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 25

KABUPATEN TABALONG

MARCH 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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 25

KABUPATEN TABALONG

MARCH 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

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

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

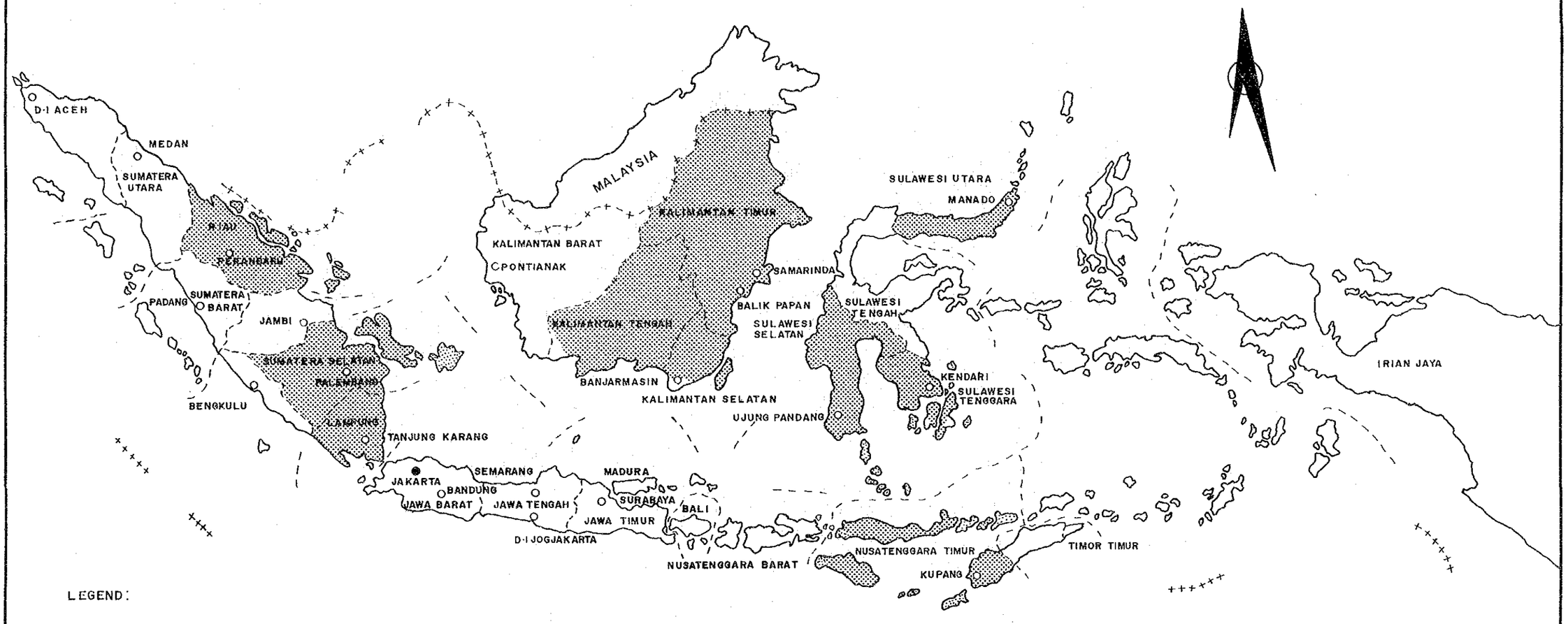
Since the study period was limited, without cooperation of Bina Marga, Bangda and local governments of both province and Kabupaten in collecting the data, the study would not have been completed within the period.

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

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

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

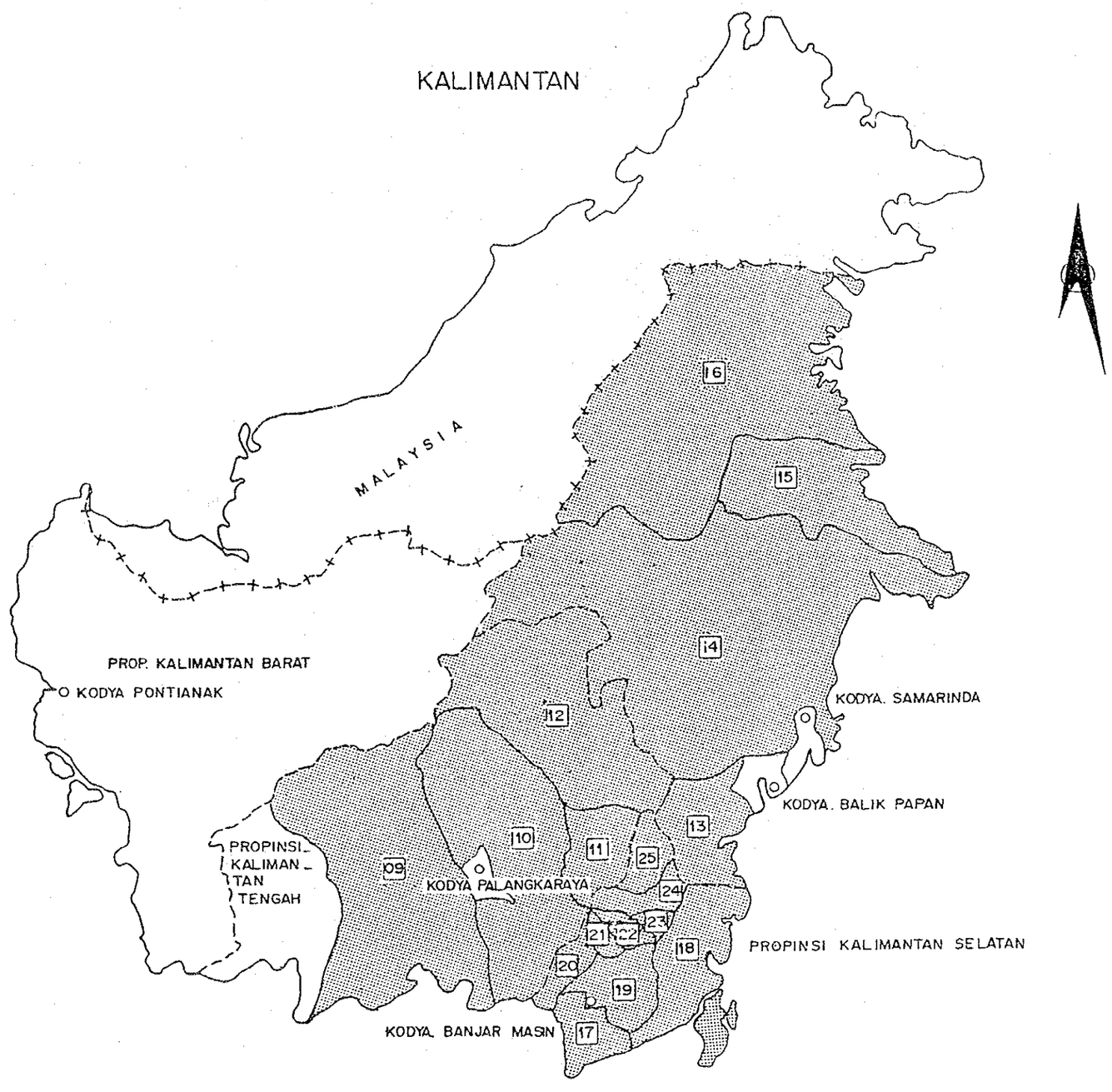
LOCATION MAP OF THE PROJECT AREAS



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

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

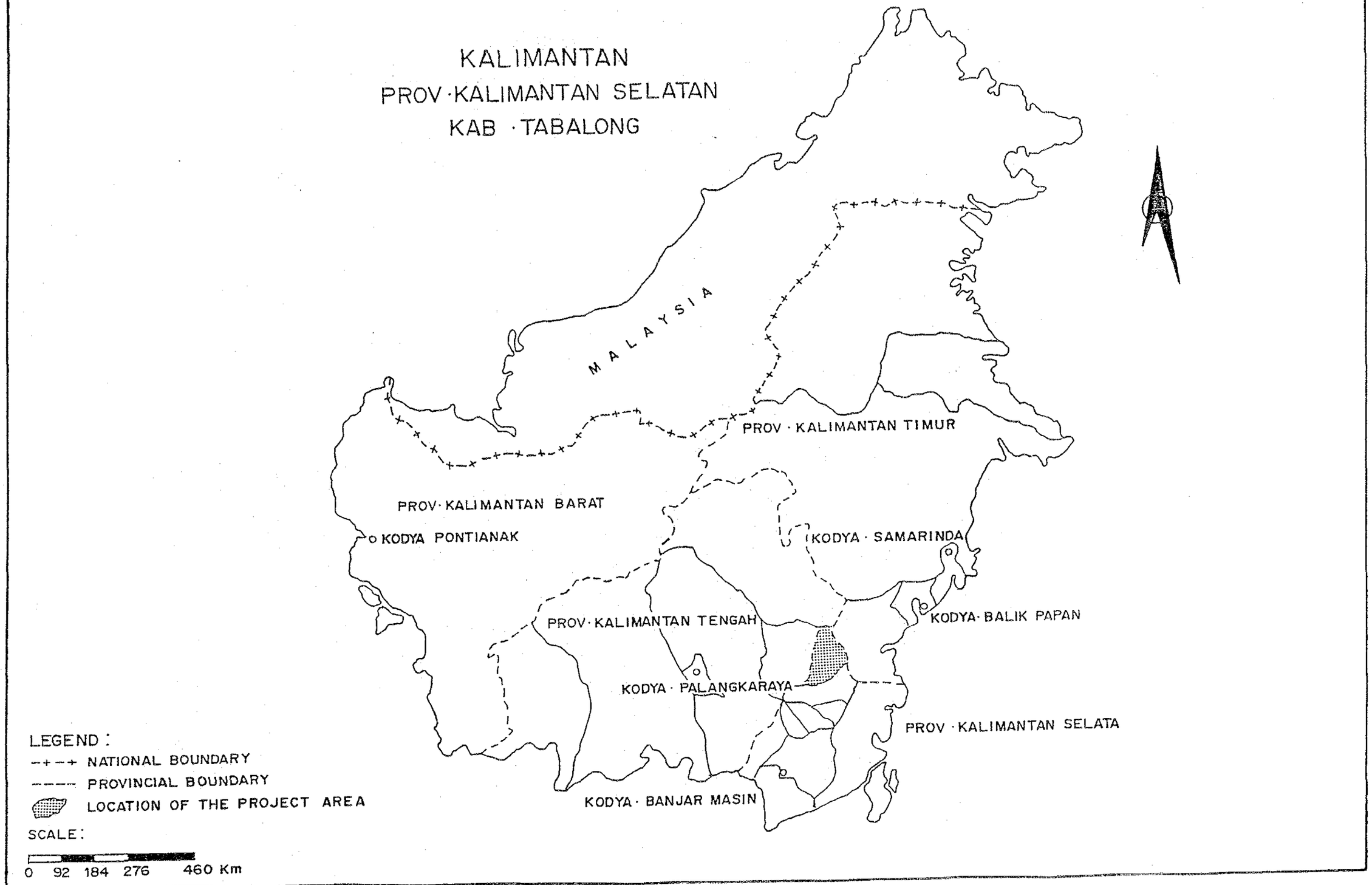
VI · PROPINSI KALIMANTAN SELATAN
- 17 · KAB · TANAH LAUT
- 18 · KAB · KOTA BARU
- 19 · KAB · BANJAR
- 20 · KAB · BARITO KUALA
- 21 · KAB · TAPIN
- 22 · KAB · HULU SUNGAI SELATAN
- 23 · KAB · HULU SUNGAI TENGAH
- 24 · KAB · HULU SUNGAI UTARA
- 25 · KAB · TABALONG



LEGEND :
- NATIONAL BOUNDARY
- PROVINCIAL BOUNDARY
- LOCATION OF THE PROPOSED AREA

SCALE :

0 92 184 276 460 Km.


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

KAB · TABALONG

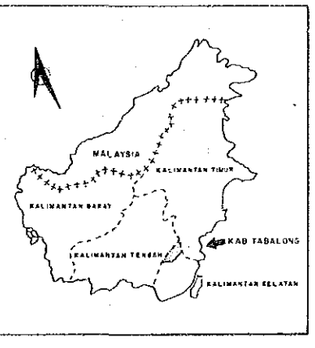
KOTA TANJUNG

JL. GARUDA (21)
JL. AGUNG (22)
JL. JAKSA AGUNG SUPRAPTO (08)
JL. JEND. BASUKI RACHMAT (02)
JL. DR MURJANI (04)
JL. KAMBOJA (05)
JL. CENDRAWASIH (20)
JL. PELAJAR (19)
JL. PUTRI ZALEHA (03)
JL. PENGHULU R (09)
JL. PANGERAN ANTA SARI (10)
JL. JEND. SUDIRMAN (12)
JL. PALANG MERAH (17)
JL. TEPIAN (13)
JL. GERILYA (15)
JL. PAHLAWAN (16)
JL. MELATI (11)
JL. MAWAR
JL. CEMPAKA (06)
SEI TABALONG
SEI TABALONG

