

Project Completion Report

PCR: CAM 27400

Phnom Penh Water Supply and Drainage Project (Loan 1468-CAM[SF]) in Cambodia

May 2005

Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – riel (KR)

		At Appraisal (1 July 1996)		At Project Completion (26 October 2004)
KR1.00	=	\$0.000385	=	\$0.0002457
\$1.00	=	KR2,600	=	KR4,070

ABBREVIATIONS

ADB	–	Asian Development Bank
BT	–	Boeng Trabek
CAP	–	Cleansing Authority of Phnom Penh
CDC	–	community development committee
DCIP	–	ductile iron pipes
DPWT	–	Department of Public Works and Transport, MPP
EA	–	executing agency
EIRR	–	economic internal rate of return
FIRR	–	financial internal rate of return
IA	–	implementing agency
ICB	–	international competitive bidding
MPP	–	Municipality of Phnom Penh
MPWT	–	Ministry of Public Works and Transport
NIP	–	Neighborhood Improvement Program
NORAD	–	Norwegian Agency for Development Cooperation
O&M	–	operation and maintenance
OPEC	–	Organization of Petroleum Exporting Countries
PCR	–	project completion review
PMU	–	project management unit
PPWM	–	Phnom Penh Waste Management Authority
PPWSA	–	Phnom Penh Water Supply Authority
PSC	–	Project Steering Committee
SWM	–	solid waste management
TA	–	technical assistance
TS	–	Toul Sen
WAP	–	Wastewater Authority of Phnom Penh

WEIGHTS AND MEASURES

km	–	kilometer
m ²	–	square meter
m ³	–	cubic meter

NOTES

- (i) The fiscal year (FY) of the Government and PPWSA ends on 31 December.
- (ii) In this report, "\$" refers to US dollars.

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BASIC DATA

A. Loan Identification

1.	Country	Cambodia
2.	Loan Number	1468-CAM(SF)
3.	Project Title	Phnom Penh Water Supply and Drainage
4.	Borrower	Cambodia
5.	Executing Agencies	Phnom Penh Water Supply Authority Municipality of Phnom Penh
6.	Amount of Loan	SDR13,721,000
7.	Project Completion Report Number	CAM 881

B. Loan Data

1.	Appraisal	
	– Date Started	1 July 1996
	– Date Completed	16 July 1996
2.	Loan Negotiations	
	– Date Started	28 August 1996
	– Date Completed	30 August 1996
3.	Date of Board Approval	26 September 1996
4.	Date of Loan Agreement	4 November 1996
5.	Date of Project Agreement	4 November 1996
6.	Date of Loan Effectiveness	
	– In Loan Agreement	6 February 1997
	– Actual	8 September 1997
	– Number of Extensions	1
7.	Closing Dates	
	ADB	
	– In Loan Agreement	30 June 2003
	– Actual	7 October 2003
	– Number of Extensions	0
	OPEC Fund	
	– In Loan Agreement	30 June 2002
	– Actual	31 August 2003
	– Number of Extensions	1
8.	Terms of Loan	
	ADB	
	– Interest Rate	1.0%
	– Maturity (number of years)	40
	– Grace Period (number of years)	10
	OPEC Fund	
	– Interest Rate	2%
	– Service Charge	1%
	– Maturity (number of years)	17
	– Grace Period (number of years)	5

9. Terms of Relending 6.5%
 – Interest Rate 30
 – Maturity (number of years) 5
 – Grace Period (number of years)

10. Disbursements

a. ADB Loan 1468-CAM

i. Dates

Initial Disbursement	Final Disbursement	Time Interval
October 1997	October 2003	72 months
Effective Date	Original Closing Date	Time Interval
September 1997	June 2003	69 months

ii. Amount (\$)

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
Civil Works-Part A	11,036,347	3,386,315	584,687	3,386,315	2,801,628	0
Civil Works-Part B	574,780	531,474	77,129	531,474	454,445	0
Equipment-Part A	495,350	6,802,608	(2,215,894)	6,802,608	9,018,502	0
Equipment-Part B	1,981,401	1,886,894	617,582	1,886,894	1,269,312	0
Consulting Services-Part A	792,849	717,528	(207,536)	717,528	925,064	0
Consulting Services-Part B	2,278,900	2,126,343	140,923	2,126,343	1,985,420	0
Service Charge	792,849	753,732	289,342	753,732	464,390	0
Unallocated	1,862,979	1,844,429	1,844,429	1,844,429	0	0
Imprest Fund	0	7,255	7,255	7,255	0	0
Total	19,815,457	18,056,678	1,137,917	18,056,678	16,918,761	0

ADB – Asian Development Bank, OPEC – Organization of Petroleum Exporting Countries.

Source: Asian Development Bank loan financial information system.

b. OPEC Fund Loan

i. Dates

Initial Disbursement	Final Disbursement	Time Interval
August 2000	August 2003	36 months
Effective Date	Original Closing Date	Time Interval
7 November 1997	30 June 2002	55 months

ii. Amount (\$)

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
Civil Works – Drainage	4,000,000	4,000,000	0	4,000,000	3,688,245	311,755

Source: Asian Development Bank loan financial information system.

2. Local Costs (OPEC Fund & NORAD Financed)	
- Amount (\$)	1.64 million
- Percent of Local Costs	31
- Percent of Total Cost	6

C. Project Data

3. Project Cost (\$ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	25.20	23.60
Local Currency Cost	10.60	5.34
Total	35.80	28.94

4. Financing Plan (\$ million)

Cost	Appraisal Estimate			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
Implementation Costs						
ADB-Financed	18.30	0.90	19.20	16.46	0.00	16.46
OPEC Fund	3.40	0.60	4.00	3.10	0.59	3.69
NORAD	2.70	0.30	3.00	3.57	1.05	4.62
Government	0.00	5.50	5.50	0.00	0.96	0.96
PPWSA	0.00	3.10	3.10	0.00	2.74	2.74
Local Communities	0.00	0.20	0.20	0.00	0.00	0.00
Subtotal	24.40	10.60	35.00	23.14	5.34	28.48
IDC Costs						
ADB-Financed	0.80	0.00	0.80	0.46	0.00	0.46
Total	25.20	10.60	35.80	23.60	5.34	28.94

ADB = Asian Development Bank, IDC = interest during construction, NORAD = Norwegian Agency for Development Cooperation, OPEC = Organization of Petroleum Exporting Countries, PPWSA = Phnom Penh Water Supply Authority.

Source: Asian Development Bank loan financial information system, Phnom Penh Water Supply Authority and Ministry of Public Works and Transport.

5. Cost Breakdown by Project Component (\$ million)

Component	Appraisal Estimate			Actual		
	Foreign Exchange	Local Cost	Total Cost	Foreign Exchange	Local Cost	Total Cost
Base Cost						
1. Part A – Water Supply	11.60	5.40	17.00	12.74	2.74	15.48
a. Civil Works	10.40	4.50	14.90	2.80	2.49	5.29
b. Equipment	0.50	0.10	0.60	9.02	0.00	9.02
c. Consulting Services	0.70	0.80	1.50	0.93	0.24	1.17
2. Part B – Drainage	9.00	4.00	13.00	10.40	2.59	12.99
a. Civil Works	3.40	1.50	4.90	3.57	1.16	4.73
b. Equipment	1.40	1.10	2.50	1.27	0.00	1.27
c. Consulting Services	1.60	1.10	2.70	1.99	0.38	2.37
d. Capacity Building and NIP	2.70	0.30	3.00	3.57	1.05	4.62
I. Total Base Cost	20.60	9.40	30.0	23.14	5.34	28.48
II. Contingencies						
- Physical	1.80	0.50	2.30	0.00	0.00	0.00
- Price	2.00	0.70	2.70	0.00	0.00	0.00
III. Service Charges	0.80	0.00	0.80	0.46	0.00	0.46
Total (I+II+III)	25.20	10.60	35.80	23.60	5.34	28.94

NIP - Neighborhood Improvement Program.

Source: Asian Development Bank loan financial information system, Phnom Penh Water Supply Authority and Ministry of Public Works and Transport.

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants		
Part A	April 1997	September 1997
Part B	December 1997	December 1997
Civil Works Contracts		
Date of Award		
Part A – Water Supply	January 1998	July 2000
Part B – Drainage	October 1998	April 2000
Completion of Work		
Part A – Water Supply	June 2001	March 2002
Part B – Drainage	December 2002	April 2003
Equipment		
First Procurement	January 1998	October 1997

Item	Appraisal Estimate	Actual
Last Procurement	December 2002	June 2003
Completion of Equipment Installation		
Part A – Water Supply	June 2001	March 2002
Part B – Drainage (Pumping Station)	December 2002	March 2003
Institutional Capacity Building and Neighborhood Improvement Program		
Phase 1 – Pilot Program	January–December 1999	July 1997–February 2000
Phase 2 – Extension	January 2000–December 2002	July 2000–March 2002

5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From June 1998 to December 1998	Satisfactory	Satisfactory
From January 1999 to December 1999	Satisfactory	Satisfactory
From January 2000 to December 2000	Satisfactory	Satisfactory
From January 2001 to December 2001	Satisfactory	Satisfactory
From January 2002 to December 2002	Satisfactory	Satisfactory
From January 2003 to February 2003	Satisfactory	Satisfactory
From March 2003 to October 2003	Satisfactory	Highly Satisfactory

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members ^a
Appraisal	1–16 Jul 1996	5	58	a, b, c, d, e
Inception Review	27 Jan–4 Feb 1997	2	18	a, h
Review 1	4–12 Dec 1997	1	9	a
Review 2	20–29 Apr 1998	1	10	a
Review 3	1–09 Mar 1999	1	9	b
Review 4 (Midterm)	13–23 Sep 1999	2	22	c, h
Review 5	20–28 Jun 2000	1	9	c,
Review 6	13–19 Dec 2000	1	7	c,
Review 7	12–22 Mar 2001	1	11	c
Review 8	20–28 Sep 2001	1	9	c
Review 9 (SLAM)	5–9 Nov 2001	1	5	a

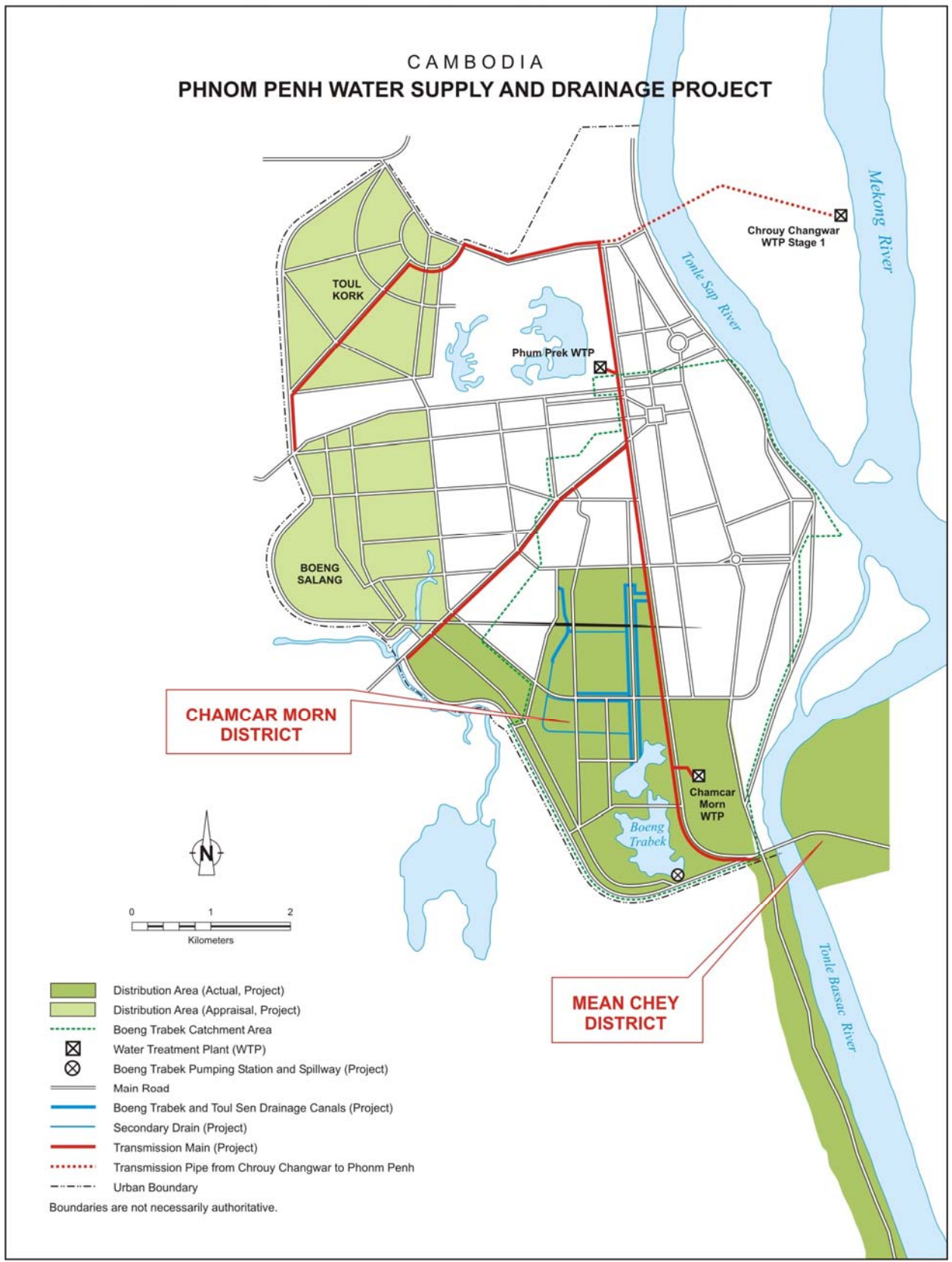
Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members^a
Review 10	22–26 Apr 2002	1	5	c
Review 11	2–7 Sep 2002	1	6	c
Review 12	5–14 May 2003	2	20	c, h
Project Completion Review ^b	26 Oct–5 Nov 2004	3	33	f, g, h

SLAM = special loan administration mission.

