

## **CHAPTER 8 ENVIRONMENTAL CONSIDERATIONS**

### **8.1 Basic Approaches for Environmental Considerations**

Since the F/S roads are urban arterial roads in the Mamminasata Metropolitan Area, the key issues for environmental considerations are land acquisition and involuntary resettlement. In addition, it is anticipated that there will be a wide range of negative socio-economic impacts on local stakeholders as well as negative environmental impacts on flora and fauna species around the selected roads.

The JICA Guidelines for Environmental and Social Considerations which came into force in April 2004 classify projects into 3 categories in accordance with the extent of environmental and social impacts, taking into account the outline and scale of the project, and the site condition. The projects involving the F/S roads are classified into Category A, i.e. projects which might have significant negative impacts on the environment and society.

Both the Indonesian AMDAL regulations and the JICA Guidelines have been applied in the study on environmental considerations for the F/S roads. At the same time, Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) were conducted for the environmental considerations of the F/S roads. IEE is an initial impact assessment based on existing data and site reconnaissance survey results. IEE has been applied in the evaluation of the alternative routes and development concepts to select the most appropriate plan for the F/S roads. On the other hand, EIA is a more in-depth environmental impact survey based on the selection of the most appropriate route through IEE-level evaluation in the engineering, economic and environmental aspects. The EIA document should be finally agreed among relevant stakeholders.

Apart from the EIA, in accordance with the basic philosophies of the JICA Guidelines, verification should be made on whether or not the land acquisition and resettlement plans (LARAP) for the F/S projects ensure that incomes and living standards of project-affected persons (PAPs) will be restored to pre-project levels. A policy framework for the LARAP was formulated in compliance with the Indonesian regulations and procedures as well as the basic philosophies of the JICA Guidelines.

### **8.2 Methodology for Study on Environmental Considerations for Assessment of the F/S Roads**

#### **(1) IEE**

The IEE matrix designed for assessment of the F/S projects is composed of fourteen (14) items in three (3) project stages (pre-construction, construction, and post-construction). **Table 8.2.1** shows the number of alternative routes to be evaluated in the IEE-level study on environmental considerations for each F/S road. The Pre-F/S Outer Ring Road is to be evaluated in the IEE-level study on environmental considerations only.

**Table 8.2.1 Alternative Routes for F/S and Pre-F/S Roads by Section for IEE**

F/S and Pre-F/S Roads	Section	Number of Alternative Routes
(1) Mamminasa Bypass	North	4
	Middle	3
	South	5
(2) Trans-Sulawesi Road Mamminasata Section (Maros-Takalar)	A	2
	B	2
	C	3
	D	2
(3) Hertasning Road	End	2
(4) Abdullah Daeng Sirua Road	A	3
	B	Not applied*
	C	2
	D	4
	E	2
	F	3
(5) Outer Ring Road (Pre-F/S road)	North	3
	Middle	4
	South	4

Note: \* No alternatives are set up for this section as the detailed design was completed and construction is in progress.

The above alternative routes have been evaluated on technical, economic and environmental aspects, and thereby the most appropriate route in each section has been selected.

## (2) EIA

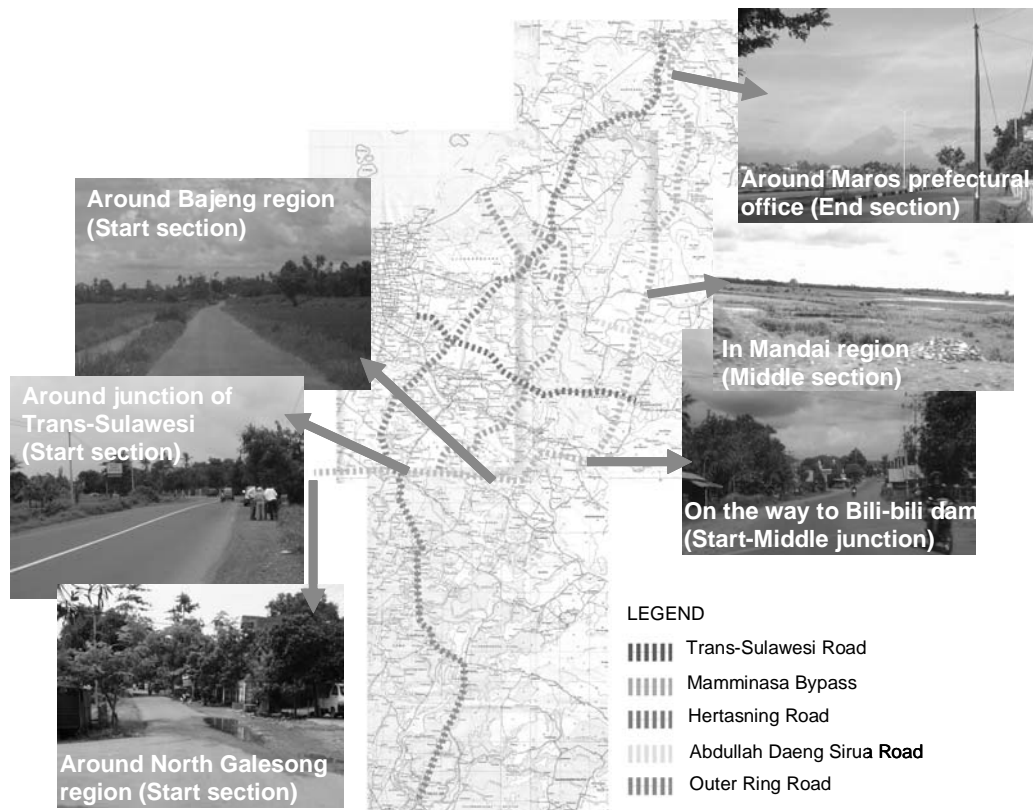
EIA was conducted for the routes selected as the best or the most practical ones through IEE. The F/S roads selected for EIA are classified into two groups: the 1<sup>st</sup> group consists of the Trans-Sulawesi Road Mamminasata Section, the national road or proposed national road with the highest priority, and the 2<sup>nd</sup> group consists of the Mamminasata Bypass, Hertasning Road and Abdullah Daeng Sirua Road as shown in **Table 8.2.2**. The EIA report is being prepared for each group.

**Table 8.2.2 Grouping of F/S Roads for EIA**

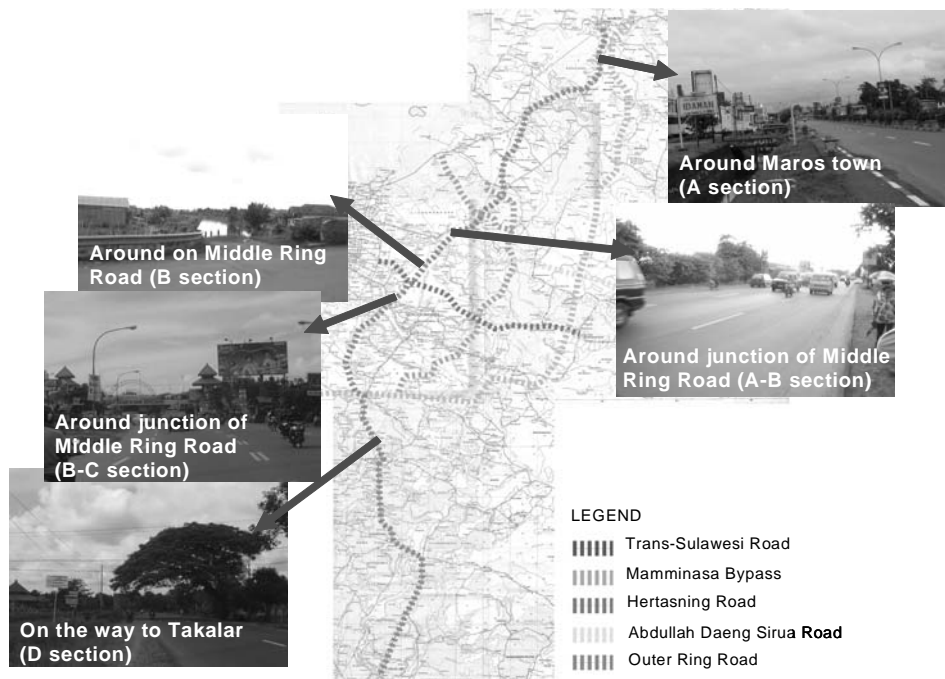
Road Name	Group for EIA
(1) Mamminasa Bypass (3) Hertasning Road (4) Abdullah Daeng Sirua Road	Group 2
(2) Trans-Sulawesi Road Mamminasata Section	Group 1

**Figures 8.2.1, 8.2.2 and 8.2.3** show typical site conditions of the Mamminasa Bypass,

Trans-Sulawesi Road Mamminasata Section, Hertasing Road and Abdullah Daeng Sirua Road, respectively.



**Figure 8.2.1 Typical Site Conditions of Mamminasa Bypass for EIA**



**Figure 8.2.2 Typical Site Conditions of Trans-Sulawesi Road Mamminasata Section**

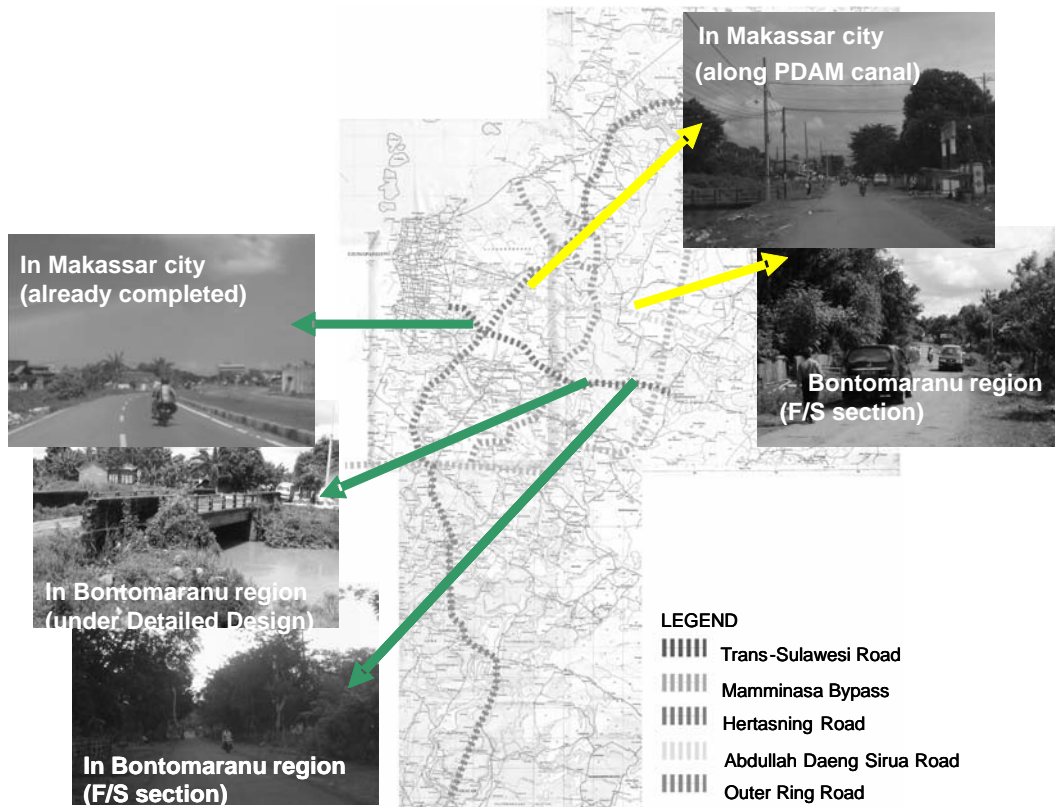


Figure 8.2.3 Typical Site Conditions of Hertasing and Abdullah Daeng Sirua Roads

## 8.3 Scope of Study for IEE and EIA

### 8.3.1 Scope of Study for IEE

#### (1) Objective

The main objective of Initial Environmental Examination (IEE) is to conduct an initial environmental impact assessment on the alternative plans for the F/S roads. IEE for the F/S roads was carried out based on the existing data, including the data collected during the Mamminasata Spatial Plan Study in 2005, and site reconnaissance surveys. Multi Criteria Analysis (MCA), which is composed of engineering, economic and environmental factors (IEE results), was conducted for comparative analysis of alternative routes for each F/S road project. The most appropriate alternative route for each F/S project, with the highest score among the alternatives, was selected in the F/S road study and subject to be studied under the subsequent EIA.

#### (2) Schedule

IEE and MCA were conducted for the four F/S roads. Meanwhile, IEE for the Pre-F/S Outer Ring Road was commenced in April 2007 and completed by the middle of October 2007. **Table 8.3.1** shows the schedule of route selection for the F/S roads and IEE, including stakeholder meetings.

**Table 8.3.1 Schedule of Route Selection for F/S Roads and IEE**

Activity and FS road	2006	2007												2008		
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>FS Route Selection</b>																
(1) Mamminasa Bypass																
(2) Trans-Sulawesi Mamminasata section																
(3) Hertasning Road																
(4) Abdullah Daeng Sirua Road																
(5) Outer Ring Road (Pre-F/S)																
<b>IEE Study</b>																
(1) Mamminasa Bypass				3/7 ○												
(2) Trans-Sulawesi Mamminasata section		2/6 ○														
(3) Hertasning Road				3/7 ○												
(4) Abdullah Daeng Sirua Road				3/7 ○												
(5) Outer Ring Road (Pre-F/S)						6/7 ○										

Notes: ○ Stakeholder Meeting (BAPEDALDA, BINA MARGA etc.)

#### (3) Stakeholder Meetings

A series of stakeholder meetings for IEE were held to explain the results of IEE to the public. The 1<sup>st</sup> stakeholder meeting was held on 6<sup>th</sup> February 2007 at Bappeda, South Sulawesi Province with participation of Bina Marga (central office), Bappeda, PU, Bapedalda of South Sulawesi Province, Makassar City, Kabupaten Maros, Kabupaten Gowa and Kabupaten Takalar for the Trans-Sulawesi Road Mamminasata Section. The 2<sup>nd</sup> stakeholder meeting was held on 7<sup>th</sup> March 2007 at the time of the workshop in Makassar with additional participation of Land Agency, Transport Agency and NGO for the Trans-Sulawesi Road, Mamminasa Bypass, Hertasning Road and Abdullah Daeng Sirua Road. Three stakeholder meetings will be finally held for the Outer

Ring Road. Since only pre-F/S study is required for the Outer Ring Road, only IEE-level study was conducted for this road.

#### (4) Study Area

The Study area covers Kabupaten Maros, Kabupaten Gowa, Kabupaten Takalar and Makassar City in South Sulawesi Province. **Table 8.3.2** shows the locations of F/S and Pre-F/S roads in the regencies concerned.

**Table 8.3.2 Locations of Study Areas by F/S and Pre-F/S Road and District**

No.	FS and Pre-FS Road		Regency (Kota / Kabupaten)			
			Makassar	Maros	Gowa	Takalar
1	Mamminasa Bypass			O	O	O
2	Trans-Sulawesi Mamminasata (Total Length: 58 km)	Maros-Middle Ring Road IC (Jl. Perintis)	O	O		
		Middle Ring Road	O			
		Middle Ring Road Access	O		O	
		Middle Ring Road Access - Takalar			O	O
3	Hertasning Road		<b>Works Completed</b>		O	
4	Abdullah Daeng Sirua Road		O	O	O	
5	Outer Ring Road		O	O	O	

Note: O The regency where the F/S roads pass through.

#### (5) Legal Framework

The study on environmental considerations was conducted in accordance with both the Indonesian AMDAL (EIA) regulations and the JICA Guidelines. While the JICA Guidelines require both IEE and EIA, no legal framework of IEE in the planning stage (route selection) is specified in Indonesian regulations. The Study Team and the agencies concerned of Indonesia have agreed to conduct IEE for the alternative route selection on environmental considerations.

#### (6) IEE Procedures

The IEE-level study was conducted in 3 steps: 1) preliminary survey, 2) design of the IEE matrix and its application, and 3) design of the MCA matrix and its application. Though a common IEE does not include MCA, the Study Team combined MCA and IEE to evaluate alternative plans in an integrated way.

### 8.3.2 Scope of Study for EIA

#### (1) Scope of Study

The scope of the EIA (AMDAL) study covers the following items:

- Scope of the project to be studied
  - ✧ Main issues
  - ✧ Scope of the Study area
- Study methods
  - ✧ Data collection and analysis method
  - ✧ Major and significant impact prediction method
  - ✧ Major and significant impact evaluation method
- Project owner identity
  - ✧ Executing agency
  - ✧ EIA study team
  - ✧ Study costs
  - ✧ Study period
- Bibliography.

The EIA study also covers UKL (Environmental Management Plan) and UPL (Environmental Monitoring Plan).

#### (2) Objectives

The major objectives of the EIA study are:

- To carry out more in-depth field surveys covering a wide range of environmental and socio-economic baseline information;
- To quantitatively and qualitatively assess significance of a wide range of potential impacts by the selected road development plan; and
- To summarize environmental mitigation measures and establish environmental management plan including environmental monitoring plan during both pre-construction and post-construction phases.

Though EIA generally deals with negative environmental impacts, positive effects will also be estimated in this study. In accordance with the result of EIA and public consultations, the proposed projects will be reviewed by BAPEDALDA and approved by the Governors.

#### (3) Schedule

The EIA study is being conducted for the F/S roads: the Mamminasa Bypass, Trans-Sulawesi Road Mamminasata Section, Hertasning Road and Abdullah Daeng Sirua Road. Those roads are classified into two groups: the 1<sup>st</sup> group consists of the Trans-Sulawesi Road and the 2nd group consists of the other 3 roads. The Terms of Reference (TOR) for EIA was prepared for each group. **Table 8.3.3** shows the schedule of F/S, EIA and stakeholder meetings.

**Table 8.3.3 Schedule of F/S Study and EIA**

Activity and FS road	2006	2007												2008		
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>FS Study</b>																
(1) Mamminasa Bypass																
(2) Trans-Sulawesi Mamminasata section																
(3) Hertasning Road																
(4) Abdullah Daeng Sirua Road																
<b>EIA Study</b>																
<b>Group 1</b>																
(2) Trans-Sulawesi Mamminasata section					●	⊙	○	⊙		approval						
<b>Group 2</b>																
(1) Mamminasa Bypass						EIA				EIA						approval
(3) Hertasning Road							●	⊙			○		⊙			
(4) Abdullah Daeng Sirua Road																

Notes: ⊙ Following both Indonesian EIA procedure and JICA guideline

● Following only Indonesian Guideline

○ Following only JICA guideline

**(4) Stakeholder Meetings (Public Consultations)**

A series of public consultations are basic requirements in EIA and for its approval. Four public consultation sessions are scheduled for each F/S road project. Participants to the public consultation are Bina Marga, Bappedalda of Kabupaten Maros, Kabupaten Gowa, Kabupaten Takalar and Makassar City, local government agencies, general public from affected villages, representatives of educational societies, religious societies, women's association, NGO, business associations and others.

**(5) Study Area**

The study area covers the specified areas in Kabupaten Maros, Kabupaten Gowa, Kabupaten Takalar and Makassar City (refer to **Table 8.3.2**) along the F/S roads to be affected directly and indirectly by planning and implementation of the Project.

**(6) Legal Framework**

The EIA (AMDAL) study was conducted in accordance with the Indonesian regulations, for which related documents are listed below, and "JICA Guidelines for Environmental and Social Considerations".

1. Undang-undang No. 5 tahun 1960 concerning Basic Agrarian Regulation
2. Undang-Undang No. 5 tahun 1990 concerning Ecosystem and Natural Biological Conservation
3. Undang-Undang No. 4 tahun 1992 concerning Housings and Settlement
4. Undang-Undang No. 14 tahun 1992 concerning Traffic and Road Transportation
5. Undang-Undang No. 24 tahun 1992 concerning Spatial Plan
6. Undang-Undang No. 23 tahun 1997 concerning Environmental Management
7. Peraturan Pemerintah No. 20 tahun 1990 concerning Water Pollution



8. Peraturan Pemerintah No. 27 tahun 1999 concerning AMDAL
9. Keputusan Menteri KLH No. Kep-02/MENKLH/1998, concerning Environment Quality Standard Guidelines
10. Keputusan Menteri KLH No. Kep-14/MENLH/3/1994, concerning AMDAL Compilation Guidelines
11. Kepka BAPEDAL No. 229/1996 concerning Technical Guidance on Social Aspect Consideration in AMDAL Formulation
12. Kepka BAPEDAL No. 28/2000 concerning Society Involvement and Information Disclosure in AMDAL Process
13. Kepka BAPEDAL No. 09/2000 concerning AMDAL Compilation Guidelines
14. Peraturan Menteri Negara Lingkungan Hidup Nomor 11 TAHUN 2006, Regulation for Types of Works and Activities to be Conducted in EIA
15. Peraturan Menteri Negara Lingkungan Hidup, Nomor 08 TAHUN 2006, Environmental Impact Assessment Guidelines
16. Keputusan Gubernur Sulawesi Selatan, Nomor 14 Tahun 2003, Quality Standard of Water and Air Emission

**(7) EIA procedures**

EIA was conducted in accordance with the procedures illustrated in **Figure 8.3.1**. The procedures meet the Indonesian EIA regulations in principle. The 2<sup>nd</sup> Public Consultation is an additional requirement to satisfy the JICA Guidelines.

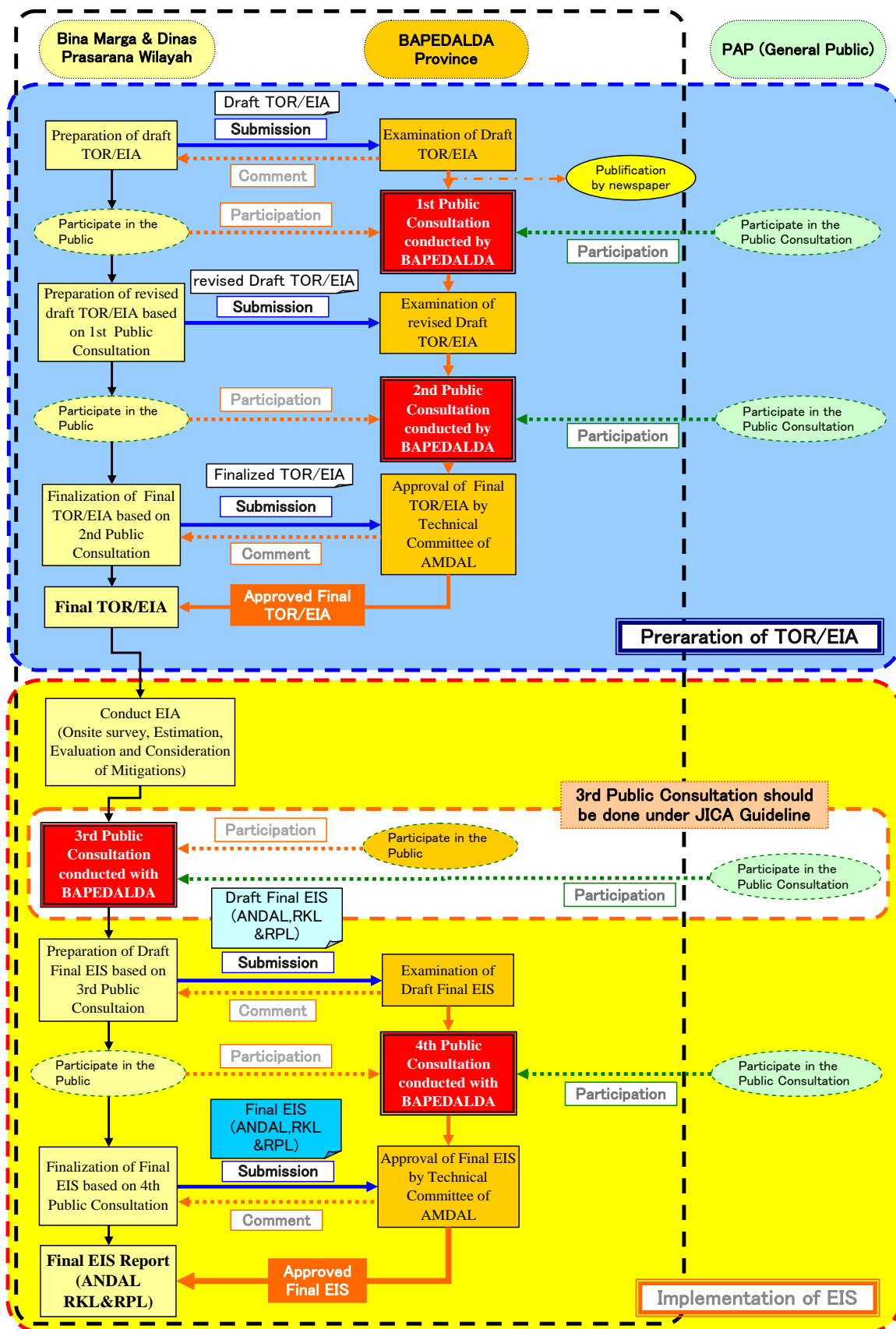


Figure 8.3.1 EIA Procedures

## 8.4 Methodology for IEE and EIA

### 8.4.1 Methodology for IEE

#### (1) Preliminary Survey

Preliminary survey was carried out using the existing data and conducting site reconnaissance. Major public infrastructure and private facilities including schools, mosques, cemeteries, government offices, hospitals, markets, bus stations, etc. along the alternative routes for the F/S projects were identified by site reconnaissance surveys conducted by relevant officers. Rivers, swamps and other essential natural landmarks were also identified through those site surveys. The required scale and seriousness of resettlements were estimated based on satellite images of topographic maps produced in the Mamminasata Spatial Plan Study.

#### (2) Design of IEE Matrix

The IEE matrix for the preliminary environmental assessment was designed for F/S (refer to **Table 8.4.1**). The matrix was prepared with reference to both the scoping matrix in the Indonesian EIA Guidelines and scoping items in the JICA Guidelines. The main columns show the alternatives including “Zero-Option (without project case)”. The sub-items of the column are the stages of project implementation: pre-construction, construction (roadway construction and bridge construction) and post-construction.

**Table 8.4.1 IEE Matrix Designed for Environmental Assessment**

Item / Description	Alternative 1			Alternative 2			Alternative 3 (Zero-Option)				
	Overall Evaluation	Preparation of control measurement	Post-control Stage	Overall Evaluation	Pre-construction Stage	Construction Stage	Post-construction Stage	Overall Evaluation	Pre-construction Stage	Construction Stage	Post-construction Stage
1 Migration of Populations Involuntary Resettlement a. Number of houses / building to be moved (no) b. Area of land acquisition required (ha)											
2 Impact on Local Economy (Employment, Livelihood, etc.)											
3 Utilization of Land and Local Resources											
4 Social Institutions (Social Capital and Local Decision-making institution)											
5 Existing Social Infrastructure and Services											
6 Vulnerable Social Groups											
7 Equality of Benefits and Losses and Equality in Development process											
8 Local Conflicts of Interests											
9 Gender											
10 Children's Rights (interruption of children's schooling and increase in the number of children's traffic accidents, etc.)											
11 Cultural Heritage											
12 Infectious Diseases (HIV/AIDS)											
13 Traffic Jam											
14 Traffic accidents											
15 Geographical Conditions											
16 Geological Conditions											
17 Soil Erosion											
18 Faunal Ecology											
19 Flora Ecology											
20 Effects on the Ground Water											
21 Effect on the Surface Water Body (River, Lakes, etc)											
22 Effect on the Coastal Environment											
23 Oceanographic Changes											
24 Effect on the Natural/Ecological Reserves and Sanctuaries											
25 Localised Climatic Changes											
26 Effect on the Global Warming Issues											
27 Effect on Drainage and Floods											
28 Air Pollution											
29 Water Pollution											
30 Soil Pollution											
31 Solid Waste and/or Industrial Discharge Management											
32 Noise and Vibration											
33 Large Scale Ground Settlement											
34 Emanating Odour											
35 Pollution on the Water Bottom/Sludge and Its Effect on the Aquatic Life											

Notes: A: Significant changes expected, B: Relatively significant changes expected, C: Not significant but subject to further study, "-": Neglectable impact, A+, B+, C+ indicates relatively positive changes, A-, B-, C- indicates relatively negative changes.

### (3) Design of MCA Matrix

Multi Criteria Analysis (MCA) is one of typical evaluation methods to evaluate plural options by an integrated way weighing different categories and items. The designed MCA matrix is shown in **Table 8.4.2**. The columns show the options (alternatives). The rows indicate the evaluation categories and items established by the Study Team for the F/S route selection. The weight is allocation of values given to main items and sub-items. The unit of weight is percentage and the total weight must be 100%. The evaluators' idea and philosophy are reflected in the evaluation items and their weight. The evaluators fill their judgments in the matrix with five relative points: 5 points for the most positive (or highest) one and 1 point for the most negative one (or lowest). Then, the points are converted to relative values by item, multiplied by weight and integrated at the end. The total points by option indicate the overall evaluation result (comparison of alternatives).

The evaluation categories and items of MCA were designed to be appropriate enough at the stage of F/S route selection for comparison of the alternatives. The ratio of weight allocated to engineering, economic and environmental aspects is 40%, 30% and 30%, respectively.

**Table 8.4.2 MCA Matrix Designed for the F/S Road Route Selection**

Evaluation Items	Weight				5 grades assessment			ed score (Relative evaluation, average			Weighted score (* weight)		
	Level 1	Level 2	Level 3	Composite weight	Alternative 1	Alternative 2	Zero Option	Alternative 1	Alternative 2	Zero Option	Alternative 1	Alternative 2	Zero Option
					New route (16.8km)	New route (20.3km)	Existing road (9.1km)	New route (16.8km)	New route (20.3km)	Existing road (9.1km)	New route (16.8km)	New route (20.3km)	Existing road (9.1km)
<b>Total</b>				<b>1.00</b>									
<b>Engineering Aspect</b>	<b>0.40</b>			<b>0.40</b>									
1 Road Alignment			0.30	0.12									
2 Construction Feasibility/ Flood			0.30	0.12									
3 Traffic Demand			0.20	0.08									
4 Road Network			0.20	0.08									
<b>Economical and Financial Aspect</b>	<b>0.30</b>			<b>0.30</b>									
5 Cost (Construction & Maintenance)			0.30	0.09									
6 Economic Effectiveness			0.30	0.09									
7 Impacts on Regional Economy			0.20	0.06									
8 Others			0.20	0.06									
<b>Environmental Aspect</b>	<b>0.30</b>			<b>0.30</b>									
<b>Social Environment</b>		<b>0.50</b>		<b>0.15</b>									
9 Resettlement and Land acquisition			0.50	0.08									
10 Existing Social Infrastructure and Services			0.25	0.04									
11 Traffic Jam			0.25	0.04									
<b>Natural Environment</b>		<b>0.30</b>		<b>0.09</b>									
12 Flora, Fauna and Ecosystem			0.40	0.04									
13 Geographical Conditions, Geological Conditions			0.30	0.03									
14 Effect on the Natural/Ecological Reserves and Sanctuaries			0.30	0.03									
<b>Pollution</b>		<b>0.20</b>		<b>0.06</b>									
15 Air Pollution			0.50	0.03									
16 Noise and Vibration			0.30	0.02									
17 Water Pollution			0.20	0.01									

The engineering and economic aspects were evaluated by the engineers and regional development specialists assigned to the F/S. The values on environmental aspect were converted from the IEE Matrix table. **Table 8.4.3** shows relative scoring grades (5 grades) applied for MCA. The highest point of 5 indicates the most positive effects compared with other alternatives while the lowest point of 1 means the most negative effects.

**Table 8.4.3 Relative Scoring Grade applied for MCA**

Evaluation Items		Point 1	Point 2	Point 3	Point 4	Point 5
<b>Engineering Aspect</b>						
1	Road Alignment	Low adequacy	Relatively low adequacy	Middle adequacy	Adequacy is relatively high	High adequacy
2	Construction Feasibility/ Flood	Low construction Feasibility	Relatively low construction feasibility	Middle construction feasibility	Relatively high construction feasibility	High feasibility
3	Traffic Demand	Does not match to the demand at all	Scarcely match to the demand	A little match to the demand	Relatively match to the demand	Match to the demand
4	Road Network	Low function	Relatively low function	Middle function	Relatively high function	High function
<b>Economical and Financial Aspect</b>						
5	Cost (Construction & Maintenance)	High cost	Relatively high cost	Middle cost	Relatively low cost	Low cost
6	Economic Effectiveness	Low effectiveness	Relatively low effectiveness	Middle effectiveness	Relatively high effectiveness	High effectiveness
7	Impacts on Regional Economy	Low impact on regional economy	Relatively low impact on regional economy	Middle impact on regional economy	Relatively high impact on regional economy	High impact on regional economy
8	Others	Low economic impact	Relatively low economic impact	Middle economic impact	Relatively high economic impact	High economic impact
<b>Environmental Aspect</b>						
<b>Social Environment</b>						
9	Migration of Populations Involuntary Resettlement	More than 99 households	More than 49 and less than 100 households	More than 29 and less than 50 households	more than 9 and less than 30 households	Less than 10 households
10	Existing Social Infrastructure and Services	No improvement on existing social infrastructure and service	Few improvement on existing social infrastructure and service	Middle improvement on existing social infrastructure and service	Relatively high improvement on existing social infrastructure and service	High improvement on existing social infrastructure and service
11	Traffic Jam	No resolution on traffic jam	Few resolution on traffic jam	Middle resolution on traffic jam	Relatively good resolution on traffic jam	Good resolution on traffic jam
<b>Natural Environment</b>						
12	Flora, Fauna and Ecosystem	High impact on ecosystem	Relatively high impact on ecosystem	Middle impact on ecosystem	Relatively low impact on ecosystem	Low impact on ecosystem
13	Geographical Conditions, Geological Conditions	High impact on geographical or geological condition	Relatively high impact on geographical or geological condition	Middle impact on geographical or geological condition	Relatively low impact on geographical or geological condition	Low impact on geographical or geological condition
14	Effect on the Natural/Ecological Reserves and Sanctuaries	Large scale impact on conservation area	Relatively large scale impact on conservation area	Relatively small scale impact on conservation area	Small scale impact on conservation area	No impact on conservation area
<b>Pollution</b>						
15	Air Pollution	Worse air pollution	Relatively worse air pollution	Same air pollution as before	Improve air pollution a little	Improve air pollution
16	Noise and Vibration	Worse noise and vibration level	Relatively worse noise and vibration level	Same noise and vibration level as before	Improve noise and vibration level a little	Improve noise and vibration level
17	Water Pollution	Worse water contamination	Relatively worse water contamination	Same water contamination as before	Improve water contamination a little	Improve water contamination

## 8.4.2 Methodology for EIA

### (1) Data Collection and Impact Identification

Various kinds of data collection and field survey are necessary for identification, evaluation and establishment of mitigation measures for possible impacts. The items which might affect the environment either in negative or positive ways are screened and forecast in IEE through the route selection work. The result of IEE study is reflected in the data collection planning for EIA and impact identification.

## (2) Field Survey

### 1) Natural Environment

A wide range of existing data, including those collected in the Mamminasata Spatial Plan Study, and information on the natural environment and pollution will be collected and used for EIA. A series of on-site surveys were conducted covering air quality, noise/vibration and water quality which have comparatively higher impacts. In addition, field reconnaissance for the flora and fauna was also carried out since the existing data in the study area are not sufficient. The major items for data collection on the natural environment and pollution are shown in **Tables 8.4.4 to 8.4.7** and **Figure 8.4.1**.

**Table 8.4.4 Survey Items and Survey Points (Air Quality)**

Item	Survey Point
Ambient Air Quality (hourly and daily average) <ul style="list-style-type: none"> <li>➤ Sulfur Dioxide(SO<sub>2</sub>)</li> <li>➤ Carbon Oxide(CO)</li> <li>➤ Nitrogen Dioxide(NO<sub>2</sub>)</li> <li>➤ Ozone(O<sub>3</sub>)</li> <li>➤ Hydro-Carbon(HC)</li> <li>➤ Particulate Matter(PM<sub>10</sub>)</li> <li>➤ Total Suspended Particulate Matter(TSP)</li> <li>➤ Lead(Pb)</li> </ul> <p style="text-align: right;"><b>Total 8 items</b></p>	At roadside during 24 hours <ul style="list-style-type: none"> <li>✓ Trans-Sulawesi Mamminasata : 8 points</li> <li>✓ Mamminasa Bypass: 6 points</li> <li>✓ Hertasning road : 2 points</li> <li>✓ Abdullah Daeng Sirua road : 2 points</li> </ul> <p style="text-align: right;"><b>Total 18 points</b></p>
On-site Traffic Density Counting and recording the number of vehicles hourly data by car type and cpu	<ul style="list-style-type: none"> <li>✓ Trans-Sulawesi Mamminasata : 8 points</li> <li>✓ Mamminasa Bypass : 6 points</li> <li>✓ Hertasning road : 2 points</li> <li>✓ Abdullah Daeng Sirua road : 2 points</li> </ul> <p style="text-align: right;"><b>Total 18 points</b></p>
Wind Velocity and Direction (Windrose)	<ul style="list-style-type: none"> <li>✓ Trans-Sulawesi Mamminasata : 8 points</li> <li>✓ Mamminasa Bypass : 6 points</li> <li>✓ Hertasning road : 2 points</li> <li>✓ Abdullah Daeng Sirua road : 2 points</li> </ul> <p style="text-align: right;"><b>Total 18 points</b></p>

**Table 8.4.5 Survey Items and Survey Points (Noise Level)**

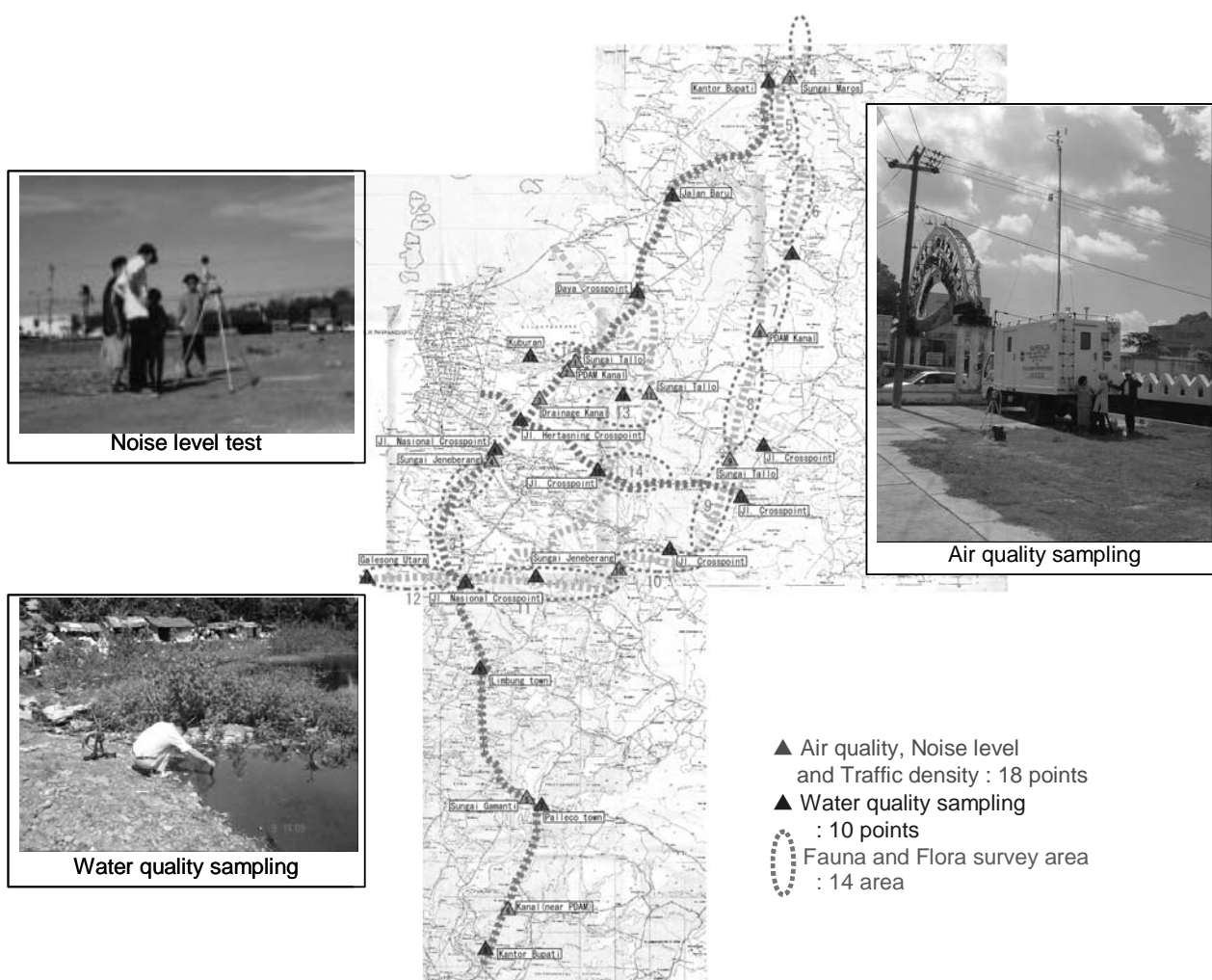
Item	Survey Point
Noise level during 10 minutes every hour	At roadside during 24 hours as same as air quality survey point <ul style="list-style-type: none"> <li>✓ Trans-Sulawesi Mamminasata : 8 points</li> <li>✓ Mamminasa Bypass : 6 points</li> <li>✓ Hertasning road : 2 points</li> <li>✓ Abdullah Daeng Sirua road : 2 points</li> </ul> <p style="text-align: right;"><b>Total 18 points</b></p>

**Table 8.4.6 Survey Items and Survey Points (Water Quality)**

Item	Survey Point
Temperature	At cross points of river and canal (including canal along routes) in dry season
Color	
Total Dissolved Solid(TDS)	✓ Trans-Sulawesi Mamminasata : 6 points
Total Suspended Solid(TSS)	✓ Mamminasa Bypass : 4 points
Electric Conductivity(EC)	✓ Abdullah Daeng Sirua road : 1 points
Turbidity (Physical :6 items)	
pH	<b><u>Total 11 points</u></b>
Biological Oxygen Demand(BOD5)	
Chemical Oxygen Demand(COD)	
Dissolved Oxygen(DO)	
Total Phosphate(P)	
Nitrate(NO <sub>3</sub> -N)	
Ammonium(NH <sub>3</sub> -N)	
Cadmium(Cd)	
Chrome(CrVI)	
Cuprum(Cu)	
Iron(Fe)	
Lead(Pb)	
Manganese(Mn)	
Mercury(Hg)	
Zink (Zn)	
Chloride (Cl)	
Cyanide (Cn)	
Fluoride (F)	
Nitrite (NO <sub>2</sub> -N)	
Sulphate (SO <sub>4</sub> )	
Cl <sub>2</sub> – free	
H <sub>2</sub> S	
CaCO <sub>3</sub>	
Calcium (ca) (Chemical :24 items)	
Oil and Grease	
Detergent (MBAS)	
Fenolic (Organic Chemical :3 items)	
Fecal Coliform	
Total Coliforms (Microorganism :2 items)	
<b><u>Total 35 items</u></b>	

**Table 8.4.7 Survey Items and Survey Points (Flora and Fauna)**

Items	Survey point
Flora :General vegetation patterns, Plant species, Tree species, Rare plant species in entire area, Others	Along proposed routes and in relatively high natural environmental condition area
Fauna :Amphibians, Reptiles, Mammals, Birds, Rare faunal species, Others	Trans-Sulawesi Mamminasata : 3 areas (around Tallo river and C section)
Arrangement of data by kind and species, common name, habitat, endemism, protected or not and so on	Mamminasa Bypass road : 8 areas (along all of proposed routes)
	Hertasning road : 1 area (middle part of this route)
	Abdullah Daeng Sirua road : 1 area (middle part of this route)
	<b><u>Total 14 area</u></b>



**Figure 8.4.1 Site Survey Points for Natural Environment**

The survey of natural environment and pollutions was carried out from the end of March to the beginning of June 2007. Regarding pollution, the dates of survey and sampling points are shown in **Table 8.4.8**. The field reconnaissance on flora and fauna in the rainy season was conducted from the end of March to the beginning of April 2007. The dry season survey was done between the end of May and the middle of June.

**Table 8.4.8 Date of Survey for Pollution and Sampling Points**

Pollution Item	Date of Practice
Air Quality, Noise Level, Traffic Density, Wind Velocity and Direction	Trans-Sulawesi Road (No.1~8, 15) : 1 <sup>st</sup> to 12 <sup>th</sup> of May 2007
	Mamminasa Bypass (No.1, 5, 9~14) : 1 <sup>st</sup> ,8 <sup>th</sup> ,14 <sup>th</sup> ,18 <sup>th</sup> ,19 <sup>th</sup> , 21 <sup>st</sup> to 23 <sup>rd</sup> of May
	Hertasning (No.11,15, 16) : 4 <sup>th</sup> ,22 <sup>nd</sup> ,24 <sup>th</sup> of May
	Abdullah Daeng Sirua (No.10, 17, 18) : 15 <sup>th</sup> ,16 <sup>th</sup> ,23 <sup>rd</sup> of May
Water Quality	No.1, 4~9 : 24 <sup>th</sup> of May 2007
	No.2, 3, 8~11 : 25 <sup>th</sup> of May 2007



## 2) Social Environment

The survey items include economy, health, daily life by region, income level, generation, etc. as listed in **Table 8.4.9**. Questionnaire surveys along the F/S roads were carried out and approximately 200 answers were obtained (refer to **Table 8.4.9**). The interview survey of Group 1 (Trans-Sulawesi Road Mamminasata section) was carried out in May 2007, and 150 sheets of answers by the affected people were collected. Regarding Group 2, the interview survey was carried out in October 2007, and 40 sheets of answers by the affected people were collected.

**Table 8.4.9 Survey Items and Survey Points (Social Environment)**

Item	Survey Point
Economy, health, daily life, surrounding environment condition, etc. by region, income level, generation, etc.	Along proposed routes Target number of answers : about 250 Trans-Sulawesi Mamminasata : 58 km Mamminasa Bypass road : 27.9 km Hertasning road : 4.5 km Abdullah Daeng Sirua road : 17.9 km <b>Total 4 routes (length 108.3km)</b>

## (3) Methodology for Impact Assessment

### 1) Air Quality Prediction

- i) The pollution volume is calculated from the exhaust gas of vehicles referring to the exhaust regulation in Indonesia.
- ii) The statistical future air quality level is predicted from the result of on-site survey. After statistical analysis between air quality and traffic volume, future air quality level is predicted using the projected traffic volume along the F/S route.

### 2) Noise Level Prediction

Relationships between noise level and traffic volume are identified. The future noise level is predicted based on the result of on-site survey. After statistical analysis between noise level and traffic volume, future noise level is predicted using the projected traffic volume along the F/S route.

### 3) Water Quality Prediction

Water quality is predicted referring to the regulation on discharge and present condition data on the rivers where the F/S road is constructed.

### 4) Flora and fauna

- i) A list of existing flora and fauna along the F/S roads will be compared with the list of endangered species, such as Red Data Book (RDB).
- ii) Assessed distribution areas are indicated in the flora and fauna maps produced by the Study Team.

- iii) These maps are layered on the road F/S route map and the possible impact area will be identified.

#### 5) Social Environment

The impact prediction and evaluations have been and are being conducted through the following procedures.

- i) Socio-economic impacts on possible PAPs.
- ii) Counting of the number of PAPs and identification of the locations of those PAPs by using satellite maps (Google Earth) and topographic maps and confirmation through field survey.

Estimated quantitative socio-economic impacts on possible PAPs include the following items:

- Population to be resettled (by gender, ethnics, age, etc.)
- Number of households to be resettled
- Estimated affected area for land acquisition (agricultural, residential and other areas)
- Number and scale of structures (houses, shops, offices, factories) to be resettled
- Number and scale of public infrastructures (public facilities, public utilities and regional infrastructure)
- Other socio-economic impacts on PAPs

The predicted impacts are being comprehensively evaluated by summing up positive and negative impacts based on the quantitative and qualitative methods. In addition, evaluation on the impact on the social environment is being analyzed more deeply from outcomes of the questionnaire survey on PAPs as well as other socio-economic surveys to identify and assess potential social impacts.

## 8.5 Summary of IEE for Route Selection for F/S Roads

### 8.5.1 Preliminary Survey for IEE

Preliminary survey was conducted to identify possible impacts as well as the scale and extent on both natural and socio-economic environments. It was observed that more than 90% of the areas where the F/S roads pass through are farmland or urbanized areas, while the remaining 10% is lowland (swamps) or uncultivated land. There are a restriction area near the Outer Ring Road at the northern upstream part of the Tallo River and a planned flood retarding area at the southern upstream part of the same river.

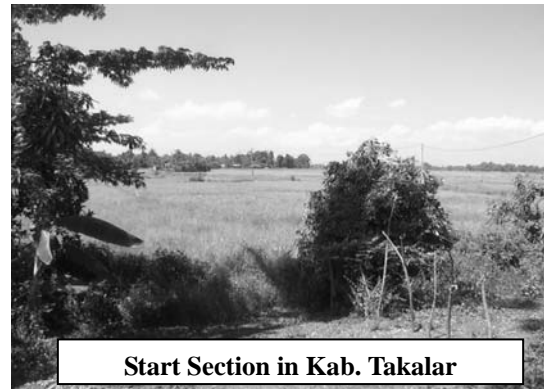
Since the F/S roads are urban roads, land acquisition and resettlement are the critical issues in both project planning and implementation. It is estimated that resettlement of approximately 2,000 households is required as shown in **Table 8.5.1**. Maximum efforts should be made to minimize the number of PAPs to be resettled during the design stage.

### 8.5.2 IEE for Mamminasa Bypass

#### (1) South Section

The south section of the Mamminasa Bypass passes through a rural area where many paddy fields and farmlands are still dominant in many villages except for the area along the national road to Takalar. The F/S route crosses the Jeneberang River, the largest river in Mamminasata, at the end of this section.

Agriculture is currently one of the main economic activities along this route. As a result of the development of the irrigation system from the Bili-bili Dam, agricultural productions in this region will be stable in the future. A bridge was constructed over the mouth of the Jeneberang River in 2005 and, therefore, the south area has a direct access to the Makassar City center and Tanjung Bunga. Therefore, natural urbanization is unavoidable along the Tanjung Bunga road. As the population density is still relatively low, public facilities and lifeline are not yet well provided. Because of the relatively small size of wetland and no existence of forest, biodiversity seems to be low. Common species of flora and fauna are found around this area.

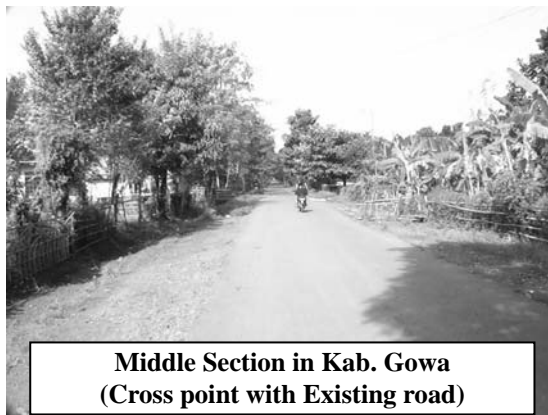
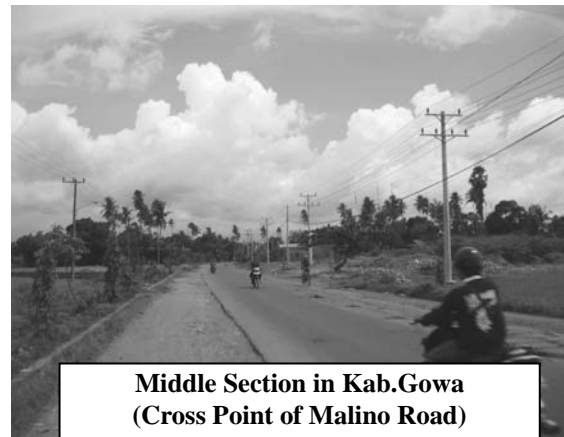


There are no significant negative impacts (A-) for Alternative 1 (the recommended F/S route). Some negative impacts (B-) are anticipated in 12 items. Land acquisition and resettlement in the pre-construction stage will be the most essential issues on social environmental considerations. Two items, soil erosion and effect on the water in the Jeneberang River during the construction

stage were screened out in the natural environmental category. Water contamination and noise caused by the operation of heavy equipment (machines and trucks, etc.) are also anticipated. As the traffic will increase in the future, the air quality and noise will become worse compared with the present condition. On the other hand, positive impacts on local economic activities, land use and utilization of local resources are expected. Traffic jam on the existing road will be improved conspicuously while serious traffic jam is anticipated as the traffic volume will far exceed the capacity in the without-project case.

