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 37

KABUPATEN MUNA

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 Muna in Sulawesi Tenggara 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.

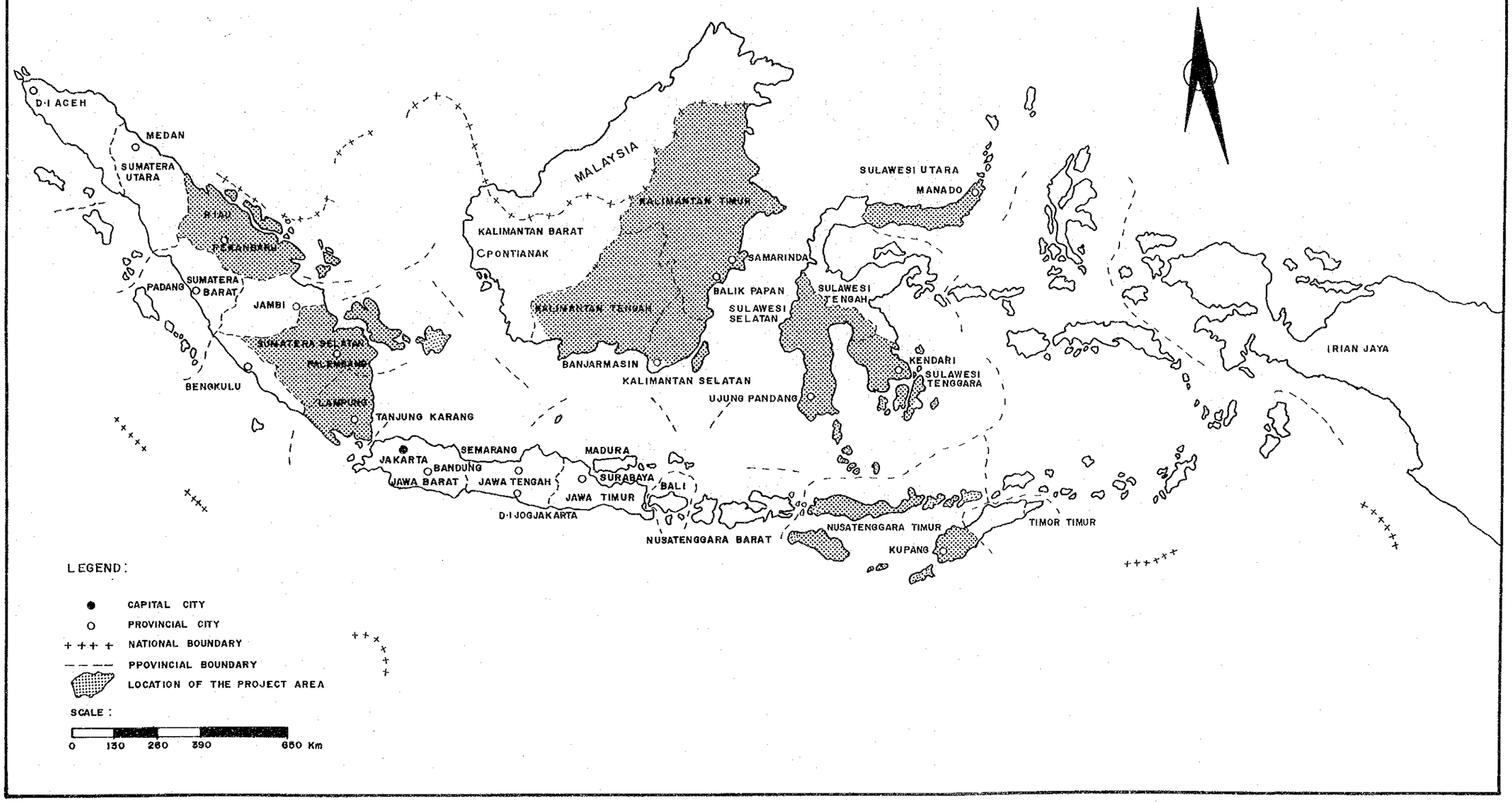
Since the study period was limited, without cooperation of Bina Marga, Bangda and local governments of both province and Kabupaten in collecting the data, the study would not have been completed within the period.

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.

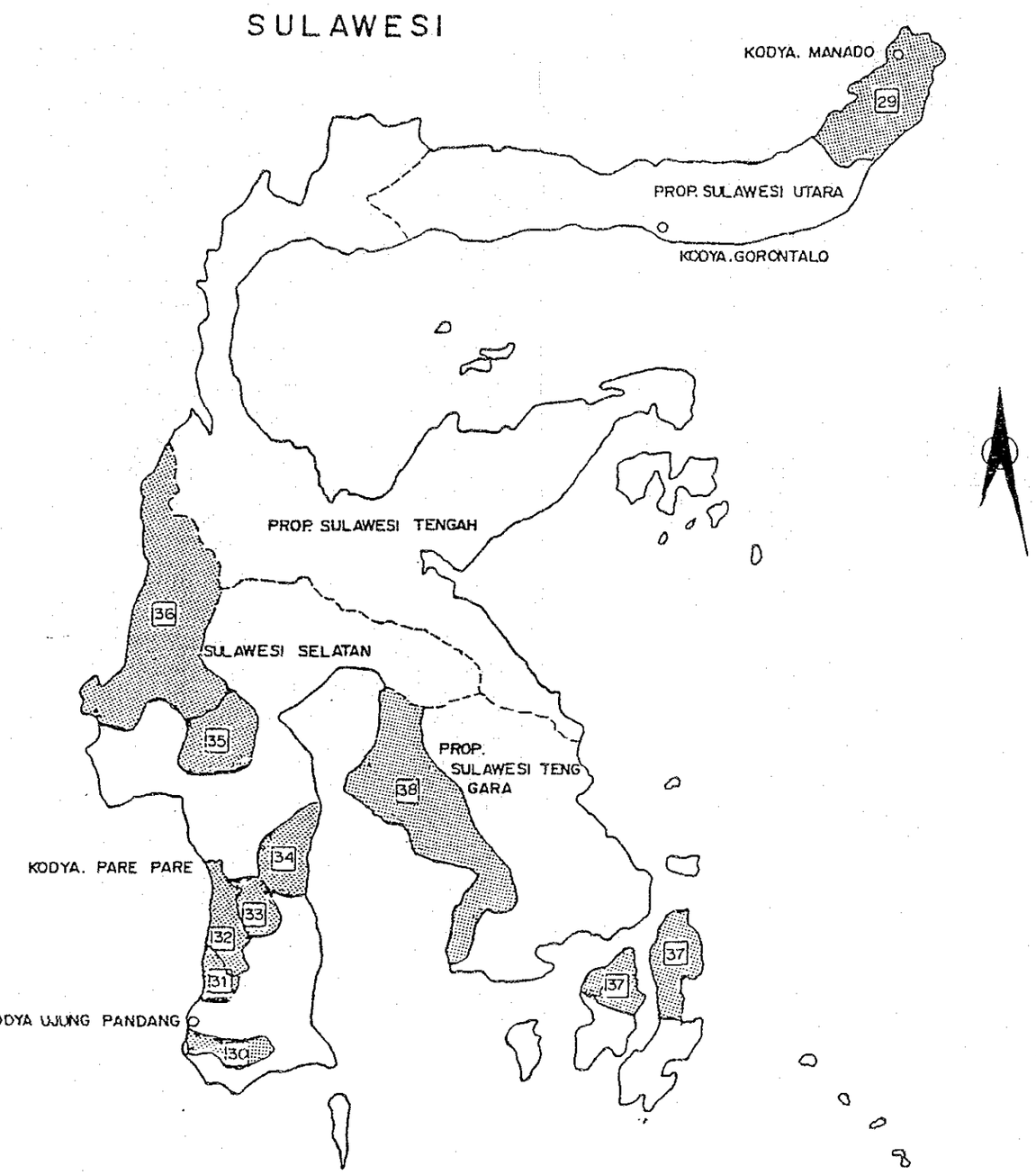
LOCATION MAP OF THE PROJECT AREAS



VIII · PROPINSI SULAWESI UTARA
29 · KAB · MINAHASA

IX · PROPINSI SULAWESI SELATAN
30 · KAB · GOWA
31 · KAB · PANGKAJENE KEPULAUAN
32 · KAB · BARRU
33 · KAB · SOPENG
34 · KAB · WAJO
35 · KAB · TANA TORAJA
36 · KAB · MAMUJU

X · PROPINSI SULAWESI TENGGARA
37 · KAB · MUNA
38 · KAB · KOLAKA



LEGEND :

---- PROVINCIAL BOUDER

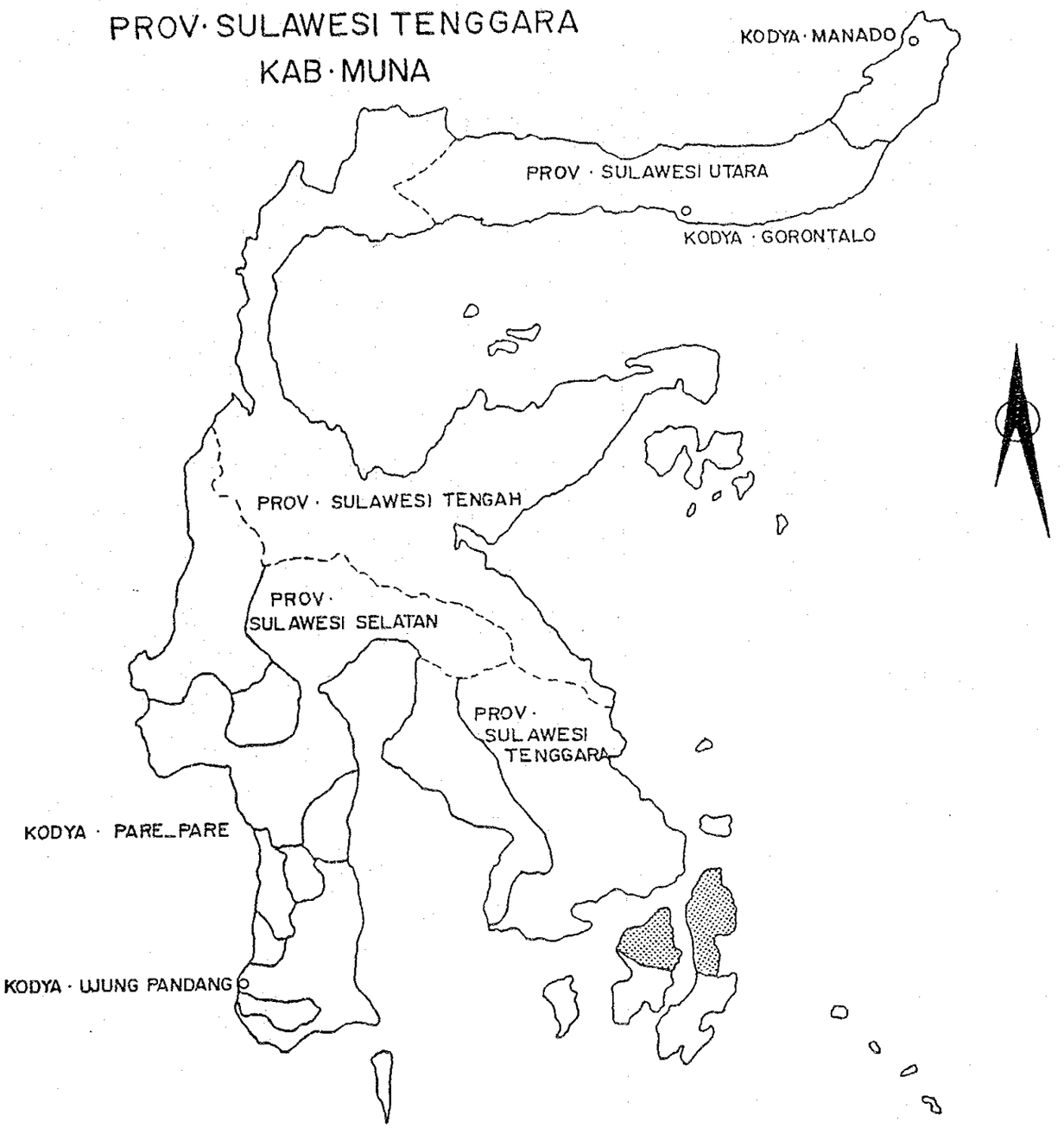
LOCATION OF THE PROPOSED AREA

SCALE :

0 92 184 276 460 Km

SULAWESI

PROV. SULAWESI TENGGARA
KAB. MUNA



LEGEND :

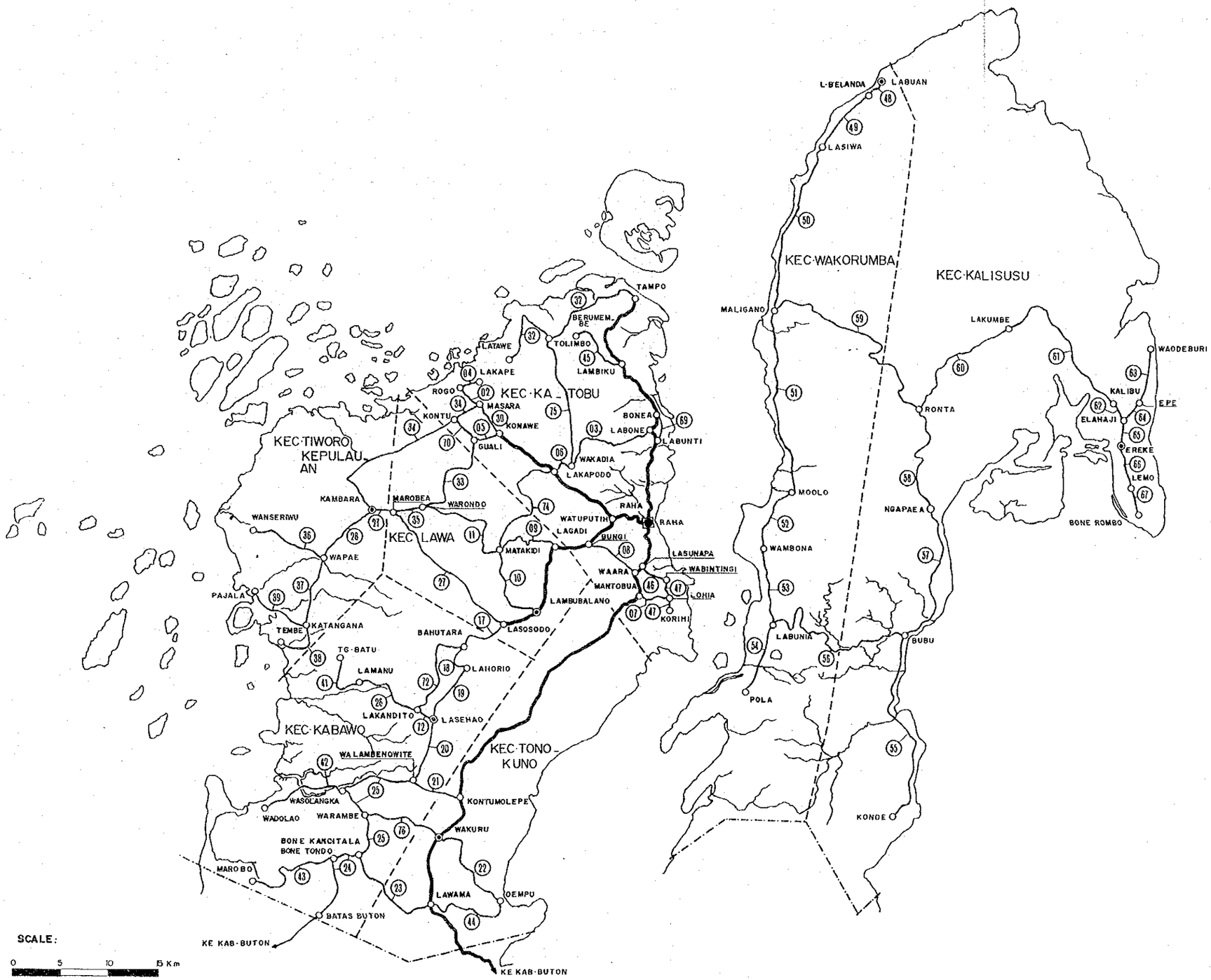
---- PROVINCIAL BOUNDARY

LOCATION OF THE PROJECT AREA

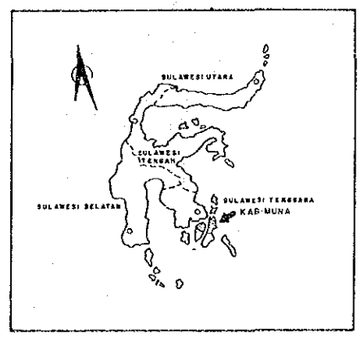
SCALE :

0 92 184 276 460 Km

KABUPATEN MUNA



LOCATION MAP



LEGEND :

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

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

TITLE :

SOURCE:	SCALE:	PROVINCE : SULAWESI TENGGARA
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPATEN: MUNA

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 Muna occupys the north portions of Muna and Buton Island, approximately half of the islands area, and their islets. The Kabupaten is located in the south of Sulawesi Tenggara Province, facing the Flores Sea.

