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 14

KABUPATEN KUTAI

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 Kutai in Kalimantan Timur 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.

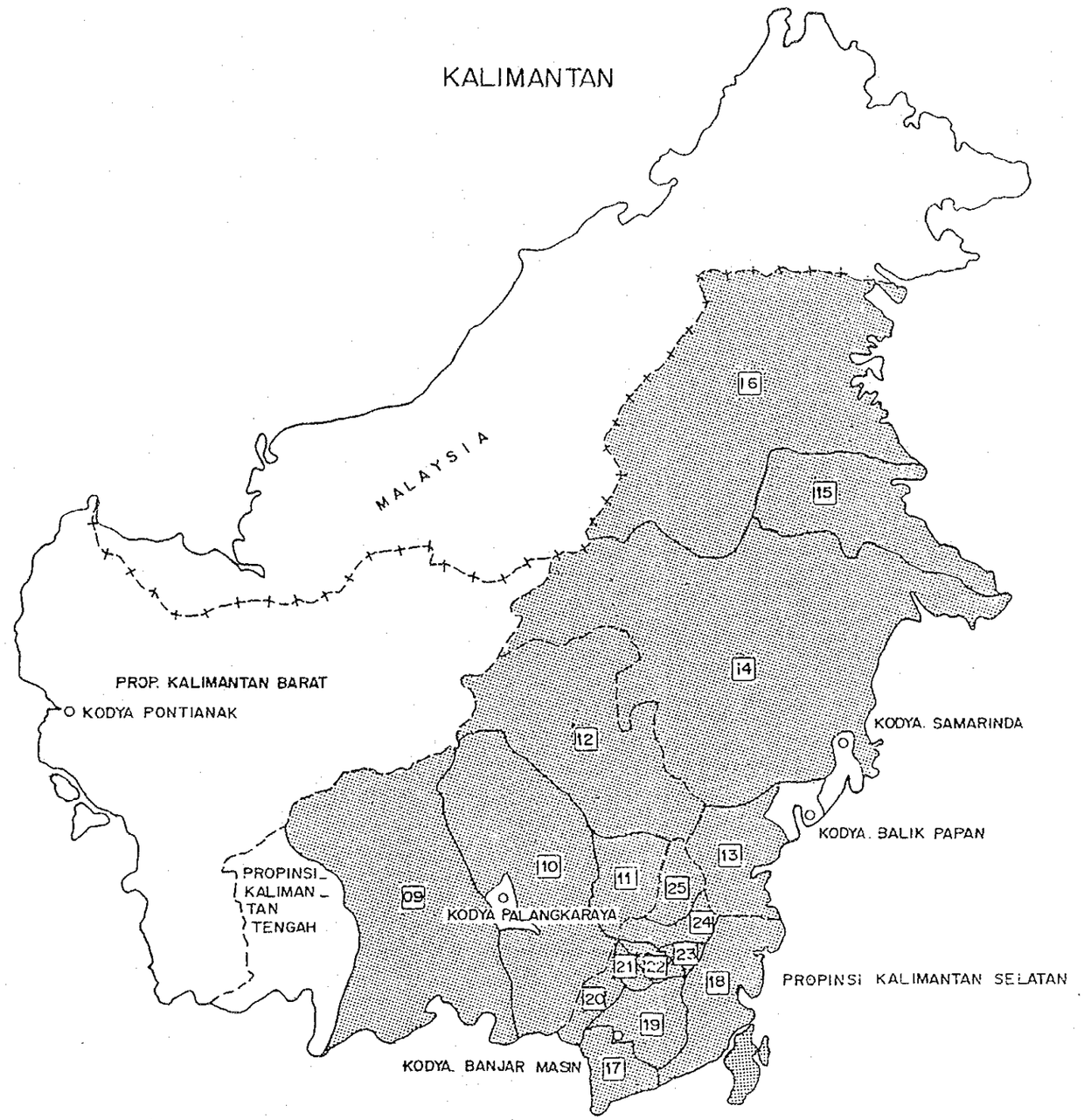
The purpose of the study for the Kabupaten is mainly to estimate the total Project Cost for the local road development but only limited data is available for study base. Therefore a detailed survey and design for the improvement of the Kabupaten roads should be carried out before commencing the Project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

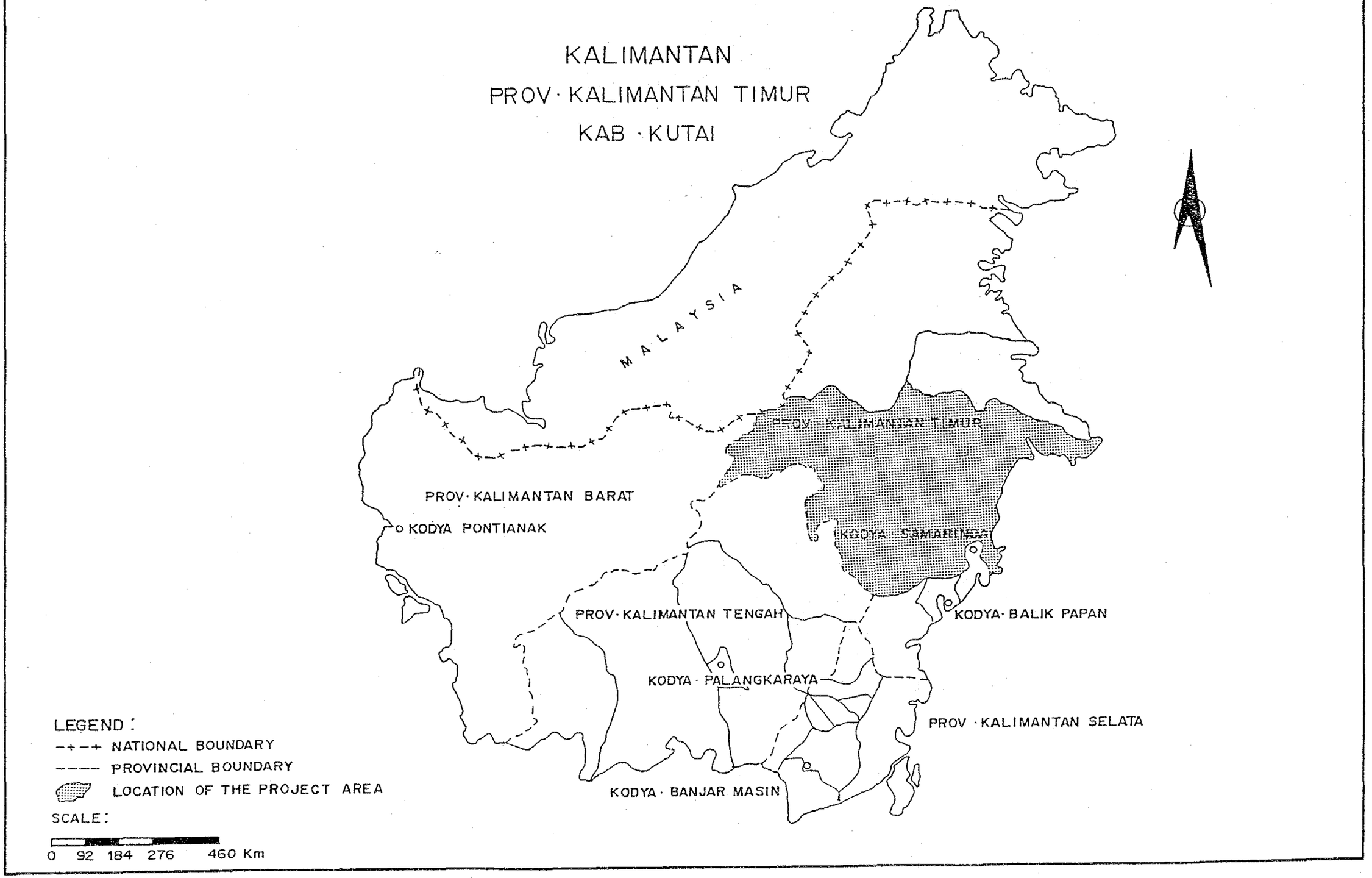
V · PROPINSI KALIMANTAN TIMUR
13 · KAB·PASIR
14 · KAB·KUTAI
15 · KAB·BERAU
16 · KAB·BULUNGAN

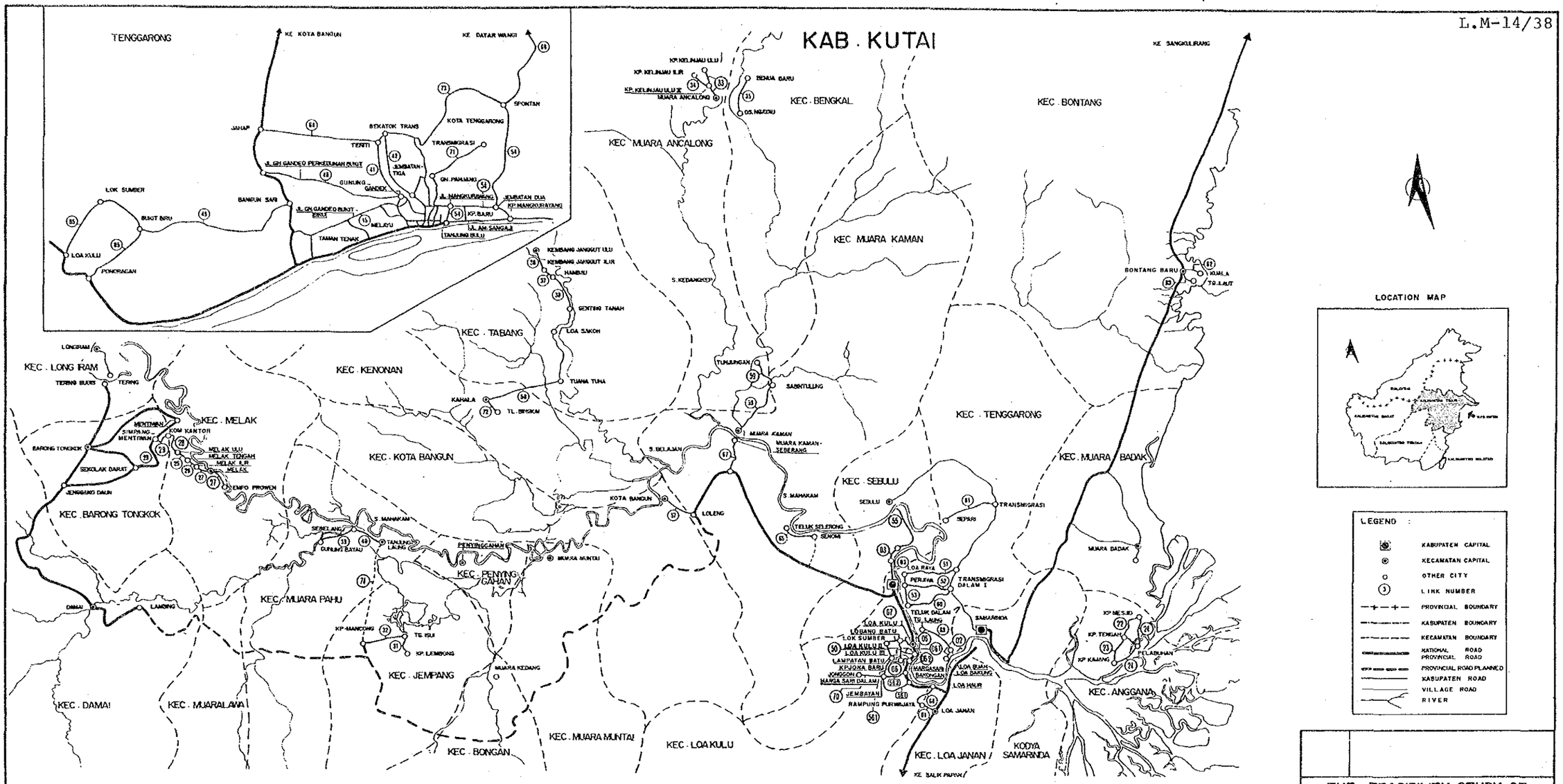
VI · PROPINSI KALIMANTAN SELATAN
17 · KAB·TANAH LAUT
18 · KAB·KOTA BARU
19 · KAB·BANJAR
20 · KAB·BARITO KUALA
21 · KAB·TAPIN
22 · KAB·HULU SUNGAI SELATAN
23 · KAB·HULU SUNGAI TENGAH
24 · KAB·HULU SUNGAI UTARA
25 : KAB·TABALONG



LEGEND :
−+−+ NATIONAL BOUNDARY
– – – – PROVINCIAL BOUNDARY
LOCATION OF THE PROPOSED AREA

SCALE :
0 92 184 276 460 Km.


KALIMANTAN
PROV · KALIMANTAN TIMUR
KAB · KUTAI
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



LOCATION MAP

LEGEND :

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

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

TITLE :

SOURCE:	SCALE:	PROVINCE: KALIMANTAN TIMUR
DIREKTORAT JENDERAL AGRARIA	AS SHOWN	KABUPATEN: KUTAI

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 Kutai has a vast area almost covering the whole Mahakam basin. It is bordered on the southeast by Samarinda city, the capital of Kalimantan Timur Province, and on the northwest partially by Serawak Province of the Republic of Malaysia.

The Mahakam River rising in the northwest around the national boundary with Malaysia, flows towards the southeast crossing almost in the senter of the Kabupaten. It flows through several into the Makassar Strait on the southeast of the Kabupaten. Two main branches of the Mahakam River, namely the Kadangkepala and Belayan Rivers, which flow from the northernmost part of the Kabupaten towards the south, meet the Mahakam River in the centre of the Kabupaten dividing it into three areas. Flat areas in the centre of the Kabupaten are limited to the coastal area facing the Makassar Strait and to a few areas along the Mahakam River. The remaining vast areas are mostly undulating hills or mountains covered with typical tropical forests. In the centre of the Kabupaten three lakes lie along the Mahakam River namely Senayan, Melintang and Jempang, south of which the land is considered to be suitable for cultivation.

The Kabupaten has an area of 91,000 square kilometers, approximately 45 percent of the total of Kalimantan Timur Province. It is the largest of all the Kabupatens in the Study. It consists administratively of 30 Kecamatans.

1.1.2 Meteorological Conditions

The average number of rainy days and the average amount of yearly rainfall in Kabupaten Kutai are 129 days and 2,136 mm respectively.

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

The number of working days per year, which is necessary for planning the construction schedule in chapter 6, is estimated at 240 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 Timur
KABUPATEN : Kutai STATION : Melak

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					11	201				
February					16	295				
March					16	215				
April					10	190				
May					6	125				
June					4	95				
July					7	175				
August					8	120				
September					11	185				
October					8	120				
November					17	225				
December					15	190				
Total	-	-	-	-	129	2,136	-	-	-	-

1.2 Socio-Economic Conditions

1.2.1 Population

The population of Kabupaten Kutai in 1983 was 440,129 which was approximately 30.6 % of the 1,438,700 total population of Kalimantan Timur Province as shown in Table 1-2-1.

The population density was 0.05 persons per ha which was lower than the provincial density of 0.07 and indicates the underpopulation of the Kabupaten because it is a vast area in a remote region.

The recent annual average growth rate of population of the Kabupaten is 6.3 % which is higher than both the provincial rate of 5.7 % and the national rate of 2.2 %. This may be a result of the on-going transmigration programme.

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:					
PASIR	94,620	4.5	2,004,000	0.05	1984
KUTAI	440,129	6.3	9,102,700	0.05	1983
BERAU	48,900	4.3	3,270,000	0.01	1984
BULUNGAN	198,570	5.0	6,400,000	0.03	1984
PROVINCE:					
KALIMANTAN TIMUR	1,362,800		20,244,000		1982
	1,438,700	5.7	20,244,000	0.07	1983
	1,518,800		20,244,000		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 : 1983

PROVINCE : KALIMANTAN TIMUR

KABUPATEN : KUTAI

KECAMATAN	POPULATION	PROPORTION (%)
DAMAI	8,900	2.0
BENTIAN BESAR	2,560	0.6
MUARA LAWA	3,308	0.8
BARONG TONGKOK	15,828	3.6
MELAK	12,915	2.9
MUARA PAHU	11,724	2.7
JEMPANG	7,197	1.6
PENYINGGAHAN	3,428	0.8
BONGAN	4,811	1.1
MUARA MUNTAI	12,093	2.7
LOA KULU	17,333	3.9
LOA JANAN	30,257	6.9
ANGGANA	22,532	5.1
MUARA BADAK	22,932	5.2
TENGGARONG	57,840	13.1
SEBULU	18,030	4.1
KOTA BANGUN	17,461	4.0
KENOHAN	8,298	1.9
KEMBANG JANGGUT	8,378	1.9
MUARA ANCALONG	13,636	3.1
MUARA BENGKAL	10,062	2.3
MUARA KAMAN	13,383	3.0
BONTANG	53,478	12.2
SANGKULIRANG	19,173	4.4
MUARA WAHAU	9,174	2.1
TABANG	6,130	1.4
LONG IRAM	18,312	4.2
LONG BANGUN	4,883	1.1
LONG PAHANGAI	4,012	0.9
LONG APARI	2,061	0.5
TOTAL	440,129	100

1.2.2 Land Use

In Kabupaten Kutai, 216,700 ha of the current available land use area, which is approximately 2.4% of the 9,102,700 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 146,400 ha of agricultural harvest area, 25,000 ha of residential area and 45,300 ha of usable open space which are 67.6%, 11.5% and 20.9% of the current available land use area respectively.

The agricultural harvest area consists of 52,400 ha of paddy field and 94,000 ha of other cultivated area which are 35.8% and 64.2% 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 TIMUR

(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
PASIR	7,881 (0.4)	19,666 (1.0)	-	21,557 (1.1)	3,204 (0.2)	-	32,685 (1.6)	1,038,033 (51.8)	880,974 (44.0)	2,004,000 (100)	1984
KUTAI	52,400 (0.6)		94,000 (1.0)	-	25,000 (0.3)	45,300 (0.5)	34,500 (0.4)	8,831,500 (97.0)	20,000 (0.2)	9,102,700 (100)	1982
BERAU	–	–	–	–	–	–	–	–	–	–	–
BULUNGAN	7,203 (0.1)	13,494 (0.2)	6,492 (0.1)	2,785 (0.04)	2,792 (0.04)	-	-	6,732,000 (99.5)	225 (0.003)	6,765,000 (100)	1982

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 Kutai in 1982 was 68,838 ha and 162,421 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 were 56,960 ha and 138,511 ton respectively which are 82.7% and 85.3% of the total food crops. The yield rate of paddy production is 2.43 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 1982 were 14.0% and 14.0% respectively which show a favorable development of paddy production. The paddy production of the Kabupaten is characterized by the production of upland paddy being more than that of wet paddy, forming respectively approximately 70% and 30% of the total productions. It is desirable that the productivity of paddy becomes higher and this depends upon the expansion of wet paddy field through the development of irrigation together with river improvement.

The population of the agricultural sector which is assumed from the employment in the Kabupaten is 81.4% of the total population as shown in Table 1-2-6. Thus it is an agricultural Kabupaten.