## (2) Middle Section

The proposed F/S route of the middle section of the Mamminasa Bypass passes through the rural area in Maros and Gowa districts. The route crosses upstream the Tallo River. The F/S route for Alternative 1 avoids most of small villages. Paddy fields in the lowland and crop cultivation fields on the rolling terrain are spreading around the F/S road. The cross point of the PDAM canal from the Lekopancing barrage to Makassar city exists on the route.



This middle section route passes through the area of low population density but around the cross points of existing roads, there are some houses to be resettled. Along this route the lifeline is well developed but some of the roads are in bad condition in the rainy season. It is assumed that biodiversity is relatively low.

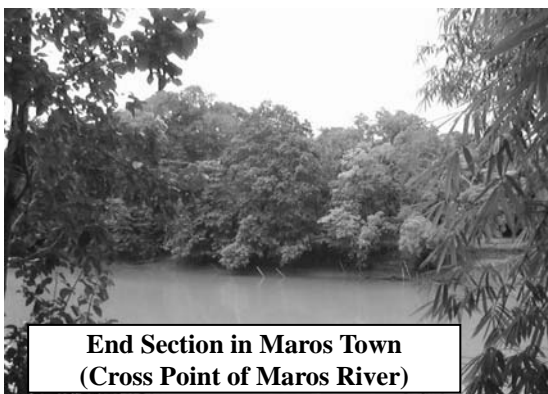
There are no significant negative impacts (A-) for Alternative 1 (the recommended F/S route).

Relatively negative impacts (B-) are anticipated in 12 items. Land acquisition and resettlement at the pre-construction stage will be the most essential issues. Natural environmental condition and pollution are almost same as in the above start section. Minor soil erosion, effect on surface water and water contamination in the Tallo River might occur in the construction stage. Noise pollution is anticipated in the construction stage. Air quality and noise will become worse compared with the without-project case. Significant positive impacts on local economic activities, land use and utilization of local resources are expected. Traffic jam will be improved conspicuously. The road is also expected to contribute to inducing new satellite towns at the foot of Mt. Moncongloe.

### (3) End (North) Section

The proposed F/S route of the end (north) section of the Mamminasa Bypass passes on the periphery of Maros town avoiding a planned flood retarding basin in paddy field. The bypass crosses over the Maros River at the east edge of Maros town and, then, the national road to Kabupaten Bone. It meets the national road to Parepare at about 1.5 km, at the northern end of Maros town.

**End Section in Maros  
(Cross Point of Existing road)**



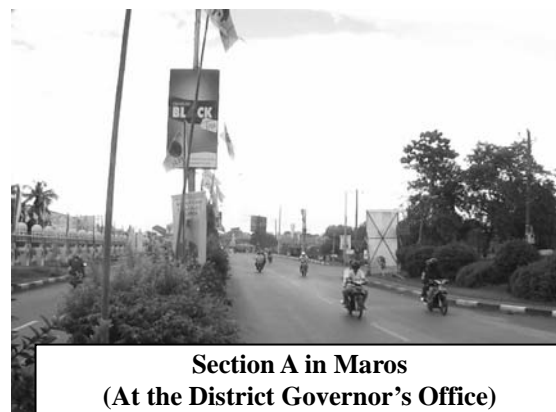
**End Section in Maros Town  
(Cross Point of Maros River)**

Significant negative impacts (A-) are not expected for the recommended Alternative 1. Relatively negative impacts (B-) are anticipated in 12 items. Land acquisition and resettlement are the most essential issues among these items. In natural environmental category, soil erosion and effect on the water of the Maros River in the construction stage are anticipated. Noise increase is also anticipated. As the traffic volume will increase in the future, air quality and noise will become worse compared with the present condition. However, the significant positive impacts on local economic activities, land use and utilization of local resources, solving traffic jam etc. , especially solving serious traffic jam in the Maros town center, are expected.

### 8.5.3 IEE for Trans-Sulawesi Road Mamminasata Section

#### (1) Section A (Maros-Middle Ring Road)

The road development concept of Section A is widening of the existing national road from 4 lanes to 6 or 8 lanes, except in the new Maros town area where the existing 4-lane road will be kept. The F/S road starts at Maros town and passes through the national road up to the intersection of Jl.Ir.Sutami (near the entrance to Makassar City) and, then, runs on Jl.Perintis Kemerdekaan up to the planned middle ring road interchange near the Tallo River Bridge.



**Section A in Maros  
(At the District Governor's Office)**

Many buildings and houses exist along the route, especially around the airport, Mandai, Biringkanaya and Daya towns.

The forecast traffic volume for Section A is higher than that of other roads and the population

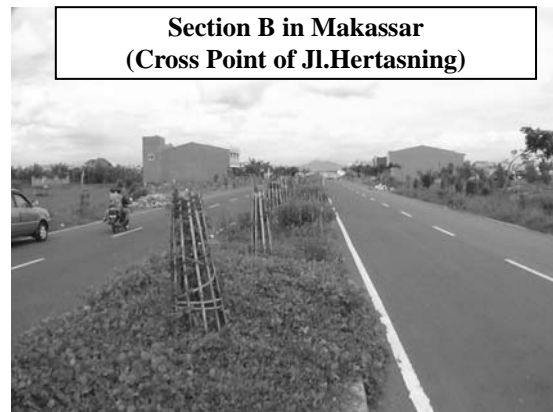
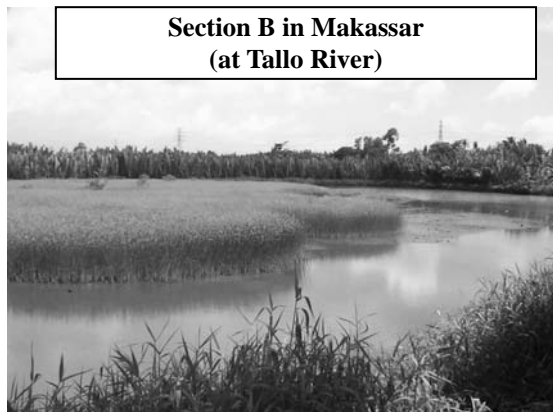
density is also relatively high. Several mosques exist along this road and a general hospital at the cross point of Daya town. Some large and small markets exist and, therefore, this road is very important for daily life. Natural environmental condition and biodiversity in flora and fauna are assumed to be at low level.

Significant negative impacts (A-) are anticipated for land acquisition and resettlement in the case of widening of the existing road. Relatively negative impacts (B-) are seen in 11 items for Section A. It seems that traffic accident is one of the important social environmental elements. In the future, air quality and noise level will become worse due to the increase of traffic volume. However, significant positive impacts on traffic jam are expected. Local economic activities and utilization of local resources will also receive positive impacts.



## (2) Section B (Middle Ring Road)

The Middle Ring Road passes through the urban districts of Makassar City. The road alignment has already been fixed and land acquisition and resettlement are in progress. The Middle Ring Road passes through a high population density area and partly runs along a drainage canal. This route crosses the Tallo River just after entering the Middle Ring Road from Jl.Perintis



Kemerdekaan. It seems that the natural environmental condition and biodiversity are relatively high at this point. Other areas from the Abdullah Daeng Sirua road to Sunggminasa in Gowa have high population density and the level of natural environment and biodiversity is low.

Land acquisition and resettlement are anticipated to give significant negative impacts (A-) though 60% - 70% of land acquisition has been completed. Eleven items are anticipated to receive relatively negative impacts (B-). As to the social environmental category, traffic accident is an important item to be considered as the population density in this area is high. Water contamination and noise during the Tallo River bridge substructure construction are anticipated. It seems that

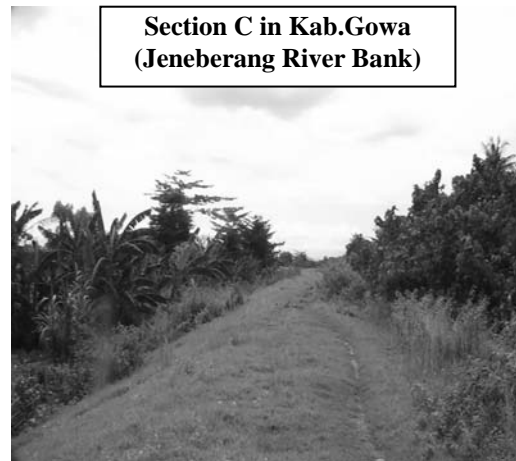
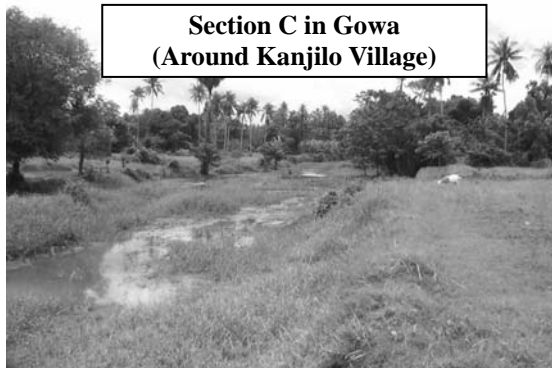
consideration for flora and fauna will be necessary according to on-site survey around the Tallo River. Air quality and noise will become worse in the future due to traffic increase. The Middle Ring Road will have a significant positive impact on traffic jam by reducing traffic on other urban roads. Utilization of local resources, social infrastructure and services will also receive positive impacts.

### (3) Section C (Sungguminasa IC - National Road)

A new road construction was recommended by the Study Team. The new route crosses the Jeneberang River after the Sungguminasa IC. Paddy fields and villages are spreading along the new route in the south of the Jeneberang River. The population density is relatively small. It seems that possibility of endemic species is relatively low.

Land acquisition and resettlement have a relatively negative impact (B-) except around the Sungguminasa intersection. Twelve items might cause relatively negative impacts (B-) including land

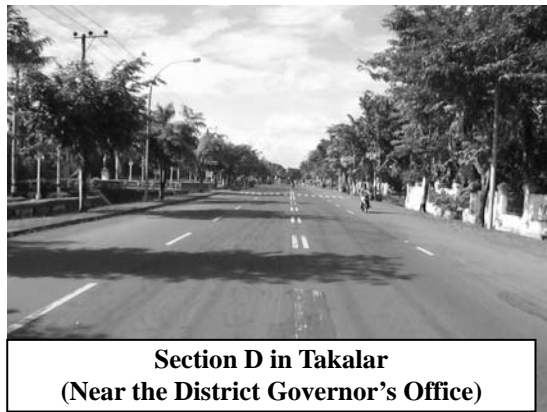
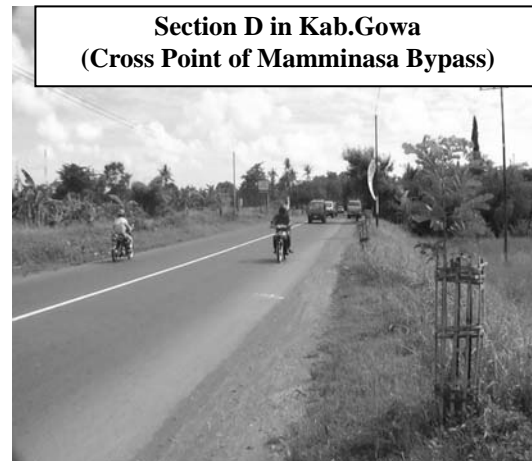
acquisition and resettlement. It seems that traffic accident is relatively important in the social environmental category as the traffic volume will increase. Soil erosion and effect on the surface water are expected. Water contamination and noise pollution may happen during the Jeneberang River bridge construction. In addition, it seems that consideration for flora and fauna may be necessary around the proposed route alignment. Air quality and noise will be a problem in the future due to traffic increase. The new road will give a very big positive effect on traffic jam. Utilization of local resources, social infrastructure and services, control of drainage and flood will receive positive impacts.



Noise may happen during the Jeneberang River bridge construction. In addition, it seems that consideration for flora and fauna around the proposed route alignment may be necessary. Air quality and noise caused by traffic increase will be a problem in the future. The new road will give a very big positive effect on traffic jam. Utilization of local resources, social infrastructure and services, control of drainage and flood will receive positive impacts.

#### (4) Section D (Boka - Takalar)

The development concept of Section D is widening of the existing national road from 2-lane road to 4-lane road. There is an irrigation canal on the east side along the road. On the way to Takalar town, small towns (Limbung in Gowa and Palleko in Takalar) exist. The population density along the road side is relatively high. Irrigated paddy cultivation is dominant along the road. Part of the national road near the central part of Takalar town has already been widened to 4 lanes.

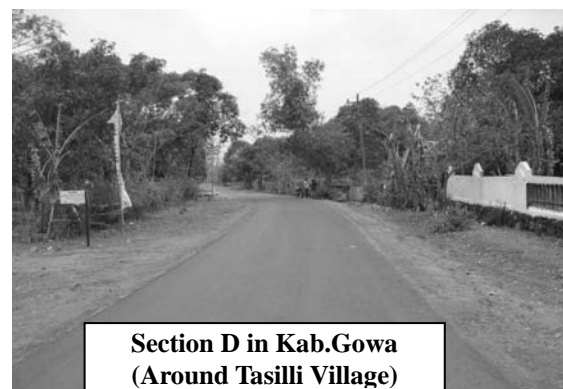


The number of resettlements (houses and buildings) is large as widening can be made on the west side because the irrigation canal is located in the east. One item is classified as significant negative impact (A-) and eleven items are anticipated as relatively negative impacts (B-) including traffic accident, soil erosion, effect on the surface water, water contamination, noise and so on. It seems that consideration for flora will be necessary because

a lot of trees are planted along this route. In future, air quality and noise will be worsening due to the traffic increase. However, traffic jam improvement and utilization of local resources are positive impacts.

#### 8.5.4 Hertasning Road (refer to Appendix B as to IEE and MCA Matrixes)

The existing Kabupaten road (Section D of the Hertasning Road) located in Pattallassang in Gowa will be widened from 2-lane road to 4-lane road. Paddy field and crop cultivation are dominant in landuse and the population density is relatively low. The existing road in Gowa had been in bad condition but it was improved recently.



Land acquisition and resettlement are significant negative impacts (A-) because some houses are located along the existing road. Relatively negative impacts (B-) are anticipated in 8 items including traffic accident, soil erosion, water contamination, noise level, and so on. It seems that consideration for flora and fauna along the

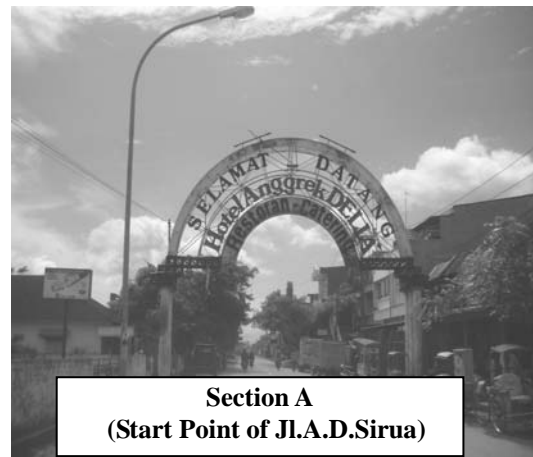


proposed road will be necessary. Air quality and noise will be a problem as the traffic will increase in the future. Traffic jam, local economic activities, utilization of local resources, social infrastructure and services, control of drainage and flood will receive positive impacts.

### 8.5.5 Abdullah Daeng Sirua Road (refer to Appendix B as to IEE and MCA Matrixes)

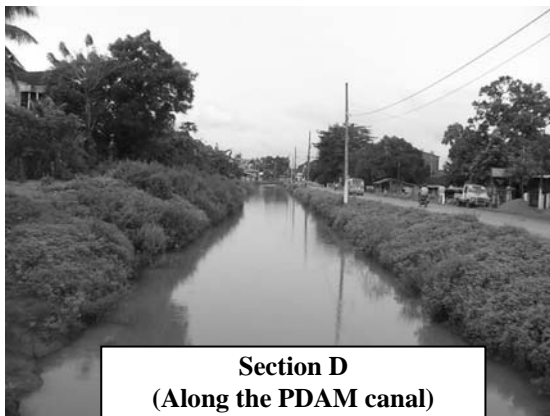
This route connects the Makassar City center with the suggested new towns (satellite towns) in Gowa and Maros in the future. It will also directly connect the new landfill site proposed in the Mamminasata Spatial Plan.

The proposed route in the Makassar City starts at the town center where buildings and houses are densely located (Section A). Section B - Section D passes along the water supply canal up to the Makassar / Maros border and the project concept is construction of a new 2-lane road on the ROW of the PDAM canal or improvement of the existing PDAM inspection road.



**Section A**  
**(Start Point of Jl.A.D.Sirua)**

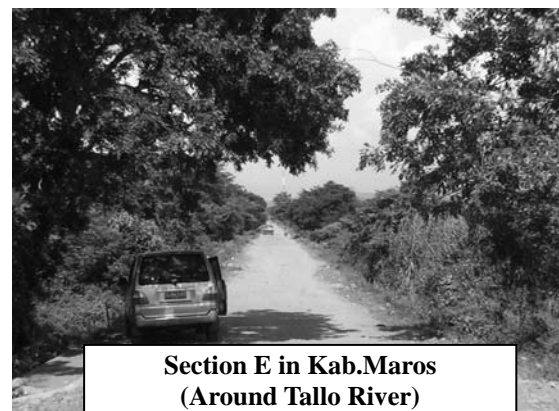
From then, the existing road will be widened for about 1.2 km (Section E). The paddy fields located on both sides of the existing road are flooded by the Tallo River during the rainy season. The end section (Section F) is a new road of 7 km long passing through the paddy field, crop field and some uncultivated land. Small villages are scattered along this route and population density is low. On the way to Pattallassang region some soil borrow areas, sand and gravel quarry sites exist.



**Section D**  
**(Along the PDAM canal)**

Land acquisition and resettlement constitute relatively negative impacts (B-) in the residential area of

Makassar, because houses and buildings exist in the Section A and Section C. Though the number of houses and buildings to be resettled in the eastern part of the Makassar City, Maros and Gowa is not so much, it requires land acquisition. Relatively negative impacts (B-) are anticipated in 3 to 10 items by each section including traffic accident, soil erosion, surface water, air quality, water contamination and noise, and so on. Consideration for contamination of raw water in the PDAM canal is an important item to be studied.



**Section E in Kab.Maros**  
**(Around Tallo River)**

In the construction stage of the bridge substructure, it is necessary to consider mitigation measures for controlling water contamination and noise. It seems that consideration for flora and fauna around the proposed route alignment will be necessary. In future, air quality and noise will be worsened in the Makassar City districts due to traffic increase. However, the F/S road will give positive impacts on traffic jam, local economic activities, utilization of local resources, social infrastructure and services, especially for the eastern part of the Makassar city, Moncongloe in Maros and Pattallassang in Gowa.

## 8.6 EIA Status for Feasibility Study Roads

The EIA (AMDAL) TOR was approved and the Final report or AMDAL Documents for two project groups were submitted to Bapedalda South Sulawesi Province by the Proponent, Directorate General of Highways, Ministry of Public Works (in this project, represented by the Public Infrastructure Agency South Sulawesi, whose representative was transferred to Balai Besar Pelaksana Jalan Nasional VI, Directorate General of Highways, Ministry of Public Works). Based on the draft proposed, Bapedalda announced the project implementation plan publicly afterwards through mass media. As for the 1<sup>st</sup> group roads, namely the Trans Sulawesi Mamminasata Road, the announcement on the project plan was published in the Fajar Daily on March 20<sup>th</sup>, 2007. A Public Consultation Meeting for the Trans Sulawesi Mamminasata Road, facilitated by Bapedalda, was held in April 2007. The TOR was approved by the AMDAL Appraisal Technical Team on May 28<sup>th</sup>, 2007. The Draft AMDAL Final Report (ANDAL, RKL and RPL) was presented and discussed at the AMDAL Committee/AMDAL Appraisal Technical Team Meeting on August 20<sup>th</sup>, 2007. Recommendations of the AMDAL Appraisal Technical Team on the Final Report, including ANDAL, RKL and RPL documents, were given in the letter No.660/745/II/Bapedalda dated September 28<sup>th</sup>, 2007. The AMDAL Documents' approval was furthermore confirmed by the Decree of the Head of Bapedalda South Sulawesi Province No.660/746/II/Bapedalda, dated September 28<sup>th</sup>, 2007. The complete schedule of EIA is illustrated in **Table 8.6.1**.

**Table 8.6.1 EIA Study Schedule**

Type of Document	Road Groups	
	Group 1 Trans Sulawesi Mamminasata Road	Group 2 (1) Mamminasa Bypass (2) Hertasning Road (3) Abdullah Daeng Sirua Road
Draft AMDAL TOR	Submission of Draft TOR: March 14 <sup>th</sup> , 2007 Discussion: May 8 <sup>th</sup> , 2007	Submission of Draft TOR: May 12 <sup>th</sup> , 2007 Discussion: September 3 <sup>rd</sup> , 2007
Approval of AMDAL TOR	Decree of Head of Bapedalda No. 188.4/399.a/II/Bapedalda concerning TOR AMDAL Approval dated May 28 <sup>th</sup> , 2007	Decree of Head of Bapedalda No 660/781/II/ Bapedalda concerning TOR AMDAL Approval, dated October 11 <sup>th</sup> , 2007
Site survey	March-July 2007	May-October 2007
Draft AMDAL Final Report	Report submission: July 2007 Discussion: August 20 <sup>th</sup> , 2007	Report submission: November 1 <sup>st</sup> , 2007 Discussion: November 27 <sup>nd</sup> , 2007
AMDAL Documents' Approval	Recommendation of AMDAL Appraisal Technical Team No. 660/745/II/Bapedalda dated September 28 <sup>th</sup> , 2007 and Decree of Head of Bapedalda No. 660/746/II/Bapedalda dated September 28 <sup>th</sup> , 2007	Recommendation of AMDAL Appraisal Technical Team No. ....../Bapedalda dated December 8 <sup>th</sup> , 2007 and Decree of Head of Bapedalda No. Bapedalda dated December 8 <sup>th</sup> , 2007

The Draft AMDAL TOR for group 2 roads (Mamminasa Bypass, Hertasning and Abdullah Daeng Sirua Road) was submitted to Bapedalda on May 16<sup>th</sup>, 2007 and public announcement on the project plan was made in the Fajar Daily on May 22<sup>nd</sup>, 2007. A Public Consultation Meeting facilitated by Bapedalda was held on June 6<sup>th</sup>, 2007. The Draft AMDAL TOR was presented at the Technical Committee Meeting on September 3<sup>rd</sup>, 2007. The AMDAL TOR document was approved by the Technical Committee and its approval was confirmed by the Decree No 660/781/II/ Bapedalda of the Head of Bapedalda. Based on TOR, site survey was conducted and the AMDAL Final Report (ANDAL, RKL, RPL) was presented at the AMDAL Committee/AMDAL Appraisal Technical Team Meeting on November 27<sup>th</sup>, 2007.

### **8.6.1 Trans Sulawesi Mamminasata Road Section**

#### **(1) AMDAL TOR**

The Draft AMDAL TOR for the Trans Sulawesi Mamminasata Road Section was submitted in March 2007. The format and contents of TOR followed the EIA Guidelines of the Government of Indonesia. Public announcement on the project plan was made by the South Sulawesi Province Bapedalda in the Fajar Daily on March 20<sup>th</sup>, 2007. The community was given one month time to raise and submit their comments, opinions, inputs and objections regarding the project plan. A Public Consultation Meeting for the Trans Sulawesi Mamminasat Road Section, facilitated by Bapedalda, was held in April 2007. The Final AMDAL TOR incorporating various opinions obtained from the Public Consultation Meeting was then presented at the AMDAL Committee/AMDAL Appraisal Technical Team Meeting on May 2007 for discussion by the Team and stakeholders. The Draft TOR was revised based on written responses compiled by Bapedalda Secretariat from comments got at the AMDAL Committee/AMDAL Appraisal Technical Team Meeting, as well as taking into consideration advices from the EIA Technical Committee Team. The AMDAL TOR was approved by the AMDAL Appraisal Technical Team and its approval was confirmed the Decree of the Head of Bapedalda No. 188.4/399.a/II/ Bapedalda dated May 28<sup>th</sup>, 2007.

#### **(2) AMDAL Documents (ANDAL, RKL&RPL)**

The Draft AMDAL Final Report (including ANDAL, RKL, and Executive Summary) was presented at the AMDAL Committee/AMDAL Appraisal Technical Team Meeting on August 20<sup>th</sup>, 2007. The Report was revised based on stakeholders' inputs and advices provided by the Technical Committee and summarized by Bapedalda Secretariat. The AMDAL Appraisal Technical Team's recommendations on the Final Report consisting of ANDAL, RKL and RPL documents were given in the letter No. 660/745/II/Bapedalda dated September 28<sup>th</sup>, 2007. The AMDAL Approval was confirmed by the Decree of the Head of Bapedalda No. 660/746/II/Bapedalda dated September 28<sup>th</sup>, 2007.

## **8.6.2 Mamminasa Bypass, Hertasning and Abdullah Daeng Sirua Road**

### **(1) AMDAL TOR**

The Draft AMDAL TOR for group 2 roads (Mamminasa Bypass, Hertasning and Abdullah Daeng Sirua Road) was submitted to Bapedalda on May 16<sup>th</sup>, 2007 and public announcement on the project plan was made in the Fajar Daily on May 22<sup>nd</sup>, 2007. A Public Consultation Meeting facilitated by Bapedalda was conducted on June 6<sup>th</sup>, 2007. The Draft AMDAL TOR was presented at the AMDAL Committee/AMDAL Appraisal Technical Team Meeting on September 3<sup>rd</sup>, 2007. The AMDAL TOR document was approved by the Technical Committee and the approval was confirmed by the Decree of the Head of Bapedalda No 660/781/II/ Bapedalda dated October 11<sup>th</sup>, 2007. The scoping matrix for AMDAL TOR is shown in **Table 8.6.3**.

### **(2) AMDAL Documents (ANDAL, RKL&RPL)**

The AMDAL Final Report was submitted to the Bapedalda South Sulawesi on November 1<sup>st</sup> and presented on November 27<sup>th</sup>, 2007.

## **8.7 Community Involvement in EIA**

Information regarding the EIA study needs to be transparently disclosed to the public in various ways so that it can be extended to all possible affected people and other parts of the society. A series of meetings should be held to ensure that project stakeholders and local community have access to information required, as well as to identify significant impacts caused by the proposed project in order to understand the mitigation measures against negative impacts predicted to emerge.

The Government's regulation provides and encourages the community to involve in the EIA study process. The legal basis consists of the Act No. 23 of 1997 concerning Environmental Management, and the Government Regulation No. 27 of 1999 concerning Environmental Impact Analysis. Details of public involvement are regulated by the Decree of the Head of BAPEDAL No. 8 of 2000 concerning Community Involvement and Information Disclosure in EIA Process. This Decree describes how, when and who can be involved, as well as expected outcomes to minimize negative impact and measures to be taken to maximize the benefits to be attained. The parties expected to be involved are:

1. People who reside in and/or have activities in areas around the planned project site. They are called "Possible affected community", or
2. People who do not reside in the project surrounding areas, but are concerned with the planned project activities and impacts. They are called "Concerned parties". They can be an organization or a group or individuals.

### **Advantage of Public Involvement in EIA**

Public involvement in EIA provides them with opportunities to give comments, suggestions and

inputs related to the EIA Study. The community is expected to pay attention to the EIA scope and give comments, suggestions and inputs regarding the planned activities and predicted impacts, information and inputs related to the natural and social environmental conditions, suggestions and inputs on how to establish good relations with the local community.

There are several opportunities to participate, namely:

1. During the ANNOUNCEMENT: the community, in groups or individually can convey their comments, suggestions and inputs in writing.
2. During CONSULTATION meetings: comments, suggestions and inputs can be given verbally and in writing.
3. During REPRESENTATIVE PARTICIPATION in COMMISSION: representatives chosen by the community (only possible affected community) participate in discussions in the Commission and provide inputs related to ANDAL, RKL and RPL study document appraisal.
4. Particularly in this project, there is one additional opportunity to fulfill the requirement of JICA Guidelines for Public Consultation (3), that is open meeting inviting all stakeholders in a broader scope.

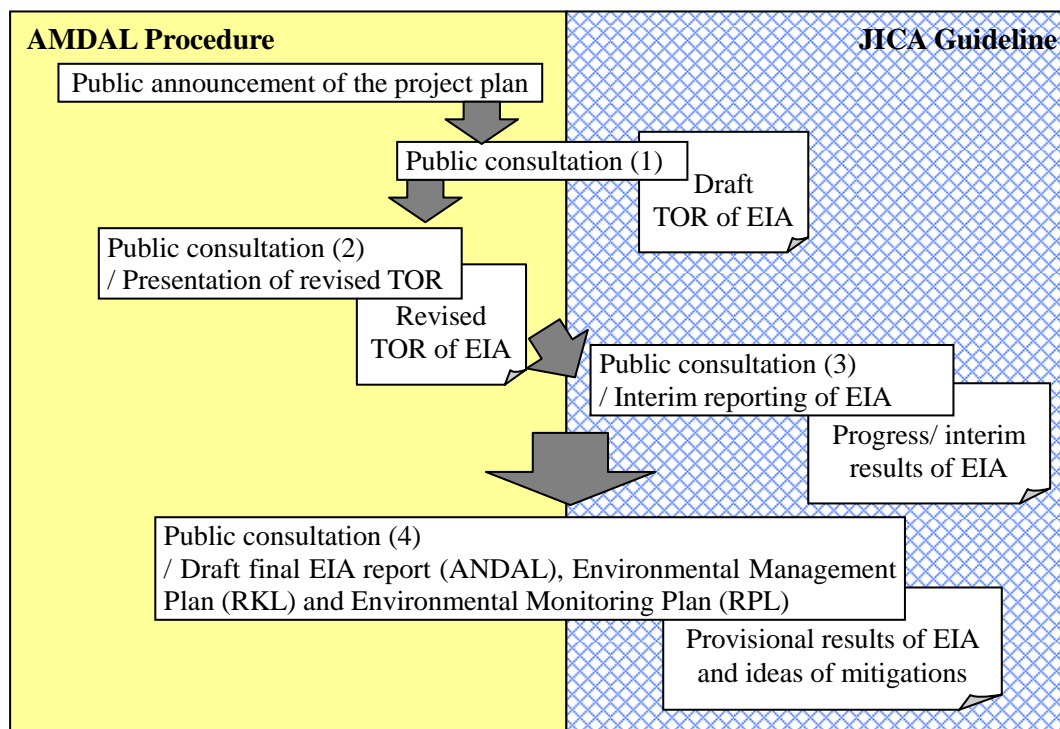
### **8.7.1 Public Consultation Methodology**

In accordance with the relevant regulation of the Government of Indonesia<sup>1</sup>, the project implementing body has to fulfill the AMDAL procedure including public consultations for the Trans-Sulawesi Road Mamminasata Section, Mamminasa Bypass, Hertasning Road and Abdullah Daeng Sirua Road. At the same time, it also has to comply with the “Japan International Cooperation Agency (JICA) Guidelines for Environmental and Social Considerations” (April 2004, JICA). Therefore, there is a need to conduct some Public Consultations in accordance with both AMDAL procedures and JICA Guidelines as shown in Figure 8.7.1. Four public consultations have to be held: two in accordance with both AMDAL procedure<sup>2</sup> and JICA Guidelines, and one each separately for AMDAL procedure and JICA Guidelines. Three public consultation or stakeholder meetings are required at slightly different stages.

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<sup>1</sup> Peraturan Menteri Negara Lingkungan Hidup No.11 Tahun 2006 tentang Jenis Usaha dan/atau Kegiatan yang Wajib Dilengkapi dengan Analisis Mengenai Dampak Lingkungan Hidup (AMDAL) (Living Environment Minister’s Regulation No. 11, 2006 on Type of Project and/or Activity subject to Complete Environmental Impact Assessment)

<sup>2</sup> Keputusan Kepala Badan Pengendalian Dampak Lingkungan No.8, 2000 tentang Keterlibatan Masyarakat dan Keterbukaan Informasi dalam Process AMDAL (Living Environment Minister’s Decision No.8, 2000 on Public Involvement and Information Disclosure under AMDAL Procedure)



**Figure 8.7.1 Public Consultation Procedures conducted by the Project**

Indonesia EIA procedures schedule Public Consultation Meeting in the compilation of TOR. This Public Consultation Meeting in EIA procedures is in accordance with JICA Guidelines. Therefore, the meeting facilitated by Bapedalda is called Public Consultation (1) by the Study Team. Furthermore, in EIA Procedures stakeholders are also given opportunities to participate in AMDAL Committee/AMDAL Appraisal Technical Team Meeting conducted for discussion of AMDAL TOR. This meeting is called Public Consultation (2) by the Study Team. On the contrary, JICA Guidelines do not require meeting to be conducted in this stage, however they requires Public Consultation to discuss the Interim Report with a particular schedule, that is called Public Consultation (3). Other stakeholders' participation is made during the AMDAL Committee/AMDAL Appraisal Technical Team Meeting to discuss the Draft AMDAL Final Report or AMDAL Documents. JICA Guidelines also require stakeholders' participation at the same stage, and the meeting is called Public Consultation (4).

### 8.7.2 Outline of Public Consultation

The types of Public Consultation and the number of participants as well as documents presented for each Public Consultation are presented in **Table 8.7.1**.

**Table 8.7.1 Meeting Types and Documents to be Discussed in Public Consultation**

Public Consultation	Type of Meeting	Documents Discussed	Regulations or Guidelines
1	General Meeting	Draft AMDAL TOR	Indonesian AMDAL Regulation, JICA Guidelines
2	AMDAL Appraisal Technical Team Meeting	AMDAL TOR	Indonesian AMDAL Regulation
3	Stakeholder Meeting	Project Interim Report	JICA Guidelines
4	AMDAL Committee/ Appraisal Technical Team Meeting	Draft ANDAL, RKL and RPL Documents	Indonesian AMDAL Regulation, JICA Guidelines

Public Consultation (1) is conducted to explain the Draft AMDAL TOR to the public to hear their opinions. After Public Consultation (1), the Draft TOR will be revised taking into account comments and inputs obtained from such Public Consultation, as well as suggestions from Bapedalda. The Final TOR will be presented in Public Consultation (2), and subsequently field survey will be executed based on TOR. In Public Consultation (3), the Interim Report will be presented for discussion by stakeholders. Public Consultation (4) will be held by Bapedalda, and the Draft Final Report (ANDAL), RKL and RPL will be presented for the Trans Sulawesi Mamminasata Road Section. After Public Consultation (4), if necessary, the report and documents will be revised, referring to the summary of comments compiled by Bapedalda Secretariat. These documents will then be submitted to the Technical Committee for evaluation and after obtaining recommendations from the AMDAL Appraisal Technical Team, the Head of Bapedalda will give written approval of the AMDAL TOR Report.

**Table 8.7.2 Public Consultation Schedule and its Inter-relatedness with Other Activities**

Activities	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
I. Trans Sulawesi Mamminasata (Maros-Takalar) Road												
a. Public Announcement				Fajar Daily								
b. Draft of AMDAL TOR compilation												
c. Public Consultation (1)				1	5 sub-districts							
d. Draft of AMDAL TOR Revision												
e. Public Consultation (2)					2	AMDAL Committee/AMDAL Appraisal Technical Team Meeting to discuss the TOR						
f. Agreement/consensus on TOR												
g. Field Survey												
h. Draft of Final Report Compilation												
i. Public Consultation (3)						3	(JICA GUIDE LINE)					
j. Public Consultation (4)								4	AMDAL Committee/AMDAL Appraisal Technical Team Meeting to discuss draft of Final Report			
k. AMDAL Approval Decree												

### 8.7.3 Public Consultation Implementation

Open announcement to the public on the EIA Study for the Trans Sulawesi Mamminasata Road Section was made by publication in the Fajar Daily on March 20<sup>th</sup>, 2007. Public Consultation (1) was conducted in April 2007 in 5 sub-districts surrounding the project administrative area. Then, Public Consultation (2) was conducted in the form of AMDAL Committee/AMDAL Appraisal Technical Team Meeting with community representatives and stakeholders. Public Consultation (3) was conducted on June 6<sup>th</sup>, 2007 to explain the Interim Report in order to fulfill JICA Guidelines which require Public Consultation in this stage. Public Consultation (4) was conducted in the form of AMDAL Appraisal Technical Team Meeting to discuss the Draft AMDAL Final Report in Bapedalda office on August 20<sup>th</sup>, 2007.

For the Mamminasa, Hertasning and Abdullah Daeng Sirua Road, public announcement was published in the Fajar Daily on May 22<sup>nd</sup>, 2007. Public Consultation (1) was conducted in early June in 5 sub-districts surrounding the project area. Public Consultation (2) was conducted on September 3<sup>rd</sup>, 2007. Public Consultation (3) was conducted on September 11<sup>th</sup>, 2007 to discuss the Interim Report. Public Consultation (4) was conducted on November 27<sup>th</sup>, 2007 to discuss the Draft Final Report.

**Table 8.7.3 Public Consultation Implementation**

Public Consultation	Schedule	No. of Participants	Participants	Location
<b>Trans Sulawesi Mamminasata Road</b>				
1	April 2-9, 2007	59+59+51+36+44= 249 participants	Community, representatives of related villages, related institutions	(Head of Barombong, Polut, Biringkanaya, Rappocini, Mandai sub district offices
2	May 8, 2007	51 participants	Technical Team and Committee members	Bapedalda Office
3	June 7, 2007	68 participants	Related institutions and community	Imperial Arya Duta hotel Makassar
4	20 Agustus 2007	51 orang	Technical Team and Committee members	Bapedalda Office
<b>Mamminasata Bypass, Hertasning, Abd. Daeng Sirua Road</b>				
1	May 26 – June 7 2007	50+50+50+50+45= 245 participants	Community, representatives of related villages, related institutions	Head of Galut, Pallangga, Pattallasang, Panakukang, Mandai sub district offices
2	September 3, 2007	45 participants	Technical Team and Committee members	Bapedalda office
3	September 11, 2007	112 participants	Related institutions and community	Clarion Hotel Makassar
4	November 27, 2007	50 participants	Technical Team and Committee members	Bapedalda office



## (1) Trans Sulawesi Mamminasata Road Section

### 1) Public Consultation (1)

The first Public Consultation for the Trans Sulawesi Mamminasata is shown in **Table 8.7.4**. The purpose of the meeting was to explain the project outline and the Draft AMDAL TOR, as well as to get opinions from the community and stakeholders in the project affected areas.



**Table 8.7.4 Outline of First Public Consultation for Trans Sulawesi Road (T1)**

NO	Date	Location and participants
T1-1	15:00 – 17:30 02 April 2007	BAROMBONG (Barombong sub-district office (Goaw)) 59 including representatives from villages in 3 sub-districts (Somba Opu, Pallangga, and Barombong) and agencies/ institutions concerned
T1-2	15:00 – 17:30 03 April 2007	POLOMBANGKENG UTARA (Polombangkeng Utara sub-district office) 59 including representatives from villages in 4 sub-districts (Bajeng, Bontonompo (Gowa), Polombangkeng Utara and Pattallassang (Takalar)) and agencies/ institutions concerned
T1-3	09:00 – 12:00 04 April 2007	BIRINGKANAYA (Biringkanaya sub-district office (Makassar)) 51 including representatives from villages in 2 sub-districts (Biringkanaya and Tamalanrea) and agencies/ institutions concerned
T1-4	15:00 – 17:30 05 April 2007	RAPPOCINI (Rappocini sub-district office (Makassar)) 36 including representatives from villages in 4 sub-districts (Manggala, Panakkukang, Rappocini, Tamalate) and agencies/ institutions concerned
T1-5	15:00 – 17:30 09 April 2007	MANDAI (Mandai sub-district office (Maros)) 44 including representatives from villages in 3 sub-districts (Marusu, Turikale, Mandai) and agencies/ institutions concerned

Comments and inputs from the participants are summarized in **Table 8.7.5**. Generally, they supported the project to promote development of their area, but expressed concerns about drainage to prevent flood from which they suffer every year, compensation for project affected people (PAP) and transparency in land acquisition process.



**Table 8.7.5 Summary of Comments and Inputs from Participants in  
 First Public Consultation for Trans Sulawesi Road (T1)**

No.	Location	Comments/ Inputs	Ob	PR	FI	Sf	Lv	LA
T1-1	BAROMBONG (Gowa)	<ul style="list-style-type: none"> <li>- Transparency in land acquisition process is required.</li> <li>- The project is welcome as it will bring development in this area.</li> <li>- Quality control of the construction works is important. We saw many roads got broken just after completion of construction, because the contractor did not fulfill the standard.</li> <li>- Consideration for people who will lose their farmland is required.</li> <li>- Consideration for high capacity drainage is required.</li> </ul>			O		O	O
T1-2	POLOMBANGK ENG UTARA (Gowa and Takalar)	<ul style="list-style-type: none"> <li>- Poles to show the areas to be affected by the project are required to have people understand not to construct new building in the target areas.</li> <li>- Because the existing road does not match current traffic volume, the project is welcome.</li> <li>- Consideration for compensation for PAP is required.</li> </ul>		O				O
T1-3	BIRINGKANAYA (Makassar)	<ul style="list-style-type: none"> <li>- The project is welcome.</li> <li>- Consideration for drainage facility is required, because places in front of Kopsau, Wisma Dirgantara and Old Asrama Haji have suffered from flood up to knee for two and half years and drainage along Sutami road does not have sufficient capacity.</li> <li>- Not well functioning drainage might affect public health situation.</li> <li>- Education about regulations and rules on land acquisition is necessary to avoid trouble in land acquisition process.</li> <li>- Consideration for PAP is required.</li> <li>- Pedestrian overpasses are required to enable people to cross the road easily.</li> </ul>			O	O		O
T1-4	RAPOCCINI (Makassar)	<ul style="list-style-type: none"> <li>- Fair and appropriate compensation is required.</li> <li>- Is any drainage system planned for Panakkukang which is flooded regularly?</li> <li>- Consideration for appropriate drainage facility is required. There are also concerns about flood caused by newly constructed road.</li> <li>- Will Stami road become a national road?</li> <li>- Poles to show the areas to be affected by the project are required to have people understand not to construct new buildings in the target areas.</li> </ul>		O	O			O

No.	Location	Comments/ Inputs	Ob	PR	FI	Sf	Lv	LA
T1-5	MANDAI (Maros)	<ul style="list-style-type: none"> <li>- The project is welcome.</li> <li>- Transparency is strongly required especially in land acquisition process. Because the community had bad experience that paid amount for PAP was much lower than the stated amount.</li> <li>- Information disclosure on the project should be done with explanation that is easy to understand for community people.</li> <li>- Poles to show the areas to be affected by the project are required to have people understand not to construct new buildings in the target areas.</li> <li>- Drainage channel is required to protect paddy fields from flood.</li> </ul>						

- <Note> Ob: Objection to the project: Did anybody raise objection to the project?  
 PR: Public relations about project: Does the executing agency need to take further action to inform about the project to the public, because people have not been well informed about the project?  
 FI: Concern about flood: Did anybody show concern about flood and/or ask for drainage facility?  
 Sf: Concern about traffic safety: Did anybody show concern about traffic accident and/or ask for traffic safety facility?  
 Lv: Concern about livelihood: Did anybody show concern about sustaining their livelihood?  
 LA: Concern about land acquisition and/or compensation for PAP: Did anybody show concern about land acquisition and/or compensation for PAP?

The draft TOR for AMDAL was revised in the light of the above comments and based on discussions with BAPEDALDA. The revised TOR for AMDAL was submitted to BAPEDALDA in April 2007 and approved in the second Public Consultation held on May 4<sup>th</sup>, 2007.



## 2) Second Public Consultation (2)

The second Public Consultation for the Trans Sulawesi Road was held on May 8<sup>th</sup>, 2007 aiming to present the revised TOR for AMDAL to stakeholders. Details of the second Public Consultation are presented in **Table 8.7.6**.

Public Consultation (2) was conducted in the form of presentation and discussion of AMDAL TOR with the AMDAL Appraisal Technical Team. The Committee members comprise a technical team and relevant stakeholders. The local community dispatched their representative to attend the meeting. Heads of villages and sub-districts also attended as temporary members of the Committee. The results of discussion were compiled by Bapedalda Secretariat and provided to the EIA Consultant to serve as a basis for preparation of the AMDAL TOR Report.



**Table 8.7.6 Outline and Summary of Comments and Inputs from Participants in Public Consultation (2) for Trans Sulawesi Road**

Date:	08 May 2007
Place:	Meeting room of BAPEDALDA South Sulawesi Province
Participants:	50 from project target areas and concerned agencies
Summary of Comments and Inputs from Participants	
<ul style="list-style-type: none"> <li>- Detailed explanation about drainage is required.</li> <li>- District governments need more detailed information about the exact project areas and progress of land acquisition. (Note: Such topics should not be included this time.)</li> <li>- Close coordination with the National Land Agency (BPN: Badan Pertanahan Nasional) and related local bureaus.</li> <li>- Explanation on how to deal with irrigation facilities in Takalar is required.</li> <li>- Explanation about consideration on DAS of the Jeneberang River is required.</li> </ul>	

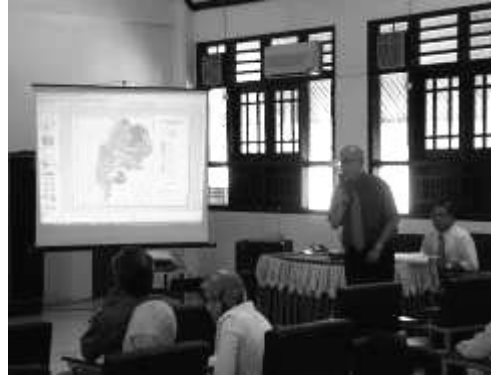
## 3) Public Consultation (3)

Public Consultation (3) for the Trans Sulawesi Mamminasata Road was conducted on June 7<sup>th</sup>, 2007 aiming to present the Interim Report to all stakeholders. This Public Consultation was held to fulfill the requirements in the JICA Environmental Guidelines. Public Consultation (3) was attended by agencies concerned with the project planning and implementation at provincial and district levels; besides, the meeting was also attended by the representatives from 16 related sub-districts in 4 Regencies/Cities.



#### 4) Public Consultation (4)

Public Consultation (4) for the Trans Sulawesi Mamminasata Road was conducted on August 20th, 2007 in Bapedalda office, South Sulawesi Province. Public Consultation (4) was the last meeting to fulfill the requirements of the Indonesian EIA Regulation as well as JICA Guidelines. This meeting discussed the Draft AMDAL Final Report, including ANDAL, RKL and RPL. The Report was revised and finalized based on the summary results compiled by Bapedalda



Secretariat which were sent to the AMDAL Consultant. Recommendations given by the AMDAL Appraisal Technical Team on the ANDAL, RKL and RPL documents were mentioned in the Decree of the Head of Bapedalda South Sulawesi No. 660/746/II/Bapedalda dated September 28<sup>th</sup>, 2007

### (2) Mamminasa Bypass, Hertasing and Abdullah Daeng Sirua Road

#### 1) Public Consultation (1)

Public Consultation (1) for the Mamminasa Bypass, Hertasing and Abdullah Daeng Sirua Road was conducted from end May to early June 2007, in 5 sub-districts along the project route. The consultation meeting was held in the project area so that the local community can have easier access to the venue. Participants represented all groups in the community, in particular those having minimum access, such as the women group. All the villages and sub-districts affected by the project dispatched their respective representatives. The meeting was facilitated by Bapedalda. Details of Public Consultation (1) are shown in **Table 8.7.7**.



**Table 8.7.7. Outline of 1<sup>st</sup> Public Consultation for Mamminasa Bypass, Hertasing and  
Abdullah Daeng Sirua Road**

NO	Date	Location and participants
M1-1	10:00 – 12:00 26 May 2007	GALESONG UTARA (Galesong Utara sub-district office (Takalar)) 50 participants including representatives from villages in 1 sub-district (Galesong Utara) and agencies/ institutions concerned
M1-2	10:00 – 12:00 28 May 2007	PALLANGGA (Pallangga sub-district office (Gowa)) 50 participants including representatives from villages in 3 sub-districts (Pallangga, Barombong, and Bajeng) and agencies/ institutions concerned
M1-3	10:00 – 12:00 29 May 2007	PANAKKUKANG (Panakkukang sub-district office (Makassar)) About 50 participants including representatives from villages in 2 sub-districts (Panakkukang and Manggala) and agencies/ institutions concerned
M1-4	10:00 – 12:00 04 June 2007	PATTALLASSANG (Pattallassang sub-district office (Gowa)) 45 participants including representatives from villages in 2 sub-districts (Pattallassang and Bontomarannu) and agencies/ institutions concerned
M1-5	10:00 – 12:00 06 June 2007	MANDAI (Mandai sub-district office (Maros)) 50 participants including representatives from villages in 3 sub-districts (Moncongloe, Mandai, and Turikale) and agencies/ institutions concerned

Comments and inputs from the participants are summarized in **Table 8.7.8**. Generally, they supported the project to promote development of their area, but expressed concerns about drainage to prevent flood from which they suffer every year, compensation for project affected people (PAP) and transparency in land acquisition process.

**Table 8.7.8 Outline and Summary of Comments and Inputs from the Participants in Public  
Consultation (1) for By-Pass Mamminasa and other roads.**

No	Date/Time	Venue	Conclusion of Responses
1	26 <sup>th</sup> of May 2007 10.00 AM - Finish	Galesong Sub-District Office, District of Takalar	<ul style="list-style-type: none"> <li>• The community supports the development of these road sections</li> <li>• Requesting socialization up to the lower levels/strata of community</li> <li>• Expecting a transparent process on land acquisition system as most of the acquired lands are productive areas (rice fields)</li> <li>• Suggesting alternative access facilities</li> <li>• Suggesting to change the name of Mamminasa Bypass to Mamminasata Bypass</li> </ul>
2	28 <sup>th</sup> of May 2007 10.00 AM - Finish	Pallangga Sub-District Office, District of Gowa	<ul style="list-style-type: none"> <li>• The community supports the development of these road sections and suggests that they should be constructed soon</li> <li>• Requesting further socialization to the lower levels/strata of community</li> <li>• Access should be available to some isolated regions</li> <li>• Transparency on land acquisition process is required</li> </ul>
	29 <sup>th</sup> of May 2007 10.00 AM - Finish	Panakkukang Sub-District Office, Makassar City	<ul style="list-style-type: none"> <li>• The community supports the development of these road sections</li> <li>• There is a concern about the increased levels of air pollution</li> <li>• Transparency on land acquisition process is required</li> <li>• The surrounding areas of the road axes are prone to flood hazards, therefore drainage systems must be considered.</li> <li>• Workers should be recruited from locals</li> </ul>
4	4 <sup>th</sup> of June	Pattalassang	<ul style="list-style-type: none"> <li>• The community supports the development of these road sections</li> </ul>

	2007 10.00 AM - Finish	Sub-District Office, District of Gowa	<ul style="list-style-type: none"> <li>• Transparency on land acquisition process is required</li> <li>• There are concerns about potential flood hazard after completion of road construction , therefore good drainage facilities should be provided.</li> <li>• Suggesting to provide alternative access roads</li> </ul>
5	6 <sup>th</sup> of June 2007 10.00 AM - Finish	Mandai Sub-District Office, District of Maros	<ul style="list-style-type: none"> <li>• The community supports the development of these road sections</li> <li>• There are concerns about potential flood after completion of road construction, therefore good drainage facilities should be provided.</li> <li>• The community still has trauma on land acquisition process under the airport development project and requests a transparent process for land acquisition for this road development project.</li> <li>• Suggesting to provide alternative access roads</li> <li>• Requesting to construct crossing bridges for pedestrians</li> <li>• The community is concerned about some existing trees to be removed.</li> </ul>

**Table 8.7.9 Relations of Suggestions and Inputs at Public Consultation (1) among  
Sub-districts**

Issue Location	A. Land Acquisition	B. Drainage	C. Local Labour	D. Socialization	E. Alternative Routes	F. Open Area	G. Transportation	H. Green Lines	I. Sidewalks and Zebra cross
	1. Galesong Utara Kab. Takalar (Mamminasa Bypass)	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	
2. Pallangga Kab. Gowa (Mamminasa Bypass)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		
3. Panakkukang Kota Makassar (Dg. Sirua)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					<input type="radio"/>	
4. Pattalassang Kab. Gowa (Hertasning)	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				
5. Mandai Kabupaten Maros (Mamminasa Bypass)	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 2) Public Consultation (2)

Public Consultation (2) for the Mamminasa Bypass, Hertasning and Abdullah Daeng Sirua Road was conducted on September 7<sup>th</sup>, 2007. The consultation meeting was facilitated by Bapedalda South Sulawesi in the form of AMDAL Appraisal Technical Committee Meeting. Participants to the meeting included permanent members, Technical Team and temporary members, related stakeholders and local community. There were 45 participants.



