(5) The Estimated Annual Number of Working Days for Equipment

When estimating the number of working days for equipment, the degree affected by rainfall differs depending upon the type of work. Therefore, the number of working days used for the equipment cost estimation should be adjusted by the following modification ratios to give working days:

- Badly affected equipment :1.0 x Annual Number of Working Days
- Moderately affected equipment :1.2 x Annual Number of Working Days

Where "Annual Number of Working Days" is as described in Sub-Clause 2.1.2 "Meteorological Conditions"

However, the maximum number of working days for any equipment should be 250 days.

Where :

- Badly affected equipment includes :
  Bulldozer, Swamp Bulldozer, Road Stabilizer, Tire Roller, Hydraulic Excavator, Concrete Mixer, Water Pump, Concrete Vibrator, Asphalt Sprayer.
- Moderately affected equipment includes :
  Motor Grader, Hand Guided Vibratory Roller, Vibratory Roller, Wheel Roller, Water Tank Truck, Dump Truck, Flat Bed Truck with Crane, Flat Bed Truck

6.3 Unit Construction Cost by Work Type

6.3.1 All Works Except Bridges

The unit construction costs by work type, excluding bridge construction costs, are estimated using the combination of equipment described in Clause 5.4 and the unit prices already listed. The results are summarized in Table 6-3-1 (1) and Table 6-3-1 (2).

An example of the detailed calculation of the unit construction costs for each work type are shown in the Appendix A-1.

Table 6-3-1 (1)

UNIT CONSTRUCTION COST BY WORK TYPE

(Excluding Bridge Construction Cost)

(Rp)

ITEM	UNIT	RIAU (3)			SUMATERA SELATAN (4)			LAMPUNG (1)			KALIMANTAN TENGAH (4)			KALIMANTAN TIMUR (4)		
		L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL
Site Clearance in Light Bush	M^2	210	91	301	160	91	251	144	90	234	174	91	265	199	91	290
Subgrade Preparation	M^2	27	11	38	20	11	31	18	11	29	22	11	33	25	11	36
Normal Fill	M^3	2,182	862	3,045	1,649	860	2,509	1,484	859	2,343	1,797	863	2,660	2,078	863	2,941
Fill in Swamp	M^3	7,976	528	8,504	3,486	854	4,340	2,208	1,047	3,255	8,638	267	8,905	3,005	1,053	4,058
Normal Excavation to Spoil	M^3	1,269	522	1,791	964	521	1,485	873	520	1,393	1,050	523	1,573	1,214	523	12,737
Sub Base Course	M^3	3,529	1,345	4,874	3,111	1,660	4,771	2,813	1,340	4,153	-	-	-	3,857	1,348	5,205
Base Course	M^3	4,861	2,296	7,157	4,277	2,294	6,571	3,861	2,290	6,151	-	-	-	5,306	2,300	7,606
Cement Stabilizing	M^3	16,382	13,134	29,516	10,621	10,436	21,057	-	-	-	13,148	12,368	25,516	-	-	-
Shoulder	M^2	382	146	528	289	145	434	256	145	401	316	146	462	360	146	506
Asphalt Patching	M^2	9,084	1,419	10,503	4,943	1,332	6,275	3,079	1,371	4,450	8,630	1,443	10,073	4,124	1,478	5,602
Surface Dressing (Single)	M^2	1,387	910	2,297	728	638	1,366	601	595	1,196	1,166	1,067	2,233	620	723	1,343
Surface Dressing (Double)	M^2	1,869	1,432	3,301	960	1,003	1,963	740	935	1,675	1,658	1,681	3,339	788	1,139	1,927
Earth Drain	M	1,220	119	1,339	923	118	1,041	721	118	839	951	119	1,070	1,414	119	1,533
Earth Drain in Swamp (by machine)	M^3	1,575	473	2,048	1,177	473	1,650	1,039	472	1,511	1,277	474	1,751	1,447	474	1,921
Pipe Culvert D 80 Cm	M	68,706	44,420	113,126	47,065	45,032	92,097	38,324	48,854	87,178	63,325	49,971	113,296	47,706	49,795	97,501
Mansory Culvert (80 x 80 Cm)	M	118,512	37,445	115,957	70,865	37,027	107,892	51,373	38,938	90,311	97,644	39,061	136,705	72,168	40,825	112,993
Retaining Wall and Wing Wall (Timber)	M^2	14,605	246	14,851	13,657	245	13,902	11,313	245	11,558	9,789	246	10,035	12,760	246	13,006
Retaining Wall and Wing Wall (Masonry)	M^3	88,278	10,954	99,232	51,478	11,192	62,670	36,883	11,442	48,325	69,392	10,457	79,849	54,016	11,872	65,888
Gabion Protection	M^3	36,546	120	36,666	17,330	120	17,450	24,904	120	25,024	25,090	120	25,210	19,284	120	19,404

Note :

L.C : Local Currency

F.C : Foreign Currency

Table 6-3-1 (2)

UNIT CONSTRUCTION COST BY WORK TYPE
(Excluding Bridge Construction Cost)

(Rp)

ITEM	UNIT	KALIMANTAN SELATAN (9)			NUSA TENGGARA TIMUR (3)			SULAWESI UTARA (1)			SULAWESI SELATAN (7)			SULAWESI TENGGARA (2)		
		L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL
Site Clearance in Light Bush	M^2	172	91	263	159	91	250	186	91	277	167	91	258	162	91	253
Subgrade Preparation	M^2	22	11	33	20	11	31	24	11	35	21	11	32	21	11	32
Normal Fill	M^3	1,783	863	2,646	1,644	865	2,509	1,921	865	2,786	1,725	865	2,590	1,671	866	2,537
Fill in Swamp	M^3	3,768	965	4,733	2,424	1,055	3,479	2,860	1,055	3,915	2,556	1,055	3,611	2,495	1,058	3,553
Normal Excavation to Spoil	M^3	1,043	522	1,565	965	523	1,488	1,119	524	1,643	1,008	524	1,532	981	525	1,506
Sub Base Course	M^3	3,297	1,347	4,644	3,112	1,350	4,462	3,609	1,351	4,960	3,260	1,351	4,611	3,165	1,355	4,520
Base Course	M^3	4,527	2,299	6,826	4,265	2,305	6,570	4,950	2,304	7,254	4,465	2,303	6,768	4,342	2,310	6,652
Cement Stabilizing	M^3	18,284	12,366	30,650	-	-	-	-	-	-	-	-	-	-	-	-
Shoulder	M^2	311	146	457	285	146	431	340	146	486	302	146	448	293	146	439
Asphalt Patching	M^2	4,130	1,365	5,495	3,228	1,560	4,788	4,447	1,447	5,894	3,578	1,369	4,947	3,760	1,451	5,211
Surface Dressing (Single)	M^2	678	624	1,302	873	823	1,696	669	680	1,349	609	577	1,186	646	681	1,227
Surface Dressing (Double)	M^2	847	981	1,828	1,038	1,297	2,335	838	1,071	1,909	760	915	1,675	799	1,072	1,871
Earth Drain	M	906	119	1,025	690	119	809	1,186	119	1,305	834	119	953	824	120	944
Earth Drain in Swamp (by machine)	M^3	1,395	474	1,869	1,119	474	1,593	1,396	475	1,871	1,198	475	1,673	1,185	476	1,661
Pipe Culverr D 80 Cm	M	47,676	48,045	95,721	40,613	64,654	105,267	50,919	45,715	96,634	42,079	43,617	85,696	45,468	43,930	89,398
Mansory Culvert (80 x 80 Cm)	M	67,254	39,529	106,783	52,764	48,852	101,616	72,228	37,567	109,795	58,990	36,705	95,695	59,102	37,997	97,099
Retaining Wall and Wing Wall (Timber)	M^2	11,169	246	11,415	16,147	246	16,393	16,989	246	17,235	16,339	246	16,585	12,713	246	12,959
Retaining Wall and Wing Wall (Masonry)	M^3	49,130	11,633	60,763	37,142	12,211	49,353	51,939	11,513	63,452	41,799	11,543	53,342	42,086	11,867	53,953
Gabion Protection	M^3	14,668	120	14,788	11,615	121	11,736	11,203	121	11,324	10,972	121	11,093	9,819	121	9,940

Note :

L.C : Local Currency

F.C : Foreign Currency

6.3.2 Bridges

The unit construction costs by bridge type including the cost of demolition of existing bridges are shown in Table 6-3-2 (1) and Table 6-3-2 (2).

An example of the detailed calculation of the unit construction costs by bridge types are listed in the Appendix A-2.

6.4 Construction and Maintenance Costs

6.4.1 Construction Cost

The estimation of construction cost for each road link was computerized and computed based on the quantities estimated using the inventory data and the unit construction cost previously described.

The construction cost is estimated for foreign and local currencies.

6.4.2 Maintenance Cost

The maintenance cost is estimated from the following items.

(1) Roadway Maintenance Cost

The estimated roadway maintenance cost for each road link is based on the following considerations.

1) Asphalt Surface Dressed Road

Quantity of asphalt patching : 100 m^2/km/year

2) Gravel Road

Quantity of pavement crusher run : 22.5 m^3/km/year

3) Earth Road

Average frequency of motor grader operation : 3 times/year

4) Cleaning, Weeding Ditches, and Slope Restoration

Average frequency : 2 times/year

The above is also used for existing earth roads not selected for improvement.

Table 6-3-2 (1)

UNIT CONSTRUCTION COST BY WORK TYPE

BRIDGES

(Rp)

ITEM	UNIT	RIAU (3)			SUMATERA SELATAN (4)			LAMPUNG (1)			KALIMANTAN TENGAH (4)			KALIMANTAN TIMUR (4)		
		L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL
Superstructure (Timber; Span 3 m; 10 T)	M²	54,573	3,359	57,932	50,007	4,218	54,225	40,079	3,539	43,618	37,489	3,812	41,301	46,085	3,323	49,408
Superstructure (Timber; Span 5 m; 10 T)	M²	60,447	3,710	64,157	55,391	4,657	60,048	44,394	3,908	48,302	41,525	4,209	45,734	51,047	3,670	54,717
Superstructure (Timber; Span 8 m; 10 T)	M²	80,063	4,874	84,937	73,366	6,116	79,482	58,802	5,134	63,936	54,998	5,528	60,526	67,613	4,822	72,435
Superstructure (Timber; Span 3 m; BM 50)	M²	67,667	4,154	71,821	62,007	5,215	67,222	49,696	4,376	54,072	46,484	4,713	51,197	57,144	4,109	61,253
Superstructure (Timber; Span 5 m; BM 50)	M²	73,872	4,502	78,374	67,694	5,649	73,343	54,255	4,742	58,997	50,746	5,106	55,852	62,385	4,454	66,839
Superstructure (Timber; Span 8 m; BM 50)	M²	93,690	5,699	99,389	85,854	7,151	93,005	68,810	6,003	74,813	64,359	6,463	70,822	79,122	5,638	84,760
Superstructure (Concrete; Span 3 m; BM 50)	M²	75,599	92,523	168,122	58,806	93,862	152,668	48,185	103,551	151,736	61,730	106,749	168,479	51,800	103,858	155,658
Superstructure (Concrete; Span 5 m; BM 50)	M²	78,510	103,297	181,807	60,528	104,938	165,466	49,858	115,886	165,744	64,641	119,370	184,011	53,187	116,063	169,250
Superstructure (Concrete; Span 8 m; BM 50)	M²	81,538	112,456	193,994	62,453	114,330	176,783	51,623	126,328	177,951	67,534	130,068	197,902	54,780	126,421	181,201
Superstructure (Concrete; Span 10 m; BM 50)	M²	89,522	127,627	217,149	68,350	129,896	198,246	56,675	143,635	200,310	74,373	147,794	222,167	59,892	143,580	203,472
Superstructure (Concrete; Span 15 m; BM 50)	M²	97,844	150,217	248,061	73,882	153,064	226,946	61,652	169,392	231,044	81,982	174,184	256,166	64,389	169,130	233,519
Substructure (Pier; for Timber; 10 T)	NO	475,434	31,144	506,578	435,610	39,263	474,873	349,086	32,844	381,930	326,679	35,419	362,098	401,437	30,802	432,239
Substructure (Abut; for Timber; 10T)	NO	1,483,207	132,069	1,615,276	1,215,922	170,097	1,386,019	945,723	154,108	1,099,831	1,132,418	138,539	1,270,957	1,125,669	147,319	1,272,988
Substructure (Pier; for Timber; BM 50)	NO	699,232	46,085	745,317	640,655	58,121	698,776	513,397	48,605	562,002	480,466	52,422	532,888	590,395	45,578	635,973
Substructure (Abut; for Timber; BM 50)	NO	1,652,189	148,267	1,800,456	1,370,612	190,920	1,561,532	1,069,576	171,273	1,240,849	1,248,723	157,169	1,405,892	1,193,915	188,317	1,382,232
Substructure (Pier; for Concrete; BM 50)	NO	3,322,446	478,749	3,801,195	2,017,734	460,412	2,478,146	1,524,140	455,692	1,979,832	2,351,051	477,264	2,828,315	2,168,545	477,290	2,645,835
Substructure (Abut; for Concrete; BM 50)	NO	6,983,538	949,232	7,932,770	4,203,094	951,286	5,154,380	3,131,466	962,632	4,094,098	5,288,223	920,351	6,208,574	4,440,622	999,701	5,440,323
Demolition of Bridge (Timber —> Timber)	M²	16,131	1,224	17,355	14,003	1,561	15,564	11,066	1,371	12,437	11,698	1,328	13,026	12,933	1,302	14,235
Demolition of Bridge (Timber —> Concrete)	M²	16,131	1,224	17,355	14,003	1,561	14,564	11,066	1,371	12,437	11,698	1,328	13,026	12,933	1,302	14,235
Demolition of Bridge (Concrete)	M²	149,920	71,235	221,155	97,034	72,083	169,117	74,972	78,195	153,167	115,379	79,667	195,046	97,148	78,846	175,994

Note :

