2.3.3 Employment

In the Indonesian census system working age is considered as 10 years and above and that population group is classified into economically active and economically non-active. The former is defined as the labor force and is further sub-divided into employed and unemployed (job-seeking) groups.

The labor force participation rate (LFPR) in the rural areas is generally higher than in the urban areas, except in the case of DKI Jakarta (refer to Table-2.3.7).

Labor force participation rate in DKI Jakarta is decreasing, however in West Java it has gradually increased as seen in Table-2.3.8. In particular the LFPR for total population in respective region (LFPR (2) in Table-2.3.8) shows rapid increase in all regions. If economic development will continue at the current pace, in the near future the rate will reach 40% throughout Indonesia.

Meanwhile the employment rate is also very high, exceeding 96% in all regions, although there is some reservation to these figures due to some doubt in the reliability of the survey method (refer to Table-2.3.7).

Table-2.3.7 Employment in Year 1980

Unit: 1,000 persons

	DKI JAKARTA	WEST JAVA	CENTRAL & EAST JAVA	INDONESIA
(Urban Area)				
Popu.>=10 years	4,414.9	4,149.5	8,381.1	24,090.7
Econ. Active Popu.	1,895.6	1,590.5	3,840.8	9,968.9
LFPR	42.9%	38.3%	45.8%	41.4%
(Rural Area)				
Popu.>=10 years	269.3	1,496.2	33,951.2	80,261.9
Econ. Active Popu.	108.9	7,018.8	18,970.4	42,184.4
LFPR	40.4%	46.9%	55.9%	52.6%
(Urban+Rural)				
Popu.>=10 years	4,684.2	19,112.7	42,332.3	104,352.6
Econ. Active Popu.	2,004.5	8,609.3	22,811.1	52,153.3
Employed Population	1,924.0	8,426.2	22,487.0	51,257.0
LFPR	42.8%	45.0%	53.9%	50.0%
Employment Rate	96.0%	97.9%	98.6%	98.3%

Note : LFPR = Labor Force Participation Rate
Source: HASIL SENSUS PENDUDUK 1980

Table-2.3.8 Growth of Employment

Unit: 1,000 persons

DKI JAKARTA	1971	1980	1985
Popu.>=10 years	3,126.4	4,684.2	5,965.2
Econ. Active Popu.	1,351.4	2,004.5	2,538.8
LFPR (1)	43.2%	42.8%	42.6%
LFPR (2)	29.7%	30.9%	32.2%
WEST JAVA	1971	1980	1985
Popu.>=10 years	14,418.6	19,112.7	22,356.9
Econ. Active Popu.	6,689.3	8,609.3	10,777.4
LFPR (1)	46.4%	45.0%	48.2%
LFPR (2)	30.9%	31.4%	35.0%
CENTRAL & EAST JAVA	1971	1980	1985
Popu.>=10 years	34,724.4	42,332.3	46,607.3
Econ. Active Popu.	18,891.8	22,811.1	26,553.7
LFPR (1)	54.4%	53.9%	57.0%
LFPR (2)	37.9%	39.8%	43.4%
INDONESIA	1971	1980	1985
Popu.>=10 years	96,381.2	104,352.6	120,380.0
Econ. Active Popu.	41,261.2	52,153.3	63,825.6
LFPR (1)	42.8%	50.0%	53.0%
LFPR (2)	34.9%	35.5%	38.9%

Source: HASIL SENSUS PENDUDUK 1971, 1980
HASIL SURVEI PENDUDUK ANTAR SENSUS 1985

The growth rate of employees exceeded that of total population in each Kab./Kod., particularly in Botabek Development Region where the progress was very rapid at the rate of 7.61% (refer to Table-2.3.9). Generally it can be said that the growth is remarkable in the areas of Tangerang, Bogor, Bekasi and Karawang, which are situated in or near the Jakarta Metropolitan area.

Table-2.3.9 Employment and Average Annual Growth Rate by Kab./Kodya.

Unit: 1,000 persons

	1971	1980	AVERAGE ANNUAL GROWTH RATE
WP Banten	553.1	744.4	3.36%
- Kab. Serang	200.3	302.6	4.69%
- Kab. Pandeglang	153.7	219.6	4.04%
- Kab. Lebak	199.1	222.2	1.23%
WP Botabek	762.1	1,475.0	7.61%
- Kab. Tangerange	162.1	400.3	10.57%
- Kab. Bogor	393.0	675.2	6.20%
- Kab. Bekasi	163.3	335.8	8.34%
- Kodya Bogor	43.7	63.7	4.28%
WP Purwasuka	550.4	862.2	5.11%
- Kab. Karawang	208.1	364.9	6.44%
- Kab. Purwakarta	89.8	147.6	5.68%
- Kab. Subang	252.5	349.7	3.68%
WP Sukabumi	323.3	540.4	5.87%
- Kab. Sukabumi	302.5	508.6	5.94%
- Kodya Sukabumi	20.8	31.8	4.83%
WP Bandung Raya	1,649.4	2,312.5	3.83%
- Kab. Bandung	501.0	770.8	4.90%
- Kab. Cianjur	329.6	469.4	4.01%
- Kab. Garut	322.0	427.0	3.19%
- Kab. Sumedang	234.0	262.8	1.30%
- Kodya Bandung	262.8	382.5	4.26%
WP Cirebon	1,059.0	1,369.0	2.89%
- Kab. Cirebon	313.2	367.2	1.78%
- Kab. Indramayu	268.1	386.2	4.14%
- Kab. Kuningan	196.5	248.7	2.65%
- Kab. Majalengka	241.0	311.6	2.90%
- Kodya Cirebon	40.2	55.3	3.61%
WP Priatim	818.2	1,122.7	3.58%
- Kab. Tasikmalaya	416.7	609.8	4.32%
- Kab. Ciamimis	401.5	512.9	2.76%

Source: HASIL SENSUS PENDUDUK 1971, 1980

Table-2.3.10 shows the employed population distributed by industry sector. In all regions, the proportion of primary sector is decreasing and the same is true of West Java, however the secondary and tertiary sector proportions are increasing. In particular, in West Java the proportion for tertiary sector increased from 29.0% in 1971 census to 37.7% in the 1985 census, which is higher than the Indonesian average.

Table-2.3.10 Employment by Industry

Unit: 1,000 persons (%)

DKI JAKARTA	1971	1980	1985
Pri. Sect.	42.0 (3.6%)	36.9 (1.9%)	20.5 (0.9%)
Sec. Sect.	207.0 (17.6%)	438.8 (22.8%)	582.8 (24.3%)
Tert. Sect.	930.0 (78.9%)	1,451.9 (75.3%)	1,792.1 (74.8%)
Total	1,179.0 (100.0%)	1,927.6 (100.0%)	2,395.4 (100.0%)
WEST JAVA	1971	1980	1985
Pri. Sect.	3,490.1 (61.1%)	4,062.2 (47.8%)	4,889.2 (46.6%)
Sec. Sect.	569.9 (10.0%)	1,325.3 (15.6%)	1,621.9 (15.5%)
Tert. Sect.	1,655.6 (29.0%)	3,113.4 (36.6%)	3,944.4 (37.7%)
Total	5,715.5 (100.0%)	8,500.9 (100.0%)	10,455.5 (100.0%)
C & E JAVA	1971	1980	1985
Pri. Sect.	11,669.5 (65.6%)	12,303.0 (54.4%)	13,820.5 (52.9%)
Sec. Sect.	1,746.9 (9.8%)	3,224.1 (14.3%)	3,920.1 (15.0%)
Tert. Sect.	4,377.8 (24.6%)	6,870.2 (30.4%)	8,364.5 (32.0%)
Total	17,794.2 (100.0%)	22,597.3 (100.0%)	26,105.1 (100.0%)
INDONESIA	1971	1980	1985
Pri. Sect.	24,936.3 (66.3%)	28,834.0 (55.9%)	34,141.8 (54.7%)
Sec. Sect.	3,327.4 (8.8%)	6,790.5 (13.2%)	8,376.7 (13.4%)
Tert. Sect.	9,363.9 (24.9%)	15,928.5 (30.9%)	19,938.6 (31.9%)
Total	37,627.7 (100.0%)	51,553.1 (100.0%)	62,457.1 (100.0%)

Source: HASIL SENSUS PENDUDUK 1971, 1980
HASIL SURVEY PENDUDUK ANTAR SENSUS 1985

2.3.4 Gross Regional Domestic Product

Indonesia experienced a high growth rate during the 1970's because of the increase in oil price, however the decline of oil price at the beginning of the 1980's had a severe impact on the national economy. Based on this important experience, the ROI has been actively promoting the conversion of industrial structure, from that which is wholly dependent on primary products such as agriculture and oil and has a fragile economic structure.

All the provinces in Java Island recorded higher growth rates (over 8%) than the Indonesian average rate (annual growth rate during 1980-1986 is 5.2%) in the 1980's (Table-2.3.13).

The relative share of GRDP of West Java in Indonesia increased from 13.5% in 1980 to 16.4% in 1986, respectively (refer to Table-2.3.12), and the shares of DKI Jakarta and Central & East Java also increased. This means that the difference among the provinces or islands is increasing compared to the previous period and this can also be inferred from the GRDP per Capita shown in Table 2.3.13. Attaining equality among the provinces or islands is currently one of the most strategic issues in Indonesia.

Influenced by the drop in oil price the Cirebon development region recorded the lowest growth in West Java (5.4%), although the development regions of Banten and Botabek recorded high growth rates of more than 11%. Sukabumi and Bandung Raya showed moderate growth rates close to the average rate in West Java (Table 2.3.13).

Table-2.3.11 GRDP in Indonesia at 1983 Constant Price

Unit: Billion Rp.

	1980	1981	1982	1983	1984	1985	1986
DKI JAKARTA	5,876	6,897	7,224	7,819	8,648	9,013	9,445
WEST JAVA	8,218	9,158	9,682	10,191	11,940	12,671	13,505
C & E JAVA	13,263	14,942	15,538	17,813	19,021	20,165	21,461
INDONESIA	60,650	65,925	68,898	73,698	78,144	79,985	82,175

Source: Statistic Indonesia

Table-2.3.12 Composition of GRDP in Indonesia

Unit: %

	1980	1981	1982	1983	1984	1985	1986
DKI JAKARTA	9.7	10.5	10.5	10.6	11.1	11.3	11.5
WEST JAVA	13.5	13.9	14.1	13.8	15.3	15.8	16.4
C & E JAVA	21.9	22.7	22.6	24.2	24.3	25.2	26.1
INDONESIA	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Statistic Indonesia

Table-2.3.13 Summary of GRDP Related Data

Unit: Billion Rp.

REGION	GRDP IN 1986 *	POPULATION IN 1986	GRDP PER CAPITA (1,000)	GROWTH RATE (%)
DKI JAKARTA	9,445	8,207	1,151	8.2
WEST JAVA	13,505	30,147	448	8.6
C & E JAVA	21,411	62,104	345	8.4
INDONESIA	82,175	168,348	488	5.2
BANTEN	1,231.1	2,717	453	13.5
BOTABEK	2,681.9	6,388	420	11.4
SUKABUMI	409.0	1,803	227	7.0
BANDUNG RAYA	3,573.9	8,302	430	9.6
PRIANGAN TIMUR	980.0	3,046	322	6.0
CIREBON	3,946.0	4,890	807	5.4
PURWASUKA	1,039.0	2,998	347	8.6

Note: * 1983 Constant Price

Table-2.3.14 shows GRDP by industrial sector, with respect to its composition and growth rate during the period 1980 - 1987, in each development region within West Java. According to the figures in the Table, in West Java the primary sector share fell from 44.2% in 1980 to 33.5% in 1987, while in contrast the secondary and tertiary sectors shares increased at rates of 7.4% and 2.6% respectively. All the development regions are showing the same tendency, and it proves that conversion of industrial structure is progressing comparatively well in West Java.

Among the regions related to the Study both Botabek and Bandung have similar industrial structure where both secondary and tertiary sectors exceed primary sector, however in Sukabumi the primary sector continues to show a high rate.

Table-2.3.14 Composition of GRDP in West Java

Unit: Billion Rp.

	G R D P			GROWTH
	1980	1985	1987	RATE 80-87
BANTEN				
Primary	171.9(32.7)	254.9(24.0)	280.2(21.3)	7.23%
Secondary	151.0(28.8)	493.6(46.4)	643.2(48.9)	23.01%
Tertiary	202.0(38.5)	315.4(29.6)	392.6(29.8)	9.96%
Total	524.8(100.0)	1,063.9(100.0)	1,316.0(100.0)	14.03%
BOTABEK				
Primary	291.9(20.7)	408.4(16.6)	400.3(14.0)	4.62%
Secondary	493.1(35.0)	918.7(37.4)	1,106.7(38.7)	12.24%
Tertiary	622.7(44.2)	1,129.9(46.0)	1,352.0(47.3)	11.71%
Total	1,407.6(100.0)	2,457.0(100.0)	2,858.7(100.0)	10.65%
SUKABUMI				
Primary	102.7(38.3)	144.6(36.1)	139.9(33.5)	4.51%
Secondary	30.9(11.5)	53.4(13.3)	58.0(13.9)	9.40%
Tertiary	134.3(50.1)	203.1(50.6)	220.1(52.7)	7.31%
Total	267.9(100.0)	401.1(100.0)	418.0(100.0)	6.56%
BANDUNG RAYA				
Primary	532.6(28.3)	694.8(22.2)	754.6(21.1)	5.10%
Secondary	449.0(23.9)	1,007.8(32.2)	1,216.8(34.0)	15.31%
Tertiary	898.5(47.8)	1,425.3(45.6)	1,602.5(44.8)	8.62%
Total	1,880.1(100.0)	3,127.9(100.0)	3,573.9(100.0)	9.61%
PRIANGAN TIMUR				
Primary	241.4(38.5)	270.2(31.0)	309.1(31.5)	3.59%
Secondary	128.0(20.4)	221.0(25.3)	244.9(25.0)	9.72%
Tertiary	258.5(41.2)	381.5(43.7)	426.0(43.5)	7.40%
Total	627.9(100.0)	872.7(100.0)	980.0(100.0)	6.57%
CIREBON				
Primary	2,042.8(70.2)	2,437.4(64.0)	2,482.1(62.9)	2.82%
Secondary	210.9(7.3)	286.3(7.5)	333.6(8.5)	6.77%
Tertiary	654.4(22.5)	1,083.3(28.5)	1,130.3(28.6)	8.12%
Total	2,908.1(100.0)	3,807.0(100.0)	3,946.0(100.0)	4.46%
PURWASUKA				
Primary	245.4(40.8)	347.8(37.0)	375.1(36.0)	6.25%
Secondary	59.8(9.9)	134.7(14.3)	154.2(14.8)	14.49%
Tertiary	296.1(49.2)	456.5(48.6)	513.9(49.3)	8.20%
Total	601.3(100.0)	939.0(100.0)	1,043.2(100.0)	8.19%
WEST JAVA				
Primary	3,286.7(44.2)	4,558.3(35.9)	4,741.4(33.5)	3.90%
Secondary	1,522.6(18.5)	3,115.7(24.6)	3,663.1(25.9)	13.36%
Tertiary	3,066.5(37.3)	4,997.1(39.4)	5,636.5(39.9)	9.09%
Total	8,217.7(100.0)	12,688.6(100.0)	14,135.8(100.0)	8.06%

Note : 1983 Constant Price
Source: PRODUK DOMESTIK REGIONAL BRUTO DAERAH TINGKAT I JAWA BARAT

2.3.5 Vehicle Ownership

The vehicle ownership in this Study covers three types of vehicles; passenger cars, trucks and buses. Bearing in mind that the Study's main aspect is inter-city transportation, vehicles for short-trip, such as bajaj, beca, motorcycles, etc., are excluded.

The registered vehicles (except for motorcycles) are shown in Table-2.3.15 and Fig.-2.3.4.

The number of registered vehicles in Indonesia grew from approximately 1,200,000 vehicles in 1980 to 2,427,000 vehicles in 1987, and the average annual growth rate from 1980 to 1987 was approximately 10.6%. The annual growth rate by vehicle type from 1980 to 1987 was 9.0% for passenger cars, 10.5% for trucks and 19.7% for buses. The bus growth rate in Indonesia is considerably high due to the reason that buses have prevailed as the mass/public transit mode in intra-city and inter-city transportation.

Java Island has the largest amount of registered vehicles in Indonesia. Remarkably, the share of DKI Jakarta is large, accounting for 27.2% of total registered vehicles (1987) and 40.1% of buses in Indonesia.

The number of registered vehicles per 1,000 persons is also shown in Table 2.3.15. The number of registered vehicles per 1,000 persons (1987) is 14.1 vehicles in Indonesia, 77.7 in DKI Jakarta, 12.7 in West Java and 9.6 in Central/East Java. Although the high accumulation of motorization in DKI Jakarta is recognized, the level of motorization in Indonesia is still low compared to other countries. On the other hand the number of registered vehicles per 1,000 persons in West Java is higher than in Central/East Java.

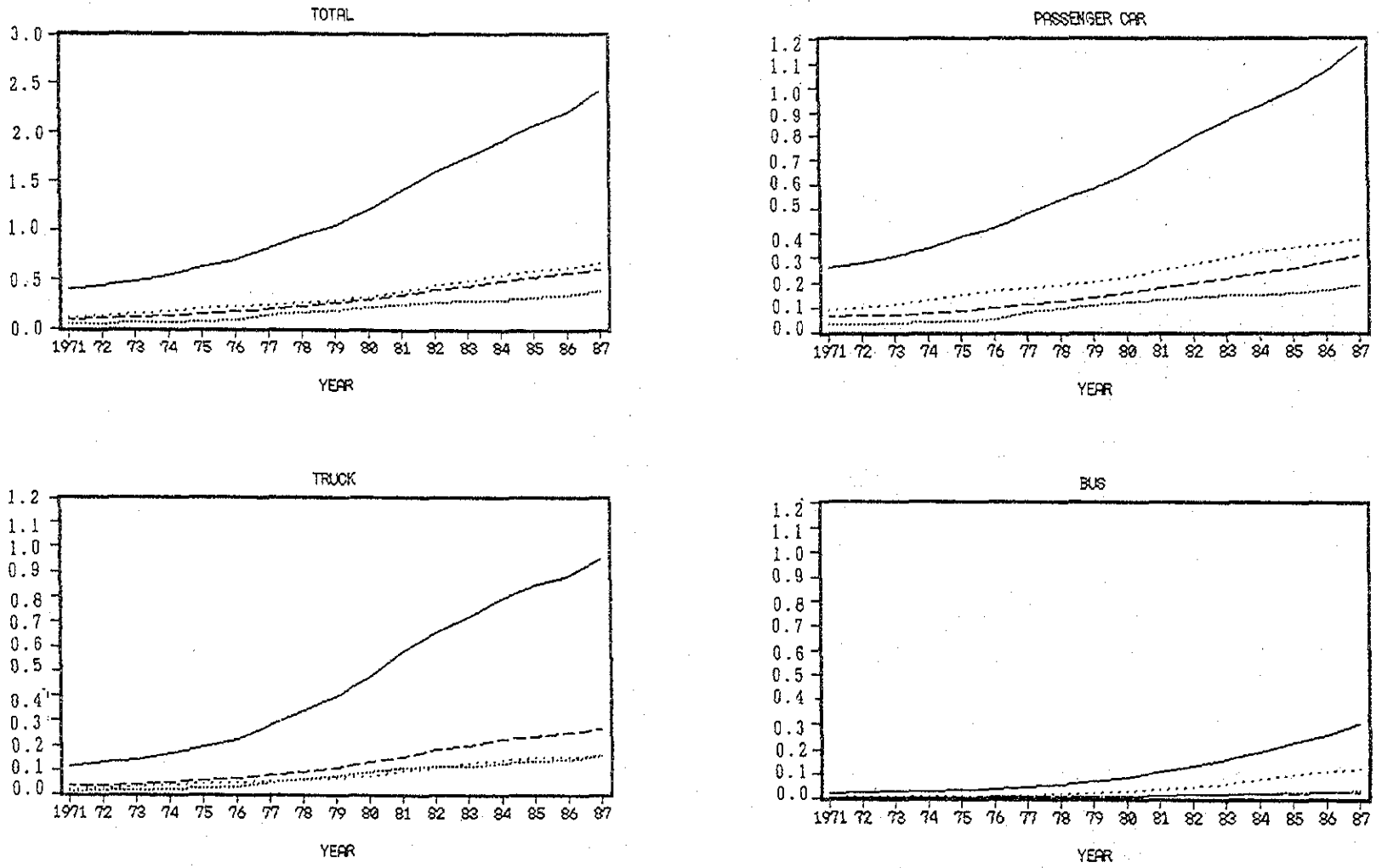
Referring to the number of registered vehicles per 1,000 persons by type in 1987, Indonesia had 6.8 passenger cars, 5.5 trucks and 1.8 buses, and West Java had 6.2 passenger cars, 5.3 trucks and 1.2 buses.

The number of registered vehicles in 1989 was estimated as shown in Table-2.3.16 in order to analyze the relation between the vehicle ownership and the current traffic data which were collected through the O/D survey (1989) of this Study.

Table-2.3.15 Vehicle Ownership

	NUMBER OF OWNERSHIP			GROWTH RATE (%) PER ANNUM ('80-'87)	NUMBER PER 1000 PERSONS (1987)
	1980	1985	1987		
-TOTAL-					
DKI JAKARTA	325,637	589,036	659,991	10.6	77.7
WEST JAVA	225,771	316,969	387,846	8.0	12.7
C & E JAVA	299,663	521,553	602,480	10.5	9.6
INDONESIA	1,199,579	2,065,959	2,427,175	10.6	14.1
-PASSENGER CAR-					
DKI JAKARTA	220,872	340,177	376,907	7.9	44.3
WEST JAVA	122,901	160,247	190,305	6.4	6.2
C & E JAVA	157,437	256,344	310,349	10.2	4.9
INDONESIA	639,464	989,158	1,170,103	9.0	6.8
-TRUCK-					
DKI JAKARTA	75,219	149,781	159,344	11.3	18.7
WEST JAVA	91,864	137,293	160,111	8.3	5.3
C & E JAVA	131,439	236,627	263,921	10.5	4.2
INDONESIA	473,831	845,338	953,694	10.5	5.5
-BUS-					
DKI JAKARTA	29,546	99,078	123,740	22.7	14.6
WEST JAVA	10,997	25,797	37,430	19.1	1.2
C & E JAVA	10,796	22,210	28,210	14.7	0.4
INDONESIA	86,284	231,463	303,378	19.7	1.8

Source: STATISTIK KENDARAAN BERMOTOR DAN PANJANG JALAN (BPS)



Feasibility Study on Bogor- Bandung Road Project

Fig.-2.3.4 Number of Registered Vehicle

Table-2.3.16 Vehicle Ownership by Administrative Region

*** REGION	1980	VEHICLE OWNERSHIP *1982	1985	*1989	GROWTH RATE (83-86)**
-TOTAL-					
BANTEN	7,280	8,286	10,539	13,300	6.6%
BOGOR	46,827	53,814	67,747	82,700	5.5%
BANDUNG	97,045	115,539	127,021	161,400	3.4%
PRIATIM.	33,765	50,536	62,795	87,400	8.8%
CIREBON	23,182	32,393	38,996	50,200	5.6%
PURWAKARTA	17,674	13,700	16,243	21,900	6.4%
-PASSENGER CAR-					
BANTEN	2,594	2,719	3,330	4,500	7.8%
BOGOR	19,877	24,168	29,998	32,400	3.1%
BANDUNG	65,060	75,554	79,604	99,000	2.6%
PRIATIM.	17,996	24,277	28,618	38,200	6.8%
CIREBON	8,758	12,694	14,741	18,600	4.8%
PURWAKARTA	8,616	5,308	5,956	7,800	4.8%
-TRUCK-					
BANTEN	4,297	4,795	5,900	6,800	3.0%
BOGOR	22,440	25,524	32,050	38,100	4.3%
BANDUNG	28,904	36,769	42,348	56,100	4.9%
PRIATIM.	14,336	23,884	27,216	38,500	6.4%
CIREBON	13,412	17,591	21,113	27,500	5.5%
PURWAKARTA	8,485	7,549	8,668	11,800	5.6%
-BUS-					
BANTEN	389	914	1,309	2,000	18.0%
BOGOR	4,510	5,264	7,699	12,200	18.9%
BANDUNG	3,081	4,434	5,069	6,300	5.5%
PRIATIM.	1,433	2,957	6,961	10,700	32.9%
CIREBON	1,012	2,414	3,142	4,100	10.3%
PURWAKARTA	573	999	1,619	2,300	18.3%

Note: * estimated value
** administrative region was changed
*** BANTEN ----- KAB. Pandeglang, KAB. Lebak, KAB. Serang, KAB. Tangerang
BOGOR ------ KAB. Bogor, KOD. Bogor, KAB. Sukabumi, KOD. Sukabumi, KAB. Cianjur
BANDUNG ---- KAB. Bandung, KOD. Bandung
PRIATIM ---- KAB. Garut, KAB. Tasikmalaya, KAB. Ciamis KAB. Sumedang
CIREBON ---- KAB. Cirebon, KOD, Cirebon, KAB. Kuningan KAB. Majalengka, KAB. Indramayu
PURWAKARTA - KAB. Subang, KAB. Purwakarta, KAB. Karawang KAB. Bekasi

Source: STIATISTIK KENDARAAN BERMOTOR DAN PANJANG JALAN 1987
KEPOLISIAN DAERAH TINGKAT I JAWA BARAT (POLDA)

2.3.6 Land use

The land use in West Java and most kabupatens in the Study Area is still dominated by agricultural areas (refer to Table-2.3.17 and Fig.-2.3.5). The proportion of agricultural area within the Study Area exceeded 50% in 1987.

In the north and east parts of the Study Area, paddy field occupation is very high. In the southern part, forests cover a high percentage of the area. In the central parts of the Study Area paddy fields and forest areas collectively have a high occupation rate. Settlement occupation in the east section is higher than other parts of the Study Area. Industrial occupation within the Study Area is very low.

One feature particular to DKI Jakarta and its surrounding area is the remarkable and drastic change that took place in land utilization within the recent several years.

The land from Ciawi/Cibadak to Bandung, except for the mountainous area, is mainly covered by paddy fields. Most of the remaining areas are dry fields, agricultural gardens and so on. Residential areas exist mainly along trunk roads (refer to Fig.-2.3.6).

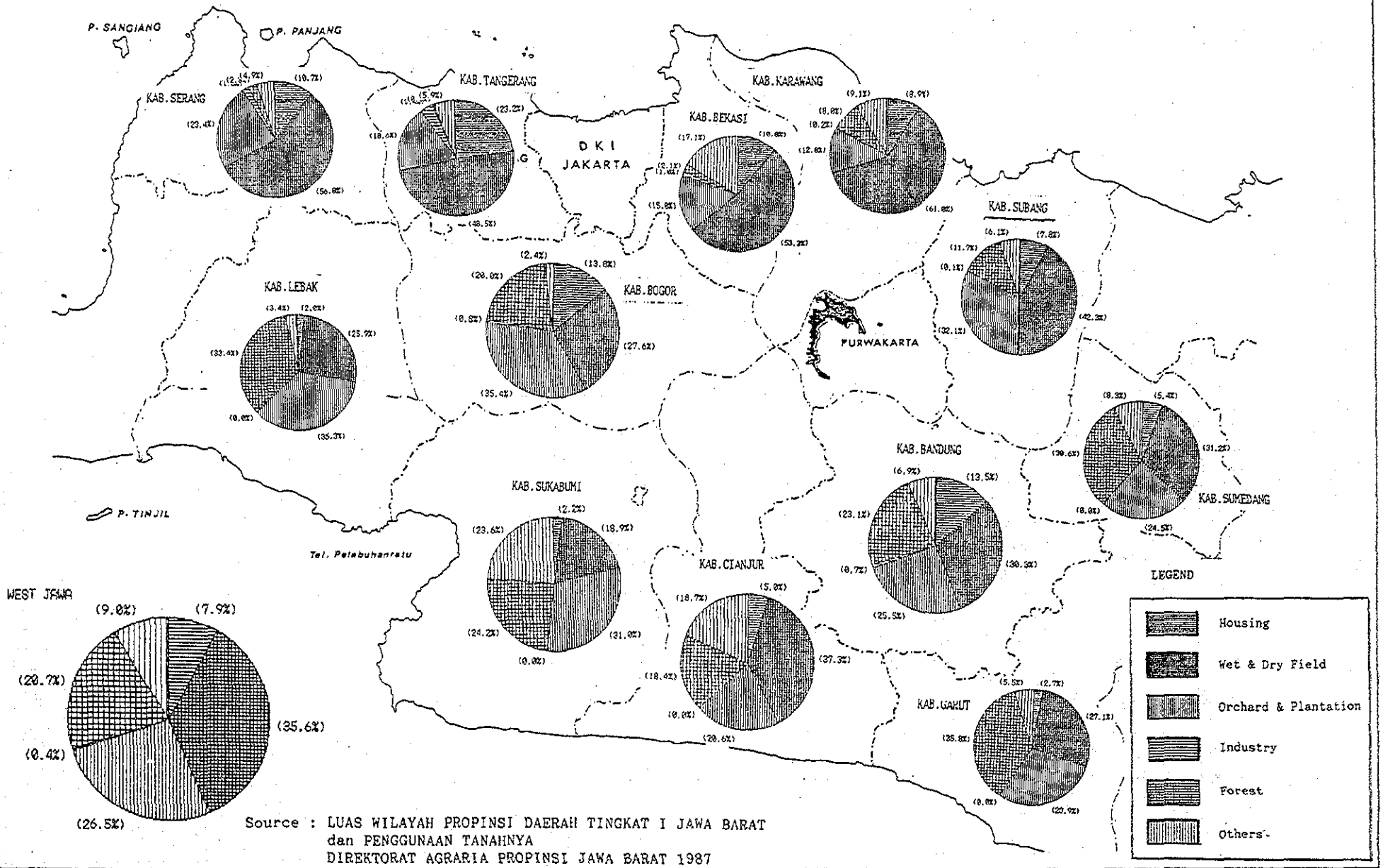
In the Study Area both forest preservation and water conservation areas are designated by Presidential Decree (No. 48 in 1983, No. 79 in 1985) as shown in Fig.-2.3.7. Since the areas are widely spread in the Study Area, they posed the most severe restriction during the route selection process.

