

# Project Completion Report

PCR: FSM 27465

## Water Supply and Sanitation Project (Loan 1459-FSM) in the Federated States of Micronesia

March 2005

Asian Development Bank

## CURRENCY EQUIVALENTS

The currency unit of the Federated States of Micronesia is the US dollar.

## ABBREVIATIONS

ADB	–	Asian Development Bank
BME	–	benefit monitoring and evaluation
CPUC	–	Chuuk Power Utilities Corporation
DSCR	–	debt-service coverage ratio
DTCI	–	Department of Transport Communication and Infrastructure
EA	–	Executing Agency
EIRR	–	economic internal rate of return
EOCC	–	economic opportunity cost of capital
IDC	–	interest during construction
FIRR	–	financial internal rate of return
FSM	–	Federated States of Micronesia
O&M	–	operation and maintenance
PCR	–	project completion report
PIA	–	project implementation agency
PMU	–	project management unit
PPTA	–	project preparatory technical assistance
PUC	–	Pohnpei Utilities Corporation
SOE	–	statement of expenditure
TA	–	technical assistance
UC	–	utility corporation
WACC	–	weighted average cost of capital
YSPSC	–	Yap State Public Service Corporation

## WEIGHTS AND MEASURES

m <sup>3</sup>	–	cubic meter
m <sup>3</sup> /day	–	cubic meter per day
km	–	kilometer
km <sup>2</sup>	–	square kilometers
gpm	–	galloon per minute
ha	–	hectare
mgd	–	million galloon per day
mg/l	–	milligram per liter
ml/day	–	megaliters per day

## NOTES

- (i) The fiscal year (FY) of the Government and its agencies ends on 30 September. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2002 ends on 30 September 2002.
- (ii) In this report, "\$" refers to US dollars.

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## BASIC DATA

### A. Loan Identification

1.	Country	Federated States of Micronesia
2.	Loan Number	1459-FSM(SF)
3.	Project Title	Water Supply and Sanitation Project
4.	Borrower	Federated States of Micronesia
5.	Executing Agency	Department of Transportation, Communications and Infrastructure (DTCI) <sup>1</sup>
6.	Amount of Loan	SDR7,233,000
7.	Project Completion Report Number	PCR:FSM 846

### B. Loan Data

1.	Appraisal	
	– Date Started	20 May 1996
	– Date Completed	11 June 1996
2.	Loan Negotiations	
	– Date Started	12 August 1996
	– Date Completed	14 August 1996
3.	Date of Board Approval	19 September 1996
4.	Date of Loan Agreement	10 January 1997
5.	Date of Loan Effectiveness	
	– In Loan Agreement	10 April 1997
	– Actual	10 October 1997
	– Number of Extensions	2
6.	Closing Date	
	– In Loan Agreement	31 October 2000
	– Actual	4 February 2004
	– Number of Extensions	4
7.	Terms of Loan	
	– Interest Rate	Service charge of 1% per annum
	– Maturity	40 years
	– Grace Period	10 years
8.	Terms of Relending (if any)	
	– Interest Rate	National Government to the State Governments
	– Maturity	Service charge of 1% per annum
	– Grace Period	25 years
	– Second-Step Borrower	5 years
		The state governments to their respective utility companies at Asian Development Bank's interest rate for US dollar loans from its ordinary capital resources (6.82% per annum), an amortization period of 25 years, including a grace period of 5 years. A portion of the loan proceeds was held in the National Government to finance consulting services.

<sup>1</sup> The Executing Agency for the project at appraisal was the Office of Planning and Statistics.

## 9. Disbursements

## a. Dates

Initial Disbursement	Final Disbursement	Time Interval
12 December 1997	5 August 2003	67.9 months

Effective Date	Original Closing Date	Time Interval
10 October 1997	31 October 2001	48.36 months

## b. Amount (\$)

Category	Original Allocation	Last Revised Allocation	Net Amount Available	Amount Disbursed	Undisbursed Balance <sup>a</sup>
<b>01 Civil Works</b>					
01A-Chuuk	1,612,056	2,446,561	2,446,561	2,453,139	(6,578)
01B-Kosrae	1,207,576	0	0	0	0
01C-Pohnpei	1,206,111	948,293	948,293	856,050	92,243
01D-Yap	1,411,282	2,377,432	2,377,432	2,244,920	132,512
<b>02 Equipment</b>					
02A-Chuuk	449,910	661,732	661,732	581,610	80,122
02B-Kosrae	65,948	0	0	0	0
02C-Pohnpei	29,310	200,224	200,224	248,901	(48,677)
02D-Yap	240,343	126,661	126,661	25,917	100,744
<b>03 Materials</b>					
03A-Chuuk	174,395	438,587	438,587	426,985	11,602
3B-Kosrae	212,498	0	0	0	0
03C-Pohnpei	293,101	885,080	885,080	1,013,818	(128,738)
03D-Yap	240,343	129,749	129,749	0	129,749
04 Consulting Services	1,486,022	1,031,421	1,031,421	1,029,750	1,671
05 Service Charge	124,568	229,501	229,501	227,428	2,073
06 Unallocated	1,846,537	92,381	92,381	0	92,381
99 Imprest Account	0	0	0	0	0
<b>Total</b>	<b>10,600,000</b>	<b>9,567,622</b>	<b>9,567,622</b>	<b>9,108,518</b>	<b>459,104</b>

<sup>a</sup> Undisbursed amount was cancelled on 4 February 2004.  
Source: Asian Development Bank.

## c. TA Amount (\$)

Category	Allocation	Commitment	Disbursed	Undisbursed
Consultants	414,000	410,236	389,812	24,188
Materials and Equipment	80,000	114,500	105,036	(25,036)
Workshops, Training, and Seminars	9,000	21,400	21,400	(12,400)
Studies, Surveys, and Reports	5,000	18,000	18,000	(13,000)
Miscellaneous Administration	2,000	9,750	9,750	(7,750)
Contingencies	73,000	4,114	0	73,000
Government Observer	4,000	4,695	4,695	(695)
<b>Total</b>	<b>587,000</b>	<b>582,695</b>	<b>548,693</b>	<b>38,307</b>

Source: Asian Development Bank.

10.	Local Costs (Financed)	
	- Amount (\$)	\$0.91 million
	- Percent of Local Costs	34
	- Percent of Total Cost	8

## C. Project Data

## 1. Project Cost (\$ million)

	Appraisal Estimate			Actual		
	ADB	FSM	Total	ADB	FSM	Total
Foreign Exchange Cost	9.20	0.00	9.20	8.20	0.00	8.20
Local Currency Cost	1.40	2.70	4.10	0.91	1.74	2.65
<b>Total Cost</b>	<b>10.60</b>	<b>2.70</b>	<b>13.30</b>	<b>9.11</b>	<b>1.74</b>	<b>10.85</b>

ADB = Asian Development Bank, FSM = Federated States of Micronesia.

Source: Asian Development Bank.

## 2. Financing Plan (\$ million)

Source	Appraisal			Actual		
	Foreign	Local	Total	Foreign	Local	Total
A Implementation Costs						
National and State Governments	0.00	2.70	2.70	0.00	1.74	1.74
ADB Financed	9.00	1.40	10.40	7.98	0.91	8.89
<b>Total A</b>	<b>9.00</b>	<b>4.10</b>	<b>13.10</b>	<b>7.98</b>	<b>2.65</b>	<b>10.63</b>
B Service Charge						
Borrower Financed	0.00	0.00	0.00	0.00	0.00	0.00
ADB Financed	0.20	0.00	0.20	0.23	0.00	0.23
<b>Total B</b>	<b>0.20</b>	<b>0.00</b>	<b>0.20</b>	<b>0.23</b>	<b>0.00</b>	<b>0.23</b>
<b>Total A and B</b>	<b>9.20</b>	<b>4.10</b>	<b>13.30</b>	<b>8.20</b>	<b>2.65</b>	<b>10.85</b>

ADB = Asian Development Bank.

Source: Asian Development Bank.

## 3. Cost Breakdown by Project Component

Component	Appraisal			Actual		
	ADB	FSM	Total	ADB	FSM	Total
Civil Works	6.36	0.71	7.07	7.00	0.78	7.77
Equipment	0.79	0.09	0.88	0.86	0.10	0.96
Consulting Services	1.49	0.20	1.69	1.03	0.06	1.09
Project Management Office	0.00	1.17	1.17	0.00	0.80	0.80
Contingencies	1.85	0.53	2.38	0.00	0.00	0.00
Service Charge	0.13	0.00	0.13	0.23	0.00	0.23
<b>Total</b>	<b>10.60</b>	<b>2.70</b>	<b>13.30</b>	<b>9.11</b>	<b>1.74</b>	<b>10.85</b>

ADB = Asian Development Bank, IDC = interest during construction.

Source: Asian Development Bank.

## 4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants <sup>a</sup>		
1. Parsons Engineering Science	October 1996	29 August 1997
2. Sinclair Knight Merz		March 2001
3. Professor Keyan Zheng		March 2001
4. Mahabub K. Chowdhury		February 2002
5. Pipeline Network Analysis		September 2002
<b>Chuuk State:</b>		
Completion of Engineering Designs	November 1997	September 1999
Civil Works Contracts:		
CWC-01: Well Drilling		
Award of Contract	November 1996	May 1998
Completion of Work	June 1997	December 1999
CWC-02: Rehabilitation of Weno Water Supply		
Award of Contract	March 1998	March 2000
Completion of Work	April 1999	March 2001
CWC-03: Installation of Power Supplies		
Award of Contract	March 1998	February 2001
Completion of Work	April 1999	June 2002
CWC-05: Installation of Water Meters		
Award of Contract	March 1998	September 2002
Completion of Work	April 1999	October 2002
Equipment and Materials		
Dates:		
First Procurement	October 1997	December 1997
Last Procurement	March 1998	December 2000
Completion of Equipment Installation	April 2000	December 2001
Start of Operations		
Completion of Tests and Commissioning	April 2000	March 2001
<b>Pohnpei State:</b>		
Completion of Engineering Designs	January 1999	June 2001
Civil Works Contracts:		
CWP-01: Pipeline Construction		
Award of Contract	January 1998	March 2000

<b>Item</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
Completion of Work	February 1999	September 2001
CWP-02: Well Drilling		
Award of Contract	June 2001	March 2002
Completion of Work	December 2001	October 2002
Equipment and Materials		
Dates:		
First Procurement	November 1997	December 1999
Last Procurement	March 1998	October 2002
Completion of Equipment Installation	April 2000	October 2002
Start of Operations		
Completion of Tests and Commissioning	April 2000	October 2002
<b>Yap State:</b>		
Completion of Engineering Designs	November 1997	August 2000
Civil Works Contract		
CWY-01: Well Drilling		
Award of Contract	November 1997	February 1999
Completion of Work	June 1998	October 1999
CWY-02: Transmission Line		
Award of Contract	March 1998	February 1999
Completion of Work	April 1999	September 2001
CWY-03RS: Development of Wellfield		
Award of Contract	March 1998	February 2000
Completion of Work	April 1999	June 2002
Equipment and Supplies		
Dates:		
First Procurement	May 1997	August 2001
Last Procurement	November 1998	August 2001
Completion of Equipment Installation		
Start of Operations		
Completion of Tests and Commissioning	January 1999	October 2001

#### 5. Project Performance Report Ratings

<b>Implementation Period</b>	<b>Ratings</b>	
	<b>Development Objectives</b>	<b>Implementation Progress</b>
30 November 1998 to 31 December 1998	S	U
31 January 1999 to 31 May 1999	S	U
30 June 1999 to 31 December 1999	S	S
31 January 2000 to 31 March 2000	S	S
30 April 2000 to 31 August 2003	S	S

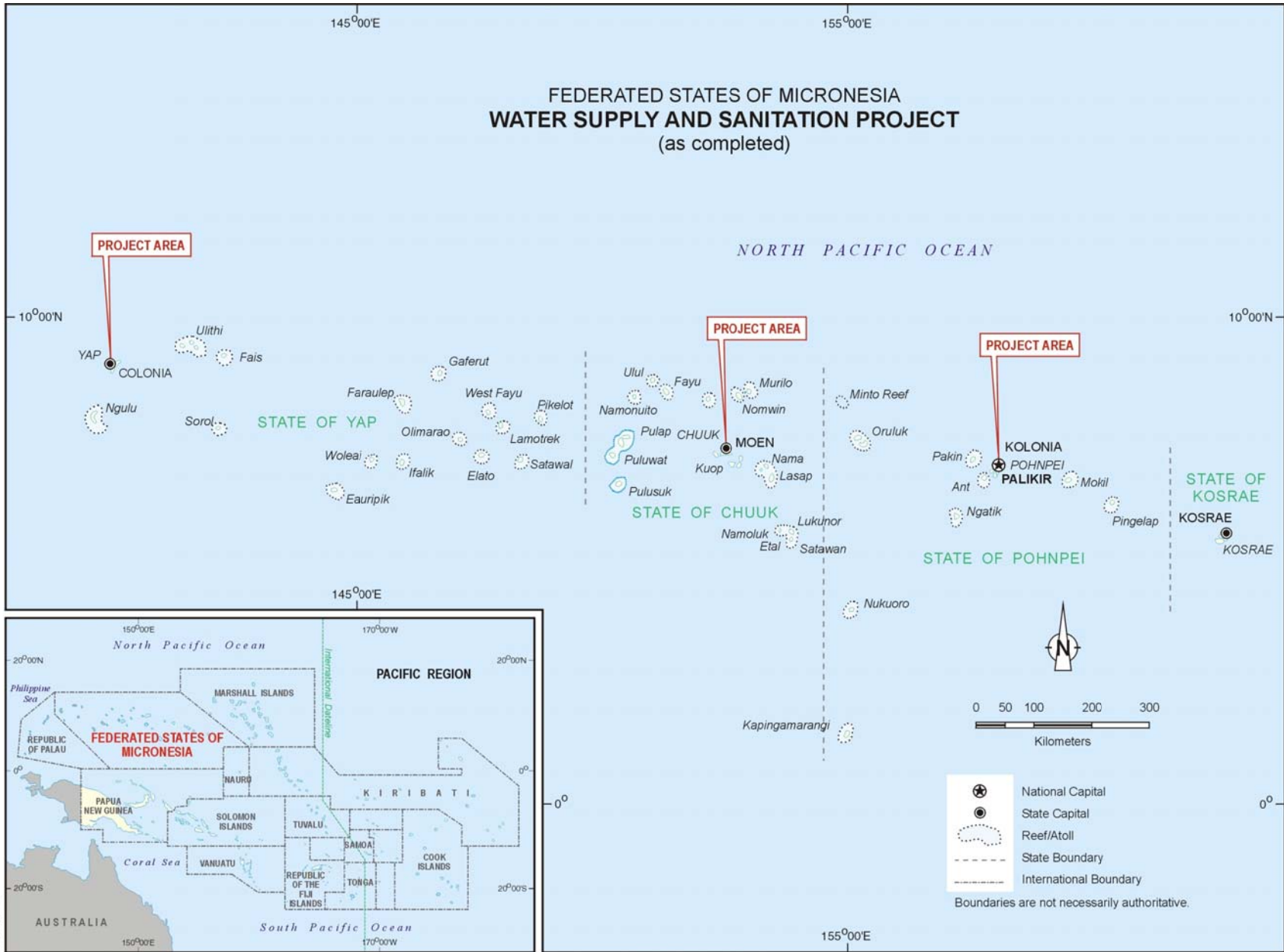
<b>D. Data on Asian Development Bank Missions</b>				
<b>Name of Mission</b>	<b>Date</b>	<b>No. of Persons</b>	<b>No. of Person-Days</b>	<b>Specialization of Members<sup>a</sup></b>
Fact-Finding Consultation	5–23 February 1996			a
Appraisal	April 1996			a
Inception	20 May to 11 June 1996	4		a, b, c, d
Special Project Review 1	17 February to 4 March 1997	2	32	a, h
Review 1	6 to 9 May 1997	3	9	e, f, h
Review 2	25 November to 6 December 1997	2	22	a, h
Special Project Review 2	10 to 14 May 1998	1	5	a
Review 3	11 to 13 November 1998	1	3	f
Midterm Review	17 to 23 May 1999	2	12	g, h
<b>Total</b>	17 to 28 September 2000	<b>17</b>	<b>105</b>	g, h
Project Completion Review <sup>b</sup>	31 August to 13 September 2003	3	42	g, h, i

<sup>a</sup> a – project engineer, b – economist/financial analyst, c – water supply engineer, d – assistant general counsel, e – project administration specialist, f – project administration unit head, g – project implementation specialist, h – senior assistant/assistant project administration analyst, i – staff consultant/financial specialist.

<sup>b</sup> The Project Completion Report was prepared by Amarnath Hinduja, Senior Project Specialist, Antonietta Salvador, Assistant Project Administration Analyst, and Teresa Villareal, Staff Consultant.

Source: Asian Development Bank.

FEDERATED STATES OF MICRONESIA  
**WATER SUPPLY AND SANITATION PROJECT**  
 (as completed)



05-1926 RM

## I. PROJECT DESCRIPTION

1. An analysis of the rain patterns in the Federated States of Micronesia (FSM) showed that all four states (Chuuk, Kosrae, Pohnpei, and Yap) receive ample but uneven annual rainfall. During the El Nino phenomenon in the early 1990s, all the islands suffered from severe droughts. Yap, in particular, has endured a series of relatively harsh droughts, which occur every 3–5 years and last for several months. This situation has been aggravated by the generally old and disparate water supply systems on the islands, which need repair, maintenance, and supervision. In addition, no new water sources have been developed to address the seasonal shortages. Health indicators have shown a high incidence of water-related diseases, such as diarrhea and typhoid, which can be attributed directly to poor water supply, sanitation, and hygiene. This reflected the status of the services before the FSM Water Supply and Sanitation Project (the Project).<sup>1</sup>

2. The main objective of the Project was to continue the Asian Development Bank's (ADB) support for the Government's efforts to improve water supply and sanitation services in the four island states. Chuuk, Kosrae, Pohnpei, and Yap include more than 600 islands scattered over 2.6 million square kilometers (km<sup>2</sup>) of the western Pacific Ocean. The land area of Micronesia is about 700 km<sup>2</sup>, while the country's population at project appraisal was about 105,000. By 2000, nearly 6 years after appraisal, the population had increased to 107,000.<sup>2</sup>

3. The Project focused on policy reforms in the water supply sector, particularly in the areas of demand management and cost recovery.<sup>3</sup>

4. The project scope and anticipated outputs at appraisal consisted of Part A, Water Supply Facilities Improvements; and Part B, Project Implementation Support. (Hereafter, the states are listed in order of their population, from largest to smallest.)

### **Part A:** Water Supply Facilities Improvement:

- (i) Chuuk: Construction of 30 water wells, refurbishment of a water treatment plant and three water tanks, construction of a new water transmission pipeline, and installation of chlorinating facilities;
- (ii) Pohnpei: Construction of four water distribution pipelines to extend the coverage of the service areas;
- (iii) Yap: Construction of seven water wells and deepening of another well, construction of transmission and distribution pipelines and a pumping station, refurbishment of a water treatment plant, and installation of chlorinating facilities and a water tank;
- (iv) Kosrae: Construction of four water treatment plants and water transmission and distribution pipelines, and refurbishment of one intake; and

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<sup>1</sup> The most striking examples of the effect of poor water and sanitation conditions were outbreaks of cholera in Chuuk between 1980 and 1982, and again in 1990. In all states, outbreaks of leptospirosis have been associated with contamination by rats of rainwater collected from roofs and stored in household rainwater tanks.

<sup>2</sup> The population based on the 2000 census: Chuuk, 53,595; Kosrae, 7,678; Pohnpei, 34,486; and Yap, 11,241.

<sup>3</sup> The Government has encouraged the states to undertake the institution-building reforms necessary to establish autonomous, self-governing utility companies (UCs). But reforms between the states reflect the small size of the systems and intersystem differences, and the socioeconomic difference between the states.

- (v) Connections to new households and installation of consumer water meters in all states.

**Part B:** Project Implementation Support: This covered consulting services for project management and project implementation support.

5. The Project also had associated technical assistance (TA),<sup>4</sup> which aimed to improve (i) operation and maintenance (O&M) procedures, (ii) billing, (iii) accounting, and (iv) management information systems. It also covered the development of utility companies' (UCs) abilities in public education and participation. Outputs of the TA were to include capacity building activities including training manuals and equipment. The manuals focused on reinforcing the capacity building activities at each UC in an attempt to improve its economic and technical efficiencies, which would enable them to consistently attract the necessary investments to the sector.

## II. EVALUATION OF DESIGN AND IMPLEMENTATION

### A. Relevance of Design and Formulation

6. With the urban population in the FSM rising as people from different parts of the country—including those from the outer islands—migrated to the state capitals in search of employment, the timing of the Project was especially relevant. The deterioration of the health made the development of water supply and sanitation facilities necessary. The Project Completion Report (PCR) Review Mission concluded that the project objectives generally had been achieved. Pohnpei and Yap produced more successful results, while the successes were limited in Chuuk. In Kosrae, while the Project remains highly relevant, its objectives were not achieved due to the state's withdrawal from the Project. The communities in Pohnpei and Yap significantly benefited from the project through improvements in the quantity and quality of the water supply. In Chuuk, the implementation of the physical works was completed successfully. However, the Project did not establish a sustainable institutional structure to maintain the infrastructure and associated benefits.

7. The Mission also found that the proposed design and formulation, as conceived at the time of appraisal, was highly relevant to the strategies and objectives of both ADB and the Government. However, the Mission noted that the project proposal and implementation plan failed to take into account the difficulties of working effectively with five governments (national and four states). A precondition for project effectivity was that two states and their UCs must enter into a tripartite financing agreement satisfactory to ADB. The national Government's reluctance to sign the loan agreements until it was reasonably sure that the states would comply with the conditions of loan disbursement delayed project implementation for more than a year. Land acquisition also delayed implementation. While land ownership issues are not uncommon in most Pacific island countries, the Project failed to take into account the particularly difficult situation in FSM.<sup>5</sup> The sustainability of the project in Chuuk already is in question, partly due to the land issues faced during implementation. Although there were implementation problems, nevertheless, the project design is considered relevant at completion.

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<sup>4</sup> ADB. 1996. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance to the Federated States of Micronesia for the Water Supply and Sanitation Project*. Manila.

<sup>5</sup> Due to the cross-migration among the four states that are separated by vast distances and tribal cultures, land ownership is a particularly sensitive issue.