All the inputs, written and verbal, were compiled by Bapedalda Secretariat and provided to the EIA Consultant, for reference in TOR revision. TOR was approved by the Technical Committee and confirmed by the Decree No. 660/781/II/Bapedalda on EIA TOR Approval, dated October 11<sup>th</sup>, 2007.

3) Public Consultation (3)

Public Consultation (3) was conducted by the Study Team to fulfill the requirements of the JICA Guidelines. The consultation meeting was held on September 11<sup>th</sup>, 2007, and attended by 112 participants from 4 related Regencies/cities, and agencies concerned from local and central governments.



4) Public Consultation (4)

Public Consultation (4) was conducted on November 27<sup>th</sup>, 2007. The Draft Final Report is was presented at the AMDAL Committee Meeting.

**Table 8.7.10 Outline and Summary of Comments and Inputs from Participants in Public Consultation (4) for Mamminasa By-Pass, Hertasning and Sirua Road**

Date:	27 November 2007
Place:	Meeting room of BAPEDALDA South Sulawesi Province
Participants:	50 participants from AMDAL Committee/Appraisal team members including representatives from the project area
Summary of Comments and Inputs form Participants <ul style="list-style-type: none"> <li>- Change of road name of Hertasning to Aorepala</li> <li>- Update of the population rate and number of households referring to the latest statistics, and correction of the rainfall rate</li> <li>- More detaited elaboration on the quarry sites plan</li> <li>- Highlighting of the importance of drainage in the preparation stage</li> <li>- Study on land acquisition is important and description of land acquisition area by sub-district</li> <li>- Estimate of the value of land acquisition and buildings to be displaced</li> <li>- Description of the standard use for water quality</li> <li>- Adding the source of data and name of laboratory</li> <li>- Clarification on the number of respondents related to the length of roads</li> </ul>	





## **8.8 Summary of Final EIA Documents for Trans-Sulawesi Road Mamminasata Section**

### **8.8.1 Environmental Category and Draft EIA (AMDAL) Report**

The Trans-Sulawesi Road Mamminasata Section was classified into Category A in accordance with both the JICA and JBIC Guidelines as it is likely to have significant adverse environmental impacts related to involuntary resettlement. On the other hand, positive impacts are anticipated on improvement of accessibility to markets, accessibility to various public utilities, increase in job opportunities. EIA (AMDAL) was conducted in accordance with the Japanese Guidelines and Indonesian law/regulations and its Draft Final Report has been shortly completed. This is a summary of EIA (AMDAL) for the Trans-Sulawesi Road Mamminasata Section including environmental management and monitoring plans.

- Environmental Impact Analysis
  - Study approach, main and purpose
  - Scope of study
  - Components of study method
  - Activity plan
  - Environmental components and conditions
  - Predicted significant impacts
  - Evaluation of significant impacts
  - Recommended Mitigation Measures
- Environmental Management Plan (RKL)
  - Environmental management purpose
  - Environmental management approach
  - Environmental management plan
- Environmental Monitoring Plan (RPL)
  - Environmental monitoring purpose and activities
  - Environmental monitoring plan

The Report also includes recommended action plans required for the project implementation preparation and external financing arrangement.

### **8.8.2 Physical Environment (Natural Environment)**

#### **(1) Present Condition**

##### **a) Air Pollution**

The ambient air along the project road is not really polluted at present except for the presence of total suspended particulate (TSP) such as dust in and around the street. Therefore, at the target year (2023) the air conditions will be changed considerably by exhaust from the vehicles along the

project road. The TSP value depends on dust so its density is different by season.

The results of air quality survey along the proposed project road are shown in **Table 8.8.1**. The analysis results show that the existing air consists of SO<sub>2</sub>, CO, NO<sub>2</sub>, O<sub>3</sub>, HC, PM<sub>10</sub>, TSP and Pb in the study area but all are within the maximum standard except the ones at the Sungguminasa cross point. Especially, CO and Pb have been bettered in recent years by exhaust regulation and fuel improvement.

**Table 8.8.1 Air Quality Survey Results of Proposed Project Road**

	NO.	SO <sub>2</sub>	CO	NO <sub>2</sub>	O <sub>3</sub>	HC	PM <sub>10</sub>	TSP	Pb	Remarks
		μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	
Trans-Sulawesi Mamminasata	1 Kantor Bupati Maros	10.0	84.3	25.9	3.8	16.3	43.8	168.2	0.003	1-May-07
	2 Mandai crosspoint (New road)	9.5	95.9	34.6	4.9	13.4	39.5	121.3	0.003	2-May-07
	3 Daya crosspoint	9.8	148.3	31.2	2.9	14.0	84.6	169.3	0.006	3-May-07
	4 Sungguminasa crosspoint	17.2	133.7	32.5	3.9	15.6	79.0	322.2	0.003	7-May-07
	5 Baronbong (National road)	11.9	84.3	36.2	4.1	14.7	68.7	124.5	0.001	8-May-07
	6 Limbung (National road)	10.8	135.3	30.9	4.2	23.8	42.4	150.2	0.003	9-May-07
	7 Palleco (National road)	11.5	133.1	29.5	5.1	17.0	41.0	140.3	0.001	10-May-07
	8 Kantor Bupati Takalar	9.3	101.4	35.4	4.7	19.3	44.9	146.3	0.002	11-May-07
	15 Hertasning street	10.7	101.0	33.7	4.4	14.3	77.1	126.3	0.004	4-May-07
Environmental Standard	National standard for ambient air quality *2)									
	measured duration 1 hour	900	30,000	400	235	-	-	-	-	-
	measured duration 3 hours	-	-	-	-	160	-	-	-	-
	measured duration 24 hours	365	10,000	150	-	-	150	230	2.00	-
	Local standard for ambient air quality *3)									
	measured duration 1 hour	900	30,000	400	230	-	-	-	-	-
measured duration 3 hours	-	-	-	-	160	-	-	-	-	
measured duration 24 hours	360	10,000	150	-	-	150	230	2.00	-	

Notes:  Exceeding the standard value

Source:

\*1) Sulawesi Road M/P & F/S JICA study team data Year 2007

\*2) Government Regulation regarding Control of Air Pollution No.41-1999

\*3) Governor's Regulation of South Sulawesi Province No. 14-2003

\*4) Governor's Dgree of the Minister for Environment concerning Guidekines for Establishment of Environmental Quality Standards No.2-1988

\*5) Governor's Dgree of South Sulawesi Province No.465-1995

Figure 8.8.1 shows the location of on-site survey points and areas regarding air quality, noise, water quality, flora and fauna.

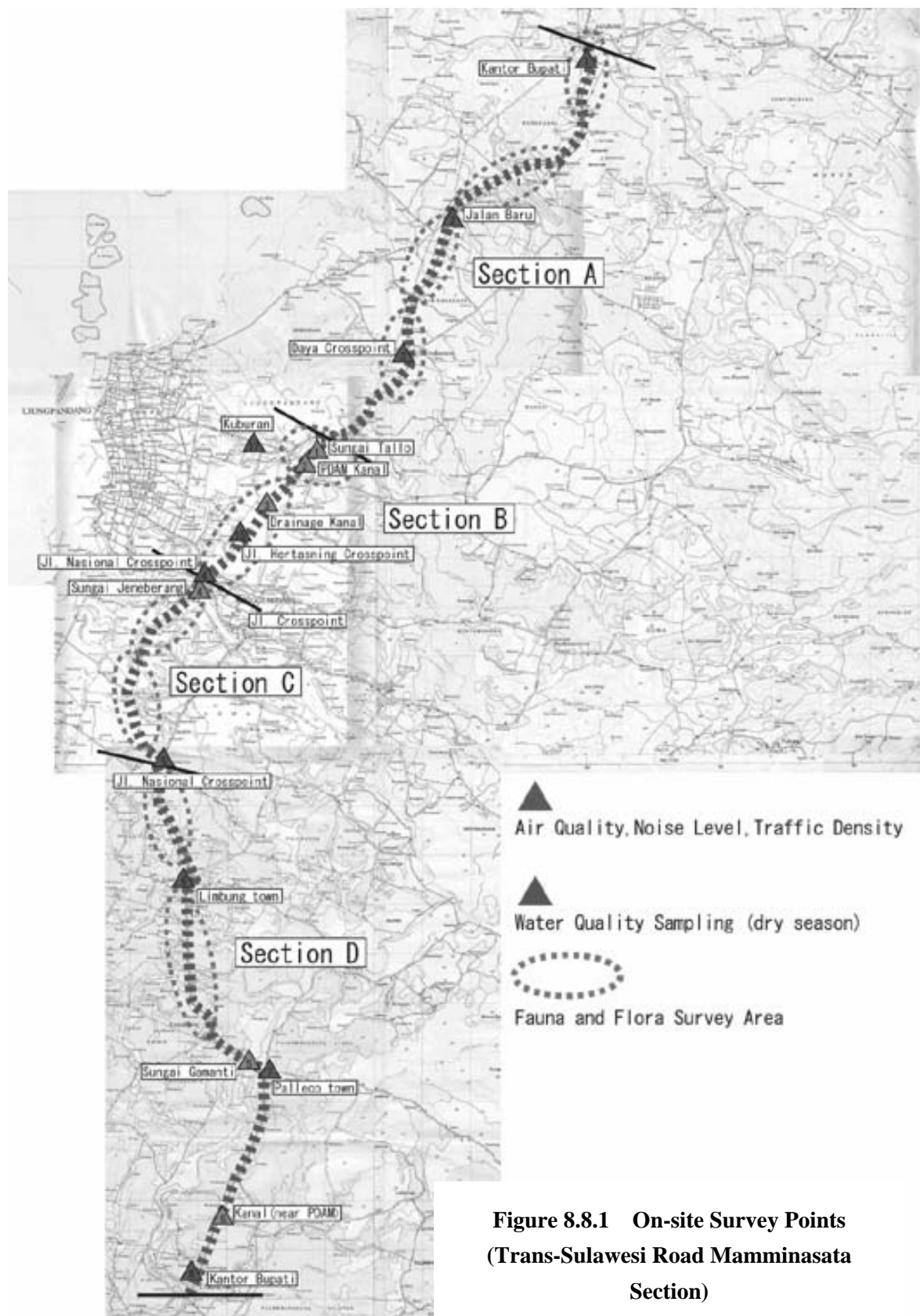


Figure 8.8.1 On-site Survey Points  
 (Trans-Sulawesi Road Mamminasata  
 Section)

b) Noise Level

**Table 8.8.2** is a summary of noise measurements along the Project road. All noise levels at daytime exceed the Environmental Standard in the commercial and service area. The noise at the night time is mostly less than the admissible limit. The maximum noise level is over 80 dB(A) at the Daya cross point and the daily average at the Sungguminasa cross point exceeds 70 dB(A).

The assumed reasons for high noise level are that the traffic volume of motorcycles is huge and horn is used too frequently in the present driving custom.

**Table 8.8.2 Noise Level Survey Result of Proposed Project Road**

	NO.	L <sub>50</sub>		Average	Max L <sub>50</sub>	Remarks (data)
		daytime	night			
Trans-Sulawesi Mamminasata	1 Kantor Bupati Maros	72.8	66.2	69.5	77.2	1-May-07
	2 Mandai crosspoint (New road)	71.9	54.3	63.1	75.8	2-May-07
	3 Daya crosspoint	75.5	63.8	69.7	80.8	3-May-07
	4 Sungguminasa crosspoint	76.2	66.5	71.3	79.3	7-May-07
	5 Baronbong (National road)	70.9	62.3	66.6	79.2	8-May-07
	6 Limbung (National road)	71.9	59.0	65.5	79.4	9-May-07
	7 Palleko (National road)	71.3	54.4	62.8	79.6	10-May-07
	8 Kantor Bupati Takalar	70.3	56.0	63.2	76.8	11-May-07
	15 Hertasing street	74.4	59.9	67.2	79.0	4-May-07
Environmental Standard	Area classification		National	Provincial		
	Commercial and Service		70.0	70.0		
	Industry		70.0	70.0		
	Office Buildings and Commercial		65.0	65.0		
	Recreation		70.0	65.0		
	Government and Public Facilities		60.0	60.0		
	Housing and Settlement		55.0	55.0		
	Green Open Space		50.0	50.0		

Notes:  Exceeding the standard value (Maximum Environmental Standard: 70dB(A))

Source : Sulawesi Road M/P & F/S JICA study team data Year 2007

c) Water Pollution

The results of quality tests of water sampled along the Project road are summarized in **Table 8.8.3**. Several values exceed the River Water Quality Standards.

The TSS density is relatively high as a characteristic of Indonesia. BOD<sub>5</sub> values show a high density for the reason that the sampling points are located relatively near the high population density area.

**Table 8.8.3 Water Level Survey Result of Proposed Project Road**

Parameters	Governmental Regulations No.82-2001				Unit	1	2	3	4	5	6
	Class I	Class II	Class III	Class IV		24-May-07	25-May-07		24-May-07		
						Tallo River	PDAM canal in Makassar	Drainage canal	Jeneberang river	Gamanti river	Irrigation canal
<b>Physical :</b>											
Temperature	±3°C	±3°C	±3°C	±5°C	°C	30	29	29	30	30	30
Color	(-)	(-)	(-)	(-)	TCU	6	5	27	12	25	30
Total Suspended Solid (TSS)	50	50	400	400	mg/l	12.8	3.6	6	69.6	696	312
Electric Conductivity	(-)	(-)	(-)	(-)	µS/cm	506	111	3.802	92	123	74
<b>Chemical</b>											
pH	6-9	6-9	6-9	5-9	-	7.0	7.9	7.1	7.0	7.0	7.0
BOD <sub>5</sub>	2	3	6	12	mg/l	2.42	3.78	5.670	4.589	2.174	3.780
COD	10	25	50	100	mg/l	2.98	4.94	7.41	5.65	2.68	4.94
Disolved Oxygen (DO)	6	4	3	0	mg/l	7.974	7.991	6.300	7.749	7.350	7.140
Phosphorus (P)	0.2	0.2	1.0	5.0	mg/l	0.003	0.006	0.004	0.005	0.006	0.003
Nitrate (NO <sub>3</sub> -N)	10	10	20	20	mg/l	0.002	ttd	0.12	0.001	0.001	0.001
Amonium (NH <sub>4</sub> -N)	0.5	(-)	(-)	(-)	mg/l	0.031	0.009	2.4	0.019	0.028	0.019
Cadmium (Cd)	0.01	0.01	0.01	0.01	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Chromium (Cr <sup>6+</sup> )	0.05	0.1	0.1	1.0	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Copper (Cu)	0.02	0.02	0.02	0.20	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Iron (Fe)	0.30	(-)	(-)	(-)	mg/l	0.059	0.171	0.061	0.457	0.324	0.537
Lead (Pb)	0.03	0.03	0.03	1.0	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Mangan (Mn)	0.10	(-)	(-)	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Mercury (Hg)	0.001	0.002	0.002	0.005	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Zinc (Zn)	0.05	0.05	0.10	2.00	mg/l	0.0018	ttd	ttd	ttd	ttd	ttd
Chloride (Cl)	600	(-)	(-)	(-)	mg/l	133.92	4.11	70.66	9.04	4.11	4.93
Cyanide (CN)	0.02	0.02	0.02	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Fluorine (F)	0.50	1.50	1.50	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Nitrite (NO <sub>2</sub> -N)	0.06	0.06	0.06	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Sulphate (SO <sub>4</sub> )	400	(-)	(-)	(-)	mg/l	3.2	0.97	2.7	4.1	1.34	1.6
Free Chlorine (Cl <sub>2</sub> )	0.03	0.03	0.03	(-)	mg/l	0.0036	0.0009	0.0018	0.0036	0.0018	0.0036
Hydrogen Sulphide (H <sub>2</sub> S)	0.002	0.002	0.002	(-)	mg/l	0.002	ttd	0.005	0.002	0.005	0.004
Calcium Carbonate (CaCO <sub>3</sub> )	(-)	(-)	(-)	(-)	mg/l	44.04	44.04	130.12	28.03	40.04	46.04
Calcium (Ca)	(-)	(-)	(-)	(-)	mg/l	17.64	17.64	36.07	11.22	16.03	18.44
<b>Organic Chemical</b>											
Mineral oil	0.6	0.8	1.0	(-)	mg/l	ttd	0.8	ttd	1.2	0.8	0.8
Detergent	0.1	0.1	0.1	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Phenol compounds	0.001	0.001	0.001	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
<b>Bacteriology :</b>											
Fecal Coliform	100	1,000	2,000	2,000	MPN/100ml	0	0	0	0	0	0
Total Coliforms	1,000	5,000	10,000	10,000	MPN/100ml	110	17	17	70	49	22

Notes:  Exceeding the standard

Source : Mamminasata JICA study team data Year 2006

Remarks: ttd means below the limit value of quantitative analysis

## d) Biology (Flora and Fauna)

The scope of works for Sections A (Maros - Makassar) and D (Gowa - Takalar) consists of widening of the existing road. The proposed project road will pass through both semi urban and rural areas. Sections B and C are new road construction. Section C passes through urban and semi urban areas. Section C starts in the urban area but passes mostly in paddy fields after crossing the Jeneberang River.

## i) Section A

During the field reconnaissance around small rivers, such birds like waterfowls that are mainly egrets, herons were observed. The existing species are common ones in the rural area of South Sulawesi. No large mammals were observed in the project area.

The vegetation consists mostly of planted species along the existing road such as mango trees, coconuts, bananas and other fruit trees. It seems that the precious vegetation species listed or designated in the standards of Indonesia do not exist around the project area.

**Table 8.8.4 Survey Result of Fauna (Birds in Section A)**

No.	Local Name	Species Name	Individual Number
1	layang-layang	<i>Hirundo tahitica</i>	50
2	kutilang	<i>Pygnonotus aurigaster</i>	75
3	bondol kepala pucat	<i>Lonchura pallida</i>	25
4	burung gereja	<i>Passer montanus</i>	110
5	kacamata	<i>Zosterops chloris</i>	64
6	gagak	<i>Cervus enca</i>	3
7	burung madu hitam	<i>Nectarinia aspasia</i>	7
8	burung madu	<i>Nectarinia jugularis</i>	7
9	bondol hitam	<i>Lonchura molucca</i>	22
10	kepodang sungu	<i>Coracina bicolor</i>	7
11	bangau merah kecil	<i>Ixorichus sinensis</i>	1
12	kuntul perak	<i>Egretta intermedia</i>	39
13	raja udang	<i>Halcyon chloris</i>	3
14	bangau	<i>Ardeola speciosa</i>	53
15	apung tanah	<i>Anthus novaeseelandiae</i>	12
16	kuntul kerbau	<i>Bubulcus ibis</i>	8
17	itik	<i>Anas sp.</i>	7
Total Spesies			17
Total Individual Number			493

## ii) Section B

Along the Tallo River, such birds like waterfowls that are mainly egrets, wild ducks, kingfishers, etc. were observed. These species are common ones in the rural area of South Sulawesi and any mammals were not observed in the project area.

**Table 8.8.5 Survey Result of Fauna (Birds in Section B :Tallo river)**

No.	Local Name	Species Name	Individual Number
1	layang-layang	<i>Hirundo tahitica</i>	52
2	kacamata	<i>Zosterops chloris</i>	8
3	bangau merah kecil	<i>Ixorichus sinensis</i>	3
4	kutilang	<i>Pygnonotus aurigaster</i>	32
5	burung gereja	<i>Passer montanus</i>	40
6	raja udang	<i>Halcyon chloris</i>	2
7	bondol kepala pucat	<i>Lonchura pallida</i>	12
8	bondol hitam	<i>Lonchura molucca</i>	3
9	bangau besar	<i>Ardeola speciosa</i>	2
10	balangkoa	<i>Pandion heliaetus</i>	1
11	bubut	<i>Centropus bengalensis</i>	2
12	bangau abu2	<i>Egretta sp.</i>	1
13	kepodang sungu	<i>Coracina bicolor</i>	1
14	burung cabai	<i>Dicaeum aureolimbatum</i>	2
15	burung madu	<i>Nectarinia jugularis</i>	1
Total Spesies			15
Total Individual Number			162

**Table 8.8.6 Survey Result of Fauna (Birds in Section B)**

No.	Local Name	Species Name	Individual Number
1	burung gereja	<i>Passer montanus</i>	28
2	kutilang	<i>Pygnonotus aurigaster</i>	10
3	burung madu	<i>Nectarinia jugularis</i>	2
4	kacamata	<i>Zosterops chloris</i>	1
5	layang-layang	<i>Hirundo tahitica</i>	72
6	bangau putih	<i>Egretta intermedia</i>	8
7	bangau abu2	<i>Ardeola speciosa</i>	2
8	bondol kepala pucat	<i>Lonchura pallida</i>	15
9	bondol kepala hitam	<i>Lonchura molucca</i>	2
10	bangau merah kecil	<i>Ixorichus sinensis</i>	2
11	raja udang	<i>Halcyon chloris</i>	1
12	bondol hitam	<i>Lonchura molucca</i>	2
13	bangau besar	<i>Ardeola speciosa</i>	2
14	bubut	<i>Centropus bengalensis</i>	2
Total Spesies			14
Total Individual Number			149

The vegetation consists of mostly planted species in/along the proposed road alignment. Nipah palms grow along the Tallo River and these contribute to the purification of water. It seems that the vegetation species that are found in/around this section are not the essential ones to be protected by regulations.

In addition, though on-site survey results or data are not available on the freshwater aquatic species in the Tallo River and any drainage canal in this area, it is considered no protective or endangered species exist. However, if some endemic and/or protected species of flora and fauna are found during the design or construction phases, especially in/around the Tallo River, it is important to confirm such species and to report to authorities concerned. In addition, proper countermeasures and positive protection programs should be implemented to minimize negative effects on the existing environment.

iii) Section C

It was not reported at the previous investigation and on-site survey that endemic and protected species of flora and fauna inhabit in/around the project site. Only common species of flora and fauna were confirmed by on-site survey in this project site. Precious diversity of biota also was not reported and discovered.

If during the construction phase some endemic and/or protected species of flora and fauna are found in the project site, it is necessary to confirm such species and report to authorities concerned.

**Table 8.8.7 Survey Result of Fauna (Birds in Section C)**

No.	Local Name	Species Name	Individual Number
1	layang-layang	<i>Hirundo tahitica</i>	96
2	kutilang	<i>Pygnonotus aurigaster</i>	26
3	kacamata	<i>Zosterops chloris</i>	12
4	raja udang	<i>Halcyon chloris</i>	2
5	bondol kepala pucat	<i>Lonchura pallida</i>	16
6	bangau	<i>Ardeola speciosa</i>	7
7	burung gereja	<i>Passer montanus</i>	57
8	burung madu	<i>Nectarinia aspasia</i>	4
9	bondol kepala hitam	<i>Lonchura molucca</i>	11
10	kepodang sungu	<i>Coracina bicolor</i>	3
11	bondol hitam	<i>Lonchura molucca</i>	7
12	kuntul perak	<i>Egretta intermedia</i>	3
Total Spesies			12
Total Individual Number			244

## iv) Section D

The project road passes through the existing road and irrigated agricultural areas in Gowa and Takalar Regencies. The flora and fauna species observed are the common ones and no species which require protection were found.

Sparrows, muias and finches were observed in the plain during the field reconnaissance. No endemic mammals of conservation species were seen.

The vegetation consists of mostly hilly land species and cultivation species are paddy and corn (jagung). The existing trees are common kinds of fruit trees.

**Table 8.8.8 Survey Result of Fauna (Birds in Section D)**

No.	Local Name	Species Name	Individual Number
1	bondol kepala pucat	<i>Lonchura pallida</i>	26
2	kepodang	<i>Lonchura molucca</i>	3
3	burung gereja	<i>Passer montanus</i>	21
4	burung madu	<i>Nectarinia aspasia</i>	5
5	kutilang	<i>Pygnonotus aurigaster</i>	4
6	layang-layang	<i>Hirundo tahitica</i>	46
7	kapinis laut	<i>Apus pacificus</i>	6
8	bondol kepala hitam	<i>Lonchura molucca</i>	4
9	raja udang	<i>Halcyon chloris</i>	1
10	kacamata	<i>Zosterops chloris</i>	9
11	bangau abu2	<i>Ardeola speciosa</i>	1
Total Spesies			9
Total Individual Number			126

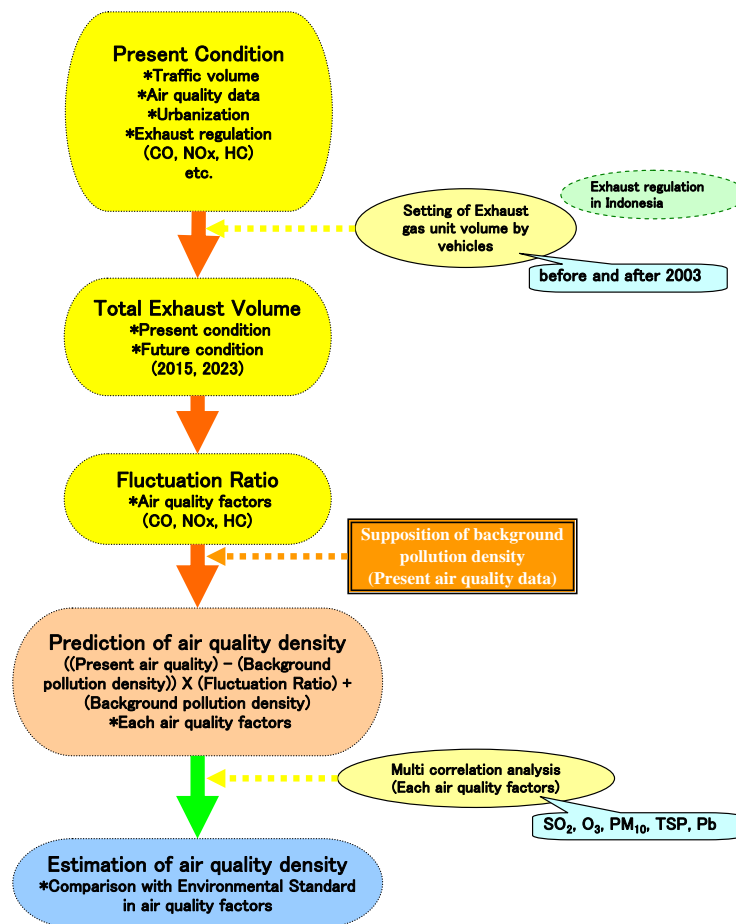


## (2) Prospect and Estimation Method

### a) Air Pollution

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 grasp the adequate meteorological data for long term in each forecasting point. Therefore, it is decided that the application of Atmospheric Dispersion Model (Plume-Puff Model, etc.) as popularly applied is not so easy.

The Study Team proposes the mathematical method estimated by the fluctuation ratio in total exhaust volume. The fluctuation ratio is calculated applying the exhaust regulation for vehicles. The flow of mathematical method for air quality prospect is shown in **Figure 8.8.2**.



**Figure 8.8.2 Prediction Flow of Air Quality**

Trial calculation of air pollutant volumes in exhaust gas from operating vehicles was executed by applying the above traffic demand forecast results. In these cases of calculation, the prerequisite conditions as shown below are set by the Study Team.

- Calculation of unit volume of pollution gas from vehicles exhaust in 2005 is made by referring to the regulation before 2003

- Unit volume of pollution gas from vehicles exhaust in 2023 is adopted by referring to the new regulation in 2003

**Table 8.8.9 Unit Volume of Exhaust Gas in the Regulation before 2003**

before 2003		Motorcycle	Car/Taxi/Jeep	Bus	Pickup	Truck	Unit:g/km
CO	Gasline	56.3	84.4	210.9	93.8	-	-
	Gas-oil	-	75.0	187.5	83.3	262.5	-
	2stroke	112.5	168.8	-	-	-	-
NOx	Gasline	4.5	3.2	8.0	3.6	-	-
	Gas-oil	-	3.2	8.0	3.6	11.3	-
	2stroke	10.7	6.4	-	-	-	-
HC	Gasline	1.4	1.1	2.8	1.3	-	-
	Gas-oil	-	1.1	2.8	1.3	3.9	-
	2stroke	3.5	2.3	-	-	-	-

Remarks; Calculated by JICA Study Team on the basis in regulation before 2003

**Table 8.8.10 Unit Volume of Exhaust Gas in New Regulation after 2003**

after 2003		Motorcycle	Car/Taxi/Jeep	Bus	Pickup	Truck	Unit:g/km
CO	Gasline	7.0	5.0	5.0	5.0	-	-
	Gas-oil	-	1.5	1.5	1.5	5.0	-
	2stroke	14.0	10.0	-	-	-	-
NOx	Gasline	0.7	0.2	0.2	0.2	-	-
	Gas-oil	-	0.6	7.0	0.6	7.0	-
	2stroke	1.3	0.4	-	-	-	-
HC	Gasline	1.2	0.5	0.5	0.5	-	-
	Gas-oil	-	1.0	1.2	1.0	1.1	-
	2stroke	2.4	1.0	-	-	-	-

Remarks; Set by JICA Study Team on the basis in regulation in 2003

The components of operating vehicles in 2005 and 2023 are set in the table below:

**Table 8.8.11 Components of Operating Vehicles**

	Motorcycle	Car/Taxi/Jeep	Large Bus	Pickup	Truck	Mini Bus
Gasline	60%	95%		90%		100%
Gas-oil	-	5%	100%	10%	100%	
2stroke	40%					

The accommodation ratio to the regulation of exhaust gas is presupposed as follows:

- All operating vehicles in 2005 conformed to the exhaust gas regulation before 2003.
- In the case of estimated vehicles in 2023, 30% of increased vehicles conform to the new regulation (after 2003) and 70% conform to the old regulation (before 2003).

It is assumed that the average speed of the car/taxi/jeep and pickup will be changed from 40km/h to 50km/h owing to the implementation of proposed projects. Regarding mini bus (Pete-pete), large

bus and truck, the average speed will be improved from 30km/h to 45km/h. For the small buses (Pete-pete) which separated into bus are prepared bus lay-by, therefore their average speed will be increased similarly. It is expected that the control of exhaust pollution gas would reduce it by about 5% ~ 32% by the improvement of average speed. However, in the case of without projects where the improvement of vehicle speed is not expected, it is forecast that the average speed of operating vehicles will slow down.

**Table 8.8.12 Reduction Ratio in Air Quality**

40--->50	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck
Nox/HC	86.3%	86.5%	85.9%	86.1%	85.9%
CO	95.4%	96.2%	92.6%	94.7%	92.6%
30--->45	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck
Nox/HC	75.1%	75.3%	67.6%	74.8%	67.6%
CO	85.4%	87.0%	85.1%	83.9%	85.1%

The air quality estimation method is the method of comparison with the Environmental Standard in principle.

b) Noise Level

The prospect method for noise level has not yet been established officially in Indonesia. The noise source level of vehicles is not ensured yet also. In addition, it is difficult to decide the noise source in each forecasting point. Therefore, it is judged that the simulation method of the Acoustic Society of Japan (ASJ Model 1998) cannot be used for this study.

The Study Team proposes the multi-regression analysis among the traffic volume, vehicle composition ratio, urbanization level and road grade in each survey point. The urbanization is classified into 5 levels: urban, semi-urban, city, town, and rural. The road grade is also classified into 5 grades: national, provincial, prefectural, county, town, and village road. The flow of multi regression analysis for noise level prospect is shown in **Figure 8.8.3**.

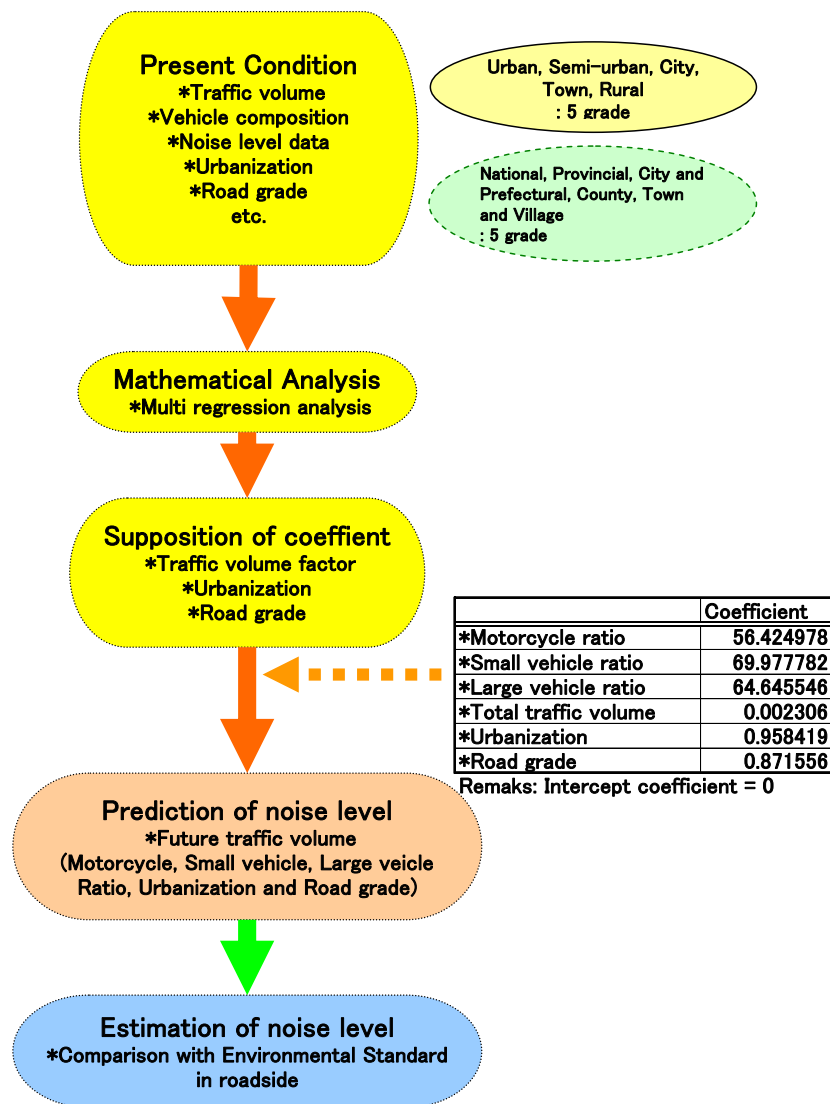


Figure 8.8.3 Prediction Flow of Noise Level

The result of multi-regression analysis among motorcycle ratio, small vehicle ratio, large vehicle ratio, traffic volume, urbanization level and road grade is shown in **Table 8.8.13**. Especially, the corrected multi-correlation of determination that shows the reliance on prediction model is estimated to be over 99 %. The coefficient for each factor is shown in **Table 8.8.14**.

Table 8.8.13 Multi-Regression Analysis Results for Noise Level

Regression Analysis Result	
Multi Correlation Coefficient (R)	0.9972
Multi Correlation of Determination (R2)	0.9945
Corrected Multi Correlation of Determination (R2)	0.9906
Standard Error of the Regression Coefficient	5.1098
Number of data	272

**Table 8.8.14 Coefficients for Noise Level Prediction**

	coefficient
Intercept	0
Motorcycle ratio	56.42497795
Small vehicle ratio	69.97778191
Large vehicle ratio	64.64554613
Total traffic volume	0.002306122
Road grade	0.958419138
Urbanization	0.871555865

The noise level is estimated by the same method as for air quality, that is to compare with the Environmental Standard.

c) Water Pollution

The prospect method for water pollution is based on the perfect mixed formula. Water pollution is estimated by the same method as for air quality, that is to compare with the Environmental Standard.

d) Flora and Fauna

The prospect method for flora and fauna depends on the habitats of endangered and protected species in this region. If the confirmed species are categorized as invaluable ones over the world (endangered species on the Red Data Book), basically their habitats must be protected and conserved at an international level. For the protected or endemic species in this region, it is desirable to devote effort to easing these impacts.

**(3) Result of Prospect and Mitigations**

a) Air Pollution

The number of vehicles on the target roads by section is estimated in **Table 8.8.15**. The traffic volumes in 2023 are predicted with the assumption that they will increase by 3.0 times as much as the traffic volumes in 2005.

Table 8.8.15 Traffic Demand Forecast for 2023

Section	2005							2023							Growth
	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	
A-1	6.701	2.834	994	2,169	8,068	2,277	23,043	12,834	2,720	254	854	3,794	1,934	22,390	97%
A-2	6.701	2.834	994	2,169	8,068	2,277	23,043	22,032	5,172	1,266	2,426	8,970	4,702	44,568	193%
A-3	10,832	3,983	1,071	2,338	8,263	4,020	30,507	21,556	5,150	1,266	2,424	9,010	4,830	44,236	145%
A-4	4,867	8,543	399	2,228	8,026	5,154	29,217	17,456	11,864	1,074	2,012	2,694	8,558	43,658	149%
A-5	10,843	15,098	417	3,279	10,081	10,317	50,035	21,188	11,336	906	2,088	2,672	6,226	44,416	89%
A-6	14,809	15,393	409	4,595	14,604	12,024	61,834	21,505	14,754	1,162	2,414	3,354	11,804	54,993	89%
A-7	14,809	15,393	409	4,595	14,604	12,024	61,834	34,490	24,941	1,401	3,452	4,880	28,684	97,848	158%
A-8	14,809	15,393	409	4,595	14,604	12,024	61,834	34,260	24,889	1,399	3,444	4,876	28,068	96,936	157%
B-1	9,577	14,326	152	4,053	12,059	9,066	49,233	40,585	17,272	1,426	3,496	11,646	26,316	100,741	205%
B-2	22,869	18,231	787	3,152	7,015	20,222	72,276	36,254	15,086	1,299	3,403	8,621	17,882	82,545	114%
B-3	17,155	15,303	678	2,619	6,276	14,315	56,346	25,648	8,842	1,097	2,419	8,269	6,380	52,655	93%
B-4	13,273	11,888	662	2,276	5,733	11,063	44,895	21,536	7,512	944	2,248	5,576	4,294	42,110	94%
B-5	15,265	8,515	620	2,542	6,082	16,468	49,492	23,992	9,852	996	2,412	5,948	9,632	52,832	107%
B-6	8,921	4,632	882	1,567	7,168	6,953	30,123	23,992	9,852	996	2,412	5,948	9,632	52,832	175%
C-1	11,170	4,812	936	1,729	7,458	7,865	33,970	31,968	13,644	1,406	3,130	8,528	15,860	74,536	219%
C-2	12,532	4,373	927	1,963	9,214	6,217	35,226	29,276	9,724	1,396	3,066	7,756	13,118	64,336	183%
C-3	13,528	5,060	885	2,016	9,918	6,555	37,962	20,014	5,500	1,290	2,190	7,280	5,740	42,014	111%
C-4	12,263	4,957	814	1,866	9,197	6,461	35,558	13,786	4,846	1,072	1,868	6,096	4,562	32,230	91%
C-5	12,263	4,957	814	1,866	9,197	6,461	35,558	16,592	5,214	1,050	1,722	5,526	7,068	37,172	105%
D-1	6,193	5,227	711	1,536	7,000	4,156	24,823	12,340	11,296	1,320	1,946	6,412	9,284	42,598	172%
D-2	4,603	3,703	689	1,335	5,180	2,962	18,472	9,932	6,712	1,148	1,690	5,038	6,250	30,770	167%
D-3	4,208	2,691	630	1,158	4,711	2,297	15,695	13,606	8,920	1,202	1,840	6,418	6,726	38,712	247%
D-4	3,438	2,256	563	1,005	3,285	2,120	12,667	10,996	7,790	1,082	1,646	5,150	6,410	33,074	261%
D-5	3,642	2,510	454	844	3,481	2,010	12,941	9,820	6,584	938	1,354	4,676	5,342	28,714	222%
D-6	2,875	2,076	114	360	2,635	1,804	9,864	8,172	5,662	930	1,286	4,104	4,854	25,008	254%
D-7	3,072	2,102	130	410	2,765	1,879	10,358	10,582	7,314	988	1,476	5,594	6,030	31,984	309%
D-8	2,850	1,818	102	311	2,417	1,196	8,694	9,476	5,434	958	1,288	4,652	3,164	24,972	287%

Remarks : Section B and C in 2003 are shown the traffic density of existing road (Urip Sumoharjo, Petarani and Sultan Alauddin street)

The results of prospect of ambient air quality along the project area are shown in **Table 8.8.16**. The air quality values do not exceed the Environmental Standard except for the total suspended particulate (TSP). It is considered that TSP can be controlled by spraying water, road side plantation, cleaning of road and maintenance of pavement.

Table 8.8.16 Results of Prospect of Air Quality in 2023

NO.	SO <sub>2</sub>	CO	NO <sub>2</sub>	O <sub>3</sub>	HC	PM <sub>10</sub>	TSP	Pb
	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>
1 Kantor Bupati Maros	9.6	81.8	23.6	2.7	12.4	40.4	137.7	0.001
2 Mandai crosspoint (New road)	9.2	84.8	25.3	2.4	12.7	36.6	101.4	0.001
3 Daya crosspoint	9.4	100.6	25.0	1.9	12.7	57.0	125.2	0.002
4 Sungguminasa crosspoint	14.5	106.1	28.5	3.0	16.1	64.8	247.2	0.001
5 Baronbong (National road)	11.2	82.1	32.6	3.4	15.3	61.1	116.8	0.000
6 Limbung (National road)	10.5	108.0	28.7	3.6	25.6	40.9	138.3	0.002
7 Palleco (National road)	11.2	109.5	28.4	4.6	18.9	40.3	134.6	0.001
8 Kantor Bupati Takalar	9.4	94.8	37.1	5.1	24.2	46.0	152.4	0.001
15 Hertasing street	10.8	101.4	34.8	4.6	16.6	80.2	129.0	0.004
National standard for ambient air quality *2)								
measured duration 1 hour	900	30,000	400	235	-	-	-	-
measured duration 3 hours	-	-	-	-	160	-	-	-
measured duration 24 hours	365	10,000	150	-	-	150	230	2.00
Local standard for ambient air quality *3)								
measured duration 1 hour	900	30,000	400	230	-	-	-	-
measured duration 3 hours	-	-	-	-	160	-	-	-
measured duration 24 hours	360	10,000	150	-	-	150	230	2.00

Notes:   Exceeding the standard value

Source:

\*1) Sulawesi Road M/P & F/S JICA study team data Year 2007

\*2) Government Regulation regarding Control of Air Pollution No.41-1999

\*3) Governor's Regulation of South Sulawesi Province No. 14-2003

\*4) Governor's Dgree of the Minister for Environment concerning Guidekines for Establishment of Environmental Quality Standards No.2-1988

\*5) Governor's Dgree of South Sulawesi Province No.465-1995

Especially, dust from the construction will be generated in a short period during the land leveling stage (excavation and filling). It can be minimized by applying countermeasures such as sprinkling water. Air pollution caused by operation of construction machines can also be reduced by regular maintenance and efficiently scheduled operation.

During the construction phase, operation of trucks and construction machines will affect air quality conditions. However, the number of such vehicles and machines will be limited, so the environmental impact may be forecast and evaluated based on the planned environmental studies and countermeasures.

For example, the evaluation can be based on the following conditions:

- the number of vehicles is minimized
- their tires are washed when they go out from the construction area
- construction machines are regularly inspected and monitored
- their operation is efficiently planned

In addition, dust from the construction should be regularly monitored and evaluated against the environmental standard.

After the completion of the project, it is necessary to monitor regularly the air conditions caused by the operating vehicles on the road. The air quality condition will deteriorate because it is estimated that the traffic density in 2023 will increase considerably.

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

In a 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 future.

#### b) Noise and Vibration

Noise of the construction machines can be reduced by regular maintenance and efficiently scheduled operation. The noise around the construction areas should be monitored so that countermeasures can be taken timely. For example, evaluation should be made on whether the noise impact could be reduced by a proper schedule of the operating hours of construction machines.

The number of vehicles and machines will be limited. Therefore, the environmental impact during the construction phase may be forecast and evaluated based on the planned study and countermeasures against noise and vibration.

Monitoring of noise and vibration along the planned alignment is also necessary for evaluation according to the standard.

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

Noise and vibration generated by operating vehicles need to be studied. However, the noise and vibration level does not become higher simply and immediately at the time of traffic density increase as the main cause. It is necessary to investigate the composition of operating vehicles, noise and vibration level of vehicles and so on for unerring anticipation of noise and vibration.

The result of prospect is shown in **Table 8.8.17**. Around the intersection of the Perintis road and the Middle Ring Road, Sungguminasa cross point where traffic will be concentrated, it is assumed that the noise level will exceed 80 dB(A).

**Table 8.8.17 Results of Prospect of Noise Level in 2023**

Section	2023							Noise level
	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	
A-1	12,834	2,720	254	854	3,794	1,934	22,390	75.4
A-2	22,032	5,172	1,266	2,426	8,970	4,702	44,568	77.0
A-3	21,556	5,150	1,266	2,424	9,010	4,830	44,236	76.9
A-4	17,456	11,864	1,074	2,012	2,694	8,558	43,658	75.6
A-5	21,188	11,336	906	2,088	2,672	6,226	44,416	77.3
A-6	21,505	14,754	1,162	2,414	3,354	11,804	54,993	76.8
A-7	34,490	24,941	1,401	3,452	4,880	28,684	97,848	81.7
A-8	34,260	24,889	1,399	3,444	4,876	28,068	96,936	81.6
B-1	40,585	17,272	1,426	3,496	11,646	26,316	100,741	82.1
B-2	36,254	15,086	1,299	3,403	8,621	17,882	82,545	81.2
B-3	25,648	8,842	1,097	2,419	8,269	6,380	52,655	79.0
B-4	21,536	7,512	944	2,248	5,576	4,294	42,110	78.6
B-5	23,992	9,852	996	2,412	5,948	9,632	52,832	79.5
C-1	31,968	13,644	1,406	3,130	8,528	15,860	74,536	82.2
C-2	29,276	9,724	1,396	3,066	7,756	13,118	64,336	78.2
C-3	20,014	5,500	1,290	2,190	7,280	5,740	42,014	75.1
C-4	13,786	4,846	1,072	1,868	6,096	4,562	32,230	73.7
C-5	16,592	5,214	1,050	1,722	5,526	7,068	37,172	74.8
D-1	12,340	11,296	1,320	1,946	6,412	9,284	42,598	75.1
D-2	9,932	6,712	1,148	1,690	5,038	6,250	30,770	73.4
D-3	13,606	8,920	1,202	1,840	6,418	6,726	38,712	76.7
D-4	10,996	7,790	1,082	1,646	5,150	6,410	33,074	74.7
D-5	9,820	6,584	938	1,354	4,676	5,342	28,714	74.2
D-6	8,172	5,662	930	1,286	4,104	4,854	25,008	72.3
D-7	10,582	7,314	988	1,476	5,594	6,030	31,984	74.2
D-8	9,476	5,434	958	1,288	4,652	3,164	24,972	74.8

Remarks: Noise level is shown as peak (maximum level).

c) Water Pollution

The Tallo and Pampang rivers around the project area are polluted by domestic wastewater from neighboring households resulting in rather high indexes of BOD<sub>5</sub>, COD and Total Suspended Solid (TSS). However, the density of heavy metals is thought to be low because no polluting factories are located along the rivers.



The road construction will be increase TSS in the near-by river bodies. However, it can be minimized by installing temporary sedimentation ponds at an early stage of the construction. The pollution is thought to be limited also because turbid water will be generated in a limited period for excavation and filling ground. For the construction of bridge piers in river it is necessary to adopt the steel sheet piling method or other similar methods in order to avoid turbid water generation.

Drainage water should be discharged after proper treatment of TSS, pH, oil and grease. It is also important to enforce regular monitoring to evaluate the conditions against the river water standard. It is difficult to analyze storm water from the construction site because it is affected by a variety of conditions such as rainfall, reclamation, ground and soil. Therefore, the environmental impact may be evaluated based on the planned studies, programmed countermeasures and the scheduled monitoring of water pollution.

During the operation phase, it is judged that there is no wastewater discharge from the target road.

d) Flora and fauna

If some unique species and/or other precious kinds to be conserved are found, it is necessary to take proper measures for flora and fauna protection, i.e. limited protection zone, bedded in other place, etc.

There are many fruit trees around the houses and in the project area. It is necessary to protect as many fruits trees as possible from the project impacts, because these fruits trees are the resource of financial income for the residents in the surrounding areas. Design of buffer zones including some existing copses is very effective to ensure that the road project is eco-friendly.

### **8.8.3 Social Environment**

#### **(1) Population**

The data on population of the affected villages in the Maros - Takalar road development plan are shown in **Table 8.8.18**.

