The total number of pulses (as estimated in the
analysis of the call demand under Section 4-3)
includes DINAS pulses, which have no potential of
generating revenue. For this reason, the number of
DINAS pulses was estimated, using the data for the
past three years.

As a result, the number is projected in the
following equation:

Number of DINAS pulses = 0.122 x (Total number of pulses)$^{0.918}$

$$(R = 0.93)$$

Thus, revenue is calculated by deducting the number
of DINAS pulses from the total number of pulses.

(3) Project Loan
     Based upon the assumptions for the Pelita IV, the
     project loan should reflect the following scenario:

     1) 60% of the initial investment should be
         financed by external funds.

     2) The interest rate should be 18% per annum, with
         a grace period of 5 years and a repayment
         period of 10 years for principal.

8-1-4 Results of the Analysis

The cash flow statements, the profit and loss statement
and the source and application statement are shown in
Table 8-1-3, 4, 5, 6 respectably.

Table 8-1-3   Cash Flow Statement of Scenario-1

IRR= 6.8%   (Rp.1000)

Description	1989	1990	1991	1992	1993	1994	1995	1996
A.Cash Inflow								
1.Installation Fee				15910435	15653187	19165399	14091308	18598626
2.Annual Rental				3054804	6060215	9739972	12445503	16016439
3.Call Charge				113638690	231500227	378489221	489419410	636853670
Total Inflows				132603929	253213630	407394591	515956222	671468735
Contribution of Project				112713340	215231585	346285402	438562788	570748425
B.Cash Outflow								
1.Initial Investment	158320735	287796585	431095557	387860371	417324427	402851884	415376164	364298769
2.Working Capital				33814002	30755474	39316145	27683216	39655691
3.Maintenance				23009091	33182578	44128901	54695613	65590833
4.Operation				41479442	79941328	128102558	162022824	212121375
Total Outflow	158320735	287796585	431095557	486162906	561203807	614399488	659777816	681666668
C.Cash Surplus (*1000)	-158321	-287797	-431096	-373450	-345972	-268114	-221215	-110918

	1997	1998	1999	2000	2001	2002	2003	2004	2005
	13456143	14069510	16659657	4648856	8617709				
	18600019	21301365	24500019	25392599	27047199	27047199	27047199	27047199	27047199
	747488257	865168239	1005878899	1054348329	1134545487	1153038579	1171833107	1190933987	1210346211
	779544419	900539113	1047038575	1084389784	1170210395	1180085778	1199880307	1217981186	1237393410
	662612756	765458246	889982788	921731316	994678836	1003072911	1019048261	1035284008	1051784399
	607694613	676864104	760456983	733791016					
	27559299	30853647	37357363	9524558	21884256	2518223	4792605	4870724	4950117
	75146306	91085995	108839983	128786594	148033762	148033762	148033762	148033762	148033762
	245095770	285074276	328464358	338170134	366869981	366427194	373390801	375065568	382678003
	955495988	1083878022	1235118687	1210272302	536787999	516979179	526717167	527970054	535661882
	-292883	-318420	-345136	-288541	457891	486094	492331	507314	516123

	2006	2007	2008	2009	2010	2011	2012	2013	2014
	27047199	27047199	27047199	27047199	27047199	27047199	23992396	20986984	17307227
	1230074854	1250125074	1270502113	1291211298	1312258042	1333647848	1203204327	1068840123	895802239
	1257122054	1277172274	1297549312	1318258497	1339305241	1360695047	1226296722	1089827106	913109467
	1085553746	1085596433	1102916916	1120519722	1138409455	1156590790	1042352214	926353040	776143047
	5030804	5112806	5196145	5280842	5366920	5454401	0	0	0
	148033762	148033762	148033762	148033762	143881046	1436332208	125024672	114851184	103904861
	383610971	384308953	392026369	392429357	392559546	400343595	354927347	310047510	260679423
	536675537	537455522	545256276	545743961	541807511	542130204	479952019	424898694	364584284
	531878	548141	557661	574776	596602	614461	562400	501454	411559

	2015	2016	2017	2018	2019	2020
	14601696	11030760	8447180	5745835	2547180	1654600
	768086049	589703803	458946637	317267413	142940067	94364631
	782687745	600734563	467393818	323013248	145487248	96019231
	665284583	510624378	397284745	274561261	123664161	81616346
	0	0	0	0	0	-346977237
	93338149	82442929	72887456	569477767	39193779	19247168
	219407551	165207828	128940401	89391941	40391405	26743754
	312745700	247650756	201827858	146339708	79585184	-300986314
	352539	262974	195457	128222	44079	382603

Table 8-1-4 Cash Flow Statement of Scenario-2

IRR= 6.7%   (Rp.1000)

Description	1989	1990	1991	1992	1993	1994	1995	1996
A.Cash Inflow								
1.Installation Fee				14.386.472	13.412.339	16.817.519	18.484.776	18.816.616
2.Annual Rental				2.762.203	5.337.372	8.566.335	12.115.412	15.728.202
3.Call Charge				102.753.939	203.887.599	332.882.435	476.438.586	625.392.649
Total Inflows				119.902.614	222.637.309	358.266.289	507.038.775	659.937.467
Contribution of Project				101.917.222	189.241.713	304.526.346	430.982.958	560.946.847
B.Cash Outflow								
1.Initial Investment	149.564.421	270.703.670	401.681.603	395.653.424	437.248.515	430.947.145	413.306.902	361.467.595
2.Working Capital				30.575.167	26.197.347	34.585.390	37.936.984	38.989.167
3.Maintenance				21.559.550	31.937.448	43.406.375	54.710.019	65.550.963
4.Operation				37.506.381	70.326.746	112.658.411	158.738.540	208.421.419
Total Outflow	149.564.421	270.703.670	401.681.603	485.294.522	565.710.056	621.597.321	664.692.445	674.429.144
C.Cash Surplus (*1000)	-149.564	-270.704	-401.682	-383.377	-376.468	-317.071	-233.709	-113.482

	1997	1998	1999	2000	2001	2002	2003	2004	2005
1.Installation Fee	13.135.874	15.230.639	17.432.021	4.641.521	8.513.157				
2.Annual Rental	18.250.290	21.174.573	24.521.521	25.412.693	27.047.219	27.047.219	27.047.219	27.047.219	27.047.219
3.Call Charge	733.433.542	860.018.515	1.006.761.699	1.055.182.664	1.134.546.319	1.153.039.424	1.171.833.967	1.190.934.860	1.210.347.099
Total Inflows	764.819.707	896.423.726	1.048.715.242	1.085.236.878	1.170.106.695	1.180.086.643	1.198.881.186	1.217.982.080	1.237.394.318
	650.096.751	761.960.167	891.407.056	922.451.346	994.590.691	1.003.073.647	1.019.049.008	1.035.284.768	1.051.785.170
1.Initial Investment	616.464.161	687.293.599	755.433.659	723.966.513					
2.Working Capital	26.744.971	33.559.025	38.834.336	9.313.017	21.641.803	2.544.887	4.792.608	4.870.728	4.950.121
3.Maintenance	75.032.174	91.201.886	109.229.438	129.044.288	148.033.762	148.033.762	148.033.762	148.033.762	148.033.762
4.Operation	240.473.043	283.641.970	328.913.652	338.435.397	366.848.032	366.427.463	373.891.075	375.065.843	382.678.283
Total Outflow	958.714.349	1.095.696.480	1.232.411.086	1.200.759.215	536.523.597	517.006.112	526.717.445	527.970.333	535.662.166
C.Cash Surplus (*1000)	-308.618	-333.736	-341.003	-278.308	458.067	486.068	492.332	507.314	516.123

	2006	2007	2008	2009	2010	2011	2012	2013	2014
	27.047.219	27.047.219	27.047.219	27.047.219	27.047.219	27.047.219	24.285.016	21.709.847	18.480.884
	1.230.075.756	1.250.125.991	1.270.503.045	1.291.212.245	1.312.259.004	1.333.648.826	1.216.968.102	1.105.654.632	956.549.351
	1.257.122.976	1.277.173.210	1.297.550.264	1.318.259.464	1.339.306.223	1.360.696.045	1.241.253.118	1.127.364.480	975.030.235
	1.068.554.529	1.085.597.229	1.102.917.724	1.120.520.544	1.138.410.290	1.156.591.638	1.055.065.151	958.259.808	828.775.700
	5.030.808	5.112.810	5.196.149	5.280.846	5.366.924	5.454.405	0	0	0
	148.033.762	148.033.762	148.033.762	148.033.762	144.110.722	137.010.227	126.474.212	116.096.314	104.627.387
	383.611.252	384.309.235	392.026.657	392.429.645	392.559.834	400.343.888	359.256.181	320.726.607	278.356.898
	536.675.822	537.455.807	545.256.568	545.744.253	542.037.479	542.808.520	485.730.393	436.822.921	382.984.285
	531.879	548.141	557.661	574.776	596.373	613.783	569.335	521.437	445.791

	2015	2016	2017	2018	2019	2020
	14.931.807	11.319.017	8.796.929	5.872.646	2.525.698	1.634.526
	785.450.705	605.113.992	477.948.934	324.269.559	141.734.541	93.219.775
	800.382.512	616.433.009	486.745.863	330.142.205	144.260.239	94.854.301
	680.325.135	523.968.058	413.733.984	280.620.875	122.621.203	80.626.156
	0	0	0	0	0	-346.977.491
	93.323.743	82.482.799	73.001.588	56.831.876	38.804.324	18.989.474
	224.367.850	169.525.052	134.279.070	91.364.836	40.050.752	26.419.292
	317.691.594	252.007.851	207.280.657	148.196.712	78.855.076	-301.568.725
	362.634	271.960	206.453	132.424	43.766	382.195

Table 8-1-5 Profit and Loss Statement of Scenario-1

(Rp.1000)

Description	1989	1990	1991	1992	1993	1994	1995	1996
A.Operating Revenue								
1.Installation Fee				15.910.435	15.653.187	19.165.399	14.091.308	18.598.626
2.Annual Rental				3.054.804	6.060.215	9.739.972	12.445.503	16.016.439
3.Call Charge				113.638.690	231.500.227	378.489.221	489.419.410	636.853.670
Total Revenue	0	0	0	132.603.929	253.213.630	407.394.591	515.956.222	671.468.735
Contribution of Project	0	0	0	112.713.340	215.231.585	346.285.402	438.562.788	570.748.425
B.Operating Expense								
1.Maintenance	0	0	0	23.009.091	33.182.578	44.128.901	54.695.613	65.590.833
2.Operation	0	0	0	41.479.442	79.941.328	128.102.558	162.022.824	212.121.375
3.Depriciation	0	0	0	239.062.272	111.715.288	129.046.966	145.777.593	163.028.359
Total Expense	0	0	0	303.550.804	224.839.195	301.278.425	362.496.029	440.740.567
C.Operating Profit	0	0	0	-190.837.464	-9.607.609	45.006.977	76.066.759	130.007.858
After Corporate Tax	0	0	0	0	0	24.753.838	41.836.718	71.504.322
DPS	0	0	0	0	0	13.614.611	23.010.195	39.327.377
Deffered Profit	0	0	0	0	0	6.188.459	10.459.179	17.876.080
Retained Earnings	0	0	0	0	0	4.950.768	8.367.344	14.300.864
OPERATING RATIO (%)	0	0	0	269	104	87	83	77

	1997	1998	1999	2000	2001	2002	2003	2004	2005
	13.456.143	14.069.510	16.659.657	4.648.856	8.617.709				
	18.600.019	21.301.365	24.500.019	25.392.599	27.047.199	27.047.199	27.047.199	27.047.199	27.047.199
	747.488.257	865.168.239	1.005.878.899	1.054.348.329	1.134.545.487	1.153.038.579	1.171.833.107	1.190.933.987	1.210.346.211
	779.544.419	900.539.113	1.047.038.575	1.084.389.784	1.170.210.395	1.180.085.778	1.198.880.307	1.217.981.186	1.237.393.410
	662.612.756	765.458.246	889.982.788	921.731.316	994.678.836	1.003.072.911	1.019.048.261	1.035.284.008	1.051.784.399
	75.146.306	91.085.995	108.839.983	128.786.594	148.033.762	148.033.762	148.033.762	148.033.762	148.033.762
	245.095.770	285.074.276	328.464.358	338.170.134	366.869.981	366.427.194	373.890.801	375.065.568	382.678.003
	178.157.856	203.395.697	231.506.179	263.088.312	293.562.996	293.562.996	293.562.996	293.562.996	293.562.996
	498.399.932	579.555.968	668.810.520	730.045.040	808.466.739	808.023.952	815.487.558	816.662.326	824.274.760
	164.212.824	185.902.279	221.172.269	191.686.276	186.212.097	195.048.959	203.560.702	218.621.683	227.509.638
	90.317.053	102.246.253	121.644.748	105.427.452	102.416.653	107.276.928	111.958.386	120.241.925	125.130.301
	49.674.379	56.235.439	66.904.611	57.985.098	56.329.159	59.002.310	61.577.112	66.133.059	68.821.666
	22.579.263	25.561.563	30.411.187	26.356.863	25.604.163	26.819.232	27.989.597	30.060.481	31.282.575
	18.063.411	20.449.251	24.328.950	21.085.490	20.483.331	21.455.386	22.391.677	24.048.385	25.026.060
	75	76	75	79	81	81	80	79	78

	2006	2007	2008	2009	2010	2011	2012	2013	2014
	27.047.199	27.047.199	27.047.199	27.047.199	27.047.199	27.047.199	23.992.396	20.986.984	17.307.227
	1.230.074.854	1.250.125.074	1.270.502.113	1.291.211.298	1.312.258.042	1.333.647.848	1.202.304.327	1.068.840.123	895.802.239
	1.257.122.054	1.277.172.274	1.297.549.312	1.318.258.497	1.339.305.241	1.360.695.047	1.226.296.722	1.089.827.106	913.109.467
	1.068.553.746	1.085.596.433	1.102.916.916	1.120.519.722	1.138.409.455	1.156.590.790	1.042.352.214	926.353.040	776.143.047
	148.033.762	148.033.762	148.033.762	148.033.762	143.881.046	136.332.208	125.024.672	114.851.184	103.904.861
	383.610.971	384.308.953	392.026.369	392.429.357	392.559.546	400.343.595	354.927.347	310.047.510	260.679.423
	293.562.996	293.562.996	293.562.996	293.562.996	227.811.656	215.859.330	197.955.730	181.847.708	164.516.030
	825.207.729	825.905.711	833.623.127	834.026.115	764.252.247	752.535.133	677.907.749	606.746.402	529.100.313
	243.346.017	259.690.722	269.293.788	286.493.608	374.157.207	404.055.657	364.444.465	319.606.639	247.042.733
	133.840.309	142.829.897	148.111.584	157.571.484	205.786.464	222.230.612	200.444.456	175.783.651	135.873.503
	73.612.170	78.556.443	81.461.371	86.664.316	113.182.555	122.226.836	110.244.451	96.681.008	74.730.427
	33.460.077	35.707.474	37.027.896	39.392.871	51.446.616	55.557.653	50.111.114	43.945.913	33.968.376
	26.768.062	28.565.979	29.622.317	31.514.297	41.157.293	44.446.122	40.088.891	35.156.730	27.174.701
	77	76	76	74	67	65	65	65	68

2015	2016	2017	2018	2019	2020
14.601.696	11.030.760	8.447.180	5.745.835	2.547.180	1.654.600
768.086.049	589.703.803	458.946.637	317.267.413	142.940.067	94.364.631
782.687.745	600.734.563	467.393.818	323.013.248	145.487.248	96,019,231
665.284.583	510.624.378	397.284.745	274.561.261	123.664.161	81.616.346
93.338.149	82.442.929	72.887.456	56.947.767	39.193.779	19.247.168
219.407.551	165.207.828	128.940.401	89.391.941	40.391.405	26.743.754
147.785.403	130.534.637	115.405.139	90.167.299	62.056.816	30.474.683
460.531.103	378.185.393	317.232.997	236.507.007	141.642.000	76.465.606
204.753.480	132.438.985	80.051.748	38.054.254	-17.977.840	5.150.740
112.614.414	72.841.442	44.028.461	20.929.840	-9.887.812	2.832.907
61.937.928	40.062.793	24.215.654	11.511.412	-5.438.296	1.558.099
28.153.604	18.210.360	11.007.115	5.232.460	-2.471.953	708.227
22.522.883	14.568.288	8.805.692	4.185.968	-1.977.562	566.581
69	74	80	86	115	94

Table 8-1-6   Source and Application Statement of Scenario-1

(Rp.1000)

Description	1989	1990	1991	1992	1993	1994	1995	1996
A.Source								
1.Operating Income	0	0	0	112.713.340	215.231.585	346.285.402	438.562.788	570.748.425
2.Depreciation	0	0	0	239.062.272	111.715.288	129.046.966	145.777.593	163.028.359
Sub-total				351.775.611	326.946.873	475.332.368	584.340.381	733.776.783
3.Long-term Borrowings	94.992.441	172.677.951	258.657.334	232.716.223	250.394.656	241.711.130	249.225.698	218.579.261
TOTAL SOURCES	94.992.441	172.677.951	258.657.334	584.491.834	577.341.529	717.043.499	833.566.079	952.356.045
B.Application								
1.Initial Investment	158.320.735	287.796.585	431.095.557	387.860.371	417.324.427	402.851.884	415.376.164	364.298.769
2.Working Capital				33.814.002	30.755.474	39.316.145	27.683.216	39.655.691
3.Maintenance				23.009.091	33.182.578	44.128.901	54.695.613	65.590.833
4.Operation				41.479.442	79.941.328	128.102.558	162.022.824	212.121.375
5.Repayment of Interest & Principal	17.098.639	48.180.671	94.738.991	136.627.911	181.698.949	229.245.522	281.447.489	331.788.480
TOTAL APPLICATION	175.419.374	335.977.256	525.834.548	622.790.816	742.902.756	843.645.010	941.225.305	1.013.455.148
C.Change in Cash	-80.426.933	-163.299.305	-267.177.214	-38.298.983	-165.561.227	-126.601.511	-107.659.225	-61.099.103
Debt-Service Ratio	0	0	0	2.10	1.18	1.32	1.31	1.37

	1997	1998	1999	2000	2001	2002	2003	2004	2005
	662.612.756	765.458.246	889.982.788	921.731.316	994.678.836	1.003.072.911	1.019.048.261	1.035.284.008	1.051.784.399
	178.157.856	203.395.697	231.506.179	263.088.312	293.562.996	293.562.996	293.562.996	293.562.996	293.562.996
	840.770.613	968.853.943	1.121.488.968	1.184.819.629	1.288.241.832	1.296.635.907	1.312.611.256	1.328.847.004	1.345.347.394
	364.616.768	406.118.463	456.274.190	440.274.609	0	0	0	0	0
	1.205.387.380	1.374.972.406	1.577.763.158	1.625.094.238	1.288.241.832	1.296.635.907	1.312.611.256	1.328.847.004	1.345.347.394
	607.694.613	676.864.104	760.456.983	733.791.016	21.884.256	2.518.223	4.792.605	4.870.724	4.950.117
	27.559.299	30.853.647	37.357.363	9.524.558	148.033.762	148.033.762	148.033.762	148.033.762	148.033.762
	75.146.306	91.085.995	108.839.983	128.786.594	366.869.981	366.427.194	373.890.801	375.065.568	382.678.003
	245.095.770	285.074.276	328.464.358	338.170.134	682.603.713	698.105.264	715.371.245	713.632.369	693.927.114
	407.313.344	491.060.107	583.465.723	673.310.894					
	1.362.809.333	1.574.938.129	1.818.584.410	1.883.583.196	1.219.391.712	1.215.084.443	1.242.088.412	1.241.602.424	1.229.588.996
	-157.421.952	-199.965.723	-240.821.252	-258.488.958	68.850.120	81.551.464	70.522.844	87.244.580	115.758.399
	1.28	1.21	1.17	1.07	1.13	1.12	1.11	1.13	1.17

