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 28

KABUPATEN NGADA

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 Ngada 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.

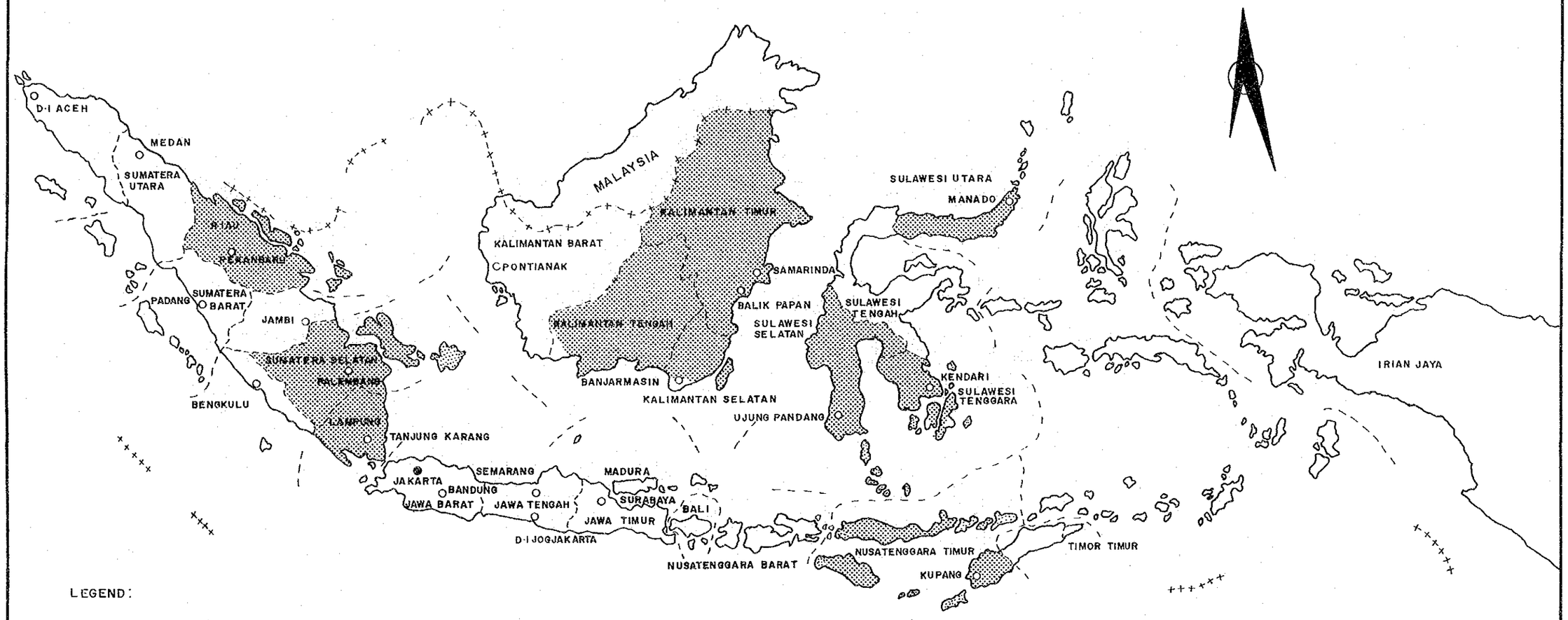
Since the study period was limited, without cooperation of Bina Marga, Bangda and local governments of both province and Kabupaten in collecting the data, the study would not have been completed within the period.

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.

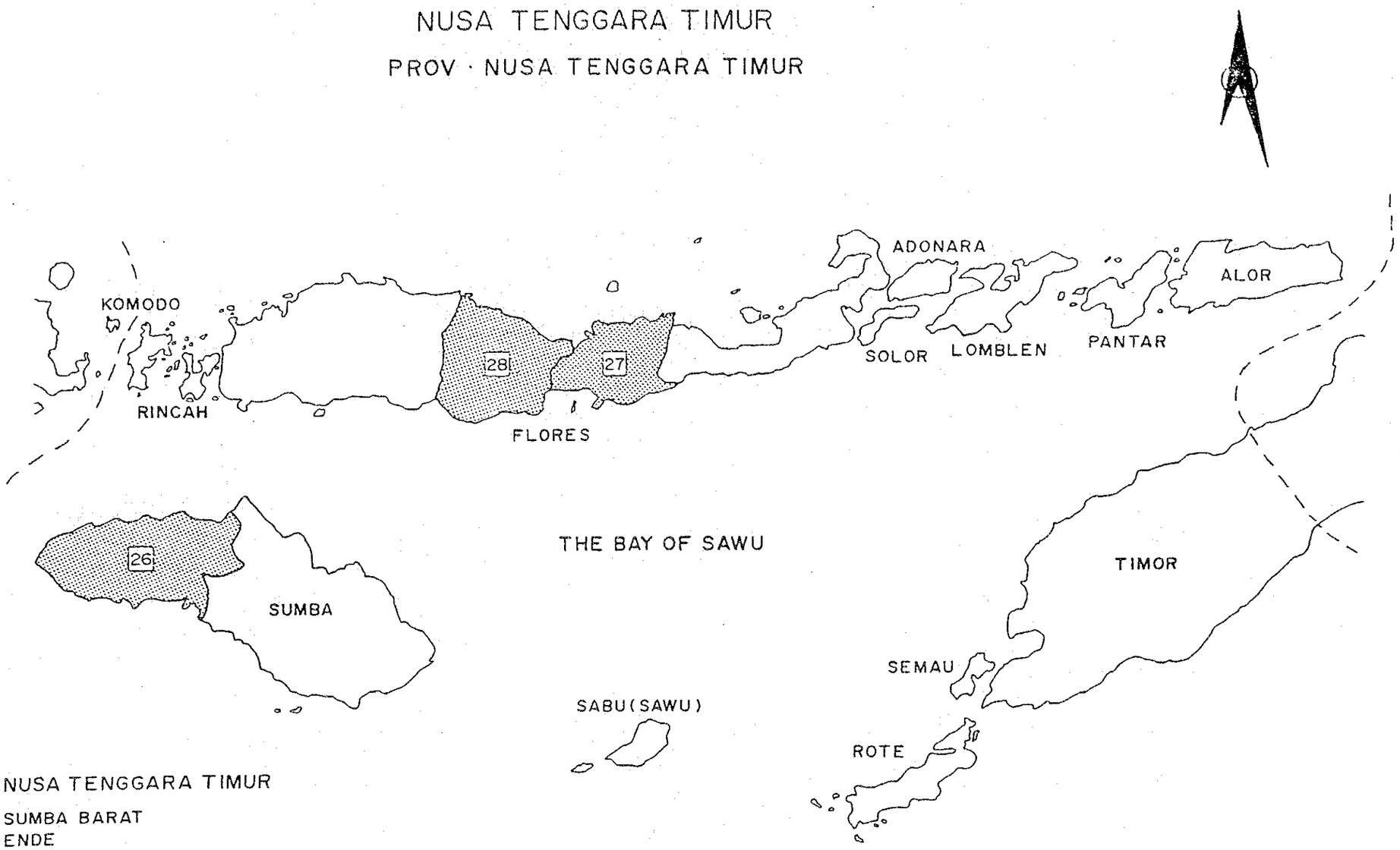
The purpose of the study for the Kabupaten is mainly to estimate the total Project Cost for the local road development but only limited data is available for study base. Therefore a detailed survey and design for the improvement of the Kabupaten roads should be carried out before commencing the Project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

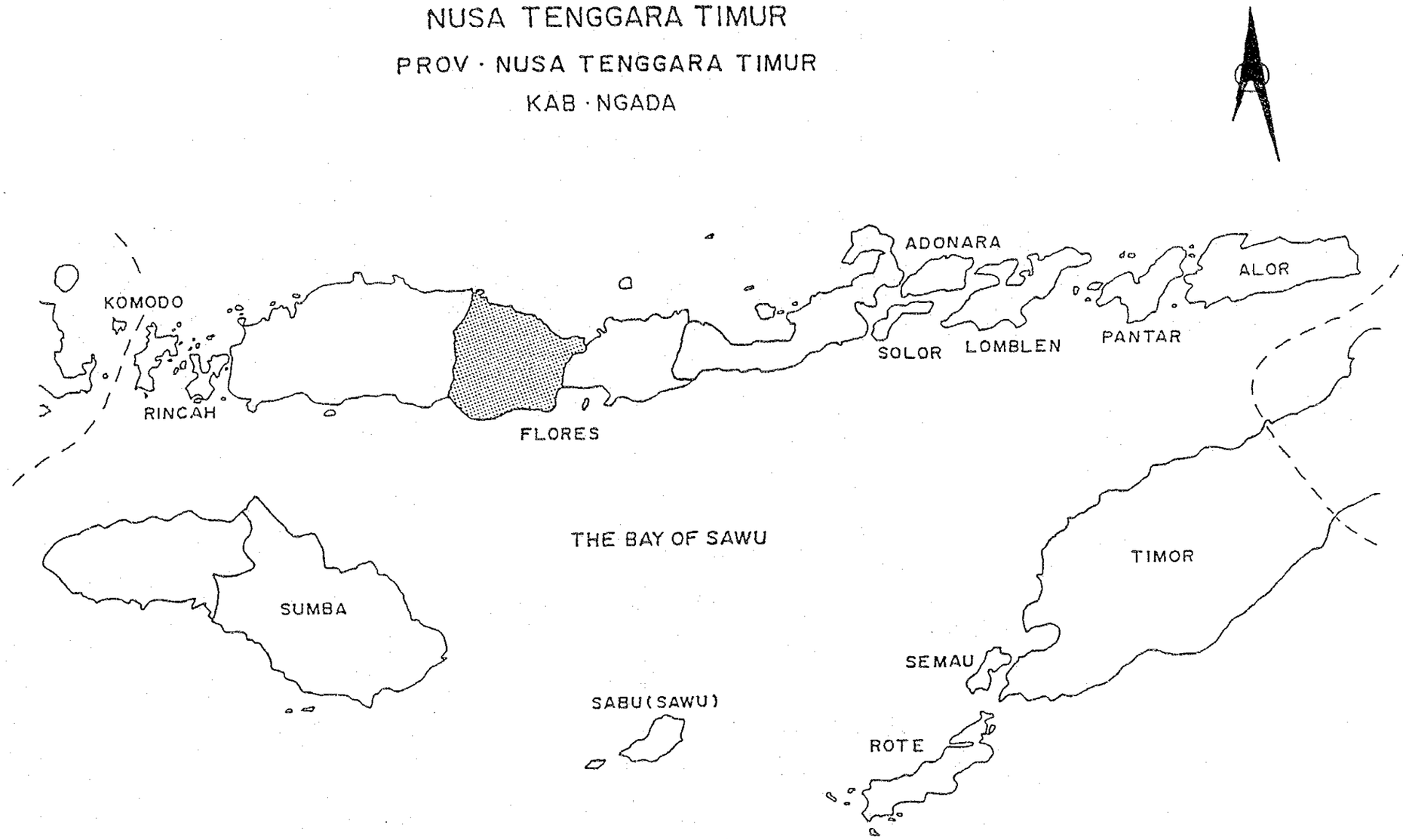
SCALE :

0 25 50 75 100 Km

NUSA TENGGARA TIMUR

PROV · NUSA TENGGARA TIMUR

KAB · NGADA



LEGEND :

---- PROVINCIAL BOUNDARY

LOCATION OF THE PROJECT AREA

SCALE :

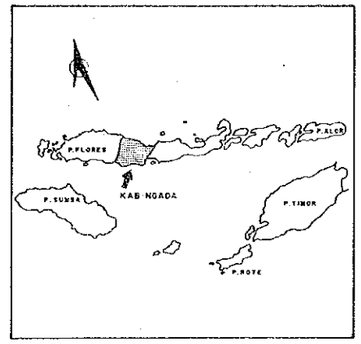
0 25 50 75 100 Km

KAB· NGADA

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
- VILLAGE ROAD
- RIVER

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

TITLE :

SOURCE :	SCALE :	PROVINCE : NUSA TENGGARA TIMUR
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPATEN : NGADA

C O N T E N T S

Chapter 1 BACKGROUND OF THE KABUPATEN

1.1 Topographic and Meteorological Conditions

1.1.1 location and Topography

Kabupaten Ngada is located slightly to the west of the centre of Flores Island. Its north coast faces the Flores Sea, and south coast the Sawu Sea. It is bordered on the east by Kabupaten Ende and on the west by Kabupaten Manggarai.

The south of the Kabupaten is entirely covered with 1000 to 1500 meter high volcanic mountains from which steep slopes fall into the sea. On the north coast a flat area lies on the Sissa basin, which is a typical feature of a volcanic island. The capital of the Kabupaten, Bajawa, is located in the southwest of the mountianous region.

The area of the Kabupaten is about 3,038 square kilometers approximately 6 percent of the total of the province. It consists administratively of 9 Kecamatans.

1.1.2 Meteorological Conditions

The average number of rainy days and the average amount of yearly rainfall in Kabupaten Ngada are 69 days and 1,184 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.

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

Where :

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

Table 1-1-1

METEOROLOGICAL CONDITIONS

PROVINCE : Nusa Tenggara Timur
KABUPATEN : Ngada STATION : Ngada

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	13	169	14	265	13	213	9	156	10	182
February	8	107	9	120	11	176	14	276	14	283
March	6	54	7	92	11	176	14	273	12	221
April	6	78	4	52	5	95	11	193	10	174
May	2	21	6	125	3	16	6	81	6	78
June	1	5	4	42	1	12	-	-	2	22
July	-	-	6	66	1	1	-	-	2	23
August	3	17	2	20	1	12	-	-	1	5
September	3	6	4	49	-	-	1	26	2	28
October	7	25	2	42	-	-	4	125	3	144
November	5	65	13	175	1	15	7	159	8	178
December	1	154	16	211	8	169	9	221	9	222
Total	55	701	87	1,259	55	886	75	1,511	75	1,561

NOTE : Data show the mean value of 5 stations.

1.2 Socio-Economic Conditions

1.2.1 Population

The population of the Kabupaten Ngada in 1984 was 183,532 which was approximately 6.2% of the 2,947,900 total population of Nusa Tenggara Timur Province as shown in Table 1-2-1.

The population density was 0.60 persons per ha which was almost the same as the provincial density of 0.61.

The recent annual average growth rate of population of the Kabupaten is 2.0% which is 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 : NGADA

KECAMATAN	POPULATION	PROPORTION (%)
AEIMERE	15,966	8.7
WOGOMANGULEWA	24,954	13.6
MAUPONGGO	27,699	15.1
NANGARORO	20,359	11.1
BOAWAE	22,926	12.5
BAJAWA	25,436	13.8
RIUNG	14,807	8.1
AESESA	22,128	12.1
KOPETA BAJAWA	9,257	5.0
TOTAL	183,532	100

1.2.2 Land Use

In Kabupaten Ngada, 149,055 ha of the current available land use area, which is approximately 49.1% of the 303,788 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 102,048 ha of agricultural harvest area, 3,175 ha of residential area and 43,832 ha of usable open space which are 68.5%, 2.1% and 29.4% of the current available land use area respectively.

The agricultural harvest area consists of 45,345 ha of paddy field, 12,864 ha of plantation and 43,839 ha of other cultivated area which are 44.4%, 12.6% and 43.0% of the agricultural harvest area respectively.

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

Table 1-2-3

LAND USE

PROVINCE : 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 Ngada in 1984 were 29,435 ha and 102,175 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 14,126 ha and 65,522 ton respectively which are 48.0% and 64.1% of the total food crops. The yield rate of paddy production is 4.64 ton per ha. Thus, paddy is the most predominant agricultural crop of the Kabupaten.

As the table shows, average annual growth rates of area and production of paddy in 1981 through 1984 were 6.0% and 9.0% respectively which indicate favorable development of the paddy production in the long term.

Upland paddy accounts for 40% of the all paddy production. Regarding the fluctuation of annual productivity it is pointed out that the agriculture of the Kabupaten is easily affected by weather changes because of undeveloped irrigation facilities.

The commodity crops, of which palm oil, and coffee are major, are produced in the plantations. The area and production of plantation crops in 1983 were 40,183 ha and 10,891 ton respectively with current growth rates of 16.5% and 16.5% as shown in Table 1-2-5. Thus the plantation crop which is exported is an important agricultural product. Some changes are expected considering the international balance of supply and demand.

The population of the agricultural sector which is assumed from the employment in the Kabupaten is 84.5% of the total population as shown in Table 1-2-7. Thus this is an agricultural Kabupaten.

Future measures suggested to be taken by the kabupaten include increase of the cultivated area with the progress of road development and appropriation of agricultural investment for improvement of irrigation facilities in order to attain stable growth of productivity.

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

KABUPATEN : NGADA

CULTIVATED AREA

(ha)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	13,082	17,459	22,792	18,825	17,666	9,778	6.0
OTHERS	15,599	20,755	22,712	19,152	17,894	27,665	-20.0
TOTAL	28,681	38,214	45,504	37,977	35,560	37,443	-9.8

PRODUCTION

(ton)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	11,902	38,939	25,184	30,434	30,813	26,459	9.0
OTHERS	41,407	118,784	53,711	77,862	95,817	100,344	-20.0
TOTAL	53,309	157,723	78,895	108,296	126,630	126,803	-6.0

YIELD RATE

(ton/ha)

ITEM	YEAR						AAGR
	1979	1980	1981	1982	1983	1984	(%)
PADDY	0.91	2.23	1.10	1.62	1.74	2.71	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

Notable economic activities excluding agriculture in Kabupaten Ngada are only livestock sector.

According to the Kabupaten data, the production volume of livestock in 1983 recorded approx. 2,410 tons and approx 1,500 tons out of 2,410 tons excluding the consumption of the Kabupaten itself are exported out of the Kabupaten. And this sector is expected to become prosperous.

1.3 Present Status of Kabupaten Roads

1.3.1 Outline of Road Networks

The regional trunk roads of Kabupaten Ngada consist of one national road and four provincial roads. The national road runs across the Kabupaten in the southern region from east to west via Bajawa, the Kabupaten capital. Two of the provincial roads lead to the south coast of the Kabupaten, to Manponggo and Maumbawa from Gako and Malanuza, respectively their junctions with the national road. The other two provincial roads run towards the north, to Danga and Poma from Aegela and Bajawa, respectively their junctions with the national road.

However two provincial roads which run towards the central and northern regions do not act as regional trunk roads at present due to their bad road surface conditions.

The Kabupaten roads formed in the central area north of the national road seem to have an important role as the facility for industrial development of the Kabupaten. It seems necessary to develop access roads to the northern coastal area which is expected to be one of the centers for developing the Kabupaten.

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 Ngada are confirmed as 50 links and 937 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 3.08 m per ha. This is distinctly higher than the national density of 0.48 m per ha and distinctly more 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 well advanced in density of Kabupaten roads.

	Total Length (km)	Area (ha)	Density (m/ha)
Kabupaten : Ngada	937	303,788	3.08
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 source 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 : NGADA

(Km)

NO	TYPE	THH	KRK	ASP	BTB	L.L	TOTAL
LINK 1		5					5
LINK 2		16					16
LINK 3		4	12				16
LINK 4					6		7
LINK 5		3	15				19
LINK 6		8					8
LINK 7			20				20
LINK 8		1	11		31		43
LINK 9		19			1		20
LINK 10		16			18		34
LINK 11		26	6		2		34
LINK 12			28				28
LINK 13		25					25
LINK 14		47					47
LINK 15		41					41
LINK 16		15					15
LINK 17		9	4				13
LINK 18		22					22
LINK 19		50					50
LINK 20		20					20
LINK 21		8					8
LINK 22		25					25
LINK 23		10					10
LINK 24		20					20
LINK 25			16				16
LINK 26		15					15
LINK 27		5					6
LINK 28		15					15
LINK 29		38					38
LINK 30		25					25
LINK 31		10					10
LINK 32		25					25
LINK 33		4					4
LINK 34		7					7
LINK 35		7					7
LINK 36		10					12
LINK 37		12					12
LINK 38		9					9
LINK 39		15					15
LINK 40		4					4
LINK 41		56					56
LINK 42		12					12
LINK 43		7					8
LINK 44		5					6
LINK 45		18					18
LINK 46		7					7
LINK 47		30					30
LINK 48		18					18
LINK 49		9					9
LINK 50		8					8
TOTAL		761	113	2	59	2	937
RATIO		81	12	0	6	0	(%)

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 : Ngada	0.2	18.3	81.4
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 either than that of Indonesia and of Jawa Island. The proportion of low grade roads such as earth roads and others is distinctly high. This means that the road classification in the Kabupaten is low.

(3) Surface Condition of Kabupaten Roads

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

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

	Good	Fair	Poor	Bad
Kabupaten : Ngada	16.3	20.2	29.0	34.5
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

The surface condition level of the Kabupaten roads in the Kabupaten is lower than that of Indonesia and Jawa Island.

