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 27

KABUPATEN ENDE

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 Ende in Nusa Tenggara Timur Province. The report has been prepared by the Study Team of the Japan International Cooperation Agency (hereinafter called JICA).

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

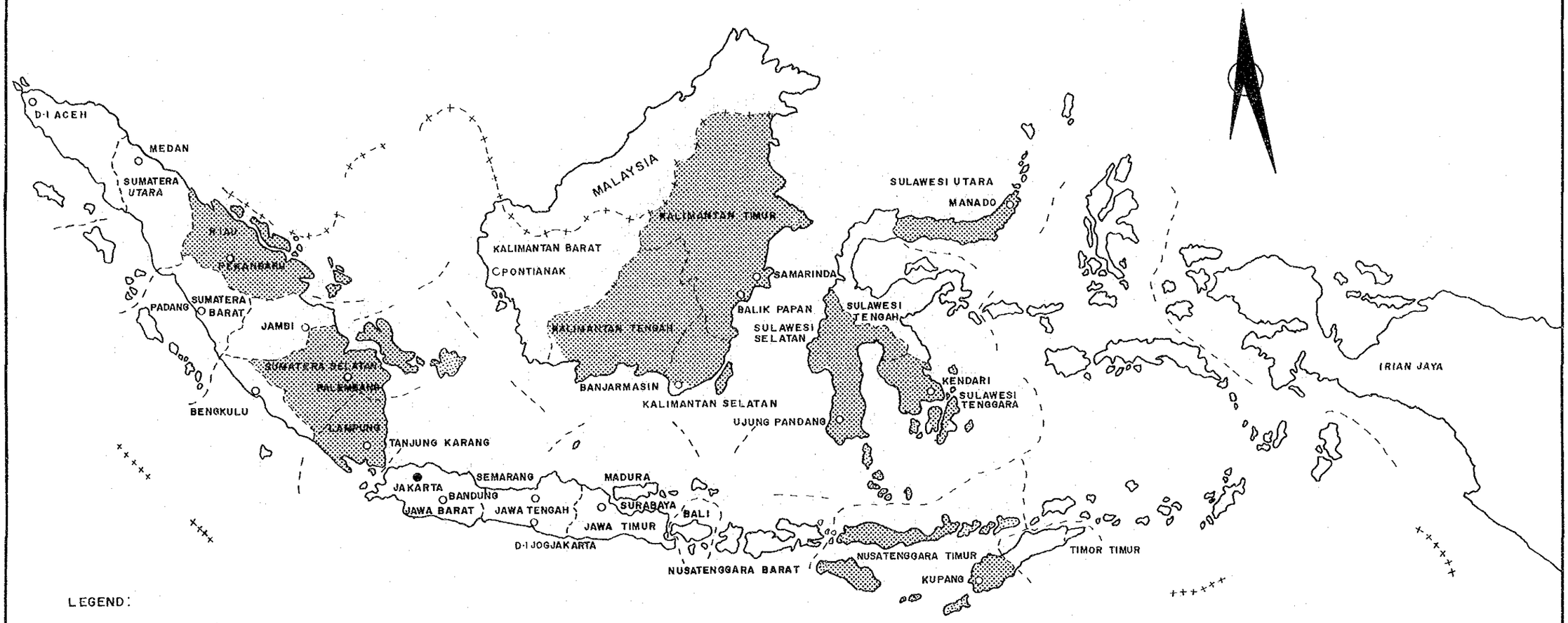
Since the study period was limited, without cooperation of Bina Marga, Bangda and local governments of both province and Kabupaten in collecting the data, the study would not have been completed within the period.

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

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

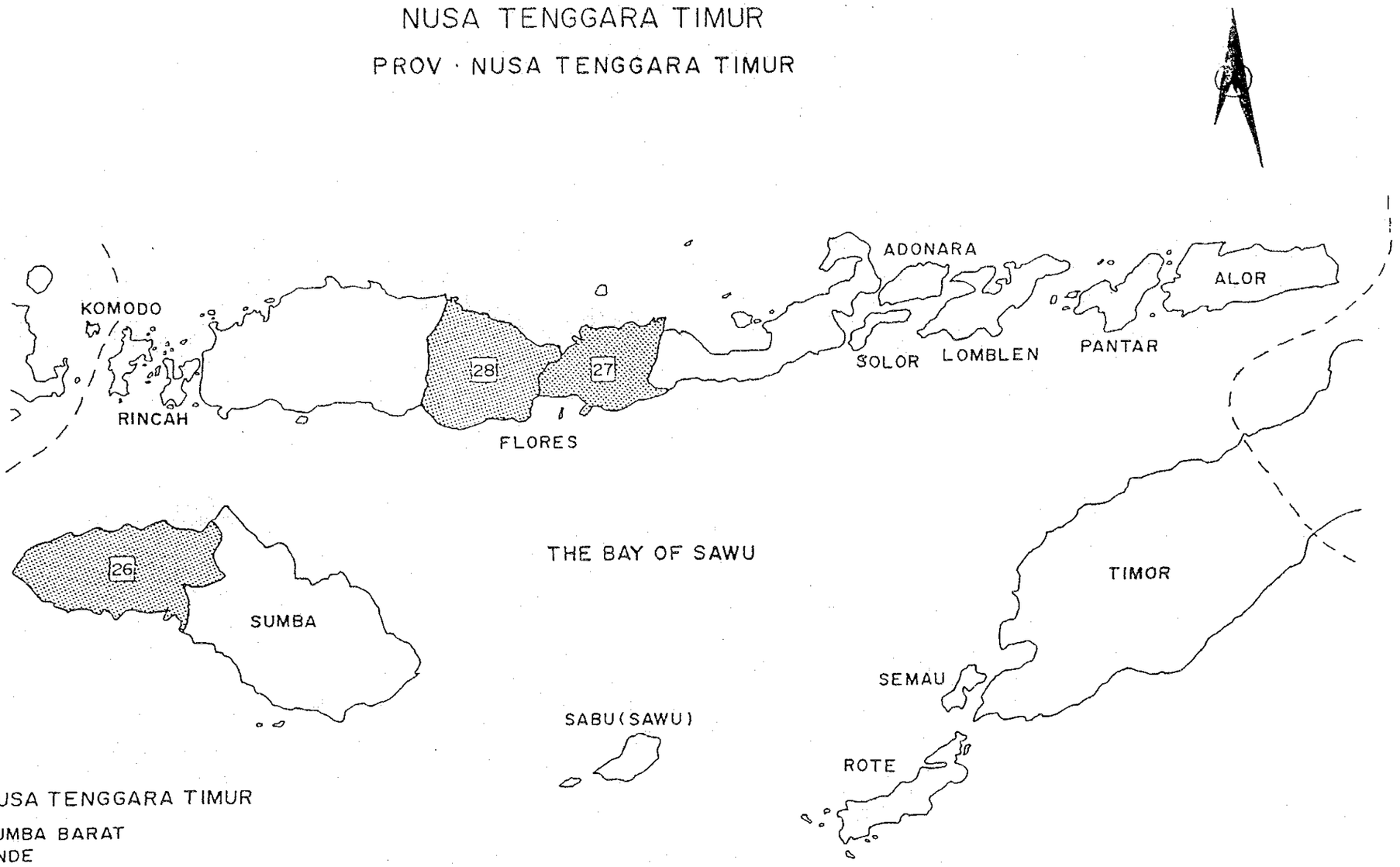
The purpose of the study for the Kabupaten is mainly to estimate the total Project Cost for the local road development but only limited data is available for study base. Therefore a detailed survey and design for the improvement of the Kabupaten roads should be carried out before commencing the Project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

LOCATION MAP OF THE PROJECT AREAS



NUSA TENGGARA TIMUR

PROV · NUSA TENGGARA TIMUR



PROVINCE : NUSA TENGGARA TIMUR

26 · KAB · SUMBA BARAT
27 · KAB · ENDE
28 · KAB · NGADA

LEGEND :

---- PROVINCIAL BOUDER

LOCATION OF THE PROPOSED AREA

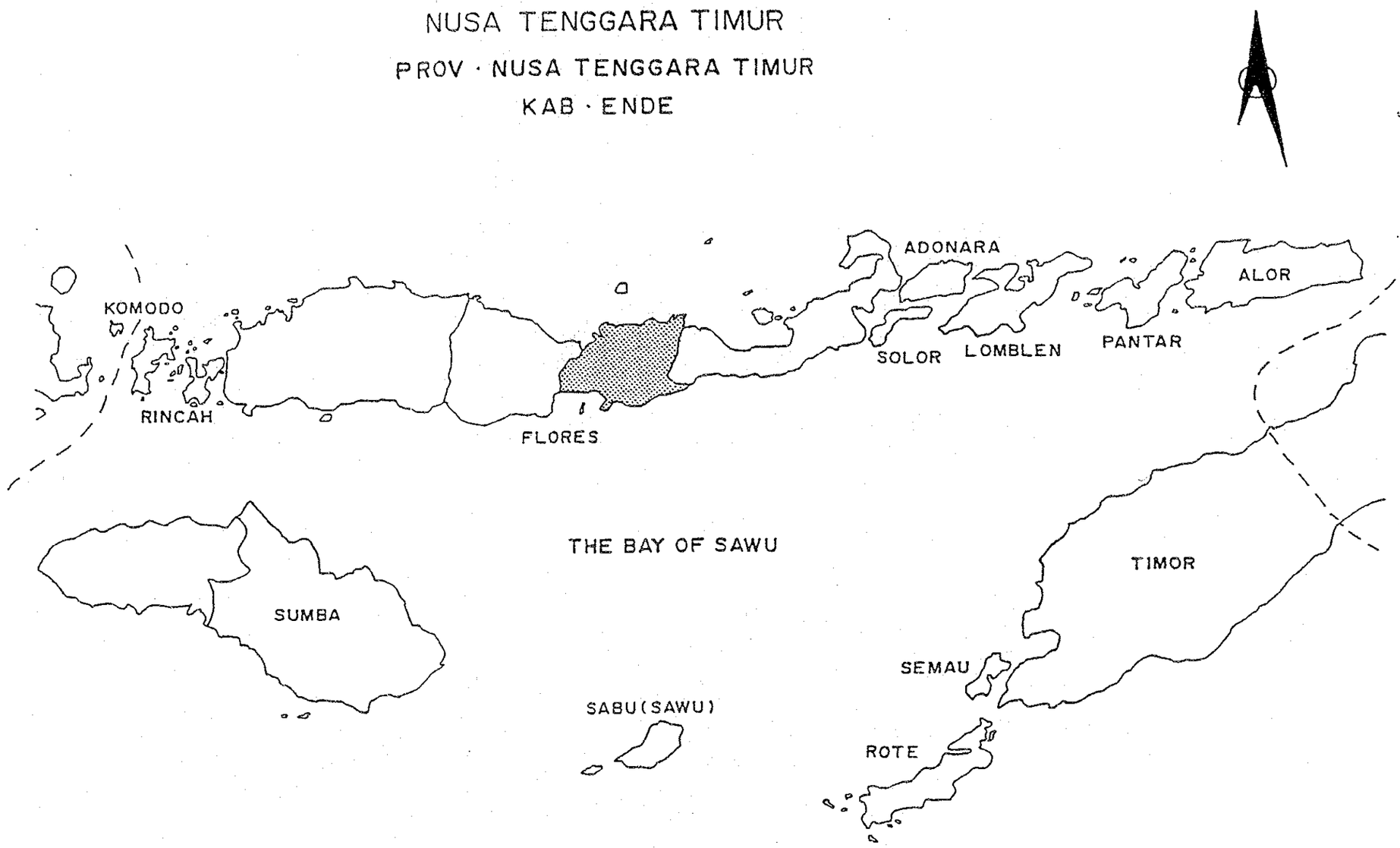
SCALE :

0 25 50 75 100 Km

NUSA TENGGARA TIMUR

PROV · NUSA TENGGARA TIMUR

KAB · ENDE



LEGEND :

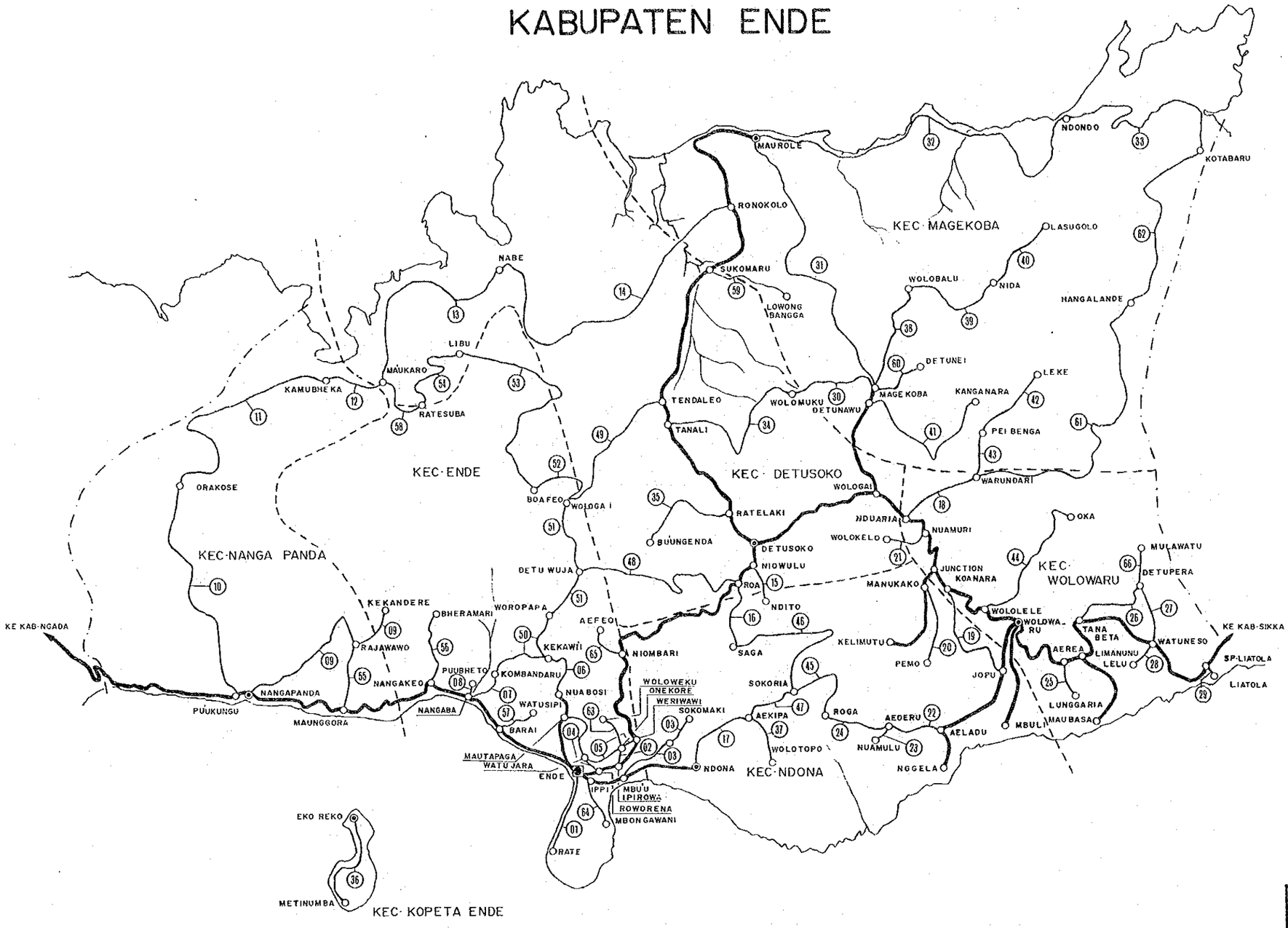
---- PROVINCIAL BOUNDARY

LOCATION OF THE PROJECT AREA

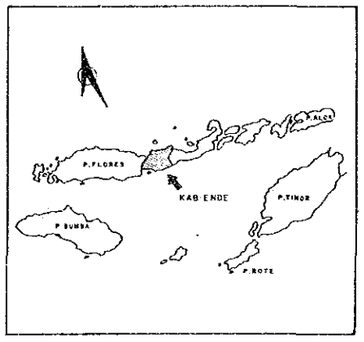
SCALE :

0 25 50 75 100 Km

KABUPATEN ENDE



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

SCALE : 0 5 10 15 Km

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

TITLE :

SOURCE:	SCALE:	PROVINCE: NUSATENGGARA TIMUR
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPAETN: ENDE

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

Kabuapten Ende is located almost in the middle of Flores Island. Its north coast faces the Flores Sea and the south coast faces the Sawu Sea. It is bordered on the east by Kabupaten Sikka and on the west by Kabupaten Ngada.

Almost the whole area of the Kabupaten is covered with 1,000 to 1,500 meter high mountains and steep slopes flall directly into the sea. On the south coast there is little flat land except for the strip of land where the capital of the Kabupaten, Ende, is located. On the north coast however there is some flat land formed on river basins in the areas facing the bays of Nangarudjeng and Dondo. There is no tableland formed by volcano in the middle of the Kabupaten.

The area of the Kabupaten is about 2,047 square kilometers, approximately 4 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 Ende are 110 days and 2,500 mm respectively.

One year in the Kabupaten consists of a rainy season and a dry season. The dry season is from June through October 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 : Nusa Tenggara Timur
KABUPATEN : Ende STATION : Ende

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	14	410	15	454	16	257	14	295	15	227
February	13	420	13	429	13	273	22	404	19	400
March	9	354	9	372	10	246	18	248	18	308
April	7	333	7	318	7	176	15	263	17	282
May	12	486	11	470	5	81	16	256	17	258
June	8	348	7	310	2	20	6	51	8	67
July	8	244	8	277	1	2	4	26	4	25
August	3	38	2	30	-	-	1	12	1	10
September	4	226	3	175	-	-	2	48	4	71
October	3	18	5	27	-	-	10	156	11	171
November	10	167	10	173	4	76	13	259	14	264
December	13	283	13	264	11	142	11	239	12	204
Total	104	3,329	103	3,299	69	1,277	132	2,258	140	2,338

NOTE : Data show the mean value of 5 stations.

1.2 Socio-Economic Conditions

1.2.1 Population

The population of Kabupaten Ende in 1984 was 214,627 which was approximately 7.3% of the 2,947,900 total population of Nusa Tenggara Timur Province as shown in Table 1-2-1.

The population density was 1.05 persons per ha which was higher than the provincial density of 0.61.

The recent annual average growth rate of population of the Kabupaten is 2.0% which is slightly lower than both the provincial rate of 2.3% and the national rate of 2.2%. This may be caused by outflow of population to other areas.

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:					
SUMBA BARAT	261,721	3.0	458,700	0.57	1984
ENDE	214,627	2.0	204,650	1.05	1984
NGADA	183,532	2.0	303,788	0.60	1984
PROVINCE:					
NUSA TENGGARA TIMUR	2,846,400	2.3	4,787,600	0.61	1982
	2,917,900		4,787,600		1983
	2,947,900		4,787,600		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 : NUSA TENGGARA TIMUR

KABUPATEN : ENDE

KECAMATAN	POPULATION	PROPORTION (%)
NANGA PANDA	28,013	13.1
ENDE	18,377	8.6
NDONA	22,325	10.4
WOLOWARU	46,189	21.5
MAGEKOBA/MAUROLE	21,076	9.8
DETUSOKO	25,569	11.9
KOPETA ENDE	53,078	24.7
TOTAL	214,627	100

1.2.2 Land Use

In Kabupaten Ende, 150,612 ha of the current available land use area, which is approximately 73.6% of the 204,650 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 40,625 ha of agricultural harvest area, 9,987 ha of residential area and 100,000 ha of usable open space which are 27.0%, 6.6% and 66.4% of the current available land use area respectively.

The agricultural harvest area consists of 9,355 ha of paddy field, 16,300 ha of plantation and 14,970 ha of other cultivated area which are 23.0%, 40.1% and 36.9% 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 : NUSA TENGGARA TIMUR

(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
SUMBA BARAT	13,298	62,061	8,270	59,819	10,371	13,100	42,805	56,043	192,133	450,700	1984
	(3.0)	(13.8)	(1.8)	(13.3)	(2.3)	(2.9)	(9.5)	(12.4)	(41.0)	(100)	
ENDE	1,401	7,954	14,970	16,300	9,987	100,000	19,485	33,878	675	204,650	1984
	(0.7)	(3.9)	(7.3)	(8.0)	(4.9)	(48.8)	(9.5)	(16.6)	(0.3)	(100)	
NGADA	7,250	38,095	43,839	12,864	3,175	43,832	32	110,865	43,837	303,788	1984
	(2.4)	(12.5)	(14.4)	(4.2)	(1.0)	(14.4)	(0)	(36.5)	(14.4)	(100)	

Notes :

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

1.2.3 Agriculture

The cultivated area and food crop production in Kabupaten Ende in 1984 were 40,124 ha and 137,383 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 15,279 ha and 64,883 ton respectively which are 38.1% and 47.2% of the total food crops. The yield rate of paddy production is 4.25 ton per ha.

The production of maize, cassava and other food crops amounts to 72,500 ton accounting for 52.8% of the total food crops. Thus, in this Kabupaten paddy is not so predominant compared with other Kabupatens.

As the table showns, average annual growth rates of area and production of paddy in 1981 through 1983 were 15.0% and 7.0% respectively which indicate favorable development of the paddy production. Upland paddy account for 80% of all paddy production in the Kabupaten.

The commodity crops are produced in the plantations. The area and production of plantation crops in 1983 were 15,309 ha and 3,106 ton respectively with current growth rates of 5.1% and 0% as shown in Table 1-2-5. Thus the plantation crop which is exported is an important agricultural product. However current growth of production is stagnant. 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 83.0% of the total population as shown in Table 1-2-6. Thus this is an agricultural Kabupaten.

It is suggested that the Kabupaten takes measures to proceed with agricultural development with the progress of road development in the north costal and central erater basin areas as well as promoting agricultural commodities required internationally.