	2006	2007	2008	2009	2010	2011	2012	2013	2014
	1.068.553.746	1.085.596.433	1.102.916.916	1.120.519.722	1.138.409.455	1.156.590.790	1.042.352.214	926.353.040	776.143.047
	293.562.996	293.562.996	293.562.996	293.562.996	227.811.656	215.859.330	197.955.730	181.847.708	164.516.030
	1.362.116.741	1.379.159.428	1.396.479.911	1.414.082.718	1.366.221.111	1.372.450.120	1.240.307.944	1.108.200.748	940.659.076
	0	0	0	0	0	0	0	0	0
	1.362.116.741	1.379.159.428	1.396.479.911	1.414.082.718	1.366.221.111	1.372.450.120	1.240.307.944	1.108.200.748	940.659.076
	5.030.804	5.112.806	5.196.145	5.280.842	5.366.920	5.454.401	0	0	0
	148.033.762	148.033.762	148.033.762	148.033.762	143.881.046	136.332.208	125.024.672	114.851.184	103.904.861
	383.610.971	384.308.953	392.026.369	392.429.357	392.559.546	400.343.595	354.927.347	310.047.510	260.679.423
	636.372.070	584.589.303	528.872.826	475.088.561	419.632.194	370.995.108	289.862.539	199.495.234	97.967.547
	1.173.047.607	1.122.044.825	1.074.129.102	1.020.832.522	961.439.705	913.125.311	769.814.557	624.393.928	462.551.830
	189.069.134	257.114.604	322.350.809	393.250.196	404.781.406	459.324.808	470.493.386	483.806.820	478.107.246
	1.31	1.45	1.62	1.84	1.98	2.26	2.62	3.43	5.88

	2015	2016	2017	2018	2019	2020
	665.284.583	510.624.378	397.284.745	274.561.261	123.664.161	81.616.346
	147.785.403	130.534.637	115.405.139	90.167.299	62.056.816	30.474.683
	813.069.986	641.159.015	512.689.884	364.728.559	185.720.977	112.091.029
	0	0	0	0	0	0
	813.069.986	641.159.015	512.689.884	364.728.559	185.720.977	112.091.029
	0	0	0	0	0	-346.977.237
	93.338.149	82.442.929	72.887.456	56.947.767	39.193.779	19.247.168
	219.407.551	165.207.828	128.940.401	89.391.941	40.391.405	26.743.754
	0	0	0	0	0	0
	312.745.700	247.650.756	201.827.858	146.339.708	79.585.184	-300.986.314
	500.324.286	393.508.259	310.862.027	218.388.851	106.135.793	413.077.344

The cash flow statement (scenario 1) produce higher
internal rate of return (I.R.R.), 6.8% thus scenario 2
due to the emphasize placed on the financial revenue of
evaluation criteria (in area priority ordering) though,
more or less, these two scenario have not such a big
difference in I.R.R. (The value of F.I.R.R is based on
"Before Tax")

The FIRR of 6.8% which results if the network is
extended to cover the Desa is only one-third of the FIRR
of 19.5% which results if network coverage extends to
only the IKK. In other words, the FIRR in the Desa is
extremely poor compared with that of IKK and KEC. (Refer
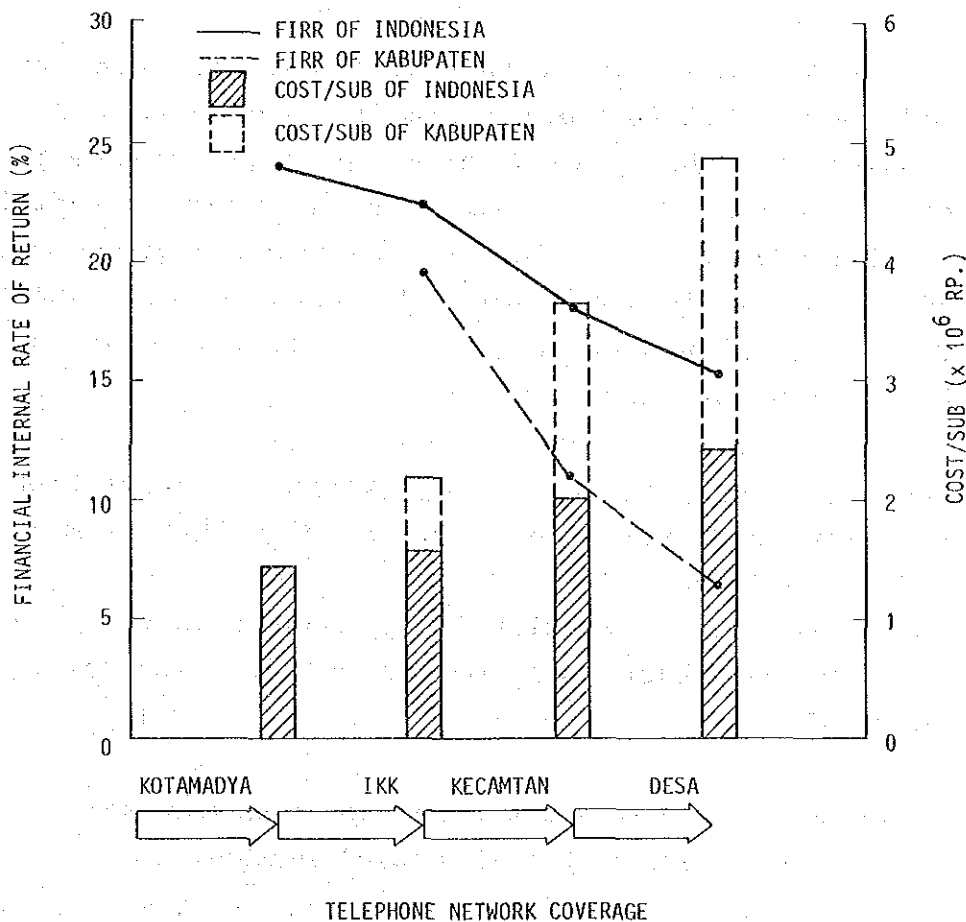to Figure 8-1-1)

Figure 8-1-1   Telephone Network Coverage and F.I.R.R.

In the profit and loss statement, the operating ratios of the first several years show the deficit of operating profits, that is, more than 100%. However, this ratio will be turned down to around 80% in the later stage.

The corporate tax rate is assumed to be 45% in this plan. DPS means the provision for the development fund and 55% of the operating profits (after tax) is allocated.

The total amount of internal reserve generated until the year 2000 is estimated about 2000 billion rupiahs and shares about 35% of the total investment cost. (about 5643 billion rupiahs) This proves the plan to be financially feasible since this holds the same share as in PELITA IV described in the next section.

The source and application statement is prepared in the conditions that 60% of the initial investment cost is procured for this plan with 18% of annual interest rate. Of this Table, "Change in Cash" are in deficit until the year 2000 and turn is surplus from the year 2001. The maximum cumulated deficits amounted about 1867 billion rupiahs in the year 2000 and requires the procurement of short-time loan.

Debt-service ratio (operating profit + depreciation / repayment of interest and principle) shifts from 2.1 in 1992 to 1.07 in 2000.
In general, telecommunication project requires at least 1.3, but this plan positions under this rate until the year 2005.

Therefore, the following financial measures are requested to reduce the financial burden.

1. The procurement of soft loan

2. The reduction of maintenance and operation cost of
    Desa

3   Teke the measures to reduce the initial investment
    cost of Desa (obtained low FIRR) or to procure a
    external subsidy for Desa.

4. Area priority ordering plan is prepared without
    creating any gaps in priority between Province, but
    the financial burden can be relieved to some extent
    if the ordering plan is re-prepared in accordance
    with the high FIRR obtained obtained by Kabupaten.

8-1-5 Changes in the Financial Position of PERUMTEL

(1) Outline of the year until the period of the PELITA
     IV Table 8-1-7 shows the profit and loss statements
     of PERUMTEL for 1979 through 1983. PERUMTEL has
     not operated on a profitable basis over the past 5
     years. Expenditures have grown at a higher rate
     than revenues, thus raising the operating ratio
     (Expenditures/Revenues x 100). Therefore, its
     financing has been dependent on continual equity
     contributions from the Government.

     Under the PELITA IV, the operating ratio is
     expected to change from 84% to 62%, a very sound
     rate. This reflects a proposed tariff rate
     revision, in which the tariff rate will be raised
     by 20% every two years.

     Under the PELITA IV, the internal reserves are
     projected at Rp. 1,065,791 million (approximately
     equal to one-third of the total investment for the
     period). Fig. 8-1-1 shows the financial sources
     intended for the PELITA IV.

Table 8-1-7 Profit and Loss Statement Until PELITA IV

(Million Rp.)

	1979	1980	1981	1982	1983	Total	1984	1985	1986	1987	1988	Total
Operating Revenue	147.404	194.001	248.422	324.477	409.276		615.740	739.760	1.153.090	1.517.290	1.908.640	5.934.520
share of Telephone(%)	84.6	81.4	81.9	88.1	87.9		83.4	85.2	88.2	86.9	87.9	86.9
Operating Expense	106.313	129.982	199.360	263.705	336.519		443.520	517.510	616.100	79.100	858.070	3.164.390
Operating Profit	41.091	64.019	49.061	60.772	72.757		172.220	222.250	536.990	788.190	1.050.570	2.770.130
Net Profit	38.807	37.666	36.528	51.551	53.770	218.322	102.520	89.980	328.910	513.180	716.020	1.750.610
Net Profit After Tax	21.406	20.779	20.153	28.416	29.636	12.390	56.386	49.489	180.81	282.249	393.811	962.836
Operating Ratio(%)	72.1	67.0	80.3	81.3	82.2		72.0	70.0	53.4	48.1	45.0	53.3

		Soft Loan	12%
Total Investment Cost	External Fund	Bank	33%
		Other	12%
	Internal Fund	Equity	10%
		Internal Reserve	33%

Figure 8-1-2 Fund Procurement in Pelita IV

(2) Financial Position Up to the Year 2000

In order to analyze the potential impact of this
plan (which is scheduled for implementation from
1989 on) on the financial position of PERUMTEL, the
assumptions shown in Table 8-1-2 are made regarding
the demand and cost in the area (Kotamadya) that is
not covered by the plan.

If the Kotamadya are included, then the FIRR is
estimated at 15% even if the network is extended to
cover the Desa. It can therefore be judged that the
implementation of a rural telecommunications network
project is sufficiently feasible from a financial
viewpoint.

The cash flow statement (PERUMTEL) based on the above
assumptions will be shown in Table 8-1-8.

If the Kotamadya are included, then the FIRR is
estimated at 15% (shown in Figure 8-1-1) even if the
netwrok is extended to cover the Desa. The FIRR,
extendeing to cover the Kecamatan, is abut 18% shows the
possibility to implement the plan even if the external
loan with 18% of interest rate is procured.

Therefore, Rural Telecommunications Network Projectd in
Indonesia, in the angle of network coverage
consideration, can be concluded as the compensation of
using the profits derived in Kotamadya to the low
profits seen in Kabupaten.

Soft loan or external subsidy should be procured for
Desa construction to relieve the financil burden.

Although the FIRR varies greatly depending on specific
areas and network coverage, it can be justified
financial feasibility to implement this plan in general.

Based on the above discussion, although the FIRR of a
rural telecommunications network project in Indonesia
varies greatly depending on specific areas and network
coverage, it is possible to obtain an adequately
sufficient value overall if the low FIRR seen in some
areas is compensated using the profits derived in areas
with high FIRR.

8-2   Economic Evaluation

8-2-1   Objective

This section is to examine economic effects of this
project. For this purpose, study is made to measure the
economic effects which this project will generate to the
nation and the rural areas.

Table 8-1-8 Cash Flow Statement of PERUMTEL Total (Urban + Rural)

IRR= 15.1%   (Unit: Rp.1000)

Description / Year	1989	1990	1991	1992	1993	1994	1995
A. Cash Inflow							
1. Installation Fee	0	17625000	18500000	35375000	36000000	40625000	36625000
2. Annual Rental	0	3384000	6936000	13728000	20640000	28440000	35472000
3. Call Charge	0	117530550	242239800	510681600	788448000	1105160625	1394936400
Total Inflows	0	138539550	267675800	559784600	845088000	1174225625	1467033400
Contribution of Project	0	138539550	267675800	559784600	845088000	1174225625	1467033400
B. Cash Outflow							
1. Initial Investment	524000000	714000000	917000000	891000000	941000000	944000000	978000000
2. Working Capital	0	41561865	38740875	87632640	85591020	98741288	87842333
3. Maintenance	0	15720000	37140000	64650000	91380000	119610000	147930000
4. Operation	0	46555366	92084686	189349299	284835256	393784460	490153816
Total Outflow	524000000	817837231	1084965561	1232631939	1402806276	1556135748	1703926148
C. Cash Surplus (x1000)	-524000	-679298	-817290	-672847	-557718	-381910	-236893

	1996	1997	1998	1999	2000	2001	2002	2003	2004
A. Cash Inflow									
1. Installation Fee	42250000	38375000	40125000	44000000	33375000	38750000	0	0	0
2. Annual Rental	43584000	50952000	58656000	67104000	73512000	80952000	80952000	80952000	80952000
3. Call Charge	1733008800	2047633500	2382350100	2755038600	3052356075	3956683425	3451033065	3507284904	3564453648
Total Inflows	1818842800	2136960500	2481131100	2866142600	3159243075	3515385425	3531985065	3588236904	3645405648
Contribution of Project	1818842800	2136960500	2481131100	2866142600	3159243075	3515385425	3531985065	3588236904	3645405648
B. Cash Outflow									
1. Initial Investment	949000000	1171000000	1221000000	1286000000	1285000000	0	0	0	0
2. Working Capital	105542820	95435310	103251180	115503450	87930143	106842705	4979892	16875552	17150623
3. Maintenance	177270000	205740000	240870000	277500000	316080000	354630000	354630000	354630000	354630000
4. Operation	610873590	714104046	833554110	956420208	1047597196	1171239118	1169102583	1191748733	1198906330
Total Outflow	1842686410	2186279356	2398675290	2635423658	2736607339	1632711823	1528712475	1563254284	1570686954
C. Cash Surplus (x1000)	-23844	-49319	82456	230719	422636	1882674	2003273	2024983	2074719

	2005	2006	2007	2008	2009	2010	2011	2012	2013
	0	0	0	0	0	0	0	0	0
	80952000	80952000	80952000	80952000	80952000	77568000	74016000	67224000	60312000
	3622554242	3681601876	3741611987	3802600262	3864582647	3763392680	3649593368	3368721775	3071612661
	3703506242	3762553876	3822563987	3883552262	3945534647	3840960680	3723609368	3435945775	3131924661
	3703506242	3762553876	3822563987	3883552262	3945534647	3840960680	3723609368	3435945775	3131924661
	0	0	0	0	0	0	0	0	0
	17430178	17714290	18003033	18296483	18594715	0	0	0	0
	354630000	354630000	354630000	354630000	354630000	338910000	317490000	289980000	263250000
	1205603595	1228757315	1234946795	1240592727	1264179463	1216130981	1164436412	1077453629	969336020
	1577663774	1601101605	1607579829	1613519210	1637404179	1555040981	1481926412	1367433629	1232586020
	2125842	2161452	2214984	2270033	2308130	2285920	2241683	2068512	1899339

	2014	2015	2016	2017	2018	2019	2020
	0	0	0	0	0	0	0
	52512000	45480000	37368000	30000000	22296000	13848000	7440000
	2717960894	2392362719	1997691169	1629940218	1231116926	777107906	424315731
	2770472894	2437842719	2035059169	1659940218	1253412926	790955906	431755731
	2770472894	2437842719	2035059169	1659940218	1253412926	790955906	431755731
	0	0	0	0	0	0	0
	0	0	0	0	0	0	-1103357654
	235020000	206700000	177360000	148890000	113760000	77130000	38550000
	845813087	746121280	613904621	501926306	379906412	240315102	131499690
	1080833087	952821280	791264621	650816306	493666412	317445102	-933307964
	1689640	1485021	1243795	1009124	759747	473511	1365064

The people or organizations affected by
telecommunications business can be classified into the
following three categories. Their cost benefits items
are also.

	Costs	Benefits
User	Installation fee, Rental fee, call charge	Economic benefits
PERUMTEL	Construction costs, Operation/maintenance costs	Financial benefits - Installation fee, Rental fee, - Call charge
Regional Society	Subsidy/Development expenditures	Economic benefits

Financial analysis is conducted by considering only the
revenue and cost incurred in PERUMTEL. The objective of
economic evaluation is to measure economic benefits that
accrue to users and thus to evaluate rural projects from
the national perspective.

8-2-2 Economic Effects

Telecommunications are a kind of modern communication
media. They can make information exchanges with remote
areas at once. Telephone plays a significant role in
daily activities as a one of the important two-way
personal communication media. Development of
communications will establish the closer socio-economic
inter-dependence between isolated areas through
inter-regional division of labour.

The impacts of telephone services introduction will be
summarized as expansion effects and substitution effects.

The expansion effects mean that time reduction in
communications by exchanging information and the faster
communications with remote areas will improve managerial
efficiency in both public and private sectors, the
increase of profit opportunities as the results of
easier market accessibility and improve life-styles of
people through being able to obtain better information.

The impact flow chart of telephone services introduction
will be shown in Figure 8-2-1.

The impact on industrial sector will result in easier
market accessibility. The easier market accessibility
will make business firms collect market information more
quickly, will improve the existing market structure,
and will introduce agricultural technologies, which
will bring more production. Another impacts on
modernization of the agricultural sector come for faster
preparations against vermins faster reactions to natural
disasters and easier monetary transactions. Development
of the agricultural sector will accelerate the
establishment of agro industry, encourage other business
sectors, increase employment opportunities and increase
regional income as the final results.

In Indonesia, communication media such as H. F. Radio,
and messengers are widely used in the rural areas.
However, these communication methods keep the management
efficiency and social services levels to local people
low because they cannot respond well to recent demand
for faster communications and high quality information.

The telephone services can be expected to bring more
efficient organizational structure better
social/medicals service to local people.

The substitution effects mean cost savings on communication expenses. Cost of telephone use are cheaper than those of other communication media. The efficient use of communication media will be also realized by introduction of telephone services.
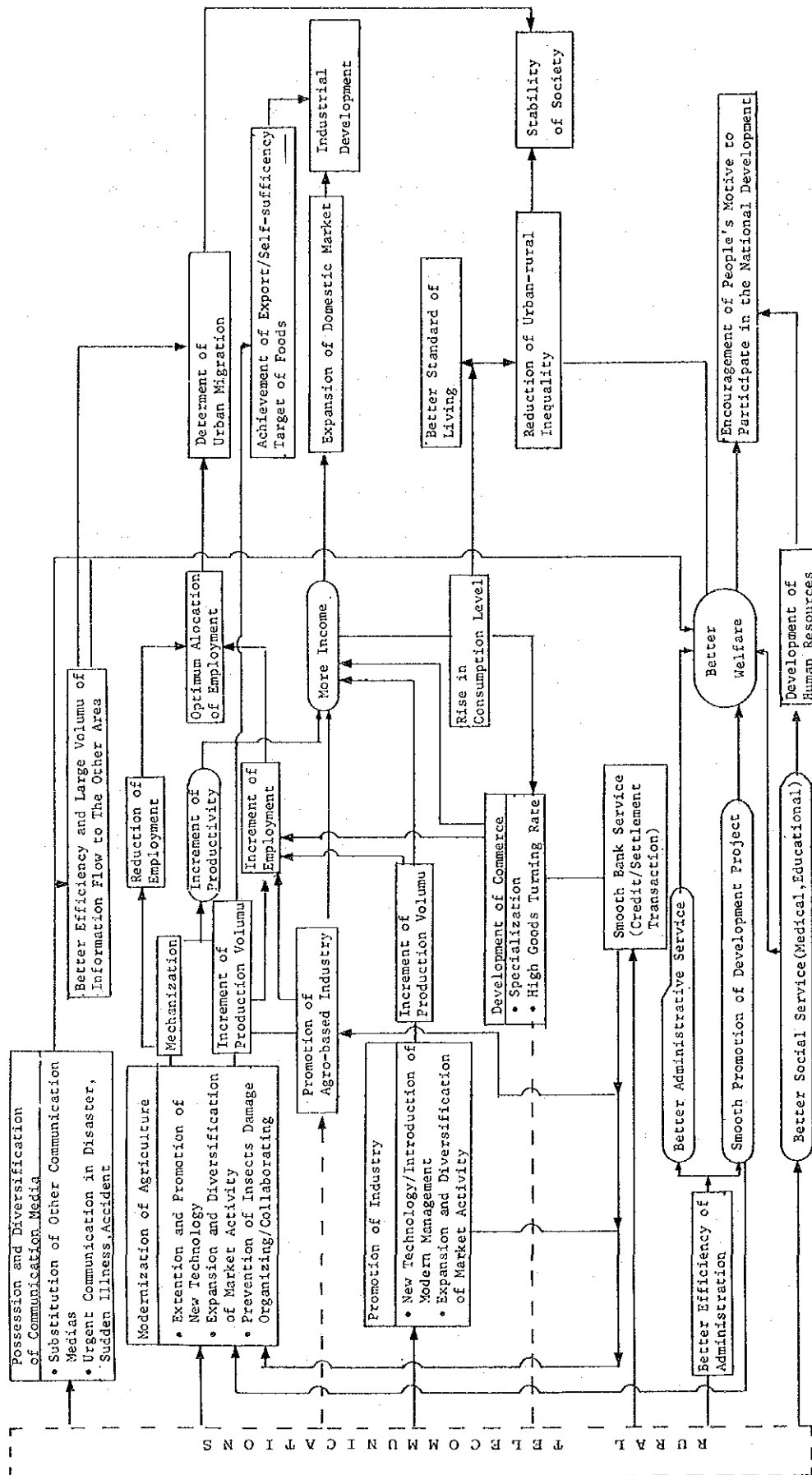
Figure 8-2-1 Impact Flow

8-2-3 Measurement of Economic Effects

In this, the following three analyses will be considered to measure the effects of telephone services.

