


BASIC DESIGN STUDY REPORT  
ON  
PRASLIN TREATED WATER  
SUPPLY PROJECT  
OF  
THE REPUBLIC OF SEYCHELLES

MARCH 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

3  
1.8  
88

G R B

82 - 82



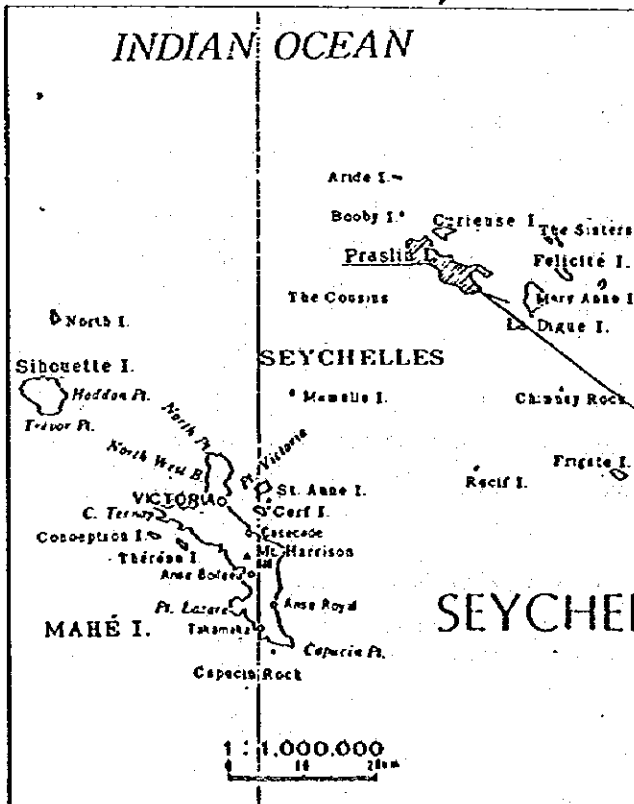
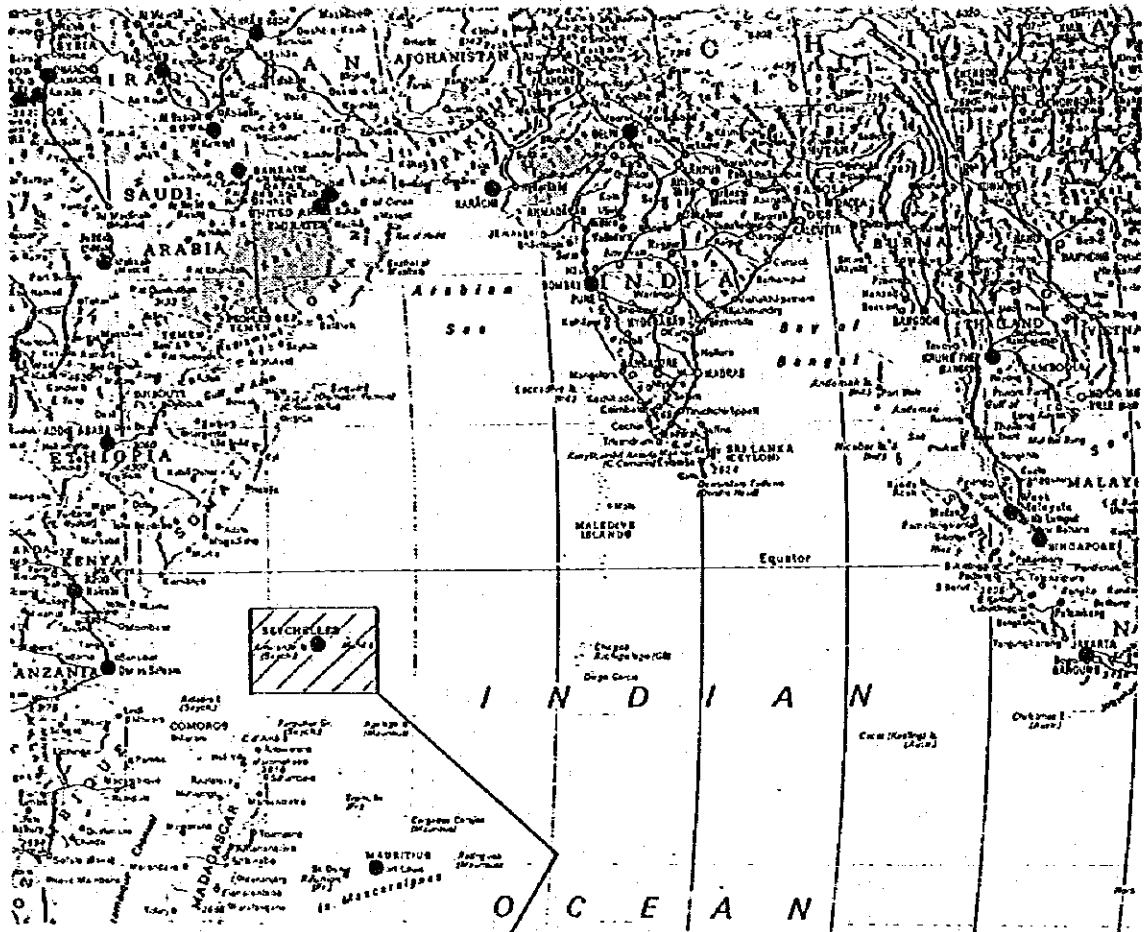
JICA LIBRARY



1063265[1]

国際協力事業団	
船	87.9.26
登録No.	6409
	9063
	413
	61.8
	GRB

LOCATION MAPS



SEYCHELLES ISLANDS

## SUMMARY

To review the Preinvestment Study Report, present condition of water supply and management system of the Seychelles Water Authority Ltd. (the Authority), a survey was conducted. Based on such review, the extent of materials and equipment which Seychelles Government wishes to be covered by foreign aid are examined and finally clarified.

The survey reveals the followings in connection with the project implementation:

- a) Projected future water demand, future water sources and water supply facilities proposed in the Preinvestment Study Report are generally appropriate and suitable to the present project.
- b) The Authority, actually, has an ability to perform the construction of facilities and pipelaying works by the work force of its own staff and labourers.
- c) The Authority, recently formed, is not necessarily in a financial position to undertake expansion and rehabilitation works of the existing system.
- d) According to the Team's financial projection, business of Praslin Treated Water Supply is expected to generate some profit in the future.
- d) The present project pursuant to the Five Year Plan, effects on the improvement of living standard and the acceleration of industrial activities in the area.
- f) The Five Year Plan puts a stress on the urgent implementation of the present project in Praslin.

## 1. Background

The Government of Seychelles has been planning to serve safe and plentiful water to the whole people of the country by 1990 as described in the Five Year Plan. The Government places an emphasis on local islands development rather than the main island, Mahe, to decentralize the national development. The Praslin island, second largest island, is planned to be developed urgently and the Praslin Treated Water Supply Project is expected to be implemented at an earliest possible date in accordance with the policyline.

## 2. Outline of the Project

The Project is divided into two stages, stage I up to 1985 and stage II up to 1990. The future water demand, 17.3 l/sec in 1990, was calculated by multiplying estimated figures of population, hotel beds and hospital beds with each unit water consumption. As for the water sources, 21.0 l/sec was estimated to be available in the future, mainly from river water and supplementally from groundwater and surface impounded water by a proposed dam.

Proposed Water Supply System is composed of treatment facilities and distribution system, as outlined below.

### a) Treatment Facility

Consisted of simple sedimentation, rapid pressure filtration and chlorination equipment.

### b) Distribution System

Ductile Cast Iron Pipe to be used for main pipe and High-density Polyethylene Pipe to be used for smaller pipes.

Above systems are considered as economical and simple for construction, operation and maintenance, taking into account the local condition.

The Authority has a labour force of more than 250 persons in total and some equipment for civil works, so that the Authority can undertake, to a great extent, construction works by own forces.

Operation and Maintenance of the existing water supply system in Praslin is entrusted to two engineers from the Department of Planning and Development but they are responsible not only for the water supply but also for whole civil works.

Approximate financial condition of Praslin Treated Water Supply System was projected as follows:

Item	(in thousand SR)	
	1985	1990
Operation/Maintenance Costs	713	950
Revenue	1,047	1,828
Net Income	334	878

In the meantime, the team found through discussion with the inhabitants that people in Praslin have willingness to connect and ability to pay for water. As the result of income survey in Praslin, approximately 2.6% of monthly income is projected to be used for the water, which is thought appropriate.

### 3. Materials and Equipment to be required

The items of materials and equipment requiring foreign grant-aid are ductile cast iron pipes, high density polyethylene pipes, valves, water treatment equipment, pumps and vehicles. The cost for those materials and equipment is estimated to be 300 million yen in CIF at Port Victoria at 1982 price level.



#### 4. Benefit and Recommendation

Benefits prospected are as follows:

- a) Availability of safe and plentiful water
- b) Release of women and children from water carrying work
- c) Availability of water for irrigation
- d) Availability of water for hotel services
- e) Availability of fire fighting water

Recommendation by the Team are as follows:

- a) For the construction, special attention should be given to the way of installing pipes in special portions such as river crossings and near the seacoast, and for backfilling of trenches, sand or soft earth should be used.
- b) For the operation and maintenance of the system, personnel should be trained prior to start-up of operation.