KE BATU BABI
LIANG TAPAH (86)
GARAGATA
JARO DAM (88)
SIMP4 JARO (81)
JARO ATAS
JARO (80)
PIANANG
BINJAI (90)
NYALI (82)
ANGKIL (73)
NAMUN (74)
KEC· MUARA UYA
LUMBANG (78)
SIMP· TERATAU
MUANG (74)
MUANG ATAS
TERATAU (87)
MUARA UYA
BANGKAR
PURUI (92)
TAWI (91)
RANDU (79)
AYAH (85)
SIMPANG LAYUNG (94)
OJEK
KUPANG NUNDING
PALAPAI (76)
PASAR BATU (78)
KAMPONG BARU (89)
MANGKUPOM (77)
KEC· HARUAI
BURUM
DANAU
HAYUP (97)
KEC· TANJUNG
PUJUNG (64)
RINTIS (24)
HARUAI BONGKANG (63)
WIRANG (65)
TAMPOREJO (62)
SIMP. MAHE
MAHE (69)
KINARUM (70)
WIKAU
KAMBITIN
SIMP. TIGA KITANG (25)
KEMBANG KUNING (66)
TABING SIRING (28)
PADANG LUMBU (23)
SIMPANG MURUNG PUDAK
MURUNG PUDAK (29)
NASUKAU (31)
KASIAU
PASAR PANAS (84)
UPAU (67)
KAONG (71)
BILAS (93)
SEI. ULIN (68)
JAING HULU
KEC· MURUNG PUDAK
KE PROPINSI KAL-TENG
JAAN
SP.3 PEMBATAAN
JANGKUNG (26)
BANGUN SARI (40)
TANJUNG (33)
PEMBATAAN
KEC· KELUA
KEC· TANTA
SEI· PIMPING
SIMP· SEI· PIMPING
GALIGUR
SP.3 PUAIN (41)
TANTA KOTA
TANTA
SIMPANG TANTA
MURUNG BARU (34)
LUK KU-LUR (101)
SEI GAMPA (107)
KARANG PUTIH (49)
SIMP3 BAYAHIN (100)
MUARA PADANGIN (37)
BINTURU (48)
TALAN (46)
PASINTRIK (45)
TANTARI NGIN
MURUNG KARANGAN
SP. MUARA PADINGIN
KELUA
GAYAM (47)
HABAU (45)
BARIMBUN (39)
WALANGKIR (38)
KEC· BENUA LAWAS
PURAI (98)
BACO (55)
MASINTAN (44)
UNGGAN (95)
BAJUD
BANUARANTAU (92)
SEI. HANYAR KANAN
SEI. HANYAR KIRI
SEI HANYAR
PASAR ARBA
LIANG (43)
JIRAK (53)
PULAU KU'U (36)
LAJAR (35)
KE KAB· HULU SUNGAI UTARA
HAPALAH (56)
SEI DURIAN (54)
SIMP. 3 PEMATANG (58)
PAMPANAN (50)
BANGKILING (57)
TABUR (59)
TAMUNTI (51)
BATANG BANYU (61)
BATAS AMUNTAI
GUNTUNG (51)
KE KAB· HULUSUNGAI UTARA

SCALE:
0 5 10 15Km

LOCATION MAP



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

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

TITLE :

SOURCE:	SCALE:	PROVINCE : KALIMANTAN SELATAN
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPATEN : TABALONG

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 Tabalong is the northernmost Kabupaten in Kalimantan Selatan Province. It is bordered on the east by Kalimantan Timur Province, on the northwest by Kalimantan Tengah Province and on the south by Kabupaten Hulu Sungai Utara.

The middle and the south of the Kabupaten, except for the eastern mountainous district located on the west side of the Meratus mountains, are flat areas formed on the basin of the upper Negara River, where the capital of the Kabupaten, Tanjung, is located almost central.

The area of the Kabupaten is about 3,946 square kilometers, approximately 11 percent of the total of the province. It consists administratively of 7 Kecamatans.

1.1.2 Meteorological Conditions

The average number of rainy days and the average amount of yearly rainfall in Kabupaten Tabalong are 94 days and 1,947 mm respectively.

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

The number of working days which is necessary for planning the construction schedule in chapter 6, is estimated at 250 days using the following formula based upon the data shown in the table referred to above.

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

Where :

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

Table 1-1-1

METEOROLOGICAL CONDITIONS

PROVINCE : Kalimantan Selatan
KABUPATEN : Tabalong STATION : Tanjung

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	9	179	9	159	13	303	4	179	3	179
February	10	204	11	195	5	28	8	188	7	188
March	9	205	8	195	9	530	1	34	3	34
April	8	89	9	80	7	485	6	70	7	70
May	9	76	9	67	3	112	4	80	3	80
June	5	130	8	122	5	180	9	219	10	220
July	4	68	5	59	2	16	4	60	7	65
August	8	87	4	77	3	63	6	220	8	222
September	4	151	9	142	2	46	9	105	13	105
October	4	48	5	39	2	40	12	234	14	237
November	11	198	13	189	6	115	10	222	11	231
December	19	501	20	502	9	209	16	277	17	285
Total	100	1,936	110	1,826	66	2,127	89	1,888	103	1,916

1.2 Socio-Economic Conditions

1.2.1 Population

The population of Kabupaten Tabalong in 1984 was 130,218 which was approximately 5.8% of the 2,241,600 total population of Kalimantan Selatan Province as shown in Table 1-2-1.

The population density was 0.33 persons per ha which was lower than the provincial density of 0.58.

The recent annual average growth rate of population of the Kabupaten is 2.0% which is lower than both the provincial rate of 2.1% and the national rate of 2.2%. This may be caused by outflow of population to other areas in the province although the transmigration programme is planned for the Kabupaten.

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

Table 1-2-1 POPULATION BY KABUPATEN

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

Notes :

1. Sources:

   Kabupaten; Kabupaten concerned with the study

   Province ; Jawa and Indonesia:

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

2. AAGR ; Average Annual Growth Rate.

Table 1-2-2 POPULATION BY KECAMATAN

Year : 1984

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : TABALONG

KECAMATAN	POPULATION	PROPORTION (%)
BENUA LAWAS	14,315	11.0
KELUA	27,945	21.4
TANTA	11,634	8.9
TANJUNG	19,763	15.2
HARUAI	20,838	16.0
MUARA UYA	19,506	15.0
MURUNG PUDAK	16,217	12.5
TOTAL	130,218	100

1.2.2 Land Use

In Kabupaten Tabalong, 78,761 ha of the current available land use area, which is approximately 19.8% of the 394,600 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 46,461 ha of agricultural harvest area, 7,300 ha of residential area and 25,000 ha of usable open space which are 59.0%, 9.3% and 31.7% of the current available land use area respectively.

The agricultural harvest area consists of 18,805 ha of paddy field, 19,980 ha of plantation and 7,676 ha of other cultivated area which are 40.5%, 43.0% and 16.5% of the agricultural harvest area respectively.

It can be realized from the land use that the main industry in the Kabupaten is plantation.

Table 1-2-3

LAND USE

PROVINCE : KALIMANTAN SELATAN

(ha)

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

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 Tabalong in 1984 were 18,931 ha and 57,970 ton respectively as shown in Table 1-2-4. Of food crops, the area and production of paddy, which consists of wet paddy and upland paddy, was 17,461 ha and 51,572 ton respectively which are 92.2% and 89.0% of the total food crops. The yield rate of paddy production is 2.95 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 1984 were 2.7% and 8.1% respectively which indicate favorable development of paddy production. It is desirable that productivity of paddy increases and this depends upon the future development of irrigation together with river improvement.

The commodity crops are produced in the plantations. The area and production of plantation crops in 1983 were 27,109 ha and 10,073 ton respectively with current growth rates of 5.0% and 12.6% as shown in Table 1-2-5. Thus the plantation crop which is exported is an important agricultural product. Some changes are expected considering the international balance of supply and demand.

The population of the agricultural sector which is assumed from the employment in the Kabupaten is 81.5% of the total population as shown in Table 1-2-6. Thus this is an agricultural Kabupaten.

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

KABUPATEN : TABALONG

CULTIVATED AREA

(ha)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	15,275	17,806	18,698	18,295	13,637	17,461	2.7
OTHERS	2,268	1,605	1,379	886	1,291	1,470	0
TOTAL	17,543	19,411	20,077	19,181	14,928	18,931	1.5

PRODUCTION

(ton)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	34,902	41,406	47,634	51,441	41,125	51,572	8.1
OTHERS	18,137	11,196	10,818	2,727	3,640	6,398	-19.0
TOTAL	53,039	52,602	58,452	54,168	44,765	57,970	1.8

YIELD RATE

(ton/ha)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	2.28	2.32	2.55	2.81	3.02	2.95	5.5

Notes :

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

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

PROVINCE : KALIMANTAN SELATAN

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

Table 1-2-6 POPULATION OF AGRICULTURAL SECTOR

PROVINCE : KALIMANTAN SELATAN

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

Notes :

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

1.2.4 Other Economic Activities

Notable economic activities excluding agriculture in Kabupaten Tabalong are only the forestry industry and the current growth rates are shown in table below.

As can be seen in the table below, an extreme decrease is seemed to be caused by some reasons such as the government policy which prohibits exporting the green wood etc.

	1980	1984	AAGR (%)
Production (ton)	229,365	50,410	- 31.5

However the volumes of both the fishery and livestock productions are just enough to supply the consumption of the Kabupaten itself.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

In Kabupaten Tabalong there is one national road which runs across the Kabupaten from southwest to northeast via Tanjung, the Kabupaten capital. In parallel with the national road one provincial road also runs toward the neighbouring Kabupaten from Tanjung. Besides this provincial road there are three other provincial roads. Of these, two form a circular route between Tanjung and Bajud in the area south of Tanjung and the other separates from the national road at Kelua which is west of Tanjung and leads to the neighbouring Province of Kalimantan Tengah.

These national and provincial roads play an important role as regional trunk roads of the Kabupaten.

Except for the mountainous area in the east and the area towards the southeast boundary the whole area of the Kabupaten is covered by flat or hilly areas. Consequently the Kabupaten roads are mostly developed along the regional trunk roads as rural service roads connecting with the regional trunk road.

A high density Kabupaten road network is developed to the southwest of Tanjung because the area is flat and suitable for regional development. However the northeast part of the Kabupaten is mostly covered by a low swampy area and the Kabupaten roads are not yet developed.

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 Tabalong are confirmed as 104 links and 434 Km respectively. These figures exclude Kabupaten roads with no data.

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

(1) Density of Kabupaten Roads

The density of the Kabupaten roads is 1.10 m per ha. This is higher than the national density of 0.48 m per ha but distinctly lower than 2.11 m per ha which is the density in Jawa Island, excluding DKI Jakarta, as shown in the following table. Thus the Kabupaten is presently at the stage of road development.

	Total Length (km)	Area (ha)	Density (m/ha)
Kabupaten : Tabalong	434	394,600	1.10
Province : Kalimantan Selatan	3,029	3,938,091	0.77
Jawa Is.(Excluding DKI Jakarta)	27,715	13,159,700	2.11
Indonesia	92,038	191,944,300	0.48

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

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

(2) Kabupaten Road Surface Type

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

The legend used in the table is as follows:

ASP : Asphalt

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(Km)

I02 (7)	ASP	TNH	BTB	KRK	TOTAL
LINK 1					
LINK 2					
LINK 3					
LINK 4					
LINK 5					
LINK 6					
LINK 7					
LINK 8					
LINK 9					
LINK 10					
LINK 11					
LINK 12					
LINK 13					
LINK 14					
LINK 15					
LINK 16					
LINK 17					
LINK 18					
LINK 19					
LINK 20					
LINK 21					
LINK 22		3			3
LINK 23		4	1		5
LINK 24		3		1	4
LINK 25		3	8		11
LINK 26		5			5
LINK 27		5			5
LINK 28				5	5
LINK 29		1			1
LINK 30				1	1
LINK 31		3			3
LINK 32				6	6
LINK 33			7		7
LINK 34		6			6
LINK 35		8			8
LINK 36		7			7
LINK 37				3	3
LINK 38		6			6
LINK 39		7			7
LINK 40			3		3
LINK 41			7		7
LINK 42		1			1
LINK 43		8			8
LINK 44		8			8
LINK 45		2			2
LINK 46		6			6
LINK 47		4			4
LINK 48		2			2
LINK 49		2			2
LINK 50		5			5
LINK 51		5			5
LINK 52		3			3
LINK 53		3			3
LINK 54		5			5
LINK 55		5			5
LINK 56		6			6
LINK 57		6			6
LINK 58		1		4	5
LINK 59		4			4
LINK 60		4		1	5
LINK 61		2			2
LINK 62		2			2
LINK 63		1	9		9
LINK 64		4		2	6
LINK 65		9			9
LINK 66		8			8
LINK 67		2			2
LINK 68		7			7
LINK 69		1		7	8
LINK 70		8	2		10
LINK 71		1	6		6
LINK 72		2	2	6	10
LINK 73		2			2
LINK 74		7			7
LINK 75		4			4
LINK 76		4			4
LINK 77		4			4
LINK 78		4			4
LINK 79		1	4		4
LINK 80		3			3
LINK 81		6			6
LINK 82		1		10	10
LINK 83		1	2		3
LINK 84		2		4	6
LINK 85		3			3
LINK 86		2			2
LINK 87		2			2
LINK 88	3	1			3
LINK 89		4			4
LINK 90		1		1	1
LINK 91		3		1	4
LINK 92		4			4
LINK 93	6	1			6
LINK 94		2			2
LINK 95		7			7
LINK 96		2		7	9
LINK 97		6			6
LINK 98		4			4
LINK 99		3			3
LINK 100		10			10
LINK 101		2			2
LINK 102		3			3
LINK 103		10			10
LINK 104		4			4
TOTAL	30	294	51	59	434

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 : Tabalong	6.9	25.4	67.7
Province : Kalimantan Selatan	10.5	41.1	48.4
Jawa Is.(Excluding DKI Jakarta)	56.2	25.0	18.8
Indonesia	26.0	26.6	47.4

Thus, in the Kabupaten the proportion of Kabupaten roads with asphalt surface is much lower than either that of Indonesia or of Jawa Island. The proportion of low grade roads such as earth roads and others is distinctly high. This means that the road classification in the Kabupaten is 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 : Tabalong	15.7	14.5	40.1	29.7
Province : Kalimantan Selatan	26.4	34.2	31.4	8.0
Jawa Is.(Excluding DKI Jakarta)	45.6	29.8	19.6	5.0
Indonesia	43.5	21.8	21.1	13.6

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

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : TABALONG

(1)