Table-2.3.18 shows the area converted from agricultural land to other purpose land in the past decade (1978-1987). Especially Kabupaten Bekasi and Kabupaten Tangerang have undergone considerable land use changes in line with the policy on diversification from agricultural activity to industrial activity.

Table-2.3.17 Land Area by Land Utilization Type in West Java

No	KABUPATEN/KODYA	AREA (Ha)	TYPE of LAND UTILIZATION										
			Settlement (Ha)	Wet Field (Ha)	Dry Field (Ha)	Orchard (Ha)	Plantation (Ha)	Waste Land (Ha)	Green/Open space (Ha)	River/Swamp /Pond (Ha)	Industry (Ha)	Forest (Ha)	Others (Ha)
1	KAB.BANDUNG	317,840	42,751	76,445	19,956	42,046	39,144	431	2,072	8,785	2,196	73,330	10,684
2	KAB.BEKASI	148,437	16,023	75,368	3,688	23,284	169	-	694	9,267	1,425	3,071	15,448
3	KAB.BOGOR	344,072	47,592	73,754	21,128	92,675	29,278	84	4,436	2,736	2,737	68,647	1,005
4	KAB.CIAMIS	255,675	29,061	50,001	4,597	101,925	12,544	-	-	5,382	89	36,504	15,572
5	KAB.CIANJUR	343,296	17,060	59,965	68,163	12,537	58,142	7,524	4,528	9,785	-	63,092	42,500
6	KAB.CIREBON	98,828	13,805	62,773	3,115	6,039	4,068	-	1,076	3,148	32	2,357	2,413
7	KAB.GARUT	306,519	8,239	44,243	38,696	60,449	28,220	-	11,160	1,601	14	109,760	4,137
8	KAB.INDRAMAYU	208,099	19,467	120,413	2,718	3,219	2,639	-	7,944	7,215	-	31,799	4,685
9	KAB.KARAWANG	173,753	15,481	103,654	2,403	20,934	1,275	-	1,696	10,548	346	13,850	3,566
10	KAB.KUNINGAN	117,858	8,744	30,548	31,172	2,859	843	-	1,702	475	-	36,872	4,643
11	KAB.LEBAK	285,996	5,767	34,496	39,500	79,732	21,361	-	1,298	619	-	95,529	7,694
12	KAB.MAJAKENGKA	120,424	9,078	54,162	13,550	15,798	4,060	-	1,321	391	-	20,045	1,999
13	KAB.PANDEGLANG	274,690	4,734	48,363	11,639	61,197	7,798	-	4,912	8,459	37	125,785	1,765
14	KAB.PURWAKARTA	96,982	2,377	17,164	2,730	34,003	4,907	-	1,377	10,158	56	23,363	847
15	KAB.SERANG	188,716	20,280	64,380	42,780	43,473	732	262	-	6,645	3,467	4,390	2,306
16	KAB.SUBANG	205,176	15,973	86,122	578	44,000	21,799	-	-	4,637	165	24,036	7,866
17	KAB.SUKABUMI	393,447	8,641	49,403	25,095	56,533	65,610	562	5,401	971	64	95,290	85,878
18	KAB.SUMEDANG	152,221	8,138	34,738	13,475	28,505	8,559	-	-	515	1	46,279	12,011
19	KAB.TANGERANG	128,181	29,796	54,311	7,821	20,952	2,835	-	-	4,489	4,351	602	3,024
20	KAB.TASIKMALAYA	268,048	17,669	50,899	31,502	94,666	17,378	-	4,053	3,930	141	41,835	5,973
21	KODYA.BANDUNG	8,098	5,740	787	290	-	-	-	-	22	371	-	888
22	KODYA.BOGOR	2,156	1,333	7	471	-	-	-	-	7	34	-	305
23	KODYA.CIREBON	3,736	1,593	817	862	-	-	-	-	7	64	-	393
24	KODYA.SUKABUMI	1,215	622	412	25	-	-	-	-	38	17	-	101
TOTAL		4,435,462	349,962	1,193,225	385,954	844,826	331,381	8,863	53,671	99,829	15,609	916,437	235,705

Source : LUAS WILAYAH PROPINSI DAERAH TINGKAT I JAWA BARAT
dan PENGGUNAAN TANAHNYA
DIREKTORAT AGRARIA PROPINSI JAWA BARAT 1987



Source : LUAS WILAYAH PROPINSI DAERAH TINGKAT I JAWA BARAT
dan PENGGUNAAN TANAHNYA
DIREKTORAT AGRARIA PROPINSI JAWA BARAT 1987

Feasibility Study on Bogor- Bandung Road Project

Fig.-2.3.5 Proportion of Land Use in Main Kabupatens (1987)

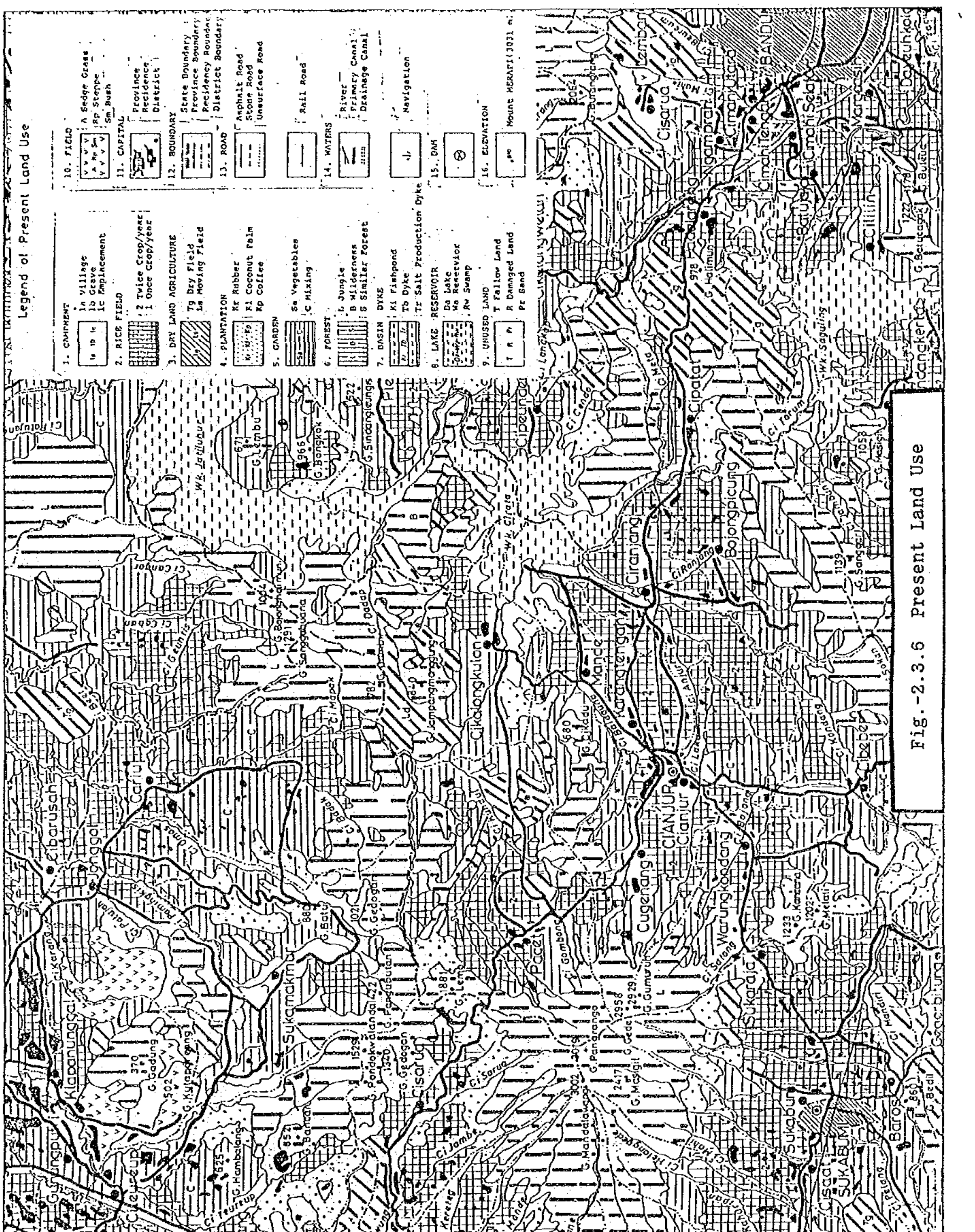
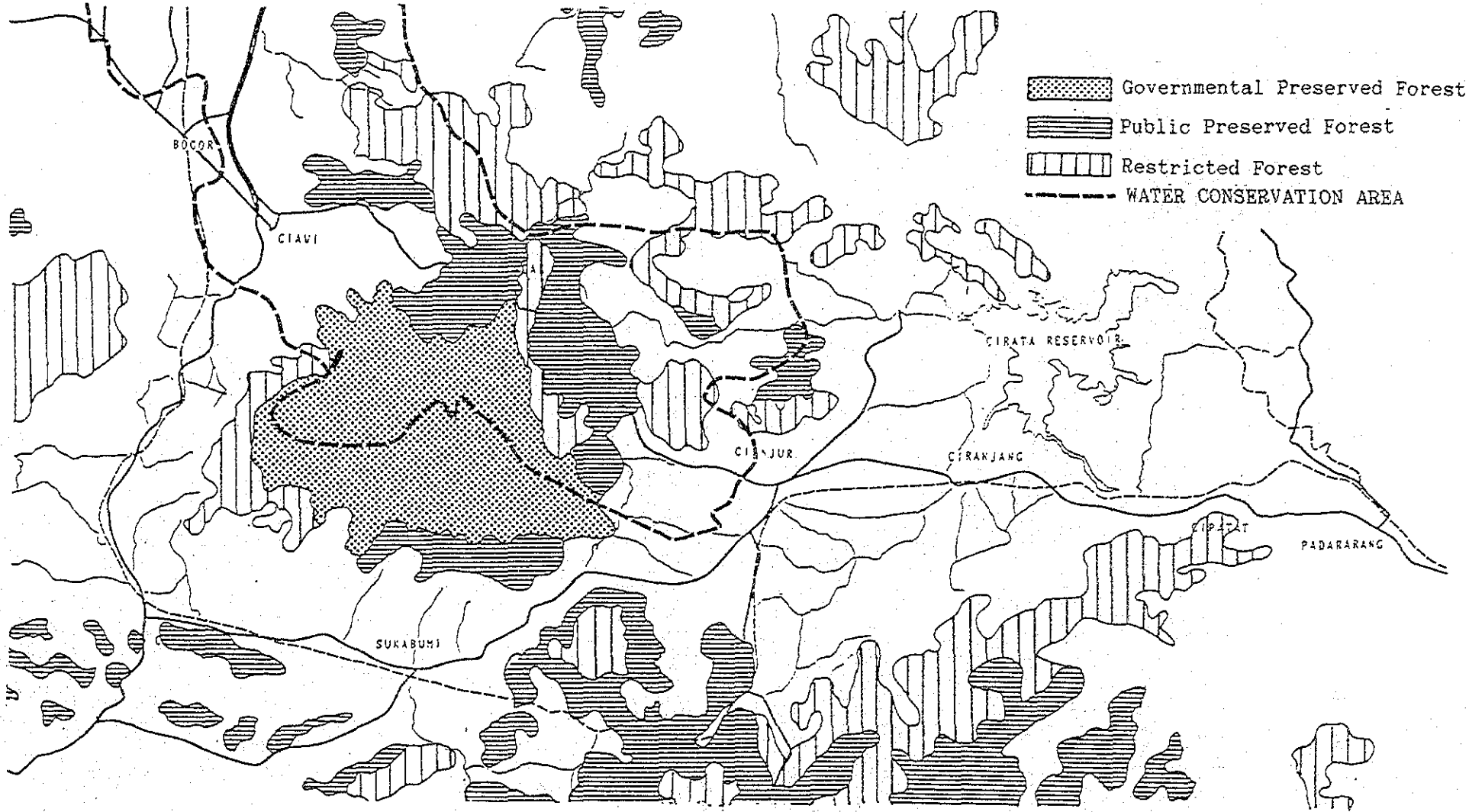


Fig.-2.3.6 Present Land Use



Feasibility Study on Bogor- Bandung Road Project

Fig.-2.3.7 Distribution of Preserved Forest and Water Conservation Areas

Table-2.3.18 Area Converted from Agricultural Land (1978-1987)

Unit: Ha

	HOUSING	INDUSTRY	ROAD.ETC	OTHERS	TOTAL	CONV.RATE
KAB.PANDEGLANG	1,665	0	0	957	2,622	1.0%
KAB.LEBAK	17	4	7	2,854	2,881	1.0%
KAB.BOGOR	2,047	476	0	2,908	5,431	1.6%
KAB.SUKABUMI	28	1	22	4,297	4,348	1.1%
KAB.CIANJUR	132	4	0	3,648	3,780	1.1%
KAB.BANDUNG	1,275	152	1	6,836	8,063	2.5%
KAB.GARUT	165	13	3	82	263	0.1%
KAB.TASIKMALAYA	48	9	6	46	108	0.04%
KAB.CIAMIS	14	4	0	929	947	0.4%
KAB.KUNINGAN	101	2	0	475	577	0.5%
KAB.CIREBON	124	50	65	1,131	4,824	4.9%
KAB.MAJALENGKA	16	0	0	1,428	1,444	1.2%
KAB.SUMEDANG	108	2	0	236	346	0.2%
KAB.INDRAMAYU	202	52	77	2,878	3,209	1.6%
KAB.SUBANG	95	5	94	748	942	0.5%
KAB.PURWAKARTA	132	11	0	2,737	2,879	3.0%
KAB.KARAWANG	126	11	30	631	848	0.5%
KAB.BEKASI	32,595	220	81	3,307	35,837	24.1%
KAB.TANGERANG	40,540	642	162	4,446	45,731	35.7%
KAB.SERANG	164	0	230	677	1,070	0.6%
KODYA.BOGOR	93	1	0	6	100	4.6%
KODYA.SUKABUMI	13	0	0	0	13	1.1%
KODYA.BANDUNG	204	51	0	178	432	5.3%
KODYA.CIREBON	931	0	0	64	995	26.6%
WEST JAVA	72,314	1,466	867	40,521	115,136	2.6%

Source: AGRARIA JAWA BARAT

2.3.7 Zonal Socio-economic Conditions

In the case of abundant historical data, such as annual data, seasonal data, etc., the trend method is usually adopted as a convenient and rational method. Unfortunately the amount of existing data is not always sufficient enough, therefore, some co-relation method was selected for the estimates of present value. As the traffic analysis are conducted in parallel with socio-economic analysis, in particular the following four socio-economic indicators are determined to be important to forecast the future traffic demand.

- night time population,
- population by industrial sector,
- vehicle ownership, and
- household number.

The result of the estimated socio-economic conditions aforementioned are shown in Table-2.3.19 to Table-2.3.21.

Table-2.3.19 Estimated Zonal Population and Number of Households

Unit: x1,000

	POPULATION		NUMBER OF HOUSEHOLDS	
	1982	1989	1982	1989
1	7,034	9,105	1,278	1,847
2	2,947	3,474	582	689
3	767	901	167	689
4	932	1,079	218	258
5	1,444	1,645	329	366
6	4,343	4,953	864	1,004
7	4,589	5,056	1,049	1,153
8	1,638	2,071	307	418
9	1,217	1,625	246	341
10	2,600	3,034	531	616
11	1,764	2,048	404	466
12	1,100	1,235	270	297
13	5,408	6,246	1,250	1,400
14	58,893	64,375	12,833	13,885

Table-2.3.20 Estimated Zonal Employment

Unit: x1,000

		TOTAL		PRIMARY		SECONDARY		TERTIARY	
		1982	1989	1982	1989	1982	1989	1982	1989
393	1	2,118	2,978	43	53		558	1,682	2,366
	2	828	1,150	191	268	224	334	393	548
	3	265	349	147	174	16	24	108	151
	4	321	419	177	209	20	29	130	181
	5	510	611	290	283	60	90	171	238
	6	1,269	1,680	527	639	191	285	542	756
	7	1,665	1,865	897	929	179	249	528	687
	8	447	686	44	94	150	224	264	368
	9	373	582	34	75	129	192	226	315
	10	812	1,033	430	481	129	192	258	360
	11	556	749	308	384	32	48	227	317
	12	376	468	240	263	18	27	128	178
	13	1,766	2,124	1,390	1,087	83	173	328	864
	14	23,924	26,659	-	-	-	-	-	-

Table-2.3.21 Estimated Present Vehicle Ownership

Unit: x1,000

	Total		Passenger Car		Truck		Bus	
	1982	1989	1982	1989	1982	1989	1982	1989
1	437,460	758,501	275,139	422,736	112,494	198,826	49,827	136,940
2	28,957	42,070	11,436	15,844	14,089	17,820	3,432	8,406
3	6,156	11,771	2,977	3,926	2,651	6,775	528	1,070
4	7,476	10,453	3,616	5,114	3,219	3,945	641	1,394
5	11,853	16,202	5,600	7,517	5,590	7,355	663	1,330
6	115,073	161,400	73,870	99,000	36,769	56,100	4,434	6,300
7	42,794	73,485	20,902	32,661	19,370	31,686	2,522	9,138
8	3,316	5,708	1,052	1,827	1,765	2,829	499	1,052
9	4,363	7,628	1,582	2,582	2,408	3,988	373	1,058
10	5,117	7,594	1,667	2,674	3,035	3,972	415	948
11	6,220	8,866	2,293	3,260	3,487	4,732	440	874
12	3,683	5,414	1,428	1,966	2,068	3,080	187	368
13	41,041	64,088	16,069	24,138	22,122	34,288	2,850	5,662
14	398,636	681,604	198,593	332,294	184,388	319,521	15,655	29,789

CHAPTER 3 EXISTING ROAD AND TRANSPORTATION SITUATION

3.1 Transportation Network and Operation

3.1.1 Road Network

Fig.-3.1.1 and Table-3.1.1 are the results of the survey conducted by Bina Marga in 1987, and show the road network in West Java by status, function, lengths and widths.

Of a total length of 2,546.5 km, 74% of the road network has been classified as provincial, and national roads comprise 23%. Length of toll roads are 1.8% of total network length.

In terms of function, the network is roughly divided into collectors (44%) and arteries (36%). Local roads account for 20% of the total. Fig.-3.1.2, prepared in accordance with the Bina Marga survey, shows the main roads of the network and their lengths.

Bina Marga executed a road conditions survey in 1988, and the road conditions were thereby identified as shown in Fig.-3.1.3. Table-3.1.2 shows the road conditions distributed according to their classifications. The high percentage of national roads categorized in good condition reflects the importance attached to them and thereby their maintenance in such a condition.

Table-3.1.2 Road Conditions in West Java

Unit: km, (%)

Road Condition	National	Provincial	Total
Good	580.2 (88.7)	589.3 (29.7)	1,169.5 (44.3)
Moderate	72.1 (11.0)	1,368.7 (68.9)	1,440.8 (54.6)
Damaged	1.9 (0.3)	29.2 (1.4)	31.1 (1.1)
TOTAL	654.2	1,987.2	2,641.4

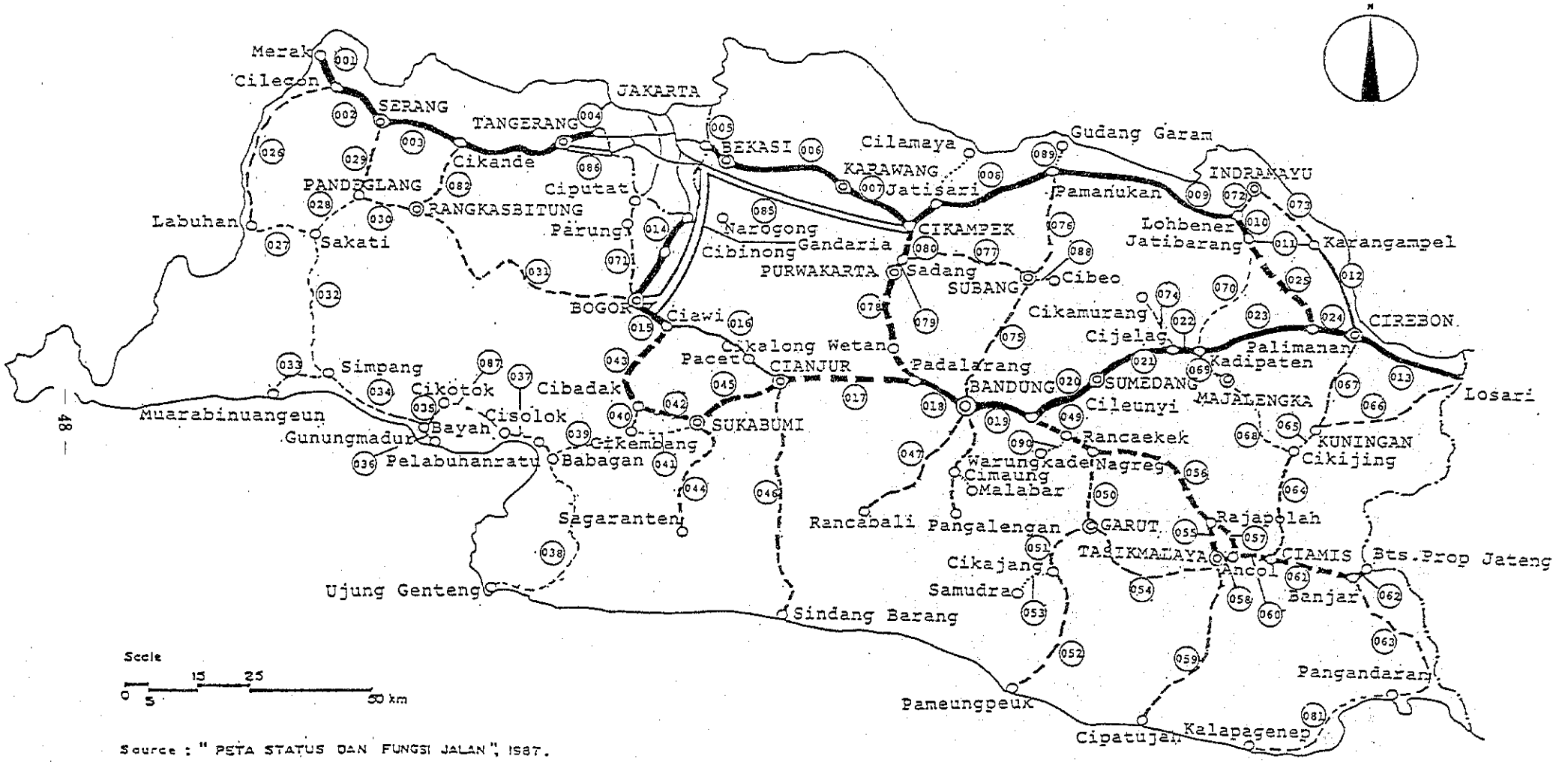


Fig.-3.1.1 Road Functional Classification in West Java

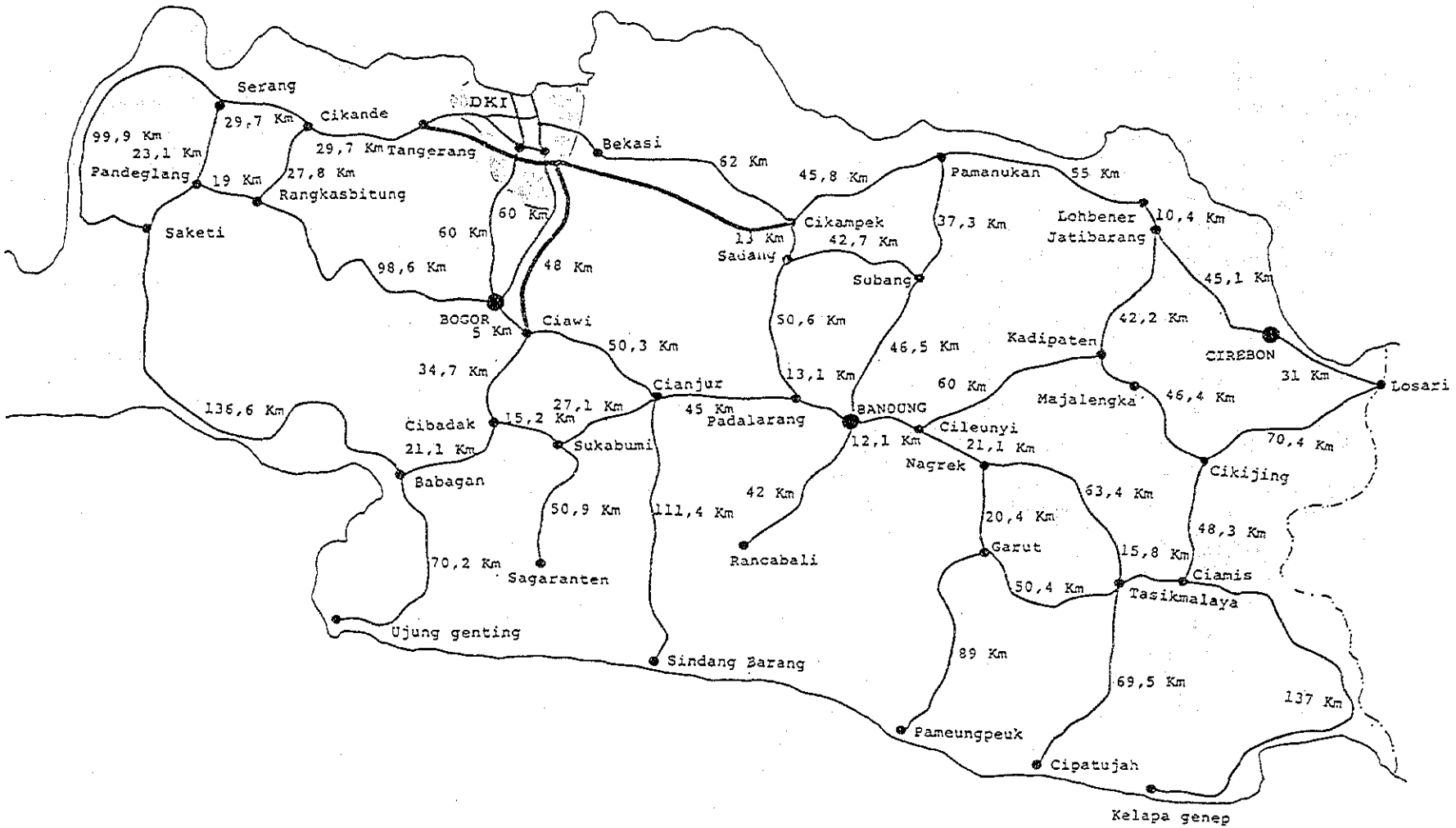
Table-3.1.1 Bina Marga Survey Road Inventory

Road Status Code	Function	Road Name	Length (km)	Width (m)
001 National	Artery	Merak - Ciregon	12.2	6.1
002 National	Artery	Ciregon - Serang	17.9	7.3
003 National	Artery	Serang - Tangerang	29.7	7.0
004 National	Artery	Tangerang - Batas DKI Jakarta	7.0	11.4
005 National	Artery	Batas DKI Jakarta - Bekasi	6.4	13.4
006 National	Artery	Bekasi - Karawang	37.6	7.1
007 National	Artery	Karawang - Cikampek	24.4	7.3
008 National	Artery	Cikampek - Pamanukan	45.4	7.0
009 National	Artery	Pamanukan - Lohbener	55.7	7.0
010 National	Artery	Lohbener - Jatibarang	10.4	7.1
011 National	Local	Jatibarang - Karangampel	17.7	6.6
012 National	Collector	Karangampel - Cirebon	28.8	6.3
013 National	Artery	Cirebon - Losari	31.0	8.0
014 National	Artery	Gandaria - Bogor	26.8	7.0
015 National	Artery	Bogor - Ciawi	5.0	7.6
016 National	Collector	Ciawi - Cianjur	50.3	8.0
017 National	Artery	Cianjur - Padalarang	45.0	6.7
018 National	Artery	Padalarang - Bypass - Ciduku	13.1	24.3
019 National	Artery	Bandung - Cileunyi	12.1	7.2
020 National	Artery	Cileunyi - Sumedang	26.2	7.0
021 National	Artery	Sumedang - Cijelag	29.2	7.2
022 National	Artery	Cijelag - Kadipaten	4.6	7.0
023 National	Artery	Kadipaten - Palimanan	33.9	7.0
024 National	Artery	Palimanan - Cirebon	13.4	7.1
025 Provincial	Artery	Palimanan - Jatibarang	31.7	7.0
026 Provincial	Collector	Cilegon - Labuan	59.2	5.6
027 Provincial	Local	Labuan - Saketi	22.8	5.2
028 Provincial	Local	Saketi - Pandeglang	18.8	5.7
029 Provincial	Collector	Pandeglang - Serang	23.1	6.0
030 Provincial	Collector	Pandeglang - Rangkas Bitung	19.0	5.2
031 Provincial	Collector	Rangkas Bitung - Bogor	98.6	5.1
032 Provincial	Local	Saketi - Simpang	62.1	4.8
033 Provincial	Local	Simpang - Muara Binuangeun	16.8	4.0
034 Provincial	Local	Simpang - Bayah	33.7	4.2
035 Provincial	Local	Bayah - Cikotok	13.4	4.1
036 Provincial	Local	Bayah - Gunungmadur	5.5	3.5
037 Provincial	Local	Cisolok - Babagan	19.3	5.3
038 Provincial	Local	Babagan - Ujung Genteng	70.2	4.2
039 Provincial	Local	Babagan - Cikembang	11.5	5.2
040 Provincial	Collector	Cikembang - Cibadak	9.6	4.8
041 Provincial	Local	Cikembang - Sukabumi	19.0	5.1
042 Provincial	Artery	Cibadak - Sukabumi	15.2	6.2
043 Provincial	Artery	Ciawi - Cibadak	34.7	6.5
044 Provincial	Collector	Sukabumi - Sagaranten	50.9	4.5
045 Provincial	Artery	Sukabumi - Cianjur	27.1	6.0
046 Provincial	Collector	Cianjur - Sindang Barang	111.4	4.3
047 Provincial	Collector	Bandung - Rancabali	40.3	5.9
048 Provincial	Collector	Bandung - Pangalengan	40.7	5.7
049 Provincial	Artery	Cileunyi - Nagreg	20.1	7.2

Table-3.1.1 (Cont.)

