

## 2.5 Present Transport Problems

As the results of traffic and transport facilities surveys and careful reconnaissance survey, following present transport condition problems are pointed out.

### 2.5.1 Road Traffic Problems

#### 1) Mixed Traffic

Traffic disturbance due to mixed traffic made of high and low speed vehicles frequently occurs inside the urbanized area of Ujung Pandang. This is because the number of becaks running is many, difference of travel speed between 4-wheel vehicles and becaks is large, and these vehicles run on the same lane. It seems that traffic disturbance caused by becaks leads to a high rate of traffic accidents.

#### 2) Saturated Intersections

There are four (4) saturated intersections of which the degree of saturation exceeds 0.9 in the peak hour. These are also assumed to be bottleneck intersections measured by the saturation degree. Both the bottleneck intersections selected by aforesaid two methods are not corresponding with each other. However, it seems to indicate that traffic problems exist at the intersections.

#### 3) Congested Roads

As a result, congestion degrees of the following seven (7) roads are calculated to exceed 0.9 in the peak hour. If congestion degree exceeded 0.9, some improvement to the existing road condition are considered necessary.

Name of Road	Congestion Degree
a) Jl. Gowa Jaya (Urip Sumoharjo)	2.10
b) Jl. Pangerang Pettarani	1.03
c) Jl. Gowa Raya (St. Alauddin)	1.31
d) Jl. Tinumbu	1.14
e) Jl. Jend.A.Yani	0.90
f) Jl. Bulusaraung	1.22
g) Jl. Mesjid Raya	1.15

### 2.5.2 Road Network Problems

As a result of careful reconnaissance survey and its analysis regarding the existing road network and land use pattern, the following problems are identified.

- a) In the light of effective traffic control and traffic safety, the road network configuration is required to

form based on the road function and characteristics, that is arterial road, collector road and local road. The existing road network, however, does not seem to be used effectively in accordance with the function of each road.

- b) The road ratios (road area/land area) of the urbanized, sub-urban and rural areas are 14.8%, 5.2% and 1.4%, respectively. The road ratio of the sub-urban area is very low. In addition, the new housing development projects are undergoing in the sub-urban area.

As a whole, the existing road area shows quite a shortage in the sub-urban area against the traffic volume.

### 2.5.3 Traffic Management Problems

#### 1) Problems of Intersections

- a) Traffic signals are not functioning effectively due to inadequate channelization at intersections (such as no provision of right/left turn lanes).
- b) Many traffic signals have remained broken, which cause traffic confusion in those intersections.
- c) Visibility of traffic signal displays are not so good due to inadequate location of stop line markings, which are too close to signal displays.
- d) Traffic flows at intersections are confused, even at signalized intersections, mainly due to improper channelization and to ignorance of driving priority by drivers.

#### 2) Problems in Traffic Regulations

##### (1) Parking

- a) Since on-street parking lots are not clearly marked, drivers often park their vehicles irregularly, and these parked vehicles become obstacles to traffic flows on the carriageway.
- b) Drivers often ignore parking prohibition regulation on Jl. Bandang and J. Veteran, which affects the traffic flows.

##### (2) Traffic Signs and Pavement Markings

- a) Installation of traffic signs is insufficient in number, especially for stop signs and parking prohibition signs, while traffic law enforcement has not been carried out effectively.
- b) Channelization by pavement markings at intersections is almost disappeared, so confusion of traffic flows is often observed.

- c) Pavement markings on most of roads, including arterial roads, are also disappeared, therefore drivers can not drive on proper lanes.

### (3) Problems of Traffic Accidents

- a) Traffic safety devices are not sufficiently and not properly installed, which becomes cause of traffic accidents.
- b) Many drivers are indisciplined to traffic rules in driving their vehicles, including becak drivers.
- c) Traffic law enforcement to prevent traffic accidents, such as to control dangerous driving, is not conducted properly.

## 2.5.4 Transport Facilities Problems

### 1) Problems on Pedestrian Facilities

- a) Generally, provision of sidewalks is insufficient, even around busy places, such as market.
- b) Existing sidewalks are often occupied by street vendors, so pedestrians are forced to walk either on shoulders or on the carriageway.
- c) As same as pavement markings, most of crosswalk markings are disappeared, which might lead pedestrians to make random crossing on streets.
- d) There are four (4) pedestrian overpasses existing in the CBD area. However, it is observed that most of pedestrians do not use these facilities.
- e) Even though traffic signal displays for pedestrians are installed at some intersections, they are not used at all.

### 2) Problems of Bus Terminals

In general, a bus berth, which is a fundamental facility for waiting passengers as well as to control movement of buses and pete-petes/microlets in a terminal, is not installed at all in the Study area. Besides, facilities to provide comfortableness for waiting passengers, such as shelters and benches, are also not installed at terminals, except at Terminal Panaikang and Terminal Sungguminasa. Followings are the major problems identified at some terminals.

### 3) Problems of Bus Stop Facilities

Shelters to provide comfortableness for waiting passengers under the hot climate as well as heavy rain fall are installed only at a limited bus stops. In addition, benches for waiting passengers and information of bus operation, such as bus routes and time schedule, are not provided at bus stops.

Bus bays or bus stop markings on the pavement to secure space for buses to load/unload passengers are not installed, except at a few bus stops. Therefore, stopping buses on the carriageway affects the through traffic flow or parking vehicles at bus stops forces bus drivers to load/unload passengers on the main carriageway.

#### 2.5.5. Public Transport System Problems

As mentioned in previous section, taxi has only minor roles in public transport, therefore, the problems identified here are centering round bus, pete-pete and becak services.

##### 1) Problems Related to Public Transport Operation

###### (1) Urban Bus Service

###### a) Insufficient Bus Network

Urban bus network covers most of arterial roads in Ujung Pandang since opening of new urban bus routes in April, 1988. However, those urban routes are still limited to only 6 routes, hence, it is rather difficult to admit that the urban bus services are functioning as only one major public transport mode besides the pete-pete/microlet services.

###### b) Competition with Pete-pete/Microlet Operation

On each urban bus route, urban bus service faces very severe competition with pete-pete/microlet services, since most part of urban bus routes are double trucking with pete-pete/microlet routes, even though urban bus fare is cheaper than pete-pete/microlet fare. And also, frequency of pete-pete/microlet operations is much higher as compared with urban bus operation.

###### (2) Pete-pete/microlet Services

###### a) Income-oriented Base Operation

The majority of Pete-petes/microlets are operated by individual drivers on their own account. Therefore, they are likely to make an income-oriented/demand base operation. This system may contribute to decrease in travel time on one hand but may have adverse effects on the other hand: for instance, a sudden stop at terminals to pick up passengers, long hour stopping at terminals to get a higher passenger occupancy, and rushing at intersections, etc. These phenomenon may cause an unpunctual operation of pete-petes/microlets and sometimes may lead to an traffic accident.

b) Concentration on Certain Routes

Even though 22 pete-pete/microlet routes are permitted by the Municipality, most of pete-petes/microlets are concentrated on certain routes with higher passenger demand in order to earn higher profit. Table 2.4.11 shows that average occupancy of pete-petes/microlets at the Pasar Sentral and Pa'baeng-baeng sub-terminals are significantly low, ranging from 1.7 to 3.4 persons per vehicle and an average occupancy is 2.5 persons per vehicle, even though the maximum capacity of pete-pete/microlet is 8-10 persons. This implies that there is a considerable number of pete-petes which would not have to come to those terminals, since most of the passengers get on or get off on the way to the terminals. Accordingly, it suggests a necessity of rearrangement of pete-pete/microlet operation.

**Table 2.4.7 Average Occupancy of Pete-pete/Microlet**

Pasar Sentral Sub-Terminal

Time Range	No. of Passengers	No. of Pete-petes/Microlets	Average Occupancy (person/veh.)
<b>Morning</b>			
7:00 - 8:00	3,329	1,220	2.7
8:00 - 9:00	3,199	1,313	2.4
9:00 - 10:00	3,519	1,159	3.0
<b>Afternoon</b>			
15:00 - 16:00	2,035	607	3.4
16:00 - 17:00	2,914	1,676	1.7
17:00 - 18:00	3,043	1,112	2.7
<b>T o t a l</b>	<b>18,039</b>	<b>7,087</b>	<b>2.5</b>

Pa'baeng-baeng Sub-Terminal

Time Range	No. of Passengers	No. of Pete-pete/Microlet	Average Occupancy (person/veh.)
<b>Morning</b>			
7:00 - 8:00	2,931	1,818	2.5
8:00 - 9:00	2,527	898	2.8
9:00 - 10:00	2,021	1,000	2.0
<b>Afternoon</b>			
15:00 - 16:00	2,749	1,165	2.4
16:00 - 17:00	3,524	1,429	2.5
17:00 - 18:00	4,134	1,425	2.9
<b>T o t a l</b>	<b>17,886</b>	<b>7,097</b>	<b>2.5</b>

Source : Terminal Survey conducted by the Study Team

c) Routes with Low Service Level

On the contrary, about a half of pete-pete/microlet routes are either operated by a limited number of pete-petes/microlets with less than 40 vehicles or not operated at all. Therefore, service level of pete-pete/microlet operation in those areas are very low, hence, people have to wait a long time to get pete-petes/microlets or they have to take another transport mode, such as a becak. These situation is similar to people living in isolated areas from main roads.

d) Illegal Operation

In addition, many pete-petes/microlets operate on routes other than their permitted routes, if passengers request or drivers try to load additional passengers. These operations are clearly illegal, although they may contribute to encourage people for taking public transport system.

2) Traffic Congestion Related to Public Transport Services

(1) Urban Bus Service

Since frequency of urban buses is still not so high, it seems that traffic congestions have not been generated due to operation of the urban bus service. However, it should be noted that stopping buses at bus stops often cause a queue of the following vehicles, especially on two-lane roads, where no bus bay is provided.

(2) Pete-pete/microlet Service

The basic problems of pete-pete/microlet operation related to the traffic congestions are the concentration of a great number of pete-petes/microlets on certain routes as well as certain arterial roads. On these arterial roads, composition of pete-petes/microlets among four wheel motor vehicles is much less than 50%, even though their occupancy seems not to be high due to the severe competition between pete-petes/microlets themselves.

As mentioned in the previous section, attitude of pete-pete/microlet drivers often causes disorderly traffic flows as well as traffic accidents. Those wrong driving attitudes are:

- a) Sudden stopping of pete-petes/microlets to load/unload passengers.
- b) Long time stopping to secure higher occupancy, even on the carriageway.
- c) improper driving way, such as improper overtaking, improper turning, etc.

### (3) Becak Service

Even though, there are some restrictions on operation of becaks in the Study area, especially on arterial roads, becak drivers often ignore the regulations. As a result, many becaks operate with other motorized vehicle traffic, even on arterial roads, and cause disorderly traffic flows. Since running speed of becaks is very slow, these becaks on arterial roads are one of the major causes of traffic congestion. And also, there are so many becaks crossing arterial roads, even at unsignalized intersections. In addition, many becak drivers often ignore the traffic regulations, such as one way regulation.





## CHAPTER 3 SOCIO-ECONOMIC STUDY



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### 3.1 Existing Conditions of Population and Employment

#### 3.1.1 Existing Trend of Population

Population of Indonesia has increased with the annual rate of 2.1 % in the years 1980 - 1985. In Sulawesi, its growth rate is also 2.1 % in this period. On the other hand, South Sulawesi where the Study area is located has a low growth rate at 1.3 % per annum in the period 1980 - 1986. This rate is lower than those of Java and other main cities in Indonesia.

During the 1970's, Ujung Pandang Municipality had a high growth rate. But after 1980, it has gone down rapidly with an average annual growth rate of 1.6 % in the period 1980 - 1986.

The population and its growth trend in Indonesia and its major places are shown in Table 3.1.1. and Fig. 3.1.1 respectively.

Population in Regencies of Gowa, Maros, and Takalar has grown with the average annual growth rates between 1961 and 1986 as follows:

	1961 - 1986	1980 - 1986
South Sulawesi	1.5 %/year	1.3 %/year
Ujung Pandang	2.8	1.6
Kab. Gowa	1.1	1.7
Kab. Maros	1.5	1.7
Kab. Takalar	1.4	1.5

Table-3.1.1 Population Trend & Trend Growth Rate

REGION, CITY	POPULATION ( 1000 person)				AVERAGE ANNUAL GROWTH RATE (%)		
	1961	1971	1980	1986	1961-1971	1971-1980	1980-1986
INDONESIA	97,086	119,208	147,490	163,876*	2.1	2.4	2.1
SULAWESI	7,079	9,527	10,410	11,554*	1.9	2.2	2.1
SOUTH SULAWESI	4,516	5,181	6,062	6,545	1.4	1.3	1.3
UJUNG PANDANG	384	554** (485)	708	779	3.7 (2.4)	2.3 (4.3)	1.6
JAVA	63,060	76,086	91,270	99,852*	1.9	2.0	1.8
JAKARTA	2,973	4,579	6,503	7,985*	4.4	4.0	3.9
SURABAYA	1,165	1,566	2,018	2,115	3.0	2.9	0.8
MEDAN	479	635***	1,379	1,700	2.9	3.6 (1974-1979)	3.5

Source : SULAWESI SELATAN DALAM ANGKA 1985. BAPPEDA DAN KANTOR STATISTIK KOTAMADYA UJUNG PANDANG DALAM ANGKA 1986. ARTERIAL ROAD SYSTEM DEVELOPMENT STUDY IN JAKARTA METROPOLITAN AREA (REPORT NO. 1) SEP. 1987 JICA

(\*) : Census Data \* 1985  
 \*\* include incorporated area population  
 \*\*\* before incorporated Serdang

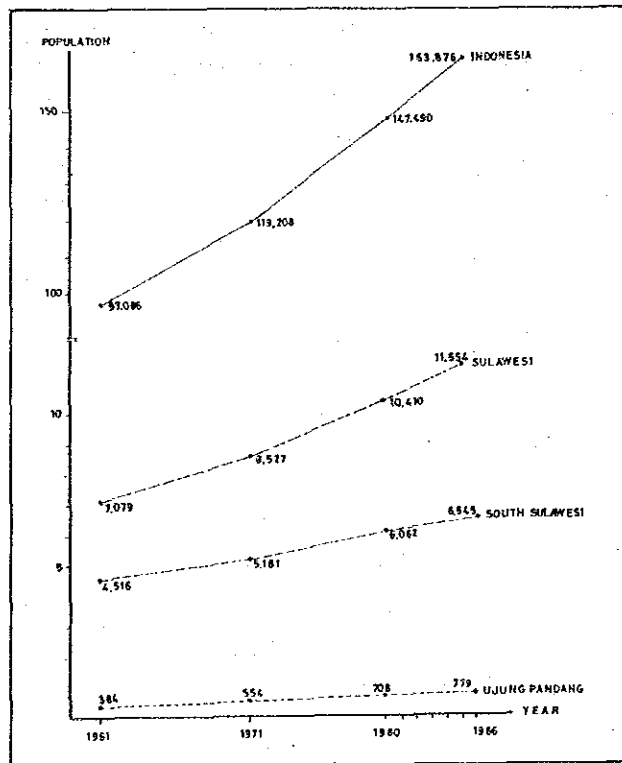


Fig. 3.1.1 Population Trend ( x 1000)

### 3.1.2 Existing Trend of Each District (Kecamatan)

The existing population growth trend of 11 districts in Ujung Pandang from 1980 to 1986 is shown in Table 3.1.2.

The growth rate is different from each other, and judging from the growth rate, 11 districts can be divided into 3 groups as tabulated below.

- 1) High growth group  
(annual growth rate 1986/1980 is over 1.25%)
  - a) Kecamatan Panakkukang 1.47
  - b) Kecamatan Tamalate 1.40
  - c) Kecamatan Biringkanaya 1.38
  
- 2) Medium growth group  
(annual growth rate 1986/1980 is between 1.00 and 1.25 %)
  - d) Kecamatan Bontoala 1.01
  - e) Kecamatan Tallo 1.04
  - f) Kecamatan Ujung Tanah 1.08
  
- 3) Low growth group  
(annual growth rate 1986/1980 is under 1.00 %)
  - g) Kecamatan Mariso 0.97
  - h) Kecamatan Mamajang 0.95
  - i) Kecamatan Makassar 0.89
  - j) Kecamatan Ujung Pandang 0.97
  - k) Kecamatan Wajo 0.96

The average annual growth rate of 11 Kecamatan in total during 1980 - 1986 is 1.10 % and location of each Kecamatan is illustrated in Interim Report (1). Low growth group is located in the center of Ujung Pandang City, and High growth group is in the east and south east suburban area of the city.

From these data, it can be said that the city of Ujung Pandang has expanded to the directions of eastern and south-eastern suburbs in recent years and this trend will continue in the future.

Table-3.1.2 Population Trend of Each Kecamatan  
in Ujung Pandang 1979 - 1986

KECAMATAN (District)	persons									
	Year	1979	1980	1981	1982	1983	1984	1985	1986	
1. Mariso	47,838	52,685	52,446	52,520	52,717	54,782	54,892	51,127		
2. Mamajang	69,823	71,560	71,560	70,962	70,962	71,750	68,325	67,820		
3. Makassar	92,074	102,973	103,197	103,481	104,123	104,458	96,065	91,291		
4. Ujung Pandang	44,568	44,102	43,419	42,961	42,620	42,304	41,729	42,658		
5. Wajo	53,113	49,186	49,251	47,507	46,988	47,433	47,514	47,299		
6. Bontoeala	67,528	68,073	68,072	67,996	68,092	68,146	68,511	68,631		
7. Tallo	60,670	78,193	79,826	80,084	79,171	80,052	80,845	81,001		
8. Ujung Tanah	37,864	42,514	43,170	43,110	43,483	43,719	43,897	45,968		
9. Panakkukang	50,141	68,022	69,246	69,355	72,699	74,072	76,118	99,764		
10. Tamalate	72,542	99,502	99,192	106,169	120,454	124,609	137,466	139,452		
11. Biringkanaya	27,824	31,655	32,840	33,440	34,850	37,286	38,000	43,582		
T O T A L	623,985	708,465	712,219	717,585	736,159	748,611	753,362	778,593		

Kecamatan = District  
Source : Ujung Pandang Municipality Statistic Office

### 3.1.3 Labor Force and Employment

In Ujung Pandang, working age population and labor force have increased from 470,000 to 486,000 persons and from 203,000 to 210,000 persons, respectively in 1981-1983.

In proportion to the increase of population, the rate of unemployment has almost been constant at around 5.4%; and total unemployed persons have shown an increase from 192,000 to 198,000 persons in the same period, as shown in Table 3.1.3. Sector component of workers in Ujung Pandang is summarized below.

The share of primary workers is low, under 5 % and that of tertiary workers is high, about 60 %, while secondary workers at 25.0 %. The rate of tertiary workers is especially high in Kecamatan (district) Mamajang (88%), Ujung Pandang (70%) and Makassar (68%), and these Kecamatan are located at the center of Ujung Pandang.

**Table-3.1.3 Labor Force Trend in Ujung Pandang**

(persons)

ITEM	YEAR			
	1980	1981	1982	1983
POPULATION	708,465	712,219	717,585	736,159
WORKING AGE POPULATION	466,308	470,491	474,034	486,279
LABOR FORCE	210,913	202,980	204,515	209,803
PARTICIPATION RATE	45.2 %	43.1 %	43.1 %	43.1 %
ACTIVITY RATE	29.8 %	28.5 %	28.5 %	28.5 %
UNEMPLOYED	10,903	11,121	11,044	11,328
UNEMPLOYMENT RATE	5.2 %	5.5 %	5.4 %	5.4 %
TOTAL EMPLOYMENT PERSONS	200,010	191,859	193,471	198,475

**SOURCE :**

- KOTAMADYA UJUNG PANDANG DALAM ANGKA 1981, 1982, 1983, 1986 BAPPEDA DAN KANTOR STATISTIK
- DEPARTEMEN TENAGA KERJA REPUBLIK INDONESIA KANTOR KOTAMADYA UJUNG PANDANG
- BUKU KOMPILASI DATA, RENCANA INDUK KOTAMADYA UJUNG PANDANG TAHUN 1984

### 3.1.4 Student and Pupil

Number of students and pupils in Ujung Pandang are listed in Table 3.1.4, and this table shows that Ujung Pandang has so many students and pupils, especially students of universities in comparison with the population.

Universities are composed of the state universities (UNHAS, IKIP, IAIN, STIA-LAN and APDN) and the private universities and colleges.

Table 3.1.4 Number of Students in Ujung Pandang 1986/1987

(persons)

Kecamatan	School	Kinder- garten	Primary School	Junior High School	High School	Sub Total	Univer- sity	Total
1. Mariso		196	6,668	1,204	2,346	10,414		
2. Mamajang		341	10,410	5,501	4,882	21,134		
3. Makassar		474	15,369	5,099	3,762	24,704		
4. Ujung Pandang		1,438	12,696	8,645	4,236	27,015		
5. Wajo		286	6,129	4,096	2,926	13,437		
6. Bontoala		283	9,372	4,675	4,348	18,678		
7. Tallo		247	13,591	2,435	771	17,044		
8. Ujung Tanah		176	7,690	2,811	1,465	12,142		
9. Panakkukang		516	13,422	4,982	5,045	23,965		
10. Tamalate		1,140	19,369	10,142	6,145	36,796		
11. Biringkanaya		249	7,792	3,182	2,345	13,568		
TOTAL		5,346	122,508	52,772	38,271	218,897	87,549	306,446
%		1.7	40.0	17.2	12.5	71.4	28.6	100.0

Kindergarten : 4 - 5 years old  
 Primary School : 6 - 12 years old  
 Junior High School : 13 - 15 years old  
 High School : 16 - 18 years old

Source : Kotamadya ujung pandang Dalam Angka 1986



### 3.2 Existing Land Use

#### 3.2.1 Land Use in South Sulawesi

Composition of existing land use in South Sulawesi is characterized by a low ratio of housing area (1.98 %), and high ratios of rice field (34.4%) and forest (30.2). (Source : REPELITA IV. Propinsi Sulawesi Selatan)

Existing land use in Gowa, Maros and Takalar is shown in Table 3.2.1 and Fig. 3.2.1 respectively. The areal rate of forest is highest at 40 % and 34 % respectively in Gowa and Takalar, and the rate of underbrush is highest at 32 % in Maros, followed by forest at 27%. The rate of rice field is not so high in Gowa and Maros ranging from 12 to 15 %, but in Takalar it stands at 31 %. Among these three regencies, Maros has the highest areal rate (58 %) of savage land (forest underbrush). On the other hand, Takalar has the lowest areal rate (34 %) of savage land.

Table 3.2.1 Land Use in Gowa, Maros, Takalar

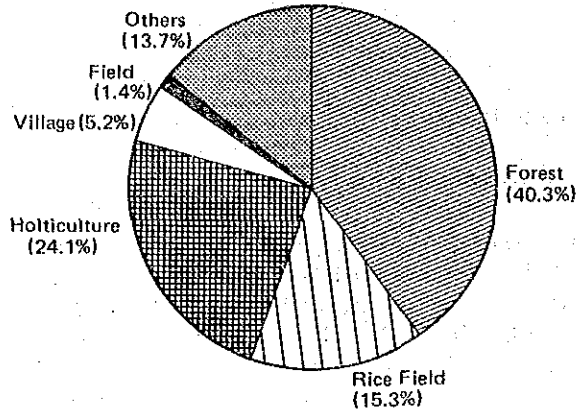
Utility of fields/ Land Use	Gowa 1) (ha) (X)	Maros 2) (ha) (X)	Takalar 3) (ha) (X)
Forest	75,895 (40.3)	43,004 (26.6)	19,219 (33.9)
Rice Field	28,828 (15.3)	19,931 (12.3)	17,367 (30.7)
Horticulture	45,456 (24.1)	10,978 (6.8)	9,733 (17.2)
Fish-pond	144 (0.1)	4,485 (2.8)	2,058 (3.6)
Dam/Fish-pond	134 (0.1)	-	-
River	-	-	235 (0.4)
Lake	-	1,020 (0.6)	-
Swamp (Wet land)	-	-	55 (0.1)
Village/Yard	9,732 (5.2)	4,874 (3.0)	4,074 (7.2)
Grass field	2,612 (1.4)	-	1,182 (2.1)
Dried field	-	21,243 (13.1)	-
Underbrush	-	51,456 (31.8)	-
Others	25,531 (13.5)	4,921 (3.0)	2,728 (4.8)
Total	188,332 (100.0)	161,912 (100.0)	56,651 (100.0)

Source : 1) Basic pattern of Kabupaten Gowa local development 1984/1985 - 1988/1989.