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

PROVINCE : NUSA TENGGARA TIMUR

KABUPATEN : NGADA

(%)

NO		ERTH				KRK				ASP				BTB				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		24	76																	
LINK	2	6	18	28	48																
LINK	3	60		40		41	24	35													
LINK	4									80	10	10		80	14	6					
LINK	5	13	37	27	23	4	56	33	7												
LINK	6		38	31	32																
LINK	7					56	11	33													
LINK	8	40	40	20		61	26	13						91	7	3					
LINK	9	39	43	13	6									80	20						
LINK	10	17	47	22	14									53	30	17					
LINK	11	20	39	36	6	25	58	17						60	38	3					
LINK	12						64	36													
LINK	13		16	48	36																
LINK	14	66	30	46	8																
LINK	15		17	37	46																
LINK	16	10	13	31	46																
LINK	17	3	9	22	66	15	23	63													
LINK	18	20	5	18	58																
LINK	19			19	81																
LINK	20	3	32	55	10																
LINK	21			60	40																
LINK	22	12	18	12	59																
LINK	23	4	14	24	58																
LINK	24	9	18	19	55																
LINK	25					71	28	2													
LINK	26	26	8	27	39																
LINK	27		67	33			55	45													
LINK	28	23	15	27	35																
LINK	29			26	74																
LINK	30	16	17	9	58																
LINK	31	6	14	20	60																
LINK	32	7	22	16	55																
LINK	33		86	14																	
LINK	34		3	55	42																
LINK	35	1	1	5	92																
LINK	36		3	43	55						60	40				95	5				
LINK	37		10	50	40																
LINK	38		22	47	31																
LINK	39			1	99																
LINK	40	18	20	38	25																
LINK	41			27	73																
LINK	42			6	94																
LINK	43	36	23	41															8	99	
LINK	44	31	12	29	28													5	35	60	
LINK	45			1	99																
LINK	46	21	19	51	10																
LINK	47		1	1	99																
LINK	48		6	78	16																
LINK	49	34	12	31	23																
LINK	50			1	99																
AVERAGE		11	18	30	42	30	38	31	1	10	35	25	0	61	18	21	1	0	3	18	80
LENGTH		761 Km				513 Km				2 Km				59 Km				2 Km			
Dist		84	137	228	320	34	43	35	1	1	1	1	0	36	11	12	1	0	0	0	2

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 42.0% flat, and 39.0% hilly, 19.0% mountainous. There is no swampy area in the Kabupaten.

1.3.3 Bridge Inventory

A bridge inventory showing the existing condition of bridges on the Kabupaten roads in Kabupaten Ngada 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 29 bridges with a total length of 231 m of which 1 or 6.9% are timber, 8 or 27.6% are concrete and 17 or 58.6% are others. Steel bridges account for only 2 or 6.7% of the total. On the other hand, 121 bridges with a total length of 1,716 m are required to be newly constructed.

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(Km)

[02	3)	BK	DT	RW	GN	TOTAL
LINK	1	5				5
LINK	2	1	14	1		16
LINK	3	2	6		8	16
LINK	4		7			7
LINK	5	16	2			18
LINK	6	3	5			8
LINK	7	11	7		2	20
LINK	8	1	42			43
LINK	9		17		3	20
LINK	10	1	29		4	34
LINK	11	14	12		8	34
LINK	12	7	21			28
LINK	13	5	20			25
LINK	14	47				47
LINK	15	15	26			41
LINK	16	3	12			15
LINK	17	2	11			13
LINK	18	13	9			22
LINK	19	45			5	50
LINK	20	20				20
LINK	21	4	4			8
LINK	22	8	17			25
LINK	23		10			10
LINK	24	6	14			20
LINK	25		16			16
LINK	26	10	5			15

(Km)

[02	3)	BK	DT	RW	GN	TOTAL
LINK	27	4	2			6
LINK	28	8	7			15
LINK	29				38	38
LINK	30	15	10			25
LINK	31	4	6			10
LINK	32	9	16			25
LINK	33	4				4
LINK	34	6	1			7
LINK	35	6	1			7
LINK	36	5	7			12
LINK	37		12			12
LINK	38				9	9
LINK	39	10			5	15
LINK	40	2	1		1	4
LINK	41	5			51	56
LINK	42	12				12
LINK	43	1	6	1		8
LINK	44	2	4			6
LINK	45	18				18
LINK	46	2	5			7
LINK	47				30	30
LINK	48				18	18
LINK	49	4	5			9
LINK	50	8				8
TOTAL		364	389	2	182	937
RATIO		39	42	0	19	(%)

Table 1-3-4 NUMBER AND LENGTH OF BRIDGES

PROV : NUSA TENGGARA TIMUR KAB : NGADA

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

	EXISTING		NOT EXIST		TOTAL	
LINK NO	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
1			1	6.00	1	6.00
2	1	8.00	3	40.00	4	48.00
3	1	5.00			1	5.00
4	3	50.00	1	50.00	4	100.00
5			1	60.00	1	60.00
6			3	141.00	3	141.00
7	13	87.00			13	87.00
8	1	7.00	3	44.00	4	51.00
9			1	150.00	1	150.00
11			2	28.00	2	28.00
12	4	28.00	2	26.00	6	54.00
13			4	38.00	4	38.00
14			3	55.00	3	55.00
15			6	210.00	6	210.00
16			9	92.00	9	92.00
17			11	140.00	11	140.00
18	1	6.00	2	21.00	3	27.00
19			3	43.00	3	43.00
20			2	20.00	2	20.00
21			2	24.00	2	24.00
22			5	65.00	5	65.00
23			6	35.00	6	35.00
24			2	15.00	2	15.00
25	3	10.00			3	10.00
26	1	6.00	2	18.00	3	24.00
27			2	30.00	2	30.00
28			4	50.00	4	50.00
29	1	24.00			1	24.00
30			5	34.00	5	34.00
31			4	35.00	4	35.00
32			6	36.00	6	36.00
33			3	22.00	3	22.00
34			3	40.00	3	40.00
35			3	15.00	3	15.00
36			1	7.00	1	7.00
37			1	7.00	1	7.00
38			1	8.00	1	8.00
39			2	18.00	2	18.00
40			1	7.00	1	7.00
41			2	20.00	2	20.00
42			2	15.00	2	15.00
43			1	7.00	1	7.00
44			1	9.00	1	9.00
46			2	15.00	2	15.00
47			1	7.00	1	7.00
48			1	8.00	1	8.00
49			1	5.00	1	5.00
TOTAL	29	231.00	121	1716.00	150	1947.00

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(No)

103 (18)	<<< BRIDGE >>> KY	LL	BJ	BT	TOTAL
LINK 1					
LINK 2	1				1
LINK 3		1			1
LINK 4		1	2		3
LINK 5					
LINK 6					
LINK 7	1	10		2	13
LINK 8				1	1
LINK 9					
LINK 11					
LINK 12		3		1	4
LINK 13					
LINK 14					
LINK 15					
LINK 16					
LINK 17					
LINK 18		1			1
LINK 19					
LINK 20					
LINK 21					
LINK 22					
LINK 23					
LINK 24					
LINK 25				3	3
LINK 26		1			1
LINK 27					
LINK 28					
LINK 29				1	1
LINK 30					
LINK 31					
LINK 32					
LINK 33					
LINK 34					
LINK 35					
LINK 36					
LINK 37					
LINK 38					
LINK 39					
LINK 40					
LINK 41					
LINK 42					
LINK 43					
LINK 44					
LINK 46					
LINK 47					
LINK 48					
LINK 49					
TOTAL	2	17	2	8	29
RATIO	7	59	7	28	(2)

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

Bridge Type	Span Length (m)										
	〈3	〈5	〈8	〈10	〈12	〈14	〈16	〈18	〈20	〈99	Total
Timber	-	-	-	-	-	-	-	-	-	-	-
Concrete	2	2	1	-	3	-	-	-	-	-	8
Steel	-	-	-	-	-	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-	-	-	-
Total	2	2	1	-	3	-	-	-	-	-	8

Existing bridges are of in various types but concrete bridge is prevailing. 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 Ngada 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	498	145	160	513	1,316
Proportion (%)	37.84	11.02	12.16	38.98	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	4.97	14.93	80.10	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 : NGADA

A)	Growth Rate of Population	:	2.00 (%)
B)	Growth Rate of Cultivated Area	:	7.00 (%)
C)	Growth Rate of Rice field	:	8.00 (%)
D)	Growth Rate of Rice yield rate	:	5.00 (%)
E)	Growth Rate of GDP / capita	:	7.70 (%)
a)	Geometrical Mean (A x B)	:	4.47 (%)
b)	Geometrical Mean (C x D)	:	6.49 (%)
c)	Geometrical Mean (a x b)	:	5.47 (%)
d)	Geometrical Mean (c x E)	:	6.58 (%)
	TRAFFIC GROWTH RATE	:	6.58 (%)

2.1.2 Present and Future Traffic Volume

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

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

Where :

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

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

Table 2-1-2 EXISTING AND FUTURE TRAFFIC VOLUME

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(SPD : 1/2)

	INVENTORY (1985)					RATE	AFTER 13 YEARS (1998)					CLASS
LINK NO	MBL	BUS	TRUK	SPD	TOTAL		MBL	BUS	TRUK	SPD	TOTAL	
1	50	20	10	40	100	6.6%	114	46	23	92	229	IIIB-1
2	25	10	10	40	65	6.6%	57	23	23	92	149	IIIB-2
3	0	0	0	20	10	6.6%	0	0	0	46	23	IIIC
4	40	20	20	20	90	6.6%	92	46	46	46	206	IIIB-1
5	1	0	0	2	2	6.6%	2	0	0	5	5	IIIC
6	10	10	5	20	35	6.6%	23	23	11	46	80	IIIB-2
7	2	0	0	4	4	6.6%	5	0	0	9	9	IIIC
8	10	0	10	5	23	6.6%	23	0	23	11	53	IIIB-2
9	8	0	2	0	10	6.6%	18	0	5	0	23	IIIC
10	0	0	2	0	2	6.6%	0	0	5	0	5	IIIC
11	2	0	0	0	2	6.6%	5	0	0	0	5	IIIC
12	20	10	10	20	50	6.6%	46	23	23	46	114	IIIB-2
13	1	0	2	0	3	6.6%	2	0	5	0	7	IIIC
14	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
15	1	0	2	0	3	6.6%	2	0	5	0	7	IIIC
16	50	40	0	0	90	6.6%	114	92	0	0	206	IIIB-1
17	10	0	0	8	14	6.6%	23	0	0	18	32	IIIC
18	10	0	0	10	15	6.6%	23	0	0	23	34	IIIC
19	0	0	2	2	3	6.6%	0	0	5	5	7	IIIC
20	0	0	2	2	3	6.6%	0	0	5	5	7	IIIC
21	0	0	1	1	2	6.6%	0	0	2	2	5	IIIC
22	30	0	0	20	40	6.6%	69	0	0	46	92	IIIB-2
23	15	0	0	15	23	6.6%	34	0	0	34	53	IIIB-2
24	15	0	0	15	23	6.6%	34	0	0	34	53	IIIB-2
25	8	2	15	15	33	6.6%	18	5	34	34	76	IIIB-2
26	10	0	0	10	15	6.6%	23	0	0	23	34	IIIC
27	15	1	25	25	54	6.6%	34	2	57	57	124	IIIB-2
28	20	0	0	25	33	6.6%	46	0	0	57	76	IIIB-2
29	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
30	30	0	0	25	43	6.6%	69	0	0	57	98	IIIB-2
31	20	0	0	15	28	6.6%	46	0	0	34	64	IIIB-2
32	25	0	0	25	38	6.6%	57	0	0	57	87	IIIB-2
33	0	0	10	15	18	6.6%	0	0	23	34	41	IIIC
34	20	10	5	40	55	6.6%	46	23	11	92	126	IIIB-2
35	40	20	20	60	110	6.6%	92	46	46	137	252	IIIB-1
36	0	0	2	2	3	6.6%	0	0	5	5	7	IIIC
37	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
38	2	0	2	2	5	6.6%	5	0	5	5	11	IIIC
39	0	0	1	2	2	6.6%	0	0	2	5	5	IIIC
40	0	0	2	4	4	6.6%	0	0	5	9	9	IIIC
41	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
42	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
43	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
44	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
45	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
46	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
47	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
48	2	0	0	0	2	6.6%	5	0	0	0	5	IIIC
49	0	0	0	0	0	6.6%	0	0	0	0	0	IIIC
50	6	2	0	4	10	6.6%	14	5	0	9	23	IIIC
PERCENT	37.84	11.02	12.16	38.98			37.84	11.02	12.16	38.98		

2.2 Benefit

2.2.1 Benefit Estimation Method

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

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

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

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

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

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

(KM)

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

Source : Bina Marga

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(1998)

LINK NO	CLASS	SURFACE	MOBIL	BUS	TRUCK	SEPEDA	TOTAL
3	IIIC	KRK	3	1	1	3	7
5	IIIB-2	KRK	82	24	27	85	176
6	IIIC	KRK	19	6	6	20	41
7	IIIB-2	KRK	41	12	13	43	88
8	IIIB-1	ASP	139	40	45	143	296
9	IIIB-2	KRK	55	16	18	57	118
10	IIIC	KRK	7	2	2	8	15
11	IIIC	KRK	7	2	2	7	15
12	IIIB-2	KRK	64	19	20	66	136
13	IIIB-1	ASP	117	34	38	121	250
14	IIIB-1	ASP	116	34	37	120	247
15	IIIB-1	ASP	117	34	38	121	250
17	IIIC	KRK	1	0	0	1	2
18	IIIC	KRK	11	3	4	11	24
19	IIIC	KRK	8	2	3	8	17
20	IIIB-2	KRK	77	23	25	80	165
21	IIIB-2	KRK	23	7	8	24	50
22	IIIB-2	KRK	85	25	27	88	181
23	IIIC	KRK	17	5	6	18	37
24	IIIB-2	KRK	64	19	21	66	137
25	IIIB-2	KRK	55	16	18	56	117
26	IIIB-2	KRK	47	14	15	48	100
27	IIIC	KRK	13	4	4	13	28
28	IIIB-2	KRK	26	8	8	27	56
29	IIIC	KRK	1	0	0	1	2
30	IIIB-2	KRK	76	22	24	79	162
31	IIIB-2	KRK	32	9	10	33	68
32	IIIB-2	KRK	78	23	25	81	167
33	IIIC	KRK	12	4	4	13	27
34	IIIC	KRK	22	6	7	22	46
36	IIIB-2	KRK	37	11	12	38	79
37	IIIB-2	KRK	41	12	13	42	87
38	IIIC	KRK	13	4	4	13	28
39	IIIC	KRK	16	5	5	16	34
40	IIIC	KRK	7	2	2	7	15
41	IIIB-1	ASP	138	40	44	142	293
42	IIIC	KRK	19	6	6	20	41
43	IIIC	KRK	2	1	1	2	5
44	IIIC	KRK	10	3	3	11	22
45	IIIB-2	KRK	31	9	10	32	66
46	IIIC	KRK	12	4	4	12	26
47	IIIC	KRK	3	1	1	4	7
48	IIIB-2	KRK	34	10	11	35	73
49	IIIB-2	KRK	71	21	23	73	152
50	IIIC	KRK	14	4	4	14	29

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 : NGADA

(1000Rupiah)

	LINK 1	LINK 2	LINK 3	LINK 4	LINK 5	LINK 6	LINK 7	LINK 8	LINK 9	LINK 10
	5 Ka	16 Ka	16 Ka	7 Ka	18 Ka	8 Ka	20 Ka	43 Ka	20 Ka	34 Ka
	IIIB-1	IIIB-2	IIIC	IIIB-1	IIIB-2	IIIC	IIIB-2	IIIB-1	IIIB-2	IIIC
YEAR	VOC	VOC	Surplus	VOC	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
1988	0	0	0	0	0	0	0	0	0	0
1989	25376	47235	298	6382	22662	3960	6081	49694	27407	2960
1990	27069	50469	298	6809	24964	3960	6704	54340	29967	3708
1991	28566	54471	298	7182	27267	4997	7338	58986	32630	3708
1992	30490	57706	298	7609	29569	5706	8165	64145	35882	4456
1993	32470	61791	883	8164	32300	6427	9183	69772	39133	4456
1994	34653	65108	883	8655	35358	7174	9637	75445	42385	4538
1995	37087	69193	1154	9327	38821	7528	10679	82414	45709	5953
1996	39298	73279	1154	9882	42652	9273	11720	88554	49549	7417
1997	41732	78049	1452	10555	46484	9665	12762	96550	53534	8165
1998	44664	83833	1452	11291	51131	11096	13827	104957	58096	8246
SUM	341405	641134	8170	85856	351208	69786	96096	744857	414292	53607
COST	172573	317611	-53314	12180	136363	10325	-17023	195571	166587	-92354
/Ka	34515	19851	-3332	1740	7576	1291	-851	4548	8329	-2716

Chapter 3 ENGINEERING

3.1 Design Criteria and Specification

3.1.1 Geometric Design Criteria

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

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

3.1.2 Loading Specification

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

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

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

Table 3-1-1

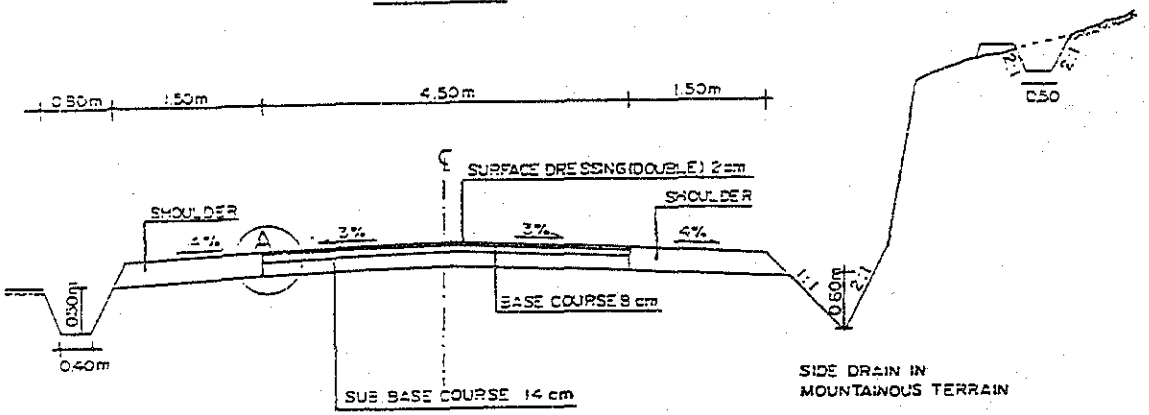
DESIGN CRITERIA FOR KABUPATEN ROADS

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

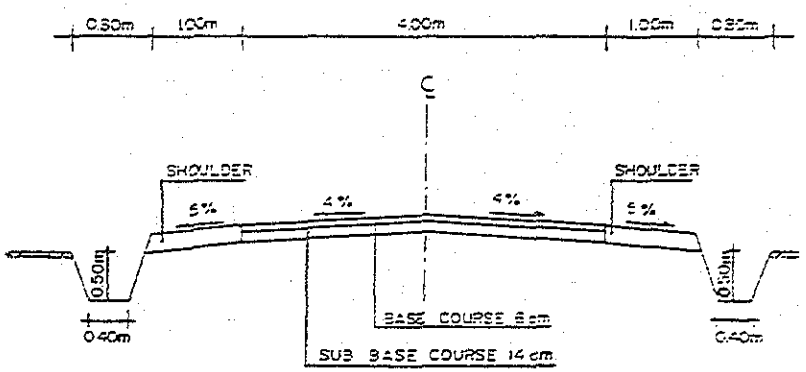
Fig. 3-1-1

STANDARD ROAD CROSS SECTIONS

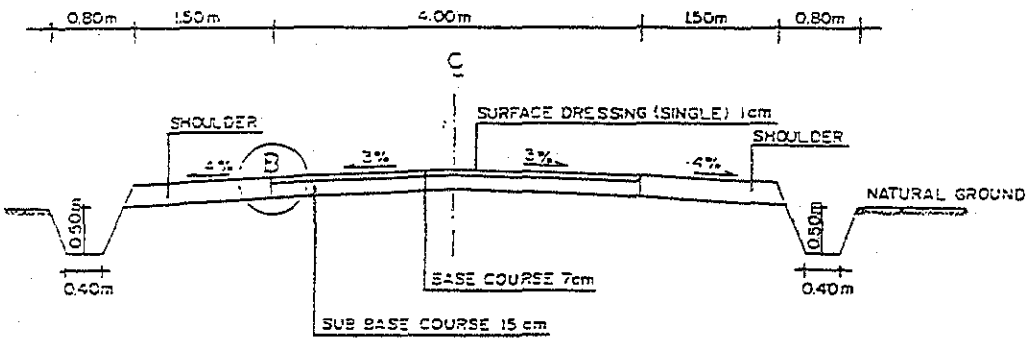
CLASS III A



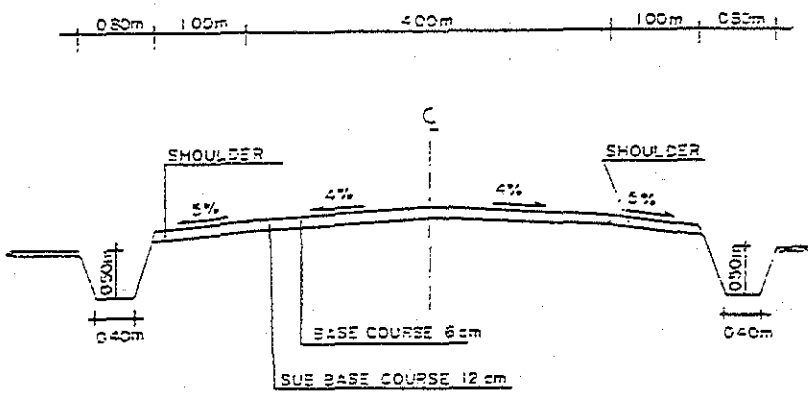
CLASS III B-2



CLASS III B-1



CLASS III C



3.2 Pavement Design

3.2.1 Design Conditions

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

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

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

1) Design Traffic Volume

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

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

2) Strength of Roadbed

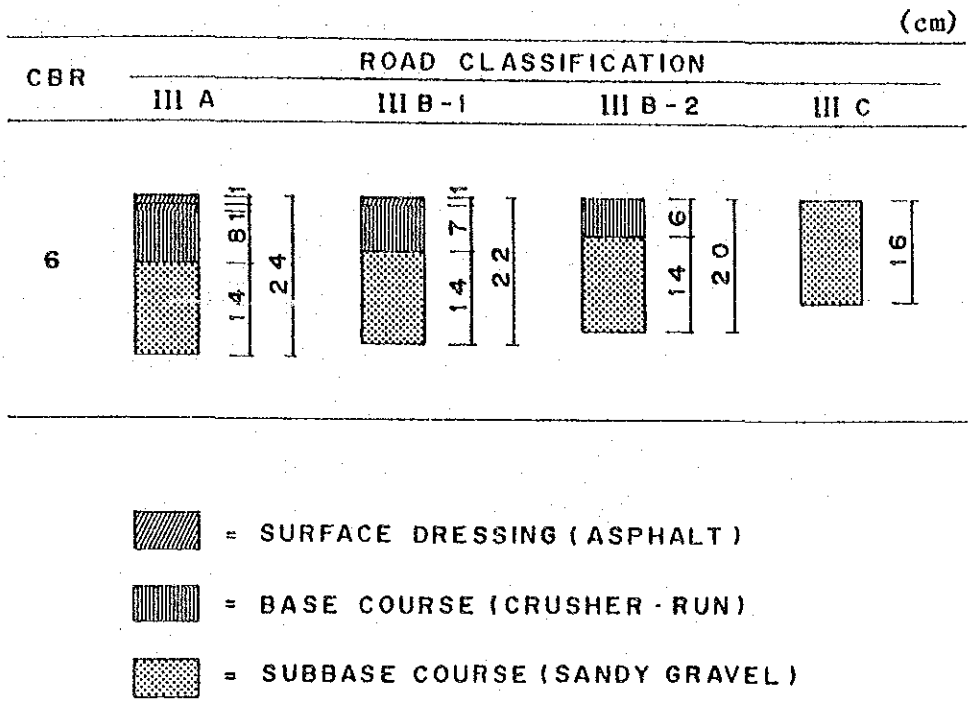
The CBR value of the existing roadbed is a very important factor for the pavement design but no results are available from CBR tests on the Kabupaten roads.