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

KABUPATEN : ENDE

CULTIVATED AREA

(ha)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	-	-	10,319	10,036	14,973	15,279	7.0
OTHERS	-	-	16,061	16,859	24,140	24,850	15.0
TOTAL	-	-	26,380	26,895	39,113	40,129	14.0

PRODUCTION

(ton)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	-	-	13,575	28,386	41,583	64,883	15.0
OTHERS	-	-	60,635	35,348	72,003	72,500	6.1
TOTAL	-	-	74,210	63,734	113,586	64,883	22.7

YIELD RATE

(ton/ha)

ITEM	YEAR						AAGR (%)
	1979	1980	1981	1982	1983	1984	
PADDY	-	-	1.32	2.83	2.78	4.25	5.0

Notes :

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

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

PROVINCE : NUSA TENGGARA TIMUR

KABUPATEN	AREA (ha)	PRODUCTION (ton)	AAGR (%) AREA	AAGR (%) PRODUCTION
SUMBA BARAT	38,564	2,646	0.4	1.3
ENDE	15,309	3,106	5.1	0
NGADA	40,183	10,891	16.5	16.5

Table 1-2-6 POPULATION OF AGRICULTURAL SECTOR

PROVINCE : NUSA TENGGARA TIMUR

KABUPATEN	AGRICULTURAL SECTOR	TOTAL POPULATION	PROPORTION (%)	AAGR (%)	SURVEY YEAR
SUMBA BARAT	187,000	261,721	71.5	2.5	1984
ENDE	178,000	214,627	83.0	5.0	1984
NGADA	160,000	183,532	84.2	5.0	1984

Notes :

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

1.2.4 Other Economic Activities

Due to the lack of data on the other industrial activities besides the agriculture sector, it was obliged to omit the analysis on the other economic activities in Kabupaten Ende.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

In Kabupaten Ende there is one national road (Trans Flores Highway) which runs across the Kabupaten from east to west. It leads from the neighbouring Kabupaten Sikka through the central area of the Kabupaten to Ende, the Kabupaten capital, and along the south coast towards the west boundary of the Kabupaten.

Three provincial roads run towards the south, to Nggela, Mbuli and Man Basa from Wolowaru and Limanunu respectively from their junctions with the national road. The other two provincial roads are developed in the north central regions of the Kabupaten. These provincial roads lead to Maurole and MageKoba from Detusoko and Wologai, respectively from their junctions with the national road.

These national and provincial roads play an important role as the regional trunk roads of the Kabupaten. However travelling conditions by road are not good at present because the area is mostly covered by steep slopes and hills.

Accordingly, it seem to be difficult for the Kabupaten roads to consolidate a network from the alignment point of view.

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 Ende are confirmed as 66 links and 479 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 2.34 m per ha. This is distinctly higher than the national density of 0.48 m per ha and also higher than 2.11 m per ha which is the density in Jawa Island, excluding DKI Jakarta, as shown in the following table. Thus, the Kabupaten is will advanced in density of Kabupaten roads.

	Total Length (km)	Area (ha)	Density (m/ha)
Kabupaten : Ende	479	204,650	2.34
Province : Nusa Tenggara Timur	1,882	967,138	1.95
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 : NUSA TENGGARA TIMUR KAB : ENDE

(Km)

NO	TYPE	INP	BTB	ASP	KRK	L.L	TOTAL
LINK 1		4					4
LINK 2		2					2
LINK 3		1	1				2
LINK 4		4		1			5
LINK 5				2			2
LINK 6		3					3
LINK 7					3		3
LINK 8					1		1
LINK 9		13					13
LINK 10		1				14	14
LINK 11		14					14
LINK 12		1	4				4
LINK 13		1				12	13
LINK 14		6			15	1	22
LINK 15		3					3
LINK 16						4	4
LINK 17		9					9
LINK 18		5			1		6
LINK 19		3			3		6
LINK 20		3					3
LINK 21		2			1		3
LINK 22		2					2
LINK 23					2		2
LINK 24		4					4
LINK 25		3					3
LINK 26		5					5
LINK 27						4	4
LINK 28		2					2
LINK 29		1					1
LINK 30		5					5
LINK 31		21					21
LINK 32		9	11				20
LINK 33		11					11

(Km)

NO	TYPE	INP	BTB	ASP	KRK	L.L	TOTAL
LINK 34		14					14
LINK 35		6					6
LINK 36		6					6
LINK 37		3					3
LINK 38		10					10
LINK 39		8					8
LINK 40		5					5
LINK 41		11					11
LINK 42		8					8
LINK 43		3					3
LINK 44		11					11
LINK 45		7					7
LINK 46		10			4		14
LINK 47		21					21
LINK 48		11					11
LINK 49		12					12
LINK 50		10					10
LINK 51		10					10
LINK 52		3					3
LINK 53		15					15
LINK 54		15					15
LINK 55		5					5
LINK 56		5					5
LINK 57		3					3
LINK 58			4				4
LINK 59		6					6
LINK 60		4					4
LINK 61		10					10
LINK 62		12					12
LINK 63		2					2
LINK 64				3			3
LINK 65		3					3
LINK 66		3					3
TOTAL		308	20	6	30	35	479
RATIO		81	4	1	6	7	(%)

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 : Ende	1.3	10.5	88.3
Province : Nusa Tenggara Timur	1.6	26.5	71.9
Jawa Is.(Excluding DKI Jakarta)	56.2	25.0	18.8
Indonesia	26.0	26.6	47.4

Thus, in the Kabupaten the proportion of Kabupaten roads with asphalt surface is much lower than either that of Indonesia or of Jawa Island. The proportion of low grade roads such as earth roads and others is distinctly high. This means that the road classification in the Kabupaten is low.

(3) Surface Condition of Kabupaten Roads

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

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

	Good	Fair	Poor	Bad
Kabupaten : Ende	5.1	23.4	50.8	32.7
Province : Nusa Tenggara Timur	13.8	29.5	30.7	26.0
Jawa Is.(Excluding DKI Jakarta)	45.6	29.8	19.6	5.0
Indonesia	43.5	21.8	21.1	13.6

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

PROVINCE : NUSA TENGGARA TIMUR

KABUPATEN : ENDE

(%)

NO	?	INH				BTB				ASP				KRK				L.L			
NO		BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB	BA	SD	RU	RB
LINK	1		19	51	30																
LINK	2		13	18	70																
LINK	3		90	10		30	60	10													
LINK	4		60	40						60	40										
LINK	5									5	15	60	20								
LINK	6			85	15																
LINK	7														30	70					
LINK	8														90	10					
LINK	9	2	26	68	4																
LINK	10																		16	83	
LINK	11		8	61	32																
LINK	12					84		15													
LINK	13			99														17	52	32	
LINK	14		28	48	23									10	30	52	7			80	20
LINK	15		10	90																	
LINK	16																			99	
LINK	17	2	38	60																	
LINK	18		21	72	7										75	25					
LINK	19		13	77	10									67	20	13					
LINK	20	3	23	70	3																
LINK	21		20	80										20	70	10					
LINK	22		23	78																	
LINK	23													60	40						
LINK	24		23	76																	
LINK	25		10	90																	
LINK	26			99																	
LINK	27																		63	38	
LINK	28	40	40	20																	
LINK	29		99																		
LINK	30		10	90																	
LINK	31			87	13																
LINK	32		99				99														
LINK	33			2	98																
LINK	34			99																	
LINK	35			99																	
LINK	36		99																		
LINK	37		2	12	87																
LINK	38		10	78	13																
LINK	39		3	22	76																
LINK	40		3	22	75																
LINK	41			9	91																
LINK	42		4	68	29																
LINK	43		7	10	83																
LINK	44	5	8	50	37																
LINK	45	3	30	44	23																
LINK	46			78	23											40	60				
LINK	47			77	23																
LINK	48			16	83																
LINK	49			10	90																
LINK	50		13	36	52																
LINK	51			11	89																
LINK	52			12	88																
LINK	53			79	21																
LINK	54			10	90																
LINK	55			73	27																
LINK	56			10	90																
LINK	57		8	29	63																
LINK	58					90	10														
LINK	59			49	51																
LINK	60			90	10																
LINK	61			10	90																
LINK	62			10	90																
LINK	63		90	5	5																
LINK	64										62	37	2								
LINK	65			10	90																
LINK	66			10	90																
AVERAGE		1	17	47	35	51	43	7	0	22	39	32	7	20	44	28	8	3	26	66	4
LENGTH			388 Ke				20 Ke				6 Ke				30 Ke				35 Ke		
(Ke)		4	66	182	136	10	9	1	0	1	2	2	0	6	13	8	2	1	9	23	1

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

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(Km)

I02 (3)	DT	BK	RH	GN	TOTAL
LINK 1	3	1			4
LINK 2	2				2
LINK 3	1	1			2
LINK 4	3	2			5
LINK 5	2				2
LINK 6	2	1			3
LINK 7	3				3
LINK 8	1				1
LINK 9	3	10			13
LINK 10		14			14
LINK 11		14			14
LINK 12	4				4
LINK 13		13			13
LINK 14	9	10	2		22
LINK 15		3			3
LINK 16		4			4
LINK 17		9			9
LINK 18	4	2			6
LINK 19		6			6
LINK 20		3			3
LINK 21		3			3
LINK 22		2			2
LINK 23		2			2
LINK 24		4			4
LINK 25		3			3
LINK 26		5			5
LINK 27		4			4
LINK 28		2			2
LINK 29	1				1
LINK 30	4	1			5
LINK 31		21			21
LINK 32	17	3			20
LINK 33	4	7			11
LINK 34	13	1			14
LINK 35		6			6
LINK 36	2	4			6
LINK 37		3			3
LINK 38		10			10
LINK 39		8			8
LINK 40		5			5
LINK 41		11			11
LINK 42		8			8
LINK 43		3			3
LINK 44		1		10	11
LINK 45	1	1		5	7
LINK 46		6		8	14
LINK 47		21			21
LINK 48		11			11
LINK 49		12			12
LINK 50		10			10
LINK 51		10			10
LINK 52		3			3
LINK 53		15			15
LINK 54		15			15
LINK 55		5			5
LINK 56	5				5
LINK 57		3			3
LINK 58	4				4
LINK 59		6			6
LINK 60		4			4
LINK 61		10			10
LINK 62	1	11			12
LINK 63	2				2
LINK 64	3				3
LINK 65		3			3
LINK 66		3			3
TOTAL	94	359	2	24	479
RATIO	20	75	0	5	(%)

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

(4) Terrain Conditions of Kabupaten Roads

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

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

The proportions of terrain conditions in the Kabupaten are 20.0% flat, 75.0% hilly, and 5.0% mountainous. There is thus no mountainous area in the Kabupaten and road construction is anticipated to be not so difficult.

1.3.3 Bridge Inventory

A bridge inventory showing the existing condition of bridges on the Kabupaten roads in Kabupaten Ende 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 20 bridges with a total length of 168 m of which 15 or 75% are concrete and 3 or 15% are others. Steel bridges account for only 2 or 10% of the total. On the other hand, 54 bridges with a total length of 800 m are required to be newly constructed.

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

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : NUSA TENGGARA TIMUR KAB : ENDE

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

	EXISTING		NOT EXIST		TOTAL	
LINK NO	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
2	1	6.20			1	6.20
7			1	27.00	1	27.00
9	1	8.00			1	8.00
10	3	17.00			3	17.00
11	9	63.25			9	63.25
14	2	14.00	2	14.00	4	28.00
17	1	12.00	1	18.00	2	30.00
19	1	14.00			1	14.00
20			1	4.00	1	4.00
21			1	7.00	1	7.00
22			1	4.00	1	4.00
23			1	10.00	1	10.00
24			1	7.00	1	7.00
26			2	50.00	2	50.00
27	1	27.50	1	30.00	2	57.50
30			2	36.00	2	36.00
31			2	36.00	2	36.00
32	1	6.00	1	14.00	2	20.00
33			4	65.00	4	65.00
34			3	73.00	3	73.00
35			1	8.00	1	8.00
41			1	15.00	1	15.00
42			2	14.00	2	14.00
43			1	7.00	1	7.00
44			1	12.00	1	12.00
45			1	10.00	1	10.00
46			1	12.00	1	12.00
50			1	10.00	1	10.00
51			2	30.00	2	30.00
52			2	27.00	2	27.00
53			3	42.00	3	42.00
55			1	12.00	1	12.00
57			2	16.00	2	16.00
59			3	39.00	3	39.00
60			1	12.00	1	12.00
61			3	59.00	3	59.00
62			3	55.00	3	55.00
66			1	25.00	1	25.00
TOTAL	20	167.95	54	800.00	74	967.95

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

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(No)

103 (18)	BRIDGE LL	BT	BJ	TOTAL
LINK 2	1		1	1
LINK 7				
LINK 9		1		1
LINK 10		3		3
LINK 11	1	8		9
LINK 14		2		2
LINK 17			1	1
LINK 19			1	1
LINK 20				
LINK 21				
LINK 22				
LINK 23				
LINK 24				
LINK 26				
LINK 27		1		1
LINK 30				
LINK 31				
LINK 32	1			1
LINK 33				
LINK 34				
LINK 35				
LINK 41				
LINK 42				
LINK 43				
LINK 44				
LINK 45				
LINK 46				
LINK 50				
LINK 51				
LINK 52				
LINK 53				
LINK 55				
LINK 57				
LINK 59				
LINK 60				
LINK 61				
LINK 62				
LINK 66				
TOTAL	3	15	2	20
RATIO	15	75	10	(%)

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	-	-	-	-	-	-	-	-	-	-	-
Concrete	-	3	10	2	-	-	-	-	-	-	15
Steel	-	-	-	-	1	1	-	-	-	-	2
Others	-	1	2	-	-	-	-	-	-	-	3
Total	-	4	12	2	1	1	-	-	-	-	20

Thus, most of the existing bridges on the Kabupaten roads are concrete and the majority of spanlengths is within the range of 5 m to 8 m.

1.3.4 Traffic

Inventories of the average daily traffic (ADT) on the Kabupaten roads in Kabupaten Ende 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	244	15	168	188	615
Proportion (%)	39.67	2.44	27.32	30.57	100.00

Source : Bina Marga Inventory

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

	SEDAN	BUS	TRUCK	MOTOR-CYCLE	TOTAL
Proportion (%)	0.00	17.61	16.92	65.47	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 : NUSA TENGGARA TIMUR KAB : ENDE

A)	Growth Rate of Population	: 2.00 (%)
B)	Growth Rate of Cultivated Area	: 6.00 (%)
C)	Growth Rate of Rice field	: 7.00 (%)
D)	Growth Rate of Rice yield rate	: 5.00 (%)
E)	Growth Rate of GDP / capita	: 7.70 (%)
a)	Geometrical Mean (A x B)	: 3.98 (%)
b)	Geometrical Mean (C x D)	: 6.00 (%)
c)	Geometrical Mean (a x b)	: 4.98 (%)
d)	Geometrical Mean (c x E)	: 6.33 (%)
	TRAFFIC GROWTH RATE	: 6.33 (%)

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 : NUSA TENGGARA TIMUR KAB : ENDE

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
1	45	2	20	25	80	6.3%	100	4	44	56	178	IIIB-2
2	10	0	2	4	14	6.3%	22	0	4	9	31	IIIC
3	16	0	2	4	20	6.3%	36	0	4	9	44	IIIC
4	15	2	7	16	32	6.3%	33	4	16	36	71	IIIB-2
5	75	5	20	50	125	6.3%	167	11	44	111	278	IIIB-1
6	10	1	3	6	17	6.3%	22	2	7	13	38	IIIC
7	15	1	5	4	23	6.3%	33	2	11	9	51	IIIB-2
8	16	1	6	3	25	6.3%	36	2	13	7	56	IIIB-2
9	2	0	3	2	6	6.3%	4	0	7	4	13	IIIC
10	2	0	4	4	8	6.3%	4	0	9	9	18	IIIC
11	3	0	4	6	10	6.3%	7	0	9	13	22	IIIC
12	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
13	0	0	4	1	5	6.3%	0	0	9	2	11	IIIC
14	5	0	4	0	9	6.3%	11	0	9	0	20	IIIC
15	1	0	2	2	4	6.3%	2	0	4	4	9	IIIC
16	1	0	3	1	5	6.3%	2	0	7	2	11	IIIC
17	2	0	3	2	6	6.3%	4	0	7	4	13	IIIC
18	0	0	4	2	5	6.3%	0	0	9	4	11	IIIC
19	2	0	3	1	6	6.3%	4	0	7	2	13	IIIC
20	0	0	3	2	4	6.3%	0	0	7	4	9	IIIC
21	0	0	5	2	6	6.3%	0	0	11	4	13	IIIC
22	0	0	4	2	5	6.3%	0	0	9	4	11	IIIC
23	0	0	2	2	3	6.3%	0	0	4	4	7	IIIC
24	0	0	4	2	5	6.3%	0	0	9	4	11	IIIC
25	0	0	5	1	6	6.3%	0	0	11	2	13	IIIC
26	0	0	3	2	4	6.3%	0	0	7	4	9	IIIC
27	0	0	4	2	5	6.3%	0	0	9	4	11	IIIC
28	0	0	2	1	3	6.3%	0	0	4	2	7	IIIC
29	1	0	2	1	4	6.3%	2	0	4	2	9	IIIC
30	2	0	4	8	10	6.3%	4	0	9	18	22	IIIC
31	0	0	3	1	4	6.3%	0	0	7	2	9	IIIC
32	0	0	4	2	5	6.3%	0	0	9	4	11	IIIC
33	4	2	6	3	14	6.3%	9	4	13	7	31	IIIC
34	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
35	0	0	3	0	3	6.3%	0	0	7	0	7	IIIC
36	0	0	3	4	5	6.3%	0	0	7	9	11	IIIC
37	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
38	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
39	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
40	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
41	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
42	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
43	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
44	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
45	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
46	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
47	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
48	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
49	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
50	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC

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

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
51	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
52	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
53	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
54	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
55	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
56	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
57	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
58	2	0	4	0	6	6.3%	4	0	9	0	13	IIIC
59	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
60	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
61	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
62	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
63	5	1	3	5	12	6.3%	11	2	7	11	27	IIIC
64	10	0	5	15	23	6.3%	22	0	11	33	51	IIIB-2
65	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
66	0	0	0	0	0	6.3%	0	0	0	0	0	IIIC
PERCENT	39.67	2.44	27.32	30.57			39.67	2.44	27.32	30.57		

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 (1) FUTURE TRAFFIC VOLUME ESTIMATED BY THE PRODUCER'S SURPLUS

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
2	IIIC	KRK	3	0	2	2	6
3	IIIC	KRK	6	0	4	5	13
4	IIIC	KRK	4	0	3	3	9
6	IIIC	KRK	3	0	2	2	6
7	IIIC	KRK	3	0	2	2	6
8	IIIC	KRK	1	0	1	1	3
9	IIIC	KRK	13	1	9	10	28
10	IIIB-2	KRK	46	3	32	36	99
11	IIIB-2	KRK	46	3	32	36	99
12	IIIC	KRK	14	1	10	11	31
13	IIIB-2	KRK	54	3	37	42	115
14	IIIB-2	KRK	88	5	60	68	187
15	IIIC	KRK	8	0	5	6	16
16	IIIC	KRK	10	1	7	8	22
17	IIIC	KRK	14	1	10	11	31
18	IIIB-2	KRK	62	4	42	48	132
19	IIIC	KRK	21	1	14	16	44
20	IIIC	KRK	7	0	5	6	15
21	IIIB-2	KRK	25	2	17	19	54
22	IIIC	KRK	7	0	5	6	15
23	IIIC	KRK	4	0	2	3	8
24	IIIC	KRK	7	0	5	6	15
25	IIIB-2	KRK	31	2	21	24	66
26	IIIB-2	KRK	51	3	35	40	109
27	IIIB-2	KRK	41	3	28	32	88
28	IIIC	KRK	21	1	14	16	44
29	IIIC	KRK	10	1	7	8	22
30	IIIC	KRK	11	1	8	9	25
31	IIIB-2	KRK	35	2	24	27	75
32	IIIB-2	KRK	33	2	23	26	71
33	IIIB-2	KRK	55	3	38	42	117
34	IIIB-2	KRK	63	4	43	49	135
35	IIIB-2	KRK	27	2	19	21	59
36	IIIC	KRK	6	0	4	5	13
37	IIIC	KRK	5	0	4	4	11
38	IIIC	KRK	17	1	11	13	36
39	IIIC	KRK	13	1	9	10	28
40	IIIC	KRK	8	1	6	6	18

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

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(1990)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
41	IIIC	KRK	10	1	13	14	39
42	IIIC	KRK	13	1	9	10	28
43	IIIC	KRK	5	0	3	4	10
44	IIIB-1	ASP	113	7	78	87	242
45	IIIC	KRK	11	1	7	8	23
46	IIIB-2	KRK	25	2	17	19	54
47	IIIB-2	KRK	36	2	25	28	77
48	IIIB-2	KRK	41	3	28	31	88
49	IIIB-2	KRK	50	3	34	38	106
50	IIIC	KRK	11	1	7	8	23
51	IIIC	KRK	11	1	7	9	23
52	IIIC	KRK	7	0	5	5	15
53	IIIC	KRK	23	1	16	18	49
54	IIIB-2	KRK	68	4	47	52	145
55	IIIC	KRK	17	1	11	13	36
56	IIIC	KRK	5	0	4	4	11
57	IIIC	KRK	3	0	2	2	6
58	IIIC	KRK	15	1	10	11	32
59	IIIC	KRK	14	1	9	10	29
60	IIIC	KRK	7	0	5	5	15
61	IIIC	KRK	17	1	11	13	36
62	IIIC	KRK	20	1	14	15	43
63	IIIC	KRK	2	0	1	2	4
64	IIIC	KRK	3	0	2	2	6
65	IIIC	KRK	3	0	2	2	6
66	IIIB-2	KRK	31	2	21	21	66

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 : ENDE

(1000Rupiah)

