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 21

KABUPATEN TAPIN

MARCH 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

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

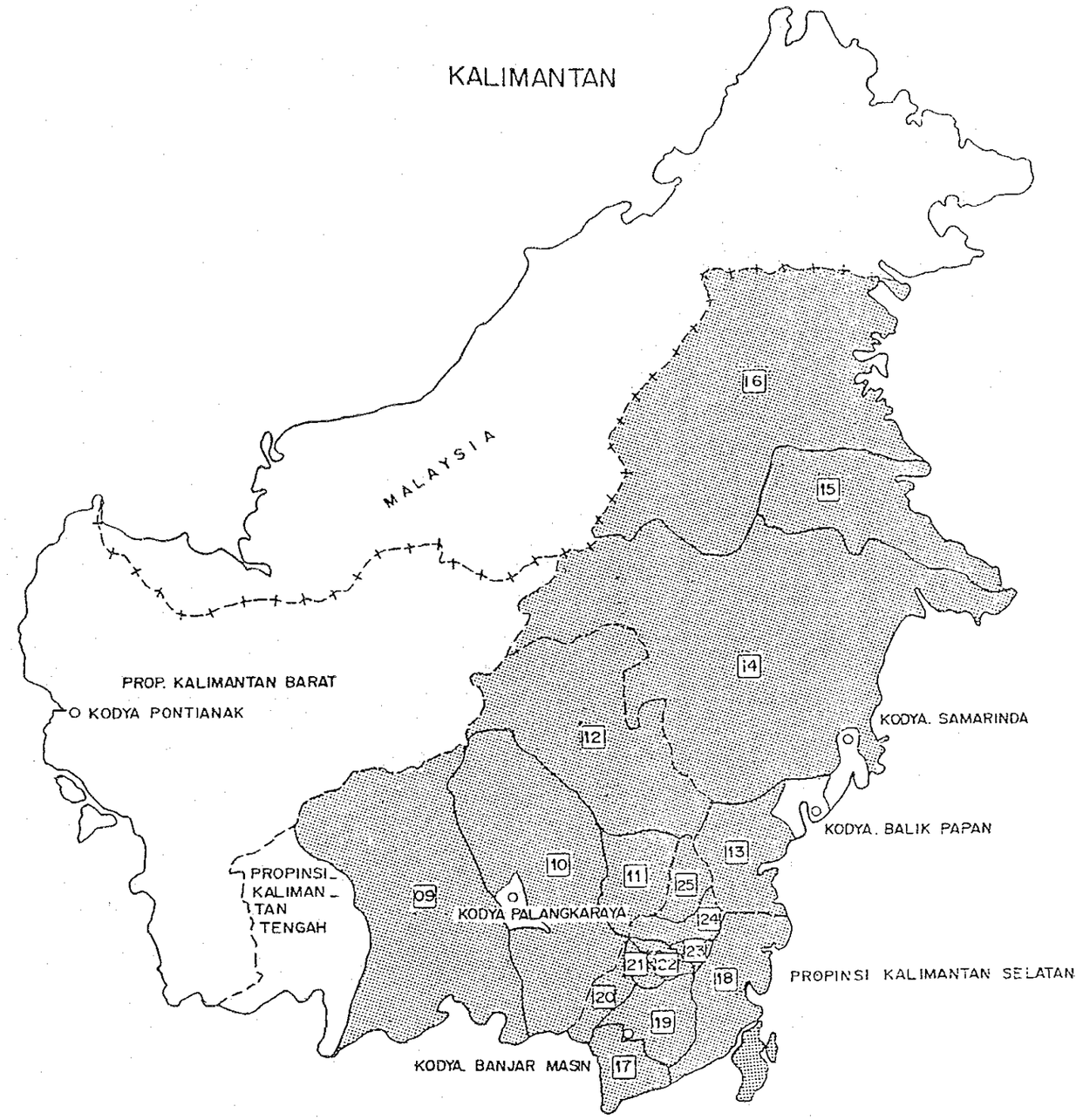
The purpose of the study for the Kabupaten is mainly to estimate the total Project Cost for the local road development but only limited data is available for study base. Therefore a detailed survey and design for the improvement of the Kabupaten roads should be carried out before commencing the Project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

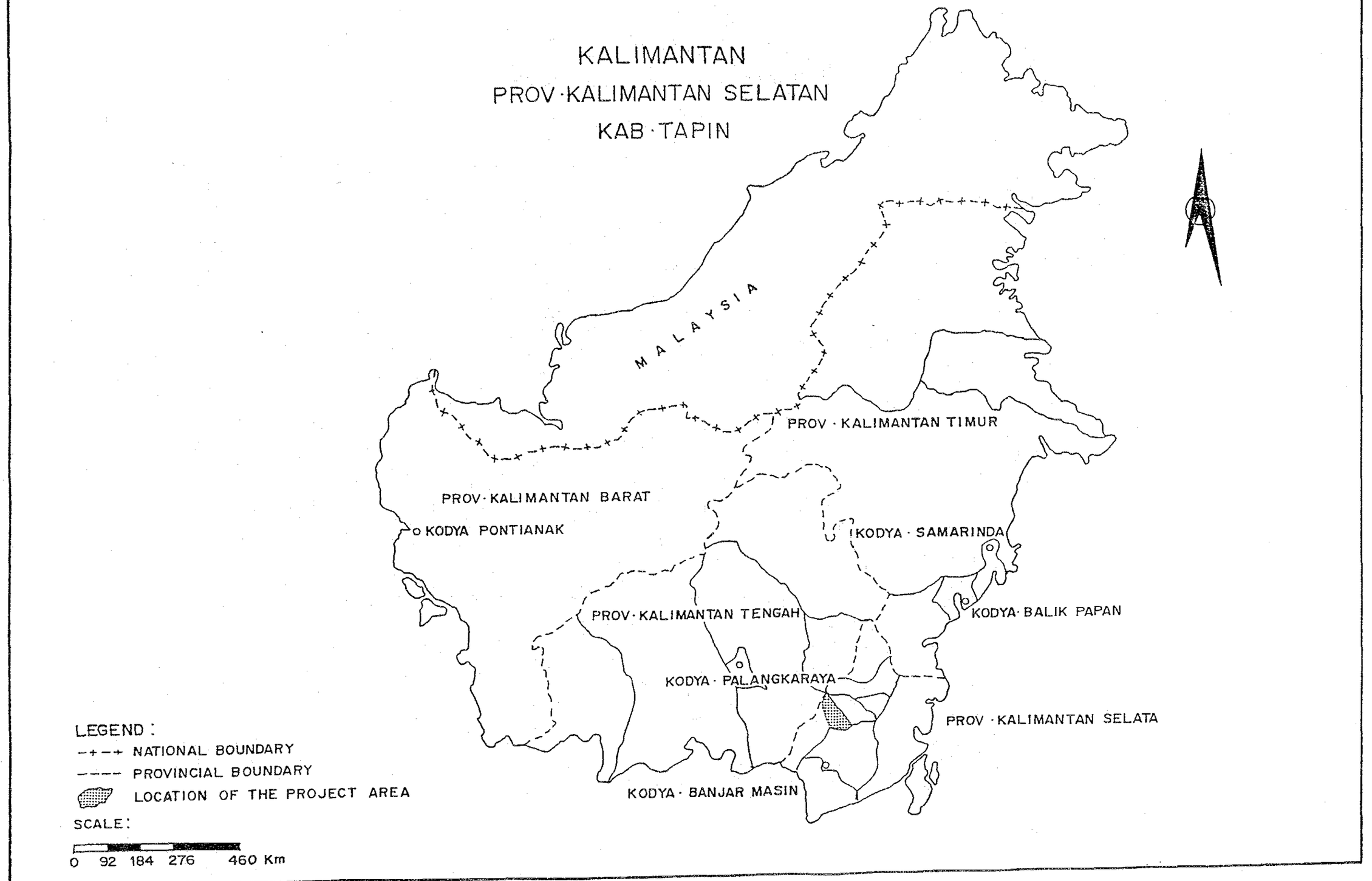
VI · PROPINSI KALIMANTAN SELATAN
- 17 · KAB · TANAH LAUT
- 18 · KAB · KOTA BARU
- 19 · KAB · BANJAR
- 20 · KAB · BARITO KUALA
- 21 · KAB · TAPIN
- 22 · KAB · HULU SUNGAI SELATAN
- 23 · KAB · HULU SUNGAI TENGAH
- 24 · KAB · HULU SUNGAI UTARA
- 25 · KAB · TABALONG



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

SCALE :

0 92 184 276 460 Km.


KALIMANTAN
PROV·KALIMANTAN SELATAN
KAB·TAPIN
MALAYSIA
PROV·KALIMANTAN BARAT
KODYA PONTIANAK
PROV · KALIMANTAN TIMUR
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 · TAPIN

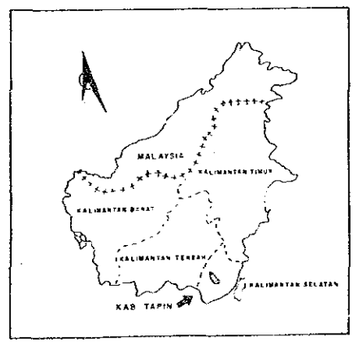
KEC CANDI LARAS UTARA
KEC · CANDI LARAS - SELATAN
KEC BAKARANGAN
KEC · TAPIN TENGAH
KEC TAPIN UTARA
KEC · PIANI
KEC · TAPIN SELATAN
KEC · BINUANG

GARIS HALAT
TANGKAWANG
MARGA - SARI HILIR
MARGASARI ULU
MUNGKUR GALAH
PARANDAKAN
KE KANDANGAN
GADUNG
KARATAU
BAKA RANGAN
BANUA HALAT
LOKPAIKAT
BATARATAT
PARIGI
ANIM - PARIGI RECIL
SAHIGAR
DULANG
PAUL
BINDERANG LUMBU
PANDAHAN
KAPAYANG
PADANG BUNTU
BITAHAN PERINTIS
PAUH
WALANG SERAWI
RAN - ITAU
MANDURIAN
MATANG RAMBAI
TAMBA RUNTUNG
AMPERA
KULUR
TIMBAAN
PANDULANGAN
LABUNG
TELUK MESJID
CINTA WARI
TIRIK
BUNGUR
AYUNAN PAPAN
TIMBUNG SABAH
HARAPAN - MASA
TRANSLOK
BERAMBAN
MIAWA
BATU AMPAR
BATUNG
SAWANG
TAMBA - RANGAN
SUMINTIN
KUMPAI
TAMPONANG
LINUH
SOATO - TATAKAN
DATU SANGGUL
TATAKAN
TANDUI
KAMPUNG BARU
SP KEMBANG HABANG
PANTAI CABI
SUATO
GUNUNG PAKAN
KEMBANG - HABANG
NES III
PULAU PINANG
PADANG SARI
A.YANI
BATU HAPU
KEMBANG - KUNING
BUMBUN
TRANSAD
ASAM RANDAH
HATUNGUN
PANTAI SELANTI
HARUBAN
BINUANG
BURAKAI
GUNUNG BATU
SARANG SAMUT
KE BANJARMASIN

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

SCALE:
0 5 10 15 Km

LOCATION MAP



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 : TAPIN

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 Tapin is a long and narrow shaped Kabuapten stretching from the southeast at the foot of the Meratus mountains towards the northwest. The Kabupaten is adjoined on the nothern point by Kalimantan Tengah Province and bordered on the south by Kabupaten Banjar, on the east by Kabupaten Hulu Sungai Selatan and on the west by kabupaten Barito Kuala.