8. The Project was generally well formulated through the Project Preparatory TA (PPTA).<sup>6</sup> It included relevant support for project management and implementation components for the UCs. However, the PPTA could have designed the project monitoring system for better implementation. The original project objectives and project elements did not change throughout implementation. However, some appropriate and relevant design changes in the Yap component, such as replacing the booster-fed system with a gravity-based system, were made to lower the operating cost of the system. Overall, the quality of the PPTA was satisfactory.

9. The attached TA<sup>7</sup> included measures that assisted the development of the UCs as viable and sustainable institutions by ensuring their autonomy from the states. Appropriate cost-recovery policies and mechanisms have been put in place to eliminate subsidies to UCs within 5 years of project completion. Full cost recovery<sup>8</sup> was expected within 10 years of project completion. Such measures were in line with ongoing reforms in the sector. The Government planned to initiate legislative reforms aimed at providing autonomy and accountability for the financial and operational performance of the enterprises. The advisory TA support was relevant to the Project.

## **B. Project Outputs and Implementation**

10. A brief summary of outputs anticipated at appraisal for the four states is listed in para. 4. Apart from some necessary changes, the outputs were achieved in Pohnpei and Yap. In Chuuk, the achievement was partly satisfactory. With the cancellation of the project in Kosrae, none of the outputs were achieved. A brief summary of the issues faced in each state is provided in paras. 11–17. The details of achievements are in Appendix 1.

### **1. Chuuk**

11. Chuuk was the first state to comply fully with the conditions of loan effectiveness. However, the Project faced difficulties from the outset. Procurement of a drilling rig for use in Chuuk was part of the advance action approved under the Project. Due to delays in project implementation, this procurement was deferred. Later when the procurement was initiated, the actual cost of the rig was considerably higher than projections.

12. The Project remains highly relevant in Chuuk, but it failed to achieve the immediate objective of providing improved water supply services to targeted beneficiaries. These were due to (i) fewer households than expected were connected, and (ii) the quantity and quality of the water provided varied. The Chuuk Public Utilities Corporation (CPUC) is in severe financial difficulty due to less than 50% collection rate and poor management. This has resulted in poor maintenance and inefficient service, which have left only five of 16 ADB-sponsored wells in operation. Due to the lack of administrative direction and excessive dependence on the board of directors and the Government for most administrative decisions, major changes in the administrative structure of the UC would be necessary before it could provide the level of services expected.

<sup>6</sup> ADB. 1994. *Technical Assistance to the Federated States of Micronesia for Water Supply and Sewerage*. Manila. (TA No.2137-FSM, approved on 18 August 1994).

<sup>7</sup> ADB. 1996. *Capacity Building for Management and Operation of Water Supply and Sanitation System*. Manila.

<sup>8</sup> In the loan covenant, each UC was expected to formulate the appropriate tariff structures and levels, and develop programs for the implementation of these tariffs, and determine the degree of cross-subsidization between user groups to ensure that a basic quantity of water is available at an affordable price to lower-income consumers.

## **2. Pohnpei**

13. Pohnpei was the last of the three states to comply with the disbursement conditions, which significantly delayed the start of implementation. While the scope of activities to be undertaken by the Pohnpei Utilities Corporation (PUC) was limited mainly to construction of four new water distribution pipelines to extend the coverage of the service area, PUC management was extremely proactive and completed the work well within the prescribed schedule. Seizing the opportunity created by the withdrawal of Kosrae, PUC requested assistance for a hydrogeological survey for new well sites, the procurement of the necessary equipment and material, and the drilling of 10 new wells that would help increase the source of water supply. PUC undertook the work soon after the increase in scope was approved, and completed it by the extended loan closing date.

14. During a site inspection, the PCR Mission confirmed that all activities were completed according to the agreed scope, and the facilities were being operated and maintained efficiently. The Project's objectives of providing safe and reliable water supply and better sanitation were addressed successfully.

## **3. Yap**

15. Significant design changes were made to the Yap component of the Project. The change in scope covered additional work for the study, design, and construction of a water treatment plant to reduce the iron and manganese in the groundwater of Eyeb Well field. It also included further study of the Gitam treatment plant, which was not envisaged during project formulation. Yap's original design featured a booster-operated supply system, which was found to be inefficient and difficult to maintain. The system was redesigned into a gravity-fed system, which has been proven to be more suitable to local topography. The new system also is less expensive to maintain.

16. The PCR Mission confirmed that the essential infrastructure to support urban development was in place and operating efficiently. This has been instrumental in improving the living conditions of people in Yap.

## **4. Kosrae**

17. The Kosrae component was cancelled in late 2000 due to the state's noncompliance with a disbursement condition that required the state legislature to authorize the governor to sign the financing agreement. The Mission concluded that the community in Kosrae generally agreed on the need for a safe water supply. However, Kosrae could not reach a consensus on the community paying for such services. This was the primary reason for the failure of the state legislature to pass the legislation, despite repeated attempts. After the cancellation of the Kosrae component, the loan proceeds were reallocated to the other three states to offset cost escalations and support approved changes in scope:

- (i) Chuuk: To include the design and rehabilitation of the sewer treatment plant, in an attempt to prevent the dumping of raw sewage into the lagoon.
- (ii) Pohnpei: To support an expected increase in the demand for water as a result of expansion in the distribution system, to conduct a hydrogeological survey for the

new well, and to assist in the procurement of equipment and materials for the well drilling program.

- (iii) Yap: To support the financing shortfall due to necessary changes in the project design.

### C. Project Costs

18. At appraisal, the project cost was estimated at \$13.30 million.<sup>9</sup> The Government requested a loan of \$10.60 million equivalent to cover \$9.20 million in foreign exchange costs and \$1.40 million in local currency costs. The approved loan for SDR7.23 million (or \$10.60 million equivalent) from ADB's Special Fund resources covered 80% of the project cost.<sup>10</sup> The national Government and the state governments were to jointly meet the remaining local currency cost of \$2.70 million. Due to depreciation of the SDR against the dollar, the amount available for the loan at closing was \$9.57 million equivalent compared to \$10.60 million at approval. While the available loan amount was reduced, following the cancellation of the Kosrae component, the cost and the scope of the Project increased in the three remaining states. To offset the shortfall and support the scope increases necessary to enhance the outputs in the three states, the loan funds originally for Kosrae were reallocated at the request of the Government. At project completion, the amount disbursed for the three states was \$9.11 million.

19. The actual project cost of \$10.85 million was lower than the appraisal estimate of \$13.30 million due to the realignment of project coverage from four states to three states. The revised project costs resulted in lower financial internal rates of return (FIRRs) and economic internal rates of return (EIRRs) for the three states. The project EIRR was 12.9%, lower than the 16.2% estimated at appraisal.

20. Table 1 compares the actual costs for the project components with the appraisal estimates.

**Table 1: Project Cost Comparison (\$ million)**

Component	Appraisal			Actual		
	Foreign	Local	Total	Foreign	Local	Total
Civil Works	5.11	1.96	7.07	6.24	1.56	7.80
Equipment	0.63	0.25	0.88	0.77	0.19	0.96
Consulting Services	1.49	0.20	1.69	0.97	0.12	1.09
Project Management Office	0.00	1.17	0.17	0.00	0.78	0.78
Contingencies	1.85	0.53	2.38	0.00	0.00	0.00
Service Charge	0.13	0.00	0.13	0.23	0.00	0.23
<b>Total</b>	<b>9.20</b>	<b>4.10</b>	<b>13.30</b>	<b>8.20</b>	<b>2.65</b>	<b>10.85</b>

Source: Asian Development Bank and Consultant's Report.

<sup>9</sup> Comprising \$9.20 million in foreign currency, and \$4.10 million in local currency.

<sup>10</sup> FSM's national and state governments, as the Borrowers, were to have allocated \$2.70 million (20% of the project cost) as matching funds. This \$2.70 million equity contribution comprised counterpart funds for land and contributions for taxes and duties.

#### **D. Disbursements**

21. Government approval procedures delayed loan effectiveness, which in turn delayed the start-up Project activities. Under the re-lending agreements between the Borrower and Chuuk, Yap, and Pohnpei, the states had to submit their withdrawal applications to the central PMU established by the Borrower. Soon after the Project became effective on 10 October 1997, an imprest account was established and an amount of \$120,000 was deposited to the account with Bank of FSM.

22. Loan disbursements amounted to a total of \$9.11 million (Appendix 2). The use of the imprest account and SOE procedures simplified the procedures for drawing advances and replenishments, and were extremely beneficial to Project implementation. However, replenishment of the imprest account was often delayed, mainly due to the lack of dedicated accounting staff to oversee the project accounts. The loan closing was delayed beyond the allowable winding-up period of 90 days. This undue delay was a result of delays on the part of the Borrower in reconciling and settling the unliquidated advances of the imprest account with ADB. A refund of \$6,502.37 was finally received by ADB on 4 February 2004. Upon this final settlement, the loan was effectively closed as of 4 February 2004.

#### **E. Project Schedule**

23. The loan was approved on 19 September 1996, became effective on 10 October 1997, and had an original closing date of 31 October 2000. However, the Project was significantly delayed, mainly due to the states' late compliance with disbursement conditions. As explained in paras. 12, 14 and 22, appropriate dialogue during the design stage could have minimized the delays. Chuuk was the first state to comply with the conditions, nearly 13 months after approval. Yap and Pohnpei complied with the loan conditions 24 and 34 months after loan approval, respectively. By July 1999, three states had complied, and the withdrawal of Kosrae was confirmed. At around this time, disbursements picked up significantly, reflecting major contract awards for civil works. The reallocation of funds from the Kosrae component to the other three states supported significant scope changes that enhanced project objectives. However, this necessitated a loan extension. The Project finally closed on 4 February 2004, after five loan extensions. In light of the 34 months of delay, an implementation period of 70 months from effectivity—including the approved major increase in scope—was considered satisfactory (Appendix 3).

#### **F. Implementation Arrangements**

24. The original Executing Agency (EA) for the Project, the Office of Planning and Statistics, was changed to the Department of Transportation, Communications and Infrastructure (DTCI), which is the agency responsible for public utilities. The utility corporation in each state were the implementing agencies: CPUC, Yap State Public Service Corporation (YSPSC), and PUC. DTCI provided the overall coordination for the Project through the PMU, which was established in 1997. The PMU consisted of a project manager under UN funding, and a project supervision consultant, funded under the Project. DTCI, the Government, the consultants, and ADB coordinated closely. The PMU effectively managed the Project, despite the land acquisition problems, and the lack of materials and capable staff. However, after the departure of the project manager and the accountant, implementation slowed during the closing months of the Project. This led to problems in finalizing the liquidation of the imprest fund at loan closing (Appendix 4).

25. The Project's implementation arrangements were effective, and facilitated the transition from project implementation to operations and management of project facilities. Overall, the implementation, though delayed, was satisfactory.

#### **G. Conditions and Covenants**

26. Loan effectivity was conditional on the states' compliance with the disbursement conditions. This appeared to be a major hurdle, requiring almost 13 months for the first state to comply, while the other two complied within 24 and 34 months, respectively. No covenants were modified, suspended, or waived during implementation. A majority of the loan covenants were complied with (Appendix 5). Partial compliance was observed in relation to (i) financial management and project accounting due to the absence of full-time accounting staff in Chuuk and PMU; (ii) revenue generation and reduction of non-revenue water. Chuuk was the only utility that did not comply with the covenant. These conditions are not likely to be complied with in the short term due to the serious management problems at the Chuuk utility; and (iii) asset inventory and valuation covenant for development of a benefit monitoring and evaluation (BME) manual was not complied with. Neither the PMU nor the state utilities maintained a benefit monitoring system. In the future, the applicability and relevance of some of the covenants should be carefully considered before being included to ensure effective compliance.

#### **H. Related Technical Assistance**

27. The PPTA was evaluated as satisfactory. It formulated the Project clearly, defining all the components and assessing the needs of each state. The project design appropriately included an advisory TA<sup>11</sup> to provide capacity building and institutional strengthening to the UCs. Major TA activities included (i) training in operation and maintenance of water and sewage treatment plants for Yap, Chuuk, and Kosrae; (ii) capacity building in billing, accounting, and management information systems for the Chuuk and Kosrae UCs to bring them up to the standard of PUC and YSPSC; and (iii) capacity building in leakage prevention and detection, including the preparation of base plans of water distribution systems.

28. While the concept and coverage of the advisory TA were very appropriate, the implementation schedule was problematic. The TA consultants were mobilized in October 1997, before the Project began. Since the participation of the states and their utilities depended on their compliance with the disbursement conditions, the timing of the TA implementation should have been programmed to match the project implementation. Further, Kosrae's failure to participate in the Project made it impractical for that state to receive training on billing and accounting of water supply services, as the UC did not have a water supply system under its jurisdiction. In Chuuk, the sustainability of the TA's benefits was questionable, because the services of the personnel trained in billing and financial management and O&M of project facilities were terminated.<sup>12</sup> The CPUC lacks administrative direction. Overall, the benefits achieved from the TA have been limited.

29. The TA was designed to increase the UCs' capabilities in O&M, billing and financial management, and enhance the capabilities of the state Government departments in public education and participation in water supply and sanitation issues.<sup>13</sup> However, only YSPSC and

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<sup>11</sup> ADB. 1996. *Technical Assistance to the Federated States of Micronesia for Capacity Building for Management and Operation of Water Supply and Sanitation System*. Manila.

<sup>12</sup> Since October 2002, no accountant was assigned, resulting in a lack of financial management and control.

<sup>13</sup> Even though the Kosrae component was cancelled, some basic training in financial management and operations was given to Kosrae Utilities Authority staff during a review mission in 1998.

PUC undertook more effective financial management, which enabled them to cover O&M costs, including salaries, repairs, maintenance, and supplies.<sup>14</sup> Despite having a small customer base, YSPSC was the most efficient in its water supply operations. PUC has not increased its tariff and reduced its non-revenue water, two steps needed for its operations to become self-sustaining.

30. CPUC suffered from inefficient management, an inability to provide a continuous supply of good quality water, and delays in the implementation of a tariff at any level. As a result, CPUC was unable to collect arrears from customers, and failed to charge appropriate water tariffs to recover its O&M costs. To improve the financial viability of its operations, drastic reforms in management, billing and collection, and operations are needed. This should be undertaken based on a comprehensive financial restructuring and performance audit by the national and state governments.

31. Management and operational training manuals on water supply production and treatment plants were prepared under the TA for the benefit of the new staff. These were used to orient the new staff. About 20 employees from the UCs and other government agencies benefited from the TA. The outputs of the TA were rated as partly satisfactory.

#### **I. Consultant Recruitment and Procurement**

32. Goods and services were procured from loan funds in accordance with ADB's *Guidelines for Procurement* and *Guidelines on the Use of Consultants*. Civil works, equipment, and materials were procured largely as appraised. All civil works contracts, equipment, and materials were procured through international competitive bidding. No major problems were encountered in packaging contracts, preparing bidding documents, or evaluating bids. Further, no disputes or contractual difficulties were encountered with any contracts. The recruitment of design and supervision consultants also complied fully with ADB guidelines.

#### **J. Performance of Consultants, Contractors, and Suppliers**

33. The overall performance of consultants, contractors and suppliers was generally satisfactory. Implementation could have been expedited if the consultants had been recruited, fielded and managed in a timely manner. The consultants' inputs were critical in the implementation of the project components, especially the civil works. The contractors and suppliers completed their contracts generally on time. The Project has helped to further enhance local small contractors and to undertake small contracts.

#### **K. Performance of the Borrower and the Executing Agency**

34. The performances of the Borrower and EA were generally satisfactory. They met their responsibilities and obligations during project implementation. The initial delays in project implementation cannot be attributed to their performance, as they were due to the political structure of four independent state governments and the national Government. However, CPUC's implementation suffered extensive delays due to the delayed release of adequate counterpart funds, and the UC's organizational and operational uncertainties. A change in its management structure should be a prerequisite for any future assistance to this utility. Future

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<sup>14</sup> Starting in May 2002, Chuuk implemented a flat tariff of \$5 per connection, regardless of water consumption. CPUC has been reluctant to impose consumption-based charges until the quality and reliability of its water supply significantly improves (May 1998). CPUC's failure to enforce effective user charges compromised its financial operations.

projects must ensure that a political consensus is secured during appraisal to avoid unnecessary delays.

#### **L. Performance of the Asian Development Bank**

35. Overall, ADB's assistance was satisfactory. ADB undertook six review missions to monitor the progress of the Project, and worked on the resolution of implementation issues. ADB review missions worked closely with the Government and the EA to overcome disruptions caused by land acquisition problems and design changes. However, during the appraisal and early stages of implementation, ADB should have given more attention to the Government's political structure. ADB also should have anticipated higher physical contingencies on some subcomponents, and should have focused on technical requirements and capacity building needs that could have facilitated project implementation. ADB was flexible and agreed to a number of minor changes to overcome problems and facilitate better implementation.

### **III. EVALUATION OF PERFORMANCE**

#### **A. Relevance**

36. The Project was highly relevant in meeting the immediate and the long-term objectives of the Government and ADB's country strategy. The Project was formulated to improve the efficiency of water supply services and to enhance the commercial viability of the UCs by addressing their facilities and management. Measures included (i) cost-recovery mechanisms, such as establishing affordable tariff structures; (ii) a reduction in non-revenue water to sustain the financial viability of the UCs; and (iii) the introduction of a billing system.

37. The changes made in Yap water supply system to suit the local topography and to lower O&M costs enhanced Project objectives. Policy reforms to establish water treatment standards and increase tariffs to achieve full cost recovery, and institutional strengthening in water demand management were fully supported under the Project. Key elements of UCs' policies that are still in force include (i) the expansion of service areas of urban water supply, (ii) government funding of capital works, (iii) user tariffs, and (iv) greater autonomy and accountability on financial and operational performance. However, the project design failed to take into account the political structure of four individual state governments, which led to considerable delays in project effectivity and implementation. The PCR Mission, nevertheless, rated the project as relevant.

38. The advisory TA was provided to strengthen the UCs' operational and financial management capacities, focusing on (i) corporate planning and management, (ii) operational performance indicators, (iii) non-revenue water management, and (iv) design of water and sewerage tariffs. The TA scope and design were highly relevant. However, while the TA addressed the critical areas for institutional strengthening of the UCs, it could have been more effective with better timing. Therefore, it was rated as partly relevant.

#### **B. Efficacy in Achievement of Purpose**

39. At appraisal, the water supply in the three participating states was unreliable, requiring water rationing. The system had poor pressure and inconsistent water quality. The Project achieved its immediate objectives of providing its targeted beneficiaries—domestic, commercial, and industrial customers in Yap and Pohnpei—with a water supply service that is reliable, safe, and available 24 hours a day. The systems in these two states have the capacity to meet the

anticipated 2005 demand, and can be considered efficacious. However, the Project was rated as less efficacious in Chuuk.

40. **Chuuk.** The Project implemented the components as proposed, and achieved 0.8 million gallons per day (mgd) of additional output.<sup>15</sup> However, it did not ensure a sustainable supply of water that is better in quantity and quality. CPUC was unable to provide the necessary management support and understanding required to operate, monitor, and maintain the project outputs. Although the project TA instituted appropriate O&M manuals, and provided operator training, CPUC's O&M capabilities and implementation procedures were not satisfactory. CPUC is generally reactive, and lacks the financial resources to sustain O&M requirements. CPUC management recognized the shortfall of trained staff for O&M of electrical equipment. However, outsourcing and training of more staff to meet O&M staffing needs was not carried out, resulting in the deterioration of project facilities. Moreover, the required length of transmission and distribution pipeline was not completed due to land disputes. As of August 2003, CPUC had 960 connections, covering 65% of the 1,480 potential connections on Weno Island.

41. **Yap.** The Project in Yap provides reliable and safe water on a 24-hour basis. The system also has the capacity to meet the anticipated 2005 demand. As of August 2003, Yap had 778 connections, covering 91% of the 850 potential connections on Kolonia. This represented an increase of 238 connections over the 540 connections at appraisal. The increase in connections was the result of constructed capacity of 240 gallons per minute (gpm) water production and the expansion of distribution system by 28,500 feet (ft).

42. **Pohnpei.** The Project in Pohnpei provides reliable and safe water on a 24-hour basis in Awak, Meitik, and Sekere, servicing a combined population of about 3,500. The system also has the capacity to meet the anticipated 2005 demand of 6,180 cubic meters (m<sup>3</sup>). As of August 2003, PUC had 3,387 connections, covering 89% of the 3,800 potential connections.<sup>16</sup> This represented an increase of 554 connections over the 2,833 connections at appraisal.

43. Considering the performance of the project in Chuuk, the project in Chuuk was rated as less efficacious. However, with improvements in living conditions and the socioeconomic impact in Yap and Pohnpei, the Project as a whole was considered relevant and efficacious.

### **C. Efficiency in Achievement of Outputs and Purpose**

44. ADB's internal processing of the Project was efficient and satisfactory. The organization and management of the EA and the implementing agencies were effective in ensuring efficient project implementation, as well as timely. This contributed to the anticipated outputs being achieved on schedule in three states, despite startup delays.

45. As part of the policy reforms, the UCs increased water tariffs in stages to ensure financial viability. Physical investments under the Project included the design and installation of production and treatment facilities for Yap and Chuuk to address the short supply and poor quality of the water. The facilities were completed within a reasonable schedule, given the changes in design and additional scope of works. The facilities were fully operational, though Chuuk was unable to maximize its benefits. Twenty staff were trained directly under the Project, while many others received indirect training from consultants, contractors, and co-workers.

<sup>15</sup> CPUC had an additional ground water production of 860,000 gallons per day to augment its surface water source of 251,000 gallons.

<sup>16</sup> The 3,387 connections comprise 237 commercial, 2,533 residential, 69 state governments, 45 other governments, and 503 connections not billed.

## **1. Economic Internal Rate of Return**

46. The EIRRs for the Chuuk, Yap, and Pohnpei components were recalculated and compared with the estimates at appraisal. In Chuuk, the EIRR was lower than at appraisal due to (i) an increase in project costs, (ii) the inability to provide a reliable and safe water supply, and (iii) fewer-than-expected connections after project completion. In Yap and Pohnpei, the EIRRs were higher due to their ability to provide safe and reliable water supply to a greater percentage of population, particularly during dry periods.

47. Overall, the EIRR was 12.7%, compared with 16.2% at appraisal. The EIRRs for individual states were 5.5% for Chuuk, compared with 19.9% at appraisal; 15.2% for Yap, compared with 14.9% at appraisal; and 20.9% for Pohnpei, compared with 14% at appraisal. Sensitivity analyses indicated that the EIRRs of the project components were relatively more susceptible to a reduction in project benefits than a reduction in costs, as anticipated during appraisal. Appendix 6 presents a more detailed analysis of the economic reevaluation.