	LINK 1	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 7	LINK 8	LINK 9	LINK 10
	4 Ka	2 Ka	2 Ka	5 Ka	2 Ka	3 Ka	3 Ka	1 Ka	13 Ka	14 Ka
	IIIB-2	IIIC	IIIC	IIIC	IIIB-1	IIIC	IIIC	IIIC	IIIC	IIIB-2
YEAR	VOC	Surplus	Surplus	Surplus	VOC	Surplus	Surplus	Surplus	Surplus	Surplus
1988	0	0	0	0	0	0	0	0	0	0
1989	15961	219	197	436	6029	289	136	0	5396	13237
1990	16698	312	197	453	6405	419	198	9	5454	14292
1991	17796	312	201	599	6782	419	198	9	6495	16066
1992	18895	312	237	736	7251	419	198	9	7053	17453
1993	20181	323	277	736	7724	434	206	10	8110	18898
1994	21279	438	277	736	8192	579	272	21	8668	20675
1995	22751	438	318	752	8712	579	272	21	9767	22452
1996	24037	531	358	889	9230	708	334	21	10266	24268
1997	25684	531	394	1035	9842	708	334	21	11365	26414
1998	27158	531	398	1035	10457	708	334	21	12465	28913
SUM	210440	3947	2854	7407	80624	5262	2482	142	83039	202668
COST	108977	-4947	-5568	-13769	36361	-7795	-9384	-3525	1656	66023
/Ka	27244	-2473	-2784	-2754	18180	-2598	-3128	-3525	127	4716

Chapter 3 ENGINEERING

3.1 Design Criteria and Specification

3.1.1 Geometric Design Criteria

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

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

3.1.2 Loading Specification

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

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

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

Table 3-1-1

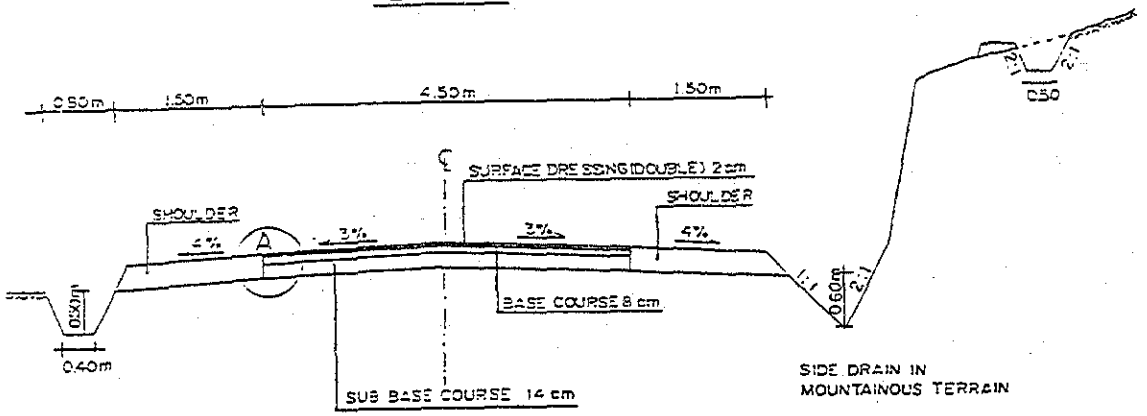
DESIGN CRITERIA FOR KABUPATEN ROADS

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

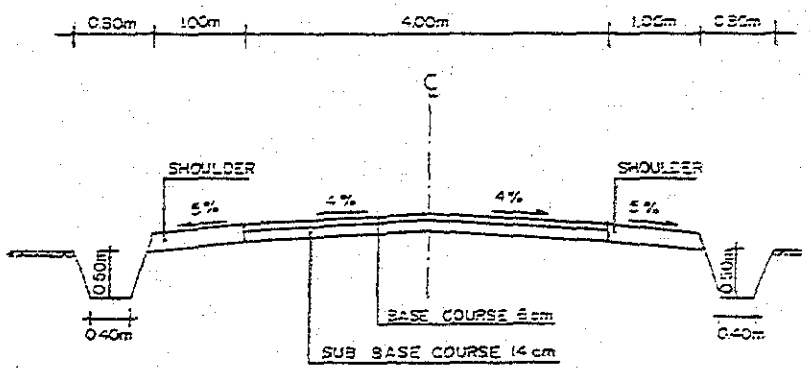
Fig. 3-1-1

STANDARD ROAD CROSS SECTIONS

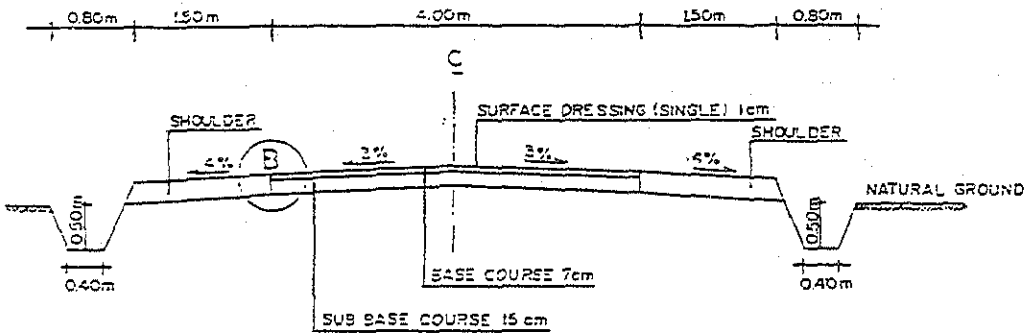
CLASS III A



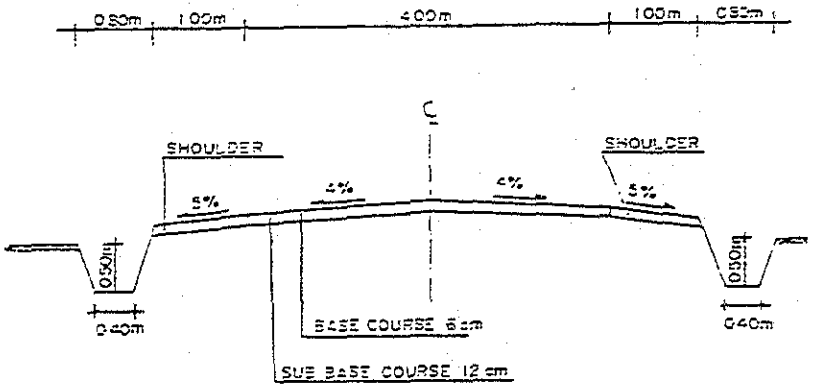
CLASS III B-2



CLASS III B-1



CLASS III C



3.2 Pavement Design

3.2.1 Design Conditions

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

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

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

1) Design Traffic Volume

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

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

2) Strength of Roadbed

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

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

3.2.2 Pavement Structure

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

Fig. 3-2-1 PAVEMENT STRUCTURE

(cm)

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


= SURFACE DRESSING (ASPHALT)


= BASE COURSE (CRUSHER-RUN)


= SUBBASE COURSE (SANDY GRAVEL)

3.3 Design of Bridges and Other Structures

3.3.1 Standard Bridge

There are so many bridges to be improved or to be 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

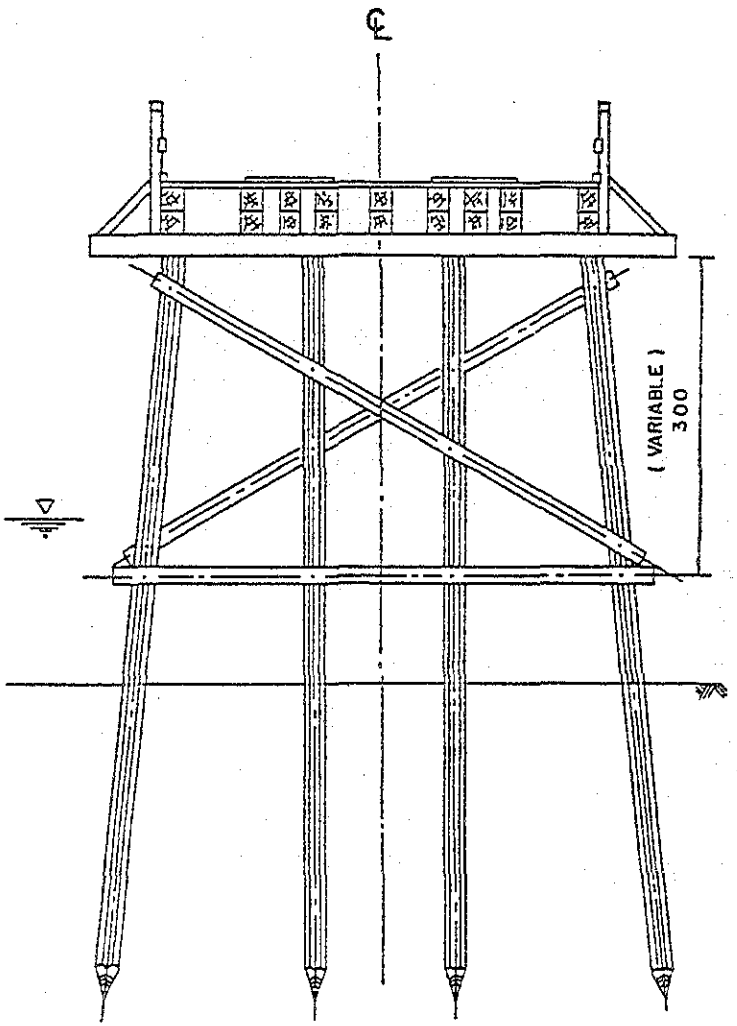
3) Foundation

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.

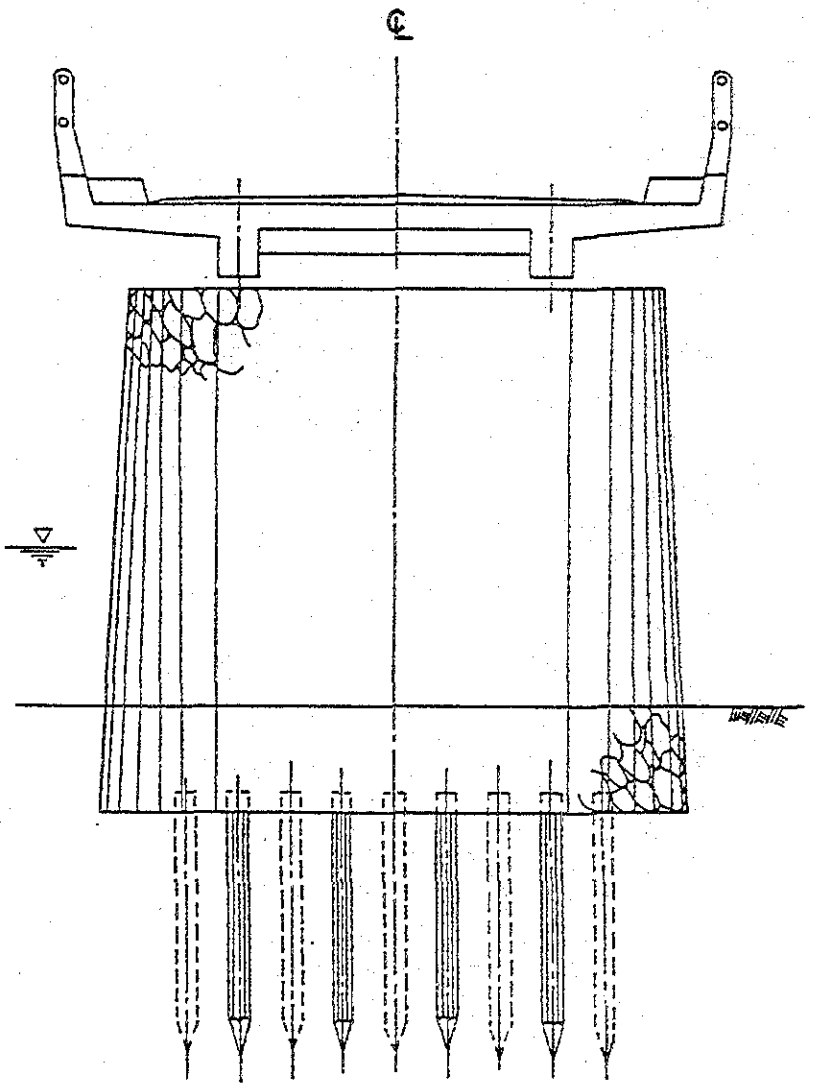
The pile length is suggested to be a minimum of 3 meters under the bottom of the foundation. The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

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

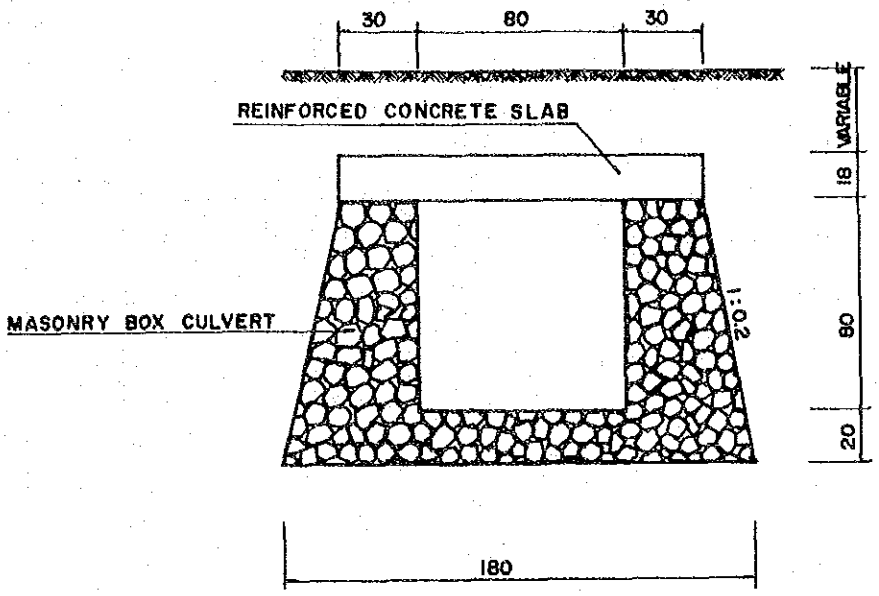
(2) Retaining Wall

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

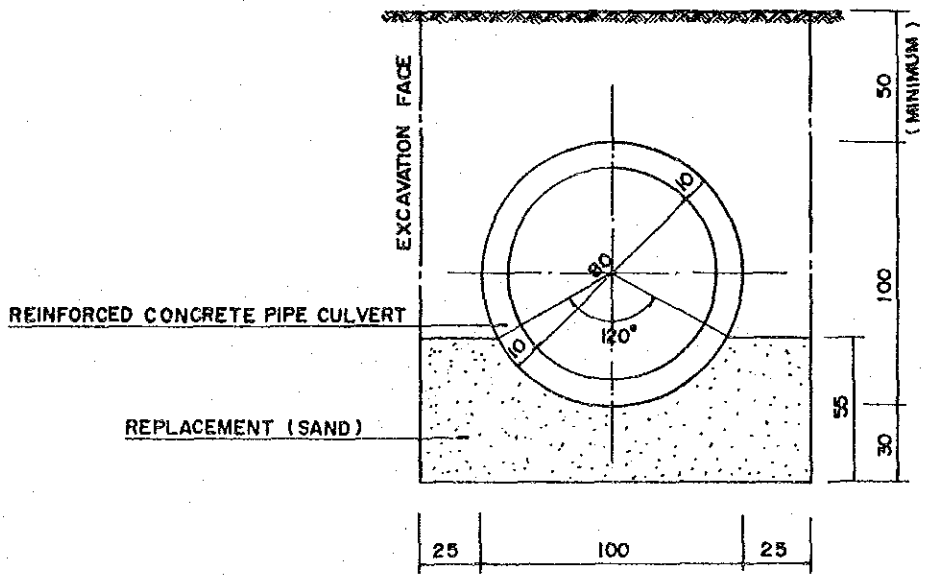
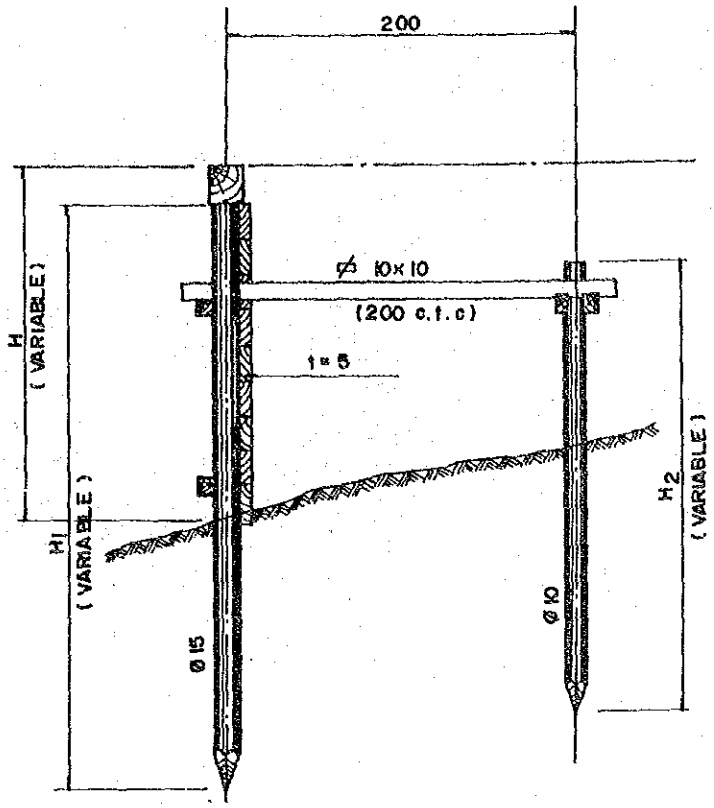
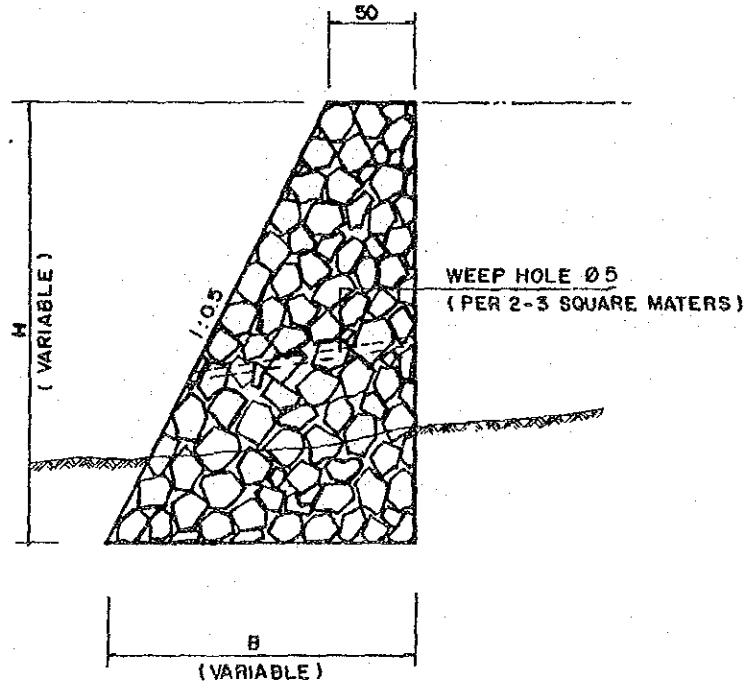


Fig. 3-3-3 STANDARD RETAINING WALLS

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 Ende and other Kabupatens in Nusa Tenggara Timur Province are shown in Table 4-1-1.

Table 4-1-1 UNIT LABOUR PRICE

(Rp)

KABUPATEN	MAN	SKL LAB	CAP	MAS	LAB	DRIV	OPE
Sumba Barat	2,000	2,000	2,000	2,000	1,500	2,500	2,750
Ende	2,500	1,600	1,750	1,750	1,100	2,500	2,500
Ngada	1,500	1,300	2,000	2,000	1,100	2,000	3,000
Average	2,000	1,300	1,917	1,917	1,233	2,333	2,750

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 Ende together with for other Kabupatens in Nusa Tenggara Timur Province.