Road Status Code	Function	Road Name	Length (km)	Width (m)
050 Provincial	Collector	Nagreg - Garut	20.4	5.9
051 Provincial	Collector	Garut - Cikajang	23.4	5.6
052 Provincial	Collector	Cikajang - Pameungpeuk	65.6	4.3
053 Kabupaten	Local	Cikajang - Samudra	12.4	4.7
054 Provincial	Collector	Garut - Tasikmalaya	50.4	5.4
055 Provincial	Artery	Rajapolah - Tasikmalaya	12.3	6.3
056 Provincial	Artery	Nagreg - Rajapolah	51.1	6.3
057 Provincial	Artery	Rajapolah - Ancol	13.6	4.6
058 Provincial	Artery	Tasikmalaya - Ancol	3.8	6.8
059 Provincial	Collector	Tasikmalaya - Cipatujah	69.5	4.9
060 Provincial	Artery	Ancol - Ciamis	12.0	7.0
061 Provincial	Artery	Ciamis - Banjar	23.8	4.5
062 Provincial	Artery	Banjar - Bts. Prop Jateng	5.9	6.0
063 Provincial	Artery	Banjar - Pangandaran	62.2	6.1
064 Provincial	Collector	Ciamis - Cikijing	48.3	6.1
065 Provincial	Collector	Cikijing - Kuningan	22.3	6.6
066 Provincial	Collector	Kuningan - Losari	48.1	5.3
067 Provincial	Collector	Kuningan - Cirebon	23.5	7.1
068 Provincial	Local	Cikijing - Majalengka	32.8	5.5
069 Provincial	Collector	Kadipaten - Majalengka	13.6	6.7
070 Provincial	Local	Kadipaten - Jatibarang	42.2	4.9
071 Provincial	Collector	Bogor - Ciputat	36.5	7.0
072 Provincial	Collector	Lohbener - Indramayu	9.7	6.7
073 Provincial	Collector	Indramayu - Karangampel	24.1	6.5
074 Provincial	Local	Cijelag - Cikamurang	21.2	4.0
075 Provincial	Collector	Bandung - subang	46.5	5.8
076 Provincial	Collector	Subang - Pamanukan	37.3	5.3
077 Provincial	Collector	Subang - Sadang	42.7	6.0
078 Provincial	Artery	Padalarang - Purwakarta	47.2	6.3
079 Provincial	Artery	Purwakarta - Sadang	3.4	6.1
080 Provincial	Artery	Sadang - Cikampek	13.0	6.2
081 Provincial	Local	Pangndaran - Kalapagenep	51.0	4.5
082 Provincial	Collector	Rangkasbitung - Cikande	27.8	5.7
084 Kabupaten	Local	Cimaung - Malabar	11.0	6.0
085 Tollway	Artery	Jakarta - Cikampek	27.3	6.3
086 Tollway	Artery	Jakarta - Tangerang	17.9	11.0
087 Kabupaten	Collector	Cikotok - Cisolok	8.1	3.3
088 Kabupaten	Local	Subang - Cipeo	1.6	4.0
089 Kabupaten	Local	Pamanukan - Gudang Garam	1.0	
090 Kabupaten	Local	Warungkalde - Rangaekek	2.5	4.1
TOTAL			2,546.5	

Source: Subdit Perencanaan Umum Data Kondisini
Julan Hasil Survey RMMS, 1987, Bina Marga



Feasibility Study on Bogor- Bandung Road Project

Fig.-3.1.2 Network of Main Roads in West Java

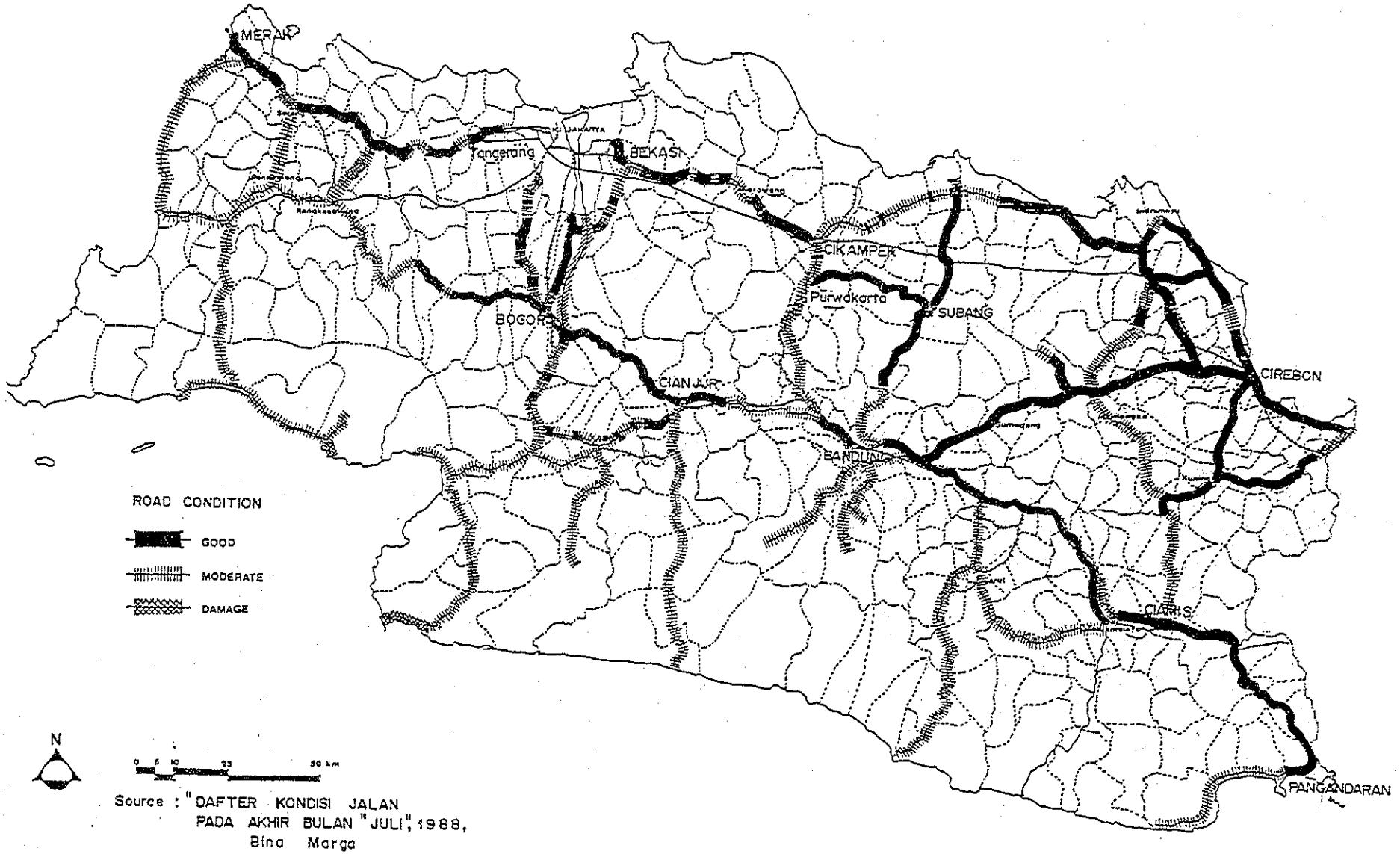


Fig.-3.1.3 Road Conditions in West Java

3.1.2 Inter-City Public and Cargo Transportation

1) Railway Transportation

(a) Passengers

Table-3.1.3 shows transport volumes of railway in West Java. The highest figure, at 64 million passengers, was recorded at 1960, after which the volumes have been in decline, reaching a minimum of 9 million in 1975. From that period onwards passenger volumes showed an upward trend, reaching 31 million in 1985. Of the total passengers in 1985, approximately half were registered on the Jabotabek commuter lines. In terms of passenger-kilometers, however, the Jabotabek services accounted for only 17% of the total, with an average of 36 km per passenger. The average distance per passenger for the other lines is approximately 200 km.

There are two railway transportation routes between Jakarta and Bandung which are considered to influence the Study Area;

1) Jakarta - Cikampek - Bandung (173.6 km)
2) Jakarta - Bogor - Sukabumi - Cianjur - Bandung (209.8 km)

The number of passengers within the previous 2 years on 4 sections are shown in Table-3.1.4. Small passenger volumes ware recorded at Bogor - Sukabumi (281,558 in 1988), and Sukabumi - Bandung (597,835 in 1988).

Table-3.1.4 Number of Railway Passengers

Section	1987	1988
Jakarta - Bogor	13,524,477	13,372,471
Bogor - Sukabumi	330,666	281,538
Sukabumi - Bandung	563,670	597,935
Jakarta - Bandung	1,520,291	1,379,903

Source: PJKA

Table-3.1.5 shows the number of train trips at 5 sections. Only 2 to 4 train trips are operating between Bogor - Sukabumi, and Sukabumi - Bandung. On the contrary 12 trips are directly operating between Jakarta - Bandung (through Cikampek).

Table-3.1.3 Railway Transport Volume in West Java Province (1950 - 1985)

Year	Passengers				Goods			
	Passengers (x 1000)	% incr	Passenger - kilometer (x 1,000,000)	% incr	Ton (x 1000)	% incr	Ton-Kilometer (x 1,000,000)	% incr
1950	33,835				1,750			
1951	34,875	3.1			1.789	2.2		
1952	32,970	-5.4			1.382	-22.7		
1953	38,751	17.5			1.387	0.4		
1954	46,333	19.6			1.479	6.6		
1955	55,109	18.9			1.749	18.2		
1956	50,893	-7.6			1.646	-5.9		
1957	50,164	-1.3			1.477	-10.3		
1958	54,461	8.4			1.363	-7.7		
1959	59,622	9.5			1.389	1.9		
1960	64,103	7.5			1,680	20.9		
1961	62,742	-2.1			1,630	-3,0		
1962	52,875	-15.7	2,525		1.378	-15.5	313	
1963	40,102	-24.1	2,138	-15.3	1.421	3.1	329	5.1
1965	40,701		2,569		1.323		272	
1971	17,337		1,513		1,260		247	
1972	14,879	-14.2	1,423	-5.9	1.369	8.6	289	17,0
1973	10,637	-28.5	1,304	-8.4	1.612	17.7	337	16.6
1974	10,292	-3.2	1,495	14.6	1.486	-7.7	334	-0.9
1975	9,305	-9.6	1,521	1.7	1.127	-24.3	257	-23,0
1976	9,661	3.8	1,604	5.4	913	-19,0	213	-17.1
1977	11,459	18.6	1,775	10.7	1.037	13.6	262	23,0
1978	17,914	56.3	2,267	27.7	1.178	13.6	279	6.5
1979	23,123	29.1	2,713	19.7	1.035	-12.1	206	-26.2
1980	25,457	10.1	2,909	7.2	926	-10.5	189	-8.2
1981	27,161	6.7	3,015	3.6	870	-6,0	180	-4.8
1982	27,057	-0.4	3,139	4.1	683	-21.5	161	-10.5
1983	29,716	9.8	3,029	-3.5	593	-13.2	118	-26.7
1984	30,500	2.6	3,185	5.1	719	21.2	194	64.4
1985	30,600	0.3	3,469	8.9	757	5.3	290	57.6

Source : - PJKA, Kantor Pusat

Table-3.1.5 Number of Train Trips

Section	Trips
Bogor - Bandung	4
Sukabumi - Cianjur	2
Sukabumi - Bandung	3
Jakarta - Cikampek	88
Cikampek - Bandung	45

Source: PJKA

Table-3.1.6 shows the rail road distances between Jakarta and Bandung. The route through Sukabumi is 36.2 km longer than that through Cikampek.

Thus, the Jakarta - Bandung route through Cikampek is used as the main railway transportation between Jakarta and Bandung. The route through Sukabumi is used as short trip railway transportation (mainly trips between intermediate stations).

(b) Freight

Freight volumes decreased rapidly in the late seventies and early eighties, a slide which bottomed out in 1983 (Table-3.1.3). Amount of freight in 1985 was around 800,000 tons per year, mainly consisting of bulk transport such as oil, fertilizer, Galunggung sand and cement.

Average distance per ton has increased from approximately 240 km in 1979 to over 380 km in 1985. With the conversion from oil to coal firing of cement kilns, coal will become another bulk commodity transported by rail. Estate products and rice are not transported by rail in West Java.

In 1986 a container service by rail was opened between Tanjung Priok and Bandung. Table-3.1.7 shows the results of container service during two years, which clearly indicate increasing volumes.

There is no freight car service between Jakarta - Bandung through Sukabumi.

2) Bus Transportation

There are two kinds of bus transportation in Indonesia;

- Bus (usually more than 10 seats)
- Angkutan Kota (usually less than 9 seats)

(a) Bus

This type is used for long or middle distance transportation.

Table-3.1.6 Railway Distances

JAKARTA - CIKAMPEK - BANDUNG

(PJKA)

Name of Station	Distance
Jakarta	0,1 km
Sawah Besar	3,8 km
Gambir	5,5 km
Gondangdia	6,7 km
Cikini	8,0 km
Pegangsaan	8,6 km
Manggarai	9,9 km
Jatinegara	2,7 km
Jakarta	0 km
Rajawali	2,8 km
Kemayoran	4,7 km
Pasarsenen	6,1 km
Gang Sentiong	7,7 km
Kramat	8,7 km
Pondokjati	10,5 km
Jatinegara	11,8 km
Cipinang	13,4 km
Klender	15,1 km
Klenderbaru	19,8 km
Cakung	21 km
Kranji	24 km
Bekasi	26,6 km
Tambun	33,4 km
Cikarang	43,3 km
Lemahabang	47,6 km
Kedunggedeh	56,6 km
Karawang	62,7 km
Klari	69,9 km
Kosambi	73,8 km
Dawuan	80,8 km
Cikampek	84 km
Cibungur	91,6 km
Sadang	97,8 km
Purwakarta	103,1 km
Ciganea	110 km
Sukatani	117 km
Plered	121 km
Cisomang	127,2 km
Cikadongdong	133 km
Rendeh	136 km
Maswati	140,1 km
Sasaksaat	144,7 km
Cilame	152 km
Padalarang	159,1 km
Gadobangkong	162,6 km
Cimahi	165,6 km
Cimindi	168,6 km
Andir	171 km
Bandunggudang	172,6 km
Bandung	173,6 km

JAKARTA - BOGOR - BANDUNG

(PJKA)

Name of Station	Distance
Jakarta	0 km
Sawah Besar	3,8 km
Gambir	5,5 km
Gondangdia	6,7 km
Cikini	8,0 km
Pegangsaan	8,6 km
Manggarai	9,9 km
Tebet	12,5 km
Durenkalibata	15,3 km
Pasarminggu	18,6 km
Lentengagung	24 km
Pondokcina	28,4 km
Depokbaru	31 km
Depok	32,7 km
Citayam	37,8 km
Bojonggedeh	43 km
Cilebut	47,3 km
Kebonpedes	51,1 km
Bogor	54,8 km
Batutulis	59,1 km
Ciomas	64,1 km
Maseng	68,9 km
Cigombong	74,4 km
Cicurug	81,5 km
Cijambe	km
Parungkuda	89,3 km
Cibadak	94,8 km
Karangtengah	99,6 km
Pondokleungsir	103,2 km
Cisaat	107,1 km
Sukabumi	112 km
Ranji	116,5 km
Gandasoli	119,1 km
Cireungas	124,9 km
Lampegan	128,1 km
Sindangresmi	135,5 km
Cibeber	137,2 km
Cilaku	143 km
Pasirhayam	147,5 km
Cianjur	150,6 km
Maleber	154,5 km
Tipar	158,8 km
Selajambe	159,7 km
Ciranjang	162,9 km
Cipeuyeum	168,1 km
Rajamandala	174,8 km
Cipatat	178,9 km
Tagogapu	189,8 km
Padalarang	195,3 km
Gadobangkong	198,8 km
Cimahi	201,8 km
Cimindi	204,8 km
Andir	207,2 km
Bandunggudang	208,8 km
Bandung	209,8 km

Table-3.1.7 Container Loading and Unloading

SENT — a) 1987 — RECEIVED

MONTH	CONTAINER 20' FL	CONTAINER 20' MT	CONTAINER 40' FL	CONTAINER 40' MT	AMOUNT BOXES	AMOUNT TEU	AMOUNT TON	INCOME (Rp)	DIP PKPKN	DIP PPCW	DIP PCW	CONTAINER 20' FL	CONTAINER 20' MT	CONTAINER 40' FL	CONTAINER 40' MT	AMOUNT BOXES	AMOUNT TEU	AMOUNT TON	INCOME (Rp)	DIP PKPKN	DIP PPCW	DIP PCW	REMARK
JANUARY	4	26		20	50	70	161	2.395.400	26	6	12	21	11	16		48	63	324	3.726.720	21	9	13	
FEBRUARY	32	21	35	17	105	157	1.481	7.503.100	56	20	25	20	29	18	27	93	139	451	5.166.480	51	13	22	
MARCH	24	21	2	27	74	103	507	4.155.300	43	5	12	38	21	23	5	79	107	496	5.149.730	45	7	18	
APRIL	7	42	19	29	97	145	729	5.505.000	69	5	5	51	19	33	19	122	174	902	9.364.300	82	5	7	
MAY	59	29	6	35	129	170	704	6.499.200	62	2	16	34	21	32	15	102	149	704	7.584.300	60	5	20	
JUNE	2	55	15	40	112	167	686	6.327.000	67	8	20	31	13	33	13	90	136	660	6.962.000	59	4	14	
JULY	33	36	13	34	116	163	1.077	8.764.700	71	4	19	41	32	42	7	122	171	955	8.151.800	72	4	24	
AUGUST	32	49	10	30	121	181	850	6.474.300	69	2	23	52	21	22	5	110	147	877	7.372.700	83	1	21	
SEPTEMBER	37	37		39	113	152	818	8.000.500	69	5	10	59	19	39		117	156	974	8.242.500	71	5	15	
OCTOBER	41	54		23	118	141	908	5.364.100	49	34	11	64	44	29	3	140	172	950	9.558.300	58	41	16	
NOVEMBER	39	40	3	20	102	125	937	5.468.900	38	47	6	40	40	26	3	109	138	813	6.589.900	38	55	7	
DECEMBER	25	102	5	41	173	217	878	7.986.000	74	64	8	106	24	39	2	171	212	1.720	11.618.000	75	52	6	
TOTAL	335	512	108	355	1.310	1.771	9.656	71.943.500 26.908.727	692 165	202 49	167	549	293	362	99	1.303	1.763	9.834	89.366.000 35.843.233	695 171	207 49	176	

SENT — b) 1988 — RECEIVED

MONTH	CONTAINER 20' FL	CONTAINER 20' MT	CONTAINER 40' FL	CONTAINER 40' MT	AMOUNT BOXES	AMOUNT TEU	AMOUNT TON	INCOME (Rp)	DIP PKPKN	DIP PPCW	DIP PCW	CONTAINER 20' FL	CONTAINER 20' MT	CONTAINER 40' FL	CONTAINER 40' MT	AMOUNT BOXES	AMOUNT TEU	AMOUNT TON	INCOME (Rp)	DIP PKPKN	DIP PPCW	DIP PCW	REMARK
JANUARY	66	68	10	15	159	184	1.556	8.501.300	69	43	3	69	63	22	8	183	194	1.020	9.251.900	76	41	4	
FEBRUARY	80	131	23	33	247	303	1.785	13.357.000	127	53	3	116	60	31	19	226	278	1.693	14.439.300	111	58	4	
MARCH	95	98	46	34	273	353	2.559	22.604.400	155	61		119	79	42	43	283	360	2.190	24.296.300	163	58		
APRIL	87	121	21	58	287	346	1.939	19.239.000	158	36		124	76	64	30	294	388	2.482	24.479.000	181	33		
MAY	73	90	39	54	255	348	2.124	25.642.000	163	25		98	75	50	35	258	345	2.119	20.469.000	164	21		
JUNE	78	134	18	79	301	390	2.165	21.108.000	180	45		143	16	74	10	243	327	2.763	21.968.000	153	32		
JULY	51	98	37	84	270	391	2.115	33.015.600	170	54		167	19	77	34	297	409	3.124	49.504.450	188	59		
AUGUST	46	110	26	77	259	362	1.803	29.254.500	173	46		132	15	98	22	267	367	3.068	46.264.800	167	42		
SEPTEMBER	81	133	18	94	318	422	2.291	35.418.350	196	26		178	32	96	11	317	424	3.759	53.530.000	219	19		
OCTOBER	86	139	8	101	334	443	2.513	36.346.000	188	57		170	18	99	9	296	404	3.719	51.993.800	194	59		
NOVEMBER	81	140	29	74	304	407	2.000	38.041.800	197	39		163	27	85	18	293	396	3.599	49.544.650	199	29		
DECEMBER	97	156	21	96	370	487	2.985	42.377.500	202	189		132	97	100	17	406	523	4.035	64.304.700	238	44		
TOTAL	880	1.419	290	799	3.357	4.436	25.835	324.905.450 26.908.727	1.968 165	593 49	6	1.671	577	829	256	3.333	4.412	33.571	430.146.480 35.843.233	2.053 171	431 49	8	

Figures 3.1.4 and 3.1.5 show the number of daily trips for buses under the registry of the Land Transport Office in West Java and Jakarta. These figures are readily available at the Land Transport Office, in terms of bus numbers and trips.

The largest number is Jakarta - Cirebon (2,132 trips), followed by Jakarta - Bandung (1,059 trips), and Jakarta - Sukabumi (512 trips).

In all the survey stations the largest trip number was at station No. 4 (Ciawi - Cibadak) at 1,461 trips, followed by No. 7 (Cipatat - Cianjur) at 1,390 trips, No. 6 (Sukabumi - Cibadak) at 1,323 trips, and Nos. 1 and 2 (Bogor - Puncak and Puncak - Cianjur) at 1,075 trips.

Judging from the figures most of the buses run between Jakarta and Bandung passing through Puncak.

(b) Angkutan Kota

This type of bus transport is used for short distance transportation.

Fig.-3.1.6 shows the number of daily trips for buses. This number was estimated based on the number of buses registered at the Land Transport Office in West Java. Data available at the Land Transport Office shows number of buses only, and trip numbers shown in the figure were estimated.

The largest number is Bogor - Puncak (3,284 trips), followed by Bogor - Cicurug (2,870 trips), Puncak - Cianjur (1,434 trips), and Bogor - Sukabumi (1,136 trips).

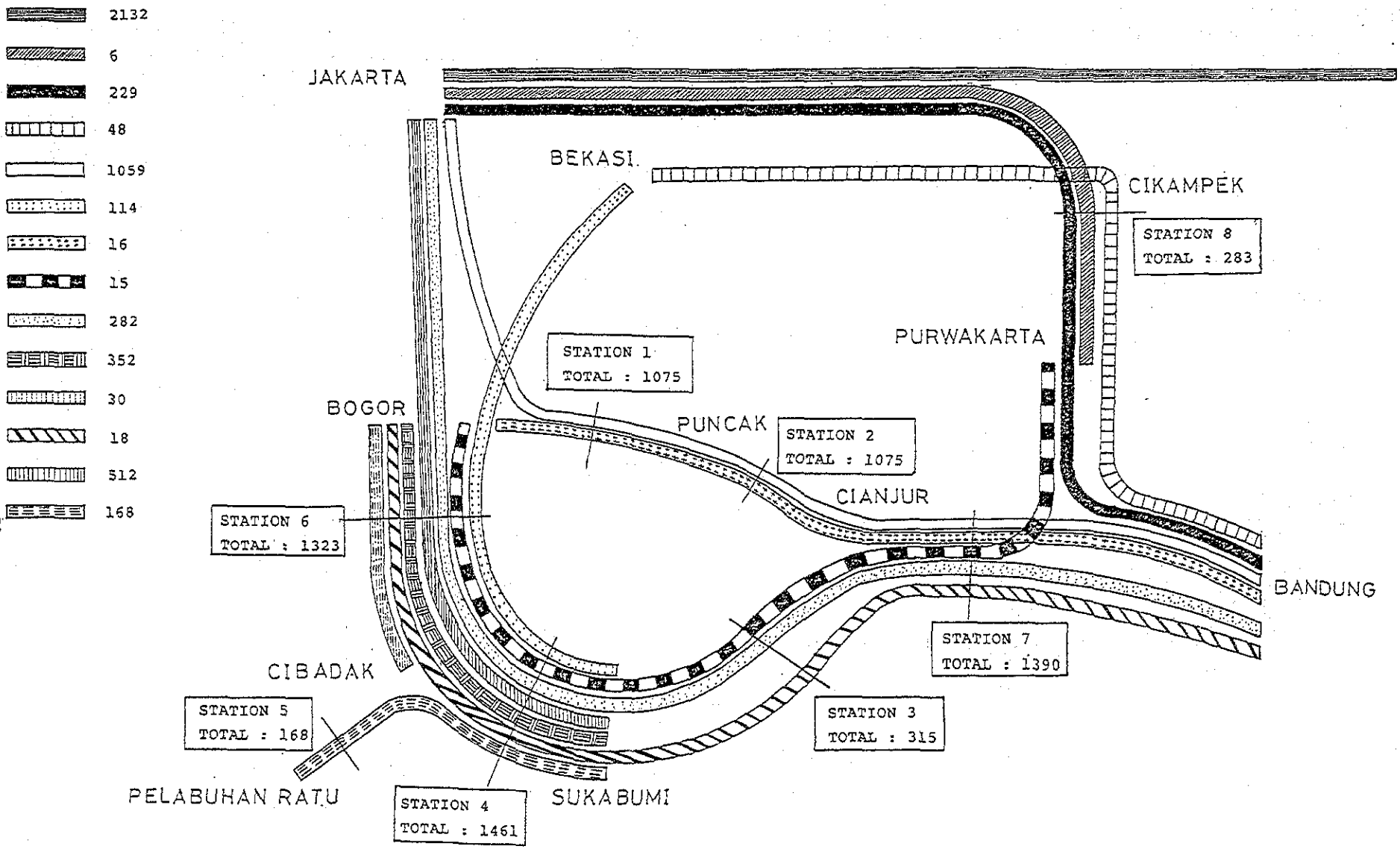
For the trip number through the survey stations, the largest number was at station No. 1 (Bogor - Puncak) at 4,132 trips, followed by No. 6 (Bogor - Cibadak), No. 4 (Cibadak - Sukabumi), No. 2 (Puncak - cianjur), and No. 3 (Sukabumi - Cianjur) with about 2,000 trips for each.

3) Truck Transport

In the past tip trucks had to be checked at weigh bridges. However, in 1983 this system was abolished. Consequently it is difficult to determine the types of goods and volumes being transported.

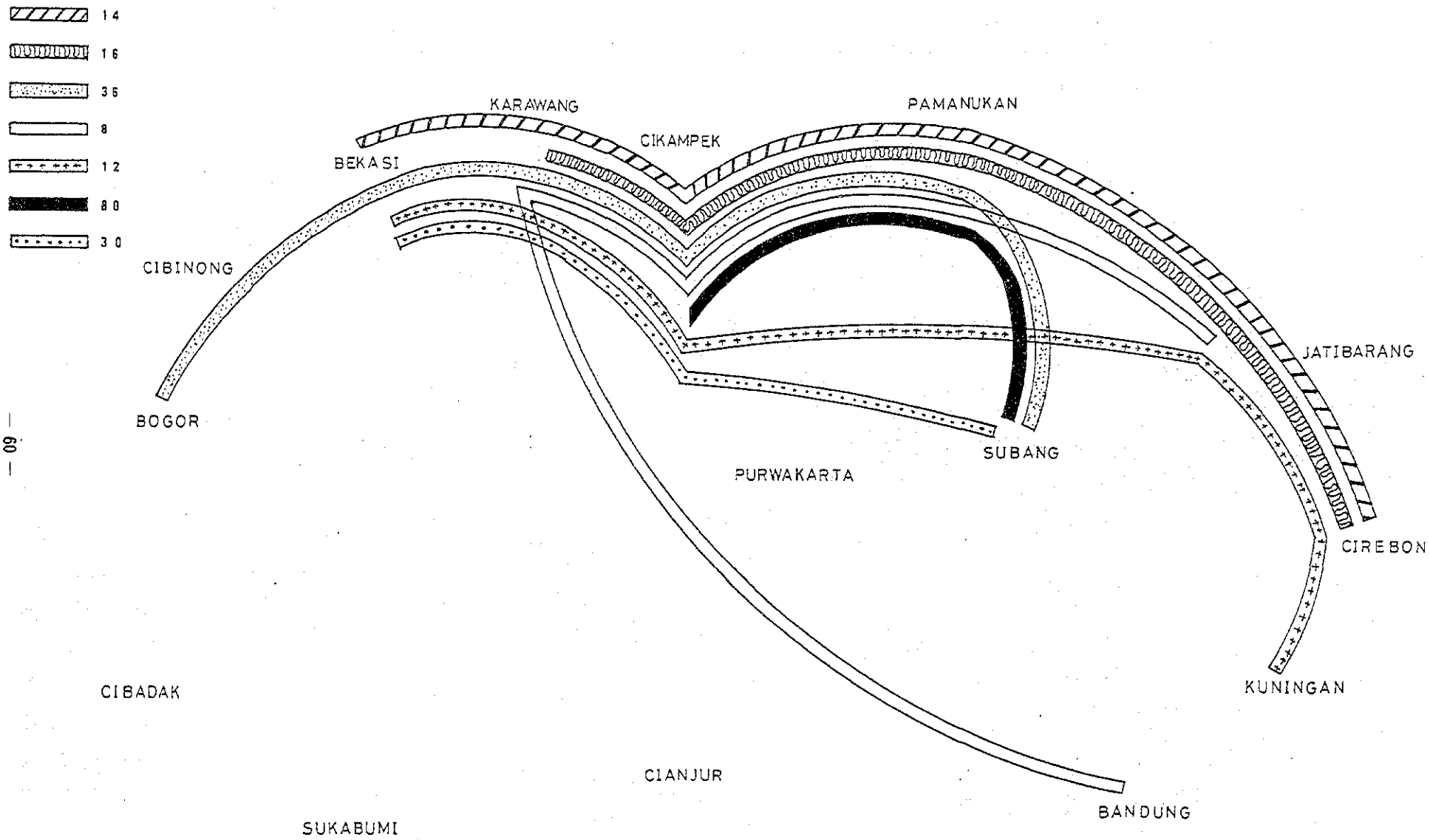
Only 27% of all the trucks passing the survey point of the Land Transport Office in Cianjur have their origin or destination in Cianjur or Sukabumi.