The main topographic feature of the Kabupaten is the Meratus mountains which change into flatland sloping to the north to the capital of the Kabupaten, Rantau. From here the Negara River basin covered with swamps spread wide to the north. The Negara River is one of the Barito River's tributaries. Further over the Negara River basin covered with swamps spreads wide to the north. The Negara River is one of the Barito River's tributaries. Further over the Negara River hills appear in the northern area.

The area of the Kabupaten is about 2,700 square kilometers, approximately 7 percent of the total of the province. It consists administratively of 8 Kecamatan.

1.1.2 Meteorological Conditions

The average number of rainy days and the average amount of yearly rainfall in Kabupaten Tapin are 166 days and 2,262 mm respectively.

One year in the Kabupaten consists of a rainy season and a dry season. The dry season is from July through September 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 210 days using the following formula based upon the data shown in the table referred to above.

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

Where :

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

Table 1-1-1

METEOROLOGICAL CONDITIONS

PROVINCE : Kalimantan Selatan
KABUPATEN : Tapin

STATION : Tatakan Rantau

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	24	272	16	203	25	301	14	151	24	196
February	21	204	18	280	20	191	14	163	24	229
March	17	211	18	152	22	444	9	126	23	263
April	22	375	17	233	14	331	11	148	22	341
May	17	316	19	264	13	77	21	305	24	211
June	16	171	10	25	11	163	10	103	11	137
July	8	66	18	154	2	22	8	96	18	163
August	14	83	4	19	2	27	7	46	8	79
September	5	90	14	94	4	30	8	73	18	196
October	10	124	16	247	6	148	10	105	11	92
November	18	123	23	216	10	275	24	487	19	228
December	24	282	30	402	19	245	19	225	22	287
Total	196	2,317	105	2,289	148	2,254	155	2,029	224	2,421

1.2 Socio-Economic Conditions

1.2.1 Population

The population of Kabupaten Tapin in 1983 was 115,752 which was approximately 5.4% of the 2,128,400 total population of Kalimantan Selatan Province as shown in Table 1-2-1.

The population density was 0.42 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 3.0% which is higher than both the provincial rate of 2.1% and the national rate of 2.2%.

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 : 1983

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : TAPIN

KECAMATAN	POPULATION	PROPORTION (%)
BINUANG	21,743	18.8
TAPIN SELATAN	16,958	14.7
TAPIN TENGAH	15,314	13.2
TAPIN UTARA	28,374	24.5
CANDI LARAS SELATAN	9,606	8.3
CANDI LARAS UTARA	12,280	10.6
BAKARANGAN	8,215	7.1
PIANI	3,262	2.8
TOTAL	115,752	100

1.2.2 Land Use

In Kabupaten Tapin, 131,987 ha of the current available land use area, which is approximately 49.0% of the 270,082 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 121,342 ha of agricultural harvest area, 6,120 ha of residential area and 4,525 ha of usable open space which are 91.9%, 4.6% and 3.5% of the current available land use area respectively.

The agricultural harvest area consists of 51,032 ha of paddy field, 20,694 ha of plantation and 49,616 ha of other cultivated area which are 42.1%, 17.1% and 40.8% of the agricultural harvest area respectively.

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

Table 1-2-3

LAND USE

PROVINCE : KALIMANTAN SELATAN

(ha)

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

Notes :

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

1.2.3 Agriculture

The cultivated area and food crop production in Kabupaten Tapin in 1983 were 38,126 ha and 137,663 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 33,105 ha and 131,271 ton respectively which are 86.8% and 95.4% of the total food crops. The yield rate of paddy production is 3.97 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 1980 through 1983 were 3.0% and 7.3% respectively which indicate favorable development of the paddy production. It is desirable that productivity of paddy increases and this depends upon the future development of irrigation.

The population of the agricultural sector which is assumed from the employment in the Kabupaten is 61.5% of the total population as shown in Table 1-2-6. Thus this is an agricultural Kabupaten.

Future agricultural development of the Kabupaten will need to introduce commodity crops other than paddy to realize multiple agricultural production. However it is also important for the Kabupaten to make an effort to improve paddy productivity.

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

KABUPATEN : TAPIN

CULTIVATED AREA

(ha)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	33,427	31,124	33,227	29,207	33,105	-	3.0
OTHERS	4,285	2,624	3,403	-	5,021	-	24.0
TOTAL	37,712	33,748	36,630	29,207	38,126	-	4.1

PRODUCTION

(ton)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	99,089	103,512	111,173	103,125	131,271	-	7.3
OTHERS	7,268	5,190	7,401	-	6,392	-	7.2
TOTAL	106,357	108,702	118,574	103,125	137,663	-	8.1

YIELD RATE

(ton/ha)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	2.96	3.35	3.53	3.97	-	-	7.0

Notes :

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

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

PROVINCE : KALIMANTAN SELATAN

KABUPATEN	AREA (ha)	PRODUCTION (ton)	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 Tapin are presuned to be only the fishery industry. However this sector also is a industry to just be enough to supply for the consumption of the Kabupaten itself. Besides the fishery sector there is no remarkable industries in the Kabupaten.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

The regional trunk roads of Kabupaten Tapin consist of one national road which runs across the Kabupaten from south to north via Rantau, the Kabupaten capital, and one provincial road which leads to Margasari Ulu from Rantau, from its junction with the national road. Therefore the Kabupaten roads are developed to link with these national and provincial roads as follows.

1. East of the national road :
   A relatively large link road in formed because the area is hilly.

2. West of the national road and in the north area along the provincial road, that is, mostly the area around Rantau:
   A high density road network is formed because the area is flat.

3. Southwest of Rantau :
   Roads are not yet developed because the area is mostly covered by swamp.

In particular the area along the Negada river in the northwest region of the Kabupaten is less advanced due to the geographical conditions, accordingly 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 Tapin are confirmed as 54 links and 295 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 1.09 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 : Tapin	295	270,062	1.09
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 : TAPIN

(Km)

NO	TI	ASP	BTB	KRK	TNH	L.L	TOTAL
LINK	1	12					12
LINK	2		2	2			4
LINK	3		3				4
LINK	4	2	3				5
LINK	5	4					4
LINK	6		3				3
LINK	7		2				2
LINK	8	6					6
LINK	9			2			2
LINK	10						1
LINK	11	5					5
LINK	12	4					4
LINK	13				3		3
LINK	14		4				4
LINK	15		2				2
LINK	16		4				4
LINK	17			1			1
LINK	18	3	4		6		14
LINK	19		5				5
LINK	20	13	4		7		24
LINK	21		3				3
LINK	22		5				5
LINK	23		4				4
LINK	24	9	3		1		13
LINK	25		5		2		7
LINK	26		5		1		6
LINK	27	7					7
LINK	28				3		3
LINK	29		3				3
LINK	30		17				17
LINK	31				8	9	8
LINK	32		3	2			5
LINK	33	17					17
LINK	34	3					3
LINK	35		5				5
LINK	36			4			4
LINK	37		9		2		11
LINK	38		5				5
LINK	39				8	2	10
LINK	40		4				4
LINK	41		5				5
LINK	42						
LINK	43						
LINK	44				2		2
LINK	45						
LINK	46				8		8
LINK	47						
LINK	48						
LINK	49						
LINK	50				6		6
LINK	51						
LINK	52						
LINK	53				18		18
LINK	54				7		7
TOTAL		86	113	11	82	3	275
RATIO		29	38	4	28	1	(2)

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 : Tapin	29.2	42.0	28.8
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 not lower than that of Indonesia but is distinctly lower for that of Jawa Island. The proportion of low grade roads such as earth roads and others is fairly high. This means that the road classification in the Kabupaten is still considered as low.

(3) Surface Condition of Kabupaten Roads

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

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

	Good	Fair	Poor	Bad
Kabupaten : Tapin	30.2	38.6	28.1	3.1
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 EXISTING ROAD CONDITION BY SURFACE TYPE

PROVINCE : KALIMANTAN SELATAN

KABUPATEN : TAPIN

(1)

102 (71)	ASP				BTB				KRK				INH				L.I			
102	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB
LINK 1	16	68	11	5																
LINK 2					75	16	9		25	68	8									
LINK 3		40	60			63	32	5												
LINK 4	99	1			99	1														
LINK 5	47	43	10																	
LINK 6					38	62	8													
LINK 7						25	75													
LINK 8	60	39	2																	
LINK 9										68	33									
LINK 10						60	40													
LINK 11	55	43	2																	
LINK 12		18	77	5																
LINK 13														43	56					
LINK 14						37	33	29												
LINK 15						30		70												
LINK 16					79	10	11													
LINK 17										20	80									
LINK 18	91	9			50	19	31							86	14		20	40	20	20
LINK 19						41	45	14												
LINK 20	31	52	13	4	78	8	15							80	20					
LINK 21						20	70	10												
LINK 22					42		58													
LINK 23					25	45	30													
LINK 24	67	32	1		92	8								35	65					
LINK 25						69	31							1	99					
LINK 26					18	57	25						40		60					
LINK 27	10	28	58	4																
LINK 28													37	27	3	33				
LINK 29					66	24	10													
LINK 30					27	55	17	1												
LINK 31						6								72	25	3				
LINK 32						82	18			97	3									
LINK 33	70	19	11																	
LINK 34		27	73																	
LINK 35						43	57													
LINK 36										90	10									
LINK 37					19	56	26						38	63						
LINK 38					80		20													
LINK 39													18	83			15	85		
LINK 40					13	41	44	3												
LINK 41					98	2														
LINK 42																				
LINK 43																				
LINK 44													50	1	50					
LINK 45																				
LINK 46													7	86	4					
LINK 47																				
LINK 48																				
LINK 49															1					
LINK 50													6	74	20					
LINK 51																				
LINK 52																				
LINK 53															99	1				
LINK 54													13	57	1					
AVERAGE	42	32	24		34	31	27	5	5	69	27	0	16	47	34	2	18	63	10	10
LENGTH	86 Ka				113 Ka				11 Ka				82 Ka				3 Ka			
(Ka)	36	28	21		38	38	31	6	1	8	3	0	13	39	28	2	1	2	0	0

The surface condition level of the Kabupaten roads in the Kabupaten is approaching that of Indonesia but is still lower than that of Jawa Island. The proportion in good condition is relatively low. Therefore further maintenance 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 54.0% flat, 13.0% hilly, 26.0% mountainous and 6.0% swampy. Road construction is anticipated to become difficult in future because of the large proportions of hill and mountain.