NO	ASP				INI				BTB				KRK			
NO	BA	SB	RU	RB	BA	SB	RU	RB	BA	SB	RU	RB	BA	SB	RU	RB
LINK 1	70	30														
LINK 2	80	20														
LINK 3	40	60														
LINK 4	10	80	10													
LINK 5	20	80														
LINK 6	30	20	50													
LINK 7	30	10	60													
LINK 8	90	10														
LINK 9	10	90														
LINK 10	10	80	10													
LINK 11	90	10														
LINK 12	87	13														
LINK 13	30	10	60													
LINK 14	8	80	12													
LINK 15		90	10													
LINK 16	30	10	60													
LINK 17	30	60	10													
LINK 18	50	30	20													
LINK 19	90	10														
LINK 20	20	60	20													
LINK 21	10	60	30													
LINK 22					13	20	67									
LINK 23							70	30			70	30				
LINK 24							33	67							10	90
LINK 25							20	80		3	51	46				
LINK 26						14	79	7								
LINK 27					20		80									
LINK 28														27	37	36
LINK 29							40	60								
LINK 30														80	20	
LINK 31							40	60								
LINK 32														36	58	12
LINK 33										19	59	22				
LINK 34						7	28	65								
LINK 35							23	77								
LINK 36						7	30	63								
LINK 37													23	20	47	3
LINK 38						15	73	12								
LINK 39							40	60								
LINK 40									43	17	40					
LINK 41											70	30				
LINK 42					40	10	20	30								
LINK 43					33	16	49	3								
LINK 44					26	26	48									
LINK 45					15		85									
LINK 46					17	27	57									
LINK 47					78	13	10									
LINK 48					20	20	60									
LINK 49					30	20	50									
LINK 50					34	26	40									
LINK 51					24	34	42									
LINK 52					30	17	53									
LINK 53					47	30	17	7								
LINK 54					64	6	30									
LINK 55					12	26	62									
LINK 56					40	25	35									
LINK 57					20	18	62									
LINK 58					10	40	50						33	18	50	
LINK 59					18	30	52									
LINK 60					35	33	33						20	20	40	20
LINK 61					15	15	70									
LINK 62						1	23	78								
LINK 63									22	23	52	2				
LINK 64						1	40	60							25	75
LINK 65							22	78								
LINK 66							39	61								
LINK 67							35	65								
LINK 68							29	71								
LINK 69					50		50						36	36	27	
LINK 70							36	64			10	90				
LINK 71											18	83				
LINK 72							28	73		40	25	35			33	67
LINK 73					25	10	65									
LINK 74							15	85								
LINK 75					3		51	46								

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

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : TABALONG

(KM)

NO	ASP				IMP				GRB				KRK			
NO	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB
LINK 76					85	15	5									
LINK 77					35	35	30									
LINK 78					45	10	45									
LINK 79										55	45					
LINK 80							15	85								
LINK 81							43	57								
LINK 82													16	87	64	5
LINK 83							10	90			30	70				
LINK 84							55	45						13	43	45
LINK 85							20	80								
LINK 86							30	70								
LINK 87							15	85								
LINK 88		60	40													
LINK 89					13	30	58									
LINK 90													10	30	60	
LINK 91							13	87							50	50
LINK 92							18	83								
LINK 93		48	44	8												
LINK 94					20	5	75									
LINK 95							19	81								
LINK 96							35	65					23	41	33	3
LINK 97							21	79								
LINK 98					30	18	52									
LINK 99					43	23	33									
LINK 100					17	8	75									
LINK 101					10	25	65									
LINK 102					30	10	60									
LINK 103					30	4	33	33								
LINK 104					18	25	58									
AVERAGE	36	44	19	0	16	10	41	32	6	14	43	37	11	22	40	27
LENGTH		30 Ke				294 Ke				51 Ke				59 Ke		
(Ke)	11	13	6	0	47	29	121	94	3	7	22	19	6	13	24	16

The surface condition level of the Kabupaten roads in the Kabupaten is lower than that of Indonesia and of Jawa Island. The proportion in good condition is relatively low.
Therefore improvement of Kabupaten roads in poor or bad condition is desirable.

(4) Terrain Conditions of Kabupaten Roads

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

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

The proportions of terrain conditions in the Kabupaten are 49.0% flat, 24.0% hilly, 21.0% mountainous and 6.0% swampy. There is much hilly and mountainous area in the Kabupaten and therefore road construction is anticipated to be not so easy particularily considering the proportion of swamp.

1.3.3 Bridge Inventory

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

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

The inventory shown in Table 1-3-4 and Table 1-3-5 indicates a total of 213 bridges with a total length of 2,502 m of which 204 or 96.2% are timber, 2 or 0.9% are concrete and 6 or 2.8% are others. On the other hand, 5 bridges with a total length of 41 m are required to be newly constructed.

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(Km)

ID2	ID1	DI	BK	GN	RW	TOTAL
LINK	1	1				1
LINK	2					
LINK	3					
LINK	4					
LINK	5					
LINK	6					
LINK	7					
LINK	8					
LINK	9					
LINK	10					
LINK	11					
LINK	12					
LINK	13					
LINK	14					
LINK	15					
LINK	16					
LINK	17					
LINK	18					
LINK	19					
LINK	20					
LINK	21					
LINK	22	3				3
LINK	23	1	4			5
LINK	24	1	3			4
LINK	25	6	5			11
LINK	26	1	2	2		5
LINK	27	5				5
LINK	28	1	4			5
LINK	29	1				1
LINK	30	1				1
LINK	31	2	1			3
LINK	32	5	1			6
LINK	33	7				7
LINK	34				6	6
LINK	35	8				8
LINK	36		4	2	1	7
LINK	37	3				3
LINK	38	3	1		2	6
LINK	39	4			3	7
LINK	40		3			3
LINK	41	7				7
LINK	42	1				1
LINK	43	7			1	8
LINK	44	8				8
LINK	45	2				2

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(Km)

NO (3)	DT	BK	GN	RW	TOTAL
LINK 46	6				6
LINK 47	4				4
LINK 48	2				2
LINK 49			1	1	2
LINK 50	4			1	5
LINK 51	5				5
LINK 52	3				3
LINK 53	1			2	3
LINK 54	5				5
LINK 55	5				5
LINK 56	6				6
LINK 57	6				6
LINK 58	4			1	5
LINK 59	2			2	4
LINK 60	5				5
LINK 61	2				2
LINK 62			2		2
LINK 63	3	1	5		9
LINK 64			6		6
LINK 65		7	2		9
LINK 66		8			8
LINK 67			2		2
LINK 68		6	1		7
LINK 69		4	4		8
LINK 70		1	9		10
LINK 71			6		6
LINK 72	1	9			10
LINK 73	2				2
LINK 74		7			7
LINK 75	1	3			4
LINK 76	2		2		4
LINK 77	1		3		4
LINK 78			4		4
LINK 79			4		4
LINK 80	2			1	3
LINK 81		4	2		6
LINK 82	4		6		10
LINK 83		2	1		3
LINK 84		6			6
LINK 85			3		3
LINK 86		2			2
LINK 87		2			2
LINK 88		3			3
LINK 89	2		1	1	4
LINK 90	1				1
LINK 91			4		4
LINK 92			4		4
LINK 93	1		5		6
LINK 94			2		2
LINK 95	5	2			7
LINK 96		9			9
LINK 97	1	2	2	1	6
LINK 98	4				4
LINK 99	1			2	3
LINK 100	10				10
LINK 101	2				2
LINK 102	3				3
LINK 103	5		4	1	10
LINK 104	3			1	4
TOTAL	212	106	89	27	434
RATIO	49	24	21	6	(%)

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : KALIMANTAN SELATAN KAB : TABALONG

(UNIT: m)

LINK NO	EXISTING NO.	EXISTING LENGTH	NOT EXIST NO.	NOT EXIST LENGTH	TOTAL NO.	TOTAL LENGTH
22	4	71.50			4	71.50
23	1	6.00			1	6.00
24	1	3.75			1	3.75
25	9	49.30			9	49.30
26	2	38.00			2	38.00
27	6	162.00			6	162.00
32	4	43.00			4	43.00
33	5	416.66			5	416.66
34	5	33.00			5	33.00
35	6	28.40			6	28.40
36	4	12.50			4	12.50
37	4	23.00			4	23.00
38	2	15.50	2	16.00	4	31.50
39	1	4.00			1	4.00
40	4	12.60			4	12.60
41	3	17.50			3	17.50
42	1	3.00			1	3.00
43	2	35.00			2	35.00
44	6	26.45			6	26.45
45	2	16.50			2	16.50
46	8	69.50			8	69.50
47	3	19.00			3	19.00
48	2	62.50			2	62.50
49	2	21.00			2	21.00
50	1	17.00			1	17.00
51	6	50.60			6	50.60
54	1	14.00			1	14.00
55	4	64.00			4	64.00
57	1	12.00			1	12.00
58	2	31.50			2	31.50
59	3	25.25			3	25.25
60	1	27.00			1	27.00
61	1	14.60			1	14.60
62	1	6.00			1	6.00
63	10	78.40			10	78.40
64	1	21.00			1	21.00
65	3	31.00			3	31.00
66	5	30.50			5	30.50
67	2	17.00			2	17.00
68			2	21.00	2	21.00
69	1	6.50			1	6.50
70	1	3.50			1	3.50
71	7	38.70			7	38.70
72	3	11.00			3	11.00
73	1	9.80			1	9.80
74	3	37.50			3	37.50
75	2	7.00			2	7.00
76	1	17.00			1	17.00
80	2	8.00			2	8.00
81	3	20.00			3	20.00
82	6	103.00			6	103.00
85	2	11.50			2	11.50
86	2	18.00			2	18.00
87	1	2.50			1	2.50
89	2	14.70			2	14.70
93	6	37.80			6	37.80
94	2	12.50			2	12.50
95	1	4.00	1	4.00	2	8.00
96	3	17.50			3	17.50
98	4	66.00			4	66.00
99	4	23.00			4	23.00
100	13	280.10			13	280.10
101	2	14.50			2	14.50
102	2	4.20			2	4.20
103	7	79.75			7	79.75
104	3	24.50			3	24.50
TOTAL	213	2502.06	5	41.00	218	2543.06

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

103 (18)	<<< BRIDGE >>> KY	BJ	LL	BT	TOTAL (No)
LINK 22	4				4
LINK 23	1				1
LINK 24	1				1
LINK 25	8	1			9
LINK 26	2				2
LINK 27	6				6
LINK 32	4				4
LINK 33	3		2		5
LINK 34	5				5
LINK 35	5		1		6
LINK 36	4				4
LINK 37	4				4
LINK 38	2				2
LINK 39	1				1
LINK 40	4				4
LINK 41	3				3
LINK 42	1				1
LINK 43	2				2
LINK 44	6				6
LINK 45	2				2
LINK 46	7		1		8
LINK 47	3				3
LINK 48	2				2
LINK 49	2				2
LINK 50	1				1
LINK 51	6				6
LINK 54	1				1
LINK 55	4				4
LINK 57	1				1
LINK 58	2				2
LINK 59	3				3
LINK 60	1				1

103 (18)	<<< BRIDGE >>> KY	BJ	LL	BT	TOTAL (No)
LINK 61	1				1
LINK 62	1				1
LINK 63	10				10
LINK 64	1				1
LINK 65	3				3
LINK 66	5				5
LINK 67	2				2
LINK 68	1				1
LINK 69	1				1
LINK 70	1				1
LINK 71	7				7
LINK 72	3				3
LINK 73	1				1
LINK 74	3				3
LINK 75	2				2
LINK 76	1				1
LINK 80	2				2
LINK 81	3				3
LINK 82	6				6
LINK 85	2				2
LINK 86	2				2
LINK 87	1				1
LINK 89	2				2
LINK 93	6				6
LINK 94	1		1		2
LINK 95	1				1
LINK 96	3				3
LINK 98	4				4
LINK 99	4				4
LINK 100	13				13
LINK 101	2				2
LINK 102	2				2
LINK 103	6			1	7
LINK 104	2			1	3
TOTAL	205	1	5	2	213
RATIO	96	0	2	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	68	121	11	-	-	-	-	-	-	4	204
Concrete	-	2	-	-	-	-	-	-	-	-	2
Steel	1	-	-	-	-	-	-	-	-	-	1
Others	1	4	-	-	-	-	-	-	-	-	5
Total	70	127	11	-	-	-	-	-	-	4	212

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

1.3.4 Traffic

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

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

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Total Trips	3,766	128	3,386	15,350	22,630
Proportion (%)	16.64	0.57	14.96	67.83	100.00

Source : Bina Marga Inventory.

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

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Proportion (%)	6.76	0.10	11.46	81.68	100.00

Source : Kabupaten.

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

From the above tables the following can be observed:

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

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

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

Chapter 2 ESTIMATIONS OF FUTURE TRAFFIC VOLUME AND BENEFIT

2.1 Future Traffic Volume

2.1.1 Traffic Growth Rate

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

Growth of Production Basis "A":

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

Growth of Productivity "B" :

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

Traffic Growth Rate: Initial estimated figure:

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

Traffic Growth Rate GR =Final adjusted figure:

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

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

Table 2-1-1 TRAFFIC GROWTH RATE ESTIMATION

PROV : KALIMANTAN SELATAN. KAB : TABALONG

A)	Growth Rate of Population	:	2.00 (%)
B)	Growth Rate of Cultivated Area	:	3.00 (%)
C)	Growth Rate of Rice field	:	2.70 (%)
D)	Growth Rate of Rice yield rate	:	5.50 (%)
E)	Growth Rate of GDP / capita	:	6.60 (%)
a)	Geometrical Mean (A x B)	:	2.50 (%)
b)	Geometrical Mean (C x D)	:	4.09 (%)
c)	Geometrical Mean (a x b)	:	3.29 (%)
d)	Geometrical Mean (c x E)	:	4.93 (%)
	TRAFFIC GROWTH RATE	:	4.93 (%)

2.1.2 Present and Future Traffic Volume

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

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

Where :

