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REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF HIGHWAYS

THE FEASIBILITY STUDY OF THE LOCAL ROAD DEVELOPMENT IN THE REPUBLIC OF INDONESIA

KABUPATEN REPORT 23

KABUPATEN HULU SUNGAI TENGAH

MARCH 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

This is the Kabupaten Report of the Feasibility Study of the Local Road Development in the Republic of Indonesia for Kabupaten Hulu Sungai Tengah in Kalimantan Selatan Province. The report has been prepared by the Study Team of the Japan International Cooperation Agency (hereinafter called JICA).

Based upon a request from the Government of Indonesia, the Government of Japan arranged for JICA to conduct the Study and JICA accordingly organized a Study Team. The study was carried out using data which were generally prepared by the Kabupaten, routed through the province, under the instructions of Bina Marga of the Ministry of Public Works and Bangda of the Ministry of Home Affairs.

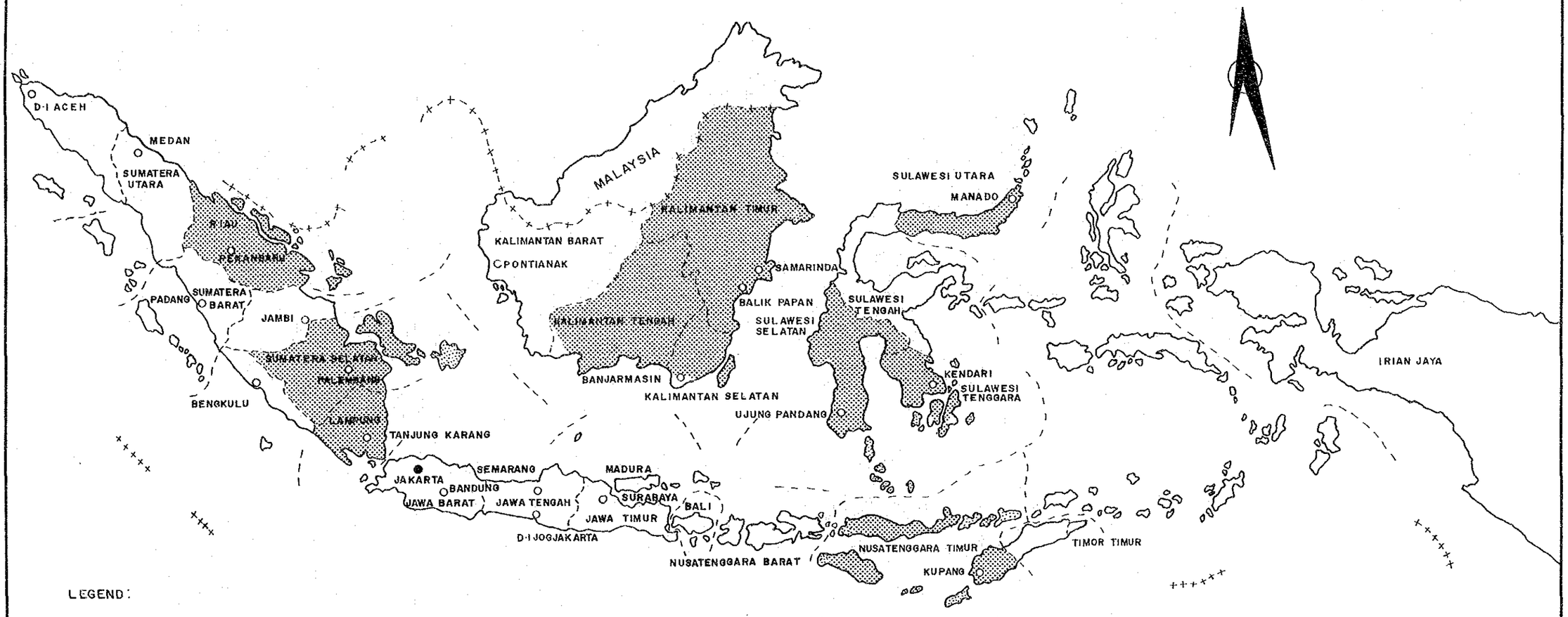
Since the study period was limited, without cooperation of Bina Marga, Bangda and local governments of both province and Kabupaten in collecting the data, the study would not have been completed within the period.

The report consists of the results of the feasibility study and proposed implementation programme of the local road development in the Kabupaten.

The simplified economic feasibility evaluation methodology utilized for the study was established by the Study Team in Phase I Study through a pilot study of seven (7) model Kabupatens, and is described in the Main Report.

The purpose of the study for the Kabupaten is mainly to estimate the total Project Cost for the local road development but only limited data is available for study base. Therefore a detailed survey and design for the improvement of the Kabupaten roads should be carried out before commencing the Project together with a review of this report.

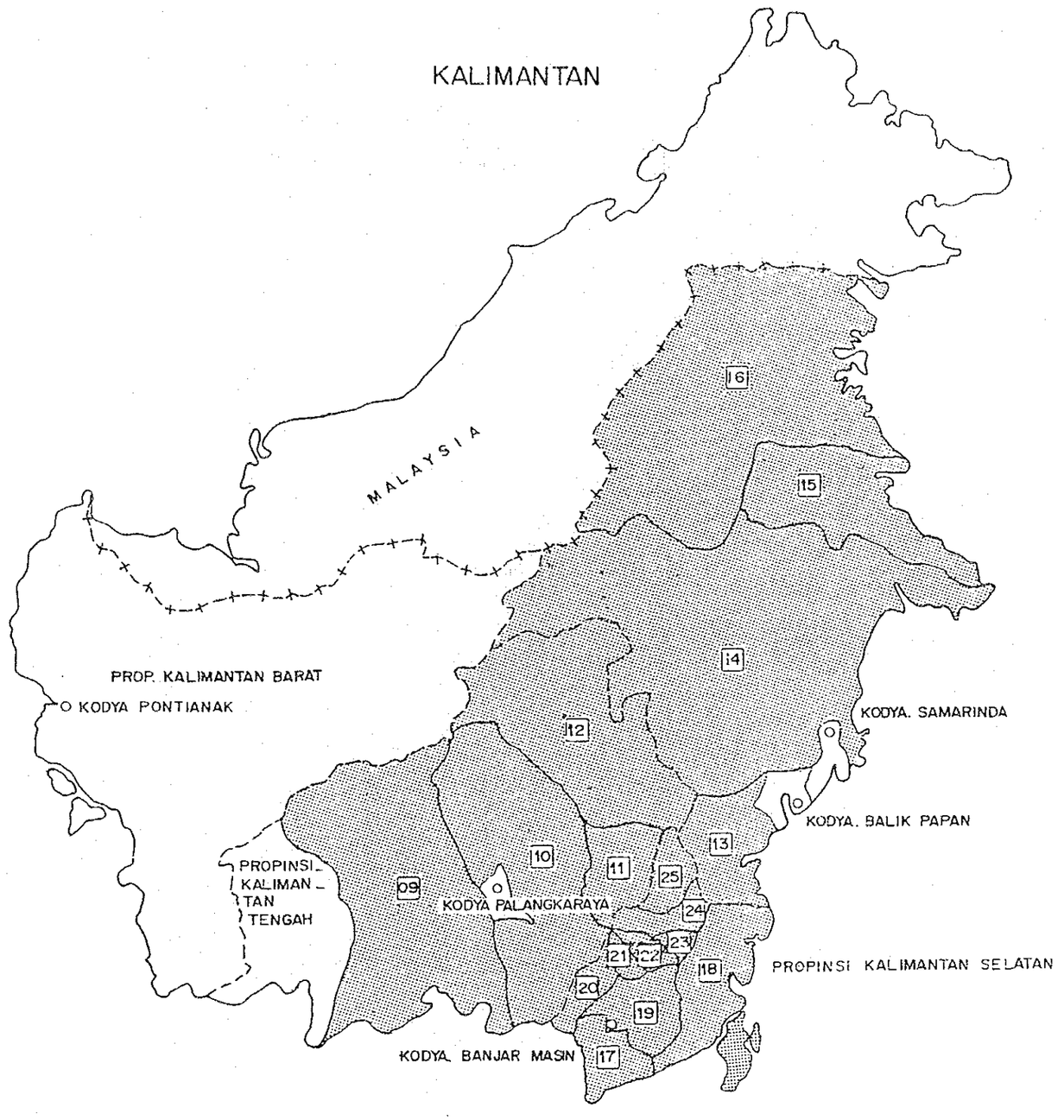
LOCATION MAP OF THE PROJECT AREAS



IV · PROPINSI KALIMANTAN TENGAH
09 · KAB · KOTA WARINGIN TIMUR
10 · KAB · KAPUAS
11 · KAB · BARITO SELATAN
12 · KAB · BARITO UTARA

V · PROPINSI KALIMANTAN TIMUR
13 · KAB · PASIR
14 · KAB · KUTAI
15 · KAB · BERAU
16 · KAB · BULUNGAN

VI · PROPINSI KALIMANTAN SELATAN
17 · KAB · TANAH LAUT
18 · KAB · KOTA BARU
19 · KAB · BANJAR
20 · KAB · BARITO KUALA
21 · KAB · TAPIN
22 · KAB · HULU SUNGAI SELATAN
23 · KAB · HULU SUNGAI TENGAH
24 · KAB · HULU SUNGAI UTARA
25 · KAB · TABALONG



LEGEND :
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LOCATION OF THE PROPOSED AREA

SCALE :
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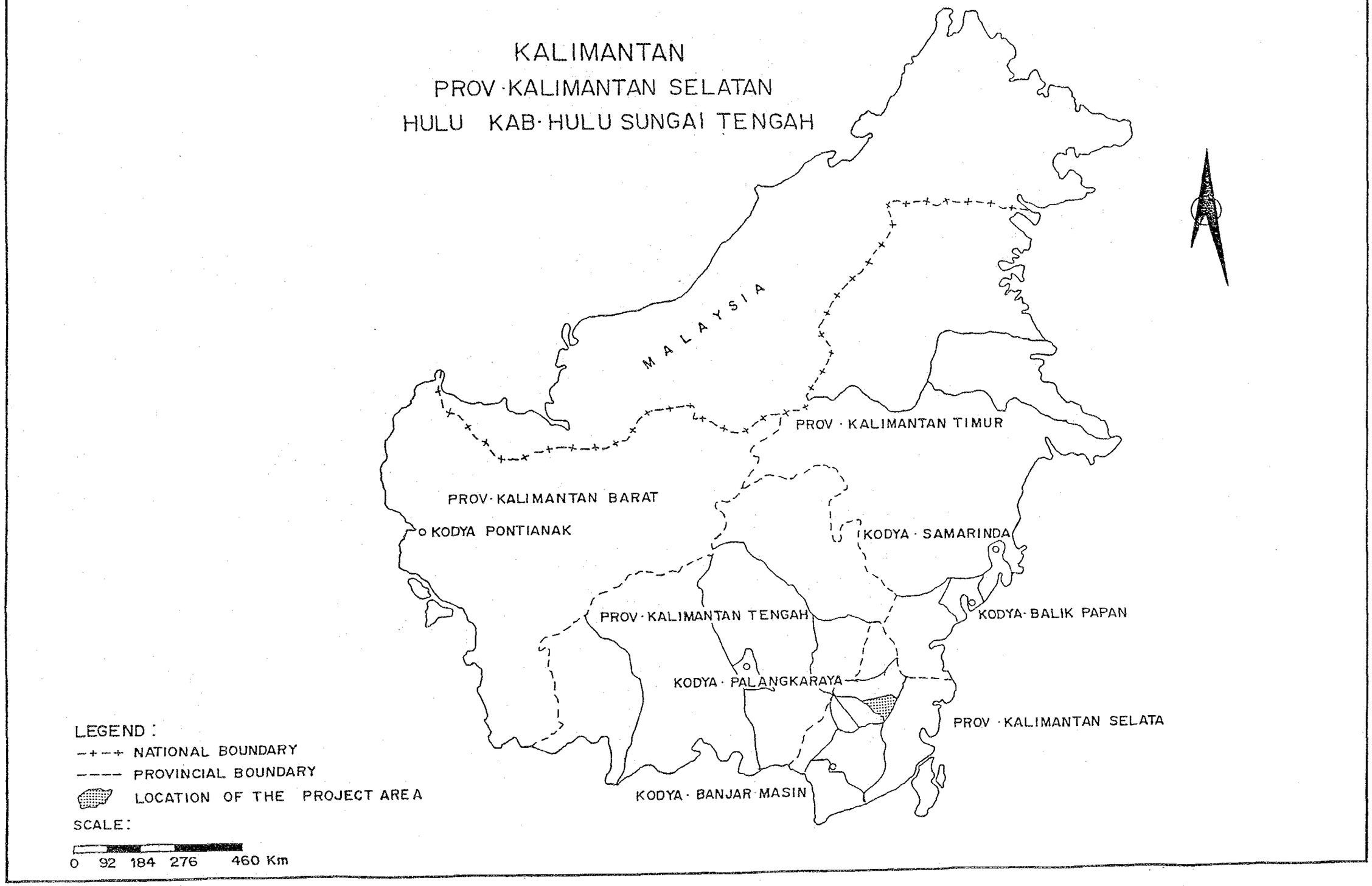
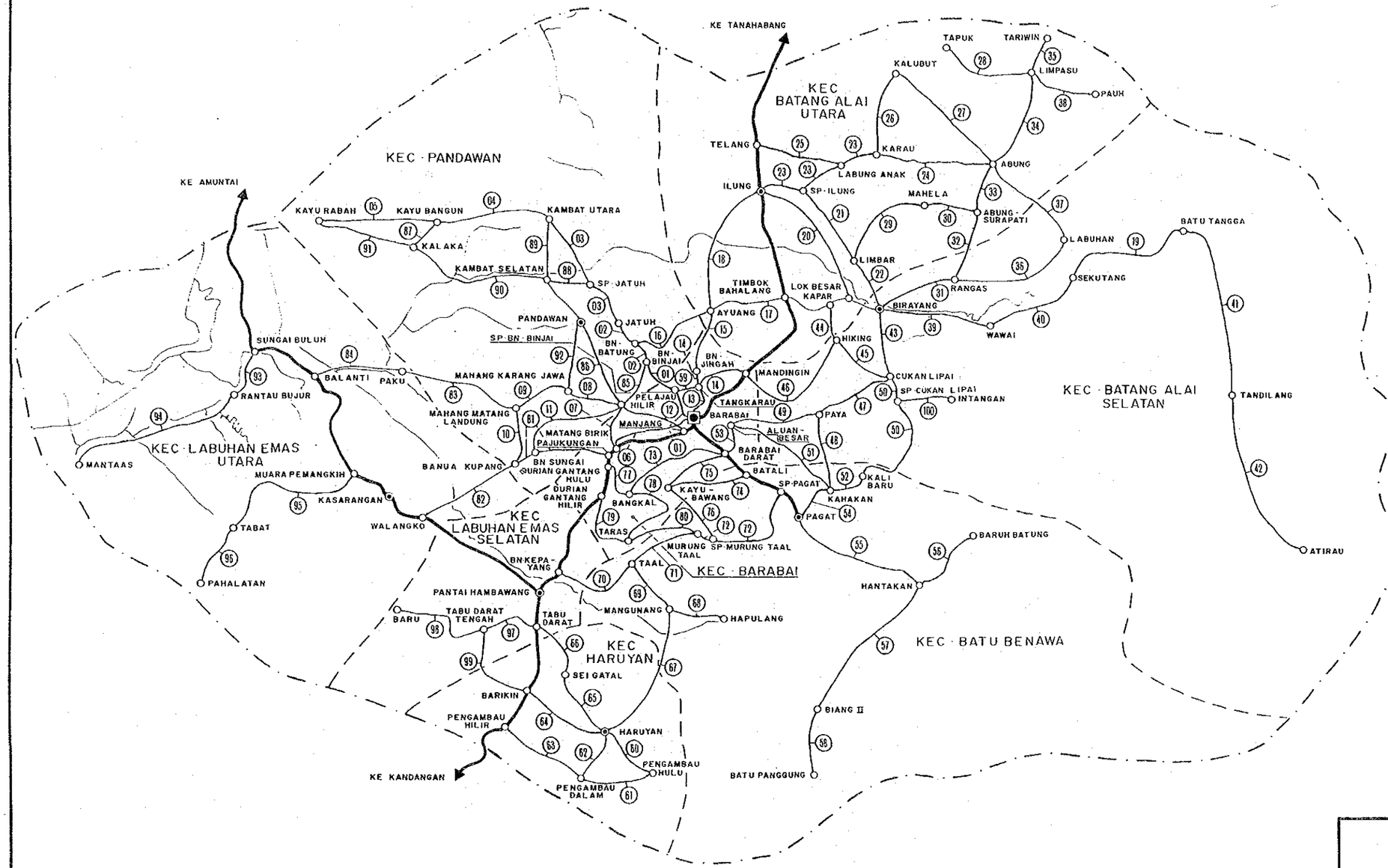
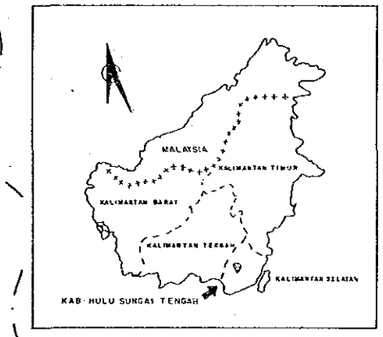

KALIMANTAN
PROV·KALIMANTAN SELATAN
HULU KAB·HULU SUNGAI TENGAH
MALAYSIA
PROV·KALIMANTAN TIMUR
PROV·KALIMANTAN BARAT
KODYA PONTIANAK
KODYA·SAMARINDA
PROV·KALIMANTAN TENGAH
KODYA·BALIK PAPAN
KODYA·PALANGKARAYA
PROV·KALIMANTAN SELATA
KODYA·BANJAR MASIN
LEGEND :
NATIONAL BOUNDARY
PROVINCIAL BOUNDARY
LOCATION OF THE PROJECT AREA
SCALE:
0 92 184 276 460 Km

KAB · HULU SUNGAI TENGAH



LOCATION MAP



LEGEND :

- KABUPATEN CAPITAL
- KECAMATAN CAPITAL
- OTHER CITY
- (3) LINK NUMBER
- PROVINCIAL BOUNDARY
- KABUPATEN BOUNDARY
- KECAMATAN BOUNDARY
- NATIONAL ROAD
- PROVINCIAL ROAD
- KABUPATEN ROAD
- VILLAGE ROAD
- RIVER

SCALE:
0 5 10 15 Km

THE FEASIBILITY STUDY OF THE LOCAL ROAD DEVELOPMENT IN THE REPUBLIC OF INDONESIA

TITLE :

SOURCE:	SCALE:	PROVINCE: KALIMANTAN SELATAN
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPATEN: HULU SUNGAI TENGAH

C O N T E N T S

Chapter 1 BACKGROUND OF THE KABUPATEN

1.1 Topographic and Meteorological Conditions

1.1.1 Location and Topography

Kabupaten Hulu Sungai Tengah is an inland Kabupaten located in central Kalimantan Selatan Province. It is bordered on the north by Kabupaten Hulu Sungai Utara, on the southwest by Kabupaten Hulu Sungai Selatan and on the east by Kabupaten Kota Baru and the Meratus mountains.

In the eastern extremity of the Kabupaten, mountainous features are presented by the west side of the Meratus mountains where the mountain Besar 1,892 meter high, stands on the boundary. Towards the west there are flatlands on the basins of the Negara's tributaries, where the capital of the Kabupaten, Barabai is located. Further west, swampy lands appear on the boundary with Kabuapten Hulu Sungai Selatan.