Mountians lie along the east coast of Muna Island and on the north foot of the mountains stands Raha city, the capital of the Kabupaten. The remaining area is entirely covered by flatlands and the coastal area from the north to the west is covered with swamps. In Buton Island mountains and/or hills cover almost the whole island except for the flat hinterland of Kora bay. The highest peak in the island is Mountian Wani, 1190 meter high.

The Kabupaten has an area of 4,887 square kilometers, approximately 18 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 Muna are 98 days and 1,474 mm respectively.

One year in the Kabupaten consists of a rainy season and a dry season. The dry season is from April through November 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 : Sulawesi Tenggara
KABUPATEN : Muna STATION : Raha

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	16	178	15	196	12	184	6	196	14	229
February	10	89	15	188	15	235	5	119	16	247
March	11	170	16	191	19	375	13	100	16	354
April	9	184	3	21	17	297	9	84	11	261
May	12	116	18	335	8	109	13	247	12	280
June	10	53	7	106	2	14	14	276	12	280
July	-	-	15	247	-	-	3	46	5	68
August	8	56	1	3	-	-	2	9	-	-
September	-	-	11	137	-	-	-	-	8	53
October	-	-	4	29	-	-	4	50	2	29
November	1	6	6	53	-	-	7	84	2	20
December	17	176	8	73	2	59	14	189	15	271
Total	94	1,028	119	1,579	75	1,273	90	1,400	113	2,092

1.2 Socio-Economic Conditions

1.2.1 Population

The population of Kabupaten Muna in 1984 was 187,653 which was approximately 17.7% of the 1,061,200 total population of Sulawesi Tenggara Province as shown in Table 1-2-1.

The population density was 0.38 persons per ha which was almost the same as the provincial density of 0.37.

The recent annual average growth rate of population of the Kabupaten is 3.0% which is almost the same as the provincial rate of 3.1% and slightly higher than the national rate of 2.2%. This may be a result of the natural increase of population.

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:					
MUNA	187,653	3.0	488,725	0.38	1984
KOLAKA	159,790	5.7	885,495	0.18	1982
PROVINCE:					
SULWESI TENGGARA	1,002,100		2,768,600		1982
	1,031,200	3.1	2,768,600	0.37	1983
	1,061,200		2,768,600		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 : SULAWESI TENGGARA

KABUPATEN : MUNA

KECAMATAN	POPULATION	PROPORTION (%)
TIWORO KEPULAUAN	17,363	9.3
KABAWO	25,746	13·7
LAWA	17,949	9.6
TONOKUNO	13,160	7.0
KATO BU	76,219	40.6
WAKORUMBA	14,657	7·8
KALI SUSU	22,559	12·0
TOTAL	187,653	100

1.2.2 Land-Use

In Kabupaten Muna, 229,960 ha of the current available land use area, which is approximately 47.1% of the 488,725 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 83,700 ha of agricultural harvest area, 4,260 ha of residential area and 142,000 ha of usable open space which are 36.4%, 1.9% and 61.7% of the current available land use area respectively.

The agricultural harvest area consists of 3,379 ha of paddy field, 26,322 ha of plantation and 53,999 ha of other cultivated area which are 4.1%, 31.4% and 64.5% 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 : SULAWESI TENGGARA

(ha)

KABUPATEN	WET PADDY FIELD	UPLAND PADDY FIELD	OTHER CULTIVATED AREA	PLANTATION AREA	RESIDENTIAL AREA	USABLE OPEN SPACE	RIVER & LAKE	FORESTRY AREA	OTHERS	TOTAL AREA	SURVEY YEAR
MUNA	12 (0.1)	3,367 (0.7)	53,999 (11.0)	26,322 (5.4)	4,260 (0.9)	142,000 (29.1)	1,062 (0.2)	221,440 (45.3)	36,278 (7.4)	488,725 (100)	1984
KOLAKA	12,178 (1.4)	-	8,989 (1.0)	7,012 (0.8)	4,020 (0.5)	-	-	773,286 (87.3)	80,000 (9.0)	885,495 (100)	1982

Notes :

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

1.2.3 Agriculture

The cultivated area and food crop production in Kabupaten Muna in 1984 were 43,297 ha and 165,640 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 3,379 ha and 3,916 ton respectively which are only 7.8% and 2.4% of the total food crops. The yield rate of paddy production is 1.16 ton per ha. On the other hand, the production of maize, cassava and other crops was 161,724 ton which is over 40 times the paddy production. Thus, paddy is a minor agricultural crop in the Kabupaten and can not fulfill the Kabupaten demand.

As the table shows, average annual growth rates of area and production of paddy in 1979 through 1984 were -5.4% and -5.3% respectively which indicate a decreasing tendency of the paddy production. The low paddy productivity is due to the high portion of upland paddy field. It is desirable that productivity of paddy increases and this depends upon the future development of wet paddy field by the improvement of irrigation.

The commodity crops, of which palm oil, coffee and shaddock are major, are produced in the plantations. The area and production of plantation crops in 1983 were 22,244 ha and 57,038 ton respectively with current growth rates of 30.9% and 25.7% as shown in Table 1-2-5. Thus the plantation crop, which is exported, 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 63.6% of the total population as shown in Table 1-2-6. Thus this is an agricultural Kabupaten.

The Kabupaten should develop wet paddy field to improve productivity toward self-sufficiency of rice.

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

KABUPATEN : MUNA

CULTIVATED AREA

(ha)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	4,471	3,596	4,102	3,575	3,341	3,379	
OTHERS	28,507	32,507	35,940	36,095	37,049	39,918	
TOTAL	32,978	36,103	40,042	39,670	40,390	43,297	

PRODUCTION

(ton)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	5,122	4,366	5,802	5,432	5,774	3,916	
OTHERS	91,608	100,636	154,747	145,781	232,178	161,724	
TOTAL	96,730	105,002	160,549	151,213	237,952	165,640	

YIELD RATE

(ton/ha)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	0.87	0.82	1.41	1.52	1.73	1.16	

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 : SULAWESI TENGGARA

KABUPATEN	AREA	PRODUCTION	AAGR (%) AREA	AAGR (%) PRODUCTION
MUNA	22,244	57,038	30.9	25.7
KOLAKA	-	-	-	-

Table 1-2-6 POPULATION OF AGRICULTURAL SECTOR

PROVINCE : SULAWESI TENGGARA

KABUPATEN	AGRICULTURAL SECTOR	TOTAL POPULATION	PROPORTION (%)	AAGR (%)	SURVEY YEAR
MUNA	119,000	187,653	63.6	0.7	1984
KOLAKA	140,000	159,790	87.4	4.0	1982

Notes :

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

1.2.4 Other Economic Activities

Notable economic activities excluding agriculture in Kabupaten Muna are fishery and livestock sectors at present. Even though some activities of both the forestry and the manufacturing sectors are also reported as table below, these sectors have just enough production volume to supply for the consumption of the Kabupaten itself. However, the current growth rate of the forestry production shows a high growth tendency, therefore this sector is expected to develop in the future.

	1980	1984	AAGR (%)
Timber production (m^3)	3,316	12,711	40.0

The following table shows the current growth of both the fishery and the livestock productions.

	1980	1984	AAGR (%)
Catch (ton)	4,938	8,421	14.3
Livestock production (ton)	558	1,045	17.0

It is presumed that yearly approx. 6,000 tons of the catch and approx. 500 tons of the livestock production are exported out of the Kabupaten.

Therefore, both these sections are expected to become continuously prosperous.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

In Kabupaten Muna, which consists of two main islands, that is Buton Island and Muna Island, there are three provincial roads developed in Buton Island and none in Muna Island. One provincial road runs across Buton Island from south to north via Raha, the Kabupaten capital and the other provincial roads start from Raha being divided into two roads running towards the northwest and the southwest, leading to Tampo and Lasosodo respectively. These provincial roads have an important role as regional trunk roads of Buton Island.

The Kabupaten roads west of Raha form road networks around Kambara as a center connecting to the provincial roads. The Kabupaten roads in the south part of the Island form road networks around Wakuku as a center.

Muna Island is mostly hilly and mountainous. Therefore only one Kabupaten road between Maligano and Ronta, located in the center of the Island, connects the two Kabupaten roads which are being developed only along the west and east coasts of the Island.

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 Muna are confirmed as 76 links and 514 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 1.05 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, there is yet scope for improvement in density of the Kabupaten roads.

	Total Length (km)	Area (ha)	Density (m/ha)
Kabupaten : Muna	514	488,725	1.05
Province : Sulawesi Tenggara	1,268	1,374,220	0.92
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 : SULAWESI TENGGARA KAB : KUNA

(Km)

NO (ZI)	BTD	ASP	KRK	TNH	L.L	TOTAL
LINK 1						
LINK 2	3					3
LINK 3	12					12
LINK 4	2					2
LINK 5		2				2
LINK 6		2				2
LINK 7	6					6
LINK 8	7					7
LINK 9	6					6
LINK 10	4					4
LINK 11	7					7
LINK 12						
LINK 13						
LINK 14						
LINK 15						
LINK 16						
LINK 17	5					5
LINK 18	1		3			4
LINK 19			5	1		6
LINK 20	4	3				7
LINK 21	2		5			7
LINK 22			10			10
LINK 23			12			12
LINK 24				2		2
LINK 25	14		1	2		17
LINK 26				12		12
LINK 27	18					18
LINK 28	5			1		6
LINK 29						
LINK 30	4					4
LINK 31						
LINK 32				19		19
LINK 33	9					9
LINK 34				15		15
LINK 35	3					3
LINK 36	1			7		8
LINK 37				7		7
LINK 38				4		4

(Km)

NO (ZI)	BTD	ASP	KRK	TNH	L.L	TOTAL
LINK 39				5		5
LINK 40						
LINK 41				6		6
LINK 42				12		12
LINK 43	2			7		9
LINK 44				10		10
LINK 45	7					7
LINK 46	1			2		3
LINK 47	3					3
LINK 48	3					3
LINK 49				7		7
LINK 50				19		19
LINK 51				15		15
LINK 52						
LINK 53			5	1	1	7
LINK 54			1	5		6
LINK 55				22		22
LINK 56				1	7	8
LINK 57				16		16
LINK 58				12		12
LINK 59				20		20
LINK 60			19			19
LINK 61				18		18
LINK 62	1			3		4
LINK 63			2	2		4
LINK 64				5		5
LINK 65			1			1
LINK 66		1	6			7
LINK 67				3		3
LINK 68						
LINK 69	1					1
LINK 70	3					3
LINK 71						
LINK 72			12			12
LINK 73						
LINK 74	7					7
LINK 75	8					8
LINK 76				6		6
TOTAL	149	8	82	267	8	514
RATIO	29	2	16	52	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 : Muna	1.6	44.9	53.5
Province : Sulawesi Tenggara	4.3	25.9	69.8
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 both that of Indonesia and 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 : Muna	28.4	24.5	30.7	16.3
Province : Sulawesi Tenggara	30.6	21.5	36.8	11.1
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 : SULAWESI TENGGARA

KABUPATEN : MUNA

(1)

NO		BAI	SDI	RUI	RBI	BAL	SDL	RUL	RBL	BAK	SDK	RUK	RBK	BAH	SDH	RUH	RBH	BAT	SDT	RUT	RBT
1	LHK																				
2	LHK	22	17	62																	
3	LHK	28	16	75																	
4	LHK	45	43	13																	
5	LHK					78	15	8													
6	LHK					10	19	73													
7	LHK	55	25	20																	
8	LHK	56	26	19																	
9	LHK	73	3	24																	
10	LHK	1	73	3	25																
11	LHK	54	4	43																	
12	LHK																				
13	LHK																				
14	LHK																				
15	LHK																				
16	LHK																				
17	LHK	69	30	2																	
18	LHK	60	1	40						30	53	10	17	1							
19	LHK		1	1						46	46	8		65	35						
20	LHK	55	33	13		67	33														
21	LHK	56	18	33						69	12	20									
22	LHK									63	11	26									
23	LHK									63	10	28									
24	LHK													10	25	15	50				
25	LHK	66	23	11						60		40		48	15	20	18				
26	LHK													13	38	30	20				
27	LHK	90	10																		
28	LHK	58	24	18											30	30	40				
29	LHK																				
30	LHK	69	15	8																	
31	LHK																				
32	LHK														83	13	4				
33	LHK	68	20	12																	
34	LHK													31	17	33	19				
35	LHK	50	30	20																	
36	LHK		90	10											33	11	26				
37	LHK														81	19					
38	LHK													23	52	18	9				
39	LHK														42	30	28				
40	LHK																				
41	LHK													17	48	35					
42	LHK													11	39	26	18				
43	LHK	25	38	38										13	41	28	18				
44	LHK													26	33	25	16				
45	LHK	92	8	2																	
46	LHK			40	60											40	60				
47	LHK	33	30	37																	
48	LHK	76	16	9																	
49	LHK													34	47	16	3				
50	LHK													53	34	13					
51	LHK													50	37	12					

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

PROVINCE : SULAWESI TENGGARA

KABUPATEN : MUNA

(2)

ROAD	BIT				ASP				KRK				TNH				L.L			
ROAD	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB
LINK 52																				
LINK 53									36	10	48	6			70	30		50		50
LINK 54									80		20		30	38	22	10				
LINK 55															10	90				
LINK 56														30	70		26	39	10	26
LINK 57															44	56				
LINK 58															44	56				
LINK 59													49	31	17	4				
LINK 60										85	15									
LINK 61															1	99				
LINK 62			90	10											35	65				
LINK 63											69	31			84	16				
LINK 64														4	73	23				
LINK 65											70	30								
LINK 66						60	40			23	66	11								
LINK 67															81	19				
LINK 68																				
LINK 69	30	20	40	10																
LINK 70	38	30	25	7																
LINK 71																				
LINK 72									73	19	8									
LINK 73																				
LINK 74	29	44	16	11																
LINK 75	52	26	22																	
LINK 76															90	10				
AVERAGE	46	26	24	4	39	32	30	0	40	20	33	7	15	24	35	26	13	45	5	38
LENGTH	149 Km				8 Km				82 Km				267 Km				8 Km			
(Km)	69	39	36	6	3	3	2	0	33	16	27	6	40	64	93	69	1	4	0	3

The surface condition level of the Kabupaten roads in the Kabupaten is lower than either that of Indonesia or of Jawa Island. The proportion in good condition is 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 89.0% flat, 9.0% hilly, and 2.0% swampy. Thus the Kabupaten has favorable terrain conditions for road construction.

1.3.3 Bridge Inventory

A bridge inventory showing the existing condition of bridges on the Kabupaten roads in Kabupaten Muna 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 69 bridges with a total length of 876 m of which 62 or 89.6% are timber, 3 or 4.3% are concrete and 4 or 5.8% are others. On the other hand, 108 bridges with a total length of 1,164 m are required to be newly constructed.