**Table 8.8.18 Population of Affected Villages in the Maros - Takalar Road Development Plan**

No	Location	Population		
		Male	Female	Total
<b>I.</b>	<b>Maros District</b>			
	A. Turikale			
	1. Aliri Tengae	3,357	2,334	5,691
	2. Pettuadae	2,262	2,442	4,704
	3. Adatongeng	3,081	3,146	6,227
	4. Taroada	3,116	3,251	6,367
	B. Mandai			
1. Hasanuddin	3,518	3,460	6,978	
C. Marusu				
1. Marumpa	2,926	3,303	6,229	
<b>II.</b>	<b>Makassar City</b>			
	A. Biringkanaya			
	1. Sudiang	12,519	13,028	25,547
	2. Sudiang Raya	13,241	13,543	26,784
	3. Bulurokeng	2,868	3,103	5,971
	4. Paccerakang	14,739	15,030	29,769
	B. Tamalanrea*)			
	1. Tamalanrea Indah	6,648	6,480	13,128
	2. Tamalanrea Jaya	4,977	5,794	10,771
	3. Tamalanrea	15,092	14,083	29,175
	4. Kapasa	5,317	5,631	10,948
	C. Manggala			
	1. Borong	7,673	8,163	15,836
	2. Batua	9,026	9,161	18,187
	D. Panakkukang			
	1. Tello Baru	4,950	5,414	10,364
	E. Rappocini			
	1. Kassi-Kassi	7,073	7,543	14,616
	2. Mappala	4,964	5,359	10,323
	3. Karunrung	4,564	5,030	9,594
	4. Gunung Sari	15,662	16,170	31,832
	F. Tamalate			
	1. Mangasa	10,911	11,453	22,364

<b>III.</b>	<b>Gowa District</b>			
	A. Somba Opu			
	1. Pandang-pandang	2,721	3,004	5,725
	B. Barombong			
	1. Tinggimae	2,108	2,180	4,288
	2. Kanjilo	3,019	3,041	6,060
	C. Pallangga			
	1. Bontoala	5,355	5,473	10,828
	2. Jenetallasa	5,394	5,609	11,003
	3. Taeng	2,452	2,554	5,006
	D. Bajeng			
	1. Bontosunggu	2,676	2,702	5,378
	2. Mataallo	1,899	1,964	3,863
	3. Limbung	2,058	2,209	4,267
	4. Kalebajeng	1,723	1,800	3,523
5. Tangke Bajeng	1,877	1,992	3,869	
E. Bontonompo				
1. Bontonompo	1,749	1,880	3,629	
2. Kalaserena	1,279	1,303	2,582	
3. Tamallayang	2,298	2,448	4,740	
<b>IV.</b>	<b>Takalar District</b>			
	A. Polombangkeng Utara			
	1. Palleko	1,364	1,558	2,922
	2. Manongkoki	1,687	1,858	3,545
	3. Panranuangku	1,704	1,850	3,554
	4. Malewang	1,518	1,670	3,188
	B. Pattalassang			
	1. Bajeng	2,486	2,689	5,175
	2. Kalabbirang	1,847	1,929	3,776
	3. Sabintang	789	869	1,658
	4. Sombalabella	2,543	2,824	5,367
5. Pattalassang	2,612	2,832	5,444	

Source: Statistic Office of District/City

\*) Sub-District Office of Tamalanrea

The above table shows that administratively Makassar City, composed of six sub-districts and 16 villages with most populated areas, has the longest road section in the Maros-Takara Road Development Plan. On the other hand, the Takalar District with only two sub-districts and nine wards/villages has the shortest road section in the plan.

## (2) Land Use by Section

The land use along the Project road is as follows:

Section A: Semi urban to urban areas from Maros to Jl Ir.Sutami. Urban area from Jl Ir.Sutami to Middle Ring along Jl.Perintis Kemerdekaan. There are shops, residential houses, industrial estates, government offices, and local markets along the project road.

Section B: Urban – semi urban areas. The start point of this section is located in the swamp area of the Tallo River basin. Approximately a half of the section is in the

residential area and 20% in paddy fields.

Section C: Urban area around Jl.Sultan Alauddin and rural area after crossing the Jeneberang River. The road alignment passes mostly through paddy fields by-passing the villages.

Section D: Semi urban and rural areas along the existing national road from Sungguminasa to Takalar. The road passes through Limbung town located approximately 10 km south of Sungguminasa.

### (3) Required Land Acquisition and Resettlement

**Table 8.8.19** is an estimation and classification of the required land acquisition and resettlement based on site inventory. In general, 63% of the required land acquisition area is agricultural area. Almost 89% of section C and 71% of section B are agricultural area. In the other hand, 82% of section A and 48% of section D are residential area.

**Table 8.8.19 Classification of Land Acquisition**

Road section	Unit (m2)			
	Residential	Bushes	Agricultural	Total
A1	79,000	15,000	2,000	96,000
B	84,000	0	210,000	294,000
C	14,000	26,000	320,000	360,000
D	210,000	10,000	220,000	440,000
Total	387,000	51,000	752,000	1,190,000

### (4) Project affected buildings

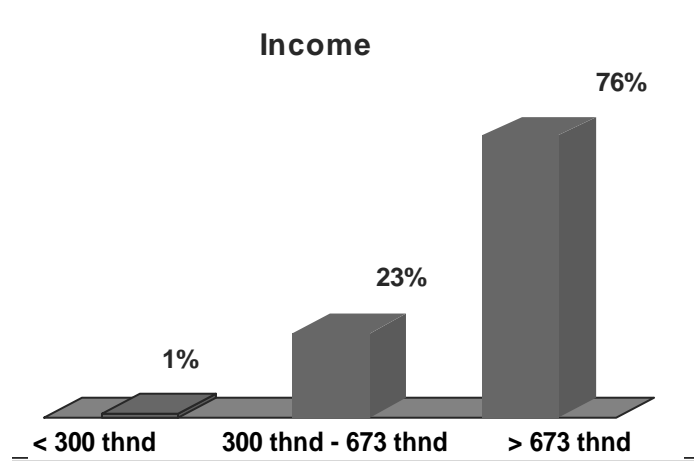
Project affected buildings in total is about 2700 units, among them about 1700 units is in the Maros district along the section A of the Maros-Takalar road. The largest number is shops, most of (1080 units), along the section A of the road. On the other hand, most of the affected houses are in Gowa district, along section C and D of the road. Several houses and shops also affected by the road plan development project.

Table 8.8.20 Project Affected Buildings in each District/Municipality by road section

Road Status	Name	Length (Km)	Existing roadway	Plan Roadway	Work	ROW (m)		Land Area (m <sup>2</sup> )	District / Municipality	Kind of Building			
						Plan	Existing			House	Shop	Public building	Street vendor
A National Road	Maros - Jl. Sutami IC	8	4	6 - 8	Widening	42	30	96.000	<b>TOTAL A</b>	<b>320</b>	<b>1.083</b>	<b>67</b>	<b>267</b>
									Maros	283	905	40	120
									Turikale	132	490	21	39
									Mandai	63	183	15	36
									Maros Baru	24	44	2	4
	Jl. Sutami IC - middle Ring (Perintis Road)	12	4	8-10	Widening	42	30		Marusu	64	188	2	41
									<b>Makassar</b>	<b>37</b>	<b>178</b>	<b>27</b>	<b>147</b>
									Biringkanaya	37	178	27	147
									<b>Makassar</b>				
									Biringkanaya				
Tamalanrea													
B Municipal Road	Middle Ring Road	7	-	8	New	42	0	<b>TOTAL B</b>	<b>92</b>	<b>16</b>	<b>2</b>	<b>1</b>	
								<b>Makassar</b>	<b>92</b>	<b>16</b>	<b>2</b>	<b>1</b>	
								Mangala	43	1	0	0	
								Panakukkang	9	0	0	1	
								Rappocini	27	6	1	0	
								Tamalate	13	9	1	0	
C Kab. Road	Middle Ring Road access road	9	-	4	New	40	0	<b>TOTAL C</b>	<b>42</b>	<b>10</b>	<b>2</b>	<b>3</b>	
								<b>Gowa</b>	<b>42</b>	<b>10</b>	<b>2</b>	<b>3</b>	
								Mangasa	22	0	1	1	
								Barombong	13	10	1	1	
								Pallangga	7	0	0	1	
D National Road	Middle Ring Road Access - Takalar	22	2	4	Widening	30	0	<b>TOTAL D</b>	<b>661</b>	<b>374</b>	<b>54</b>	<b>37</b>	
								<b>Gowa</b>	<b>380</b>	<b>239</b>	<b>28</b>	<b>7</b>	
								Bajeng	211	184	15	5	
								Bontonompo	169	55	13	2	
								<b>Takalar</b>	<b>281</b>	<b>135</b>	<b>26</b>	<b>30</b>	
								Galesong					
								Utara	41	20	2	0	
								Polombangkeng Utara	171	46	5	22	
								Pattalassang	69	69	19	8	
Total	58								<b>1.115</b>	<b>1.483</b>	<b>125</b>	<b>308</b>	
<b>Grand TOTAL Trans Sulawesi</b>									<b>2.723</b>			<b>308</b>	

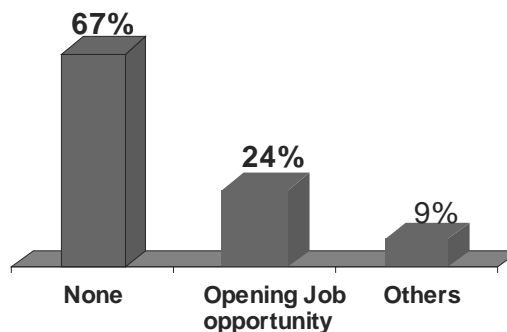
**(5) Results of Socio-Economic Surveys**

Interview survey was conducted by directly visiting affected or nearby households along the project road. One hundred forty eight (148) households of PAP were interviewed and responded in 45 Desa/Kel in 16 kecamatan. Eighty eight percent (88%) of the interviewees live in own houses and the remainder live in rented houses. Men account for 77% and women for 23%. Forty one percent (41%) are shop owners/self-businesses, 19% are engaged in agriculture, 9% are workers/officers of public and private companies. As to monthly income, seventy six percent (76%) have less than Rp 676,000, and 23 % have Rp 300,000 to 673,000.



**Figure 8.8.4 Monthly Income of Interviewees (Respondents)**

Eighty two percent (82%) of the interviewees already know about the Trans-Sulawesi Road Project. Eighty one percent (81%) are satisfied with the current compensation model and agree to move their property if it is required, but 20% disagree. Sixty seven percent (67%) of the interviewees do not have any specific direct expectations but 24% expect job opportunities (Figure 8.8.5) during the construction.



**Figure 8.8.5 Expectations from the Project**

Socio-economic, cultural, and community health data were obtained through questionnaire interviews of the people in the affected communities along the planned Maros - Takalar road. The total number of respondents was 150 including 10% of the households that will be subject to the direct impacts of this project (residents of the planned road development areas).

The number of respondents in each district/city was not always the same because of the difference in the number of villages in the respective district where the road will pass through (Table 8.8.21). As a result, Makassar City with 16 villages had the biggest number of samples/respondents and

Maros District with only 6 villages had the smallest number of respondents

**Table 8.8.21 Number of Respondent in Each District/City**

No	District/City	Number of Respondent
1	Maros	21
2	Makassar	49
3	Gowa	42
4	Takalar	38
Total		150

Source: Analyzed Primary Data, 2007

**Table 8.8.22 Number of Respondents by Age Group**

No	District/City	Age Group(%)				Total (%)
		≤ 19	20 - 39	40 - 59	≥ 60	
1	Maros	4	48	24	24	100
2	Makassar	0	45	51	4	100
3	Gowa	0	17	69	14	100
4	Takalar	0	18	69	13	100

Source: Analyzed Primary Data, 2007

**Table 8.8.22** shows that the dominant age group of respondents (householders) is 40 - 59 years in most districts along the planned Maros - Takalar road, but it is only 20 - 39 years in Maros District.

**Table 8.8.23 Educational Background of Respondents**

No	DistrictCity	Educational Background (%)					Total
		Drop-out	Elementary	Junior High	Senior High	University	
1	Maros	0	23	10	57	10	100
2	Makassar	4	12	6	39	39	100
3	Gowa	7	33	14	26	20	100
4	Takalar	26	21	24	29	0	100

Source: Analyzed Primary Data, 2007

**Table 8.8.23** shows that the educational background of the respondents in the study area is quite varied, with the dominant one being the senior high school level. People with drop-out or never attending school background are still found in three regencies/cities, and they are dominant in Takalar District. Among the regencies/cities, Makassar City has the biggest number of university graduates.

**Table 8.8.24 Respondents' Residential Status**

No	District/City	Residency Status (%)			Total
		Own	Contract	Stay	
1	Maros	100	0	0	100
2	Makassar	69	29	2	100
3	Gowa	98	0	2	100
4	Takalar	95	5	0	100

Source: Analyzed Primary Data, 2007

**Table 8.8.24** shows that most residents in the planned Maros - Takalar road development areas own land and only few of them stay with their relatives. **Table 8.8.25** shows that the function of respondents' houses is dominantly for living and doing business. There are relatively many living-business places where the planned Maros - Takalar road will pass through, but places for business solely are rarely found in the study area.

**Table 8.8.25 Function of Respondents' Houses**

No	District/City	House Function (%)			Total
		Place of Living	Place of Living and Business	Other	
1	Maros	10	90	0	100
2	Makassar	18	74	8	100
3	Gowa	81	19	0	100
4	Takalar	76	24	0	100

Source: Interview Survey

**Table 8.8.26 Livelihood Type of Respondents**

No	District/City	Livelihood								Total
		1	2	3	4	5	6	7	8	
1	Maros	62	0	14	5	5	0	0	14	100
2	Makassar	53	10	29	2	6	0	0	0	100
3	Gowa	18	17	9	5	5	7	29	10	100
4	Takalar	32	0	7	3	5	0	50	3	100

Source: Analyzed Primary Data, 2007

Remarks: 1. Merchant      2. Officer/Police/Army      3. Private Officer      4. Retiree      5. Craftsman  
6. Labor      7. Peasant      8. Other

**Table 8.8.26** shows the various types of respondents' livelihood. Mainly, the dominant livelihood among the people in the regencies/cities is merchant, officer/police/army, private officer, and peasant. In Maros District and Makassar City, merchant is the most dominant livelihood of the respondents. Meanwhile in Gowa District and Takalar District, peasant is the most dominant livelihood among the respondents.



**Table 8.8.27 Respondents' Income Level**

No	District/City	Income Level (%)			Total
		< Rp. 300.000,-	Rp. 300.000,- – Rp. 673.000,-	> Rp. 673.000,-	
1	Maros	0	5	95	100
2	Makassar	0	6	94	100
3	Gowa	5	12	83	100
4	Takalar	0	68	32	100

Source: Analyzed Primary Data, 2007

**Table 8.8.27** shows that the income level of respondents is very varied and dominantly is above the Provincial Minimum Wage of Rp. 673,200. The respondents' income varies from Rp. 250,000 to Rp. 50,000,000 and the trading activity represents the biggest income source of the respondents. In Gowa District, there are few respondents with an income of less than Rp. 300,000 and in Takalar District, the dominant income averages Rp. 300,000 to Rp. 673,200. But, the average income rate of the respondents as a whole is far above the Provincial Minimum Wage, reaching as much as Rp. 2,750,000 per month.

**Table 8.8.28 Respondents' perception on the project plan**

No	District/City	Perception/opinion (%)		Total
		Agree	Disagree	
1	Maros	73.5	26.5	100
2	Makassar	83.3	17.7	100
3	Gowa	97.4	2.6	100
4	Takalar	66.7	33.3	100
Average		81.3	18.7	100

**Table 8.8.28** shows that about 81% of respondents agree on the project plan. This opinion is based on the condition that the land acquisition will be executed accordance to the regulations. Most of disagree persons are the person who does not want to relocate to other places. And about 24% of respondents express their expectation to have work opportunities during the project implementation.

## (6) Culture/Custom

Regarding the culture and customs of the affected communities, the community activities inherently with mutual assistance such as environmental cleaning, religious building construction, house repair, and area security show that there have been an established norm system through the community participation in doing the cooperation among insiders and outsiders in the community.

The mutual assistance activities are very often performed by community in study area are communal work on cleaning the surrounding and keeping the area security such as water channel cleaning, road, and area security security (*siskamling*). This activity includes the religious events activities which are conducted in communal work spirit such as celebrating the religious holidays

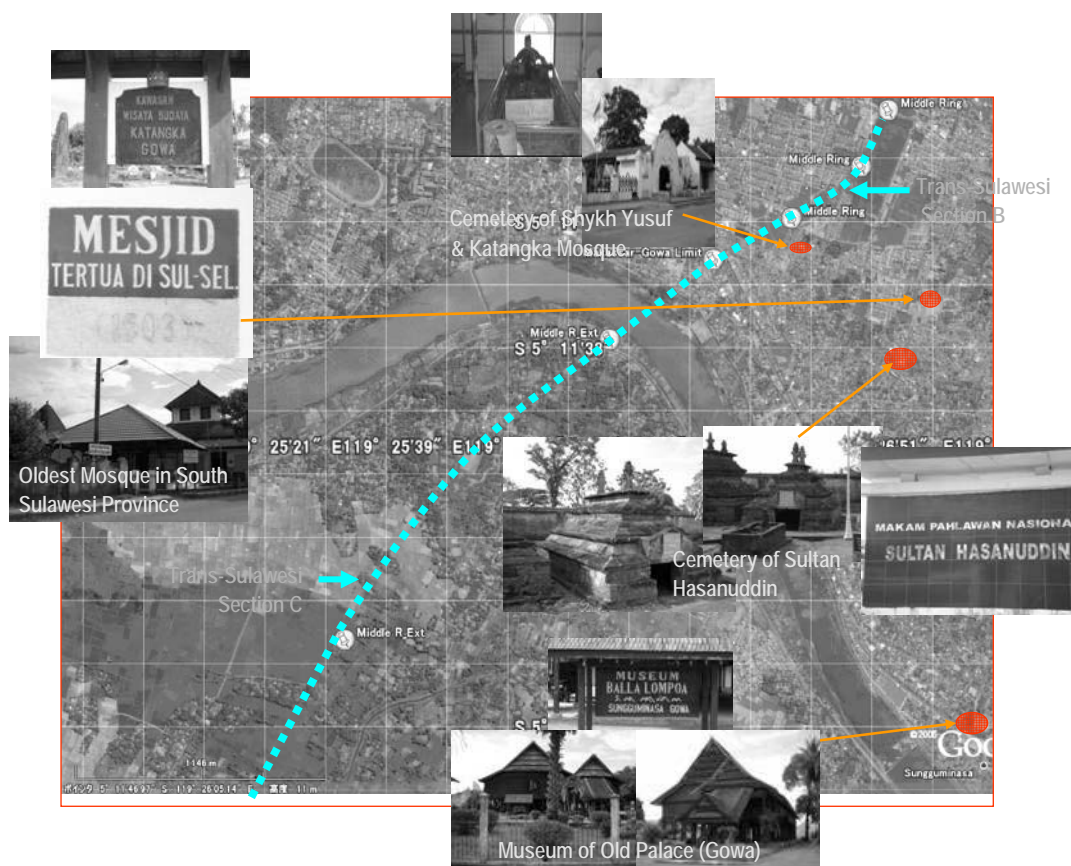
and constructing religious buildings in the area.

As a whole, it shows that wholly, the interview result to the community expresses the result that 81% of the community state that the culture of communal work is still existed in their area, but 19% of them say that it doesn't exist anymore. From the respondents who say that the communal work exists in the area, 89% of them give the physical help as the form of participation and 11% of them give money as their participation.

According to society experience during the time, it shows that the initiators of communal work activities are local government staff (86%) and community leader (14%). As for conflict resolution in community, the data shows that 67% is solved by local government staff, 17% by community leader, and as for the rest, 16% is solved by police department.

### (7) Cultural Heritages

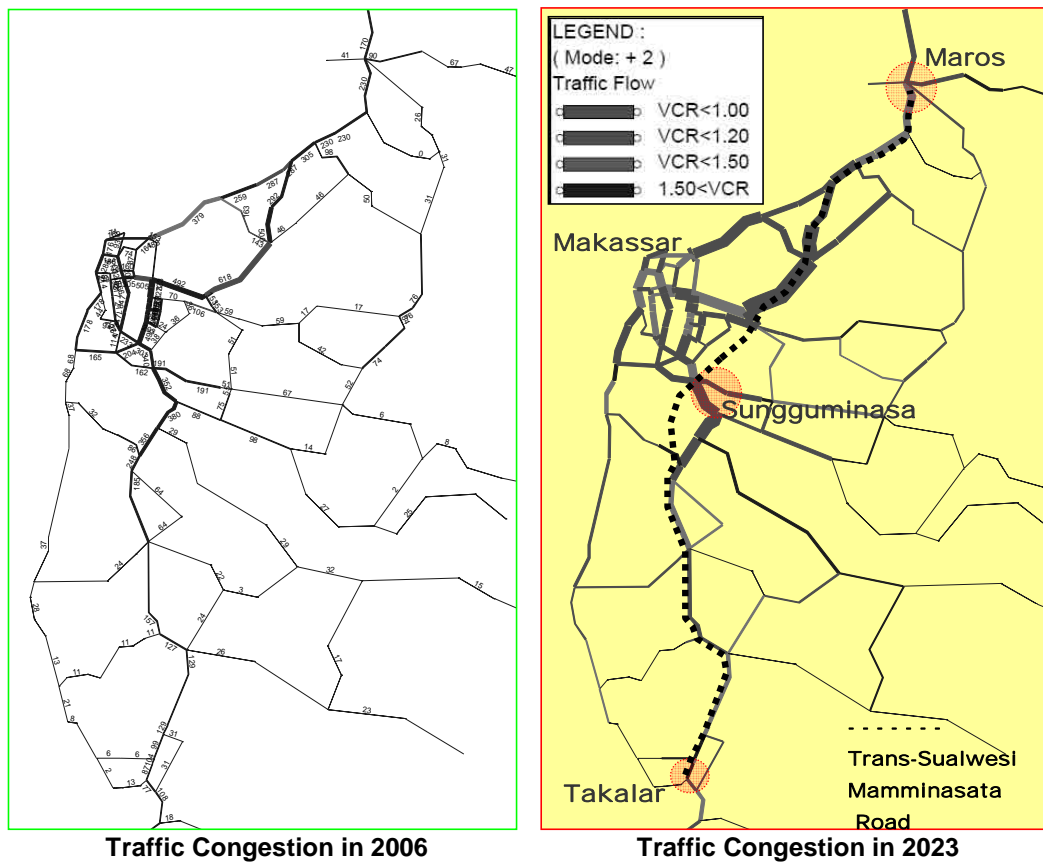
Some important cultural heritages exist around the border of Section B and C of the Project road. These include the oldest mosque in South Sulawesi Province, Place of Gowa Kingdom, Cemetery of Sultan Hasanuddin and Shykh Yusuf (see **Figure 8.8.6**).



**Figure 8.8.6 Cultural Heritages along Trans-Sulawesi Mamminasata Road**

**(8) Traffic Jam**

**Figure 8.8.7** shows a comparison of traffic congestion conditions in 2006 and 2023 without any new road development. The current traffic congestion is mostly on Jl.Perintis Kemerdekaan, Jl.Ir.Sutami, Jl.Urip Sumoharjo and some other urban roads in the Makassar old town centre. However, most of the road links would face traffic jam in 2023. Especially, it is serious on Jl.Perintis Kemerdekaan, Jl.Ir.Sutami, Jl.Urip Sumoharjo, Jl.Sultan Alauddin, Jl.Gowa Raya, Jl.Abdullah Daeng Sirua and national roads from Maros to Jl.Ir.Sutami IC and Sungguminasa to Takalar. The Trans-Sulawesi Mamminasata Road Project will substantially contribute to reducing these traffic constraints.



**Figure 8.8.7 Traffic Congestion (Jam) Without-Project Case**

**8.8.4 Summary of Impacts under AMDAL Impact Matrix**

The following table summarizes the impacts under the AMDAL impact matrix, showing the major impacts during the pre-construction, construction and post-construction stages of the Trans-Sulawesi Mamminasata Section.

**Table 8.8.29 Matrix of Hypothetical Significant Impact of Maros - Takalar Road Development in South Sulawesi**

No	Activity Stage	Pre-construction Stage		Construction Stage					Post-construction Stage	
		Re-measurement	Land Acquisition	Materials Mobilization	Labor Availability	Location Cleaning	Road/Bridge Construction	Network/ Facility	Operation	Maintenance
	<b>Environmental Components</b>									
<b>I</b>	<b>PHYSICAL-CHEMICAL COMPONENTS</b>									
1.	Air Quality			- P			- TP			
2.	Hydrology						- P			
3.	Water Quality						- TP			
4.	Road Facility			- P						
5.	Traffic Flows						- P		+ P	
6.	Space, Road, and Land		- TP							
<b>II</b>	<b>BIOLOGICAL COMPONENTS</b>									
1.	Flora					- P		+ P		
2.	Fauna					- P		+ P		
<b>III</b>	<b>SOCIAL CULTURE-PUBLIC HEALTH COMPONENTS</b>									
1.	Social Perception	- TP	- P						- P	
2.	Job Opportunity				+ P					
3.	Social Interaction				- TP					
4.	Historic Heritages		- TP							
5.	Public Health			- P	-TP					
6.	Green Area / Aesthetics									+ P

Category : P = Important      - = Negative Impact

TP = Not Important      + = Positive Impact

## 8.9 Summary of Draft Final EIA Documents for Mamminasa Bypass, Hertasing and Abdullah Daeng Sirua Road

### 8.9.1 Natural Environment

#### (1) Present Condition

##### a) Air Pollution

The ambient air along the project road is not really polluted at present except for the presence of total suspended particulate (TSP) such as dust in and around the street. The survey results of air quality along the proposed project road are shown in Table 8.9.1.

The analysis results show that the existing air consists of SO<sub>2</sub>, CO, NO<sub>2</sub>, O<sub>3</sub>, HC, PM<sub>10</sub>, TSP and Pb in the study area but all are within the maximum standard except the ones at Batu Raya street. Especially, CO and Pb have been bettered in recent years by exhaust regulation and fuel improvement.

**Table 8.9.1 Air Quality Survey Result of Proposed Project Road**

NO.	SO <sub>2</sub>	CO	NO <sub>2</sub>	O <sub>3</sub>	HC	PM <sub>10</sub>	TSP	Pb	Remarks	
	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>	μg/Nm <sup>3</sup>		
Mamminasa Bypass	1 Kantor Bupati Maros	10.0	84.3	25.9	3.8	16.3	43.8	168.2	0.003	1-May-07
	5 Baronbong (National road)	11.9	84.3	36.2	4.1	14.7	68.7	124.5	0.001	8-May-07
	9 Moncongloe (Maros)	10.6	117.5	30.3	4.2	13.3	53.8	150.6	0.001	14-May-07
	10 Panaikang (Gowa)	11.0	87.9	39.6	4.2	14.6	59.0	124.1	0.001	23-May-07
	11 Bontmaranu (Gowa)	9.8	92.2	31.7	4.4	12.4	58.4	96.1	0.001	22-May-07
	12 Malino street (Gowa)	12.7	105.7	35.2	5.5	18.8	62.5	123.3	0.001	21-May-07
	13 Bajeng (Gowa)	11.9	102.1	32.3	4.8	14.7	58.9	145.6	0.001	19-May-07
	14 Galesong Utara (Takalar)	11.9	89.5	34.0	4.5	12.4	57.2	110.3	0.001	18-May-07
Hertasing road	11 Bontmaranu (Gowa)	9.8	92.2	31.7	4.4	12.4	58.4	96.1	0.001	22-May-07
	15 Hertasing street	10.7	101.0	33.7	4.4	14.3	77.1	126.3	0.004	4-May-07
	16 Samata (Gowa)	13.7	90.4	40.4	4.3	15.8	57.2	113.0	0.001	24-May-07
ADS road	10 Panaikang (Gowa)	11.0	87.9	39.6	4.2	14.6	59.0	124.1	0.001	23-May-07
	17 Batu Raya street	14.7	101.3	42.5	5.9	15.8	80.7	239.1	0.005	16-May-07
	18 ADS street (Manggala)	13.7	128.9	39.3	5.9	19.0	48.5	152.3	0.002	15-May-07
Environmental Standard	National standard for ambient air quality *2)									
	measured duration 1 hour	900	30,000	400	235	-	-	-	-	-
	measured duration 3 hours	-	-	-	-	160	-	-	-	-
	measured duration 24 hours	365	10,000	150	-	-	150	230	2.00	-
	Local standard for ambient air quality *3)									
	measured duration 1 hour	900	30,000	400	230	-	-	-	-	-
	measured duration 3 hours	-	-	-	-	160	-	-	-	-
	measured duration 24 hours	360	10,000	150	-	-	150	230	2.00	-

Notes:  Exceeding the standard value

Source:

\*1) Sulawesi Road M/P & F/S JICA study team data Year 2007

\*2) Government Regulation regarding Control of Air Pollution No.41-1999

\*3) Governor's Regulation of South Sulawesi Province No. 14-2003

\*4) Governor's Dgree of the Minister for Environment concerning Guidekines for Establishment of Environmental Quality Standards No.2-1988

\*5) Governor's Dgree of South Sulawesi Province No.465-1995

**Figures 8.9.1 to 8.9.3** show the locations of on-site survey points and areas regarding air quality, noise, water quality, flora and fauna.

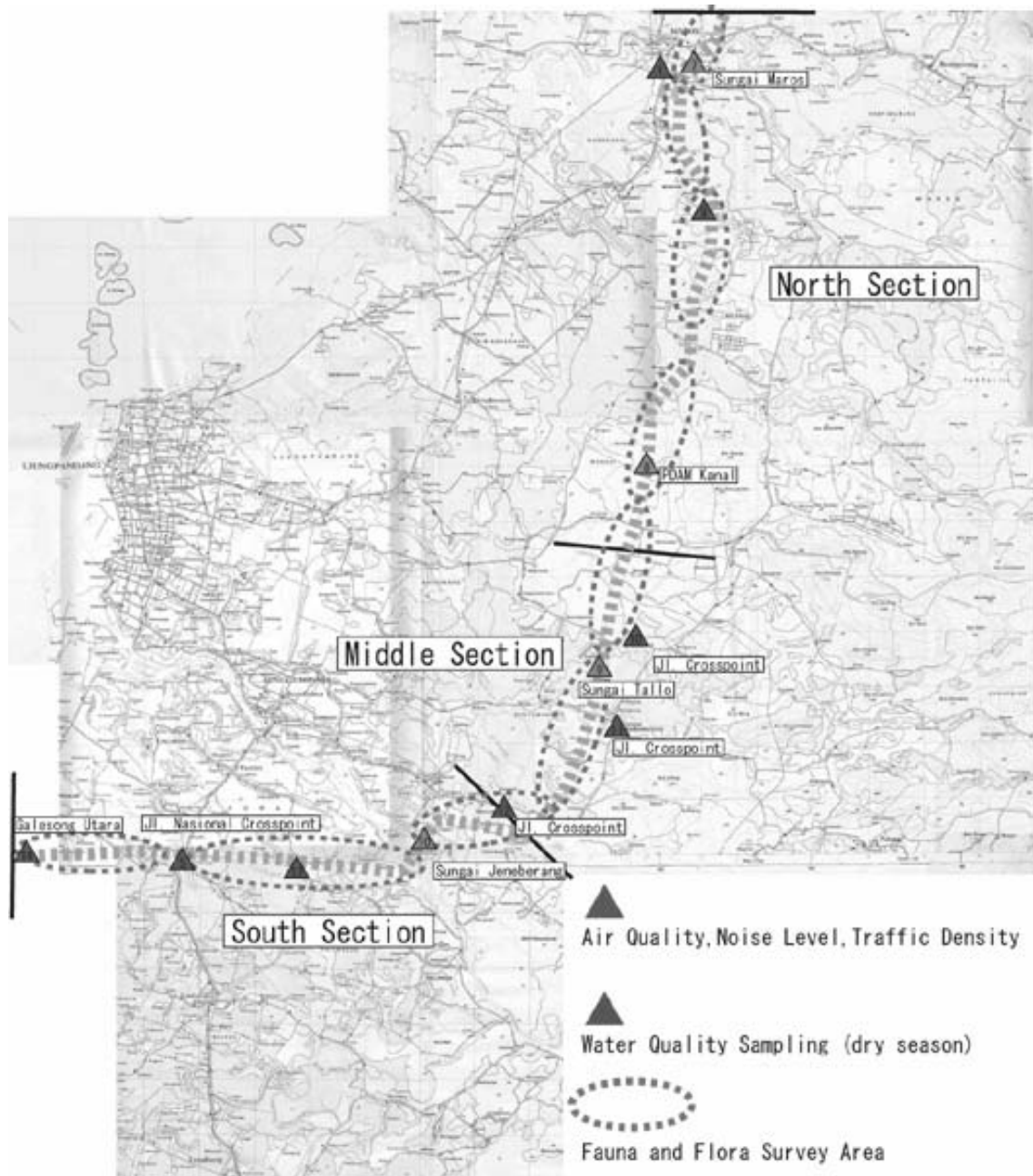


Figure 8.9.1 On-site Survey Points (Mamminasata Bypass)

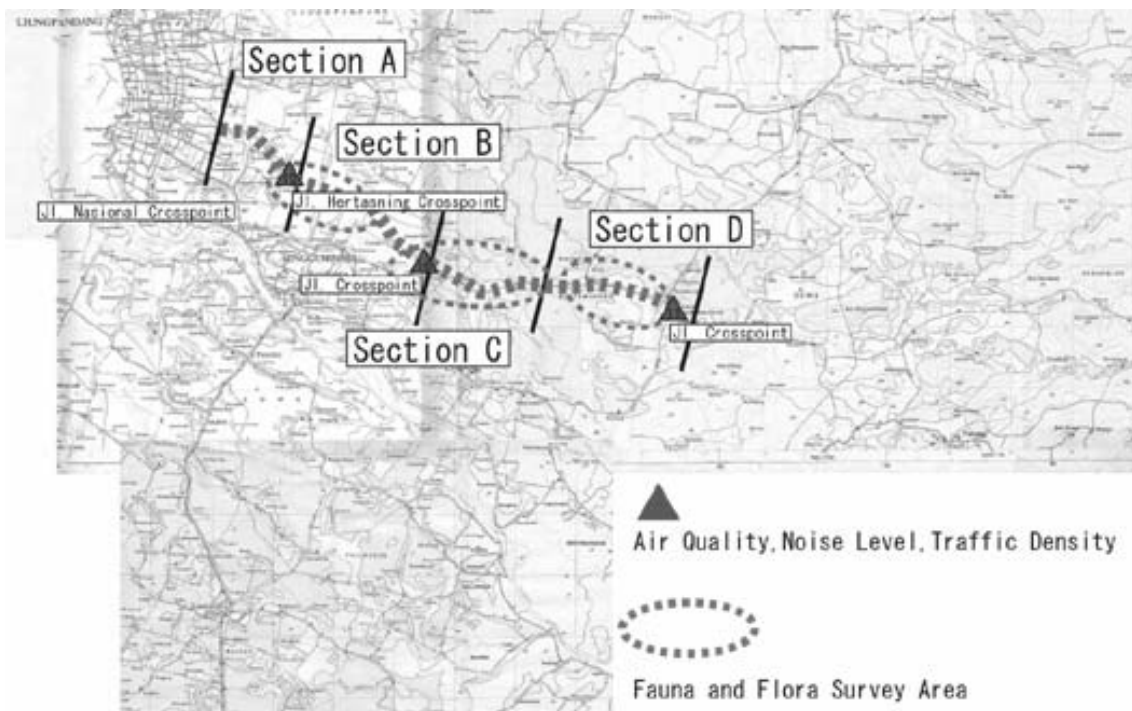


Figure 8.9.2 On-site Survey Points (Hertasning Road)

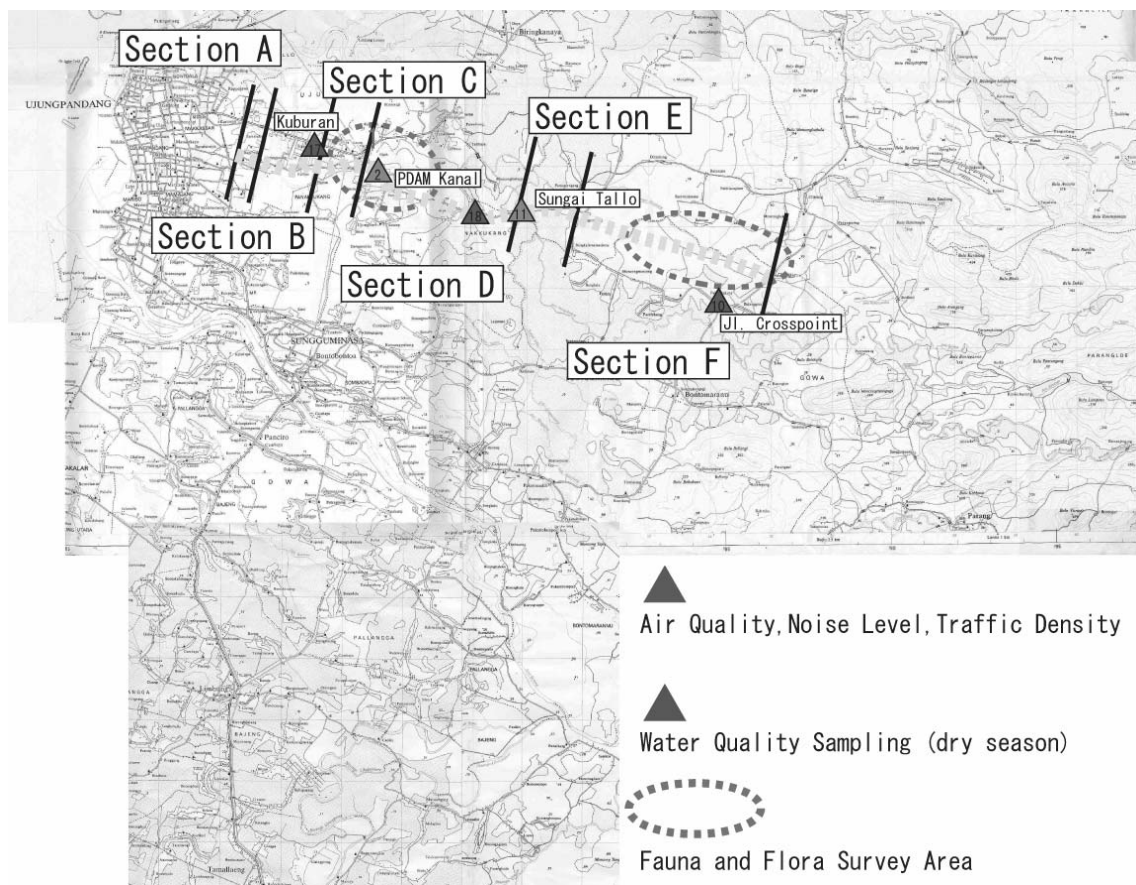


Figure 8.9.3 On-site Survey Points (Abdullah Daeng Sirua Road)



b) Noise Level

A summary of noise measurements along the Project road is shown in **Table 8.9.2**. All noise levels in the daytime along the national road and in the city area exceeded the Environmental Standard for commercial and service areas. The noise levels in the night time are mostly less than the admissible limit. The maximum noise levels are almost 80 dB(A) at Barombong point, Hertasing street and Batua Raya street.

**Table 8.9.2 Noise Level Survey Results of Proposed Project Road**

	NO.	L <sub>50</sub>		Average	Max L <sub>50</sub>	Remarks (data)
		daytime	night			
Mamminasa Bypass	1 Kantor Bupati Maros	72.8	66.2	69.5	77.2	1-May-07
	5 Baronbong (National road)	70.9	62.3	66.6	79.2	8-May-07
	9 Moncongloe (Maros)	66.2	59.1	62.6	70.2	14-May-07
	10 Panaikang (Gowa)	60.0	52.8	56.4	67.2	23-May-07
	11 Bontmaranu (Gowa)	60.9	51.9	56.4	67.3	22-May-07
	12 Malino street (Gowa)	69.8	56.7	63.3	71.9	21-May-07
	13 Bajeng (Gowa)	58.6	50.9	54.7	64.0	19-May-07
	14 Galesong Utara (Takalar)	58.8	49.5	54.1	67.8	18-May-07
Hertasing road	11 Bontmaranu (Gowa)	60.9	51.9	56.4	67.3	22-May-07
	15 Hertasing street	74.4	59.9	67.2	79.0	4-May-07
	16 Samata (Gowa)	64.0	55.9	60.0	66.6	24-May-07
ADS road	10 Panaikang (Gowa)	60.0	52.8	56.4	67.2	23-May-07
	17 Batua Raya street	72.2	64.7	68.3	78.9	16-May-07
	18 ADS street (Manggala)	65.9	51.2	58.6	69.5	15-May-07
Environmental Standard	Area classification		National	Provincial		
	Commercial and Service		70.0	70.0		
	Industry		70.0	70.0		
	Office Buildings and Commercial		65.0	65.0		
	Recreation		70.0	65.0		
	Government and Public Facilities		60.0	60.0		
	Housing and Settlement		55.0	55.0		
	Green Open Space		50.0	50.0		

Notes:  Exceeding the standard value (Maximum Environmental Standard: 70dB(A))

Source : Sulawesi Road M/P & F/S JICA study team data Year 2007

c) Water Pollution

The results of quality tests of water sampled along the Project road are summarized in **Table 8.9.3**. Several values exceed the River Water Quality Standards but are still not so big.

The TSS density is relatively high as a characteristic of Indonesia, however the TSS value recorded at all survey points is below the Environmental Standard. BOD<sub>5</sub> values are also relatively low for the reason that the sampling points are not located in the high population density area.



**Table 8.9.3 Water Level Survey Results of Proposed Project Road**

Parameters	Governmental Regulations No.82-2001				Unit	2	7	8	9	10	11
	Class I	Class II	Class III	Class IV		25-May-07	24-May-07	25-May-07			
						PDAM canal in Makassar	Maros river	PDAM canal in Maros	Tallo river (Bypass)	Jeneberang river (Bypass)	Tallo river (ADS road)
<b>Physical :</b>											
Temperature	±3°C	±3°C	±3°C	±5°C	°C	29	30	29.5	31.1	30.3	29.5
Color	(-)	(-)	(-)	(-)	TCU	5	8	12	10	30	10
Total Suspended Solid (TSS)	50	50	400	400	mg/l	3.6	18.4	32.8	4.8	11.6	39.6
Electric Conductivity	(-)	(-)	(-)	(-)	µS/cm	111	628	111	66	29	100
<b>Chemical</b>											
pH	6-9	6-9	6-9	5-9	-	7.9	7.5	7.8	7.7	7.7	7.8
BOD <sub>5</sub>	2	3	6	12	mg/l	3.78	5.072	0.483	1.932	2.310	0.242
COD	10	25	50	100	mg/l	4.94	6.25	1.03	4.11	3.07	0.32
Dissolved Oxygen (DO)	6	4	3	0	mg/l	7.991	7.140	8.043	7.980	7.938	7.980
Phosphorus (P)	0.2	0.2	1.0	5.0	mg/l	0.006	0.001	0.004	0.005	0.003	0.006
Nitrate (NO <sub>3</sub> -N)	10	10	20	20	mg/l	ttd	0.003	ttd	ttd	0.001	0.001
Amonium (NH <sub>3</sub> -N)	0.5	(-)	(-)	(-)	mg/l	0.009	0.055	0.006	0.009	0.025	0.016
Cadmium (Cd)	0.01	0.01	0.01	0.01	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Chromium (Cr <sup>6+</sup> )	0.05	0.1	0.1	1.0	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Copper (Cu)	0.02	0.02	0.02	0.20	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Iron (Fe)	0.30	(-)	(-)	(-)	mg/l	0.171	0.101	0.076	0.120	0.51	0.137
Lead (Pb)	0.03	0.03	0.03	1.0	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Mangan (Mn)	0.10	(-)	(-)	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Mercury (Hg)	0.001	0.002	0.002	0.005	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Zinc (Zn)	0.05	0.05	0.10	2.00	mg/l	ttd	0.0021	ttd	ttd	ttd	ttd
Chloride (Cl)	600	(-)	(-)	(-)	mg/l	4.11	62.44	4.93	3.29	2.46	4.93
Cyanide (CN)	0.02	0.02	0.02	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Fluorine (F)	0.50	1.50	1.50	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Nitrite (NO <sub>2</sub> -N)	0.06	0.06	0.06	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Sulphate (SO <sub>4</sub> )	400	(-)	(-)	(-)	mg/l	0.97	3.7	0.75	0.52	0.81	0.41
Free Chlorine (Cl <sub>2</sub> )	0.03	0.03	0.03	(-)	mg/l	0.0009	0.0018	0.0009	0.0009	0.0009	0.0009
Hydrogen Sulphide (H <sub>2</sub> S)	0.002	0.002	0.002	(-)	mg/l	ttd	0.006	0.004	0.004	0.003	0.003
Calcium Carbonate (CaCO <sub>3</sub> )	(-)	(-)	(-)	(-)	mg/l	44.04	38.03	50.05	23.02	24.02	22.02
Calcium (Ca)	(-)	(-)	(-)	(-)	mg/l	17.64	15.23	20.04	12.02	9.62	8.82
<b>Organic Chemical</b>											
Mineral oil	0.6	0.8	1.0	(-)	mg/l	0.8	ttd	1.2	0.4	1.6	2.0
Detergent	0.1	0.1	0.1	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
Phenol compounds	0.001	0.001	0.001	(-)	mg/l	ttd	ttd	ttd	ttd	ttd	ttd
<b>Bacteriology :</b>											
Fecal Coliform	100	1,000	2,000	2,000	MPN/100ml	0	0	0	0	0	0
Total Coliforms	1,000	5,000	10,000	10,000	MPN/100ml	17	94	26	70	49	79

Notes:  Exceeding the standard

Source : Mamminasata JICA study team data Year 2006

Remarks: ttd means below the limit value of quantitative analysis

## d) Biology (Flora and Fauna)

The scope of works for the Mamminasata Bypass consists of new road construction. For the Hertasing Road (Section D), it is widening of the existing road. The Abdullah Daeng Sirua Road (Sections A~C) passes through the urban area of Makassar City and Sections D~F pass through the rural area. Only Section F is a new road. The Abdullah Daeng Sirua road crosses the Tallo River between Sections D and E.

## i) Mamminasata Bypass

During the field reconnaissance around small rivers and paddy fields such birds like waterfowls that are mainly egrets, herons were observed. The existing species are common ones in the rural area of South Sulawesi and the protected birds are confirmed by on-site survey. But no endemic mammals were observed in the project area.

**Table 8.9.4 Survey Results of Fauna (Birds in Mamminasa Bypass South Section)**

No.	Local Name	Species Name	Individual Number
1	layang-layang	<i>Hirundo tahitica</i>	12
2	kacamata	<i>Zosterops chloris</i>	2
3	kuntul kerbau	<i>Egretta intermedia</i>	3
4	kepudang	<i>Lonchura molucca</i>	1
5	kutilang	<i>Pygnonotus aurigaster</i>	14
6	burung gereja	<i>Passer montanus</i>	5
7	raja udang	<i>Halcyon chloris</i>	2
8	bondol kepala pucat	<i>Lonchura pallida</i>	2
9	bondol kepala hitam	<i>Lonchura molucca</i>	7
10	bondol kepala putih	<i>Lonchura palida</i>	5
11	kepudang sungubelang	<i>Coracina bicolor</i>	3
12	burung madu	<i>Nectarinia jugularis</i>	1
Total Spesies			12
Total Individual Number			57

**Table 8.9.5 Survey Results of Fauna (Birds in Mamminasa Bypass Middle Section)**

No.	Local Name	Species Name	Individual Number
1	layang-layang	<i>Hirundo tahitica</i>	6
2	kacamata	<i>Zosterops chloris</i>	2
3	kepudang	<i>Oriouls chinensis</i>	1
4	burung gereja	<i>Passer montanus</i>	12
5	bondol kepala hitam	<i>Lonchura molucca</i>	2
Total Spesies			5
Total Individual Number			23

**Table 8.9.6 Survey Result of Fauna (Birds in Mamminasa Bypass North Section)**

No.	Local Name	Species Name	Individual Number
1	layang-layang	<i>Hirundo tahitica</i>	34
2	kacamata	<i>Zosterops chloris</i>	6
3	kuntul perak	<i>Egretta intermedia</i>	12
4	kuntul kerbau	<i>Bubulcus ibis</i>	38
5	kutilang	<i>Pygnonotus aurigaster</i>	14
6	burung gereja	<i>Passer montanus</i>	5
7	raja udang	<i>Halcyon chloris</i>	1
8	bondol kepala hitam	<i>Lonchura molucca</i>	12
9	bangau abu2	<i>Egretta sp.</i>	1
10	kepudang sungu	<i>Coracina bicolor</i>	1
11	merpati		4
Total Spesies			11
Total Individual Number			128

Vegetation consists mostly of planted species along the proposed road such as mango trees, coconuts, bananas, other fruit trees, and so on. It seems that the precious vegetation species listed or designated in the standards of Indonesia are not found around the project area. The project road passes almost through paddy fields.

ii) Hertasning Road

The proposed road for F/S is only Section D located in the rural area of Gowa. Some birds like

waterfowls consisting mainly of egrets, wild ducks, kingfishers, etc. were observed. These species are common ones in the rural area and on mammals were observed in the project area.

**Table 8.9.7 Survey Results of Fauna (Birds in Hertasing Road)**

No.	Local Name	Species Name	Individual Number
1	burung gereja	<i>Passer montanus</i>	30
2	kepodang	<i>Oriouls chinensis</i>	2
3	kacamata	<i>Zosterops chloris</i>	4
4	layang-layang	<i>Hirundo tahitica</i>	39
5	bangau putih	<i>Egretta intermedia</i>	8
6	bangau abu2	<i>Ardeola speciosa</i>	2
7	bondol kepala pucat	<i>Lonchura pallida</i>	13
8	bondol kepala hitam	<i>Lonchura molucca</i>	6
Total Spesies			8
Total Individual Number			104

Vegetation consists mostly of planted species along the proposed road alignment. It seems that the vegetation species that are found in/around Section D are not essential ones to be protected by regulations.

iii) Abdullah Daeng Sirua Road

It was not observed in the previous investigation and on-site survey that endemic and protected species of flora and fauna inhabit in/around the project road. Only the presence of common species of flora and fauna was confirmed. The precious diversity of biota was not reported and discovered too.

**Table 8.9.8 Survey Result of Fauna (Birds in Abdullah Daeng Sirua Road)**

No.	Local Name	Species Name	Individual Number
1	layang-layang	<i>Hirundo tahitica</i>	49
2	kutilang	<i>Pygnonotus aurigaster</i>	29
3	tikusan	<i>Rallina eurizonoides</i>	1
4	bondol kepala pucat	<i>Lonchura pallida</i>	3
5	burung gereja	<i>Passer montanus</i>	26
6	kacamata	<i>Zosterops chloris</i>	4
7	burung madu	<i>Nectarinia jugularis</i>	2
8	bondol kepala hitam	<i>Lonchura molucca</i>	9
9	kuntul kerbau	<i>Egretta intermmedia</i>	6
10	raja udang	<i>Halcyon chloris</i>	3
Total Spesies			10
Total Individual Number			132

**(2) Prospect and Estimation Method**

a) Air Pollution

The prospect method for air quality is the same as for the Trans-Sulawesi Road Mamminasata Section. The air pollution in future was predicted by the mathematical method applying the fluctuation ratio in total exhaust volume.

The air quality was also estimated by the same method of comparison with the Environmental

Standard in principle.

b) Noise Level

The prospect method for noise level is the same as for the Trans-Sulawesi Road Mamminasata Section. The Mamminasa Bypass is classified as a national road, while the Hertasning and Abdullah Daeng Sirua Road are city and/or prefectural roads.

The coefficients used in calculation formula are the same as for the Trans-Sulawesi Road Mamminasata Section.

The noise level was also estimated by the same method as for the Trans-Sulawesi Road Mamminasata Section, by comparing with the Environmental Standard.

c) Water Pollution

The prospect method for water pollution is also the same as for the Trans-Sulawesi Road Mamminasata Section, applying the perfect mixed formula. The water pollution was estimated by the same method as for the Trans-Sulawesi Road Mamminasata Section, by comparing with the Environmental Standard.

d) Flora and fauna

The prospect method for flora and fauna is also the same as for the Trans-Sulawesi Road Mamminasata Section. But as these project roads pass through the rural area and some copses, it was assumed that the possibility of existence of habitations of endangered and protected species is relatively high. Especially, it is necessary to consider and observe the flora and fauna along the proposed route of the Mamminasa Bypass.

**(3) Results of Prospect and Mitigations**

a) Air Pollution

The number of vehicles on the target roads by section is estimated in **Tables 8.9.9 to 8.9.11**.

The average traffic volume of the Mamminasa Bypass in 2023 is predicted to be over 20,000 in daytime. The traffic volume of Section D of the Hertasning Road in 2023 will be predicted to be around 2 times as much as the traffic volume in 2005.

