandung City/Regency Region Development Division (BAPPEDA)
- District/sub-district officials
- Self supporting institution designated by the initiator
- University/college institutions

5) Venue and Schedule of Activities

Implementation of group discussions shall be focused on the main participants representing 17 districts of the region affected by the development plans BIUT Road. The meetings, made up of four sessions each, were held in two days as shown in the table below:

Table 3.7.30 Supplemental Public Consultation Meeting Schedule

Date	Sub-District	Time	Attendance	Place
Tuesday, 24th March 2009 (FGD)	a. Bojongsoang	08:00 – 11:30	25	Pusjatan E Building (PU)
	b. Cileunyi			
	a. Cinambo	13:00 – 17:00	42	
	b. Cibiru			
	c. Panyileukan			
	e. Gedebage			
Wednesday, 25th March 2009 (FGD)	a. Sukajadi	08:00 – 12:00	61	Wisma Bina Marga A Building
	b. Cicendo			
	c. Coblong			
	d. Bandung Wetan			
	e. Cibeunying Kaler			
	f. Cibeunying Kidul			
	a. Kiaracondong	13:00 – 17:00	52	
	b. Mandalajati			
	c. Antapani			
	d. Arcamanik			
	e. Ujungberung			

The attendees of the supplemental public consultation meeting were consisted of officials from provincial, city and regency governments, district and sub-district governments, local communities, academies and NGO staffs.

Table 3.7.31 Attendees of Supplemental Public Consultation Meeting

Date	Sub-District	Total Attendance	NGO & Academic	Local Government	Local Community
Tuesday, 24th March 2009 (FGD)	a. Bojongsoang	25	9	7	6
	b. Cileunyi				
	a. Cinambo	42	16	17	9
	b. Cibiru				
	c. Panyileukan				
	e. Gedebage				
Wednesday, 25th March 2009 (FGD)	a. Sukajadi	61	9	22	30
	b. Cicendo				
	c. Coblong				
	d. Bandung Wetan				
	e. Cibeunying Kaler				
	f. Cibeunying Kidul				
	a. Kiaracondong	52	8	17	27
	b. Mandalajati				
	c. Antapani				
	d. Arcamanik				
	e. Ujungberung				

6) Discussion Result

The opinions and suggestions obtained from above attendees are summarized as follows:

- Most participants agreed to the implementation of the Project, and expect re-development and improvement of related regions.
- Attendees requests for information and obtain understanding on the concept and policy of the local government (city and regency) for land use, urban and regional development plans.
- Residents expect improvement and mitigation of drainage system and flood protection, while the Project is in progress.
- Local communities expect promotion of close relationships among each of the stakeholders during the implementation of the Project.
- Land acquisition procedure must be published for local communities.
- Land price should be adjusted according to market price or as agreed between local communities and Land Acquisition Committee (P2t).
- The values of building, plants, trees, means of worship and public spaces should be considered.
- Impacts of implementation during construction and operation of the Project should be considered.
- The effects of the Project related to the improvement of existing traffic condition should be presented clearly.
- Policy of land acquisition and resettlement should be suggested.
- Relocation program for public facilities (schools, universities, hospital, mosque and so on) should be proposed.
- Effects of regional flooding and improvement of drainage system should be considered.

Main issues of the Project discussed during public consultation include aspects such as traffic, environment and socio-environment conditions, and government policies. Summary of the main issues raised by the participants are outlined as follows:

- Traffic condition: congestion, accidents, safety for children and elderly
- Environment: air quality, noise, flood, drainage and garbage
- Socio-environment: land price (acquisition), resettlement (relocation), local economy, business activities, local communities
- Local government policy and basic frameworks: master plan of regional development, traffic control program and others

The general result of the focus group discussions during the public consultation are enclosed in Appendix 8.

In addition, the JICA Survey Team held a meeting with concerned local government staffs in the province, Bandung City and Bandung Regency, to discuss LARAP Framework. The venue, date and attendees of this meeting are shown in Table 3.7.32.

The agenda of the meeting include the situation, role and responsibility of LARAP Framework, and discussion of contents of the draft LARAP Framework document.

Table 3.7.32 Meeting for LARAP Framework in Bandung City

Place	Date	Attendance
BAPEEDA Bandung City	Wednesday, 8th April 2009	1.Directorate General of Bina Marga Department of Public Works (Dirjen PU Bina Marga) 2.West Java Province Planning Agency (Bapeda Provinsi) 3.West Java Province Housing and Settlements Agency (Dinas Perumahan and Pemukiman) 4.Region Secretary of Bandung City (Sekretaris daerah) 5.Asset Department Secretariat of Bandung City 6.Bandung City Development Planning Area Agency 7.Bandung City Space Regulation and Cipta Karya Agency 8.Bandung City Bina Marga and Watering Agency 9.Bandung City Environment Control Agency 10.Bandung City Land Authorization Agency 11.Bandung City Housing, Spatial and Hygiene Agency 12.JICA Survey Team 13.PT. Diantama Rekanusa

The conclusions from this meeting are as follows:

- Schedule for comprehensive explanation of the LARAP Framework need to be determined
- LARAP Framework should be ideal
- Request participation of a national authority representative for the subsequent discussions
- Identify the authority responsible for the preparation of the LARAP document
- Description of land freezing should be included in the LARAP Framework document.
- For the procurement of land, designated committee will require proper support.
- The term “consultation” (with the community) shall be replaced with “socialization”.
- Inventory should later include mapping and measurements prepared by BPN (Land Authorization Agency).
- Define the procedure of LARAP, and possible alternatives if negotiations fail
- Type of PAPs needs to be defined clearly including corresponding compensation.

7) Establishment of LARAP Framework

The LARAP Framework for the BIUT Road project is necessary to be established prior to JICA’s Approval for the Japanese ODA loan, in cooperation with West Java Province, Bandung City, Bandung Regency and Bina Marga. The related document should be approved by Bina Marga and local governments, and then submitted to JICA by Bina Marga.

It should contain the policy and concept of land acquisition and resettlement plan for the PAPs along the Project road. These contents should be warranted by concerned authorities.

8) Procedure for Establishment of LARAP

The LARAP should be prepared by local government in compliance with the LARAP Framework approved by JICA. After determining the project area and requesting permission for location, the Provincial Governor, City Mayor and Regional Director will agree for project location and announce the information regarding the Project road construction plan. Usually, during the detail design stage, a social survey for PAPs is implemented, related to livelihood, economic and physical conditions, etc. Additionally, the opinions and requirements

concerning land acquisition and resettlement are collected through public consultation and/or the individual dialogues with PAPs. Meanwhile, the Land Acquisition Committee (P2T) will decide on the land procurement price and compensation for buildings and crops with due consideration to the NJOP, evaluation price and market price of land.

The LARAP will be established by local governments (Bandung City and Bandung Regency) based on the collected information and data on PAPs, local economic and physical conditions, etc. After the approval of Bina Marga and West Java Province is obtained, it is anticipated that local governments will publish LARAP for PAPs and residents along the Project road. The policy of land acquisition program and relocation program are expected to be included in the LARAP document.

Table 3.7.33 Proposed Responsibility for LARAP Framework and LARAP Making

	Loan Agreement Stage LARAP Framework	Detail Design Stage LARAP	Implementation Stage	
			Land Acquisition Program	Resettlement Program
Establishment	Bina Marga (assisted by JICA survey team)	Local Government (West Java Province /Bandung City /Bandung Regency)	Local Government (Bandung City /Bandung Regency)	Local Government (Bandung City /Bandung Regency)
Review	Bina Marga/JICA	Bina Marga	Bina Marga /West Java Province	Bina Marga /West Java Province
Approval	Bina Marga/JICA /West Java Province /Bandung City /Bandung Regency	Bina Marga/JICA /West Java Province	BinaMarga /West Java Province	BinaMarga /West Java Province
Implementation /Socialization	West Java Province	Bandung City /Bandung Regency	Bandung City /Bandung Regency	Bandung City /Bandung Regency

The monitoring and evaluation for the programs should be implemented properly. Moreover, is important to consider the feedbacks obtained from these programs in order to improve PAPs livelihood and environmental conditions.

Since the full-scale detailed LARAP for the BIUT Road Project will be formulated only during the Detail Design stage, a draft LARAP Framework document was proposed. (See Appendix 10)

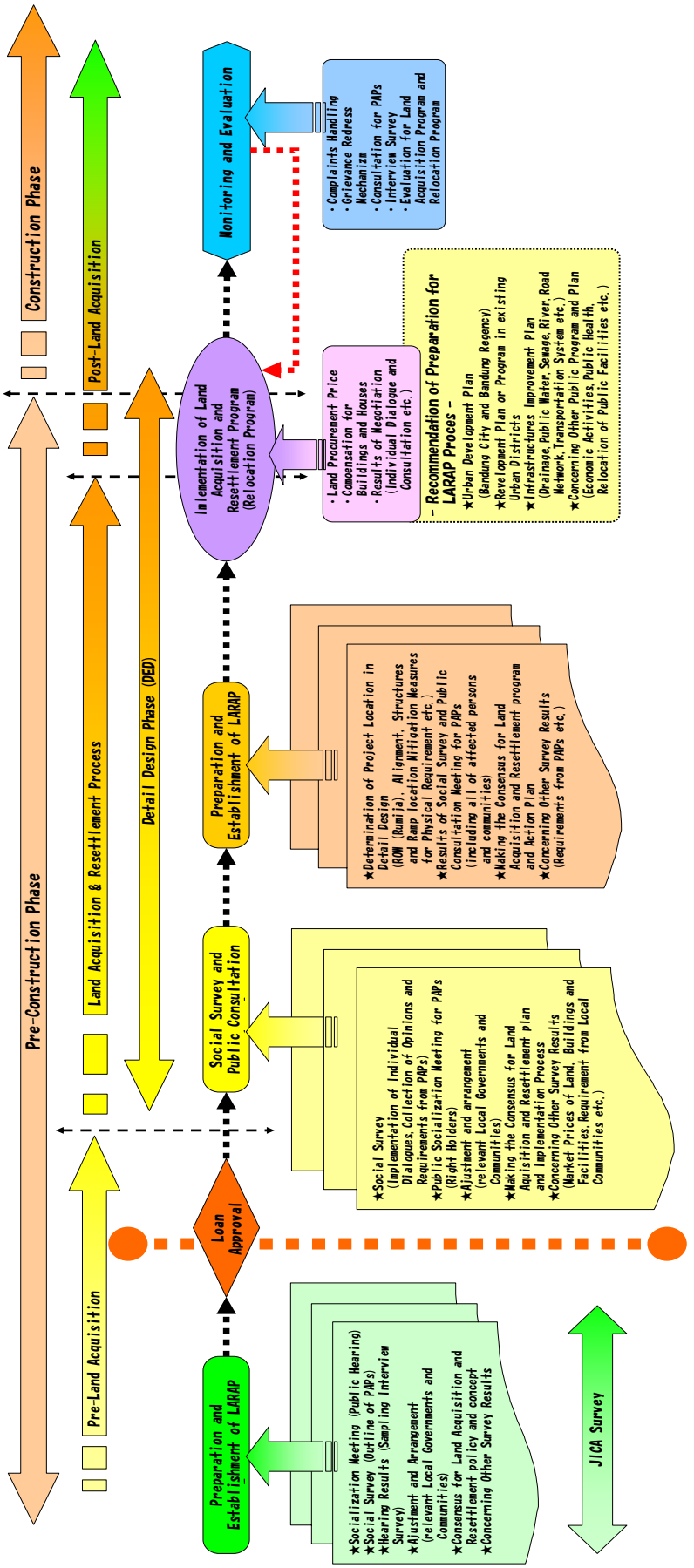


Figure 3.7.5 Proposed Procedure of LARAP Framework to LARAP Implementation Program

3.7.4 ENVIRONMENTAL CHECK LIST AND RECOMMENDED MITIGATION MEASURES

The result of confirmation of conformity with the environmental check list of the JBIC Guidelines (April 2002) are shown below. These tables include the considerations and suggestions based on the study results of the additional and supplemental surveys for socio-environmental aspects, and the public consultation meeting for the establishment of the draft LARAP Framework, were implemented by the JICA Survey Team.

(1) Environmental Check List Following JBIC Guidelines

1) Environmental Procedure

The procedure of AMDAL in Indonesia has already been completed. In March, 2007, the West Java Provincial Government approved the AMDAL of the BIUT Road Project.

The public consultation meeting (PCM) related to the TOR of ANDAL was held in September 2006. The PCM on KA-ANDAL was also held in September 2006 at two areas for the delegates of the districts. The PCM for the final ANDAL, RKL and RPL report was held for the representatives of the regional governments.

2) Environmental Consideration

Although the volume of NO_2 and HC was predicted to increase greatly, these concentrations are below the allowed environmental standards. Similarly, the concentrations of SO_2 and CO were predicted to increase slightly to less than the environmental standards. The parameters which were found to exceed are TSP and PM_{10}. This implies that the ambient air quality in the City has improved recently.

On the other hand, the noise level in the City is already exceeding the environmental standard limits. In the future, it appears that the noise levels along the arterial road and the Project road will also be exceeded. It is noted however, that complaints on noise and vibration from residents within the vicinity of the Project are not recorded.

No nature conservation area is located within the vicinity of the Project road. The protected habitats of endangered species designated by the country's laws or international treaties and conventions are, do not exist in the Project area.

3) Social Environment Considerations

The estimated number of families to be removed is about 772 based on AMDAL reports. Project Affected Persons (PAPs) are estimated to be about 3,080. According to the study conducted by the JICA Survey Team, the number of affected buildings is estimated to be about 2,600 units, and the land acquisition will be about 67 ha.

The LARAP should be established before the land acquisition and resettlement. According to the LARAP, the public consultation for PAPs related to land acquisition and resettlement will be done under the local law. The comprehensive socio-economic studies should be established in LARAP concerning proper compensation, restoration of livelihoods and living standards.

Bandung City government designated Surapati Street as an organized area. Hence, this program will appropriate the project land need. Resettlement procedure will be judged during the LARAP. The capacity and budget will be secured to implement the plan.

In Indonesia, people usually dislike sun rays directed into their room. The shade along the Project road is formed under the elevated road, designed for Pasteur and Cileunyi section. Therefore, the impact of sun shading is negligible.

As most residents along the Project road utilize the antenna system for getting television (TV) wave signals, it is expected that radio interference will occur along the south side of the Project road. However, the condition of TV reception is not grasped exactly and the maintenance and operation of antenna is not sufficient. Therefore, in case there will be future complaints of radio interference, it is suggested to advise residents to adopt cable TV, if the cause is determined to be due to the Project road implementation.

4) Notes and Others

The implementation of surveys for air quality, noise, related drainage condition and others are stipulated in RKL and RPL. If the influences due to road construction are clarified, proper mitigation measures will be implemented by the contractor.

The anticipated social impacts of the construction include job opportunity, entrepreneurship, social jealously, and traffic issues. The implementation of management and monitoring programs are stipulated in RKL and RPL. The proper mitigation measures will be conducted after checking the condition around the Project area through the relevant social surveys such as focus group discussion (FGD), dialogue, direct observation and interview.

The purpose, method, location, term and time of survey concerning the monitoring program are indicated in the RPL report. If this report will be implemented with accuracy, it is judged that the monitoring program will be effective.

The Environmental Check List following the JBIC Guidelines is shown in Appendix 11.

(2) Recommended Mitigation Measures for Each Phase

Mitigation measures, based upon the AMDAL reports and supplementary JICA surveys, proposed for the project at each phase are shown in Appendix 12.

1) Pre-construction Phase

There are mitigation measures for social-environment considerations during the pre-construction phase. The main target is to grasp and collect the data and materials for establishing LARAP.

In this phase, the following environmental items for mitigation measures are intended for social environment only:

- Social Restlessness
- Land Owner Unwillingness
- Loss of Business Place
- Change the Source of Income Structure
- Loss of Agricultural Land
- Dissatisfaction on Compensation

2) Construction Phase

In the construction phase, the countermeasures for mitigating and reducing the impacts from construction activities are main purpose. The considerations for the implementation plan for construction are essential and significant.

In the construction phase the management and monitoring for LARAP is very important and useful in evaluating and modifying the next phase, and introducing other projects.

In this phase the environmental items for mitigation measures are as follows:

- Ambient air quality
- Noise and vibration
- Water environment
- Hydrology
- Topology and geology
- Impacts on traffic activities
- Health and safety at work (diseases transmission – construction accident)
- Job opportunity and chance to run business
- Social jealousy

3) Post-construction Phase

The countermeasures for mitigating and reducing the impacts by operation and maintenance of toll road activities are the main purposes in the post-construction phase. It is significant to minimize and control the influences to the residents in the vicinity and to road users. The monitoring of the implementation in mitigation measures during post-construction phase is very important for applying the subsequent development programs.

In this phase, the environmental items for mitigation measures are as follows:

- Ambient air quality
- Noise and vibration
- Water environment
- Landscape
- Change of space order and land allocation
- Change of traffic pattern and flow
- Increase of traffic facility
- Job opportunity
- Disharmony of social interaction

3.8 TRAFFIC MANAGEMENT IN THE PROJECT AREA

3.8.1 Study on Traffic Problems in the Project Area

(1) General

One of the problems which Bandung City and surrounding areas have been facing is traffic congestion especially in the morning and evening peak periods caused by too many motor vehicles on an inadequate capacity of road network. As the center for economic activities in West Java province, the city of Bandung has suffered quite serious losses caused by transportation problems resulting in higher transportation costs, deteriorating city center, and lower commercial activities. The congestion in certain road sections has become a normal experience that people have to cope with.

Construction of a new road will solve congestion problems in a certain section or area, although at the same time, such improvement may create another problem in a different location. The lack of road network in Bandung will necessitate considering not only increasing the road capacity but also introducing comprehensive transportation policy measures for bus and rail mass transportation, non-motorized transport mode, TDM, and so on. The objectives of traffic management are to best utilize the available space for transportation among various users through infrastructure improvement, provision of various management facilities, effective management of transportation demand and so on.

The traffic management plan within the scope of this survey can be divided into two major aspects: traffic management measures along the planned toll highway corridor, and medium-long term traffic management policy in the city of Bandung. The former will focus on the planned toll highway corridor based on the present and future traffic conditions, while the latter will mainly deal with general suggestions for the policy implementation of the city of Bandung in the future.