1.3.3 Bridge Inventory

A bridge inventory showing the existing condition of bridges on the Kabupaten roads in Kabupaten Tapin 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 129 bridges with a total length of 986 m of which 124 or 96.1% are timber, 1 or 0.8% are concrete and 3 or 2.3% are others. Steel bridges account for only 1 or 0.8% of the total. There are no bridges listed in the inventory to be newly constructed.

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

PROV : KALIMANTAN SELATAN KAB : TAPIN

(Km)

NO (3)	DT	RW	GN	BK	TOTAL
LINK 1	12				12
LINK 2	4				4
LINK 3	4				4
LINK 4	5				5
LINK 5	4				4
LINK 6	3				3
LINK 7	2				2
LINK 8	6				6
LINK 9	2				2
LINK 10		1			1
LINK 11	5				5
LINK 12	4				4
LINK 13	3				3
LINK 14	4				4
LINK 15		2			2
LINK 16		4			4
LINK 17		1			1
LINK 18	14				14
LINK 19	5				5
LINK 20	9		15		24
LINK 21	3				3
LINK 22	5				5
LINK 23	1		3		4
LINK 24	3			10	13
LINK 25	2			5	7
LINK 26				6	6
LINK 27	3		4		7
LINK 28	2	1			3
LINK 29	1	2			3
LINK 30	12		5		17
LINK 31	2	6			8
LINK 32	5				5
LINK 33	11		4	2	17
LINK 34	3				3
LINK 35	3		2		5
LINK 36	4				4
LINK 37			11		11
LINK 38	5				5
LINK 39	1		5	4	10
LINK 40	3	1			4
LINK 41	1		3	1	5
LINK 42					
LINK 43					
LINK 44	2				2
LINK 45					
LINK 46			8		8
LINK 47					
LINK 48					
LINK 49					
LINK 50	2			4	6
LINK 51					
LINK 52					
LINK 53			18		18
LINK 54				7	7
TOTAL	160	18	78	39	295
RATIO	54	6	26	13	(%)

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : KALIMANTAN SELATAN KAB : TAPIN

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

	EXISTING		NOT EXIST		TOTAL	
LINK NO	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
1	5	24.50			5	24.50
2	3	13.00			3	13.00
3	3	13.50			3	13.50
5	2	35.50			2	35.50
6	2	24.00			2	24.00
7	1	3.75			1	3.75
8	2	8.00			2	8.00
10	1	4.00			1	4.00
12	2	10.50			2	10.50
14	2	7.00			2	7.00
15	1	15.00			1	15.00
16	2	7.00			2	7.00
18	3	23.00			3	23.00
20	17	92.50			17	92.50
21	2	12.50			2	12.50
22	2	18.00			2	18.00
23	1	6.00			1	6.00
24	10	82.90			10	82.90
25	2	13.00			2	13.00
26	2	7.00			2	7.00
27	4	46.00			4	46.00
28	1	5.50			1	5.50
29	2	7.00			2	7.00
30	14	97.40			14	97.40
31	3	25.00			3	25.00
32	1	5.50			1	5.50
33	7	38.00			7	38.00
35	3	16.00			3	16.00
36	4	34.00			4	34.00
37	4	29.00			4	29.00
38	3	26.00			3	26.00
40	2	21.50			2	21.50
41	4	25.00			4	25.00
44	1	22.50			1	22.50
46	6	112.00			6	112.00
50	1	5.00			1	5.00
53	1	28.00			1	28.00
54	3	21.50			3	21.50
TOTAL	129	985.55			129	985.55

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

PROV : KALIMANTAN SELATAN KAB : TAPIN

(No)

	<<< BRIDGE >>>				
	KY	LL	BT	BJ	TOTAL
LINK 1	5				5
LINK 2	3				3
LINK 3	2	1			3
LINK 5	2				2
LINK 6	2				2
LINK 7	1				1
LINK 8	2				2
LINK 10	1				1
LINK 12	2				2
LINK 14	2				2
LINK 15	1				1
LINK 16	2				2
LINK 18	3				3
LINK 20	17				17
LINK 21	2				2
LINK 22	2				2
LINK 23	1				1
LINK 24	8		1	1	10
LINK 25	2				2
LINK 26	2				2
LINK 27	4				4
LINK 28	1				1
LINK 29	2				2
LINK 30	14				14
LINK 31	2	1			3
LINK 32	1				1
LINK 33	7				7
LINK 35	3				3
LINK 36	4				4
LINK 37	4				4
LINK 38	3				3
LINK 40	2				2
LINK 41	4				4
LINK 44	1				1
LINK 46	6				6
LINK 50	1			1	1
LINK 53		1			1
LINK 54	3				3
TOTAL	124	3	1	1	129
RATIO	96	2			(%)

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	43	60	8	2	6	1	1	-	1	2	124
Concrete	-	1	-	-	-	-	-	-	-	-	1
Steel	-	-	-	-	-	1	-	-	-	-	1
Others	1	1	-	-	-	-	-	-	-	1	3
Total	44	62	8	2	6	2	1	-	1	3	129

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 Tapin 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	867	38	432	2,523	3,860
Proportion (%)	22.46	0.98	11.19	65.37	100.00

Source : Bina Marga Inventory

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

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Proportion (%)	5.38	0.00	6.65	87.97	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 : TAPIN

A)	Growth Rate of Population	: 3.00 (%)
B)	Growth Rate of Cultivated Area	: 6.00 (%)
C)	Growth Rate of Rice field	: 3.00 (%)
D)	Growth Rate of Rice yield rate	: 7.00 (%)
E)	Growth Rate of GDP / capita	: 6.60 (%)
a)	Geometrical Mean (A x B)	: 4.49 (%)
b)	Geometrical Mean (C x D)	: 4.98 (%)
c)	Geometrical Mean (a x b)	: 4.73 (%)
d)	Geometrical Mean (c x E)	: 5.66 (%)
	TRAFFIC GROWTH RATE	: 5.66 (%)

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 EXISTING AND FUTURE TRAFFIC VOLUME

PROV : KALIMANTAN SELATAN KAB : TAPIN

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
1	106	4	42	148	226	5.7%	217	8	86	303	462	IIIB-1
2	20	0	10	40	50	5.7%	41	0	20	82	102	IIIB-2
3	4	0	0	60	34	5.7%	8	0	0	123	70	IIIB-2
4	28	1	8	84	79	5.7%	57	2	16	172	162	IIIB-2
5	30	2	6	68	72	5.7%	61	4	12	139	147	IIIB-2
6	8	0	0	22	19	5.7%	16	0	0	45	39	IIIC
7	8	0	0	18	17	5.7%	16	0	0	37	35	IIIC
8	38	1	18	70	92	5.7%	78	2	37	143	188	IIIB-2
9	14	2	20	62	67	5.7%	29	4	41	127	137	IIIB-2
10	18	2	8	100	78	5.7%	37	4	16	205	160	IIIB-2
11	54	2	28	152	160	5.7%	110	4	57	311	327	IIIB-1
12	10	0	4	52	40	5.7%	20	0	8	106	82	IIIB-2
13	0	0	0	36	18	5.7%	0	0	0	74	37	IIIC
14	3	0	1	16	12	5.7%	6	0	2	33	25	IIIC
15	2	0	0	10	7	5.7%	4	0	0	20	14	IIIC
16	34	1	8	88	87	5.7%	70	2	16	180	178	IIIB-2
17	0	0	0	10	5	5.7%	0	0	0	20	10	IIIC
18	38	2	18	115	116	5.7%	78	4	37	235	237	IIIB-1
19	4	0	3	15	15	5.7%	8	0	6	31	31	IIIC
20	12	0	4	52	42	5.7%	25	0	8	106	86	IIIB-2
21	8	0	0	14	15	5.7%	16	0	0	29	31	IIIC
22	5	0	2	20	17	5.7%	10	0	4	41	35	IIIC
23	2	0	2	12	10	5.7%	4	0	4	25	20	IIIC
24	72	4	40	154	193	5.7%	147	8	82	315	395	IIIB-1
25	12	2	24	78	77	5.7%	25	4	49	160	158	IIIB-2
26	0	0	14	20	24	5.7%	0	0	29	41	49	IIIC
27	38	1	8	60	77	5.7%	78	2	16	123	158	IIIB-2
28	0	0	0	5	3	5.7%	0	0	0	10	6	IIIC
29	4	0	2	18	15	5.7%	8	0	4	37	31	IIIC
30	25	0	8	60	63	5.7%	51	0	16	123	129	IIIB-2
31	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
32	10	0	8	32	34	5.7%	20	0	16	65	70	IIIB-2
33	88	4	40	142	203	5.7%	180	8	82	290	415	IIIB-1
34	52	2	28	265	215	5.7%	106	4	57	542	440	IIIB-1
35	0	0	0	12	6	5.7%	0	0	0	25	12	IIIC
36	0	0	0	16	8	5.7%	0	0	0	33	16	IIIC
37	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
38	6	0	4	15	18	5.7%	12	0	8	31	37	IIIC
39	38	2	24	134	131	5.7%	78	4	49	274	268	IIIB-1
40	3	0	3	15	14	5.7%	6	0	6	31	29	IIIC
41	32	4	24	84	102	5.7%	65	8	49	172	209	IIIB-1
42	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
43	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
44	30	2	18	84	92	5.7%	61	4	37	172	188	IIIB-2
45	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
46	0	0	0	20	10	5.7%	0	0	0	41	20	IIIC
47	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
48	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
49	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
50	4	0	2	20	16	5.7%	8	0	4	41	33	IIIC
51	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
52	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
53	0	0	0	0	0	5.7%	0	0	0	0	0	IIIC
54	7	0	3	25	23	5.7%	14	0	6	51	47	IIIC
PERCENT	22.46	0.98	11.19	65.36			22.46	0.98	11.19	65.36		

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 : TAPIN

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
2	IIIB-2	KRK	30	1	15	89	91
3	IIIB-2	KRK	23	1	12	68	70
6	IIIB-2	KRK	35	2	17	102	105
7	IIIC	KRK	7	0	3	20	20
12	IIIB-2	KRK	60	3	30	175	181
13	IIIC	KRK	10	0	5	29	30
14	IIIB-2	KRK	18	1	9	52	54
15	IIIC	KRK	9	0	4	26	26
17	IIIC	KRK	15	1	8	44	46
19	IIIB-2	KRK	17	1	8	49	51
20	IIIB-1	ASP	98	4	49	284	293
21	IIIC	KRK	13	1	7	39	41
22	IIIB-2	KRK	19	1	9	54	56
23	IIIB-2	KRK	19	1	9	54	56
26	IIIB-2	KRK	28	1	14	81	84
28	IIIC	KRK	13	1	7	39	41
29	IIIC	KRK	10	0	5	29	30
31	IIIB-1	ASP	79	3	40	231	238
32	IIIB-2	KRK	17	1	8	49	51
35	IIIB-2	KRK	22	1	11	65	67
36	IIIC	KRK	13	1	7	39	41
37	IIIB-2	KRK	29	1	14	84	86
38	IIIB-2	KRK	17	1	8	49	51
40	IIIB-2	KRK	55	2	27	160	164
46	IIIB-2	KRK	37	2	19	108	112
50	IIIB-2	KRK	33	1	16	95	98
53	IIIB-2	KRK	36	2	18	105	109
54	IIIB-2	KRK	24	1	12	68	71

