CHAPTER 2 EXISTING CONDITION OF THE STUDY AREA

2.1 Natural Conditions

2.1.1 Meteorology

The representative meteorological stations which gauge the climatic data as listed in **Table 2.1.1**, are operated by either the Meteorological and Geophysical Agency (BMG) or the Provincial Public Works Service (DPUP). Seven (7) stations are located in the study area.

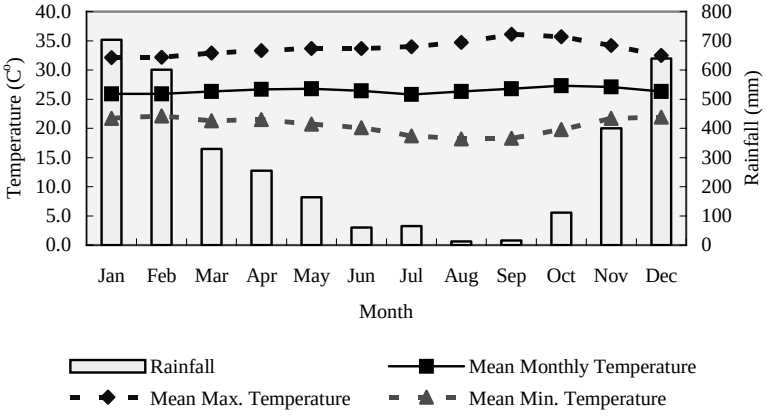
Table 2.1.1 Climatic Records Gauged by Representative Stations

Station / Observed Item	Hasanuddin in Maros Regency (Ave. From 1981 to date)	Bonto Bili in Gowa Regency (Ave. From 1980 to date)	Gantinga in Jeneponto Regency (Ave. From 1994 to date)
Mean Temperature (^oC)	26.5	23.6	26.3
Mean Max. Temperature (^oC)	33.8	25.9	28.8
Mean Min. Temperature (^oC)	20.5	21.3	23.4
Relative Humidity (%)	79.4	81.0	92.6
Wind Velocity (m/s)	1.3	1.3	2.7
Sunshine Hour (hr/day)	8.3	4.0	6.0
Evaporation (mm/day)	5.3	4.3	5.1
Annual Rainfall (mm)	3,357	5,454	1,085

Source: Comprehensive Water Management Plan Study for Maros Jeneberang River Basin, Nov. 2001 prepared by P.U.

The entire study area is under the tropical climate characterized by high air temperature with small variation throughout a year and distinct wet/dry seasons in a year. There are, however, large spatial variation of annual rainfall and temporal variation of monthly rainfall attributed to variations of monsoons and topographic conditions. The monthly mean, maximum, and minimum temperature, and monthly rainfall are shown in **Figure 2.1.1**, which were recorded in the Hasanuddin Meteorological Station (B.G.M.), Maros. The mean annual rainfall (Hasanuddin Meteorological Station, Maros) is estimated to be 3,357 mm as shown below. The annual rainfall pattern of the study area is shown in **Figure 2.1.2**.

In the study area which covers Makassar City and the three regencies of Maros, Gowa, and Takalar, the northwest monsoon prevails from November to May, while the southwest monsoon from April to October. The northwest monsoon has high moisture, which is unloaded by the mountain ranges running



Source: Comprehensive Water Management Plan Study for Maros-Jeneberang River Basin, Nov. 2001 prepared by P.U.

Figure 2.1.1 Monthly Mean Temperature and Rainfall (Data from Hasanuddin Meteorological Station, Maros)

from north to south. As a result, the northern part of the study area, the mountainous area in particular, receives a large volume of rainfall during the northwest monsoon period. On the other hand, the area receives little rainfall during the east monsoon due to the sheltering effect of the mountain ranges. The monthly variations of other climatic data such as relative humidity, evaporation, wind velocity, and sunshine hour are shown in **Figures 2.1.3, 2.1.4** and **2.1.5** respectively.

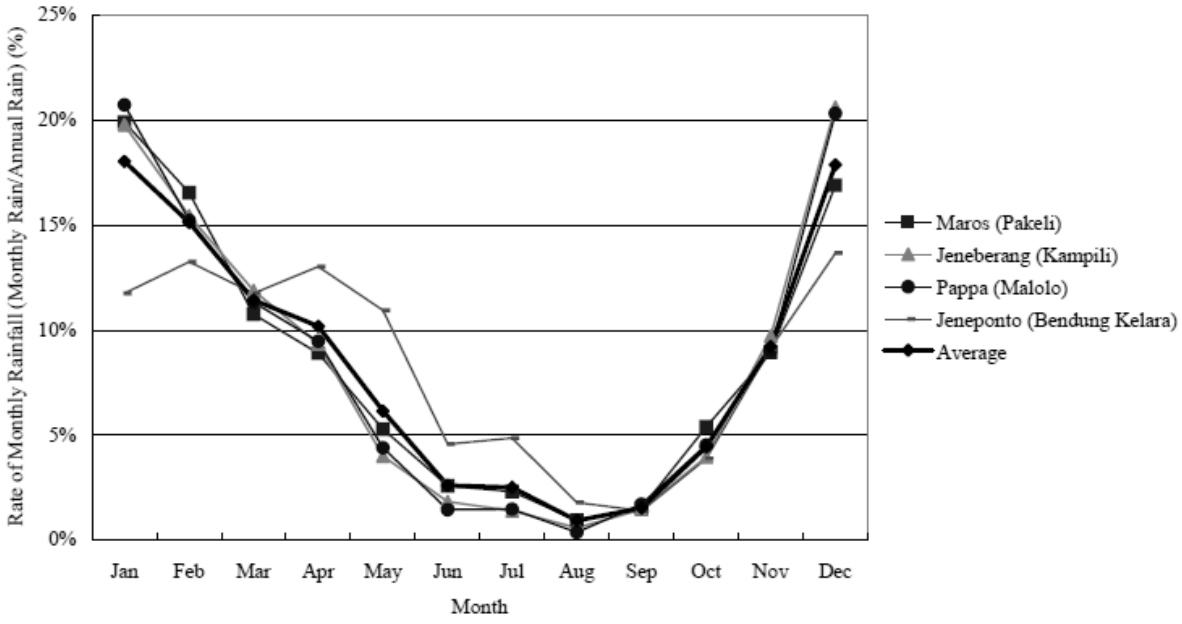


Figure 2.1.2 Annual Rainfall Pattern on the Study Area

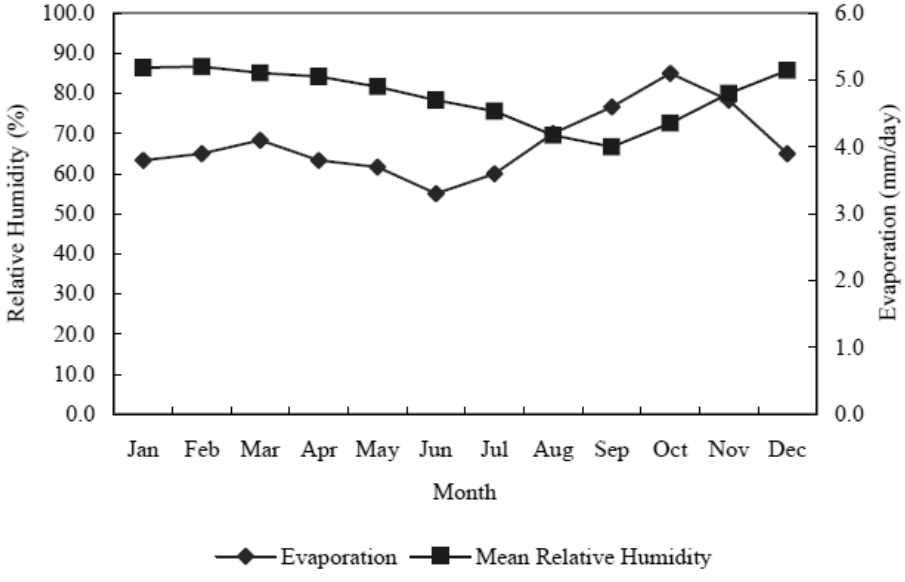


Figure 2.1.3 Monthly Mean Relative Humidity and Evaporation
(Data from Hasanuddin Meteorological Station, Maros)

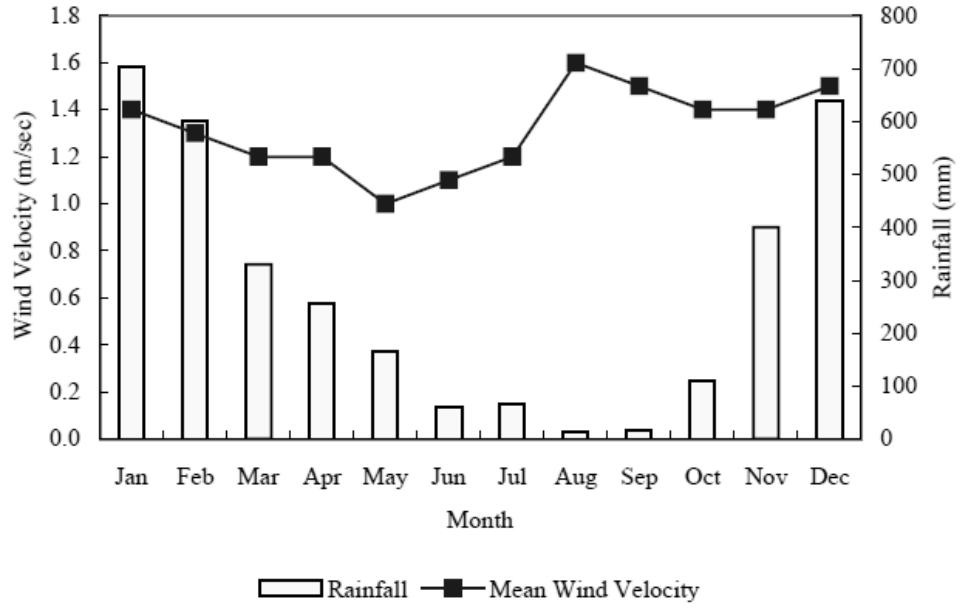


Figure 2.1.4 Monthly Mean Wind Velocity and Rainfall
(Data from Hasanuddin Meteorological Station, Maros)

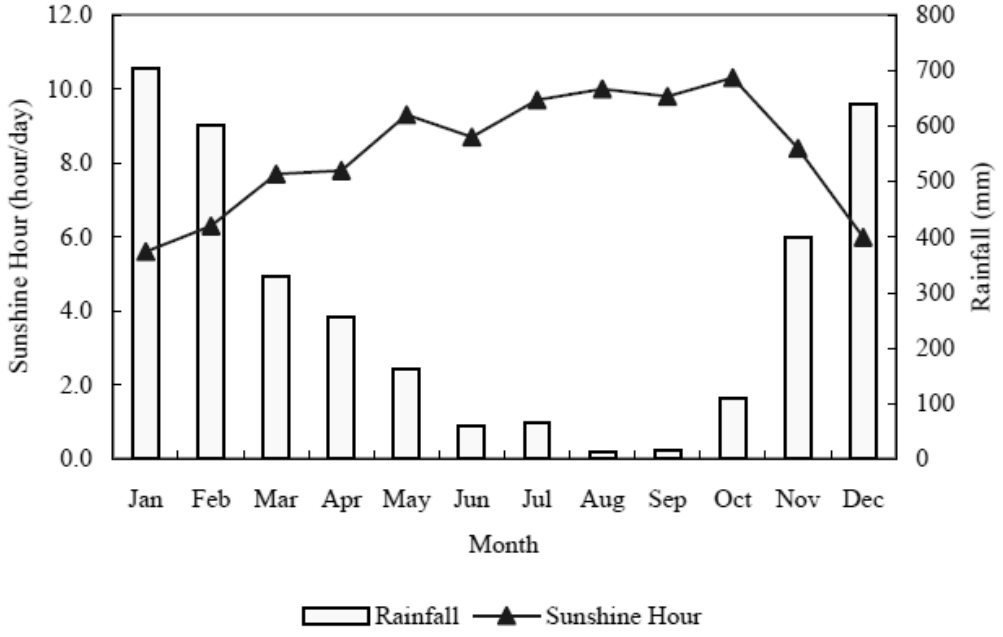


Figure 2.1.5 Monthly Mean Sunshine Hour and Rainfall
(Data from Hasanuddin Meteorological Station, Maros)

2.1.2 Topography and Hydrology

(1) Topography

The study area mainly consists of two (2) topographical types; the eastern mountainous region and the western flat land. The river basins in the project area are shown in **Figure 2.1.6**.

The mountainous region elevation of more than EL. 1,000 m has been dissected by erosion of rivers. The Lompobatang Volcano with EL. 2,768 m rises in the southeast of the study area.

Most part of the flat land has gentle undulation ranging from 5 to 40 m in elevation. The flat land between Makassar City and Takalar is an old floodplain of the Jeneberang River formed in the Late Quaternary age. In the vicinity of the river mouths and along the seacoast, little scale sandbars and swamp are distributed. A substantial part of the Regencies of Maros, Makassar, Takalar and Jeneponto is in the flat land, while the Regency of Gowa is covered with the mountainous land as listed in **Table 2.1.2**.

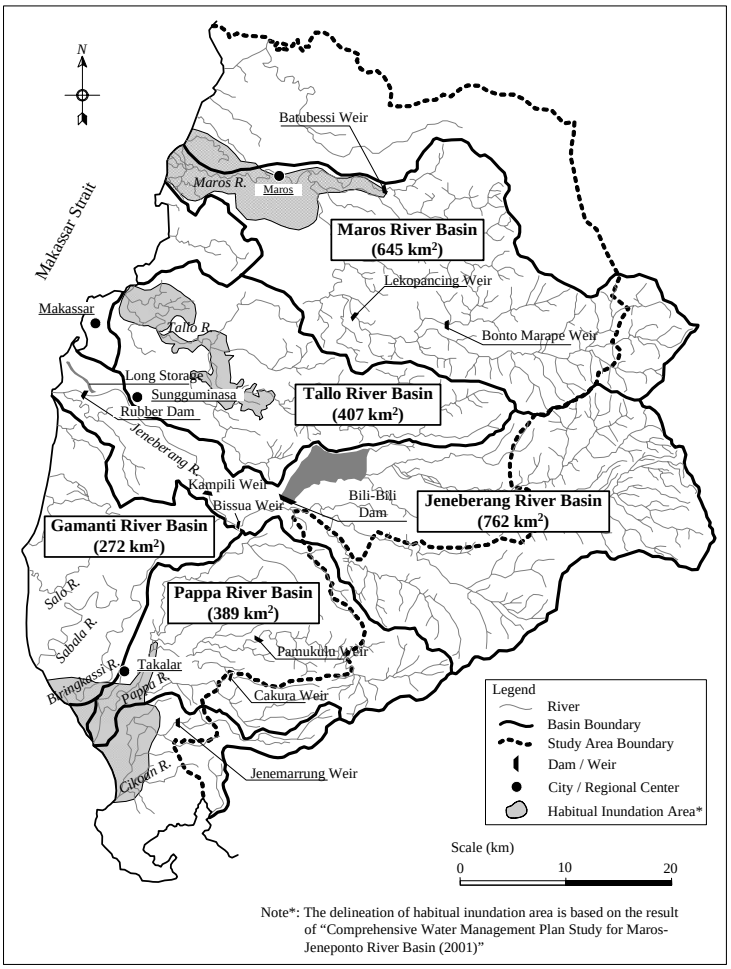


Figure 2.1.6 River Basins in the Study Area

Table 2.1.2 Land Slope by City/Regency

Slope (%)	Maros		Makassar		Gowa		Takalar		Average in the Study Area	
0-2	685.20	42.9 %	108.51	61.7 %	294.28	15.6 %	339.34	45.3 %	1,427.33	32.4 %
2-15	91.70	5.7 %	54.26	30.9 %	263.79	14.0 %	206.88	27.6 %	616.63	14.0 %
15-40	320.00	20.1 %	13.02	7.4 %	660.39	35.1 %	118.07	15.7 %	1,111.48	25.2 %
>40	498.70	31.3 %	0.00	0.0 %	664.87	35.3 %	85.56	11.4 %	1,249.13	28.4 %
Total	1,595.60	100 %	175.79	100 %	1,883.33	100 %	749.85	100 %	4,404.57	100 %

Source: Comprehensive Water Management Plan Study for Maros-Jeneberang River Basin, Nov. 2001 prepared by P.U.

(2) River Basin Condition

The study area is composed of the catchment areas of five major rivers (Maros, Tallo, Jeneberang, Gamanti, and Pappa) and several small rivers. Five of these rivers run from east to west and finally flow into the Makassar Strait. The catchment area, river length, and longitudinal slope of the rivers are given in **Table 2.1.3**.

Table 2.1.3 Topographic Features of Rivers in the Study Area

River Basin	Location (City/Regency)	Catchment Area (km^2)	River Name	River Length (km)	Stretch (Distance from River Mouth)	Average River Slope
Maros	Maros	645	Maros	82	0km – 16km	1/1,440
					16km – 40km	1/1,040
					40km – upper	-
Tallo	Makassar Gowa	407	Tallo	72	0km – 14km	1/2,780
					14km – 46km	1/2,130
					46km – upper	-
Jeneberang	Makassar Gowa	762	Jeneberang	82	0km – 32km	1/1,120
					32km – 34km	1/160
					34km – upper	-
			Jenelata	38	32km – 35km	1/220
					35km – upper	
Gamanti	Takalar Gowa	272	Biringkassi	43	0km – 9km	1/1,220
					9km – 43km	1/2,270
Pappa	Takalar Gowa Jeneponto	389	Pappa	14	0km – 9km	1/2,860
					9km – 14km	1/930
			Pamukulu	43	14km – 34km	1/330
					34km – upper	1/110
			Dingau	33	14km – 35km	1/770
					35km – upper	1/100
Cikoang	Takalar Jeneponto	113	Cikoang	32	0km – 8km	1/4,000
					8km – 32km	1/280

Source: Comprehensive Water Management Plan Study for Maros-Jeneberang River Basin, Nov. 2001 prepared by P.U.