(2) Road Network in Bandung City

Bandung City covers an area of approximately 16,730 ha, with the largest special use for housing (73%), for agriculture purpose (14%), and for other uses such as for offices and business centers (7.4%). Normal density settlement is concentrated in the boundary regions of Bandung City, while high density settlement is located in the city center.

Industrial parks are being developed in the surrounding areas in the south, east and west of the city, while the northern part of Bandung is intentionally undeveloped to be an environment preservation area. This pattern of development determines the trip patterns and purposes.

The dominant transportation system in Bandung City is land transport, or more specifically, road system, either by private or public vehicles.

Figure 3.8.1 Typical Mixtures of Transportation Modes in the City

The total length of roads in Bandung for the year 2000 is approximately 933 km, with 84.5% being local roads. The primary arterial roads are classified as national/state, the primary collector roads are provincial, while secondary and local roads are city roads.

Table 3.8.1 Length and Width of Roads (2000)

Type of Roads	Road Length (km)	Road Width (m)
Primary Artery	49.5	14 - 30
Secondary Artery	26.1	8 – 20
Primary Collector	31.7	7 – 12
Secondary Collector	37.3	4 – 9
Local	788.1	2.5 - 7
Total	932.7	

Source: Bandung City Department of Public Works

The total length of roads in Bandung for the year 2002 is 1,169 km, among which city roads comprise about 94.4 % based on administrative classification.

Table 3.8.2 Length of Roads by Administrative Classification (2002)

Class of Roads	Road Length (km)
National Roads	42
Provincial Roads	23
City Roads	1,104
Total	1,169

Source: Bandung City Department of Public Works

Road network in Bandung City is mainly radial and circular in form, the center of which is in the Bandung City government office area, with six to seven radial roads and two incomplete ring roads, i.e. the Laswi-BKR-Peta and Soekarno-Hatta Highway, forming the south ring. East-west traffic or bypassing traffic can be handled by two major highways, namely the Soekarno-Hatta Bypass and the Padalarang-Cileunyi Toll Road; both located in the south of the city area. The Padalaran-Cileunyi Toll Road, together with the planned toll highway, Pasteur-Cileunyi and Cibiru-Gede Bage, form an outer ring road of the Bandung City area once connected. They also serve as access to the city center through the nearest interchanges or access ramps.

The existing east-west connection in the north of the city center starts from Jl.Dr.Djundjunan - Jl.Pasteur - Jl.Layang Pasupati - Jl.Surapati - Jl.K.H.P.Hasan Mustopha. These roads are partly elevated structures with the cable-stayed bridge of the Pasupati Bridge. Although the distance is short, traffic seems fairly smooth. This road also forms a part of the outer ring road of the city in the north as mentioned above. However, until the completion of the elevated Pasteur-Cileunyi Toll Highway, which is now under planning, the traffic needs to go through the narrow streets with frequent at-grade intersections to travel from east to west of the city. There are other east-west roads in the city center such as Jl.Sudirman - Jl.Asia Africa - Jl.Gatot Subrot, Jl.Rajawali - Jl.Kebonjati - Jl.Veteran - Jl.Ahmad Yani.

North-south traffic is mainly handled by several roadways, which also form part of the radial road network. It can be said that there are no arterial roads or highways which can handle the large traffic volume in the north-south direction. Most of these roads are either narrow two-lane, two-way roads or four or more lane roads with frequent at-grade signaled or non-signaled intersections. There are 154 intersections in Bandung with traffic lights, 134 of which are connected with the Area Traffic Control System (ATCS). This system is planned to coordinate the intersections in real time through a centralized control. However, due to poor maintenance, the ATCS is not currently optimal in

controlling traffic. North-south traffic is mainly composed of traffic from industrial areas located in the south of Bandung and from residential areas located in the north of the city. Typical north-south roads are Jl.Sukajadi - Jl.Pasirkaliki - Jl.Kopo, Jl.Cihampelas - Jl.Iskandardinata, Jl.Ir.H.Juanda - Jl.Merdeka and other minor roads.

Another feature of the road network in Bandung is that there are many one-way streets in the central part of the city. It seems that the system works to maintain smooth traffic flow along the dominant direction with a large number of traffic during peak periods. However, the system requires a longer trip distance due to detours, which may cause traffic congestion. In addition, the many roundabouts and intersections interrupt smooth traffic movement, especially when traffic reaches the limit capacity. Intersections without exclusive right turn lane(s) for right turning vehicles also hinder smooth traffic flow, resulting in creating bottlenecks along the city streets when traffic volume reaches almost saturated conditions.

Figure 3.8.2 Typical 6-lane Arterial Road in the City

(3) Present Conditions of Traffic

1) Overview

Transportation in Indonesia depends much on the road network system, which has a share of more than 80 % of passenger traffic and 90 % of freight. Bandung is located in the center of Java Island and the capital of West Java Province, with a population of 2.7 million in 2007. The overall population of the Bandung Metropolitan Area reaches even 7.5 million. With increased number of population and economic development, together with longer travel distance due to rapid expansion of housing areas at the outskirts of the city, traffic conditions have became worse, creating severe congestion on the trunk roads especially in morning and evening peak periods.

The main activities in Bandung City are trade, industry, government and education. Trade has developed and advanced with the construction of large-scale shopping centers in the 1980's. These shopping centers were mainly built around the city center (Dalem Kaum, Ahmad Yani, and Asia Africa). Even today, large-scale commerce is still building up in the same location, such as in Pasar Baru and Merdeka Street.

2) Present Conditions of Traffic

The concentration of business in the city center results in higher transportation costs, congestion, parking problems, etc. Without fundamental changes in city planning and development, commercial activities in the city center will decrease. Although a wide range of measures have been identified by past studies to alleviate traffic congestion in Bandung, implementation of such recommended projects and plans has not satisfactorily took off. Some of the major issues identified in past studies are:

- Concentration of the business/commercial/industrial areas in the CBD and rapid growth of residential areas in suburbs;
- Mixture of a variety of traffic of different demand/characteristics: international, regional and local travel demands;
- Deterioration of urban public transport services;
- On-street parking vehicles hindering smooth flow of traffic;
- Lack of intersection capacity to handle peak hour traffic;
- Weekend traffic coming from Jakarta to cause weekly congestion in the city; and
- Narrow roadway in the CBD area, with complicated network configuration.

Figure 3.8.3 Congestion near the Pasteur Toll Plaza

3) Travel Speed on Arterial Roads in Bandung

In order to identify actual traffic conditions on the arterial roads, a travel speed survey has been conducted. Seven routes were selected to cover the major roads in and around Bandung City for this survey. For each route, a total of six samples (round trip) were obtained, two samples per time period. The survey covered the following three time periods: (a) Morning Peak Hours (7:00-10:00), (b) Evening Peak Hours (16:00-19:00) and (c) Off Peak Hours (10:00-16:00).

The survey has been conducted through the “floating car method” for cars, which requires the survey vehicle to keep the same position in the traffic flow; i.e. if the survey vehicle is overtaken by other vehicles, it should overtake the same number of vehicles. The route of the travel speed survey is shown in Figure 3.8.4.

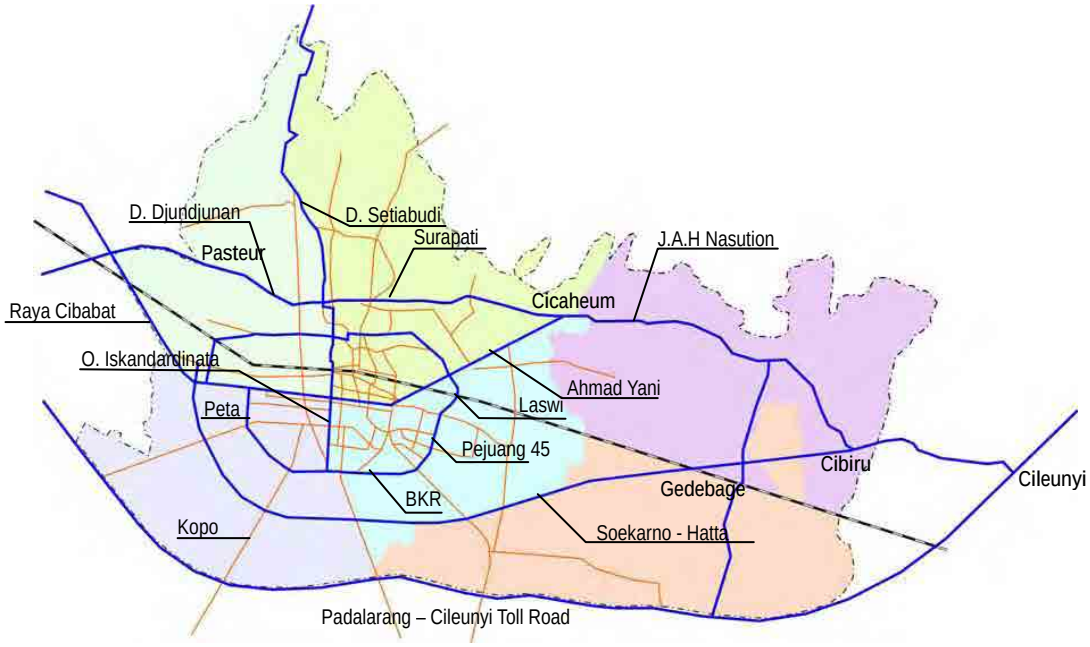


Figure 3.8.4 Route of Travel Speed Survey

The results for each road segment are tabulated in the table below.

Table 3.8.3 Travel Speed Survey Results

No	Route	Segment	Average Speed (km/hr)
I	Pasteur-Cicaheum		
		Pasteur → Ir. H. Juanda	31
		Ir. H. Juanda → Pahlawan	14
		Pahlawan → Cikutra	30
		Cikutra → Cimuncang	40
		Cimuncang → Cicaheum	40
		Cicaheum → Cikutra	17
		Cikutra → Pahlawan	35
		Pahlawan → Gasibu	19
		Gasibu → Ir. H. Juanda	19
		Ir. H. Juanda → Cipaganti	23
		Cipaganti → Pasteur	19
II	Cicaheum-Cileunyi		
		Cicaheum → Cibiru	19
		Cibiru → Cileunyi	25
		Cileunyi → Cibiru	24
		Cibiru → Cicaheum	38
III	Soekarno-Hatta (Cibiru-Cibeureum)		
		S. Hatta → Pasir Koja	11
		Pasir Koja → Kopo	14
		Kopo → Moh Toha	11
		Moh Toha → Kircon	19
		kircon→ Gedebage	31
		Gedebage → Cibiru	31
		Cibiru → Gedebage	34
		Gedebage → Kiara Condong	34
		Kiara Condong → Moh Toha	18
		Moh Toha → Kopo	11
		Kopo → Pasir Koja	12
		Pasir Koja → S.Hatta	12
IV	Cicaheum-Cimindi		
		Ahmad Yani → Kiara Condong	11
		Kiara Condong → Jl.Jakarta	20
		Jl. Jakarta → A.yani	6

No	Route	Segment	Average Speed (km/hr)
		A.Yani → Asia Afrika	20
		Asia Afrika → Jend. Sudirman	20
		Jamika → jl. Rajawali	30
		Jl. Rajawali → cimindi	24
		Cimindi → Jl.Rajawali Barat	15
		Jl. Rajawali Barat → Rajawali Timur	12
		Jl. Rajawali Timur→ Kebon Jati	12
		Kebon Jati → Suniaraja	13
		Suniaraja → Lembong	30
		Lembong → Veteran	30
		Veteran → Ahmad Yani	30
		Ahmad Yani → Cicaheum	14
V	Laswi-Pelajar Pejuang-BKR-Jamika		
		Laswi → Pelajar	49
		Pelajar → BKR	29
		BKR → Peta	45
		Peta → Jamika	33
		Jamika → Sudirman	24
		Sudirman → Jamika	34
		Jamika → Peta	35
		Peta → BKR	35
		BKR → Pelajar Pejuang	14
		Pelajar Pejuang → Laswi	21
VI	Kiara Condong		
		Kiara Condong→ Jl.Jakarta	63
		Jl. Jakarta → Binong	48
		Binong → Soekarno Hatta	34
		Soekarno Hatta → Binong	42
		Binong → Jl.Jakarta	61
		Jl.Jakarta → Ahmad Yani	35
VII	Tegallega-Setiabudi		
		Ledeng → Setiabudi	25
		Setiabudi → Cihampelas	46
		Cihampelas → Padjajaran	18
		Padjajaran → Wastu Kencana	18
		Wastu Kencana → Kebon Kawung	23
		Kebon Kawung → Kebon Jati	11
		Kebon Jati → Otista	11
		Astana Anyar → Gardu Jati	15
		Gardu Jati → Pasir Kaliki	22
		Pasir Kaliki → Padjajaran	27
		Padjajaran → Cipaganti	12
		Cipaganti → Setiabudi	19
		Setiabudi → Ledeng	25

Source: JICA Survey Team

The results of the travel speed survey are shown in the Table 3.8.3. From the average speed survey; Especially congested sections with travel speed of less than or equal to 20 km/h are written in red color. Such congested road sections include: Pasteur-Cicaheum Road of Surapati-K.H.P Mustopha section, Soekarno-Hatta Road of south-central part of the city, Ahmad Yani Road of Cicaheum to Asia Afrika Road to Jend. Sudirman Road and around Rajawali Barat, Rajawali Timur Road section, and south-west part of Tegallega-Setiabudi Road. This situation is also shown in the Figure 3.8.5. These congested sections are concentrated in the center and southwest part of central Bandung.

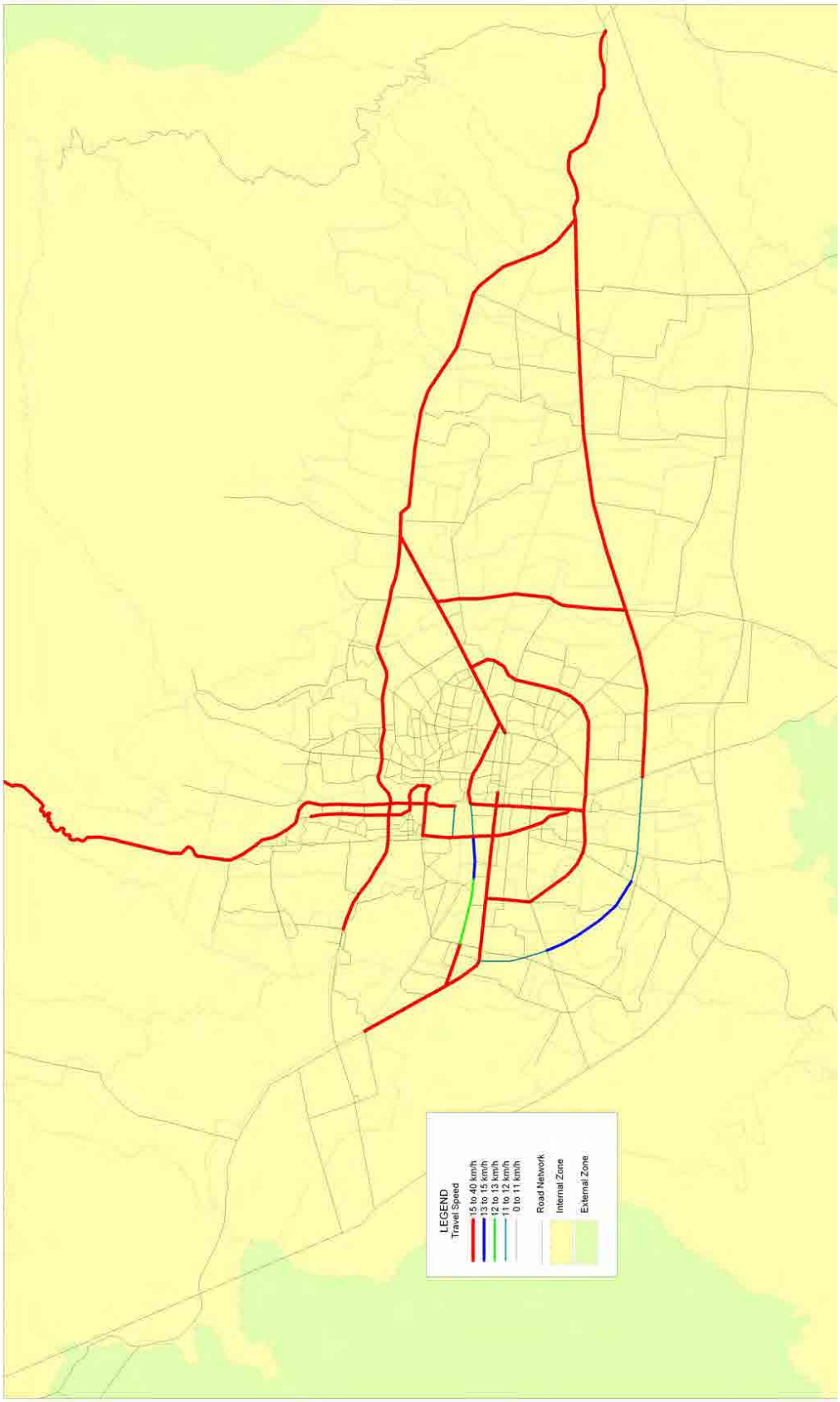


Figure 3.8.5 Result of Travel Speed Survey

There would be some practical policy instruments to tackle with these problems in various fields such as land use control, urban re-generation in CBD, more road development, mass public transport development, and traffic control and management. As one of the measures to deal with the traffic congestion and associated problems such as environmental deterioration, the Survey sought to establish a strategic policy in the field of traffic management.

There are two types of congestions: namely, repeated and irregular. Repeated congestion is one that occurs daily or repeatedly due to daily activities and/or some other regular events. A typical repeated congestion is observed in peak hours on the major radial roads, which is caused by car-using commuters coming from suburban areas to the CBD.

Irregular traffic congestion sometimes happens unexpectedly due to a special event. Typical irregular traffic congestion is caused by road accidents. A broken car by an accident will easily cause traffic congestion, and in many cases, it takes a long time to remove the car from the carriageway and to restore the accident site into normal condition.

As briefly discussed here, the policy for traffic management can be prepared from two aspects: measures for repeated congestion and those for the unexpected/irregular traffic congestion.

