APPENDIX-F

PRE-FEASIBILITY STUDY FOR OUTER RING ROAD

Appendix F Pre-feasibility Study for Outer Ring Road

F-1 Route Selection and Development Concept

F-1.1 Pre-feasibility Study for Outer Ring Road

Japan International Cooperation Agency (JICA), the Directorate General of Highways (DH) and South Province Government agreed to conduct a pre-feasibility study (the Pre-F/S) for the Outer Ring Road in addition to the F/S roads.

Table F-1.1 shows those F/S and Pre-FS Roads.

Table F-1.1 List of FS and Pre-FS Roads

	No.	Name of Road/Road Section		Length (km)	Function	Administrative Status
F/S	1	Mamminasa Bypass		49.1	Arterial (Secondary)*	- #
	2	Trans-Sulawesi Road Mamminasata Section (Total: 58 km)	Maros-Middle Ring (Perintis Kemerdekaan	19.6	Arterial (Primary)	National
			Middle Ring Road	7.3	Arterial (Secondary)*	- **
			Middle Ring Road Access	8.6	Arterial (Secondary)*	- **
			Middle Ring Road Access-Takalar	22.5	Arterial (Primary)	National
	3	Hertasning Road (Section D Only)		4.9	Arterial (Secondary)*	Province
	4	Abdullah Daeng Sirua Road (Excluding Section B)		15.3	Arterial (Secondary)*	Makassar/ - #
Pre-F/S	5	Outer Ring Road		20.4	Arterial (Secondary)*	- #
			Total:	147.7 km		

Notes: * Proposed function
** Proposed to be national road in future (strategic road)
# Proposed to be provincial road (strategic road)

F-1.2 Arterial Road Network Plan for the Mamminasata Metropolitan Area

(1) JICA 1989 Highway Development Plan

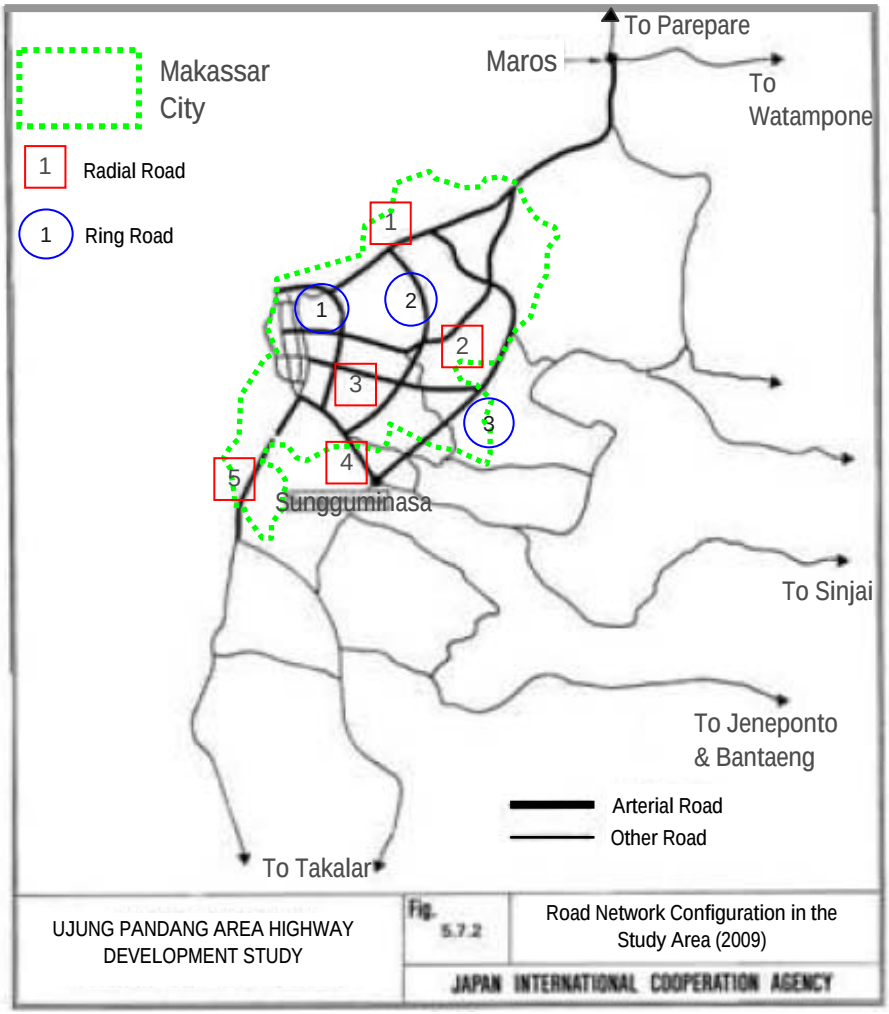
JICA conducted the "Ujung Pandang Highway Development Study" in 1989 ("the 1989 JICA Study or Plan") for the target year of 2009. The urban arterial road network system in the Makassar Metropolitan Area was configured with five radial roads and three ring roads, as follows (also refer to **Figure F-1.1)**.

Radial Roads:

- Jl.Tol.Ir.Sutami
- Jl. Urip Sumoharjo / Jl.Perintis Kemerdekaan
- Jl.Boulevard Pannakukang and its east and west extension (Central Radial Road)
- Jl.Sultan Alauddin / Jl.Gowa Raya
- Takalar – Jl.Metro Tj.Bunga (South Radial Road)

Ring Roads:

- Inner Ring Road (Jl.Andi Pangerang Pettarani / Jl.Tol Reformasi)
- Middle Ring Road (Jl.Tol.Ir.Sutami – Jl.Perintis Kemerdekaan - Jl. Sultan Alauddin)
- Outer Ring Road (Jl.Perintis Kemerdekaan – Sungguminasa)



Source: Ujung Pandang Area Highway Development Study, JICA

Figure F-1.1 Road Development Plan by JICA in 1989

These development plans are well coordinated with the Spatial Plan of Makassar City. Makassar City has developed the arterial road network as recommended in the 1989 JICA Study and completed most of them by 2005, except Central Radial Road, South Radial Road (Tj Bunga-Takalar Road), Middle Ring Road and Outer Ring Road.

(2) Road Development Plan in Mamminasata Spatial Plan Study

The Mamminasata Spatial Plan Study reviewed the JICA 1989 Plan. It added two new road development concepts, Mamminasa Bypass and Trans-Sulawesi Mamminasata Road, to the 1989 highway plan **(Figure F-1.2)**. A total of 268 km of roads were planned to be improved by the

target year of 2020 and the priority four roads (1 to 4 in the **Figure F-1.2**) are subject to the FS by JICA.