The area of the Kabupaten is about 1,472 square kilometers, approximately 4 percent of the total of the province, which makes it the smallest Kabupaten Selatan Province. It consists administratively of 8 Kecamatans.

1.1.2 Meteorological Conditions

The average number of rainy days and the average amount of yearly rainfall in Kabupaten Hulu Sungai Tengah are 183 days and 2,376 mm respectively.

One year in the Kabupaten consists of a rainy season and a dry season. The dry season is from August through October in general. However this is variable as Table 1-1-1 shows.

The number of working days which is necessary for planning the construction schedule in chapter 6, is estimated at 200 days using the following formula based upon the data shown in the table referred to above.

$$\text{Working Days} = 365 - \text{Holidays} - \text{Rainy Days} + \left(\text{Rainy Days} \times \frac{\text{Holiday}}{365}\right) + (0.10 \times \text{Rainy Days})$$

Where :

- Holidays consist of 52 Sundays and 13 national holidays; and
- 10% of rainy days are assumed to be workable days.

Table 1-1-1

METEOROLOGICAL CONDITIONS

PROVINCE : Kalimantan Selatan
KABUPATEN : Hulu Sungai Tengah STATION : Barabai

MONTH	1980		1981		1982		1983		1984	
	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)
January	17	646	15	172	21	447	17	308	21	204
February	14	300	17	422	16	57	9	214	22	273
March	13	315	19	244	22	282	10	56	22	261
April	18	421	19	212	15	216	13	224	19	353
May	19	445	12	169	18	148	18	156	21	149
June	11	87	13	71	-	-	15	111	13	84
July	10	155	19	127	4	20	15	160	21	135
August	16	269	3	4	6	84	9	161	12	157
September	4	28	12	119	4	44	11	71	16	131
October	18	134	13	213	9	93	18	201	7	67
November	16	245	22	207	18	190	20	226	16	277
December	24	246	23	394	24	237	22	213	23	224
Total	180	3,291	187	2,354	157	1,818	177	2,101	213	2,315

1.2 Socio-Economic Conditions

1.2.1 Population

The population of Kabupaten Hulu Sungai Tengah in 1983 was 205,266 which was approximately 9.3% of the 2,198,400 total population of Kalimantan Selatan Province as shown in Table 1-2-1.

The population density was 1.39 persons per ha which was higher than the provincial density of 0.58.

The recent annual average growth rate of population of the Kabupaten is 0.5% which is lower than both the provincial rate of 2.1% and the national rate of 2.2%. This may be caused by outflow of the population to other Kabupatens and cities in the province.

The population of each Kecamatan and its proportion to the Kabupaten population is shown in Table 1-2-2.

Table 1-2-1 POPULATION BY KABUPATEN

DESCRIPTION	POPULATION	AAGR (%)	AREA (ha)	POPULATION DENSITY (persons/ha)	SURVEY YEAR
KABUPATEN:					
TANAH LAUT	148,708	3.5	347,682	0.43	1984
KOTA BARU	253,400	5·6	1,426,432	0.18	1984
BANJAR	355,078	3·0	503,980	0.70	1982
BARITO KUALA	198,282	4·0	299,696	0.66	1984
TAPIN	115,752	3·0	270,062	0.42	1983
HULU SUNGAI SELATAN	187,161	3·5	189,261	0.99	1984
HULU SUNGAI TENGAH	205,266	0·5	147,200	1.39	1983
HULU SUNGAI UTARA	248,860	1·5	359,178	0.69	1984
TABALONG	130,218	2·0	394,600	0.33	1984
PROVINCE:					
KALIMANTAN SELATAN	2,155,700		3,766,000		1982
	2,198,400	2.1	3,766,000	0·58	1983
	2,241,600		3,766,000		1984
JAWA IS.(Excluding DKI JAKARTA)	91,126,900	1·7	13,159,700	6·92	-
INDONESIA	161,579,500	2·2	191,944,300	0·84	-

Notes :

1. Sources:

   Kabupaten; Kabupaten concerned with the study

   Province ; Jawa and Indonesia:

   Statistical yearbook of Indonesia 1984, published by the Central statistics Bureau.

2. AAGR ; Average Annual Growth Rate.

Table 1-2-2 POPULATION BY KECAMATAN

Year : 1984

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : HULU SUNGAI TENGAH

KECAMATAN	POPULATION	PROPORTION (%)
HARUYAN	18,031	8.9
BATU BENAWA	25,865	12.7
LABUHAN EMAS SELATAN	22,907	11.3
LABUHAN EMAS UTARA	23,478	11.6
PANDAWAN	24,739	12.2
BARABAI	37,063	18.2
BATANG ALAI SELATAN	26,780	13.2
BATANG ALAI UTARA	24,060	11.9
TOTAL	202,370	100

1.2.2 Land Use

In Kabupaten Hulu Sungai Tengah, 45,548 ha of the current available land use area, which is approximately 30.9% of the 147,168 ha total area of the Kabupaten, is used for living purposes and for industrial activity of the inhabitants of the Kabupaten. It is the total value of columns (1) through (6) in Table 1-2-3.

The current available land use area consists of 42,289 ha of agricultural harvest area, 1,329 ha of residential area and 1,930 ha of usable open space which are 92.8%, 2.9% and 4.3% of the current available land use area respectively.

The agricultural harvest area consists of 25,864 ha of paddy field and 16,425 ha of plantation area which are 61.2% and 38.8% of the agricultural harvest area respectively.

It can be realized from the land use that the main industrial production in the Kabupaten is food crops, especially paddy.

Table 1-2-3

LAND USE

PROVINCE : KALIMANTAN SELATAN

(ha)

KABUPATEN	WET PADDY FIELD	UPLAND PADDY FIELD	OTHER GUL-TIVATED AREA	PLANTATION AREA	RESIDENTIAL AREA	USABLE OPEN SPACE	RIVER & LAKE	FORESTRY AREA	OTHERS	TOTAL AREA	SURVEY YEAR
TANAH LAUT	53,787 (15.5)	9,266 (2.7)	6,890 (2.0)	30,350 (8.7)	13,839 (4.0)	15,000 (4.3)	300 (0.1)	173,539 (49.9)	44,712 (12.9)	347,683 (100)	1984
KOTA BARU	14,997 (1.1)	37,331 (2.6)	73,244 (5.1)	27,050 (1.9)	14,184 (1.0)	92,450 (6.5)	-	1,108,967 (77.7)	58,524 (4.1)	1,426,432 (100)	1984
BANJAR	52,360 (10.4)		17,590 (3.5)	22,850 (4.5)	16,000 (3.2)	-	12,500 (2.5)	248,340 (49.3)	134,340 (26.6)	503,980 (100)	1982
BARITO KUALA	76,493 (25.5)	-	-	18,274 (6.1)	6,006 (2.0)	3,678 (1.2)	1,408 (0.5)	121,494 (40.6)	72,343 (24.1)	299,696 (100)	1984
TAPIN	33,647 (12.5)	17,385 (6.4)	49,616 (18.4)	20,694 (77)	6,120 (2.3)	4,525 (1.7)	16,366 (6.1)	63,819 (23.6)	57,910 (21.4)	270,082 (100)	1983
HULU SUNGAI SELATAN	29,725 (15.7)	414 (0.2)	4,651 (2.5)	21,544 (11.4)	6,733 (0.9)	37,451 (19.8)	38,681 (20.4)	47,956 (25.3)	1,053 (0.6)	189,261 (100)	1984
HULU SUNGAI TENGAH	23,764 (16.1)	2,100 (1.4)	-	16,425 (11.2)	1,329 (0.9)	1,930 (1.3)	11,060 (7.5)	40,846 (27.7)	49,733 (33.8)	147,168 (100)	1984
HULU SUNGAI UTARA	99,035 (27.6)	7,828 (2.2)	48,032 (13.4)	66,068 (18.4)	11,586 (3.2)	15,000 (4.2)	69,866 (19.4)	33,482 (9.3)	10,055 (2.8)	359,178 (100)	1984
TABALONG	13,085 (3.3)	5,720 (1.4)	7,676 (1.9)	19,980 (5.1)	7,300 (1.8)	25,000 (6.3)	12,215 (3.1)	258,867 (65.7)	44,759 (11.4)	394,600 (100)	1984

Notes :

1. The value in ( ) denotes the proportion
2. Source : Kabupaten concerned with the study

1.2.3 Agriculture

The cultivated area and food crop production in Kabupaten Hulu Sungai Tengah in 1983 were 26,564 ha and 110,011 ton respectively as shown in Table 1-2-4. Of food crops, the area and production of paddy, which consists of wet paddy and upland paddy, was 25,974 ha and 107,082 ton respectively which are 97.8% and 97.3% of the total food crops. The yield rate of paddy production is 4.12 ton per ha. Thus, paddy is the most predominant agricultural crop of the Kabupaten.

As the table shows, average annual growth rates of area and production of paddy in 1979 through 1983 were 1.0% and 15.2% respectively which indicate remarkable development of paddy production. It is desirable that productivity of paddy becomes still higher and this depends upon the future development of irrigation together with an increase of double crop fields.

The commodity crops, of which palm oil, rubber and coffee are major, are produced in the plantations. The area and production of plantation crops in 1983 were 18,000 ha and 6,400 ton respectively with current growth rates of 1.9% and 11.7% as shown in Table 1-2-5. Thus the plantation crop which is exported is an important agricultural production. Some changes are expected considering the international balance of supply and demand.

The population of the agricultural sector which is assumed from the employment in the Kabupaten is 61.9% of the total population as shown in Table 1-2-6. Thus this is an agricultural Kabupaten.

It is suggested for future development of the Kabupaten that efforts are made to increase not only paddy productivity but also other commodities with the aim of achieving multiple agricultural production.

Table 1-2-4 AREA AND PRODUCTION OF FOOD CROPS

KABUPATEN : HULU SUNGAI TENGAH

CULTIVATED AREA

(ha)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	26,836	27,508	27,770	27,411	25,411	-	1.0
OTHERS	533	568	579	592	591	-	3.0
TOTAL	27,369	28,076	28,349	28,003	26,564	-	1.0

PRODUCTION

(ton)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	60,746	81,284	92,628	92,490	107,082	-	15.2
OTHERS	2,683	2,959	3,018	3,004	2,929	3,054	2.2
TOTAL	63,429	84,243	95,646	95,494	110,011	3,054	14.8

YIED RATE

(ton/ha)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	2.26	2.95	3.34	3.37	4.12	-	12.0

Notes :

1. AAGR : Average annual growth rate
2. Source : Kabupaten concerned with the study

Table 1-2-5 AREA AND PRODUCTION OF PLANTATION CROPS
Year : 1983

PROVINCE : KALIMANTAN SELATAN

KABUPATEN	AREA (ha)	PRODUCTION (ton)	AAGR (%) AREA	AAGR (%) PRODUCTION
TANAH LAUT	9,095	1,500	6.3	18.0
KOTA BARU	9,517	703	3.4	0
BANJAR	-	-	-	-
BARITO KUALA	13,021	9,013	4.0	11.0
TAPIN	-	-	-	-
HULU SUNGAI SELATAN	12,603	6,165	11.3	10.0
HULU SUNGAI TENGAH	18,000	6,400	1.9	11.7
HULU SUNGAI UTARA	19,721	7,176	3.5	0
TABALONG	27,107	10,073	5.0	12.6

Table 1-2-6 POPULATION OF AGRICULTURAL SECTOR

PROVINCE : KALIMANTAN SELATAN

KABUPATEN	AGRICULTURAL SECTOR	TOTAL POPULATION	PROPORTION (%)	AAGR (%)	SURVEY YEAR
TANAH LAUT	122,000	148,708	82.3	3.5	1984
KOTA BARU	161,000	253,400	63.7	4.0	1984
BANJAR	312,000	355,078	88.0	3.0	1982
BARITO KUALA	156,000	198,282	78.6	5.0	1984
TAPIN	71,000	115,752	61.5	3.0	1983
HULU SUNGAI SELATAN	114,000	187,161	61.0	3.0	1984
HULU SUNGAI TENGAH	125,000	202,370	61.9	0.3	1984
HULU SUNGAI UTARA	192,000	248,860	77.0	1.5	1984
TABALONG	106,000	130,218	81.5	3.0	1984

Notes :

1. AAGR : Average annual growth rate
2. Kabupaten concerned with the Study

1.2.4 Other Economic Activities

Notable economic activities excluding agriculture in Kabupaten Hulu Sungai Tengah are manufacturing and livestock sectors.

The manufacturing industry consists of the small scale industries such as ice manufacture and timber dealer as shown in table below :

	1980	1984	AAGR (%)
Production (ton)	798	1,248	11.8

Notes : 1. AAGR : Average annual growth rate
2. Source : Kabupaten data

With regard due to the lack of data. However the total volume of the livestock production can be seen in table below.

	1980	1984	AAGR (%)
Production (ton)	302	487	12.7

Notes : 1. AAGR : Average annual growth rate
2. Source : Kabupaten data

Yearly approx. 200 tons excluding the consumption of the Kabupaten itself are exported out of the Kabupaten . The recent growth rates continuously indicate a high tendency, therefore this sector is expected to become prosperous.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

In Kabupaten Hulu Sungai Tengah there is one national road which runs across the western region of the Kabupaten from south to north. From Pantai Hambawang, the junction with the national road, one provincial road runs toward the neighbouring Kabupaten Hulu Sungai Utara via Barabai, the Kabupaten capital, and also another provincial road leads from Barabai to Pagat in the southeast direction.

These national and provincial roads act as the regional trunk road of the Kabupaten, however the provincial road has a more important role than that of the national road.

Since the east region of the Kabupaten is a mountainous area and the southwest region forms a low swampy area, a dense Kabupaten road network is developed on both sides of the provincial road and in the south area along the national road, especially a high density Kabupaten road network is formed in and around Barabai.

An important Kabupaten road network for future development of the Kabupaten seems to be the roads in the area from the central area to the north on the east side of the provincial road which runs across the Kabupaten.

1.3.2 Road Inventory

From the road inventory data prepared by the Kabupaten, the number and total length of Kabupaten roads to be studied in Kabupaten Hulu Sungai Tengah are confirmed as 99 links and 343 Km respectively. These figures exclude Kabupaten roads with no data.

According to the data the present status of the Kabupaten roads is as follows:

(1) Density of Kabupaten Roads

The density of the Kabupaten roads is 2.33 m per ha. This is distinctly higher than the national density of 0.48 m per ha and also higher than 2.11 m per ha which is the density in Jawa Island, excluding DKI Jakarta, as shown in the following table. Thus, the Kabupaten is progressive in density of Kabupaten roads.

	Total Length (km)	Area (ha)	Density (m/ha)
Kabupaten : Hulu Sungai Tengah	343	147,200	2.33
Province : Kalimantan Selatan	3,029	3,938,091	0.77
Jawa Is.(Excluding DKI Jakarta)	27,715	13,159,700	2.11
Indonesia	92,038	191,944,300	0.48

Notes : 1. The value for the province is the total value for the Kabupatens included in the study.

2. The sources of data are as follows:
Kabupaten and Province : Bina Marga Inventory
Jawa and Indonesia : Statistical Yearbook of Indonesia 1984, published by the Central Statistics Bureau

(2) Kabupaten Road Surface Type

The type of surface on the Kabupaten roads in the Kabupaten is shown in Table 1-3-1.

Table 1-3-1 EXISTING ROAD LENGTH BY SURFACE TYPE

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(Km)

NO	TYPE	BTB	KRK	L.L	TNH	ASP	TOTAL
LINK	1		2				3
LINK	2	1	1				2
LINK	3		5				5
LINK	4		3	1			4
LINK	5		3	2			5
LINK	6	1	2				3
LINK	7	1	1				2
LINK	8	1		1			2
LINK	9		3				3
LINK	10		1		1		2
LINK	11	1	2	1			4
LINK	12						
LINK	13		2				2
LINK	14	2					2
LINK	15	3					3
LINK	16	3	1				4
LINK	17	1			1		2
LINK	18	5					5
LINK	19	5					5
LINK	20		5				5
LINK	21		5				5
LINK	22		2				2
LINK	23		2				2
LINK	24		6	1			7
LINK	25		2	1	1		4
LINK	26		1		3		4
LINK	27		4	1			5
LINK	28				4		4
LINK	29		1		2		3
LINK	30		2				2
LINK	31		3				3
LINK	32		2	1			3
LINK	33		2				2
LINK	34	4					4
LINK	35		2				2
LINK	36		4				4
LINK	37		4				4
LINK	38		2				2
LINK	39		2	2			4
LINK	40	4					4
LINK	41				7		7
LINK	42				7		7
LINK	43		3				3
LINK	44	1	1				2
LINK	45	3					3
LINK	46	5	1				6
LINK	47	3	1				4
LINK	48		3				3
LINK	49	2	2				4
LINK	50		6				6
LINK	51		1			5	5
LINK	52		1			2	2
LINK	53		1			2	2
LINK	54		4				4
LINK	55		5				5
LINK	56	1	2				3
LINK	57	1	6				7
LINK	58	1	3				4
LINK	59	1					1
LINK	60	1	1			2	3
LINK	61	1	2				3
LINK	62		1		1	1	2
LINK	63		2	1			3
LINK	64		1	1		2	3
LINK	65		2	1			3
LINK	66		2	1			3
LINK	67		4	1			5
LINK	68		1	1			2
LINK	69		1	1			2
LINK	70		1	1		3	4
LINK	71		2	1			3
LINK	72		4	1			5
LINK	73		6	1			7
LINK	74	1	2				3
LINK	75		2	1			3
LINK	76	1	2				3
LINK	77	1	1				2
LINK	78	1	3				4
LINK	79	1	2				3
LINK	80	1	1				2
LINK	81	1	3				4
LINK	82	1	4				5
LINK	83		5				5
LINK	84				3		3
LINK	85		2				2
LINK	86		4				4
LINK	87		1				1
LINK	88		2				2
LINK	89		2				2
LINK	90		1		5		6
LINK	91				3		3
LINK	92			1	1		2
LINK	93		1				1
LINK	94				6		6
LINK	95	1			5		6
LINK	96	1			1		2
LINK	97	1		1			2
LINK	98	1	1				2
LINK	99	1	3				4
LINK	100	1	1				2
TOTAL		67	183	25	51	17	343
RATIO		20	53	7	15	5	(%)

The legend used in the table is as follows:

ASP : Asphalt

KRK : Gravel/Stone/Telford/Water Bound Macadam

TNH : Earth

LL : Others

Comparison of the proportion of surface type in the Kabupaten with other regions is as follows:

	ASP	KRK	TNH/LL
Kabupaten : Hulu Sungai Tengah	5.0	72.9	22.2
Province : Kalimantan Selatan	10.5	41.1	48.4
Jawa Is.(Excluding DKI Jakarta)	56.2	25.0	18.8
Indonesia	26.0	26.6	47.4

Thus, in the Kabupaten the proportion of Kabupaten roads with asphalt surface is much lower than either that of Indonesia or of Jawa Island. The proportion of low grade roads such as earth roads and others is fairly high. This means that the road classification in the Kabupaten is still low.

(3) Surface Condition of Kabupaten Roads

The surface condition of the Kabupaten roads classified as good, fair, poor and bad which are shown as BA, SD, RU and RB respectively, are summarized in Table 1-3-2.