The study area receives an average annual rainfall of 2,860 mm, out of which about 1,800 mm is estimated as annual runoff depth, therefore the annual runoff ratio (runoff depth / rainfall depth) is calculated at 63 % as summarized in **Table 2.1.4**:

Table 2.1.4 Annual Rainfall Depth and Annual Runoff Depth in the Study Area

Name of River Basin	Catchment Area (km^2)	Annual Rainfall Depth (mm)	Annual Runoff Depth (mm)	Runoff Percentage (%)	Gauging Station	
					Rainfall	Runoff
Moros	645	3,673	2,404	65	Pakeli	Puka (277 km^2)
Jeneberang	762	2,727	1,484	54	Kampili	Pattalikang (318 km^2)
Pappa	389	2,853	1,904	67	Malolo	Komara (106 km^2)
Jeneponto	379	1,728	1,204	70	Bendung	Likupande (276 km^2)
Areal Weighted Average		2,856	1,783	63		

Source: Comprehensive Water Management Plan Study for Maros-Jeneberang River Basin, Nov. 2001 prepared by P.U.

As shown in the isohyetal map on **Figure 2.1.7**, the annual rainfall depth tends to increase from less than 1,500 mm in the southwestern region to more than 4,000 mm in the northern region of the study area. Theses large variations of rainfall depth could be attributed to the effect of topographical condition and monsoon. The relation between Rainfall and Runoff (monthly average river discharge and rainfall at Hasanuddin Meteorological Station, Maros) is shown in **Figure 2.1.8**.

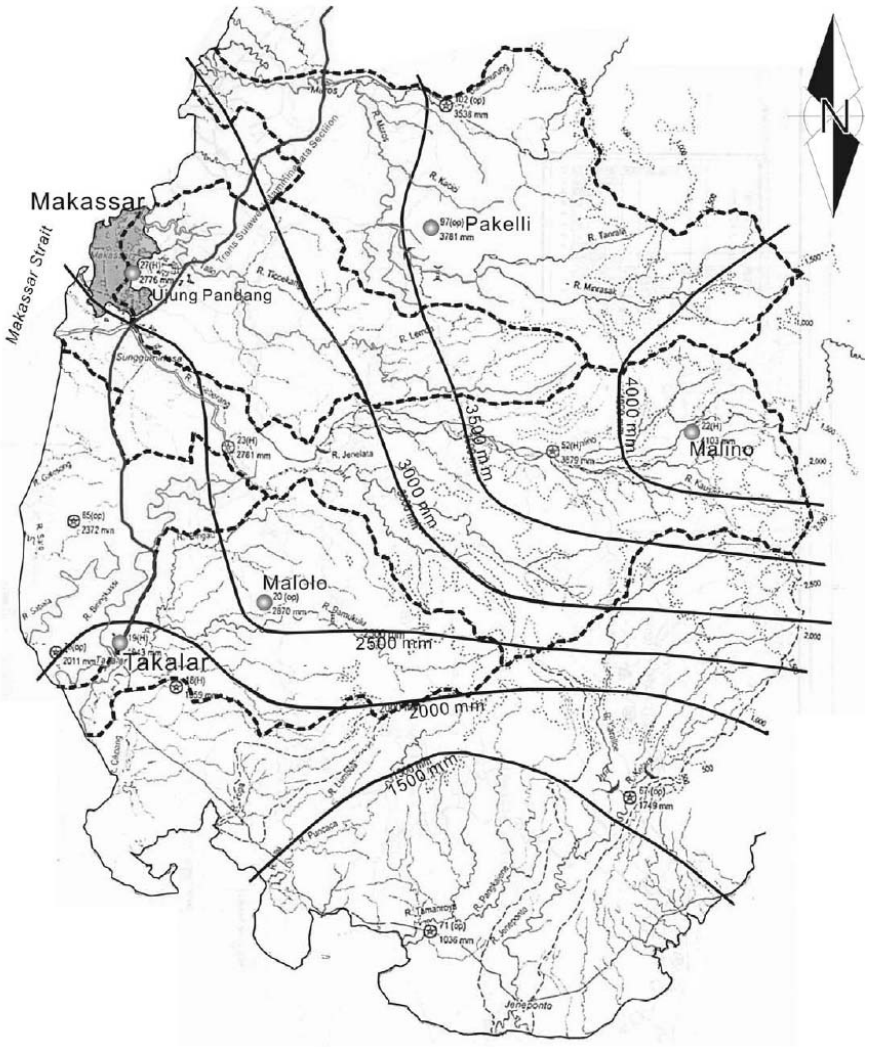


Figure 2.1.7 Isohyetal Map of the Study Area (Annual Rainfall)

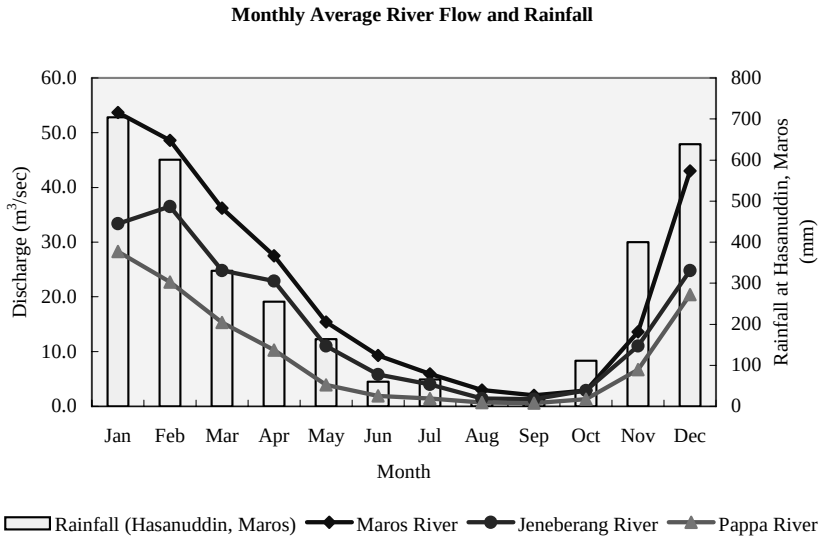


Figure 2.1.8 Relation between Rainfall and Runoff

The condition of each river basin in the study area is described below. Regarding soil erosion/sediment runoff, the present dominant one occurs in the Maros and Jeneberang rivers.

1) Maros River

The Maros River has the second largest catchment area (645 km^2) next to the Jeneberang River and the longest river length, which is almost equal to that of the Jeneberang River. The river originates from the mountain range in the northeast of the study area, flows through the town of Maros after meeting its major tributaries, the Bantimimurung River and the Arparang River, and finally empties into the Makassar Strait. The main stream heavily meanders downstream along the town of Maros. The longitudinal river slope of the lower reaches (estuary to around 10 km upstream) is estimated to be 1/9,000 to 1/4,500.

The upper reaches of the Maros River is covered with hard rocks formed by Baturape - Cindako Volcanic, which are hardly eroded and therefore produce less sediment runoff. In spite of such favorable geological conditions, a rather large volume of sediment runoff occurs due to the following complex factors:

i) Landslides along the upstream section of the river; and

ii) Removal of vegetation along the river channel by illegal dwellers .

In order to cope with the sediment runoff, the Land Rehabilitation and Soil Conservation Office, Ministry of Forest ("Balai Rehabilitasi Lahan dan Konservasi Tana (BRLKT)") has constructed 25 sabo dams and further plans to construct another three sabo dams.

2) Tallo River

The Tallo River originates in Mt. Kallapolompo (EL. 725 m) with a catchment area of 407 km2,

flows through the town of Makassar City meeting its major tributaries, the Bangkala River and Manglarang River. A low-lying area spreads out its lower reaches where the urbanized area of Makassar City is located. The mainstream of the river remains as a natural channel without any major flood protection work with an extremely gentle channel slope of about 1/10,000 to 1/5,000 in the lower reaches (estuary to around 10 km upstream). Due to these river channel conditions, the lower reaches particularly in the vicinity of Makassar City are habitually inundated by flood overflow from the river.

3) Jeneberang River

The Jeneberang River originates in Mt. Bawakareng (EL. 2,833m) and has the largest catchment area of 762 km2 and the longest channel length of about 82 km. Improvement of 16 km along the lower stretch was completed in 1993, and the Bili-Bili Multipurpose Dam with a flood capacity of 41 million m3 (the total effective storage capacity of 346 million m3) was further completed in the upper reaches in 1999.

During floods, an extremely large volume of sediment runoff containing weathered volcanic products is produced from the Lompobatang Volcano, which is located in the upper reaches of the Jeneberang River. Serious soil erosion is also in progress in the catchment area of the Jenelata River, a major tributary of the Jeneberang River, due to the shifting cultivation. Moreover, the several landslides along the river course as well as the buff riverbanks cause soil erosion and sediment runoff. In order to protect the Bili-Bili dam reservoir completed in 1999 against soil erosion and sediment runoff, the measures summarized in **Table 2.1.5** have been taken through the "Environmental Improvement Works in the Bili-Bili Multipurpose Dam Project".

Table 2.1.5 Soil Conservation Works in the Catchment Area of Bili-Bili Dam

Works Item	Work Quantity
i) Reforestation:	890.5 ha
ii) Sabo Dam:	8 dams (total sediment capacity: 814,000m^3)
iii) Erosion Control:	18 units of gabion mattress on the stream

Source: Comprehensive Water Management Plan Study for Maros Jeneberang River Basin, Nov. 2001 prepared by P.U.

4) Gamanti River and Papa River

The town of Takalar is located between the Gamanti and the Papa Rivers and the river overflow tends to directly hit the town proper. The Gamanti River has a catchment area of 272 km2 and the town of Takalar along its middle reaches (call Bajeng area) is habitually inundated by river flood overflow in the rainy season. As for the Papa River, the catchment area is about 389 km2, and the town area along the lower stretch is also easily inundated by river flow channel overflow, particularly during high tide in the rainy season.

2.1.3 Soil and Geology

(1) Geomorphology

The objective study area principally covers the three (3) river basins of Maros, Tallo and Jeneberang, which are located in the municipality of Makassar.

The study area is in a flat land near the sea. The flat land has gentle undulation ranging from 5 to 40 m in elevation. A marine terrace, which is generally a component of a coastal plain, is not distributed. Laterites and soils cover the basement rocks in thin layers, and outcrops of basement rocks can be observed everywhere. From these notable geographical features, this flat land is presumed to be a pen plain formed by lateral erosion of rivers.

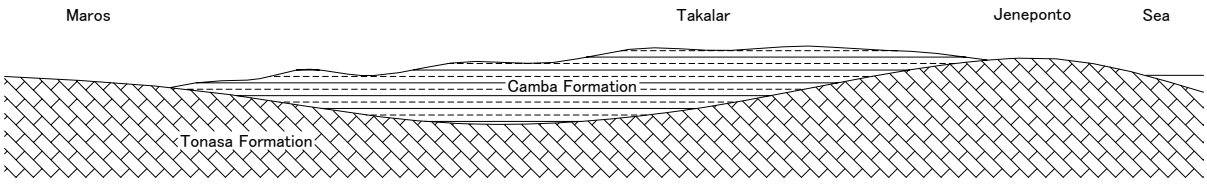
The flat land between Makassar and Takalar is an old floodplain of the Jeneberang River formed in the Late Quaternary age. In the vicinity of the river mouths and along the seacoast, little scale sandbars and swamps are distributed. In the shallow sea to the northwest side of Makassar, many coral reefs have grown on submerged hills.

(2) Geology

The basement rocks in the study area are composed as follows:

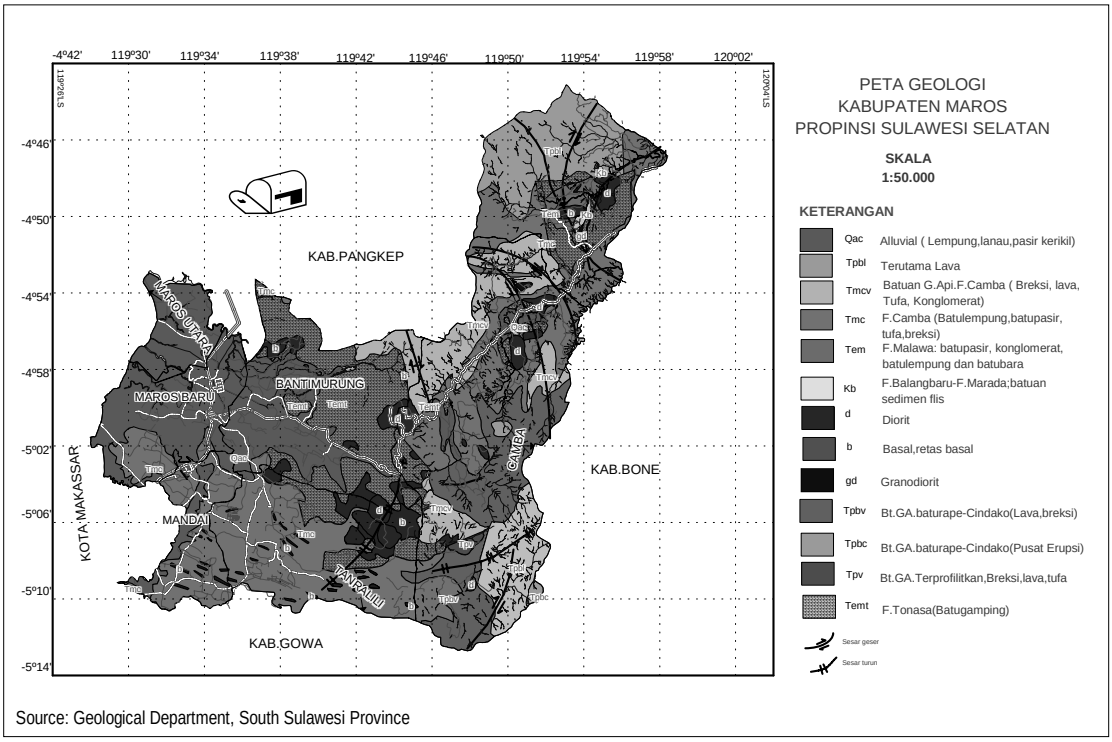
i) Tonasa Formation
ii) Camba Formation
iii) Quaternary Sediment

The geological formation of the study area along the north-south axis is as illustrated in Figure 2.1.9. Sediment rock of Camba formation sits on old rock of Tenasa formation. Alluvial deposits exist along the coast lines and flood plains of Jeneberang River, Tallo River, Maros River, Gamanti River and Papa River. Figures 2.10 and 2.1.11 show Geological maps of Makassar City, Kabupaten Maros, Kabipaten Gowa and Kabpaten Takalar.