L.C : Local Currency

F.C : Foreign Currency

Table 6-3-2 (2)

UNIT CONSTRUCTION COST BY WORK TYPE

BRIDGES

(Rp)

ITEM	PROVINCE	UNIT	KALIMANTAN SELATAN (9)			NUSA TENGGARA TIMUR (3)			SULAWESI UTARA (1)			SULAWESI SELATAN (7)			SULAWESI TENGGARA (2)		
			L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL	L.C	F.C	TOTAL
Superstructure (Timber; Span 3 m; 10 T)		M^2	41,402	3,764	45,166	54,418	3,812	58,230	61,083	2,456	63,539	56,845	3,890	60,735	46,740	4,084	50,824
Superstructure (Timber; Span 5 m; 10 T)		M^2	45,859	4,156	50,015	60,277	4,209	64,486	67,659	2,713	70,372	62,965	4,295	67,260	51,771	4,509	56,280
Superstructure (Timber; Span 8 m; 10 T)		M^2	60,741	5,459	66,200	79,843	5,529	85,372	89,618	3,568	93,186	83,402	5,641	89,043	68,572	5,922	74,494
Superstructure (Timber; Span 3 m; BM 50)		M^2	51,337	5,364	56,701	67,477	4,714	72,191	75,741	3,038	78,779	70,486	4,810	75,296	57,955	5,049	63,004
Superstructure (Timber; Span 5 m; BM 50)		M^2	56,044	5,043	61,087	80,525	5,108	85,633	82,689	3,296	85,985	76,953	5,211	82,164	63,271	5,471	68,742
Superstructure (Timber; Span 8 m; BM 50)		M^2	71,079	6,383	77,462	93,433	6,466	99,899	104,872	4,173	109,045	97,597	6,596	104,193	80,243	6,925	87,168
Superstructure (Concrete; Span 3 m; BM 50)		M^2	49,303	100,076	149,379	55,457	140,405	195,862	65,155	95,353	160,508	51,508	102,559	154,067	52,635	88,937	141,572
Superstructure (Concrete; Span 5 m; BM 50)		M^2	50,802	111,839	162,641	56,252	157,132	213,384	66,651	106,641	173,292	60,157	100,365	160,522	54,323	103,362	157,685
Superstructure (Concrete; Span 8 m; BM 50)		M^2	52,458	121,821	174,279	57,881	171,244	229,125	68,459	116,207	184,666	61,717	109,329	170,486	55,674	115,166	170,840
Superstructure (Concrete; Span 10 m; BM 50)		M^2	57,458	138,358	195,816	61,369	194,751	256,120	74,742	132,062	206,804	67,285	124,187	191,472	60,904	133,196	194,100
Superstructure (Concrete; Span 15 m; BM 50)		M^2	62,194	162,980	225,174	67,582	229,681	297,263	80,157	155,660	235,817	72,010	146,302	218,312	65,641	144,241	209,882
Substructure (Pier; for Timber; 10 T)		NO	325,446	34,968	360,414	473,883	35,429	500,312	532,007	22,603	554,610	495,081	36,161	531,242	407,186	37,996	445,182
Substructure (Abut; for Timber; 10T)		NO	1,050,197	158,859	1,209,056	1,244,783	163,257	1,408,040	1,447,247	119,304	1,566,551	1,318,529	165,796	1,484,325	1,116,929	172,146	1,289,075
Substructure (Pier; for Timber; BM 50)		NO	530,482	51,753	582,235	696,920	52,436	749,356	782,414	33,422	815,836	728,104	53,521	781,625	598,856	56,242	655,098
Substructure (Abut; for Timber; BM 50)		NO	1,178,395	177,234	1,355,629	1,412,643	181,891	1,594,534	1,635,943	130,625	1,766,568	1,494,070	184,848	1,678,918	1,261,615	192,243	1,453,858
Substructure (Pier; for Concrete; BM 50)		NO	1,835,941	473,029	2,308,970	1,591,865	494,695	2,086,560	1,963,876	457,848	2,421,724	1,682,231	459,362	2,141,593	1,619,422	476,085	2,095,507
Substructure (Abut; for Concrete; BM 50)		NO	3,916,435	983,776	4,900,211	3,316,300	1,029,299	4,345,599	4,170,765	967,543	5,138,308	3,550,115	970,174	4,520,289	3,422,751	998,485	4,421,236
Demolition of Bridge (Timber -> Timber)		M^2	11,830	1,431	13,261	14,811	1,462	16,273	16,898	1,018	17,916	15,571	1,488	16,976	12,982	1,552	14,534
Demolition of Bridge (Timber -> Concrete)		M^2	11,830	1,431	13,261	14,811	1,462	16,273	16,898	1,018	17,916	15,571	1,488	16,976	12,982	1,552	14,534
Demolition of Bridge (Concrete)		M^2	87,269	76,318	163,587	80,942	101,766	182,708	99,288	73,210	172,498	86,303	69,814	156,117	81,277	69,632	150,909

Note :

L.C : Local Currency

F.C : Foreign Currency

(2) Bridge Maintenance Cost

The estimated maintenance cost for the bridges is based on the following assumptions.

1) Timber Bridge

a. New Bridge

Timber handrails and longitudinal timber plates for tracks are replaced every two years.

b. Existing Bridges

Timber handrails and longitudinal timber plates for tracks are replaced every year.

2) RC Bridge

a. New Bridge

After bridge construction, the costs for mending or patching of pavement, handrails and slabs are estimated for every 5 years.

b. Existing Bridge

The costs for mending or patching of pavement, handrails and slabs are estimated for every year.

Chapter 7 RESULTS OF FEASIBILITY EVALUATION

Chapter 7 RESULTS OF FEASIBILITY EVALUATION

7.1 Preliminary Screening

In accordance with the methodologies previously described in Chapter 4, road links in the study Kabupatens are evaluated by the process of preliminary screening at the start of the study. The result of the first step is summarized in Table 7-1-1.

Table 7-1-1 RESULTS OF PRELIMINARY SCREENING

PROVINCE	NO.OF KABS	STUDIED		SCREENED OUT		SELECTED	
		NO.	LENGTH (km)	NO.	LENGTH (km)	NO.	LENGTH (km)
RIAU	3	131	1882	12	105	119	1777
SUMATRA SELATAN	4	268	2905	36	256	232	2649
LAMPUNG	1	137	1231	10	108	127	1123
KALIMANTAN TENGAH	4	56	1076	-	-	56	1076
KALIMANTAN TIMUR	4	190	1340	105	344	85	996
KALIMANTAN SELATAN	9	639	3030	131	291	508	2738
NUSA TENGGARA TIMUR	3	151	1882	3	30	148	1852
SULAWESI UTARA	1	153	1470	32	218	121	1252
SULAWESI SELATAN	7	395	2730	16	38	379	2692
SULAWESI TENGGARA	2	126	1268	1	1	125	1267
TOTAL	38	2246	18814	346	1391	1900	17422

7.2 Feasibility Evaluation

7.2.1 Primary Analysis

The primary analysis is carried out by the method of IRR calculation for each road link selected by the preliminary screening. The IRR calculation is performed on the cash flow analysis for the Project life of 10 years with the input data of construction and maintenance costs and benefit of each road link. The result of the primary analysis is summarized in Table 7-2-1.

7.2.2 Secondary Analysis

Among the road links not selected by the primary analysis, the road links which fall within the following re-evaluation criteria should be re-analyzed by the IRR calculation after down grading their road classification.

- Road links which are just outside the feasible requirement i.e. their IRRs range between 1% and 10%.

The result of the secondary analysis is summarized in Table 7-2-2.

7.2.3 Feasible Road Links

Feasible road links from the economic evaluation should be composed of the total of both the selected road links in the primary and secondary analyses, as summarized in Table 7-2-3.

However, it is noted that the following six Kabupatens resulted in having no feasible road links.

- Belitung
- Barito Selatan
- Kota Baru
- Kotawaringin Timur
- Barito Utara
- Mamuju

Table 7-2-1 RESULTS OF PRIMARY ANALYSIS

PROVINCE	NO.OF KABS.	III - A		III B-1		III B-2		III - C		TOTAL	
		NO.	LENGTH (km)	NO.	LENGTH (km)	NO.	LENGTH (km)	NO.	LENGTH (km)	NO.	LENGTH (km)
RIAU	3	11	269	1	18	1	15	-	-	13	302
SUMATERA SELATAN	4	19	284	20	320	2	19	-	-	41	623
LAMPUNG	1	30	327	16	96	3	15	-	-	49	438
KALIMANTAN TENGAH	4	1	25	1	50	-	-	-	-	2	75
KALIMANTAN TIMUR	4	15	125	9	136	4	94	-	-	123	355
KALIMANTAN SELATAN	9	30	214	53	329	40	257	-	-	122	800
NUSA TENGGARA TIMUR	3	-	-	9	168	14	220	-	-	23	388
SULAWESI UTARA	1	-	-	3	50	15	275	1	7	19	332
SULAWESI SELATAN	7	28	229	36	295	34	284	-	-	98	808
SULAWESI TENGGARA	2	2	86	7	132	5	44	-	-	14	262
TOTAL	38	136	1559	155	1594	118	1223	1	7	410	4383

Table 7-2-2 RESULTS OF SECONDARY ANALYSIS

PROVINCE	NO.OF KABS.	III - A		III B-1		III B-2		III - C		TOTAL	
		NO.	LENGTH (km)	NO.	LENGTH (km)	NO.	LENGTH (km)	NO.	LENGTH (km)	NO.	LENGTH (km)
RIAU	3	-	-	2	56	2	48	2	14	6	118
SUMATRA SELATAN	4	-	-	-	-	6	98	-	-	6	98
LAMPUNG	1	-	-	1	8	3	14	-	-	4	22
KALIMANTAN TENGAH	4	-	-	-	-	1	50	-	-	1	50
KALIMANTAN TIMUR	4	-	-	-	-	2	11	1	5	3	16
KALIMANTAN SELATAN	9	-	-	2	12	6	21	9	80	17	113
NUSA TENGGARA TIMUR	3	-	-	-	-	2	67	4	68	6	135
SULAWESI UTARA	1	-	-	-	-	-	-	3	37	3	37
SULAWESI SELATAN	7	-	-	1	8	4	22	8	65	13	95
SULAWESI TENGGARA	2	-	-	1	22	-	-	1	18	2	40
TOTAL	38	-	-	7	106	26	331	28	287	61	724

Table 7-2-3 RESULTS OF ECONOMIC FEASIBILITY EVALUATION

PROVINCE	NO.OF KABS.	STUDIED		FEASIBLE		OTHERS	
		NO.	LENGTH (km)	NO.	LENGTH (km)	NO.	LENGTH (km)
RIAU	3	131	1882	19	420	112	1462
SUMATRA SELATAN	4	268	2905	47	721	221	2184
LAMPUNG	1	137	1231	53	460	84	771
KALIMANTAN TENGAH	4	56	1076	3	125	53	951
KALIMANTAN TIMUR	4	190	1340	31	371	159	969
KALIMANTAN SELATAN	9	639	3030	140	913	499	2116
NUSA TENGGARA TIMUR	3	151	1882	29	523	122	1359
SULAWESI UTARA	1	153	1470	22	369	131	1101
SULAWESI SELATAN	7	395	2730	111	403	284	1827
SULAWESI TENGGARA	2	126	1268	16	302	110	966
TOTAL	38	2246	18814	471	5107	1775	13706

Chapter 8 IMPLEMENTATION PROGRAMME

Chapter 8 IMPLEMENTATION PROGRAMME

8.1 Implementation Schedule

8.1.1 Project Cost

The total Project Cost is composed of the cost of construction and maintenance, supplementation as described later, workshop, laboratory and survey equipment and consulting service. The total Project Cost is summarized in Table 8-1-1 for each study province broken down into foreign and local currencies.

The total Project Cost for the 38 Kabupatens concerned with the Study is summarized as follows:

	Foreign Currency	Local Currency	Total ($Rpx10^6$)
Construction & Maintenance	39,696	84,621	124,317
Supplementation	16,518	-	16,518
Workshop/Laboratory/Survey Equipment	1,736	-	1,736
Consulting Service	7,296	4,814	12,110
Total	65,246	89,435	154,681

The total Project Cost can be divided into following costs:

	Foreign Currency	Local Currency	Total ($Rpx10^6$)
Civil Work	21,952	84,044	105,996
Construction & Maintenance Equipment	31,945	-	31,945
Spare Parts	2,317	577	2,894
Workshop/Laboratory/Survey Equipment	1,736	-	1,736
Consulting Service	7,296	4,814	12,110
Total	65,246	89,435	154,681

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.

Table 8-1-1 PROJECT COST

(Rp. x 10^6)

PROVINCE	CONSTRUCTION AND MAINTENANCE			SUPPLEMENTATION	WORKSHOP/ LABORATORY/ SURVEY EQUIPMENT	CONSULTING SERVICE			TOTAL		
	F.C	L.C	TOTAL	F.C	F.C	F.C	L.C	TOTAL	F.C	L.C	TOTAL
RIAU	5,356	10,749	16,105	1,166	135	-	-	-	6,657	10,749	17,406
SUMATERA SELATAN	5,980	10,663	16,643	1,681	187	-	-	-	7,848	10,663	18,511
LAMPUNG	3,760	5,419	9,179	577	52	-	-	-	4,389	5,419	9,808
KALIMANTAN TENGAH	4,580	7,930	12,510	1,517	180	-	-	-	6,277	7,930	14,207
KALIMANTAN TIMUR	4,212	9,215	13,427	1,753	180	-	-	-	6,145	9,215	15,360
KALIMANTAN SELATAN	5,872	12,981	18,853	3,926	405	-	-	-	10,203	12,981	23,184
NUSA TENGGARA TIMUR	2,333	4,860	7,193	1,464	135	-	-	-	3,932	4,860	8,792
SULAWESI UTARA	1,727	4,271	5,998	742	45	-	-	-	2,514	4,271	6,785
SULAWESI SELATAN	5,913	12,394	18,307	2,756	329	-	-	-	8,998	12,394	21,392
SULAWESI TENGGARA	2,105	3,996	6,101	936	90	-	-	-	3,131	3,996	7,127
TOTAL	41,838	82,478	124,316	16,518	1,738	7,296	4,814	12,110	67,390	87,292	154,682

Notes : F.C : Foreign Currency
L.C : Local Currency

8.1.2 Proposed Road Links

(1) Road Links to be Improved

The road links finally proposed to be improved were selected following the method described in Sub-Clause 4.3.4 and are summarized in Table 8-1-2 for each study province. Among the proposed road links 5 links with a 366 km total length are recommended to be newly constructed from the engineering point of view or basic human needs.