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

3.2.2 Pavement Structure

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

Fig. 3-2-1 PAVEMENT STRUCTURE



3.3 Design of Bridges and Other Structures

3.3.1 Standard Bridge

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

(1) Bridge Type

1) Superstructure

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

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

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

2) Substructure

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

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

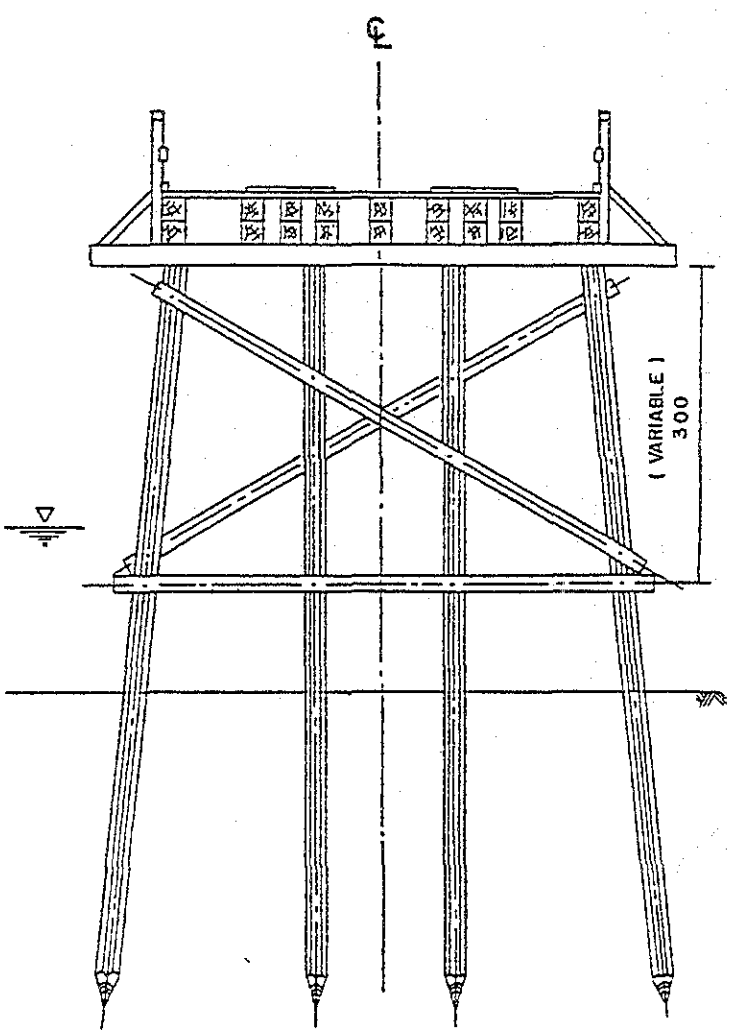
3) Foundation

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

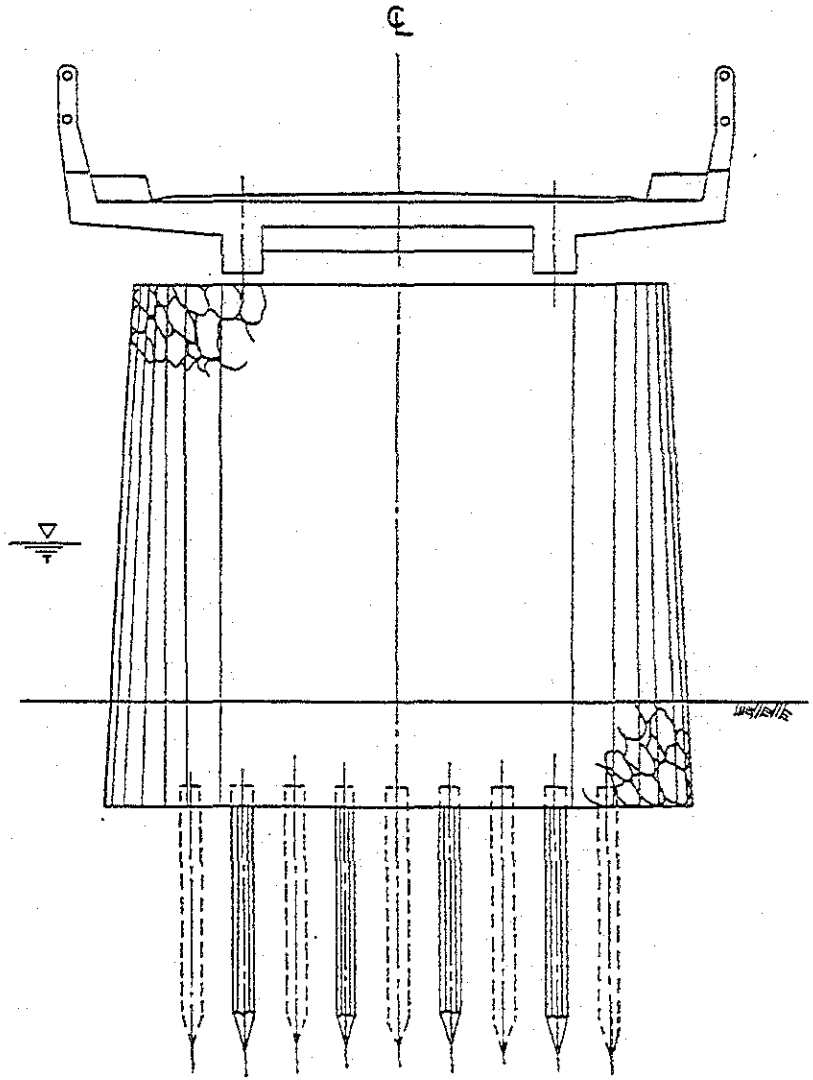
The pile length is suggested to be a minimum of 3 meters under the bottom of the foundation. The length and number of piles should be decided in order to be adequate for the condition of the foundation materials.

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

TIMBER BRIDGE



REINFORCED CONCRETE BRIDGE



(2) Bridge Width

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

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

(3) Span Length

The range of span lengths are determined as:

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

3.3.2 Other Structure

Culverts and retaining walls shown in Fig. 3-3-2 and Fig. 3-3-3 are recommended as standard structures.

(1) Culvert

The following two culvert types have been adopted for the transverse drainage.

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

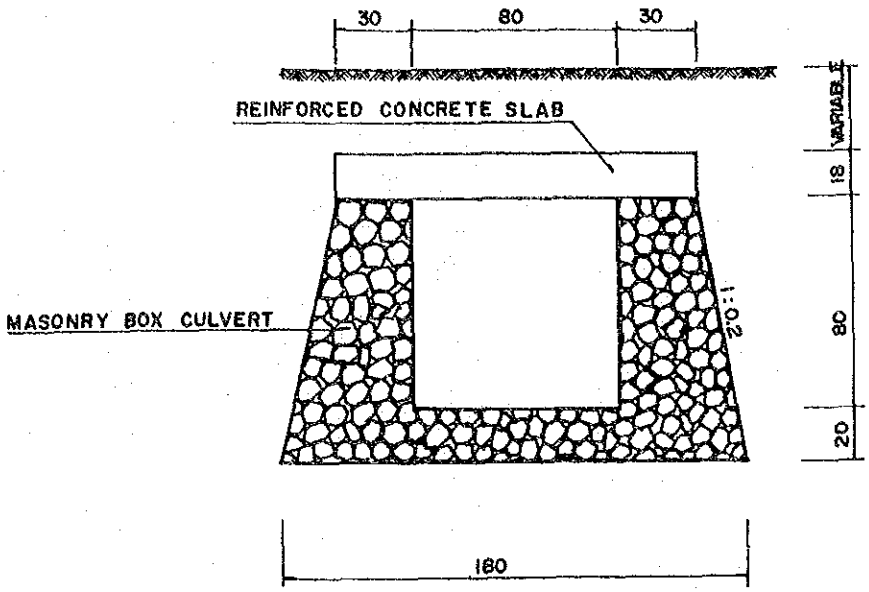
(2) Retaining Wall

The following two types of retaining walls have been adopted because of ease of construction, economy and familiarity in Indonesia.

a) Rubble in mortar retaining wall
b) Timber retaining wall

Fig. 3-3-2 STANDARD CULVERTS

80 x 80 RUBBLE IN MORTAR BOX CULVERTS



Ø 80 RENFORCED CONCRETE PIPE CULVERT

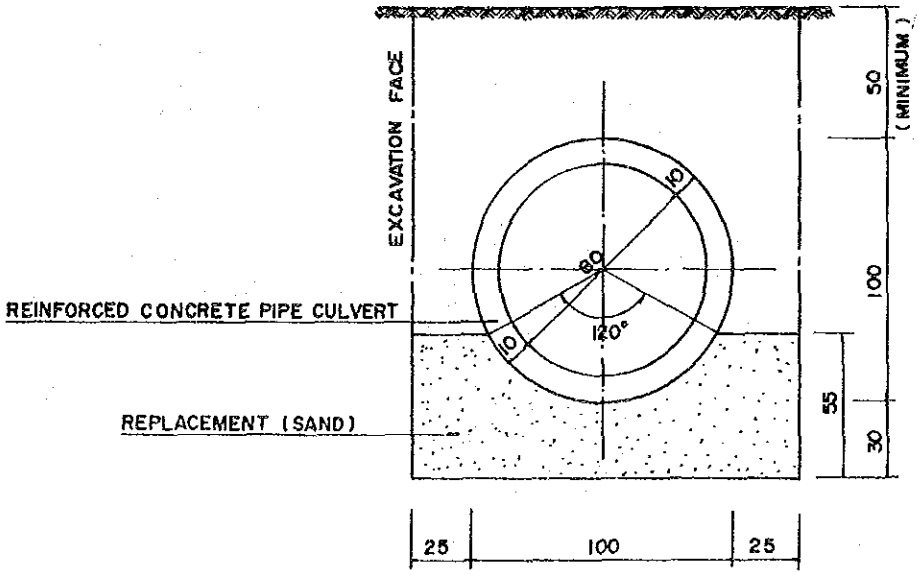
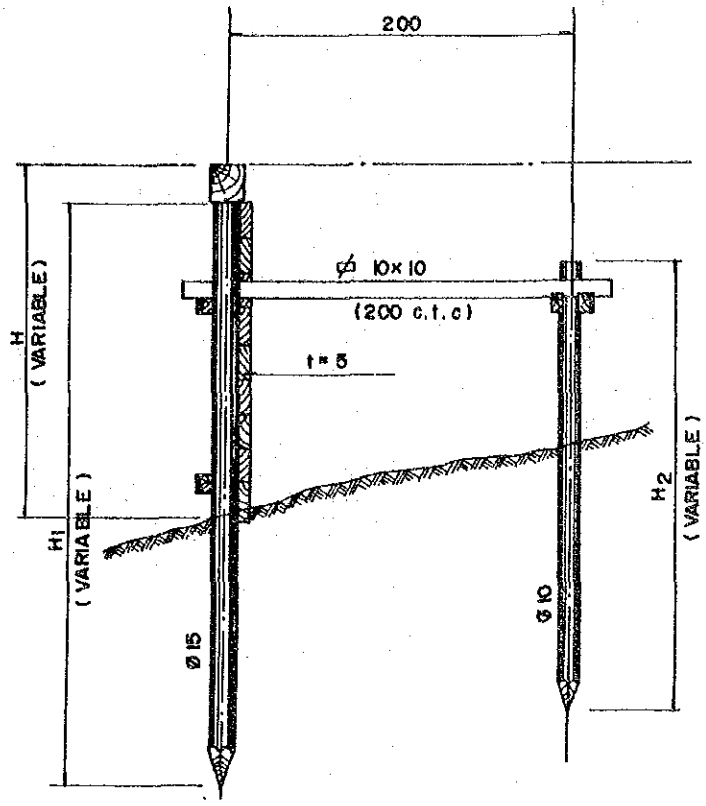
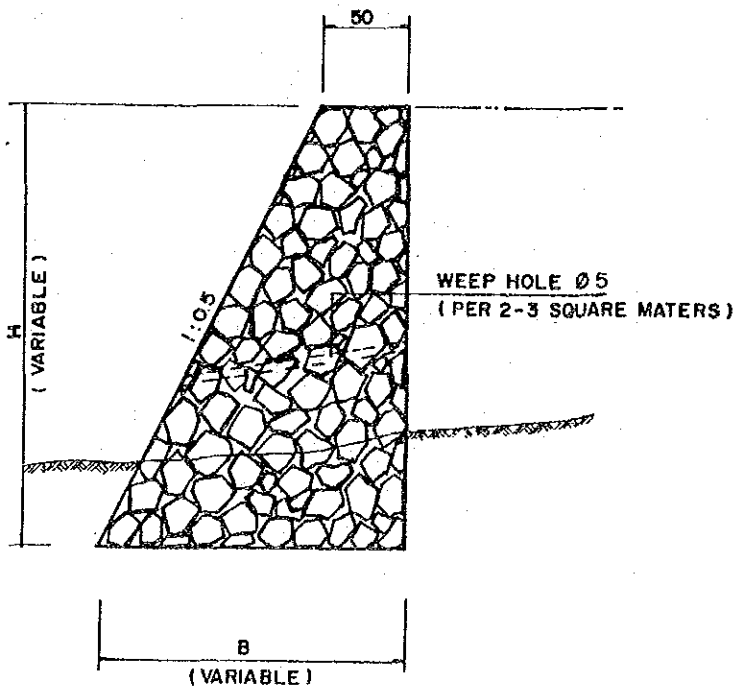


Fig. 3-3-3 STANDARD RETAINING WALLS

TIMBER RETAINING WALL



RUBBLE IN MORTAR WALL



3.4 Selection of Equipment Types

From the results of comparison of two types of Kabupaten road construction methods, i.e. equipment intensive method and labour intensive method construction methods for major works were basically decided as shown in Table 3-4-1.

Table 3-4-1 CONSTRUCTION METHODS FOR MAJOR WORKS

METHOD	WORK TYPE
Equipment Intensive	Earthwork, Base Course and Subbase Course
Labour Intensive	Surface Dressing, Drainage, Bridge and Other Structures.

3.4.1 Points to be Considered for the Selection

Full consideration was given to the following points in studying the selection of equipment type.

a. Most of the construction in the Project is pavement works for road improvement.

b. The pavement width adopted is equal to or less than 4.5 m and therefore large sized equipment is omitted from the selection process.

c. Equipment should be capable of with standing the heavy rainfall and poor soil quality. Equipment for construction in swampy areas is considered if necessary.

d. Uniformity of equipment types with existing equipment is considered to facilitate repair of the equipment in the provincial work shop.

e. Since the scale of the construction is small and transportation of equipment will frequently be necessary, wheel type equipment has been selected as much as possible as this can move by itself or by being towed.

f. The road like to be improved are scattered all over the Kabupatens and therefore a low bed truck or equivalent is necessary for transportation of crawler type equipment. It is desirable to protect the existing pavement from damage caused by the movement of crawler type equipment on the existing roads.

g. The capacity of the equipment has been decided taking into consideration the construction volume and the combination of equipment in the main work.

3.4.2 Combinations of Equipment for Major Works and Maintenance

The combinations of equipment for major works and maintenance are listed in Table 3-4-2 and 3-4-3 respectively.

Table 3-4-2 EQUIPMENT OF ONE WORK GANG FOR MAJOR TYPES OF WORK

TYPE OF WORK	EQUIPMENT REQUIRED	
1. Site Clearing in Light Bush	1- Bulldozer 90 HP 2- Dump Truck 3.0 Ton	1- Wheel Loader 1.2 m^3
2. Excavation & Embankment		
i) Normal Fill	1- Bulldozer 90 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
ii) Fill by Borrow Material	1- Bulldozer 90 HP 3- Dump Truck 3.0 Ton	1- Wheel Loader 1.2 m^3
iii) Fill in Swamp	1- Swamp Bulldozer 90 HP 1- Water Tank Truck 4,000 Ltr	1- Vibratory Roller 4.0 Ton (D&T)
iv) Excavation to Spoil	1- Bulldozer 90 HP 1- Wheel Loader 1.2 m^3	4- Dump Truck 3.0 Ton
3. Subgrade Preparation	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
4. Subbase Course	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton (D&T)	1- Water Tank Truck 4,000 Ltr
5. Base Course	1- Motor Grader 75 HP 1- Vibratory Roller 4.0 Ton 1- Portable Crusher/Screens 30-40 Ton/H	1- Water Tank Truck 4,000 Ltr
6. Cement Stabilizing	1- Motor Grader 70 HP 1- Bulldozer 90 HP 1- Wheel Loader 1.2 m^3 1- Flat Bed Truck 3.0 Ton	1- Vibratory Roller 4.0 Ton (D&T) 1- Road Stabilizer 1- Water Tank Truck 4,000 Ltr
7. Surface Course	1- Asphalt Sprayer 850 Ltr 1- Tyre Roller 8-15 Ton 1- Portable Crusher/Screens 30-40 Ton/H	1- Flat Bed Truck 3.0 Ton
8. Concrete	1- Concrete Mixer 0.5 m^3 1- Water Pump 200 Ltr/Min 1- Concrete Vibrator 3.3 HP	1- Flat Bed Truck 3.0 Ton 1- Hand-Guided Vibratory Roller 1000 Kg

Table 3-4-3 EQUIPMENT OF ONE WORK GANG FOR MAINTENANCE

TYPE OF WORK	EQUIPMENT REQUIRED
Road	1- Motor Grader
	1- Tyre Roller 8-15 Ton
	1- Hand-Guided Vibratory Roller 1000 Kg
	1- Flat Bed Truck 3.0 Ton
	1- Dump Truck 3.0 Ton
Bridge and Other Structure	1- Flat Bed Truck With Crane 3.0 Ton

3.5 Workshop and Laboratory

3.5.1 Policy of the Kabupaten Workshop

A workshop will be provided for each Kabupaten. The function of the workshop is to cope with requests from the construction site. The main service will be routine maintenance while the secondary service will be light repairs which can be carried out by changing parts. Dismantling and assembling of units which need setting or adjustment using special equipment or facilities will not be carried out in the Kabupaten workshop. Such repairs are planned to be carried out by the provincial workshop or the regional Workshop of Bina Marga.

Accordingly the main tasks of the Kabupaten workshop are as follows:

1) Administration for and storage of equipment
2) Routine maintenance and light repair of equipment
3) Storage and supply of spare parts
4) Operation of equipment including crushing plant.

3.5.2 Workshop Equipment and Tools

Equipment and tools for the workshop are recommended as shown in Table 3-5-1.

Table 3-5-1 WORKSHOP EQUIPMENT AND TOOLS

DESCRIPTION	QUANTITY
Upright Drilling Machine	1 Set
Electric Hand Drill	1
Electric Portable Grinder	1
Disc Grinder	1
Bench Electric Grinder	1
Engineer's Vice	1
DC Electric Welder with Engine	1 Set
Portable Hydraulic Jack, Screw Head	1
Hydraulic Jack	1
Grease Gun	2
Suction Pump for Oil Recovery	2
High Pressure Grease Pump	1

continued

DESCRIPTION	QUANTITY
Drum Opening Spanner	1
Silicon Normal Charger	1
Tyre Changer Air Operated	1
Tyre Service Tool Set	1
Tyre Pressure Gauge	1
Automatic Tyre Inflator	1
Plug Cleaner and Tester	1
Mechanics Tool Set, Heavy Equipment	1
Mechanics Tool Set, Large Vehicle	1
Portable Air Compressor	1
Electric Cord Reel, 15 A, 50 m	1
Oil Measure, Polyethylene	1
Funnel 200 mm, Steel	3
Hand Truck (Cart), 4-Wheel	1
Nylon Sling, 10 ton	2
Chain Block, 1 ton	2
Wire Rope (for sling), 1.8 ton	2
Wire Rope (for sling) 3.2 ton	2
Generator	1

3.5.3 Laboratory

For quality control of construction in the Project it is recommended that a laboratory is provided for each Kabupaten. For each laboratory, provision of laboratory test equipment for the following tests is recommended:

- Physical characteristic, compaction and strength tests for the road bed and pavement materials.
- Slump and strength tests for the bridge concrete.