Future agricultural development will be needed by promoting more intensive productivity through improvement of the irrigation system in parallel with development of the cultivated area for agriculture together with the implimentation of a transmigration programme.

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

KABUPATEN : KUTAI

CULTIVATED AREA

(ha)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	38,680	-	-	56,960	-	-	
OTHERS	7,278	-	-	11,878	-	-	
TOTAL	45,958	-	-	68,838	-	-	

PRODUCTION

(ton)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	57,353	-	-	138,511	-	-	
OTHERS	38,680	-	-	56,960	-	-	
TOTAL	86,535	-	-	162,421	-	-	

YIELD RATE

(ton/ha)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	1.48	-	-	2.43	-	-	

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 TIMUR

KABUPATEN	AREA (ha)	PRODUCTION (ton)	AAGR (%) AREA	AAGR (%) PRODUCTION
PASIR	10,021	4,645	0.7	0
KUTAI	-	-	-	-
BERAU	6,814	3,771	17.5	28.7
BULUNGAN	2,954	465	17.0	9.5

Table 1-2-6 POPULATION OF AGRICULTURAL SECTOR

PROVINCE : KALIMANTAN TIMUR

KABUPATEN	AGRICULTURAL SECTOR	TOTAL POPULATION	PROPORTION (%)	AAGR (%)	SURVEY YEAR
PASIR	83,000	94,620	87.6	4.5	1984
KUTAI	358,000	440,129	81.4	6.0	1982
BERAU	37,000	48,900	76.1	5.4	1984
BULUNGAN	149,000	198,570	75.2	5.5	1984

Notes :

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

1.2.4 Other Economic Activities

From the national point of view there are two kinds of very important industrial activities in Kabupaten Kutai. They are oil and its related industries and the timber industry. However of the total employed population of Kabupaten Kutai only less than 0.2% are engaged in the above industrial activities, therefore these industrial activities do not influence the whole of the industrial activities in the Kabupaten.

The agricultural and forest sectors employ about 81.5% of the total workforce while the tertiary industries such as commercial and transportation services relating to the oil and timber industries employ about 17.8% and are managed by outside investors.

(1982)

Item	Workforce	Share(%)	Sector Share(%)
Agriculture	74,430	81.39	
Livestock	-	-	81.39
Fishery	-	-	
Industry	148	0.16	
Mining	121	0.13	0.29
Commerce	6,717	7.34	
Service	10,048	10.98	18.32
Total	91,464	100	

The existing transportation system in Kabupaten Kutai mainly relies upon river transportation. However progress of the land transportation system is being watched with keen interest for its influence on industrial activities.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

It is a characteristic of Kabupaten Kutai that the majority of the existing transportation is by river, i.e. Mahakam river as the main thoroughfare and its tributaries. 80% of transportation in the Kabupaten is by boats on the rivers.

There are three national roads in the Kabupaten. The first one is north from Samarinda to Sangkulirang via Bontang along the coastline. The second one is from Sangkulirang to Ma.Wahu and the third from Samarinda to Balikpapan. Some sections of the first and second roads are under construction and will be completed within 1984/1985. They have the characteristics of industrial development roads, mainly for oil, and of roads to transmigration and agricultural developing areas.

The Provincial roads consist of a road leaving the national road south of Samarinda and running to Tering Bugis of Kecamatan Long Iram and the road networks near Barong Tongkok. According to DPUP information a section of the provincial road, between Loleng south of Kota Bangun and Lambing of Kecamatan Damai, is planned to be completed within PELITA IV.

After this provincial road is completed, a transportation system alternative to the river network connecting east and west of the Kabupaten will be available to provide a choice for economical transportation.

Furthermore after the Mahakam river bridge construction is completed in 1986, roads on both sides of Mahakam river will be connected with each other and the effect on the overland transportation system will become clear.

The existing road network in Melak district, at the upper part of Mahakam river, which serves the Desas in the district, has no transportation system to connect with other districts except for river transportation.

Since the trunk roads (national and provincial) have not been improved, networks of the Kabupaten roads have not been developed

in general except for the Tenggarong district. These road networks are isolated and only serve local areas. They are connected with other networks only by river transportation. The isolated road networks mentioned above are as follows:

- Three links in Kecamatan Anggana near the mouth of Mahakam river
- Links along Kedang Keple river in Muara Ancalong district of central Kabupaten
- Links along Belajan river in Kecamatan Tabang
- Links in Kecamatan Muara Pahu
- Links in Kecamatan Jempang south of Jempang Lake
- Links near Muara Kaman

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 Kutai are confirmed as 73 links and 384 Km respectively. These figures exclude Kabupaten roads with no data are not included.

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 0.04 m per ha. This is distinctly lower than the national density of 0.48 m per ha and far 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 lags behind greatly in density of Kabupaten roads.

	Total Length (km)	Area (ha)	Density (m/ha)
Kabupaten : Kutai	384	9,102,700	0.04
Province : Kalimantan Timur	1,340	20,776,700	0.06
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 : KALIMANTAN TIMUR KAB : KUTAI

(Km)

NO	ITEM	IMP	ASP	DIR	KRK	L.L	TOTAL
1	LINK	2					2
2	LINK	1	3	1		1	5
3	LINK	4	3	3		1	10
4	LINK			4		1	4
5	LINK	5					5
6	LINK	1					1
7	LINK		1	1		1	1
8	LINK	1	1	7		1	9
9	LINK			3			3
10	LINK	1		1		1	1
11	LINK		1		3	1	3
12	LINK	4				1	4
13	LINK	2		1		1	2
14	LINK	2		1		1	2
15	LINK	4		1		1	4
16	LINK	1		1		1	1
17	LINK	3		1		1	3
18	LINK	4		1		1	4
19	LINK	2		1		1	3
20	LINK	2		1		1	2
21	LINK		1	1	3	1	4
22	LINK	3		1		1	3
23	LINK	1	1	1		1	1
24	LINK	3	3	1		1	6
25	LINK			1			1
26	LINK		1	1		1	1
27	LINK	4	1	3		1	7
28	LINK		1	1	1	1	2
29	LINK		1	1		1	1
30	LINK	1	1	10		2	13
31	LINK	3		1		1	3
32	LINK	1	1	1	7	1	8
33	LINK	3	1	1	1	1	4
34	LINK	4	1	1		1	4
35	LINK	7	1	1		1	7
36	LINK	4	1	1		1	4
37	LINK	2	1	1		1	2
38	LINK	6	1	1		1	6
39	LINK	6	1	1		1	6
40	LINK	6	1	1		1	6
41	LINK	2	1	1		1	3
42	LINK		1	3		1	3
43	LINK	1	1	1		1	1
44	LINK	1	1	1		1	1
45	LINK	1	1	1		1	1
46	LINK	1	1	1		1	1
47	LINK	1	1	1		1	1
48	LINK	1	1	5		1	6
49	LINK	1	1	8		1	8
50	LINK	1	1	5	1	1	6
51	LINK	1	1	10		1	10
52	LINK	1	1	8		1	8
53	LINK	1	1	3		1	3
54	LINK	1	1	5		1	5
55	LINK	1	1	14		1	14
56	LINK	16	1	1		3	19
57	LINK	1	1	2		1	3
58	LINK	6	1	1	6	1	15
59	LINK	6	1	5	4	1	16
60	LINK	3	1	1	2	1	6
61	LINK	1	1	10	1	2	12
62	LINK	1	1	1	1	1	2
63	LINK	3	1	1	1	1	3
64	LINK	6	1	1	1	1	6
65	LINK	6	1	1	1	1	6
66	LINK	1	1	4	1	1	6
67	LINK	2	1	1	3	1	7
68	LINK	5	1	1	3	1	9
69	LINK	3	1	5	3	1	12
70	LINK	8	2	1	4	1	14
71	LINK	2	1	1	2	1	4
72	LINK	1	1	2	1	1	2
73	LINK	1	1	11	1	1	13
TOTAL		166	21	135	45	17	394
RATIO		43	5	35	12	4	(%)

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 : Kutai	5.5	46.9	47.6
Province : Kalimantan Timur	5.8	37.5	56.7
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 lower than either that of Indonesia or of Jawa Island. The proportion of low grade roads such as earth roads and others is distinctly high. This means that the road classification as well as the road density is very 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 : Kutai	39.6	34.4	18.7	6.2
Province : Kalimantan Timur	38.1	29.7	23.2	9.0
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 TIMUR

KABUPATEN : KUTAI

(1)

NO		IMP				ASP				OTH				KRK				T.T			
NO		GA	SD	RU	RB	GA	SD	RU	RB	GA	SD	RU	RB	GA	SD	RU	RB	GA	SD	RU	RB
1	LINK	99	1																		
2	LINK	99	1			99	1			99	1										
3	LINK	50	50	1					99	99	1	1									
4	LINK									99	1										
5	LINK			99	1																
6	LINK		99	1																	
7	LINK									99	1										
8	LINK			99	1	99	1				99	1									
9	LINK										99	1									
10	LINK			1	99																
11	LINK													99	1						
12	LINK		99	1																	
13	LINK		99	1																	
14	LINK		99	1																	
15	LINK	99	1																		
16	LINK		99	1																	
17	LINK			96	4																
18	LINK		95	4																	
19	LINK	95	3	3														90	5	5	
20	LINK	95	4																		
21	LINK													97	3			10	90		
22	LINK	99	1																		
23	LINK	99	1																		
24	LINK	33	66	1					99												
25	LINK									99	1										
26	LINK																			99	1
27	LINK		83	18						90	10										
28	LINK						99	1						99	1						
29	LINK					99	1														
30	LINK			90	10						90	10							95	15	
31	LINK		65	23	12																
32	LINK	60	40											55	30	15					
33	LINK		99	1											99	1					
34	LINK	25	72	3																	
35	LINK		95	5																	
36	LINK	25	72	3																	
37	LINK		95	6																	
38	LINK		99	1																	
39	LINK		80	20																	
40	LINK		88	12																	
41	LINK		13	87		99	1														
42	LINK									25	27	48									
43	LINK																	2	44	50	4
44	LINK			1			90	10													
45	LINK			90	10																
46	LINK			90	10																
47	LINK					90	10														
48	LINK						25	75			22	78									
49	LINK									6	51	43									
50	LINK									99	1			99	1						
51	LINK									3	69	29									

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

PROVINCE : KALIMANTAN TIMUR

KABUPATEN : KUTAI

(%)

ROAD	INH				ASP				BIB				KRK				L.L			
ROAD	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB
LINK 52									3	68	29									
LINK 53										80	20									
LINK 54											70	30								
LINK 55											70	30								
LINK 56	99																99	1		
LINK 57		60	30	10						48	40	13								
LINK 58	98	3					1	99		40	50	10	98	2			10	90		
LINK 59	81	12	5	2						46	43	11	74	15	10		10	90		
LINK 60	99	1					1	99					99	1						
LINK 61											69	32					99	1		
LINK 62	99	1															99	1		
LINK 63	99	1																		
LINK 64	99	1																		
LINK 65	99	1																		
LINK 66		60	30	10						48	41	11		55	40	5				
LINK 67	95	6								40	50	10	99	1			10	90		
LINK 68	99	1					1	99					99	1						
LINK 69	83	24	10	3						46	43	11	66	19	13	2	10	90		
LINK 70	99	1					1	99					99	1						
LINK 71	50	31	15	5									99	1						
LINK 72										48	40	13								
LINK 73										82	16	2		55	40	5		90	10	
AVERAGE	42	37	17	4	35	16	7	42	27	38	29	6	74	18	7	1	34	52	14	0
LENGTH	166 Km				21 Km				135 Km				45 Km				17 Km			
(Km)	70	61	28	7	7	3	1	9	36	51	39	8	33	8	3	0	6	9	2	0

It seems that road maintenance in the Kabupaten is in relatively good condition despite the low road density and low asphalted portion.

(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 85.0% flat, 4.0% hilly, 10.0% mountainous and 1.0% swampy. There area of hills and mountains in the Kabupaten is small and road construction is anticipated to be rather 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 Kutai were 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 67 bridges with a total length of 524 m of which 62 or 92.5% are timber, and 4 or 5.9% are others. Steel bridges account for only 1 or 1.6% of the total. On the other hand, 3 bridges with a total length of 36 m are required to be newly constructed.

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

PROV : KALIMANTAN TIMUR KAB : KUTAI

(Km)

NO (3)	DT	GN	BK	RW	TOTAL
LINK 1	2				2
LINK 2	5				5
LINK 3	10				10
LINK 4	4				4
LINK 5	5				5
LINK 6	1				1
LINK 7	1				1
LINK 8	9				9
LINK 9	3				3
LINK 10	1				1
LINK 11	1	2			3
LINK 12	4				4
LINK 13	2				2
LINK 14	2				2
LINK 15	4				4
LINK 16	1				1
LINK 17	3				3
LINK 18	4				4
LINK 19	3				3
LINK 20	2				2
LINK 21	4				4
LINK 22	3				3
LINK 23	1				1
LINK 24	6				6
LINK 25	1				1
LINK 26	1				1
LINK 27	7				7
LINK 28	2				2
LINK 29	1				1
LINK 30	13				13
LINK 31	3				3
LINK 32	2	3	2	1	8
LINK 33	4				4
LINK 34	4				4
LINK 35	7				7
LINK 36	4				4
LINK 37	2				2

(Km)

NO (3)	DT	GN	BK	RW	TOTAL
LINK 38	6				6
LINK 39	6				6
LINK 40	6				6
LINK 41	3				3
LINK 42	3				3
LINK 43	1				1
LINK 44	1				1
LINK 45	1				1
LINK 46	1				1
LINK 47	1				1
LINK 48	3	3			6
LINK 49	4	4			8
LINK 50	3	3			6
LINK 51	4	6			10
LINK 52	3	5			8
LINK 53	3				3
LINK 54	1	4			5
LINK 55	7	6		1	14
LINK 56	19				19
LINK 57	3				3
LINK 58	14		1		15
LINK 59	13		3		16
LINK 60	6				6
LINK 61	7	4		1	12
LINK 62	2				2
LINK 63	3				3
LINK 64	6				6
LINK 65	6				6
LINK 66	4		2		6
LINK 67	6		1		7
LINK 68	9				9
LINK 69	9		3		12
LINK 70	14				14
LINK 71	4				4
LINK 72	2				2
LINK 73	11		2		13
TOTAL	327	40	14	3	384
RATIO	85	10	4	1	(%)

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : KALIMANTAN TIMUR KAB : KUTAI

<<<< BRIDGE >>>> (UNIT: m)

	EXISTING		NOT EXIST		TOTAL	
LINK NO	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
1	3	20.70			3	20.70
2	5	45.50	1	14.00	6	59.50
3	14	86.00			14	86.00
4	7	43.00			7	43.00
9	5	33.00			5	33.00
12	3	69.50			3	69.50
13	4	21.00			4	21.00
14	5	25.50	1	12.00	6	37.50
16	2	13.00			2	13.00
24	1	40.00			1	40.00
33	1	6.50			1	6.50
35	2	24.00			2	24.00
36	1	6.00			1	6.00
37	2	10.00			2	10.00
39	1	25.40			1	25.40
42	4	15.50			4	15.50
45	1	8.00			1	8.00
49	4	13.50			4	13.50
51	1	6.00	1	10.00	2	16.00
53	1	12.00			1	12.00
TOTAL	67	524.10	3	36.00	70	560.10

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

PROV : KALIMANTAN TIMUR KAB : KUTAI

(No)

	<<< BRIDGE >>>			
103 (18)	KY	LL	BJ	TOTAL
LINK 1	3			3
LINK 2	5			5
LINK 3	13	1		14
LINK 4	7			7
LINK 9	5			5
LINK 12	2		1	3
LINK 13	3	1		4
LINK 14	5			5
LINK 16	2			2
LINK 24	1			1
LINK 33	1			1
LINK 35	2			2
LINK 36	1	1		1
LINK 37	2			2
LINK 39	1			1
LINK 42	4			4
LINK 45	1			1
LINK 49	3	1		4
LINK 51	1			1
LINK 53	1		1	1
TOTAL	62	4	1	67
RATIO	93	6	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	47	12	1	-	1	1	-	-	-	-	62
Concrete	-	-	-	-	-	-	-	-	-	-	-
Steel	-	-	-	-	-	-	-	-	-	1	1
Others	3	-	1	-	-	-	-	-	-	-	4
Total	50	12	2	-	1	1	-	-	-	1	67

Thus, most of the existing bridges on the Kabupaten roads are timber and the majority of spanlengths is less than 3 m.

1.3.4 Traffic

Inventories of the average daily traffic (ADT) on the Kabupaten roads in Kabupaten Kutai 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 1984 are summarized as follows:

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Total Trips	221	668	719	3,520	5,120
Proportion (%)	4.31	13.03	14.02	68.64	100.00

Source : Bina Marga Inventory

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

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Proportion (%)	-	-	-	-	-

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 TIMUR KAB : KUTAI

A)	Growth Rate of Population	:	6.30 (%)
B)	Growth Rate of Cultivated Area	:	14.50 (%)
C)	Growth Rate of Rice field	:	14.00 (%)
D)	Growth Rate of Rice yield rate	:	14.00 (%)
E)	Growth Rate of GDP / capita	:	3.90 (%)
a)	Geometrical Mean (A x B)	:	10.32 (%)
b)	Geometrical Mean (C x D)	:	14.00 (%)
c)	Geometrical Mean (a x b)	:	12.15 (%)
d)	Geometrical Mean (c x E)	:	7.94 (%)
	TRAFFIC GROWTH RATE	:	7.94 (%)

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 1984
r : Traffic growth rate

The results are shown in Table 2-1-2 together with the traffic volume in 1984.