The itemized proposed road links for each Kabupaten are shown in each Kabupaten Report.

Eventually, the Project is expected to obtain final results from the investment as shown in Fig. 8-1-1, in which progress of the road improvement ratio is estimated by year for the period of execution of the Project.

(2) Road Links to Be Maintained

The road links finally proposed to be maintained were selected following the method described in Sub-Clause 4.3.5 and are summarized in Table 8-1-3 for each study province. The itemized proposed road links for each Kabupaten are shown in each Kabupaten Report.

8.1.3 Annual Construction and Maintenance Cost

The annual allocation of the total construction and maintenance cost in the five years programme is finally recommended as shown in Tables 8-1-4 (1), (2) and (3) for the construction, maintenance and the total respectively. The tables present the annual costs for each study province broken down into foreign and local currencies.

8.1.4 Equipment Cost

(1) Proposed Numbers of Equipment

The numbers of construction and maintenance equipment proposed to be purchased are recommended as the numbers remaining after reducing by the numbers of existing equipment considered to be available for the Project from the total numbers estimated

Table 8-1-2 ROAD LINKS TO BE IMPROVED

PROVINCE	NO.OF KAB.S	REASON FOR SELECTION: FEASIBLE (PRIMARY) NO.	FEASIBLE (PRIMARY) LENGTH (km)	FEASIBLE (SECONDARY) NO.	FEASIBLE (SECONDARY) LENGTH (km)	E.P.O.V NO.	E.P.O.V LENGTH (km)	B.H.N NO.	B.H.N LENGTH (km)	TOTAL NO.	TOTAL LENGTH (km)
RIAU	3	12	290	4	104	5	72	-	-	21	466
SUMATERA SELATAN	4	29	533	5	94	20	281	9	174	63	1,082
LAMPUNG	1	49	438	4	22	6	63	-	-	59	523
KALIMANTAN TENGAH	4	2	75	1	50	-	-	(1)18	(13) 277	(1)21	(13)402
KALIMANTAN TIMUR	4	27	349	3	16	(3)14	(298)522	-	-	(3)44	(298)887
KALIMANTAN SELATAN	9	109	729	14	98	48	236	(1) 3	(55) 75	174	(55)1,138
NUSA TENGGARA TIMUR	3	14	231	3	49	15	194	-	-	32	474
SULAWESI UTARA	1	19	332	3	37	16	120	-	-	38	489
SULAWESI SELATAN	7	88	771	11	88	18	110	9	133	126	1,102
SULAWESI TENGGARA	2	13	240	2	40	13	134	-	-	28	414
TOTAL	38	362	3,988	50	598	155	1,732	39	659	606	6,977

Notes : - E.P.O.V : Engineering point of view
- B.H.N : Basic human needs
- The figure in ( ) denotes the number or length of the road links proposed to be newly constructed.

Table 8-1-3 ROAD LINKS TO BE MAINTAINED

PROVINCE	NO.OF KAB.S	TO BE STUDIED NO.	TO BE STUDIED LENGTH (km)	TO BE MAINTAINED NO.	TO BE MAINTAINED LENGTH (km)	PROPORTION BY LENGTH (%)
RIAU	3	131	1882	43	695	37
SUMATERA SELATAN	4	268	2905	107	1271	44
LAMPUNG	1	137	1231	102	978	79
KALIMANTAN TENGAH	4	57	1089	28	506	46
KALIMANTAN TIMUR	4	193	1638	162	571	35
KALIMANTAN SELATAN	9	640	3085	344	1542	50
NUSA TENGGARA TIMUR	3	151	1882	60	712	38
SULAWESI UTARA	1	153	1470	41	398	27
SULAWESI SELATAN	7	395	2730	258	1704	62
SULAWESI TENGGARA	2	126	1268	26	306	24
TOTAL	38	2251	19180	1111	8683	45

Note : The road links to be studied include the road links proposed to be newly constructed.

Fig. 8-1-1 ROAD SURFACE TYPE BY YEAR

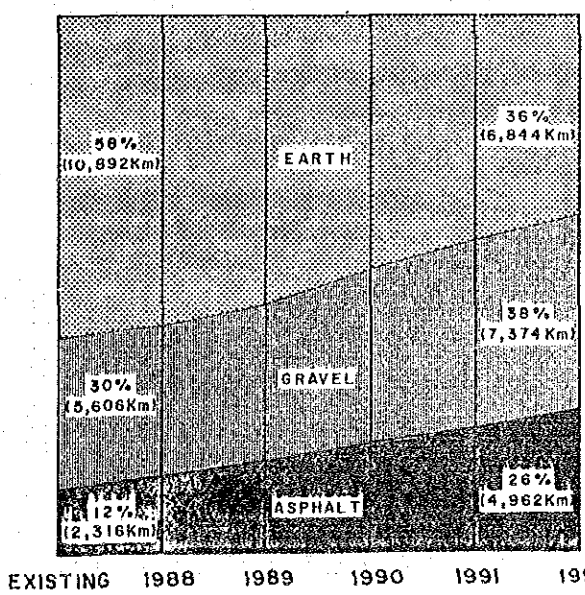


Table 8-1-4 (1)

ANNUAL CONSTRUCTION COST

(Rp X 10^6)

PROVINCE	NO OF KABS.	1988/89			1989/90			1990/91			1991/92			1992/93			TOTAL		
		F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL
RIAU	3	448	802	1,250	996	1,744	2,740	1,122	1,855	2,977	1,286	2,098	3,384	1,117	1,913	3,030	4,969	8,412	13,381
SUMATRA SELATAN	4	480	674	1,154	1,114	1,595	2,709	1,214	1,837	3,051	1,386	1,995	3,381	1,084	1,505	2,589	5,278	7,606	12,884
LAMPUNG	1	301	381	682	660	807	1,467	748	902	1,650	806	956	1,762	695	809	1,504	3,210	3,855	7,065
KALIMANTAN TENGAH	4	472	703	1,175	988	1,556	2,544	1,284	1,843	3,127	1,213	1,791	3,004	441	525	966	4,398	6,418	10,816
KALIMANTAN TIMUR	4	369	710	1,079	817	1,487	2,304	843	1,744	2,587	975	1,991	2,966	830	1,751	2,581	3,834	7,683	11,517
KALIMANTAN SELATAN	9	537	948	1,485	1,228	2,157	3,385	1,242	2,297	3,539	1,073	2,193	3,266	829	1,764	2,593	4,909	9,359	14,268
NUSA TENGGARA TIMUR	3	186	337	523	452	786	1,238	474	862	1,336	495	1,037	1,532	418	879	1,297	2,025	3,901	5,926
SULAWESI UTARA	1	140	235	375	243	594	837	292	669	961	401	709	1,110	312	631	943	1,388	2,838	4,226
SULAWESI SELATAN	7	501	803	1,304	1,079	1,811	2,890	1,153	2,034	3,187	1,239	2,419	3,658	963	2,140	3,103	4,935	9,207	14,142
SULAWESI TENGGARA	2	206	301	507	409	654	1,063	440	726	1,166	475	931	1,406	406	779	1,185	1,936	3,391	5,327
TOTAL	38	3,640	5,894	9,534	7,986	13,191	21,177	8,812	14,769	23,581	9,349	16,120	25,469	7,095	12,696	19,791	36,882	62,670	99,552

Notes:

F.C : Foreign Currency

L.C : Local Currency

Table 8-1-4 (2)

ANNUAL MAINTENANCE COST

(Rp x 10^6)

PROVINCE	NO.OF KABS.	1988/89			1989/90			1990/91			1991/92			1992/93			TOTAL		
		F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL
RIAU	3	36	206	242	71	412	483	78	474	552	95	594	689	107	651	758	387	2,337	2,724
SUMATRA SELATAN	4	68	295	363	142	617	759	152	663	815	169	738	907	171	744	915	702	3,057	3,759
LAMPUNG	1	54	155	209	112	317	429	120	338	458	128	365	493	136	389	525	550	1,564	2,114
KALIMANTAN TENGAH	4	21	181	202	42	379	421	41	387	428	56	478	534	22	87	109	182	1,512	1,694
KALIMANTAN TIMUR	4	30	125	155	65	270	335	76	316	392	87	352	439	120	469	589	378	1,532	1,910
KALIMANTAN SELATAN	9	103	380	483	211	775	986	236	876	1,112	214	811	1,025	199	780	979	963	3,622	4,585
NUSA TENGGARA TIMUR	3	29	92	121	58	185	243	62	195	257	73	223	296	86	264	350	308	959	1,267
SULAWESI UTARA	1	30	125	155	64	269	333	72	305	377	82	345	427	91	389	480	339	1,433	1,772
SULAWESI SELATAN	7	94	307	401	198	647	845	207	676	883	229	742	971	250	815	1,065	978	3,187	4,165
SULAWESI TENGGARA	2	15	57	72	31	112	143	35	124	159	41	146	187	47	166	213	169	605	774
TOTAL	38	480	1,923	2,403	994	3,983	4,977	1,079	4,352	5,431	1,174	4,794	5,968	1,229	4,754	5,983	4,956	19,808	24,764

Notes :

F.C : Foreign Currency

L.C : Local Currency

Table 8-1-4 (3)

ANNUAL TOTAL COST

(Rp X 10^6)

PROVINCE	NO.OF KABS.	1988/89			1989/90			1990/91			1991/92			1992/93			TOTAL		
		F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL	F.C	L.C	TOTAL
RIAU	3	484	1,008	1,492	1,067	2,156	3,223	1,200	2,329	3,529	1,381	2,692	4,073	1,224	2,564	3,788	5,356	10,749	16,105
SUMATRA SELATAN	4	548	969	1,517	1,256	2,212	3,468	1,366	2,500	3,866	1,555	2,733	4,288	1,255	2,249	3,504	5,980	10,663	16,643
LAMPUNG	1	355	536	891	772	1,124	1,896	868	1,240	2,108	934	1,321	2,255	831	1,198	2,029	3,760	5,415	9,179
KALIMANTAN TENGAH	4	493	884	1,377	1,030	1,935	2,965	1,325	2,230	3,555	1,269	2,269	3,538	463	612	1,075	4,580	7,930	12,510
KALIMANTAN TIMUR	4	399	835	1,234	882	1,757	2,639	919	2,060	2,979	1,062	2,343	3,405	950	2,220	3,170	4,212	9,215	13,427
KALIMANTAN SELATAN	9	640	1,328	1,968	1,439	2,932	4,371	1,478	3,173	4,651	1,287	3,004	4,291	1,028	2,544	3,572	5,872	12,981	18,854
NUSA TENGGARA TIMUR	3	215	429	644	510	971	1,481	536	1,057	1,593	568	1,260	1,828	504	1,143	1,647	2,333	4,860	7,193
SULAWESI UTARA	1	170	360	530	307	863	1,170	364	974	1,338	483	1,054	1,537	403	1,020	1,423	1,727	4,271	5,998
SULAWESI SELATAN	7	595	1,110	1,705	1,277	2,458	3,735	1,360	2,710	4,070	1,468	3,161	4,629	1,213	2,955	4,168	5,913	12,394	18,307
SULAWESI TENGGARA	2	221	358	579	440	766	1,206	475	850	1,325	516	1,077	1,593	453	945	1,398	2,105	3,996	6,101
TOTAL	38	4,120	7,817	11,937	8,980	17,174	26,154	9,891	19,123	29,014	10,523	20,914	31,437	8,324	17,450	25,774	41,838	82,478	124,316

Notes :

F.C : Foreign Currency

L.C : Local Currency

from the annual requirements as shown below.

PN = RN - EN

Where :

PN : Proposed number to be purchased for the Project.
RN : Required number estimated by the Study
EN : Existing number considered to be available for the Project

A summary of the required, existing and proposed numbers of equipment is shown in Table 8-1-5.

The numbers of existing equipment considered to be available for use in the Project were decided according to the following:

a. Among the equipment in good condition, the equipment owned by the Kabupaten and one third of the equipment owner by the local contractors should be available for the Project. The others are assumed to be for other employment.

b. Existing stone crusher equipment can be considered available for the Project only in Kabupatens with small construction volume, and should not be considered available in Kabupatens with large construction volume. This is because the capacity of the existing machines is not proven in the inventory data.

c. For Kabupatens which have steel rollers, tire rollers should be provided to make an operational set with the existing steel roller. This is as a substitute for the proposed vibratory roller.

The proposed numbers of maintenance equipment have been decided from the proposed annual maintenance volume for each Kabupaten taking into account the capacity of the proposed maintenance gangs. Road maintenance gangs are proposed for each Kabupaten as follows.