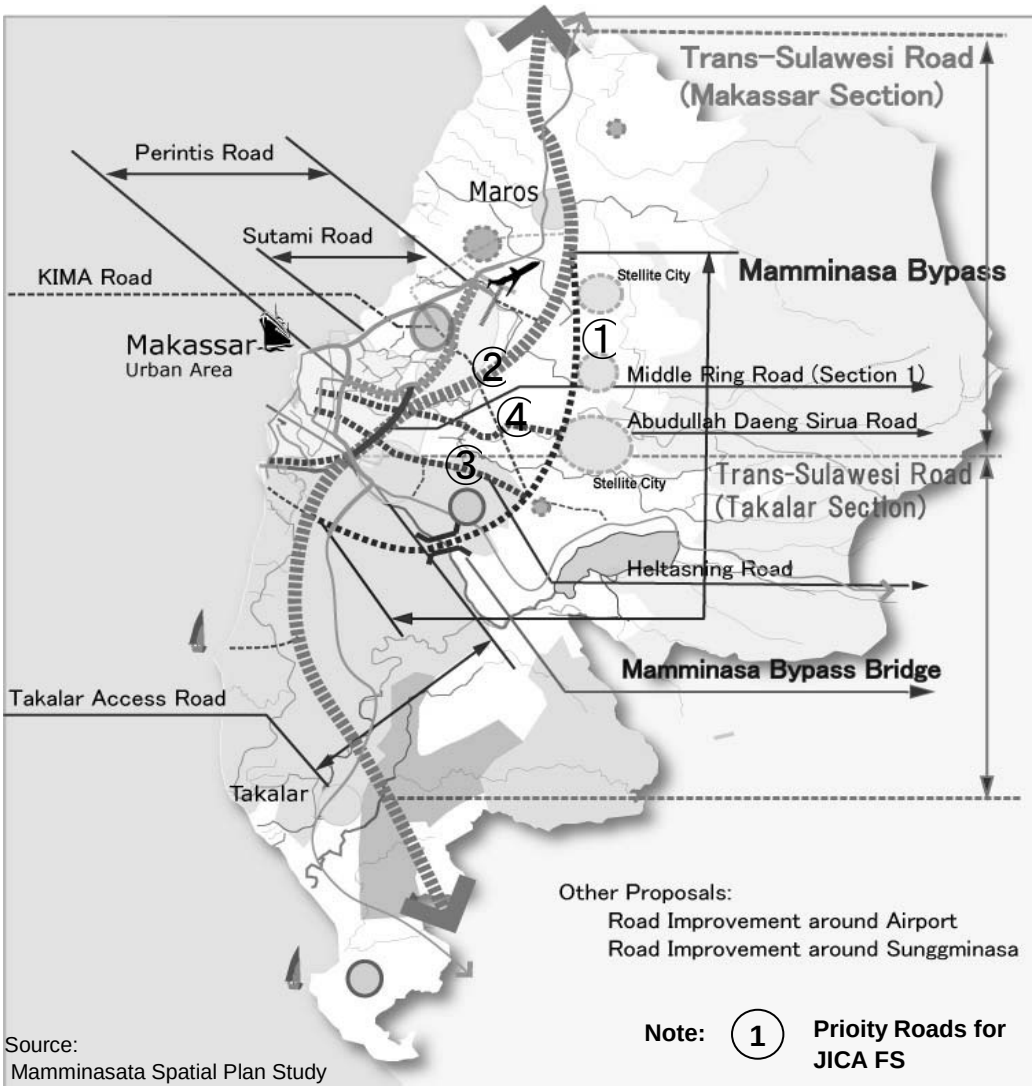


Figure F-1.2 Urban Road Network System Planned in Mamminasata Study

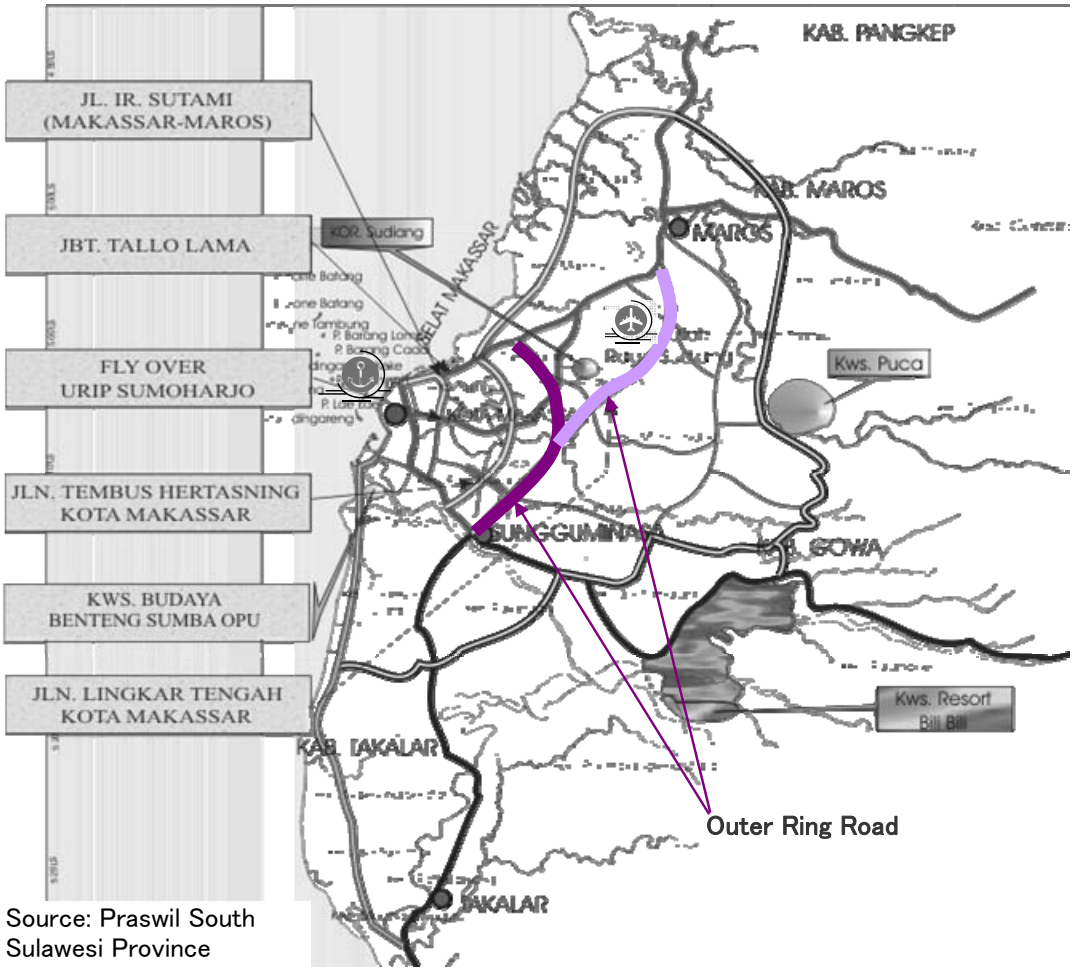
The Mamminasata Study deleted the northern part of the Middle Ring Road (Section 2) taking reservation of the Tallo River estuary environment and higher construction costs into consideration. The Mamminasata Spatial Plan did not recommend the Outer Ring Road and the Central Radial Road. However, a pre-feasibility study will be conducted as proposed by the South Sulawesi Province and Makassar City and agreed between DGH and JICA at the Inception Report stage.

(3) Road Development Plan of South Sulawesi Province

The original route of the Outer Ring Road in the 1989 JICA Study was a route connecting KIMA/Jl.Tol.Ir.Sutami (Jl.Tallo) and Sungguminasa (Kabupaten Capital of Gowa) crossing

Jl.Perintis Kemerdekaan and the central radial road.

The Outer Ring Road proposed by South Sulawesi Province in the 2003 – 3012 Spatial Plan has two accesses; one going to KIMA (Kel.Daya) and the other is an extension of it to the north bypassing the east side of the Hasanuddin Air Port and joining the national road as shown in **Figure F-1.3**.



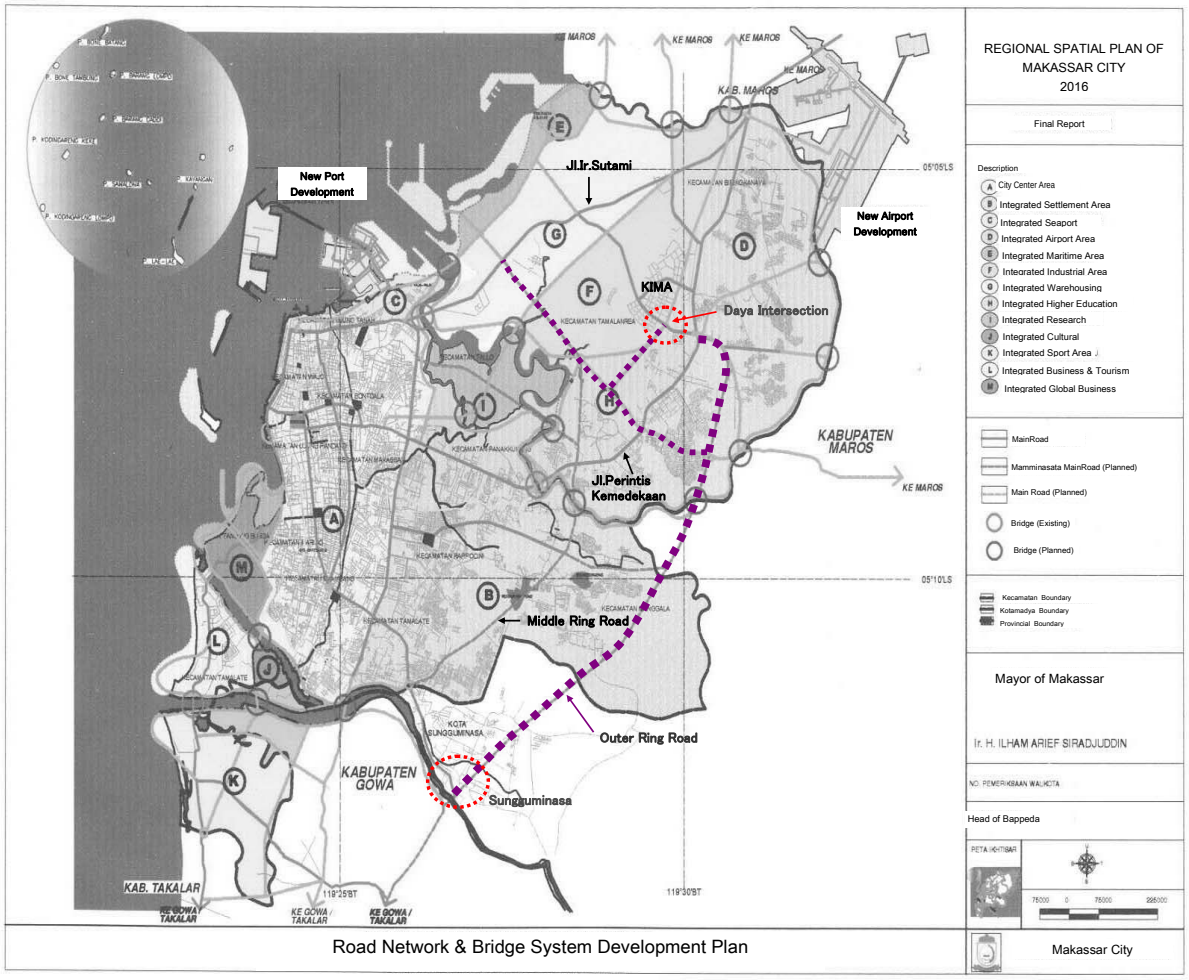
Source: Praswil South Sulawesi Province

Figure F-1.3 Road Development Plan of South Sulawesi Province (2003 – 2012)

(4) Plan of Makassar City

Figure F-1.4 shows the route of the Outer Ring Road in the 2005 - 2016 Spatial Plan of Makassar City. This road starts at Sungguminasa (Kabupaten capital of Gowa) and goes to the north through the dense residential area. Then, it passes through Kec.Manggara (Makassar City) and enters into a short stretch in Kec.Moncongloe inKabupaten Maros. After crossing the Tallo River, it is connected to KIMA at the Daya intersection as planned in the JICA 1989 Study.

The Outer Ring Road branches off approximately 2.5km before the Daya intersection and turns to the west through BTP (Perumahan Bumi Tamalanrea Permai), a new residential area and connects KIMA and Jl.Tol.Ir.Sutami.



Source: Makassar City

Figure F-1.4 Road and Bridge Development Plan of Makassar City

F-1.3 Recommended Urban Arterial Road Network System for Mamminasata Metropolitan Area

Figure F-1.5 shows the urban arterial road network system recommended by the 1989 JICA Study, the Mamminasata Spatial Plan and by this F/S. The urban arterial road system is composed of five radial roads and four ring roads (including Mamminasa Bypass).

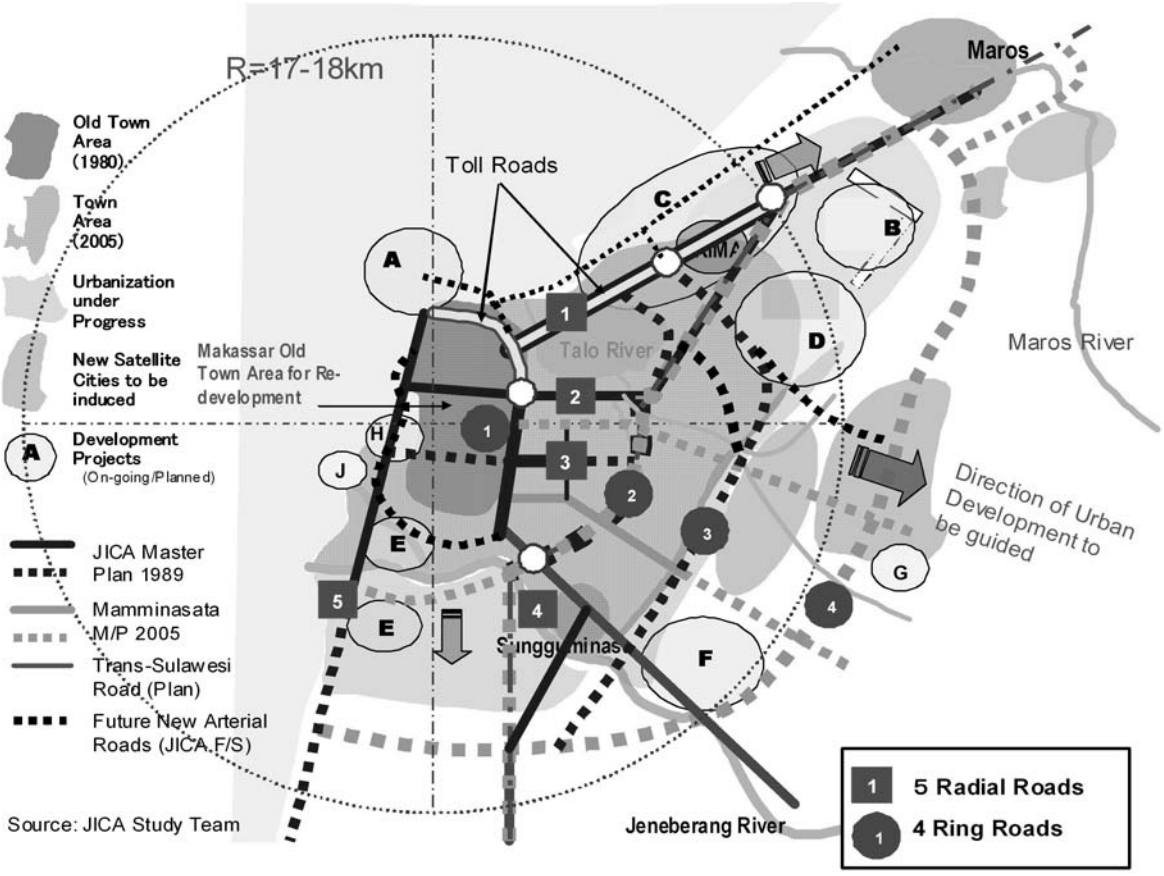


Figure F-1.5 Urban Arterial Road Network System for Mamminasata Metropolitan Area

The JICA Study Team reviewed the Mamminasata Study on engineering and implementation aspects and made the following modifications and additions to it for the target year of 2023:

- Modification of the northern and the southern part of Trans-Sulawesi Mamminasata Road route
- Shifting of Mamminasa Bypass to the front of Mt. Moncongloe and Mt. Bogo (on the Makassar side)
- Recovery of the Outer Ring Road as planned in the JICA 1989 Study
- Recovery of the Central Radial Road as planned in the JICA 1989 Study
- Recovery of Section 2 (northern extension) of the Middle Ring Road to connect to Jl.Tol.Ir.Sutami by keeping an appropriate distance from the Tallo River to avoid negative effects to the estuary environment
- Addition of an access road between a proposed satellite town and KIMA
- Extension of the Inner Ring Road to the south and west through Losari Beach
- Addition of the new Port Access Road
- Addition of the Northwest Coast Road from Jl.Tol.Ir.Sutami to Tambua (Kab.Maros)

F-1.4 Traffic Demand Forecast for Outer Ring Road

The traffic demand estimated in the Mamminasata Study was reviewed to avoid over-planning of road facilities. The present traffic (2006) and the future traffic demand for the FS and Pre-FS roads are indicated in **Figure F-1.6**. The year 2023 traffic was estimated at 25,000 pcu/day (south of Sungguminasa) and 30,000 - 40,000 pcu/day at the middle part of the Outer Ring Road.

