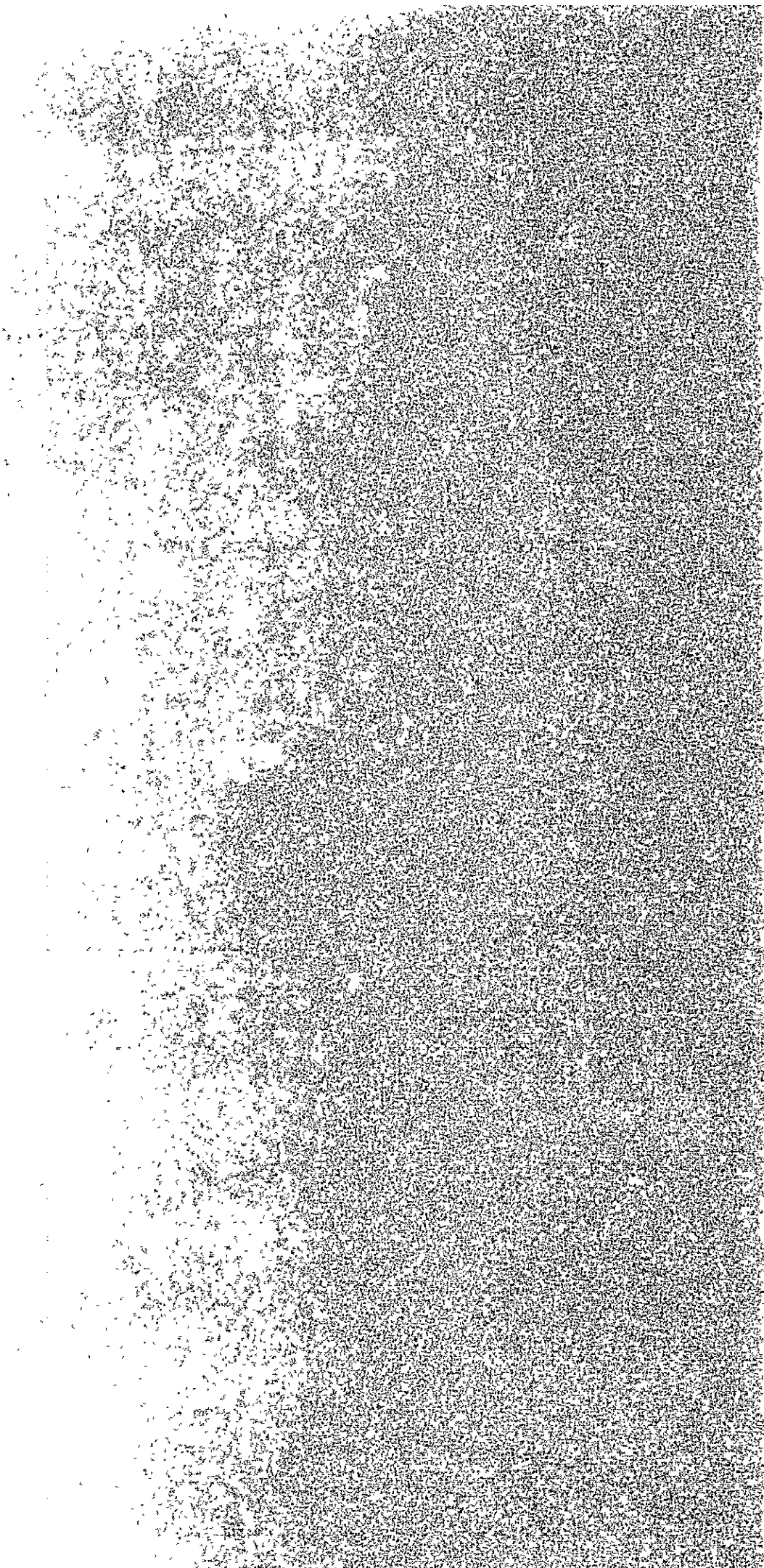


CHAPTER 6

PROJECT COST AND PROJECT PROGRESS SCHEDULE



Chapter 6 Project Cost and Project Progress Schedule

6-1 Estimation of Construction Cost

Table 6-1 and Table 6-2 present the construction cost estimates for the terrestrial radio system proposed in Chapter 4: Transmission Route Plan and System Design.

The construction work cost is based on the cost level as of 1979. The cost estimation uses the international tender prices for overseas projects in recent years as references. Table 6-1 cost estimate covers Phase I work, i.e., the basic trunk line construction connecting the Primary Center (Honiara) and Local Exchange (Auki, Gizo, Kirakira, Tulagi and Tenakaro).

Phase 1 Project is to satisfy the circuit demand in the initial stage. It does not include the construction work which is necessary for system expansion to meet with the circuit demand in the ultimate stage.

Table 6-2 cost estimate covers the construction work for branch lines from the basic trunk line that connects the abovementioned six exchange areas plus the system expansion work also referred to above.

These cost estimates are in the Japanese yen. The conversion of the yen values into the U.S. dollars and Solomon dollars is by the following exchange rates:

One U.S. dollar:	Equivalent to Japanese yen 220
One Solomon dollar:	Equivalent to Japanese yen 250

Since the construction work cost is estimated by the cost level as of 1979 as aforementioned, it will be necessary to consider a 6-8% (per year) increase for reason of cost rise due to inflation when the project is implemented in the future.

6-2 Implementation Schedule

The exchange construction plan for the six areas mentioned in the preceding Paragraph has already been decided. The exchange construction schedule for other areas than those six is now being studied and the construction work period is still pending. Therefore, it is proposed that, in the Phase I Project, the already decided trunk line construction no connect exchanges in the six areas be carried out, and the Phase II Project be executed when the local exchange construction plan has become definite, in accordance with the construction schedule.

The Phase II Project execution in accordance with the local exchange construction schedule makes it possible to provide the toll service to the subscribers immediately after the completion of the toll network and to

expect the toll service revenue. In other works, the system idling after the investment in system construction can be eliminated so that the desirable investment effect can be obtained.

Table 6-3 outlines the Phase I and Phase II project sizes. In the formulation of construction schedules, consideration has been made in order that the rational investment effect can be realized by means of gradual execution of construction work. In the table, the initial year is assigned to the detailed system design including field surveys, formulation of tender specifications, evaluation of offered proposals, land acquisition and civil works. In the second year, the construction work contractor will be decided and the equipment manufacture will be started. In the third year, the equipment installation will be completed and the acceptance test will be carried out, thus bringing the Phase I Project to completion and putting the system into operation.

For the Phase II Project, though the starting period cannot yet be defined, the construction work is to proceed in accordance with the local exchange construction schedule. Since the system design has already been completed, the Tender will be the first work procedure. Then, in the same order as the Phase I Project, the work will be executed to complete the whole Project.

Table 1

Table 6-1 Project Cost of Proposed System (Phase-I)

Item	Foreign Currency Portion		Local Currency Portion
	Thousand Japanese Yen	Equivalent US Dollars	Equivalent Solomon Dollars
1. Equipment Work Portion			
A. Communication equipment	576,128	2,618,764	-
B. Power plants	174,746	794,300	-
C. Cables	16,690	75,864	-
D. Antenna supporting structures	141,855	644,795	-
E. Maintenance facilities	97,420	442,818	-
F. Installation materials	34,778	158,082	-
G. Equipment shelters	166,647	757,486	-
H. Sub-total (F.O.B.)	1,208,264	5,492,109	-
I. Ocean freight & Marine Insurance	48,331	219,686	-
J. Sub-total (H+I)	1,256,595	5,711,795	-
K. Installation & the associated test	579,028	2,631,945	-
L. Training	25,000	113,636	-
M. One year maintenance	25,900	117,727	-
N. Customs clearance & domestic freight	-	-	49,532
O. Sub-total (J+K+L+M+N)	1,866,523	8,575,103	49,532
2. Civil Work Portion			
P. Land procurement & site formation	-	-	201,860
Q. Access-road construction	-	-	23,856
R. Sub-total (P+Q)	-	-	225,716
3. Consulting Engineering Services	179,000	813,636	-
4. Basic Project Cost	2,065,523	9,388,739	275,248
5. Contingency	188,000	854,545	28,000
6. Total Project Cost	2,253,523	10,243,284	303,248

Exchange Rate: US\$ 1 = 220 Japanese yen
Solomon \$1 = 250 Japanese yen

Table 2

Table 6-2 Project Cost of Proposed System (Phase-II)