**Table 8.9.9 Traffic Demand Forecast for 2023 (Mamminasa Bypass)**

Section	2005							2023						
	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total
S-1	-	-	-	-	-	-	-	12,178	3,864	442	1,134	3,486	6,774	27,878
S-2	-	-	-	-	-	-	-	16,592	5,214	1,050	1,722	5,526	7,068	37,172
S-3	-	-	-	-	-	-	-	16,592	5,214	1,050	1,722	5,526	7,068	37,172
S-4	-	-	-	-	-	-	-	12,310	5,134	714	842	2,908	4,288	26,196
S-5	-	-	-	-	-	-	-	5,732	560	388	408	1,764	1,270	10,122
M-1	-	-	-	-	-	-	-	6,874	2,908	498	548	2,158	2,260	15,246
M-2	-	-	-	-	-	-	-	6,874	2,908	498	548	2,158	2,260	15,246
M-3	-	-	-	-	-	-	-	7,798	1,880	642	695	2,927	1,474	15,416
M-4	-	-	-	-	-	-	-	7,798	1,880	642	695	2,927	1,474	15,416
M-5	-	-	-	-	-	-	-	13,774	654	470	579	3,183	1,230	19,890
N-1	-	-	-	-	-	-	-	16,641	942	478	604	2,262	1,520	22,447
N-2	-	-	-	-	-	-	-	16,296	898	478	592	2,162	1,520	21,946
N-3	-	-	-	-	-	-	-	11,955	898	510	712	2,784	1,766	18,625
N-4	-	-	-	-	-	-	-	8,560	702	430	538	1,938	1,574	13,742
N-5	-	-	-	-	-	-	-	6,528	702	408	502	1,836	1,388	11,364
N-6	-	-	-	-	-	-	-	15,606	3,154	1,420	2,074	6,992	4,156	33,402
N-7	-	-	-	-	-	-	-	16,152	3,154	1,434	2,102	7,050	4,156	34,048
N-8	-	-	-	-	-	-	-	8,438	1,294	960	1,018	2,734	2,670	17,114
N-9	-	-	-	-	-	-	-	11,738	2,452	1,068	1,644	5,564	2,828	25,294

**Table 8.9.10 Traffic Demand Forecast for 2023 (Hertasing Road)**

Section	2005							2023						
	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total
A-1	12,522	5,190	248	1,228	860	15,570	35,618	17,972	6,832	300	1,436	1,136	13,820	41,496
A-2	7,498	4,448	260	856	1,138	9,564	23,764	11,969	4,826	228	894	1,202	9,678	28,797
A-3	6,530	4,052	230	668	1,038	7,020	19,538	9,818	4,598	211	616	520	7,198	22,961
B-1	7,902	2,412	756	1,100	5,158	4,654	21,982	12,202	5,748	404	791	3,557	6,024	28,726
B-2	7,902	2,412	756	1,100	5,158	4,654	21,982	12,202	5,748	404	791	3,557	6,024	28,726
B-3	6,046	2,070	608	928	4,686	1,552	15,890	11,686	5,574	386	767	3,389	5,142	26,944
C	6,046	2,070	608	928	4,686	1,552	15,890	8,068	5,698	394	563	2,615	2,812	20,150
D	4,152	294	352	488	2,274	214	7,774	8,956	560	550	616	2,454	324	13,460

**Table 8.9.11 Traffic Demand Forecast for 2023 (Abdullah Daeng Sirua Road)**

Section	2005							2023						
	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total
A	5,714	2,928	109	533	739	5,907	15,930	3,868	1,664	12	234	508	1,862	8,148
B	2,267	746	139	274	401	3,146	6,973	8,354	4,704	76	642	184	9,736	23,696
C	4,755	918	194	480	598	3,642	10,587	8,354	4,704	76	642	184	9,736	23,696
D-1	4,755	918	194	480	598	3,642	10,587	21,241	5,438	491	1,839	3,405	13,150	45,564
D-2	4,760	4	138	190	575	187	5,854	11,721	4,324	283	1,233	2,697	6,762	27,020
D-3	4,760	4	138	190	575	187	5,854	11,721	4,324	283	1,233	2,697	6,762	27,020
E	4,760	4	138	190	575	187	5,854	14,991	1,248	332	733	3,353	2,980	23,637
F-1	-	-	-	-	-	-	-	14,991	1,248	332	733	3,353	2,980	23,637
F-2	-	-	-	-	-	-	-	12,744	1,068	304	374	1,608	1,442	17,540

The results of prospect of ambient air quality along the project area are shown in **Table 8.9.12**. All air quality values do not exceed the Environmental Standard, but the values of total suspended particulate (TSP) and PM<sub>10</sub> are relatively high. It is considered that TSP and PM<sub>10</sub> can be controlled by spraying water, road side plantation, cleaning of road and maintenance of pavement.

**Table 8.9.12 Results of Prospect of Air Quality in 2023**

	NO.	SO <sub>2</sub>	CO	NO <sub>2</sub>	O <sub>3</sub>	HC	PM <sub>10</sub>	TSP	Pb	
		μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	μ g/Nm <sup>3</sup>	
Mamminasa Bypass	1 Kantor Bupati Maros	9.6	81.8	23.6	2.7	12.4	40.4	137.7	0.001	
	5 Baronbong (National road)	11.2	82.1	32.6	3.4	15.3	61.1	116.8	0.000	
	9 Moncongloe (Maros)	11.1	111.9	33.6	5.2	47.5	59.9	170.2	0.001	
	10 Panaikang (Gowa)	10.7	84.9	37.3	3.8	38.8	56.1	120.0	0.001	
	11 Bontmaranu (Gowa)	9.6	86.4	29.6	3.8	28.4	54.1	95.0	0.001	
	12 Malino street (Gowa)	10.1	85.0	24.3	2.3	23.8	42.8	99.5	0.000	
	13 Bajeng (Gowa)	10.7	87.8	27.1	3.2	13.8	48.9	122.3	0.000	
	14 Galesong Utara (Takalar)	13.2	89.7	40.2	6.1	13.7	67.0	119.2	0.001	
Hertasning road	11 Bontmaranu (Gowa)	9.6	86.4	29.6	3.8	28.4	54.1	95.0	0.001	
	15 Hertasning street	10.8	101.4	34.8	4.6	16.6	80.2	129.0	0.004	
	16 Samata (Gowa)	10.0	89.8	24.3	1.7	12.3	39.7	94.9	0.001	
ADS road	10 Panaikang (Gowa)	10.7	84.9	37.3	3.8	38.8	56.1	120.0	0.001	
	17 Battua Raya street	13.4	92.9	37.2	4.8	19.0	69.8	203.7	0.003	
	18 ADS street (Manggala)	16.6	139.0	51.1	8.8	33.3	56.7	190.1	0.002	
Environmental Standard	National standard for ambient air quality *2)									
	measured duration 1 hour	900	30,000	400	235	-	-	-	-	-
	measured duration 3 hours	-	-	-	-	160	-	-	-	-
	measured duration 24 hours	365	10,000	150	-	-	150	230	2.00	-
	Local standard for ambient air quality *3)									
	measured duration 1 hour	900	30,000	400	230	-	-	-	-	-
	measured duration 24 hours	360	10,000	150	-	-	150	230	2.00	-

Notes:   Exceeding the standard value

Source:

\*1) Sulawesi Road M/P &amp; F/S JICA study team data Year 2007

\*2) Government Regulation regarding Control of Air Pollution No.41-1999

\*3) Governor's Regulation of South Sulawesi Province No. 14-2003

\*4) Governor's Dgree of the Minister for Environment concerning Guidekines for Establishment of Environmental Quality Standards No.2-1988

\*5) Governor's Dgree of South Sulawesi Province No.465-1995

The mitigation measures against air pollution are the same as those for the Trans-Sulawesi Road Mamminasata Section.

#### b) Noise and Vibration

The results of prospect of noise level for the Mamminasa Bypass are shown in **Table 8.9.13**. The peak noise level at all sections exceeds the Environmental Standard (70 dB(A)) in commercial and service areas.

The results of prospect for the Hertasning Road are shown in **Table 8.9.14**. The peak noise level at all sections exceeds the Environmental Standard (70 dB(A)) in commercial and service areas. In Makassar city the noise level is relatively higher.

The results of prospect for the Abdullah Daeng Sirua Road are shown in **Table 8.9.15**. The peak noise level at all sections exceeds the Environmental Standard (70 dB(A)) in commercial and service areas. Especially, the noise level at Section D-1 which is the cross point of Middle Ring Road is assumed to be over 78 dB(A).

**Table 8.9.13 Results of Prospect of Noise Level in 2023 (Mamminasa Bypass)**

Section	2023							Noise level
	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	
S-1	12,178	3,864	442	1,134	3,486	6,774	27,878	73.0
S-2	16,592	5,214	1,050	1,722	5,526	7,068	37,172	73.0
S-3	16,592	5,214	1,050	1,722	5,526	7,068	37,172	73.9
S-4	12,310	5,134	714	842	2,908	4,288	26,196	72.2
S-5	5,732	560	388	408	1,764	1,270	10,122	70.4
M-1	6,874	2,908	498	548	2,158	2,260	15,246	71.9
M-2	6,874	2,908	498	548	2,158	2,260	15,246	72.0
M-3	7,798	1,880	642	695	2,927	1,474	15,416	72.5
M-4	7,798	1,880	642	695	2,927	1,474	15,416	71.6
M-5	13,774	654	470	579	3,183	1,230	19,890	72.9
N-1	16,641	942	478	604	2,262	1,520	22,447	73.6
N-2	16,296	898	478	592	2,162	1,520	21,946	73.5
N-3	11,955	898	510	712	2,784	1,766	18,625	72.4
N-4	8,560	702	430	538	1,938	1,574	13,742	71.4
N-5	6,528	702	408	502	1,836	1,388	11,364	70.8
N-6	15,606	3,154	1,420	2,074	6,992	4,156	33,402	73.4
N-7	16,152	3,154	1,434	2,102	7,050	4,156	34,048	74.4
N-8	8,438	1,294	960	1,018	2,734	2,670	17,114	71.8
N-9	11,738	2,452	1,068	1,644	5,564	2,828	25,294	74.1

Remaks: Noise level is shown as peak (maximum level).

**Table 8.9.14 Results of Prospect of Noise Level in 2023 (Hertasing Road)**

Section	2023							Noise level
	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	
A-1	17,972	6,832	300	1,436	1,136	13,820	41,496	78.2
A-2	11,969	4,826	228	894	1,202	9,678	28,797	75.4
A-3	9,818	4,598	211	616	520	7,198	22,961	74.2
B-1	12,202	5,748	404	791	3,557	6,024	28,726	76.1
B-2	12,202	5,748	404	791	3,557	6,024	28,726	76.1
B-3	11,686	5,574	386	767	3,389	5,142	26,944	75.2
C	8,068	5,698	394	563	2,615	2,812	20,150	74.0
D	8,956	560	550	616	2,454	324	13,460	74.2

**Table 8.9.15 Results of Prospect of Noise Level in 2023 (Abdullah Daeng Sirua Road)**

Section	2023							Noise level
	Car/Taxi	Mini Bus	Large Bus	Pickup	Truck	Motorcycle	Total	
A	3,868	1,664	12	234	508	1,862	8,148	75.0
B	8,354	4,704	76	642	184	9,736	23,696	75.2
C	8,354	4,704	76	642	184	9,736	23,696	74.3
D-1	21,241	5,438	491	1,839	3,405	13,150	45,564	78.3
D-2	11,721	4,324	283	1,233	2,697	6,762	27,020	75.7
D-3	11,721	4,324	283	1,233	2,697	6,762	27,020	74.9
E	14,991	1,248	332	733	3,353	2,980	23,637	74.7
F-1	14,991	1,248	332	733	3,353	2,980	23,637	74.7
F-2	12,744	1,068	304	374	1,608	1,442	17,540	74.6

Remaks: Noise level is shown as peak (maximum level).

### c) Water Pollution

Mitigation measures against water pollution consist of creating temporary sedimentation ponds at an early stage of the construction, steel sheet piling and/or other similar methods in order to avoid generating turbid water. In addition, the drainage water should be discharged after proper treatment

of TSS, pH, oil and grease.

At the operation phase, it is judged that there will be no wastewater discharge from the target road.

d) Flora and fauna

Almost all the project area is covered by cultivation land for paddy, vegetables, corn, etc. But copses remain in some parts of the project road area, so it cannot be denied that there is possible existence of natural habitat of endemic and protected flora and fauna. Therefore, if some unique species and/or other precious kinds to be conserved are found, it is necessary to take proper measures, i.e. limited protection zone, bedded in other place, etc.

Moreover, there are many fruit trees around the houses and in the project area. It is necessary to protect as many fruits trees as possible from the project impacts, because these fruits trees are resource of financial income for the residents in the surrounding areas. Design of buffer zones including some existing copses is very effective to ensure that the road project is eco-friendly.

## **8.9.2 Social Environment**

### **(1) Population**

The number of population in affected villages of the Abdullah Daeng Sirua, Hertasning and Maminasa bypass road development plan in total is 248,420 persons in 2006 according to House Hold Surveys. Project affected persons (direct and indirect) in Gowa and Maros Districts are the highest, followed by Makassar City and the lowest population rate is in Takalar District. The detail is presented in the following table.

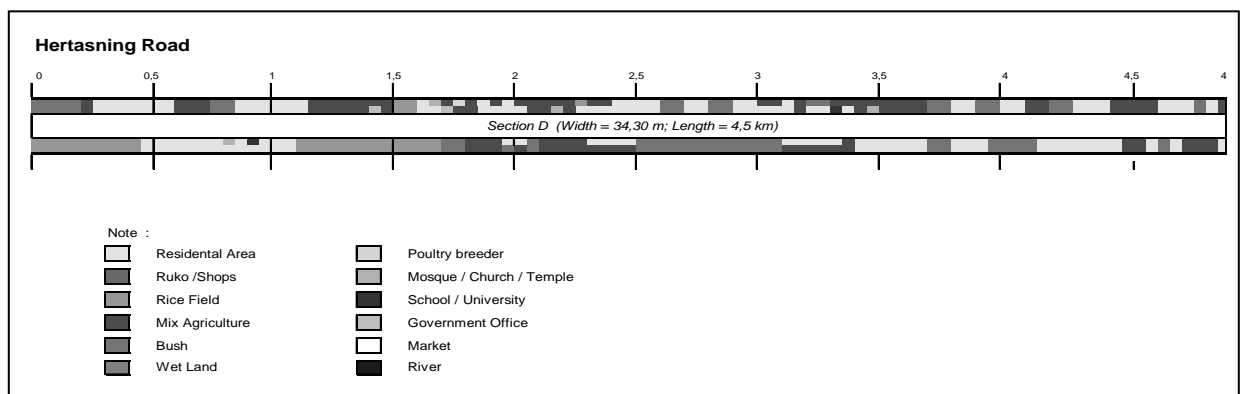
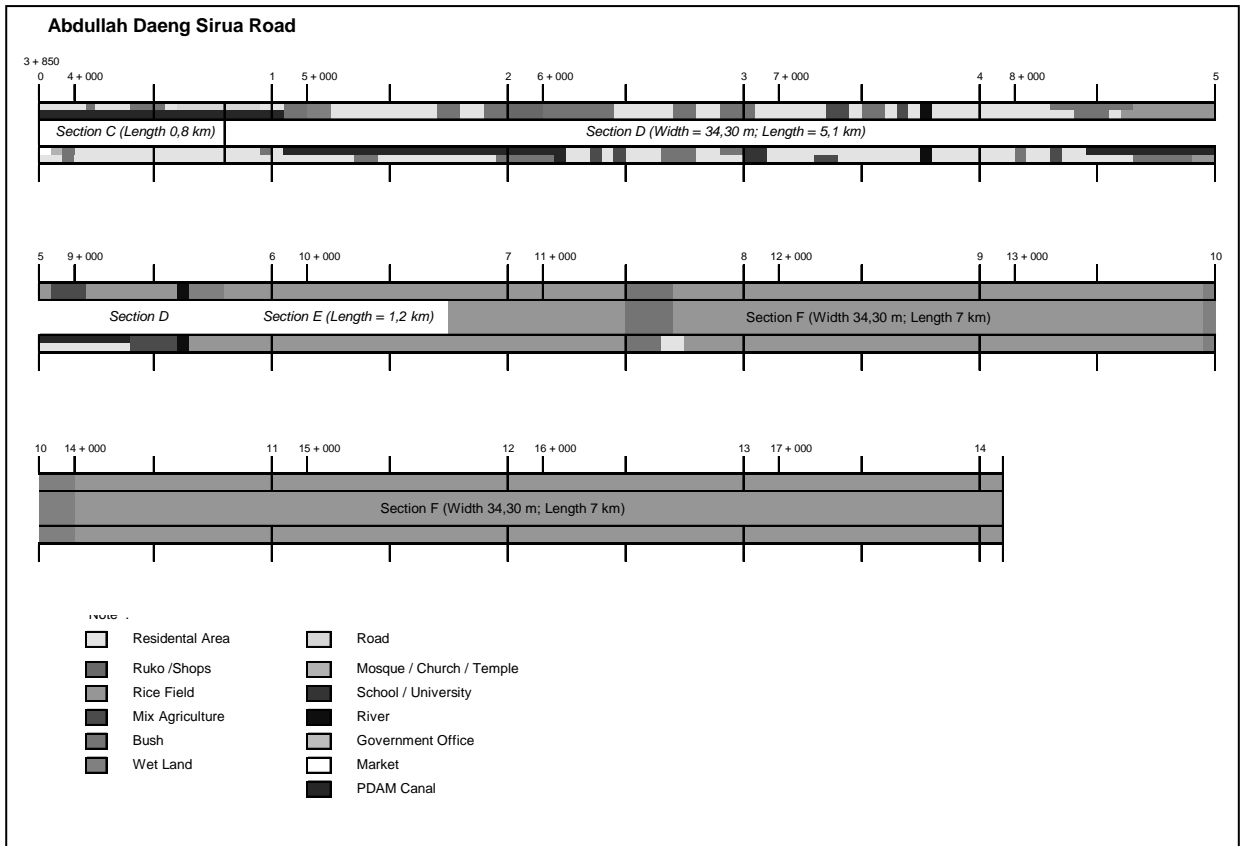


**Table 8.9.16 Population number of affected villages by Abdullah Daeng Sirua, Hertasing and Mamminasa bypass road development**

NO	District/sub-district	Populatiojn			Households
		Male	Female	JUMLAH	
I	Maros District				
1	Allepolea / Lau	3.325	3.349	6.674	1.669
2	Turikale / Turikale	1.963	2.779	4.742	1.186
3	Allirotengae / Turikale	3.414	2.371	5.785	1.446
4	Pettu Adae / Turikale	2.310	2.504	4.814	1.204
5	Adatongeng / Turikale	3.130	3.210	6.340	1.585
6	Taroada / Turikale	3.165	3.308	6.473	1.618
7	Bontoa / Mandai	3.581	3.517	7.098	1.775
8	Hasanuddin / Mandai	4.996	5.214	10.210	2.553
9	Bonto Matene / Mandai	2.522	2.566	5.088	1.272
10	Tenrigangkae / Mandai	1.560	1.697	3.257	814
11	Baji Mangngai	1.295	1.369	2.664	666
12	Pattontongan / Mandai	934	950	1.884	471
13	Bonto Marannu / Moncongloe	964	1.118	2.082	521
14	Bonto Bunga / Moncongloe	617	649	1.266	317
15	Moncongloe Bulu / Moncongloe	1.680	1.488	3.168	792
16	Moncongloe Lappara / Moncongloe	1.398	1.311	2.709	677
17	Moncongloe/Moncongloe	1.032	1.189	2.221	555
18	Damai/Tanralili	2.018	2.129	4.147	1.037
	<i>Total</i>	<b>39.904</b>	<b>40.718</b>	<b>80.622</b>	20.156
II	Gowa District				
1	Paccele kang / Pattallassang	1.264	1.391	2.655	664
2	Pattallassang / Pattallassang	1.545	1.508	3.053	763
3	Sunggumanai / Pattallassang	771	796	1.567	392
4	Timbuseng / Pattallassang	1.812	1.886	3.698	740
5	Pakkatto / Bonto Marannu	2.138	2.147	4.285	1.428
6	Bontomanai / Bonto Marannu	1.763	1.821	3.584	896
7	Sokkolia / Bonto Marannu	1.392	1.392	2.784	696
8	Bontoramba / Pallangga	1.897	1.943	3.840	768
9	Kampili / Pallangga	1.865	1.949	3.814	954
10	Toddotoa / Pallangga	1.388	1.949	3.337	834
11	Julupamai / Pallangga	1.223	1.273	2.496	624
12	Julubori / Pallangga	2.201	2.250	4.451	1.113
13	Pallangga / Pallangga	5.394	5.609	11.003	2.201
14	Julukanaya / Pallangga	1.995	2.014	4.009	802
15	Maradekaya / Bajeng	2.334	2.418	4.752	950
16	Bontosunggu / Bajeng	2.676	2.702	5.378	1.345
17	Panakkukang / Pallangga	2.063	2.160	4.223	1.056
18	Bungaejaya / Pallangga	1.359	1.407	2.766	553
19	Panciro / Bajeng	2.567	2.588	5.155	1.031
20	Tinggimae / Barombong	2.108	2.180	4.288	1.072
21	Moncobalang / Barombong	1.860	2.050	3.910	978
22	Biringngala / Barombong	1.381	1.343	2.724	681
	<i>Total</i>	<b>42.996</b>	<b>44.776</b>	<b>87.772</b>	<b>20.539</b>
III	Takalar District				
	Galesong Utara Sub-District				
1	Bonto Lebang	2.270	2.369	4.639	1.160
2	Tamalate	2.960	3.013	5.973	1.493
3	Bonto Lanra	1.959	2.051	4.010	1.003
4	Pakkabba	2.284	2.392	4.676	1.169
	<i>Jumlah</i>	<b>9.473</b>	<b>9.825</b>	<b>19.298</b>	4.825
IV	Makassar City				
1	Batua / Manggala	9.026	9.161	18.187	4.547
2	Antang / Manggala	7.900	8.069	15.969	3.992
3	Manggala/Manggala	8.275	8.808	17.083	4.271
4	Tello Baru / Panakkukang	4.720	4.769	9.489	2.372
	<i>Jumlah</i>	<b>29.921</b>	<b>30.807</b>	<b>60.728</b>	<b>15.182</b>
	<i>Total</i>	<b>122.294</b>	<b>126.126</b>	<b>248.420</b>	<b>60.701</b>

**(2) Land use by road sections**

Land use along the Abdullah Daeng Sirua road mainly agricultural area (62 %), bushes and wetland (12%), and residential area (21%). In the other hand Hertasing road dominated by residential area (41%), agricultural area (38%) and bushes (21%). Land use along Mamminasa bypass road mainly agricultural area (76 %), bushes and wetland (19%), and also residential area (4.6%). The detail is illustrated as follows:



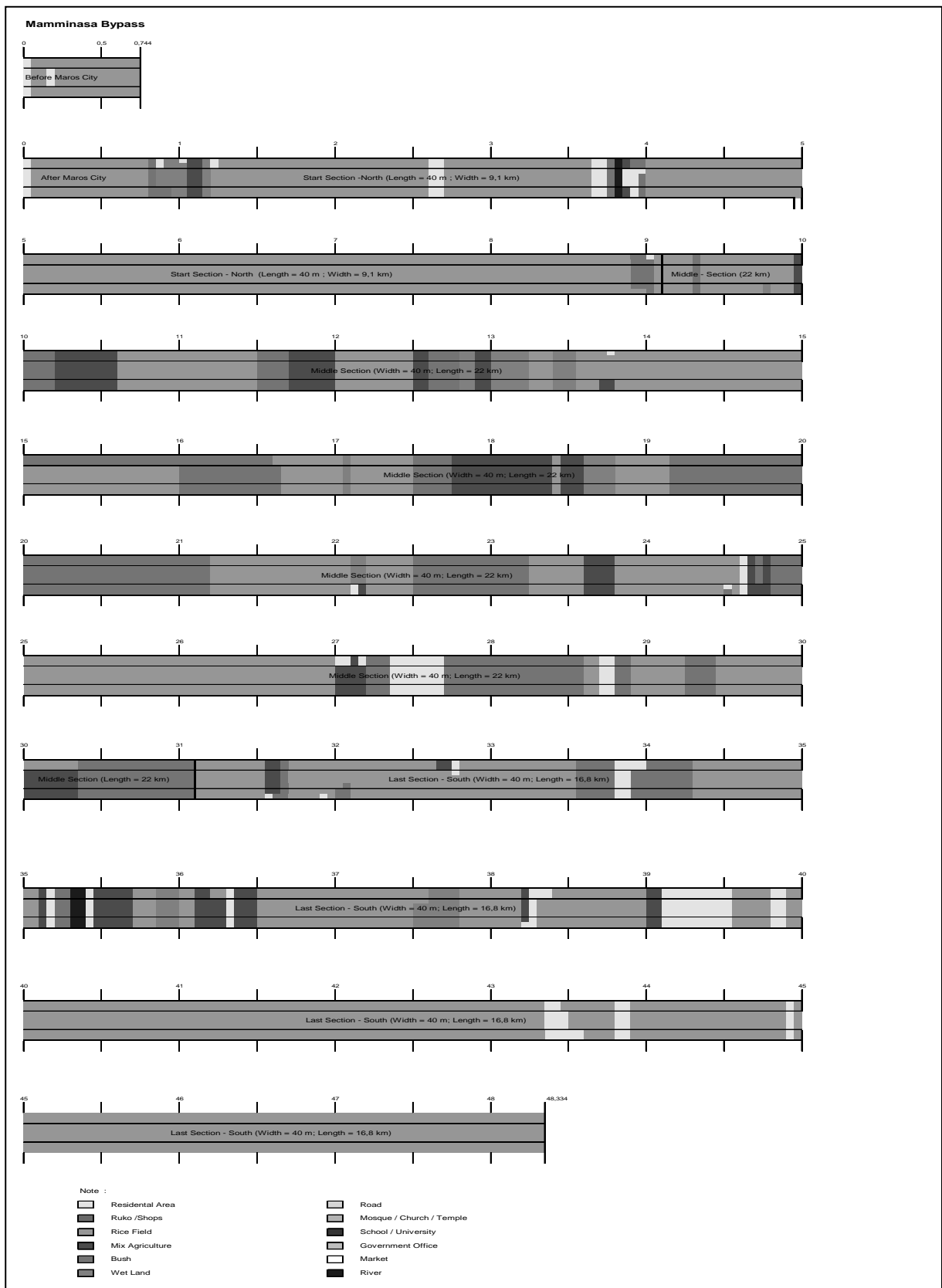


Figure 8.9.4 Illustration of land use in Abdullah Daeng Sirua, Hertasing and Mamminasa bypass road

### (3) Required Land Acquisition and Resettlement

Required land area in total is 6,650,000 m<sup>2</sup> atau 665 ha. The land use survey resulted the land size by land use category as follows

- a. Residential Area 704,800 m<sup>2</sup> or 70.48 ha
- b. Agricultural Land 4,690,500 m<sup>2</sup> or 469.05 ha
- c. Bush = 991,000 m<sup>2</sup> or 99.10 ha
- d. Wet land = 192,450 m<sup>2</sup> or 19.245 ha
- e. Others (canal of PDAM) = 71,250 m<sup>2</sup> or 7.125 ha

The land area by land use category for each road is presented in the following table.

**Table 8.9.17 Land use Category by Road development Plan**

Land	Land use Category	Length (m)	Width (m)	Total (m <sup>2</sup> )	Percentage (%)
<b>A. Mamminasa Bypass</b>					
1	<b>Total</b>	<b>49000</b>	<b>40</b>	<b>1960000</b>	
2	Residential Area	2500	40	100000	5.10
3	Agricultural Area	37000	40	1480000	75.51
4	Bush	8000	40	320000	16.33
5	Forest Land	-	40	0	0.00
6	Wet Land	1500	40	60000	3.06
					100.00
<b>B. Abdullah Daeng Sirua Road</b>					
1	<b>Total</b>	<b>17800</b>	<b>25</b>	<b>445000</b>	
2	Residential Area	4000	25	100000	22.47
3	Agricultural Area	10900	25	272500	61.24
4	Bush	1250	25	31250	7.02
5	Forest Land	0	25	-	-
6	Wet Land	550	25	13750	3.09
7	PDAM Canal	1100	25	27500	6.18
<b>C. Hertasning Road</b>					
1	<b>Total</b>	<b>4900</b>	<b>34</b>	<b>166600</b>	
2	Residential Area	2100	34	71400	42.86
3	Agricultural Area	1800	34	61200	36.73
4	Bush	1000	34	34000	20.41
5	Forest Land	0	-	0	-
6	Wet Land	0	-	0	-
<b>D. Total</b>				<b>2571600</b>	
Residential Area				271400	10.55
Agricultural Area				1813700	70.53
Bush				385250	14.98
Forest Land					
Wet Land				73750	2.87
PDAM Canal				27500	1.07

### (3) Project Affected Buildings

Buildings inventory in the location of Mamminasa Bypass, Abdullah Daeng Sirua Road and Hertasning Road is divided into four types, which are houses, shops, public buildings and street vendors. These four types of buildings will be divided again based on category as follow:

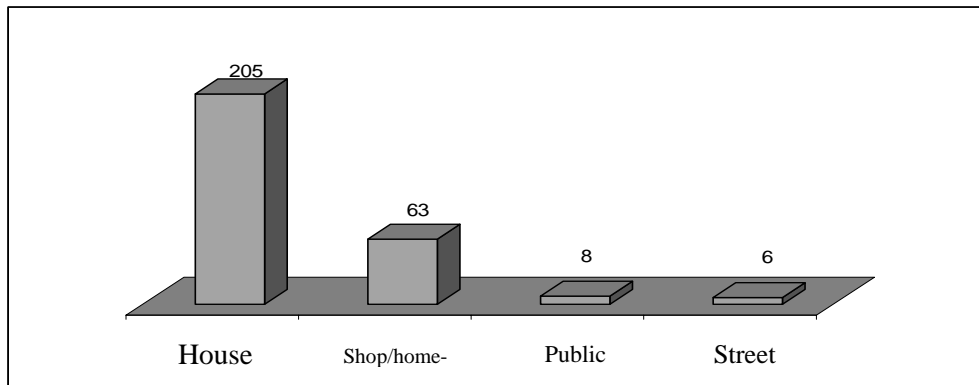
- a. Residential Houses is divided to 3 (three) categories, which are permanent, semi permanent and emergency/temporary buildings.
- b. Shops is divided to 3 (three) categories, which are permanent, semi permanent and temporary buildings.
- c. Public facility is divided to 4 (four) categories, which are governmental office, school, hospital/public health care and praying facility buildings.
- d. Street Vendors Kiosks

Based on inventory result on site, number of buildings that affected by project are 669 units in total, which consist of 544 houses, 97 shops and 16 public facilities. Total number of buildings directly affected by the project is 657 units.

**Table 8.9.18 Number and kind of buildings along the Abdullah Daeng Sirua, Hertasning and Bypass Mamminasa roads which are directly affected by the projects**

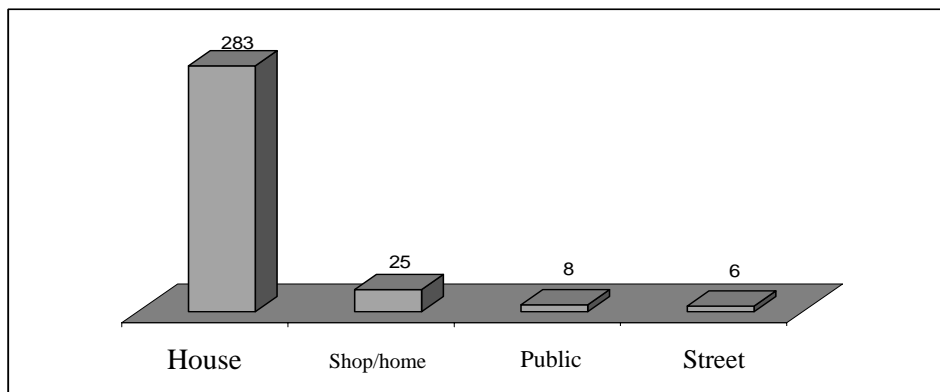
Roads	Kind of Buildings													
	Houses				Shops				Public Buildings					Street Vendors
	Permanent	Semi Permanent	Temporary Dwelling	Total	Permanent	Semi Permanent	Temporary	Total Shops	Government Office	School	Hospital/Clinic	Religions Building	Total	
Abd. Dg. Sirua	12	63	130	205	20	37	6	63	0	3	1	4	8	6
Hertasning	10	121	12	143	10	15	0	25	1	3	0	4	8	6
Mammimasa by pass	3	20	33	56	1	7	1	9	0	0	0	0	0	0
<b>Total</b>			Houses/Rumah	<b>404</b>			Shops/Toko-Ruko	<b>97</b>				Public buildings/Sarana P	<b>16</b>	<b>12</b>

Number of buildings in location on Hertasning Road is the most compacted part or the larger number of buildings that need to be acquired, then Abdullah Daeng Sirua Road because widened of the existing road. Section Mamminasa Bypass is new road development which mostly located in agriculture area, bush and swamp. Number of each building can be seen in following figures.



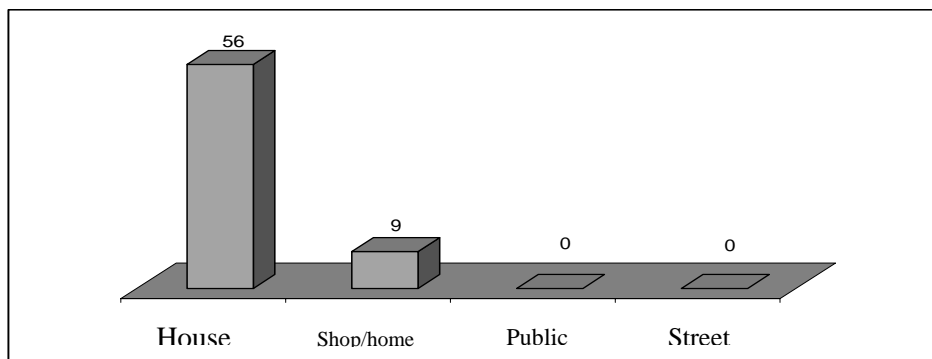
**Figure 8.9.5 Project Affected Buildings in Abdullah Daeng Sirua Road**

As shown above, the Abdullah Daeng Sirua Road is dominated by residential houses, which are 205 units and 63 shops, public facility buildings are 8 units and about 6 units of street vendor. In total, project affected buildings in this road are 276 units.



**Figure 8.9.6 Project Affected Buildings in Hertasing Road.**

Hertasing Road is dominated by residential houses (283 units). Other buildings are shops 25 units, public facility buildings 8 units and 6 unit street vendors. Total number of project affected buildings is 316 units.



**Figure 8.9.7 Project Affected Buildings in Mamminasa Bypass**

Project affected building in Mamminasa Bypass is dominated by houses (56 units) and 9 unit shops. Total number of project affected buildings in this road is 65 units.

Mamminasa Bypass, Abdullah Daeng Sirua and Hertasning Road Development Plan pass through 4 (four) District/municipality, which are Maros District, Makassar City, Gowa District and Takalar District.

Administratively, this road section is located in Daeng Sirua Road plan only in Makassar City (Manggala Sub-District. Hertasning road only in Gowa District (Pattallasang, and Somba Opu Sub-Districts). Mamminasa by pass pass through Maros District, (Turikale and Tanralili Sub-Districts), Gowa District (Pattallasang, Bontomarannu, Palangga, Bajeng, and Barombong Sub-Districts) and Takalar District (Galesong Utara Sub-District). Total number of project affected buildings in Makassar City are 282 units ( Daeng Sirua Road). Total number of project affected buildings in Gowa district is 381 units (322 units along Hertasning road and 49 units along Bypass Mamminasa road). Total number of project affected buildings in Maros district is 16 units (along Bypass Mamminasa road). While in Takalar District there is no affected building. Number of project affected buildings by districts for each road is presented in table as follows:

**Table 8.9.19 Number and Kinds of Buildings Affected by Projects in each District**

Abd. Daeng Sirua road

District/ Municipality	Sub District	Kind of Building													Street Vendor
		House				Shop				Public Building					
		Permanent	Semi Permanent	Temporary Dwelling	Total House	Permanent	Semi Permanent	Temporary	Total Shops	Government Office	School	Hospital/ Clinic	Religions Building	Total	
MAKASSAR	Manggala	12	63	130	205	20	37	6	63	0	3	1	4	8	6
<b>Grand TOTAL</b>		<b>12</b>	<b>63</b>	<b>130</b>	<b>205</b>	<b>20</b>	<b>37</b>	<b>6</b>	<b>63</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>4</b>	<b>8</b>	<b>6</b>

Hertasnign road

District/ Municipality	Sub District	Kind of Building													Street Vendor
		House				Shop				Public Building					
		Permanent	Semi Permanent	Temporary Dwelling	Total House	Permanent	Semi Permanent	Temporary	Total Shops	Government Office	School	Hospital/ Clinic	Religions Building	Total	
GOWA	Somba Opu	1	23	8	32	1	2	0	3	0	0	0	0	0	2
	Pattalassang	9	98	144	251	9	13	0	22	1	3	0	4	8	4
<b>Grand TOTAL</b>		<b>10</b>	<b>121</b>	<b>152</b>	<b>283</b>	<b>10</b>	<b>15</b>	<b>0</b>	<b>25</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>8</b>	<b>6</b>

Bypass Mamminasa road

District/ Municipality	Sub District	Kind of Building													Street Vendor
		House				Shop				Public Building					
		Permanent	Semi Permanent	Temporary Dwelling	Total House	Permanent	Semi Permanent	Temporary	Total Shops	Government Office	School	Hospital/ Clinic	Religions Building	Total	
MAROS	<b>TOTAL</b>	<b>0</b>	<b>8</b>	<b>2</b>	<b>10</b>	<b>1</b>	<b>4</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	Maros Baru	0	0	1	1	1	1	0	2	0	0	0	0	0	0
	Turikale	0	6	1	7	0	3	1	4	0	0	0	0	0	0
	Tanralili	0	2	0	2	0	0	0	0	0	0	0	0	0	0
GOWA	<b>TOTAL</b>	<b>3</b>	<b>12</b>	<b>31</b>	<b>46</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	Barombong	0	0	3	3	0	0	0	0	0	0	0	0	0	0
	Bajeng	2	0	10	12	0	1	0	1	0	0	0	0	0	0
	Pallangga	1	4	6	11	0	2	0	2	0	0	0	0	0	0
	Bontomarannu	0	4	6	10	0	0	0	0	0	0	0	0	0	0
TAKALAR	<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	Galesong Utara	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Grand TOTAL</b>		<b>3</b>	<b>20</b>	<b>33</b>	<b>56</b>	<b>1</b>	<b>7</b>	<b>1</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

<b>Total</b>		House /rumah	<b>544</b>		Shops/ Toko	<b>97</b>		Public Buildings /Sarana P	<b>16</b>	<b>12</b>
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#### (4) Results of Interview Survey

Socio-economic, cultural, and community health data were obtained through a series of questionnaire interviews of the people in the communities along the planned road sections of the

Mamminasa Bypass, Abdullah Daeng Sirua Road, and Hertasning Road. The total number of respondents was 40 including 10% of the households that will be subject to the direct impacts of this project (residents of the planned road development areas).

The number of respondents in each district/city was not always the same because of the difference in the number of villages in the respective regency/city where the planned roads pass through. As a result, the number of samples/respondents for the Hertasning Road was the largest because this road passes through the largest number of villages, and that for the Mamminasa Bypass was the smallest because this road passes through ten villages only.

**Table 8.9.20 Number of Respondents in Project Area**

No	Road Section	Number of Respondents
1	Mamminasa Bypass	10
2	Abdullah Daeng Sirua Road	14
3	Hertasning Road	16
Total		40

Source: Interview Survey, 2007

**Table 8.9.21 Number of Respondents by Age Group**

No	Age Group (Year)	Respondent	Percentage (%)
1	≤ 19	1	2,5
2	20 – 39	6	15
3	40 – 59	22	55
4	≥ 60	11	27,5
Total		40	100

Source: Interview Survey, 2007

**Table 8.9.21** shows that the dominant age group of respondents (householders) in the planned road sections of the Mamminasa Bypass, Abdullah Daeng Sirua Road, and Hertasning Road is 40 - 59 years.

**Table 8.9.22 Educational Background of Respondents**

No	Education Background Level	Respondent	Percentage (%)
1	Drop-Out	19	47,5
2	Elementary	13	32,5
3	Junior High School	5	12,5
4	Senior High School	2	5
5	University	1	2,5
Total		40	100

Source: Analyzed Primary Data, 2007



**Table 8.9.22** shows that the educational level of the respondents within the study area is relatively varied. Respondents with drop out background are dominant, and those with university graduation background are rare in the project site.

**Table 8.9.23 Status of Respondents' Residency**

No	Residency Status (%)	Respondent	Percentage (%)
1	Ownership	40	100
2	Contract	0	0
3	Stay	0	0
Total		40	100

Source: Analyzed Primary Data, 2007

**Table 8.9.23** shows that most residents of the areas along the planned road sections of the Mamminasa Bypass, Abdullah Daeng Sirua Road, and Hertasning Road own lands. **Table 8.9.24** shows that the function of respondents' houses is dominantly for living. There are relatively many living-business places where the planned roads sections of the Mamminasa Bypass, Abdullah Daeng Sirua Road, and Hertasning Road pass through, but places for business solely are rarely found in the study area.

**Table 8.9.24 Function of Respondents' Houses**

No	House Function	Respondent	Percentage (%)
1	Place of Living	30	75
2	Place of Living and Business	10	25
3	Others	0	0
Total		40	100

Source: Analyzed Primary Data, 2007

**Table 8.9.25 Livelihood Type of Respondents**

No	Livelihood	Respondent	Percentage (%)
1	Merchant	5	12,5
2	Officer/Police/Army	1	2,5
3	Private Office	4	10
4	Retirement	0	0
5	Craftsman	4	10
6	Labor	3	7,5
7	Peasant	14	35
8	Others	9	22,5
Total		40	100

Source: Analyzed Primary Data, 2007

**Table 8.9.25** shows the various types of respondents livelihood. Mainly, the livelihood of the people in the regencies/cities includes peasant, merchant, private officer, craftsman, labor, and officer/police/army. The dominant livelihood is peasant, and people in the retirement and officer/police/army categories are very rarely found in the project site.

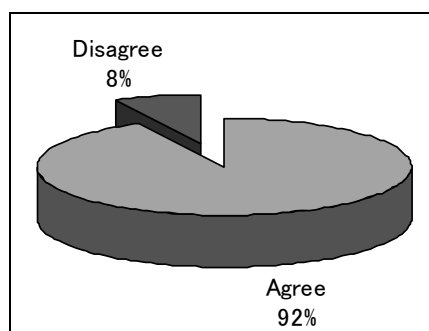
**Table 8.9.26 Respondents' Income Level**

No	Income Level (Rp)	Respondent	Percentage (%)
1	< 300.000	3	7,5
2	300.000 – 673.200	3	7,5
3	> 673.200	34	85
Total		40	100

Source: Analyzed Primary Data, 2007

**Table 8.9.26** shows that the income level of respondents is very varied and is dominantly above the Provincial Minimum Wage of Rp. 673,200. The respondents' income varies from Rp. 250,000 to Rp. 3,000,000 and trading activity is the biggest income source of the respondents. As a whole, the average income of respondents is above the Provincial Minimum Wage, reaching as much as Rp. 1,038,750 per month.

The perception of the community on road section development plan for the Mamminasa Bypass, Abdullah Daeng Sirua Road, and Hertasning Road need to be seriously considered because it is highly related to the successful of upcoming activities. The posture of the community here means its agreement to the project planning, and perception means the assessment and reaction of the community to the project planning.



**Figure 8.9.8 Behavior of Community toward Project Planning**

**Figure 8.9.8** demonstrates that the majority of communities agree with the road section development plan for the Mamminasa Bypass, Abdullah Daeng Sirua Road, and Hertasning Road and only a few of them disagree with the project planning. The knowledge of the community is highly related to these answers because most of the communities which do not agree consider the problem of compensation for houses/land as the main reason.

### 8.9.3 Summary of Impacts under AMDAL Impact Matrix

The following table summarizes the impacts under the AMDAL impact matrix, showing the major impacts during the pre-construction, construction and post-construction stages of the Mamminasa Bypass and 2 other roads.

**Table 8.9.27 The Matrix of Hypothetical Significant Impact of Mamminasa Bypass and Two Other Roads**

No	Activity Period Environment Component	Pre Construction Period		Construction Period							Post Construction Period	
		Re-measurement	Land Acquisition	Mobilization	Employment Procurement	Utility Mobilization	Venue Cleansing	Road/Bridge Construction	Facility/Infrastructure Construction	Operational	Maintenance	
I	CHEMISTRY - PHYSICS COMPONENT											
1.	Air Quality				- P		- P	- P				
2.	Hydrology							- P				
3.	Water Quality					- P						
4.	Road Infrastructure				- P							
5.	Traffic Flow				- P		- P	- P		+ P	- TP	
6.	Spatial, Terrain and Land		- TP									
II	BIOLOGY COMPONENT		- P							- P		
1.	Flora				- P							
2.	Fauna											
III	SOCIO CULTURAL – PUBLIC HEALTH COMPONENT						- P					
1.	People Perception											
2.	Working Opportunity	- TP	- P			- P						+ P
3.	Social Interaction			+ P								
4.	Historical Heritage		- TP									
5.	Public Health				- P		- P	- P				
6.	Median / Esthetic								+ P			

Category : P = Important                      - = Negative Impact

TP = Not Important                      + = Positive Impact

### **8.10 Environmental Management Plan (RKL)**

Effective environmental management during the pre-construction and construction stages requires the establishment of effective institutional arrangements for the implementation of the Environmental Management Plan (EMP or RKL in Indonesia). In general, any environmental management programme should be carried out as an integrated part of project planning and its execution, making a significant and continuous contribution to the overall development of the scheme. It must not be regarded merely as an activity limited to monitoring and regulating activities using a pre-determined checklist of required actions. Rather, it must interact dynamically as the project implementation proceeds, dealing flexibly with environmental impacts – both expected and unexpected as they arise. For this reason, the plan provides for periodic audits, which will evaluate compliance of on-site environmental management practices with the EMP requirements and also to refocus the plan itself in the light of experience and issues arising. The following is the proposed RKL for the Trans-Sulawesi Mamminasata Section Project.

**Table 8.10.1 Environmental Management Plan (RKL) for Trans-Sulawesi Mamminasata Section**

No.	ENVIRONMENT MANAGEMENT PLAN							
	AFFECTED PARAMETER / COMPONENT OF ENVIRONMENT	SOURCE OF IMPACT	STANDARD PARAMETER OF IMPACT	OBJECTIVE OF ENVIRONMENT MANAGEMENT PLAN	ENVIRONMENT MANAGEMENT	LOCATION OF ENVIRONMENT MANAGEMENT	PERIOD OF ENVIRONMENT MANAGEMENT	INSTITUTION OF ENVIRONMENT MANAGEMENT
	1	2	3	4	5	6	7	8
<b>I. PRE-CONSTRUCTION PERIOD</b>								
<b>1. Land Acquisition</b>								
	Disquiet of land owners which incurs the road location.	The land acquisition activity for the importance of Maros – Takalar road development.	The presence of land owners' fretfulness (fearfulness?) in the area of Maros – Takalar road.	Avoid the presence of land owners' fretfulness in the area of Maros – Takalar road.	<ul style="list-style-type: none"> <li>▪ Asking the local Mayor/Regent to establish the Land Acquisition Committee P<sub>2</sub>T which is attended by local community leaders.</li> <li>▪ Doing socialization in every period of land acquisition activity.</li> <li>▪ Giving compensation to the land and building owners at appropriate prices.</li> </ul>	The location of management is the Maros – Takalar road.	The period of environment management will be implemented before the engagement of Maros – Takalar road construction period.	<ul style="list-style-type: none"> <li>• <b>The Organizer of Environment Management:</b> The organizing institution of environment management is the project proponent, i.e. the Proponent and Administrator of Maros – Takalar road.</li> <li>• <b>The Supervisor of Environment Management:</b> The supervising institution of environment management includes the General Directorate of Highways, Department of Public Works and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li>• <b>Reporting the Result of Environment Management:</b> The report on environment management results is submitted to the General Directorate of Highways, Department of Public Works, and Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

No.	ENVIRONMENT MANAGEMENT PLAN							
	AFFECTED PARAMETER / COMPONENT OF ENVIRONMENT	SOURCE OF IMPACT	STANDARD PARAMETER OF IMPACT	OBJECTIVE OF ENVIRONMENT MANAGEMENT PLAN	ENVIRONMENT MANAGEMENT	LOCATION OF ENVIRONMENT MANAGEMENT	PERIOD OF ENVIRONMENT MANAGEMENT	INSTITUTION OF ENVIRONMENT MANAGEMENT
	1	2	3	4	5	6	7	8
<b>II. CONSTRUCTION PERIOD</b>								
<b>1. Material Mobilization</b>								
	<ul style="list-style-type: none"> <li>• Transportation infrastructures where transportation vehicles pass.</li> <li>▪ Dust in the community settlements in surrounding area of Maros – Takalar road.</li> <li>▪ Safety of other road users, especially along the Maros – Takalar road.</li> </ul>	Material transportation for the importance and needs of Maros – Takalar road development.	<ul style="list-style-type: none"> <li>• Breakage of road infrastructures.</li> <li>• Change of air quality that exceeds the regulated quality standard.</li> <li>• Presence of traffic accidents on the road where transportation vehicles pass.</li> </ul>	<ul style="list-style-type: none"> <li>• To reduce the breakage risk of road infrastructures where the transportation vehicles pass.</li> <li>• To minimize the dust concentration in surrounding areas of the road where transportation vehicles pass.</li> <li>• To avoid traffic accidents</li> </ul>	<ul style="list-style-type: none"> <li>▪ Adjusting the transported material volume with the road capacity, and improving the breakage of roads due to material transportation activities.</li> <li>▪ Closing the transported material with plastic mat and sprinkling water on roads to minimize floating dust.</li> <li>▪ Reducing the vehicles' speed when they pass the populated settlement area.</li> </ul>	The location of environment management is the Maros – Takalar road.	Environment management will be implemented during the material transportation activities.	<ul style="list-style-type: none"> <li>• <b>The Organizer of Environment Management:</b> The organizing institution of environment management is the project proponent, i.e. the Administrator of Maros – Takalar road development.</li> <li>• <b>The Supervisor of Environment Management:</b> The supervising institution of environment management includes the Project Proponent and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li>• <b>Reporting the Result of Environment Management:</b> The report on environment management results is submitted to the Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

No.	ENVIRONMENT MANAGEMENT PLAN							
	AFFECTED PARAMETER / COMPONENT OF ENVIRONMENT	SOURCE OF IMPACT	STANDARD PARAMETER OF IMPACT	OBJECTIVE OF ENVIRONMENT MANAGEMENT PLAN	ENVIRONMENT MANAGEMENT	LOCATION OF ENVIRONMENT MANAGEMENT	PERIOD OF ENVIRONMENT MANAGEMENT	INSTITUTION OF ENVIRONMENT MANAGEMENT
	1	2	3	4	5	6	7	8
<b>2. Road and Bridge Construction</b>								
	<ul style="list-style-type: none"> <li>▪ Existence of water pools.</li> <li>▪ Increasing noise level.</li> <li>▪ Decreasing air quality level.</li> </ul>	Construction of Maros – Takalar road development.	The perception of community, especially for the people in the surrounding area of Maros – Takalar road.	To minimize the impacts created by the road and bridge construction of Maros – Takalar road.	<ul style="list-style-type: none"> <li>• Accentuating the drainage channels construction.</li> <li>• Arranging the erection schedule (only during the working time)</li> <li>• Doing periodical water sprinkling in areas with potentiality of creating dust.</li> </ul>	The Maros – Takalar road.	Environment management will be implemented before and during the road and bridge construction of Maros – Takalar road.	<ul style="list-style-type: none"> <li>• <b>The Organizer of Environment Management:</b> The organizing institution of environment management is the project proponent, i.e. the Administrator of Maros – Takalar road development.</li> <li>• <b>The Supervisor of Environment Management:</b> The supervising institution of environment management is the Project Proponent.</li> <li>• <b>Reporting the Result of Environment Management:</b> The report on environment management results is submitted to the Project Proponent and Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

No.	ENVIRONMENT MANAGEMENT PLAN							
	AFFECTED PARAMETER / COMPONENT OF ENVIRONMENT	SOURCE OF IMPACT	STANDARD PARAMETER OF IMPACT	OBJECTIVE OF ENVIRONMENT MANAGEMENT PLAN	ENVIRONMENT MANAGEMENT	LOCATION OF ENVIRONMENT MANAGEMENT	PERIOD OF ENVIRONMENT MANAGEMENT	INSTITUTION OF ENVIRONMENT MANAGEMENT
	1	2	3	4	5	6	7	8
<b>3. Facility and Infrastructure Construction Works</b>								
	<ul style="list-style-type: none"> <li>The safety of road users.</li> <li>Aesthetics of Maros – Takalar road.</li> </ul>	Supporting facility and infrastructure construction works such as overpass construction, road signs installment, tree planting, etc. of Maros – Takalar road development.	The perception of road users and community in the surrounding area of Maros – Takalar road.	To avoid the presence of negative impacts and to develop the positive impacts of Maros – Takalar road development activities.	<ul style="list-style-type: none"> <li>Implementing the overpass construction in the strategic locations based on the current standard.</li> <li>Enforcing better regulation for Maros – Takalar road areas.</li> </ul>	The Maros – Takalar road.	Environment management will be implemented during the facility and infrastructure construction works.	<ul style="list-style-type: none"> <li><b>The Organizer of Environment Management:</b> The organizing institution of environment management is the project proponent, i.e. the Administrator of Maros – Takalar road development.</li> <li><b>The Supervisor of Environment Management:</b> The supervising institution of environment management includes the Project Proponent and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li><b>Reporting the Result of Environment Management:</b> The report on environment management results is submitted to the Project Proponent and Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>



No.	ENVIRONMENT MANAGEMENT PLAN							
	AFFECTED PARAMETER / COMPONENT OF ENVIRONMENT	SOURCE OF IMPACT	STANDARD PARAMETER OF IMPACT	OBJECTIVE OF ENVIRONMENT MANAGEMENT PLAN	ENVIRONMENT MANAGEMENT	LOCATION OF ENVIRONMENT MANAGEMENT	PERIOD OF ENVIRONMENT MANAGEMENT	INSTITUTION OF ENVIRONMENT MANAGEMENT
	1	2	3	4	5	6	7	8
<b>III. POST-CONSTRUCTION</b>								
<b>1. Operational of Maros – Takalar Road</b>								
	Continuity of transportation system.	Operational activities of Maros – Takalar road with 58 km length.	The perception of community as road users along the Maros – Takalar road.	<ul style="list-style-type: none"> <li>• To simplify the traffic flow, especially for the vehicles that shouldn't enter the city centers through which they pass..</li> <li>• To reduce traffic accidents.</li> <li>• To locate officer to manage the traffic flow diversion.</li> </ul>	Traffic signs installment which can guide the road users, especially for those who do not need to enter the city centers through which vehicles pass.	The Maros – Takalar road.	To be implemented in continuity during the operational stage of Maros – Takalar road.	<ul style="list-style-type: none"> <li>• <b>The Organizer of Environment Management:</b> The organizing institution of environment management is the road users of Maros – Takalar road development.</li> <li>• <b>The Supervisor of Environment Management:</b> The supervising institution of environment management is the Project Proponent</li> <li>• <b>Reporting the Result of Environment Management:</b> The report on environment management results is submitted to the Project Proponent and Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

No.	ENVIRONMENT MANAGEMENT PLAN							
	AFFECTED PARAMETER / COMPONENT OF ENVIRONMENT	SOURCE OF IMPACT	STANDARD PARAMETER OF IMPACT	OBJECTIVE OF ENVIRONMENT MANAGEMENT PLAN	ENVIRONMENT MANAGEMENT	LOCATION OF ENVIRONMENT MANAGEMENT	PERIOD OF ENVIRONMENT MANAGEMENT	INSTITUTION OF ENVIRONMENT MANAGEMENT
	1	2	3	4	5	6	7	8
<b>2. Maintenance of Maros – Takalar Road</b>								
	Aesthetics and existence of medians.	Maintenance activities of Maros – Takalar road.	The perception of road users and community in the surrounding area of Maros – Takalar road.	To develop and improve the positive impacts of Maros – Takalar road development activities.	Making maintenance efforts on surrounding area of Maros – Takalar road and keeping the existence of medians.	The Maros – Takalar road.	To be implemented as needed, during the operational stage of Maros – Takalar road.	<ul style="list-style-type: none"> <li>• <b>The Organizer of Environment Management:</b> The organizing institution of environment management is the project proponent of Maros – Takalar road development.</li> <li>• <b>The Supervisor of Environment Management:</b> The supervising institution of environment management includes the General Directorate of Highways, Department of Public Works and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li>• <b>Reporting the Result of Environment Management:</b> The report on environment management results is submitted to the General Directorate of Highways, Department of Public Works and Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

### **8.11 Environmental Monitoring Plan (RPL)**

The main objectives of environmental monitoring are to provide a continuous feedback on project implementation to identify actual or potential successes or problems at an early stage, and to implement timely adjustments to the whole project management work. Monitoring is a continuous assessment of project implementation and must be an integrated part of good management during the construction.