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 : TAPIN

(1000Rupiah)

	LINK 1	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 7	LINK 8	LINK 9	LINK 10
	12 Ka	4 Ka	4 Ka	5 Ka	4 Ka	3 Ka	2 Ka	6 Ka	2 Ka	1 Ka
	IIIB-1	IIIB-2	IIIB-2	IIIB-2	IIIB-2	IIIB-2	IIIC	IIIB-2	IIIB-2	IIIB-2
YEAR	VOC	Surplus	Surplus	VOC	VOC	Surplus	Surplus	VOC	VOC	VOC
1988	0	0	0	0	0	0	0	0	0	0
1989	22891	908	1971	21	1155	1008	382	1424	1521	751
1990	24234	936	2111	23	1264	1033	433	1521	1623	825
1991	25554	986	2126	24	1320	1060	433	1604	1724	853
1992	27117	1015	2202	25	1392	1111	438	1690	1824	899
1993	28590	1044	2280	27	1471	1162	482	1803	1928	943
1994	30259	1072	2356	28	1545	1189	487	1902	2035	1006
1995	31964	1125	2432	30	1625	1240	492	2007	2142	1054
1996	33669	1153	2572	32	1740	1290	492	2128	2304	1134
1997	35610	1206	2586	33	1838	1341	497	2251	2411	1183
1998	37663	1234	2733	35	1920	1393	546	2372	2548	1250
SUM	297551	10679	23369	278	15270	11827	4682	18702	20060	9898
COST	109942	-8014	-421	-17840	-5415	-3740	-4394	-10608	4588	2226
/Ka	9162	-2004	-105	-3568	-1354	-1247	-2197	-1768	2294	2226

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.

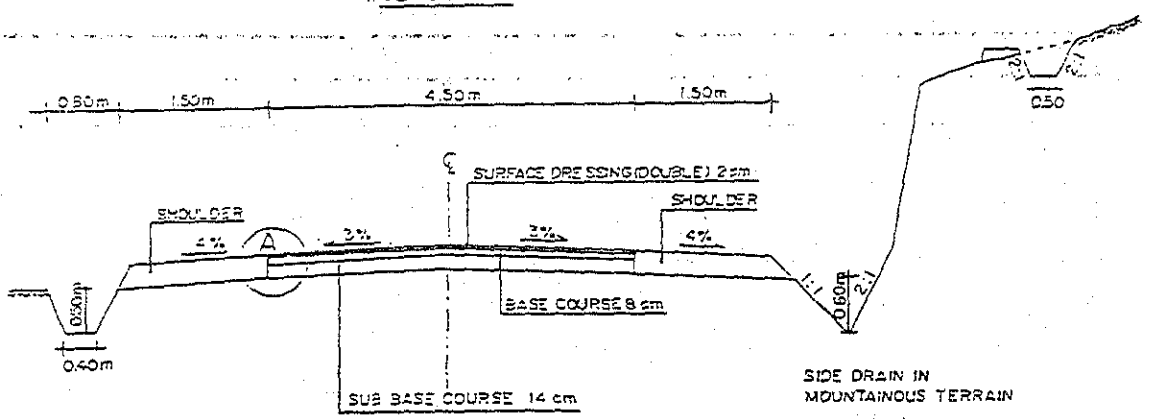
b. 10-ton truck load is applied for timber bridges on roads of III B-1, III B-2 and III C classification.

Table 3-1-1 DESIGN CRITERIA FOR KABUPATEN ROADS

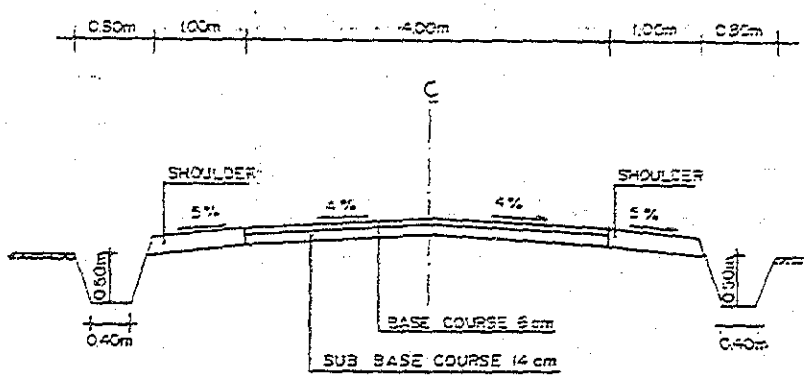
ROAD CLASSIFICATION		CLASS III A			CLASS III B-1			CLASS III B-2			CLASS III C		
SURFACE TYPE		ASPHALT SEAL (DOUBLE)			ASPHALT SEAL (SINGLE)			GRAVEL			GRAVEL		
TRAFFIC VOLUME : ADT (Forecast 10 th year average per day)		3000 - 500			500 - 200			200 - 50			50		
T E R R A I N		FLAT TO ROLLING	HILLY	MOUNT-AINOUS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

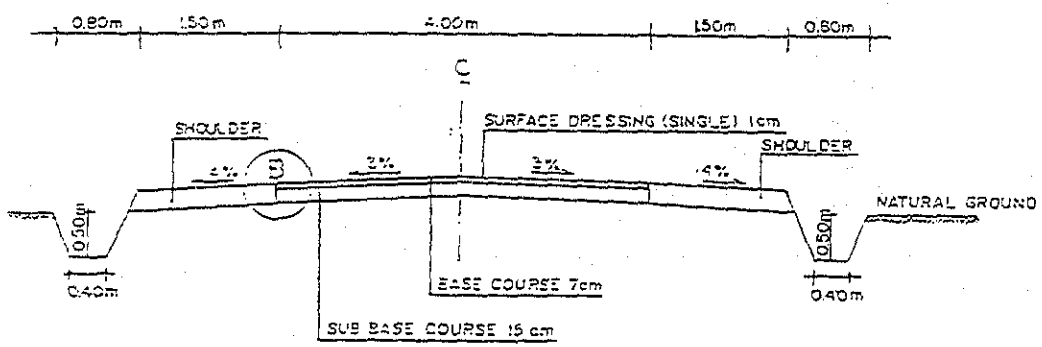
CLASS III A



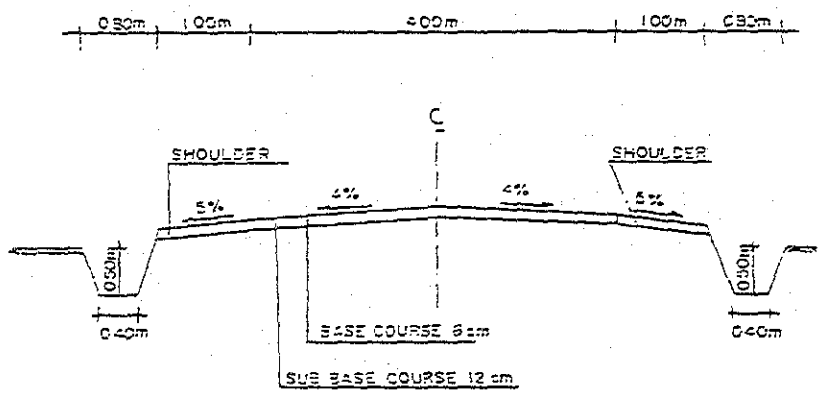
CLASS III B-2



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	14 | 8 = 24	14 | 7 = 22	14 | 6 = 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.

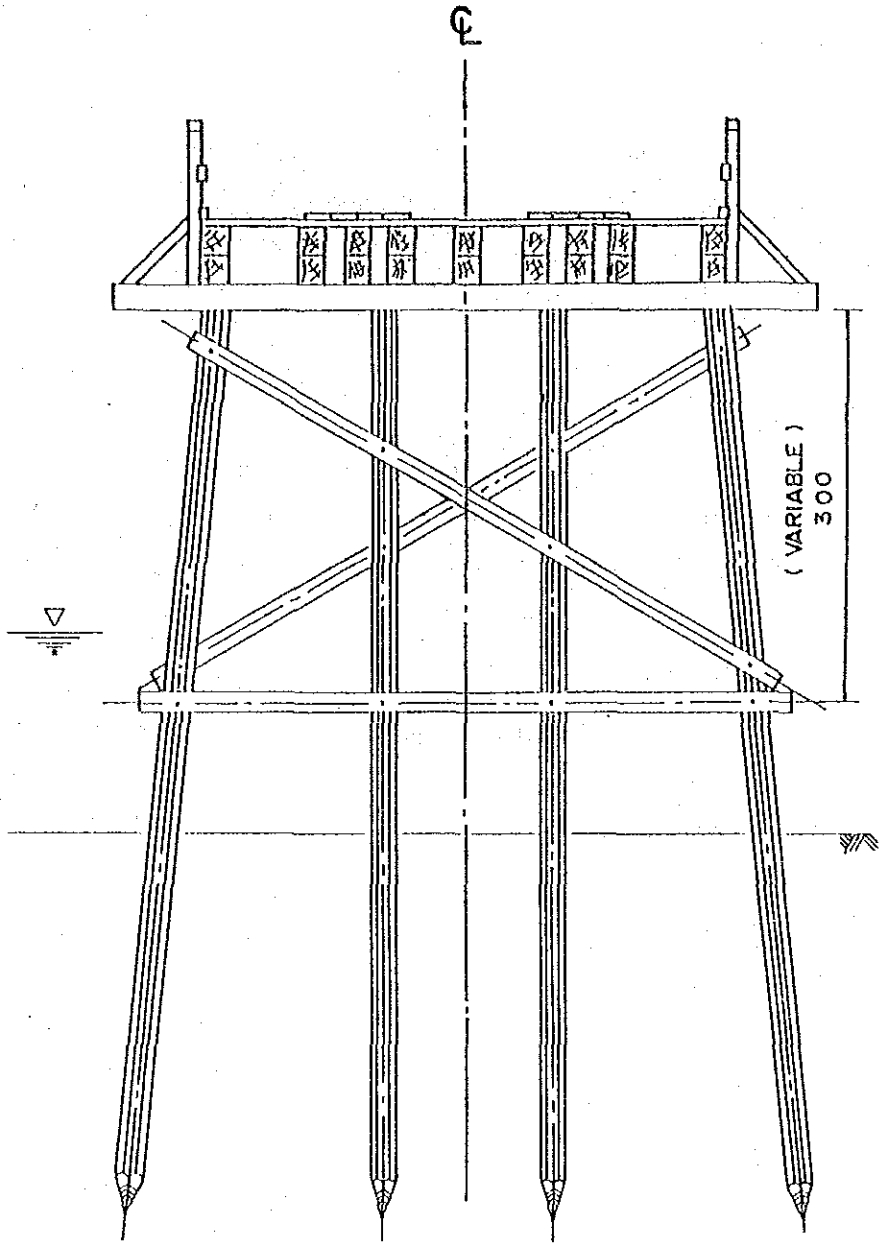
The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