Item	Foreign Currency Portion		Local Currency Portion
	Thousand Japanese Yen	Equivalent US Dollars	Equivalent Solomon Dollars
1. Equipment Work Portion			
A. Communication equipment	493,299	2,242,268	-
B. Power plants	266,503	1,211,377	-
C. Cables	5,902	26,827	-
D. Antenna supporting structures	187,103	850,468	-
E. Maintenance facilities	40,326	183,300	-
F. Installation materials	27,688	125,855	-
G. Equipment shelters	76,830	349,227	-
H. Sub-total (F.O.B.)	1,097,651	4,989,322	-
I. Ocean freight & Marine Insurance	43,906	199,573	-
J. Sub-total (H+I)	1,141,557	5,188,895	-
K. Installation & the associated test	549,787	2,499,032	-
L. Training	-	-	-
M. One year maintenance	-	-	-
N. Customs clearance & domestic freight	-	-	42,708
O. Sub-total (J+K+L+M+N)	1,691,344	7,687,927	42,708
2. Civil Work Portion			
P. Land procurement & site formation	-	-	153,392
Q. Access-road construction	-	-	23,856
R. Sub-total (P+Q)	-	-	177,248
3. Consulting Engineering Services	165,000	750,000	-
4. Basic Project Cost	1,856,344	8,437,927	219,956
5. Contingency	169,000	768,182	22,000
6. Total Project Cost	2,025,344	9,206,109	241,956

Exchange Rate: US\$ 1 = 220 Japanese yen

Solomon \$ 1 = 250 Japanese yen

Table 6-3 Project Size Breakdown

Item	Phase-I Work	Phase-II Work
1) Number of work sites	10	19
2) Number of radio station to be newly constructed	9	19
3) Number of existing radio station	1	0
4) Number of radio sections	9	19
5) Total length of radio sections	888.1 km	1,540.2 km
6) Total number of telephone circuits	126 ch	342 ch
7) Number of station requiring newly built access road	1	1
8) Length of newly built access road	150 m	150 m
9) Total length of cable sections	5.5 km	7.0 km

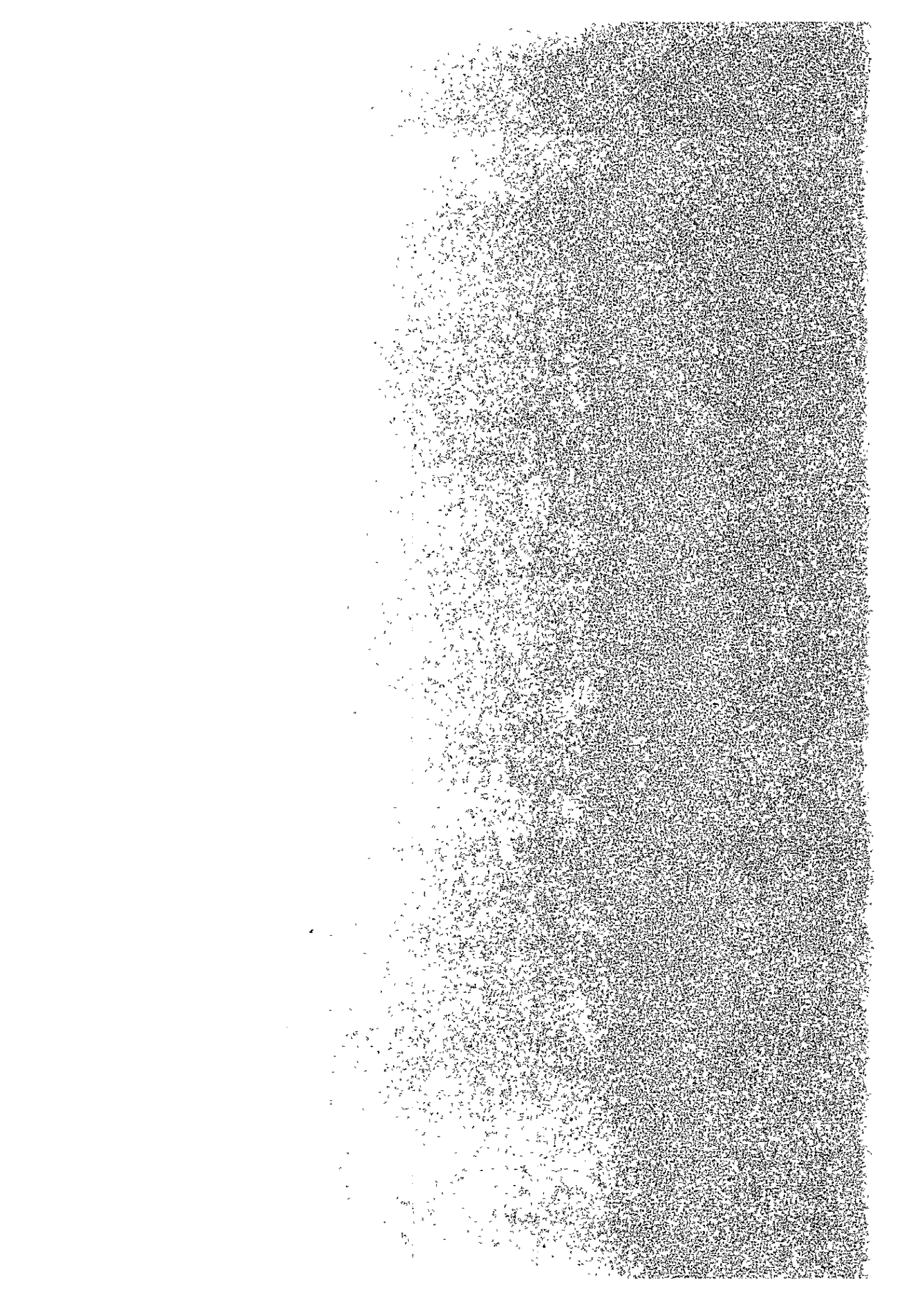


Definition	Phase-II								Remarks
	1st				2nd				
PHASE-I	4/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	
1. Detail System									
2. Preparation of Specifications									
3. Evaluation									
4. Contract Negotiation and Signing									
5. Land Procurement									
6. Ground Leveling and Access									
7. Construction of Structures, Power Plant									
8. Fabrication									
1) Antenna Structure									
2) Communication and Power									
3) Shelter									
9. Transportation									
10. Training in									
11. Construction									
1) Erection of Support									
2) Construction									
3) Installation of Equipment Plants									
12. Acceptance									
PHASE-II									
Performance Construction Channel Extension for T									Completion of Project

Table 6-4 Construction and Procurement Schedule

Year	Phase-I												Phase-II								Remarks
	1st				2nd				3rd				1st				2nd				
Definition	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	
PHASE-I																					
1. Detail System-Design																					
2. Preparation of Tender Specification																					
3. Evaluation of Tender Proposal																					
4. Contract Negotiation and Signing																					
5. Land Procurement																					
6. Ground Leveling/Land Formation and Access Road Construction																					
7. Construction of Concrete Foundation for Antenna Supporting Structures, Shelters and Power Plants																					
8. Fabrication:																					
1) Antenna Supporting Structures																					
Factory Inspection																					
2) Communication Equipment and Power Plants																					
Factory Inspection																					
3) Shelters																					
Factory Inspection																					
9. Transportation																					
10. Training in Supplier's Country																					
11. Construction and Installation																					
1) Erection of Antenna Supporting Structures																					
2) Construction of Shelters																					
3) Installation of Communication Equipment and Power Plants																					
12. Acceptance Test and Inspection																					
PHASE-II																					
Performance of the Remaining Construction Work including Channel Expansion Installation for The Ultimate Stage																					
																				Completion of Project	

CHAPTER 7
ECONOMIC EVALUATION



Chapter 7 Economic Evaluation

This chapter deals with the study of investment effect, financial analysis and economic analysis of the project.

While the project for construction of a domestic telecommunication trunk network is divided into Phase-1 covering six main areas of Honiara, Auki, Gizo, Kirakira, Tulagi and Tenakaro and Phase-2 covering 20 other areas, the financial analysis and economic analysis in this Chapter are made on the assumption that the start of Phase-1 work is in 1981 and the inauguration of services in the covered area is in 1984. For Phase-2 work, the start of construction work was assumed to be in 1991, 10 years from the start of Phase-1 work and the inauguration of services was assumed to be in 1994 in consideration of investment and economic effect of the project and the telephone exchange construction program for Solomon Islands. The period covered by economic analysis and other analyses is 20 years from 1984, in which the service of Phase-1 work is expected to start, through the year 2003.

7-1 Investment Effect

Solomon Islands have a population of about 200,000 and a total land area of approximately 28,900 km², which comprises six main islands and nearly 100 small islands scattered over a vast sea area.

