

**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 24

KABUPATEN HULU SUNGAI UTARA

MARCH 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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国際協力事業団		
受入 月日	'87. 5. 21	108
登録 No.	16447	61.4 SDF

PREFACE

This is the Kabupaten Report of the Feasibility Study of the Local Road Development in the Republic of Indonesia for Kabupaten Hulu Sungai Utara 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.

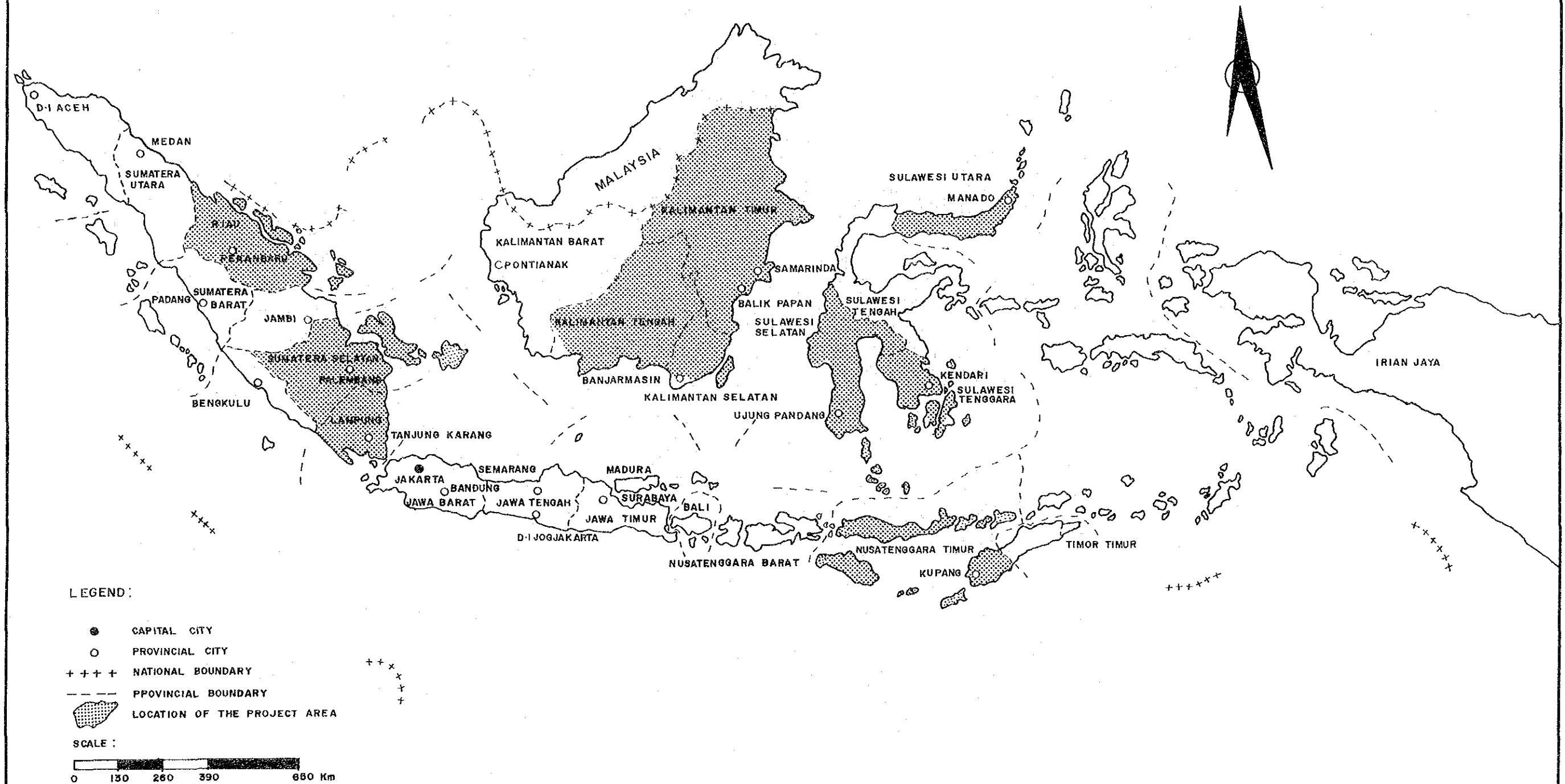
Since the study period was limited, without cooperation of Bina Marga, Bangda and local governments of both province and Kabupaten in collecting the data, the study would not have been completed within the period.

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

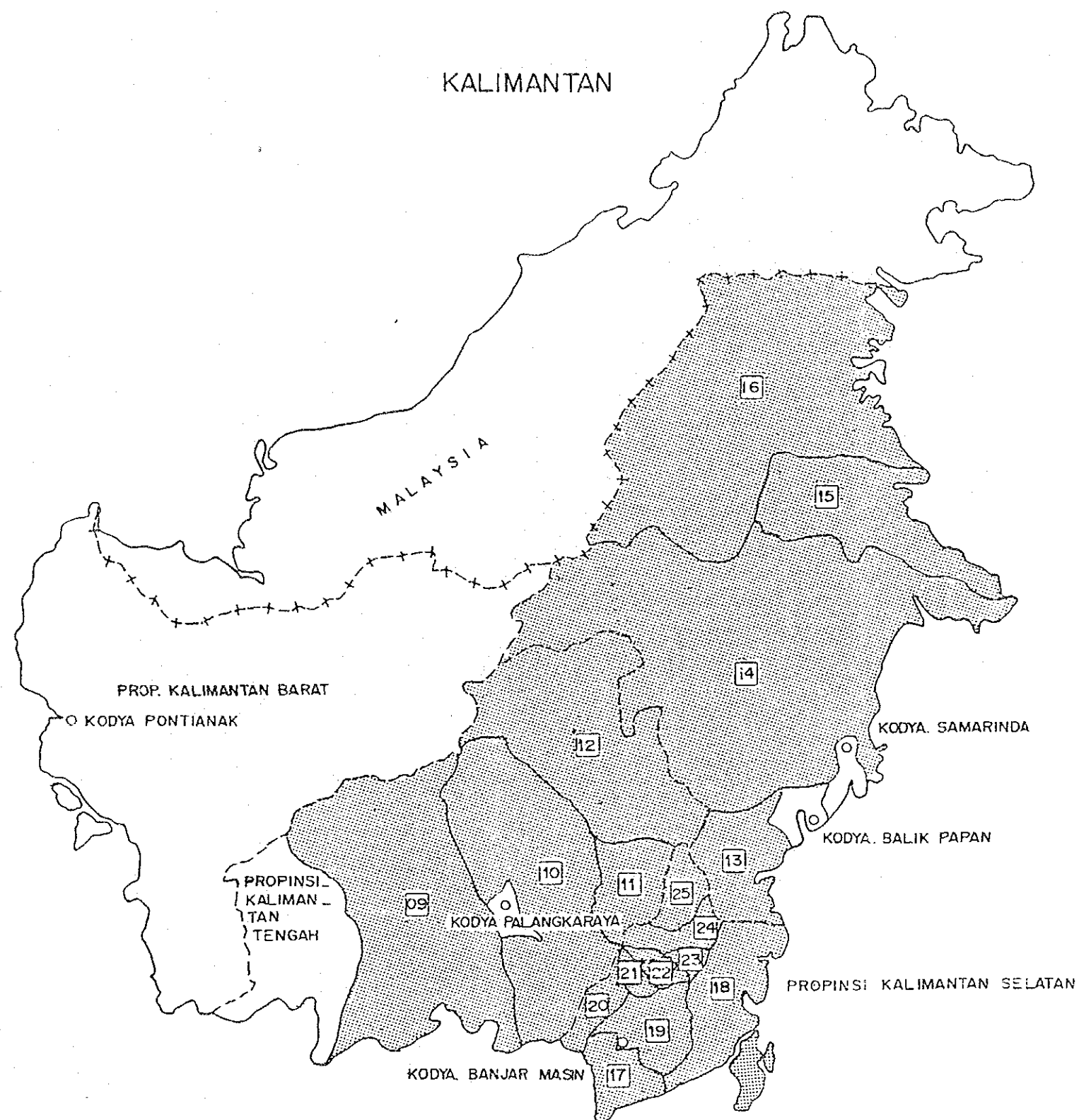
- 17 · KAB · TANAH LAUT
- 18 · KAB · KOTA BARU
- 19 · KAB · BANJAR
- 20 · KAB · BARITO KUALA
- 21 · KAB · TAPIN
- 22 · KAB · HULU SUNGAI SELATAN
- 23 · KAB · HULU SUNGAI TENGAH
- 24 · KAB · HULU SUNGAI UTARA
- 25 · KAB · TABALONG

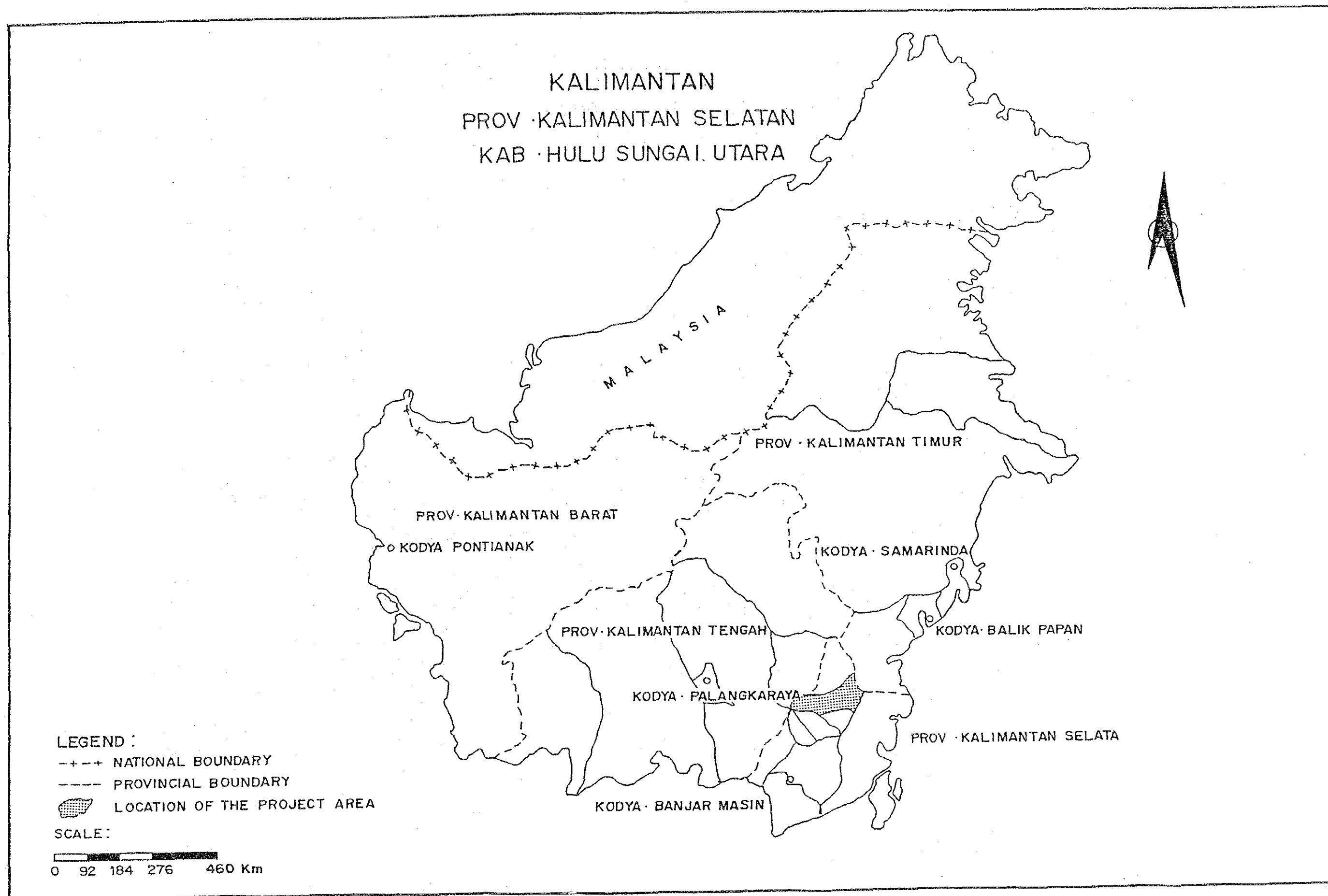
LEGEND :