Comparison of the proportions of the various surface conditions of the Kabupaten roads in the Kabupaten with other regions is as follows:

	Good	Fair	Poor	Bad
Kabupaten : Hulu Sungai Tengah	17.5	48.4	32.9	1.2
Province : Kalimantan Selatan	26.4	34.2	31.4	8.0
Jawa Is.(Excluding DKI Jakarta)	45.6	29.8	19.6	5.0
Indonesia	43.5	21.8	21.1	13.6

Table 1-3-2 (1) EXISTING ROAD CONDITION BY SURFACE TYPE

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : HULU SUNGAI TENGAH

(%)

NO	BTB				KRK				L.L				INH				ASP			
	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB
LINK 1	25	65	5	5		75	25													
LINK 2	15	60	25			70	30													
LINK 3					3	56	41													
LINK 4					5	63	32			60	40									
LINK 5					5	63	32			65	35									
LINK 6	15	60	25			30	45	25												
LINK 7	15	60	25			60	40			70	30									
LINK 8	15	60	25																	
LINK 9					3	70	27													
LINK 10						80	20						10	60	30					
LINK 11	15	65	20			75	25			70	30									
LINK 12																				
LINK 13					8	55	38													
LINK 14	8	58	35																	
LINK 15	5	45	50																	
LINK 16	5	35	60			40	60													
LINK 17		20	80										15	45	40					
LINK 18	3	63	34																	
LINK 19		68	32																	
LINK 20						44	56													
LINK 21					20	62	18													
LINK 22						75	25													
LINK 23					50	36	15													
LINK 24						65	35			70	30									
LINK 25						15	85			20	80			20	80					
LINK 26						20	80							20	80					
LINK 27						60	40			70	30									
LINK 28														20	80					
LINK 29					25		30	45						23	78					
LINK 30						20	80													
LINK 31						30	70													
LINK 32						60	40			60	40									
LINK 33						60	40													
LINK 34	25	55	20																	
LINK 35						65	35													
LINK 36						73	28													
LINK 37						68	33													
LINK 38					15	50	35													
LINK 39						60	40			60	40									
LINK 40		50	50																	
LINK 41														19	81					
LINK 42													2	17	77	4				
LINK 43					3	70	27													
LINK 44		20	80		30	30	40													
LINK 45		53	47																	
LINK 46		24	76		30	30	40													
LINK 47		37	63		10	30	60													
LINK 48					13	57	30													
LINK 49		60	40		5	50	45													
LINK 50					3	57	40													
LINK 51																	16	48	36	

Table 1-3-2 (2) EXISTING ROAD CONDITION BY SURFACE TYPE

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : HULU SUNGAI TENGAH (1)

NO (2)	BTB				KRK				L.L				INH				ASP			
NO	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB
LINK 52																	10	30	60	
LINK 53																	15	10	75	
LINK 54					83	52	35													
LINK 55					48	38	14													
LINK 56	70	20	10		70	20	10													
LINK 57	10	50	40		33	54	83													
LINK 58	10	50	40		10	53	37													
LINK 59	10	50	40																	
LINK 60	10	50	40														40	60		
LINK 61	10	50	40		10	80	30													
LINK 62													80	50	40		99	1		
LINK 63					99	1			10	50	40									
LINK 64									10	25	65							99	1	
LINK 65					10	83	8		15	60	25									
LINK 66					18	78	5		15	60	25									
LINK 67					23	70	8		50	50										
LINK 68						75	25		50	40	10									
LINK 69					10	80	10		50	40	10									
LINK 70									50	40	10						50	38	12	
LINK 71					13	75	13		50	40	10									
LINK 72					18	48	35		50	40	10									
LINK 73					23	48	29		50	40	10									
LINK 74	50	40	10		45	50	5													
LINK 75					25	65	10		50	40	10									
LINK 76	50	40	10		20	65	15													
LINK 77	30	60	10		70	15	15													
LINK 78	30	60	10		22	68	10													
LINK 79	30	60	10		13	55	33													
LINK 80	25	65	10		30	60	10													
LINK 81	50	30	20		43	50	7													
LINK 82	50	30	20		36	38	25													
LINK 83					77	15	8													
LINK 84													3	7	24	66				
LINK 85					30	40	30													
LINK 86					45	38	18													
LINK 87					20	20	60													
LINK 88					10	50	40													
LINK 89					50	40	10													
LINK 90					40	40	20						25	36	39					
LINK 91													13	50	37					
LINK 92									25	60	10	5	15	45	40					
LINK 93					25	60	10	5												
LINK 94													13	60	28					
LINK 95	15	75	10										11	70	19					
LINK 96	10	85	5											60	40					
LINK 97	10	60	30						10	50	40									
LINK 98	10	50	40		10	50	40													
LINK 99	10	40	50		10	40	50													
LINK 100	50	50			70	30														
AVERAGE	18	51	32	0	18	51	30	1	21	51	27	0	7	38	51	4	33	45	22	0
LENGTH	67 Km				183 Km				25 Km				51 Km				17 Km			
(Km)	12	34	21	0	33	93	55	2	5	13	7	0	4	19	26	2	6	8	4	0

The surface condition level of the Kabupaten roads in the Kabupaten does not approach either that of Indonesia or of Jawa Island. However the proportion in fair condition is relatively high. Therefore further improvement of Kabupaten roads in poor condition is desirable.

(4) Terrain Conditions of Kabupaten Roads

The difficulty of road improvement is mainly dependent upon the terrain conditions.

The terrain conditions of the Kabupaten roads, classified as flat, hilly, mountainous and swampy which are shown as DT, BK, GN and RW, are summarized in Table 1-3-3.

The proportions of terrain conditions in the Kabupaten are 94.0% flat, 3.0% hilly, 2.0% mountainous and 1.0% swampy. There are only a few hilly and mountainous areas in the Kabupaten and road construction is anticipated to be easy because of the small proportion of swamp.

1.3.3 Bridge Inventory

A bridge inventory showing the existing condition of bridges on the Kabupaten roads in Kabupaten Hulu Sungai Tengah was prepared by the Kabupaten.

The bridge types are classfied as timber, concrete, steel and others which are shown in the inventory as KY, BT, BJ and LL respectively.

The inventory shown in Table 1-3-4 and Table 1-3-5 indicates a total of 221 bridges with a total length of 1,413 m of which 166 or 75.1% are timber, 51 or 23.1% are others. Steel bridges account for only 2 or 0.9% of the total. There are no bridges listed in the inventory to be newly constructed.

Table 1-3-3 (1) EXISTING ROAD LENGTH BY TERRAIN CONDITION

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(Km)

NO (3)	DI	HM	BK	GN	TOTAL
LINK 1	3				3
LINK 2	2				2
LINK 3	5				5
LINK 4	3				4
LINK 5	4				5
LINK 6	3				3
LINK 7	2				2
LINK 8	2				2
LINK 9	3				3
LINK 10	2				2
LINK 11	4				4
LINK 12					
LINK 13	2				2
LINK 14	2				2
LINK 15	3				3
LINK 16	4				4
LINK 17	2				2
LINK 18	5				5
LINK 19	5				5
LINK 20	5				5
LINK 21	5				5
LINK 22	2				2
LINK 23	2				2
LINK 24	7				7
LINK 25	4				4
LINK 26	4				4
LINK 27	5				5
LINK 28	4				4
LINK 29	3				3
LINK 30	2				2
LINK 31	3				3
LINK 32	3				3
LINK 33	2				2
LINK 34	4				4
LINK 35	2				2
LINK 36	4				4
LINK 37	4				4
LINK 38	2				2
LINK 39	4				4
LINK 40	4				4
LINK 41	3	2	2		7
LINK 42	6			1	7
LINK 43	3				3
LINK 44	2				2
LINK 45	3				3
LINK 46	6				6
LINK 47	4				4
LINK 48	3				3
LINK 49	4				4
LINK 50	6				6

Table 1-3-3 (2) EXISTING ROAD LENGTH BY TERRAIN CONDITION

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(Km)

NO		DT	RW	BK	GN	TOTAL
LINK	51	5				5
LINK	52	2				2
LINK	53	2				2
LINK	54	4				4
LINK	55	5				5
LINK	56	3				3
LINK	57			6		7
LINK	58	2		1		4
LINK	59					1
LINK	60	3				3
LINK	61	2				3
LINK	62	1				2
LINK	63	3				3
LINK	64	3				3
LINK	65	3				3
LINK	66	3				3
LINK	67	5				5
LINK	68	2				2
LINK	69	2				2
LINK	70	4				4
LINK	71	3				3
LINK	72	5				5
LINK	73	7				7
LINK	74	3				3
LINK	75	3				3
LINK	76	3				3
LINK	77	2				2
LINK	78	4				4
LINK	79	3				3
LINK	80	2				2
LINK	81	4				4
LINK	82	5				5
LINK	83	5				5
LINK	84	2	1			3
LINK	85	2				2
LINK	86	4				4
LINK	87	1				1
LINK	88	2				2
LINK	89	2				2
LINK	90	6				6
LINK	91	3				3
LINK	92	2				2
LINK	93	1				1
LINK	94	6				6
LINK	95	6				6
LINK	96	2				2
LINK	97	2				2
LINK	98	2				2
LINK	99	4				4
LINK	100	1		1		2
TOTAL		322	5	10	6	343
RATIO		94	1	3	2	(%)

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

	((((BRIDGE))))				UNIT: m		((((BRIDGE))))				UNIT: m
	EXISTING		NOT EXIST		TOTAL		EXISTING		NOT EXIST		TOTAL	
LINK NO	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	LINK NO	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
1	1	7.50			1	7.50	50	6	46.00		6	46.00
3	2	26.00			2	26.00	53	2	7.95		2	7.95
6	1	5.00			1	5.00	54	4	41.00		4	41.00
7	1	4.00			1	4.00	55	2	24.00		2	24.00
9	2	8.00			2	8.00	56	4	26.00		4	26.00
10	2	6.00			2	6.00	57	12	144.00		12	144.00
15	2	8.00			2	8.00	60	1	10.00		1	10.00
16	6	21.00			6	21.00	61	1	4.00		1	4.00
17	1	6.00			1	6.00	62	3	30.00		3	30.00
18	4	20.00			4	20.00	63	3	12.00		3	12.00
20	2	8.50			2	8.50	65	7	23.00		7	23.00
21	4	17.20			4	17.20	66	6	17.70		6	17.70
22	1	19.50			1	19.50	67	4	27.30		4	27.30
23	4	23.80			4	23.80	68	1	3.00		1	3.00
24	1	5.00			1	5.00	69	4	35.00		4	35.00
25	1	4.00			1	4.00	73	5	40.50		5	40.50
26	1	2.40			1	2.40	74	6	21.00		6	21.00
27	1	3.00			1	3.00	75	3	10.50		3	10.50
30	2	7.50			2	7.50	76	1	13.00		1	13.00
32	4	20.00			4	20.00	79	3	11.50		3	11.50
33	3	27.12			3	27.12	80	2	10.00		2	10.00
34	6	59.05			6	59.05	81	1	10.00		1	10.00
38	3	11.00			3	11.00	86	2	6.00		2	6.00
39	1	8.00			1	8.00	87	2	6.50		2	6.50
40	7	53.00			7	53.00	90	3	12.50		3	12.50
41	15	126.00			15	126.00	91	1	8.00		1	8.00
42	11	67.00			11	67.00	92	2	8.35		2	8.35
43	1	3.50			1	3.50	93	6	14.60		6	14.60
44	2	20.00			2	20.00	94	8	103.00		8	103.00
46	2	16.00			2	16.00	95	4	36.00		4	36.00
48	3	14.20			3	14.20	96	5	18.50		5	18.50
49	3	10.80			3	10.80	98	2	3.16		2	3.16
							99	5	0.22		5	0.22
							TOTAL	221	1413.35		221	1413.35

Table 1-3-5 NUMBER OF EXISTING BRIDGES BY BRIDGE TYPE

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

	<<< BRIDGE >>>					(No)
103 (18)	KY	BJ	LL	BT	PB	TOTAL
LINK 1	1					1
LINK 3	2					2
LINK 6	1					1
LINK 7	1					1
LINK 9	2					2
LINK 10	2					2
LINK 15	2					2
LINK 16	6					6
LINK 17	1					1
LINK 18	4					4
LINK 20	2					2
LINK 21	2		1			4
LINK 22	1		1			1
LINK 23	3		1			4
LINK 24	1		1			1
LINK 25	1		1			1
LINK 26	1		1			1
LINK 27	1		1			1
LINK 30	2		1			2
LINK 32	4		1			4
LINK 33	3		1			3
LINK 34	2		1	4		6
LINK 38	1		1	3		3
LINK 39	1		1			1
LINK 40	5		1	2		7
LINK 41	9		1	5	1	15
LINK 42	11		1			11
LINK 43	1		1	1		1
LINK 44	2		1			2
LINK 46	2		1			2
LINK 48	3		1			3
LINK 49	3		1			3
LINK 50	6		1			6
LINK 53			1	2		2
LINK 54	3		1	1		4
LINK 55	1		1	2		2
LINK 56	1		1	4		4
LINK 57	11		1	1		12
LINK 60	1		1	1		1
LINK 61	1		1	1		1
LINK 62	1		1	3		3
LINK 63	1		1	3		3
LINK 65	7		1	1		7
LINK 66	6		1	1		6
LINK 67	2		1	2		4
LINK 68	1		1	1	1	1
LINK 69	1		1	4		4
LINK 73	5		1	1		5
LINK 74	1		1	6		6
LINK 75	3		1	1		3
LINK 76	1		1	1		1
LINK 79	3		1	1		3
LINK 80	1		1	1		2
LINK 81	1		1	1		1
LINK 86	2		1	1		2
LINK 87	2		1	1		2
LINK 90	3		1	1		3
LINK 91	1		1	1		1
LINK 92	1		1	1		2
LINK 93	6		1	1		6
LINK 94	8		1	1		8
LINK 95	4		1	1		4
LINK 96	5		1	1		5
LINK 98	1		1	1		2
LINK 99	5		1	1		5
TOTAL	166	2	51	1	1	221
RATIO	75	1	23	0	0	(1)

The number of existing bridges by span length is as follows:

Bridge Type	Span Length (m)										
	〈3	〈5	〈8	〈10	〈12	〈14	〈16	〈18	〈20	〈99	Total
Timber	57	87	20	1	1	-	-	-	-	-	166
Concrete	-	1	-	-	-	-	-	-	-	-	1
Steel	1	-	1	-	-	-	-	-	-	-	2
Others	20	21	7	2	-	-	-	-	-	1	51
Total	79	109	28	3	1	-	-	-	-	1	221

Thus, most of the existing bridges on the Kabupaten roads are timber and the majority of spanlengths is within the range of 3 m to 5 m.

1.3.4 Traffic

Inventories of the average daily traffic (ADT) on the Kabupaten roads in Kabupaten Hulu Sungai Tengah were prepared by the Kabupaten and are shown in Chapter 2.

From the inventories, total value of average daily trips by vehicle type and their proportions in the Kabupaten in 1985 are summarized as follows:

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Total Trips	1,635	134	1,228	2,924	5,921
Proportion (%)	27.61	2.26	20.74	29.39	100.00

Source : Bina Marga Inventory

The proportions of registered vehicles by vehicle type are as follows:

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Proportion (%)	0.29	0.02	1.75	97.94	100.00

Source : Kabupaten.

Thus, the proportion of motorcyles in the Kabupaten is by far the highest.

From the above tables the following can be observed:

- Number of total trips might be underestimated
- Proportions are probably reasonable.

Essentially, for estimation of future traffic volumes past and present traffic data together with the trend in the number of registered vehicles are important basic data. However the data obtained for the study was traffic count data for each road link in 1985 and of low reliability.

Therefore the future traffic volumes are estimated by the calculation process recommended in chapter 3 of the Main Report.

Chapter 2 ESTIMATIONS OF FUTURE TRAFFIC VOLUME AND BENEFIT

2.1 Future Traffic Volume

2.1.1 Traffic Growth Rate

The traffic growth rate used for estimation of the future traffic volume on the Kabupaten roads was estimated by the following calculation process.

Growth of Production Basis "A":

$$\sqrt{\text{Annual Population Growth of the Kabupaten} \times \text{Growth of the Total Cultivated Area}}$$

Growth of Productivity "B" :

$$\sqrt{\text{Growth of the Total Paddy Field Area} \times \text{Growth of the Paddy Production per ha}}$$

Traffic Growth Rate: Initial estimated figure:

$$\overline{GR'} = \sqrt{A \times B}$$

Traffic Growth Rate GR =Final adjusted figure:

$$\sqrt{GR' \times \text{Trend of GDP/Capita of the Province Concerned}}$$

Results of the estimation are shown in Table 2-1-1.

Table 2-1-1 TRAFFIC GROWTH RATE ESTIMATION

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

A)	Growth Rate of Population	:	0.50 (%)
B)	Growth Rate of Cultivated Area	:	1.00 (%)
C)	Growth Rate of Rice field	:	1.00 (%)
D)	Growth Rate of Rice yield rate	:	12.00 (%)
E)	Growth Rate of GDP / capita	:	6.60 (%)
a)	Geometrical Mean (A x B)	:	0.75 (%)
b)	Geometrical Mean (C x D)	:	6.36 (%)
c)	Geometrical Mean (a x b)	:	3.52 (%)
d)	Geometrical Mean (c x E)	:	5.05 (%)
	TRAFFIC GROWTH RATE	:	5.05 (%)

2.1.2 Present and Future Traffic Volume

The future traffic volumes on the Kabupaten roads in 1998 for the Project life time of ten years were estimated by the following formula :

$$Tn = Te\ (1 + r)^n$$

Where :

Tn : Future traffic volume n years later
Te : Traffic volume in 1985
r : Traffic growth rate

The results are shown in Table 2-1-2 together with the traffic volume in 1985.