Table 4-1-2 UNIT PRICE OF MATERIALS

(Rp)

MATERIAL	UNIT	SUMBA BARAT	ENDE	NGADA	AVERAGE
Bitumen	L	500	400	400	433
Asphalt oil	L	1,500	1,500	1,500	1,500
Gasoline	L	300	250	250	267
Sand	M^3	9,000	8,000	5,000	7,333
Cement	bag	6,000	6,000	5,500	5,833
River Stone	M^3	8,000	6,000	4,000	6,000
Steel moulds	Set	8,500	8,500	8,500	8,500
Timber	M^3	200,000	200,000	200,000	200,000
Paint	L	4,000	2,500	1,750	2,750
Reinforcing Steel	Kg	1,500	800	1,750	1,350
Tying Wire	Kg	1,250	1,250	2,500	1,667
Equivalent Royalty	M^3	250	250	250	250

4.1.3 Hourly Equipment Cost

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

Table 4-1-3

HOURLY EQUIPMENT COST

PROVINCE : NUSA TENGGARA TIMUR
KABUPATEN : ENDE

(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	311	12,465	12,776	7,769	1,034	8,803	21,579
	Bulldozer/Ripper	120 HP	340	13,486	13,826	8,500	1,591	10,091	23,917
	Swamp Bulldozer	120 HP	356	13,730	14,086	8,879	1,662	10,541	24,627
	Bulldozer	90 HP	197	8,495	8,692	4,914	654	5,568	14,260
	Bulldozer/Ripper	90 HP	212	9,092	9,304	5,300	992	6,292	15,596
	Bulldozer	65 HP	140	6,171	6,311	3,500	465	3,965	10,276
	Bulldozer/Ripper	65 HP	153	6,625	6,778	3,819	714	4,533	11,311
	Swamp Bulldozer	90 HP	212	9,082	9,294	5,284	989	6,273	15,567
	Swamp Bulldozer	65 HP	162	6,485	6,647	4,050	758	4,808	11,455
	Motor Grader	110 HP	277	10,890	11,167	6,919	1,295	8,214	19,381
	Motor Grader	75 HP	192	7,464	7,656	4,779	894	5,673	13,329
	Motor Grader	65 HP	172	6,571	6,743	4,300	804	5,104	11,847
	Road Stabilizer	W=1850 mm	344	3,414	3,758	8,594	428	9,022	12,780
	Vibratory Roller	4 ton	116	3,265	3,381	2,900	385	3,285	6,666
	Hand-guide Vib. Roller	1000 Kg	94	592	686	849	30	879	1,565
	Tire Roller	8-15 ton	125	7,162	7,287	3,106	103	3,209	10,496
	Vibratory Roller (D&T)	4 ton	116	3,265	3,381	2,900	385	3,285	6,666
	Hand-guide Vib. Roller	600 Kg	66	405	471	600	21	621	1,092
	Rough Terrain Crane	10 ton	402	12,692	13,094	10,039	751	10,790	23,884
	Hydraulic Excavator; Wheel	0.3 m3	165	7,619	7,784	4,109	546	4,655	12,439
	Wheel Loader	1.2 m3	281	8,294	8,575	7,019	934	7,953	16,528
	Wheel Loader	0.3 m3	91	2,891	2,982	2,269	302	2,571	5,553
	Water Tank Truck	4000 ltr.	96	2,753	2,849	868	123	991	3,840
	Fuel Tank Truck	4000 ltr.	98	2,760	2,858	882	125	1,007	3,865
	Dump Truck	3.0 ton	162	3,471	3,633	1,469	208	1,677	5,310
	Flat Bed Truck with Crane	3.0 ton	69	2,995	3,064	1,717	128	1,845	4,909
	Dump Loader Truck	12 ton	154	18,292	18,446	3,838	127	3,965	22,411
	Dump Truck	5.0 ton	241	5,723	5,964	2,189	311	2,500	8,464
	Flat Bed Truck	3.0 ton	23	2,565	2,588	563	42	605	3,193
	Portable Crusher/Screening	30-40 t/h	752	21,074	21,826	18,800	2,502	21,302	43,128
	Concrete Mixer	0.5 m3	594	2,441	3,035	5,400	431	5,831	8,866
	Water Pump	200 l/min	21	254	275	188	6	194	469
	Concrete Vibrator	3.3 HP	9	218	227	73	2	75	302
	Asphalt Sprayer	850 ltr.	113	761	874	1,019	144	1,163	2,037

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 : NUSA TENGGARA TIMUR KAB : ENDE

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	152	91	243
Subgrade Preparation	m2	19	11	30
Normal Fill	m3	1,565	865	2,430
Fill in Swamp	m3	2,319	1,054	3,373
Normal Excavation to Spoil	m3	919	523	1,442
Sub Base Course	m3	2,980	1,350	4,330
Base Course	m3	4,066	2,303	6,369
Shoulder	m2	271	146	417
Asphalt Patching	m2	3,089	1,514	4,603
Surface Dressing (Single)	m2	858	766	1,624
Surface Dressing (Double)	m2	1,016	1,207	2,223
Earth Drain	m	645	119	764
Earth Drain in Swamp (by machine)	m3	1,060	474	1,534
Pipe Culvert D80cm	m	39,849	47,521	87,370
Masonry Culvert (80x80cm)	m	50,912	41,199	92,111
Retaining Wall and Wing Wall (Timber)	m2	16,034	246	16,280
Retaining Wall and Wing Wall (Masonry)	m3	35,768	12,267	48,035
Gabion Protection	m3	10,681	121	10,802
Manual routine maintenance of road	Km	101,056	7,260	108,316
Routine maintenance of earth road	Km	84,124	37,948	122,072
Routine maintenance of gravel road	Km	174,087	88,186	262,273
Routine maintenance of asphalt road	Km	308,900	151,400	460,300

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 : NUSA TENGGARA TIMUR KAB : ENDE

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	53,913	3,541	57,454
Superstructure (Timber;Span 5m;10T)	m2	59,718	3,910	63,628
Superstructure (Timber;Span 8m;10T)	m2	79,102	5,137	84,239
Superstructure (Timber;Span 3m;BM50)	m2	66,851	4,379	71,230
Superstructure (Timber;Span 5m;BM50)	m2	72,985	4,745	77,730
Superstructure (Timber;Span 8m;BM50)	m2	92,566	6,007	98,573
Superstructure (Concrete;Span 3m;BM50)	m2	54,717	95,935	150,652
Superstructure (Concrete;Span 5m;BM50)	m2	55,829	106,961	162,790
Superstructure (Concrete;Span 8m;BM50)	m2	57,231	116,358	173,589
Superstructure (Concrete;Span10m;BM50)	m2	62,312	131,913	194,225
Superstructure (Concrete;Span15m;BM50)	m2	66,591	155,090	221,681
Substructure (Pier;for Timber;10T)	NO	469,482	32,863	502,345
Substructure (Abut;for Timber;10T)	NO	1,228,353	154,433	1,382,786
Substructure (Pier;for Timber;BM50)	NO	690,448	48,632	739,080
Substructure (Abut;for Timber;BM50)	NO	1,394,647	171,604	1,566,251
Substructure (Pier;for Concrete;BM50)	NO	1,553,618	497,829	2,051,447
Substructure (Abut;for Concrete;BM50)	NO	3,227,651	1,034,415	4,262,066
Demolition of Bridge (Timber->Timber)	m2	14,647	1,373	16,020
Demolition of Bridge (Timber->Concrete)	m2	14,647	1,373	16,020
Demolition of Bridge (Concrete)	m2	79,176	74,382	153,558
Maintenance of Timber Bridge (New)	m2	9,552	1,121	10,673
Maintenance of Concrete Bridge (New)	m2	1,913	3,128	5,041
Maintenance of Timber Bridge (Exist)	m2	8,340	2,405	10,745
Maintenance of Concrete Bridge (Exist)	m2	3,946	2,470	6,416

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 Ende are shown in Table 5-1-1.

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

KABUPATEN : ENDE

CRITERIA NO	ROAD LINK NO
(1)	08,29

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 : NUSA TENGGARA TIMUR KABUPATEN : ENDE

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
1	4 Km	IIIB-2	25.973	VDC
5	2 Km	IIIB-1	21.293	VDC
34	14 Km	IIIB-2	15.716	Surplus
18	6 Km	IIIB-2	14.174	Surplus
33	11 Km	IIIB-2	12.046	Surplus
44	11 Km	IIIB-1	8.945	Surplus
54	15 Km	IIIB-2	7.106	Surplus
31	21 Km	IIIB-2	6.784	Surplus
14	22 Km	IIIB-2	4.717	Surplus
11	14 Km	IIIB-2	4.695	Surplus
10	14 Km	IIIB-2	2.025	Surplus
47	21 Km	IIIB-2	1.525	Surplus
35	6 Km	IIIB-2	0.305	Surplus
15	3 Km	IIIC	0.078	Surplus
16	4 Km	IIIC	0.078	Surplus
17	9 Km	IIIC	0.078	Surplus
6	3 Km	IIIC	0.078	Surplus
19	6 Km	IIIC	0.078	Surplus
20	3 Km	IIIC	0.078	Surplus
21	3 Km	IIIB-2	0.078	Surplus
22	2 Km	IIIC	0.078	Surplus
23	2 Km	IIIC	0.078	Surplus
24	4 Km	IIIC	0.078	Surplus
25	3 Km	IIIB-2	0.078	Surplus
26	5 Km	IIIB-2	0.078	Surplus
27	4 Km	IIIB-2	0.078	Surplus
28	2 Km	IIIC	0.078	Surplus
30	5 Km	IIIC	0.078	Surplus
7	3 Km	IIIC	0.078	Surplus
32	20 Km	IIIB-2	0.078	Surplus
9	13 Km	IIIC	0.078	Surplus
3	2 Km	IIIC	0.078	Surplus
4	5 Km	IIIC	0.078	Surplus
36	6 Km	IIIC	0.078	Surplus
37	3 Km	IIIC	0.078	Surplus
38	10 Km	IIIC	0.078	Surplus
39	8 Km	IIIC	0.078	Surplus
40	5 Km	IIIC	0.078	Surplus
41	11 Km	IIIC	0.078	Surplus
42	8 Km	IIIC	0.078	Surplus
43	3 Km	IIIC	0.078	Surplus
12	4 Km	IIIC	0.078	Surplus
45	7 Km	IIIC	0.078	Surplus
46	14 Km	IIIB-2	0.078	Surplus
13	13 Km	IIIB-2	0.078	Surplus
48	11 Km	IIIB-2	0.078	Surplus
49	12 Km	IIIB-2	0.078	Surplus
50	10 Km	IIIC	0.078	Surplus
51	10 Km	IIIC	0.078	Surplus
52	3 Km	IIIC	0.078	Surplus

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

PROVINCE : NUSA TENGGARA TIMUR KABUPATEN : ENDE

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
53	15 Km	IIIC	0.078	Surplus
2	2 Km	IIIC	0.078	Surplus
55	5 Km	IIIC	0.078	Surplus
56	5 Km	IIIC	0.078	Surplus
57	3 Km	IIIC	0.078	Surplus
58	4 Km	IIIC	0.078	Surplus
59	6 Km	IIIC	0.078	Surplus
60	4 Km	IIIC	0.078	Surplus
61	10 Km	IIIC	0.078	Surplus
62	12 Km	IIIC	0.078	Surplus
63	2 Km	IIIC	0.078	Surplus
64	3 Km	IIIC	0.078	Surplus
65	3 Km	IIIC	0.078	Surplus
66	3 Km	IIIB-2	0.078	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : NUSA TENGGARA TIMUR KABUPATEN : ENDE

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
44	11 Km	IIIB-2	10.270	Surplus
31	21 Km	IIIC	9.678	Surplus
54	15 Km	IIIC	8.460	Surplus
11	14 Km	IIIC	6.440	Surplus
14	22 Km	IIIC	5.260	Surplus
47	21 Km	IIIC	3.752	Surplus
10	14 Km	IIIC	2.660	Surplus

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

PROVINCE : NUSA TENGGARA TIMUR KABUPATEN : ENDE

LINK NO	LENGTH	CLASS	NPV (1000Rp)	B/C	IRR (%)	REMARK
34	14 Km	IIIB-2	59586	1.259	15.716	Surplus
1	4 Km	IIIB-2	55293	1.790	25.973	VOC
33	11 Km	IIIB-2	22244	1.091	12.046	Surplus
18	6 Km	IIIB-2	16124	1.191	14.174	Surplus
5	2 Km	IIIB-1	15380	1.482	21.293	VOC
44	11 Km	IIIB-2	5380	1.013	10.270	Surplus
SUM	48 Km		174007			

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: Ende

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	554	1,324	1,878
MAINTENANCE	79	243	322
SUPPLEMENTATION	454	-	454
WORKSHOP EQUIPMENT & TOOLS	28	-	28
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	1,132	1,567	2,699

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	128	1,550	1,678
CONSTRUCTION & MAINTENANCE EQUIPMENT	889	-	889
SPARE PARTS	70	17	87
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	1,132	1,567	2,699

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 12 links with the total length of 102 km which is 21% of the 479 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 : ENDE

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary - Secondary	1,5,18,33,34, 44,
Engineering Point of View	6,30,32,48,50,51
Basic Human Needs	-

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

Since Road Links No 30 and No 32 are key road links which are located at the strategic point to complete the local road networks consisting of feasible road links, these road links are selected from the engineering points of view.

Road Links No 6, No 48, No,50 and No 51 form a by pass of the national road near Ende, the Kabupaten capital, where land slide is always observed, therefore these road links are proposed to be improved.

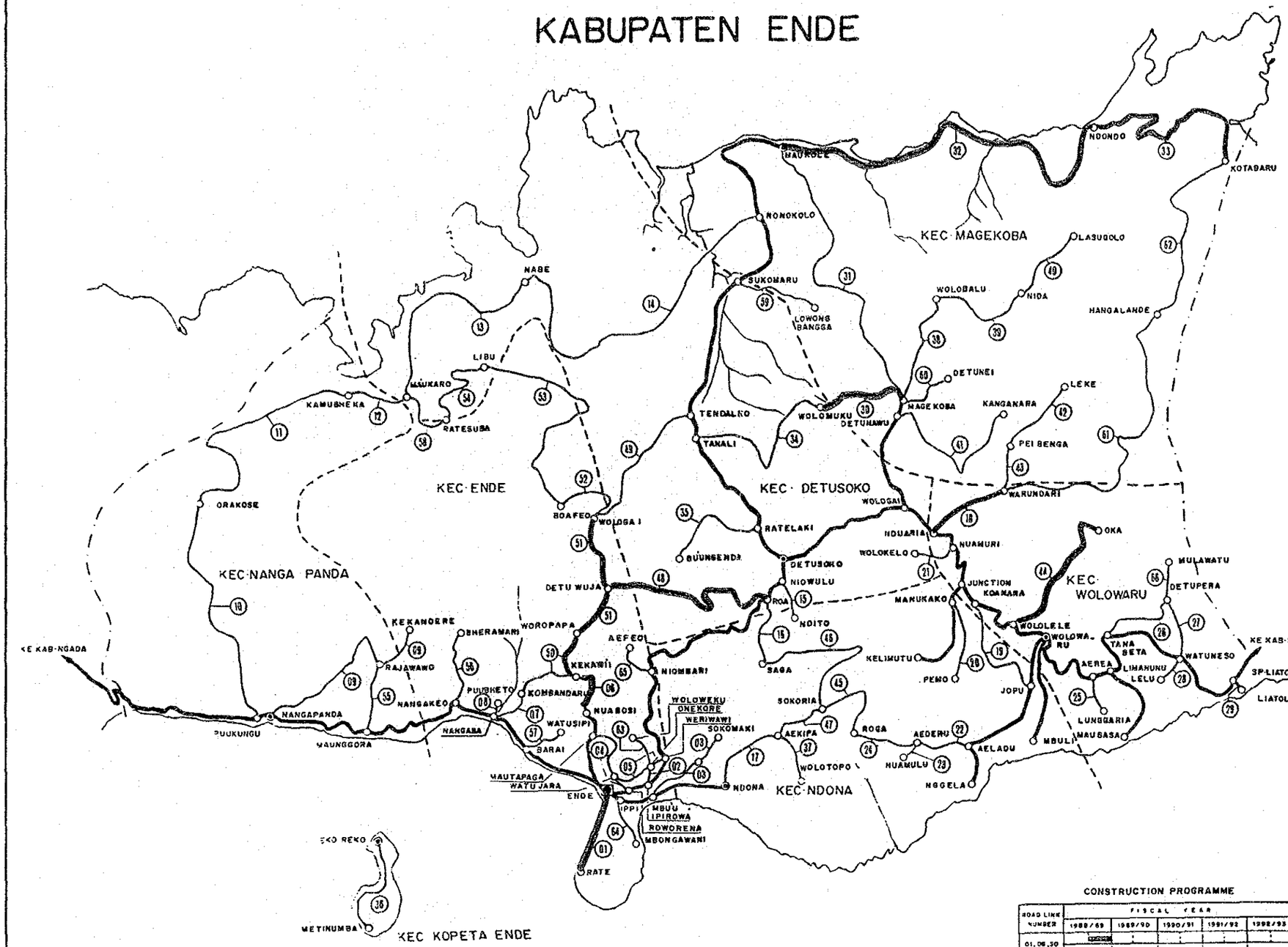
The order of proceeding with the improvement of the proposed road links are decided as shown in Table 6-1-4.

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

PROV : NUSA TENGGARA TIMUR KAB : ENDE

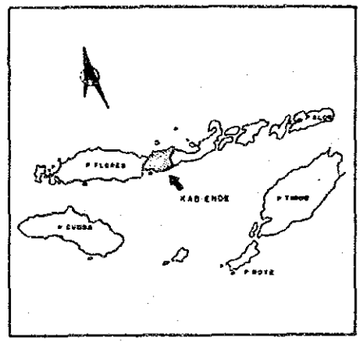
YEAR	LINK NO	( ) : rate
1988 :	1, 6, 30	
1989 :	32, 48	
1990 :	18, 33, 51 (45%)	
1991 :	34, 50	
1992 :	5, 44	

KABUPATEN ENDE



SCALE: 0 5 10 15 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 1988/89	1989/90	1990/91	1991/92	1992/93
01, 06, 50	145				
32, 48		408			
33			431		
18, 51				473	
34, 50					419
35, 44					419
TOTAL COST (10^6 Rp.)	145	408	431	473	419

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

TITLE : CONSTRUCTION PROGRAMME

SOURCE:	SCALE:	PROVINCE:
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	NUSATENGGARA TIMUR
		KABUPAEN: ENDE

(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 : NUSA TENGGARA TIMUR KAB : ENDE

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	GD (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TN NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
1	4	0.0	18.8	51.3	30.0	0	0	4	0	0.00	0	0.00	0	741	181	922
2	2	0.0	12.5	17.5	70.0	0	0	2	0	0.00	1	37.20	239	517	182	699
3	2	15.0	75.0	10.0	0.0	0	1	1	0	0.00	0	0.00	0	460	141	601
4	5	12.0	56.0	32.0	0.0	1	0	4	0	0.00	0	0.00	0	1,151	339	1,490
5	2	5.0	15.0	60.0	20.0	2	0	0	0	0.00	0	0.00	0	820	317	1,137
6	3	0.0	0.0	85.0	15.0	0	0	3	0	0.00	0	0.00	0	556	136	692
7	3	0.0	30.0	70.0	0.0	0	3	0	0	0.00	0	0.00	0	825	286	1,111
8	1	0.0	90.0	10.0	0.0	0	1	0	0	0.00	0	0.00	0	275	95	370
9	13	2.3	25.8	67.7	4.2	0	0	13	0	0.00	1	43.20	277	2,578	694	3,272
10	14	0.0	15.8	82.8	1.4	0	14	0	0	0.00	3	95.00	610	4,227	1,571	5,798
11	14	0.0	7.5	60.7	31.8	0	0	14	0	0.00	9	328.90	2,110	3,890	1,445	5,335
12	4	84.3	0.8	15.0	0.0	0	4	0	0	0.00	0	0.00	0	1,101	382	1,483
13	13	15.2	48.0	36.8	0.0	0	12	1	0	0.00	0	0.00	0	3,487	1,191	4,678
14	22	7.0	28.4	52.3	12.3	0	16	6	0	0.00	2	56.00	359	5,734	1,937	7,671
15	3	0.0	10.0	90.0	0.0	0	0	3	0	0.00	0	0.00	0	556	136	692
16	4	0.0	0.0	99.0	1.0	0	4	0	0	0.00	0	0.00	0	1,101	382	1,483
17	9	2.2	37.9	59.9	0.0	0	0	9	0	0.00	1	43.20	277	1,837	514	2,351
18	6	0.0	30.0	64.2	5.8	0	1	5	0	0.00	0	0.00	0	1,201	321	1,522
19	6	33.3	16.7	45.0	5.0	0	3	3	0	0.00	1	56.00	359	1,602	560	2,162
25	3	0.0	10.0	90.0	0.0	0	0	3	0	0.00	0	0.00	0	556	136	692
28	2	40.0	40.0	20.0	0.0	0	0	2	0	0.00	0	0.00	0	370	90	460
29	1	0.0	99.0	1.0	0.0	0	0	1	0	0.00	0	0.00	0	185	45	230
36	6	1.0	99.0	0.0	0.0	0	0	6	0	0.00	0	0.00	0	1,111	271	1,382
47	21	0.0	0.0	77.4	22.6	0	0	21	0	0.00	0	0.00	0	3,889	949	4,838
58	4	90.0	10.0	0.0	0.0	0	4	0	0	0.00	0	0.00	0	1,101	382	1,483
64	3	0.0	61.7	36.7	1.7	3	0	0	0	0.00	0	0.00	0	1,230	476	1,706
SUM	170					6	63	101	0	0.00	18	659.50	4,231	41,101	13,159	54,260

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 Ende 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 1,878 x 10^6 and maintenance cost is Rp 322 x 10^6 which is approximately 15% of the total expenditure.

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

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	104,173	279,128	296,755	327,975	271,659	1,279,690	(68.1%)
Ownership Cost	1,967	6,221	6,171	6,941	6,520	27,820	(2.2%)
Operation Cost	46,160	154,125	160,714	183,849	176,801	721,649	(56.4%)
Material Cost	19,335	23,792	36,976	35,385	15,724	131,212	(10.3%)
Labour Cost	23,123	58,582	54,187	59,021	37,180	232,093	(18.1%)
Contingency	13,588	36,408	38,707	42,779	35,434	166,916	(13.0%)
FOREIGN CURRENCY :	40,711	129,099	134,703	145,915	147,945	598,373	(31.9%)
Ownership Cost	26,496	87,974	91,710	104,031	101,446	411,657	(68.8%)
Operation Cost	3,670	12,765	13,586	15,632	15,353	61,006	(10.2%)
Material Cost	5,235	11,521	11,837	7,220	11,849	47,662	(8.0%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	5,310	16,839	17,570	19,032	19,297	78,048	(13.0%)
TOTAL COST :	144,884	408,227	431,458	473,891	419,604	1,878,064	
Ownership Cost	28,463	94,195	97,881	110,972	107,966	439,477	(23.4%)
Operation Cost	49,830	166,890	174,300	199,481	192,154	782,655	(41.7%)
Material Cost	24,570	35,313	48,813	42,605	27,573	178,874	(9.5%)
Labour Cost	23,123	58,582	54,187	59,021	37,180	232,093	(12.4%)
Contingency	18,898	53,247	56,277	61,812	54,731	244,965	(13.0%)

(Contingency : 15%)

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

(MAINTENANCE)

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	20,213	43,091	52,508	58,489	69,149	243,450	(75.5%)
Ownership Cost	268	582	717	829	935	3,331	(1.4%)
Operation Cost	11,832	25,373	30,566	34,773	39,120	141,664	(58.2%)
Material Cost	311	690	1,763	1,352	4,379	8,495	(3.5%)
Labour Cost	7,802	16,446	19,462	21,535	24,715	89,960	(37.0%)
FOREIGN CURRENCY :	6,494	13,984	17,018	19,337	21,993	78,826	(24.5%)
Ownership Cost	5,515	11,913	14,526	16,629	18,817	67,400	(85.5%)
Operation Cost	640	1,391	1,715	1,980	2,242	7,968	(10.1%)
Material Cost	339	680	777	728	934	3,458	(4.4%)
Labour Cost	0	0	0	0	0	0	(0.0%)
TOTAL COST :	26,707	57,075	69,526	77,826	91,142	322,276	
Ownership Cost	5,783	12,495	15,243	17,458	19,752	70,731	(21.9%)
Operation Cost	12,472	26,764	32,281	36,753	41,362	149,632	(46.4%)
Material Cost	650	1,370	2,540	2,080	5,313	11,953	(3.7%)
Labour Cost	7,802	16,446	19,462	21,535	24,715	89,960	(27.9%)

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

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	124,386	322,219	349,263	386,464	340,808	1,523,140	(69.2%)
Ownership Cost	2,235	6,803	6,888	7,770	7,455	31,151	(2.0%)
Operation Cost	57,992	179,498	191,280	218,622	215,921	863,313	(56.7%)
Material Cost	19,646	24,482	38,739	36,737	20,103	139,707	(9.2%)
Labour Cost	30,925	75,028	73,649	80,556	61,895	322,053	(21.1%)
Contingency	13,588	36,408	38,707	42,779	35,434	166,916	(11.0%)
FOREIGN CURRENCY :	47,205	143,083	151,721	165,252	169,938	677,199	(30.8%)
Ownership Cost	32,011	99,887	106,236	120,660	120,263	479,057	(70.7%)
Operation Cost	4,310	14,156	15,301	17,612	17,595	68,974	(10.2%)
Material Cost	5,574	12,201	12,614	7,948	12,783	51,120	(7.5%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	5,310	16,839	17,570	19,032	19,297	78,048	(11.5%)
TOTAL COST :	171,591	465,302	500,984	551,717	510,746	2,200,340	
Ownership Cost	34,246	106,690	113,124	128,430	127,718	510,208	(23.2%)
Operation Cost	62,302	193,654	206,581	236,234	233,516	932,287	(42.4%)
Material Cost	25,220	36,683	51,353	44,685	32,886	190,827	(8.7%)
Labour Cost	30,925	75,028	73,649	80,556	61,895	322,053	(14.6%)
Contingency	18,898	53,247	56,277	61,812	54,731	244,965	(11.1%)

(Contingency : 15%)

6.1.4 Construction and Maintenance Equipment Cost

(1) Required Number of Equipment

The required numbers of construction equipment for Kabupaten Ende are estimated from the annual proposed construction quantities as shown in Table 6-1-7.