SURVEY REPORT  
ON  
PRASLIN TREATED WATER SUPPLY PROJECT  
OF  
THE REPUBLIC OF SEYCHELLES

CONTENT

	Page
1. <u>INTRODUCTION</u> .....	1
2. <u>DESCRIPTION OF THE PROJECT</u> .....	2
2-1 Background .....	2
1) General .....	2
2) Location and Geography .....	3
3) Present Water Use and Existing Water Supply Systems .....	4
4) Present Organization of the Water Authority .....	5
5) Financial Status of the Water Authority .....	8
2-2 Outline of the Project .....	9
1) Future Population and Water Demand .....	9
2) Water Sources .....	12
3) Proposed Water Supply System .....	12
4) Project Cost and Operation/Maintenance Cost .....	16
5) Intention of the Seychelles Government and Financing .....	18
6) Benefits of the Project .....	19
3. <u>MATERIALS AND EQUIPMENT REQUIRING FOREIGN GRANT AID</u> .....	21
3-1 Materials and Equipment Requiring Foreign Grant Aid ...	21
3-2 Procedures for Procurement .....	22
4. <u>CONCLUSIONS AND RECOMMENDATIONS</u> .....	24

APPENDICES

- A. MEMBER OF SURVEY TEAM AND SITE WORK SCHEDULE
- E. MINUTES OF DISCUSSION
- C. BILL OF QUANTITY
- D. PHOTOGRAPHS

SURVEY REPORT  
ON  
PRASLIN TREATED WATER SUPPLY PROJECT  
OF  
THE REPUBLIC OF SYCHELLES

1. INTRODUCTION

The present field survey has been conducted for the purpose to review the preinvestment study report (The report) made by the Government of the Republic of Seychelles (the Government) and the present conditions of water supply in the area of Praslin, and finally, based on the above review, to identify the materials and equipment requiring to construct the proposed water supply system with a grant aid requested to the Government of Japan.

The Survey Team (the Team) visited the country including the project area from January 22 to February 21, 1982, during which time the review of the water supply plan and the prevailing conditions of water supply in the project area was carried out and the minutes of discussions as attached in Appendix B signed by the Seychelles government officials and the Survey Team, after exchanging views about the project. After return to home office, further detailed analysis and study has been carried out. The present survey report describes all the results of the review and field investigation and of the study subsequently performed, and in addition presents conclusions and recommendations.

## 2. DESCRIPTION OF THE PROJECT

First, to visualize the whole picture of the project and its urgency, all related general conditions of the project area, water supply conditions, institutional arrangement and intention of the Government with respect to water supply will be described. Then, the report will proceed to the details of the project to identify all requirements for grant aid. For this, review of the report will be described together with result of field investigations of all existing water supply facilities. Finally, benefits to be derived from this project will be evaluated.

### 2-1 Background

#### 1) General

The Government policy is to realize eventually the self-sustained economy starting with the agriculture and stock-farming. On the other hand, the Government intends to accentuate tourism development which is completely dependant upon the foreign countries, limiting further tourism on Mahe and promoting on other islands. Although a tentative limit of 1,000 hotel beds has been set for Praslin by the Government, the tourism development will lead to an increase of employment opportunities in the island.

The Government puts an emphasis especially on public health essential for the inhabitants and the tourists, taking measures for refuse collection and periodical disinfection with a spray over the island. As stated above, the Government is making all efforts to maintain hygienic environmental conditions and expects urgent implementation of Praslin Treated Water Supply System.

For the field of construction of public works, Seychelles has commendable experience and capability. In Mahe, large scale civil engineering works are currently under way, such as expansion and maintenance of roads, electricity system and water works. All these civil works require not only work force, but also materials and equipment; the work force is available in the country, and materials and equipment, such as steel bar, cement, pumps, compressors and bulldozers are all well stored and operated. Therefore, construction of waterworks in Praslin may have no problem, so far as the above matters are concerned.

## 2) Location and Geography

Praslin is one of the three largest islands in the Seychelles archipelago. The archipelago is characterized by the tropical tourist spots which lie on the western Indian Ocean between latitude 4° and 10° south and between longitude 46° and 55° east, and it consists of more than 100 large and small islands. These islands vary in size from tiny uninhabitable islets, which in many cases are merely outcrops jutting out of the sea, to fairly substantial land masses on the scale of the three largest islands, Mahe, Praslin and Silhouette. Geologically, formations of these islands are all granite, and lack ground water.

Praslin is located 40 km north-eastward from Mahe. The island is approximately 11 km long and 4 km wide with an area of about 45 sq km. The population is about 5,000, accounting for 8% of the total population of the country. It can be reached from Mahe in 15 minutes by small aircraft.

The climate of Praslin is of the nature of tropics and ocean, having monthly average temperature ranging from 24°C to 28°C, and annual rainfalls 1,300 to 3,200 mm in the past 20 years.

Populated area is in the coastal plain of Grand Anse and Cote D'Or. Tourism and agriculture are major industries in Praslin. In the following paragraphs, these two features are described further.

The Praslin island as well as other islands in Seychelles is surrounded with scenic beauty of clean sea and coral reef. Besides, Praslin has another typical feature. That is National Park "Vallee De Mai" beautifully forested with "coco de mer" palm-trees which are indigenous to Praslin. As Praslin thus abounds in beauty, it is expected to attract more tourists in the future.

Regarding stock-farming and agriculture in Praslin, there is a state farm, breeding cows, hens and pigs and planting several kinds of vegetables and fruits which are to be supplied mainly to Mahe. As water is not necessarily sufficient, the stock-farming and agriculture are all limited.

### 3) Present Water Use and Existing Water Supply Systems

Two-thirds of the total population in Praslin are served by the existing water supply systems. The rest are obliged to use water from the streams for daily use. When a drought continues for a couple of weeks, some of the streams are dried up. The Seychelles Water Authority Limited (the Authority), therefore, keeps a tank lorry to serve the consumers with water. The present water consumption is supposed to be less than 100 l/capita/day from general water supply conditions, although no exact figures can be obtained.

People in Seychelles including Praslin generally use water without disinfection such as boiling or filtering at home for drinking. To make the matter worse, all the existing water supply systems in Praslin are serving water from the rivers without filtration and disinfection, with only sedimentation for the purpose of sand removal. These facilities are far inadequate to supply safe water.

Water sources of the existing water supply systems are the Kerlan, Nouvelle Decouverte, the Fond B'Offay Pellisier, the Consolation, the Salazie and the Lazio Rivers as shown in Fig. 2-1. They are all small rivers, some of which dry up except in rainy season. The water quality of those rivers is generally good except some turbidity and color after heavy rains, and has slightly low pH.

From each stream, water is channeled, by a barrage, into the Asbestos (AC)/Cast Iron (CI) mains, the CI mains installed more than 20 years ago are all deteriorated with encrustations due to aggressive acid in water as shown in Appendix D Photographs. That causes remarkable reduction of carrying capacity of pipe.

What is to be noted regarding the existing pipelines is that some portions of the pipelines are laid on the ground in the rocky area, and some other portions are installed close to the seashore, usually in shallow trenches. Heavy seeds or fruits of tropical trees often drop and damage the pipe. Selection of pipe materials and method of laying must be considered reflecting the above conditions.

#### 4) Present Organization of the Authority

The Authority, established at the beginning of 1981, is responsible for maintenance and operation of the existing water supply systems and extensions thereof in the whole islands. The present structure of the organization and the number of staff are presented in Fig. 2-2.

The Authority is under the control of Department of Planning and Development and consists of a Board of Directors and an Executive Organ headed by a Manager, who is responsible for the overall management of the organization. The organization is composed of three sections, namely (1) Engineering, (2) Accounting and (3) Administration. Engineering Section is responsible for maintenance and operation of the water supply