(4) Past and Present Traffic Management Methods in Bandung

Identified road traffic management methods applied so far is the one-way system. The intention of the system is to make traffic flow smoother. However, there are cases where the traffic situation does not necessarily improve. Trip length may become longer due to detours, which also may cause traffic congestion.

Figure 3.8.6 Exit of One-way Street

Bus transportation system has been implemented everywhere in the city for selective users as well as captive users. Taxi is also considered as a public transportation system. However, these systems depend on the road network that is insufficient at present. Exclusive lanes for buses or priority lanes will not be influenced by congestion on the roads as well as rail system, thus these systems would help mitigate traffic congestion in town.

3.8.2 Mitigation of Traffic Congestion near the Project Road

(1) Effects of the Project Road on the Traffic Conditions

Apart from over-all traffic congestion in Bandung, there will be some impact on the local traffic along the planned toll highway once it is completed and directly connected to the Pasteur Toll Highway.

1) Intersection Traffic Survey

According to the intersection traffic survey, the peak hour traffic in pcu/h of intersection along the toll highway is as follows:

a. Djunjunan-Surya Sumantri

Table 3.8.4 Peak Hour Traffic from Each Approach (pcu/h)

					R	S	L		
		598	*1,096*	*362*	373	184	1,621		
L	598							*1,621*	
S	1,149							*1,149*	
R	40							*81*	
	373							362	R
	1,627							1,627	S
	1,622							3,470	L
		1,622	1,096	81	*40*	*184*	*3,470*		
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

b. Djunjunan-Pasir Kaliki

Table 3.8.5 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
		348	*902*	*465*	380	811	636		
L	348							*636*	
S	1,415							*1,415*	
R	647							*552*	
	380							465	R
	1,092							1,092	S
	123							132	L
		123	902	552	*647*	*811*	*132*		
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

c. Pastuer-Cipaganti

Table 3.8.6 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
		1,101	*1,696*	*1,101*	-	-	-		
L	1,101								
S	445							*445*	
R	-							*52*	
	-							1,101	R
	1,118							1,118	S
	1,217							-	L
		1,217	1,696	52	*One-way*				
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

d. Pasteur-Cihampelas

Table 3.8.7 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
			One-way		5,697	2,575	672		
L	-							*672*	
S	1,415							*1,415*	
R	647							-	
	5,697							-	R
	1,375							1,375	S
								586	L
		-	-	-	*647*	*2,575*	*586*		
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

e. Taman Sari-Cikapayang

Table 3.8.8 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
		455	*509*	*69*	751	480	135		
L	455							*135*	
S	680							*680*	
R	227							*586*	
	751							69	R
	635							635	S
	771							164	L
		771	509	586	*227*	*480*	*164*		
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

f. Cikapayang-Ir.H.Juanda

Table 3.8.9 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
		290	*1,031*	*599*	440	1,269	60		
L	290							*60*	
S	299							*299*	
R	612							*264*	
	440							599	R
	303							303	S
	175							63	L
		175	1,031	264	*612*	*1,269*	*63*		
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

g. Gasibu (Sentot Alibasayah-Surapati)

Table 3.8.10 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
					-	-	-		
L	296								
S	4,904							*4,904*	
R	3,135								
								-	R
	4,284							4,284	S
	2,682							560	L
		2,682	-	-	*3,135*		*560*		
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

h. Surapati-Pahlawan

Table 3.8.11 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
		249	*718*	*156*	535	491	333		
L	249							*333*	
S	1,432							*1,432*	
R	126							*226*	
	535							156	R
	1,388							1,388	S
	400							352	L
		400	718	226	*126*	*491*	*352*		
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

i. PHH Mustopa-Cikutra

Table 3.8.12 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
		134	*165*	*358*	220	178	313		
L	134							*313*	
S	1,085							*1,085*	
R	206							*153*	
	220							358	R
	2,121							2,121	S
	192							130	L
		192	165	153	*206*	*178*	*130*		
		L	S	R					

Source: This study, L: Left turning, S: Straight, R: Right turning

j. PHH Mustopa-Ahmad Yani (3-legs)

Table 3.8.13 Peak Hour Traffic by Each Approach (pcu/h)

					R	S	L		
L	-								
S	1,478	→						*1,478*	
R	-							*990*	
								-	R
	1,771						←	1,771	S
	119	↰		↱			↙	1,893	L
		119	-	990			*1,893*		
		L	S	R					

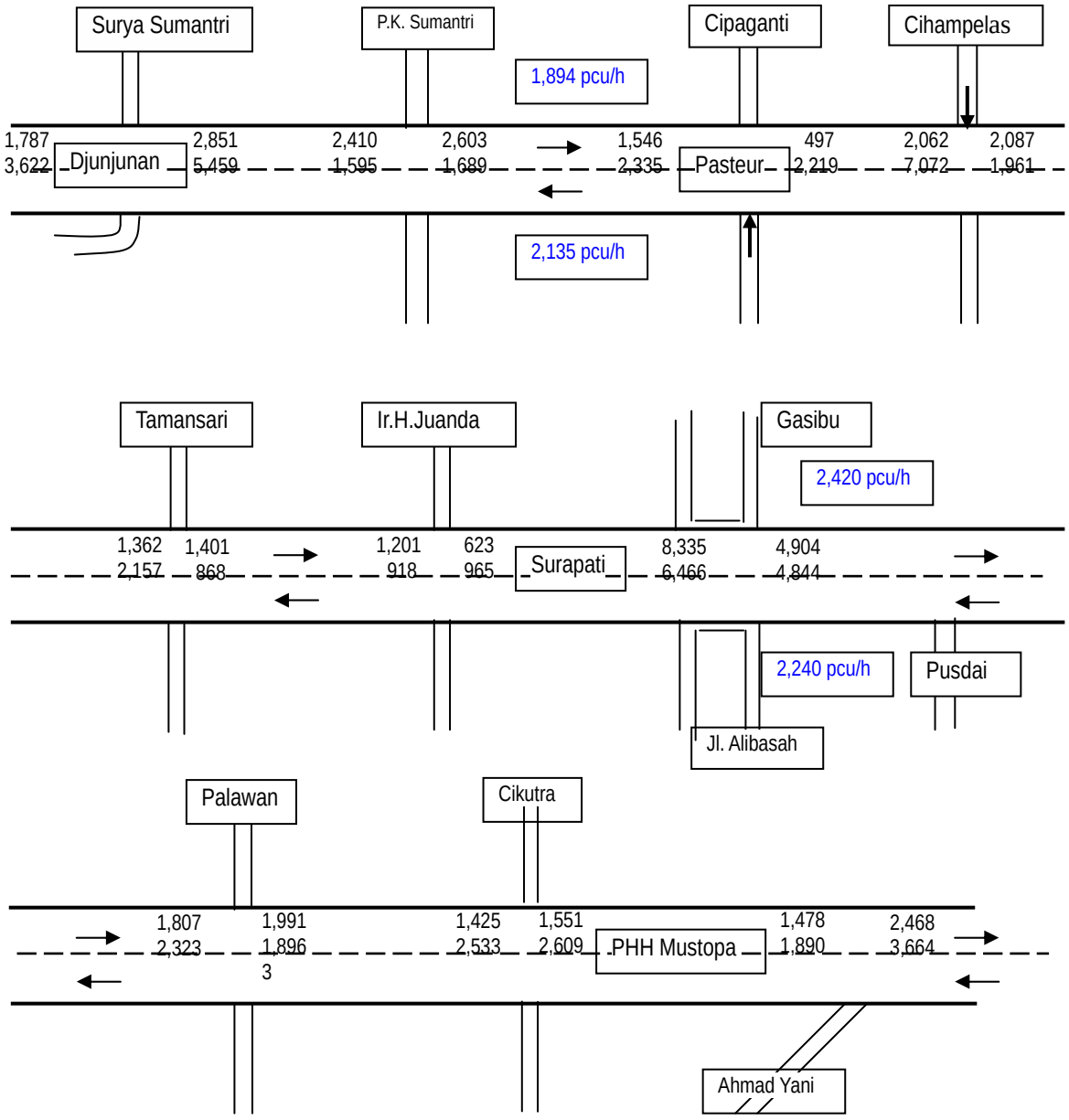
Source: This study, L: Left turning, S: Straight, R: Right turning

It was found out that most of these intersections are oversaturated during peak hour periods. The capacity analysis shows the degree of saturation in Table 3.8.14.

The frontage road peak traffic volumes near the intersections are depicted in Figures 3.8.4. Although this count does not include the main line traffic volume, such as the traffic on the elevated section or the Pasupati Bridge, it can be seen from the figure that Jl. Cihampelas absorbs traffic from Djunjunan into the center, traffic increases at the end of the elevated section from Pasteur at Gasibu, and Jl. Alibasa absorbs a significant volume of traffic from Pasteur and Surapati leading to the city center.

These trends imply that the capacity of Jl. Alibasa, Jl. Pusdai Jl. Surapati near Gasibu area should be increased. Measures to increase capacity would be widening of the roadway itself, implementation of a one-way system that best fit for better circulation, exclusive left turn lane at the intersection as well as introduction of demand-activated traffic signals.

Once the elevated toll highway is constructed, the traffic volume (pcu/h) in the frontage road will decrease as can be seen from the figure between Pasir Kaliki and Cihampelas, and Ir.H. Juanda. The congestion of such roads will be lessened.



Note: Figures in blue: estimated frontage road volume in 2015

Figure 3.8.7 Peak Traffic Count along North Corridor near Intersection

Table 3.8.14 Result of Intersection Analysis

No	Intersection	Total Volume (pcu/hr)				Capacity (pcu/hr)				Degree of Saturation				Delay (sec/ pcu)	Average no. of vehicle stop
		N	E	S	W	N	E	S	W	N	E	S	W		
1	Junjunan-Surya Sumantri	2,178	5,459	2,799	1,787	492	4,688	1,162	2,663	1.13	0.42	2.34	0.45	611.6	16.1
2	Junjunan-Pasir Kaliki	1,827	1,688	1,576	2,410	1,393	2,984	2,593	2,293	0.86	0.52	0.56	0.90	14.8	2.5
3	Pasteur-Cipaganti	-	2,219	2,965	1,546		1,760	1,860	894	-	1.26	0.94	0.50	173.4	4.7
4	Pasteur-Cihampelas	8,944	1,961	-	2,062	4,486	2,060		2,848	1.99	0.95	-	0.72	1,273	16.2
5	Taman Sari-Cikapayang	1,366	869	1,866	1,362	2,222	2,910	869	2,507	0.55	0.24	1.26	0.36	174.8	4.3
6	Cikapayang-Ir. H. Juanda	1,769	965	1,470	1,202	1,189	1,122	1,675	1,410	1.44	0.80	0.77	0.65	273.0	5.5
7	Gasibu (Sentot Alibasyah-Surapati)	-	4,844	2,682	8,335		7,192		2,187		0.60		3.68	1,036	21.6
8	Surapati-Pahlawan	1,359	1,896	1,345	1,807	1,579	1,187	561	1,124	0.65	1.30	1.68	1.39	635.0	9.6
9	PHH Mustopa-Cikutra	711	2,608	510	1,424	295	1,446	290	1,741	1.35	1.71	1.09	0.74	764.9	10.9
10	PHH Mustopa-Ahmad Yani	-	3,664	2,588	1,478		2,945	2,501	1,810	-	1.24	1.03	0.82	249.0	5.5
11	Bundaran Cibiru	5,736	4,345	-	1,303	4,111	4,844	6,873		1.40	0.90		0.19	-	-
12	Soekarno Hatta-Gedebage	1,254	3,690	627	2,993	1,502	4,066	686	4,018	0.83	0.91	0.91	0.74	15.3	1.2

2) Traffic Management near Gasibu Area

Special attention should be paid to the traffic conditions in the east of the Gasibu underpass area. Present traffic, according to the intersection survey, shows 4,900 pcu/h for eastbound and 4,800 pcu/h for westbound in the vicinity of Gasibu section. In the F/S 2006, the traffic volume showed 4,200 pcu/h for eastbound and 5,300 pcu/h for westbound during morning peak period. This road section is a four-lane undivided street, of which capacity in pcu/h/lane will be 1,800 ~ 2,000 pcu/h x 4 (both directions) = 7,200 ~ 8,000 pcu/h under desirable and uninterrupted conditions. In reality, there are many neighboring intersections where the capacity limit to interrupted flow is less than the capacity above, depending on allocated green periods. In fact, the traffic in the section near the Palawan intersection is 1,800 pcu/h for eastbound and 2,300 pcu/h for westbound, which are almost half of the traffic in the Gasibu area. The actual traffic count near the Gasibu area therefore implies that this specific section of Jl Surapati up to Jl. Pusdai is capable of absorbing a large amount of traffic.

On the other hand, the figure below shows the hourly traffic near the Gazibu area in 2015 based on the estimated daily traffic. A peak hour factor of 10 % is used to convert from daily to hourly traffic. The traffic flow of this stretch of the Surapati Road is fairly smooth compared with neighboring sections, which are congested due to almost uninterrupted flow conditions of the street. However, it seems necessary to widen the road from the existing four lanes to six lanes for both directions at least until Jl. Pusdai, to avoid congestion at the exit and entrance of the toll highway. An exclusive right turn lane should be constructed at the Pusdai intersection as well as a right turn signal phasing for traffic coming from the underpass to the city center through Jl. Diponegoro or W.R. Supratman.

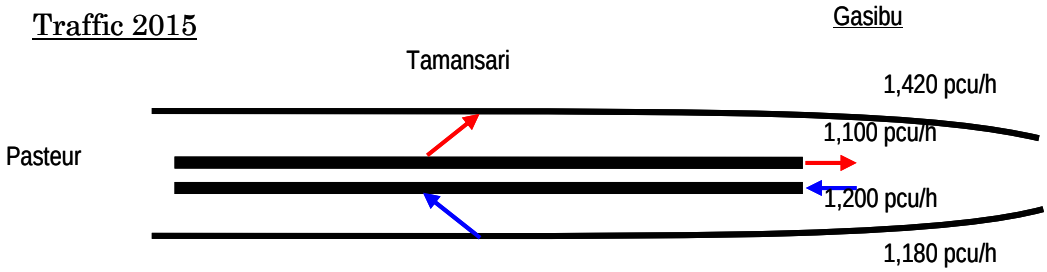


Figure 3.8.8 Hourly Forecasted Traffic near Gasibu Area

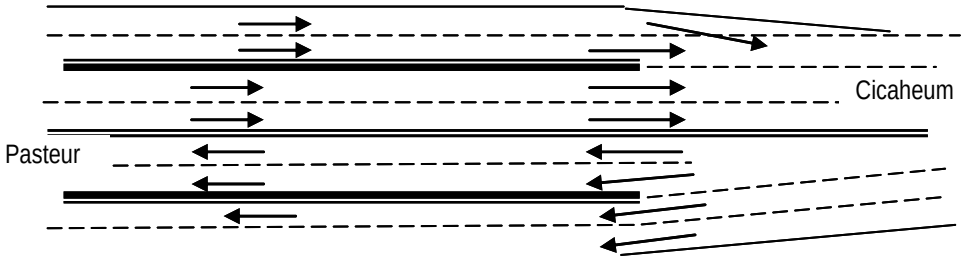


Figure 3.8.9 Image of Traffic Operation at Gasibu Entrance-Exit (1st Phase)

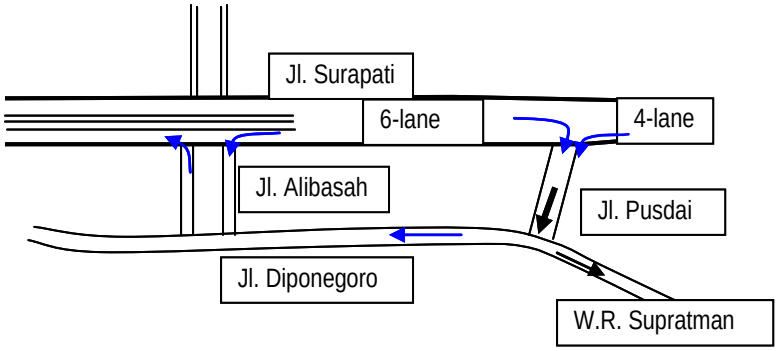


Figure 3.8.10 Traffic Movement at Gasibu Entrance-Exit (1st Phase)

Attention also must be paid to traffic operation during construction of the Gasibu underpass. Although the specific construction methods will be examined at the detailed design stage, detour of the existing roadway utilizing the existing frontage road space is necessary. Traffic diversion to Tamansari Road and S. Alibasah would be possible.

3) Traffic Management of the Intersections along the Project Road

As can be seen from "Present Conditions of Traffic", road area in Bandung is smaller than any other major cities in Indonesia. Among measures to mitigate traffic congestion, road development is one of the solutions. Although the Pasteur-Cileunyi Toll Highway and Cibiru-Gedebage Toll Highway can improve the transportation system performance in terms of reduction of travel time and mitigation of congestion in a certain location, there will be some impacts on the local traffic on the frontage road along the planned toll highway once it is completed and directly connected to the Pasteur Toll Highway. There are some locations where the present intersection will be able to handle the future traffic; on the other hand there are some locations where improvement is required. These are;

- Pasteur-Cihampelas Intersection

This intersection is located on the east of the Paspati Bridge. The traffic from north leg that is one-way is predominant and exceeds the capacity. The present roadway width of 8.1 m should be widened to cater for two-lane through traffic and a right-turning lane to increase the

capacity. Traffic signal phase for the north direction should be much longer.