^a a = financial analyst, b = project specialist, c = project engineer, d= program officer, e = social development specialist; f = project economist, g = consultant; h = assistant project analyst..

^b Yong Ye, project economist, Social Sectors Division, Mekong Department, prepared this project completion report.

CAMBODIA PHNOM PENH WATER SUPPLY AND DRAINAGE PROJECT



Boundaries are not necessarily authoritative.

I. PROJECT DESCRIPTION

1. In 1992, the Government of Cambodia requested the assistance of the Asian Development Bank (ADB) in improving the water supply and sanitation facilities in major urban centers. A small-scale technical assistance (TA), approved in December 1993, made a general assessment of the physical conditions and institutional capacities of the urban water supply and sanitation sector. The TA recommended to the Government and ADB the most needed interventions. Following the completion of a project preparatory TA in March 1996, ADB fielded the Fact-Finding Mission in May 1996, followed by the Appraisal Mission in July 1996. ADB approved a loan of SDR13.721 million, or \$20 million, on 26 September 1996.

2. The Phnom Penh Water Supply and Drainage Project (the Project) was an integral part of the overall water supply and drainage rehabilitation program in the Cambodian capital. It aimed to improve the quality of life and the environment in Phnom Penh. The objectives were to (i) help the Phnom Penh Water Supply Authority (PPWSA) improve and expand access to a reliable, convenient, and potable water supply in the urban areas of Phnom Penh; (ii) improve the environmental sanitation of Phnom Penh; and (iii) enhance public awareness of the importance of community participation in maintaining environmental sanitation; and, through community participation, improve solid waste disposal and drainage systems in neighborhoods. Appendix 1 shows the project framework that the Project Completion Review (PCR) Mission prepared.

3. As envisaged at appraisal, the scope of the Project consisted of two components:

- (i) Part A: The water supply component included (a) installation of about 15.6 kilometers (km) of water transmission mains from the treatment plants to the distribution mains, (b) rehabilitation of about 96 km of water distribution systems in Toul Kork and Boeng Salang areas, and (c) institutional support to PPWSA by providing equipment for operation and maintenance (O&M).
- (ii) Part B: The drainage component included (a) upgrading the Boeng Trabek (BT) main drainage canal and Toul Sen (TS) canal, and the connected branches; and (b) rebuilding the BT pumping station and spillway to a capacity of 8 cubic meters per second (m³/s). This component also included institutional capacity building of the Department of Public Works and Transport (DPWT) and the Neighborhood Improvement Program (NIP), which the Norwegian Agency for Development Cooperation (NORAD) cofinanced. The OPEC Fund for International Development (OPEC Fund) financed part of the cost of the civil works of the drainage component.

4. PPWSA was the Executing Agency (EA) for Part A, while the Municipality of Phnom Penh (MPP) was the EA for Part B. DPWT of MPP was the Implementing Agency (IA) for Part B. PPWSA and DPWT established project management units (PMUs) to implement their respective project components. A project steering committee (PSC) was established, which the MPP governor chaired, to supervise project implementation and provide policy guidance.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

5. The Government's policy continues to support sustainable development of water supply and sanitation services to alleviate urban and rural poverty, develop human resources, generate economic growth, and protect the urban environment. The National Policy on Water Supply and Sanitation, approved in February 2003, reemphasized the importance of sustained access to safe water supply and sanitation services in improving the living standards and general welfare of the people. The policy highlighted the need to (i) expand the water supply and sanitation services through the adoption of appropriate technologies; (ii) pursue full cost recovery, decentralization, and financial autonomy of water supply utilities; (iii) enhance regulatory capacity; and (iv) encourage private sector participation.

6. ADB's strategy for Cambodia at project appraisal supported the Government's efforts to rebuild basic infrastructure. The thrusts of the strategy were to (i) make investments that support efficient economic growth, (ii) encourage institutional reforms through policy dialogue, and (iii) induce related legal and policy changes that facilitate sustainable development. ADB's strategy also aimed to contribute to human resource development, poverty reduction, improvement of conditions affecting women, and economic growth.

7. The Project was a response to the urgent need of the people of Phnom Penh for accessible and reliable piped water supply, and improved urban environment. The infrastructure in the city, particularly the water supply and drainage systems, deteriorated severely in the 2 decades before project appraisal due to war, ineffectual management, and lack of maintenance. Thus, the Project was in line with Government and ADB policies and strategies. Project design was sound. The only major changes in the design during implementation was the switch in distribution areas from Toul Kork and Boeng Salang to Chamcar Morn districts to take advantage of the completion of the Chamcar Morn Water Treatment Plant, and the procurement and installation of distribution pipes in the Mean Chey district using loan savings.

B. Project Outputs

8. The scope of works proposed at appraisal and executed is in Appendix 2. The status of works completed is described in paras. 9–16.

1. Part A: Water Supply

9. This component included the installation of about 15.6 km of transmission mains to supply bulk water from the treatment plants to the distribution mains in the inner city districts. Installation of 15.2 km of transmission mains was completed in March 2002. The pipeline is supplying about 160,000 m³/day of water to approximately 940,000 people in the inner city area. The mains were designed large enough to accommodate the demand of 2 million people.

10. At appraisal, about 96 km of pipes for water distribution were to be installed in Toul Kork and Boeng Salang. At an early stage, PPWSA decided to prioritize the rehabilitation of the Chamcar Morn area to take advantage of the completion of the Chamcar Morn Water Treatment Plant. The Toul Kork and Boeng Salang areas were waiting for the supply from the World Bank-funded Chrouy Changvar Water Treatment Plant, which had not been completed near the end of 2001. ADB and the World Bank agreed to switch the distribution areas they were supporting to enable early use of water from the Chamcar Morn plant, which was completed in the third quarter of 1997. As a result, about 86.3 km of distribution pipes were installed in Chamcar Morn by June 1999, and 24,130 households now receive potable water.

11. In January 2001, ADB approved PPWSA's request to use loan savings to procure 64.8 km of distribution pipe materials for Mean Chey district. This district includes Chbar Ampouw, a heavily populated area without water supply. The majority of the residents are poor who pay high costs for drinking water from water vendors. The materials were delivered in August 2002, and installation was completed in June 2003. About 9,220 households now are served in Mean Chey district.

12. O&M equipment was delivered to PPWSA in June 1999, as originally envisaged. This was composed of seven cargo dump trucks, a wheel loader, pipe laying tools, computers, and office furniture. Additional loan savings also were used to procure a utility vehicle with equipment and tools for urgent maintenance needs, steel pipes, valves, and appurtenances.

6. Part B: Drainage

13. The upgrading of the canals and drains included concrete lining of the old BT main canal, the TS canals, and branch canals with a combined length of 3.5 km. The rehabilitation of the BT main canal, the East TS canal, and branch canal 288 were completed in August 2002. The West TS canal was finished in December 2002. The works included the rehabilitation of 34 road culverts, installation of handrails, connection of secondary drain pipes, and road restoration. Since the completion of the rehabilitation works, the project catchment area has not experienced any major flooding, benefiting about 240,000 residents. Residents observed that floods caused by short, intense rains recede within an hour or less, compared to 2 days before the Project.

14. The new BT pumping station was shifted slightly east to keep part of the old pumping station intact, enabling continuous pumping during construction. The original plan was to demolish and rebuild the old BT pumping station. Construction of the pumping station, spillway improvement, and installation of eight pumps, control panels, and electrical works were completed in March 2003. An overhead crane and a gantry crane for maintenance work, as well as a diesel generating set capable of providing secure and stable power to drive four of the new pumps during electrical interruptions, also were procured.

15. The capacity building and NIP programs funded by NORAD (Phase 1) were completed in June 2000, as envisaged at appraisal. Subsequently, NORAD agreed to extend the programs under Phase 2, which were completed in March 2002. Under Phase 1 of capacity building, DPWT was provided with excavators, trucks, and other heavy equipment. In addition, 88 MPP and DPWT staff were trained in English, computer usage, computer-aided design, accounting and finance, land surveying, and sanitary engineering. A complete, computerized asset management system and management information system were developed, and a reference library was set up for DPWT. Significant resources and efforts under Phase 2 went into developing the competence and skills of the staff of the new Phnom Penh Waste Management Authority (PPWM), which is responsible for refuse collection in the NIP areas and operation of disposal sites (para. 27). Information technology equipment and software programs were developed for invoicing of refuse services and performance monitoring of solid waste management (SWM). PPWM staffs were trained in drainage design and SWM.

16. NIP provided assistance to 24 communities in two *sangkats* (communes or subdistricts), which formed community development committees (CDCs). About 65 small-scale community infrastructure projects were constructed through the CDCs, benefiting 3,200 residents. These projects included community sewerage and drainage, well construction, latrines, access bridge, and walkways. A workable community-based SWM system was organized, and is operating successfully in the NIP area. Two waste recycling development centers were established for recycling and composting activities, which PPWM operates. A waste picker development center

also was established for the nonformal education of waste pickers. Hygiene awareness education was provided to women, self-help groups, and waste pickers in these communities to mitigate the risk in collecting solid waste and garbage. More than 30,000 people participated in hygiene awareness campaigns.

C. Project Costs

17. At appraisal, the project cost was estimated at \$35.80 million, including \$25.20 million in foreign exchange costs. ADB's loan was to finance the foreign exchange cost of Part A, and the foreign exchange cost of the equipment and materials and part of the cost of civil works for Part B. With ADB assistance, the Borrower secured an OPEC Fund loan of \$4.00 million to finance 80% of the civil works cost of the drainage system. ADB administered the OPEC Fund loan, with procurement in accordance with ADB's *Guidelines for Procurement* and eligibility requirements. The Borrower also obtained a grant of \$3.00 million from NORAD for the institutional capacity building and NIP components.

18. Upon completion, the cost of the Project was \$28.94 million, comprising \$23.60 million equivalent in foreign exchange costs and \$5.34 million equivalent in local currency costs. ADB financed \$16.92 million equivalent in foreign exchange costs, including a service charge of \$0.46 million; OPEC Fund financed \$3.69 million; and the NORAD grant was \$4.62 million. Lower-than-expected contract prices accounted for most of the foreign exchange savings of about \$1.60 million equivalent. Savings in local cost (\$5.26 million equivalent) was mainly due to the depreciation of the riel during construction—from KR2,600/\$1.00 at appraisal to KR4,070/\$1.00 at project completion. The estimated and actual project costs are in Appendix 3, while the financing plans at appraisal and at completion are in Appendix 4.

D. Disbursements

19. At approval, the loan amount was \$19.82 million equivalent. However, due to exchange rate fluctuations, the loan amount at the time of loan closing was \$18.06 million equivalent. The amount disbursed was \$16.92 million, and the balance of \$1.14 million was canceled. Funds were disbursed in accordance with Government and ADB procedures. Disbursements for the first 2 years were made only for the Project's institutional support equipment and supply of pipes, and payments to consultants. Disbursements accelerated starting in the second quarter of 2000 after the awarding of major contracts. An imprest fund was established for the PMUs in 1997 to facilitate timely disbursements on small, eligible expenditures. However, the imprest fund was utilized only briefly since most of the procurement was through international competitive bidding (ICB), and operational costs for PMUs were included in the consultants' contracts.

20. The ADB loan account was closed on 7 October 2003 without any extensions. Due to the delay in beginning construction of the drainage system, the OPEC Fund loan was extended from 30 June 2002 to 31 August 2003. The Government and PPWSA generally provided the necessary counterpart funds on time. Appendix 5 shows the breakdown of annual disbursements of ADB and OPEC Fund loans.

E. Project Schedule

21. The loan was approved on 26 September 1996. The Project was scheduled for completion on 31 December 2002, with loan closing on 30 June 2003. The loan became effective on 8 September 1997. Despite delays in the early stages of implementation, the Project was completed in June 2003, only 6 months behind schedule. This resulted mainly from (i) delays in fielding consultants, (ii) implementation delays during design and procurement; and (iii) construction delays in the drainage component. The additional works and procurement for

components funded from loan savings also required additional time to complete the Project. Appendix 6 compares the scheduled and actual project implementation.

22. For Part A, the consultant started the design of the transmission mains in October 1997, and installation of the mains was completed in March 2002. This subcomponent required 54 months, compared to 51 months estimated at appraisal. Design and contract documentation took 9 months longer than the appraisal estimate. Tendering, including prequalification of contractors, resulted in an additional 15-month delay. However, the contractor needed only 21 months to install the pipes (completed 6 months ahead of contract date), compared to 42 months estimated at appraisal. Factoring in the 6-month delay in fielding the consultants, the total delay for this subcomponent was 9 months. The delays in the design and tendering were due mainly to two changes ADB requested on bid packaging and materials specifications (para. 33), and an investigation of one losing bidder's allegations. Despite these delays, the installation of the transmission mains was completed on time—coinciding with the completion of the Chrouy Changvar water treatment plant. This allowed PPWSA to distribute from the plant 65,000 m³/day of additional water immediately upon completion of the facilities.

23. Installation of 86.3 km of distribution pipes in Chamcar Morn started in March 1998 and was completed in June 1999. Installation of 64.8 km of distribution pipes in Mean Chey district started in May 2002 and was completed by June 2003. O&M equipment for PPWSA was delivered in June 1998. Additional tools, steel pipes and appurtenances, and the utility vehicle for maintenance of the distribution system were procured in June 2003 before the completion date. This subcomponent was not delayed as the completion date for the original distribution system was June 2001, while the distribution pipes for Mean Chey district comprised additional works.