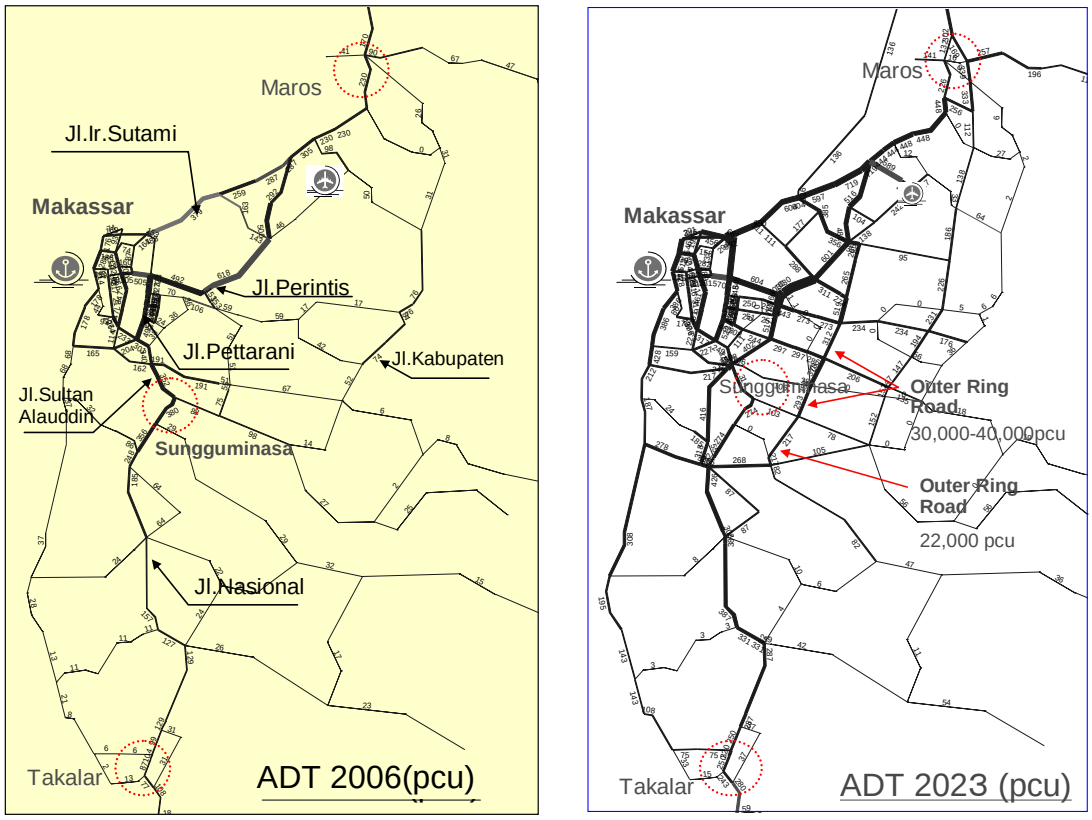


Figure F-1.6 Traffic Demand Forecast for FS & Pre-FS Roads in Year 2023

F-1.5 Development Concept and Alternative Route Planning for Outer Ring Road

(1) Function of Outer Ring Road

The Outer Ring Road is one of the important links in the Mamminasata Metropolitan arterial road network system and its expected functions are as follows:

- Ring road to contribute to harmonizing urban development
- Bypass for the traffic from/to the northern part and to/from the southern part of Makassar City
- Logistic route for the coming in and out traffic from/to the southern area of the South Sulawesi Province to/from KIMA, Makassar Port, new industrial areas along Jl.Tol.Ir.Sutami
- Reduction of traffic burden on Jl.Perintis Kemerdekaan, the Middle Ring Road and

Jl.Sultan Alauddin.

- Connection between the north educational center (Hasanuddin University, Institut Agama Islam Negeri, etc) and the south educational center (Hasanuddin University Technology Faculty, Universitas Islam Negeri Alauddin Makassar).

The Outer Ring Road and Mamminasa Bypass share the same road at their southern part to connect to Tj Bunga Development Area.

(2) Overall Plan

The Outer Ring Road consists of three parts. The northern ring is the part accessing to KIMA, Jl.Tol.Ir.Sutami and Makassar Port. The middle ring is a straight road section parallel with the Middle Ring Road, and the southern ring is a connection to Sungguminasa and Mamminasa Bypass. The road development concept has been established in accordance with these traffic demands. A 2-lane 2-way road is the basic concept required for the Outer Ring Road based on traffic demand and envisaged road functions. However, reservation of land for additional 2 lanes should be made for the sections where ROW acquisition is not difficult for the future widening requirements.

Three aspects (engineering, economic and environmental aspects) will be considered for the establishment of development concept and alternative route selection for the Outer Ring Road. The engineering aspect includes road functions, traffic demand and reduction of overburden on Jl.Perintis Kemerdekaan, matching with the existing flood control plan for the Tallo River. The economic aspect includes contribution to KIMA / new industrial development areas along Jl.Tol.Ir.Sutami, logistic support for the southern area development of the South Sulawesi Province and connection of the educational facilities located along Jl.Perintis Kemerdekaan with those planned along Jl.Malino. The major socio-environmental issues are land acquisition, resettlement and effects on wetlands (natural environment) along the Tallo River.

A road development concept and alternative route plans for the Outer Ring Road are shown in the following **Table F-1.2** and **Figure F-1.7**. The Outer Ring Road will be planned in 3 parts; north section, middle section and south section. Three alternative routes for the north section, four routes for the middle section and four routes for the south section were established for comparison (refer to Attachment F.1 as to the detailed alternative route map).

Table F-1.2 Development Concept and Alternative Plans for Outer Ring Road

Section	Alt.	Development Concept	Length (km)	Location	Number of Lanes		Measures for Major Issues			
					Existing	Plan	Support of KIMA/ New Industry	Support of Logistics	Flood Control	Land Acquisition & Resettlement
North	1	Access through BTP to KIMA (Makassar City Plan)	2.2+5.5+ 1.6	Makassar	-	4	O	O	△	O
	2	Access through Jl. Daya to Jl.Ir.Sutami (Original Plan)	3.3		-	4	O	O	△	△
	3	Access through Jl. Daya to Jl.Ir.Sutami (New Plan)	3.8		-	4	△	O	O	O
Middle	1	Road construction with Flood control works / dykes (West Bank Route)	7.3	Makassar & Gowa (and partly Maros)	-	4			O	O
	2	Pass through wet land in Makassar （West Bank Route)	7.5		-	4			△	△
	3	Pass in flood retarding area (East Bank Route)	8.6		-	4			△	O
	4	Pass avoiding flood retarding area (East Bank Route)	11.8		-	4			O	O
South	1	New road passing through the 3-3.5km east of Sungguminasa and connect to M.Bypass	9.8	Gowa	-	4		O		
	2	Connection to Sungguminasa through Malino Road	8.5		2	4		△		
	3	Connection to Sungguminasa through developed area	7.7		-	4		△		
	4	Original Plan (connection to Sungguminasa)	7.2		-	4		△		

Notes: Proposed function of the road is Arterial (Secondary)
O Positive Direct Effects △ Some positive effect − No direct influence Recommeded Plan

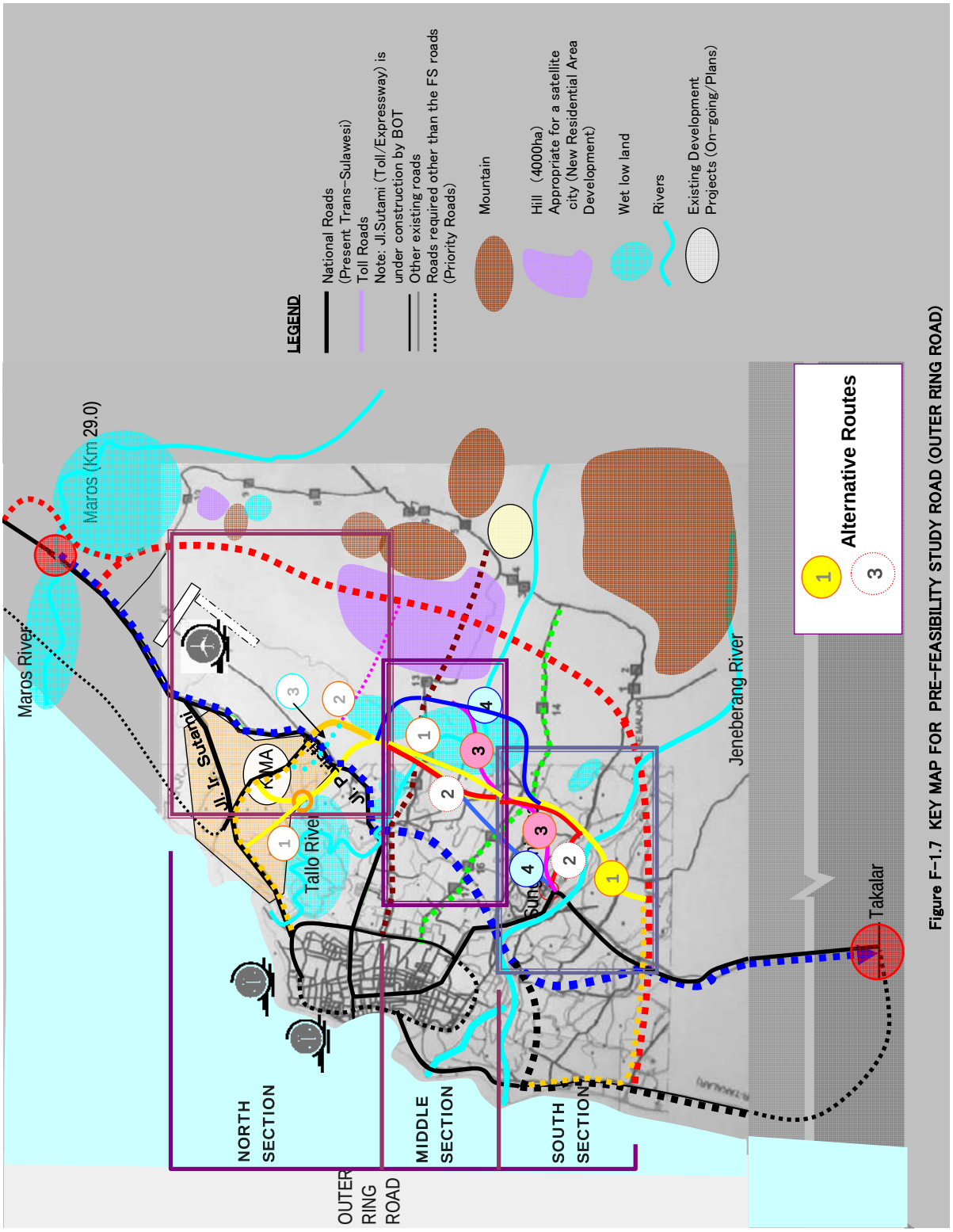


Figure F-1.7 KEY MAP FOR PRE-FEASIBILITY STUDY ROAD (OUTER RING ROAD)

(3) Standard Cross Sections

Types 1 and 2

The proposed standard cross-section for the north section and part of the middle section consists of 2 lanes, 2 ways with either two drainage canals on both sides or a large drainage canal at the median as illustrated in **Figure F-1.8**.

