



**SECTION 9**  
**PROJECT IMPLEMENTATION AND**  
**COST ESTIMATE**



## SECTION 9 PROJECT IMPLEMENTATION AND COST ESTIMATE

This SECTION describes basic conditions for establishment of the Project Implementation Program and the project cost estimate during REPELITA-VI.

### 1. BASIC CONDITIONS FOR ESTABLISHING THE PROJECT IMPLEMENTATION PROGRAM

The Project Implementation Program will be prepared based on the following:

- (1) Projects to be proposed are classified into the following two categories:
  - a) Area project packages covering specific areas; and
  - b) Backbone transmission project packages
- (2) An area project package is to be composed consisting of all the network components for a specific area to regard the following as important:
  - a) to build up well-balanced network on area by area basis; and
  - b) to simplify project formation and program management.

As stated above, projects are formed on area by area basis except backbone transmission projects. However, conventional project formation by network component is available by rearrangement of the tables, as installation plan for an exchange is indicated by network component.

- (3) Finance sources are not specified for each project formed. However, each project will be classified by profitability on profitability index derived from per line unit cost and productivity, and construction period in association with financial internal rate of return (FIRR).

### 2. PROJECT FORMATION

Area project packages to be proposed are formed by assembling several minimum project units from a viewpoint of network development and investment cost (approximately million US\$ 100 for a project package considering past fund procurement).

#### (1) Minimum Project Unit

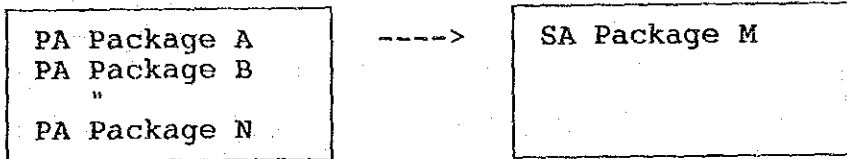
An area project package covering a primary area is a minimum project unit. The area project package basically consists of all the network components i.e.

land, building, switching system, spur transmission link, junction network, subscriber cable network and radio subscriber system, etc. A primary area as a telecommunications administrative area is equivalent to a Kabupaten area as an administrative area.

(2) Project Packages to be proposed

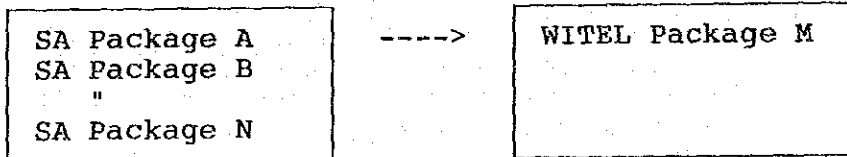
Project packages are basically proposed in consideration to a suitable project size. A typical project formation is defined as follows:

a) Primary Area Packages to Secondary Area Packages

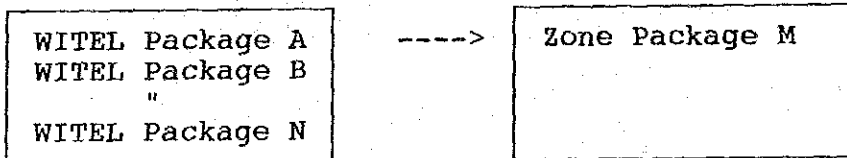


Note: PA: Primary Area  
SA: Secondary Area

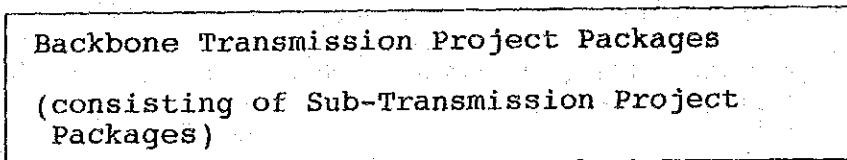
b) Secondary Area Packages to WITEL Packages



c) WITEL Packages to Zone Packages



d) Backbone Transmission Project Packages



e) Other Project Packages

- Mobile Telephone Packages
- Radio Paging Packages
- Operation and Maintenance Packages
- Others

2.1 Summary of Projects to be Proposed

Based on the above conditions for establishing the project formation during REPELITA-VI, the projects were formed. The projects to be proposed are summarized in the following Table 1-9-1:

Table 1-9-1 Summary of Project Packages Proposed

Category of Project Packages	No. of Packages
Area Project Packages (including 2 Junction Projects)	53
Backbone Transmission Projects	19
Mobile Telephone Project packages	4
Radio Paging Project Packages	4
1.5 MLU Area Project Packages (JKT, SBY, BDG)	3
O&M Project Packages	2
Coin Telephone Project package	1
Project Management/Engineering	1
<b>Total Project Packages</b>	<b>87</b>

The detail of the project packages is referred to in Installation Program for REPELITA-VI of Volume II.

2.2 Project List & Digest

A project package to be proposed is defined by implementation units coded by sub-system in a project area which are mentioned in the Installation Program for REPELITA-VI of Volume II. A project digest covers an outline of the project package shown in the project list. Items mentioned in the project list and digest are as follows:

(1) Project List

- a) Project name;
- b) Objective area;

- c) Total project cost;
- d) Financial IRR (internal rate of return);
- e) Implementation unit No.;
- f) Supply volume by implementation unit No.; and
- g) Cost by implementation unit No.

(2) Project Digest

- a) Project title;
- b) Project name (code name);
- c) Location;
- d) Executive agency;
- e) Objectives;
- f) Project description;
  - Implementation
  - Technical component and scope of work
- g) Implementation time schedule;
- h) Project cost;
- i) Amount proposed for commitment;
- j) Related to technical assistance;
- k) Stage of project preparation; and
- l) Additional information.
  - Objective exchange
  - Related projects

3. PROJECT COST ESTIMATE

(1) Unit Cost

The project cost estimate is made based on the unit cost by sub-system. The unit cost is established considering a cost trend during PELITA-V and cost reduction to be expected. Overall unit cost for the whole system and unit costs by sub-system are shown in the following Table 1-9-2:

Table 1-9-2 Unit Investment Cost for REPELITA-VI

Items	Unit Cost(US\$)	Share(%)
Land	22.66	1.50
Telephone Exchange	300.36	20.00
Telex exchange	12.36	0.80
Outside Plant	500.00	33.20
Terrestrial Transmission	368.74	24.50
Satellite Transmission	212.18	14.20
Supporting Facility	57.68	3.80
Consultant	28.84	2.00
Total	1,502.00	100.00

## (2) Cost Summary of REPELITA-VI

The outline of project formation and project costs by WITEL are shown in the following Table 1-9-3:

Table 1-9-3 Cost Summary of REPELITA-VI

Package Category	No. of Packages	Project Cost (MUS\$)
<Area Project Packages for 3.5 MLU>		
I	4	264.15
II	2	160.53
III	3	260.56
IV	15	882.82
V	9	593.79
VI	4	422.68
VII	7	543.79
VIII	2	204.14
IX	2	250.93
X	3	227.30
XI	1	56.66
XII	1	89.17
Coin Telephone (Note 1)	1	170.00
-----		
<Backbone Project Packages for 5.0 MLU>		
Backbone Transmission	19	1,248.73
-----		
<Profitable Area Project Packages for 1.5 MLU>		
Jakarta	1	507.82
Surabaya	1	292.81
Bandung	1	292.87
-----		
Total	76	6,468.75
-----		
<Other Project Packages>		
Mobile Telephone	4	625.27
Paging	4	180.30
Operation & Maintenance	2	10.09
Project Manage/Engineering	1	326.90
-----		
GRAND TOTAL	87	7,611.31
-----		

Note 1: the cost for coin telephone project package is included in the area project packages.



4. FINANCIAL EVALUATION OF THE PROJECTS

4.1 Evaluation Method

The development of the telecommunications network covering entire Indonesia is considered as the prerequisite of its social and economic development. In association with this condition and telecommunications network's hazardless nature, lower cost approach with technical considerations is mostly solution of the development issue.

Financial viabilities of the projects formulated in this report are measured by

- (1) a profitability index derived from per line unit development cost, per line unit pulse productivity and construction period, and
- (2) financial internal rate of return (FIRR) which is based on the calculation method and conditions taken in the program financial evaluation described in Section 11.

The profitability index is not directly applicable to the backbone projects since line unit pulse development cost and pulse is not able apply on them. Therefore roughly estimated index figures from FIRR value are used for the profitability classification.

Since socio-economic impact of the total REPELITA-VI investment program is evaluated in SECTION 11, financial evaluation of each project is enough to valuate project financial and economic viabilities.

The formula of the profitability index is obtained as follows:

$$(PI) = (1/LUC) \times (PPR) \times (1/CPF) \times (ADF)$$

Where,

- PI : profitability index
- LUC : per line unit cost
- PPR : per line unit pulse productivity performance ratio, which is explained in the following FIRR calculation explanation.
- CPF : construction period classification factor
- ADF : adjustment factor, which is used to adjust index range for fund procurement purpose.

For the FIRR calculations, the estimated development costs, and operation and maintenance costs clarified in the corporate and program financial evaluations shown in Section 11 are used as a project cost. Revenue of the

projects are derived from revenue base identified in the corporate and program financial evaluations shown in Section 11. Though the result of the project cost estimate is directly used as a development cost of each project, operation and maintenance costs and revenue used are adjusted. Project life cycle is 15 years.

For the backbone projects, both operation and maintenance costs and revenue are allocated from the REPELITA-VI program's total operation and maintenance costs and revenue corresponding to the ratio of backbone project's cost against the total program cost. FIRR calculations of junction packages among the WITEL packages are almost same as the backbone packages' calculation except consideration of each WITEL's productivity performance stated below.

Operation and maintenance costs and revenue of the other WITEL package projects are calculated by per line unit and/or per staff unit costs and revenue basis. Per line unit operating costs are discounted by the proportion of WITEL package investments to the total REPELITA-VI investment. Per line unit revenue basis are adjusted by the WITELs' per line unit pulse productivity performance ratios against the national average pulse productivity listed in Table 1-9-4. The lowest performance of 84.53 percent level to the national average is observed at WITEL XII while the highest is WITEL IX's 125.64 percent.

#### 4.2 Result of the Financial Evaluation

Indices of WITEL package projects are ranges from 0.33 to 2.16. In terms of FIRR, it is very wide range from -4.26 percent to 50.28 percent. FIRRs of Backbone packages are ranging from 17.75 percent to 25.13 percent, since revenue levels per investment cost are basically the same. Corresponding profitability indices to backbone packages' FIRRs are 1.0 with 20 percent deviation both sides.

The following is a reference for the correspondence between values of the index and FIRR values;

- (1) 1.30 or more = approximately FIRR 32% or more;
- (2) 1.15 or more = approximately FIRR 25% or more;
- (3) 1.00 or more = approximately FIRR 22% or more;
- (4) 0.90 or more = approximately FIRR 19% or more;
- (5) 0.75 or more = approximately FIRR 15% or more;
- (6) 0.60 or more = approximately FIRR 9% or more;
- (7) 0.50 or more = approximately FIRR 6% or more;
- (8) 0.40 or more = approximately FIRR 0% or more.

Significant differences among WITEL package projects' profitabilities are mainly due to variance of the per line unit development cost in association with the revenue level deviations. Projects which are able to utilize

existing facilities have advantages to lower per line unit investment cost. Dense demand areas, too, are favored for reduction of per line unit development by shorter connection lines to users.

From WITEL based point of view, WITEL IV with average 1.24 point is the highest performance WITEL followed by WITEL VI having 1.17 point and WITEL I showing 1.00 point. Average index of additional packages for 1.5 million line unit capacity projects is 1.14. However, their indices may be higher than results of this calculation since their per line unit productivities are expected to be higher than average of each WITEL's. WITEL IV's Utara and Pusat have remarkably high average index of 1.61 and 1.52 points respectively.

The lowest is WITEL XII's 0.43 point followed by WITEL XI, WITEL II, WITEL III and WITEL X whose indices are 0.61, 0.62, 0.63 and 0.63 respectively. The simple average of basic WITEL packages' indices is 0.96 points. The simple average of basic WITEL packages' FIRR is 19.80 percent while the backbone packages' and the additional packages' are 22.27 percent and 26.47 percent respectively.

Further differentiation and review on revenue of Backbone packages by traffic volumes bared by each package are necessary for more accurate evaluation. Also allocation of revenue base between Backbone packages and Area packages by revenue generation perspective is alternative way to this investment cost oriented allocation.

The mobile projects, the public phone project and the operation and maintenance projects are omitted from the project financial evaluation, since necessary data and information are not available in this stage.

#### 4.3 Funding Suggestion

Profitability classification of the projects are based on the profitability indices. Classification categories are following four; highly profitable, profitable, moderately profitable, and marginally profitable. Since these projects are minimum implementation units, actual implementation packages are expected to consist of a few or several project units.

Therefore, compilation of project units to form implementation packages is key for the successful implementation especially from the fund procurement point of view. For example, combination of high profitability project and higher medium profitability projects shall be attractive for private investors. Another example is that a combination for a commercial loan package by higher

medium projects and a lower medium project can be possible.

Projects with more than 1.15 points are classified as high profitability project. They may bear burden of higher interest payments for the development funding by commercial loans. They are attractive for the private investors too. It is suggested to make them cores for high interest loan packages or private investment component.

Upper middle profitability projects with indices between 0.90 point and 1.15 point are classified as profitable project. They are basically feasible with commercial loan level interest burden.

Lower middle profitability projects classified as moderate profitability project have indices of 0.60 points to 0.90 points. They requires lower cost fund than commercial loan. These projects themselves are not attractive for the private investors. Combination with (a) high profitability project(s) is indispensable for funding from outside except for low interest loan borrowing.

Projects with 0.60 or less indices are marginal profitability projects. They have to be funded by internal fund without good project packaging.

All Backbone projects are classified as profitable project since the indices of Backbone packages are ranging from 0.80 to 1.20. Furthermore additional revenue is expected from future network development.

Exception of the classification is two of the additional component projects which are Greater Bandung Project and Greater Surabaya Project. Since per line unit pulse productivities of these projects are expected to be much higher than the ones of the entire WITELs which contain these projects, actual profitabilities should be much higher than the indices shown in the table.

Sum of high profitability project development costs, profitable ones', moderately profitable ones and marginal profitability ones' are 1.9, 2.3, 1.4 and 0.9 billion U.S. dollars respectively. Considering PT. TELKOM's own usable investment fund of 2 billion U.S. dollars projected in the basic corporate financial forecast in SECTION 11, and availability of foreign official loans and private equity investment, this classification is appropriate basic reference for the fund allocation.