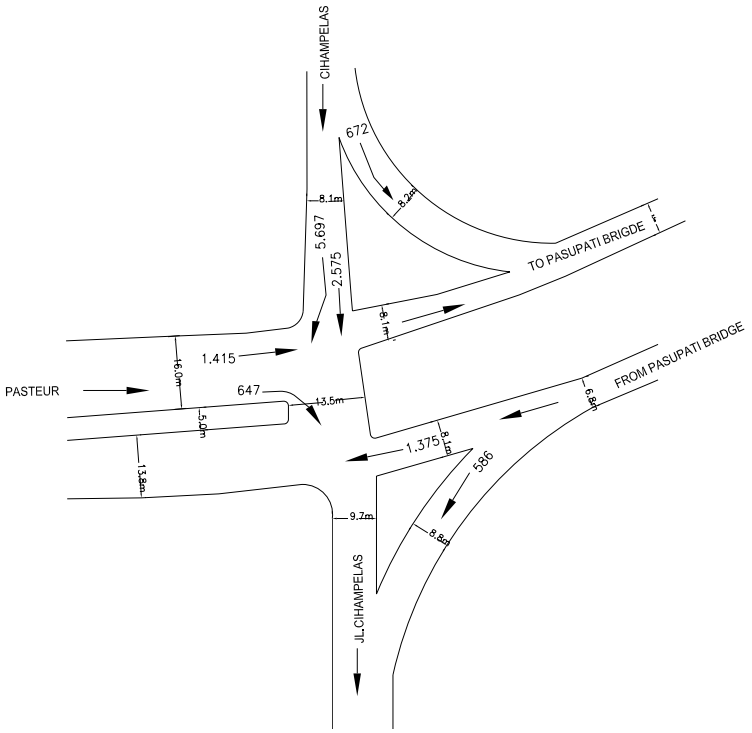


Figure 3.8.11 Pasteur – Cihampelas Intersection

- Cikapayang-Ir. H. Junada Intersection

  This intersection handles prevailing traffic of north-south direction. The traffic flow at present and future will be relatively smooth according to the future traffic forecast. The priority signal phasing to the north-south traffic will be necessary.

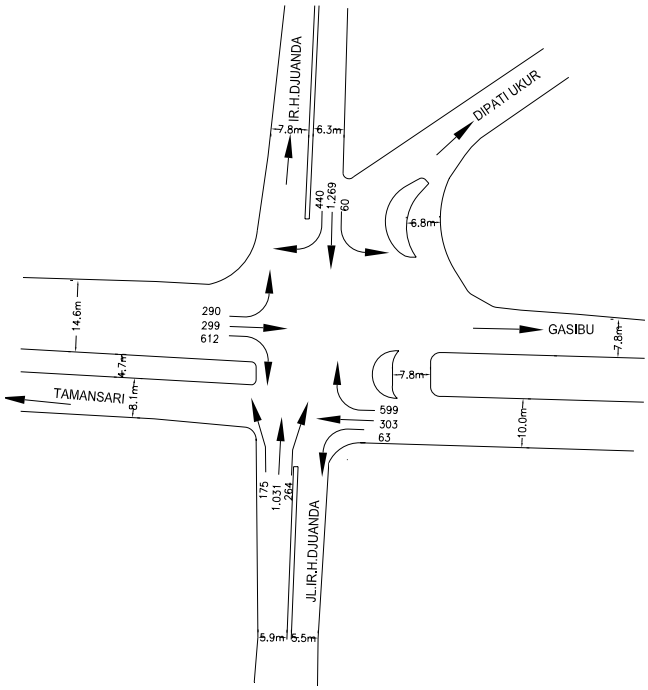


Figure 3.8.12 Cikapayang – Ir. H. Junada Intersection

- Sulapati-Pahlawan Intersection

  This intersection is saturated during peak periods. Unless grade separated structure is constructed this intersection will become a bottleneck. However, when the second phase IUTR is completed the elevated road will absorb a significant volume of traffic resulting in less traffic at the intersection even during peak periods. South leg section of the road should be widened to cater for through traffic and exclusive right lane traffic.

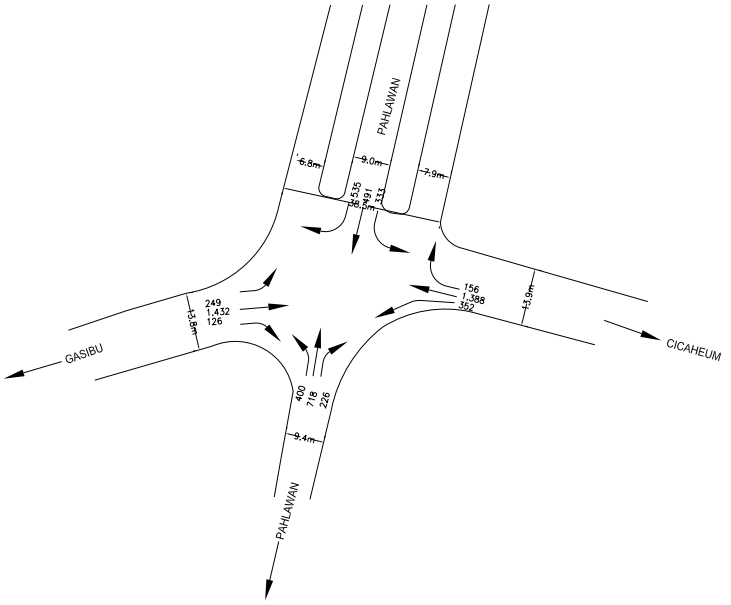


Figure 3.8.13 Sulapati - Pahlawan Intersection

- PHH Mustopa-Cikutra Intersection

  The traffic of east-west direction prevails at the intersection. Priority signal phasing should be given to these directions. Jl. Cikutra should be widened from 6.8 m to at least 11 m to handle through and right-turning traffic.

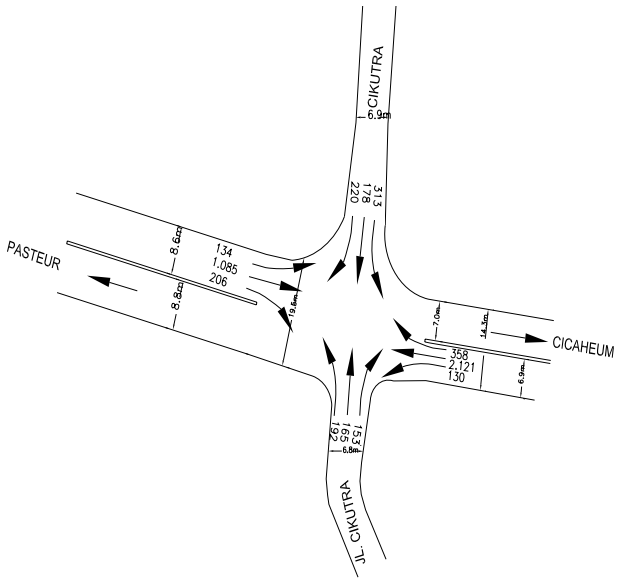


Figure 3.8.14 PHH Mustopa - Cikutra Intersection

- PHH Mustopa-Ahmad Yani Intersection

  The east-west traffic prevails at the intersection. Priority signal phasing to the east-west traffic will mitigate congestion together with elevate road which handles through traffic once it is completed.

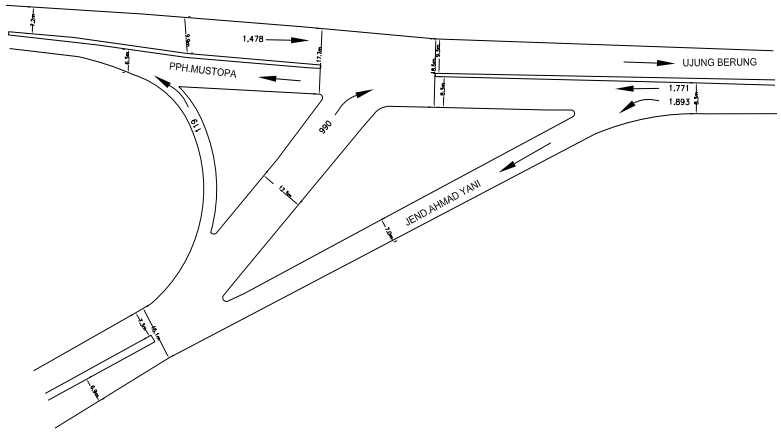


Figure 3.8.15 PHH Mustopa – Ahmad Yani Intersection

4) Intersection Capacity Analysis

Based on the analysis, nine out of twelve surveyed intersections have one or more legs with saturated flow. Severe congestion must have occurred at Djunjunan-Surya Sumantri, Pasteur-Cihampelas, Gasibu, Surapati-Pahlawan, PHH Mustopa-Cikura, and PHH Mustopha-Ahmad Yani. These intersections are not able to absorb traffic demand during peak periods irrespective of signal phase changes

Mitigation measures for these intersections are limited to hard measures of widening each leg and introduction of channelization that allows left-turning vehicles to turn on red, especially in the saturated direction so that the capacity of such leg becomes larger to absorb demands. Another mitigation measure will be the introduction of TDM to reduce demands especially during peak periods.

(2) Measures against Traffic Congestion at Pasteur Toll Gate

Pasteur toll gate handles about 30,000 vehicles a day during weekdays and 50,000 to 60,000 vehicles per day on weekends. The number of toll gates at the entrance is four and the exit is seven. The handling capacity of the gate is roughly 4,500 vehicles per hour.

Apart from the handling capacity of the Pasteur Toll Gate, the major cause of congestion is the accumulation of traffic at the intersection soon after the toll gate. The Jl.P.Dr.Surya Sumantri - Jl.Dr.Djundjunan intersection is signalized and handles a large amount of traffic especially from Jl.P.Dr.Syrya Sumantri. The through-traffic from the Pasteur Toll Gate to the east is hindered by right turning traffic from Jl.P.Dr.Surya Sumantri.

According to the traffic survey in 2009, the peak hour traffic at the Djunjunan and Surya Sumantri intersection located soon after the Pasteur Toll gate is shown in the following table:

Table 3.8.15 Peak Hour Traffic for Each Approach (pcu/h)

					R	S	L		
		1,597	*1,096*	*362*	373	184	1,621		
L	1,597							*1,621*	
S	1,149							*1,149*	
R	40							*81*	
	373							362	R
	1,627							1,627	S
	1,622							3,470	L
		1,622	1,096	81	*40*	*184*	*3,470*		
		L	S	R					

L: Left turning, S: Straight, R: Right turning

The basis of the intersection analysis assumes that the signal phasing is three, E-W, N-S, and exclusive right turns. Based on the preliminary analysis during peak period, the total governing normalized traffic (0.46 + 0.21 + 0.70) exceeds 1.0, which means that the intersection is oversaturated. The most influential direction is from the south leg, which may have interrupted east-west traffic at the present condition. Since the traffic count given in the figure is actually counted at site, left-turning traffic from the west leg may have turned on red. In order to control traffic at this intersection with signal, it is necessary to increase the number of left turn lanes from the south leg. Thus, it is recommended to provide exclusive left turning lanes toward the direction of the Pasteur Toll Gate.

Table 3.8.16 Capacity Analysis of Jl.P.Dr.Surya Sumantri and Jl.Dr.Djundjunan Intersection

Entering Leg		West			North			East			South	
		Left/s	Str.	Right	Left	Str.	Right	Left/s	Str.	Right	Left/St	Right
Basic saturation flow		2,000	2,000	1,800	2,000	2,000	1,800	2,000	2,000	1,800	2,000	1,800
# of Lanes		1	1	1	1	1	1	2	2	1	2	1
Adjustment of lane		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Adjustment of slope		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Adjustment of large vehicles		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Adjustment of left turn vehicles ratio (%)		0.90 34.2 %	1.0	1.0	0.97	1.0	1.0	0.97	1.0	1.0	0.97 6.9 %	1.0
Saturation flow		1,800	2,000	1,800	1,940	2,000	1,800	3,880	4,000	1,800	3,880	1,800
Traffic volume			1,747	40	1,621	184	373	3,470	1,627	362	2,718	81
Normalized traffic			0.46	0.02	Ex.	0.09	0.21	Ex.	0.41	0.20	0.70	0.05
Signal Phase	1(E-W)		0.46						0.41			
	2(Right)						0.21					0.05
	3(N-S)					0.09					0.70	

Note: Ex: - Exclusive, Str. - Straight

The future traffic condition of this intersection will be dramatically improved due to the construction of the planned Pasteur-Cileunyi Toll Highway. The grade-separated structures will handle a large volume of through-traffic to and from the toll gate. The local traffic passing through the intersection can be managed by traffic signals. The future signal split, which gives more green time for the right turning movement from the Jl.P.Dr.Surya Sumantri, will result to smoother traffic flow.

(3) Measures for Inbound Motorcycle Traffic caused by Tolling of the Pasupati Bridge

1) Existing Conditions

According to the F/S study, the Pasupati Bridge will be incorporated as part of the toll highway and used by toll highway users. There are presently three lanes for each direction. The two lanes in the median side are used by through-traffic connecting Pasteur and Surapati.

The one-lane shoulder side is mainly used by local traffic from the city roads of both sides of the bridge, namely Cihampelas Road and Tamansari Road. Access from the bridge to both city roads and vice versa is secured at the present stage. Thus, the shoulder side lane is considered as both speed-change lane and local traffic lane as shown below:

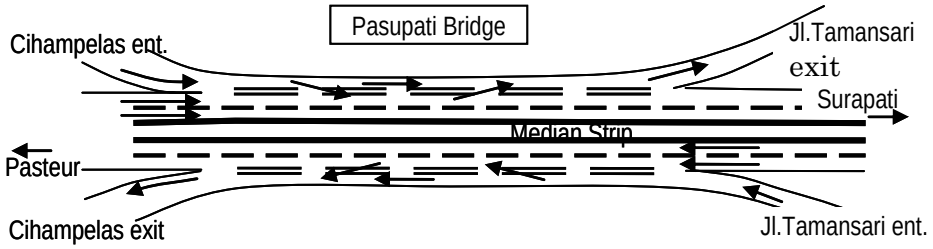


Figure 3.8.16 Present traffic operation

The number of registered motor vehicles in Bandung City is approximately 600,000, 200,000 of which belong to Bandung Province. The highest proportions of the vehicles are motorcycles, which comprise 68%, followed by automobiles of 24%, and trucks, 7%. Management of motorcycle traffic currently using the Pasupati Bridge influences traffic movement in the north-central part of the Bandung City area. This is especially true along Jl.Cihanmpelas, Jl. Tamansari, Jl.H.Juanda and other north-south and east-west connections.

2) Issues Caused by New Traffic Operation

If motorcycle traffic is not allowed on the bridge because motorcycles are not permitted on toll roads, and instead has to make detours to the center of the city, there would be severe congestion on the streets as mentioned before. On the other hand, the location of access ramps along the planned toll highway will influence the traffic operation of the Pasupati Bridge. Section 3.4.1 reviews the location and design of on/off-ramps. Based on the review, the access to and from the Tamansari Road going to H.Juanda Road is important to serve the traffic demand between the Pasteur Toll Highway and the north and central areas of Bandung. The measures should consider both requirements at the same time.

3) Measures for Inbound Motorcycle Traffic caused by Tolling of the Pasupati Bridge

In order to avoid such worst situation where motorcycle traffic have to detour the bridge and turn around utilizing city roads and streets, there are several ways to manage both local traffic dominated by motorcycles and toll highway traffic passing through the Pasupati Bridge.

- Concept of Solution 1

Local traffic is allowed to use the shoulder-side lane of the bridge, but not allowed to use the toll highway by posting traffic signs and markings. Naturally, local traffic is not going to be tolled. The roadway configuration will be same as the present shape. This method only requires markings and regulatory signs to control traffic. New toll highway users do not have access to both ends of the Pasupati Bridge, namely, the Tamansari Road and Cihampelas Road. The previous local bridge users cannot use the new toll road from both roads either.

The consequences of this operation are two-fold: automobile users will be embarrassed with the no-enter regulation of local traffic into the toll highway, which used to be free to use. Influence on the motorcycle traffic will be minimized. However, there will be a possibility of violation of traffic rules unless the enforcement is strictly done.

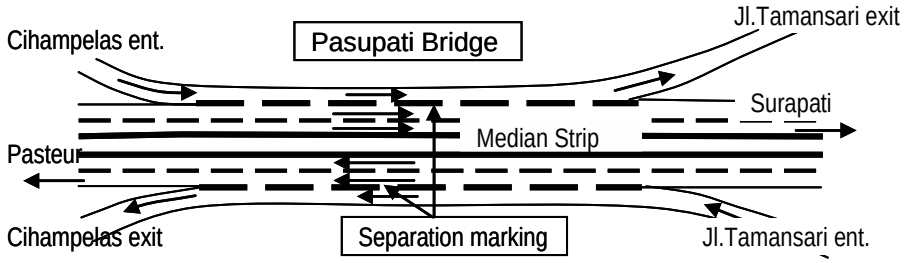


Figure 3.8.17 Concept of traffic operation (1)

- Concept of Solution 2

  Median-side lanes and shoulder-side lane are divided by physical barriers to separate local and through-traffic; local traffic, mostly motorcycles, is not tolled and will use the existing shoulder-side lane to maintain the present local traffic service on both sides of the bridge.

  There are both merits and demerits of this operation: Providing a physical barrier to separate toll highway traffic and local traffic can secure smooth flow of toll highway traffic, and at the same time, the local traffic can still use the bridge as before the construction of the planned toll highway. On the other hand, new toll highway users do not have access to both ends of the Pasupati Bridge. The previous local bridge users cannot use the new toll road from both roads either.

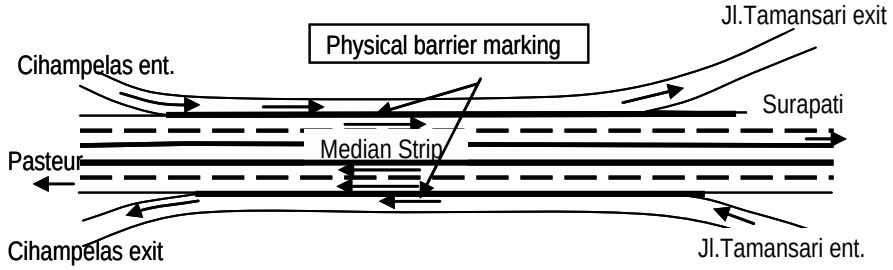


Figure 3.8.18 Concept of traffic operation (2)

- Concept of Solution 3

  Access to and from the toll highway is allowed only at the Jl. Tamansari entrance and exit. Motorcycle traffic is not tolled and allowed to use the shoulder-side lane by traffic regulation. Traffic from Pasteur can use the Jl. Tamansari exit to access to the north and city center. The shoulder-side lanes on both directions will be operated as mix traffic of motorcycles and enter-exiting vehicles. If the access at the both ends of the bridge is closed by physical barriers or traffic regulation, through-traffic coming from Pasteur would have to use the exit after the Gasibu underpass section according to the F/S plan.