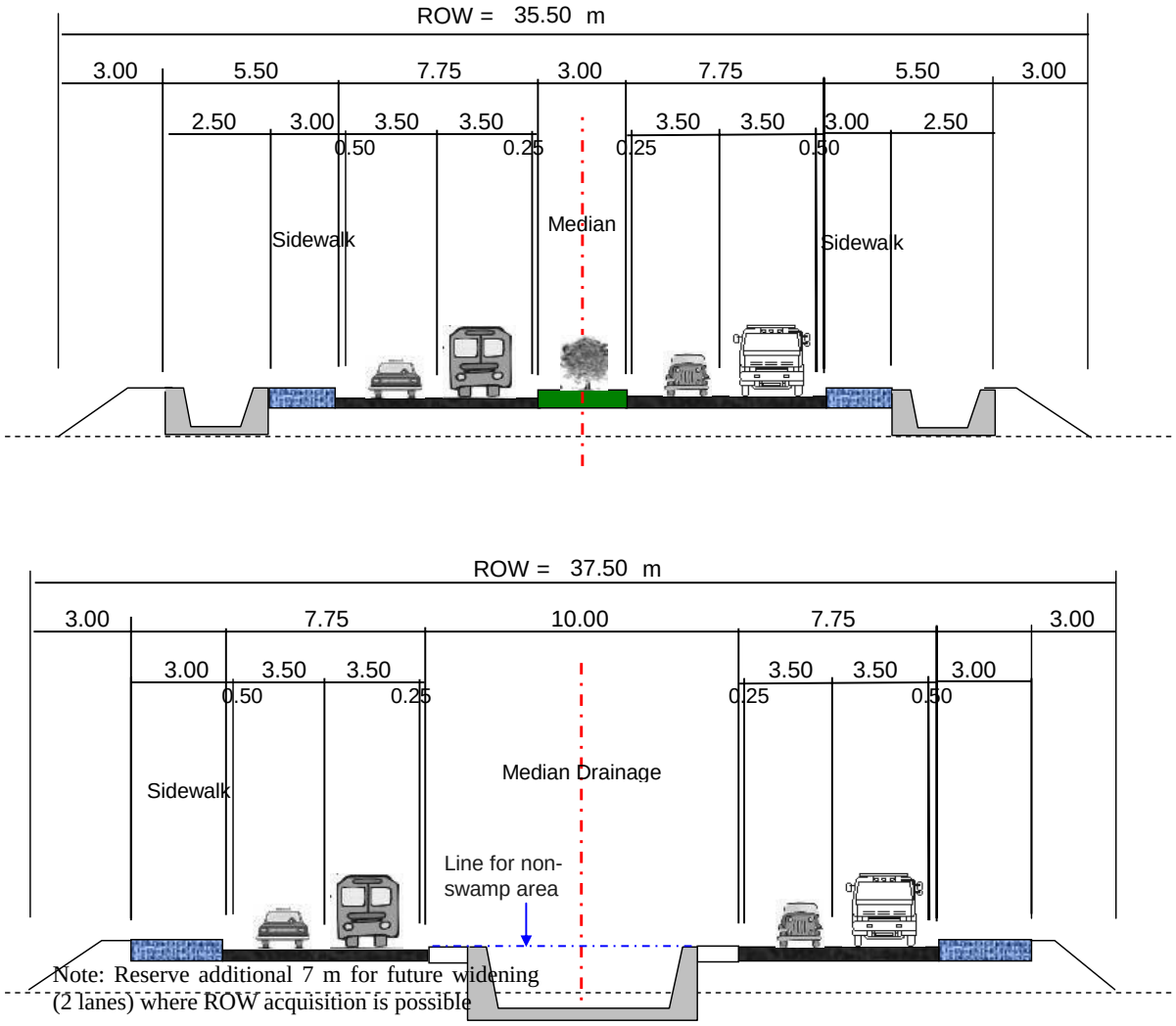


Figure F-1.8 Typical Cross Section for Swamp Area (Types 1 and 2)

Type 3

Reservation of land for additional 2 lanes will be made for the sections where ROW is available without difficulty for the future widening to 6 lanes. **Figure F-1.9** shows the standard cross section for Type 3 which would be applicable for a part of the middle section and the south section.

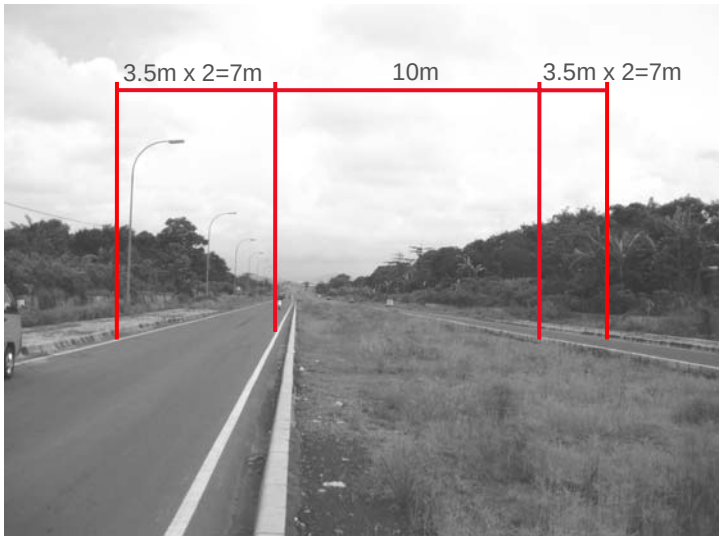


Figure F-1.9 Typical Cross Section for Type 3

Type 4

Figure F-1.10 shows the standard cross section for the Tallo River flood area. A river dike and the roadway may be constructed together. Where the road is subject to attack by flood water flow, concrete sheet piles will be required to protect the roadway from scouring.

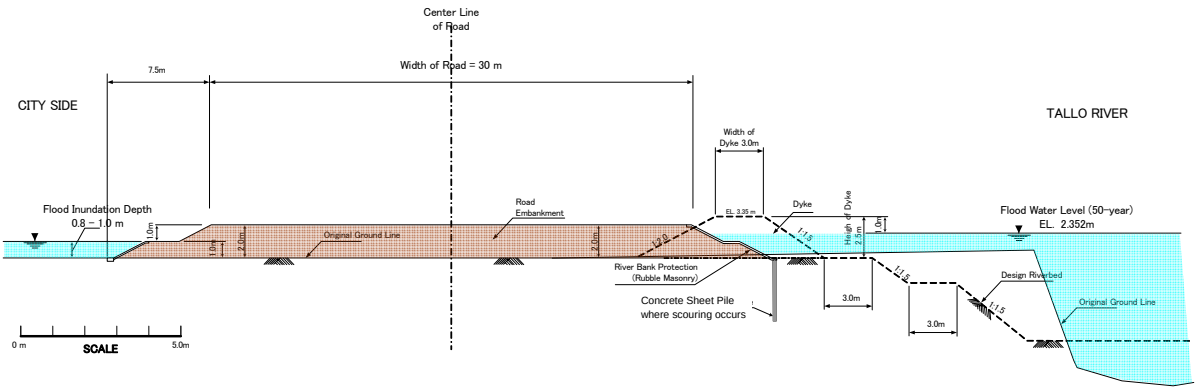


Figure F-1.10 Typical Cross Section for Tallo River Flood Area (Type 4)

(4) North Section

The north section of the Outer Ring Road is located at the north of the Tallo River. Three alternative routes were planned for this section (refer to **Figure F-1.11**). A connection from the Middle Ring Road and/or the Outer Ring Road to KIMA, Jl.Tol.Ir.Sutami and Makassar Port was also envisaged.

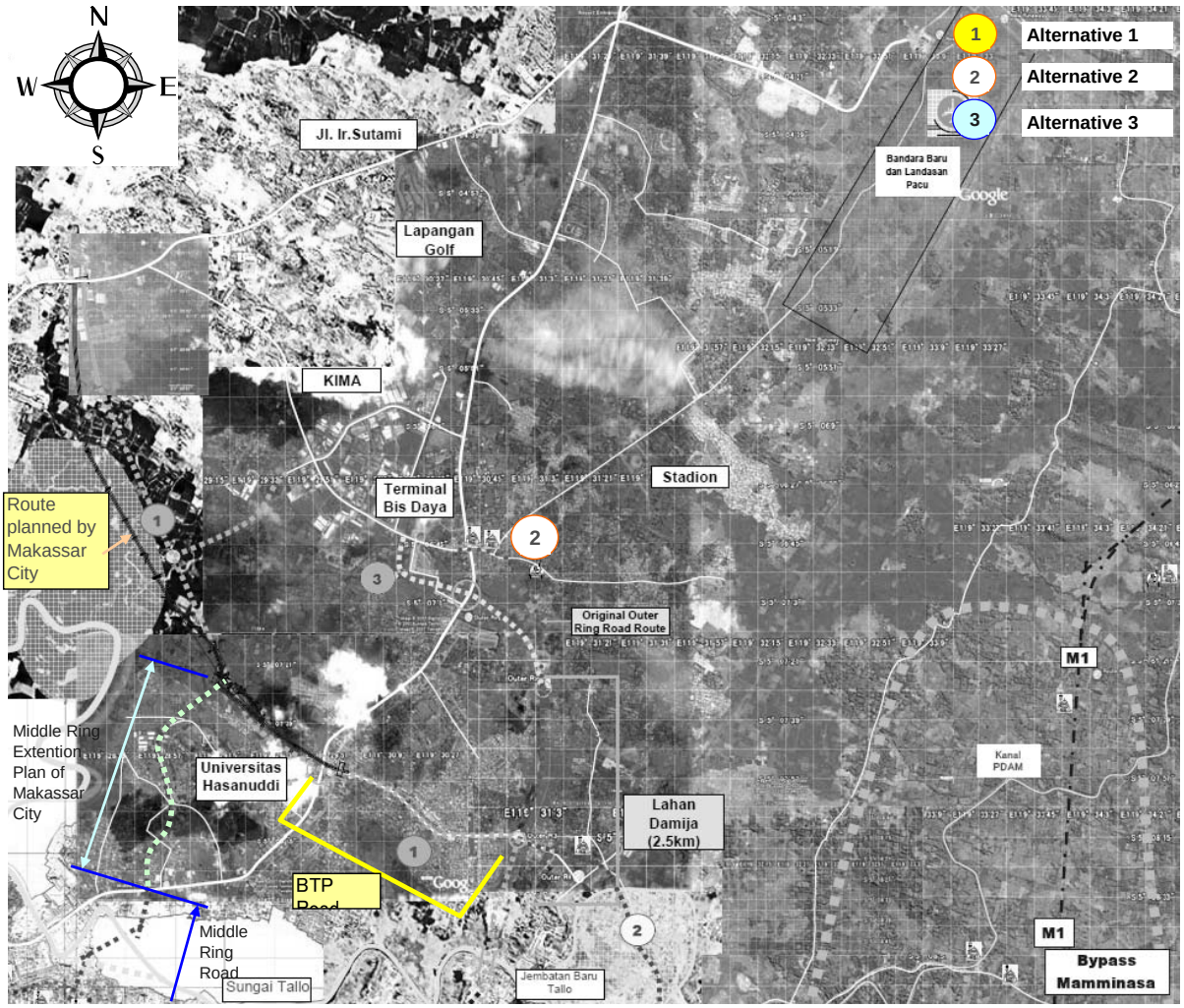


Figure F-1.11 Alternative Routes of Outer Ring Road for North Section

Alternative 1

This is one of the current plans of Makassar City. The planned route is a connection from Alternatives 1, 2, 3 or 4 of the middle section to Jl.Perintis Kemerdekaan through the BTP (Bumi Tamalanrea Permai) road. The BTP road is a road constructed for housing developments and it was transferred to Makassar City (see right photograph). However, as this road is narrow (5.0-5.5m width x 2 ways), it needs widening by sacrificing the median to provide a 6 m wide road.

It will not be appropriate for heavy vehicles to go to KIMA and Makassar Port through this road. Passage of heavy vehicles through the BTP road should be limited for avoiding negative effects (congestion, traffic accidents, noise, etc.) on the

residents staying along this road.