Table 1-9-4 Per Line Unit Pulse Productivity  
WITELs' Performance

	1984	1985	1986	1987	1988	1989	1990	1991	Rate	Adj Rate
WITEL I	10,628	9,965	9,345	9,850	10,667	10,948	11,111	8,867		
	<b>90.90%</b>	<b>90.08%</b>	<b>87.10%</b>	<b>89.31%</b>	<b>95.70%</b>	<b>95.05%</b>	<b>90.86%</b>	<b>90.38%</b>	91.17%	<b>91.36%</b>
WITEL II	9,476	8,894	9,409	9,835	10,883	10,578	11,576	10,634		
	81.05%	80.40%	87.70%	89.17%	97.64%	91.84%	94.66%	108.39%	98.13%	<b>98.34%</b>
WITEL III	12,950	11,279	10,622	11,054	11,588	11,323	11,312	8,672		
	110.76%	101.97%	99.01%	100.22%	103.96%	98.31%	92.50%	88.39%	90.45%	<b>90.64%</b>
WITEL IV	13,078	12,218	11,720	11,626	11,311	11,439	12,151	10,160		
	111.86%	110.45%	109.24%	105.41%	101.47%	99.31%	99.37%	103.57%	101.82%	<b>102.04%</b>
WITEL V	10,533	10,252	9,911	9,692	9,986	10,981	11,240	8,909		
	<b>90.09%</b>	<b>92.68%</b>	<b>92.38%</b>	<b>87.88%</b>	<b>89.59%</b>	<b>95.34%</b>	<b>91.92%</b>	<b>90.82%</b>	91.34%	<b>91.53%</b>
WITEL VI	10,909	10,617	10,293	10,681	10,976	11,435	11,757	9,509		
	93.31%	95.98%	95.94%	96.84%	98.47%	99.28%	96.15%	96.93%	97.53%	<b>97.74%</b>
WITEL VII	9,629	9,504	9,495	10,930	11,033	11,852	14,389	10,854		
	82.36%	85.91%	88.50%	99.10%	98.98%	102.90%	117.67%	110.64%	110.40%	<b>110.63%</b>
WITEL VIII	8,428	8,115	8,044	8,998	10,005	10,687	11,727	8,793		
	72.09%	73.36%	74.98%	81.58%	89.76%	92.78%	95.90%	89.63%	92.02%	<b>92.21%</b>
WITEL IX	15,236	15,108	14,129	15,633	17,788	19,412	16,072	11,707		
	130.32%	136.58%	131.69%	141.74%	159.59%	168.54%	131.43%	119.33%	125.38%	<b>125.64%</b>
WITEL X	11,223	10,422	10,327	10,360	10,205	10,693	10,869	8,323		
	95.99%	94.22%	96.26%	93.93%	91.56%	92.83%	88.88%	84.84%	88.85%	<b>89.04%</b>
WITEL XI	12,241	10,064	10,481	10,686	11,103	12,763	12,836	8,268		
	104.70%	90.97%	97.70%	96.88%	99.61%	110.81%	104.97%	84.28%	100.02%	<b>100.23%</b>
WITEL XII	15,287	13,069	12,949	11,115	10,371	10,277	9,856	8,168		
	130.75%	118.15%	120.70%	100.78%	93.04%	89.22%	80.59%	83.26%	84.36%	<b>84.53%</b>
National	11,691	11,062	10,729	11,030	11,146	11,518	12,229	9,810	100.21%	Adjustment
							Weighted Average			99.79%

Source : PT. TELKOM

\* Bold Numbers are objects of performance ratio considerations and performance ratios used in the project evaluations.

Table 1-9-5 Expected Profitabilities of the Projects

Category	Sum	Profitability Criteria			Cost Unit : Mill US\$					
High	1,942.88	More Than		1.15						
Profitable	2,304.57			0.90						
Moderate	1,437.69			0.60						
Marginal	940.51	= or Less Than		0.60						
WITEL	Name	Index	Categ	Cost	WITEL	Name	Index	Categ	Cost	
I	VI/I/01	2.01	High	36.35	VII	VI/VII/01	1.34	High	50.81	
	VI/I/02	0.94	Profitable	52.88		VI/VII/02	1.78	High	53.22	
	VI/I/03	0.56	Marginal	110.51		VI/VII/03	1.28	High	88.82	
	VI/I/04	0.50	Marginal	77.79		VI/VII/04	1.33	High	56.52	
II	VI/II/01	0.48	Marginal	78.55	VI/VII/05	0.92	Profitable	96.2		
	VI/II/02	0.77	Moderate	90.01	VI/VII/06	0.85	Moderate	87.01		
III	VI/III/01	0.35	Marginal	105.12	VIII	VI/VIII/01	1.03	Profitable	93.27	
	VI/III/02	0.91	Profitable	88.7		VI/VIII/02	0.47	Marginal	121.08	
	VI/III/03	0.62	Moderate	79.77	IX	VI/IX/01	0.81	Moderate	138.08	
IV	VI/IV/U/01	2.16	High	38.23		VI/IX/02	0.84	Moderate	125.4	
	VI/IV/U/02	0.94	Profitable	71.1	X	VI/X/01	0.60	Moderate	116.62	
	VI/IV/U/03	1.72	High	26.42		VI/X/02	0.81	Moderate	68.7	
	VI/IV/P/01	1.47	High	57.77		VI/X/03	0.48	Marginal	53.34	
	VI/IV/P/02	1.58	High	61.24	XI	VI/XI/01	0.61	Moderate	59.49	
	VI/IV/S/01	0.65	Moderate	87.23		XII	VI/XII/01	0.43	Marginal	93.63
	VI/IV/S/02	1.42	High	65.77	Backbone		JK-SB FO-2	1.00 (±20%)	Profitable	55.32
	VI/IV/S/03	1.69	High	60.46			SB-UP SKKL		Profitable	92.76
	VI/IV/B/01	1.00	Profitable	87.37			MDN-BNA		Profitable	17.58
	VI/IV/B/02	1.17	High	67.91			T-SUM EXP		Profitable	73.45
	VI/IV/B/03	1.20	High	67.13			PALAPA CI		Profitable	315
	VI/IV/T/01	1.06	Profitable	85.03			J-B M/W EXP		Profitable	37.18
	VI/IV/T/02	0.73	Moderate	56.28			UP-BIA SKKL		Profitable	166.85
VI/IV/T/03	0.51	Marginal	43.37	SAT CH EXP			Profitable		58.56	
Junction		Profitable	51.66	BJM-BPP M/W			Profitable		14.81	
V	VI/V/01	1.09	Profitable	77.79		JK-PGP-PTK	Profitable		195.16	
	VI/V/02	1.08	Profitable	36.65	2nd T-SUM	Profitable	119.43			
	VI/V/03	0.85	Moderate	93.77	X-KAL EXP	Profitable	25.1			
	VI/V/04	0.78	Moderate	98.93	T-SUL EXP	Profitable	12.48			
	VI/V/05	1.24	High	64.06	SB-BJW EXP	Profitable	9.57			
	VI/V/06	1.08	Profitable	77.14	JK-SB FO-I	Profitable	12.68			
	VI/V/07	0.94	Profitable	52.53	JK-PD M/W	Profitable	44.75			
	VI/V/08	0.33	Marginal	122.61	SB-ML M/W	Profitable	2.47			
	Junction		Profitable	11.76	BIA-JAP SKKL	Profitable	50.54			
VI	VI/VI/01	1.08	Profitable	111.3	TR-NT EXP	Profitable	7.5			
	VI/VI/02	0.67	Moderate	115.82	IV	Greater Jakarta	1.20	High	533.21	
	VI/VI/03	0.59	Marginal	134.51	V	Gre. Bandung*	1.07	High	307.45	
	VI/VI/04	0.62	Moderate	82.19	VII	Gre. Surabaya*	1.15	High	307.51	

\*: Revenue level of these projects are expected to be significantly higher than average WITELs'.



**SECTION 10**  
**OPERATION & MAINTENANCE PLAN**





**SECTION 10 OPERATION & MAINTENANCE PLAN**

**1. OPERATION AND MAINTENANCE**

**1.1 Management of Operation and Maintenance(O&M)**

**1.1.1 Present Status of Operation and Maintenance Management**

Present status of the operation and maintenance management in PT. TELKOM may be summarized as follows:

- (1) Lack of technicians in number and quality;
- (2) Poor preventive and corrective maintenance provided for existing network;
- (3) Lack of spares and of measuring equipment;
- (4) Maintenance centers which are not in good condition;
- (5) Insufficient network control; and
- (6) Insufficient reporting and data processing functions.

**1.1.2 Operation and Maintenance Management Policy**

Key items to enhance the operation and maintenance management are:

- (1) Improvement of technician's ability;
- (2) Expansion of O&M Built-In-Training;
- (3) Promotion in rehabilitation of telecommunication network;
- (4) Provision of sufficient amount of spares and measuring equipment;
- (5) Keeping enough amount (multi-year) of spares;
- (6) Development of repair center;
- (7) Consolidation of System Operation Procedures (SOP) / System Maintenance Procedures (SMP);
- (8) Development of Integrated Network Management System (IMS); and
- (9) Effective utilization of reports and data works.

**1.2 Necessity of Enhanced Operation and Maintenance for Telecommunication Network**

Sophistication of telecommunication system will increase the function of the network and also enhance its responsibility in the society. Nowadays, importance of ensuring network reliability against failures and natural disasters, taking adequate countermeasures to abnormal traffic and also taking security measures against crimes in handling information has become widely recognized, calling for development of an appropriate integrated management and operation system.

The operation and maintenance of telecommunications network include;

- (1) network management pertaining to routine services and business operation;
- (2) network maintenance such as surveillance, testing and fault correction; and
- (3) network control such as adaptive network control and handling an abnormal traffic.

As the network expands the capacity and spreads the area to be served, such operation and maintenance works as monitoring, testing, controlling tied to specific equipment or facilities become impossible or extremely difficult to implement.

Therefore, it is desirous to centralize the network management for efficient operation and maintenance.

For the integrated network management system, refer to para.3 Network Management Plan.

**1.3 Simplification of Procedures for Immediate Actions to be taken in Equipment Maintenance**

To ensure the high reliability of network, the network needs to apply various kinds of techniques such as equipment or system redundancy, diversity, etc.

In case of a network failure, automatic switchover to a redundant equipment or system takes place, in general, and then, localization of a failed component and replacement of the faulty component with a spare follows.

Thereafter, the faulty component is sent to the manufacturer for repair.

In these processes, the local technician may consult an engineer in the region or an engineer in the center for

any action to be taken by the local technician.

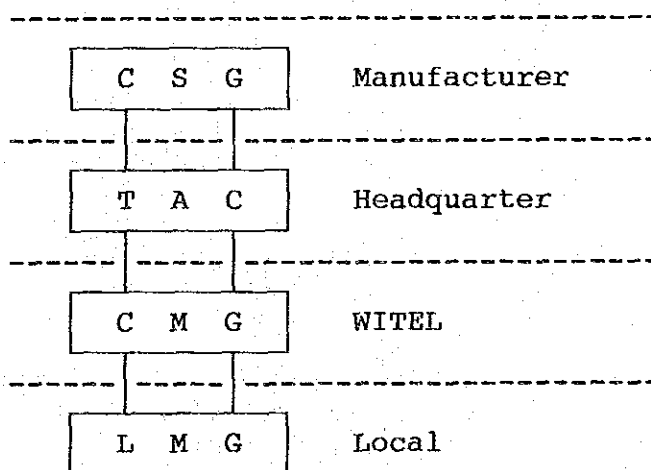
Conventionally, such action was used to be delayed due to bureaucracy in the organization.

In January, 1992, a guideline to simplify the process was announced by PT. TELKOM.

In the guideline, is defined "LCT" flow, where "L" means Local Maintenance Group (LMG), "C", Centralized Maintenance Group (CMG) in WITEL region, and "T", Technical Assistance Center (TAC).

These three groups are organized within PT. TELKOM, while there is another group, i.e., Customer Service Group (CSG) by manufacturer as shown in Figure 1-10-1.

According to this flow, direct consultation to the upper group eliminating intermediate procedures due to bureaucratic way.



Note : Arrow marks indicate coordination and assistance

Source: Harkat Kita Menunjang Sukses Pelayanan, Direktorat Operasi Jan. 1992

Figure 1-10-1 Coordination by LCT Flow

Introduction of such procedural simplification is expected to contribute to improvement of reliability and eventually to improvement of SCR.

Successful implementation following to LCT flow requires an appropriate deployment of technicians and engineers with sufficient skill, proficiency and necessary technical knowhow.

It is very important to record correctly and accurately the state of failures and actions to have been taken, for later reference, and accumulation of these data will be very useful and may be utilized in expert system in the network management system.

#### 1.4 Quality of Service and Network Performance

According to CCITT recommendations, two categories of performance measurement, i.e., Quality of Service (QOS) and Network Performance (NP) are defined.

The QOS is measured on customer-to-customer basis, while the NP, between the network termination point A and the other network termination point B, eliminating the influence by customer's premises equipment and customer's human factor.

Thus, parameters such as loudness, percentage of calls with excessive distortion or percentage of calls failed due to network congestion are categorized as NP, while the quality of conversation, the successful connection ratio (SCR), etc. are categorized as QOS.

To indicate the reliability performance of the network, "failure rate" or "MTBF (Mean Time Between Failures)" statistically estimated from data on reported failures are used.

In reporting failures, it is necessary to describe the phenomena of failure and measures taken for fault correction precisely.

The fault claimed from a customer sometimes is of "fault not found" or "right when tested", and such a fact should be clearly mentioned in the report.

Table 1-10-1 is the achievements gained in national operation system for the period from 1987 to 1991.

Reviewing the statistical data, there are found a series of annually taken data showing an irregular jump or dip at a certain year without any remark.

It is desirous to specify, in detail, sources of data, means of collecting data, etc. to obtain meaningful data for a later evaluation.

#### 1.5 Improvement of SCR

##### 1.5.1 SCR in Recent Five Year Period and Causes of Low SCR

According to data (1987 to 1991) on telephone service for whole Indonesia, the SCR achieved for local automatic

telephone are shown in Table 1-10-1.

Table 1-10-1 Achievement in National System (%)

Type of Service	Measures	1987	1988	1989	1990	1991
<Phone charge bill>	6 days	79.2	68.9	87.0	91.6	97.2
<Total interruption> auto/100sst/month	5 times	6.0	6.9	5.8	5.9	5.5
<Fault restoration>						
Aerial Cable	2 days	74.1	69.8	82.5	71.2	73.2
Cable Underground	7 days	73.6	65.9	81.1	66.4	68.3
House & Set inst'n	2 days	71.3	75.2	85.0	75.5	74.9
Exchange & MDF	1 day	68.8	65.6	78.7	48.8	64.6
Coin Box	3 days	72.1	72.6	79.2	78.6	76.3
<Total phone pulse claim>	0.09%	0.08	0.09	0.09	0.07	0.08
<Settlement of pulse>						
Claim in Jakarta	3 weeks	8.6	7.1	8.1	29.5	56.5
Outside of Jakarta	1 month	56.5	32.9	34.7	34.0	43.7
<SCR in MEA>						
Local auto Ex	60%	29.7	31.7	30.4	39.1	42.8
SLJJ	45%	24.1	23.2	22.8	19.0	22.0

Note: MEA: Multi-Exchange Area

According to Table 1-10-1, the data on telephone service for whole Indonesia, the SCR achieved for local automatic telephone are gradually being improved, but still remains at lower level, around 40% against the target value, 60%.

The region suffering most seriously from low SCR is Jakarta multi-exchange area.

The SCRs as to the subscribers accommodated in EWSDs and PRXs in Jakarta multi-exchange area were only 11.8% and 12.5%, respectively, according to the report "Network Performance in Jakarta Multi-Exchange Area (for improvement of telecom. network)" by PMC-V, 1991 and the details of the results are shown in the Table 1-10-2.

The lost calls at originating stage is attributed partly to obsolete subscribers' network, and partly to improper subscribers' behavior. The obsolete subscribers' network needs to be replaced or rehabilitated and the improper subscribers' behavior could be rectified through a positive campaign by PT. TELKOM, but it will be a time

consuming task.