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

PROV : SULAWESI TENGGARA KAB : MUNA

(Km)

I02 (3)	DT	BK	RW	GH	TOTAL
LINK 1					
LINK 2	3				3
LINK 3	12				12
LINK 4	2				2
LINK 5	2				2
LINK 6	2				2
LINK 7	6				6
LINK 8	5	2			7
LINK 9	6				6
LINK 10	4				4
LINK 11	7				7
LINK 12					
LINK 13					
LINK 14					
LINK 15					
LINK 16					
LINK 17	5				5
LINK 18	4				4
LINK 19	6				6
LINK 20	7				7
LINK 21	7				7
LINK 22	3	7			10
LINK 23	10	2			12
LINK 24	2				2
LINK 25	17				17
LINK 26	12				12
LINK 27	18				18
LINK 28	6				6
LINK 29					
LINK 30	4				4
LINK 31					
LINK 32	19				19
LINK 33	9				9
LINK 34	15				15
LINK 35	3				3
LINK 36	8				8
LINK 37	7				7
LINK 38	2		2		4

(Km)

I02 (3)	DT	BK	RW	GH	TOTAL
LINK 39	5				5
LINK 40					
LINK 41	6				6
LINK 42	12				12
LINK 43	9				9
LINK 44	7	3			10
LINK 45	7				7
LINK 46		2	1		3
LINK 47	2	1			3
LINK 48	3				3
LINK 49	2	4		1	7
LINK 50	19				19
LINK 51	15				15
LINK 52					
LINK 53	1	1	5		7
LINK 54	6				6
LINK 55	16	6			22
LINK 56	8				8
LINK 57	16				16
LINK 58	12				12
LINK 59	12	8			20
LINK 60	19				19
LINK 61	10	8			18
LINK 62	3	1			4
LINK 63	4				4
LINK 64	5				5
LINK 65		1			1
LINK 66	7				7
LINK 67	3				3
LINK 68					
LINK 69		1			1
LINK 70	3				3
LINK 71					
LINK 72	12				12
LINK 73					
LINK 74	7				7
LINK 75	8				8
LINK 76	6				6
TOTAL	458	47	8		514
RATIO	89	9	2	0	(%)

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : SULAWESI TENGGARA KAB : KUNA

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

	EXISTING		NOT EXIST		TOTAL	
LINK NO	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
2			1	4.00	1	4.00
3	6	252.50			6	252.50
4			1	4.00	1	4.00
5			1	4.00	1	4.00
6	1	6.00			1	6.00
7			1	4.00	1	4.00
8			1	4.00	1	4.00
9			1	4.00	1	4.00
10			1	4.00	1	4.00
11			1	4.00	1	4.00
17			1	4.00	1	4.00
18			1	4.00	1	4.00
19			1	4.00	1	4.00
20	1	6.00			1	6.00
21	1	6.00			1	6.00
22			1	4.00	1	4.00
23	1	4.00			1	4.00
24			1	4.00	1	4.00
25	2	21.00			2	21.00
26	1	6.00			1	6.00
27	8	80.00			8	80.00
28	3	14.00			3	14.00
30	1	12.00			1	12.00
32			2	19.00	2	19.00
33	3	50.00			3	50.00
34	3	20.00	6	34.00	9	54.00
35	1	9.00			1	9.00
36	2	64.00			2	64.00
37	2	17.00			2	17.00
38	1	5.00			1	5.00
39	1	35.00			1	35.00
41			1	4.00	1	4.00
42			1	4.00	1	4.00
44			1	6.00	1	6.00
45	1	6.00			1	6.00
46			1	4.00	1	4.00
49			4	27.00	4	27.00
50			4	104.00	4	104.00
53			6	24.00	6	24.00
54			3	12.00	3	12.00
55			10	233.00	10	233.00
56			1	7.00	1	7.00
57			15	135.00	15	135.00
58			13	210.00	13	210.00
60	11	116.00			11	116.00
61			10	210.00	10	210.00
62	1	8.00	5	46.00	6	54.00
63	4	39.00			4	39.00
64	6	43.00			6	43.00
72	1	0.02			1	0.02
74	2	20.00			2	20.00
75	5	36.00			5	36.00
76			4	33.00	4	33.00
TOTAL	69	875.52	108	1164.00	177	2039.52

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

PROV : SULAWESI TENGGARA					KAB : KUNA
	<<< BRIDGE >>>				(No)
NO (10)	KY	BI	LL	TOTAL	
LINK 2					
LINK 3	6			6	
LINK 4					
LINK 5					
LINK 6	1			1	
LINK 7					
LINK 8					
LINK 9					
LINK 10					
LINK 11					
LINK 12					
LINK 13					
LINK 19					
LINK 20		1		1	
LINK 21			1	1	
LINK 22					
LINK 23	1			1	
LINK 24					
LINK 25	2			2	
LINK 26	1			1	
LINK 27	8			8	
LINK 28	3			3	
LINK 30		1		1	
LINK 32					
LINK 33	3			3	
LINK 34	3			3	
LINK 35			1	1	
LINK 36	2			2	
LINK 37	2			2	
LINK 38	1			1	
LINK 39			1	1	
LINK 41					
LINK 42					
LINK 44					
LINK 45	1			1	
LINK 46					
LINK 49					
LINK 50					
LINK 53					
LINK 54					
LINK 55					
LINK 56					
LINK 57					
LINK 58					
LINK 60	10		1	11	
LINK 61					
LINK 62	1			1	
LINK 63	4			4	
LINK 64	6			6	
LINK 72		1		1	
LINK 74	2			2	
LINK 75	5			5	
LINK 76					
TOTAL	62	3	4	69	
RATIO	90	4	6	(%)	

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	28	15	17	1	-	-	-	-	-	1	62
Concrete	1	-	1	-	1	-	-	-	-	-	3
Steel	-	-	-	-	-	-	-	-	-	-	-
Others	1	-	1	2	-	-	-	-	-	-	4
Total	30	15	19	3	1	-	-	-	-	1	69

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

1.3.4 Traffic

Inventories of the average daily traffic (ADT) on the Kabupaten roads in Kabupaten Muna 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	531	213	330	928	1,545
Proportion (%)	26.52	10.64	16.48	46.36	100.00

Source : Bina Marga Inventory

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

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Proportion (%)	1.94	0.77	11.58	85.71	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 : SULAWESI TENGGARA KAB : MUNA

A)	Growth Rate of Population	:	3.00 (%)
B)	Growth Rate of Cultivated Area	:	9.00 (%)
C)	Growth Rate of Rice field	:	0.00 (%)
D)	Growth Rate of Rice yield rate	:	6.00 (%)
E)	Growth Rate of GDP / capita	:	5.70 (%)
a)	Geometrical Mean (A x B)	:	5.96 (%)
b)	Geometrical Mean (C x D)	:	2.96 (%)
c)	Geometrical Mean (a x b)	:	4.45 (%)
d)	Geometrical Mean (c x E)	:	5.07 (%)
	TRAFFIC GROWTH RATE	:	5.07 (%)

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 : SULAWESI TENGGARA KAB : MUNA

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	HBL	BUS	TRUK	SPD	TOTAL		HBL	BUS	TRUK	SPD	TOTAL	
1	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
2	10	1	9	10	25	5.1%	19	2	17	19	48	IIIC
3	2	0	0	5	5	5.1%	4	0	0	10	10	IIIC
4	8	1	7	10	21	5.1%	15	2	13	19	40	IIIC
5	75	35	15	60	155	5.1%	143	67	29	114	295	IIIB-1
6	50	30	20	150	175	5.1%	95	57	38	285	333	IIIB-1
7	60	20	20	75	138	5.1%	114	38	38	143	262	IIIB-1
8	12	2	10	12	30	5.1%	23	4	19	23	57	IIIB-2
9	5	2	4	10	16	5.1%	10	4	8	19	30	IIIC
10	10	3	5	18	27	5.1%	19	6	10	34	51	IIIB-2
11	5	2	4	7	15	5.1%	10	4	8	13	29	IIIC
12	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
13	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
14	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
15	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
16	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
17	10	7	5	15	30	5.1%	19	13	10	29	57	IIIB-2
18	5	7	4	10	21	5.1%	10	13	8	19	40	IIIC
19	9	6	7	15	30	5.1%	17	11	13	29	57	IIIB-2
20	10	9	5	15	32	5.1%	19	17	10	29	61	IIIB-2
21	6	7	7	15	28	5.1%	11	13	13	29	53	IIIB-2
22	25	0	0	25	38	5.1%	48	0	0	48	72	IIIB-2
23	30	4	20	40	74	5.1%	57	8	38	76	141	IIIB-2
24	5	8	2	10	20	5.1%	10	15	4	19	38	IIIC
25	2	1	5	10	13	5.1%	4	2	10	19	25	IIIC
26	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
27	6	4	6	9	21	5.1%	11	8	11	17	40	IIIC
28	10	10	10	10	35	5.1%	19	19	19	19	67	IIIB-2
29	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
30	10	1	9	10	25	5.1%	19	2	17	19	48	IIIC
31	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
32	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
33	2	0	7	5	12	5.1%	4	0	13	10	23	IIIC
34	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
35	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
36	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
37	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
38	0	0	10	20	20	5.1%	0	0	19	38	38	IIIC
39	0	0	0	5	3	5.1%	0	0	0	10	6	IIIC
40	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
41	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
42	0	0	0	4	2	5.1%	0	0	0	8	4	IIIC
43	5	7	4	10	21	5.1%	10	13	8	19	40	IIIC
44	0	0	0	15	8	5.1%	0	0	0	29	15	IIIC
45	6	2	8	8	20	5.1%	11	4	15	15	38	IIIC
46	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
47	30	10	10	20	60	5.1%	57	19	19	38	114	IIIB-2
48	2	0	5	30	22	5.1%	4	0	10	57	42	IIIC
49	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
50	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC

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

PROV : SULAWESI TENGGARA KAB : MUNA

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	HBL	BUS	TRUK	SPD	TOTAL		HBL	BUS	TRUK	SPD	TOTAL	
51	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
52	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
53	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
54	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
55	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
56	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
57	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
58	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
59	0	0	2	0	2	5.1%	0	0	4	0	4	IIIC
60	0	0	0	8	4	5.1%	0	0	0	15	8	IIIC
61	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
62	2	0	2	6	7	5.1%	4	0	4	11	13	IIIC
63	5	0	12	30	32	5.1%	10	0	23	57	61	IIIB-2
64	6	0	12	30	33	5.1%	11	0	23	57	63	IIIB-2
65	8	0	12	26	33	5.1%	15	0	23	49	63	IIIB-2
66	35	0	20	40	75	5.1%	67	0	38	76	143	IIIB-2
67	10	0	10	20	30	5.1%	19	0	19	38	57	IIIB-2
68	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
69	5	3	7	25	28	5.1%	10	6	13	48	53	IIIB-2
70	10	1	5	10	21	5.1%	19	2	10	19	40	IIIC
71	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
72	5	10	5	15	28	5.1%	10	19	10	29	53	IIIB-2
73	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
74	10	10	10	20	40	5.1%	19	19	19	38	76	IIIB-2
75	25	10	15	40	70	5.1%	48	19	29	76	133	IIIB-2
76	0	0	0	0	0	5.1%	0	0	0	0	0	IIIC
PERCENT	26.52	10.64	16.48	46.35			26.52	10.64	16.48	46.35		

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 : SULAWESI TENGGARA KAB : MUNA

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
2	IIIC	KRK	11	5	7	20	33
3	IIIB-2	KRK	46	18	28	80	132
4	IIIC	KRK	8	3	5	13	23
8	IIIB-2	KRK	27	11	17	47	79
9	IIIC	KRK	7	3	4	12	20
10	IIIC	KRK	5	2	3	8	14
11	IIIC	KRK	8	3	5	14	23
17	IIIC	KRK	5	2	3	10	15
18	IIIC	KRK	2	1	1	4	6
19	IIIC	KRK	3	1	2	5	9
20	IIIC	KRK	4	1	2	6	10
21	IIIC	KRK	4	2	3	7	13
22	IIIC	KRK	7	3	4	12	20
24	IIIC	KRK	1	0	1	2	3
25	IIIC	KRK	9	3	5	15	25
26	IIIC	KRK	6	2	4	11	18
27	IIIB-2	KRK	40	16	25	71	117
28	IIIB-2	KRK	66	27	41	118	192
30	IIIC	KRK	15	6	9	27	44
32	IIIB-1	ASP	72	29	45	126	209
33	IIIC	KRK	16	6	10	27	46
34	IIIB-1	ASP	99	40	61	172	286
35	IIIC	KRK	3	1	2	6	9
36	IIIB-1	ASP	88	35	55	154	255
37	IIIB-1	ASP	77	31	48	135	224
38	IIIB-2	KRK	44	18	27	77	128
39	IIIB-2	KRK	55	22	34	96	159
41	IIIC	KRK	3	1	2	5	9
42	IIIC	KRK	6	2	4	11	18
43	IIIC	KRK	5	2	3	8	14
44	IIIC	KRK	7	3	4	12	20
45	IIIB-2	KRK	27	11	17	47	79
46	IIIC	KRK	11	5	7	20	33
48	IIIC	KRK	2	1	1	3	6
49	IIIC	KRK	4	2	3	8	13
50	IIIC	KRK	12	5	7	21	35
51	IIIC	KRK	13	5	8	22	37
53	IIIC	KRK	5	2	3	9	15
54	IIIC	KRK	4	2	3	8	13
55	IIIB-2	KRK	25	10	15	44	72
56	IIIC	KRK	15	6	9	26	43
57	IIIB-2	KRK	18	7	11	32	52
58	IIIC	KRK	14	5	8	24	39
59	IIIB-2	KRK	20	8	12	35	58
60	IIIB-2	KRK	29	12	18	51	85
61	IIIB-2	KRK	27	11	17	48	79
62	IIIC	KRK	5	2	3	9	14
63	IIIC	KRK	6	2	4	10	17
64	IIIC	KRK	2	1	1	4	6
65	IIIC	KRK	8	3	5	14	23
67	IIIC	KRK	3	1	2	6	9
70	IIIC	KRK	11	5	7	20	33
72	IIIC	KRK	6	2	4	11	18
74	IIIC	KRK	16	6	10	28	46
76	IIIC	KRK	3	1	2	6	9

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 : MUNA

(1000Rupiah)

	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 7	LINK 8	LINK 9	LINK 10	LINK 11
	3 Km	12 Km	2 Km	2 Km	2 Km	6 Km	7 Km	6 Km	4 Km	7 Km
	IIIC	IIIB-2	IIIC	IIIB-1	IIIB-1	IIIB-2	IIIB-2	IIIC	IIIC	IIIC
YEAR	Surplus	Surplus	Surplus	VOC	VOC	VOC	Surplus	Surplus	Surplus	Surplus
1988	0	0	0	0	0	0	0	0	0	0
1989	1358	12753	236	811	4544	5749	2975	681	767	1455
1990	1358	12753	236	854	4769	6126	2975	681	767	1455
1991	1358	12753	236	898	4997	6413	2975	681	767	1455
1992	1358	12753	236	941	5258	6699	2975	681	767	1455
1993	1358	12753	236	988	5546	7076	2975	681	767	1455
1994	1358	12753	236	1041	5811	7411	2975	681	767	1455
1995	1358	12753	236	1094	6110	7793	2975	681	767	1455
1996	1358	12753	236	1148	6407	8127	2975	681	767	1455
1997	1358	12753	236	1208	6748	8600	2975	681	767	1455
1998	1358	12753	236	1275	7079	9030	2975	681	767	1455
SUM	13580	127530	2360	10258	57269	73024	29750	6810	7670	14550
COST	-2458	35153	-5751	-4801	22993	21575	-6925	-17420	-9690	-16265
/Km	-819	2929	-2876	-2401	11497	3596	-989	-2903	-2422	-2324

Chapter 3 ENGINEERING

3.1 Design Criteria and Specification

3.1.1 Geometric Design Criteria

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

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

3.1.2 Loading Specification

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

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

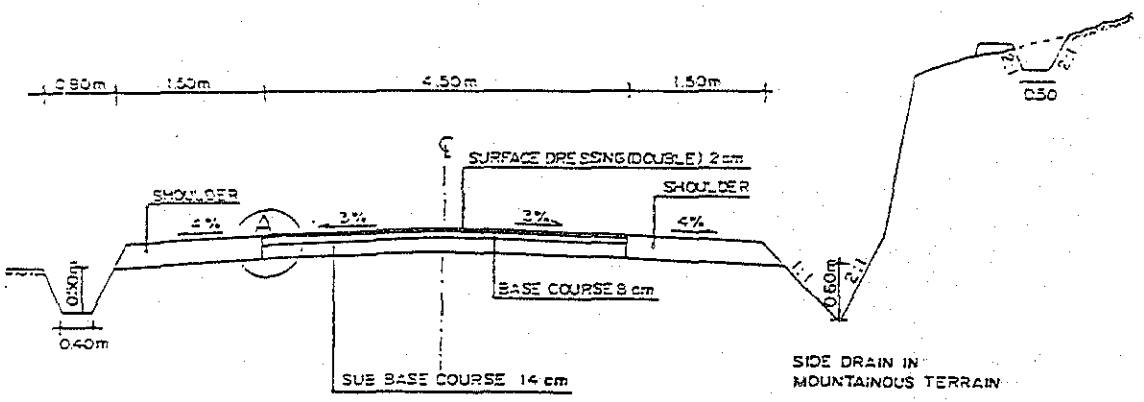
b. 10-ton truck load is applied for timber bridges on roads of III B-1, III B-2 and III C classification.