- +--+ NATIONAL BOUNDARY
- PROVINCIAL BOUNDARY
-  LOCATION OF THE PROPOSED AREA

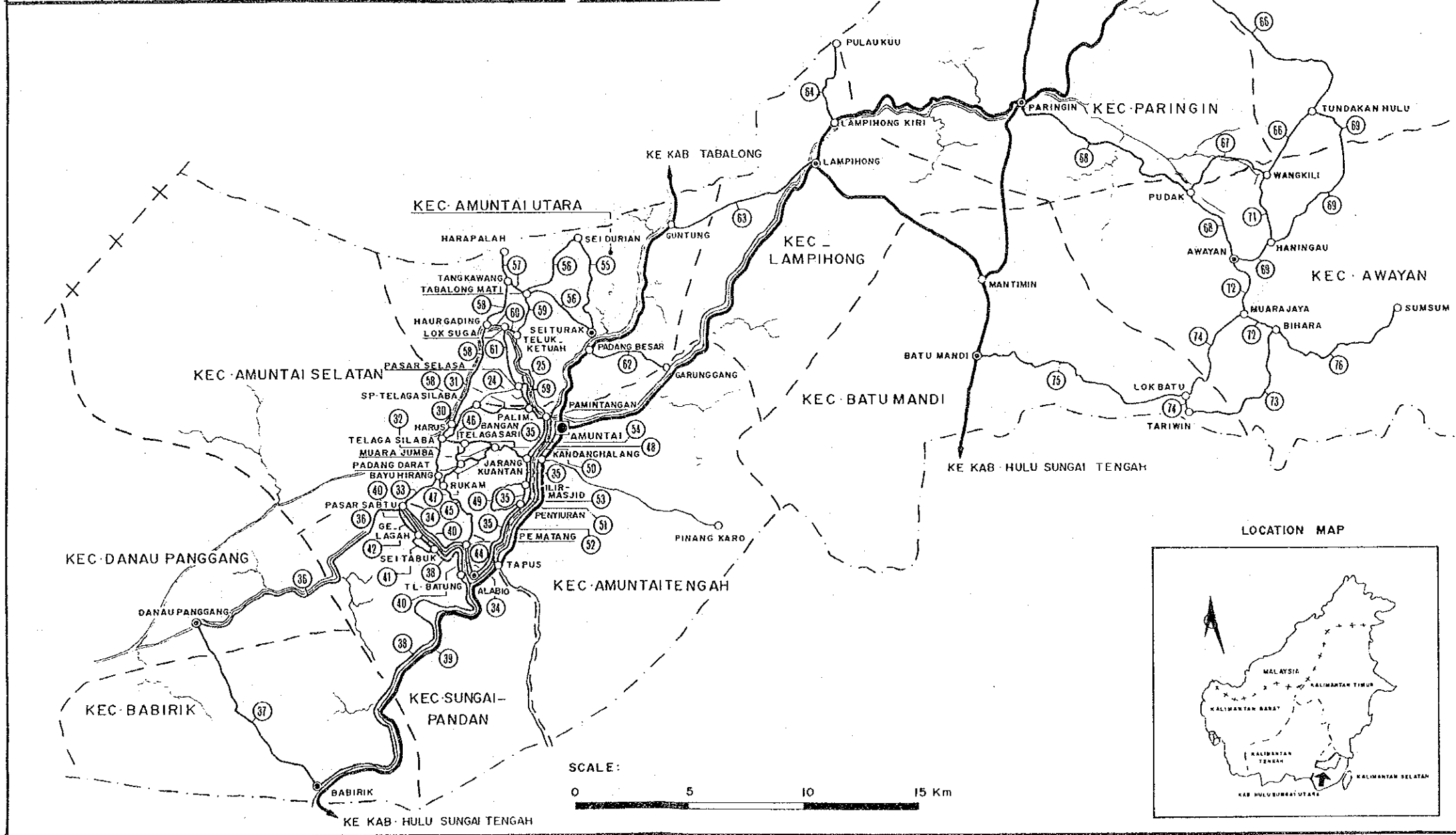
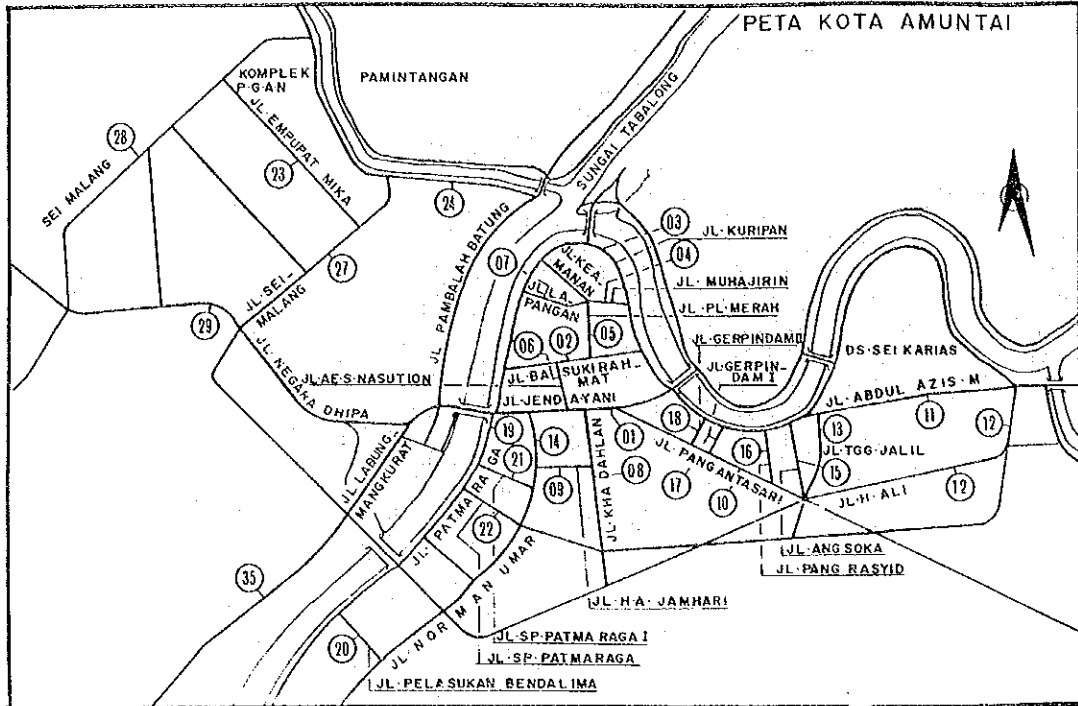
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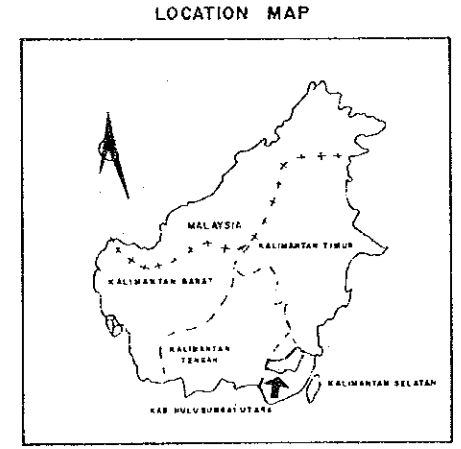


KAB. HULU SUNGAI UTARA



LEGEND :

- KABUPATEN CAPITAL
- KECAMATAN CAPITAL
- OTHER CITY
- LINK NUMBER
- PROVINCIAL BOUNDARY
- KABUPATEN BOUNDARY
- KECAMATAN BOUNDARY
- NATIONAL ROAD
- PROVINCIAL ROAD
- KABUPATEN ROAD
- VILLAGE ROAD
- RIVER
- BRIDGE



THE FEASIBILITY STUDY OF THE LOCAL ROAD DEVELOPMENT IN THE REPUBLIC OF INDONESIA		
TITLE :		
SOURCE : DIREKTORAT JENDERAL CIPTA KARYA	SCALE : AS SHOWN	PROVINCE KALIMANTAN SELATAN KABUPATEN HULU SUNGAI UTARA



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Chapter 1 BACKGROUND OF THE KABUPATEN

1.1 Topographic and Meteorological Conditions

1.1.1 Location and Topography

Kabupaten Hulu Sungai Utara is a long and narrow shaped Kabupaten in the east west direction located on the upper Negara River. It is bordered on the north by Kabupateen Tabalong, the northernmost Kabupaten in Kalimantan Selatan Province, on the east by the Kalimantan Timur Province and Kabupaten Kota Baru, on the south by Kabupatens Hulu Sungai Tengah and Hulu Sungai Selatan and on the west by Kalimantan Tengah Province.

Westwards from the capital of the Kabupaten, Amuntai, swampy land strerches up to the provincial boundary. However, eastwards there is flat land which transforms into hills close to the eastern boundary and up to the Meratus mountains.

The area of the Kabupaten is about 3,592 kilometers, approximately 10 percent of the total of the province. It consists administrative-ly of 12 Kecamatans.

1.1.2 Meteorological Conditions

The average number of rainy days and the average amount of yearly rainfall in Kabupaten Hulu Sungai Utara are 171 days and 1,854 mm respectively.

One year in the Kabupaten consists of a rainy season and a dry season. The dry season is from June through December 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.

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

Where :

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

Table 1-1-1

METEOROLOGICAL CONDITIONS

PROVINCE : Kalimantan Selatan
KABUPATEN : Hulu Sungai Utara

STATION : Amuntai

	1 9 8 0		1 9 8 1		1 9 8 2		1 9 8 3		1 9 8 4	
MONTH	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)	RAINY DAYS	RAINFALL (mm)
January	20	190	24	206	21	284	12	110	17	141
February	17	303	10	196	19	97	17	192	20	225
March	11	109	16	209	13	139	20	201	14	119
April	14	150	9	113	10	117	14	106	17	291
May	11	54	15	196	12	104	18	131	10	106
June	7	199	21	214	5	121	19	120	18	211
July	6	104	11	107	14	204	14	216	14	216
August	7	54	16	212	20	116	13	116	11	180
September	2	3	20	139	12	108	18	121	19	226
October	15	104	9	142	6	98	16	117	12	104
November	18	211	13	208	18	206	8	208	13	96
December	20	233	19	114	14	130	10	113	15	108
Total	148	1,714	183	2,056	164	1,724	179	1,751	180	2,023

1.2 Socio-Economic Conditions

1.2.1 Population

The population of Kabupaten Hulu Sungai Utara in 1984 was 248,860 which was approximately 11.1% of the 2,241,600 total population of Kalimantan Selatan Province as shown in Table 1-2-1.

The population density was 0.69 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 1.5% 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 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 UTARA

KECAMATAN	POPULATION	PROPORTION (%)
DANAU PANGGANG	20,024	8.0
BABIRIK	16,683	6.7
SUNGAI PANDAN	37,702	15.1
AMUNTAI SELATAN	19,850	8.0
AMUNTAI TENGAH	44,951	18.1
AMUNTAI UTARA	30,655	12.3
LAMPIHONG	13,640	5.5
BATU MANDI	12,007	4.8
AWAYAN	14,659	5.9
PARINGIN	17,389	7.0
JUAI	10,220	4.1
HALONG	11,080	4.5
TOTAL	248,860	100

1.2.2 Land Use

In Kabupaten Hulu Sungai Utara, 247,547 ha of the current available land use area, which is approximately 68.9% of the 359,178 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 220,963 ha of agricultural harvest area, 11,586 ha of residential area and 15,000 ha of usable open space which are 89.3%, 4.7% and 6.0% of the current available land use area respectively.

The agricultural harvest area consists of 106,863 ha of paddy field, 66,068 ha of plantation and 48,032 ha of other cultivated area which are 48.4%, 29.9% and 21.7% 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

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	(ha) 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)	17,590 (3.5)	22,850 (4.5)	16,000 (3.2)	-	12,590 (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)	1,488 (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 (7.7)	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 Utara in 1984 were 34,212 ha and 98,530 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 32,551 ha and 93,518 ton respectively which are 95.1% and 94.9% of the total food crops. The yield rate of paddy production is 2.87 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 3.0% and 6.7% respectively which indicate favorable development of paddy production. It is desirable that productivity of paddy increases and this depends upon the future development of irrigation together with river improvement.

The commodity crops, of which palm oil is major, are produced in the plantations. The area and production of plantation crops in 1983 were 19,721 ha and 7,176 ton respectively with current growth rates of 3.5% and 0% as shown in Table 1-2-5. Thus the plantation crop which is exported is an important agricultural product. 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 77.0% of the total population as shown in Table 1-2-6. Thus this is an agricultural Kabupaten.

Table 1-2-4

AREA AND PRODUCTION OF FOOD CROPS

KABUPATEN : HULU SUNGAI UTARA

CULTIVATED AREA

ITEM	YEAR						(ha)
	1979	1980	1981	1982	1983	1984	AAGR (%)
PADDY	27,262	31,947	32,063	30,857	26,176	32,551	3.0
OTHERS	844	812	1,096	1,478	1,517	1,661	14.5
TOTAL	28,106	32,759	33,159	32,335	27,693	34,212	4.0

PRODUCTION

ITEM	YEAR						(ton)
	1979	1980	1981	1982	1983	1984	AAGR (%)
PADDY	73,815	98,311	97,692	74,867	95,697	93,518	6.7
OTHERS	1,678	1,939	2,306	6,282	3,603	5,012	24.4
TOTAL	75,493	100,250	99,998	81,149	99,300	98,530	7.1

YIELD RATE

ITEM	YEAR						(ton/ha)
	1979	1980	1981	1982	1983	1984	AAGR (%)
PADDY	2.71	3.08	3.05	2.43	3.66	2.87	7.0

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)	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 Utara are forestry, manufacturing and livestock sectors.

The following tables show the current growth of the forestry and the manufacturing sectors. It should be noted that the some volumes relating to the sawing production are seemed to also be included in the volume of the manufacturing production.

	<u>1980</u>	<u>1984</u>	<u>AAGR (%)</u>
Timber production (ton)	19,549	16,059	- 4.8
Manufacturing Production (ton)	16,329	15,380	- 1.5

Notes : 1. AAGR : Average annual growth rate

2. Source : Kabupaten data

The current growth rates of the livestock sector are shown in table below.

	<u>1980</u>	<u>1984</u>	<u>AAGR (%)</u>
Production (ton)	480	652	8.0

It is presumed that yealy approx. 250 tons excluding the consumption of the Kabupaten itself are exported out of the Kabupaten. This sector is expected to become prosperous judging from the recent high growth tendency.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

The regional trunk roads in Kabupaten Hulu Sungai Utara consist of one national road which runs across the Kabupaten from south to north and one provincial road which runs across the Kabupaten from southwest to northeast. Besides this provincial road there is another provincial road which leaves the said provincial road at Lampihong and leads to Mantimin, its junction with the national road.

The Kabupaten road networks are only formed west of Amuntai, the Kabupaten capital, and, because it is a relatively gentle hilly area, in the area centering on Awayan east of the national road. In the remaining areas Kabupaten roads are not yet developed due to the geographical conditions of 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 Utara are confirmed as 87 links and 251 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 0.70 m per ha. This is higher than the national density of 0.48 m per ha but distinctly lower 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 presently of the stage of road develment,

	<u>Total Length</u> (km)	<u>Area</u> (ha)	<u>Density</u> (m/ha)
Kabupaten : Hulu Sungai Utara	251	359,178	0.70
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.