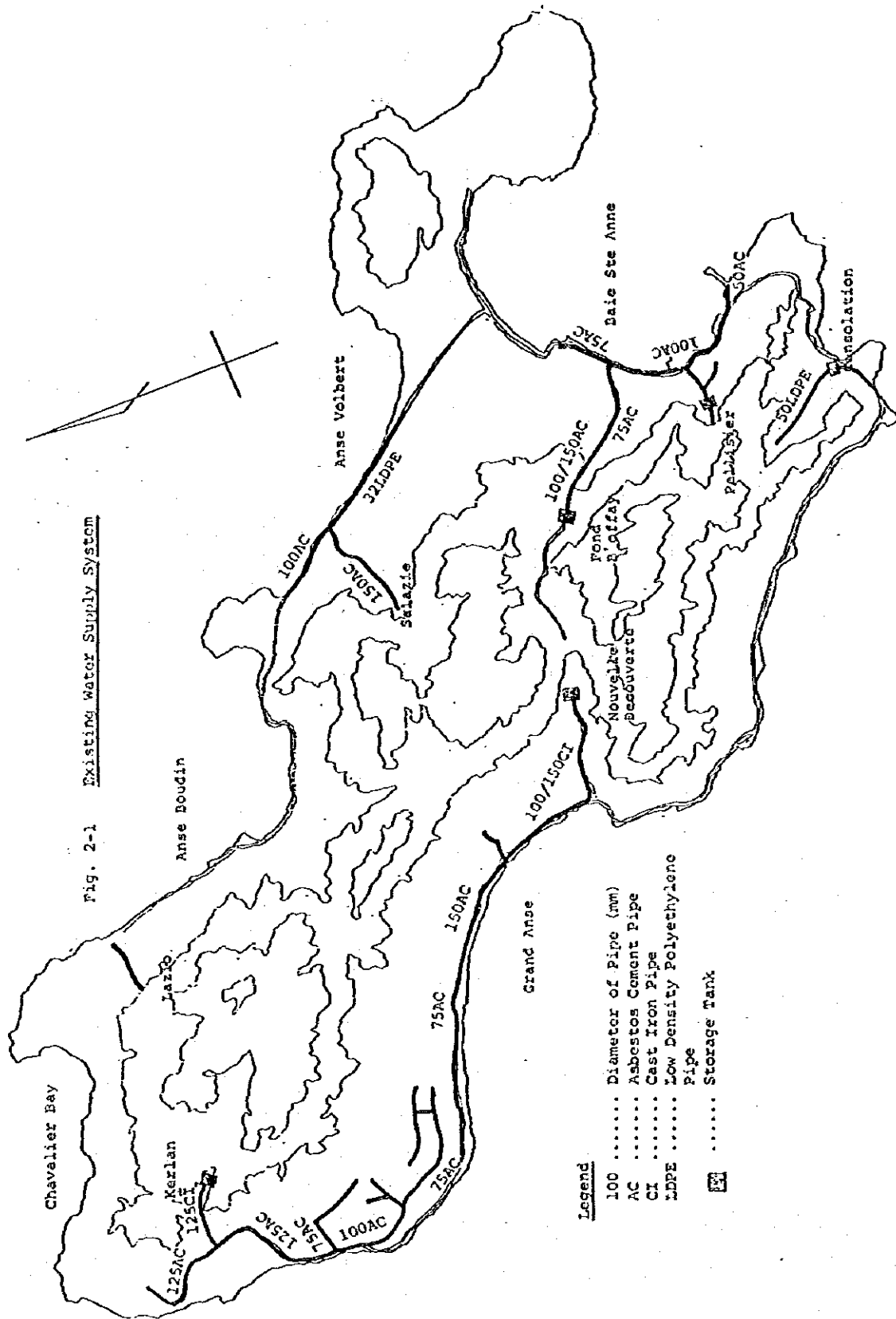
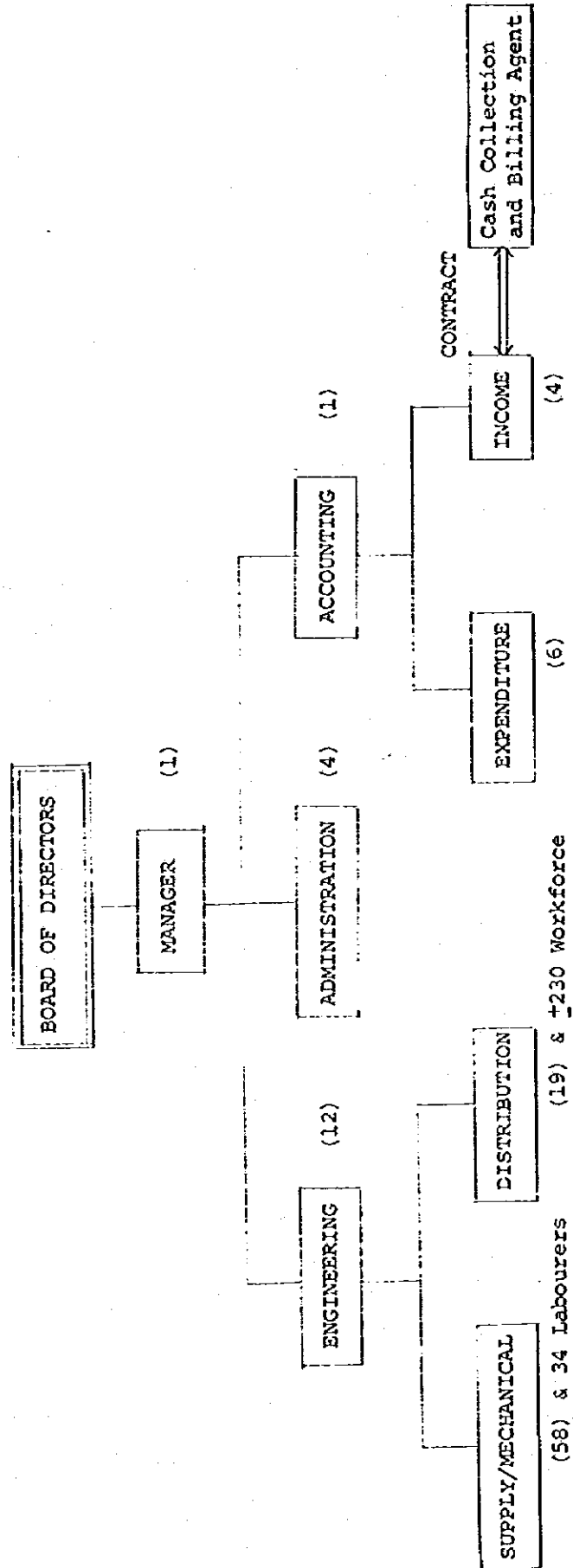


Fig. 2-1 Existing Water Supply System

- Legend**
- 100 ..... Diameter of Pipe (mm)
  - AC ..... Asbestos Cement Pipe
  - CI ..... Cast Iron Pipe
  - LDPE ..... Low Density Polyethylene Pipe
  - ☐ ..... Storage Tank



Fig. 2-2 Organization Chart of the Seychelles Water Authority Limited



Note: ( ) denotes staff number

facilities as well as design of new works. Accounting Section is responsible for routine bookkeeping and billing and collection including meter reading. The billing and collection is subcontracted to a private agency. Administration Section manages the business of the Authority and coordinates all the activities of the Sections to attain maximum efficiency. The Authority has a labor force of more than 250 persons in total and some equipment for civil works, so that the Authority can undertake, to a great extent, construction works by own force.

Under these Sections, a number of foreign experienced engineers are retained for the purpose of training local personnel and supplementing the in-house force. Speaking conclusively, the present organization is well organized and has a sufficient capability for conducting its business.

Operation and maintenance of the existing water supply systems in Praslin is entrusted to a few district engineers from the Department of Planning and Development. They are responsible for not only water supply but also construction and maintenance of the whole civil works, such as road construction, building, electricity and so on. They are quite experienced and skilled, but the number of the engineers seems not necessarily sufficient.

The Authority keeps a workshop near the office. Piping materials for repair and equipment, such as concrete mixers, a scraper and a truck are kept in stock, all of which are available for the present project.

#### 5) Financial Status of the Water Authority

The Authority, as stated in the foregoing paragraphs, is responsible for the management of all the existing water supply systems in Seychelles. The Authority constructs water facilities under the budget of the Government, and operates the completed facilities. For

the use of the water facilities thus constructed, the Water Authority pays some lease charge to the Government, the amount of which accounts for only a small percentage of the revenue from water sale. The revenue, therefore, covers mainly the operation cost including costs for personnel salary, office operation and maintenance and operation of the facilities.

Depreciation of the fixed assets and amortization of loan, if any, are usually excluded from the operation cost, and they are covered by the budget of the Government. Even with such subsidy as stated above from the Government, the Authority is presently not in a financial position to afford to carry out expansion projects of the water supply systems.

## 2-2 Outline of the Project

The review of the Report was carried out by the Team based on both study of basic relevant data and survey in the project area.

As a result of review, it was concluded that the Praslin Treated Water Supply Project described in the Report is technically sound and feasible to execute.

Following is the Outline of the Project taken out from the Report with some corrections and revisions made by the Team.

### 1) Population and Future Water Demand

#### a. Population and Number of Beds

The Ministry of Planning and Development has planned the maximum tourist hotel beds to be facilitated in Praslin Island to amount 500 beds by 1985, the target year of Stage I and 1,000 beds by 1990, the target year of Stage II, and these figures are employed for the present estimation.

The increase of the new hotels and improvement of hotels are expected in the future to accommodate the increasing tourists, and those hotel improvements are assumed to produce new 2,000 jobs which to be filled up by the original residents and new residents who move in to Praslin Island from other islands. It is also assumed that this increase by the new residents is only a factor for population growth, considering the past trend of population in Praslin. On such assumption in the report, 500 residents by 1985 and 1,000 residents by 1990 were planned to be increased.

Number of hospital beds were not planned to increase due to the most of the patients in Praslin to be hospitalized in Mahe, main island.

This report adopts the figures in Table 2-1 based on the above planning in the report.

Table 2-1 NUMBER OF FUTURE POPULATION AND BEDS

Item	1985(Stage I)	1990(Stage II)
Population (Residents)	4,300	4,800
Hotel bed	500	1,000
Hospital bed	35	35

b. Unit Water Consumption

For future unit water consumption, "Water Requirement Study Report in Mahe Island" prepared by Seychelles Government based on the experiences and data of Mahe are also adopted in this report as shown in Table 2-2.