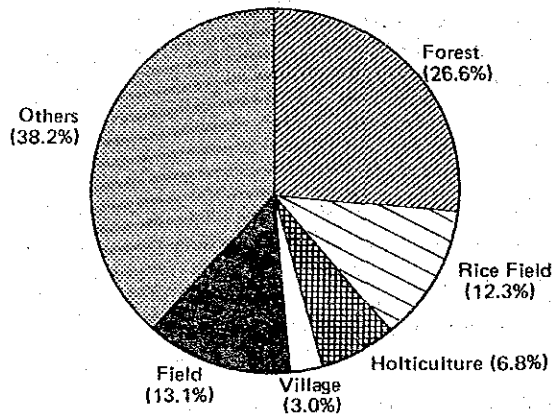
2) General city planning construction project, pre-study of Kabupaten Gowa, Maros, UjungPandang (Minasamaupa) capital city planning area, Bappeda South Sulawesi

3) Basic pattern of Kabupaten Takalar local development 1984/1985 - 1988/1989.

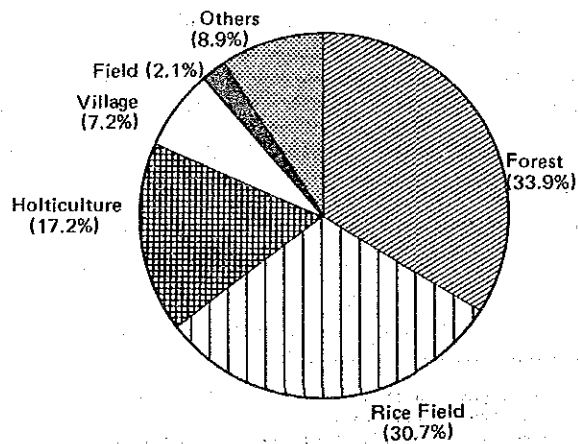
GOWA



MAROS



TAKALAR



UJUNG PANDANG AREA  
HIGHWAY DEVELOPMENT STUDY

Fig.

3.2.1 Existing Land Use in Each Kabupaten

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### 3.2.2 Land Use in Ujung Pandang

As mentioned in Interim Report (1), the area of respective land use and its composition rate in Ujung Pandang in 1984 are summarized as follows and illustrated in Fig. 3.2.2.

Residential (housing)	2.513 ha	14.3%
Commercial/business	790	4.5%
Educational	88	0.5%
Industrial	88	0.5%
Port	88	0.5%
Agriculture	6.150	35.0%
Swamp (Fish-pond)	3.584	20.4%
Green/park	105	0.6%
Others	4.164	23.7%
<b>Total</b>	<b>17.570 ha</b>	<b>100.0%</b>

Source : Kompilasi Data RIK Ujung Pandang 1984.

Note : Others include cemetery, road, forest, river, etc.

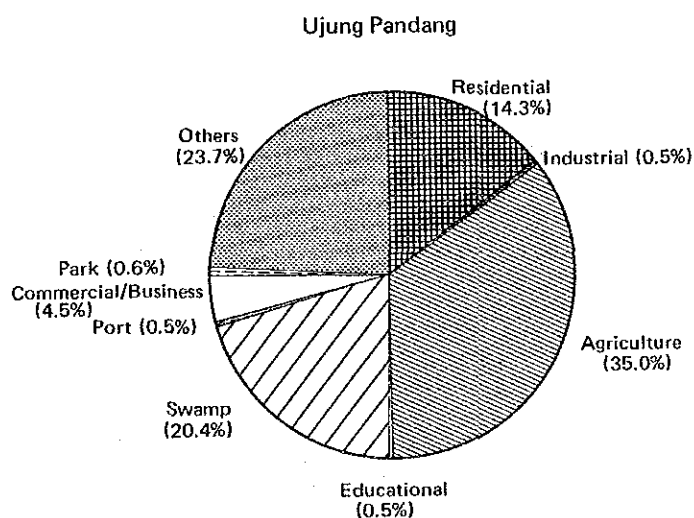


Fig. 3.2.2 Composition of Existing Land Use

According to the existing land use map of Ujung Pandang, the pattern of land use is characterized as follows :

- a) Commercial Area is concentrated on northern part or along the arterial roads in the central zone of Ujung Pandang.
- b) Residential area spreads over the urbanized area and along arterial roads, such as Jl. Gowa Jaya (Urip Sumoharjo), Jl. Toll (Prof. Dr. Ir. Sutami) and Jl. Gowa Raya (St. Alauddin).
- c) Rice fields spread over the north-eastern, eastern and southern parts of the city except the urbanized area.
- d) Swamp is located around the river mouths of Sg. Tallo and Sg. Jeneberang, some of which is used for the fish-pond cultivating shrimp and prawn.
- e) Surrounding zone of the Municipality is studded with forest with dense clump of woods.

### **3.3 Review of Land Use Plan**

#### **3.3.1 General**

The Master Plan with target year 2004 for urban development of Ujung Pandang City was prepared in 1984 by Pemerintah Kotamadya Daerah Tingkat II Ujung Pandang.

A review on the land use plan described in this Master Plan has been made by the Study Team for formulation of the land use plan with target year 2009. The review was focused on the following items :

- a) Concept of land use plan.
- b) Zoning by function.
- c) Population allocation.
- d) Future economic framework.
- e) Existing ground condition for development of housing, industrial estate and so on.

#### **3.3.2 Concept of Master Plan**

According to the Master Plan of Ujung Pandang (Target Year 2004), the city is divided into 6 zones according to the future land use characteristics as described below.

- a) Residential Zone
- b) Agricultural Zone
- c) Industrial Zone
- d) Commercial and Business Zone
- e) Educational Zone
- f) Recreational Zone

The outline and characteristics of the land use plan in Master Plan were described in Interim Report (1), Section 4.5. By the Master Plan of Ujung Pandang, the development concept of residential district is stated as follows:

- a) To provide sufficient area for each residential district to absorb the increased population in the future.
- b) To encourage equal distribution and density of population at each section of the city.
- c) To preserve and enhance the supporting factors of the urban and rural environment to ensure the balance of "ecosystem".

### 3.3.3 Development Strategy of Master Plan

In the previous section, three (3) concepts of Master Plan are pointed out as i) to balance distribution of population, ii) to encourage and enhance the city activities and iii) to keep a good environment.

In addition, the population of South Sulawesi and Ujung Pandang in 1986 is 6,545,000 and 779,000 respectively, and 436,000 persons or 56 percent of the population in Ujung Pandang City are living in the urbanized area. So, the urbanized area of Ujung Pandang is saturated by increased population and its activities.

### 3.3.4 Land Use Plan of Master Plan

Regarding dwelling district plan in the Master Plan, residential area in Ujung Pandang is divided into 3 zones; 'central zone', 'transitional zone', and 'border zone'.

'Central zone' is the center area of Ujung Pandang, and has high population density, 265 persons/ha (1986) excluding islands in Kecamatan Ujung Tanah.

'Transitional zone' is an intermediate area between 'central zone' and 'border zone', and has low population density, 42 persons/ha (1986). But the population of this zone is going to increase rapidly, because there are some big new residential area development plans in this zone.

'Border zone' is in the suburban area, and has very low population density now, less than 10 persons/ha (1986). But this zone has some places planned for a large scale development which will attract and generate many trips in future.

The review confirms and justifies future development potentials and a frame work of Ujung Pandang, in particular its land use plan. Therefore, future land use plan with target year 2009 is formulated in line with that of MASTER PLAN, with some modifications.

### 3.4 Land Use Plan With Target Year 2009

The Land Use Plan 2009 is studied on the basis of reviewing the Master Plan and studying of the general conditions and analysis on the socio-economic potentials of Ujung Pandang.

#### 3.4.1 Planning Policy

In order to solve the urban problems, following two (2) planning policies for land use plan are conceived:

- a) To distribute the urban activities to the outside of urbanized area
- b) To provide the sufficient infrastructure for the outside of urbanized area.

#### 3.4.2 Planning Guideline

Based on the above planning policies, the following guidelines are identified for preparation of land use plan in the year 2009:

- a) Location of future residential areas of good environmental condition.
- b) Re-location of the central commercial, business zone.
  - Renewal of the city center
  - Shifting of center activities to surrounding area (development of new sub-centers in surrounding areas).
- c) Location of industrial area to be separated from residential area.
- d) Location of transportation facilities area to be connected with arterial roads.
  - Cargo terminal
  - Bus terminal
- e) Adjustment of land use along roads.
- f) Preservation and re-arrangement of agricultural zone.
  - Productive green fields (paddy fields etc.)
  - Fish ponds (Shrimp breeding)

By the allocation of future population into each zone, the population density in the planned residential area will be 100 - 200 persons/ha in the target year 2009. This population density level is considered to be optimum as a residential area which is almost same as a big "new town" (newly planned residential area) in Japan.

It is to be mentioned that most of the big development projects except housing development are those for industrial estate, educational facilities, cargo terminals, city sub-centers, etc. which will be located in the suburban area of the city. Therefore, major trip directions from residential zone are :

- a) To connect to the CBD.

- b) To connect to the sub-center.
- c) To connect to the industrial, educational zone.

Since these directions are inverse each other (Fig. 3.4.1), the traffic congestion will be relieved after completion of the zoning of the land use, which will otherwise worsen due to traffic concentration to the central zone.

### 3.4.3 Modification of Master Plan

Modification of the Master Plan has been achieved by analyzing the following items :

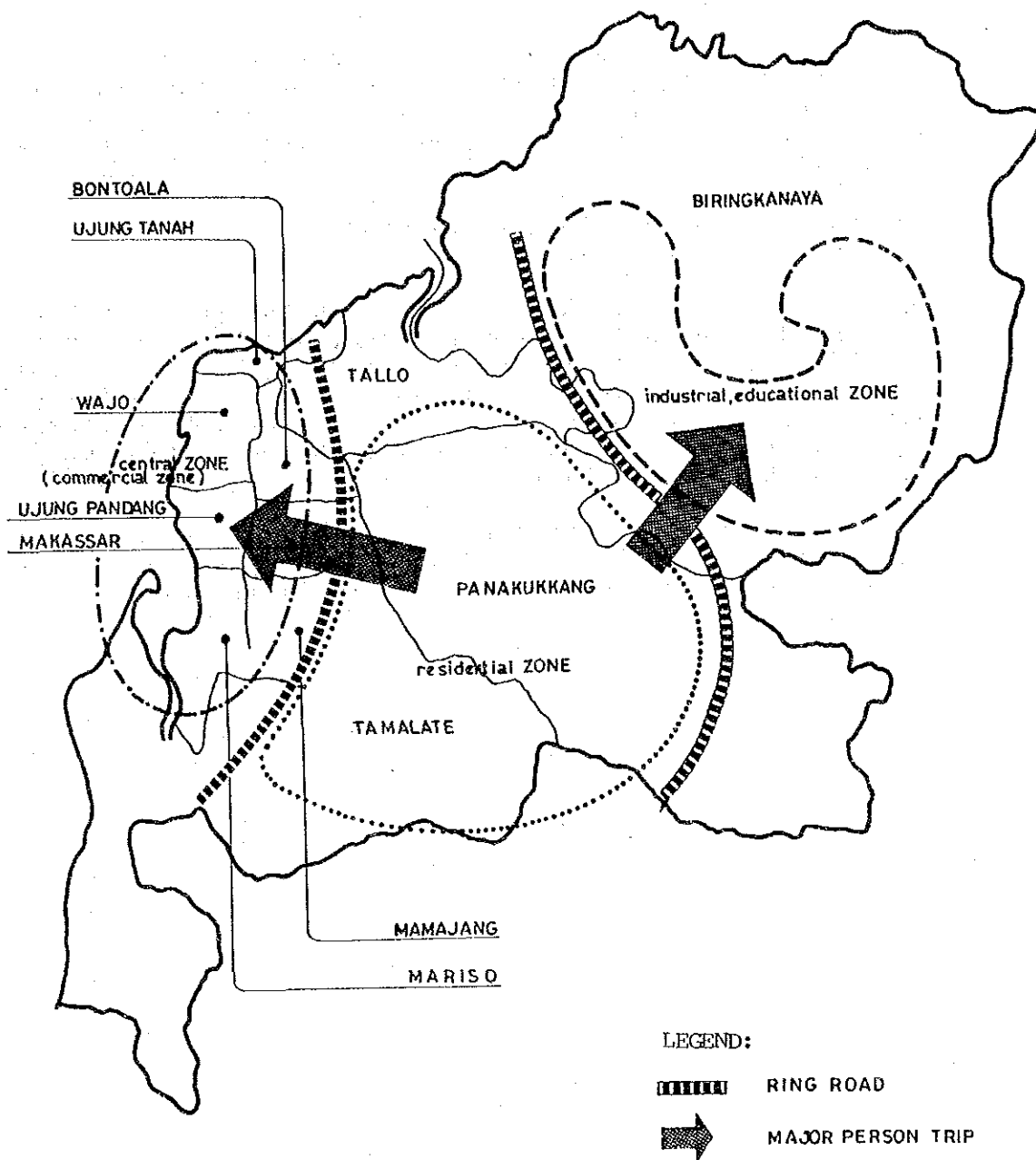
- a) Natural conditions on the possibility to develop the wet land or paddy-field.
- b) Population density of planned residential area.
- c) Road network configuration.

#### 1) Natural Conditions

Ujung Pandang has broad wet land, especially along the Tallo river and Jl. Tallo. These areas are sometimes flooded in rainy season, but the flooded depth is under 1 m in most places, and the sub-surface ground condition is found to be solid by the soil survey data. Therefore, these areas can be developed for residential purpose by embankment to elevate the foundation level.

In this case it is possible for Ujung Pandang to allocate larger area for residential zone than the planned area by Master Plan.





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**Fig. 3.4.1** Major Person Trips between Zones

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## 2) Population Density

The population density in existing urbanized area of Ujung Pandang City is high, and is getting low gradually when going to the suburban area. According to the Master Plan, the population density (gross) in the year 2004 will be :

- a) 265 persons/ha. (in central zone)
- b) 100 persons/ha. (in transitional zone)

On the other hand, the population in the year 2009 is estimated to be 1,520,000 persons, which means about 200,000 persons will increase from 2004 to 2009. If this increased population will inhabit in the transitional zone, the population density will be over 100 persons/ha (gross) or over 200 persons /ha. (net), and this density is considered to be high.

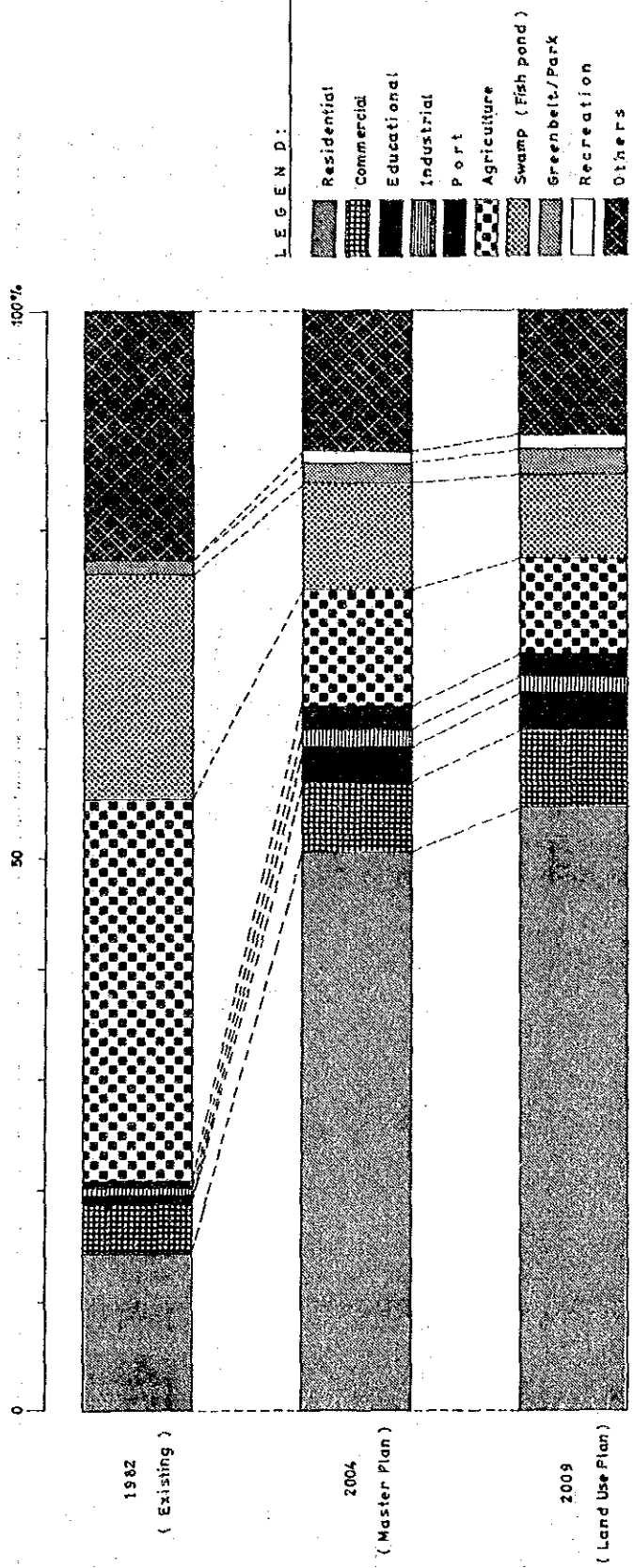
The composition of the land use plan 2009 is shown in Table 3.4.1. and Fig. 3.4.2 and the composition of the land use area per person is shown in Table 3.4.2.

Table-3.4.1 Land Use Composition (By Land Use Plan 2009)

(ha)

Land use Kec.	Residen- tial	Commer- cial	Commercial/ Business	Educa- tional	Indus- trial	Port Terminal	Agri- culture (fishpond)	Swamp	Greenbelt Park	Recrea- tion	Others	Total
Ujung Tanah	-	8.0	20.0	-	-	93.6	-	-	-	-	474.4 (island)	594.0
Wajo	-	171.4	-	-	-	27.6	-	-	-	-	-	199.0
Ujung Pandang	82.0	-	189.8	-	-	-	-	-	11.2	-	-	263.0
Mariso	117.0	-	55.0	-	-	-	-	-	10.0	-	-	182.0
Tallo	119.2	-	40.0	-	-	200.8	-	-	-	-	223.0	583.0
Sontolala	83.5	-	126.5	-	-	-	-	-	-	-	-	210.0
Makassar	161.7	-	90.3	-	-	-	-	-	-	-	-	252.0
Mamajang	138.7	6.0	80.3	-	-	-	-	-	-	-	-	225.0
Biringkanaya	5,038.0	-	80.0	568.4	260.4	26.4	-	1,050.0	259.0	-	723.8	8,006.0
Panakukang	2,366.0	-	167.0	-	9.0	-	1,034.4	-	76.0	-	466.6	4,119.0
Tamalate	1,929.7	19.3	200.8	-	-	-	519.6	325.0	70.0	260.0	79.6	2,944.0
Total	9,635.8	202.7	1,025.7	568.4	269.4	348.4	1,554.0	1,375.0	426.2	200.0	1,967.4	17,577.0
Composition rate (%)	54.8	1.2	5.9	3.2	1.5	2.0	8.8	7.8	2.4	1.1	11.3	100.0

Note : Value is measured on the land use plan map.  
Include road, river, etc.



Source :  
 1982: Kompas Data RIK Ujung Pandang 1984  
 1984: Measured on the Map of LAND USE PLAN 2009

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**Fig. 3.4.2** Composition of Land Use in Each Year

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Table-3.4.2 Comparison of Land Use Area per Person

Year	1982 (existing)		2004 (Master Plan)		2009 (Land Use Plan)	
Population	717,585 persons		1,310,000 persons		1,520,000 persons	
Residential	2,512.5 ha	35.0 m <sup>2</sup> /persons 286 persons/ha	8,900.3 ha	67.9 m <sup>2</sup> /persons 147 persons/ha	9,635.8 ha	63.4 m <sup>2</sup> /persons 158 persons/ha
Commercial/ Business	790.6	11.0	1,101.2	8.4	1,232.4	8.1
Educational	87.9	1.2	568.4	4.3	568.4	3.7
Industrial	87.9	1.2	269.4	2.1	269.4	1.8
Port (include warehouse)	88.2	1.2	348.4	2.7	348.4*	2.3
Agriculture	6,150.0	85.7	1,874.6	14.3	1,554.0	10.2
Swamp (fish-pond)	3,584.3	49.9	1,735.0	13.2	1,375.0	9.0
Greenbelt park (open yard)	193.3	2.7	314.2	2.4	426.2	2.8
Recreation	-	-	170.0	1.3	200.0	1.3
Others**	4,075.3	56.8	2,295.5	17.5	1,967.4	12.9
TOTAL	17,570.0	244.8	17,577.0	134.2	17,577.0	115.6

\* include social service

\*\* include road, river, forest, uncultivated land etc.

Source : 1982 : Kompilasi Data RIK Ujung Pandang 1984  
2004 : Measured on the map of Land Use Plan 2009

#### 3.4.4 Land Use Plan by Area Function

In addition to 6 functional zones worked out by the Master Plan, the functional classification of land use plan in this study has been extended to define 5 more zones or areas for more practical planning purpose.

These 11 zones/areas are described as follows :

- a) Residential Area
- b) Commercial Area
- c) Commercial/Business Area
- d) Educational Area
- e) Industrial Area
- f) Port and Terminal
- g) Agricultural Area
- h) Swamp Area
- i) Green Belt and Park
- j) Recreational Area
- k) Other Area

Detailed description of each area is presented as follows :

##### 1) Residential Area

The population will increase about 740,000 persons from 1986 (778,593 persons) to 2009 (1,520,000 persons). If the population density in 2009 is set 100 persons/ha, 7,400 ha land will be required to develop as new residential area.

The total existing residential area is 2,513 ha<sup>\*1</sup> in 1982, therefore total residential area will be about 9,900 ha<sup>\*2</sup> in 2009.

\* 1 Source : Kompilasi Data RIK Ujung Pandang 1984

$$\begin{aligned} * 2 \quad 2,513 + 7,400 &= 9,913 \\ &= 9,900 \text{ ha} \end{aligned}$$

On the other hand, the future total residential area in Ujung Pandang is estimated to be about 9,900 ha by the Land Use Plan 2009. That is :

$$\begin{aligned} \text{Residential area + island (in Kecamatan Ujung Tanah)} \\ &= 9,635.8 + 391 \times 1/2^* \\ &= 9,832 \\ &= 9,900 \text{ ha} \end{aligned}$$

\* Residential area is supposed to be 1/2 of the total island area.

Therefore, the residential area by the Land Use Plan 2009 is equal to the area needed for the future population frame.