Table-3.1.8 shows the result of a survey conducted in a one week period during May, 1988. The trucks running between Sukabumi and Cianjur during that period were surveyed according to type of cargo being handled. The results showed that the majority of trucks carry agriculture and plantation products, while very little industrial products are handled.



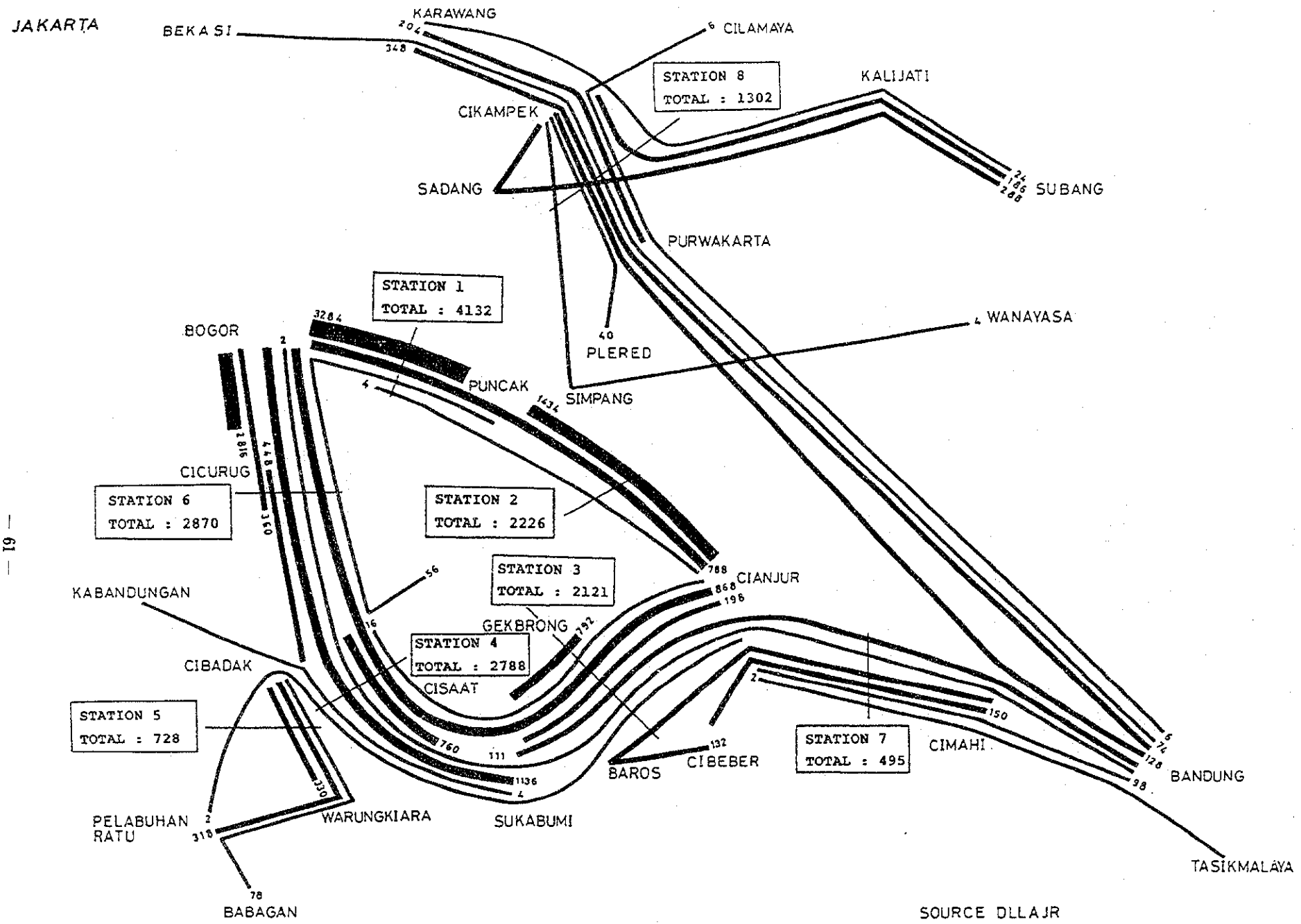
SOURCE DLLAJR

Feasibility Study on Bogor - Bandung Road Project	Fig.-3.1.4 Number of Buses by Station



SOURCE DLLAJR

Feasibility Study on Bogor - Bandung Road Project	Fig.-3.1.5 Number of Buses Through Cikampek



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Feasibility Study on Bogor-Bandung Road Project	Fig.-3.1.6 Number of Angkutan Kota by Station

Table-3.1.8 Truck Cargo Survey

1.	Agriculture Product	33%
2.	Plantation Product	19%
3.	Fish, domestic Animal	7%
4.	Forest Product	6%
5.	Crude Oil, Liquid Fuels	0%
6.	Mineral Product, Stone	18%
7.	Plastic, Metal, Rubber Product	0%
8.	Chemical, Textile, Machine, Parts	5%
9.	Foods	12%

Source: GOODS DATA OF TRUCKS IN MAY 1988, DLLAJR CIANJUR

4) Sea Transportation

The following harbors for ocean going vessels are located in West Java, Jakarta;

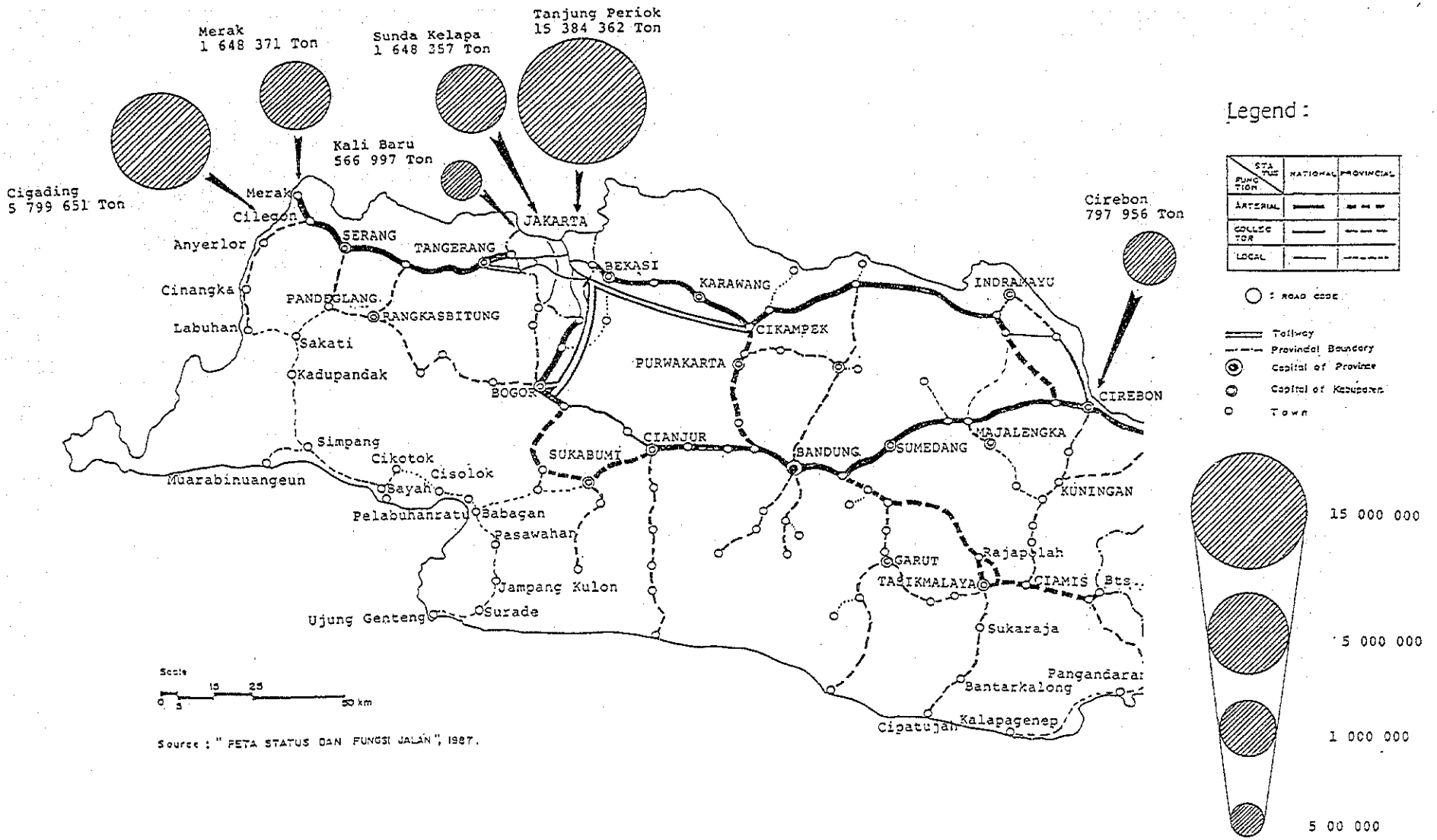
- Tanjung Priok
- Sunda Kelapa
- Kali Baru
- Merak
- Cigading
- Cirebon

Fig.-3.1.7 shows the location of ports, and cargo loading and unloading volumes. The majority of shipments are concentrating at Tanjung Priok. Tables-3.1.9 and -3.1.10 show commodity by loading and unloading at each port. The main unloaded goods at Tanjung Priok are high speed diesel, and plastic materials and the loaded goods are plastic materials, cement, and chemical products. Cigading, the second largest port in West Java, is a port complex belonging to Krakatau Steel. This port is used for the unloading of iron ore pellets, construction plant and spare parts, other raw materials needed for steel production and coal for the Indocement plant in Cibinong.

5) Air Transportation

The following airports are located in West Java;

- Soekarno - Hatta International Airport at Cengkareng, Kabupaten Tangerang
- Halim Perdana Kusuma Airport at Jakarta
- Hussein Sastranegara Airport, Kotamadya Bandung
- Penggung Airport, Kotamadya Cirebon



Feasibility Study on Bogor - Bandung Road Project	Fig.-3.1.7 Volumes of Loading-Unloading by Sea Port in West Java

Table-3.1.9 Inter-island Cargo Loading and Unloading by Commodity

CARGO	TANJUNG PRIOK				SUNDA KELAPA				KALI BARU				MERAK				CIREBON				CIGADING			
	LOADING		UNLOADING		LOADING		UNLOADING		LOADING		UNLOADING		LOADING		UNLOADING		LOADING		UNLOADING		LOADING		UNLOADING	
RICE	35,360	3%	164,634	3%	119,651	15%			7,344	44%			32,032	4%	65	0%	122,805	34%						
MAIZE	1,369	0%	15,141	0%													350	0%	447	0%				
PULSES	1,877	0%	7,335	0%																				
WHEAT FLOUR	44,367	4%	3,455	0%	71,768	9%			324	2%			15,207	2%	35	0%	915	0%						
OTHER CEREAL																	217	0%	38,864	14%				
VEGETABLES													6,349	1%	19,835	1%	331	0%						
CATTLE FODDER	17,542	2%	1,356	0%													2,047	1%						
OTHER - AGRICULTURE													18,110	2%	480,268	59%								
COCONUT & COPRA																			979	0%				
COOKING OIL			570,841	9%											661	0%	4	0%	1,117	0%				
WHITE SUGAR	4,621	0%	18,197	0%	9,217	1%			44	0%			6,084	1%	1,423	0%	12,121	3%						
TEA																	225	0%						
TOBACCO													475	0%	316	0%								
PALM OIL	16,857	2%																	44,005	15%				
CAPOK & COTTON																	47	0%						
COWS			6,218	0%							14	0%												
DRIED FISH													9,071	1%	16,442	2%			2,728	1%				
BLACKAN																			8,168	3%				
LOG	3,203	0%	35,884	1%							17,600	3%							42,741	15%			166,710	15%
SAWN TIMBER	3,189	0%	62,589	1%			686,257	70%	29	0%	482,665	88%							88,630	31%				
RATTAN																			279	0%				
CHARCOAL																			1,187	0%				
OTHER FORESTRY PRODUCT	214	0%	105,001	2%															34	0%				
HIGH SPEED - DIESEL			4,514,988	72%																			354,115	32%
LUBRICATING OIL	47,355	4%	2,093	0%																				
COAL																							514,740	47%
SAND			198,886	3%																				
STONES																					94,731	25%		
ASPHALT	14,146	1%	8,588	0%																				
IRON & STEEL	185,277	17%	41,566	1%																	43,862	12%		
OTHER METAL - PRODUCTS													5,557	1%	65,422	8%					5,520	2%		
PRIME MOVER	11,929	1%	3,197	0%																				
SPARE PARTS & EQUIPMENT	1,674	0%	159	0%									1,697	0%	714	0%								
MOTOR VIHICLES	23,223	2%	1,098	0%																				
FERTILIZER	27,859	3%	125,208	2%	12,778	2%							4,115	1%	129	0%								
PAPERS	21,788	2%	49,878	1%											7	0%								
SALT									518	3%			687	0%	1	0%	723	0%	1,342	1%				
PLASICS MATERIAL	3,818	0%	486	0%																				
SOAP	9,536	1%											13,822	2%	3,834	1%	173	0%						
CEMENT	308,766	28%	48,619	1%	101,277	13%			192	1%			2,783	0%	4	0%	47,633	13%						
AMUNATION & OTHER EXPLOSIVES	17,160	2%	17,843	0%									12,505	2%	9,270	1%					38,743	10%		
CHEMICAL PRODUCT	5,403	1%	341	0%																				
TEXTILE PRODUCTS	3,214	0%											10,558	1%	1,191	0%								
FURNITURE									3	0%														
BEVERAGES	14,811	1%	8	0%																				
OTHER FOOD & BEVERAGES PRODUCTS													656,850	78%	73,754	9%	194	0%						
OTHERS	300,623	27%	307,035	5%	461,531	60%	265,878	31%	8,429	50%	49,841	9%	51,336	6%	157,262	19%	174,294	48%	54,888	19%	190,848	51%	66,262	6%
TOTAL	1,124,381	100%	6,293,588	100%	776,222	100%	872,135	100%	16,877	100%	550,120	100%	847,078	100%	821,633	100%	362,079	100%	285,241	100%	372,984	100%	1,095,827	100%

Table-3.1.10 International Cargo Loading and Unloading by Commodity

(Ton)

1986

CARGO	TANJUNG PRIOK				SUNDA KELAPA				KALI BARU				MERAK				CIREBON				CIGADING			
	LOADING		UNLOADING		LOADING		UNLOADING		LOADING		UNLOADING		LOADING		UNLOADING		LOADING		UNLOADING		LOADING		UNLOADING	
RICE	21,500	1%	31,893	1%																				
MAIZE				0%																				
PULSES			328,866	6%													51	0%						
WHEAT FLOUR				0%																				
OTHER CEREAL			724,587	13%																				
VEGETABLES																	238	0%						
CATTLE FODDER	109,331	5%	71,074	1%													70,180	75%						
OTHER - AGRICULTURE	179	0%															1,250	0% 1%						
COCONUT & COPRA	1,470	0%																						
COOKING OIL				0%																				
WHITE SUGAR				0%																				
TEA	10,839	0%																						
TOBACCO																								
PALM OIL	26,197	1%	8,509	0%																				
CAPOK & COTTON																								
COWS				0%																				
DRIED FISH																								
BLACHAN																								
LOG				0%																				0%
SAWN TIMBER	3,580	0%		0%																				
RATTAN																								
CHARCOAL																								
OTHER FORESTRY PRODUCT	28,786	1%		0%													45	0%						
HIGH SPEED - DIESEL				0%																				0%
LUBRICATING OIL	1,809	0%	3,078	0%																				
COAL			891	0%																			1,349,374	26%
SAND & OTHER MINING			114,598	2%															16,163	28%			16,675	0%
STONES																						0%		
ASPHALT			55,952	1%																				
IRON & STEEL	2,023	0%	481,409	9%																	53,710	20%		
OTHER METAL - PRODUCTS																					5,694	2%	1,683,580	42%
PRIME MOVER	2,044	0%	8,342	0%															761	1%				
SPARE PARTS & EQUIPMENT	28	0%	26,539	1%													6	0%	53	0%				
MOTOR VEHICLES	107	0%	1,495	0%																				
FERTILIZER	168,776	7%	30,880	1%																				
PAPERS	28,156	1%	219,256	4%															3,130	5%				
SALT																								
PLASTICS MATERIAL	1,057,302	44%	3,051,691	55%																				
SOAP																								
CEMENT	667,516	28%		0%													17,067	18%						
AMUNATION & OTHER EXPLOSIVES	881	0%	272,221	5%															3,579	6%	6,774	3%	300,205	7%
CHEMICAL PRODUCT	294,172	12%	82,882	2%															189	0%			1,000	0%
TEXTILE PRODUCTS	17	0%	37,309	1%																				
FURNITURE																								
BEVERAGES				0%																				
OTHER FOOD & BEVERAGES PRODUCTS	-																							
OTHERS				0%													4,435	5%	34,014	59%	203,873	75%	1,005,749	25%
TOTAL	2,424,622	100%	5,541,771	100%	0	0%	0	0%	0	0%	0	0	0	0%	0	0%	93,272	100%	57,889	100%	269,251	100%	4,056,588	100%

Table-3.1.11 shows the airplane operation schedules in West Java, Jakarta. Table-3.1.12 clearly shows that passenger and cargo traffic volumes between Jakarta - Bandung, and Jakarta - Cirebon are very low.

Table-3.1.11 Air Flights Operation (1988)

Destination	Times	Company	Type	Seats
Jakarta - Bandung	5 times	Merpati	CESSNA 235	35
	1 time	Bouraq	HAWKER 748	40
Jakarta - Cirebon	2 times	Merpati	CASA 212	15
Bandung - Cirebon	No Flights			

Table-3.1.12 Domestic Air Traffic by Origin & Destination (1986)

Origin	Dest.	Passengers	Cargo	Baggage	Mail
Bandung	Jakarta	32,958	131,715	143,656	44,234
Halim	Bandung	1,201	3,834	25,725	0
S - Hatta	Bandung	28,475	70,391	87,706	83,607
Others	Others	7,054,271	81,088,701	64,176,828	7,709,232
Total		7,116,905	81,294,641	64,433,915	7,837,073

3.2 Traffic Surveys and Analysis

3.2.1 Traffic Count Survey

1) Traffic Count Survey

(a) Survey Objective

The objective of the survey was to ascertain the traffic characteristics on the arterial roads that influence the proposed road improvement, and to apply the data obtained to induce the expansion factor of the road side survey data.

(b) Survey Stations and Period

Table-3.2.1 shows the total eight (8) survey stations and survey periods. The traffic count survey was carried out at all the eight stations and consisted of a survey period for 16 hours (6:00 to 22:00) at four (4) of the stations, and a survey period for 24 hours (6:00 to 6:00) at the other four (4) stations. All the stations were located close to stations of traffic surveys undertaken previously by Bina Marga.

(c) Survey Method and Items

After taking into consideration vehicle classification of existing traffic volume data (Bina 1979 to 1988, classification into 8 types), vehicle classification of the traffic count survey was further broken down into 14 types to enable detail analysis. Vehicle classification was as follows:

1. Passenger car (Sedan, Jeep, Station Wagon)
2. Taxi
3. Angkutan Kota
4. Mini Bus (R) ---------- route Bus
5. Mini Bus (S) ---------- private, Sightseeing Bus
6. Large Bus (R) ---------- route Bus
7. Large Bus (S) ---------- private, Sightseeing Bus
8. Light Truck ---------- less than 5t
9. Heavy Truck (2 AS) ---- more than 5t, 2 AS
10. Heavy Truck (3 AS) ---- more than 5t, 3 AS
11. Trailer
12. 2 Wheels
13. 3 Wheels
14. Others

Traffic volume by 14 vehicle type categories and by directions were counted with manual counters. The results of this traffic count survey are shown in Table-3.2.2.

Table-3.2.1 Traffic Survey Stations and Period

STAT-ION NO.	STREET NAME	SURVEY DATE	SURVEY PERIOD (16/24)	WEATHER
1	KEC. CISARUA	MAY,23,1989	24 HRS	FAIR
2	JL.IR H JUANDA	MAY,24,1989	16 HRS	FAIR/RAIN
3	KEC. WARUNGKONDANG	MAY,24,1989	16 HRS	FAIR/CLOUDY
4	JL. RAYA CIJALINGAN	MAY,24,1989	16 HRS	FAIR/RAIN
5	JL. PERINTIS KEMERDEKAAN	MAY,24,1989	16 HRS	FAIR/RAIN
6	DESA WATESJAYA KEC. CIJERUK	MAY,23,1989	24 HRS	FAIR
7	WEST OF CITARUM-RAJAMANDALA BRIDGE	MAY,23,1989	24 HRS	FAIR
8	DESA WANAKERTA KEC.CAMPAKA	MAY,23,1989	24 HRS	FAIR

Table 3.2.2 Results of Traffic Count Survey

UNIT : NUMBER OF VEHICLES IN 24 HOURS

STATION NO.	ANGKUT-AN KOTA	BUS	CAR	L.TRUCK	H.TRUCK	OTHERS	TOTAL
FROM JKT	2,000	520	3,849	1,048	506	522	8,445
TO JKT	2,106	804	3,346	930	387	451	8,024
NO.1	4,106	1,324	7,195	1,978	893	973	16,469
FROM JKT	1,266	626	2,381	1,072	217	755	6,317
TO JKT	1,156	601	1,682	1,050	489	951	5,929
NO.2	2,422	1,227	4,063	2,122	706	1,706	12,246
FROM JKT	331	144	747	203	558	19	2,002
TO JKT	342	149	673	336	565	20	2,085
NO.3	673	293	1,420	539	1,123	39	4,087
FROM JKT	1,379	440	1,468	423	811	358	4,879
TO JKT	1,419	381	1,204	335	761	468	4,568
NO.4	2,798	821	2,672	758	1,572	826	9,447
FROM JKT	820	85	269	261	229	419	2,083
TO JKT	851	86	236	183	273	368	1,997
NO.5	1,671	171	505	444	502	787	4,080
FROM JKT	1,257	292	1,101	626	1,408	209	4,893
TO JKT	1,327	269	1,147	683	1,314	214	4,954
NO.6	2,584	561	2,248	1,309	2,722	423	9,847
FROM JKT	205	610	2,706	569	727	16	4,833
TO JKT	245	578	2,686	558	951	44	5,062
NO.7	450	1,188	5,392	1,127	1,678	60	9,895
FROM JKT	551	723	1,840	447	2,215	489	6,265
TO JKT	699	1,162	2,071	622	2,714	501	7,769
NO.8	1,250	1,885	3,911	1,069	4,929	990	14,034

Note: Each of the 16 hours survey locations data were converted into 24 hours data based on the results of the other similar 24 hours data.

2) Traffic Volume Profile and Analysis

(a) Traffic Volume

The results of traffic volume surveys conducted by Bina Marga from 1972 to 1988 are shown in Fig.-3.2.1. The general trend in change of traffic volume is clearly seen as increasing steadily year after year. Fig.-3.2.2 shows the traffic volume data obtained from the Study Team surveys.

The highest traffic volume was observed at Station No. 8; 14,034 veh/day, indicating an extreme increase in volume. This is attributed to a damaged bridge on the arterial road, east of Cikampek. Consequently the traffic volume counted included abnormal traffic destined for Cirebon.

On the other hand, traffic volume at Station No. 6 is decreasing. This is caused by the difference in survey locations between Bina Marga and the Study Team. Bina Marga's survey location was nearer to Bogor therefore traffic volume between Bogor and Cicurug was included in its survey results, while it is excluded in the case of Station No. 6 of the Study. As a whole traffic survey results indicated an increasing trend.

(b) Hourly Fluctuations

Fig.-3.2.3 shows the hourly fluctuations at the Study survey stations. At Stations Nos. 1, 7, and 8 fluctuations are clearly observed. At the other stations (throught Sukabumi) not much fluctuations were recorded, and the resulting curves are generally horizontal.

(c) Composition of Vehicles

The composition of vehicles on the arterial roads are presented in Fig.-3.2.4.

The highest vehicle type shares recorded at Stations No. 1 and 7 are for car at 43.7% and 54.5% respectively, and heavy truck at Station No. 8 (35.1%). Station No. 8 is near the Jakarta - Cikampek toll gate, and many heavy trucks travelling from Jakarta towards east Cikampek were observed there. The highest vehicle classification percentage observed at Station No. 5 is angkutan kota at 41.1%.

Smaller percentages of heavy truck vehicles are found at Stations Nos. 1 and 2 (5.5% and 5.8% respectively) due to the prohibition of trucks of more than 13 tons of passing through the Puncak area.

3.2.2 Roadside Origin-Destination Survey

1) Roadside Origin-Destination Survey

(a) Survey Objectives

To analyze the distribution of vehicle traffic and the diversion of vehicle traffic to a new road from a parallel arterial road.

(b) Survey Periods and Locations

Table-3.2.3 shows the total twenty (20) survey stations and survey periods. Roadside O-D survey was carried out at all twenty stations as follows; a survey period of 16 hours (6:00 to 22:00) at four (4) stations, a 24 hour survey period (6:00 to 6:00) at four (4) staitons, and a survey period of basically 14 hours (6:00 to 22:00) at the other stations. Stations No. 1 to No. 8 were close to stations used by bina Marga for traffic surveys.

(c) Survey Method

The survey covered the following vehicle types:

- Passenger car (Sedan, Jeep, Station Wagon)
- Taxi
- Mini Bus (S) ---------- private, Sightseeing Bus
- Large Bus (S) ---------- private, Sightseeing Bus
- Light Truck ---------- less than 2t
- Heavy Truck (2 AS) ------ more than 2t, 2 AS
- Heavy Truck (3 AS) ------ more than 2t, 3 AS
- Trailer

At each survey station the object vehicles were stopped, with the cooperation of the police and land transport office. The drivers were interviewed at the roadside while causing the minimum traffic jams or troubles possible.