In the laboratory a fixed water tank should be provided for CBR tests and curing of concrete specimens.

The proposed laboratory equipment is listed in Table 3-5-2.

Table 3-5-2 LABORATORY TEST EQUIPMENT

DESCRIPTION	QUANTITY
Soil Moisture Test Set (JIS A1203)	1
Liquid Limit Set (JIS A1205)	1
Plastic Limit Set (JIS A1206)	1
Compaction Set (JIS A1210)	1
CBR Laboratory Set, Mechanical (JIS A1211)	1
Sand Density Apparatus (JIS A1214)	1
Aggregate Test Sieve Set	1
Portable Cone Penetrometer	1
Compression & Bending Test Machine	1
Cylinder Mould (JIS A1132, 1108)	9
Slump Test Apparatus (JIS A1101)	2

To conduct the surveys necessary for road and structure construction such as centering, profile leveling, cross section leveling etc., the surveying equipment listed in Table 3-5-3 recommended.

Table 3-5-3 SURVEYING EQUIPMENT

DESCRIPTION	QUANTITY
Transit	1
Level	1
Staff	3

Chapter 4 CONSTRUCTION AND MAINTENANCE COST ESTIMATIONS

4.1 Unit Price

With regard to the unit prices of materials and labor, the data were collected from each Kabupaten through Bina Marga. The collected data were compared with those of Jakarta using BAHAN BANGUNAN DKI-JAKARTA MAY & JUNE 1985 compiled by PUSAT INFORMASI TEHNIK PEMBANGUNAN, and then finalized.

4.1.1 Unit Labour Price

The unit labour prices of Kabupaten Ngada 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 Ngada 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 : NGADA

(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	12,800	13,111	7,769	1,034	8,803	21,914
	Bulldozer/Ripper	120 HP	340	13,821	14,161	8,500	1,591	10,091	24,252
	Swamp Bulldozer	120 HP	356	14,065	14,421	8,879	1,662	10,541	24,962
	Bulldozer	90 HP	197	8,657	8,854	4,914	654	5,568	14,422
	Bulldozer/Ripper	90 HP	212	9,254	9,466	5,300	992	6,292	15,758
	Bulldozer	65 HP	140	6,290	6,430	3,500	465	3,965	10,395
	Bulldozer/Ripper	65 HP	153	6,744	6,897	3,819	714	4,533	11,430
	Swamp Bulldozer	90 HP	212	9,244	9,456	5,284	989	6,273	15,729
	Swamp Bulldozer	65 HP	162	6,647	6,809	4,050	758	4,808	11,617
	Motor Grader	110 HP	277	11,088	11,365	6,919	1,295	8,214	19,579
	Motor Grader	75 HP	192	7,600	7,792	4,779	894	5,673	13,465
	Motor Grader	65 HP	172	6,689	6,861	4,300	804	5,104	11,965
	Road Stabilizer	W=1850 mm	344	3,414	3,758	8,594	428	9,022	12,780
	Vibratory Roller	4 ton	116	3,323	3,439	2,900	385	3,285	6,724
	Hand-guide Vib. Roller	1000 Kg	94	602	696	849	30	879	1,575
	Tire Roller	8-15 ton	125	7,342	7,467	3,106	103	3,209	10,676
	Vibratory Roller (D&T)	4 ton	116	3,323	3,439	2,900	385	3,285	6,724
	Hand-guide Vib. Roller	600 Kg	66	411	477	600	21	621	1,098
	Rough Terrain Crane	10 ton	402	12,926	13,328	10,039	751	10,790	24,118
	Hydraulic Excavator; Wheel	0.3 m3	165	7,781	7,946	4,109	546	4,655	12,601
	Wheel Loader	1.2 m3	281	8,426	8,707	7,019	934	7,953	16,660
	Wheel Loader	0.3 m3	91	2,939	3,030	2,269	302	2,571	5,601
	Water Tank Truck	4000 ltr.	96	2,825	2,921	868	123	991	3,912
	Fuel Tank Truck	4000 ltr.	98	2,833	2,931	882	125	1,007	3,938
	Dump Truck	3.0 ton	162	3,550	3,712	1,469	208	1,677	5,389
	Flat Bed Truck with Crane	3.0 ton	69	3,067	3,136	1,717	128	1,845	4,981
	Dump Loader Truck	12 ton	154	18,820	18,974	3,838	127	3,965	22,939
	Dump Truck	5.0 ton	241	5,859	6,100	2,189	311	2,500	8,600
	Flat Bed Truck	3.0 ton	23	2,637	2,660	563	42	605	3,265
	Portable Crusher/Screening	30-40 t/h	752	21,619	22,371	18,800	2,502	21,302	43,673
	Concrete Mixer	0.5 m3	594	2,454	3,048	5,400	431	5,831	8,879
	Water Pump	200 l/min	21	262	283	188	6	194	477
	Concrete Vibrator	3.3 HP	9	226	235	73	2	75	310
	Asphalt Sprayer	850 ltr.	113	774	887	1,019	144	1,163	2,050

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 : NGADA

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Site Clearance in Light Bush	m2	153	91	244
Subgrade Preparation	m2	19	11	30
Normal Fill	m3	1,576	865	2,441
Fill in Swamp	m3	2,325	1,054	3,379
Normal Excavation to Spoil	m3	926	523	1,449
Sub Base Course	m3	2,984	1,350	4,334
Base Course	m3	4,100	2,303	6,403
Shoulder	m2	273	146	419
Asphalt Patching	m2	2,938	1,514	4,452
Surface Dressing (Single)	m2	843	766	1,609
Surface Dressing (Double)	m2	1,001	1,207	2,208
Earth Drain	m	629	119	748
Earth Drain in Swamp (by machine)	m3	1,065	474	1,539
Pipe Culvert D80cm	m	36,882	76,576	113,458
Masonry Culvert (80x80cm)	m	47,364	53,860	101,224
Retaining Wall and Wing Wall (Timber)	m2	15,772	246	16,018
Retaining Wall and Wing Wall (Masonry)	m3	32,773	12,077	44,850
Gabion Protection	m3	11,004	121	11,125
Manual routine maintenance of road	Km	96,920	7,260	104,180
Routine maintenance of earth road	Km	85,342	37,948	123,290
Routine maintenance of gravel road	Km	176,065	88,186	264,251
Routine maintenance of asphalt road	Km	293,800	151,400	445,200

4.2.2 Bridges

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

Table 4-2-2 BRIDGE COST

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(Rp)

ITEM	UNIT	LOCAL	FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	52,702	2,727	55,429
Superstructure (Timber;Span 5m;10T)	m2	58,376	3,012	61,388
Superstructure (Timber;Span 8m;10T)	m2	77,325	3,961	81,286
Superstructure (Timber;Span 3m;BM50)	m2	65,349	3,373	68,722
Superstructure (Timber;Span 5m;BM50)	m2	71,346	3,658	75,004
Superstructure (Timber;Span 8m;BM50)	m2	90,487	4,632	95,119
Superstructure (Concrete;Span 3m;BM50)	m2	52,924	171,810	224,734
Superstructure (Concrete;Span 5m;BM50)	m2	53,980	192,600	246,580
Superstructure (Concrete;Span 8m;BM50)	m2	55,318	210,151	265,469
Superstructure (Concrete;Span10m;BM50)	m2	60,222	239,232	299,454
Superstructure (Concrete;Span15m;BM50)	m2	64,324	282,524	346,848
Substructure (Pier;for Timber;10T)	NO	458,897	25,168	484,065
Substructure (Abut;for Timber;10T)	NO	1,200,388	128,063	1,328,451
Substructure (Pier;for Timber;BM50)	NO	674,875	37,224	712,099
Substructure (Abut;for Timber;BM50)	NO	1,362,835	140,846	1,503,681
Substructure (Pier;for Concrete;BM50)	NO	1,393,463	487,788	1,881,251
Substructure (Abut;for Concrete;BM50)	NO	2,948,676	1,017,596	3,966,272
Demolition of Bridge (Timber->Timber)	m2	14,316	1,106	15,422
Demolition of Bridge (Timber->Concrete)	m2	14,316	1,106	15,422
Demolition of Bridge (Concrete)	m2	73,686	121,003	194,689
Maintenance of Timber Bridge (New)	m2	9,334	954	10,288
Maintenance of Concrete Bridge (New)	m2	1,822	4,303	6,125
Maintenance of Timber Bridge (Exist)	m2	8,203	2,322	10,525
Maintenance of Concrete Bridge (Exist)	m2	3,900	2,705	6,605

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 Ngada are shown in Table 5-1-1.

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

KABUPATEN : NGADA

CRITERIA NO	ROAD LINK NO
-	-

5.2 Evaluation

5.2.1 Primary Analysis

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

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

5.2.2 Secondary Analysis

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

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

5.2.3 Ranking of Feasible Road Links

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

Table 5-2-1 RESULTS OF PRIMARY ANALYSIS

PROVINCE : NUSA TENGGARA TIMUR KABUPATEN : NGADA

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
35	7 Km	IIIB-1	45.671	VOC
32	25 Km	IIIB-2	33.841	Surplus
16	15 Km	IIIB-1	31.795	VOC
22	25 Km	IIIB-2	31.572	Surplus
30	25 Km	IIIB-2	30.899	Surplus
24	20 Km	IIIB-2	29.825	Surplus
14	47 Km	IIIB-1	27.453	Surplus
1	5 Km	IIIB-1	26.673	VOC
13	25 Km	IIIB-1	22.064	Surplus
2	16 Km	IIIB-2	20.761	VOC
49	9 Km	IIIB-2	19.430	Surplus
20	20 Km	IIIB-2	17.676	Surplus
26	15 Km	IIIB-2	15.853	Surplus
5	18 Km	IIIB-2	13.208	Surplus
37	12 Km	IIIB-2	12.661	Surplus
15	41 Km	IIIB-1	10.828	Surplus
36	12 Km	IIIB-2	9.875	Surplus
41	56 Km	IIIB-1	9.850	Surplus
45	18 Km	IIIB-2	9.632	Surplus
12	28 Km	IIIB-2	5.831	Surplus
31	10 Km	IIIB-2	5.621	Surplus
9	20 Km	IIIB-2	4.829	Surplus
23	10 Km	IIIC	0.078	Surplus
3	16 Km	IIIC	0.078	Surplus
25	16 Km	IIIB-2	0.078	Surplus
6	8 Km	IIIC	0.078	Surplus
27	6 Km	IIIC	0.078	Surplus
28	15 Km	IIIB-2	0.078	Surplus
29	38 Km	IIIC	0.078	Surplus
7	20 Km	IIIB-2	0.078	Surplus
8	43 Km	IIIB-1	0.078	Surplus
4	7 Km	IIIB-1	0.078	VOC
33	4 Km	IIIC	0.078	Surplus
34	7 Km	IIIC	0.078	Surplus
17	13 Km	IIIC	0.078	Surplus
18	22 Km	IIIC	0.078	Surplus
19	50 Km	IIIC	0.078	Surplus
38	9 Km	IIIC	0.078	Surplus
39	15 Km	IIIC	0.078	Surplus
40	4 Km	IIIC	0.078	Surplus
10	34 Km	IIIC	0.078	Surplus
42	12 Km	IIIC	0.078	Surplus
43	8 Km	IIIC	0.078	Surplus
44	6 Km	IIIC	0.078	Surplus
21	8 Km	IIIB-2	0.078	Surplus
46	7 Km	IIIC	0.078	Surplus
47	30 Km	IIIC	0.078	Surplus
48	18 Km	IIIB-2	0.078	Surplus
11	34 Km	IIIC	0.078	Surplus
50	8 Km	IIIC	0.078	Surplus

Table 5-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE : NUSA TENGGARA TIMUR KABUPATEN : NGADA

LINK NO	LENGTH	CLASS	IRR(%)	REMARK
45	18 Km	IIIC	14.854	Surplus
36	12 Km	IIIC	13.919	Surplus
41	56 Km	IIIB-2	10.580	Surplus
31	10 Km	IIIC	7.851	Surplus
12	28 Km	IIIC	7.203	Surplus
9	20 Km	IIIC	6.707	Surplus

Table 5-2-3 RANKING OF FEASIBILITY ROAD LINKS

PROVINCE : NUSA TENGGARA TIMUR KABUPATEN : NGADA

LINK NO	LENGTH	CLASS	NPV (1000Rp)	B/C	IRR (%)	REMARK
14	47 Km	IIIB-1	815683	1.887	27.453	Surplus
13	25 Km	IIIB-1	413233	1.614	22.064	Surplus
16	15 Km	IIIB-1	383175	2.079	31.795	VOC
22	25 Km	IIIB-2	352809	2.132	31.572	Surplus
32	25 Km	IIIB-2	351508	2.218	33.841	Surplus
30	25 Km	IIIB-2	317019	2.066	30.899	Surplus
35	7 Km	IIIB-1	258111	2.870	45.671	VOC
24	20 Km	IIIB-2	214032	1.978	29.825	Surplus
2	16 Km	IIIB-2	126991	1.497	20.761	VOC
20	20 Km	IIIB-2	112110	1.369	17.676	Surplus
1	5 Km	IIIB-1	91882	1.818	26.673	VOC
41	56 Km	IIIB-2	76439	1.028	10.580	Surplus
15	41 Km	IIIB-1	68282	1.038	10.828	Surplus
49	9 Km	IIIB-2	56273	1.453	19.430	Surplus
26	15 Km	IIIB-2	44518	1.260	15.853	Surplus
45	18 Km	IIIC	38413	1.212	14.854	Surplus
5	18 Km	IIIB-2	23406	1.129	13.208	Surplus
37	12 Km	IIIB-2	17095	1.117	12.661	Surplus
36	12 Km	IIIC	16039	1.128	13.010	Surplus
SUM	411 Km		3777018			

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: Ngada

(Rpx10^6)

COST	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
CONSTRUCTION	891	1,564	2,455
MAINTENANCE	127	378	505
SUPPLEMENTATION	524	-	524
WORKSHOP EQUIPMENT & TOOLS	28	-	28
LABORATORY EQUIPMENT	12	-	12
SURVEY EQUIPMENT	5	-	5
TOTAL	1,587	1,942	3,529

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	455	1,925	2,380
CONSTRUCTION & MAINTENANCE EQUIPMENT	1,019	-	1,019
SPARE PARTS	68	17	85
WORKSHOP/LABORATORY/SURVEY EQUIPMENT	45	-	45
TOTAL	1,587	1,942	3,529

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 9 links with the total length of 191 km which is 20% of the 937 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 : NGADA

REASON FOR SELECTION	ROAD LINK NO
Feasible	
- Primary	2,13,14,20,24,26,30,
- Secondary	-
Engineering Point of View	4,25
Basic Human Needs	-

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

- Road links which form the local road network; and
- Road links which are effective in providing more effective development from road improvement.

Since Road Link No 4 is a trunk road which connects two provincial roads, this road link is selected from the engineering points of view.

Since Road Link No 25 is a key road link which is located at the strategic point to complete the local road network together with a feasible road link, this road link is also selected.

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

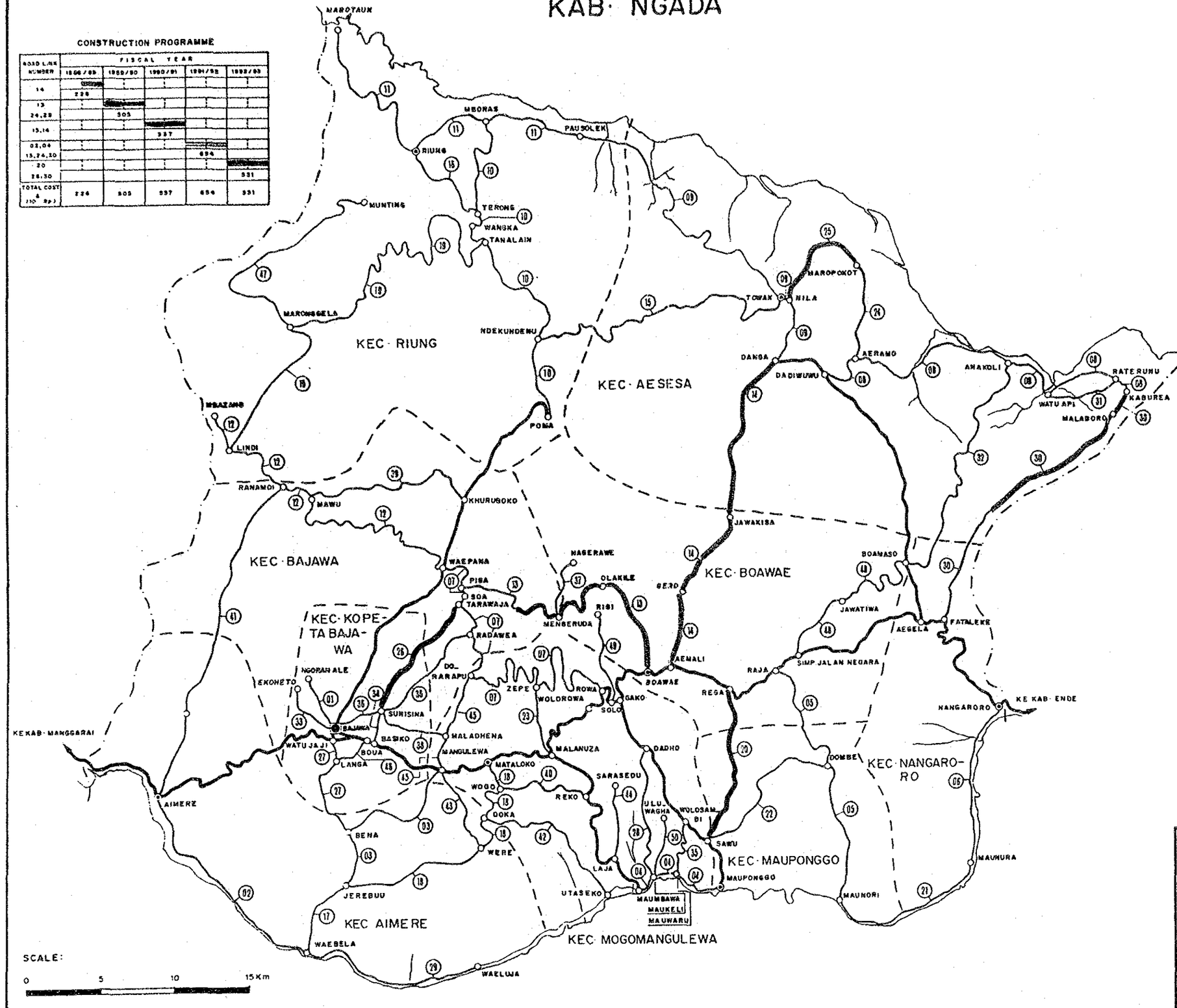
PROV : NUSA TENGGARA TIMUR KAB : NGADA

YEAR	LINK NO ( ) : rate
1988 :	14 (30%)
1989 :	13 (40%), 14 (30%), 25
1990 :	13 (40%), 14 (40%)
1991 :	2, 4, 13 (20%), 24, 30 (40%)
1992 :	20, 26, 30 (60%)

KAB· NGADA

CONSTRUCTION PROGRAMME

ROAD LINK NUMBER	FISCAL YEAR 1989/89	1989/90	1990/91	1991/92	1992/93
14	226				
13		505			
24,29			337		
15,16				694	
03,04					931
15,26,30					
20					
28,30					
TOTAL COST (Rp)	226	505	337	694	931



SCALE:

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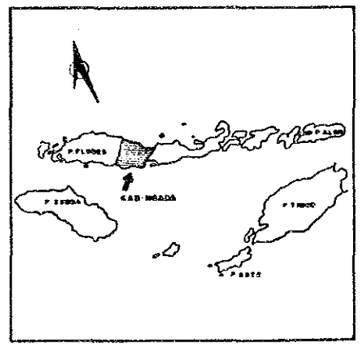
LOCATION MAP



LEGEND :

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

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

TITLE : CONSTRUCTION PROGRAMME

SOURCE:	SCALE:	PROVINCE: NUSATENGGARA TIMUR
DIREKTORAT JENDERAL CIPTA KARYA	AS SHOWN	KABUPATEN: NGADA

(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 : NGADA

(1000Rp)

LINK NO	LENGTH (Km)	BA (%)	SD (%)	RU (%)	RB (%)	ASPHAL (Km)	GRAVEL (Km)	EARTH (Km)	TM NO	AREA (m2)	RC NO	AREA (m2)	BRIDGE COST	LOCAL COST	FOREIGN COST	TOTAL COST
1	5	0.0	24.0	76.0	0.0	0	0	5	0	0.00	0	0.00	0	911	226	1,137
3	16	45.6	18.1	36.3	0.0	0	12	4	0	0.00	1	20.00	132	4,083	1,380	5,463
4	7	80.0	13.6	6.4	0.0	1	6	0	0	0.00	3	188.00	1,242	2,762	1,240	4,002
5	18	5.6	53.1	31.9	9.4	0	15	3	0	0.00	0	0.00	0	4,642	1,567	6,209
7	20	55.0	11.0	33.3	0.0	0	20	0	1	28.00	12	301.50	2,286	6,865	2,789	9,654
8	43	81.8	12.2	5.9	0.0	0	42	1	0	0.00	1	28.00	185	11,757	4,130	15,887
9	20	41.0	41.5	12.0	5.5	0	1	19	0	0.00	0	0.00	0	3,736	954	4,690
10	34	35.9	38.1	19.3	6.8	0	18	16	0	0.00	0	0.00	0	7,830	2,441	10,271
12	28	0.0	63.6	36.4	0.0	0	28	0	0	0.00	4	98.00	647	8,026	2,938	10,964
14	47	15.5	29.7	46.5	8.3	0	0	47	0	0.00	0	0.00	0	8,566	2,125	10,691
20	20	3.3	32.0	54.8	10.0	0	0	20	0	0.00	0	0.00	0	3,645	904	4,549
25	16	70.6	27.5	1.9	0.0	0	16	0	0	0.00	3	33.50	221	4,498	1,618	6,116
27	6	0.0	65.0	35.0	0.0	0	1	5	0	0.00	0	0.00	0	1,184	321	1,505
33	4	0.0	86.0	14.0	0.0	0	0	4	0	0.00	0	0.00	0	729	181	910
43	8	31.3	20.0	36.4	12.4	0	1	7	0	0.00	0	0.00	0	1,549	412	1,961
46	7	20.7	18.6	50.7	10.0	0	0	7	0	0.00	0	0.00	0	1,276	316	1,592
48	18	0.0	5.6	78.3	16.1	0	0	18	0	0.00	0	0.00	0	3,281	814	4,095
49	9	34.4	11.7	30.6	23.3	0	0	9	0	0.00	0	0.00	0	1,640	407	2,047
SUM	326					1	160	163	1	28.00	24	669.00	4,713	76,980	24,763	101,743

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

The proposed construction cost is Rp 2,455 x 10^6 and maintenance cost is Rp 505 x 10^6 which is approximately 17% of the total expenditure.