The legend used in the table is as follows:

ASP : Asphalt

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

PROV : KALIHARAN SELATAN

KAB : HULU SUNGAI UTARA

(km)							(km)						
102 (7)	ASP	KRK	BTB	L.L	TNI	TOTAL	102 (7)	ASP	KRK	BTB	L.L	TNI	TOTAL
LINK 1	1					1	LINK 45						
LINK 2		1				1	LINK 46					1	1
LINK 3		1				1	LINK 47					3	3
LINK 4	1					1	LINK 48					4	4
LINK 5	1					1	LINK 49						
LINK 6	1					1	LINK 50						
LINK 7	1					1	LINK 51						
LINK 8	1					1	LINK 52						
LINK 9	1					1	LINK 53						
LINK 10	1					1	LINK 54						
LINK 11	1					1	LINK 55	4					4
LINK 12	1					1	LINK 56			5			5
LINK 13			1			1	LINK 57					2	3
LINK 14							LINK 58			1		6	7
LINK 15	1					1	LINK 59					8	8
LINK 16	1					1	LINK 60					2	2
LINK 17				1		1	LINK 61					3	3
LINK 18				1		1	LINK 62					3	3
LINK 19	2					2	LINK 63		1	7			8
LINK 20	1					1	LINK 64			4			4
LINK 21				1		1	LINK 65		7				8
LINK 22	1					1	LINK 66		15				15
LINK 23	2					2	LINK 67			5			5
LINK 24		1	2			3	LINK 68			1		11	12
LINK 25		2				2	LINK 69					8	8
LINK 26		4				4	LINK 70						
LINK 27		1				1	LINK 71						
LINK 28		1				1	LINK 72			5			5
LINK 29		3				3	LINK 73			7			7
LINK 30					3	3	LINK 74	7					7
LINK 31					2	2	LINK 75	11					11
LINK 32		1	1			2	LINK 76			12			12
LINK 33		2				2	LINK 77						
LINK 34		5				5	LINK 78			3			3
LINK 35	7					7	LINK 79						
LINK 36							LINK 80						
LINK 37							LINK 81						
LINK 38							LINK 82					1	1
LINK 39					15	15	LINK 83	2	3	3			8
LINK 40		3				3	LINK 84		8				8
LINK 41		1				1	LINK 85						
LINK 42		2				2	LINK 86						
LINK 43	1					1	LINK 87		5				5
LINK 44													
TOTAL								50	67	59	3	72	251
RAJID								20	27	24	1	29	(%)

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:

	<u>ASP</u>	<u>KRK</u>	<u>TNH/LL</u>
Kabupaten : Hulu Sungai Utara	19 9	50 2	29 9
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 considered as 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:

	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>Bad</u>
Kabupaten : Hulu Sungai Utara	7 2	44 2	45 8	2 8
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 UTARA

(1)

102 71		OSP				KPK				UTB				L.L				TKI			
102		BA	SO	RU	RB	BA	SO	RU	RB	BA	SO	RU	RB	BA	SO	RU	RB	BA	SO	RU	RB
LINK 1	1		50	30	70																
LINK 2	2					45	30	25													
LINK 3	3					50	30	20													
LINK 4	4		75	25																	
LINK 5	5	60	10	30																	
LINK 6	6	80	20																		
LINK 7	7	60	70	20																	
LINK 8	8	40	10	30	20																
LINK 9	9	60	20	20																	
LINK 10	10		40	50	10																
LINK 11	11		70	25	5																
LINK 12	12		50	50																	
LINK 13	13									30	70										
LINK 14	14																				
LINK 15	15	60	30	10																	
LINK 16	16	60	30	10																	
LINK 17	17													80	20						
LINK 18	18													99							
LINK 19	19		6	95																	
LINK 20	20		60	40																	
LINK 21	21													99							
LINK 22	22		50	50																	
LINK 23	23		70	20	10																
LINK 24	24						40	60		20	25	5									
LINK 25	25						75	26													
LINK 26	26					30	50	18	3												
LINK 27	27					30	20	50													
LINK 28	28						15	80	5												
LINK 29	29					7	37	57													
LINK 30	30																	16	84		
LINK 31	31																	60	33	8	
LINK 32	32						70	30		60	40										
LINK 33	33						10	45	45												
LINK 34	34						47	48	5												
LINK 35	35		46	49	6																
LINK 36	36																				
LINK 37	37																				
LINK 38	38																				
LINK 39	39																	40	40		
LINK 40	40						34	46													
LINK 41	41					25	75														
LINK 42	42						50	50													
LINK 43	43		30	40	30																
LINK 44	44																				
LINK 45	45																				
LINK 46	46																	20	80		
LINK 47	47																	13	85	2	
LINK 48	48																	28	68	5	

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

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : HULU SUNGAI UTARA

(2)

102	71	ASP				KPK				RTB				L.L				TBR						
102		BA	SO	RU	RB	BA	SO	RU	RB	BA	SO	RU	RB	BA	SO	RU	RB	BA	SO	RU	RB			
LINK 49																								
LINK 50																								
LINK 51																								
LINK 52																								
LINK 53																								
LINK 54																								
LINK 55			23	73	5																			
LINK 56												35	65											
LINK 57												99	1						20	80				
LINK 58												95	8						42	58				
LINK 59																			33	67				
LINK 60																			73	28				
LINK 61																				52	48			
LINK 62																		7	17	77				
LINK 63						30	20	40	10			51	49											
LINK 64												30	70											
LINK 65							50	50				95	5											
LINK 66							31	67																
LINK 67										3	25	68	4											
LINK 68											80	17	3											
LINK 69																			55	45				
LINK 70																			18	82				
LINK 71																								
LINK 72												51	46											
LINK 73												65	35											
LINK 74			53	30	11																			
LINK 75			61	37	2																			
LINK 76												45	35	1										
LINK 77																								
LINK 78												73	27											
LINK 79																								
LINK 80																								
LINK 81																								
LINK 82																			99	1				
LINK 83				45	15			77	23		40	40												
LINK 84							69	31																
LINK 85																								
LINK 86																								
LINK 87							56	44																
AVERAGE		22	36	37	5	11	40	44	5	0	59	41	1	0	93	7	0	0	37	59	4			
LENGTH		59 Km				67 Km					59 Km					3 Km					72 Km			
(Kg)		11	18	19	3	7	27	29	3	0	35	24	1	0	3	0	0	0	27	42	3			

The surface condition level of the Kabupaten roads in the Kabupaten is lower than either that of Indonesia or of Jawa Island. The proportion in good condition is very low.

(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 63.0% flat, 18.0% hilly, 3.0% mountainous and 17.0% swampy. There mountainous areas in the Kabupaten. However, road construction is anticipated to be a little difficult because of the large 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 Utara were prepared by the Kabupaten.

The bridge types are classified 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 165 bridges with a total length of 1,281 m all of which are timber. There are no bridges listed in the inventory to be newly constructed.

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

PROV : KALIMANTAN SELATAN

KAB : HULU SUNGAI UTARA

(Km)						(Km)					
102 (3)	DT	RW	BK	GN	TOTAL	102 (3)	DT	RW	BK	GN	TOTAL
LINK 1	1				1	LINK 45	1				1
LINK 2	1				1	LINK 46	1				1
LINK 3	1				1	LINK 47	3				3
LINK 4	1				1	LINK 48	4				4
LINK 5	1				1	LINK 49					1
LINK 6	1				1	LINK 50					1
LINK 7	1				1	LINK 51					1
LINK 8	1				1	LINK 52					1
LINK 9	1				1	LINK 53					1
LINK 10	1				1	LINK 54					1
LINK 11	1				1	LINK 55	4				4
LINK 12		1			1	LINK 56	1	4			5
LINK 13	1				1	LINK 57	2	1			3
LINK 14					1	LINK 58		7			7
LINK 15	1				1	LINK 59		8			8
LINK 16	1				1	LINK 60		2			2
LINK 17	1				1	LINK 61	3				3
LINK 18	1				1	LINK 62	2	1			3
LINK 19	2				2	LINK 63		8			8
LINK 20	1				1	LINK 64	4				4
LINK 21	1				1	LINK 65			8		8
LINK 22	1				1	LINK 66			15		15
LINK 23	2				2	LINK 67				5	5
LINK 24	3				3	LINK 68	12				12
LINK 25	2				2	LINK 69	1	7			8
LINK 26	4				4	LINK 70					1
LINK 27		1			1	LINK 71					1
LINK 28	1				1	LINK 72	5				5
LINK 29	3				3	LINK 73	7				7
LINK 30	3				3	LINK 74			7		7
LINK 31	2				2	LINK 75	9		2		11
LINK 32	2				2	LINK 76			10	2	12
LINK 33	2				2	LINK 77					1
LINK 34	5				5	LINK 78	3				3
LINK 35	7				7	LINK 79					1
LINK 36					1	LINK 80					1
LINK 37					1	LINK 81					1
LINK 38					1	LINK 82	1				1
LINK 39	15				15	LINK 83	6	2			8
LINK 40	3				3	LINK 84	7		1		8
LINK 41	1				1	LINK 85					1
LINK 42	2				2	LINK 86					1
LINK 43	1				1	LINK 87	3		2		5
LINK 44					1						
TOTAL						TOTAL					
RATIO						RATIO					
</											

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : KALINANTAN SELATAN

KAB : HULU SUNGAI UTARA

<<<< BRIDGE >>>>

(UNIT: m)

EXISTING		NOT EXIST		TOTAL	
LINK NO	NO.	LENGTH	NO.	LENGTH	NO., LENGTH
12	2	6.00			2 6.00
21	1	3.50			1 3.50
24	2	9.00			2 9.00
26	2	23.00			2 23.00
27	1	4.00			1 4.00
29	2	7.00			2 7.00
31	2	8.00			2 8.00
32	1	4.00			1 4.00
33	6	57.00			6 57.00
34	2	44.00			2 44.00
35	2	10.00			2 10.00
39	4	24.00			4 24.00
47	2	29.00			2 29.00
48	8	42.00			8 42.00
55	6	32.00			6 32.00
56	3	54.00			3 54.00
57	4	37.00			4 37.00
59	1	4.00			1 4.00
60	1	24.00			1 24.00
61	1	40.00			1 40.00
62	1	18.00			1 18.00
63	5	68.00			5 68.00
64	13	96.50			13 96.50
65	6	36.00			6 36.00
66	5	40.50			5 40.50
67	11	107.00			11 107.00
68	7	86.00			7 86.00
69	15	94.00			15 94.00
72	6	32.00			6 32.00
73	3	19.00			3 19.00
74	10	58.00			10 58.00
75	5	16.00			5 16.00
76	4	49.00			4 49.00
78	1	7.00			1 7.00
83	9	32.00			9 32.00
84	4	15.00			4 15.00
87	7	45.00			7 45.00
TOTAL	165	1280.50			165 1280.50

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

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI UTARA

(No)	
103 (18)	KY
LINK 12	2
LINK 21	1
LINK 24	2
LINK 26	2
LINK 27	1
LINK 29	2
LINK 31	2
LINK 32	1
LINK 33	6
LINK 34	2
LINK 35	2
LINK 39	4
LINK 47	2
LINK 48	8
LINK 55	6
LINK 56	3
LINK 57	4
LINK 59	1
LINK 60	1
LINK 61	1
LINK 62	1
LINK 63	5
LINK 64	13
LINK 65	6
LINK 66	5
LINK 67	11
LINK 68	7
LINK 69	15
LINK 72	6
LINK 73	3
LINK 74	10
LINK 75	5
LINK 76	4
LINK 78	1
LINK 83	9
LINK 84	4
LINK 87	7
TOTAL : 165	
RATIO :	

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

<u>Bridge Type</u>	<u>Span Length (m)</u>										<u>Total</u>
	<u><3</u>	<u><5</u>	<u><8</u>	<u><10</u>	<u><12</u>	<u><14</u>	<u><16</u>	<u><18</u>	<u><20</u>	<u><99</u>	
Timber	43	108	12	2	-	-	-	-	-	-	165
Concrete	-	-	-	-	-	-	-	-	-	-	-
Steel	-	-	-	-	-	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-	-	-	-
Total	43	108	12	2	-	-	-	-	-	-	165

Thus, all 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 Utara 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	1,433	308	1,006	3,824	6,571
Proportion (%)	21.81	4.69	15.30	58.20	100.00

Source : Bina Marga Inventory

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

	SEDAN	BUS	TRUCK	MOTOR- CYCLE	TOTAL
Proportion (%)	0.85	0.09	2.94	96.12	100.00

Source : Kabupaten.