(d) Survey Items

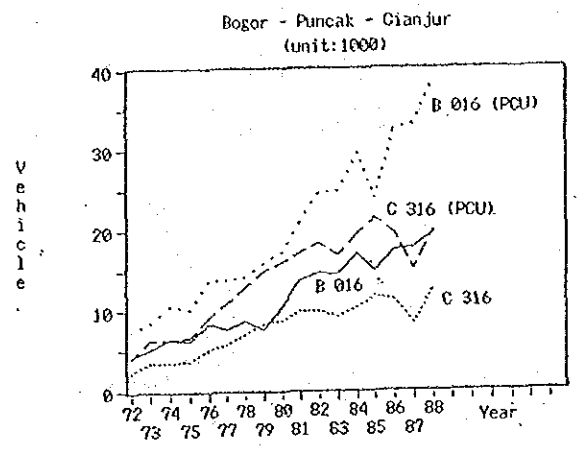
The roadside interview obtained the following information from drivers:

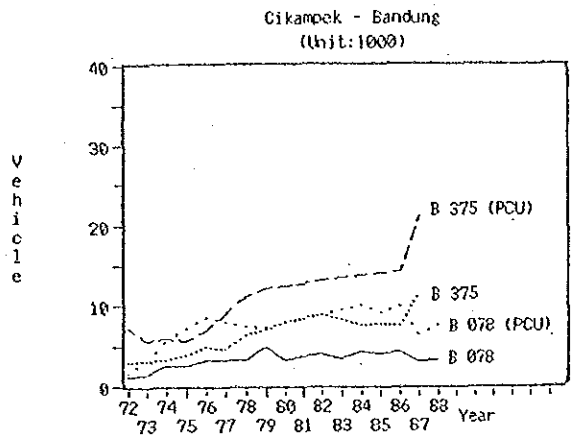
- Origin and Destination of vehicle
- Type of vehicle
- Trip purpose
- Number of passengers

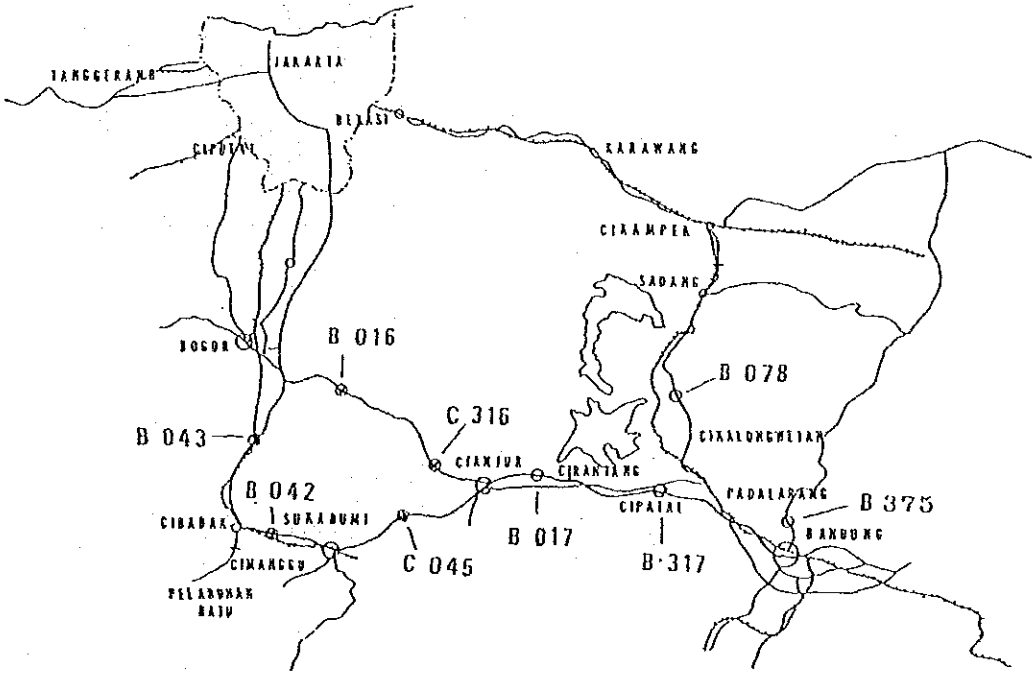
The survey form is shown in Figures 3.2.5 and 3.2.6

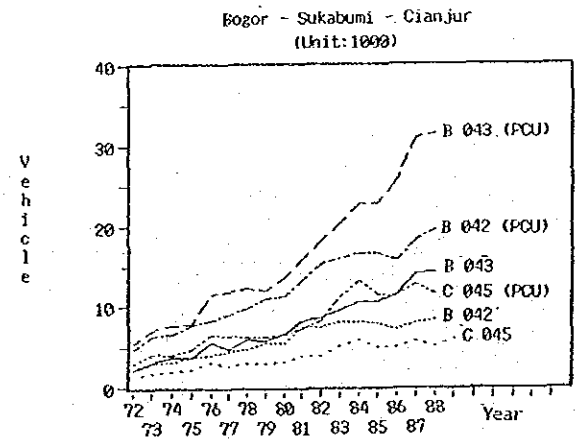
(e) Results of the roadside O-D survey

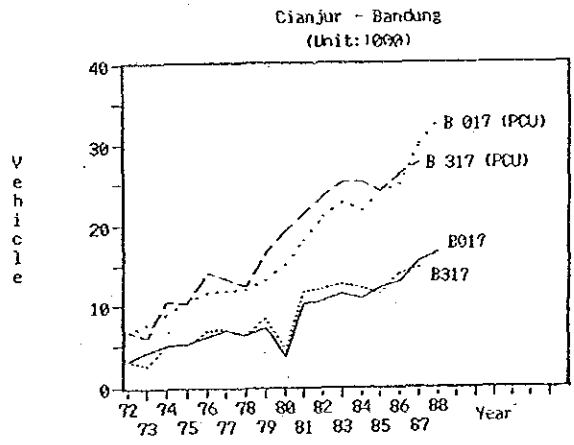
The results of this survey shall be explained in Section 3.3.1 of this Chapter.





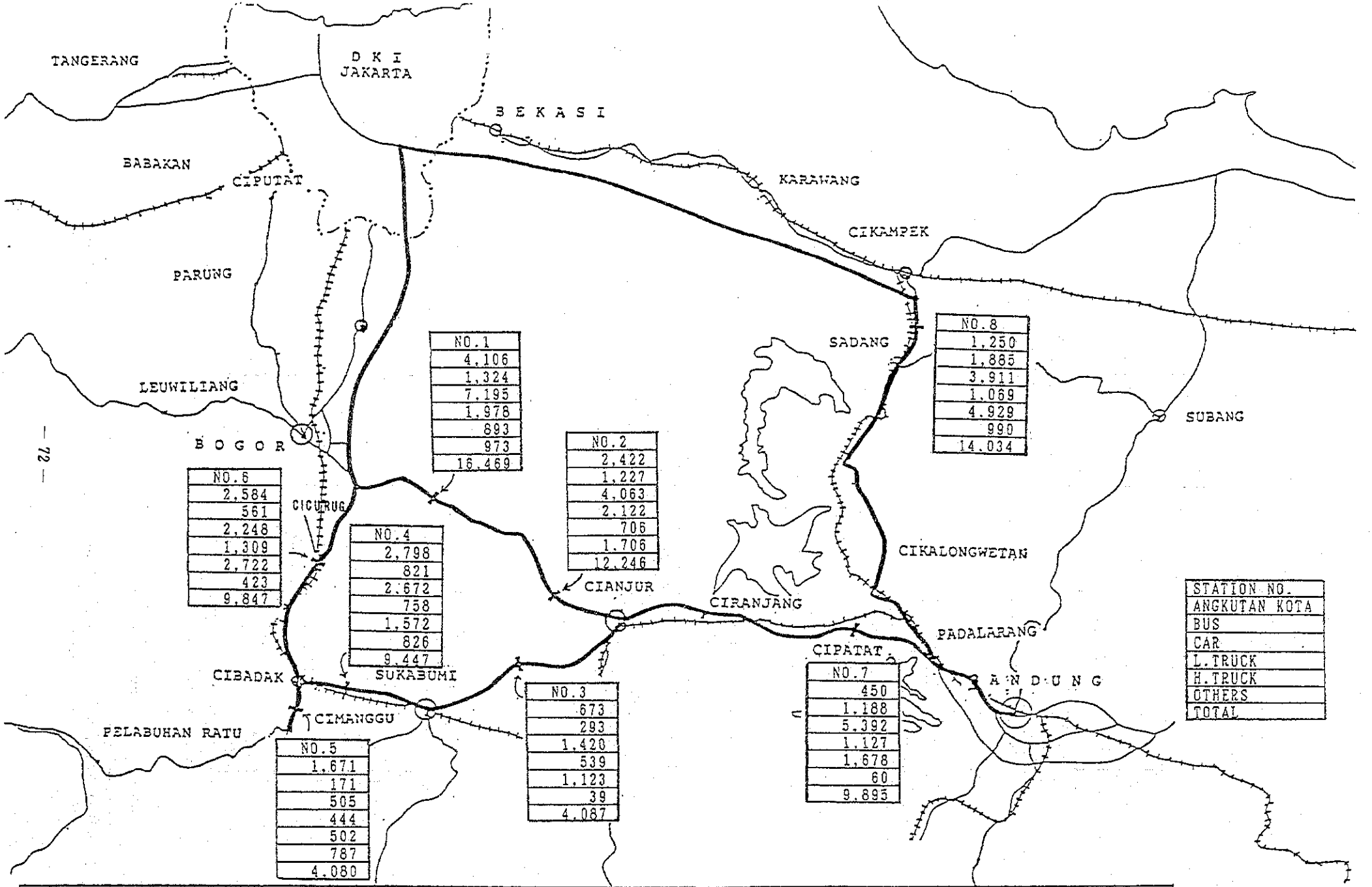






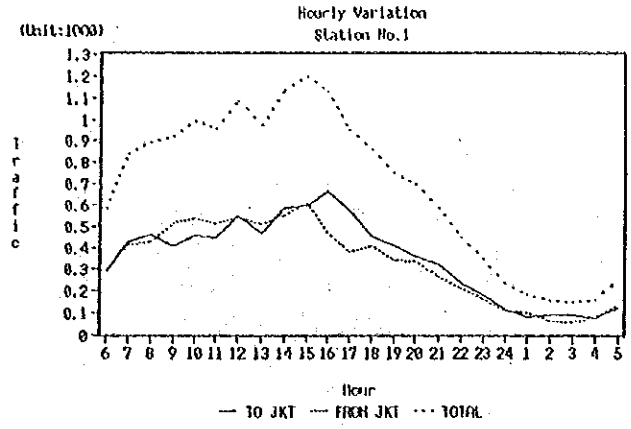
saurce : Biva Mavga Surveys

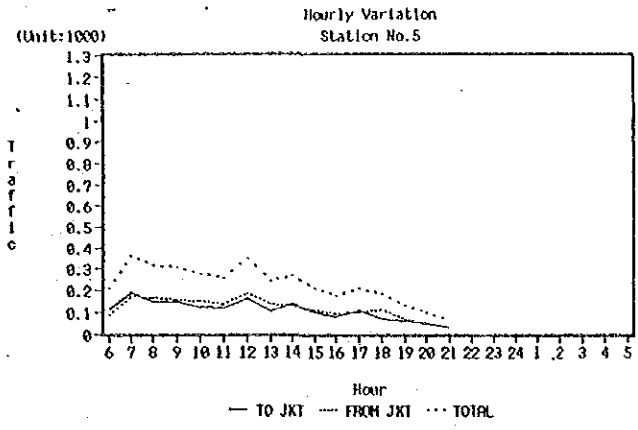
Feasibility Study on Bogor-Bandung Road Project	Fig.-3.2.1 Traffic Volume Fluctuation

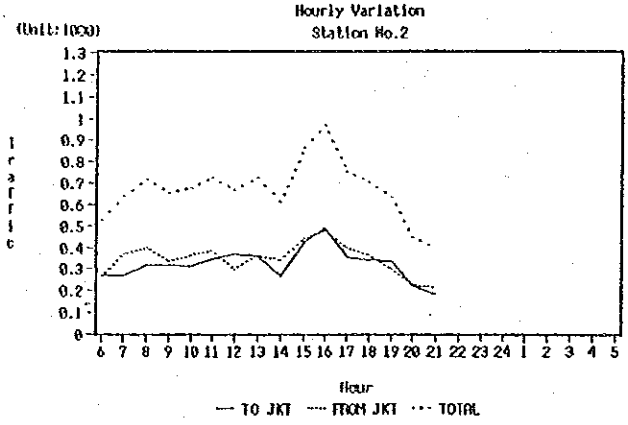


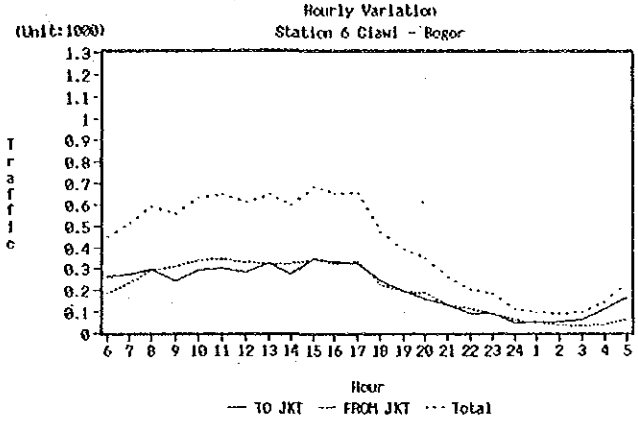
Feasibility Study on Bogor-Bandung Road Project

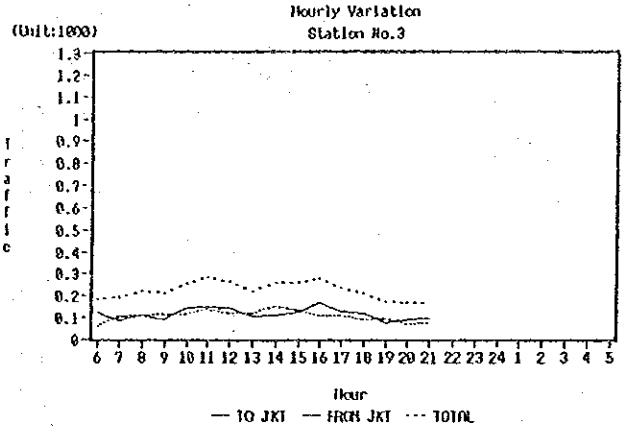
Fig.-3.2.2 Traffic Volume Classification

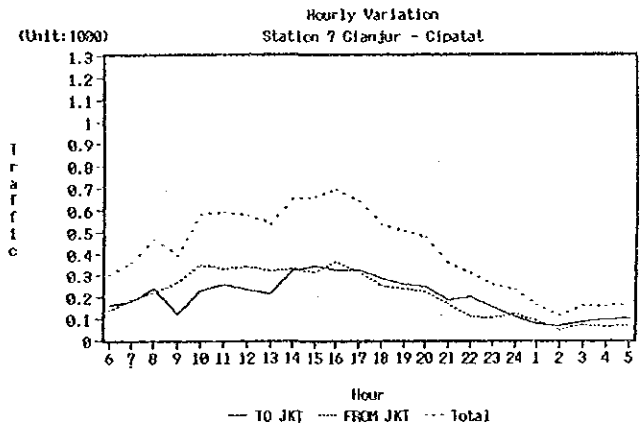


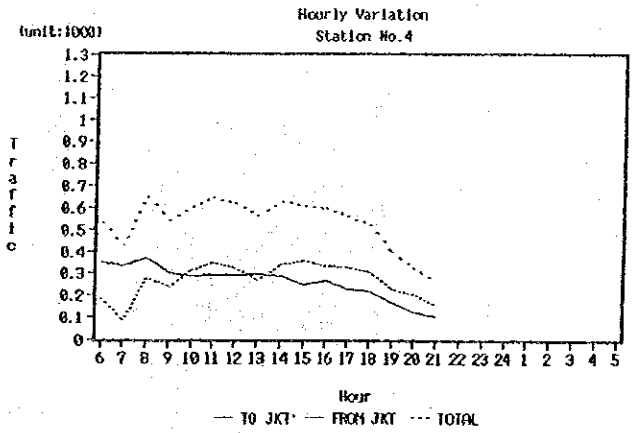


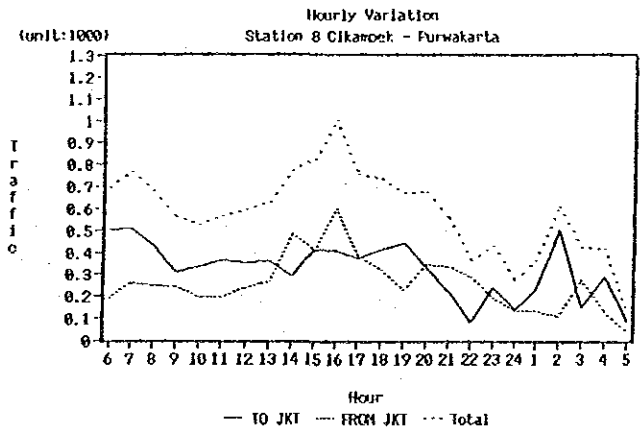




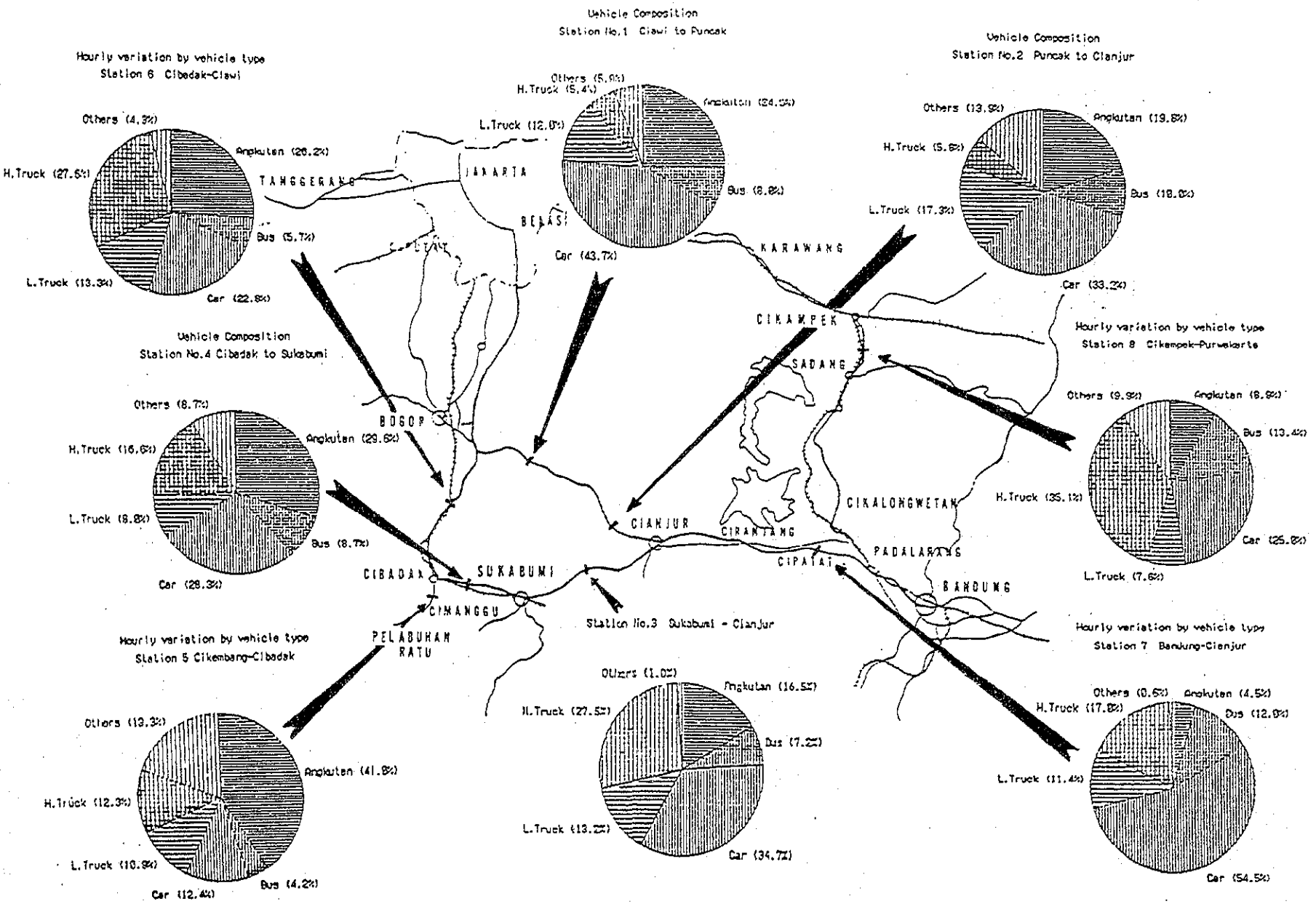








Feasibility Study on Bogor-Bandung Road Project	Fig.-3.2.3 Hourly Variation



Feasibility Study on Bogor-Bandung Road Project

Fig.-3.2.4 Traffic Composition

Table-3.2.3 Roadside OD Survey Stations and Period

Roadside OD Survey Stations and Period

STAT-ION NO.	STREET NAME	SURVEY DATE	SURVEY PERIOD (16/24)	WEATHER
1	KEC. CISARUA	MAY,23,1989	24 HRS	FAIR
2	JL.IR H JUANDA	MAY,24,1989	16 HRS	FAIR/RAIN
3	KEC. WARUNGKONDANG	MAY,24,1989	16 HRS	FAIR/CLOUDY
4	JL. RAYA CIJALINGAN	MAY,24,1989	16 HRS	FAIR/RAIN
5	JL. PERINTIS KEMERDEKAAN	MAY,24,1989	16 HRS	FAIR/RAIN
6	DESA WATESJAYA KEC. CIJERUK	MAY,23,1989	24 HRS	FAIR
7	WEST OF CITARUM-RAJAMANDALA BRIDGE	MAY,23,1989	24 HRS	FAIR
8	DESA WANAKERTA KEC.CAMPAKA	MAY,23,1989	24 HRS	FAIR
9	CIAWI TOLL GATE	MAY,30,1989	14 HRS	FAIR/RAIN
10	BOGOR TOLL GATE	MAY,30,1989	14 HRS	FAIR/RAIN
11	CITEUREUP TOLL GATE	MAY,30,1989	14 HRS	FAIR/RAIN
12	GUNUNG PUTRI TOLL GATE	MAY,30,1989	14 HRS	FAIR/RAIN
13	CIBUBUR TOLL GATE	MAY,30,1989	14 HRS	FAIR/RAIN
14	TAMAN MINI TOLL GATE	MAY,30,1989	14 HRS	FAIR/RAIN
15	JL. RAYA TAJUR	MAY,30,1989	14 HRS	FAIR/RAIN
16	JL. BOGOR RAYA KEDUNGHALA	MAY,30,1989	14 HRS	FAIR/RAIN
17	JL. BOGOR RAYA CIMANGGIS	MAY,30,1989	14 HRS	FAIR/RAIN
18	JL. BOGOR RAYA CIJANTUNG	MAY,30,1989	14 HRS	FAIR/RAIN
19	KEMANG	MAY,30,1989	14 HRS	FAIR/RAIN
20	KEC. CILENUNGSI	MAY,30,1989	14 HRS	FAIR/RAIN

Fig.-3.2.5 Roadside Origin-Destination Survey Forms (1)

JICA STUDY TEAM

LEMBAR PERTANYAAN ASAL TUJUAN

TGL: MEI,1989

POS: NO.	WAKTU: -----S/D------	ARAH DARI-------- KE----------	NAMA PEWAWANCARA: ----------	NAMA SUPERVISOR ----------	LEMBAR KE: ----------

NO:	JENIS KENDARAAN	JALANAN ASAL - TUJUAN			HANYA UNTUK SEDAN MAKSUDNYA	HANYA UNTUK SEDAN PENUMPANG
CONTOH	1.SEDAN 2.TAXI 3.TRUK MINI 4.TRUK 2 AS 5.TRUK 3 AS 6.TRAILLER 7.ANGKUTAN 4.LAIN-LAIN ( )	1. JAKUT, JAKPUS 2. JAKBAR 3. JAKSEL-1 (KEBAYORAN BARU) 4.JAKSEL-2(PS.MINGGU) 5.JAKTIM-1(P.GADUNG) 6.JAKTIM- 7.JAKTIM-3(PS.REBO) 8.BOGOR-1(CIMANGGIS) 9.BOGOR-2(GN.PUTRI) 10.BOGOR-3(CIBINONG) 11.BOGOR-4(KOD.BOGOR) 12.BOGOR-5(CIAWI) 13.BOGOR-6(CARIU) 14.BOGOR-7(DEPOK) 15.BOGOR-8(PARUNG) 16.BOGOR-9(LEUWILANG) 17.KAB.TANGERANG 18.KAB.SERANG 19.KAB-PANDEGLANG 20.KAB.SUKABUMI 21.KAB.BEKASI 22.KAB.CIANJUR 23.KAB.BANDUNG 24.KAB.PURWAKARTA 25.kAB.TASIKMALAYA 26.KAB.CIREBON 27.JAWA TENGAH & TIMUR [ ]		1.Pergi Kerja 2.Bisnis 3.Berbelanja 4.Pesiar 5.Ke Rumah 6.Ke Sekolah 7.Kunj. Sosial 8.Lain-lain	PENGEMUDI + ( )ORANG
1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 ( )	ASAL 1 4 7 10 13 16 19 22 25 2 5 8 11 14 17 20 23 26 3 6 9 12 15 18 21 24 27 ( )	TUJUAN 1 4 7 10 13 16 19 22 25 2 5 8 11 14 17 20 23 26 3 6 9 12 15 18 21 24 27 ( )		1 3 5 7 2 4 6 8	PENGEMUDI + ( )ORANG
2	1 2 3 4 5 6 7 8 9 10 11 12 13 14 ( )	1 4 7 10 13 16 19 22 25 2 5 8 11 14 17 20 23 26 3 6 9 12 15 18 21 24 27 ( )	1 4 7 10 13 16 19 22 25 2 5 8 11 14 17 20 23 26 3 6 9 12 15 18 21 24 27 ( )		1 3 5 7 2 4 6 8	PENGEMUDI + ( )ORANG
3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 ( )	1 4 7 10 13 16 19 22 25 2 5 8 11 14 17 20 23 26 3 6 9 12 15 18 21 24 27 ( )	1 4 7 10 13 16 19 22 25 2 5 8 11 14 17 20 23 26 3 6 9 12 15 18 21 24 27 ( )		1 3 5 7 2 4 6 8	PENGEMUDI + ( )ORANG
4	1 2 3 4 5 6 7 8 9 10 11 12 13 14 ( )	1 4 7 10 13 16 19 22 25 2 5 8 11 14 17 20 23 26 3 6 9 12 15 18 21 24 27 ( )	1 4 7 10 13 16 19 22 25 2 5 8 11 14 17 20 23 26 3 6 9 12 15 18 21 24 27 ( )		1 3 5 7 2 4 6 8	PENGEMUDI + ( )ORANG

Fig.-3.2.6 Roadside Origin-Destination Survey Forms (2)

LEMBAR PERTANYAAN ASAL TUJUAN

JICA STUDY TEAM
TGL MEI,1989

POS NO.6	WAKTU. S/D	ARAH: DARI KE	NAMA PEWAWANCARA:	NAMA SUPERVISOR:	LEMBAR KE :

No.	JENIS KENDARAAN	ASAL	TUJUAN	HANYA UNTUK SEDAN	
				MAKSUDNYA	PENUMPANG
1.	1.SEDAN 8.BIS MN 2.TAXI 9.BUS MN WST 3.TRUK MINI 10.B BSR UMUM 4.TRUK 2 AS 11.B BSR WST 5.TRUK 3 AS 12.KEND. 2 RODA 6.TRAILLER 13.KEND. 3 RODA 7.ANGKUTAN 14. LAIN - LAIN ( )	1.DKI 9.RANGKAS BITUNG 2.BOGOR 10.BEKASI 3.PELABUHAN RATU 11.KRAWANG 4.SUKABUMI 12.SUBANG 5.CIANJUR 13.SUMEDANG 6.BANDUNG 14.PURWAKARTA 7.GARUT 15.SEMARANG 8.TANGGERANG 16.( )	1.DKI 9.RANGKAS BITUNG 2.BOGOR 10.BEKASI 3.PELABUHAN RATU 11.KRAWANG 4.SUKABUMI 12.SUBANG 5.CIANJUR 13.SUMEDANG 6.BANDUNG 14.PURWAKARTA 7.GARUT 15.SEMARANG 8.TANGGERANG 16.( )	1.Pergi Kerja 2.Bisnis 3.Berbelanja 4.Pesiar 5.Ke Rumah 6.Ke Sekolah 7.Kunj. Sosial 8.Lain-lain	PENGEMUDI + ( )ORANG
2.	1 3 5 7 9 11 13 2 4 6 8 10 12 14 [ ]	1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 16 [ ]	1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 16 [ ]	1 3 5 7 2 4 6 8	PENGEMUDI + ( )ORANG
3.	1 3 5 7 9 11 13 2 4 6 8 10 12 14 [ ]	1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 16 [ ]	1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 16 [ ]	1 3 5 7 2 4 6 8	PENGEMUDI + ( )ORANG
4.	1 3 5 7 9 11 13 2 4 6 8 10 12 14 [ ]	1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 16 [ ]	1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 16 [ ]	1 3 5 7 2 4 6 8	PENGEMUDI + ( )ORANG
5.	1 3 5 7 9 11 13 2 4 6 8 10 12 14 [ ]	1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 16 [ ]	1 4 7 10 13 2 5 8 11 14 3 6 9 12 15 16 [ ]	1 3 5 7 2 4 6 8	PENGEMUDI + ( )ORANG

3.2.3 Travel Speed Survey

1) Survey Objectives

The object of the travel speed survey is to determine the travel speed and travel condition for each link. The travel speed will be reflected in the QV equation which defines the relationship between capacity of road and travel speed.

2) Survey Method

- The travel speed survey was carried out during a weekday on Jagorawi Highway and the arterial roads located between Jakarta and Bandung.
- The interval distance, the time traveled between each check point and the time passed at a check point were measured.
- The drivers of this survey were induced to travel at the normal speed of each section.
- Data was collected during the daytime period and the drivers traveled back and forth along the route surveyed up to two or three times.

3) Average Travel Speed

The average travel speed is displayed in Fig.-3.2.7.

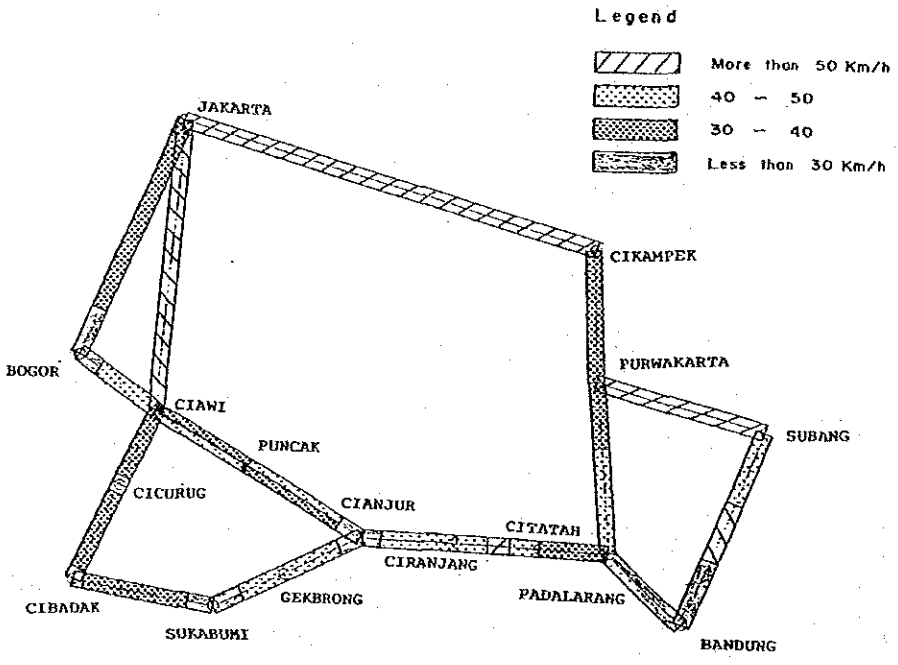


Fig.-3.2.7 Average Travel Speed by Link

3.3 Present Vehicle OD Tables

3.3.1 Formation

1) Procedure

Present OD tables were formed according to the procedure shown in Fig.-3.3.1.