## **2. Financial Internal Rate of Return**

48. The FIRRs of the three states were recalculated based on actual project cost and data on financing and revenue, and compared with the weighted average cost of capital (WACC) of 3.3%. The FIRRs for Yap and Pohnpei were 7.3% and 5.9%, respectively, higher than the 6.7% and 4.6%, respectively, estimated at appraisal. The recalculated FIRR for Chuuk was 4.7%, lower than the 7.4% at appraisal. Overall, the FIRR was 5.1%, which was lower than the 7% estimate at appraisal. Sensitivity analyses indicated that the FIRRs of the three states were more vulnerable to decreases in revenues than increases in O&M costs, as expected during appraisal. The Project was rated partly efficient due to inability of CPUC to charge appropriate tariffs and increase its collection efficiency. Appendix 6 provides a detailed analysis of the financial assessment.

## **D. Preliminary Assessment of Sustainability**

49. The sustainability of the Project was rated as likely in Yap and Pohnpei, as the physical outputs were technically sound and the personnel were trained to handle operational and technical problems. While financial sustainability was expected in Yap and Pohnpei, improvements are required in increasing connections and monitoring performance indicators. In Chuuk, the sustainability of the Project was rated as less likely. Significant improvements in managing the system need to be institutionalized. These include adopting proper O&M procedures and deploying staff with adequate technical and financial capabilities to manage, operate, and maintain the project facilities.

50. Overall, the sustainability of the Project was rated as likely. The Project is relevant, efficacious, efficient, and sustainable. Improvements in the living conditions and socioeconomic conditions were evident in Yap and Pohnpei, though not in Chuuk (Appendix 7).

## **E. Environmental, Sociocultural, and Other Impacts**

### **1. Environmental Impact**

51. As anticipated at appraisal, environmental impacts of the Project were minimal. During project implementation, the backwashing of the rapid sand filters and chlorination system testing in Chuuk raised some early environmental concerns. However, these were unfounded. No

environmental concerns related to the project components were raised in Yap and Pohnpei. Overall, the improvement in water quality and sanitation, along with the better management of the water supply, had a positive impact on the environment.

## **2. Social Impact**

52. At appraisal, the Project was anticipated to benefit 13,100 people—7,520 people in Chuuk, 1,860 people in Yap, and 3,720 people in Pohnpei. At completion, based on the service area population of the water supply system, beneficiaries were estimated at 3,360 in Chuuk, 1,428 in Yap, and 2,042 people in Pohnpei. The project benefits have not been fully realized, and the process of adding new connections is ongoing. While Yap and Pohnpei are extremely active in expanding coverage, the process in Chuuk is slow and service connection capacity only has been partially achieved. The social impact, therefore, is moderate.

## **3. Other Impacts**

53. The Project, in general, had a significant impact. It strengthened the UCs in Yap and Pohnpei, and assisted them in identifying opportunities to achieve its statutory mandate of providing a safe water supply and improved sanitation. The UCs are also providing advisory assistance to the government at various levels on developing urban water systems. One significant benefit of the Project in Pohnpei was an initiative that used the experience gained to provide training on the design and operation of water supply production and treatment facilities for community-based systems. Chuuk, on the other hand, is still struggling due to management and political problems.

# **IV. OVERALL ASSESSMENT AND RECOMMENDATIONS**

## **A. Overall Assessment**

54. The objectives of the Project and associated TA, while appropriate, were not fully achieved. However, the physical infrastructure generally met the targets set at appraisal. With the revised scope for the Yap component, it will meet the anticipated 2005 needs.

55. In terms of the scope of facilities, the Chuuk component facilities essentially were built as envisaged at appraisal. However, the completed facilities were not properly operated and maintained. As a result, the capacity of the system could not be fully utilized. O&M funding in their operating budget was insufficient. CPUC continues to depend heavily on subsidies that are irregular due to financial problems faced by the state government. Tariff increases have been difficult to implement, while the collection efficiency has been poor. The UC, therefore, has been unable to achieve the required cost recovery.

56. The Yap portion of the Project has performed well. With the substantial changes in the Yap component, including a switch from a booster-fed system to gravity-based system, the UC in Yap benefited from the resulting lower operating costs. The primary objectives of improving the water supply, enhancing living conditions, and supporting development in the main urban center of Kolonia have been fully met.

57. The Pohnpei component pipelines were built as envisaged at appraisal, and are properly operated and maintained. The funding allocation for O&M is sufficient. While the cost recovery is adequate to sustain the O&M costs, tariffs need to be increased to achieve the projected cost recovery. The PUC has good administrative structure, confirming the effectiveness of the

institutional strengthening program. The management continues to identify strategic planning needs, and addresses areas of operational improvements.

58. The Project has been successful in Yap and Pohnpei, generating significant improvements in living conditions and socioeconomic conditions. In other areas, the impacts have been moderate (Appendix 8). For improvements to be effective in Chuuk, significant administrative and structural changes are necessary. Political interference also must be minimized. Overall, the Project was rated as successful.

## **B. Lessons Learned**

59. The PCR identified several lessons learned that should be applied to future water supply sector projects.

- (i) In FSM, the readiness of essential legislative support and project cofinancing by the state and national governments should be confirmed at project appraisal or the loan negotiation stage to avoid implementation delays.
- (ii) Land acquisition remains a difficult challenge in all states. Future projects must attempt to resolve such issues at appraisal to minimize land issues. Where land acquisition is necessary, the acquisition process should be established early at appraisal stage.
- (iii) For works such as wells, reservoirs, water tanks, and other capital assets constructed on land belonging to third parties, such transactions should be properly documented with lease registers and approved minutes. These should be reflected in the annual financial statements of the UCs. The financial statements should clearly explain the procedure in dealing with leases to ensure fair valuation of the assets.
- (iv) Necessary design changes and construction variations with major cost implications should be discussed and agreed with ADB early to avoid implementation delays.
- (v) A full-time project accountant to manage project accounts should be fielded from the start of the project to prepare and monitor project expenditures.
- (vi) Where a single UC is responsible for both water and power, the UC must maintain separate records for the water supply operations and power operations to assist in cost recovery.
- (vii) A review of variations for the expansion of distribution systems should, in future, include the legal requirements for connection, particularly where the extension involves use of leased land.
- (viii) Comprehensive connection programs should be developed to include targeted areas, businesses, compliance and enforcement, connection maintenance, and connection targets. Such programs are especially relevant in places such as Chuuk. An associated public education and awareness program should be developed to improve community understanding of the benefits of connection, availability of lifeline block supplies, and payment methods. Customer data and

performance indicators must be reported properly to the management in a timely manner to allow necessary adjustments in O&M, budgets, and connection programs; and to improve administration and customer relations.

- (ix) Establishment of suitable and appropriate indicators is important to properly monitor and evaluate the effectiveness of the Project during implementation. These should include water quality baseline data to evaluate improvements in quality under the Project.
- (x) Incidents of water-borne diseases should be reported in more detail by community to assist in identifying the problem areas that need more sanitation education.
- (xi) Sufficient data on improvements in water supply and quality under the Project must be provided by technical staff in coordination with the financial and customer services staff.

### **C. Recommendations**

60. Based on key lessons learned, the Mission noted that implementation of future projects in Chuuk would require special attention. Appendix 9 highlights some of the problems faced, and specific recommendations for future interventions in Chuuk. General recommendations for future ADB projects in the water supply sector include the following:

- (i) The project design should give more emphasis to identifying specific physical infrastructure and improved living condition targets.<sup>17</sup>
- (ii) ADB must ensure that, before the start of any technical assistance, the recipient agencies are demonstrably committed and the assistance is timed for maximum benefit.
- (iii) ADB should undertake regular technical and financial review of projects throughout implementation to identify and respond quickly to potential changes in the scope or construction variations. Such review should include detailed updating of project component progress and financial reports, as this will facilitate PCRs.
- (iv) More guidance should be provided to the PMU and implementing agencies in developing more meaningful and measurable project performance indicators early in project implementation. This should preferably be established during project inception stage.
- (v) The Project readiness should be carefully assessed to avoid unnecessary delays in loan effectivity and project implementation.

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<sup>17</sup> Time-bound targeted outputs are required for the project framework.

- (vi) The establishment of a BME system to evaluate project benefits, such as health improvements and cost savings,<sup>18</sup> is valuable. However, its value for corporations should be carefully assessed before including them as covenants.

The project performance audit review could be undertaken in 2005 or 2006, when full operational data on project facilities in all UCs is available.

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<sup>18</sup> A loan covenant required development and implementation of a BME program. The Midterm Review Mission advised the PMU to coordinate with each UC a detailed implementation plan for BME and submit to ADB by 30 March 2001. This was not complied with.

## PURPOSE, TARGETS, AND ACHIEVEMENTS

Purpose/Scope	Targets	Outputs and Outcomes
<b>A. Chuuk Water Supply</b>		
<b>1. Improve water supply capacity and reliability</b>	<p>Drilling of exploratory boreholes and development of 30 water wells to the depth of approximately 80–100 feet (ft).</p> <p>Installation of submersible pumps, water discharge, and interconnection with water transmission lines.</p> <p>Installation of chlorinating systems at each well</p> <p>Refurbishment of Pou Water Treatment Plant, as follows:</p> <ul style="list-style-type: none"> <li>(i) Installation of a 12-inch water production meter</li> <li>(ii) Installation of new chlorinating equipment</li> <li>(iii) Replacement of standby power generator</li> <li>(iv) Repairs of filter hardware and filter media, and reestablishment of backwash facilities</li> <li>(v) Development of water meter shop and storage facilities.</li> </ul>	<p>Drilling of 16 water wells to the depth of approximately 80–100 ft. Field tests confirmed that the 16 wells provided sufficient output.</p> <p>Installation of submersible pumps, water discharge, and interconnection with water transmission lines.</p> <p>Installation of chlorinating systems at each well.</p> <p>Refurbishment of Pou Water Treatment Plant, as follows:</p> <ul style="list-style-type: none"> <li>(i) Installed 12-inch production meter</li> <li>(ii) New chlorinating equipment installed</li> <li>(iii) Replaced standby power generator</li> <li>(iv) Repairs of filter hardware and filter media, and reestablishment of backwash facilities</li> <li>(v) Installation of raw water and clear water pumps</li> <li>(vi) Construction of waterworks building and storage facilities.</li> </ul>
<b>2. Reliably serve existing and 2005 demand</b>	<p>Installation of 9,840 ft. of 8-inch high density poly-ethylene (HDPE) looping main from Sapuk to Epinup.</p>	<p>Installation of 6,000 ft., or 1.13 miles, of 8-inch HDPE waterline from Sapuk to Epinup villages to distribute water to 40 households. Therefore, capacity achieved, but total available demand not served.</p>
<b>3. Improve Living Conditions</b>	<p>No specific targets.</p>	<p>Additional 240 people provided a piped water supply.<sup>1</sup></p>
<b>4. Support Urban Development</b>	<p>No specific targets.</p>	<p>Supply exists to support urban development.</p>

<sup>1</sup> As of September 2003, domestic connections served with piped water supply totaled 9,401 for Chuuk, 2,683 for Pohnpei, and 778 for Yap.

Purpose/Scope	Targets	Outputs and Outcomes
<b>B. Yap Water Supply</b>		
<b>1. Improve water supply capacity and reliability, and extend distribution system</b>	Drilling of 6 wells to a depth of approximately 250 ft. in the Eyeb Valley.	Drilling of 7 wells at the Eyeb Valley.
	Installation of submersible pumps and well discharge lines.	Installation of submersible pumps and well discharge line.
	Drilling of one new well and deepening of a second in the vicinity of the Gitam reservoir.	Installation of pumping main to Feereel Hill and installation of power lines.
	Construction of a 60,000 gallon balancing tank at Feereel Hill.	Modifications of the Feereel Hill water tank.
	Installation of 9,500 ft. of a 4-inch and 6-inch pumping main from Eyeb Valley well field to Feereel Hill tank and the new Gitam Wells.	Installation of 28,500 ft. of 10-inch HDPE waterline from Colonia to Feereel Hill Tank.
	Installation of 22,000 ft. of 6-inch HDPE transmission main from Feereel Hill to Colonia.	Installation of a 40 kilowatt-hour (kWh) backup generator at the Eyeb Valley well field.
	Installation of a new booster station in Colonia to pump water to the Nimar water tank.	Construction of a chlorinating plant adjacent to the water tank.
	Installation of 5,900 feet of pumping main from the booster station to the existing Nimar water tank.	
<b>2. Improve Living Conditions</b>	No specific targets.	Increase in population provided a piped water supply resulting in reduced water costs being spread across larger number of users with a net. Health indicators suggest a decline in waterborne diseases. <sup>2</sup>
<b>3. Support Urban Development</b>	No specific targets.	Supply exists to support urban development
<b>C. Pohnpei Water Supply</b>		
<b>1. Improve water supply capacity and reliability, and extend distribution system</b>	Awak Extension of 19,500 ft. of 8-inch HDPE.	Awak Extension of 16,500 ft. 8-inch HDPE and 1,800 ft. of 4-inch HDPE.
	Metik Loop Extension of 14,200 ft. of 6-inch HDPE waterline.	Metik Loop Extension of 14,800 ft. 6-inch HDPE and 700 ft. of 8-inch.
	Sekere Extension of 9,200 ft. 8-	Sekere Extension of 12,500 ft. of 8-

<sup>2</sup> See footnote 1.

Purpose/Scope	Targets	Outputs and Outcomes
<b>2. Improve Living Conditions</b>  <b>3. Support Urban Development</b>	inch HDPE waterline.	inch HDPE.
	Likie Extension of 11,000 ft. 4-inch HDPE waterline.	
	No specific targets.	Likie Extension of 11,300 ft. of 4-inch HDPE.
	No specific targets.	Increase in population provided a piped water supply resulting in reduced water costs being spread across larger number of users with a net. Health indicators suggest a decline in waterborne diseases. <sup>3</sup> Supply exists to support urban development.

HDPE = high density poly-ethylene.

Source: Asian Development Bank.

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<sup>3</sup> See footnote 1.

## DISBURSEMENTS AND REALLOCATIONS

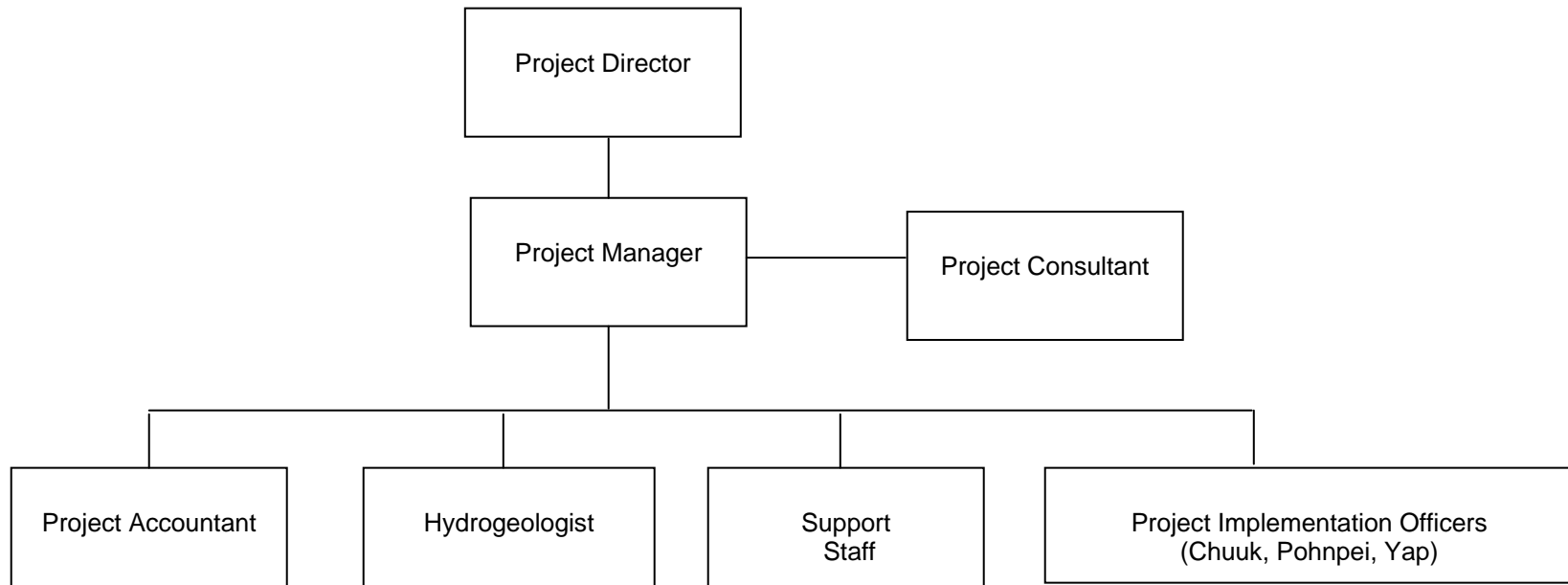
Category	Original Allocation	Last Revised Allocation	Net Amount Available	Amount Disbursed	Undisbursed Balance <sup>1</sup>
<b>01 Civil Works</b>					
01A-Chuuk	1,612,056	2,446,561	2,446,561	2,453,139	(6,578)
01B-Kosrae	1,207,576	0	0	0	0
01C-Pohnpei	1,206,111	948,293	948,293	856,050	92,243
01D-Yap	1,411,282	2,377,432	2,377,432	2,244,920	132,512
<b>02 Equipment</b>					
02A-Chuuk	449,910	661,732	661,732	581,610	80,122
02B-Kosrae	65,948	0	0	0	0
02C-Pohnpei	29,310	200,224	200,224	248,901	(48,677)
02D-Yap	240,343	126,661	126,661	25,917	100,744
<b>03 Materials</b>					
03A-Chuuk	174,395	438,587	438,587	426,985	11,602
03B-Kosrae	212,498	0	0	0	0
03C-Pohnpei	293,101	885,080	885,080	1,013,818	(128,738)
03D-Yap	240,343	129,749	129,749	0	129,749
04 Consulting Services	1,486,022	1,031,421	1,031,421	1,029,750	1,671
05 Service Charge	124,568	229,501	229,501	227,428	2,073
06 Unallocated	1,846,537	92,381	92,381	0	92,381
99 Imprest Fund	0	0	0	0	0
<b>Total</b>	<b>10,600,000</b>	<b>9,567,622</b>	<b>9,567,622</b>	<b>9,108,518</b>	<b>459,104</b>

Source: Asian Development Bank.

<sup>1</sup> Undisbursed amount was cancelled at loan closing.



**PROJECT ORGANIZATION OF EXECUTING AGENCY AND UTILITIES CORPORATIONS**



### STATUS OF COMPLIANCE WITH LOAN COVENANTS

Covenant	Reference in Loan Agreement	Status of Compliance
<p>The Borrower shall cause the Department of Transport Communication and Infrastructure (DTCI) to carry out the Project with due diligence and efficiency and in conformity with sound administrative, financial, engineering, environmental, and water supply and sanitation practices.</p>	<p style="text-align: center;">Article IV, Section 4.01 (a)</p>	<p style="text-align: center;">Complied with.</p>
<p>In carrying out the Project and operation of the Project facilities, the Borrower shall perform, or cause to be performed, all obligations set forth in Schedule 6 to this Loan Agreement.</p>	<p style="text-align: center;">Article IV, Section 4.01 (b)</p>	<p style="text-align: center;">Complied with.</p>
<p>The Borrower shall make, or cause to be made, available to DTCI and to each corporation, promptly as needed, the funds, facilities, services, land, and other resources which are required, in addition to the proceeds of the loan, for carrying out and implementing the Project.</p>	<p style="text-align: center;">Article IV, Section 4.02</p>	<p style="text-align: center;">Complied with.</p>
<p>The Borrower shall ensure that the activities of its departments and agencies, and of the corporations, with respect to carrying out and implementing the Project and operating the project facilities, are conducted and coordinated in accordance with sound administrative policies and procedures.</p>	<p style="text-align: center;">Article IV, Section 4.03</p>	<p style="text-align: center;">Complied with.</p>
<p>The Borrower shall furnish, or cause to be furnished, to the Asian Development Bank (ADB) all such reports and information as ADB shall reasonably request concerning (i) the loan, and the expenditure of the proceeds and maintenance of the service thereof; (ii) the goods and services and other items of expenditure financed out of the proceeds of the loan; (iii) the Project; (iv) the administration, operations and financial condition of the corporations and any other agencies of the Borrower responsible for carrying out and implementing the Project and operating the project facilities, or any part thereof; (v) financial and economic conditions in the territory of the Borrower and the international balance of payments position of the Borrower; and (vi) any other matters relating to the purposes of the loan.</p>	<p style="text-align: center;">Article IV Section 4.03</p>	<p style="text-align: center;">Complied with.</p>

Covenant	Reference in Loan Agreement	Status of Compliance
<b>Financial</b>		
<p>The Borrower shall (i) maintain separate accounts for Part B of the Project; (ii) have such accounts and related financial statements audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB; (iii) furnish to ADB, as soon as available but in any event not later than 12 months after the end of each related fiscal year, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditors' opinion on the use of the loan proceeds and compliance with the covenants of this Loan Agreement), all in the English language; and (iv) furnish to ADB such other information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request.</p>	<p>Article IV, Section 4.04 (b)</p>	<p>Not complied with. Separate accounts were maintained, but audit of project account needs to be included as part of the terms of reference of private government auditor.</p>
<p>The Borrower shall exercise its rights under each Financing Agreement in such a manner as to protect the interests of the Borrower and ADB and to accomplish the purposes of the loan.</p>	<p>Article IV, Section 4.07 (a)</p>	<p>Complied with.</p>
<p>No rights or obligations under any Financing Agreement shall be assigned, amended, abrogated, or waived without the prior concurrence of ADB.</p>	<p>Article IV, Section 4.07 (b)</p>	<p>Complied with.</p>
<p>It is the mutual intention of the Borrower and ADB that no other external debt owed a creditor other than ADB shall have any priority over the loan by way of a lien on the assets of the Borrower. To that end, the Borrower undertakes (i) that, except as ADB may otherwise agree, if any lien shall be created on any assets of the Borrower as security for any external debt, such lien will ipso facto equally and ratably secure the payment of the principal of, and service charge and any other charge on the loan; and (ii) that the Borrower, in creating or permitting the creation of any such lien, will make express provision to that effect.</p>	<p>Article IV, Section 4.08 (a)</p>	<p>Complied with.</p>
<p>The term "assets of the Borrower" as used in</p>	<p>Article IV,</p>	

<b>Covenant</b>	<b>Reference in Loan Agreement</b>	<b>Status of Compliance</b>
<p>paragraph (a) of this section includes assets of any political subdivision or any agency of the Borrower and assets of any agency of any such political subdivision, including any central bank which may be established by the Borrower and such terms includes assets held on behalf of the Borrower with any foreign or local commercial bank or institution for the time being performing the functions of a central bank for the Borrower; provided that if for any constitutional or other legal reason, such provision cannot be made with respect to any lien created on assets of any of its political subdivisions, the Borrower shall promptly and at no cost to ADB secure the principal of, and service charge on, the loan by an equivalent lien on other assets of the Borrower satisfactory to ADB.</p>	Section 4.08 (c)	Complied with.
<b>Implementation</b>		
<p><b>General</b></p> <p>As the Project's Executing Agency, DTCl shall be responsible for overseeing and coordinating project implementation. Chuuk Power Utilities Corporation (CPUC), Kosrae Utilities Authority (KUA), Pohnpei Utilities Corporation (PUC), and Yap State Public Service Corporation (YSPSC) shall be responsible for the implementation of Parts A.1, A.2, A.3 and A.4 of the Project, respectively. DTCl shall be responsible for the implementation of Part B of the Project.</p>	Schedule 6 Para. 1	Complied with.
<p><b>Project Management Unit</b></p> <p>The project management unit (PMU), established by the Borrower to assist DTCl in project implementation, shall be responsible for day-to-day management and coordination of all project activities. The director of DTCl, designated by the Borrower as project director, shall be supported by a project manager and necessary support staff.</p>	Schedule 6 Para. 2	Complied with. PMU established. Project manager, accountant and water engineer appointed. However, project accounts have not been properly recorded and updated, particularly on counterpart funding and implementing agency contribution.
<p><b>Project Implementation Officers</b></p> <p>Each corporation shall appoint a project implementation officer (PIO) from its staff. Each PIO shall be responsible for coordination with the PMU on project activities</p>	Schedule 6 Para. 3	Complied with.