Consumer surplus can be classified into realized and unrealized surplus. Those two surpluses will accrue to users and regional societies. Consumer surplus include the expansion and substitution effect.

Media cost comparison analysis can be made only in the sample areas and should not be applied in the nation wide level. Therefore, the measured benefits of this study should be applied in the feasibility study which will be executed by PERUMTEL in future.

The economic benefits can be measured by a functional relationship of gross regional domestic products and telephone service. This relationship is derived from results of statistical analysis on socio-economic data since this relationship does not reveal the actual cause and effect relationship. The purpose of this analysis will be restricted to illustrate the significance of telecommunications development against other infrastructure development. This analysis will not measure the economic benefits in monetary terms.

(1) Consumer Surplus
     The method of estimation is described in Chapter 6 "Area Priority Ordering" in detail.

     The results of estimation for province will be shown in Table 8-2-1. The procedure of calculation is shown as follows.

```
┌─────────────────────────────────────────────┐
│ Subscriber demand forecast for                │
│ each propinsi                                 │
└─────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────┐
│ Estimation of "marginal willingness           │
│ to pay"                                       │
└─────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────┐
│ Estimation of consumer surplus per            │
│                   subscriber                  │
└─────────────────────────────────────────────┘
                        │                        ┌──────────┐
                        ├─────────────────────── │ Supply   │
                        │                        │ Scenario │
                        ▼                        └──────────┘
┌─────────────────────────────────────────────┐
│ Calculation of total consumer surplus in      │
│ the project areas                             │
└─────────────────────────────────────────────┘
```
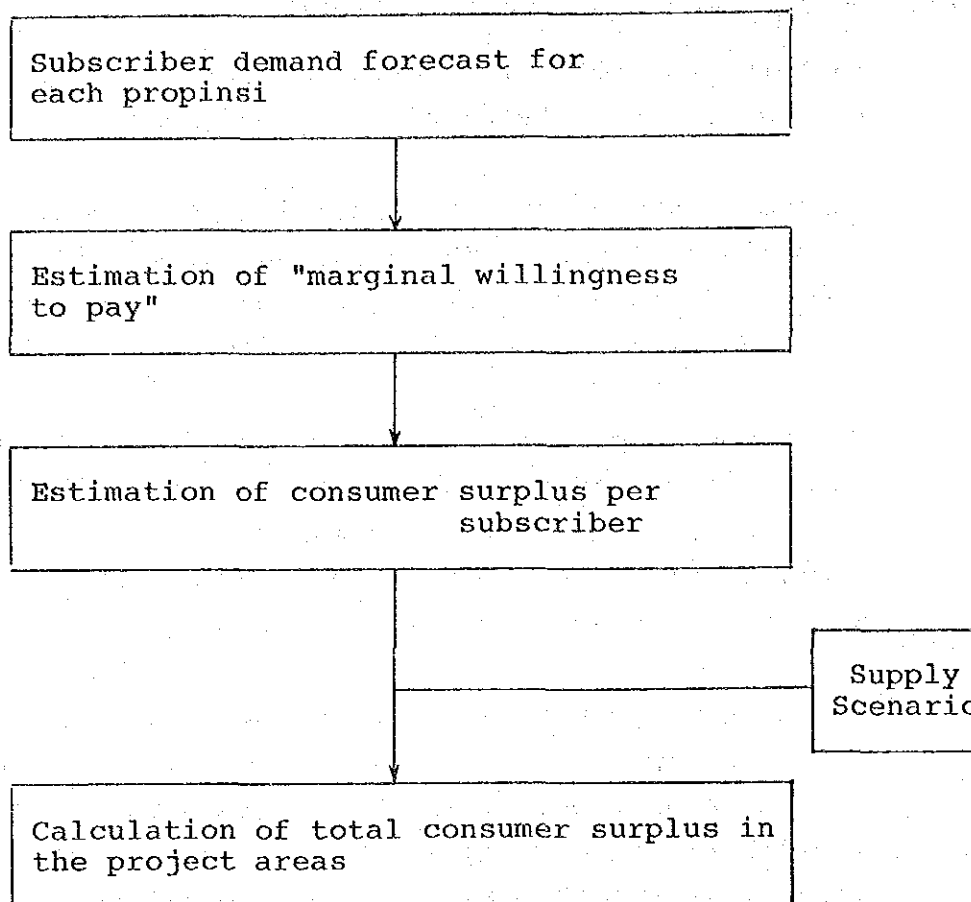
It is assumed to be no differences of surplus
between the objective area and the non-objective
area.

The nominal installation fee is assumed to be
Rp500,000 (from the year 1985) for all propinsi,
that is charged real terms by the consumer price
index in 1975 for each propinsi.

In Indonesia rural, the total amount Rp670 billion
of consumer surplus can be expected to accrue to
users and Rp491,000 per subscriber on average. The
cost benefit ratio in the installation of telephone
will be expected to be 12 ("total willingness to
pay"/actual expenditure). Estimated marginal

willingness to pay is very close to what people in the sample areas mentioned in the interviews. Therefore, these facts are concluded to indicate that the high benefit will be generated to users in telephone introduction.

(2) Media Costs comparison

In Indonesia, the following communication medias are observed to be widely used in general.

- Telephone service
- Telegram service
- H. F. Radio (SSB)
- Mail service
- Messenger services
- Face to face meetings

1) Theoretical Consideration

A person will choose a communication method which is the most effective for him.

In this study, media costs, one of the important factors for media selection will carefully examined.

Media costs will be classified into non-transmission costs include those cost incurred in the possession of communication means and time costs of making messages.

Assume that there exist the above-mentioned six communication methods between two remote area and denote TC_i as the transmission costs, NTC_i as the non-transmission costs of the i-th communication method. One may choose mail services which incur zero possession costs but

Table 8-2-1　Consumer Surplus of Economic Analysis

(Rp.1000)

Code	Province	-P 1992	^P 1992	*P 1992	(P-*P)/2 1992	-P 2000	^P 2000	*P 2000	(P-*P)/2 2000	RURAL TOTAL DEMAND (2000)	CONSUMER SURPLUS 1992-2001
11	D.I. Aceh	783	501	87	348	1.409	861	53	678	41646	21.357.147
12	Sumatra Utara	1.233	725	87	573	2.387	1.334	54	1.167	98923	86.045.705
13	Sumatra Barat	647	407	83	282	1.270	765	51	610	17517	7.811.894
14	Riau	787	490	84	351	1.405	842	52	677	22404	11.518.639
15	Jambi	737	455	85	326	1.280	773	52	614	10376	4.875.433
16	Sumatra Selatan	759	482	95	332	1.336	818	59	639	62118	30.156.284
17	Bengkulu	449	208	108	170	670	249	66	302	5620	1.326.869
18	Lampung	637	488	92	272	1.071	837	57	507	44362	17.292.114
31	Dki Jakarta	6.081	2.317	88	2.996	11.188	10.166	54	5.567	0	0
32	Jawa Barat	619	396	92	263	1.164	710	57	553	361764	147.701.817
33	Jawa Tengah	460	302	96	182	902	561	59	421	164906	49.760.781
34	D.I. Yogyakarta	842	507	86	378	1.680	972	53	813	16165	9.628.093
35	Jawa Timur	777	477	94	342	1.587	929	58	765	278450	154.011.264
51	Bali	1.241	721	113	564	2.527	1.384	70	1.229	20701	18.556.665
52	Nusa Tenggara Barat	308	212	95	106	551	361	59	246	14480	2.554.787
53	Nusa Tenggara Timur	384	253	100	142	705	445	61	322	14150	3.281.391
54	Timor Timur				142				322	1938	449.616
61	Kalimantan Barat	482	322	99	192	851	543	61	395	22592	6.632.646
62	Kalimantan Tengah	669	432	84	293	1.131	703	52	539	10251	4.264.499
63	Kalimantan Selatan	1.047	623	84	482	2.025	1.155	52	987	16020	11.764.032
64	Kalimantan Timur	1.670	984	64	803	2.743	1.549	39	1.352	18828	20.290.558
71	Sulawesi Utra	825	513	105	360	1.551	918	64	743	20791	11.471.288
72	Sulawesi Tengah	493	323	89	202	837	525	55	391	9838	2.917.733
73	Sulawesi Selatan	723	451	98	312	1.416	844	60	678	40152	19.882.036
74	Sulawesi Tenggara	611	394	88	262	1.071	659	54	509	7758	2.987.907
81	Maluku	754	474	90	332	1.357	818	55	651	13132	6.453.188
82	Irian Jaya	924	604	114	405	1.611	974	70	770	28660	16.842.583
	INDONESIA (AVERAGE)	959	541	92	423	1.759	1.181	57	831	1.363.542	669.834.971

a high time costs or he may choose telephone
services which incur high possession costs but
the smallest time costs. These tell that
people evaluate their time costs differently.

Assume that total cost incurred to use the i-th
method is Si, one will choose method which
minimizes Si, i.e..

Min Si = NTCi + TCi

The total costs Si will be affected by the
frequency of media use and the distance for
messages to be transmitted.

Suppose that three media cost curves are drawn
as S1, S2 and S3 in the following figures, the
medium 2 will be used up to Di and the medium 3
will be used for more than Dl. Therefore, the
triangle area NTC3-D2-NTC2 is the total amount
of cost saving's incurred to a user when he
chooses the medium 2 up to the distance D2.
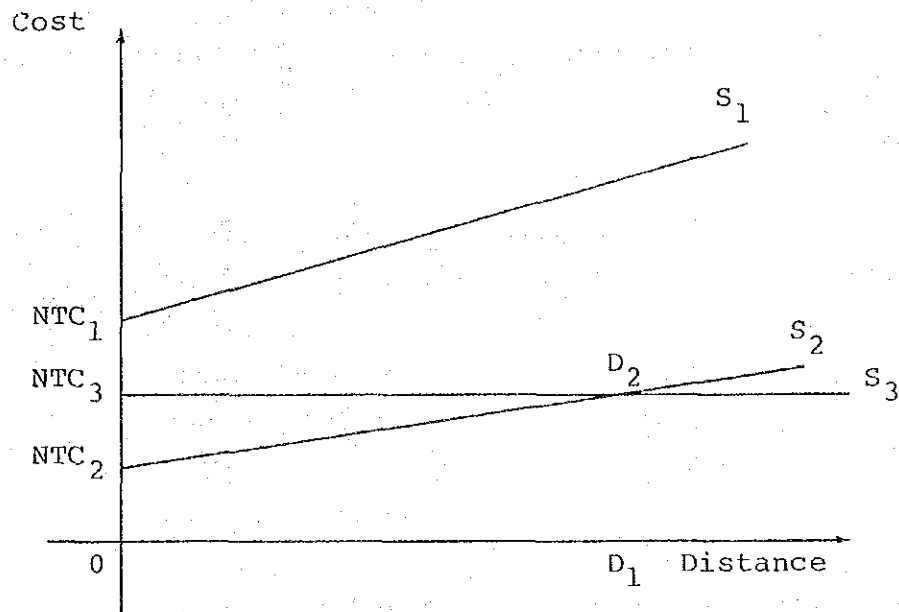
Figure   8-2-2   Cost Curve of Media

2)   Break-down of Media Costs

Any medium will be considered to generate the following costs.

a)   Non-transmission cost
   . Message preparation costs
   . Access costs to media
   . Operator's costs
   . Possession costs

The possession costs of media are shown in Table 8-2-2.   The annual present value is estimated from durable periods for each medium.   The 12% of interest rate per year is applied to calculate the discounted time value, ie., the present time value.

Table 8-2-2 Annual Present Cost of Each Media (Possessioin Cost)

(Rp)

Media		Initial Cost	Durable Period	Salvage Value	Pay-back Coefficient	Annual Pay-back of Initial Cost	O/M Cost	Annuity Cost	Present Value Coefficient	Annual Present Cost
Telephone	Manual	90,000			0.12	10,800	12,000	22,800		22,800
	Automatic	125,000			0.12	15,000	24,000	39,000		39,000
Motor Cycle		300,000	5	0	0.2774	83,220	48,000	131,220	3.605	473,048
Motor Vehicle		2,000,000				554,800	70,000	624,800		2,252,404
H.F. Radio 1		800,000	5	0	0.2774	221,920	80,000	301,920	3.605	1,088,422
H.F. Radio 2		4,000,000				1,109,600	400,000	1,509,600		5,442,108

* Interest Rate per year : 12%

* Motor Cycle, Motor Vehicle is Second-hand Price.

b) Transmission costs

The following assumptions are made to calculate the transmission cost of each medium.

. The volume of information was assumed to be the same as the three minutes communication by telephone. One minute in telephone communication can transmit 300 words. The conversion rate of telephone to other media are assumed as follows (applied in the Japanese standards);

Three minutes in Telephone   - 900 words
Letter   - 1000 words
Telegram   - 900 words
Three minutes in H. F. Radio - 900 words

. The frequency of information to be exchanged is assumed to be 10 times per month (three minutes communication for each time, obtained from the interview survey of the sample area).

. Transportation costs are based on the following assumptions.

(Km/hr.)
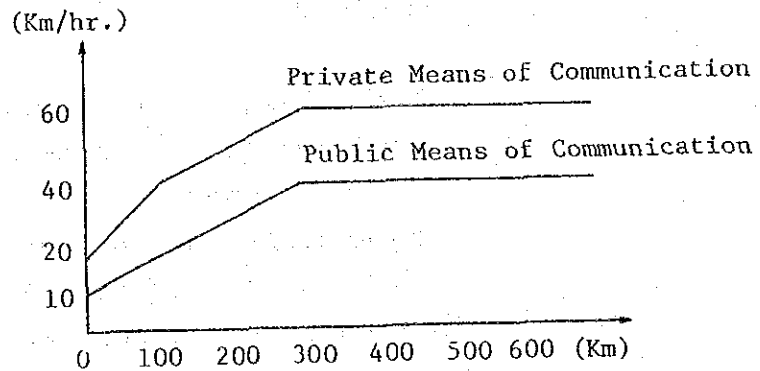
Figure 8-2-3 Speeds of Transportation

Up to 100 km, the average speed can be in
the range between 20 km/hour and 40 km/hour
by private means of transportation.

The costs incurred by using private means
of transportation are assumed to be mainly
gasoline cost. This method requires one
liter of gas per 50 km. The price of
gasoline is Rp 350 per one liter. Thus,
Rp 7 is required for 1 km of operation.

The costs incurred by using public means of
transportation are bus fares shown as
follows.

Charging Zone in Telephone	0-25 km	25-100 km	100-200 km	200-300 km
Road Distance	12.5 km	100 km	300 km	600 km
Bus Fares	Rp.200	Rp.500	Rp.2000	Rp.5000

. Time value of messengers is estimated as Rp300-Rp700 per hour.

3) Results of analysis

The following situations are analyzied.

1. Telephone subscriber in automatic office to telephone subscriber in automatic office

2. Telephone subscriber in manual office to telephone subscriber in automatic office

3. Telephone subscriber in manual office to telephone subscriber in manual office

4. A user in public call office to telephone subscriber in automatic office

5. A user in a public call office to telephone subscriber in manual office

6. Letters

7. Messenger sent by motor bikes

8. Messenger sent by bus

9. Telegrams

10. H.F radio

a) Non-transmission costs

The formula of non-transmission costs is as follows.

$$NTC = (TM \times 2 + TA + TO) \times N \times W + PC$$

where, NTC: Non-transmission costs
TM : Preparation costs
TA : Access costs to media
TO : Operator's costs
N : Frequency of information per month
W : Time Value
PC : Possession costs of a medium per month

The results of analysis are shown in Table 8-2-3, 4. The H.F radio is most expensive and requires Rp900,000 per month to use because of its high possession costs. Compared with telephone, H.F radios have shorter service periods and high trouble occurrence rate. Though the possession cost of motorbike is higher, the total costs of motorbike are cheaper than that of H.F radios because motor bikes can be used not just for sending messages (here, 40% of total possession cost are assumed to be incurred for communication purpose.)

The difference between in Riau and in Jawa Tengah is access costs to public call offices, which affect the non-transmission costs in medium 4 and 5.

Table 8-2-3   MEDIA COST COMPARISON   NON-TRANSMISSION COST(NTC)

PROVINCE: RIAU

MEDIA	TM	TA	TO	PC	W	N	COST(Rp)	COST FORMULA(NTC)
1. AUTO TO AUTO TEL	0.05	0	0	6500	700	10	7200	(TM*2+TA+TO)*N*W+PC
2. MANU TO AUTO TEL	0.05	0	1	5150	700	10	12850	(TM*2+TA+TO)*N*W+PC
3. MANU TO MANU TEL	0.05	0	1	3800	700	10	11500	(TM*2+TA+TO)*N*W+PC
4. PCO TO AUTO TEL	0.05	2	1	3250	700	10	24950	(TM*2+TA+TO)*N*W+PC
5. PCO TO MANU TEL	0.05	2	1	1900	700	10	23600	(TM*2+TA+TO)*N*W+PC
6. LETTER TO LETTER	0.25	1	0	0	700	9	9450	(TM*2+TA+TO)*N*W+PC
7. MESSENGER BY BIKE	0.25	0	0	15768	700	9	18918	(TM*2+TA+TO)*N*W+PC
8. MESSENGER BY BUS	0.25	0.5	0	0	700	9	6300	(TM*2+TA+TO)*N*W+PC
9. TELEGRAM	0.25	1	0	0	700	10	10500	(TM*2+TA+TO)*N*W+PC
10. H.F. RADIO	0.05	0	0.25	907018	700	10	909468	(TM*2+TA+TO)*N*W+PC

Table 8-2-4   MEDIA COST COMPARISON   NON-TRANSMISSION COST(NTC)

PROVINCE: JAWA TENGAH

MEDIA	TM	TA	TO	PC	W	N	COST(Rp)	COST FORMULA(NTC)
1. AUTO TO AUTO TEL	0.05	0	0	6500	700	10	7200	(TM*2+TA+TO)*N*W+PC
2. MANU TO AUTO TEL	0.05	0	1	5150	700	10	12850	(TM*2+TA+TO)*N*W+PC
3. MANU TO MANU TEL	0.05	0	1	3800	700	10	11500	(TM*2+TA+TO)*N*W+PC
4. PCO TO AUTO TEL	0.05	1	1	3250	700	10	17950	(TM*2+TA+TO)*N*W+PC
5. PCO TO MANU TEL	0.05	1	1	1900	700	10	16600	(TM*2+TA+TO)*N*W+PC
6. LETTER TO LETTER	0.25	1	0	0	700	9	9450	(TM*2+TA+TO)*N*W+PC
7. MESSENGER BY BIKE	0.25	0	0	15768	700	9	18918	(TM*2+TA+TO)*N*W+PC
8. MESSENGER BY BUS	0.25	0.5	0	0	700	9	6300	(TM*2+TA+TO)*N*W+PC
9. TELEGRAM	0.25	1	0	0	700	10	10500	(TM*2+TA+TO)*N*W+PC
10. H.F. RADIO	0.05	0	0.25	907018	700	10	909468	(TM*2+TA+TO)*N*W+PC

b) Transmission Costs

The formula is given as follows

Telephone   : $TC = Tariff \times TM \times 60 \times N$

letter   : $TC = Tariff \times N$

Transportation $TC = (\dfrac{D}{V} \times W + Gasoline \times D) \times N \times 2$

Transportation   : $TC = (W/Vf + Gasoline \times D) \times 2$

Telegram   : $TC = (Tariff) \times N \times 900$

H.F radio   : $TC = 0$

where, TC   :   Transmission cost

       TM   :   Time to transmit message

       V   :   Speed (km per hour)

       D   :   One-way distance (km)

Transmission costs depend on distance. This
analysis is made according to the distances
divided by the telephone charging zones.