Thus, the proportion of motorcycles 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:

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

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 BUNGA UTARA

A)	Growth Rate of Population	:	1.50 (%)
B)	Growth Rate of Cultivated Area	:	4.00 (%)
C)	Growth Rate of Rice field	:	3.00 (%)
D)	Growth Rate of Rice yield rate	:	7.00 (%)
E)	Growth Rate of GDP / capita	:	6.60 (%)
a)	Geometrical Mean (A x B)	:	2.74 (%)
b)	Geometrical Mean (C x D)	:	4.98 (%)
c)	Geometrical Mean (a x b)	:	3.86 (%)
d)	Geometrical Mean (c x E)	:	5.22 (%)
TRAFFIC GROWTH RATE			: 5.22 (%)

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 :

$$T_n = T_e (1 + r)^n$$

Where :

T_n : Future traffic volume n years later

T_e : 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 UTARA

< SPD : 1/2 >

LINK NO	INVENTORY (1985)					RATE		AFTER 13 YEARS (1998)					CLASS	
	MBL	BUS	TRUK	SPD	TOTAL			MBL	BUS	TRUK	SPD	TOTAL		
1	105	36	65	200	306	5.2%		203	70	126	388	593	111A	
2	75	30	25	90	175	5.2%		145	58	48	174	339	111B-1	
3	95	24	42	120	221	5.2%		184	47	81	233	428	111B-1	
4	30	6	20	75	94	5.2%		58	12	39	145	182	111B-2	
5	15	3	12	60	60	5.2%		29	6	23	116	116	111B-2	
6	15	4	15	70	69	5.2%		29	8	29	136	134	111B-2	
7	14	4	15	66	66	5.2%		27	8	29	128	128	111B-2	
8	80	50	95	120	285	5.2%		155	97	184	233	552	111A	
9	35	12	12	64	91	5.2%		68	23	23	124	176	111B-2	
10	85	6	65	158	235	5.2%		165	12	126	306	455	111B-1	
11	95	24	60	280	319	5.2%		184	47	116	543	618	111A	
12	102	12	65	214	286	5.2%		198	23	126	415	554	111A	
13	65	6	35	154	183	5.2%		126	12	68	298	355	111B-1	
14	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
15	15	3	14	60	62	5.2%		29	6	27	116	120	111B-2	
16	22	4	16	74	79	5.2%		43	8	31	143	153	111B-2	
17	15	4	16	66	68	5.2%		29	8	31	128	132	111B-2	
18	15	4	16	62	66	5.2%		29	8	31	120	128	111B-2	
19	22	4	18	76	82	5.2%		43	8	35	147	159	111B-2	
20	15	4	16	74	72	5.2%		29	8	31	143	140	111B-2	
21	0	0	0	25	13	5.2%		0	0	0	48	25	111C	
22	15	4	14	62	64	5.2%		29	8	27	120	124	111B-2	
23	65	12	42	280	259	5.2%		126	23	81	543	502	111A	
24	7	0	4	20	21	5.2%		14	0	8	39	41	111C	
25	10	0	2	20	22	5.2%		19	0	4	39	43	111C	
26	8	0	4	10	17	5.2%		16	0	8	19	33	111C	
27	3	0	1	20	14	5.2%		6	0	2	39	27	111C	
28	2	0	5	50	32	5.2%		4	0	10	97	62	111B-2	
29	2	0	0	4	4	5.2%		4	0	0	8	8	111C	
30	0	0	0	10	5	5.2%		0	0	0	19	10	111C	
31	4	0	2	11	12	5.2%		8	0	4	21	23	111C	
32	4	0	2	7	10	5.2%		8	0	4	14	19	111C	
33	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
34	3	0	1	5	7	5.2%		6	0	2	10	14	111C	
35	95	24	60	220	289	5.2%		184	47	116	426	560	111A	
36	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
37	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
38	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
39	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
40	10	0	5	35	33	5.2%		19	0	10	68	64	111B-2	
41	2	0	0	4	4	5.2%		4	0	0	8	8	111C	
42	6	0	2	10	13	5.2%		12	0	4	19	25	111C	
43	12	0	4	25	29	5.2%		23	0	8	48	56	111B-2	
44	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
45	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
46	2	0	0	10	7	5.2%		4	0	0	19	14	111C	
47	3	0	0	10	8	5.2%		6	0	0	19	16	111C	
48	7	0	2	24	21	5.2%		14	0	4	47	41	111C	
49	0	0	0	0	0	5.2%		0	0	0	0	0	111C	
50	0	0	0	0	0	5.2%		0	0	0	0	0	111C	

Table 2-1-2 (2)

EXISTING AND FUTURE TRAFFIC VOLUME

PROV : KALIMANTAN SELATAN

KAB : HULU SUNGAI UTARA

< SPD : 1/2 >

INVENTORY (1985)						RATE		AFTER 13 YEARS (1998)					CLASS	
LINK NO	HBL	BUS	TRUK	SPD	TOTAL			HBL	BUS	TRUK	SPD	TOTAL		
51	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
52	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
53	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
54	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
55	25	4	16	56	73	5.2%		48	8	31	109	141	IIIB-2	
56	2	0	1	10	8	5.2%		4	0	2	19	16	IIIC	
57	0	0	0	5	3	5.2%		0	0	0	10	6	IIIC	
58	0	0	0	5	3	5.2%		0	0	0	10	6	IIIC	
59	0	0	0	50	25	5.2%		0	0	0	97	48	IIIC	
60	0	0	0	50	25	5.2%		0	0	0	97	48	IIIC	
61	2	0	2	10	9	5.2%		4	0	4	19	17	IIIC	
62	0	0	0	10	5	5.2%		0	0	0	19	10	IIIC	
63	2	0	1	25	16	5.2%		4	0	2	48	31	IIIC	
64	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
65	3	0	2	5	8	5.2%		6	0	4	10	16	IIIC	
66	0	0	2	6	5	5.2%		0	0	4	12	10	IIIC	
67	0	0	1	5	4	5.2%		0	0	2	10	8	IIIC	
68	35	6	46	96	135	5.2%		68	12	89	186	262	IIIB-1	
69	15	0	8	50	48	5.2%		29	0	16	97	93	IIIB-2	
70	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
71	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
72	35	4	48	62	118	5.2%		68	8	93	120	229	IIIB-1	
73	20	0	10	75	68	5.2%		39	0	19	145	132	IIIB-2	
74	65	14	52	160	211	5.2%		126	27	101	310	409	IIIB-1	
75	15	0	20	100	85	5.2%		29	0	39	194	165	IIIB-2	
76	12	0	10	4	24	5.2%		23	0	19	8	47	IIIC	
77	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
78	10	0	5	10	20	5.2%		19	0	10	19	39	IIIC	
79	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
80	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
81	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
82	3	0	1	25	17	5.2%		6	0	2	48	33	IIIC	
83	2	0	2	20	14	5.2%		4	0	4	39	27	IIIC	
84	10	0	3	20	23	5.2%		19	0	6	39	45	IIIC	
85	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
86	0	0	0	0	0	5.2%		0	0	0	0	0	IIIC	
87	2	0	4	20	16	5.2%		4	0	8	39	31	IIIC	
PERCENT	21.81	4.69	15.31	58.20				21.81	4.69	15.31	58.20			

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

FUTURE TRAFFIC VOLUME ESTIMATED
BY THE PRODUCER'S SURPLUS

PROV : KALIMANTAN SELATAN

KAB : HULU SUNGAI UTARA

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
21	111C	KRK	2	0	1	5	6
24	111C	KRK	8	1	5	24	26
25	111C	KRK	7	1	4	21	23
27	111C	KRK	2	0	1	5	6
28	111C	KRK	2	0	1	5	6
29	111C	KRK	6	1	3	16	18
30	111C	KRK	1	0	1	4	4
31	111C	KRK	1	0	1	3	4
32	111C	KRK	1	0	1	3	4
33	111C	KRK	1	0	1	3	4
34	111C	KRK	9	1	5	26	28
40	111C	KRK	5	1	3	15	17
41	111C	KRK	2	0	1	5	6
42	111C	KRK	4	0	2	10	11
46	111C	KRK	0	0	0	1	1
47	111C	KRK	1	0	1	4	4
48	111C	KRK	2	0	1	6	6
56	111B-2	KRK	18	2	10	52	56
57	111C	KRK	11	1	6	31	34
58	111B-2	KRK	16	2	9	46	50
59	111C	KRK	4	0	2	11	12
60	111C	KRK	7	1	4	21	23
61	111C	KRK	11	1	6	31	34
62	111C	KRK	11	1	6	31	34
63	111B-1	ASP	83	8	45	237	255
64	111B-2	KRK	50	5	28	144	155
65	111B-2	KRK	47	5	26	135	146
66	111A	ASP	311	30	171	893	959
67	111B-2	KRK	48	5	26	138	148
69	111B-1	ASP	78	8	43	224	241
76	111B-2	KRK	34	3	19	98	105

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 UTARA

(1000Rupiah)

	LINK 1	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 7	LINK 8	LINK 9	LINK 10
	I Km	I Km	I Km	I Km	I Km	I Km	I Km	I Km	I Km	I Km
	IIIA	IIIB-1	IIIB-1	IIIB-2	IIIB-2	IIIB-2	IIIB-2	IIIA	IIIB-2	IIIB-1
YEAR	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC
1988	0	0	0	0	0	0	0	0	0	0
1989	1687	2765	3149	794	311	64	264	4433	446	3671
1990	1768	2904	3339	839	320	67	277	4675	461	3879
1991	1861	3059	3515	876	337	70	291	4932	485	4055
1992	1962	3217	3692	930	355	74	309	5174	515	4283
1993	2067	3388	3885	968	385	80	328	5447	545	4513
1994	2174	3562	4079	1014	403	84	342	5723	569	4728
1995	2289	3752	4303	1072	421	88	361	6029	600	4977
1996	2408	3942	4527	1138	438	92	382	6350	631	5262
1997	2528	4134	4753	1186	469	97	401	6673	662	5532
1998	2662	4341	5009	1253	488	102	420	7028	699	5819
SUM	21406	35064	40251	10070	3927	818	3375	56464	5613	46719
COST	7208	15283	18335	2348	-1284	-3118	-1610	27910	-286	22153
/Km	7208	15283	18335	2348	-1284	-3118	-1610	27910	-286	22153

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.

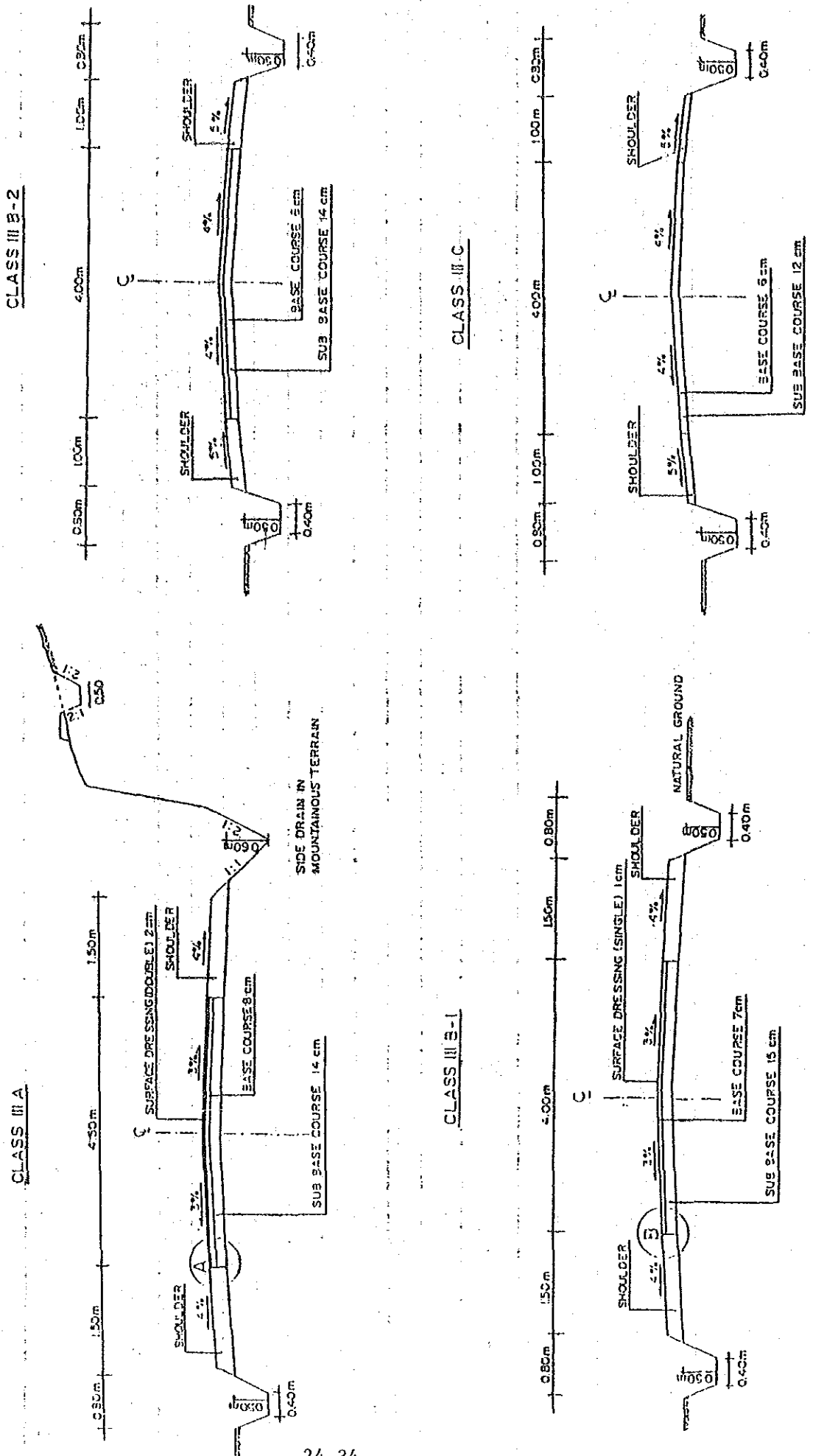
Table 3-1-1

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 (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	FLAT TO ROLLING	HILLY	MOUNT- AINOUS	
TRAFFIC LANES		1+	1+	1+	1+	1+	1+	1+	1+	1+	1+	1+	1+	1	1	1	
DESIGN SPEED (Km/hr)		DESIRABLE	70	60	40	70	40	30	30	60	40	30	30	50	30	30	AS PRACTI- CABLE
		MINIMUM	30	30	30	30	30	AS PRACTI- CABLE	30	30	30	30	AS PRACTI- CABLE	30	30	AS PRACTICABLE	
GRADIENT (LIMITING) (%)		DESIRABLE	4	5	8	4	6	8	8	4	7	8	8	5	8	12	
		MAXIMUM	7	7	10	7	8	10	10	7	9	12	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	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	3.5	3.5	3.0	3.0	3.0	
SHOULDER WIDTH (M)		DESIRABLE	2.0	1.5	1.5	1.5	1.5	1.0	1.0	1.5	1.0	1.0	1.0	1.0	1.0	0.75	
		MINIMUM	1.5	1.0	0.75	1.0	1.0	0.75	0.75	1.0	0.75	0.5	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	6.5	7.5	6.5	6.5	6.5	5.5	5.5	5.0	
		MINIMUM	6.0	6.0	6.0	5.5	5.5	5.0	5.0	5.5	5.0	4.5	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



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:

<u>Road Classification</u>	<u>Design Traffic Volume (vpd)</u>
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.