This project was planned to provide a domestic telecommunication trunk network connecting 26 areas of a relatively high population density to contribute to the promotion of economic and industrial development and improvement of people's livelihood through prompt transmission of information by means of telecommunications and has a great variety of investment effects. Main investment effects may be pointed out as follows.

7-1-1 Promotion of economic and industrial development

Solomon Islands are blessed with abundant natural resources such as marine, forestry, and mine resources in comparison with a small population of 200,000. However, these resources have not been adequately exploited partly because of incomplete marketing and distribution system. How to exploit and market these resources is a major task for economic development of Solomon Islands.

Under these circumstances, construction of a domestic communication network under the project for prompt transmission of a large volume of information concerning the demand and supply of main products and the availability of labor force to the necessary area in Solomon Islands will bring about a tremendous effect on the strengthen-

ing of the basis for economic and industrial development of the region. In Solomon Islands where transportation and storage facilities are not adequate, producers limit their production to satisfy only their own demand and that of other people around them. If the proposed domestic telecommunication trunk network is completed, producers can obtain promptly and accurately a large volume information relative to the demand for their products from a wide area and can plan their production and transportation accordingly, which will subsequently lead to a sharp increase of production. This will, in turn, contribute to the expansion of production capability and improvement of distribution and marketing system.

7-1-2 Substantiation of administrative functions

In Solomon Islands, seven provincial governments administer their respective provinces under the central government. Communications between the central government and provincial governments are provided by means of shortwave radio, mail and sometimes by messenger. Communications between a provincial government and its local agencies are a more difficult problem. . Because of this situation, the information received by various administrative agencies is very limited in promptness and in volume, with the resultant restriction of the necessary administrative works. If the proposed telecommunication trunk network is completed in Solomon Islands, communications between the central government and local governments or between local government agencies will be beyond comparison with the present state in promptness and in volume, and carefully and well planned administration can be realized. Especially in case of emergency such as natural disasters, the necessary information can be exchanged between the government agencies promptly and adequately for providing appropriate and timely measures.

7-1-3 Diffusion and development of culture

The proposed telecommunication trunk network is also planned for use as a relay circuit for broadcasting programs, and the improvement and expansion of the broadcasting network will contribute to the improvement of broadcasting services and wide area dissemination of information. In Solomon Islands, a majority of people inhabit in the same place for many years in the unit of tribes and make a living of selfsufficiency by engaging in shifting cultivation or coastal fisheries

on a very small scale. There is almost no communication between tribes and people live in a very closed community environment. Under these circumstances, the construction of the proposed communication network will open the way for communications between tribes in different districts.

Substantiation of broadcasting network and promotion of communications between districts, which may be brought about by the project, will contribute greatly to the unification of the people and diffusion and development of culture in Solomon Islands.

7-2 Financial Analysis

7-2-1 Revenue

Revenues from the project are shown in Table 7-1.

(1) Income from telephone service

Income from telephone service consists of incomes from toll call charge and the income from toll call charge was calculated on the basis of the traffic described in Chapter 3.

(2) Income from telegraph service

In calculating the income from telegraph service, assumption was made that the growth rate of telegraphs in the 10 year period following the inauguration of service will be the same as in the past (the average growth rate in the past three years is about 4%) and that the growth will stop and the number of telegraphs will level off thereafter with the diffusion of telephone.

Since the delivery service has a major share in telegraph service, one-third of the income from telegraph service was assumed to be the share of the toll circuit network under the project, with project, with consideration given to the wage of delivery men.

(3) Income from lease service

Income from lease service was estimated at 10 percent of the income from toll circuit network. This estimation was made in consideration of the share of income from lease service in the category of income from toll circuits in other developing countries in South-east Asia and also the geographical conditions of Solomon Islands.

7-2-2 Expenditures

(1) Construction cost

Annual disbursement of construction cost is shown in Table 7-2. The term of repayment of foreign currency portion includes an annual interest rate of 3.5%, payable in 20 years with a grace period of seven years.

(2) Maintenance and operating cost

Maintenance and operating cost was estimated at 3 percent of the initial cost in consideration of low wage levels as compared with Japan (Table 7-3). Fluctuation of wages and commodity prices was not taken into account in the estimation of maintenance and operating cost. The increase of cost due to fluctuation of commodity prices and other factors is to be covered by the raising of telephone and telegraph rate.

(3) Working capital

The working capital was estimated at 20 percent of the total annual revenue. This estimation is based on examples of working capital for telecommunication projects in Southeast Asian countries and data obtained from the World Bank (Table 7-3).

7-2-3 Financial analysis of the project

A financial analysis of the project based on the revenue and expenditure calculated in the previous section shows that the profit rate of gross capital is 0.9 percent as indicated in Table 7-3. This figure is far below the cost for the procurement of borrowed capital, which is 3.5 percent, and is problematic as business earnings.

On the other hand, an analysis of the project from the standpoint of fund raising shows in table 7-4 that because of a very favorable loan terms for foreign currency portion, which carries an annual interest rate of 3.5 percent and is payable in 20 years with a grace period of seven years, the difference between revenue and expenditure for Phase-1 work turns to the black figure in the third year of operation after the completion of the project and that while the difference between revenue and expenditure is in the red temporarily due to expenditures for construction work during the period of Phase-2 work, the business turns to the black in the second year of operation after completion of Phase-2 work. However, the total recovery of owned

capital can be realized only in the 18th year of operation.

7-3 Economic Analysis

7-3-1 Benefits of the project

The benefits derived from the proposed domestic telecommunication trunk network are national economic benefits as a result of qualitative and quantitative improvement of communications, but the quantification of all values of such benefits for measurement is extremely difficult.

It may be considered, therefore, that the benefit derived from the qualitative and quantitative improvement of communications is given back directly to telephone rate and other charges paid by users of the proposed telecommunication system. The linkage of the place of demand with the place of production through the proposed domestic communication trunk network will promote industrial development and will contribute greatly to the increase of production.

From the above analysis, the benefits to be derived from the project were considered as follows.

(1) Revenues from telephone rate and others

All operating revenues calculated in the financial analysis in the previous section are considered to be the benefit derived from the project.

(2) Consumer's surplus as a result of increased agricultural and fishery production.

In Solomon Islands, 90 percent of the population live in fishing and agrarian villages and make a living of self-sufficiency by engaging in agriculture and fisheries on a very small scale. However, the GDP in these self-sufficient areas is less than half of the national GDP in Solomon Islands. This is because the production in these areas are limited to the amount which merely satisfies demand of producers themselves and that of the people around them. With the completion of the proposed domestic telecommunication trunk network, the information concerning the demand for products in remote areas can be obtained promptly and adequately and the producers can increase their production according to the demand. Especially in agricultural and fisheries sectors, production will increase sharply by planned

production and effective utilization of labor force can also be expected.

The consumer's surplus shown in Table 7-5 was calculated on the basis of the following assumptions.

Calculation of Consumer's Surplus

$$\begin{aligned}
 & \text{(A. GDP of agriculture and fisheries in non-monetary economic sector)} \quad \times \quad \text{(B. Increase rate of production)} \\
 \times & \text{(C. Rate of added value brought about by the telecommunication system)} \quad \times \quad \text{(D. Population coverage by telephone network)} \\
 \times & \text{(E. Rate of resident who can utilize telephone directly or indirectly to the population covered by telephone network)} \\
 - & \text{(F. Revenue from toll call rate)} \\
 \times & \left(\frac{\text{GDP of agriculture and fisheries in non-monetary economy sector}}{\text{GDP of the country}} \right)
 \end{aligned}$$

- A. The annual growth rate of GDP was estimated at 4 percent.
- B. Agricultural and fisheries production which has so far been limited to two units - one unit for consumption by producers themselves and one unit for consumption by the people of their own areas (within one tribe) - was considered to be increased by one unit for consumption in remote areas such as urban areas with the use of the domestic telecommunication trunk network.
- C. Cost of production and distribution for additional one unit was estimated at 70 percent of the price of said product.
- D. The population coverage of the domestic telecommunication trunk network under the project was estimated to be 15 percent in the initial stage (according to 1978 population distribution).

However, the population coverage of telephone network in five years after the inauguration of services under the project was considered to increase by 20 percent to 18 percent on the assumption that the population will concentrate in the covered area with the increase of economic activities. When the domestic telecommunication trunk network extends to cover all of the 26 areas upon completion of Phase-2 work, the population coverage of telephone network is estimated to increase further by

35 percent.

- E. It was assumed that approximately 35 percent of the population covered by telephone network would be able to utilize telephone directly or indirectly in some form or other.
- F. Same as the revenue from toll call service calculated in financial analysis.
- G. The ratio of GDP of agriculture and fisheries in non-monetary economy sector to GDP of all industries in Solomon Islands was estimated at 40 percent (Achievement in 1972).