The telephone tariffs in 1985 are given as
follows.

0 – 25 km	Rp.75
25 – 100 km	Rp.750
100 – 200 km	Rp.900
200 – 300 km	Rp.1125
300 – 1000 km	Rp.1500
more than 1000	Rp.2250

Mail charge is Rp.140 for a normal letter in
1984. The speed and distance are based on the
assumptions shown in Figure 8-2-3. Telegram
tariff is Rp.10 per word.

Total costs of each medium including
non-transmission costs and transmission
costs are shown in Figure 8-2-5, 6. These
figures show the high costs of H.F radio
and telegrams. Transmission costs of
telegrams are extremely expensive in
comparison with those of telephone.

The costs of letter are extremely low at
distance more than 25 km. If the time cost
of letters in the rural areas of Indonesia
are taken into account, the costs of
letters will be higher than those of
telephone because it usually takes one week
for a letter to reach in the rural areas.

In conclusion, the substitution effects of
telephone introduction to all other media
will be generated in the distance more than
100 km and even within the distance 100 km,
the effects will be generated against the
media of H.F radio, telegram and messengers
sent by motorbike.

(3) Cross Impact Analysis
The objective of this analysis is to examine the
functional relationship between economic
development and telephone introduction by applying
the statistical analysis (Macro-approach).

1) Theoretical consideration
Those indexs such as economic activity index,
communication index, standard of living index,

Total Cost (Rp.1000)

H.F. radio

Telegram

P.C.O to Manual
Telephone

Manual to Manual Telephone

Auto to Auto Telephone

Messenger by Bus

Messenger by Bike

Letter to Letter

900

100

60

50

40

30

20

10

0   25   100   200   300   1000   (Distance Km)
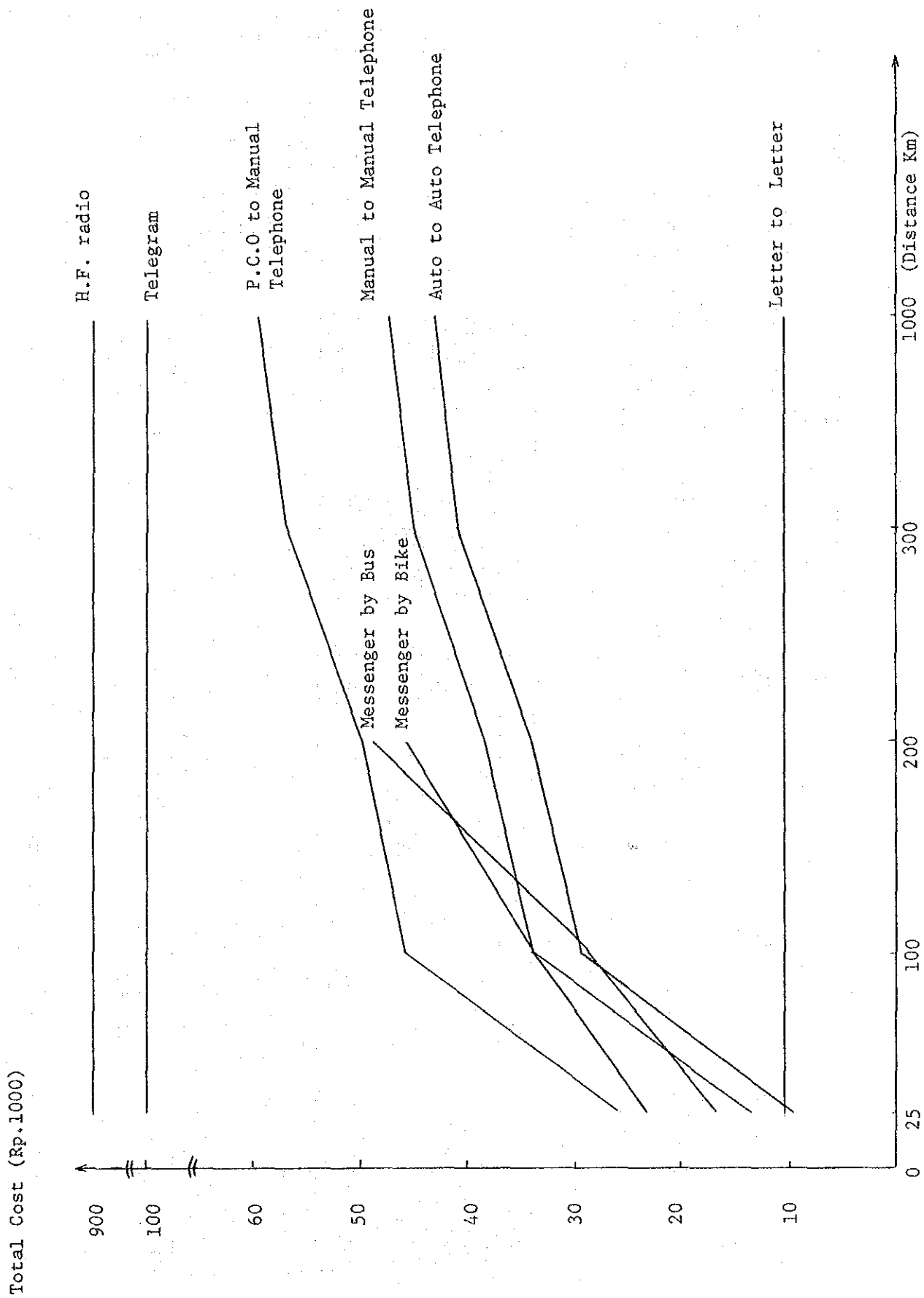
Figure 8-2-4   Results of Media Cost Comparison (Riau Province 1984)

Table 8-2-5 Media Cost Comparison Total Cost

PROVINCE: RIAU

MEDIA	0-25Km	(Rp)	25-100Km	(Rp)	100-200Km	(Rp)
1. AUTO TO AUTO TEL	NTC+75*TM*60*N	9450	NTC+750*TM*60*N	29700	NTC+900*TM*60*N	34200
2. MANU TO AUTO TEL	NTC+75*TM*60*N	15100	NTC+750*TM*60*N	35350	NTC+900*TM*60*N	39850
3. MANU TO MANU TEL	NTC+75*TM*60*N	13750	NTC+750*TM*60*N	34000	NTC+900*TM*60*N	38500
4. PCO TO AUTO TEL	NTC+75*TM*60*N	27200	NTC+750*TM*60*N	47450	NTC+900*TM*60*N	51950
5. PCO TO MANU TEL	NTC+75*TM*60*N	25850	NTC+750*TM*60*N	46100	NTC+900*TM*60*N	50600
6. LETTER TO LETTER	NTC+140*N	10710	NTC+140*N	10710	NTC+140*N	10710
7. MESSENGER BY BIKE	NTC+(400/20+7)*N*25*2	23493	NTC+(300/40+7)*N*100*2	34218	NTC+(300/50+7)*N*300*2	45918
8. MESSENGER BY BUS	NTC+(300/10*25+200)*N*2	17100	NTC+(400/20+100+500)*N*2	28800	NTC+(400/30*200+2000)*N*2	48300
9. TELEGRAM	NTC+10*N*900	100500	NTC+10*N*900	100500	NTC+10*N*900	100500
10. H.F. RADIO	NTC	909468	NTC	909468	NTC	909468

200-300Km	(Rp)	300-1000Km	(Rp)	MORE 1000Km	(Rp)
NTC+1125*TM*60*N	40950	NTC+1200*TM*60*N	43200	NTC+2250*TM*60*N	74700
NTC+1125*TM*60*N	46600	NTC+1200*TM*60*N	48850	NTC+2250*TM*60*N	80350
NTC+1125*TM*60*N	45250	NTC+1200*TM*60*N	47500	NTC+2250*TM*60*N	79000
NTC+1125*TM*60*N	58700	NTC+1200*TM*60*N	60950	NTC+2250*TM*60*N	92450
NTC+1125*TM*60*N	57350	NTC+1200*TM*60*N	59600	NTC+2250*TM*60*N	91100
NTC+140*N	10710	NTC+140*N	10710	NTC+140*N	10710
NO CALCULATION		NO CALCULATION		NO CALUCULATION	
NO CALCULATION		NO CALCULATION		NO CALUCULATION	
NTC+10*N*900	100500	NTC+10*N*900	100500	NTC+10*N*900	100500
NTC	909468	NTC	909468	NTC	909468

Table 8-2-6 Media Cost Comparison Total Cost

PROVINCE: JAWA TENGAH

MEDIA	0-25Km	(Rp)	25-100Km	(Rp)	100-200Km	(Rp)
1. AUTO TO AUTO TEL	NTC+75*TM*60*N	9450	NTC+750*TM*60*N	29700	NTC+900*TM*60*N	34200
2. MANU TO AUTO TEL	NTC+75*TM*60*N	15100	NTC+750*TM*60*N	35350	NTC+900*TM*60*N	39850
3. MANU TO MANU TEL	NTC+75*TM*60*N	13750	NTC+750*TM*60*N	34000	NTC+900*TM*60*N	38500
4. PCO TO AUTO TEL	NTC+75*TM*60*N	20200	NTC+750*TM*60*N	40450	NTC+900*TM*60*N	44950
5. PCO TO MANU TEL	NTC+75*TM*60*N	18850	NTC+750*TM*60*N	39100	NTC+900*TM*60*N	43600
6. LETTER TO LETTER	NTC+140*N	10710	NTC+140*N	10710	NTC+140*N	10710
7. MESSENGER BY BIKE	NTC+(300/20+7)*N*25*2	23493	NTC+(300/40+7)*N*100*2	34218	NTC+(300/50+7)*N*300*2	45918
8. MESSENGER BY BUS	NTC+(300/10*25+200)*N*2	17100	NTC+(400/20*100+500)*N*2	28800	NTC+(400/30*200+2000)*N*2	48300
9. TELEGRAM	NTC+10*N*900	100500	NTC+10*N*900	100500	NTC+10*N*900	100500
10. H.F. RADIO	NTC	909468	NTC	909468	NTC	909468

200-300Km	(Rp)	300-1000Km	(Rp)	MORE 1000Km	(Rp)
NTC+1125*TM*60*N	40950	NTC+1200*TM*60*N	43200	NTC+2250*TM*60*N	74700
NTC+1125*TM*60*N	46600	NTC+1200*TM*60*N	48850	NTC+2250*TM*60*N	80350
NTC+1125*TM*60*N	45250	NTC+1200*TM*60*N	47500	NTC+2250*TM*60*N	79000
NTC+1125*TM*60*N	51700	NTC+1200*TM*60*N	53950	NTC+2250*TM*60*N	85450
NTC+1125*TM*60*N	50350	NTC+1200*TM*60*N	52600	NTC+2250*TM*60*N	84100
NTC+140*N	10710	NTC+140*N	10710	NTC+140*N	10710
NO CALCULATION		NO CALCULATION		NO CALCULATION	
NO CALCULATION		NO CALCULATION		NO CALCULATION	
NTC+10*N*900	100500	NTC+10*N*900	100500	NTC+10*N*900	100500
NTC	909468	NTC	909468	NTC	909468

quality of manpower index were created by
applying socio-economic data of 26 province
(excluding Timor Timur) in Indonesia (1980)
through the principal component analysis.

These indexes are the scores of the first
principal components described in Chapter 2
"General View" in detail..

The impact flow of the telephone introduction
is assumed to be as follows.

```
                  ┌─────────────────────────────┐
                  │    Telephone Introduction   │
                  └─────────────────────────────┘
                                 │
                                 ▼
                  ┌─────────────────────────────┐
                  │      Communication Index    │
                  └─────────────────────────────┘
                   │             │             │
          ┌────────┘             │             └────────┐
          ▼                      │                      ▼
┌───────────────────────────┐    │      ┌───────────────────────────┐
│ Quality of Manpower Index │    │      │   Economic Activity Index │
└───────────────────────────┘    │      └───────────────────────────┘
          │                      ▼
          │          ┌─────────────────────────────┐
          │          │  Economic Development Index │
          │          └─────────────────────────────┘
          │                      │
          │                      ▼
          │          ┌─────────────────────────────┐
          └──────────│    Standard of Living Index │
                     └─────────────────────────────┘
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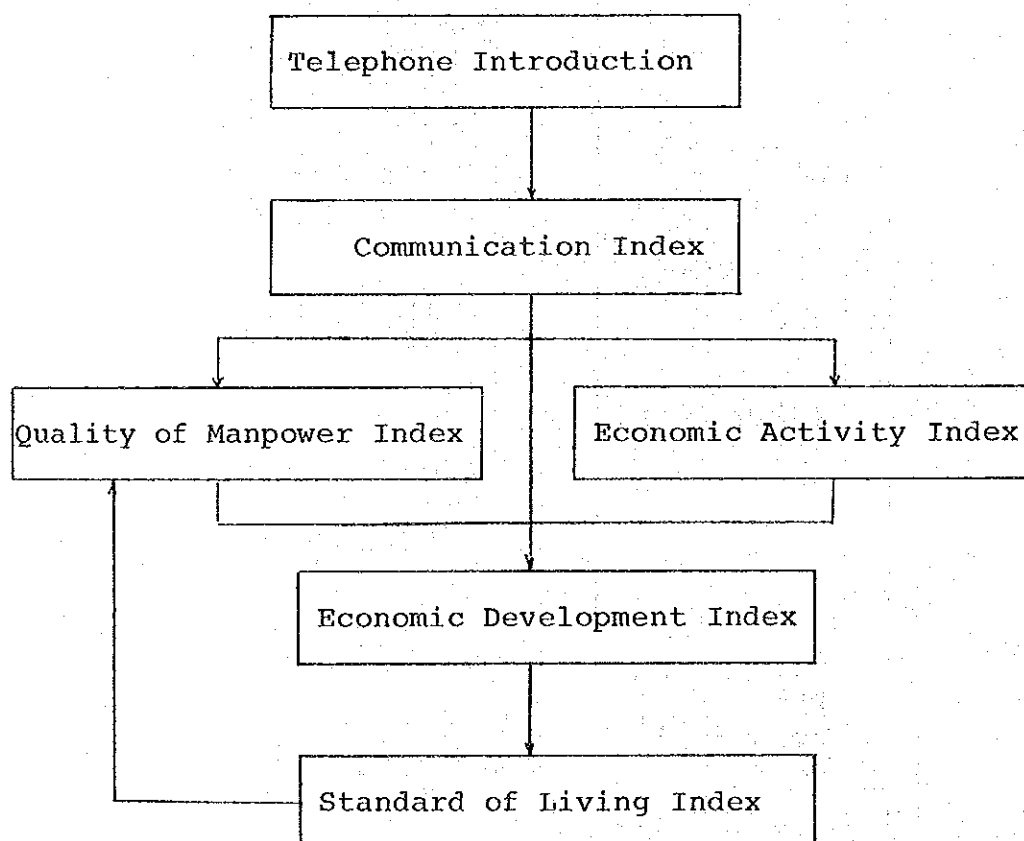
Table 8-2-7 Score of Principal Component Analysis

Code	Province	COMUNICATION SCORE 1	COMUNICATION SCORE 2	QUALITY OF MANPOWER SCORE 1	QUALITY OF MANPOWER SCORE 2	ECONOMIC ACIVITY SCORE 1	ECONOMIC ACIVITY SCORE 2	STANDARD OF LIVING SCORE 1	STANDARD OF LIVING SCORE 2	ECONOMIC ACTIVITY*MANP OWER QUALITY
11	D.I. Aceh	-0.309	-0.097	-0.287	-0.241	-1.069	-0.859	-0.413	-0.367	3.727
12	Sumatra Utara	0.114	-0.237	-0.070	-0.217	-0.193	-0.568	0.786	-0.502	2.778
13	Sumatra Barat	-0.061	-0.206	0.132	-0.054	-0.305	-0.122	-0.242	-0.016	-2.304
14	Riau	-0.060	0.929	0.108	-0.227	0.111	0.550	0.059	0.045	1.028
15	Jambi	-0.242	-0.579	-0.536	-0.112	-0.386	-0.064	-0.467	0.685	0.719
16	Sumatra Selatan	-0.235	-0.255	-0.300	-0.345	-0.263	-0.296	0.571	0.244	0.878
17	Bengkulu	0.006	0.577	0.891	-0.288	-0.213	0.534	-0.356	0.540	0.239
18	Lampung	-0.412	-0.744	-0.952	0.477	-0.458	-0.231	-0.723	0.744	0.481
31	Dki Jakarta	4.683	-1.220	4.214	0.471	4.277	-1.460	4.010	0.762	1.015
32	Jawa Barat	-0.483	-1.070	0.049	1.990	-0.238	-0.819	-0.616	0.060	-4.863
33	Jawa Tengah	-0.393	-0.676	-0.357	1.590	-0.168	-0.911	-0.708	-0.198	-0.471
34	D.I. Yogyakarta	-0.033	0.032	0.839	-0.730	-0.192	-0.375	-0.279	2.510	-0.229
35	Jawa Timur	-0.328	-0.984	-0.360	1.920	-0.167	-0.823	-0.628	-0.179	-0.463
51	Bali	-0.136	-0.549	0.386	0.073	-0.277	-0.447	0.257	2.340	-0.719
52	Nusa Tenggara Barat	-0.649	-0.996	-0.363	-1.400	-0.558	-0.443	-0.920	0.510	1.539
53	Nusa Tenggara Timur	-0.489	-0.356	-0.835	-1.180	-0.641	-0.365	-1.062	-0.130	0.768
61	Kalimantan Barat	-0.467	-0.852	-1.167	0.362	-0.331	-0.166	-0.067	-0.388	0.284
62	Kalimantan Tengah	-0.323	-0.005	-0.538	-0.493	-0.158	0.924	-0.239	-0.927	0.293
63	Kalimantan Selatan	0.303	1.180	-0.025	0.543	0.252	0.583	0.206	-0.355	-10.036
64	Kalimantan Timur	0.302	2.310	0.618	0.934	1.847	4.000	1.589	-1.790	2.987
71	Sulawesi Utra	-0.102	-0.090	0.821	-1.360	-0.003	-0.093	0.196	-1.120	-0.004
72	Sulawesi Tengah	-0.420	0.366	-0.277	-1.110	-0.257	0.194	-0.389	-0.374	0.926
73	Sulawesi Selatan	-0.397	-0.684	0.134	-0.169	-0.237	-0.349	-0.334	-0.421	-1.777
74	Sulawesi Tenggara	-0.566	-0.284	-0.362	-0.615	-0.163	0.564	-0.582	0.977	0.449
81	Maluku	0.129	1.840	0.355	1.780	-0.438	0.160	-0.453	-0.929	-1.232
82	Irian Java	0.553	2.400	0.321	-1.420	0.224	0.677	0.234	1.690	-0.698

The impact on communication index will affect the encouragement of economic activity by increasing accessibility to markets and social service organizations, and then lead to economic development.

As results of economic development, living standards will go up.

2) Results of Estimation

The result of functional equation in terms of GRDP per capita is as follows;

$$GRDP/Capita = 117.1 + 34.29 \ COM + 6.38 \ \frac{ECAC}{QM}$$
$$(3.44) \qquad (1.69)$$

$$R = 0.63$$

$$QM = 0.0016 + 0.605 \ COM + 0.312 \ STAN$$
$$(2.87) \qquad (1.48)$$

$$R = 0.9$$

where, COM : Communication Index
ECAC : Economic Activity Index
QM : Quality of Manpower Index
STAN : Living Standard Index
R : Co-relation Co-efficient

Figures in ( ) are t-value

3) Findings

a) If communication index increase by 1 unit GRDP per capita increase by 34.39 (Rp1000).

b) If economic activity index increases by 1 unit weighted by quality of manpower index, GRDP per capita (Rp1000) increase by 6.38 (Rp1000)

c) Communication index increases by 1 unit
    causes quality of manpower index increase
    by 0.605 and standard of living index
    increase by 1 unit causes quality of
    manpower index increase by 0.312.

d) The relation between GRDP per capita and
    communication index is shown in Figure
    8-2-5. The functional equation is derived
    as

        GRDP per capita = 116 + 34.29 COM.

    Those provinces located in the down-part
    of this line, can be regarded as the
    relatively developed area in communication
    and those provinces, located in the
    upper-part, can be regarded as the
    relatively less developed. Thus, the
    policy consideration is requested in those
    provinces located in the upper-part to
    increase GRDP per capita.

e) The communication index has a close
    correlation with the quality of manpower
    index. This fact is shown in Figure
    8-2-6. Those provinces located in the
    upper-part of the line, can be regarded as
    the less developed area in communication,
    compared with the development level of
    manpower quality. Therefore, these
    provinces are requested to provide more
    communication facilities because there
    exist more people who are able to use
    communication media.
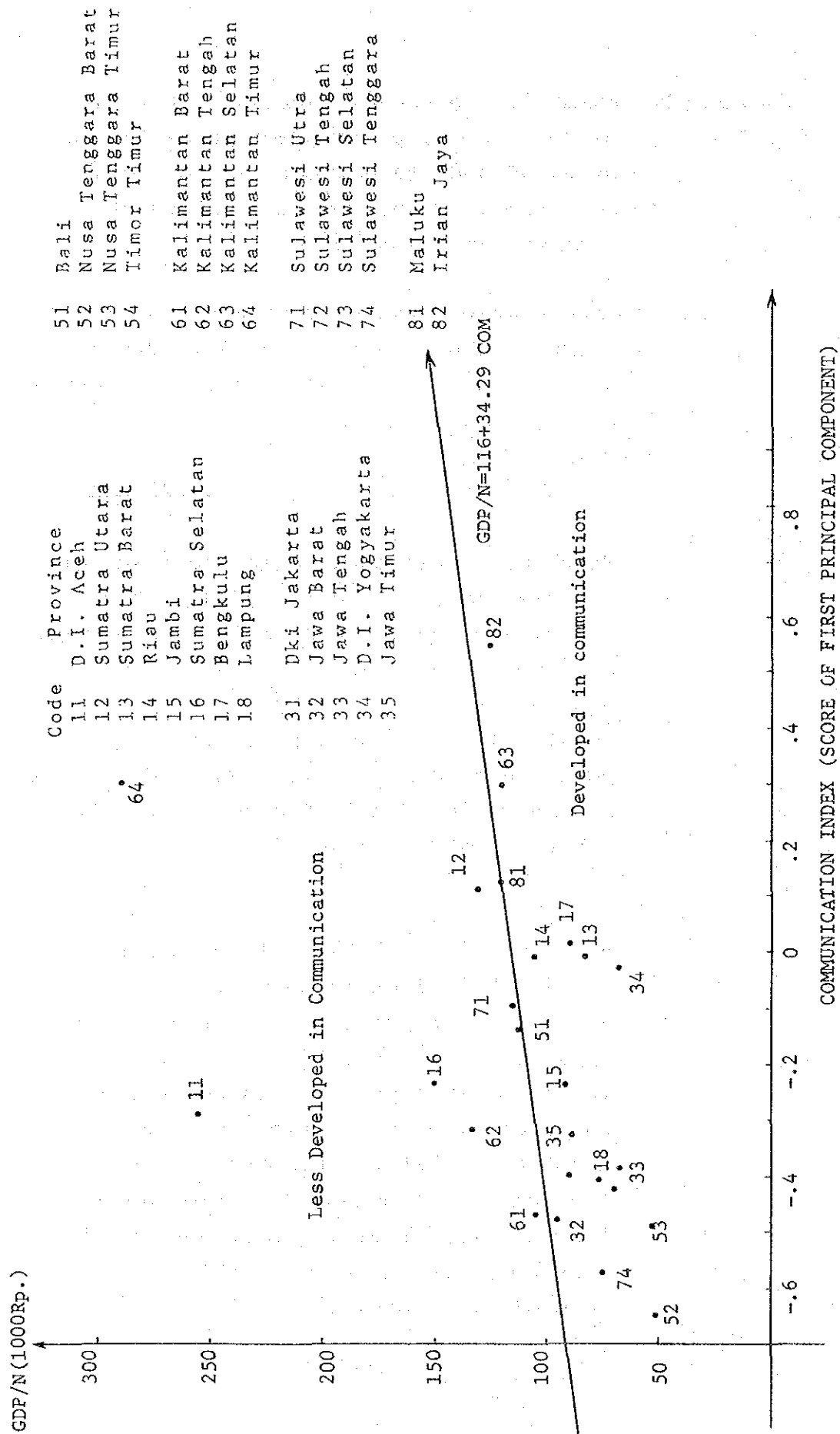
Figure 8-2-5 Economic Performance Index Versus Communication Index

QUALITY OF MANPOWER INDEX

QM=0.00188+0.886×COM

COMMUNICATION INDEX

Code	Province
11	D.I. Aceh
12	Sumatra Utara
13	Sumatra Barat
14	Riau
15	Jambi
16	Sumatra Selatan
17	Bengkulu
18	Lampung
31	Dki Jakarta
32	Jawa Barat
33	Jawa Tengah
34	D.I. Yogyakarta
35	Jawa Timur
51	Bali
52	Nusa Tenggara Barat
53	Nusa Tenggara Timur
54	Timor Timur
61	Kalimantan Barat
62	Kalimantan Tengah
63	Kalimantan Selatan
64	Kalimantan Timur
71	Sulawesi Utra
72	Sulawesi Tengah
73	Sulawesi Selatan
74	Sulawesi Tenggara
81	Maluku
82	Irian Jaya

Figure 8-2-6 Quality of Manpower Index Versus Communication Index

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CHAPTER 9 GUIDELINES FOR BASIC PLANS, DESIGNS, AND EVALUATION OF RURAL TELECOMMUNICATIONS NETWORK

CHAPTER 9.   GUIDELINES FOR BASIC PLANS, DESIGNS, AND
            EVALUATION OF RURAL TELECOMMUNICATIONS NETWORK

The following elements shall be especially
considered in planning telecommunications network.

(1)   Technological advances in telecommunications are
      so rapid that a wide technological gap is normally
      produced between new and existing facilities. A
      variety of problems (in operation, maintenance,
      investment, etc.) may occur at the transition
      stage (where the new and old facilities coexist),
      and thus should be dealt with in a long-term view
      point.

(2)   The integration of various elements into a single
      system is essential in order for
      telecommunications to be able to fully function.

(3)   The domestic network must be developed to comply
      with the international standards as much as
      possible because it forms a part of the worldwide
      telephone network..

The Flow of the study procedure is outlined in
Figure 9-1-1.

9-1