Table 2-1-2 (1) EXISTING AND FUTURE TRAFFIC VOLUME

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
1	64	6	76	94	193	5.1%	121	11	144	178	366	IIIB-1
2	28	2	32	67	96	5.1%	53	4	61	127	182	IIIB-2
3	85	6	48	115	197	5.1%	161	11	91	218	374	IIIB-1
4	30	0	15	16	53	5.1%	57	0	28	30	101	IIIB-2
5	10	0	15	20	35	5.1%	19	0	28	38	66	IIIB-2
6	30	0	15	40	65	5.1%	57	0	28	76	123	IIIB-2
7	30	0	10	40	60	5.1%	57	0	19	76	114	IIIB-2
8	10	0	10	40	40	5.1%	19	0	19	76	76	IIIB-2
9	30	0	10	40	60	5.1%	57	0	19	76	114	IIIB-2
10	10	0	9	45	42	5.1%	19	0	17	85	80	IIIB-2
11	11	0	6	15	25	5.1%	21	0	11	28	47	IIIC
12	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
13	16	0	5	40	41	5.1%	30	0	9	76	78	IIIB-2
14	15	0	2	9	22	5.1%	28	0	4	17	42	IIIC
15	12	0	3	19	25	5.1%	23	0	6	36	47	IIIC
16	11	0	3	19	24	5.1%	21	0	6	36	46	IIIC
17	10	0	2	12	18	5.1%	19	0	4	23	34	IIIC
18	15	0	2	30	32	5.1%	28	0	4	57	61	IIIB-2
19	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
20	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
21	10	5	5	10	25	5.1%	19	9	9	19	47	IIIC
22	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
23	24	6	20	85	93	5.1%	46	11	38	161	176	IIIB-2
24	32	6	44	85	125	5.1%	61	11	83	161	237	IIIB-1
25	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
26	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
27	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
28	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
29	0	0	0	5	3	5.1%	0	0	0	9	6	IIIC
30	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
31	26	8	28	72	98	5.1%	49	15	53	137	186	IIIB-2
32	24	6	32	80	102	5.1%	46	11	61	152	194	IIIB-2
33	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
34	10	5	5	10	25	5.1%	19	9	9	19	47	IIIC
35	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
36	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
37	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
38	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
39	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
40	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
41	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
42	0	0	0	5	3	5.1%	0	0	0	9	6	IIIC
43	35	4	24	74	100	5.1%	66	8	46	140	190	IIIB-2
44	0	0	0	15	8	5.1%	0	0	0	28	15	IIIC
45	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
46	0	0	0	15	8	5.1%	0	0	0	28	15	IIIC
47	2	0	1	15	11	5.1%	4	0	2	28	21	IIIC
48	2	0	0	10	7	5.1%	4	0	0	19	13	IIIC
49	2	0	0	10	7	5.1%	4	0	0	19	13	IIIC
50	18	6	32	98	105	5.1%	34	11	61	186	199	IIIB-2

Table 2-1-2 (2) EXISTING AND FUTURE TRAFFIC VOLUME

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
51	42	4	30	56	104	5.1%	80	8	57	106	197	IIIB-2
52	75	6	45	94	173	5.1%	142	11	85	178	328	IIIB-1
53	46	4	34	92	130	5.1%	87	8	65	175	247	IIIB-1
54	30	0	5	65	68	5.1%	57	0	9	123	129	IIIB-2
55	15	0	10	65	58	5.1%	28	0	19	123	110	IIIB-2
56	12	0	0	17	21	5.1%	23	0	0	32	40	IIIC
57	15	0	5	25	33	5.1%	28	0	9	47	63	IIIB-2
58	5	0	5	25	23	5.1%	9	0	9	47	44	IIIC
59	35	0	25	40	80	5.1%	66	0	47	76	152	IIIB-2
60	55	4	36	75	133	5.1%	104	8	68	142	252	IIIB-1
61	25	0	20	10	50	5.1%	47	0	38	19	95	IIIB-2
62	85	14	62	115	219	5.1%	161	27	118	218	416	IIIB-1
63	30	10	25	50	90	5.1%	57	19	47	95	171	IIIB-2
64	80	16	56	104	204	5.1%	152	30	106	197	387	IIIB-1
65	60	0	15	60	105	5.1%	114	0	28	114	199	IIIB-2
66	15	0	16	60	61	5.1%	28	0	30	114	116	IIIB-2
67	10	0	25	10	40	5.1%	19	0	47	19	76	IIIB-2
68	10	0	10	10	25	5.1%	19	0	19	19	47	IIIC
69	10	0	5	15	23	5.1%	19	0	9	28	44	IIIC
70	10	0	15	10	30	5.1%	19	0	28	19	57	IIIB-2
71	17	0	15	45	55	5.1%	32	0	28	85	104	IIIB-2
72	55	6	42	94	150	5.1%	104	11	80	178	285	IIIB-1
73	20	0	25	45	68	5.1%	38	0	47	85	129	IIIB-2
74	17	0	25	25	55	5.1%	32	0	47	47	104	IIIB-2
75	15	0	30	25	58	5.1%	28	0	57	47	110	IIIB-2
76	15	0	10	25	38	5.1%	28	0	19	47	72	IIIB-2
77	15	0	10	45	48	5.1%	28	0	19	85	91	IIIB-2
78	15	0	7	25	35	5.1%	28	0	13	47	66	IIIB-2
79	30	2	28	44	82	5.1%	57	4	53	83	156	IIIB-2
80	25	2	40	44	89	5.1%	47	4	76	83	169	IIIB-2
81	5	0	2	10	12	5.1%	9	0	4	19	23	IIIC
82	5	0	2	10	12	5.1%	9	0	4	19	23	IIIC
83	2	0	0	5	5	5.1%	4	0	0	9	9	IIIC
84	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
85	45	6	30	92	127	5.1%	85	11	57	175	241	IIIB-1
86	2	0	1	15	11	5.1%	4	0	2	28	21	IIIC
87	0	0	0	5	3	5.1%	0	0	0	9	6	IIIC
88	10	0	0	15	18	5.1%	19	0	0	28	34	IIIC
89	3	0	0	15	11	5.1%	6	0	0	28	21	IIIC
90	0	0	0	10	5	5.1%	0	0	0	19	9	IIIC
91	10	0	3	10	18	5.1%	19	0	6	19	34	IIIC
92	10	0	15	10	30	5.1%	19	0	28	19	57	IIIB-2
93	10	0	15	15	33	5.1%	19	0	28	28	63	IIIB-2
94	0	0	0	2	1	5.1%	0	0	0	4	2	IIIC
95	10	0	15	15	33	5.1%	19	0	28	28	63	IIIB-2
96	15	0	15	25	43	5.1%	28	0	28	47	82	IIIB-2
97	11	0	0	0	11	5.1%	21	0	0	0	21	IIIC
98	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
99	5	0	0	0	5	5.1%	9	0	0	0	9	IIIC
100	1	0	0	5	4	5.1%	2	0	0	9	8	IIIC
PERCENT	27.61	2.26	20.74	49.38			27.61	2.26	20.74	49.38		

2.2 Benefit

2.2.1 Benefit Estimation Method

Generally, estimation of the benefit on each Kabupaten road due to the Project was made by analyzing the direct benefit i.e. the VOC reduction benefit, which was estimated by comparing "with project" and "without project" based upon the future traffic volume on the road. However for the following road links it was decided to estimate the indirect benefit through the producer's surplus benefit.

a) Road links with present traffic volume (ADT) less than 60 equivalent 4-wheel vehicles.

b) Road links with no 4-wheel vehicle operation at present.

The indirect benefit was changed into the future traffic volume and the VOC reduction benefit was estimated.

The VOC adopted for the estimation is shown in Table 2-2-1.

Table 2-2-1 VEHICLE OPERATION COST ON KABUPATEN ROADS

(KM)

SURFACE	CONDITION	SEDAN	BUS	TRUCK	MOTORCYCLE
ASPHALT	GOOD	104.7	86.2	85.4	15.9
	Fair	125.5	101.0	98.0	18.2
	Poor	164.1	135.2	138.5	22.8
	Bad	222.1	202.0	205.0	29.1
GRAVEL	Good	125.7	101.4	102.5	18.5
	Fair	145.0	124.6	127.1	21.1
	Poor	198.6	172.6	178.4	27.1
	Bad	242.7	228.9	231.2	31.8
EARTH	Fair	201.8	180.0	185.1	28.0
	Poor	240.7	218.2	225.8	31.8
	Bad	264.9	278.0	281.7	35.5

Source : Bina Marga

Table 2-2-2 (1) FUTURE TRAFFIC VOLUME ESTIMATED BY THE PRODUCER'S SURPLUS

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
4	IIIC	KRK	7	0	4	11	17
5	IIIC	KRK	7	0	4	11	17
8	IIIC	KRK	3	0	2	6	8
10	IIIC	KRK	3	0	2	6	8
11	IIIC	KRK	6	0	4	11	16
13	IIIC	KRK	6	0	4	10	15
14	IIIC	KRK	5	0	3	8	12
15	IIIC	KRK	6	0	4	11	16
16	IIIC	KRK	6	0	4	11	16
17	IIIC	KRK	7	0	4	12	17
18	IIIC	KRK	10	0	6	17	25
19	IIIC	KRK	11	0	7	19	28
20	IIIC	KRK	11	0	7	18	27
21	IIIC	KRK	9	0	6	15	23
22	IIIC	KRK	7	0	5	13	19
25	IIIC	KRK	6	0	4	11	16
26	IIIC	KRK	7	0	5	12	18
27	IIIC	KRK	11	0	7	19	28
28	IIIC	KRK	8	0	5	14	20
29	IIIC	KRK	8	0	5	14	20
30	IIIC	KRK	4	0	3	7	11
33	IIIC	KRK	4	0	3	7	11
34	IIIC	KRK	9	0	6	15	23
35	IIIC	KRK	3	0	2	5	8
36	IIIC	KRK	8	0	5	14	20
37	IIIC	KRK	11	0	7	19	28
39	IIIC	KRK	9	0	6	15	23
40	IIIC	KRK	8	0	5	14	20
41	IIIC	KRK	15	1	10	26	39
42	IIIC	KRK	16	1	10	27	41
44	IIIC	KRK	3	0	2	4	7
45	IIIC	KRK	6	0	4	10	15
46	IIIC	KRK	12	0	7	20	29
47	IIIC	KRK	7	0	5	12	18
48	IIIC	KRK	6	0	4	11	16
49	IIIC	KRK	8	0	5	14	20
55	IIIC	KRK	14	1	9	25	37
56	IIIC	KRK	8	0	5	13	20
57	IIIC	KRK	19	1	12	33	49
58	IIIC	KRK	7	0	4	11	17
61	IIIC	KRK	15	1	10	26	39

Table 2-2-2 (2) FUTURE TRAFFIC VOLUME ESTIMATED BY THE PRODUCER'S SURPLUS

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
67	IIIB-2	KRK	39	2	25	68	100
68	IIIC	KRK	6	0	4	10	15
69	IIIC	KRK	6	0	4	10	15
70	IIIB-2	KRK	20	1	13	35	52
71	IIIC	KRK	7	0	5	13	19
74	IIIC	KRK	9	0	6	15	23
75	IIIC	KRK	7	0	4	11	17
76	IIIC	KRK	7	0	5	13	19
77	IIIC	KRK	4	0	3	7	11
78	IIIC	KRK	10	0	6	17	25
81	IIIC	KRK	8	0	5	13	20
82	IIIB-2	KRK	22	1	14	37	56
83	IIIC	KRK	9	0	6	16	23
84	IIIC	KRK	18	1	11	31	46
86	IIIC	KRK	6	0	4	10	15
87	IIIC	KRK	2	0	1	3	5
88	IIIC	KRK	2	0	1	4	5
89	IIIC	KRK	4	0	2	6	9
90	IIIC	KRK	9	0	6	15	23
91	IIIC	KRK	5	0	3	8	12
92	IIIC	KRK	4	0	2	6	9
93	IIIC	KRK	9	0	6	16	23
94	IIIB-2	KRK	34	1	22	59	87
95	IIIB-2	KRK	33	1	21	57	84
96	IIIC	KRK	12	1	9	21	32
97	IIIB-2	KRK	23	1	15	39	59
98	IIIB-2	KRK	40	2	26	68	102
99	IIIB-2	KRK	26	1	17	45	67

2.2.2 Benefit

The benefit estimation was carried out for each Kabupaten road. Table 2-2-3 shows a sample of the result of benefit estimation. In the table "surplus" and "VOC" show the estimation method utilized and III A, III B-1, III B-2 and III C show the road classification.

Table 2-2-3

RESULTS OF BENEFIT ESTIMATION

KABUPATEN : HULU SUNGAI TENGAH

(1000Ruplah)

	LINK 1	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 7	LINK 8	LINK 9	LINK 10
	3 Km	2 Km	5 Km	4 Km	5 Km	3 Km	2 Km	2 Km	3 Km	2 Km
	IIIB-1	IIIB-2	IIIB-1	IIIC	IIIC	IIIB-2	IIIB-2	IIIC	IIIB-2	IIIC
YEAR	VOC	VOC	VOC	Surplus	Surplus	VOC	VOC	Surplus	VOC	Surplus
1988	0	0	0	0	0	0	0	0	0	0
1989	10597	2152	20943	507	630	3777	1454	137	2048	245
1990	11132	2290	22047	507	630	3918	1515	140	2134	250
1991	11671	2404	23173	507	630	4126	1576	140	2220	250
1992	12216	2520	24285	567	704	4327	1662	140	2342	250
1993	12917	2633	25529	627	779	4536	1752	140	2469	250
1994	13518	2776	26768	627	779	4805	1868	140	2631	250
1995	14232	2895	28238	627	779	5079	1929	140	2717	250
1996	14951	3038	29617	633	787	5355	2048	143	2884	255
1997	15721	3234	31213	633	787	5564	2137	143	3011	255
1998	16439	3380	32592	687	853	5840	2256	143	3178	255
SUM	133394	27322	264405	5922	7358	47327	18197	1406	25634	2510
COST	62585	8954	129169	-10861	-13603	17169	3555	-6340	4351	-5663
/Km	20862	4477	25834	-2715	-2721	5723	1778	-3170	1450	-2832

Chapter 3 ENGINEERING

3.1 Design Criteria and Specification

3.1.1 Geometric Design Criteria

Currently a technical standard for improvement of Kabupaten roads i.e. PETUNJUK TEKNIS INPRES PENUNJANGAN JALAN KABUPATEN, TAHUN 1984-1985 is established by Bina Marga.

The geometric design criteria in the above standard are recommended to be adopted in general for the Project. Following discussions with Bina Marga, exceptions to this are allowed for Pavement width and pavement type to minimize the construction cost of the Kabupaten road improvement, if necessary. The geometric design criteria adopted for the Project are shown in Table 3-1-1. The typical cross sections of Kabupaten roads are shown in Fig. 3-1-1.

3.1.2 Loading Specification

The LOADING SPECIFICATIONS FOR HIGHWAY BRIDGES BY DIRECTORATE GENERAL BINA MARGA is used in principle as the basic specification of loading and the TECHNICAL STANDARD FOR KABUPATEN ROADS compiled by Bina Marga shows that the design live load for bridges on Kabupaten roads is 70% of the Bina Marga live road. However, after discussions with Bina Marga the following loads were decided as the design live loads for the standard bridges of Kabupaten roads:

a. 50% of Bina Marga live load (hereinafter BM 50) is applied for concrete and timber bridges on roads of III A classification.

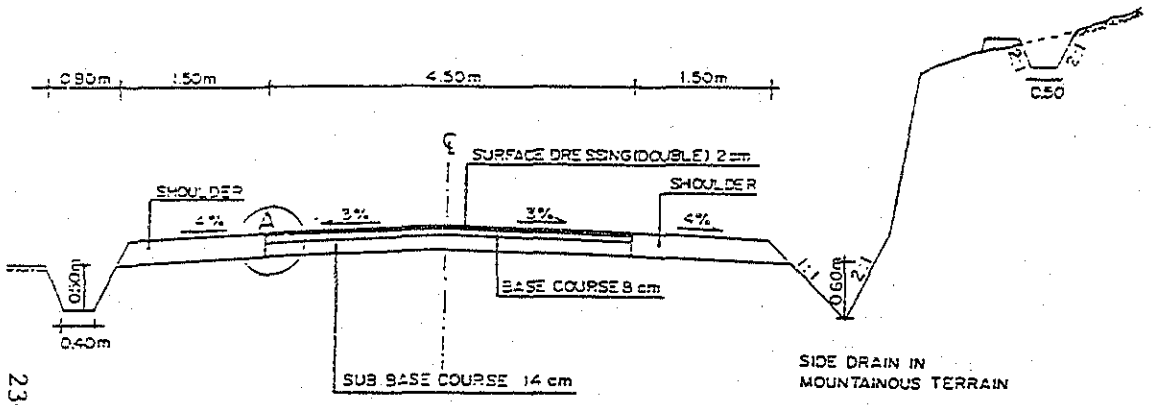
b. 10-ton truck load is applied for timber bridges on roads of III B-1, III B-2 and III C classification.

Table 3-1-1 DESIGN CRITERIA FOR KABUPATEN ROADS

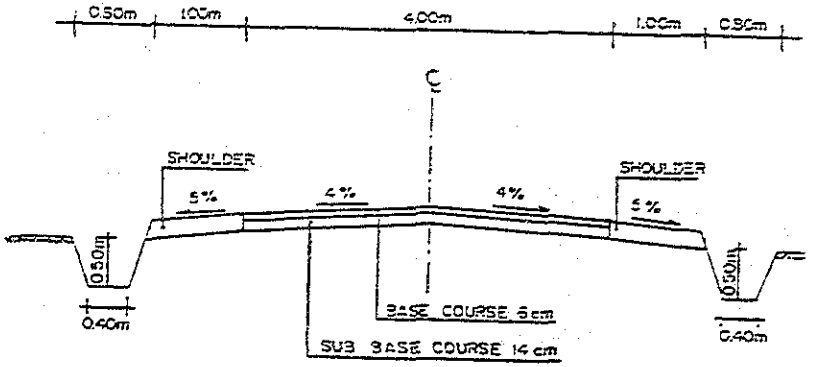
ROAD CLASSIFICATION		CLASS III A			CLASS III B-1			CLASS III B-2			CLASS III C		
SURFACE TYPE		ASPHALT SEAL (DOUBLE)			ASPHALT SEAL (SINGLE)			GRAVEL			GRAVEL		
TRAFFIC VOLUME : ADT (Forecast 10 th year average per day)		3000 - 500			500 - 200			200 - 50			50		
T E R R A I N		FLAT TO ROLLING	HILLY	MOUNT-AINOUS	FLAT TO ROLLING	HILLY	MOUNT-AINOUS	FLAT TO ROLLING	HILLY	MOUNT-AINOUS	FLAT TO ROLLING	HILLY	MOUNT-AINOUS
TRAFFIC LANES		1+	1+	1+	1+	1+	1+	1+	1+	1+	1	1	1
DESIGN SPEED (Km/hr)	DESIRABLE	70	60	40	70	40	30	60	40	30	50	30	AS PRACTI-CABLE
	MINIMUM	30	30	30	30	30	AS PRACTI-CABLE	30	30	AS PRACTI-CABLE	30	AS PRACTICABLE	
GRADIENT (LIMITING) (%)	DESIRABLE	4	5	8	4	6	8	4	7	8	5	8	12
	MAXIMUM	7	7	10	7	8	10	7	9	12	7	12	16
PAVEMENT WIDTH (M)	DESIRABLE	6.0	6.0	6.0	4.5	4.5	4.5	4.5	4.5	4.5	3.5	3.5	3.5
	MINIMUM	4.5	4.5	4.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0
SHOULDER WIDTH (M)	DESIRABLE	2.0	1.5	1.5	1.5	1.5	1.0	1.5	1.0	1.0	1.0	1.0	0.75
	MINIMUM	1.5	1.0	0.75	1.0	1.0	0.75	1.0	0.75	0.5	0.75	0.5	0.5
ROAD BED WIDTH (M)	DESIRABLE	10.0	9.0	9.0	8.0	7.5	6.5	7.5	6.5	6.5	5.5	5.5	5.0
	MINIMUM	6.0	6.0	6.0	5.5	5.5	5.0	5.5	5.0	4.5	4.5	4.0	4.0
RIGHT OF WAY (M)	DESIRABLE	16			12			12			12		
	MINIMUM	12			10			10			8		
ROAD CAMBER (%)	PAVEMENT	3			3			4			4		
	SHOULDER	4			4			5			5		

Fig. 3-1-1 STANDARD ROAD CROSS SECTIONS

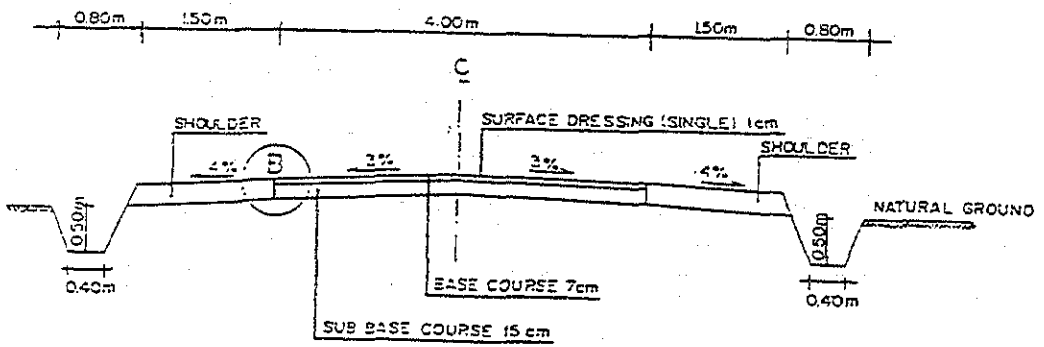
CLASS III A



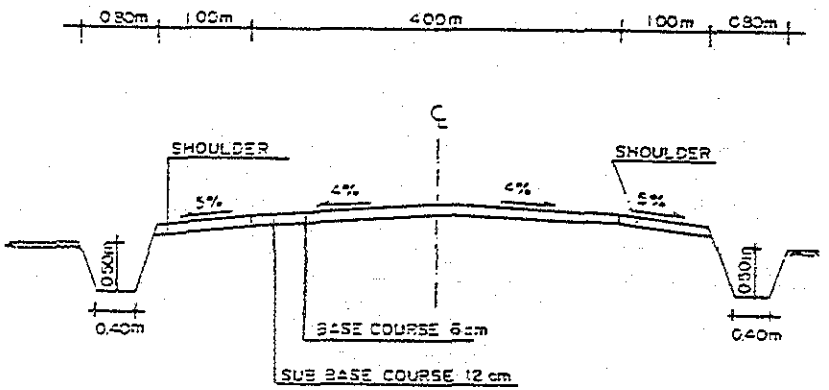
CLASS III B-2



CLASS III B-1



CLASS III C



3.2 Pavement Design

3.2.1 Design Conditions

From the engineering data prepared by the Kabupaten it is noted that the pavement structure of the Kabupaten roads seems to have been determined without adequate designs, therefore the Kabupaten roads generally have insufficient capacity. The standards generally used for highway pavement design such as Road Note 29, Road Note 31 and AASHTO are not suitable for Kabupaten roads with small traffic volumes and loads.