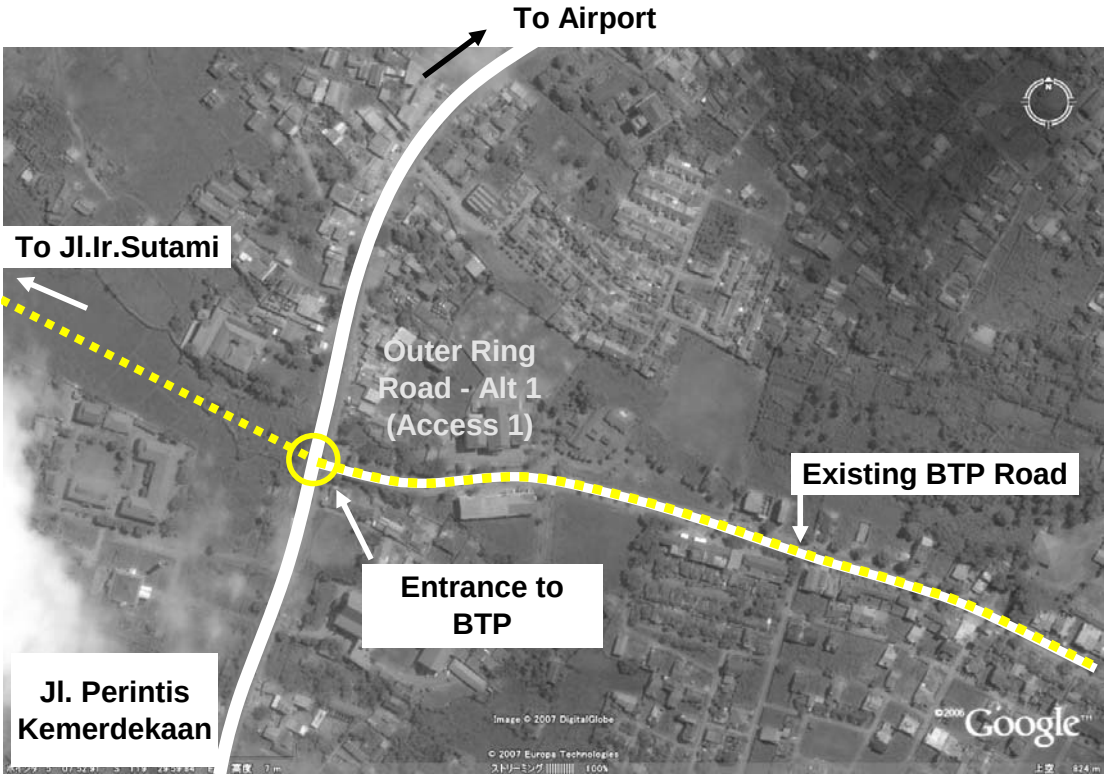


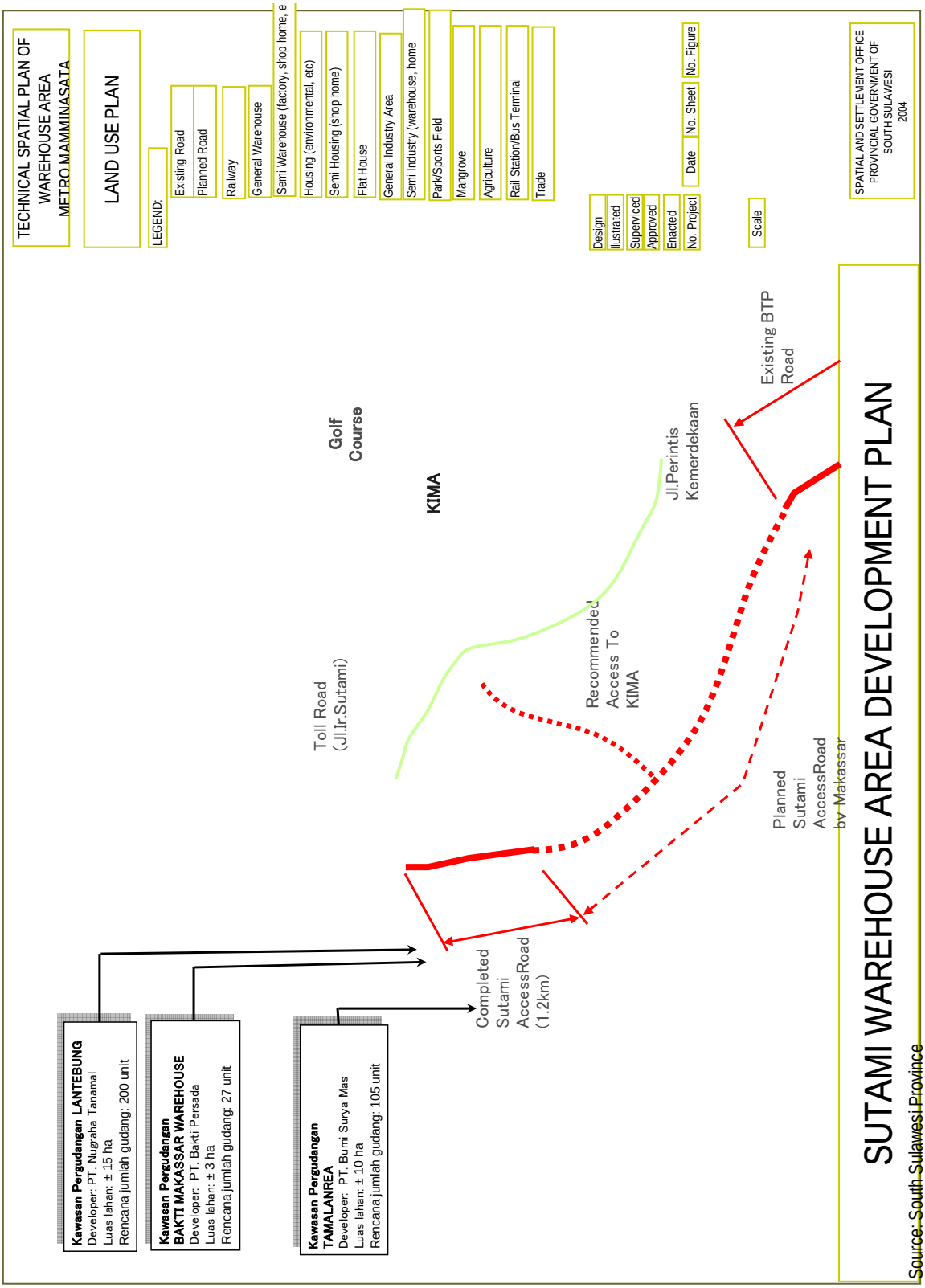
Figure F-1.12 Alternative 1 of Outer Ring Road North Access

This route will be extended crossing over Jl.Perintis Kemerdekaan up to Jl.Tol.Ir.Sutami through paddy fields and fish farming ponds (**Figure F-1.13**). Approximately 1.2 km of the 5.6 km road from Jl.Tol.Ir.Sutami has already been constructed by a developer and he is able to provide a 30-34 m wide ROW for the road space (**Figure F-1.14**).

Entrance of Warehouse and New Industrial Area

New Industrial Estate Road (7.0 m x 2-ways)

Figure F-1.13 Jl.Tol.Ir.Sutami Access Road through New Industrial Area (Kawasan Pergudangan dan Industri Parangloe Indah)



Source: South Sulawesi Province

Figure F-1.14 Land Use Plan of South Sulawesi Province along Jl.Ir.Sutami and its Access (Makassar City Plan)

Dinas PU Makassar (Makassar City Public Works Department) has recently surveyed this route and drew a proposed road alignment (red lines in **Figure F-1.13**). This proposed route will not cause negative effects to the Tallo River environment if it is about 500-700 m away from the Tallo River.

Alternatives 2

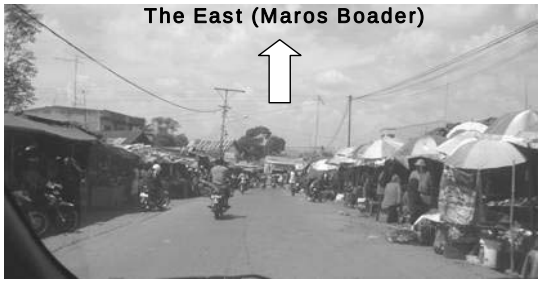
This access passes through an open band of wetland located in the housing development area and is connected to the KIMA entrance. This open band is a ROW already provided by Perumahnas (National Housing Corporation) for about 2.5 km in length (**Figure F-1.15**).

Direction 1

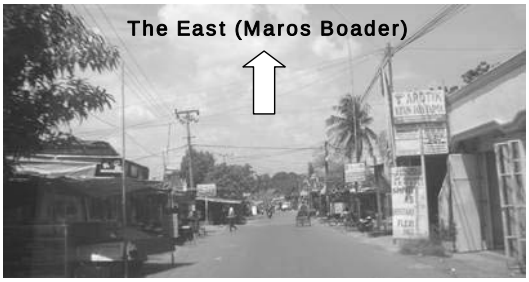
Direction 2

Figure F-1.15 Open Wet Band (Swamp) for Outer Ring Road

Alternative 2 is the original plan in which the road is directly connected to KIMA through Jl. Daya (**Figure F-1.16**). However, it will not be easy to acquire the required ROW as a local market exists and many houses are densely located along this road for about 400-500 m (**Figure F-1.17**).



Entrance of Jl.Daya (Local Market)



Residential Houses along Jl.Daya

Figure F-1.16 Entrance to Jl.Daya (Outer Ring Road Intersection)

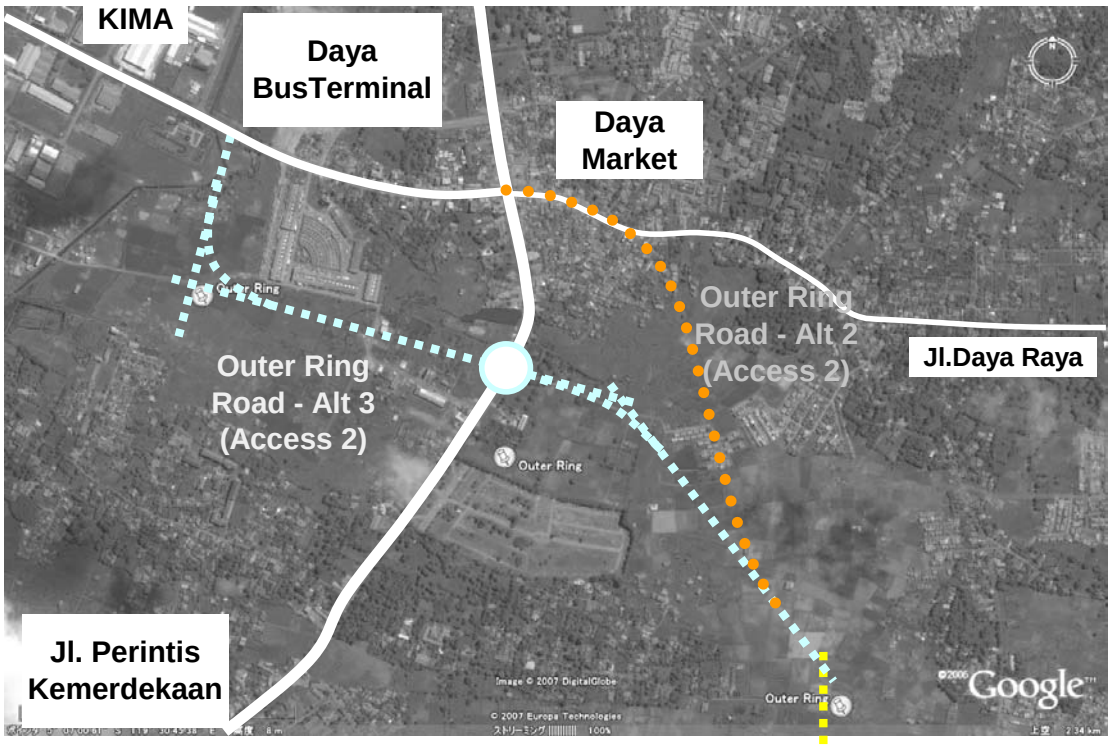


Figure F-1.17 Alternatives 2 and 3 for Outer Ring Road Access to KIMA

The existing road connection between Jl.Perintis Kemerdekaan and Jl.Tol.Ir.Sutami is a partly 4-lane and partly 2-lane road. The 2-lane road section should be widened to a 4-lane road as soon as possible. As most of ROW has already been secured, it will not be much difficult to acquire it.