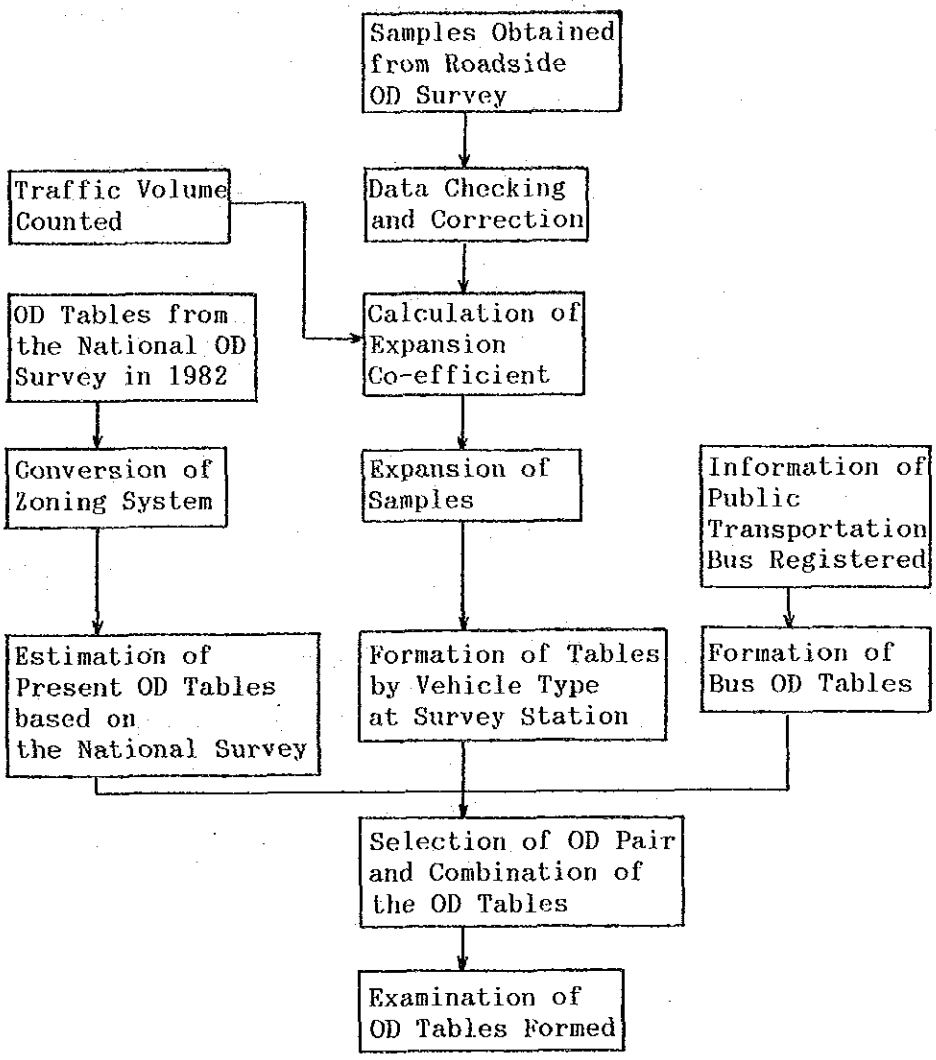


Fig.-3.3.1 Procedure of Present OD Table Formation

In the formation procedure, mainly data obtained from the roadside OD survey was processed. The data, however, does not cover the whole Study Area, since the survey was carried out, focusing on the inter-city traffic between Bogor and Bandung. Furthermore, traffic volume of public transportation modes such as angkutan kota and public bus, although counted was however not surveyed as to origin and destination. Therefore, supplementary data was collected in order to formulate the present OD tables.

Such data was gathered from public transportation information, as stated in the former section and the OD tables studied in the National Origin Destination Survey in 1982.

2) Data Check and Correction

Principle of data checking was not neglected. Based on this principle, the data surveyed was checked and reasonably corrected to the extent possible.

The following two checks were carried out.

- Numerical check
- Logical check

3) Expansion of Samples

In the survey, information on all vehicles could not be corrected. Besides, several inevitable errors were found in the data check step. Therefore, the OD data actually corrected was expanded to form the complete data.

The expansion coefficient was calculated by dividing traffic volume counted by number of samples at each station, by direction and type of vehicle. Then, the data was expanded by multiplying the OD data collected and the expansion coefficient.

Table-3.3.1 shows the result of traffic count survey, number of samples after checking and the expansion coefficient by type of vehicle and station.

Table-3.3.1 Expansion Coefficients

Survey Satation		Traffic Volume Counted					Number of Samples					Expansion Co-efficient				
		Sight-seeing Bus	Passenger Car	Light Truck	Heavy Truck	Total	Sight-seeing Bus	Passenger Car	Light Truck	Heavy Truck	Total	Sight-seeing Bus	Passenger Car	Light Truck	Heavy Truck	Total
Station 1	to JKT	43	3,849	1,048	506	5,446	34	2,295	416	298	3,043	1.265	1.677	2.519	1.697	1.790
	from JKT	169	3,346	930	387	4,832	36	2,564	346	316	3,262	4.694	1.305	2.688	1.225	1.481
Station 2	to JKT	82	3,620	1,050	489	5,241	19	1,967	413	233	2,632	4.316	1.840	2.542	2.099	1.991
	from JKT	88	2,381	1,072	217	3,758	15	2,079	379	187	2,660	5.867	1.145	2.828	1.160	1.413
Station 3	to JKT	0	673	336	565	1,574	0	608	244	556	1,408	-	1.107	1.377	1.016	1.118
	from JKT	0	747	203	558	1,508	0	466	175	437	1,077	-	1.603	1.163	1.278	1.400
Station 4	to JKT	11	1,204	335	761	2,311	2	582	152	295	1,031	5.500	2.069	2.204	2.580	2.242
	from JKT	34	1,468	423	811	2,736	7	609	71	347	1,034	4.857	2.411	5.958	2.337	2.646
Station 5	to JKT	0	236	183	273	692	0	143	89	152	384	-	1.656	2.054	1.796	1.804
	from JKT	1	269	261	229	760	0	180	55	133	368	-	1.494	4.745	1.719	2.064
Station 6	to JKT	1	1,147	683	1,314	3,145	0	678	253	983	1,914	-	1.691	2.700	1.337	1.643
	from JKT	14	1,101	626	1,408	3,149	5	899	229	927	2,060	2.800	1.225	2.734	1.519	1.529
Station 7	to JKT	7	2,686	558	951	4,202	6	1,768	335	712	2,821	1.167	1.519	1.667	1.336	1.490
	from JKT	13	2,706	569	727	4,015	7	1,565	386	416	2,374	1.857	1.729	1.474	1.748	1.691
Station 8	to JKT	76	2,071	622	2,714	5,483	3	1,071	253	1,422	2,748	25.333	1.934	2.458	1.909	1.995
	from JKT	77	1,940	447	2,215	4,679	2	1,118	158	1,521	2,799	38.500	1.735	2.834	1.456	1.672

Note: Unit of traffic volume = vehicle/day
Expansion Coefficient = Traffic volume/Number of samples

4) Conversion of the OD Table of the National Survey

Traffic flow in the whole Study Area was not obtained in the OD survey carried out by the Study Team. For example, the traffic between Jakarta and Bekasi does not pass any survey station. However, it is supposed this traffic does not have much influence on the traffic in the Study Area. Therefore, detailed estimation is not required to compile the OD table. It was determined that the OD table of the Naitonal OD Survey would be used as the basis.

Two problems had to be solved in order to use the OD table of the National OD Survey. The first was that the OD table was not classified by vehicle type. Therefore, OD tables by vehicle type had to be estimated based on this OD table. The second problem was the gap in between the study years. Therefore, it was necessary to fill in the gap.

To solve these problems, the following assumptions were made.

Table-3.3.2 shows the vehicle type composition in Java surveyed in the National OD Survey. This composition was employed to classify the OD table into that by vehicle type.

Table-3.3.2 Vehicle Type Composition in Java

Vehicle Type	Rate
Motorcycle	23.0%
Car, Jeep or Combi	20.0%
Opelet	21.0%
Bus	7.0%
Pickup	7.0%
Truck	22.0%
Total	100.0%

Note: Surveyed by Bina Marga in 1982

The OD tables were then multiplied by the growth rate to cover the present OD volume. Growth rate was taken as 7.9% annually, which was the growth rate in vehicle ownership between 1982 and 1989.

Upon completion of the aforementioned estimation, the OD table was converted according to the zoning system applied in the Study.

5) Formation of Public Transportation OD Table

Formation of public transportation OD table was simple and easy. The information such as number of vehicles, route covered, origin and destination of the route and frequency of service was registered. Counting by OD pair, the public transportation OD table was then obtained.

6) Combination of the OD Tables

Up to this point, the following three types of present OD tables had been obtained.

- OD tables expanded at each survey station
- OD tables based on the National Survey
- Public transportation OD table

The combination of these three OD tables in order to obtian the final present OD tables, was as follows;

Table-3.3.3 Combination of OD Tables

Vehicle Type	OD tables expanded	OD tables based on National Survey	Public transport OD tables
Angkutan Kota			*
Bus	*1		*2
Passenger Car	**	**	
Light Truck	**	**	
Heavy Truck	**	**	

Note: * : Selected
*1: Sightseeing bus OD
*2: Public bus OD
**: Selected by comparison of OD pair

7) Examination of OD Tables Formed

The formation procedure described in this section involved several assumptions. Therefore, the OD tables obtained should be checked as to the extent they reflect the actual conditions.

The screen line survey is the only way to provide such a check. By comparing the actual traffic volume across a certain screen line and the traffic volume from the OD table across the same screen line, the OD tables could be checked.

Two screen lines were set up. From the combined OD tables, the traffic volume which passes across these screen lines was summed up, and compared with the total traffic volume which was actually counted at the traffic count survey. Table-3.3.4 indicates the result of comparison which was done on the two screen lines A and B which are shown in Fig.-3.3.2.

The check proved that the OD tables for all vehicle types, with the exception of angkutan kota and bus, formed well. Number of angkutan kota units actually operated are much larger than times registered. On the other hand, operated buses are less than that registered.

Table-3.3.4 Screen Line Check of Present OD Table

Screen Line	(A)			(B)		
Vehicle Type	Traffic Volume Counted	Traffic Volume from OD Table	Degree of Error	Traffic Volume Counted	Traffic Volume from OD Table	Degree of Error
Mini Bus	7,940	3,852	-0.515	1,700	1,497	-0.119
Bus	3,770	5,625	0.492	3,073	4,248	0.382
Passenger Car	13,354	13,769	0.031	9,303	9,060	-0.026
Light Truck	4356	4703	0.080	2196	2492	0.135
Heavy Truck	8544	8675	0.015	6607	6435	-0.026
Total	37964	36624	-0.035	22879	23732	0.037

Note: Degree of Error = (OD Volume - Traffic Counted) / Traffic Counted

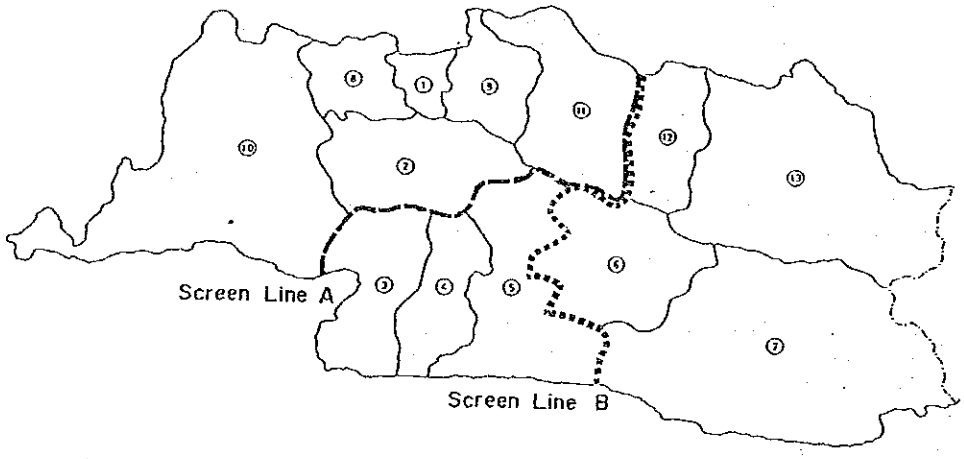


Fig.-3.3.2 Screen Line Locations

3.3.2 Characteristics

1) Existing OD Tables

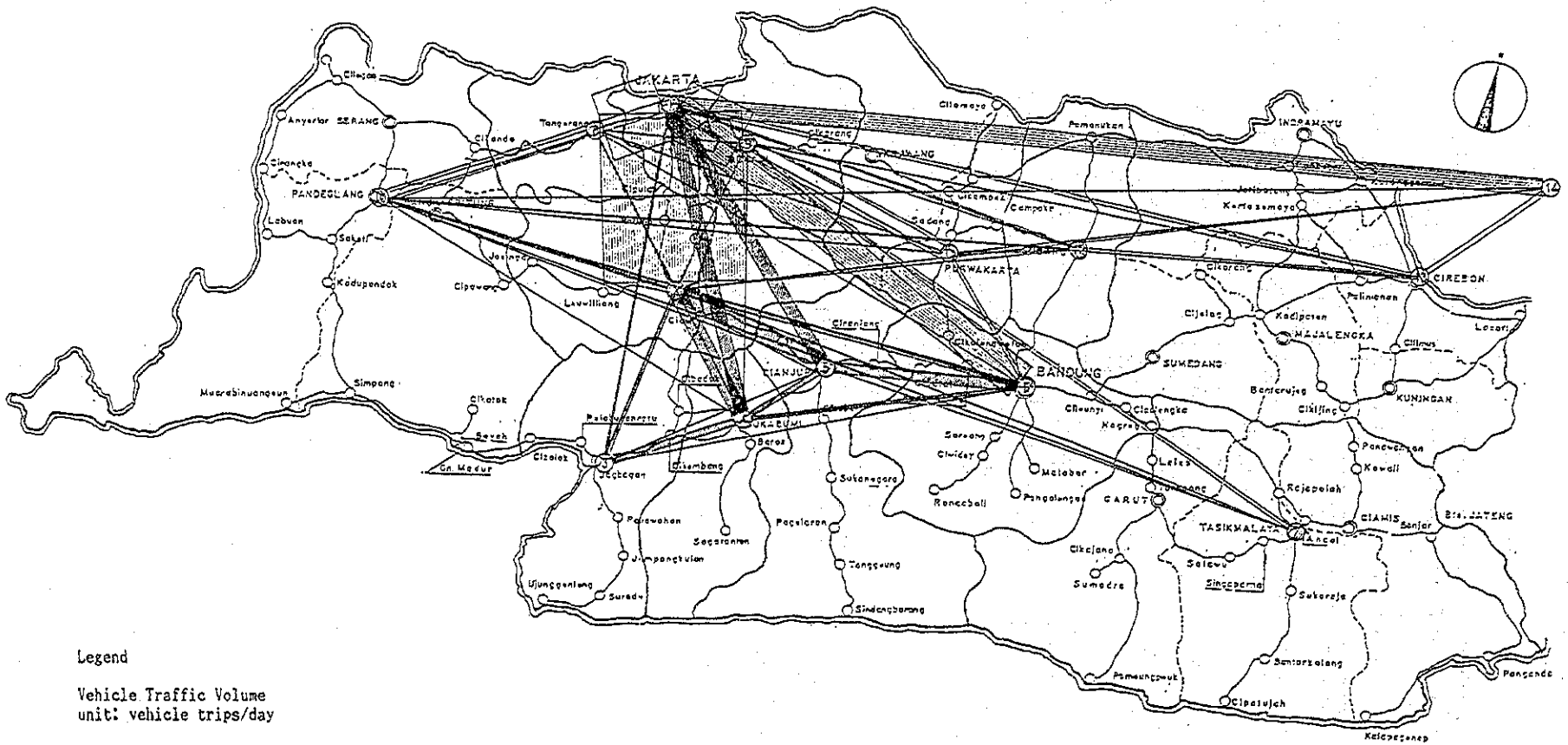
The generation/attraction of the OD tables by zone, built according to the formation aforementioned are shown in Table-3.3.5.

Table-3.3.5 Existing Generation/Attraction by Vehicle Type

	Generation						Attraction					
Zone	Angkutan Kota	Bus	Pass. Car	Light Truck	Heavy Truck	Total	Angkutan Kota	Bus	Pass. Car	Light Truck	Heavy Truck	Total
1	12,505	6,205	11,443	3,798	11,130	45,081	12,505	6,200	11,462	3,836	11,206	45,209
2	7,505	2,475	5,023	2,205	4,968	22,176	7,505	2,468	5,069	2,204	4,962	22,208
3	587	164	375	328	380	1,834	587	164	388	344	383	1,866
4	1,323	727	1,799	841	1,135	5,825	1,324	729	1,786	840	1,136	5,815
5	1,136	43	2,823	1,056	772	5,830	1,136	58	2,834	1,022	742	5,792
6	501	605	3,454	893	2,048	7,501	500	601	3,472	908	2,061	7,542
7	1	258	128	55	144	586	1	258	119	60	133	571
8	3,241	1,086	1,825	708	2,240	9,100	3,241	1,083	1,818	709	2,229	9,080
9	3,069	1,177	1,675	640	2,011	8,572	3,069	1,177	1,679	643	2,014	8,582
10	846	424	600	264	747	2,881	846	424	581	266	744	2,861
11	1,722	447	984	365	947	4,465	1,722	447	962	357	937	4,425
12	421	201	259	91	254	1,226	421	201	250	83	236	1,191
13	407	662	282	107	308	1,766	407	663	280	102	301	1,753
14	245	703	900	291	1,033	3,172	245	704	870	268	1,033	3,120
Total	33,509	15,177	31,570	11,642	28,117	120,015	33,509	15,177	31,570	11,642	28,117	120,015

The total trip production in the Study Area is about 120 thousand trips. Trips to/from Jakarta represent about 30% of this total. Furthermore, the number of trips which are generated in and attracted to the survey area at locations such as Bogor, Cibadak, Sukabumi, Cianjur and Bandung, is 43 thousand.

In Fig.-3.3.3, the desire lines are displayed.



Feasibility Study on Bogor-Bandung Road Project

Fig.-3.3.3 Desire Lines of Existing OD

Traffic volumes between Jakarta and Bogor, and Jakarta and Bandung are huge. The traffic volume travelling through the survey area between Bogor and Bandung is also large at about 20,000.

At present the Jagorawi Highway is already in operation to serve the huge traffic between Jakarta and Bogor, and Cikampek-Padalarang Road is planned to serve the traffic between Jakarta and Bandung. Therefore, the main points of this study shall be to analyze the future growth of the existing 20,000 vehicle trips between Bogor and Bandung traveling within the survey area, and accordingly develop a road project plan for the area.

2) Characteristics

(1) Average Trip Length

Table-3.3.6 describes the average trip length by vehicle type and the distribution shape is exhibited in Fig.-3.3.4. Trip lengths were calculated off the actual map.

Table-3.3.6 Average Trip Length

Distance Rank (km)	Vehicle Type					Total
	Angkutan Kota	Bus	Passenger Car	Light Truck	Heavy Truck	
0 ~ 30	254	10	611	306	239	1,420
30 ~ 60	24,530	7,814	13,679	5,297	15,429	66,749
60 ~ 90	5,109	1,129	4,206	1,903	2,441	14,788
90 ~ 120	2,456	1,696	5,112	1,792	3,205	14,261
120 ~ 150	128	225	1,189	563	1,002	3,107
150 ~ 180	516	1,206	4,437	939	3,061	10,159
180 ~ 210	480	199	359	137	431	1,606
210 ~ 240	26	132	107	81	149	495
240 ~ 270	0	1,321	212	98	236	1,867
270 ~ 300	0	126	143	57	160	486
300 ~ 330	0	0	20	6	12	38
330 ~ 360	10	6	6	4	6	32
360 ~ 390	0	82	248	120	141	591
390 ~	0	1,231	1,241	339	1,605	4,416
Mean Trip Length (km)	56.40	119.95	99.46	91.49	99.03	89.15

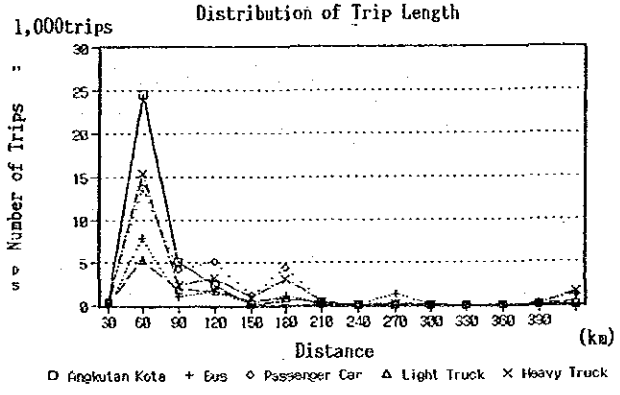


Fig.-3.3.4 Distribution of Trip Length

All vehicles except angkutan kota have almost the same average trip length of about 100 km. This figure indicates long distance trips, suggesting that a high-standard road to serve such long distance trips would be very effective.

2) Summary of Roads within the Survey Area

Characteristics of roads (links) in the Study Area, obtained from the Surveys and the present OD tables are summarized in Table-3.3.7.

Table-3.3.7 Characteristics of Links in the Study Area

Link City		Survey Station	Traffic Volume Counted	Heavy Truck Ratio	Peak Hour	Peak Ratio	Usage of Link	
							Main OD Pair	Traffic Volume (veh/day)
Ciawi	~ Puncak	1	16,469	5.4%	15~16	7.29%	JKT~BDG	3,200
							JKT~CJR	2,800
Puncak	~ Cianjur	2	12,246	5.8%	16~17	7.40%	JKT~BDG	3,400
							BGR~CJR	1,400
Ciawi	~ Cibadak	6	9,847	27.6%	15~16	6.93%	JKT~SKB	2,400
							BGR~SKB	2,000
Cibadak	~ Sukabumi	4	9,447	16.6%	15~16	6.44%	JKT~SKB	2,200
							BGR~SKB	1,100
Sukabumi	~ Cianjur	3	4,087	27.5%	11~12	6.97%	SKB~CJR	1,100
							SKB~BDG	1,000
Cianjur	~ Padalarang	7	9,895	17.0%	16~17	7.01%	JKT~BDG	3,400
							CJR~BDG	2,000

Note: Abbreviation of city name is as follows.

JKT : Jakarta
BGR : Bogor
SKB : Sukabumi
CJR : Cianjur
BDG : Bandung

The following was deduced from this table;

- Truck traffic is restricted on the Puncak pass. Accordingly, trucks are traveling along other roads, effecting the congestion of those roads, as well as taking longer routes resulting in an economic loss. It was therefore necessary to consider this point in this study.

- The traffic volumes of all the links in the Study Area exceed the link capacities, especially the Puncak pass which has a traffic volume of more than 15,000.

- The congestion of Ciawi-Puncak-Cianjur-Padaralang route is attributed to the huge traffic volume between Jakarta and Bandung. Therefore, it is required to ascertain the movement and the influence of that traffic, and the effect the completion of the Cikampek-Padalarang Toll Road will have on it.

CHAPTER 4 DEVELOPMENT FRAMES

4.1 Regional Development Plan

4.1.1 General Policy

In accordance with the fifth Five Year National Development Plan (Pelita V, 1989-1994), the Provincial Government of West Java has prepared it's Regional Development Plan. The strategic policy of that Regional Development Plan has been established taking into consideration the existing problems and development related problems. The plan's objectives are as follows:

- to enhance the quality of human resources,
- to encourage economic activities by supporting the development of economic organizations, especially cooperatives,
- to create broader employment opportunities, especially in rural areas,
- to effectively increase the number of regional governmental officers, and
- to adequately balance the use of natural resources and the conservation of the environment.

The economical development strategies of the Regional Development Plan are described as follows:

- The long-term development scheme calls for the extension of West Java's economic development through the intensification and diversification of products in the direction of creating a balanced agro-economic and industrial structure in terms of all Indonesia.
- The intensification and diversification with regard to rice field products is to be achieved without a decrease in food production, but rather through the increase in horticulture, cattle and fishery production.
- It is important to insure cooperation between a modern/dynamic economy and lesser class village economy. Therefore it is necessary to provide support for the integration of, and inter-connection within the economic organization.
- The concentration and centralization of capital on heavy industry in urban area should be adjusted in order to attain a balance with rural areas. Urban problems, caused by unplanned urbanization can be prevented through the harmonious development between rural and urban areas.

4.1.2 General Land Use Policy

In order to balance the need for maintaining the environment and at the same time foster economic activities and public welfare schemes, policy on spatial usage of limited land made for the long term is universally recognized as being of the utmost importance. From this viewpoint, West Java classified its land area into 4 land use groups, by types as follows:

- Non-budidaya land:
  This land should be eternally preserved for maintaining hydrologis function, forestry production and living resources. (Consists of preserved land, productive forestry, and natural and animal preserves).

- Wet land:
  This land is utilized to increase agricultural productivity, specially technically irrigated rice fields. (Consists of rice fields, salt water fish farming and fresh water fish farming).

- Dry land:
  This land is also utilized for increasing agricultural products. (Consists of plantation estates, secondary crops, land for livestock breeding and grazing).

- Non-agricultural land:
  This land is used to develop cities under a hierarchical structure in order to create a dynamic balance between urban and rural development. (Consists of urban area, industrial area and mines).

4.1.3 Road Development

1) General

Road works are classified into five categories, details of which are outlined in Fig.-4.1.1. Due to the recent economic difficulties of the nation, more emphasis is being paid towards the road rehabilitation programs in order to secure a greater length of serviceable roads at local level. New road construction is limited only to cases where it is absolutely necessary. Large part of such works rely heavily on international financial assistance.

2) International Assistance

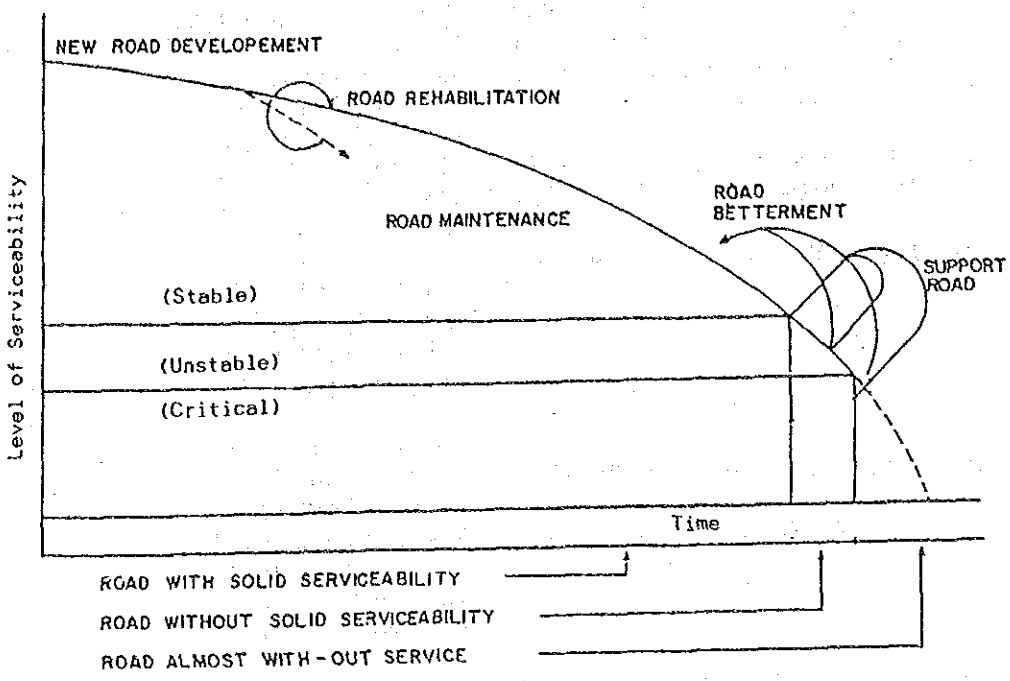
Assistance on roads works from international funding agencies is normally extended among the following classifications; new road development, road betterment, and road rehabilitation (periodic maintenance). The works assisted by international financial organizations in West Java are presented in Fig.-4.1.2.

- Past and on-going;

1.	KFAED 203	: 21.11.1981 :	Cibitung-Cikampek
2.	OECF IP 183	: 30.11.1977 :	Jakarta-Tangerang (Toll)
3.	SFD 3/174	: 25.02.1983 :	Padalarang-Bandung
4.	KFAED 316	: 23.07.1987 :	Bandung-Cileunyi
5.	USAID 479-T-031	: 24.01.1974 :	Jakarta-Ciawi
6.	IBRD 1236 IND	: 15.04.1976 :	Cileunyi-Cilacap
			Banjar-Pangandaran
7.	IBRD 1696 IND	: 01.06.1979 :	Bandung-Palimanan
8.	IBRD 2049 IND	: 09.10.1981 :	Jakarta-Cibitung (Toll)
			Bekasi-Cikampek
9.	IBRD 2404 IND	: 11.05.1984 :	Ciamis-Cirebon
			Cirebon-Pejagan
			Ciawi-Cianjur
			Subang-Rancabali
			Tangerang-Merak
			Subang-Sadang
			Subang-Pamanukan
10.	IBRD 2717 IND	: 26.06.1986 :	Gandaria-Jasinga
			Serpong-Parung
11.	ADB 692 INO	: 03.10.1984 :	Nagreg-Cikajang
			Cikijing-Kadipaten
			Garut-Cipatujah
			Kuningan-Losari

- Pledged by ADBP (Phase IV - ADB 692, 03.10.1984)

	Road No.	Length	Location
1.	008	45.0	Cikampek-Pamanukan
2.	009	55.0	Pamanukan-Lohbener
3.	025	43.0	Palimanan-Jatibarang-Lohbener
4.	029-030	42.0	Serang-Pandeglang-Rangkasbitung
5.	031	53.0	Rangkasbitung-Jasinga
6.	026	58.0	Cilegon-Labuan
7.	027-028	41.0	Pandeglang-Saketi-Labuan
8.	048	40.8	Bandung-Pangalengan



Note 1) New Road Development;
Plan and construct new roads.