The proposed numbers of equipment to be purchased are finally decided considering the following number of existing equipment in the Kabupaten which are available for the Project.

- 2-Steel Roller
- 2-Hand-guided Vibratory Roller
- 1-Portable Crusher

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 : NUSA TENGGARA TIMUR KAB : ENDE

EQUIPMENT NAME	WORKABLE	EXISTING	(1988)	(1989)	(1990)	(1991)	(1992)
Bulldozer/Ripper	250	0	0.25	2.15	2.49	3.11	3.67
Swamp Bulldozer	250	0	0.01	0.00	0.01	0.00	0.01
Motor Grader	250	0	0.38	0.66	0.66	0.73	0.42
Hand-guide Vib. Roller	250	3	0.57	1.15	0.64	0.42	0.43
Tire Roller	250	0	0.00	0.00	0.00	0.00	0.05
Vibratory Roller (D&T)	250	0	0.38	1.58	1.67	2.13	2.30
Hydraulic Excavator; Wheel	250	0	0.11	0.01	0.06	0.02	0.05
Wheel Loader	250	0	0.49	1.67	1.92	2.12	2.03
Water Tank Truck	250	0	0.23	0.87	0.92	1.14	1.19
Dump Truck	250	0	4.75	14.84	14.64	16.65	14.48
Flat Bed Truck with Crane	250	0	0.30	0.50	0.44	0.34	0.19
Flat Bed Truck	250	0	0.16	0.37	0.20	0.14	0.17
Portable Crusher/Screening	250	1	0.03	0.07	0.10	0.08	0.08
Concrete Mixer	250	0	0.18	0.38	0.16	0.10	0.12
Water Pump	250	0	0.12	0.26	0.12	0.08	0.09
Concrete Vibrator	250	0	0.02	0.03	0.04	0.02	0.02
Asphalt Sprayer	250	0	0.00	0.00	0.00	0.00	0.05

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

Table 6-1-8 EQUIPMENT PURCHASE COST

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(1000 Rp)

EQUIPMENT NAME	CLASS	CIF (JAKARTA)	PURCHASE NO.	PURCHASE COST
Bulldozer	90 HP	49,150	-	-
Bulldozer/Ripper	90 HP	53,000	3	159,000
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	-	-
Tire Roller	8-15 ton	31,070	2	62,140
Vibratory Roller (D&T)	4 ton	29,000	1	29,000
Vibratory Roller	4 ton	29,000	-	-
Rough Terrain Crane	10 ton	100,400	-	-
Hydraulic Excavator; Wheel	0.3 m3	41,100	-	-
Wheel Loader	1.2 m3	70,200	2	140,400
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	16	235,200
Dump Loader Truck	12 ton	56,300	1	56,300
Flat Bed Truck with Crane	3.0 ton	25,190	1	25,190
Flat Bed Truck	3.0 ton	11,275	2	22,550
Portable Crusher/Screening	30-40 t/h	188,000	-	-
Concrete Mixer	0.5 m3	18,000	1	18,000
Water Pump	200 l/min	630	-	-
Concrete Vibrator	3.3 HP	740	-	-
Asphalt Sprayer	850 ltr.	10,200	-	-
Service Car	3 ton	11,600	1	11,600
4 Wheel Drive Vehicle	70 HP	17,500	1	17,500
Motorcycle	100 cc	1,100	3	3,300

PURCHASE COST TOTAL	888,530
OWNERSHIP COST (FOREIGN)	434,724
EQUIPMENT COST SUPPLEMENTED	453,806

NOTE : OWNERSHIP COST (FOREIGN) for Existing Equipment

Hand-guide Vib. Roller	4,393
Vibratory Roller (D&T)	23,033
Portable Crusher/Screening	16,907
TOTAL	44,333

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 : NUSA TENGGARA TIMUR KAB : ENDE

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
Site Clearance in Light Bush	m2	10000.00	59000.00	50000.00	79500.00	45700.00	244200.00
Subgrade Preparation	m2	80000.00	115500.00	129310.00	151000.00	77810.00	553620.00
Normal Fill	m3	2111.00	50800.00	55675.00	75638.00	98280.00	282504.00
Fill in Swamp	m3	273.80	0.00	87.00	0.00	42.00	402.80
Normal Excavation to Spoil	m3	3039.00	3011.00	15556.55	3864.00	1084.00	26554.55
Sub Base Course	m3	7360.00	13284.40	11687.80	13260.00	6216.00	51768.20
Base Course	m3	960.00	2640.00	3900.00	2940.00	2640.00	13080.00
Shoulder	m2	32000.00	52000.00	51500.00	62000.00	39000.00	236500.00
Asphalt Patching	m2	0.00	0.00	0.00	0.00	456.00	456.00
Surface Dressing (Single)	m2	0.00	0.00	0.00	0.00	8000.00	8000.00
Surface Dressing (Double)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Earth Drain	m	15000.00	53420.00	36620.00	46540.00	8000.00	159580.00
Earth Drain in Swamp (by machine)	m3	1950.00	0.00	600.00	0.00	600.00	3150.00
Pipe Culvert D80cm	m	32.00	155.00	54.00	0.00	18.00	259.00
Masonry Culvert (80x80cm)	m	82.00	115.00	269.25	185.00	180.00	831.25
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	319.50	750.10	53.46	19.00	65.60	1207.66
Gabion Protection	m3	0.00	400.00	0.00	75.00	0.00	475.00
Superstructure (Timber;Span 3m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;10T)	m2	0.00	0.00	0.00	40.00	0.00	40.00
Superstructure (Timber;Span 8m;10T)	m2	144.00	56.00	314.00	292.00	48.00	854.00
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	3.00	1.00	5.90	8.00	1.00	18.90
Substructure (Abut;for Timber;10T)	NO	4.00	2.00	9.80	8.00	2.00	25.80
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	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Timber->Concrete)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Demolition of Bridge (Concrete)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Manual routine maintenance of road	Km	83.25	175.00	203.00	227.00	250.00	938.25
Routine maintenance of earth road	Km	48.75	94.00	91.50	89.00	89.00	412.25
Routine maintenance of gravel road	Km	31.50	75.00	105.50	132.00	156.00	500.00
Routine maintenance of asphalt road	Km	3.00	6.00	6.00	6.00	5.00	26.00
Maintenance of Timber Bridge (New)	m2	0.00	0.00	144.00	56.00	524.00	724.00
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Concrete Bridge (Exist)	m2	329.75	659.50	689.50	689.50	689.50	3057.75

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.

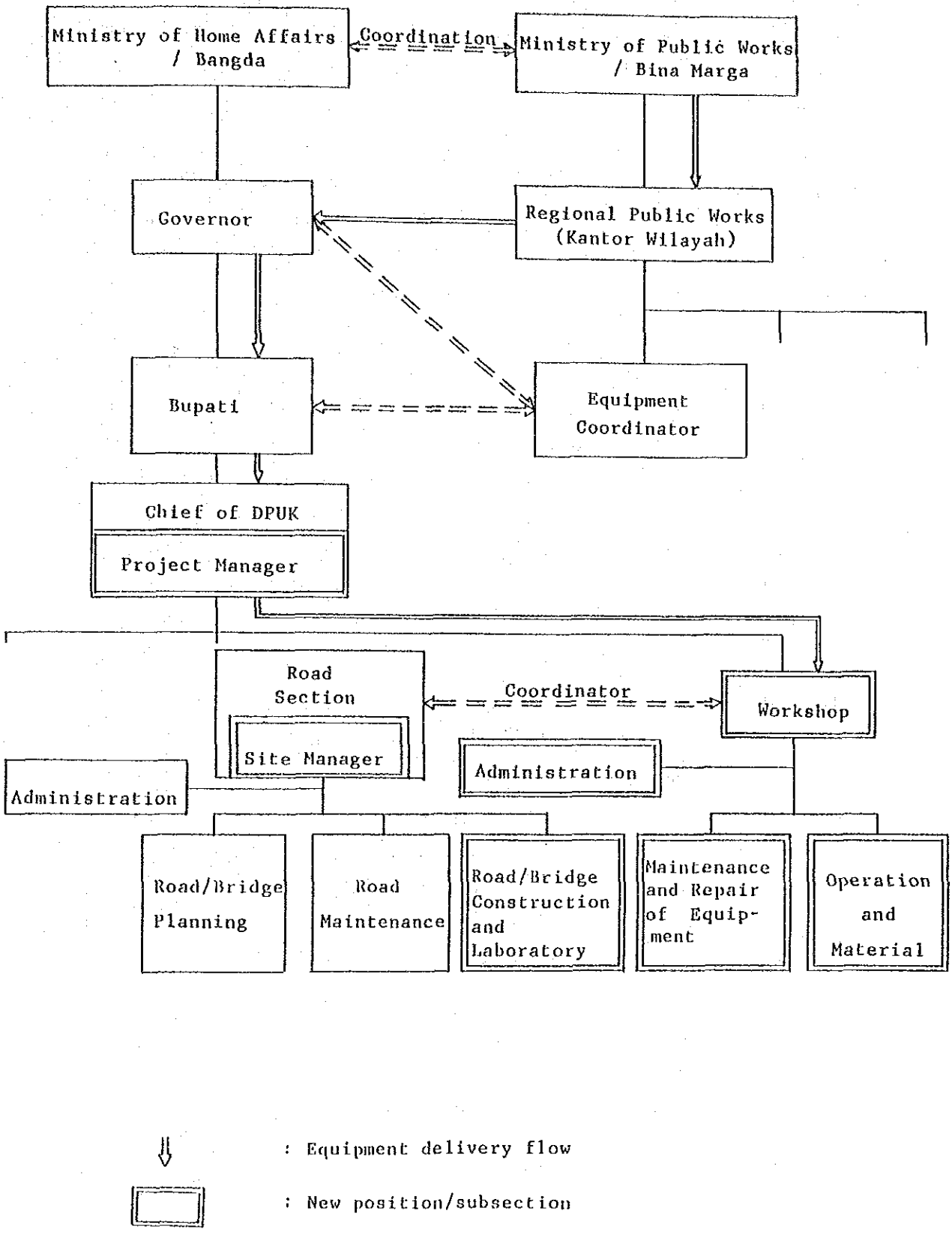
It is recommended that the workshop is newly organized to consist of three sub-sections, i.e. maintenance and repair of equipment, operation and materials, and administration to execute the main tasks described in Clause 3.5.

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. : NUSA TENGGARA TIMUR KAB. : ENDE SURVEY YEAR: 1984

Code No.	KECAMATAN NAME	CULTIVATED AREA : (PA)	YIELD RATE : (Y)	FARMER'S POPULATION : (AP)	CIRCULATED COMMODITY : (PG)
01	NANGA PANDA	1,353	4.19	14,834	1,000
02	ENDE	1,069	4.50	11,150	500
03	NDONA	1,505	4.23	13,477	1,000
04	WOLOWARU	4,162	4.30	27,050	1,000
05	MAGEKOBA/MAUROLE	2,520	4.40	12,992	3,000
06	DETUSUKO	4,670	4.08	17,355	2,000

	r_1	r_2	r_3	r_4
ANNUAL AVERAGE GROWTH RATE %	8.0	0.9	5.0	6.3

FARMER'S CONSUMPTION : (Cp)	NON-AGRO REQUIRMENT : (NG)
0.11 Ton/head/year	0.07 Ton/ton

	SEDAN	BUS	TRUCK	MOTOR CYCLE
RATE OF EACH VEHICLE TYPE %	39.67	2.94	27.32	30.57

AVERAGE FREIGHT TONAGE	0.6 Ton/Truck

Appendix A-2 Engineering Data

ROAD LINK DATA

PROVINCE : Nusa Tenggara Timur

KABUPATEN: Ende

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
01	E n d e	R a t e	4	E n d e	4	
02	Ipirowa	Weriwawi	2	E n d e	2	
03	Sokomaki	Mbu'u	2	E n d e Ndona	0.5 1.5	
04	Mautapaga	Roworena	5	E n d e	5	
05	Onekore	Watujara	2	E n d e	2	
06	Nuabosi	Kekawi'i	3	E n d e	3	
07	Nangaba	Kombandaru	3	E n d e	3	
08	Nangaba	Pu'ubheto	1	E n d e	1	
09	Nangapanda	Kekandere	13	Nanga Panda E n d e	10 3	
10	Pu'ukungu	Orakose	14	Nanga Panda	14	1
11	Orakose	Kamubheka	14	Nanga Panda	14	2
12	Kamubheka	Ma'ukaro	4	Detu soko Nanga Panda	1 3	3
13	Ma'ukaro	N a b e	13	Detu Soko	13	4
14	N a b e	Ronokolo	22	Detu Soko Magekoba	18 4	5
15	Niowulu	N d i t o	3	Detu Soko Ndona	2 1	
16	Roa	S a g a	4	Detu Soko Ndona	1 3	
17	N d o n a	A e k i p a	9	N d o n a	9	
18	Nduaria	Warundari	6	Wolowaru	6	
19	Koanara	J o p u	6	N d o n a Wolowaru	5 1	
20	Manukako	P e m o	3	N d o n a	3	
21	Nuamuri	Wolokelo	3	Detu Soko Wolowaru	1 2	
22	Aeladu	Aederu	2	N d o n a	2	
23	Aederu	Nuamulu	2	N d o n a	2	
24	Aederu	R o g a	4	N d o n a	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 : Nusa Tenggara Timur

KABUPATEN: E n d e

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
25	Lunggaria	Aerea	4	Wolowaru	4	
26	Tanabeta	Detupera	3	Wolowaru	3	
27	Watuneso	Detupera	5	Wolowaru	5	
28	Watuneso	L e l u	4	Wolowaru	4	
29	Liatola	Sp.Liatola	1	Wolowaru	1	
30	Magekoba	Wolomuku	5	Magekoba Detu Soko	4 1	9
31	Magekoba	Maurole	21	Magekoba	21	10
32	Ndondo	Maurole	20	Magekoba	20	6
33	Ndondo	Kotabaru	11	Magekoba	11	7
34	Tanali	Wolomuku	14	Detu Soko	14	8
35	Rate laki	Bu'ungenda	6	Detu Soko	6	
36	Ekoreko	Metinumba	6	E n d e	6	
37	Wolotopo	Aekipa	3	N d o n a	3	
38	Wolobalu	Magekoba	10	Magekoba	10	
39	Wolobalu	N i d a	8	Magekoba	8	
40	N i d a	Lasugolo	5	Magekoba	5	
41	Detunawu	Kanganara	11	Magekoba	11	
42	L e k e	Peibenga	8	Magekoba	8	
43	Peibenga	Warundari	3	Magekoba	3	
44	O k a	Wololele	11	Wolowaru	11	
45	R o g a	Sokoria	7	N d o n a	7	
46	Sokoria	S a g a	14	N d o n a	14	
47	Sokoria	Aekipa	21	N d o n a	21	
48	R o a	Detuwuja	11	Detu Soko E n d e	9 2	

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 : Nusa Tenggara Timur

KABUPATEN: Ende

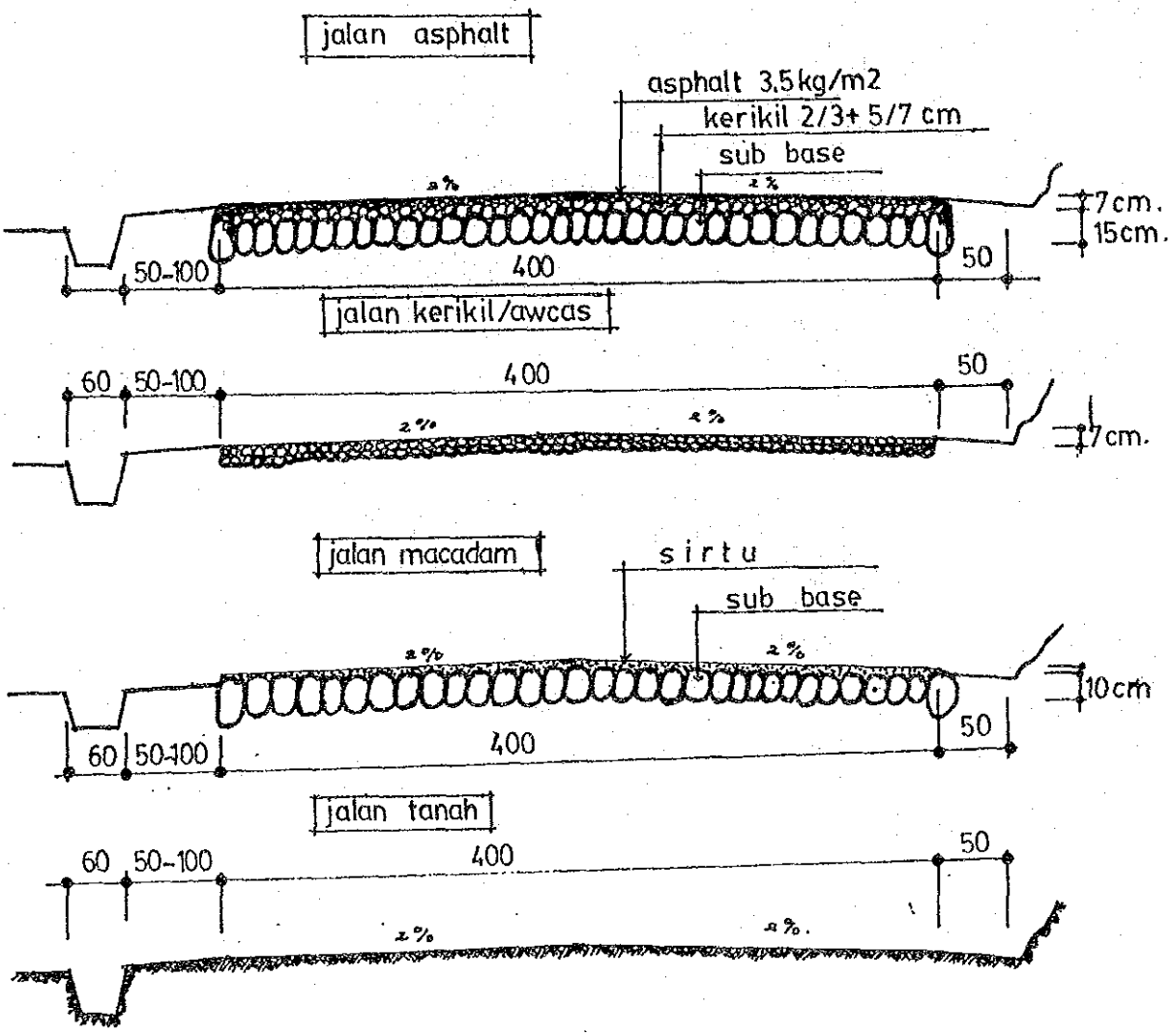
LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
49	Wologai	Tandaleo	12	Detu Soko E n d e	11 1	
50	Komban Ndaru	Woropapa	10	E n d e	10	
51	Wologai	Woropapa	10	E n d e	10	
52	Wologai	Boafeo	3	Detu Soko E n d e	1 2	
53	Boafeo	L i b u	15	Detu Soko E n d e	2 13	
54	L i b u	Ratesuba	15	Detu Soko	15	
55	Rajawawo	Maunggora	5	Nanga Panda	5	
56	Bheramari	Nangakeo	5	E n d e	5	
57	B a r a i	Watusipu	3	E n d e	3	
58	Ma'ukaro	Ratesuba	4	Detu Soko E n d e	2 2	
59	Sukomaru	Lowong Bang-ga	6	Detu Soko Magekoba	1 5	
60	Detunei	Magekoba	4	Magekoba	4	
61	Warundari	Hangalande	10	Magekoba	10	
62	Hangalande	Kota Baru	12	Magekoba	12	
63	Onekore	Woloweku	2	E n d e	2	
64	Mbongawani	I p p i	3	E n d e	3	
65	Niombari	Aefero	3	E n d e	3	
66	Detupera	Mulawatu	3	Wolowaru	3	

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.