Table 2-2 FUTURE UNIT WATER CONSUMPTION

Item	1985 and 1990
Residential Consumer	120 l/h/d
Hotel Consumption	650 l/b/d
Hospital Consumption	400 l/b/d

c. Future Water Demand

The future water demand was calculated by multiplying figures, described in foregoing paragraph, of population hotel beds for the tourists and hospital beds with each unit water consumption.

Most of figures were taken from the Report and confirmed by recalculation. Future water demand thus obtained is shown in the following Table 2-3.

Table 2-3 FUTURE WATER DEMAND

Item	1985	1990
Resident	516 m <sup>3</sup> /day	576 m <sup>3</sup> /day
Hotel	325	650
Hospital	14	14
Sub-total	855	1,240
System Loss	171	248
Total	1,026 (11.9 l/s)*	1,488 (17.3 l/s)*

\* Total water demand is somewhat different from that in the Report.

## 2) Water Source

In the report, river water was proposed to be used for main sources for the system, and groundwater and surface impounded water, by the planned Hollandaise dam, were planned to be used for supplemental water sources. By the investigation and studies on each water source carried out by the Authority, following quantity of water was estimated to be available in the future.

Being found appropriate in the present survey, the figures in Table 2-4 taken from the report are used in this report for future water sources.

Table 2-4 WATER SOURCE

Year	Quantity (l/s)	Source
1985	14.2	River water and groundwater
1990	21.0	River water, groundwater and surface impounded water (dam)

## 3) Proposed Water Supply System

### a. Treatment Facility

A system consisting of simple sedimentation and rapid pressure filtration (see Fig. 2-3) was adopted for Praslin Water Treatment Facility by the Authority that investigated and studied the water treatment method.

An aeration system for the groundwater to be used as a supplemental source was adopted in the Report to remove noxious gases by oxygen gas transfer prior to mixing with the river water.

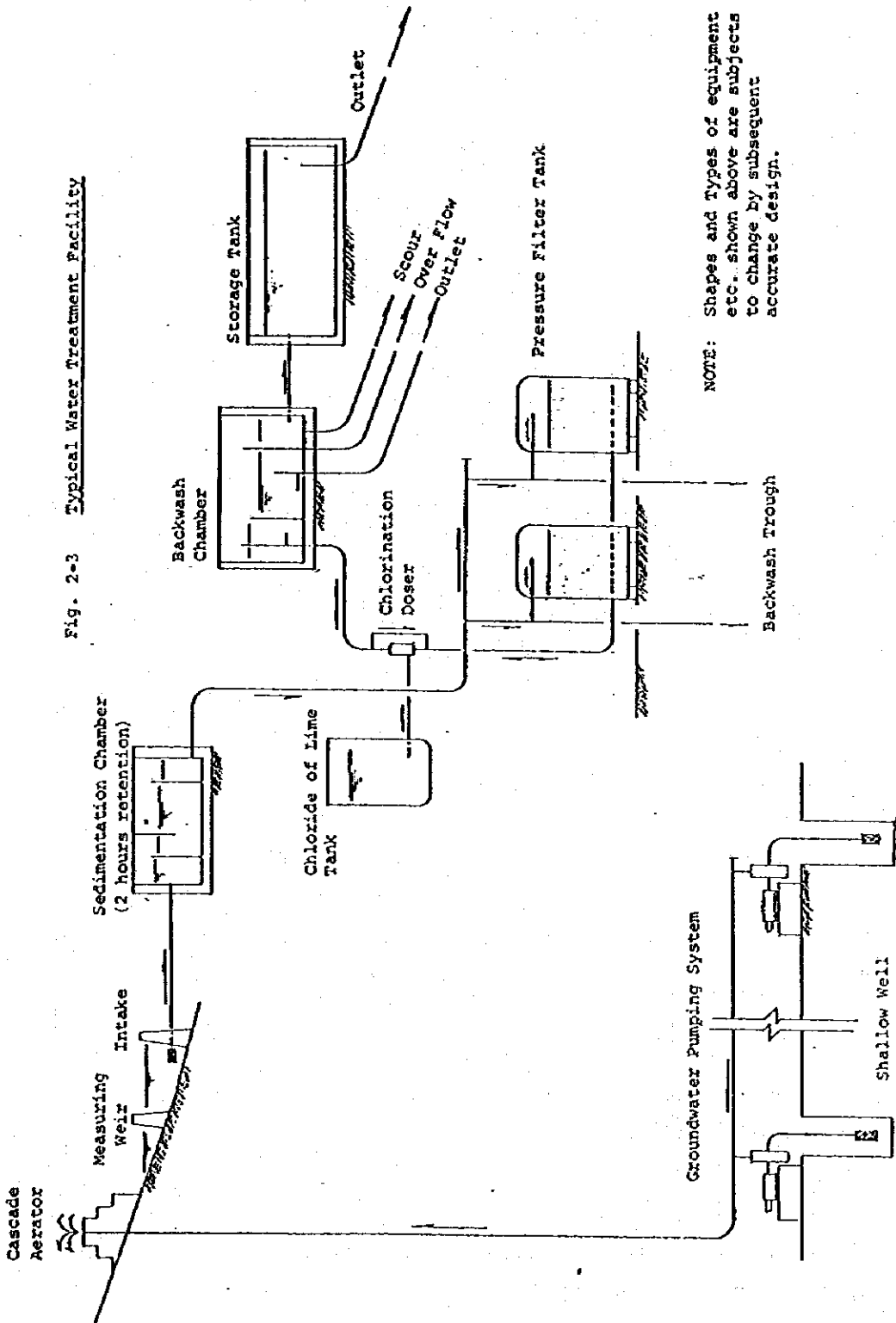


Fig. 2-3 Typical Water Treatment Facility

NOTE: Shapes and Types of equipment etc. shown above are subjects to change by subsequent accurate design.

Above facilities are considered as economical and simple for construction, operation and maintenance. They are technically sound. This report, therefore, adopts facilities as shown in Fig. 2-3 and Table 2-5, as proposed in the Report.

Table 2-5 MAJOR WATER TREATMENT FACILITY

Item	Facility
Intake Facility:	Concrete Barrage with intake pipe and screen
Sedimentation Chamber:	Concrete Structure 2 hours retention time to remove coarse sedimentable solids
Pressure Filter Tank:	Metal Tank To remove small organic materials and color etc.
Chlorination System:	Semi-manual dosing system of chloride of lime for disinfection
Storage Reservoir:	Concrete Structure To store the treated water prior to distribution

b. Distribution System

In the report, Ductile Cast Iron Pipe (DCIP) for main distribution pipes and High Density Polyethylene Pipe (HDPE) for smaller pipes were selected by the reasons that DCIP can be installed in shallow trenches and HDPE is light, non-notch sensitive, flexible and not affected by sun-light or chemicals.

It was proposed to install the main pipe with minimum earth covering of 60 cm, and in special locations, an earth cover of 30 cm would be allowed.

Above described system was well considered by the Authority based on the study and experience, and this report considers the proposed system is appropriate.

Major distribution pipe routes and locations of the water treatment facilities are shown in Fig. 2-4.