Kabupaten	Number of Road Maintenance Gangs
Lampung Tengah	2
Minahasa	2
Others	1

Table 8-1-5 PROPOSED NUMBERS OF CONSTRUCTION AND MAINTENANCE EQUIPMENT

EQUIPMENT	CLASS	RIAU (3)			SUMATERA SELATAN (4)			LAMPUNG (1)			KALIMANTAN TENGAH (4)			KALIMANTAN TIMUR (4)			KALIMANTAN SELATAN (9)			NUSA TENGGARA TIMUR (3)			SULAWESI UTARA (1)			SULAWESI SELATAN (7)			SULAWESI TENGGARA (2)			TOTAL (38)		
		RN	EN	PN	RN	EN	PN	RN	EN	PN	RN	EN	PN	RN	EN	PN	RN	EN	PN	RN	EN	PN	RN	EN	PN	RN	EN	PN	RN	EN	PN	RN	EN	PN
Bulldozer	90 HP	2	0	2	1	0	1	0	0	0	4	0	4	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	18	0	8
Bulldozer/Ripper	90 HP	1	0	1	4	0	4	2	1	1	1	0	1	3	0	3	7	0	7	6	1	5	2	1	1	6	0	6	2	1	1	33	3	30
Swamp Bulldozer	90 HP	2	0	2	0	0	0	0	0	0	3	0	3	2	0	2	3	0	3	0	0	0	0	0	0	2	0	2	0	0	0	12	0	12
Motor Grader	75 HP	7	1	6	11	1	10	6	1	5	6	1	5	9	0	9	16	0	16	7	2	5	5	2	3	12	0	12	4	1	3	83	9	74
Road Stabilizer	W=1850 mm	2	0	2	1	0	1	0	0	0	4	0	4	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	8	0	8
Hand-guided Vib.Roller	1000 Kg	3	0	3	6	4	2	4	2	2	4	3	1	6	2	4	10	4	6	5	2	3	2	0	2	9	3	6	2	0	2	51	20	31
Tire Roller	8-15 Ton	4	0	4	9	1	8	6	6	0	5	1	4	5	1	4	10	0	10	4	0	4	2	0	2	10	0	10	5	0	5	60	9	51
Vibratory Roller (D&T)	4.0 Ton	5	0	5	7	3	4	3	3	0	6	5	1	8	0	8	10	1	9	5	2	3	3	0	3	10	4	6	2	2	0	59	20	39
Hydraulic Excavator; Wheel	0.3 m^3	3	0	3	1	0	1	1	1	0	4	0	4	4	0	4	3	0	3	1	0	1	1	0	1	3	0	3	1	0	1	22	1	21
Wheel Loader	1.2 m^3	6	1	5	10	0	10	5	1	4	6	0	6	9	0	9	14	2	12	7	0	7	4	0	4	13	0	13	4	0	4	78	4	74
Water Tank Truck	4000 Ltr.	3	0	3	4	0	4	2	0	2	4	0	4	4	0	4	9	0	9	3	0	3	2	0	2	7	0	7	2	0	2	40	0	40
Dump Truck	3.0 Ton	42	10	32	72	15	57	37	17	20	32	1	31	68	1	67	103	16	87	56	12	44	32	12	20	91	14	77	30	0	30	563	98	465
Dump Loader Truck	12.0 Ton	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	6	0	6
Flat Bed Truck With Crane	3.0 Ton	3	0	3	6	0	6	2	0	2	4	0	4	6	0	6	11	0	11	3	0	3	1	0	1	11	0	11	2	0	2	49	0	49
Flat Bed Truck	3.0 Ton	8	0	8	8	0	8	6	0	6	8	0	8	8	0	8	15	0	15	6	0	6	3	0	3	13	0	13	4	0	4	79	0	79
Portable Crusher/Screening	30-40 Ton/$_{Hr}$	1	0	1	3	1	2	2	0	2	2	2	0	3	1	2	7	0	7	3	1	2	1	0	1	7	2	5	2	0	2	31	7	24
Concrete Mixer	0.5 m^3	1	0	1	1	0	1	1	0	1	0	0	0	1	0	1	1	0	1	3	0	3	1	0	0	3	0	3	1	0	1	12	0	12
Water Pump	200 Ltr/$_{Min}$	1	0	1	1	0	1	1	0	1	0	0	0	1	0	1	0	0	0	1	0	1	1	0	0	3	0	3	1	0	1	9	0	9
Concrete Vibrator	3.3 HP	1	0	1	0	0	1	1	0	1	0	0	0	1	0	1	0	0	0	1	0	1	1	0	1	3	0	3	1	0	1	9	0	9
Asphalt Sprayer	850 Ltr	4	0	4	5	2	3	3	0	3	2	1	1	3	0	3	9	5	4	2	1	1	1	0	1	6	2	4	2	0	2	37	11	26
Service Car	3.0 Ton	3	0	3	5	1	4	1	0	1	4	0	4	4	0	4	9	0	9	3	0	3	1	0	1	7	0	7	2	0	2	38	0	38
4 Wheel Drive Vehicle	70 HP	3	0	3	4	0	4	2	0	2	4	0	4	4	0	4	9	0	9	3	0	3	1	0	1	7	0	7	2	0	2	39	0	39
Motorcycle	100 cc	9	0	9	16	2	14	5	0	5	13	2	11	14	0	14	27	2	25	9	0	9	3	0	3	21	0	21	6	0	6	123	6	117

Notes :

RN = Required number estimated by the Study

EN = Existing number to be considered for the Project

PN = Proposed number to be purchased for the Project

The figure in ( ) shows the number of Kabupaten (s) concerned with the Study.

One set of road maintenance equipment shown in Table 5-4-4 is recommended for each road maintenance gang.
However, the following equipment :

- Motor Grader;
- Tire Roller 8-15 Ton; and
- Hand - Guided Vibratory Roller 1000 kg

are not proposed as maintenance equipment for the following 13 Kabupatens because of their small maintenance requirements.

- Indragiri Hilir, Belitung, Barito Selatan, Barito Utara, Berau, Barito Kuala, Hulu Sungai Selatan, Hulu Sungai Tengah, Pangkajene Kepulauan, Barru, Soppeng, Tana Toraja and Mamuju.

One flat bed truck with crane 3.0 ton is recommended as equipment for bridge and other structure maintenance for each Kabupaten except the following four Kabupatens:

- Indragiri Hilir, Barito Utara, Pangkajene Kepulauan and Tana Toraja.

In those Kabupatens, the equipment mentioned above should be used for both construction and maintenance works of Kabupaten roads.

(2) Supplementation Cost

Supplementation cost is the difference between the purchase cost for newly supplied equipment and the depreciated value at the end of the Project. This comes about because full depreciation of the supplied equipment would not be completed within the Project Period of 5 years.

The relationship is explained by the following formula :

Supplementation Cost for Newly Supplied Equipment
= Purchase Cost for Newly Supplied Equipment (CIF Jakarta)
- Depreciated Value of the Newly Supplied Equipment

Depreciated value of the newly supplied equipment is the total ownership cost which was estimated in Sub-Clause 6.2.3 less the transportation cost and less the depreciated value of existing equipment as shown below:

Depreciated Value for Newly Supplied Equipment

= Estimated Total Ownership Cost
- Transportation Cost for Newly Supplied Equipment
- Depreciated Value of Existing Equipment

The purchase cost for newly supplied equipment is calculated and summarized together with depreciated value and supplementation cost for newly supplied equipment in Table 8-1-6 for each province.

8.1.5 Cost for Consulting Service

Based upon the consulting services described in Clause 8.3 the cost for the consulting service is estimated as follows:

	F.C	L.C	Total (Rp.x10^6)
Mobilization & Demobilization	320	51	371
Salary	6,264	1,323	7,587
Other Cost	49	3,002	3,051
Contingencies	663	438	1,101
Total	7,296	4,814	12,110

8.1.6 Other Costs

Cost for other items includes the costs of workshop equipment and tools, laboratory test equipment and survey equipment. These total costs are summarized in Table 8-1-7 for each province. The cost estimation is based on the following conditions :

a. Each Kabupaten should be supplied with at least one (1) set of workshop equipment and tools and a contigency of 15% should be allowed.

b. For laboratory test equipment, one (1) set of soil test apparatus should be supplied for each Kabupaten, however concrete test apparatus should be limited to only the Kabupaten in which concrete bridges are proposed.

Table 8-1-6 EQUIPMENT PURCHASE COST

(Rp x 10^6)

PROVINCE	NO. OF KABS.	PURCHASE COST	DEPRECIATION COST	SUPPLEMENTATION COST
RIAU	3	2,561	1,395	1,166
SUMATRA SELATAN	4	3,694	2,013	1,681
LAMPUNG	1	1,562	985	577
KALIMANTAN TENGAH	4	2,575	1,058	1,517
KALIMANTAN TIMUR	4	3,716	1,963	1,753
KALIMANTAN SELATAN	9	6,578	2,652	3,926
NUSA TENGGARA TIMUR	3	2,697	1,233	1,464
SULAWESI UTARA	1	1,350	608	742
SULAWESI SELATAN	7	5,479	2,723	2,756
SULAWESI TENGGARA	2	1,733	797	936
TOTAL	38	31,945	15,427	16,518

Table 8-1-7 WORKSHOP, LABORATORY AND SURVEY EQUIPMENT

(Rp x 10^6)

PROVINCE	NO. OF KABS.	WORKSHOP EQUIPMENT AND TOOLS	LABORATORY EQUIPMENT		SURVEY EQUIPMENT	TOTAL
			SOIL	CONCRETE		
RIAU	3	84	36	-	15	135
SUMATRA SELATAN	4	112	48	7	20	187
LAMPUNG	1	28	12	7	5	52
KALIMANTAN TENGAH	4	112	48	-	20	180
KALIMANTAN TIMUR	4	112	48	-	20	180
KALIMANTAN SELATAN	9	252	108	-	45	405
NUSA TENGGARA TIMUR	3	84	36	-	15	135
SULAWESI UTARA	1	28	12	-	5	45
SULAWESI SELATAN	7	196	84	14	35	329
SULAWESI TENGGARA	2	56	24	-	10	90
TOTAL	38	1,064	456	28	190	1,738

8.1.7 Quantities by Work-Types

The total quantities of each work item are summarized for each province in Tables 8-1-8(1) and (2) divided into bridge and other construction.

Table 8-1-8(1) TOTAL BRIDGE CONSTRUCTION QUANTITIES

ITEM	UNIT	RIAU (3)	SUMATRA SELATAN (4)	LAMPUNG (1)	KALIMANTAN TENGAH (4)	KALIMANTAN TIMUR (4)	KALIMANTAN SELATAN (9)	NUSA TENG GARA TIMUR (3)	SULAWESI UTARA (1)	SULAWESI SELATAN (7)	SULAWESI TENGGARA (2)	TOTAL (38)
Superstructure(Timber;Span 3m;10T)	M^2	112	60	0	16	162	748	72	0	88	24	1,282
Superstructure(Timber;Span 5m;10T)	M^2	16	88	0	741	2064	1,262	516	0	1,243	360	6,340
Superstructure(Timber;Span 8m;10T)	M2	1,208	2,810	192	1,276	735	2,208	2,098	348	5,056	1,616	17,547
Superstructure(Timber;Span 3m;BM50)	M^2	0	0	0	0	0	612	0	0	0	0	612
Superstructure(Timber;Span 5m;BM50)	M^2	0	0	0	0	107	528	0	0	0	0	635
Superstructure(Timber;Span 8m;BM50)	M_2	0	0	0	0	0	400	0	0	0	0	400
Superstructure(Concrete;Span 3m;BM50)	M^2	0	0	0	0	0	0	0	0	59	0	59
Superstructure(Concrete;Span 5m;BM50)	M^2	0	23	0	0	0	0	0	0	158	0	181
Superstructure(Concrete;Span 8m;BM50)	M^2	0	135	27	0	0	0	0	0	108	0	270
Superstructure(Concrete;Span10m;BM50)	M^2	0	302	0	0	0	0	0	0	0	0	302
Superstructure(Concrete;Span15m;BM50)	M^2	167	162	117	0	0	0	0	0	234	0	680
Substructure(Pier;for Timber;10T)	NO.	29	87	4	22	22	115	52	8	117	32	488
Substructure(Abut;for Timber;10T)	NO.	58	26	6	104	244	209	110	8	270	90	1,125
Substructure(Pier;for Timber;BM50)	NO.	0	0	0	0	3	62	0	0	0	0	65
Substructure(Abut;for Timber;BM50)	NO.	0	0	0	0	6	86	0	0	0	0	92
Substructure(Pier;for Concrete;BM50)	NO.	1	6	0	0	0	0	0	0	1	0	8
Substructure(Abut;for Concrete;BM50)	NO.	4	27	6	0	0	0	0	0	40	0	77
Demolition of Bridge(Timber- Timber)	M^2	95	274	0	54	510	1,757	24	0	257	176	3,147
Demolition of Bridge(Timber- Concrete)	M^2	0	173	22	0	0	0	0	0	154	0	349
Demolition of Bridge(Concrete)	M^2	0	1	0	0	0	0	0	0	56	0	57

Note : The figure in ( ) shows the number of Kabupaten(s) concerned with the Study.