PROPINSI: Nusa Tenggara Timur

E-03-(1)

KABUPATEN: Ende

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
19	Koanara - Jopu	- / 3.5	- / Gelagor Baja	- / 14 m	19,000	

* 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: Nusa Tenggara Timur

KABUPATEN: Ende

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
10	Puukungu - Orakose	4	Gravel	13	61,929	
		4	Beton	47 m	77,969	
11	Orakose - Kamulheka	-	-	-	73,993	
		4	Beton	44 m'		
31	Magekoba - Maurole	3.5	Gravel/Awcas	5	35,298	
		-	-	-		
6	Nuabosi - Kekawii	4	Gravel/Awcas	3.2	27,976	
		-	-	-		
3	Sokomaki - Mbuu	4	Gravel/Awcas	2.5	26,919	
		-	-	-		

* 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: Nusa Tenggara Timur

E-03-(3)

KABUPATEN: Ende

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
32	Ndondo - Maurole	4	Gravel	11	70,488	
		-	-	-		
14	Nabe - Kanokolo	4	Gravel	21	141,987	
		4	-	-		
05	Onekore - Watujara	4	Asphalt	1.5	43,731	
		-	-	-		
35	Ratelaki - Mbuungenda	4	Gravel/Awcas	8	20,421	
		-	-	-		
34	Tanali - Wolomuku	4	Gravel/Awcas	10	25,260	
		-	-	-		
31	Muamuri - Wolokelo	4	Gravel/Awcas	3	14,550	
		-	-	-		
25	Alrea - Lunggaria	4	Gravel/Awcas	2	12,363	
		-	-	-		
20	Manukako - Pemo	4	Gravel/Awcas	4.1	14,557	
		-	-	-		

* 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: Nusa Tenggara Timur E-03-(4)

KABUPATEN: Ende

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
19	Koanora - Jopu	4	Gravel	1.4	30,487	
		-	-	-		
23	Ae Deru - Nuamulu	4	Gravel	1.5	13,890	
		-	-	-		
26	Tanabeta - Detupera	4	Gravel/Awcas	2.2	17,542	
		-	-	-		
27	Kolojana - Detupera	4	Gravel/Awcas	2	24,185	
		-	-	-		
09	Nangapanda-Kekandere	4	Gravel/Awcas	12.1	44,350	
		-	-	-		
07	Nangaba - Komboru	4	Gravel	3.6	23,206	
08	Nangaba - Pubheto	-	-	-		
13	Manharo - Nabe	4	Gravel	13	133,363	
		-	-	-		
12	Kamubhéka - Mankaro	4	Gravel	6	52,734	
		4	Beton	15 m	19,771	

* 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: Nusa Tenggara Timur

E-03-(5)

KABUPATEN: Ende

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
21	Nuamuri - Wolakelo	4	Gravel	2.9	30,500	
		-	-	-		
34	Tanali - Wolomuku	4	Gravel	6	51,091	
		-	-	-		
11	Orakose - Kamubheka	4	Gravel	14	99,597	
		-	-	-		
32	Ndondo - Maurole	4	Gravel	9	59,850	
		-	-	-		

* 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 : Nusa Tenggara Timur

E-04

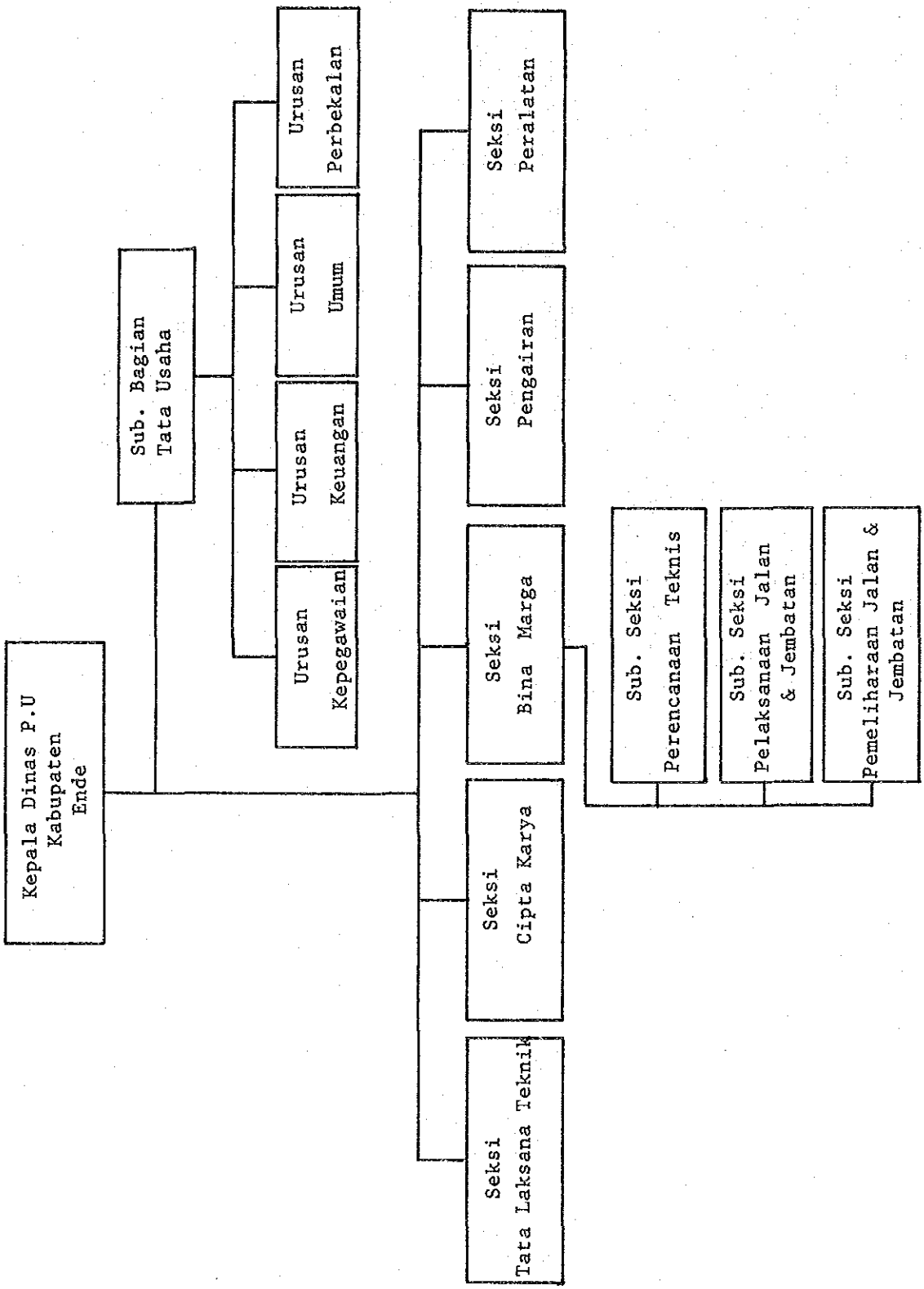
KABUPATEN: Ende

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: Nusa Tenggara Timur

KABUPATEN: Ende

DESCRIPTION /Uraian	NUMBER / Jumlah	REMARKS Keterangan
CONTROLING STAFF Staff teknis PUK	(15)	
DPUK ENGINEED Sarjana Teknik	-	
ASSISTANT ENGINEER Sarjana Muda Teknik	3	
TECHNICIAN STAFF Staff Teknik (STM)	12	
ADMINISTRATION Tenaga Administrasi	16	
SUPERVISOR Tenaga Pengawas	8	
WORKING FORCE Tenaga Pelaksana Lapangan	(83)	
OPERATORS Operators	10	
DRIVERS Supir	7	
MECHANICS Mechanic	6	
TRADESMAN Tukang	5	
L A B O U R Buruh / Pekerja	40	
OTHERS Lain-lain	15	
TOTAL / JUMLAH	117	

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

E-06

LOCATION AND AREA OF DPUK WORKSHOP

Lokasi Workshop DPUK

PROPINSI : Nusa Tenggara Timur

KABUPATEN: Ende

LOCATION Lokasi	AREA (m2) Luas	NUMBER Jumlah	REMARKS Keterangan
Ende	20.000	-	-

PROPINSI: Nusa Tenggara Timur

E-07

KABUPATEN: Ende

LAND ACQUISITION COST

Daftar harga pembebasan tanah

DESCRIPTION Uraian	UNIT Satuan	RATE (RP) Harga	REMARKS Keterangan
CITY/kota	M2	10,000	
VILLAGE / desa	M2	5,000	
RICE FIELD/sawah	M2	7,500	
DRY FIELD/ladang	M2	5,000	
MIX CROPS/panen	M2	8,000	
FOREST/hutan	M2	10,000	
SWAMP / rawa	M2	3,000	
OTHERS / lain-lain	M2	-	

PROPINSI: Nusa Tenggara Timur

KABUPATEN: Ende

E-08

Classification of local contractors at Kabupaten level.

Klasifikasi kontraktor di Kabupaten

COMPANY NAME Nama Kontraktor	CLASS Kelas	CAPITAL Modal (Rp)	NUMBER OF EMPLOYEE Jumlah pegawai	REMARKS Keterangan
1	A	1,725,001,000	28	
7	B2	161,086,000	9	
1	C2	65,723,000	7	
51	C3	48,866,000	7	

NOTE: DATI II

PROPINSI: Nusa Tenggara Timur

KABUPATEN: Ende

E-09

LIST OF EXISTING EQUIPMENT OF LOCAL CONTRACTOR

Name of contractor

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

PROPINSI: Nusa Tenggara Timur

KABUPATEN: Ende

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	MV 6 P	1969	2	5	7		
Vibration Roller	MGB I	1981	3	1	4		
Wheel Loader							
Front End Loader and Backhoe							
Mobile Crane							
Concrete Mixer							
Stone Crusher	DDV I	1978	1	1	2		
Portable Compressor							
Hydraulic Excavator							
Asphalt Paving Machine							
Asphalt Sprayer							
Asphalt Mixing Machine							
Mobile Workshop							
Mechanic Rammer							
Plate Tamper							
Pile Driver							
Leg Drill							
Hand Hammer							
Farm Tractor							
Dump Truck							
Water Tank Truck							
Fuel Tank Truck							
Pick Up							
Jeep							
Motorcycle							
Generator							
Water Pump							
Others							
-							

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

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 51 (IIIC) LENGTH : 10 Km

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

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Site Clearance in Light Bush	m2	50000.0	152	91	7,600,000	4,550,000	12,150,000
Subgrade Preparation	m2	60000.0	19	11	1,140,000	660,000	1,800,000
Normal Fill	m3	78500.0	1,565	865	122,852,500	67,902,500	190,755,000
Fill in Swamp	m3	0.0	2,319	1,054	0	0	0
Normal Excavation to Spoil	m3	739.0	919	523	679,141	386,497	1,065,638
Sub Base Course	m3	6400.0	2,980	1,350	19,072,000	8,640,000	27,712,000
Base Course	m3	0.0	4,066	2,303	0	0	0
Shoulder	m2	20000.0	271	146	5,420,000	2,920,000	8,340,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	17600.0	645	119	11,352,000	2,094,400	13,446,400
Earth Drain in Swamp (by machine)	m3	0.0	1,060	474	0	0	0
Pipe Culvert D80cm	m	0.0	39,849	47,521	0	0	0
Masonry Culvert (80x80cm)	m	185.0	50,912	41,199	9,418,720	7,621,815	17,040,535
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	24.8	35,768	12,267	887,046	304,221	1,191,267
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	15,344,616	1,299,898	16,644,514
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		193,766,023	96,379,331	290,145,354
Overhead (15%)					29,064,903	14,456,899	43,521,802
			TOTAL COST		222,830,926	110,836,230	333,667,156
Manual routine maintenance of road	Km	10.0	101,056	7,260	1,010,560	72,600	1,083,160
Routine maintenance of gravel road	Km	10.0	174,087	88,186	1,740,870	881,860	2,622,730
			Sub Total		2,751,430	954,460	3,705,890
Maintenance of Timber Bridge (New)	m2	120.0	9,552	1,121	1,146,240	134,520	1,280,760
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	31,452,597
Timber Bridge	Unit Cost	(Rp/m2)	:	159,510
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	11,084,800
Maintenance Rate without Bridge		(%)	:	1.18
New Bridge Cost Rate		(%)	:	5.74

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 50 (111C) LENGTH : 10 Km

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

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	40500.0	152	91	6,156,000	3,685,500	9,841,500
Subgrade Preparation	m2	60000.0	19	11	1,140,000	660,000	1,800,000
Normal Fill	m3	68238.0	1,565	865	106,792,470	59,025,870	165,818,340
Fill in Swamp	m3	0.0	2,319	1,054	0	0	0
Normal Excavation to Spoil	m3	1774.0	919	523	1,630,306	927,802	2,558,108
Sub Base Course	m3	6400.0	2,980	1,350	19,072,000	8,640,000	27,712,000
Base Course	m3	0.0	4,066	2,303	0	0	0
Shoulder	m2	20000.0	271	146	5,420,000	2,920,000	8,340,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	19800.0	645	119	12,771,000	2,356,200	15,127,200
Earth Drain in Swamp (by machine)	m3	0.0	1,060	474	0	0	0
Pipe Culvert D80cm	m	0.0	39,849	47,521	0	0	0
Masonry Culvert (80x80cm)	m	105.0	50,912	41,199	5,345,760	4,325,895	9,671,655
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	11.7	35,768	12,267	418,485	143,523	562,008
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	5,314,908	498,129	5,813,037
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		164,060,929	83,182,919	247,243,848
Overhead (15%)					24,609,139	12,477,437	37,086,576
			TOTAL COST		188,670,068	95,660,356	284,330,424
Manual routine maintenance of road	Km	10.0	101,056	7,260	1,010,560	72,600	1,083,160
Routine maintenance of gravel road	Km	10.0	174,087	88,186	1,740,870	881,860	2,622,730
			Sub Total		2,751,430	954,460	3,705,890
Maintenance of Timber Bridge (New)	m2	40.0	9,552	1,121	382,080	44,840	426,920
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement Unit Cost		(Rp/Km)	:	27,764,543
Timber Bridge Unit Cost		(Rp/m2)	:	167,125
Concrete Bridge Unit Cost		(Rp/m2)	:	
Survived Value		*(Rp)*	:	*11,084,800*
Maintenance Rate without Bridge		(%)	:	1.33
New Bridge Cost Rate		(%)	:	2.35

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 48 (IIIC) LENGTH : 11 Km

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

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	55000.0	152	91	8,360,000	5,005,000	13,365,000
Subgrade Preparation	m2	66000.0	19	11	1,254,000	726,000	1,980,000
Normal Fill	m3	50800.0	1,565	865	79,502,000	43,942,000	123,444,000
Fill in Swamp	m3	0.0	2,319	1,054	0	0	0
Normal Excavation to Spoil	m3	2291.0	919	523	2,105,429	1,198,193	3,303,622
Sub Base Course	m3	7040.0	2,980	1,350	20,979,200	9,504,000	30,483,200
Base Course	m3	0.0	4,066	2,303	0	0	0
Shoulder	m2	22000.0	271	146	5,962,000	3,212,000	9,174,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	18700.0	645	119	12,061,500	2,225,300	14,286,800
Earth Drain in Swamp (by machine)	m3	0.0	1,060	474	0	0	0
Pipe Culvert D80cm	m	140.0	39,849	47,521	5,578,860	6,652,940	12,231,800
Masonry Culvert (80x80cm)	m	0.0	50,912	41,199	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	735.2	35,768	12,267	26,296,633	9,018,698	35,315,331
Gabion Protection	m3	400.0	10,681	121	4,272,400	48,400	4,320,800
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		166,372,022	81,532,531	247,904,553
Overhead (15%)					24,955,803	12,229,879	37,185,682
			TOTAL COST		191,327,825	93,762,410	285,090,235
Manual routine maintenance of road	Km	11.0	101,056	7,260	1,111,616	79,860	1,191,476
Routine maintenance of gravel road	Km	11.0	174,087	88,186	1,914,957	970,046	2,885,003
			Sub Total		3,026,573	1,049,906	4,076,479
Maintenance of Timber Bridge (New)	m2	0.0	9,552	1,121	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	25,917,294
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	12,193,280
Maintenance Rate without Bridge		(%)	:	1.43
New Bridge Cost Rate		(%)	:	

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 44 (IIIB-2) LENGTH : 11 Km

UPGRADE : 7.0m road bed, 4.0m road with surface Base Cource

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	45700.0	152	91	6,946,400	4,158,700	11,105,100
Subgrade Preparation	m2	77000.0	19	11	1,463,000	847,000	2,310,000
Normal Fill	m3	97800.0	1,565	865	153,057,000	84,597,000	237,654,000
Fill in Swamp	m3	0.0	2,319	1,054	0	0	0
Normal Excavation to Spoil	m3	984.0	919	523	904,296	514,632	1,418,928
Sub Base Course	m3	6160.0	2,980	1,350	18,356,800	8,316,000	26,672,800
Base Course	m3	2640.0	4,066	2,303	10,734,240	6,079,920	16,814,160
Shoulder	m2	33000.0	271	146	8,943,000	4,818,000	13,761,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	8000.0	645	119	5,160,000	952,000	6,112,000
Earth Drain in Swamp (by machine)	m3	0.0	1,060	474	0	0	0
Pipe Culvert D80cm	m	18.0	39,849	47,521	717,282	855,378	1,572,660
Masonry Culvert (80x80cm)	m	180.0	50,912	41,199	9,164,160	7,415,820	16,579,980
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	35.6	35,768	12,267	1,273,340	436,705	1,710,045
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	6,723,084	588,305	7,311,389
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		223,442,602	119,579,460	343,022,062
Overhead (15%)					33,516,390	17,936,919	51,453,309
			TOTAL COST		256,958,992	137,516,379	394,475,371
Manual routine maintenance of road	Km	11.0	101,056	7,260	1,111,616	79,860	1,191,476
Routine maintenance of gravel road	Km	11.0	174,087	88,186	1,914,957	970,046	2,885,003
			Sub Total		3,026,573	1,049,906	4,076,479
Maintenance of Timber Bridge (New)	m2	48.0	9,552	1,121	458,496	53,808	512,304
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	35,097,025
Timber Bridge	Unit Cost	(Rp/m2)	:	175,169
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	13,336,400
Maintenance Rate without Bridge		(%)	:	1.06
New Bridge Cost Rate		(%)	:	2.13

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 34 (IIIB-2) LENGTH : 14 Km

UPGRADE : 6.5m road bed, 3.5m road with surface Base Cource

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	39000.0	152	91	5,928,000	3,549,000	9,477,000
Subgrade Preparation	m2	91000.0	19	11	1,729,000	1,001,000	2,730,000
Normal Fill	m3	7400.0	1,565	865	11,581,000	6,401,000	17,982,000
Fill in Swamp	m3	0.0	2,319	1,054	0	0	0
Normal Excavation to Spoil	m3	2090.0	919	523	1,920,710	1,093,070	3,013,780
Sub Base Course	m3	6860.0	2,980	1,350	20,442,800	9,261,000	29,703,800
Base Course	m3	2940.0	4,066	2,303	11,954,040	6,770,820	18,724,860
Shoulder	m2	42000.0	271	146	11,382,000	6,132,000	17,514,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	26740.0	645	119	17,247,300	3,182,060	20,429,360
Earth Drain in Swamp (by machine)	m3	0.0	1,060	474	0	0	0
Pipe Culvert D80cm	m	0.0	39,849	47,521	0	0	0
Masonry Culvert (80x80cm)	m	80.0	50,912	41,199	4,072,960	3,295,920	7,368,880
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	7.3	35,768	12,267	261,106	89,549	350,655
Gabion Protection	m3	75.0	10,681	121	801,075	9,075	810,150
New Bridge (Timber)	SET	1.0	--	--	33,754,276	2,656,643	36,410,919
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		121,074,267	43,441,137	164,515,404
Overhead (15%)					18,161,140	6,516,170	24,677,310
			TOTAL COST		139,235,407	49,957,307	189,192,714
Manual routine maintenance of road	Km	14.0	101,056	7,260	1,414,784	101,640	1,516,424
Routine maintenance of gravel road	Km	14.0	174,087	88,186	2,437,218	1,234,604	3,671,822
			Sub Total		3,852,002	1,336,244	5,188,246
Maintenance of Timber Bridge (New)	m2	292.0	9,552	1,121	2,789,184	327,332	3,116,516
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement Unit Cost	(Rp/Km)	:	10,522,868
Timber Bridge Unit Cost	(Rp/m2)	:	143,399
Concrete Bridge Unit Cost	(Rp/m2)	:	
Survived Value	(Rp)	:	14,051,900
Maintenance Rate without Bridge	(%)	:	3.52
New Bridge Cost Rate	(%)	:	22.13

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 33 (IIIB-2) LENGTH : 11 Km

UPGRADE : 6.5m road bed, 4.0m road with surface Base Cource

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	27500.0	152	91	4,180,000	2,502,500	6,682,500
Subgrade Preparation	m2	71500.0	19	11	1,358,500	786,500	2,145,000
Normal Fill	m3	14550.0	1,565	865	22,770,750	12,585,750	35,356,500
Fill in Swamp	m3	0.0	2,319	1,054	0	0	0
Normal Excavation to Spoil	m3	13436.0	919	523	12,347,684	7,027,028	19,374,712
Sub Base Course	m3	6160.0	2,980	1,350	18,356,800	8,316,000	26,672,800
Base Course	m3	2640.0	4,066	2,303	10,734,240	6,079,920	16,814,160
Shoulder	m2	27500.0	271	146	7,452,500	4,015,000	11,467,500
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,916	1,207	0	0	0
Earth Drain	m	19800.0	645	119	12,771,000	2,356,200	15,127,200
Earth Drain in Swamp (by machine)	m3	0.0	1,060	474	0	0	0
Pipe Culvert D80cm	m	54.0	39,849	47,521	2,151,846	2,566,134	4,717,980
Masonry Culvert (80x80cm)	m	84.0	50,912	41,199	4,276,608	3,460,716	7,737,324
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	26.2	35,768	12,267	937,121	321,395	1,258,516
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	32,740,754	2,735,399	35,476,153
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		130,077,803	52,752,542	182,830,345
Overhead (15%)					19,511,670	7,912,881	27,424,551
			TOTAL COST		149,589,473	60,665,423	210,254,896
Manual routine maintenance of road	Km	11.0	101,056	7,260	1,111,616	79,860	1,191,476
Routine maintenance of gravel road	Km	11.0	174,087	88,186	1,914,957	970,046	2,885,003
			Sub Total		3,026,573	1,049,906	4,076,479
Maintenance of Timber Bridge (New)	m2	260.0	9,552	1,121	2,483,520	291,460	2,774,980
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement Unit Cost	(Rp/Km)	:	15,405,211
Timber Bridge Unit Cost	(Rp/m2)	:	156,914
Concrete Bridge Unit Cost	(Rp/m2)	:	
Survived Value	(Rp)	:	13,336,400
Maintenance Rate without Bridge	(%)	:	2.41
New Bridge Cost Rate	(%)	:	19.40