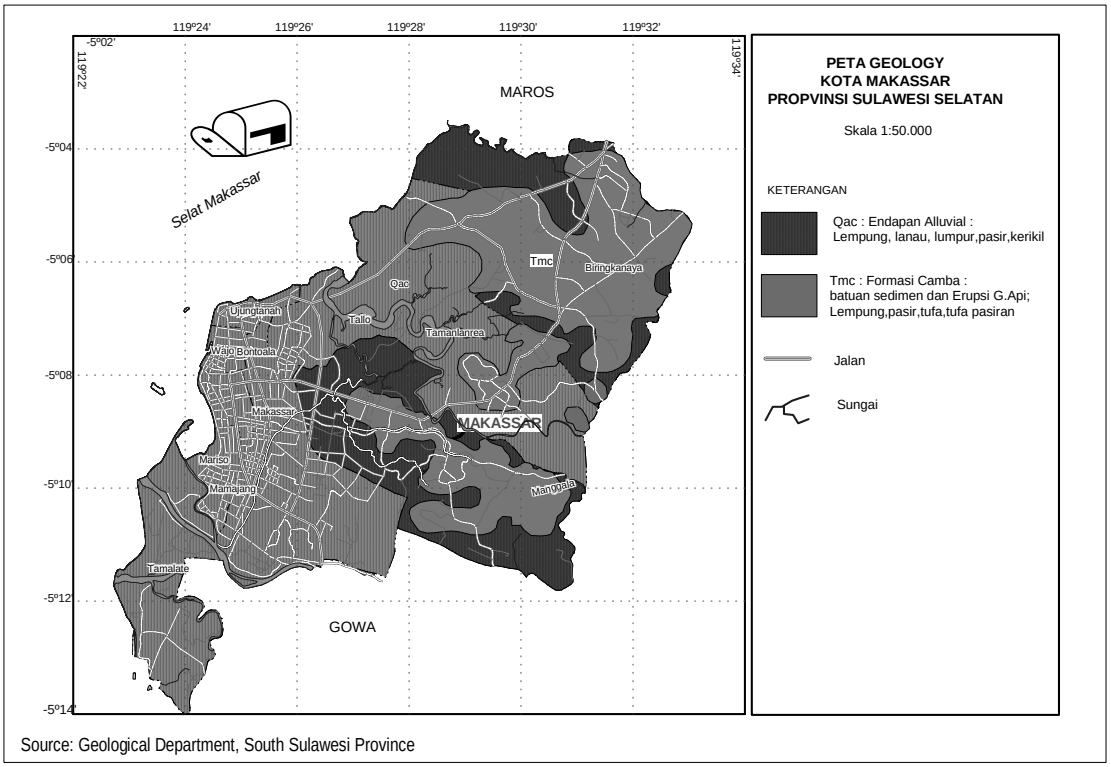
Source: JICA Study Team

Figure 2.1.9 Geological Formation of the Study Area along the North-South Axis



Source: Geological Department, South Sulawesi Province

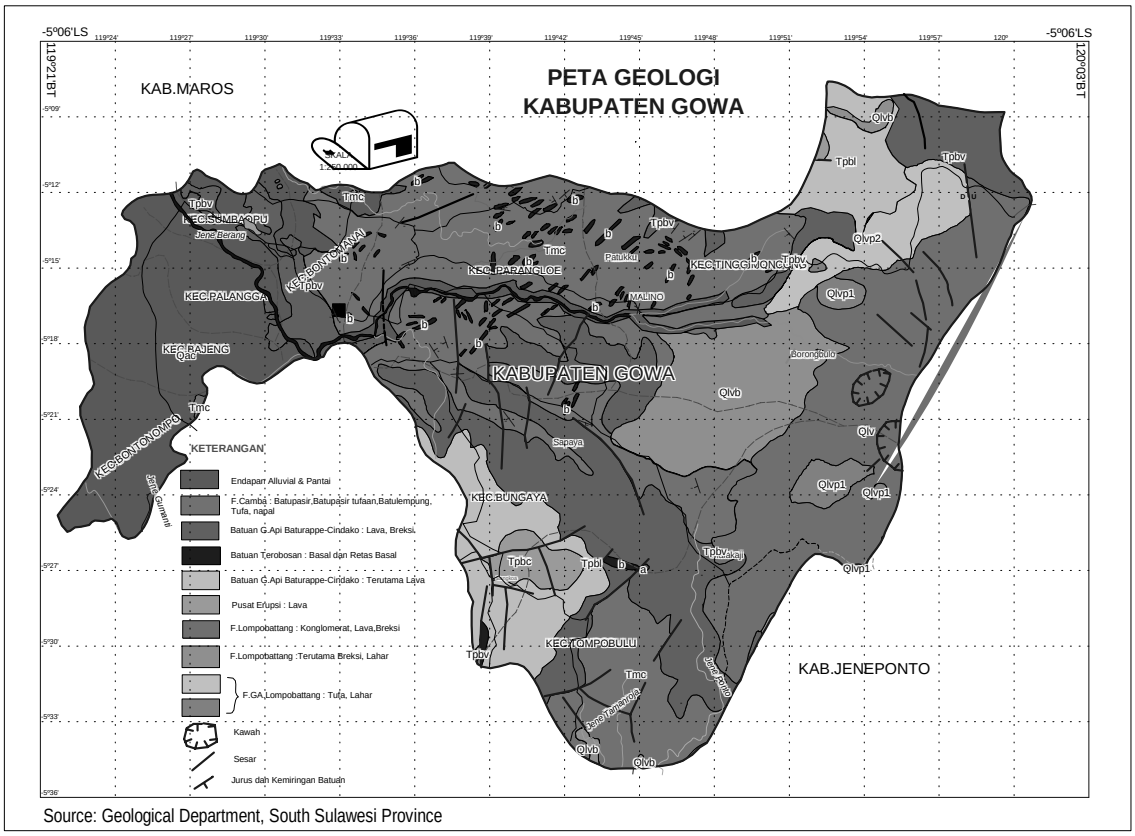
Geological Map of Kabupaten Maros



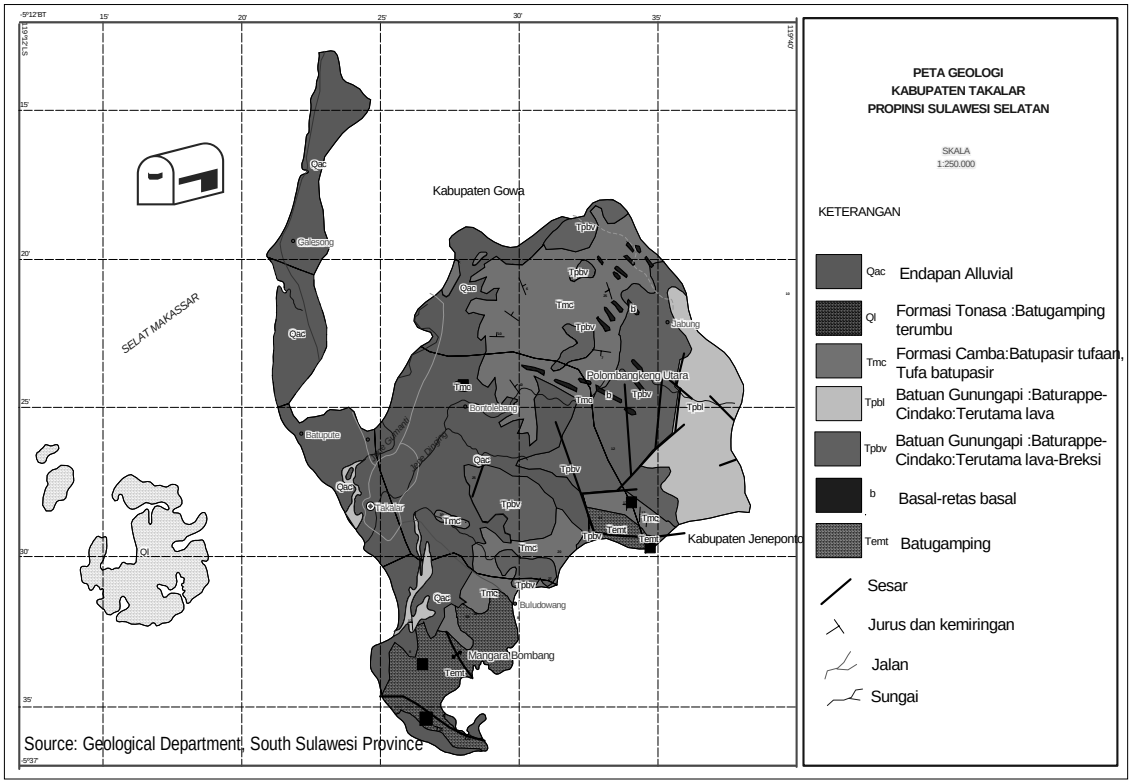
Source: Geological Department, South Sulawesi Province

Geological Map of Makassar City

Figure 2.1.10 Geological Maps of Kabupaten Maros and Makassar City



Geological Map of Kabupaten Gowa



Geological Map of Kabupaten Takalar

Figure 2.1.11 Geological Maps of Kabupaten Gowa and Kabupaten Takalar

i) Tonasa Formation

The oldest rock is the Tonasa Formation consisting of limestone and marl, which is formed in the Eocene to Middle Miocene age. It is observed around the right tributary and a part of the middle reaches of the Maros River, and the pen plain lying along the south coast between Takalor and Jeneponto, with a thickness of over 1,000 m. The Tonasa Formation would be broadly distributed under other formations formed after the Middle Miocene age. When fresh and intact, the limestone is usually dense, non-porous and strong and its permeability is very low. Many cavities are limited in limestone distributed around the right tributary of the Maros River.

ii) Camba Formation

The Camba Formation is a sedimentary rock consisting of tuffaceous sandstone interbedded with tuff, siltstone and volcanic rocks. It was deposited to overlie unconformably the Tonasa Formation in shallow marine in the Middle to Late Miocene age. The Camba Formation distributed in the flat land of the study area is almost soft.

iii) Quaternary Sediment

The main constituent of the Quaternary Sediments in the study area is the old floodplain deposit of the Jeneberang River. It was formed in the Late Quaternary age. The deposits are characterized by variability, and can range from clay to sand, gravel and boulder. Since the river course has frequently changed and meandered, flood plain deposits are widely distributed from the south of Makassar to the neighborhood of Takalar. Many winding natural levees can be observed in this area, the thickness of this deposit is 10 - 30 m.

2.2 Socio-Economic Condition

2.2.1 Demography

(1) Population of City and Regencies

The Mamminasata Metropolitan Area has a total population of 2.06 million (2003) and a land area of 246,230 ha covering Makassar city, 12 sub-districts of Maros regency, 10 sub-districts of Gowa regency, and Takalar regency. More than half of its population resides in Makassar, 19.4% in Gowa, 12.7% in Maros, and 11.6% in Takalar (see **Table 2.2.1**).

Table 2.2.1 Size and Population of Mamminasata Metropolitan Area (2003)

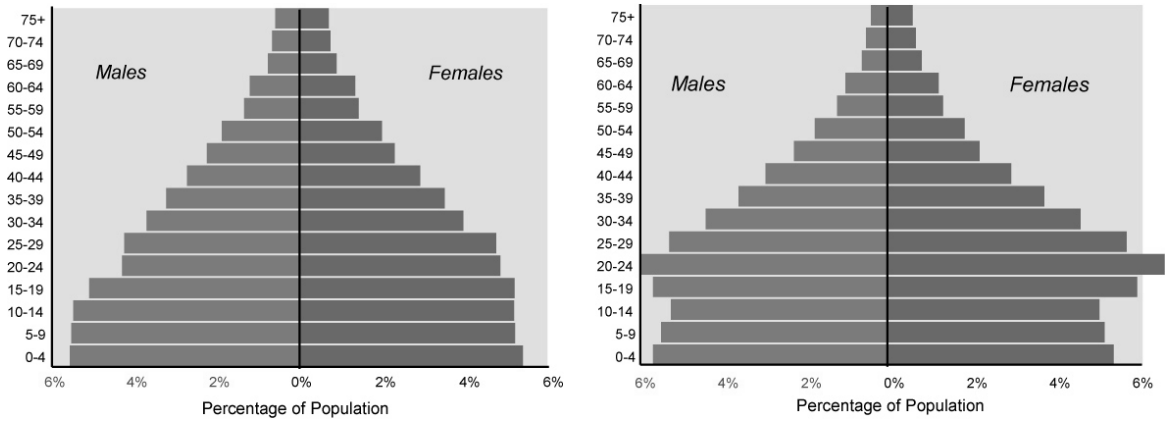
District		Size (ha)*	(%)	Population**	(%)
Makassar	(All 14 Sub-district)	18,057	7.3	1,160,011	56.3
Maros	(12 of 14 Sub-districts)	103,902	42.2	261,732	12.7
Gowa	(10 of 16 Sub-districts)	72,325	29.4	399,698	19.4
Takalar	(All 7 Sub-districts)	51,947	21.1	239,425	11.6
Total		246,230	100.0	2,060,866	100.0

Source: JICA Study Team*; BPS**

The population in Mamminasata has been growing steadily with an average annual growth rate of 1.9% between 2000 and 2003. Gowa has the highest growth rate of 2.5% among the four districts, while that in the districts remain below 2% (i.e. Makassar 1.8%; Maros 1.8%; Takalar 1.4%).

(2) Population Structure

The population structure of Mamminasata is rather distinct from that of South Sulawesi province. The population pyramids below indicate that the Mamminasata area has a more even age distribution than South Sulawesi, which has an unbalanced distribution among age groups with a larger proportion of population less than 20 years old (see **Figure 2.2.1**).



Source: BPS statistics

Figure 2.2.1 Population Pyramid in 2003: South Sulawesi (left), and Maminasata (right)

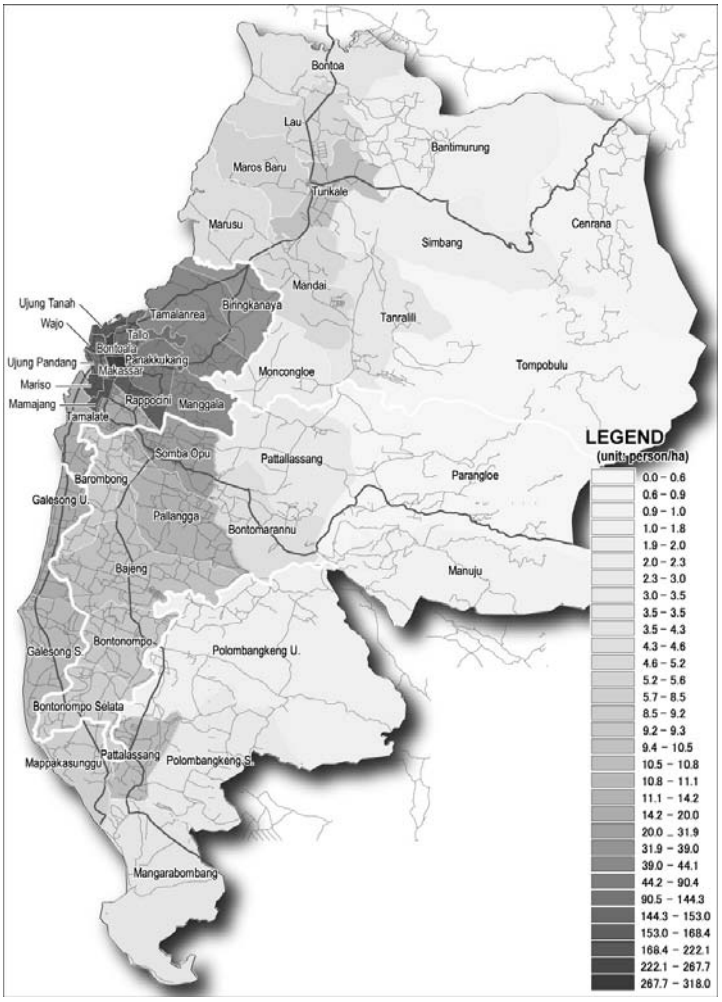
(3) Population by Sub-district

1) Population Size and Density

The population size significantly varies among the 43 sub-districts, which constitute Mamminasata. Most of the populous sub-districts with more than 50,000 residents are in Makassar and Gowa, while the sub-districts in Maros and Takalar typically have 20,000 to 40,000 residents within their areas.

The population density has a clearer difference between the sub-districts in Makassar and those in the other districts (see **Figure 2.2.2**).

The sub-districts with highest population density (more than 40 persons per ha) are mostly seen in the inner old city of Makassar, such as Makassar, Ujung Tanah, Bontoala, Wajo, Mamajang, Mariso, Rappocini, Tallo, Panakkukang, and Ujung Pandang.



Source: BPS

Figure 2.2.2 Population Density in 2003

On the other hand, those with a medium density (20-40 persons per ha) are seen in sub-urban areas such as Tamalanrea, Somba Opu, Galesong Utara, Manggala, and Biringkanaya.

The sub-districts with low density (less than 20 persons per ha) are those located mainly in the eastern part of the Study area.

(4) Population Growth

The population growth rate also varies significantly among sub-districts, though it is only 1.9% in the Mamminasata area as a whole (see **Figure 2.2.3**). Many populous inner sub-districts of Makassar such as Wajo, Bontoala, Mamajang, Ujung Pandang, and Makassar, experience population decline while a few others record only minor escalation. In contrast, the sub-urban districts, including Biringkanaya, Manggala, Mandai, Moncongloe, and Tamalanrea, have a growth rate of more than 3 %. The majority of rural areas have neither significant population escalation nor decline.

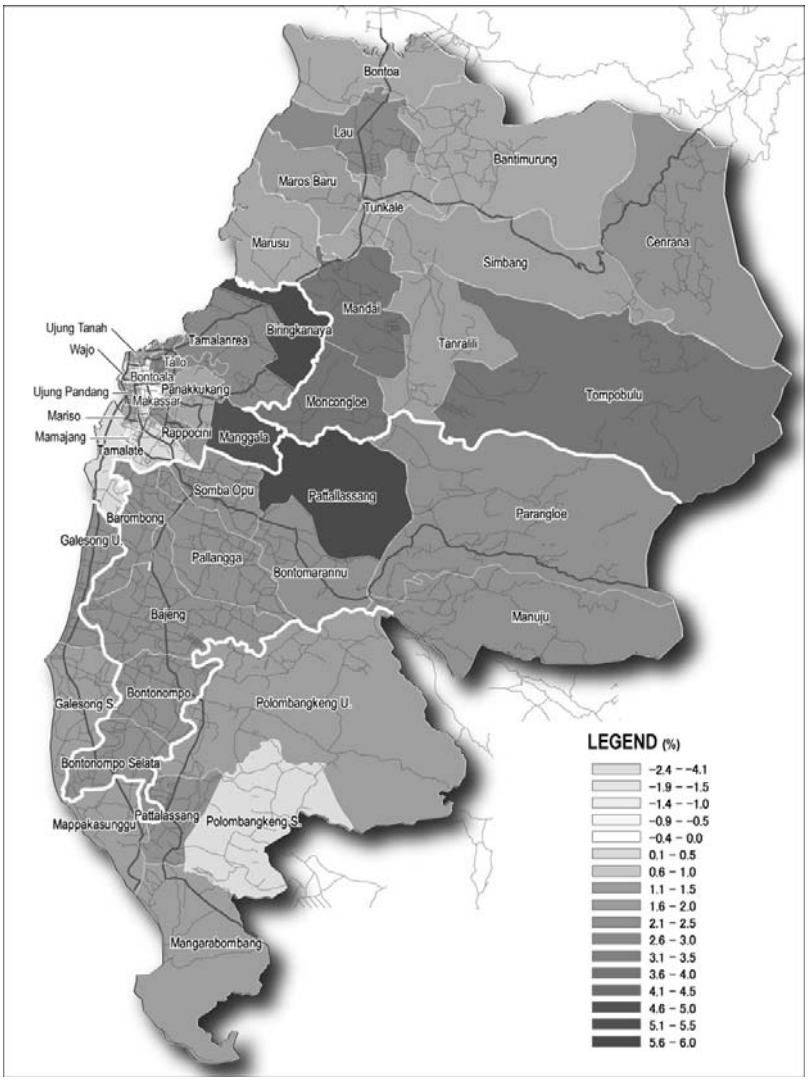


Figure 2.2.3 Population Growth Rate by Sub-District (2000-2003)

2.2.2 Economic Performance of Mamminasata Metropolitan Area

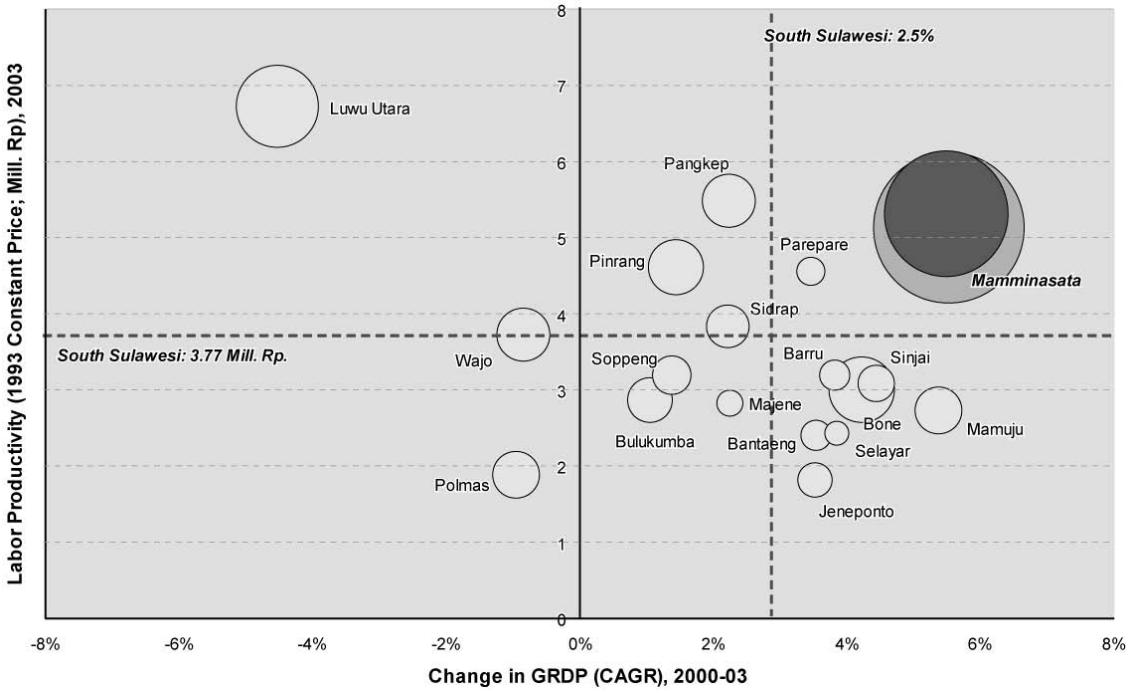
The GRDP of South Sulawesi province was Rp. 48,509,525 million in 2004, accounting for 2.6% of the national GDP. Of the whole Sulawesi region, South Sulawesi shares more than a half of its GRDP. The GRDP per capita of South Sulawesi remains at a low level at around 67% of the national average (see **Table 2.2.2**).