(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

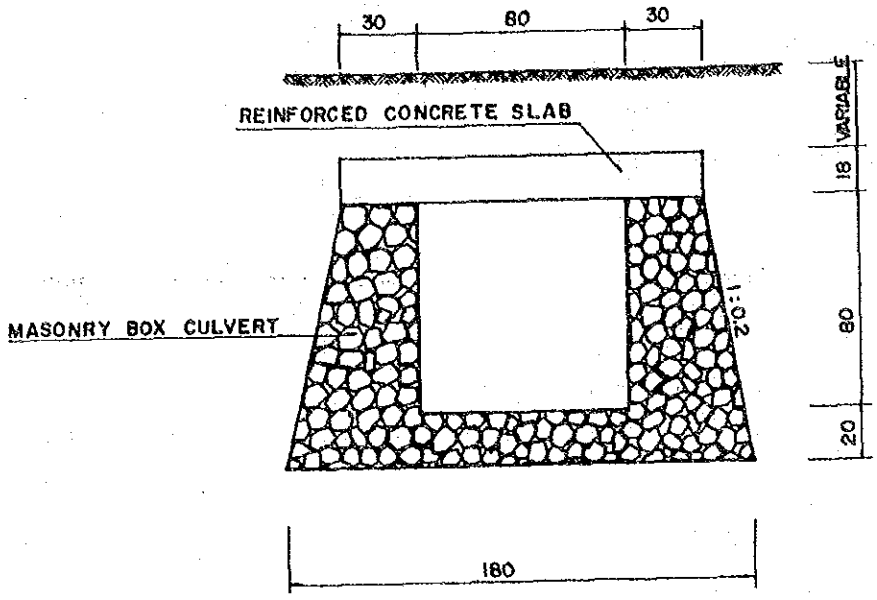
(2) Retaining Wall

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

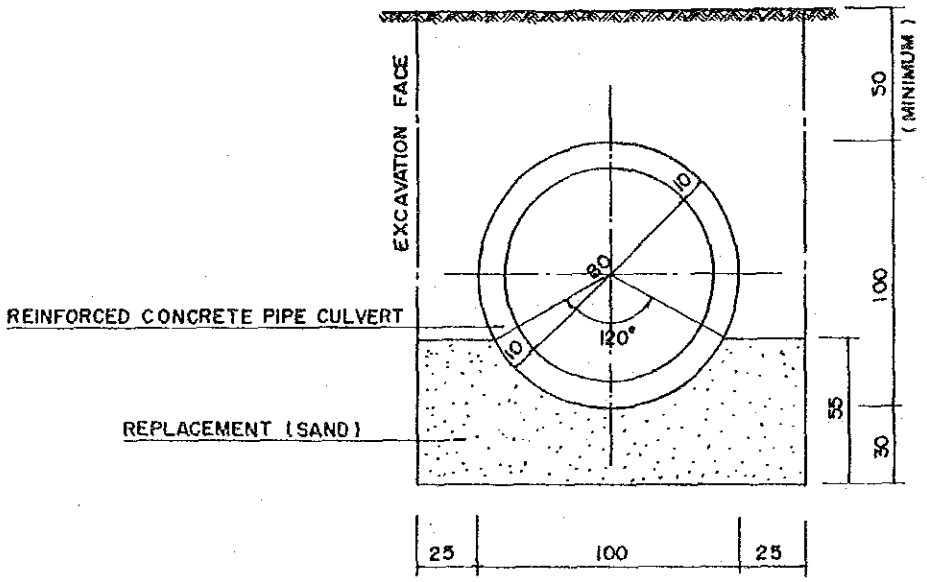
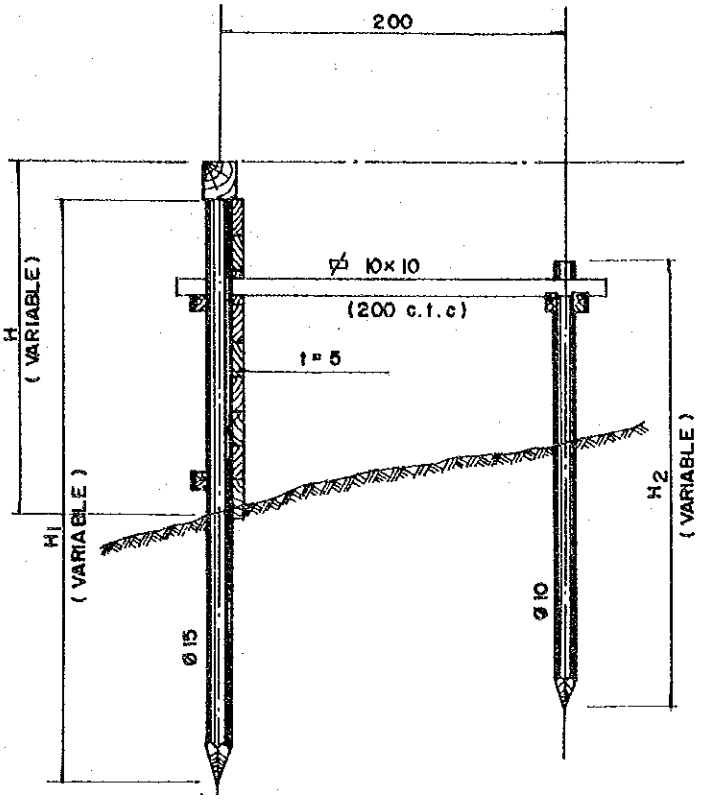
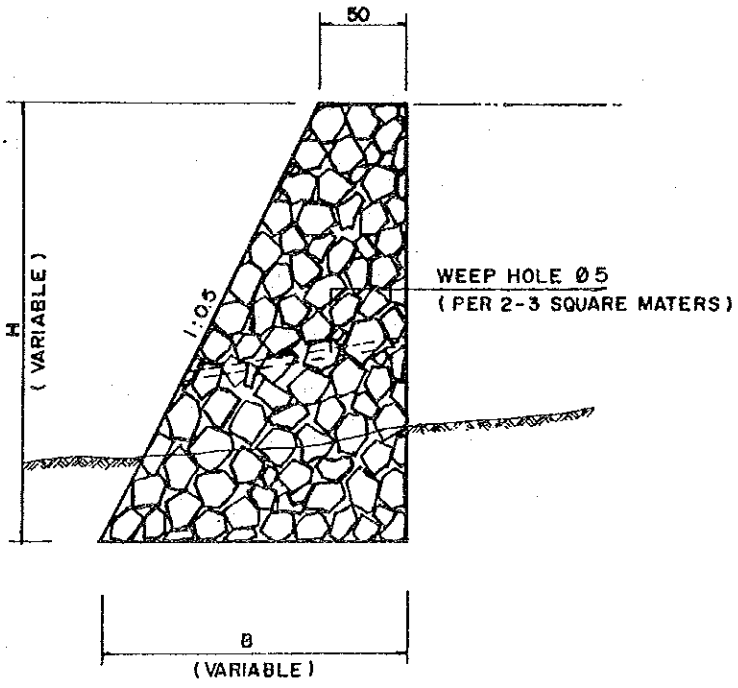


Fig. 3-3-3 STANDARD RETAINING WALLS

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 Tapin 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 Tapin together with for other Kabupatens in Kalimantan Selatan Province.

Table 4-1-2 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 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 : TAPIN

(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	12,311	12,545	7,769	1,024	8,793	21,338
	Bulldozer/Ripper	120 HP	255	13,322	13,577	8,500	1,575	10,075	23,652
	Swamp Bulldozer	120 HP	267	13,564	13,831	8,879	1,646	10,525	24,356
	Bulldozer	90 HP	148	8,415	8,563	4,914	647	5,561	14,124
	Bulldozer/Ripper	90 HP	159	9,005	9,164	5,300	982	6,282	15,446
	Bulldozer	65 HP	105	6,112	6,217	3,500	461	3,961	10,178
	Bulldozer/Ripper	65 HP	115	6,561	6,676	3,819	708	4,527	11,203
	Swamp Bulldozer	90 HP	159	8,995	9,154	5,284	979	6,263	15,417
	Swamp Bulldozer	65 HP	122	6,405	6,527	4,049	750	4,799	11,326
	Motor Grader	110 HP	208	10,781	10,989	6,919	1,282	8,201	19,190
	Motor Grader	75 HP	144	7,390	7,534	4,779	885	5,664	13,198
	Motor Grader	65 HP	129	6,505	6,634	4,300	797	5,097	11,731
	Road Stabilizer	W=1850 mm	258	3,381	3,639	8,594	424	9,018	12,657
	Vibratory Roller	4 ton	87	3,233	3,320	2,900	382	3,282	6,602
	Hand-guide Vib. Roller	1000 Kg	68	582	650	850	29	879	1,529
	Tire Roller	8-15 ton	94	7,090	7,184	3,106	102	3,208	10,392
	Vibratory Roller (D&T)	4 ton	87	3,233	3,320	2,900	382	3,282	6,602
	Hand-guide Vib. Roller	600 Kg	48	397	445	600	20	620	1,065
	Rough Terrain Crane	10 ton	302	12,565	12,867	10,039	744	10,783	23,650
	Hydraulic Excavator; Wheel	0.3 m3	124	7,542	7,666	4,109	541	4,650	12,316
	Wheel Loader	1.2 m3	211	8,213	8,424	7,019	925	7,944	16,368
	Wheel Loader	0.3 m3	69	2,862	2,931	2,269	299	2,568	5,499
	Water Tank Truck	4000 ltr.	70	2,718	2,788	868	120	988	3,776
	Fuel Tank Truck	4000 ltr.	71	2,725	2,796	882	121	1,003	3,799
	Dump Truck	3.0 ton	118	3,420	3,538	1,469	202	1,671	5,209
	Flat Bed Truck with Crane	3.0 ton	52	2,964	3,016	1,717	127	1,844	4,860
	Dump Loader Truck	12 ton	116	18,104	18,220	3,837	126	3,963	22,183
	Dump Truck	5.0 ton	176	5,644	5,820	2,189	302	2,491	8,311
	Flat Bed Truck	3.0 ton	17	2,540	2,557	563	41	604	3,161
	Portable Crusher/Screening	30-40 t/h	564	20,816	21,380	18,800	2,478	21,278	42,658
	Concrete Mixer	0.5 m3	432	2,379	2,811	5,400	419	5,819	8,630
	Water Pump	200 l/min	16	249	265	188	6	194	459
	Concrete Vibrator	3.3 HP	6	213	219	73	2	75	294
	Asphalt Sprayer	850 ltr.	82	745	827	1,019	140	1,159	1,986