The lost calls at terminating stage could have been caused by Subscriber Busy for EWSDs or No Answer for PRXs.

The lost calls within network could mostly be attributable to the network portion, i.e., lack of transmission circuit, etc., however, there may be cases attributable to subscribers' behavior.

The lost calls at terminating stage may be caused by "Subscriber Busy" for EWSDs and "Subscriber Busy" and No Answer" will be made through implementation of Pilot/Trial/Rehabilitation Project.

Table 1-10-2 Current SCR in Jakarta Multi-Exchange Area

CATEGORY	CAUSES OF LOST CALLS	PROPORTION OF CALLS (%)			
		PRX		EWSD	
Successful Calls		12.5		11.8	
Lost Calls at Originating Stage	Non-Dial/Release	23.1	13.3	21.9	17.1
	Non-Dial/Timeout		9.8		4.8
	NU Connection (Reroute)	2.3	2.3	3.7	3.7
Lost Calls Within Network	TRGP (Trunk Group Busy)	7.8	7.8	8.2	8.2
	Internal Loss	26.9	2.4	32.4	0.0
			5.7		0.1
			3.9		14.2
			14.9		18.1
Partial Dial/ After Seizure (Note 1)					
Lost Calls at Terminating Stage	Subscriber Busy	27.3	10.8	21.9	14.0
	No Answer		16.5		7.9
	T O T A L	100 %		100 %	

Note 1 : Lost calls due to "Partial Dial" may be attributable to subscribers' behavior; however Partial Dial here is categorized as a cause of lost calls within the network since most of the partially dialled calls are lost after circuit seizure thus resulting in the losses physically within the network.

Note 2 : Sampled 19 PRXs (local)  
 Sampled 6 EWSDs (combined)  
 Sampled 18 EWSDs (local)

Note 3 : Analysis made on originating outgoing traffic including SLDD calls but excluding intra-unit calls

Note 4 : NU Connection = Number Unobtainable Connection  
 = Lost calls due to subscribers' Wrong Dialling, Partial Dial before seizure.



### 1.5.2 Projects to Improve Operation and Maintenance

#### (1) Short-term Solution

To improve the SCR, the short-term solution focussed on metropolitan Jakarta network which exhibits very low SCR is proposed. The short-term solution is to:

- a) identify key customer by exchange location;
- b) prepare an overlay network to transfer about 50,000 key subscribers from selected PRX exchanges and providing facilities as appropriate;
- c) introduce unified seven digit numbering scheme; and
- d) serve high-rise buildings by fiber-optic cable.

#### (2) Medium-term Solution

The medium-term solution to improve SCR is proposed by the PMC and they include the Pilot Project (SCR Attack 1), the Trial Project (SCR Attack 2) and the Rehabilitation Project to be carried out in Jakarta multi-exchange area. The former two projects are implemented mainly in PELITA-V, however, it will complete in the early stage of REPELITA-VI, while the latter (Rehabilitation Project) is to be implemented in REPELITA-VI.

After reviewing the results of the above three projects, the guideline for REPELITA-VII to improve further the SCR of whole networks in Indonesia will be prepared.

##### a) Pilot Project (SCR Attack 1)

Pilot Project aims at evaluation of a number of possible measures to improve SCR and is to be implemented in one local exchange area in Jakarta MEA (Multi-Exchange Area). Measures to be taken include:

- provision of appropriate number of circuit groups;
- provision of line-hunting system for "busy subscribers", etc.

To enable these measures more effective, promoting campaign to eliminate call loss due to human behavior and marketing effort to subscribers to adopt the line-hunting system, etc. are indispensable.

This project is carried out by one adhoc group comprising of 7 engineers in a variety of fields including "marketing" personnel, in the period from October 1992 to August 1994 including three months for preparatory work.

b) Trial Project (SCR Attack 2)

The target area in SCR Attack 2 will be extended to a specific tandem area that includes the local exchange area in Pilot Project.

Required number of staffs depends on the number of local switches involved in the tandem area selected.

The project aim, measures to be taken, necessity of campaigning and marketing are same as in the Pilot Project mentioned above.

The period required is from January 1993 to August 1994 including three months for preparatory work.

c) Rehabilitation Project

Rehabilitation of subscribers' network is one of measures to improve the SCR.

The scope of services to be provided under the Rehabilitation of subscribers' network in Jakarta includes:

- measurement of local cable pair characteristics;
- replacement of obsolete/faulty cables;
- check and replacement of dropwires;
- replacement of damaged DP housings;
- replacement of damaged Cross Connection Cabinet;
- anti-dewing treatment of housings;
- installation of duct systems, if required;
- preparation of As-Built Drawings;
- arrangement of junction network;
- provision of required digital interfaces;
- updating Station Data, if required;
- deloading CPU of switches;
- promotion of marketing activities;
- obtaining of road digging permits as required;
- updating Plant Record;
- compiling and analysis of the past Fault Record;
- arranging complete Trunking Diagram; and
- collection and analysis on Traffic/Network Performance Data.

This project is scheduled to start on the middle of 1994 and continues to the middle of 1997, after

the International Competitive Bidding (ICB), for all the local exchange areas belonging to the remaining five(5) tandem areas.

d) List of general countermeasures to improve SCR

General countermeasures possible to improve the SCR are shown in the Table 1-10-3 below.

Table 1-10-3 Countermeasures for Improvement of SCR

<Incomplete & Wrong Dialling>
* Public Campaign "How to handle Telephone Sets"
* Timely Update of Directory "New & Changeover"
-----
<Called Subscriber Busy>
* Increase of Telephone density
* Line Hunting facilities
* Call Waiting Services
-----
<No Answer>
* Answering phone
* Call Forwarding
* Campaign "No Immediate Call Repeat, when busy"

(3) On-going OPMC Project (Phase I)

Locations of OPMC (Phase I) under implementation include one existing OPMC in Bandung and twelve (12) other OPMCs in Jakarta Utara, Jakarta Pusat, Jakarta Selatan, Jakarta Barat, Jakarta Timur, Medan, Surabaya Utara, Surabaya Selatan, Ujung Pandang, Palembang, Denpasar and Semarang.

(4) OPMC Project (Phase II)

The OPMC Project (Phase II) should furnish eleven (11) locations which are originally planned and four (4) newly added locations as follows:

- a) Original plan: Banda Aceh, Louksuawe, Pematang Siantar, Padang, Pakanbaru, Jambi, Bandar Lampung, Yogyakarta, Solo, Malang and Banjarmasin.
- b) New addition: Tangerang, Bekasi, Depok and Bogor.

## 2. HUMAN RESOURCES DEVELOPMENT PLAN

### 2.1 General

To support corporatization of PT. TELKOM and decentralization of functions in PT. TELKOM and to enhance the operation and maintenance, development of human resources is essential.

As to the PT. TELKOM staff efficiency, it is considerably lower than the international level and it has to be improved.

Progressive digitalization and rapid expansion of the network towards ISDN, requires use of far more sophisticated equipment than conventional one and introduction of a computerized network management system.

As a result, qualitative improvement of PT. TELKOM staff, especially in technical capability is considered imminent.

To meet such requirements, a ratio in number of technical staff to non-technical staff should be raised and distribution of PT. TELKOM staff in terms of educational levels should be modified to an adequate proportion for reinforcing management, operation and maintenance of the telecommunication system.

### 2.2 PT. TELKOM Staff Efficiency and Composition

PT. TELKOM staff efficiency expressed in the number of staff/1000 DEL at the end of 1991 is 32 and the target figure at the end of REPELITA-VI is set at 10 for whole Indonesia.

The staff efficiency may differ WITEL by WITEL depending on number of planned line units, density of subscribers, easiness of access from the maintenance center, etc.

Taking these factors into account, the staff efficiency toward the end of REPELITA-VI for each WITEL region and for both 3.5 and 5.0 MLU Expansion Plan is estimated and shown in Table 1-10-5. According to the estimation, the staff efficiency in WITEL IV for 5.0 MLU Plan will reach 6, while the same in WITEL XII, 27 in 1998.

Since there will be a rapid expansion of DEL in REPELITA-VI, total number of staff to be newly employed during REPELITA-VI will amount to 16,020 for 3.5 MLU Plan and 25,700 for 5.0 MLU Plan. Number of staff to be employed by PT. TELKOM is shown below.

Table 1-10-4 The Number of New Employees Estimated

Category	Number of New Employees	
	<3.5 MLU basis>	<5.0 MLU basis>
<hr/>		
<Specified Field>		
Technical	11,740 (2,348)	17,060 (3,412)
Non-technical	3,980 ( 796)	8,640 (1,728)
<hr/>		
<Qualification>		
University	7,590 (1,518)	9,530 (1,906)
Academy	5,080 (1,016)	8,070 (1,614)
High/Jun.High Sch.	3,350 ( 670)	8,100 (1,620)
<hr/>		
Total	16,020 (3,204)	25,700 (5,140)

Note: figures in ( ) show the number of staff / annum.

FILE:STAFF.WJ2

Table 1-10-5 Staff Efficiency by WITEL at the End of REPELITA-VI

WITEL & Others	No. of staff		L.U.Capacity(*1000)		Staff Efficiency	
	Sept/81	Dec/91	3.5MLU/98	5.0MLU/98	/KDEL/3.5	/KDEL/5.0
I	3155	3268	25	4416	449	449
II	1826	1891	5	2546	255	255
III	2248	2328	45	3174	341	341
IV	7320	7581	0	10188	2425	3125
V	3703	3835	5	5159	826	1226
VI	3805	3941	75	5371	498	498
VII	5235	5422	5	7291	829	1229
VIII	2167	2244	5	3021	244	244
IX	1713	1774	90	2474	262	262
X	2652	2747	35	3726	295	295
XI	714	739	80	1074	51	51
XII	952	986	80	1405	64	64
Sub-Total	36480	36757	450	49846	6539	8039
Staff (H/Q)	3667	2400	-	2400	-	-
Total	39157	39157	-	52246	-	-
Others	348	349	-	349	-	-
Grand Total	39506	39506	-	52595	-	-
Column No.	B	C	D	E	F	G
						H
						I
						J

Notes: B/C: No. of staff in Sept/Dec 1991

D: Adjustment due to dispersiveness of subscribers to estimate "E" and "F"

E/F: Estimated no. of staff in 1998 for 3.5m/5.0m expansion plan

G/H: Required l.u. capacity in 1998 for 3.5m/5.0m expansion plan

I/J: Staff efficiency in 1998 for 3.5m/5.0m expansion plan

## 2.3 Enhancement of Human Resources

### 2.3.1 Staff Recruitment in REPELITA-VI

According to the foregoing analysis, number of staff to be recruited each year in REPELITA-VI period is estimated as 16,020 persons for 3.5 MLU Plan and 25,700 persons for 5.0 MLU Plan. It seems to be not so easy to collect such a big number of staff, especially of university graduated staff who are excellent and match to PT. TELKOM's expectation.

To insure the scheduled recruitment of fresh staff, it is recommended to take the following measures, e.g., to;

- (1) make utmost effort to recruit excellent graduates from university/academy/high school through promoting appropriate public relation activities; and
- (2) expand the capacity of STTT (Skolah Tinggi Teknik Telekomunikasi) to meet the requirement.

Note: The STTT is the university established by PT. TELKOM as a subsidiary in 1990, with 3.5-year education solely in telecommunication engineering course. No. of students accommodated in each year is approximately 1,000.

Currently studying students are composed of mostly senior high school graduates and a small number of PT. TELKOM staff (several ten staffs depending on test results).

Students should have passed a very stringent competitive entrance examination.

### 2.3.2 Staff Training

For operation and maintenance of newly provided telecommunication facilities, training of PT. TELKOM staff to adapt to newly introduced telecommunication systems is very important for insuring smooth transition from conventional analog/digital to ISDN environment.

Thus, to cope with a rapid development of network, it is recommended to;

- (1) expand the training capacity of the Central Training Center and Regional Training Center (RTC) for PT. TELKOM staff. For CTC, it seems difficult to expand the training facilities within the existing site space. It is recommended to have the second CTC in Bandung or in Jakarta. In this case, it is desirous

to concentrate the technical training at the present CTC and the other training, at the second CTC, because the most of model communication facilities and laboratory equipment are existing in the present CTC, and it is not economical to remove these facilities to the other site.

- (2) reinforce the project-associated training in the manufacturer's factories and also in Indonesia.

### 3. NETWORK MANAGEMENT PLAN

#### 3.1 General

Telecommunications networks in Indonesia have been developed by PERUMTEL up to September 24, 1991 and thereafter by PT. TELKOM through implementation of a number of telecommunication projects under PELITA-I through PELITA-IV and currently under PELITA-V.

Recently the telecommunications network is being rapidly digitalized globally and in Indonesia as well.

Digitalization of the network promotes provision of enhanced functions to telecommunication services to meet the public demands.

Further development of telecommunications network towards ISDN inevitably augments the role of telecommunications in social activities.

In such a situation, if a certain kind of failure in the backbone telecommunications network occurs, for example, both business and personal activities may undergo a serious damage.

Thus the telecommunications network should be managed to prevent such a damage from happening or to minimize the damage.

And conventionally the management has been made separately for individual facility, i.e., for individual switching equipment and for individual transmission system and management in such a manner will not only become inefficient, but also sometimes lead to a confusion in the network operation. And to overcome such problems mentioned above, adoption of the integrated network management system (IMS) is considered indispensable.

Adopting the IMS for PT. TELKOM's network in this country, will give advantages, firstly, in ensuring continuous monitoring of overall status of the networks and secondly in easing difficulties in operating and maintaining the telecommunications network systems.



It is noted that there has been some recent development in this connection as follows:

- (1) PT. TELKOM signed a contract with AT&T Network Systems Nederland B.V. (AT&T) for provision of IMS facilities and for training program in February 27, 1991 and thereafter AT&T carried out IMS survey and submitted the report for supporting;
  - a) digital SPC exchanges at RNCC (Regional Network Control Center) MFOS (Multifunction Operations System);
  - b) digital transmission supervisory systems at NNCC (National Network Control Center) MFOS TNS (Total Network Surveillance);
  - c) analogue SPC exchanges at RNCC MFOS;
  - d) satellite transmission supervisory systems at NNCC; and
  - e) analogue transmission supervisory system at NNCC.

According to the above contract (original) the IMS systems will be completed within 13 months from the EDC (Effective Date of Contract) for NNCC (Bandung), RNCCs (Jakarta, Bandung and Surabaya) and the training, within 57 weeks from the EDC. The training is scheduled for managers, specialists, an instructor, technicians and operators, and the total training will amount to 2017 days.

(2) Fourth Telecommunications Project

The Fourth Telecommunications Project under finance by IBRD includes the project component to support for PT. TELKOM's 1992 - 1996 investment program in Java, Bali, Nusa-Tenggara, Kalimantan and Sulawesi which would comprise "establishment of a modern network management system to improve network supervision and to improve traffic monitoring and management.

Installation of the IMS is scheduled to start from 1992 and to complete in 1996. The Fourth Telecommunications Project also includes the technical assistance program for IMS, which requires defining, assistance in acceptance test and in implementation of operational procedures.

**3.2 Present Status of Network Management**

At present, the switching system, in general, is provided with the alarm and control devices on equipment by

equipment basis or system by system basis and the transmission system, on system by system or route by route basis, and there is no unified supervisory and control system to cover the switching and transmission systems.