Table 3-1-1 DESIGN CRITERIA FOR KABUPATEN ROADS

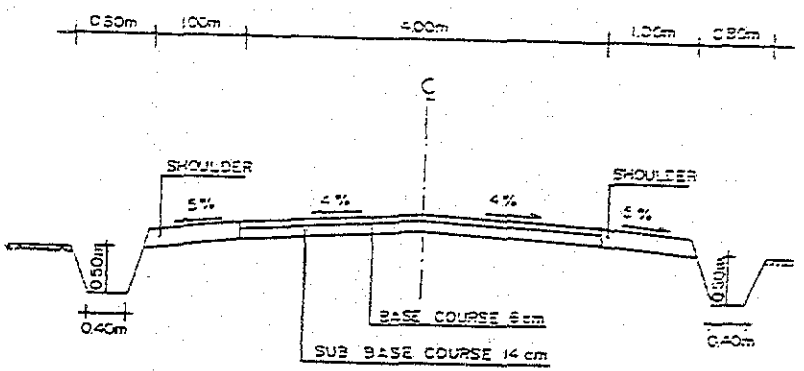
ROAD CLASSIFICATION		CLASS III A			CLASS III B-1			CLASS III B-2			CLASS III C		
SURFACE TYPE		ASPHALT SEAL (DOUBLE)			ASPHALT SEAL (SINGLE)			GRAVEL			GRAVEL		
TRAFFIC VOLUME : ADT (Forecast 10 th year average per day)		3000 - 500			500 - 200			200 - 50			50		
T E R R A I N		FLAT TO ROLLING	HILLY	MOUNT-AINOUS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

Fig. 3-1-1 STANDARD ROAD CROSS SECTIONS

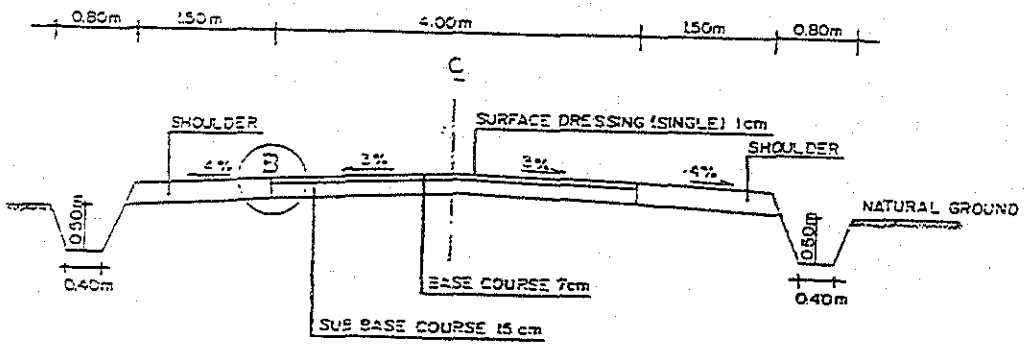
CLASS III A



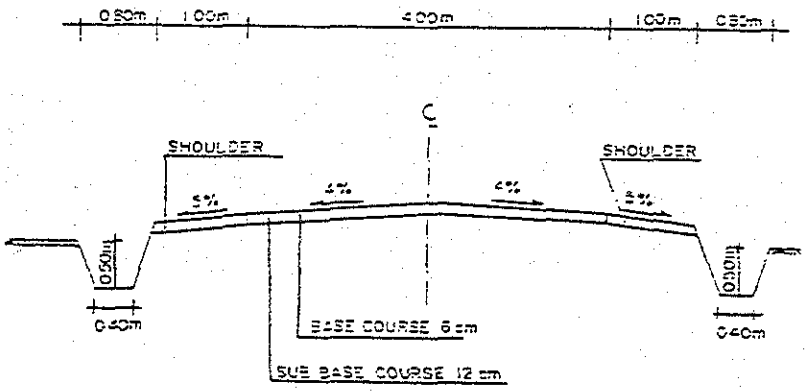
CLASS III B-2



CLASS III B-1



CLASS III C



3.2 Pavement Design

3.2.1 Design Conditions

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

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

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

1) Design Traffic Volume

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

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

2) Strength of Roadbed

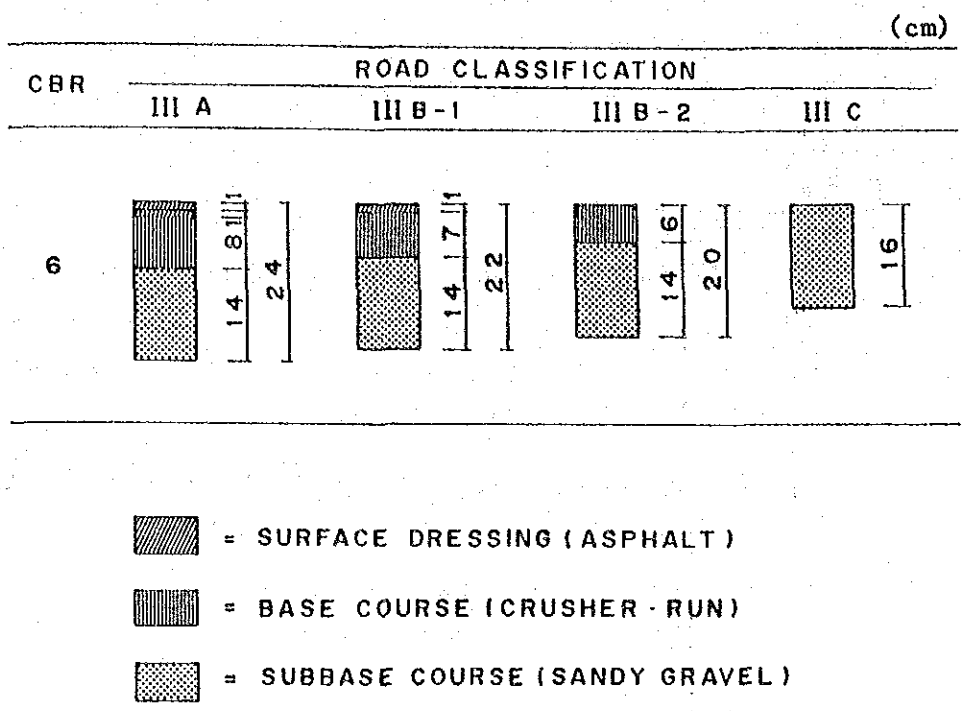
The CBR value of the existing roadbed is a very important factor for the pavement design but no results are available from CBR tests on the Kabupaten roads.

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

3.2.2 Pavement Structure

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

Fig. 3-2-1 PAVEMENT STRUCTURE



3.3 Design of Bridges and Other Structures

3.3.1 Standard Bridge

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

(1) Bridge Type

1) Superstructure

The following two types have been finally selected with the agreement of Bina Marga after studying the actual rural conditions of bridge construction. Fig. 3-3-1 shows the cross sections of standard types.

a. Timber beam bridge (hereinafter timber bridge) for roads class III B-1, III B-2 and III C.

b. Reinforced concrete T-girder bridge (hereinafter RC-bridge) for roads class III A.

2) Substructure

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

a) Timber pile bents for timber bridge
b) Rubble in Mortar masonry for RC bridge

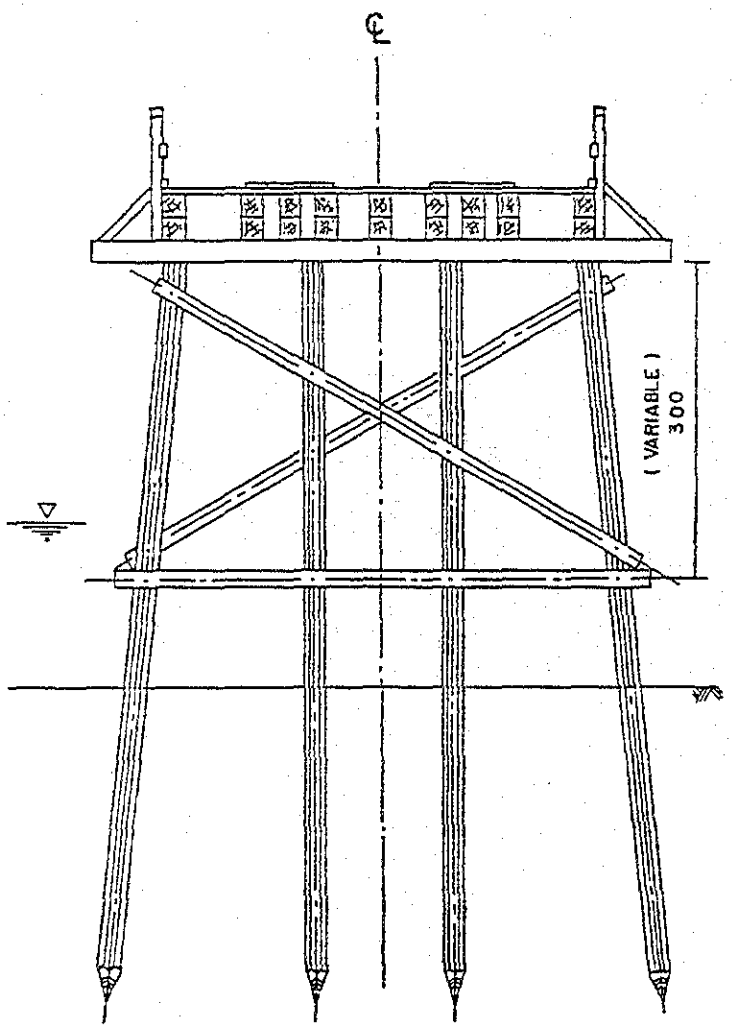
3) Foundation

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

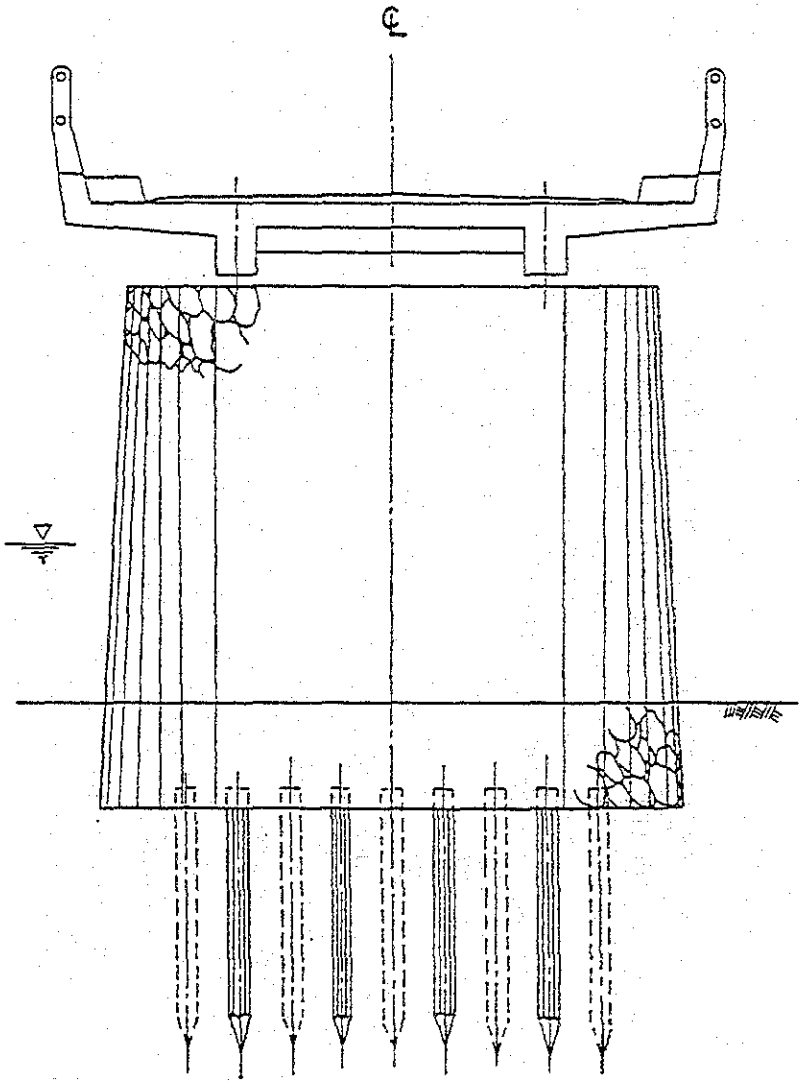
The pile length is suggested to be a minimum of 3 meters under the bottom of the foundation. The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

Fig. 3-3-1 CROSS SECTIONS OF STANDARD BRIDGES

TIMBER BRIDGE



REINFORCED CONCRETE BRIDGE



(2) Bridge Width

The effective bridge widths for the standard bridges have been decided as follows through discussions with Bina Marga considering the actual width of Kabupaten roads:

a) Timber bridge: 4.0 m in general
b) RC bridge : 4.5 m in general

(3) Span Length

The range of span lengths are determined as:

a) Timber bridge: 3.0, 5.0 and 8.0 m
b) RC bridge : 3.0, 5.0, 10.0 and 15.0 m

3.3.2 Other Structure

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 transverse drainage.

a) Reinforced concrete pipe culvert ϕ 80 cm
b) Rubble in mortar box culvert with RC slab 80 cm X 80 cm