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

PROV : KALIMANTAN TIMUR KAB : KUTAI

(SPD : 1/2)

	INVENTORY (1984)					RATE	AFTER 14 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
1	1	2	8	24	23	7.9%	3	6	23	70	67	IIIB-2
2	1	3	7	24	23	7.9%	3	9	20	70	67	IIIB-2
3	1	3	12	30	31	7.9%	3	9	35	87	90	IIIB-2
4	0	2	6	24	20	7.9%	0	6	17	70	58	IIIB-2
5	12	30	6	120	108	7.9%	35	87	17	350	315	IIIB-1
6	1	6	22	90	74	7.9%	3	17	64	262	216	IIIB-1
7	0	0	0	0	0	7.9%	0	0	0	0	0	IIIC
8	0	4	15	45	42	7.9%	0	12	44	131	122	IIIB-2
9	0	3	15	38	37	7.9%	0	9	44	111	108	IIIB-2
10	2	6	10	75	56	7.9%	6	17	29	219	163	IIIB-2
11	1	7	10	75	56	7.9%	3	20	29	219	163	IIIB-2
12	0	0	0	15	8	7.9%	0	0	0	44	23	IIIC
13	0	0	0	15	8	7.9%	0	0	0	44	23	IIIC
14	0	0	0	12	6	7.9%	0	0	0	35	17	IIIC
15	0	0	0	45	23	7.9%	0	0	0	131	67	IIIB-2
16	0	0	0	45	23	7.9%	0	0	0	131	67	IIIB-2
17	0	0	0	90	45	7.9%	0	0	0	262	131	IIIB-2
18	0	0	0	45	23	7.9%	0	0	0	131	67	IIIB-2
19	3	15	10	38	47	7.9%	9	44	29	111	137	IIIB-2
20	0	0	0	30	15	7.9%	0	0	0	87	44	IIIC
21	20	40	50	113	167	7.9%	58	117	146	329	487	IIIB-1
22	5	10	5	22	31	7.9%	15	29	15	64	90	IIIB-2
23	0	0	0	22	11	7.9%	0	0	0	64	32	IIIC
24	1	10	5	22	27	7.9%	3	29	15	64	79	IIIB-2
25	2	8	4	52	40	7.9%	6	23	12	152	117	IIIB-2
26	2	7	4	22	24	7.9%	6	20	12	64	70	IIIB-2
27	2	6	4	53	39	7.9%	6	17	12	154	114	IIIB-2
28	2	10	0	52	38	7.9%	6	29	0	152	111	IIIB-2
29	2	12	4	52	44	7.9%	6	35	12	152	128	IIIB-2
30	4	15	5	38	43	7.9%	12	44	15	111	125	IIIB-2
31	0	0	15	112	71	7.9%	0	0	44	326	207	IIIB-1
32	0	0	10	75	48	7.9%	0	0	29	219	140	IIIB-2
33	0	0	0	0	0	7.9%	0	0	0	0	0	IIIC
34	0	0	0	0	0	7.9%	0	0	0	0	0	IIIC
35	0	0	0	0	0	7.9%	0	0	0	0	0	IIIC
36	2	0	0	3	4	7.9%	6	0	0	9	12	IIIC
37	0	0	2	60	32	7.9%	0	0	6	175	93	IIIB-2
38	0	0	0	90	45	7.9%	0	0	0	262	131	IIIB-2
39	0	0	0	60	30	7.9%	0	0	0	175	87	IIIB-2
40	0	0	0	60	30	7.9%	0	0	0	175	87	IIIB-2
41	2	15	20	23	49	7.9%	6	44	58	67	143	IIIB-2
42	5	35	10	75	88	7.9%	15	102	29	219	256	IIIB-1
43	20	60	30	105	163	7.9%	58	175	87	306	475	IIIB-1
44	15	50	60	113	182	7.9%	44	146	175	329	530	IIIA
45	1	12	5	15	26	7.9%	3	35	15	44	76	IIIB-2
46	0	0	10	30	25	7.9%	0	0	29	87	73	IIIB-2
47	5	35	20	75	98	7.9%	15	102	58	219	286	IIIB-1
48	1	11	15	45	50	7.9%	3	32	44	131	146	IIIB-2
49	1	25	15	75	79	7.9%	3	73	44	219	230	IIIB-1
50	2	7	15	30	39	7.9%	6	20	44	87	114	IIIB-2

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

PROV : KALIMANTAN TIMUR KAB : KUTAI

(SPD : 1/2)

	INVENTORY (1984)					RATE	AFTER 14 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
51	20	45	60	180	215	7.9%	58	131	175	525	627	IIIA
52	5	5	10	45	43	7.9%	15	15	29	131	125	IIIB-2
53	4	18	15	90	82	7.9%	12	52	44	262	239	IIIB-1
54	2	7	10	22	30	7.9%	6	20	29	64	87	IIIB-2
55	1	4	15	15	28	7.9%	3	12	44	44	82	IIIB-2
56	4	15	22	90	86	7.9%	12	44	64	262	251	IIIB-1
57	2	10	10	45	45	7.9%	6	29	29	131	131	IIIB-2
58	1	5	5	22	22	7.9%	3	15	15	64	64	IIIB-2
59	2	12	10	45	47	7.9%	6	35	29	131	137	IIIB-2
60	20	50	60	180	220	7.9%	58	146	175	525	641	IIIA
61	2	7	7	45	39	7.9%	6	20	20	131	114	IIIB-2
62	2	5	7	30	29	7.9%	6	15	20	87	85	IIIB-2
63	1	3	5	15	17	7.9%	3	9	15	44	50	IIIC
64	1	4	0	15	13	7.9%	3	12	0	44	38	IIIC
65	2	0	10	0	12	7.9%	6	0	29	0	35	IIIC
66	10	0	5	90	60	7.9%	29	0	15	262	175	IIIB-2
67	5	0	5	90	55	7.9%	15	0	15	262	160	IIIB-2
68	5	0	0	30	20	7.9%	15	0	0	87	58	IIIB-2
69	0	0	7	30	22	7.9%	0	0	20	87	64	IIIB-2
70	5	12	15	30	47	7.9%	15	35	44	87	137	IIIB-2
71	4	7	0	15	19	7.9%	12	20	0	44	55	IIIB-2
72	2	10	5	22	28	7.9%	6	29	15	64	82	IIIB-2
73	5	0	7	0	12	7.9%	15	0	20	0	35	IIIC
PERCENT	4.31	13.03	14.02	68.64			4.31	13.03	14.02	68.64		

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 TIMUR KAB : KUTAI

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
1	IIIA	ASP	230	695	748	3671	3509
2	IIIB-1	ASP	16	49	53	261	249
3	IIIA	ASP	34	103	111	545	521
4	IIIB-1	ASP	16	49	53	261	249
13	IIIB-2	KRK	4	11	12	57	56
14	IIIB-2	KRK	4	11	12	57	56
15	IIIB-2	KRK	7	21	23	114	108
16	IIIC	KRK	2	5	6	28	27
25	IIIB-1	ASP	14	42	45	221	212
26	IIIB-1	ASP	20	60	65	319	305
28	IIIB-1	ASP	23	70	75	368	352
30	IIIA	ASP	172	519	559	2743	2622
32	IIIA	ASP	113	341	367	1802	1722
39	IIIA	ASP	78	236	255	1249	1194
40	IIIA	ASP	78	236	255	1249	1194
41	IIIB-2	KRK	5	16	17	85	81
48	IIIB-2	KRK	10	30	32	156	150
50	IIIB-1	ASP	17	51	55	270	258
52	IIIB-1	ASP	14	43	46	227	217
54	IIIB-2	KRK	9	27	29	142	136
55	IIIA	ASP	63	190	205	1006	961
57	IIIA	ASP	136	410	442	2169	2073
59	IIIA	ASP	170	514	554	2718	2597
61	IIIB-1	ASP	21	64	69	341	325
64	IIIB-2	KRK	11	32	35	170	163
65	IIIA	ASP	62	187	201	988	944
67	IIIA	ASP	72	218	235	1153	1102
68	IIIB-1	ASP	29	89	96	469	449
69	IIIA	ASP	39	118	127	625	597
70	IIIB-1	ASP	25	75	81	397	380
71	IIIB-2	KRK	7	21	23	114	108
73	IIIB-1	ASP	23	70	75	369	353

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 : KUTAI

(1000Rupiah)

	LINK 1	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 13	LINK 14	LINK 15	LINK 16
	2 Km	5 Km	10 Km	4 Km	5 Km	1 Km	2 Km	2 Km	4 Km	1 Km
	IIIA	IIIB-1	IIIA	IIIB-1	IIIB-1	IIIB-1	IIIB-2	IIIB-2	IIIB-2	IIIC
YEAR	Surplus	Surplus	Surplus	Surplus	VOC	VOC	Surplus	Surplus	Surplus	Surplus
1988	0	0	0	0	0	0	0	0	0	0
1989	30638	1288	17530	822	22557	2099	369	369	1358	77
1990	36861	1551	21232	992	23939	2289	501	501	1760	83
1991	44340	1831	25614	1173	25849	2486	522	522	2199	174
1992	52994	2247	31043	1438	28037	2683	661	661	2531	181
1993	63264	2676	37034	1711	30525	2884	750	750	3103	188
1994	75526	3164	44978	2022	32800	3090	958	958	3699	254
1995	89855	3804	53448	2433	35589	3342	1112	1112	4554	264
1996	106977	4550	64047	2910	38193	3629	1392	1392	5316	334
1997	127149	5406	76478	3456	41097	3889	1627	1627	6341	407
1998	150759	6337	90848	4051	44309	4190	1982	1982	7543	479
SUM	778363	32854	462252	21008	322895	30581	9874	9874	38404	2441
COST	410097	-1642	208554	-4143	167658	13855	1231	1231	12413	-720
/Km	205049	-328	20855	-1036	33532	13855	615	615	3103	-720

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.

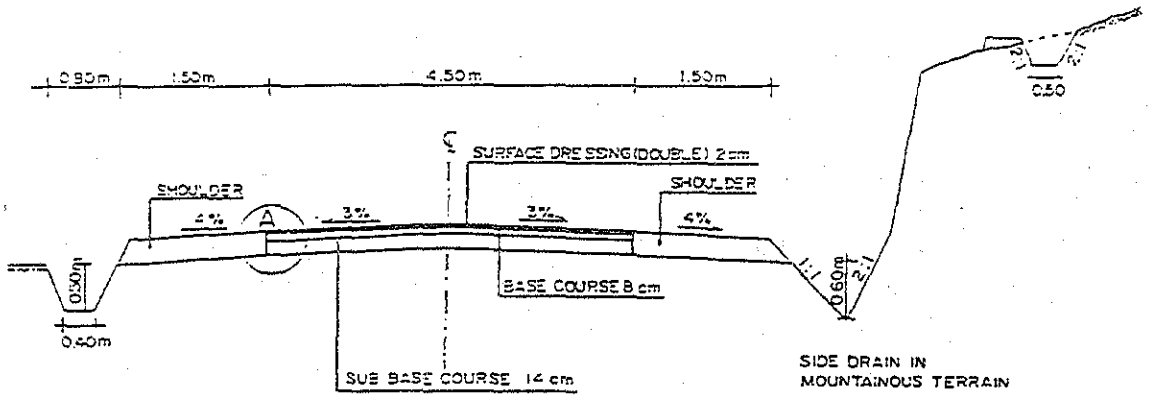
Table 3-1-1

DESIGN CRITERIA FOR KABUPATEN ROADS

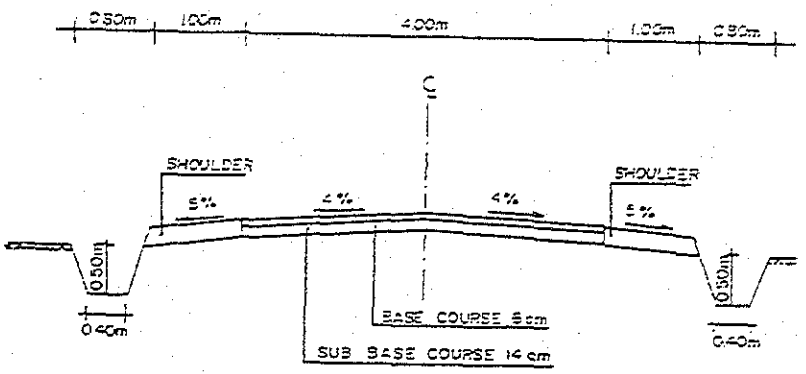
ROAD CLASSIFICATION		CLASS III A			CLASS III B-1			CLASS III B-2			CLASS III C		
SURFACE TYPE		ASPHALT SEAL (DOUBLE)			ASPHALT SEAL (SINGLE)			GRAVEL			GRAVEL		
TRAFFIC VOLUME : ADT (Forecast 10 th year average per day)		3000 - 500			500 - 200			200 - 50			50		
T E R R A I N		FLAT TO ROLLING	HILLY	MOUNT-AINOUS	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 PRACTICABLE
	MINIMUM	30	30	30	30	30	AS PRACTICABLE	30	30	AS PRACTICABLE	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

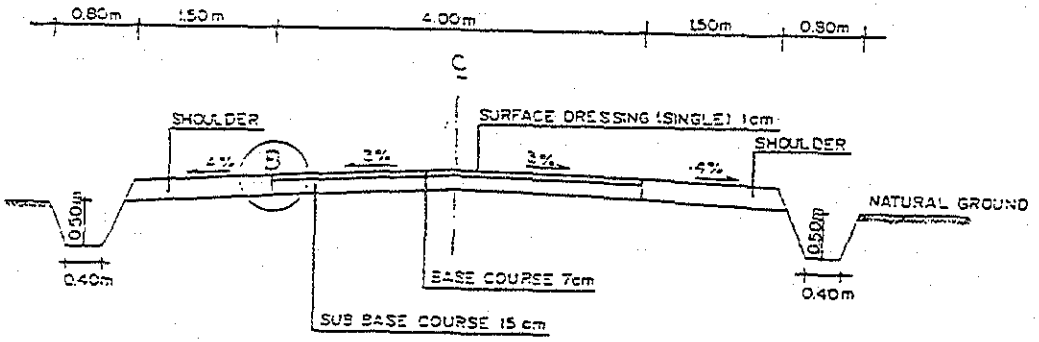
CLASS III A



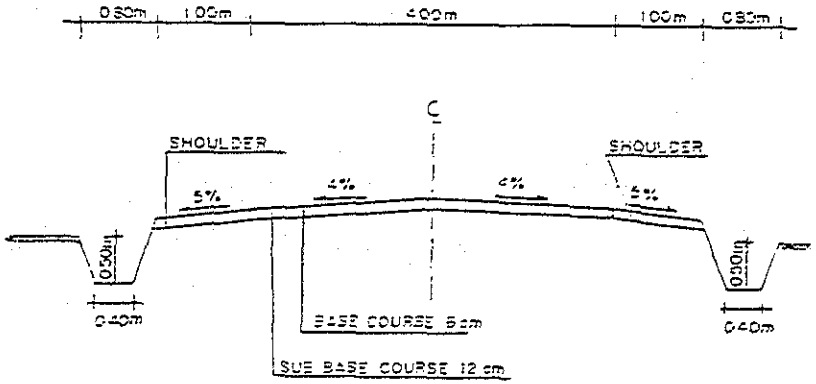
CLASS III B-2



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.

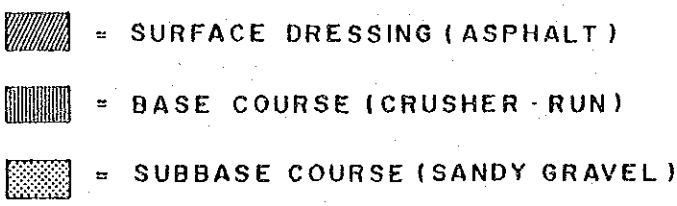
3.2.2 Pavement Structure

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

Fig. 3-2-1 PAVEMENT STRUCTURE

(cm)

CBR	ROAD CLASSIFICATION			
	III A	III B-1	III B-2	III C
6	8 / 14 / 24	7 / 14 / 22	6 / 14 / 20	16



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.

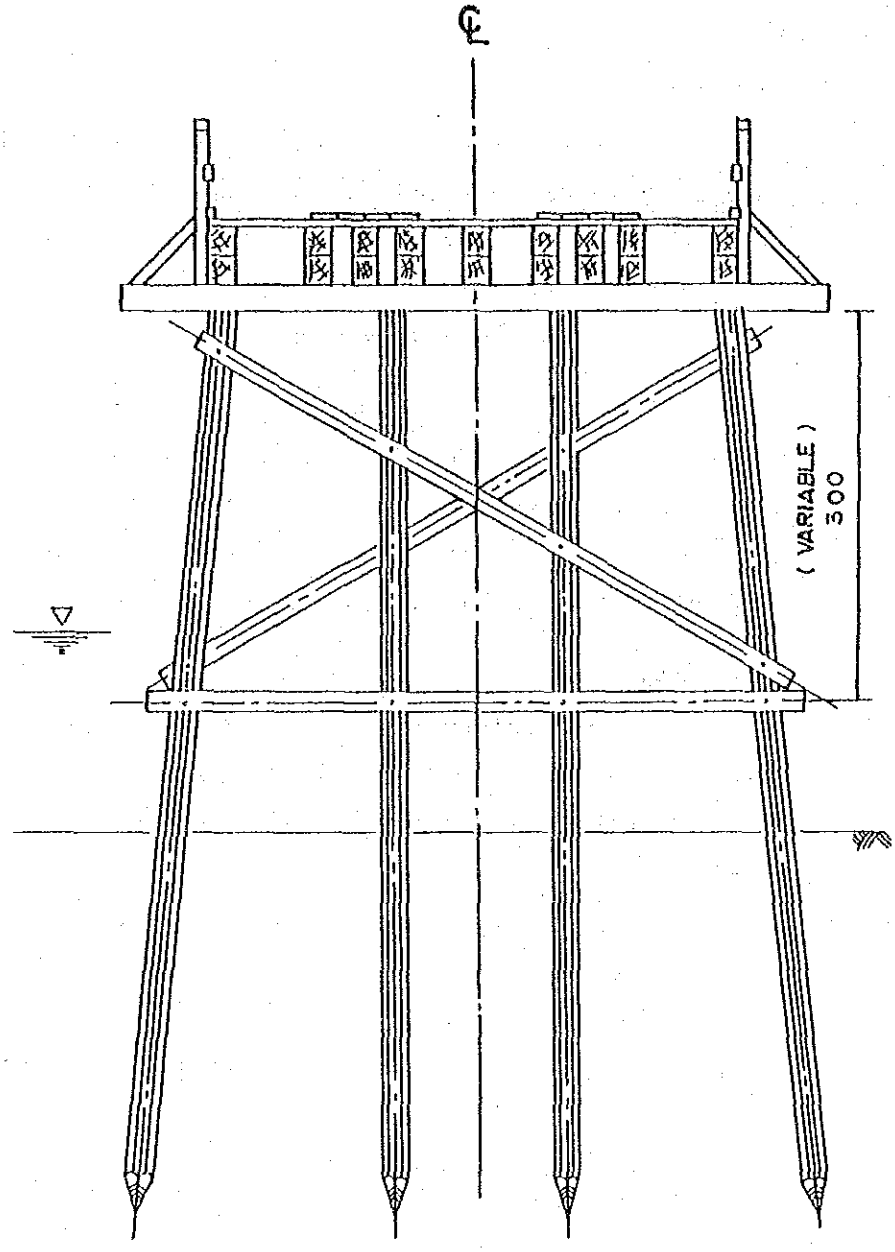
The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

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

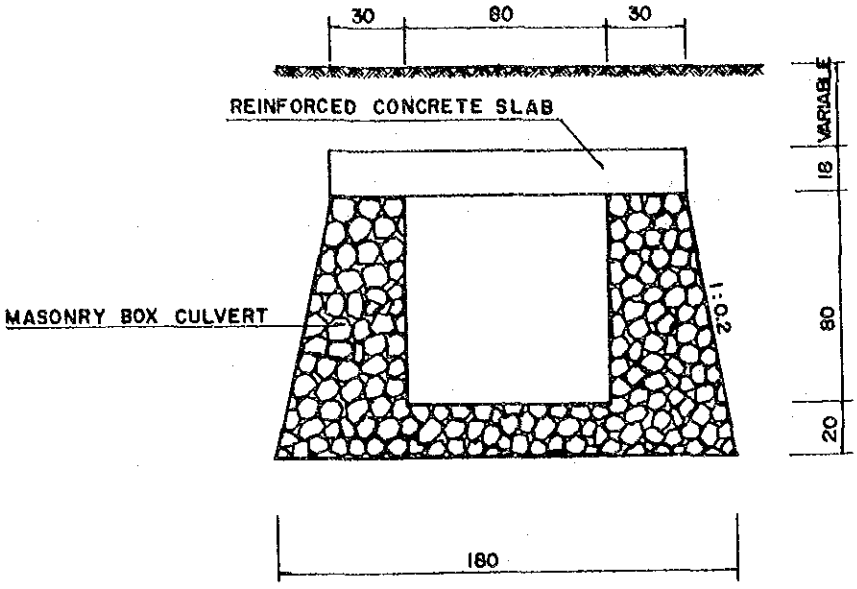
(2) Retaining Wall

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 RENFORCED CONCRETE PIPE CULVERT