The objectives of the monitoring system are to assist the project management through:

- Defining requirements and procedures for environmental monitoring (type of equipment to be used, monitoring schedule, parameters to be monitored, and so on);
- Identifying targets and objectives for the project implementation;
- Keeping environmental records for the project evaluation;
- Identifying problems arising from the project, and figuring out procedures for the environmental remediation in the event of pollution or similar incidents; and
- Providing readily available results of related environmental analysis for decision making.

The following is the proposed RPL for the Trans-Sulawesi Mamminasata Section Project.

**Table 8.11.1 Monitoring Plan (RPL) for Trans-Sulawesi Mamminasata Section**

No.	RPL							Institution of Environment Monitoring
	Important Impact to be Monitored	Source of Impact	Environment Parameter to be Monitored	Objective of Environment Monitoring Plan	Environment Monitoring Method			
					Method of Data Collection and Analysis	Monitoring Location	Period and frequency of Monitoring	
1	2	3	4	5	6	7	8	
<i>Pre-Construction Stage</i>								
<i>1. Land Acquisition</i>								
	Disquiet of land owners which incurred the road location	Land acquisition activities for the Maros-Takalar Road development	Incidence of disquiet of land owners which incurs the location of Maros-Takalar Road.	To know incidence of disquiet of land owners residing in the Maros-Takalar Road area.	Doing field observation and interview of the land owners incurred by road location	Maros-Takalar Road	To be executed at the time of compensatory payment, done once during compensation process.	<ul style="list-style-type: none"> <li>• <b><i>The Organizer of Environment Monitoring</i></b> The organizing institution of environment monitoring is the project proponent, i.e. the Administrator of Maros – Takalar road development.</li> <li>• <b><i>The Supervisor of Environment Monitoring:</i></b> The supervising institution of environment monitoring includes the Project Proponent and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li>• <b><i>Reporting the Result of Environment Monitoring</i></b> The report on environment management results is submitted to the Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

No.	RPL							Institution of Environment Monitoring
	Important Impact to be Monitored	Source of Impact	Environment Parameter to be Monitored	Objective of Environment Monitoring Plan	Environment Monitoring Method			
					Method of Data Collection and Analysis	Method of Collecting and Data Analysis	Method of Collecting and Data Analysis	
1	2	3	4	5	6	7	8	
<b>a. The Environment Monitoring on Construction Period</b>								
● <b>CONSTRUCTION STAGE</b>								
1. <b>Material Mobilization</b>								
	<ul style="list-style-type: none"> <li>Transportation Infrastructures where transportation vehicles pass</li> <li>Dust in residential settlements around Maros-Takalar Road .</li> <li>Safety of road users especially in areas along Maros-Takalar Road</li> </ul>	Transportation of material for the construction requirements of Maros-Takalar Road development.	<ul style="list-style-type: none"> <li>Incidence of road infrastructure damage</li> <li>Decrease of air quality exceeding the determined criteria value</li> <li>Incidence of traffic accident in the roads where transportation vehicles pass</li> </ul>	<ul style="list-style-type: none"> <li>Decreasing the risk of damage of road infrastructures where transportation vehicles pass</li> <li>Minimizing dust concentration in the region where transportation vehicles pass</li> <li>Preventing incidence of traffic accidents.</li> </ul>	Doing field observation and interview of the residents oaround Maros-Takalar Road and also measuring the dust level and comparing its result with Environment Criteria according to Decision of Governor of Sulsel No. 14 in 2003.	The monitoring location is Maros-Takalar Road.	To be executed at the time of material transportation, conducted once every 6 months.	<ul style="list-style-type: none"> <li><b>The Organizer of Environment Monitoring</b> The organizing institution of environment monitoring is the project proponent, i.e. the Administrator of Maros – Takalar road development.</li> <li><b>The Supervisor of Environment Monitoring</b> The supervising institution of environment monitoring includes the Project Proponent and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li><b>Reporting the Result of Environment Monitoring</b> The report on environment management results is submitted to the Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

No.	RPL							Institution of Environment Monitoring
	Important Impact to be Monitored	Source of Impact	Environment Parameter to be Monitored	Objective of Environment Monitoring Plan	Environment Monitoring Method			
					Method of Data Collection and Analysis	Method of Collecting and Data Analysis	Method of Collecting and Data Analysis	
1	2	3	4	5	6	7	8	
2.	<i>Road and Bridge Construction</i>							
	<ul style="list-style-type: none"> <li>▪ Presence of water suffusing</li> <li>▪ Increasing noise</li> <li>• Decreasing air quality</li> </ul>	Development activities of Maros-Takalar Road.	Residents' perception, especially those living around Maros-Takalar road areas.	Minimizing the impact caused by activities of Maros-Takalar road and bridge works.	Doing field observation and interview of the residents around Maros-Takalar Road and also measuring the noise and dust levels and comparing their results with Criteria Value of Environment according to Decision of Governor of Sulsel No. 14 in 2003.	The monitoring location is Maros-Takalar Road.	To be executed at the time of activities of road and bridge construction, conducted once every 6 months.	<ul style="list-style-type: none"> <li>• <b>The Organizer of Environment Monitoring</b> The organizing institution of environment monitoring is the project proponent, i.e. the Administrator of Maros – Takalar road development.</li> <li>• <b>The Supervisor of Environment Monitoring</b> The supervising institution of environment monitoring is the project proponent</li> <li>• <b>Reporting the Result of Environment Monitoring</b> The report on environment management results is submitted to the project proponent and the Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

No.	RPL							Institution of Environment Monitoring
	Important Impact to be Monitored	Source of Impact	Environment Parameter to be Monitored	Objective of Environment Monitoring Plan	Environment Monitoring Method			
					Method of Data Collection and Analysis	Method of Collecting and Data Analysis	Method of Collecting and Data Analysis	
1	2	3	4	5	6	7	8	
3.	<i>Structure/Infrastructure Construction</i>							
	- Safety of road users - Maros-Takalar road aesthetics	Execution of bridge development, traffic equipment installation, tree cultivation, etc for Maros-Takalar Road.	Residents' perception, especially those living around the Maros-Takalar road areas.	Preventing incidence of negative impact, and developing the positive impact from activities of supporting structure at Maros-Takalar Road.	Doing field observation and interview of the residents around Maros-Takalar Road.	The monitoring location is Maros-Takalar Road.	To be executed during activities of structure/ infrastructure construction, conducted once every 6 months.	<ul style="list-style-type: none"> <li>• <b>The Organizer of Environment Monitoring:</b> The organizing institution of environment monitoring is the project proponent, i.e. the Administrator of Maros – Takalar road development.</li> <li>• <b>The Supervisor of Environment Monitoring</b> The supervising institution of environment monitoring includes the project proponent and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li>• <b>Reporting the Result of Environment Monitoring</b> The report on environment management results is submitted to the project proponent and the Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

No.	RPL							Institution of Environment Monitoring
	Important Impact to be Monitored	Source of Impact	Environment Parameter to be Monitored	Objective of Environment Monitoring Plan	Environment Monitoring Method			
					Method of Data Collection and Analysis	Method of Collecting and Data Analysis	Method of Collecting and Data Analysis	
1	2	3	4	5	6	7	8	
<ul style="list-style-type: none"> <li>● <b>a. POST CONSTRUCTION STAGE</b> <ul style="list-style-type: none"> <li>1. <i>Operation Maros-Takalar Road</i></li> </ul> </li> </ul>								
	Important impact of operational activity of Maros-Takalar Road is fluidity of transportation system.	Activity of operation of Maros-Takalar Road as long as 58 km.	Perception of User Society of Maros-Takalar Road.	-To know the fluidity of traffic current, especially for vehicles which needn't enter the downtown centers in regions where vehicles pass.  -Decreasing traffic accidents	Doing field observation and interview of the residents around Maros-Takalar Road.	The monitoring location is Maros-Takalar Road.	To be executed during the operational stage of Maros-Takalar Road, conducted once every 6 months.	<ul style="list-style-type: none"> <li>● <b>The Organizer of Environment Management:</b> The organizing institution of environment management is the project proponent</li> <li>● <b>The Supervisor of Environment Management:</b> The supervising institution of environment management includes the General Directorate of Highway, Department of Public Works and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li>● <b>Reporting the Result of Environment Management:</b> The report on environment management results is submitted to the General Directorate of Highway, Department of Public Works and Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>



No.	RPL							Institution of Environment Monitoring
	Important Impact to be Monitored	Source of Impact	Environment Parameter to be Monitored	Objective of Environment Monitoring Plan	Environment Monitoring Method			
					Method of Data Collection and Analysis	Method of Collecting and Data Analysis	Method of Collecting and Data Analysis	
1	2	3	4	5	6	7	8	
2. <i>Maintenance of Maros-Takalar Road</i>								
	Important impact of maintenance activity of Maros-Takalar Road is aesthetics and green line existence.	Maintenance Activity of Maros-Takalar Road	Perception of User Society of Maros-Takalar Road.	To know the positive impact of development of Maros-Takalar Road.	Doing field observation and interview of the residents around Maros-Takalar Road.	The monitoring location is Maros-Takalar Road.	To be executed during the maintenance of Maros-Takalar Road, conducted once every 6 months.	<ul style="list-style-type: none"> <li>• <b>The Organizer of Environment Management:</b> The organizing institution of environment management is the project proponent</li> <li>• <b>The Supervisor of Environment Management:</b> The supervising institution of environment management includes the General Directorate of Highway, Department of Public Works and Board of Environment Impact Monitoring South Sulawesi Province.</li> <li>• <b>Reporting the Result of Environment Management:</b> The report on environment management results is submitted to the General Directorate of Highway, Department of Public Works and Board of Environment Impact Monitoring South Sulawesi Province once every six months.</li> </ul>

## **8.12 LARAP Policy Framework**

### **8.12.1 Objectives**

A Land Acquisition and Resettlement Action Plan (LARAP) is a document required for any project which results in the physical resettlement of people, and it must specify the procedures and actions it should take in order to properly resettle and compensate PAPs and communities. According to the basic concept of the JICA guidelines, a LARAP is required to ensure that their incomes and living standards of PAPs should be restored to at least pre-project levels and are not worse off than they would have been without the project. More specifically, a LARAP should be prepared as a detailed plan for mitigating the land acquisition impacts in an attempt:

- to ensure that the social and economic livelihood of PAPs is recovered 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 on for the community participation of the PAPs could be involved in the various stages of the project, including the implementation of the RAP

Since the full-scale detailed LARAP for the Trans-Sulawesi Mamminasa Section, the priority project, will be formulated after the feasibility study, the policy framework for the LARAP was proposed.

### **8.12.2 Legal Basis for LARAP**

The regulation which is used for execution of land acquisition for development implementation of public interest is Presidential Regulation No. 36 Year 20052 which it is implemented using Agrarian State Ministry Regulation No. 1 Year 1994 concerning Operational Directive of Presidential Decree No. 55 Year 1993. No new operational directive has been established related with the new regulation.

### **8.12.3 Framework for LARAP**

A Land Acquisition and Resettlement Action Plan (LARAP) is a document required for any project which results in the physical resettlement of people, and it must specify the procedures and actions it should take in order to properly resettle and compensate PAPs and communities. According to the basic concept of the JICA guidelines, a LARAP is required to ensure that their incomes and living standards of PAPs should be restored to at least pre-project levels and are not worse off than they would have been without the project. More specifically, a LARAP should be prepared as a

detailed plan for mitigating the land acquisition impacts in an attempt:

- to ensure that the social and economic livelihood of PAPs is recovered 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 on for the community participation of the PAPs could be involved in the various stages of the project, including the implementation of the RAP

Since the full-scale detailed LARAP for the Trans-Sulawesi Mamminasa Section will be formulated after the feasibility study, apart from the EIA reports, in an attempt to mitigate the negative impacts by the land acquisition and resettlement, the policy framework for the LARAP was formulated. In case of formulating the final full-scale LARAP, the following contents should be included as the full-scale LARAP.

- Results of Socio-economic Survey
- Outline of Land Acquisition and Compensation Package
- Institutional Set-up for LAC (Land Acquisition Committee)
- Public Consultations
- Grievance Mechanizm
- Monitoring and Evaluation

**(1) Outline of PAPs**

The required acquisition for the land and structures are as follows.

**Table 8.12.1 Estimated Required Land Acquisition and structures compensation for  
Trans-Sulawesi Mamminasa Section**

Road Status	Name	Length (Km)	Existing roadway	Plan Roadway	Work	ROW (m)		Land Area (m <sup>2</sup> )	District / Municipality	Kind of Building			
						Plan	Existing			House	Shop	Public building	Street vendor
A National Road	Maros - Jl. Sutami IC	8	4	6 - 8	Widening	42	30	96.000	<b>TOTAL A</b>	<b>320</b>	<b>1.083</b>	<b>67</b>	<b>267</b>
									<b>Maros</b>	<b>283</b>	<b>905</b>	<b>40</b>	<b>120</b>
	Turikale	132	490	21	39								
	Mandai	63	183	15	36								
	Maros Baru	24	44	2	4								
	Marusu	64	188	2	41								
	<b>Makassar</b>	<b>37</b>	<b>178</b>	<b>27</b>	<b>147</b>								
	Biringkanaya	37	178	27	147								
	<b>Makassar</b>												
	Biringkanaya												
Tamalanrea													
B Municipal Road	Middle Ring Road	7	-	8	New	42	0	294.000	<b>TOTAL B</b>	<b>92</b>	<b>16</b>	<b>2</b>	<b>1</b>
									<b>Makassar</b>	<b>92</b>	<b>16</b>	<b>2</b>	<b>1</b>
									Mangala	43	1	0	0
									Panakkukang	9	0	0	1
									Rappocini	27	6	1	0
									Tamalate	13	9	1	0
C Kab. Road	Middle Ring Road access road	9	-	4	New	40	0	360.000	<b>TOTAL C</b>	<b>42</b>	<b>10</b>	<b>2</b>	<b>3</b>
									<b>Gowa</b>	<b>42</b>	<b>10</b>	<b>2</b>	<b>3</b>
									Mangasa	22	0	1	1
									Barombong	13	10	1	1
									Pallangga	7	0	0	1
D National Road	Middle Ring Road Access - Takalar	22	2	4	Widening	30	0	440.000	<b>TOTAL D</b>	<b>661</b>	<b>374</b>	<b>54</b>	<b>37</b>
									<b>Gowa</b>	<b>380</b>	<b>239</b>	<b>28</b>	<b>7</b>
									Bajeng	211	184	15	5
									Bontonompo	169	55	13	2
									<b>Takalar</b>	<b>281</b>	<b>135</b>	<b>26</b>	<b>30</b>
									Galesong Utara	41	20	2	0
									Polombangkeng Utara	171	46	5	22
									Pattalassang	69	69	19	8
Total		58							<b>1.115</b>	<b>1.483</b>	<b>125</b>	<b>308</b>	
<b>Grand TOTAL Trans Sulawesi</b>									<b>2.723</b>			<b>308</b>	

The section of the Perintis Road is the on-going project of the Indonesian Government, and, therefore, this section is not included in the Trans-Sulawesi Road Project. As a result, the costs for the land acquisition and resettlement required for the Perintis Road would not be included in the project cost of the Trans-Sulawesi Road Project.

## (2) Eligibility and Entitlement and Compensation Policies

Eligibility as well as entitlement policy is an integral part of the RAP, since PAPs should clearly recognize the established date for eligibility as well as entitlement for the compensation of losses.

Among potential PAPs, eligibility for entitlement for compensation is determined by the establishment of a cut-off date. Cut-off date means the date prior to which the occupation or use of the Project area makes residents/users eligible to be categorized as PAPs. The establishment of the cut-off date aims at preventing the inflow of ineligible non-residents who might take advantage of the compensation policies or speculate on land values.

The compensation package includes a wide range of compensation measures like cash compensation and institutional support provided to eligible PAPs. Major compensation packages include:

- Loss of land;

- Loss of structures;
- Loss of productive trees; and
- Loss of commune and public assets
- Allowances for socially vulnerable households

### **(3) Compensation Rate**

The difference of the compensation unit price between the public buildings and houses/stores is derived from the locations of those facilities. (The public buildings are normally located in the center of the towns.) In addition to the compensation for these properties, the compensation for the loss of business opportunities during the resettlement or relocation should be included in the final version of the LARAP in accordance with the compensation policies of the Indonesian Government.

The amount of compensation for the land is determined based on the combination of land price for tax purposes (NJOP) and market price. According to the Regulation of Agrarian State Minister/Head of Land Agency No 1/1994 article 17, compensation for certificated land will be 100% of the agreement price, while compensation for non certificated land will be 90% of the agreement price.

According to the regulation, building and plants selling price are to be estimated by the institution responsible on that matters.

Regarding the price for buildings, the compensations will consider permission letter, year of construction and type of building structure (permanent, semi permanent, temporary). Basic price of building is determined according to the unit price of state building (A Joint Circular of BAPPENAS and Financial Department) and estimation prices are made by Building Department of the Regency.

The most important point on compensation and entitlement policies for PAPs under is the comprehensive and complete application of the concept of “Replacement Cost”.

“Replacement Cost” is defined that it is an amount needed for obtaining or replacing acquired land or property with similar land or property with equivalent or better productive capacity at current market price/value without deduction of any salvage or depreciation and take no account of the influence by development project on the value of the acquired land or property, plus the cost of transferring or registering the rights to the new land or property.

### **(4) Institutional Set-up**

The Land Acquisition Committee (LAC) will be set up in each District/City in line with the regulation No. 36 of 2005 JO No. 65 of 2006. The duties of LAC includes

- a) conduct the research and assets inventory
- b) conduct legal status and document research for the land which rights to be released
- c) determine the amount of compensation
- d) giving explanation to stakeholders
- e) conduct deliberation
- f) witness the undertaking of compensation
- g) make official report of land release/assignment
- h) administer and document all land provision files and submit to competent parties

**(5) Budgetary Arrangement**

A full itemized budget should be reviewed for all resettlement activities, including compensation for land acquisition and resettlement cost after the detailed measurement of land and structures.

**(6) Public Consultation and Information Disclosure**

The information disclosure and public consultations will commence prior to the marking of the alignment and will continue at all stages of decision making. The transparent information disclosure is a key to promoting effective public consultations for planning and implementation of the LARAP. In other words, keeping PAPs fully informed of their rights and obligations is crucial to the success of the implementation of the LARAP. In order to make the information understandable and accessible for all LAPAPs, relevant information should be translated into local languages, paying special attentions to accessibility of socially vulnerable groups of people.

- Definitions of terms in the LARAP
- Frequently asked questions and answers over the Project
- Detailed explanation on the Project
- Scope and categories of PAPs and predicted impacts
- Details of eligibility and entitlements under the LARAP
- Implementation schedule together with the timetable for the delivery of entitlements
- Compensation policies and rates
- Procedures for the grievance redress
- Outline of the public consultations

Generally, the following meetings and consultations will be conducted during the preparation stage

of the LARAP.

- 1) Kick-off Information Campaigns before LARAP Preparation
- 2) Consultations during LARAP Preparation
- 3) Public Information Meeting after LARAP Preparation

**(7) Grievance Mechanism**

It is critical to allow PAPs to express their complaints or claims with assuring timely and satisfactory resolutions of those complaints or claims, when PAPs are not satisfied with the compensation and resettlement package in accordance with the formal procedure. The main objective of the grievance procedure is to provide PAPs with ample opportunities to ensure that the compensation and resettlement package proposed by the will be implemented in the accurate and fair manner. The current grievance mechanism is being individually established on ad-hoc and project basis.

**(8) Monitoring and Evaluation**

Monitoring for the implementation of the LARAP is of critical importance in all projects involving involuntary resettlement in terms of the following factors:

- Measurement of input indicators against proposed timetable and budget related to the contents of the compensation;
- Measurement of effectiveness of inputs against baseline indicators and assessment of PAPs' satisfaction with inputs; and
- Measurement of output indicators such as livelihood restoration and development impacts against baseline.

In addition to internal monitoring, external monitoring is normally required to provide an independent periodic assessment of resettlement implementation and impacts, to verify internal reporting and monitoring, and to suggest adjustment of delivery mechanisms and procedures as required to function effectively.

The main indicators which should be regularly monitored are:

- Entitlements of PAPs are in accordance with the approved entitlement policies;
- Assessment of compensation is carried out in accordance with agreed procedures;
- Payment of compensation to the affected people in the various categories according to the level of compensation as described in the LARAP;
- Public information and public consultation and grievance procedures are followed as described in the LARAP; and

- Relocation, if any, and payment of compensation are made in timely manner

The collection of monitored data as well as their evaluations should be implemented by the relevant agency by conducting regular sample surveys and etc.



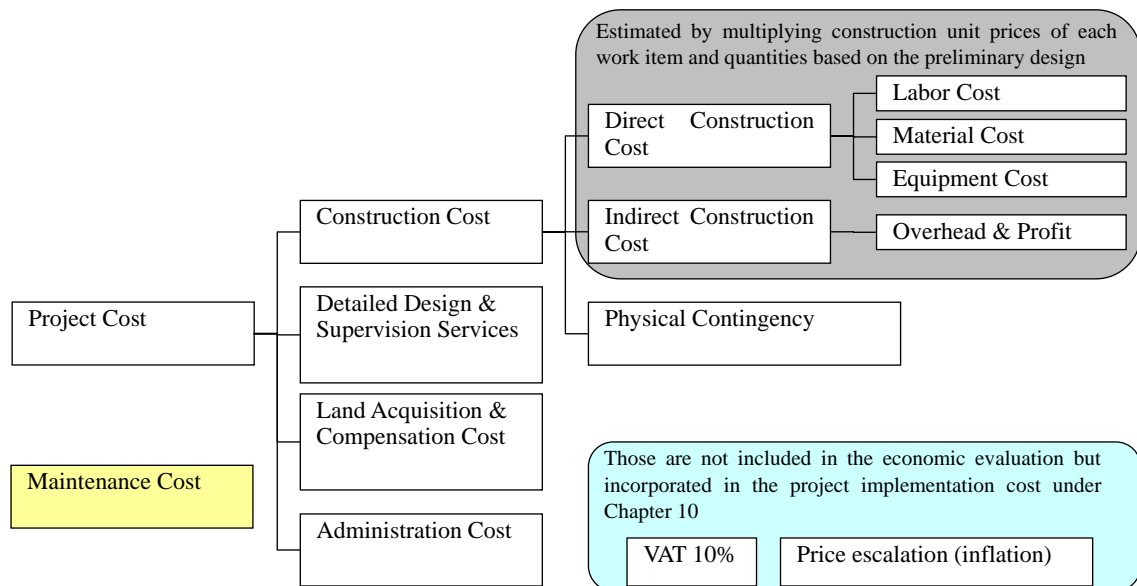
## CHAPTER 9 COST ESTIMATE AND PROJECT EVALUATION

### 9.1 Cost Estimate

#### 9.1.1 Composition of Project Cost

The project cost consists of construction cost, detailed design and supervision costs, land acquisition and compensation cost and administration cost. The construction cost was estimated based on the result of the preliminary engineering design, quantities of major work items and assumptions on the percentages of overhead and profit of the contractor, and physical contingency. The value added tax (VAT) of 10% and inflation (price escalation) were excluded for the economic evaluation but included in the financing plan under Chapter 9,- Project Implementation Plan. The cost for periodic maintenance and routine maintenance was also estimated.

The components of the project cost are shown in **Figure 9.1.1**.



**Figure 9.1.1 Project Cost Components**

#### 9.1.2 Conditions of Cost Estimate

Cost estimate was made based on the following conditions:

- i) Time of cost estimate: May 2007
- ii) Foreign currency: US dollar
- iii) Exchange rate: 1 US dollar = Rp. 9,322 (Bank of Indonesia, 16 May 2007)
- iv) Taxes: Not included for the economic evaluation but included in the project implementation plan as a part of the project cost.

## (1) Construction Cost

### 1) General

The construction cost is composed of direct construction cost, indirect construction cost and physical contingency. The direct construction cost consists of labor cost, material cost, and equipment cost. The construction cost was estimated by multiplying construction unit prices and quantities calculated based on the preliminary design, and physical contingency was considered to be 10%. Estimation was made by major work items quoted from the standard specifications of DGH, Indonesia, since they can be considered as the most general categorization of work items in this country.

### 2) Construction Unit Prices

Construction unit prices for every work item include direct construction cost and indirect construction cost. The direct construction cost is composed of labor cost, material cost, and equipment cost, including all the relevant expenditures necessary to conduct the work, such as taxes on the procurement of materials, operation costs of equipment and so on. The indirect construction cost includes overhead and profit margin of the contractor.

Construction unit prices applied to the cost estimate were set based on the standard unit prices in South Sulawesi Province (Harga Satuan Pokok Kegiatan (HSPK), 2006) and also on the comparison results of contract unit prices in the past and on-going projects. The sites of all the projects referred to are located in the Mamminasata area, and the contracts of which were made in the period of 2005-2007.

Unit prices of major pay items applied for cost estimation are shown in **Table 9.1.1**.

**Table 9.1.1 Unit Prices of Major Items**

Item	Unit	Unit Price (Rp. per unit)
Mortared Stonework	m3	334,361
Common Excavation	m3	25,337
Common Embankment	m3	25,337
Selected Embankment	m3	63,654
Aggregate Base Class A	m3	230,015
Aggregate Base Class B	m3	205,723
Asphalt Concrete-Wearing Course (5cm)	m2	55,374
Structural Concrete Class K250	m3	659,436
Precast Unit Type I Girder (31m)	nos	189,264,348
Reinforcing Steel	kg	7,807

Source: JICA Study Team design

### 3) Indirect Construction Cost

The overhead and profit were assumed to be twenty percent (20%) of the estimated direct construction cost.

**(2) Detailed Design and Supervision Services**

The cost for detailed design and supervision services was assumed to be seven percent (7%) of the estimated construction cost.

**(3) Land Acquisition and Compensation Cost**

Fund for land acquisition and compensation would be coming from APBN and/or APBD depending on the agreement by both central and regional governments. On the basis of the current procedure of land acquisition and compensation in Indonesia, the transaction prices and *Nilai Jual Objek Pajak (NJOP)* prices heard from each Kota/Kabupaten, the land acquisition and compensation costs were estimated as shown in the following tables.

**Table 9.1.2 Land Acquisition and Compensation Costs for Mamminasa Bypass**

No.	Item	Section 1-A Maros (M Rp.)	Section 1-C Maros (M Rp.)	Section 1-B Maros, Gowa (M Rp.)	Section 1-D Gowa (M Rp.)	Total (M Rp.)
1	Land Acquisition	9,900	15,100	46,560	6,686	78,246
2	Building Compensation	863	69	1,346	2,588	4,865
<b>Total</b>		<b>10,763</b>	<b>15,169</b>	<b>47,906</b>	<b>9,274</b>	<b>83,111</b>

Source: JICA Study Team estimation

**Table 9.1.3 Land Acquisition and Compensation Costs for Trans-Sulawesi  
Mamminasata Road**

No.	Item	Section 2-A (M Rp.)	Section 2-B (M Rp.)	Section 3-C (M Rp.)	Section 4-D (M Rp.)	Total (M Rp.)
1	Land Acquisition	35,256	85,260	38,592	18,627	177,735
2	Building Compensation	50,457	1,639	1,639	28,868	82,603
<b>Total</b>		<b>85,713</b>	<b>86,899</b>	<b>40,231</b>	<b>47,495</b>	<b>260,338</b>

Source: JICA Study Team estimation

**Table 9.1.4 Land Acquisition and Compensation Costs for Hertasing Road**

No.	Item	Section 3-End Gowa (M Rp.)	Total (M Rp.)
1	Land Acquisition	4,865	4,865
2	Building Compensation	4,968	4,968
<b>Total</b>		<b>9,833</b>	<b>9,833</b>

Source: JICA Study Team estimation

**Table 9.1.5 Land Acquisition and Compensation Costs for A.D. Sirua Road**

No.	Item	Section 4-A, C, D Makassar (M Rp.)	Section 4-E Maros (M Rp.)	Section 4-F1 Maros (M Rp.)	Section 4-F2 Gowa (M Rp.)	Total (M Rp.)
1	Land Acquisition	26,655	978	3,125	1,183	31,941
2	Building Compensation	4,796	0	138	0	4,934
<b>Total</b>		<b>31,451</b>	<b>978</b>	<b>3,263</b>	<b>1,183</b>	<b>36,874</b>

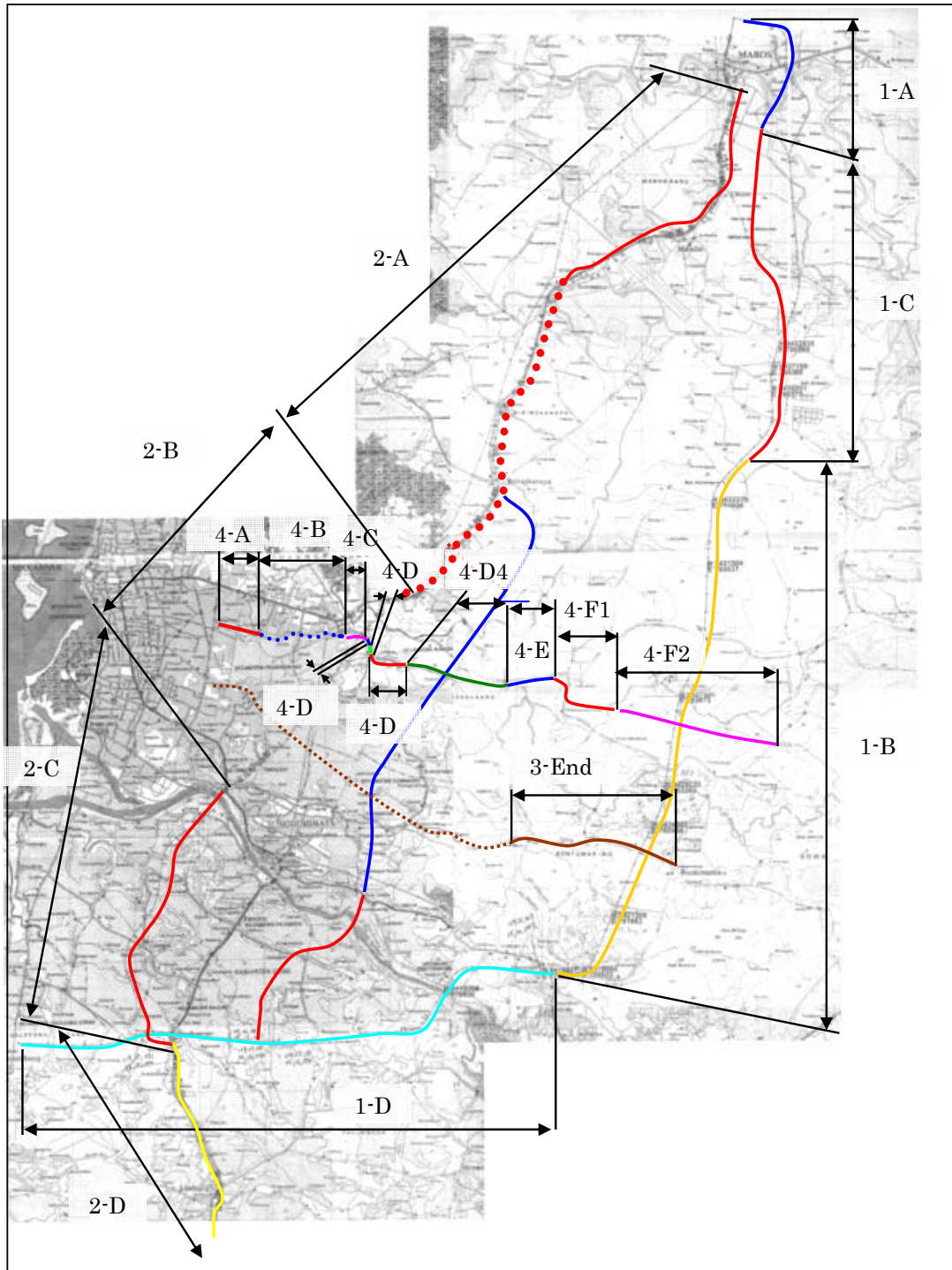
Source: JICA Study Team estimation

#### (4) Administration Cost

The administration cost was assumed to be two percent (2%) of the estimated construction cost.

#### 9.1.3 Project Cost

The project cost was estimated in accordance with the road sub-sections shown in **Figure 9.1.2**.



**Figure 9.1.2 Sections of the Project Road**

(1) Mamminasa Bypass

The major construction quantities are shown in Table 9.1.6.

**Table 9.1.6 Major Construction Quantities for Mamminasa Bypass**

Item	Unit	Section 1-A	Section 1-C	Section 1-B	Section 1-D	Total
Mortared Stonework	m3	18,810	28,690	73,720	63,521	<b>184,721</b>
Common Excavation	m3	108,331	149,454	424,152	345,040	<b>1,026,978</b>
Common Embankment	m3	270,318	375,074	1,332,351	1,021,917	<b>2,999,660</b>
Selected Embankment	m3	4,378	1,082	5,369	7,641	<b>18,469</b>
Aggregate Base Class A	m3	15,246	23,254	59,752	51,485	<b>149,737</b>
Aggregate Base Class B	m3	23,760	36,240	93,120	80,237	<b>233,357</b>
Asphalt Concrete -Wearing & Binder Course (5cm)	m2	153,748	227,396	588,176	509,736	<b>1,479,056</b>
Structural Concrete Class K250	m3	7,729	6,872	20,455	19,264	<b>54,320</b>
Precast Unit Type I Girder (16-35m)	nos	268	78	0	70	<b>416</b>
Reinforcing Steel	ton	33	219	944	1,100	<b>2,296</b>

Source: JICA Study Team design

Based on the examination on construction unit prices and quantities from the preliminary design, the construction cost was estimated as shown in Table 9.1.7.

**Table 9.1.7 Construction Cost of Mamminasa Bypass Project**

Division No.	Item	Section 1-A (M Rp.)	Section 1-C (M Rp.)	Section 1-B (M Rp.)	Section 1-D (M Rp.)	Total (M Rp.)	Percentage
1	General	1,540	1,580	4,909	4,384	<b>12,413</b>	<b>1.9%</b>
2	Drainage	7,573	11,549	29,672	25,568	<b>74,361</b>	<b>11.6%</b>
3	Earthworks	20,665	27,838	96,431	75,037	<b>219,971</b>	<b>34.2%</b>
5	Granular Pavement	8,395	12,804	32,901	28,349	<b>82,449</b>	<b>12.8%</b>
6	Asphalt Pavement	10,848	16,072	41,555	36,002	<b>104,476</b>	<b>16.2%</b>
7	Structures	27,710	8,008	37,834	48,137	<b>121,688</b>	<b>18.9%</b>
8	Reinstatement and Minor Works	1,633	2,489	6,389	5,506	<b>16,017</b>	<b>2.5%</b>
10	Routine Maintenance Works	173	263	676	583	<b>1,695</b>	<b>0.3%</b>
-	Public Utility Relocation	1,049	1,601	4,113	3,544	<b>10,307</b>	<b>1.6%</b>
	<b>Total</b>	<b>79,584</b>	<b>82,205</b>	<b>254,481</b>	<b>227,108</b>	<b>643,378</b>	<b>100.0%</b>
	Physical Contingency (10%)	7,958	8,220	25,448	22,711	<b>64,338</b>	-
	<b>Total of Construction Cost</b>	<b>87,543</b>	<b>90,425</b>	<b>279,929</b>	<b>249,819</b>	<b>707,716</b>	-
	<b>Percentage</b>	<b>12.4%</b>	<b>12.8%</b>	<b>39.6%</b>	<b>35.3%</b>	<b>100.0%</b>	-

Source: JICA Study Team estimation

**(2) Trans-Sulawesi Mamminasata Road**

The major construction quantities by section are shown in **Table 9.1.8**.

**(3) Table 9.1.8 Major Construction Quantities for Trans-Sulawesi Mamminasata Road**

Item	Unit	Section A	Section B	Section C	Section D	Total
Mortared Stonework	m3	1,382	1,076	44,280	108,240	<b>154,978</b>
Common Excavation	m3	92,939	114,119	54,294	114,875	<b>376,227</b>
Common Embankment	m3	36,643	484,152	286,903	153,609	<b>961,307</b>
Selected Embankment	m3	838	13,216	9,426	1,968	<b>25,447</b>
Aggregate Base Class A	m3	0	0	30,501	61,139	<b>91,640</b>
Aggregate Base Class B	m3	18,930	29,607	49,101	96,113	<b>193,751</b>
Cement Treated Sub Base	m3	9,465	12,812	0	0	<b>22,277</b>
Asphaltic Concrete-Wearing Course (3-5cm)	m2	189,352	8,288	143,972	612,595	<b>954,207</b>
Asphaltic Concrete-Binder Course	m3	0	0	5,299	18,586	<b>23,885</b>
Asphaltic Concrete-Base Course	m3	0	0	6,624	8,412	<b>15,036</b>
Portland Cement Concrete Pavement	m3	24,610	38,045	0	0	<b>62,655</b>
Structural Concrete	m3	27,854	31,583	10,858	3,157	<b>73,453</b>
Precast Unit Type I Girder (16-35m)	nos	15	216	209	18	<b>458</b>
Reinforcing Steel	ton	111	1,309	1,344	268	<b>3,032</b>

Source: JICA Study Team design

Based on the examination on construction unit prices and quantities from the preliminary design, the construction cost was estimated as shown in **Table 9.1.9**.

**Table 9.1.9 Construction Cost of Trans-Sulawesi Mamminasata Road Project**

Division No.	Item	Section A (M Rp.)	Section B (M Rp.)	Section C (M Rp.)	Section D (M Rp.)	Total (M Rp.)	Percentage
1	General	1,966	4,843	3,377	3,474	<b>13,661</b>	<b>1.8%</b>
2	Drainage	23,026	18,030	18,265	44,488	<b>103,809</b>	<b>13.6%</b>
3	Earthworks	4,836	35,868	21,177	13,014	<b>74,894</b>	<b>9.8%</b>
5	Granular Pavement	8,598	12,457	17,117	33,836	<b>72,008</b>	<b>9.4%</b>
6	Asphalt Pavement	11,156	502	22,735	68,048	<b>102,441</b>	<b>13.4%</b>
-	Concrete Pavement	22,103	34,169	0	0	<b>56,273</b>	<b>7.4%</b>
7	Structures	27,328	139,523	88,189	11,808	<b>266,848</b>	<b>35.0%</b>
8	Reinstatement and Minor Works	917	737	791	1,900	<b>4,344</b>	<b>0.6%</b>
10	Routine Maintenance Works	330	856	658	582	<b>2,426</b>	<b>0.3%</b>
-	Public Utility Relocation	19,082	0	0	47,704	<b>66,785</b>	<b>8.7%</b>
	<b>Total</b>	<b>119,341</b>	<b>246,985</b>	<b>172,309</b>	<b>224,853</b>	<b>763,489</b>	<b>100%</b>
	Physical Contingency (10%)	11,934	24,699	17,231	22,485	<b>76,349</b>	-
	<b>Total of Construction Cost</b>	<b>131,275</b>	<b>271,684</b>	<b>189,540</b>	<b>247,338</b>	<b>839,838</b>	-
	<b>Percentage</b>	<b>15.6%</b>	<b>32.3%</b>	<b>22.6%</b>	<b>29.5%</b>	<b>100%</b>	-

Source: JICA Study Team estimation

### (3) Hertasing Road

The major construction quantities are shown in **Table 9.1.10**.

**Table 9.1.10 Major Construction Quantities for Hertasing Road**

Item	Unit	Total of Section 3-End
Mortared Stonework	m3	13,719
Common Excavation	m3	60,212
Common Embankment	m3	178,096
Selected Embankment	m3	892
Aggregate Base Class A	m3	14,984
Aggregate Base Class B	m3	23,352
Asphalt Concrete -Wearing & Binder Course (5cm)	m2	146,910
Structural Concrete	m3	4,421
Precast Unit Type I Girder (16-35m)	nos	11
Reinforcing Steel	ton	154

Source: JICA Study Team design

Based on the examination on construction unit prices and quantities from the preliminary design, the construction cost was estimated as shown in **Table 9.1.11**.

**Table 9.1.11 Construction Cost of Hertasing Road Project**

Division No.	Item	Section 3-End (M Rp.)	Percentage
1	General	885	1.6%
2	Drainage	5,764	10.4%
3	Earthworks	13,007	23.5%
5	Granular Pavement	8,251	14.9%
6	Asphalt Pavement	9,487	17.1%
7	Structures	6,153	11.1%
8	Reinstatement and Minor Works	1,413	2.5%
10	Routine Maintenance Works	170	0.3%
-	Public Utility Relocation	10,315	18.6%
<b>Total</b>		<b>55,445</b>	<b>100.0%</b>
Physical Contingency (10%)		5,544	-
<b>Total of Construction Cost</b>		<b>60,989</b>	-
<b>Percentage</b>		<b>100.0%</b>	-

Source: JICA Study Team estimation

#### (4) Abdullah Daeng Sirua Road

The major construction quantities by section are shown in **Table 9.1.12**.

**Table 9.1.12 Major Construction Quantities for Abdullah Daeng Sirua Road**

Item	Unit	Section 4-A	Section 4-C	Section 4-D	Section 4-E	Section 4-F	Total
Mortared Stonework	m3	2,565	1,045	9,400	4,370	27,485	44,865
Common Excavation	m3	16,190	34,251	218,549	103,421	299,308	671,719
Common Embankment	m3	11,109	14,372	224,819	99,541	423,538	773,379
Selected Embankment	m3	644	0	1,450	1,262	458	3,814
Aggregate Base Class A	m3	2,079	847	15,400	3,542	22,278	44,146
Aggregate Base Class B	m3	3,240	1,320	24,000	5,520	34,718	68,798
Asphalt Concrete -Wearing & Binder Course (5cm)	m2	21,370	8,250	151,344	36,420	217,406	434,790
Structural Concrete	m3	1,276	168	4,689	2,564	5,094	13,791
Precast Unit Type I Girder (16-35m)	nos	15	0	18	22	0	55
Reinforcing Steel	ton	112	1,793	223	238	115	2,481

Source: JICA Study Team design

Based on the examination on construction unit prices and quantities from the preliminary design, the construction cost was estimated as shown in **Table 9.1.13**.

**Table 9.1.13 Construction Cost of Abdullah Daeng Sirua Road Project**

Division	Item	Sections 4-A, C & D (M.Rp)	Sections 4-E and F (M.Rp)	Total (M.Rp)	Percentage
1	General	1,367	2,136	3,503	1.8%
2	Drainage	5,640	12,831	18,471	9.4%
3	Earthworks	23,089	43,780	66,869	34.1%
5	Granular Pavement	10,091	14,217	24,308	12.4%
6	Asphalt Pavement	12,783	17,934	30,717	15.7%
7	Structures	14,530	14,972	29,502	15.1%
8	Reinstatement and Minor Works	2,042	2,775	4,817	2.5%
10	Routine Maintenance Works	196	291	487	0.2%
-	Public Utility Relocation	13,198	3,972	17,170	8.8%
	Sub-Total	82,936	112,908	195,845	100.0%
	Physical Contingency (10%)	8,294	11,291	19,584	
	Total of Construction Cost	91,230	124,199	215,429	
	Percentage	42.3%	57.7%	100.0%	

Source: JICA Study Team estimation

#### 9.1.4 Maintenance Cost

Road maintenance activities are generally divided into two categories as listed below.

- i) Routine Maintenance including;
  - \* Inspection and patrol,
  - \* Cleaning of road surface/drainage facilities,
  - \* Trimming/cutting of trees/grass,



- \* Pothole patching and crack sealing for AC pavement, and
  - \* Minor repairs of miscellaneous facilities.
- ii) Periodic Maintenance including;
- \* Overlay for AC pavement at 5-year intervals, and
  - \* Re-pavement (or AC overlay) for PCCP at 20-year intervals.

Taking the above activities into account, the maintenance cost for the Trans-Sulawesi Mamminasata Road and Mamminasa Bypass, Hertasning Road & A.D. Sirua Road was estimated as shown in **Tables 9.1.14** and **9.1.15** respectively.

**Table 9.1.14 Maintenance Cost of Trans-Sulawesi Mamminasata Project**

No.	Item	Section A (M Rp.)	Section B (M Rp.)	Section C (M Rp.)	Section D (M Rp.)	Total (M Rp.)
1	Routine Maintenance	1,454	1,030	1,652	4,946	<b>9,082</b>
2	Periodic Maintenance per 5-year	3,283	148	6,691	20,026	<b>30,147</b>
3	Periodic Maintenance per 20-year	22,103	34,169	0	0	<b>56,273</b>

Source: JICA Study Team estimation

Taking the above mentioned activities into consideration, the maintenance cost for the Mamminasa Bypass, Hertasning Road & A.D. Sirua Road was estimated as below.

**Table 9.1.15 Maintenance Cost of Mamminasa Bypass, Hertasning Road and  
Abdullah Daeng Sirua Road**

Project Name	Section	Length	Area	Unit Price	Routine Maintenance for AC Pavement Section 5% of One Layer	Periodic Maintenance One Overlay for AC Pavement with 5 Years Intervals
		m	m <sup>2</sup>	Rp / m <sup>2</sup>	M Rp./ year	M Rp./5years
<b>Mamminasa Bypass</b>						
- Maros Bypass Section (North)	1-A	4,950	74,250	55,374	206	4,112
- Maros-KIMA Access (Middle North)	1-C	7,550	113,250	55,374	314	6,271
- Middle Section (KIMA Access-Jl. Malino) (Middle South)	1-B	19,400	291,000	55,374	806	16,114
- Jl. Malino- South Section (Jl.Tj.Bunga) (South)	1-D	16,716	250,740	55,374	694	13,884
Project Subtotal		48,616	729,240		2,019	40,381
<b>Hertasning Road</b>						
- Hertasning Road	3-End	4,865	72,975	55,374	202	4,041
Project Subtotal		4,865			202	4,041
<b>Abdullah Daeng Sirua Road</b>						
- Makassar Section (West)	4-A,C,D	6,225	89,250	55,374	247	4,942
- Maros/Gowa Section (East)	4-E	1,150	17,250	55,374	348	6,963
	4-F1	2,500	37,500	55,374		
	4-F2	4,733	70,995	55,374		
Project Subtotal		14,608	214,995		595	11,905

Source: JICA Study Team estimation

**9.1.5 Cost Estimate for the Implementation Plan**

Project costs for the alternative implementation plans were estimated on the basis of contract packaging described in **Chapter 10.2** and implementation schedule in **Chapter 10.3**.