Alternative 3

The JICA Study Team established an alternative route which passes behind the shopping building (Pusat Niaga Daya) and connects KIMA and Jl.Tol.Ir.Sutami (**Figure F-1.17)** without requiring much resettlement. However, as this is too near to the Jl.Daya Intersection, it will not be appropriate from the engineering viewpoint.

(5) Middle Section

This is the section between the Tallo River and Jl.Hertasning. The road passes through or near the flood retarding area of the Tallo River (refer to **Figure F-1.18).** Four alternative routes were planned for this section as shown in **Figure F-1.19.**

Alternative 1 route crosses over the Tallo River and runs along its west bank to the south. It is influenced by the flood control work planned for the Tallo River. The new roadway embankment and river dyke for flood control could share their functions as indicated in the standard cross sections (refer to **Figure F-1.10**).

Alternative 2 is same as Alternative 1 but it goes to the south passing through the wetland and new residential areas. Some resettlements are unavoidable.

Flood Condition of Tallo River Basin

Tallo River

Figure F-1.18 Flood Condition of Tallo River (Rainy Season)

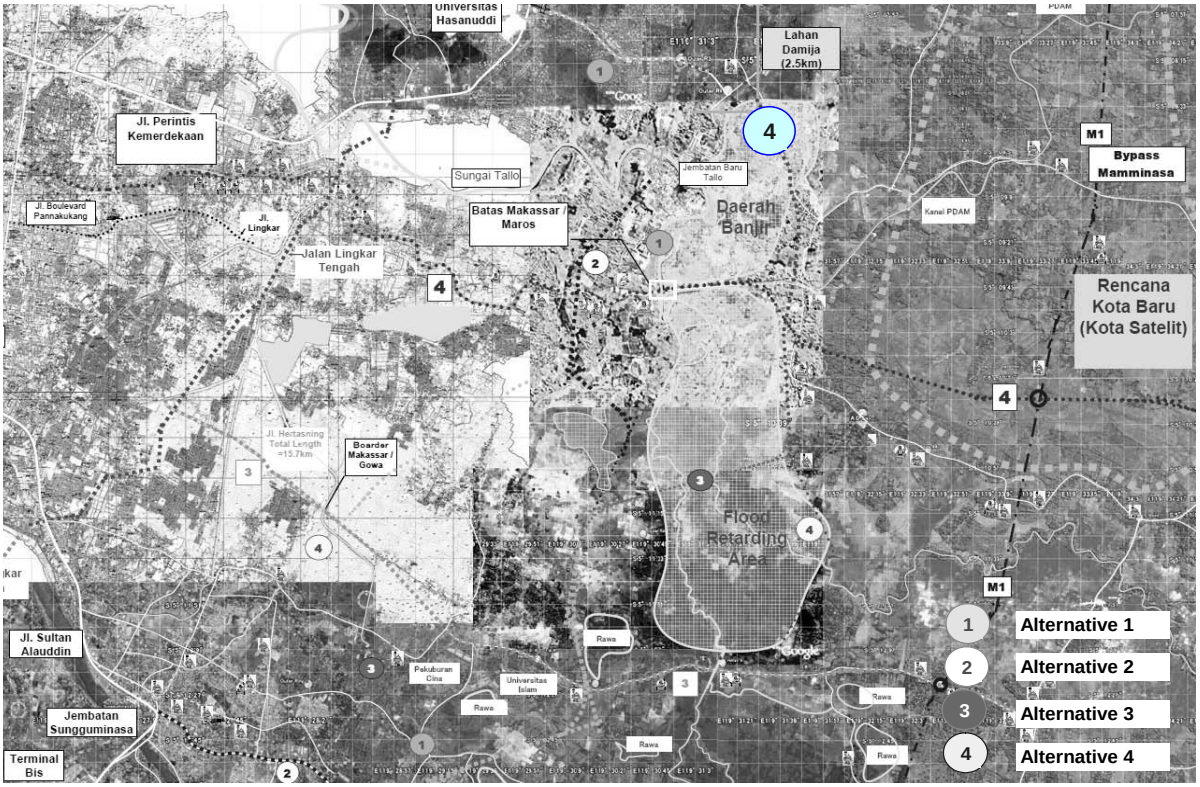


Figure F-1.19 Alternative Routes for Middle Section of Outer Ring Road

The route in Alternatives 3 and 4 passes through the east part of the Tallo River flood basin (Kabupaten Maros and Gowa). Alternative 3 crosses through the middle of the flood retarding basin while that of Alternative 4 bypasses it. These routes, especially that of Alternative 4, seem to be too far from the Middle Ring Road while too near to Mamminasa Bypass. As a flood area of 7 km x 2 km exists between the east and the west banks of the Tallo River, the route of the Outer Ring Road would be better aligned on the west side. Among those alternatives, the JICA Study Team recommends that Alternative 1 is the most appropriate plan from the engineering viewpoint.

(6) South Section

There are several control points to be considered for selection of the appropriate route for this

section, including lakes/swamps, Chinese cemetery, State Islam University under construction (**Figure F-1.20**), crossing point of the Jeneberang River, traffic congestion and dense residential area around Sungguminasa. Four alternative routes were planned for the south section (**Figure F-1.21**).

Entrance of UINAM at Jl.Hertasning

Inside of UINAM

Figure F-1.20 New Islam University along the proposed Outer Ring Road

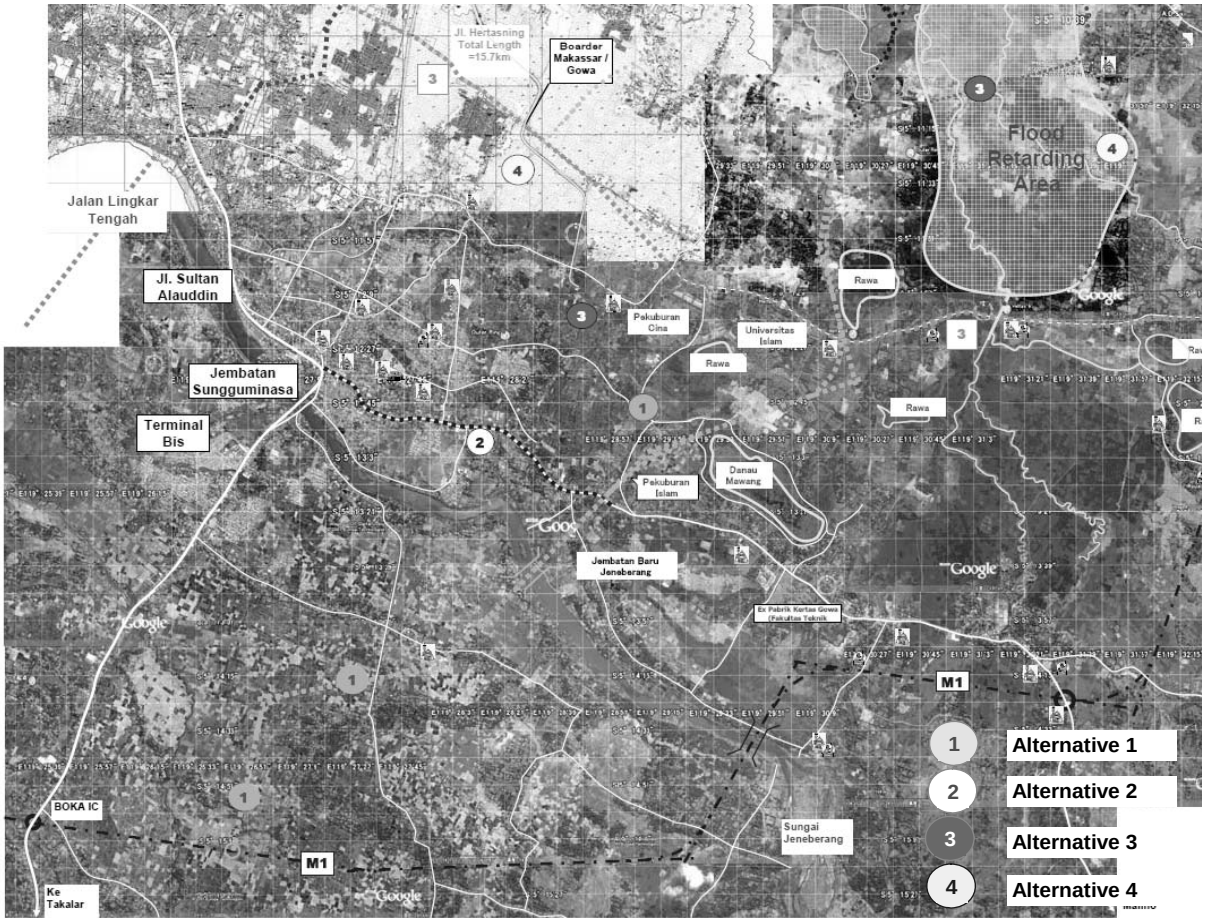


Figure F-1.21 Alternative Routes of Outer Ring Road for South Section

Alternative 4 is the original plan in the JICA 1989 study. The Outer Ring Road was planned to connect Sungguminasa (Jl.Gowa Raya) in the original plan. However, as the access area to Sungguminasa is densely occupied by residential houses, it will be very difficult to acquire the required ROW. Alternative 3 is a plan to connect the Outer Ring Road to Sungguminasa by reducing resettlement.

Alternative 2 is to make a ring road system by using the existing provincial road (Malino Road). Widening of the Malino road from 2 lanes to 4 lanes is necessary considering the future traffic demand. This route seems to be appropriate for the medium term.

Alternative 1 is a plan to locate the Outer Ring Road at approximately 3.0 km east of the Sungguminasa / Jl.Malino intersection where resettlement requirement is far less compared with other alternatives. It extends to the south passing over the Jeneberang River (**Figure F-1.22**) and is connected to the Mamminasa Bypass. From where it uses the Mamminasa Bypass then joins the national road and ends at the Tj.Bunga – Takala Road near the west coast. This plan will contribute to reducing traffic jam at Sungguminasa and Alternative 4 is the most appropriate plan in the long term from the engineering viewpoint.

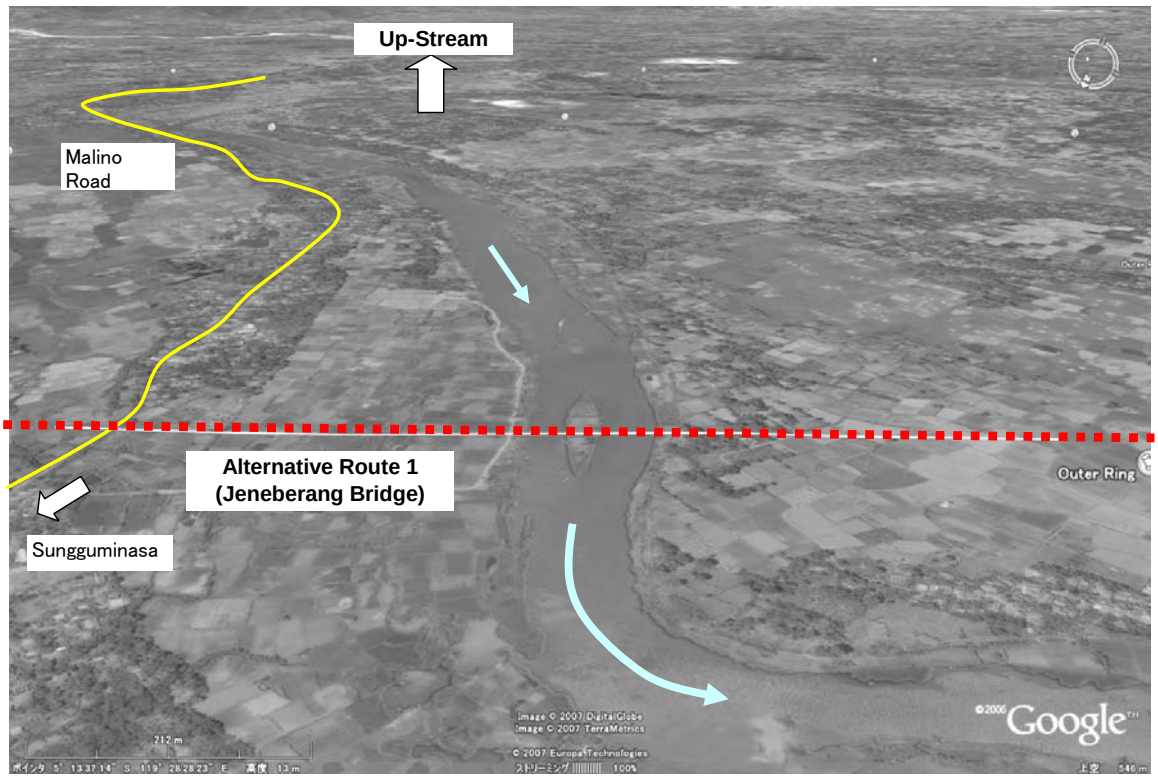


Figure F-1.22 Crossing Point of Outer Ring Road at Jeneberang River

F-1.6 Evaluation and Recommendation on Alternative Routes

(1) Alternative Route Evaluation Method

An Initial Environmental Examination (IEE) was carried out based on the existing data, the data collected for the FS roads, and site reconnaissance survey. Multi Criteria Analysis (MCA), which comprises engineering, economic and environmental elements (IEE results), was used for evaluation of alternatives. The Middle Ring Road and Outer Ring Road, both new ring roads, are expected to contribute to logistic flow between the international port / the new industrial areas and the southern area of South Sulawesi Province.