7-3-2 Internal rate of return

The internal rate of return for the project calculated from the above cost and benefit is 4.3 percent as shown in Table 7-6.

7-4 Conclusions

As mentioned previously, the result of financial and economic analyses of the project shows that the profit rate of gross capital is 0.9 percent, for below the procurement cost of borrowed capital which is 3.5 percent. The project, therefore, is problematic in respect of business earnings.

From the economic aspect, the internal rate of return is 4.3 percent, which by no means is a high figure. Nevertheless, the need of the project is fully recognized from a long-range national economic point of view when the contribution of the proposed telecommunication system to the improvement of people's life in such aspects as the promotion of economic and industrial development, substantiation of administrative functions and diffusion of culture is taken into consideration from a comprehensive point of view.

In the event of construction of a telecommunication trunk network only in the 6 area (Honiara, Auki, Gizo, Kirakira, Tulagi and Tenakaro) in Phase-1, the result of a financial analysis shows that the profit rate of gross capital stands at 4.7 percent as indicated in Table 7-7 and the economic analysis shows an internal rate of return of 7.5 percent as indicated in Table 7-8. When compared with the construction of a domestic telecommunication trunk network in all of the 26 areas, there is an increase both in the profit rate of gross capital and the internal rate of return, but the increase rate is not considered adequate.

Table 7-1 PROJECT REVENUE

(Unit: 1,000SI\$)

Year	Income from toll calls	Income from telegraph	Income from leased circuits	Total
1981				
1982				
1983				
1984	447	15	46	508
1985	499	15	51	565
1986	552	16	57	625
1987	604	17	62	683
1988	657	17	67	741
1989	710	18	73	801
1990	736	19	76	831
1991	788	19	81	888
1992	841	20	86	947
1993	867	21	89	977
1994	1,209	21	123	1,353
1995	1,261	21	128	1,409
1996	1,367	21	139	1,527
1997	1,419	21	144	1,584
1998	1,498	21	152	1,671
1999	1,604	21	163	1,788
2000	1,682	21	170	1,873
2001	1,787	21	181	1,989
2002	1,892	21	191	2,104
2003	1,997	21	202	2,220

Table 7-2 ANNUAL DISBURSEMENT OF PROJECT COST

(Unit: 1,000SI\$)

Year	Foreign currency portion	Local currency portion	Total
1981	240	-	240
1982	4,013	551	4,564
1983	4,009	551	4,560
1984			
1985			
1986			
1987			
1988			
1989			
1990			
1991	220	-	220
1992	3,603	440	4,043
1993	3,603	440	4,043
1994			
1995			
1996			
1997			

Table 7-3 FINANCIAL ANALYSIS
(Profit Rate of Gross Capital)

(Unit: 1,000SI\$)

Year	Expenditure (1)				Revenue (2)	Balance (2)-(1)	Discount rate	
	Construction cost	Operation & maintenance cost	Working capital	Total			1%	0%
1981	240			240		△ 240	△ 240	△ 240
1982	4,564			4,564		△4,564	△4,564	△4,564
1983	4,560			4,560		△4,560	△4,560	△4,560
1984		220	102	323	508	185	183	185
1985		220	11	231	565	334	327	334
1986		220	12	232	625	393	381	393
1987		220	12	232	683	451	433	451
1988		220	11	231	741	510	485	510
1989		220	12	232	801	569	536	569
1990		220	6	226	831	605	564	605
1991	220	220	12	452	888	436	403	436
1992	4,043	220	11	4,274	947	△3,327	△3,045	△3,327
1993	4,043	220	6	4,269	977	△3,292	△2,980	△3,292
1994		423	76	499	1,353	854	765	854
1995		423	11	434	1,409	975	865	975
1996		423	24	447	1,527	1,080	949	1,080
1997		423	11	434	1,584	1,150	1,001	1,150
1998		423	17	440	1,671	1,231	1,060	1,231
1999		423	24	447	1,788	1,341	1,144	1,341
2000		423	17	440	1,873	1,433	1,210	1,433
2001		423	23	446	1,989	1,543	1,290	1,543
2002		423	23	446	2,104	1,658	1,372	1,658
2003		423	△ 421	2	2,220	2,641	2,164	2,641
							15,132	17,389
							△15,389	△15,986
							(△ 257)	(1,403)

Table 7-4 FUNDS STATEMENT

Year	Funds raising (1)			Operation (2)					(1)-(2)	Cumulative net worth required (Δmark) or surplus
	Borrowed capital	Operating revenue	Total	Equipment investment	Working capital	Operation and maintenance cost	Payment of principal and interest for borrowed capital	Total		
1981	240		240	240			8	248	Δ 8	Δ 8
1982	4,013		4,013	4,564			149	4,713	Δ 700	Δ 700
1983	4,009		4,009	4,560			289	4,849	Δ 840	Δ 1,548
1984		508	508		102	220	289	611	Δ 103	Δ 1,596
1985		565	565		11	220	289	520	45	Δ 1,551
1986		625	625		12	220	289	521	104	Δ 1,447
1987		683	683		12	220	289	521	162	Δ 1,285
1988		741	741		11	220	301	532	209	Δ 1,076
1989		801	801		12	220	494	726	75	Δ 1,001
1990		831	831		6	220	681	907	Δ 76	Δ 1,077
1991	220	888	1,108	220	12	220	674	1,126	Δ 18	Δ 1,095
1992	3,603	947	4,550	4,043	11	220	786	5,060	Δ 510	Δ 1,605
1993	3,603	977	4,580	4,043	6	220	897	5,166	Δ 586	Δ 2,191
1994		1,353	1,353		76	423	883	1,382	Δ 29	Δ 2,220
1995		1,409	1,409		11	423	868	1,302	107	Δ 2,113
1996		1,527	1,527		24	423	854	1,301	226	Δ 1,887
1997		1,584	1,584		11	423	839	1,273	311	Δ 1,576
1998		1,671	1,671		17	423	835	1,275	396	Δ 1,180
1999		1,788	1,788		24	423	994	1,441	347	Δ 833
2000		1,873	1,873		17	423	1,148	1,588	285	Δ 548
2001		1,989	1,989		23	423	1,120	1,566	423	Δ 125
2002		2,104	2,104		23	423	1,091	1,537	567	442
2003		2,220	2,220		Δ 421	423	1,062	1,064	1,156	1,598

Table 7-5 CONSUMER'S SURPLUS WITH THE INCREASE OF AGRICULTURAL AND FISHERIES PRODUCTION

(Unit: 1,000SIS)

Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Consumer's surplus (6)-(7)
	GDP of agriculture and fisheries in non-monetary economic sector	Rate of production increase (%)	Rate of added value (%)	Population coverage by telephone network (%)	Telephone utility rate (%)	Total benefit (1)x(2)x(3)x(4)	Income of telecommunication service (telephone) from agriculture and fisheries in non-monetary economic sector	
1981	36,277							
1982	37,728							
1983	39,237							
1984	40,806	50	30	15	35	321	179	142
1985	42,439	50	30	15	35	334	200	134
1986	44,136	50	30	15	35	348	221	127
1987	45,902	50	30	15	35	361	242	119
1988	47,738	50	30	15	35	376	263	113
1989	49,647	50	30	18	35	469	284	185
1990	51,633	50	30	18	35	488	294	194
1991	53,699	50	30	18	35	507	315	192
1992	55,847	50	30	18	35	528	336	192
1993	58,080	50	30	18	35	549	347	202
1994	60,404	50	30	29	35	920	484	436
1995	62,820	50	30	29	35	956	504	452
1996	65,333	50	30	29	35	995	547	448
1997	67,946	50	30	29	35	1,034	568	466
1998	70,664	50	30	29	35	1,076	599	477
1999	73,490	50	30	35	35	1,350	642	708
2000	76,430	50	30	35	35	1,404	673	731
2001	79,487	50	30	35	35	1,461	715	746
2002	82,667	50	30	35	35	1,519	757	762
2003	85,973	50	30	35	35	1,580	799	781