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

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

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
1	250	6	100	350	531	4.9%	467	11	187	654	993	IIIA
2	250	6	100	350	531	4.9%	467	11	187	654	993	IIIA
3	200	4	100	300	454	4.9%	374	7	187	561	849	IIIA
4	150	2	50	350	377	4.9%	280	4	93	654	705	IIIA
5	150	2	50	350	377	4.9%	280	4	93	654	705	IIIA
6	150	4	100	400	454	4.9%	280	7	187	748	849	IIIA
7	100	4	50	200	254	4.9%	187	7	93	374	475	IIIB-1
8	80	2	60	250	267	4.9%	150	4	112	467	499	IIIB-1
9	100	4	80	400	384	4.9%	187	7	150	748	718	IIIA
10	60	2	50	450	337	4.9%	112	4	93	841	630	IIIA
11	80	6	100	500	436	4.9%	150	11	187	935	815	IIIA
12	100	6	80	500	436	4.9%	187	11	150	935	815	IIIA
13	50	2	60	300	262	4.9%	93	4	112	561	490	IIIB-1
14	60	2	20	150	157	4.9%	112	4	37	280	293	IIIB-1
15	250	6	100	350	531	4.9%	467	11	187	654	993	IIIA
16	300	6	150	400	656	4.9%	561	11	280	748	1226	IIIA
17	200	4	100	300	454	4.9%	374	7	187	561	849	IIIA
18	280	2	150	400	632	4.9%	523	4	280	748	1181	IIIA
19	50	2	30	350	257	4.9%	93	4	56	654	480	IIIB-1
20	40	2	30	100	122	4.9%	75	4	56	187	228	IIIB-1
21	50	2	50	200	202	4.9%	93	4	93	374	378	IIIB-1
22	0	0	0	50	25	4.9%	0	0	0	93	47	IIIC
23	20	2	50	100	122	4.9%	37	4	93	187	228	IIIB-1
24	8	0	50	100	108	4.9%	15	0	93	187	202	IIIB-1
25	10	0	50	150	135	4.9%	19	0	93	280	252	IIIB-1
26	0	0	0	100	50	4.9%	0	0	0	187	93	IIIB-2
27	10	0	20	150	105	4.9%	19	0	37	280	196	IIIB-2
28	6	2	40	100	98	4.9%	11	4	75	187	183	IIIB-2
29	50	30	100	300	330	4.9%	93	56	187	561	617	IIIA
30	10	0	40	150	125	4.9%	19	0	75	280	234	IIIB-1
31	6	2	40	150	123	4.9%	11	4	75	280	230	IIIB-1
32	10	2	30	150	117	4.9%	19	4	56	280	219	IIIB-1
33	40	0	40	250	205	4.9%	75	0	75	467	383	IIIB-1
34	6	0	20	60	56	4.9%	11	0	37	112	105	IIIB-2
35	6	0	20	80	66	4.9%	11	0	37	150	123	IIIB-2
36	8	0	30	100	88	4.9%	15	0	56	187	165	IIIB-2
37	10	0	50	200	160	4.9%	19	0	93	374	299	IIIB-1
38	8	0	40	150	123	4.9%	15	0	75	280	230	IIIB-1
39	0	0	0	10	5	4.9%	0	0	0	19	9	IIIC
40	100	4	100	250	329	4.9%	187	7	187	467	615	IIIA
41	30	0	30	100	110	4.9%	56	0	56	187	206	IIIB-1
42	20	10	20	150	125	4.9%	37	19	37	280	234	IIIB-1
43	0	0	0	100	50	4.9%	0	0	0	187	93	IIIB-2
44	0	0	0	100	50	4.9%	0	0	0	187	93	IIIB-2
45	6	0	30	150	111	4.9%	11	0	56	280	208	IIIB-1
46	10	0	50	200	160	4.9%	19	0	93	374	299	IIIB-1
47	6	0	30	80	76	4.9%	11	0	56	150	142	IIIB-2
48	0	0	0	30	15	4.9%	0	0	0	56	28	IIIC
49	6	0	10	50	41	4.9%	11	0	19	93	77	IIIB-2
50	0	0	0	30	15	4.9%	0	0	0	56	28	IIIC

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
51	0	0	0	100	50	4.9%	0	0	0	187	93	IIIB-2
52	10	0	30	150	115	4.9%	19	0	56	280	215	IIIB-1
53	20	0	30	150	125	4.9%	37	0	56	280	234	IIIB-1
54	10	0	30	150	115	4.9%	19	0	56	280	215	IIIB-1
55	10	0	30	130	105	4.9%	19	0	56	243	196	IIIB-2
56	20	0	40	200	160	4.9%	37	0	75	374	299	IIIB-1
57	0	0	0	30	15	4.9%	0	0	0	56	28	IIIC
58	20	0	40	150	135	4.9%	37	0	75	280	252	IIIB-1
59	10	0	30	150	115	4.9%	19	0	56	280	215	IIIB-1
60	10	0	20	100	80	4.9%	19	0	37	187	150	IIIB-2
61	20	0	40	150	135	4.9%	37	0	75	280	252	IIIB-1
62	6	0	20	90	71	4.9%	11	0	37	168	133	IIIB-2
63	10	0	30	150	115	4.9%	19	0	56	280	215	IIIB-1
64	0	0	6	50	31	4.9%	0	0	11	93	58	IIIB-2
65	6	0	20	100	76	4.9%	11	0	37	187	142	IIIB-2
66	6	0	20	100	76	4.9%	11	0	37	187	142	IIIB-2
67	0	0	8	20	18	4.9%	0	0	15	37	34	IIIC
68	0	0	4	100	54	4.9%	0	0	7	187	101	IIIB-2
69	30	0	50	200	180	4.9%	56	0	93	374	336	IIIB-1
70	20	0	40	200	160	4.9%	37	0	75	374	299	IIIB-1
71	6	0	20	100	76	4.9%	11	0	37	187	142	IIIB-2
72	20	0	50	200	170	4.9%	37	0	93	374	318	IIIB-1
73	0	0	0	100	50	4.9%	0	0	0	187	93	IIIB-2
74	10	0	30	150	115	4.9%	19	0	56	280	215	IIIB-1
75	10	0	30	100	90	4.9%	19	0	56	187	168	IIIB-2
76	8	0	20	60	58	4.9%	15	0	37	112	108	IIIB-2
77	0	0	0	50	25	4.9%	0	0	0	93	47	IIIC
78	10	0	10	50	45	4.9%	19	0	19	93	84	IIIB-2
79	30	0	20	100	100	4.9%	56	0	37	187	187	IIIB-2
80	16	0	0	30	31	4.9%	30	0	0	56	58	IIIB-2
81	10	0	10	50	45	4.9%	19	0	19	93	84	IIIB-2
82	4	0	10	50	39	4.9%	7	0	19	93	73	IIIB-2
83	10	0	40	70	85	4.9%	19	0	75	131	159	IIIB-2
84	4	0	10	50	39	4.9%	7	0	19	93	73	IIIB-2
85	4	0	10	60	44	4.9%	7	0	19	112	82	IIIB-2
86	4	0	8	50	37	4.9%	7	0	15	93	69	IIIB-2
87	4	0	6	50	35	4.9%	7	0	11	93	65	IIIB-2
88	10	0	20	100	80	4.9%	19	0	37	187	150	IIIB-2
89	4	0	6	50	35	4.9%	7	0	11	93	65	IIIB-2
90	4	0	8	50	37	4.9%	7	0	15	93	69	IIIB-2
91	10	0	20	50	55	4.9%	19	0	37	93	103	IIIB-2
92	0	0	0	20	10	4.9%	0	0	0	37	19	IIIC
93	20	0	30	100	100	4.9%	37	0	56	187	187	IIIB-2
94	0	0	0	50	25	4.9%	0	0	0	93	47	IIIC
95	0	0	0	50	25	4.9%	0	0	0	93	47	IIIC
96	20	0	30	100	100	4.9%	37	0	56	187	187	IIIB-2
97	4	0	10	150	89	4.9%	7	0	19	280	166	IIIB-2
98	0	0	0	40	20	4.9%	0	0	0	75	37	IIIC
99	0	0	0	150	75	4.9%	0	0	0	280	140	IIIB-2
100	0	0	0	20	10	4.9%	0	0	0	37	19	IIIC

Table 2-1-2 (3) EXISTING AND FUTURE TRAFFIC VOLUME

PROV : KALIMANTAN SELATAN KAB : TABALONG

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
101	0	0	0	10	5	4.9%	0	0	0	19	9	IIIC
102	0	0	0	20	10	4.9%	0	0	0	37	19	IIIC
103	0	0	0	20	10	4.9%	0	0	0	37	19	IIIC
104	0	0	0	40	20	4.9%	0	0	0	75	37	IIIC
PERCENT	16.64	0.57	14.96	67.83			16.64	0.57	14.96	67.83		

2.2 Benefit

2.2.1 Benefit Estimation Method

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

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

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

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

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

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

(KM)

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

Source : Bina Marga

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
22	IIIC	KRK	3	0	3	13	13
26	IIIC	KRK	6	0	5	24	23
34	IIIC	KRK	7	0	6	29	28
39	IIIC	KRK	8	0	7	32	31
43	IIIC	KRK	8	0	7	31	31
44	IIIC	KRK	10	0	9	41	40
48	IIIC	KRK	2	0	2	9	9
49	IIIC	KRK	2	0	2	10	9
50	IIIC	KRK	5	0	4	19	19
51	IIIC	KRK	4	0	4	17	17
57	IIIC	KRK	6	0	5	22	22
64	IIIC	KRK	9	0	8	38	36
67	IIIC	KRK	2	0	2	8	8
68	IIIC	KRK	11	0	10	44	43
73	IIIC	KRK	6	0	5	23	23
76	IIIC	KRK	10	0	9	41	40
77	IIIC	KRK	9	0	8	35	35
78	IIIC	KRK	9	0	8	36	35
80	IIIC	KRK	8	0	7	34	32
81	IIIB-2	KRK	19	1	17	79	77
82	IIIB-2	KRK	28	1	25	113	111
84	IIIC	KRK	9	0	8	38	36
85	IIIC	KRK	8	0	7	34	32
86	IIIC	KRK	6	0	5	23	23
87	IIIC	KRK	6	0	5	23	23
89	IIIC	KRK	9	0	8	36	35
90	IIIC	KRK	3	0	2	11	11
91	IIIC	KRK	11	0	10	45	44
92	IIIC	KRK	11	0	10	45	44
94	IIIC	KRK	5	0	5	21	21
95	IIIC	KRK	8	0	8	35	34
98	IIIC	KRK	4	0	3	15	15
99	IIIC	KRK	4	0	3	15	15
100	IIIC	KRK	11	0	10	47	45
101	IIIC	KRK	2	0	2	7	8
102	IIIC	KRK	4	0	3	15	15
103	IIIC	KRK	5	0	5	21	21
104	IIIC	KRK	3	0	3	13	13

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 : TABALONG

(1000Rupiah)

	LINK 1	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 7	LINK 8	LINK 9	LINK 10
	1 Ke	1 Ke	1 Ke	1 Ke	1 Ke	1 Ke	1 Ke	1 Ke	1 Ke	1 Ke
	IIIA	IIIA	IIIA	IIIA	IIIA	IIIA	IIIB-1	IIIB-1	IIIA	IIIA
YEAR	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC
1988	0	0	0	0	0	0	0	0	0	0
1989	975	650	1636	2246	1623	4275	2846	134	1619	1461
1990	1025	683	1716	2363	1707	4485	2984	141	1699	1532
1991	1075	717	1801	2474	1788	4695	3123	148	1779	1609
1992	1127	751	1893	2595	1875	4940	3288	155	1872	1686
1993	1183	788	1986	2716	1963	5178	3443	162	1966	1764
1994	1242	828	2081	2853	2062	5430	3610	170	2057	1858
1995	1305	870	2187	2999	2167	5706	3794	178	2159	1945
1996	1366	911	2297	3146	2273	5995	3989	187	2272	2042
1997	1434	956	2404	3301	2385	6276	4173	197	2381	2147
1998	1504	1003	2525	3458	2499	6582	4374	207	2498	2247
SUM	12236	8157	20526	28151	20342	53562	35624	1679	20302	18291
COST	1810	-605	6714	11231	6609	26267	15653	-4438	6582	5395
/Ke	1810	-605	6714	11231	6609	26267	15653	-4438	6582	5395