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 : TAPIN

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	159	91	250
Subgrade Preparation	m2	20	11	31
Normal Fill	m3	1,635	863	2,498
Fill in Swamp	m3	2,445	1,052	3,497
Normal Excavation to Spoil	m3	956	522	1,478
Sub Base Course	m3	3,096	1,347	4,443
Base Course	m3	4,238	2,299	6,537
Shoulder	m2	288	146	434
Asphalt Patching	m2	3,663	1,343	5,006
Surface Dressing (Single)	m2	594	552	1,146
Surface Dressing (Double)	m2	742	868	1,610
Earth Drain	m	909	119	1,028
Earth Drain in Swamp (by machine)	m3	1,165	474	1,639
Pipe Culvert D80cm	m	43,874	51,386	95,260
Masonry Culvert (80x80cm)	m	63,563	41,554	105,117
Retaining Wall and Wing Wall (Timber)	m2	10,244	246	10,490
Retaining Wall and Wing Wall (Masonry)	m3	47,464	11,868	59,332
Gabion Protection	m3	15,591	120	15,711
Manual routine maintenance of road	Km	148,684	7,248	155,932
Routine maintenance of earth road	Km	91,766	37,904	129,670
Routine maintenance of gravel road	Km	184,800	88,047	272,847
Routine maintenance of asphalt road	Km	366,300	134,300	500,600

4.2.2 Bridges

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

Table 4-2-2 BRIDGE COST

PROV : KALIMANTAN SELATAN KAB : TAPIN

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	39,013	3,541	42,554
Superstructure (Timber;Span 5m;10T)	m2	43,213	3,910	47,123
Superstructure (Timber;Span 8m;10T)	m2	57,235	5,136	62,371
Superstructure (Timber;Span 3m;BM50)	m2	48,375	4,378	52,753
Superstructure (Timber;Span 5m;BM50)	m2	52,810	4,745	57,555
Superstructure (Timber;Span 8m;BM50)	m2	66,977	6,006	72,983
Superstructure (Concrete;Span 3m;BM50)	m2	46,053	107,965	154,018
Superstructure (Concrete;Span 5m;BM50)	m2	47,428	120,694	168,122
Superstructure (Concrete;Span 8m;BM50)	m2	48,954	131,491	180,445
Superstructure (Concrete;Span10m;BM50)	m2	53,650	149,376	203,026
Superstructure (Concrete;Span15m;BM50)	m2	58,035	176,007	234,042
Substructure (Pier;for Timber;10T)	NO	339,916	32,859	372,775
Substructure (Abut;for Timber;10T)	NO	964,092	154,362	1,118,454
Substructure (Pier;for Timber;BM50)	NO	499,927	48,627	548,554
Substructure (Abut;for Timber;BM50)	NO	1,084,991	171,532	1,256,523
Substructure (Pier;for Concrete;BM50)	NO	1,821,504	477,161	2,298,665
Substructure (Abut;for Concrete;BM50)	NO	3,755,081	999,497	4,754,578
Demolition of Bridge (Timber->Timber)	m2	11,009	1,373	12,382
Demolition of Bridge (Timber->Concrete)	m2	11,009	1,373	12,382
Demolition of Bridge (Concrete)	m2	83,389	81,377	164,766
Maintenance of Timber Bridge (New)	m2	7,203	1,121	8,324
Maintenance of Concrete Bridge (New)	m2	1,752	3,135	4,887
Maintenance of Timber Bridge (Exist)	m2	7,217	2,404	9,621
Maintenance of Concrete Bridge (Exist)	m2	3,966	2,471	6,437

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 Tapin are shown in Table 5-1-1.

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

KABUPATEN : TAPIN

CRITERIA NO	ROAD LINK NO
(6)	34
(8)	42,43,45,47,48,49,51,52

5.2 Evaluation

5.2.1 Primary Analysis

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

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

5.2.2 Secondary Analysis

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

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

5.2.3 Ranking of Feasible Road Links

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

Table 5-2-1 RESULTS OF PRIMARY ANALYSIS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : TAPIN

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
31	8 Km	IIIB-1	31.385	Surplus
39	10 Km	IIIB-1	19.300	VOC
20	24 Km	IIIB-1	15.756	Surplus
27	7 Km	IIIB-2	15.428	VOC
1	12 Km	IIIB-1	14.459	VOC
25	7 Km	IIIB-2	13.458	VOC
12	4 Km	IIIB-2	13.156	Surplus
44	2 Km	IIIB-2	11.435	VOC
18	14 Km	IIIB-1	10.904	VOC
53	18 Km	IIIB-2	9.957	Surplus
50	6 Km	IIIB-2	7.702	Surplus
9	2 Km	IIIB-2	2.641	VOC
13	3 Km	IIIC	0.078	Surplus
14	4 Km	IIIB-2	0.078	Surplus
15	2 Km	IIIC	0.078	Surplus
16	4 Km	IIIB-2	0.078	VOC
17	1 Km	IIIC	0.078	Surplus
4	5 Km	IIIB-2	0.078	VOC
19	5 Km	IIIB-2	0.078	Surplus
5	4 Km	IIIB-2	0.078	VOC
21	3 Km	IIIC	0.078	Surplus
22	5 Km	IIIB-2	0.078	Surplus
23	4 Km	IIIB-2	0.078	Surplus
24	13 Km	IIIB-1	0.078	VOC
6	3 Km	IIIB-2	0.078	Surplus
26	6 Km	IIIB-2	0.078	Surplus
7	2 Km	IIIC	0.078	Surplus
28	3 Km	IIIC	0.078	Surplus
29	3 Km	IIIC	0.078	Surplus
30	17 Km	IIIB-2	0.078	VOC
8	6 Km	IIIB-2	0.078	VOC
32	5 Km	IIIB-2	0.078	Surplus
33	17 Km	IIIB-1	0.078	VOC
35	5 Km	IIIB-2	0.078	Surplus
36	4 Km	IIIC	0.078	Surplus
37	11 Km	IIIB-2	0.078	Surplus
38	5 Km	IIIB-2	0.078	Surplus
2	4 Km	IIIB-2	0.078	Surplus
40	4 Km	IIIB-2	0.078	Surplus
41	5 Km	IIIB-1	0.078	VOC
10	1 Km	IIIB-2	0.078	VOC
46	8 Km	IIIB-2	0.078	Surplus
11	5 Km	IIIB-1	0.078	VOC
3	4 Km	IIIB-2	0.078	Surplus
54	7 Km	IIIB-2	0.078	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : TAPIN

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
53	18 Km	IIIC	14.187	Surplus
50	6 Km	IIIC	13.882	Surplus
9	2 Km	IIIC	3.564	VOC

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

PROVINCE : KALIMANTAN SELATAN KABUPATEN : TAPIN

LINK NO	LENGTH	CLASS	NPV (1000Rp)	B/C	IRR (%)	REMARK
31	8 Km	IIIB-1	118120	1.872	31.385	Surplus
39	10 Km	IIIB-1	70182	1.395	19.300	VOC
20	24 Km	IIIB-1	64025	1.188	15.756	Surplus
53	18 Km	IIIC	38712	1.165	14.187	Surplus
1	12 Km	IIIB-1	23124	1.151	14.459	VOC
25	7 Km	IIIB-2	7774	1.121	13.458	VOC
50	6 Km	IIIC	7455	1.137	13.882	Surplus
18	14 Km	IIIB-1	7223	1.033	10.904	VOC
27	7 Km	IIIB-2	6504	1.128	15.428	VOC
12	4 Km	IIIB-2	4450	1.107	13.156	Surplus
44	2 Km	IIIB-2	2274	1.058	11.435	VOC
SUM	112 Km		349843			

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: Tapin

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	469	888	1,357
MAINTENANCE	119	420	539
SUPPLEMENTATION	398	-	398
WORKSHOP EQUIPMENT & TOOLS	28	-	28
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	1,031	1,308	2,339

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	248	1,298	1,546
CONSTRUCTION & MAINTENANCE EQUIPMENT	696	-	696
SPARE PARTS	42	10	52
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	1,031	1,308	2,339

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 17 links with the total length of 153 km which is 52% of the 295 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 : TAPIN

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary - Secondary	1,12,18,20,25,27,31,39,44, 50,53,
Engineering Point of View	2,3,24,26,28,37
Basic Human Needs	-

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

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

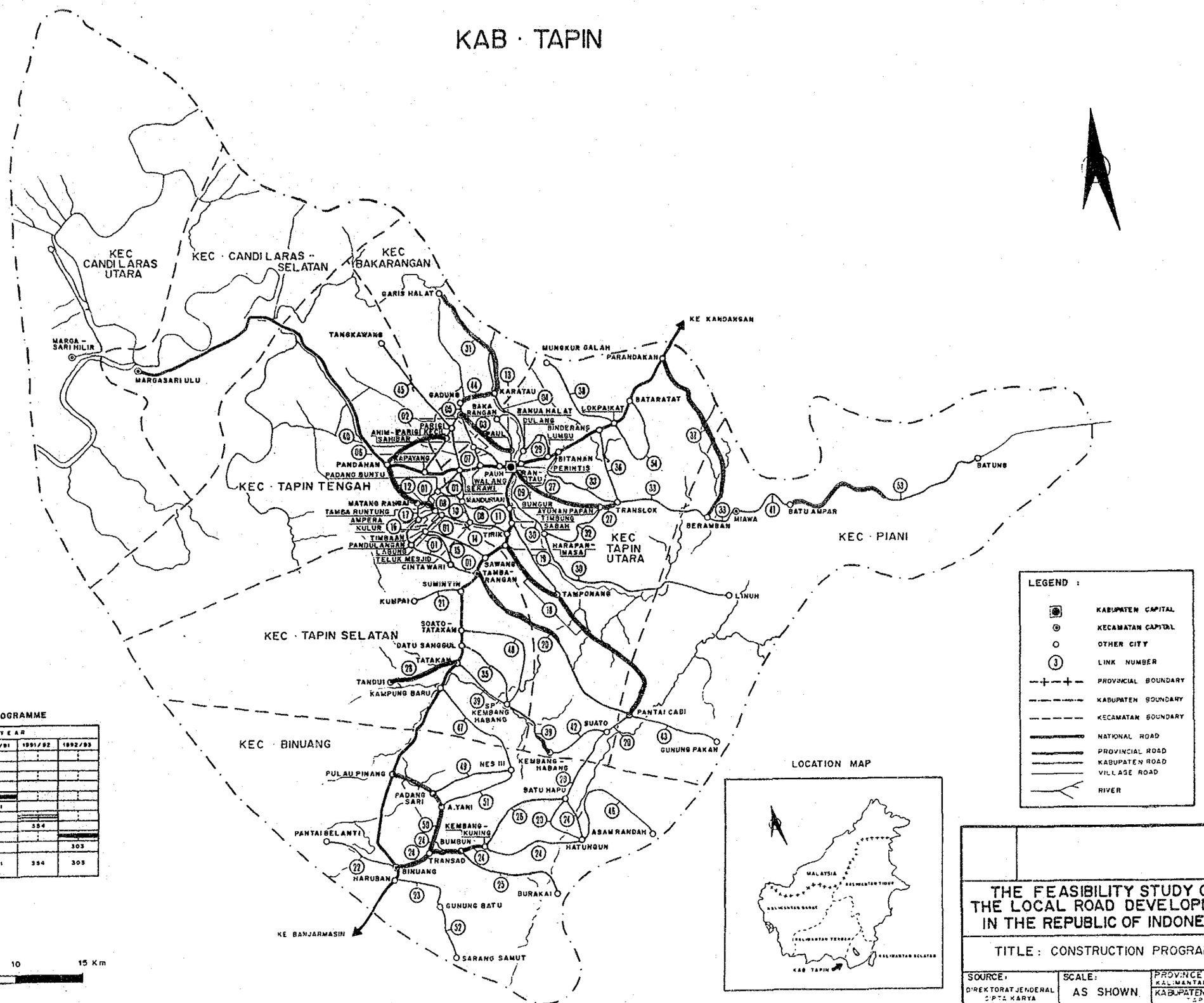
The order of proceeding with the improvement of the proposed road links are decided as shown in Table 6-1-4.