24. For Part B, detailed design of the rehabilitation of the BT pumping station and drainage canals started in March 1998. Improvement of the main BT canal, East TS canal, West TS canal, and branch canal 288 were completed in December 2002. Construction of the BT pumping station and spillway improvement were completed in March 2003. The drainage component took 60 months, as estimated at appraisal. However, it was completed later than expected due to the 3-month delay in fielding the design consultants.

25. The drainage component could have been completed as early as June 2002. Based on the civil works contracts, construction of the BT pumping station and spillway improvement, which began in October 2000, should have been finished by September 2001. The drainage canals improvement, which began in July 2000, should have been completed by June 2002.

26. The drainage component was completed later than the contracted schedule due to (i) a delay in fielding design consultants, (ii) adverse weather conditions and difficult subsoil conditions that hampered excavations, (iii) resurvey of canal alignment by the contractor due to errors in the design survey, and (iv) old equipment and limited number of qualified staff initially fielded by the contractor. The contractor had to revise the construction schedule and work arrangements several times to correct its limitations. Furthermore, the lack of a clear line of command in the management of the Project affected DPWT PMU's project management. Some municipal and district officials bypassed the PMU, and gave instructions directly to the contractor or consultant. This caused confusion and conflicts among the contractor, consultant, and PMU staff. These problems were resolved during an ADB special loan administration mission in November 2001.

27. Phase 1 for the capacity building and NIP components began in July 1997 and were completed in June 2000. Phase 2 started in July 2000 and was completed in March 2002. This implementation schedule was based on the revised program the consultants made for these components. In February 2000, MPP established a Cleansing Authority of Phnom Penh (CAP)

responsible for refuse collection in the NIP pilot area and operation of the Stung Mean Chey disposal site. The Wastewater Authority of Phnom Penh (WAP) also was set up to handle the collection of septic sludge. In February 2002, CAP and WAP merged to become PPWM, which is responsible for refuse collection in the NIP areas and operation of the final disposal sites. Phase 2 focused on the development of these agencies.

F. Implementation Arrangements

28. The implementation arrangements generally were satisfactory, and worked as envisaged at appraisal. The PPWSA was the EA for Part A, while MPP was the EA for Part B. DPWT-MPP was the IA for Part B. By August 1996, PPWSA and DPWT established PMUs, which were responsible for implementing their respective project components. The PPWSA PMU had 10 staff members, and was headed by a qualified, full-time project manager with technical, accounting, procurement, and administrative support. The DPWT PMU had 11 staff members, and was headed by a manager and a deputy manager with technical, accounting, and procurement support. The DPWT PMU initially had some difficulties in effectively managing the drainage component. However, an ADB special loan administration mission (para. 26) intervened to help resolve the problem, which had been a major cause for construction delays. The PSC was established in August 1996, with the MPP governor as chairman, to review project implementation and provide policy guidance. However, the PSC did not meet as frequently as proposed at appraisal, because the EAs were able to consult with PSC members whenever they needed to.

G. Conditions and Covenants

29. The status of compliance with loan covenants is provided in Appendix 7. Almost all loan covenants were complied with. As of December 2003, PPWSA's metering ratio was nearly 100%, unaccounted for water was 17% (compared with 45% in the loan covenant), staffing level was four per 1,000 connections (12 covenanted), average self-financing ratio was 94% (20% covenanted), debt service ratio was 2.6 (2 covenanted), and rate of return on net fixed assets was 2.0% (2% covenanted). The bill collection ratio for consumers, excluding government institutions and offices, was recorded at 99% (85% covenanted). Tariff collection from public institutions increased from KR1.5 billion in 1999 to KR5.5 billion in 2003. Accounts receivable improved to 26 days in 2003 from 110 days in 2001. Cumulative unpaid bills of the Ministry of Defense (KR1.3 million) and of MPP (KR300,000) were paid to PPWSA in October 2001. PPWSA's financial performance in 2003 was hurt by the advanced repayment of KR28.5 billion in principal of a World Bank loan, compared with the scheduled KR9.2 billion, following the request of central Government.

30. In June 1997, PPWSA introduced a new water tariff schedule with a water consumption block system, aiming to fully cover O&M costs. While the electricity tariff was raised in January 2000, water tariff adjustments were withheld, as new electricity tariff rates were not applied to PPWSA. In January 2001, however, tariffs were increased to an average of KR1,050/m³, up from KR840/m³. With this adjustment, PPWSA could recover the full costs of O&M and depreciation, and service its debts. The house connection fee was adjusted from KR450,000–750,000 to KR338,400–720,900 in June 1997. Further, a wastewater surcharge equivalent to 10% of the water bill has been collected since July 1997.

H. Consultants Recruitment and Procurement

31. Consultants were selected and engaged in accordance with ADB's *Guidelines on the Use of Consultants*. For Part A, 203 person-months of consulting inputs (32 from international and 171 from domestic consultants) were envisaged at appraisal. The consultants began their services in October 1997. The recruitment of the consultants took 12 months, twice as long as

estimated at appraisal, due mainly to unfamiliarity with procedures. Two amendments were made to the contract to extend the services of the team leader until project completion, and to adjust the inputs of consultants without changing the contract price. PPWSA asked to use unused loan funds (about \$90,000) for additional consulting services to update a computerized mapping system that it was using for planning, designing, and O&M of pipelines. ADB approved that request in February 2002. At project completion, the consultants had provided 120 person-months of consulting inputs (42 from international and 78 from domestic consultants). The shortening of the construction duration for the transmission mains from 42 months at appraisal to 21 months reduced the inputs of domestic consultants.

32. For Part B, 296 person-months of consulting inputs (70 from international and 226 from domestic consultants) were envisaged at appraisal. The contract was signed on 16 December 1997, and the consultants started their services in March 1998. Three amendments were issued for additional consulting services associated with the shift in the location of the pumping station and the extended construction period, and to accommodate incremental administration costs for the PMU. Consulting services subsequently were extended to 15 June 2003. At project completion, the drainage consultants had provided 307 person-months of consulting inputs (79 from international and 228 from domestic consultants). Consultants for institutional capacity building for DPWT and NIP were recruited under NORAD financing. Phase I of the program was implemented July 1997–June 2000, and Phase II July 2000–March 2002 under an amendment to the original contract executed in March 2000.

33. Procurement was in accordance with ADB's *Guidelines for Procurement*. Procurement under Part A comprised 10 packages, including 5 ICB, 2 international shopping, and 3 direct purchase packages. PPWSA laid distribution pipes in Chamcar Morn and Mean Chey by using force account. Delays in the procurement for the supply and installation of pipes for the water supply transmission mains contributed to the late start of construction works for this component. ADB initially agreed to separate bids for supply and for installation of ductile iron pipes (DCIP) for the transmission mains. However, ADB later requested only one package. As a result, the consultants had to revise the bid documents and redo the prequalification. ADB also requested that the use of steel pipes be allowed to widen the competition. This request was contrary to the recommendation of the consultants and PPWSA, who argued that steel pipes are unsuitable for the aggressive and unstable soil conditions in Phnom Penh. Eventually, DCIP and high density polyethylene pipes were used.

34. Procurement under Part B comprised 6 packages, including 1 ICB, 4 direct purchase, and 1 force account. OPEC Fund financed four of these packages (1 ICB, 2 direct purchase, and 1 force account), which were mostly for civil works in the BT main canal and the West TS canal.

I. Performance of Consultants, Contractors, and Suppliers

35. The performance of the water supply consultants was satisfactory, while that of the drainage consultants was partly satisfactory. The water supply consultants worked and coordinated well with the PPWSA PMU and the contractor, which led to the construction of the transmission mains and the distribution systems in Chamcar Morn and Mean Chey districts ahead of the contract schedule and within the budget. The drainage consultants could have provided better coordination and stricter supervision on the design. This could have minimized the errors in the design survey by the surveyors, which caused some of the delays in the rehabilitation of the main canals.

36. The contractors' performance was generally satisfactory. The contractor for the water supply component did well in completing the transmission mains 3 months earlier than the contractual date. Despite the traffic on the main roads and adverse weather conditions, the

contractor produced quality work. However, the contractor for the drainage component experienced significant delays in the rehabilitation of the main canals. The contractor had limited equipment and qualified personnel available, delaying the commencement of the works; and also faced difficult subsoil conditions. The contractor eventually was given an extension for the construction of the canals and the pumping station works to 31 March 2003. The contractor then provided more construction equipment, as well as reliable and qualified personnel, to finish the works within the new schedule.

37. The performance of the suppliers also was satisfactory. Suppliers delivered good quality pipe materials and equipment on time. DCIP supplied for the transmission mains used a technology that allowed fast jointing. The technology was appropriate for the soil condition in the project area, which is susceptible to shoring collapse during construction. This helped to reduce substantially the installation time for the transmission mains.

J. Performance of the Borrower and the Executing Agencies

38. Overall, the performance of the Borrower and EAs was satisfactory. PPWSA PMU was established in August 1996 with adequate staff and appropriate expertise. With strong support from PPWSA management, the PMU was highly effective in coordinating the water supply component. While PPWSA is new to ADB procedures, it has significant experience implementing projects funded by the World Bank, Japan International Cooperation Agency, and the Government of France. PPWSA successfully installed the distribution pipes in Chamcar Morn and Mean Chey districts using its own personnel. For Part B, DPWT established its PMU in July 1996. However, it was unable to manage effectively the implementation of the drainage component, particularly during construction, until organizational responsibilities and functions were delineated clearly. The capacity building provided DPWT with equipment, software, systems, procedures, manuals, and training to enable the organization to fulfill its responsibility for drainage, sewerage, and solid waste management for the city.

K. Performance of the Asian Development Bank

39. During project implementation—from September 1997 to June 2003—ADB dispatched 14 review missions, including the Inception Mission, Midterm Review Mission, and Special Loan Administration Mission. The review missions were effective and instrumental in resolving implementation issues. The Special Loan Mission intervened effectively to resolve the organizational problem of the DPWT PMU, which improved the implementation of the drainage component. The missions produced well-prepared aide-memoires, which presented records of discussions and recommendations for necessary actions to be taken by parties involved in the implementation of the Project. ADB's responses to PMUs' requests and inquiries were timely and without undue delays. Such positive responses resulted in the expansion of the distribution system to more district communities, as well as the provision of more O&M equipment to the EAs, within the project budget and timetable. Overall, ADB's performance was satisfactory.

III. EVALUATION OF PERFORMANCE

A. Relevance

40. During the 2 decades of war and conflicts that preceded project appraisal, the urban infrastructure in the country deteriorated severely. The Government recognized that the urban infrastructure, particularly the water supply and drainage systems, urgently needed to be rehabilitated to (i) restore economic development, (ii) improve the living conditions of the people, and (iii) reduce poverty. The Government's first Socioeconomic Development Plan (1996–2000) accorded high priority to the rehabilitation of the water supply and sanitation system in Phnom

Penh. The Project, which was in line with Government policy, was developed as an integral part of the overall water supply and drainage rehabilitation program in Phnom Penh. The Project was formulated in close consultation and collaboration with local development agencies, the community, and other funding agencies. The water supply component supported PPWSA's moves to improve its performance by reducing water losses, improving financial autonomy, rationalizing the tariff structure and levels, and improving collection efficiency. The construction of the transmission mains provided the vital link between the three water treatment plants and the distribution areas. Constructing the distribution system in Chamkar Morn district, rather than Toul Kork and Boeng Salang as originally planned, resulted in early utilization of the newly rehabilitated Chamkar Morn treatment plant with immediate benefits to the district residents. The installation of the Mean Chey distribution system, though not included in the Project at appraisal, increased the number of project beneficiaries by at least 65,000 people. Among the new beneficiaries were the urban poor of the Chbar Ampouv community. The drainage component, covering the rehabilitation of the main and secondary drains and pumping station in the largest catchment area of Phnom Penh, prevented severe flooding in more than 40% of the inner city. The capacity building for DPWT, funded by NORAD, complemented the physical improvements in the BT main canals and pumping station, and improved the inner city's environment. Additional equipment, tools, and software procured from loan savings towards the end of the Project enhanced the O&M capability of PPWSA and DPWT, which will help improve the sustainability of the Project. These changes during implementation increased the relevance of the Project, which is assessed as highly relevant.

B. Efficacy in Achievement of Purpose

41. The Project is assessed as highly efficacious. The immediate objectives of the Project were (i) helping PPWSA improve and expand access to a reliable, convenient, and potable water supply for existing and potential customers in the urban areas of Phnom Penh; and (ii) improving the environmental sanitation in the project area. Both were achieved. The full capacity of the treatment plants of 235,000 m³/day (80,000 m³/day at appraisal) can be distributed to the PPWSA service area with higher pressures and 24-hour supply, which can meet the demand up to 2007. PPWSA generates enough income to recover fully its O&M and depreciation costs due to significant improvement in technical and financial performance. The rehabilitation of the BT and TS canals, as well as the increased capacity of the pumping station, have prevented severe flooding in its catchment area. The duration of floods caused by intense rains has been reduced from 1–2 days to about 1 hour or less in most areas. In some areas without adequate secondary and/or tertiary drains, floods still take hours or even a day to recede.

42. The Government approved on 12 December 1996 a sub-decree granting operational autonomy to PPWSA. It also approved a new tariff, which was implemented starting June 1997. These two measures enhanced PPWSA's ability to improve its management and financial performance, and expand access to the remaining unserved areas of the inner city. The capacity building and NIP components, which complemented the physical improvement of the drainage system, significantly enhanced the institutional and management capacities of DPWT's Drainage and Sewerage Division and PPWM. The capacity building component provided maintenance and office equipment, conducted training programs, and developed accounting and billing software and operation manuals. NIP developed a workable community-based approach to solid waste management, and conducted community training for undertaking small-scale community infrastructure projects aimed at improving the immediate environment of residents.