Chapter 3 ENGINEERING

3.1 Design Criteria and Specification

3.1.1 Geometric Design Criteria

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

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

3.1.2 Loading Specification

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

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

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

Table 3-1-1

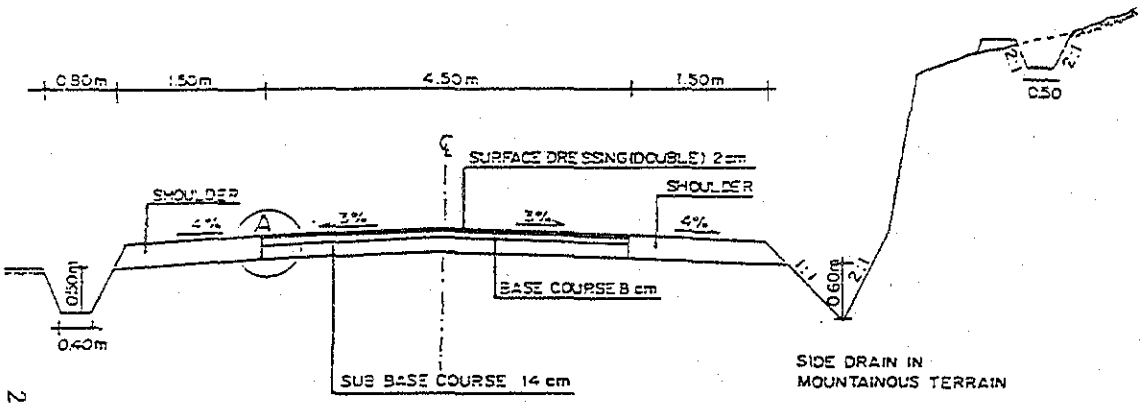
DESIGN CRITERIA FOR KABUPATEN ROADS

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

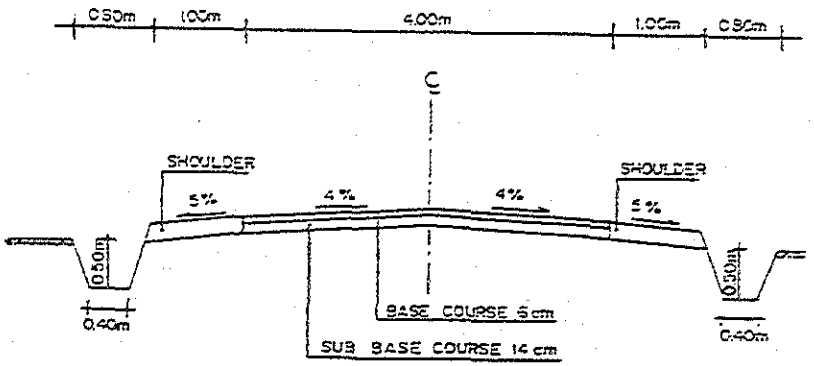
Fig. 3-1-1

STANDARD ROAD CROSS SECTIONS

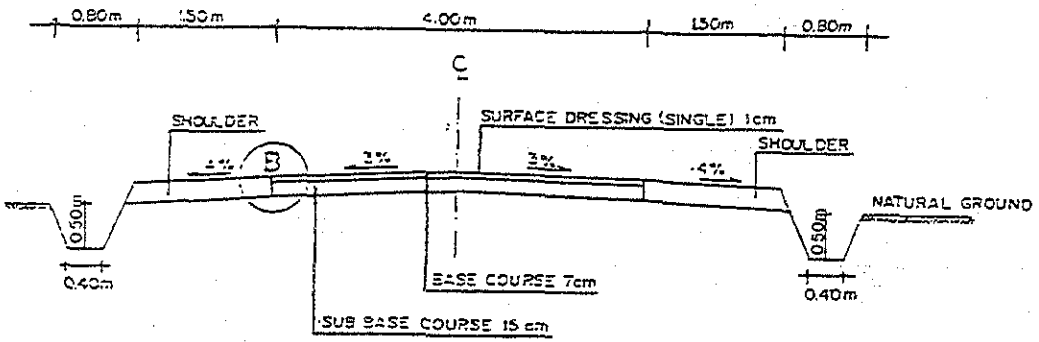
CLASS III A



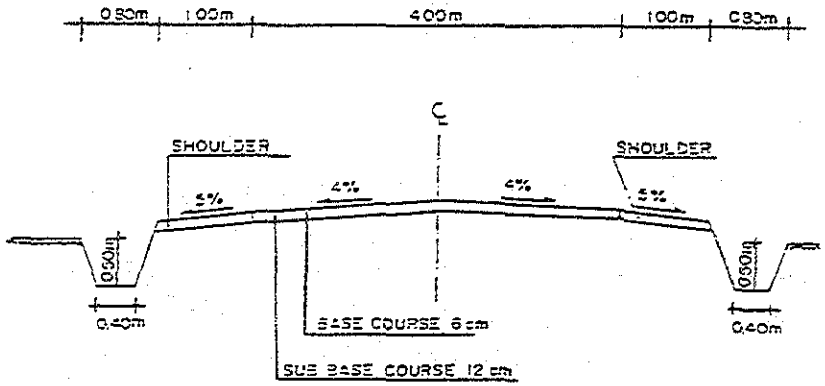
CLASS III B-2



CLASS III B-1



CLASS III C



3.2 Pavement Design

3.2.1 Design Conditions

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

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

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

1) Design Traffic Volume

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

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

2) Strength of Roadbed

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

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

3.2.2 Pavement Structure

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

Fig. 3-2-1 PAVEMENT STRUCTURE

(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

= SURFACE DRESSING (ASPHALT)

= BASE COURSE (CRUSHER-RUN)

= SUBBASE COURSE (SANDY GRAVEL)

3.3 Design of Bridges and Other Structures

3.3.1 Standard Bridge

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

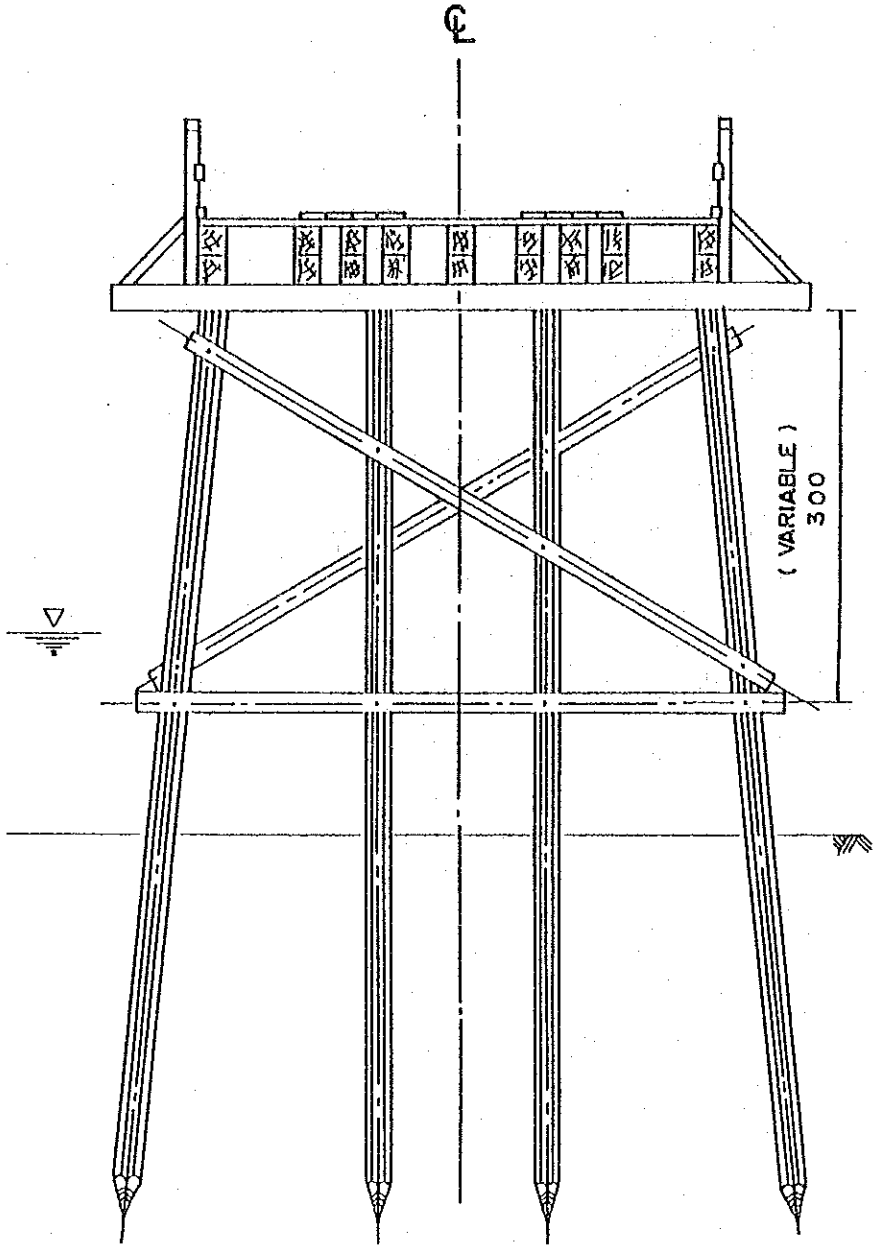
The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

(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

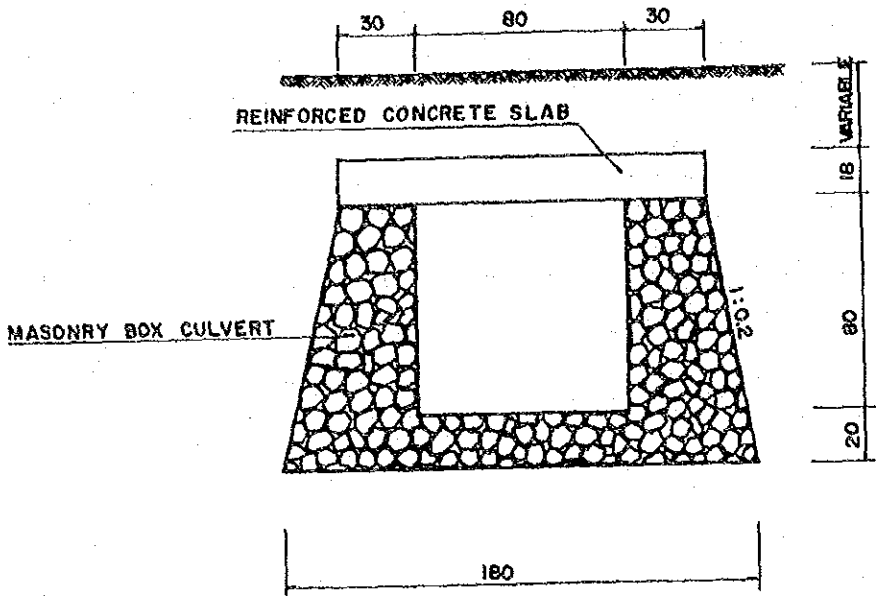
(2) Retaining Wall

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

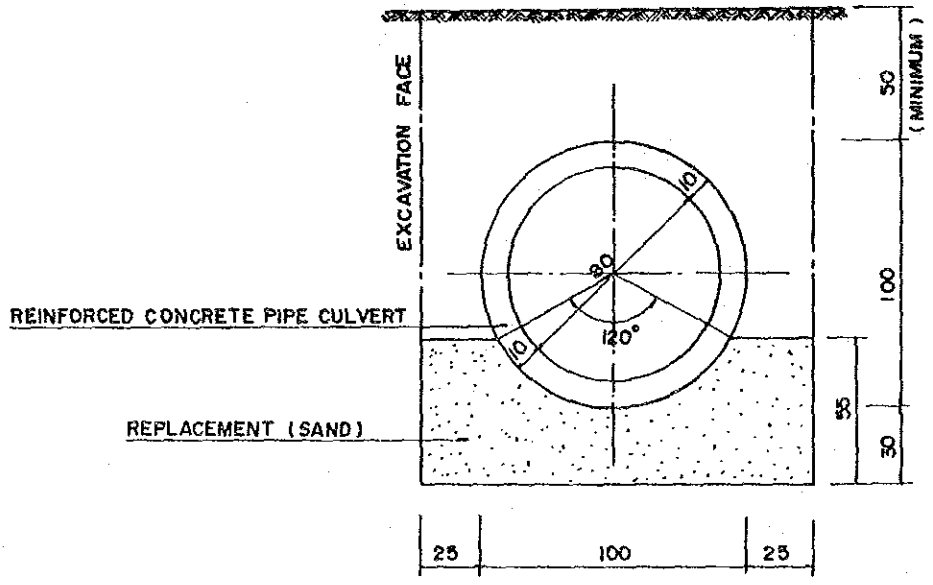
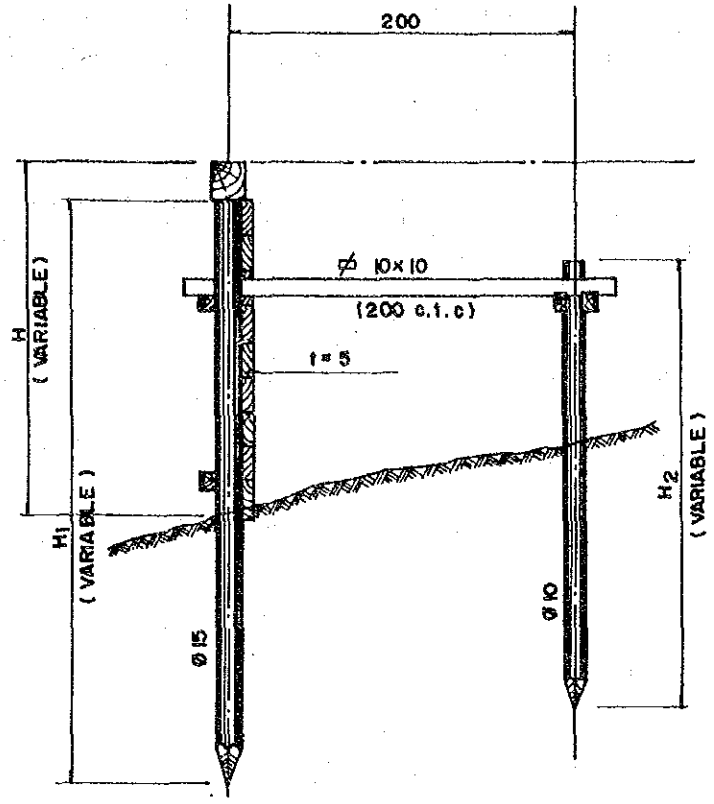
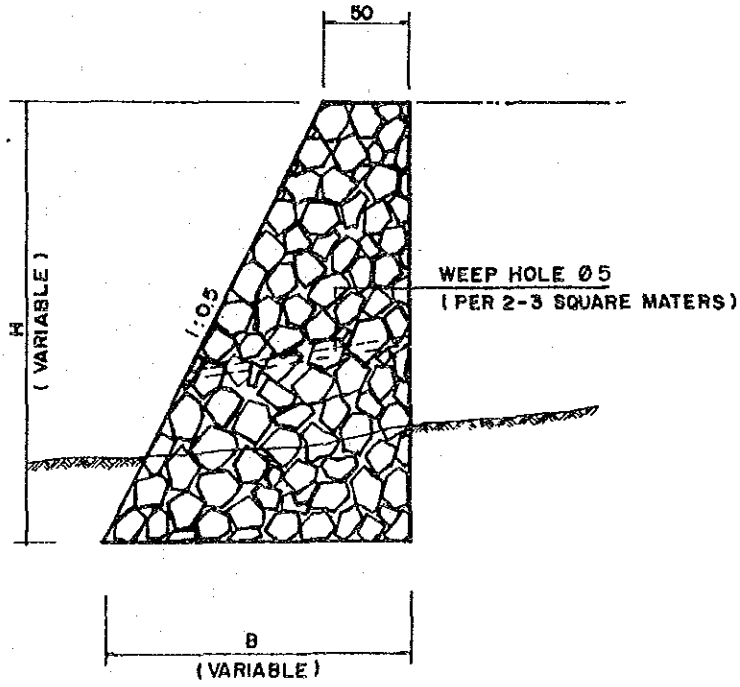


Fig. 3-3-3 STANDARD RETAINING WALLS

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

Table 4-1-1 UNIT LABOUR PRICE

(Rp)

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

Notes :

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

4.1.2 Unit Price of Materials

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

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

(Rp)

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

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

(Rp)

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

4.1.3 Hourly Equipment Cost

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

Table 4-1-3

HOURLY EQUIPMENT COST

PROVINCE : KALIMANTAN SELATAN
KABUPATEN : TABALONG

(UNIT : Rp) (6'85)