**(1) Mamminasa Bypass**

The project cost estimated by fiscal year according to the implementation schedule is shown in **Table 9.1.16**.

**Table 9.1.16 Cost Distribution according to Implementation Schedule of Mamminasa Bypass**

Item	Estimated Amount (M. Rp.)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
<b>I. Mamminasa Bypass</b>	<b>49.1 km</b>																			
<b>Maros Bypass Section (North)</b>	<b>5.0 km</b>																			
Land Acquisition and Compensation										20%	40%	40%								
Detailed Design and Supervision Services											30%	35%	35%							
Construction												50%	50%							
Administration										25%	25%	25%	25%							
Maintenance Routine																				
Maintenance Overlay per 5 Years																				
<b>Maros Bypass Section (North)</b>																				
Land Acquisition and Compensation	10,763									2,153	4,305	4,305								
Detailed Design and Supervision Services	6,128										1,838	2,145	2,145							
Construction	87,543											43,771	43,771							
Administration	1,751								438	438	438	438								
Maintenance Routine	1,233													206	206	206	206	206	206	
Maintenance Overlay per 5 Years	4,112																		4,112	
<b>Total</b>	<b>111,529</b>									<b>2,590</b>	<b>6,581</b>	<b>50,659</b>	<b>46,354</b>	<b>206</b>	<b>206</b>	<b>206</b>	<b>206</b>	<b>4,317</b>	<b>206</b>	
	<b>100%</b>									<b>2.3%</b>	<b>5.9%</b>	<b>45.4%</b>	<b>41.6%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>3.9%</b>	<b>0.2%</b>	
<b>Middle Section (KIMA Access-Jl. Malino) (Middle South)</b>																				
<b>19.7 km</b>																				
Land Acquisition and Compensation							20%	40%	40%											
Detailed Design and Supervision Services								25%	25%	25%	25%									
Construction									30%	40%	30%									
Administration							20%	20%	20%	20%	20%									
Maintenance Routine																				
Maintenance Overlay per 5 Years																				
Land Acquisition and Compensation	47,906						9,581	19,162	19,162											
Detailed Design and Supervision Services	19,595							4,899	4,899	4,899	4,899									
Construction	279,929								83,979	111,972	83,979									
Administration	5,599						1,120	1,120	1,120	1,120	1,120									
Maintenance Routine	2,508											314	314	314	314	314	314	314	314	
Maintenance Overlay per 5 Years	6,271															6,271				
<b>Total</b>	<b>361,807</b>						<b>10,701</b>	<b>25,181</b>	<b>109,159</b>	<b>117,990</b>	<b>89,997</b>	<b>314</b>	<b>314</b>	<b>314</b>	<b>314</b>	<b>6,581</b>	<b>314</b>	<b>314</b>	<b>314</b>	
	<b>100%</b>						<b>3.0%</b>	<b>7.0%</b>	<b>30.2%</b>	<b>32.6%</b>	<b>24.9%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>1.8%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>0.1%</b>	
<b>Maros-KIMA Access (Middle North)</b>																				
<b>7.6 km</b>																				
Land Acquisition and Compensation																20%	40%	40%		
Detailed Design and Supervision Services																	25%	25%	25%	
Construction																		30%	30%	
Administration																20%	20%	20%	20%	
Maintenance Routine																				
Maintenance Overlay per 5 Years																				
Land Acquisition and Compensation	15,169															3,034	6,068	6,068		
Detailed Design and Supervision Services	6,330																1,582	1,582	1,582	
Construction	90,425																27,128	36,170	27,128	
Administration	1,809															362	362	362	362	
Maintenance Routine																				
Maintenance Overlay per 5 Years																				
<b>Total</b>	<b>113,733</b>															<b>3,396</b>	<b>8,012</b>	<b>35,139</b>	<b>38,114</b>	<b>29,072</b>
	<b>100%</b>															<b>3.0%</b>	<b>7.0%</b>	<b>30.9%</b>	<b>33.5%</b>	<b>25.6%</b>
<b>Jl. Malino- South Section (Jl.Tj.Bunga) (South)</b>																				
<b>16.7 km</b>																				
Land Acquisition and Compensation																20%	40%	40%		
Detailed Design and Supervision Services																17%	17%	17%	17%	
Construction																	20%	20%	20%	
Administration																14%	14%	14%	14%	
Maintenance Routine																				
Maintenance Overlay per 5 Years																				
Land Acquisition and Compensation	9,274															1,855	3,710	3,710		
Detailed Design and Supervision Services	17,487																2,915	2,915	2,915	
Construction	249,819																49,964	49,964	49,964	
Administration	4,996															714	714	714	714	
Maintenance Routine																				
Maintenance Overlay per 5 Years																				
<b>Total</b>	<b>281,576</b>															<b>2,569</b>	<b>7,338</b>	<b>57,302</b>	<b>53,592</b>	<b>53,592</b>
	<b>100%</b>															<b>0.9%</b>	<b>2.6%</b>	<b>20.4%</b>	<b>19.0%</b>	<b>19.0%</b>

**(2) Trans-Sulawesi Mamminasata Road****1) Alternative A**

Alternative A is the implementation plan in which all sections (Sections A–D) of the project from Maros to Takalar are constructed in one time. The project cost estimated by fiscal year according to the implementation schedule is shown in **Table 9.1.17**.

**Table 9.1.17 Cost Distribution according to Implementation Schedule for Alternative A**

Item	Estimated Amount (M Rp.)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Section A, B, C &amp; D</b>	<b>47.1km</b>																	
Land Acquisition and Compensation		5.0%	30.0%	30.0%	35.0%													
Detailed Design and Supervision Services				40.0%	20.0%	20.0%	20.0%											
Construction					35.0%	35.0%	30.0%											
Administration				25.0%	25.0%	25.0%	25.0%											
Maintenance																		
<b>Section A, B, C &amp; D</b>																		
Land Acquisition and Compensation	260,338	13,017	78,101	78,101	91,118	0	0	0	0	0	0	0	0	0	0	0	0	0
Detailed Design and Supervision Services	58,789	0	0	23,515	11,758	11,758	11,758	0	0	0	0	0	0	0	0	0	0	0
Construction	839,838	0	0	0	293,943	293,943	251,951	0	0	0	0	0	0	0	0	0	0	0
Administration	16,797	0	0	4,199	4,199	4,199	4,199	0	0	0	0	0	0	0	0	0	0	0
Routine Maintenance	99,902							9,082	9,082	9,082	9,082	9,082	9,082	9,082	9,082	9,082	9,082	9,082
Periodic Maintenance	60,294																	30,147
<b>Total</b>	<b>1,335,958</b>	<b>13,017</b>	<b>78,101</b>	<b>105,816</b>	<b>401,019</b>	<b>309,900</b>	<b>267,908</b>	<b>9,082</b>	<b>9,082</b>	<b>9,082</b>	<b>9,082</b>	<b>39,229</b>	<b>9,082</b>	<b>9,082</b>	<b>9,082</b>	<b>9,082</b>	<b>39,229</b>	<b>9,082</b>
	<b>(100%)</b>	<b>(1.0%)</b>	<b>(5.8%)</b>	<b>(7.9%)</b>	<b>(30.0%)</b>	<b>(23.2%)</b>	<b>(20.1%)</b>	<b>(0.7%)</b>	<b>(0.7%)</b>	<b>(0.7%)</b>	<b>(0.7%)</b>	<b>(2.9%)</b>	<b>(0.7%)</b>	<b>(0.7%)</b>	<b>(0.7%)</b>	<b>(0.7%)</b>	<b>(2.9%)</b>	<b>(0.7%)</b>

Source: JICA Study Team

**2) Alternative B**

Alternative B is the plan in which the project is implemented in two phases: Phase I covers Section B (the Middle Ring Road section) and Section C (southern extension of the Middle Ring Road), while Phase II covers Section A (Maros – Jl. Ir. Sutami IC) and Section D (Sungguminasa (Boka IC) – Takalar section). The project cost estimated by fiscal year according to the implementation schedule is shown in **Table 9.1.18**.

**Table 9.1.18 Cost Distribution according to Implementation Schedule for Alternative B**

Item	Estimated Amount (M Rp.)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
<b>Phase I</b>																			
<b>Section B &amp; C</b>	<b>15.9km</b>																		
Land Acquisition and Compensation		5.0%	30.0%	30.0%	35.0%														
Detailed Design and Supervision Services				40.0%	20.0%	20.0%	20.0%												
Construction					35.0%	35.0%	30.0%												
Administration				25.0%	25.0%	25.0%	25.0%												
Maintenance																			
<b>Phase II</b>																			
<b>Section A &amp; D</b>	<b>31.2km</b>																		
Land Acquisition and Compensation					25.0%	25.0%	25.0%	25.0%											
Detailed Design and Supervision Services						8.0%	32.0%	20.0%	20.0%	20.0%									
Construction								33.3%	33.3%	33.3%									
Administration						11.1%	22.2%	22.2%	22.2%	22.2%									
Maintenance																			
<b>Phase I</b>																			
<b>Section B &amp; C</b>																			
Land Acquisition and Compensation	127,130	6,357	38,139	38,139	44,496	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detailed Design and Supervision Services	32,286	0	0	12,914	6,457	6,457	6,457	0	0	0	0	0	0	0	0	0	0	0	0
Construction	461,224	0	0	0	161,428	161,428	138,367	0	0	0	0	0	0	0	0	0	0	0	0
Administration	9,224	0	0	2,306	2,306	2,306	2,306	0	0	0	0	0	0	0	0	0	0	0	0
Routine Maintenance	29,506							2,682	2,682	2,682	2,682	2,682	2,682	2,682	2,682	2,682	2,682	2,682	2,682
Periodic Maintenance	17,090											8,545							8,545
<b>Total</b>	<b>676,460</b>	<b>6,357</b>	<b>38,139</b>	<b>53,359</b>	<b>214,687</b>	<b>170,192</b>	<b>147,130</b>	<b>2,682</b>	<b>2,682</b>	<b>2,682</b>	<b>2,682</b>	<b>2,682</b>	<b>11,227</b>	<b>2,682</b>	<b>2,682</b>	<b>2,682</b>	<b>2,682</b>	<b>11,227</b>	<b>2,682</b>
	<b>(100%)</b>	<b>(0.9%)</b>	<b>(5.6%)</b>	<b>(7.9%)</b>	<b>(31.7%)</b>	<b>(25.2%)</b>	<b>(21.8%)</b>	<b>(0.4%)</b>	<b>(0.4%)</b>	<b>(0.4%)</b>	<b>(0.4%)</b>	<b>(0.4%)</b>	<b>(1.7%)</b>	<b>(0.4%)</b>	<b>(0.4%)</b>	<b>(0.4%)</b>	<b>(0.4%)</b>	<b>(1.7%)</b>	<b>(0.4%)</b>
<b>Phase II</b>																			
<b>Section A &amp; D</b>																			
Land Acquisition and Compensation	133,208	0	0	0	33,302	33,302	33,302	33,302	0	0	0	0	0	0	0	0	0	0	0
Detailed Design and Supervision Services	26,503	0	0	0	0	2,120	8,481	5,301	5,301	5,301	0	0	0	0	0	0	0	0	0
Construction	378,614	0	0	0	0	0	0	126,205	126,205	126,205	0	0	0	0	0	0	0	0	0
Administration	7,572	0	0	0	0	841	1,683	1,683	1,683	1,683	0	0	0	0	0	0	0	0	0
Routine Maintenance	51,197											6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Periodic Maintenance	21,602															21,602			
<b>Total</b>	<b>618,696</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>33,302</b>	<b>36,264</b>	<b>43,466</b>	<b>166,490</b>	<b>133,188</b>	<b>133,188</b>	<b>6,400</b>	<b>6,400</b>	<b>6,400</b>	<b>6,400</b>	<b>28,002</b>	<b>6,400</b>	<b>6,400</b>	<b>6,400</b>	<b>6,400</b>
	<b>(100%)</b>	<b>(0.0%)</b>	<b>(0.0%)</b>	<b>(0.0%)</b>	<b>(5.4%)</b>	<b>(5.9%)</b>	<b>(7.0%)</b>	<b>(26.9%)</b>	<b>(21.5%)</b>	<b>(21.5%)</b>	<b>(1.0%)</b>	<b>(1.0%)</b>	<b>(1.0%)</b>	<b>(1.0%)</b>	<b>(4.5%)</b>	<b>(1.0%)</b>	<b>(1.0%)</b>	<b>(1.0%)</b>	<b>(1.0%)</b>
<b>Grand Total</b>	<b>1,295,157</b>	<b>6,357</b>	<b>38,139</b>	<b>53,359</b>	<b>247,989</b>	<b>206,455</b>	<b>190,596</b>	<b>169,172</b>	<b>135,870</b>	<b>135,870</b>	<b>9,082</b>	<b>17,627</b>	<b>9,082</b>	<b>9,082</b>	<b>30,684</b>	<b>9,082</b>	<b>17,627</b>	<b>9,082</b>	<b>9,082</b>
	<b>(100%)</b>	<b>(0.5%)</b>	<b>(2.9%)</b>	<b>(4.1%)</b>	<b>(19.1%)</b>	<b>(15.9%)</b>	<b>(14.7%)</b>	<b>(13.1%)</b>	<b>(10.5%)</b>	<b>(10.5%)</b>	<b>(0.7%)</b>	<b>(1.4%)</b>	<b>(0.7%)</b>	<b>(0.7%)</b>	<b>(2.4%)</b>	<b>(0.7%)</b>	<b>(1.4%)</b>	<b>(0.7%)</b>	<b>(0.7%)</b>

Source: JICA Study Team

### 3) Alternative C

Alternative C is the plan in which Section B (the Middle Ring Road section) and Section C (southern extension of the Middle Ring Road) would be constructed as an express toll road with frontage roads along Section B in Phase I, while Section A (Maros – Jl. Ir. Sutami IC section) and Section D (Sungguminasa (Boka IC) – Takalar section) would be widened in Phase II. The project cost estimated by fiscal year according to the implementation schedule is shown in **Table 9.1.19**.

**Table 9.1.19 Cost Distribution according to Implementation Schedule for Alternative C**

Item	Estimated Amount (M Rp.)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
<b>Phase I</b>																			
<b>Section B &amp; C (Toll Road)</b>		<b>15.9km</b>																	
Land Acquisition and Compensation	127,130																		
Detailed Design and Supervision Services	35,514																		
Construction	507,346																		
Administration	10,147																		
Maintenance																			
<b>Section B (Frontage Road)</b>		<b>7.1km</b>																	
Land Acquisition and Compensation	0																		
Detailed Design and Supervision Services	11,411																		
Construction	163,010																		
Administration	3,260																		
Maintenance																			
<b>Phase II</b>																			
<b>Section A &amp; D</b>		<b>31.2km</b>																	
Land Acquisition and Compensation	133,208																		
Detailed Design and Supervision Services	26,503																		
Construction	378,614																		
Administration	7,572																		
Maintenance																			
<b>Section B &amp; C (Toll Road)</b>																			
Land Acquisition and Compensation	127,130	6,357	38,139	38,139	44,496	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detailed Design and Supervision Services	35,514	0	0	14,206	7,103	7,103	7,103	0	0	0	0	0	0	0	0	0	0	0	0
Construction	507,346	0	0	0	177,571	177,571	152,204	0	0	0	0	0	0	0	0	0	0	0	0
Administration	10,147	0	0	2,537	2,537	2,537	2,537	0	0	0	0	0	0	0	0	0	0	0	0
Routine Maintenance	101,469							9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224
Periodic Maintenance	55,347																		
<b>Total</b>	<b>836,954 (100%)</b>	<b>6,357 (0.8%)</b>	<b>38,139 (4.6%)</b>	<b>54,881 (6.6%)</b>	<b>231,706 (27.7%)</b>	<b>187,211 (22.4%)</b>	<b>161,843 (19.3%)</b>	<b>9,224 (1.1%)</b>	<b>9,224 (1.1%)</b>	<b>9,224 (1.1%)</b>	<b>9,224 (1.1%)</b>	<b>36,898 (4.4%)</b>	<b>9,224 (1.1%)</b>	<b>9,224 (1.1%)</b>	<b>9,224 (1.1%)</b>	<b>9,224 (1.1%)</b>	<b>36,898 (4.4%)</b>	<b>9,224 (1.1%)</b>	
<b>Section B (Frontage Road)</b>																			
Land Acquisition and Compensation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detailed Design and Supervision Services	11,411	0	0	4,564	2,282	2,282	2,282	0	0	0	0	0	0	0	0	0	0	0	0
Construction	163,010	0	0	0	57,054	57,054	48,903	0	0	0	0	0	0	0	0	0	0	0	0
Administration	3,260	0	0	815	815	815	815	0	0	0	0	0	0	0	0	0	0	0	0
Routine Maintenance	16,301							1,482	1,482	1,482	1,482	1,482	1,482	1,482	1,482	1,482	1,482	1,482	1,482
Periodic Maintenance	14,819																		
<b>Total</b>	<b>208,801 (100%)</b>	<b>0 (0.0%)</b>	<b>0 (0.0%)</b>	<b>5,379 (2.6%)</b>	<b>60,151 (28.8%)</b>	<b>60,151 (28.8%)</b>	<b>52,000 (24.9%)</b>	<b>1,482 (0.7%)</b>	<b>1,482 (0.7%)</b>	<b>1,482 (0.7%)</b>	<b>1,482 (0.7%)</b>	<b>8,891 (4.3%)</b>	<b>1,482 (0.7%)</b>	<b>1,482 (0.7%)</b>	<b>1,482 (0.7%)</b>	<b>1,482 (0.7%)</b>	<b>8,891 (4.3%)</b>	<b>1,482 (0.7%)</b>	
<b>Phase II</b>																			
<b>Section A &amp; D</b>																			
Land Acquisition and Compensation	133,208	0	0	0	33,302	33,302	33,302	33,302	0	0	0	0	0	0	0	0	0	0	0
Detailed Design and Supervision Services	26,503	0	0	0	0	2,120	8,481	5,301	5,301	5,301	0	0	0	0	0	0	0	0	0
Construction	378,614	0	0	0	0	0	0	126,205	126,205	126,205	0	0	0	0	0	0	0	0	0
Administration	7,572	0	0	0	0	841	1,683	1,683	1,683	1,683	0	0	0	0	0	0	0	0	0
Routine Maintenance	22,193										2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Periodic Maintenance	13,870																		
<b>Total</b>	<b>581,961 (100%)</b>	<b>0 (0.0%)</b>	<b>0 (0.0%)</b>	<b>0 (0.0%)</b>	<b>33,302 (5.7%)</b>	<b>36,264 (6.2%)</b>	<b>43,466 (7.5%)</b>	<b>166,490 (28.6%)</b>	<b>133,188 (22.9%)</b>	<b>133,188 (22.9%)</b>	<b>2,774 (0.5%)</b>	<b>2,774 (0.5%)</b>	<b>2,774 (0.5%)</b>	<b>2,774 (0.5%)</b>	<b>16,645 (2.9%)</b>	<b>2,774 (0.5%)</b>	<b>2,774 (0.5%)</b>	<b>2,774 (0.5%)</b>	
<b>Grand Total</b>	<b>1,627,716 (100%)</b>	<b>6,357 (0.4%)</b>	<b>38,139 (2.3%)</b>	<b>60,261 (3.7%)</b>	<b>325,159 (20.0%)</b>	<b>283,625 (17.4%)</b>	<b>257,309 (15.8%)</b>	<b>177,196 (10.9%)</b>	<b>143,894 (8.8%)</b>	<b>143,894 (8.8%)</b>	<b>13,480 (0.8%)</b>	<b>48,563 (3.0%)</b>	<b>13,480 (0.8%)</b>	<b>13,480 (0.8%)</b>	<b>27,351 (1.7%)</b>	<b>13,480 (0.8%)</b>	<b>48,563 (3.0%)</b>	<b>13,480 (0.8%)</b>	

Source: JICA Study Team

Source: JICA Study Team estimation

### (3) Hertasing Road

The project cost estimated by fiscal year according to the implementation schedule is shown in **Table 9.1.20**.

**Table 9.1.20 Cost Distribution according to Implementation Schedule for Hertasing Road**

Item	Estimated Amount	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	(M. Rp.)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
<b>3. Hertasing Road</b>	<b>4.9 km</b>																		
Land Acquisition and Compensation		40%	50%	10%															
Detailed Design and Supervision Services			10%	30%	30%	30%													
Construction				30%	40%	30%													
Administration			25%	25%	25%	25%													
Maintenance Routine																			
Maintenance Overlay per 5 Years											4,041					4,041			
Land Acquisition and Compensation	9,833	3,933	4,917	983															
Detailed Design and Supervision Services	4,269		427	1,281	1,281	1,281													
Construction	60,989			18,297	24,396	18,297													
Administration	1,220		305	305	305	305													
Maintenance Routine	2,627						202	202	202	202	202	202	202	202	202	202	202	202	202
Maintenance Overlay per 5 Years	8,082										4,041					4,041			
<b>Total</b>	<b>87,019</b>	<b>3,933</b>	<b>5,648</b>	<b>20,866</b>	<b>25,981</b>	<b>19,882</b>	<b>202</b>	<b>202</b>	<b>202</b>	<b>202</b>	<b>4,243</b>	<b>202</b>	<b>202</b>	<b>202</b>	<b>202</b>	<b>4,243</b>	<b>202</b>	<b>202</b>	<b>202</b>
	<b>100%</b>	<b>4.5%</b>	<b>6.5%</b>	<b>24.0%</b>	<b>29.9%</b>	<b>22.8%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>4.9%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>4.9%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.2%</b>

Source: JICA Study Team estimation

#### (4) Abdullah Daeng Sirua Road

The project cost estimated by fiscal year according to the implementation schedule is shown in **Table 9.1.21**.

**Table 9.1.21 Cost Distribution according to Implementation Schedule for Abdullah Daeng  
Sirua Road**

Item	Amount (M. Rp.)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
<b>4. Abdullah Daeng Sirua Road</b>	<b>15.3 km</b>																		
Makassar Section (West)	7.0 km																		
Land Acquisition and Compensation				50%	50%														
Detailed Design and Supervision					33%	33%	33%												
Construction					50%	50%													
Administration			25%	25%	25%	25%													
Maintenance Routine																			
Maintenance Overlay per 5 Year																			
Makassar Section (West)																			
Land Acquisition and Compensation	31,451			15,725	15,725														
Detailed Design and Supervision	6,386				2,129	2,129	2,129												
Construction	91,230					45,615	45,615												
Administration	1,825		456	456	456	456													
Maintenance Routine	2,965							247	247	247	247	247	247	247	247	247	247	247	247
Maintenance Overlay per 5 Year	9,884											4,942	4,942	4,942	4,942	4,942	4,942	4,942	4,942
Sub-Total	143,741			16,181	18,310	48,200	48,200	247	247	247	247	5,189	247	247	247	247	5,189	247	247
	100%			11.3%	12.7%	33.5%	33.5%	0.2%	0.2%	0.2%	0.2%	3.6%	0.2%	0.2%	0.2%	0.2%	3.6%	0.2%	0.2%
Maros/Gowa Section (East)	8.3 km																		
Land Acquisition and Compensation						20%	40%	40%											
Detailed Design and Supervision							20%	20%	20%	20%	20%								
Construction								25%	25%	25%	25%								
Administration						17%	17%	17%	17%	17%	17%								
Maintenance Routine																			
Maintenance Overlay per 5 Year																			
Maros/Gowa Section (East)																			
Land Acquisition and Compensation	5,424					1,085	2,170	2,170											
Detailed Design and Supervision	8,694						1,739	1,739	1,739	1,739	1,739								
Construction	124,199							31,050	31,050	31,050	31,050								
Administration	2,484					414	414	414	414	414	414								
Maintenance Routine	2,785											348	348	348	348	348	348	348	348
Maintenance Overlay per 5 Year	6,963															6,963			
Sub-Total	150,549					1,499	4,322	35,372	33,203	33,203	33,203	348	348	348	348	7,311	348	348	348
	100%					1.0%	2.9%	23.5%	22.1%	22.1%	22.1%	0.2%	0.2%	0.2%	0.2%	4.9%	0.2%	0.2%	0.2%
Total	150,549			16,181	18,310	49,699	52,522	35,619	33,450	33,450	33,450	5,537	595	595	595	7,558	5,537	595	595
	100%			11.3%	12.7%	33.5%	33.5%	23.5%	22.1%	22.1%	22.1%	3.6%	0.4%	0.4%	0.4%	5.0%	3.7%	0.4%	0.4%

Source: JICA Study Team estimation

## 9.2 Economic Evaluation

### 9.2.1 Target Roads for Evaluation

The purpose of economic evaluation is to investigate whether the implementation of the selected roads is justified from the viewpoint of national economy, by comparing their economic benefits with economic costs. The target roads for evaluation are the following four (4) roads in the Mamminasata Metropolitan Area:

- 1) Road-1: Mamminasa Bypass (48.6 km)
- 2) Road-2: Trans-Sulawesi Mamminasata Road (47.3 km)
- 3) Road-3: Hertasing Road (4.9 km)
- 4) Road-4: Abdullah Daeng Sirua Road (14.6 km)

In addition to the above four (4) roads, the Outer Ring Road and Tj.Bunga-Takalar Road were also evaluated and the results are presented in Appendix F and Appendix G respectively.



## 9.2.2 Evaluation Scenarios

### (1) Implementation Schedule of Target Roads

The economic benefit of each target road is affected by its implementation timing (construction period and opening year) and the construction of other competitive road links as well. The overall implementation schedule for all road projects including the above target roads is proposed in **Chapter 10** and traffic demand forecasts were carried out in **Chapter 5** in accordance with that overall schedule. Therefore, economic evaluation of the target roads was made keeping consistency with the overall implementation schedule.

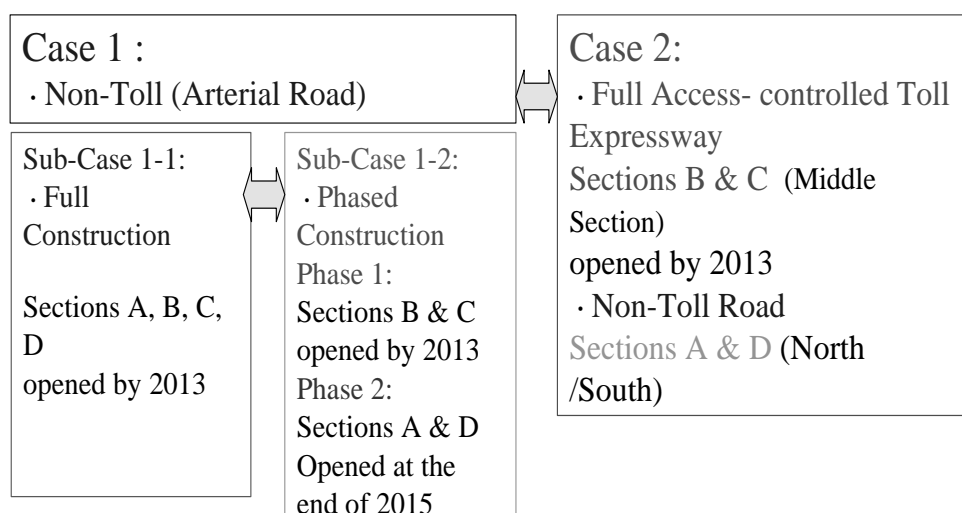
All the above target roads were evaluated as non-toll roads except for the Trans-Sulawesi Mamminasata Road for which alternative evaluation cases for both non-toll and toll expressway were examined as explained below.

### (2) Evaluation of Alternatives for Trans-Sulawesi Mamminasata Road

Considering its importance and roles in the Mamminasata Metropolitan Area, the following three (3) evaluation scenarios were prepared for the Trans-Sulawesi Mamminasata Road.

- Case 1: Non-toll (toll-free) road case (the Trans-Sulawesi Mamminasata Road is constructed as a toll-free road like an ordinary national road or city road). However, it is proposed to collect a low toll at the two bridges (Tallo River Bridge and Jeneberang River Bridge) in order to secure a fund source to cover the annual maintenance cost.
  - Sub-Case 1-1: Construction of all sections of the Trans-Sulawesi Mamminasata Road and their opening to public traffic at the beginning of 2013 simultaneously.
  - Sub-Case 1-2: Phase-wise construction (Phase 1: the Middle Ring Road and its access sections opening to public traffic in 2013, and Phase 2: the rest of the sections opening at the beginning of 2016).
- Case 2: Toll road case (the Middle Ring Road Section and its access road are constructed as a full access-controlled toll road with frontage roads, opening to public traffic in 2013 and the rest of the sections opening at the beginning of 2016).

**Figure 9.2.1** illustrates the above scenarios to be examined for the Trans-Sulawesi Mamminasata Road.



**Figure 9.2.1 Economic Evaluation Scenarios for Trans-Sulawesi Mamminasata Road**

### 9.2.3 Economic Costs

The project costs consist of construction cost, land acquisition and compensation cost, detailed design and construction supervision cost, and administration cost. All of the costs (and benefits) estimated at the market prices were converted into economic prices in the economic evaluation by excluding such transfer items as taxes and duties. The results of economic cost estimation for all the target roads are summarized in **Table 9.2.1**.

**Table 9.2.1 Economic Costs (Rp. million, at 2006 Price)**

Target Roads	Length (km)	Economic Cost (Rp. Million)
R1: Mamminasa Bypass	48.6	854,521
R2: Trans-Sulawesi Mamminasata - Non-Toll	47.3	1,175,761
- Toll Expressway		1,382,835
R3: Hertasning Road	4.9	76,310
R4: Abd. Daeng Sirua Road	14.6	271,692

Source: JICA Study Team

The land acquisition cost was included in the economic cost in this Study. As the target roads are located in urban and partly suburban areas in the Mamminasata Metropolitan Area, the Right-of-way (ROW) for the project roads will be used for other economic activities if the project roads are not constructed. Therefore, the opportunity cost of land is not zero and its real values are considered as the reflected actual transaction prices (market prices) of land.

The operation and maintenance (O&M) costs after opening of the roads to traffic were also estimated as presented in the previous section and converted into economic costs.

## 9.2.4 Economic Benefits

### (1) Quantified Economic Benefits

The quantified economic benefits in this Study include the following two types of benefits which will be enjoyed by road users:

- 1) Savings in Vehicle Operating Costs (VOC Savings), and
- 2) Savings in passenger Travel Time Costs (TTC Savings)

The above benefits were estimated based on the “With and Without Project comparison method”. For the purpose of benefit estimation, the necessary input data such as future traffic demand, network conditions (link length, speed, and road roughness), unit VOC (Rp/km) and unit TTC (Rp/hour) were used.

### (2) Vehicle Operating Cost (VOC)

The Vehicle Operating Cost consist of 1) vehicle cost, 2) fuel cost, 3) tire cost, 4) crew cost, 5) maintenance cost, and 6) overhead cost for commercial vehicles. The basic VOC data had been prepared for the “Indonesian Road Management System (IRMS)” and updated periodically. IRMS defines the “Road User Costs (RUC) as follows:

- $RUC = VOCs + \text{Passenger Travel Time Cost (TTC)}$

In the above formula, unit VOCs are calculated applying the following equations:

- $VOC_i = BASE_i * NDX_i$
- $NDX_i = k_{1i} + k_{2i}/V_i + k_{3i}*V_i^2 + k_{4i}*IRI + k_{5i}*IRI^2$

Where	$VOC_i$	: Unit VOC for vehicle type (i) in Rp/km
	$BASE_i$	: Base VOC for vehicle type (i) in Rp/km under the “good condition” with roughness 3
	$NDX_i$	: VOC index for vehicle type (i)
	$V_i$	: Vehicle speed for vehicle type (i) in km/hour
	$IRI$	: Road roughness (m/km)
	$k_{1--k5}$	: Coefficients by vehicle type

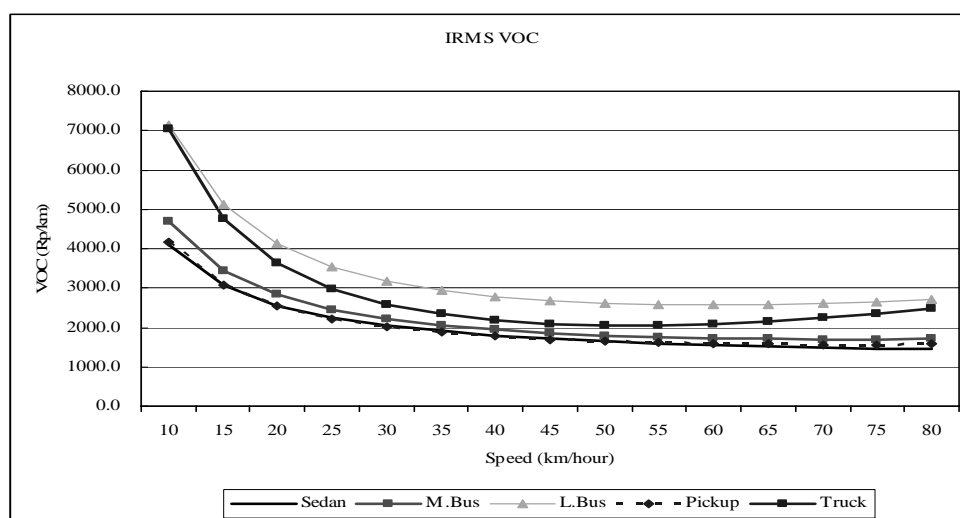
The latest base VOCs ( $BASE_i$ ) and coefficients in the above equation are given in **Table 9.2.2** for 11 vehicle types:

**Table 9.2.2 VOC Coefficients and Base VOC**

No.	Vehicle Type	K1	K2	K3	K4	K5	Base VOC (Rp/km)
1	Sedan	0.66707	22.23983	0.00006808	0.012937	0.00139	1,396.10
2	Utility Passenger	0.57932	20.34176	0.000018379	0.014087	0.00093	1,186.77
3	Utility Freight	0.58382	20.30049	0.000018278	0.013313	0.00079	1,414.64
4	Light Bus	0.32475	21.93222	0.000028582	0.068937	-0.00007	1,724.67
5	Large Bus	0.32985	22.26215	0.000053281	0.012930	0.00069	2,735.78
6	Light Truck	0.42258	20.52269	0.000027740	0.044006	-0.00006	1,592.41
7	Medium Truck	-0.17257	28.62223	0.000100534	0.061250	0.00016	2,444.33
8	Heavy Truck	0.11065	21.20004	0.000085612	0.044117	0.00041	3,481.37
9	Truck Trailer	0.29038	13.69068	0.000068153	0.053472	0.00027	5,447.68
10	Tractor Trailer	0.59807	10.02214	0.000021525	0.044723	0.00009	7,180.32
11	Motor cycle	1.05130	13.71763	-0.000009124	0.009024	0.00052	201.90

Source: IRMS: Updating the VOC Equation Coefficients, 2006

The above base data and coefficients were applied to this Study after checking and comparing the calculated unit VOC values with those of other recent studies. **Figure 9.2.2** indicates the estimated VOC curves explained by travel speed in the case of road roughness 3.



Source: JICA Study Team (drawn from the data of IRMS)

**Figure 9.2.2 VOC Curves by Vehicle Type (IRI=3)**

### (3) Passenger Travel Time Cost (TTC)

The savings in travel time cost are another important component of road users' benefit. IRMS estimated the unit value of travel time (Rp/hour/vehicle) at 2006 price level based on the traditional "income approach method" as shown in **Table 9.2.3**. Factors which were taken into account for the calculation of unit TTC per vehicle for IRMS are:

- 1) Monthly income of passengers by vehicle group,
- 2) Shadow Wage Rate (=0.85),
- 3) Monthly working hours (=191 hours),

- 4) Non-work time value (=28% of work time value),
- 5) Trip purpose percentage of work trips and non-work trips by vehicle group, and
- 6) Average occupancy (number of passengers per vehicle).

**Table 9.2.3 Passenger Travel Time Cost (Rp/hour/vehicle: 2006)**

Passenger Monthly Income							
Vehicle Type	Sedan	Utility Passenger	Utility Freight	Light Bus	Large Bus	Truck	Motor-Cycle
Income/month (Rp)	2,640,000	836,000	748,000	836,000	836,000	748,000	1,056,000
Income at SWR	2,244,000	710,600	635,800	710,600	710,600	635,800	897,600
Working hours/month	191	191	191	191	191	191	191
Passenger TTC per Hour							
Work time value (Rp)	11,749	3,720	3,329	3,720	3,720	3,329	4,699
Non-work time value	3,290	1,042	932	1,042	1,042	932	1,316
% Work trips	50%	30%	75%	30%	30%	75%	50%
% Non-work trips	50%	70%	25%	70%	70%	25%	50%
Occupancy (persons)	2.0	8.0	1.0	16.0	32.0	1.0	1.2
TTC/passenger/hr	7,519	1,845	2,730	1,845	1,845	2,730	3,008
TTC/vehicle/hr (Rp)	15,038	14,763	2,730	29,525	59,050	2,730	3,609

Source: IRMS: Updating the VOC Equation Coefficients, 2006

In order to confirm the applicability of the above estimated time value to this Study, a comparison with a past study (*Heavy Loaded Road Improvement Project (HLIP) – Master Plan Review Study, December 2001*) was made as shown in **Table 9.2.4**:

**Table 9.2.4 Comparison of Time Values**

Category	Time Value/hour/person		Vehicle Type	Time Value/hour/vehicle	
	HLIP 2001 (Sulawesi)*	IRMS 2006**		HLIP 2001 (Sulawesi)*	IRMS 2006**
Car user, working	9,735	11,749	Car	11,560	15,038
Bus user, working	3,809	3,720	Passenger Utility	12,850	14,763
Car user, non-working	2,920	3,290	Medium Bus	26,226	29,525
Bus user, non-working	1,143	1,042	Large Bus	53,996	59,050

Source: \*: Heavy Loaded Road Improvement Project-II, Master Plan Review Study for National Network Roads, Final Report, Volume 2, December 2001.

\*\* : IRMS: Updating the VOC Equation Coefficients, 2006.

Although the time values shown in **Table 9.2.3** by IRMS (2006) seem to be not much higher than those of the HLIP Study considering a five-year span (2001 - 2006), it was judged that the time values in **Table 9.2.3** are in the acceptable range and thus they were applied to this Study.

#### (4) Total Benefits Estimated

The road users' costs (VOC and TTC) were calculated applying the above unit values (Rp/vehicle/km and Rp/vehicle/hour) to the results of traffic assignment simulations for the both "With Project" and "Without Project" cases. The economic benefit is defined as the difference of the total road users' cost between "Without Project" and "With Project" cases. The results of benefit estimate are summarized in **Table 9.2.5**.

**Table 9.2.5 Estimated Economic Benefits**

(Unit: Rp million)

Target Roads	Year	Economic Benefit		Total
		VOC Savings	Passenger Travel Time Savings	
R1: Mamminasa Bypass	2016	35,473	10,569	46,042
	2020	54,027	17,939	71,966
	2023	185,774	79,428	265,202
R2: Trans-Sulawesi Mamminasata (Non-toll) Simultaneous opens in 2013	2013	360,515	142,759	503,274
	2015	364,933	150,449	515,382
	2020	375,979	169,673	545,652
	2023	431,086	195,523	626,609
R2: Trans-Sulawesi Mamminasata (Non-toll) Phase-wise construction	2013	144,206	57,104	201,310
	2015	364,933	150,449	515,382
	2020	375,979	169,673	545,652
	2023	431,086	195,523	626,609
R2: Trans-Sulawesi Mamminasata (Toll Expressway)	2013	144,565	57,721	202,287
	2015	369,826	153,578	523,404
	2020	390,859	176,764	567,623
	2023	452,647	206,180	658,827
R3: Hertasning Road	2011	17,710	9,931	27,641
	2015	36,272	8,833	45,105
	2020	54,871	15,313	70,184
	2023	59,687	18,972	78,659
R4: Abd. Daeng Sirua Road (*)	2012	43,765	20,509	64,274
	2015	62,521	29,299	91,820
	2020	30,056	23,512	53,568
	2023	29,142	27,321	56,463

Source: JICA Study Team

Note: (\*): Benefits of Abd. Daeng Sirua Road will be affected by introduction of a competitive new road link before 2020.

## 9.2.5 Economic Evaluation

### (1) Premises for Evaluation

For the purpose of economic evaluation, the following preconditions were established:

- Price level : Constant 2006 prices
- Evaluation Period : 30 years after the first opening to traffic
- Disbursement Schedule : Assumed in accordance with the construction plan
- Residual Value : No residual values
- Opportunity Cost of Capital : 15% (and 12% for reference)

### (2) Economic Cash Flows and Evaluation Indicators

The calculated cost and benefit cash flows are shown in **Table 9.2.8** to **Table 9.2.13**. The following three kinds of evaluation indicators were calculated based on the conventional Discount Cash Flow method (DCF):

- 1) Economic Internal Rate of Return (EIRR)
- 2) Net Present Value (NPV)
- 3) Benefit/ Cost Ratio (B/C)

The results of evaluation are summarized in **Table 9.2.6** :

**Table 9.2.6 Results of Economic Evaluation**

Target Roads	Evaluation Indicators		
	EIRR	NPV (Rp. million) (*)	B/C (*)
R1: Mamminasa Bypass	22.4%	171,550	1.97
R2: Trans-Sulawesi Mamminasata Road			
- (Non-Toll) 2013 simultaneous open	28.5%	768,273	2.30
- (Non-Toll) Phasing	30.2%	721,063	2.45
- (Toll Expressway)	26.7%	648,842	2.07
R3: Hertasing Road	33.8%	122,258	3.51
R4: Abd. Daeng Sirua Road	31.0%	110,466	1.96

Source: JICA Study Team

(\*) Discount Rate = 15%

The above results show that the implementation of all the target roads is economically feasible with values of EIRR sufficiently higher than the opportunity cost of capital ( $> 15\%$ ), positive figures of NPV ( $> 0$ ), and higher B/C ratios than unity ( $> 1$ ). Among all the target roads, the Trans-Sulawesi Mamminasata Road (non-toll and phasing construction case), Abd. Daeng Sirua Road and Hertasing Road have a higher EIRR of 30.7%, 31.0% and 33.8% respectively. NPV for the Trans-Sulawesi Mamminasata Road is the highest among the F/S roads.

### (3) Sensitivity Analysis

#### 1) Prepared Cases for Sensitivity Tests

The robustness of feasibility of the Project was tested by changing the related factors within a probable range. The test cases prepared in this sensitivity analysis are as follows:

- Test 1: Project Cost: 10% up, Project Benefit: 10% down
- Test 2: Project Cost 20% up, Project Benefit: 20% down
- Test 3: Evaluation Period: 20 years after opening

## 2) Results of Sensitivity Analysis

The results of the three tests for each target road are summarized in **Table 9.2.7**.

**Table 9.2.7 Sensitivity Analysis**

Target Roads	Tested Cases	EIRR (%)	NPV (*) (Rp.Million)	B/C (*)
R1: Mamminasa Bypass	Original Case	22.4	171,550	1.97
	Test 1: cost 10% up, benefit 10 % down	20.0	119,192	1.62
	Test 2: cost 20% up, benefit 20% down	17.8	66,835	1.32
	Test 3: evaluation period: 20 years	21.3	112,193	1.64
R2: Trans-Sulawesi Mamminasata	Sub-Case 1-1 : (Non-toll, Simultaneous open)			
	Original Case	28.5	768,273	2.30
	Test 1: cost 10% up, benefit 10 % down	24.7	573,342	1.88
	Test 2: cost 20% up, benefit 20% down	21.2	378,412	1.53
	Test 3: evaluation period: 20 years	28.4	697,599	2.18
	Sub-Case 1-2 : (Non-toll, Phased construction)			
	Original Case	30.2	721,063	2.45
	Test 1: cost 10% up, benefit 10 % down	26.2	549,738	2.01
	Test 2: cost 20% up, benefit 20% down	22.5	378,413	1.64
	Test 3: evaluation period: 20 years	30.1	650,842	2.32
	Case 2 : Toll Road Case			
	Original Case	26.7	648,842	2.07
	Test 1: cost 10% up, benefit 10 % down	23.0	462,164	1.69
Test 2: cost 20% up, benefit 20% down	19.6	275,487	1.38	
Test 3: evaluation period: 20 years	26.5	575,360	1.95	
R3: Hertasning Road	Original Case	33.8	122,258	3.51
	Test 1: cost 10% up, benefit 10 % down	30.0	100,279	2.87
	Test 2: cost 20% up, benefit 20% down	26.4	78,300	2.34
	Test 3: evaluation period: 20 years	33.7	107,936	3.22
R4: Abd. Daeng Sirua Road	Original Case	31.0	110,466	1.96
	Test 1: cost 10% up, benefit 10 % down	25.5	76,357	1.60
	Test 2: cost 20% up, benefit 20% down	20.5	42,248	1.31
	Test 3: evaluation period: 20 years	30.9	102,522	1.89

Source: JICA Study Team

(\*) Discount Rate = 15%

The above results indicate the robustness of the economic feasibility of all the target roads showing that the values of EIRR are higher than 15%, figures of NPV are positive ( $NPV > 0$ ), and B/C ratios are higher than unity ( $B/C > 1$ ) in any of the cases prepared for the sensitivity analysis.

## 9.2.6 Conclusions of Economic Evaluation

### (1) High Economic Return and Recommended Construction Schedule

The results of economic evaluation justify the viability of all the target roads to be constructed in accordance with the proposed overall implementation schedule. The Trans-Sulawesi Mamminasata Road (non-toll case), Abd. Daeng Sirua Road and Hertasning Road (and other target roads as well) show quite high economic returns with values of EIRR higher than the opportunity cost of capital (15.0%), and the implementation of all the target roads is justified from the viewpoint of national economy. In addition, the target roads will contribute to sustainable economic growth of the



Mamminasata Metropolitan Area by supporting regional development plans in various sectors. Regarding the Trans-Sulawesi Mamminasata Road, it is recommended to be implemented as a non-toll arterial road (not as a toll expressway) because the economic return in the non-toll road case is higher than that in the toll expressway case.

**(2) Ensuring Maintenance Cost after Opening**

Maintenance after opening of the target roads is very important for maintaining the project roads in good condition. Therefore, it is recommended to collect a low toll fee from road users for the purpose of securing the annual and periodic maintenance cost. In this Study, it is assumed to collect users' charge at the toll gates provided at the two new bridges along the Trans-Sulawesi Mamminasata Road (Tallo River Bridge and Jeneberang Bridge) at a rate of one-third of that applied at the existing Ir. Sutami Toll Road.