Table 2.2.2 Economic Comparison (2004 Current Price)

	South Sulawesi	Sulawesi Region	Indonesia
GRDP (2002) (Rp. Million)	48,509,525	92,010,735	1,863,274,686
GRDP Share (of Sulawesi)	52.7%	-	-
GRDP Share (of Indonesia)	2.6%	4.9%	-
GRDP per Capita	5,711,236	5,751,498	8,500,158

Source: BPS Statistics 2006

Figure 2.2.4 shows the economic performance of the South Sulawesi province from 1999 to 2003. Mamminasata shows an obviously different pattern from that of other regencies in South Sulawesi in terms of change of GRDP (i.e. annual average GRDP growth rate) and labor productivity (i.e. value added productivity). The economic performance of Mamminasata is superior to that of South Sulawesi both in change of GRDP and in labor productivity. This indicates that, with the large size of the Mamminasata economy, the economic development of Mamminasata can greatly enhance that of the Sulawesi Island as a whole.



Source: JICA Study Team

Figure 2.2.4 Economic Performance of Mamminasata (2000-2003)

2.2.3 Poverty Rate and other Socio-economic Indicators

According to the National Socio- economic Survey ("Survei Social Ekonomi Nasional" in Indonesian; hereafter mentioned as "Susenas") which is sampled and compiled by the Bureau of Central Statistic (BPS), the poverty ratio of the Sulawesi Island was 18.9% in 2002, which was almost same as the national average of 18.2% in the same year. The poverty ratio in Makassar (5.6%) was well lower than the national average, and that of Takalar (15.8%) was also below the national average. However, the poverty ratio in Maros (23.7%) and Gowa (19.6%) is higher.

Other socio-economic indicators included in the Millennium Development Goals (MGDs) are shown below. While school participation rate is lower than the national average, infant mortality rate and accessibility to water show better performance than the national average.

Table 2.2.3 Poverty and Other Socio-economic Indicators for Mamminasata

	Indonesia	South Sulawesi	Districts in Mamminasata			
			Makassar	Maros	Gowa	Takalar
Poverty rate: %	18.2	18.9	5.6	23.7	19.6	15.8
School participation rate for age group 7-12 (%)	96.1	92.5	95.6	92.8	92.5	90.0
Female mean years of schooling	6.5	6.4	9.8	5.4	5.9	5.4
Male mean years of schooling	7.6	7.3	10.8	6.2	6.7	6.0
Infant mortality rate: per 1,000	43.5	33.0	22.3	30.7	27.0	40.5
Population without access to safe water: (%)]	55.2	58.7	8.0	48.0	41.8	54.0

Source: Indonesia Human Development Report, BPS/ BAPPENAS

2.3 Industrial Sector of Mamminasata Metropolitan Area

2.3.1 Overview of Industrial Sector Performance

Mamminasata's economy highly depended on *the manufacturing industry* and *trade, restaurant & hotel sectors* as of 2005 and these would still remain the mainstays in GRDP share even towards 2020.

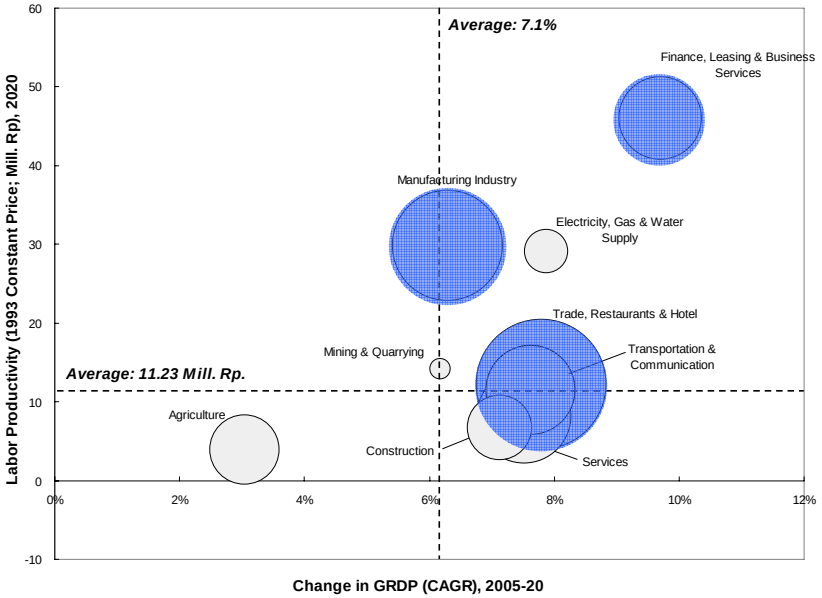
Table 2.3.1 GRDP Projection: Moderate Scenario

(1993 constant price, million Rp.)

Industry	2005		2010		2020		CAGR
	GRDP	(%)	GRDP	(%)	GRDP	(%)	(%)
Agriculture	665,608	13.3	760,568	10.1	1,043,014	7.5	3.0%
Mining & Quarrying	43,315	0.9	60,255	0.8	106,426	0.8	6.2%
Manufacturing Industry	1,046,325	20.9	1,420,147	18.8	2,616,181	18.8	6.3%
Electricity, Gas & Water Supply	139,965	2.8	214,245	2.8	436,259	3.1	7.9%
Construction	331,526	6.6	748,859	9.9	931,910	6.7	7.1%
Trade, Restaurants & Hotel	1,188,170	23.8	1,862,851	24.7	3,664,500	26.4	7.8%
Transportation & Communication	572,739	11.5	876,742	11.6	1,724,664	12.4	7.6%
Finance, Leasing & Business Services	366,918	7.3	622,097	8.2	1,472,730	10.6	9.7%
Services	643,829	12.9	979,567	13.0	1,910,794	13.7	7.5%
Total	4,998,395	100.0	7,545,331	100.0	13,906,478	100.0	7.1%

Source: Integrated Spatial Plan for Mamminasata Metropolitan Area (Main Report)

Considering the labor productivity and GRDP scale of each sector, the *finance, leasing & business services sector* is expected to be a new prospective sector in the future economy of Mamminasata in addition to the two mainstays (*manufacturing industry* and *trade, restaurant & hotel*). Other sectors would not be so significant in contribution to the economic growth because of their relatively low productivity and growth rate.



Source: Integrated Spatial Plan for Mamminasata Metropolitan Area (Main Report)

Figure 2.3.1 Projected Economic Performance of Mamminasata (2005~2020)

To attain the target economic growth in Mamminasata, it is expected that the priority sectors (*manufacturing*, *trade, restaurant and hotel*, and *finance, leasing & business services*) will stably grow and establish their positions in the economic activities, while other sectors will make efforts to improve their productivity and to keep up their pace in the economic growth.
Current features of the three priority sectors are summarized as follows:

Manufacturing Industry

In the manufacturing sector of Mamminasata, only 12% of GRDP is from small-scaled enterprises, while 88% depends on medium- and large-scaled enterprises[1]. There are about 180 medium and large enterprises in Mamminasata, many of which are located in the existing KIMA (*Kawasan Industri Makassar*) industrial estate, the largest in Eastern Indonesia.

Source: Google Earth

Figure 2.3.2 A Satellite Image of KIMA

KIMA was opened in late 1988 at a distance of 15 km from downtown Makassar, 20 minutes by car from Hasanuddin International Airport or 20 minutes from Soekarno Hatta Seaport. Its total area is 703 ha, of which 192 ha have been so far in use accommodating 189 factories[2] (as of December 2006), which consist mainly of food and beverage industry, marine product processing and light industry. Supporting infrastructures/facilities such as clean water reservoir, waste water treatment plant, electricity supply, telecommunication network, road network, etc. are well equipped. After obtaining International Certification of ISO 9001, KIMA is on the way of getting ISO 1400 certification for environmental management. In 1992, KIMA signed an agreement on Trade Development Zone with Darwin (TDZA), and in 2002, it built a partnership with China National Heavy Machinery Corporation in the field of business information, economy, trade and human resource development. In this way, KIMA has been making an effort to enhance its attractiveness in the business of modern industrial estate.

[1] Study on Implementation of Integrated Spatial Plan for the Mamminasata Metropolitan Area

[2] By December 2006, KIMA has acquired 321 ha of the total planned area of 703 ha. Out of 321 ha, 192 ha have been sold 189 ha to the factories.

In the Mamminasata metropolitan area, there are several new industrial area development plans proposed after KIMA (see 2.3.2) to introduce more manufacturing industries so as to attain the target economic growth.

Trade, Restaurant & Hotel

The trade business is closely related to the people's daily life and companies' activities, such as shopping and commercial transaction. It is understood, in general, that trade business grows in accordance with the increase in population and the number of companies. Recently in Makassar City, large-scaled shopping centers (*Carrefour* and *hypermart*) have been opened at a location adjacent to the newly developed residential area in the suburbs, Panakkukang. It is likely that this kind of modern shopping centers would be more required as the people's standard of living improves in pace with the economic growth.

As for commercial transaction, though it is not easy to draw a whole picture because of its various types of activities, warehousing is a good indicator for understanding the trend. There are more than 100 warehouses registered in and around Makassar and more investments in this field are likely to be made. The function of warehouses is to store agricultural products, fishery products and construction materials without processing. Economic growth is not attainable if activities are limited to the least value added practices. It is expected that more new ideas will be applied to increase value in commercial transaction instead of only storing or moving goods.

On the other hand, the restaurant & hotel business largely depends on the tourism demand (the number of sightseeing tourists and people to join international/national meetings or events). Makassar is famous for its spectacular sunsets, and it is said to be one of the most beautiful ones in the world, while there are attractive marine diving spots and many cultural, historical and religious places as well in and around Mamminasata. However, the average length of a foreign tourist's stay is only 1.5 days with an average expenditure of around 80 US dollars per day. From these figures, Mamminasata including Makassar City has not been really attractive to tourists, possibly due to the lack of integration or programming among the original resources, resulting in a small contribution of only 2% of the hotel and restaurant sub-sector to the overall GRDP of Mamminasata.

Currently MICE (Meeting, Incentive Convention and Exhibition) tourism, which includes seminars, conferences, conventions, exhibitions, and wedding/religious ceremonies, is being promoted in Makassar City, involving both public and private sectors, for the purpose of inducing more spending and longer stay of visitors, and more employment opportunities for the locals. As a part of MICE promotion, a new large convention center, CCC (*Celebes Convention Center*), is under construction and some improvement works in cultural, historical and waterfront spots are under way.

Finance, Leasing and Business Services

Although the present contribution of this sector to the overall economy of Mamminasata seems not

so significant, it is expected that this sector will rapidly grow to support all the industrial sectors in the financial aspect. Demand for office floors, factory equipment and even housing would require plenty of capital or leasable assets/facilities from investors/entrepreneurs. Once their businesses go well, they would need another investment. In this way, the *finance, leasing and business services* sector and the other sectors would depend on each other for growing.

Office workers for this type of business are career workers with high education in general. Their working style is likely to be stressful, therefore they prefer to take time off in a green environment to ease stress. Currently most companies/enterprises are inclined to have their main offices in the city center, with poor working environment in terms of space, facilities and exterior environment (green space). Makassar, a key city in Mamminasata, has recently prepared an urban development plan aimed at making the built-up city area more attractive and enchanting for the people to live and work in, with an expectation to attract intelligent service activities/investment including the finance, leasing and business sectors.

2.3.2 Future Development Plan for Mamminasata

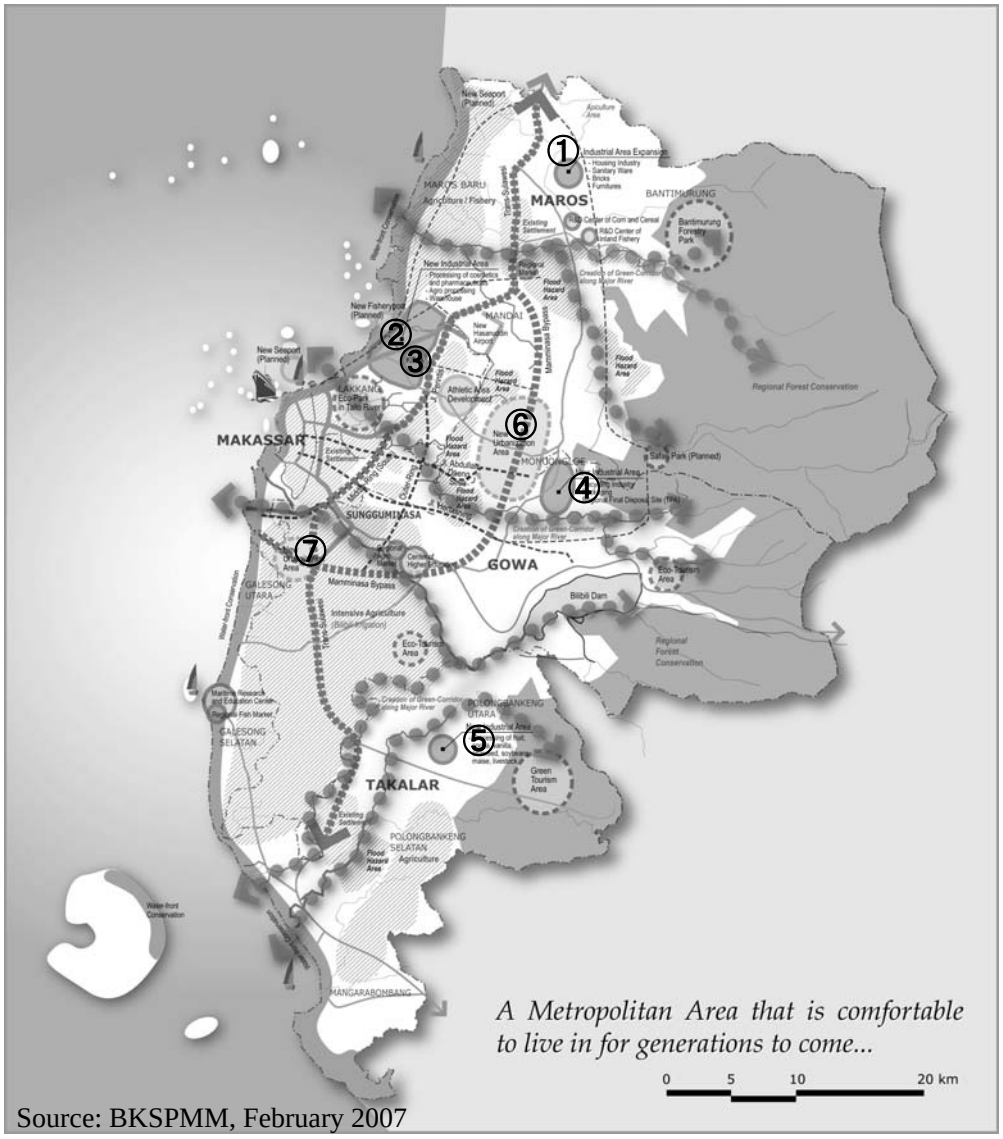
The Mamminasata Metropolitan Development Cooperation Board (MMDCB) recently has renewed a future development plan for the area, under the cooperation of JICA, with its overall slogan "*A Metropolitan Area that is comfortable to live in for the generation to come…*". The plan defines priority development/improvement areas together with necessary infrastructures.

There are five industrial areas and two new urbanization areas envisaged in the plan as strategic development areas. These are outlined in the table below.

Table 2.3.2 Outline of Future Industrial Areas and Urbanization Areas

Area Type	Name of Area	Location	Remarks
Industrial Area	① KIROS	Maros	Housing Industry, Sanitary Ware, Bricks, Furniture
	② KIMA2	Makassar, Maros	Processing of Cosmetics and Pharmaceuticals, Agro-processing, Warehouse
	③ KIMA (expansion)	Makassar	Agro-processing, Furniture, Electronics, etc.
	④ KIWA	Gowa	Recycling Industry, Packaging, Regional Final Disposal Site (TPA)
	⑤ KITA	Takalar	Processing of Fruit, Cocoa, Vanilla, Seaweed, Soybeans, Maize and Livestock
New Urbanization Area	⑥ To be named	Gowa, Maros	Residence, Business, Governmental Offices
	⑦ To be named	Takalar	Residence, Business

Source: JICA Mamminasata Study



Source: BKSPMM, February 2007

Note: ~ correspond to the numbers in Table 2.3.2

Figure 2.3.3 Mamminasata Metropolitan Area Development Plan

Each industrial area is planned on a large scale of hundreds hectares to accommodate various types of industries in consideration of original resources of each regency, while further feasibility studies are needed for implementation. To boost and accelerate these development areas, transportation facilities (road, seaport and airport) are expected to be improved/developed in harmony with environmental improvement such as regional green corridor, green tourism area, eco-park, etc.