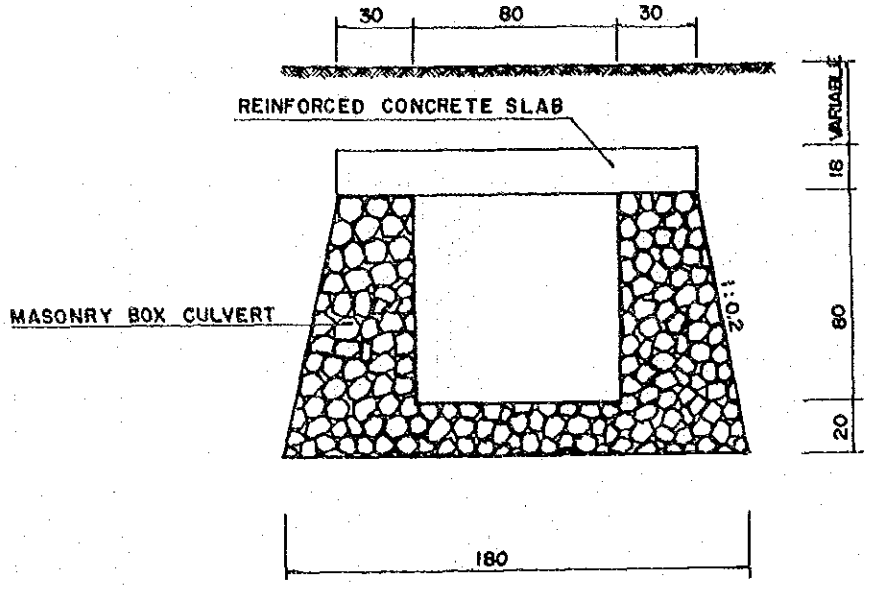
(2) Retaining Wall

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

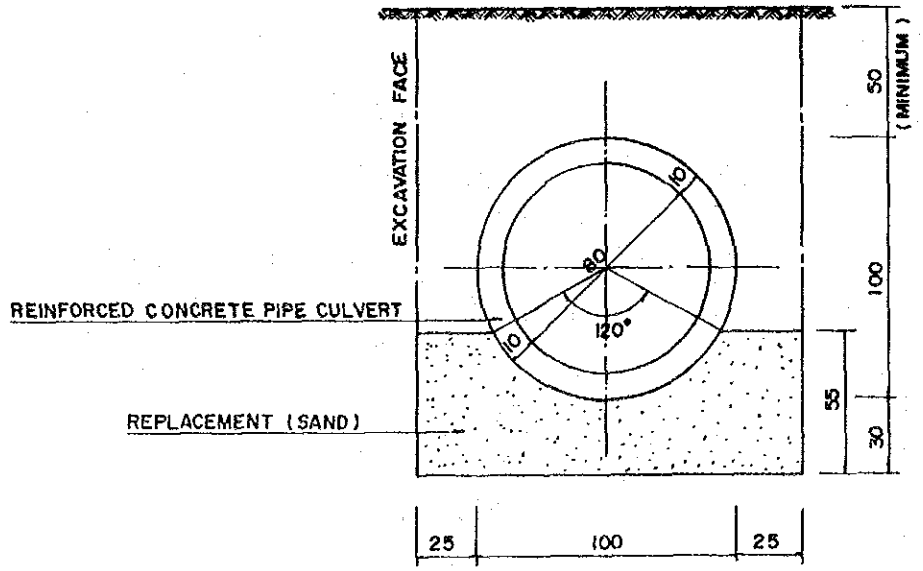
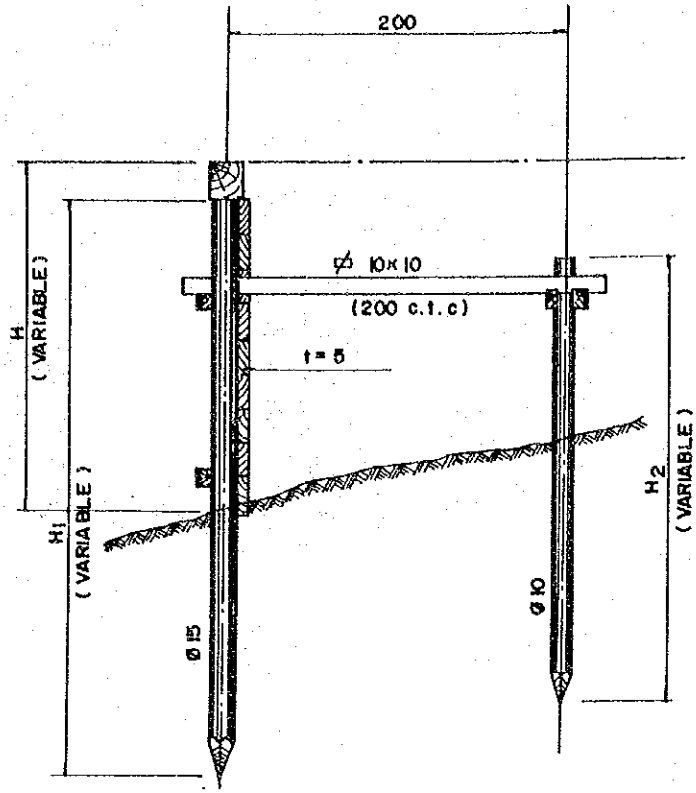
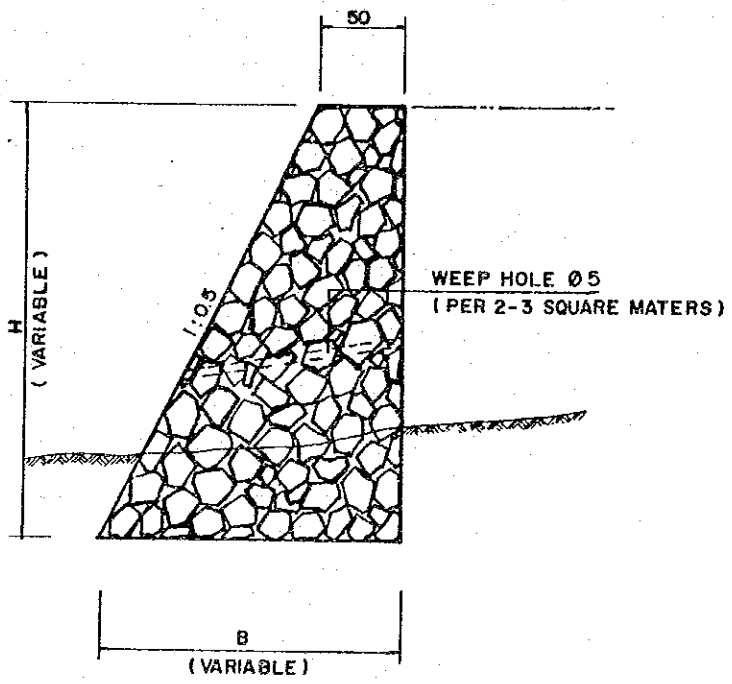


Fig. 3-3-3 STANDARD RETAINING WALLS

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 Muna and other Kabupatens in Sulawesi Tenggara 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
Muna	2,500	2,250	3,000	3,000	1,750	2,000	2,500
Kolaka	3,300	3,000	3,500	3,500	2,200	3,000	4,000
Average	2,900	2,625	3,250	3,250	1,975	2,500	3,250

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 Muna together with for other Kabupatens in Sulawesi Tenggara Province.

Table 4-1-2 UNIT PRICE OF MATERIALS

(Rp)

MATERIAL	UNIT	MUNA	KOLAKA	AVERAGE
Bitumen	L	300	400	350
Asphalt oil	L	800	850	825
Gasoline	L	250	250	250
Sand	M^3	7,500	4,000	5,750
Cement	bag	5,000	4,750	4,875
River Stone	M^3	3,500	5,000	4,250
Steel moulds	Set	8,500	8,500	8,500
Timber	M^3	125,000	110,000	117,500
Paint	L	3,000	3,000	3,000
Reinforcing Steel	Kg	750	800	775
Tying Wire	Kg	1,200	1,200	1,200
Equivalent Royalty	M^3	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 : SULAWESI TENGGARA
KABUPATEN : MUNA

(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	428	12,753	13,181	7,769	1,048	8,817	21,998
	Bulldozer/Ripper	120 HP	468	13,788	14,256	8,499	1,613	10,112	24,368
	Swamp Bulldozer	120 HP	489	14,036	14,525	8,879	1,686	10,565	25,090
	Bulldozer	90 HP	271	8,645	8,916	4,914	663	5,577	14,493
	Bulldozer/Ripper	90 HP	292	9,249	9,541	5,299	1,006	6,305	15,846
	Bulldozer	65 HP	193	6,278	6,471	3,499	472	3,971	10,442
	Bulldozer/Ripper	65 HP	211	6,739	6,950	3,819	725	4,544	11,494
	Swamp Bulldozer	90 HP	291	9,239	9,530	5,284	1,003	6,287	15,817
	Swamp Bulldozer	65 HP	223	6,631	6,854	4,049	768	4,817	11,671
	Motor Grader	110 HP	381	11,086	11,467	6,919	1,314	8,233	19,700
	Motor Grader	75 HP	263	7,599	7,862	4,779	907	5,686	13,548
	Motor Grader	65 HP	237	6,688	6,925	4,299	816	5,115	12,040
	Road Stabilizer	W=1850 mm	473	3,463	3,936	8,594	435	9,029	12,965
	Vibratory Roller	4 ton	160	3,320	3,480	2,899	391	3,290	6,770
	Hand-guide Vib. Roller	1000 Kg	128	609	737	849	31	880	1,617
	Tire Roller	8-15 ton	171	7,301	7,472	3,106	104	3,210	10,682
	Vibratory Roller (D&T)	4 ton	160	3,320	3,480	2,899	391	3,290	6,770
	Hand-guide Vib. Roller	600 Kg	90	416	506	600	22	622	1,128
	Rough Terrain Crane	10 ton	553	12,922	13,475	10,039	762	10,801	24,276
	Hydraulic Excavator; Wheel	0.3 m3	227	7,761	7,988	4,109	554	4,663	12,651
	Wheel Loader	1.2 m3	387	8,441	8,828	7,019	947	7,966	16,794
	Wheel Loader	0.3 m3	125	2,942	3,067	2,269	306	2,575	5,642
	Water Tank Truck	4000 ltr.	131	2,816	2,947	868	127	995	3,942
	Fuel Tank Truck	4000 ltr.	133	2,823	2,956	882	129	1,011	3,967
	Dump Truck	3.0 ton	221	3,556	3,777	1,469	216	1,685	5,462
	Flat Bed Truck with Crane	3.0 ton	95	3,053	3,148	1,716	130	1,846	4,994
	Dump Loader Truck	12 ton	212	18,660	18,872	3,837	129	3,966	22,838
	Dump Truck	5.0 ton	329	5,862	6,191	2,189	322	2,511	8,702
	Flat Bed Truck	3.0 ton	31	2,617	2,648	563	42	605	3,253
	Portable Crusher/Screening	30-40 t/h	1,034	21,554	22,588	18,800	2,538	21,338	43,926
	Concrete Mixer	0.5 m3	810	2,526	3,336	5,400	447	5,847	9,183
	Water Pump	200 l/min	29	263	292	188	6	194	486
	Concrete Vibrator	3.3 HP	12	225	237	73	2	75	312
	Asphalt Sprayer	850 ltr.	153	786	939	1,020	150	1,170	2,109

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 : SULAWESI TENGGARA KAB : MUNA

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	159	91	250
Subgrade Preparation	m2	20	11	31
Normal Fill	m3	1,631	866	2,497
Fill in Swamp	m3	2,429	1,058	3,487
Normal Excavation to Spoil	m3	959	525	1,484
Sub Base Course	m3	3,090	1,355	4,445
Base Course	m3	4,244	2,310	6,554
Shoulder	m2	284	146	430
Asphalt Patching	m2	3,579	1,383	4,962
Surface Dressing (Single)	m2	636	595	1,231
Surface Dressing (Double)	m2	784	936	1,720
Earth Drain	m	834	120	954
Earth Drain in Swamp (by machine)	m3	1,144	476	1,620
Pipe Culvert D80cm	m	44,401	43,445	87,846
Masonry Culvert (80x80cm)	m	55,358	37,949	93,307
Retaining Wall and Wing Wall (Timber)	m2	12,615	246	12,861
Retaining Wall and Wing Wall (Masonry)	m3	39,102	11,915	51,017
Gabion Protection	m3	8,729	121	8,850
Manual routine maintenance of road	Km	133,276	7,260	140,536
Routine maintenance of earth road	Km	89,928	38,004	127,932
Routine maintenance of gravel road	Km	183,586	88,384	271,970
Routine maintenance of asphalt road	Km	357,900	138,300	496,200

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 : SULAWESI TENGGARA KAB : MUNA

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	45,559	4,084	49,643
Superstructure (Timber;Span 5m;10T)	m2	50,463	4,509	54,972
Superstructure (Timber;Span 8m;10T)	m2	66,841	5,922	72,763
Superstructure (Timber;Span 3m;BM50)	m2	56,491	5,049	61,540
Superstructure (Timber;Span 5m;BM50)	m2	61,673	5,471	67,144
Superstructure (Timber;Span 8m;BM50)	m2	78,217	6,925	85,142
Superstructure (Concrete;Span 3m;BM50)	m2	50,846	87,433	138,279
Superstructure (Concrete;Span 5m;BM50)	m2	52,182	97,542	149,724
Superstructure (Concrete;Span 8m;BM50)	m2	53,726	106,148	159,874
Superstructure (Concrete;Span10m;BM50)	m2	58,730	120,400	179,130
Superstructure (Concrete;Span15m;BM50)	m2	63,247	141,625	204,872
Substructure (Pier;for Timber;10T)	NO	396,853	37,996	434,849
Substructure (Abut;for Timber;10T)	NO	1,079,749	172,146	1,251,895
Substructure (Pier;for Timber;BM50)	NO	583,653	56,242	639,895
Substructure (Abut;for Timber;BM50)	NO	1,220,647	192,243	1,412,890
Substructure (Pier;for Concrete;BM50)	NO	1,540,360	478,596	2,018,956
Substructure (Abut;for Concrete;BM50)	NO	3,247,012	1,002,690	4,249,702
Demolition of Bridge (Timber->Timber)	m2	12,605	1,552	14,157
Demolition of Bridge (Timber->Concrete)	m2	12,605	1,552	14,157
Demolition of Bridge (Concrete)	m2	77,585	68,755	146,340
Maintenance of Timber Bridge (New)	m2	8,201	1,233	9,434
Maintenance of Concrete Bridge (New)	m2	1,857	2,792	4,649
Maintenance of Timber Bridge (Exist)	m2	7,648	2,462	10,110
Maintenance of Concrete Bridge (Exist)	m2	3,919	2,404	6,323

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 Muna are shown in Table 5-1-1.

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

KABUPATEN : MUNA

CRITERIA NO	ROAD LINK NO
(1)	69
(8)	01,12,13,14,15,16,29,31,40,52,68,71,73

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 : SULAWESI TENGGARA KABUPATEN : MUNA

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
34	15 Km	IIIB-1	67.413	Surplus
37	7 Km	IIIB-1	57.924	Surplus
39	5 Km	IIIB-2	54.687	Surplus
36	8 Km	IIIB-1	48.426	Surplus
32	19 Km	IIIB-1	40.099	Surplus
38	4 Km	IIIB-2	32.041	Surplus
66	7 Km	IIIB-2	23.605	VOC
28	6 Km	IIIB-2	23.299	Surplus
6	2 Km	IIIB-1	18.366	VOC
55	22 Km	IIIB-2	11.672	Surplus
61	18 Km	IIIB-2	9.722	Surplus
7	6 Km	IIIB-1	7.273	VOC
59	20 Km	IIIB-2	4.493	Surplus
47	3 Km	IIIB-2	4.182	VOC
21	7 Km	IIIC	0.078	Surplus
22	10 Km	IIIC	0.078	Surplus
23	12 Km	IIIB-2	0.078	VOC
24	2 Km	IIIC	0.078	Surplus
25	17 Km	IIIC	0.078	Surplus
26	12 Km	IIIC	0.078	Surplus
27	18 Km	IIIB-2	0.078	Surplus
4	2 Km	IIIC	0.078	Surplus
30	4 Km	IIIC	0.078	Surplus
5	2 Km	IIIB-1	0.078	VOC
33	9 Km	IIIC	0.078	Surplus
2	3 Km	IIIC	0.078	Surplus
35	3 Km	IIIC	0.078	Surplus
3	12 Km	IIIB-2	0.078	Surplus
8	7 Km	IIIB-2	0.078	Surplus
9	6 Km	IIIC	0.078	Surplus
10	4 Km	IIIC	0.078	Surplus
41	6 Km	IIIC	0.078	Surplus
42	12 Km	IIIC	0.078	Surplus
43	9 Km	IIIC	0.078	Surplus
44	10 Km	IIIC	0.078	Surplus
45	7 Km	IIIB-2	0.078	Surplus
46	3 Km	IIIC	0.078	Surplus
11	7 Km	IIIC	0.078	Surplus
48	3 Km	IIIC	0.078	Surplus
49	7 Km	IIIC	0.078	Surplus
50	19 Km	IIIC	0.078	Surplus
51	15 Km	IIIC	0.078	Surplus
53	7 Km	IIIC	0.078	Surplus
54	6 Km	IIIC	0.078	Surplus
17	5 Km	IIIC	0.078	Surplus
56	8 Km	IIIC	0.078	Surplus
57	16 Km	IIIB-2	0.078	Surplus
58	12 Km	IIIC	0.078	Surplus
18	4 Km	IIIC	0.078	Surplus
60	19 Km	IIIB-2	0.078	Surplus