Table 8-1-8(2) TOTAL CONSTRUCTION QUANTITIES EXCLUDING BRIDGES

ITEM	UNIT	RIAU (3)	SUMATRA SELATAN (4)	LAMPUNG (1)	KALIMANTAN TENGAH (4)	KALIMANTAN TIMUR (4)	KALIMANTAN SELATAN (9)	NUSA TENG-GARA TIMUR (3)	SULAWESI UTARA (1)	SULAWESI SELATAN (7)	SULAWESI TENGGARA (2)	TOTAL (38)
Site Clearance in Light Bush	M^2	536,500	57,000	82,100	148,500	695,750	740,550	381,700	352,250	730,310	486,750	4,211,410
Subgrade Preparation	M^2	2,617,080	2,655,069	1,447,500	1,880,490	4,036,035	3,876,991	1,994,684	1,371,893	3,743,396	1,673,118	5,296,256
Normal Fill	M^3	1,550	6,028	0	1,800	43,650	89,870	286,764	5,070	217,575	0	652,307
Fill in Swamp	M^3	48,888	13,500	336	78,278	159,254	108,501	7,657	1,576	93,610	14,275	525,875
Normal Excavation to Spoil	M^3	71,184	38,424	30,264	44,234	48,751	260,927	71,996	43,767	117,600	17,371	744,518
Sub Base Course	M^3	128,901	253,230	185,272	-	416,581	421,778	188,313	136,139	373,140	157,543	2,260,847
Base Course	M^3	75,390	221,930	170,210	-	121,460	216,048	94,510	56,610	236,669	75,010	1,267,887
Cement Stabilizing	M^3	155,960	94,380	-	234,200	-	-	-	-	-	-	484,540
Shoulder	M^2	1,262,500	3,048,000	2,339,500	1,517,000	2,813,000	3,443,100	1,114,500	1,150,000	3,151,200	1,115,000	20,952,800
Asphalt Patching	M^2	12	6,919	709	0	3,626	10,967	522	22,250	9,858	1,815	56,678
Surface Dressing (Single)	M^2	448,500	1,329,000	434,500	348,500	604,000	1,769,550	400,000	740,000	1,618,000	755,000	8,447,050
Surface Dressing (Double)	M^2	691,500	980,000	1,566,000	0	469,000	439,580	0	0	794,000	187,000	5,127,000
Earth Drain	M	211,020	445,640	8,000	183,460	419,180	424,760	492,580	332,340	579,060	531,480	5,627,520
Earth Drain in Swamp (by machine)	M^3	388,800	41,688	4,800	352,550	250,400	249,256	57,240	9,180	186,060	27,480	1,567,520
Pipe Culvert D80cm	M	1,469	1,424	8	1,241	9,167	2,803	2,929	1,236	4,049	3,446	27,772
Masonry Culvert (80x80cm)	M	6	24	169	0	98	5	1,544	10	1,077	2	2,935
Retaining Wall and Wing Wall (Timber)	M^2	8,170	350	0	999	380	3,365	0	110	400	0	13,774
Retaining Wall and Wing Wall (Masonry)	M^3	477	656	446	243	3,494	1,437	3,845	555	4,016	1,107	16,276
Gabion Protection	M^3	0	0	0	0	0	0	475	0	1,834	0	2,309

Note : The figure in ( ) shows the number of Kabupaten(s) concerned with the Study.

8.2 Organization and Construction System

8.2.1 Organization

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

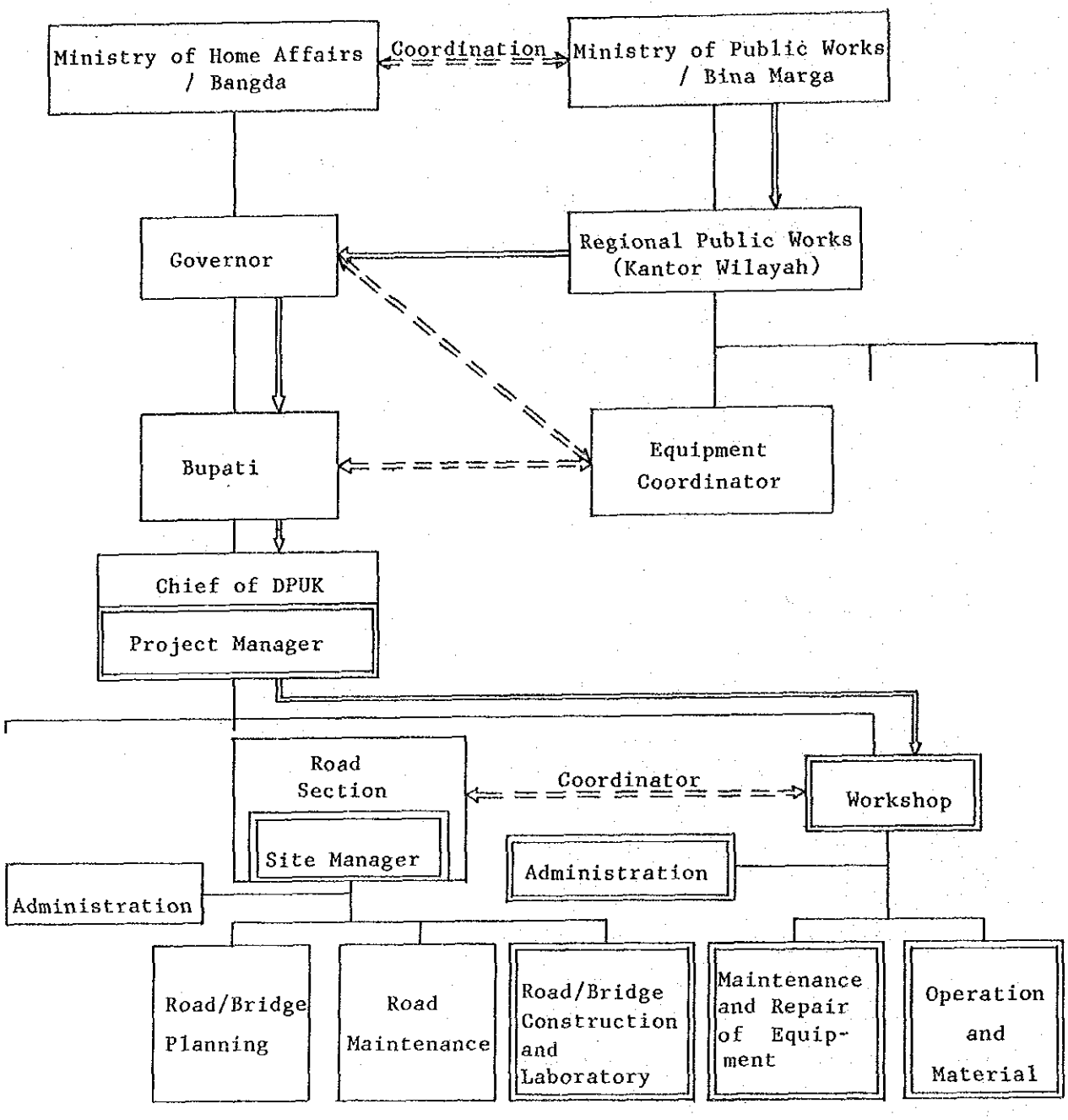
The standard organization of DPUK consists of a minimum of four sections, i.e. Road Section, Housing and City Planning Section, Irrigation Section and Administration Section. However, from the result of the engineering survey, it is apparent that there are Kabupatens in which the organization does not have the complete sections mentioned above. In some Kabupatens it is observed that DPUK is not clearly separated from that Section of the DPUP in the Kabupaten which is the agency responsible for improvement and maintenance of both national and provincial roads. The chief of the DPUK is sometimes also chief of the Section of the DPUP in the Kabupaten.

For execution of the Project it is strongly recommended that structural organization of DPUK is established. It will be necessary not only to organized 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 5.5.

The sub-section of laboratory would be under the relevant Road Section. The proposed organization is shown in Fig. 8-2-1.

Fig. 8-2-1 PROPOSED ORGANIZATION



⇓ : Equipment delivery flow

▭ : New position/subsection

8.2.2 Construction System

For the construction of Kabupaten roads of ten years effective design life, it has been recommended in Clause 5.4 that the equipment intensive method should be adopted for earth work and pavement work with the exception of surface dressing.

From the results of the engineering survey it is noted that in most of the Kabupatens the DPUK has no equipment or at best only a few pieces which are insufficient for road construction by the equipment intensive method. Furthermore the local contractors have in general only transportation equipment such as dump trucks or pick-ups. Where the local contractors do have some kind of equipment the different types are very limited.

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. 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 the execution of road improvements 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 parts 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

8.3 Training Programme and Consulting Service

8.3.1 Background

From the result of the engineering survey it is assumed that most of the Kabupatens in the Project Area do not have either enough human resources or the technique to execute the Local Road Development Project. For realization of the Project it is essential to ensure availability of the required human resources of DPUK and to train those human resources in an advanced/basic training couse. This course should take place before implementation of the Project and also during implementation in a field training course at the time of delivery of the equipment to the Kabupatens. The necessity of this technical transfer is recognized by the GOI.

In accordance with Law no. 13 of 1980 (Undang-Undang Jalan) and instruction letter no. 620/975/BANGDA, the Directorat General of Highways is responsible for providing through the Ministry of Home Affairs technical advice to Kabupatens in the implemention of local roadwork programmes. Accordingly the Education and Training Project Team of Bina Marga has started to conduct the training programme.

The training courses to be conducted before and during implementation of the Project are as follows:

i) Advanced/basic training course
ii) Field training course

8.3.2 Advanced/Basic Training Course

It should be recognized from the experiences in the first local road project that the required human resources of each Kabupaten should be acquired and the advanced/basic training course for the human resources conducted by the team of the Education and Training Project of Bina Marga should be completed before the commencement of the Project, i.e before delivery of the equipment to the Kabupatens.

It is recommended that for implementation of the initial stage of the Project the trainees shown in Table 8-3-1 should be core staff of DPUK. The concept of the advanced/basic training course is described in the Appendix A-3.

Table 8-3-1 PROVISIONAL STAFFING REQUIREMENT

TRAINING CATEGORY	PROPOSED NUMBER OF TRAINEES PER KABUPATEN	FOR 38 KABUPATENS
Project Manager and Site Manager (Pimbagpro)	2	76
Administration Staff	2	76
Assistant Engineer (Highway/Bridge/Soil)	3	114
Technician (Survey/Laboratory)	4	152
Supervisor	5	190
Operator	4	152
Mechanic	2	76
Driver	5	190
Total		1,026

8.3.3 Field Training Course

(1) General

The field training course aims to foster professional competence in technical expertise and related policy management (Kebijaksanaan Manajimen) as required for the DPUK staff and to consolidate the foundations for development of self reliability.

The aforementioned field training course is recommended to be conducted for personnel who have been trained through the advanced/basic training course or are experienced in local road projects.

The training should be by way of consultants performing consulting services. In terms of providing the training, the consulting services should also take the form of technical advisory services instead of the consulting supervisory services. Without proper consulting services, effective implementation of the Kabupaten road development for the 38 Kabupatens can not be ensured.

The consulting service, so called "Tailor Made Training Course", conducted by consultants has been started by the Ministry of Public Works for the local road development programmes of REPELITA IV in the framework of foreign aid provided by OECF, ADB and IBRD.

Taking into consideration experience of the above the following consulting services are recommended.

(2) Consulting Services

The technical advisory services conducted by the consultants should be comprised of the following training items.

i) Construction :
- Construction by equipment intensive techniques and other techniques
- Quality control including laboratory tests
- Survey

ii) Maintenance :
- Comprehensive systems of routine and periodical maintenance for Kabupaten roads

iii) Material :
- Quality control and operation management for crushing and screening plants

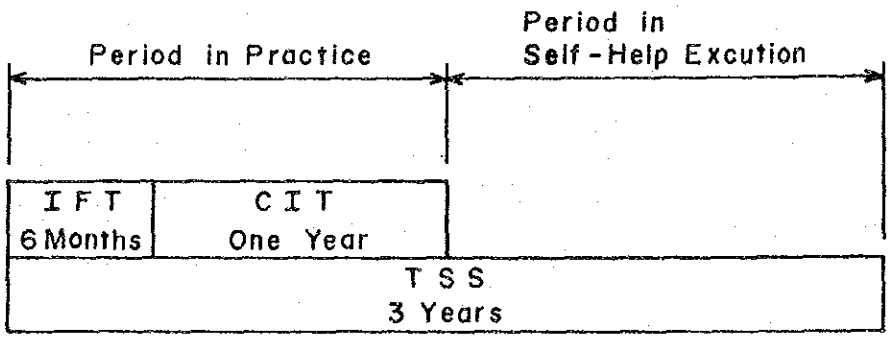
iv) Mechanical Services :
- Maintaining and repairing equipment
- Management of workshop

v) Design :
- Design criteria and specifications
- Detailed design for roads and structures including cost estimation

Judging from the initial experiences in the first local road projects, which are now under implementation through the assistance of OECF, ADB and IBRD, it is recommended that the consulting services for the training items mentioned above should be conducted by dividing them into the following three courses:

a) Intensive field training (I.F.T) over a period of six months;
b) Circulating inspection training (C.I.T) over a period of one year; and
c) Technical support service (T.S.S) over a period of three years.

The complete schedule of the technical advisory services is summarized as follows:



a) Intensive Field Training

The intensive field training is recommended to be completed within 6 months from commencement of the consulting services period. The training period for each Kabupaten is a maximum of two weeks including travel time. The objective of the consulting services in this training course would be to provide guidance for the DPUK staff for standard techniques through demonstration work.

The guidance would cover all training items mentioned before including the demonstration of equipment operation. The training course for each Kabupaten would be conducted by a field team and resident staff in collaboration with DPUP staff within the structural organization described in Sub-Section (3).

Since the objective number of Kabupatens is thirty eight and the total intensive field training period is 6 months (26 weeks), the required number of field training teams would be:

$$\frac{\text{2 weeks/Kabupaten/Team x 38 Kabupatens}}{\text{26 weeks}} = 2.9 \fallingdotseq 3 \text{ teams}$$

b) Circulating Inspection Training

The circulating inspection training would be carried out after the 6 months continuous intensive field training. The objective of the consulting services in this training course would be to monitor both the progress of the road construction pilot project and the working efficiency of the equipment, and to provide technical advice required for operating and maintaining the equipment together with other related engineering matters. Under the management of the core team the training course would be conducted periodically by two parties of field training teams and resident staff over a period of 12 months.

c) Technical Support Services

The technical support services would be conducted by the resident staff in collaboration with DPUP staff over the whole of the consulting services period. The objective of the consulting services in this course would be to monitor the daily works and to provide general technical guidance as required for implementation of the Project. In principle, the total programmed period could be divided into the following two stages. The first stage is a period of eighteen months which is programmed for providing DPUK with technical support services to ensure the proper operation of the road construction equipment. The second stage is also a period of eighteen months and it is programed for providing DPUK with technical support services to ensure proper management for the road construction and maintenance.

These services will be conducted under the management and instructions of the core team over the whole period.

(3) Structural Organization for the Consulting Services

The recommended structural organization to execute the above consulting services is shown in Fig. 8-3-1.

a) Consultants

The consultants would consists of the following three levels as shown in Fig. 8-3-2:

i) Core team at central level;
ii) Resident staff at provincial level;
iii) Resident staff and field teams at Kabupaten level.

i) Core Team

The core team would consist of a team leader and a coordinator, both expatriates, to manage the whole consulting services and to monitor the project implementation in all the participating Kabupatens over the three years period in collaboration with the other groups.