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	141,062	304,066	322,258	426,932	367,979	1,562,297	(63.6%)
Ownership Cost	2,097	4,924	4,864	7,835	7,897	27,417	(1.8%)
Operation Cost	55,196	129,204	127,465	190,575	201,440	711,880	(45.6%)
Material Cost	45,778	86,887	101,140	86,573	39,136	359,514	(23.0%)
Labour Cost	19,592	43,390	46,755	78,262	71,709	259,708	(16.6%)
Contingency	18,399	39,661	42,034	55,687	47,997	203,778	(13.0%)
FOREIGN CURRENCY :	85,446	201,052	213,661	228,347	164,169	892,675	(36.4%)
Ownership Cost	30,076	71,832	69,810	110,794	109,662	392,174	(43.9%)
Operation Cost	4,135	9,878	9,501	15,691	15,732	54,937	(6.2%)
Material Cost	40,090	93,118	106,481	72,078	17,362	329,129	(36.9%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	11,145	26,224	27,869	29,784	21,413	116,435	(13.0%)
TOTAL COST :	226,509	505,118	535,918	655,279	532,149	2,454,973	
Ownership Cost	32,173	76,756	74,674	118,629	117,359	419,591	(17.1%)
Operation Cost	59,331	139,082	136,966	214,266	217,172	766,817	(31.2%)
Material Cost	85,868	180,005	207,621	158,651	56,498	688,643	(28.1%)
Labour Cost	19,592	43,390	46,755	78,262	71,709	259,708	(10.6%)
Contingency	29,545	65,885	69,902	85,471	69,411	320,214	(13.0%)

(Contingency : 15%)

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

(MAINTENANCE)

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	37,830	73,429	75,245	85,369	106,459	378,332	(74.9%)
Ownership Cost	512	983	1,017	1,329	1,708	5,549	(1.5%)
Operation Cost	23,263	45,086	46,297	50,703	61,972	227,321	(60.1%)
Material Cost	547	1,051	1,096	2,004	4,112	8,810	(2.3%)
Labour Cost	13,508	26,309	26,835	31,333	38,667	136,652	(36.1%)
FOREIGN CURRENCY :	12,218	23,633	24,336	29,476	37,198	126,861	(25.1%)
Ownership Cost	10,659	20,614	21,220	23,625	29,191	105,317	(83.0%)
Operation Cost	1,271	2,455	2,531	2,835	3,510	12,602	(9.9%)
Material Cost	288	564	577	3,016	4,497	8,942	(7.0%)
Labour Cost	0	0	0	0	0	0	(0.0%)
TOTAL COST :	50,048	97,062	99,581	114,845	143,657	505,193	
Ownership Cost	11,171	21,597	22,245	24,954	30,899	110,866	(21.9%)
Operation Cost	24,534	47,541	48,828	53,538	65,482	239,923	(47.5%)
Material Cost	835	1,615	1,673	5,020	8,609	17,752	(3.5%)
Labour Cost	13,508	26,309	26,835	31,333	38,667	136,652	(27.0%)

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

(TOTAL)

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(UNIT : 1000Rp)

ITEM	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)	
LOCAL CURRENCY :	178,892	377,495	397,503	512,301	474,438	1,940,629	(65.6%)
Ownership Cost	2,609	5,907	5,881	9,164	9,405	32,966	(1.7%)
Operation Cost	78,459	174,290	173,762	249,278	263,412	939,201	(48.4%)
Material Cost	46,325	87,938	102,236	88,577	43,248	368,324	(19.0%)
Labour Cost	33,100	69,699	73,590	109,595	110,376	396,360	(20.4%)
Contingency	18,399	39,661	42,034	55,687	47,997	203,778	(10.5%)
FOREIGN CURRENCY :	97,664	224,685	237,997	257,823	201,367	1,019,536	(34.4%)
Ownership Cost	40,735	92,446	91,038	134,419	138,853	497,491	(48.8%)
Operation Cost	5,406	12,333	12,032	18,526	19,242	67,539	(6.6%)
Material Cost	40,378	93,682	107,058	75,094	21,859	338,071	(33.2%)
Labour Cost	0	0	0	0	0	0	(0.0%)
Contingency	11,145	26,224	27,869	29,784	21,413	116,435	(11.4%)
TOTAL COST :	276,557	602,180	635,499	770,124	675,806	2,960,166	
Ownership Cost	43,344	98,353	96,919	143,583	148,258	530,457	(17.9%)
Operation Cost	83,865	186,623	185,794	267,804	282,654	1,006,740	(34.0%)
Material Cost	86,703	181,620	209,294	163,671	65,107	706,395	(23.9%)
Labour Cost	33,100	69,699	73,590	109,595	110,376	396,360	(13.4%)
Contingency	29,545	65,885	69,902	85,471	69,411	320,214	(10.8%)

(Contingency : 15%)

6.1.4 Construction and Maintenance Equipment Cost

(1) Required Number of Equipment

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

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

- 1-Asphalt Sprayer

The proposed numbers of maintenance equipment have been decided as shown below from the proposed annual maintenance volume taking into account the capacity of the proposed maintenance gangs.

a. Equipment for Road Maintenance

- 1-Motor Grader 75 HP
- 1-Tire Roller 8-15 Ton
- 1-Dump Truck 3 Ton
- 1-Hand Guided Vibratory Roller 1000 Kg
- 1-Flat Bed Truck 3 Ton

b. Equipment for Bridge Maintenance

- 1-Flat Bed Truck with Grane 3 Ton

(2) Equipment Cost

The proposed construction and maintenance equipment and their purchase costs are shown in Table 6-1-8. In the Project the supplementation cost or equipment cost supplemented is the difference between the purchase cost for newly supplied equipment and the depreciated value.

This comes about because full depreciation of the supplied equipment would not be completed within the Project Period of 5 years.

Table 6-1-7 REQUIRED NUMBER OF EQUIPMENT

PROV : NUSA TENGGARA TIMUR KAB : NGADA

EQUIPMENT NAME	WORKABLE	EXISTING	(1988)	(1989)	(1990)	(1991)	(1992)
Bulldozer/Ripper	250	0	0.11	0.35	0.30	0.75	0.69
Swamp Bulldozer	250	0	0.01	0.02	0.03	0.01	0.08
Motor Grader	250	0	0.46	0.98	0.93	1.73	1.59
Hand-guide Vib. Roller	250	0	0.09	0.46	0.49	1.00	0.54
Tire Roller	250	0	0.32	0.54	0.64	0.12	0.00
Vibratory Roller (D&T)	250	0	0.37	0.76	0.77	1.46	1.38
Hydraulic Excavator; Wheel	250	0	0.04	0.40	0.42	0.18	1.51
Wheel Loader	250	0	0.56	1.35	1.27	2.25	2.04
Water Tank Truck	250	0	0.27	0.53	0.55	0.99	0.92
Dump Truck	250	0	5.29	11.85	11.86	19.95	20.12
Flat Bed Truck with Crane	250	0	0.07	0.36	0.39	0.91	0.37
Flat Bed Truck	250	0	0.41	0.80	0.93	0.48	0.18
Portable Crusher/Screening	250	1	0.13	0.32	0.27	0.35	0.28
Concrete Mixer	250	0	0.02	0.12	0.12	0.21	0.10
Water Pump	250	0	0.02	0.09	0.10	0.17	0.08
Concrete Vibrator	250	0	0.01	0.05	0.05	0.10	0.03
Asphalt Sprayer	250	1	0.32	0.54	0.64	0.12	0.00

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

Table 6-1-8 EQUIPMENT PURCHASE COST

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(1000 Rp)

EQUIPMENT NAME	CLASS	CIF (JAKARTA)	PURCHASE NO.	PURCHASE COST
Bulldozer	90 HP	49,150	-	-
Bulldozer/Ripper	90 HP	53,000	1	53,000
Swamp Bulldozer	90 HP	52,850	-	-
Swamp Bulldozer	65 HP	40,500	-	-
Motor Grader	75 HP	47,800	2	95,600
Road Stabilizer	W=1850 mm	85,950	-	-
Hand-guide Vib. Roller	1000 Kg	8,500	1	8,500
Tire Roller	8-15 ton	31,070	1	31,070
Vibratory Roller (D&T)	4 ton	29,000	1	29,000
Vibratory Roller	4 ton	29,000	-	-
Rough Terrain Crane	10 ton	100,400	-	-
Hydraulic Excavator; Wheel	0.3 m3	41,100	1	41,100
Wheel Loader	1.2 m3	70,200	3	210,600
Water Tank Truck	4000 ltr.	12,750	1	12,750
Dump Truck	3.0 ton	14,700	17	249,900
Dump Loader Truck	12 ton	56,300	-	-
Flat Bed Truck with Crane	3.0 ton	25,190	1	25,190
Flat Bed Truck	3.0 ton	11,275	2	22,550
Portable Crusher/Screening	30-40 t/h	188,000	1	188,000
Concrete Mixer	0.5 m3	18,000	1	18,000
Water Pump	200 l/min	630	1	630
Concrete Vibrator	3.3 HP	740	1	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	1,019,030
OWNERSHIP COST (FOREIGN)	495,047
EQUIPMENT COST SUPPLEMENTED	523,983

NOTE : OWNERSHIP COST (FOREIGN) for Existing Equipment

Asphalt Sprayer	2,444

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 : NGADA

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
Site Clearance in Light Bush	m2	0.00	16000.00	16000.00	48500.00	52500.00	133000.00
Subgrade Preparation	m2	84600.00	144600.00	172800.00	314000.00	310000.00	1026000.00
Normal Fill	m3	0.00	0.00	0.00	2670.00	1590.00	4260.00
Fill in Swamp	m3	104.40	873.92	908.72	384.76	3206.30	5478.10
Normal Excavation to Spoil	m3	1398.10	4356.10	4888.80	8938.60	7358.40	27140.00
Sub Base Course	m3	7896.00	13696.00	16128.00	29428.50	26600.00	93748.50
Base Course	m3	3948.00	10588.00	8064.00	13880.00	11400.00	47880.00
Shoulder	m2	28200.00	80200.00	57600.00	124000.00	120000.00	410000.00
Asphalt Patching	m2	0.00	0.00	0.00	33.00	0.00	33.00
Surface Dressing (Single)	m2	56400.00	96400.00	115200.00	20000.00	0.00	288000.00
Surface Dressing (Double)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Earth Drain	m	22110.00	33910.00	41280.00	61100.00	80700.00	239100.00
Earth Drain in Swamp (by machine)	m3	720.00	7920.00	8160.00	3600.00	30000.00	50400.00
Pipe Culvert D80cm	m	3.00	363.00	364.00	790.60	213.40	1734.00
Masonry Culvert (80x80cm)	m	25.20	25.20	33.60	0.00	18.00	102.00
Retaining Wall and Wing Wall (Timber)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Retaining Wall and Wing Wall (Masonry)	m3	12.00	146.40	150.40	274.56	165.54	748.90
Gabion Protection	m3	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 3m;10T)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;10T)	m2	0.00	30.40	30.40	100.00	187.20	348.00
Superstructure (Timber;Span 8m;10T)	m2	66.00	96.40	118.40	436.80	46.40	764.00
Superstructure (Timber;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Timber;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span10m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Superstructure (Concrete;Span15m;BM50)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Substructure (Pier;for Timber;10T)	NO	1.50	2.70	3.20	10.40	4.20	22.00
Substructure (Abut;for Timber;10T)	NO	1.80	5.00	5.60	19.60	14.00	46.00
Substrurture (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	24.00	0.00	24.00
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	159.48	310.95	316.60	322.50	377.00	1486.53
Routine maintenance of earth road	Km	78.98	157.95	155.60	118.00	108.00	618.53
Routine maintenance of gravel road	Km	80.00	152.00	160.00	157.00	197.00	746.00
Routine maintenance of asphalt road	Km	0.50	1.00	1.00	47.50	72.00	122.00
Maintenance of Timber Bridge (New)	m2	0.00	0.00	0.00	0.00	220.00	220.00
Maintenance of Concrete Bridge (New)	m2	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of Timber Bridge (Exist)	m2	14.00	28.00	28.00	28.00	28.00	126.00
Maintenance of Concrete Bridge (Exist)	m2	334.50	652.25	669.00	575.00	669.00	2899.75

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.

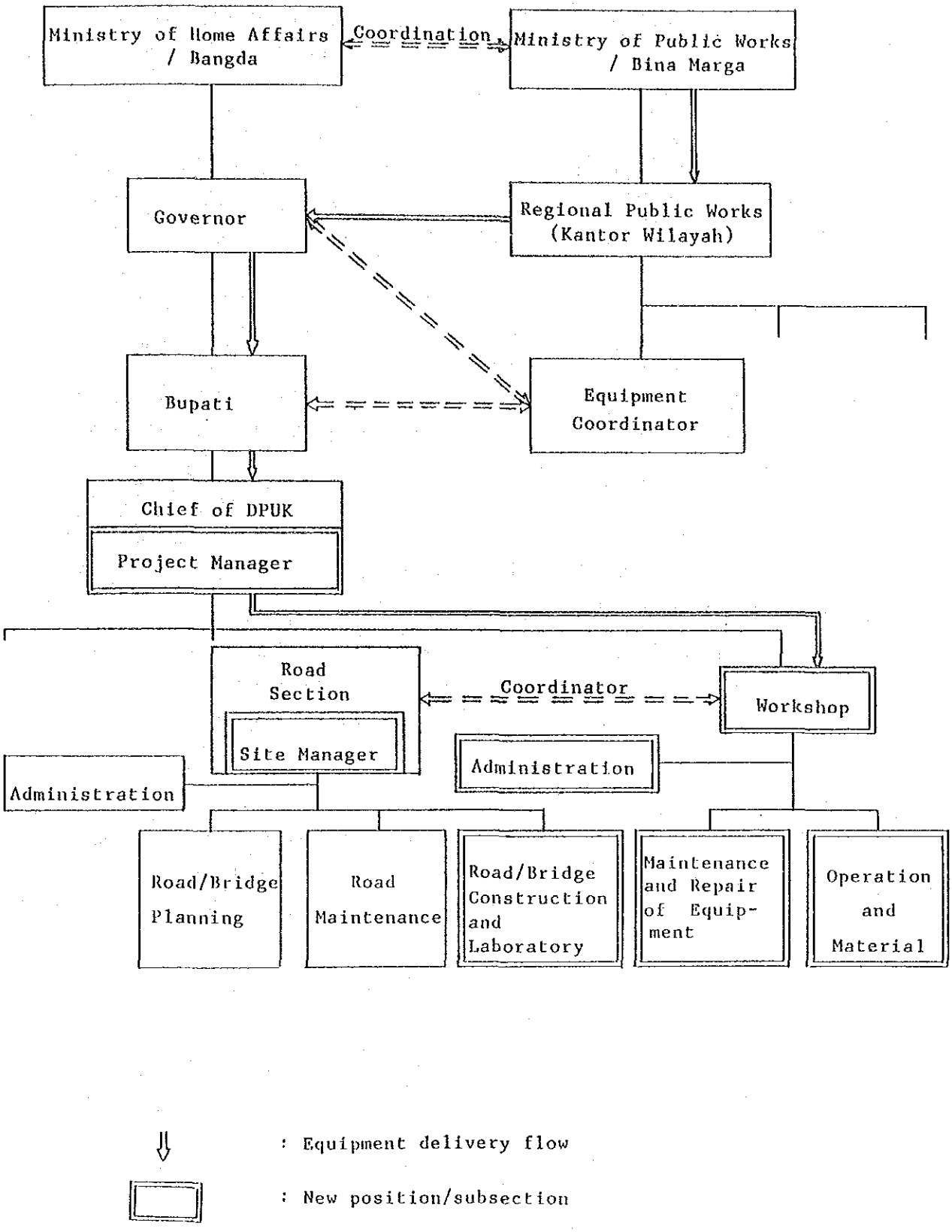
It is recommended that the workshop is newly organized to consist of three sub-sections, i.e. maintenance and repair of equipment, operation and materials, and administration to execute the main tasks described in Clause 3.5.

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. : NGADA SURVEY YEAR : 1983

Code No.	KECAMATAN NAME	CULTIVATED AREA : (PA)	YIELD RATE : (Y)	FARMER'S POPULATION : (AP)	CIRCULATED COMMODITY : (PG)
01	AEIMERE	601	1.39	8,070	0
02	WOGOMANGULEWA	1,906	2.29	13,800	0
03	MAUPONGGO	1,793	2.64	20,470	0
04	NANGARORO	912	1.53	7,680	0
05	BOAWAE	2,478	2.67	12,900	0
06	BAJAWA	3,669	2.29	23,500	0
07	RIUNG	625	1.56	6,100	0
08	AESESA	2,714	3.93	12,500	0

	r_1	r_2	r_3	r_4
ANNUAL AVERAGE % GROWTH RATE	3.2	4.8	5.0	6.6

FARMER'S CONSUMPTION : (Cp)	NON-AGRO REQUIRMENT : (NG)
0.19 Ton/head/year	0.43 Ton/ton

	SEDAN	BUS	TRUCK	MOTOR CYCLE
RATE OF EACH VEHICLE TYPE %	37.84	11.02	12.16	38.98

AVERAGE FREIGHT TONAGE	0.6 Ton/Truck

Appendix A-2 Engineering Data

ROAD LINK DATA

PROVINCE : Nusa Tenggara Timur

KABUPATEN: Ngada

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
01	Bajawa	Ngoranale	5	Kopeta Bajawa	5	12
02	Aimere	Waebela	16	Aimere	16	8
03	Mangulewa	Jerubuu	16	Aimere Mogomangulewa	15 1	13
04	Maumbawa	Mauponggo	7	Mogomangulewa	7	1
05	Raja	Maunori	18	Mauponggo Boawae	14 4	11
06	Nangaroro	Maunura	8	Nangaroro	8	23
07	Rowa	Waepana	20	Mogomangulewa Bajawa	13 7	3
08	Dadiwuwu	Kaburea	43	Aesesa	43	10
09	Danga	Pausolek	20	Riung Aesesa	4 16	14
10	Poma	Mboras	34	Riung	34	5
11	Pausolek	Marotauk	34	Riung	34	15
12	Waepana	Mbazang	28	Bajawa Riung	20 8	4
13	Boawae	Piga	25	Boawae Bajawa	15 10	7
14	Aemali	Danga	47	Boawae Aesesa	20 27	
15	Ndekundenu	Towak	41	Riung Aesesa	6 35	16
16	Riung	Terong	15	Riung	15	
17	Jerebuu	Waebela	13	Aimere	13	18
18	Mataloko	Jerebuu	22	Aimere Mogomangulewa	17 5	
19	Lindi	Tanalain	50	Riung	50	19
20	Rega	Sawu	20	Mauponggo Boawae	16 4	20
21	Maunori	Maunura	8	Mauponggo Nangaroro	3 5	
22	Sawu	Dombe	25	Mauponggo	25	
23	Malanuza	Zepe	10	Mogomangulewa	10	21
24	Maropokot	Aeramo	20	Aesesa	20	

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: Ngada

LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
25	Nila	Maropokot	16	Aesesa	16	2
26	Surisina	Tarawaja	15	Bajawa	7	6
				Kopeta Bajawa	8	
27	Watujaji	Bena	6	Aimere	1	22
				Kopeta Bajawa	5	
28	Dadho	Maukeli	15	Mogomangulewa	15	
29	Waeluja	Waebela	38	Aimere	38	
30	Fataleke	Kaburea	25	Nangaroro	8	
				Aesesa	17	
31	Raterunu	Watuapi	10	Aesesa	10	
32	Boamaso	Anakoli	25	Nangaroro	5	
				Aesesa	20	
33	Bajawa	Ekoheto	4	Kopeta Bajawa	4	24
34	Basiko	Surisina	7	Kopeta Bajawa	7	
35	Wolosambi	Mauwaru	7	Mogomangulewa	7	
36	Bajawa	Radawea	12	Bajawa	5	9
				Kopeta Bajawa	7	
37	Mengeruda	Nagerawe	12	Bajawa	2	
				Boawae	10	
38	Maladhena	Surisina	9	Mogomangulewa	1	25
				Kopeta Bajawa	8	
39	Khuruboko	Mawu	15	Bajawa	15	
40	Wogo	Reko	4	Mogomangulewa	4	
41	Aimere	Ranamoi	56	Aimere	27	
				Bajawa	29	
42	Doka	Utaseko	12	Mogomangulewa	12	
43	Mangulewa	Were	8	Aimere	6	
				Mogomangulewa	2	
44	Sarasedu	Laja	6	Mogomangulewa	6	
45	Mangulewa	Dorarapu	18	Mogomangulewa	18	
46	Boua	Langa	7	Kopeta Bajawa	7	
47	Maronggela	Munting	30	Riung	30	
48	Simp. Jalan Negara	Boamaso	18	Boawae	18	

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: Ngada

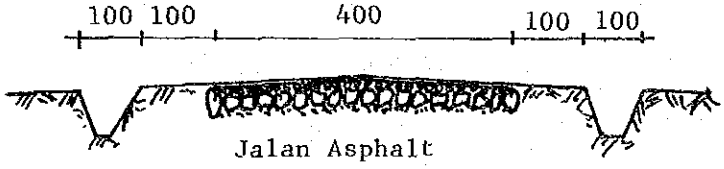
LINK NO.	BEGINNING POINT (DESA NAME)	END POINT (DESA NAME)	LENGTH (KM)	THROUGH THE KEC. NAME & LENGTH		REMARKS
				KEC. NAME	LENGTH (KM)	
49	S o l o	R i g i	9	Mogomangulewa	5	17
				Boawae	4	
50	Maukeli	Uluwagha	8	Mogomangulewa	8	

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

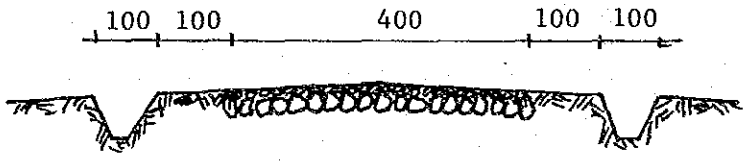
What Kind of Design Criteria has being applied for the new road construction and the improvement for the Kabupaten Road ?
Kriteria Perencanaan yang dipakai pada program penanganan jalan Kabupaten, baik untuk jalan lama maupun pembangunan baru.