C. Efficiency in Achievement of Outputs and Purpose

43. The Project's economic benefits are (i) cost savings and benefits associated with the improved water supply, (ii) reduced energy consumption and maintenance expenditure, (iii) increased land value due to the construction of the drainage system and associated service road, and (iv) reduced road maintenance costs due to mitigated flooding. The economic internal rate of return (EIRR) was calculated separately for the water supply and drainage components to assess the Project's economic efficiency. The economic analysis for the water supply component was based on the overall water supply rehabilitation program in Phnom Penh. The program increased the water supply capacity by 155,000 m³ per day and reduced unaccounted for water from 57% to 17%, which will enable about 1.1 million additional people in Phnom Penh (besides businesses, industries, and institutions) to receive piped water supply service.¹ PPWSA supplies about 160,000 m³ per day of the treated water to 940,000 people in Phnom Penh. The rehabilitation of the system reduced the unit water production cost by 8.2%. Land values around the rehabilitated main canals increased by 3.5–5.0 times, and the average road maintenance costs were reduced by \$18 per square meter per year for main roads and \$9 per square meter per year for secondary roads. Although health benefits were anticipated, they were not considered in the economic analysis, because reliable data was unavailable. In addition, those benefits might be captured partially in the willingness to pay and land value increases. At completion, the EIRRs for water supply and drainage components were 19.9% and 18.7%, respectively. Thus, the EIRRs were higher than the economic opportunity cost of capital in Cambodia, which was estimated at 12.0%. Appendix 8 provides details on the economic analysis.

44. The recalculated financial internal rate of return (FIRR) was 7.8%, higher than the appraisal estimate of 6.5% and the weighted average cost of capital for the Project of 4%. The higher FIRR was due mainly to PPWSA's success in reducing unaccounted for water, improving collection efficiency, and controlling costs (para. 29). PPWSA's overall financial performance was good with sufficient operating revenues to cover O&M expenses and depreciation during project implementation. PPWSA realized net income ranging from KR0.7 billion to KR 7.6 billion during 1996–2003, and had accumulated cash or cash equivalent of KR25.6 billion by the end of 2003. With current tariffs, PPWSA is likely to be able to repay its long-term debts from internally generated income. Appendix 9 presents the detailed financial analysis.

45. Based on this analysis, the Project is assessed as highly efficient.

D. Preliminary Assessment of Sustainability

46. Project facilities were completed generally in accordance with the required standards and specifications. They are considered to be of sufficient quality to ensure the continuous achievement of project benefits over the Project's economic life.

47. Headed by a strong and inspired leadership, PPWSA is staffed with a well trained, managed, motivated workforce consisting of 423 permanent staff and 114 contractors. In the past decade, PPWSA has built up its capacity and significantly improved its performance with support from external funding agencies. Its operating revenue is adequate to cover O&M costs and depreciation of its facilities. PPWSA manages the facilities well, generating outstanding technical and financial performance indicators (para. 29). PPWSA is highly likely to sustain its success and continue to manage the water supply services in Phnom Penh in a sustainable manner.

¹ Average water consumption is about 76 liters per capita per day for households without a direct connection, and about 120 liters per capita per day for those with a direct connection.

48. The rehabilitated canals and pumping station under the Project have worked well in the past 2 years. Since completion of the facilities, the BT catchment area has not experienced any serious flooding. However, the dumping of garbage into the canals threatens the sustainability of the benefits from Part B. Garbage is dumped despite regular collections by the solid waste management contractor. Due to the unpaved road in its catchment area, the mouth of the main canal leading to the BT retention pond is susceptible to sedimentation. Thus, regular dredging is required to ensure the free flow of storm and wastewater to the pond. Some illegal backfills and encroachment of informal settlers in the pond areas have reduced its retention capacity, threatening the effectiveness of flood regulation. Regular dredging and prevention of illegal garbage dumping and/or backfills and encroachments are needed for the pond to function properly. Regular system maintenance equipment has been purchased under the Project. However, a larger O&M budget is needed for DPWT to undertake more frequent maintenance, including those mentioned above. In addition, legislation to protect the drainage systems from illegal backfills or encroachment is critical to the long-term sustainability of the benefits. If these issues are not resolved, the sustainability of the drainage component of the Project is assessed as less likely.

49. On balance, the Project's sustainability is assessed as likely.

E. Environmental, Sociocultural, and Other Impacts

50. The Project produced environmental improvements, and did not have any significant adverse environmental impacts. The rehabilitation of the drainage canals and pumping station, which has mitigated flooding in the project area, substantially improved the urban environment. Detention in the BT pond and a larger retention pond downstream improved the quality of wastewater before it is discharged into the receiving water body at Cheung Aek. However, the Mission requested the Government to monitor closely the water quality at the Cheung Aek discharge point, and to assess the adequacy of treatment at the retention pond. NIP provided an example of solid waste management at the community level, complementing the efforts to keep the open canals clean and free from garbage. The success of the Project in the pilot sites could be replicated in the other sangkats and communities of the city.

51. The completion of the transmission mains linking the water treatment plants improved the distribution and reliability of the water supply around the city. The distribution system in Chamcar Morn and Mean Chey provided many urban poor families with access to piped water at lower cost. Access to affordable and reliable water means more water available for personal use, leading to health and hygiene benefits.

52. Adverse environmental impacts during project implementation were minor and temporary, as predicted during appraisal. The consultants for the two components designed proper mitigating measures for these impacts. Traffic rerouting, dust, and noise disturbances around the construction areas caused some inconvenience. Pipe laying along the roads was done in sections, and the efficient pace of work during construction shortened the interruption to those residing along the roads.

53. The construction of the pumping station required the resettlement of 13 families, while the improvement of the main canals added 28 more families for resettlement. The families agreed to be relocated to a resettlement area in Toul Sambo, 12 km from the canal construction site. The affected families along the canals were relocated in December 1999, while those from the pumping station site were relocated in August 2000. The resettlement site has been satisfactorily developed with adequate infrastructure, including access roads, community water wells, drainage system, electricity, primary school, etc.

54. The resettled families were compensated based on the resettlement plan approved by the Ministry of Economy and Finance and ADB. While the resettled families were satisfied with the relocation site, they requested more livelihood opportunities at the site. Proper management of solid waste collection and disposal also is needed, and the hand pumps require repair and maintenance as only three of nine are still working. The PCR mission requested that MPP assist the community in creating some livelihood improvement opportunities, and establishing a mechanism of community fundraising and mobilization of residents to maintain their clean environment. Appendix 10 presents a summary of the post-resettlement evaluation report.

IV. OVERALL ASSESSMENTS AND RECOMMENDATIONS

A. Overall Assessment

55. Despite initial delays, the Project generally was completed on time, and achieved its primary and secondary objectives. Based on ADB's five evaluation criteria (relevance, efficacy, efficiency, sustainability, and institutional and other development impacts), the Project is rated highly successful.² A detailed project performance assessment and project rating, based on Operations Evaluation Department's (OED) standard weighted rating system, are in Appendix 11.

B. Lessons Learned

56. Based on the preliminary assessment of the Project, the lessons learned are:

- (i) The accountability and autonomy of PPWSA, together with its strong leadership, were critical to the success of Part A of the Project.
- (ii) During project preparation, consultants should carefully assess conditions in project areas that are likely to be encountered during construction to achieve more realistic time schedules and durations.
- (iii) Consultants must monitor closely the performance of contractors, and advise the PMU early if corrective measures are needed to prevent construction delays.
- (iv) The track records of consultants and contractors should be evaluated and checked carefully to verify their ability to mobilize qualified staff and sufficient equipment and other resources to undertake contracted works well and within the specified duration.
- (v) Government staff assigned to a project should be trained before implementation to familiarize them with ADB guidelines and procedures for project implementation.
- (vi) The lines of authority and responsibilities of concerned agencies in project implementation must be clearly defined, the project participants (Borrower, EA, IA, PMU, contractors, and consultants) must be made aware of them at the start of a project. Appropriate decision-making authorities should be delegated to the PMU.

² This is based on a four-category scale (highly successful, successful, partly successful, and unsuccessful).

- (vii) ADB should provide timely advice to the EAs if changes are made in bidding packages and specifications to avoid unnecessary delays caused by revisions of bidding documents and redoing of the prequalification.

C. Recommendations

1. Project-Related

57. Project-related recommendations include:

- (i) DPWT should undertake regular maintenance and dredging of the BT canals and BT retention pond. MPP should ensure an adequate budget for this, as well as the O&M of the pumping station.
- (ii) DPWT should continue the public awareness campaign among residents living along the canals, the area surrounding the pumping station, and within the retention pond to prevent dumping of garbage in these areas.
- (iii) MPP should consider issuing an instruction or decree that will penalize acts that damage or destroy the drainage systems, including dumping of garbage, illegal backfills, and encroachment into the drainage systems.
- (iv) PPWM should consider expanding the NIP approach to other areas to help solve solid waste collection and disposal issues; and to undertake small-scale environmental infrastructure projects, including community drainage, water, and sanitation facilities.
- (v) MPP should prepare a follow-up income and/or livelihood restoration program for the relocated residents in the Toul Sambo resettlement site, which could include small tracts of agricultural land and basic skill training.
- (vi) MPP should assist the relocated residents in the Toul Sambo resettlement site in establishing a mechanism for community fundraising and mobilization of residents for proper management of solid waste collection and disposal, maintenance of the drainage system, and the community water wells.
- (vii) The Government should consider disseminating a study on the successful experiences of the PPWSA under the Project to other cities in the country, particularly the provincial towns that are rehabilitating their water supplies and sanitation systems with assistance from external funding agencies, including ADB.
- (viii) MPP should monitor closely the water quality at the wastewater discharge point, and take appropriate action when the detention of wastewater in existing ponds does not achieve the required quality standard improvements.
- (ix) MPP should consider follow-up projects to expand the benefits of the Project, particularly the drainage component. Follow-up projects could include constructing secondary and tertiary drains, dredging the retention ponds, and paving the road.

2. General

58. General recommendations are:

- (i) Efforts should be made to promote the accountability and autonomy of the water utilities as evidenced by the success of PPWSA.
- (ii) Livelihood improvement measures for relocated people should be included in, and form an integral part of, the resettlement plan.
- (iii) A public awareness campaign for sustaining the improved urban environment, particularly the drainage systems, should be continued after project implementation until good habits are established.

PROJECT FRAMEWORK

Design Summary	Appraisal Targets	Project Achievements	Monitoring Mechanisms	Key Issues and Recommendations
<p>Goal</p> <p>Improve human development and quality of life in Phnom Penh through:</p> <p>Improving the public health profile</p> <p>Improving the urban environment</p> <p>Contributing to economic growth</p> <p>Reducing poverty</p>	<p>Reduction of the incidence of waterborne diseases</p> <p>Cleaner urban environment</p> <p>Sustained growth and more employment</p> <p>Reduction of the percentage of the urban poor in the city</p>	<p>Waterborne diseases declined slightly after project completion</p> <p>Other achievements to be examined when statistical data become available 2 years after project completion</p>	<p>A socioeconomic survey conducted by PPWSA</p> <p>Health and socioeconomic statistics.</p>	<p>Monitoring of the project impacts needs to continue</p>
<p>Purpose</p> <p>Water Supply</p> <p>Improve service level of water supply in Phnom Penh</p> <p>Expand water supply to more urban residents</p> <p>Obtain financial and operational autonomy of PPWSA</p>	<p>Achieve 24-hour water supply with adequate pressure within the inner city districts by 2000, and for all connections by 2005</p> <p>Connect and supply 700,000 inhabitants by 2000 and 1.4 million inhabitants by 2005 in Phnom Penh</p> <p>PPWSA will be operationally and financially autonomous.</p>	<p>All connections are provided with 24-hour water supply and adequate pressure</p> <p>Population served reached 532,130 in 2000 and 912,580 in June 2004</p> <p>PPWSA is operationally and financially autonomous. No</p>	<p>BME</p> <p>Loan review missions</p> <p>Financial statements of PPWSA</p>	<p>Current production capacity of 235,000 m³/day is sufficient to meet demand until 2007</p> <p>Target of 1.4 million connected by 2005 might have been optimistic. Phnom Penh population is 1.3 million.</p>

Design Summary	Appraisal Targets	Project Achievements	Monitoring Mechanisms	Key Issues and Recommendations
<p>Maintain water tariffs at full cost recovery level</p> <p>Reduce connection fee to enhance access to the system</p>	<p>By 1997, PPWSA's tariff will be increased to the level for full recovery of O&M costs and depreciation</p> <p>By 1997, PPWSA's connection fees will be reduced by 50%</p>	<p>subsidy is provided</p> <p>Current tariff covers O&M costs and depreciation</p> <p>In 1997, connection fees were reduced by 50%. Current connection fees are between KR338,400 and KR720,900.</p>		
<p>Drainage</p> <p>Prevent flooding in Boeng Trabek area during the rainy season</p> <p>Improve managerial and operation efficiency of DPWT</p> <p>Increase public awareness of sanitation and public hygiene</p> <p>Encourage community participation in small-scale drainage and sewerage investment and maintenance</p> <p>Control long-run project maintenance cost</p>	<p>Eliminate severe floods in Boeng Trabek catchment area by 2002</p> <p>DPWT will develop and implement operational and financing plans</p> <p>Reduce solid waste dumped into the drainage system in a pilot area with a local community, NGO, and Government by 2000</p> <p>DPWT will generate sufficient revenues from wastewater</p>	<p>Boeng Trabek catchment area has not experienced severe and prolonged flooding since 2002</p> <p>DPWT is able to develop and implement operational and financing plans</p> <p>A workable community-based SWM system is in place, and solid waste dumped into the drainage system has been reduced significantly</p> <p>Communities were well mobilized. About 3,200 residents benefited from 65 small-scale community environmental improvement projects</p> <p>While wastewater surcharge has been collected since 2001,</p>	<p>DPWT's records</p> <p>Management Information System of DPWT</p> <p>NIP project reports</p>	<p>Secondary and tertiary drains are needed in some areas to maximize the Project's flood mitigation benefits</p> <p>Sufficient O&M budget should be for the entire drainage system</p> <p>Community-based SWM approach should be introduced in other areas</p> <p>A public awareness campaign should be continued, especially in areas along the open canals.</p>