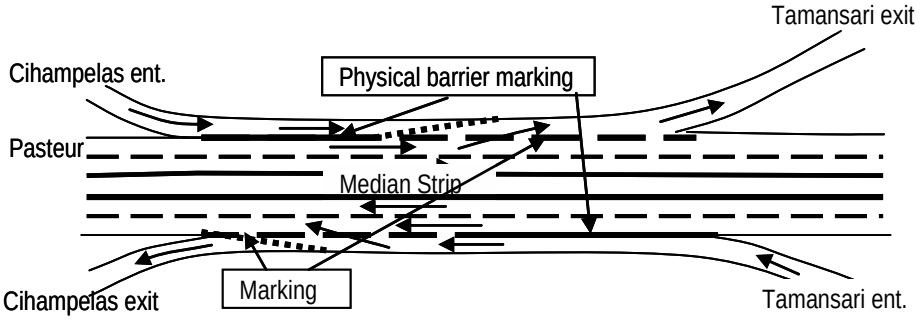


Figure 3.8.19 Concept of traffic operation (3)

- Concept of Solution 4

Variation of operation (3) will be the separation of toll road users and local traffic with physical barriers but access to and from Tamansari Road is secured by providing deceleration-acceleration lanes on the bridge. In order to install both local lane and deceleration-acceleration lanes on the bridge, exceptional lane allocations will be necessary: through lane width of 3.25 m x 2, deceleration-acceleration lanes of 3.0 m and local lane of 3.0 m as shown below:

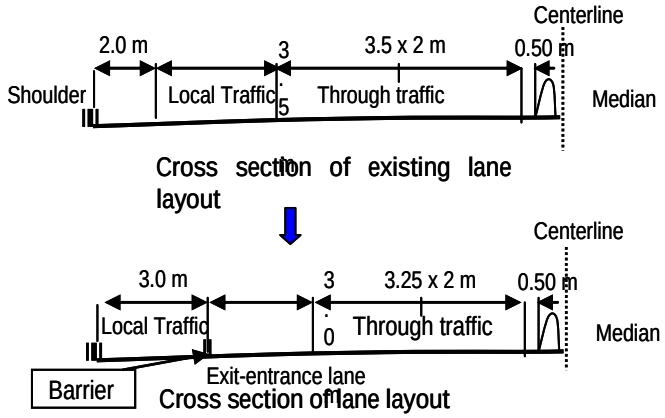


Figure 3.8.20 Cross section changes

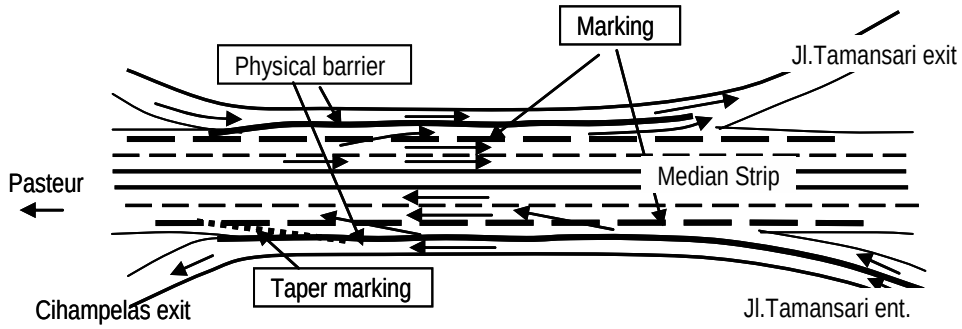


Figure 3.8.21 Concept of traffic operation (4)

Providing physical barriers secures a complete separation of local traffic and toll road traffic to Tamansari Road, which is different from solution No. 3 to regulate local traffic with barriers and marking/signs. However, the No.4 solution needs exceptional treatment of traffic lanes, which necessitates imposing a speed limit of less than 60 km/h near the bridge area. In either case, traffic enforcement should be strictly implemented until people get used to the intended use of the bridge.

In summary, solutions No.1 and 2 do not create problems of additional traffic load on the existing conditions, but access of toll road traffic to both ends of the Pasupati Bridge is limited. Solutions No.3 and 4 try to separate local traffic from toll road users, but will provide exiting-entering access to Tamansari Road. As far as the local traffic is able to use the Pasupati Bridge when the new toll road is completed, there would not be serious traffic problems in town except some inconveniences to local traffic, which has been accustomed to enter the elevated road from the Cihampelas Road. Therefore, solution No.4 is the best option since it satisfies both requirements.

(4) Measures against Traffic Congestion on PH. Hassan Mutopa and J.A. Yani Streets

The section near the P.H. Mutopa Street is narrow and goes through active commercial areas with a lot of small shops. The road is originally designed as two-lane for each direction within the limited road space. However, curbside lanes are always occupied by parked vehicles which hinder smooth traffic flow. Logically, the capacity of the road becomes half of the expected capacity.

Figure 3.8.22 Congestion along Hassan Mutopa Street

J.A. Yani Street is also located along the active commercial areas, where loading and unloading vehicles park along the street, occupying one lane as well as parking vehicles of customers. There are some sections where the one-way system is applied along this street

1) Parking control

   Commercial activities of small shops and restaurants attract more people. Although there are public bus services along the street, people use their own automobiles and park alongside the street, thus hindering passing traffic. One of the ways to relieve the present traffic congestion is to regulate on-street parking.

   However, regulation alone cannot solve the present problems. Off-street parking facilities along this road will shift on-street parking vehicles to the parking garage.

2) Relocation of small businesses and shops

   The Bandung City government is trying to relocate small shops along the Hassan Mutopa Street for the future planned toll road implementation. The expected relocation areas have already been presented to shop owners. One of the choices would be the Cicaheum Bus Terminal of a local bus service. Parking buildings, together with a nice shopping complex, would attract people.

(5) Optimization of Ramp Locations, Interchange Type and Geometry

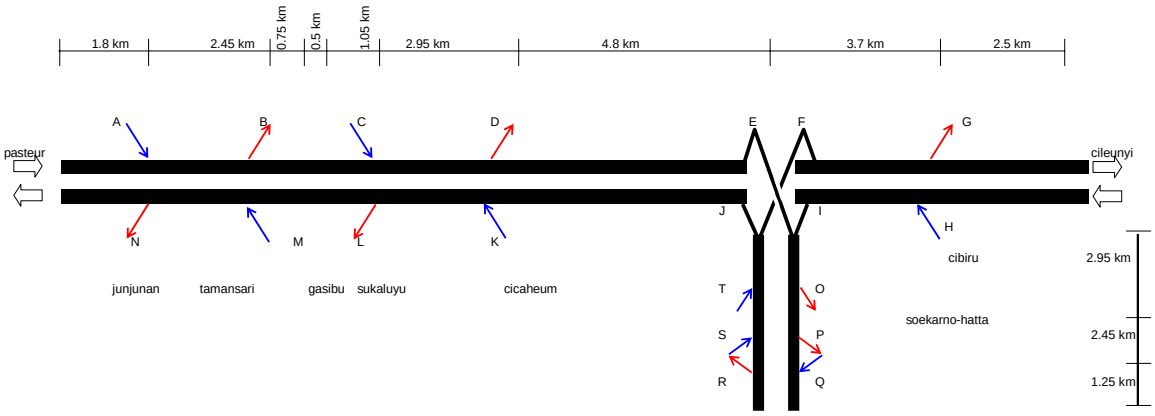


Figure 3.8.23 Proposed Ramp Location

1) Djunjunan Ramp

The VCR value for on-ramps is significantly different compared with that of off-ramps, i.e. 0.04 for on-ramp and 0.38 for off-ramp. This shows that the number of vehicles exiting the toll using the ramp is significant; implying that the exiting speeds are probably not much different to those traveling on the existing roads accommodating vehicles from the toll. As such, existing roads connecting to this off-ramp only require curbs of 5-meter length. Furthermore, because the ramp at Djunjunan Intersection covers the exits from housing areas, hotels, or even offices, it requires frontage or access roads to maintain normal accessibility of the surrounding community.

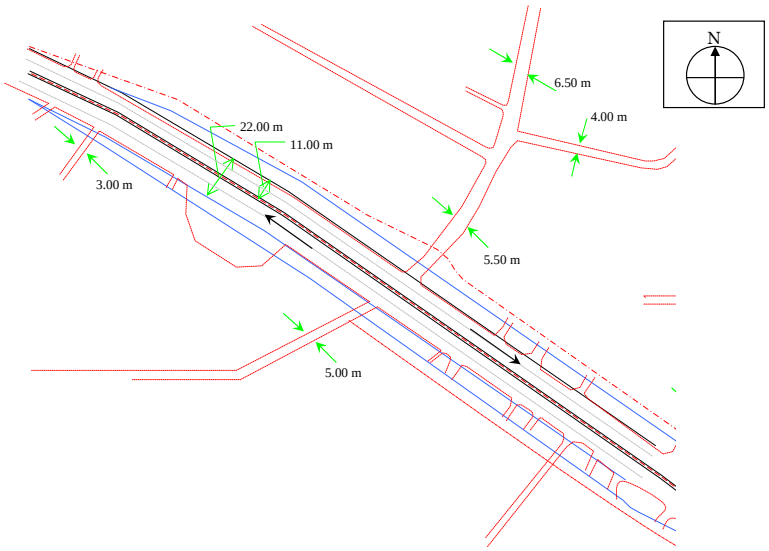


Figure 3.8.24 Djunjunan Ramp

2) Sukaluyu Ramp

The area in Sukaluyu in the second phase will be an elevated structure. The on- and off-ramps are basically the same as the Djunjunan Ramp. This ramp is designed for trips from the city center to the eastern part of Bandung. Merging and diverting areas need extra space on the street. In order to mitigate congestions that will occur due to the magnitude of traffic in Surapati Road, a traffic light system must be installed at the end of the off-ramp in Sukaluyu.

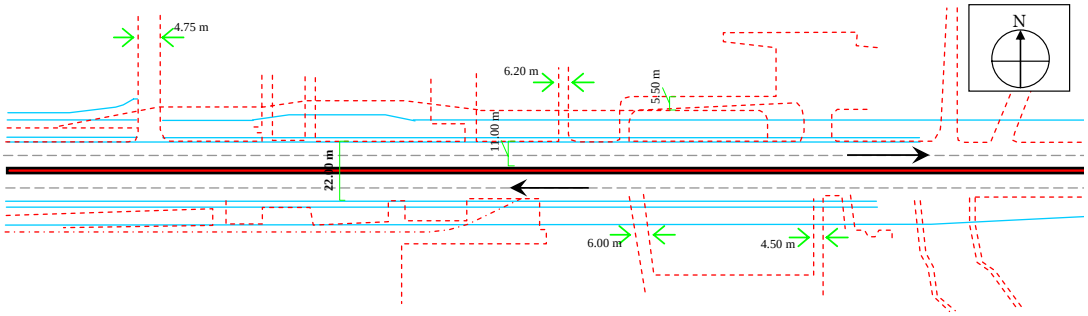


Figure 3.8.25 Sukaluyu Ramp

3) Cicaheum Ramp

The Cicaheum on-ramp is planned to traverse existing local roads, taking up a lot of public and industrial unit space. The off-ramp will block some of the community shops and housing, and entrance to slums in Jatihandap. That is why a new access/frontage road will be constructed to connect these locations with existing/arterial roads underneath the toll.

Considering that the Cicaheum area has an inter-provincial terminal, traffic lights will be constructed at the off-ramp connection with existing roads, in addition to also constructing kerbs.

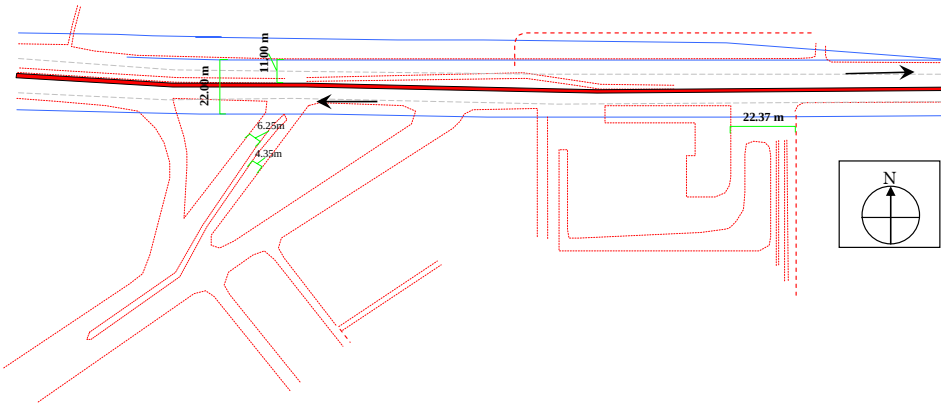


Figure 3.8.26 Cicaheum Off-ramp

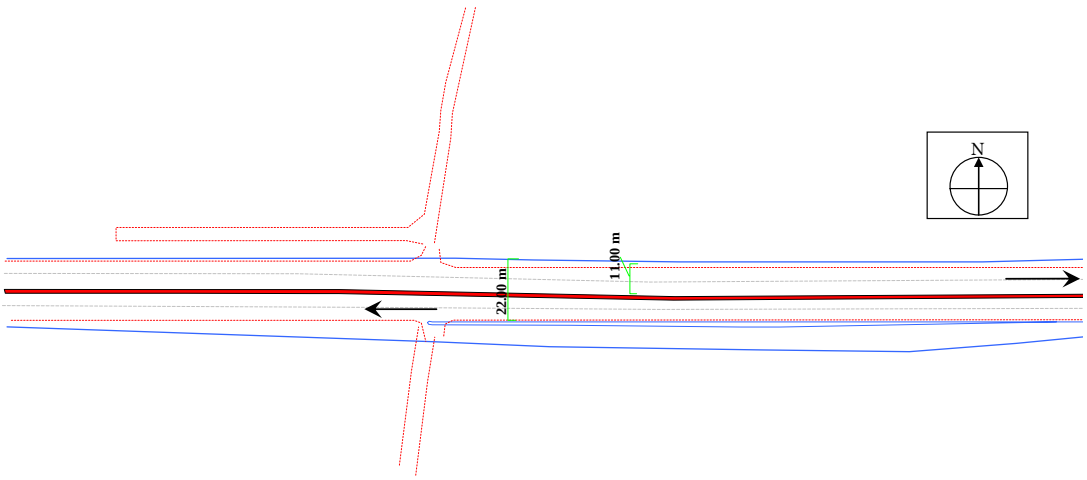


Figure 3.8.27 Cicaheum On-ramp

4) Cibiru Ramp

Cibiru Ramp located at Sta. 16+500 – Sta. 17+500 consist of on- and off-ramps. The planned on-ramp will block the access road to surrounding industrial estates and also community housing, while the off-ramp will block entrance to the slums. Therefore, a frontage road will be constructed to replace these access roads to preserve accessibility of the surrounding community to the existing artery roads beneath the toll.

The VCR values of the on- and off-ramps at the Cibiru Intersection are relatively high, i.e., 0.49 and 0.38, respectively. The off-ramp will connect with a two-way existing road, i.e., the Cibiru – Cileunyi Main Road, which does not have a median. As such, the management system for the existing roads can be done through the following alternatives:

- Maintain the two-way direction, but build a median or kerb, or
- Restrict the existing road to a one-way road.

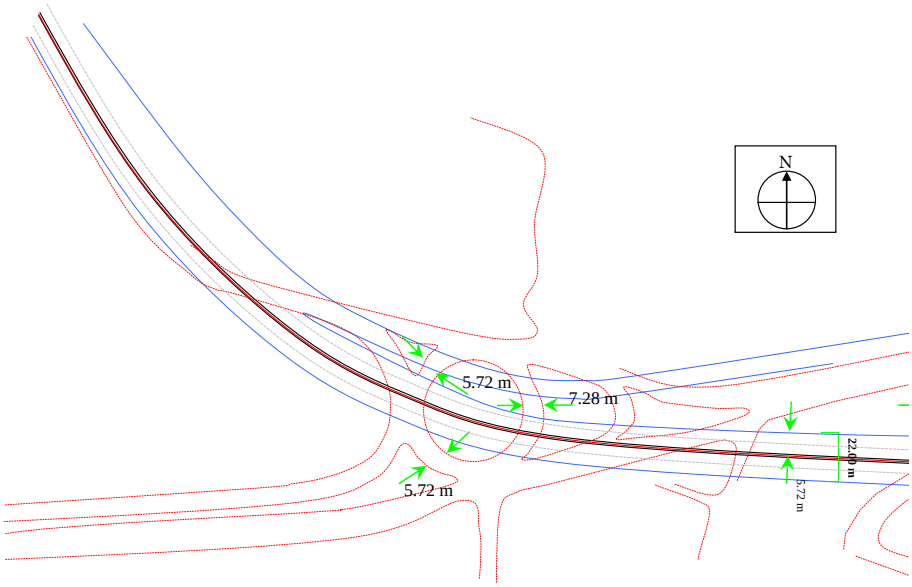


Figure 3.8.28 Cibiru Ramp

5) Soekarno-Hatta Ramp

At the on-ramp of Soekarno-Hatta, the speed of vehicles entering the toll is lower than that of those exiting, which is evident in their respective VCR values. Exiting speed requires five to ten meters kerb to be built at the off-ramp as separator between the ramp with existing roads.