The operation and maintenance of outside plant is normally being carried out by a regional OPMC (Outside Plant Maintenance Center).

### 3.3 Introduction of Integrated Management System

#### 3.3.1 Background

As the telecommunications network expands and the equipment used in the network becomes more and more sophisticated applying new technology, then, operating and maintaining the network in a conventional manner will no longer be adequate, especially, in the event of occurring an abnormally large traffic load or a difficult failure, which may lead to degradation of the SCR or to a serious interruption of communication. To solve such problems, PT. TELKOM proposed, in Fourth Telecommunications Project, to install Integrated Network Management Systems(IMS) in Jakarta, Surabaya, Medan, Bandung, Ujung Pandang and Banjarmasin for monitoring the performance of the local and long distance network components so as to optimize the traffic load distribution or to rectify facility failure, and made a contract with AT&T Network System Nederland B.V. for supply and installation of IMS(ATT/MFOS) on 27th, February, 1991.

World Bank intends to appoint an experienced consultant to assess in the following tasks to complement the ATT(MFOS) system:

Task A: Define and specify the system concept, and design integrated network management system(s) for the local and the long-distance networks;

Task B: Assist PT. TELKOM in acceptance testing of the system installed by the contractor; and

Task C: Assist PT. TELKOM in implementation of the operational procedures associated with the IMS.

Thereafter, as a part of contract for 350,500 line units and 50,000 trunk/tandem circuits digital telephone exchange No.5ESS, additional provision of IMS facilities has been requested (Addendum 2(IMS)). Additional provisions are as follows:

- (1) NNCC/MFOS(Expansion)  
1 location (BD) and 7 data-links
- (2) RNCC/MFOS(Expansion)  
3 locations (JKT, BD & SB)
- (3) RNCC/MFOS(New Installation)  
7 locations (MDN, PBR, JB, SM, DPR, BPP and UP)
- (4) Model Test System(Expansion)  
1 location (BD)

These addendum works are scheduled to start at completion of the phase-1 work and to complete within 36 months.

It is noted that the location of the NNCC has been changed from Bandung to Jakarta, and the location of RNCC at Banjarmasin, to Balikpapan.

### 3.3.2 Establishment of Network Center

Development of networks by PT. TELKOM to cope with public demands in Indonesia in these several years has been so rapid that in carrying out network planning, network management and information management in the conventional methods would no more be effective for maintaining communication services continuously and smoothly.

It is recognized that the introduction of PLANITU for network planning and IMS/MFOS contracted on February, 1991 is considered as one of important approaches for further network development.

In such a circumstance, establishment of a network center aiming at network planning, network management and information management would become necessary, however, an anticipated large scale alteration in corporate organization based on decentralization policy will call for making some adjustment in functions of the network center due to reasons as follow:

- a) Holding company will manage the subsidiary companies through furnishing a strategic plan, and controlling and auditing the company's management, however, the holding company won't be involved directly in operation and maintenance of the network owned by the subsidiaries.

- b) A subsidiary company for backbone long distance terrestrial network manages the backbone terrestrial transmission system and switching system composed of secondary centers (SCs) and tertiary centers (TCs) only.
- c) A subsidiary company for regional network manages regional transmission systems accessing up to the SC from the primary centers (PCs) and local exchanges (LEs), and local cable networks.
- d) A subsidiary company for domestic satellite system manages networks via PALAPA satellite between TCs, SCs, PCs and LEs will become a new separate company by the end of 1993.

Followings are the functions of the network center.

(1) Network Planning

To provide satisfactory communication services to the public, timely installation of switching, transmission and local cable facilities of an appropriate capacity is considered indispensable. At present, such a planning work is implemented by PT. TELKOM Headquarters, however, due to the decentralization policy by PT. TELKOM, many of those engineers who had been in charge of planning work in the Headquarters were transferred to WITELs and as a result, the planning capability in the Headquarters has been considerably lowered.

The Network Center will strengthen and unify the planning activities in various fields such as switching, transmission, subscriber cables.

Taking into account change of corporate structure, the national network planning is recommended to be undertaken by the subsidiary company for the long-distance network, and the planning work is to be limited to the backbone terrestrial transmission system together with the secondary and tertiary centers.

And the regional network planning work undertaken by the regional network center is to be limited to the regional network composed of transmission systems, primary center and local exchanges.

As a tool for network planning, computers and the associated software with training for PT. TELKOM operator have already been provided to PT. TELKOM by PLANITU.

Training for PLANITU is now being implemented.

The network planning should also include as its subfunction, data collection and database management.

The data and database imply those relating to the network planning, however, when necessary, the data and database may be used for other purposes.

Since the national network plan is interacted with the regional network plan and satellite network plan each other, an appropriate coordination should be made through guidance by the holding company.

## (2) Network Management

Network management aims at management of performances, faults (or maintenance), configuration, accounting and security, while the current IMS project is to provide functions:

- a) "alarm" processing and display;
- b) "NE(Network Element)" maintenance;
- c) data collection and reporting;
- d) transmission facilities;
- e) user programmability;
- f) access security management; and
- g) electronic mail facility between all IMS users.

And PT. TELKOM intends to expand the system by adding the following functions:

- h) dynamic network management;
- i) configuration management;
- j) accounting management; and
- k) network performance management.

It is recommended that the national network management is also undertaken by the subsidiary company for long-distance backbone network system, while the regional network management, by the regional network center.

similarly to the network planning, regional network management should be undertaken by the regional network center and coordination between networks is necessary.

## (3) Information Management

"Information" implies those relating to administration of departments, personnel, accounting and financial management. These data, may be used for the network management if necessary, and for information management system. Some of the information such as

corporate data or database collected in individual subsidiary companies shall be sent directly to computer center in the holding company for processing and furnishing to its top management.

(4) Organizational Structures

Considering particular constraints derived from characteristics and structures of new corporate organization, the nationwide network management should be undertaken by the subsidiary company for long-distance backbone network and the regional network management, by the regional subsidiary companies.

The National Network Center (NNC) is to be located at Jakarta and the Regional Network Center (RNCs), at Jakarta, Bandung, Surabaya, Medan, Ujung Pandang and Balikpapan. The training facilities are to be installed at Central Training Center in Bandung.

The organization(s) and associated facilities and personnel for IMS and PLANITU existing before establishing the network centers are to be combined into a single new organization, i.e., NNC.

(5) Staffing

Required number of staff for the NNC and RNC is estimated as shown in the following Figure:

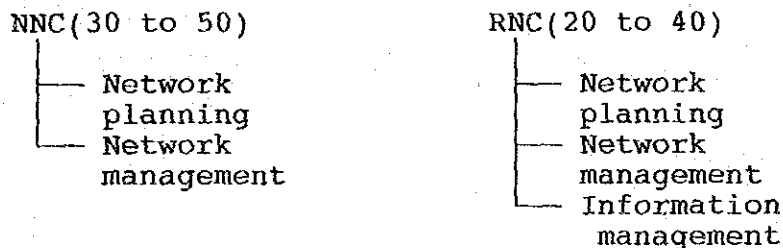


Figure 1-10-2 Required Number of Staff and Tasks

Figures given are provisional because the required number of staff depends largely on capability of staff and the size of network involved.

It is recommended to recruit the staff through outsourcing and request them to work and transfer relating technology to PT. TELKOM for five years at least.

4. INFORMATION RESOURCE MANAGEMENT POLICY

The word "Information" implies here those pertaining to employee, inventory control, accounting, customer billing, financial and any other information relating to corporate management.

Data or database as resources can become useful information only after making an appropriate processing, and the information itself is considered as resources or assets for company management, like human resources, physical assets, etc. especially in coming information society towards ISDN environment.

Nowadays, it is becoming a common understanding that companies who fail to manage information well will be difficult to survive in the information oriented society.

In the Fourth Telecommunication Project by the World Bank is included the technical assistance for improving and strengthening the accounting systems and financial function by a consulting team, and the further step after the technical assistance is to establish an appropriate MIS (Management Information System) to furnish the corporate top management the useful and comprehensive information processed from various data and database concerning corporate management.

**SECTION 11**  
**INVESTMENT VIABILITY ASSESSMENT**





## SECTION 11 Investment Viability Assessment

Viability of the investment program for REPELITA VI is assessed from three different viewpoints. One is from corporate financial point of view. Next one is based on project financial evaluation. The last one is from project economic evaluation. (Table 1-11-1)

The latter two identify conceptual viability of a program or a project while the first one incorporates realistic conditions of operations. Also objectives of assessments are different. The objectives of the latter two are evaluation of an isolated program or project and the first one's is assessment of impacts of the investment on the executive body's entire operations.

Its great importance and hazardless nature tend to make solution of the development of the telecommunications network adopt lower cost approach with technical considerations. This assessment is based on the approach.

Since the results of the financial and economic evaluations are favorable as a development program, the corporate financial point of view is stressed herein. In addition, to compensate difficulty of quantifying economic benefit of the program, economic impact display and its utilization idea are incorporated.

### 1. Concept and Framework of Evaluations

#### 1.1 Concept of Evaluations

Financial and economic evaluations aim to assess financial and economic viability of investment program or project. These evaluations are rather conceptual. Economic evaluation is more conceptual than financial evaluation since economic evaluation employs perspective of society while financial evaluation is based on executive entity's perspective. Benefit and cost of economic analysis are not directly related to actual monetary flow. Objective project is isolated from other operations of the executive body to identify its own cost and benefit. (Table 1-11-1)

Also both evaluations are isolated from nominal changes of value such as inflation and foreign exchange rate fluctuation to reveal essential viability of the project. Net present value and internal rate of return (IRR) are typical means to value the project.

#### 1.2 Framework of Evaluations

In this study, financial evaluation is based on assumptions employed in or developed from the corporate financial projection and analysis. Based on the financial

evaluation, the economic evaluation is conducted. In the economic evaluation, value added tax, discounted portion of the public phone tariff system, and other economic benefit are incorporated in association with economic cost adjustment. In addition to the above indirect benefit and cost, the relational mechanism of network development impact are identified in the economic evaluation. Favorable effects on global environment is also stated. An example of an applicable program for better utilization of the mechanism to enhance indirect benefit in rural area is displayed.

Objects of the financial evaluation are the entire REPELITA VI investment program and individual projects while one of economic evaluation is only the entire program. Differences of revenue and cost conditions among WITELs are incorporated in financial evaluations for the individual projects.

## 2. Program Financial Evaluation

The program financial evaluation is conducted to identify financial viability of the REPELITA VI investment program itself. The result of FIRR 19.31 percent indicates that the program basically retains satisfactory level profitability for the PT. TELKOM.

### 2.1 Method and Conditions

As mentioned in SECTION 2, development of the telecommunications network covering entire Indonesia is considered as the prerequisite of its social and economic development. Tendency of solutions to adopt lower cost approach with technical considerations derived from the above is enhanced by telecommunications network's hazardless nature. Economic and financial evaluations are based on this approach.

Program financial viability is measured mainly by the profitability indicator derived from per line unit development cost and pulse productivity, and construction period in association with financial internal rate of return (FIRR). Result of project cost estimate in SECTION 9 is used as development cost and its disbursement. Operation and maintenance cost and revenue base are based on the corporate financial projection stated later part of this SECTION. Tax and interest payment are excluded from expenditure since the corporate financial projection covers these aspects. Project life cycle is 15 years.

Disbursement and development schedule are listed in Table 1-11-2 and -3. Basic conditions, and expenditure and revenue calculation are as same as the corporate financial projection. Modification is made for marketing pattern

from first year 40 percent, second year 50 percent, and third year 10 percent of marketable capacity, which is 80 percent of developed capacity, to first year 65 percent and 35 percent second year of marketable capacity with same marketable capacity ratio. As explained in Table 1-11-1, inflation factor is eliminated from this calculation.

In addition to the original financial evaluation sensitivity analyses are conducted to identify the influence of development cost fluctuation. Because two factors, which are technological advancement and rural area network development, make future development cost uncertain. The analyses are by two cases. One is 20 percent higher development cost and the other is 20 percent lower development cost than the original.

## 2.2 Result

As shown in Table 1-11-4, FIRR is 19.31 percent, cost to benefit ratio 1.26 and benefit minus cost is 2.0 billion U.S. dollars in terms of net present value discounted by 13 percent interest rate. This indicates rather higher profitability as a development program. Theoretically this investment program can earn money as if necessary fund is lent somebody with interest rate of 19.31 percent. This indicates that the program is viable up to approximately 19.31 percent interest rate fund ideally.

Condition of this profitability is without inflation consideration. Simple way to appreciate this FIRR ratio is to compare with the market interest rate discounted by inflation ratio which is about 10 percent at present. This program looks very attractive. In real situation, however, telecommunications tariff, for example, can not be increased parallel to the inflation. Therefore detailed examination is required to identify actual profitability.

Overall the financial evaluation indicates essentially good financial viability of the program.

## 2.3 Sensitivity Analysis

Uncertainty of the development cost is the most considerable factor for the financial evaluation since conditions of construction, and changes in price of equipment, facilities and construction materials for the REPELITA VI period are unforeseeable. Development of information technology and associating decrease in price per unit capacity are very fast now. Scale of rural area network development in the REPELITA VI program has never been seen in the country.

From this reason sensitivity analysis for development cost is conducted. In the case 1 development cost is increased by 20 percent while the case 2 employs 20 percent decrease in the cost.

As shown in the table 1-11-5 and 1-11-6 FIRR for the case 1 is 15.93 percent and one for the case 2 is 23.86 percent. The result of the case 1 indicates marginal profitability for the private company while the case 2's may satisfy private investors.

### 3. Program Economic Evaluation

The program economic evaluation is to identify economic viability of the REPELITTA VI investment program itself. The result of the evaluation indicates program's profitability for the nation of Indonesia.

#### 3.1 Method and Conditions

Since socio-economic impact of the telecommunications network development involves so many kinds of benefits which are practically impossible to quantify, qualitative analysis of the network development in general is important. For this reason, characteristics of telecommunications network development impact and its utilization idea for rural development is stated in advance to the result of quantitative economic evaluation.

The quantitative economic evaluation is based on the program financial evaluation. To apprehend revenue as economic benefit, public phone's tariff is raised as same level as subscriber's, and outsider's portion of international telephone charge, WARTEL charges and other charges is incorporated. In addition to the above, value added tax of 6 percent of sales is also considered as benefit. Economic viability of the program is measure by the economic internal rate of return (EIRR).

#### 3.2 Socio-Economic Impact of the Telecommunications Network Development

As shown in the Figure 1-11-1, telecommunications network is characterized by three main features: connecting remote areas, relatively low cost communications, and speediness. Along with the development of the network, spatial coverage and traffic capacity increase, and quality of telecommunications is improved. Then provision of advanced services which require better quality, larger traffic volume, and larger number of network users becomes feasible. (Figure 1-11-2)

As mentioned in SECTION 2, development impact of the telecommunications network is categorized in two. One is

macroscopic impact and the other is the microscopic impact. Macro-impact include driving effects toward information society and toward global society/economy in collaboration with advancement of information technology and development of transportation network. (Figure 1-11-3)

A special note for one of the characteristics of the information society is the energy efficient society. Sophisticated information technology and telecommunications network linkages bestow great energy saving effect on the society. Global environmental degradation by energy consumption associating the economic development/growth is lessened by the telecommunications network development.