Year	Cost (1)			Benefit (2)			Difference between benefit and cost (2)-(1)	Discount rate	
	Construc- tion cost	Operating and maintenance cost	Working capital	Total	Operating revenue	Consumer's surplus		Total	5%
1981	240			240			△ 240	△ 240	△ 240
1982	4,564			4,564			△ 4,564	△ 4,564	△ 4,564
1983	4,560			4,560			△ 4,560	△ 4,560	△ 4,560
1984		220	102	323	508	142	650	311	314
1985		220	11	231	565	134	689	416	423
1986		220	12	232	625	127	752	449	462
1987		220	12	232	683	119	802	469	487
1988		220	11	231	741	113	854	488	512
1989		220	12	232	801	185	986	563	596
1990		220	6	226	831	194	1,025	568	607
1991	220	220	12	452	888	192	1,080	425	459
1992	4,043	220	11	4,274	947	192	1,139	△ 2,023	△ 2,205
1993	4,043	220	6	4,269	977	202	1,179	△ 1,897	△ 2,088
1994		423	76	499	1,353	436	1,789	754	490
1995		423	11	434	1,409	452	1,861	795	891
1996		423	24	447	1,527	448	1,975	810	918
1997		423	11	434	1,584	466	2,050	816	933
1998		423	17	440	1,671	477	2,148	822	948
1999		423	24	447	1,788	708	2,496	939	1,094
2000		423	17	440	1,873	731	2,604	944	1,111
2001		423	23	446	1,989	746	2,735	951	1,130
2002		423	23	446	2,104	762	2,866	958	1,149
2003		423	△421	2	2,220	781	3,001	1,130	1,369
								12,608	△ 13,893
								△ 13,284	13,657
								(△ 676)	(236)

Table 7-7 FINANCIAL ANALYSIS
(Profit Rate of Gross Capital)

(6 areas) (Unit: 1,000SI\$)

Year	Expenditure (1)			Total	Revenue (2)	Balance (2)-(1)	Discount rate	
	Construction cost	Operation & maintenance cost	Working capitl				5%	4%
1981	240			240		△ 240	△ 240	△ 240
1982	4,564			4,564		△ 4,564	△ 4,564	△ 4,564
1983	4,560			4,560		△ 4,560	△ 4,560	△ 4,560
1984		220	102	324	508	184	175	177
1985		220	11	231	565	334	303	309
1986		220	12	232	625	393	339	349
1987		220	12	232	683	451	371	386
1988		220	11	231	741	510	400	419
1989		220	12	232	801	569	425	450
1990		220	6	226	831	605	430	460
1991		220	11	231	888	657	445	480
1992		220	11	231	947	716	462	503
1993		220	6	226	977	751	461	507
1994		220	12	232	1,035	803	470	522
1995		220	11	231	1,092	861	479	538
1996		220	12	232	1,151	919	487	552
1997		220	18	238	1,238	1,000	505	578
1998		220	11	231	1,295	1,064	512	591
1999		220	12	232	1,353	1,121	514	599
2000		220	11	231	1,410	1,179	514	605
2001		220	17	237	1,497	1,260	524	622
2002		220	18	238	1,584	1,346	533	639
2003		220	△ 316	△ 96	1,642	1,738	655	793
							9,004	10,079
							△ 9,364	△ 9,364
							△ (360)	(715)

Table 7-8 ECONOMIC ANALYSIS

(6 areas)

(Unit: 1,000SI\$)

Year	Cost (1)			Benefit (2)		Difference between benefit and cost (2)-(1)	Discount rate	
	Construction cost	Operating and maintenance cost	Working capital	Operation revenue	Consumer's surplus		8%	7%
1981	240					△ 240	△ 240	△ 240
1982	4,564					△ 4,564	△ 4,564	△ 4,564
1983	4,560					△ 4,560	△ 4,560	△ 4,560
1984		220	102	508	142	326	301	305
1985		220	11	565	134	468	401	409
1986		220	12	625	127	520	413	424
1987		220	12	683	119	570	419	435
1988		220	11	741	113	623	424	444
1989		220	12	801	185	754	475	502
1990		220	6	831	194	799	466	498
1991		220	11	888	192	849	459	494
1992		220	11	947	192	908	454	493
1993		220	6	977	202	953	441	484
1994		220	12	1,035	330	1,133	486	538
1995		220	11	1,092	337	1,198	476	532
1996		220	12	1,151	345	1,264	465	526
1997		220	18	1,238	343	1,343	457	521
1998		220	11	1,295	354	1,418	447	514
1999		220	12	1,353	519	1,640	479	556
2000		220	11	1,410	539	1,718	464	544
2001		220	17	1,497	549	1,809	453	535
2002		220	18	1,584	560	1,906	442	527
2003		220	△ 316	1,642	585	2,323	498	600
							8,920	9,881
							△ 9,364	△ 9,364
							(△ 444)	(517)

Data Sheet No. 1

Itinerary of Field Survey

Jan. 25 (Thu)	Arrival in Honiara
" 26 (Fri)	Consulation with P&T for implementation of field survey
" 27 (Sat)	Same as above
" 28 (Sun)	Inspection and preparation of survey equipment
" 29 (Mon)	Aerial survey of Western District
" 30 (Tue)	Study of survey results for Western District
" 31 (Wed)	Aerial survey of Eastern District
Feb. 1 (Thu)	Field survey in the Honiara-Visale section Survey of road conditions in the Honiara-Visale section
" 2 (Fri)	Field survey in Visale and survey of road conditions in the lambea-Lambi section Radio wave propagation test in the Honiara-Visale section
" 3 (Sat)	Field survey in Ruavatu
" 4 (Sun)	Putting in order of survey data
" 5 (Mon)	Study of survey data and adjustment of survey schedule
" 6 (Tue)	Field survey in Tulagi and Pidgeon-point
" 7 (Wed)	Field survey in Auki
" 8 (Thu)	Field survey in Kiu and survey of road conditions in Manakwai, Malu'u and Sulufou Radio wave propagation test in the Auki-Malu'u section and Auki-Kiu section
" 9 (Fri)	Survey of cable route in Malu'u and Sulufou Radio wave propagation test in the Auki-Sulufou section
" 10 (Sat)	Radio wave propagation test in the Lalande-Malu'u section, Malu'u-Sulufou section, and Lalande-Auki section
" 11 (Sun)	Field survey in MA-Y4 (Malu'u) Radio wave propagation test in the Malu'u-MA-Y4 section, Malu'u-Takwa section, MA-Y4-Takwa section, Malu'u-Sulufou section and Malu'u-Lalande section
" 12 (Mon)	Putting in order of survey data
" 13 (Tue)	Study of survey data
" 14 (Wed)	Same as above
" 15 (Thu)	Putting in order of survey data
" 16 (Fri)	Inspection and preparation of survey equipment for the Western District
" 17 (Sat)	Field survey in Yandina and aerial survey of Mbarakua
" 18 (Sun)	Field survey in Taro and aerial survey of Sasamunga
" 19 (Mon)	Field survey in Noro

Feb. 20 (Tue) Field survey in Gizo
 " 21 (Wed) Field survey in Buala and Mbaracoma
 Aerial survey of Raucos and Orete-Cove
 " 22 (Thu) Field survey in Seghe and Cape-Harting
 " 23 (Fri) Putting in order of survey data
 " 24 (Sat) Study of survey data
 " 25 (Sun) Same as above
 " 26 (Mon) Intermediate consultation with P&T
 " 27 (Tue) Line-of-sight propagation test
 Field survey in Visal district
 " 28 (Wed) Overseas propagation test
 Mar. 1 (Thu) Field survey in Rennel and Maran
 " 2 (Fri) Preliminary study of survey results with P&T
 " 3 (Sat) Study of survey results for summarization
 " 4 (Sun) Same as above
 " 5 (Mon) Compliation of a summary of survey results
 " 6 (Tue) Discussion with P&T in relation to a summary of survey results
 " 7 (Wed) Preparation of a summary of survey results
 " 8 (Thu) Final consultation with the government of Solomon Islands
 " 9 (Fri) Packing of survey equipment and preparations for return to Japan
 " 10 (Sat) Departure from Honiara and arrival in Port Moresby
 Visit to the Japanese Embassy for briefing the outcome of survey
 " 13 (Tue) Departure from Port Moresby for Japan

Data Sheet No. 2

SCOPE OF WORK
FOR
FEASIBILITY STUDY
ON
THE TELECOMMUNICATIONS TRUNK NETWORK CONSTRUCTION PROGRAMME
IN
SOLOMON ISLANDS

This Scope of Work is agreed by the following two authorities concerned;

Ministry of Transport and Communications,
the Government of Solomon Islands

Japan International Cooperation Agency,
the official agency responsible for
the implementation of technical cooperation
programmes of the Government of Japan

To confirm the aforementioned, the Scope of Work is herewith attached and signed
by the responsible personnels of the said authorities concerned.