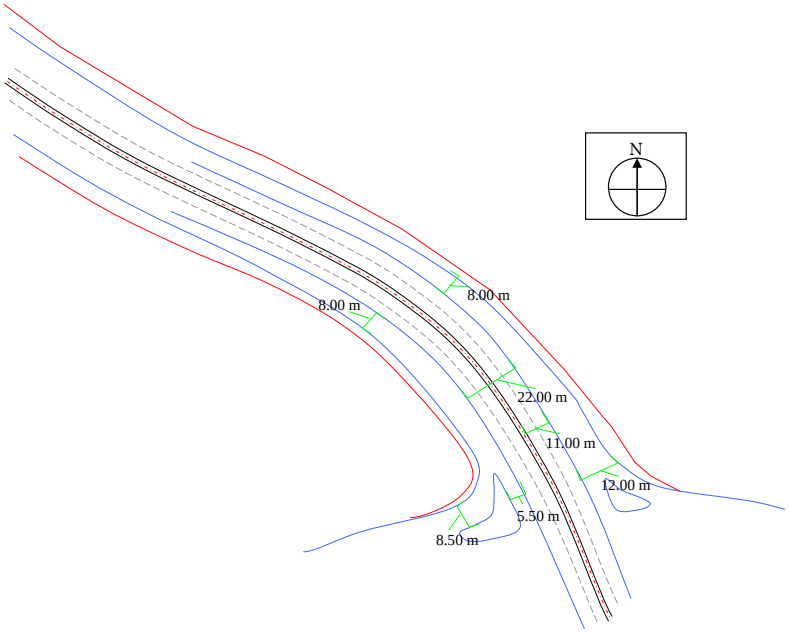


Figure 3.8.29 Soekarno-Hatta Ramp

6) Gedebage Ramp

The on- and off-ramps in Gedebage also have relatively small VCRs, i.e. 0.09 for on-ramp and 0.01 for off-ramp. This also implies quite a significant length of kerb is required, like in the Ciwastra area. However, in accordance with the regional development plan, in the near future both the ramp and planned frontage road are estimated to experience a significant rise in VCR values. As such, traffic lights are also planned at the off-ramp.

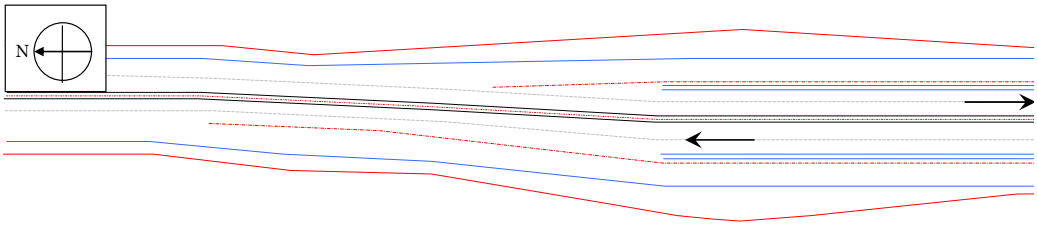


Figure 3.8.30 Gedebage Ramp

3.8.3 Suggestions for Area-Wide Traffic Management in Bandung

(1) Infrastructure Development

As can be concluded from Section 3.9.1(3), the road area in Bandung is smaller than in any other major cities of Indonesia. It can be said that road development is necessary. The construction of the Pasteur-Cileunyi Toll Highway and Cibiru-Gedebage Toll Highway can improve the transportation system performance in terms of reduction of travel time and mitigation of congestion in certain locations. However, road construction alone would not completely solve the traffic problems in Bandung. There are many aspects and locations where improvement is required, which include:

- Grade-separated structures of major intersections along the east-west and north-south arterials as well as railroad crossings;
- Widening of existing roads;
- Intersection improvement;

- Signalization of intersections (including demand-activated signals and/or area signal control);
- Removing roundabouts in heavy traffic areas; and
- Introduction of left-turning-on-red system, with exclusive left lanes at specific intersections where left turning vehicles prevail.

(2) Medium- to Long-Term Traffic Management

1) Transportation Demand Management (TDM)

For overall traffic control and management, one of the policy instruments is the so-called transportation demand management. The purpose of TDM is to reduce automobile use so that any type of transportation mode can effectively use the present road facilities. With the increase of population in Bandung City from 1.8 million in 1998 to about 2.7 million in 2007, together with the outward expansion of residential development, traffic condition in the city areas is expected to become worse in terms of traffic volume and travel time in the coming year. In order to relieve the present and future conditions, a one-way circulation of roads and bus transportation system has been practiced in the city center. However, the introduction of mass transit system and road circulation alone cannot solve the problems of traffic congestion with increased population and vehicles. Apart from the development of the road network, various types of TDM are necessary in the future, as enumerated below:

- Encourage more use of mass transportation systems such as:
  - Bus Rapid Transit (BRT) or LRT (Light Rail Transit), new vehicles with higher capacity, comfortable ride, reliable services and safe transportation to attract more people to use this transportation;
  - Secondary bus service, which supplements trunk bus services routed on the primary or secondary roads;
  - Zone bus service, which serves only a specific zone (same as feeder service bus);
  - Bus service for handicapped people;
  - High-speed shuttle bus service between two points (express bus service);
  - Circumferential bus service in the CBD, which contributes to the promotion of public transport use; and
  - Park and ride facilities, which encourages modal shift from automobile use to mass transit, especially with urban residential area development at the outskirts of the city in the future. One of the examples of “park and ride” facilities is the BART system in San Francisco, in the United States of America (USA), where every station has a wide parking space. BART is managing the rapid transportation system as well as parking facilities.

- Encourage use of bicycles and pedestrian traffic by providing:
  - Pedestrian mall in commercial and business districts,
  - Pedestrian zone in the CBD,
  - Bike lanes to encourage use of non-motorized transportation modes.

Figure 3.8.31 Previous Street Turned to be a Linear Park in Milan, Italy (Sidewalk is provided in the gallery)

- Control car ownership by enforcing:
  - Car sharing; this reduces the number of registered automobiles,
  - Automobile tax increase, which slows down the increase rate of car ownership,
  - Strict regulations of automobile storage, especially in the CBD area.

- Restrain automobile use and promote effective use of automobiles by implementing:
  - One-way system to maintain smooth traffic flow,
  - Traffic control zone that allows only accepted vehicles,
  - Road pricing to limit the number of vehicles, such as allowing only high occupancy vehicles,
  - Parking management (increasing fares and strict regulation),
  - Car pooling; this aims to reduce commuting traffic during peak periods, and
  - Limitation of vehicles entering into the CBD by providing detours.

- Control trip generation and destination through:
  - Land use control and regulation;
  - Regulation of development area by city planning; and
  - Limiting new development in a designated area.

2) Traffic Control Center (TCC)

For better traffic control with modern control devices and computerized system, it is recommended to establish and organize the Traffic Control Center in the city. The city of Bandung already established TCC and is being operated by the police and city government officers. There are 154 intersections in Bandung with traffic lights, 134 of which are connected with the Area Traffic Control System (ATCS). This system is planned to coordinate the intersections in real time, through centralized control. However, due to poor maintenance, the ATCS is currently not optimal in controlling traffic.

The TCC controls traffic as a centralized function that collects, processes and disseminates traffic information. The photographic image of the center is shown below:

Figure 3.8.32 Control Center Monitor Screen

Figure 3.8.33 Control Center Monitor Screen

The system operated by the TCC is composed of the following:

- Traffic information dissemination system;
- Emergency help and information system;
- Driving safety support system;
- Public transportation priority system; and
- Environmental protection management system.

A schematic image of the role of the center is given by Figure 3.8.34 below:

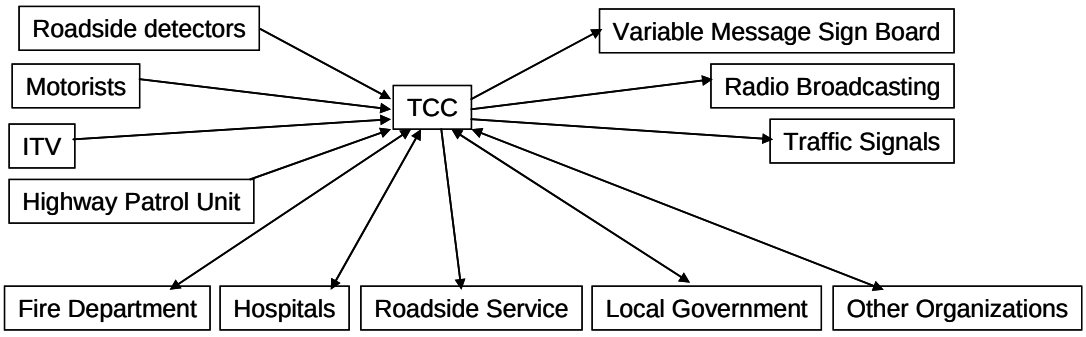


Figure 3.8.34 Traffic Control and Emergency Management Flow

Information collection system is installed along the roadway. There are several types of information collection measures:

- Loop coil detectors embedded in the pavement;

- Ultrasonic detectors;
- ITV traffic monitoring cameras;
- Optical beacon detectors; and
- Information from motorists via mobile telephone or emergency telephone, if the road is equipped.

All the information, such as traffic volume every 15 minutes or ITV images, are transmitted to the TCC via optical fiber cables installed along the roads for better control of traffic. The optical fiber has a bigger capacity to transmit sophisticated information such as ITV images, which require more space.

Figure 3.8.35 Ultra Sonic Detector

Figure 3.8.36 ITV Camera & Vehicle Detector

Figure 3.8.37 Optical Beacon Vehicle Detector

The information gathered from every collection station, ITV cameras, patrolling vehicles etc. are processed and informed via roadside boards, radio services, and patrol vehicles. Traffic signals are centrally controlled according to the demand. Public transportation such as BRT will be given priority based on the control system managed by the TCC. Parking information can be disseminated if proper parking data is collected.

Figure 3.8.38 Variable Message Sign Board

Figure 3.8.39 Radio Broadcasting Room

Figure 3.8.40 Travel Time Information Board

Figure 3.8.41 Public Transportation Priority System

Figure 3.8.42 Traffic Signal Control & Monitor Board

Incident management is one of the important elements of traffic control. A certain number of traffic congestion and disturbance is caused by accidents and breakdown of vehicles. Once accident happens, especially fatal or injury accident, it is urgent to call an ambulance and police. This reporting can be either by cellphones or roadside emergency telephone, if any. The officer on duty in the TCC immediately calls an ambulance and reports details of location and situation of the accident. If it is necessary, fire brigade rushes to the site. Roadside service companies may be called to the site depending on the situation.

Figure 3.8.43 Highway Patrol Vehicles

3.9 STUDY ON APPLICATION OF INTELLIGENT TRANSPORTATION SYSTEMS (ITS) TECHNOLOGY, INCLUDING ELECTRONIC TOLL COLLECTION (ETC)

3.9.1 Introduction

The Intelligent Transportation Systems (ITS) is a new approach to solve transportation problems such as congestion, traffic accidents and air pollution by utilizing information and communication technologies. Many developed countries have been applying ITS for the solution of traffic problems. However, developing countries likewise have opportunities for applying ITS due to the rapid growth of information and communication technology in the world. More importantly, developing countries have the great advantages for applying the already proven technologies established in developed countries. The application of ITS technology to the Bandung Intra Urban Toll Road is studied based on the following policies:

(1) Conformity with the existing ITS Master Plan

ITS is composed of a number of subsystems and it is important to secure compatibility among other subsystems. A common basic ground policy shall be employed at the beginning stage. The Ministry of Public Works conducted the ITS Master Plan study in JABODETABEK in 2007 as part of the detailed design of the Tanjung Priok Access Road. Bandung City has been defined as one of the prioritized cities next to Jakarta in the Master Plan. The study follows the basic policy of the Master Plan.

(2) Consideration of current condition and existing plans

The existing plans of ITS development in Indonesia are rather limited and they are hardly available in Bandung City. However some basic plans such as the deployment of the touch and go system in Jakarta City is ongoing. The study considered the current conditions and existing plans in Jakarta as well.

(3) Consideration of characteristics of project toll road in Bandung city

The effects provided by ITS vary depending on the regional peculiarity and road characteristics. It is important for inner urban toll roads to alleviate congestion and air pollution, and it becomes more important for inter urban toll roads to secure safety driving and disaster control. The study considered the importance of addressing the issues for the inner urban toll road in Bandung City.

(4) Consideration of future expansion of ITS services

The deployment of ITS facilities has been extremely rare in Indonesia. However, at the beginning stage, it is important to introduce the technologies of which applicability to different services can be expanded when developed in the future.

3.9.2 Issues to be solved by ITS

The issues to be solved by ITS are summarized as follows:

- Traffic congestion

  The average traffic volume is forecast at approximately 20,000 vehicles per day upon completion of the phase-1 section in 2015, and it is expected that traffic congestion will be alleviated by the construction of the project toll road. However, the traffic at the section between Pasteur and Gasibu, in particular, is estimated to become nearly double in volume in 2025. Considering the limited transaction capacity of manual toll collection, it shall be maximized by introducing ITS, such as Electronic Toll Collection (ETC).

- Restriction of Overloaded Vehicles

Overloaded vehicles often cause damage on the toll road surfaces and structures, and create congestion due to the reduced speed on the on-ramp. The development of the Gedebage complex is planned and a truck terminal is located near the project section in Gedebage. Under this condition, it is forecast that the volume of large vehicles will become nearly double in 2025 after the completion of the section of phase-1 and it is expected that this will continue to increase due to the regional peculiarity. Therefore, the measures for restriction of overloaded vehicles are important.

- Air Pollution

Air pollution in Bandung City is seriously harmful to the health of the residents. Although the level of observed air pollution in Bandung stays relatively low in recent years, it is expected that it will become worse considering the expected increase in traffic in the future. Such pollution is caused by the increasing exhaust gases from traffic congestion and thus, countermeasures are required through the introduction of ITS.

3.9.3 Current Condition

The current conditions related to ITS development are summarized below.

- Touch and Go Toll Collection System

The deployment of the touch and go toll collection system, called 'e-Toll card', by the toll road operators is underway. The service has started since the end of January in 2009 at all toll booths in the Jakarta Intra Urban Toll Road (JIUT) and Jakarta Outer Ring Road (JORR). It is planned in 2009 for the system to cover whole areas in Indonesia, including the Jakarta – Bandung and Padalarang – Cileunyi toll roads in Bandung City. Bank MANDIRI, the state owned bank, and toll road operators issue the prepaid card for the 'e-Toll card'. The usage of the prepaid card is limited to toll payment as of February in 2009, and the payment is planned to be expanded for other services such as parking, gas stations and convenient stores.

- Area Traffic Control System (ATCS) in Bandung

Bandung City, Dinas Perhubungan Kota Bandung operates the traffic control center, Area Traffic Control System (ATCS). It was developed in 1997 through the assistance of Australia and adopted the Sydney Coordinative and Adaptive Traffic System (SCAT). At the time of the development, traffic lights, loop coil detectors and CCTVs at major intersections were installed. The traffic congestion level is supposed to be captured and displayed for traffic control. However, nearly half the number of the roadside equipment is not currently working properly, and the patrol officers at the site report via wireless radio communication and a limited number of CCTV, which are the major sources of traffic information collection. There has not been any major system upgrade conducted since the initial installation and there are no plans for upgrade.

- Electronic Road Pricing (ERP)

Jakarta City, Daerah Khusus Ibulkoa Jakarta (DKI Jakarta), has been studying traffic demand management-based (TDM-based) policies such as restricting use of vehicle by license plate, parking pricing and congestion charging. The possibility of introduction of ERP has been under consideration as well. However, there are no defined specific plans of introducing ERP yet as of February 2009.

- Related Regulations

The Minimal Service Standard, issued by the Indonesian Toll Road Authority, Badan Pengatur Jalan Tol (BPJT), stipulates that the required time for the vehicles to pass the gate shall be

within 8 seconds at a barrier toll gate, 7 seconds at on-ramp, and 11 seconds at off-ramp. Furthermore, the capacity of the toll gates shall be 500 vehicles per hour at an on-ramp and 300 vehicles per hour at the off-ramp.

The guideline for ETC standard is currently being prepared by BPJT and it describes the basic functions to be fulfilled by Touch and Go and Non-Stop Toll Collection Systems, including requirements of the IC-card fulfilling the standards of ISO 14443 – A/B.

- Establishment of ITS Indonesia

The Ministry of Transport shows the intention to establish ITS Indonesia. The Ministry is considered as an agency consisting of the related domestic organizations for ITS development in Indonesia. However, specific plans, such as the period of establishment and its members, have not yet been defined.

3.9.4 Proposed ITS Services in Bandung City

The following ITS services are proposed for the Bandung Intra Urban Toll Road:

- Non-Stop Electronic Toll Collection (Non-Stop ETC)
- Heavy Truck Control

(1) Non-Stop ETC

For the solution of congestion at the toll gates, non-stop ETC is proposed. However, the use of the Touch and Go System is still underway in Jakarta and it is planned to cover the toll road in Bandung City. It is therefore important to secure the compatibility with the Touch and Go system. The following technical requirements and step-wise development, in line with the existing system, are proposed.

1) Technical Requirements

- 2-Piece Type On-Board Unit (OBU)

The multiple usage of a single IC-card for the Touch and Go system is planned. This includes payment at gas stations, parking lots and convenience stores. It is important to make it possible to share the existing IC-card among ETC OBU and other services. Consequently, the 2-piece type OBU enables sharing of the IC-card between the Touch and Go System and Non-stop ETC, as illustrated below. This allows a step-wise development.

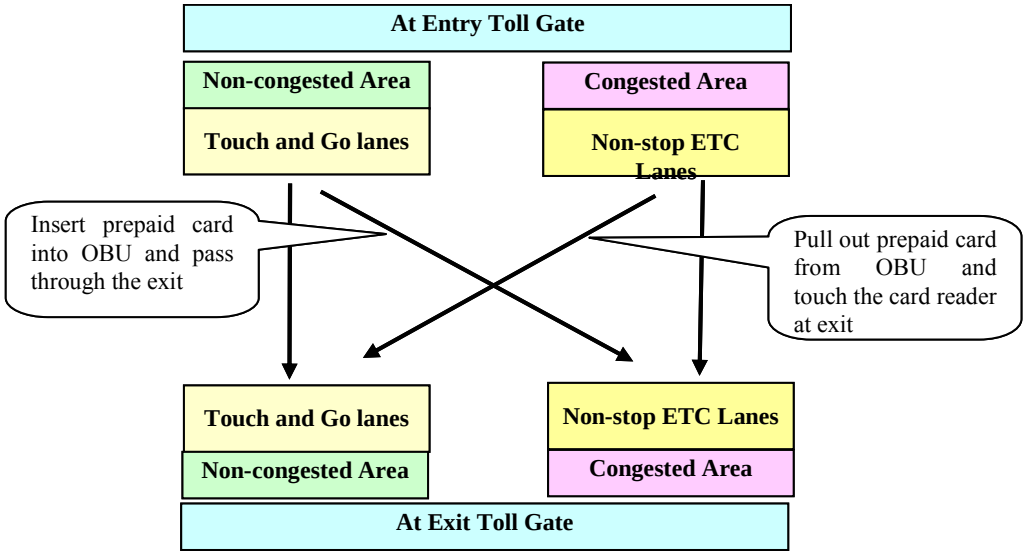


Figure 3.9.1 Advantage of a Single IC-Card Usage

- Road to Vehicle Communication Method

Active-DSRC (Radio Frequency) is recommended because of the following advantages:

- Large and high communication capacity
- Availability of 2-piece type OBU
- Applicability to future expansion of ETC technology, such as the multilane ERP, with a single antenna due to the former two advantages.