```
┌─────────────────────────────────────────────────────────────┐
│  Analysis and future perspection of communication            │
│  facilities,socio-economic status,development plans,          │
│  overseas status,etc.                                         │
│                                                               │
│         (Formulation of planning concepts)                    │
└─────────────────────────────────────────────────────────────┘
```

9-2

```
┌──────────────────┐
│  Subscriber      │
│  telephone       │
│  demand forecast │
└──────────────────┘
```

9-3

```
┌──────────────────┐
│  Traffic forecast│
│  Telephone circuit│
│  computation     │
└──────────────────┘
```

9-4

```
┌──────────────────┐
│  Fundamental plan│
│  of telephone    │
│  network (Technical│
│  standard)       │
└──────────────────┘
```

9-5

```
┌─────────────────────────────────┐
│                                 │
│        System Designing         │
│                                 │
└─────────────────────────────────┘
```

9-6

```
┌─────────────────────────────────┐
│                                 │
│      Implementation plan        │
│                                 │
└─────────────────────────────────┘
```

9-7

```
┌─────────────────────────────────┐
│          Maintenance            │
│             and                 │
│          operation              │
│             plan                │
└─────────────────────────────────┘
```

9-8

```
┌─────────────────────────────────┐
│        Financial and            │
│      economic evaluation        │
└─────────────────────────────────┘
```
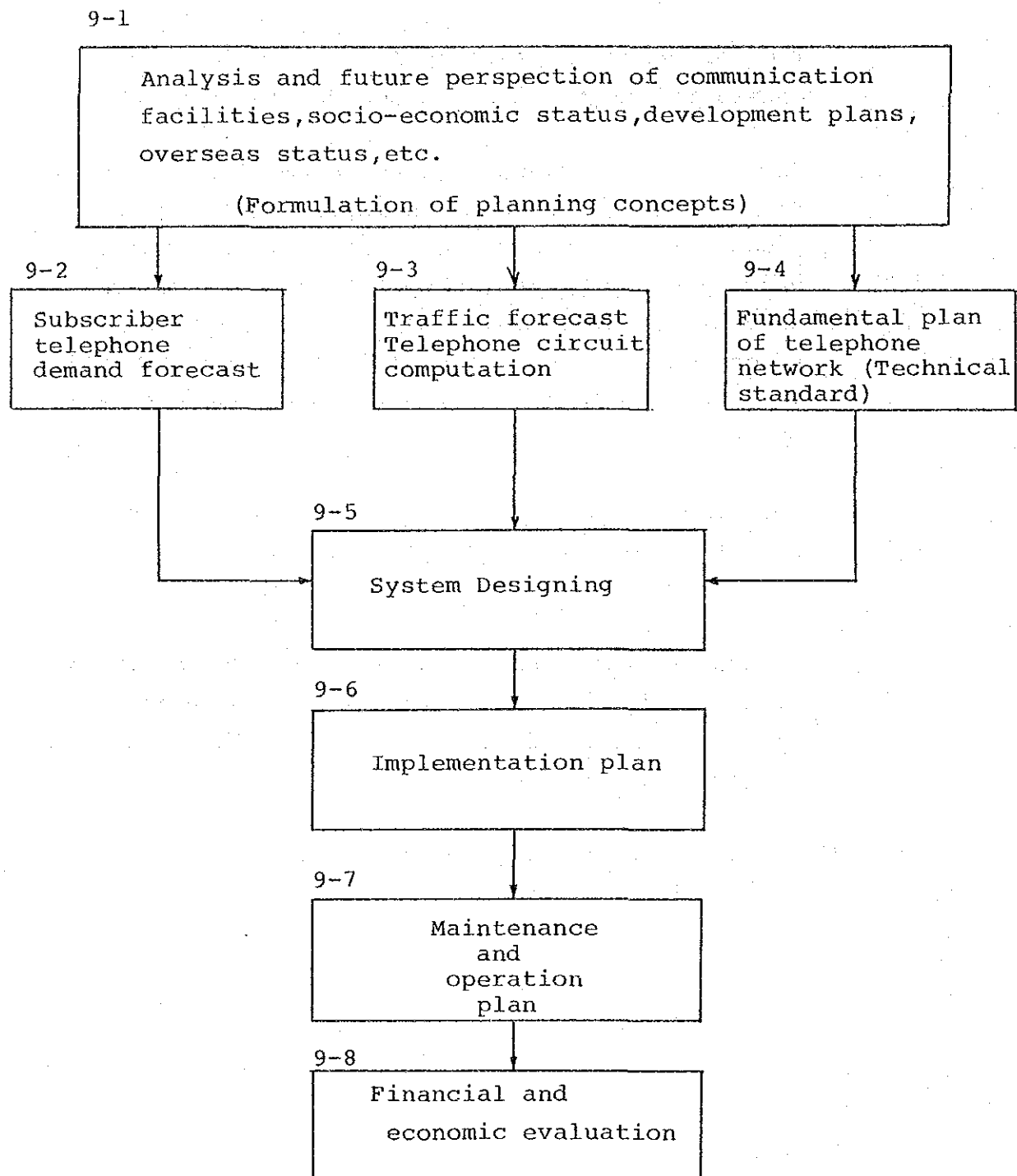
FIGURE   9-1-1   OUTLINE OF STUDY PROCEDURE

9-1 Apprehension of status quo and future prospects

Planning concepts such as the significance and future
prospects of the project shall be formulated in accordance
with the present status of society, the economy,
communication facilities.

All relevant information and data with regard to existing
facilities and service conditions shall be collected in
tandem with close reference to almanacs and statistics.

9-2 Subscriber telephone demand estimation

The estimation procedure for subscriber telephone demand
is outlined in Figure 9-2-1.

The growth path of telephone demand may be classified into
the following three stages: slow growth period (initial
stage), accelerated growth period (rapid growth stage),
and decelerated growth period (saturation stage). A
preliminary basic configuration should be conceived prior
to the initiation of actual forecast, to determine the
stage of demand growth (taking account of overseas
situations, urban situations, etc.).

The estimation method shall be selected from the
following: (1) Estimation by time series data; (2)
Estimation by cross sectional data; (3) a combination of
the above two methods . Demand estimation for small areas
shall be subject to a carefull consideration because of
lack of time series data. The past data will not possess
information of the future development plan, the national
policy, etc. In addition, because the public needs
(administrative offices, etc.), economic needs (commercial
offices, etc.) and personal needs (individuals) occur
sequantially (corresponding to a certain priority),
accuracy may be improved by estimating demand by
subscriber categories.