Fig. 8-3-1 STRUCTURAL ORGANIZATION FOR THE CONSULTING SERVICES

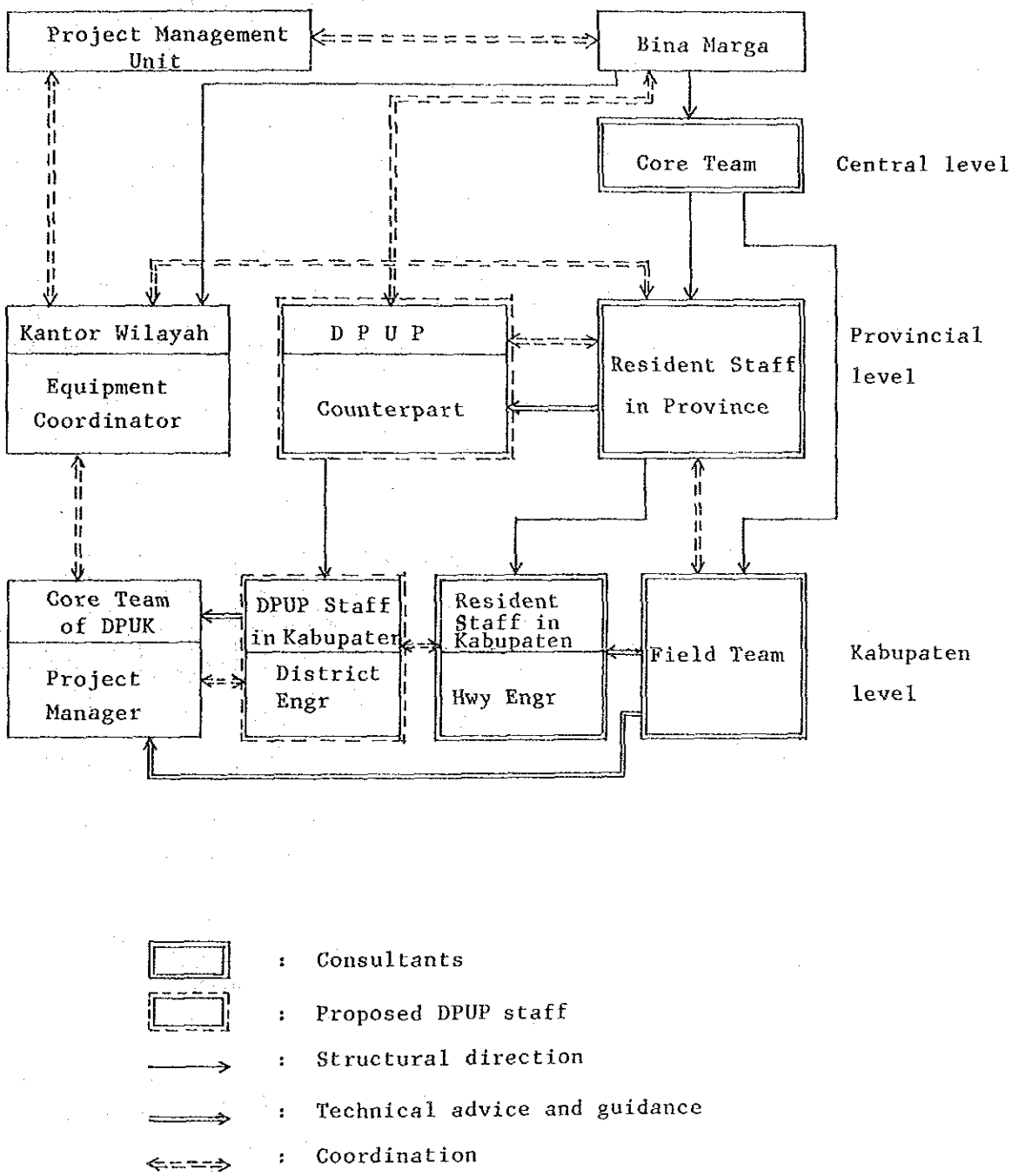
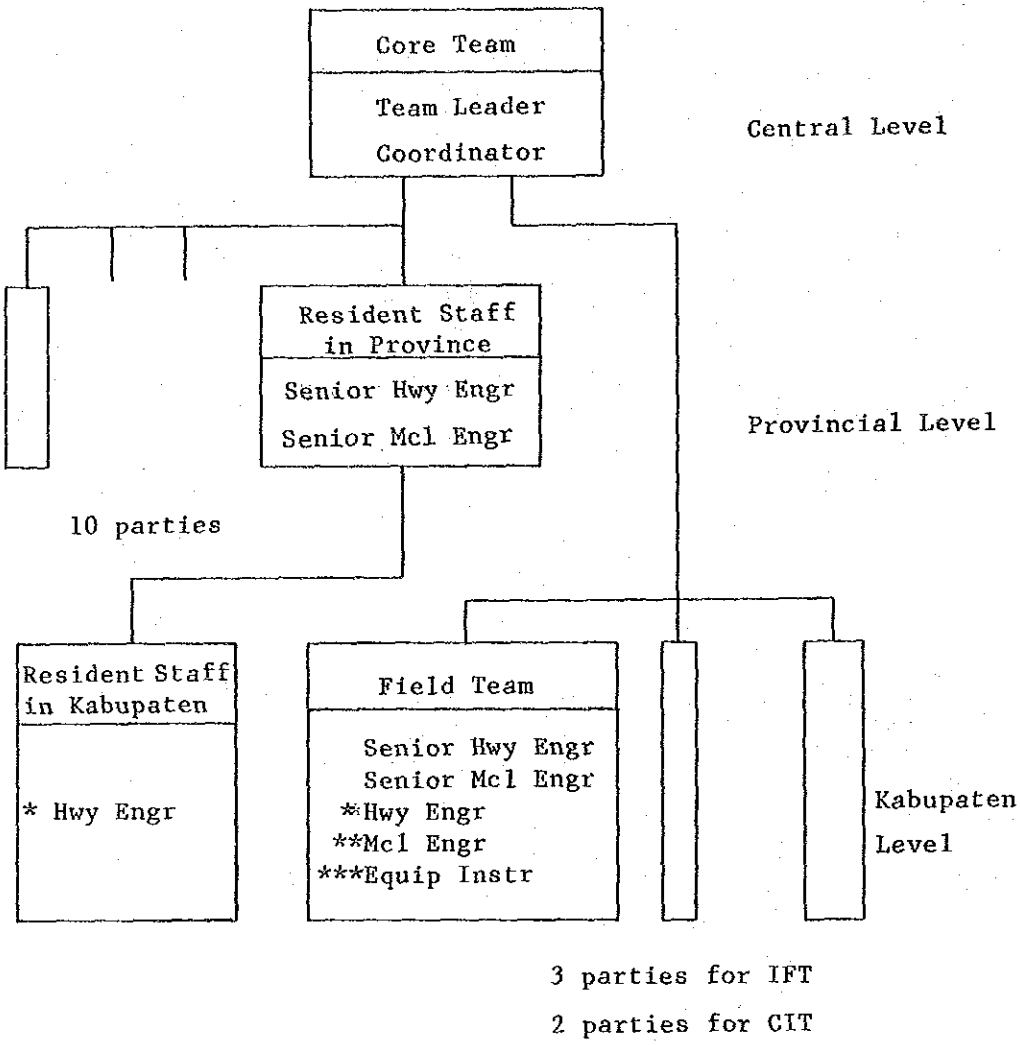


Fig. 8-3-2 STRUCTURAL ORGANIZATION OF CONSULTANTS



Notes : IFT : Intensive Field Training
CIT : Circulating Inspection Training
* : Local Consultant
** : Provided by supplier for IFT only
Hwy Engr : Highway Engineer
Mcl Engr : Mechanical Engineer
Equip Instr : Equipment Instructor

ii) Resident Staff in the Province

The resident staff at provincial level would be based in each relevant provincial centre. Each party would consist of two expatriates, i.e. a senior highway engineer assigned for a three years period and a senior mechanical engineer assigned for 18 months from the commencement of the consulting services. They would provide technical support services in collaboration with DPUP staff and the local consultant mentioned later. The senior highway engineer would take responsibility for coordination with the field team during the intensive training and circulating inspection training period.

iii) Resident Staff in the Kabupaten

It will be necessary to assign one local consultant to each Kabupaten as a highway engineer over the whole period of the consulting services. The highway engineer will be conversant with all relevant activities in each DPUK cooperating with the district Engineer who is assigned as a full time counterpart from DPUP and be responsible for explanation of technical problems to the resident staff at Provincial level.

iV) Field Team

The field teams would be organized into 3 parties for the intensive field training and 2 parties for the circulating inspection training. Each party would consist of 2 expatriates, 2 local consultants and an equipment instructor as follows:

Expatriates	:	- Senior highway engineer
		- Senior mechanical engineer
Local Consultants	:	- Highway engineer
	:	- Mechanical engineer
Supplier	:	- Equipment instructor

The equipment instructors will be provided during the intensive field training period only by the supplier awarded the equipment supply.

b) DPUP Staff

In order to realize effective and fruitful on-the-job training it is strongly recommended that the following local staff be appointed from the staff of DPUP as full time counterparts during the three years consulting services period.

i) Counterpart for the expatriate staff at provincial level

ii) District engineer for each Kabupaten

The district engineer from DPUP in each Kabupaten will monitor the daily works of construction, maintenance of the roads and the workshop, and provide proper technical guidance for the Kabupaten staff under the management and instruction of the provincial counterpart. Through the counterpart, who will be familiar with the Kabupaten, the resident expatriates will be able to comprehend the actual situation.

(4) Assigment Schedule and Required Man-Months

a) Assigment Schedule

The recommended assigment schedules of consultants and DPUP staff are shown in Fig. 8-3-3 (1) and Fig. 8-3-3 (2) respectively. The equipment instructors provided by the supplier are listed in the item of local consultants.

Fig. 8-3-3 (1)

ASSIGNMENT SCHEDULE

Consultants

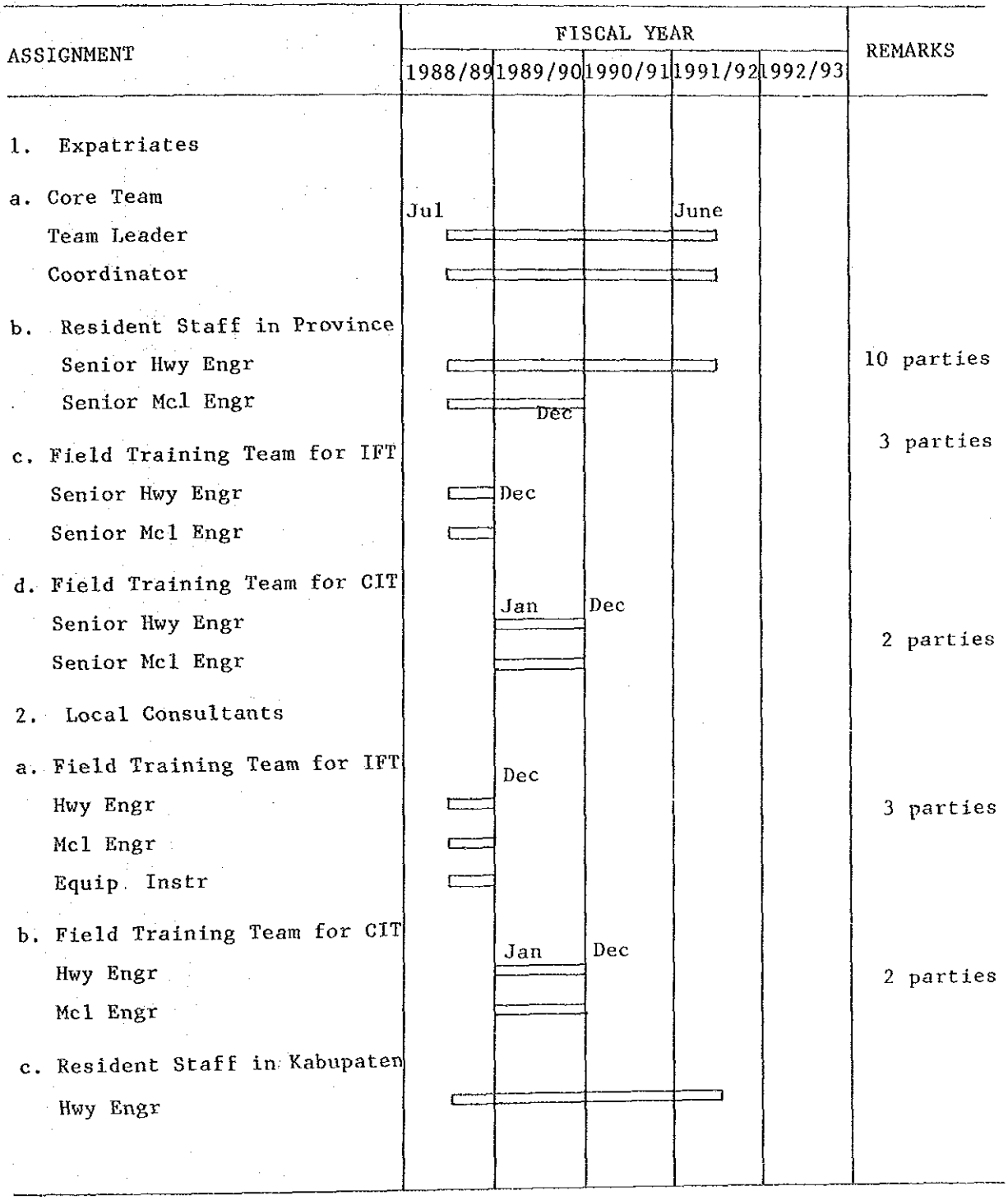


Fig. 8-3-3 (2) ASSIGNMENT SCHEDULE

DPUP Staff

ASSIGNMENT	FISCAL YEAR					REMARKS
	1988/89	1989/90	1990/91	1991/92	1992/93	
a. Resident in Province Counterpart	Jul			June		10 persons
b. Resident in Kabupaten District						38 parties

Notes : IFT : Intensive Field Training

CIT : Circulating Inspection Training

Hwy Engr : Highway Engineer

Mcl Engr : Mechanical Engineer

Equip Instr : Equipment Instructor provided by supplier

b) Required Man-Months

The recommended man-months of consultants and DPUP staff are shown in Table 8-3-2 (1) and Table 8-3-2 (2) respectively. The equipment instructors provided by the supplier are listed in the item of the local consultants.