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

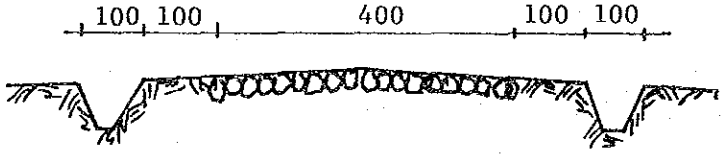
TYPICAL CROSS SECTION.



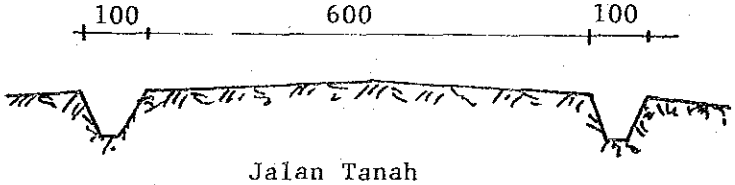
Jalan Asphalt



Jalan Kerikil/Macadam



Jalan Macadam/Batu belah



Jalan Tanah

PROPINSI: Nusa Tenggara Timur

E-03-(1)

KABUPATEN: Ngada

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

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

LINK NO. : Nomor Ruas	L O C A T I O N From - To (dari - ke)	Lebar perkerasan(m) / Lebar Jembatan	Type perkerasan / Type Jembatan	LENGTH Panjang (KM)	COSTS Harga (Rp 10^6)	REMARKS Keterangan
10	Poma - Mboras	4	Gravel	16	76,566	
		4	Beton	22	29,412	

* 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: Ngada

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
05	Raja - Maunori	4	Gravel	18.75	106,508	
		-	-	-		
08	Dadiwuwu - Kaburea	4	Gravel	10	56,573	
		-	-	-		
10	Poma - Mboras	4	Gravel	3	12,500	
		-	-	-		
29	Waeluja - Boba	-	-	-	52,010	
		4	Beton	24 m		
12	Waepana - Mbazang	-	-	-	41,190	
		4	Beton	32 m		

* 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: Ngada

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
03	Mangulewa - Jerebuu	4	Gravel	10	64,764	
		-	-	-		
07	Rowa - Soa	4	Gravel	7.5	47,338	
		4	Beton	12 m	13,889	
12	Waepana - Mbazang	4	Gravel	12.5	79,212	
		4	Beton	24 m	36,482	
05	Raja - Maunori	-	-	-	11,079	
		4	Beton	8 m		
10	Poma - Mboras	-	-	-	5,148	
		4	Beton	4 m		

* 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: Ngada

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
08	Dadiwuwu - Kaburea	4	Telfort	12	91,896	
		-	-	-		
25	Danga - Marapokot	4	Telfort	16	116,700	
		-	-	-		
07	Rowa - Soa	4	Telfort	8	60,440	
		4	Beton	33 m	47,453	
12	Waepena - Mbazang	-	-	-	40,970	
		4	Beton	26 m		
10	Poma - Mboras	-	-	-	10,253	
		4	Beton	6 m		

* 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: Ngada

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
08	Dadiwuwu - Kaburea	4	Telfort	16	116,725	
		-	-	-		
12	Waepana - Mbazang	4	Telfort	14.75	126,968	
		4	Beton	7 m	16,123	
04	Maumbawa - Mauponggo	4	Telfort	9	85,951	
		4	Beton	6 m	8,577	
09	Danga - Pausalek	-	-	-	12,090	
		4	Beton	8 m		

* 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

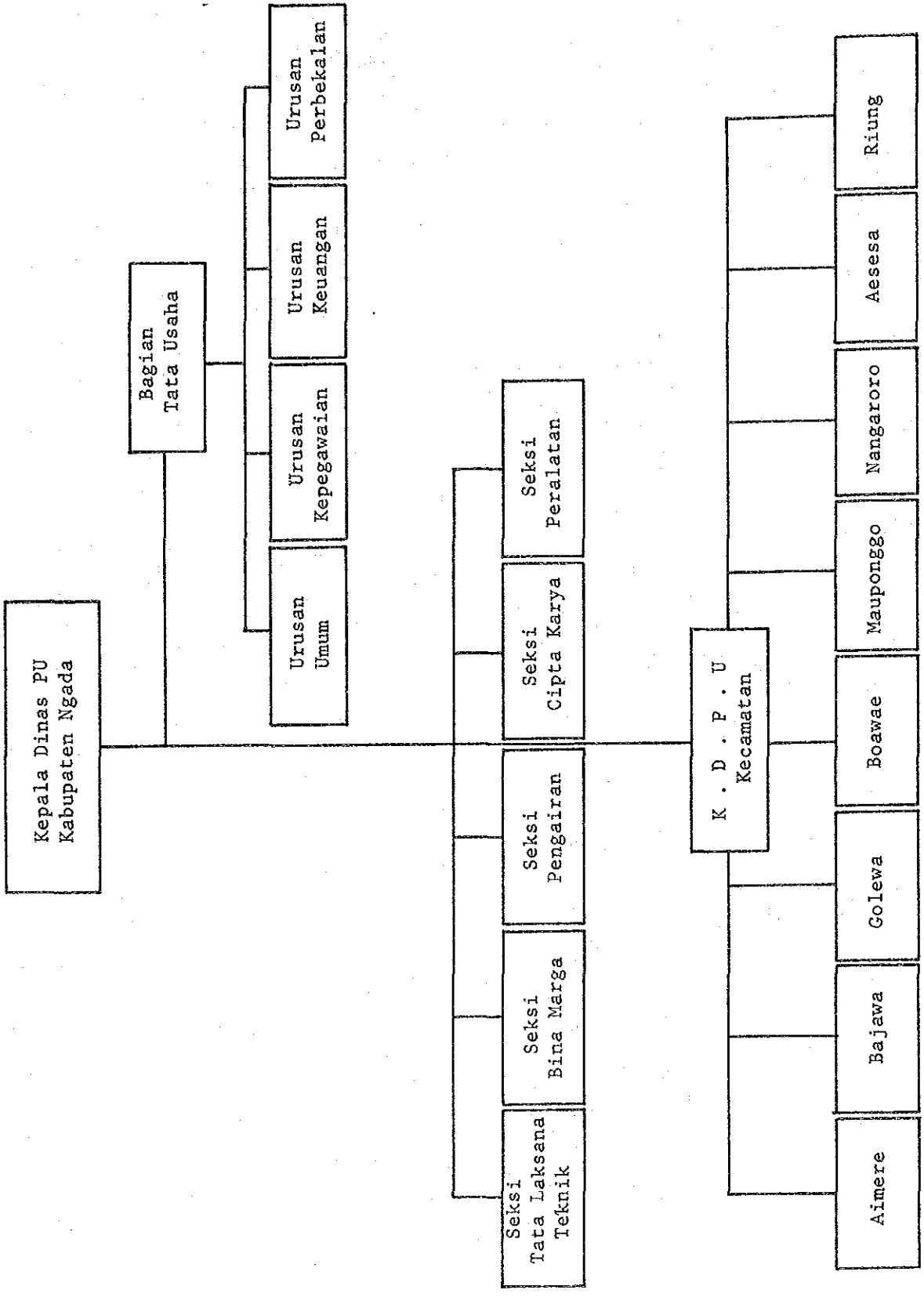
KABUPATEN: Ngada

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: Ngada

DESCRIPTION /Uraian	NUMBER / Jumlah	REMARKS Keterangan
CONTROLING STAFF Staff teknis PUK	———	———
DPUK ENGINEED Sarjana Teknik	-	-
ASSISTANT ENGINEER Sarjana Muda Teknik	1	-
TECHNICIAN STAFF Staff Teknik (STM)	8	8
ADMINISTRATION Tenaga Administrasi	9	-
SUPERVISOR Tenaga Pengawas	11	-
WORKING FORCE Tenaga Pelaksana Lapangan	———	———
OPERATORS Operators	6	5
DRIVERS Supir	2	-
MECHANICS Mechanic	3	3
TRADESMAN Tukang	-	-
L A B O U R Buruh / Pekerja	8	1
OTHERS Lain-lain		
TOTAL / JUMLAH	48	17

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

LOCATION AND AREA OF DPUK WORKSHOP

E-06

Lokasi Workshop DPUK

PROPINSI : Nusa Tenggara Timur

KABUPATEN: Ngada

LOCATION Lokasi	AREA (m2) Luas	NUMBER Jumlah	REMARKS Keterangan
Ogi	13.000		

PROPINSI: Nusa Tenggara Timur

E-07

KABUPATEN: Ngada

LAND ACQUISITION COST

Daftar harga pembebasan tanah

DESCRIPTION Uraian	UNIT Satuan	RATE (RP) Harga	REMARKS Keterangan
CITY/kota	M2	3,000	
VILLAGE / desa	M2	1,250	
RICE FIELD/sawah	M2	850	
DRY FIELD/ladang	M2	400	
MIX CROPS/panen	M2	400	
FOREST/hutan	M2	200	
SWAMP / rawa	M2	200	
OTHERS / lain-lain	M2	200	

PROPINSI: Nusa Tenggara Timur

KABUPATEN: Ngada

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
2	B2	-	7	
25	C3	-	3	

NOTE: DATI II

PROPINSI: Nusa Tenggara Timur

KABUPATEN: Ngada

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			28	-	28		
Generator							
Water Pump							
Others							

PROPINSI: Nusa Tenggara Timur

KABUPATEN: Ngada

LIST OF EXISTING EQUIPMENT OF P.U KABUPATEN

NAME OF EQUIPMENT Jenis peralatan	EXISTING CONDITION/ Kondisi Peralatan						REQUIRE - MENT / Kebutuhan peralatan baru
	TYPE/ Tipe	P.Y	NUMBER / Jumlah			REASON OF BAD CONDITION/Sebab Kerusakan	
			GOOD Baik	BAD Rusak	TOTAL Jumlah		
Bulldozer							
Motor Grader							
Tyre Roller							
Steel Whell Roller							
Vibration Roller							
Wheel Loader							
Front End Loader and Backhoe							
Mobile Crane							
Concrete Mixer							
Stone Crusher			1	1	2		
Portable Compressor							
Hydraulic Excavator							
Asphalt Paving Machine							
Asphalt Sprayer			1	-	1		
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			1	-	1		
Motorcycle			1	-	1		
Generator							
Water Pump							
Others							

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 30 (IIIB-2) LENGTH : 25 Km

UPGRADE : 6.0m 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	0.0	153	91	0	0	0
Subgrade Preparation	m2	150000.0	19	11	2,850,000	1,650,000	4,500,000
Normal Fill	m3	1050.0	1,576	865	1,654,800	908,250	2,563,050
Fill in Swamp	m3	0.0	2,325	1,054	0	0	0
Normal Excavation to Spoil	m3	4299.0	926	523	3,980,874	2,248,377	6,229,251
Sub Base Course	m3	14000.0	2,984	1,350	41,776,000	18,900,000	60,676,000
Base Course	m3	6000.0	4,100	2,303	24,600,000	13,818,000	38,418,000
Shoulder	m2	50000.0	273	146	13,650,000	7,300,000	20,950,000
Asphalt Patching	m2	0.0	2,938	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	843	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,001	1,207	0	0	0
Earth Drain	m	40500.0	629	119	25,474,500	4,819,500	30,294,000
Earth Drain in Swamp (by machine)	m3	0.0	1,065	474	0	0	0
Pipe Culvert D80cm	m	154.0	36,882	76,576	5,679,828	11,792,704	17,472,532
Masonry Culvert (80x80cm)	m	0.0	47,364	53,860	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	38.4	32,773	12,077	1,258,483	463,756	1,722,239
Gabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	21,315,586	1,763,374	23,078,960
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		142,240,071	63,663,961	205,904,032
Overhead (15%)					21,336,010	9,549,594	30,885,604
			TOTAL COST		163,576,081	73,213,555	236,789,636
Manual routine maintenance of road	Km	25.0	96,920	7,260	2,423,000	181,500	2,604,500
Routine maintenance of gravel road	Km	25.0	176,065	88,186	4,401,625	2,204,650	6,606,275
			Sub Total		6,824,625	2,386,150	9,210,775
Maintenance of Timber Bridge (New)	m2	136.0	9,334	954	1,269,424	129,744	1,399,168
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,900	2,705	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	8,409,953
Timber Bridge	Unit Cost	(Rp/m2)	:	195,153
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	30,338,000
Maintenance Rate without Bridge		(%)	:	4.38
New Bridge Cost Rate		(%)	:	11.21

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 26 (111B-2) LENGTH : 15 Km

UPGRADE : 6.0m 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	0.0	153	91	0	0	0
Subgrade Preparation	m2	90000.0	19	11	1,710,000	990,000	2,700,000
Noreal Fill	m3	600.0	1,576	865	945,600	519,000	1,464,600
Fill in Swamp	m3	0.0	2,325	1,054	0	0	0
Noreal Excavation to Spoil	m3	2316.0	926	523	2,144,616	1,211,268	3,355,884
Sub Base Course	m3	8400.0	2,984	1,350	25,065,600	11,340,000	36,405,600
Base Course	m3	3600.0	4,100	2,303	14,760,000	8,290,800	23,050,800
Shoulder	m2	30000.0	273	146	8,190,000	4,380,000	12,570,000
Asphalt Patching	m2	0.0	2,938	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	843	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,001	1,207	0	0	0
Earth Drain	m	20400.0	629	119	12,831,600	2,427,600	15,259,200
Earth Drain in Swamp (by machine)	m3	0.0	1,065	474	0	0	0
Pipe Culvert D80cm	m	84.0	36,882	76,576	3,098,088	6,432,384	9,530,472
Masonry Culvert (80x80cm)	m	0.0	47,364	53,860	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	16.0	32,773	12,077	524,368	193,232	717,600
Gabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	10,069,889	784,652	10,854,541
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		79,339,761	36,568,936	115,908,697
Overhead (15%)					11,900,964	5,485,340	17,386,304
			TOTAL COST		91,240,725	42,054,276	133,295,001
Manual routine maintenance of road	Km	15.0	96,920	7,260	1,453,800	108,900	1,562,700
Routine maintenance of gravel road	Km	15.0	176,065	88,186	2,640,975	1,322,790	3,963,765
			Sub Total		4,094,775	1,431,690	5,526,465
Maintenance of Timber Bridge (New)	m2	72.0	9,334	954	672,048	68,688	740,736
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	24.0	8,203	2,322	196,872	55,728	252,600
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,900	2,705	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	8,054,152
Timber Bridge	Unit Cost	(Rp/m2)	:	173,371
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	18,202,800
Maintenance Rate without Bridge		(%)	:	4.57
New Bridge Cost Rate		(%)	:	9.36

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 25 (IIIC) LENGTH : 16 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	0.0	153	91	0	0	0
Subgrade Preparation	m2	0.0	19	11	0	0	0
Normal Fill	m3	0.0	1,576	865	0	0	0
Fill in Swamp	m3	0.0	2,325	1,054	0	0	0
Normal Excavation to Spoil	m3	0.0	926	523	0	0	0
Sub Base Course	m3	200.0	2,984	1,350	596,800	270,000	866,800
Base Course	m3	3840.0	4,100	2,303	15,744,000	8,843,520	24,587,520
Shoulder	m2	32000.0	273	146	8,736,000	4,672,000	13,408,000
Asphalt Patching	m2	0.0	2,938	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	843	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,001	1,207	0	0	0
Earth Drain	m	0.0	629	119	0	0	0
Earth Drain in Swamp (by machine)	m3	0.0	1,065	474	0	0	0
Pipe Culvert D80cm	m	0.0	36,882	76,576	0	0	0
Masonry Culvert (80x80cm)	m	0.0	47,364	53,860	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	32,773	12,077	0	0	0
Gabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	0	0	0
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		25,076,800	13,785,520	38,862,320
Overhead (15%)					3,761,520	2,067,828	5,829,348
			TOTAL COST		28,838,320	15,853,348	44,691,668
Manual routine maintenance of road	Km	16.0	96,920	7,260	1,550,720	116,160	1,666,880
Routine maintenance of gravel road	Km	16.0	176,065	88,186	2,817,040	1,410,976	4,228,016
			Sub Total		4,367,760	1,527,136	5,894,896
Maintenance of Timber Bridge (New)	m2	0.0	9,334	954	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	33.5	3,900	2,705	130,650	90,617	221,267

Earthwork & Pavement Unit Cost	(Rp/Km)	:	2,793,229
Timber Bridge Unit Cost	(Rp/m2)	:	
Concrete Bridge Unit Cost	(Rp/m2)	:	
Survived Value	(Rp)	:	346,720
Maintenance Rate without Bridge	(%)	:	13.19
New Bridge Cost Rate	(%)	:	

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 24 (IIIB-2) LENGTH : 20 Km

UPGRADE : 6.0m 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	0.0	153	91	0	0	0
Subgrade Preparation	m2	120000.0	19	11	2,280,000	1,320,000	3,600,000
Normal Fill	m3	0.0	1,576	865	0	0	0
Fill in Swamp	m3	0.0	2,325	1,054	0	0	0
Normal Excavation to Spoil	m3	3080.0	926	523	2,852,080	1,610,840	4,462,920
Sub Base Course	m3	11200.0	2,984	1,350	33,420,800	15,120,000	48,540,800
Base Course	m3	4800.0	4,100	2,303	19,680,000	11,054,400	30,734,400
Shoulder	m2	40000.0	273	146	10,920,000	5,840,000	16,760,000
Asphalt Patching	m2	0.0	2,938	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	843	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,901	1,207	0	0	0
Earth Drain	m	26700.0	629	119	16,794,300	3,177,300	19,971,600
Earth Drain in Swamp (by machine)	m3	0.0	1,065	474	0	0	0
Pipe Culvert D80cm	m	120.0	36,882	76,576	4,425,840	9,189,120	13,614,960
Masonry Culvert (80x80cm)	m	0.0	47,364	53,860	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	32.0	32,773	12,077	1,048,736	386,464	1,435,200
Gabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	9,441,052	749,912	10,190,964
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		100,862,808	48,448,036	149,310,844
Overhead (15%)					15,129,421	7,267,205	22,396,626
			TOTAL COST		115,992,229	55,715,241	171,707,470
Manual routine maintenance of road	Km	20.0	96,920	7,260	1,938,400	145,200	2,083,600
Routine maintenance of gravel road	Km	20.0	176,065	88,186	3,521,300	1,763,720	5,285,020
			Sub Total		5,459,700	1,908,920	7,368,620
Maintenance of Timber Bridge (New)	m2	60.0	9,334	954	560,040	57,240	617,280
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,900	2,705	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	7,999,393
Timber Bridge	Unit Cost	(Rp/m2)	:	195,327
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	24,270,400
Maintenance Rate without Bridge		(%)	:	4.61
New Bridge Cost Rate		(%)	:	6.83