It is to be noted that the average population density in the area will drop from 286 persons/ha (1982) to 158

persons/ha (2009). This drop is owing to a considerable expansion of the residential area planned for 2009 which is in line with the development concept of the Master Plan 2004, "To provide sufficient area for each residential district to absorb the increased population in the future".

The population density of three (3) sectors mentioned before is summarized in Table 3.4.3.

**Table 3.4.3 Population Density in 3 Sectors**

ZONE (3 sectors)	Residential Area (ha)	Population (persons)	Density (persons/ha)
Central zone	582.9	400,000	686
Transitional Zone	4,014.9	790,000	197
Border Zone	5,038.0	330,000	66
Total	9,635.8	1,520,000	158

## 2) Commercial Area

In inverse proportion to the increase of population in Ujung pandang, the unit area of commercial and social service per person will decrease in spite of increase in the total commercial area. But the unit floor area per person will increase owing to a change of existing shops or offices to multi-story buildings.

Main commercial area located in Kecamatan Wajo and Ujung Tanah is the central area of Ujung Pandang City, and this area is surrounded by the roads, Jl. Martadinata, Jl. Nusantara, Jl. Satando, Jl. Andalas, Jl. Bulusaraung and Jl. A. Yani.

This area is composed of retail shops, wholesale shops, economic service offices (private offices), public offices, etc. including 'Pasar Sentral' (Central trade center).

The sub commercial area is located surrounding the intersection of Jl. Ratulangi and Jl. Veteran. This area is the southern city center of Ujung Pandang.

The commercial area (main + sub) is estimated to have an area of 200 ha in 2009.

### 3) Commercial/Business Area

Commercial/Business area can be classified into 3 types as follows :

- a) Type 1. Area in the center of city
- b) Type 2. Area along the roads
- c) Type 3. Sub center (Daya, Antang)

Total area is estimated to be about 1,000 ha in 2009.

#### (1) Area in the Center of City (Type 1)

Type 1 area is located in the center of Ujung Pandang City and spreads widely to surround the main commercial area and extends southward to sub commercial area. The existing urban facilities in this area are as follows :

- a) Public Service
  - \* municipal office
  - \* hospital
  - \* school
  - \* religious facility
  - \* army base and camp
  - \* bank, etc.
- b) Trade Service
  - \* private office
  - \* amusement center and facility
  - \* gymnasium
  - \* shop, etc.

#### (2) Area Along the Roads (Type 2)

Type 2 area widely spreads along the arterial roads, Jl. Veteran, Jl. Pettarani, Jl. Sumoharjo, Jl. Gowa Raya (St. Alauddin), Jl. Kumala and planned Center Radial Road. This area has about 100 m width on both sides of these arterial roads.

#### (3) Sub Center (Type 3)

Sub center (Pusat Sekunder) can be defined as a complex which has various urban facilities and is located in suburban residential area. Two sub centers are planned to be located at Daya and Antang in 2009.

According to Master Plan 2004, the sub center Daya is planned to locate at east side of Jl. Sumoharjo between educational area and industrial estate ( 14 Km east from the center of Ujung Pandang City), with an area of 12 ha.

The sub center Antang is planned to locate at the intersection of the planned Center Radial Road and Middle Ring Road (about 7 Km east from the center of Ujung Pandang City).



Sub center is considered to have the following functions :

- \* Shopping center (pasar) including restaurant
- \* Amusement center (theater, hall etc.)
- \* Community center
- \* Business office
- \* Public service office (Branch of municipal office)
- \* Bank
- \* Post, telephone office
- \* Clinic
- \* Bus, Pete-pete Terminal
- \* Taxi terminal
- \* Parking area
- \* Park, green area (multi-use plaza)
- \* Memorial, symbol plaza
- \* Others

The location of sub center can be decided from the followings 2 factors :

Factor 1 : Urban life service level

Factor 2 : Public transport service level

a) Urban life service level (Factor 1)

The urban life service level can be evaluated by the number of urban facilities. Table 3.4.4 shows the number of shops and restaurants in each Kecamatan as a comparison of urban life service level. According to Table 3.4.4, population in 2009 per total number of shops and restaurants is expected to have a highest rate in Kecamatan Panakkukang and Biringkanaya.

Therefore, it is considered necessary to increase the number of shops and restaurants in these Kecamatan in the future.

Basically, sub center (includes shops and restaurants) will be located outside the planned Middle Ring Road, because there are little commercial area along the arterial road outside the planned Middle Ring Road.

b) Public transport service level (Factor 2)

There are 3 main bus and pete-pete terminals in Ujung Pandang City, i.e. Pasar Sentral, Panaikang, Pa'Baeng-Baeng terminals and one each in Sungguminasa and Maros i.e. Sungguminasa terminal.

In 2009, the population will increase, especially in Kecamatan Panakkukang and Biringkanaya. Each existing terminal serves an area with population of about 300,000 persons. Since the population of 2 Kecamatan Panakkukang and Biringkanaya is estimated to be 300,000 and 330,000 persons in 2009 respectively, new bus terminals

Table-3.4.4 Number of Shops and Restaurants per Population

KECAMATAN	Number of Shops	Number of Restaurants	Total	① 1982 Population/total	② 2009 Population/total	②/①	zones need to increase shops & Restaurants
Ujung Tanah	106	4	110	392	560	1.43	
Wajo	1,032	24	1,056	45	42	0.93	
Ujung Pandang	399	59	458	94	89	0.95	
Mariso	120	3	123	427	403	0.94	
Tallo	55	1	56	1,430	2,018	1.41	
Bontoala	241	113	354	192	211	1.10	
Makassar	125	45	170	609	397	0.65	
Mamajang	234	10	244	291	251	0.86	
Biringkanaya	6	22	28	1,194	11,786	9.87	○ High Increasing Area
Panakukang	87	6	93	746	4,032	5.40	○ High Increasing Area
Tamalate	40	15	55	1,930	5,491	2.85	
Total	2,445	302	2,747	261	553	2.12	

Source : 1. kantor Pembangunan Desa Kotamadya Ujung Pandang , 1982  
 2. Survey Tata Guna Lahan RIK Ujung Pandang, Mei 1984

shall be located in these Kecamatan.

The future population which will be served by each terminal is roughly estimated as follows :

- Panaikang (existing)	300,000
- Daya (planned)	330,000
- Antang (planned)	300,000
- Sungguminasa (existing)	320,000

#### 4) Educational Area

Educational area is an important area for Ujung Pandang City, because Ujung Pandang has many university students now and the number of students will increase in the future.

Educational area is planned to locate Hasanuddin University (UNHAS) as the center of this area. UNHAS has an area of 220 ha with 50 ha of residential area now. Educational area is planned to extend to both sides of Jl. Sumoharjo with an area of about 880 ha in 2009 based on Master Plan's allocation.

#### 5) Industrial Area

##### (1) Industrial Estate

Ujung Pandang Industrial Estate located in Daya about 15 Km from the center of the city has 3 development stages from 1982 to 1991, and is expected to have 32,000 employees. The composition of land use is shown in Table 3.4.5.

##### (2) Small Industry Area (LIK)

The area of small industry is planned for an area of 20 ha located a long Jl. Prof. Ir. Sutami (Toll Bridge). The priority of small industry invited to LIK will be given to 16 kinds of industries with 180 types of business. All will be coming in 2 (two) phases.

This area is considered to be completed by the target year 2009, and 334 units are planned on the final stage. Expected employees will be 10-25 persons per unit, so, maximum number of employees will be 8,000 .

Total area of industrial and small industry areas (LIK) is same as the area estimated by the Master Plan 2004.

**Table 3.4.5 Composition Rate of Land Use in Industrial Estate**

Classification	Area	Composition Rate
Factory Site	61.0 (ha)	70.9 (%)
Office (Sub-center)	0.5	0.6
Road	13.5	15.7
Water Way	2.5	2.9
Green Belt	5.5	6.4
Electrical	0.5	0.6
Industrial/Drink Water	1.0	1.2
Waste Water Treatment Plant	1.5	1.7
<b>T O T A L</b>	<b>86.0</b>	<b>100.0</b>

Note : Area is developed on

Stage I (1982 - 1985)	: 86.0 (ha)
Stage II (1985 - 1988)	: 80.0
Stage III (1988 - 1991)	: 58.3
Total	224.3

Source : Guide book of UJUNG PANDANG INDUSTRIAL ESTATE

## 6) Port, Terminal

### (1) Port

Makassar Port will be expanded by the Port Development Plan based on the Master Plan and a feasibility study in 2 phases as follows :

Phase I : 1985 - 1990

Phase II : 1990 - 2000

Total area is 5.5 ha in phase I, and new island development is planned in phase II. Considerable area is used for the facilities related to the port in Kecamatan Tallo and Ujung Tanah.

### (2) Cargo Terminal

Cargo Terminal located along the Jl. Toll (Prof. Dr. Ir. Sutami) will be completed in 1990 under the existing plan. According to BAPPEDA, the planned area is 15.8 ha (6 ha in Phase I), and 7 buildings (storage) are planned.

This cargo terminal is considered to have strong impact and relation to the Makassar Port in the future. Total area of port and cargo terminal is same as the area planned by the Master Plan 2004.

### (3) Bus Terminal

Bus terminals are planned to be reconstructed or renewed, and are mentioned in detail in other chapter of this report. The plan area of the above mentioned facilities and its related area are estimated about 321 ha in 2009.

### 7) Agricultural Area

Agricultural area is located in the south-end and southeast-end areas of Ujung Pandang City, in Kecamatan Panakkukang and Tamalate.

Total existing agricultural area is 6,150 ha (35.0 % of the total city area), and total agricultural area in the year 2009 is estimated to be about 1,500 ha which correspond to the area planned by Master Plan 2004.

Therefore, the agricultural area decreases by 75 % from the existing area. Most agricultural area will change to the residential area in future. So, the total area of agriculture will be less than 9 % of the total city area in 2009. But in outside area of Ujung Pandang, most of the existing agricultural area will remain. Agricultural area is composed of paddy-fields or cattle-fields, etc.

### 8) Swamp (Fish-pond) Area

Total existing area of fishery and swamp is 3,584 ha in 1982\*. In 2009, the considerable area of these swamp will be converted to residential or industrial area, as mentioned in Section 3.2 in this report.

Total area to be converted from swamp (fish-pond) to residential area will be less than 40 % or 1400 ha in 2009. And the remaining swamp (fish-pond) will be located only in 2 Kecamatan, Biringkanaya and Tamalate.

\* Source : Kompilasi Data RIK Ujung Pandang 1984

### 9) Greenbelt, Park

A wide green area is composed of the existing parks and planned greenbelt. The existing wide parks are "Karebosi" Park in Kecamatan Ujung Pandang, and stadium park in Kecamatan Mariso. The existing parks will remain as the green space in the center of the city in 2009.

Greenbelt is planned along the 'Middle Ring Road' on both sides whose width is about 100 m on each side. This greenbelt will have a function of open space and prevention from running car noises, so, this greenbelt

is considered to be important for good environment in residential area.

A greenbelt or park is also planned around the industrial estate or educational zone in 2009. Aside from these greenbelts and parks mentioned above, many small parks will be located in new residential area depending on the planned area or scale of population. The existing golf-link located near the industrial estate can be included into green open space like the greenbelt or parks mentioned above.

Total area of 425 ha will be twice the existing area in 2009, but the unit area per person will not grow because of considerable increase of population. (from 2.7 to 2.8 m<sup>2</sup>/person from 1982 to 2009).

#### 10) Recreation Area

Recreation area is planned in the southwest area of Ujung Pandang City, and this area is located near the sea in Kecamatan Tamalate. The planned area is about 200 ha in 2009.

A wide wet land area along the Tallo river which is not used effectively can be converted to recreation area. But this area can also be considered as industrial area, if economic activities so require. Therefore, the wet land remain as "others" (other land) in the Land Use Plan 2009.

According to the Master Plan 2004, the planned recreation area is about 170 ha in 2004, which is almost same in 2009.

#### 11) Other Area

As mentioned previously, the land use by functional classification is planned without using the flooded area located along the Tallo and Jeneberang rivers. The development cost of this area is costly compared with other areas because 1.5-2.0 meter embankment is required for development. At present, this area, is classified as 'Other Area' having about 1500 ha.

### 3.4.5 Summary of Land Use Plan in Year 2009

The Land Use Plan of Ujung Pandang and the Study area in 2009 is illustrated in Fig. 3.4.3 and Fig. 3.4.4.

The Land Use Plan in 2009 is summarized as follows :

- a) The population will increase about 200,000 persons from 2004 to 2009. Therefore, the residential area must be expanded to ensure the reasonable level of population density (158 persons per ha in 2009), almost same density level as the representative residential area in Japan as discussed in this report.

The area needed to expand is about 750 ha, and this new residential area shall be located in northern area, Kecamatan Biringkanaya.

- b) Agricultural area will be less than 9 % of the total city area in 2009 , because it is considered better to locate this area outside the planned Outer Ring Road in order to separate the agricultural area from the residential area clearly.

- c) Swamp (Fish pond) will also be less than 40 % of the existing area in 2009. The reasons of the reduction (reduced area is about 360 ha) are mentioned as follows:

- \* There is a necessity of the extension of residential area in Kecamatan Biringkanaya, because of increasing population in future.

- \* Soil condition is good and not flooded in the area along Jl. Toll. So, this area can be used more usefully than using as fish pond.

- d) Other area, the wet land along the river Tallo, will be reduced a little to be used as the residential area.

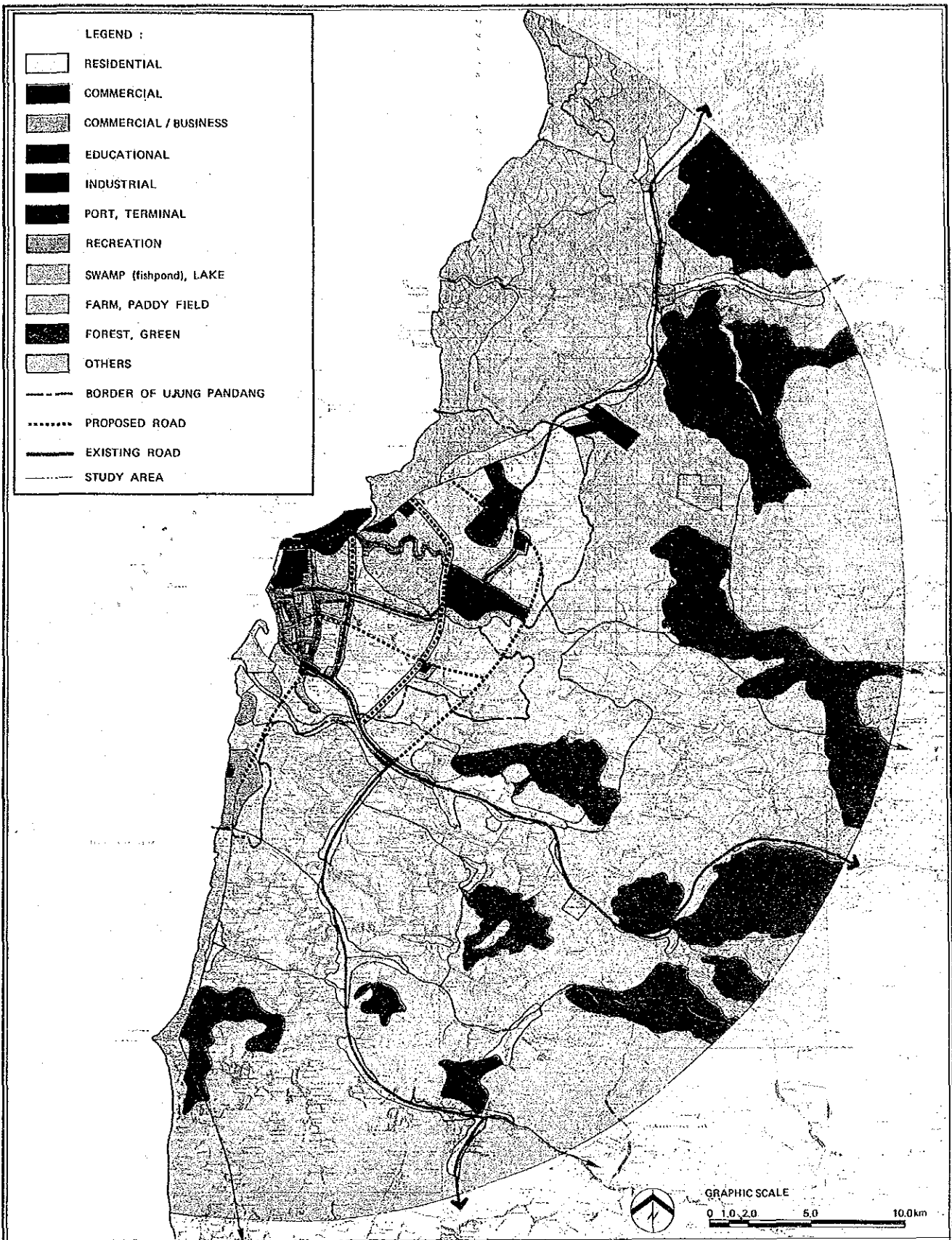
Educational, Industrial, Port, Greenbelt/Park and Recreation areas are almost same as the areas planned by the Master Plan.

The area by functional classification of land use and respective composition rate is shown below in Table 3.4.6.

Table 3.4.6 Composition Rate of Future Land Use in 2009

a) Residential Area	9,900 ha	56.4 %
b) Commercial Area	200	1.1
c) Commercial and Business Area	1,000	5.7
d) Educational Area	880	5.0
e) Industrial Area	244	1.4
f) Port Terminal and Related Area	321	1.9
g) Agricultural Area	1,500	8.5
h) Swamp Area	1,400	8.0
i) Green and Park	425	2.4
j) Recreational Area	200	1.1
k) Other Area	1,500	8.5
Total	17,570 ha	100 %





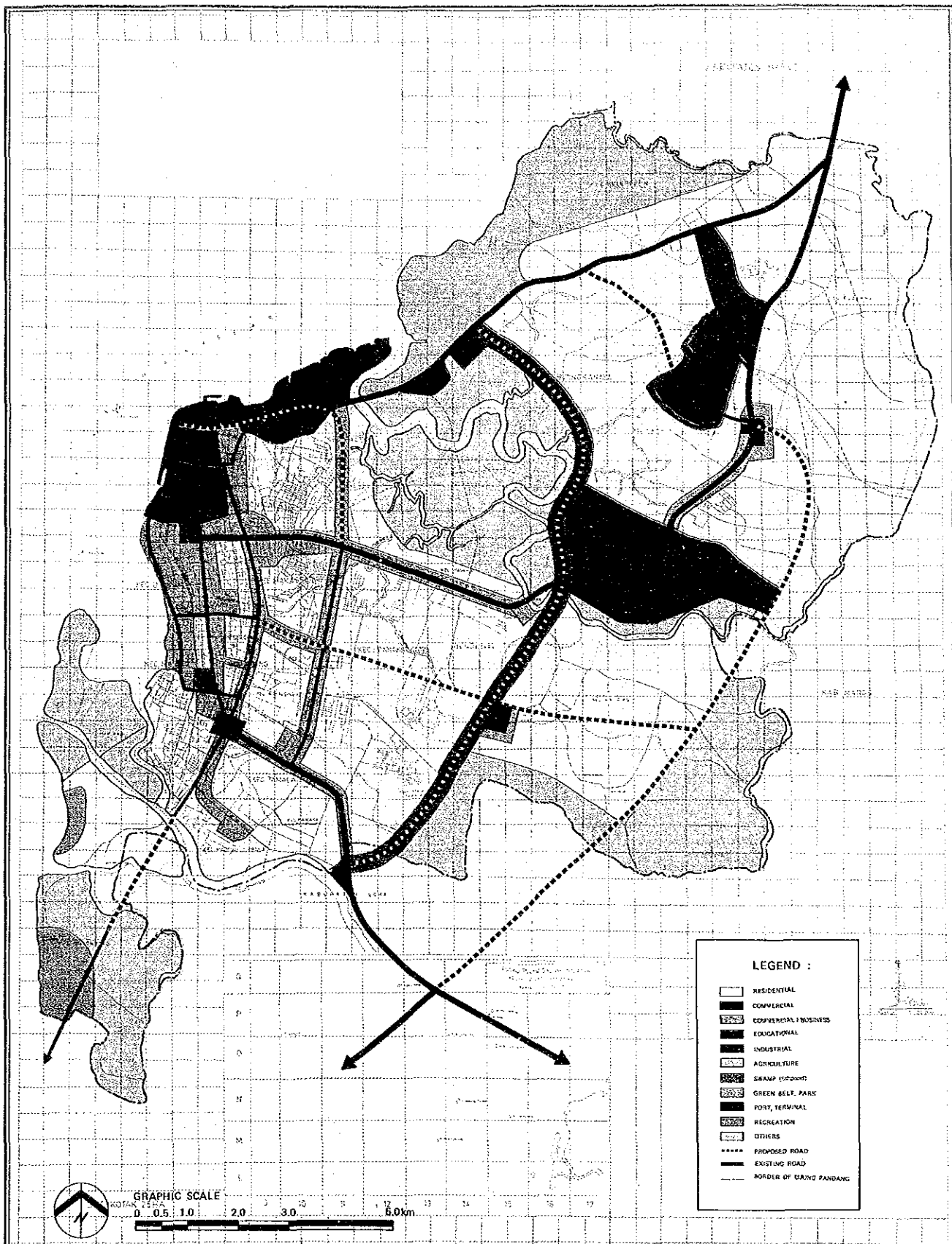
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**Fig.  
3.4.3**

**LAND USE PLAN OF STUDY AREA**

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**UJUNG PANDANG AREA  
HIGHWAY DEVELOPMENT STUDY**

**Fig. 3.4.4**

**LAND USE PLAN OF UJUNG PANDANG  
CITY**

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### 3.5 Socio-Economic Framework

#### 3.5.1 Future Population

As mentioned in Section 3.1.1, the population of Ujung Pandang City in 1986 is presented as 778.000 persons. The future population of Ujung Pandang City in 1994, 2004 and 2009 are estimated based on a comparative study of various population projection cases such as case 1, case 2, and case 3.

The detailed description of the comparative study was given in the Interim Report (1). The results of the future population study are summarized below based on the Interim Report (1).

Year	Population Frame (persons)
1994	976,000
2004	1,310,000 (based on Master Plan)
2009	1,520,000

#### 3.5.2 Allocation of Population to the Three (3) Zones

##### 1) General

In this section, the forecasted future population are allocated to three (3) zones as described below.