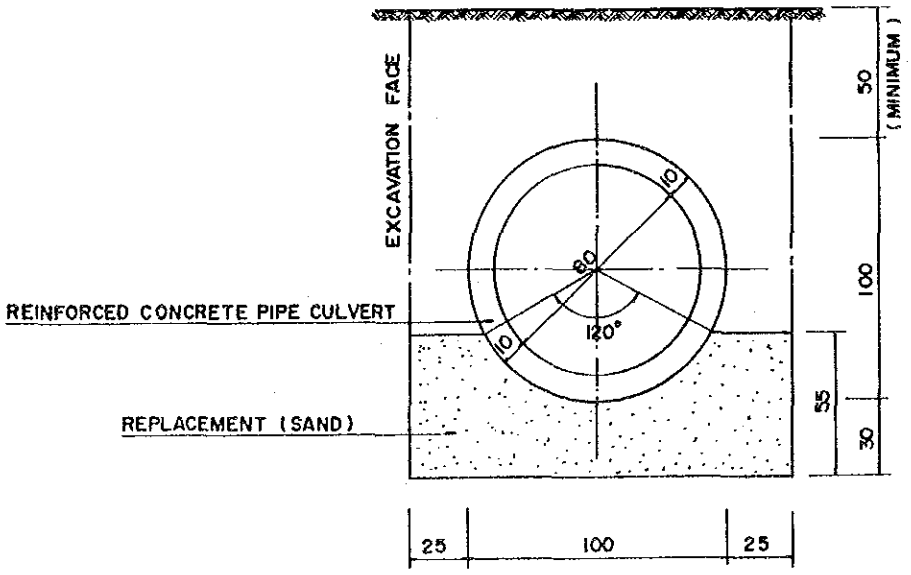
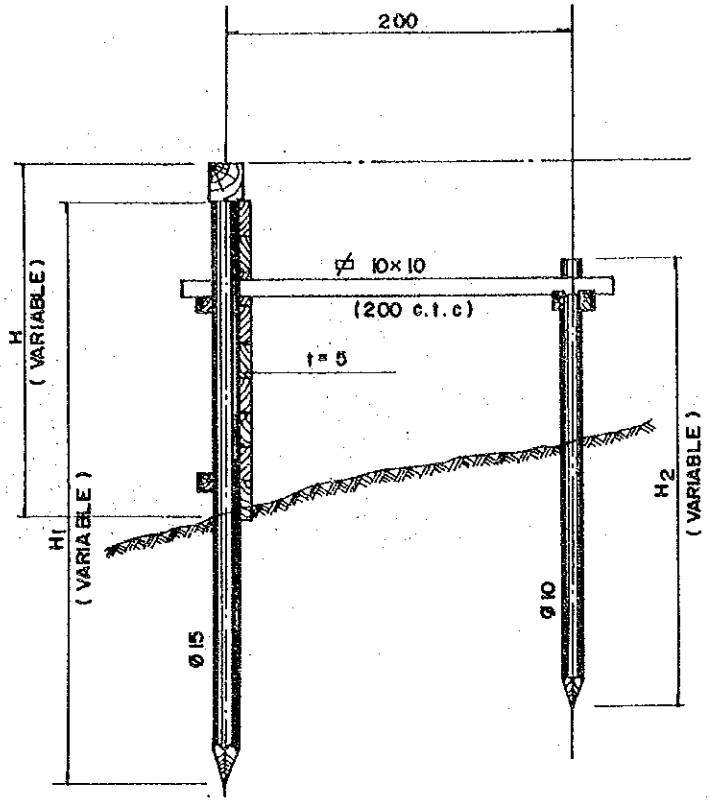
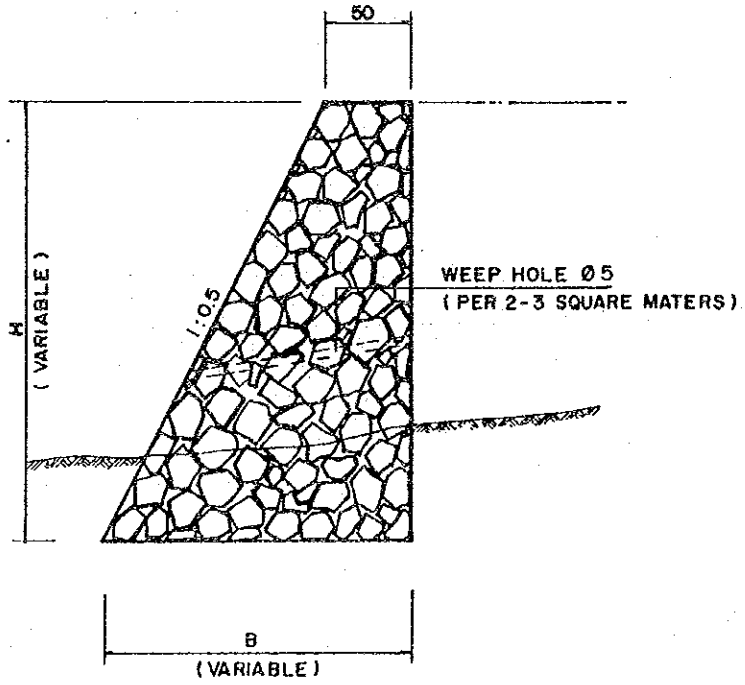


Fig. 3-3-3 STANDARD RETAINING WALLS

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 Kutai and other Kabupatens in Kalimantan Timur 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
Pasir	3,500	3,000	4,000	4,000	2,500	3,500	5,000
Kutai	2,500	2,000	2,500	2,500	1,500	3,000	3,500
Berau	2,500	2,000	2,500	2,500	1,500	3,000	3,500
Bulungan	3,000	2,000	2,500	2,500	1,500	2,000	3,500
Average	2,875	2,250	2,875	2,875	1,750	2,875	4,125

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 Kutai together with for other Kabupatens in Kalimantan Timur Province.

Table 4-1-2 UNIT PRICE OF MATERIALS

(Rp)

MATERIAL	UNIT	PASIR	KUTAI	BERAU	BULUNGAN	AVERAGE
Bitumen	L	300	400	400	400	375
Asphalt oil	L	600	600	600	600	600
Gasoline	L	250	250	250	250	250
Sand	M^3	9,000	8,000	4,500	4,500	6,500
Cement	bag	5,000	4,500	6,000	4,500	5,000
River Stone	M^3	13,500	15,000	12,000	15,000	13,875
Steel moulds	Set	8,000	8,000	8,000	8,000	8,000
Timber	M^3	150,000	100,000	100,000	150,000	125,000
Paint	L	3,000	2,000	2,000	2,200	2,250
Reinforcing Steel	Kg	800	1,000	1,000	1,000	950
Tying Wire	Kg	900	1,200	1,200	1,200	1,125
Equivalent Royalty	M^3	250	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 TIMUR
KABUPATEN : KUTAI

(UNIT : Rp) (6'85)

CODE NO	EQUIPMENT NAME	CLASS	LOCAL COST OWERSHIP	LOCAL COST OPERATION	LOCAL COST SUB-TOTAL	FOREIGN COST OWERSHIP	FOREIGN COST OPERATION	FOREIGN COST SUB-TOTAL	TOTAL COST
	Bulldozer	120 HP	272	14,147	14,419	7,769	1,029	8,798	23,217
	Bulldozer/Ripper	120 HP	298	15,163	15,461	8,499	1,583	10,082	25,543
	Swamp Bulldozer	120 HP	311	15,407	15,718	8,879	1,654	10,533	26,251
	Bulldozer	90 HP	173	9,612	9,785	4,914	650	5,564	15,349
	Bulldozer/Ripper	90 HP	186	10,204	10,390	5,299	987	6,286	16,676
	Bulldozer	65 HP	123	6,988	7,111	3,499	463	3,962	11,073
	Bulldozer/Ripper	65 HP	134	7,440	7,574	3,819	711	4,530	12,104
	Swamp Bulldozer	90 HP	185	10,194	10,379	5,284	984	6,268	16,647
	Swamp Bulldozer	65 HP	142	7,296	7,438	4,049	754	4,803	12,241
	Motor Grader	110 HP	243	12,162	12,405	6,919	1,289	8,208	20,613
	Motor Grader	75 HP	168	8,331	8,499	4,779	890	5,669	14,168
	Motor Grader	65 HP	151	7,321	7,472	4,299	801	5,100	12,572
	Road Stabilizer	W=1850 mm	301	3,398	3,699	8,594	426	9,020	12,719
	Vibratory Roller	4 ton	102	3,660	3,762	2,899	384	3,283	7,045
	Hand-guide Vib. Roller	1000 Kg	77	653	730	849	29	878	1,608
	Tire Roller	8-15 ton	109	8,332	8,441	3,106	102	3,208	11,649
	Vibratory Roller (O&T)	4 ton	102	3,660	3,762	2,899	384	3,283	7,045
	Hand-guide Vib. Roller	600 Kg	54	445	499	600	20	620	1,119
	Rough Terrain Crane	10 ton	352	14,196	14,548	10,039	748	10,787	25,335
	Hydraulic Excavator; Wheel	0.3 m3	144	8,665	8,809	4,109	544	4,653	13,462
	Wheel Loader	1.2 m3	246	9,135	9,381	7,019	929	7,948	17,329
	Wheel Loader	0.3 m3	80	3,204	3,284	2,269	300	2,569	5,853
	Water Tank Truck	4000 ltr.	79	3,221	3,300	868	120	988	4,288
	Fuel Tank Truck	4000 ltr.	80	3,228	3,308	882	122	1,004	4,312
	Dump Truck	3.0 ton	133	3,973	4,106	1,469	204	1,673	5,779
	Flat Bed Truck with Crane	3.0 ton	61	3,468	3,529	1,716	127	1,843	5,372
	Dump Loader Truck	12 ton	135	21,735	21,870	3,837	127	3,964	25,834
	Dump Truck	5.0 ton	198	6,581	6,779	2,189	305	2,494	9,273
	Flat Bed Truck	3.0 ton	20	3,040	3,060	563	41	604	3,664
	Portable Crusher/Screening	30-40 t/h	658	23,807	24,465	18,800	2,490	21,290	45,755
	Concrete Mixer	0.5 m3	486	2,464	2,950	5,400	423	5,823	8,773
	Water Pump	200 l/min	18	296	314	188	6	194	508
	Concrete Vibrator	3.3 HP	7	260	267	73	2	75	342
	Asphalt Sprayer	850 ltr.	92	815	907	1,019	142	1,161	2,068

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 TIMUR KAB : KUTAI

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	172	91	263
Subgrade Preparation	m2	22	11	33
Normal Fill	m3	1,784	863	2,647
Fill in Swamp	m3	2,621	1,053	3,674
Normal Excavation to Spoil	m3	1,044	523	1,567
Sub Base Course	m3	3,357	1,348	4,705
Base Course	m3	4,604	2,300	6,904
Shoulder	m2	310	146	456
Asphalt Patching	m2	3,617	1,512	5,129
Surface Dressing (Single)	m2	587	766	1,353
Surface Dressing (Double)	m2	737	1,207	1,944
Earth Drain	m	800	119	919
Earth Drain in Swamp (by machine)	m3	1,231	474	1,705
Pipe Culvert D80cm	m	44,289	50,140	94,429
Masonry Culvert (80x80cm)	m	66,426	40,282	106,708
Retaining Wall and Wing Wall (Timber)	m2	10,566	246	10,812
Retaining Wall and Wing Wall (Masonry)	m3	50,559	11,682	62,241
Gabion Protection	m3	20,132	120	20,252
Manual routine maintenance of road	Km	127,720	7,248	134,968
Routine maintenance of earth road	Km	98,333	37,924	136,257
Routine maintenance of gravel road	Km	200,130	88,092	288,222
Routine maintenance of asphalt road	Km	361,700	151,200	512,900

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 TIMUR KAB : KUTAI

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	38,480	2,998	41,478
Superstructure (Timber;Span 5m;10T)	m2	42,622	3,311	45,933
Superstructure (Timber;Span 8m;10T)	m2	56,454	4,351	60,805
Superstructure (Timber;Span 3m;BM50)	m2	47,713	3,707	51,420
Superstructure (Timber;Span 5m;BM50)	m2	52,089	4,019	56,108
Superstructure (Timber;Span 8m;BM50)	m2	66,063	5,088	71,151
Superstructure (Concrete;Span 3m;BM50)	m2	44,804	105,767	150,571
Superstructure (Concrete;Span 5m;BM50)	m2	46,108	118,299	164,407
Superstructure (Concrete;Span 8m;BM50)	m2	47,568	128,919	176,487
Superstructure (Concrete;Span10m;BM50)	m2	52,059	146,517	198,576
Superstructure (Concrete;Span15m;BM50)	m2	56,260	172,712	228,972
Substructure (Pier;for Timber;10T)	NO	335,202	27,724	362,926
Substructure (Abut;for Timber;10T)	NO	947,708	136,771	1,084,479
Substructure (Pier;for Timber;BM50)	NO	492,985	41,015	534,000
Substructure (Abut;for Timber;BM50)	NO	1,066,758	151,014	1,217,772
Substructure (Pier;for Concrete;BM50)	NO	2,060,372	467,275	2,527,647
Substructure (Abut;for Concrete;BM50)	NO	4,152,360	982,926	5,135,286
Demolition of Bridge (Timber->Timber)	m2	10,841	1,195	12,036
Demolition of Bridge (Timber->Concrete)	m2	10,841	1,195	12,036
Demolition of Bridge (Concrete)	m2	89,220	79,820	169,040
Maintenance of Timber Bridge (New)	m2	7,234	1,009	8,243
Maintenance of Concrete Bridge (New)	m2	1,812	3,001	4,813
Maintenance of Timber Bridge (Exist)	m2	7,746	2,347	10,093
Maintenance of Concrete Bridge (Exist)	m2	4,491	2,443	6,934

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 Kutai are shown in Table 5-1-1.

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

KABUPATEN : KUTAI

CRITERIA NO	ROAD LINK NO
(2)	22,23,24,33,34,35,36,37,38,58,62,63,72
(6)	08,09,10,11,12,13,14,15,16,43,44,45,46,47,71
(7)	17,18,19,20,21
(8)	04,07,03

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 RESULTS OF PRIMARY ANALYSIS

PROVINCE : KALIMANTAN TIMUR KABUPATEN : KUTAI

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
1	2 Km	IIIA	78.595	Surplus
57	3 Km	IIIA	70.729	Surplus
59	16 Km	IIIA	54.282	Surplus
55	14 Km	IIIA	38.316	Surplus
32	8 Km	IIIA	29.128	Surplus
60	6 Km	IIIA	26.955	VOC
39	6 Km	IIIA	26.519	Surplus
51	10 Km	IIIA	26.232	VOC
40	6 Km	IIIA	25.216	Surplus
5	5 Km	IIIB-1	24.431	VOC
65	6 Km	IIIA	20.387	Surplus
61	12 Km	IIIB-1	13.656	Surplus
68	9 Km	IIIB-1	13.550	Surplus
67	7 Km	IIIA	13.297	Surplus
69	12 Km	IIIA	12.092	Surplus
3	10 Km	IIIA	10.489	Surplus
56	19 Km	IIIB-1	10.444	VOC
70	14 Km	IIIB-1	10.174	Surplus
54	5 Km	IIIB-2	9.876	Surplus
49	8 Km	IIIB-1	9.710	VOC
42	3 Km	IIIB-1	6.930	VOC
48	6 Km	IIIB-2	6.804	Surplus
66	6 Km	IIIB-2	3.978	VOC
73	13 Km	IIIB-1	3.789	Surplus
31	3 Km	IIIB-1	3.683	VOC
64	6 Km	IIIB-2	2.111	Surplus
53	3 Km	IIIB-1	1.270	VOC
26	1 Km	IIIB-1	0.078	Surplus
41	3 Km	IIIB-2	0.078	Surplus
28	2 Km	IIIB-1	0.078	Surplus
2	5 Km	IIIB-1	0.078	Surplus
6	1 Km	IIIB-1	0.078	VOC
50	6 Km	IIIB-1	0.078	Surplus
25	1 Km	IIIB-1	0.078	Surplus
32	8 Km	IIIB-1	0.078	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : KALIMANTAN TIMUR KABUPATEN : KUTAI

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
49	8 Km	IIIB-2	22.267	VOC
54	5 Km	IIIC	11.505	Surplus
42	3 Km	IIIB-2	11.410	VOC
73	13 Km	IIIB-2	9.884	Surplus
31	3 Km	IIIB-2	9.763	VOC
48	6 Km	IIIC	8.319	Surplus
53	3 Km	IIIB-2	7.744	VOC
66	6 Km	IIIC	5.699	VOC
64	6 Km	IIIC	4.178	Surplus

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

PROVINCE : KALIMANTAN TIMUR KABUPATEN : KUTAI

LINK NO	LENGTH	CLASS	NPV (1000Rp)	B/C	IRR (%)	REMARK
59	16 Km	IIIA	1434853	4.495	54.282	Surplus
55	14 Km	IIIA	573153	2.998	38.316	Surplus
1	2 Km	IIIA	360451	7.042	78.595	Surplus
57	3 Km	IIIA	280475	5.998	70.729	Surplus
39	6 Km	IIIA	243961	2.058	26.519	Surplus
40	6 Km	IIIA	228414	1.984	25.216	Surplus
32	8 Km	IIIA	208331	2.198	29.128	Surplus
51	10 Km	IIIA	159776	1.775	26.232	VOC
60	6 Km	IIIA	143711	1.874	26.955	VOC
65	6 Km	IIIA	138704	1.634	20.387	Surplus
5	5 Km	IIIB-1	78603	1.701	24.431	VOC
67	7 Km	IIIA	38823	1.177	13.297	Surplus
61	12 Km	IIIB-1	33199	1.179	13.656	Surplus
69	12 Km	IIIA	29782	1.108	12.092	Surplus
68	9 Km	IIIB-1	28019	1.178	13.550	Surplus
49	8 Km	IIIB-2	23489	1.425	22.267	VOC
56	19 Km	IIIB-1	7240	1.019	10.444	VOC
3	10 Km	IIIA	5734	1.023	10.489	Surplus
70	14 Km	IIIB-1	2129	1.008	10.174	Surplus
54	5 Km	IIIC	2100	1.062	11.505	Surplus
42	3 Km	IIIB-2	1495	1.047	11.410	VOC
SUM	181 Km		4022442			

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: Kutai

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	1,617	2,449	4,066
MAINTENANCE	124	434	558
SUPPLEMENTATION	602	-	602
WORKSHOP EQUIPMENT & TOOLS	28	-	28
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	2,388	2,883	5,271

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	990	2,861	3,851
CONSTRUCTION & MAINTENANCE EQUIPMENT	1,265	-	1,265
SPARE PARTS	88	22	110
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	2,388	2,883	5,271

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 22 links with the total length of 206 km which is 51% of the 407 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 : KUTAI

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary	1,3,5,32,39,40,51,55,56,57 59,60,61,67,68,69,70
- Secondary	42,49,54
Engineering Point of View	52,74*
Basic Human Needs	

* Link 74 is New Construction Road

As the table shows all feasible road links except Road Link No 65 are proposed to be improved.