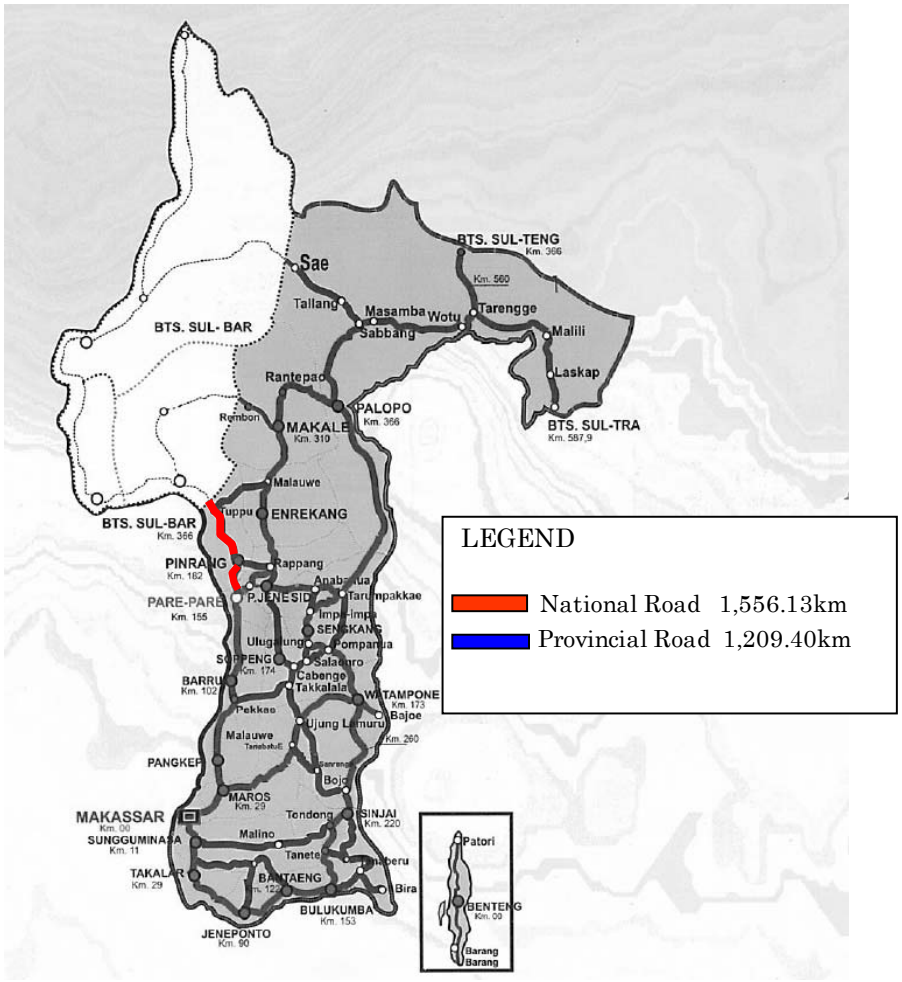
As for the road network, the Mamminasa Bypass and Trans-Sulawesi Road would play key roles in inter-district transportation so as to ensure smooth and efficient transportation of goods and people by connecting the strategic development areas and the existing city centers, while several arterial roads, including Abdullah Daeng Sirua Roads, Hertasning Roads and Outer Ring Road are planned to connect the new and existing centers with a side expectation of reducing traffic congestion in and around Makassar City.

2.4 Road and Transport Situations

2.4.1 Road Facilities and Traffic Situation

(1) Road Network in South Sulawesi by Administrative Classification

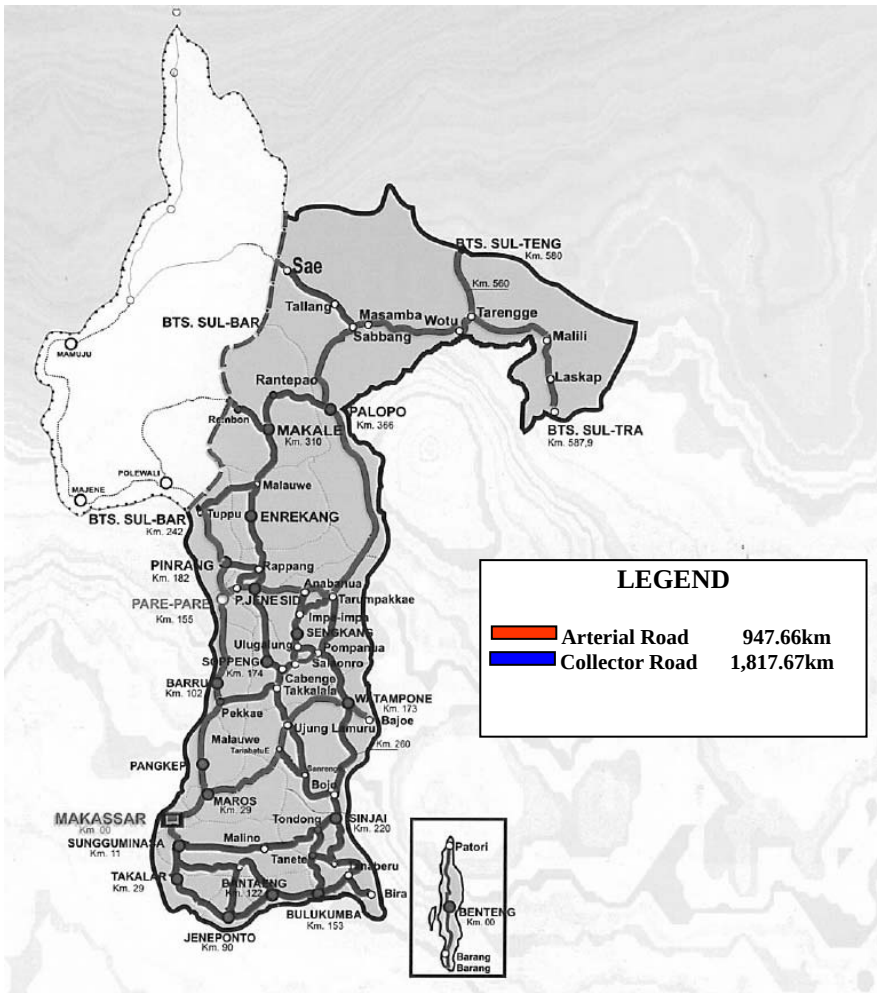
As of 2006, 1,556 km of national roads and 1,209 km of provincial roads are located in South Sulawesi Province as shown in **Figure 2.4.1**. National roads connect Makassar City with adjacent cities (regional activity centers) and provincial roads connect regional and local activity centers.



Source: Praswil, South Sulawesi Province (2006)

Figure 2.4.1 Road Network in South Sulawesi

Road functions for national and provincial roads are categorized into arterial and collector roads as shown in **Figure 2.4.2**. Arterial roads of 947 km are mostly located along coastal area and link between/among national activity and regional activity centers. Collector roads of 1,817 km link between/among regional and local activity centers.



Source: Praswil, South Sulawesi Province (2006)

Figure 2.4.2 Functional Classification of Roads in South Sulawesi

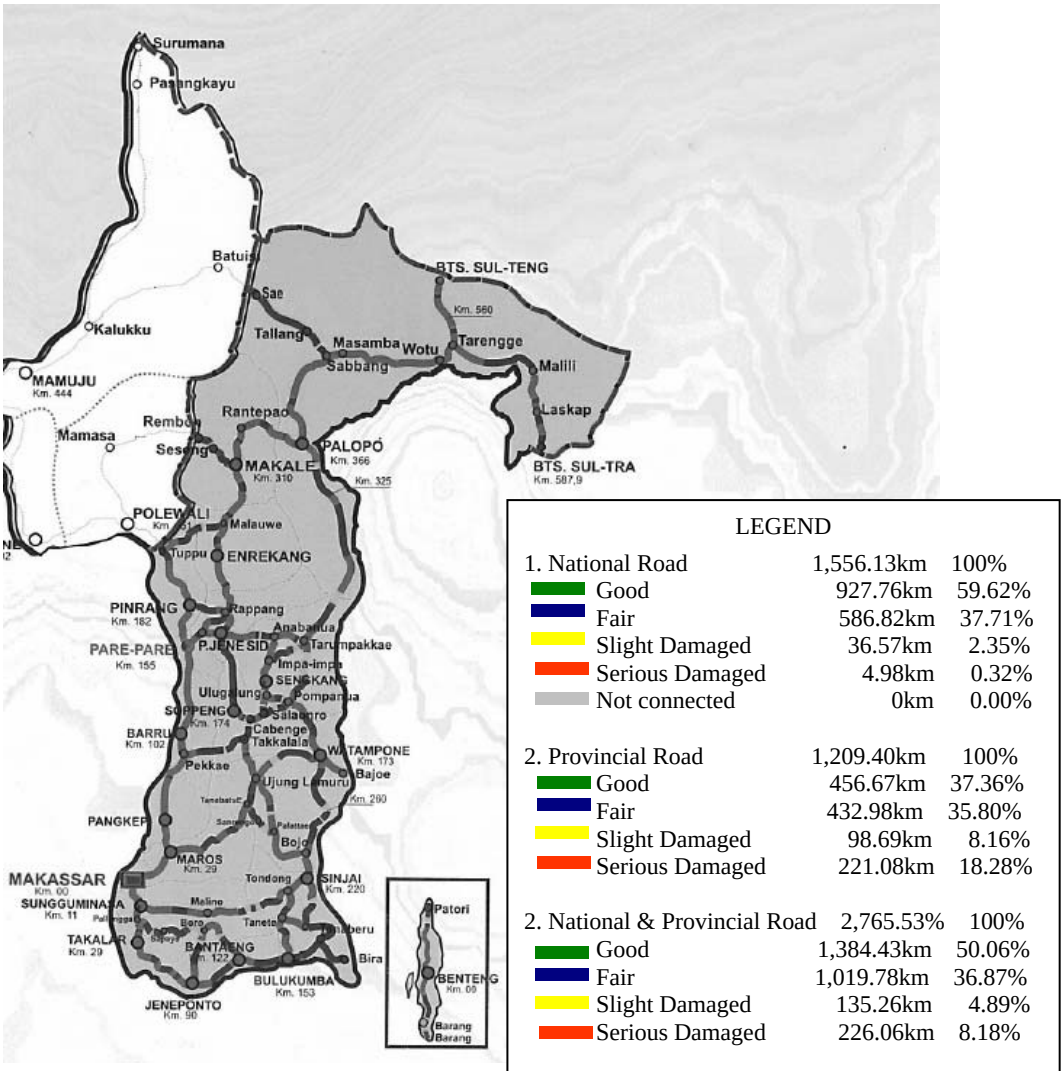
(2) Road Condition

Road surface condition of national and provincial roads in South Sulawesi Province is shown in **Table 2.4.1** and **Figure 2.4.3**.

Table 2.4.1 Road Surface Condition in South Sulawesi

Degree	Good	Fair	Slight Damage	Serious Damage
Composition	50%	37%	5%	8%

Source: Praswil, South Sulawesi Province (2006)

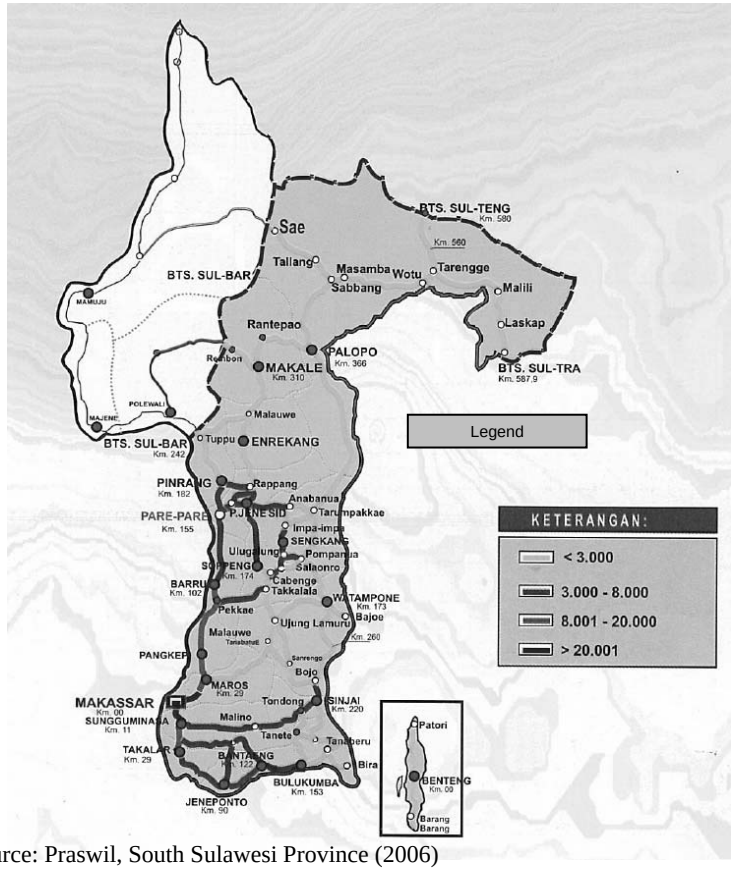


Source: Praswil, South Sulawesi Province (2006)

Figure 2.4.3 Surface Condition

(3) Road Traffic Situation in the Study Area

Traffic volume data of trunk roads, both national and provincial, have been updated by Bina Marga every year. The 2004 figures show that the maximum traffic is recorded around Makassar city, exceeding 20,000 vehicles per day, and slightly fewer volumes are observed on connecting roads around Makassar. The least volume is observed in rural areas with less than 3,000 vehicles per day as shown in the following table.



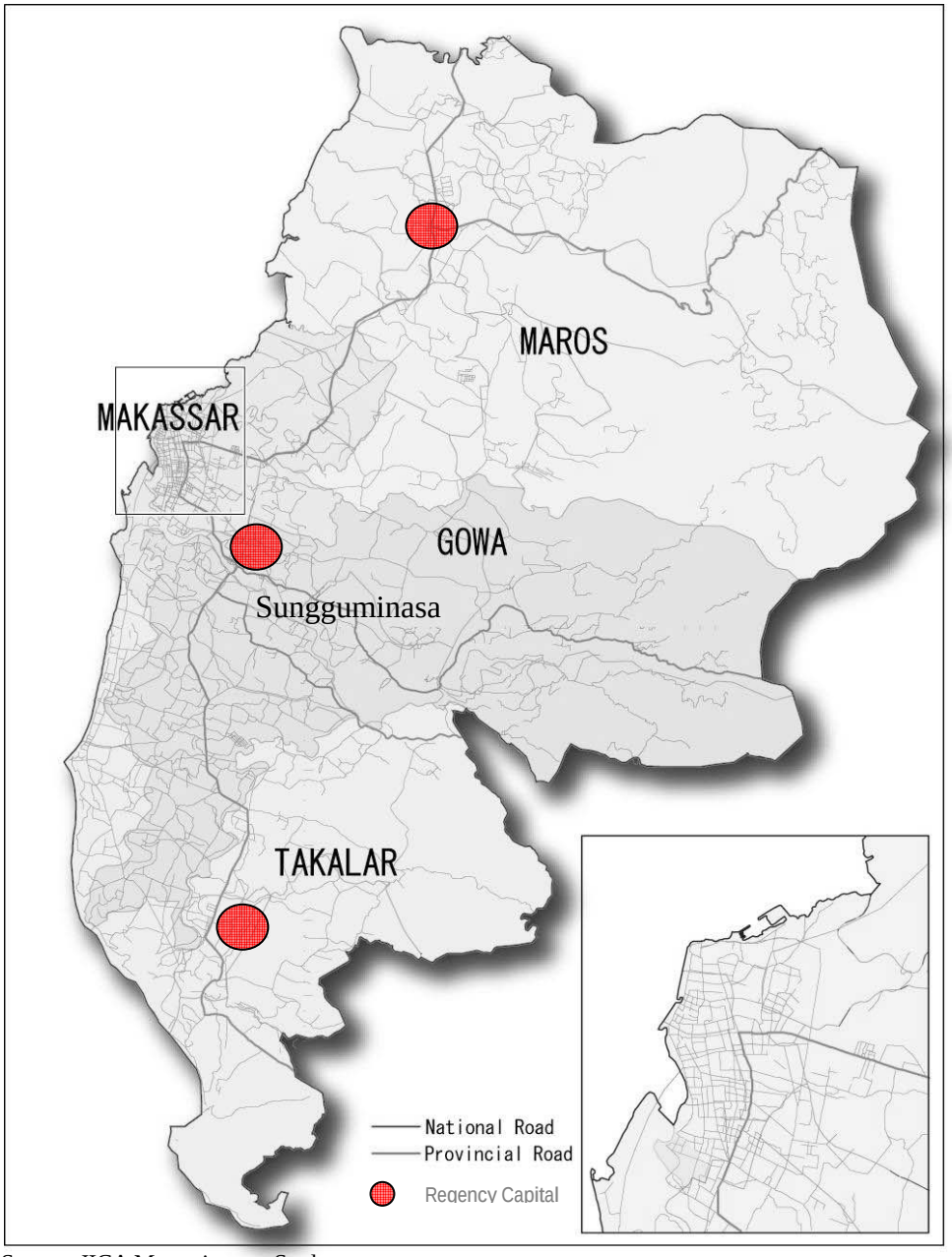
Source: Praswil, South Sulawesi Province (2006)

Figure 2.4.4 Traffic Volume on Main Trunk Roads

2.4.2 Road Facilities of Mamminasata Metropolitan Area

(1) Road Network

The present road network in the Mamminasata Metropolitan Area is illustrated in **Figure 2.4.5**. Three regency capitals of Maros, Gowa and Takalar are connected with Makassar City by national roads. The provincial roads connect the regional activity centers in the sub-regions outside of Mamminasata Metropolitan Area. Regency/City and other roads are access and community road network for various regional activities and daily life.



Source: JICA Mamminasata Study

Figure 2.4.5 Present Road Network in Mamminasata Metropolitan Area

The roads by administrative classification in the Mamminasata Metropolitan Area are summarized in **Table 2.4.2**. The road data are kept in IRMS and updated by MPW and Dinas Praswil every year.

Table 2.4.2 Road Length in the Study Area by Road Classification

Items	Maros	Makassar	Gowa	Takalar	Total	Remarks
National Road	86.8 km	25.7 km	21.3 km	28.4 km	143.2 km	Arterial /Collector 1
Provincial Road	-	-	58.5 km	21.7 km	80.2 km	Collector 2 / Collector 3
Sub-Total	86.8 km	25.7 km	79.8 km	21.7 km	223.4 km	
City / Regency Road	892 km (177 roads)	765 km	2196 km (573 roads)	755 km (384 roads)		

Source: Praswil, South Sulawesi Province (2006)

(2) Road Condition

The surface condition of roads in urban areas is fairly maintained, while the roads in suburban areas are not maintained adequately.