Table 8-3-2 (1) REQUIRED MAN-MONTHS

Consultants

ASSIGNMENT	MAN - MONTHS STAFF MONTHS	MAN - MONTHS REQUIRED
1. Expatriates		
a. Core Team		
Team Leader	1 x 36	36
Coordinator	1 x 36	36
b. Resident Staff in Province		
Senior Hwy Engr	10 x 36	360
Senior Mcl Engr	10 x 18	180
c. Field Training Team for IFT		
Senior Hwy Engr	3 x 6	18
Senior Mcl Engr	3 x 6	18
d. Field Training Team for CIT		
Senior Hwy Engr	2 x 12	24
Senior Mcl Engr	2 x 12	24
Total of Except rates		696
2. Local Consulatnats		
a. Field Training Team for IFT		
Hwy Engr	3 x 6	18
Mcl Engr	3 x 6	18
Equip Instr	3 x 6	18
b. Field Training Team for CIT		
Hwy Engr	2 x 12	24
Mcl Engr	2 x 12	24
c. Resident Staff in Kabupaten		
District Engr	38 x 36	1,368
Total of Local Consultants		1,470
Total of Consultants		2,166

Notes : IFT : Intensive Field Training
CIT : Circulating Inspection Training
Hwy Engr : Highway Engineer
Mcl Engr : Mechanical Engineer
Equip.Instr : Equipment Instructor Provided by Supplier

Table 8-3-2 (2) REQUIRED MAN-MONTHS

DPUP Staff

ASSIGNMENT	STAFF MONTHS	REQUIRED
a. Resident in Province		
Counterpart	10 x 36	360
b. Resident in Kabupaten		
District Engr	38 x 36	360
Total of DPUP Staff		720

APPENDIX

APPENDIX A-1 UNIT CONSTRUCTION COST EXCLUDING BRIDGES

Sample

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Borrow Pit Excavation (for Fill)

Cost analysis for 180 m3/day

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Equipment :							
E15	Bulldozer/Ripper	hr	6.00	9,677	6,292	58,062	37,752
E63	Dump Truck	hr	42.00	3,831	1,679	160,902	70,518
E52	Wheel Loader	hr	6.00	8,866	7,953	53,196	47,718
					Sub Total	272,160	155,988
Labour :							
L01	Mandur	man day	1.00	3,000		3,000	
L05	Labourer	man day	5.00	2,000		10,000	
L06	Driver	man day	7.00	3,000		21,000	
L07	Operator	man day	2.00	3,500		7,000	
					Sub Total	41,000	
					T O T A L	313,160	155,988
					UNIT COST	1,739	866

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Base Course

Cost analysis for 170 m3/day

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Equipment :							
E22	Motor Grader	hr	6.00	7,954	5,673	47,724	34,038
E35	Vibratory Roller (D&T)	hr	3.00	3,515	3,285	10,545	9,855
E61	Water Tank Truck	hr	4.00	3,023	992	12,092	3,968
				Sub Total		70,361	47,861
Labour :							
L01	Mandur	man day	1.00	3,000		3,000	
L05	Labourer	man day	10.00	2,000		20,000	
L07	Operator	man day	3.00	3,500		10,500	
L06	Driver	man day	1.00	3,000		3,000	
				Sub Total		36,500	
Material :							
K73	Production of Base Course Material	m3	170.00	3,820	2,022	649,400	343,740
				T O T A L		756,261	391,601
				UNIT COST		4,448	2,303

PROVINCE : RIAU
KABUPATEN : INDRAGIRI HILIR

I t e m : Cement Stabilizing

Cost analysis for 80 m3/day

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Equipment :							
E24	Road Stabilizer	hr	4.00	3,580	9,016	14,320	36,064
E22	Motor Grader	hr	6.00	11,617	5,660	69,702	33,960
E35	Vibratory Roller (D&T)	hr	6.00	5,204	3,279	31,224	19,674
E67	Flat Bed Truck	hr	6.00	4,771	603	28,626	3,618
E61	Water Tank Truck	hr	6.00	4,982	985	29,892	5,910
E52	Wheel Loader	hr	6.00	12,383	7,939	74,298	47,634
E63	Dump Truck	hr	30.00	5,912	1,668	177,360	50,040
E14	Bulldozer	hr	4.00	13,865	5,558	55,460	22,232
				Sub Total		480,882	219,132
Labour :							
L01	Handur	man day	2.00	4,000		8,000	
L07	Operator	man day	4.00	5,000		20,000	
L06	Driver	man day	7.00	5,000		35,000	
L05	Labourer	man day	15.00	2,750		41,250	
				Sub Total		104,250	
Material :							
M05	Cement	bag	154.00	0	6,000	0	924,000
M04	Sand	m3	80.00	4,500	0	360,000	0
				Sub Total		360,000	924,000
				T O T A L		945,132	1,143,132
				UNIT COST		11,814	14,289

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Surface Dressing (Double)

Cost analysis for 1800 m2/day

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Equipment :							
E76	Asphalt Sprayer	hr	5.00	912	1,164	4,560	5,820
E67	Flat Bed Truck	hr	6.00	2,748	605	16,488	3,630
E34	Tire Roller	hr	5.00	7,683	3,209	38,415	16,045
				Sub Total		59,463	25,495
Labour :							
L01	Mandur	man day	1.00	3,000		3,000	
L02	Skilled Labourer	man day	3.00	2,500		7,500	
L05	Labourer	man day	11.00	2,000		22,000	
L07	Operator	man day	1.00	3,500		3,500	
L06	Driver	man day	2.00	3,000		6,000	
				Sub Total		42,000	
Material :							
M01	Bitumen	l	1800.00	0	325	0	585,000
M02	Asphalt Oil	l	45.00	750	0	33,750	0
M03	Kerosene	l	225.00	250	0	56,250	0
K74	Production of Crushed Stone Aggregate	m3	20.00	4,259	2,425	85,180	48,500
K14	Surface Dressing (Single)	m2	1000.00	628	638	1,130,400	1,148,400
				Sub Total		1,305,580	1,781,900
				T O T A L		1,407,043	1,807,395
				UNIT COST		781	1,004

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Pipe Culvert D80cm

Cost analysis for 8 m

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Equipment :							
E64	Flat Bed Truck with Crane	hr	6.00	3,224	1,845	19,344	11,070
Labour :							
L01	Mandur	man day	2.00	3,000		6,000	
L06	Driver	man day	1.00	3,000		3,000	
L05	Labourer	man day	15.00	2,000		30,000	
				Sub Total		39,000	
Material :							
M04	Sand	m3	5.40	6,000	0	32,400	0
K70	Structure Excavation by hand	m3	21.60	4,565	839	98,604	18,122
K75	D80cm x 1.0m Pipe Culvert Production	m	8.00	15,795	35,179	126,360	281,432
K80	Structure Backfill	m3	7.40	5,866	1,599	43,408	11,832
				Sub Total		300,772	311,386
				TOTAL		359,116	322,456
				UNIT COST		44,889	40,307

APPENDIX A-2 UNIT CONSTRUCTION COST OF BRIDGES

Sample

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Superstructure (Timber;Span 5m;10T)

Cost analysis for 20.8 m2

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp) LOCAL	RATE (Rp) FOREIGN	AMOUNT (Rp) LOCAL	AMOUNT (Rp) FOREIGN
Material :							
K90	Timber Bridge; Timbering; Timber Pile	m3	4.50	295,165	4,243	1,328,242	19,093
K91	Painting	m2	83.00	125	750	10,375	62,250
					Sub Total	1,338,617	81,343
					TOTAL	1,338,617	81,343
					UNIT COST	64,356	3,910

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Superstructure (Timber;Span 3m;10T)

Cost analysis for 12.8 m2

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp) LOCAL	RATE (Rp) FOREIGN	AMOUNT (Rp) LOCAL	AMOUNT (Rp) FOREIGN
Material :							
K90	Timber Bridge; Timbering; Timber Pile	m3	2.50	295,165	4,243	737,912	10,607
K91	Painting	m2	46.30	125	750	5,787	34,725
					Sub Total	743,699	45,332
					TOTAL	743,699	45,332
					UNIT COST	58,101	3,541

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Superstructure (Concrete;Span 8m;BM50)

Cost analysis for 39.6 m2

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp) LOCAL	RATE (Rp) FOREIGN	AMOUNT (Rp) LOCAL	AMOUNT (Rp) FOREIGN
Material :							
K76	Concrete 1:2:4	m3	23.30	15,308	39,020	356,676	909,166
K79	Reinforcing Steel	kg	3651.80	87	825	317,706	3,012,735
K92	Formwork	m2	101.70	10,697	147	1,087,884	14,949
K90	Timber Bridge; Timbering; Timber Pile	m3	2.70	295,165	4,243	796,945	11,456
				Sub Total		2,559,211	3,948,306
				T O T A L		2,559,211	3,948,306
				UNIT COST		64,626	99,704

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Superstructure (Concrete;Span10m;BM50)

Cost analysis for 48.6 m2

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp) LOCAL	RATE (Rp) FOREIGN	AMOUNT (Rp) LOCAL	AMOUNT (Rp) FOREIGN
Material :							
K76	Concrete 1:2:4	m3	31.80	15,308	39,020	486,794	1,240,836
K79	Reinforcing Steel	kg	5124.20	87	825	445,805	4,227,465
K92	Formwork	m2	142.20	10,697	147	1,521,113	20,903
K90	Timber Bridge; Timbering; Timber Pile	m3	3.30	295,165	4,243	974,044	14,001
				Sub Total		3,427,756	5,503,205
				T O T A L		3,427,756	5,503,205
				UNIT COST		70,529	113,234

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Substructure (Abut;for Timber;10T)

Cost analysis for 1 NO

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Material :							
K90	Timber Bridge; Timbering; Timber Pile	m3	3.90	295,165	4,243	1,151,143	16,547
K80	Structure Backfill	m3	31.30	5,866	1,599	183,605	50,048
K91	Painting	m2	117.20	125	750	14,650	87,900
					Sub Total	1,349,398	154,495
					T O T A L	1,349,398	154,495
					UNIT COST	1,349,398	154,495

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Substructure (Pier;for Timber;10T)

Cost analysis for 1 NO

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Material :							
K90	Timber Bridge; Timbering; Timber Pile	m3	1.70	295,165	4,243	501,780	7,213
K91	Painting	m2	34.20	125	750	4,275	25,650
					Sub Total	506,055	32,863
					T O T A L	506,055	32,863
					UNIT COST	506,055	32,863

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Stone Masonry of Abut and Pier

Cost analysis for 6 m3

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Equipment :							
E04	Flat Bed Truck with Crane	hr	6.00	3,224	1,845	19,344	11,070
E13	Concrete Mixer	hr	4.00	3,132	5,835	12,528	23,340
E14	Water Pump	hr	6.00	293	194	1,758	1,164
				Sub Total		33,630	35,574
Labour :							
L01	Mandur	man day	1.00	3,000		3,000	
L04	Mason	man day	5.00	3,000		15,000	
L05	Labourer	man day	14.00	2,000		28,000	
L06	Driver	man day	1.00	3,000		3,000	
				Sub Total		49,000	
Material :							
M06	River Stone	m3	6.00	6,000	0	36,000	0
M04	Sand	m3	1.80	6,000	0	10,800	0
M05	Cement	bag	2.30	0	3,750	0	8,625
				Sub Total		46,800	8,625
				T O T A L		129,430	44,199
				UNIT COST		21,571	7,366

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Demolition of Bridge (Concrete)

Cost analysis for 79.2 m2

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Material :							
K58	Superstructure (Concrete;Span 8m;BM50)	m2	39.60	64,626	99,704	2,559,189	3,948,278
K65	Substructure (Pier;for Concrete;BM50)	NO	0.50	1,795,557	452,906	897,778	226,453
K66	Substructure (Abut;for Concrete;BM50)	NO	1.00	3,754,600	959,362	3,754,600	959,362
				Sub Total		7,211,567	5,134,093
				T O T A L		7,211,567	5,134,093
				UNIT COST		91,055	64,824

PROVINCE : SULAWESI SELATAN
KABUPATEN : BARRU

I t e m : Demolition of Bridge (Timber->Concrete)

Cost analysis for 1 m2

	DESCRIPTION	UNIT	QUANTITY	RATE (Rp)		AMOUNT (Rp)	
				LOCAL	FOREIGN	LOCAL	FOREIGN
Material :							
K67	Demolition of Bridge (Timber->Timber)	m2	1.00	15,925	1,374	15,925	1,374
				T O T A L		15,925	1,374
				UNIT COST		15,925	1,374

APPENDIX A-3 CONCEPT OF THE ADVANCED/BASIC TRAINING COURSE

(1) Training Level and Category

Level	Category
Central	Project Manager and Treasurer/ Administrator
Regional	Assistant Engineer, Technicial and Supervisor/Foreman
Provincial	Operator, Mechanic and Driver

(2) Agencies Responsible for the Training Programme

Central level:

1) Directorate General of Regional Development, Ministry of Home Affairs.
2) Directorate General of Bina Marga, Ministry of Public Works.
3) Deputy Regional and District Board, BAPPENAS
4) Secretary General of Personnel Bureau, Ministry of Home Affairs.
5) Departement of Finance i.e Directorate General of Budget.

Provincial level:

1) Development Bureau of PEMDA Tingkat I
2) Personnel Bureau of PEMDA Tingkat I
3) Regional Office of Ministry of Public Works/Provincial Public Works.

Kabupaten level:

1) Bupati
2) DPUK
3) Personnel Section of PEMDA, Tingkat II.