Road Link No 65 is located far from the provincial road and its approach has not been improved yet therefore this road link is not selected.

Since Road Link No 52 and is key road link which is located at the strategic point to complete the local road network consisting of feasible road links, these road links are selected from the engineering points of view.

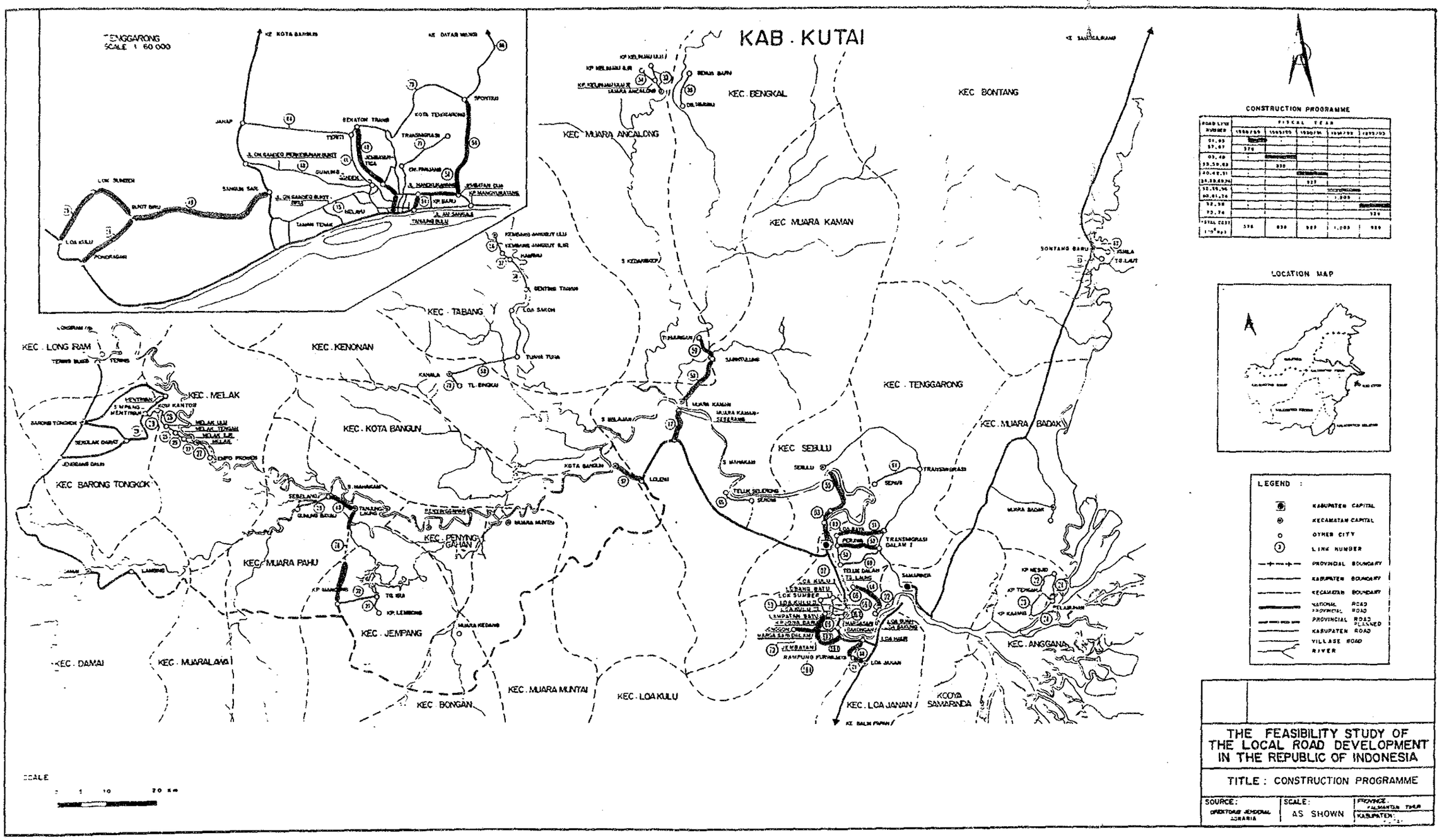
The construction of a new road link which connects Tanjung Laung and Mancong via west Bank of Jempang lake is recommended from the engineering point of view. Construction of the provincial road from Loleng to Lambing via Mancong as the regional trunk road of Kabupaten Kutai, will be completed in 1986/87. The new road link will connect the provincial road with feasible road which are isolated from each other at present and therefore the construction of the new road link will produce satisfactory results for the development of the area.

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 TIMUR KAB : KUTAI

YEAR	LINK NO ( ) : rate
1988 :	1, 5, 57, 67
1989 :	3, 49, 55, 59 (75%), 68
1990 :	40, 42, 51, 54, 59 (25%), 69, 74 (20%)
1991 :	32, 39, 56 (30%), 60, 61, 74 (30%)
1992 :	52, 56 (70%), 70, 74 (50%)


KAB . KUTAI
TENGGARONG
SCALE 1 60 000
KEC . BENGKAL
KEC BONTANG
KEC MUARA ANCALONG
KEC MUARA KAMAN
KEC . TABANG
KEC . KENONAN
KEC . LONG RAM
KEC . MELAK
KEC . TENGGARONG
KEC . MUARA BADAK
KEC SEBULU
KEC . KOTA BANGUN
KEC BARONG TONGKOK
KEC . PENYINGGAHAN
KEC . MUARA PAHU
KEC . JEMPANG
KEC . DAMAI
KEC . MUARALAWA
KEC . BONGAN
KEC . MUARA MUNTAI
KEC . LOA KULU
KEC . LOA JANAN
KEC . ANGGANA
KOTA SAMARINDA
CONSTRUCTION PROGRAMME
FISCAL YEAR
LOCATION MAP
LEGEND :
KABUPATEN CAPITAL
KECAMATAN CAPITAL
OTHER CITY
LINK NUMBER
PROVINCIAL BOUNDARY
KABUPATEN BOUNDARY
KECAMATAN BOUNDARY
NATIONAL ROAD
PROVINCIAL ROAD
PROVINCIAL ROAD PLANNED
KABUPATEN ROAD
VILLAGE ROAD
RIVER
SCALE
THE FEASIBILITY STUDY OF THE LOCAL ROAD DEVELOPMENT IN THE REPUBLIC OF INDONESIA
TITLE : CONSTRUCTION PROGRAMME
SOURCE : DIREKTORAT JENDERAL AGRARIA
SCALE : AS SHOWN
PROVINCE : KALIMANTAN TIMUR
KABUPATEN :

(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 TIMUR KAB : KUTAI

(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	2	99.0	1.0	0.0	0.0	0	0	2	3	54.05	0	0.00	546	871	217	1,088
4	4	99.0	0.0	1.0	0.0	0	4	0	7	248.00	0	0.00	2,503	3,232	963	4,195
6	1	0.0	99.0	1.0	0.0	0	0	1	0	0.00	0	0.00	0	226	45	271
8	9	11.0	77.1	11.8	0.1	1	7	1	0	0.00	0	0.00	0	3,010	871	3,881
9	3	0.0	99.0	1.0	0.0	0	3	0	5	142.00	0	0.00	1,433	2,083	619	2,702
11	3	99.0	1.0	0.0	0.0	0	3	0	0	0.00	0	0.00	0	984	286	1,270
15	4	99.0	1.0	0.0	0.0	0	0	4	0	0.00	0	0.00	0	904	181	1,085
16	1	0.0	99.0	1.0	0.0	0	0	1	2	52.00	0	0.00	525	629	167	796
18	4	0.0	94.5	5.5	0.0	0	0	4	0	0.00	0	0.00	0	904	181	1,085
19	3	93.0	3.7	3.3	0.0	0	1	2	0	0.00	0	0.00	0	780	186	966
20	2	94.5	5.5	0.0	0.0	0	0	2	0	0.00	0	0.00	0	452	90	542
21	4	75.5	24.5	0.0	0.0	0	4	0	0	0.00	0	0.00	0	1,311	381	1,692
25	1	99.0	1.0	0.0	0.0	0	1	0	0	0.00	0	0.00	0	328	95	423
27	7	38.6	51.4	10.0	0.0	0	3	4	0	0.00	0	0.00	0	1,888	467	2,355
28	2	49.5	50.0	0.5	0.0	1	1	0	0	0.00	0	0.00	0	817	254	1,071
29	1	99.0	1.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	489	158	647
30	13	0.0	82.3	16.9	0.8	0	12	1	0	0.00	0	0.00	0	4,160	1,189	5,349
31	3	0.0	65.0	23.3	11.7	0	0	3	0	0.00	0	0.00	0	678	136	814
32	8	55.6	31.3	13.1	0.0	0	7	1	0	0.00	0	0.00	0	2,521	713	3,234
39	6	0.0	80.0	20.0	0.0	0	0	6	1	101.60	0	0.00	1,025	2,143	509	2,652
40	6	0.0	88.3	11.7	0.0	0	0	6	0	0.00	0	0.00	0	1,356	271	1,627
42	3	25.0	26.7	48.3	0.0	0	3	0	4	67.50	0	0.00	681	1,506	444	1,950
44	1	0.0	90.0	10.0	0.0	1	0	0	0	0.00	0	0.00	0	489	158	647
47	1	90.0	10.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	489	158	647
49	8	6.3	50.6	43.1	0.0	0	8	0	4	54.00	0	0.00	545	3,041	889	3,930
50	6	99.0	1.0	0.0	0.0	0	6	0	0	0.00	0	0.00	0	1,967	572	2,539
52	8	2.5	68.1	29.4	0.0	0	8	0	0	0.00	0	0.00	0	2,623	763	3,386
53	3	0.0	80.0	20.0	0.0	0	3	0	1	48.00	0	0.00	484	1,355	399	1,754
56	19	99.0	1.0	0.0	0.0	0	3	16	0	0.00	0	0.00	0	4,600	1,009	5,609
57	3	0.0	51.7	36.7	11.7	0	2	1	0	0.00	0	0.00	0	882	236	1,118
58	15	78.9	10.4	3.4	7.3	1	8	6	0	0.00	0	0.00	0	4,469	1,192	5,661

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

PROV : KALIMANTAN TIMUR KAB : KUTAI

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SO (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TH NO	AREA (m2)	BC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
59	16	49.6	28.3	17.8	4.4	0	10	6	0	0.00	0	0.00	0	4,635	1,224	5,859
60	6	82.5	0.8	0.2	16.5	1	2	3	0	0.00	0	0.00	0	1,823	485	2,308
62	2	99.0	1.0	0.0	0.0	0	1	1	0	0.00	0	0.00	0	554	141	695
63	3	99.0	1.0	0.0	0.0	0	0	3	0	0.00	0	0.00	0	678	136	814
64	6	99.0	1.0	0.0	0.0	0	0	6	0	0.00	0	0.00	0	1,356	271	1,627
65	6	99.0	1.0	0.0	0.0	0	0	6	0	0.00	0	0.00	0	1,356	271	1,627
66	6	0.0	50.8	39.2	10.0	0	5	1	0	0.00	0	0.00	0	1,865	522	2,387
67	7	70.9	20.6	7.1	1.4	0	5	2	0	0.00	0	0.00	0	2,091	567	2,658
68	9	80.0	0.9	0.1	11.0	1	3	5	0	0.00	0	0.00	0	2,603	670	3,273
69	12	33.1	37.3	23.8	5.8	0	9	3	0	0.00	0	0.00	0	3,629	994	4,623
70	14	84.9	0.9	0.1	14.1	2	4	8	0	0.00	0	0.00	0	4,099	1,060	5,159
71	4	74.3	15.8	7.5	2.5	0	2	2	0	0.00	0	0.00	0	1,108	281	1,389
SUM	245					10	128	107	27	767.15	0	0.00	7,743	76,984	20,421	97,405

6.1.3 Annual Construction and Maintenance Cost

The annual allocation of the total construction and maintenance cost in the five years programme for Kabupaten Kutai 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 4,066 x 10^6 and maintenance cost is Rp 558 x 10^6 which is approximately 12% of the total expenditure.

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

(CONSTRUCTION)

PROV : KALIMANTAN TIMUR KAB : KUTAI

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	208,068	443,915	549,814	620,787	626,426	2,449,010	(60.2%)
Ownership Cost	2,730	6,156	7,056	7,989	7,730	31,661	(1.3%)
Operation Cost	97,524	220,692	256,801	292,794	274,352	1,142,163	(46.6%)
Material Cost	46,044	95,479	106,880	121,086	127,213	496,702	(20.3%)
Labour Cost	34,631	63,686	107,362	117,946	135,423	459,048	(18.7%)
Contingency	27,139	57,902	71,715	80,972	81,708	319,436	(13.0%)
FOREIGN CURRENCY :	168,610	386,859	373,184	384,584	304,188	1,617,425	(39.8%)
Ownership Cost	48,785	111,097	126,805	144,480	137,369	568,536	(35.2%)
Operation Cost	6,495	14,965	16,967	19,557	18,791	76,775	(4.7%)
Material Cost	91,337	210,337	180,736	170,304	108,351	761,145	(47.1%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	21,993	50,460	48,676	50,163	39,677	210,969	(13.0%)
TOTAL COST :	376,678	830,774	922,998	1,005,371	930,613	4,066,436	
Ownership Cost	51,515	117,253	133,861	152,469	145,099	600,197	(14.8%)
Operation Cost	104,019	235,657	273,768	312,351	293,143	1,218,938	(30.0%)
Material Cost	137,381	305,816	287,616	291,390	235,564	1,257,847	(30.9%)
Labour Cost	34,631	63,686	107,362	117,946	135,423	459,048	(11.3%)
Contingency	49,132	108,362	120,391	131,135	121,384	530,404	(13.0%)

(Contingency : 15%)

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

(MAINTENANCE)

PROV : KALIMANTAN TIMUR KAB : KUTAI

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	37,514	77,004	94,521	107,760	117,371	434,170	(77.8%)
Ownership Cost	368	793	1,036	1,272	1,431	4,900	(1.1%)
Operation Cost	20,818	41,744	49,562	54,758	58,134	225,016	(51.8%)
Material Cost	1,058	2,455	4,048	5,035	6,202	18,798	(4.3%)
Labour Cost	15,270	32,012	39,875	46,695	51,604	185,456	(42.7%)
FOREIGN CURRENCY :	9,955	20,895	26,660	31,628	35,068	124,206	(22.2%)
Ownership Cost	8,597	17,285	20,784	23,147	24,711	94,524	(76.1%)
Operation Cost	1,006	2,023	2,403	2,682	2,857	10,971	(8.8%)
Material Cost	352	1,587	3,473	5,799	7,500	18,711	(15.1%)
Labour Cost	0	0	0	0	0	0	(0.0%)
TOTAL COST :	47,469	97,899	121,181	139,388	152,439	558,376	
Ownership Cost	8,965	18,078	21,820	24,419	26,142	99,424	(17.8%)
Operation Cost	21,824	43,767	51,965	57,440	60,991	235,987	(42.3%)
Material Cost	1,410	4,042	7,521	10,834	13,702	37,509	(6.7%)
Labour Cost	15,270	32,012	39,875	46,695	51,604	185,456	(33.2%)

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

(TOTAL)

PROV : KALIMANTAN TIMUR KAB : KUTAI

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	245,582	520,919	644,335	728,547	743,797	2,883,180	(62.3%)
Ownership Cost	3,098	6,949	8,092	9,261	9,161	36,561	(1.3%)
Operation Cost	118,342	262,436	306,363	347,552	332,486	1,367,179	(47.4%)
Material Cost	47,102	97,934	110,928	126,121	133,415	515,500	(17.9%)
Labour Cost	49,901	95,698	147,237	164,641	187,027	644,504	(22.4%)
Contingency	27,139	57,902	71,715	80,972	81,708	319,436	(11.1%)
FOREIGN CURRENCY :	178,565	407,754	399,844	416,212	339,256	1,741,631	(37.7%)
Ownership Cost	57,382	128,382	147,589	167,627	162,080	663,060	(38.1%)
Operation Cost	7,501	16,988	19,370	22,239	21,648	87,746	(5.0%)
Material Cost	91,689	211,924	184,209	176,183	115,851	779,856	(44.8%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	21,993	50,460	48,676	50,163	39,677	210,969	(12.1%)
TOTAL COST :	424,147	928,673	1,044,179	1,144,759	1,083,052	4,624,810	
Ownership Cost	60,480	135,331	155,681	176,888	171,241	699,621	(15.1%)
Operation Cost	125,843	279,424	325,733	369,791	354,134	1,454,925	(31.5%)
Material Cost	138,791	309,858	295,137	302,304	249,266	1,295,356	(28.0%)
Labour Cost	49,901	95,698	147,237	164,641	187,027	644,504	(13.9%)
Contingency	49,132	108,362	120,391	131,135	121,384	530,404	(11.5%)

(Contingency : 15%)

6.1.4 Construction and Maintenance Equipment Cost

(1) Required Number of Equipment

The required numbers of construction equipment for Kabupaten Kutai 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-Motor Grader 75 HP
- 1-Tire Roller 8-15 Ton
- 1-Dump Truck 3 Ton
- 1-Hand Guided Vibratory Roller 1000 Kg
- 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 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 TIMUR KAB : KUTAI

EQUIPMENT NAME	WORKABLE	EXISTING	(1988)	(1989)	(1990)	(1991)	(1992)
Bulldozer/Ripper	240	0	0.19	0.60	0.65	0.92	1.19
Swamp Bulldozer	240	0	0.09	0.06	0.35	0.49	0.61
Motor Grader	250	0	0.58	1.50	1.06	1.28	1.29
Hand-guide Vib. Roller	250	0	0.29	0.40	1.12	1.30	2.11
Tire Roller	240	0	0.59	1.48	1.11	1.15	0.68
Vibratory Roller (D&T)	250	0	0.50	1.14	1.07	1.38	1.53
Hydraulic Excavator; Wheel	240	0	0.41	0.32	2.61	2.96	1.64
Wheel Loader	250	0	0.91	2.20	2.29	2.74	2.96
Water Tank Truck	250	0	0.35	0.73	0.77	0.93	1.01
Dump Truck	250	0	7.35	16.67	19.00	21.49	21.04
Flat Bed Truck with Crane	250	0	0.24	0.15	0.76	0.78	1.25
Flat Bed Truck	250	0	0.78	1.78	1.65	1.74	1.44
Portable Crusher/Screening	250	0	0.23	0.58	0.46	0.43	0.30
Concrete Mixer	240	0	0.07	0.06	0.15	0.10	0.14
Water Pump	240	0	0.06	0.05	0.12	0.08	0.11
Concrete Vibrator	240	0	0.03	0.03	0.06	0.04	0.06
Asphalt Sprayer	240	0	0.59	1.48	1.11	1.15	0.68