Table 2.4.3 Pavement Condition of National and Provincial Roads in Mamminasata Metropolitan Area

	Good	Fair	Slightly Damaged	Seriously Damaged
National Roads	31.4%	68.2%	0.6%	-
Provincial Roads	39.9%	33.6%	8.7%	17.8%

Source: Data Informasi 2006, Praswil, South Sulawesi Province

2.4.3 Public Transport System and Facilities

(1) General

The current public transport services in the Mamminasata Metropolitan Area are provided by road-based transport modes (i.e. buses, mini bus, taxi, beca, etc.). According to the results of traffic count survey conducted during February-April 2007, mini bus is the main public transport mode in the Mamminasata Metropolitan Area.

1) Bus Service

Bus service is provided for inter-city transport between the Mamminasata Metropolitan Area and other major cities in the entire Sulawesi Island. The Mallengkeri and Daya bus terminals are operated as inter-city bus stations in the Mamminasata Metropolitan Area at the locations shown in **Figure 2.4.6.** The terminals are provided with transferring facilities from inter-city buses to other public transport services.

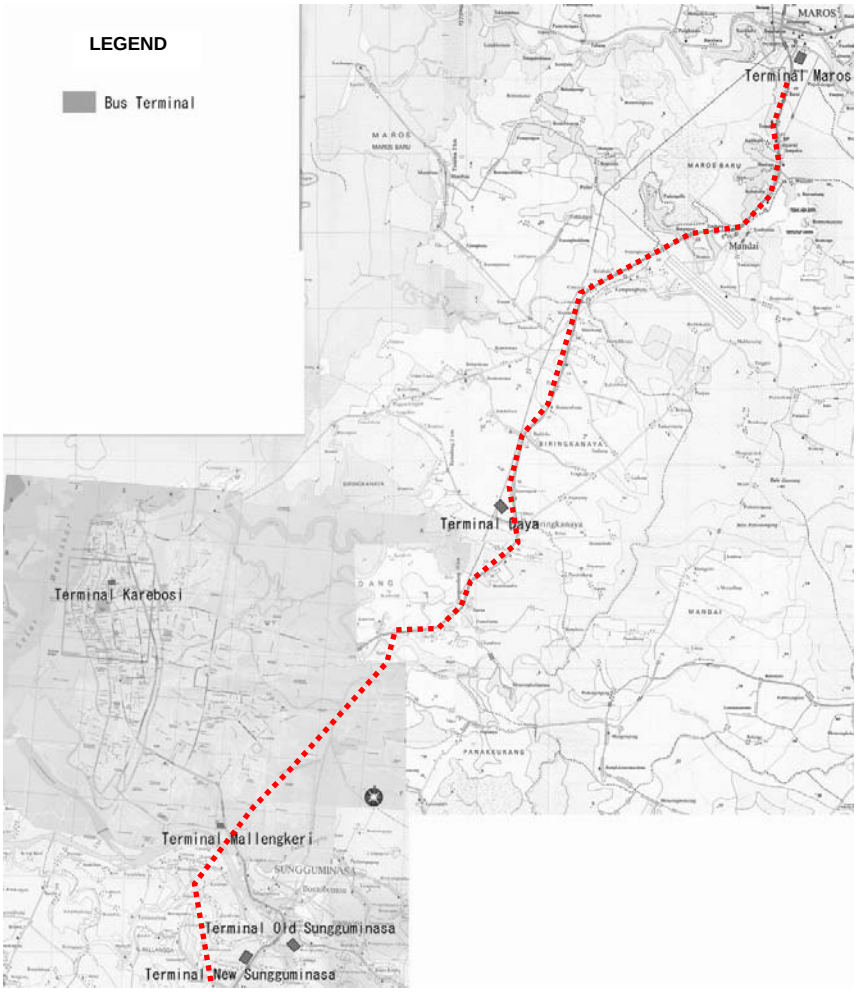


Figure 2.4.6 Location of Bus Terminals along the Trans-Sulawesi Mamminasata Road

Table 2.4.4 Facilities and Capacity of DAYA and Mallengkeri Bus Terminal

Facilities of Terminal DAYA	Capacities of Terminal DAYA
1. Motorcycle parking area for passengers 2. Car parking area for passengers 3. Toilets 4. Waiting room for passengers 5. Mosque 6. Shops 7. Resting place for crews 8. Parking area for public transport vehicles 9. Bus bay 10. Washing and workshop area for cars and buses 11. Information room 12. TV in waiting room	1. Terminal Area ±12ha 2. Parking capacity of passenger cars ±1,473 units 3. Capacity of waiting room ±250 persons 4. Toilets 3 units 5. Average number of passengers a day 2,603-3,104 persons 6. Average number of passenger cars (public transport) 724 units a day for Terminal Daya and 147 units a day for Terminal Mallengkeri.

Facilities of Terminal Mallengkeri	Capacities of Terminal Mallengkeri
1. Parking 2. Toilets 3. Waiting room for passengers 4. Mosque 5. Café/Shops 6. Workshop 7. Bus bay 8. Dinas LLAJ Makassar office	1. 140 units light vehicle parking 2. 8 units bus parking

Source: JICA Mamminasata Study

2) Mini Bus Service

Mini bus service is provided on most of the arterial and collector roads in the Mamminasata Metropolitan Area as a major intra-city transport mode.

Mini bus lay-bys are installed on the mini bus operation routes. However, the number of bus lay-bys and the size of lay-bys at several congested sections are not adequate to cover the present demand of pete-pete. Due to the above situation, mini buses take on passengers outside the bus lay-bys, thus causing traffic jam on the roads especially in the morning and evening peak hours.

Figure 2.4.7 Present Situation of Mini Bus Operation on the Trunk Road Side

(2) Service Network and Volume

1) Bus Service

Buses are operated by private companies between Makassar and outside destinations shown in **Table 2.4.5** and **Table 2.4.6**.

Table 2.4.5 Present Bus Service Network and Operation Volume at Daya Bus Terminal

(day)

Destination	Vehicle	Seat	Passenger
Kendari	6.8	161	103
Poso	0.6	22	13
Palu	4.2	118	69
K.Dale	1.8	49	28
Luwu	1.5	36	20
G.Talo	0.8	21	12
Menado	1.1	29	16

Note: Operational volume are average from Nov 2006 to Feb 2007 of "To" only.

Table 2.4.6 Present Bus Service Network and Operation Volume at Mallengkeri Bus Terminal

(day)

Destination	Bus			Non Bus		
	Vehicle	Seat	Passenger	Vehicle	Seat	Passenger
Bantaeng	0.40	4.52	3.18	25.81	182.77	153.81
Bulukumba	0.13	1.60	0.70	647.83	4,997.30	4,687.73
Sinjai	0.32	3.72	2.06	48.51	392.87	323.89
Selayar	8.95	254.19	133.88	-	-	-

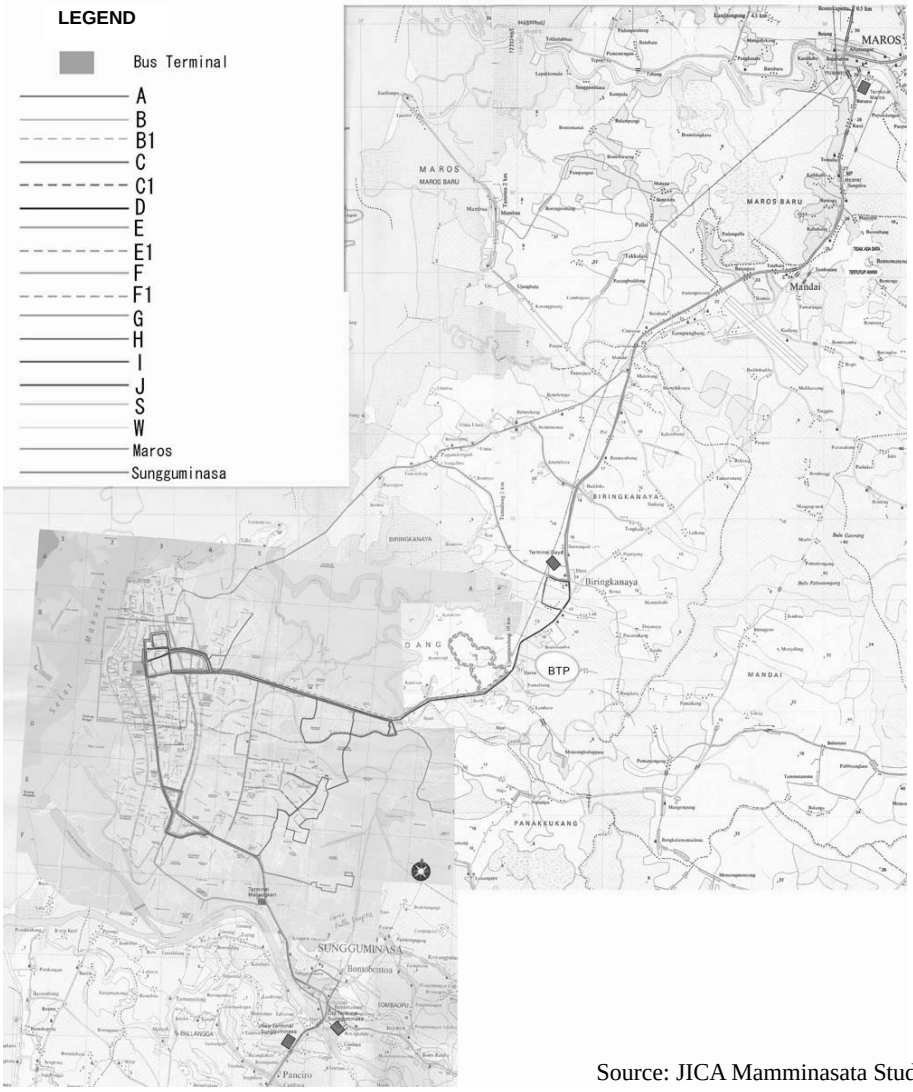
Note: Operational volume are average from July 2005 to December 2005 of "to" and "from".

2) Mini Bus Service

Mini buses are operated by private bus owners and their operation routes are shown in **Table 2.4.7** and **Figure 2.4.8**. The frequency of mini bus operation is normally 5 trips/day per car (3 trips/day/car on Maros-Makassar and Sungguminasa-Makassar) and the average number of passengers is 5 per car. The tariff applied for mini bus service is IDR 2,000 a time.

Table 2.4.7 Present Service Network and Operation Volume of Mini Bus

Route Code	Route	Number of Bus	Estimated Operation Frequency (Trip/day)
A	Mks. Mall – BTN Minasa Upa	189	945
B	Psr. Butung – Cenrawasih – Term. Malengkeri	497	2,485
B1	Term. Malengkeri – Cenrawasih	151	755
C	Mks. Mall - Tallo	247	1,235
C1	Tallo – Kampus. UNHAS	38	190
D	Mks. Mall – Trm. Regional Daya – Perumnas Sudiang	939	4,695
S	Mks. Mall - BTP	200	1,000
E	Mks. Mall – UNM – Perumnas Panakukang	413	2,065
E1	Perumnas Panakukang – UNM – Kampus UNHAS	152	760
F	Mks. Mal – Veteran – Kampus UNHAS	331	1,655
F1	Trm. Malengkeri – Veteran – Kampus UNHAS	55	275
G	Mks. Mall – Ir. Sutami / Toll – Trm. Regional Daya	381	1,905
H	Mks. Mall – Perumnas Antang	356	1,780
I	Mks. Mall – STIKI - Borong	327	1,635
J	Mks. Mall – Pa'baeng-baeng – Perumanas Panakukang	222	1,110
R	Abolishment Route	2	10
W	BTP – Trm. Daya – SMA Neg.6	50	250
Sub-Total		4,550	22,750
-	Maros – Makassar	472	1,416
-	Sungguminasa – Makassar	657	1,971
Total		5,679	26,137



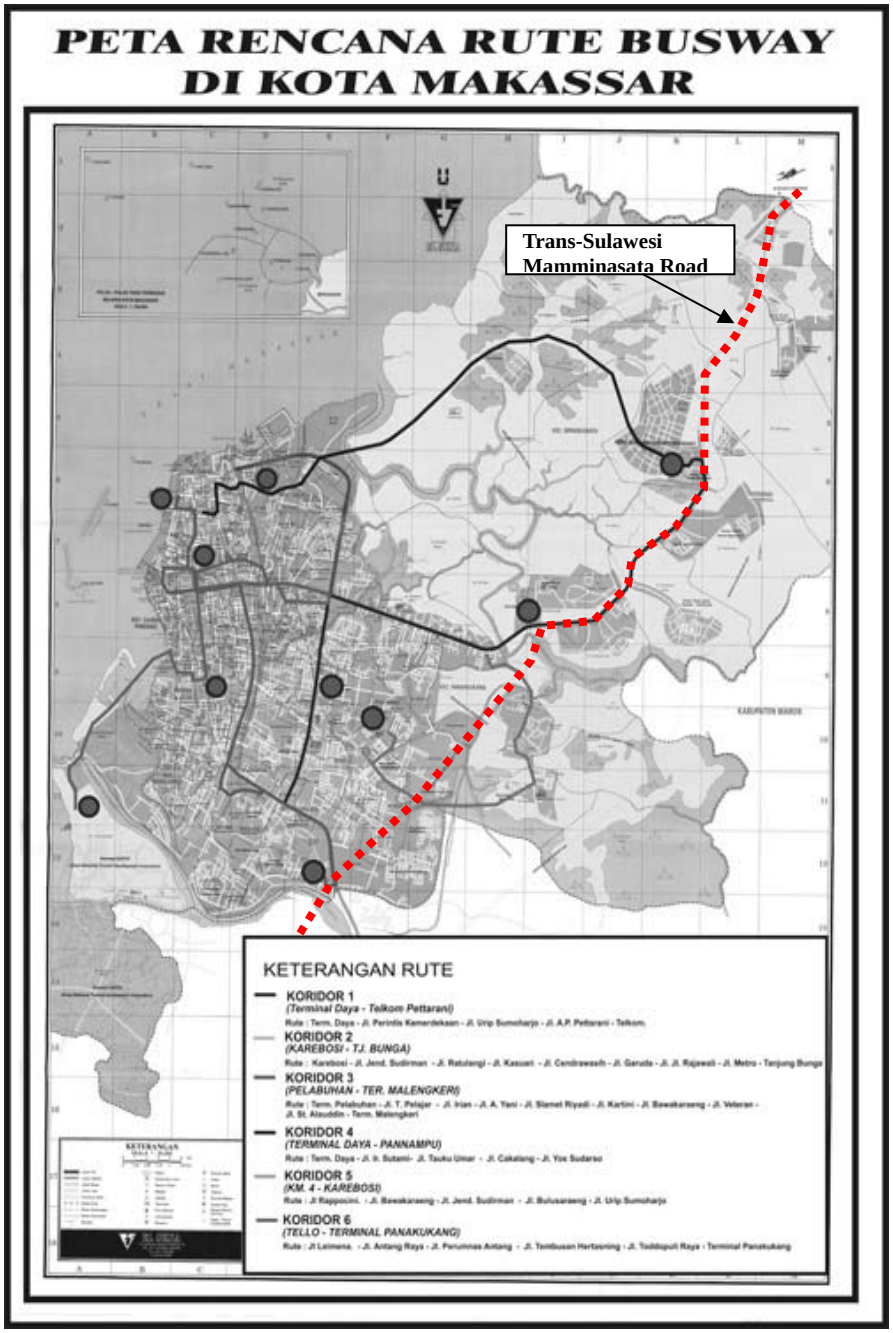
Source: JICA Mamminasata Study

Figure 2.4.8 Pete-Pete Service Network

(3) Other Public Transportation Plan

1) New Busway System

Dinas Perhubungan (Transport Agency) of Makassar City has worked out a new busway system plan. The busway system intends to replace the present mini bus and private passenger cars with large buses on the urban trunk roads. Some of the proposed operation routes, shown in **Figure 2.4.9**, in the plan are duplicated with the present mini bus operation routes.



Source: Dinas Perhubungan, Makassar City

Figure 2.4.9 New Busways Plan of Makassar City

The bus type proposed to be used for the new busway system is shown in **Figure 2.4.10.**

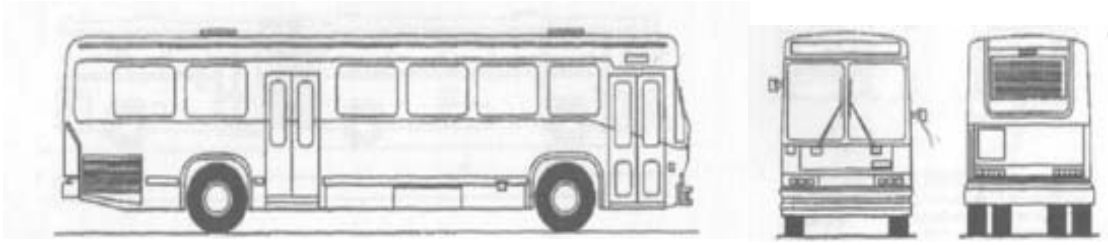


Figure 2.4.10 Proposed Vehicle Type (40ft) for New Busways

The busway routes are planned to set on existing roads as an exclusive lane. The local governments are required to bear the road widening and land acquisition costs under budget shortage. The exclusive busways on the 2-lane road are physically not applicable. Installation on 4-lane roads would be also not easy. As the exclusive lane without providing additional lanes by road widening reduces traffic capacity, the traffic congestion problems would not be solved.

The preliminary design considered the busways plan and provided sufficient lanes on the middle ring road for the future busways introduction. However, approval of MPW, road administrator, is required when installing busways on the national roads.

2) Inland Water Transport

The Makassar City has developed a master plan for inland water transport network as shown in **Figure 2.4.11**. The Tallo River will be a part of the network and the clearance of roads crossing it shall be considered for navigational operation. Since the Trans-Sulawesi road crosses the Tallo river, the Study Team planned that the height of bridges crossing the river shall secure existing clearance.