Energy saving effect of the telecommunications network is explained by its substitution effect too. One aspect of the telecommunications is substitute for actual trips. The telecommunications network development saves energy which is expected to be consumed for trips for meetings being done without it. Furthermore the telecommunications network is substitute for letters. This substitution is also saves energy for letter transportation which is more energy consuming than the telecommunications.

Micro-impact occurs on every type of individual entity. By increased and/or improved communication and/or accessibility to relating/transacting or potential transacting entities, individual entity is raised its potential of more choices, more chances, better decision, and more efficiency for its business, life, amenity, etc. (Figure 1-11-3 and -4)

As well known, well-developed telecommunications network is indispensable for industrial and business advancement. Speediness and effective intra- and inter-transaction through telecommunications network has been changing locational advantages of industries in association with development of transportation. Enhanced availability of market information for sales and procurement enables not only efficient operations but also increases business chances. Worldwide operation is realized by the telecommunications network development.

For rural area development, the telecommunications network has a great potential as same reason as the above. Market needs, technological information, input procurement information, meteorological information and so on, become more easily available to rural peasant through the network development. With these information rural area can utilize its potential like following manners:

- (1) With market needs, rural people have higher possibility to produce commodity and goods

corresponding to the needs in appropriate time;

- (2) With market needs, rural people have higher possibility to find out market which accept or value their products;
- (3) With technological information, rural people have higher possibility to innovate their production technology for cost reduction, quality improvement, and productivity increase;
- (4) With input procurement information, rural people have higher possibility to procure input with better quality and/or lower price;
- (5) With input meteorological information, rural people have higher possibility to avoid climatically caused damage; and etc.

Telecommunications network enhances nationwide/worldwide personal communication which is key for diffusion of new idea/technology. Development of telecommunications network helps people to improve their knowledge and know-how. This results in level up of the people with informal education or self-education.

In addition to that, telecommunications network enables rural people direct contact/transaction with provider and purchaser of service, goods, and information who are located in regional, national, or world centers. This could eliminate intermediately exploitation and enable efficient transactions.

Furthermore, frequent telecommunications to the separated family, relatives, and/or friends provide amenity to the users. Through the telecommunications information of and access to social services including medical services/advice are able to be enhanced. Accessibility of people live in isolated area could be enhanced.

In this way telecommunications network development in rural areas expedite rural development directly and indirectly.

### 3.3 Telephone Subsidy Program for Rural Area Development

Following is the brief idea of the telephone subsidy program for rural area development.

#### I. Program Objective

Enhancing Cooperatives' activities by providing telephone facilities.

II. Program Contribution to the Development

- (1) Equity Development
- (2) Rural Development
  - A) Economic Development
    - 1) Agricultural Improvement
    - 2) Agro Industry Development
  - B) Social Development
    - 1) Fostering New Value System Fitting to the Present Social Conditions
    - 2) Widening Recognition of Rural Peasants

III. Program Effects

- (1) Economic Development
  - A) Agricultural Improvement
    - 1) Diffusion of new technology/know-how and new inputs for cultivation
    - 2) Market oriented production fostering
    - 3) Increase in environmental information influencing cultivation
    - 4) Diffusion of organizational and institutional development knowledge
    - 5) Efficient agricultural inputs purchasing
    - 6) Increase in fund procurement information
    - 7) Speedup in business transaction
  - B) Agro Industry Development
    - 1) Diffusion of agro-industry technology/know-how and inputs
    - 2) Increase in accessibility to market demand/needs information
    - 3) Diffusion of agro-industry management know-how and information
    - 4) Efficient procurement



- 5) Increase in fund procurement information
- 6) Speedup in business transaction

(2) Social Development

A) Fostering New Value System Fitting to the Present Social Conditions by;

- 1) Diffusion of new social ideas  
Contraception, Importance of Education, Global Environmental Perspective, Self-help Minds, etc.
- 2) Diffusion of new social system  
New Neighborhood/Community Relations, New Family/Relatives Relations, etc.

B) Widening Recognition of Rural Peasants by;

- 1) Increase in communication and exchange with national/regional centers
- 2) Increase in communication and exchange with other rural areas

(3) Basic Concept of Telecommunication's Functions and Socio-Economic Impacts

A) Functions

- 1) Increase in Data/Information Transaction Volume
- 2) Increase in Communications Speed
- 3) Increase in Communications Density
- 4) Improve in Communications Quality
- 5) Diversification of Communications Opportunities
- 6) Diversification of Telecommunications Means

B) Socio-Economic Impacts

- 1) Increase in Social and Business Opportunities
  - a) Fundamental Effects

- i) Removal of Barrier of Time/Distance
  - ii) Expansion of Spatial Extent of Social and Economic Exchange
  - iii) Increase in Interdependency of Regions
- b) Secondary Effects
- i) Diffusion of Innovation (New Idea)/Increase in General Knowledge
    - Diffusion of New Technology and Know-how
    - Diffusion of New Institution
    - Diffusion of New Value System
  - ii) Increase in Knowledge of External World
    - Increase in Sales Market Information
    - Increase in Knowledge of Business Environment
    - Increase in Fund Procurement Information
- 2) Increase in Communications/Information Processing Efficiency
- a) Increase in Information Disposal (Transaction) Speed
    - i) Business Transaction
    - ii) Monetary Transaction
  - b) Increase in Information Handling Capacity
  - c) Increase in Information Quality
  - d) Streamlining Effect
    - i) Increase in Procurement Market Information
  - e) Substitution/Complement of Transportation
  - f) Complement of Other Telecommunications Means

#### IV. Target Population

Rural Peasants

V. Executive Agency

VI. Program Description

- (1) Provision of subsidy to cooperatives in rural area  
  
Governmental organization pays to PT. Telkom for installation of telephones to cooperatives.
- (2) Provision and education of telephone use knowledge/know-how
- (3) Provision and education of organizational telephone operation and maintenance system
- (4) Development of new telephone using activities for cooperatives

3.4 Result

As shown in Table 1-11-7, EIRR is 26.08 percent, cost to benefit ratio 1.6 and benefit minus cost is 4.6 billion U.S. dollars in terms of net present value discounted by 13 percent interest rate. In addition to that large amount of consumer surplus is inferred. Therefore, higher EIRR than this result shall be deduced from the calculation incorporating the consumer surplus.

Besides the consumer surplus, the above stated qualitative benefits implies higher EIRR than this calculation in real situation. This indicates that economic viability of the program for the Indonesian nation is very high.

4. Basic Corporate Finance Forecast

The corporate finance forecast is conducted to identify impacts of the REPELITA VI investment program on the PT. TELKOM. The projection model used for this evaluation displays PT. TELKOM's profitability, fund requirements, and financial compositions.

4.1 Method and Conditions

A corporate accounting model is used for the corporate financial projection. The model used in this study is based on the model provided by PUSRENLITBANG, PT. TELKOM. Modification was made by the study team to fit the model for the particular study purposes. The assumption is summarized in Table 1-11-8. Special note here is that every 5 years 20 percent tariff increase starting from FY 1995 is already incorporated as a basic assumption. Another note is that streamlining effort of PT. TELKOM to decrease staff number per 1,000 main line unit is also

incorporated. Furthermore, PT. TELKOM's sharing ratio of international call is raised 5 percent annually from 45 percent in 1993 to 60 percent in 1996.

Given detailed assumption listed in the Table A 3-7, the model calculates development expenses and quality improvement expenses, marketing and utilized capacity, revenue from telephone and other services operations, depreciation cost, staff number and staff cost, and general administration cost. Based on these figures, the model further calculates required fund, loan repayment and interest payment in parallel with compilation of the accounting statements.

Analysis of the corporate financial condition is mainly based on the profitability. Through profitability analysis, burden of development loan is clarified. Financial composition is not so important for the PT. TELKOM since it embraces firm revenue base of its main operation. For understanding of the sensitivity of the development scale, another basic corporate financial projection is conducted for the development of 3.5 million line unit capacity which is the basic component of the REPELITA VI program.

#### 4.2 Profitability and Other Financial Analysis

Results of the basic financial projection for the full scale development and the case of basic component (3.5 million line unit capacity) only are displayed in Figure 1-11-5 and -6. Details of the full scale development case are shown in Table A 3-8 to -11.

Profit of PT. TELKOM becomes negative in FY 1997 in both case despite 20 percent tariff raising is applied in FY 1995. Amounts of losses grow just before FY 2000 at the point of the second 20 percent tariff raising. Tendency of deficits in each case is the same until FY 2000. However, the full scale case's deficit is larger than the basic component case.

From FY 2000 to FY 2003 deficits of the full scale case maintained the same level, while the basic component case's deficits increase. In FY 2004 both cases face deficits increases followed by decrease of deficits in FY 2005 due to the third 20 percent tariff increase. From the FY 2005 deficits of the full scale case are smaller than the basic component case's ones.

This comparison implies that short term negative investment impact caused by development expenditure correlate with the scale of development at the same time long term profitability correlate with the development scale too. Last three years' fast deficit increase are

due to increased development burden from 800,000 line units level capacity increase in the REPELITA VII period to 1,000,000 line units level capacity increase in the REPELITA VIII period. With basic assumptions, even in the REPELITA VIII period continuous 1,000,000 line units level capacity increase is burdensome for the company.

Figure 1-11-7, which is the result of sensitivity analysis that development cost inflation is assumed as 5 percent per annum instead of 10 percent in the basic projection, shows degree of development cost burden. It shows good profitability performance from FY 2000 at the time of the second 20 percent tariff increase. The third 20 percent in FY 2005 may unnecessary. Considering the present technological advancement, this 5 percent development cost inflation is possible. However, since the principle for the projection is not to deal with uncertainty optimistic, this assumption is not suitable for forecasting.

Annual average increases of capacity and number of main line unit connected from 1993 to 2008 are both 12 percent level. Annual average increases of operating and total income are both 15 percent levels due to tariff raising. On the other hand annual average increases of operating expenses, non operating expenses, and total expenses are 12 percent, 25 percent, and 16 percent levels respectively. These ratios display the reason of negative profitability. The reason is that non operating expense which represents payments of interests is a main cause of negative profitability.

Significant increase in interest payments for the long term debt described in the above implies enormous increase of long term debt and shortage of internal cash generation for investments. Balance sheet (Table A 3-9) shows, however, long term debt's rather moderate average annual increase ratio of 22 percent comparing to interest payment's 25 percent. Another factor to push interest payment is increase of unfavorable loan portion in total long term debt. Fund requirement calculation sheet (table A 3-10) clearly shows disproportionate increase of local loans.

Excessive reliance on debt for investments is clearly shown by Table A 3-11. Burden of debt and its service seriously harms profitability and stability of PT. TELKOM. Long term debt to total capital ratio starting 41 percent in 1993 rises continuously and exceeds 100% level in 2002. This investment program may exceed PT. TELKOM's financial capability unless revenue and/or equity increase(s).

There are four possible manipulatable factors for the improvement of profitability. They are revenue, interest payment burden, depreciation ratio, and operating cost.

Among them adequate level of operating cost streamlining is already incorporated into the basic assumptions. As shown in Figure 1-11-8, depreciation ratio lowering has effect to improve profitability in short to medium term. In medium to long term, payments of interest represented by non operating expense are larger than the basic projection. As a result profitability of this case in FY 2008 is almost the same as the basic and lower profitability is expected in further future.

## 5. Sensitivity Analysis

### 5.1 Direction of the Analyses

Analysis of the basic financial projection indicates solutions for the profitability are categorized in two direction. One is to increase revenue and the other is decrease interest payments.

For the revenue increase, there are two ways. One is to raise tariff and the other is to increase operating efficiency. The latter includes two means; raising or maintaining pulse productivity per main line unit currently assumed -1.5 percent declining annually and raising marketable or usable capacity currently assumed 80 percent.

The interest payment decreasing also has two directions. One is to increase equity and the other is to procure lower interest funds. The latter has two options. One is to have favorable interest rate for the government lending currently 13 percent annual. The other one is to issue specially low interest bond such as telephone user bond.

### 5.2 Sensitivity Analysis

Simple sensitivity analyses are conducted for following ways and purposes:

- (1) Adopt tariff increases by 30 percent instead of 20 percent for each 5 years from FY 1995 -- to identify the tariff raising sensitivity,
- (2) Adopt tariff increases for maintaining profitability (avoiding continuous increase) -- to identify the necessary tariff raising level to have profitability,
- (3) Marketable capacity set for 85 percent instead of 80 percent -- to identify effect of marketable capacity increase,
- (4) Apply no declining of pulse productivity per main line unit instead of 1.5 percent annual declining -- to identify effect of maintaining productivity per main

line unit,

- (5) Apply both marketable capacity of 85 percent and no declining productivity -- to identify combining effect of them,
- (6) Assume additional equity for local fund requirement -- to identify effect of no cost financing,
- (7) Assume all foreign official loans' interest rate of 8 percent -- to identify effect of massive low cost financing.

### 5.3 Revenue Sensitivity

Results of revenue sensitivity analyses are shown in Figure 1-11-9 to -13.

Each 5 years 30 percent tariff raising is not able to cover significant development impacts during FY 1997 to 1999 while, FY 2005's raising seems unnecessarily high. (Figure 1-11-9) To maintain profitability, tariff raising are necessary in FY 1995, 1997, and 2006 with rate of 30 percent, 20 percent, and 25 percent. These indicate that rather higher tariff raising are required for profitability in early stages. From the diffusion oriented point view, tariff raising should be kept minimum.

Figure 1-11-11 to -13 show sensitivity of operational efficiency improvement. Effect of marketable capacity increase is moderate. (Figure 1-11-11) No declining has larger impact than the marketable capacity increase. However, the latter can not cover the strong negative impacts during FY 1997 to 1999 too. (Figure 1-11-12) Even combine both efforts, the negative impacts during FY 1997 to 1999 are not able to be absorbed. (Figure 1-11-13)

Increasing marketable capacity is possible with accurate marketing research and effort for marketing itself. Pulse productivity maintenance might be possible if SCR ratio is heightened and not so high tariff raising are made. As shown in Figure 1-11-14 to -16 productivity seemed to be in slight upward trend from 1986 to 1990. Tariff raising in 1990 lowered productivity significantly. Keeping the present level productivity might be possible with conditions mentioned before.

### 5.4 Interest Sensitivity

Figure 1-11-17 and -18 show results of sensitivity analysis regarding financing with lower interest burdens. Figure 1-11-17 is a case that almost all necessary local funds are provided by additional equity. Even in this

case, the development impact during FY 1997 to 1999 is not absorbed though this measure requires huge amount of money for the additional capital. It seems that this type of financing is not necessary for the later period from FY 2004 to 2008.

Lower interest rate for foreign official loans has smaller effect to cover the development impact. However, in the long run it has certain effects. (Figure 1-11-18)

Realistically both case might be impossible. The first case's fund requirement is too large and the latter is too much dependent to the government. Consideration of other options of low cost fund procurement such as telephone user bond, or government purchasing bond is necessary.

## 6. Possible Scenarios for Implementation

### 6.1 Implications of the Analyses

Implication obtained from the above analyses is that both revenue increase measures and low cost financing are indispensable to carry out this huge investment program for the REPELITA VI. Study to find out optimal combination(s) of these factors requires detailed data, investigation and analyses, and political and managerial considerations. However, brief study for the implementation is conducted as following.