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

PROVINCE : SULAWESI TENGGARA KABUPATEN : MUNA

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
19	6 Km	IIIC	0.078	Surplus
62	4 Km	IIIC	0.078	Surplus
63	4 Km	IIIC	0.078	Surplus
64	5 Km	IIIC	0.078	Surplus
65	1 Km	IIIC	0.078	Surplus
20	7 Km	IIIC	0.078	Surplus
67	3 Km	IIIC	0.078	Surplus
70	3 Km	IIIC	0.078	Surplus
72	12 Km	IIIC	0.078	Surplus
74	7 Km	IIIC	0.078	Surplus
75	8 Km	IIIB-2	0.078	VOC
76	6 Km	IIIC	0.078	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : SULAWESI TENGGARA KABUPATEN : MUNA

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
61	18 Km	IIIC	12.778	Surplus
59	20 Km	IIIC	8.524	Surplus
47	3 Km	IIIC	5.992	VOC
7	6 Km	IIIB-2	5.111	VOC

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

PROVINCE : SULAWESI TENGGARA KABUPATEN : MUNA

LINK NO	LENGTH	CLASS	NPV (1000Rp)	B/C	IRR (%)	REMARK
34	15 Km	IIIB-1	710218	3.466	67.413	Surplus
32	19 Km	IIIB-1	408200	2.230	40.099	Surplus
36	8 Km	IIIB-1	266807	2.562	48.426	Surplus
37	7 Km	IIIB-1	239824	2.966	57.924	Surplus
39	5 Km	IIIB-2	96121	2.590	54.687	Surplus
38	4 Km	IIIB-2	37779	1.847	32.041	Surplus
61	18 Km	IIIC	35253	1.102	12.778	Surplus
66	7 Km	IIIB-2	29706	1.519	23.605	VOC
55	22 Km	IIIB-2	23781	1.060	11.672	Surplus
28	6 Km	IIIB-2	20904	1.412	23.299	Surplus
6	2 Km	IIIB-1	7503	1.285	18.366	VOC
SUM	113 Km		1876096			

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: Muna

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	578	1,415	1,993
MAINTENANCE	100	335	435
SUPPLEMENTATION	495	-	495
WORKSHOP EQUIPMENT & TOOLS	28	-	28
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	1,218	1,750	2,968

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	215	1,735	1,950
CONSTRUCTION & MAINTENANCE EQUIPMENT	898	-	898
SPARE PARTS	60	15	75
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	1,218	1,750	2,968

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 23 links with the total length of 225 km which is 44% of the 514 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 : MUNA

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary	6,28,32,34,36,37,38,39,66
- Secondary	61
Engineering Point of View	17,18,19,21,22,25,49,50,51,59,60, 62,65
Basic Human Needs	-

As the table shows all feasible road links execpt Road link No 55 are proposed to be improved.

The road links connect to road link 55 are not feasible and nat recommended to be improved. With out improvement of these road links improvement of No 55 is impossible, therefore No 55 is not proposed to be improved.

The trunk roads which connect the Kabupaten capital with Kecamtan capital or Kecamatan capital with other capital and key road links which are the strategic point to complete the local road work consisting at feasible road links, are selected form the engineering points of view.

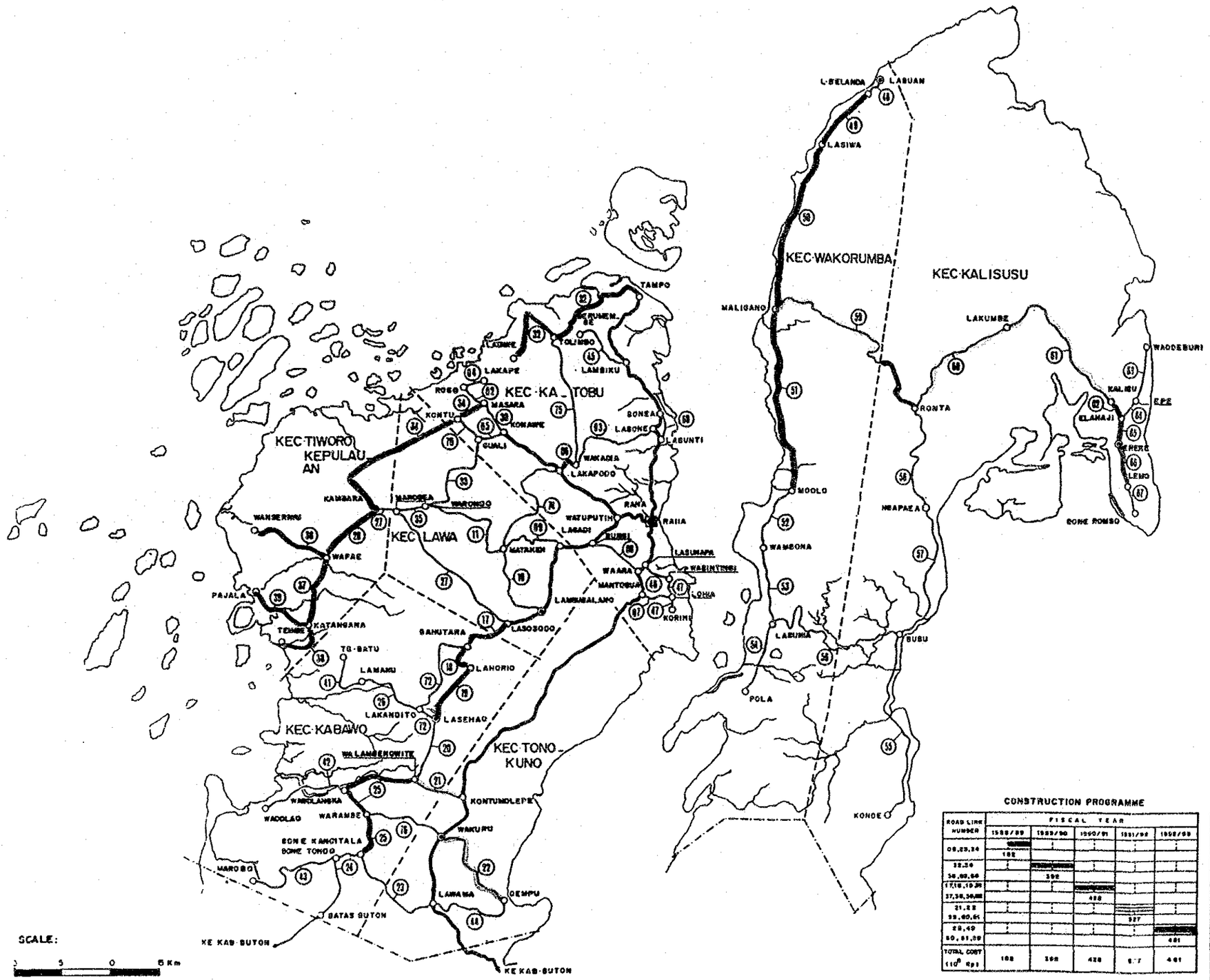
The order of proceeding with the improvement of the proposed road links are decided as shown in Table 6-1-4.

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

PROV : SULAWESI TENGGARA KAB : MUNA

YEAR	LINK NO ( ) : rate
1988 :	6, 28, 34 (60%)
1989 :	32 (50%), 34 (40%), 36, 65, 66
1990 :	17, 18, 19, 32 (50%), 37, 38, 39, 62
1991 :	21, 22, 59 (70%), 60, 61
1992 :	25, 49, 50, 51, 59 (30%)

KABUPATEN MUNA



SCALE:

0 5 0 5 Km

LOCATION MAP

LEGEND :

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

CONSTRUCTION PROGRAMME

ROAD LINK NUMBER	FISCAL YEAR				
	1989/90	1990/91	1991/92	1992/93
8,29,34	108			
32,36				
30,40,60		398		
1(10,19,35				
37,38,39,44			428	
21,22				
33,40,61				327
28,49				
50,51,59				481
TOTAL COST (10^9 Rp)	108	398	428	327	481

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

TITLE : CONSTRUCTION PROGRAMME

SOURCE:	SCALE:	PROVINCE : SULAWESI TENGGARA
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPATEN: MUNA

(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 : SULAWESI TENGGARA KAB : MUNA

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SB (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TR NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
6	2	10.0	17.5	72.5	0.0	2	0	0	1	24.00	0	0.00	243	1,166	350	1,516
20	7	60.0	32.9	7.1	0.0	3	4	0	0	0.00	1	30.00	190	2,859	891	3,750
21	7	82.9	13.6	23.6	0.0	0	7	0	1	24.00	0	0.00	243	2,402	729	3,131
23	12	62.5	9.6	27.9	0.0	0	12	0	1	16.00	0	0.00	162	3,925	1,187	5,112
24	2	10.0	25.0	15.0	50.0	0	0	2	0	0.00	0	0.00	0	446	91	537
27	18	90.3	9.7	0.0	0.0	0	18	0	8	480.00	0	0.00	4,853	9,375	2,903	12,278
28	6	48.3	25.0	20.0	6.7	0	5	1	3	56.00	0	0.00	566	2,236	661	2,897
30	4	47.5	45.0	7.5	0.0	0	4	0	0	0.00	1	72.00	455	1,550	556	2,106
33	9	67.8	20.0	12.2	0.0	0	9	0	3	225.00	0	0.00	2,275	4,573	1,415	5,988
35	3	50.0	30.0	20.0	0.0	0	3	0	0	0.00	1	54.00	341	1,162	417	1,579
36	8	0.0	40.0	37.5	22.5	0	1	7	2	256.00	0	0.00	2,588	3,837	1,043	4,880
37	7	0.0	11.4	88.6	0.0	0	0	7	2	68.00	0	0.00	687	2,082	484	2,566
38	4	22.5	52.5	17.5	7.5	0	0	4	1	20.00	0	0.00	202	1,046	230	1,276
43	9	15.6	40.6	30.0	13.9	0	2	7	0	0.00	0	0.00	0	2,196	508	2,704
45	7	92.0	0.9	7.1	0.0	0	7	0	1	36.00	0	0.00	364	2,493	758	3,251
48	3	75.7	15.7	8.7	0.0	0	3	0	0	0.00	0	0.00	0	951	287	1,238
70	3	38.3	30.0	25.0	6.7	0	3	0	0	0.00	0	0.00	0	951	287	1,238
72	12	73.3	18.8	7.9	0.0	0	12	0	0	0.00	1	0.08	1	3,803	1,148	4,951
74	7	28.6	44.3	15.7	11.4	0	7	0	2	80.00	0	0.00	809	2,830	866	3,696
75	8	52.5	25.6	21.9	0.0	0	8	0	5	164.00	0	0.00	1,658	3,789	1,169	4,958
SUM	138					5	105	28	30	1449.00	4	156.08	15,636	53,672	15,980	69,652

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 Muna 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 1,993 x 10^6 and maintenance cost is Rp 435 x 10^6 which is approximately 18% of the total expenditure.

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

PROV : SULAWESI TENGGARA KAB : MUNA

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	116,404	255,191	285,752	394,880	342,034	1,394,261	(70.0%)
Ownership Cost	2,618	5,556	6,780	8,690	8,501	32,145	(2.3%)
Operation Cost	51,440	108,613	131,946	166,770	161,078	619,847	(44.5%)
Material Cost	27,741	59,448	56,850	61,012	40,485	245,536	(17.6%)
Labour Cost	19,422	40,288	52,904	106,902	87,357	314,873	(22.6%)
Contingency	15,183	33,286	37,272	51,506	44,613	181,860	(13.0%)
FOREIGN CURRENCY :	65,288	137,225	143,166	132,987	120,252	598,918	(30.0%)
Ownership Cost	28,800	60,182	74,205	92,135	86,827	342,149	(57.1%)
Operation Cost	4,133	8,625	10,623	13,714	13,083	50,378	(8.4%)
Material Cost	23,839	50,519	39,464	9,792	4,657	128,271	(21.4%)
Labour Cost	.0	0	0	0	0	0	(0.0%)
Contingency	8,516	17,899	18,674	17,346	15,685	78,120	(13.0%)
TOTAL COST :	181,692	392,416	428,918	527,867	462,286	1,993,179	
Ownership Cost	31,418	65,738	80,985	100,825	95,328	374,294	(18.8%)
Operation Cost	55,573	117,238	142,769	180,484	174,161	670,225	(33.6%)
Material Cost	51,580	109,967	96,314	70,804	45,142	373,807	(18.8%)
Labour Cost	19,422	40,288	52,904	106,902	87,357	314,873	(15.8%)
Contingency	23,699	51,185	55,946	68,852	60,298	259,980	(13.0%)

(Contingency : 15%)

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

(MAINTENANCE)

PROV : SULAWESI TENGGARA KAB : MUNA

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	25,963	51,813	63,632	86,546	106,682	334,636	(76.9%)
Ownership Cost	446	904	1,196	1,659	2,016	6,221	(1.9%)
Operation Cost	13,453	26,917	31,873	41,528	52,081	165,852	(49.6%)
Material Cost	1,717	3,304	3,996	6,251	7,678	22,946	(6.9%)
Labour Cost	10,347	20,688	26,567	37,108	44,887	139,597	(41.7%)
FOREIGN CURRENCY :	7,730	15,503	19,214	25,860	31,939	100,246	(23.1%)
Ownership Cost	6,620	13,259	15,722	20,492	25,753	81,846	(81.6%)
Operation Cost	758	1,528	1,838	2,416	3,035	9,575	(9.6%)
Material Cost	352	716	1,654	2,952	3,151	8,825	(8.8%)
Labour Cost	0	0	0	0	0	0	(0.0%)
TOTAL COST :	33,693	67,316	82,846	112,406	138,621	434,882	
Ownership Cost	7,066	14,163	16,918	22,151	27,769	88,067	(20.3%)
Operation Cost	14,211	28,445	33,711	43,944	55,116	175,427	(40.3%)
Material Cost	2,069	4,020	5,650	9,203	10,849	31,791	(7.3%)
Labour Cost	10,347	20,688	26,567	37,108	44,887	139,597	(32.1%)

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

(TOTAL)

PROV : SULAWESI TENGGARA KAB : MUNA

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	142,367	307,004	349,384	481,426	448,716	1,728,897	(71.2%)
Ownership Cost	3,064	6,460	7,976	10,349	10,517	38,366	(2.2%)
Operation Cost	64,893	135,530	163,819	208,298	213,159	785,699	(45.4%)
Material Cost	29,458	62,752	60,046	67,263	48,183	268,502	(15.5%)
Labour Cost	29,769	68,976	79,471	144,010	132,244	454,470	(26.3%)
Contingency	15,183	33,286	37,272	51,506	44,613	181,860	(10.5%)
FOREIGN CURRENCY :	73,018	152,728	162,380	158,847	152,191	699,164	(28.8%)
Ownership Cost	35,420	73,441	89,927	112,627	112,580	423,995	(60.6%)
Operation Cost	4,891	10,153	12,661	16,130	16,118	59,953	(8.6%)
Material Cost	24,191	51,235	41,118	12,744	7,808	137,096	(19.6%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	8,516	17,899	18,674	17,346	15,685	78,120	(11.2%)
TOTAL COST :	215,385	459,732	511,764	640,273	600,907	2,428,061	
Ownership Cost	38,484	79,901	97,903	122,976	123,097	462,361	(19.0%)
Operation Cost	69,784	145,683	176,480	224,428	229,277	845,652	(34.8%)
Material Cost	53,649	113,987	101,964	80,007	55,991	405,598	(16.7%)
Labour Cost	29,769	68,976	79,471	144,010	132,244	454,470	(18.7%)
Contingency	23,699	51,185	55,946	68,852	60,298	259,980	(10.7%)

(Contingency : 15%)

6.1.4 Construction and Maintenance Equipment Cost

(1) Required Number of Equipment

The required numbers of construction equipment for Kabupaten Muna 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.