Design Summary	Appraisal Targets	Project Achievements	Monitoring Mechanisms	Key Issues and Recommendations
Promote domestic resource mobilization for urban infrastructure development and maintenance	surcharge by 2000 to pay for O&M costs of the pumping station and the canal.	collection in 2003 was insufficient to cover O&M cost of the entire drainage system		
<p>Outputs</p> <p>Water Supply</p> <p>Installation of 15.6 km of transmission mains, supplying bulk water from the treatment plant to the distribution network</p> <p>Installation of 96 km of distribution network in Toul Kork and Boeng Salang areas</p> <p>Provision of institutional support equipment to PPWSA</p> <p>Drainage</p> <p>Rehabilitate and upgrade the drainage canals in Boeng Trabek and Toul Sen.</p> <p>Rehabilitate and upgrade the pumping station in the largest catchment area of Phnom Penh</p>	<p>Transmission mains will be completed before the end of 2000</p> <p>Distribution network will be completed before mid-2001</p> <p>Main canal will be completed before the end of 2001</p> <p>Toul Sen canal and secondary drains will be completed before mid-2001</p> <p>Pumping station will be completed before mid-2001</p>	<p>15.2 km transmission mains were installed before end of 2002</p> <p>86.28 km distribution pipes were installed in Chamcar Morn district before December 1999, and 64.79 km distribution pipes in Mean Chey district before June 2003</p> <p>Equipment delivered in June 1999, as originally envisaged</p> <p>The rehabilitation of Boeng Trabek main canal, the Toul Sen canal, and secondary drains were completed by December 2002</p> <p>The pumping station and spillway were rehabilitated and expanded with capacity of 8</p>	<p>Project progress reports</p> <p>BME</p> <p>Loan review missions</p> <p>Project progress reports</p> <p>BME</p> <p>Loan review missions</p>	<p>Transmission main design capacity can meet the demand for 2 million users.</p>

Design Summary	Appraisal Targets	Project Achievements	Monitoring Mechanisms	Key Issues and Recommendations
<p>With assistance from an NGO, organize local communities in the project area to participate in solid waste management, drainage network extension, and maintenance</p> <p>Provide institutional capacity building assistance to DPWT</p>	<p>NIP will start in 1998</p> <p>Key officials at DPWT will receive adequate training</p> <p>Officials at DPWT will be able to operate independently, according to the procedures established by consultant.</p>	<p>m³/s before March 2003</p> <p>NIP, Phase I started in July 1997 and was completed in June 2000. Phase II started in July 2000 and was completed in March 2002. A workable community-based SWM system was put in place, and 65 small-scale community environmental improvement projects were implemented</p> <p>88 officials were trained in English, computer use, computer-aided design, accounting and finance, land surveying, and sanitary engineering</p> <p>15 DPWT staff members were trained in planning and design of combined sewerage systems</p>	<p>NIP project reports</p>	<p>DPWT and PPWM staff should expand the community SWM model to other areas in the Boeng Trabek catchment</p> <p>DPWT should continue capacity building among its staff using the facilities, equipment, computers, software and manuals developed under the Project. MPP should provide funds for these activities</p>
<p>Activities and/or Inputs</p> <p>Water Supply</p> <p>Civil Works</p> <p>Equipment and materials</p> <p>Consulting Services</p>	<p>Resources and Schedule</p> <p>\$14.9 million January 1998–June 2001</p> <p>\$0.6 million January 1998–June 1998</p> <p>\$1.5 million March 1997–June 2001</p>	<p>Resources and Schedule</p> <p>\$5.3 million July 2000–June 2003</p> <p>\$9.0 million July 1997–June 1998</p> <p>\$1.2 million October 1997–June 2003</p>	<p>Project progress reports</p> <p>BME</p> <p>Loan review missions</p>	<p>Local conditions should be assessed carefully to ensure the time schedules for implementation are realistic</p>

Design Summary	Appraisal Targets	Project Achievements	Monitoring Mechanisms	Key Issues and Recommendations
<p>Activities and/or Inputs</p> <p>Drainage</p> <p>Civil Works - Rehabilitation of Boeng Trabek pumping station and drainage canals</p> <p>Equipment</p> <p>Consulting Services</p> <p>Capacity building and NIP</p>	<p>Resources and Schedule</p> <p>\$4.9 million October 1998–December 2002</p> <p>\$2.5 million (Part of procurement under civil works)</p> <p>\$2.7 million January 1998–December 2002</p> <p>\$3.0 million January 1998–December 2000</p>	<p>Resources and Schedule</p> <p>\$4.7 million June 2000–March 2003</p> <p>\$1.3 million (Part of procurement under civil works)</p> <p>\$2.4 million March 1998–June 2003</p> <p>\$4.6 million July 1997–March 2002</p>	<p>Project progress reports</p> <p>BME</p> <p>Review missions</p> <p>Project completion report and/or project performance audit report</p>	<p>As with the water supply comp</p> <p>onent, the drainage component did not allot enough time for design, and construction duration was overestimated</p> <p>Delays were caused by insufficient equipment and qualified personnel initially fielded by the contractor, as well as difficult subsoil conditions and adverse weather conditions</p>

PPWSA - Phnom Penh Water Supply Authority, BME – Benefit Monitoring Evaluation, km – kilometer, m³ - cubic meter, O&M - operation and maintenance, DPWT - Department of Public Works and Transport, MPP, NGO - nongovernment organization, SWM - solid waste management, NIP - Neighborhood Improvement Program, PPWM - Phnom Penh Waste Management Authority.

Sources:Project Completion Mission.

LIST OF WORKS PROPOSED AT APPRAISAL AND IMPLEMENTED

Description of Work	Unit	Appraisal Estimate	Works Executed
Part A: Water Supply			
Installation of transmission mains	km	15.6	15.6
Installation of distribution network in Toul Kork and Boeng Salang areas (installation instead in Chamcar Morn)	km	96.0	86.3
Installation of distribution network in Mean Chey (additional)	km	0.0	64.8
Provision of institutional support equipment to PPWSA	\$ million	0.47	0.48
Consulting services for design and supervision of construction	person-month	203.0	120.0
Part B: Drainage			
Rehabilitation and upgrading of Boeng Trabek main canal and Toul Sen canal and connected branches	km	3.5	3.5
Rebuilding the Boeng Trabek pumping station and spillway to a new capacity	m ³ /s	8	8
Provision of institutional capacity building assistance to DPWT, and neighborhood improvement program to develop and test a community-managed solid waste disposal and drainage development program in about 1,000 households within Boeng Trabek catchment	\$ million	3.0	4.6
Consulting services for design and supervision of construction	person-month	296.0	307.0

DPWT – Department of Public Works and Transport, km – kilometer, m³/s - cubic meter per second, PPWSA – Phnom Penh Water Supply Authority.

Source: Asian Development Bank estimates

PROJECT COSTS
(\$ Million)

Item	At Appraisal			Actual		
	Foreign	Local	Total	Foreign	Local	Total
A. Base Cost						
1. Part A - Water Supply	11.60	5.40	17.00	12.74	2.74	15.48
a. Civil Works	10.40	4.50	14.90	2.80	2.49	5.29
b. Equipment	0.50	0.10	0.60	9.02	0.00	9.02
c. Consulting Services	0.70	0.80	1.50	0.93	0.24	1.17
2. Part B - Drainage	9.00	4.00	13.00	10.40	2.59	12.99
a. Civil Works	3.40	1.50	4.90	3.57	1.16	4.73
b. Equipment	1.40	1.10	2.50	1.27	0.00	1.27
c. Consulting Services	1.60	1.10	2.70	1.99	0.38	2.37
d. Capacity Building and NIP	2.70	0.30	3.00	3.57	1.05	4.62
Subtotal (A)	20.60	9.40	30.00	23.14	5.34	28.48
B. Contingencies						
1. Physical ^a	1.80	0.50	2.30	0.00	0.00	0.00
2. Price ^b	2.00	0.70	2.70	0.00	0.00	0.00
Subtotal (B)	3.80	1.20	5.00	0.00	0.00	0.00
C. Service Charge During Construction	0.80	0.00	0.80	0.46	0.00	0.46
Total	25.20	10.60^c	35.80	23.60	5.34	28.94
Percent	70	30	100	82	18	100

NIP = neighborhood improvement program

^a Physical contingencies: civil works, 10%; equipment, 8%; consultant, 10%

^b Price contingencies: domestic inflation, 5%; foreign inflation, 2.4%

^c Including taxes and duties amounting to \$3.4 million (9.5% of project cost)

Source: Asian Development Bank estimates.

FINANCING PLAN BY SOURCE
(\$ million)

SOURCE	At Appraisal				At Completion			
	Foreign Exchange	Local Currency	Total Costs	Percent	Foreign Exchange	Local Currency	Total Costs	Percent
ADB	19.10	0.90	20.00	55.87	16.92	0.00	16.92	58.49
Cofinancing (OPEC Fund)	3.40	0.60	4.00	11.17	3.10	0.59	3.69	12.75
Cofinancing (NORAD)	2.70	0.30	3.00	8.38	3.57	1.05	4.62	15.97
Government	0.00	5.50	5.50	15.36	0.00	0.96	0.96	3.32
PPWSA	0.00	3.10	3.10	8.66	0.00	2.74	2.74	9.47
Local Communities	0.00	0.20	0.20	0.56	0.00	0.00	0.00	0.00
TOTAL	25.20	10.60	35.80	100.00	23.60	5.34	28.94	100.00

OPEC - Organization of Petroleum Exporting Countries, NORAD - Norwegian Agency for Development Cooperation, PPWSA - Phnom Penh Water Supply Authority
Source: Asian Development Bank estimates, Ministry of Public Work and Transport and PPWSA.

BREAKDOWN OF YEARLY DISBURSEMENTS OF ASIAN DEVELOPMENT BANK AND OPEC FUNDS
(\$ million)

Year	Quarter	ADB		OPEC		Total
		Amount	Cumulative	Amount	Cumulative	
1997	III	0.000	0.000	0.000		0.000
	IV	0.648	0.648	0.000		0.648
1998	I	0.252	0.900	0.000		0.252
	II	1.396	2.296	0.000		1.396
	III	0.300	2.596	0.000		0.300
	IV	0.094	2.690	0.000		0.094
1999	I	0.912	3.602	0.000		0.912
	II	0.163	3.765	0.000		0.163
	III	0.093	3.858	0.000		0.093
	IV	-0.151	3.707	0.000		-0.151
2000	I	0.072	3.779	0.000		0.072
	II	0.092	3.871	0.000		0.092
	III	0.449	4.320	0.469	0.469	0.918
	IV	2.231	6.551	0.000	0.469	2.231
2001	I	0.326	6.877	0.089	0.558	0.415
	II	3.036	9.913	0.000	0.558	3.036
	III	0.887	10.800	0.051	0.609	0.938
	IV	0.739	11.539	0.137	0.746	0.876
2002	I	0.824	12.363	0.055	0.801	0.879
	II	0.824	13.187	0.901	1.702	1.725
	III	1.392	14.579	0.600	2.302	1.992
	IV	0.604	15.183	0.264	2.566	0.868
2003	I	0.710	15.893	0.572	3.138	1.282
	II	0.464	16.357	0.178	3.316	0.642
	III	0.344	16.701	0.373	3.689	0.717
	IV	0.218	16.919			0.218
Total		16.919		3.689		20.608

ADB = Asian Development Bank, OPEC = Organization of Petroleum Exporting Countries.

Source: Asian Development Bank loan financial information system.

PROJECT IMPLEMENTATION SCHEDULE

Component	1996		1997				1998				1999				2000				2001				2002				2003	
	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
CAPITAL INVESTMENT																												
Water Supply - Transmission Mains																												
Design & Contract Documentation																												
Prequalify Contractor																												
Tender																												
Procurement & Construction Period																												
Water Supply - Distribution Mains																												
Tender (Chamcar Morn)																												
Supply of Pipes																												
Civil Works																												
Drainage - Canal and Pumping Station																												
Design & Contract Documentation																												
Prequalify Contractors																												
Tender																												
Procurement & Construction Period																												
SUPPORTING INVESTMENTS																												
Neighborhood Improvement Program																												
Design & Implement Pilot Program - Phase 1																												
Extend Program to Adjacent Areas - Phase 2																												
Consulting Services																												
Prequalify and Recruit Consultants																												
Water Supply Consultants																												
Drainage Consultants																												
Fielding of Consultants																												
Water Supply Component																												
Drainage Component																												
Project Management - PMUs																												
Institutional Support																												
Procurement of Equipment for PPWSA																												
Institutional Capacity Building for DPWT																												

DPWT = Department of Public Works and Transportation

PPWSA = Phnom Penh Water Supply Authority

^a Recruitment for Water Supply

^b Recruitment for Drainage

^c Recruitment for Nongovernment Organization

Source: Asian Development Bank estimates.