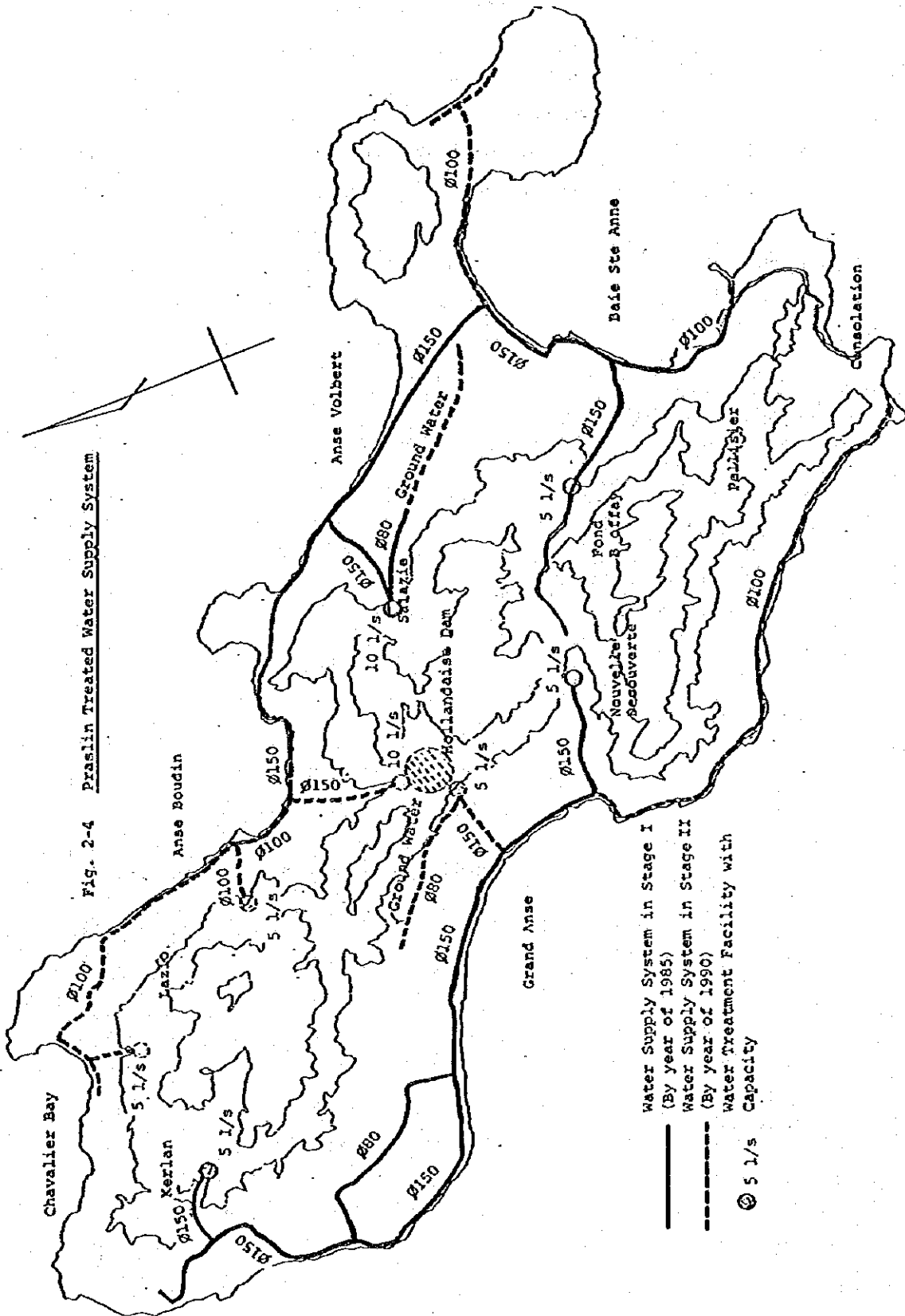


Fig. 2-4 Praslin Treated Water Supply System

- Water Supply System in Stage I (By year of 1985)
- Water Supply System in Stage II (By year of 1990)
- Water Treatment Facility with 5 l/s Capacity

4) Project Cost and Operation/Maintenance Cost

a. Estimated Project Cost

The estimated project costs for Stage I and II are shown in Table 2-6 and Table 2-7, in which components for foreign and local currencies are also shown.

Table 2-6 ESTIMATED PROJECT COSTS FOR STAGE I

Item	(thousand SR)		
	Foreign Cost	Local Cost	Total
Pipe, Fittings and Valves, and Installation Costs	6,080	6,550	12,630
Water Treatment Facilities, Equipment and Installation/Construction Cost	2,080	1,680	3,760
Ground Water Investigation, Pump Equipment and Installation Cost	123	380	503
Vehicles and Transportation Costs for Construction	287	-	287
	8,570	8,610	17,180

Note: Following exchange rate was used, 6.3 SR = 1 US\$  
 225 Yen = 1 US\$  
 1 SR = 35 Yen

Table 2-7 ESTIMATED PROJECT COSTS FOR STAGE II

Item	(thousand SR)		
	Foreign Cost	Local Cost	Total
Engineering Study and Construction Cost for Hollandaise Dam	2,800	3,510	6,310
Pipe, Fittings and Valves, and Installation Costs	2,230	5,350	7,580
Water Treatment Facilities, Equipment and Installation/Construction Cost	880	1,200	2,080
Pump Equipment and Installation Cost	100	140	240
	6,010	10,200	16,210

b. Operation and Maintenance Cost (O/M)

To examine the financial condition of Praslin Treated Water Supply System after the completion of the project, a projection of operation and maintenance cost is made as shown in the following Table 2-8. In actual practice in the country, all accounting of this System is included in that of the Water Authority. Therefore, the above said projection is solely provisional, only to see financial appropriateness of the project.

Table 2-8 O/M COST AND REVENUE

			(thousand SR)
Item	1985	1990	Remarks
<b>I. Operation Cost</b>			
1. Personnel Cost (Salaries)	405	405	one engineer, three for O/M, three for billing/accounting, one secretary and 10 labours.
2. Operation/Maintenance			
a. Maintenance	103	201	0.6% of fixed assets
b. Office Operation Cost	10	12	2 SR for every customer
c. Chemical Cost	50	70	12 SR/kg, design rate = 10 ppm
d. Electricity & Fuel	111	222	1.3 SR/KWH
(Total 1 & 2 a, b, c, d)	679	910	
e. Other Expenses	34	40	5% of total
<b>Total</b>	<b>713</b>	<b>950</b>	
<b>II. Revenue</b>			
1. Revenue from Water Sales (Residential & Hospital)	927	1,683	
(Commercial)	(215)	(259)	
(Commercial)	(712)	(1,424)	
2. Other Fee	120	145	Installation of house connection and meter
<b>Total</b>	<b>1,047</b>	<b>1,828</b>	
<b>III. Net Income</b>	<b>334</b>	<b>878</b>	<b>II - I = III</b>

Note: All above figures are on the basis of present value (1982).

In the meantime, to obtain information on the present water use in Praslin, meetings were held between SPPF (Seychelles People's Progressive Front) in Praslin and the Survey Team during the field survey period. Explanations and discussions in the meetings revealed that people in Praslin have willingness to connect and ability to pay for water. As Praslin is quite limited in available water resources, and people are chronically suffering from water shortage, they are very eager for treated water supply.

To ascertain the ability to pay for water, the Team conducted a survey of household income. It is found as a result of the survey that the household incomes per month are in a range of SR 800 to SR 18,000 with an average of SR 1,300. Presently in Mahe the water rate is 1 SR/cu m for water use for the first 10 cu m/month and 2 SR/cu m for the second 10 cu m/month. In addition, 8 SR/month is charged to each connection as a base connection charge. Supposing an average family consumes 18 cu m/month, the total charge is around 34 SR, which is equivalent to 2.6% of the average monthly income. This percentage is less than that of similar cities. Conclusively, if the same water rate as Mahe is applied for Praslin, it will be appropriate.

##### 5) Intention of the Seychelles Government and Financing

The Seychelles Government intends and has a policy to limit a further increase of tourism in Mahe and promote tourism activities in other islands including Praslin. Regarding water supply, the Government established a target in the Five Year Plan that all people in the country shall benefit from treated water by the year 1990. In compliance with this policy, the present project has been proposed and intended to be completed as early as possible. This project, when completed, will assure safe and plentiful water supply for the increasing demand. It is also expected that Praslin, the second largest and very scenic island, will attract more tourists benefitting from the improved water supply.

As regards financing of the project, the Government expects earnestly that materials and equipment for the project be granted by the foreign country, while the rest of the project cost is determined to be appropriated in the national budget of the Government. As for the foreign exchange position of the country, deficit amounted to US\$ 80 million in 1980, with export US\$ 16.7 million against import US\$ 97 million. The major foreign exchange earner of the country is tourism, but recently foreign visitors are decreasing due to the worldwide depression, and besides, tourism cannot expect a rapid expansion because of the limitation of accommodation and transportation facilities.

On the other hand, with regard to the execution of the construction work, the Authority is prepared to carry out all the works by own force, thus economizing construction costs. In this connection, the Authority keeps experienced engineering force, and skilled and unskilled labor is plentifully available in the country.

#### 6) Benefits of the Project

Because of its geographical feature of a small rocky island, Praslin is limited in favourable water sources. From the standpoint of tourism, it abounds in scenic beauties, such as coral sea in Grand Anse, Baie Ste. Anse, and Cote D'Or and tropical forests in National Park, Vallee de Mai. Due to insufficiency of drinking water, however, its development has been retarded. The construction of the water supply system will bring the following benefits to the consumers and development of Praslin.

##### a. Safety of Drinking Water

Water Supply is basic condition for good public health. The existing water supply, however, do not always ensure safe water, since it serves the untreated water and furthermore, the inhabitants use water for drinking customarily without any disinfection. And the quantity of water sources is far less than enough, particularly in dry season. By the present project all the people in Praslin will be able to enjoy safe as well as plentiful drinking water.

Further, health of the people, presently maintained in good condition, can be secured and promoted by the construction of the Treated Water Supply System.

b. Release of Women and Children from Water Carrying

Women and children have been obliged to carry water from a distant water source all the year round. Once the water supply system is completed, they will be released from such hard labour.

c. Water for New Hotels

New modern hotels are planned to be constructed in Grand Anse and Cote D'Or Area in the near future. The existing water supply system, however, are unable to supply sufficient and safe water to the consumers, whereas it is an essential condition for the island to become a tourist resort. When the present project is executed, this problem will be immediately solved.

d. Water for Irrigation

Water source in Praslin is so limited that even for the agricultural irrigation farmers are obliged to take groundwater from the existing shallow well located near the sea. Such groundwater is apt to be contaminated by saline water and have adverse effects on the agricultural products. After operation of the present water supply project, the overflow water from the water works can be utilized for irrigation and this probably results in the increase of the product.

e. Fire Fighting Water

By the construction of the project, fire fighting water becomes available throughout the island. There is no water source for fire fighting. Vallee De Mai, national park, one of the visiting spots of travellers, is densely forested with tropical trees. These trees are also invaluable resources for tourism. Once a fire breaks out in this area, all the resources will be burnt to ashes. Provision of water is very important not only for the safety of inhabitants but also for the preservation of natural condition.