NOTE WORKABLE : workable days in a year

EXISTING : number of existing equipment

Table 6-1-8 EQUIPMENT PURCHASE COST

PROV : KALIMANTAN TIMUR KAB : KUTAI

(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	1	52,850
Swamp Bulldozer	65 HP	40,500	-	-
Motor Grader	75 HP	47,800	2	95,600
Road Stabilizer	W=1850 mm	85,950	-	-
Hand-guide Vib. Roller	1000 Kg	8,500	2	17,000
Tire Roller	8-15 ton	31,070	2	62,140
Vibratory Roller (D&T)	4 ton	29,000	2	58,000
Vibratory Roller	4 ton	29,000	-	-
Rough Terrain Crane	10 ton	100,400	-	-
Hydraulic Excavator; Wheel	0.3 m3	41,100	2	82,200
Wheel Loader	1.2 m3	70,200	3	210,600
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	20	294,000
Dump Loader Truck	12 ton	56,300	-	-
Flat Bed Truck with Crane	3.0 ton	25,190	2	50,380
Flat Bed Truck	3.0 ton	11,275	3	33,825
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	2	20,400
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	5	5,500

PURCHASE COST TOTAL	1,265,345
OWNERSHIP COST (FOREIGN)	663,060
EQUIPMENT COST SUPPLEMENTED	602,285

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 TIMUR KAB : KUTAI

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
Site Clearance in Light Bush	m2	5000.00	16125.00	86175.00	128200.00	207000.00	442500.00
Subgrade Preparation	m2	73500.00	116600.00	96840.00	154355.00	224240.00	665535.00
Normal Fill	m3	0.00	0.00	1000.00	1500.00	2500.00	5000.00
Fill in Swamp	m3	3861.00	2400.00	14991.50	20853.00	26348.00	68453.50
Normal Excavation to Spoil	m3	1386.00	3820.50	3227.50	3333.00	1140.00	12907.00
Sub Base Course	m3	7948.40	19056.10	15055.50	18356.72	18942.98	79359.70
Base Course	m3	6265.00	16280.00	13120.00	12135.50	9229.50	57030.00
Shoulder	m2	50000.00	164500.00	88000.00	123100.00	122900.00	548500.00
Asphalt Patching	m2	0.00	1988.00	0.00	497.00	994.00	3479.00
Surface Dressing (Single)	m2	17500.00	49500.00	0.00	74150.00	115850.00	257000.00
Surface Dressing (Double)	m2	63000.00	154500.00	143000.00	92500.00	0.00	453000.00
Earth Drain	m	6040.00	10775.00	24485.00	14070.00	10250.00	65620.00
Earth Drain in Swamp (by machine)	m3	7800.00	6000.00	50000.00	56700.00	31400.00	151900.00
Pipe Culvert D80cm	m	240.00	180.00	496.00	294.60	419.40	1630.00
Masonry Culvert (80x80cm)	m	0.00	0.00	0.00	25.80	32.20	58.00
Retaining Wall and Wing Wall (Timber)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Retaining Wall and Wing Wall (Masonry)	m3	96.00	72.00	198.40	116.17	167.83	650.40
Gabion Protection	m3	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;10T)	m2	0.00	12.00	0.00	0.00	0.00	12.00
Superstructure (Timber;Span 5m;10T)	m2	0.00	0.00	400.00	600.00	1000.00	2000.00
Superstructure (Timber;Span 8m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;BM50)	m2	66.80	0.00	40.00	0.00	0.00	106.80
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	0.00	2.00	40.00	60.00	100.00	202.00
Substructure (Pier;for Timber;BM50)	NO	2.00	0.00	1.00	0.00	0.00	3.00
Substructure (Abut;for Timber;BM50)	NO	4.00	0.00	2.00	0.00	0.00	6.00
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	39.25	12.00	0.00	0.00	0.00	51.25
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	119.50	235.50	261.50	276.15	283.35	1176.00
Routine maintenance of earth road	Km	52.25	97.25	91.75	74.60	62.40	378.25
Routine maintenance of gravel road	Km	62.25	111.75	110.75	97.05	87.95	471.75
Routine maintenance of asphalt road	Km	5.00	26.50	57.00	102.50	133.00	326.00
Maintenance of Timber Bridge (New)	m2	0.00	0.00	66.80	12.00	106.80	185.60
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	370.06	700.90	1014.15	1021.10	1071.90	4178.11
Maintenance of Concrete Bridge (Exist)	m2	0.00	0.00	64.00	64.00	64.00	192.00

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.

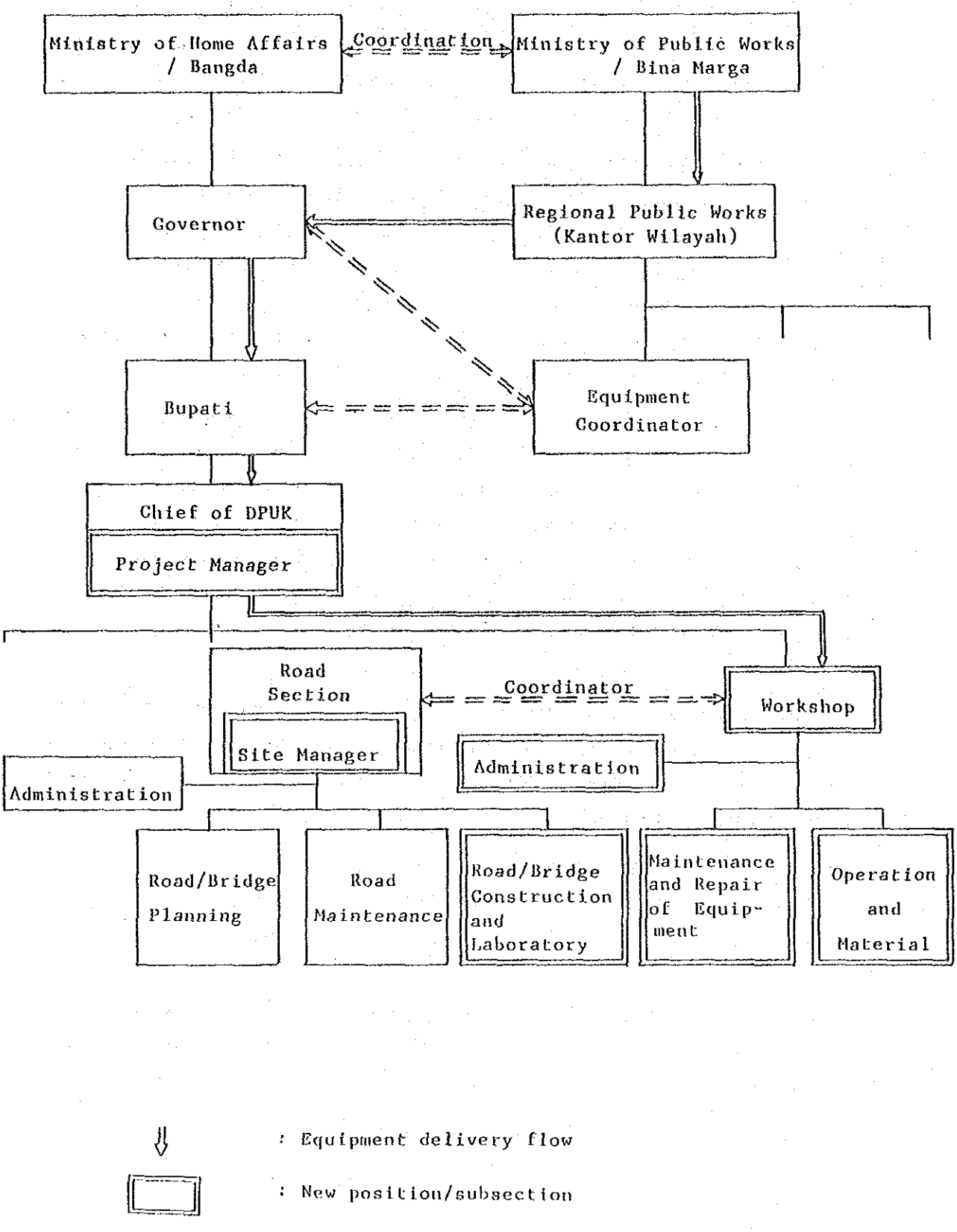
It is recommended that the workshop is newly organized to consist of three sub-sections, i.e. maintenance and repair of equipment, operation and materials, and administration to execute the main tasks described in Clause 3.5.

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

APPENDIX

INPUT DATA

Appendix A-1 FOR ESTIMATION OF THE PRODUCER'S SURPLUS BENEFIT

PRV. : KALIMANTAN TIMUR KAB. : KUTAI SURVEY YEAR : 1982

Code No.	KECAMATAN NAME	CULTIVATED AREA : (PA)	YIELD RATE : (Y)	FARMER'S POPULATION : (AP)	CIRCULATED COMMODITY : (PG)
01	DAMAI	2,475	2.38	16,740	0
02	BENTIAN BESAR	1,660	2.33	16,700	0
03	MUARA LAWA	2,438	2.32	3,990	0
04	BARONG TONGKOK	2,273	2.30	5,950	0
05	MELAK	1,845	2.23	5,410	0
06	MUARA PAHU	2,356	2.51	15,540	0
07	JEMPANG	1,993	2.21	7,960	0
08	PENYINGGAHAN	2,078	2.39	8,610	0
09	BONGAN	2,256	2.23	6,450	0
10	MUARA MUNTAI	953	2.65	6,380	0
11	LOA KULU	1,540	2.44	30,900	0
12	LOA JANAN	1,318	2.49	14,500	0
13	ANGGANA	2,179	3.77	4,000	0
14	MUARA BADAK	1,625	4.52	10,540	0
15	TENGGARONG	3,301	1.45	14,450	0
16	SEBULU	2,384	2.36	10,400	0
17	KOTA BANGUN	1,102	2.72	10,580	0
18	KENOHAN	249	2.62	2,970	0
19	KEMBANG JANGGUT	2,304	2.32	9,530	0
20	MUARA ANCALONG	1,295	2.29	2,610	0
21	MUARA BENGKAL	1,720	2.20	2,040	0
22	MUARA KAMAN	875	2.33	7,230	0
23	BONTANG	2,604	2.44	12,670	0
24	SANGKULIRANG	2,936	2.35	10,060	0
25	MUARA WAHAU	1,806	2.35	19,460	0
26	TABANG	1,087	2.20	3,250	0
27	LONG IRAM	830	2.21	1,760	0
28	LONG BANGUN	2,958	2.74	29,740	0
29	LONG PAHANGAI	3,556	2.94	99,820	0
30	LONG APARI	1,494	2.88	13,950	0

	r_1	r_2	r_3	r_4
ANNUAL AVERAGE GROWTH RATE %	10.0	7.0	6.0	7.9

FARMER'S CONSUMPTION : (Cp)	NON-AGRO REQUIRMENT : (NG)
0.13 Ton/head/year	0.068 Ton/ton

	SEDAN	BUS	TRUCK	MOTOR CYCLE
RATE OF EACH VEHICLE TYPE %	4.31	13.03	14.02	68.64

AVERAGE FREIGHT TONAGE	0.4 Ton/Truck

Appendix A-2 Engineering Data

ROAD LINK DATA

PROVINCE : KALIMANTAN TIMUR

KABUPATEN: KUTAI

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
01	Loa Janan	Rampung Pur Wajaya	2	Loa Janan	2	
02	Loa Bakung	Loa Buah	5	Loa Janan	5	
03	Tenggarong	Loa Tebu	10	Tenggarong	6	
				Sebulu	4	
04	Jl.Prop. Tenggarong	Km 5	4	Tenggarong	4	
05	Loa Kulu I	Ponoragan	5	Tenggarong	5	
06	Loa Kulu I	Kp.Jona Baru	1	Tenggarong	1	
06.1	Loa kulu II	Jl.Prop.		Tenggarong		
06.2	Loa Kulu III	Jl.Prop.		Tenggarong		
07	Lok Sumber	Lobang Batu	1	Tenggarong	1	
08	Km 8	Jahal	9			Dalam Kota
09	Tenggarong	M.Rawang	3			Dalam Kota
10	Kp.Mangkurawang	Kp.Baru	1			Dalam Kota
11	Mawak	Mangkurawang	3			Dalam Kota
12	Tenggarong	Ipuh	4			Dalam Kota
13	Loa Ipuh	Tenggarong	2			Dalam Kota
14	Loa Ipuh	Tenggarong	2			Dalam Kota
15	Jl. Gn.Gandeq Bukit Biru		4	Tenggarong	4	Dalam Kota
16	Raman Aji	Kartini	1			Dalam Kota
17	Jl.Pertamina		3			
18	"					
19	"					
20	"					
21	"					
22	Kp.Tengah	Kp.Mesjid	3	Anggana	3	

Please note the priority No. in the Remarks of this list for each links No. according to the each Kabupaten's development plan.

ROAD LINK DATA

PROVINCE : KALIMANTAN TIMUR

KABUPATEN: KUTAI

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
23	Kp.Tengah	Kp.Kajang		Anggana		
24	Kp.Mesjid	Kp.Kajang	6	Anggana	6	
25	Melak Tengah	Melak Ulu	1	Melak	1	
26	Melak Tengah	Melak Ilir	1	Melak	1	
27	Melak Ilir	Empo Prowen	7	Melak	7	
28	Melak Ulu	Komp.Kantor	2	Melak	2	
29	Komp.Kantor	Sp.Mentiwan	1	Barong Tong-kok	1	
30	Barong Tong-kok	Empo Prowen	13			
31	Kp.Lembong	Tg.Isui	3	Jempang	3	
32	Tg.Isui	Kp.Mancong	8	Jempang	8	
33	Kp. Kelinjau Ulu	Muara Anca-long	4	M. Ancalong	4	
34	Kp. Kelinjau Ulu II	Kp. Kelinjau Ilir	4	M. Ancalong	4	
35	Ds.Ngayau	Benua Baru	7	Bengkal	7	
36	Kembang Jang-gut Ulu	Kembang Jang-gut Ilir	4	Tabang	4	
37	K. Janggut Ilir	Hambau	2	Tabang	2	
38	Hambau	Genting Tanah	6	Tabang	6	
39	Sebelang	Gunung Bayau	6	Muara Pahu	6	
40	Tanjung Laung	Sebelang	6	Muara Pahu	6	
41	Gn.Gandek	Teriti	3	Tenggarong	3	
42	Bekatok	Jembatan III	3	Tenggarong	3	
43			1			Dalam Kota
44			1			Dalam Kota
45			1			Dalam Kota
46			1			Dalam Kota

Please note the priority No. in the Remarks of this list for each links No. according to the each Kabupaten's development plan.

ROAD LINK DATA

PROVINCE : KALIMANTAN TIMUR

KABUPATEN: KUTAI

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
47			1			Dalam Kota
48	Gn.Gandek	Perkebunan Bukit Biru	6	Tenggarong	6	
49	Bukit Biru	Bangun sari	8	Tenggarong	8	
50	Lok Sumber	Lampatan batu	6	Tenggarong	6	
51	Loa Raya	Transmigrasi dalam I	10	Tenggarong	10	
52	Perjiwa	Transmigrasi dalam I	8	Tenggarong	8	
53	Perjiwa	Teluk Dalam	3	Tenggarong	3	
54	Tanjung bulu	Spontan	5	Tenggarong	5	
55	Loa tebu	Sebulu	14	Sebulu	14	
56.1	Bakongan	Lampatan batu	19	Loa kulu	19	
56.2	Margasari	Margasari Dalam		Loa kulu		
57	Kota bangun	Loleng	3	Kota bangun	3	
58	Kahala	Tuana Tuha	15	Tabang Kenonan	7 8	
59	Muara Kaman	Tunjungan	16	Muara Ancalong Muara Kaman	10 6	
60	Teluk Dalam	Transmigrasi Dalam I	6	Tenggarong	6	
61	Separi	Transmigrasi	12	Tenggarong	12	
62	Bontang baru	B.Kuala	2	Bontang	2	
63	Bontang baru	Tg. Laut	3	Bontang	3	
64	Teriti	Jahab	6	Tenggarong	6	
65	Senomi	Teluk Selerong	6	Muara kaman	6	
66	Sepontan	Datar wangi	6	Muara kaman Sebulu	4 2	
67	Ma.Kaman Seberang	Jl.Prop.	7	Muara kaman	7	
68	Loa Haur	Rampung Purwajaya	9	Loa Janan	9	
69	Loa buah	Tg.Laung	12	Tenggarong	12	

Please note the priority No. in the Remarks of this list for each links No. according to the each Kabupaten's development plan.

ROAD LINK DATA

PROVINCE : KALIMANTAN TIMUR

KABUPATEN: KUTAI

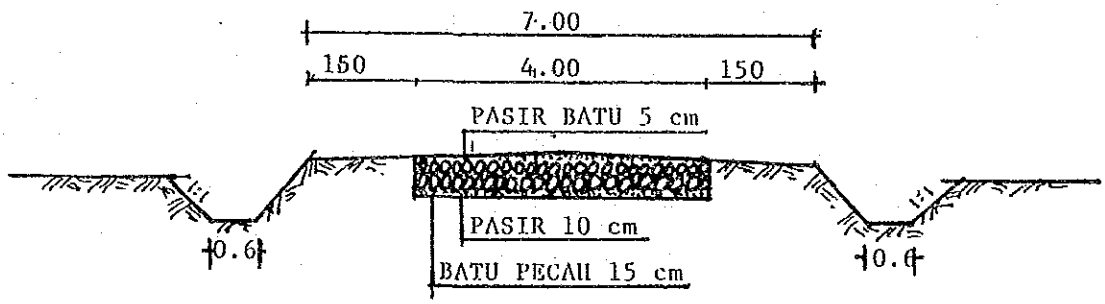
LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
70	Jembayan	Jonggon	14	Sebulu	14	
71	Gn.Panjang	Transmigrasi	4	Tenggarong	4	Dalam Kota
72	Kahala	TL.Bingkai	2	Kanonan	2	
73	Bekatok	Spontan	13	Sebulu	13	

Please note the priority No. in the Remarks of this list for each links No. according to the each Kabupaten's development plan.