Planned

Actual

COMPLIANCE WITH LOAN COVENANTS

Covenants	Status
Project Implementation	
<p>1. The Borrower shall establish a Project Steering Committee before 31 December 1996, consisting of senior officials from the Borrower's Ministry of Economy and Finance, the Ministry of Planning, the Ministry of Public Works and Transportation, MPP, CDC, PPWSA and DPWT. The committee shall meet at least twice a year to review all aspects of project implementation, to provide policy guidance to the PMUs, and to decide on project-related issues, which the PMUs may present to the Steering Committee. [LA, Sch. 6, para. 1(d)]</p>	<p>Partially complied with. The PSC was established in August 1996. The first meeting was held on 29 April 1998. The PSC met again in March 1999. PSC did not convene any meetings in 2000 and 2001. However, staffs of the agencies concerned were consulted on project-related issues when the need arose.</p>
Financial Matters; Tariffs	
<p>2. The Borrower and PPWSA shall, before the Effective Date of this loan, implement the new tariff schedule as agreed to among the Borrower, PPWSA, and the Asian Development Bank (ADB), and thereafter maintain the tariff at a level that shall enable PPWSA to recover (i) the cost of operation and maintenance (O&M) by 31 December 1997, and (ii) the full costs of operation and maintenance, debt service, and depreciation by 31 December 2000. [LA, Sch. 6, para. 2]</p>	<p>Complied with. In June 1997, a consumption block system was introduced to set an average tariff of KR840/m³ to cover full cost of O&M. The average tariff was increased further in January 2001 to KR1,050 to cover full costs of O&M, debt service, and depreciation.</p>
<p>3. The Borrower shall cause PPWSA to reduce its connection fees by 50%, and such reduced fees shall be effective on the same date as that for the new tariff schedule under para. 2 of this schedule. [LA, Sch. 6, para. 3]</p>	<p>Partially complied with. The new connection fee was reduced by 50% in June 1997.</p>
<p>4. The Borrower shall take all measures needed to generate revenue from new sources to cover the O&M costs of the project facilities, including the levy of a wastewater surcharge, and land and property taxes. [LA, Sch. 6, para. 4]</p>	<p>Complied with. A water surcharge has been collected through the water bill since July 1997, and transferred to MPP. Local taxes and duties, such as for unused land, vehicles, slaughterhouses, patent, stamp, and alcohol have been levied since 1999.</p>

Covenants	Status
<p>5. The Borrower shall cause PPWSA to achieve by 31 December 2000 (i) a collection ratio of not lower than 85%; (ii) unaccounted for water of not more than 45%; (iii) full recovery of O&M costs, debt service, and depreciation; (iv) a staffing level of not more than 12 staff per 1,000 connections; (v) an average self-financing ratio of not less than 20%; (vi) a debt service ratio of not less than 2:1; and (vii) a rate of return on assets of not less than 2%. [LA, Sch. 6, para. 5(a)]</p>	<p>Complied with. As of December 2003, PPWSA had a collection ratio of 99%; unaccounted for water of 17%; a staffing level of 4 per 1000 connections; an average self-financing ratio of 94%; a debt service ratio of 2.6:1; and a return on net fixed assets of 2.0%. Financial performance is expected to improve further in the future.</p>
<p>6. The Borrower shall cause PPWSA to (i) install meters on all connections before 31 December 1997; (ii) establish and implement procedures for disconnection and dispute settlement; and (iii) formulate and implement a detailed program on leakage detection, and removal of unauthorized connections. [LA, Sch. 6, para. 5(b)]</p>	<p>Complied with. The metering ratio was 99.99% since December 2001. Items (ii) and (iii) are complied with.</p>
<p>7. The Borrower shall take all necessary measures, including the provision of budgetary resources to public entities, to enable PPWSA to collect water charges from all such public entities. [LA, Sch. 6, para. 6]</p>	<p>Complied with. PPWSA has issued two letters to all public institutions to include the projection for water consumption in their annual budget, and to pay for water bills. Tariff collection from public institutions increased from KR1.5 billion in 1999 to KR2.6 billion in 2000, KR3.03 billion in 2001, KR2.7 billion in 2002, and KR5.5 billion in 2003. Accounts receivable improved from 110 days in 2001 to 63 days in 2002 to 26 days in 2003.</p>
<p>8. The Borrower shall cause MPP, in consultation with PPWSA, to establish detailed billing and collection procedures before 31 December 1997. Such procedures shall include the wastewater surcharge described in para. 9 of Schedule 6 of the Loan Agreement. [LA, Sch. 6, para. 7]</p>	<p>Complied with. Computerized billing and collection system has been established and is operational. A 10% wastewater surcharge has been incorporated into the water bill since June 1997.</p>

Covenants	Status
Midterm Review	
9. The Borrower, MPP, and PPWSA shall carry out a midterm review of project implementation at the end of the second year after the Effective Date to evaluate progress of the Project, implementation procedures, benefit monitoring and evaluation (BME) activities, and performance of the PMUs and the consultants. [LA, Sch. 6, para. 8(a)]	Complied with. The midterm review was conducted from 13–24 Sep 1999.
10. The Borrower shall cause PPWSA to carry out, at the end of the second year of the Effective Date a midterm review of its tariff policies, including the structure and level of the tariff, connection fees, and feasibility of introducing a credit system for payment of connection fees for the benefit of low-income households, particularly those headed by women. [LA, Sch. 6, para. 8(b)]	Complied with. New tariff was introduced in January 2001. Connection fee was reduced by 50% in 1997. A credit system for payment of connection fee for low-income households was set up, and its implementation started in February 1999.
11. The Government shall ensure that BME systems will be developed under the Project for PPWSA and DPWT to ensure that the Project shall be implemented and operated as designed. [LA, Sch. 6, para. 9]	Complied with. BME reports with baseline data were submitted in August 1999 for Parts A and B followed by reports for 2000 and 2001. Final BME reports for 2002 were submitted in February 2003 for Part B, and in October 2003 for Part A.
Wastewater Measures	
12. The Borrower shall approve, not later than 31 December 1998, a decree authorizing a wastewater surcharge equivalent to not more than 10% of the water tariff, which shall be added to each user's water bill. [LA, Sch. 6, para. 10]	Complied with. PPWSA is collecting 10% wastewater surcharge, which has been included in the water bill since July 1997 under the authority given by MPP in its Letter No. 133 dated 18 July 1997.

Covenants	Status
Implementation	
<p>13. The Borrower shall cause MPP and PPWSA to include plans for mitigating traffic congestion and noise caused by project implementation, as well as for worker safety, in the design of the Project; and shall ensure that such plans are implemented subsequently. Such plans shall be reviewed and approved by the Department of Environment of MPP. [LA, Sch. 6, para. 11]</p>	<p>Complied with. Department of Environment was invited to discuss construction plans for Parts A and B.</p>
<p>14. The Borrower and MPP shall prepare, not later than 31 December 1997, a detailed time-bound plan acceptable to ADB for relocating the families living near the Boeng Trabek pumping station, which shall include adequate compensation for such families, and the option to return to their original home sites upon completion of the construction. The Borrower and MPP shall complete relocation of such families in accordance with the plan before construction commences. [LA, Sch. 6, para. 12]</p>	<p>Partially Complied with. ADB approved the relocation plan, which covered 28 families affected by construction of drainage canals and 13 by rebuilding of the pumping station in June 2000. While the resettlement was generally undertaken based on the approved resettlement plan, 28 families affected by construction of drainage canals were relocated in December 1999, before the approval of the resettlement plan. The PMU submitted in October 2003 a post-evaluation report on the resettlement.</p>
Project Agreement	
<p>15. MPP and PPWSA shall take out and maintain with responsible insurers, or make other arrangements satisfactory to ADB, for insurance of project facilities and the goods to be imported to such extent and against such risks and in such amounts as shall be consistent with sound practice. [Project Agreement, para 2.05]</p>	<p>Complied with. Provisions for insurance of imported goods were included in bid documents prepared under the Project.</p>
<p>16. MPP and PPWSA shall furnish to ADB quarterly reports on the execution of their respective parts of the Project, and on the O&M of the project facilities. [Project Agreement, Section 2.08(b)]</p>	<p>Complied with.</p>

Covenants	Status
<p>17. Promptly after physical completion of the Project, but in any event not later than 3 months thereafter, MPP and PPWSA shall prepare and furnish to ADB a report, in such form and in such detail as ADB shall reasonably request, on the execution and initial operation of the Project, including its cost, the performance by MPP and PPWSA of their respective obligations under this Project Agreement, and the accomplishment of the purposes of the loan. [Project Agreement, Section 2.08(c)]</p>	<p>Complied with for PPWSA. The PCR was received on 22 April 2003.</p> <p>MPP submitted the PCR in June 2003.</p>
<p>18. MPP and PPWSA shall (i) maintain separate accounts for their respective parts of the Project, and for their respective overall operations; (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 whose qualifications, experience and terms of reference are acceptable to ADB; (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 the auditors relating thereto (including the auditor's opinion on the use of the loan proceeds and compliance with the covenants of this Loan Agreement, as well as on the use of the procedures for imprest account and statement of expenditures), all in the English language. [Project Agreement, Section 2.09]</p>	<p>Complied with. Financial statements are prepared and audited annually by a private auditing firm.</p>

BME – Benefit and Monitoring Evaluation, CDC - community development committee, DPWT - Department of Public Works and Transport, MPP, MPP - Municipality of Phnom Penh, O&M - operation and maintenance, PMU - project management unit, PPWSA - Phnom Penh Water Supply Authority, , PSC - Project Steering Committee,

Source: PPWSA - Phnom Penh Water Supply Authority and Phnom Penh Waste Management Authority.

ECONOMIC ANALYSIS

A. General

1. To assess the economic efficiency of the Phnom Penh Water Supply and Drainage Project (the Project) at completion, an economic analysis was carried out following the Asian Development Bank's (ADB's) *Guidelines for the Economic Analysis of Projects* (1997) and *Guidelines for the Economic Analysis of Water Supply Projects* (1998). The economic analysis was conducted separately for water supply and drainage components over 30 years. Since the water supply component of the Project is an integral part of Phnom Penh's overall water supply rehabilitation program, the economic analysis for the component was based on the total costs and benefits of the rehabilitation program.

B. Project Scenarios

2. The "without project" scenario was rebuilt based on historical records, discussions with Phnom Penh Water Supply Authority (PPWSA) and Department of Public Works and Transport (DPWT), and field visits and the survey done by the Project Completion Report (PCR) Mission. Due to the aging of and poor maintenance of the system, the without project scenario assumed that (i) water production capacity will decline by 1% per year, (ii) unaccounted for water (UFW) will increase by 0.5% per year, and (iii) drainage and sanitation conditions around the Boeng Trabek and Toul Sen areas would not change. The "with project" scenario was based on the recorded results at project completion. With the Project, water production capacity increased by 155,000 cubic meters (m³) per day and UFW dropped significantly to 17%. Meanwhile, drainage and sanitation improvements reduced flooding in its catchment area, enabling some economic development around the rehabilitated canal areas.

C. Costs

3. The capital costs and incremental operation and maintenance (O&M) costs were considered. The unit O&M costs for without and with project scenarios were estimated using the O&M costs before and after the Project. All costs are expressed in constant 2004 prices. To convert the financial costs to the economic costs, taxes and duties as well as loan service charges were discounted, as appropriate. Tradable components were adjusted using a shadow exchange rate factor,¹ while non-tradable components were valued at domestic market prices. A shadow wage rate factor for unskilled labor was used to reflect its opportunity costs in the context of a wide availability of unskilled labor in Cambodia.²

D. Benefits

4. The rehabilitation increased PPWSA's water production capacity by 155,000 m³ per day, and reduced UFW from 57% to 17%. The drainage component of the Project reduced the flooding in more than 40% of the inner city of Phnom Penh, enabling some economic development around the rehabilitated canal areas. As a result, PPWSA provided about 80,500 m³ per day of additional water in 2003 to (i) 76,000 households through house connections; and (ii) nondomestic users, who otherwise might have gotten water from other sources, such as wells, rivers, private vendors, or neighbors.³ The major economic benefits of the water supply component of the Project considered in the economic analysis were cost savings and benefits

¹ The shadow exchange rate factor is estimated at 1.11.

² The shadow wage rate factor is estimated at 0.75.

³ Compared with the without project scenario. The estimates for 2004 show quick increases of the figures.

associated with the improved water supply, and reductions in energy consumption and maintenance expenditures. The major economic benefits of the drainage improvement component of the Project considered in the analysis were increased land values associated with improved drainage and sanitation conditions, and lower maintenance costs for the roads in the catchment area.

5. Quantifiable economic benefits of improved water supply resulted from nonincremental and incremental water supply. For domestic users, nonincremental water supply was valued at the average supply price from nonpiped sources, which was about KR1,700 per m³. Incremental water supply was valued at an average demand price of about KR1,230 per m³. The volumes of nonincremental and incremental water supply for domestic users were estimated based on the socioeconomic survey done at appraisal, as well as the Project's benefit monitoring and evaluation reports. For nondomestic users, identifying nonincremental and incremental water usage, and supply costs for nonincremental water without the Project, was difficult. Thus, water supply for nondomestic users was valued at its current selling price, which is normally lower than the supply price for nonincremental water and the demand price for incremental water. Moreover, the socioeconomic survey at appraisal and the survey completed by the PCR Mission showed that households without piped connections were equipped with water storage facilities, such as water tanks and jars. Those households had to spend about 30 minutes a day fetching water from other sources. The around-the-clock stable water supply service provided by the Project enabled households to get rid of water storage facilities and save time once spent to fetch water. The benefits from water transportation and storage cost savings were estimated at KR85,000 per household per year, while the benefits from time savings were estimated at KR68,000 per household per year.