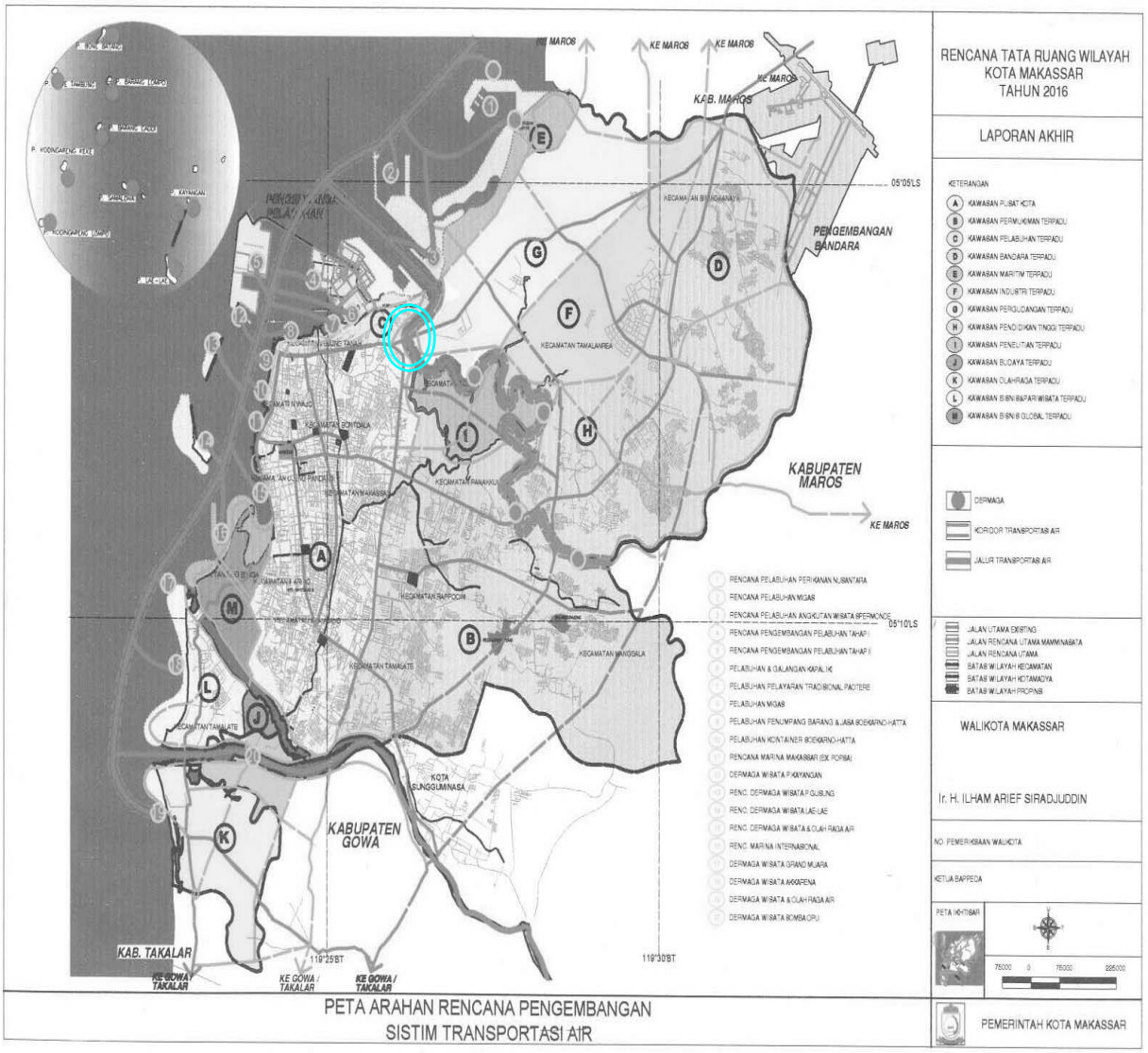
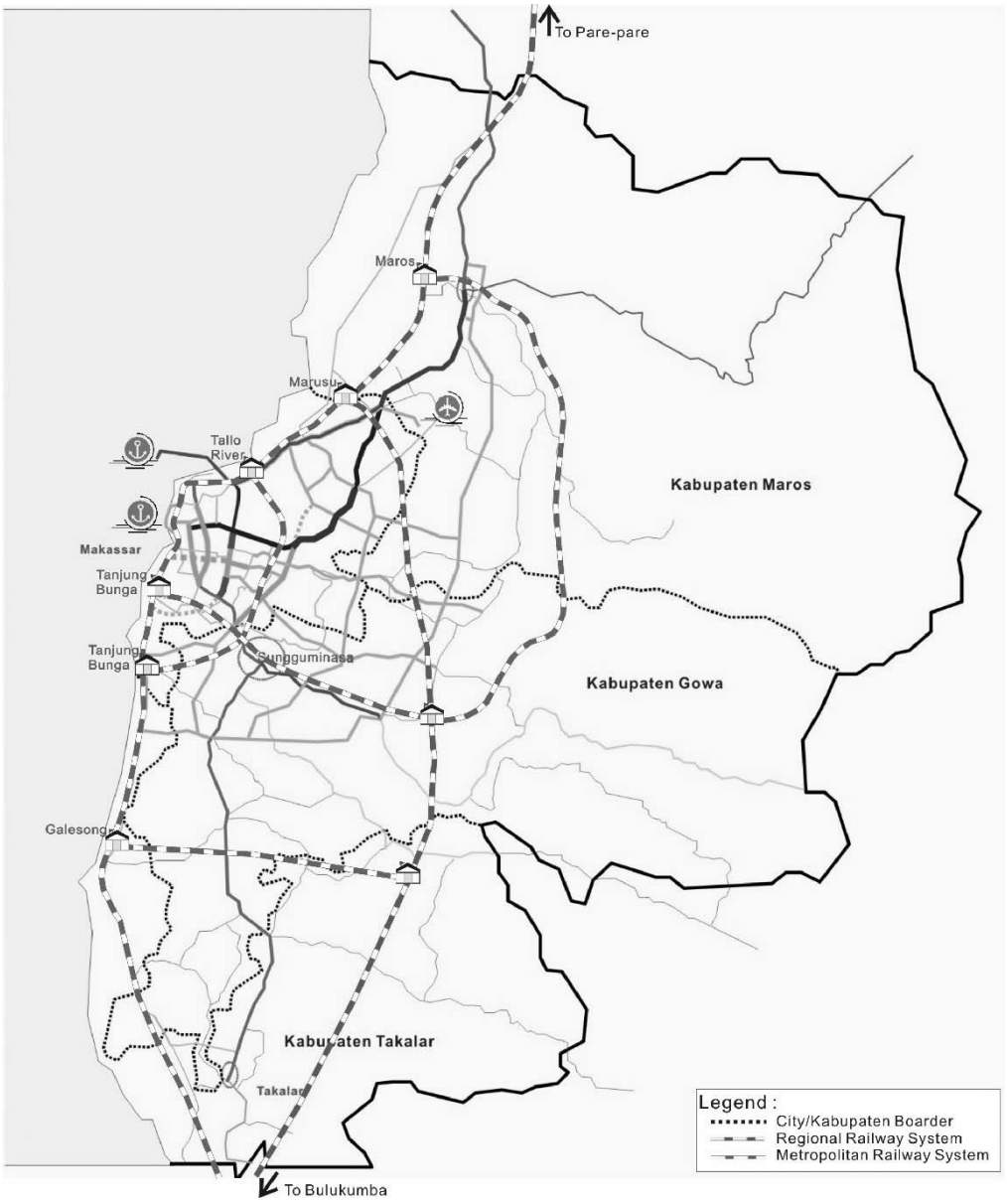


Figure 2.4.11 Inland Water Transportation Network Plan (2016) by Makassar City

3) Railway System

Dinas Tata Ruang (Spatial Planning Agency) has prepared a railway development master plan for the Mamminasata Metropolitan Area shown in **Figure 2.4.12**. The planned rail network covers the entire Mamminasata Metropolitan Area using the ring and radial network as an urban railway system. However, as the investment cost is very large, introduction of the railway system was not recommended in the Mamminasata Spatial Plan Study of JICA. The railways, MRT (Mass Rapid Transit) or LRT (Light Rail Transit) would be a future challenge and a further study should be made in the future.



Source: Praswil South Sulawesi Province

Figure 2.4.12 Railway Network Plan by South Sulawesi Province

2.4.4 Other Transport Facilities

(1) Airport

The Hasanuddin Airport acts as a transit point of air passengers for other destinations in Sulawesi Island and a gateway to eastern Indonesia. The airport is managed by PT. Angkasa Pura I. Part of the Trans-Sulawesi Mamminasata road is on a planned busways route.

1) Airport Facilities

An outline of the Hasanuddin airport is shown in **Table 2.4.8**. The airport has a 2,500 m long runway which is capable of accommodating B737 aircraft.

Table 2.4.8 Outline of Airport Facilities

Location	05°03'39" S, 119°33'16" E
Elevation	14.3 m
Runway	L=2,500 m x W=45 m Destination 130°－310°
Taxiway	50,755 m2, Total length : 1,959 m
Apron	69,147 m2 A-300, DC-10, MD-11, B737, F-100, CN-212, MD-82, F-27, CN-235
Terminal	Passenger : 10,815 m2, Cargo : 4,000 m2
Parking Area	12,272 m2
Navigation Facilities	NDB, DVOR, DME, ILS, RVR, ATIS, PSR, SSR, RDPS, DISPLAY RADAR
Communication Facilities	HF/VHF, HF SSB, VHF-ER, VSAT, ADC, APP, ACC, MWARA, RDARA, etc

Source: Dinas Perhubungan, South Sulawesi Province

2) Flight Routes and Passenger and Cargo Traffic

The Hasanuddin Airport has 18 direct domestic flight routes and 1 international flight route. Major destinations of present flight routes are major national and provincial cities in the Sulawesi Island as shown in **Table 2.4.9**. The passenger and cargo traffic volumes of the airport as of 2006 are shown in **Table 2.4.10**. The airport handled a total of approximately 3.9 million air passengers in 2006.

Table 2.4.9 Major Origin-Destination of Hasanuddin Airport

		Passenger	**Cargo**
Major OD	International	Singapore	Singapore
	Domestic	Jakarta, Surabaya, Manado, Kendari, Palu, Gorontalo, Bali, Papua, etc.	Jakalta, Surabaya, Denpasar, Manado, Palu

Table 2.4.10 Passenger and Cargo Traffic Volume of Hasanuddin Airport (2006)

Item	Number of Flight			Number of Passenger			Baggege Volume (ton)		Cargo Volume (ton)		Post (ton)	
	Arrive	Depart	LCL	Arrive	Depart	Transfer	Arrive	Depart	Arrive	Depart	Arrive	Depart
International	155	171	4	20,413	16,380	0	1,104	909	0	85	0	0
Domestic	22,416	22,394	66	1,509,649	1,421,245	947,925	17,061	26,687	16,398	25,684	583	598
Sub-total	22,571	22,565	70	1,530,062	1,437,625	947,925	18,165	27,596	16,398	25,769	583	598
Total	45,206			3,915,612			45,761		42,167		1,181	

3) Future Development Plan

Since the capacity of the existing taxiway and apron of Hasanuddin Airport has been saturated due to rapid increment of air traffic, new terminal building (51,000 m^2), taxiway (1,917 m) and apron (62,800 m^2) has been constructed by the budget of the central government. The construction will be completed in 2008. Bidding for the new runway with a length of 1,300 m is in progress and its construction would be started within 2007. In the long term, the government will extend it up to 3,100 m. The direction of new runway is planned at almost right angle to the existing runway to avoid the mountain located at the east of existing airport and an obstacle to air navigation safety.

4) Accessibility

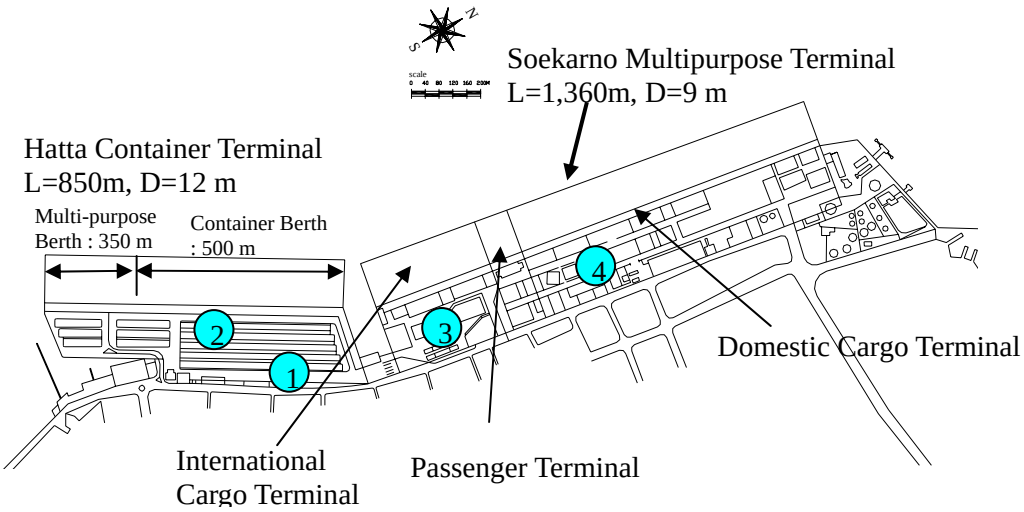
The Hasanuddin International Airport is located at the northeast of the city center of the Mamminasata Metropolitan Area, in Kabupaten Maros. The main access routes from the city center to the airport are the Perintis Kemerdekaan and Ir Sutami Toll roads. A new Airport Terminal Access Road was completed in 20006. Traffic jam occurs on those main access roads especially in the morning and evening peak times due to insufficient traffic capacity. It takes about 1.0-1.5 hours from the city center to the airport during the rush hours.

Figure 2.4.13 Present condition of Perintis Kemerdekaan

Figure 2.4.14 New Airport Terminal Access Road

(2) Port

Makassar City is the main outlet/inlet of cargo movement in Sulawesi. The Makassar port is located at the center of the Mamminasata Metropolitan Area and its logistical role as the sole container port of the South Sulawesi province is essential.



Source: Ministry of Transport

Figure 2.4.15 Outline Map of the Makassar Port

1) Port Facilities and Cargo Handling

The port has 3 container berths with a maximum depth of 12 m and 4 units of gantry crane. A container yard with an area of 114,416 m^2 is provided in the port area and an inland container depot has been constructed along the port access road, Jl Tol Ir Sutami. Past records of ship calls and cargo handling volumes are shown in **Table 2.4.11**.

Table 2.4.11 Outline of Port Facilities and Cargo Handling

Ship Service Facilities (1) Berth/Wharf	- Soekrno : 1,360 m; -9.00 m LWS - Hatta Quay : 850 m, -12.0 m LWS - Hasanussin Quay : 210 m,-5.0 m LWS - Small ship : 510 m, -3 m	**Ship Call (Vessels)** (1) International	Ship call	GT	Ave. GT
			298	2,205,392	7,400
		(2) Domestic	4,687	18,440,551	3,934
(2) Access Channel	- Length : 2 sea miles - Minimum width : 150 m - Depth : -13.0 m LWS	**Cargo Throughput (ton)** (1) International	1,917,209		
(3)Pilotage/Towage	- Towing boats : 3 units - Pilot boats : 3 units	Unloading	1,110,486		
		Loading	806,723		
Cargo Service Facilities (1) Shed	- Shed 101 : 3,800 m2 - Shed 102 : 3,800 m2 for flour - Shed 103 : 4,000 m2 for general cargo (rice, coffee, cashew nuts, plywood) - Shed 104 : 3,800 m2 for general cargo and cacao shed - Shed 105 : 3,800 m2 for cacao shed CFS Shed : 4,000 m2 for plywood, nickel, cacao seed, coffee, etc	(2) Domestic	7,819,862		
		Unloading	4,648,548		
		Loading	3,171,314		
		Container Traffic (TEU)	Full Container		Empty Container
		(1) International	13,545 (100%)		0
		Unloading	1,262 (100%)		0
		Loading	12,283 (100%)		0
(2) Cargo Stacking Yard	Yard 100 : 26,538 m2 Yard 101 : 1,213 m2 Yard 102 : 1,930 m2 Yard 103 : 3,374 m2	(2) Domestic	187,892 (77.5%)		54,634 (22.5%)
		Unloading	124,437 (97.8%)		2,829 (2.2%)

Table 2.4.11 Outline of Port Facilities and Cargo Handling

	Yard 104 : 1,017 m2 Yard 105 : 1,216 m2 Yard 106 : 925 m2		Loading	63,455 (55.1%)	51,805 (44.9%)
			Major Cargo Commodities (1) International		
(3) Container Yard	Hatta Container Yard : 114,416 m2 (350,000 TEU/year)				
(4) Loading/Unloading Equipment	Container Gantry Crane	4 units (25T x 1 unit, 40T x 3 units)	Export	Clinker, Cacao, Flour	
			Import	Wheat, Sugar, Fertilizer	
	Reach Stacker	2 units x 42 ton	(2) Domestic		
	Top loader	2 units x 30 ton	Loading	Cement, Car & S. parts, Rice	
			Unloading	Car & S/ parts, Fertilizer, Coal	
	Mobile crane	2 units x 40/25 ton	**Cargo Handling Productivity**	International	Domestic
	Forklift	2 units x 5&3 ton	(1) General Cargo (T/G/h)	16.99	18.06
	Forklift	10 units x 2 ton	(2) Bagged Cargo (T/G/h)	37.80	18.86
	Bottom Lift	1 unit x 15 ton	(3) Dry Bulk Cargo (T/G/h)	113.27	118.64
	Head Truck	14 units x 45 ton	(4) Liquid Cargo (T/G/h)	5.32	15.76
	Chassis	32 units x 20'&40'	(5) Container Cargo (TEU/h)	-	24.00
	Transtainer	5 units	**Ship Service Performance (hour)**	International	Domestic
(5) Reefer Plug	36 units		(1) Waiting time	4.01	8.98
			(2) Berthing time	65.87	24.22
(6) Inland Container Depot	Inner port area 1) TEMAS 2) Dyzkarto 3) PT Tanto		(3) Turn Round Time	69.88	33.20
			Port Facility Performance (%)	Hatta (Container)	Soekarno (Multi)
	Outer port area 1) METRATUS 2) JAYA KUSUMA 3) TEMAS		(1) Berth Occupancy Ration		45.93
			(2) Shed Occupancy Ration		24.03
			(3) Yard Occupancy Ration	50.70	8.77

Source: Pelindo IV

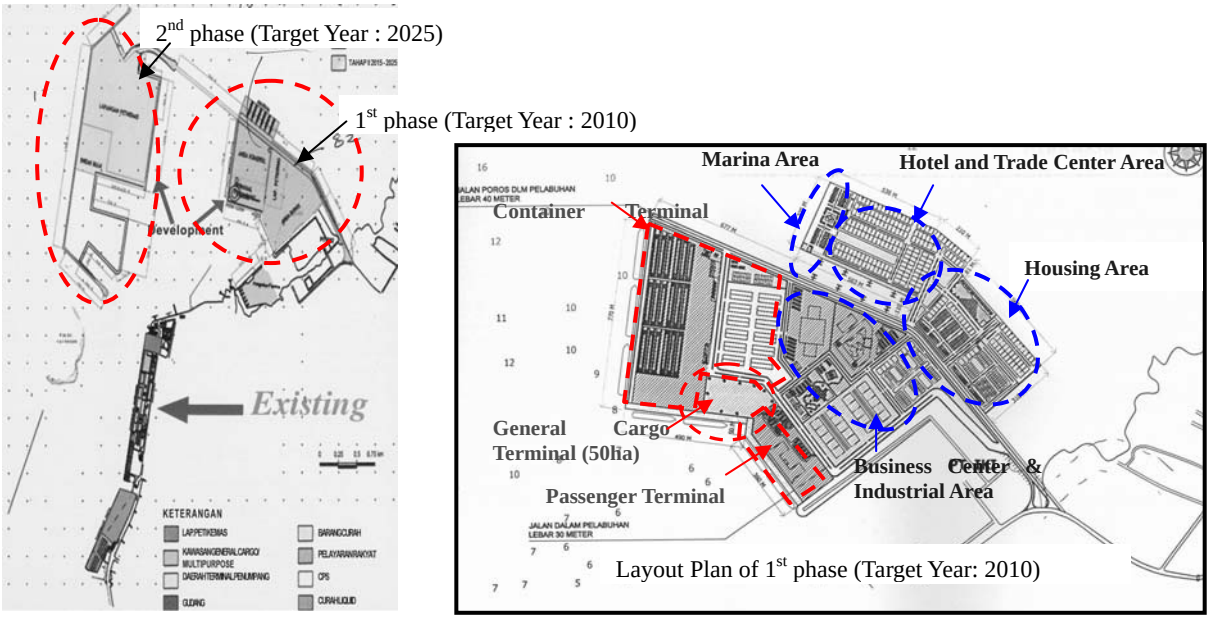
2) Future Development Plan

Since the container traffic at the new container terminal will reach 500,000 TEU/year in the near future, PELINDO IV intends to conduct the preliminary study or feasibility study for expansion plan of the port. Following is the principal policy of improvement plan.