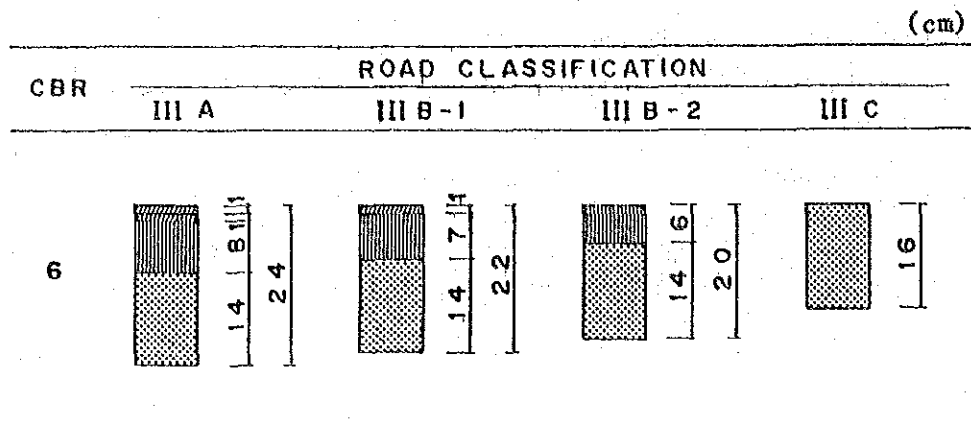
CBR of the laterite is generally in the range of CBR 4 to 10. However site CBR tests should be conducted before construction to finally decide the pavement thickness.

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



-  = SURFACE DRESSING (ASPHALT)
-  = BASE COURSE (CRUSHER-RUN)
-  = SUBBASE COURSE (SANDY GRAVEL)

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 described 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 rural 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 diameter 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.

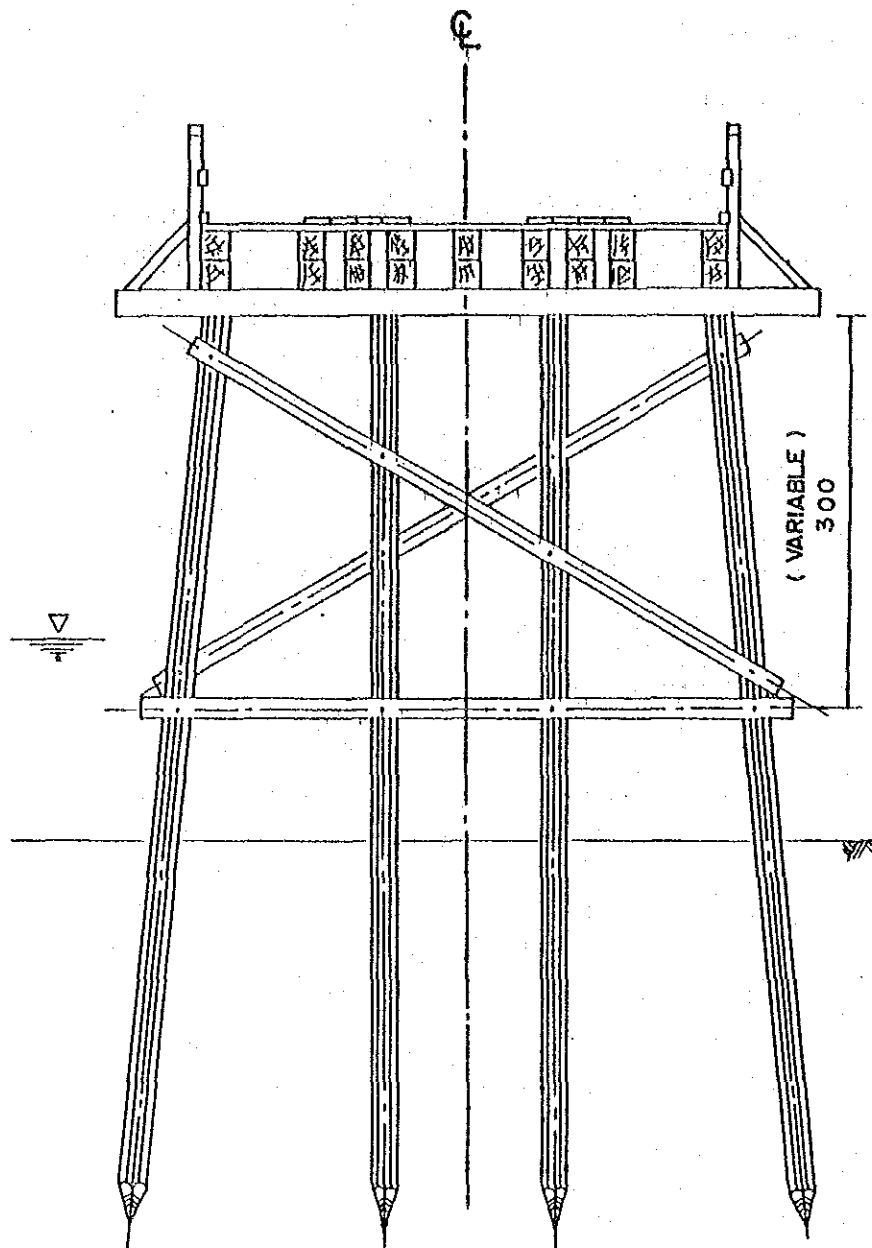
The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

(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 mortar box culvert with RC slab 80 cm X 80 cm

(2) Retaining Wall

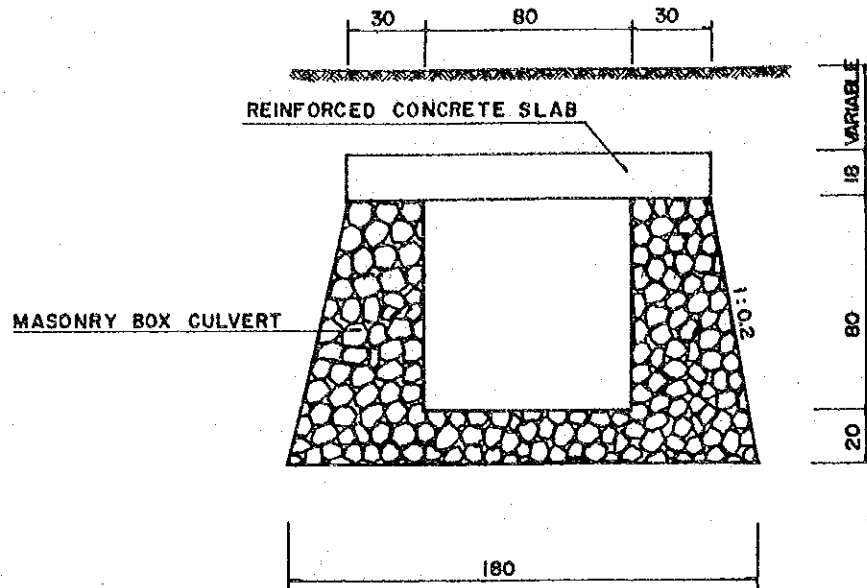
The following two types of retaining walls have been adopted because of ease of construction, economy and familiarity in Indonesia.

- a) Rubble in mortar retaining wall
- b) Timber retaining wall

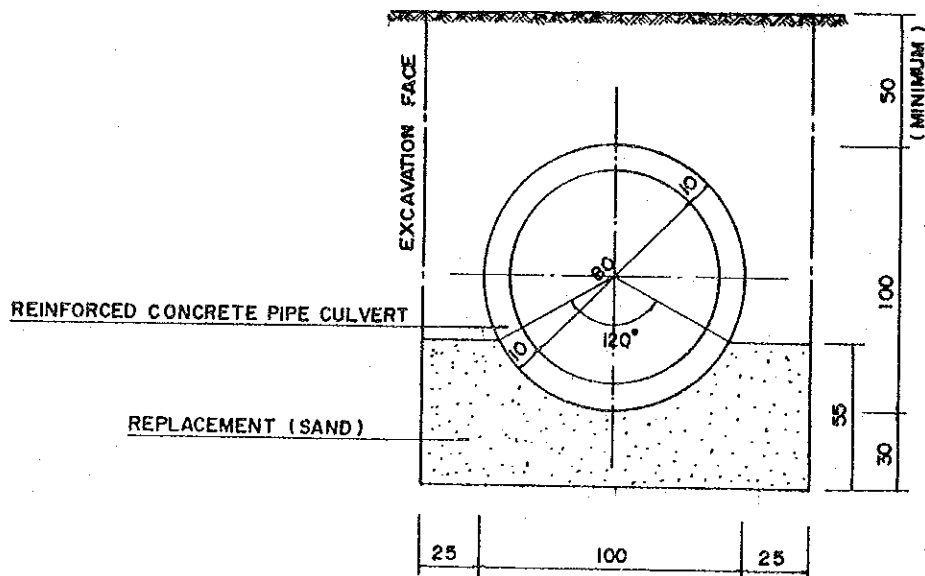
Fig. 3-3-2

STANDARD CULVERTS

80 x 80 RUBBLE IN MORTAR BOX CULVERTS

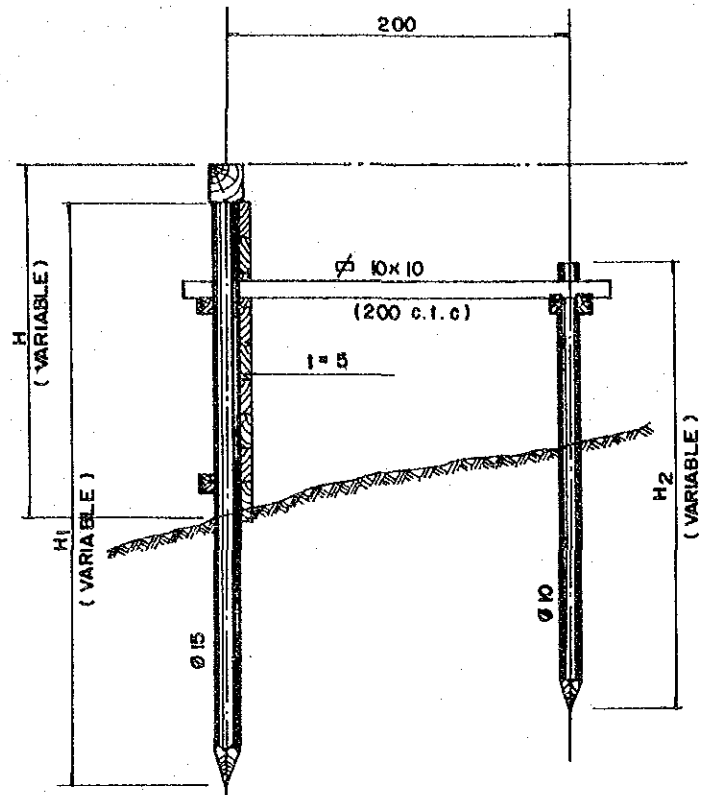


Ø 80 REINFORCED CONCRETE PIPE CULVERT

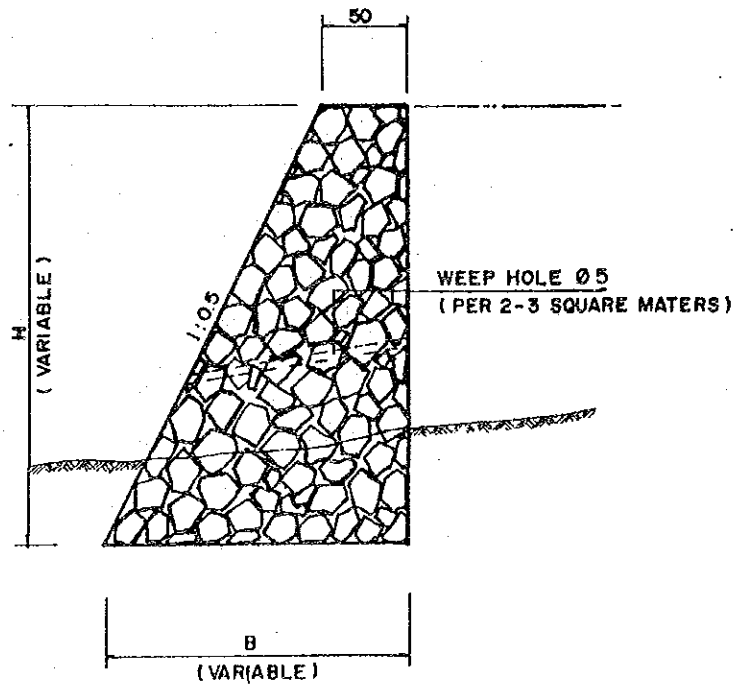


STANDARD RETAINING WALLS

200



50



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 Utara and other Kabupatens in Kalimantan Selatan Province are shown in Table 4-1-1.

Table 4-1-1 UNIT LABOUR PRICE

KABUPATEN	(Rp)						
	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 Utara together with for other Kabupatens in Kalimantan Selatan Province.