- a) Central zone
- b) Transitional zone
- c) Border zone

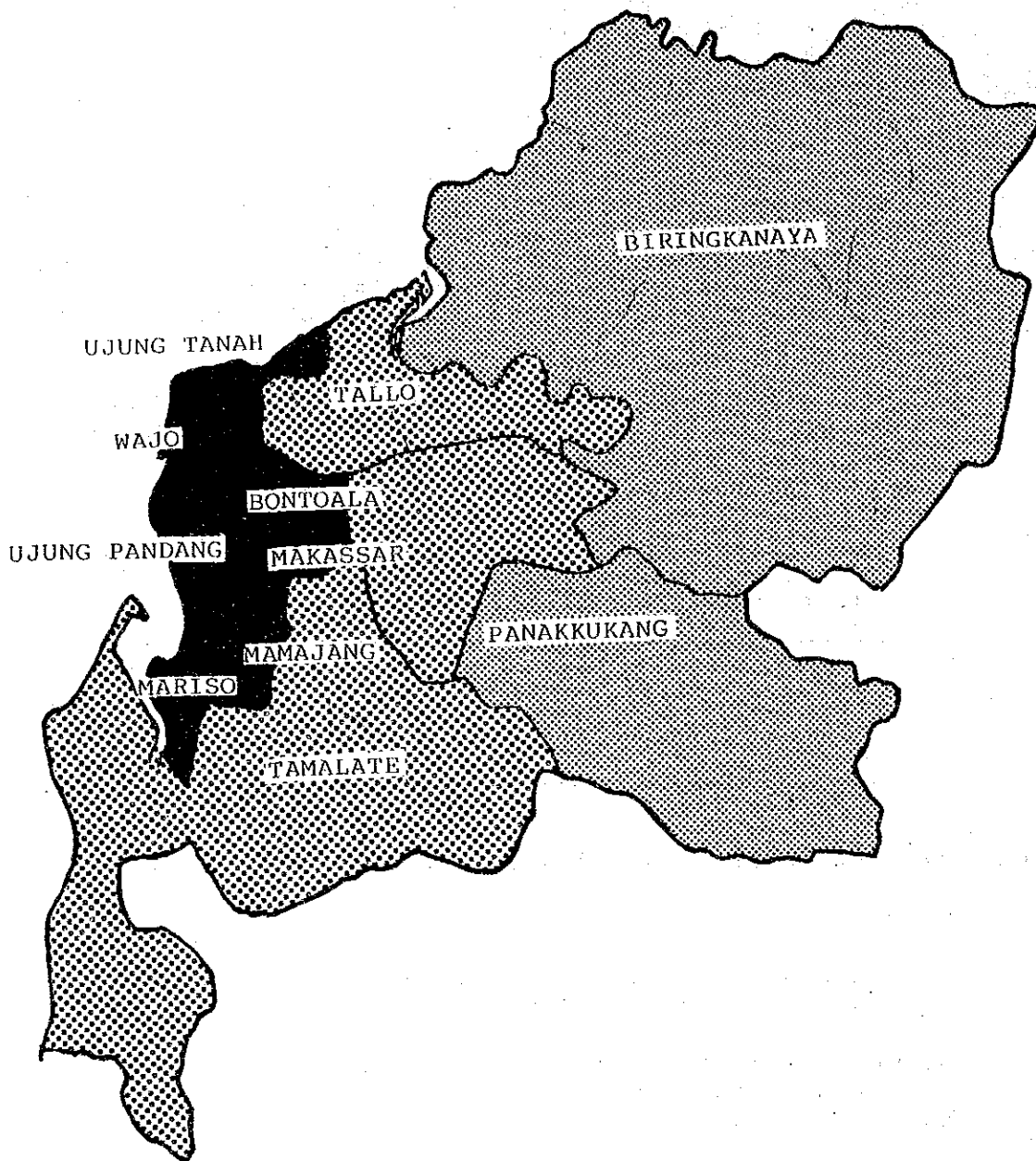
Above mentioned each zone is shown in Fig. 3.5.1. The most important points of the allocation of population into each zone are :

- a) How to allocate the increased population
  - \* 540,000 persons (from 1986 to 2004)
  - \* 200,000 persons (from 2004 to 2009)




- b) Setting up the population density level in each zone

A flowchart of allocation of population to each zone is illustrated in Fig. 3.5.2.

The population frames of 3 zones (central, transitional, border) at the year 1994, 2004 and 2009 are estimated by the method as follows:



LEGEND:

-  central zone
-  transitional zone
-  border zone



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**Fig. 3.5.1 Dwelling District Plan ( by, Master Plan )**

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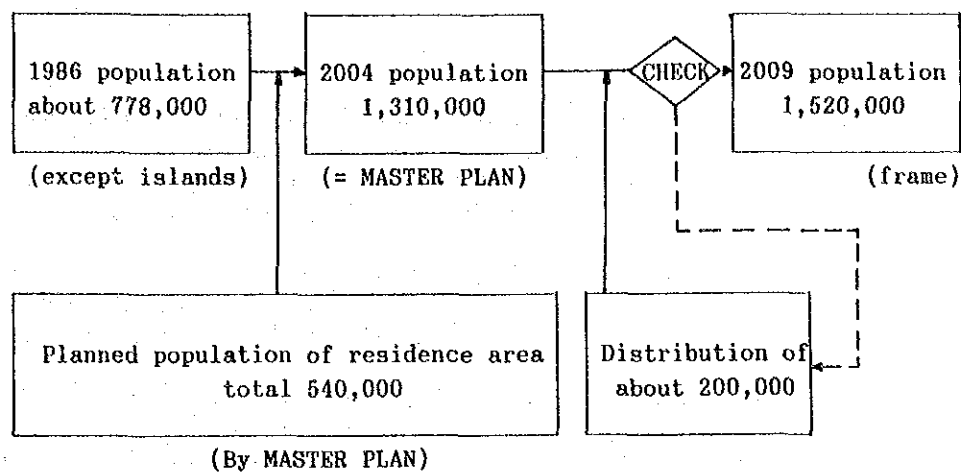


Fig. 3.5.2 Future Estimation of Population in Each Zone

## 2) Central Zone

Population of Central Zone is almost constant in recent years. Increase rate of this zone is almost 1.00 as follows :

Year	Population
1979	412,808 (persons)
1986	414,794 (persons)
1986/1979	= 1.005 (average annual increase rate is 0.07 %)

And this zone has no plan of new residential area that makes the population increase based on Master Plan. So, the population of this zone is considered to be constant until 2009 from now, judging from the above mentioned population increase trend.

## 3) Transitional Zone

Population of transitional zone has been increased in recent years with a high increase rate.

Year	Population
1979	183,353 (persons)
1986	320,217 (persons)
1986/1979	1.746 (average annual increase rate is 8.3 %)

According to the Master Plan of Ujung Pandang, this zone has some big residential area plans with total population of 469,000 persons. Supposing that the increasing

population after now will dwell in these planned residential areas, the population of this zone in 2004, the year of completion of these plans, is considered as follows :

$$\begin{aligned} 2004 \text{ population} &= 1986 \text{ population} + \text{new residential} \\ & \qquad \qquad \qquad \qquad \qquad \qquad \text{area population} \\ &= 320,217 + 469,000 = 790,000 \text{ (persons)} \end{aligned}$$

Then, after 2004 until 2009, the population of this zone will be constant. Because the population density of this zone in 2004 will be over 100 persons/ha as follows :

$$\begin{aligned} A &: 2004 \text{ population} \quad 790,000 \text{ (persons)} \\ B &: \text{Total area} \quad \quad \quad 7,646 \text{ (ha)} \\ A/B &: \text{Density (gross)} \quad 790,000/7,646 = 103 \text{ (persons/ha)} \end{aligned}$$

This density is considered as the maximum value of the transitional zone considering to keep a good environmental conditions. In other words, more new residential areas will not be required in this zone after the year 2004.

Then, 1994 population, an intermediate value between now (1988) and completion year (2004), can be calculated on the assumption that new houses will be built step by step until 2004 from now. So, in the intermediate year 1994, the new houses will be completed about 38 % as follows:

$$(1994-1988)/(2004-1988) = 6/16 = 0.375$$

So, the population in the intermediate year 1994 can be calculated as follows:

$$\begin{aligned} 1994 \text{ population} &= 1986 \text{ population} + \text{new residential area} \\ & \qquad \qquad \qquad \qquad \qquad \qquad \text{population completed until 1994} \\ &= 320,217 + 469,000 \times 0.375 = 500,000 \\ & \qquad \qquad \qquad \qquad \qquad \qquad \text{(persons)} \end{aligned}$$

#### 4) Border Zone

This zone has the planned residential area with the total population of 72,000 persons. So 2004 population is :

$$\begin{aligned} 2004 \text{ population} &= 1986 \text{ population} + \text{new residential area} \\ & \qquad \qquad \qquad \qquad \qquad \qquad \text{population} \\ &= 43,582 + 72,000 \\ &= 120,000 \text{ (persons)} \\ &\text{---> } 122,000 \text{ (adjusted to the total value} \\ & \qquad \qquad \qquad \qquad \qquad \qquad \text{as frame)} \end{aligned}$$

And the population in the intermediate year 1994 can be calculated by the same way as above.



After 2004, total population of Ujung Pandang City will increase, and then will reach to the 2009 frame, 1,520,000 persons. So, the amount increased from 2004 to 2009 is about 208,000 persons. ( $= 1,520,000 - 1,312,000 = 208,000$ ).

Then the population of this zone will be the value as follows :

$$2009 \text{ population} = 2004 \text{ population} + 208,000 = 330,000 \text{ (persons)}$$

5) Outside of Study Area

The future population of outside area that is outer area of Ujung Pandang city can be estimated basically by time series trend. And then, the future total population of Kabupaten (KAB) is allocated to each zone by the weight of future population. The future population estimation flow chart for outside of the Study area is illustrated in Fig. 3.5.3.

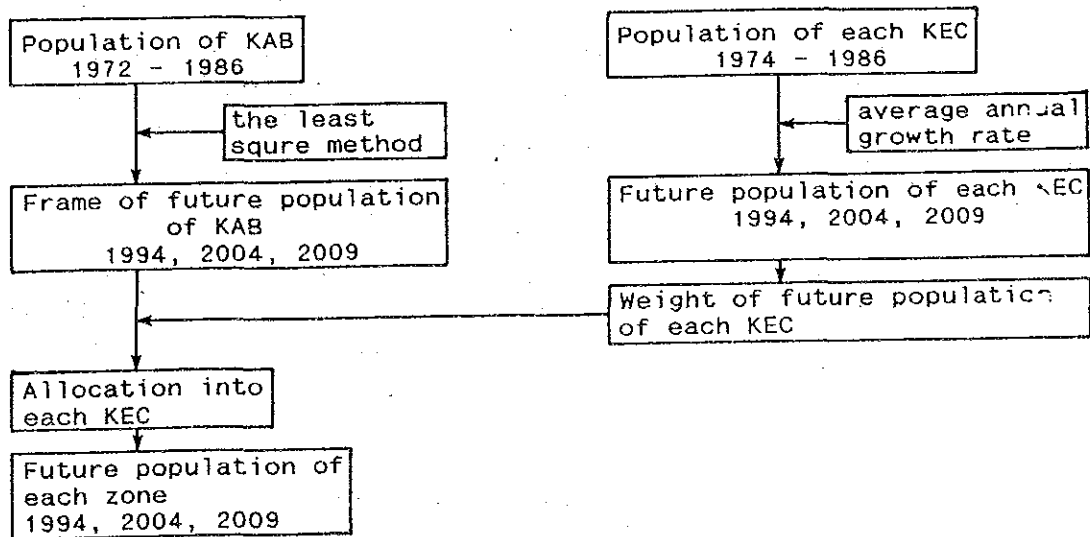


Fig. 3.5.3 Future Population Estimation Flow Chart (Outside of Study Area)

Future population of these regencies (KAB.) can be estimated by the least square method (linear) from 1972\* to 1986. (\* a part of Gowa is incorporated in Ujung Pandang)

The future population calculated is shown as follows :

(Unit : persons)

Year	KAB. GOWA	KAB. MAROS	KAB. TAKALAR
1972	307,485	179,997	155,291
1986	393,474	223,534	189,558
1994	436,300	240,900	208,900
2004	496,500	268,700	235,300
2009	526,600 (r=0.991)	282,600 (r=0.861)	248,600 (r=0.984)

And the total population of South Sulawesi is calculated as follows :

Year	South Sulawesi
1961	4,516,544 (persons)
1986	6,544,881
1994	7,172,005
2004	8,025,679
2009	8,452,515 (r=0.989)
	1994/1986 = 1.096
	2004/1986 = 1.226
	2009/1986 = 1.291

The population projection of South Sulawesi is estimated by Statistical Office of South Sulawesi as follows :

Year	Population
1980	6,084,600 (persons)
1985	6,651,300
1990	7,240,500
1995	7,854,900
2000	8,487,900

(South Sulawesi in Figures 1986, Statistical Office)

This projection value is considered to be higher in comparison with actual value as follows :

Year	Projection	Actual	Projection/actual
1980	6,084,600	6,062,212	1.004
1985	6,651,300	6,407,720	1.038

So, we use the value calculated by the least square method.

#### 6) Conclusion

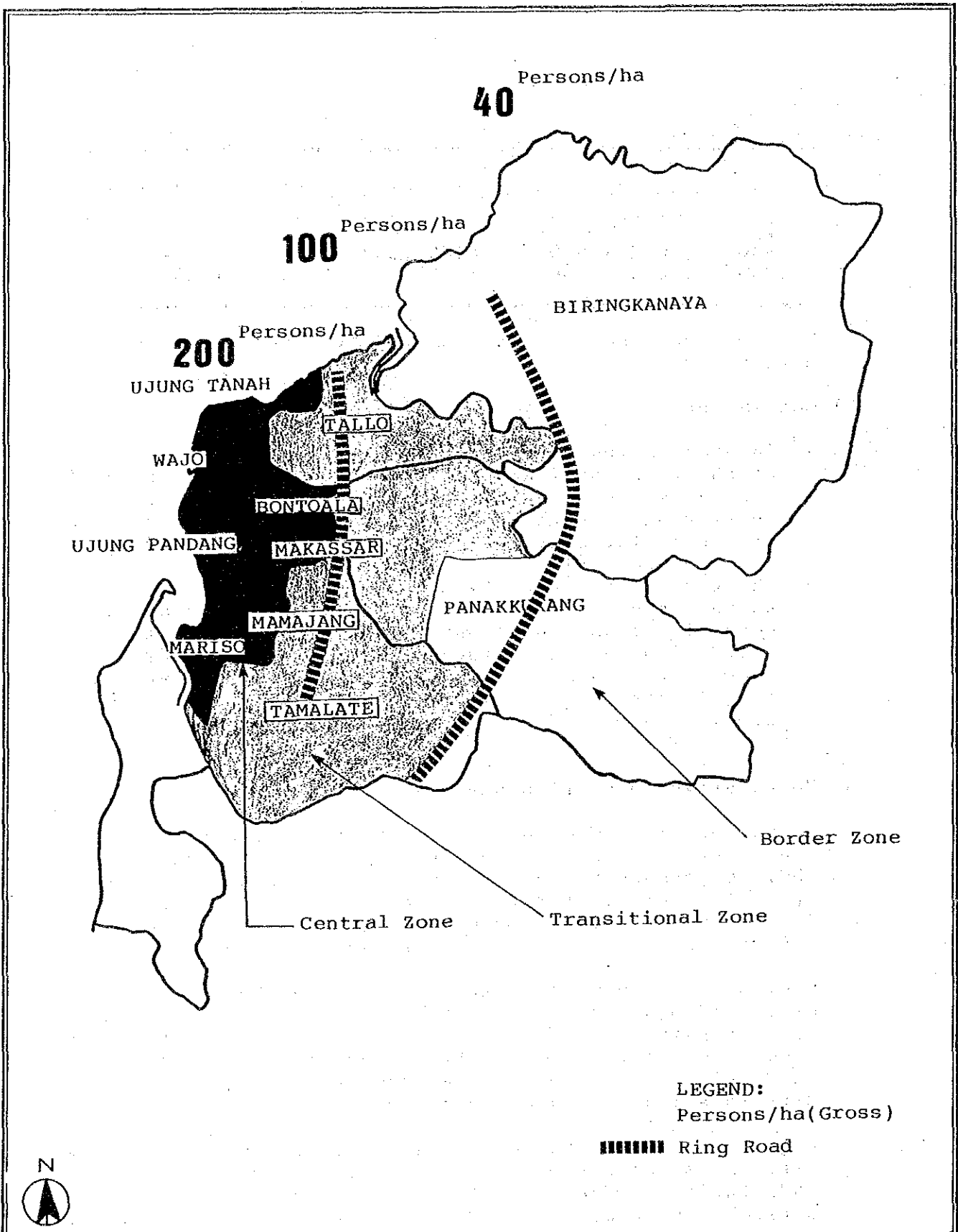
- a) The population of each zone  
As the results of allocation study, the population of each zone are calculated as shown in Table 3.5.1. The population of central, transitional and border zone are calculated as 400,000, 790,000 and 330,000 persons respectively.
- b) The population density of each zone  
As the results of allocation study, the population of central, transitional and border zones are formulated as 200,100, and 40 persons per hectare in 2009 respectively. The above mentioned density in year 2009 are illustrated in Fig. 3.5.4 and summarized in Table 3.5.1.

### 3.5.3 Comparative Population Density

In the previous section, the population density of central, transitional and border zones are calculated as 200,100 persons per ha and 40 persons per ha respectively. In this section, the above mentioned population density is compared with other major cities of Indonesia country and other cities of foreign countries.

Fig. 3.5.5 shows the comparison between Ujung Pandang City and other major cities of Indonesia. The population density of major cities of Indonesia country are shown as population density of Perumnas. According to this Figure, the population density of Ujung Pandang City is slightly higher than other cities.

Fig. 3.5.6 shows the comparison between Ujung Pandang City and major cities of foreign countries such as Japan and England. The population density of a to d as described in Fig. 3.5.6 are illustrated in Fig. 3.5.7. According to this Figure, the population density of Ujung Pandang City is almost the same as population density of Nagoya and Senri New Town in Japan.



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Fig.

3.5.4

Population Dencity and Ring Road(2009)

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Table-3.5.1 Future Population and Density

Zone	1986 population	Planned Population (residential area)		2004 Population (1+2)		2009 Population		Population Density	
		(Persons)	(persons)	(persons)	(persons)	(persons/ha)	(persons/ha)	Gross (Kecamatan)	Net (residential area)
Central Zone	414,794	not planned	400,000	400,000	400,000	200	300		
Transitional Zone	320,217	469,000	790,000	790,000	100	150 - 200			
Border Zone	43,582	72,000	120,000	330,000	40	100			
				+ about 200,000					
Total	778,593	541,000	1,310,000	1,520,000	90	150			
		by the MASTER PLAN (= MASTER PLAN)		(= FRAME)					

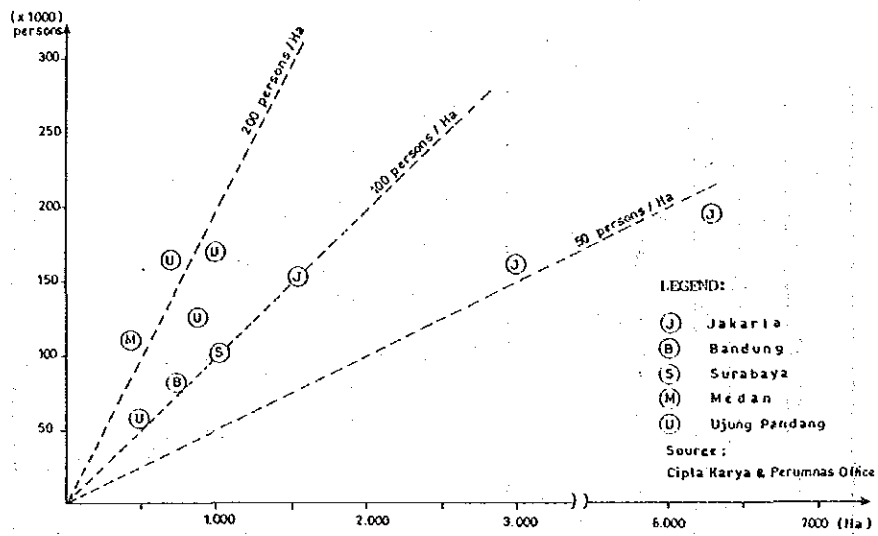


Fig. 3.5.5 Comparison of Population and Planned Area to Major Cities of Indonesia

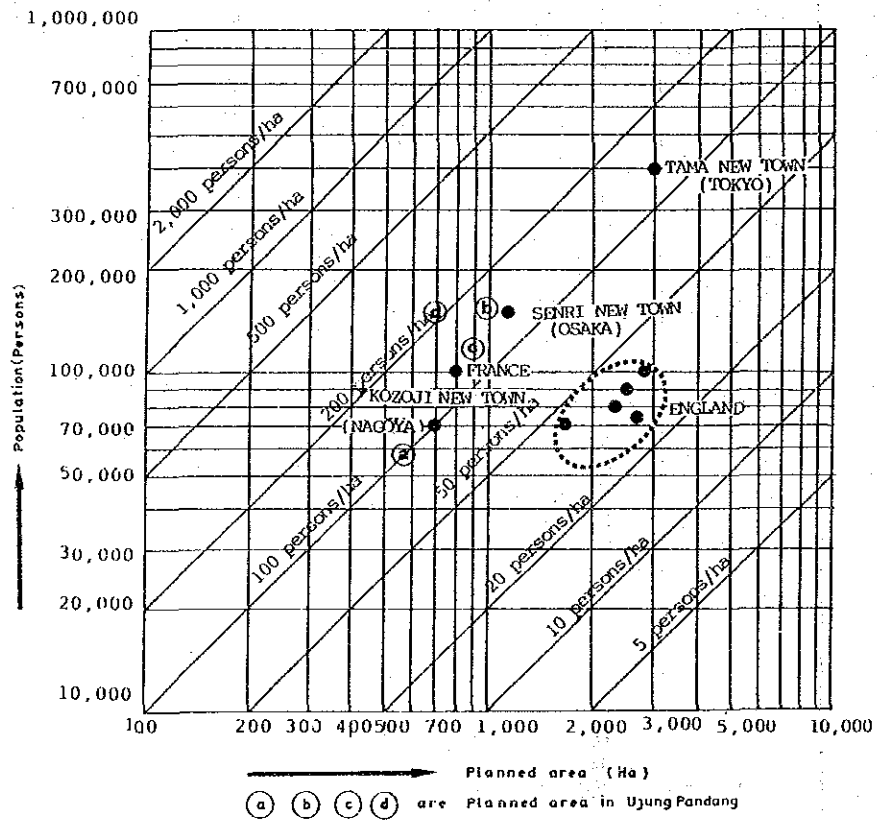
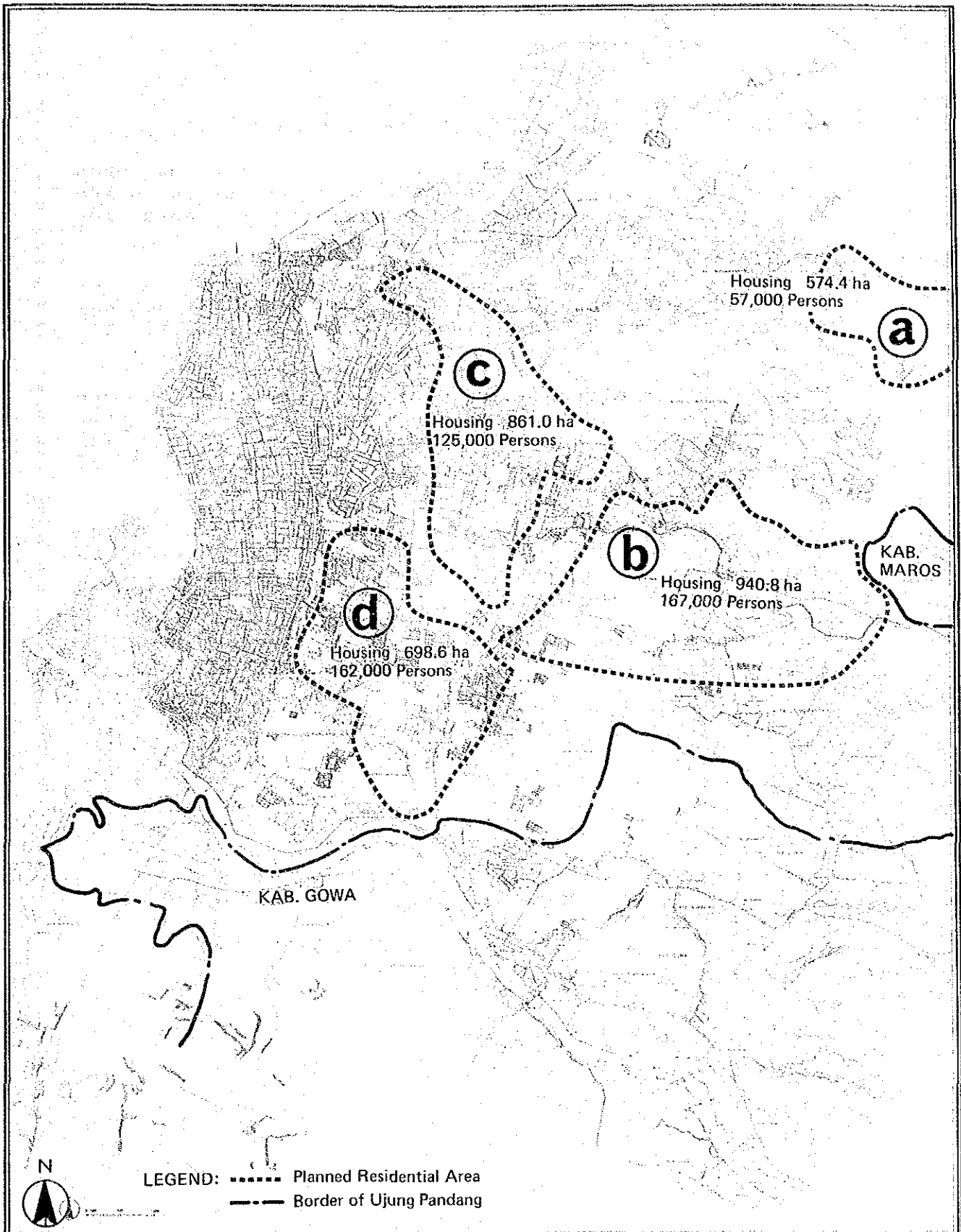


Fig. 3.5.6 Comparison of Population and Planned Area to Other Countries



**UJUNG PANDANG AREA  
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**Fig.**  
3.5.7

Planned Housing Area

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#### 3.5.4 Population Distribution to the Traffic Zone

Based on the allocation of population to three (3) zones previously mentioned, the population distribution to the traffic zone is carried out to find out the data for traffic projection study.