2) Stepwise Development

The stepwise development with the existing Touch and Go System shall be employed. Non-stop ETC is introduced at heavily congested toll gates on a priority basis, then the areas are gradually extended in accordance with the increase of the number of users, as illustrated below.

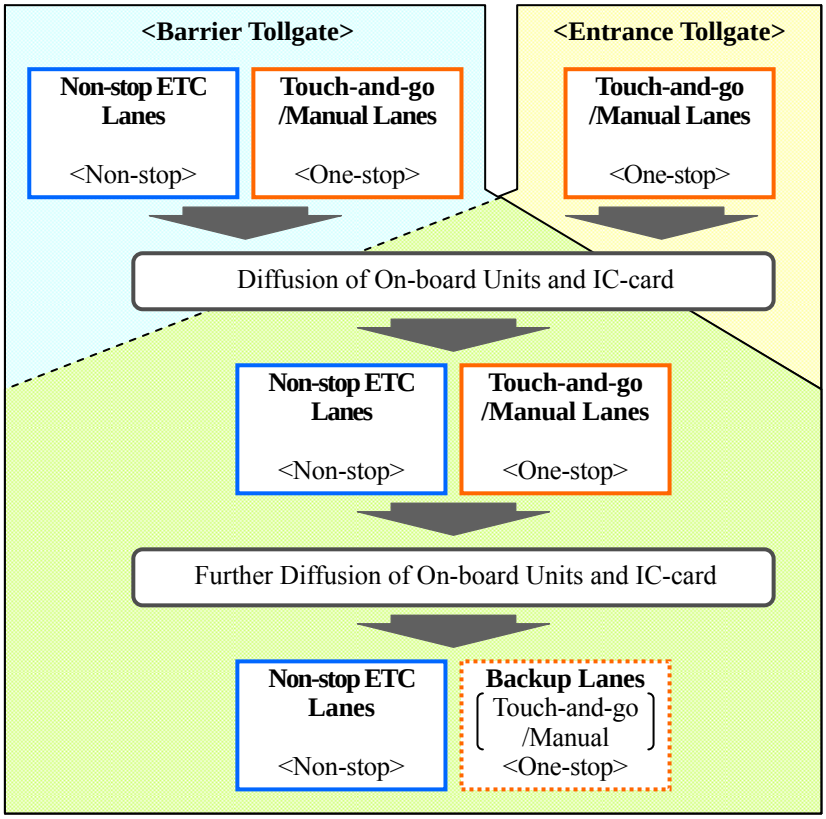


Figure 3.9.2 Stepwise Development

3) Issues Necessary to Be Addressed

While there are a number of issues that shall be addressed for the introduction of Non-Stop ETC, the major ones are summarized below.

- Establishment of a Clearing House

The clearing system, which divides the toll charges on the basis of the different operator's actual value of traveled kilometers by vehicle type, shall be established as illustrated below.

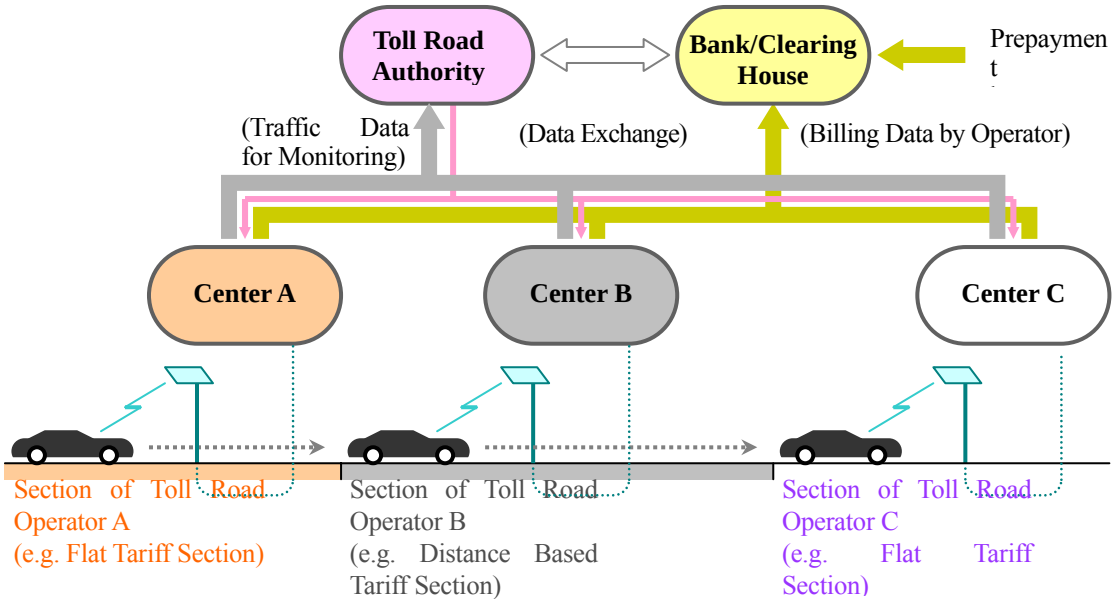


Figure 3.9.3 Outline of Clearing Process

- Establishment of Enforcement Scheme

The enforcement scheme shall be fairly established before implementation. There are a number of issues that need to be settled such as modification of the existing laws, establishment of new regulations, and clarification of demarcation of the related institutions.

- OBU Dissemination

The ETC OBU will become widespread among the general public, and measures need to be further studied. These include, among others, the procurement of OBU by government and its lease to users requiring deposit, issuance of official requirement of installation of OBU on taxies and freight trucks for probe on-board sensor, and introduction of discount services for short-distance drives of ETC users.

(2) Heavy Truck Control System

Considering the development of the Gedebage complex and relatively higher traffic volume of large vehicles in the area, a heavy truck control system is proposed as a measure to assure traffic security and longer durability period of the road structures. The system is aimed to control the entry of overloaded trucks into the toll road.

In addition to the above concern specific to the project site in Bandung City, the necessity of regulating the entry of overloaded trucks into the urban areas has been pointed out by such projects as the Heavy Loaded Road Improvement, as reported by the Ministry of Public Works.

The problems caused by overloaded trucks are summarized as follows:

- The road surfaces and structures are seriously damaged due to the overloaded vehicles
- The overloaded vehicles are frequently stuck at on-ramps and often cause lane closure
- The velocity and acceleration of the overloaded vehicles are generally much slower than other vehicles and can cause congestion at on-ramps
- Accidents caused by heavy trucks are usually severe and prone to have serious consequences.

The Heavy Truck Control System consists of roadside equipment, and a control office, which are connected by network. It spots overweight vehicles and gives warning when detected as overweight. It shall have the following functions.

- Detection Function: It detects the entrance of the vehicle and the axle load weight
- Measurement Function: It measures the weight of vehicle loads and judges the excess overweight
- Warning Function: It transmits the warning to the control office when it detects the overload and displays the warning message on the sign board
- Image Capture Function: It takes the photograph or plate number of the violating vehicles
- Data Transmission Function: It transmits the measured data to the server in the control office
- Data Storage Function: It stores the transmitted data for the record and further utilization

3.9.5 Recommendation

The following are recommended for the effective development of ITS facilities:

1) Implementation of Pilot Project

Based on the studies thus far, implementation of pilot projects is proposed. The location of Non-Stop ETC shall be selected at sections with higher traffic volume, such as between Pasteur and Gasibu. The heavy truck control system is also recommended to be located at the on-ramp in the section in Gedebage area.

2) Formation of a national ITS advisory group

The deployment of ITS facilities in Indonesia has been rare. Therefore, it is recommended to organize an advisory group composed of experts from such fields as academia and industry for the effective planning and development of ITS in Indonesia.

3) Commitment at national level

The development of ITS involves a large number of implementing bodies, and even the deployment of a limited number of subsystems such that ETC requires the involvement of different organizations. Efficient ITS development thus requires a national level commitment.

4) Standardization of ITS systems

The entire ITS system consists of many different components and the interfaces among them should be ensured. The standardization of ITS systems, including ETC, is critical to ensure inter-operation and interconnection.

5) Formation of a national ITS organization, such as ITS Indonesia

For the promotion of ITS, it is recommended to establish a national ITS organization, consisting of the academe, major private companies, and other relevant organizations. The roles include promotion and coordination among related public, private and academic organizations, support for standardization, and networking with overseas institutions.

6) Encouragement of private sector

The domestic private sectors such as suppliers of equipment and services shall be encouraged to support the sustainable implementation of ITS.

7) Sustainable operation and maintenance

As one of distinctive characteristics of ITS, operation and maintenance after deployment of the facilities has particular importance. The scheme for sustainable operation and maintenance, including conduct of training programs, shall be established.

CHAPTER 4 PROJECT EVALUATION

4.1 GENERAL OVERVIEW

The Bandung Intra-Urban Toll Road Project (BIUT Road Project), encompassing with 27.3 kilometers of toll road has been proposed by the Indonesian Government based on diverse qualitative and quantitative selection criteria. Subsequent tasks for the study include conducting economic and financial viability analysis of the BIUT Road Project, with a view toward developing a prioritized implementation plan.

In this context, the objectives of the economic and financial evaluations are to calculate the economic and financial viability measures for each of the BIUT Road Project sections. The measures of the economic and financial evaluation will be the Internal Rate of Return (IRR).

The IRR is used to explore the rate if the Net Present Value (NPV) = 0, by investigating the present rate and its tendency in the future, in order to arrive at the conclusion whether or not an activity shall be implemented. The IRR must be more than the current interest rate. If the IRR is less than the current interest rate, then capital is better off invested in other options.

$$\sum_{t=0}^{n} \frac{Bt}{(1+i)^n} = \sum_{t=0}^{n} \frac{Ct}{(1+i)^n}$$

Iteration process on the above equation will yield the discount rate value.

For the project effects, the following indicators are for future evaluation.

(1) Operation Indicator

The cross-section traffic volume will be an operation indicator:

Pasteur-Djunjunan Section:

(Year 2009 T/C Survey result)

	Veh/ day	**PCU/ day**
Without Motorcycle	43,537	48,761
With Motorcycle	107,926	68,348

(Year 2020 Forecasted)

Tollway	26,235	29,878
Frontage	286,867	88,264
Total	313,102	118,142

(include Motorcycle)

(2) Effect Indicator

Several indicators will be selected

1) Average Traffic Volume

The tollway traffic for years 2015, 2020, 2025 and 2030 are explained in previous chapter and those for frontage road traffic volume are shown in Appendix 2.

2) Required Time (Time Saving)

This indicator is explained in this chapter and calculation of time savings are shown in Appendix 15. (Time saving for tollroad users and time saving for whole network)

3) Vehicle Operating Cost Saving

This indicator is also explained in this chapter for both tollway user's and whole network.

4) Average Travel Speed

By assignment simulation, average tollroad running speed is estimated as 65 Km/h and the one of frontage road is 35 Km/h.

Other indicators such as traffic accident, length of congestion, etc are not examined.

4.2 QUANTITATIVE EFFECTS (EIRR & FIRR)

4.2.1 Economic Evaluation

In order to evaluate the project, first of four (4) alternatives of phasing are assumed. Those four alternatives of staging are shown in Table 4.2.1.

For evaluation two major indicators are computed; one is B/C ratio and the other is Economic Internal Rate of Return (EIRR). B/C ratio are calculated with discount rates of 15% per annum (p.a.), 20% p.a. and 25% p.a. for the period up to 2035 (21 years for Phase 1) and 2040 (26 years for Phase 1). (Usually in Ministry of Public Works, the project is evaluated to adopt B/C ratio is more than 1.0 with discount rate of 15% p.a. in Java island project. Therefore, discount rate of 15% is set as evaluation case, and case of 20% and 25% are also carried out due to road classification of the BIUT road.)

To formulate the economic costs and the economic benefit, it is applied 85% of financial cost, and savings as 10% of cost is for value added tax and 5% is other financial costs.

Table 4.2.1 Year of Operation Start

	Phase 1	Phase 2-1,2-2	Phase 2-3
Alternative-1	2015	2020	2025
Alternative-2	2015	2020	2030
Alternative-3	2015	2018	2025
Alternative-4	2015	2018	2030

(1) Economic Benefits

Quantitative economic benefits are classified into the following three categories:

- Direct (tollroad) User's Saving Benefit (vehicle operation cost saving and vehicle time cost saving)
- Network Saving Benefit (Saving of total veh-kilometers and saving of total veh-hours in the network compared with the tollway case and without the tollway case)
- Multiplier Effects of Construction Cost.

1) Economic Direct User's Saving Benefit

The savings of vehicle operating cost and time cost of the tollroad user are computed. Summarized results of daily savings are shown in the following Table 4.2.2 and calculations are shown in Appendix 15.

Table 4.2.2 Daily Savings Economic Benefit of Tollroad Users in 2009 Prices

(Rp/PCU/day)

Construction Phase	Vehicle Operating Cost Savings	Vehicle Time Costs Savings	Total
Phase 1-1	3,637.86	2,271.50	5,909.36
Phase 1-2	5,139.53	2,506.48	7,646.01
Phase (1+2-1+2-2)	9,923.01	5,764.90	15,687.91
Phase (1+2)	9,923.01	5,764.90	15,687.91

Therefore, based on the number of daily users and assuming 365 days in a year, the annual savings benefit were computed as presented in the following Table 4.2.3.

Major assumptions for computation are as follows:

- In case phase 1 only, for phase 1-1 package, users are assumed to utilize frontage road in case without the project tollroad (trip length for both case are same of 5.5 km, while the average travel speeds are 65 km/hr and 35 km/hr respectively)
- For phase 1-2, the users without the project tollroad trip length are 4.5 km while the tollroad trip length are 3.1 km, other conditions are same. The growth to year 2020 from 2015 are 2% p.a.
- In case phase (1+2) in year 2020

Those users trip length are assumed from assigment simulation as follows:

- With the tollway : on tollway 12 km and access 1.5 km
- Without tollway: arterial road 14.4 km

The growth to year 2025, 2030, 2035 are computed parallel with user volume for each year.

The computation process is attached to the Appendix 15. The vehicle operation costs by speed classification table are shown in the Appendix 15 for year 2005 and as shown in computation process escalated by 6% p.a. to year 2009.

Speed	2005 Value (Rp/Km)	2009 Value (Rp/Km)
65 Km/h	1,439.80	1,817.73
35 km/h	2,056.18	2,595.88

Also, the time value of vehicle (PCU) is computed as shown in Appendix 15. The results in year 2009 price is Rp. 36,860/PCU-hr as shown in follows:

Time Value Calculation

For the calculation of time value, the following assumptions/ process are applied.

1. Average time value is computed from the Regional per capita in Bandung area from "Year 2005, Figures of Bandung City/ Dalam Angka Tahun 2005" with average 6% p.a. growth since year 2005 to year 2009.
2. It is divided into 2 categories; one is "Business" and the other is "non-business". "Business" is 25% and "non-business" is 75%, while "Business" is 4 time of average time value.
3. Occupancy of the car is 3.0
4. Economic value : 85%

The calculation process is as follows;

Time Value

2005 : Rp. 15,702,470/ year
(Regional Income per-capita) from "Dalam Angka"
2009 : Rp. 19,824,007/ year (Rp. 15,702,470 x 1.06^4)

(Business)

Rp. 19,824,047 / 12 x 200 hr/month x 0.85 x 4.0		=	Rp. 28,084/Hour/person (2009)
Business:	25% x Rp. 28,084	=	Rp. 7,021
Non-business:	75% x Rp. 7,021	=	Rp. 5,266
		=	Rp. 12,287/man-hour

Vehicle Time Value (Economic)			
	(Rp. 28,084 x ¼ + 7,021 x ¾)	=	Rp. 12,287
	Occupancy per-veh: 3.0	x	3
		=	Rp. 36,860/veh.hr (2009)

Table 4.2.3 Annual Savings Economic Benefit of Tollroad Users in 2009 prices

(Billion Rp/ Year)

	Vehicle Operating Cost Savings	Vehicle Time Cost Savings	Total	Remark
Phase-1-1	30.03	18.75	48.75	2015
Phase-1-2	67.25	32.80	100.05	2015
Phase-1	97.28	51.50	148.83	2015
Phase (1+2-1+2-2)	327.30	190.15	517.45	2020
Phase (1+2-1+2-2)	443.86	257.86	701.72	2025
Phase (1+2-1+2-2)	579.69	336.78	916.47	2030
Phase (1+2)	341.25	198.25	539.50	2020
Phase (1+2)	513.77	298.16	811.93	2025
Phase (1+2)	658.43	382.52	1040.95	2030

2) Network Costs Saving Benefit

The impacts of the project tollway to the whole network are computed through the assignment simulation comparing with the project tollway case and without the project tollway cases. Indicators are vehicle-kilometers and vehicle-hours for both cases. The computation process is shown in Appendix 15.

The savings are summarized as follows:

('000)

	Veh-km Savings			Veh-hour Savings		
	With Tollroad	Without Tollroad	Savings	With Tollroad	Without Tollroad	Savings
2015 Ph-1 only	13,564	13,783	219	765.6	776.4	10.8
2020 Ph-(1+2)	21,925	22,278	293	1,367.0	1,386.3	19.3

The saving are computed as follows:

	Vehicle Operating Cost Savings	Vehicle Time Cost Savings	Total
2015 (Ph-1 only)	219 x 10^3 x Rp. 2,595.88 x 85% x 365 = Rp. 176.38	10.8 x 10^3 x Rp. 36,860 x 85% x 365 = Rp. 123.51	299.89
2020 Ph-(1+2)	293 x 10^3 x Rp. 2,595.88 x 85% x 365 = Rp. 235.97	19.3 x 10^3 x Rp. 36,860 x 85% x 365 = Rp. 220.71	456.68

Note: Travel speed in the road network is assumed at 35 Km/h.