Table 4-1-2 (1)

UNIT PRICE OF MATERIALS

MATERIAL	UNIT					
		TANAH LAUT	KOTA BARU	BANJAR KUALA	BARITO	(Rp) 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

MATERIAL	UNIT					(Rp)
		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 UTARA

(UNIT : Rp)

< 6'85 >

CODE NO	EQUIPMENT NAME	CLASS	<<<< LOCAL COST >>>>			<<<< FOREIGN COST >>>>			TOTAL COST
			OWNERSHIP	OPERATION	SUB-TOTAL	OWNERSHIP	OPERATION	SUB-TOTAL	
	Bulldozer	120 HP	234	13,383	13,617	7,769	1,024	8,793	22,410
	Bulldozer/Ripper	120 HP	255	14,393	14,648	8,500	1,575	10,075	24,723
	Swamp Bulldozer	120 HP	267	14,636	14,903	8,879	1,646	10,525	25,428
	Bulldozer	90 HP	148	9,004	9,152	4,914	647	5,561	14,713
	Bulldozer/Ripper	90 HP	159	9,594	9,753	5,300	982	6,282	16,035
	Bulldozer	65 HP	105	6,544	6,649	3,500	461	3,961	10,610
	Bulldozer/Ripper	65 HP	115	6,993	7,108	3,819	708	4,527	11,635
	Swamp Bulldozer	90 HP	159	9,584	9,743	5,284	979	6,263	16,006
	Swamp Bulldozer	65 HP	122	6,924	7,046	4,049	750	4,799	11,845
	Motor Grader	110 HP	208	11,481	11,689	6,919	1,282	8,201	19,890
	Motor Grader	75 HP	144	7,867	8,011	4,779	885	5,664	13,675
	Motor Grader	65 HP	129	6,918	7,047	4,300	797	5,097	12,144
	Road Stabilizer	W=1850 mm	258	3,381	3,639	8,594	424	9,018	12,657
	Vibratory Roller	4 ton	87	3,443	3,530	2,900	382	3,282	6,812
	Hand-guide Vib. Roller	1000 Kg	68	617	685	850	29	879	1,564
	Tire Roller	8-15 ton	94	7,726	7,820	3,106	102	3,208	11,028
	Vibratory Roller (D&T)	4 ton	87	3,443	3,530	2,900	382	3,282	6,812
	Hand-guide Vib. Roller	600 Kg	48	422	470	600	20	620	1,090
	Rough Terrain Crane	10 ton	302	13,392	13,694	10,039	744	10,783	24,477
	Hydraulic Excavator; Wheel	0.3 m3	124	8,115	8,239	4,109	541	4,650	12,889
	Wheel Loader	1.2 m3	211	8,677	8,888	7,019	925	7,944	16,832
	Wheel Loader	0.3 m3	69	3,035	3,104	2,269	299	2,568	5,672
	Water Tank Truck	4000 ltr.	70	2,975	3,045	868	120	988	4,033
	Fuel Tank Truck	4000 ltr.	71	2,982	3,053	882	121	1,003	4,056
	Dump Truck	3.0 ton	118	3,701	3,819	1,469	202	1,671	5,490
	Flat Bed Truck with Crane	3.0 ton	52	3,222	3,274	1,717	127	1,844	5,118
	Dump Loader Truck	12 ton	116	19,970	20,086	3,837	126	3,963	24,049
	Dump Truck	5.0 ton	176	6,120	6,296	2,189	302	2,491	8,787
	Flat Bed Truck	3.0 ton	17	2,797	2,814	563	41	604	3,418
	Portable Crusher/Screening	30-40 t/h	564	22,558	23,122	18,800	2,478	21,278	44,400
	Concrete Mixer	0.5 m3	432	2,419	2,851	5,400	419	5,819	8,670
	Water Pump	200 l/min	16	276	292	188	6	194	486
	Concrete Vibrator	3.3 HP	6	240	246	73	2	75	321
	Asphalt Sprayer	850 ltr.	82	785	867	1,019	140	1,159	2,026

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 UTARA		
(Rp)				
ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	164	91	255
Subgrade Preparation	m2	21	11	32
Normal Fill	m3	1,698	863	2,561
Fill in Swamp	m3	2,537	1,052	3,589
Normal Excavation to Spoil	m3	995	522	1,517
Sub Base Course	m3	3,221	1,347	4,568
Base Course	m3	4,405	2,299	6,704
Shoulder	m2	295	146	441
Asphalt Patching	m2	3,819	1,377	5,196
Surface Dressing (Single)	m2	605	595	1,200
Surface Dressing (Double)	m2	757	936	1,693
Earth Drain	m	937	119	1,056
Earth Drain in Swamp (by machine)	m3	1,210	474	1,684
Pipe Culvert Ø80cm	m	44,708	43,411	88,119
Masonry Culvert (80x80cm)	m	62,536	37,886	100,422
Retaining Wall and Wing Wall (Timber)	m2	10,216	246	10,462
Retaining Wall and Wing Wall (Masonry)	m3	46,225	11,868	58,093
Gabion Protection	m3	14,482	120	14,602
Manual routine maintenance of road	Km	153,768	7,248	161,016
Routine maintenance of earth road	Km	94,913	37,904	132,817
Routine maintenance of gravel road	Km	192,232	88,047	280,279
Routine maintenance of asphalt road	Km	381,900	137,700	519,600

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 BELATAN KAB : HULU SUNGAI UTARA

(Rp)				
ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber; Span 3m; IOT)	m2	38,866	3,812	42,678
Superstructure (Timber; Span 5m; IOT)	m2	43,049	4,209	47,258
Superstructure (Timber; Span 8m; IOT)	m2	57,019	5,529	62,548
Superstructure (Timber; Span 3m; BH50)	m2	48,192	4,713	52,905
Superstructure (Timber; Span 5m; BH50)	m2	52,610	5,107	57,717
Superstructure (Timber; Span 8m; BH50)	m2	66,723	6,465	73,188
Superstructure (Concrete; Span 3m; BH50)	m2	46,273	87,419	133,692
Superstructure (Concrete; Span 5m; BH50)	m2	47,686	97,527	145,213
Superstructure (Concrete; Span 8m; BH50)	m2	49,245	106,131	155,376
Superstructure (Concrete; Span 10m; BH50)	m2	53,983	120,381	174,364
Superstructure (Concrete; Span 15m; BH50)	m2	58,444	141,603	200,047
Substructure (Pier; for Timber; IOT)	NO	338,631	35,424	374,055
Substructure (Abut; for Timber; IOT)	NO	960,831	163,152	1,123,983
Substructure (Pier; for Timber; BH50)	NO	498,037	52,429	550,466
Substructure (Abut; for Timber; BH50)	NO	1,081,276	181,784	1,263,060
Substructure (Pier; for Concrete; BH50)	NO	1,798,331	477,161	2,275,492
Substructure (Abut; for Concrete; BH50)	NO	3,718,725	999,497	4,718,222
Demolition of Bridge (Timber->Timber)	m2	10,970	1,462	12,432
Demolition of Bridge (Timber->Concrete)	m2	10,970	1,462	12,432
Demolition of Bridge (Concrete)	m2	82,929	68,697	151,626
Maintenance of Timber Bridge (New)	m2	7,240	1,176	8,416
Maintenance of Concrete Bridge (New)	m2	1,794	2,790	4,584
Maintenance of Timber Bridge (Exist)	m2	7,494	2,432	9,926
Maintenance of Concrete Bridge (Exist)	m2	4,232	2,402	6,634

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 Utara are shown in Table 5-1-1.

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

KABUPATEN : HULU SUNGAI UTARA

CRITERIA NO	ROAD LINK NO
(6)	01,02,03,04,05,06,07,08,09,10,11,12,15,16,17,18, 19,20,21,22,23,24,25,27,28,29,35
(8)	14,26,36,37,38,43,44,45,49,50,51,52,53,54,70,71, 77,78,79,80,81,82,83,84,85,86,87

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 : KALINANTAN SELATAN KABUPATEN : HULU BUNGA UTARA

LINK NO	LENGTH	CLASS	IRR (%)	REMARK
66	15 Km	IIIA	70.446	Surplus
35	7 Km	IIIA	47.848	VDC
19	2 Km	IIIB-2	44.453	VDC
10	1 Km	IIIB-1	44.057	VDC
13	1 Km	IIIB-1	41.746	VDC
12	1 Km	IIIA	38.417	VDC
68	12 Km	IIIB-1	37.167	VDC
11	1 Km	IIIA	36.927	VDC
55	4 Km	IIIB-2	27.963	VDC
23	2 Km	IIIA	26.192	VDC
3	1 Km	IIIB-1	23.596	VDC
72	5 Km	IIIB-1	20.878	VDC
2	1 Km	IIIB-1	19.035	VDC
69	8 Km	IIIB-1	16.254	Surplus
20	1 Km	IIIB-2	14.346	VDC
75	11 Km	IIIB-2	13.885	VDC
74	7 Km	IIIB-1	10.571	VDC
65	8 Km	IIIB-2	9.926	Surplus
22	1 Km	IIIB-2	7.629	VDC
63	8 Km	IIIB-1	4.031	Surplus
1	1 Km	IIIA	2.105	VDC
5	1 Km	IIIB-2	0.078	VDC
24	3 Km	IIIC	0.078	Surplus
25	2 Km	IIIC	0.078	Surplus
27	1 Km	IIIC	0.078	Surplus
28	1 Km	IIIC	0.078	Surplus
29	3 Km	IIIC	0.078	Surplus
30	3 Km	IIIC	0.078	Surplus
31	2 Km	IIIC	0.078	Surplus
32	2 Km	IIIC	0.078	Surplus
33	2 Km	IIIC	0.078	Surplus
34	5 Km	IIIC	0.078	Surplus
6	1 Km	IIIB-2	0.078	VDC
40	3 Km	IIIC	0.078	Surplus
41	1 Km	IIIC	0.078	Surplus
42	2 Km	IIIC	0.078	Surplus
46	1 Km	IIIC	0.078	Surplus
47	3 Km	IIIC	0.078	Surplus
48	4 Km	IIIC	0.078	Surplus
7	1 Km	IIIB-2	0.078	VDC
56	5 Km	IIIB-2	0.078	Surplus
57	3 Km	IIIC	0.078	Surplus
58	7 Km	IIIB-2	0.078	Surplus
59	8 Km	IIIC	0.078	Surplus
60	2 Km	IIIC	0.078	Surplus
61	3 Km	IIIC	0.078	Surplus
62	3 Km	IIIC	0.078	Surplus
15	1 Km	IIIB-2	0.078	VDC
64	4 Km	IIIB-2	0.078	Surplus
16	1 Km	IIIB-2	0.078	VDC

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

PROVINCE : KALIMANTAN SELATAN KABUPATEN : HULU SUNGAI UTARA

LINK NO	LENGTH	CLASS	IRR (%)	REMARK
17	1 Km	IIIB-2	0.078	VDC
67	5 Km	IIIB-2	0.078	Surplus
18	1 Km	IIIB-2	0.078	VDC
8	1 Km	IIIA	0.078	VDC
9	1 Km	IIIB-2	0.078	VDC
73	7 Km	IIIB-2	0.078	VDC
21	1 Km	IIIC	0.078	Surplus
4	1 Km	IIIB-2	0.078	VDC
76	12 Km	IIIB-2	0.078	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : HULU SUNGAI UTARA

LINK NO	LENGTH	CLASS	IRR (%)	REMARK
65	8 Km	IIIC	13.010	Surplus
1	1 Km	IIIB-1	8.481	VDC
22	1 Km	IIIC	7.629	VDC
63	8 Km	IIIB-2	3.606	Surplus

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : HULU SUNGAI UTARA

LINK NO	LENGTH	CLASS	NPV (1000Rp)	B/C	IRR (%)	REMARK
66	15 Km	IIIA	942098	4.045	70.446	Surplus
68	12 Km	IIIB-1	237604	2.127	37.167	VDC
35	7 Km	IIIA	123625	2.480	47.848	VDC
69	8 Km	IIIB-1	58135	1.251	16.254	Surplus
72	5 Km	IIIB-1	29001	1.382	20.878	VDC
13	1 Km	IIIB-1	18948	2.367	41.746	VDC
10	1 Km	IIIB-1	15857	2.352	44.057	VDC
23	2 Km	IIIA	13253	1.578	26.192	VDC
12	1 Km	IIIA	12583	1.974	38.417	VDC
11	1 Km	IIIA	11584	2.019	36.927	VDC
19	2 Km	IIIB-2	9521	1.978	44.453	VDC
55	4 Km	IIIB-2	9278	1.356	27.963	VDC
3	1 Km	IIIB-1	8629	1.555	23.596	VDC
2	1 Km	IIIB-1	5551	1.356	19.035	VDC
75	11 Km	IIIB-2	4336	1.081	13.885	VDC
65	8 Km	IIIC	4000	1.073	13.010	Surplus
74	7 Km	IIIB-1	2645	1.019	10.571	VDC
20	1 Km	IIIB-2	399	1.091	14.346	VDC
SUM	88 Km		1507047			

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 Utara

(Rp $\times 10^6$)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	402	656	1,058
MAINTENANCE	46	166	212
SUPPLEMENTATION	632	-	632
WORKSHOP EQUIPMENT & TOOLS	28	-	28
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	1,125	822	1,947

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

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

(Rp $\times 10^6$)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CIVIL WORK	204	815	1,019
CONSTRUCTION & MAINTENANCE EQUIPMENT	848	-	848
SPARE PARTS	28	7	35
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	1,125	822	1,947

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 21 links with the total length of 95 km which is 38% of the 251 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 UTARA

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary	2,3,10,11,12,13,19,20,23,35,55,66,68,69,
- Secondary	65,
Engineering Point of View	30,31,58,59,60,63
Basic Human Needs	-

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

Six key road links which are located at the strategic point to complete the local road network consisting of feasible road links or connect the national road with the provincial road, these road links are selected from the engineering points of view.