Date: 22 January, 1979

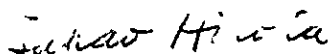
30 January, 1979

Issued at: Tokyo

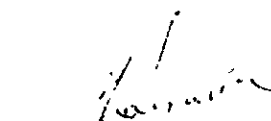
Honiara

For the Japan International
Cooperation Agency;

For the Ministry
of Transport and Communications,
the Government of Solomon Islands;



(Takao Hirota)



(The Honourable J. Tapaika)

Director,
Department
Social Development Cooperation,
Japan International
Cooperation Agency.

Minister of Transport and
Communications,
Honiara,
Solomon Islands.

I. Introduction

In response to agreement reached between the Government of Solomon Islands and the Government of Japan concerning the Telecommunications Trunk Network Construction Programme in Solomon Islands, the Japan International Cooperation Agency (hereinafter referred to as JICA) will provide a Study Team to carry out the Study.

The Government of Solomon Islands entrusts the guidance and coordination of the Study to the Ministry of Transport and Communications in co-operating with the Japanese Team.

The present document sets forth the Scope of Work for the Study.

I. Objective of the Study

The objective of the Study is to prepare the basic plan for the Telecommunications Trunk Network Construction Programme in Solomon Islands and to investigate feasibility of the project.

III. Outline of the Study

1. Study Items

Study items are as follows;

- (1) Forecast of telecommunications circuit demand
- (2) Selection of optimum transmission system
- (3) Frequency allocation plan
- (4) Establishment of design criteria
- (5) Optimum scale of the project including system design
- (6) Cost estimation
- (7) Construction schedule
- (8) Operation and maintenance
- (9) Personnel plan and training programme
- (10) Financial and economic evaluation

2. Survey Work

In order to carry out the aforementioned Study, the Study Team will conduct surveys on the following items;

2.1 General Matter

- (1) Present status of telecommunications facilities and service
- (2) Basic plan for telephone network
- (3) Present status and forecast of telephone demand
- (4) Present status and forecast of traffic

- (5) Technical standards of telecommunications facilities
- (6) Revenue and expenditure of telecommunication service

2.2 Transmission Network

- (1) The locations of Network Terminals are divided into three priorities and are given below.

Priority 1 being terminals where it is essential to provide trunk telephone service.

Priority 2 being terminals where it is desirable to provide trunk telephone service but may not necessarily be provided with such service if extraordinary engineering resources would be required.

Priority 3 being terminals that could, in the opinion of JICA, be accessed by reasonable engineering means if a line-of-sight repeater or similar is required in the vicinity.

It is stressed that routes for all terminals of Priorities 1 and 2 should be surveyed.

Priority 1 Terminals

*Auki	*Kira Kira	Santa Cruz
Buala	Malu'u	*Tenakaro (Tenavatu)
*Gizo	Munda	*Tulagi
*Honiara	Noro	Yandina

*Terminals where telephone exchanges are proposed

Priority 2 Terminals

Cape Hartig	Ruavatu	Tambea
Haja	Sasamunga	Taro Airfield
Kiu	Seghe Airfield	Tetere
Marau	Sulufou	Visale
Mbarakoma	Rennell	

Priority 3 Terminals

As suggested by JICA.

- (2) Selection of optimum transmission routes
- (3) Topographical conditions of expected sites and their surroundings
- (4) Radio propagation tests (if necessary)
- (5) Cable route survey

(6) Route survey of access roads to sites (if necessary)

IV. Report

The JICA will prepare and submit 20 copies of the following report to the Government of Solomon Islands.

1. Draft Final Report

Within 6 (six) months after the completion of field survey, the JICA will prepare the Draft Final Report and will dispatch a Team to Solomon Islands for supplementary explanation of the said Report.

The Government of Solomon Islands is requested to provide the JICA Team with comments on the Report during its stay in Solomon Islands.

2. Final Report

Within 3 (three) months after return to Japan of the said Explanation Team, a final Report.

V. Measures to be undertaken by the Government of Solomon Islands

1. To exempt the Study Team from Taxes and duties on the materials and equipment brought into Solomon Islands by the Team for the purpose of the study.
2. To exempt the members of the Team from income tax and charges of any kind to be imposed on or in connection with the living allowances remitted from abroad and from import and export duties imposed on their personal effects
3. To prepare necessary permits for the implementation of the outdoor work (Ex. to operate radio transmitter equipments for radio propagation test, to enter private lands, to take photos, etc.)
4. To assign at least 2 (two) official counterparts during the Study period in Solomon Islands and to arrange necessary number of labourers (expenses for employment of labourers will be borne by the Team) to be employed on wages and conditions as advised by SIG
5. To arrange adequate means of transportation such as vehicles, ships and airplanes (expenses for transportation will be borne by the Team)
6. To provide the Team with a suitable office with necessary equipment for the Study

7. To provide the Team with relevant data, information and materials necessary for the Study shown in the Annex, and to arrange for the Team to take these data and materials back to Japan in order to prepare the Report

The Government of Solomon Islands will be kindly requested to prepare the following documents and statistics prior the arrival of the Study Mission.

1. National development plan
2. Latest annual report
3. Maps of Solomon Islands (a scale of 1:150,000 and 1:1,000,000) and maps of following Islands (a scale of 1:50,000);
Guadalcanal, Malaita, San Cristobal, Santa Cruz, Santa Isabel, New Georgia, Gizo, Vella La Vella, Choiseul, Rennell.
4. General statistics on population, economy, transportation, etc. (total, by year and by regions)
5. Telecommunication development plan
6. Organization of management and operation of Telecommunication service
7. Telecommunication ordinance and regulations
8. Climatic data in nation wide
 - (1) Temperature, Humidity, Precipitation --- maximum, average and minimum per month
 - (2) Seasonal wind directions and velocity
9. Construction or expansion programme of exchange system at projected districts (including toll zone system, signaling system, installation schedule, etc).
10. Transmission engineering standards (loss distribution, noise distribution, etc.)
11. Electric power service
 - (1) Condition of commercial power lines (voltage and frequency, distance from projected sites and their regulations)
 - (2) Route of power lines
(maps of distribution mains)
12. Technical standards and levels of civil work engineers and labourers
13. Improvement plan of Aviation Control/Communication Network
14. Expansion programme of Radio Broadcasting Network
15. List of radio frequencies used in Solomon Islands
16. Tariff system

Data Sheet No. 3
Minutes of the Meeting
on
The Telecommunication Trunk Network Construction Project
in
Solomon Islands

In reponse to a request from the Government of Solomon Islands for technical assistance on the Telecommunication Trunk Network Construction Project in Solomon Islands, the Government of Japan through the Japan International Cooperation Agency (hereinafter referred to as JICA), has sent a Survey Team headed by Mr. Hiroshi Furukawa, special assistant to Director General of Radio Regulatory Bureau, The Ministry of Posts and Telecommunications, to the Solomon Islands to carry out a Feasibility Study on this Project from January 25 to March 10, 1979.

The Team has conducted field survey throughout the Solomon Islands and has held a series of discussions and exchanged views with officials of the Government of Solomon Islands on the construction project of the Telecommunication Trunk Network.

As a result of the survey and discussions, the Japanese Survey Team and the Ministry of Transport and Communications agreed to complete the Feasibility Study Report on the basis of the Minutes of the discussions attached herewith.



Hiroshi Furukawa,
Leader of Japanese
Survey Team



John Topaika
Minister
Transport & Communications

March 8, 1979
Honiara, Solomon Islands

Authorities concerned of the Ministry of Transport and Communications of the Government of Solomon Islands and JICA Survey Team held meeting on 8th March, 1979 and both parties agreed following items;

1. Trank Call Traffic

Trank Call Traffic will be estimated as shown in ANNEX-1.

2. Transmission Loss Distribution Plan

Transmission Loss Distribution Plan on the project is shown ANNEX-2.

3. Interface Between Telephone Exchange Equipment and Radio Terminal Equipment

The interface between Telephone Exchange Equipment and Radio Terminal Equipment is shown in ANNEX-3.

4. Buildings for the Radio Stations

Shelter will be considered to be used for Radio Station Buildings.