### 6.2 Possible Scenarios

From the point view of independence and self-help, PT. TELKOM's efforts to increase revenue should be the base of the discussion. Therefore, the case of combined efforts for raising marketable capacity and maintaining pulse productivity shown in Figure 1-11-13 is a starting point.

Tariff raising are maintained as same as the basic projection since minimizing tariff raising is important for the faster diffusion of telephone use. However, the raising ratios are very provisional figure. Detailed study on the tariff raising including tariff structure change is desirable.

Based on the case, equity finance for local fund requirement for the period from FY 1995 to 1998, which require huge amount of money, is assumed. Figure 1-11-19 shows the result. The severe development impact during FY 1997 to 1999 is completely covered and profits are secured whole through the projection period. However, total amount required for additional capital is 2.4 billion U.S. dollar.

Furthermore, assumption that special consideration of



interest rate of 8 percent for the foreign official loans occurred in the period from FY 1993 to 1997 is added. As shown in Figure 1-11-20, additional capital amounting to 1.4 billion U.S. dollar is enough to secure the profits.

This is one of the ways of thinking to solve the corporate financial problems for implementation of REPELITA VI program. There are many applicable options contributing corporate financial improvement. Some of them such as telephone user bond are mentioned while the above discussion.

Many feasible alternatives are able to be planned by combination of these options. Decision of adopting the plan is subject to the political and managerial considerations.

### 6.3 Recommendations

Immediate implementation of detailed studies for productivity improvement, the tariff review, and low cost fund raising methods are recommended to establish corporate financial policy.

Marketable capacity increase requires accurate planning based on the sophisticated marketing research, and marketing effort both sophisticated and enduring ones. Further study on these issues and practical training for the execution are necessary. SCR improvement is one of the key factors for the pulse productivity per line unit. Tariff structure and raising affects productivity seriously too.

The tariff raising study, requires balanced consideration between price elasticity of subscription and pulse production per line unit, and company's necessary revenue and profitability. Tariff structural consideration is also important to maximizing revenue increase.

Attractiveness and implementation viability analysis of the objective methods in terms of fund raising amount consists integral part of the fund raising study. Main options for fund raising shall be capital increase and low or no interest telephone user bond and/or telephone bond. Attractiveness such as profitability and soundness of the company, and viability of the business is key issue for the capital increase. Price elasticity of subscription might be a main issue for the telephone user bond issuance.

Necessary arrangement to acquired favorable interest rate loan and international call sharing rate raising are the key issues. This requires political approaches.

## Evaluation Structure

Table 1-11-1

	Corporate Financial Evaluation	Project Financial Evaluation	Project Economic Evaluation
Object	Executive Entity	Investment Program/Project	Investment Project/Program
Objectives	Evaluation of Financial Impacts of Investment Program	Evaluation of Financial Viability of Program/Project	Evaluation of Economic Viability of Program/Project
Perspective	Executive Entity	Executive Entity	Society
Value Term	Current Value (Realistic)	Financial Real Present Value (Conceptual)	Economic Real Present Value (Conceptual)
Purpose	Identification of Corporate Viability Profitability/Soundness Actual Fund Requirement etc.	Identification of Investment Viability Profitability for Investor	Identification of Investment Viability Profitability for Society

Table 1-11-2

## REPELITA VI Disbursement Schedule

(Mill. US\$)

	1993	1994	1995	1996	1997	1998	Total
3.5Mill							
Corp. Total	1,041.50	544.41	1,900.05	1,797.42	1,186.31	621.09	
Repelita VI	328.70	544.41	1,900.05	1,797.42	1,186.31	621.09	6,377.98
5.0Mill							
Corp. Total	1,041.50	544.41	1,954.72	2,198.37	1,477.91	1,022.04	
Repelita VI	328.70	544.41	1,954.72	2,198.37	1,477.91	1,022.04	7,526.15
Mobile	0.00	40.29	241.67	161.12	161.12	241.70	845.90

Table 1-11-3

## REPELITA VI Development Schedule

(Line Unit)

	1993	1994	1995	1996	1997	1998	Total
3.5Mill							
Construction	963,577	449,754	705,259	1,418,099	785,181	876,942	4,235,235
Remove	163,913	76,507	114,197	249,347	109,595	118,641	668,287
Increased	799,664	373,247	591,062	1,168,752	675,586	758,301	3,566,948
Mobile		0	0	0	0	440,000	440,000
5.0Mill							
Construction	963,577	449,754	705,259	1,418,099	1,485,181	1,676,942	5,735,235
Remove	163,913	76,507	114,197	249,347	109,595	118,641	668,287
Increased	799,664	373,247	591,062	1,168,752	1,375,586	1,558,301	5,066,948
Mobile		0	0	0	0	440,000	440,000

Table 1-11-4 Calculation for Program Financial Evaluation

Year	Expenditure			Revenue			Net Cash				
	FIRR	B/C	B-C Dis. Rate	Disburse.	Oper. Improve.	Total	Charge	Install.	Rental Intern'l	Others	Total
	19.31%	1.25974	2001.32	13.00%							
1993		328.70	0.00	328.70	0.00	328.70	0.00	0.00	0.00	0.00	0.00
1994		544.41	0.00	560.85	16.44	560.85	0.00	0.00	0.00	0.00	0.00
1995		1,954.72	35.75	2,034.13	43.66	2,034.13	58.21	23.07	21.96	5.15	113.91
1996		2,198.37	95.69	2,435.45	141.39	2,435.45	226.89	72.55	74.75	15.43	411.59
1997		1,477.91	190.45	1,919.67	251.31	1,919.67	547.90	142.17	179.14	35.24	958.49
1998		1,022.04	271.45	1,618.70	325.21	1,618.70	994.44	218.58	310.89	58.46	1,682.15
1999		0.00	362.53	738.84	376.31	738.84	1,494.34	270.28	473.64	124.18	2,514.95
2000		0.00	395.41	771.72	376.31	771.72	1,831.19	198.40	549.59	154.50	2,924.01
2001		0.00	396.48	772.79	376.31	772.79	1,891.37	54.00	549.59	153.77	2,848.78
2002		0.00	398.96	775.26	376.31	775.26	1,863.00	0.00	549.59	153.06	2,765.69
2003		0.00	397.74	774.05	376.31	774.05	1,835.05	0.00	549.59	152.35	2,737.04
2004		0.00	386.84	763.15	376.31	763.15	1,807.53	0.00	549.59	151.66	2,708.82
2005		0.00	379.89	756.20	376.31	756.20	1,780.41	0.00	549.59	150.98	2,681.03
2006		0.00	374.91	751.22	376.31	751.22	1,753.71	0.00	549.59	150.30	2,653.65
2007		0.00	371.08	747.39	376.31	747.39	1,727.40	0.00	549.59	149.64	2,626.68
2008		0.00	360.56	736.86	376.31	736.86	1,701.49	0.00	549.59	148.99	2,600.11
2009		0.00	352.67	728.98	376.31	728.98	1,675.97	0.00	549.59	148.34	2,573.95
2010		0.00	317.94	664.74	346.80	664.74	1,521.37	0.00	506.49	140.39	2,352.61
2011		0.00	269.52	570.05	300.52	570.05	1,298.59	0.00	438.91	128.31	2,025.57
2012		0.00	182.05	389.52	207.48	389.52	883.08	0.00	303.02	104.66	1,401.06
2013		0.00	94.46	204.49	110.03	204.49	461.29	0.00	160.70	79.97	760.45

**Table 1-11-5 Calculation for Program Financial Evaluation  
(20% Development Cost Up)**

	FIRR			B/C			B-C			Dis. Rate			(unit: mill US\$)									
	15.93%			1.12242			1058.66			13.00%			Expenditure		Revenue					Net		
	Disburse.	Oper.	Improve.	Total	Charge	Install.	Rental	Intern'l	Others	Total	Cash											
1993	328.70	0.00	0.00	394.44	0.00	0.00	0.00	0.00	0.00	0.00	-394.44											
1994	544.41	0.00	16.44	669.73	0.00	0.00	0.00	0.00	0.00	0.00	-669.73											
1995	1,954.72	35.75	43.66	2,425.07	58.21	23.07	5.52	21.96	5.15	113.91	-2,311.16											
1996	2,198.37	95.69	141.39	2,875.12	226.89	72.55	21.97	74.75	15.43	411.59	-2,463.53											
1997	1,477.91	190.45	251.31	2,215.25	547.90	142.17	54.04	179.14	35.24	958.49	-1,256.76											
1998	1,022.04	271.45	325.21	1,823.10	994.44	218.58	99.78	310.89	58.46	1,682.15	-140.95											
1999	0.00	362.53	376.31	738.84	1,494.34	270.28	152.50	473.64	124.18	2,514.95	1,776.12											
2000	0.00	395.41	376.31	771.72	1,831.19	198.40	190.33	549.59	154.50	2,924.01	2,152.29											
2001	0.00	396.48	376.31	772.79	1,891.37	54.00	200.05	549.59	153.77	2,848.78	2,075.99											
2002	0.00	398.96	376.31	775.26	1,863.00	0.00	200.05	549.59	153.06	2,765.69	1,990.43											
2003	0.00	397.74	376.31	774.05	1,835.05	0.00	200.05	549.59	152.35	2,737.04	1,962.99											
2004	0.00	386.84	376.31	763.15	1,807.53	0.00	200.05	549.59	151.66	2,708.82	1,945.68											
2005	0.00	379.89	376.31	756.20	1,780.41	0.00	200.05	549.59	150.98	2,681.03	1,924.83											
2006	0.00	374.91	376.31	751.22	1,753.71	0.00	200.05	549.59	150.30	2,653.65	1,902.43											
2007	0.00	371.08	376.31	747.39	1,727.40	0.00	200.05	549.59	149.64	2,626.68	1,879.29											
2008	0.00	360.56	376.31	736.86	1,701.49	0.00	200.05	549.59	148.99	2,600.11	1,863.25											
2009	0.00	352.67	376.31	728.98	1,675.97	0.00	200.05	549.59	148.34	2,573.95	1,844.97											
2010	0.00	317.94	346.80	664.74	1,521.37	0.00	184.36	506.49	140.39	2,352.61	1,687.88											
2011	0.00	269.52	300.52	570.05	1,298.59	0.00	159.76	438.91	128.31	2,025.57	1,455.52											
2012	0.00	182.05	207.48	389.52	883.08	0.00	110.30	303.02	104.66	1,401.06	1,011.53											
2013	0.00	94.46	110.03	204.49	461.29	0.00	58.49	160.70	79.97	760.45	555.96											

**Table 1-11-6 Calculation for Program Financial Evaluation**  
 (20% Development Cost Down)

Year	Expenditure			Revenue							Net	
	Disburse.	Oper.	Improve.	Total	Charge	Install.	Rental	Intern'l	Others	Total	Cash	
	FIRR	B/C	B-C	Dis. Rate								
	23.86%	1.43535	2943.98	13.00%								
1993	328.70	0.00	0.00	262.96	0.00	0.00	0.00	0.00	0.00	0.00	-262.96	
1994	544.41	0.00	16.44	451.96	0.00	0.00	0.00	0.00	0.00	0.00	-451.96	
1995	1,954.72	35.75	43.66	1,643.18	58.21	23.07	5.52	21.96	5.15	113.91	-1,529.27	
1996	2,198.37	95.69	141.39	1,995.78	226.89	72.55	21.97	74.75	15.43	411.59	-1,584.18	
1997	1,477.91	190.45	251.31	1,624.09	547.90	142.17	54.04	179.14	35.24	958.49	-665.60	
1998	1,022.04	271.45	325.21	1,414.29	994.44	218.58	99.78	310.89	58.46	1,682.15	267.86	
1999	0.00	362.53	376.31	738.84	1,494.34	270.28	152.50	473.64	124.18	2,514.95	1,776.12	
2000	0.00	395.41	376.31	771.72	1,831.19	198.40	190.33	549.59	154.50	2,924.01	2,152.29	
2001	0.00	396.48	376.31	772.79	1,891.37	54.00	200.05	549.59	153.77	2,848.78	2,075.99	
2002	0.00	398.96	376.31	775.26	1,863.00	0.00	200.05	549.59	153.06	2,765.69	1,990.43	
2003	0.00	397.74	376.31	774.05	1,835.05	0.00	200.05	549.59	152.35	2,737.04	1,962.99	
2004	0.00	386.84	376.31	763.15	1,807.53	0.00	200.05	549.59	151.66	2,708.82	1,945.68	
2005	0.00	379.89	376.31	756.20	1,780.41	0.00	200.05	549.59	150.98	2,681.03	1,924.83	
2006	0.00	374.91	376.31	751.22	1,753.71	0.00	200.05	549.59	150.30	2,653.65	1,902.43	
2007	0.00	371.08	376.31	747.39	1,727.40	0.00	200.05	549.59	149.64	2,626.68	1,879.29	
2008	0.00	360.56	376.31	736.86	1,701.49	0.00	200.05	549.59	148.99	2,600.11	1,863.25	
2009	0.00	352.67	376.31	728.98	1,675.97	0.00	200.05	549.59	148.34	2,573.95	1,844.97	
2010	0.00	317.94	346.80	664.74	1,521.37	0.00	184.36	506.49	140.39	2,352.61	1,687.88	
2011	0.00	269.52	300.52	570.05	1,298.59	0.00	159.76	438.91	128.31	2,025.57	1,455.52	
2012	0.00	182.05	207.48	389.52	883.08	0.00	110.30	303.02	104.66	1,401.06	1,011.53	
2013	0.00	94.46	110.03	204.49	461.29	0.00	58.49	160.70	79.97	760.45	555.96	

(unit: mill US\$)