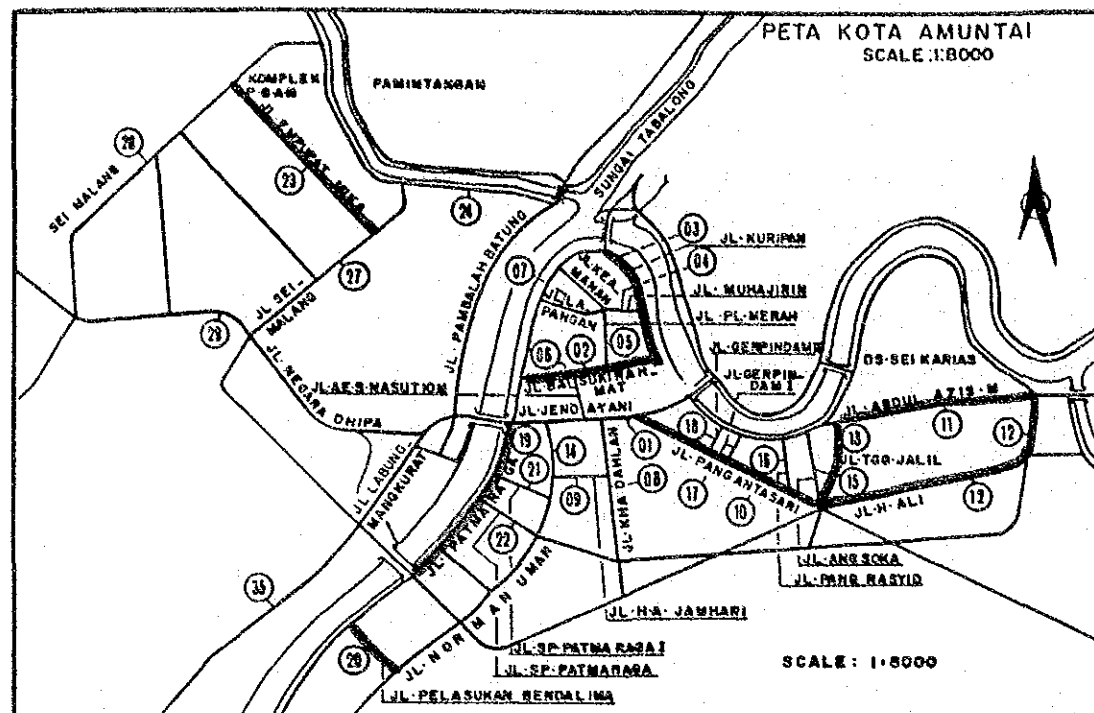
The order of proceeding with the improvement of the proposed road links are decided as shown in Table 6-1-4.

Table 6-1-4

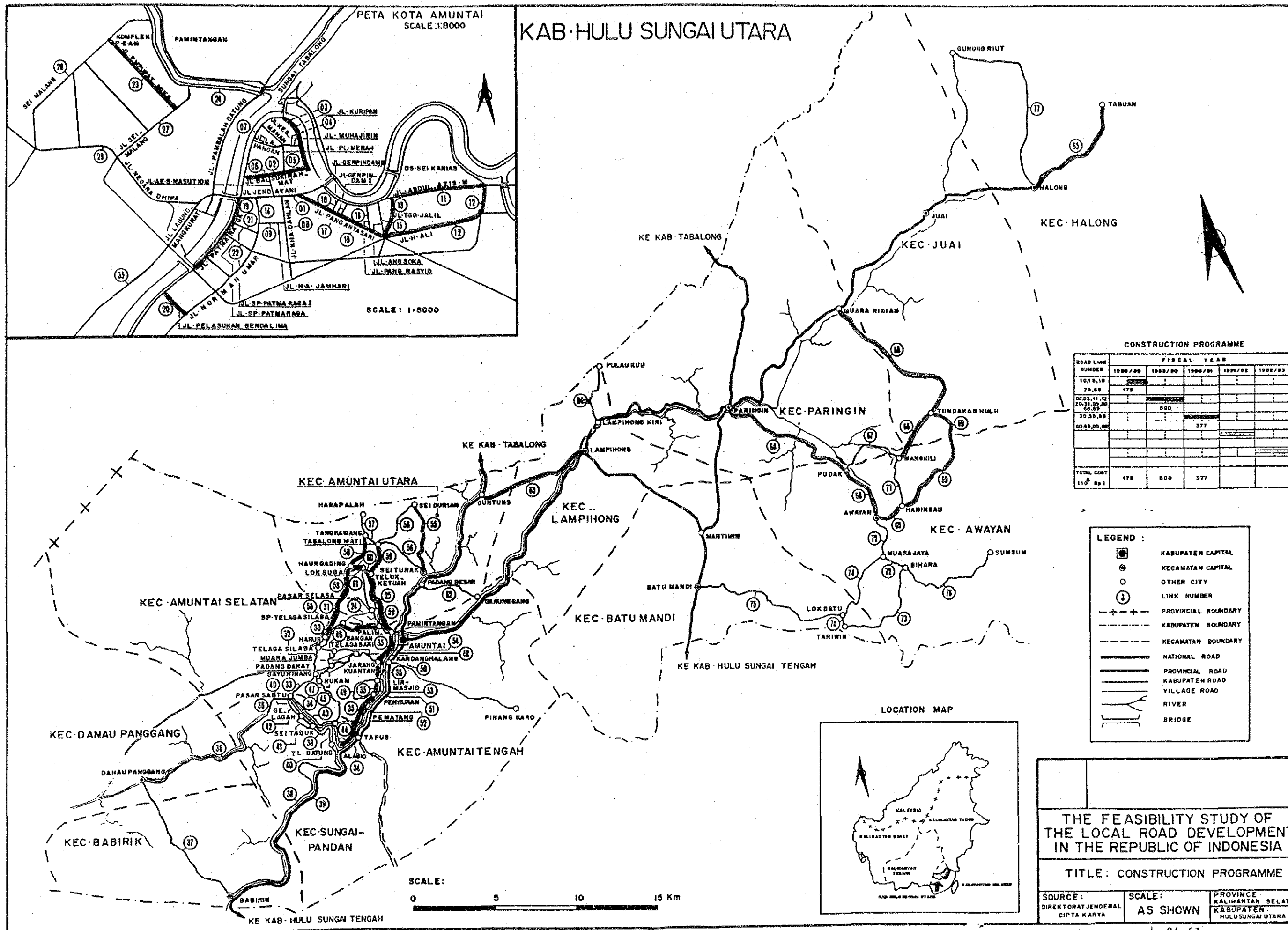
ROAD LINKS TO BE IMPROVED BY YEAR

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI UTARA

YEAR	LINK NO	() : rate
1988	: 10, 13, 19, 23, 68	
1989	: 2, 3, 11, 12, 20, 31, 35, 59, 66, 69 (50%)	
1990	: 30, 55, 58, 60, 63, 65, 69 (50%)	
1991	:	
1992	:	



KAB. HULU SUNGAI UTARA



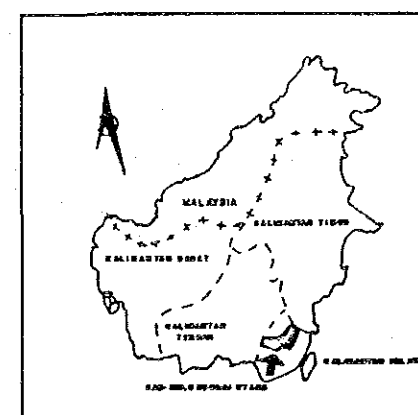
CONSTRUCTION PROGRAMME

ROAD LINE NUMBER	FISCAL YEAR				
	1988/89	1989/90	1990/91	1991/92	1992/93
10,18,19					
29,68	178				
32,35,11,12					
20,31,32,33		500			
30,35,68					
60,63,66,69			377		
TOTAL COST (10 ⁸ Rp)	178	500	377		

LEGEND :

- KABUPATEN CAPITAL
- KECAMATAN CAPITAL
- OTHER CITY
- LINK NUMBER
- PROVINCIAL BOUNDARY
- KABUPATEN BOUNDARY
- KECAMATAN BOUNDARY
- NATIONAL ROAD
- PROVINCIAL ROAD
- KABUPATEN ROAD
- VILLAGE ROAD
- RIVER
- BRIDGE

LOCATION MAP



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 UTARA

(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 UTARA

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SD (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TN NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
1	1	50.0	30.0	20.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
2	1	45.0	30.0	25.0	0.0	0	1	0	0	0.00	0	0.00	0	346	95	441
3	1	50.0	30.0	20.0	0.0	0	1	0	0	0.00	0	0.00	0	346	95	441
4	1	0.0	75.0	25.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
5	1	60.0	10.0	30.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
6	1	80.0	20.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
7	1	60.0	20.0	20.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
8	1	40.0	10.0	30.0	20.0	1	0	0	0	0.00	0	0.00	0	536	145	681
9	1	60.0	20.0	20.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
10	1	0.0	40.0	50.0	10.0	1	0	0	0	0.00	0	0.00	0	536	145	681
11	1	0.0	70.0	25.0	5.0	1	0	0	0	0.00	0	0.00	0	536	145	681
12	1	0.0	50.0	50.0	0.0	1	0	0	2	24.00	0	0.00	238	716	203	919
13	1	0.0	30.0	70.0	0.0	0	1	0	0	0.00	0	0.00	0	346	95	441
15	1	60.0	30.0	10.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
16	1	60.0	30.0	10.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
19	2	0.0	5.5	94.5	0.0	2	0	0	0	0.00	0	0.00	0	1,071	290	1,361
20	1	0.0	60.0	40.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
22	1	0.0	50.0	50.0	0.0	1	0	0	0	0.00	0	0.00	0	536	145	681
23	2	0.0	70.0	20.0	10.0	2	0	0	0	0.00	0	0.00	0	1,071	290	1,361
24	3	0.0	26.7	70.0	3.3	0	3	0	2	31.50	0	0.00	313	1,274	362	1,636
25	2	0.0	74.5	25.5	0.0	0	2	0	0	0.00	0	0.00	0	692	191	883
28	1	0.0	15.0	80.0	5.0	0	1	0	0	0.00	0	0.00	0	346	95	441
31	2	0.0	60.0	32.5	7.5	0	0	2	2	28.00	0	0.00	278	707	158	865

Table 6-1-5 (2)

ROAD LINKS TO BE MAINTAINED

PROV : KALIMANTAN SELATAN

KAB : HULU SUNGAI UTARA

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SD (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TN NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
32	2	0.0	65.0	35.0	0.0	0	2	0	1	14.00	0	0.00	139	797	225	1,022
35	7	0.0	44.3	49.3	6.4	7	0	0	2	35.00	0	0.00	347	4,012	1,100	5,112
40	3	0.0	34.0	65.7	0.3	0	3	0	0	0.00	0	0.00	0	1,038	286	1,324
41	1	25.0	75.0	0.0	0.0	0	1	0	0	0.00	0	0.00	0	346	95	441
48	4	0.0	27.5	67.5	5.0	0	0	4	8	147.00	0	0.00	1,459	2,096	530	2,634
55	4	0.0	22.5	72.5	5.0	4	0	0	6	112.00	0	0.00	1,112	2,982	852	3,834
59	8	0.0	33.1	66.9	0.0	0	0	8	1	14.00	0	0.00	139	2,094	395	2,489
60	2	0.0	72.5	27.5	0.0	0	0	2	1	84.00	0	0.00	834	1,127	295	1,422
63	8	3.8	47.5	47.5	1.3	0	8	0	5	238.00	0	0.00	2,362	4,552	1,341	5,893
68	12	0.0	57.5	42.3	0.3	0	1	11	7	301.00	0	0.00	2,988	5,337	1,324	6,661
69	8	0.0	17.5	82.4	0.1	0	0	8	15	329.00	0	0.00	3,266	4,455	1,161	5,616
72	5	0.0	54.0	46.0	0.0	0	5	0	6	112.00	0	0.00	1,112	2,569	749	3,318
73	7	0.0	65.0	35.0	0.0	0	7	0	3	66.50	0	0.00	660	2,920	829	3,749
74	7	5.7	52.9	30.0	11.4	7	0	0	10	203.00	0	0.00	2,015	5,271	1,508	6,779
75	11	0.0	60.9	37.3	1.8	11	0	0	5	56.00	0	0.00	556	6,312	1,731	8,043
76	12	0.0	65.0	34.5	0.5	0	12	0	4	171.50	0	0.00	1,702	5,437	1,561	6,998
SUM	130					47	48	35	80	1966.50	0	0.00	19,519	65,228	17,749	82,977

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 Utara 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 1,058 x 10⁶ and maintenance cost is Rp 212 x 10⁶ which is approximately 17% of the total expenditure.