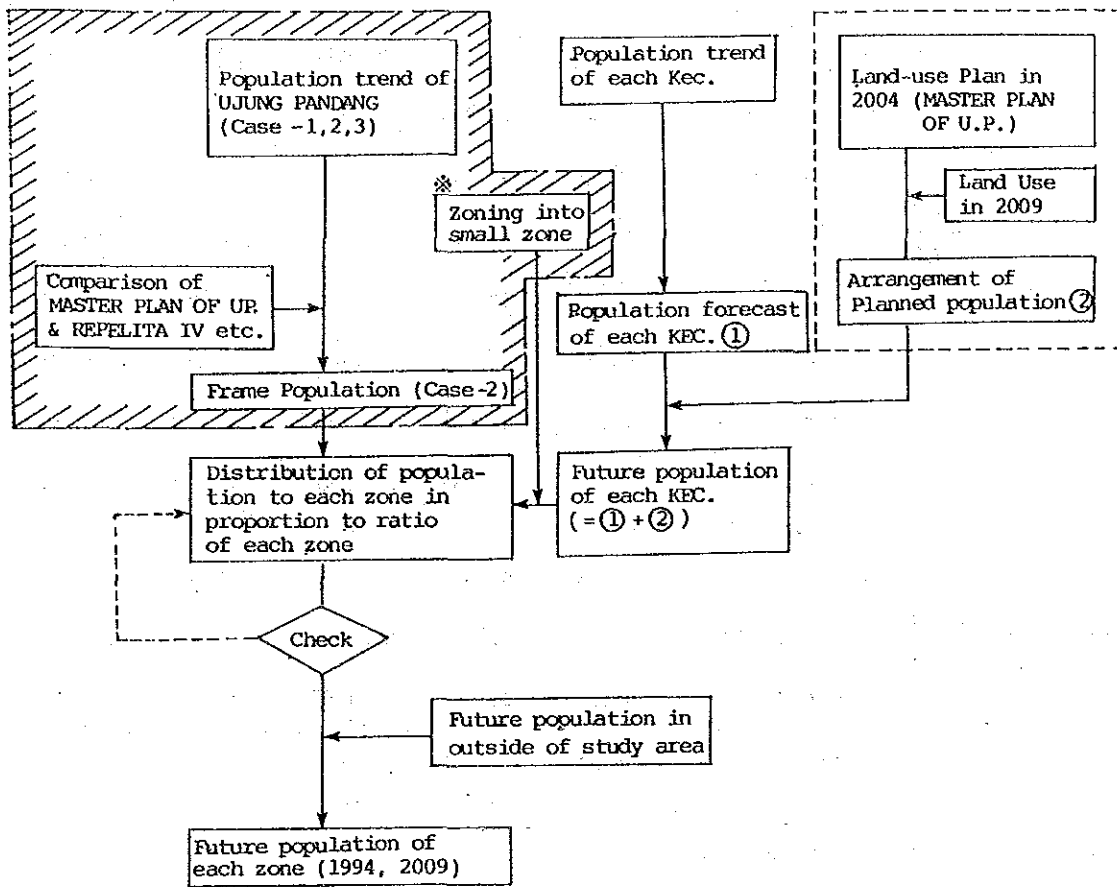
As presented in Fig. 3.5.8, firstly, the population of three (3) each zone is distributed to each Kecamatan. Secondly, distributed population to Kecamatan is distributed to each traffic zone.

The population distribution method to each traffic zone is illustrated in Fig. 3.5.8 and the results of distribution to each Kecamatan is shown in Table 3.5.2. The results of distribution to each traffic zone in 1988, 1994, 2004 and 2009 are shown in Appendix.

As the results of population distribution to each Kecamatan, the population density of each Kecamatan is changed as shown in Fig 3.5.9 compared with those in the year 1986 and the year 2009.

The trend of population of each Kecamatan in the year 1986, 1994 and 2009 are illustrated in Fig. 3.5.10.





 : INTERIM REPORT (1)

 : REVIEW OF LAND USE PLAN

\* Inside of study area : Zone Code 01-61

Outside of study area : Zone Code 62-70

**UJUNG PANDANG AREA  
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**Fig.  
3.5.8**

**Population Distribution Method into  
Each Zone**

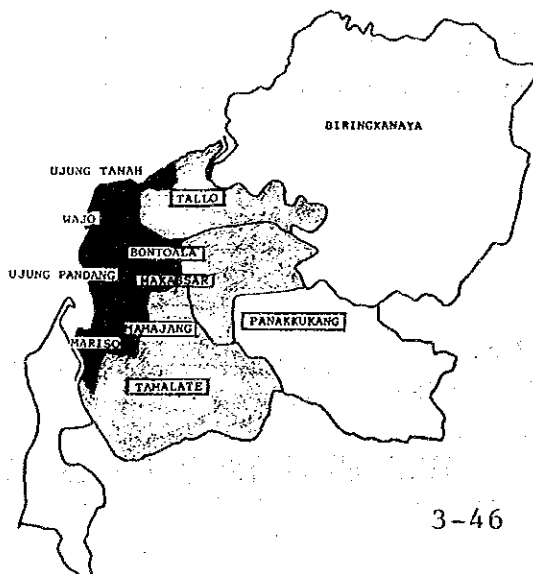
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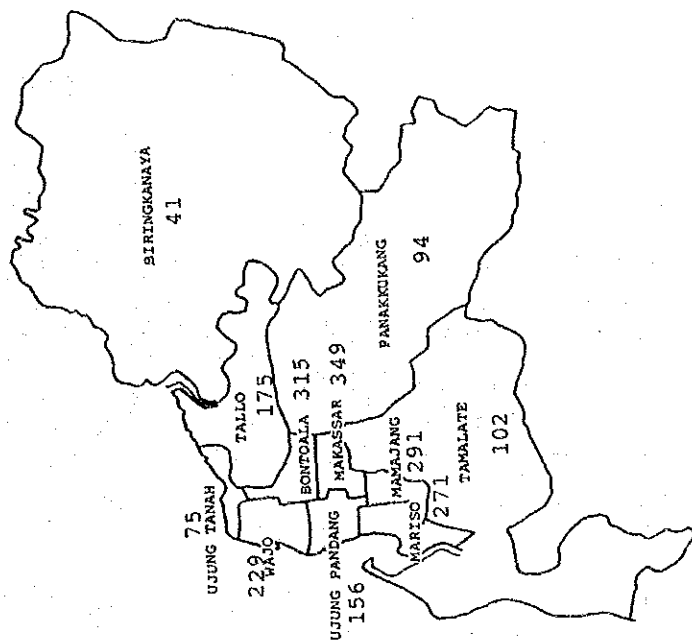
Table-3.5.2 Population Frame

(persons)

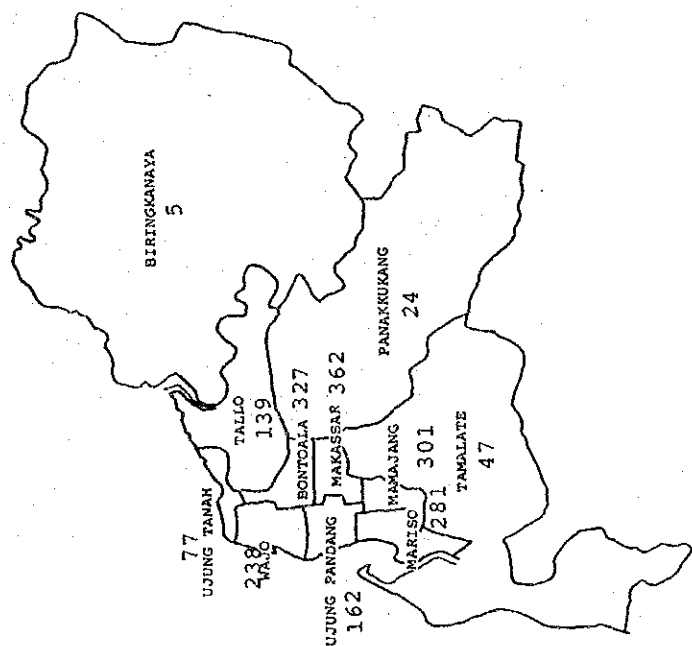
Zone of 3 sectors:	KECAMATAN (District)	1980	1986	1994	2004	2009
Central Zone	1. MARISO	52,685	51,127	50,400	49,600	49,600
	2. MAMAJANG	71,560	67,820	64,900	61,200	61,200
	3. MAKASSAR	102,973	91,291	80,700	67,500	67,500
	4. UJUNG PANDANG	44,102	42,658	41,900	40,900	40,900
	5. WAJO	49,186	47,299	46,100	44,600	44,600
	6. BONTOALA	68,073	68,631	71,300	74,600	74,600
	7. UJUNG TANAH	42,514	45,968	52,900	61,600	61,600
	Sub Total	431,093	414,794	408,200	400,000	400,000
Transitional Zone	8. TALLO	78,193	81,001	94,000	113,000	113,000
	9. PANAKKUKANG	68,022	99,764	204,000	375,000	375,000
	10. TAMALATE	99,502	139,452	211,000	302,000	302,000
	Sub Total	245,717	320,217	509,000	790,000	790,000
Border Zone	11. BIRINGKANAYA	31,655	43,582	58,800	120,000	330,000
	T O T A L	708,465	778,593	976,000	1,310,000*	1,520,000

\* Frame of Master Plan  
1980, 1986 by Sensus





Population Density in 2009



Population Density in 1986

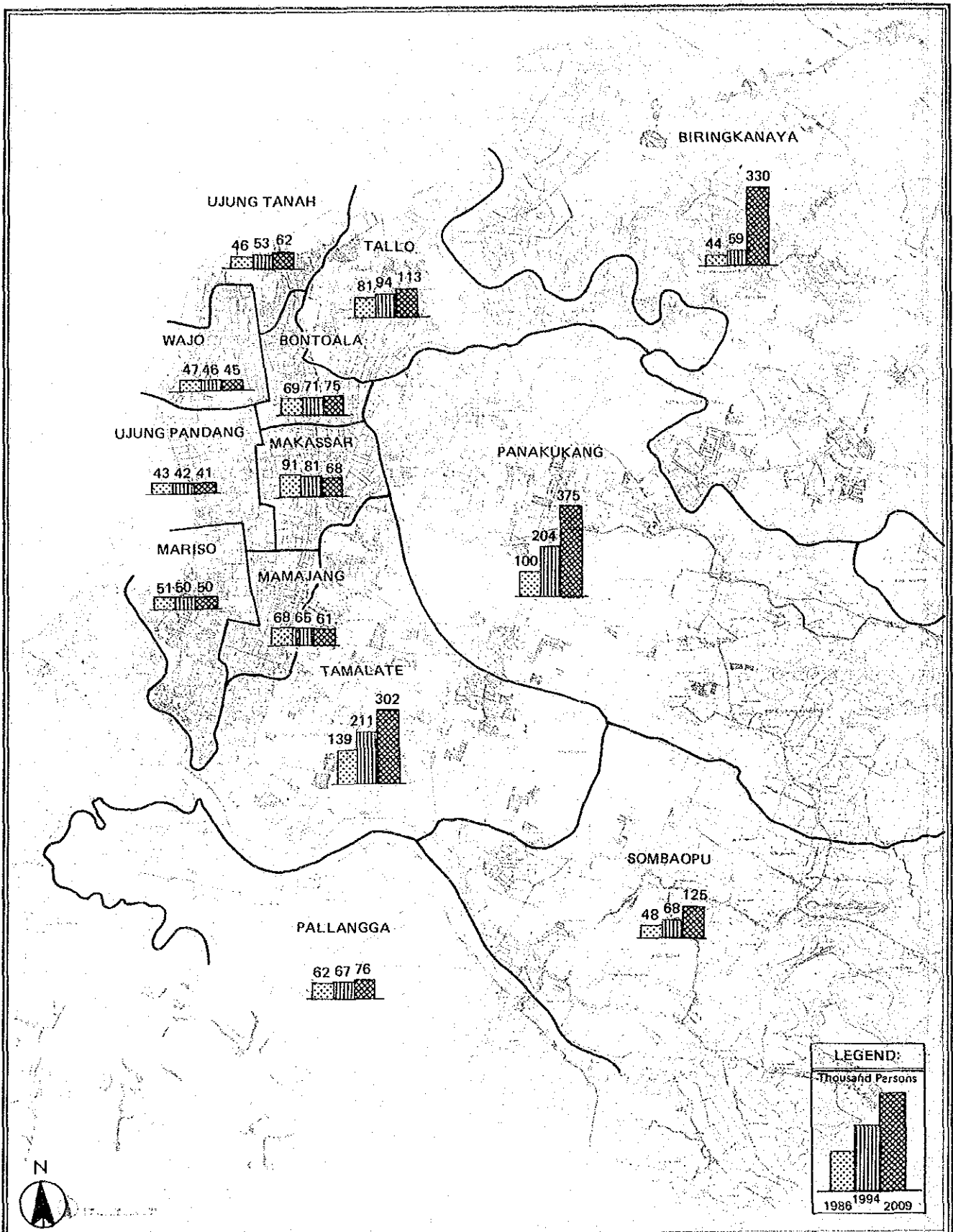
**UJUNG PANDANG AREA  
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**Fig.**

**3.5.9**

**Population Density (Gross)  
( persons/ha )**

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**Fig.**  
3.5.10

Trend of Population in Each Kecamatan

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### 3.5.5 Employment

#### 1) Employment Projection

Employment in this section is defined as the number of residents who have a regular occupation (fixed employment), and is different from 'the worker' mentioned in the next section. Hence, the number of 'employment' depends on the night-time population.

According to the data of Tenaga Kerja, the number of employment in Ujung Pandang has increased with the average annual increasing rate of 0.85 % from 1980 to 1986.

Year	Employment	Ratio to population
1980	210,913 (persons)	29.8 (%)
1981	202,980	28.5
1982	204,515	28.5
1983	209,803	28.5
1986	(215,724)	(28.5)

(1986 : by home interview survey as shown in Fig. 3.5.10)

This tendency is considered to continue until the target year 2009 on the assumption as follows :

- a) Declining birth rate  
(Decreasing tendency of the percentage share of age group under 7 years old).
- b) Inflow of working population into the city of Ujung Pandang.

Then the ratio of employment to the total population is forecasted to increase as follows :

Year	Ratio to Population
1983	28.5 (%)
1986	28.5
.....	.....
1994	29.2
2004	29.8
2009	30.4

The number of future employment is estimated by using the ratio above as shown in Table 3.5.3.

**Table 3.5.3 Employment Projection**

	1988	1994	2009
Ujung Pandang	215,700	285,000	462,000
Sombaopu & Pallanga	30,200	39,500	60,900
Total	245,900	324,500	522,900

The future employment in outside of Study area is also estimated in the same way as Study area.

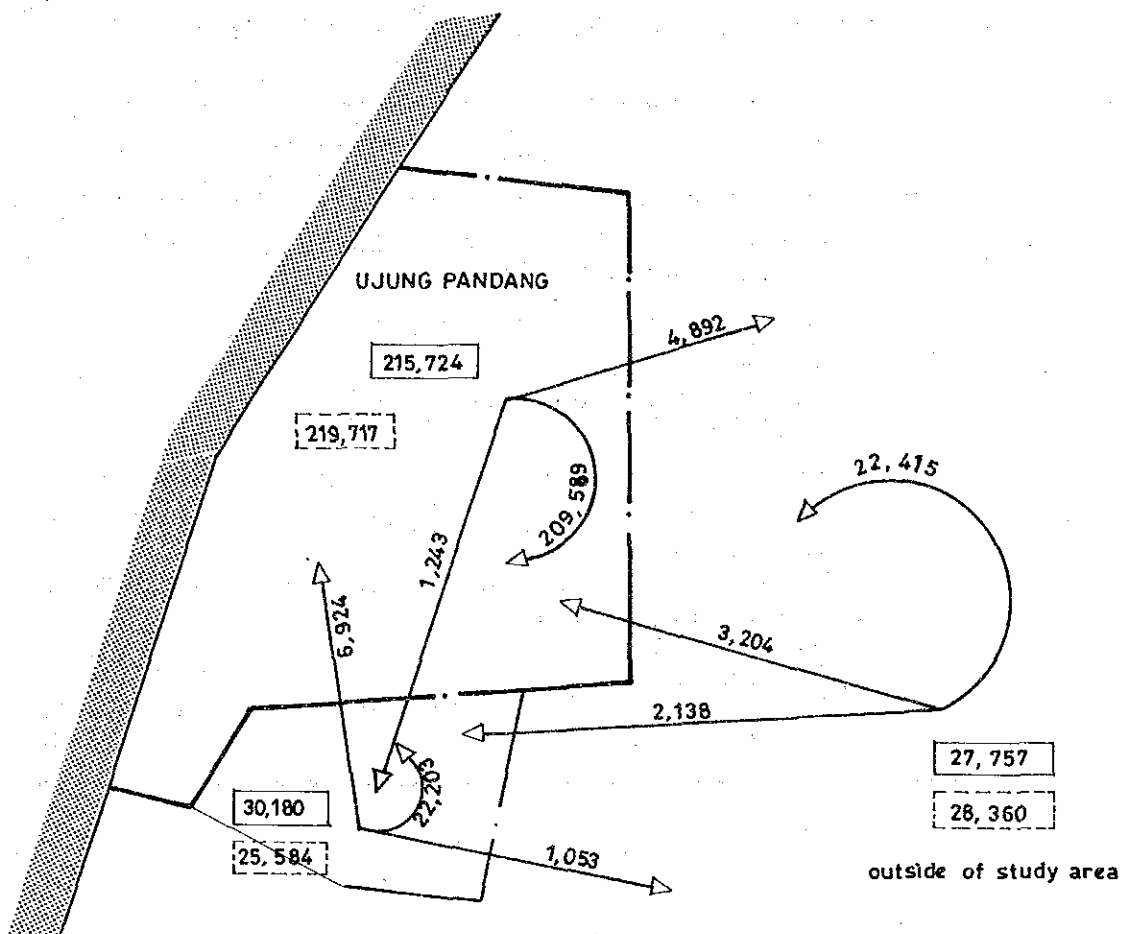
2) Employment in 3 Sectors

The future employment estimated above is subdivided into 3 sectors based on the present composition rate which is obtained from the home interview survey.

The definition of the three (3) sectors such as primary, secondary and tertiary is shown in Table 3.5.4. The estimated composition of employment in the years 1986, 1994 and 2009 are illustrated in Fig. 3.5.12.

3) Number of Employment of Each Traffic Zone

The number of employment of each traffic zone in the year 1986, 1994 and 2009 is calculated as shown in Appendix, on the basis of the existing employment by zone found by the Home Interview Survey.



NOTE :

- Total Employment (origin)
- Total Workers (destination)
- Trip/Day (all status)

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**Fig.**  
3.5.11

**Trip to Work  
(by Home Interview Survey)**

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Table 3.5.4 Kind of Occupation in Three Sectors

3 Sectors	Kind of Occupation
Primary	. Agriculture, Forestry, Hunting, Fishery . Mining and Quarrying
Secondary	. Manufacturing . Electricity, Gas and Water . Construction
Tertiary	. Wholesale and retail trade . Restaurant . Transportation, storage and Communication . Financing, Insurance, Real Estate and Business Service . Public Service (include activities not adequately defined, not stated)

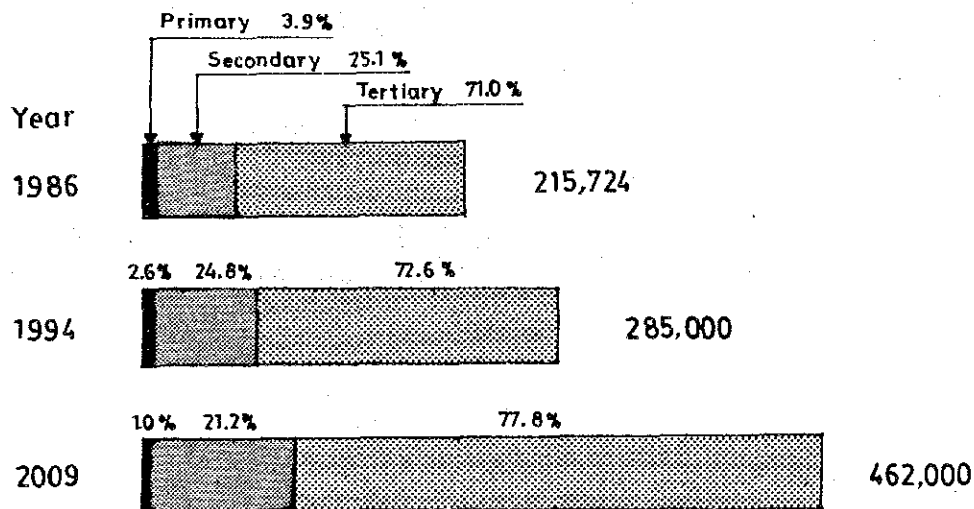


Fig. 3.5.12 Employment Composition in Ujung Pandang



### 3.5.6 Number of Workers

#### 1) Estimation Procedure

The definition of 'workers' in this section is 'the people who work at their employed place'. In the Study area, the statistical data on the workers are extremely poor; the only one available is that from the Home Interview Survey by the Study Team.

As shown in Table 3.5.5., the total number of workers in the Ujung Pandang is found to be 219,700 persons as of 1986. Based on these data, the future workers are estimated in accordance with the procedure shown in Fig. 3.5.13.