2) Road Betterment
Upgrade the unstable and critical roads to stable ones.

3) Support Work
Recover the better unstable roads from worse unstable and critical ones.

4) Road Rehabilitation (Periodic Maintenance)
Special maintenance work on the stable roads when excess damages are found.

5) Road Maintenance
Daily and small road works which are patching of road surface, clearing of gutter and general maintenance.

Fig.-4.1.1 Level of Serviceability and Road Works

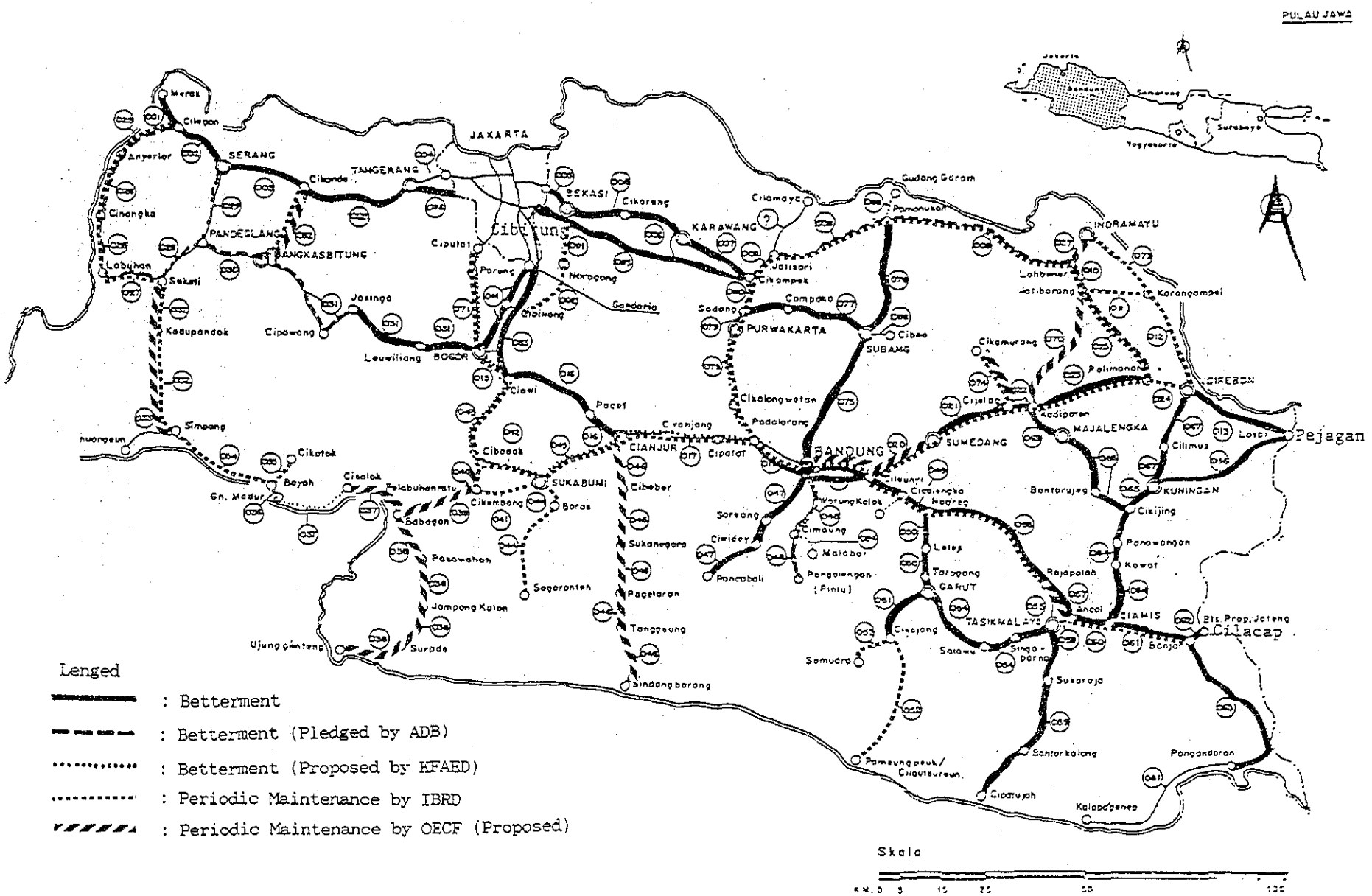


Fig.-4.1.2 Road Works by International Assistance

Proposed by KFAED

	Road No.	Location
1.	071	Ciputat-Bogor
2.	015/143/042	Bogor-Ciawicibadak
3.	045	Sukabumi-Cianjur
4.	017/018	Cianjur-Bandung
5.	078/079	PDL-Cikampek
6.		Cibadak-Sukabumi-Cianjur

Although the Road Betterment work theoretically includes widening, improvements of alignment and gradient; overlay on existing road surface dominates in actual implementation. As a result, the road capacity after the work does not increase very much; rather, it should be considered that the previous condition is restored.

Work sections are solely determined by the present and near future demand, such that sections in parallel with new toll highways are subject to betterment work just the same as others.

3) Tollways

Both existing and future tollways planned near the Study Area are presented in Fig.-4.1.3. There is a continuous line of tollways along the northern coast, which are West Jakarta - Merak Tollway, various tollways in Jakarta, Jakarta - Cikampek Tollway, and Cikampek - Cirebon Tollway. At present the status of each is as follows;

- Jakarta - Merak Tollway
  Jakarta - Tangerang is in operation together with two bypasses at Cikande and Serang.
- Tollways in Jakarta
  Jakarta Intra Urban Tollway is under construction and partly in operation. Harbor Road is at the preparation stage for construction and Outer Ring Road is in the detailed design stage.
- Jakarta - Cikampek Tollway
  The Tollway is in operation in its total extension since late 1988.

Other ones are as follows;

- Jagorawi Tollway
  Opened in 1979 from Jakarta to Ciawi with a spur toward Bogor. Constructed with USAID assistance.
- Cikampek - Padalarang Tollway
  From the Jakarta - Cikampek Tollway, this is planned to branch off toward Bandung to be connected with the Bandung Bypass. A feasibility study was completed in August of 1987, in which 1993 was considered as the target year for opening.
- Padalarang - Cileunyi Tollway
  Financial assistance from Saudi Fund and Kuwait Fund has been extended and construction commenced in late 1987, and is scheduled to be completed by 1990. This toll road will provide a bypass for Bandung, with many spurs directly connecting it to the city center.

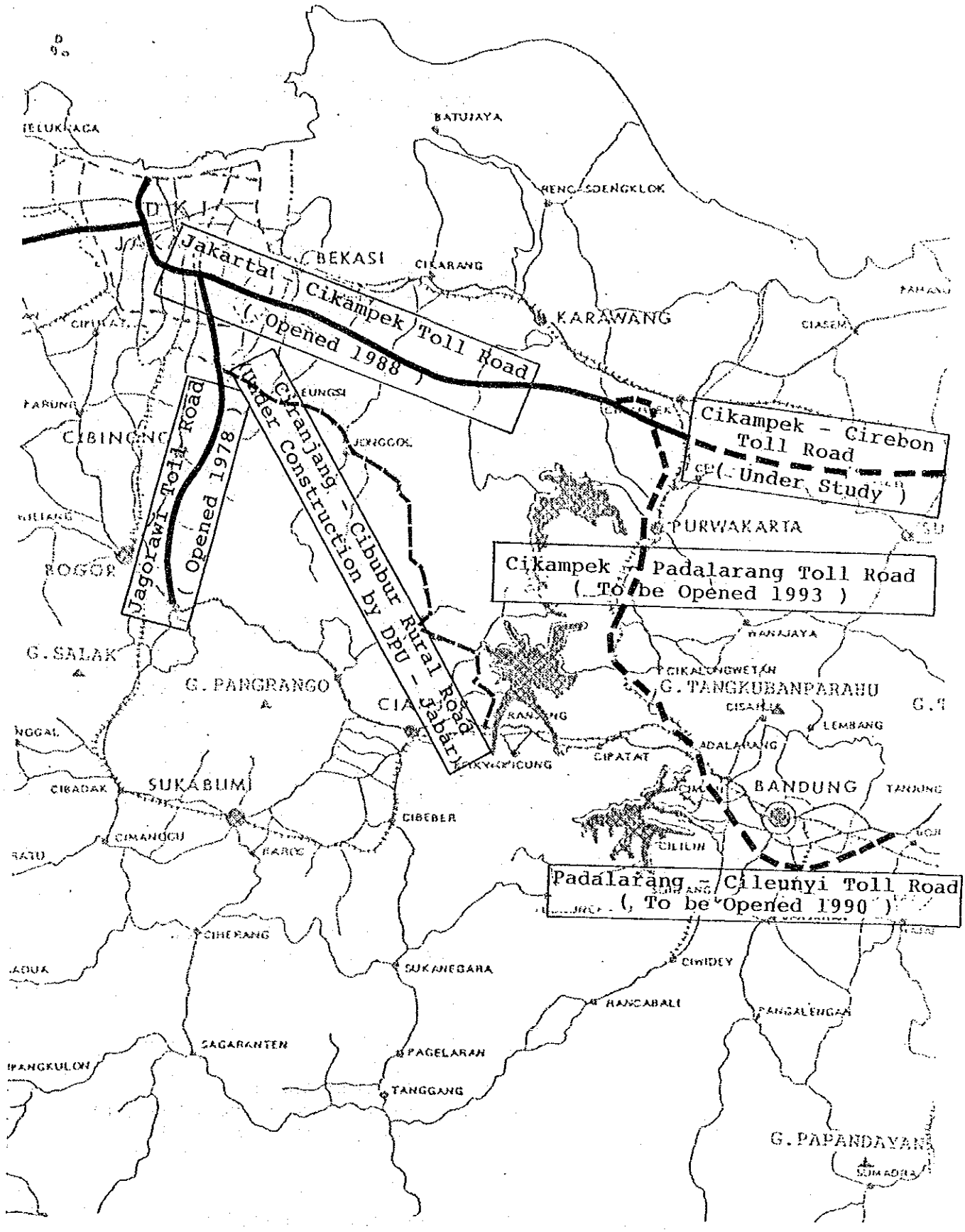


Fig.-4.1.3 Road Development near the Study Area

4) Other road development

The Government of West Java Province is to carry out a rural 2 lane road construction between Ciranjang and Cibubur in order to disperse traffic at Puncak Pass.

4.2 Regional Structural Plan

4.2.1 Function of Each Development Region

According to The Provincial Pelita V, each Development Region is directed to attain a balanced economic and spatial structure. The main function of each Development Region is as follows.

1) Banten Development Region

- To provide an industrial zone with Cirebon as its center
- To develop land for wet rice cropping in the northern part
- To develop tourism
- To develop agricultural land in the southern part of the region

2) Botabek Development Region

- To support DKI Jakarta
- To function as a buffer zone for activities in Jakarta as well as outside Jakarta which have a negative impact on the environment
- To function as a center for agricultural crops, in particular for vegetables, fruits, and flowers

3) Sukabumi Development Region

- To function as a counter-magnet for DKI Jakarta
- To function as a center of tourism development
- To develop the agricultural sector

4) Purwasuka Development Region

- To be the rice granary of West Java
- To develop the estate agriculture and the fishery sector
- To develop small scale industry and handicrafts

5) Bandung Raya Development Region

- To serve as the regional center for industrial development
- To be the center of higher education
- To be the center for governmental administration
- To maintain the regional functions of conservation of natural resources, agricultural development and energy generation

6) Cirebon Development Region

- To develop in relation to the development of DKI Jakarta
- To be the main gateway from/to Central Java
- To be the center of agricultural development

7) Priangan Timur Development Region

- To develop dry land cropping in the northern area
- To develop handicraft industry in the central area
- To develop estate agriculture and tourism in the southern area
- To develop wet paddy field cultivation in the area with technical irrigation system

4.2.2 Urban Development

The National Urban Development Strategy (NUDS) study projected that the urban population in each Development Region (WP) would be as described in Table-4.2.1.

Table-4.2.1 Percentage of Total Population in Urban Centers

	1971	1980	2000
WP Banten	5.3	6.7	14.3
WP Botabek	17.7	22.0	53.7
WP Sukabumi	17.8	19.9	19.1
WP Purwasuka	10.7	11.2	28.0
WP Bandung Raya	29.9	32.3	43.4
WP Priatim	9.0	9.8	14.4
WP Cirebon	12.4	13.4	19.7
West Java	17.4	19.6	34.7

NUDS classifies a city into five (5) categories based on magnitude and location. These categories are:

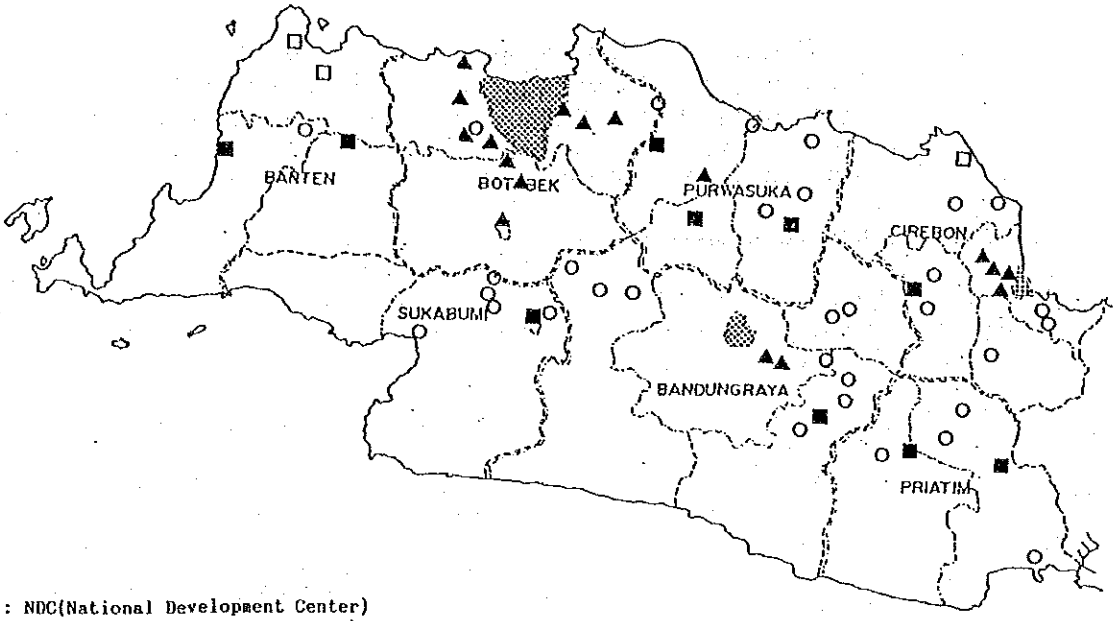
NDC : National Development Center
RDC : Regional Development Center
IDC : Inter-regional Development Center
SNDC: Sub Center of NDC
LDC : Local Development Center

In accordance with the preceding classification, 76 cities are projected to develop respectively as shown in Fig.-4.2.1. A remarkable feature of the Study Area is that Sukabumi and it's surroundings formulate one city zone between Jakarta and Bandung Metropolitan Area.

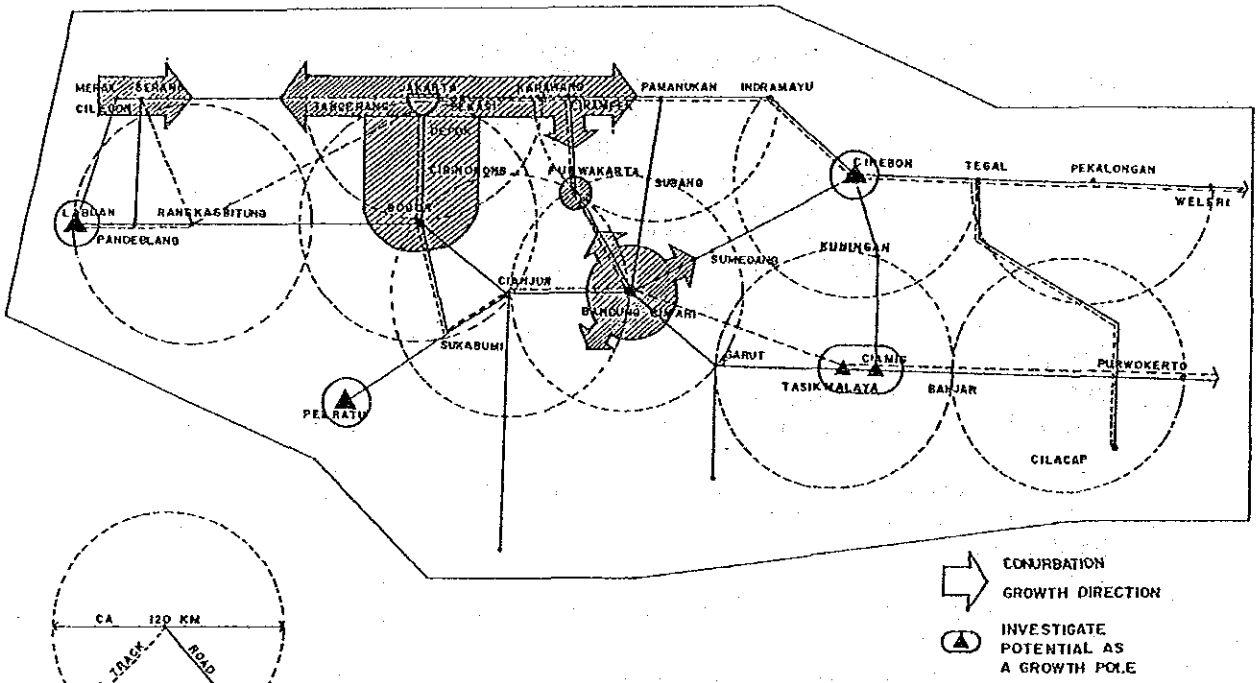
Furthermore, in the LTA-47 Report, intermediate cities that are considered capable of becoming independent thriving growth centers are those cities that;

- are located more than 60 kilometers from the metropolitan area, and
- have a proven potential for economic development.

Accordingly 9 cities qualify and Sukabumi city is one of them. The trend of urban growth in West Java can be illustrated as shown in Fig.-4.2.1.



: NDC(National Development Center)
: RDC(Regional Dvelopment Center)
: IDC(Inter-regional Development Center)
: SNDC(Subcenter of NDC)
: LDC(Local Development Center)



FEASIBILITY STUDY ON BOGOR - BANDUNG ROAD PROJECT	Fig.-4.2.1 Urban Development Trend in West Java

The axis of Jabotabek-Sukabumi-Bandung may be considered as one of the most important strategic axes in parallel with the Jabotabek-Cikampek-Cirebon axis in West Java.

4.3 Spatial Development Plan

4.3.1 Long Term Spatial Development Plan

West Java Province and each Kabupaten/Kotamadya have prepared their long term spatial development plans in accordance with the "Basic Pattern on Region Development (POLA DASAR DAERAH TINGKAT I/II)" The plan shows the area development schemes by Kecamatan basis. The plan also shows the land use and spatial distribution of socio-economic activities.

According to the plan, the development of each development region was directed to facilitate the realization of that region's potentials. The potentials in the development region situated in the Study Area are as follows.

- Botabek Development Region

a. Vicinity to large potential markets
b. Vicinity to many government facilities
c. Under utilized agricultural potential
d. Concentration of industrial activities
e. Large skilled and semi-skilled labor force

- Sukabumi Development Region

a. North Sukabumi is near enough to Jabotabek for the development of economic activities oriented to urban needs, such as tourism and food products
b. Possibilities for improvement of estate agriculture
c. Small-scale industry with high growth rate (10% per year)

- Bandung Raya Development Region

a. Strong domestic industrial base
b. Large army of experienced industrial laborers
c. Considerable potential for technical research and training
d. Highly developed agricultural sector
e. Good transport facilities to the rest of Java and export market

Table-4.3.1 shows the district and basic development direction within each development region based on its long term plan. In addition Fig.-4.3.1 and Fig.-4.3.2 show the main urban spatial development area directed in the Pola Dasar in each Kabupaten/Kotamadya. These figures and table indicate the direction of development is towards the tourism industry in the Kabupaten Sukabumi and Kabupaten Bandung, adjacent area of Bogor, caostal zone around Pelabuhan Ratu, south of Saguling and east of Tangkuban Perahu, which are located in the Study Area. Housing areas are concentrated around the large cities of Bogor and Bandung.

In addition to the spatial development plan, there are many plans to transfer Kabupaten administrative centers, in particular in Kabupaten Bogor to Cibinong and in Kabupaten Sukabumi to Pelabuhan Ratu.

Furthermore, the area of Kotamadya Bandung will be expanded in the near future. Such a decentralization policy will contribute to the realization of well-balanced area development in West Java.

4.3.2 Planned Projects

Several projects which are in various planning stages, related to the Study are enumerated by sector as listed below and the location of each project is shown in Fig.-4.3.3.

I. Roads:

1) Tangerange-Merak Tollway
2) Cikampek-Padalarang Tollway
3) Cikampek-Cirebon Tollway
4) Padalarang-Cileuni Tollway
5) Ciranjang-Cibubur Road
6) Sukabumi Bypass

II. Other Transportation Facilities:

1) Bandung New Airport
2) Cirebon Port Improvement

III. Water Resources:

1) Cisadane-Ciujung River Basin Development
2) Cirata Area River Basin Development

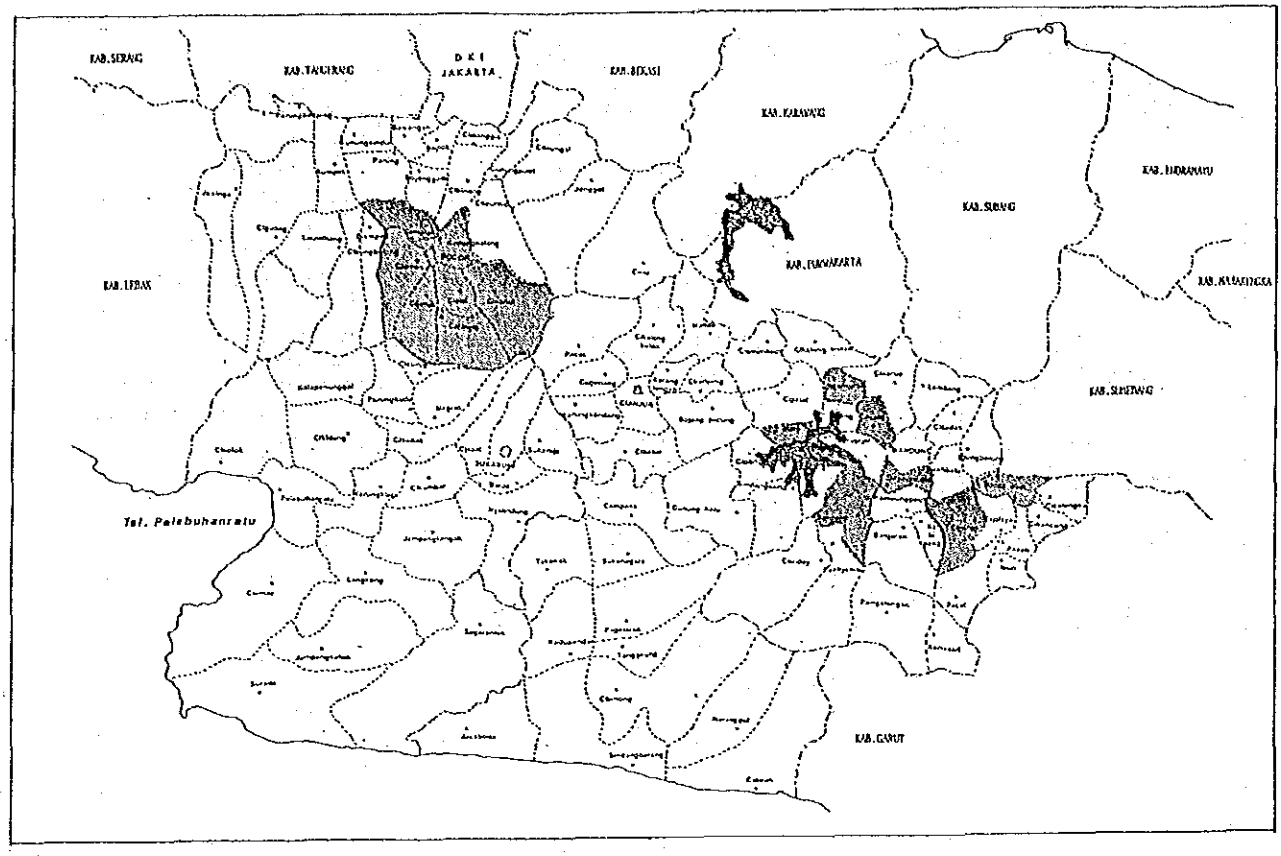
Among the projects listed above both Cikampek-Padalarang Tollway and Ciranjang-Cibubur Provincial Road connect DKI Jakarta area and Bandung metropolitan, therefore the traffic through Puncak pass will divert to those proposed roads after their completion and undoubtedly contribute to reduction of traffic congestion at Puncak pass. According to current programs both of the roads will be completed in the mid 1990's.

Table-4.3.1 Spatial Policy on Development District based on POLA DASAR (Basic Pattern) of West Java Province

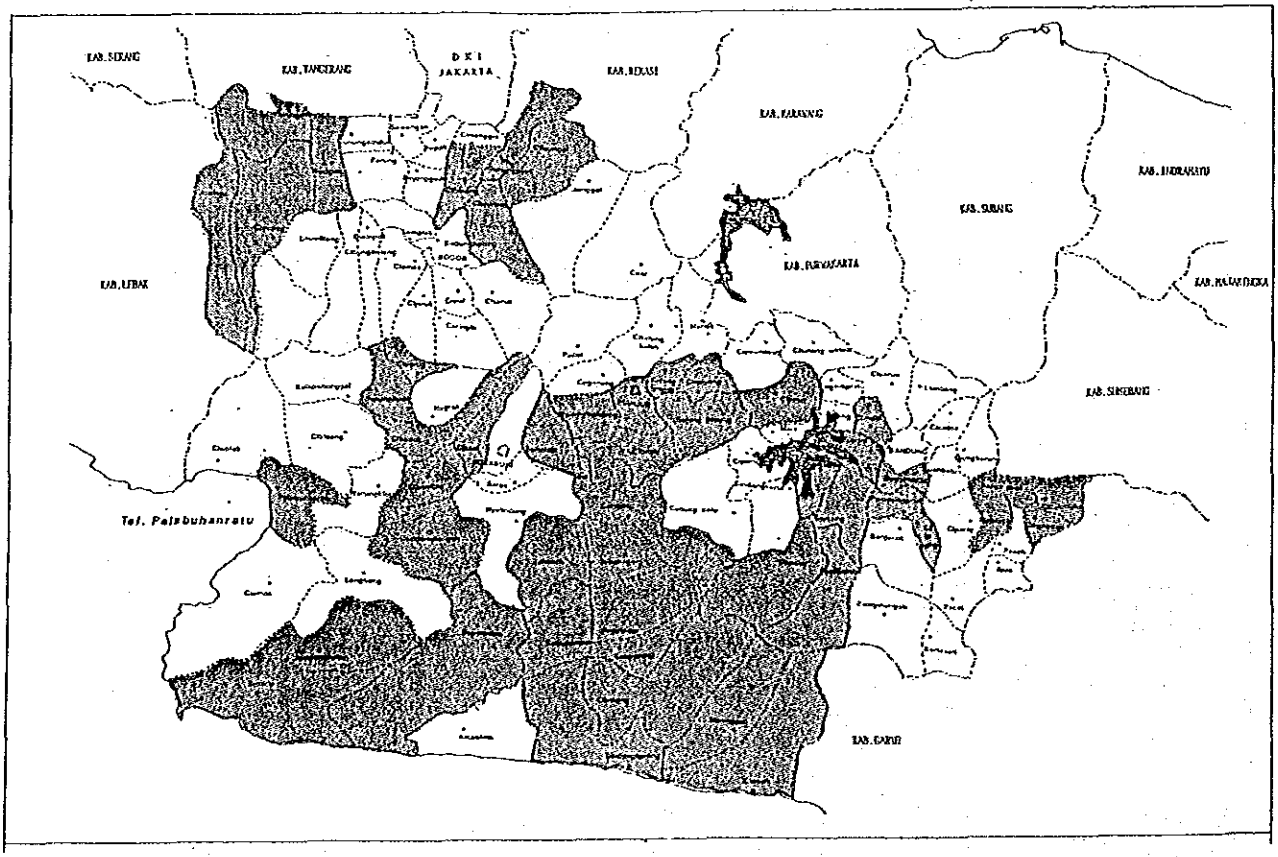
BASIC ACTIVITY DOMINATION	DEVELOPMENT AREA		
	BOTABEK	SUKABUMI	BANDUNG RAYA
1. AGRICULTURE RICE FIELD	Western of Bogor, North Bekasi, North Tangerang.	Ciletuh, Nagrak, Sukabumi.	At the plateau of Bandung between the cities of : - Surrounding of Cianjur & Ciranjang. - Surrounding of Sumedang, Cimalaka, Congeang, Wado, Darmaraja, Buahdua, Situraja.
2. FRESH WATER FISHERY	Central & North Bogor.	Sukabumi & Cibadak.	Majalaya, Soreang, Rancaekek, Ciparay, Banjaran, Cicalengka, Cianjur, Cipanas, Sumedang, Taragong.
3. DAM-FISHERY	North Beach of Tangerang & Bekasi.	---	---
4. SEA-FISHERY	North Beach of Tangerang & Bekasi.	Pelabuhan Ratu.	---
5. SECOND CROPS PLANTATION	Central Bogor, South Bogor, South Tangerang South Bekasi.	---	South Cianjur, Paseh, Cadasngampar, Tanjung-Kerta, South Garut, Malangbong.
6. VEGETABLES	---	North area of Sukabumi.	Lembang, Pacet, Ciwidey, Cipanas and its surrounding, Cikajang, Cisurupan, Sumedang.
7. FRUITS	---	Central & South Sukabumi.	Lembang, Pacet, Ciwidey, Cipanas and its surrounding.
8. BIG CATTLE-BREEDING	South Bekasi, South Tangerang, Central & North Bogor.	Central & South Sukabumi.	Pangalengan, Lembang, South Garut.
9. SMALL CATTLE-BREEDING	South Bekasi, South Tangerang, Central & North Bogor.	North Sukabumi.	Mixed Farming at the Agriculture area of South Garut.
10.BIG ESTATE	Supporting area of Puncak line.	Central & South Sukabumi	South Cianjur, South Garut.
11.PUBLIC ESTATE	Supporting area of Puncak line.	---	South Cianjur.
12.PRODUCTED AND PROTECTED FOREST	Protected area of Puncak line, Salak Mountain, Beach Forest on Ujung Karawang, North Beach of Tangerang.	Pangrango Mountain, Ciletuh, Gunung Parang, Ujung Genteng, Jampang Tengah, Gunung Halimun.	South & North Bandung, Supporting area on the mountains surrounded the Bandung Plateau, Surrounding Takokak area, Sukanegara, Naringgul, South Cianjur, South Garut, Surrounding of Gunung Guntur, Papandayan.
13.MINERALS (GROUP C)	Gunung Cimanceuri, Eastern of South Bogor.	Cibadak, South Sukabumi.	Dayeuh Kolot, South Cimahi, Cililin, Batujajar.
14.INDUSTRY AREA	Balaraja, Cikupa, Pasar Kemis, Tambun, Cibitung, Cikarang, Citeureup, Gunung Putri.	North & Central Sukabumi.	Rancaekek, Cicalengka, Ciparay, Majalaya, Padalarang, Kodya. Bandung, Garut.
15.TOURISM	---	Gede & Pangrango Mountain, Pelabuhan Ratu, South Sukabumi area	Taragong (Cipanas & Cilateureum).