### 3. MATERIALS AND EQUIPMENT REQUIRING FOREIGN GRANT AID

To construct the project that has been reviewed and examined about its appropriateness, it is concluded that materials and equipment are vitally necessary to be granted because of unfavorable economic national conditions, and urgent necessity of drinking water in the area concerned. The plan of water supply prepared based on this necessity is clearly represented in Table 2-3, Future Water Demand. The items and quantities of materials and equipment requiring foreign grant aid are summarized in the following and necessary procedures to be taken are also presented to facilitate smooth implementation of the project.

#### 3-1 Materials and Equipment Requiring Foreign Grant Aid

All the items of materials and equipment, their specifications and costs for the Stage I are summarized in the following Table 3-1 and Appendix C. The costs are based on C.I.F. at Victoria Port at 1982 price level and not include the transportation cost from Victoria Port to the project site, Praslin Island, and installation/construction cost at site. As shown in Table 2-6 Estimated Project Cost, about 50% of Project cost is proposed to be covered by the grant aid.

Table 3-1 ITEMS AND COST (CIF) FOR THE GRANT

Item	CIF Cost (Thousand Yen)
1. Ductile Cast Iron Pipe and Fittings (ND100-150)	117,500
2. Flanged Ductile Cast Iron Pipe and Fittings (ND80-150)	23,000
3. High Density Polyethylene Pipe and Fittings (OD27-60)	48,200
4. Valves - Cast Iron (ND80-150)	18,900
5. Gunmetal Valve (3/4" - 3")	20,800
6. Valve Cover and Frame	7,500
7. Treatment and Pumping Equipment	54,100
8. Vehicle	10,000
Total	300,000

Note: ND100 - denotes, 100 mm Nominal Diameter  
OD27 - denotes, 27 mm Outside Diameter

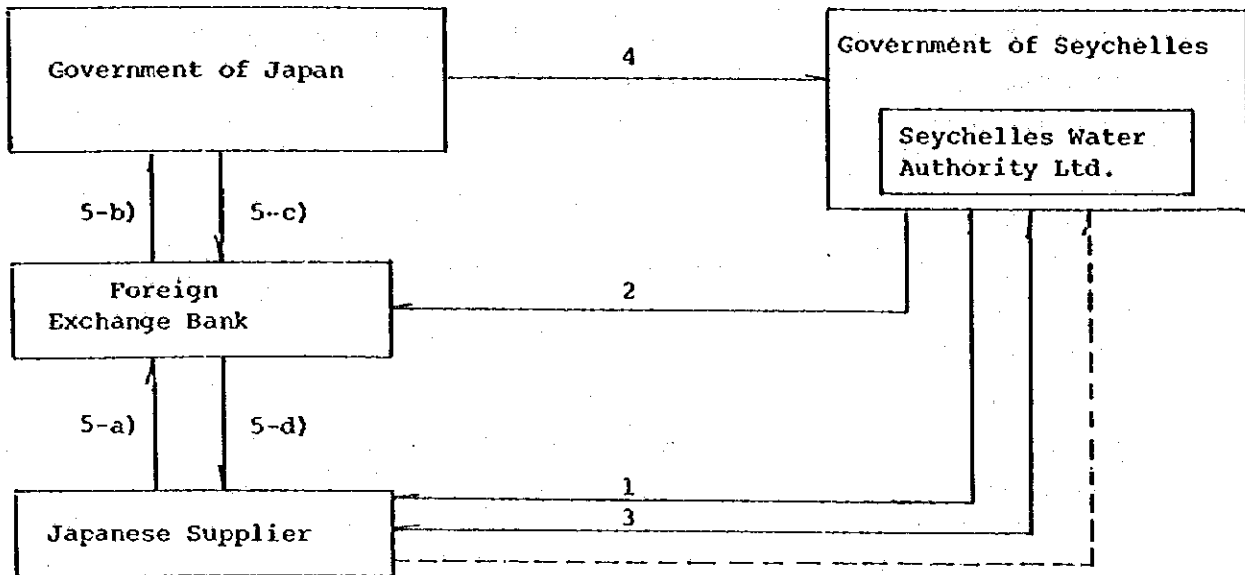
### 3-2 Procedures for Procurement

Chart of procurement procedures is shown in Fig. 3-1, where all necessary formal procedures to be taken between the Governments of Seychelles and Japan after the Exchange of Note are indicated. Explanation about procurement procedures has been made in Annex II of Appendix B.

As stated in the foregoing section, the Authority retains a number of foreign experienced engineers and also has the experience of tendering held in Seychelles. Furthermore a consulting firm for the service of preparation of necessary documents is available in Seychelles. Anyhow, the Water Authority is well capable of prosecuting of tenders. Hence, the tender documents for the procurement of piping materials and equipment is to be prepared, beforehand, by the Seychelles Government and the procurement should be made through open tendering to be held in Seychelles.



Fig. 3-1 Procedures for Procurement  
(after the Exchange of Notes)



- Note:
1. Open tender
  2. Banking arrangement
  3. Signing of a contract
  4. Verification of the contract
  5. Disbursement of grant
    - a) Requests for payments to the Bank
    - b) Requests for payments to the Government of Japan
    - c) Payments to the Bank
    - d) Payments to the Supplier
- denotes the execution of the Contract

#### 4. CONCLUSIONS AND RECOMMENDATIONS

As a result of all the review and study, it is found that the water supply project proposed by the Water Authority is technically sound and appropriate, and the project is urgently needed for the welfare of the public and the development of the region concerned, and further it is confirmed that grant aid for materials and equipment is recommended to implement the project.

For better execution of the construction work, the following is desired to be taken in design and construction of the project.

##### a. Siting of Pipeline

Most of the pipelines are planned to be installed near the seacoast. Metallic pipes are likely to be corroded by seawater. Therefore, the pipelines should be placed as far inland as practicable.

##### b. River Crossing of Pipeline

Pipelines at the river crossing are vulnerable to damages, so such pipelines should be firmly fixed to bridges or laid under the riverbed with sufficient protection concrete work.

##### c. Burial of Pipeline

The soil formation is generally hard and rugged with granite rocks, and the pipe laid is apt to be damaged by hard rocks. Therefore, backfilling the trenches should be made with sand or soft earth. Where exposed piping is practicable, pipe should be firmly supported.

##### d. Securing of Personnel

When the present project is completed, four new water works are to be put into operation. Personnel required for operation and maintenance of these works should be secured and trained for the job in time.

APPENDIX A  
MEMBER OF SURVEY TEAM AND  
SITE WORK SCHEDULE



## Member of Survey Team and Site Work Schedule

### 1) Member of Survey Team

The Survey Team was composed by following members:

Name	Period of Stay
Team Leader, Yasuyoshi Komizo (From Japanese Foreign Affairs)	22nd Jan - 28th Jan '82
Yuriko Suzuki (From Japanese Foreign Affairs)	22nd Jan - 28th Jan '82
Manabu Aiba (From JICA)	22nd Jan - 13th Feb '82
Hiroyasu Yoda (Water Supply Engineer)	22nd Jan - 20th Feb '82
Hajime Sakurai (Water Supply Engineer)	22nd Jan - 20th Feb '82

2) Site Work Schedule

Date	Schedule	Major Daily Work Item	
Jan. 23	(Mr. Komizo, Ms. Suzuki)	Meeting with Officials from RS/SWAL	
24		Site Survey to Praslin Island	
25		Discussion and Data Collection	
26		Existing Water Supply Facility Survey in Mahe	
27		Discussion and Exchange of "Minutes of Discussion"	
28		Existing Water Supply Facility Survey in Mahe	
29		Discussion for Work Schedule and Data Collection	
30		Study on Collected Data and Report	
31		- ditto -	
Feb. 1		(Mr. Aiba)  (Mr. Yoda, Mr. Sakurai)	Preparation of Questionnaire
2			Existing Water System Survey in La Digue
3	Site Survey and Discussion in Praslin		
4	- ditto -		
5	- ditto -		
6	Study on Collected Data		
7	- ditto -		
8	Discussion for Site Inspection Result		
9	Costing Study		
10	Discussion for BQ and Specification		
11	Estimation of BQ and Adjustment		
12	- ditto -		
13	- ditto -		
14	Preparation of Data for Survey Report		
15	Final Discussion on BQ and Specification		
16	- ditto -		
17	Preparation of Data for Survey Report		
18	- ditto -		
19	Final Meeting with Officials from RS/SWAL		
20	Departure for Japan		

Note: RS - Ministry of Planning and Development of Republic of Seychelles  
 SWAL - Seychelles Water Authority Ltd.  
 BQ - Bill of Quantity

**APPENDIX B**  
**MINUTES OF DISCUSSIONS**





MINUTES OF DISCUSSIONS  
ON  
THE PROCUREMENT PLAN FOR MATERIALS AND EQUIPMENT FOR  
THE IMPLEMENTATION OF THE PRASLIN TREATED  
WATER SUPPLY PROJECT

---

In response to the request made by the Republic of Seychelles, the Government of Japan dispatched, through Japan International Co-operation Agency, a survey team headed by Mr. Yasuyoshi Komizo, official of the Ministry of Foreign Affairs, from 23rd January, 1982, on the procurement plan for material and equipment for the implementation of the Praslin Treated Water Supply Project.

The team conducted a field survey and held a series of discussions and exchanged views with Seychelles Government Officials.

As a result of the survey and discussions, the Japanese Survey Team and the Seychelles Officials agreed to recommend to their respective governments the results of the discussions attached herewith.