Table 1-11-7 Calculation for Program Economic Evaluation

Year	EIRR		B/C	B-C	Dis. Rate	Revenue										Net Cash	
	26.08%	1.597374				4602.789	13.00%	Disburse.	Oper.	Improve.	Total	Charge	Install.	Rental	Intern'l		Others
1993	328.70	0.00	0.00	0.00	328.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-328.70
1994	544.41	0.00	16.44	560.85	560.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-560.85
1995	1,954.72	35.75	43.66	2,034.13	2,034.13	60.01	23.07	5.52	39.93	5.17	141.71	5.17	141.71	5.17	141.71	5.17	-1,892.41
1996	2,198.37	95.69	141.39	2,435.45	2,435.45	233.18	72.55	21.97	124.58	15.51	495.86	15.51	495.86	15.51	495.86	15.51	-1,939.59
1997	1,477.91	190.45	251.31	1,919.67	1,919.67	562.30	142.17	54.04	298.56	35.43	1,158.05	35.43	1,158.05	35.43	1,158.05	35.43	-761.62
1998	1,022.04	271.45	325.21	1,618.70	1,618.70	1,019.67	218.58	99.78	518.15	58.81	2,029.89	58.81	2,029.89	58.81	2,029.89	58.81	411.19
1999	0.00	362.53	376.31	738.84	738.84	1,531.04	270.28	152.50	789.40	233.85	3,155.70	233.85	3,155.70	233.85	3,155.70	233.85	2,416.87
2000	0.00	395.41	376.31	771.72	771.72	1,873.53	198.40	190.33	915.98	324.26	3,712.65	324.26	3,712.65	324.26	3,712.65	324.26	2,940.93
2001	0.00	396.48	376.31	772.79	772.79	1,933.07	54.00	200.05	915.98	322.03	3,630.63	322.03	3,630.63	322.03	3,630.63	322.03	2,857.84
2002	0.00	398.96	376.31	775.26	775.26	1,904.07	0.00	200.05	915.98	319.83	3,540.33	319.83	3,540.33	319.83	3,540.33	319.83	2,765.06
2003	0.00	397.74	376.31	774.05	774.05	1,875.51	0.00	200.05	915.98	317.66	3,507.75	317.66	3,507.75	317.66	3,507.75	317.66	2,733.71
2004	0.00	386.84	376.31	763.15	763.15	1,847.38	0.00	200.05	915.98	315.53	3,475.67	315.53	3,475.67	315.53	3,475.67	315.53	2,712.52
2005	0.00	379.89	376.31	756.20	756.20	1,819.67	0.00	200.05	915.98	313.42	3,444.07	313.42	3,444.07	313.42	3,444.07	313.42	2,687.87
2006	0.00	374.91	376.31	751.22	751.22	1,792.37	0.00	200.05	915.98	311.35	3,412.94	311.35	3,412.94	311.35	3,412.94	311.35	2,661.72
2007	0.00	371.08	376.31	747.39	747.39	1,765.49	0.00	200.05	915.98	309.31	3,382.28	309.31	3,382.28	309.31	3,382.28	309.31	2,634.89
2008	0.00	360.56	376.31	736.86	736.86	1,739.01	0.00	200.05	915.98	307.30	3,352.08	307.30	3,352.08	307.30	3,352.08	307.30	2,615.22
2009	0.00	352.67	376.31	728.98	728.98	1,712.92	0.00	200.05	915.98	305.33	3,322.33	305.33	3,322.33	305.33	3,322.33	305.33	2,593.35
2010	0.00	317.94	346.80	664.74	664.74	1,554.92	0.00	184.36	844.15	296.01	3,052.20	296.01	3,052.20	296.01	3,052.20	296.01	2,387.46
2011	0.00	269.52	300.52	570.05	570.05	1,327.23	0.00	159.76	731.51	282.54	2,651.10	282.54	2,651.10	282.54	2,651.10	282.54	2,081.05
2012	0.00	182.05	207.48	389.52	389.52	902.55	0.00	110.30	505.03	257.45	1,881.85	257.45	1,881.85	257.45	1,881.85	257.45	1,492.33
2013	0.00	94.46	110.03	204.49	204.49	471.46	0.00	58.49	267.83	231.33	1,090.86	231.33	1,090.86	231.33	1,090.86	231.33	886.37

**Table 1-11-8 Major Condition and Assumption  
for  
Corporate Financial Forecast  
(Details for Calculation are Provided in Table A 3-7)**

1 . Projection Period	From 1993 to 2008
2 . Fiscal Year	From April 1 to March 31 (Actual FY is from January 1 to December 31)
3 . Development Plan	Based on Supply Plan prepared by the Team
4 . Investment System	PT. TELKOM as a sole investor in principle
5 . Value Term	Current Monetary Value
6 . Disbursement Pattern	2 years completion 1st Year:2nd Year = 60:40
Target Year:	25% (Even distribution for one year)
Previous Year:	50% (Actual disbursement for REPELITA
2 Years Before:	25% VI is incorporated)
7 . Marketing Pattern	1.5 years marketing Y1:Y2 = 80:20
Connectable Capacity:	80% (Even distribution for one year)
1st Year Marketing:	40%
2nd Year Marketing:	50%
3rd Year Marketing:	10%
8 . Revenue Calculation (Major Assumption)	
Pulse/Unit '92:	9,297
Tariff/Pulse:	100 (Tariff increase by 20% at every 5
Installation Fee/Unit:	500,000 years from FY 1995)
Monthly Charge/Unit:	90,000 (annual amount)
Declining Factor:	-1.5%
	(Revenue from PBH, International Call, WARTEL, Public Phones, and other services are calculated independently)
International Call:	Productivity of pulse increases 5% per annum until 2000. Sharing ratio for PT. TELKOM increase by 5 points annually up to 60% from 45% in 1993.
9 . Development Cost	
Unit Cost/LU '92 (US\$)	1,502 (2.5% of contingency is added to this) (Inflated by Exchange Rate increase)
10 . O&M Cost	Considered inflation and streamlining effort by PT. TELKOM
Depreciation:	25% per annum
11 . Loan Conditions	Separately considered by Foreign Official Loans (600 mill US\$ per annum) and Local Loans