```
┌──────────────────┐
│ Planning concepts │
└──────────────────┘
         │
         ▼
┌──────────────────┐        ⎡ • Application purpose
│  Confirmation of │────────  of forecasted value
│ forcasting objective │      • Objective area
└──────────────────┘        ⎣ • Objective period
         │
         ▼
┌──────────────────┐        ⎡ • Time series data(telecom.)
│      Data        │────────    No.of new subscribers
│   collection     │            No.of waiting applicants
└──────────────────┘            Total subscribers
         │                       Subscription fee
         ▼                     • Time series data(socio-econo
┌──────────────────┐             mic)
│  Data analysis   │─────        Population,household,income
│ and field survey │             consumer price index,
└──────────────────┘             industrial category,
         │                       no.of enterprises and emplo-
         │                       yee,migration plan,
         │                       local development plan
         │                     •Relevant oversees data
         │
         │                     ⎡ Questionnaire on sampling
         │                     ⎣   survey
         ▼
┌──────────────────┐        ⎡ • Demend rate method
│   Selection      │────────  • Regression method
│   of method      │          • Comparison method
└──────────────────┘
         │
         ▼
┌──────────────────┐
│ Forecast of Supple- │
│ mental statistics │
│ Computation of fore- │
│ cast value       │
└──────────────────┘
         │
         ▼
┌──────────────────┐
│   Evaluation     │
└──────────────────┘
         │
         ▼
┌──────────────────┐
│ Determination of │
│ forecasted value │
└──────────────────┘
```
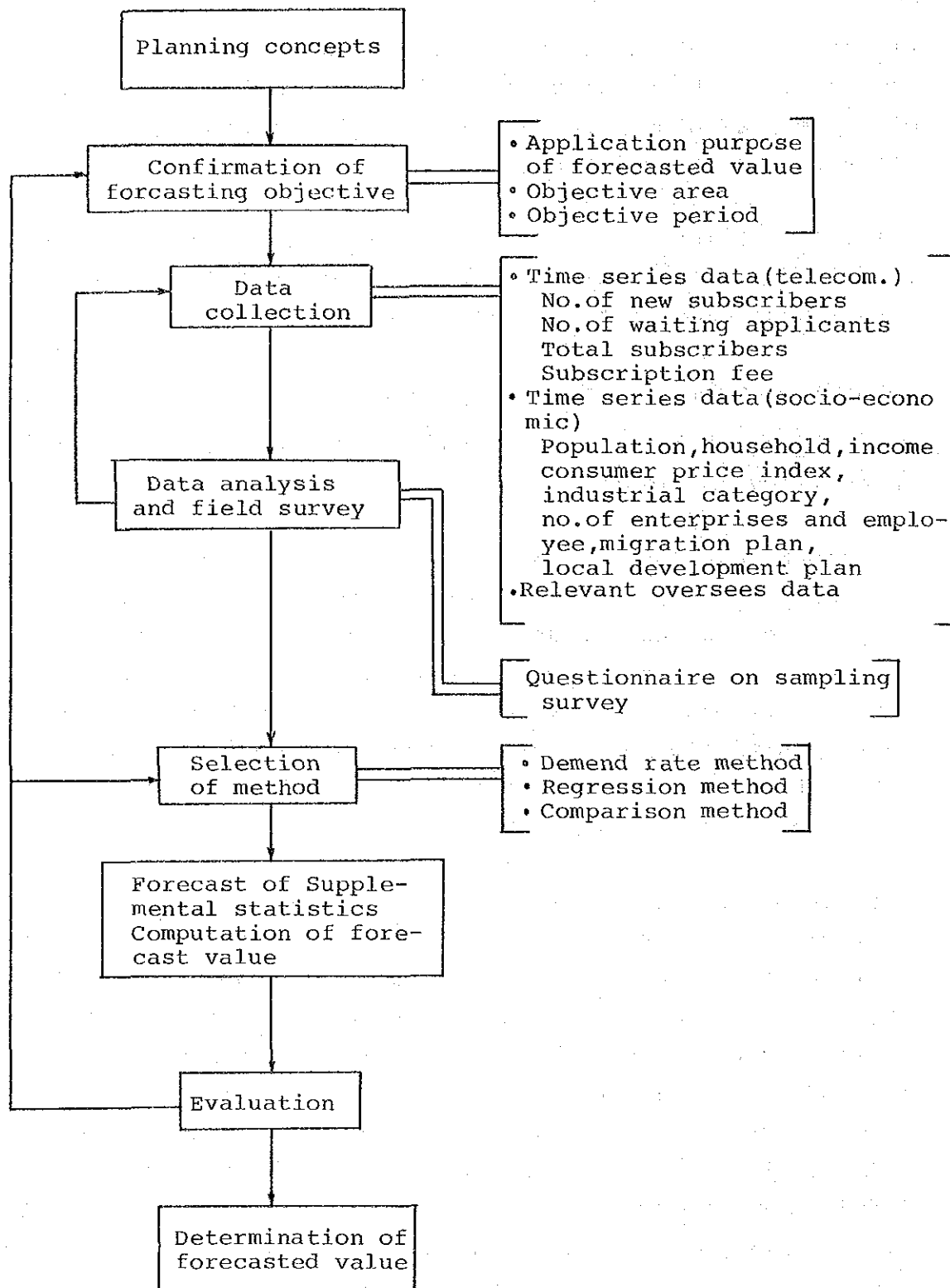
Figure 9-2-1   Outline of Forecasting Procedure for
              Subscriber Telephone Demand

9-3 Traffic forecast

Traffic data are used for operational planning, facility costs computation, revenue estimation, etc. The average subscriber calling rate, the average holding time, and the toll-to-local ratio of traffic are specific variables needed as traffic data.

In this study, the traffic forecast was made by metered pulses (which is closely related to calling rate) because of the insufficient time series traffic data. The forecasting procedure shall be shown in Figure 9-3-1. And distribution ratio of toll to local traffic was obtained as follows:

$$\frac{\text{toll metered pulses}}{\text{local metered pulses}} = \frac{CR \cdot at \frac{Dt}{Tt}}{CR \cdot al \frac{Dl}{Tl}}$$

$$= \frac{at}{al} \cdot \frac{Dt}{Dl} \cdot \frac{Tl}{Tt} = \frac{a \cdot D}{T}$$

where,

  CR: Average subscriber calling rate (Erlang)
  at: Toll call rate in traffic
  al: Local call rate in traffic
  Tt: Average holding time per toll call
  Tl: Average holding time per local call
  Dt: Average metered pulses per toll call
  Dl: Average metered pulses per local call

$$a = \frac{at}{al} \ , \quad D = \frac{Dt}{Dl} \ , \quad T = \frac{Tt}{Tl}$$

Collection of traffic data on automatic exchanges in the rural areas are not often available due to the limited number of existing facilities. In such cases, the use of traffic data of manual exchanges may be one of the alternative methods. It is generally said that an automatic exchange operates with twice as many calls. (0.7

- 0.8 times of the holding time) as a manual exchange
does. Thus an approx. 50% traffic increase may be
expected in some cases.

Past traffic data, especially toll call data, may be
greatly affected by trunk links conditions. For instance,
in a case that transfer links are insufficient and that
busy conditions continue for a long time, subscribers may
lose their desive to call. This makes traffic
unpredictable. A continual supervision and reevaluation
of the traffic will become necessary.

The required number of telephone circuits shall be
calculated by the estimated traffic (calling rate x number
of subscribers) that satisfies the specified connection
quality. Because the forecasted traffic value differs
from the real traffic value in many cases, it is
inevitably necessary to reevaluate the number of telephone
circuits by conducting continual supervision, to maintain
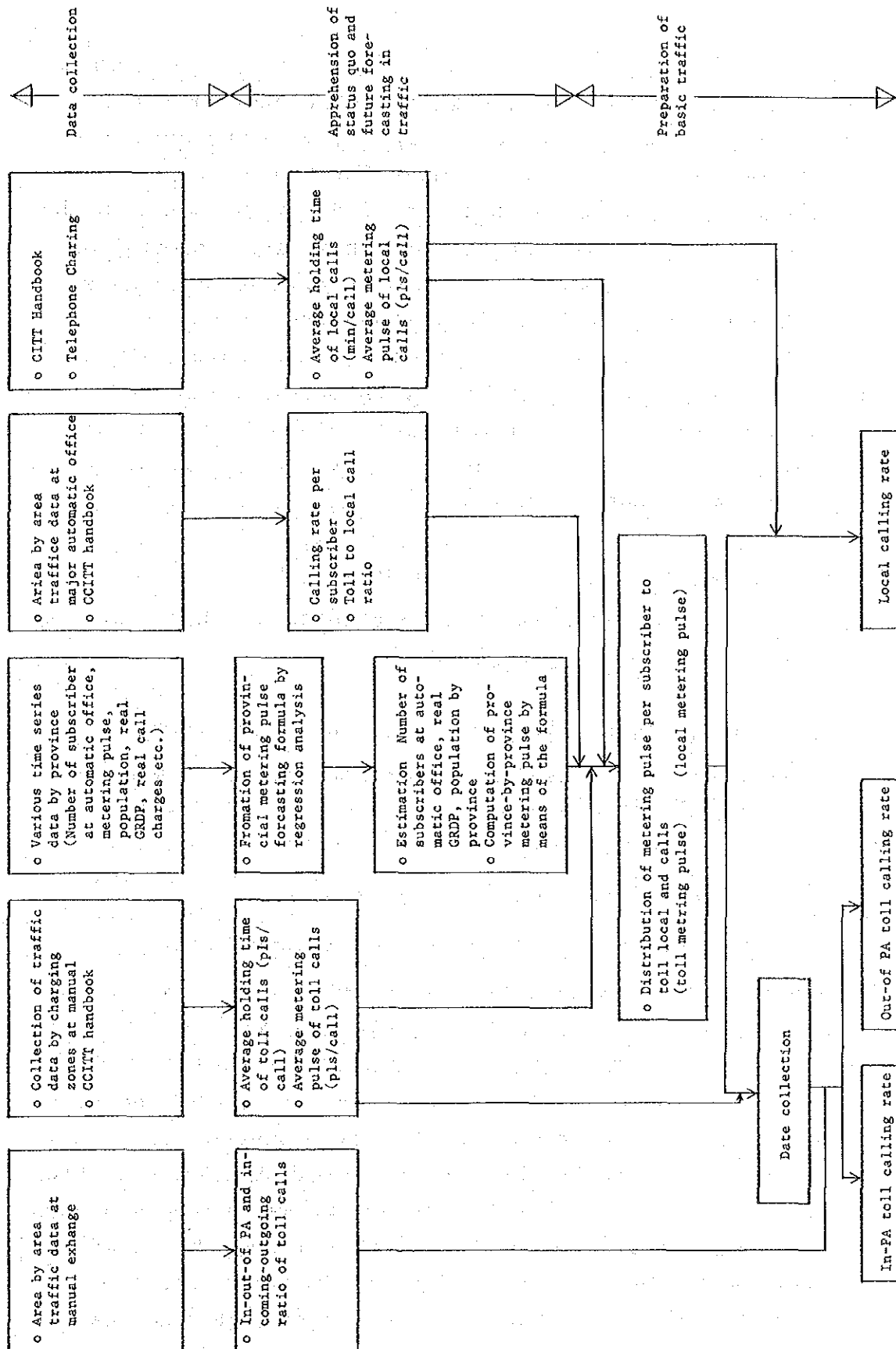a telephone service satisfactory.

Figure 9-3-1 Traffic Forecasting Procedure

Data collection

Apprehension of status quo and future fore-casting in traffic

Preparation of basic traffic

o CCITT Handbook
o Telephone Charging

o Average holding time of local calls (min/call)
o Average metering pulse of local calls (pls/call)

o Ariea by area traffice data at major automatic office
o CCITT handbook

o Calling rate per subscriber
o Toll to local call ratio

o Various time series data by province (Number of subscriber at automatic office, metering pulse, population, real GRDP, real call charges etc.)

o Fromation of provincial metering pulse forecasting formula by regression analysis

o Estimation Number of subscribers at automatic office, real GRDP, population by province
o Computation of province-by-province metering pulse by means of the formula

o Distribution of metering pulse per subscriber to toll local and calls (toll metering pulse) (local metering pulse)

Local calling rate

o Collection of traffic data by charging zones at manual
o CCITT handbook

o Average holding time of toll calls (pls/call)
o Average metering pulse of toll calls (pls/call)

o Area by area traffic data at manual exhange

o In-out of PA and in-coming-outgoing ratio of toll calls

Date collection

Out-of PA toll calling rate

In-PA toll calling rate

9-4 Technical standards

Technical standards are a significant factor in the
determination of service quality. They also have a big
impact on the scale of investment for the construction of
a telecommunications network. An 1 dB improvement in the
transmission loss for subscriber lines, for example, an
extremely large amount of investment will be necessary.
For this reason, the technical standards must be based on
long-term strategies to meet telecommunications network
development plans. Fortunately, Indonesia possesses its
own "Fundamental Plan" for technical standards, and its
domestic network has been developed to be a part of the
worldwide telephone network.

9-5 System designing

Upon planning a telecommunications network, the following
standards are commonly applied:

- Consistency with the government objectives

- Consistency with the government policies and
  strategies

- Economic advantages

- Financial and resource requirements

- Flexibility of telecommunications network

Because of ISDN construction as an ultimate objective of
Indonesia and its already developed digital
telecommunications technology, economic factors are
regarded as the most significant standard among the above
items. From economic points of view, construction,
maintenance and operating expenses, revenue, depreciation
expenses, etc. must be considered. Depreciation expenses
and revenue depend on construction costs and the number of
subscribers. Maintenance and operating expenses are
expected to be reduced by a certain amount due to new

technologies. It is essential to combine the subsystems shown in Figure 5-2-2, according to the procedure shown in Figure 5-2-3 to obtain the least costs system.

In this project, a system selection diagram (Fig. 5-4-9) was prepared. This diagram shows the combination of main exchange technologies and transmission technologies for various parametric combinations of sizes of users and distance from main exchanges. Taking account of this diagram and the geographical conditions (mountains, rivers, jungles, islands, etc.), systems in sample areas were examined. Total construction costs in Indonesia were estimated by regression analyses based on the construction costs of the sample areas and geographical data (distance between Kabupaten capital and Kecamatan capital, number of subscribers per unit area size, etc.).

9-6   Implementation plan

Construction of telecommunications network shall be implemented, according to area priority orderings. However, the scale of the implementation plan may be expanded or reduced, depending on the government budget and/or other development plans. Especially, at the time the world recession, the reduction in scale is unavoidable in many cases. In such cases, supply rate of telephone services (fulfilment rate) will be reduced or the target year of demand fulfilment realization will be postponed. To determine supply rates, the following factors should be considered:

(1)   The demand fulfilment rate up to the target year is reduced in a certain percentage for all areas.

(2)   Mainly accommodate subscribers into nearby exchanges of which construction costs are relatively inexpensive, are connect in priority and restrict new subscriptions from remote areas.

(3) Establishing an area priority ordering and a high priority area only will be suffices completely in accordance with the budgetary constraints.

(4) Giving priority in public and industrial subscribers and suspending the demand fulfilment of residential subscribers to the next program.

(5) Determine a scale of demand fulfilment by combining above-mentioned factors.

To determine an area priority ordering, the following points should be taken into consideration:

1) From the viewpoint of area development policy -
   - Boundary areas
   - Inconvenient transportation areas
   - Developing areas whose industry requires telephone installation high.
   - Regional potentiality (Increment of population density)
2) From the view point of social and economic effects -
   - Consumer surplus
   - Covering Population size per subscriber

3) From the view point of financial revenue
   - Internal rate of return gaining rate

The determination of, "what view point shall be preferable" is rather impracticable, because of the diverse state of national affairs. Instead, this shall be determined by the planners, in consultation with the relevant authority concerned.

A bar chart provided in this report was made to fulfil the demand for rural telecommunications in the

year 2000, assuming each Kabupaten as a unit of
construction. In compiling this chart, the following
periods were used as standards of the required
numbers of months in the construction work schedule:

Field survey and basic design	3 - 5 months
Preparation of specifications	2 - 4 months
Tendering period	2 months
Tender document evaluation	2 - 4 months
Contract negotiations	1 - 3 months
Preparation of construction DWGs	4 - 6 months
Review of construction inspection of equipment	6 - 10 months
Tower construction	6 - 10 months
Delivery period	2 - 3 months
Construction period	20 - 24 months
Acceptance inspection	2 - 8 months
Construction supervision	- 30 months
Training	3 - 6 months

The entire period for a single project (Kabupaten
unit) including the above work schedules is
estimated to take approx. 24 - 48 months on
average.

9-7 Maintenance and Operation

Maintenance and operation work faces the following
problems:

(1) The maintenance area is excessively large.
(2) Most sites are located in hard-to-reach areas.

(3) Because a cable or radio transmission system is used
for distribution to subscribers besides audio cables,
multiple types of technicians are required for lthe
maintenance of subscriber facilities.

(4) Because a state-of-the-art digital exchange replaces
     the existing local exchange, additional specialists
     are required for their maintenance.

     A large number of staff will be required if
     maintenance and operation personnel are assigned to
     individual offices to cope with these problems.
     Therefore, an intensive maintenance circuit will
     become inevitable, utilizing mobility to the full
     extent. In addition, the required number of
     operation personnel may be reduced, and the
     productivity of staff may increase, by introducing
     new technologies.

     This is quite conceivable fact that 40 - 100 or more
     staffs are employed per 1,000 subscribers in
     developing countries, whereas 10 or fewer staffs per
     1,000 subscriber are generally engaged in advanced
     countries. A maintenance and operation plan is
     recommended to be formulated at the level of 20
     staffs per 1,000 subscribers in the target year of
     2000.

9-8   Financial Analysis and Economic Evaluation

9-8-1 Financial Analysis

     This chapter is intended to show the method, how to
     check the feasibility of the project easily for the
     PERUMTEL's regional feasibility study in the future.

     In general, the index of financial internal rate of
     return (F.I.R.R.) is applied for the study.

     F.I.R.R is a function of revenue and cost will be
     indicated as in Figure 9-8-1. If revenue (call charge)
     per subscriber takes in the horizontal line and cost
     (initial cost) per subscriber in the vertical line, the
     value of F.I.R.R can obtain in the I.R.R. line in Figure
     9-8-1.

COST PER SUBSCRIBER (1000Rp.)

CALL REVENUE/SUB. (1000Rp.)
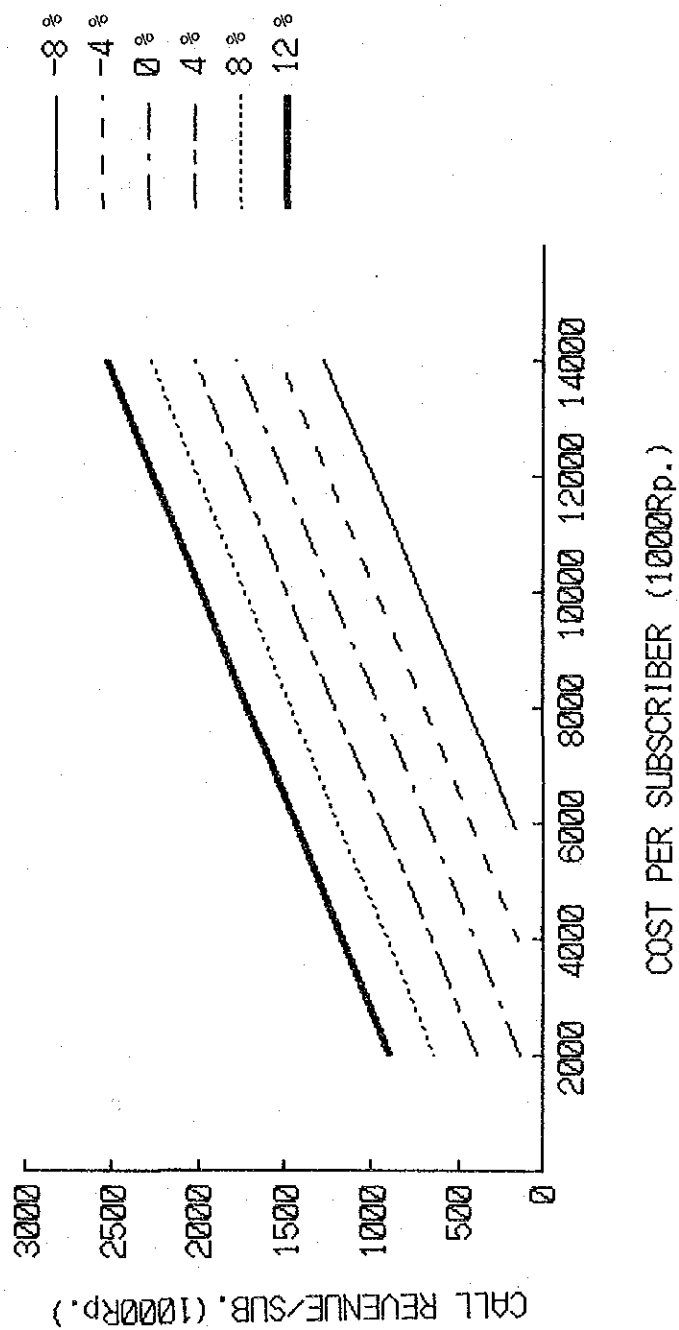
Figure 9-8-1   Chart of IRR

The other revenue and cost items are based on the
assumption described in Chapter 8 "Financial Analysis".

In this figure, the value of F.I.R.R. can estimate by
applying the incurred cost and revenue of a particular
Kabupaten. When the required F.I.R.R. is obtained
before-hand, the maximum cost to invest can be
calculated by applying the F.I.R.R. line with the
expected revenue.

The functional equation of F.I.R.R., cost per subscriber
and revenue per subscriber is as follows.

$$F.I.R.R = 2.14363 - 0.0021625 \ C + 0.01579 \ Re$$
$$(-19.675) \qquad (7.52298)$$
$$(R = 0.97)$$

where, C :   construction cost per subscriber
       Re: calling revenue per subscriber
       R :   correlating coefficient
             The figure in ( ) indicate t-value

In financial analysis, the following indexes are used
besides the index of F.I.R.R.

- Self-financing ratio
  This index is used for checking the extent of internal
  fund coverage over new annual amount of investment.

  The value of this ratio indicates the stability of a
  financial status and this should be in the range between
  25% and 40%

The Formula is as follows.

$$\frac{\text{Total Revenue} - (\text{Operation cost} + \text{Interest \& Principle Repayment}}{\text{New Investment Amount} + \text{Interest Repayment in New Investment Amount}}$$

- Internal Cash Ratio
  This index shows that the amount of internal fund, as the percentage of total investment capital, can retain every year.

  The value of this ratio indicates the availability of internal fund when the business entity makes a plan of new investment. This should be 3-4% in general.

  The formula is as follows.

$$\frac{\text{Total Revenue} - (\text{Operation Cost} + \text{Interest \& Principal Repayment})}{\text{Total Investment Capital}}$$

- Debt-service Ratio
  This index indicate the repayment capability of interest and principale every year and the minimum 1.3 of value is required to keep the sound financial position.

  The Formula is as follows.

$$\frac{\text{Total Revenue} - \text{Operating Cost}}{\text{The Repayment Amount of Interest and Principle}}$$