<b>Covenant</b>	<b>Reference in Loan Agreement</b>	<b>Status of Compliance</b>
to be implemented by the corporation. The duties of PIOs shall include (a) monitoring the progress of project implementation, (b) presentation of periodic project progress reports to the PMU, (c) ensuring that satisfactory plans and descriptions of project works within their relevant project area are prepared with the assistance of consultants, and (d) ensuring smooth project implementation and timely consideration of issues by the project implementation committee (PIC).		
<p>Project Implementation Committee</p> <p>The PIC, established by the Borrower to provide overall coordination of project activities throughout the project area, shall have as members the general manager of each corporation, and one representative nominated by each state, and shall be chaired by the project director. The PIC shall meet at least semiannually and shall invite other representatives to attend, as necessary, to ensure satisfactory resolution of all project implementation issues. The PMU shall serve as the secretariat for the PIC.</p>	<p>Schedule 6 Para. 4</p>	<p>Complied with.</p>
<p>Operation and Maintenance</p> <p>The Borrower shall ensure, or cause the respective states to ensure, that structured O&amp;M systems are developed by each corporation to develop and maintain appropriate service levels in a cost-effective manner.</p>	<p>Schedule 6 Para. 5</p>	<p>Being complied with by YSPSC and PUC. In the case of CPUC, proper and sufficient O&amp;M is provided for the project facilities.</p>
<p>The Borrower shall ensure, or cause Chuuk to ensure, that, by 31 March 1997, CPUC has prepared and submitted an application for comprehensive assistance to the Operation and Maintenance Improvement Program (OMIP) of the US Department of the Interior, and shall have prepared and submitted, or caused to have been submitted, to the Chuuk legislature a formal request for the appropriation of state counterpart funds necessary for OMIP assistance.</p>	<p>Schedule 6 Para. 6</p>	<p>Complied with. OMIP application submitted in July 1997.</p>
<p>Public Education and Participation</p> <p>The Borrower shall ensure, or cause to ensure, that during project implementation,</p>	<p>Schedule 6 Para. 7</p>	<p>Complied with.</p>

<b>Covenant</b>	<b>Reference in Loan Agreement</b>	<b>Status of Compliance</b>
<p>each corporation undertakes public education programs, during the course of which public meetings are held to review and discuss project-related issues, including water conservation, health aspects of water use, rights of access to water resources, and water tariffs and their affordability. In such connection, the Borrower shall inform ADB annually of measures taken to improve community acceptance metered billings and willingness to pay.</p>		
<p><b>Land and Water Rights</b></p> <p>The Borrower shall ensure, or cause each state to ensure, that all land, right in land and water, including riparian rights, and other rights privileges required for construction of project facilities are promptly acquired or otherwise made available so as to ensue timely implementation of project construction activities.</p>	<p>Schedule 6 Para. 8</p>	<p>Complied with.</p>
<p><b>Benefit Monitoring and Evaluation</b></p> <p>The Borrower shall ensure that a benefit monitoring and evaluation (BME) program shall be developed and implemented. Such BME program shall be based on ADB's <i>Handbook for Benefit Monitoring and Evaluation</i>, and an evaluation exercise shall be undertaken after an extended period of operation of the project facilities.</p>	<p>Schedule 6 Para. 9</p>	<p>Not complied with. A BME program was not developed and implemented.</p>
<p><b>Midterm Review</b></p> <p>Within 18 months after the Effective Date, the Borrower shall undertake a comprehensive midterm review which shall, inter alia, evaluate project progress, implementation procedures, procurement, the BME program, and performance of the project consultants and the effectiveness of the Borrower's public education and community participation initiatives. Such midterm review shall be conducted in consultation with ADB and the project consultants and shall formulate, as necessary, recommendations for remedial action.</p>	<p>Schedule 6 Para. 10</p>	<p>Complied with. There was no BME program evaluated.</p>

<b>Covenant</b>	<b>Reference in Loan Agreement</b>	<b>Status of Compliance</b>
<p>Environmental Matters</p> <p>The Borrower shall ensure, or cause the respective states to ensure, that each corporation shall comply with ADB's environmental requirements and all applicable environmental laws and regulations of the Borrower, including all state and local laws and regulations.</p>	<p>Schedule 6 Para. 11</p>	<p>Being complied with.</p>

**CHUUK PUBLIC UTILITIES CORPORATION  
STATUS OF COMPLIANCE WITH LOAN COVENANTS  
OF PROJECT IMPLEMENTATION AGREEMENT**

Covenant	Reference in Loan Agreement	Status of Compliance
<p>The corporation shall furnish the Asian Development Bank (ADB), through the project management unit (PMU), quarterly reports on the execution of the Project and on the operation and management of facilities provided under the Project. Such report shall indicate progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and the proposed program of activities and expected progress during the following quarter.</p>	<p>Project Implementation Agreement (PIA), Section 2.08(b)</p>	<p>Complied with.</p>
<p>The corporation shall:</p> <ul style="list-style-type: none"> <li>(i) maintain, or cause to be maintained, separate accounts for the Project;</li> <li>(ii) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors acceptable to ADB; and</li> <li>(iii) furnish to ADB, promptly after their preparation, but in any event not later than 12 months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditor's opinion on the use of the loan proceeds and compliance with the covenants of the PIA, all in the English language).</li> </ul>	<p>PIA, Section 2.09(a)</p>	<p>Complied, but only from 1998–2001.</p>
<p>The corporation shall make best efforts to generate revenues to fund (i) operating expenses (and thus eliminate the need for subsidies) within 5 years of project completion; and (ii) all operation and maintenance (O&amp;M) expenses, including depreciation and interest expenses, within 10 years of project completion.</p>	<p>PIA, Schedule (i)</p>	<p>Not complied with. In 2001 and 2002, water and sewerage revenues covered only 5.6% and 8.5% of O&amp;M expenses, respectively.</p>
<p>The Corporation shall make best efforts to maintain a debt service ratio, within 5 years of project completion, of at least 1.0 and, within 10 years of project completion, of at least 1.2.</p>	<p>PIA, Schedule (ii)</p>	<p>Not yet due.</p>
<p>The corporation shall adopt measures to reduce non-revenue water (NRW) to 30% by the end of FY2005, including use of improved meter reading, computerized</p>	<p>PIA, Schedule (iii)</p>	<p>Not complied with. As of 2002, estimated NRW was 60% and O&amp;M</p>

Covenant	Reference in Loan Agreement	Status of Compliance
billing, operational procedures, construction standards, and leakage detection programs.		procedures were not being undertaken.
<p>The corporation shall achieve the following accounts receivable targets expressed in terms of average number of days of water and sanitation services billings:</p> <ul style="list-style-type: none"> <li>(i) within 12 months from project completion, 110 days;</li> <li>(ii) within 24 months from project completion, 90 days; and</li> <li>(iii) within 36 months from project completion and thereafter, 70 days.</li> </ul>	PIA, Schedule (iv)	Not complied with. About 50% of accounts receivables and arrears are more than 180 days.
<p>The corporation shall submit annually to ADB prior to the start of each fiscal year during project implementation, through the PMU, a draft corporate plan for review and comment, which details the projected development and operation of the corporation on a 3-year rolling basis, including (i) establishing annual financial performance objectives; (ii) providing a strategy for delivering such objectives; (iii) providing projections of operating and maintenance expenses, capital expenditures, and tariff requirements; and (iv) identifying the need for, and availability of, grants and subsidies.</p>	PIA, Schedule (v)	Complied with in 2000.
<p>The corporation shall implement procedures to promote the continuing institutional improvement of the corporation, including:</p> <ul style="list-style-type: none"> <li>(i) preparation of a fixed assets register;</li> <li>(ii) development of an appropriate billing, accounting, and management information system;</li> <li>(iii) development of an appropriate staffing structure;</li> <li>(iv) identification of short-term capital works and maintenance requirements;</li> <li>(v) preparation of annual budgets for water supply and sewerage operations;</li> <li>(vi) adoption of appropriate connection and disconnection policies and practices;</li> <li>(vii) implementation of water and sewerage tariffs;</li> <li>(viii) promotion of the development of appropriate regulations for water resources management;</li> <li>(ix) implementation of O&amp;M impact statements; and</li> <li>(x) development of long-term corporate plans.</li> </ul>	PIA, Schedule (vi)	<p>Partly complied with since procedures are not followed according to established accounting rules (posting, etc.)</p> <p>Not complied with.</p> <p>Partly complied with.</p> <p>Complied with.</p> <p>Partly complied with.</p> <p>Complied with.</p> <p>Complied with.</p> <p>Complied with.</p> <p>Long-term plan not complied with.</p>

**POHNPEI UTILITIES CORPORATION  
STATUS OF COMPLIANCE WITH LOAN COVENANTS  
OF PROJECT IMPLEMENTATION AGREEMENT**

Covenant	Reference in Loan Agreement	Status of Compliance
<p>The corporation shall furnish the Asian Development Bank (ADB), through the project management unit (PMU), quarterly reports on the execution of the Project and on the operation and management of facilities provided under the Project. Such report shall indicate progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and the proposed program of activities and expected progress during the following quarter.</p>	<p style="text-align: center;">Project Implementation Agreement (PIA), Section 2.08(b)</p>	<p>Complied with.</p>
<p>The corporation shall:</p> <ul style="list-style-type: none"> <li>(i) maintain, or cause to be maintained, separate accounts for the Project;</li> <li>(ii) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors acceptable to ADB; and</li> <li>(iii) furnish to ADB, promptly after their preparation, but in any event not later than 12 months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditor's opinion on the use of the loan proceeds and compliance with the covenants of the PIA, all in the English language).</li> </ul>	<p>PIA, Section 2.09(a)</p>	<p>Complied with.</p>
<p>The corporation shall make best efforts to generate revenues to fund (i) operating expenses (and thus eliminate the need for subsidies) within 5 years of project completion; and (ii) all operation and maintenance (O&amp;M) expenses, including depreciation and interest expenses, within 10 years of project completion.</p>	<p style="text-align: center;">PIA, Schedule (i)</p>	<p>Being complied with.</p>
<p>The corporation shall adopt measures to reduce non-revenue water (NRW) to 30% by the end of FY2005, including the use of improved meter reading, computerized billing, operational procedures, construction standards, and leakage detection programs.</p>	<p style="text-align: center;">PIA, Schedule (iii)</p>	<p>Being complied with. NRW is still at 45%, measures have been instituted to reduce NRW</p>

<b>Covenant</b>	<b>Reference in Loan Agreement</b>	<b>Status of Compliance</b>
<p>The corporation shall implement procedures to promote the continuing institutional improvement of the Corporation, including:</p> <ul style="list-style-type: none"> <li>(i) preparation of a fixed assets register;</li> <li>(ii) development of an appropriate billing, accounting, and management information system;</li> <li>(iii) development of an appropriate staffing structure;</li> <li>(iv) identification of short-term capital works and maintenance requirements;</li> <li>(v) preparation of annual budgets for water supply and sewerage operations;</li> <li>(vi) adoption of appropriate connection and disconnection policies and practices;</li> <li>(vii) implementation of water and sewerage tariffs;</li> <li>(viii) promotion of the development of appropriate regulations for water resources management;</li> <li>(ix) implementation of O&amp;M impact statements; and</li> <li>(x) development of long-term corporate plans.</li> </ul>	<p>PIA, Schedule (vi)</p>	<p>Complied with.</p>

**YAP STATE PUBLIC SERVICE CORPORATION  
STATUS OF COMPLIANCE WITH LOAN COVENANTS  
OF PROJECT IMPLEMENTATION AGREEMENT**

Covenant	Reference in Loan Agreement	Status of Compliance
<p>The corporation shall furnish the Asian Development Bank (ADB), through the project management unit (PMU), quarterly reports on the execution of the Project and on the operation and management of facilities provided under the Project. Such report shall indicate progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and the proposed program of activities and expected progress during the following quarter.</p>	<p>Project Implementation Agreement (PIA), Section 2.08(b)</p>	<p>Complied with.</p>
<p>The corporation shall:</p> <ul style="list-style-type: none"> <li>(i) maintain, or cause to be maintained, separate accounts for the Project;</li> <li>(ii) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors acceptable to ADB; and</li> <li>(iii) furnish to ADB, promptly after their preparation, but in any event not later than 12 months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditor's opinion on the use of the loan proceeds and compliance with the covenants of the PIA, all in the English language).</li> </ul>	<p>PIA, Section 2.09(a)</p>	<p>Complied with.</p>
<p>The corporation shall make best efforts to generate revenues to fund (i) operating expenses (and thus eliminate the need for subsidies) within 5 years of project completion; and (ii) all operation and maintenance (O&amp;M) expenses, including depreciation and interest expenses, within 10 years of project completion.</p>	<p>PIA, Schedule (i)</p>	<p>Being complied with. As of 2003, operating revenues covered O&amp;M expenses but not depreciation expense.</p>
<p>The corporation shall make best efforts to maintain a debt service ratio, within 5 years of project completion, of at least 1.0 and, within 10 years of project completion, of at least 1.2.</p>	<p>PIA, Schedule (ii)</p>	<p>Not yet due.</p>

Covenant	Reference in Loan Agreement	Status of Compliance
<p>The corporation shall implement procedures to promote the continuing institutional improvement of the corporation, including:</p> <ul style="list-style-type: none"> <li>(i) preparation of a fixed assets register;</li> <li>(ii) development of an appropriate billing, accounting, and management information system;</li> <li>(iii) development of an appropriate staffing structure;</li> <li>(iv) identification of short-term capital works and maintenance requirements;</li> <li>(v) preparation of annual budgets for water supply and sewerage operations;</li> <li>(vi) adoption of appropriate connection and disconnection policies and practices;</li> <li>(vii) implementation of water and sewerage tariffs;</li> <li>(viii) promotion of the development of appropriate regulations for water resources management;</li> <li>(ix) implementation of O&amp;M impact statements; and</li> <li>(x) development of long-term corporate plans.</li> </ul>	<p>PIA, Schedule (vi)</p>	<p>Complied with. The corporation maintains an updated fixed assets registry with depreciation schedule. It has a fully computerized billing, accounting and management information system and approved staffing structure.</p> <p>It regularly updates its capital works and O&amp;M budget and annual operating budgets for water supply and sewerage operation. It adapted connection and disconnection policies and tariffs approved by the board. It has not updated its long-term corporate plan.</p>

ADB = Asian Development Bank, BME = benefit monitoring and evaluation, CPUC = Chuuk Power Utilities Corporation, DTCL = Department of Transport Communication and Infrastructure, FY = fiscal year, KUA = Kosrae Utilities Authority, NRW = non-revenue water, O&M = operation and maintenance, OMIP = Operation and Maintenance Improvement Program, PIA = Project Implementation Agreement, PIC = project implementation committee, PIO = project implementation officer, PMU= project management unit, PUC = Pohnpei Utilities Corporation, YSPSC = Yap State Public Service Corporation.  
Source: Asian Development Bank Review Mission.

## FINANCIAL AND ECONOMIC EVALUATION

### A. Financial Evaluation

#### 1. Scope and Methodology

1. The financial internal rates of return (FIRR) of the Chuuk, Yap and Pohnpei water supply components were evaluated. The results were compared with the appraisal estimates. Project costs, financing plan, and revenues were revised based on information provided during the Project Completion Review (PCR) mission.<sup>1</sup> The financial analysis was done at constant 2003 prices. The FIRR and sensitivity analysis are shown in Table A6.1 below.

#### 2. Project Cost and Revenues

2. Capital costs were revised based on actual expenditures at project completion.<sup>2</sup> The costs of operations and maintenance (O&M) for 2002 were provided by the utilities corporations (UCs), and these were divided by the estimated volumes of water treated to arrive at the individual O&M cost per 1000 gallons.<sup>3</sup> O&M cost projections for succeeding years were based on 2003 prices.<sup>4</sup> The incremental operating costs were based on the 2003 average cost per 1,000 gallons of water treated for Chuuk, Yap and Pohnpei.

3. **Chuuk.** The capacity target of 1.08 million gallons per day (mgd) to augment the 0.2 mgd production before the Project was achieved with 16 new wells, instead of the 30 wells envisaged at appraisal. However, the increased capacity was not sustained starting in mid-2002, after project completion, because of the lack of (i) power supply, (ii) suitable chlorinators, and (iii) adequate O&M budget. Low water pressure, poor service reliability, and non-uniform water quality—with bacteriological contamination, and high iron was reported. The PCR Mission told management and the Executing Agency (EA) that appropriate and immediate measures must be undertaken to make the non-functional wells operational.

4. **Yap.** The project scope involved (i) the construction of seven water wells, (ii) the deepening of another well, (iii) construction of transmission and distribution pipelines and a pumping station, (iv) refurbishment of a water treatment plant, and (v) installation of chlorinating facilities and a water tank. The Project increased the capacity of the Yap water supply system to 175.3 mgd.

5. **Pohnpei.** The project scope involved the construction of distribution pipelines and service connections. This has provided water to about 3,500 people in remote villages through an additional 500 connections.

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<sup>1</sup> Pohnpei Utilities Corporation's (PUC's) financial and operational data was from 1995–2002; Chuuk Power Utilities Corporation (CPUC) data was for 1999–2001 (2002 was not complete due to absence of a comptroller); and Yap State Public Service Corporation (YSPC) data prior to 2001 was destroyed by a fire in early 2001.

<sup>2</sup> The FSM Water Supply and Sanitation Project was financed by a loan from the Asian Development Bank (ADB) and Government equity, comprising contributions from national and state governments.

<sup>3</sup> One cubic meter (m<sup>3</sup>) is equivalent to 263.85 gallons.

<sup>4</sup> The UCs provided O&M data for 2002 based on actual operating conditions. They comprise (i) labor cost for operation, preventive maintenance, and minor repairs; (ii) electricity cost; (iii) chemical cost; (iv) reticulation system maintenance; and (v) mechanical and electrical plant maintenance.

## B. Financial Reevaluation

6. The FIRR was recalculated for Chuuk, Yap, and Pohnpei physical components as well as the Project as a whole based on actual project cost, financing revenue, and cost data.<sup>5</sup> The financial reevaluation of the components was carried out on an incremental basis (with and without the Project), using 2003 constant prices in dollars. The economic life of the water treatment plants was set at 30 years. Capacity utilization of Chuuk in 2003 was 46%, which was projected to increase to 60% in 2005 once the new wells were operational and the increase in the number of connections was attained. In Yap and Pohnpei, the capacity utilization was about 80% in 2003, and was projected to increase to 90% in 2005 if connection targets are met in expansion areas.

7. The FIRRs of the three components were recalculated and compared with WACC of 3.3%. The FIRRs for Yap and Pohnpei were 7.3% and 5.9%, respectively, higher than the 6.7% and 4.6% estimated at appraisal. The recalculated FIRR for Chuuk was 4.7%, significantly lower than the 7.4% envisaged at appraisal. The lower-than-expected FIRR for Chuuk was caused by the low number of connections and poor revenue collection efficiency due to variable water quantity and quality. The FIRR for the Project was 5.1%, which was lower than the 7.0% estimate at appraisal due to the failure of Chuuk to improve water supply services despite meeting the targeted capacity improvement. Standard and additional sensitivity analyses were undertaken for sales volume, non-revenue water (NRW), and tariffs. The results indicated that the FIRRs of the three components were more vulnerable to decreases in revenues than increases in O&M costs, as projected at appraisal. Tables A6.2, A6.3, A6.4, and A6.5 present the FIRR calculations for Chuuk, Yap and Pohnpei, and the Project. The Project was rated less efficient due to inability of CPUC to charge appropriate tariffs and increase collection efficiency.

**Table A6.1: Financial Internal Rate of Return and Sensitivity Analysis**

Item	At Appraisal (%)	At Project Completion (%)
<b>1. Overall Project: Base Case</b>	<b>7.0</b>	<b>5.1</b>
(i) Capital cost increase by 10%	6.2	—
(ii) Revenues decrease by 10%	5.9	4.3
(iii) O&M increase by 10%	6.8	4.9
(iv) Project delay	6.6	—
(v) Combination of (i)–(iv)	4.8	—
(vi) Combination of (ii) & (iii)	—	4.1
(vii) Decrease in sales volume by 30%	—	3.0
(viii) Increase in NRW by 20%	—	3.8
(ix) Decrease in Tariff revenues by 20%	—	3.6
<b>2. Chuuk Component: Base Case</b>	<b>7.4</b>	<b>4.7</b>
(i) Capital cost increase by 10%	6.6	—
(ii) Revenues decrease by 10%	6.4	4.0
(iii) O&M increase by 10%	7.2	3.6
(iv) Project delay	—	—
(v) Combination of (i)–(iv)	5.3	—
(vi) Combination of (ii) & (iii)	—	3.9
(vii) Decrease in sales volume by 30%	—	3.1
(viii) Increase in NRW by 20%	—	2.3
(ix) Decrease in tariff revenues by 20%	—	4.0

*Continued on next page*

<sup>5</sup> The weighted average cost of capital (WACC) was 3.3% based on the project financing mix: ADB and Government equity.