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 32 (IIIC) LENGTH : 20 Km

UPGRADE : 5.5m road bed, 4.0m road with surface Subbase Cource

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	4000.0	152	91	608,000	364,000	972,000
Subgrade Preparation	m2	49500.0	19	11	940,500	544,500	1,485,000
Normal Fill	m3	0.0	1,565	865	0	0	0
Fill in Swamp	m3	0.0	2,319	1,054	0	0	0
Normal Excavation to Spoil	m3	720.0	919	523	661,680	376,560	1,038,240
Sub Base Course	m3	6204.4	2,980	1,350	18,489,112	8,375,940	26,865,052
Base Course	m3	2640.0	4,066	2,303	10,734,240	6,079,920	16,814,160
Shoulder	m2	30000.0	271	146	8,130,000	4,380,000	12,510,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	34720.0	645	119	22,394,400	4,131,680	26,526,080
Earth Drain in Swamp (by machine)	m3	0.0	1,060	474	0	0	0
Pipe Culvert D80cm	m	15.0	39,849	47,521	597,735	712,815	1,310,550
Masonry Culvert (80x80cm)	m	115.0	50,912	41,199	5,854,880	4,737,885	10,592,765
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	14.9	35,768	12,267	532,943	182,778	715,721
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	7,355,900	629,401	7,985,301
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		76,299,390	30,515,479	106,814,869
Overhead (15%)					11,444,908	4,577,321	16,022,229
			TOTAL COST		87,744,298	35,092,800	122,837,098
Manual routine maintenance of road	Km	20.0	101,056	7,260	2,021,120	145,200	2,166,320
Routine maintenance of gravel road	Km	20.0	174,087	88,186	3,481,740	1,763,720	5,245,460
			Sub Total		5,502,860	1,908,920	7,411,780
Maintenance of Timber Bridge (New)	m2	56.0	9,552	1,121	534,912	62,776	597,688
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	30.0	3,946	2,470	118,380	74,100	192,480

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	5,682,700
Timber Bridge	Unit Cost	(Rp/m2)	:	163,984
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	10,746,020
Maintenance Rate without Bridge		(%)	:	6.52
New Bridge Cost Rate		(%)	:	7.48

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 30 (IIIC) LENGTH : 5 Km

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

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Site Clearance in Light Bush	m2	10000.0	152	91	1,520,000	910,000	2,430,000
Subgrade Preparation	m2	30000.0	19	11	570,000	330,000	900,000
Normal Fill	m3	970.0	1,565	865	1,518,050	839,050	2,357,100
Fill in Swamp	m3	52.5	2,319	1,054	121,747	55,335	177,082
Normal Excavation to Spoil	m3	863.0	919	523	793,097	451,349	1,244,446
Sub Base Course	m3	3200.0	2,980	1,350	9,536,000	4,320,000	13,856,000
Base Course	m3	0.0	4,066	2,303	0	0	0
Shoulder	m2	10000.0	271	146	2,710,000	1,460,000	4,170,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	9600.0	645	119	6,192,000	1,142,400	7,334,400
Earth Drain in Swamp (by machine)	m3	750.0	1,060	474	795,000	355,500	1,150,500
Pipe Culvert D80cm	m	0.0	39,849	47,521	0	0	0
Masonry Culvert (80x80cm)	m	74.0	50,912	41,199	3,767,488	3,048,726	6,816,214
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	10.2	35,768	12,267	364,833	125,123	489,956
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	17,712,546	1,456,049	19,168,595
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		45,600,761	14,493,532	60,094,293
Overhead (15%)					6,840,114	2,174,029	9,014,143
			TOTAL COST		52,440,875	16,667,561	69,108,436
Manual routine maintenance of road	Km	5.0	101,056	7,260	505,280	36,300	541,580
Routine maintenance of gravel road	Km	5.0	174,087	88,186	870,435	440,930	1,311,365
			Sub Total		1,375,715	477,230	1,852,945
Maintenance of Timber Bridge (New)	m2	144.0	9,552	1,121	1,375,488	161,424	1,536,912
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	9,412,911
Timber Bridge	Unit Cost	(Rp/m2)	:	153,083
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	5,542,400
Maintenance Rate without Bridge		(%)	:	3.94
New Bridge Cost Rate		(%)	:	31.90

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 18 (IIIB-2) LENGTH : 6 Km

UPGRADE : 6.0m road bed, 3.5m road with surface Base Cource

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	COST TOTAL
Site Clearance in Light Bush	m2	0.0	152	91	0	0	0
Subgrade Preparation	m2	30810.0	19	11	585,390	338,910	924,300
Normal Fill	m3	5800.0	1,585	885	9,077,000	5,017,000	14,094,000
Fill in Swamp	m3	87.0	2,319	1,054	201,753	91,698	293,451
Normal Excavation to Spoil	m3	1788.0	919	523	1,643,172	935,124	2,578,296
Sub Base Course	m3	2647.8	2,980	1,350	7,890,444	3,574,530	11,464,974
Base Course	m3	1260.0	4,066	2,303	5,123,160	2,901,780	8,024,940
Shoulder	m2	15000.0	271	146	4,065,000	2,190,000	6,255,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	8900.0	645	119	5,740,500	1,059,100	6,799,600
Earth Drain in Swamp (by machine)	m3	600.0	1,060	474	636,000	284,400	920,400
Pipe Culvert D80cm	m	0.0	39,849	47,521	0	0	0
Masonry Culvert (80x80cm)	m	102.0	50,912	41,199	5,193,024	4,202,298	9,395,322
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	16.1	35,768	12,267	575,864	197,498	773,362
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		40,731,307	20,792,338	61,523,645
Overhead (15%)					6,109,696	3,118,850	9,228,546
			TOTAL COST		46,841,003	23,911,188	70,752,191
Manual routine maintenance of road	Km	6.0	101,056	7,260	606,336	43,560	649,896
Routine maintenance of gravel road	Km	6.0	174,087	88,186	1,044,522	529,116	1,573,638
			Sub Total		1,650,858	572,676	2,223,534
Maintenance of Timber Bridge (New)	m2	0.0	9,552	1,121	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	11,792,032
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	5,732,487
Maintenance Rate without Bridge		(%)	:	3.14
New Bridge Cost Rate		(%)	:	

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 6 (IIIC) LENGTH : 3 Km

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

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	152	91	0	0	0
Subgrade Preparation	m2	18000.0	19	11	342,000	198,000	540,000
Normal Fill	m3	266.0	1,565	865	416,290	230,090	646,380
Fill in Swamp	m3	0.0	2,319	1,054	0	0	0
Normal Excavation to Spoil	m3	623.0	919	523	572,537	325,829	898,366
Sub Base Course	m3	1920.0	2,980	1,350	5,721,600	2,592,000	8,313,600
Base Course	m3	0.0	4,066	2,303	0	0	0
Shoulder	m2	6000.0	271	146	1,626,000	876,000	2,502,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	0.0	645	119	0	0	0
Earth Drain in Swamp (by machine)	m3	0.0	1,060	474	0	0	0
Pipe Culvert D80cm	m	0.0	39,849	47,521	0	0	0
Masonry Culvert (80x80cm)	m	0.0	50,912	41,199	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	35,768	12,267	0	0	0
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		8,678,427	4,221,919	12,900,346
Overhead (15%)					1,301,764	633,287	1,935,051
			TOTAL COST		9,980,191	4,855,206	14,835,397
Manual routine maintenance of road	Km	3.0	101,056	7,260	303,168	21,780	324,948
Routine maintenance of gravel road	Km	3.0	174,087	88,186	522,261	264,558	786,819
			Sub Total		825,429	286,338	1,111,767
Maintenance of Timber Bridge (New)	m2	0.0	9,552	1,121	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	4,945,133
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	3,325,440
Maintenance Rate without Bridge		(%)	:	7.49
New Bridge Cost Rate		(%)	:	

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 5 (IIIB-1) LENGTH : 2 Km

UPGRADE : 7.0m road bed, 4.0m road with surface Dressing (1)

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	COST TOTAL
Site Clearance in Light Bush	m2	0.0	152	91	0	0	0
Subgrade Preparation	m2	810.0	19	11	15,390	8,910	24,300
Normal Fill	m3	480.0	1,565	865	751,200	415,200	1,166,400
Fill in Swamp	m3	42.0	2,319	1,054	97,398	44,268	141,666
Normal Excavation to Spoil	m3	100.0	919	523	91,900	52,300	144,200
Sub Base Course	m3	56.0	2,980	1,350	166,880	75,600	242,480
Base Course	m3	0.0	4,066	2,303	0	0	0
Shoulder	m2	6000.0	271	146	1,626,000	876,000	2,502,000
Asphalt Patching	m2	456.0	3,089	1,514	1,408,584	690,384	2,098,968
Surface Dressing (Single)	m2	*8000.0*	858	766	*6,864,000*	*6,128,000*	*12,992,000*
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	0.0	645	119	0	0	0
Earth Drain in Swamp (by machine)	m3	600.0	1,060	474	636,000	284,400	920,400
Pipe Culvert D80cm	m	0.0	39,849	47,521	0	0	0
Masonry Culvert (80x80cm)	m	0.0	50,912	41,199	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	30.0	35,768	12,267	1,073,040	368,010	1,441,050
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		12,730,392	8,943,072	21,673,464
Overhead (15%)					1,909,558	1,341,460	3,251,018
			TOTAL COST		14,639,950	10,284,532	24,924,482
Manual routine maintenance of road	Km	2.0	101,056	7,260	202,112	14,520	216,632
Routine maintenance of asphalt road	Km	2.0	308,900	151,400	617,800	302,800	920,600
			Sub Total		819,912	317,320	1,137,232
Maintenance of Timber Bridge (New)	m2	0.0	9,552	1,121	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	12,462,242
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	169,736
Maintenance Rate without Bridge		(%)	:	4.56
New Bridge Cost Rate		(%)	:	

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 1 (IIIB-2) LENGTH : 4 Km

UPGRADE : 8.0m road bed, 4.0m road with surface Base Cource

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Site Clearance in Light Bush	m2	0.0	152	91	0	0	0
Subgrade Preparation	m2	32000.0	19	11	608,000	352,000	960,000
Normal Fill	m3	875.0	1,565	865	1,369,375	756,875	2,126,250
Fill in Swamp	m3	221.3	2,319	1,054	513,194	233,250	746,444
Normal Excavation to Spoil	m3	1553.0	919	523	1,427,207	812,219	2,239,426
Sub Base Course	m3	2240.0	2,980	1,350	6,675,200	3,024,000	9,699,200
Base Course	m3	960.0	4,066	2,303	3,903,360	2,210,880	6,114,240
Shoulder	m2	16000.0	271	146	4,336,000	2,336,000	6,672,000
Asphalt Patching	m2	0.0	3,089	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	858	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,016	1,207	0	0	0
Earth Drain	m	5400.0	645	119	3,483,000	642,600	4,125,600
Earth Drain in Swamp (by machine)	m3	1200.0	1,060	474	1,272,000	568,800	1,840,800
Pipe Culvert D80cm	m	32.0	39,849	47,521	1,275,168	1,520,672	2,795,840
Masonry Culvert (80x80cm)	m	8.0	50,912	41,199	407,296	329,592	736,888
Retaining Wall and Wing Wall (Timber)	m2	0.0	16,034	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	309.3	35,768	12,267	11,063,042	3,794,183	14,857,225
Gabion Protection	m3	0.0	10,681	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		36,332,842	16,581,071	52,913,913
Overhead (15%)					5,449,926	2,487,160	7,937,086
			TOTAL COST		41,782,768	19,068,231	60,850,999
Manual routine maintenance of road	Km	4.0	101,056	7,260	404,224	29,040	433,264
Routine maintenance of gravel road	Km	4.0	174,087	88,186	696,348	352,744	1,049,092
			Sub Total		1,100,572	381,784	1,482,356
Maintenance of Timber Bridge (New)	m2	0.0	9,552	1,121	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,946	2,470	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	15,212,750
Timber Bridge	Unit Cost	(Rp/m2)	:	
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	4,849,600
Maintenance Rate without Bridge		(%)	:	2.44
New Bridge Cost Rate		(%)	:	

Appendix A-4 CONSTRUCTION AND MAINTENANCE QUANTITIES
FOR ALL PROPOSED ROAD LINKS
(CONSTRUCTION)

PROV : NUSA TENGGARA TIMUR KAB : ENDE

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :							
Bulldozer/Ripper	hr	368.2	3211.4	3729.9	4660.3	5495.9	17465.7
Swamp Bulldozer	hr	9.1	0.0	2.9	0.0	1.4	13.4
Motor Grader	hr	566.3	987.9	989.5	1093.5	615.5	4252.7
Hand-guide Vib. Roller	hr	854.8	1718.9	950.7	626.2	636.8	4787.4
Tire Roller	hr	0.0	0.0	0.0	0.0	66.6	66.6
Vibratory Roller (D&T)	hr	556.0	2361.3	2490.2	3186.7	3440.4	12034.6
Hydraulic Excavator; Wheel	hr	155.9	13.7	77.1	22.1	66.5	335.3
Wheel Loader	hr	725.4	2497.2	2868.9	3176.7	3034.7	12302.9
Water Tank Truck	hr	337.5	1303.1	1371.7	1709.6	1779.5	6501.4
Dump Truck	hr	7124.0	22257.6	21955.1	24962.3	21707.9	98006.9
Flat Bed Truck with Crane	hr	440.3	746.6	657.5	508.1	283.8	2636.3
Flat Bed Truck	hr	237.6	552.7	291.6	206.6	247.5	1536.0
Portable Crusher/Screening	hr	35.3	97.0	142.0	106.2	105.6	486.1
Concrete Mixer	hr	256.7	560.1	237.0	145.9	173.2	1372.9
Water Pump	hr	177.0	388.0	174.5	106.5	125.5	971.5
Concrete Vibrator	hr	17.7	43.7	49.5	27.7	30.0	168.6
Asphalt Sprayer	hr	0.0	0.0	0.0	0.0	66.6	66.6
LABOUR :							
Mandor	man day	1010.1	2522.4	2285.9	2440.2	1606.2	9864.8
Skilled Labourer	man day	1341.9	805.2	3044.4	2939.8	699.5	8830.8
Carpenter	man day	697.6	309.8	1570.3	1540.5	288.1	4406.3
Mason	man day	398.4	860.7	312.5	197.0	238.8	2007.4
Labourer	man day	9882.2	28854.4	21618.0	24210.2	12801.6	97366.4
Driver	man day	1440.2	4468.2	4344.4	4934.4	4307.8	19495.0
Operator	man day	825.6	2412.7	2267.5	2485.1	2510.1	10501.0
MATERIAL :							
Bitumen	l	0.0	0.0	0.0	0.0	14282.2	14282.2
Asphalt Oil	l	0.0	0.0	0.0	0.0	2733.3	2733.3
Kerosene	l	0.0	0.0	0.0	0.0	3335.0	3335.0
Sand	m3	158.7	406.5	179.8	86.8	165.1	996.9
Cement	bag	410.7	966.1	842.7	479.5	529.4	3228.4
River Stone	m3	398.4	1260.7	312.5	272.0	238.8	2482.4
Steel Moulds	set	32.0	155.0	54.0	0.0	18.0	259.0
Timber	m3	62.8	26.8	141.2	139.1	25.2	395.1
Paint	l	397.1	168.3	897.5	869.0	155.7	2487.6
Reinforcing Steel	kg	2223.8	6631.6	5672.8	2714.1	3215.0	20457.3
Tying Wire	kg	20.1	860.2	51.5	174.6	29.2	1135.6
Equivalent Royalty	m3	11277.1	20897.0	19600.0	20086.5	11245.1	83105.7

CONSTRUCTION AND MAINTENANCE QUANTITIES
FOR ALL PROPOSED ROAD LINKS
(MAINTENANCE)

PROV : NUSA TENGGARA TIMUR KAB : ENDE

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :							
Bulldozer/Ripper	hr	0.0	0.0	0.0	0.0	0.0	0.0
Swamp Bulldozer	hr	0.0	0.0	0.0	0.0	0.0	0.0
Motor Grader	hr	336.7	713.5	840.7	950.0	1058.0	3898.9
Hand-guide Vib. Roller	hr	45.0	90.0	90.0	90.0	75.0	390.0
Tire Roller	hr	336.7	713.5	840.7	950.0	1058.0	3898.9
Vibratory Roller (D&T)	hr	0.0	0.0	0.0	0.0	0.0	0.0
Hydraulic Excavator; Wheel	hr	0.0	0.0	0.0	0.0	0.0	0.0
Wheel Loader	hr	53.5	126.2	174.7	216.8	253.8	825.0
Water Tank Truck	hr	0.0	0.0	0.0	0.0	0.0	0.0
Dump Truck	hr	411.8	938.1	1228.8	1481.3	1673.0	5733.0
Flat Bed Truck with Crane	hr	337.8	675.7	750.5	723.5	866.8	3354.3
Flat Bed Truck	hr	1336.1	2814.3	3277.5	3674.8	4058.8	15161.5
Portable Crusher/Screening	hr	26.9	63.3	87.5	108.6	127.0	413.3
Concrete Mixer	hr	1.2	2.4	2.5	2.5	2.5	11.1
Water Pump	hr	1.2	2.4	2.5	2.5	2.5	11.1
Concrete Vibrator	hr	1.2	2.4	2.5	2.5	2.5	11.1
Asphalt Sprayer	hr	0.0	0.0	0.0	0.0	0.0	0.0
LABOUR :							
Mandur	man day	414.3	872.6	1026.6	1140.1	1292.1	4745.7
Skilled Labourer	man day	37.3	74.7	167.4	111.1	400.7	791.2
Carpenter	man day	3.1	6.3	56.0	25.7	186.6	277.7
Mason	man day	0.0	0.0	0.0	0.0	0.0	0.0
Labourer	man day	4981.5	10480.1	12194.7	13610.1	15050.7	56317.1
Driver	man day	359.9	762.5	908.0	1008.0	1147.9	4186.3
Operator	man day	130.3	280.4	339.0	389.3	437.6	1576.6
MATERIAL :							
Bitumen	l	405.0	810.0	810.0	810.0	675.0	3510.0
Asphalt Oil	l	0.0	0.0	0.0	0.0	0.0	0.0
Kerosene	l	45.0	90.0	90.0	90.0	75.0	390.0
Sand	m3	8.7	17.4	17.5	17.5	15.0	76.1
Cement	bag	17.6	35.3	36.9	36.9	36.9	163.6
River Stone	m3	0.0	0.0	0.0	0.0	0.0	0.0
Steel Moulds	set	0.0	0.0	0.0	0.0	0.0	0.0
Timber	m3	0.2	0.4	4.9	2.1	16.7	24.3
Paint	l	0.0	0.0	32.0	12.4	116.6	161.0
Reinforcing Steel	kg	90.8	181.7	190.0	190.0	190.0	842.5
Tying Wire	kg	0.8	1.6	1.7	1.7	1.7	7.5
Equivalent Royalty	m3	760.2	1790.5	2476.9	3073.2	3596.7	11697.5

CONSTRUCTION AND MAINTENANCE QUANTITIES
FOR ALL PROPOSED ROAD LINKS
(TOTAL)

PROV : NUSA TENGGARA TIMUR KAB : ENDE

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :							
Bulldozer/Ripper	hr	368.2	3211.4	3729.9	4660.3	5495.9	17465.7
Swamp Bulldozer	hr	9.1	0.0	2.9	0.0	1.4	13.4
Motor Grader	hr	903.0	1701.4	1830.2	2043.5	1673.5	8151.6
Hand-guide Vib. Roller	hr	899.8	1808.9	1040.7	716.2	711.8	5177.4
Tire Roller	hr	336.7	713.5	840.7	950.0	1124.6	3965.5
Vibratory Roller (D&T)	hr	556.0	2361.3	2490.2	3186.7	3440.4	12034.6
Hydraulic Excavator; Wheel	hr	155.9	13.7	77.1	22.1	66.5	335.3
Wheel Loader	hr	778.9	2623.4	3043.6	3393.5	3288.5	13127.9
Water Tank Truck	hr	337.5	1303.1	1371.7	1709.6	1779.5	6501.4
Dump Truck	hr	7535.8	23195.7	23183.9	26443.6	23380.9	103739.9
Flat Bed Truck with Crane	hr	778.1	1422.3	1408.0	1231.6	1150.6	5990.6
Flat Bed Truck	hr	1573.7	3367.0	3569.1	3881.4	4306.3	16697.5
Portable Crusher/Screening	hr	62.2	160.3	229.5	214.8	232.6	899.4
Concrete Mixer	hr	257.9	562.5	239.5	148.4	175.7	1384.0
Water Pump	hr	178.2	390.4	177.0	109.0	128.0	982.6
Concrete Vibrator	hr	18.9	46.1	52.0	30.2	32.5	179.7
Asphalt Sprayer	hr	0.0	0.0	0.0	0.0	66.6	66.6
LABOUR :							
Mandur	man day	1424.4	3395.0	3312.5	3580.3	2898.3	14610.5
Skilled Labourer	man day	1379.2	879.9	3211.8	3050.9	1100.2	9622.0
Carpenter	man day	700.7	316.1	1626.3	1566.2	474.7	4684.0
Mason	man day	398.4	860.7	312.5	197.0	238.8	2007.4
Labourer	man day	14863.7	39334.5	33812.7	37820.3	27852.3	153683.5
Driver	man day	1800.1	5230.7	5252.4	5942.4	5455.7	23681.3
Operator	man day	955.9	2693.1	2606.5	2874.4	2947.7	12077.6
MATERIAL :							
Bitumen	l	405.0	810.0	810.0	810.0	14957.2	17792.2
Asphalt Oil	l	0.0	0.0	0.0	0.0	2733.3	2733.3
Kerosene	l	45.0	90.0	90.0	90.0	3410.0	3725.0
Sand	m3	167.4	423.9	197.3	104.3	180.1	1073.0
Cement	bag	428.3	1001.4	879.6	516.4	566.3	3392.0
River Stone	m3	398.4	1260.7	312.5	272.0	238.8	2482.4
Steel Moulds	set	32.0	155.0	54.0	0.0	18.0	259.0
Timber	m3	63.0	27.2	146.1	141.2	41.9	419.4
Paint	l	397.1	168.3	929.5	881.4	272.3	2648.6
Reinforcing Steel	kg	2314.6	6813.3	5862.8	2904.1	3405.0	21299.8
Tying Wire	kg	20.9	861.8	53.2	176.3	30.9	1143.1
Equivalent Royalty	m3	12037.3	22687.5	22076.9	23159.7	14841.8	94803.2