Source : BAPPEDA Tingkat I Propinsi Jawa Barat Tahun 1988.

HOUSING



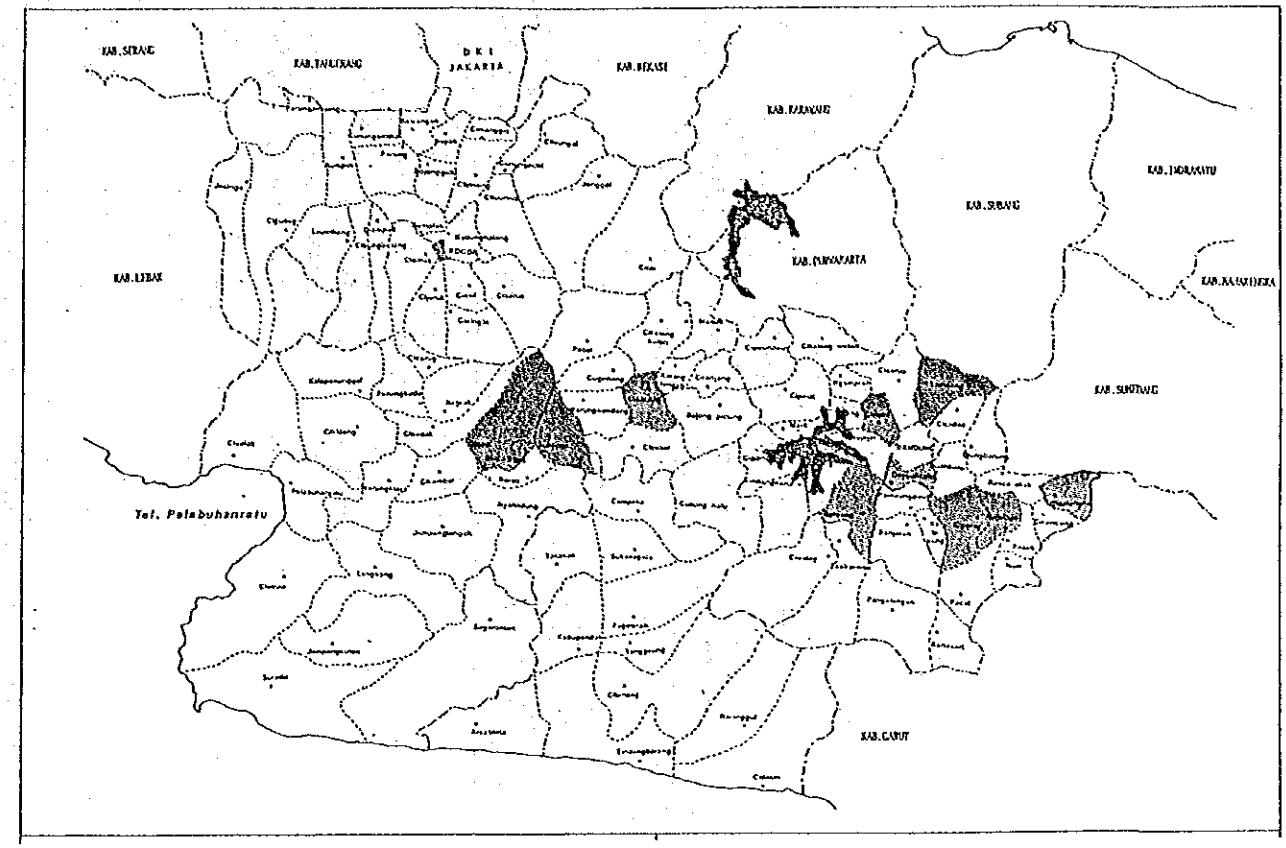
INDUSTRY



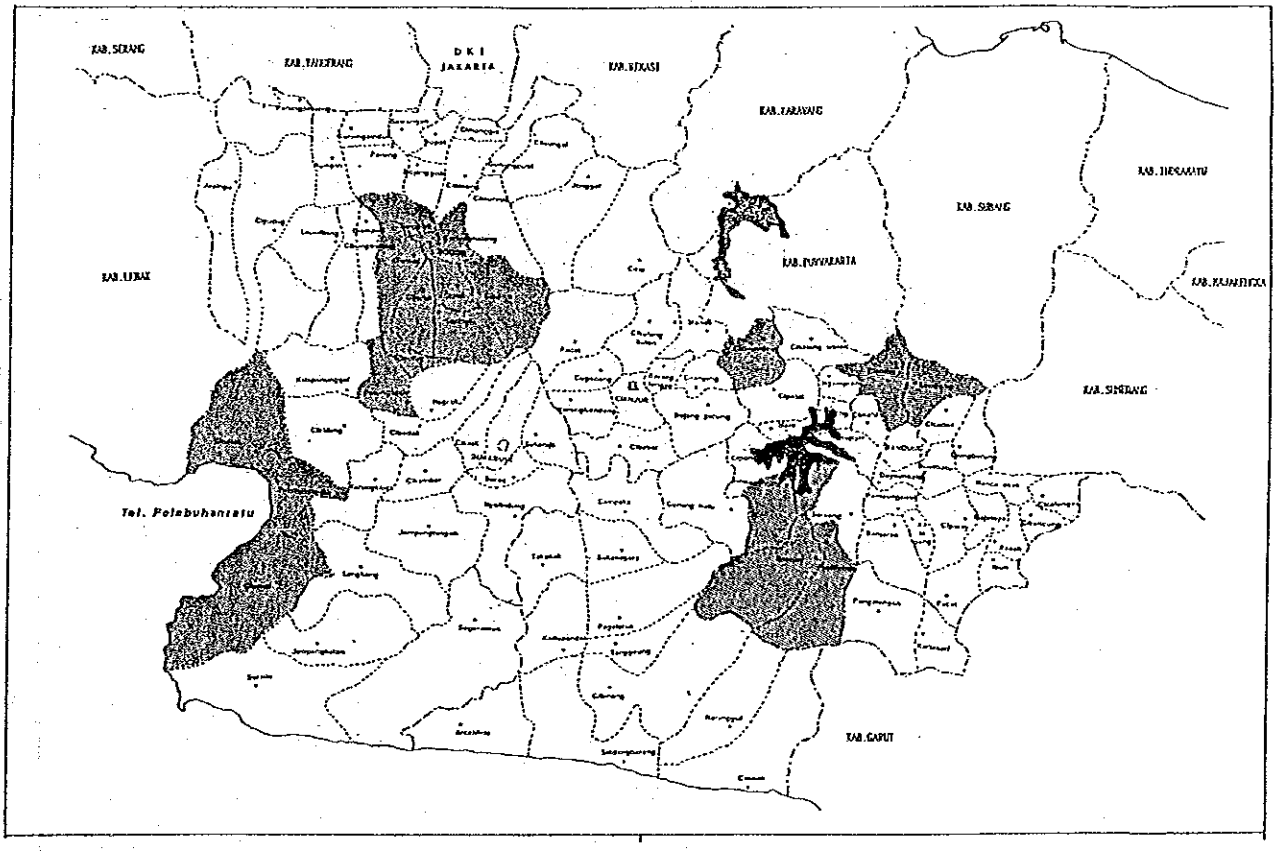
FEASIBILITY STUDY ON BOGOR - BANDUNG ROAD PROJECT

Fig.-4.3.1 Spatial Development Plan (Housing and Industry)

TRADING

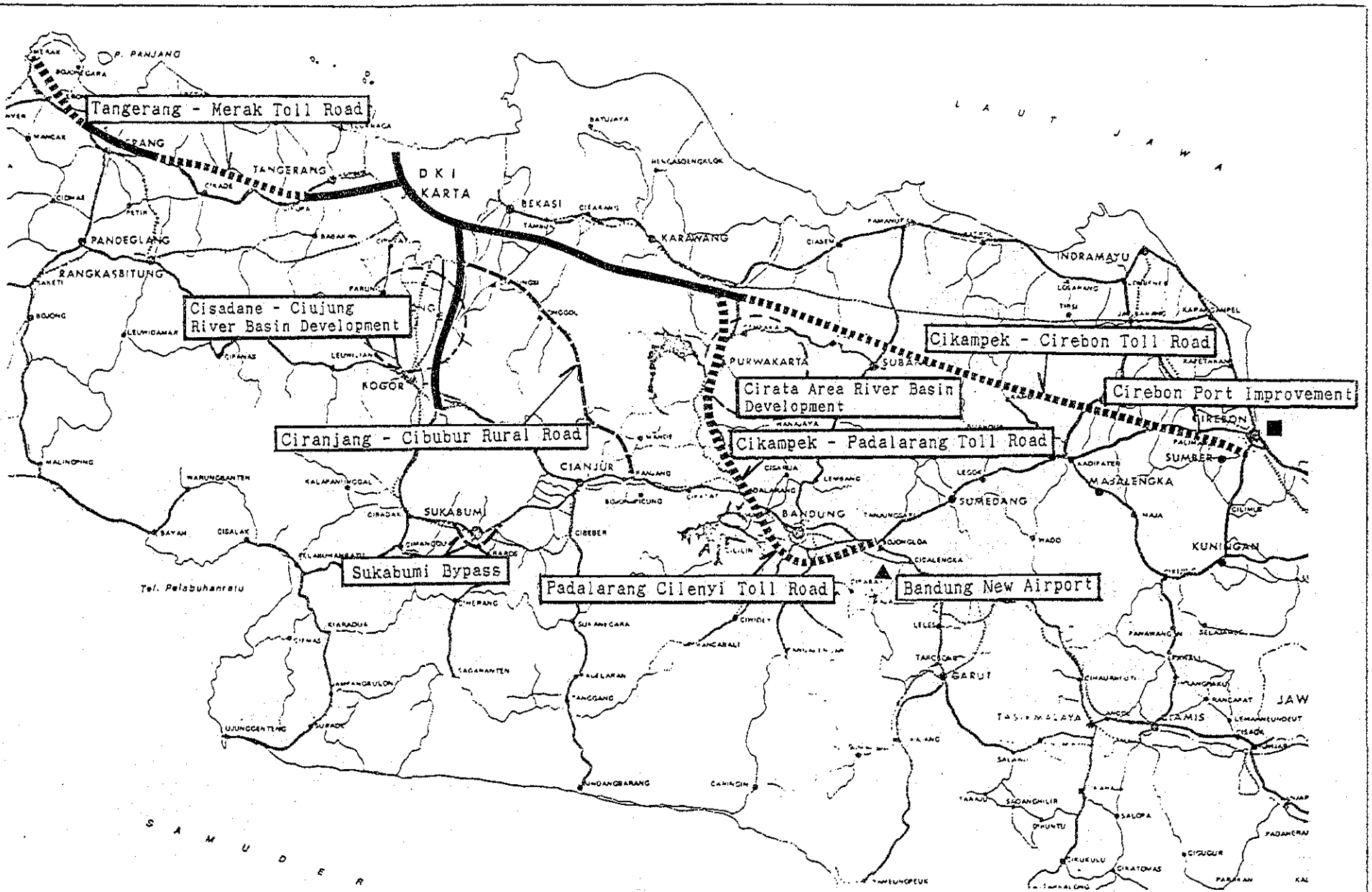


TOURISM



FEASIBILITY STUDY ON BOGOR - BANDUNG ROAD PROJECT

Fig.-4.3.2 Spatial Development Plan (Trading and Tourism)



Feasibility Study on Bogor- Bandung Road Project

Fig.-4.3.3 Planned Projects in the Study Area

4.4 Future Development Framework

4.4.1 Population

There are many projection data for the future population, such as that of BAPPEDA (planning department of West Java Province), BPS (Central Statistic Bureau), and NUDS (National Urban Development Strategy). Table-4.4.1 summarizes the data.

Table-4.4.1 Projections of West Java Future Population

Unit: 1,000

	1980	1985	1990	1995	2000
BAPPEDA	25,373	30,968	34,728	38,911	43,516
BPS	27,556	30,973	34,288	37,676	40,947
NUDS	27,556	30,517	33,268	35,918	38,397

Source:
- Proyeksi Penduduk Java Barat 1980-2000 (BAPPEDA)
- Proyeksi Penduduk Indonesia per Propinsi 1980-2000 (BPS)
- Provincial Population Projections (NUDS)
- LTA-47

The LTA-47 study conducted a great deal of review and identified that the difference among the projected results was due to the difference in the assumptions of migration rate, expected life time and birth rate. On the basis of their review they concluded that the most probable growth rates were as shown in Table-4.4.2. Based on these growth rates population figures were estimated as shown in Table-4.4.3.

According to the projection, the population of West Java will grow to around 41 million in the year 2000.

Table-4.4.2 Projected Annual Population Growth Rate by Development Region during 1980-2000

Unit: %

	1971-80	1980-85	1985-90	1990-95	1995-2000
Banten	2.56	1.98	1.66	1.56	1.37
Botabek	4.12	3.97	3.66	3.56	3.37
Purwasuka	2.17	1.78	1.46	1.26	1.07
Sukabumi	2.46	1.87	1.46	1.26	1.07
Bandung Raya	2.59	2.07	1.76	1.56	1.37
Cirebon	2.36	1.87	1.46	1.26	1.07
Priatim	1.72	1.37	1.07	0.86	0.77
West Java	2.66	2.28	1.99	1.87	1.74

Source: LTA-47

Between 1971 and 1980, among all the regions only Botabek development region grew at a rate higher than the provincial one, and it is expected that this growth trend will continue until the 21st century under the prime policy of structural change in industry by the Indonesian Government.

Bandung Raya will grow at a slower pace than Botabek, but faster than the other development regions because of the concentration of governmental organizations and industrial potential there.

The Sukabumi development region will grow at a somewhat lower rate than Bandung Raya because of the lack of similar favorable conditions.

Table-4.4.3 Population Projection of West Java by Development Region, 1980-2000

Unit: 1,000

	1980	1985	1990	1995	2000
Banten	2.496	2.753	2.989	3.231	3.459
Botabek	5.434	6.602	7.901	9.411	11.109
Purwasuka	2.770	3.025	3.253	3.464	3.654
Sukabumi	1.634	1.793	1.928	2.053	2.166
Bandung Raya	7.755	8.593	9.378	10.134	10.850
Cirebon	4.494	4.931	5.303	5.647	5.957
Priatim	2.972	3.182	3.355	3.503	3.641
West Java	27.555	30.879	34.107	37.442	40.835

Source: LTA-47

Based upon the LTA-47 projection, the Study Team projected the population in the target year 2010. Then a combined analysis, by smoothing method and GOMBERZ curve, was adopted. As the projection indicator the Study Team considered the cumulative growth ratio to the population in 1961.

By using this methodology the population in year 2010 was estimated as shown in Table-4.4.4 and Fig.-4.4.1.

Table-4.4.4 Total Population of West Java in Target Year of 2000 and 2010

Unit: 1,000

	1980	2000	2010
WP Banten	2,496	3,459	3,899
WP Botabek	5,434	11,109	14,806
WP Sukabumi	2,770	3,654	4,016
WP Bandung Raya	1,634	2,166	2,441
WP Priangan Timur	7,755	10,850	11,623
WP Cirebon	4,494	5,957	6,547
WP Purwasuka	2,972	3,641	4,000
West Java	27,555	40,835	47,332
DKI Jakarta	6,503	10,934	12,508
Central & East Java	49,883	83,237	96,498

4.4.2 Employment

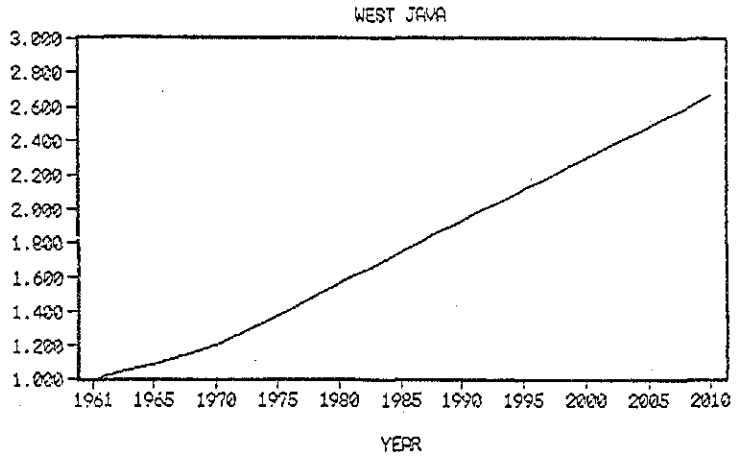
1) Total Employment

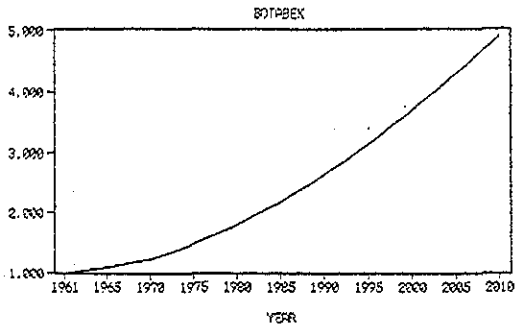
The LTA-47 projected the labor force growth rate in the year 2000 as shown in Table-4.4.5.

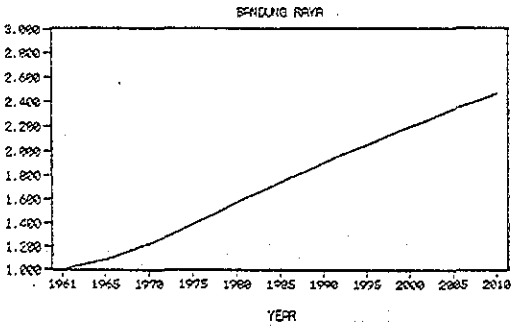
Table-4.4.5 Growth Rate of Labor Force

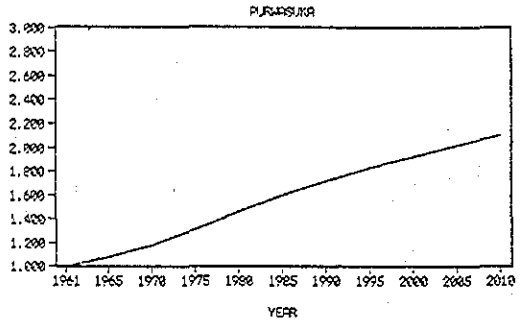
	1980-1989	1989-1994	1994-2000
DKI Jakarta	3.8%	3.0%	3.0%
West Java	3.1%	2.8%	2.8%

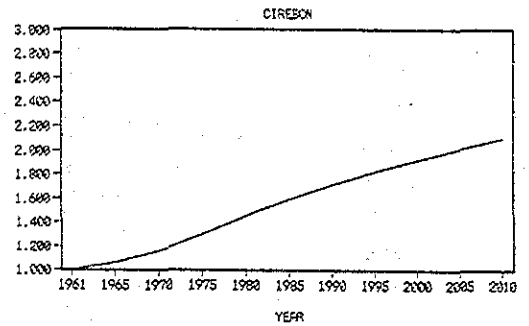
Source: LTA-47

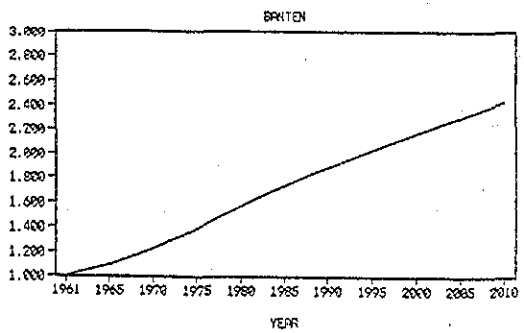


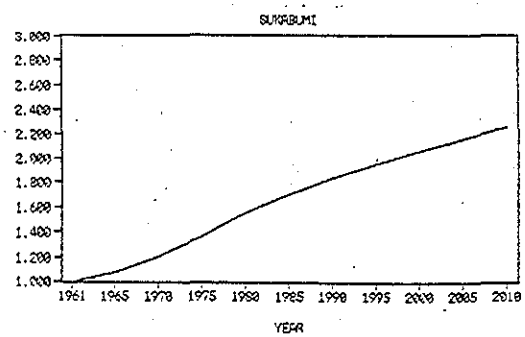


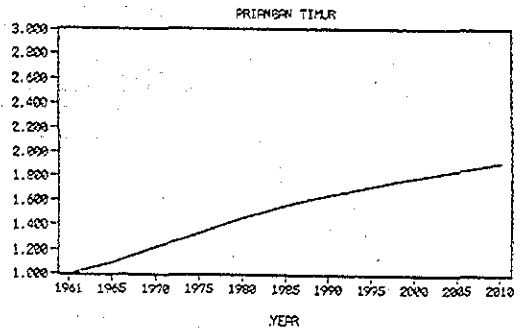












Feasibility Study on Bogor- Bandung Road Project

Fig.-4.4.1 Trend of Population Growth by Development Region (Relative Value to 1961)

In some small instances growth rates do not coincide with total labor force and sectorial ones in the LTA-47 study, therefore the Study Team dealt with each data as follows under the following assumptions:

a. Projected figures of total labor force were dealt with as control values.
b. Projected figures of sectorial labor force were used for distribution to the three (3) basic industries.
c. As a basic figure the 1980's census result was used.

Projected total labor force based on the above is arranged in Table-4.4.6.

Table-4.4.6 Total Labor Force

Unit: 1,000

	1980	2000	2010
DKI Jakarta	1,928	3,893	4,978
West Java	8,501	15,847	19,241
Central & East Java	22,597	-	-

2) Employment by Sector

The future employment in 2000 is projected by the LTA-47 study, in which the projection of sectorial employment was conducted by 29 sub-divided sectors respectively. In the LTA-47 study the same growth rate was used within all the development regions, however for DKI Jakarta a different rate was adopted. The Study Team calculated the growth ratio of each of the 29 sectors by using the rate mentioned above and then aggregated the results into the three (primary, secondary and tertiary) basic sectors.

The estimated growth ratios between 1980 and 2000 by sector are summarized in Table-4.4.7. Among the sectorial growth ratios "mining oil gas" and "water transportation" are applicable only in WP Cirebon, and "air transportation" is estimated for WP Bandung Raya only.

Table-4.4.7 The Annual Employment Growth Ratio between 1980 and 2000 in West Java

Primary Sector		Secondary Sector		Tertiary Sector	
Food crops	1.386	Food processing	1.372	Trade	1.736
Estate crops	1.300	Textiles	1.521	Hotel&restaurant	1.725
Livestock	1.406	Wood products	1.646	Railway transp.	1.374
Forestry	1.348	Paper products	1.451	Road transp.	1.340
Fisheries	1.418	Chemical product	1.457	Water transp.	1.290
Mining non-oil gas	1.517	Non metal	1.456	Air transp.	1.226
Mining oil gas	1.027	Basic metals	1.376	Communication	1.346
		Metal products	1.427	Finance	1.367
		Other manufac.	1.562	Public admi. & defense	2.761
		Petroleum	1.000	Other services	1.550
		Elec. gas&water	1.306		
		Construction	1.477		
		TOTAL :	1.560		

Source: LTA-47

Under the assumptions mentioned above the control frame value of employment by sector was projected as arranged in Table-4.4.8.

Table-4.4.8 Frame Value of Employment by Sector in the Years 2000 and 2010

	Total		Primary		Secondary		Tertiary	
	2000	2010	2000	2010	2000	2010	2000	2010
DKI Jakarta	3,893	4,978	57	53	743	910	3,093	4,015
West Java	15,847	19,241	6,018	6,470	2,698	33,501	7,131	9,270

4.4.3 Vehicle Ownership

In order to estimate the future total traffic demand (control total), the future total number of registered vehicles in West Java and DKI Jakarta was forecast. The following were taken into consideration.

- The 1987 to 1977 ratio for the total registered vehicle in West Java and DKI Jakarta is 2.72. During these 10 years, rapid growth in the area is recognized. Although the area is the most developed in Indonesia, however the number of vehicles per 1,000 population is approximately 27 vehicles and the motorization in the area is still low compared to other countries. In future, therefore, the rapid growth of motorization is expected to continue in the area.

- The number of registered vehicles per 1,000 population by type in the Study Area (1987) is 14.6 passenger cars, 8.2 trucks and 4.1 buses. The number of buses per 1,000 population is high compared to other countries. The 1987 to 1977 ratio of registered vehicle by type is 2.15 for passenger car, 3.09 for truck and 8.88 for bus. The bus ratio is high. The rapid growth in buses, as can be determined from the above is caused by the household-economic/financial circumstances in spite of the recognition of the importance and high-mobility (door-to-door) of passenger car.

  In future, however, the passenger car is to prevail because of the increasing preference for high mobility and the increase of income. Furthermore, in the future the bus growth rate is expected to gradually stabilize because of users' transfer from bus to passenger car and prevalence of large-sized bus.

- The number of trucks in West Java and DKI Jakarta steadily grew from approximately 103,000 trucks in 1977 to 319,000 trucks in 1987. The 1987 to 1977 ratio is 3.1. It is likely that the number of trucks will continue to increase steadily in the future.

On the basis of the considerations mentioned above, the methodology for estimation of the number of vehicles in this Study was selected as follows:

- Number of vehicles was estimated per 1,000 population.
- Forecast model for number of vehicles per 1,000 population was statistically prepared in the form of growth curve (GOMBERZ).
- Forecast model was hierarchically built up as in Fig.-4.4.2.
- The parameters of the forecast model for number of vehicles per 1,000 population were estimated using 1971 to 1987 data. The bus parameters, however, were estimated by 1977 to 1987 data which is the period when number of buses began to increase.

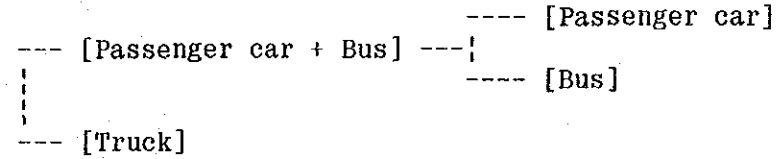


Fig.-4.4.2 The Classification of Forecast Model for Number of Vehicles per 1,000 Persons

Table-4.4.9 and Table-4.4.10 show the results of the estimated model and number of vehicles per 1,000 persons by type, and Table-4.4.11 shows the result of the estimated number of vehicles by type.

Table-4.4.9 Forecast Model for Number of Vehicles per 1,000 Population

Vehicle Type	Formulation	R
Passenger Car + Bus	$Y_{PB} = 66.665x[0.9199]^{(0.9552xT)}$	0.98
Truck	$Y_T = 14.122x[0.1191]^{(0.8990xT)}$	0.98
Passenger Car	$Y_P = Y_{PB} - Y_B$	
BUS	$Y_B = 11.357x[0.0827]^{(0.8909xT)}$	0.97

Note: Y - Vehicle per 1,000 population
T - Year
R - Correlation Coefficient

Table-4.4.10 Number of Vehicles per 1,000 Persons (West Java + DKI Jakarta)

Unit: veh/1,000 person (ratio to 1987)

Vehicle Type	1987	2000	2010
Passenger Car + Bus	14.55 (1.00)	24.27 (1.67)	32.46 (2.23)
Truck	8.20 (1.00)	12.52 (1.53)	13.55 (1.65)
Bus	4.13 (1.00)	6.12 (1.48)	6.18 (1.50)
TOTAL	26.88 (1.00)	42.91 (1.60)	52.19 (1.94)

Table-4.4.11 Number of Vehicles (West Java + DKI Jakarta)

Unit: 1,000 (ratio to 1987)

Vehicle Type	1987	2000	2010
Passenger Car	567 (1.00)	1,256 (2.27)	1,942 (3.43)
Truck	319 (1.00)	648 (2.03)	811 (2.54)
Bus	161 (1.00)	317 (1.97)	370 (3.43)
TOTAL	1,048 (1.00)	2,221 (2.12)	3,123 (2.98)