9-8-2 Economic Evaluation

The economic benefits can possible to measure in monetary value, will be proposed the following two, expansion effect and substitution effect.

	Expansion Effect	Substitution Effect
User	. Consumer Surplus (Realized)	. Consumer Surplus . Media Cost Comparison
Regional Society	. Consumer Surplus (Not-realized) . Cross-impact study	. Consumer Surplus

(1) Consumer Surplus

Consumer surplus can be generated in the insdata.

The consumer surplus of call charge can be estimated when the following equation is introduced.

$$T = f (W, \text{ Inc, Pop, } S, X) \quad \ldots\ldots\ldots\ldots \quad (1)$$

where, T : Traffic
       W : Call charge
       Inc : GRDP per capita
       Pop : Population
       S : No. of Subscribers
       X : Socio-economic variables besides the above-mentioned

And the equation (1) will be modified in terms of "W"

$$W = f(T, \text{ Inc, Pop, } S, X) \quad \ldots\ldots\ldots\ldots \quad (2)$$

In the equation (2), the functional relation between W and T can be graphically illustrated as follows.
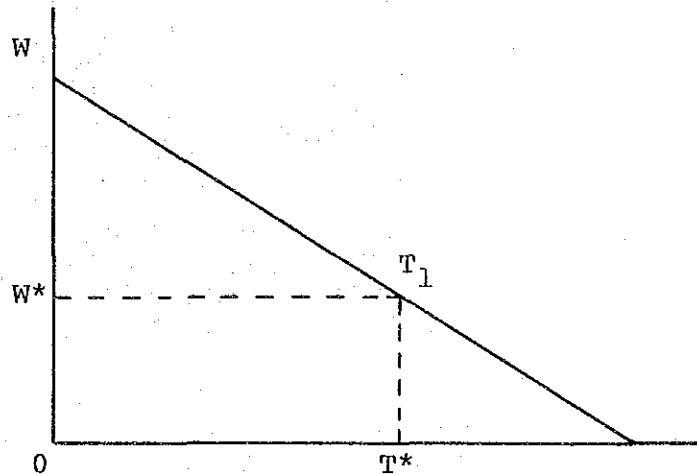
Assuming that traffic volume is T*, the call charge
W* is determined. In this case, the triangle area
W-Tl-W* is called as the consumer surplus in the
call charge W*. The square area W*-Tl-T*-O
indicate the total call charge payment to PERUMTEL.

(2) Media Cost Comparison
The formula of media cost comparison was described
in detail in "Chapter 8 Economic Analysis". This
formula can be applicable to the economic
evaluation of Feasibility Study, to be executed in
the future.

ANNEX

ANNEX 2-2-1
THE DISTRIBUTION OF THE NUMBER OF KABUPATEN
ACCORDING TO POPULATION SIZE IN KECAMATAN WITH
MANUAL EXCHANGE STATIONS (1980)
ANNEX 2-2-2
- DITTO - WITH AUTOMATIC EXCHANGE STATIONS (1980)
ANNEX 2-2-3
- DITTO - WITH NO TELEPHONE STATIONS (1980)

Note: These data are prepared for the significance of the
       project.
       ANNEX 2-2-1 shows that D.I. Aceh province has eight
       Kabupatens and, among them, one Kabupaten has a less
       than 10% of Kecamatan share with manual exchange office,
       4 Kabupatens have 10 - 20% of Kecamatan share and 3
       Kabupatens have 20 - 40% of Kecamatan share.

Province	Less than 10%	10	20	30	40	50	60	70	80	90	100(%)
D.I. Aceh	1	4	3								
S. Utara	1	6	3	1							
S. Barat	3	1	1	3							
Riau	1	2		1	1						
Jambi	2	3									
S. Selatan	2	2		2	2						
Bengkulu		1		2							
Lampung	2		1								
J. Barat	4	9	7								
J. Tengah	13	8	6	1	1						
D.I. Yogyakarta	2	2									
J. Timur	14	6	6	2	1						
Bali	4	2	1								
N. Teng Barat	1	2	2								
N.T. Timur	5	5	1			1					
Timor Timur	6	1	2	2	2						
K. Barat	3	1	2								
K. Tengah	3	3	2	1							
K. Selatan	2	4	1	1	1						
K. Timur		3	1								
Sul Utara	2	1	1								
Sul Tengah	2		2								
Sul Selatan	5	4	7	3	1		1				
Sul Tengara	1	1	1	1							
Maluku	1	2		1							
Irian Jaya	5	1	2	1							

ANNEX 2-2-2 The Distribution of the Number of Kabupaten According to population Size in Kecamantan with Automatic Exchange Stations (1980)

Province	10	20	30	40	50	60	70	80	90	100(%)
D.I. Aceh	6		1	1						
S. Utara	6	1	4							
S. Barat	7	1								
Riau	4			1						
Jambi	3	1		1						
S. Selatan	4	4								
Bengkulu	2			1						
Lampung	3									
J. Barat	13	3	4							
J. Tengah	19	9	1							
D.I. Yogyakarta	4									
J. Timur	26	3								
Bali	4	2	1	1						
N. Teng Barat	4	1	1							
N.T. Timur	11	1								
Timor Timur	8		1	2		1	1			
K. Barat	4	2								
K. Tengah	7	1		1						
K. Selatan	9									
K. Timur	3			1						
Sul Utara	4									
Sul Tengah	3	1								
Sul Selatan	19		1	1						
Sul Tengara	2	1	1							
Maluku	2	1	1							
Irian Jaya	4	2		1	2					

Province	10	20	30	40	50	60	70	80	90	100(%)
D.I. Aceh						1	1	3	3	
S. Utara					1	2	1	4	2	1
S. Barat							3	1	2	2
Riau					2		1		2	
Jambi							2		2	1
S. Selatan					1	2	1	2	2	
Bengkulu		1					1		1	
Lampung							1		1	1
Dki Jakarta										
J. Barat						1	4	8	5	2
J. Tengah					1		3	9	10	6
D.I.									2	2
Yogyakarta										
J. Timur						2	3	5	12	7
Bali						1	1	2	4	
N. Teng Barat	1				1	1		2	2	
N.T. Timur							1	1	6	4
Timor Timur				1	1	2	4	3	1	1
K. Barat									2	2
K. Tengah							2	3	2	2
K. Selatan						1	1	1	4	2
K. Timur					1			1	2	
Sul Utara								1	1	2
Sul Tengah								2	1	1
Sul Selatan				1		1	4	8	4	3
Sul Tengara							1	1	1	1
Maluku					1			1	1	1
Irian Jaya			1		1	1		3	2	1

ANNEX 2-4-1
SOCIO-ECONOMIC VARIABLES FOR PRINCIPAL COMPONENT ANALYSIS
ANNEX 2-4-1
SHOWS THE FIGURES OF THE ORIGINAL 20 VARIABLES.

1) Index of manpower quality
   This index was created by the following three variables
   through the principal component analysis.
   1: The number of high school, vocational academy and
      university graduates per 100 people.
   2: The number of professional and managerial workers per
      100 working population.
   3: The number of workers in the tertiary sector per 100
      working population.

2) Index of Living Conditions
   This index was created by the following 5 variables trough
   the principal component analysis.
   4: The number of hospitals per 10,000 people
   5: The number of radios possessed per 100 people
   6: The number of T.V. sets possessed per 100 people
   7: The number of motorized vehicles possessed per 100 people
   8: The number of cinema houses per 10,000 people

3) Index of Economic Activities
   This index was created by the following five variables
   through the principal component analysis.
   9: The amount of development expenditures (10,000 Rp per
      people)
   10: The amount of government expenditures (10,000 Rp per
       people)
   11: The ratio of asphalted road length to the total road
       length (%)
   12: The share of urban population (%)
   13: The total amount of bank credits (10,000 Rp per person)
   14: The share of the secondary sector in GRDP (%)
   15: The share of the tertiary sector in GRDP (%)

4) Index of communications
   This index was created by the following five variables
   through the principal component analysis.
   16: Telephone density per 100 people
   17: The number of post offices per 1,000 people
   18: The number of letters sent per person
   19: The number of metered telephone meterd pulses (10 pulses
       per person)
   20: The number of telegraphs per 100 people

ANNEX 2-4-1 (1/2)   Socio-Economic Variables for Principal Component Analysis

Code	Province	QUALITY OF MANPOWER		POPIND-	IIOS/N	STANDARD OF LIVING			
		EDUCATIO	INTELEC			RADIO/N	T.V./N	MOTOR/N	CINE/N
		1	2	3	4	5	6	7	8
11	D.I. Aceh	3.25	3.09	0.22	0.44	0.34	0.78	2.97	0.11
12	Sumatra Utara	4	3.2	0.24	1.35	2.32	1.1	3.79	0.19
13	Sumatra Barat	3.71	3.62	0.28	0.8	1.41	0.93	2.31	0.09
14	Riau	3.7	3.64	0.27	0.49	2.29	2.04	2.12	0.16
15	Jambi	2.57	2.84	0.2	0.34	2.39	0.72	2.71	0.09
16	Sumatra Selatan	3.27	2.85	0.24	0.83	2.45	1.42	5.12	0.15
17	Bengkulu	2.71	2.2	0.14	0.3	2.69	0.7	2.58	0.13
18	Lampung	2.11	2.04	0.17	0.34	2.44	0.64	1.54	0.07
31	DKI Jakarta	12.79	7.53	0.74	1.95	4.55	8.01	11.6	0.22
32	Jawa Barat	2.82	3.07	0.36	0.39	0.78	1.18	2.02	0.07
33	Jawa Tengah	2.6	2.55	0.29	0.53	0.03	0.8	2.11	0.05
34	D.I. Yogyakarta	7.16	3.87	0.3	0.95	6.55	1.08	3.67	0.05
35	Jawa Timur	2.71	2.39	0.3	0.52	0.03	1.19	2.15	0.05
51	Bali	3.17	4.24	0.33	0.67	6.66	1.17	3.4	0.1
52	Nusa Tenggara Barat	2.09	2.8	0.29	0.26	2.11	0.36	0.86	0.08
53	Nusa Tenggara Timur	2.36	2.75	0.12	0.54	0.38	0.21	0.57	0.04
61	Kalimantan Barat	1.78	1.81	0.14	0.68	2.04	1.01	1.49	0.18
62	Kalimantan Tengah	2.9	2.85	0.18	0.44	0.79	0.91	1.61	0.2
63	Kalimantan Selatan	3.09	3.35	0.29	0.76	0.55	2.17	3.69	0.11
64	Kalimantan Timur	4.78	3.76	0.37	1.35	0.68	3.21	4.6	0.29
71	Sulawesi Utra	4.91	4.9	0.31	1.42	0.24	1.43	1.6	0.12
72	Sulawesi Tengah	3.16	3.45	0.19	0.44	1.58	0.32	1.79	0.17
73	Sulawesi Selatan	3.45	3.76	0.28	0.86	0.16	0.82	2.6	0.07
74	Sulawesi Tenggara	2.94	3.2	0.2	0.51	3.2	0.52	1.57	0.07
81	Maluku	4.12	4.49	0.24	0.92	0.05	0.53	1.02	0.11
82	Irian Jaya	2.65	3.67	0.18	1.28	0.05	0.61	1.8	0.2

ANNEX 2-4-1 (2/2)   Socio-Economic Variables for Principal Component Analysis

| Code | Province | LEVEL OF ECONOMIC ACTIVITY | | | | | | | COMMUNICATION DEVELOPMENT | | | | | GRDP/N |
		DEVEX/N 9	GEXP/N 10	ROAD 11	URBANPO 12	BANKCRE 13	GRDP-2S 14	GRDP-3S 15	TELSUB 16	POSTOFF 17	POSTLET 18	TELTRAP 19	TELGRM 20	
11	D.I. Aceh	0.32	1.16	12.39	8.9	1.85	71.47	10.35	0.17	0.06	0.64	0.52	4.49	256.03
12	Sumatra Utara	0.26	1.05	26.8	25.4	3.39	27.96	36.24	0.31	0.07	1.4	2.92	2.43	129.64
13	Sumatra Barat	0.19	1.07	17.07	12.7	1.43	16.27	48.3	0.24	0.06	1.67	1.5	4.8	82.14
14	Riau	0.39	1.18	3.22	27.1	2.05	14.25	56.5	0.19	0.06	0.87	0.97	14.55	106.86
15	Jambi	0.41	1.39	13	12.6	1.69	14.13	33.81	0.21	0.05	1	1.84	3.85	92.04
16	Sumatra Selatan	0.3	0.91	15.63	27.4	2.3	32.78	37.47	0.15	0.06	0.83	1.78	3.65	151.3
17	Bengkulu	0.6	1.53	12.56	9.4	1.36	11.86	41.34	0.19	0.08	1.86	0.09	5.6	90.39
18	Lampung	0.17	0.68	12.55	12.5	1.53	9.83	43.86	0.12	0.05	1.12	0.91	1.57	77.67
31	Dki Jakarta	1.2	2.41	223.2	93.4	33.88	21.59	76.82	1.89	0.08	14.92	23.11	13.89	259.31
32	Jawa Barat	0.08	0.68	45.79	21	1.79	26.22	44.51	0.15	0.04	0.9	1.12	1.49	96.14
33	Jawa Tengah	0.08	0.72	56.68	18.7	1.68	14.41	45.21	0.14	0.05	1.06	0.86	2.23	67.68
34	D.I. Yogyakarta	0.18	1.18	21.55	22.1	1.71	17.05	43.65	0.13	0.06	2.45	1.51	7.04	68.61
35	Jawa Timur	0.09	0.64	50.32	19.6	2.32	17.27	46.09	0.21	0.04	1.21	1.72	3	88.75
51	Bali	0.16	1.06	27.24	14.7	2.06	14.02	44.03	0.26	0.05	1.29	2.07	4.6	111.53
52	Nusa Tenggara Barat	0.14	0.83	11.22	14.1	0.97	11.08	37.13	0.14	0.03	0.37	0.23	4.3	52.82
53	Nusa Tenggara Timur	0.19	1.07	10.53	7.5	0.44	5.26	34.35	0.08	0.04	0.79	0.57	7.59	56.4
61	Kalimantan Barat	0.23	1.2	2.91	16.8	3.07	18.14	40.96	0.11	0.04	1.23	0.85	3.43	105.59
62	Kalimantan Tengah	0.93	2.59	0.86	10.3	1.77	29.03	28.54	0.13	0.07	0.71	0.07	2.13	131.97
63	Kalimantan Selatan	0.37	1.35	9.5	21.4	3.36	5.86	62.61	0.19	0.09	1.97	2.02	9.42	119.89
64	Kalimantan Timur	2.06	3.53	2.02	39.8	4.84	6.45	72.86	0.25	0.09	1.16	0.11	18.85	290.01
71	Sulawesi Utra	0.36	1.73	14.04	16.8	3.13	7.49	46.24	0.26	0.05	0.62	2.2	10.29	114.21
72	Sulawesi Tengah	0.44	2.05	5.82	9	1.91	10.68	37.83	0.12	0.03	0.7	0.05	17.1	70.15
73	Sulawesi Selatan	0.16	1.04	16.07	20	2.1	7.41	43.84	0.18	0.04	0.71	1.34	5.23	90.5
74	Sulawesi Tenggara	0.46	1.6	7.87	9.3	1.18	13.65	49.84	0.07	0.04	0.48	1.02	7.78	74.26
81	Maluku	0.4	1.63	3.94	8.9	0.72	15.41	36.86	0.18	0.06	0.87	1.62	23.38	119.41
82	Irian Jaya	0.64	3.33	1.66	20.2	0.9	8.26	40.38	0.33	0.09	1.86	1.09	20.89	122.28

ANNEX 2-5-1 SYSTEM PARAMETERS - EARTH STATIONS

ANNEX 2-5-1 (1/3)   System Parameters - Earth Stations

		PALAPA A	PALAPA B	
			For Indonesia	For ASEAN
1.	Ant. Gain [Tx]	29.0 (25.0) dB	28.0	24.0
2.	Ant. Gain [Rx]	28.0 (24.0) dB	28.0	24.0
3.	G/T	- 7.5 dB/k	- 5.0	- 7.0
4.	e.i.r.p	34.0 (30.0) dB$\overline{\text{W}}$	36.0	32.5

( ) : Beam Edge

	Positions in Orbit	Launch
PALAPA A 1	83° E	Aug . 1976
PALAPA A 2 *)	77° E	Aug . 1976
PALAPA B 1 *)	108° E	June. 1983
PALAPA B 2	113° E	
PALAPA B 3	118° E	July . 1986 (Scheduled)
PALAPA C	141° E	

*) In Service. As of Dec. 1984.

1. STANDARD STATIONS   (SBB / SBS)

CARRIER SIZE	MIN	MAX
600 FDM	20.8 dB$\overline{\text{W}}$	24.7 dB$\overline{\text{W}}$
12 FDM	6.7	12.0
SCPC	− 4.4	2.7

2. SMALL EARTH STATION (SBK)

	MIN	MAX
SCPC	0.4 dB$\overline{\text{W}}$	9.7 dB$\overline{\text{W}}$

NOTE : The maximum e.i.r.p. toward the orbital
position of 74°E long. for earth stations
located within the operating INSAT − IA
10 dB − down contour. shall not exceed
25 dB$\overline{\text{W}}$ in any contiguous 30 KHz in the band
6,265 MHz   to   6,340 MHz.

ANNEX 2-5-3 (3/3) System Parameters - Satellite

		MCS (Master Control St.)	SBB	SBS	SBK
1.	Ant. Diameter	10.0 mø	10.0	10.0	4.5
2.	Ant. Gain [Tx]	53.5 dB	53.5	53.5	46.5
	[Rx]	50.5 dB	50.5	50.5	43.5
3.	Beam width [Tx]	0.35°	0.35°	0.35°	1.0°
	[Rx]	0.5°	0.5°	0.5°	0.8°
4.	G/T	>29.0 dB/k	29.0	25.0	18.6
5.	HPA Output (MAX.)	3 kw	400 w	400 w	10 w / 7.5 w (SOLID)
6.	E/G	500 KVA x 3	80 KVA x 2	40 KVA x 2	15 KVA x 2 (Manual Ex.)
		250 KVA x 2 (SURABAYA)			25 KVA x 2 (Auto. Ex.)

ANNEX 2-6-1
REQUIREMENTS AND SYSTEM TECHNICAL STANDARD
FOR EARTH STATION LOCATED IN RURAL AREA
ANNEX 2-6-2
LIST OF SCPC STATION/INCLUDING PELITA IV
ANNEX 2-6-3
LOCATION MAPS OF SCPC STATIONS/SUPERIMPOSED
ON TERRESTRIAL NETWORK
ANNEX 2-6-4
ACCESSIBILITIES OF EACH KABUPATEN

ANNEX 2-6-1   Requirements and System Technical Standard for
             Earth Station located in Rural Area

1. Requirements for Earth Stations located in Rural Areas

    Following are required for the earth stations to be located
    in the rural areas:

    1) Low cost

        Small-sized earth station is preferable for the purpose
        of cost reduction. However, it is not recommendable to
        reduce the present standard size of SBK antenna
        (standard 4.5m) in order to satisfy the transmission
        quality of satellite link as specified for 75 SBK
        project.

        Following alternative measures could be taken in order
        to minimize the size of an earth station:

        a) Raise the frequency band to be used.

            However, it should be noted that rainfall
            attenuation as well as degradation of cross
            polarization discrimination (XPD) cannot be ignored
            above the frequency range of 10 GHz.

            A great deal of rainfall margin must be secured for
            the satellite communications system at the band of
            more than 10 GHz, judging from the meteorological
            conditions in Indonesia.

            Therefore, it may be troublesome to reduce the size
            of antenna used for the satellite communications
            system, even though frequency band is raised.

        b) Raise the E.I.R.P (Equivalent Isotropically
            Radiated Power)
            In order to raise the E.I.R.P. of a satellite
            itself, there are two ways.

- 433 -

- To raise the output power of a satellite itself, or

- To employ spot-beam arrangement.

Adoption of three-axis stabilized satellite instead of spin-stabilized may be required to achieve those objectives.

2) Easy Operation and Maintenance

It is very difficult to secure the skilled technicians for maintenance and operation in rural areas. Therefore, centralization of monitoring functions is essential to the satellite communications system.

On the other hand, the functions required for an earth station to be situated in rural areas shall be simplified as much as possible.

In addition, progressive use of solar power supply system is desirable to raise maintenability of power supply system, parallel to technical evolution in terms of power consumption conservation for equipment.

3) Good Transportability

Accessibility to rural community where earth station(s) are located is not good. It means that rural communities are isolated from urban areas in most cases. Total cost for installing an earth station in rural area is very sensitive to the transportability of an earth station.

Transportability could be raised by sheltering equipment. It is also cost-effective to house equipment in a small-sized shelter, even if relocation of earth stations is required afterward.

2. System Technical Standard