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

PROV : KALIMANTAN SELATAN KAB : TAPIN

YEAR	LINK NO ( ) : rate
1988	31, 50
1989	1, 3, 12, 24 (70%), 44
1990	2, 20 (50%), 24 (30%), 27, 53 (50%)
1991	20 (50%), 25, 26, 39 (60%), 53 (50%)
1992	18, 28, 37, 39 (40%)

KAB · TAPIN



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

CONSTRUCTION PROGRAMME

ROAD LINK NUMBER	FISCAL YEAR 1989/90	1990/91	1991/92	1992/93
31,50	134			
01,03,12		273		
24,44			291	
02,20,26				354
27,53				303
20,25,29				
39,33				
16,28				
37,38				
TOTAL COST (10^6 Rp)	134	273	291	354 / 303

SCALE: 0 5 10 15 Km

LOCATION MAP

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

TITLE : CONSTRUCTION PROGRAMME

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

(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 ROAD LINKS TO BE MAINTAINED

PROV : KALIMANTAN SELATAN KAB : TAPIN

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SD (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TH NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
1	12	15.8	68.2	11.0	5.0	12	0	0	5	98.00	0	0.00	943	6,887	1,934	8,821
2	4	50.0	41.8	8.3	0.0	0	4	0	3	52.00	0	0.00	500	1,709	506	2,215
3	4	0.0	57.5	38.8	3.8	1	3	0	3	54.00	0	0.00	520	1,905	557	2,462
4	5	99.0	1.0	0.0	0.0	2	3	0	0	0.00	0	0.00	0	2,030	569	2,599
5	4	47.0	43.0	10.0	0.0	4	0	0	2	136.25	0	0.00	1,311	3,043	894	3,937
6	3	30.0	61.7	8.3	0.0	0	3	0	2	96.00	0	0.00	924	1,693	517	2,210
8	6	59.7	38.5	1.8	0.0	6	0	0	2	32.00	0	0.00	308	3,321	926	4,247
9	2	0.0	67.5	32.5	0.0	0	2	0	0	0.00	0	0.00	0	667	191	858
10	1	0.0	60.0	40.0	0.0	0	1	0	1	16.00	0	0.00	154	449	131	583
11	5	55.0	43.0	2.0	0.0	5	0	0	0	0.00	0	0.00	0	2,575	708	3,283
16	4	78.8	10.0	11.3	0.0	0	4	0	2	28.00	0	0.00	269	1,536	448	1,984
18	14	35.1	47.2	16.3	1.4	3	5	6	3	89.00	0	0.00	856	5,297	1,386	6,683
20	24	29.6	52.9	15.4	2.1	13	4	7	17	423.50	0	0.00	4,074	12,768	3,555	16,323
24	13	67.3	26.9	5.8	0.0	9	3	1	8	208.00	2	121.26	2,782	7,858	2,405	10,263
26	6	21.7	47.5	30.8	0.0	0	5	1	2	28.00	0	0.00	269	2,110	589	2,699
29	3	66.0	24.0	10.0	0.0	0	3	0	2	28.00	0	0.00	269	1,203	353	1,556
30	17	26.9	55.3	16.6	1.2	0	17	0	14	389.60	0	0.00	3,748	8,481	2,357	11,038
32	5	0.0	87.8	12.2	0.0	0	5	0	1	22.00	0	0.00	212	1,826	529	2,355
33	17	70.3	18.5	11.2	0.0	17	0	0	7	152.00	0	0.00	1,462	9,852	2,772	12,624
38	5	80.0	0.0	20.0	0.0	0	5	0	3	91.00	0	0.00	876	2,324	695	3,019
39	10	17.0	83.0	0.0	0.0	0	2	8	0	0.00	0	0.00	0	2,591	552	3,143
41	5	98.0	2.0	0.0	0.0	0	5	0	4	96.00	0	0.00	924	2,360	707	3,067
44	2	47.5	1.0	49.5	0.0	0	0	2	1	45.00	0	0.00	433	806	198	1,004
50	6	5.8	74.2	20.0	0.0	0	0	6	1	20.00	0	0.00	192	1,587	319	1,906
54	7	42.9	57.1	0.0	0.0	0	0	7	3	86.00	0	0.00	827	2,304	523	2,827
SUM	184					72	74	38	86	2190.35	2	121.26	21,854	87,182	24,524	111,706

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 Tapin is finally recommended as shown in Tables 6-1-6 (1), (2) and (3) for the construction, maintenance and total respectively.

The proposed construction cost is Rp 1,357 x 10^6 and maintenance cost is Rp 539 x 10^6 which is approximately 28% of the total expenditure.

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

PROV : KALIMANTAN SELATAN KAB : TAPIN

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	84,469	173,642	189,475	229,667	192,210	869,463	(64.0%)
Ownership Cost	1,247	1,693	2,313	3,085	2,754	11,092	(1.3%)
Operation Cost	44,134	61,789	81,080	107,670	99,324	393,997	(45.3%)
Material Cost	14,900	49,062	33,127	35,928	28,968	161,985	(18.6%)
Labour Cost	13,170	38,449	48,241	53,027	36,093	188,980	(21.7%)
Contingency	11,018	22,649	24,714	29,957	25,071	113,409	(13.0%)
FOREIGN CURRENCY :	50,560	100,017	100,637	125,604	111,275	488,093	(36.0%)
Ownership Cost	25,352	34,752	45,744	61,616	57,041	224,505	(46.0%)
Operation Cost	3,580	4,617	6,343	8,650	8,054	31,244	(6.4%)
Material Cost	15,033	47,602	35,423	38,955	31,666	168,679	(34.6%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	6,595	13,046	13,127	16,383	14,514	63,665	(13.0%)
TOTAL COST :	135,028	273,659	290,112	355,271	303,485	1,357,555	
Ownership Cost	26,599	36,445	48,057	64,701	59,795	235,597	(17.4%)
Operation Cost	47,714	66,406	87,423	116,320	107,378	425,241	(31.3%)
Material Cost	29,933	96,664	68,550	74,883	60,634	330,664	(24.4%)
Labour Cost	13,170	38,449	48,241	53,027	36,093	188,980	(13.9%)
Contingency	17,612	35,695	37,841	46,340	39,585	177,073	(13.0%)

(Contingency : 15%)

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

(MAINTENANCE)

PROV : KALIMANTAN SELATAN KAB : TAPIN

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	43,179	85,024	89,383	94,715	107,381	419,682	(77.9%)
Ownership Cost	433	855	912	966	1,116	4,282	(1.0%)
Operation Cost	18,659	36,832	38,536	40,654	46,547	181,228	(43.2%)
Material Cost	2,256	4,428	4,596	5,228	5,539	22,047	(5.3%)
Labour Cost	21,831	42,909	45,339	47,867	54,179	212,125	(50.5%)
FOREIGN CURRENCY :	12,177	24,012	25,309	26,906	30,771	119,175	(22.1%)
Ownership Cost	9,476	18,722	19,605	20,764	23,809	92,376	(77.5%)
Operation Cost	1,030	2,048	2,148	2,264	2,626	10,116	(8.5%)
Material Cost	1,671	3,242	3,556	3,878	4,336	16,683	(14.0%)
Labour Cost	0	0	0	0	0	0	(0.0%)
TOTAL COST :	55,356	109,036	114,692	121,621	138,152	538,857	
Ownership Cost	9,909	19,577	20,517	21,730	24,925	96,658	(17.9%)
Operation Cost	19,689	38,880	40,684	42,918	49,173	191,344	(35.5%)
Material Cost	3,927	7,670	8,152	9,106	9,875	38,730	(7.2%)
Labour Cost	21,831	42,909	45,339	47,867	54,179	212,125	(39.4%)

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

(TOTAL)

PROV : KALIMANTAN SELATAN KAB : TAPIN

(UNIT : 1000Rp)

I T E M	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	127,648	258,666	278,858	324,382	299,591	1,289,145	(68.0%)
Ownership Cost	1,680	2,548	3,225	4,051	3,870	15,374	(1.2%)
Operation Cost	62,793	98,621	119,616	148,324	145,871	575,225	(44.6%)
Material Cost	17,156	53,490	37,723	41,156	34,507	184,032	(14.3%)
Labour Cost	35,001	81,358	93,580	100,894	90,272	401,105	(31.1%)
Contingency	11,018	22,649	24,714	29,957	25,071	113,409	(8.8%)
FOREIGN CURRENCY :	62,737	124,029	125,946	152,510	142,046	607,268	(32.0%)
Ownership Cost	34,828	53,474	65,349	82,380	80,850	316,881	(52.2%)
Operation Cost	4,610	6,665	8,491	10,914	10,680	41,360	(6.8%)
Material Cost	16,704	50,844	38,979	42,833	36,002	185,362	(30.5%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	6,595	13,046	13,127	16,383	14,514	63,665	(10.5%)
TOTAL COST :	190,384	382,695	404,804	476,892	441,637	1,896,412	
Ownership Cost	36,508	56,022	68,574	86,431	84,720	332,255	(17.5%)
Operation Cost	67,403	105,286	128,107	159,238	156,551	616,585	(32.5%)
Material Cost	33,860	104,334	76,702	83,989	70,509	369,394	(19.5%)
Labour Cost	35,001	81,358	93,580	100,894	90,272	401,105	(21.2%)
Contingency	17,612	35,695	37,841	46,340	39,585	177,073	(9.3%)

(Contingency : 15%)

6.1.4 Construction and Maintenance Equipment Cost

(1) Required Number of Equipment

The required numbers of construction equipment for Kabupaten Tapin 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-Dump Truck