6. The benefits associated with reduced energy consumption and maintenance expenditures were already captured in the lower O&M costs. Therefore, they were not listed separately in the Project's benefits calculation.

7. The rehabilitation of the drainage and sewerage canals in Boeng Trabek and Toul Sen reduced the flooding in its catchment area, lowering road maintenance costs. The rehabilitated canals, together with its service road, helped stimulate economic activities in adjacent areas. A conservative estimate based on the survey by DPWT showed that land values increased by 4.0–5.0 times along the main canals during project implementation. In addition, the appraisal report estimated that the average road maintenance costs would decline by \$18 per meter per year for main roads and by \$9 per meter per year for the secondary roads in the catchment areas. The details used in calculating benefits associated with the land value increase are summarized in Table A8.1.

Table A8.1: Land Value Increase Resulting from the Project

Location	Land Area (ha)	Land Value (\$ per m ² , 2004 price level)	
		Without Project	With Project
Along the Main Drain	8.3	46	117

ha = hectare, m² = square meter.

Source: Department of Public Works and Transport estimates.

E. Results of the Economic Analysis

8. The results of the economic analysis are summarized in Tables A8.2, A8.3a, and A8.3b. The recalculated Economic Internal Rate of Return (EIRR) is 19.9% for the water supply component and 18.7% for the drainage component of the Project. Both are higher than the

economic opportunity cost of capital in Cambodia, which is estimated at 12.0%. The net present value is about \$39.5 million for the water supply component and \$5.1 million for the drainage component. The sensitivity analysis shows that the both EIRRs are more vulnerable to the benefits reduction—a 10.0% reduction in project benefits would reduce the EIRR for the water supply component to 17.8% and for the drainage component to 16.8%. The calculated switching values are 328.5% for O&M cost increase and 35.5% for benefits decrease for water supply. For the drainage component, the calculated switching values are 324.3% for O&M cost increase and 33.0% for benefits decrease. These are all beyond the plausible ranges of variability of the tested variables.

Table A8.2: Results of the Economic Analysis

Components	Item	Base Case	Sensitivity Tests	
			O&M Costs (+ 10%)	Benefits (– 10%)
Water Supply	EIRR (%)	19.9	19.7	17.8
	NPV (\$ million)	39.5	38.3	28.4
	SI		0.3	2.8
	SV (%)		328.5	35.5
Drainage	EIRR (%)	18.7	18.5	16.8
	NPV (\$ million)	5.1	4.9	3.5
	SI		0.3	3.0
	SV (%)		324.3	33.0

EIRR = economic internal rate of return, NPV = net present value, O&M= operation and maintenance, SI = sensitivity indicator, SV = switching values.

Source: Asian Development Bank estimates.

Table A8.3a: Summary of Economic Internal Rate of Return—Water Supply Component
(\$ million, 2004 price level)

Year	Economic Cost		Gross Economic Benefits				Net Economic Benefits
	Capital	O&M	Water Collecting and Storing Cost Savings	Substituting Nonincremental Water Supply	Incremental Water Supply	Total	
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	11.5	0.4	0.5	1.5	0.5	2.5	(9.5)
1998	18.2	0.5	0.4	1.2	0.4	2.1	(16.7)
1999	6.4	0.6	0.8	2.4	0.8	4.1	(2.9)
2000	11.2	0.5	1.7	4.7	1.6	8.0	(3.6)
2001	13.8	0.4	1.6	4.7	1.6	7.9	(6.3)
2002	20.0	0.7	2.1	6.0	2.1	10.2	(10.5)
2003	21.1	1.0	2.9	8.2	2.8	14.0	(8.1)
2004	7.5	1.8	3.8	10.7	3.7	18.2	8.9
2005	0.0	2.4	4.8	13.5	4.6	22.9	20.5
2006	0.0	2.9	5.5	15.6	5.3	26.5	23.6
2007	0.0	3.4	6.3	17.8	6.1	30.1	26.6
2008	0.0	3.5	6.3	17.8	6.1	30.2	26.7
2009	0.0	3.5	6.3	17.9	6.1	30.3	26.8
2010	0.0	3.5	6.3	17.9	6.1	30.4	26.9
2011	0.0	3.5	6.4	18.0	6.2	30.5	27.0
2012	0.0	3.5	6.4	18.1	6.2	30.6	27.1
2013	0.0	3.5	6.4	18.1	6.2	30.7	27.2
2014	0.0	3.6	6.4	18.2	6.2	30.8	27.3

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Year	Economic Cost		Gross Economic Benefits				Net Economic Benefits
	Capital	O&M	Water Collecting and Storing Cost Savings	Substituting Nonincremental Water Supply	Incremental Water Supply	Total	
2015	0.0	3.6	6.4	18.2	6.2	30.9	27.3
2016	0.0	3.6	6.5	18.3	6.3	31.0	27.4
2017	0.0	3.6	6.5	18.3	6.3	31.1	27.5
2018	0.0	3.6	6.5	18.4	6.3	31.2	27.6
2019	0.0	3.6	6.5	18.5	6.3	31.3	27.6
2020	0.0	3.6	6.5	18.5	6.3	31.4	27.7
2021	0.0	3.7	6.5	18.6	6.3	31.5	27.8
2022	0.0	3.7	6.6	18.6	6.4	31.5	27.9
2023	0.0	3.7	6.6	18.6	6.4	31.6	27.9
2024	0.0	3.7	6.6	18.6	6.4	31.6	27.9
2025	0.0	3.7	6.6	18.7	6.4	31.6	27.9
NPV	59.8	12.0	23.2	65.7	22.5	111.4	39.5
EIRR							19.9%

EIRR = economic internal rate of return, NPV = net present value, O&M = operation and maintenance.

Source: Asian Development Bank estimates

Table A8.3b: Summary of Economic Internal Rate of Return—Drainage Component
(\$ million, 2004 price level)

Year	Economic Cost		Gross Economic Benefits			Net Economic Benefits
	Capital	O&M	Road Maintenance Savings	Land Value Increase	Total	
1996	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.6	0.0	0.0	0.0	0.0	(0.6)
1998	1.8	0.0	0.0	0.0	0.0	(1.8)
1999	3.1	0.0	0.0	0.0	0.0	(3.1)
2000	4.4	0.0	0.0	0.0	0.0	(4.4)
2001	3.4	0.0	0.0	0.0	0.0	(3.4)
2002	1.4	0.3	0.0	0.0	0.0	(1.8)
2003	0.5	0.4	3.7	5.9	9.6	8.8
2004	0.0	0.4	3.7	0.0	3.7	3.3
2005	0.0	0.4	3.7	0.0	3.7	3.3
2006	0.0	0.4	3.7	0.0	3.7	3.3
2007	0.0	0.4	3.7	0.0	3.7	3.3
2008	0.0	0.4	3.7	0.0	3.7	3.3
2009	0.0	0.4	3.7	0.0	3.7	3.3
2010	0.0	0.4	3.7	0.0	3.7	3.3
2011	0.0	0.4	3.7	0.0	3.7	3.3
2012	0.0	0.8	3.7	0.0	3.7	2.9
2013	0.0	0.4	3.7	0.0	3.7	3.3
2014	0.0	0.4	3.7	0.0	3.7	3.3
2015	0.0	0.4	3.7	0.0	3.7	3.3
2016	0.0	0.4	3.7	0.0	3.7	3.3
2017	0.0	0.4	3.7	0.0	3.7	3.3
2018	0.0	0.4	3.7	0.0	3.7	3.3
2019	0.0	0.4	3.7	0.0	3.7	3.3
2020	0.0	0.4	3.7	0.0	3.7	3.3

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Year	Economic Cost		Gross Economic Benefits			Net Economic Benefits
	Capital	O&M	Road Maintenance Savings	Land Value Increase	Total	
2021	0.0	0.4	3.7	0.0	3.7	3.3
2022	0.0	0.4	3.7	0.0	3.7	3.3
2023	0.0	0.8	3.7	0.0	3.7	2.9
2024	0.0	0.4	3.7	0.0	3.7	3.3
2025	0.0	0.4	3.7	0.0	3.7	3.3
NPV	8.7	1.6	13.0	2.4	15.4	5.1
EIRR						18.7%

EIRR = economic internal rate of return, NPV = net present value, O&M = operation and maintenance.
Source: Asian Development Bank estimates.

FINANCIAL ANALYSIS AND ASSESSMENTS

A. General

1. A financial analysis was conducted to determine the financial viability and sustainability of the water supply component of the Phnom Penh Water Supply and Drainage Project (the Project) at completion, following the *Guidelines for Financial Governance and Management of Investment Project Financed by the Asian Development Bank*. The analysis had two parts: (i) project financial analysis for the water supply component, which aimed to calculate a financial internal rate of return (FIRR); and (ii) assessment of the financial performance of the Phnom Penh Water Supply Authority (PPWSA).

B. Major Assumptions

2. Since the water supply component of the Project is an integral part of Phnom Penh's overall water supply rehabilitation program, the project financial analysis for the component was based on the costs and benefits of the entire rehabilitation program. The project financial analysis applied to the incremental capital and operation and maintenance (O&M) costs and revenues under the rehabilitation program, not to PPWSA's entire operations. The analysis was based on the same with and without project scenarios described in the economic analysis (Appendix 8). The major assumptions applied in the project financial analysis are (i) the analysis is conducted over 25 years, from 1996 to 2020; (ii) the project-induced incremental revenues and costs are expressed in US dollars, in constant 2004 prices; (iii) the costs—including capital, O&M, and replacement costs—are recorded in the year they incurred; and (iv) the equipment components have a life of 12 years with 20% residual value, while civil works have a life of 40 years with no residual value. The financial performance assessment of PPWSA was based on its audited financial reports for its operations in 1997–2003. The income statement, balance sheet, and cash-flow statement were presented in Cambodian riels and expressed in current prices.

C. Water Tariff

3. At appraisal, the average water tariff for domestic and government and institutional users were KR250 per cubic meter (m^3). For industrial and commercial users, the average tariff was KR700 per m^3 . During project implementation, the average water tariffs increased gradually to allow PPWSA full cost recovery from operations. In 2004, the average water tariffs were (i) KR770 per m^3 for domestic users, (ii) KR1030 per m^3 for government and institutional users, and (iii) KR1,400 per m^3 for industrial and commercial users. Since the current levels of tariffs have ensured full cost recovery of PPWSA's operations, another tariff increase is not planned in the near future.

D. Project Financial Analysis

4. The results of the project financial analysis for the water supply component are presented in Table A9.1 and Table A9.5. The FIRR for the water supply component was 7.8%, which was higher than the appraisal estimate of 6.5% and the estimated weighted average cost of capital (WACC) of 4.0%. The higher FIRR was due mainly to the PPWSA's success in reducing unaccounted for water, improving the collection efficiency, and controlling the costs. Unaccounted for water is now about 17%, less than half the assumption of 35% at appraisal. The collection efficiency is about 98%, better than the appraisal estimate of 85%. Staff per 1,000 connections is 4.0, a third of the appraisal estimate of 12.0. The sensitivity analysis indicated that the FIRR is more vulnerable to a decrease in revenues than an increase in O&M costs. A 10% decrease in revenues will reduce the FIRR to 6.1%. The calculated switching values are 88.7% for an O&M cost increase and 21.9% for a revenue decrease, which are beyond the plausible ranges of variability of the tested variables.

Table A10.1: Results of the Project Financial Analysis

Item	Base Case	Sensitivity Tests	
		O&M Costs (+ 10%)	Benefits (- 10%)
FIRR (%)	7.8	7.4	6.1
NPV at WACC (Mn \$)	30.1	26.7	16.3
SI		1.1	4.6
SV (%)		88.7	21.9

FIRR = financial internal rate of return, NPV = net present value, O&M = operation and maintenance, SI = sensitivity indicator, SV = switching value, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates

E. Assessment of Financial Performance the Water Supply Company

5. PPWSA has shown increasing net incomes, ranging from KR0.73 billion in 1998 to KR 7.61 billion in 2003. The returns on fixed assets and the returns on equity vary from 0.5% to 2.0% during the assessment period. Table A9.2 summarizes PPWSA's income statement.

Table A9.2: Summary of Income Statements
(KR billion)

Item	1997	1998	1999	2000	2001	2002	2003
Operating Incomes							
Water sales	13.82	20.48	23.18	26.38	31.14	37.02	47.62
Other incomes	0.26	0.00	(0.16)	2.09	3.26	3.54	1.86
Total Operating Incomes	14.08	20.48	23.02	28.47	34.40	40.56	49.48
Operating Expenses							
Depreciation	3.62	6.43	7.68	8.45	8.49	10.44	14.45
Interest expense	0.00	0.33	1.37	2.26	5.36	7.81	7.22
Cost of water production	3.90	4.30	4.71	4.69	5.13	6.29	6.79
Salaries, wages, and related expenses	1.46	3.43	2.86	2.70	3.24	3.67	4.50
Cost of materials	1.29	3.06	2.52	3.11	2.95	4.03	4.55
Repairs and maintenance	0.48	0.97	0.76	0.97	0.77	0.52	0.55
Taxes and duties	0.00	0.21	0.01	0.02	0.02	0.03	0.02
Other incentives						0.36	
Other expense	1.95	0.83	1.21	1.88	1.25	1.14	1.69
Total Operating Expenses	12.70	19.55	21.12	24.07	27.22	34.27	39.77
Profit Before Tax	1.38	0.93	1.90	4.40	7.19	6.29	9.71
Profit tax	0.00	0.20	0.38	0.93	1.43	1.24	2.10
Net Profit For The Year	1.38	0.73	1.52	3.47	5.75	5.05	7.61
Return on Net Fixed Assets (%)	0.5	0.8	1.4	1.6	1.8	1.8	2.0
Return on Equity (%)	0.5	0.7	1.4	1.8	2.0	1.9	2.0

Source: Audited financial reports of PPWSA and staff estimates.