CODE NO	EQUIPMENT NAME	CLASS	LOCAL COST OWNERSHIP	LOCAL COST OPERATION	LOCAL COST SUB-TOTAL	FOREIGN COST OWNERSHIP	FOREIGN COST OPERATION	FOREIGN COST SUB-TOTAL	TOTAL COST
	Bulldozer	120 HP	234	14,015	14,249	7,769	1,024	8,793	23,042
	Bulldozer/Ripper	120 HP	255	15,026	15,281	8,500	1,575	10,075	25,356
	Swamp Bulldozer	120 HP	267	15,268	15,535	8,879	1,646	10,525	26,060
	Bulldozer	90 HP	148	9,544	9,692	4,914	647	5,561	15,253
	Bulldozer/Ripper	90 HP	159	10,134	10,293	5,300	982	6,282	16,575
	Bulldozer	65 HP	105	6,940	7,045	3,500	461	3,961	11,006
	Bulldozer/Ripper	65 HP	115	7,389	7,504	3,819	708	4,527	12,031
	Swamp Bulldozer	90 HP	159	10,124	10,283	5,284	979	6,263	16,546
	Swamp Bulldozer	65 HP	122	7,230	7,352	4,049	750	4,799	12,151
	Motor Grader	110 HP	208	12,075	12,283	6,919	1,282	8,201	20,484
	Motor Grader	75 HP	144	8,272	8,416	4,779	885	5,664	14,080
	Motor Grader	65 HP	129	7,269	7,398	4,300	797	5,097	12,495
	Road Stabilizer	W=1850 mm	258	3,381	3,639	8,594	424	9,018	12,657
	Vibratory Roller	4 ton	87	3,635	3,722	2,900	382	3,282	7,004
	Hand-guide Vib. Roller	1000 Kg	68	646	714	850	29	879	1,593
	Tire Roller	8-15 ton	94	8,266	8,360	3,106	102	3,208	11,568
	Vibratory Roller (D&T)	4 ton	87	3,635	3,722	2,900	382	3,282	7,004
	Hand-guide Vib. Roller	600 Kg	48	441	489	600	20	620	1,109
	Rough Terrain Crane	10 ton	302	14,094	14,396	10,039	744	10,783	25,179
	Hydraulic Excavator; Wheel	0.3 m3	124	8,601	8,725	4,109	541	4,650	13,375
	Wheel Loader	1.2 m3	211	9,072	9,283	7,019	925	7,944	17,227
	Wheel Loader	0.3 m3	69	3,181	3,250	2,269	299	2,568	5,818
	Water Tank Truck	4000 ltr.	70	3,193	3,263	868	120	988	4,251
	Fuel Tank Truck	4000 ltr.	71	3,200	3,271	882	121	1,003	4,274
	Dump Truck	3.0 ton	118	3,938	4,056	1,469	202	1,671	5,727
	Flat Bed Truck with Crane	3.0 ton	52	3,440	3,492	1,717	127	1,844	5,336
	Dump Loader Truck	12 ton	116	21,554	21,670	3,837	126	3,963	25,633
	Dump Truck	5.0 ton	176	6,526	6,702	2,189	302	2,491	9,193
	Flat Bed Truck	3.0 ton	17	3,015	3,032	563	41	604	3,636
	Portable Crusher/Screening	30-40 t/h	564	23,586	24,150	18,800	2,478	21,278	45,428
	Concrete Mixer	0.5 m3	432	2,442	2,874	5,400	419	5,819	8,693
	Water Pump	200 l/min	16	291	307	188	6	194	501
	Concrete Vibrator	3.3 HP	6	255	261	73	2	75	336
	Asphalt Sprayer	850 ltr.	82	808	890	1,019	140	1,159	2,049

4.2 Unit Construction Cost by Work Type

4.2.1 All Works Except Bridges

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

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	174	91	265
Subgrade Preparation	m2	22	11	33
Normal Fill	m3	1,796	863	2,659
Fill in Swamp	m3	2,656	1,052	3,708
Normal Excavation to Spoil	m3	1,051	522	1,573
Sub Base Course	m3	3,379	1,347	4,726
Base Course	m3	4,637	2,299	6,936
Shoulder	m2	314	146	460
Asphalt Patching	m2	3,900	1,377	5,277
Surface Dressing (Single)	m2	621	595	1,216
Surface Dressing (Double)	m2	777	936	1,713
Earth Drain	m	939	119	1,058
Earth Drain in Swamp (by machine)	m3	1,271	474	1,745
Pipe Culvert D80cm	m	46,069	51,386	97,455
Masonry Culvert (80x80cm)	m	63,136	41,554	104,690
Retaining Wall and Wing Wall (Timber)	m2	10,758	246	11,004
Retaining Wall and Wing Wall (Masonry)	m3	46,111	11,868	57,979
Gabion Protection	m3	13,146	120	13,266
Manual routine maintenance of road	Km	152,384	7,248	159,632
Routine maintenance of earth road	Km	100,898	37,904	138,802
Routine maintenance of gravel road	Km	203,196	88,047	291,243
Routine maintenance of asphalt road	Km	390,000	137,700	527,700

4.2.2 Bridges

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

Table 4-2-2 BRIDGE COST

PROV : KALIMANTAN SELATAN KAB : TABALONG

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	40,370	3,541	43,911
Superstructure (Timber;Span 5m;10T)	m2	44,715	3,910	48,625
Superstructure (Timber;Span 8m;10T)	m2	59,226	5,136	64,362
Superstructure (Timber;Span 3m;BM50)	m2	50,057	4,378	54,435
Superstructure (Timber;Span 5m;BM50)	m2	54,646	4,745	59,391
Superstructure (Timber;Span 8m;BM50)	m2	69,306	6,006	75,312
Superstructure (Concrete;Span 3m;BM50)	m2	47,530	107,965	155,495
Superstructure (Concrete;Span 5m;BM50)	m2	48,944	120,694	169,638
Superstructure (Concrete;Span 8m;BM50)	m2	50,515	131,491	182,006
Superstructure (Concrete;Span10m;BM50)	m2	55,338	149,376	204,714
Superstructure (Concrete;Span15m;BM50)	m2	59,852	176,007	235,859
Substructure (Pier;for Timber;10T)	NO	351,722	32,859	384,581
Substructure (Abut;for Timber;10T)	NO	997,907	154,362	1,152,269
Substructure (Pier;for Timber;BM50)	NO	517,289	48,627	565,916
Substructure (Abut;for Timber;BM50)	NO	1,122,973	171,532	1,294,505
Substructure (Pier;for Concrete;BM50)	NO	1,752,880	477,161	2,230,041
Substructure (Abut;for Concrete;BM50)	NO	3,673,465	999,497	4,672,962
Demolition of Bridge (Timber->Timber)	m2	11,393	1,373	12,766
Demolition of Bridge (Timber->Concrete)	m2	11,393	1,373	12,766
Demolition of Bridge (Concrete)	m2	82,705	81,377	164,082
Maintenance of Timber Bridge (New)	m2	7,532	1,121	8,653
Maintenance of Concrete Bridge (New)	m2	1,864	3,135	4,999
Maintenance of Timber Bridge (Exist)	m2	7,858	2,404	10,262
Maintenance of Concrete Bridge (Exist)	m2	4,464	2,471	6,935

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 Tabalong are shown in Table 5-1-1.

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

KABUPATEN : TABALONG

CRITERIA NO	ROAD LINK NO
(3)	20
(6)	01,02,03,04,05,06,08,09,10,11,12,13,15,16,17,19, 21,22
(8)	14,18,42

5.2 Evaluation

5.2.1 Primary Analysis

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

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

5.2.2 Secondary Analysis

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

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

5.2.3 Ranking of Feasible Road Links

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

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

PROVINCE : KALIMANTAN SELATAN KABUPATEN : TABALONG

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
29	1 Km	IIIA	86.762	VOC
16	1 Km	IIIA	78.517	VOC
72	10 Km	IIIB-1	36.118	VOC
6	1 Km	IIIA	34.243	VOC
23	5 Km	IIIB-1	32.758	VOC
70	10 Km	IIIB-1	31.685	VOC
40	3 Km	IIIA	29.007	VOC
83	3 Km	IIIB-2	28.107	VOC
7	1 Km	IIIB-1	27.561	VOC
36	7 Km	IIIB-2	25.569	VOC
24	4 Km	IIIB-1	24.825	VOC
74	7 Km	IIIB-1	24.093	VOC
66	8 Km	IIIB-2	24.015	VOC
46	6 Km	IIIB-1	23.879	VOC
25	11 Km	IIIB-1	22.557	VOC
75	4 Km	IIIB-2	22.089	VOC
28	5 Km	IIIB-2	21.399	VOC
31	3 Km	IIIB-1	20.008	VOC
65	9 Km	IIIB-2	18.967	VOC
53	3 Km	IIIB-1	18.320	VOC
61	2 Km	IIIB-1	16.092	VOC
54	5 Km	IIIB-1	14.373	VOC
45	2 Km	IIIB-1	14.013	VOC
96	9 Km	IIIB-2	13.883	VOC
41	7 Km	IIIB-1	13.794	VOC
38	6 Km	IIIB-1	13.143	VOC
17	1 Km	IIIA	13.032	VOC
62	2 Km	IIIB-2	11.808	VOC
97	6 Km	IIIB-2	10.958	VOC
4	1 Km	IIIA	10.644	VOC
69	8 Km	IIIB-1	10.416	VOC
35	8 Km	IIIB-2	9.196	VOC
71	6 Km	IIIB-2	8.881	VOC
9	1 Km	IIIA	8.829	VOC
56	6 Km	IIIB-1	7.267	VOC
93	6 Km	IIIB-2	6.856	VOC
32	6 Km	IIIB-1	5.858	VOC
10	1 Km	IIIA	4.753	VOC
5	1 Km	IIIA	4.703	VOC
13	1 Km	IIIB-1	4.540	VOC
88	3 Km	IIIB-2	4.522	VOC
81	6 Km	IIIB-2	1.884	Surplus
33	7 Km	IIIB-1	1.796	VOC
27	5 Km	IIIB-2	1.518	VOC
52	3 Km	IIIB-1	1.261	VOC
21	1 Km	IIIB-1	0.392	VOC
3	1 Km	IIIA	0.078	VOC
22	3 Km	IIIC	0.078	Surplus
11	1 Km	IIIA	0.078	VOC
55	5 Km	IIIB-2	0.078	VOC
34	6 Km	IIIC	0.078	Surplus
57	6 Km	IIIC	0.078	Surplus
50	5 Km	IIIB-1	0.078	VOC
59	4 Km	IIIB-1	0.078	VOC
60	5 Km	IIIB-2	0.078	VOC
12	1 Km	IIIA	0.078	VOC
1	1 Km	IIIA	0.078	VOC
63	9 Km	IIIB-1	0.078	VOC
64	6 Km	IIIC	0.078	Surplus
37	3 Km	IIIB-1	0.078	VOC
26	5 Km	IIIC	0.078	Surplus
67	2 Km	IIIC	0.078	Surplus
68	7 Km	IIIC	0.078	Surplus
39	7 Km	IIIC	0.078	Surplus
8	1 Km	IIIB-1	0.078	VOC

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

PROVINCE : KALIMANTAN SELATAN KABUPATEN : TABALONG

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
2	1 Km	IIIA	0.078	VOC
43	8 Km	IIIC	0.078	Surplus
73	2 Km	IIIC	0.078	Surplus
44	8 Km	IIIC	0.078	Surplus
19	1 Km	IIIB-1	0.078	VOC
76	4 Km	IIIC	0.078	Surplus
77	4 Km	IIIC	0.078	Surplus
78	4 Km	IIIC	0.078	Surplus
79	4 Km	IIIB-2	0.078	VOC
80	3 Km	IIIC	0.078	Surplus
30	1 Km	IIIB-1	0.078	VOC
82	10 Km	IIIB-2	0.078	Surplus
47	4 Km	IIIB-2	0.078	VOC
84	6 Km	IIIC	0.078	Surplus
85	3 Km	IIIC	0.078	Surplus
86	2 Km	IIIC	0.078	Surplus
87	2 Km	IIIC	0.078	Surplus
48	2 Km	IIIC	0.078	Surplus
89	4 Km	IIIC	0.078	Surplus
90	1 Km	IIIC	0.078	Surplus
91	4 Km	IIIC	0.078	Surplus
92	4 Km	IIIC	0.078	Surplus
49	2 Km	IIIC	0.078	Surplus
94	2 Km	IIIC	0.078	Surplus
95	7 Km	IIIC	0.078	Surplus
50	5 Km	IIIC	0.078	Surplus
51	5 Km	IIIC	0.078	Surplus
98	4 Km	IIIC	0.078	Surplus
99	3 Km	IIIC	0.078	Surplus
100	10 Km	IIIC	0.078	Surplus
101	2 Km	IIIC	0.078	Surplus
102	3 Km	IIIC	0.078	Surplus
103	10 Km	IIIC	0.078	Surplus
104	4 Km	IIIC	0.078	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : TABALONG

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
13	1 Km	IIIB-2	15.025	VOC
32	6 Km	IIIB-2	11.943	VOC
35	8 Km	IIIC	11.228	VOC
71	6 Km	IIIC	9.888	VOC
9	1 Km	IIIB-1	8.829	VOC
10	1 Km	IIIB-1	8.496	VOC
5	1 Km	IIIB-1	8.239	VOC
56	6 Km	IIIB-2	7.521	VOC
73	6 Km	IIIC	6.856	VOC
88	3 Km	IIIC	4.522	VOC
81	6 Km	IIIC	3.699	Surplus
27	5 Km	IIIC	3.310	VOC
52	3 Km	IIIB-2	2.285	VOC
33	7 Km	IIIB-2	0.078	VOC