(2) North Section

Alternative 1 is one of the routes planned in the Makassar City Spatial Plan. This route is advantageous compared with others as it is connected to Jl.Tol.Ir.Sutami using the existing road (BTP road) and a new industrial area road, which is constructed by an investor. As the road section between Jl.Perintis Kemerdekaan and Jl.Tol.Ir.Sutami is constructed by the investor, expenditures by the public sector can be minimized. The Alternative 1 route can also be used for the access of the Middle Ring Road. As ROW acquisition for Alternative 2 route is difficult, it will be a mid-term to long term plan. Alternative 3 is not recommendable as it needs a new intersection near the Jl. Daya intersection. Hence, the JICA Study Team recommends Alternative 1 for the short term and together with Alternative 2 for the medium and long terms. Results of Multi Criteria Analysis (MCA) are given in **Table F-1.3**.

(3) Middle Section

The route of Alternatives 1 and 2 is located at the west and Alternatives 3 and 4 at the east of the Tallow River flood basin. As a flood retarding band of 7 km x 2 km is located between the west and the east banks, the road route should be on the west (Makassar) side taking the envisaged road functions into consideration.

Alternative 1 is advantageous compared with Alternative 2 as it requires less resettlement and its embankment can share with the flood control dyke. Results of Multi Criteria Analysis (MCA) are given in **Table F-1.4**.

Table F-1.3 Overall rating matrix based on Multi Criteria Analysis for Outer Ring Road (North Section)

Evaluation Items		Weight				5 grades assessment				Converted score (Relative evaluation, average = 100)				Weighted score (* weight)			
						Alternative 1	Alternative 2	Alternative 3	Zero Option	Alternative 1	Alternative 2	Alternative 3	Zero Option	Alternative 1	Alternative 2	Alternative 3	Zero Option
		Level 1	Level 2	Level 3	Composite weight	Access through BTP to Jl.Ir.Sutami/ KIMA 9.3km	Access through Jl. Daya to Jl.Ir.Sutami (Original) 3.1km	Access through Jl. Daya to Jl.Ir.Sutami (New Plan) 3.8km	No Outer Ring Road Construction -	Access through BTP to Jl.Ir.Sutami/ KIMA 9.3km	Access through Jl. Daya to Jl.Ir.Sutami (Original) 3.1km	Access through Jl. Daya to Jl.Ir.Sutami (New Plan) 3.8	No Outer Ring Road Construction -	Access through BTP to Jl.Ir.Sutami/ KIMA 9.3km	Access through Jl. Daya to Jl.Ir.Sutami (Original) 3.1km	Access through Jl. Daya to Jl.Ir.Sutami (New Plan) 3.8	No Outer Ring Road Construction -
Total					**1.00**	**4.04**	**3.78**	**3.53**	**2.36**	**117.06**	**110.70**	**102.34**	**69.90**	**119.87**	**109.18**	**101.38**	**69.58**
Engineering Aspect		**0.40**			**0.40**	**4.50**	**3.75**	**3.25**	**2.00**	**133.33**	**111.67**	**95.00**	**60.00**	**53.33**	**45.07**	**37.07**	**24.53**
1	Road Alignment			0.30	0.12	4	4	2	2	133.33	133.33	66.67	66.67	16.00	16.00	8.00	8.00
2	Construction Feasibility/ Flood			0.30	0.12	4	3	3	2	133.33	100.00	100.00	66.67	16.00	12.00	12.00	8.00
3	Traffic Demand			0.20	0.08	5	4	4	2	133.33	106.67	106.67	53.33	10.67	8.53	8.53	4.27
4	Road Network			0.20	0.08	5	4	4	2	133.33	106.67	106.67	53.33	10.67	8.53	8.53	4.27
Economical and Financial Aspect		**0.30**			**0.30**	**4.50**	**4.25**	**4.00**	**1.75**	**123.08**	**118.46**	**110.77**	**47.69**	**36.31**	**36.25**	**33.48**	**13.97**
5	Cost (Construction & Maintenance)			0.30	0.09	3	5	4	1	92.31	153.85	123.08	30.77	8.31	13.85	11.08	2.77
6	Economic Effectiveness			0.30	0.09	5	4	4	2	133.33	106.67	106.67	53.33	12.00	9.60	9.60	4.80
7	Impacts on Regional Economy			0.20	0.06	5	4	4	2	133.33	106.67	106.67	53.33	8.00	6.40	6.40	3.20
8	Others			0.20	0.06	5	4	4	2	133.33	106.67	106.67	53.33	8.00	6.40	6.40	3.20
Environmental Aspect		**0.30**			**0.30**	**3.11**	**3.33**	**3.33**	**3.33**	**94.78**	**101.97**	**101.24**	**102.01**	**30.23**	**27.87**	**30.83**	**31.07**
Social Environment			**0.50**		**0.15**	**4.00**	**3.33**	**3.33**	**2.67**	**120.15**	**101.83**	**99.63**	**78.39**	**17.80**	**12.53**	**15.49**	**14.18**
9	Migration of Populations Involuntary Resettlement			0.50	0.08	4	1	4	5	114.29	28.57	114.29	142.86	8.57	2.14	8.57	10.71
10	Existing Social Infrastructure and Services			0.25	0.04	3	5	3	2	92.31	153.85	92.31	61.54	3.46	5.77	3.46	2.31
11	Traffic Jam			0.25	0.04	5	4	3	1	153.85	123.08	92.31	30.77	5.77	4.62	3.46	1.15
Natural Environment			**0.30**		**0.09**	**2.67**	**3.67**	**3.67**	**4.67**	**72.22**	**100.00**	**100.00**	**127.78**	**6.53**	**9.00**	**9.00**	**11.48**
12	Flora, Fauna and Ecosystem			0.40	0.04	3	4	4	5	75.00	100.00	100.00	125.00	2.70	3.60	3.60	4.50
13	Geographical Conditions, Geological Conditions			0.30	0.03	3	4	4	5	75.00	100.00	100.00	125.00	2.03	2.70	2.70	3.38
14	Effect on the Natural/Ecological Reserves and Sanctuaries			0.30	0.03	2	3	3	4	66.67	100.00	100.00	133.33	1.80	2.70	2.70	3.60
Pollution			**0.20**		**0.06**	**2.67**	**3.00**	**3.00**	**2.67**	**91.97**	**104.09**	**104.09**	**99.86**	**5.90**	**6.34**	**6.34**	**5.42**
15	Air Pollution			0.50	0.03	4	4	4	2	114.29	114.29	114.29	57.14	3.43	3.43	3.43	1.71
16	Noise and Vibration			0.30	0.02	2	2	2	3	88.89	88.89	88.89	133.33	1.60	1.60	1.60	2.40
17	Water Pollution			0.20	0.01	2	3	3	3	72.73	109.09	109.09	109.09	0.87	1.31	1.31	1.31

Table F-1.4 Overall rating matrix based on Multi Criteria Analysis for Outer Ring Road (Middle Section)

No.	Evaluation Items	Weight Level 1	Weight Level 2	Weight Level 3	Composite weight	5 grades assessment: Alternative 1 Road construction with Flood control works / dykes (West 6.3km	5 grades: Alternative 2 Pass through wet land in Makassar (West Bank Route) 6.5km	5 grades: Alternative 3 Pass in flood retarding area (East Bank Route) 7.6km	5 grades: Alternative 4 Pass avoiding flood retarding area (East Bank Route) 10.8km	5 grades: Zero Option No Outer Ring Road Construction -	Converted score (Relative evaluation, average = 100): Alternative 1 6.3km	Converted: Alternative 2 6.5km	Converted: Alternative 3 7.6km	Converted: Alternative 4 10.8km	Converted: Zero Option -	Weighted score (* weight): Alternative 1 6.3km	Weighted: Alternative 2 6.5km	Weighted: Alternative 3 7.6km	Weighted: Alternative 4 10.8km	Weighted: Zero Option -
	Total				**1.00**	**4.10**	**4.10**	**3.40**	**2.98**	**2.81**	**117.50**	**118.13**	**96.67**	**85.80**	**81.90**	**120.71**	**117.13**	**94.91**	**86.00**	**81.25**
	Engineering Aspect	**0.40**			**0.40**	**5.00**	**4.50**	**3.25**	**2.75**	**2.00**	**144.01**	**128.73**	**90.20**	**79.46**	**57.60**	**58.30**	**50.97**	**34.64**	**32.76**	**23.32**
1	Road Alignment			0.30	0.12	5	4	4	3	2	138.89	111.11	111.11	83.33	55.56	16.67	13.33	13.33	10.00	6.67
2	Construction Feasibility/ Flood			0.30	0.12	5	4	1	3	2	166.67	133.33	33.33	100.00	66.67	20.00	16.00	4.00	12.00	8.00
3	Traffic Demand			0.20	0.08	5	5	4	3	2	131.58	131.58	105.26	78.95	52.63	10.53	10.53	8.42	6.32	4.21
4	Road Network			0.20	0.08	5	5	4	2	2	138.89	138.89	111.11	55.56	55.56	11.11	11.11	8.89	4.44	4.44
	Economical and Financial Aspect	**0.30**			**0.30**	**3.75**	**4.25**	**3.50**	**2.75**	**2.75**	**108.59**	**123.87**	**102.53**	**80.67**	**84.34**	**32.01**	**36.68**	**30.77**	**23.73**	**26.82**
5	Cost (Construction & Maintenance)			0.30	0.09	2	3	3	2	5	66.67	100.00	100.00	66.67	166.67	6.00	9.00	9.00	6.00	15.00
6	Economic Effectiveness			0.30	0.09	5	5	4	3	2	131.58	131.58	105.26	78.95	52.63	11.84	11.84	9.47	7.11	4.74
7	Impacts on Regional Economy			0.20	0.06	4	5	4	3	2	111.11	138.89	111.11	83.33	55.56	6.67	8.33	6.67	5.00	3.33
8	Others			0.20	0.06	4	4	3	3	2	125.00	125.00	93.75	93.75	62.50	7.50	7.50	5.63	5.63	3.75
	Environmental Aspect	**0.30**			**0.30**	**3.56**	**3.56**	**3.44**	**3.44**	**3.67**	**99.91**	**101.81**	**97.27**	**97.27**	**103.75**	**30.40**	**29.48**	**29.50**	**29.50**	**31.11**
	Social Environment		**0.50**		**0.15**	**4.00**	**4.00**	**3.67**	**3.67**	**3.33**	**106.35**	**109.13**	**98.41**	**98.41**	**87.70**	**15.71**	**15.09**	**14.82**	**14.82**	**14.55**
9	Migration of Populations Involuntary Resettlement			0.50	0.08	4	3	4	4	5	100.00	75.00	100.00	100.00	125.00	7.50	5.63	7.50	7.50	9.38
10	Existing Social Infrastructure and Services			0.25	0.04	3	4	3	3	2	100.00	133.33	100.00	100.00	66.67	3.75	5.00	3.75	3.75	2.50
11	Traffic Jam			0.25	0.04	5	5	4	4	3	119.05	119.05	95.24	95.24	71.43	4.46	4.46	3.57	3.57	2.68
	Natural Environment		**0.30**		**0.09**	**3.67**	**3.67**	**3.67**	**3.67**	**5.00**	**92.86**	**93.78**	**92.86**	**92.86**	**127.65**	**8.42**	**8.27**	**8.42**	**8.42**	**11.46**
12	Flora, Fauna and Ecosystem			0.40	0.04	4	3	4	4	5	100.00	75.00	100.00	100.00	125.00	3.60	2.70	3.60	3.60	4.50
13	Geographical Conditions, Geological Conditions			0.30	0.03	4	4	4	4	5	95.24	95.24	95.24	95.24	119.05	2.57	2.57	2.57	2.57	3.21
14	Effect on the Natural/Ecological Reserves and Sanctuaries			0.30	0.03	3	4	3	3	5	83.33	111.11	83.33	83.33	138.89	2.25	3.00	2.25	2.25	3.75
	Pollution		**0.20**		**0.06**	**3.00**	**3.00**	**3.00**	**3.00**	**2.67**	**100.53**	**102.51**	**100.53**	**100.53**	**95.90**	**6.26**	**6.12**	**6.26**	**6.26**	**5.10**
15	Air Pollution			0.50	0.03	4	4	4	4	2	111.11	111.11	111.11	111.11	55.56	3.33	3.33	3.33	3.33	1.67
16	Noise and Vibration			0.30	0.02	3	2	3	3	3	107.14	71.43	107.14	107.14	107.14	1.93	1.29	1.93	1.93	1.93
17	Water Pollution			0.20	0.01	2	3	2	2	3	83.33	125.00	83.33	83.33	125.00	1.00	1.50	1.00	1.00	1.50