Therefore formulae suitable for the pavement design of Kabupaten roads are recommended as described in Chapter 5 of the Main Report.

The following are important factors for the design of pavement thickness.

1) Design Traffic Volume

As the pavement thickness is designed for each road classification the design traffic volume of which the target year is 1998, is adopted for each classification as follows:

Road Classification	Design Traffic Volume (vpd)
III A	1,000
III B-1	500
III B-2	200
III C	50

2) Strength of Roadbed

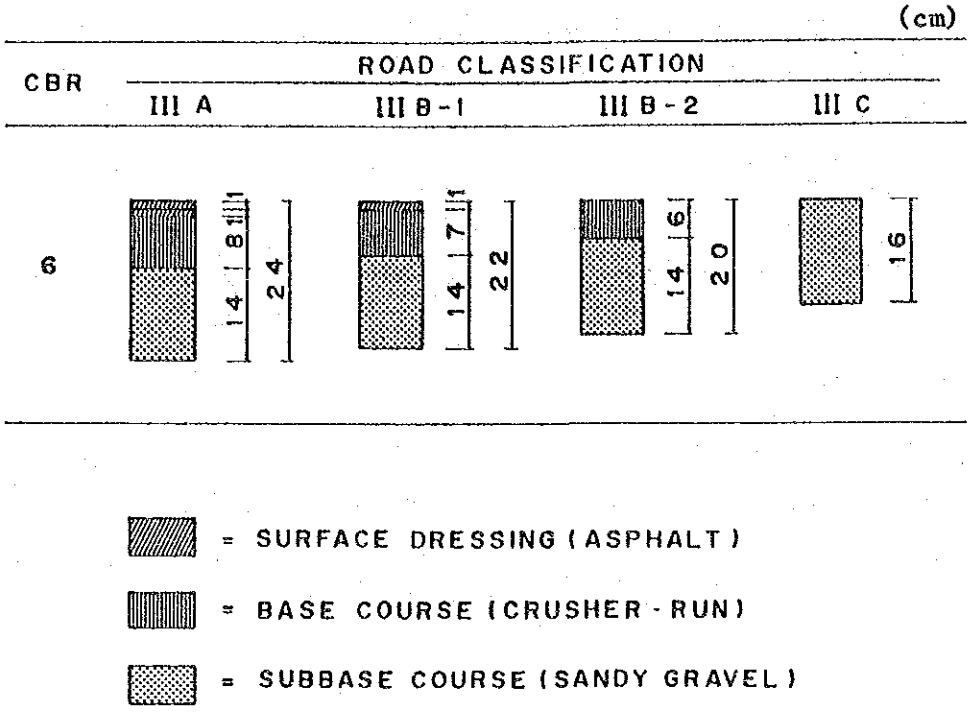
The CBR value of the existing roadbed is a very important factor for the pavement design but no results are available from CBR tests on the Kabupaten roads.

CBR of the laterite is generally in the range of CBR 4 to 10. However site CBR tests should be conducted before construction to finally decide the pavement thickness.

3.2.2 Pavement Structure

Fig. 3-2-1 shows the standard pavement structure adopted for the Kabupaten roads.

Fig. 3-2-1 PAVEMENT STRUCTURE



3.3 Design of Bridges and Other Structures

3.3.1 Standard Bridge

There are so many bridges to be improved or to be newly constructed on the Kabupaten roads in the Project Area that it is very difficult to prepare an individual design for each bridge. Therefore, standardization is recommended as being necessary for the bridge design with conclusions as deseribed below.

(1) Bridge Type

1) Superstructure

A timber beam bridge (hereinafter timber bridge has been finally selected regardless of road classification by the agreement of Bina Marga after studying the actual rurall condition of bridge construction. Fig. 3-3-1 shows the cross section of the standard type.

2) Substructure

Taking account of the actual combinations of super and substructure types noted from the field survey, timber pile barts are recommended as standard because of ease of construction and economy.

3) Foundation

There is no information of subsoil conditions in the inventory data. However, timber piles of 20 cm diamenter are generally recommended as piles of this type are in common use.

The pile length is suggested to be a minimum of 3 meters under the bottom of the foundation or river bed.

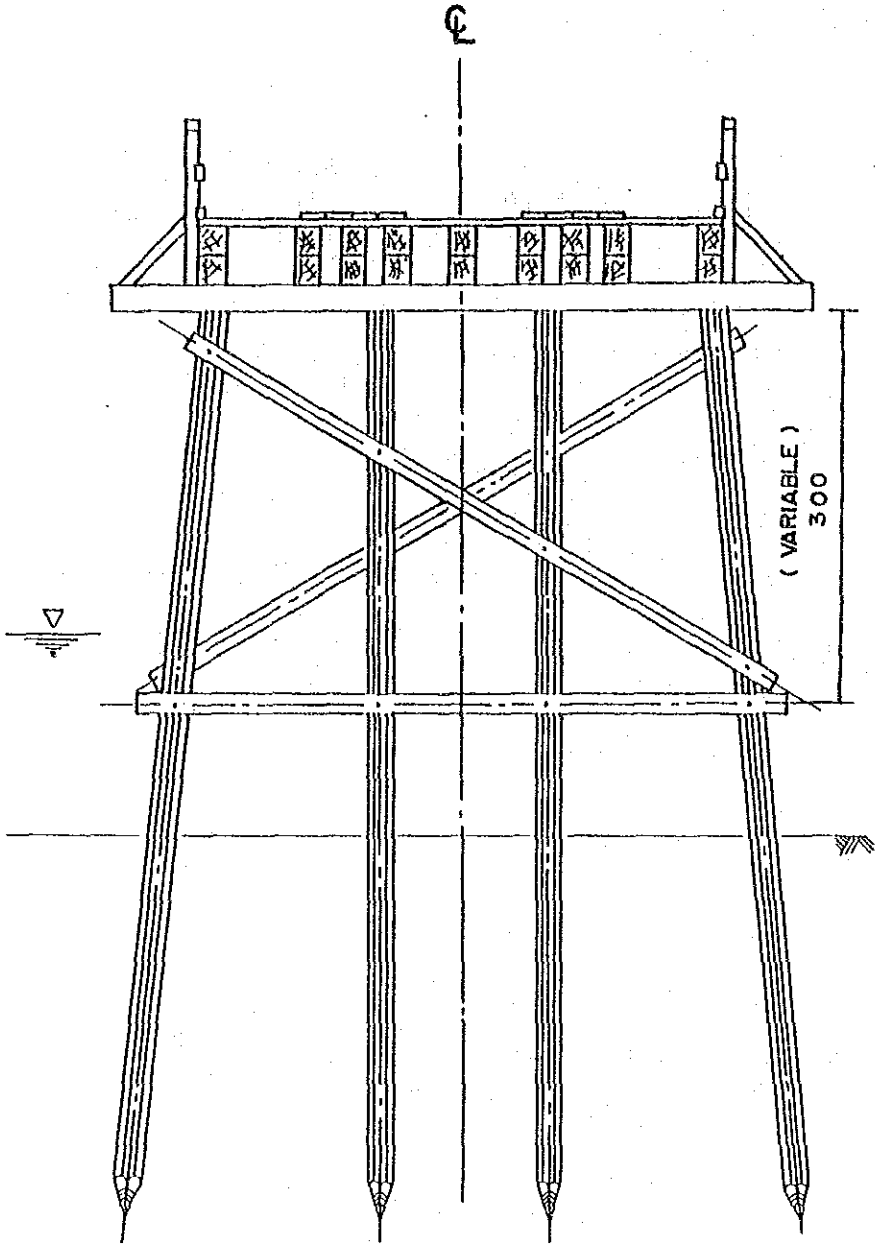
The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

(2) Bridge Width

The effective bridge width for the standard bridge has been generally decided as 4.0 m through discussions with Bina Marga and considering the actual width of Kabupaten roads.

Fig: 3-3-1 CROSS SECTION OF STANDARD BRIDGE

TIMBER BRIDGE



(3) Span Length

The range of span lengths are determined as:

Timber bridge: 3.0, 5.0 and 8.0 m

3.3.2 Other Structures

Culverts and retaining walls shown in Fig. 3-3-2 and Fig. 3-3-3 are recommended as standard structures.

(1) Culvert

The following two culvert types have been adopted for the tranverse drainage.

a) Reinforced concrete pipe culvert Ø 80 cm m
b) Rubble in mortared box culvert with RC slab 80 cm X 80 cm

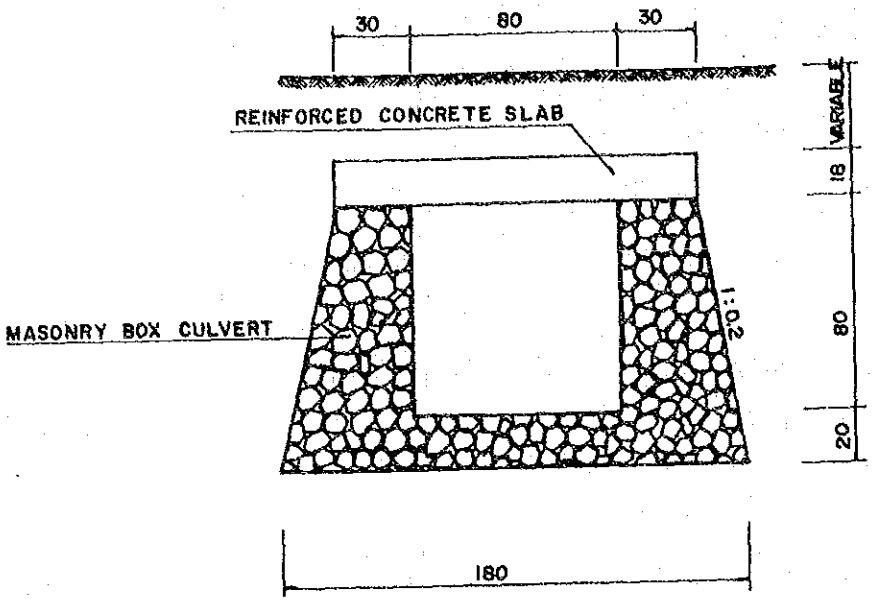
(2) Retaining Wall

The following two types of retaining walls have been adopted because of ease of construction, economy and familiarity in Indonesia.

a) Rubble in mortared retaining wall
b) Timber retaining wall

Fig. 3-3-2 STANDARD CULVERTS

80 x 80 RUBBLE IN MORTAR BOX CULVERTS



Ø 80 RENFORCED CONCRETE PIPE CULVERT

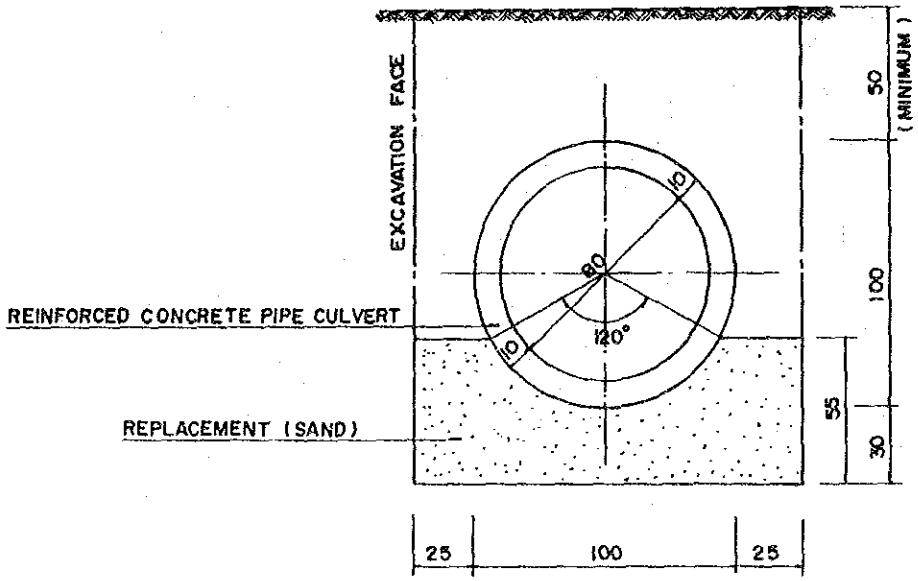
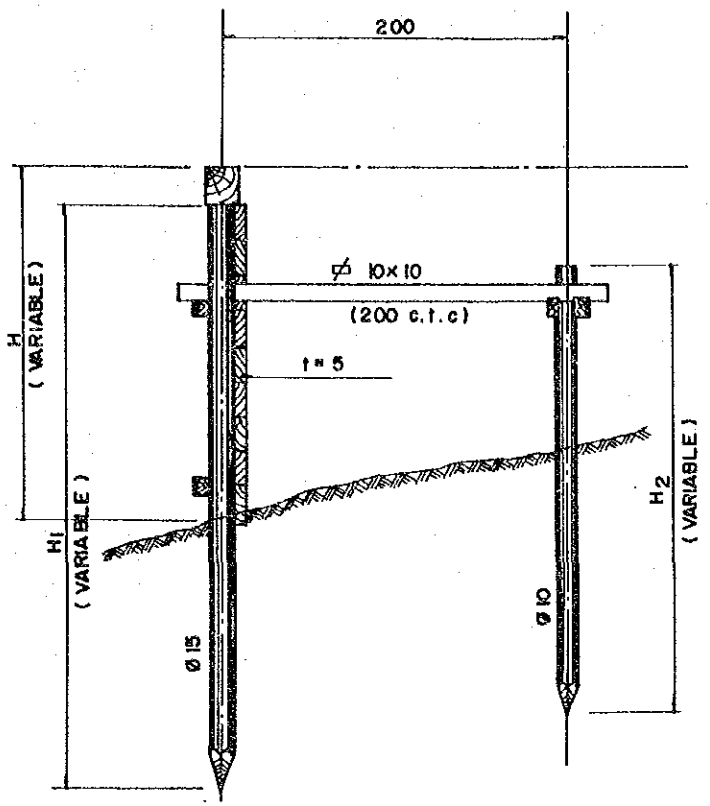
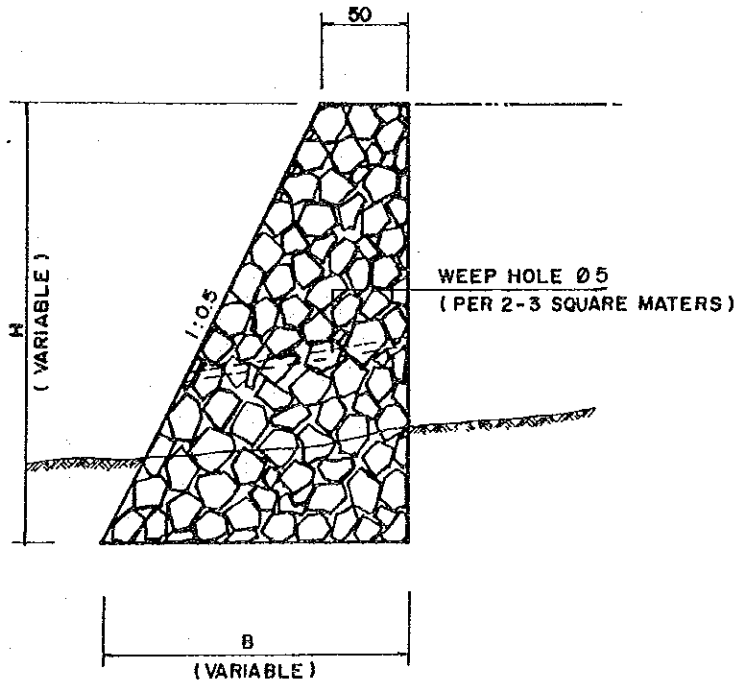


Fig. 3-3-3 STANDARD RETAINING WALLS

TIMBER RETAINING WALL



RUBBLE IN MORTAR WALL



3.4 Selection of Equipment Types

From the results of comparison of two types of Kabupaten road construction methods, i.e. equipment intensive method and labour intensive method construction methods for major works were basically decided as shown in Table 3-4-1.

Table 3-4-1 CONSTRUCTION METHODS FOR MAJOR WORKS

METHOD	WORK TYPE
Equipment Intensive	Earthwork, Base Course and Subbase Course
Labour Intensive	Surface Dressing, Drainage, Bridge and Other Structures.

3.4.1 Points to be Considered for the Selection

Full consideration was given to the following points in studying the selection of equipment type.

a. Most of the construction in the Project is pavement works for road improvement.

b. The pavement width adopted is equal to or less than 4.5 m and therefore large sized equipment is omitted from the selection process.

c. Equipment should be capable of with standing the heavy rainfall and poor soil quality. Equipment for construction in swampy areas is considered if necessary.

d. Uniformity of equipment types with existing equipment is considered to facilitate repair of the equipment in the provincial work shop.

e. Since the scale of the construction is small and transportation of equipment will frequently be necessary, wheel type equipment has been selected as much as possible as this can move by itself or by being towed.

f. The road like to be improved are scattered all over the Kabupatens and therefore a low bed truck or equivalent is necessary for transportation of crawler type equipment. It is desirable to protect the existing pavement from damage caused by the movement of crawler type equipment on the existing roads.

g. The capacity of the equipment has been decided taking into consideration the construction volume and the combination of equipment in the main work.

3.4.2 Combinations of Equipment for Major Works and Maintenance

The combinations of equipment for major works and maintenance are listed in Table 3-4-2 and 3-4-3 respectively.