**Table 9.2.8 Cost Benefit Cash Flow (R1: Mamminasa Bypass)**  
(Rp. million)

SQ No.	Year	Cost (C)			Benefit (B)	Balance B-C
		Project Cost (incl.LA)	O & M	Total Cost		
	2006			0	0	0
	2007			0	0	0
	2008			0	0	0
	2009			0	0	0
	2010			0	0	0
	2011	10,701		10,701	0	-10,701
	2012	25,181		25,181	0	-25,181
	2013	109,159		109,159	0	-109,159
	2014	120,580		120,580	0	-120,580
	2015	96,578		96,578	0	-96,578
1	2016	50,659	314	50,973	46,042	-4,931
2	2017	48,923	314	49,236	52,523	3,287
3	2018	7,338	519	7,857	59,004	51,147
4	2019	60,697	519	61,216	65,485	4,269
5	2020	61,604	6,790	68,394	71,966	3,572
6	2021	88,731	519	89,251	136,378	47,127
7	2022	91,706	4,631	96,337	200,790	104,453
8	2023	82,664	519	83,183	265,202	182,019
9	2024		2,019	2,019	297,408	295,389
10	2025		8,290	8,290	329,614	321,324
11	2026		2,019	2,019	361,820	359,801
12	2027		6,131	6,131	394,026	387,895
13	2028		32,017	32,017	426,232	394,215
14	2029		2,019	2,019	458,438	456,419
15	2030		8,290	8,290	490,644	482,354
16	2031		2,019	2,019	522,850	520,831
17	2032		6,131	6,131	555,056	548,925
18	2033		32,017	32,017	587,262	555,245
19	2034		2,019	2,019	619,468	617,449
20	2035		8,290	8,290	651,674	643,384
21	2036		2,019	2,019	683,880	681,861
22	2037		6,131	6,131	716,086	709,955
23	2038		32,017	32,017	748,292	716,275
24	2039		2,019	2,019	780,498	778,479
25	2040		8,290	8,290	812,704	804,414
26	2041		2,019	2,019	844,910	842,891
27	2042		6,131	6,131	877,116	870,985
28	2043		32,017	32,017	909,322	877,305
29	2044		2,019	2,019	941,528	939,509
30	2045		8,290	8,290	973,734	965,444
		854,521	226,338	1,080,859	14,879,952	13,799,093

EIRR		22.4%
NPV (Rp million)	Discount Rate 15%	171,550
	Discount Rate 12%	414,057
B/C	Discount Rate 15%	1.97
	Discount Rate 12%	2.74

Source: JICA Study Team

**Table 9.2.9 Cost Benefit Cash Flow**  
**(R2: Trans-Sulawesi Mamminasata Road: Case 1-1:Non-Toll)**

(Rp. million)

SQ	Year	Cost (C)				Benefit (B)			Balance B-C
		Construction & Land Aquisition	O & M		Total Cost	VOC Savings	TCC Savings	Total Benefit	
			Routin	Periodic					
	2006	0	0		0	0	0	0	0
	2007	13,017	0		13,017	0	0	0	-13,017
	2008	78,101	0		78,101	0	0	0	-78,101
	2009	105,816	0		105,816	0	0	0	-105,816
	2010	401,019	0		401,019	0	0	0	-401,019
	2011	309,900	0		309,900	0	0	0	-309,900
	2012	267,908	0		267,908	0	0	0	-267,908
1	2013		9,082		9,082	360,515	142,759	503,274	494,192
2	2014		9,082		9,082	362,724	146,604	509,328	500,246
3	2015		9,082		9,082	364,933	150,449	515,382	506,300
4	2016		9,082		9,082	367,142	154,294	521,436	512,354
5	2017		9,082	30,147	39,229	369,351	158,139	527,490	488,261
6	2018		9,082		9,082	371,561	161,983	533,544	524,462
7	2019		9,082		9,082	373,770	165,828	539,598	530,516
8	2020		9,082		9,082	375,979	169,673	545,652	536,570
9	2021		9,082		9,082	394,348	178,290	572,638	563,556
10	2022		9,082	30,147	39,229	412,717	186,906	599,623	560,394
11	2023		9,082		9,082	431,086	195,523	626,609	617,527
12	2024		9,082		9,082	431,086	195,523	626,609	617,527
13	2025		9,082		9,082	431,086	195,523	626,609	617,527
14	2026		9,082		9,082	431,086	195,523	626,609	617,527
15	2027		9,082	30,147	39,229	431,086	195,523	626,609	587,380
16	2028		9,082		9,082	431,086	195,523	626,609	617,527
17	2029		9,082		9,082	431,086	195,523	626,609	617,527
18	2030		9,082		9,082	431,086	195,523	626,609	617,527
19	2031		9,082		9,082	431,086	195,523	626,609	617,527
20	2032		9,082	86,420	95,502	431,086	195,523	626,609	531,107
21	2033		9,082		9,082	431,086	195,523	626,609	617,527
22	2034		9,082		9,082	431,086	195,523	626,609	617,527
23	2035		9,082		9,082	431,086	195,523	626,609	617,527
24	2036		9,082		9,082	431,086	195,523	626,609	617,527
25	2037		9,082	30,147	39,229	431,086	195,523	626,609	587,380
26	2038		9,082		9,082	431,086	195,523	626,609	617,527
27	2039		9,082		9,082	431,086	195,523	626,609	617,527
28	2040		9,082		9,082	431,086	195,523	626,609	617,527
29	2041		9,082		9,082	431,086	195,523	626,609	617,527
30	2042		9,082	30,147	39,229	431,086	195,523	626,609	587,380
		1,175,761	272,460	237,155	1,685,376	12,374,759	5,525,386	17,900,145	16,214,769

EIRR		28.5%
NPV (Rp million)	Discount Rate: 15%	768,273
	Discount Rate: 12%	1,340,979
B/C	Discount Rate: 15%	2.30
	Discount Rate: 12%	2.94

Source: JICA Study Team

**Table 9.2.10 Cost Benefit Cash Flow**  
**(R2: Trans-Sulawesi Mamminasata Road, Case 1-2: Non-Toll: Phasing)**  
(Rp. million)

SQ	Year	Cost (C)							Benefit (B)			Balance B-C	
		Land Acquisition & Construction		O & M				Total Cost	VOC Savings	TCC Savings	Total Benefit		
		Phase 1	Phase 2	Routine		Periodic							
				Phase 1	Phase 2	Phase 1	Phase 2						
		2006	0	0	0				0	0	0	0	0
		2007	6,357	0	0				6,357	0	0	0	-6,357
		2008	38,139	0	0				38,139	0	0	0	-38,139
		2009	53,359	0	0				53,359	0	0	0	-53,359
		2010	214,687	33,302	0				247,989	0	0	0	-247,989
		2011	170,192	36,264	0				206,456	0	0	0	-206,456
Phase 1		2012	147,130	43,466	0				190,596	0	0	0	-190,596
1		2013		166,490	2,682				169,172	144,206	57,104	201,310	32,138
2	Phase 2	2014		133,188	2,682				135,870	254,569	103,776	358,346	222,476
3		2015		133,188	2,682				135,870	364,933	150,449	515,382	379,512
4	1	2016			2,682	6,400			9,082	367,142	154,294	521,436	512,354
5	2	2017			2,682	6,400	8,545		17,627	369,351	158,139	527,490	509,863
6	3	2018			2,682	6,400			9,082	371,561	161,983	533,544	524,462
7	4	2019			2,682	6,400			9,082	373,770	165,828	539,598	530,516
8	5	2020			2,682	6,400		21,602	30,684	375,979	169,673	545,652	514,968
9	6	2021			2,682	6,400			9,082	394,348	178,290	572,638	563,556
10	7	2022			2,682	6,400	8,545		17,627	412,717	186,906	599,623	581,996
11	8	2023			2,682	6,400			9,082	431,086	195,523	626,609	617,527
12	9	2024			2,682	6,400			9,082	431,086	195,523	626,609	617,527
13	10	2025			2,682	6,400		21,602	30,684	431,086	195,523	626,609	595,925
14	11	2026			2,682	6,400			9,082	431,086	195,523	626,609	617,527
15	12	2027			2,682	6,400	8,545		17,627	431,086	195,523	626,609	608,982
16	13	2028			2,682	6,400			9,082	431,086	195,523	626,609	617,527
17	14	2029			2,682	6,400			9,082	431,086	195,523	626,609	617,527
18	15	2030			2,682	6,400		21,602	30,684	431,086	195,523	626,609	595,925
19	16	2031			2,682	6,400			9,082	431,086	195,523	626,609	617,527
20	17	2032			2,682	6,400	42,714		51,796	431,086	195,523	626,609	574,813
21	18	2033			2,682	6,400			9,082	431,086	195,523	626,609	617,527
22	19	2034			2,682	6,400			9,082	431,086	195,523	626,609	617,527
23	20	2035			2,682	6,400		43,705	52,787	431,086	195,523	626,609	573,822
24	21	2036			2,682	6,400			9,082	431,086	195,523	626,609	617,527
25	22	2037			2,682	6,400	8,545		17,627	431,086	195,523	626,609	608,982
26	23	2038			2,682	6,400			9,082	431,086	195,523	626,609	617,527
27	24	2039			2,682	6,400			9,082	431,086	195,523	626,609	617,527
28	25	2040			2,682	6,400		21,602	30,684	431,086	195,523	626,609	595,925
29	26	2041			2,682	6,400			9,082	431,086	195,523	626,609	617,527
30	27	2042			2,682	6,400	8,545		17,627	431,086	195,523	626,609	608,982
			629,864	545,898	80,460	172,800	85,439	130,113	1,644,574	12,050,296	5,396,902	17,447,198	15,802,624
			1,175,762										

EIRR		30.2%
NPV	Discount Rate: 15%	721,063
(Rp million)	Discount Rate: 12%	1,258,780
B/C	Discount Rate: 15%	2.45
	Discount Rate: 12%	3.11

Source: JICA Study Team

**Table 9.2.11 Cost Benefit Cash Flow**  
**(R2: Trans-Sulawesi Mamminasata Road, Case 2: Toll Expressway)**

(Rp. million)

SQ	Year	Cost (C)							Benefit (B)			Balance B-C	
		Construction & L.A. cost		O & M				Total Cost	VOC Savings	TCC Savings	Total Benefit		
		Toll & Frontage	Other sections	Routin 1	Routin 2	Periodic 1	Periodic 2						
	2006	0	0	0				0	0	0	0	0	
	2007	6,357	0	0				6,357	0	0	0	-6,357	
	2008	38,139	0	0				38,139	0	0	0	-38,139	
	2009	60,260	0	0				60,260	0	0	0	-60,260	
	2010	291,857	27,286	0				319,143	0	0	0	-319,143	
	2011	247,362	31,309	0				278,671	0	0	0	-278,671	
Phase 1	2012	213,843	38,511	0				252,354	0	0	0	-252,354	
1	Phase 2	2013		161,535	10,706			172,241	144,565	57,721	202,287	30,046	
2		2014		133,188	10,706			143,894	257,196	105,650	362,845	218,951	
3		2015		133,188	10,706			143,894	369,826	153,578	523,404	379,510	
4	1	2016			10,706	2,774		13,480	374,033	158,215	532,248	518,768	
5	2	2017			10,706	2,774	35,083	48,563	378,239	162,852	541,092	492,529	
6	3	2018			10,706	2,774		13,480	382,446	167,490	549,935	536,455	
7	4	2019			10,706	2,774		13,480	386,652	172,127	558,779	545,299	
8	5	2020			10,706	2,774		27,350	390,859	176,764	567,623	540,273	
9	6	2021			10,706	2,774		13,480	411,455	186,569	598,024	584,544	
10	7	2022			10,706	2,774	35,083	48,563	432,051	196,375	628,426	579,863	
11	8	2023			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
12	9	2024			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
13	10	2025			10,706	2,774		27,350	452,647	206,180	658,827	631,477	
14	11	2026			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
15	12	2027			10,706	2,774	35,083	48,563	452,647	206,180	658,827	610,264	
16	13	2028			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
17	14	2029			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
18	15	2030			10,706	2,774		27,350	452,647	206,180	658,827	631,477	
19	16	2031			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
20	17	2032			10,706	2,774	35,083	48,563	452,647	206,180	658,827	610,264	
21	18	2033			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
22	19	2034			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
23	20	2035			10,706	2,774		27,350	452,647	206,180	658,827	631,477	
24	21	2036			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
25	22	2037			10,706	2,774	35,083	48,563	452,647	206,180	658,827	610,264	
26	23	2038			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
27	24	2039			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
28	25	2040			10,706	2,774		27,350	452,647	206,180	658,827	631,477	
29	26	2041			10,706	2,774		13,480	452,647	206,180	658,827	645,347	
30	27	2042			10,706	2,774	35,083	48,563	452,647	206,180	658,827	610,264	
			857,818	525,017	321,180	74,898	210,498	69,350	2,058,761	12,580,262	5,660,941	18,241,203	16,182,442
			1,382,835										

EIRR		26.7%
NPV	Discount Rate: 15%	648,842
(Rp million)	Discount Rate: 12%	1,188,006
B/C	Discount Rate: 15%	2.07
	Discount Rate: 12%	2.62

Source: JICA Study Team

**Table 9.2.12 Cost Benefit Cash Flow  
(R3: Hertasning Road)**

(Rp. million)

SQ No.	Year	Cost (C)			Benefit (B)	Balance B-C
		Project Cost (incl.LA)	O & M	Total Cost		
	2006	3,933		3,933	0	-3,933
	2007	5,648		5,648	0	-5,648
	2008	20,866		20,866	0	-20,866
	2009	25,981		25,981	0	-25,981
	2010	19,882		19,882	0	-19,882
1	2011		202	202	27,641	27,439
2	2012		202	202	32,007	31,805
3	2013		202	202	36,373	36,171
4	2014		202	202	40,739	40,537
5	2015		4,243	4,243	45,105	40,862
6	2016		202	202	50,121	49,919
7	2017		202	202	55,137	54,935
8	2018		202	202	60,152	59,950
9	2019		202	202	65,168	64,966
10	2020		4,243	4,243	70,184	65,941
11	2021		202	202	73,009	72,807
12	2022		202	202	75,834	75,632
13	2023		202	202	78,659	78,457
14	2024		202	202	80,072	79,869
15	2025		4,243	4,243	81,484	77,241
16	2026		202	202	82,897	82,694
17	2027		202	202	84,309	84,107
18	2028		202	202	85,722	85,519
19	2029		202	202	87,134	86,932
20	2030		4,243	4,243	88,547	84,304
21	2031		202	202	89,959	89,757
22	2032		202	202	91,372	91,169
23	2033		202	202	92,784	92,582
24	2034		202	202	94,197	93,994
25	2035		4,243	4,243	95,609	91,366
26	2036		202	202	97,022	96,819
27	2037		202	202	98,434	98,232
28	2038		202	202	99,847	99,644
29	2039		202	202	101,259	101,057
30	2040		4,243	4,243	102,672	98,429
		76,310	30,307	106,617	2,263,445	2,156,828

EIRR		33.8%
NPV (Rp million)	Discount Rate 15%	122,258
	Discount Rate 12%	200,823
B/C	Discount Rate 15%	3.51
	Discount Rate 12%	4.69

Source: JICA Study Team

**Table 9.2.13 Cost Benefit Cash Flow  
(R4: Abdullah Daeng Sirua Road)**

(Rp. million)

SQ No.	Year	Cost (C)			Benefit (B)	Balance B-C
		Project Cost (incl.LA)	O & M	Total Cost		
	2006			0	0	0
	2007			0	0	0
	2008	16,181		16,181	0	-16,181
	2009	18,310		18,310	0	-18,310
	2010	49,699		49,699	0	-49,699
	2011	52,522		52,522	0	-52,522
1	2012	35,372	247	35,619	64,274	28,655
2	2013	33,203	247	33,450	73,456	40,006
3	2014	33,203	247	33,450	82,638	49,188
4	2015	33,203	247	33,450	91,820	58,370
5	2016		5,537	5,537	101,002	95,465
6	2017		595	595	110,184	109,589
7	2018		595	595	119,366	118,771
8	2019		595	595	128,548	127,953
9	2020		7,558	7,558	53,568	46,010
10	2021		5,537	5,537	54,533	48,996
11	2022		595	595	55,498	54,903
12	2023		595	595	56,463	55,868
13	2024		595	595	56,946	56,351
14	2025		7,558	7,558	57,428	49,870
15	2026		5,537	5,537	57,911	52,374
16	2027		595	595	58,393	57,798
17	2028		595	595	58,876	58,281
18	2029		595	595	59,358	58,763
19	2030		7,558	7,558	59,841	52,283
20	2031		5,537	5,537	60,323	54,786
21	2032		595	595	60,806	60,211
22	2033		595	595	61,288	60,693
23	2034		595	595	61,771	61,176
24	2035		7,558	7,558	62,253	54,695
25	2036		5,537	5,537	62,736	57,199
26	2037		595	595	63,218	62,623
27	2038		595	595	63,701	63,106
28	2039		595	595	64,183	63,588
29	2040		7,558	7,558	64,666	57,108
30	2041		5,537	5,537	65,148	59,611
		271,693	80,925	352,618	2,090,192	1,737,574
<b>EIRR</b>					<b>31.0%</b>	
<b>NPV</b>					<b>Discount Rate 15%</b>	
<b>(Rp million)</b>					<b>Discount Rate 12%</b>	
<b>B/C</b>					<b>Discount Rate 15%</b>	
<b>B/C</b>					<b>Discount Rate 12%</b>	

Source: JICA Study Team

## 9.3 Financial Evaluation

### 9.3.1 Purpose of Analysis

It is recommended, based on the results of economic evaluation, to implement the Trans-Sulawesi Mamminasata Road as a non-toll road from the viewpoint of national economy.

Bina Marga conducted a freeway/toll road study for Sulawesi Island in 2006. The study recommended to implement the Trans-Sulawesi Mamminasata Middle Section as a PPP project. Therefore, its financial viability was reviewed in addition to the above economic evaluation and recommendations. An additional analysis was carried out to determine whether the Project Road should be implemented as a full access-controlled toll expressway with participation of the private sector such form as BOT (Build-Operate-Transfer) or PPP (Public-Private Partnership). The purpose of the analysis was to evaluate the financial viability of the toll road and effects on the Government's financial burden.

### 9.3.2 Target Toll Road Sections for Financial Evaluation

In this Study, the analysis was carried out assuming that the toll road system (fully access-controlled with ramps/interchanges to collect toll fares and keeping higher serviceability) will be introduced for the sections of the Middle Ring and its southern access roads (total length = 15.8 km as indicted in **Figure 9.3.1**). Therefore, the project costs (construction cost and operation and maintenance cost) to be compared with the toll revenues are limited to the costs of this toll road section (not all the costs of the whole Trans-Sulawesi Mamminasata Section).

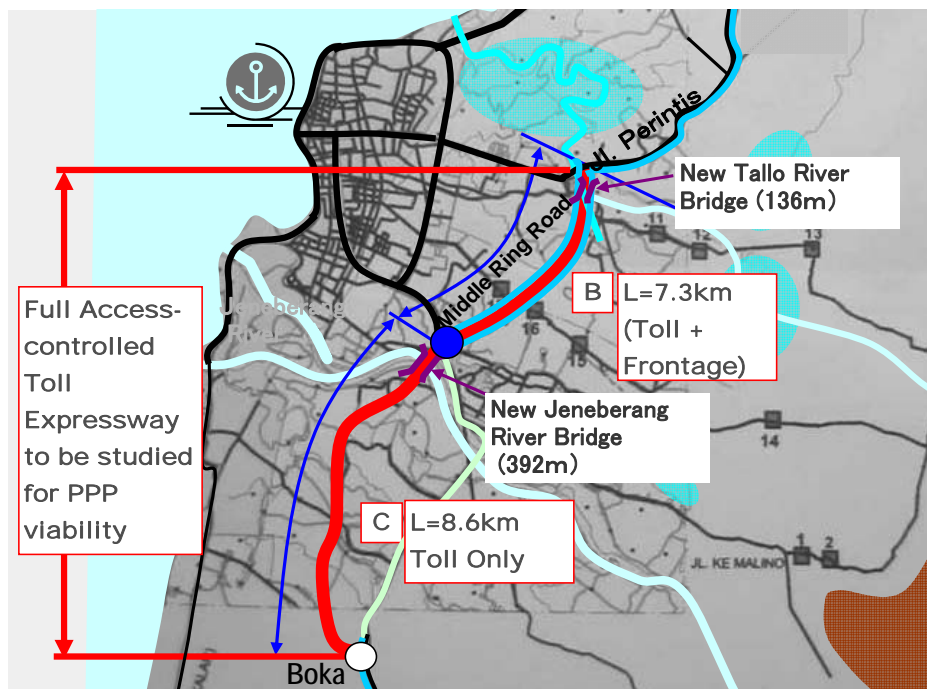


Figure 9.3.1 Target Road Sections for Fully Access-controlled Toll Road

### 9.3.3 Analytical Framework



Financial analysis is, in general, carried out for the projects which generate revenue/income. The purpose of financial analysis is to investigate the financial viability of a project by comparing the revenues with the costs in terms of market prices (financial costs).

The first step of the evaluation is to calculate the Financial Internal Rate of Return (FIRR) from the side of a Special Purpose Company (SPC) which is responsible for preparing its own fund, constructing and operating the toll road.

The second step is to judge to which category the project toll road will belong, referring to its financial viability (value of FIRR). According to the government regulation, the basic concept of toll road investment classifies the toll road business into the following three categories (refer to “*Toll Road in Indonesia*” of Indonesian Toll Road Authority):

- 1) If a toll road is economically feasible, but not financially viable, it is financed by the Government. This is the case of conventional public investment.
- 2) If a toll road is economically feasible and financially viable, it can be financed by a business entity (private sector). This is the case of BOT (Build-Operate-Transfer).
- 3) If a toll road is economically feasible, but marginally viable, it can be co-financed by both the Government and business entities. This is the case of PPP (Public-Private Partnership) scheme.

The minimum FIRR value required for a project to be financially viable and acceptable or attractive for private sector participation is generally considered to be in a range of 16% - 20%. However, in actual situations, a FIRR of 16% is not sufficient to attract private sector participation due to many kinds of risk of toll road business. Therefore, the threshold value of FIRR is set at 20% in this Study.

The third step of the evaluation is that if the project toll road falls into the category 3) above, analysis is focused on how much the Government should be involved in financing the toll road in various ways such as subsidies to initial investment, “shadow toll” to cover the shortage of toll revenues, and service payments in order to achieve the minimum FIRR requirement of 20%.

### **9.3.4 Financial Return on Investment**

#### **(1) Assumptions for Calculation of FIRR**

The following assumptions were set to calculate FIRR for the first step:

- Toll Rate: The initial toll rates by vehicle type were decided to be at the same level of the existing Ir Sutami Toll Road considering the route length as shown below:

Vehicle Type	Tariff
1. Sedan	Rp. 1500
2. Mini Bus	Rp. 1500
3. Large Bus	Rp. 2500
4. Pickup	Rp. 2500
5. Truck	Rp. 3000

- Revision of Toll Rates: The toll rates were adjusted every two years based on the inflation index (8.6% per annum, an average of Makassar City, 2002- April 2007, BPS).
- Evaluation Period: 30 years after opening.
- Traffic Volume on Toll Road: Future traffic demand on the project toll road was forecast in Chapter 5 of this Report.

## (2) Financial Viability

Based on the above assumptions, FIRR was calculated as shown in **Table 9.3.1**. The value of FIRR of this toll road was estimated at 6.5% without any subsidies or other financial support by the Government.

In general, the toll road project with such a low financial return should be implemented under the conventional public investment scheme (toll road category 1 as explained above).

However, considering the financial situation of the Government, the next step of the analysis is to investigate how much the government subsidy to the private sector (SPC) for initial investment is required to recover the financial return (up to a FIRR of 20%).

### 9.3.5 Requirement of Government Subsidy

As shown in **Table 9.3.2**, in order to achieve the FIRR value of 20%, the Government should subsidy SPC with an amount equal to about 66.5% of the total construction cost (Rp. 405,270 million) and 72.0% (Rp. 523,078 million) of the total investment cost including the land acquisition cost. Although the Government's financial burden will be reduced by about 28% (Value for Money: VFM) compared to the conventional public investment, the necessary expenditure by the Government is still huge.

There is no clear standard for PPP schemes to decide the financial sharing between the Government and the private sector in Indonesia at present.

**Table 9.3.1 Financial Cash Flow (No Government Subsidy)**

Year	COST		REVENUES		R-C
	Construction	O & M	Toll	GOI subsidy	
2007	0	0	0	0	0
2008	9,563	0	0	0	-9,563
2009	181,133	0	0	0	-181,133
2010	178,742	0	0	0	-178,742
2011	178,742	0	0	0	-178,742
2012	60,909	5,881	6,570		-60,220
2013		12,115	16,993		4,878
2014		12,479	18,488		6,009
2015		12,853	23,568		10,714
2016		13,239	25,331		12,092
2017		54,545	31,954		-22,591
2018		14,045	34,033		19,988
2019		14,466	42,591		28,125
2020		14,900	45,043		30,143
2021		15,347	52,839		37,492
2022		63,233	52,555		-10,678
2023		16,282	61,647		45,365
2024		16,770	61,311		44,540
2025		17,274	73,047		55,773
2026		17,792	73,784		55,992
2027		73,304	88,212		14,908
2028		18,875	89,404		70,529
2029		19,442	106,849		87,407
2030		20,025	108,255		88,230
2031		20,626	129,333		108,708
2032		84,980	130,992		46,012
2033		21,882	156,447		134,565
2034		22,538	158,402		135,864
2035		23,214	189,126		165,911
2036		23,911	191,432		167,521
2037		98,515	228,494		129,980
2038		25,367	231,215		205,848
2039		26,128	275,902		249,774
2040		26,912	279,110		252,198
2041		27,719	332,965		305,246
2042		114,205	336,749		222,544

FIRR	6.5%
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Source JICA Study Team

**Table 9.3.2 Financial Cash Flow (With Government Subsidy)**

Year	COST		REVENUES		R-C	GOI Subsidy
	Construction	O & M	Toll	GOI subsidy		<b>66.5%</b>
2007	0	0	0	0	0	(Rp. Million)
2008	9,563	0	0	202,635	193,072	405,270
2009	181,133	0	0	202,635	21,502	
2010	178,742	0	0	0	-178,742	
2011	178,742	0	0	0	-178,742	
2012	60,909	5,881	6,570		-60,220	
2013		12,115	16,993		4,878	
2014		12,479	18,488		6,009	
2015		12,853	23,568		10,714	
2016		13,239	25,331		12,092	
2017		54,545	31,954		-22,591	
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2019		14,466	42,591		28,125	
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2021		15,347	52,839		37,492	
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2025		17,274	73,047		55,773	
2026		17,792	73,784		55,992	
2027		73,304	88,212		14,908	
2028		18,875	89,404		70,529	
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2036		23,911	191,432		167,521	
2037		98,515	228,494		129,980	
2038		25,367	231,215		205,848	
2039		26,128	275,902		249,774	
2040		26,912	279,110		252,198	
2041		27,719	332,965		305,246	
2042		114,205	336,749		222,544	

FIRR	20.00%
------	--------

Source: JICA Study Team

### 9.3.6 Comparison of Government Burden

The Government's financial burden for the project implementation changes depending on the road type (toll or non-toll) and implementation scheme (public investment or PPP). Cost comparison was made for each case as shown below:

**Table 9.3.3 Comparison of Government Burden**

(Rp. Million)

	<b>Toll Road Construction</b>	<b>Non-toll Road</b>	<b>Difference</b>
Public Investment	① 726,116	③ 670,815	①-③ 55,301
PPP Scheme	② 523,078	—	
Saving	①-② 203,038	② < ③	

Source: JICA Study Team

The above comparison indicates that the Government's burden will be reduced by Rp 203,038 million if the toll road construction is implemented under the PPP scheme. On the other hand, if the same road section is constructed as a non-toll road, the cost is Rp 55,301 million lower than the cost of its construction as a toll road by public investment. However, a comparison between a toll road under PPP and a non-toll road by public investment shows that the Government's burden under the PPP scheme (Rp.523,078 million) is still lower than the non-toll road under traditional public investment (Rp.670,815 million) even if the total cost of a toll road is higher than that of a non-toll road.

It is noted, however, that decision on toll or non-toll, PPP or public investment should be given not only based on the simple cost comparison but also in a more comprehensive framework including the results of economic analysis.

### 9.3.7 Conclusions of Financial Evaluation

The financial evaluation indicates that the financial return of the Project as a toll road is very low with a FIRR of 6.5%. In general, the toll road project with such a low return is recommended to be implemented by public investment. In order to achieve the FIRR requirement of 20% to attract private sector participation, the Government should provide an upfront subsidy of more than 70 % of the total cost. This percentage of government subsidy is too high compared with the normal PPP schemes. The project is recommended to be implemented with public financing.

		Economic Feasibility		
		Good EIRR>18%	Marginal 12% - 18%	Bad EIRR< 12%
Financial Viability	Good FIRR>20%	BOT*	BOT*	-
	Marginal 10%-20%	PPP**	PPP**	-
	Bad FIRR<10%	Public Finance	Public Finance	-

Note:  As FIRR of the project was estimated at 6.5%, it is categorized into Public Finance.

**Figure 9.3.2 Conclusion of Financial Evaluation**

## 9.4 Role of Mamminasata Metropolitan Area in the Sulawesi and Eastern Indonesia Regional Development

The JICA Study Team conducted the Arterial Road Network Development Study for Sulawesi Island (the Master Plan Study) to support the regional development in parallel with the F/S in the Mamminasata Metropolitan Area. The regional development study was conducted and recommended plans were presented as a part of the Master Plan Study in Volume 1 of the Study Report. This section outlines the role of the Mamminasata Metropolitan Area given in the Master Plan in relation with the F/S roads.

### 9.4.1 National and Sulawesi Island Spatial Plans

#### (1) National Spatial Plan

The latest National Spatial Plan (RTRWN) is a final draft of October 2007 for the period of 20 years from 2007 to 2027. The RTRWN formulates hierarchical national urban system development plans composed of National Activity Center (PKN), Regional Activity Center (PKW), and Local Activity Center. Besides the national urban system, the National Strategic Development Center (PKSN) was established to foster the nation's border area development. The Mamminasata Metropolitan Area was designated as a superior area in tourism, industry, agriculture and agro-industry.

**Table 9.4.1 National Urban System Development Plan for Sulawesi**

National Activity Centers (PKN)					
- Gorontalo (I) - Urban Area of Manado-Bitung (I) - Palu (I) - Kendari (I)			- Makassar-Sungguminasa-Takalar-Maros (Mamminasata) Metropolitan Area (I)		
Regional Activity Centers (PKW)					
North Sulawesi Province	Gorontalo Province	Central Sulawesi Province	West Sulawesi Province	South Sulawesi Province	South East Sulawesi Province
- Tomohon (I) - Kotamobagau (III) - Tondano (III)	- Kwandang (III) - Isimu (III) - Tiilamuta (II)	- Luwuk (II) - Kolonodale (II) - Poso (II) - Buol (II) - Toli-Toli (III) - Donggala (III)	- Mamuju (I/C/1)	- Palopo (I) - Parepare (II) - Watampone (II) - Bulukumba (II) - Jenepono (I) - Pangkajene (II) - Barru (III)	- Unaaha (IV) - Lasolo (III) - Raha (II) - Baubau (I)
National Strategic Activity Centers (PKSN) in North Sulawesi					
- Melonguane (I) - Tahuna (I)					

Note: I (2008-2014), II (2015-2019), III (2024-2024) and IV (2025-2027) mean development stages.

Source: National Spatial Plan (Draft), October 2007

The spatial plan designates national strategic areas based on the interests of defense and security,

economic growth, society and culture, efficiency of natural resources and/or high technology and natural environment. The Mamminasata Metropolitan Area is one of the national strategic areas considered for revitalization and quality improvement.

## (2) Sulawesi Island Spatial Plan

The Provincial Governments of Sulawesi agreed to implement the integrated regional development programs under joint vision and mission. Under this agreement the Regional Development Cooperation Board of Sulawesi (BKPRS) was founded in October 2001. BKPRS aims at carrying out the profitable partnership programs of inter-provincial governments of Sulawesi, developing harmonious relation among the provincial governments, other part of East Indonesia and the central government in order to support the regional autonomy, to secure the national unity and to realize equal and prosperous society, especially in the Sulawesi region.

The latest draft Sulawesi Island Spatial Plan (RTR Plau Sulawesi) was formulated in December 2005 by the joint work of MPW and BKPRS. The plan designates more regional activity centers (PKW) in Sulawesi Island taking the regional situation into account (Table 9.4.1). The spatial plan includes the development of road, including three trans-Sulawesi corridors, railway, and ferry infrastructure. However, this RTR Pulau Sulawesi is under review because West Sulawesi Province became a new member of BKPRS.

**Table 9.4.2 Activity Centers in Sulawesi Island Special Plan**

National Activity Centers (PKN)					
Primary Activity Center			Secondary Activity Center		
- Mamminasata Metropolitan Area			- Gorontalo , - Kendari		
- Manado- Bitung			- Palu		
Regional Activity Centers (PKW)					
North Sulawesi Province	Gorontalo Province	Central Sulawesi Province	West Sulawesi Province	South Sulawesi Province	South East Sulawesi Province
- Tomohon	- Kwandang	- Luwuk	- Mamuju	- Palopo	- Unaaha
- Kotamobagau	- Marisa	- Kolonodale		- Parepare	- Lasolo
- Tondano	- Isimu	- Poso		- Watampone	- Raha
- Amurang*	- Tiilamuta*	- Buol		- Bulukumba	- Baubau
	- Suwawa*	- Toli-Toli		- Jenepono	- Lasusua*
		- Donggala		- Pangkajene	- Rarowatu
				- Barru	- Kolaka
National Strategic Activity Centers (PKSN) in North Sulawesi					
- Melonguane					
- Tahuna					

Note: \* In RTR Pulau Sulawesi of 2004 version but not in RTR Pulau Sulawesi of December 2005 Version

Source: Sulawesi Island Spatial Plan (December 2005), BKPRS

## 9.4.2 Development Strategies and Concepts in the Master Plan

### (1) Regional Development Goals and Strategies

The following development goals and strategies for an integrated regional development of

Sulawesi Island were formulated.

Goal 1: Economic development through industrialization on the basis of ample natural resources from the agriculture, mining, and fishery sectors.

Goal 2: Island integration through social service improvement and the mitigation of economic gaps in the undeveloped rural areas.

To attain the development goals, the following regional development strategies are proposed:

**Strategy 1: Economic growth through industrial development**

To promote the economic growth of Sulawesi, industrial development, especially local processing industries utilizing agriculture, forest, fishery, and mining resources, is necessary.

**Strategy 2- Effective economic growth on the basis of existing economic linkage**

The existing economic linkage between six provinces of Sulawesi should be sufficiently utilized for the effective economic growth of Sulawesi. The economic linkage between priority service centers will benefit the rural areas, effectively alleviating poverty there.

**Strategy 3: Social service improvement and mitigation of regional gaps through regional integration**

Social service improvement and narrowing of regional gaps should be realized through regional integration and equitable provision of social services throughout the island.

**Strategy 4: Development with due consideration of environmental preservation and disaster mitigation**

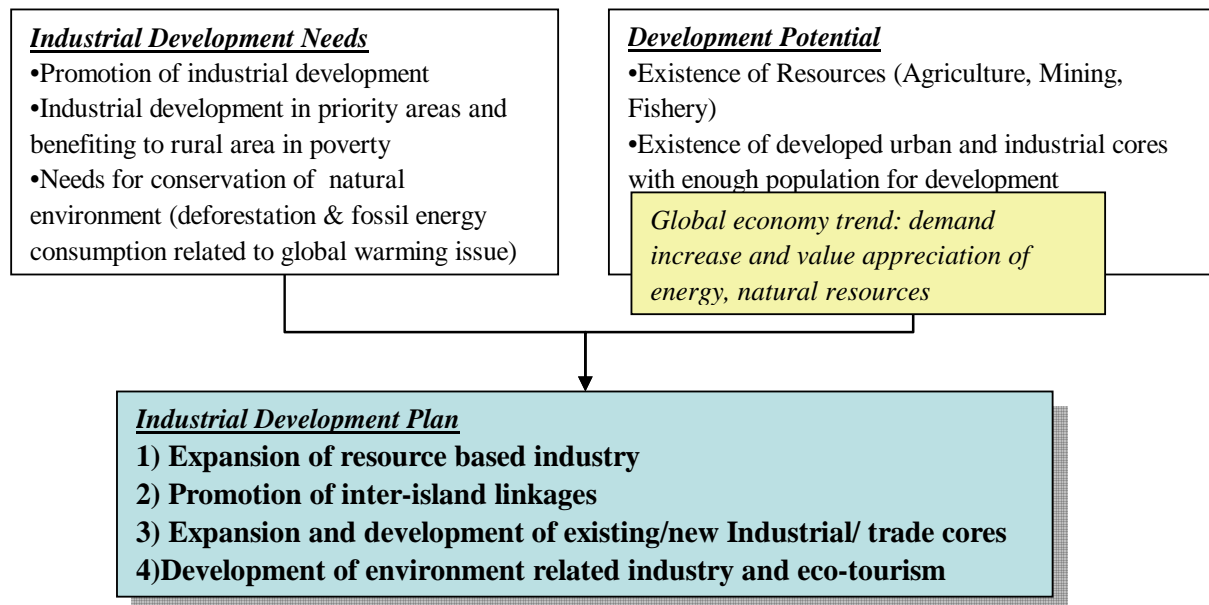
For local farmers to benefit from the fruits of economic growth gained through strategies 1 and 2, training in modern agricultural technologies, methods and livelihood improvement is necessary.

**(2) Sulawesi Island Development Concept**

1) Industrial Development Concept

To help attaining the goals of economic growth through industrial development as indicated in Regional Development Strategy 1, four industrial development plans are proposed, as shown in **Figure 9.4.1**. These were based on the results of an analysis of development needs, development potentials, and global economic circumstances.





**Figure 9.4.1 Industrial Development Plan for Sulawesi**

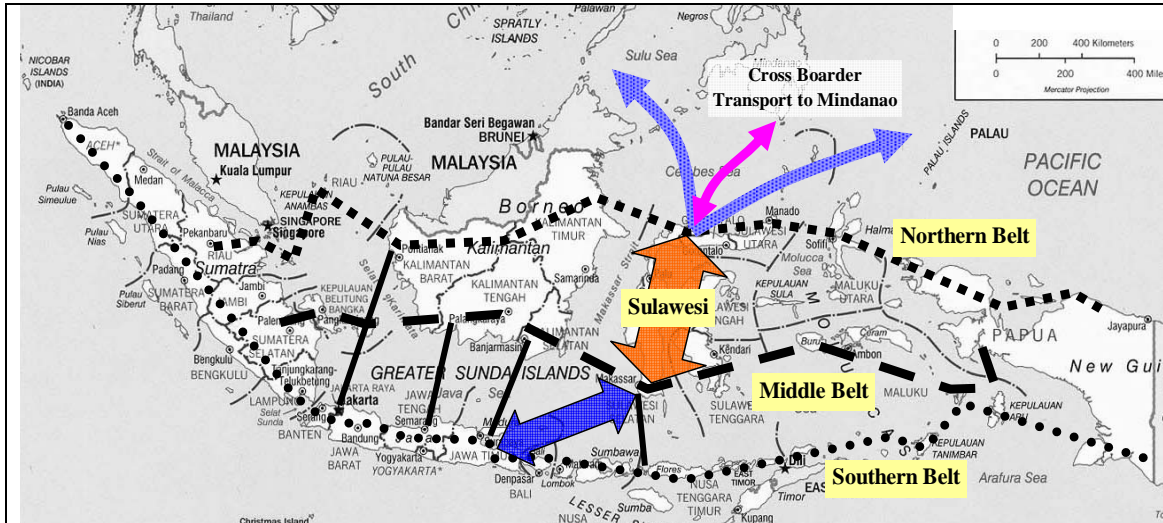
#### Prospective Resource-based Industries in Sulawesi

Several resource-based industries have great potential for development based on their production potential, global market trends, and domestic market linkages. New market tactics are important in order to realize the development of these prospective industries. To open up markets, especially China, some strategic measures should be taken under the framework of the ASEAN-China Free Trade Agreement (FTA). For instance, the export of cacao butter and powder processed in Sulawesi could find new markets if the imposed VAT is modified to benefit locally processed cacao. Moreover, the better treatment of FDI (foreign direct investment)/DDI (domestic direct investment) should also be tactically studied.

#### Promotion of Inter-island Linkages

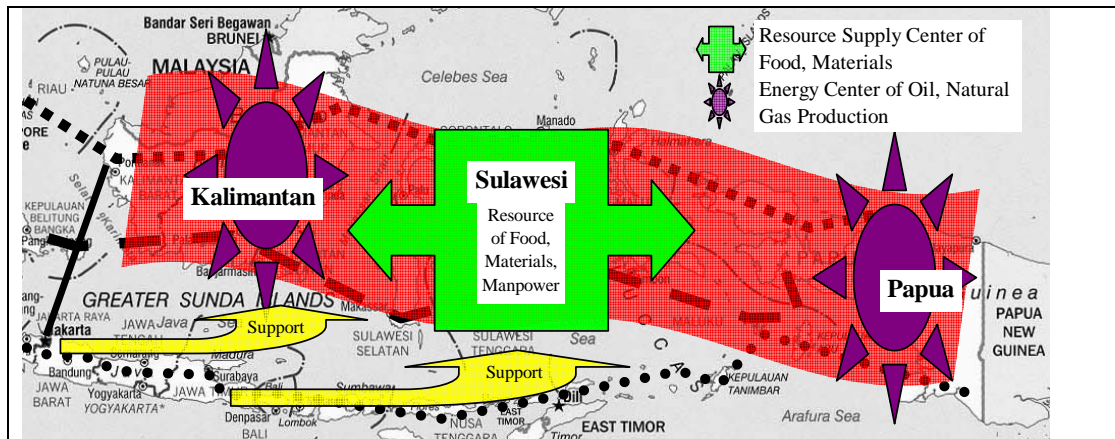
The national spatial plan defines three transport corridors throughout Indonesia. These are the Northern, Middle and Southern corridors, as shown in **Figure 9.4.2**. Sulawesi occupies a strategic location that could link the three corridors including the neighboring ASEAN countries and even the northeastern Asian countries.

Another vital aspect of Sulawesi's role in the national development is that it is located near the energy- resource-rich Kalimantan and Papua, as shown in **Figure 9.4.3**.



Source: JICA Study Team

Figure 9.4.2 Proposed Linkage of Development Belts in Sulawesi

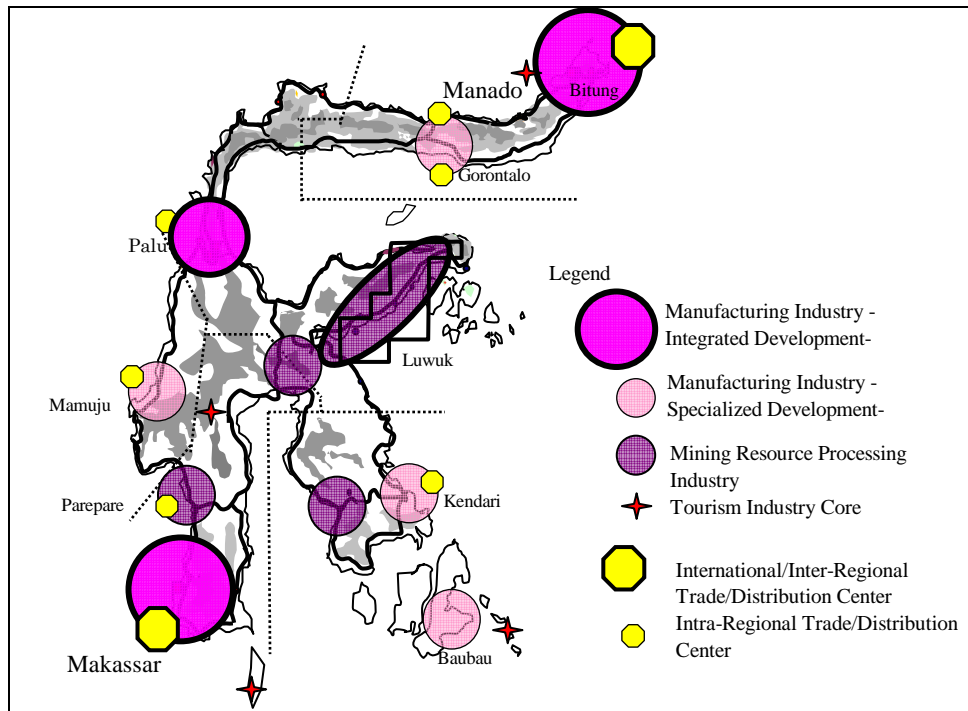


Source: JICA Study Team

Figure 9.4.3 Sulawesi's Role in Energy Resource Development in Eastern Indonesia

Development of Industrialized Centers

To promote industrial development, industrial centers should be enhanced in a manner that the investment environment for FDI and DDI is improved. Considering the availability and distribution of resources and the establishment of existing industries, the concept of industrialized centers is proposed as shown in **Figure 9.4.4**.



Source; JICA Study Team

**Figure 9.4.4 Concept of Industrial/Trade Centers**

## 2) Development Plan on the basis of Existing Economic Linkage

To carry out Regional Development Strategy 2, which is “effective economic growth on the basis of the existing economic linkage,” development plans are proposed on the basis of the Economic Linkage between South Provinces and Southeast Provinces (see **Figure 9.4.5**).

Makassar will continuously function as the gateway for inter-island linkages. Both the neighboring Kalimantan energy base and Java Island will be tightly linked with the Makassar and Pare-pare priority areas through the distribution and transportation of commodities and passengers.

Kendari/Kolaka/Buton (Bukari) Integrated Economic Development Areas (KAPET) will be further developed as a mineral resources industrial center for nickel and asphalt. Agricultural (cashew nut, palm oil, cacao) and fishery, as well as wood processing industries will have great potentials for growth. Eco-tourism activities, on the other hand, can be promoted in the remote islands of Wakatobi and Selayar Island, as shown in **Figure 9.4.5**.

3) Social Service Improvement and Alleviation of Economic Gaps

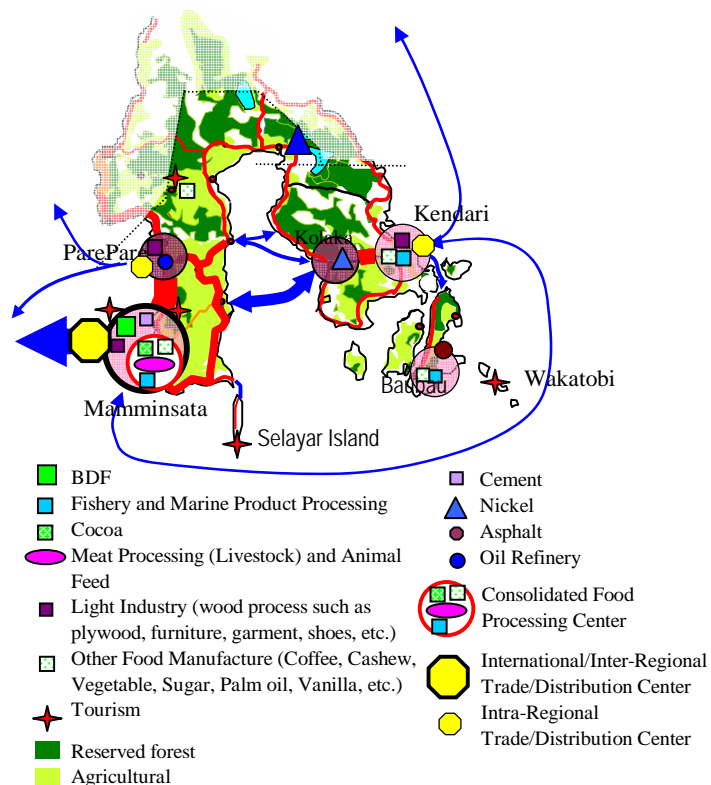
In order to implement the Regional Development Strategy 3 on “social service improvement and alleviation of regional gaps by regional integration,” the following linkage plan between areas was conceived:

In line with population increases, the population concentration in the two developed cores of Makassar and Manado will accelerate, thereby requiring that the two developed cores be further developed to cope with such increases. At the same time, each provincial capital should function as the social and economic center of the respective province.

9.5 Logistic Support to promote Trade and Investment

(1) Present Situation

Within the Mamminasata Metropolitan Area, freight traffic is concentrated at present in the Makassar Industrial Estate (PT Kawasan Industri Makassar – KIMA). KIMA is located in the suburbs of Makassar City along the Ir. Sutami Toll road, 15 km north of the Makassar Port and around 10 minutes drive from the Hasanuddin International Airport. The existing area of KIMA is 203 hectares, and it is planned to be expanded to 703 hectares. The potentiality to provide more industrial estates is high in this area. Most of the KIMA area is currently occupied by agro-industrial business and other area by warehouses. There is no significant presence of manufacturing industries.



Source: JST

**Figure 9.4.5 Development Plan on the basis of Economic Linkage between Makassar-Kendari**

## (2) Development Plan for the Makassar Port

The cargo throughput of the Makassar Port in 2006 was around 7 million tons, of which the international cargo throughput accounted for around 33%.

**Table 9.5.1 Cargo Throughput of the Makassar Port in 2006**

(Unit: million tons)

Type	Unloaded	Loaded	Total
International Cargo	0.75	1.57	2.32
Domestic Cargo	3.43	1.34	4.77
Total	4.18	2.91	7.09

The PELINDO that is operating and managing the Makassar Port projected that by year 2015 the volume of containers to be handled by the Port would exceed the present handling capacity of 350,000 TEU per year of its container terminal. In order to cope with such situation, it was planned to build a new container terminal off-shore of the present berth, with a capacity of 500,000 TEU to meet the cargo demand in 2030 (refer to **Figure 2.4.16** in Section 2.4).

**Table 9.5.1** shows the present cargo throughput of the Makassar Port in 2006.

The volume of containers handled in the Makassar Port in 2006 was around 65,000 TEU. Assuming the average cargo load per TEU is 10 tons, it can be estimated at around 650,000 tons in weight. This accounts for just around 9% of the total cargo throughput of the Port.

**Table 9.5.2** presents the projected cargo throughput in the Makassar Port in 2020 and 2030. The cargo throughput is projected to constantly increase at 2% per year and the containerization will reach 60% of the total cargo traffic.

**Table 9.5.2 Projection of Cargo Throughput of the Makassar Port**

Year	Total Cargo Throughput	Container Cargo	General Cargo
2020	9.36 million tons	560,000 TEU	3.7 million tons
2030	11.40 million tons	680,000 TEU	4.6 million tons

Source: JICA Study Team

## (3) Hasanuddin Airport

The construction work of the new passenger terminal and taxiways has been progressing as scheduled and they are expected to be completed by the end of 2007. The Hasanuddin Airport is functioning as a hub-port for Eastern Indonesia. Though international flights are limited at present, it is anticipated that they will increase in the future in view of the progress of BIMP-EAGA and other international relations.

## (4) Prospect of Industrialization in Mamminasata Metropolitan Area

The main stay of South Sulawesi's economy is agriculture and the major commodities exported both to the international and regional destinations through the Makassar Port are agricultural

products as shown in **Table 9.5.3**.

**Table 9.5.3 Cargo Volume Handled at the Makassar Port in 2006**

(Unit: '000 tons)

	<b>Outbound</b>	<b>%</b>	<b>Inbound</b>	<b>%</b>	<b>Total</b>	<b>%</b>
Agriculture Product	674	90	1,965	83	2,639	85
Other Product	73	10	403	17	476	15
<b>Total</b>	<b>746</b>	<b>100</b>	<b>2,369</b>	<b>100</b>	<b>3,115</b>	<b>100</b>

Source: JICA Study Team

As shown in the above table, agricultural products account for around 85% of the total cargo throughput of the Makassar Port. Although agriculture is dominant in the economy of this area, most of agricultural products are exported in their natural condition or are processed simply for exportation, except in the case of forestry products. Some of the existing significant manufacturing industries in South Sulawesi or in Mamminasata are wood processing, garment and steel fabrication.

Industrialization in Makassar is planned to be developed by consolidating agro-industry and manufacturing industry in combination at different locations but appropriate for respective processing and manufacturing activities.

**Consolidation of Agriculture and Fish Processing Activities in the South:** In order to obtain and secure more added values for the agricultural products for export, agro-processing industry is to be introduced further in Sulawesi in general and in Mamminasata in particular. However, if the economic benefits being derived through the agro-processing industry are to be maximized, then consolidation of different kinds of processing is recommended to be realized as, in such a way, all the waste coming out of agriculture or farm product processing including fish processing could be turned into valuable products as organic fertilizer, etc. Then, such organic fertilizer can be recycled into the farming system so as to attain increased output without expanding the cultivation area.

This type of food processing industry is recommended for the development of the Mamminasata area. It should be located in the southern part of Makassar (close to Takalar) as the food processing industry requires a relatively huge land area and is better to be far from the residential area.

**Consolidation of Manufacturing Activities in the North:** The basic comparative advantage of Makassar or Mamminasata is the geographical location and this advantage should be maximized in reality. The particular comparative advantage of Makassar is the closeness of the international seaport and airport especially in view of logistics. As a matter of fact there exists the industrial estate in between the international seaport and airport, i.e. KIMA. The area where KIMA is located is quite ideal and thought to have great potentiality for further industrialization although the content of on-going manufacturing activities would be quite different from the present state. KIMA itself is able to expand its area to 703 hectares from the present area of 203 hectares. The

area available for manufacturing activities, however in between the international seaport and airport, is vast and would possibly accommodate hundreds of manufacturers subject to the preparation of various infrastructures, not only physical infrastructure but also managerial infrastructure, that attract foreign and local investors to come in this area aiming at manufacturing competitive products.

#### (5) Projected Cargo Volume and Flow of Major Cargo

The northern zone would be occupied by manufacturing enterprises: It is assumed that the total area of industrial estate in the northern part of Makassar is 1,400 hectares. Assuming that one manufacturer would operate in this industrial estate and produce its products in an area of 4 hectares and the container transport requirement by one manufacturer per month is 40 TEU for transportation of raw materials and finished products, the annual cargo volume generated would be 168,000 TEU.

The southern zone has high potentiality for agro-processing enterprises. It is assumed that around 20% of raw materials collected in this zone will be processed into the final products for distribution both in Sulawesi and out of Sulawesi. **Table 9.5.4** shows the projected cargo volume of processed agricultural products for distribution and export. The cargo volume concentrated in these two different types of industrial zones is projected as shown in **Table 9.5.5**.

**Table 9.5.4 Projection of Cargo Volume of Processed Agricultural Products**

Year	Inter-provincial	Intra-provincial	Total	Southern Zone in Tons	Southern Zone in TEU
2005	800	1,000	1,800	360	36
2020	4,000	4,900	8,900	1,780	178

Source: JICA Study Team

**Table 9.5.5 Projection of Cargo Volume at Northern Part and Southern Part of Makassar (2020)**

	Projected Cargo Volume	In TEU per Year	Remarks
Northern Zone	1,680,000 tons	168,000	Area: 1,600 hectares
Southern Zone	1,780,000 tons	178,000	Livestock, fish preserved, animal feed, etc.
Total	3,400,000 tons	346,000	

Source: JICA Study Team

#### (6) Inducing Trade and Investment

The comparative advantage of Sulawesi in general and Makassar in particular lies on their geographical location. However, this comparative advantage has not been realized as seen in

business as well as in investment, especially in the international market and foreign direct investment. This means that Makassar does not realize this comparative advantage that appeals to the international market and international investors. If and when the following conditions are met then the foreign capital and market will flow into Makassar.

- 1) Transport infrastructure combined with road, seaport and airport in an integrated way is available.
- 2) Other infrastructures such as power supply, water supply, wastewater treatment, telecommunication, etc. are provided in complete set for at least one modern industrial estate in between the international seaport and airport.
- 3) Containerization proceeds at a certain degree or more than 40% of goods produced and exported can be containerized.
- 4) Cost of logistics comprising container handling charge, trucking cost, agent fee, etc. is lowered to a competitive level against not only other major cities in Indonesia but also in other major cities in ASEAN countries.
- 5) At least one shuttle feeder service flying between Singapore and Makassar per week is realized by shipping companies.
- 6) At least one international flight between Singapore and other cities in Asia is available.
- 7) Regulation that attracts foreign direct investment is established.
- 8) Organized promotional activity is conducted for the introduction of foreign direct investment.

The development of the F/S roads would enhance industrial development in Sulawesi South Province and in the Mamminasata Metropolitan Area in particular. The Trans-Sulawesi Mamminasata Road will function as a major land transport infrastructure for sourcing and collection of raw materials for manufacturing and processing of various kinds of industrial products at a closest and proper location to the international seaport and airport, from north and south raw material production areas.

To realize industrialization as planned for Mamminasata, which would push up the economy of Sulawesi South as a whole, a large and constant flow of investment both from local and foreign countries is required. The potential investors who would consider Mamminasata as an interesting and safe destination for their investment would be attracted if and when the land and infrastructure which ensure the best function of logistic services for them have been prepared and put in the proper place in time. On the contrary if such needed infrastructure is lacking or does not exist, no investors will willingly invest into the industrial activities in Southern Sulawesi in general and in Mamminasata Region in particular.