(4) South Section

Implementation of Alternative 4 recommended in the JICA 1989 Plan is difficult as the Sungguminasa town development was faster and required ROW acquisition is now difficult. Alternative 3 reduces resettlement compared with Alterative 4 but still requires considerable resettlement.

Widening of the Malino Road from 2 lanes to 4 lanes is necessary either with or without the Outer Ring Road to meet the traffic demand in the future. Alternative 3 is a ring road system by using the Malino Road and seems to be appropriate for the medium term.

Those Alternatives 2, 3 and 4 do not much resolve traffic congestion at the Sungguminasa/ Malino Road intersection as shown in Figure F-1.23. These also do not meet the required road functions for the Outer Ring Road as a bypass for the traffic from/to the northern part to/from the southern part of Makassar City and connection between the north and the south education centers.

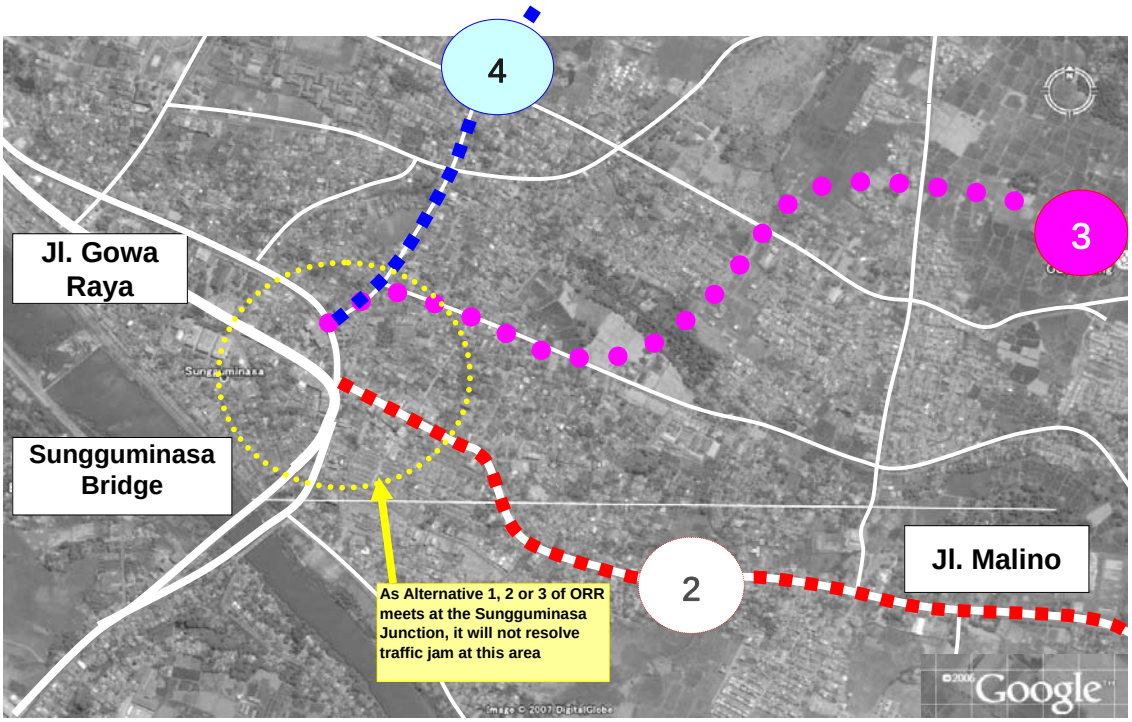


Figure F-1.23 Crossing Point of Outer Ring Road at Jeneberang River

Alternative 1 could resolve those disadvantages though its initial traffic is low. Hence the JICA Study Team recommends Alternative 2 for the medium term and Alternative 1 for the long term (**Table F-1.5)**.

Table F-1.5 Overall rating matrix based on Multi Criteria Analysis for Outer Ring Road (South Section)

	Evaluation Items	Weight				5 grades assessment					Converted score (Relative evaluation, average = 100)					Weighted score（* weight)				
						Alternative 1	Alternative 2	Alternative 3	Alternative 4	Zero Option	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Zero Option	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Zero Option
		Level 1	Level 2	Level 3	Composite weight	New road passing through the 3.5km east of Sungguminasa and connect to	Connection to Sungguminasa through Malino Road	Connection to Sungguminasa through developed area	Original Plan (connection to Sungguminasa)	No Outer Ring Road Construction	New road passing through the 3.5km east of Sungguminasa and connect to	Connection to Sungguminasa through Malino Road	Connection to Sungguminasa through developed area	Original Plan (connection to Sungguminasa)	No Outer Ring Road Construction	New road passing through the 3.5km east of Sungguminasa and connect to	Connection to Sungguminasa through Malino Road	Connection to Sungguminasa through developed area	Original Plan (connection to Sungguminasa)	No Outer Ring Road Construction
						9.3km	8.0km	7.2km	6.7km	-	6.3km	6.5km	7.6km	10.8km	-	6.3km	6.5km	7.6km	10.8km	-
Total					**1.00**	**3.61**	**3.55**	**3.21**	**3.42**	**2.40**	**112.85**	**108.26**	**97.98**	**104.04**	**76.87**	**115.86**	**105.40**	**96.53**	**104.76**	**77.45**
Engineering Aspect		**0.40**			**0.40**	**4.25**	**3.50**	**3.25**	**3.75**	**2.00**	**125.86**	**104.57**	**97.22**	**111.93**	**60.43**	**49.27**	**41.28**	**38.93**	**45.98**	**24.55**
1	Road Alignment			0.30	0.12	4	3	3	5	2	117.65	88.24	88.24	147.06	58.82	14.12	10.59	10.59	17.65	7.06
2	Construction Feasibility/ Flood			0.30	0.12	3	3	3	3	2	107.14	107.14	107.14	107.14	71.43	12.86	12.86	12.86	12.86	8.57
3	Traffic Demand			0.20	0.08	5	4	3	3	2	147.06	117.65	88.24	88.24	58.82	11.76	9.41	7.06	7.06	4.71
4	Road Network			0.20	0.08	5	4	4	4	2	131.58	105.26	105.26	105.26	52.63	10.53	8.42	8.42	8.42	4.21
Economical and Financial Aspect		**0.30**			**0.30**	**3.25**	**4.25**	**3.50**	**3.50**	**1.75**	**100.37**	**130.76**	**107.26**	**107.26**	**54.35**	**29.38**	**39.32**	**32.80**	**32.80**	**15.69**
5	Cost (Construction & Maintenance)			0.30	0.09	3	5	4	4	1	88.24	147.06	117.65	117.65	29.41	7.94	13.24	10.59	10.59	2.65
6	Economic Effectiveness			0.30	0.09	3	4	4	4	2	88.24	117.65	117.65	117.65	58.82	7.94	10.59	10.59	10.59	5.29
7	Impacts on Regional Economy			0.20	0.06	3	4	3	3	2	100.00	133.33	100.00	100.00	66.67	6.00	8.00	6.00	6.00	4.00
8	Others			0.20	0.06	4	4	3	3	2	125.00	125.00	93.75	93.75	62.50	7.50	7.50	5.63	5.63	3.75
Environmental Aspect		**0.30**			**0.30**	**3.33**	**2.89**	**2.89**	**3.00**	**3.44**	**112.33**	**89.45**	**89.45**	**92.92**	**115.84**	**37.22**	**24.80**	**24.80**	**25.97**	**37.21**
Social Environment			**0.50**		**0.15**	**4.33**	**2.33**	**2.33**	**2.67**	**2.67**	**152.08**	**78.47**	**78.47**	**88.89**	**102.08**	**23.36**	**10.39**	**10.39**	**11.56**	**19.30**
9	Migration of Populations Involuntary Resettlement			0.50	0.08	4	1	1	1	5	166.67	41.67	41.67	41.67	208.33	12.50	3.13	3.13	3.13	15.63
10	Existing Social Infrastructure and Services			0.25	0.04	4	3	3	3	2	133.33	100.00	100.00	100.00	66.67	5.00	3.75	3.75	3.75	2.50
11	Traffic Jam			0.25	0.04	5	3	3	4	1	156.25	93.75	93.75	125.00	31.25	5.86	3.52	3.52	4.69	1.17
Natural Environment			**0.30**		**0.09**	**3.00**	**4.00**	**4.00**	**4.00**	**5.00**	**75.00**	**100.00**	**100.00**	**100.00**	**125.00**	**6.75**	**9.00**	**9.00**	**9.00**	**11.25**
12	Flora, Fauna and Ecosystem			0.40	0.04	3	4	4	4	5	75.00	100.00	100.00	100.00	125.00	2.70	3.60	3.60	3.60	4.50
13	Geographical Conditions, Geological Conditions			0.30	0.03	3	4	4	4	5	75.00	100.00	100.00	100.00	125.00	2.03	2.70	2.70	2.70	3.38
14	Effect on the Natural/Ecological Reserves and Sanctuaries			0.30	0.03	3	4	4	4	5	75.00	100.00	100.00	100.00	125.00	2.03	2.70	2.70	2.70	3.38
Pollution			**0.20**		**0.06**	**2.67**	**2.33**	**2.33**	**2.33**	**2.67**	**109.92**	**89.88**	**89.88**	**89.88**	**120.44**	**7.11**	**5.41**	**5.41**	**5.41**	**6.66**
15	Air Pollution			0.50	0.03	4	3	3	3	2	133.33	100.00	100.00	100.00	66.67	4.00	3.00	3.00	3.00	2.00
16	Noise and Vibration			0.30	0.02	2	1	1	1	3	125.00	62.50	62.50	62.50	187.50	2.25	1.13	1.13	1.13	3.38
17	Water Pollution			0.20	0.01	2	3	3	3	3	71.43	107.14	107.14	107.14	107.14	0.86	1.29	1.29	1.29	1.29