* All passenger vessels will be shifted to the new passenger terminal.

* A part of bulk vessels will be shifted to the new general cargo terminal, but most of them will call at the existing berth.

The master plan of the port is shown in **Figure 2.4.16**.



Source: Ministry of Transport

Figure 2.4.16 Expansion Plan for the Makassar Port

2.4.5 Road Safety and Over Loading Control

(1) Road Safety

1) Present Situation of Traffic Accident

The registered vehicle numbers have increased by 24.8% on the average between 2002 and 2005. The lower growth rate in 2005 would be influence of fuel price rise in October 2005. The vehicle increase rate seemed to be recovered in 2006.

Table 2.4.12 Accumulated Number of Vehicles in Indonesia

Unit: 1,000

Year	2002	2003	2004	2005	Average Annual Increase
Car	3,863	5,134	6,748	7,484	
		32.9%	31.4%	10.9%	25.1%
Bus	732	1,270	2,013	2,413	
		73.5%	58.5%	19.9%	50.6%
Truck	2,015	3,058	4,360	4,574	
		51.8%	42.6%	4.9%	33.1%
Motorcycle	18,061	23,313	28,964	33,193	
		29.1%	24.2%	14.6%	22.6%
Total	24,671	32,775	42,085	47,664	
		32.8%	28.4%	13.3%	24.8%

Source: MOT, December 2006

Traffic accidents in Indonesia have increased by 19.3% per year in line with the motorization as indicated in **Table 2.4.13**. Approximately 11,600 persons died and 22,200 persons were injured in 2005.

Table 2.4.13 Traffic Accident in Indonesia

Year	2002	2003	2004	2005	Average Annual Increase
Fatal	8,762	9,856	11,204	11,610	
		12.5%	13.7%	3.6%	9.9%
Injury	14,941	14,836	21,067	22,217	
		-0.7%	42.0%	5.5%	15.6%
Number of Accidents	12,267	13,399	17,732	20,623	
		9.2%	32.3%	16.3%	19.3%

Source: MOT, December 2006

The traffic accidents in the Mamminasata Metropolitan Area have also increased in parallel with the rapid motorization as shown in **Table 2.4.14**. The average increase rate of traffic and fatal accidents in the last 4 years are 37% and 16% respectively.

Table 2.4.14 Type of Traffic Accident in the Mamminasata Metropolitan Area

UNIT	DESCRIPTION	YEAR				
		2002	2003	2004	2005	2006
Municipal District Police of Makassar	Number of Accidents	58	8	16	16	21
	Fatal	55	9	15	22	21
	Serious Injury	13	2	5	4	7
	Light Injury	16	1	5	5	3
	Property Loss(000)	57,960	24,025	9,650	30,150	112,050
Municipal Resort Police of Makassar	Number of Accidents	13	50	117	57	124
	Fatal	9	53	63	28	58
	Serious Injury	6	7	71	38	76
	Light Injury	1	5	48	11	90
	Property Loss(000)	82,250	107,000	115,430	43,830	105,500
Municipal Resort Police of West Makassar	Number of Accident	5	35	29	29	128
	Fatal	5	11	13	19	26
	Serious Injury	1	32	21	12	27
	Light Injury	2	12	13	12	139
	Property Loss(000)	1,850	44,720	26,400	51,650	191,955
Municipal Resort Police of Seaport	Number of Accidents	-	3	6	13	23
	Fatal	-	1	5	9	6
	Serious Injury	-	2	1	3	3
	Light Injury	-	-	-	2	24
	Property Loss(000)	-	7,700	23,500	78,000	8,000
Municipal Resort Police of Gowa	Number of Accidents	52	136	117	97	80
	Fatal	46	82	90	75	76
	Serious Injury	6	11	16	14	16
	Light Injury	-	46	11	8	1
	Property Loss(000)	29,250	193,300	130,330	53,730	110,750
Municipal Resort Police of Maros	Number of Accident	23	31	29	56	73
	Fatal	24	33	29	49	58
	Serious Injury	9	7	7	25	56
	Light Injury	9	6	17	41	22
	Property Loss(000)	69,300	89,300	180,550	173,930	27,250
Total	Number of Accidents	151	263	314	268	449
	Fatal	139	189	215	202	245
	Serious Injury	35	61	121	96	185
	Light Injury	28	70	94	79	279
	Property Loss (000)	240,610	466,045	485,860	431,290	555,505

Source: Municipal District Police of Makassar

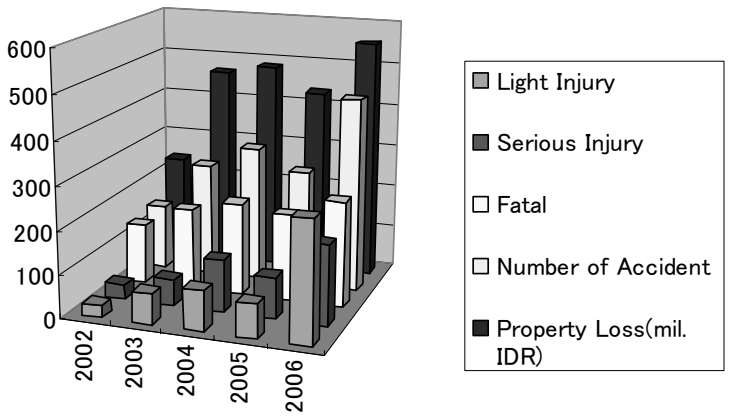


Figure 2.4.17 Trend of Traffic Accident in the Mamminasata Metropolitan Area

The fatal accident ratio of the population in the Makassar Metropolitan Area is very high compared with that in all Indonesia as shown in **Table 2.4.15**.

Table 2.4.15 Fatal Accident Ratio Comparison

	Population (2005)	Number of Fatal Accidents (2006)	Fatal Accident Ratio (per 100,000 people)
Makassar	1,193,451	111*	9.3
Maros	296,336	58*	19.6
Gowa	575,295	76*	13.2
Indonesia (all)	222,055,000	12,117**	5.5

Source: * Traffic Accident Statement, National Police Agency
** MOT, December 2006

Motorcycle is the largest mode of vehicles involved in traffic accidents and its share is 62 % of the total number of accidents as shown in **Table 2.4.16** and **Figure 2.4.18.** The major reasons are its large share in the total traffic volume, insufficient traffic safety awareness, misbehavior of drivers, insufficient traffic regulation enforcement, and under-standard traffic management and facilities. As one of the countermeasures, the motorcycle left lane use regulation was introduced in Makassar City from 2007.

Table 2.4.16 Number of Traffic Accidents by Vehicle Type in the Mamminasata Metropolitan Area

Description	Period		Grows Rate (%)
	2005	2006	
a. Passenger car	32(12%)	67(14%)	109%
b. Bus	8(3%)	29(6%)	62%
c. Truck	46(17%)	63(13%)	37%
d. Motorcycle	164(62%)	302(62%)	85%
e. Bicycle	9(3%)	14(3%)	55%
f. Tricycle	7(3%)	12(2%)	71%
Total	266(100%)	487(100%)	83%

Source: Municipal District Police of Makassar
Note: ( ): share in traffic accidents

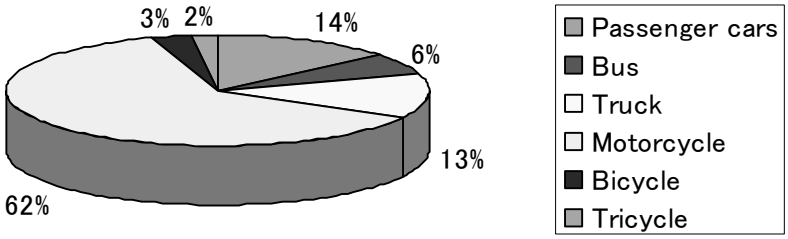
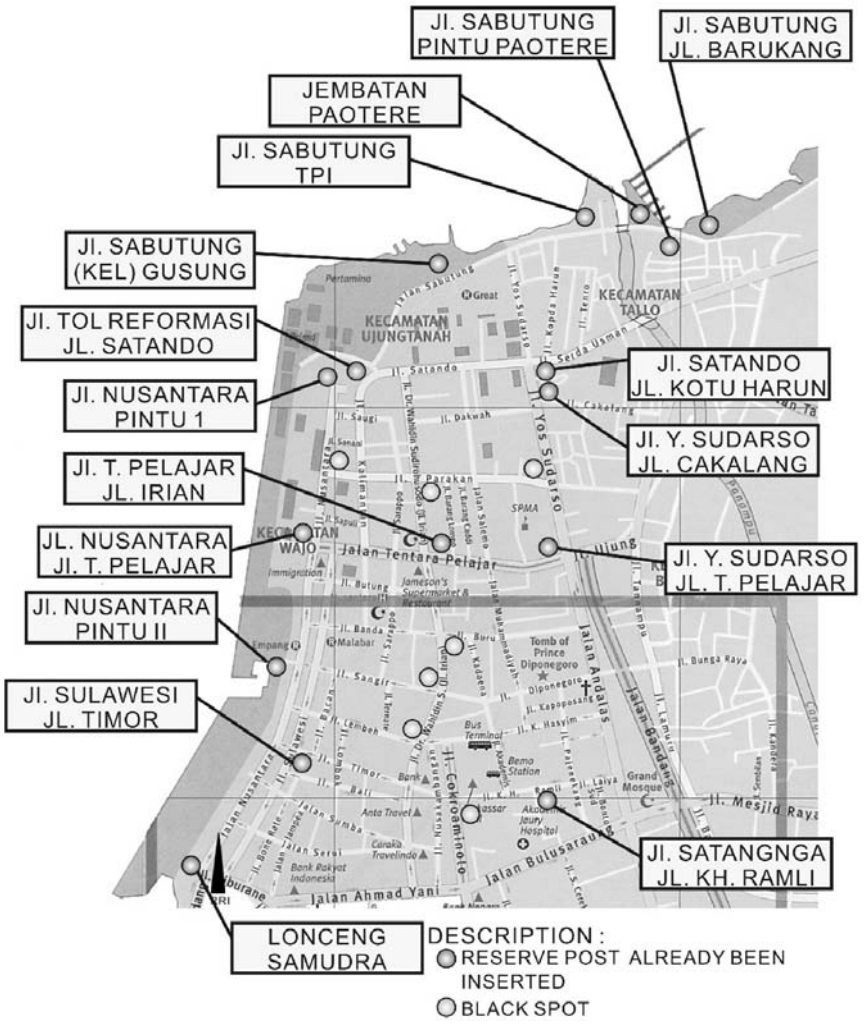


Figure 2.4.18 Share of Traffic Accident by Vehicle Type

Figure 2.4.19 shows black spots of traffic accidents in the jurisdiction of the municipal resort police of seaport. Most of the black spots are concentrated on main roads. Many traffic lights have been installed while site traffic regulation enforcement by traffic police has been enforced. However, chaotic traffic flow, especially caused by motorcycles, at intersections still remains and the following offensive driving manners are observed:

* Reckless start at traffic light phase change
* Ignoring traffic light
* Delayed start at traffic light phase change.



Source: Mamminasata Study

Figure 2.4.19 Black Spot Map in City Center Area

2) Major Issues

Following major issues are noted from the present condition of traffic safety in the Mamminasata Metropolitan Area:

* Mixed traffic with motorcar, motorcycle, bicycle and other non-motorized vehicle
* Vehicles jumping out of the narrow local road causing accident
* Risk of accident at mini bus stop areas and jaywalkers of mini bus users
* Narrow sidewalk with many obstructions, parking vehicles, large trees on sidewalks, electric poles, etc.

Countermeasures for improving the above issues would be not only physical facility improvement but also regulation enforcement, and education.

(2) Overloading

1) Regulations

The Ministry of Communications and Ministry of Public Works, Bina Marga issued "Surat No. UM-0103-Db/898" in 1999 for road re-classification in consideration of serious pavement damage by overloading of heavy vehicles.

The degree of the Minister of MOC No.KM13 Year 2001 designated the road classification in Sulawesi. Under the degree, roads are classified into Class I, II, IIIA, IIIB and IIIC.

Table 2.4.17 Axle Load Control by Road Criteria

Class	Maximum Size of Vehicles	Maximum Axle Load (ton)
I	W= 2.5m, L=18m	>10
II	W=2.5m, L=18m	10
IIIA	W=2.5m, L=18m	8
IIIB	W=2.5m, L=12m	
IIIC	W=2.1m, L=9 m	

All national roads in Sulawesi were classified into either IIIA or IIIB. The maximum axel loads allowed on the public roads is 8 tons.

2) Present Situation of Overloading

An axle load survey was executed in April 2007 as a part of traffic survey (refer to Section 5.4). According to the survey, approximately 64% of surveyed vehicles are overloaded at Maccopa Weigh Station in Maros and approximately 47% of surveyed vehicles are overloaded at Somba Opu Weigh Station in Gowa. **Table 2.4.18** and **Figure 2.4.20** show the axle load survey analysis at Macula Weigh Station. Approximately 58% of heavy vehicles exceeded the axle load limit of 8 tons.

Table 2.4.18 Axle Load Survey Result (At Macula Station in Maros)

Range (ton)	Number of Vehi
Over 20	4 (8%)
12 to 20	7 (14%)
10 to 12	8 (16%)
8 to 10	10 (20%)
Less than 8	21 (42%)
Total	50 (100%)

Source: JICA Study Team

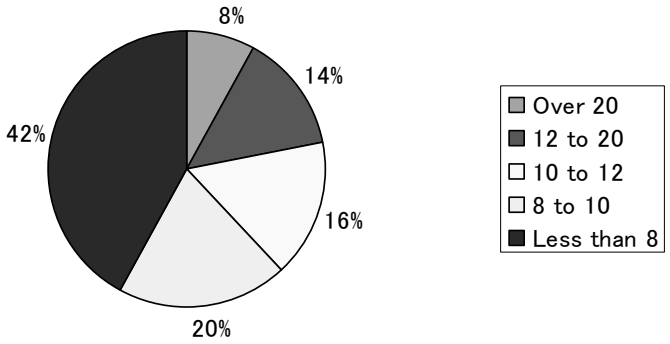


Figure 2.4.20 Axle Load Survey Result (At Macula Station in Maros)

Table 2.5.19 and **Figure 2.4.21** show the axle load survey analysis at Somba Opu Weigh Station in Gowa. Approximately 43% of heavy vehicles exceeded the axle load limit.

Table 2.4.19 Axle Load Survey Result at Somba Opu Station in Gowa

Range (ton)	Number of Vehic
Over 20	1 (3%)
12 to 20	10 (33%)
10 to 12	0 (0%)
8 to 10	2 (7%)
Less than 8	17 (57%)
Total	30 (100%)

Source: JICA Study Team

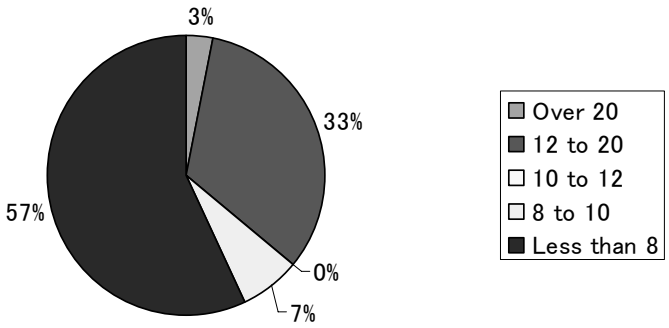


Figure 2.4.21 Axle Load Survey Result at Somba Opu Station in Gowa

3) Weigh Bridges

There are following three weigh bridge stations, under the administration of Transport Department of South Sulawesi Province, at the entrance to Makkassar City.

- Maccopa-Maros at the north entrance near the Hasanuddin Airport
- Somba Opu-Gowa at the east entrance on Malino Road
- Pallanga-Gowa at the south entrance on Sungguminasa – Takalar Road

Those weigh bridges should be used effectively and efficiently. However, as many overloaded trucks have used alternatives routes to escape from the overload control, more weigh bridges should be installed at strategic points.