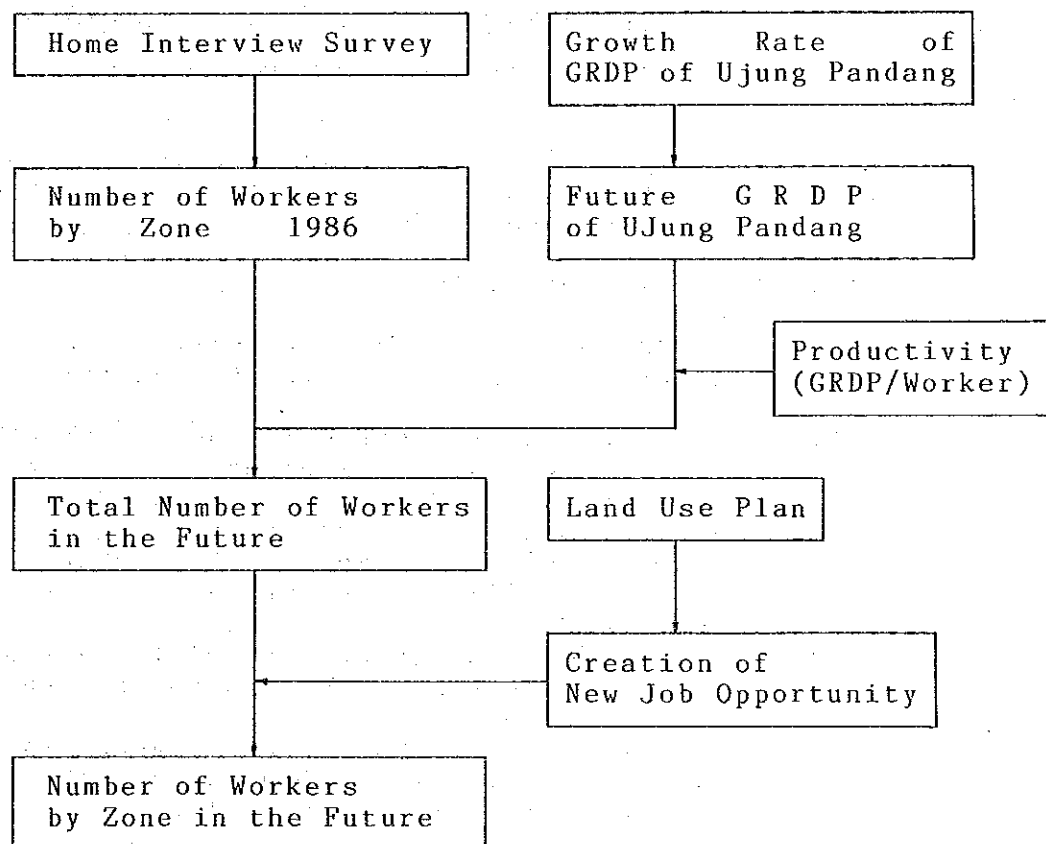


Fig. 3.5.13 Estimation Procedure of Future Workers

As will be described in Section 3.5.7, the GRDP of Ujung Pandang is forecasted to grow from Rp. 215 billion in 1985 to Rp. 822 billion in 2009. Assuming the labor productivity grows during the same period with the annual growth rate of 2.4 % which is estimated from the past trend, the total number of workers in Ujung Pandang in the year 2009 is estimated to be 469,000 persons.

The number of workers by three sectors is also estimated as shown in Table 3.5.5.

**Table 3.5.5 Number of Workers in Ujung Pandang**

Sector	1986	1994	2009
Primary	8,327 (3.8%)	7,400 (2.4%)	4,700 (1.0 %)
Secondary	56,431 (25.7%)	76,100 (24.9%)	101,900 (21.7%)
Tertiary	154,960 (70.6%)	221,700 (72.6%)	362,400 (77.3%)
Total	219,718 (100.0%)	305,200 (100.0%)	469,000 (100.0%)

Likewise, the total number of workers in Somba Opu and Pallanga is projected to grow from 18,000 persons in 1986 to 53,000 persons in 2009.

#### 4) Distribution Plan of Workers

The future workers by 3 sectors are distributed to each zone taking into account the following conditions:

- a) Central zone which is located in the center of Ujung Pandang is composed of 7 Kecamatan, Ujung Tanah, Wajo, Ujung Pandang, Mariso, Bontoala, Makassar and Mamajang. This zone is almost urbanized already, and will be completely urbanized in the future. Therefore, this zone will have no primary workers in the target year 2009.  
The number of secondary workers will increase not drastically but moderately due to the growth of the existing industries.  
The number of tertiary workers will grow in accordance with the further development of the central area as the center of the South Sulawesi.
- b) Transitional zone is a mixed zone in terms of land use, some of the swampy and agricultural area will be left as it is. However, some will be converted to residential area or other use. Hence, the number of primary workers will generally decrease, while secondary and tertiary workers will increase.
- c) Border zone is almost composed of Kecamatan Biringkanaya and this zone has large scale planned area which will have many workers, Industrial Estate, Educational Zone, Cargo terminal and Small Factory Collective Area (LIK).

Hence, the number of secondary and tertiary workers will tremendously increase in this zone.

(1) Primary Workers

In the central zone (composed of 7 Kecamatan), primary workers will be zero. For the other zones, the number of primary workers will gradually decrease according to the progress of urbanization.

(2) Secondary Workers

In the built-up area, the number of secondary workers will steadily increase due to the expansion of the existing industries and the establishment of the related small-scale industries. For the border zone, a large number of secondary workers can be expected through establishment of large-scale industries.

3) Tertiary Workers

Tertiary workers include various occupations such as government officials, sales and service workers, liberal profession, etc. According to the results of Home Interview Survey, the government official in Ujung Pandang is 91,978 persons which is about 60 % of the total tertiary workers in 1986.

The number of the government officials is expected to increase. The percentage share of the government officials to the total tertiary workers will decrease in accordance with the economic development, since sales and service sectors usually require more employment when the scale of economy grows.

On the other hand, sales and service workers are required by the corresponding sectors in commercial and business area. Accordingly, the tertiary workers are distributed by taking into account the present distribution pattern as well as the distribution plan of commercial/ business area stipulated in the future land use plan, with a due consideration to large scale development projects.

As a result, the central area such as Kec. Ujung Pandang, Wajo and sub-centers such as Kec. Panakkukang, Tamalate will have comparatively large working opportunities in the tertiary sector.

Based on the above distribution plan, the number of workers by three (3) sectors such as primary, secondary and tertiary is estimated as shown in Table 3.5.6 and Table 3.5.7. The trend of total workers in each Kecamatan is shown in Fig. 3.5.14.

**Table-3.5.6 Number of Workers by Three Sectors  
in Ujung Pandang (2009)**

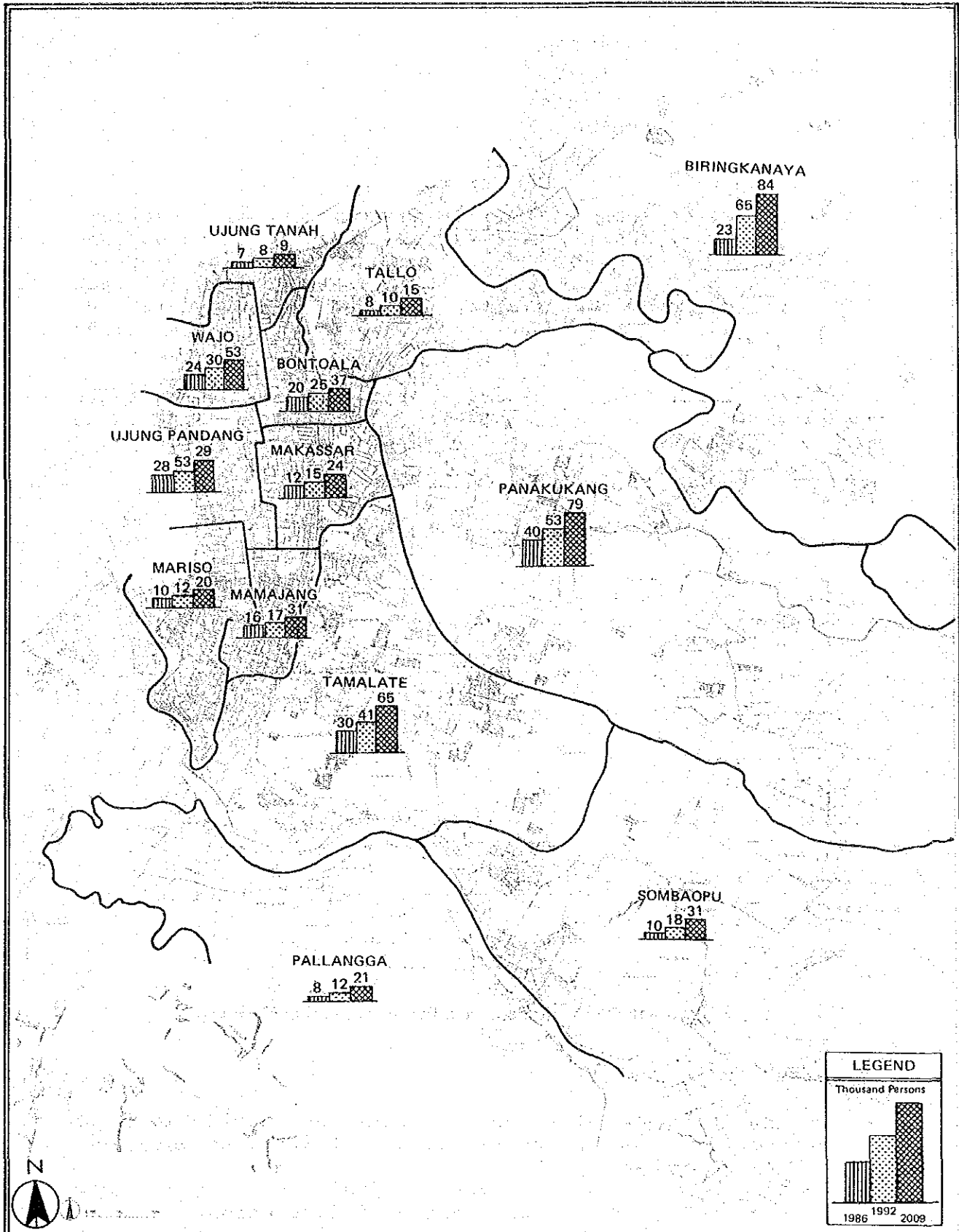
(persons)

Zone Code	Kecamatan (District)	Primary	Secondary	Tertiary	Total	Remarks
	Ujung Tanah	0	1,600	7,600	9,200	
	Wajo	0	3,800	47,100	50,900	
	Ujung Pandang	0	2,600	50,400	53,000	
	Mariso	0	2,400	17,800	20,200	
01	Tallo	900	5,100	9,400	15,400	
	Bontoala	0	6,800	30,100	36,900	
59	Makassar	0	3,200	20,700	23,900	
	Mamajang	0	5,400	25,700	31,100	
	Biringkanaya	900	48,600	34,700	84,200	industrial 32,000 educational 3,500 LIK * 8,000 sub center Daya 30,000
	Panakkukang	1,100	12,800	64,900	78,800	Sub center Antang 30,000
	Tamalate	1,800	9,600	54,000	65,400	
	Total	4,700	101,900	362,400	469,000	
Composition Rate		1.0 %	21.7 %	77.3 %	100.0 %	

\* LIK = Small Industrial Area

**Table-3.5.7 Number of Workers by Three Sectors  
in Zone 60,61 (2009)**

Zone Code	Kecamatan (District)	Primary	Secondary	Tertiary	Total	Remarks
60.	Sombaopu	4,600	2,900	24,300	31,800	
61.	Pallanga	3,100	1,900	16,200	21,200	
	Total	7,700	4,800	40,500	53,000	
Composition Rate		14.5 %	9.1 %	76.4 %	100.0 %	



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**Fig. 3.5.14**

**Number of Workers by Kecamatan**

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### 3.5.7 Students and Pupils

#### 1) Forecast Based on home

Number of students and pupils are composed of kindergarten, primary school, junior high school, high school and university or college, and depend on the night population. So, the number of students and pupils in each Kecamatan and each traffic zone can be estimated by dividing the total number in proportion to the night population.

Total number of students and pupils are calculated based on the future population of each age group and the ratio of attending school. The method is shown in Fig. 3.5.15.

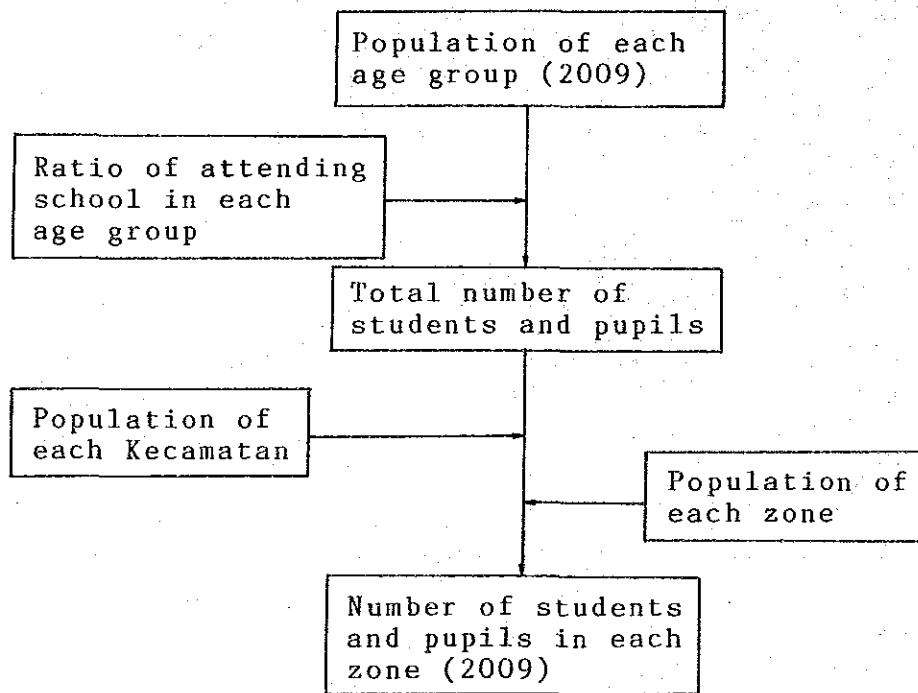


Fig. 3.5.15 Number of Students and Pupils Estimation Method

#### 2) Based on School (University)

To estimate the number of students and pupils based on school (based on the destination of trip to school), the following assumption is set:

- Kindergarten, primary school, junior high school, and high school are proportionate to population.
- Students of state university or college will increase by the increase plan, and students of private university are assumed to not increase in future based on the tendency in recent years, then the locations are assumed to remain at the existing site.

Calculation method is shown in Fig. 3.5.16. The number of schools in each Kecamatan is shown in Table 3.5.8, and future plan of students of each university is shown in Table 3.5.9.

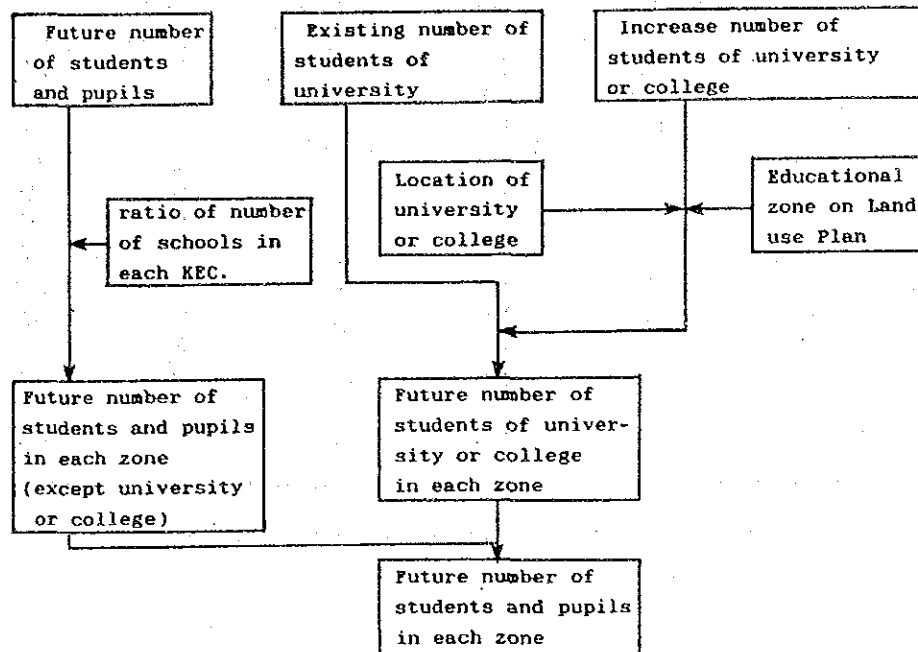


Fig. 3.5.16 Flow Chart to Estimate Number of Students and Pupils (based on school)

Table-3.5.8 Number of Schools in Each Kecamatan (1986)

Kecamatan	Kindergarten	Primary school	Junior High school	High school	Total
Marison	5	12	2	5	24
Mamajang	9	10	4	12	35
Makassar	12	23	-	16	51
Ujung Pandang	18	13	4	12	47
Wajo	8	11	2	10	30
Bontocala	13	10	8	9	40
Tallo	9	10	2	6	27
Ujung Tanah	5	11	4	3	23
Panakukang	32	14	2	19	67
Tamalat	28	17	4	26	75
Biringkanaya	9	14	10	10	43
T O T A L	148	145	42	128	463

Source : akotamadya Ujung Pandang Dalam Angka 1986

Table-3.5.9 Number of Students of University

Name of University	1985/1986 *1	1994	2004	2009	Zone Code
UNHAS	16,393	21,400	28,200	32,000	59
IKIP	9,982	13,100	17,200	19,500	51
IAIN	4,512	5,900	7,800	8,800	50
STIALAN	305	400	500	600	46
APDN	383	500	700	700	37
TOTAL	31,575	41,300*2	54,400*3	61,600*4	

Note : \*1 Source : each university  
 \*2 }  
 \*3 } Source : Buku Analisa  
 \*4 7,200 students increase per 5 years



### 3) Number of Students

The number of students at each traffic zone in the year 1988, 1994, 2004 and 2009 are calculated based on the estimation method previously mentioned.

The results are shown in Appendices and the trend of students and pupils in each Kecamatan in the year 1986, 1994 and 2009 are illustrated in Fig. 3.5.17.

### 3.5.8 Gross Regional Domestic Product (GRDP)

#### 1) GRDP of South Sulawesi

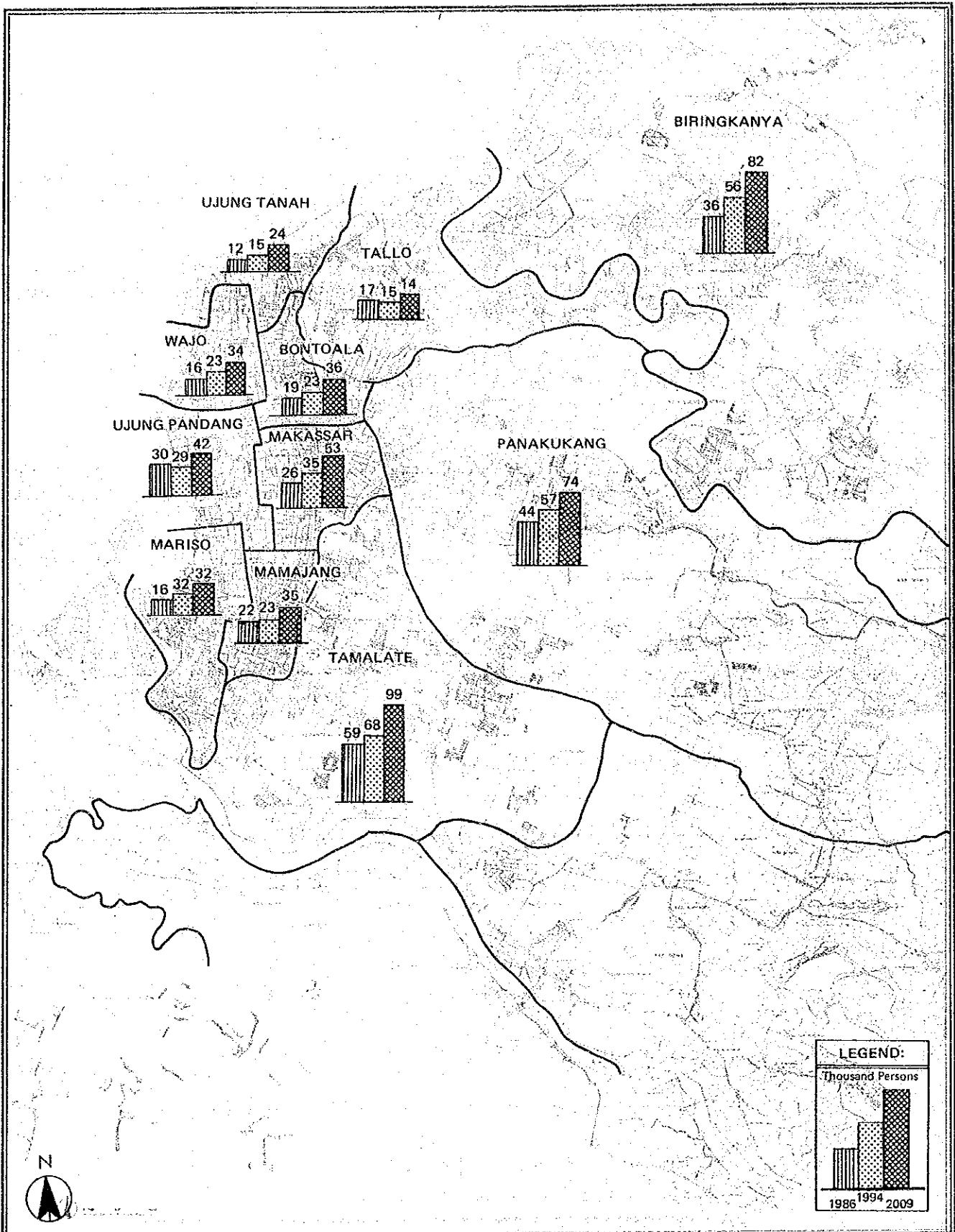
GRDP of South Sulawesi has grown from Rp. 551.7 billion in 1980 to Rp. 728.8 billion in 1986 at 1975 constant prices with the average growth rate of 4.7 % per annum. Past trend of GRDP of South Sulawesi shows almost the same growth as the national total i.e., Gross Domestic Product (GDP).

Assuming this tendency will continue in the future, the GRDP of South Sulawesi in the year 2009 will range from about Rp. 1,577 billion to Rp. 2,242 billion at 1975 constant prices.

Table 3.5.10 GRDP of South Sulawesi

(1975 constant prices)

Year		G R D P (RP. billion)	Average Annual Growth Rate (%)
1980		551.7	-
1986		728.8	4.7
1994	Low	969.0	3.6
	Medium	1037.0	4.5
	High	1079.0	5.0
2009	Low	1577.0	3.3
	Medium	1952.0	4.3
	High	2242.0	5.0



**UJUNG PANDANG AREA  
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**Fig.**  
3.5.17

Trend of Student and Pupils in  
Each Kecamatan (School based)

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## 2) GRDP of Ujung Pandang

The GRDP of Ujung Pandang has grown steadily during the recent 5 years from 1980 to 1985 with the growth rate of 6.2 % per annum, which is higher than that of South Sulawesi. This tendency is expected to continue in the future as well for that Ujung Pandang will fully function as the center of East Indonesia.

Hence, the GRDP of Ujung Pandang is projected to grow from Rp. 216,000 million in 1985 to Rp. 822,000 million in 2009 at 1980 constant prices.