- 1-Steel Roller

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 : SULAWESI TENGGARA KAB : MUNA

EQUIPMENT NAME	WORKABLE	EXISTING	(1988)	(1989)	(1990)	(1991)	(1992)
Bulldozer/Ripper	250	0	0.19	0.34	0.52	0.94	0.69
Swamp Bulldozer	250	0	0.01	0.01	0.01	0.05	0.11
Motor Grader	250	0	0.51	1.03	1.38	1.53	1.68
Hand-guide Vib. Roller	250	0	0.15	0.17	0.35	0.62	0.26
Tire Roller	250	0	0.25	0.53	0.37	0.00	0.00
Vibratory Roller (D&T)	250	0	0.39	0.80	1.05	1.21	1.50
Hydraulic Excavator; Wheel	250	0	0.01	0.01	0.03	0.29	0.16
Wheel Loader	250	0	0.59	1.21	1.55	2.01	1.83
Water Tank Truck	250	0	0.23	0.50	0.62	0.68	0.89
Dump Truck	250	0	4.53	9.93	11.97	16.42	17.01
Flat Bed Truck with Crane	250	0	0.08	0.17	0.29	0.65	0.36
Flat Bed Truck	250	0	0.34	0.68	0.56	0.21	0.09
Portable Crusher/Screening	250	0	0.13	0.26	0.29	0.21	0.08
Concrete Mixer	250	0	0.01	0.01	0.01	0.01	0.01
Water Pump	250	0	0.01	0.01	0.01	0.01	0.01
Concrete Vibrator	250	0	0.01	0.01	0.01	0.01	0.01
Asphalt Sprayer	250	0	0.25	0.53	0.37	0.00	0.00

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

Table 6-1-8 EQUIPMENT PURCHASE COST

PROV : SULAWESI TENGGARA KAB : MUNA

(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	2	62,140
Vibratory Roller (D&T)	4 ton	29,000	-	-
Vibratory Roller	4 ton	29,000	-	-
Rough Terrain Crane	10 ton	100,400	-	-
Hydraulic Excavator; Wheel	0.3 m3	41,100	1	41,100
Wheel Loader	1.2 m3	70,200	2	140,400
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	14	205,800
Dump Loader Truck	12 ton	56,300	-	-
Flat Bed Truck with Crane	3.0 ton	25,190	1	25,190
Flat Bed Truck	3.0 ton	11,275	2	22,550
Portable Crusher/Screening	30-40 t/h	188,000	1	188,000
Concrete Mixer	0.5 m3	18,000	-	-
Water Pump	200 l/min	630	-	-
Concrete Vibrator	3.3 HP	740	-	-
Asphalt Sprayer	850 ltr.	10,200	1	10,200
Service Car	3 ton	11,600	1	11,600
4 Wheel Drive Vehicle	70 HP	17,500	1	17,500
Motorcycle	100 cc	1,100	3	3,300

PURCHASE COST TOTAL	897,630
OWNERSHIP COST (FOREIGN)	402,600
EQUIPMENT COST SUPPLEMENTED	495,030

NOTE : OWNERSHIP COST (FOREIGN) for Existing Equipment

Vibratory Roller (D&T)	21,395

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 : SULAWESI TENGGARA KAB : MUNA

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
Site Clearance in Light Bush	m2	0.00	3000.00	3000.00	112400.00	51600.00	170000.00
Subgrade Preparation	m2	71000.00	166750.00	217750.00	198318.00	323000.00	976818.00
Normal Fill	m3	0.00	0.00	0.00	0.00	0.00	0.00
Fill in Swamp	m3	43.20	28.80	388.10	1807.05	4808.25	7075.40
Normal Excavation to Spoil	m3	1174.40	2869.60	3499.00	1578.50	2712.50	11834.00
Sub Base Course	m3	6320.00	14220.00	17033.50	21032.40	31113.40	89719.30
Base Course	m3	3960.00	8260.00	10350.00	8640.00	3150.00	34360.00
Shoulder	m2	59000.00	101250.00	159750.00	192500.00	168500.00	681000.00
Asphalt Patching	m2	309.00	110.00	0.00	0.00	0.00	419.00
Surface Dressing (Single)	m2	44000.00	94000.00	66000.00	0.00	0.00	204000.00
Surface Dressing (Double)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Earth Drain	m	3800.00	23820.00	12440.00	58880.00	60860.00	159800.00
Earth Drain in Swamp (by machine)	m3	108.00	72.00	600.00	5610.00	3090.00	9480.00
Pipe Culvert D80cm	m	1.00	2.00	58.00	39.60	5.40	106.00
Masonry Culvert (80x80cm)	m	0.00	0.00	0.00	2.00	0.00	2.00
Retaining Wall and Wing Wall (Timber)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Retaining Wall and Wing Wall (Masonry)	m3	0.00	0.00	6.40	0.00	0.00	6.40
Gabion Protection	m3	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;10T)	m2	14.40	9.60	0.00	0.00	0.00	24.00
Superstructure (Timber;Span 5m;10T)	m2	9.60	188.40	126.00	36.00	0.00	360.00
Superstructure (Timber;Span 8m;10T)	m2	57.60	38.40	176.00	820.00	524.00	1616.00
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	0.60	8.40	3.00	10.00	10.00	32.00
Substructure (Abut;for Timber;10T)	NO	7.20	8.80	20.00	38.00	16.00	90.00
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	144.00	32.00	0.00	0.00	176.00
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	67.00	134.00	155.50	200.50	251.00	808.00
Routine maintenance of earth road	Km	13.75	23.50	14.50	9.00	9.00	69.75
Routine maintenance of gravel road	Km	51.25	105.50	113.00	137.50	188.00	595.25
Routine maintenance of asphalt road	Km	2.00	5.00	28.00	54.00	54.00	143.00
Maintenance of Timber Bridge (New)	m2	0.00	0.00	0.00	280.00	340.00	620.00
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	704.50	1321.00	1341.00	1513.00	1989.00	6868.50
Maintenance of Concrete Bridge (Exist)	m2	78.04	156.08	156.08	156.08	156.08	702.36

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.

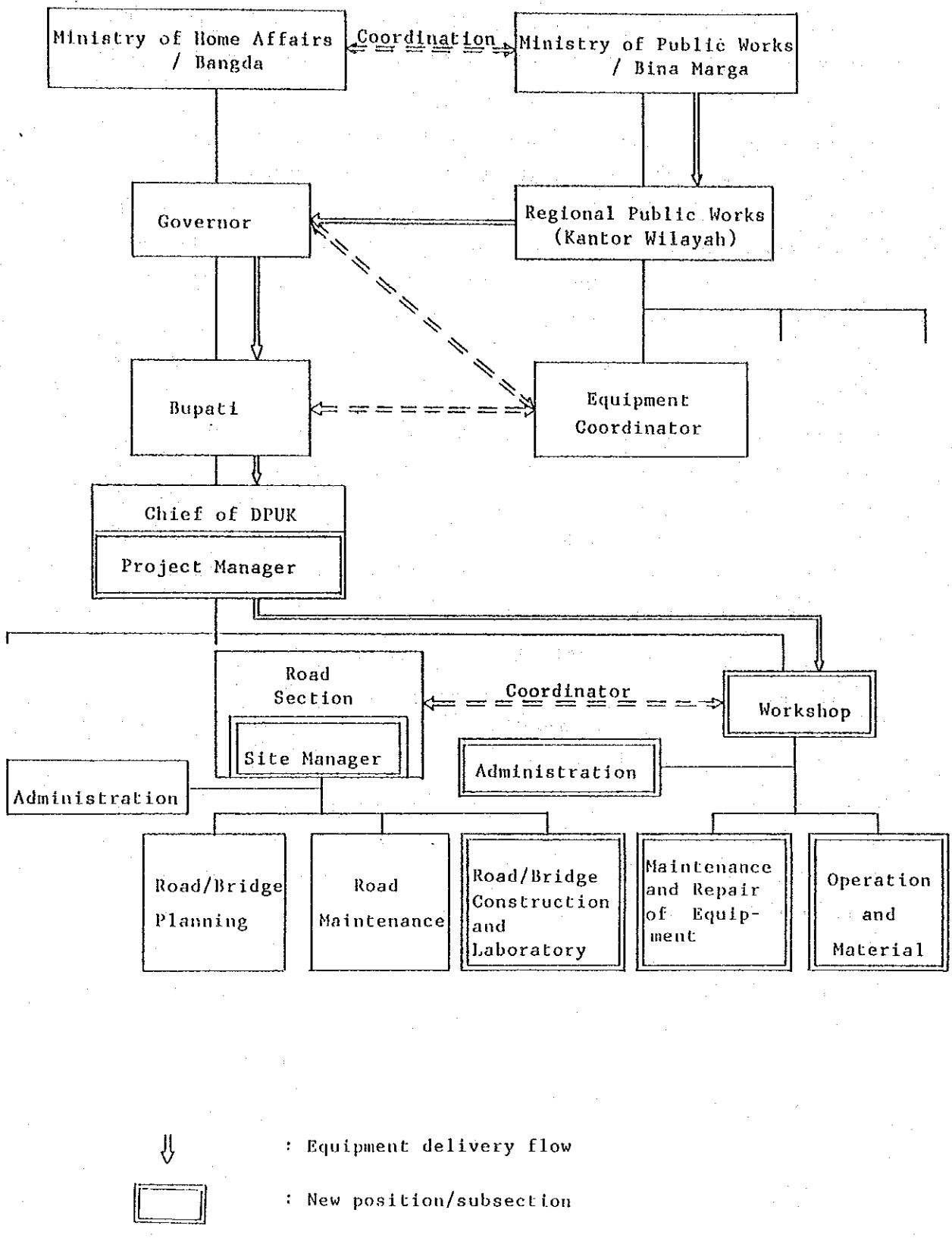
It is recommended that the workshop is newly organized to consist of three sub-sections, i.e. maintenance and repair of equipment, operation and materials, and administration to execute the main tasks described in Clause 3.5.

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. : SULAWESI TENGGARA KAB. : MUNA SURVEY YEAR : 1984

Code No.	KECAMATAN NAME	CULTIVATED AREA : (PA)	YIELD RATE : (Y)	FARMER'S POPULATION : (AP)	CIRCULATED COMMODITY : (PG)
01	TIWORO KEPULAUAN	499	1.53	3,180	58,000
02	KABAWO	108	1.37	7,951	7,080
03	LAWA	216	1.07	6,116	8,330
04	TONDKUNO	339	1.37	4,465	1,960
05	KATOBU	208	0.93	28,563	46,510
06	WAKORUMBA	725	1.33	3,486	6,820
07	KALISUSU	1,334	0.92	7,278	19,500

	r_1	r_2	r_3	r_4
ANNUAL AVERAGE GROWTH RATE %	1.1	3.0	0.7	5.1

FARMER'S CONSUMPTION : (Cp)	NON-AGRO REQUIRMENT : (NG)
0.025 Ton/head/year	0.155 Ton/ton

	SEDAN	BUS	TRUCK	MOTOR CYCLE
RATE OF EACH VEHICLE TYPE %	26.52	10.64	16.48	46.35

AVERAGE FREIGHT TONAGE	0.6 Ton/Truck

Appendix A-2 Engineering Data

ROAD LINK DATA

PROVINCE : Sulawesi Tenggara

KABUPATEN: Muna

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
01						
02	Masara	Rogo	3	Katobu	3	
03	Wakadia	Labone	12	Katobu	12	
04	Rogo	Lakape	2	Katobu	2	
05	Konawe	Guali	2	Katobu	2	
06	Lakapodo	Wakadia	2	Katobu	2	
07	Mantobua	Lohia	6	Katobu	6	16
08	Bungi	Waara	7	Katobu	7	
09	Lagadi	Matakidi	6	Lawa	6	
10	Matakidi	L.Balano	4	Lawa	4	
11	Matakidi	Warondo	7	Lawa	7	
17	Lasosodo	Bahutara	5	Kabawo Lawa	4 1	
18	Bahutara	Lahorio	4	Kabawo	4	
19	Lahorio	Lasehao	6	Kabawo	6	
20	Lasehao	W. Wite	7	Kabawo	7	
21	K. Molepe	W. Wite	7	Kabawo Tonokuno	4 3	
22	Wakuru	Oempu	10	Tongkuno	10	7
23	La Wama	B. Kancitala	12	Kabawo Tonokuno	5 7	
24	B. Kancitala	Batas Buton	2	Kabawo	2	18
25	B. Kancitala	W. Wite	17	Kabawo	17	
26	Lakandito	La Manu	12	Kabawo	12	13
27	Lasosodo	Kambara	18	Tiworo Kep Lawa	2 16	
28	Kambara	Wapae	6	Tiworo Kepu-lauan	6	
30	Konawe	Masara	4	Katobu	4	

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

ROAD LINK DATA

PROVINCE : Sulawesi Tenggara

KABUPATEN: Muna

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
32	Tampo	Latawe	19	Katobu	19	14
33	Warondo	Guali	9	Lawa Katobu	7 2	
34	Masara	Kambara	15	Tiworo Kep. Lawa Katobu	7.5 4.8 2.7	
35	Warondo	Marobea	3	Lawa	3	19
36	Wapae	Wanseriwu	8	Tiworo Kep.	8	
37	Wapae	Katangana	7	Tiworo Kep.	7	
38	Katangana	Tembe	4	Tiworo Kep.	4	
39	Katangana	Pajala	5	Tiworo Kep.	5	5
41	Tg. Batu	Lamanu	6	Kabawo	6	12
42	Wasolangka	Wadolao	12	Kabawo	12	6
43	B. Tondo	Marobo	9	Kabawo	9	
44	La Wama	Oempu	10	Tonokuno	10	
45	Lambiku	Berumembe	7	Katobu	7	
46	Lasunapa	Wabintingi	3	Katobu	3	20
47	Wabintingi	Korihi	3	Katobu	3	
48	Labuan	L. Belanda	3	Wakorumba	3	
49	L. Belanda	Lasiwa	7	Wakorumba	7	9
50	Lasiwa	Maligano	19	Wakorumba	19	8
51	Maligano	Moolo	15	Wakorumba	15	1
52	Moolo	Wambona	8	Wakorumba	8	2
53	Wambona	Labunia	7	Wakorumba	7	10
54	Labunia	Pola	6	Wakorumba	6	
55	Konde	Bubu	22	Kalisusu	22	11
56	Labunia	Bubu	8	Wakorumba Kalisusu	5 3	21

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

ROAD LINK DATA

PROVINCE : Sulawesi Tenggara

KABUPATEN: Muna

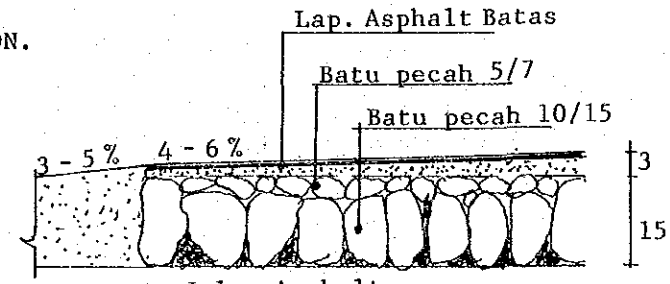
LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
57	Bubu	Ngapaea	16	Kalisusu	16	
58	Ngapaea	Ronta	12	Kalisusu	12	
59	Maligano	Ronta	20	Wakorumba	14.5	
				Kalisusu	5.5	
60	Ronta	Lakumbe	19	Kalisusu	19	
61	Lakumbe	Kalibu	18	Kalisusu	18	
62	Kalibu	Elahaji	4	Kalisusu	4	
63	Wd.Buri	Epe	4	Kalisusu	4	
64	Epe	Elahaji	5	Kalisusu	5	
65	Elahaji	Ereke	1	Kalisusu	1	
66	Ereke	Lemo	7	Kalisusu	7	
67	Lemo	B. Rombo	3	Kalisusu	3	
69	Labunti	Bonea	1	Katobu	1	
70	Guali	Kontu	3	Katobu	3	
72	Bahutara	Lasehao	12	Kabawo	12	
74	Matakidi	Lakapodo	7	Lawa	4	
				Katobu	3	
75	Wakadia	Tolimbo	8	Katobu	8	
76	Wakuru	Warambe	6	Tonokuno	1.5	
				Kabawo	4.5	

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

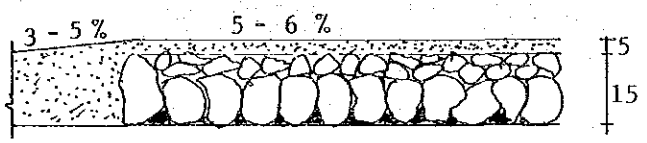
What Kind of Design Criteria has being applied for the new road construction and the improvement for the Kabupaten Road ?
Kriteria Perencanaan yang dipakai pada program penanganan jalan Kabupaten, baik untuk jalan lama maupun pembangunan baru.