For no reason whatsoever, technical standard of satellite communications system to be utilized for rural communications system to be lower than that of terrestrial communications system. Even if the technical standard of satellite communications system is lowered, no much contribution to cost reduction can be expected.

Performance standard for the now operating SCPC system is based on CCIR Rec. 353-4. Typical examples of system design are in Table 2-6-1 (1/2 - 2/2). According to this system design, SBK antenna diameter of 4.5 m is the allowable minimum. Further reduction of SBK size is not realistic unless e.i.r.p. of satellite itself is raised.

Table 2-6-1 (1/2) System Design of SCPC Link (Overall Link)

1)	C/No (Up-Link)	60.9 - 75.0	dBHz
2)	C/No (Down-Link)	50.2 - 55.2	dBHz
3)	C/I (assumed)	65.0	dBHz
4)	C/No (Overall)	49.7 - 54.7	dBHz
5)	Channel Noise Bandwidth (25 kHz : 30 kHz spacing)	44.0	dB
6)	Received C/N	5.7 - 10.7	dB
7)	Margin to Required C/N	-3.5 - 1.5	dB

Required S/N	50.0	dB
Companding Improvement	17.0	
Emphasis / Weighting	8.5	
FM Improvement	15.3	

Required C/N	9.2	dB

Table 2-6-1 (2/2) System Design of SCPC Link (Up/Down Link)

(Up-Link)

1)	Earth Station Transmit Power	-7.4 - 6.7	dBW/CH
2)	Antenna Gain (4.5 mø)	46.5	dBi
3)	Feed Line Loss	1.0	dB
4)	Earth station e.i.r.p.	38.1 - 52.2	dBW/CH
5)	Spreading Factor (38,600 km)	-162.7	dB
6)	In-orbit Flux Density/CH	-116.8	dBW/m^2
7)	Path Loss (38,600 km)	200.0	dB
8)	Rain Attenuation	0	dB
9)	Pointing Error Loss	0.8	dB
10)	Satellite Antenna Gain	28.0	dBi
11)	Satellite Receiver Noise Temp	33.0	dB
12)	Satellite G/T	-5.0	dB/K
13)	C/No , Up-Link (Note 1)	60.9 - 75.0	dBHz

(Note 1) ⑬ = ④ - (⑦ + ⑧ + ⑨) + ⑫ - (-228.6)

-228.6 : Boltzman's constant in dB/Hz.K

(Down-Link)

1)	Satellite e.i.r.p. saturated	36.0	dBW
2)	Output Back-off	5.4	dB
3)	Power sharing	26.0	dB
	Capacity : 1,000 CH/Tr.		
	Activity Factor : 0.4		
4)	Available e.i.r.p.	-0.4 - 4.6	dBW
5)	Pointing Loss	0.4	dB
6)	Path Loss (38,600 km)	196.2	dB
7)	Rain Attenuation	0	dB
8)	Earth Satation G/T (4.5 mø)	18.6	dB/K
9)	C/No , Down-Link (Note 2)	50.2 - 55.2	dBHz

(Note 2) ⑨ = ④ - (⑤ + ⑥ + ⑦) + ⑧ - (-228.6)

-228.6 : Boltzman's Constasnt in dB/Hz.K

ANNEX   2-6-2

List of SCPC Station / including PELITA IV

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
1100	DAERAH ISTIMEWA ACEH	01 ACEH SELATAN	TAPAK TUAN SINGKIL BLANGPIDI		3/9 3/9 3/9	IKK	3/3
		02 ACEH TENGGARA	KUTAKANE	BLANGKEJEREN	3/9 5	IKK	1/2
		03 ACEH TIMUR	—	—			0
		04 ACEH TENGAH	TAKENGON		2/9	IKK	1/0
		05 ACEH BARAT	MEULABOH SINABANG		3/9 3/9 5	IKK P. SIMEULUE	2/3
		06 ACEH BESAR		CALANG SEILIMUN	5		0/1 (1/2)
		07 PIDIE		MEUREUDU	5		0/1
		08 ACEH UTARA	—	—			0/0
		71 (06) KODYA/IBUKOTA PROP.	BANDA ACEH	JANTHOI	51/73 5	SBB	
1200	SUMATERA UTARA	01 NIAS	G. SITOLI		3/6	IKK/P.NIAS	1/1
		02 TAPANULI SELATAN		PANYABUNGAN	5		0/1
		03 TAPANULI TENGAH	—	—			0
		04 TAPANULI UTARA		BALIGE PANGURURAN	5 5	IKK P. SAMOSIR (INLAND)	0/2

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(SUMATERA UTARA)	05 LABUHAN BATU		LABUHAN BILIK KOTA PINANG	5 5		0/2
		06 ASAHAN	-	-			0 (1/1)
		07 SIMALUNGUN	-	-			0
		08 DAIRI	-	-			0
		09 KARO	-	-			0
		10 DELI SERDANG	-	-			0 (1/1)
		11 LANGKAT	-	-			0
		KODYA/IBUKOTA PROP. KOTAMADYA (10) 75 72 (06)	MEDAN MEDAN 1 TANJUNG BALAI		76/96 3/10	SBB	
				BAGANSIAPIAPI STABAT DOLOG MARANGIR KUALA MEMBANG MUDA PULAU RAKYAT	5 5 5 5 5 5		
1300	SUMATERA BARAT	01 PESISIR SELATAN	PAINAN	BALAI SELASA	3/9 5	IKK	1/2 (2/3)
		02 SOLOK		ALAHAN PANJANG MUARA LABUH	5 5		0/2 (0/3)

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE EXISTING (1984)	SITE PLANNED (PELITA IV)	MODEM	NOTES	1984/1989
	(SUMATERA BARAT)						
		03 SAWAHLUNTO/ SIJUNJUNG		SIJUNJUNG	5	IKK	0/1
		04 TANAH DATAR	-	-			0
		05 PADANG PARIAMAN	MUARA SIBERUT		1/9	P. SIBERUT	1/0
		06 AGAM	-	-			0
		07 LIMA PULUH KOTO	-	-			0
		08 PASMAN		LUBUKSIKAPING AIR BANGIS	5 5	IKK	0/2
		KODYA/IBUKOTA PROP. KOTAMADYA (01) (71) 73 (02)	PADANG	SAWAH LUNTO SUNGAI PENUH LUBUK BASUNG SUNGAI DAREH TALU	32/35 5 5 5 5 5	SBB	
1400	RIAU	01 INDRAGIRI HULU	RENGAT	AIR MOLEK TELUK KUANTAN	3/10 5 5	IKK	1/3
		02 INDRAGIRI HILIR	TEMBILAHAN		4/9	IKK	1/1
		03 KEPULAUAN RIAU	PULAU BATAM DABO SINGKEP TANJUNG BATU RANAI		57/57 3/9 2/9 3/10	SES/P.BATAM P.SINGKEP P.KUNDUR P.BUNGURAN	4/4
		04 KAMPAR		BANKINANG PASIR PANGARAIAN	5 5	IKK	0/2 (1/3)

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE EXISTING (1984)	SITE PLANNED (PELITA IV)	MODEM	NOTES	1984/1989
	(RIAU)	05 BENGKALIS	BENGKALIS		2/9	IKK/P. BENGKALIS	1/1
			DUMAI		25/28		(2/2)
		71 KODYA/IBUKOTA PROP.	PEKANBARU	(04) TAREMPA	45/51	SBB	0
1500	JAMBI	01 KERINCI	-	-			0/1
		02 SARKO		BANGKO	5	IKK	0 (1)
		03 BATANGHARI	-	-			1/1
		04 TANJUNG JABUNG	KUALA TUNGKAL		4/22	IKK	1/1
		05 BUNGO TEBO	MUARA BUNGO		4/9	IKK	
		71 KODYA/IBUKOTA PROP.	JAMBI (03)		23/39	SBB	
			SEKAYU	MUARA TEBO	1/9 5		
1600	SUMATERA SELATAN	01 OGAN KOMERING ULU		BELITANG	5		0/2
		02 OGAN KOMERING ILIR	-	MUARA DUA	5		0
		03 LEMATANG ILIROGAN TENGAH (LIOT)		PENDAPO LINTANG	5		0/1

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(SUMATERA SELATAN)	04 LAHAT		TEBING TINGGI	5		0/1
		05 MUSI RAWAS		MUARA RUPIT	5		0/1
		06 MUSI BANYU ASIN	—	—			0 (1)
		07 BANGKA	PANGKAL PINANG	MUNTOK TOBOALI	65/65 5 5	SBS, P.BANGKA P. BANGKA P. BANGKA	1/3
		08 BELITUNG	TANJUNG PANDAN	MANGGAR	4/9	P. BELITUNG	1/2
		71 KODYA/IBUKOTA PROP.	PALEMBANG (06)		52/131	SBB	
1700	BENGKULU	01 BENGKULU SELATAN	BINTUHAN MANA		3/9 3/9	IKK	2/2
		02 REJANG LEBONG		MUARA AMAN	5		0/1
		03 BENGKULU UTARA	ARGAMAKMUR		3/9	IKK	1/1 (2/2)
		71 KODYA/IBUKOTA PROP.	BENGKULU (03)		46/53	SBS	

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
1800	LAMPUNG	01 LAMPUNG SELATAN		KALIANDA	5		0/2 (1/3)
				KOTA AGUNG	5		
		02 LAMPUNG TENGAH	–	–			0
		03 LAMPUNG UTARA	KRUI		1/9		1/2
				MANGGARA	5		
		71 KODYA/IBUKOTA PROP.	TANJUNG KARANG (01)		29/25		
				PRING SEWU	5		
				BANDAR JAYA	5		
				WAY JEPARA	5		

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
3100	D.K.I. JAKARTA		JAKARTA/GAMBIR		257/429	SEB/SBK	1/1
3200	JAWA BARAT	01 PANDEGLANG	-	-			0
		02 LEBAK	-	-			0
		03 BOGOR	TEST CIBINONG CIBINONG		4/4 77/77	CIBINONG MASTER CONTROL ST.	1/1
		04 SUKABUMI		PELABUHAN RATU	5		0/1
		05 CIANJUR	-	-			
		06 BANDUNG	GEGERKALONG		2/2	BANDUNG TRAINING CENTER	(1/1)
		07 GARUT		PAMENGPEUK	5		0/1
		08 TASIKMALAYA	-	-			0
		09 CIAMIS	-	-			0
		10 KUNINGAN	-	-			0
		11 CIREBON	-	-			0
		12 MAJALENGKA	-	-			0
		13 SUMEDANG	-	-			0
		14 INDRAMAU	-	-			0
		15 SUBANG	-	-			0

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/ 1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(JAWA BARAT)	16 PURWAKARTA	-	-			0
		17 KARAWANG	-	-			0
		18 BEKASI	-	-			0
		19 TANGGERANG	-	-			0
		20 SERANG	-	-			0
		73 KODYA/IBUKOTA PROP.	BANDUNG (06)		31/78		0
3300	JAWA TENGAH	01 CILACAP	CILACAP	-	3/29	IKK, SBS	1/0
		02 BANYUMAS	-	-			0
		03 PURBALINGGA	-	-			0
		04 BANJARNEGARA	-	-			0
		05 KEBUMEN	-	-			0
		06 PURWOREJO	-	-			0
		07 WONOSOBO	-	-			0
		08 MAGELANG	-	-			0
		09 BOYOLALI	-	-			0
		10 KLATEN	-	-			0
		11 SUKOHARJO	-	-			0

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/ 1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(JAWA TENGAH)	12 WONOGIRI	-	-			o
		13 KARANGANYAR	-	-			o
		14 SRAGEN	-	-			o
		15 GROBOGAN	-	-			o
		16 BLORA	-	-			o
		17 REMBANG	-	-			o
		18 PATI	-	-			o
		19 KUDUS	-	-			o
		20 JEPARA	-	KARIMUN JAWA	5	P. KARIMUN JAWA	o
		21 DEMAK	-	-			o
		22 SEMARANG	-	-			o (1/1)
		23 TEMANGGUNG	-	-			o
		24 KENDAL	-	-			o
		25 BATANG	-	-			o
		26 PEKALONGAN	-	-			o
		27 PEMALANG	-	-			o
		28 TEGAL	-	-			o

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/ 1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(JAWA TENGAH)	29 BREBES	-	-			0
3400	DAERAH ISTIMEWA YOGYAKARTA	74 KODYA/IBUKOTA PROP.	SEMARANG (22)		9/89	SBB	0
		01 KULON PROGO	-	-			0
		02 BANTUL	-	-			0
		03 GUNONG KIDUL	-	-			0
		04 SLEMAN	-	-			
		71 KODYA/IBUKOTA PROP.	YOGYAKARTA (04)		3/107	SBB	0 (1/1)

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE EXISTING (1984)	SITE PLANNED (PELITA IV)	MODEM	NOTES	1984/1989
3500	JAWA TIMUR	01 PACITAN		PACITAN	5	IKK	1/1
		02 PONOROGO	–	–			0
		03 TRENGGALEK	–	–			0
		04 TULUNGAGUNG	–	–			0
		05 BLITAR	–	–			0
		06 KENDIRI	–	–			0
		07 MALANG	–	–			0
		08 LUMAJANG	–	–			0
		09 JEMBER	–	–			0
		10 BANYUWANGI	–	–			0
		11 BONDOWOSO	–	–			0
		12 SITUBONDO	–	–			0
		13 PROBOLINGGO	–	–			0
		14 PASURUAN	–	–			0
		15 SIDOARJO	–	–			0
		16 MOJOKERTO	–	–			0
		17 JOMBANG	–	–			0

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(JAWA TIMUR)						
		18 NGANJUK	–	–			0
		19 MADIUN	–	–			0
		20 MAGETAN	–	–			0
		21 NGAWI	–	–			0
		22 BOJONEGORO	–	–			0
		23 TUBAN	–	–			0
		24 LAMONGAN	–	–			0
		25 GRESIK	–	–			0 (1/1)
		26 BANGKALAN	–	–			0
		27 SAMPANG	–	–			0
		28 PAMEKASAN	–	–			0
		29 SUMENEP	–	KANGEAN			0
		78 KODYA/IBUKOTA PROP.	SURABAYA (25)		120/ 216 5	SBB SURABAYA 1 SURABAYA 2	

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
5100	BALI	01 JEMBRANA	-	-			0
		02 TABANAN	-	-			0
		03 BADUNG	-	-			0 (1/1)
		04 GIANYAR	-	-			0
		05 KLUNGKUNG	-	-			0
		06 BAWGLI	-	BAWGLI	5	IKK/P. BALI	0/1
		07 KARANGASEM	-	-			0
		08 BULELENG	-	-			0
		KOTA ADM.	DENPASAR (03)	-	12/149	SBB, P.BALI	1/2
5200	NUSA TENGGARA BARAT	01 LOMBOK BARAT	-	-			0 (1/1)
		02 LOMBOK TENGAH	-	PRAYA	5	IKK/P. LOMBOK	0/1
		03 LOMBOK TIMUR	-	SELONG	5	IKK/P. LOMBOK	0/1
		04 SUMBAWA	-	ALAS	5	P. SUMBAWA	0/1
		05 DOMPU	-	-			0
		06 BIMA	-	-			0
		KOTA ADMINISTRASI IBUKOTA PROPINSI	MATARAM (01)	-	4/49	P. LOMBOK	0

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE EXISTING (1984)	SITE PLANNED (PELITA IV)	MODEM	NOTES	1984/1989
5300	NUSA TENGGARA TIMUR						
		01 SUMBA BARAT	WAIKABUBAK		3/9	IKK/P. SUMBA	1/1
		02 SUMBA TIMUR	WAINGAPU		2/2	SBS/P. SUMBA	1/1
		03 KUPANG	KUPANG	BAA	5 70/70	P. ROTI SBS/P. TIMOR	0/1 (1/2)
		04 TIMOR TENGAH SELATAN		SOE	5	IKK/P. TIMOR	0/1
		05 TIMOR TENGAH UTARA		KEFAMENANU	5	IKK/P. TIMOR	0/1
		06 BELU	ATAMBUA		3/9	P. ALOR	1/1
		07 ALOR	KALABAHI		1/9	P. ALOR	1/1
		08 FLORES TIMUR	LARANTUKA		3/9	IKK/P. FLORES	1/1
		09 SIKKA	MAUMERE		2/9	IKK/P. FLORES	1/1
		10 ENDE	ENDE		3/25	IKK/P. FLORES	1/1
		11 NGADA		BAJAWA	5	IKK/P. FLORES	1/1
		12 MANGGARAI	-	-			0

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE EXISTING (1984)	SITE PLANNED (PELITA IV)	MODEM	NOTES	1984/1989
5400	TIMOR TIMUR	01 COVA LIMA		SUAI	5	IKK/P. TIMOR	0/1
		02 AINARO		AINARO	5	IKK/P. TIMOR	0/1
		03 MANUFAII		SAME	5	IKK/P. TIMOR	0/1
		04 VIKEKE		VIKEKE	5	IKK/P. TIMOR	0/1
		05 LAUTEM		LOS PALOS	5	IKK/P. TIMOR	0/1
		06 BAUCAU		BAUCAU	5	IKK/P. TIMOR	0/1
		07 MANATUTO		MANATUTO	5	IKK/P. TIMOR	0/1
		08 DILLI	DILLI		5/41	IBUKOTA P. TIMOR PROPINSI	1/1
		09 AILIU		AILIU	5	IKK/P. TIMOR	0/1
		10 LIQUICA		LIQUICA	5	IKK/P. TIMOR	0/1
		11 ERMERA		ERMERA	5	IKK/P. TIMOR	0/1
		12 BOBONARO		MALIANA	5	IKK/P. TIMOR	0/1
		13 AMBENO		PANTEMAKASAR	5	IKK/P. TIMOR	0/1

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
6100	KALIMANTAN BARAT	01 SAMBAS	SINGKAWANG		3/9	IKK	2/3
			SAMBAS		3/10		
				BENGKAYANG	5		0/1 (1/2)
		02 PONTIANAK		NGABANG	5		
		03 SANGGAU	ANGGAU		2/9	IKK	1/2
				BALAIKARANGAN	5		3/3
		04 KETAPANG	KETAPANG		3/9	IKK	
			PADANG KARIMATA		3/3	P. KARIMATA	
			KENDAWANGAN		3/9		
		05 SINTANG	SINTANG		2/24	IKK	1/2
				NANGAPINOH	5		
		06 KAPUAS HULU	PUTU SIBAU		3/9	IKK	1/1
		71 KODYA/IBUKOTA PROP.	PONTIANAK (02)		56/100	SBB	1/1
				NGABANG	5		
				SUKAMARA	5		
6200	KALIMANTAN TENGAH	01 KOTA WARINGIN BARAT	PANGKALAN BUN		2/22	IKK	1/1
		02 KOTA WARINGIN TIMUR	SAMPIT		4/31	IKK	1/2
				KUALA PEMBUANG	5		
		03 KATINGAN		KASONGAN	5		
		04 KAPUAS		KUALA KAPUAS	5	IKK	0/1 (1/2)

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(KALIMANTAN TENGAH)	05 BARITO SELATAN	BUNTOK		2/22	IKK	1/1
		06 BARITO TIMUR		TEMIANG LAYANG	5	IKK	0/1
		07 BARITO UTARA	MUARA TAWEH		3/9	IKK	1/1
		08 GUNUNG MAS	KUALA KURUN		3/9	IKK	1/1
		09 MURUNG RAYA	-	-			0
		71 KODYA/IBUKOTA PROP.	PALANGKA RAYA (04)		44/39	SBS	
6300	KALIMANTAN SELATAN	01 TANAH LAUT		PLEIHARI	5	IKK	0/1
		02 KOTA BARU	KOTA BARU	PAGATAN	4/9 5	IKK/P. LAUH	1/2
		03 BANJAR	-	-			0
		04 BARITO KUALA	-	-			0
		05 TAPIN	-	-			0
		06 HULU SEI SELATAN	-	-			0
		07 HULU SEI TENGAH	-	-			0
		08 HULU SEI UTARA	-	-			0

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(KALIMANTAN SELATAN)	09 TABALONG	-	-			0
6400	KALIMANTAN TIMUR	71 KODYA/IBUKOTA PROP.	BANJARMASIN	-	52/123	SBB	
		01 PASIR	-	-			0
		02 KUTAI	-	-			0
		03 BERAU	TANJUNG REDEP		2/10	IKK	1/1
		04 BULONGAN	TARAKAN		32/39	P. TARANKAN SBS	3/3
			NUNUKAN		3/13	P. NUNUKAN	
			TANJUNG SELOR		2/10	IKK	
		72 KODYA/IBUKOTA PROP.	SAMARINDA		76/113	SBB	
			KUALA KUAYAN	MELAK	2/9 5		

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EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
7100	SULAWESI UTARA	01 GORONTALO	-	-			0 (1/1)
		02 BOLAANG MANGONDOW	KOTA MOBAGO		3/7	IKK	
		03 MINAHSA		AMURANG	5		0/1 (1/2)
		04 SANGIIE TALAUD	TAHUNA		4/7	IKK/P.SANGIR	1/1
	72	KODYA/IBUKOTA PROP.	MANDADO (03)		47/152	SBB	
	71	KOTAMADYA	GORONTALO (01)		3/18	.	
7200	SULAWESI TENGAH	01 LUWUK/BANGGAI	LUWUK	BANGGAI	3/45 5	IKK P.BANGGAI	1/2
		02 POSO	POSO	AMPANA	3/9 5	IBUKOTA PROPINSI	1/2
		03 DONGGALA	PALU	PARIGI	53/68 5	KOTA ADMINISTRASI SBS	1/2
		04 BUOL TOLI-TOLI	TOLI TOLI		2/9	IKK	1/1

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
7300	SULAWESI SELATAN	01 SELAYAR	-	-			0
		02 BULUKUMBA	-	-			0
		03 BANTAENG	-	-			0
		04 JENEPONTO		JENEPONTO	5		0/1
		05 TAKALAR		TAKALAR	5	IKK	0/1
		06 GOWA	-	-			0
		07 SINJAI	SINJAI		1/10	IKK	1/1
		08 BONE	WATAMPUNE		1/10	IKK	1/1
		09 MAROS	-	-			0
		10 PANGKAJENE KEPULAUAN	-	-			0
		11 BARRU	-	-			0
		12 SOPPENG	-	-			0
		13 WAJO	-	-			0
		14 SIDDENRENG RAPPANG	-	-			0
		15 PINRANG	-	-			0
		16 ENRENKANG	ENRENKANG		1/10	IKK	1/1
		17 LUWU LUWU	SOROAKO PALOPO		3/3 3/10	SBS IKK	2/2

EARTII STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
	(SULAWESI SELATAN)						
		18 TANA TORAJA	RANTEPAO	MAKALE	3/10 5	IKK	1/2
		19 POLEWALI MAMASA	-	POLEWALI	5		0/1
		20 MAJENE	-	-			0
		21 MAMUJU	-	MAMUJU	5	IKK	0/1
		71 KODYA/IBUKOTA PROP.	UJUNG PANDANG (09)		74/119	SBB	
7400	SULAWESI TENGGARA	01 BUTON	BAU BAU		3/9	IKK/P.BUTON	1/1
		02 MUNA	RAHA		3/9	IKK/P.MUNA	1/1
		03 KENDARI	KENDARI		40/59	IBUKOTA PROPINSI/SBS	1/1
		04 KOLAKA	KOLAKA		3/9	IKK	1/1

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE		MODEM	NOTES	1984/1989
			EXISTING (1984)	PLANNED (PELITA IV)			
8100	MALUKU	01 MALUKU TENGGARA	TUAL SAUMLAKI		3/39 3/10	IKK/P.KAI P.TANIMBAR	2/2
		02 MALUKU TENGAH	NAMLEA MASOHI	SAPARUA WAHAI	1/10 1/10 5 5	P.BURU IKK/P.SERAM P.SAPARUA P.SERAM	2/4 (3/5)
		03 HALMAHERA TENGAH	SOA SIU		1/10	IKK/P.TIDORE	1/1
		04 MALUKU UTARA	TERNATE TOBELO SANANA	LABUHA	36/47 2/10 1/10 5	SBB IKK/P.TERNATE P.HALMAHERA P.SANANA P.BACAN	3/4
		71 KODYA/IBUKOTA PROP.	AMBON	DOBO BANDANAIRA MOROTAI	37/77 5 5 5	SBB, P.AMBON	
8200	IRIAN JAYA	01 MERAUKE	MERAUKE TANAH MERAH		30/34 2/10	IKK, SBS	2/2
		02 JAYA WIJAYA	WAMENA		2/7		1/1
		03 JAYAPURA	JAYAPURA		50/64	IBUKOTA PROPINSI, SBB	2/2
		04 PANIAI	SARMI NABIRE	ENAROTALI	1/10 2/6 5		1/2

EARTH STATION/SCPC

NO.	PROPINSI	KABUPATEN	SITE EXISTING (1984)	SITE PLANNED (PELITA IV)	MODEM	NOTES	1984/1989
(IRIAN JAYA)							
		05 FAK-FAK	FAK-FAK TEMBAGAPURA KAIMANA		5/5 4/4 2/10	IKK, SBS SBS	3/3
		06 SORONG	SORONG TEMINABUAN		42/44 1/10	IKK, SBS	2/2
		07 MANUKWARI	MANUKWARI	RANSIKI	30/36 5	IKK, SBS	1/2
		08 YAPEN WAROPEN	SERUI		2/10	P.SURENAWA	1/1
		09 TELUK CENDRAWASIH	BIAK		35/35	SBS/P.BIAK	1/1