Table 3-4-2 EQUIPMENT OF ONE WORK GANG FOR MAJOR TYPES OF WORK

TYPE OF WORK	EQUIPMENT REQUIRED	
1. Site Clearing in Light Bush	1- Bulldozer 90 HP 2- Dump Truck 3.0 Ton	1- Wheel Loader 1.2 m^3
2. Excavation & Embankment		
i) Normal Fill	1- Bulldozer 90 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
ii) Fill by Borrow Material	1- Bulldozer 90 HP 3- Dump Truck 3.0 Ton	1- Wheel Loader 1.2 m^3
iii) Fill in Swamp	1- Swamp Bulldozer 90 HP 1- Water Tank Truck 4,000 Ltr	1- Vibratory Roller 4.0 Ton (D&T)
iv) Excavation to Spoil	1- Bulldozer 90 HP 1- Wheel Loader 1.2 m^3	4- Dump Truck 3.0 Ton
3. Subgrade Preparation	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
4. Subbase Course	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
5. Base Course	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton 1- Portable Crusher/Screens 30-40 Ton/H	1- Water Tank Truck 4,000 Ltr
6. Cement Stabilizing	1- Motor Grader 70 HP 1- Bulldozer 90 HP 1- Wheel Loader 1.2 m^3 1- Flat Bed Truck 3.0 Ton	1- Vibratory Roller 4.0 Ton (D&T) 1- Road Stabilizer 1- Water Tank Truck 4,000 Ltr
7. Surface Course	1- Asphalt Sprayer 850 Ltr 1- Tyre Roller 8-15 Ton 1- Portable Crusher/Screens 30-40 Ton/H	1- Flat Bed Truck 3.0 Ton
8. Concrete	1- Concrete Mixer 0.5 m^3 1- Water Pump 200 Ltr/Min 1- Concrete Vibrator 3.3 HP	1- Flat Bed Truck 3.0 Ton 1- Hand-Guided Vibratory Roller 1000 Kg

Table 3-4-3 EQUIPMENT OF ONE WORK GANG FOR MAINTENANCE

TYPE OF WORK	EQUIPMENT REQUIRED
Road	1- Motor Grader
	1- Tyre Roller 8-15 Ton
	1- Hand-Guided Vibratory Roller 1000 Kg
	1- Flat Bed Truck 3.0 Ton
	1- Dump Truck 3.0 Ton
Bridge and Other Structure	1- Flat Bed Truck With Crane 3.0 Ton

3.5 Workshop and Laboratory

3.5.1 Policy of the Kabupaten Workshop

A workshop will be provided for each Kabupaten. The function of the workshop is to cope with requests from the construction site. The main service will be routine maintenance while the secondary service will be light repairs which can be carried out by changing parts. Dismantling and assembling of units which need setting or adjustment using special equipment or facilities will not be carried out in the Kabupaten workshop. Such repairs are planned to be carried out by the provincial workshop or the regional Workshop of Bina Marga.

Accordingly the main tasks of the Kabupaten workshop are as follows:

1) Administration for and storage of equipment
2) Routine maintenance and light repair of equipment
3) Storage and supply of spare parts
4) Operation of equipment including crushing plant.

3.5.2 Workshop Equipment and Tools

Equipment and tools for the workshop are recommended as shown in Table 3-5-1.

Table 3-5-1 WORKSHOP EQUIPMENT AND TOOLS

DESCRIPTION	QUANTITY
Upright Drilling Machine	1 Set
Electric Hand Drill	1
Electric Portable Grinder	1
Disc Grinder	1
Bench Electric Grinder	1
Engineer's Vice	1
DC Electric Welder with Engine	1 Set
Portable Hydraulic Jack, Screw Head	1
Hydraulic Jack	1
Grease Gun	2
Suction Pump for Oil Recovery	2
High Pressure Grease Pump	1

continued

DESCRIPTION	QUANTITY
Drum Opening Spanner	1
Silicon Normal Charger	1
Tyre Changer Air Operated	1
Tyre Service Tool Set	1
Tyre Pressure Gauge	1
Automatic Tyre Inflator	1
Plug Cleaner and Tester	1
Mechanics Tool Set, Heavy Equipment	1
Mechanics Tool Set, Large Vehicle	1
Portable Air Compressor	1
Electric Cord Reel, 15 A, 50 m	1
Oil Measure, Polyethylene	1
Funnel 200 mm, Steel	3
Hand Truck (Cart), 4-Wheel	1
Nylon Sling, 10 ton	2
Chain Block, 1 ton	2
Wire Rope (for sling), 1.8 ton	2
Wire Rope (for sling) 3.2 ton	2
Generator	1

3.5.3 Laboratory

For quality control of construction in the Project it is recommended that a laboratory is provided for each Kabupaten. For each laboratory, provision of laboratory test equipment for the following tests is recommended:

- Physical characteristic, compaction and strength tests for the road bed and pavement materials.
- Slump and strength tests for the bridge concrete.

In the laboratory a fixed water tank should be provided for CBR tests and curing of concrete specimens.

The proposed laboratory equipment is listed in Table 3-5-2.

Table 3-5-2 LABORATORY TEST EQUIPMENT

DESCRIPTION	QUANTITY
Soil Moisture Test Set (JIS A1203)	1
Liquid Limit Set (JIS A1205)	1
Plastic Limit Set (JIS A1206)	1
Compaction Set (JIS A1210)	1
CBR Laboratory Set, Mechanical (JIS A1211)	1
Sand Density Apparatus (JIS A1214)	1
Aggregate Test Sieve Set	1
Portable Cone Penetrometer	1
Compression & Bending Test Machine	1
Cylinder Mould (JIS A1132, 1108)	9
Slump Test Apparatus (JIS A1101)	2

To conduct the surveys necessary for road and structure construction such as centering, profile leveling, cross section leveling etc., the surveying equipment listed in Table 3-5-3 recommended.

Table 3-5-3 SURVEYING EQUIPMENT

DESCRIPTION	QUANTITY
Transit	1
Level	1
Staff	3

Chapter 4 CONSTRUCTION AND MAINTENANCE COST ESTIMATIONS

4.1 Unit Price

With regard to the unit prices of materials and labor, the data were collected from each Kabupaten through Bina Marga. The collected data were compared with those of Jakarta using BAHAN BANGUNAN DKI-JAKARTA MAY & JUNE 1985 compiled by PUSAT INFORMASI TEHNIK PEMBANGUNAN, and then finalized.

4.1.1 Unit Labour Price

The unit labour prices of Kabupaten Hulu Sungai Tengah and other Kabupatens in Kalimantan Selatan Province are shown in Table 4-1-1.

Table 4-1-1 UNIT LABOUR PRICE

(Rp)

KABUPATEN	MAN	SKL LAB	CAP	MAS	LAB	DRIV	OPE
Tanah Laut	2,500	2,250	2,500	2,500	1,750	2,500	4,000
Kota Baru	2,750	2,750	3,500	3,500	2,500	2,500	4,000
Banjar	2,750	2,200	2,750	2,750	1,750	2,750	3,850
Barito Kuala	3,000	3,000	3,000	3,000	2,000	3,000	3,500
Tapin	3,000	2,500	3,250	3,250	2,000	3,000	4,000
Hulu Sungai Selatan	2,000	2,250	2,500	1,500	1,750	2,500	3,000
Hulu Sungai Tengah	2,000	1,750	2,500	1,500	1,250	2,500	3,000
Hulu Sungai Utara	3,500	2,500	3,000	3,000	2,000	3,000	2,000
Tabalong	2,500	2,500	3,000	3,000	2,000	3,000	3,500
Average	2,333	2,078	2,556	2,444	1,667	2,417	3,039

Notes :

MAN : Mandur
SKL LAB : Skilled Labour
CAP : Carpenter
MAS : Mason
LAB : Labourer
DRIV : Driver
OPE : Operater

4.1.2 Unit Price of Materials

Table 4-1-2 shows the unit price of materials for Kabupaten Hulu Sungai Tengah together with for other Kabupatens in Kalimantan Selatan Province.

Table 4-1-2 (1) UNIT PRICE OF MATERIALS

(Rp)

MATERIAL	UNIT	TANAH LAUT	KOTA BARU	BANJAR KUALA	BARITO	TAPIN
Bitumen	L	275	375	300	300	275
Asphalt oil	L	700	750	700	750	700
Gasoline	L	250	250	250	250	250
Sand	M^3	5,000	12,500	6,000	12,500	4,500
Cement	bag	4,000	5,300	4,500	5,000	5,000
River Stone	M^3	5,000	12,500	7,000	17,500	10,000
Steel moulds	Set	8,000	8,000	8,000	8,000	8,000
Timber	M^3	60,000	150,000	80,000	200,000	80,000
Paint	L	4,000	3,500	3,000	2,000	2,500
Reinforcing Steel	Kg	750	1,000	750	1,000	1,000
Tying Wire	Kg	1,000	1,200	1,000	1,200	1,200
Equivalent Royalty	M^3	250	250	250	250	250

Table 4-1-2 (2) UNIT PRICE OF MATERIALS

(Rp)

MATERIAL	UNIT	HULU SUNGAI SELATAN	HULU SUNGAI TENGAH	SUNGAI UTARA	TABALONG	AVERAGE
Bitumen	L	450	300	300	300	385
asphalt oil	L	800	700	700	700	925
Gasoline	L	250	250	250	250	250
Sand	M^3	5,000	5,000	5,000	6,000	5,745
Cement	bag	4,350	5,000	5,000	5,000	4,687
River Stone	M^3	7,750	7,000	9,000	7,500	11,165
Steel moulds	Set	8,000	8,000	8,000	8,000	7,865
Timber	M^3	75,000	75,000	80,000	90,000	132,758
Paint	L	2,100	2,000	2,750	2,500	2,573
Reinforcing Steel	Kg	1,000	1,000	750	1,000	940
Tying Wire	Kg	1,200	1,200	1,100	1,200	1,897
Equivalent Royalty	M^3	250	250	250	250	-

4.1.3 Hourly Equipment Cost

The hourly equipment cost for Kabupaten is shown in Table 4-1-3.

Table 4-1-3

HOURLY EQUIPMENT COST

PROVINCE : KALIMANTAN SELATAN
KABUPATEN : HULU SUNGAI TENGAH

(UNIT : Rp) (6'85)

CODE NO	EQUIPMENT NAME	CLASS	LOCAL COST OWNERSHIP	LOCAL COST OPERATION	LOCAL COST SUB-TOTAL	FOREIGN COST OWNERSHIP	FOREIGN COST OPERATION	FOREIGN COST SUB-TOTAL	TOTAL COST
	Bulldozer	120 HP	234	14,127	14,361	7,769	1,024	8,793	23,154
	Bulldozer/Ripper	120 HP	255	15,137	15,392	8,500	1,575	10,075	25,467
	Swamp Bulldozer	120 HP	267	15,380	15,647	8,879	1,646	10,525	26,172
	Bulldozer	90 HP	148	9,598	9,746	4,914	647	5,561	15,307
	Bulldozer/Ripper	90 HP	159	10,188	10,347	5,300	982	6,282	16,629
	Bulldozer	65 HP	105	6,980	7,085	3,500	461	3,961	11,046
	Bulldozer/Ripper	65 HP	115	7,428	7,543	3,819	708	4,527	12,070
	Swamp Bulldozer	90 HP	159	10,178	10,337	5,284	979	6,263	16,600
	Swamp Bulldozer	65 HP	122	7,284	7,406	4,049	750	4,799	12,205
	Motor Grader	110 HP	208	12,141	12,349	6,919	1,282	8,201	20,550
	Motor Grader	75 HP	144	8,317	8,461	4,779	885	5,664	14,125
	Motor Grader	65 HP	129	7,308	7,437	4,300	797	5,097	12,534
	Road Stabilizer	W=1850 mm	258	3,381	3,639	8,594	424	9,018	12,657
	Vibratory Roller	4 ton	87	3,654	3,741	2,900	382	3,282	7,023
	Hand-guide Vib. Roller	1000 Kg	68	650	718	850	29	879	1,597
	Tire Roller	8-15 ton	94	8,326	8,420	3,106	102	3,208	11,628
	Vibratory Roller (D&T)	4 ton	87	3,654	3,741	2,900	382	3,282	7,023
	Hand-guide Vib. Roller	600 Kg	48	444	492	600	20	620	1,112
	Rough Terrain Crane	10 ton	302	14,172	14,474	10,039	744	10,783	25,257
	Hydraulic Excavator; Wheel	0.3 m3	124	8,655	8,779	4,109	541	4,650	13,429
	Wheel Loader	1.2 m3	211	9,115	9,326	7,019	925	7,944	17,270
	Wheel Loader	0.3 m3	69	3,198	3,267	2,269	299	2,568	5,835
	Water Tank Truck	4000 ltr.	70	3,217	3,287	868	120	988	4,275
	Fuel Tank Truck	4000 ltr.	71	3,224	3,295	882	121	1,003	4,298
	Dump Truck	3.0 ton	118	3,965	4,083	1,469	202	1,671	5,754
	Flat Bed Truck with Crane	3.0 ton	52	3,464	3,516	1,717	127	1,844	5,360
	Dump Loader Truck	12 ton	116	21,730	21,846	3,837	126	3,963	25,809
	Dump Truck	5.0 ton	176	6,570	6,746	2,189	302	2,491	9,237
	Flat Bed Truck	3.0 ton	17	3,039	3,056	563	41	604	3,660
	Portable Crusher/Screening	30-40 t/h	564	23,768	24,332	18,800	2,478	21,278	45,610
	Concrete Mixer	0.5 m3	432	2,445	2,877	5,400	419	5,819	8,696
	Water Pump	200 l/min	16	294	310	188	6	194	504
	Concrete Vibrator	3.3 HP	6	258	264	73	2	75	339
	Asphalt Sprayer	850 ltr.	82	811	893	1,019	140	1,159	2,052

4.2 Unit Construction Cost by Work Type

4.2.1 All Works Except Bridges

The unit construction costs by work type, excluding bridge construction costs, have been estimated using the combination of equipment described in Clause 3.4 and the unit prices already listed. The results are summarized in Table 4-2-1.

Table 4-2-1 UNIT COST BY WORK TYPE EXCEPT BRIDGE WORK

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	167	91	258
Subgrade Preparation	m2	21	11	32
Normal Fill	m3	1,734	863	2,597
Fill in Swamp	m3	2,539	1,052	3,591
Normal Excavation to Spoil	m3	1,016	522	1,538
Sub Base Course	m3	3,263	1,347	4,610
Base Course	m3	4,478	2,299	6,777
Shoulder	m2	300	146	446
Asphalt Patching	m2	3,292	1,377	4,669
Surface Dressing (Single)	m2	595	595	1,190
Surface Dressing (Double)	m2	744	936	1,680
Earth Drain	m	713	119	832
Earth Drain in Swamp (by machine)	m3	1,183	474	1,657
Pipe Culvert D80cm	m	39,035	51,386	90,421
Masonry Culvert (80x80cm)	m	52,335	41,554	93,889
Retaining Wall and Wing Wall (Timber)	m2	8,591	246	8,837
Retaining Wall and Wing Wall (Masonry)	m3	37,920	11,868	49,788
Gabion Protection	m3	11,791	120	11,911
Manual routine maintenance of road	Km	112,172	7,248	119,420
Routine maintenance of earth road	Km	95,081	37,904	132,985
Routine maintenance of gravel road	Km	194,356	88,047	282,403
Routine maintenance of asphalt road	Km	329,200	137,700	466,900

4.2.2 Bridges

The unit construction costs by bridge type including the cost of demolition of existing bridges are shown in Table 4-2-2.

Table 4-2-2 BRIDGE COST

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	31,874	2,998	34,872
Superstructure (Timber;Span 5m;10T)	m2	35,305	3,311	38,616
Superstructure (Timber;Span 8m;10T)	m2	46,763	4,352	51,115
Superstructure (Timber;Span 3m;BM50)	m2	39,522	3,708	43,230
Superstructure (Timber;Span 5m;BM50)	m2	43,147	4,020	47,167
Superstructure (Timber;Span 8m;BM50)	m2	54,722	5,089	59,811
Superstructure (Concrete;Span 3m;BM50)	m2	37,583	107,965	145,548
Superstructure (Concrete;Span 5m;BM50)	m2	38,699	120,694	159,393
Superstructure (Concrete;Span 8m;BM50)	m2	39,941	131,491	171,432
Superstructure (Concrete;Span10m;BM50)	m2	43,736	149,376	193,112
Superstructure (Concrete;Span15m;BM50)	m2	47,300	176,007	223,307
Substructure (Pier;for Timber;10T)	NO	277,671	27,729	305,400
Substructure (Abut;for Timber;10T)	NO	801,607	136,782	938,389
Substructure (Pier;for Timber;BM50)	NO	408,375	41,022	449,397
Substructure (Abut;for Timber;BM50)	NO	900,255	151,027	1,051,282
Substructure (Pier;for Concrete;BM50)	NO	1,444,312	477,161	1,921,473
Substructure (Abut;for Concrete;BM50)	NO	3,066,987	999,497	4,066,484
Demolition of Bridge (Timber->Timber)	m2	9,070	1,195	10,265
Demolition of Bridge (Timber->Concrete)	m2	9,070	1,195	10,265
Demolition of Bridge (Concrete)	m2	67,813	81,377	149,190
Maintenance of Timber Bridge (New)	m2	6,133	1,010	7,143
Maintenance of Concrete Bridge (New)	m2	1,585	3,135	4,720
Maintenance of Timber Bridge (Exist)	m2	7,082	2,349	9,431
Maintenance of Concrete Bridge (Exist)	m2	4,333	2,471	6,804

Chapter 5 RESULTS OF ECONOMIC FEASIBILITY EVALUATION

5.1 Preliminary Screening

The road links to be improved should be effective for development of the Project Area. The road links where improvements were assumed to be inefficient for development of the Project Area were generally screened out using the following cut-off criteria.

(1) Very short roads, less than 2 Km long, which have no connection with the trunk road network.

(2) Roads not connected to the network at any point

(3) Unpreferred roads, due to poor suitability for transportation compared to other existing alternative roads serving the same purpose.

(4) Road in good condition according to the Bina Marga road inventory which lists improvement projects carried out in the last two or three years

(5) Roads with asphalt surface in good condition

(6) Urban roads, except those forming part of a longer route

(7) Roads serving single large organizations rather than the general public

(8) Roads with no inventory data

(9) Kabupaten roads also assigned as provincial roads

The road links to be screened out in Kabupaten Hulu Sungai Tengah are shown in Table 5-1-1.

Table 5-1-1 ROAD LINKS TO BE SCREENED OUT

KABUPATEN : HULU SUNGAI TENGAH

CRITERIA NO	ROAD LINK NO
(1)	38,100
(8)	12

5.2 Evaluation

5.2.1 Primary Analysis

The Kabupaten roads were classified by using the future traffic volume on the road links in 1998. The primary analysis of the IRR was carried out using the construction and maintenance costs. Road links where IRRs were more than 10% were defined as feasible links.

Results of primary analysis are shown in Table 5-2-1.

5.2.2 Secondary Analysis

From the infeasible road links evaluated by the primary analysis, road links where the IRRs were between 1% and 10%, i.e. road links which could become feasible if down graded by one rank, in classification were down graded and the costs re-estimated. Using these costs, a secondary analysis of IRR was carried out. Road links where these IRRs were then more than 10% were also defined as feasible links. This reflected that even though the road classification was rather low the road link should be improved.

Results of secondary analysis are shown in Table 5-2-2.

5.2.3 Ranking of Feasible Road Links

From the results of the primary and secondary analysis, road links where the IRRs were more than 10% were selected and their NPVs and B/Cs were estimated. The ranking of feasible road links from the economic evaluation are decided in the order of the NPVs, i.e. the larger the NPV the higher the road link priority as shown in Table 5-2-3.