(3) Candidate Quanlification Level for Training Course

Training Course	Education Certificate	Professional Experience
1) Assist.Engineer	B.E	3 Years
2) Administration Staff	S.L.T.A	1 Years
3) Supervisor		
a. Inspector/Quality Control	B.E or S.T.M	2 Years or 3 Years
b. Foreman/Mandor	S.L.T.A	5 Years
4) Technician		
a. Surveyor	S.T.M	2 Years
b. Draftsman	S.T.M	2 Years
c. Laboratory	S.T.M	2 Years
5) Mechanic	S.T.M (Mechanical /Electrical)	3-5 Years
6) Operator	S.L.T.P	3 Years
7) Driver (Dump Truck)	S.L.T.P	2 Years (Kendaraan Umum)

Where :

B.E : Sarjana Muda Teknik (Technical College Level)

S.L.T.A : Sekolah Lanjutan Tingkat Atas (Senior High School Level)

S.T.M : Sekolah Teknik Menengah (Senior Technical High School Level)

S.L.T.P : Sekolah Lanjutan Tingkat Pertama (Junior High School Level)

(4) Provisions for Implementation of the Advanced/Basic Training Course

1) Suitable road links and workshops, to be utilized for practice of the advanced/basic training course in the framework of the force account, should be provided so that the DPUK staff increase their applied and adapted professional competence efficiently.

2) As well as the above facilities it is essential that an adequate budget is allocated by the appropriate authorities for implementation of the advanced/basic training course.

3) Course participants should have the required educational backgrounds as specified for their particular training course.

(5) Administrative Procedure for the Training Programme

1)	Collection & Registration of the Candidates	Two (2) weeks
2)	Orientation	One (1) week
3)	Administration work	Two (2) weeks
4)	Preparation for the training program	Two (2) weeks
5)	Training Course	

(6) Items to be Considered in Planning the Training Programme

1) Training objective to be achieved
2) Priority of the training items
3) Training volume/target
4) Budget allocation
5) Administrative procedure of the training programme
6) Organization of the Implementation and its related facilities
7) Training materials and curricula
8) Training method
9) Teaching staff/instructors

(7) Items to be Considered for On-the-Job Training

1) Timing/convenience, situation and condition of the job site for training
2) Training method/standard and also working procedure
3) Standard of the training level and the training periods for each training course

(8) Structure and Location of the Training

The location of the training for three (3) levels are shown in Table AP 3-1.

Table AP 3-1 STRUCTURE AND LOCATION OF THE TRAINING

TRAINING LEVEL	LOCATION	NUMBER OF KABUPATENS	TRAINING COURSE
Central	Jakarta	38	Project Manager and Administration Staff
Regional	Palembang	8	Assistant Engineer, Technician,
	Banjarmasin	17	Supervisor and Foreman.
	Ujung Pandang	13	
Provincial	Pekanbaru	3	Operator, Mechanic and Driver
	Palembang	5	
	Palangkaraya	4	
	Samarinda	4	
	Banjarmasin	9	
	Kupang	3	
	Ujung Pandang	8	
	Kendari	2	

(9) Number of Trainees

The number of trainees from DPUK staff allocated to the advanced/basic training course is shown in Table AP 3-2.

Table AP 3-2 NUMBER OF TRAINEES

TRAINING CATEGORY	NUMBER PER KABUPATEN	NUMBER FOR 38 KABUPATENS
Project Manager including Site Manager (Pimbagpro)	2	76
Administration Staff	2	76
Assistant Engineer (Highway/Bridge/Soil)	3	114
Technician (Survey/Laboratory)	4	152
Supervisor	5	190
Operator	4	152
Mechanic	2	76
Driver	5	190
Total	5	1,026

Notes :

1) The number of Kabupaten is 38.
2) Ministry of Home Affairs should be responsible for engagement of the above staff.

APPENDIX A-4 GOVERNMENT POLICY AND OTHER MEASURES

(1) Responsible Agency

The Ministry of Home Affairs had initially promoted the development of local roads as the principal responsible agency. The Government of the Republic of Indonesia has arranged for the development of local roads as one of the priority policies in the Third Five-Year Plan (1979-1984).

Therefore the implementation programme for the local road development project was accelerated with the coordination of the four responsible agencies shown in Table AP4-1 subject to the provision of road construction equipment under foreign aid loans from the Overseas Economic Cooperation Fund (OECF), the International Bank of reconstruction and Development (IBRD) and the Asian Development Bank (ADB).

Table AP4-1 RESPONSIBLE AGENCIES FOR THE PROJECT
(Central Government Level)

RESPONSIBLE AGENCY	AREAS OF RESPONSIBILITY
Ministry of Home Affairs	: Responsible for managing the execution of aid work for Kabupaten Roads.
Ministry of Finance	: Responsible for applying for aid.
Ministry of Public Works	: Responsible for planning and technical management for aid support work for Kabupaten Roads.
BAPPENAS	: Responsible for general managing the plan of aid support work for Kabupaten Roads under scheme of National Development.
All Four Ministries noted above	: to decide amount of Provincial and Kabupaten aid by joint agreement.

(2) Guidelines and Instructions by Responsible Agencies

The Ministry of Home Affairs circulated a technical and administrative guideline for procurement of equipment and for implementation of the project within the framework of local road support works on June 24, 1982 with instruction letter Ref. No. 620/975/-BANGDA.

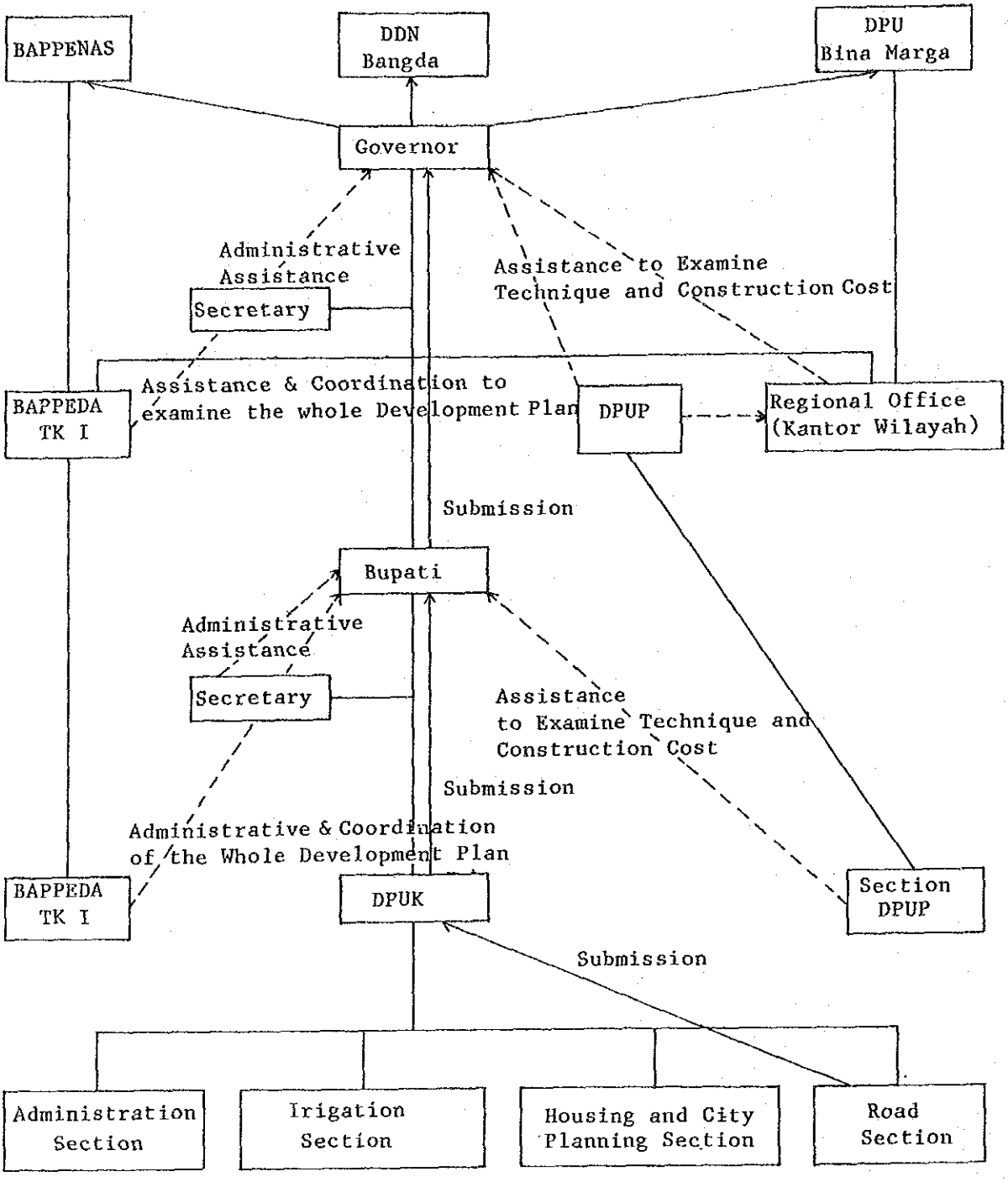
Main points stipulated in the above guideline are as follows:

1) Technical guidance
2) Planning
3) Implementation of the Project-Appointment of the Project Manager
4) Equipment-Appointment of the Equipment Coordinator
5) Technical transfer

Since delivery of the equipment through OECF's loan began to DPUP's workshop between the middle and the end of 1982, the Directorate General of Highways circulated instruction No. 188/SPRIN/B/1984 dated November 5, 1984 regarding the procurement and delivery of equipment to the nominated Kabupatens through the Regional PU Office. Also instruction No. 193/011/BANGDA dated January 1985 was circulated by the Ministry of Home Affairs regarding the advance training cost relating to the consulting services financed by OECF.

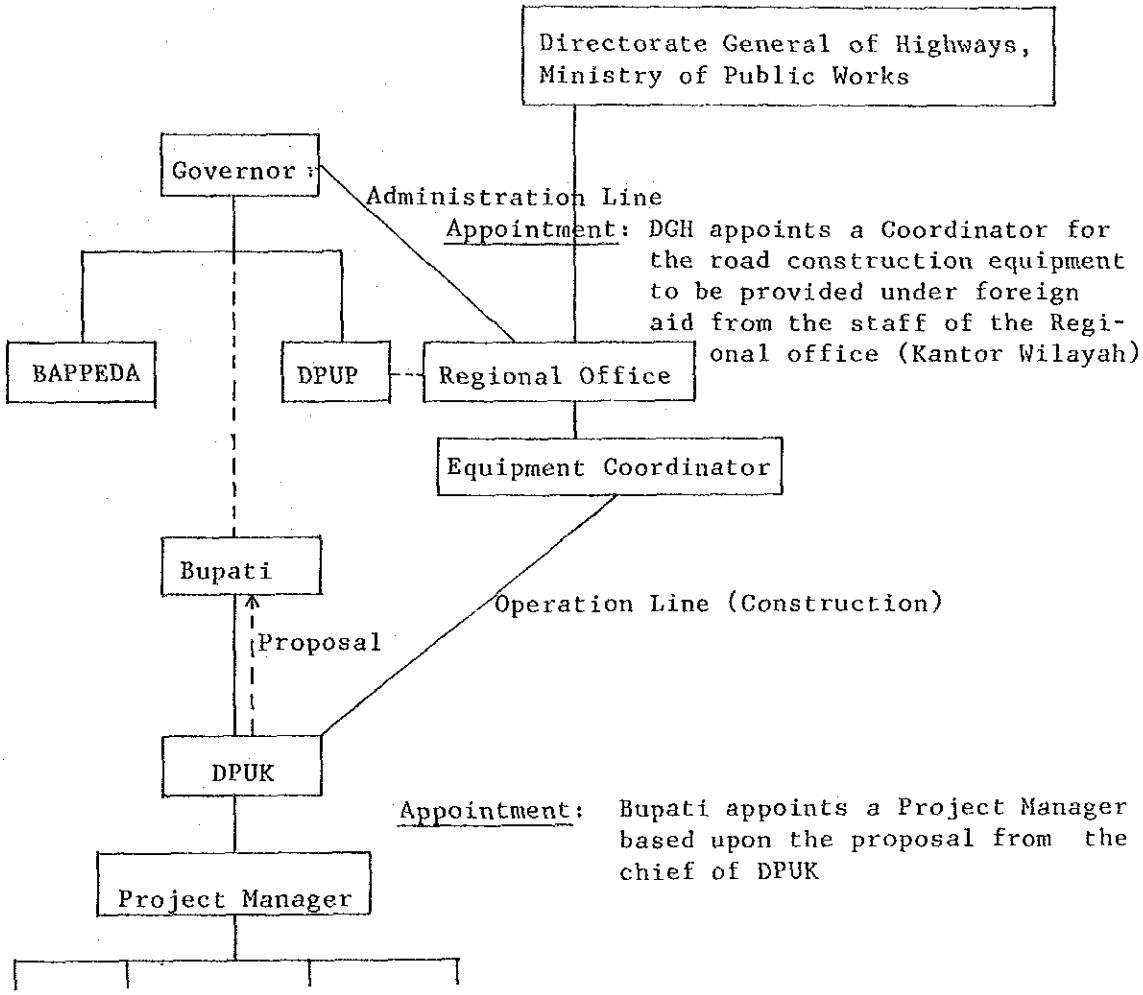
Fig. AP4-1 and Fig. AP4-2 show the procedure for applying the project plan and the procedure for appointment of a Project Manager and an Equipment Coordinator respectively.

Fig. AP 4-1 PROCEDURE FOR APPLYING THE PROJECT PLAN



Note: This diagram was made based upon the guideline dated June 24, 1982 Ref No. 620/975/BANGDA issued by the Ministry of Home Affairs.

Fig. AP 4-2 PROCEDURE FOR APPOINTMENT OF A PROJECT MANAGER AND AN EQUIPMENT COORDINATOR



Note : This diagram was made based upon the guideline dated June 24, 1982 Ref.No. 620/975/BANGDA issued by the Ministry of Home Affairs.