Appendix A-5

CONSTRUCTION AND MAINTENANCE COSTS FOR ALL PROPOSED ROAD LINKS (CONSTRUCTION)

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		78,293	261,085	272,181	310,453	300,120	1,222,132
Bulldozer/Ripper	15596	5,742	50,084	58,171	72,682	85,714	272,393
Swamp Bulldozer	11455	104	0	33	0	16	153
Motor Grader	13329	7,548	13,167	13,189	14,575	8,203	56,682
Hand-guide Vib. Roller	1565	1,337	2,690	1,487	980	996	7,490
Tire Roller	10496	0	0	0	0	699	699
Vibratory Roller (D&T)	6666	3,706	15,740	16,599	21,242	22,933	80,220
Hydraulic Excavator; Wheel	12439	1,939	170	959	274	827	4,169
Wheel Loader	16528	11,989	41,273	47,417	52,504	50,157	203,340
Water Tank Truck	3840	1,296	5,003	5,267	6,564	6,833	24,963
Dump Truck	5310	37,828	118,187	116,581	132,549	115,268	520,413
Flat Bed Truck with Crane	4909	2,161	3,665	3,227	2,494	1,393	12,940
Flat Bed Truck	3193	758	1,764	931	659	790	4,902
Portable Crusher/Screening	43128	1,522	4,183	6,124	4,580	4,554	20,963
Concrete Mixer	8866	2,275	4,965	2,101	1,293	1,535	12,169
Water Pump	469	83	181	81	49	58	452
Concrete Vibrator	302	5	13	14	8	9	49
Asphalt Sprayer	2037	0	0	0	0	135	135
LABOUR :		23,123	58,582	54,187	59,021	37,180	232,093
Mandur	2500	2,525	6,306	5,714	6,100	4,015	24,660
Skilled Labourer	1600	2,147	1,288	4,871	4,703	1,119	14,128
Carpenter	1750	1,220	542	2,748	2,695	504	7,709
Mason	1750	697	1,506	546	344	417	3,510
Labourer	1100	10,870	31,739	23,779	26,631	14,081	107,100
Driver	2500	3,600	11,170	10,861	12,336	10,769	48,736
Operator	2500	2,064	6,031	5,668	6,212	6,275	26,250
MATERIAL :		24,570	35,313	48,813	42,605	27,573	178,874
Bitumen	400	0	0	0	0	5,712	5,712
Asphalt Oil	1500	0	0	0	0	4,099	4,099
Kerosene	250	0	0	0	0	833	833
Sand	8000	1,269	3,252	1,438	694	1,320	7,973
Cement	6000	2,464	5,796	5,056	2,877	3,176	19,369
River Stone	6000	2,390	7,564	1,875	1,632	1,432	14,893
Steel Moulds	8500	272	1,317	459	0	153	2,201
Timber	200000	12,560	5,360	28,240	27,820	5,040	79,020
Paint	2500	992	420	2,243	2,172	389	6,216
Reinforcing Steel	800	1,779	5,305	4,538	2,171	2,572	16,365
Tying Wire	1250	25	1,075	64	218	36	1,418
Equivalent Royalty	250	2,819	5,224	4,900	5,021	2,811	20,775

CONSTRUCTION AND MAINTENANCE COSTS
FOR ALL PROPOSED ROAD LINKS
(MAINTENANCE)

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		18,255	39,259	47,524	54,211	61,114	220,363
Bulldozer/Ripper	15596	0	0	0	0	0	0
Swamp Bulldozer	11455	0	0	0	0	0	0
Motor Grader	13329	4,487	9,510	11,205	12,662	14,102	51,966
Hand-guide Vib. Roller	1565	70	140	140	140	117	607
Tire Roller	10496	3,534	7,488	8,823	9,971	11,104	40,920
Vibratory Roller (D&T)	6666	0	0	0	0	0	0
Hydraulic Excavator; Wheel	12439	0	0	0	0	0	0
Wheel Loader	16528	884	2,085	2,887	3,583	4,194	13,633
Water Tank Truck	3840	0	0	0	0	0	0
Dump Truck	5310	2,186	4,981	6,524	7,865	8,883	30,439
Flat Bed Truck with Crane	4909	1,658	3,317	3,684	3,551	4,255	16,465
Flat Bed Truck	3193	4,266	8,986	10,465	11,733	12,959	48,409
Portable Crusher/Screening	43128	1,160	2,730	3,773	4,683	5,477	17,823
Concrete Mixer	8866	10	21	22	22	22	97
Water Pump	469	0	1	1	1	1	4
Concrete Vibrator	302	0	0	0	0	0	0
Asphalt Sprayer	2037	0	0	0	0	0	0
LABOUR :		7,802	16,446	19,462	21,535	24,715	89,960
Mandur	2500	1,035	2,181	2,566	2,850	3,230	11,862
Skilled Labourer	1600	59	119	267	177	641	1,263
Carpenter	1750	5	11	98	44	326	484
Mason	1750	0	0	0	0	0	0
Labourer	1100	5,479	11,528	13,414	14,971	16,555	61,947
Driver	2500	899	1,906	2,270	2,520	2,869	10,464
Operator	2500	325	701	847	973	1,094	3,940
MATERIAL :		650	1,370	2,540	2,080	5,313	11,953
Bitumen	400	162	324	324	324	270	1,404
Asphalt Oil	1500	0	0	0	0	0	0
Kerosene	250	11	22	22	22	18	95
Sand	8000	69	139	140	140	120	608
Cement	6000	105	211	221	221	221	979
River Stone	6000	0	0	0	0	0	0
Steel Moulds	8500	0	0	0	0	0	0
Timber	200000	40	80	980	420	3,340	4,860
Paint	2500	0	0	80	31	291	402
Reinforcing Steel	800	72	145	152	152	152	673
Tying Wire	1250	1	2	2	2	2	9
Equivalent Royalty	250	190	447	619	768	899	2,923

CONSTRUCTION AND MAINTENANCE COSTS
FOR ALL PROPOSED ROAD LINKS
(TOTAL)

PROV : NUSA TENGGARA TIMUR KAB : ENDE

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		96,548	300,344	319,705	364,664	361,234	1,442,495
Bulldozer/Ripper	15596	5,742	50,084	58,171	72,682	85,714	272,393
Swamp Bulldozer	11455	104	0	33	0	16	153
Motor Grader	13329	12,035	22,677	24,394	27,237	22,305	108,648
Hand-guide Vib. Roller	1565	1,407	2,830	1,627	1,120	1,113	8,097
Tire Roller	10496	3,534	7,488	8,823	9,971	11,803	41,619
Vibratory Roller (D&T)	6666	3,706	15,740	16,599	21,242	22,933	80,220
Hydraulic Excavator; Wheel	12439	1,939	170	959	274	827	4,169
Wheel Loader	16528	12,873	43,358	50,304	56,087	54,351	216,973
Water Tank Truck	3840	1,296	5,003	5,267	6,564	6,833	24,963
Dump Truck	5310	40,014	123,168	123,105	140,414	124,151	550,852
Flat Bed Truck with Crane	4909	3,819	6,982	6,911	6,045	5,648	29,405
Flat Bed Truck	3193	5,024	10,750	11,396	12,392	13,749	53,311
Portable Crusher/Screening	43128	2,682	6,913	9,897	9,263	10,031	38,786
Concrete Mixer	8866	2,285	4,986	2,123	1,315	1,557	12,266
Water Pump	469	83	182	82	50	59	456
Concrete Vibrator	302	5	13	14	8	9	49
Asphalt Sprayer	2037	0	0	0	0	135	135
LABOUR :		30,925	75,028	73,649	80,556	61,895	322,053
Mandur	2500	3,560	8,487	8,280	8,950	7,245	36,522
Skilled Labourer	1600	2,206	1,407	5,138	4,880	1,760	15,391
Carpenter	1750	1,225	553	2,846	2,739	830	8,193
Mason	1750	697	1,506	546	344	417	3,510
Labourer	1100	16,349	43,267	37,193	41,602	30,636	169,047
Driver	2500	4,499	13,076	13,131	14,856	13,638	59,200
Operator	2500	2,389	6,732	6,515	7,185	7,369	30,190
MATERIAL :		25,220	36,683	51,353	44,685	32,886	190,827
Bitumen	400	162	324	324	324	5,982	7,116
Asphalt Oil	1500	0	0	0	0	4,099	4,099
Kerosene	250	11	22	22	22	851	928
Sand	8000	1,338	3,391	1,578	834	1,440	8,581
Cement	6000	2,569	6,007	5,277	3,098	3,397	20,348
River Stone	6000	2,390	7,564	1,875	1,632	1,432	14,893
Steel Moulds	8500	272	1,317	459	0	153	2,201
Timber	200000	12,600	5,440	29,220	28,240	8,380	83,880
Paint	2500	992	420	2,323	2,203	680	6,618
Reinforcing Steel	800	1,851	5,450	4,690	2,323	2,724	17,038
Tying Wire	1250	26	1,077	66	220	38	1,427
Equivalent Royalty	250	3,009	5,671	5,519	5,789	3,710	23,698

Appendix A-6 QUANTITIES OF BRIDGE ON PROPOSED ROAD LINKS

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO	BRIDGE NAME	Km	From	<< TYPE >> (EXIST)	(NEW)	DESIGN LOAD	SPAN CLASS	LENGTH (m)	SPAN NO (no)	SPAN LENGTH (m)	WIDTH (m)	AREA (EXIST) (m2)	AREA (NEW) (m2)	PIER (no)	ABUT (no)	ROAD CLASS
30	LOWO LABA	3	MEKA	--	TM	10T	(C)	12.00	2	6.00	4.00	0.00	48.00	1	2	IIIC
	LOWO SIDO	6	MEKA	--	TM	10T	(C)	24.00	3	8.00	4.00	0.00	96.00	2	2	
32	N.I	3	MARL	KB				6.00	1	6.00	5.00	30.00		0	2	IIIC
	N.I	11	MARL	--	TM	10T	(C)	14.00	2	7.00	4.00	0.00	56.00	1	2	
33	LOWO LAMO	2	NDD	--	TM	10T	(C)	15.00	2	7.50	4.00	0.00	60.00	1	2	IIIB-2
	LOWO AEURA	3	NDD	--	TM	10T	(C)	8.00	1	8.00	4.00	0.00	32.00	0	2	
	LOWO DOKE	7	NDD	--	TM	10T	(C)	12.00	2	6.00	4.00	0.00	48.00	1	2	
	WELA JAWA	8	NDD	--	TM	10T	(C)	30.00	4	7.50	4.00	0.00	120.00	3	2	
34	LOWOLUYA	2	MLMK	--	TM	10T	(C)	24.00	3	8.00	4.00	0.00	96.00	2	2	IIIB-2
	WORONDOKO	3	MLMK	--	TM	10T	(C)	24.00	3	8.00	4.00	0.00	96.00	2	2	
	WORONDOKO2	3	MLMK	--	TM	10T	(C)	25.00	4	6.25	4.00	0.00	100.00	3	2	
44	WOLOLELE	10	OKA	--	TM	10T	(C)	12.00	2	6.00	4.00	0.00	48.00	1	2	IIIB-2
50	AEPADHA	1	KBDR	--	TM	10T	(B)	10.00	2	5.00	4.00	0.00	40.00	1	2	IIIC
51	LOWONGAI	3	WLGA	--	TM	10T	(C)	15.00	2	7.50	4.00	0.00	60.00	1	2	IIIC
	LW.OETUWUJA	6	WLGA	--	TM	10T	(C)	15.00	2	7.50	4.00	0.00	60.00	1	2	

Appendix A-7 CONSTRUCTION AND MAINTENANCE COST OF BRIDGES ON PROPOSED ROAD LINKS

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 30 (IIIC) LENGTH : 5 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	53,913	3,541	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	59,718	3,910	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	144.00	79,102	5,137	11,390,688	739,728	12,130,416
Superstructure (Timber;Span 3m;BM50)	m2	0.00	66,851	4,379	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	72,985	4,745	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	92,566	6,007	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	54,717	95,935	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	55,829	106,961	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	57,231	116,358	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	62,312	131,913	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	66,591	155,090	0	0	0
Substructure (Pier;for Timber;10T)	NO	3.00	469,482	32,863	1,408,446	98,589	1,507,035
Substructure (Abut;for Timber;10T)	NO	4.00	1,228,353	154,433	4,913,412	617,732	5,531,144
Substructure (Pier;for Timber;BM50)	NO	0.00	690,448	48,632	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,394,647	171,604	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,553,618	497,829	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	3,227,651	1,034,415	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	79,176	74,382	0	0	0
Maintenance of Timber Bridge (New)	m2	144.00	9,552	1,121	1,375,488	161,424	1,536,912
Maintenance of Concrete Bridge (New)	m2	0.00	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,946	2,470	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				17,712,546	1,456,049	19,168,595
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				17,712,546	1,456,049	19,168,595
(Overhead : 15%)	TOTAL COST (Timber Bridge)				20,369,428	1,674,456	22,043,884
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				20,369,428	1,674,456	22,043,884

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 32 (IIIC) LENGTH : 20 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	53,913	3,541	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	59,718	3,910	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	56.00	79,102	5,137	4,429,712	287,672	4,717,384
Superstructure (Timber;Span 3m;BM50)	m2	0.00	66,851	4,379	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	72,985	4,745	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	92,566	6,007	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	54,717	95,935	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	55,829	106,961	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	57,231	116,358	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	62,312	131,913	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	66,591	155,090	0	0	0
Substructure (Pier;for Timber;10T)	NO	1.00	469,482	32,863	469,482	32,863	502,345
Substructure (Abut;for Timber;10T)	NO	2.00	1,228,353	154,433	2,456,706	308,866	2,765,572
Substructure (Pier;for Timber;BM50)	NO	0.00	690,448	48,632	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,394,647	171,604	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,553,618	497,829	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	3,227,651	1,034,415	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	79,176	74,382	0	0	0
Maintenance of Timber Bridge (New)	m2	56.00	9,552	1,121	534,912	62,776	597,688
Maintenance of Concrete Bridge (New)	m2	0.00	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	30.00	3,946	2,470	118,380	74,100	192,480
(Without Overhead)	TOTAL COST (Timber Bridge)				7,355,900	629,401	7,985,301
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				7,355,900	629,401	7,985,301
(Overhead : 15%)	TOTAL COST (Timber Bridge)				8,459,285	723,811	9,183,096
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				8,459,285	723,811	9,183,096

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 33 (IIIB-2) LENGTH : 11 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	53,913	3,541	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	59,718	3,910	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	260.00	79,102	5,137	20,566,520	1,335,620	21,902,140
Superstructure (Timber;Span 3m;BM50)	m2	0.00	66,851	4,379	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	72,985	4,745	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	92,566	6,007	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	54,717	95,935	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	55,829	106,961	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	57,231	116,358	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	62,312	131,913	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	66,591	155,090	0	0	0
Substructure (Pier;for Timber;10T)	NO	5.00	469,482	32,863	2,347,410	164,315	2,511,725
Substructure (Abut;for Timber;10T)	NO	8.00	1,228,353	154,433	9,826,824	1,235,464	11,062,288
Substructure (Pier;for Timber;BM50)	NO	0.00	690,448	48,632	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,394,647	171,604	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,553,618	497,829	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	3,227,651	1,034,415	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	79,176	74,382	0	0	0
Maintenance of Timber Bridge (New)	m2	260.00	9,552	1,121	2,483,520	291,460	2,774,980
Maintenance of Concrete Bridge (New)	m2	0.00	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,946	2,470	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				32,740,754	2,735,399	35,476,153
	(Concrete Bridge)				0	0	0
	TOTAL COST (Without Maintenance)				32,740,754	2,735,399	35,476,153
(Overhead : 15%)	TOTAL COST (Timber Bridge)				37,651,867	3,145,709	40,797,576
	(Concrete Bridge)				0	0	0
	TOTAL COST (Without Maintenance)				37,651,867	3,145,709	40,797,576

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 34 (IIIB-2) LENGTH : 14 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	53,913	3,541	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	59,718	3,910	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	292.00	79,102	5,137	23,097,784	1,500,004	24,597,788
Superstructure (Timber;Span 3m;BM50)	m2	0.00	66,851	4,379	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	72,985	4,745	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	92,566	6,007	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	54,717	95,935	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	55,829	106,961	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	57,231	116,358	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	62,312	131,913	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	66,591	155,090	0	0	0
Substructure (Pier;for Timber;10T)	NO	7.00	469,482	32,863	3,286,374	230,041	3,516,415
Substructure (Abut;for Timber;10T)	NO	6.00	1,228,353	154,433	7,370,118	926,598	8,296,716
Substructure (Pier;for Timber;BM50)	NO	0.00	690,448	48,632	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,394,647	171,604	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,553,618	497,829	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	3,227,651	1,034,415	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	79,176	74,382	0	0	0
Maintenance of Timber Bridge (New)	m2	292.00	9,552	1,121	2,789,184	327,332	3,116,516
Maintenance of Concrete Bridge (New)	m2	0.00	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,946	2,470	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				33,754,276	2,656,643	36,410,919
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				33,754,276	2,656,643	36,410,919
(Overhead : 15%)	TOTAL COST (Timber Bridge)				38,817,417	3,055,139	41,872,557
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				38,817,417	3,055,139	41,872,557

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 44 (IIIB-2) LENGTH : 11 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	53,913	3,541	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	59,718	3,910	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	48.00	79,102	5,137	3,796,896	246,576	4,043,472
Superstructure (Timber;Span 3m;BM50)	m2	0.00	66,851	4,379	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	72,985	4,745	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	92,566	6,007	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	54,717	95,935	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	55,829	106,961	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	57,231	116,358	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	62,312	131,913	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	66,591	155,090	0	0	0
Substructure (Pier;for Timber;10T)	NO	1.00	469,482	32,863	469,482	32,863	502,345
Substructure (Abut;for Timber;10T)	NO	2.00	1,228,353	154,433	2,456,706	308,866	2,765,572
Substructure (Pier;for Timber;BM50)	NO	0.00	690,448	48,632	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,394,647	171,604	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,553,618	497,829	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	3,227,651	1,034,415	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	79,176	74,382	0	0	0
Maintenance of Timber Bridge (New)	m2	48.00	9,552	1,121	458,496	53,808	512,304
Maintenance of Concrete Bridge (New)	m2	0.00	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,946	2,470	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				6,723,084	588,305	7,311,389
	(Concrete Bridge)				0	0	0
	TOTAL COST (Without Maintenance)				6,723,084	588,305	7,311,389
(Overhead : 15%)	TOTAL COST (Timber Bridge)				7,731,547	676,551	8,408,097
	(Concrete Bridge)				0	0	0
	TOTAL COST (Without Maintenance)				7,731,547	676,551	8,408,097

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 50 (IIIC) LENGTH : 10 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	53,913	3,581	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	40.00	59,718	3,910	2,388,720	156,400	2,545,120
Superstructure (Timber;Span 8m;10T)	m2	0.00	79,102	5,137	0	0	0
Superstructure (Timber;Span 3m;BM50)	m2	0.00	66,851	4,379	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	72,985	4,745	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	92,566	6,007	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	54,717	95,935	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	55,829	106,961	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	57,231	116,358	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	62,312	131,913	0	0	0
Superstructure (Concrete;Span15m;BM30)	m2	0.00	66,591	155,090	0	0	0
Substructure (Pier;for Timber;10T)	NO	1.00	469,482	32,863	469,482	32,863	502,345
Substructure (Abut;for Timber;10T)	NO	2.00	1,228,353	154,433	2,456,706	308,866	2,765,572
Substructure (Pier;for Timber;BM50)	NO	0.00	690,448	48,632	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,394,647	171,604	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,553,618	497,829	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	3,227,651	1,034,415	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	79,176	74,382	0	0	0
Maintenance of Timber Bridge (New)	m2	40.00	9,552	1,121	382,080	44,840	426,920
Maintenance of Concrete Bridge (New)	m2	0.00	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,946	2,470	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				5,314,908	498,129	5,813,037
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				5,314,908	498,129	5,813,037
(Overhead : 15%)	TOTAL COST (Timber Bridge)				6,112,144	572,848	6,684,993
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				6,112,144	572,848	6,684,993

PROV : NUSA TENGGARA TIMUR KAB : ENDE

LINK NO : 51 (IIIC) LENGTH : 10 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	53,913	3,541	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	59,718	3,910	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	120.00	79,102	5,137	9,492,240	616,440	10,108,680
Superstructure (Timber;Span 3m;BM50)	m2	0.00	66,851	4,379	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	72,985	4,745	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	92,566	6,007	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	54,717	95,935	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	55,829	106,961	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	57,231	116,358	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	62,312	131,913	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	66,591	155,090	0	0	0
Substructure (Pier;for Timber;10T)	NO	2.00	469,482	32,863	938,964	65,726	1,004,690
Substructure (Abut;for Timber;10T)	NO	4.00	1,228,353	154,433	4,913,412	617,732	5,531,144
Substructure (Pier;for Timber;BM50)	NO	0.00	690,448	48,632	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,394,647	171,604	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,553,618	497,829	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	3,227,651	1,034,415	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,647	1,373	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	79,176	74,382	0	0	0
Maintenance of Timber Bridge (New)	m2	120.00	9,552	1,121	1,146,240	134,520	1,280,760
Maintenance of Concrete Bridge (New)	m2	0.00	1,913	3,128	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,340	2,405	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,946	2,470	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				15,344,616	1,299,898	16,644,514
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				15,344,616	1,299,898	16,644,514
(Overhead : 15%)	TOTAL COST (Timber Bridge)				17,646,308	1,494,883	19,141,191
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				17,646,308	1,494,883	19,141,191