Table 5-2-1 (1) RESULTS OF PRIMARY ANALYSIS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : HULU SUNGAI TENGAH

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
31	3 Km	IIIB-2	37.159	VOC
51	5 Km	IIIB-2	34.780	VOC
3	5 Km	IIIB-1	34.396	VOC
52	2 Km	IIIB-1	30.237	VOC
62	2 Km	IIIB-1	28.296	VOC
1	3 Km	IIIB-1	26.390	VOC
64	3 Km	IIIB-1	22.018	VOC
24	7 Km	IIIB-1	20.369	VOC
72	5 Km	IIIB-1	19.724	VOC
50	6 Km	IIIB-2	17.953	VOC
43	3 Km	IIIB-2	15.114	VOC
6	3 Km	IIIB-2	14.750	VOC
85	2 Km	IIIB-1	11.826	VOC
32	3 Km	IIIB-2	10.641	VOC
2	2 Km	IIIB-2	9.487	VOC
53	2 Km	IIIB-1	7.324	VOC
95	6 Km	IIIB-2	4.962	Surplus
79	3 Km	IIIB-2	2.229	VOC
20	5 Km	IIIC	0.078	Surplus
21	5 Km	IIIC	0.078	Surplus
22	2 Km	IIIC	0.078	Surplus
23	2 Km	IIIB-2	0.078	VOC
5	5 Km	IIIC	0.078	Surplus
25	4 Km	IIIC	0.078	Surplus
26	4 Km	IIIC	0.078	Surplus
27	5 Km	IIIC	0.078	Surplus
28	4 Km	IIIC	0.078	Surplus
29	3 Km	IIIC	0.078	Surplus
30	2 Km	IIIC	0.078	Surplus
4	4 Km	IIIC	0.078	Surplus
7	2 Km	IIIB-2	0.078	VOC
33	2 Km	IIIC	0.078	Surplus
34	4 Km	IIIC	0.078	Surplus
35	2 Km	IIIC	0.078	Surplus
36	4 Km	IIIC	0.078	Surplus
37	4 Km	IIIC	0.078	Surplus
39	4 Km	IIIC	0.078	Surplus
40	4 Km	IIIC	0.078	Surplus
41	7 Km	IIIC	0.078	Surplus
42	7 Km	IIIC	0.078	Surplus
8	2 Km	IIIC	0.078	Surplus
44	2 Km	IIIC	0.078	Surplus
45	3 Km	IIIC	0.078	Surplus
46	6 Km	IIIC	0.078	Surplus
47	4 Km	IIIC	0.078	Surplus
48	3 Km	IIIC	0.078	Surplus
49	4 Km	IIIC	0.078	Surplus
9	3 Km	IIIB-2	0.078	VOC
10	2 Km	IIIC	0.078	Surplus
11	4 Km	IIIC	0.078	Surplus

Table 5-2-1 (2) RESULTS OF PRIMARY ANALYSIS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : HULU SUNGAI TENGAH

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
13	2 Km	IIIC	0.07B	Surplus
54	4 Km	IIIB-2	0.07B	VOC
55	5 Km	IIIC	0.07B	Surplus
56	3 Km	IIIC	0.07B	Surplus
57	7 Km	IIIC	0.07B	Surplus
58	4 Km	IIIC	0.07B	Surplus
59	1 Km	IIIB-2	0.07B	VOC
60	3 Km	IIIB-1	0.07B	VOC
61	3 Km	IIIC	0.07B	Surplus
14	2 Km	IIIC	0.07B	Surplus
63	3 Km	IIIB-2	0.07B	VOC
15	3 Km	IIIC	0.07B	Surplus
65	3 Km	IIIB-2	0.07B	VOC
66	3 Km	IIIB-2	0.07B	VOC
67	5 Km	IIIB-2	0.07B	Surplus
68	2 Km	IIIC	0.07B	Surplus
69	2 Km	IIIC	0.07B	Surplus
70	4 Km	IIIB-2	0.07B	Surplus
71	3 Km	IIIC	0.07B	Surplus
16	4 Km	IIIC	0.07B	Surplus
73	7 Km	IIIB-2	0.07B	VOC
74	3 Km	IIIC	0.07B	Surplus
75	3 Km	IIIC	0.07B	Surplus
76	3 Km	IIIC	0.07B	Surplus
77	2 Km	IIIC	0.07B	Surplus
78	4 Km	IIIC	0.07B	Surplus
17	2 Km	IIIC	0.07B	Surplus
80	2 Km	IIIB-2	0.07B	VOC
81	4 Km	IIIC	0.07B	Surplus
82	5 Km	IIIB-2	0.07B	Surplus
83	5 Km	IIIC	0.07B	Surplus
84	3 Km	IIIC	0.07B	Surplus
18	5 Km	IIIC	0.07B	Surplus
86	4 Km	IIIC	0.07B	Surplus
87	1 Km	IIIC	0.07B	Surplus
88	2 Km	IIIC	0.07B	Surplus
89	2 Km	IIIC	0.07B	Surplus
90	6 Km	IIIC	0.07B	Surplus
91	3 Km	IIIC	0.07B	Surplus
92	2 Km	IIIC	0.07B	Surplus
93	1 Km	IIIC	0.07B	Surplus
94	6 Km	IIIB-2	0.07B	Surplus
19	5 Km	IIIC	0.07B	Surplus
96	2 Km	IIIC	0.07B	Surplus
97	2 Km	IIIB-2	0.07B	Surplus
98	2 Km	IIIB-2	0.07B	Surplus
99	4 Km	IIIB-2	0.07B	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : HULU SUNGAI TENGAH

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
53	2 Km	IIIB-2	50.959	VOC
2	2 Km	IIIC	12.860	VOC
95	6 Km	IIIC	8.394	Surplus
79	3 Km	IIIC	3.576	VOC

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

Nil

Chapter 6 IMPLEMENTATION PROGRAMME

6.1 Implementation Schedule

6.1.1 Project Cost

The total Project Cost for the Kabupaten is composed of the cost of construction and maintenance, supplementation as described later, and workshop, laboratory and survey equipment. The total Project Cost for the Kabupaten is summarized in Table 6-1-1.

Table 6-1-1 TOTAL PROJECT COST (1)

KABUPATEN: Hulu Sungai Tengah

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	272	454	726
MAINTENANCE	63	196	259
SUPPLEMENTATION	506	-	506
WORKSHOP EQUIPMENT & TOOLS	28	-	28
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	886	650	1,536

The total Project Cost can be divided into costs as shown in Table 6-1-2.

Table 6-1-2 TOTAL PROJECT COST (2)

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CIVIL WORK	138	644	782
CONSTRUCTION & MAINTENANCE EQUIPMENT	681	-	681
SPARE PARTS	22	6	28
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	886	650	1,536

The cost for civil work is composed of the cost of labour and materials, operation cost excluding spare parts, indirect cost and transportation cost of equipment.

6.1.2 Proposed Road Links

(1) Road Link to be Improved

The road links to be improved were generally selected taking into consideration the following criteria:

(1) Feasible road links
- Feasible road links from the primary evaluation
- Feasible road links from the secondary evaluation

(2) Road links selected from the engineering points of view

(3) Road links selected because of basic human needs.

The road links finally proposed to be improved in the Kabupaten are the 28 links with the total length of 93 km which is 27% of the 343 km total length of Kabupaten roads studied. The proposed road links are shown in Table 6-1-3.

Table 6-1-3 ROAD LINKS TO BE IMPROVED

KABUPATEN : HULU SUNGAI TENGAH

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary	1,3,6,24,31,32,43,50,51,52,62,64, 72,85
- Secondary	2,53
Engineering Point of View	7,8,9,21,22,23,33,54,71,83,84,86
Basic Human Needs	-

As the table shows all feasible road links are proposed to be improved.

Nine key road links which are located at the strategic point to complete the local road network consisting of feasible road links or connect the Kecamatan capitals are selected from the engineering points of view.

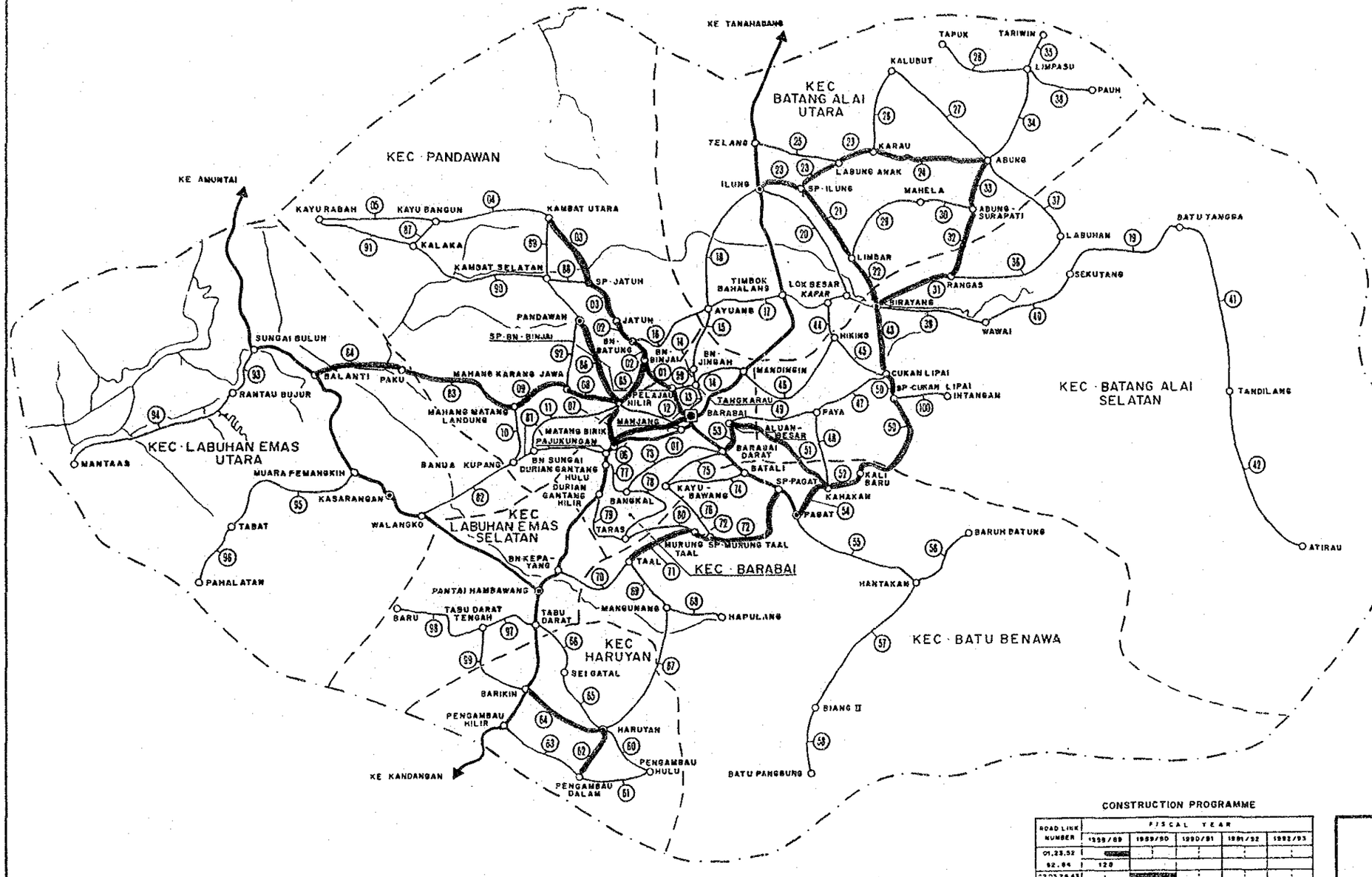
The order of proceeding with the improvement of the proposed road links are decided as shown in Table 6-1-4.

Table 6-1-4 ROAD LINKS TO BE IMPROVED BY YEAR

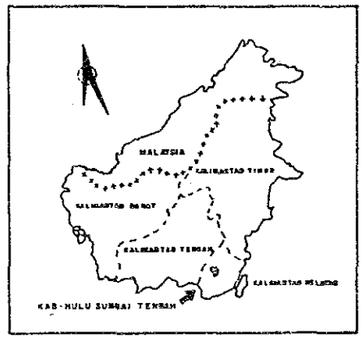
PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

YEAR	LINK NO ( ) : rate
1988 :	1, 23, 52, 62, 64
1989 :	2, 3, 24, 43, 50, 51, 53, 54, 71, 72, 86
1990 :	6, 7, 8, 9, 21, 22, 31, 32, 33, 83, 84, 85
1991 :	
1992 :	

KAB · HULU SUNGAI TENGAH



LOCATION MAP



LEGEND :

- KABUPATEN CAPITAL
- KECAMATAN CAPITAL
- OTHER CITY
- (3) LINK NUMBER
- PROVINCIAL BOUNDARY
- KABUPATEN BOUNDARY
- KECAMATAN BOUNDARY
- NATIONAL ROAD
- PROVINCIAL ROAD
- KABUPATEN ROAD
- VILLAGE ROAD
- RIVER

SCALE:

0 5 10 15 Km

CONSTRUCTION PROGRAMME

ROAD LINK NUMBER	FISCAL YEAR 1989/90	1990/91	1991/92	1992/93
01,23,52				
92,84	128			
02,03,24,43				
20,51,53,54				
71,72,86	331			
04,57,58,59				
21,22,31,32				
33,83,84,85		265		
TOTAL COST (10^6 Rp.)	128	331	265	

THE FEASIBILITY STUDY OF THE LOCAL ROAD DEVELOPMENT IN THE REPUBLIC OF INDONESIA

TITLE : CONSTRUCTION PROGRAMME

SOURCE: DIREKTORAT JENDERAL CIPTA KARYA

SCALE: AS SHOWN

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : HULU SUNGAI TENGAH

(2) Road Links to Be Maintained

It is desirable that all Kabupaten roads are maintained. However, because of the limited budget it is inevitable that some road links in the Kabupatens will be left without maintenance for the time being. The budget should be used for those which are effective in producing more useful development of the Kabupaten through the road development project. The road links to be maintained are finally proposed as shown in Table 6-1-5.

Table 6-1-5 (1) ROAD LINKS TO BE MAINTAINED

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SD (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TH NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
1	3	8.3	71.7	18.3	1.7	0	3	0	1	10.00	0	0.00	94	990	309	1,299
2	2	7.5	65.0	27.5	0.0	0	2	0	0	0.00	0	0.00	0	613	191	804
3	5	3.0	56.0	41.0	0.0	0	5	0	2	104.00	0	0.00	981	2,269	721	2,990
4	4	3.8	62.5	33.8	0.0	0	4	0	0	0.00	0	0.00	0	1,226	381	1,607
5	5	3.0	64.0	33.0	0.0	0	5	0	0	0.00	0	0.00	0	1,533	476	2,009
7	2	7.5	60.0	32.5	0.0	0	2	0	1	16.00	0	0.00	151	726	228	954
8	2	7.5	65.0	27.5	0.0	0	2	0	0	0.00	0	0.00	0	613	191	804
9	3	3.3	70.0	26.7	0.0	0	3	0	2	32.00	0	0.00	302	1,146	361	1,507
10	2	5.0	70.0	25.0	0.0	0	1	1	2	24.00	0	0.00	226	684	197	881
11	4	3.8	71.3	25.0	0.0	0	4	0	0	0.00	0	0.00	0	1,226	381	1,607
13	2	7.5	55.0	37.5	0.0	0	2	0	0	0.00	0	0.00	0	613	191	804
14	2	7.5	57.5	35.0	0.0	0	2	0	0	0.00	0	0.00	0	613	191	804
18	5	3.0	63.0	34.0	0.0	0	5	0	4	80.00	0	0.00	754	2,099	664	2,763
21	5	19.8	62.2	18.0	0.0	0	5	0	4	68.80	0	0.00	649	2,020	638	2,658
23	2	49.5	35.5	15.0	0.0	0	2	0	4	95.20	0	0.00	898	1,287	414	1,701
24	7	0.0	65.7	34.3	0.0	0	7	0	1	20.00	0	0.00	189	2,287	714	3,001
32	3	0.0	60.0	40.0	0.0	0	3	0	4	80.00	0	0.00	754	1,486	474	1,960
34	4	24.8	55.3	20.0	0.0	0	4	0	6	236.20	0	0.00	2,228	2,899	936	3,835
43	3	3.3	70.0	26.7	0.0	0	3	0	1	12.25	0	0.00	116	1,006	315	1,321
50	6	3.3	56.7	40.0	0.0	0	6	0	6	166.75	0	0.00	1,573	3,020	963	3,983
51	5	16.0	48.0	36.0	0.0	5	0	0	0	0.00	0	0.00	0	2,207	725	2,932
53	2	15.0	40.0	45.0	0.0	2	0	0	1	18.00	1	12.08	252	1,063	362	1,425
54	4	12.5	52.5	35.0	0.0	0	4	0	4	164.00	0	0.00	1,547	2,388	766	3,154
55	5	48.0	38.0	14.0	0.0	0	5	0	2	96.00	0	0.00	905	2,213	702	2,915
56	3	70.0	20.0	10.0	0.0	0	3	0	4	101.00	0	0.00	953	1,635	523	2,158
57	7	30.0	53.6	16.4	0.0	0	7	0	11	320.00	1	224.00	4,542	5,383	1,972	7,355
58	4	10.0	52.5	37.5	0.0	0	4	0	0	0.00	0	0.00	0	1,226	381	1,607
59	1	10.0	50.0	40.0	0.0	0	1	0	0	0.00	0	0.00	0	307	95	402
60	3	30.0	56.7	13.3	0.0	2	1	0	1	40.00	0	0.00	377	1,473	479	1,952

Table 6-1-5 (2) ROAD LINKS TO BE MAINTAINED

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SD (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TH NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
61	3	10.0	56.7	33.3	0.0	0	3	0	1	16.00	0	0.00	151	1,033	323	1,356
62	2	54.5	25.5	20.0	0.0	1	0	1	3	120.00	0	0.00	1,132	1,498	472	1,970
63	3	69.3	17.3	13.3	0.0	0	3	0	3	48.00	0	0.00	453	1,260	399	1,659
64	3	3.3	74.3	22.3	0.0	2	1	0	0	0.00	0	0.00	0	1,189	385	1,574
65	3	11.7	75.0	13.3	0.0	0	3	0	7	92.00	0	0.00	868	1,571	502	2,073
66	3	16.7	71.7	11.7	0.0	0	3	0	6	70.80	0	0.00	668	1,421	452	1,873
67	5	28.0	66.0	6.0	0.0	0	5	0	4	109.20	0	0.00	1,030	2,306	733	3,039
68	2	25.0	57.5	17.5	0.0	0	2	0	0	0.00	1	12.00	82	665	220	885
69	2	30.0	60.0	10.0	0.0	0	2	0	4	140.00	0	0.00	1,320	1,605	519	2,124
70	4	50.0	38.8	11.3	0.0	3	1	0	0	0.00	0	0.00	0	1,631	530	2,161
71	3	25.0	63.3	11.7	0.0	0	3	0	0	0.00	0	0.00	0	920	286	1,206
72	5	24.0	46.0	30.0	0.0	0	5	0	0	0.00	0	0.00	0	1,533	476	2,009
73	7	27.1	46.4	26.4	0.0	0	7	0	5	162.00	0	0.00	1,528	3,293	1,048	4,341
74	3	46.7	46.7	6.7	0.0	0	3	0	6	84.00	0	0.00	792	1,514	483	1,997
75	3	33.3	56.7	10.0	0.0	0	3	0	3	42.00	0	0.00	396	1,217	385	1,602
76	3	30.0	56.7	13.3	0.0	0	3	0	1	52.00	0	0.00	490	1,288	408	1,696
77	2	50.0	37.5	12.5	0.0	0	2	0	0	0.00	0	0.00	0	613	191	804
78	4	23.8	66.3	10.0	0.0	0	4	0	0	0.00	0	0.00	0	1,226	381	1,607
79	3	18.3	56.7	25.0	0.0	0	3	0	3	46.00	0	0.00	434	1,245	394	1,639
80	2	27.5	62.5	10.0	0.0	0	2	0	2	40.00	0	0.00	377	896	285	1,181
85	2	30.0	40.0	30.0	0.0	0	2	0	0	0.00	0	0.00	0	613	191	804
88	2	10.0	50.0	40.0	0.0	0	2	0	0	0.00	0	0.00	0	613	191	804
91	3	13.3	50.0	36.7	0.0	0	0	3	1	32.00	0	0.00	302	848	211	1,059
92	2	20.0	52.5	25.0	2.5	0	1	1	2	17.40	0	0.00	164	637	181	818
93	1	25.0	60.0	10.0	5.0	0	1	0	6	58.40	0	0.00	551	720	232	952
95	6	11.7	70.8	17.5	0.0	0	1	5	4	144.00	0	0.00	1,358	2,363	659	3,022
96	2	5.0	72.5	22.5	0.0	0	1	1	5	43.75	0	0.00	413	824	243	1,067
SUM	188					15	161	12	127	3001.75	3	248.08	29,997	80,793	25,721	106,514

6.1.3 Annual Construction and Maintenance Cost

The annual allocation of the total construction and maintenance cost in the three years programme for Kabupaten Hulu Sungai Tengah is finally recommended as shown in Tables 6-1-6 (1), (2) and (3) for the construction, maintenance and total respectively.