Figure 1-11-1 Characteristics of Telecommunications Network

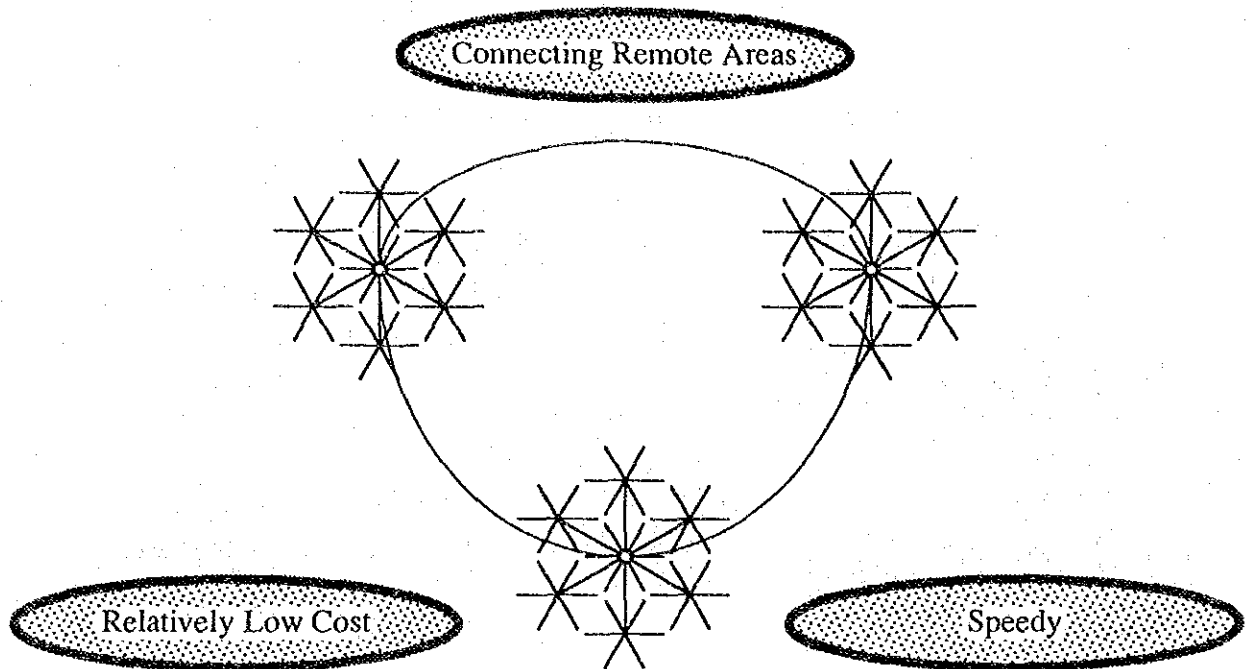


Figure 1-11-2 Network Development

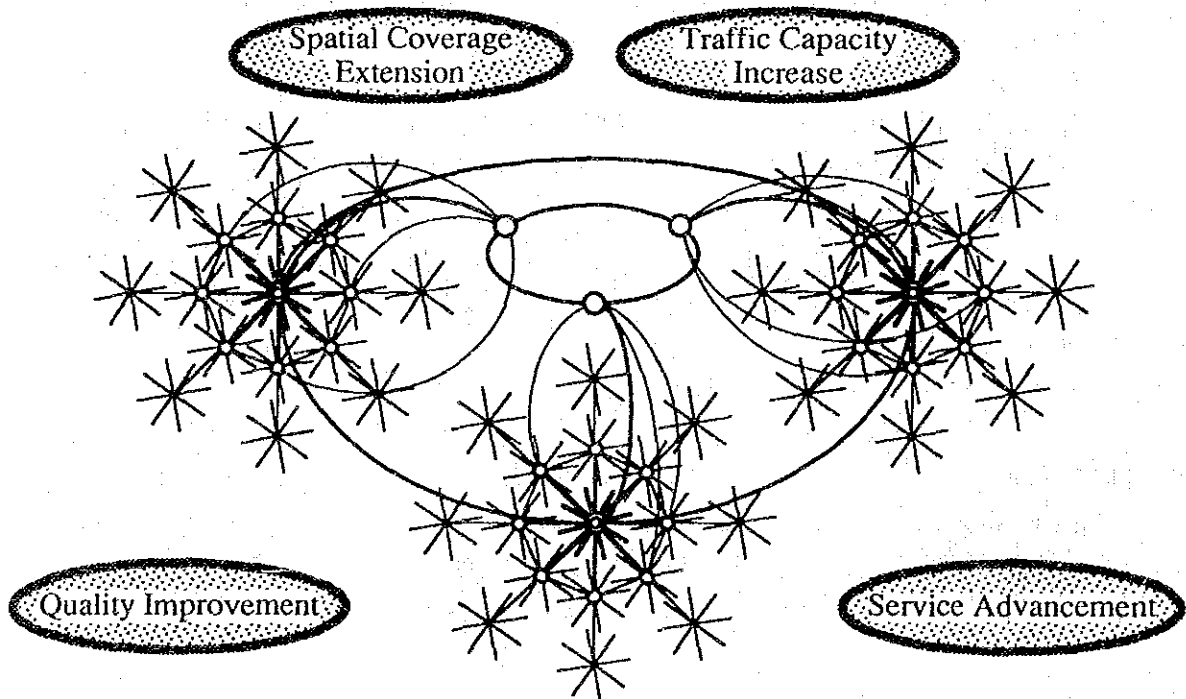


Figure 1-11-3 Effects of Telecommunications Development

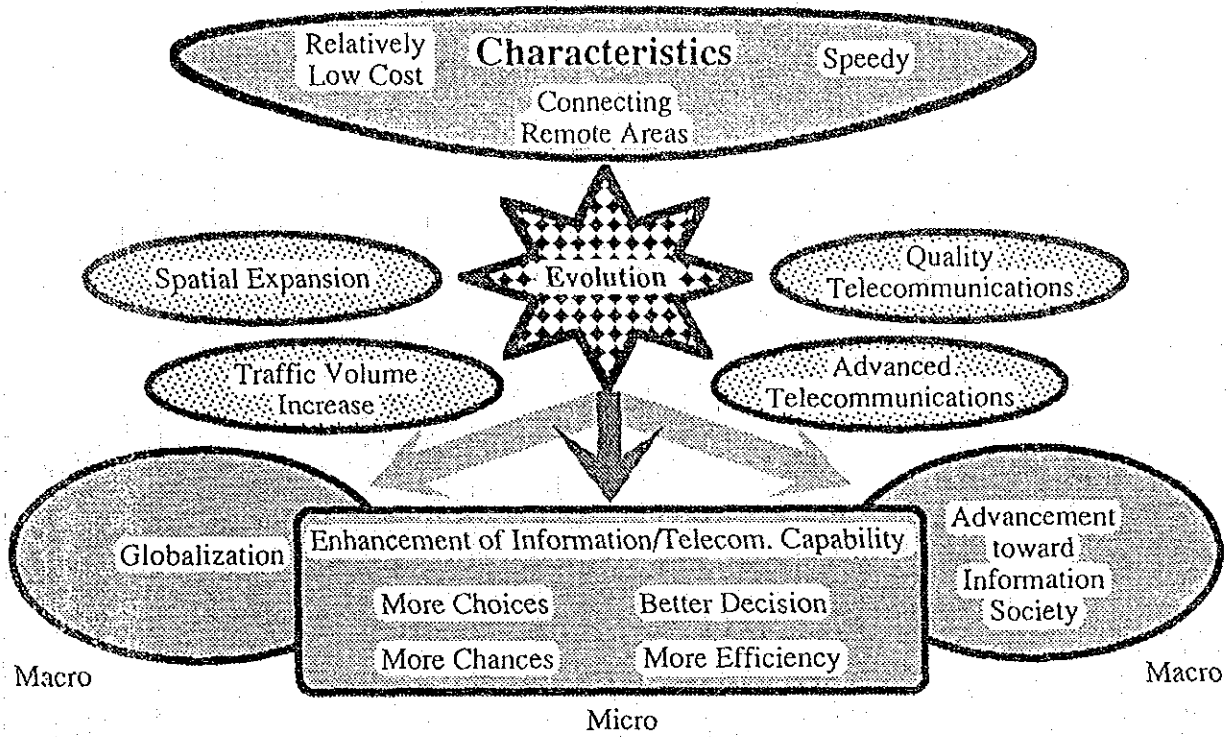


Figure 1-11-4 Micro-impact of Telecommunications Development

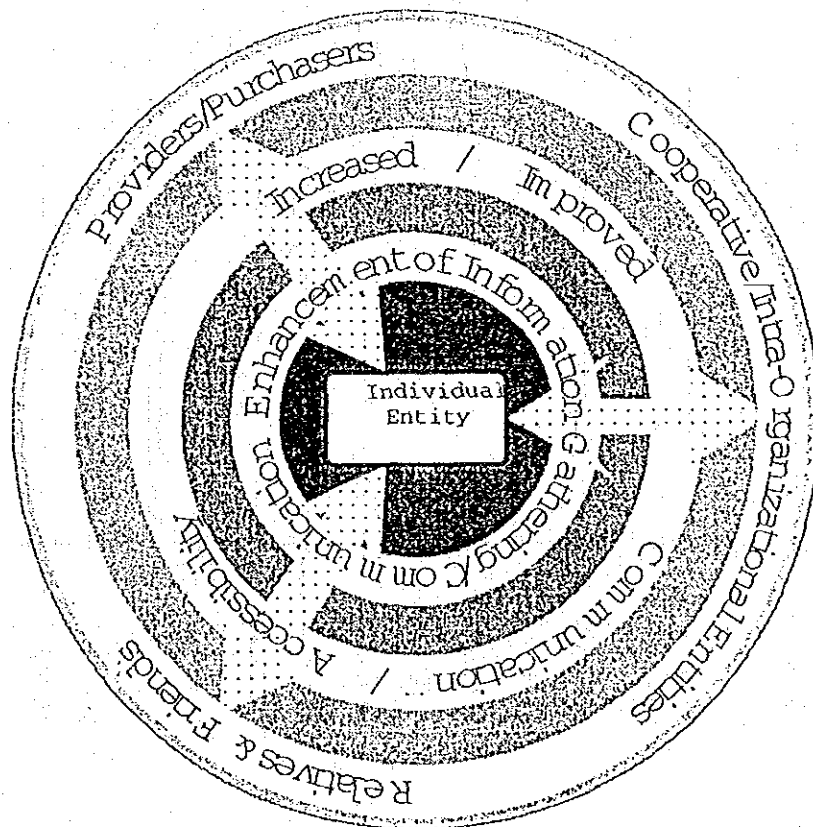
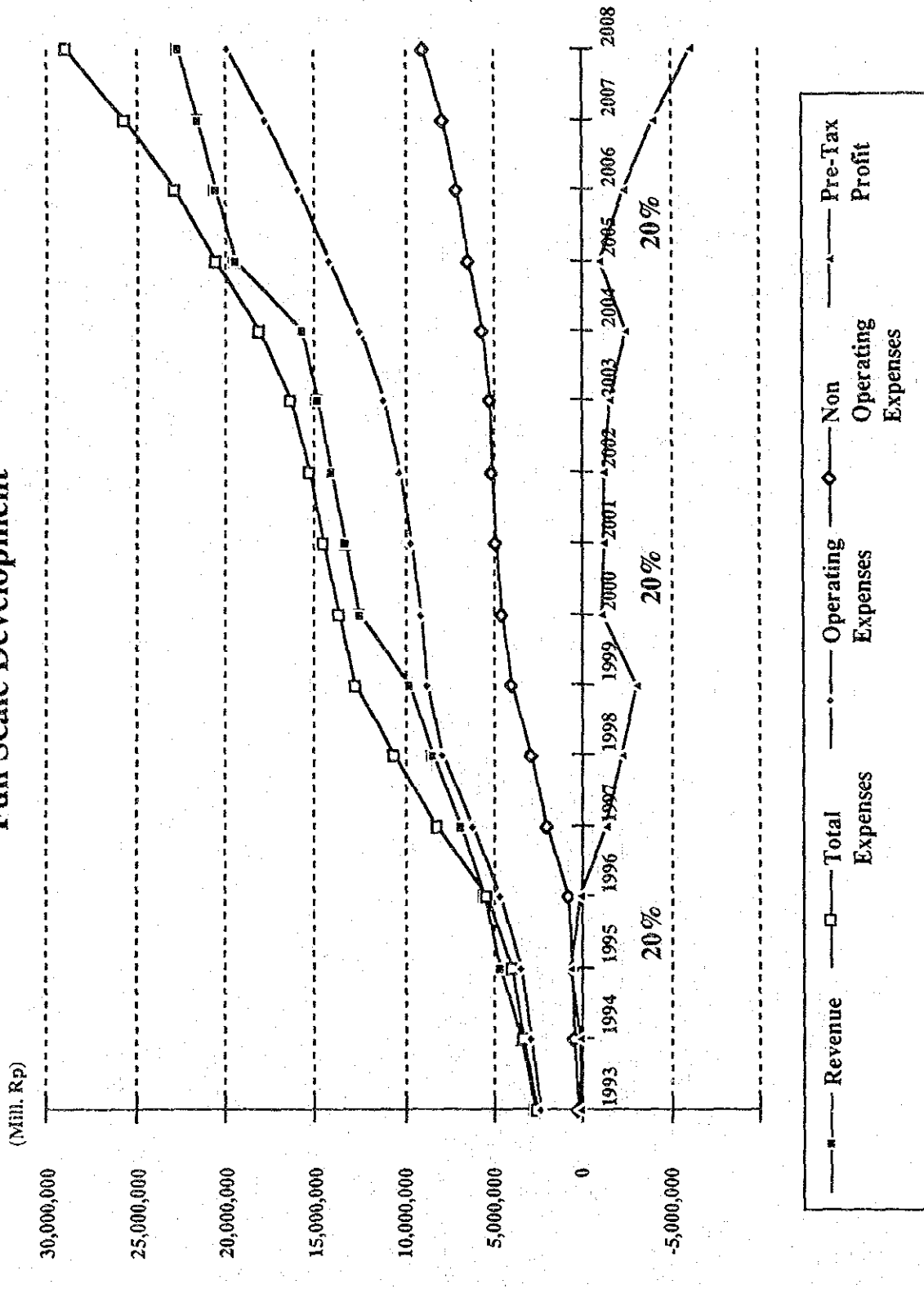


Figure 1-11-5  
Basic Corporate Financial Projection  
Full Scale Development



**Figure 1-11-6**  
**Basic Corporate Financial Projection**  
**Only Basic Component (3.5 Million)**

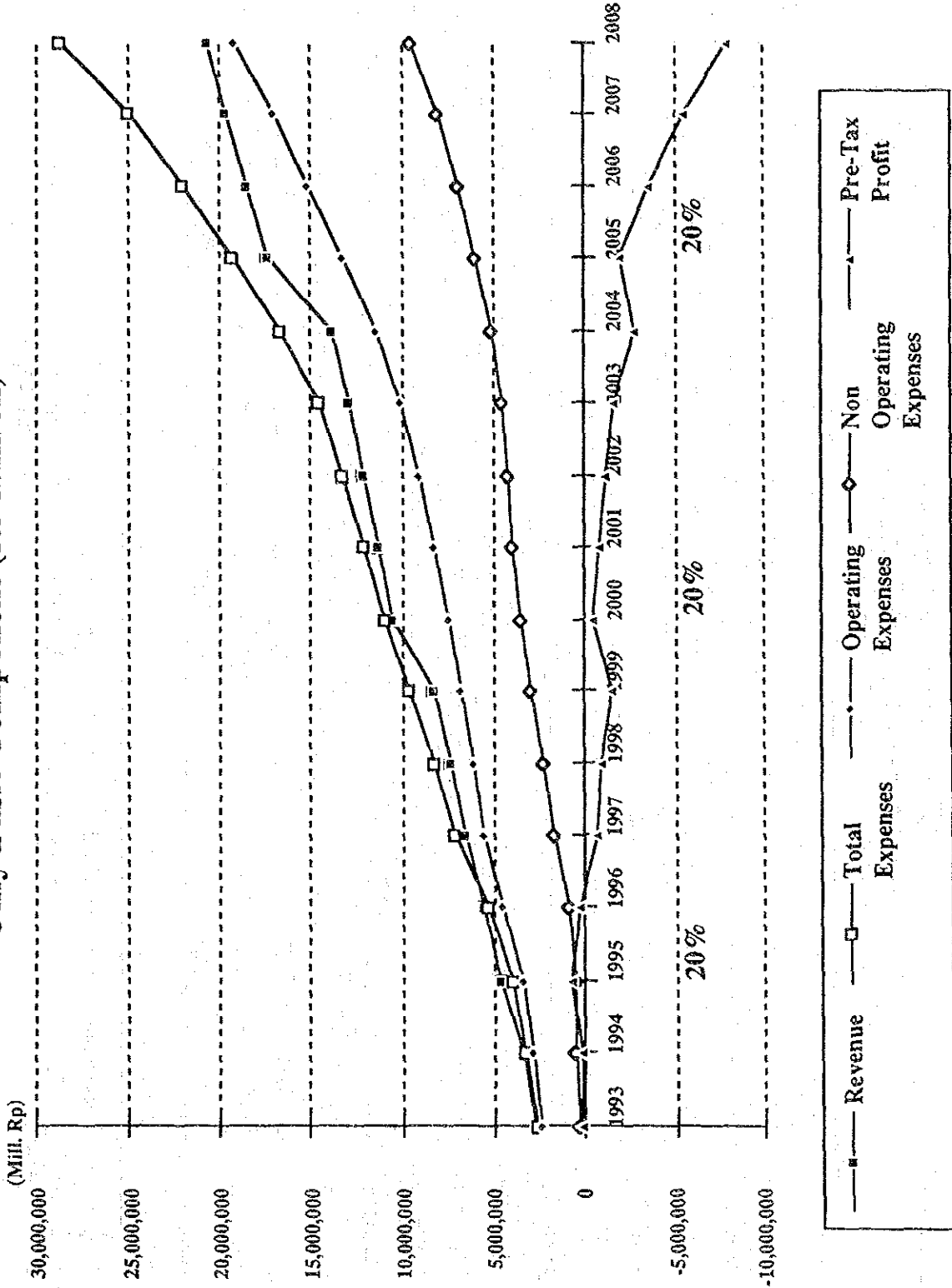


Figure 1-11-7  
 Corporate Financial Projection  
 Development Cost Inflation of 5%

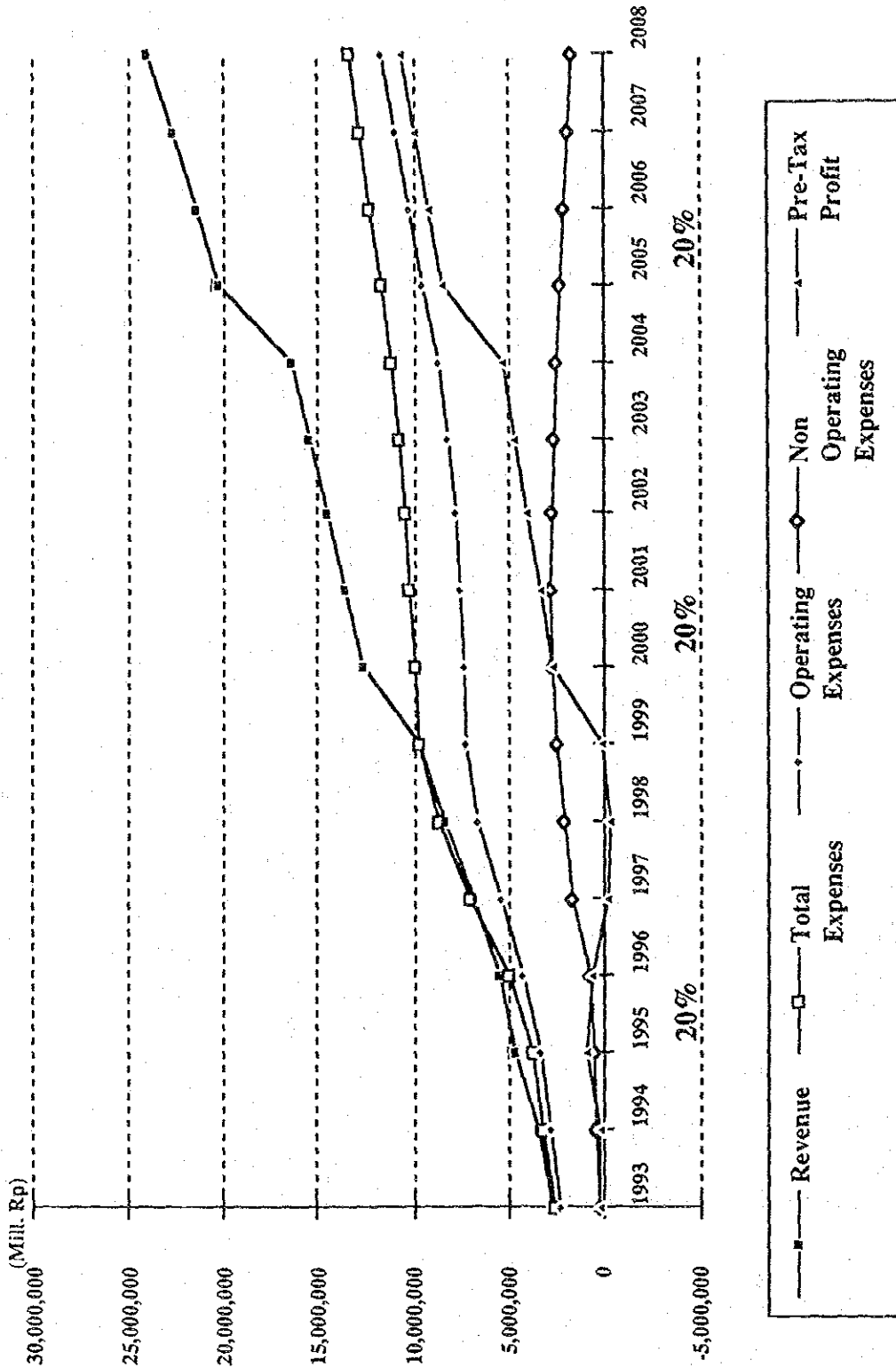


Figure 1-11-8 Corporate Financial Projection  
Depreciation Ratio of 12.5% (Half)

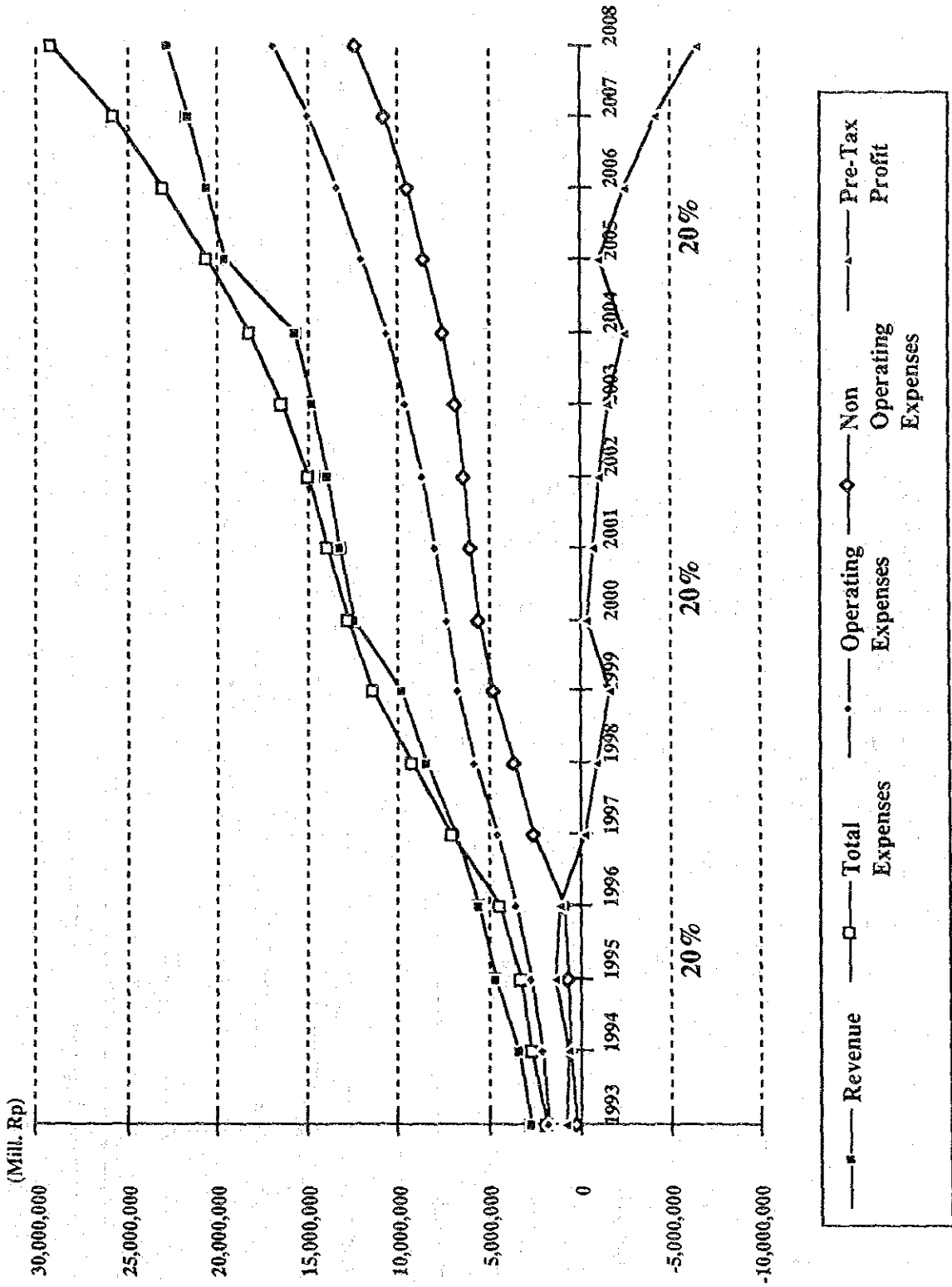


Figure 1-11-9  
 Corporate Financial Projection  
 Tariff Increase Sensitivity of 30%