**Table A6.1—continued**

Item	At Appraisal (%)	At Project Completion (%)
<b>3. Yap Component: Base Case</b>	<b>6.7</b>	<b>7.3</b>
(i) Capital cost increase by 10%	6.0	—
(ii) Revenues decrease by 10%	6.0	6.0
(iii) O&M increase by 10%	6.6	7.0
(iv) Project delay	6.4	—
(v) Combination of (i)–(iv)	4.2	—
(vi) Combination of (ii) & (iii)	—	5.7
(vii) Decrease in sales volume by 30%	—	3.8
(viii) Increase in NRW by 20%	—	5.6
(ix) Decrease in tariff revenues by 20%	—	3.8
<b>4. Pohnpei Component: Base Case</b>	<b>4.6</b>	<b>5.9</b>
(i) Capital cost increase by 10%	3.8	—
(ii) Revenues decrease by 10%	3.6	3.1
(iii) O&M increase by 10%	4.4	3.7
(iv) Project delay	—	—
(v) Combination of (i)–(iv)	2.5	—
(vi) Combination of (ii) & (iii)	—	2.8
(vii) Decrease in sales volume by 30%	—	2.7
(viii) Increase in NRW by 20%	—	3.6
(ix) Decrease in tariff revenues by 20%	—	3.3

— = no data available, NRW = non-revenue water, O&M = operation and maintenance.

Source: Asian Development Bank.

8. In Chuuk, despite staff training in financial management, urgent measures must be taken to ensure the sustainability of the project assets. These include (i) improvements in billing and collection through immediate follow-up on defaulting customers and collection of arrears from government customers; (ii) reduction in NRW by undertaking meter testing, recalibration, and a replacement program; (iii) and management reforms, such as institutionalizing cost-efficiency measures and proper accounting procedures.<sup>6</sup> These measures are needed to address serious deficiencies in management and operations, and to enable CPUC to cover at least O&M costs from its water and sewerage operations. Revenues from (i) connection and reconnection fees, (ii) water tariffs for metered and unmetered customers,<sup>7</sup> (iii) water truck deliveries, (iv) water deliveries by big tankers, and (v) water loaded to ships must be closely monitored and reported. The lack of capable accounting staff in recent years resulted in inconsistent and incomplete customer accounts, incorrect amounts collected by customer type, no data for customer arrears, and no aging of customer accounts receivables.

9. CPUC has to undertake drastic changes in financial management and operations to prevent further losses in water and sewerage operations, and to ensure debt servicing on its ADB loan starting in 2007. If it follows the best practices of YSPSC and PUC in financial management and control, such as collections of outstanding arrears, CPUCs' short-term liquidity and financial viability would improve substantially. YSPSC's policy to disconnect nonpaying customers 60 days after issuance of notice of disconnection has been an effective

<sup>6</sup> The PCR Mission noted several inefficiencies in the management and operations of the CPUC: (i) despite its policy of metering customers and undertaking meter reading, CPUC has not been consistently conducting monthly meter readings for billing purposes since all its customers are charged a flat monthly fee, not the progressive fee structure as envisioned; and (ii) despite disconnection policy for customers with arrears, nonpaying customers have not been disconnected and still consume CPUC water without being obliged to pay.

<sup>7</sup> Once the application for water service is approved, the service connection and meter are installed by CPUC at the expense of the applicant. The cost of service connection must be paid in advance.

deterrent to customers' failure to pay on time. Further, a reconnection fee of \$45 (following involuntary disconnection) and \$10 (for voluntary disconnection) after paying the arrears has been an effective measure that CPUC and PUC can adopt. For new water connections, customers pay \$45 and \$50 security deposits. For water quality control, YSPSC conducts water quality tests for bacteria and faecal coliform on a weekly or monthly basis. Other capital works are financed mainly from external sources, such as the national legislature, grant funds or community contributions.

## **B. Economic Evaluation**

### **1. Scope and Methodology**

10. The economic analysis recalculated the economic internal rates of return (EIRR) of the two components. The results were compared with the appraisal and revised project scope estimates. Project costs and benefits were reassessed based on (i) information provided to the PCR Mission by the UCs and government offices, such as the Department of Health and Office of Planning and Statistics; and (ii) detailed field interviews with beneficiaries in the newly served areas under the Project. The EIRRs were compared with the economic opportunity cost of capital (EOCC), which was assumed to be 10%, same at appraisal.

### **2. Project Cost and Benefits**

11. The updated financial costs were converted to economic costs to reflect the true cost and value to the economy of goods and services. Items such as transfer payments, price contingencies, and depreciation were excluded in the computation of the economic costs.<sup>8</sup> The analysis described the economic rationale and target beneficiaries, and set out the without-project situation. The analysis compared the calculated EIRR for the two components to the EOCC, which was assumed to be 10%. Standard and project-specific sensitivity tests were undertaken to assess the robustness of the EIRR calculation. The analysis used the domestic price numeraire, as benefits are non-tradable in nature, and was undertaken in constant 2003 prices.

12. The major quantifiable benefits of the water supply project were (i) cost savings on the installation of individual water tanks due to supply shortages;<sup>9</sup> (ii) cost savings on the purchase of additional water requirements by households; (iii) revenues earned from the sale of water to new consumers, which represented the benefits to commercial, industrial and institutional users; and (iv) revenues collected from existing customers based on the present water tariff, which was taken to represent the consumers' minimum willingness to pay.<sup>10</sup>

<sup>8</sup> ADB. 1997. *Guidelines for the Economic Analysis of Projects*. Manila.

<sup>9</sup> Water rationing was evident since service was available for only 4–6 hours daily in Chuuk and Yap during droughts. Capital cost of water tanks range from \$350 to \$750, with capacity of 1,000 gallons and up.

<sup>10</sup> Households not served by piped water supply relied more on rainwater collected from roofs and stored in circular tanks made of thin galvanized steel sheets, such as those found in Chuuk (which are mostly old and not maintained). Most households have 1,000 gallon tanks or two or three smaller tanks. Stored rainwater is not adequate to meet consumption needs during dry season, which lasts for 4 months. A significant number of households, as well as villagers, had to purchase water from vendors every other day, particularly in Yap. Other households that cannot afford to buy water relied on creeks, rivers, shallow water wells, or neighbors' supplies (larger storage tanks or piped water supply).

### 3. Results

13. The results of the economic evaluation showed that the Project is economically viable, with the recalculated EIRR estimated at 12.7%, compared with the EOCC of 10%. However, the recalculated EIRR was lower than the EIRR estimate of 16.2% at appraisal. The EIRR calculated for Chuuk indicated that the component is not economically viable due to inefficient operations since the start of the Project. The base case EIRR for Chuuk was 5.5%, compared with an estimated EIRR of 19.9% at appraisal. Yap's EIRR of 15.2% was higher than the 14.9% estimated at appraisal. This resulted from improved water supply system with lower maintenance costs (following the switch from a booster-fed to gravity-fed system) and more connections in remote villages. Pohnpei's recalculated EIRR was 20.9%, higher than the 14.0% appraisal estimate. This was due to improved services to residents and public institutions, such as schools and hospitals, and the provision of village community supplies to remote villages. Sensitivity analyses showed that the Project was most sensitive to decreases in benefits. The results are presented in Table A6.6. Tables A6.7–A6.10 present the detailed calculation of benefits, EIRR, and sensitivity analyses.

14. Other unquantifiable benefits from the Project include (i) access to safe water for low-income communities; (ii) benefits to women and children in terms of time saved for economic activities, such as fishing and selling agricultural crops;<sup>11</sup> (iii) long-term employment for UC staff on plant operation, maintenance, and operation; (iv) employment of contractors and suppliers; (v) improvement of people's health, particularly villagers' children who suffer the most from water-borne diseases from drinking from unprotected sources, such as rainwater tanks and creeks;<sup>12</sup> (vi) short-term local employment during project construction, and the experience gained in project construction that enabled them to be employed as semi-skilled labor; (vii) improved business activities of hotels and restaurants in Yap and Pohnpei; (viii) other social benefits, such as more time for women to do household chores and rear children, and reduced visits to hospitals and clinics due to child illnesses; (ix) positive impact on education sector, where schools no longer experience disruption of classes due to water interruptions; and (x) sale and lease of property by the land owners, which enabled them to generate capital for small-scale businesses.

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<sup>11</sup> Women's traditional role in Micronesian society has been focused close to the family home, even when they are assisting in economic activities, such as subsistence agriculture. Women's burden of tending the sick was reduced by the Project. Women also have must ensure sufficient quantity of water for family needs. Improvement in water supply reliability in Kolonia, Pohnpei, was reflected in the positive responses received in social surveys. The improved reliability of the water supply illustrates the benefits, which will accrue to women as improvement spreads in other areas.

<sup>12</sup> The most common water-borne disease is diarrhea. Based on the Department of Health, the incidence of diarrhea and other water-borne diseases declined: (i) Chuuk: 772 in 1999 to 708 in 2001 (but increased to 1,382 in 2002); (ii) Yap, 507 cases in 2000 to 349 cases in 2002; and (iii) Pohnpei: 3,831 cases in 2000 to 1,228 cases in 2002 (mainly people outside Kolonia).

**Table A6.2 Financial Internal Rate of Return Calculation—Chuuk (\$'000)**

Year	Capital Cost	Production	Incremental		Revenues				Sensitivity Cases						
			Cost	NRW (%)	Water Sales (mill. gals)	Tariffs	Connection Fees	Total	Net Revenues	10% Dec In Rev	10% Incr. O&M Costs	Combina. (i) & (ii)	30% Dec In Sales Vol.	20% Inc. In NRW	20% Dec. In Tariffs
1997	42.3								(42.3)	(42.3)	(42.3)	(42.3)	(42.3)	(42.27)	(42.27)
1998	323.8								(323.8)	(323.8)	(323.8)	(323.8)	(323.8)	(323.8)	(323.8)
1999	174.3	176,196	4	0.40	141,718	139.7	4.5	25.0	(34.3)	(48.3)	(154.0)	(48.7)	(76.3)	(83.7)	(62.3)
2000	1,651.6	202,440	14	0.40	157,464	155.3	4.5	49.4	(1,506.0)	(1,521.6)	(1,617.8)	(1,523.0)	(1,552.6)	(1,557.5)	(1,537.1)
2001	551.7	231,600	18	0.40	174,960	172.5	4.5	36.5	(392.2)	(409.4)	(534.4)	(411.2)	(443.9)	(445.9)	(426.7)
2002	310.0	264,000	19	0.40	194,400	191.7	4.5	37.8	(133.2)	(152.4)	(293.5)	(154.3)	(190.7)	(189.5)	(171.5)
2003	408.2	166,800	22	0.50	113,400	111.8	4.5	37.8	(313.7)	(324.8)	(394.3)	(327.0)	(347.2)	(359.7)	(336.0)
2004		166,800	22	0.60	90,720	89.4	4.5	89.5	71.9	63.0	65.3	60.8	45.1	28.5	54.0
2005		166,800	22	0.60	90,720	93.9	5.4	94.0	77.1	67.7	69.6	65.5	48.9	31.5	58.3
2006		166,800	22	0.55	102,060	110.9	5.4	111.1	93.9	82.8	86.3	80.5	60.6	44.6	71.7
2007		166,800	23	0.55	102,060	116.5	5.4	116.6	99.2	87.5	91.6	85.3	64.2	47.4	75.9
2008		166,800	23	0.55	102,060	122.3	5.4	122.4	104.8	92.6	97.2	90.3	68.1	50.4	80.3
2009		166,800	23	0.55	102,060	128.4		128.4	105.3	92.4	103.0	90.1	66.7	48.2	79.6
2010		166,800	23	0.50	113,400	149.8		149.8	126.5	111.5	124.1	109.1	81.5	64.8	96.5
2011		166,800	24	0.50	113,400	157.3		157.3	133.7	118.0	131.4	115.6	86.5	68.9	102.2
2012		166,800	24	0.50	113,400	165.2		165.2	141.3	124.8	139.0	122.4	91.8	73.3	108.3
2013		166,800	24	0.50	113,400	173.5		173.5	149.4	132.0	147.0	129.6	97.3	78.0	114.7
2014		166,800	24	0.50	113,400	182.1		182.1	157.8	139.6	155.4	137.1	103.2	82.8	121.4
2015		166,800	25	0.50	113,400	191.2		191.2	166.7	147.5	164.2	145.1	109.3	87.9	128.4
2016		166,800	25	0.50	113,400	200.8		200.8	176.0	155.9	173.5	153.4	115.7	93.3	135.8
2017		166,800	25	0.50	113,400	210.8		210.8	185.8	164.7	183.3	162.2	122.5	99.0	143.6
2018		166,800	25	0.50	113,400	221.4		221.4	196.1	173.9	193.5	171.4	129.6	104.9	151.8
2019		166,800	26	0.50	113,400	232.4		232.4	206.9	183.6	204.3	181.1	137.1	111.2	160.4
2020		166,800	26	0.50	113,400	244.1		244.1	218.2	193.8	215.7	191.3	145.0	117.8	169.4
2021		166,800	26	0.50	113,400	256.3		256.3	230.2	204.6	227.6	201.9	153.3	124.7	178.9
2022		166,800	26	0.50	113,400	269.1		269.1	242.7	215.8	240.1	213.2	162.0	132.0	188.9
2023		166,800	27	0.50	113,400	282.5		282.5	255.9	227.7	253.3	225.0	171.2	139.6	199.4
2024		166,800	27	0.50	113,400	296.7		296.7	269.8	240.1	267.1	237.4	180.8	147.7	210.5
2025		166,800	27	0.50	113,400	311.5		311.5	284.4	253.2	281.6	250.5	190.9	156.1	222.1
2026		166,800	27	0.50	113,400	327.1		327.1	299.7	267.0	296.9	264.2	201.5	165.0	234.2
2027		166,800	28	0.35	147,420	446.5		446.5	418.8	374.1	416.0	371.4	284.8	265.3	329.5

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Table A6.2—continued

Year	Capital Cost	Production	Incremental		Revenues				Sensitivity Cases						
			Cost	NRW (%)	Water Sales (mill. gals)	Tariffs	Con- nection Fees	Total	Net Revenues	10% Dec In Rev	10% Incr. O&M Costs	Combine (I) & (ii)	30% Dec. In Sales Vol.	20% Inc. In NRW	20% Dec. In Tariffs
2028		166,800	28	0.35	147,420	468.8		468.8	440.8	393.9	438.0	391.1	300.2	279.7	347.1
2029		166,800	28	0.35	147,420	492.2		492.2	464.0	414.8	461.2	411.9	316.3	294.8	365.5
2030		166,800	29	0.35	147,420	516.8		516.8	488.3	436.6	485.5	433.8	333.3	310.6	384.9
2031		166,800	29	0.35	147,420	542.7		542.7	513.9	459.6	511.0	456.7	351.1	327.3	405.3
2032		166,800	29	0.35	147,420	569.8		569.8	540.7	483.7	537.8	480.8	369.8	344.8	426.7
2033		166,800	29	0.35	147,420	598.3		598.3	568.9	509.1	566.0	506.1	389.4	363.2	449.2
<b>NPV</b>								<b>(116.7)</b>	<b>(414.2)</b>	<b>(643.1)</b>	<b>(447.1)</b>	<b>(705.5)</b>	<b>(993.8)</b>	<b>(375.1)</b>	
<b>FIRR</b>								<b>4.7%</b>	<b>4.0%</b>	<b>3.6%</b>	<b>3.9%</b>	<b>3.1%</b>	<b>2.3%</b>	<b>4.0%</b>	

FIRR = financial internal rate of return, NPV = net present value, NRW = non-revenue water, O&M = operations and maintenance.

Note: Actual revenues from 1999 to 2000.

Sources: Benefits estimation and interviews of stakeholders.

**Table A6.3 Financial Internal Rate of Return Calculation–Yap (\$'000)**

Year	Capital Cost	Incremental		Revenues				Net Revenues	10% Dec. in Revenues	10% Incr. In O&M Costs	Sensitivity Cases				
		Production mil. Gals	Cost	Water Sales mil. Gals	Tariff	Connection Fees	Total				Combined (i) & (ii)	30% Dec. In Sales Vol.	20 % Inc. In NRW	20 % Dec. In Tariffs	
1997															
1998															
1999															
2000	1,216.6		7				4.5	5	(1,219.4)	(1,219.9)	(1,220.2)	(1,220.6)	(1,219.4)	(1,219.42)	(1,219.42)
2001	911.3	396	32	278	333		4.5	338	(605.7)	(639.5)	(608.9)	(642.7)	(938.5)	(938.43)	(938.46)
2002	142.9	172,544	39	139,761	168		4.5	172	(9.8)	(27.0)	(13.7)	(30.9)	(43.3)	(17.62)	(43.29)
2003		172,544	39	139,761	168		4.5	172	133.1	115.9	129.2	112.0	99.6	125.28	99.61
2004		173,225	40	138,580	171		4.5	176	135.5	118.0	131.5	113.9	101.3	126.98	101.29
2005		173,225	41	138,580	176		4.5	181	139.5	121.4	135.3	117.2	104.2	130.66	104.20
2006		173,225	43	138,580	182		4.5	186	143.5	124.9	139.3	120.6	107.2	134.44	107.19
2007		173,225	44	138,580	187		4.5	192	147.7	128.5	143.3	124.1	110.3	138.34	110.27
2008		173,225	45	138,580	193		4.5	197	152.0	132.3	147.5	127.7	113.4	142.36	113.44
2009		173,225	47	138,580	199			199	151.9	132.1	147.3	127.4	112.2	141.99	112.21
2010		173,225	48	138,580	205			205	156.5	136.0	151.7	131.2	115.6	146.25	115.57
2011		173,225	50	138,580	211			211	160.2	139.1	155.2	134.1	118.1	149.68	118.08
2012		173,225	53	138,580	217			217	164.0	142.3	158.7	137.0	120.6	153.16	120.61
2013		173,225	56	138,580	223			223	167.9	145.5	162.3	140.0	123.2	156.70	123.17
2014		173,225	58	138,580	230			230	171.8	148.8	166.0	142.9	125.8	160.29	125.76
2015		173,225	61	138,580	237			237	175.8	152.1	169.6	145.9	128.4	163.93	128.36
2016		173,225	64	138,580	244			244	179.8	155.4	173.4	149.0	131.0	167.62	130.99
2017		173,225	68	138,580	252			252	183.9	158.8	177.2	152.0	133.6	171.36	133.63
2018		173,225	71	138,580	259			259	188.1	162.2	181.0	155.1	136.3	175.15	136.28
2019		173,225	75	138,580	267			267	192.3	165.6	184.9	158.2	139.0	178.98	138.95
2020		173,225	78	138,580	275			275	196.6	169.1	188.8	161.3	141.6	182.86	141.63
2021		173,225	82	138,580	283			283	200.9	172.6	192.7	164.4	144.3	186.78	144.31
2022		173,225	86	138,580	292			292	205.3	176.2	196.7	167.5	147.0	190.74	147.00
2023		173,225	91	138,580	300			300	209.8	179.7	200.7	170.7	149.7	194.74	149.69
2024		173,225	95	138,580	309			309	214.2	183.3	204.7	173.8	152.4	198.77	152.36
2025		173,225	100	138,580	319			319	218.8	186.9	208.8	176.9	155.0	202.83	155.03
2026		173,225	105	138,580	328			328	223.3	190.5	212.8	180.0	157.7	206.92	157.69
2027		173,225	110	138,580	338			338	227.9	194.1	216.9	183.1	160.3	211.03	160.32
2028		173,225	116	138,580	348			348	232.6	197.7	221.0	186.2	162.9	215.15	162.93
2029		173,225	121	138,580	359			359	237.2	201.4	225.1	189.2	165.5	219.30	165.50

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**Table A6.3—continued**

Year	Incremental				Revenues				Sensitivity Cases					
	Capital Cost	Production mil. Gals	Cost	Water Sales mil. Gals	Tariff	Connection Fees	Total	Net Revenues	10% Dec. in Revenues	10% Incr. In O&M Costs	Combined (i) & (ii)	30% Dec. In Sales Vol.	20 % Inc. In NRW	20 % Dec. In Tariffs
2030		173,225	127	138,580	369		369	241.9	205.0	229.2	192.2	168.0	223.45	168.04
2031		173,225	134	138,580	380		380	246.6	208.6	233.2	195.2	170.5	227.60	170.53
2032		173,225	141	138,580	392		392	251.3	212.2	237.3	198.1	173.0	231.75	172.97
2033		173,225	148	138,580	404		404	256.1	215.7	241.3	201.0	175.3	235.89	175.35
<b>NPV</b>								<b>640.6</b>	<b>270.1</b>	<b>545.0</b>	<b>174.4</b>	<b>(335.5)</b>	<b>171.2</b>	<b>(335.5)</b>
<b>FIRR</b>								<b>7.3%</b>	<b>6.0%</b>	<b>7.0%</b>	<b>5.7%</b>	<b>3.8%</b>	<b>5.6%</b>	<b>3.8%</b>

FIRR = financial internal rate of return, mil = million, NPV = net present value, NRW = non-revenue water, O&M = operations and maintenance.

Note: Actual revenues from 1999 to 2000.

Sources: Benefits estimation and interviews of stakeholders.