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : TABALONG

LINK NO	LENGTH	CLASS	NPV (1000Rp)	B/C	IRR (%)	REMARK
70	10 Km	IIIB-1	222977	2.014	31.685	VOC
72	10 Km	IIIB-1	213388	2.172	36.118	VOC
25	11 Km	IIIB-1	129418	1.527	22.557	VOC
23	5 Km	IIIB-1	102273	2.038	32.758	VOC
29	1 Km	IIIA	94655	5.207	86.762	VOC
74	7 Km	IIIB-1	87884	1.590	24.093	VOC
46	6 Km	IIIB-1	72383	1.543	23.879	VOC
36	7 Km	IIIB-2	68633	1.682	25.569	VOC
24	4 Km	IIIB-1	60908	1.666	24.825	VOC
40	3 Km	IIIA	55502	1.830	29.007	VOC
66	8 Km	IIIB-2	52530	1.552	24.015	VOC
65	9 Km	IIIB-2	46427	1.363	18.967	VOC
16	1 Km	IIIA	45549	4.196	78.517	VOC
31	3 Km	IIIB-1	34018	1.447	20.008	VOC
75	4 Km	IIIB-2	33253	1.528	22.089	VOC
83	3 Km	IIIB-2	33178	1.814	28.107	VOC
28	5 Km	IIIB-2	24560	1.457	21.399	VOC
41	7 Km	IIIB-1	23784	1.151	13.794	VOC
38	6 Km	IIIB-1	21206	1.131	13.143	VOC
53	3 Km	IIIB-1	19772	1.348	18.320	VOC
6	1 Km	IIIA	16043	2.025	34.243	VOC
54	5 Km	IIIB-1	15970	1.170	14.373	VOC
96	9 Km	IIIB-2	14045	1.141	13.883	VOC
61	2 Km	IIIB-1	13504	1.256	16.092	VOC
7	1 Km	IIIB-1	8359	1.657	27.561	VOC
35	8 Km	IIIC	6722	1.048	11.228	VOC
45	2 Km	IIIB-1	6292	1.150	14.013	VOC
32	6 Km	IIIB-2	4490	1.062	11.943	VOC
97	6 Km	IIIB-2	3525	1.039	10.958	VOC
13	1 Km	IIIB-2	2898	1.202	15.025	VOC
62	2 Km	IIIB-2	2594	1.074	11.808	VOC
69	8 Km	IIIB-1	2518	1.016	10.416	VOC
17	1 Km	IIIA	1860	1.112	13.032	VOC
4	1 Km	IIIA	372	1.023	10.644	VOC
SUM	166 Km		1541490			

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: Tabalong

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	596	1,455	2,051
MAINTENANCE	136	519	655
SUPPLEMENTATION	400	-	400
WORKSHOP EQUIPMENT & TOOLS	28	-	28
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	1,177	1,974	3,151

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	329	1,959	2,288
CONSTRUCTION & MAINTENANCE EQUIPMENT	745	-	745
SPARE PARTS	58	15	73
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	1,177	1,974	3,151

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, and ownership cost for existing 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 26 links with the total length of 143 km which is 33% of the 434 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 : TABALONG

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary	23,25,28,29,31,36,38,40,41,46,53, 54,61,65,66,69,70,72,74,75,83,96
- Secondary	-
Engineering Point of View	67,85,89,94
Basic Human Needs	-

There are so many feasible road links in the Kabupaten that some road links are not selected to be improved. Among feasible road links following road links are proposed to be improved:

- Road Link which form the local road network; and
- High priority road links.

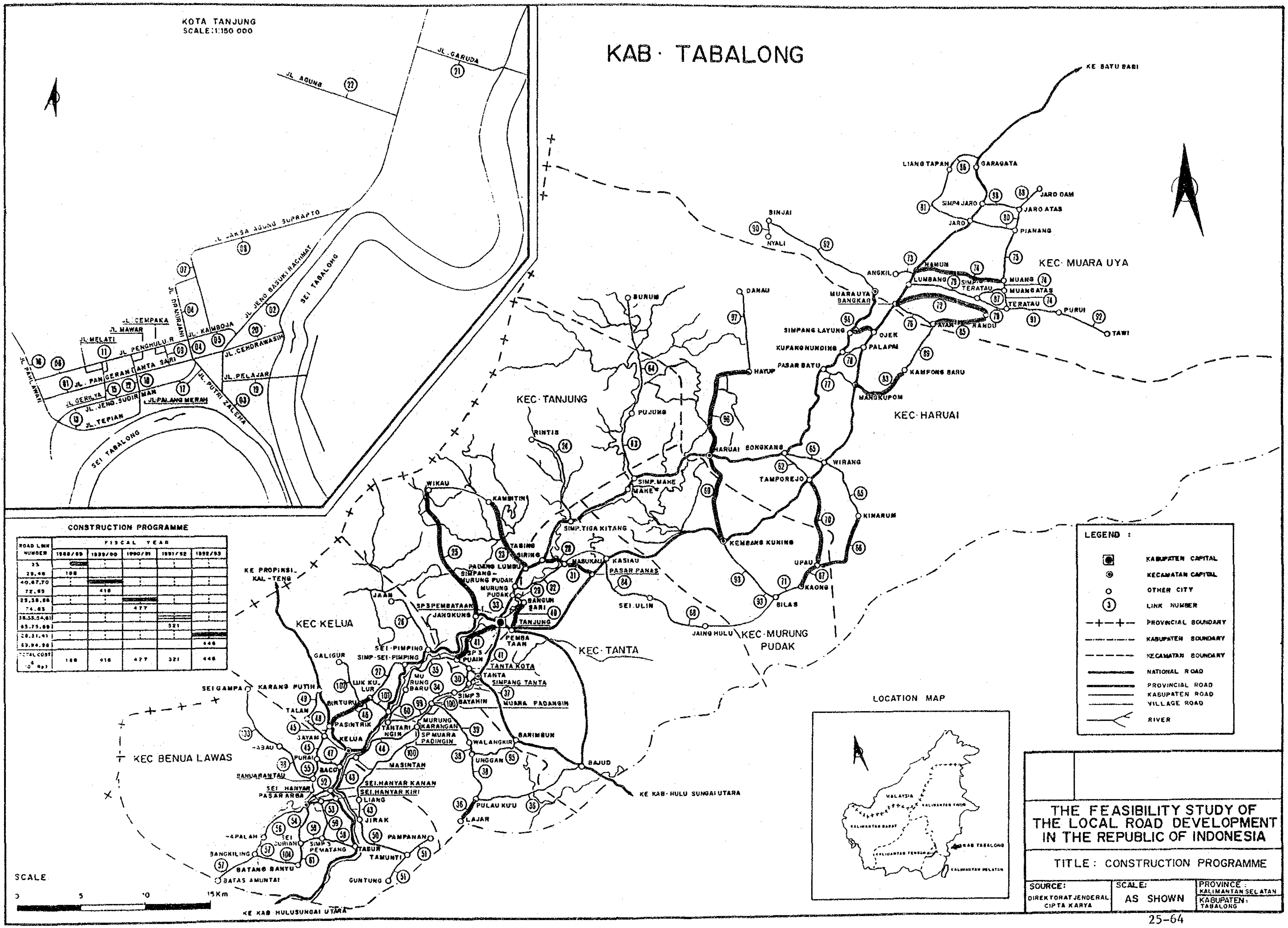
Four key road links which are located at the strategic point to complete the local road network consisting of feasible road links are selected from the engineering points of view.

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

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

YEAR	LINK NO ( ) : rate
1988 :	23, 29, 46
1989 :	40, 67, 70, 72, 85
1990 :	25, 36, 66, 74, 83
1991 :	38, 53, 54, 61, 65, 75, 89
1992 :	28, 31, 41, 69, 94, 96



CONSTRUCTION PROGRAMME

ROAD LINK NUMBER	FISCAL YEAR				
	1988/89	1989/90	1990/91	1991/92	1992/93
23, 29,46	188				
40,67,70, 72,89		416			
25,38,66, 74,85			477		
38,55,54,61, 65,75,89				321	
28,31,41, 69,94,98					446
TOTAL COST (10^6 Rp)	188	416	477	321	446

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

TITLE : CONSTRUCTION PROGRAMME

SOURCE: DIREKTORAT JENDERAL CIPTA KARYA

SCALE: AS SHOWN

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : TABALONG

(2) Road Links to Be Maintained

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

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SD (%)	HU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TN NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
1	1	70.0	30.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
2	1	80.0	20.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
3	1	40.0	60.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
4	1	10.0	80.0	10.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
5	1	20.0	80.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
6	1	30.0	20.0	50.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
7	1	30.0	10.0	60.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
8	1	90.0	10.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
9	1	10.0	90.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
10	1	10.0	80.0	10.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
11	1	90.0	10.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
12	1	87.0	13.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
13	1	30.0	10.0	60.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
14	1	8.0	80.0	12.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
15	1	0.0	90.0	10.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
16	1	30.0	10.0	60.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
17	1	30.0	60.0	10.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
18	1	50.0	30.0	20.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
19	1	90.0	10.0	0.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
20	1	20.0	60.0	20.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
21	1	10.0	60.0	30.0	0.0	1	0	0	0	0.00	0	0.00	0	542	145	687
26	5	0.0	14.0	79.0	7.0	0	0	5	2	76.00	0	0.00	780	1,864	408	2,272
27	5	20.0	0.0	80.0	0.0	0	0	5	6	567.00	0	0.00	5,819	5,722	1,589	7,311
30	1	0.0	80.0	20.0	0.0	0	1	0	0	0.00	0	0.00	0	356	95	451
32	6	0.0	30.0	58.3	11.7	0	6	0	4	158.50	0	0.00	1,627	3,379	953	4,332
33	7	0.0	19.3	58.6	22.1	0	7	0	5	860.16	0	0.00	8,827	9,248	2,735	11,983
37	3	26.7	20.0	46.7	6.7	0	3	0	4	80.50	0	0.00	826	1,699	479	2,178

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SO (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TH NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
40	3	43.3	16.7	40.0	0.0	0	3	0	1	44.10	0	0.00	453	1,413	392	1,805
43	8	32.5	16.3	48.8	2.5	0	0	8	2	122.50	0	0.00	1,257	2,989	656	3,645
44	8	26.3	26.3	47.5	0.0	0	0	8	6	86.34	0	0.00	886	2,705	569	3,274
45	2	15.0	0.0	85.0	0.0	0	0	2	2	57.75	0	0.00	593	960	229	1,189
46	6	16.7	26.7	56.7	0.0	0	0	6	8	243.25	0	0.00	2,496	3,431	856	4,287
47	4	77.5	12.5	10.0	0.0	0	0	4	3	66.50	0	0.00	682	1,536	340	1,876
52	3	30.0	16.7	53.3	0.0	0	0	3	0	0.00	0	0.00	0	760	135	895
53	3	46.7	30.0	16.7	6.7	0	0	3	0	0.00	0	0.00	0	760	135	895
54	5	64.0	6.0	30.0	0.0	0	0	5	1	49.00	0	0.00	503	1,651	344	1,995
55	5	12.0	26.0	62.0	0.0	0	0	5	4	214.50	0	0.00	2,201	2,952	741	3,693
56	6	40.0	25.0	35.0	0.0	0	0	6	0	0.00	0	0.00	0	1,520	271	1,791
58	5	28.0	22.0	50.0	0.0	0	4	1	2	110.25	0	0.00	1,131	2,542	691	3,233
59	4	17.5	30.0	52.5	0.0	0	0	4	3	83.81	0	0.00	860	1,672	382	2,054
63	9	22.2	23.3	52.2	2.2	0	9	0	10	277.00	0	0.00	2,843	5,377	1,524	6,901
69	8	37.5	31.3	30.0	1.3	0	7	1	1	22.75	0	0.00	233	2,921	767	3,688
71	6	0.0	0.0	17.5	82.5	0	6	0	7	132.45	0	0.00	1,359	3,174	890	4,064
73	2	25.0	10.0	65.0	0.0	0	0	2	1	31.36	0	0.00	322	753	164	917
76	4	82.5	15.0	2.5	0.0	0	0	4	1	57.50	0	0.00	611	1,181	324	1,805
77	4	35.0	35.0	30.0	0.0	0	0	4	0	0.00	0	0.00	0	1,013	181	1,194
78	4	45.0	10.0	45.0	0.0	0	0	4	0	0.00	0	0.00	0	1,013	181	1,194
79	4	0.0	55.0	45.0	0.0	0	4	0	0	0.00	0	0.00	0	1,422	381	1,803
88	3	0.0	60.0	40.0	0.0	3	0	0	0	0.00	0	0.00	0	1,627	435	2,062
93	6	0.0	47.5	44.2	8.3	6	0	0	6	151.20	0	0.00	1,552	4,442	1,233	5,675
96	9	17.8	32.2	33.3	16.7	0	7	2	3	61.25	0	0.00	629	3,477	905	4,382
98	4	30.0	17.5	52.5	0.0	0	0	4	4	219.00	0	0.00	2,247	2,734	707	3,441
99	3	43.3	23.3	33.3	0.0	0	0	3	4	69.00	0	0.00	708	1,302	301	1,603
104	4	17.5	25.0	57.5	0.0	0	0	4	3	85.75	0	0.00	880	1,687	387	2,074
SUM	180					30	57	93	96	3929.42	0	0.00	40,324	90,964	23,427	114,391

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 Tabalong 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 2,051 x 10^6 and maintenance cost is Rp 655 x 10^6 which is approximately 24% of the total expenditure.