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

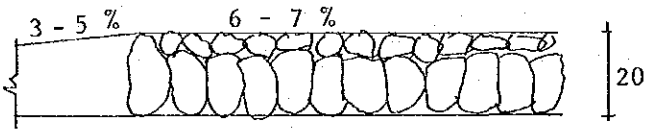
TYPICAL CROSS SECTION.



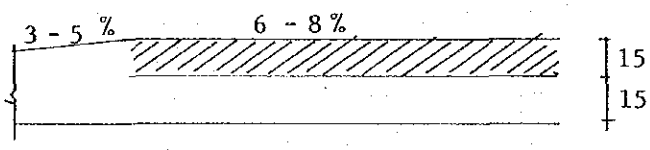
Jalan Asphalt



Jalan Kerikil/Awcas



Jalan Macadam/Batu belah



Jalan Tanah

PROPINSI: Sulawesi Tenggara E-03-(1)

KABUPATEN: Muna

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

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

LINK NO. : Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	Inpres Dati II					
	Bolo - Mabodo	4	Gravel	2	11,600	
		-	-	-		
9	Lagadi - Matakidi	4	Gravel	6	34,800	
		-	-	-		
68	Dalam Kota Raha	4	Asphalt/Gravel	4/2	35,900	
		-	-	-		
-	Raha - Loyasa	4	Gravel	1.5	8,700	
		-	-	-		
-	Pacuan - Saunghaghito	4	Gravel	1.5	8,700	
		-	-	-		
	Inpres Jalan					
27	Lasosodo - Kambara	4	Gravel/Awcas	28	149,245	
		6	Timber	25 m	4,750	

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

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

PROPINSI: Sulawesi Tenggara

KABUPATEN: Muna

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

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

LINK NO. : Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	Inpres Dati II					
66	Ereke - Lemo	4	Gravel	6	37,320	
		-	-	-		
68	Jalan Dalam Kota Raha	4	Gravel	2.35	15,731	
		-	-	-		
68	Jalan Dalam Kota Raha	4	Asphalt	1.5	18,025	
		-	-	-		
14	Mabodo - Bungi	4	Gravel/Awcas	2	22,544	
		-	-	-		
03	Labunti - Bangunsari	4	Gravel	4	29,516	
		-	-	-		
42	Jalan Pelabuhan Wasolangka	4	Gravel	2	14,822	
		-	-	-		
48	Jalan Pelabuhan Labuan	4	Gravel	3	22,500	
		-	-	-		
	Inpres Jalan					
59	Kaboibula - Lambale	4	Gravel/Awcas	30.16	291,094	
		6	Timber	200 m	38,780	
33	Waoondo - Masora	4	Gravel/Awcas	24	139,610	
		6	Timber	40 m	7,756	

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

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

PROPINSI: Sulawesi Tenggara

E-03-(3)

KABUPATEN: Muna

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

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

LINK NO. : Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	Inpres Dati II					
4	Korihi - Napabale	4	Gravel	3	31,600	
		-	-	-		
-	Lasehao - Lamaeo	4	Gravel	2	21,700	
		-	-	-		
65	Jalan Dalam Kota Kec. Kalisusu	4	Gravel	2	21,343	
		-	-	-		
47	Pelabuhan - Labuan	4	Gravel	1.5	15,950	
		-	-	-		
03	Labunti - Bangunsari	4	Gravel	1.5	16,275	
		-	-	-		
68	Jalan Dalam Kota Raha	4	Gravel/Asphalt	3.5/2	35,450	
		-			29,008	
	Inpres Jalan					
23	Walambenawite-Wale Ale-Lawana	4	Gravel/Awcas	25	181,900	
		-	-	-		
-	Konawe - Latawe	4	Gravel/Awcas	16	105,050	
		-	-	-		
3	Wakadia - Bangunsari	4	Gravel/Awcas	9	60,720	
		-	-	-		
74	Watakidi - Wakadia	4	Gravel/Awcas	8	53,680	
		-	-	-		

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

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

PROPINSI: Sulawesi Tenggara E-03-(4)

KABUPATEN: Muna

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

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

LINK NO Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga ($Rp\ 10^6$)	REMARKS Keterangan
	Inpres Dati II					
-	Wawesa - Station TVRI	4	Gravel	2	21,990	
		-	-	-		
28	Jalan Dalam Kota Kec. Tikep (Kambara)	4	Gravel	2	22,050	
		-	-	-		
48	Jalan Dalam Kota Kec. Wakorumba (Labuan)	4	Gravel	1	11,050	
		-	-	-		
22	Jalan Dalam Kota Kec. Tongkuno (Wakuru)	4	Gravel	1	11,000	
		-	-	-		
68	Jalan Dalam Kota Raha	4	Asphalt/Grave	1.5/1.5	27,650	
		-	-	-	16,650	
-	Watanea I dan Watanea II	-	-	-	39,060	
		6	Beton	14 m		
	Inpres Jalan					
63	Lambale - Eelakaji	4	Gravel/Awcas	33	239,200	
		6	Timber	240 m	114,000	
43	Bonetondo - Marobo	4	Gravel/Awcas	12	87,000	
		-	-	-		

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

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

PROPINSI: Sulawesi Tenggara

E-03-(5)

KABUPATEN: Muna

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

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

LINK NO Nomor Ruas	LOCATION From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
	Inpres Dati II					
33	Lohodu - Nihi	4	Asphalt	2.7	44,640	
		-	-	-		
07	Mantobua - Kopihi	4	Gravel	2.5	25,644	
		-	-	-		
65	Jalan Dalam Kota Kec. Kalisusu (Ereke)	4	Gravel	2.9	28,750	
		-	-	-		
-	Lanud - Guali	4	Asphalt	2	32,550	
		-	-	-		
68	Dalam Kota Raha	4	Asphalt	2	27,900	
	Inpres Jalan					
45	Lambiku - Berumembe	4	Gravel/Awcas	6.89	73,324	
		-	-	-		
18,19	Bahutara -Lupia-Lakandito	4	Gravel/Awcas	9.8	95,418	
36	Wanseriwu-Bonesantiri	4	Gravel/Awcas	8	84,816	
		6	Timber	18	9,360	
26	Bente - Lamanu	-	-	-	10,140	
		6	Timber	19.5		

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

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

PROPINSI : Sulawesi Tenggara E-04

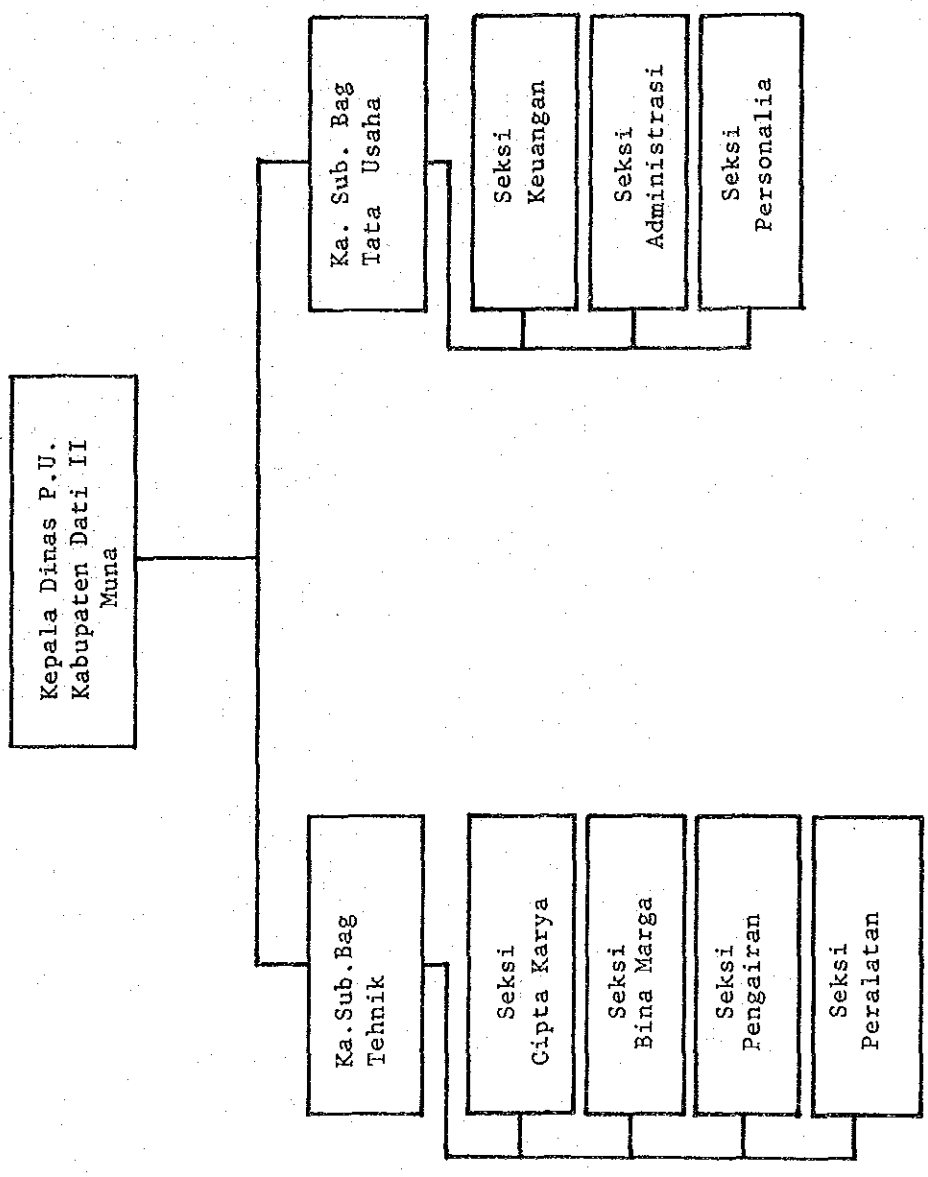
KABUPATEN: Muna

EXISTING ORGANIZATION IN KABUPATEN

Structur Organisasi yang ada dari P.U Kabupaten

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

Harap digambar bagan organisasi dari DPUK.



EXISTING STAFF RESOURCES OF BINA MARGA OF PU KABUPATEN

Tenaga Dinas PUK yang ada

PROPINSI: Sulawesi Tenggara

KABUPATEN: Muna

DESCRIPTION /Uraian	NUMBER / Jumlah	REMARKS Keterangan
CONTROLING STAFF Staff teknis PUK	(18)	
DPUK ENGINEED Sarjana Teknik	-	
ASSISTANT ENGINEER Sarjana Muda Teknik	-	
TECHNICIAN STAFF Staff Teknik (STM)	18	
ADMINISTRATION Tenaga Administrasi	15	
SUPERVISOR Tenaga Pengawas	17	
WORKING FORCE Tenaga Pelaksana Lapangan	(71)	
OPERATORS Operators	2	
DRIVERS Supir	1	
MECHANICS Mechanic	-	
TRADESMAN Tukang	16	
L A B O U R Buruh / Pekerja	19	
OTHERS Lain-lain	33	
TOTAL / JUMLAH	121	

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

E-06

LOCATION AND AREA OF DPUK WORKSHOP

Lokasi Workshop DPUK

PROPINSI :Sulawesi Tenggara

KABUPATEN:Muna

LOCATION Lokasi	AREA (m2) Luas	NUMBER Jumlah	REMARKS Keterangan
Laino	2.000		

PROPINSI: Sulawesi Tenggara

E-07

KABUPATEN: Muna

LAND ACQUISITION COST

Daftar harga pembebasan tanah

DESCRIPTION Uraian	UNIT Satuan	RATE (RP) Harga	REMARKS Keterangan
CITY/kota	M2	15,000	
VILLAGE / desa	M2	-	
RICE FIELD/sawah	M2	-	
DRY FIELD/ladang	M2	-	
MIX CROPS/panen	M2	-	
FOREST/hutan	M2	-	
SWAMP / rawa	M2	-	
OTHERS / lain-lain	M2	-	

PROPINSI: Sulawesi Tenggara

KABUPATEN: Muna

Classification of local contractors at Kabupaten level.

Klasifikasi kontraktor di Kabupaten

COMPANY NAME Nama Kontraktor	CLASS Kelas	CAPITAL Modal (Rp)	NUMBER OF EMPLOYEE Jumlah pegawai	REMARKS Keterangan
8	B2	210,339,000	9	
9	C1	80,062,000	5	
34	C2	53,235,400	7	
50	C3	52,892,000	6	

NOTE: DATI II

PROPINSI: Sulawesi Tenggara

E-09

KABUPATEN: Muna

LIST OF EXISTING EQUIPMENT OF LOCAL CONTRACTOR

Name of contractor

NAME OF EQUIPMENT Jenis peralatan	EXISTING CONDITION/ Kondisi Peralatan						REQUIRE - MENT / Kebutuhan peralatan baru
	TYPE/ Tipe	P.Y	NUMBER / Jumlah			REASON OF BAD CONDITION/Sebab Kerusakan	
			GOOD Baik	BAD Rusak	TOTAL Jumlah		
Bulldozer							
Motor Grader							
Tyre Roller							
Steel Whell Roller							
Vibration Roller							
Wheel Loader							
Front End Loader and Backhoe							
Mobile Crane							
Concrete Mixer	Kobuta	1984	5	-	5		
Stone Crusher							
Portable Compressor							
Hydraulic Excavator							
Asphalt Paving Machine							
Asphalt Sprayer							
Asphalt Mixing Machine							
Mobile Workshop							
Mechanic Rammer							
Plate Tamper							
Pile Driver							
Leg Drill							
Hand Hammer							
Farm Tractor							
Dump Truck	Toyota	1981	5	-	5		
Water Tank Truck							
Fuel Tank Truck							
Pick Up	Toyota	1981	25	-	25		
Jeep	Toyota	1982	5	-	5		
Motorcycle	Yamaha	1982	130	-	130		
Generator	Honda	1982	5	-	5		
Water Pump	Mitsubi-shi	1980	22	-	22		
Others							

PROPINSI: Sulawesi Tenggara

KABUPATEN: Muna

LIST OF EXISTING EQUIPMENT OF P.U KABUPATEN

NAME OF EQUIPMENT Jenis peralatan	EXISTING CONDITION/ Kondisi Peralatan						REQUIRE - MENT / Kebutuhan peralatan baru
	TYPE/ Tipe	P.Y	NUMBER / Jumlah			REASON OF BAD CONDITION/Sebab Kerusakan	
			GOOD Baik	BAD Rusak	TOTAL Jumlah		
Bulldozer							
Motor Grader							
Tyre Roller							
Steel Whell Roller			3	-	3		
Vibration Roller							
Wheel Loader							
Front End Loader and Backhoe							
Mobile Crane							
Concrete Mixer							
Stone Crusher							
Portable Compressor							
Hydraulic Excavator							
Asphalt Paving Machine							
Asphalt Sprayer							
Asphalt Mixing Machine							
Mobile Workshop							
Mechanic Rammer							
Plate Tamper							
Pile Driver							
Leg Drill							
Hand Hammer							
Farm Tractor							
Dump Truck							
Water Tank Truck							
Fuel Tank Truck							
Pick Up							
Jeep							
Motorcycle			5	-	5		5
Generator							
Water Pump							
Others							