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

PROV : KALIMANTAN SELATAN KAB : HULU SUNGAI UTARA

(UNIT : 1000Rp)

ITEM	< 1988 >	< 1989 >	< 1990 >	< 1991 >	< 1992 >	< TOTAL >	
LOCAL CURRENCY :	103,984	299,384	251,050	0	0	656,418	(62.0%)
Ownership Cost	1,286	3,813	3,683	0	0	8,782	(1.3%)
Operation Cost	49,318	149,810	143,598	0	0	342,726	(52.2%)
Material Cost	26,790	59,961	28,392	0	0	115,143	(17.5%)
Labour Cost	14,766	46,750	42,631	0	0	104,147	(15.9%)
Contingency	13,824	39,050	32,746	0	0	85,620	(13.0%)
FOREIGN CURRENCY :	72,528	202,033	127,113	0	0	401,674	(38.0%)
Ownership Cost	26,393	78,720	74,938	0	0	180,051	(44.8%)
Operation Cost	3,550	10,605	10,395	0	0	24,550	(6.1%)
Material Cost	33,125	86,356	25,200	0	0	144,681	(36.0%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	9,460	26,352	16,580	0	0	52,392	(13.0%)
TOTAL COST :	178,512	501,417	378,163	0	0	1,058,092	
Ownership Cost	27,679	82,533	78,621	0	0	188,833	(17.8%)
Operation Cost	52,868	160,415	153,993	0	0	367,276	(34.7%)
Material Cost	59,915	146,317	53,592	0	0	259,824	(24.6%)
Labour Cost	14,766	46,750	42,631	0	0	104,147	(9.8%)
Contingency	23,284	65,402	49,326	0	0	138,012	(13.0%)

< Contingency : 15% >

Table 6-1-6 (2)

CONSTRUCTION AND MAINTENANCE COST
(MAINTENANCE)

PROV : KALIMANTAN SELATAN

KAB : HULU SUNGAI UTARA

(UNIT : 1000Rp)

I T E M		< 1988 >	< 1989 >	< 1990 >	< 1991 >	< 1992 >	< TOTAL >
LOCAL CURRENCY :		30,502	62,609	73,187	0	0	166,298 (78.3%)
Ownership Cost		285	611	739	0	0	1,635 (1.0%)
Operation Cost		13,783	28,031	32,265	0	0	74,079 (44.5%)
Material Cost		1,712	3,631	4,021	0	0	9,364 (5.6%)
Labour Cost		14,722	30,336	36,162	0	0	81,220 (48.8%)
FOREIGN CURRENCY :		8,334	17,389	20,383	0	0	46,106 (21.7%)
Ownership Cost		6,464	13,261	15,253	0	0	34,978 (75.9%)
Operation Cost		692	1,421	1,661	0	0	3,774 (8.2%)
Material Cost		1,178	2,707	3,469	0	0	7,354 (16.0%)
Labour Cost		0	0	0	0	0	0 (0.0%)
TOTAL COST :		38,836	79,998	93,570	0	0	212,404
Ownership Cost		6,749	13,872	15,992	0	0	36,613 (17.2%)
Operation Cost		14,475	29,452	33,926	0	0	77,853 (36.7%)
Material Cost		2,890	6,338	7,490	0	0	16,718 (7.9%)
Labour Cost		14,722	30,336	36,162	0	0	81,220 (38.2%)

Table 6-1-6 (3)

CONSTRUCTION AND MAINTENANCE COST
(TOTAL)

PROV : KALIMANTAN SELATAN

KAB : HULU SUNGAI UTARA

(UNIT : 1000Rp)

ITEM	< 1988 >	< 1989 >	< 1990 >	< 1991 >	< 1992 >	< TOTAL >	
LOCAL CURRENCY :	136,486	361,993	324,237	0	0	822,716	(64.8%)
Ownership Cost	1,571	4,424	4,422	0	0	10,417	(1.3%)
Operation Cost	63,101	177,841	175,863	0	0	416,805	(50.7%)
Material Cost	28,502	63,592	32,413	0	0	124,507	(15.1%)
Labour Cost	29,488	77,086	78,793	0	0	185,367	(22.5%)
Contingency	13,024	39,050	32,746	0	0	85,620	(10.4%)
FOREIGN CURRENCY :	80,862	219,422	147,496	0	0	447,780	(35.2%)
Ownership Cost	32,857	91,981	90,191	0	0	215,029	(48.0%)
Operation Cost	4,242	12,026	12,056	0	0	28,324	(6.3%)
Material Cost	34,303	89,063	28,669	0	0	152,035	(34.0%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	9,460	26,352	16,580	0	0	52,392	(11.7%)
TOTAL COST :	217,348	581,415	471,733	0	0	1,270,496	
Ownership Cost	34,428	96,405	94,613	0	0	225,446	(17.7%)
Operation Cost	67,343	189,867	187,919	0	0	445,129	(35.0%)
Material Cost	62,805	152,655	61,082	0	0	276,542	(21.8%)
Labour Cost	29,488	77,086	78,793	0	0	185,367	(14.6%)
Contingency	23,284	65,402	49,326	0	0	138,012	(10.9%)

< 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 Utara 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 Crane 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 the depreciated value.

This comes about because full depreciation 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 UTARA

EQUIPMENT NAME	WORKABLE	EXISTING	< 1988 >	< 1989 >	< 1990 >	< 1991 >	< 1992 >
Bulldozer/Ripper	200	0	0.16	0.49	0.41	0.00	0.00
Swamp Bulldozer	200	0	0.00	0.23	0.42	0.00	0.00
Motor Grader	220	0	0.48	1.01	0.90	0.00	0.00
Hand-guide Vib. Roller	220	0	0.10	0.30	0.23	0.00	0.00
Tire Roller	200	0	0.45	1.05	0.34	0.00	0.00
Vibratory Roller (D&T)	220	0	0.38	0.94	1.02	0.00	0.00
Hydraulic Excavator; Wheel	200	0	0.00	1.62	2.35	0.00	0.00
Wheel Loader	220	0	0.61	1.65	1.58	0.00	0.00
Water Tank Truck	220	0	0.25	0.60	0.68	0.00	0.00
Dump Truck	220	0	4.57	13.49	13.73	0.00	0.00
Flat Bed Truck with Crane	220	0	0.00	0.05	0.06	0.00	0.00
Flat Bed Truck	220	0	0.49	1.18	0.41	0.00	0.00
Portable Crusher/Screening	220	0	0.15	0.32	0.19	0.00	0.00
Concrete Mixer	200	0	0.00	0.05	0.06	0.00	0.00
Water Pump	200	0	0.00	0.04	0.04	0.00	0.00
Concrete Vibrator	200	0	0.00	0.00	0.01	0.00	0.00
Asphalt Sprayer	200	0	0.45	1.05	0.34	0.00	0.00

NOTE WORKABLE : workable days in a year

EXISTING : number of existing equipment

Table 6-1-8

EQUIPMENT PURCHASE COST

PROV : KALIMANTAN SELATAN

KAB : HULU SUNGAI UTARA

(1000 Rp)

EQUIPMENT NAME	CLASS	CIF (JAKARTA)	PURCHASE NO.	PURCHASE COST
Bulldozer	90 HP	49,150	-	-
Bulldozer/Ripper	90 HP	53,000	-	-
Swamp Bulldozer	90 HP	52,850	1	52,850
Swamp Bulldozer	65 HP	40,500	-	-
Motor Grader	75 HP	47,800	1	47,800
Road Stabilizer	N=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	1	41,100
Wheel Loader	1.2 m3	70,200	2	140,400
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	14	205,800
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	-	-
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 847,610

OWNERSHIP COST (FOREIGN) 215,029

EQUIPMENT COST SUPPLEMENTED 632,581

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 UTARA

ITEM	UNIT	< 1988 >	< 1989 >	< 1990 >	< 1991 >	< 1992 >	< TOTAL >
Site Clearance in Light Bush	m2	0.00	2000.00	0.00	0.00	0.00	2000.00
Subgrade Preparation	m2	66000.00	90480.00	110700.00	0.00	0.00	267180.00
Normal Fill	m3	0.00	0.00	0.00	0.00	0.00	0.00
Fill in Swamp	m3	0.00	8720.00	15075.00	0.00	0.00	23295.00
Normal Excavation to Spoil	m3	1272.00	6827.00	6864.00	0.00	0.00	14963.00
Sub Base Course	m3	6517.20	13116.00	12689.00	0.00	0.00	32322.20
Base Course	m3	3640.00	7080.00	5520.00	0.00	0.00	16240.00
Shoulder	m2	36000.00	95500.00	76500.00	0.00	0.00	208000.00
Asphalt Patching	m2	803.00	1414.00	725.00	0.00	0.00	2942.00
Surface Dressing (Single)	m2	64000.00	60000.00	48000.00	0.00	0.00	172000.00
Surface Dressing (Double)	m2	0.00	67500.00	0.00	0.00	0.00	67500.00
Earth Drain	m	0.00	0.00	400.00	0.00	0.00	400.00
Earth Drain in Swamp (by machine)	m3	0.00	25800.00	37500.00	0.00	0.00	63300.00
Pipe Culvert 80x80cm	m	0.00	0.00	0.00	0.00	0.00	0.00
Masonry Culvert (80x80cm)	m	0.00	0.00	5.00	0.00	0.00	5.00
Retaining Wall and Wing Wall (Timber)	m2	0.00	0.00	50.00	0.00	0.00	50.00
Retaining Wall and Wing Wall (Masonry)	m3	0.00	100.00	100.00	0.00	0.00	200.00
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	0.00	0.00	0.00	0.00
Superstructure (Timber; Span 8m; 10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber; Span 3m; BH50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber; Span 5m; BH50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber; Span 8m; BH50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete; Span 3m; BH50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete; Span 5m; BH50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete; Span 8m; BH50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete; Span 10m; BH50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete; Span 15m; BH50)	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	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier; for Timber; BH50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut; for Timber; BH50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier; for Concrete; BH50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut; for Concrete; BH50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Timber->Timber)	m2	0.00	0.00	0.00	0.00	0.00	0.00
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	60.50	117.00	136.00	0.00	0.00	313.50
Routine maintenance of earth road	Km	14.75	17.00	11.00	0.00	0.00	42.75
Routine maintenance of gravel road	Km	23.50	47.00	53.00	0.00	0.00	123.50
Routine maintenance of asphalt road	Km	22.25	53.00	72.00	0.00	0.00	147.25
Maintenance of Timber Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	908.00	1833.75	1809.00	0.00	0.00	4550.75
Maintenance of Concrete Bridge (Exist)	m2	0.00	0.00	0.00	0.00	0.00	0.00

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.

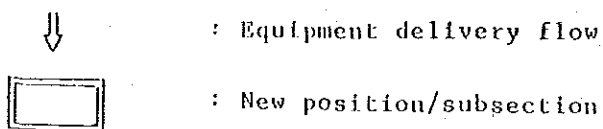
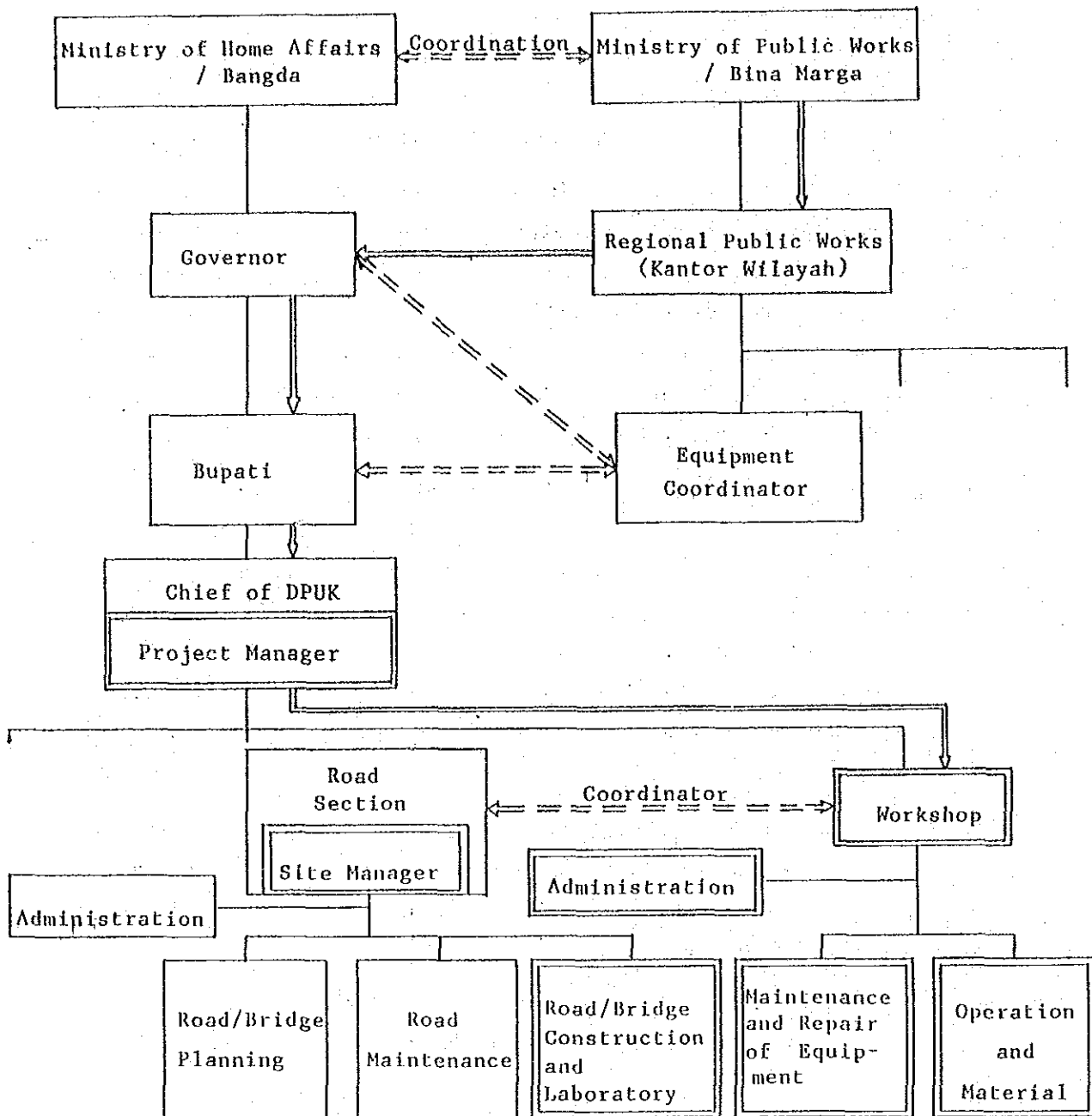
The sub-section of laboratory would be under the relevant Road Section. The proposed organization is shown in Fig. 6-2-1.

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