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 : TAPIN

EQUIPMENT NAME	WORKABLE	EXISTING	(1988)	(1989)	(1990)	(1991)	(1992)
Bulldozer/Ripper	210	0	0.21	0.37	0.55	0.65	0.61
Swamp Bulldozer	210	0	0.00	0.02	0.03	0.00	0.04
Motor Grader	230	0	0.58	0.49	0.75	1.19	1.10
Hand-guide Vib. Roller	230	0	0.00	0.33	0.31	0.16	0.03
Tire Roller	210	0	0.22	0.66	0.43	0.48	0.43
Vibratory Roller (D&T)	230	0	0.47	0.36	0.59	0.90	0.82
Hydraulic Excavator; Wheel	210	0	0.00	0.25	0.19	0.00	0.49
Wheel Loader	230	0	0.58	0.70	1.00	1.40	1.24
Water Tank Truck	230	0	0.28	0.16	0.30	0.49	0.39
Dump Truck	230	0	4.47	5.67	8.51	11.32	9.68
Flat Bed Truck with Crane	230	0	0.00	0.16	0.15	0.12	0.02
Flat Bed Truck	230	0	0.24	0.73	0.50	0.56	0.48
Portable Crusher/Screening	230	0	0.08	0.13	0.12	0.21	0.20
Concrete Mixer	210	0	0.00	0.00	0.03	0.03	0.01
Water Pump	210	0	0.00	0.00	0.03	0.03	0.01
Concrete Vibrator	210	0	0.00	0.00	0.02	0.02	0.01
Asphalt Sprayer	210	0	0.22	0.66	0.43	0.48	0.43

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

Table 6-1-8 EQUIPMENT PURCHASE COST

PROV : KALIMANTAN SELATAN KAB : TAPIN

(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	1	70,200
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	8	117,600
Dump Loader Truck	12 ton	56,300	-	-
Flat Bed Truck with Crane	3.0 ton	25,190	1	25,190
Flat Bed Truck	3.0 ton	11,275	2	22,550
Portable Crusher/Screening	30-40 t/h	188,000	1	188,000
Concrete Mixer	0.5 m3	18,000	-	-
Water Pump	200 l/min	630	-	-
Concrete Vibrator	3.3 HP	740	-	-
Asphalt Sprayer	850 ltr.	10,200	1	10,200
Service Car	3 ton	11,600	1	11,600
4 Wheel Drive Vehicle	70 HP	17,500	1	17,500
Motorcycle	100 cc	1,100	3	3,300

PURCHASE COST TOTAL	696,060
OWNERSHIP COST (FOREIGN)	297,887
EQUIPMENT COST SUPPLEMENTED	398,173

NOTE : OWNERSHIP COST (FOREIGN) for Existing Equipment

Dump Truck	18,994

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 : TAPIN

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
Site Clearance in Light Bush	m2	0.00	0.00	40000.00	36000.00	4000.00	80000.00
Subgrade Preparation	m2	110000.00	24375.60	84852.50	150500.00	124480.00	494208.10
Normal Fill	m3	0.00	0.00	0.00	0.00	0.00	0.00
Fill in Swamp	m3	0.00	588.10	935.20	0.00	1430.50	2961.80
Normal Excavation to Spoil	m3	1372.00	4971.40	2670.10	1786.30	2691.20	13491.00
Sub Base Course	m3	8320.00	4502.80	8720.80	13929.00	9223.80	44696.40
Base Course	m3	2240.00	1999.00	2716.00	6100.00	5975.00	19030.00
Shoulder	m2	54000.00	81300.00	100200.00	142000.00	162000.00	539500.00
Asphalt Patching	m2	0.00	2037.50	1596.00	481.50	40.00	4155.00
Surface Dressing (Single)	m2	32000.00	98400.00	63600.00	72000.00	65000.00	331000.00
Surface Dressing (Double)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Earth Drain	m	0.00	5360.00	23770.00	26190.00	8540.00	63860.00
Earth Drain in Swamp (by machine)	m3	0.00	4056.00	3150.00	0.00	8100.00	15306.00
Pipe Culvert D80cm	m	0.00	0.00	102.00	102.00	25.00	229.00
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	1433.00	452.00	0.00	0.00	1885.00
Retaining Wall and Wing Wall (Masonry)	m3	0.00	0.00	28.80	28.80	3.20	60.80
Gabion Protection	m3	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 8m;10T)	m2	0.00	90.00	56.00	56.00	0.00	202.00
Superstructure (Timber;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span10m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span15m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Timber;10T)	NO	0.00	2.00	1.50	1.50	0.00	5.00
Substructure (Abut;for Timber;10T)	NO	0.00	2.00	1.00	1.00	0.00	4.00
Substructure (Pier;for Timber;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Timber;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Concrete;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Abut;for Concrete;BM50)	NO	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Timber->Timber)	m2	0.00	45.00	28.00	28.00	0.00	101.00
Demolition of Bridge (Timber->Concrete)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Concrete)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Manual routine maintenance of road	Km	90.50	178.45	186.05	191.00	219.00	865.00
Routine maintenance of earth road	Km	17.50	30.65	28.10	24.35	16.40	117.00
Routine maintenance of gravel road	Km	37.00	77.45	79.55	82.90	106.10	383.00
Routine maintenance of asphalt road	Km	36.00	70.35	78.40	83.75	96.50	365.00
Maintenance of Timber Bridge (New)	m2	0.00	0.00	0.00	90.00	0.00	90.00
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	1090.18	2119.05	2124.28	2351.48	2478.85	10163.83
Maintenance of Concrete Bridge (Exist)	m2	60.63	78.82	103.07	121.26	121.26	485.04

6.2 Organization and Construction System

6.2.1 Organization

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

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

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

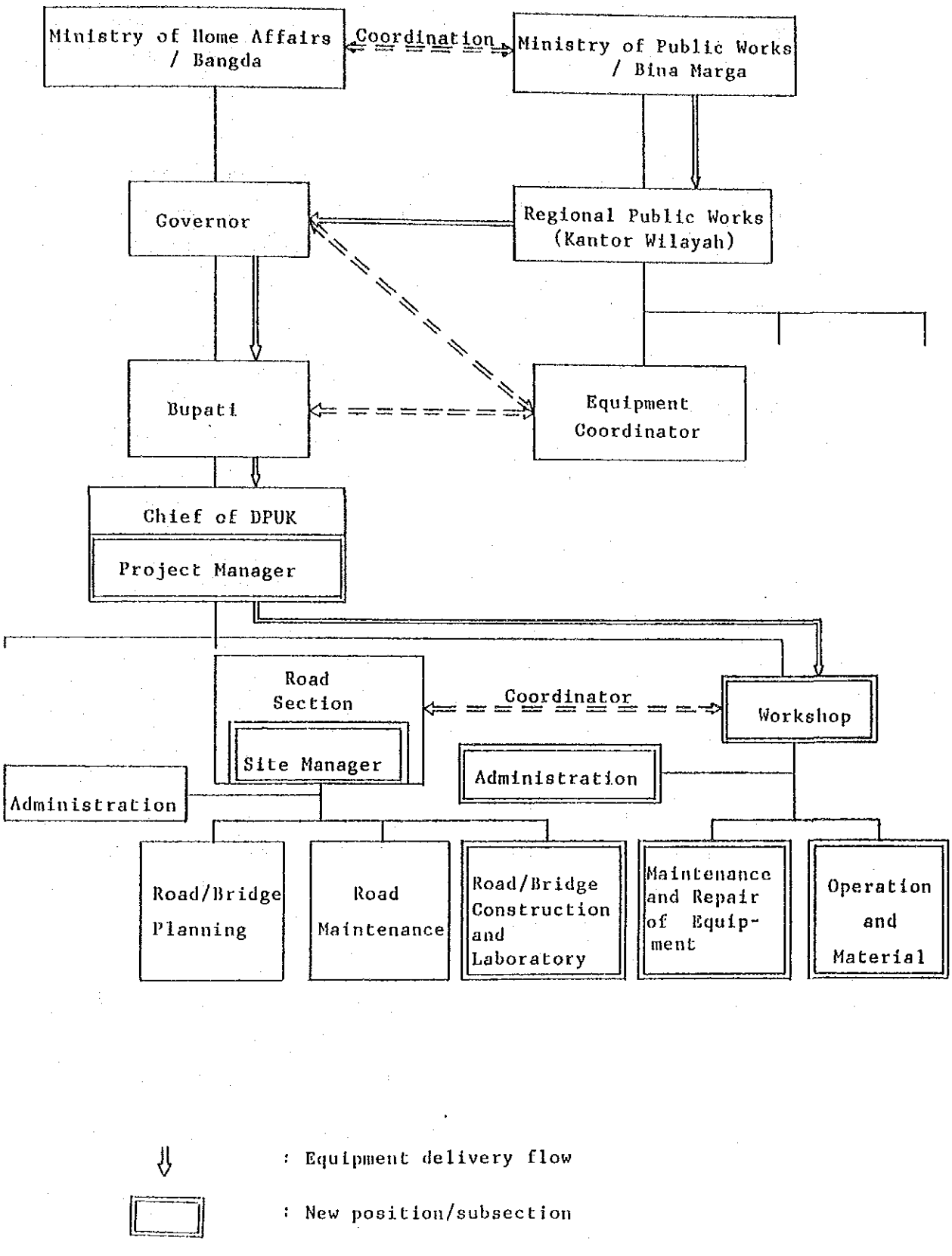
It is recommended that the workshop is newly organized to consist of three sub-sections, i.e. maintenance and repair of equipment, operation and materials, and administration to execute the main tasks described in Clause 3.5.

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

6.2.2 Construction System

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

Fig. 6-2-1 PROPOSED ORGANIZATION



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

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

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

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

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

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

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

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

APPENDIX

INPUT DATA

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

PRV. : KALIMANTAN SELATAN KAB. : TAPIN SURVEY YEAR : 1983

Code No.	KECAMATAN NAME	CULTIVATED AREA : (PA)	YIELD RATE : (Y)	FARMER'S POPULATION : (AP)	CIRCULATED COMMODITY : (PG)
01	BINUANG	4,911	4.26	10,609	0
02	TAPIN SELATAN	3,429	4.30	16,234	0
03	TAPIN TENGAH	5,069	4.07	9,114	0
04	TAPIN UTARA	4,067	5.89	8,259	0
05	CANDI LARAS SELATAN	2,962	3.86	4,842	0
06	CANDI LARAS UTARA	6,989	3.52	11,320	0
07	BAKARANGAN	5,363	2.82	6,480	0
08	PIANI	1,955	3.45	9,343	0

	r_1	r_2	r_3	r_4
ANNUAL AVERAGE GROWTH RATE %	1.5	2.1	3.0	5.7

FARMER'S CONSUMPTION : (Cp)	NON-AGRO REQUIRMENT : (NG)
0.13 Ton/head/year	0.08 Ton/ton

	SEDAN	BUS	TRUCK	MOTOR CYCLE
RATE OF EACH VEHICLE TYPE %	22.46	0.98	11.19	65.36

AVERAGE FREIGHT TONAGE	0.6 Ton/Truck