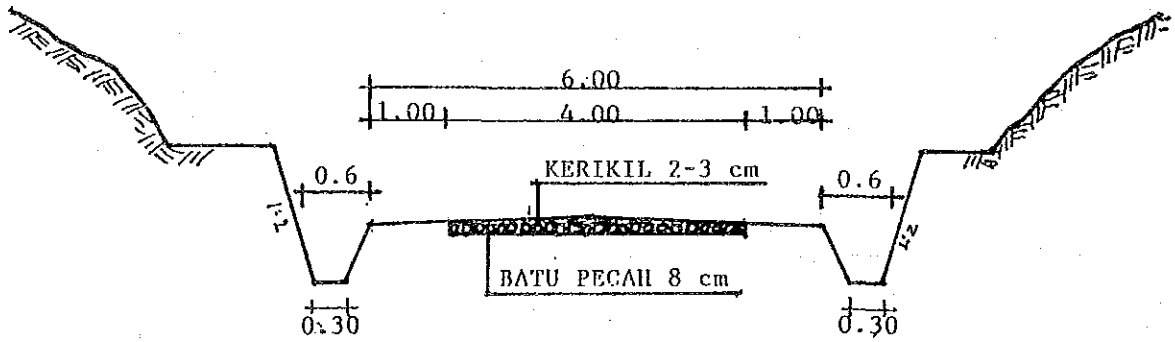
What Kind of Design Criteria has being applied for the new road construction and the improvement for the Kabupaten Road ?
Kriteria Perencanaan yang dipakai pada program penanganan jalan Kabupaten, baik untuk jalan lama maupun pembangunan baru.

Please draw the Typical Cross Section of the Kabupaten Road.
Buat gambar dan penjelasan dari: Typical cross section yang dipakai pada program penanganan jalan selama ini (baik untuk jalan lama, maupun pembangunan baru)

TYPICAL CROSS SECTION.



JALAN AWCAS



JALAN KERIKIL (GRAVEL)

PROPINSI: KALIMANTAN TIMUR

KABUPATEN: KUTAI

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1980/1981

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1980/1981

LINK NO. : Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga ($Rp\ 10^6$)	REMARKS Keterangan

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: KALIMANTAN TIMUR E-03-(2)

KABUPATEN: KUTAI

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1981/1982

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1981/1982

LINK NO. : Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	INPRES DATI II					
	T.Laut-Berebas	4.5	Gravel	2.2	29.5	
	Siar mata sapi-Jl.Mawar			0.5	13.5	Turap
	Jl.Kantor Camat-Perumahan	4	Asphalt	1.0	14.22	
	Jl.Lobang Batu				13.8	
	Jl.Danau Aji-Teriti	4	Asphalt	3.0	40.18	
	Jl.Kec.Melak	4	Asphalt	2.7	42.971	
	Jl.Baru-Jl.Sangaji	5	Asphalt	0.7	22.265	
	Jl.T.Isni-Mancong	6	Gravel	8.0	66.5	
	Jl.Mawar-Mangkurawang	4.5	Asphalt	2.3	63.619	
	Maintenance Jalan Inpres			12.2	44.240	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: KALIMANTAN TIMUR

KABUPATEN: KUTAI

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1981/1982

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1981/1982

LINK NO : Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	INPRES PENUNJANGAN JALAN					
	Loa Tebu-Sebulu	4	Awcas	18	138.320	
		4	Kayu	24 m	4.8	
	Tg.Dalam Transmigrasi	4	Awcas	5.5	45.780	
		4	Kayu	18 m	3.6	
	Meluha-Tg.Buku	4	Awcas	6	50.160	
		4	Kayu	28 m	5.6	
	Kahala-Tuana Tuha	4	Gravel	15	118.600	
		4	Kayu	32 m	3.8	
	Sabin Tulung-Ma.Makam	4	Awcas	6.6	50.1	
		4	Kayu	108 m	21.6	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: KALIMANTAN TIMUR

E-03-(3)

KABUPATEN: KUTAI

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1982/1983

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1982/1983

LINK NO. : Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	INPRES DATI II					
	Penurapan & Pengurugan Jl.Diponegoro			0.3	64.243	
	Penurapan tepi sungai Tenggarong			0.2	40.745	
	Jl.Mawar-Mangkurawang	5	Asphalt	4.5	71.750	
	Jl.Panjaitan	4	Asphalt	1.7	40.900	
	Jl.Kp.Jawa	4	Asphalt	0.9	9.065	
	Jl.T.Laut-Berebes	5	Asphalt	2.2	65.714	
	Jl.Kp.Jawa-L.Kulu	4	Asphalt	1.2	16.200	
	Jl.L.Iram	4	Asphalt	6.0	36.023	
	Jl.Puskesmas Mangkurawang / Stadion	4	Asphalt	3.0	23.263	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: KALIMANTAN TIMUR E-03-(3)

KABUPATEN: KUTAI LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1982/1983

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1982/1983

LINK NO. : Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) Lebar Jembatan	Type perkerasan Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	INPRES PENUNJANGAN					
50	Bontang-Perkampungan Nelayan	6	Gravel	12.0	111.8	
31	Muara Kaman-Sabin Tulung	6	Gravel	9.4	84	
37	Jemb.III S.Tenggarong Teriti	6	Gravel	3	26.6	
		6		8 m	2.1	
32	Separi-Trans Lampiri	6	Gravel	12	111.9	
		6		10 m	3.5	
33	Perjiwa-Lampiri	6	Gravel	10	88.8	
		6		20 m	7.0	
34	Bukit biru-Gn.Gandeq	6	Gravel		30.1	
35	Bukit Biru-Bangun Sari	6	Gravel	6.5	57.8	
		6		12	2.8	
36	Loa Raya-Lampiri	6	Gravel	10	88.8	
		6		20 m	22.4	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: KALIMANTAN TIMUR

E-03-(4)

KABUPATEN: KUTAI

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1983/1984

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1983/1984

LINK NO Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	INPRES DATI II					
	Jl.Loa-Tebu	4.5	Asphalt	3.0	99.304	
	Jl.Danau Aji-Gn.Gandek	4.0	Asphalt	2.7	69.706	
	Jl.Sangkulirang	4.0	Asphalt	2.0	66.514	
	Jl.Kp.Jawa-Tenggarong	4.0	Asphalt	0.8	28.807	
	Jl.Kp.Jawa Baru-Loa Kulu	4.0	Asphalt	1.2	37.361	
	Jl.Stadion-Maluhas	4.0	Asphalt	0.8	32.910	
	Jl.Kec.Melak	4.0	Gravel	0.5	7.329	
	Jembatan Mangkurawang			0.2	13.891	
	Jl.Kec.Long Iram	4.0	Gravel	1.0	28.471	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI: KALIMANTAN TIMUR E-03-(4)

KABUPATEN: KUTAI

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1983/1984

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1983/1984

LINK NO Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga ($Rp\ 10^6$)	REMARKS Keterangan
	INPRES PENUNJANGAN JALAN					
	Teriti-Jahab	4.5	Gravel	6	56.08	
		4.5		12 m	7.5	
	Bakongan-Lampa Patan Baru	4.5	Gravel	19	192.08	
		4.5		4 m	2.5	
	Lok Sumber-Lam.Lampatan	4.5	Gravel	6	57.93	
		4.5		10 m	6.25	
	Kp.Tengah-Kp.MasjidAnggana	4.5	Gravel	3	38.23	
		4.5		18 m	11.25	
	Senoni-Selorong	4.5	Gravel	6	56.32	
		4.5		16 m	0.4	
	Kt.Bangun Ulu-Kt.Ba.Ilir	4.5	Gravel	10	98.48	
		4.5		20 m	12.5	
	Meluhu Spontan-Datar Wangi	4.5	Gravel	6	72.60	
		4.5		15 m	9.38	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI:KALIMANTAN TIMUR

E-03-(5)

KABUPATEN: KUTAI

LOCATION AND COSTS OF THE KABUPATEN ROADS CONSTRUCTED OR INPROVED IN 1984/1985

Biaya konstruksi penanganan jalan dan jembatan Kabupaten thn. 1984/1985

LINK NO Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) Lebar Jembatan	Type perkerasan Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	INPRES DATI II					
	Jl.Umum-Kantor Camat	4.0	Asphalt	2.0	50	
	Penurapan			1.0	73.5	
	Bontang-Kuala	4.0	Gravel	2.0	45	
	Badak-Toko Lima	4.0	Gravel	2.5	57.8	
	Jl.Stadion Rondong Demang	4.0	Asphalt	0.5	18.5	
	Gn.Lumut-Jembatan IV	4.0	Gravel	1.2	27.5	
	Jl.Bekotok	4.0	Gravel	2.2	44.36	
	Jl.Loa Buah Kec.L.Janan	4.0	Gravel	1.0	22.50	
	Penurapan Tepi Sungai Mahakam dr Km 1 s/d5 Tgr			0.5	37.50	
	Jl.Long Iram	3.5	Gravel	2.0	24.336	

* PAVEMENT TYPE : Pls note the appropriate No. below.

1. : Asphalt surface / penetrasi macadam
2. : Asphalt seal / pelaburan aspal
3. : Gravel / kerikil
4. : Gravel /AWCAS / kerikil / japat

PROPINSI : KALIMANTAN TIMUR E-04

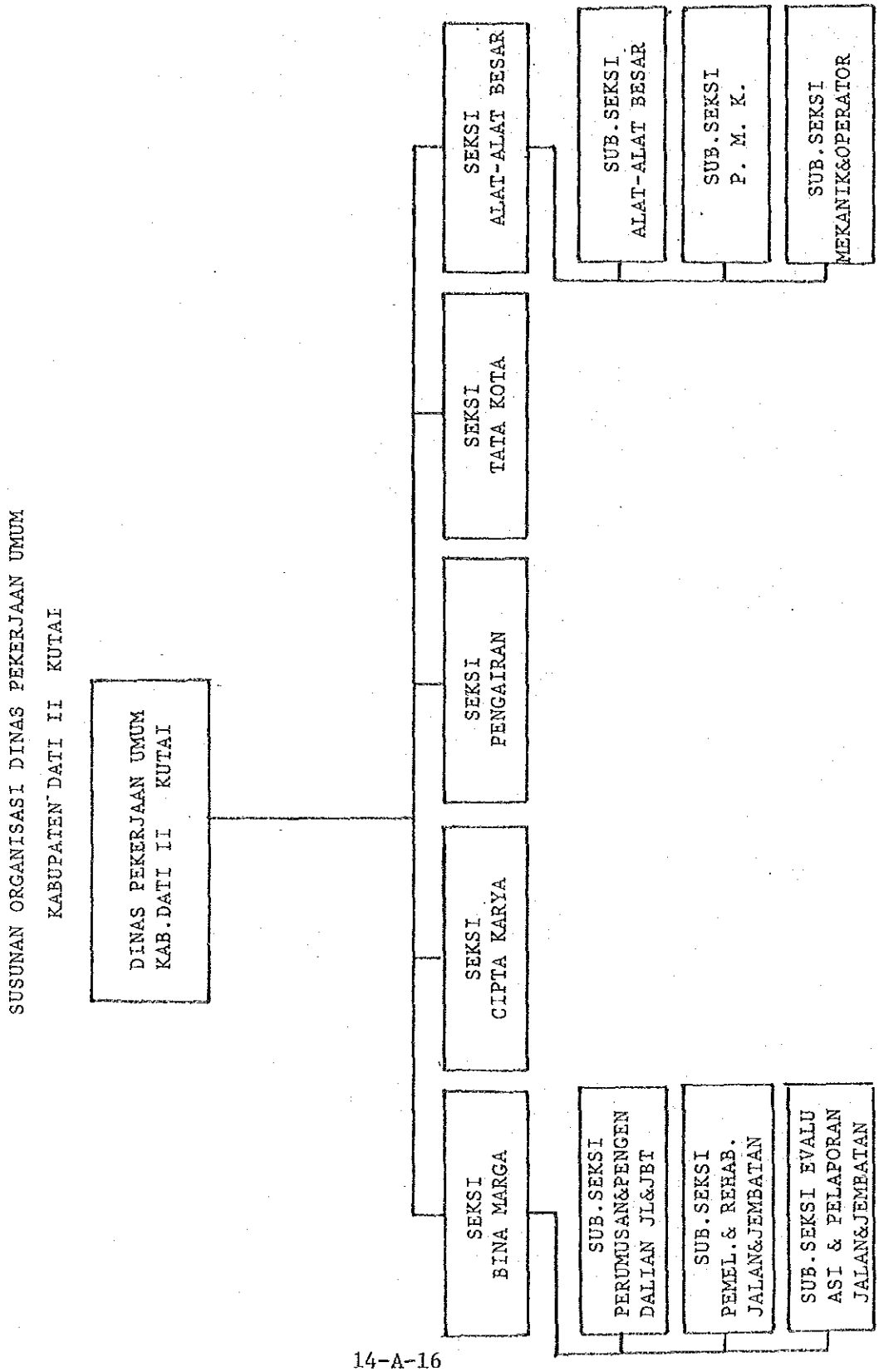
KABUPATEN: KUTAI

EXISTING ORGANIZATION IN KABUPATEN

Structur Organisasi yang ada dari P.U Kabupaten

Please draw the Cart of the Existing Organization in the Kabupaten.

Harap digambar bagan organisasi dari DPUK.



EXISTING STAFF RESOURCES OF BINA MARGA OF PU KABUPATEN

Tenaga Dinas PUK yang ada

PROPINSI: KALIMANTAN TIMUR

KABUPATEN: KUTAI/TENGGARONG

DESCRIPTION /Uraian	NUMBER / Jumlah	REMARKS Keterangan
CONTROLING STAFF Staff teknis PUK	———	———
DPUK ENGINEED Sarjana Teknik		
ASSISTANT ENGINEER Sarjana Muda Teknik	4	
TECHNICIAN STAFF Staff Teknik (STM)	20	
ADMINISTRATION Tenaga Administrasi	23	
SUPERVISOR Tenaga Pengawas		
WORKING FORCE Tenaga Pelaksana Lapangan	———	———
OPERATORS Operators		
DRIVERS Supir		
MECHANICS Mechanic		
TRADESMAN Tukang		
L A B O U R Buruh / Pekerja		
OTHERS Lain-lain		
TOTAL / JUMLAH	47	

Catatan ; Untuk kolom keterangan harap diisi berapa orang yang telah mendapat Training.

E-06

LOCATION AND AREA OF DPUK WORKSHOP

Lokasi Workshop DPUK

PROPINSI : KALIMANTAN TIMUR

KABUPATEN: KUTAI

LOCATION Lokasi	AREA (m2) Luas	NUMBER Jumlah	REMARKS Keterangan

PROPINSI: KALIMANTAN TIMUR

E-07

KABUPATEN: KUTAI

LAND ACQUISITION COST

Daftar harga pembebasan tanah

DESCRIPTION Uraian	UNIT Satuan	RATE (RP) Harga	REMARKS Keterangan
CITY/kota	M2	2,500	
VILLAGE / desa	M2	1,625	
RICE FIELD/sawah	M2	300	
DRY FIELD/ladang	M2	600	
MIX CROPS/panen	M2		
FOREST/hutan	M2		
SWAMP / rawa	M2		
OTHERS / lain-lain	M2		

PROPINSI: KALIMANTAN TIMUR

E-08

KABUPATEN: KUTAI

Classification of local contractors at Kabupaten level.

Klasifikasi kontraktor di Kabupaten

COMPANY NAME Nama Kontraktor	CLASS Kelas	CAPITAL Modal (Rp)	NUMBER OF EMPLOYEE Jumlah pegawai	REMARKS Keterangan
1	A2	200 - 500 juta	18	
6	B2	50 - 100 juta	9	
26	C1	20 - 50 juta	7	
40	C2	0 - 20 juta	8	

NOTE: DATI II

PROPINSI: KALIMANTAN TIMUR

KABUPATEN: KUTAI

LIST OF EXISTING EQUIPMENT OF LOCAL CONTRACTOR

Name of contractor

NAME OF EQUIPMENT Jenis peralatan	EXISTING CONDITION/ Kondisi Peralatan						REQUIRE - MENT / Kebutuhan peralatan baru
	TYPE/ Tipe	P.Y	NUMBER / Jumlah			REASON OF BAD CONDITION/Sebab Kerusakan	
			GOOD Baik	BAD Rusak	TOTAL Jumlah		
Bulldozer							
Motor Grader							
Tyre Roller							
Steel Whell Roller							
Vibration Roller							
Wheel Loader							
Front End Loader and Backhoe							
Mobile Crane							
Concrete Mixer							
Stone Crusher							
Portable Compressor							
Hydraulic Excavator							
Asphalt Paving Machine							
Asphalt Sprayer							
Asphalt Mixing Machine							
Mobile Workshop							
Mechanic Rammer							
Plate Tamper							
Pile Driver							
Leg Drill							
Hand Hammer							
Farm Tractor							
Dump Truck							
Water Tank Truck							
Fuel Tank Truck							
Pick Up							
Jeep							
Motorcycle							
Generator							
Water Pump							
Others							

PROPINSI: KALIMANTAN TIMUR

KABUPATEN: KUTAI

LIST OF EXISTING EQUIPMENT OF P.U KABUPATEN

NAME OF EQUIPMENT Jenis peralatan	EXISTING CONDITION/ Kondisi Peralatan						REQUIRE - MENT / Kebutuhan peralatan baru
	TYPE/ Tipe	P.Y	NUMBER / Jumlah			REASON OF BAD CONDITION/Sebab Kerusakan	
			GOOD Baik	BAD Rusak	TOTAL Jumlah		
Bulldozer							
Motor Grader							
Tyre Roller							
Steel Whell Roller							
Vibration Roller							
Wheel Loader							
Front End Loader and Backhoe							
Mobile Crane							
Concrete Mixer							
Stone Crusher							
Portable Compressor							
Hydraulic Excavator							
Asphalt Paving Machine							
Asphalt Sprayer							
Asphalt Mixing Machine							
Mobile Workshop							
Mechanic Rammer							
Plate Tamper							
Pile Driver							
Leg Drill							
Hand Hammer							
Farm Tractor							
Dump Truck							
Water Tank Truck							
Fuel Tank Truck							
Pick Up							
Jeep							
Motorcycle							
Generator							
Water Pump							
Others							

Appendix A-3 CONSTRUCTION AND MAINTENANCE COST FOR PROPOSED ROAD LINKS

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 74 (IIIC) LENGTH : 23 Km

UPGRADE : 6.0m road bed, 4.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	TOTAL >>>>>>
Site Clearance in Light Bush	m2	414000.0	172	91	71,208,000	37,674,000	108,882,000
Subgrade Preparation	m2	138000.0	22	11	3,036,000	1,518,000	4,554,000
Noraal Fill	m3	5000.0	1,784	863	8,920,000	4,315,000	13,235,000
Fill in Swamp	m3	52000.0	2,621	1,053	136,292,000	54,756,000	191,048,000
Noraal Excavation to Spoil	m3	2000.0	1,044	523	2,088,000	1,046,000	3,134,000
Sub Base Course	m3	9200.0	3,357	1,348	30,884,400	12,401,600	43,286,000
Base Course	m3	0.0	4,604	2,300	0	0	0
Shoulder	m2	0.0	310	146	0	0	0
Asphalt Patching	m2	0.0	3,617	1,512	0	0	0
Surface Dressing (Single)	m2	0.0	587	766	0	0	0
Surface Dressing (Double)	m2	0.0	737	1,207	0	0	0
Earth Drain	m	12500.0	800	119	10,000,000	1,487,500	11,487,500
Earth Drain in Swamp (by aachine)	m3	58000.0	1,231	474	71,398,000	27,492,000	98,890,000
Pipe Culvert D80cm	m	500.0	44,289	50,140	22,144,500	25,070,000	47,214,500
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	200.0	50,559	11,682	10,111,800	2,336,400	12,448,200
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	274,785,600	33,976,200	308,761,800
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		640,868,300	202,072,700	842,941,000
Overhead (15%)					96,130,245	30,310,905	126,441,150
			TOTAL COST		736,998,545	232,383,605	969,382,150
Manual routine aaintenance of road	Km	23.0	127,720	7,248	2,937,560	166,704	3,104,264
Routine aaintenance of gravel road	Km	23.0	200,130	88,092	4,602,990	2,026,116	6,629,106
			Sub Total		7,540,550	2,192,820	9,733,370
Maintenance of Timber Bridge (New)	m2	2000.0	7,234	1,009	14,468,000	2,018,000	16,486,000
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	26,708,960
Timber Bridge	Unit Cost	(Rp/m2)	:	177,538
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	17,314,400
Maintenance Rate without Bridge		(%)	:	1.58
New Bridge Cost Rate		(%)	:	36.63