January 27, 1982.

小溝泰義

Mr. Yasuyoshi Komizo  
Leader of the Japanese Survey  
Team on the procurement plan of  
equipment for the implementation  
of Praslin Treated Water Supply  
Project.

Mr. Robert Grandcourt

Mr. Robert Grandcourt  
Principal Secretary  
Ministry of Planning & Development  
Republic of Seychelles.

## MINUTES OF DISCUSSIONS

1. After the exchange of views with the Japanese Survey Team, the Seychelles Officials made a revised request for Japanese grant assistance on the procurement of materials and equipment for the implementation of the Praslin Treated Water Supply Project as attached in Annex I.
2. The Japanese Team recognised, with satisfaction through the field survey and a series of discussions with the Seychelles Government Officials, that the Praslin Treated Water Supply Project is a technically well planned project and that the Government of Seychelles has the technical ability to implement the project.
3. The Japanese Team will convey the request of the Seychelles Government to the Government of Japan that the latter will co-operate with the plan by providing the Government of Seychelles with materials and equipment as listed in Annex I. Annex I is subject to approval by the Government of Japan.
4. The Japanese Team, explained to the Seychelles Government Officials the procedures involved in the implementation of Japanese grant assistance as stated in Annex II.
5. The Seychelles Government Officials confirmed that on receiving the Japanese grant assistance, the conditions listed in Annex III, will be complied with.

Annex I. Materials and Equipment requiring foreign grant aid are as follows:

Item	Unit	Remarks
1. Ductile Cast Iron Pipe (Push on Joint)		
Straight Pipe ND100	1.5 km	
ND150	16.0 km	
Fittings and Joint Spares (ND100-150)	-	
2. Flanged Ductile Cast Iron Pipe		
Straight Pipes ND80	0.15 km	
(Inc. Short Length Pipe) ND100	0.24 km	
ND150	0.35 km	
Fittings and Joint Spares (ND80-150)	-	
3. High Density Polyethylene Pipe		
Straight Pipe OD27	10.0 km	
OD42	6.0 km	
OD60	10.0 km	
Fittings and Spares (OD27-60)	-	
4. Valve - Cast Iron		
Gate Valves ND80	100	
ND100	10	
ND150	25	
Other Valves (ND50-150)	-	
5. Gunmetal Valves		
Gate Valves 3/4"	25	
1 1/4"	60	
2"	100	
Service Connection (Saddle) 3/4"	700	
1 1/4"	100	
Other Valves (3/4"-3")	-	
6. Valve Covers and Frames		
Cover for Gate Valve (Heavy Duty)	100	
(Light Duty)	100	
Other Covers	135	

Item	Unit	Remarks
<b>7. Treatment and Pumping Equipments</b>		
Pressure Filter Tank 5 l/s (Includes Media)	6	
Chroline Doser (Includes Chroline Tank)	5	
Centrifugal Pump (3 l/s, h=100 m)	5	
<b>8. Vehicles</b>		
7-tonnes Truck	1	
5-tonnes Dump Truck	1	
Four-wheel Drive Car	1	

Note: ND-Nominal Diameter of Pipe  
OD-Outside Diameter of Pipe

Annex II

Procedures to be followed on the implementation of  
Japanese grant assistance after signing of the Exchange of Notes

1. OPEN TENDER

The Seychelles Government selects a Japanese firm to supply material and equipment purchased under Japanese grant assistance through open tender.

2. BANKING ARRANGEMENT (B/A)

An arrangement between the Seychelles Government and a Japanese foreign exchange bank be concluded in order to open an account in the name of the Seychelles Government, to receive Japanese grant in accordance with the signed Exchange of Notes. The Seychelles Government will issue to the Bank an Authorisation to Pay document in accordance with the contract.

3. SIGNING OF A CONTRACT

The Seychelles Government signs a contract in Japanese Yen for the procurement of materials and equipment with the successful tenderer. The successful Japanese tenderer shall execute the contract.

4. VERIFICATION OF THE CONTRACT

The Government of Japan will check and verify that the contract is in accordance with the signed Exchange of Notes. The contract comes into force only after the verification by the Government of Japan.

5. DISBURSEMENT OF GRANT

According to the payment schedule of the contract and the A/P the grant will be disbursed as follows :-

- a) Japanese firm requests the payments.
- b) The Japanese foreign exchange bank requests payments to Government of Japan.
- c) The Government of Japan deposits the grant money as requested to the account in the name of the Seychelles Government in the Japanese foreign exchange bank.
- d) The bank pays the amount instantly to the Japanese firm according to A/P.

Annex III

THE ARRANGEMENT TO BE MADE BY SEYCHELLES GOVERNMENT  
ON RECEIVING JAPANESE GRANT ASSISTANCE

1. To ensure prompt unloading and customs clearance at a port in Seychelles and prompt internal transportation therein of the products purchased under the grant.
2. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Seychelles with respect to the supply of the products and the services under the verified contract.
3. To maintain and use properly and effectively the materials and equipment purchased under the grant.

APPENDIX C  
BILL OF QUANTITY





Bill of Quantity requiring foreign grant aid for Praslin Treated Water Supply Project.

1. Double Socketed Ductile Cast Iron Pipe and Fittings (DCIP)

JIS

Item	Description (Nominal Diameter)	No.	Remarks
D-1	Straight Pipe (Single Socket)	100 x 4 m 150 x 5 m	380 3,200
D-2	11 1/4° Bend	100 150	15 100
D-3	22 1/2° Bend	100 150	23 150
D-4	45° Bend	100 150	12 100
D-5	90° Bend	100 150	3 4
D-6	Flanged Socket	100 150	15 70
D-7	Flanged Spigot	100 150	15 70
D-8	Tee with Flanged Branch	100 x 80 100 x 100 150 x 80 150 x 100	23 2 200 10
D-9	Taper (Reducer)	150 x 100	10
D-10	Collar (Coupling)	100 150	30 200
D-11	Spare Joint Accessories	100 150	75 500

2. Double Flanged DCIP (FDCIP)

Item	Description (Nominal Diameter)	No.	Remarks
F-1	Straight Pipe	80 x 3 m	35
		100 x 3 m	70
		150 x 4 m	75
F-2	Short Straight Pipe	80 x 0.15 m	40
		80 x 0.30 m	40
		80 x 0.45 m	40
		80 x 1.00 m	10
		100 x 0.15 m	20
		100 x 0.30	20
		100 x 0.45	25
		100 x 1.00 m	15
		150 x 0.15 m	30
		150 x 0.30 m	25
150 x 0.45 m	30		
150 x 1.00 m	20		
F-3	45° Bend	80	30
		100	40
		150	80
F-4	90° Bend	80	50
		100	30
		150	40
F-5	All Flanged Tee	80 x 80	24
		100 x 80	30
		100 x 100	10
		150 x 80	30
		150 x 100	10
		150 x 150	8
F-7	Taper (Reducer)	100 x 80	16
		150 x 100	8
F-8	Split Puddle Flange	80	10
		100	15
		150	30
F-9	Bell Mouth	80	4
		100	14
		150	4

Item	Description (Nominal Diameter)	No.	Remarks	
F-10 Blank Flange	80	300		
	100	40		
	150	60		
F-11 Spare Flange	80	400		
	Joint Accesso- ries	100	400	
		150	400	

3. High Density Polyethylene Pipe and Fittings (HDPE)

Item	Description (Outside Diameter)	No.	Remarks
P-1	Straight Pipe	27	10,000 m
		42	6,000 m
		60	10,000 m
P-2	Socket Joint	27	1,000
		42	300
		60	500
P-3	Female Adaptor	27	200
		42	60
		60	100
P-4	Male Adaptor	27	1,000
		42	240
		60	400
P-5	Male, Female Adaptor		1,200
P-6	Equal Tee	27 x 27	500
		42 x 42	60
		60 x 60	100
P-7	Female Tee	27 x 27	100
		42 x 42	180
		60 x 60	300
P-8	Plug	27	100
P-9	Threaded Nipple		540
P-10	Spare Ring and Nut	27	200
		42	60
		60	100

4. Valve-Cast Iron (VCI)

Item	Description (Nominal Diameter)	No.	Remarks
GV-1, Gate Valve	80	100	
	100	10	
	150	25	
FH, Fire Hydrant	80	40	
BYV-1 Butterfly Valve (Gear Box)	150	15	
BYV-2, Butterfly Valve (Lever Type)	50	5	
	80	40	
	100	16	
FOV-1, Float Operated Valve	80	2	
	100	4	
	150	4	
AV-1, Double Air Valve	80	30	
AV-2, Single Air Valve	50	15	
CV-1, Swing Check Valve (Larger Size)	100	4	
	150	10	
CV-3, Foot Valve	50	4	
	80	10	
CV-4, Duo Check Valve	50	2	
	80	2	
	100	6	
	150	6	