**Table 3.5.11 G R D P of Ujung Pandang**

(1980 constant prices)

Sector	GRDP (Rp.million)			Ave. Annual Growth Rate (%)	
	1) 1985	2) 1994	2) 2009	'85-'94	'94-'09
Primary	11,973	14,700	19,800	2.3	2.0
Secondary	45,719	79,000	189,500	6.3	6.0
Tertiary	158,242	266,900	612,900	6.0	5.7
T O T A L	215,934	360,600	822,200	5.9	5.6

Source : 1) Produk domestik Bruto Kotamadya Ujung Pandang  
Bappeda Kantor Statistik Kotamadya Dati II  
Ujung Pandang 1981-1985

2) Estimated by Study Team

### 3.5.9 Household Income

#### 1) Present Condition

As a result of Home Interview Survey, household income distribution in the Study area was revealed as shown in Table 3.5.12.

**Table 3.5.12 Household Income Distribution  
In the Study Area**

Monthly Income	%
Rp. 50,000	5.4
Rp. 60,000	4.2
Rp. 80,000	7.7
Rp. 100,000	14.9
Rp. 150,000	20.4
Rp. 200,000	16.5
Rp. 250,000	11.3
Rp. 300,000	12.7
Rp. 500,000	6.9
Total	100.0
Average Income	Rp. 166,100

Average household income differs zone by zone. The average rate over the whole study area is found to be Rp. 166,100 per month. Fig. 3.5.18 shows more detailed income distribution corresponding to the average income by zone. Generally, the higher the average, the more high-income people live in the zone.

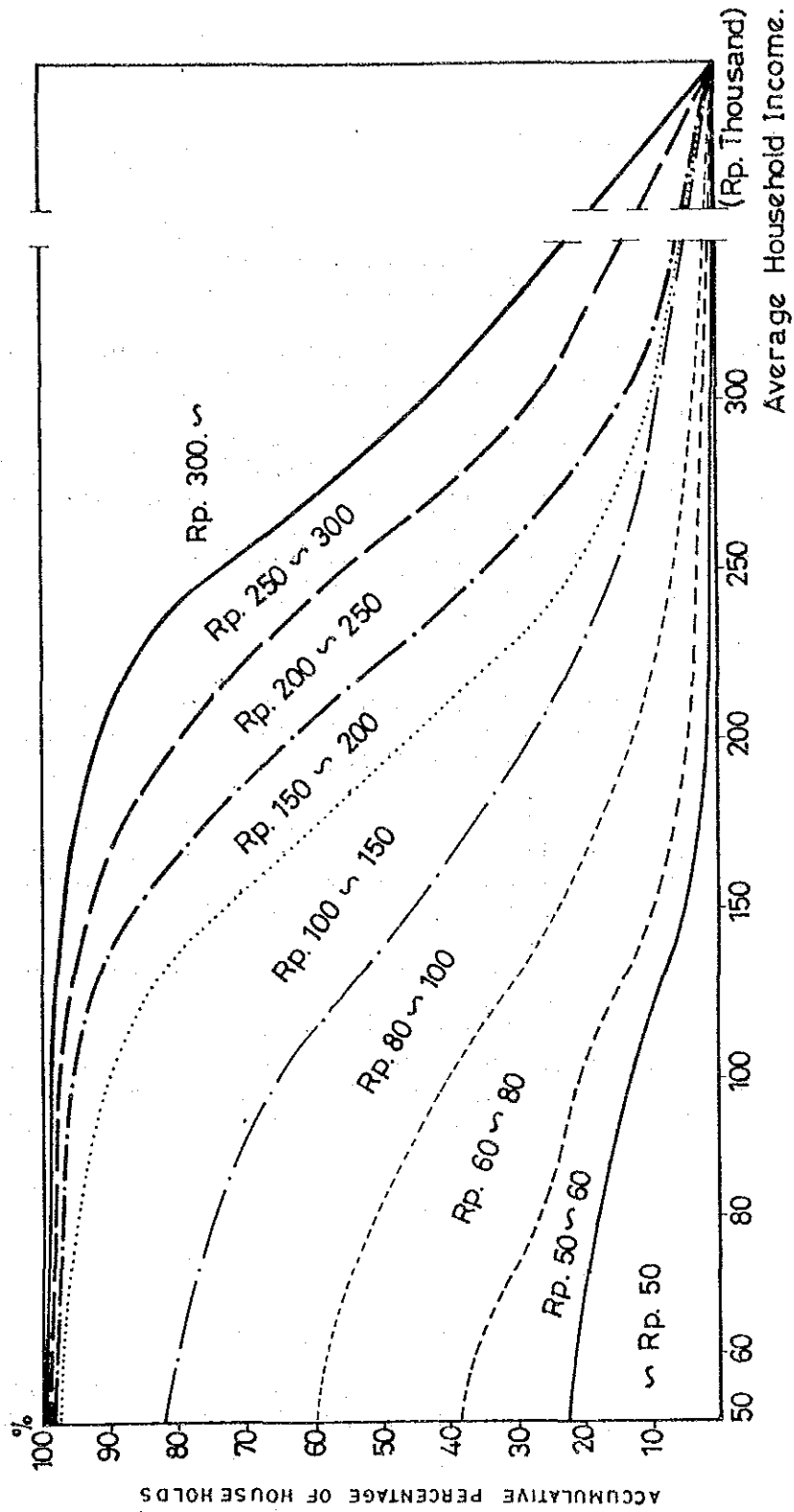
## 2) Projection

Household income is expected to increase in accordance with the economic growth, as well as the increase in the labor productivity in the region.

Assuming that the household income in the Study area grows in proportion to per capita GRDP of Ujung Pandang, and taking into account the decreasing tendency of household members in the coming decades, the average household income in the year 2009 is predicted to be Rp. 265,800.

**Table 3.5.13 Household Income Projection**

Year	Average Income	Annual Growth Rate (%)
1988	Rp. 166,100	2.6
1994	Rp. 193,800	2.1
2009	Rp. 265,800	



**UJUNG PANDANG AREA  
HIGHWAY DEVELOPMENT STUDY**

**Fig.**

**3.5.18**

**Household Income Distribution**

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### 3.5.10 Vehicle Ownership

#### 1) Present Condition

Number of vehicles and ownership rate in Ujung Pandang in the years 1975-1987 is shown in Table 3.5.14.

According to this table, the number of 4-wheeled motor vehicles has increased from 21,800 to 37,700 vehicles with the rate of 5.6 % in the past 10 years (1977-1987). The number of 2-wheeled motor vehicles has shown a remarkable increase from about 75,000 in 1977 to about 120,000 vehicles in 1987 with the growth rate of 4.8 % per annum. The ownership rate is 41 vehicles per 1,000 persons for 4-wheeled vehicles, and for 2-wheeled vehicles, 150 vehicles per 1,000 persons.

#### 2) Projection

After having examined various estimation methods, future vehicle ownership was projected by the following procedure as shown in Fig. 3.5.19.

Firstly, the past trend of vehicle ownership including motorcycles is analyzed to establish a logistic model. Secondly, the total number of vehicles in the future is forecasted by using the logistic model.

On the other hand, the relationship between household characteristics and ownership is analyzed by making use of the Home Interview Survey results. Based on the analysis, a disaggregate model is made to determine car and motorcycle ownerships. Finally, using this model, car and motorcycle ownership rates are calculated.

The first model for forecasting the total number of vehicles is obtained as follows:

$$Y = \frac{250}{1 + 0.63769 \exp(-0.084342 T)}$$

Where : Y : Total Vehicle Ownership incl. Motorcycles  
T : Year (Base Year : 1979)  
R : 0.916

As a result of the analysis on the relationship between vehicle ownership and household characteristics, it is found that household income is the most and sole influential factor in determining whether a household is a vehicle owner or not.

This relationship is illustrated in Fig. 3.5.20. Hence, the second model for determining either car owner or motorcycle owner is made as follows.

$$P_i = \frac{e^{U_i}}{e^{U_i} + e^{U_j}}$$

$$U_i = a_i x + E_i$$

Where :

$P_i$  : Probability of vehicle ownership category i

x : Household income

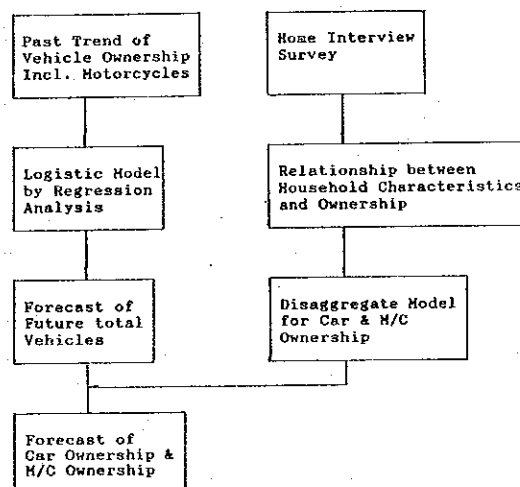
$a_i$  : Parameter for vehicle ownership category i

$E_i$  : Constant for category i

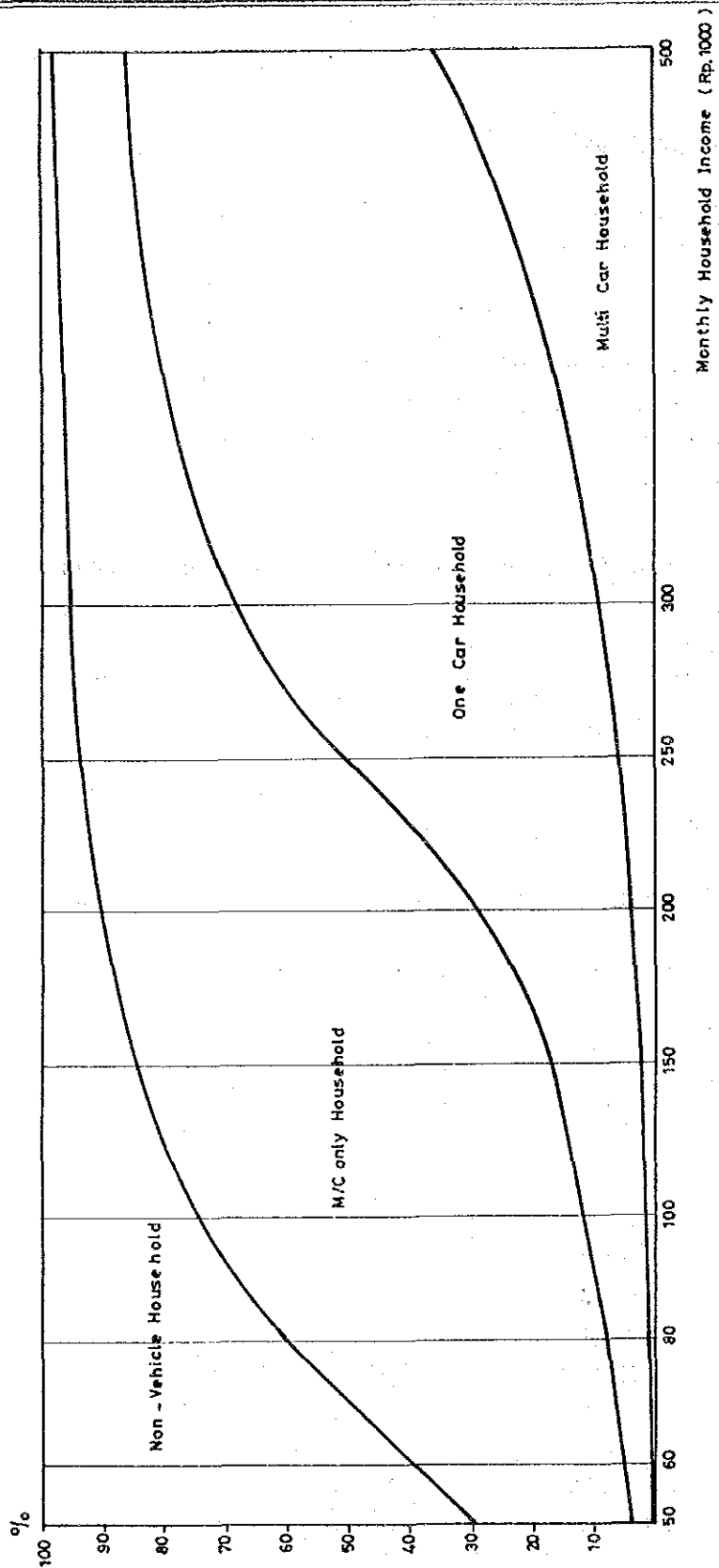
**Table-3.5.14 Number of Vehicles in Ujung Pandang**

Classi- fication	Year	1975	1977	1986	1987	Increase Rate (1977 - 1987)	Ownership Rate (vehicle/1000 persons)		Remarks
							1977	1986	
Passenger Car		5,640	7,425	11,746	12,958	5.7 %	12.3	15.1	Sedan, jeep St. wagon etc.
Truck		7,716	11,668	15,396	19,945	5.5	19.4	19.8	
Bus		1,047	2,720	4,450	4,778	5.8	4.5	5.7	incl. pete-pete, microlet
4-wheel vehicles Total		13,863	21,813	31,592	37,681	5.6	36.2	40.6	
2-wheel vehicles		49,638	75,037	115,541	118,658	4.7	124.6	148.4	motor bicycle, motor scooter
Total		63,501	96,850	147,133	156,339	4.9	160.8	189.0	

Source : Kotamadya Ujung Pandang Dalam Angka (Monografi dan Analisa kota)  
Bappeda Kotamadya Dati II Ujung Pandang  
Table of DAFTAR (1986,1987)



**Fig. 3.5.19 Estimation Procedure for Future Vehicle Ownership**



**UJUNG PANDANG AREA  
HIGHWAY DEVELOPMENT STUDY**

Fig.

3.5.20

Relationship between Household Income and Vehicle Ownership

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As a consequence, the number of vehicles and vehicle ownership in Ujung Pandang are projected as shown in Table 3.5.15 and Table 3.5.16 respectively.

The total number of 4-wheel vehicles and motorcycles in Ujung Pandang will grow from 37,681 and 118,658 in 1988 to 182,000 and 180,900 in 2009 respectively.

Accordingly, the ownership in 2009 is estimated to be 120 vehicles/1000 persons for 4-wheel vehicles and 119 vehicles/1000 persons for motorcycles.

**Table-3.5.15 Motor Vehicle Projection**

Vehicle Type	Number of Vehicles			Average Annual Growth Rate (%)	
	1987	1994	2009	'87-'94	'94-'09
4-wheel vehicle	37,681	59,700	182,000	6.5	7.8
Motorcycles	118,658	149,700	180,900	3.4	1.3
<b>T O T A L</b>	<b>156,399</b>	<b>209,400</b>	<b>362,900</b>	<b>3.6</b>	<b>3.7</b>

**Table-3.5.16 Vehicle Ownership Projection**

Household Type	Number of Household			Average Annual Growth
	1987	1994	2009	'87-'09
Non Vehicle Owner	50,627	43,700	40,600	-1.0%
M/C Only	66,537	83,900	101,500	1.9%
4-wheel Vehicle Owner	33,523	53,100	161,900	7.4%
<b>T O T A L</b>	<b>150,687</b>	<b>180,700</b>	<b>304,000</b>	<b>3.2%</b>



## CHAPTER 4 TRAFFIC PROJECTION



## CHAPTER 4 TRAFFIC PROJECTION

### 4.1 General

The procedure of traffic projection is shown in Fig. 4.1.1.

Since the traffic is a result of socio-economic activities, the future perspectives of surrounding conditions should be duly taken into account in forecasting future traffic demand. The relationship between traffic projection and the surrounding conditions is also shown in the figures calculated in each step.

The master file of person trips is derived from the Home Interview Survey. Based on the analysis of the existing person trip characteristics with a special attention to the relationship with the socio-economic conditions, the traffic forecasting model is formulated.

The forecasting procedure in this study is composed of 4 steps; Trip generation/attraction, trip distribution, modal split and traffic assignment. Each step requires a corresponding forecasting model.

#### 1) Step 1 : Trip Generation and Attraction

The total trip production is generally forecasted at the first step and used as a control total for estimating the zonal transport demand. The zonal transport demand in terms of trip generation and attraction is obtained by establishing a trip generation/attraction model based on the existing demand characteristics.

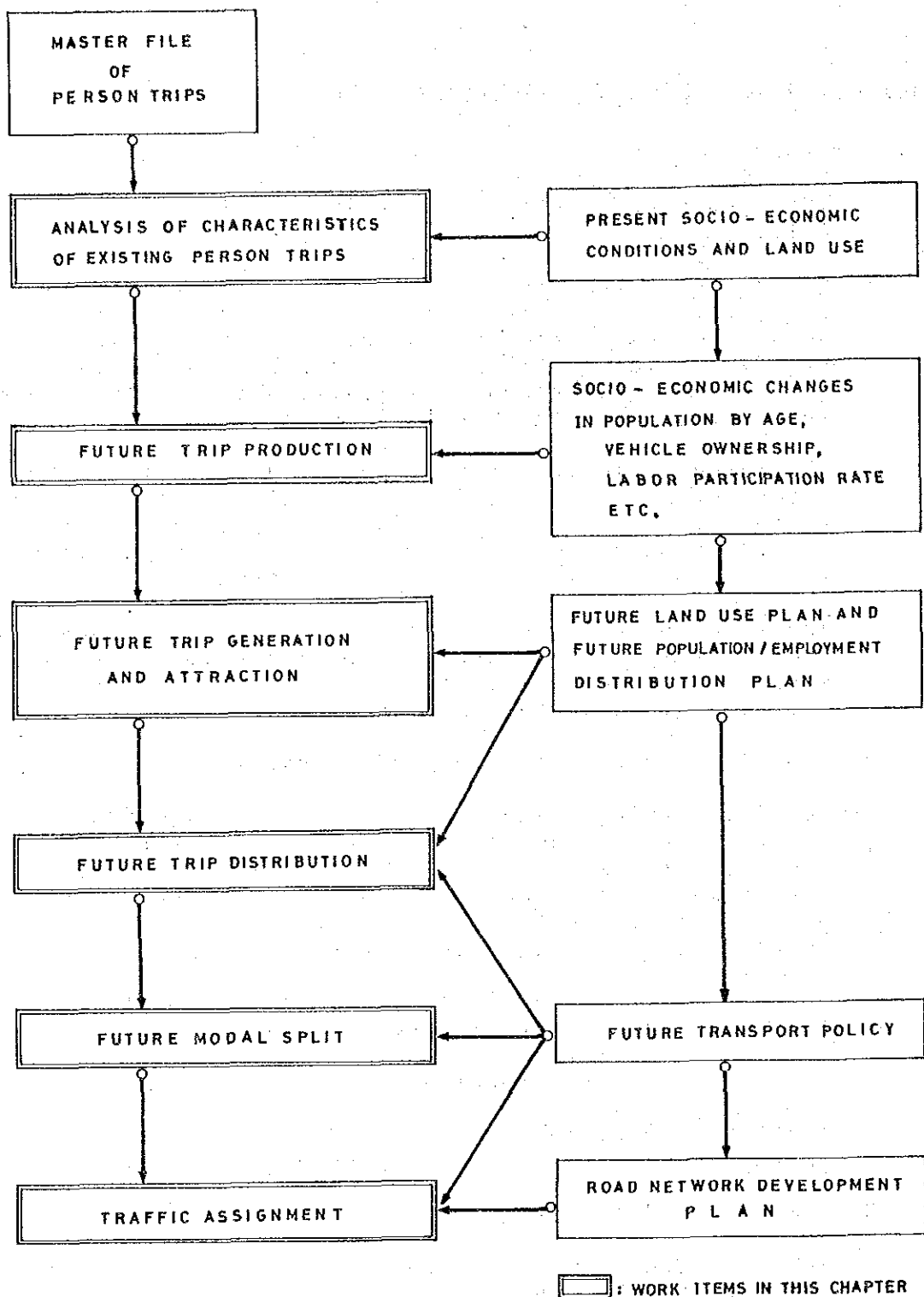
The socio-economic changes and land use plan in the future are usually reflected in this step.

#### 2) Step 2 : Trip Distribution

The future Origin-Destination (O-D) table is forecasted in this step by using trip distribution model.

#### 3) Step 3 : Modal Split

As the third step, the future modal composition is forecasted. Modal composition is affected by the transport policy undertaken by the government. For instance, if a policy which gives advantages for public transport is taken, the modal share of public transport will increase. In this study, the modal composition is estimated under the basic policy described in the succeeding section.



**UJUNG PANDANG AREA  
HIGHWAY DEVELOPMENT STUDY**

**Fig.**

**4.1.1**

**Procedure for Future Traffic Demand Forecast**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

#### 4) Step 4 : Traffic Assignment

Future person trips are converted to vehicle trips by using average occupancy rate. Finally, the vehicle trips are assigned to the road network proposed in Chapter 5.

This four-step procedure is applied only for forecasting the internal trips generated in the main Study area where Home Interview Survey has been carried out.

As for the external trips or through trips, a more simple method, i.e. a growth rate method is applied. Since the external and through trips make up only 3 % of the total person trips in the Ujung Pandang area, the influence on the forecasting accuracy of the total is not significant.

Generally, the forecast is made by trip purpose in each step except the final step. The trip purpose in this study is classified as follows:

- a) To work
- b) To school
- c) To home
- d) Business
- e) Private

## 4.2 Basic Policy for Long-term Urban Transport Planning

### 4.2.1 Overview of Present and Foreseeable Transport Conditions

As described in Chapter 2, the Ujung Pandang area is already encountering with various transport problems; a chronic traffic congestion on the arterial roads such as Jl. Gowa Jaya, Jl. Gowa Raya etc. is a typical problem. This is mainly attributed to the insufficient road network accompanied with the rapid motorization in the recent years.

Mixed traffic use of road space is another notable characteristic. High speed vehicles are running on the same lane with many low-speed vehicles such as becaks, bicycles, etc., which creates a frequent conflict between those vehicles. In addition, curb parking and indiscriminate pedestrian crossings are making the traffic condition more disordered and sometimes hazardous. Without any countermeasures, these situations will be more aggravated in the future.

The population of the Ujung Pandang area is forecasted to increase from 890,000 in 1986 to 1.7 million in 2009, and about 6,300 hectares of land will be developed for urban activities in the Study area. Household income in the year 2009 is predicted to increase as much as 1.6 times the present level. The growth in income level is closely related to the growth of car ownership.

Those economic development will result in a large increase in transport demand, as will be seen, about 2.5 times the present vehicular travel demand.

This will make the traffic conditions in the built-up area more acute and require new facilities in the newly urbanized area.

### 4.2.2 Basic Policy

In establishing future urban transport system, the following objectives can be identified :

- a) To support and promote the socio-economic development of the Ujung Pandang area.
- b) To pursue a social equity for transportation of the urban poor.
- c) To create and maintain a high quality of urban environment.



The objectives are interpreted as following targets :

- a) Satisfaction of transport demand
- b) Effective use of existing transport facilities
- c) Assuring the mobility for all the residents with equal access to transport services
- d) Compatibility with the future urban structure and land use plan
- e) Improvement of traffic safety
- f) Creation of higher quality of urban environment and beautification of urban landscape

In order to achieve the above targets, the following development measures are to be considered :

- (1) Road network development including related facilities
- (2) Public transport development
- (3) Improvement of traffic management
- (4) Traffic demand control measures including private vehicle use restriction and effective vehicle usage.

Among them the item (3) is deemed as a short-term measure, which is elaborated in Chapter 6. Therefore, the basic policy of the other three measures are described below.

#### 1) Road Network Development

The future road network should be established taking into consideration the future land use pattern, the future transport demand and the effective use of the existing network. The future urban structure has the following characteristics :

- a) Although a part of urban function such as commercial and cultural activities will be dispersed to the peripheral area of the city, the central area will function as the center of Ujung Pandang area in the future as well.
- b) Commercial and business district will further expand along the major streets such as Jl. Gowa Jaya (Urip Sumaharjo), Jl. Gowa Raya (St. Alauddin) and Jl. A. Pettarani.
- c) Industrial area will be formed at the existing Industrial Estate and the area along Jl. Toll (Prof. Dr. Ir. Sutami).
- d) Three growth centers will be established at Daya, Antang and Sungguminasa.