5. Power Suply System

Following systems should be studied for primary power supply system;

- (1) Engine Generator System
- (2) Thermo-Generator System
- (3) Solar Cell System

6. Transmission Quality

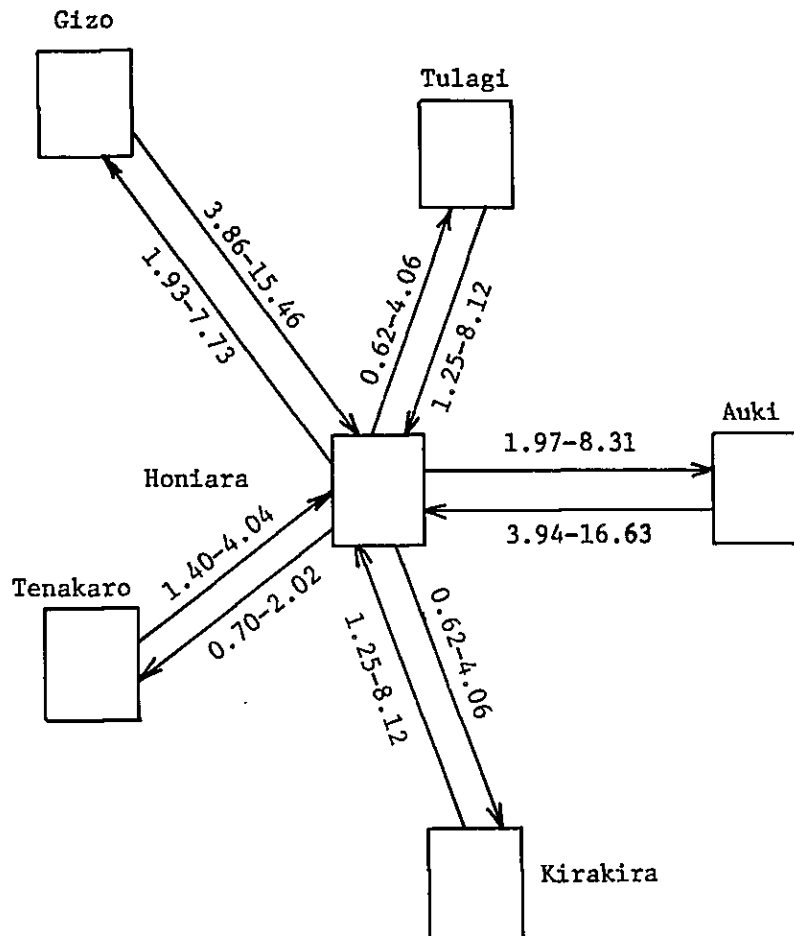
A point of view economical system designe, in some case the transmission quality might be considered not to meet to CCI Recommendation.

7. Japanese technical standards are applicable for the study on the project.

8. In order to establish optimum transmission system, customary lands might be used for the sites.

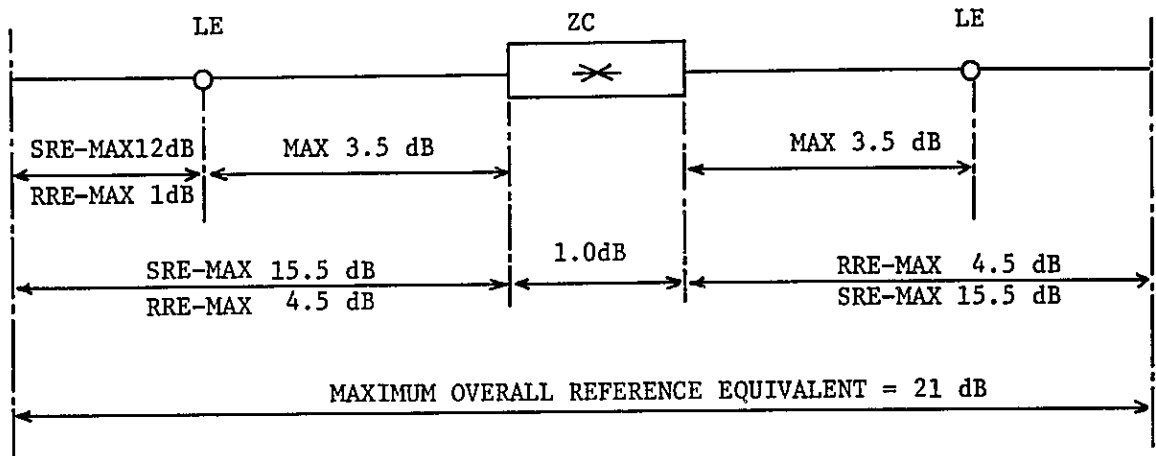
Trunk Call Traffic

Estimated trunk call traffic is as follows;

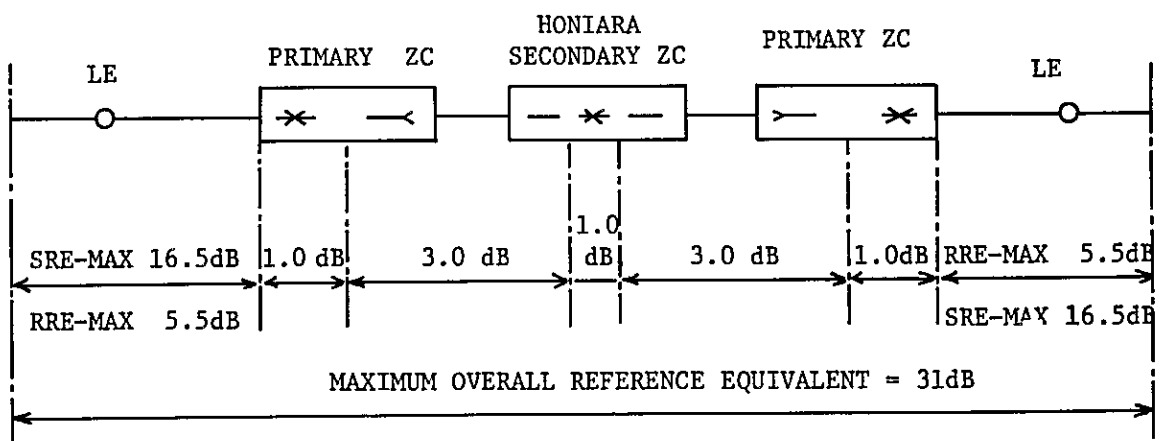


Legent 000-XXX: 000 shows trunk call traffic as of 1981 (erlangs)
 XXX shows trunk call traffic as of 2006 (erlangs)

1. Initial



2. Ultimate



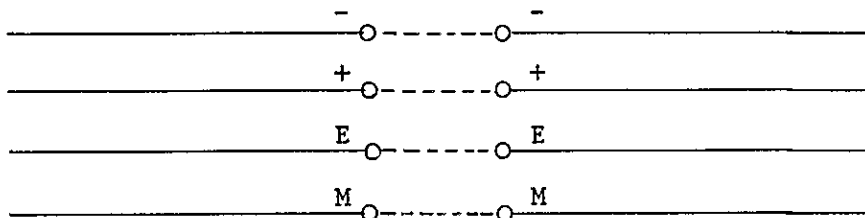
Interface between Telephone Exchange
Equipment and Radio Terminal Equipment

The interface between the telephone exchange equipment and the radio terminal equipment shall be as follows;

RADIO TERMINAL EQUIPMENT

TELEPHONE EXCHANGE EQUIPMENT

IDF
or
MDF



Supplementary Data-I

COST COMPARISON BETWEEN SATELLITE COMMUNICATION SYSTEM AND TERRESTRIAL RADIO COMMUNICATION SYSTEM

On the assumption that either the satellite communication system or the terrestrial radio communication system will be adopted in the Solomon Islands domestic telecommunications network, the equipment procurement cost (FOB), civil work cost, and maintenance/operation cost (annual) are estimated below.

In this cost comparison, the terrestrial radio communication system is divided into the line-of-sight system and the trans-horizon system.

a) Satellite Communication System

Equipment procurement cost	¥5,300,000,000
Maintenance/operation cost	¥300,000,000

b) Line-of-Sight System

Equipment procurement cost	¥4,300,000,000
Civil work cost	¥1,100,000,000
Maintenance/operation cost	¥130,000,000

c) Trans-Horizon System

Equipment procurement cost	¥2,300,000,000
Civil work cost	¥70,000,000
Maintenance/operation cost	¥70,000,000

Note 1) Equipment procurement cost includes work materials and maintenance facilities cost.

Note 2) For the satellite communication system, equipment procurement cost includes part of similar cost for the terrestrial radio communication system. Annual maintenance/operation cost includes satellite transponder lease charge.

Supplementary Data-II

TECHNICAL INFORMATION CONCERNING SOLAR CELL SYSTEM, AND INITIAL COST COMPARISON AMONG VARIOUS POWER SUPPLY SYSTEMS

1. Items to be Considered When Adopting Solar Cell System

The solar cell system performance fluctuates widely according to the meteorological conditions at the station site. Therefore, the following study and consideration are especially important:

- a) For the purpose of cost-saving design, the past record of sunshine hours at and near the station site and the incident solar energy data must be taken into full account.
- b) For detail design, the environmental conditions of each station site must be fully analyzed so that the incident solar energy may not be reduced by an obstacle, such as trees. Also important is to determine the optimum angle of inclination of the plane of incidence.
- c) To prevent the excess discharge of the storage battery due to the decrease of incident solar energy, the alarm system to indicate the excess discharge at an appropriate time must be adopted.