5. Gunmetal Valve (GV)

Item	Description (Inch)	No.	Remarks
GV-2, Gate Valve	3/4	25	
	1 1/4	60	
	2	100	
SV, Groove Valve (Stopcock)	3/4	350	
BV, Ball Valve	3/4	16	
	1 1/4	8	
	2	8	
	3	10	
PC, Plug Cock	3/4	350	
FOV-2, Float Operated Valve	3/4	8	
	2	4	
SD, Saddle	3/4	700	
	1 3/4	100	
DM, Drill machine		2	
PRV-1, Pressure Reduc- ing Valve (Adjustable)	1 1/4	24	
	2	40	
PRV-2, Pressure Reduc- ing Valve (Fixed)	3/4	100	
SP, Stand Pipe Tap	3/4	60	
CV-2, Swing Check Valve	3/4	10	
	1 1/4	5	
	2	5	
	3	5	

6. Valve Covers and Frames (Covers)

Item	Description	No.	Remarks
C-1	Cover for Gate Valve	Heavy Type Light Type	100 100
C-2	Cover for Fire Hydrant	Heavy Type Light Type	60 30
C-3	Cover for AV-1		30
C-4	Cover for AV-2		15

7. Treatment and Pumping Equipment

Item	Description	No.	Remarks
Pressure Sand Filter Tank	5 l/s	6	
Chroline Doser		5	
Centrifugal Pump	3 l/s, h=100m	5	

8. Vehicle

Item	No.	Remarks
7-tonnes Truck	1	
5-tonnes Dump Truck	1	
Four-wheel Drive Car	1	
<b>Total of Vehicle</b>		



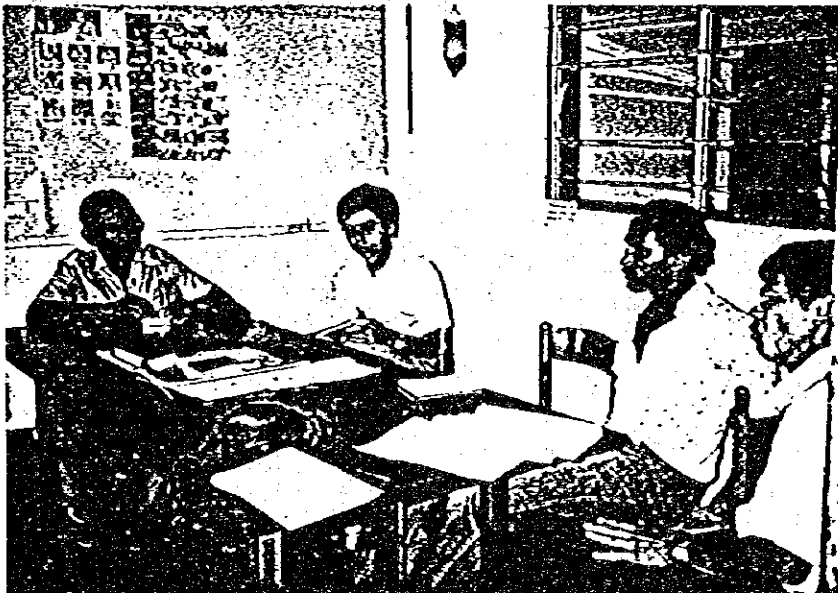
**APPENDIX D**  
**PHOTOGRAPHS**



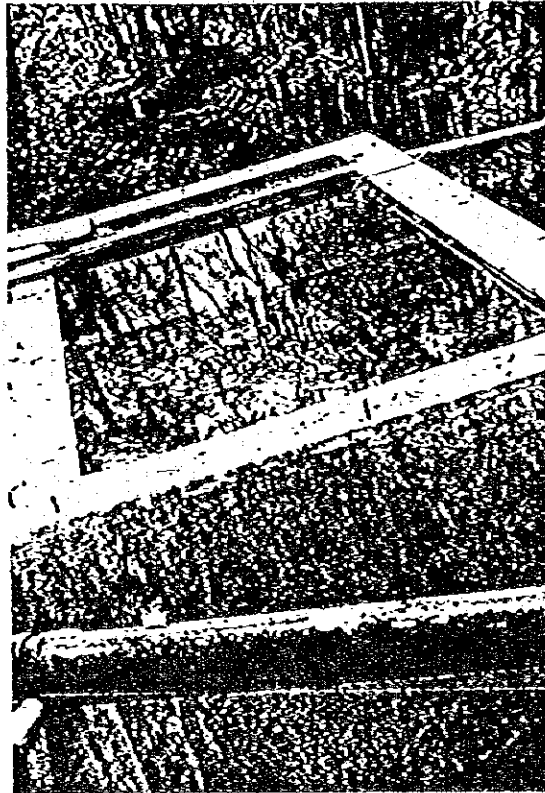
Seychelles Government Officials  
and Survey Team



Meeting with SPPF (Seychelles People's  
Progressive Front)

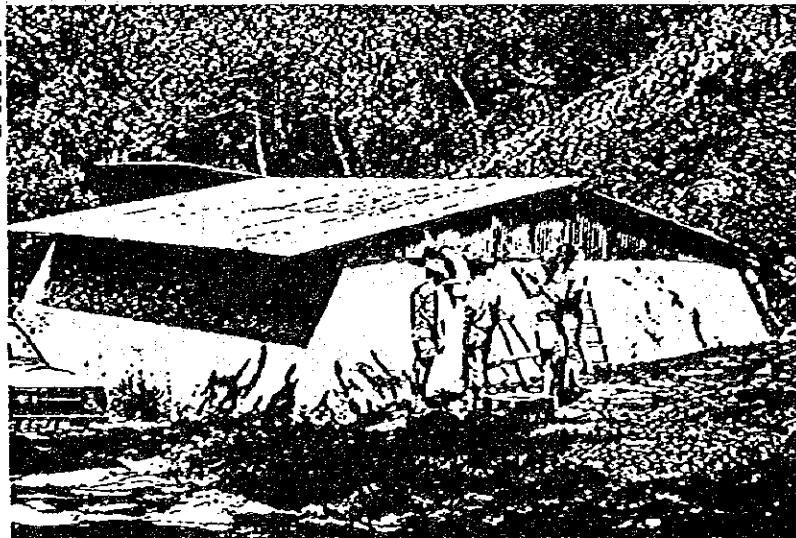


Existing Sedimentation Chamber

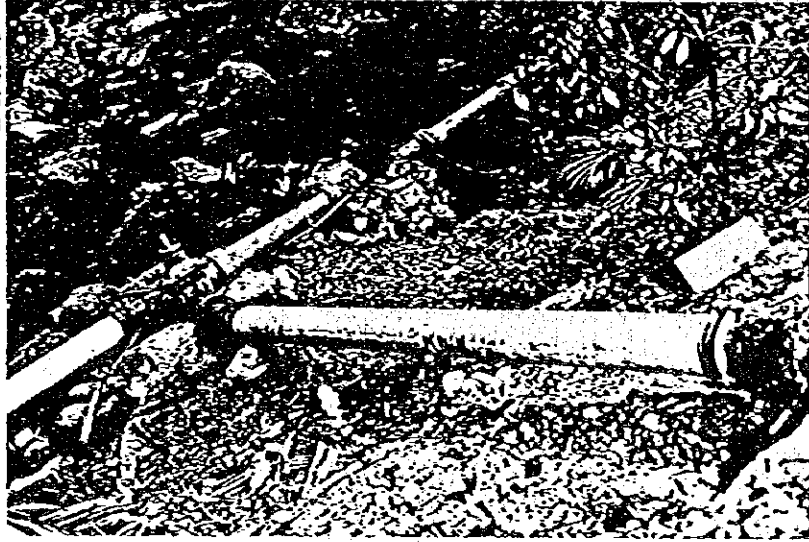


FILIKOLOR 82

Existing Reservoir



Existing Pipelines on the Riverbed



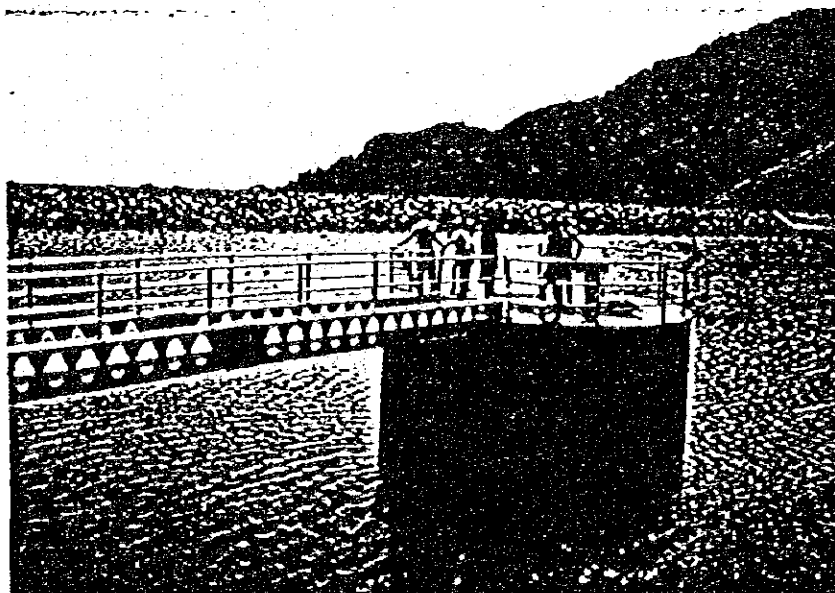
Deteriorated Pipes



Existing La Gogue Dam in Mahe



Existing La Gogue Dam in Mahe











JICA