**Table A6.4 Financial Internal Rate of Return Calculation–Pohnpei (\$'000)**

Year	Incremental			Revenues						Sensitivity Cases				
	Capital Cost	Volume 000 gals	Cost	Water Sales 000 gals	Tariffs	Con-nection Fees	Total	Net Revenues	10% Dec. in Rev.	10 % Incr. In O&M Costs	Combined Case	30% Dec. In Sales Vol.	20 % Inc. In NRW	20% Dec. in Tariffs
1997	37.8						(37.80)	(37.80)	(37.80)	(37.80)	(37.80)	(37.80)	(37.80)	(37.80)
1998														
1999	19.0		0		139.7	1.5	6.00	3.50	6.00	3.50	85.88	94.26	91.47	6.00
2000	1,003.2		10		155.3	1.5	(953.80)	(968.74)	(964.80)	(969.74)	(896.78)	(887.46)	(890.57)	(953.80)
2001	602.2	7	16	5	172.5	1.5	(565.70)	(585.35)	(583.30)	(586.95)	(489.05)	(478.70)	(482.15)	(565.70)
2002	191.8	13	18	9	191.7	1.5	(154.00)	(175.78)	(173.80)	(177.58)	(66.44)	(54.94)	(58.77)	(154.00)
2003	264.8	20	21	11	111.8	1.5	(227.00)	(251.78)	(250.10)	(253.88)	(201.57)	(194.86)	(197.10)	(227.00)
2004		22	22	13	89.4	1.5	89.50	58.55	65.30	56.35	45.66	51.02	49.23	89.50
2005		24	24	14	92.1	1.8	92.20	58.98	65.80	56.58	45.95	51.48	49.64	92.20
2006		26	25	16	106.8	1.8	106.80	71.12	79.30	68.62	55.83	62.24	60.10	106.80
2007		28	26	17	110.0	1.8	110.00	73.00	81.40	70.40	57.20	63.80	61.60	110.00
2008		30	27	20	113.3	1.8	113.30	74.97	83.60	72.27	58.64	65.44	63.17	113.30
2009		33	29	21	116.7		116.70	76.03	84.80	73.13	57.36	64.36	62.03	116.70
2010		35	30	23	133.5		133.50	90.15	100.50	87.15	68.79	76.80	74.13	133.50
2011		37	32	24	137.5		137.50	91.75	102.30	88.55	69.75	78.00	75.25	137.50
2012		40	33	28	141.6		141.60	94.44	105.30	91.14	71.78	80.28	77.45	141.60
2013		43	35	30	145.9		145.90	96.31	107.40	92.81	72.97	81.72	78.80	145.90
2014		45	37	32	150.3		150.30	98.27	109.60	94.57	74.22	83.24	80.23	150.30
2015		48	38	34	154.8		154.80	101.32	113.00	97.52	76.55	85.84	82.74	154.80
2016		51	40	36	159.4		159.40	103.46	115.40	99.46	77.96	87.52	84.33	159.40
2017		54	42	38	164.2		164.20	105.78	118.00	101.58	79.51	89.36	86.08	164.20
2018		57	45	40	169.1		169.10	107.19	119.60	102.69	80.13	90.28	86.90	169.10
2019		60	47	42	174.2		174.20	109.78	122.50	105.08	81.91	92.36	88.88	174.20
2020		63	49	44	179.4		179.40	112.46	125.50	107.56	83.76	94.52	90.93	179.40
2021		66	52	46	184.8		184.80	114.32	127.60	109.12	84.75	95.84	92.14	184.80
2022		70	54	52	190.4		190.40	117.36	131.00	111.96	86.90	98.32	94.51	190.40
2023		73	57	55	196.1		196.10	119.49	133.40	113.79	88.11	99.88	95.96	196.10
2024		77	60	57	201.9		201.90	121.71	135.90	115.71	89.41	101.52	97.48	201.90
2025		80	63	60	208.0		208.00	124.20	138.70	117.90	90.92	103.40	99.24	208.00
2026		84	66	63	214.2		214.20	126.78	141.60	120.18	92.51	105.36	101.08	214.20
2027		88	69	66	286.9		286.90	189.21	211.00	182.31	143.31	160.52	154.78	286.90
2028		92	73	69	295.5		295.50	192.95	215.20	185.65	145.67	163.40	157.49	295.50

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Table A6.4—continued

Year	Incremental			Revenues					Sensitivity Cases					
	Capital Cost	Volume 000 gals	Cost	Water Sales 000 gals	Tariffs	Con-nection Fees	Total	Net Revenues	10% Dec. in Rev.	10 % Incr. In O&M Costs	Combined Case	30% Dec. In Sales Vol.	20 % Inc. In NRW	20% Dec. in Tariffs
2029		96	76	72	304.3		304.30	197.87	220.70	190.27	149.18	167.44	161.35	304.30
2030		100	80	75	313.5		313.50	202.15	225.50	194.15	151.99	170.80	164.53	313.50
2031		105	84	79	322.9		322.90	206.61	230.50	198.21	154.95	174.32	167.86	322.90
2032		109	88	82	332.6		332.60	211.34	235.80	202.54	158.12	178.08	171.43	332.60
2033		114	93	86	342.5		342.50	215.25	240.20	205.95	160.45	181.00	174.15	342.50
<b>NPV</b>							<b>(640.78)</b>	<b>(859.50)</b>	<b>(815.08)</b>	<b>(875.35)</b>	<b>(699.08)</b>	<b>(642.67)</b>	<b>(661.47)</b>	<b>(640.78)</b>
<b>FIRR</b>							<b>5.9%</b>	<b>3.1%</b>	<b>3.7%</b>	<b>2.8%</b>	<b>2.8%</b>	<b>3.6%</b>	<b>3.3%</b>	<b>5.9%</b>

FIRR = financial internal rate of return, NPV = net present value, NRW = non-revenue water, O&M = operations and maintenance.

Notes: Actual revenues from 1999 to 2000.

Incremental production as a result of increase in connections to the system.

Sources: Benefits estimation and interviews of stakeholders.

**Table A6.5 Overall Project Financial Internal Rate of Return (\$'000)**

Year	Capital Cost	Incremental Production	Cost	Tariffs	Revenues		Net Revenues	10% Dec. in Rev	Sensitivity Analysis				
					Con- nection Fees				10% Incr. in O&M Costs	Combined . Case	30% Dec. in Sales Vol.	20% Increase in NRW	20% Dec. In Tariffs
1997	80.1						(80.1)	(80.1)	(80.1)	(80.1)	(80.1)	(80.07)	(80.07)
1998	323.8						(323.8)	(323.8)	(323.8)	(323.8)	(323.8)	(323.75)	(323.8)
1999	193.3	176,196.0	4.4	139.7	19.5	40.0	(157.7)	(161.7)	(158.1)	(162.1)	(80.4)	(87.84)	(66.4)
2000	3,871.5	202,440.0	31.7	155.3	21.0	65.9	(3,837.2)	(3,843.8)	(3,840.4)	(3,847.0)	(3,773.4)	(3,778.32)	(3,757.9)
2001	2,065.2	232,003.1	65.6	513.3	16.2	388.9	(1,741.9)	(1,780.7)	(1,748.4)	(1,787.3)	(1,988.2)	(1,988.52)	(1,970.1)
2002	644.7	436,557.1	76.5	374.6	16.2	232.4	(488.9)	(512.1)	(496.5)	(519.8)	(426.1)	(396.13)	(405.4)
2003	672.9	339,363.7	82.3	299.9	16.2	237.6	(517.6)	(541.4)	(525.8)	(549.6)	(512.3)	(496.33)	(499.1)
2004		340,046.6	84.8	293.2	9.0	297.8	213.0	183.2	204.5	174.7	146.6	161.02	158.8
2005		340,048.7	87.3	307.9	9.9	312.5	225.2	193.9	216.5	185.2	155.8	171.08	168.9
2006		340,050.8	90.0	335.6	9.9	340.2	250.2	216.2	241.2	207.2	173.0	191.40	188.4
2007		340,053.0	92.7	352.5	9.9	357.1	264.4	228.7	255.1	219.4	182.6	202.04	199.2
2008		340,055.2	95.6	375.0	9.9	379.6	284.1	246.1	274.5	236.6	196.1	218.93	214.4
2009		340,057.5	98.5	394.7		394.7	296.2	256.7	286.3	246.9	197.6	221.89	217.2
2010		340,059.9	101.6	430.6		430.6	329.0	286.0	318.9	275.8	220.3	248.89	242.9
2011		340,062.3	105.7	453.6		453.6	347.9	302.5	337.3	291.9	232.9	263.36	257.2
2012		340,064.8	110.1	485.5		485.5	375.4	326.9	364.4	315.9	251.5	287.70	278.3
2013		340,067.4	114.6	512.4		512.4	397.8	346.6	386.4	335.1	266.4	305.34	295.3
2014		340,070.0	119.4	541.2		541.2	421.8	367.7	409.9	355.7	282.5	324.26	313.6
2015		340,072.8	124.4	571.8		571.8	447.5	390.3	435.0	377.8	299.6	344.58	333.1
2016		340,075.6	129.6	604.6		604.6	475.0	414.5	462.0	401.5	318.0	366.41	354.0
2017		340,078.5	135.1	639.5		639.5	504.4	440.5	490.9	427.0	337.7	389.86	376.5
2018		340,081.5	140.8	676.8		676.8	536.0	468.3	521.9	454.2	358.8	415.08	400.6
2019		340,084.6	146.9	716.7		716.7	569.9	498.2	555.2	483.5	381.5	442.19	426.5
2020		340,087.8	153.2	759.4		759.4	606.2	530.2	590.9	514.9	405.9	471.36	454.3
2021		340,091.1	159.8	805.0		805.0	645.2	564.7	629.2	548.7	432.0	502.75	484.2
2022		340,094.4	166.8	874.7		874.7	707.9	620.5	691.3	603.8	474.7	561.66	533.0
2023		340,097.9	174.1	929.1		929.1	755.0	662.1	737.6	644.7	506.3	600.63	569.2
2024		340,101.5	181.7	987.3		987.3	805.6	706.9	787.5	688.7	540.4	642.64	608.2

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Table A6.5—continuation

Year	Capital Cost	Incremental Production	Cost	Tariffs	Revenues			Sensitivity Analysis				
					Con- nection Fees	Net Revenues	10% Dec. in Rev	10% Incr. in O&M Costs	Combined Case	30% Dec. in Sales Vol.	20% Increase in NRW	20% Dec.In Tariffs
2025		340,105.2	189.7	1,049.8	1,049.8	860.1	755.1	841.1	736.1	577.0	687.94	650.1
2026		340,109.0	198.1	1,116.7	1,116.7	918.6	806.9	898.8	787.1	616.4	736.80	695.3
2027		340,112.9	206.9	1,291.5	1,291.5	1,084.6	955.5	1,063.9	934.8	731.0	880.46	826.3
2028		340,116.9	216.1	1,373.7	1,373.7	1,157.6	1,020.2	1,136.0	998.6	780.3	941.90	882.8
2029		340,121.1	225.8	1,461.8	1,461.8	1,236.0	1,089.8	1,213.4	1,067.2	833.3	1,008.09	943.6
2030		340,116.9	236.0	1,556.2	1,556.2	1,320.2	1,164.6	1,296.6	1,141.0	890.3	1,079.40	1,009.0
2031		340,116.9	246.7	1,657.4	1,657.4	1,410.8	1,245.0	1,386.1	1,220.4	951.6	1,156.26	1,079.3
2032		340,116.9	257.8	1,766.0	1,766.0	1,508.2	1,331.6	1,482.4	1,305.8	1,017.6	1,239.10	1,155.0
2033		340,116.9	269.6	1,882.5	1,882.5	1,613.0	1,424.7	1,586.0	1,397.8	1,088.6	1,328.41	1,236.5
<b>NPV</b>						<b>81.0</b>	<b>(723.1)</b>	<b>(85.1)</b>	<b>(889.3)</b>	<b>(1,847.1)</b>	<b>(1,158.1)</b>	<b>(1,320.9)</b>
<b>FIRR</b>						<b>5.1%</b>	<b>4.3%</b>	<b>4.9%</b>	<b>4.1%</b>	<b>3.0%</b>	<b>3.8%</b>	<b>3.6%</b>
Loan	0.065											
Equity	0.03											

FIRR = financial internal rate of return, NPV = net present value, NRW = non-revenue water, O&M = operations and maintenance.  
Sources: Benefit estimations and interviews of stakeholders.

**Table A6.6: Economic Internal Rate of Return and Sensitivity Analyses**

Item	At Appraisal (%)	At Project Completion (%)
<b>1. Overall Project: Base Case</b>	<b>16.2</b>	<b>12.7</b>
(i) Capital cost increase by 10%	14.8	—
(ii) Revenues decrease by 10%	16.0	11.3
(iii) O&M increase by 10%	14.5	12.5
(iv) Project delay	14.7	—
(v) Combination of (i)–(iv)	12.0	—
(vi) Combination of (ii) & (iii)	—	11.1
(vii) Decrease in WTP by 20%	—	11.2
(viii) Decrease in cost savings by 20%	—	11.3
<b>2. Chuuk Component: Base Case</b>	<b>19.9</b>	<b>5.5</b>
(i) Capital cost increase by 10%	18.3	—
(ii) Revenues decrease by 10%	19.8	4.6
(iii) O&M increase by 10%	19.8	5.4
(iv) Project delay	17.7	—
(v) Combination of (i)–(iv)	14.8	—
(vi) Combination of (ii) & (iii)	—	4.4
(vii) Decrease in WTP by 20%	—	4.7
(viii) Decrease in cost savings by 20%	—	4.4
<b>3. Yap Component: Base Case</b>	<b>14.9</b>	<b>15.2</b>
(i) Capital cost increase by 10%	13.7	—
(ii) Revenues decrease by 10%	14.8	13.7
(iii) O&M increase by 10%	13.6	15.0
(iv) Project delay	13.5	—
(v) Combination of (i)–(iv)	11.4	—
(vi) Combination of (ii) & (iii)	—	13.5
(vii) Decrease in WTP by 20%	—	13.1
(viii) Decrease in cost savings by 20%	—	14.2
<b>4. Pohnpei Component: Base Case</b>	<b>14.0</b>	<b>20.9</b>
(i) Capital cost increase by 10%	12.8	—
(ii) Revenues decrease by 10%	13.9	18.6
(iii) O&M increase by 10%	12.5	20.7
(iv) Project delay	12.6	—
(v) Combination of (i)–(iv)	10.2	—
(vi) Combination of (ii) & (iii)	—	18.4
(vii) Decrease in WTP by 20%	—	19.1
(viii) Decrease in cost savings by 20%	—	18.1

— = no data available, O&M = operations and maintenance, WTP = water treatment plant.

Sources: Benefit estimations and interviews of stakeholders.

Table A6.7: Economic Reevaluation–Chuuk (\$'000)

Year	Without Project			Incremental		Benefits					Sensitivity Cases				20% Dec. In Cost Savings		
	Capital Cost	O&M	Total Costs	Production	O&M	Production	Volume	Cost	Non Incremental	Incremental	Net Total Benefits	10% Dec. in Rev	10% Incr. O&M Costs	In Combined Cases		20% Dec. in WTP	
1997	42.3		42.3								(42)	(42)	(42)	(42)	(42.3)	(42.3)	
1998	323.8	16.2	339.9				16				(340)	(340)	(342)	(342)	(339.9)	(339.9)	
1999	174.3	21.4	195.7	236,196.0	13	60,000	176,196	8	85.1	38.3	123.4	(59)	(71.6)	(60.1)	(72.4)	(66.9)	(76.3)
2000	1,651.6	71.0	1,722.6	262,440.0	43	60,000	202,440	28	94.7	41.4	136.1	(1,543)	(1,556.9)	(1,546.1)	(1,559.7)	(1,551.6)	(1,562.2)
2001	551.7	87.5	639.2	291,600.0	53	60,000	231,600	34	100.7	44.7	145.4	(441)	(455.1)	(444.0)	(458.5)	(449.5)	(460.7)
2002	310.0	96.8	406.8	324,000.0	59	60,000	264,000	38	107.9	48.3	156.2	(192)	(207.4)	(195.6)	(211.2)	(201.4)	(213.4)
2003	408.2	109.1	517.2	226,800.0	66	60,000	166,800	43	112.8	52.2	165.0	(286)	(302.4)	(290.2)	(306.7)	(296.4)	(308.5)
2004		110.1	110.1	226,800.0	67	60,000	166,800	43	116.4	56.3	172.8	130	112.3	125.3	108.0	118.3	106.3
2005		111.3	111.3	226,800.0	68	60,000	166,800	44	120.0	63.9	183.9	140	121.9	135.9	117.5	127.5	116.3
2006		112.4	112.4	226,800.0	68	60,000	166,800	44	123.6	72.4	196.1	152	132.4	147.6	128.0	137.5	127.3
2007		113.5	113.5	226,800.0	69	60,000	166,800	44	127.2	82.1	209.4	165	143.9	160.4	139.5	148.4	139.4
2008		114.6	114.6	226,800.0	70	60,000	166,800	45	133.2	93.1	226.4	181	158.8	176.9	154.3	162.8	154.8
2009		115.8	115.8	226,800.0	70	60,000	166,800	45	139.2	105.6	244.9	199	175.0	194.9	170.4	178.3	171.6
2010		116.9	116.9	226,800.0	71	60,000	166,800	46	146.4	119.8	266.2	220	193.8	215.8	189.2	196.4	191.1
2011		118.1	118.1	226,800.0	72	60,000	166,800	46	156.0	135.8	291.9	246	216.4	240.9	211.8	218.4	214.4
2012		119.3	119.3	226,800.0	73	60,000	166,800	47	165.6	154.0	319.7	273	240.9	268.2	236.3	242.1	239.8
2013		120.5	120.5	226,800.0	73	60,000	166,800	47	175.2	174.7	349.9	303	267.7	298.0	263.0	267.7	267.6
2014		121.7	121.7	226,800.0	74	60,000	166,800	48	175.2	198.1	373.3	326	288.3	320.8	283.5	286.0	290.6
2015		122.9	122.9	226,800.0	75	60,000	166,800	48	175.2	198.1	373.3	325	287.8	320.3	283.0	285.5	290.1
2016		124.1	124.1	226,800.0	75	60,000	166,800	49	175.2	198.1	373.3	325	287.3	319.8	282.5	285.0	289.6
2017		125.4	125.4	226,800.0	76	60,000	166,800	49	175.2	198.1	373.3	324	286.8	319.3	281.9	284.6	289.1
2018		126.6	126.6	226,800.0	77	60,000	166,800	50	175.2	198.1	373.3	324	286.3	318.7	281.4	284.1	288.6
2019		127.9	127.9	226,800.0	78	60,000	166,800	50	175.2	198.1	373.3	323	285.8	318.2	280.8	283.6	288.1
2020		129.2	129.2	226,800.0	79	60,000	166,800	51	175.2	198.1	373.3	323	285.3	317.6	280.3	283.1	287.6
2021		130.5	130.5	226,800.0	79	60,000	166,800	51	175.2	198.1	373.3	322	284.8	317.1	279.7	282.6	287.1
2022		131.8	131.8	226,800.0	80	60,000	166,800	52	175.2	198.1	373.3	322	284.3	316.5	279.2	282.0	286.6
2023		133.1	133.1	226,800.0	81	60,000	166,800	52	175.2	198.1	373.3	321	283.8	315.9	278.6	281.5	286.1
2024		134.4	134.4	226,800.0	82	60,000	166,800	53	175.2	198.1	373.3	321	283.3	315.4	278.0	281.0	285.6
2025		135.7	135.7	226,800.0	83	60,000	166,800	53	175.2	198.1	373.3	320	282.8	314.8	277.4	280.5	285.1
2026		137.1	137.1	226,800.0	83	60,000	166,800	54	175.2	198.1	373.3	320	282.2	314.2	276.9	279.9	284.5
2027		138.5	138.5	226,800.0	84	60,000	166,800	54	175.2	198.1	373.3	319	281.7	313.6	276.3	279.4	284.0
2028		139.9	139.9	226,800.0	85	60,000	166,800	55	175.2	198.1	373.3	318	281.2	313.0	275.7	278.9	283.4
2029		141.3	141.3	226,800.0	86	60,000	166,800	55	175.2	198.1	373.3	318	280.6	312.4	275.1	278.3	282.9

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**Table A6.7—continued**

Year	Without Project			Incremental		Benefits			Sensitivity Cases				20% Dec. In Cost Savings			
	Capital Cost	O&M	Total Costs	Production	O&M	Production	Volume	Cost	Non Incremental	Incremental	Net Total Benefits	10% Dec. in Rev		10% Incr. O&M Costs	In Combined Cases	20% Dec. in WTP
2030	142.7	142.7	226,800.0	87	60,000	166,800	56	175.2	198.1	373.3	317	280.1	311.8	274.5	277.8	282.3
2031	144.1	144.1	226,800.0	88	60,000	166,800	56	175.2	198.1	373.3	317	279.5	311.2	273.2	277.2	281.8
2032	145.5	145.5	226,800.0	88	60,000	166,800	57	175.2	198.1	373.3	316	278.9	310.6	273.2	276.6	281.2
2033	147.0	147.0	226,800.0	89	60,000	166,800	58	175.2	198.1	373.3	316	278.4	309.9	272.6	276.1	280.6
<b>NPV</b>											<b>(899.9)</b>	<b>(1,072.1)</b>	<b>(932.9)</b>	<b>(1,105.2)</b>	<b>(1,038.0)</b>	<b>(1,106.3)</b>
<b>EIRR</b>											<b>5.5%</b>	<b>4.6%</b>	<b>5.4%</b>	<b>4.4%</b>	<b>4.7%</b>	<b>4.4%</b>

EIRR = economic internal rate of return, NPV = net present value, O&M = operations and maintenance, WTP = water treatment plant.

Sources: Benefit estimations and interviews of stakeholders.