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 70 (IIIB-1) LENGTH : 14 Km

UPGRADE : 6.5m road bed, 4.0m road with surface Dressing (1)

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	172	91	0	0	0
Subgrade Preparation	m2	71240.0	22	11	1,567,280	783,640	2,350,920
Normal Fill	m3	0.0	1,784	863	0	0	0
Fill in Swamp	m3	348.0	2,621	1,053	912,108	366,444	1,278,552
Normal Excavation to Spoil	m3	140.0	1,044	523	146,160	73,220	219,380
Sub Base Course	m3	5807.2	3,357	1,348	19,494,770	7,828,105	27,322,875
Base Course	m3	3360.0	4,604	2,300	15,469,440	7,728,000	23,197,440
Shoulder	m2	63000.0	310	146	19,530,000	9,198,000	28,728,000
Asphalt Patching	m2	994.0	3,617	1,512	3,595,298	1,502,928	5,098,226
Surface Dressing (Single)	m2	56000.0	587	766	32,872,000	42,896,000	75,768,000
Surface Dressing (Double)	m2	0.0	737	1,207	0	0	0
Earth Drain	m	4000.0	800	119	3,200,000	476,000	3,676,000
Earth Drain in Swamp (by machine)	m3	2400.0	1,231	474	2,954,400	1,137,600	4,092,000
Pipe Culvert D80cm	m	0.0	44,289	50,140	0	0	0
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	50,559	11,682	0	0	0
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		99,741,456	71,989,937	171,731,393
Overhead (15%)					14,961,218	10,798,490	25,759,708
			TOTAL COST		114,702,674	82,788,427	197,491,101
Manual routine maintenance of road	Km	14.0	127,720	7,248	1,788,080	101,472	1,889,552
Routine maintenance of asphalt road	Km	14.0	361,700	151,200	5,063,800	2,116,800	7,180,600
			Sub Total		6,851,880	2,218,272	9,070,152
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	14,106,507
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	23,765,500
Maintenance Rate without Bridge		(%)	:	4.59
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 60 (III-1) LENGTH : 9 Km

UPGRADE : 6.5m road bed, 4.0m road with surface Dressing (1)

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	COST TOTAL
Site Clearance in Light Bush	m2	0.0	172	91	0	0	0
Subgrade Preparation	m2	42500.0	22	11	935,000	467,500	1,402,500
Normal Fill	m3	0.0	1,784	863	0	0	0
Fill in Swamp	m3	0.0	2,621	1,053	0	0	0
Normal Excavation to Spoil	m3	70.0	1,044	523	73,080	36,610	109,690
Sub Base Course	m3	3592.4	3,357	1,348	12,059,686	4,842,555	16,902,241
Base Course	m3	2240.0	4,604	2,300	10,312,960	5,152,000	15,464,960
Shoulder	m2	40500.0	310	146	12,555,000	5,913,000	18,468,000
Asphalt Patching	m2	497.0	3,617	1,512	1,797,649	751,464	2,549,113
Surface Dressing (Single)	m2	36000.0	587	766	21,132,000	27,576,000	48,708,000
Surface Dressing (Double)	m2	0.0	737	1,207	0	0	0
Earth Drain	m	2000.0	800	119	1,600,000	238,000	1,838,000
Earth Drain in Swamp (by machine)	m3	0.0	1,231	474	0	0	0
Pipe Culvert D80cm	m	0.0	44,289	50,140	0	0	0
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	50,559	11,682	0	0	0
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		60,465,375	44,977,129	105,442,504
Overhead (15%)					9,069,806	6,746,569	15,816,375
			TOTAL COST		69,535,181	51,723,698	121,258,879
Manual routine maintenance of road	Km	9.0	127,720	7,248	1,149,480	65,232	1,214,712
Routine maintenance of asphalt road	Km	9.0	361,700	151,200	3,255,300	1,360,800	4,616,100
			Sub Total		4,404,780	1,426,032	5,830,812
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	13,473,209
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	14,924,560
Maintenance Rate without Bridge		(%)	:	4.81
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 61 (III-1) LENGTH : 12 Km

UPGRADE : 7.5m road bed, 3.5m road with surface Dressing (1)

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	172	91	0	0	0
Subgrade Preparation	m2	3240.0	22	11	71,280	35,640	106,920
Normal Fill	m3	0.0	1,784	863	0	0	0
Fill in Swamp	m3	960.0	2,621	1,053	2,516,160	1,010,880	3,527,040
Normal Excavation to Spoil	m3	0.0	1,044	523	0	0	0
Sub Base Course	m3	2327.2	3,357	1,348	7,812,410	3,137,065	10,949,475
Base Course	m3	2940.0	4,604	2,300	13,535,760	6,762,000	20,297,760
Shoulder	m2	48000.0	310	146	14,880,000	7,008,000	21,888,000
Asphalt Patching	m2	0.0	3,617	1,512	0	0	0
Surface Dressing (Single)	m2	42000.0	587	766	24,654,000	32,172,000	56,826,000
Surface Dressing (Double)	m2	0.0	737	1,207	0	0	0
Earth Drain	m	0.0	800	119	0	0	0
Earth Drain in Swamp (by machine)	m3	2400.0	1,231	474	2,954,400	1,137,600	4,092,000
Pipe Culvert D80cm	m	16.0	44,289	50,140	708,624	802,240	1,510,864
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	6.4	50,559	11,602	323,577	74,764	398,341
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		67,456,211	52,140,189	119,596,400
Overhead (15%)					*10,118,431*	*7,821,028*	*17,939,459*
			TOTAL COST		77,574,642	59,961,217	137,535,859
Manual routine maintenance of road	Km	12.0	127,720	7,248	1,532,640	86,976	1,619,616
Routine maintenance of asphalt road	Km	12.0	361,700	151,200	4,340,400	1,814,400	6,154,800
			Sub Total		5,873,040	1,901,376	7,774,416
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	*Unit Cost*	*(Rp/Km)*	:	*11,461,322*
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	11,724,184
Maintenance Rate without Bridge		(%)	:	5.65
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 59 (IIIA) LENGTH : 16 Km

UPGRADE : 8.0m road bed, 5.0m road with surface Dressing (2)

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	13500.0	172	91	2,322,000	1,228,500	3,550,500
Subgrade Preparation	m2	48000.0	22	11	1,056,000	528,000	1,584,000
Normal Fill	m3	0.0	1,784	863	0	0	0
Fill in Swamp	m3	0.0	2,621	1,053	0	0	0
Normal Excavation to Spoil	m3	1106.0	1,044	523	1,154,664	578,438	1,733,102
Sub Base Course	m3	7168.4	3,357	1,348	24,064,318	9,663,003	33,727,321
Base Course	m3	6400.0	4,604	2,300	29,465,600	14,720,000	44,185,600
Shoulder	m2	48000.0	310	146	14,880,000	7,008,000	21,888,000
Asphalt Patching	m2	0.0	3,617	1,512	0	0	0
Surface Dressing (Single)	m2	0.0	587	766	0	0	0
Surface Dressing (Double)	m2	80000.0	737	1,207	58,960,000	96,560,000	155,520,000
Earth Drain	m	11700.0	800	119	9,360,000	1,392,300	10,752,300
Earth Drain in Swamp (by machine)	m3	0.0	1,231	474	0	0	0
Pipe Culvert D80cm	m	240.0	44,289	50,140	10,629,360	12,033,600	22,662,960
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	96.0	50,559	11,682	4,853,664	1,121,472	5,975,136
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		156,745,606	144,833,313	301,578,919
Overhead (15%)					23,511,840	21,724,996	45,236,836
			TOTAL COST		180,257,446	166,558,309	346,815,755
Manual routine maintenance of road	Km	16.0	127,720	7,248	2,043,520	115,968	2,159,488
Routine maintenance of asphalt road	Km	16.0	361,700	151,200	5,787,200	2,419,200	8,206,400
			Sub Total		7,830,720	2,535,168	10,365,888
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	21,675,985
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	38,028,256
Maintenance Rate without Bridge		(%)	:	2.79
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 60 (TITA) LENGTH : 6 Km

UPGRADE : 9.5m road bed, 6.5m road with surface Dressing (2)

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	4000.0	172	91	688,000	364,000	1,052,000
Subgrade Preparation	m2	28500.0	22	11	627,000	313,500	940,500
Normal Fill	m3	0.0	1,784	883	0	0	0
Fill in Swamp	m3	0.0	2,621	1,053	0	0	0
Normal Excavation to Spoil	m3	420.0	1,044	523	438,480	219,660	658,140
Sub Base Course	m3	3631.6	3,357	1,348	12,191,281	4,895,396	17,086,677
Base Course	m3	2600.0	4,604	2,300	11,970,400	5,980,000	17,950,400
Shoulder	m2	18000.0	310	146	5,580,000	2,628,000	8,208,000
Asphalt Patching	m2	497.0	3,617	1,512	1,797,649	751,464	2,549,113
Surface Dressing (Single)	m2	6500.0	587	766	3,815,500	4,979,000	8,794,500
Surface Dressing (Double)	m2	32500.0	737	1,207	23,952,500	39,227,500	63,180,000
Earth Drain	m	2000.0	800	119	1,600,000	238,000	1,838,000
Earth Drain in Swamp (by machine)	m3	0.0	1,231	474	0	0	0
Pipe Culvert 080cm	m	0.0	44,289	50,140	0	0	0
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	50,559	11,682	0	0	0
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		62,660,810	59,596,520	122,257,330
Overhead (15%)					9,399,121	8,939,478	18,338,599
			TOTAL COST		72,059,931	68,535,998	140,595,929
Manual routine maintenance of road	Km	6.0	127,720	7,248	766,320	43,488	809,808
Routine maintenance of asphalt road	Km	6.0	361,700	151,200	2,170,200	907,200	3,077,400
			Sub Total		2,936,520	950,688	3,887,208
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	23,432,655
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	18,156,941
Maintenance Rate without Bridge		(%)	:	2.76
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 69 (III A) LENGTH : 12 Km

UPGRADE : 6.0m road bed, 4.5m road with surface Dressing (2)

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	172	91	0	0	0
Subgrade Preparation	m2	18000.0	22	11	396,000	198,000	594,000
Normal Fill	m3	0.0	1,784	863	0	0	0
Fill in Swamp	m3	0.0	2,621	1,053	0	0	0
Normal Excavation to Spoil	m3	615.0	1,044	523	642,060	321,645	963,705
Sub Base Course	m3	4127.6	3,357	1,348	13,856,353	5,564,004	19,420,357
Base Course	m3	4320.0	4,604	2,300	19,889,280	9,936,000	29,825,280
Shoulder	m2	18000.0	310	146	5,580,000	2,628,000	8,208,000
Asphalt Patching	m2	0.0	3,617	1,512	0	0	0
Surface Dressing (Single)	m2	0.0	587	766	0	0	0
Surface Dressing (Double)	m2	54000.0	737	1,207	39,798,000	65,178,000	104,976,000
Earth Drain	m	7180.0	800	119	5,744,000	854,420	6,598,420
Earth Drain in Swamp (by machine)	m3	0.0	1,231	474	0	0	0
Pipe Culvert D80cm	m	240.0	44,289	50,140	10,629,360	12,033,600	22,662,960
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	96.0	50,559	11,682	4,853,664	1,121,472	5,975,136
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		101,388,717	97,835,141	199,223,858
Overhead (15%)					15,208,307	14,675,271	29,883,578
			TOTAL COST		116,597,024	112,510,412	229,107,436
Manual routine maintenance of road	Km	12.0	127,720	7,248	1,532,640	86,976	1,619,616
Routine maintenance of asphalt road	Km	12.0	361,700	151,200	4,340,400	1,814,400	6,154,800
			Sub Total		5,873,040	1,901,376	7,774,416
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	19,092,286
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	22,992,605
Maintenance Rate without Bridge		(%)	:	3.39
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 67 (IIIA) LENGTH : 7 Km

UPGRADE : 9.0m road bed, 6.0m road with surface Dressing (2)

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Site Clearance in Light Bush	m2	5000.0	172	91	860,000	455,000	1,315,000
Subgrade Preparation	m2	18000.0	22	11	396,000	198,000	594,000
Normal Fill	m3	0.0	1,784	863	0	0	0
Fill in Swamp	m3	0.0	2,621	1,053	0	0	0
Normal Excavation to Spoil	m3	570.0	1,044	523	595,080	298,110	893,190
Sub Base Course	m3	3306.4	3,357	1,348	11,099,584	4,457,027	15,556,611
Base Course	m3	3360.0	4,604	2,300	15,469,440	7,728,000	23,197,440
Shoulder	m2	21000.0	310	146	6,510,000	3,066,000	9,576,000
Asphalt Patching	m2	0.0	3,617	1,512	0	0	0
Surface Dressing (Single)	m2	0.0	587	766	0	0	0
Surface Dressing (Double)	m2	42000.0	737	1,207	30,954,000	50,694,000	81,648,000
Earth Drain	m	5000.0	800	119	4,000,000	595,000	4,595,000
Earth Drain in Swamp (by machine)	m3	0.0	1,231	474	0	0	0
Pipe Culvert D80cm	m	240.0	44,289	50,140	10,629,360	12,033,600	22,662,960
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	96.0	50,559	11,682	4,853,664	1,121,472	5,975,136
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		85,367,128	80,646,209	166,013,337
Overhead (15%)					12,805,069	12,096,931	24,902,000
			TOTAL COST		98,172,197	92,743,140	190,915,337
Manual routine maintenance of road	Km	7.0	127,720	7,248	894,040	50,736	944,776
Routine maintenance of asphalt road	Km	7.0	361,700	151,200	2,531,900	1,058,400	3,590,300
			Sub Total		3,425,940	1,109,136	4,535,076
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	27,273,620
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	18,244,648
Maintenance Rate without Bridge		(%)	:	2.38
New Bridge Cost Rate		(%)	:	

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 57 (IIIA) LENGTH : 3 Km

UPGRADE : 6.0m road bed, 4.0m road with surface dressing (2)

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	172	91	0	0	0
Subgrade Preparation	m2	6000.0	22	11	132,000	66,000	198,000
Normal Fill	m3	0.0	1,784	863	0	0	0
Fill in Swamp	m3	0.0	2,621	1,053	0	0	0
Normal Excavation to Spoil	m3	116.0	1,044	523	121,104	60,668	181,772
Sub Base Course	m3	932.0	3,357	1,348	3,128,724	1,256,336	4,385,060
Base Course	m3	960.0	4,604	2,300	4,419,840	2,208,000	6,627,840
Shoulder	m2	6000.0	310	146	1,860,000	876,000	2,736,000
Asphalt Patching	m2	0.0	3,617	1,512	0	0	0
Surface Dressing (Single)	m2	0.0	587	766	0	0	0
Surface Dressing (Double)	m2	12000.0	737	1,207	8,844,000	14,484,000	23,328,000
Earth Drain	m	1040.0	800	119	832,000	123,760	955,760
Earth Drain in Swamp (by machine)	m3	0.0	1,231	474	0	0	0
Pipe Culvert D80cm	m	0.0	44,289	50,140	0	0	0
Masonry Culvert (80x80cm)	m	0.0	66,426	40,282	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	50,559	11,682	0	0	0
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		19,337,668	19,074,764	38,412,432
Overhead (15%)					2,900,650	2,861,214	5,761,864
			TOTAL COST		22,238,318	21,935,978	44,174,296
Manual routine maintenance of road	Km	3.0	127,720	7,248	383,160	21,744	404,904
Routine maintenance of asphalt road	Km	3.0	361,700	151,200	1,085,100	453,600	1,538,700
			Sub Total		1,468,260	475,344	1,943,604
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,812	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement Unit Cost	(Rp/Km)	:	14,724,766
Timber Bridge Unit Cost	(Rp/m2)	:	
Concrete Bridge Unit Cost	(Rp/m2)	:	
Survived Value	(Rp)	:	5,165,008
Maintenance Rate without Bridge	(%)	:	4.40
New Bridge Cost Rate	(%)	:	

PROV : KALIMANTAN TIMUR KAB : KUTAI

LINK NO : 56 (IIIB-1) LENGTH : 19 Km

UPGRADE : 7.5m road bed, 4.5m road with surface Dressing (1)

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	172	91	0	0	0
Subgrade Preparation	m2	120000.0	22	11	2,640,000	1,320,000	3,960,000
Normal Fill	m3	0.0	1,784	863	0	0	0
Fill in Swamp	m3	0.0	2,621	1,053	0	0	0
Normal Excavation to Spoil	m3	0.0	1,044	523	0	0	0
Sub Base Course	m3	10486.4	3,357	1,348	35,202,844	14,135,667	49,338,511
Base Course	m3	5985.0	4,604	2,300	27,554,940	13,765,500	41,320,440
Shoulder	m2	57000.0	310	146	17,670,000	8,322,000	25,992,000
Asphalt Patching	m2	0.0	3,617	1,512	0	0	0
Surface Dressing (Single)	m2	85500.0	587	766	50,188,500	65,493,000	115,681,500
Surface Dressing (Double)	m2	0.0	737	1,207	0	0	0
Earth Drain	m	0.0	800	119	0	0	0
Earth Drain in Swamp (by machine)	m3	0.0	1,231	474	0	0	0
Pipe Culvert D80cm	m	242.0	44,289	50,140	10,717,938	12,133,080	22,851,018
Masonry Culvert (80x80cm)	m	46.0	66,426	40,282	3,055,596	1,852,972	4,908,568
Retaining Wall and Wing Wall (Timber)	m2	0.0	10,566	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	96.9	50,559	11,682	4,899,167	1,131,985	6,031,152
Gabion Protection	m3	0.0	20,132	120	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		151,928,985	118,155,004	270,083,989
Overhead (15%)					22,789,347	17,723,250	40,512,597
			TOTAL COST		174,718,332	135,878,254	310,596,586
Manual routine maintenance of road	Km	19.0	127,720	7,248	2,426,680	137,712	2,564,392
Routine maintenance of asphalt road	Km	19.0	361,700	151,200	6,872,300	2,872,800	9,745,100
			Sub Total		9,298,980	3,010,512	12,309,492
Maintenance of Timber Bridge (New)	m2	0.0	7,234	1,009	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,817	3,001	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	7,746	2,347	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	4,491	2,443	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	16,347,189
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	42,801,045
Maintenance Rate without Bridge		(%)	:	3.96
New Bridge Cost Rate		(%)	:	