The proposed construction cost is Rp 726 x 10^6 and maintenance cost is Rp 259 x 10^6 which is approximately 26% of the total expenditure.

Table 6-1-6 (1) CONSTRUCTION AND MAINTENANCE COST
(CONSTRUCTION)

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	78,315	203,888	171,981	0	0	454,184	(62.6%)
Ownership Cost	855	2,657	2,478	0	0	5,990	(1.3%)
Operation Cost	32,260	105,291	100,003	0	0	237,554	(52.3%)
Material Cost	22,170	43,137	23,679	0	0	88,986	(19.6%)
Labour Cost	12,815	26,209	23,389	0	0	62,413	(13.7%)
Contingency	10,215	26,594	22,432	0	0	59,241	(13.0%)
FOREIGN CURRENCY :	49,861	128,195	93,451	0	0	271,507	(37.4%)
Ownership Cost	16,760	54,405	51,105	0	0	122,270	(45.0%)
Operation Cost	2,097	7,344	7,041	0	0	16,482	(6.1%)
Material Cost	24,500	49,725	23,116	0	0	97,341	(35.9%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	6,504	16,721	12,189	0	0	35,414	(13.0%)
TOTAL COST :	128,176	332,083	265,433	0	0	725,692	
Ownership Cost	17,615	57,062	53,583	0	0	128,260	(17.7%)
Operation Cost	34,357	112,635	107,044	0	0	254,036	(35.0%)
Material Cost	46,670	92,862	46,795	0	0	186,327	(25.7%)
Labour Cost	12,815	26,209	23,389	0	0	62,413	(8.6%)
Contingency	16,719	43,315	34,622	0	0	94,656	(13.0%)

(Contingency : 15%)

Table 6-1-6 (2) CONSTRUCTION AND MAINTENANCE COST

(MAINTENANCE)

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	39,131	73,844	83,191	0	0	196,166	(75.8%)
Ownership Cost	399	765	893	0	0	2,057	(1.0%)
Operation Cost	23,838	44,476	48,904	0	0	117,218	(59.8%)
Material Cost	2,270	4,396	5,069	0	0	11,735	(6.0%)
Labour Cost	12,624	24,207	28,325	0	0	65,156	(33.2%)
FOREIGN CURRENCY :	12,461	23,579	26,659	0	0	62,699	(24.2%)
Ownership Cost	10,644	19,864	21,808	0	0	52,316	(83.4%)
Operation Cost	1,156	2,147	2,359	0	0	5,662	(9.0%)
Material Cost	661	1,568	2,492	0	0	4,721	(7.5%)
Labour Cost	0	0	0	0	0	0	(0.0%)
TOTAL COST :	51,592	97,423	109,850	0	0	258,865	
Ownership Cost	11,043	20,629	22,701	0	0	54,373	(21.0%)
Operation Cost	24,994	46,623	51,263	0	0	122,880	(47.5%)
Material Cost	2,931	5,964	7,561	0	0	16,456	(6.4%)
Labour Cost	12,624	24,207	28,325	0	0	65,156	(25.2%)

Table 6-1-6 (3) CONSTRUCTION AND MAINTENANCE COST

(TOTAL)

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	117,446	277,732	255,172	0	0	650,350	(66.1%)
Ownership Cost	1,254	3,422	3,371	0	0	8,047	(1.2%)
Operation Cost	56,098	149,767	148,907	0	0	354,772	(54.6%)
Material Cost	24,440	47,533	28,748	0	0	100,721	(15.5%)
Labour Cost	25,439	50,416	51,714	0	0	127,569	(19.6%)
Contingency	10,215	26,594	22,432	0	0	59,241	(9.1%)
FOREIGN CURRENCY :	62,322	151,774	120,110	0	0	334,206	(33.9%)
Ownership Cost	27,404	74,269	72,913	0	0	174,586	(52.2%)
Operation Cost	3,253	9,491	9,400	0	0	22,144	(6.6%)
Material Cost	25,161	51,293	25,608	0	0	102,062	(30.5%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	6,504	16,721	12,189	0	0	35,414	(10.6%)
TOTAL COST :	179,768	429,506	375,283	0	0	984,557	
Ownership Cost	28,658	77,691	76,284	0	0	182,633	(18.5%)
Operation Cost	59,351	159,258	158,307	0	0	376,916	(38.3%)
Material Cost	49,601	98,826	54,356	0	0	202,783	(20.6%)
Labour Cost	25,439	50,416	51,714	0	0	127,569	(13.0%)
Contingency	16,719	43,315	34,622	0	0	94,656	(9.6%)

(Contingency : 15%)

6.1.4 Construction and Maintenance Equipment Cost

(1) Required Number of Equipment

The required numbers of construction equipment for Kabupaten Hulu Sungai Tengah are estimated from the annual proposed construction quantities as shown in Table 6-1-7.

The proposed numbers of equipment to be purchased are finally decided considering the following number of existing equipment in the Kabupaten which are available for the Project.

- Nil

The proposed numbers of maintenance equipment have been decided as shown below from the proposed annual maintenance volume taking into account the capacity of the proposed maintenance gangs.

a. Equipment for Road Maintenance

- 1-Flat Bed Truck 3 Ton

b. Equipment for Bridge Maintenance

- 1-Flat Bed Truck with Grane 3 Ton

(2) Equipment Cost

The proposed construction and maintenance equipment and their purchase costs are shown in Table 6-1-8. In the project the supplementation cost or equipment cost supplemented is the difference between the purchase cost for newly supplied equipment and depreciated value.

This comes about because full depreciated of the supplied equipment would not be completed within the Project Period of 5 years.

Table 6-1-7 REQUIRED NUMBER OF EQUIPMENT

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

EQUIPMENT NAME	WORKABLE	EXISTING	(1988)	(1989)	(1990)	(1991)	(1992)
Bulldozer/Ripper	200	0	0.13	0.45	0.46	0.00	0.00
Swamp Bulldozer	200	0	0.01	0.01	0.07	0.00	0.00
Motor Grader	220	0	0.21	0.90	0.78	0.00	0.00
Hand-guide Vib. Roller	220	0	0.45	0.44	0.35	0.00	0.00
Tire Roller	200	0	0.32	0.67	0.30	0.00	0.00
Vibratory Roller (D&T)	220	0	0.15	0.60	0.57	0.00	0.00
Hydraulic Excavator; Wheel	200	0	0.03	0.05	0.83	0.00	0.00
Wheel Loader	220	0	0.33	1.25	1.14	0.00	0.00
Water Tank Truck	220	0	0.08	0.33	0.33	0.00	0.00
Dump Truck	220	0	2.64	9.18	8.71	0.00	0.00
Flat Bed Truck with Crane	220	0	0.16	0.13	0.14	0.00	0.00
Flat Bed Truck	220	0	0.46	0.82	0.42	0.00	0.00
Portable Crusher/Screening	220	0	0.09	0.33	0.24	0.00	0.00
Concrete Mixer	200	0	0.14	0.13	0.12	0.00	0.00
Water Pump	200	0	0.10	0.09	0.08	0.00	0.00
Concrete Vibrator	200	0	0.00	0.00	0.01	0.00	0.00
Asphalt Sprayer	200	0	0.32	0.67	0.30	0.00	0.00

Table 6-1-8 EQUIPMENT PURCHASE COST

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

(1000 Rp)

EQUIPMENT NAME	CLASS	CIF (JAKARTA)	PURCHASE NO.	PURCHASE COST
Bulldozer	90 HP	49,150	-	-
Bulldozer/Ripper	90 HP	53,000	1	53,000
Swamp Bulldozer	90 HP	52,850	-	-
Swamp Bulldozer	65 HP	40,500	-	-
Motor Grader	75 HP	47,800	1	47,800
Road Stabilizer	W=1850 mm	85,950	-	-
Hand-guide Vib. Roller	1000 Kg	8,500	1	8,500
Tire Roller	8-15 ton	31,070	1	31,070
Vibratory Roller (D&T)	4 ton	29,000	1	29,000
Vibratory Roller	4 ton	29,000	-	-
Rough Terrain Crane	10 ton	100,400	-	-
Hydraulic Excavator; Wheel	0.3 m3	41,100	-	-
Wheel Loader	1.2 m3	70,200	1	70,200
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	9	132,300
Dump Loader Truck	12 ton	56,300	-	-
Flat Bed Truck with Crane	3.0 ton	25,190	1	25,190
Flat Bed Truck	3.0 ton	11,275	2	22,550
Portable Crusher/Screening	30-40 t/h	188,000	1	188,000
Concrete Mixer	0.5 m3	18,000	1	18,000
Water Pump	200 l/min	630	-	-
Concrete Vibrator	3.3 HP	740	-	-
Asphalt Sprayer	850 ltr.	10,200	1	10,200
Service Car	3 ton	11,600	1	11,600
4 Wheel Drive Vehicle	70 HP	17,500	1	17,500
Motorcycle	100 cc	1,100	3	3,300

PURCHASE COST TOTAL	680,960
OWNERSHIP COST (FOREIGN)	174,586
EQUIPMENT COST SUPPLEMENTED	506,374

6.1.5 Other Costs

Cost other items includes the costs of workshop equipment and tools, laboratory test equipment and survey equipment which are recommended in Sub-Clause 3.5. These total costs are summarized in Table 6-1-1.

6.1.6 Quantities by Work Type

The annual construction and maintenance quantities for all proposed road links are shown in Table 6-1-9.

Table 6-1-9 CONSTRUCTION QUANTITIES FOR ALL PROPOSED LINKS

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI TENGAH

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
Site Clearance in Light Bush	m2	4500.00	6000.00	11500.00	0.00	0.00	22000.00
Subgrade Preparation	m2	7002.20	891.00	19620.00	0.00	0.00	27513.20
Normal Fill	m3	20.00	50.00	0.00	0.00	0.00	70.00
Fill in Swamp	m3	150.90	359.00	2277.00	0.00	0.00	2786.90
Normal Excavation to Spoil	m3	106.00	60.00	2690.00	0.00	0.00	2856.00
Sub Base Course	m3	1493.40	6420.00	6219.90	0.00	0.00	14133.30
Base Course	m3	1925.00	9735.00	7630.00	0.00	0.00	19290.00
Shoulder	m2	28500.00	120500.00	100000.00	0.00	0.00	249000.00
Asphalt Patching	m2	384.00	711.00	0.00	0.00	0.00	1095.00
Surface Dressing (Single)	m2	46000.00	95500.00	43000.00	0.00	0.00	184500.00
Surface Dressing (Double)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Earth Drain	m	2000.00	4600.00	1600.00	0.00	0.00	8200.00
Earth Drain in Swamp (by machine)	m3	372.00	660.00	13200.00	0.00	0.00	14232.00
Pipe Culvert D80cm	m	0.00	0.00	10.00	0.00	0.00	10.00
Masonry Culvert (80x80cm)	m	0.00	0.00	0.00	0.00	0.00	0.00
Retaining Wall and Wing Wall (Timber)	m2	65.00	165.00	40.00	0.00	0.00	270.00
Retaining Wall and Wing Wall (Masonry)	m3	275.00	260.00	228.20	0.00	0.00	763.20
Gabion Protection	m3	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;10T)	m2	0.00	0.00	20.00	0.00	0.00	20.00
Superstructure (Timber;Span 8m;10T)	m2	28.00	0.00	0.00	0.00	0.00	28.00
Superstructure (Timber;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span10m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span15m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Timber;10T)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Timber;10T)	NO	2.00	0.00	2.00	0.00	0.00	4.00
Substructure (Pier;for Timber;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Timber;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Concrete;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Concrete;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Timber->Timber)	m2	28.00	0.00	20.00	0.00	0.00	48.00
Demolition of Bridge (Timber->Concrete)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Concrete)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Manual routine maintenance of road	Km	91.50	167.00	185.50	0.00	0.00	446.00
Routine maintenance of earth road	Km	5.75	11.00	11.00	0.00	0.00	27.75
Routine maintenance of gravel road	Km	79.00	137.50	132.50	0.00	0.00	349.00
Routine maintenance of asphalt road	Km	6.75	20.50	42.00	0.00	0.00	69.25
Maintenance of Timber Bridge (New)	m2	0.00	0.00	28.00	0.00	0.00	28.00
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	1444.58	2731.25	2899.35	0.00	0.00	7075.18
Maintenance of Concrete Bridge (Exist)	m2	124.04	242.04	248.08	0.00	0.00	614.16

6.2 Organization and Construction System

6.2.1 Organization

The Bupati as head of the Kabupaten has been authorized by Law No. 13, 1980 as an official responsible for the Local Road Development Project implementation. This means that the DPUK is considered as a responsible agency for the actual execution of the Project.

According to instruction letter dated June 24, 1982 Ref. No. 620/975-/BANGDA, the Project Manager appointed by the Bupati will be responsible for the operation and maintenance of the equipment. Accordingly the Equipment Coordinator appointed from the staff of the Regional Public Works (Kantor Wilayah) by Bina Marga as a coordinator between the Governor and the Bupati will be responsible for delivery, effectual utilization and maintenance of the equipment.

The standard organization of DPUK consists of a minimum of four sections, i.e. Road Section, Housing and City Planning Section, Irrigation Section and Administration Section. For execution of the Project it is strongly recommended that the structural organization of DPUK is established. It will be necessary not only to organize new sections but also to reorganize the current structure through a review of the roles and responsibilities of each inter-related section.

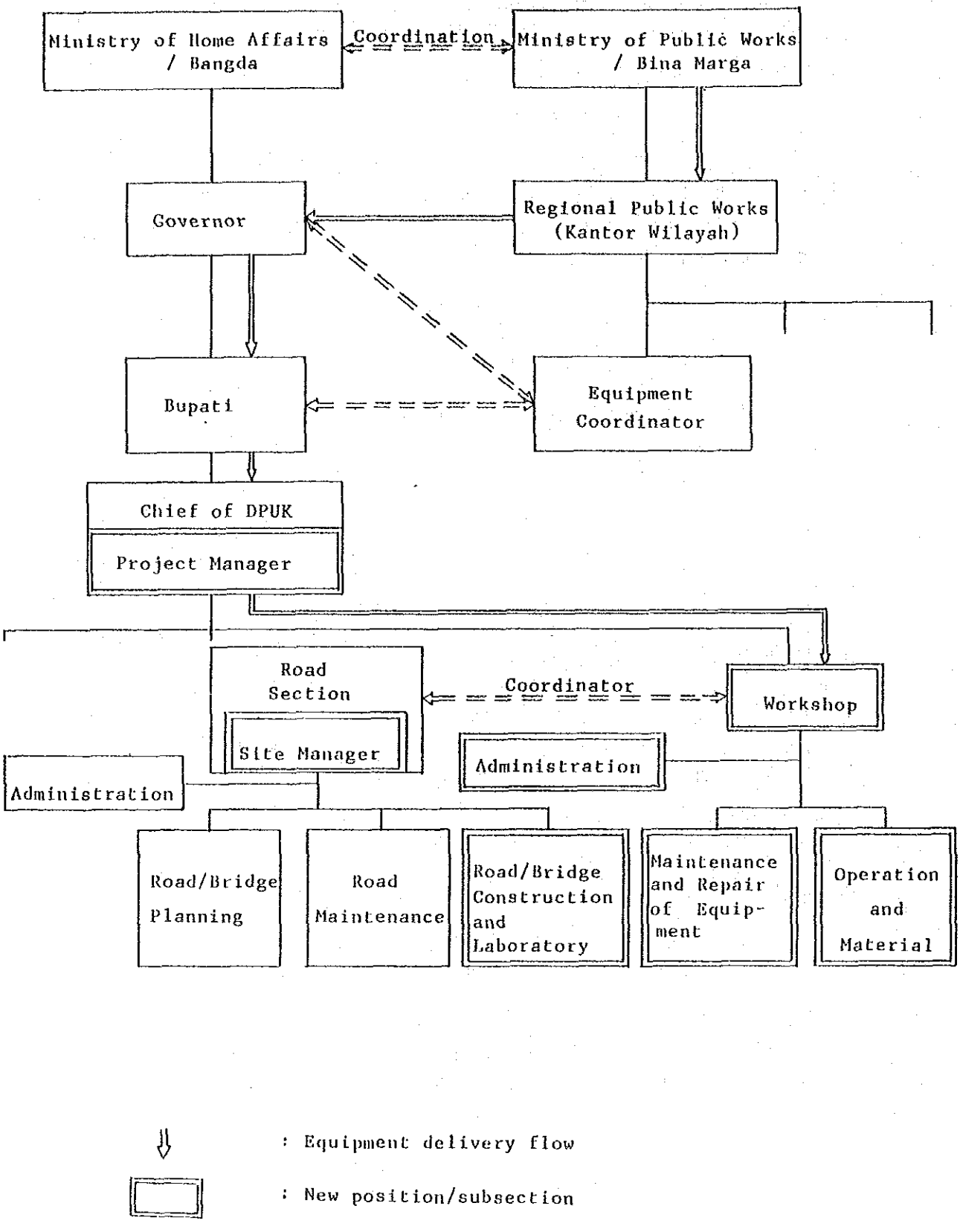
It is recommended that the workshop is newly organized to consist of three sub-sections, i.e. maintenance and repair of equipment, operation and materials, and administration to execute the main tasks described in Clause 3.5.

The sub-section of laboratory would be under the relevant Road Section. The proposed organization is shown in Fig. 6-2-1.

6.2.2 Construction System

For the construction of Kabupaten roads with a ten year effective design life, it has been recommended in Clause 3.4 that the equipment intensive method should be adopted for earth work and pavement work with the exception of surface dressing.

Fig. 6-2-1 PROPOSED ORGANIZATION



Current road construction in the Kabupatens is obliged to rely upon the traditional labour intensive method. It is therefore assumed that both the DPUK and the local contractors in the Kabupatens do not have sufficient experience and technique for the equipment intensive method of road construction.

For realization of the Local Road Development Project the GOI has ensured availability of the required human resources of DPUK and intends to conduct training programmes for those human resources as described in Clause 8.3 of the Main Report. This means that the GOI intends the Kabupatens to have the ability to execute the Project by force account (Swakelola).

It should be recognized from the experiences in the first local road project, which was assisted by OECF, ADB and IBRD, that because of their poor construction management and traditional labour intensive methods most of the road construction by local contractors could not be completed within the contract periods. Therefore execution of the road improvement by force account is desirable as recommended from their experience by the consultants for the first local road project.

It is strongly recommended that except for labourers the staff of the force account team should not be hired by the day as it would then not be able to consolidate the foundations for development of self reliability.

However, it will be very difficult to execute all the Projects by force account because of the need for many Kabupaten staff. The GOI has emphasized the need to promote the employment of local weak contractors in order to up-grade their capability in the road project schemes within the Fourth Five-Year Plan (REPELITA)

Taking into consideration the conditions mentioned above it is strongly recommended that the DPUK is obliged to lend some equipment with skilled operators to the local contractors in the Kabupatens for the execution of a part of the road improvement works.

The types of work executed only by force account are recommended as follows:

- Routine maintenance work for the Kabupaten roads
- Laboratory tests
- Production of crushed stone
- Technical service for the equipment