Table A6.8: Economic Reevaluation–Yap (\$'000)

Year	Incremental		Benefits			Sensitivity Cases						
	Capital Cost	Volume	Cost	Non Incremental	Incremental	Total	Net Benefits	10% Dec. in Revenues	10% Incr. In O&M Costs	Combined Case	20% Dec. in WTP	20% Dec. In Cost Savings
1997												
1998												
1999												
2000	1,216.6		7.3	88	102	190.0	(1,034)	(1,052.9)	(1,034.6)	(1,053.6)	(1,054.4)	(1,051.46)
2001	911.3	396	31.9	95	110	205.4	(738)	(758.4)	(741.0)	(761.6)	(759.9)	(756.82)
2002	142.9	172,544	39.1	104	119	222.9	41	18.6	37.0	14.7	17.0	20.20
2003		172,544	39.1	112	129	240.9	202	177.7	197.9	173.8	176.1	179.42
2004		173,225	40.2	116	143	259.7	219	193.5	215.4	189.5	190.8	196.18
2005		173,225	41.4	121	159	280.1	239	210.7	234.5	206.5	206.8	214.54
2006		173,225	42.7	122	177	299.8	257	227.1	252.8	222.8	221.6	232.60
2007		173,225	44.0	122	197	319.7	276	243.8	271.3	239.4	236.3	251.26
2008		173,225	45.3	122	219	341.9	297	262.4	292.1	257.9	252.7	272.12
2009		173,225	46.6	122	244	366.6	320	283.3	315.2	278.6	271.1	295.43
2010		173,225	48.0	122	272	394.0	346	306.6	341.1	301.7	291.6	321.47
2011		173,225	50.4	122	302	424.5	374	331.6	369.0	326.6	313.7	349.60
2012		173,225	53.0	122	336	458.5	406	359.7	400.2	354.4	338.3	381.04
2013		173,225	55.6	122	374	496.3	441	391.0	435.1	385.5	365.9	416.16
2014		173,225	58.4	122	416	538.3	480	426.1	474.0	420.2	396.7	455.40
2015		173,225	61.3	122	463	585.0	524	465.2	517.6	459.1	431.2	499.23
2016		173,225	64.4	122	477	598.9	535	474.6	528.1	468.2	439.2	510.04
2017		173,225	67.6	122	491	613.2	546	484.3	538.8	477.5	447.4	521.12
2018		173,225	71.0	122	506	627.9	557	494.1	549.8	487.1	455.8	532.46
2019		173,225	74.5	122	521	643.1	569	504.2	561.1	496.8	464.4	544.08
2020		173,225	78.3	122	536	658.7	580	514.6	572.6	506.8	473.2	555.97
2021		173,225	82.2	122	552	674.8	593	525.1	584.4	516.9	482.1	568.15
2022		173,225	86.3	122	569	691.4	605	536.0	596.5	527.3	491.3	580.61
2023		173,225	90.6	122	586	708.4	618	547.0	608.8	537.9	500.6	593.37
2024		173,225	95.1	122	604	726.0	631	558.3	621.4	548.8	510.2	606.42
2025		173,225	99.9	122	622	744.1	644	569.8	634.3	559.9	519.9	619.77
2026		173,225	104.9	122	640	762.8	658	581.6	647.4	571.1	529.8	633.43
2027		173,225	110.1	122	660	782.0	672	593.7	660.9	582.7	540.0	647.40
2028		173,225	115.6	122	679	801.8	686	606.0	674.6	594.4	550.3	661.68

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**Table A6.8—continued**

Year	Incremental		Benefits			Sensitivity Cases						
	Capital Cost	Volume	Cost	Non Incremental	Incremental	Total	Net Benefits	10% Dec. in Revenues	10% Incr. In O&M Costs	Combined Case	20% Dec. in WTP	20% Dec. In Cost Savings
2029	173,225	121.4	122		700	822.2	701	618.5	688.6	606.4	560.8	676.28
2030	173,225	127.5	122		721	843.2	716	631.4	702.9	618.6	571.5	691.20
2031	173,225	133.8	122		742	864.8	731	644.5	717.5	631.1	582.5	706.45
2032	173,225	140.5	122		765	887.1	747	657.8	732.5	643.8	593.6	722.03
2033	173,225	147.6	122		788	910.0	762	671.4	747.7	656.7	604.9	737.94
<b>NPV</b>							<b>893.9</b>	<b>621.7</b>	<b>858.8</b>	<b>586.7</b>	<b>514.2</b>	<b>729.20</b>
<b>EIRR</b>							<b>15.2%</b>	<b>13.7%</b>	<b>15.0%</b>	<b>13.5%</b>	<b>13.1%</b>	<b>14.2%</b>

EIRR = economic internal rate of return, NPV = net present value, O&M = operations and maintenance, WTP =water treatment plant

Sources: Benefit estimations and interviews of stakeholders.

Table A6.9: Economic Reevaluation–Pohnpei (\$'000)

Year	Incremental			Benefits			Sensitivity Cases					
	Capital Cost	Volume	Cost	Non Incremental	Incremental	Total	Net Benefits	10% Dec. in Revenues	10% Incr. In O&M Costs	Combined Cases	20% Dec. in WTP	20% Dec. In Cost Savings
1997	37.8						(38)	(38)	(38)	(38)	(37.8)	(37.8)
1998												
1999	19.0		0.1		61	61.4	42	36.2	42.3	36.2	30.0	42.3
2000	1,003.2		10.2	170	64	233.4	(780)	(803.3)	(781.0)	(804.4)	(792.7)	(814.0)
2001	602.2	6.6	16.2	175	65	240.5	(378)	(402.0)	(379.6)	(403.6)	(391.0)	(413.0)
2002	191.8	13.2	18.1	182	70	252.9	43	17.7	41.1	15.9	28.9	6.5
2003	264.8	19.8	21.4	193	84	276.9	(9)	(36.9)	(11.4)	(39.1)	(26.0)	(47.9)
2004		21.8	22.5	200	121	321.3	299	266.7	296.5	264.4	274.6	258.7
2005		23.8	23.6	208	137	344.7	321	286.6	318.7	284.2	293.6	279.6
2006		25.9	24.8	274	156	429.9	405	362.1	402.6	359.6	373.8	350.4
2007		28.1	26.0	274	164	437.7	412	367.9	409.0	365.3	378.8	356.9
2008		30.3	27.3	274	172	445.9	419	374.0	415.8	371.2	384.1	363.8
2009		32.6	28.7	274	181	454.5	426	380.4	422.9	377.5	389.6	371.1
2010		35.0	30.1	274	190	463.6	433	387.1	430.4	384.0	395.4	378.7
2011		37.4	31.7	274	199	473.1	441	394.1	438.2	390.9	401.5	386.7
2012		39.9	33.2	274	209	483.0	450	401.5	446.5	398.2	407.9	395.1
2013		42.5	34.9	274	220	493.5	459	409.3	455.1	405.8	414.6	403.9
2014		45.2	36.6	274	231	504.5	468	417.4	464.2	413.7	421.7	413.1
2015		47.9	38.5	274	242	516.0	478	426.0	473.7	422.1	429.1	422.8
2016		50.8	40.4	274	255	528.2	488	434.9	483.7	430.9	436.9	433.0
2017		53.7	42.4	274	267	540.9	498	444.4	494.2	440.1	445.0	443.8
2018		56.7	44.5	274	281	554.3	510	454.3	505.3	449.8	453.6	455.0
2019		59.8	46.8	274	295	568.3	522	464.7	516.8	460.0	462.6	466.8
2020		62.9	49.1	274	309	583.0	534	475.6	529.0	470.7	472.0	479.2
2021		66.2	51.6	274	325	598.5	547	487.1	541.8	481.9	482.0	492.2
2022		69.6	54.1	274	341	614.7	561	499.1	555.2	493.7	492.4	505.9
2023		73.1	56.8	274	358	631.8	575	511.8	569.3	506.1	503.3	520.2
2024		76.6	59.7	274	376	649.7	590	525.0	584.0	519.1	514.8	535.3
2025		80.3	62.7	274	395	668.5	606	539.0	599.6	532.7	526.9	551.1
2026		84.1	65.8	274	415	688.3	622	553.6	615.9	547.0	539.5	567.7
2027		88.0	69.1	274	435	709.0	640	569.0	633.0	562.1	552.8	585.2
2028		92.1	72.5	274	457	730.8	658	585.1	651.0	577.9	566.8	603.5

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**Table A6.9—continued**

Year	Incremental			Benefits			Sensitivity Cases					
	Capital Cost	Volume	Cost	Non Incremental	Incremental	Total	Net Benefits	10% Dec. in Revenues	10% Incr. In O&M Costs	Combined Cases	20% Dec. in WTP	20% Dec. In Cost Savings
2029		96.2	76.2	274	480	753.6	677	602.1	669.8	594.5	581.4	622.7
2030		100.5	80.0	274	504	777.6	698	619.9	689.6	611.9	596.8	642.9
2031		104.9	84.0	274	529	802.8	719	638.6	710.4	630.2	613.0	664.1
2032		109.4	88.2	274	556	829.3	741	658.2	732.3	649.3	630.0	686.4
2033		114.1	92.6	274	583	857.1	764	678.8	755.2	669.5	647.8	709.7
<b>NPV</b>							<b>1,417.0</b>	<b>1,118.9</b>	<b>1,395.8</b>	<b>1,097.7</b>	<b>1,158.4</b>	<b>1,079.3</b>
<b>EIRR</b>							<b>20.9%</b>	<b>18.6%</b>	<b>20.7%</b>	<b>18.4%</b>	<b>19.1%</b>	<b>18.1%</b>

EIRR = economic internal rate of return, NPV = net present value, O&M = operations and maintenance, WTP = water treatment plant.  
Sources: Benefit estimations and interviews of stakeholders.

Table 6.10: Economic Internal Rate of Return of the Project (\$'000)

Year	Without Project		Incremental		Benefits				Sensitivity Cases								
	Capital Cost	O&M Production	O&M Production	Volume	O&M	Non-Incremental	Incremental	Total	Net Benefits	10% Dec. in Rev	10% Incr. In O&M Costs	Combined Cases	20% Dec. in WTP	20% Dec. In Cost Savings			
1997	.0	80.1							(80.1)	(80.1)	(80.1)	(80.1)	(80.1)	(80.1)			
1998	2.0	323.8	16.2			16.2			(339.9)	(339.9)	(341.6)	(341.6)	(339.9)	(339.9)			
1999	3.0	193.3	22.0	236,196.0	13.5	60,000.0	176,196.0	8.5	85.1	99.7	184.9	(16.9)	(35.4)	(17.8)	(36.3)	(36.9)	(34.0)
2000	4.0	3,871.5	148.2	265,129.2	102.9	62,689.2	202,440.0	45.3	352.2	207.3	559.5	(3,357.2)	(3,413.2)	(3,361.7)	(3,417.7)	(3,398.7)	(3,427.7)
2001	5.0	2,065.2	216.1	294,824.4	133.7	62,821.4	232,003.1	82.4	370.8	220.5	591.3	(1,556.3)	(1,615.4)	(1,564.6)	(1,623.7)	(1,600.4)	(1,630.5)
2002	6.0	644.7	247.4	499,378.5	152.3	62,821.4	436,557.1	95.1	393.8	238.1	631.9	(107.9)	(171.1)	(117.4)	(180.6)	(155.5)	(186.7)
2003	7.0	672.9	272.9	402,185.1	169.6	62,821.4	339,363.7	103.2	418.0	264.8	682.8	(93.4)	(161.6)	(103.7)	(172.0)	(146.3)	(177.0)
2004	8.0		280.6	402,868.0	174.7	62,821.4	340,046.6	105.9	433.2	320.6	753.7	647.8	572.4	637.2	561.9	583.7	561.2
2005	9.0		288.6	402,870.1	179.9	62,821.4	340,048.7	108.7	448.3	359.2	807.5	698.8	618.1	688.0	607.2	627.0	609.2
2006	10.0		296.9	402,872.2	185.4	62,821.4	340,050.8	111.5	459.6	403.4	923.0	811.4	719.1	800.3	708.0	730.8	707.5
2007	11.0		305.6	402,874.3	191.1	62,821.4	340,053.0	114.5	523.2	438.9	962.2	847.7	751.4	836.2	740.0	759.9	743.0
2008	12.0		314.6	402,876.6	197.0	62,821.4	340,055.2	117.6	529.2	478.0	1,007.3	889.7	789.0	877.9	777.2	794.1	783.9
2009	13.0		323.9	402,878.9	203.2	62,821.4	340,057.5	120.7	535.2	521.0	1,056.2	935.5	829.9	923.4	817.8	831.3	828.5
2010	14.0		333.6	402,881.2	209.6	62,821.4	340,059.9	124.0	542.4	568.3	1,110.7	986.7	875.6	974.3	863.2	873.0	878.2
2011	15.0		345.6	402,883.7	217.2	62,821.4	340,062.3	128.4	552.0	620.3	1,172.3	1,043.9	926.7	1,031.1	913.9	919.9	933.5
2012	16.0		358.2	402,886.2	225.2	62,821.4	340,064.8	133.0	561.6	677.6	1,239.2	1,106.2	982.3	1,093.0	969.0	970.7	993.9
2013	17.0		371.3	402,888.8	233.6	62,821.4	340,067.4	137.7	571.2	740.7	1,311.9	1,174.2	1,043.0	1,160.4	1,029.2	1,026.0	1,059.9
2014	18.0		385.0	402,891.4	242.3	62,821.4	340,070.0	142.7	571.2	810.2	1,381.4	1,238.7	1,100.6	1,224.4	1,086.3	1,076.7	1,124.5
2015	19.0		399.4	402,894.2	251.5	62,821.4	340,072.8	148.0	571.2	868.5	1,439.7	1,291.8	1,147.8	1,277.0	1,133.0	1,118.1	1,177.5
2016	20.0		414.5	402,897.0	261.0	62,821.4	340,075.6	153.4	571.2	894.5	1,465.7	1,312.3	1,165.7	1,296.9	1,150.4	1,133.4	1,198.0
2017	21.0		430.2	402,899.9	271.1	62,821.4	340,078.5	159.2	571.2	921.5	1,492.7	1,333.6	1,184.3	1,317.7	1,168.4	1,149.3	1,219.3
2018	22.0		446.7	402,902.9	281.6	62,821.4	340,081.5	165.2	571.2	949.6	1,520.8	1,355.7	1,203.6	1,339.2	1,187.1	1,165.8	1,241.4
2019	23.0		464.0	402,906.0	292.6	62,821.4	340,084.6	171.4	571.2	978.8	1,550.0	1,378.6	1,223.6	1,361.5	1,206.5	1,182.8	1,264.4
2020	24.0		482.1	402,909.2	304.1	62,821.4	340,087.8	178.0	571.2	1,009.2	1,580.4	1,402.4	1,244.4	1,384.6	1,226.6	1,200.6	1,288.1
2021	25.0		501.0	402,912.5	316.2	62,821.4	340,091.1	184.9	571.2	1,040.7	1,611.9	1,427.1	1,265.9	1,408.6	1,247.4	1,218.9	1,312.8
2022	26.0		520.9	402,915.8	328.8	62,821.4	340,094.4	192.1	571.2	1,073.5	1,644.8	1,452.7	1,288.2	1,433.5	1,269.0	1,238.0	1,338.5
2023	27.0		541.6	402,919.3	342.0	62,821.4	340,097.9	199.6	571.2	1,107.7	1,678.9	1,479.3	1,311.4	1,459.3	1,291.4	1,257.8	1,365.0
2024	28.0		563.4	402,922.9	355.9	62,821.4	340,101.5	207.5	571.2	1,143.2	1,714.4	1,506.9	1,335.4	1,486.1	1,314.7	1,278.3	1,392.6
2025	29.0		586.2	402,926.6	370.4	62,821.4	340,105.2	215.8	571.2	1,180.1	1,751.3	1,535.5	1,360.4	1,514.0	1,338.8	1,299.5	1,421.3
2026	30.0		610.1	402,930.4	385.6	62,821.4	340,109.0	224.4	571.2	1,218.5	1,789.7	1,565.3	1,386.3	1,542.8	1,363.9	1,321.6	1,451.0
2027	31.0		635.1	402,934.3	401.6	62,821.4	340,112.9	233.5	571.2	1,258.4	1,829.6	1,596.1	1,413.2	1,572.8	1,389.8	1,344.5	1,481.9
2028	32.0		661.3	402,938.3	418.3	62,821.4	340,116.9	243.0	571.2	1,300.0	1,871.2	1,628.2	1,441.1	1,603.9	1,416.8	1,368.2	1,514.0
2029			688.8	402,942.5	435.8	62,821.4	340,121.1	253.0	571.2	1,343.2	1,914.4	1,661.5	1,470.0	1,636.2	1,444.7	1,392.8	1,547.2
2030			717.6	402,946.7	454.2	62,821.4	340,125.3	263.4	571.2	1,388.2	1,959.4	1,696.0	1,500.1	1,669.7	1,473.8	1,418.4	1,581.8

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**Table A6.10—continued**

Year	Without Project		Incremental		Benefits					Sensitivity Cases						
	Capital Cost	O&M Production	O&M Production	Volume	O&M	Non-Incre-mental	Incre-mental	Total	Net Benefits	10% Dec. in Rev	10% Incr. In O&M Costs	Combined Cases	20% Dec. in WTP	20% Dec. In Cost Savings		
2031	747.7	402,951.1	473.4	62,821.4	340,129.7	274.3	571.2	1,435.0	2,006.3	1,731.9	1,531.3	1,704.5	1,503.9	1,444.9	1,617.7	
2032	779.4	402,955.7	493.6	62,821.4	340,134.3	285.8	571.2	1,483.8	2,055.0	1,769.2	1,563.7	1,740.6	1,535.1	1,472.5	1,655.0	
2033	33.0	812.5	402,960.3	514.7	62,821.4	340,138.9	297.8	571.2	1,534.5	2,105.7	1,807.9	1,597.4	1,778.1	1,567.6	1,501.0	1,693.7
<b>NPV</b>										<b>1,411.0</b>	<b>668.4</b>	<b>1,321.7</b>	<b>579.2</b>	<b>634.6</b>	<b>702.2</b>	
<b>EIRR</b>										<b>12.7%</b>	<b>11.3%</b>	<b>12.5%</b>	<b>11.1%</b>	<b>11.2%</b>	<b>11.3%</b>	

EIRR = economic internal rate of return, NPV = net present value, O&M= operations and maintenance, WTP = water treatment plant.

Sources: Benefit estimations and interviews of stakeholders.

## PROJECT PERFORMANCE RATING ASSESSMENT

Relevance	Results/Remarks
Project preparation is relevant to project output at the time of approval	Relevant
Project output is relevant to achieving project goals and objectives at the time of approval	Yes
High priority of the Project in the context of the country's development strategy at the time of approval	Yes
High priority of the Project in the context of the operational strategy of Asian Development Bank (ADB) for the country at the time of approval	Yes
High priority of the Project in the context of the country's development strategy at the time of evaluation	Yes
High priority of the Project in the context of one or more of ADB's strategic objectives at the time of evaluation	Yes
Percentage of subcriteria that met assessment	100%
Evaluation rating	2.0
<b>Efficacy</b>	
Most project physical outcomes achieved <sup>1</sup>	Partly
Most project intangible outcomes (e.g., technical assistance) achieved <sup>2</sup>	Partly
Project outcomes leading to project goals	Partly
Percentage of subcriteria that met assessment	100%
Evaluation rating	1.6
<b>Efficiency</b>	
Efficient and satisfactory ADB's internal processing of the Project	Yes
Effective organization and management of Executing Agency and implementing agencies	Yes
Effective project management	Yes
Efficient in recruitment of consultants and other procurement	Partly
Timely and adequate availability of counterpart funding	Partly
Percentage of subcriteria that met assessment	100%
Evaluation rating	1.6
<b>Sustainability</b>	
Adequate demand for project services	Yes
Effective operating and financial performance of the utilities and ability to recover costs <sup>3</sup>	Partly
Existence of appropriate maintenance policy and procedures <sup>4</sup>	Partly
Available funds (cash flow) for continued operations, maintenance, and growth requirements	Partly
Adequate skills to continue project operation	Yes

<sup>1</sup> While project implementation was delayed due to delays in compliance by the states with loan disbursement conditions and a major change in project design in Yap, the project achieved capacity targets. In Chuuk, most physical outcomes were achieved, except for completion of pipeline due to land acquisition problems.

<sup>2</sup> Intentionally designed to meet 2005 targets with achieved capacity and the rehabilitation of sewerage treatment plant. The current demand in Yap and Pohnpei were met but not in Chuuk.

<sup>3</sup> Cost efficiency measures have been implemented and billing and collections are being improved in the Yap State Public Service Corporation (YSPSC) and Pohnpei Utility Corporation (PUC), but not in Chuuk Power Utility Corporation (CPUC).

<sup>4</sup> Operating and maintenance (O&M) manuals and procedures were instituted, and UCs had undertaken improvements in O&M and provided adequate O&M budgets.

Relevance	Results/Remarks
Availability of appropriate technology and equipment to operate the Project	Yes
Availability of enabling environment (subsidies, tariffs, prices, competitiveness, and political development) in which the Project is operating at the time of evaluation <sup>5</sup>	Yes
Strong ownership and commitment of the Government to the Project	Yes
Adequate community participation and beneficiary incentives to maintain the project facilities	Partly
Percentage of subcriteria that met assessment	100%
Evaluation rating	1.5
<b>Institutional Development and Other Impacts</b>	
Formal laws, regulations, and procedures being established at the national and state levels	Yes
Strong institutional/organization arrangements to maintain operation of the project facilities	Partly
Adequate institutional skills and capacities <sup>6</sup>	Partly
Active participation of the public	Partly
Macroeconomic or sector policy framework in place	Yes
Positive impact on poverty reduction	Yes
Positive impact on the environment	Yes
Positive impact on social organization <sup>7</sup>	Yes
Positive impact on political development <sup>8</sup>	Yes
Percentage of subcriteria that met assessment	80%
Evaluation rating	1.8

<sup>5</sup> The Government supported tariff increases to sustain viable operations, but the state government was reluctant to support the UCs in this area.

<sup>6</sup> Institutional capacity in technical aspects was adequate; needed measures to further strengthen the financial management and records management are now underway.

<sup>7</sup> Some communities were coordinating with the UCs on connecting to the systems in PUC and YSPSC, but CPUC needs to undertake similar activities geared towards community organization and better integration of residential areas with the water supply system.

<sup>8</sup> The UCs in Yap and Pohnpei have been working closely with the state government in the provision of better water supply for schools, hospitals, and new communities.

**Table A7.1: Assessment of Project Overall Performance**

<b>Criteria</b> (a)	<b>Weights</b> (%) (b)	<b>Assessment</b> (c)	<b>Rating Value</b> (d)	<b>Weighted Rating<sup>a</sup></b> (b x d)
Relevance	20	Highly relevant	2.0	0.41
Efficacy	25	Less Efficacious	1.6	0.40
Efficiency	20	Less Efficient	1.6	0.36
Sustainability	20	Moderately Sustainable	1.5	0.32
Institutional Development and Other Impacts	15	Moderate	1.8	0.27
<b>Overall rating</b>				<b>1.73</b> (Successful)

<sup>a</sup> Highly successful = overall weighted average (OWA) > 2.5, and no criteria less than 2; successful = OWA 1.6-2.5, and no criteria less than 1; less than successful = OWA 0.6-1.6, and not less than 2 criteria less than 1; unsuccessful = OWA < 0.6.

Source: Asian Development Bank estimates.

## PROJECT BENEFIT MONITORING AND EVALUATION

1. Monitoring of the Project's impact on beneficiary households and other users of the new project facilities is one of the measures to evaluate the sustainability of the FSM Water Supply and Sanitation Project (the Project). Under the Loan Agreement, the Executing Agency (EA) was required to provide a project benefit monitoring and evaluation (BME) report to the Asian Development Bank (ADB) in October 2001. However, it has not undertaken BME activities, based on the evaluation criteria and achievement indicators formulated at appraisal.

### A. Performance Indicators

2. The Project was aimed at increasing the water supply capacity and improving water quality in Chuuk, Yap, and Pohnpei. The project design incorporated the principles of affordability, cost effectiveness, operational efficiency, financial sustainability, governance, and accountability. Benefit monitoring indicators were developed to monitor improvements in water supply services in areas such as (i) production, (ii) distribution and consumption, (iii) operation and maintenance (O&M) costs, (iv) administration and billing, and (v) collection performance ratios. The utility companies (UCs), through their customer services divisions, have not consolidated the performance indicators reports from other divisions for a more effective monitoring and evaluation of their respective operations.