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 20 (IIIB-2) LENGTH : 20 Km

UPGRADE : 6.5m road bed, 3.5m 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	52500.0	153	91	8,032,500	4,777,500	12,810,000
Subgrade Preparation	m2	130000.0	19	11	2,470,000	1,430,000	3,900,000
Normal Fill	m3	360.0	1,576	865	567,360	311,400	878,760
Fill in Swamp	m3	3206.3	2,325	1,054	7,454,647	3,379,440	10,834,087
Normal Excavation to Spoil	m3	2463.0	926	523	2,280,738	1,288,149	3,568,887
Sub Base Course	m3	9800.0	2,984	1,350	29,243,200	13,230,000	42,473,200
Base Course	m3	4200.0	4,100	2,303	17,220,000	9,672,600	26,892,600
Shoulder	m2	60000.0	273	146	16,380,000	8,760,000	25,140,000
Asphalt Patching	m2	0.0	2,930	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	843	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,991	1,207	0	0	0
Earth Drain	m	36000.0	629	119	22,644,000	4,284,000	26,928,000
Earth Drain in Swamp (by machine)	m3	30000.0	1,065	474	31,950,000	14,220,000	46,170,000
Pipe Culvert D80cm	m	37.0	36,882	76,576	1,364,634	2,833,312	4,197,946
Masonry Culvert (80x80cm)	m	18.0	47,364	53,860	852,552	969,480	1,822,032
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	126.5	32,773	12,077	4,145,784	1,527,740	5,673,524
Gabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	10,389,426	803,548	11,192,974
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		154,994,841	67,487,169	222,482,010
Overhead (15%)					23,249,228	10,123,075	33,372,301
			TOTAL COST		178,244,067	77,610,244	255,854,311
Manual routine maintenance of road	Km	20.0	96,920	7,260	1,938,400	145,200	2,083,600
Routine maintenance of gravel road	Km	20.0	176,065	88,186	3,521,300	1,763,720	5,285,020
			Sub Total		5,459,700	1,908,920	7,368,620
Maintenance of Timber Bridge (New)	m2	80.0	9,334	954	746,720	76,320	823,040
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,900	2,705	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	12,149,120
Timber Bridge	Unit Cost	(Rp/m2)	:	160,899
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	21,236,600
Maintenance Rate without Bridge		(%)	:	3.03
New Bridge Cost Rate		(%)	:	5.03

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 14 (IIID-1) LENGTH : 47 Km

UPGRADE : 6.0m road bed, 4.0m road with surface Dressing (1)

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Site Clearance in Light Bush	m2	0.0	153	91	0	0	0
Subgrade Preparation	m2	282000.0	19	11	5,358,000	3,102,000	8,460,000
Normal Fill	m3	0.0	1,576	865	0	0	0
Fill in Swamp	m3	348.0	2,325	1,054	809,100	366,792	1,175,892
Normal Excavation to Spoil	m3	5327.0	926	523	4,932,802	2,786,021	7,718,823
Sub Base Course	m3	26320.0	2,984	1,350	78,538,880	35,532,000	114,070,880
Base Course	m3	13160.0	4,100	2,303	53,956,000	30,307,480	84,263,480
Shoulder	m2	94000.0	273	146	25,662,000	13,724,000	39,386,000
Asphalt Patching	m2	0.0	2,938	1,514	0	0	0
Surface Dressing (Single)	m2	188000.0	843	766	158,484,000	144,008,000	302,492,000
Surface Dressing (Double)	m2	0.0	1,001	1,207	0	0	0
Earth Drain	m	73700.0	629	119	46,357,300	8,770,300	55,127,600
Earth Drain in Swamp (by machine)	m3	2400.0	1,065	474	2,556,000	1,137,600	3,693,600
Pipe Culvert D80cm	m	10.0	38,882	76,576	388,820	765,760	1,154,580
Masonry Culvert (80x80cm)	m	84.0	47,364	53,860	3,978,576	4,524,240	8,502,816
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	40.0	32,773	12,077	1,310,920	483,080	1,794,000
Gabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	26,508,313	1,765,638	28,273,951
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		408,820,711	247,272,911	656,093,622
Overhead (15%)					61,323,106	37,090,936	98,414,042
			TOTAL COST		470,143,817	284,363,847	754,507,664
Manual routine maintenance of road	Km	47.0	96,920	7,260	4,555,240	341,220	4,896,460
Routine maintenance of asphalt road	Km	47.0	293,800	151,400	13,808,600	7,115,800	20,924,400
			Sub Total		18,363,840	7,457,020	25,820,860
Maintenance of Timber Bridge (New)	m2	220.0	9,334	954	2,053,480	209,880	2,263,360
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,900	2,705	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	15,361,545
Timber Bridge	Unit Cost	(Rp/m2)	:	147,796
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	96,702,312
Maintenance Rate without Bridge		(%)	:	3.58
New Bridge Cost Rate		(%)	:	4.31

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 13 (IIIB-1) LENGTH : 25 Km

UPGRADE : 6.0m 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	40000.0	153	91	6,120,000	3,640,000	9,760,000
Subgrade Preparation	m2	150000.0	19	11	2,850,000	1,650,000	4,500,000
Normal Fill	m3	0.0	1,576	865	0	0	0
Fill in Swamp	m3	1923.8	2,325	1,054	4,472,835	2,027,685	6,500,520
Noraal Excavation to Spoil	m3	6895.0	926	523	6,384,770	3,606,085	9,990,855
Sub Base Course	m3	14000.0	2,984	1,350	41,776,000	18,900,000	60,676,000
Base Course	m3	7000.0	4,100	2,303	28,700,000	16,121,000	44,821,000
Shoulder	m2	50000.0	273	146	13,650,000	7,300,000	20,950,000
Asphalt Patching	m2	0.0	2,938	1,514	0	0	0
Surface Dressing (Single)	m2	100000.0	843	766	84,300,000	76,600,000	160,900,000
Surface Dressing (Double)	m2	0.0	1,001	1,207	0	0	0
Earth Drain	m	29500.0	629	119	18,555,500	3,510,500	22,066,000
Earth Drain in Swamp (by machine)	m3	18000.0	1,065	474	19,170,000	8,532,000	27,702,000
Pipe Culvert D80cm	m	900.0	36,882	76,576	33,193,800	68,918,400	102,112,200
Masonry Culvert (80x80cm)	m	0.0	47,364	53,860	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	336.0	32,773	12,077	11,011,728	4,057,872	15,069,600
Sabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	21,293,071	1,629,956	22,923,027
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		291,477,704	216,493,498	507,971,202
Overhead (15%)					43,721,655	32,474,024	76,195,679
			TOTAL COST		335,199,359	248,967,522	584,166,881
Manual routine maintenance of road	Km	25.0	96,920	7,260	2,423,000	181,500	2,604,500
Routine maintenance of asphalt road	Km	25.0	293,800	151,400	7,345,000	3,785,000	11,130,000
			Sub Total		9,768,000	3,966,500	13,734,500
Maintenance of Timber Bridge (New)	m2	152.0	9,334	954	1,418,768	145,008	1,563,776
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,900	2,705	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	22,312,216
Timber Bridge	Unit Cost	(Rp/m2)	:	173,431
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	51,437,400
Maintenance Rate without Bridge		(%)	:	2.46
New Bridge Cost Rate		(%)	:	4.51

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 4 (IIIB-2) LENGTH : 7 Km

UPGRADE : 6.0m 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	3000.0	153	91	459,000	273,000	732,000
Subgrade Preparation	m2	0.0	19	11	0	0	0
Normal Fill	m3	350.0	1,576	865	551,600	302,750	854,350
Fill in Swamp	m3	0.0	2,325	1,054	0	0	0
Normal Excavation to Spoil	m3	270.0	926	523	250,020	141,210	391,230
Sub Base Course	m3	868.5	2,984	1,350	2,591,604	1,172,475	3,764,079
Base Course	m3	1440.0	4,100	2,303	5,904,000	3,316,320	9,220,320
Shoulder	m2	14000.0	273	146	3,822,000	2,044,000	5,866,000
Asphalt Patching	m2	33.0	2,938	1,514	96,954	49,962	146,916
Surface Dressing (Single)	m2	0.0	843	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,001	1,207	0	0	0
Earth Drain	m	9120.0	629	119	5,736,480	1,085,280	6,821,760
Earth Drain in Swamp (by machine)	m3	0.0	1,065	474	0	0	0
Pipe Culvert D80cm	m	3.0	36,882	76,576	110,646	229,728	340,374
Masonry Culvert (80x80cm)	m	0.0	47,364	53,860	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	0.0	32,773	12,077	0	0	0
Gabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	20,619,158	1,199,334	21,818,492
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		40,141,462	9,814,059	49,955,521
Overhead (15%)					6,021,219	1,472,108	7,493,327
			TOTAL COST		46,162,681	11,286,167	57,448,848
Manual routine maintenance of road	Km	7.0	96,920	7,260	678,440	50,820	729,260
Routine maintenance of gravel road	Km	7.0	176,065	88,186	1,232,455	617,302	1,849,757
			Sub Total		1,910,895	668,122	2,579,017
Maintenance of Timber Bridge (New)	m2	200.0	9,334	954	1,866,800	190,800	2,057,600
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	188.0	3,900	2,705	733,200	508,540	1,241,740

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	4,622,512
Timber Bridge	Unit Cost	(Rp/m2)	:	125,456
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	1,882,039
Maintenance Rate without Bridge		(%)	:	7.97
New Bridge Cost Rate		(%)	:	43.68

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 2 (IIIB-2) LENGTH : 16 Km

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

(Rp)

I T E M	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	COST TOTAL
Site Clearance in Light Bush	m2	37500.0	153	91	5,737,500	3,412,500	9,150,000
Subgrade Preparation	m2	104000.0	19	11	1,976,000	1,144,000	3,120,000
Normal Fill	m3	1900.0	1,576	865	2,994,400	1,643,500	4,637,900
Fill in Swamp	m3	0.0	2,325	1,054	0	0	0
Normal Excavation to Spoil	m3	2490.0	926	523	2,305,740	1,302,270	3,608,010
Sub Base Course	m3	8960.0	2,984	1,350	26,736,640	12,096,000	38,832,640
Base Course	m3	3840.0	4,100	2,303	15,744,000	8,843,520	24,587,520
Shoulder	m2	40000.0	273	146	10,920,000	5,840,000	16,760,000
Asphalt Patching	m2	0.0	2,938	1,514	0	0	0
Surface Dressing (Single)	m2	0.0	843	766	0	0	0
Surface Dressing (Double)	m2	0.0	1,001	1,207	0	0	0
Earth Drain	m	3180.0	629	119	2,000,220	378,420	2,378,640
Earth Drain in Swamp (by machine)	m3	0.0	1,065	474	0	0	0
Pipe Culvert D80cm	m	426.0	36,882	76,576	15,711,732	32,621,376	48,333,108
Masonry Culvert (80x80cm)	m	0.0	47,364	53,860	0	0	0
Retaining Wall and Wing Wall (Timber)	m2	0.0	15,772	246	0	0	0
Retaining Wall and Wing Wall (Masonry)	m3	160.0	32,773	12,077	5,243,680	1,932,320	7,176,000
Gabion Protection	m3	0.0	11,004	121	0	0	0
New Bridge (Timber)	SET	1.0	--	--	25,411,819	1,849,104	27,260,923
New Bridge (Concrete)	SET	1.0	--	--	0	0	0
			Sub Total		114,781,731	71,063,010	185,844,741
Overhead (15%)					17,217,259	10,659,451	27,876,710
			TOTAL COST		131,998,990	81,722,461	213,721,451
Manual routine maintenance of road	Km	16.0	96,920	7,260	1,550,720	116,160	1,666,880
Routine maintenance of gravel road	Km	16.0	176,065	88,186	2,817,040	1,410,976	4,228,016
			Sub Total		4,367,760	1,527,136	5,894,896
Maintenance of Timber Bridge (New)	m2	192.0	9,334	954	1,792,128	183,168	1,975,296
Maintenance of Concrete Bridge (New)	m2	0.0	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.0	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.0	3,900	2,705	0	0	0

Earthwork & Pavement	Unit Cost	(Rp/Km)	:	11,398,212
Timber Bridge	Unit Cost	(Rp/m2)	:	163,282
Concrete Bridge	Unit Cost	(Rp/m2)	:	
Survived Value		(Rp)	:	19,416,320
Maintenance Rate without Bridge		(%)	:	3.23
New Bridge Cost Rate		(%)	:	14.67

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :							
Bulldozer/Ripper	hr	157.4	523.0	442.2	1120.4	1028.5	3271.5
Swamp Bulldozer	hr	3.4	29.1	30.2	12.8	106.8	182.3
Motor Grader	hr	678.4	1462.5	1385.9	2592.2	2374.9	8493.9
Hand-guide Vib. Roller	hr	120.4	680.5	720.7	1496.8	805.6	3824.0
Tire Roller	hr	469.9	803.3	959.9	166.6	0.0	2399.7
Vibratory Roller (D&T)	hr	555.0	1138.6	1152.6	2189.6	2066.9	7102.7
Hydraulic Excavator; Wheel	hr	57.0	597.0	616.0	270.0	2252.1	3792.1
Wheel Loader	hr	838.2	2024.2	1891.4	3360.1	3051.9	11165.8
Water Tank Truck	hr	392.1	780.7	815.2	1481.5	1376.7	4846.2
Dump Truck	hr	7925.5	17772.1	17775.2	29910.9	30177.3	103561.0
Flat Bed Truck with Crane	hr	99.7	539.3	572.7	1359.5	554.6	3125.8
Flat Bed Truck	hr	600.6	1189.9	1390.2	705.8	257.1	4143.6
Portable Crusher/Screening	hr	190.8	467.1	395.3	520.4	405.8	1979.4
Concrete Mixer	hr	26.0	168.3	177.0	300.2	148.8	820.3
Water Pump	hr	18.7	134.1	140.4	245.3	112.3	650.8
Concrete Vibrator	hr	4.2	65.9	67.4	135.5	39.2	312.2
Asphalt Sprayer	hr	469.9	803.3	959.9	166.6	0.0	2399.7
LABOUR :							
Mandor	man day	826.3	2018.7	2165.5	3705.4	3264.9	11976.8
Skilled Labourer	man day	881.7	1941.1	2235.0	5591.8	2528.7	13178.3
Carpenter	man day	317.6	666.0	772.1	2708.3	1286.0	5750.0
Mason	man day	36.2	170.6	182.7	274.5	182.8	846.8
Labourer	man day	10066.3	21175.5	23492.7	35642.3	37449.6	127826.4
Driver	man day	1664.5	3628.2	3719.4	5821.4	5683.9	20517.4
Operator	man day	699.9	1874.4	1804.7	2874.1	2675.9	9929.0
MATERIAL :							
Bitumen	l	96349.9	164683.3	196799.9	34211.1	0.0	492044.2
Asphalt Oil	l	19270.0	32936.6	39360.0	6833.3	0.0	98399.9
Kerosene	l	23029.9	39363.3	47039.9	8171.5	0.0	117604.6
Sand	m3	299.1	844.1	943.9	852.2	238.0	3177.3
Cement	bag	76.3	1027.4	1052.8	2080.8	642.3	4879.6
River Stone	m3	36.2	170.6	182.7	274.5	182.8	846.8
Steel Moulds	set	3.0	363.0	364.0	790.6	213.4	1734.0
Timber	m3	28.6	58.3	67.9	241.9	115.6	512.3
Paint	l	182.0	391.0	451.6	1609.1	832.0	3465.7
Reinforcing Steel	kg	465.4	11949.4	12104.5	25220.1	7071.4	56810.8
Tying Wire	kg	4.1	108.5	109.9	229.2	64.2	515.9
Equivalent Royalty	m3	14888.9	30903.4	31779.6	53003.5	48488.0	179063.4

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

I T E M	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	675.9	1315.8	1342.4	1178.5	1318.5	5831.1
Hand-guide Vib. Roller	hr	7.5	15.0	15.0	712.5	1080.0	1830.0
Tire Roller	hr	675.9	1315.8	1342.4	1178.5	1318.5	5831.1
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	127.6	242.7	255.4	304.8	396.9	1327.4
Water Tank Truck	hr	0.0	0.0	0.0	0.0	0.0	0.0
Dump Truck	hr	781.5	1486.9	1563.2	3253.7	4540.9	11626.2
Flat Bed Truck with Crane	hr	358.8	700.4	717.6	621.3	784.9	3183.0
Flat Bed Truck	hr	2590.0	5047.9	5142.4	5049.2	5843.3	23672.8
Portable Crusher/Screening	hr	63.9	121.5	127.8	153.7	200.6	667.5
Concrete Mixer	hr	1.2	2.3	2.4	2.1	2.4	10.4
Water Pump	hr	1.2	2.3	2.4	2.1	2.4	10.4
Concrete Vibrator	hr	1.2	2.3	2.4	2.1	2.4	10.4
Asphalt Sprayer	hr	0.0	0.0	0.0	0.0	0.0	0.0
LABOUR :							
Mandur	man day	776.1	1512.4	1541.6	1778.5	2177.4	7786.0
Skilled Labourer	man day	16.8	33.4	33.8	496.7	884.6	1465.3
Carpenter	man day	5.5	11.0	11.1	10.2	86.7	124.5
Mason	man day	0.0	0.0	0.0	0.0	0.0	0.0
Labourer	man day	9308.9	18140.1	18484.2	21360.8	25971.2	93265.2
Driver	man day	634.8	1231.9	1263.8	1509.5	1896.3	6536.3
Operator	man day	268.0	519.9	533.0	495.4	573.1	2389.4
MATERIAL :							
Bitumen	l	67.5	135.0	135.0	6412.5	9720.0	16470.0
Asphalt Oil	l	0.0	0.0	0.0	0.0	0.0	0.0
Kerosene	l	7.5	15.0	15.0	712.5	1080.0	1830.0
Sand	m3	2.4	4.8	4.9	120.8	182.4	315.3
Cement	bag	17.9	34.9	35.8	30.8	35.8	155.2
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	0.4	0.8	0.8	0.7	7.6	10.3
Paint	l	1.5	3.1	3.1	3.1	52.0	62.8
Reinforcing Steel	kg	92.1	179.7	184.3	158.4	184.3	798.8
Tying Wire	kg	0.8	1.6	1.6	1.4	1.6	7.0
Equivalent Royalty	m3	1810.2	3440.4	3620.6	4319.7	5624.6	18815.5

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

ITEM	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :							
Bulldozer/Ripper	hr	157.4	523.0	442.2	1120.4	1028.5	3271.5
Swamp Bulldozer	hr	3.4	29.1	30.2	12.8	106.8	182.3
Motor Grader	hr	1354.3	2778.3	2728.3	3770.7	3693.4	14325.0
Hand-guide Vib. Roller	hr	127.9	695.5	735.7	2209.3	1885.6	5654.0
Tire Roller	hr	1145.8	2119.1	2302.3	1345.1	1318.5	8230.8
Vibratory Roller (D&T)	hr	555.0	1138.6	1152.6	2189.6	2066.9	7102.7
Hydraulic Excavator; Wheel	hr	57.0	597.0	616.0	270.0	2252.1	3792.1
Wheel Loader	hr	965.8	2266.9	2146.8	3664.9	3448.8	12493.2
Water Tank Truck	hr	392.1	780.7	815.2	1481.5	1376.7	4846.2
Dump Truck	hr	8707.0	19259.0	19338.4	33164.6	34718.2	115187.2
Flat Bed Truck with Crane	hr	458.5	1239.7	1290.3	1980.8	1339.5	6308.8
Flat Bed Truck	hr	3190.6	6237.8	6532.6	5755.0	6100.4	27816.4
Portable Crusher/Screening	hr	254.7	588.6	523.1	674.1	606.4	2646.9
Concrete Mixer	hr	27.2	170.6	179.4	302.3	151.2	830.7
Water Pump	hr	19.9	136.4	142.8	247.4	114.7	661.2
Concrete Vibrator	hr	5.4	68.2	69.8	137.6	41.6	322.6
Asphalt Sprayer	hr	469.9	803.3	959.9	166.6	0.0	2399.7
LABOUR :							
Mandur	man day	1602.4	3527.1	3707.1	5483.9	5442.3	19762.8
Skilled Labourer	man day	898.5	1974.5	2268.8	6088.5	3413.3	14643.6
Carpenter	man day	323.1	677.0	783.2	2718.5	1372.7	5874.5
Mason	man day	36.2	170.6	182.7	274.5	182.8	846.8
Labourer	man day	19375.2	39315.6	41976.9	57003.1	63420.8	221091.6
Driver	man day	2299.3	4860.1	4983.2	7330.9	7580.2	27053.7
Operator	man day	967.9	2394.3	2337.7	3369.5	3249.0	12318.4
MATERIAL :							
Bitumen	l	96417.4	164818.3	196934.9	40623.6	9720.0	508514.2
Asphalt Oil	l	19270.0	32936.6	39360.0	6833.3	0.0	98399.9
Kerosene	l	23037.4	39378.3	47054.9	8884.0	1080.0	119434.6
Sand	m3	301.5	848.9	948.8	973.0	420.4	3492.6
Cement	bag	94.2	1062.3	1088.6	2111.6	678.1	5034.8
River Stone	m3	36.2	170.6	182.7	274.5	182.8	846.8
Steel Moulds	set	3.0	363.0	364.0	790.6	213.4	1734.0
Timber	m3	29.0	59.1	60.7	242.6	123.2	522.6
Paint	l	183.5	394.1	454.7	1612.2	884.0	3528.5
Reinforcing Steel	kg	557.5	12129.1	12288.8	25378.5	7255.7	57609.6
Tying Wire	kg	4.9	110.1	111.5	230.6	65.8	522.9
Equivalent Royalty	m3	16699.1	34343.8	35400.2	57323.2	54112.6	197878.9