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

(UNIT : 1000Rp)

I T E M	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	120,482	265,361	316,296	357,436	296,747	1,356,322	(66.1%)
Ownership Cost	1,412	3,204	4,172	4,307	3,703	16,798	(1.2%)
Operation Cost	56,455	128,762	165,214	171,611	150,446	672,488	(49.6%)
Material Cost	22,825	44,014	37,921	48,342	43,423	196,525	(14.5%)
Labour Cost	24,075	54,769	67,733	86,554	60,469	293,600	(21.6%)
Contingency	15,715	34,612	41,256	46,622	38,706	176,911	(13.0%)
FOREIGN CURRENCY :	67,498	151,477	161,608	164,038	149,890	694,511	(33.9%)
Ownership Cost	28,387	64,386	82,960	85,325	76,102	337,160	(48.5%)
Operation Cost	3,898	8,961	11,711	11,867	10,751	47,188	(6.8%)
Material Cost	26,409	58,372	45,858	45,450	43,486	219,575	(31.6%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	8,804	19,758	21,079	21,396	19,551	90,588	(13.0%)
TOTAL COST :	187,980	416,838	477,904	521,474	446,637	2,050,833	
Ownership Cost	29,799	67,590	87,132	89,632	79,805	353,958	(17.3%)
Operation Cost	60,353	137,723	176,925	183,478	161,197	719,676	(35.1%)
Material Cost	49,234	102,386	83,779	93,792	86,909	416,100	(20.3%)
Labour Cost	24,075	54,769	67,733	86,554	60,469	293,600	(14.3%)
Contingency	24,519	54,370	62,335	68,018	58,257	267,499	(13.0%)

(Contingency : 15%)

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

(MAINTENANCE)

PROV : KALIMANTAN SELATAN KAB : TABALONG

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	44,617	95,244	110,336	128,651	140,446	519,294	(79.2%)
Ownership Cost	353	781	944	1,136	1,267	4,481	(0.9%)
Operation Cost	21,495	45,349	51,636	60,313	65,558	244,351	(47.1%)
Material Cost	3,176	6,762	7,587	8,587	9,189	35,301	(6.8%)
Labour Cost	19,593	42,352	50,169	58,615	64,432	235,161	(45.3%)
FOREIGN CURRENCY :	11,495	24,696	28,758	33,972	37,282	136,203	(20.8%)
Ownership Cost	9,410	19,894	22,656	26,568	28,920	107,448	(78.9%)
Operation Cost	949	2,014	2,328	2,758	3,033	11,082	(8.1%)
Material Cost	1,136	2,788	3,774	4,646	5,329	17,673	(13.0%)
Labour Cost	0	0	0	0	0	0	(0.0%)
TOTAL COST :	56,112	119,940	139,094	162,623	177,728	655,497	
Ownership Cost	9,763	20,675	23,600	27,704	30,187	111,929	(17.1%)
Operation Cost	22,444	47,363	53,964	63,071	68,591	255,433	(39.0%)
Material Cost	4,312	9,550	11,361	13,233	14,518	52,974	(8.1%)
Labour Cost	19,593	42,352	50,169	58,615	64,432	235,161	(35.9%)

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

(TOTAL)

PROV : KALIMANTAN SELATAN KAB : TABALONG

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	165,099	360,605	426,632	486,087	437,193	1,875,616	(69.3%)
Ownership Cost	1,765	3,985	5,116	5,443	4,970	21,279	(1.1%)
Operation Cost	77,950	174,111	216,850	231,924	216,004	916,839	(48.9%)
Material Cost	26,001	50,776	45,508	56,929	52,612	231,826	(12.4%)
Labour Cost	43,668	97,121	117,902	145,169	124,901	528,761	(28.2%)
Contingency	15,715	34,612	41,256	46,622	38,706	176,911	(9.4%)
FOREIGN CURRENCY :	78,993	176,173	190,366	198,010	187,172	830,714	(30.7%)
Ownership Cost	37,797	84,280	105,616	111,893	105,022	444,608	(53.5%)
Operation Cost	4,847	10,975	14,039	14,625	13,784	58,270	(7.0%)
Material Cost	27,545	61,160	49,632	50,096	48,815	237,248	(28.6%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	8,804	19,758	21,079	21,396	19,551	90,588	(10.9%)
TOTAL COST :	244,092	536,778	616,998	684,097	624,365	2,706,330	
Ownership Cost	39,562	88,265	110,732	117,336	109,992	465,887	(17.2%)
Operation Cost	82,797	185,086	230,889	246,549	229,788	975,109	(36.0%)
Material Cost	53,546	111,936	95,140	107,025	101,427	469,074	(17.3%)
Labour Cost	43,668	97,121	117,902	145,169	124,901	528,761	(19.5%)
Contingency	24,519	54,370	62,335	68,018	58,257	267,499	(9.9%)

(Contingency : 15%)

6.1.4 Construction and Maintenance Equipment Cost

(1) Required Number of Equipment

The required numbers of construction equipment for Kabupaten Tabalong 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.

- 2-Wheel Loader
- 2-Dump Truck
- 1-Asphalt Sprayer

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 SELATAN KAB : TABALONG

EQUIPMENT NAME	WORKABLE	EXISTING	(1988)	(1989)	(1990)	(1991)	(1992)
Bulldozer/Ripper	250	0	0.21	0.85	0.98	0.79	1.19
Swamp Bulldozer	250	0	0.00	0.00	0.02	0.05	0.05
Motor Grader	250	0	0.46	0.79	1.14	1.09	0.86
Hand-guide Vib. Roller	250	0	0.08	0.15	0.15	0.46	0.22
Tire Roller	250	0	0.28	0.54	0.40	0.36	0.40
Vibratory Roller (D&T)	250	0	0.36	0.90	1.17	1.02	1.09
Hydraulic Excavator; Wheel	250	0	0.00	0.00	0.09	0.77	0.27
Wheel Loader	250	5	0.59	1.27	1.70	1.71	1.53
Water Tank Truck	250	0	0.23	0.53	0.72	0.68	0.61
Dump Truck	250	0	4.64	10.58	14.21	14.58	11.94
Flat Bed Truck with Crane	250	0	0.04	0.12	0.13	0.37	0.20
Flat Bed Truck	250	0	0.36	0.70	0.54	0.58	0.55
Portable Crusher/Screening	250	0	0.12	0.22	0.27	0.22	0.25
Concrete Mixer	250	0	0.02	0.04	0.04	0.07	0.03
Water Pump	250	0	0.01	0.03	0.04	0.06	0.03
Concrete Vibrator	250	0	0.01	0.02	0.03	0.03	0.02
Asphalt Sprayer	250	1	0.28	0.54	0.40	0.36	0.40

NOTE WORKABLE : workable days in a year
EXISTING : number of existing equipment

Table 6-1-8 EQUIPMENT PURCHASE COST

PROV : KALIMANTAN SELATAN KAB : TABALONG

(1000 Rp)

EQUIPMENT NAME	CLASS	CIF (JAKARTA)	PURCHASE NO.	PURCHASE COST
Bulldozer	90 HP	49,150	-	-
Bulldozer/Ripper	90 HP	53,000	1	53,000
Swamp Bulldozer	90 HP	52,850	-	-
Swamp Bulldozer	65 HP	40,500	-	-
Motor Grader	75 HP	47,800	2	95,600
Road Stabilizer	W=1850 mm	85,950	-	-
Hand-guide Vib. Roller	1000 Kg	8,500	1	8,500
Tire Roller	8-15 ton	31,070	1	31,070
Vibratory Roller (D&T)	4 ton	29,000	1	29,000
Vibratory Roller	4 ton	29,000	-	-
Rough Terrain Crane	10 ton	100,400	-	-
Hydraulic Excavator; Wheel	0.3 m3	41,100	-	-
Wheel Loader	1.2 m3	70,200	-	-
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	13	191,100
Dump Loader Truck	12 ton	56,300	1	56,300
Flat Bed Truck with Crane	3.0 ton	25,190	1	25,190
Flat Bed Truck	3.0 ton	11,275	2	22,550
Portable Crusher/Screening	30-40 t/h	188,000	1	188,000
Concrete Mixer	0.5 m3	18,000	-	-
Water Pump	200 l/min	630	-	-
Concrete Vibrator	3.3 HP	740	-	-
Asphalt Sprayer	850 ltr.	10,200	-	-
Service Car	3 ton	11,600	1	11,600
4 Wheel Drive Vehicle	70 HP	17,500	1	17,500
Motorcycle	100 cc	1,100	3	3,300

PURCHASE COST TOTAL	745,460
OWNERSHIP COST (FOREIGN)	345,655
EQUIPMENT COST SUPPLEMENTED	399,805

NOTE : OWNERSHIP COST (FOREIGN) for Existing Equipment

Wheel Loader	77,231
Dump Truck	18,723
Asphalt Sprayer	2,999
TOTAL	98,953

6.1.5 Other Costs

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

6.1.6 Quantities by Work Type

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

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

PROV : KALIMANTAN SELATAN KAB : TABALONG

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
Site Clearance in Light Bush	m2	9000.00	0.00	0.00	8500.00	12000.00	29500.00
Subgrade Preparation	m2	82000.00	100000.00	179930.00	212500.00	64790.00	639220.00
Normal Fill	m3	0.00	14700.00	13550.00	4450.00	22100.00	54800.00
Fill in Swamp	m3	0.00	0.00	720.00	2207.10	1817.00	4744.10
Normal Excavation to Spoil	m3	3134.00	7112.00	13362.00	22558.00	5252.00	51418.00
Sub Base Course	m3	6425.00	11504.00	16924.00	18800.00	9914.00	63567.00
Base Course	m3	3400.00	6560.00	9360.00	7600.00	8400.00	35320.00
Shoulder	m2	43000.00	80500.00	103500.00	80500.00	107000.00	414500.00
Asphalt Patching	m2	0.00	0.00	0.00	0.00	0.00	0.00
Surface Dressing (Single)	m2	44000.00	80000.00	72000.00	64000.00	72000.00	332000.00
Surface Dressing (Double)	m2	4000.00	12000.00	0.00	0.00	0.00	16000.00
Earth Drain	m	12100.00	30900.00	41900.00	40900.00	21700.00	147500.00
Earth Drain in Swamp (by machine)	m3	0.00	0.00	1800.00	15300.00	5400.00	22500.00
Pipe Culvert D80cm	m	6.00	165.00	200.00	228.00	128.00	727.00
Masonry Culvert (80x80cm)	m	0.00	0.00	0.00	0.00	0.00	0.00
Retaining Wall and Wing Wall (Timber)	m2	0.00	0.00	0.00	0.00	800.00	800.00
Retaining Wall and Wing Wall (Masonry)	m3	30.00	28.80	41.60	104.80	22.40	227.60
Gabion Protection	m3	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;10T)	m2	24.00	0.00	0.00	92.80	36.00	152.80
Superstructure (Timber;Span 5m;10T)	m2	0.00	18.00	0.00	86.40	40.00	144.40
Superstructure (Timber;Span 8m;10T)	m2	0.00	0.00	0.00	64.00	0.00	64.00
Superstructure (Timber;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span10m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span15m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Timber;10T)	NO	1.00	0.00	0.00	10.00	3.00	14.00
Substructure (Abut;for Timber;10T)	NO	2.00	2.00	0.00	14.00	6.00	24.00
Substructure (Pier;for Timber;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Timber;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Concrete;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Concrete;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Timber->Timber)	m2	24.00	15.75	0.00	91.63	46.10	177.48
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	88.50	184.50	211.00	243.00	263.50	990.50
Routine maintenance of earth road	Km	45.00	87.00	87.00	83.00	77.50	379.50
Routine maintenance of gravel road	Km	28.50	55.50	59.00	77.00	87.00	307.00
Routine maintenance of asphalt road	Km	15.00	42.00	65.00	83.00	99.00	304.00
Maintenance of Timber Bridge (New)	m2	0.00	0.00	24.00	18.00	24.00	66.00
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	1903.90	3907.37	4058.42	4420.07	4535.57	18825.33
Maintenance of Concrete Bridge (Exist)	m2	0.00	0.00	0.00	85.40	85.40	170.80

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.

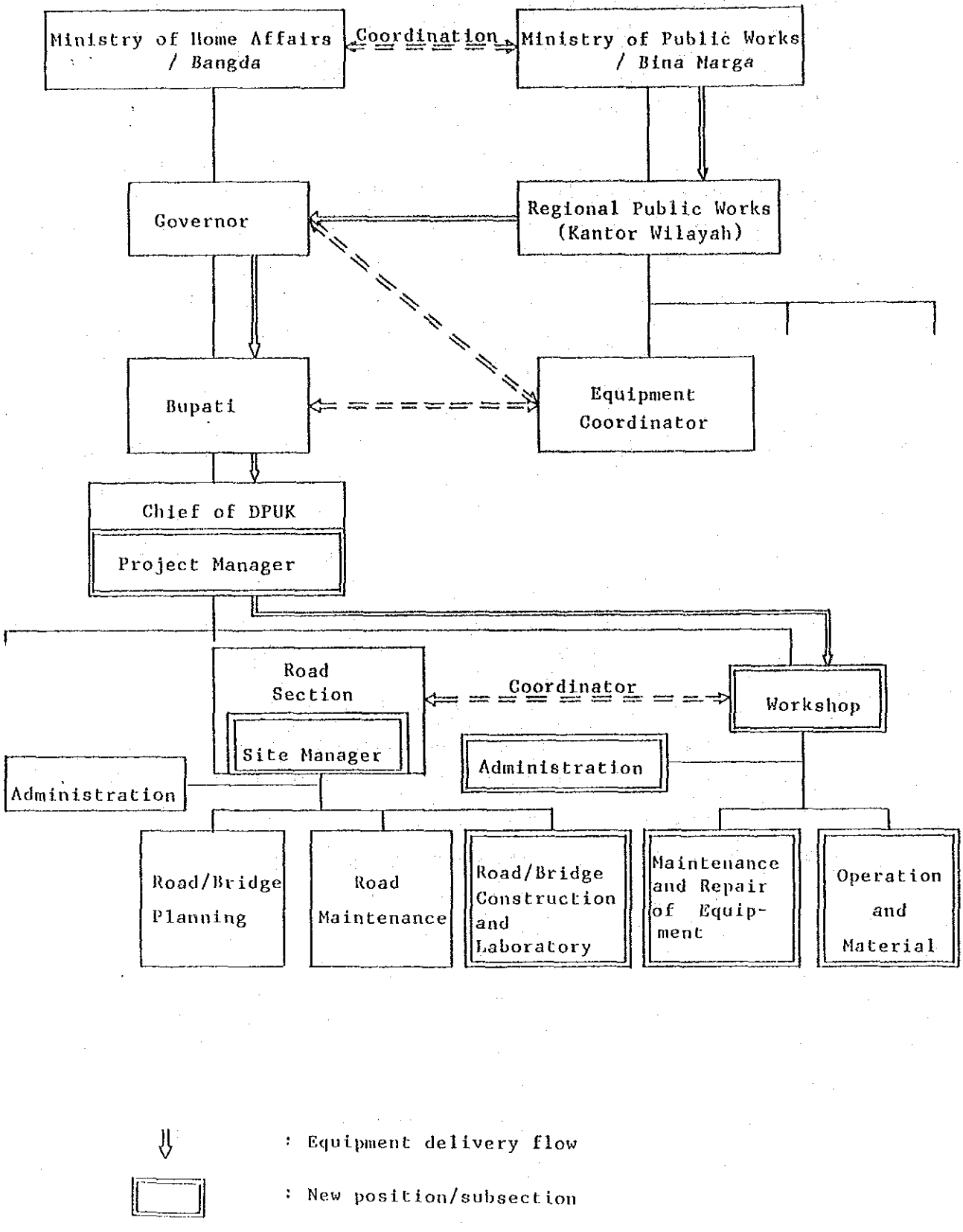
It is recommended that the workshop is newly organized to consist of three sub-sections, i.e. maintenance and repair of equipment, operation and materials, and administration to execute the main tasks described in Clause 3.5.

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