3) Direct User's Benefit and Network Savings Benefit

These two kinds of benefits are as follows:

Table 4.2.4 Economic Benefit by Year and Case

(Billion Rp/ Year)

Schedule	Year			
Ph-1 only	**2015**	**2020**	**2025**	**2030**
User Benefit	148.8	164.3		
Network Benefit	299.9	331.2		
Total	448.7	495.5		
Ph (1+2-1+2-2)				
User Benefit		517.5	701.7	916.5
Network Benefit		456.7	618.7	808.1
Total		974.2	1,320.4	1,724.6
Ph (1+2)				
User Benefit		539.5	811.9	1,041.0
Network Benefit		456.7	618.7	808.1
Total		996.2	1,430.6	1,849.1

These benefits are distributed to each year of the project life (up to year 2035 and 2040) and discounted by 15% p,a, 20% p,a, and 25% p,a. in present value to year 2009.

The results are as follows:

Table 4.2.5 Economic Benefits to Year 2009 (User Benefit and Network Benefit)

(Billion Rp)

	Discount Rate p,a.		
	15%	**20%**	**25%**
Alt-1	2,797.5	1,562.2	936.8
Alt-2	2,750.2	1,539.9	926.0
Alt-3	3,026.8	1,715.3	1,048.8
Alt-4	2,979.4	1,693.1	1,038.0

4) Multiplier Effects of the Tollroad Construction

The multiplier effects of the construction of the tollroad are based on the following assumptions:

- Approximately 30% of costs are to be re-invested in the region and 25% of this value would be the economical effects of the project.
- These effects continue for three years.

Thus, in the 1st year (next year):

- 0.30 x 0.25 = 0,075 (7.5%)
- On the 2nd year:
- 0.30 x 0.30 x 0.25 = 0.0225 (2.25%)
- And, on the 3rd year:
- 0.30 x 0.30 x 0.30 x 0.25 = 0.0068 (0.68%)

The construction schedule for the four alternatives is as follows:

	Ph-1	**Ph-2-1,2-2**	**Ph-2-3**
Alt-1	2,013.14	2,018.19	2,023.24
Alt-2	2,013.14	2,018.19	2,028.29
Alt-3	2,013.14	2,016.17	2,023.24
Alt-4	2,013.14	2,016.17	2,028.29

The economic construction costs of each phase in 2009 prices are as follows.

(Billion Rp.)

	1st year	**2nd year**	**Total**
Phase 1	510.9	510.9	1,021.8
Phase 2	1,249.9	1,249.9	2,499.8
Phase 3	783.7	783.9	1,567.4

The multiplier effects are computed based on the scheduled alternatives and discount rates, as presented in Table 4.2.6:

Table 4.2.6 Multiplier Effects

(Billion Rp.)

	Discount Rate p,a.		
	15%	**20%**	**25%**
Alt-1	140.8	99.2	72.1
Alt-2	130.7	92.6	68.0
Alt-3	162.2	118.4	111.8
Alt-4	152.1	111.8	84.5

The total benefits are as follows by alternative case of opening to public:

Table 4.2.7 Total Benefits of the Project (up to year 2035) in 2009 Present Value

(Billion Rp.)

	Discount Rate p,a.		
	15%	**20%**	**25%**
Alt-1	2,938.3	1,661.4	1,008.9
Alt-2	2,880.9	1,632.5	994.0
Alt-3	3,189.0	1,833.7	1,160.8
Alt-4	3,131.5	1,805.1	1,122.5

Table 4.2.8 Total Economic Benefit of the Project (up to year 2040) in 2009 Present Value

(Billion Rp.)

	Discount Rate p,a.		
	15%	**20%**	**25%**
Alt-1	3,168.2	1,729.0	1,029.8
Alt-2	3,110.8	1,700.1	1,014.9
Alt-3	3,418.9	1,901.3	1,191.7
Alt-4	3,361.4	1,872.7	1,143.4

(2) Economic Cost

1) Construction Costs

For the construction costs discussed in the previous chapter, these costs consist of land acquisition, engineering cost and construction cost and 85% of these costs are considered economic costs.

Following the construction schedule or the opening to public schedule, the costs are allocated for each alternative.

The economic construction costs are Rp. 7,992.4 billion in 2009 prices and broken down by phase as follows:

Phase 1	1,805.9	billion Rp.
Phase 2-1, 2-2	3,950.1	billion Rp.
Phase 2-3	2,236.4	billion Rp.
Total	7,992.4	billion Rp. (in 2009 price)

The 2009 present values by alternatives, with discount rates of 15%, 20%, 25% p.a., are as follows:

Table 4.2.9 Economic Construction Costs (2009 Present Value)

(Billion Rp.)

Schedule Alternative	**Discount Rate p,a.**		
	15%	**20%**	**25%**
Alt-1	2,106.4	1,557.1	1,208.7
Alt-2	1,974.2	1,470.7	1,152.5
Alt-3	2,400.5	1,838.6	1,440.5
Alt-4	2,277.2	1,752.2	1,385.8

2) Operation & Maintenance Costs (Economic)

The maintenance and operation costs are computed for the project life (up to year 2035 or year 2040), with the assumption that it is one percent of the construction cost for each year and another five percent for every 5 years.

The computed results are as follows:

Table 4.2.10 Operation & Maintenance Costs (up to year 2035) in 2009 Present Value

(Billion Rp.)

Schedule Alternative	Discount Rate p,a.		
	15%	20%	25%
Alt-1	128.7	66.0	34.3
Alt-2	123.2	63.3	32.7
Alt-3	140.3	73.4	40.8
Alt-4	134.7	70.7	39.2

Table 4.2.11 Total Economic Project Costs in 2009 Present Value

(Billion Rp.)

Discount Rate p,a.	Schedule			
	Alt-1	Alt-2	Alt-3	Alt-4
Up to 2035				
15%	2,235.1	2,097.4	2,540.8	2,411.9
20%	1,680.3	1,534.0	1,912.0	1,822.9
25%	1,243.0	1,185.2	1,481.3	1,425.0
Up to 2040				
15%	2,244.0	2,106.3	2,549.7	2,420.8
20%	1,682.5	1,536.2	1,914.2	1,815.1
25%	1,243.6	1,185.8	1,481.9	1,425.6

(3) Benefit–Cost Ratio and EIRR

The BIUT Road Project is evaluated by benefit-cost ratio and EIRR with project lifespans up to 2035 and 2040, based on the schedule alternatives as follows:

Table 4.2.12 Economic Evaluation (1) (Project lifespan up to 2035)

	Discount Rate			EIRR
	15%	20%	25%	
Alt-1	1.251	0.930	0.754	19.6%
Alt-2	1.311	1.004	0.781	21.0%
Alt-3	1.191	0.897	0.708	18.7%
Alt-4	1.235	0.929	0.728	19.4%

Note: Alternatives are based on the different years of opening year of phase.
Alt-1 : Ph-1 : 2015, Ph-2-1,2-2 : 2020, Ph-2-3 : 2025
Alt-2 : Ph-1 : 2015, Ph-2-1,2-2 : 2020, Ph-2-3 : 2030
Alt-3 : Ph-1 : 2015, Ph-2-1,2-2 : 2018, Ph-2-3 : 2025
Alt-4 : Ph-1 : 2015, Ph-2-1,2-2 : 2018, Ph-2-3 : 2030

Table 4.2.13 Economic Evaluation (2) (Project lifespan up to 2035)

	Discount Rate			EIRR
	15%	20%	25%	
Alt-1	1.315	0.989	0.812	19.7%
Alt-2	1.374	1.064	0.839	22.0%
Alt-3	1.255	0.959	0.784	19.6%
Alt-4	1.298	0.990	0.787	19.9%

Note: Benefits include "Multiplier Effects of Construction Cost"

Table 4.2.14 Economic Evaluation (3) (Project lifespan up to 2040)

	Discount Rate			EIRR
	15%	20%	25%	
Alt-1	1.412	1.028	0.828	21.0%
Alt-2	1.477	1.107	0.856	23.5%
Alt-3	1.341	0.993	0.804	19.9%
Alt-4	1.389	1.032	0.802	20.5%

Note: Benefits include "Multiplier Effects of Construction Cost"

Based on the above evaluations, for better return from the project, it is recommended that phase section opened to traffic in year 2020 (not year 2018 or earlier) and phase-2-3 much later. These timings must be assessed through financial analyses.

Based on the results, however, the BIUT Road Project is evaluated as economically feasible.

4.2.2 Financial Evaluation

The financial evaluation considered the scheme of project implementation. Based on the traffic simulation, the revenue will be raised from the volume of traffic and the toll tariff. Table 4.2.16 shows the cost component for the financial analysis. In Phase 1, it will be two sections, namely, the Pasteur-Gasibu section and Gede Bage INTC-New Bus Terminal (Soekarno Hatta) section. The cost components of the project will be the construction cost, O&M cost and the revenue itself. All these costs will be calculated to find the financial internal rate of return (FIRR).

In Phase 1, the Pasteur-Gasibu section will need a construction cost of around Rp. 1,283.1 billion, and the O&M cost is about Rp. 600.4 billion. The revenue from the toll operation is estimated to be approximately Rp. 6,988.7 billion. For the Gedebage-New Bus Terminal (Soekarno Hatta) section, the construction cost is estimated at around Rp. 886.4 billion and the O&M cost is Rp. 452.4 billion. The revenue of this section is calculated to be Rp. 5,265.9 billion.

Phase 2-1 and 2-2 of the BIUT Road Project, which consists of the Gasibu-Ujung Berung section and the Ujung Berung-New Bus Terminal (Soekarno Hatta) section. The Gasibu-Ujung Berung section will have a construction cost of around Rp. 4,169.7 billion and O&M cost is estimated at Rp. 998.6 billion. The revenue from the toll operation is calculated to be Rp. 11,558.6 billion. Meanwhile, the estimated construction cost for the Ujung Berung-New Bus Terminal (Soekarno Hatta) section is Rp. 1,257.1 billion and O&M cost is around Rp. 298.5 billion. The estimated revenue from operation of this section is about Rp. 3,471.9 billion.

The connection from Ujung Berung to Cibiru will be Phase 2-3 of the toll road project. Its , construction cost will be Rp. 3,410.5 billion and the O&M cost is around Rp. 174.3 billion. The revenue from operation of this section is estimated to be Rp. 2,027.8 billion. Table 4.2.15 shows the cost components for the BIUT Road Project by sections.

Table 4.2.15 Project Cost, O&M Cost and Revenue Calculation for Each Phase

(Unit : Rp. Billion)

No.	Item Cost	Phase 1_1	Phase 1_2	Phase 2_1	Phase 2_2	Phase 2_3
1	Project Cost	1,283.1	886.4	4,169.7	1,257.1	3,410.5
2	O & M Cost	600.4	452.4	998.6	298.5	174.3
3	Revenue	6,988.7	5,265.9	11,558.6	3,471.9	2,027.8

Results of the financial evaluation for each section are presented in Table 4.2.16 below. For Phase 1, the Pasteur-Gasibu section has a FIRR of 7.7%, while the Soekarno Hatta-Gede Bage section is around 8.4%. meanwhile phase 2, section Gasibu-Ujung Berung has a FIRR of 4.3%, section Ujung Berung-Bus Terminal is around 4.4%. Phase 2-3, there is no result of FIRR.

Table 4.2.16 Financial Evaluation Indicators for the BIUT Road Project by Phase

Phase	From - To	Project Cost (Billion Rp.)	Flat Rate For Type I	FIRR
1-1	Pasteur-Gazibu	1,283.1	3,000	7.7%
1-2	Soekarno Hatta-Gedebage	886.4	2,000	8.4%
P- 1	Pasteur-Soekarno Hatta	2,199.2	3,000	7.8%
2-1	Gazibu-Ujungburung	4,169.7	5,500	4.3%
2-2	Ujungburung-Bus Terminal	1,257.1	2,000	4.4%
P- 2	Gazibu-Bus Terminal	5,247.0	2,000	4.3%
2-3	Ujungburung-Cileunyi	3,410.5	4,000	Nil
P-1+2-1+2-2		7,446.2	2,000	5.0%
P- 1+2		10,856.6	2,000	3.5%

All the foregoing viability indicators show that all project phases and overall project are not financially viable.

4.3 QUALITATIVE EFFECTS

As for the qualitative effects of the BIUT Road Project, several points of view are expected. First are the effects on urban planning and development, since this tollroad would function not only as a backbone but also as a distribution road to the central region of Bandung City. Consequently, the dispersed development of the CBDs will become possible and may also solve the problem of too much concentration in the present CBD. Likewise, the CBD area would be consolidated with this new backbone and symbolic tollroad.

In addition to these effects, the tollroad will decrease traffic accidents and partially reduce the congestion in the urban road network.

CHAPTER 5 NOTES ON PROJECT IMPLEMENTATION AND SUPERVISION

To implement Phase 1 of the BIUT Road Project, the following issues identified in this survey should be noted.

(1) Implementation of Phase 1 of A Multi-Phased Project

A Japanese ODA loan will finance only Phase 1 of the BIUT Road Project, which is planned as a multi-phased project. In this survey, the scopes of this project for the succeeding phases have been identified and proposed to a certain extent. The issue, however, is that the JICA Survey Team does not have exact information about the kinds of implementation schemes and funding alternatives that will be applied by GOI to these phases. It should be noted that in many aspects adjustment and coordination with the prospective succeeding phases are necessary so that Phase 1 can be planned adequately and its implementation can proceed properly.

(2) Existence of Ceiling of Project Cost

In the list of projects for foreign assistance (Blue Book) of 2008 by the National Development Planning Agency (BAPPENUS), the amount of the loan for the Project is formally listed as US$150 million. Usually in Indonesia, a project having a cost exceeding the amount listed in the Blue Book is disapproved. Therefore, the scope and components of Phase 1 were determined, subject to the maximum project cost of US$150 million. Throughout the implementation of Phase 1, this amount should be kept in mind as the cost ceiling for the project, unless the Blue Book is amended.

(3) Coordination with Prospective Development Projects

A major multiple facility development project namely, the Gedebage Area Development Project, with an area of about 600 ha in the southeastern region of Bandung City is in progress. The BIUT Road Project is expected to function as an effective access to this new development area and will serve as an important arterial road in the area. The impact of this area development project should be considered carefully in the BIUT Project throughout its implementation.

(4) Toll Road O&M Policy

The BIUT project will finally become a typical urban tolled expressway. The O&M of toll roads must be elaborately organized and systematic. Since Indonesia has a rather long experience in the O&M of toll roads, the current practice of entrusting its O&M to private companies is generally done. Therefore, after the completion of construction of the entire network, the BIUT project will be operated and maintained by a duly selected O&M company as one of Indonesia's national toll roads. But if a portion of the network is temporarily opened to traffic after the completion of the construction of Phase 1, a temporary O&M system, for example, entrusting such a system to Jasa Marga should be considered from the viewpoints of economy and efficiency. It must be noted that Jasa Marga is actually in charge of the O&M of the existing Padalarang-Cileunyi Toll Road.

(5) Issues in Social and Environmental Considerations

In conformity with domestic regulations, the EIA for BIUT was approved by the West Java Province in March 2007, but the requirement by the JBIC Guidelines for Social and Environmental Considerations (April 2002), which classifies it as Category A, is not sufficiently met. Accordingly, assistance to supplementary public consultation meetings as well as to formulation of LARAP was undertaken in the survey. However, the prospects for a smooth and timely land acquisition and resettlement of affected persons are not clear. As usual, these matters can easily become the most serious concerns towards BIUT's implementation.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

1) Construction of BIUT Road is viable from the macro-economic perspective. It will contribute to the mitigation of traffic congestion in the urban area of the City and to the development of the regional economy. At the same time, the construction of this toll road would work as a back-bone to the central region of the City and work as a distributor from the viewpoint of urban planning or urban development. Thus, the dispersed development of CBDs will become possible and may also solve the presently concentrated CBD being dispersed.

2) Financing of Phase 1 of BIUT Road is expected to be through the Japanese ODA. Two road sections formulate Phase 1, that is, Phase 1-1: Pasupati Access-Gasibu Underpass (L=5.5km), Phase 1-2: Seokarno Hatta-Gedebage IC (L=3.1km).The project cost of Phase 1 is estimated as Rp 1,812,793 million (2009 price), which is approximately close to US$150 million mentioned in the Blue Book.

3) As for the financing option for Phase 2 implementation, PPP option was examined. In the toll road section in Indonesia the PPP scheme usually calls for a private sector contribution of 50% or more in the cost sharing. However, the examination reveals that only 15% contribution from the private sector makes it viable for both GOI and the private entity, under the consideration of the maximum allowable tariff level (Rp. 5,500). Therefore, utilizing PPP option is not appropriate. The traditional funding system, the GOI funding using ODA loans, is recommended to be adopted in Phase 2.

4) The success of the BIUT Road Project completely depends on whether smooth and timely land acquisition and relocation of affected people will be implemented. In order to attain this goal, project execution agency should refer to Chapter 3.8.3 of this report, together with resettlement experience of Pasupati Bridge in taking appropriate measures during detailed design and implementation stages. For example, a LARAP is critical to safeguard the rights of the affected people, such as replacement value of their assets, resettlement, livelihood restoration, and additional assistance to marginal and vulnerable groups.

5) The executing agency shall take the necessary actions to the timely realization of Japanese ODA. At first, the LARAP Framework for BIUT Road Project is necessary to be established at the time of Loan Appraisal by JICA. Simultaneously, EIA reports are to be opened to the public within 120 days prior to the Loan Agreement. Moreover, it must be noted by all concerned parties that an effective period of EIA is three years from its approval by the West Java Provincial Government. This means that the EIA is effective only until March 2010.

6) If the Loan Agreement will be signed in March 2010, the executing agency can immediately start to procurement process of consultants. According to the proposed implementation schedule, the construction works for Phase 1 will start in January 2013. As for Phase 2, the funding scheme is not decided yet. However, Phase 2 (excluding Udung Berung-Cileunyi section) is suggested to be open to traffic in 2020 based on the results of economic evaluation.