Appendix A-5

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		91,504	215,838	211,640	332,895	334,531	1,186,408
Bulldozer/Ripper	15758	2,480	8,241	6,968	17,655	16,207	51,551
Swamp Bulldozer	11617	39	338	350	148	1,240	2,115
Motor Grader	13465	9,134	19,692	18,661	34,903	31,978	114,368
Hand-guide Vib. Roller	1575	189	1,071	1,135	2,357	1,268	6,020
Tire Roller	10676	5,016	8,576	10,247	1,778	0	25,617
Vibratory Roller (D&T)	6724	3,731	7,655	7,750	14,722	13,897	47,755
Hydraulic Excavator; Wheel	12601	718	7,522	7,762	3,402	28,378	47,782
Wheel Loader	16660	13,964	33,723	31,510	55,979	50,844	186,020
Water Tank Truck	3912	1,533	3,054	3,189	5,795	5,385	18,956
Dump Truck	5389	42,710	95,773	95,790	161,189	162,625	558,087
Flat Bed Truck with Crane	4981	496	2,686	2,852	6,771	2,762	15,567
Flat Bed Truck	3265	1,960	3,885	4,539	2,304	839	13,527
Portable Crusher/Screening	43673	8,332	20,399	17,263	22,727	17,722	86,443
Concrete Mixer	8879	230	1,494	1,571	2,665	1,321	7,281
Water Pump	477	8	63	66	117	53	307
Concrete Vibrator	310	1	20	20	42	12	95
Asphalt Sprayer	2050	963	1,646	1,967	341	0	4,917
LABOUR :		19,592	43,390	46,755	78,262	71,709	259,708
Mandur	1500	1,239	3,022	3,248	5,558	4,897	17,964
Skilled Labourer	1300	1,146	2,523	2,905	7,269	3,287	17,130
Carpenter	2000	635	1,332	1,544	5,416	2,572	11,499
Mason	2000	72	341	365	549	365	1,692
Labourer	1100	11,072	23,293	25,841	39,206	41,194	140,606
Driver	2000	3,329	7,256	7,438	11,642	11,367	41,032
Operator	3000	2,099	5,623	5,414	8,622	8,027	29,785
MATERIAL :		85,868	180,005	207,621	158,651	56,498	688,643
Bitumen	400	30,539	65,873	78,719	13,684	0	196,815
Asphalt Oil	1500	28,905	49,404	59,040	10,249	0	147,598
Kerosene	250	5,757	9,840	11,759	2,042	0	29,398
Sand	5000	1,495	4,220	4,719	4,261	1,190	15,885
Cement	5500	419	5,650	5,790	11,444	3,532	26,835
River Stone	4000	144	682	730	1,098	731	3,385
Steel Moulds	8500	25	3,085	3,094	6,720	1,813	14,737
Timber	200000	5,720	11,660	13,580	48,380	23,120	102,460
Paint	1750	318	684	790	2,815	1,456	6,063
Reinforcing Steel	1750	814	20,911	21,182	44,135	12,374	99,416
Tying Wire	2500	10	271	274	573	160	1,288
Equivalent Royalty	250	3,722	7,725	7,944	13,250	12,122	44,763

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		35,705	69,138	71,073	78,492	96,381	350,789
Bulldozer/Ripper	15758	0	0	0	0	0	0
Swamp Bulldozer	11617	0	0	0	0	0	0
Motor Grader	13465	9,100	17,717	18,075	15,868	17,753	78,513
Hand-guide Vib. Roller	1575	11	23	23	1,122	1,701	2,880
Tire Roller	10676	7,215	14,047	14,331	12,581	14,076	62,250
Vibratory Roller (D&T)	6724	0	0	0	0	0	0
Hydraulic Excavator; Wheel	12601	0	0	0	0	0	0
Wheel Loader	16660	2,125	4,043	4,254	5,077	6,612	22,111
Water Tank Truck	3912	0	0	0	0	0	0
Dump Truck	5389	4,211	8,012	8,424	17,534	24,470	62,651
Flat Bed Truck with Crane	4981	1,787	3,488	3,574	3,094	3,909	15,852
Flat Bed Truck	3265	8,456	16,481	16,789	16,485	19,078	77,289
Portable Crusher/Screening	43673	2,790	5,306	5,581	6,712	8,760	29,149
Concrete Mixer	8879	10	20	21	18	21	90
Water Pump	477	0	1	1	1	1	4
Concrete Vibrator	310	0	0	0	0	0	0
Asphalt Sprayer	2050	0	0	0	0	0	0
LABOUR :		13,508	26,309	26,835	31,333	38,667	136,652
Mandur	1500	1,164	2,268	2,312	2,667	3,266	11,677
Skilled Labourer	1300	21	43	43	645	1,149	1,901
Carpenter	2000	11	22	22	20	173	248
Mason	2000	0	0	0	0	0	0
Labourer	1100	10,239	19,954	20,332	23,496	28,568	102,589
Driver	2000	1,269	2,463	2,527	3,019	3,792	13,070
Operator	3000	804	1,559	1,599	1,486	1,719	7,167
MATERIAL :		835	1,615	1,673	5,020	8,609	17,752
Bitumen	400	27	54	54	2,565	3,888	6,588
Asphalt Oil	1500	0	0	0	0	0	0
Kerosene	250	1	3	3	178	270	455
Sand	5000	12	24	24	604	912	1,576
Cement	5500	98	191	196	169	196	850
River Stone	4000	0	0	0	0	0	0
Steel Moulds	8500	0	0	0	0	0	0
Timber	200000	80	160	160	140	1,520	2,060
Paint	1750	2	5	5	5	91	108
Reinforcing Steel	1750	161	314	322	277	322	1,396
Tying Wire	2500	2	4	4	3	4	17
Equivalent Royalty	250	452	860	905	1,079	1,406	4,702

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

(1000 Rp)

I T E M	UNIT	(1988)	(1989)	(1990)	(1991)	(1992)	(TOTAL)
EQUIPMENT :		127,209	284,976	282,713	411,387	430,912	1,537,197
Bulldozer/Ripper	15758	2,480	8,241	6,968	17,655	16,207	51,551
Swamp Bulldozer	11617	39	338	350	148	1,240	2,115
Motor Grader	13465	18,234	37,409	36,736	50,771	49,731	192,881
Hand-guide Vib. Roller	1575	200	1,094	1,158	3,479	2,969	8,900
Tire Roller	10676	12,231	22,623	24,578	14,359	14,076	87,867
Vibratory Roller (D&T)	6724	3,731	7,655	7,750	14,722	13,897	47,755
Hydraulic Excavator; Wheel	12601	718	7,522	7,762	3,402	28,378	47,782
Wheel Loader	16660	16,089	37,766	35,764	61,056	57,456	208,131
Water Tank Truck	3912	1,533	3,054	3,189	5,795	5,385	18,956
Dump Truck	5389	46,921	103,785	104,214	178,723	187,095	620,738
Flat Bed Truck with Crane	4981	2,283	6,174	6,426	9,865	6,671	31,419
Flat Bed Truck	3265	10,416	20,366	21,328	18,789	19,917	90,816
Portable Crusher/Screening	43673	11,122	25,705	22,844	29,439	26,482	115,592
Concrete Mixer	8879	240	1,514	1,592	2,683	1,342	7,371
Water Pump	477	8	64	67	118	54	311
Concrete Vibrator	310	1	20	20	42	12	95
Asphalt Sprayer	2050	963	1,646	1,967	341	0	4,917
LABOUR :		33,100	69,699	73,590	109,595	110,376	396,360
Mandor	1500	2,403	5,290	5,560	8,225	8,163	29,641
Skilled Labourer	1300	1,167	2,566	2,948	7,914	4,436	19,031
Carpenter	2000	646	1,354	1,566	5,436	2,745	11,747
Mason	2000	72	341	365	549	365	1,692
Labourer	1100	21,311	43,247	46,173	62,702	69,762	243,195
Driver	2000	4,598	9,719	9,965	14,661	15,159	54,102
Operator	3000	2,903	7,182	7,013	10,108	9,746	36,952
MATERIAL :		86,703	181,620	209,294	163,671	65,107	706,395
Bitumen	400	38,566	65,927	78,773	16,249	3,888	203,403
Asphalt Oil	1500	28,905	49,404	59,040	10,249	0	147,598
Kerosene	250	5,758	9,843	11,762	2,220	270	29,853
Sand	5000	1,507	4,244	4,743	4,865	2,102	17,461
Cement	5500	517	5,841	5,986	11,613	3,728	27,685
River Stone	4000	144	682	730	1,098	731	3,385
Steel Moulds	8500	25	3,085	3,094	6,720	1,813	14,737
Timber	200000	5,800	11,820	13,740	48,520	24,640	104,520
Paint	1750	320	689	795	2,820	1,547	6,171
Reinforcing Steel	1750	975	21,225	21,504	44,412	12,696	100,812
Tying Wire	2500	12	275	278	576	164	1,305
Equivalent Royalty	250	4,174	8,585	8,849	14,329	13,528	49,465

Appendix A-6 QUANTITIES OF BRIDGE ON PROPOSED ROAD LINKS

PROV : NUSA TENGGARA TIMUR KAB : NGADA

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
2	LEKOGOKO	1	AIMR	KK	TM	10T	(C)	8.00	1	8.00	4.00	24.00	32.00	0	2	IIIB-2
	WAEBUA	1	AIMR	--	TM	10T	(B)	10.00	2	5.00	4.00	0.00	40.00	1	2	
	WAELAKO	5	AIMR	--	TM	10T	(C)	16.00	2	8.00	4.00	0.00	64.00	1	2	
	NGABALEWA	12	AIMR	--	TM	10T	(C)	14.00	2	7.00	4.00	0.00	56.00	1	2	
4	AEKOKO	6	MPGG	GB				26.00	1	26.00	4.00	104.00		0	2	IIIB-2
	NAUKELI	7	MPGG	GB				12.00	1	12.00	4.00	48.00		0	2	
	AETORO	10	MPGG	--	TM	10T	(C)	50.00	7	7.14	4.00	0.00	200.00	6	2	
	MAUNBAWA	10	MPGG	KB				12.00	1	12.00	3.00	36.00		0	2	
13	OLAKILE	5	BOWE	--	TM	10T	(C)	12.00	2	6.00	4.00	0.00	48.00	1	2	IIIB-1
	WAEHUTU I	11	BOWE	--	TM	10T	(B)	10.00	2	5.00	4.00	0.00	40.00	1	2	
	WAEHUTU II	11	BOWE	--	TM	10T	(B)	9.00	2	4.50	4.00	0.00	36.00	1	2	
	MENGERUDA	21	BOWE	--	TM	10T	(C)	7.00	1	7.00	4.00	0.00	28.00	0	2	
14	GERO I	2	AMLI	--	TM	10T	(C)	15.00	2	7.50	4.00	0.00	60.00	1	2	IIIB-1
	GERO II	3	AMLI	--	TM	10T	(C)	25.00	4	6.25	4.00	0.00	100.00	3	2	
	JAWAKISA II	12	AMLI	--	TM	10T	(C)	15.00	2	7.50	4.00	0.00	60.00	1	2	
20	LOKABO	10	REGA	--	TM	10T	(B)	10.00	2	5.00	4.00	0.00	40.00	1	2	IIIB-2
	N.I	20	REGA	--	TM	10T	(B)	10.00	2	5.00	4.00	0.00	40.00	1	2	
24	N.I	3	MRPK	--	TM	10T	(C)	8.00	1	8.00	4.00	0.00	32.00	0	2	IIIB-2
	N.I	15	MRPK	--	TM	10T	(C)	7.00	1	7.00	4.00	0.00	28.00	0	2	
25	MBAY I	1	DNGA	KB				4.00	1	4.00	3.50	14.00		0	2	IIIC
	MBAY II	11	DNGA	KB				3.00	1	3.00	3.50	10.50		0	2	
	MBAY	14	DNGA	KB				3.00	1	3.00	3.00	9.00		0	2	
26	N.I	2	SRSN	LL				6.00	1	6.00	4.00	24.00		0	2	IIIB-2
	N.I	5	SRSN	--	TM	10T	(C)	8.00	1	8.00	4.00	0.00	32.00	0	2	
	N.I	7	SRSN	--	TM	10T	(B)	10.00	2	5.00	4.00	0.00	40.00	1	2	
30	N.I	3	FTLK	--	TM	10T	(B)	5.00	1	5.00	4.00	0.00	20.00	0	2	IIIB-2
	N.I	6	FTLK	--	TM	10T	(C)	6.00	1	6.00	4.00	0.00	24.00	0	2	
	N.I	11	FTLK	--	TM	10T	(B)	9.00	2	4.50	4.00	0.00	36.00	1	2	
	N.I	12	FTLK	--	TM	10T	(B)	10.00	2	5.00	4.00	0.00	40.00	1	2	
	N.I	19	FTLK	--	TM	10T	(B)	4.00	1	4.00	4.00	0.00	16.00	0	2	

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

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 2 (IIIB-2) LENGTH : 16 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	40.00	58,376	3,012	2,335,040	120,480	2,455,520
Superstructure (Timber;Span 8m;10T)	m2	152.00	77,325	3,961	11,753,400	602,072	12,355,472
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,658	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,810	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	3.00	458,897	25,168	1,376,691	75,504	1,452,195
Substructure (Abut;for Timber;10T)	NO	8.00	1,200,388	128,063	9,603,104	1,024,504	10,627,608
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,846	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber-)Timber)	m2	24.00	14,316	1,106	343,584	26,544	370,128
Demolition of Bridge (Timber-)Concrete)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	192.00	9,334	954	1,792,128	183,168	1,975,296
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,900	2,705	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				25,411,819	1,849,104	27,260,923
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				25,411,819	1,849,104	27,260,923
(Overhead : 15%)	TOTAL COST (Timber Bridge)				29,223,592	2,126,470	31,350,061
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				29,223,592	2,126,470	31,350,061

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 4 (IIIB-2) LENGTH : 7 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	58,376	3,012	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	200.00	77,325	3,961	15,465,000	792,200	16,257,200
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,658	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,810	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	6.00	458,897	25,168	2,753,382	151,008	2,904,390
Substructure (Abut;for Timber;10T)	NO	2.00	1,200,388	128,063	2,400,776	256,126	2,656,902
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,846	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	200.00	9,334	954	1,866,800	190,800	2,057,600
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	188.00	3,900	2,705	733,200	508,540	1,241,740
(Without Overhead)	TOTAL COST (Timber Bridge)				20,619,158	1,199,334	21,818,492
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				20,619,158	1,199,334	21,818,492
(Overhead : 15%)	TOTAL COST (Timber Bridge)				23,712,032	1,379,234	25,091,266
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				23,712,032	1,379,234	25,091,266

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 13 (IIIB-1) LENGTH : 25 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	76.00	58,376	3,012	4,436,576	228,912	4,665,488
Superstructure (Timber;Span 8m;10T)	m2	76.00	77,325	3,961	5,876,700	301,036	6,177,736
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,658	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,810	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	3.00	458,897	25,168	1,376,691	75,504	1,452,195
Substructure (Abut;for Timber;10T)	NO	8.00	1,200,388	128,063	9,603,104	1,024,504	10,627,608
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,846	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	152.00	9,334	954	1,418,768	145,008	1,563,776
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,900	2,705	0	0	0
(Without Overhead) TOTAL COST (Timber Bridge)					21,293,071	1,629,956	22,923,027
(Concrete Bridge)					0	0	0
TOTAL COST (without Maintenance)					21,293,071	1,629,956	22,923,027
(Overhead : 15%) TOTAL COST (Timber Bridge)					24,487,032	1,874,449	26,361,481
(Concrete Bridge)					0	0	0
TOTAL COST (without Maintenance)					24,487,032	1,874,449	26,361,481

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 14 (IIIB-1) LENGTH : 47 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	COST TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	58,376	3,012	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	220.00	77,325	3,961	17,011,500	871,420	17,882,920
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,658	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,810	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	5.00	458,897	25,168	2,294,485	125,840	2,420,325
Substructure (Abut;for Timber;10T)	NO	6.00	1,200,388	128,063	7,202,328	768,378	7,970,706
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,846	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	220.00	9,334	954	2,053,480	209,880	2,263,360
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,900	2,705	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				26,508,313	1,765,638	28,273,951
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				26,508,313	1,765,638	28,273,951
(Overhead : 15%)	TOTAL COST (Timber Bridge)				30,484,560	2,030,484	32,515,044
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				30,484,560	2,030,484	32,515,044

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 20 (IIIB-2) LENGTH : 20 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	80.00	58,376	3,012	4,670,080	240,960	4,911,040
Superstructure (Timber;Span 8m;10T)	m2	0.00	77,325	3,961	0	0	0
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,658	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,810	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	2.00	458,897	25,168	917,794	50,336	968,130
Substructure (Abut;for Timber;10T)	NO	4.00	1,200,388	128,063	4,801,552	512,252	5,313,804
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,846	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber-)Timber)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Timber-)Concrete)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	80.00	9,334	954	746,720	76,320	823,040
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,900	2,705	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				10,389,426	803,548	11,192,974
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				10,389,426	803,548	11,192,974
(Overhead : 15%)	TOTAL COST (Timber Bridge)				11,947,840	924,080	12,871,920
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				11,947,840	924,080	12,871,920

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 24 (IIIB-2) LENGTH : 20 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	58,376	3,012	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	60.00	77,325	3,961	4,639,500	237,660	4,877,160
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,658	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,810	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	0.00	458,897	25,160	0	0	0
Substructure (Abut;for Timber;10T)	NO	4.00	1,200,388	128,063	4,801,552	512,252	5,313,804
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,846	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	60.00	9,334	954	560,040	57,240	617,280
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,900	2,705	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				9,441,052	749,912	10,190,964
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				9,441,052	749,912	10,190,964
(Overhead : 15%)	TOTAL COST (Timber Bridge)				10,857,210	862,399	11,719,609
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				10,857,210	862,399	11,719,609

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 25 (IIIC) LENGTH : 16 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	0.00	58,376	3,012	0	0	0
Superstructure (Timber;Span 8m;10T)	m2	0.00	77,325	3,961	0	0	0
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,658	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,810	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	0.00	458,897	25,168	0	0	0
Substructure (Abut;for Timber;10T)	NO	0.00	1,200,388	128,063	0	0	0
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,846	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	0.00	9,334	954	0	0	0
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	33.50	3,900	2,705	130,650	90,617	221,267
(Without Overhead)	TOTAL COST (Timber Bridge)				0	0	0
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				0	0	0
(Overhead : 15%)	TOTAL COST (Timber Bridge)				0	0	0
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				0	0	0

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 26 (IIIB-2) LENGTH : 15 Km

(Rp)

ITEM	UNIT	QUANTITY	UNIT COST LOCAL	UNIT COST FOREIGN	COST LOCAL	COST FOREIGN	TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	40.00	58,376	3,012	2,335,040	120,480	2,455,520
Superstructure (Timber;Span 8m;10T)	m2	32.00	77,325	3,961	2,474,400	126,752	2,601,152
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,658	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,910	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	1.00	458,897	25,168	458,897	25,168	484,065
Substructure (Abut;for Timber;10T)	NO	4.00	1,200,388	128,063	4,801,552	512,252	5,313,804
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,846	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,318	1,106	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,318	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	72.00	9,334	954	672,048	68,688	740,736
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	24.00	8,203	2,322	196,872	55,728	252,600
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,900	2,705	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				10,069,889	784,652	10,854,541
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				10,069,889	784,652	10,854,541
(Overhead : 15%)	TOTAL COST (Timber Bridge)				11,580,372	902,350	12,482,722
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				11,580,372	902,350	12,482,722

PROV : NUSA TENGGARA TIMUR KAB : NGADA

LINK NO : 30 (IIIB-2) LENGTH : 25 Km

(Rp)

ITEM	UNIT	QUANTITY	<<< UNIT COST >>> LOCAL	FOREIGN	<<<<<< COST LOCAL	FOREIGN	>>>>>> TOTAL
Superstructure (Timber;Span 3m;10T)	m2	0.00	52,702	2,727	0	0	0
Superstructure (Timber;Span 5m;10T)	m2	112.00	58,376	3,012	6,538,112	337,344	6,875,456
Superstructure (Timber;Span 8m;10T)	m2	24.00	77,325	3,961	1,855,800	95,064	1,950,864
Superstructure (Timber;Span 3m;BM50)	m2	0.00	65,349	3,373	0	0	0
Superstructure (Timber;Span 5m;BM50)	m2	0.00	71,346	3,659	0	0	0
Superstructure (Timber;Span 8m;BM50)	m2	0.00	90,487	4,632	0	0	0
Superstructure (Concrete;Span 3m;BM50)	m2	0.00	52,924	171,810	0	0	0
Superstructure (Concrete;Span 5m;BM50)	m2	0.00	53,980	192,600	0	0	0
Superstructure (Concrete;Span 8m;BM50)	m2	0.00	55,318	210,151	0	0	0
Superstructure (Concrete;Span10m;BM50)	m2	0.00	60,222	239,232	0	0	0
Superstructure (Concrete;Span15m;BM50)	m2	0.00	64,324	282,524	0	0	0
Substructure (Pier;for Timber;10T)	NO	2.00	458,897	25,168	917,794	50,336	968,130
Substructure (Abut;for Timber;10T)	NO	10.00	1,200,388	128,063	12,003,880	1,280,630	13,284,510
Substructure (Pier;for Timber;BM50)	NO	0.00	674,875	37,224	0	0	0
Substructure (Abut;for Timber;BM50)	NO	0.00	1,362,835	140,646	0	0	0
Substructure (Pier;for Concrete;BM50)	NO	0.00	1,393,463	487,788	0	0	0
Substructure (Abut;for Concrete;BM50)	NO	0.00	2,948,676	1,017,596	0	0	0
Demolition of Bridge (Timber->Timber)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Timber->Concrete)	m2	0.00	14,316	1,106	0	0	0
Demolition of Bridge (Concrete)	m2	0.00	73,686	121,003	0	0	0
Maintenance of Timber Bridge (New)	m2	136.00	9,334	954	1,269,424	129,744	1,399,168
Maintenance of Concrete Bridge (New)	m2	0.00	1,822	4,303	0	0	0
Maintenance of Timber Bridge (Exist)	m2	0.00	8,203	2,322	0	0	0
Maintenance of Concrete Bridge (Exist)	m2	0.00	3,900	2,705	0	0	0
(Without Overhead)	TOTAL COST (Timber Bridge)				21,315,586	1,763,374	23,078,960
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				21,315,586	1,763,374	23,078,960
(Overhead : 15%)	TOTAL COST (Timber Bridge)				24,512,924	2,027,880	26,540,804
	(Concrete Bridge)				0	0	0
	TOTAL COST (without Maintenance)				24,512,924	2,027,880	26,540,804