3. The UCs have not established a comprehensive benefit monitoring system to evaluate the benefits of the Project in Chuuk, Yap, and Pohnpei. Such a monitoring system could assist management in evaluating project performance and operational sustainability. The Pacific Water Association, in coordination with ADB, introduced a benchmarking system for the UCs that needs to be updated regularly, and can be linked directly with a BME system. In the absence of a comprehensive database on non-revenue water, collection efficiency, arrears collection, and disconnection of nonpaying customers, assessing the results of productivity measures undertaken by the UCs would be difficult.<sup>1</sup> In each UC, the customer services division could consolidate this information and provide progress reports on the status of UCs in (i) meeting connection targets, (ii) improving collection efficiency, and (iii) reducing non-revenue water.

4. Table A9.1 presents the benefit monitoring indicators established at appraisal to be a management tool for the UCs and EA to evaluate project performance, and to enable them to address inefficiencies in a timely manner. The BME database could be shared with the Health Department to effectively monitor the incidence of water-related diseases and to assist the UCs in conducting public awareness campaigns on the disadvantages of using alternative water supplies for drinking. In Chuuk, the Project Completion Review (PCR) Mission noted the need to closely coordinate with the provincial health inspectors in assessing the unsafe conditions of rainwater tanks of households to prevent any disease outbreaks as occurred in the past.<sup>2</sup>

<sup>1</sup> To varying degrees, the UCs have undertaken measures to improve operational performance, with the reduction in the number of staff and periodic training of their technical personnel.

<sup>2</sup> This also will help avoid another cholera outbreak, as happened in 1982. The PCR Mission visited some households in newly served areas that are used to getting drinking water from rainwater tanks that collect water flowing from the roofs that are not regularly cleaned of debris.

**Table 8.1 Project Benefit Monitoring and Evaluation**

<b>Project Objective</b>	<b>Evaluation Criteria</b>	<b>Achievement Indicators</b>
Delivery of Improved Quality of Water	Water quality vs. predefined standards	Regular water testing after treatment and throughout the system
Delivery of Improved Quality of Service	Average water availability per day meets target Minimum water availability per day meets target Adequate pressure and delivery is maintained for all users Customer complaints are addressed and reviewed	Regular water testing after treatment and throughout the system Hours operating per month Days in month Periodic checking and pressure testing at problem points in the system Customer problems recorded and action taken
Delivery of Adequate Quantities of Water	Total population served = target  Daily water production = target  Total connections = target Population served by house connections = target, new connection rate matching population growth Average production per capita per day = target Average consumption per capita per day = target	Number of house connections x average number of persons per house connection + number of stand posts x average number of people served by a stand post Monthly water production No. of days in a month Number of total connection Number of domestic connections x average household size  Daily water production Population served Metered water sold in month Population served x days in month
Affordability	House connection tariff affordable for basic needs Actual tariff affordable  Active connections as an indicator of satisfaction and ability to pay	Average household size x minimum quantity per capita x tariff Billings for all house connections/ Consumption for all house connections Active house connections Total house connections
Cost Effectiveness	Unit production cost vs. target  Number of active connections Nonrevenue water < target  Revenue sufficient to target cost recovery Collection efficiency = target	Operation and maintenance cost Monthly water production  Water sold Water produced  Collections from all users Water produced
Operational Efficiency	Staff per 1,000 connections within target Operations (connections, meter maintenance, and repairs) are completed in a timely manner Preventive maintenance program is developed and made operational	Staff (full time equivalent) Total connections / 1,000 Work orders complete in month Work orders initiated in month  Maintenance operations recorded daily and reviewed monthly
Financial Sustainability	Account receivable collection rate is stable, within the target	Accounts receivable Average day sales

Project Objective	Evaluation Criteria	Achievement Indicators
	Budget sufficient to cover cost of operations, plus the greater of finance charges or interest plus depreciation Actual operations meet budget  Cash flow sufficient to maintain operations	Budget prepared annually. Long range planning undertaken at least every 5 years, updated every 5 years Monthly comparative financial statements produced with major variances noted and addressed Cash flow plan, including capital budget, prepared annually and updated quarterly
Governance and Accountability	Public utility corporation maintains a forum for public input into the decision making process. Liaison committees to be established through community leaders and/or municipalities. The utility communicates its plans and results of operations to client groups  The utility is sensitive to parties whose interest may not be adequately represented through normal channels	Public meetings held regularly. Surveys or other assessments of customer needs and satisfaction with utility services conducted and reviewed periodically. Reporting and public relations initiatives planned and reviewed regularly Corporate policies reviewed regularly to ensure that they are non-discriminatory and take appropriate opportunities to include women, lower income, or other groups in their application

Source: ADB. 1996. *Report and Recommendation of the President to the Board of Directors on a proposed Loan and Technical Assistance to the Federated States of Micronesia for the Water Supply and Sanitation Project*. Manila.

5. Further, UCs should try to be more cost efficient by integrating the requirements and operations of technical services, administrative, and financial divisions. Based on the PCR Mission assessment, the performance indicators presented in Table 9.2 must be consolidated, updated, and reported during monthly management meetings to ensure that UC staff contribute to achieving satisfactory levels of service.

Table A8.2 Benefit Monitoring Indicators

Indicator	Basis
<b>1. Production</b> 1.1 Raw water intake 1.2 Treated water at treatment plant <b>Production: O&amp;M Cost</b> 1.3. Power consumption raw water 1.4 Power consumption treated water 1.5 Total power consumption 1.6 Total staff 1.7 Staff training 1.8 Staff leave 1.9 Total staff, salaries and wages 1.10 Total consumption–disinfectant 1.11 Total consumption–coagulant 1.12 Other utility costs 1.13 Total production costs	Gallons Gallons Kwh/ dollar Kwh/ dollar Kwh/ dollar Number Number Number In dollar Kg/ dollar Kg/ dollar Dollar Dollar
<b>2. Distribution and Consumption</b> 2.1 Active domestic connections 2.2 Active institutional and government connections 2.3 Active industrial connections 2.4 Total active connections 2.5 Bulk distribution 2.6 Consumption–Domestic 2.7 Consumption–Institutional/Government 2.8 Consumption–Commercial 2.9 Consumption–Industrial 2.10 Total consumption 2.11 Availability of water per day 2.12 Bacteriological tests taken 2.13 Bacteriological test failures 2.14 Leak repairs 2.15 Meter repair and/or replaced 2.16 Customer complaints 2.17 Public relations expenditure 2.18 Disconnection due to nonpayment 2.19 Disconnection due to customer change 2.20 Disconnection due to bill settlement 2.21 Reconnection due to customer change 2.22 Applicants for new service 2.23 Outstanding applications for new service 2.24 Total Illegal customers 2.25 Illegal customers disconnected	Number Number Number Number Gallons Gallons Gallons Gallons Gallons Gallons Hours Number Number Number Number Number Dollar Number Number Number Number Number Number Number Number
<b>3. O&amp;M Costs for Distribution and Consumption</b> 3.1 Total staff 3.2 Staff on training 3.3 Staff on leave 3.4 Staff salaries and wages 3.5 Vehicle maintenance 3.6 Fuel cost 3.7 Electricity 3.8 Telephone 3.9 Supplies consumables 3.10 Water and sewerage 3.11 Other costs 3.12 Total expenses	Number Number Number Dollar Dollar Dollar Dollar Dollar Dollar Dollar Dollar Dollar
<b>4. Administration and Billing</b> 4.1 Amount billed–Domestic 4.2 Amount billed–Institutional 4.3 Amount billed–Commercial	Dollar Dollar Dollar

Indicator	Basis
4.4 Total billings—all users	Dollar
4.5 Amount collected—Domestic	Dollar
4.6 Amount collected—Institutional	Dollar
4.7 Amount collected—Commercial	Dollar
4.8 Amount collected—Industrial	Dollar
4.9 Total collections—all users	Dollar
4.10 Accounts receivables—Total	Dollar
Aging of accounts receivables: <sup>a</sup>	
31–60 days	
61–120 days	
121–180 days	
181–360 days	
more than 360 days	
4.11 Reconnection fees <sup>b</sup>	Dollar
4.12 New connection fees <sup>c</sup>	Dollar
<b>5. O&amp;M Costs for Administration and Billing</b>	
5.1 Total staff	Number
5.2 Staff on training	Number
5.3 Staff on leave	Number
5.4 Staff salaries and wages	Dollar
5.5 Fuel cost	Dollar
5.6 Vehicle maintenance	Dollar
5.7 Electricity	Dollar
5.8 Water and sewerage	Dollar
5.9 Other costs	Dollar
5.10 Total expenses	Dollar
5.11 Grand total O&M costs	Dollar
<b>6. Performance Ratios</b>	
6.1 Population served by domestic connections	Number
= No. of household connections x average number of persons/ household	
6.2 No. of standposts provided water by the UCs x persons/school (church, community or village) <sup>d</sup>	Gallons
6.3 Daily water production	Gallons
= Volume of treated water / no. of days in the month	
6.4 Daily water distribution	Liters
= Volume of bulk distribution / no. of days in a month	
6.5 Consumption per capita per day	Dollar/Gallon
= Consumption House connections / (population x days)	
6.6 Average tariff - domestic = Domestic billings/ domestic consumption	Dollar/Gallon
6.7 Average tariff -institution = Institution billings/ institution consumption	Dollar/Gallon
6.8 Average tariff- commercial = Comm'l billings/ Commercial consumption	Dollar/Gallon
6.9 Total average tariff = All users billings/All users consumption	Dollar/Gallon
6.10 Unit production cost = Total production cost/ treated volume	Dollar/Gallon
6.11 Unit distribution cost = Total distribution cost/ distributed volume	Dollar/Gallon
6.12 Unit administration cost = total administration cost/ billed volume	Percent
6.13 Accounted water = Bulk distribution/ Treated Water	Gallon
6.14 Unaccounted for water	Percent
= 100% – Accounted Water (%)	
= Treated volume – Bulk distribution	Gallon
6.15 Non-revenue water	Dollar
= (Bulk distribution – Billed Volume)/ Bulk Distribution	Dollar
= Bulk distribution – Billed Volume	Dollar
6.16 Production Cost of NRW = Unit cost production x	Percent

Indicator	Basis
6.17 $\frac{\text{Distribution Cost of NRW}}{\text{volume of NRW}} = \text{Unit cost distribution}$	Percent
6.18 $\frac{\text{Administration Cost of NRW}}{\text{volume of NRW}} = \text{Unit cost administration}$	Percent
6.19 $\frac{\text{Production Cost of NRW}}{\text{volume of NRW}} = \text{Unit cost production}$	Percent
6.20 $\text{Opportunity Cost of NRW} = \text{Total average tariff} \times \text{volume of NRW}$	Percent
6.21 $\frac{\text{Domestic water use}}{\text{Domestic use/ bulk distribution}}$	Percent
6.22 $\frac{\text{Institutional water use}}{\text{Institutional use/ bulk distribution}}$	Percent
6.23 $\frac{\text{Commercial water use}}{\text{Commercial use/ bulk distribution}}$	Percent
6.24 $\frac{\text{Industrial water use}}{\text{Industrial use/ bulk distribution}}$	Percent
6.25 $\frac{\text{Other water use}}{\text{Other use / bulk distribution}}$	Percent
6.26 $\text{Water lost (Balance)} = 100\% - (\text{All consumption/ raw water})$	Percent
6.27 $\frac{\text{Accounts receivable}}{\text{Average day sales}}$	Dollar
6.28 $\frac{\text{Total O\&M costs}}{\text{Billings All Users}}$	Dollar
6.29 $\frac{\text{Collections all users}}{\text{Billings all users} + \text{Accounts receivables}}$ at opening balance	Dollar
6.30 $\frac{\text{Staff}}{1000 \text{ connections}} = \frac{[1000 \times \text{No. of staff}]}{\text{No. of connections}}$	Number

<sup>a</sup> PUC Accounting Division is undertaking aging of contracts receivable. Yap has no arrears, and Chuuk does not undertake aging of accounts receivable.

<sup>b</sup> Reconnection fees are collected from customers disconnected on a voluntary basis in all UCs.

<sup>c</sup> New connection fees are collected from customers for those disconnected for non-payment if they want to be reconnected to the system.

<sup>d</sup> In Pohnpei, the UC provides 24 hour potable water supply to public institutions through standposts built near schools, churches, and remote communities in response to the drought in 1998.

Source: PCR Mission assessment based on benchmarking data and other references.

6. Customer satisfaction must be the major objective of a BME system to ensure regular payment of water bills and unpaid accounts. The UCs must closely coordinate with the state government to collect huge arrears from government institutions to improve their cash flow positions and enhance the long-term financial sustainability of water supply operations in each state. Further, the UCs should provide their management and the board timely information on operational efficiency, water quality test results, operational costs, annual budgets, income sources, water tariffs, collection efficiencies, and new connection fees on a regular basis. Such information could greatly enhance staff efficiency in addressing customers' concerns.

7. At the community level, the UCs must regularly monitor the benefits experienced by households from a regular water supply, such as (i) fewer delays in getting children to school and getting ready for work; (ii) a safer supply of water than river water or rainwater collected from roofs; (iii) convenience of obtaining water for immediate use, and no intermittent supply; and (iv) better water quality reducing diarrhea cases.<sup>3</sup>

<sup>3</sup> Based on the Department of Health, the incidence of diarrhea and other water-borne diseases declined in the three participating states: (i) Chuuk; 772 in 1999 to 708 in 2001 (but increased to 1,382 in 2002); (ii) Yap, 507 cases in 2000 to 349 cases in 2002; and (iii) Pohnpei, 3,831 cases in 2000 to 1,228 cases in 2002 (mainly people outside Kolonia).

## **B. Institutional Strengthening**

8. One significant benefit of the Project was using the experience gained to provide training on the design and operation of water supply production and treatment facilities in other UCs. The UCs in Yap and Pohnpei had assisted Chuuk in the operation and maintenance of its water systems.

9. The UCs envision that the staff trained under the Project in construction and O&M of water supply systems can be organized as a core group of trainers for other staff in their UCs. Further, management and operational training manuals prepared under the Project on water supply production and treatment plants benefited the other UCs. About 20 employees from UCs benefited from the technical assistance (TA). Only Yap State Public Service Corporation (YSPSC) and Public Utilities Corporation (PUC) have routine maintenance programs and provisions for emergency repairs. O&M budget is likewise adequate, with availability of key spare parts and equipment.

10. Despite the knowledge and practical experience gained from the TA in management of project facilities, the more capable staff still need to be motivated to undertake (i) production and distribution monitoring system for detecting system leakages, (ii) data collection system in pumping stations for operational flow control, (iii) control and monitoring system for water supply treatment plant, and (iv) daily and monthly record management. Strengthening of corporate planning capabilities and formulation of corporate objectives that address the need for more cost efficient and improved water supply service on commercial terms must be immediately undertaken in Chuuk Public Utilities Corporation (CPUC), based on the PUC and YSPSC experience.

## **C. Economic**

11. Major economic benefits resulting from the Project have been sustained in Yap and Pohnpei: (i) reduced costs for the installation of rain water tanks due to provision of 24-hour water services, particularly in urban areas; (ii) reduced costs for water bought from vendors, and transport costs for fetching water from private providers during droughts in more remote villages; (iii) cost savings in treating water-borne diseases, such as diarrhea, and skin diseases among children and adults; (iv) increased business activities among commercial establishments; (v) a willingness to pay for improved water supply services and water quality; and (vi) economic gains to the business, health, and education sectors. These UCs will continue to monitor these benefits and ensure their sustainability with the support of their respective health departments and beneficiary communities.

12. To ensure that project benefits are sustainable, the UCs will have to collect relevant data to measure these benefits as part of their periodic BME report. This data would include (i) cost comparisons of water tariffs of connected households with the cost of water of alternative supplies, such as water of community systems; (ii) production and distribution costs; (iii) the amount that households are willing to pay for UC water, and if this is in line with household incomes from salaries and informal employment; (iv) the number of households, institutional, and commercial establishments that benefit from the extension of the distribution network; (v) the employment created and construction gains due to the network expansion; (vi) the increased tourism benefits, particularly hotels and restaurants, measured in terms of the number of tourists visiting the state and estimated tourist expenditures; (vii) health indicators, particularly water-borne diseases, such as diarrhea, for children and adults; (viii) indirect benefits, such as the acceleration of urbanization measured by the increase in commercial and industrial

establishments, particularly in Pohnpei and Yap; (ix) the provision of safe and potable water to school children, and improved sanitary conditions in schools, hospitals, and public places; and (x) employment created for lagoon and outer islands.

#### **D. Social**

13. Unquantifiable social benefits from the Project include (i) benefits to women and children in terms of time saved for economic activities, such as fishing and selling agricultural crops (as in the case of villagers in Pohnpei); (ii) long-term employment for UC staff for plant operation, maintenance, and operation; (iii) improvement of people's health, particularly the school children who suffer from water-borne diseases as a result of drinking water from unprotected sources such as rainwater tanks and creeks; (iv) short-term employment during project construction, particularly the locals who gained experience in project construction and are now employed as plumbers and semi-skilled labor; (v) improvement in business activities of commercial establishments, such as hotels and restaurants; (vi) other social benefits such as more time for women to do household chores and rear children due to reduced visits to hospitals and clinics; (vii) the positive impact on the education sector as schools no longer experience disruptions of classes due to a lack of water during droughts (particularly Yap); (viii) sale and lease of property by the land owners, which generates capital for small-scale businesses; (ix) improved personal hygiene, such as washing hands, and better sanitary conditions; (x) improved safety of food preparation for public consumption; and (xi) better health care and sanitary conditions in public hospitals, and commercial establishments.

14. The UCs initially conducted few public information campaigns to educate local residents about the importance of using water services provided under the Project, and the need for them to connect and pay a water tariff to bring the service to them as well as sustain the O&M of project facilities. In Yap and Pohnpei, residents were more than willing to connect and pay for improved water supplies and improved water quality. In Chuuk, the water supply was available only a few hours each day, and the water was not safe for drinking.<sup>4</sup> Rainwater was preferred for drinking.

15. In Chuuk and Pohnpei, payment of water bills was not strictly enforced, leading to huge arrears that remain unpaid (more than 360 days). In recent months, the CPUC's policy has been to disconnect nonpaying customers. Payment of reconnection fees provide disincentive to nonpaying customers. However, CPUC could not enforce payment since it failed to provide consistently improved service.

#### **E. Land Issues**

16. Particularly in Chuuk, landowners demanded huge compensation for the land to be used for wells and distribution pipelines. This greatly affected site selection of wells and the completion of expanded distribution networks, as originally envisaged under the Project.

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<sup>4</sup> The PCR Mission team learned that there were more than 1,800 complains lodged due to poor water quality and refused to pay their bills to CPUC.

## PROJECT IMPLEMENTATION PROBLEMS IN CHUUK

1. In Chuuk, the FSM Water Supply and Sanitation Project (the Project) suffered from cost and implementation problems. To get a better appreciation of the issues and the cultural climate in Chuuk, this appendix highlights the key problems, and recommends specific actions before the Asian Development Bank (ADB) embarks on any new intervention in Chuuk.

- (i) The drilling was much more difficult and expensive than anticipated due to unprecedented land problems and significant cost escalation, as the lack of local expertise necessitated bringing in more expensive imported equipment and services;
- (ii) The treatment plant was found to be in much poorer condition than first assessed, highlighting the poor maintenance culture;
- (iii) Most equipment needed to be replaced rather than repaired;
- (iv) A section of the road where a new pipeline was to be laid had been eroded, necessitating changes in the design;
- (v) Installation of the power supply to the seven of the 16 new well stations was delayed due to land access problems;
- (vi) Landowner disputes caused serious delays in the construction of well houses and the Epinup-to-Sapuk transmission pipeline;
- (vii) Lack of coordination and frequent disagreements among the general manager, the utility company's board of directors, and the state administration added to the delays; and
- (viii) Due to a lack of commitment and required counterpart funding, the proposed rehabilitation of the sewerage plant was canceled.

2. The Mission identified several measures that need to be undertaken to improve project sustainability and maximize project benefits:

- (i) Chuuk Power Utilities Corporation (CPUC) needs to update its organization chart for internal control, administrative, and management purposes. This would enable management to determine the line functions and delegate authority to key positions. This information should be kept in the *Administrative and Accounting Manual*.
- (ii) CPUC should develop more detailed, updated, and authorized procedures for internal control and delegation of authority specific to its operations, and stop using the generic accounting manual prepared by the technical assistance (TA) consultants. This should show the latest delegations of authority of board members and officers for authorizing, as well as approving, purchases and payments of accounts that comply with CPUC's policies.
- (iii) CPUC management should address urgently its operational problems, constraints, and deficiencies in billing and collection. This should cover the

absence of meter reading, setting appropriate tariffs for water supply and sewerage service to recover at least the operation and maintenance (O&M) costs, and establishing a disconnection policy for overdue accounts and unauthorized connections. Without a clear framework for improving CPUC's financial performance, it will face greater difficulties in revenue collection, which ultimately will affect its ability to sustain its operation and repay the loan.

- (iv) CPUC should undertake a physical asset inventory and internal control procedures for the verification, identification, and labeling of fixed assets, such as wells, reservoirs, water tanks, and assets constructed and repaired under the Project. An assessment of capital asset controls also should be undertaken. A fixed assets register should be established and updated on a regular basis. Adequate insurance cover for all fixed assets also should be in place.
- (v) CPUC should properly account for the lease of land where capital assets are constructed.<sup>1</sup> Lease of land is not shown in the chart of accounts, which affects CPUC projects. The accounting manual has to be updated to include a chapter on this item.
- (vi) CPUC should undertake accountability and control of fully depreciated fixed assets with general ledger, particularly for proper disposition of property acquired with loan funds. Accounting records should be adjusted for the asset and allowance for depreciation when capital items are retired, sold, or transferred.<sup>2</sup>
- (vii) CPUC should establish better O&M procedures, provide timely O&M budget, and conduct meter reading of production and customer consumption daily.
- (viii) CPUC should computerize fully its accounting system to improve operational usefulness and efficiency of financial management.
- (ix) A formal non-revenue control program should be established that includes leak detection, meter testing and replacement, and illegal connection detection and resolution.
- (x) PUC and CPUC should develop and implement a comprehensive connection program accompanied by a community awareness and education program to improve the connection rate and collection efficiency.

3. CPUC's Customer Services, Corporate Relations, Finance Division, and Technical Services must work together towards achieving improved commercial operations, similar to the internal coordination at PUC and Yap State Public Service Corporation.

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<sup>1</sup> The generic accounting manual prepared by the TA Consultants did not contain a section detailing the accounting procedures for lease transactions, or determine how this is taken up in the financial statements.

<sup>2</sup> The generic accounting manual did not segregate the assets into: capital projects fund, operating budget expenditure, and ADB loan funded capital assets.