2. Initial Cost Comparison between Solar Cell System and Other Power Supply Systems

This initial cost comparison is by the following conditions:

- a) Initial cost in the attached illustration is an estimate inclusive of system construction cost and spare parts cost for two years. Fuel tank cost is not included.
- b) Solar cell capacity is estimated from Rabual meteorological data. In this case, the required holding time of the battery is approximately 12 days.
- c) For TEG system, it is assumed that one hot-standby unit be established.
- d) System to system initial cost comparison appears in Figure S-1. System to system fuel consumption comparison appears in Figure S-2.

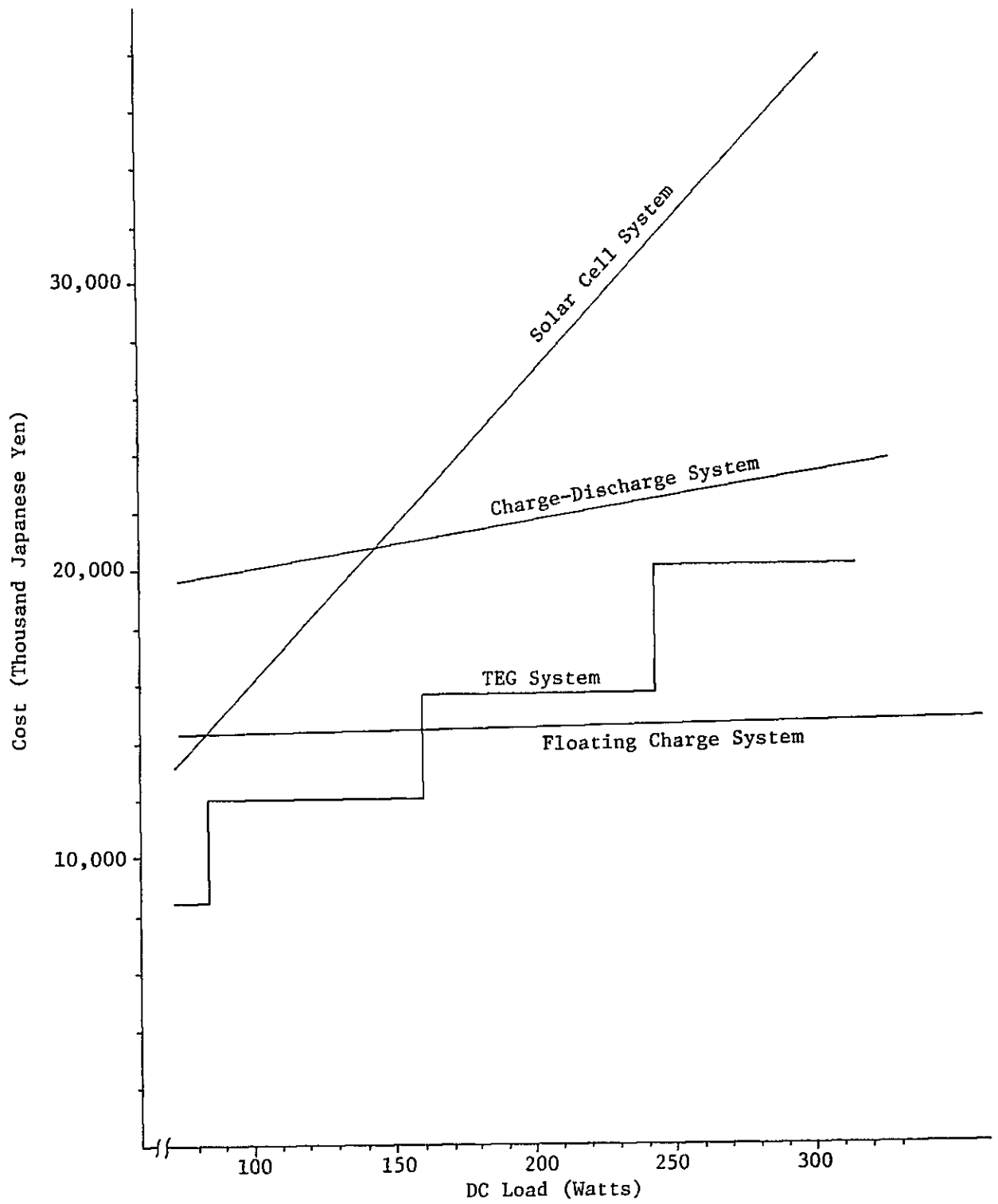


Figure S-1 Initial Cost of Various Kinds of Power Supply Systems, with DC Load of 100 - 300 Watts

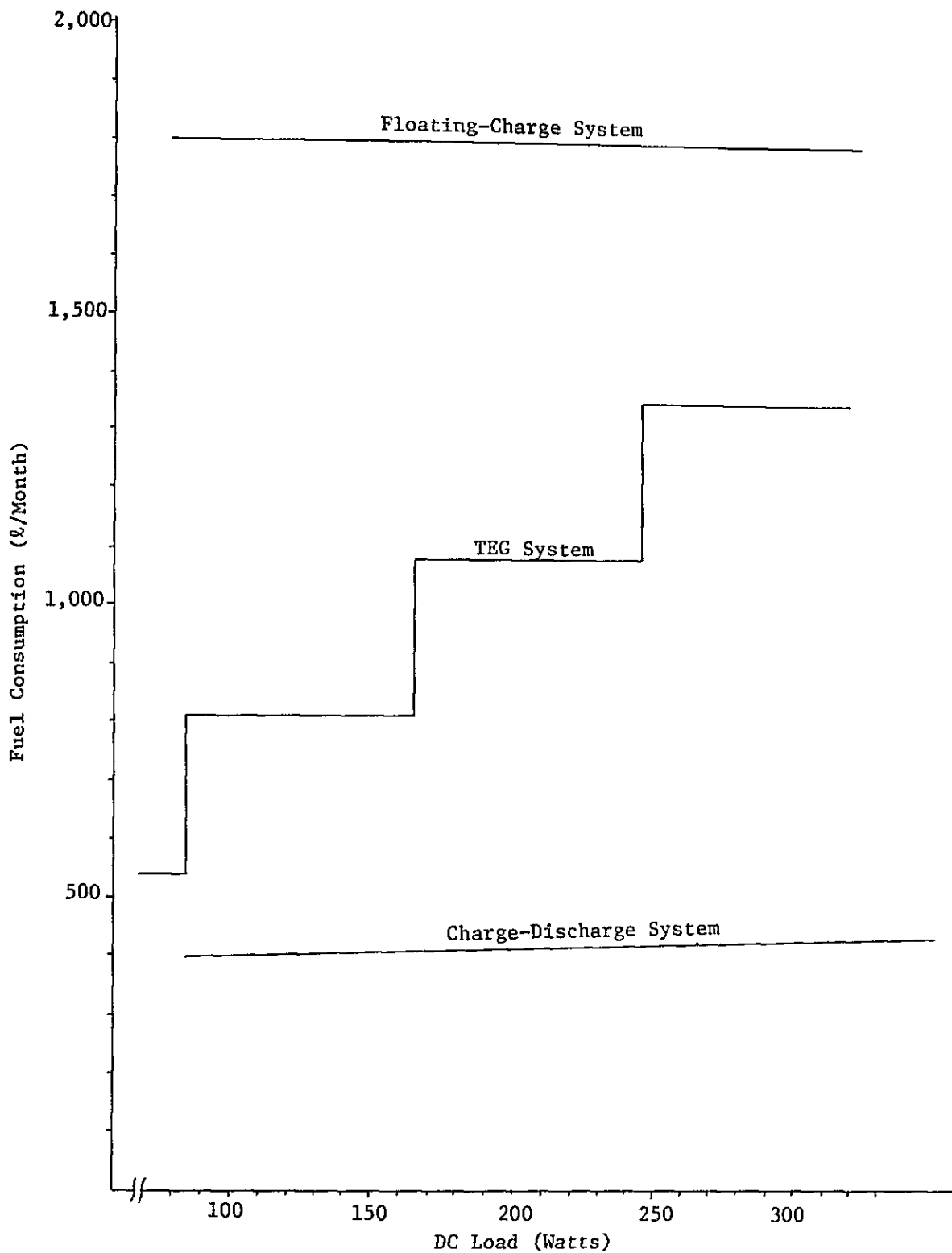


Figure S-2 Fuel Consumption of Various Kinds of Power Supply Systems, with DC Load of 100 - 300 Watts

JICA