Accordingly, the future road network will be formulated in accordance with the following concepts :

- a) The radial linkages connecting the three growth centers with the central area of Ujung Pandang should be enhanced.
- b) The circumferential linkage connecting among the three growth centers should be established as well. This linkage may have at the same time a function a bypass of the central area.
- c) New residential area to be developed in the future should also be covered by an adequate road network.
- d) When the industrial area is fully occupied, a number of heavy-vehicle trips are expected. The future network should accommodate those heavy vehicle trips without creating an adverse effect on the surrounding area.

## 2) Public Transport Development

In accordance with the increase of transport demand, public transport should be developed to provide a transport mode equally to all the people and to contribute to a decrease of private vehicle use.

The present public transport is served by bus, mini-bus, microlet, pete-pete and becak. These forms of public transport will remain in the future, however, their roles may be changed in accordance with the following basic policy :

- a) Becaks will be gradually replaced by motorized vehicles such as buses, mini-buses, taxis etc. Hence, becaks should be excluded from major roads and be limited to use only for short haul trips in a certain area.
- b) Bus size should be strategically selected in accordance with the transport demand. On the trunk routes, pete-petes and microlets should be replaced by higher capacity buses. Accordingly, pete-petes and microlets should be operated only for feeder routes.

In addition, for the purpose of enhancing public transport system, the following measures are to be considered :

- a) The function of existing major bus terminals will be changed. The intercity bus operation at Pasar Sentral, Panaikang and Pa'baeng-baeng should be shifted to the new terminals which will be constructed at the peripheral area of Ujung Pandang. Accordingly, those terminals are changed to exclusively urban bus use in the long term.

- b) The public transport capacity should be expanded by reorganizing the bus route pattern, increasing the service frequency, introducing exclusive bus lanes and replacing buses to higher capacity types. The reorganization of bus route network will be made by expanding the coverage area to new residential zones and enhancing several trunk routes in conjunction with the construction of new terminals.
- c) The bus transport, however, has a limit in terms of transport capacity, since it is difficult to drastically expand the road spaces inside the built-up area. Hence, an introduction of a rail transit system might be examined for higher capacity of public transport in the future.

### 3) Traffic Demand Control Measures

As a traffic demand control measure, the following can be listed up :

- a) Restriction of private vehicle Use
  - \* Pricing policy on private modes
  - \* Control of car ownership
  - \* Parking control
- b) Effective use of Vehicles
  - \* Share-riding
  - \* Priority lane for high-occupancy vehicles

In the Ujung Pandang area, however, these measures are not appropriate to apply at least for the coming decade, since the car ownership rate is still low and the public transport system is still at a premature level.

### 4.3 Traffic Demand Forecast

#### 4.3.1 Trip Production

Trip production is defined as the total number of person trips made by the residents in the Study area. In forecasting the future trip production, changes in socio-economic characteristics should be duly taken into account.

As a result of the home interview survey, the following characteristics were observed with regard to the trip production rate in the Study area :

- a) Vehicle ownership gives a significant influence on the trip production rate. The latter increases in accordance with the vehicle ownership rate.
- b) Status is another influential factor for the trip production rate. There is a big difference between workers and non-workers.
- c) Trip production rate also differs by sex, age and income. Among them, sex composition rate will not significantly change in the future. Age and income structures may change in the future, however, they can be taken into account by considering changes of status and vehicle ownership composition rates.

These findings indicate that the following factors are effective in explaining the person trip production :

- a) Status of each resident
- b) Vehicle ownership

Accordingly, the trip production is expressed by the following formula :

$$T_k = \sum_i \sum_j r_{ij} P_{ij}$$

Where :

- $T_k$  : Trip production by trip purpose (k)  
 $r_{ij}$  : Trip production rate by trip purpose (k), status (i) and vehicle ownership (j)  
 $P_{ij}$  : Population by status (i) and vehicle ownership (j)

The population by status in the Study area for the target years 1994 and 2009 is estimated as follows on the basis of the population projection by age group, future labor force, school attendance rate, unemployment rate, etc. which are elaborated in Chapter 3 :

**Table 4.3.1 Population by Status**

	1 9 8 6		1 9 9 4		2 0 0 9	
	Population	%	Population	%	Population	%
Worker	245,905	34.7	324,500	35.6	522,000	36.6
Student	310,531	43.7	390,700	42.8	575,500	40.3
House wife	111,685	15.8	144,800	15.9	239,900	16.8
Others	39,571	5.6	52,500	5.7	90,600	6.4
<b>Total</b>	<b>707,692</b>	<b>100.0</b>	<b>912,500</b>	<b>100.0</b>	<b>1,428,000</b>	<b>100.0</b>

Note : Population in the table shows 7 year old and above persons.

The population by vehicle ownership in the target years is calculated as follows based on the vehicle ownership projection as described in Chapter 3 :

**Table 4.3.2 Population by Vehicle Ownership**

	1 9 8 6		1 9 9 4		2 0 0 9	
	Population	%	Population	%	Population	%
Non-vehicle Owner	237,766	33.6	220,800	24.2	190,600	13.3
Motorcycle Owner	312,487	44.2	423,400	46.4	476,700	33.4
Car Owner	157,439	22.2	268,300	29.4	760,700	53.3
<b>Total</b>	<b>707,692</b>	<b>100.0</b>	<b>912,500</b>	<b>100.0</b>	<b>1,428,000</b>	<b>100.0</b>

Note

- 1) Population shows 7 year old and above persons
- 2) Owner or Non-owner is defined by the ownership of this household
- 3) Motorcycle Owner indicates the person whose household owns motorcycle only.

As a result of the changes in status and vehicle ownership, the trip production in the year 1994 and 2009 is estimated as shown in Table 4.3.3.

Table 4.3.3 Trip Production in The Study Area

Trip Purpose	1988 <sup>1)</sup>		1994 <sup>2)</sup>		2009 <sup>2)</sup>		Growth Rate
	Trip Production Rate (person trips/day)	Trip Production (person trips/day)	Trip Production Rate (person trips/day)	Trip Production (person trips/day)	Trip Production Rate (person trips/day)	Trip Production (person trips/day)	
To work	0.31	224,248	0.32	292,000	0.35	493,800	2.23
To School	0.52	376,172	0.52	474,500	0.50	714,000	1.90
To home	1.37	1,003,608	1.39	1,268,380	1.43	2,042,040	2.03
Business	0.08	57,003	0.08	73,000	0.09	128,520	2.25
Private	0.60	440,193	0.61	556,620	0.64	913,920	2.03
Total	2.88	2,101,224	2.92	2,664,500	3.01	4,928,280	2.05

Source : 1) Home Interview Survey  
2) Estimated by Study Team

#### 4.3.2 Trip Generation and Attraction

Trip generation and attraction are defined as the number of trips generated/attracted by each zone. Accordingly, if a zone is densely populated or economically active, then the zone will generate or attract more person trips.

Generally, the influential factors in determining trip generation and attraction are the number of residents, land use and urban facilities such as commerce, industries, infrastructure, etc.

Taking into account the data availability by zone in selecting the factors to explain the trip generation and attraction, the estimation model is established by trip purpose.

By employing a linear-regression analysis, the relationships between the trip generation/attraction and the explanatory variables are determined. The general formula is as follows :

$$T_i = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + \dots + a_nx_n .$$

where :

$T_i$  : Trip generation or attraction in zone  $i$   
 $x_1 - x_n$  : Zonal explanatory variables  
 $a_0$  : constant  
 $a_1 - a_n$  : coefficients

After examining various formulas by changing the combination of explanatory variables, the formula is calibrated by trip purpose by generation and attraction. The results are shown in Table 4.3.4 and Table 4.3.5.

By using the generation/attraction model, future zonal demand is estimated by applying the future trip production as the total. The estimated trip generation/attraction is shown in Fig. 4.3.1 in terms of trip ends.

The growth rate of trip generation/attraction in the suburban area of Ujung Pandang is extremely high, in Kec. Biringkanaya, for instance, the number of trip ends grows from 221,000 person trips in 1988 to 456,000 person trips in 1994 and 1,126,000 person trips in the year 2009.

On the other hand, the growth rate in the built-up area is relatively low, particularly in the central area i.e. Kec.Wajo and Ujung Pandang, the trip generation/attraction in 2009 is only 1.35 times that in 1988.

Table 4.3.4 Trip Generation Model

Trip Purpose	Vehicle Ownership	Model	Correlation Coefficient
To work	Non - Owner	$G = 140.7 + 0.056089 PN$	0.802
	M/C - Owner	$G = -26.4 + 0.28022 PM$	0.926
	Car - Owner	$G = 78.5 + 0.39657 PC$	0.906
To school	Non - Owner	$G = -40.8 + 0.24986 PN$	0.966
	M/C - Owner	$G = 200.7 + 0.41829 PM$	0.909
	Car - Owner	$G = 430.4 + 0.49207 PC$	0.857
To Home	All	$G = 3096.1 + 0.11682 P + 2.4804 E$	0.900
Business	Non - Owner	$G = 40.3 + 0.021918 E_{23}$	0.685
	M/C - Owner	$G = 124.7 + 0.067008 E_{23}$	0.818
	Car - Owner	$G = 123.6 + 0.074602 E_{23}$	0.684
Private	Non - Owner	$G = -239.6 + 0.31415 PN$	0.957
	M/C - Owner	$G = 257.2 + 0.37582 PM + 0.12048 E_{23}$	0.858
	Car - Owner	$G = 340.3 + 0.50845 PC + 0.21959 E_{23}$	0.858

Note :

G : Trip Generation (person trips/day)  
 PN, PM, PC : Population by Vehicle Ownership  
 ( N : Non-vehicle owner, M : Motorcycle Owner  
 C : Car (4-wheel Vehicle) Owner )  
 P : Total Population  
 E : Total Employment by Working Place  
 E<sub>23</sub> : Employment in Secondary and Tertiary Sectors  
 by Working Place

Table 4.3.5 Trip Attraction Model

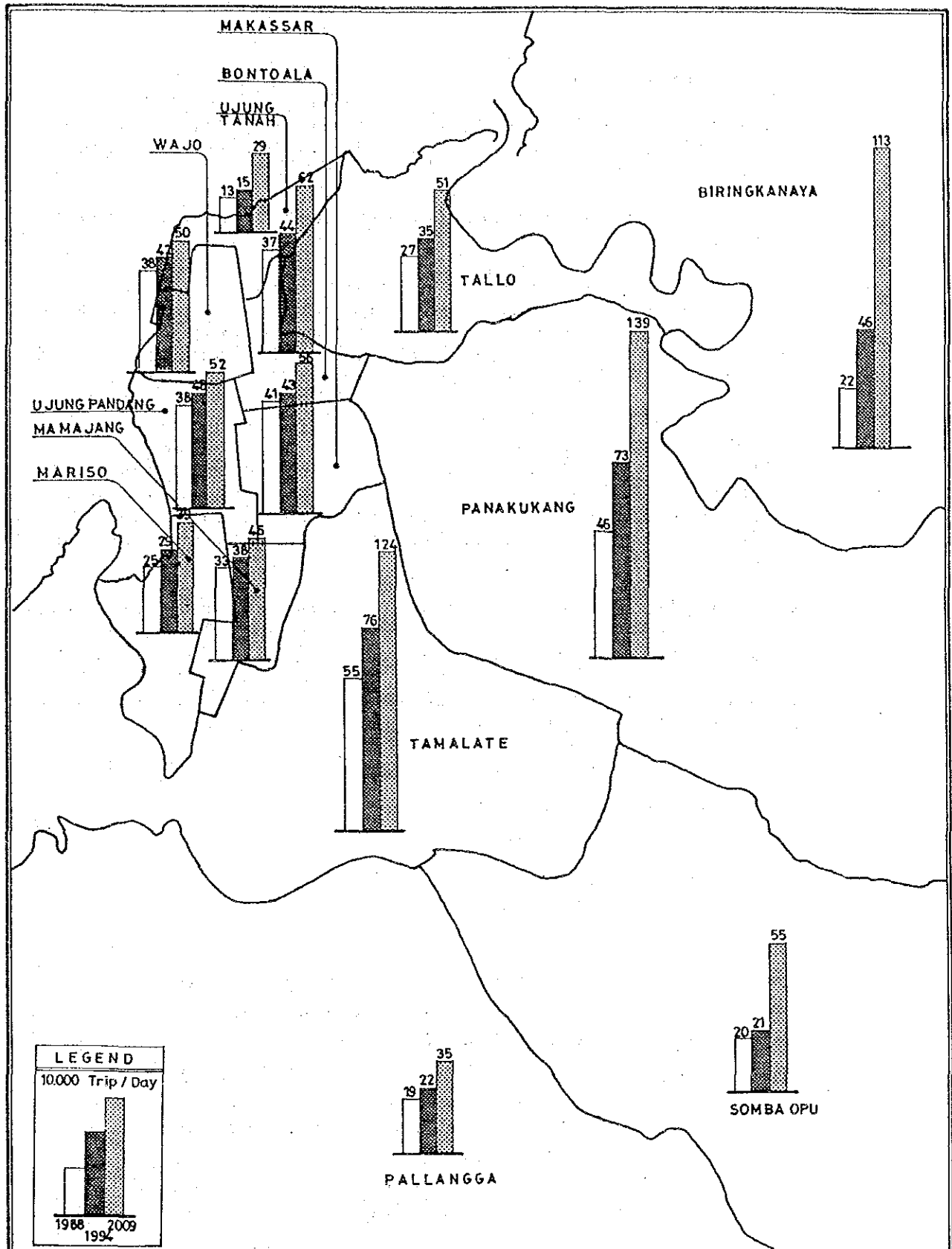
Trip Purpose	Vehicle Ownership	Model	Correlation Coefficient
To Work	All	$A = -96.3 + 0.83748 E_{23}$	0.990
To school	All	$A = 250.7 + 1.18410 S$	0.993
To Home	Non - Owner	$A = -134.9 + 0.64249 PN$	0.983
	M/C - Owner	$A = 226.5 + 1.1391 PM$	0.943
	Car - Owner	$A = 956.8 + 1.4530 PC$	0.927
Business	All	$A = 62.3 + 0.22913 E_3$	0.779
Private (Inner Area)	All	$A = -570.6 + 0.51340 P + 0.40613 E_{23}$	0.813
Private (Owner Area)	All	$A = -237.8 + 0.31026 P + 0.42069 E_{23}$	0.921

Note :

"Inner Area" indicates the area inside of Jl. Veteran (Zone No. 1 ~ 37, 40,41) and "Outer Area" indicates the rest of the study area

A : Trip Attraction (person trips/day)  
 E<sub>23</sub> : Employment in Secondary and Tertiary Sectors  
 by Working Place  
 S : Number of Students by School Address  
 PN, PM, PC : Population by Vehicle Ownership  
 (Refer the notes under the Table 4.3.4 )  
 P : Total Population  
 E<sub>3</sub> : Employment in Tertiary Sectors by Working Place





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**Fig.**  
**4.3.1**

**Future Trip Generation / Attraction**

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### 4.3.3 Trip Distribution

There are several methods for estimating trip distribution. After examining several models, the following method was selected :

- A mixed use of present pattern method and a gravity model.

The trip generation and attraction will generally increase in the future corresponding to the socio-economic growth in each zone. For estimating the trip distribution pattern in the future, the following points should be taken into consideration :

- a) The existing trip pattern of the trips moving within the built-up area will remain in the future.
- b) In the case of sub-urban area, however, a new trip pattern will be created by various development projects such as housing, sub-centers, industrial estates, etc. as identified in the future land use plan.

Accordingly, the gravity model is applied only for estimating the trip distribution of incremental volume of trip generation/attraction. The future O-D table, therefore, can be obtained by summing up the existing trip distribution and the incremental trip distribution estimated by the gravity model.

The gravity model employed in this study is as follows :

#### 1) Interzonal Trip Model

$$T_{ijk} = K_k \frac{\alpha_k \beta_k G_{ik} A_{jk}}{\gamma_k D_{ij}}$$

Where :  $T_{ijk}$  : Interzonal trip of trip purpose k between zone i and zone j.

$K_k$  : Constant by trip purpose k

$G_{ik}$  : Trip generation of trip purpose k in zone i

$A_{jk}$  : Trip attraction of trip purpose k in zone j

$D_{ij}$  : Distance between zone i and zone J

$\alpha_k, \beta_k, \gamma_k$  : Parameters by trip purpose k

#### 2) Intrazonal Trip Model

$$T_{iik} = K_k Z_i^{\alpha_k} [\min (G_{ik}, A_{ik})]^{\beta_k}$$

Where :  $T_{iik}$  : Intrazonal trip of trip purpose k

- in zone i
- $K_k$  : Constant by trip purpose k  
 $Z_i$  : Area of zone i  
 $G_{ik}$  : Trip Generation of trip purpose k  
in zone i.  
 $A_{ik}$  : Trip attraction of trip purpose k  
in zone i  
 $\alpha_k, \beta_k$  : Parameters by trip purpose k.

**Table 4.3.6 Trip Distribution Model**

	Parameters for Interzonal Trip Model				Parameters for Intrazonal Trip Model			
	k				k			
To work	0.2866	0.4150	0.4522	0.2171	0.19800	0.9318	0.4467	
To school	0.8394	0.4820	0.4138	0.4541	0.57566	0.9053	0.3024	
To home	0.0204	0.6441	0.6567	0.5560	0.09276	1.1031	0.2714	
Business	2.4455	0.2307	0.3026	0.0771	0.44119	0.7235	0.6532	
Private	0.2022	0.4550	0.5140	0.3572	0.28442	0.9578	0.3805	

Note : Interzonal Trip Model

$$T_{ij} = k \cdot \frac{G_i \cdot \alpha_j}{D_{ij}}$$

Intrazonal Trip Model

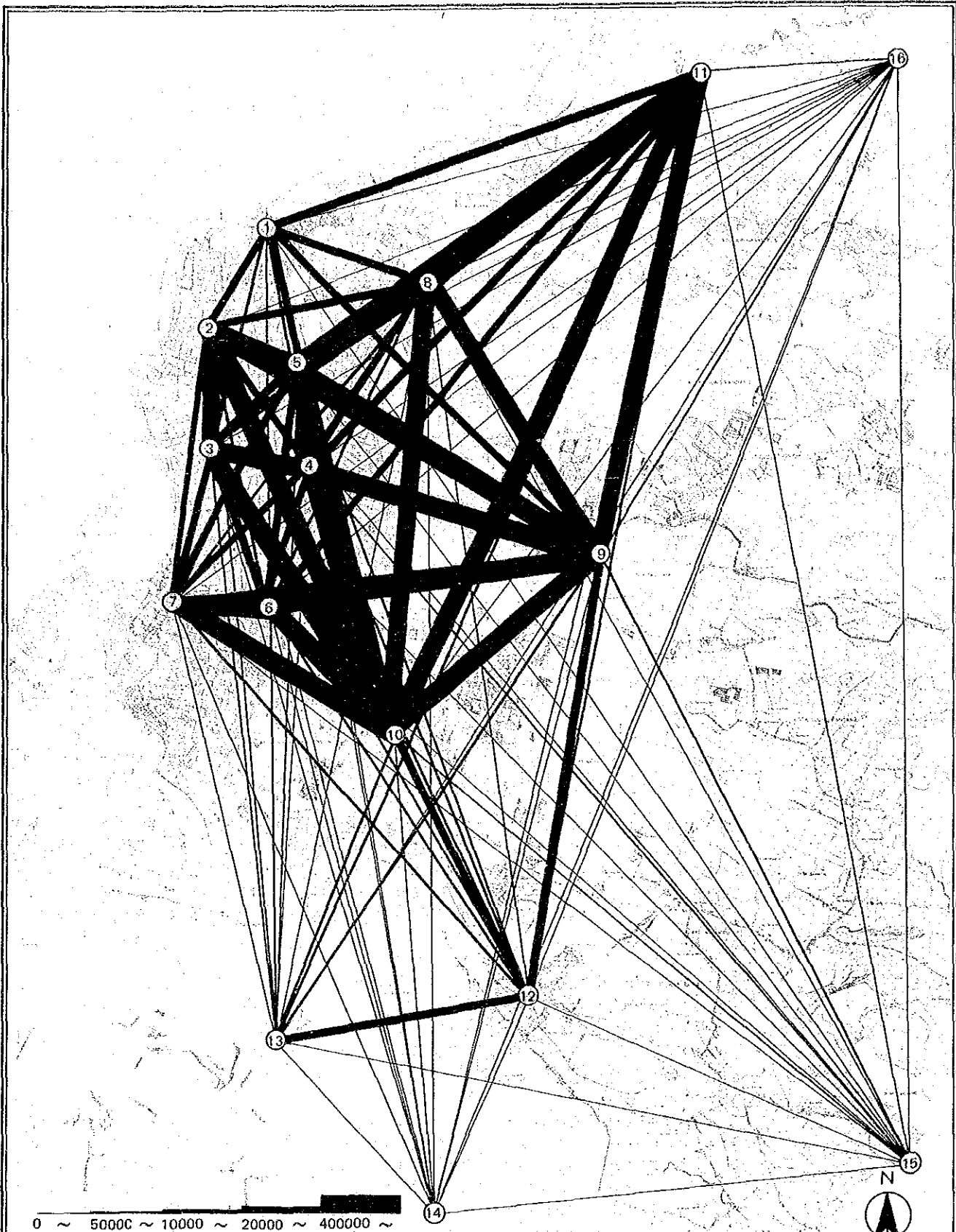
$$T_{ii} = k \cdot [\min(G_i, A_i)] \cdot Z_i$$

As a result, the desire lines of O - D pattern in the year 2009 are illustrated in Fig. 4.3.2.

The growth rate of person trips between the inside area of Jl. Andi Pangerang Pettarani and the outside area is comparatively high, about 2.4 times the present person trips, while the growth rate of the trips inside area of Jl. A. P Pettarani is low, remains only about 25 % increase.

In the case of the outside area of Jl. A.P. Pettarani, growth of the person trips among Kec. Biringkanaya, Panakukang and Tamalate is remarkable, about 3.0 times the present demand. As for the trip pattern by purpose, the following observations can be noted :

- a) In the case of work trips, the present commuting pattern remains in the year 2009. However, a remarkable change in the trip pattern can also be found. The residents in the newly urbanized area, mainly Kec. Biringkanaya and Panakukang, tend to work in the areas adjacent to their residences, owing to the new job opportunities mainly created at sub-centers.
- b) A considerable portion of school trips continues to be attracted to the areas where educational facilities concentrate at present such as Kec. Tamalate,



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**Fig.**  
4.3.2

Desire Line 2009 (Based on Person)

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Kec. Ujung Pandang and Kec. Bontoala due to the continuation of the existing pattern and the expansion of the existing facilities.

However, a concentration to new residential areas is also found, since some new schools would be established in these areas in correspondence with the population growth.

- c) As for business, the growth in Kec. Biringkanaya and Kec. Wajo is remarkable, reflecting full operation of Industrial Estate and expansion of port activities.
- d) Private purpose trips show a strong linkage between the residential area and the central area or sub-centers.

Table 4.3.7 shows the future average trip length by purpose. In accordance with the expansion of urbanized area, the average trip length will increase from 4.27 Km in 1988 to 4.65 Km in 1994 and 6.00 Km in 2009.

Table 4.3.7 Growth of Average Trip Length

unit: (Km)

Trip Purpose	1988	1994	2009
Work	5.41	5.90	7.31
School	3.76	4.07	4.96
Home	4.14	4.58	5.82
Business	5.87	6.51	8.45
Private	4.19	4.53	5.66
Total	4.27	4.65	6.00