6. The PPWSA's balance sheet shows PPWSA's strong liquidity position, with current ratios (current assets to current liabilities) ranging from 1.4 to 6.7 in 1997–2003. The debt-equity ratios ranged from 0.1 to 0.6, with long-term debt-equity ratios from 0.1 to 0.4. A summary of the balance sheet is in Table A9.3.

Table A9.3: Summary of Balance Sheets
(KR billion)

Item	1997	1998	1999	2000	2001	2002	2003
Assets							
Non-current assets	245.81	248.42	252.67	262.38	312.73	340.46	439.86
Property, plant, and equipment	245.81	248.42	252.67	262.38	312.73	340.46	439.86
Current assets	17.15	25.85	37.38	58.80	65.38	80.75	59.35
Inventories	6.55	8.92	14.20	13.49	16.25	18.88	19.44
Trade receivables	3.61	2.98	3.21	3.73	4.46	5.71	2.51
Advances receivables	0.45	0.21	0.86	11.95	8.12	2.38	0.71
Accrued income	0.00	2.50	2.46	6.03	5.28	5.69	9.64
Bank interest receivables	0.00	0.00	0.00	0.00	1.20	1.24	0.35
Receivable from the state	0.78	0.78	0.41	0.41	0.41	0.41	0.41
Other current assets	0.32	0.89	0.30	1.04	0.46	0.62	0.73
Cash and cash equivalents	5.43	9.57	15.93	22.14	29.19	45.82	25.55
Total assets	262.96	274.27	290.05	321.18	378.10	421.21	499.21
Equity and Liabilities							
Capital and reserves	250.31	251.02	257.49	261.78	267.34	272.38	378.65
Capital stock	249.07	249.63	255.31	257.34	258.32	258.32	357.51
Reserves	1.24	1.39	2.18	4.43	9.01	14.06	21.14
Non-current liability	7.52	19.39	24.37	47.78	94.38	92.36	94.34
Long-term liability	7.15	14.27	22.34	43.65	86.20	79.94	84.05
Retirement fund reserve	0.00	0.00	0.00	0.00	0.28	0.53	0.97
Government grant	0.00	3.25	0.00	0.00	0.22	2.79	0.20
Exchange rate difference	0.00	1.49	2.03	4.13	7.67	9.10	9.12
Other long-term liability	0.37	0.37	0.00	0.00	0.00	0.00	0.00
Current liability	5.12	3.86	8.18	11.63	16.38	56.47	26.21
Accounts payable-suppliers	3.04	(0.42)	1.21	1.23	1.72	2.82	1.59
Refundable water deposit	1.21	2.12	3.14	3.85	4.34	5.26	6.93
Taxes payable	0.08	1.79	3.41	1.79	1.97	3.25	2.85
Deferred credit	0.26	0.28	0.32	0.80	0.76	0.27	0.00
Other payables	0.52	0.09	0.10	3.96	7.59	12.09	5.85
Current maturity of long term liabilities	0.00	0.00	0.00	0.00	0.00	32.79	9.00
Total equity and liabilities	262.96	274.27	290.05	321.18	378.10	421.21	499.21
Current Ratio	3.35	6.70	4.57	5.06	3.99	1.43	2.26
Debt-Equity Ratio	0.05	0.09	0.13	0.23	0.41	0.55	0.32
Long-Term Debt-Equity Ratio	0.03	0.08	0.09	0.18	0.35	0.34	0.25

Source: Audited financial reports of PPWSA and Asian Development Bank estimates.

7. PPWSA recorded net cash inflow from 1997 to 2002. However, prepayment of its long-term debt created a negative inflow in 2003. The self-financing ratio increased from

27% in 1998 to 94% in 2003. Despite the prepayment of its long-term debt in 2003, the authority still recorded an accumulated net cash equivalent of about KR25.6 billion at the end of 2003. Table A9.4 summarizes the PPWSA's cash flow statements.

Table A9.4: Summary of Source and Application of Funds
(KR billion)

Item	1997	1998	1999	2000	2001	2002	2003
Cash flows from operating activities							
Net cash from operating activities	(1.74)	1.88	8.62	0.28	19.85	24.04	16.32
Cash flows from investing activities							
Purchase of fixed assets	(249.43)	(9.55)	(73.97)	(18.17)	(59.21)	(38.18)	(14.69)
Proceed from sale of fixed assets	0.00	0.00	61.43	0.00	0.00	0.00	0.00
Government grants	0.00	3.25	(3.25)	0.00	0.09	2.57	(2.68)
Net cash used in investing activities	(249.43)	(6.30)	(15.79)	(18.17)	(59.12)	(35.61)	(17.36)
Cash flows from financing activities							
Proceeds from long-term liability	7.52	7.12	7.70	21.31	42.68	26.53	13.28
Repayment of loans	0.00	0.00	0.00	0.00	0.00	0.00	(32.96)
Exchange rate difference	0.00	1.49	0.54	2.10	3.54	1.43	0.02
Proceeds from capital stock	249.07	0.56	5.67	2.03	0.98	0.00	0.00
Retirement fund reserve	0.00	(0.61)	(0.38)	(1.34)	(0.89)	0.24	0.44
Net cash used in financing activities	256.59	8.56	13.53	24.10	46.31	28.20	(19.22)
Increase in cash and cash equivalents	5.43	4.14	6.36	6.21	7.05	16.63	(20.26)
Self-Financing Ratio (%)	—	27	31	39	54	76	94
Cash and cash equivalents at the start of the year	0.00	5.43	9.57	15.93	22.14	29.19	45.82
Cash and cash equivalents at the end of the year	5.43	9.57	15.93	22.14	29.19	45.82	25.55

— = not available, () = negative.

Source: Audited financial reports of PPWSA and staff estimates.

8. Overall, the financial performance of PPWSA was sound. Its performance is likely to improve in the future with increasing utilization of the expanded water treatment and transmission capacity produced from the past investments. The capacity is not fully utilized at present.

Table A9.5 Summary of Financial Internal Rate of Return Calculation
(\$ million)

Year	Financial Cost		Revenue	Net Revenue
	Capital	O&M		
1996	0.0	0.0	0.0	0.0
1997	9.4	0.4	2.3	(7.6)
1998	15.2	0.6	0.9	(14.8)
1999	5.4	0.6	2.7	(3.3)
2000	9.8	0.5	5.4	(4.9)
2001	12.5	0.5	3.4	(9.5)
2002	18.6	0.7	5.5	(13.8)
2003	19.7	1.1	7.9	(12.9)

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Year	Financial Cost		Revenue	Net Revenue
	Capital	O&M		
2004	7.4	1.8	9.9	0.7
2005	0.0	2.5	12.3	9.8
2006	0.0	3.0	13.2	10.1
2007	0.0	3.6	14.7	11.1
2008	0.0	3.6	13.0	9.4
2009	2.7	3.6	13.0	6.7
2010	1.0	3.7	13.1	8.5
2011	2.0	3.7	13.1	7.5
2012	1.0	3.7	13.2	8.5
2013	3.9	3.7	13.2	5.6
2014	6.8	3.7	13.3	2.7
2015	2.2	3.7	13.3	7.4
2016	0.0	3.8	13.4	9.6
2017	0.0	3.8	13.4	9.6
2018	0.0	3.8	13.4	9.6
2019	0.0	3.8	13.5	9.7
2020	(38.3)	3.8	13.5	48.0
NPV	73.8	34.0	137.9	30.1
FIRR				7.8%

() = negative, NPV = net present value, FIRR = financial internal rate of return, O&M = operation and maintenance.

Source: Asian Development Bank estimates.

SUMMARY OF POST-RESETTLEMENT EVALUATION REPORT

A. Background

1. Phnom Penh has suffered from severe and frequent flooding as the city's drainage system deteriorated due to inadequate maintenance. In response to a request from the Government of Cambodia, the Asian Development Bank (ADB) approved a loan for the Phnom Penh Water Supply and Drainage Project on 26 September 1996. Part B of the Project was a drainage component that included (i) the upgrading of the Boeng Trabek main drainage canal, Toul Sen Canal, and connected branches; and (ii) rebuilding the Boeng Trabek pumping station and spillway. The Municipality of Phnom Penh (MPP) was the executing agency for Part B, and the MPP's Department of Public Works and Transport (DPWT) was the implementing agency.

2. Rehabilitation of the main canals required the resettlement of 28 households squatting along the Toul Sen and Boeng Trabek canals, as well as an additional 13 households living around the Boeng Trabek pumping station site. In accordance with the relocation plans prepared by MPP and approved by ADB, all the households were relocated to the Toul Sambo resettlement site by August 2000. They were compensated based on a compensation scheme approved by the Ministry of Economy and Finance (MEF). MPP implemented the resettlement plan. Two ADB project review missions visited the resettlement site.

3. MPP hired a local consulting firm, BN Consult, to prepare a post-resettlement evaluation report, which was submitted to ADB in October 2003. The objectives of the evaluation were to assess whether (i) the resettlement objectives were appropriate compared with ADB policy, (ii) the objectives were met, and (iii) livelihood and living standards were restored or enhanced after resettlement. The consultant also was to make recommendations for future resettlement projects based on the lessons learned. The findings of the evaluation are summarized in paras, 4–17.

B. Affected Families and Losses

4. Construction affected 186 households along the canals. These households had illegal structures (fences and roofs) or squatter dwellings encroaching on the canals' right of way. Of these, 28 households (177 persons) had houses within the right of way. The rest had only fences and overhanging roofs on the right of way, which they agreed to move within their legal property lines without compensation. Most of the relocated families started living in the area between 1982 and 1994. The families are headed mostly by office workers with some drivers, vendors, and a policeman.

5. Thirteen households (95 persons) had dwellings on or around the pumping station site. Six households were living in the worker station, which has belonged to the Government since 1979. The seven other households lived in wooden houses on their acquired land around the station. The families in the worker station had been living in the area since 1979, while the others came between 1988 and 1996. They are vendors, motorbike driver, mechanic, and the chief of the pumping station.

C. Compensation

6. The relocated families were given 144 square meters (m²) of land in Toul Sambo. Families relocated from the canals each were compensated with \$100 for house reconstruction

allowance, \$100 for relocation allowance, and \$200 as nuisance allowance. Compensation paid to the families totaled \$11,200.

7. The families relocated from the pumping station also were given a 144 m² plot in Toul Sambo. Each was compensated with a relocation allowance of \$200 and a nuisance allowance of \$200. Additional house compensation also was given to these families. The six families from the worker station were given \$2,000 for house compensation if they relocated to Toul Sambo, or \$2,400 if they opted to move elsewhere. The other seven families who owned lands but had to relocate were compensated \$15–\$43/m² for their land; and \$4.50/m² of thatch house, \$12.50/m² of wooden house, and \$65/m² of concrete building. Compensation paid to these families totaled \$50,777.

8. The difference between the two groups was the tenure or ownership of land by the families in the pumping station site. They were compensated for the land and their houses, while the squatter families along the canals were not.

9. Other assistance offered to the relocated families included housing loans of \$400 and small business loans of up to \$80 per household. Based on interviews in the area, the consultant found that the small business loans are being repaid, while most of the housing loans are not.

D. Relocation and Payment Process

10. The affected families from the Toul Sen and Boeng Trabek canals moved to the resettlement site in December 1999 before receiving their compensation. The families along the canals were invited to a meeting, where they were informed of the Project and the need to resettle some of them. They were given an initial allowance of KR10,000 and a tent. After the approval of the compensation package and the resettlement plan, the families were compensated in August 2000.

11. The affected families from the pumping station moved to Toul Sambo in August 2000 after receiving the compensation. They also were informed of the Project and the need to relocate during a meeting in the district. However, unlike the canal families, they received their compensation before resettlement.

12. The evaluation indicated that the groups from the canals were not adequately compensated. The affected families that were not relocated should have been compensated for the removal of structures (fences and roofs) from the right of way. The report also concluded that the compensation packages were inconsistent. By gaining knowledge from the canal group, the pumping station group was able to negotiate better compensation, particularly for their houses and land they gave up. Some of the relocated families also did not understand fully the compensation packages.

E. Toul Sambo Resettlement Site

13. MPP developed the Toul Sambo resettlement area earlier for the relocation of squatter families affected by improvement projects in public lands. It is 12 kilometers from the canal and pumping station sites. Toul Sambo is part of Prey Veng Sangkat of Dangkor District of Phnom Penh. NGOs and international organizations assisted MPP in developing the resettlement area. It was provided with adequate infrastructure, including access roads, community water wells,

drainage system, and a primary school. Electricity is provided by several small-scale private operators, which charge users according to appliances used.

14. While the residents expressed satisfaction with the facilities and surroundings, their main concern was the lack of livelihood opportunities in the site. Many residents still travel each day to Phnom Penh to work, while others have set up stores. Some rent nearby lots, where they plant vegetables, rice and other crops. Many have opted to return to the city for work. One community leader reported that only 148 of the 215 relocated households have remained in Toul Sambo. Of the 41 households affected by the ADB project, almost half (8 from the canals and 12 from the pumping station) no longer live in Toul Sambo.

15. The ADB review missions observed that residents need to properly manage solid waste collection and disposal. A repair and maintenance system for the wells also is needed as only three of the nine imported hand pumps that were installed are still working. Notwithstanding these issues and the lack of livelihood opportunities, the living environment for relocated families was better than where they used to live along the canals and the pumping station.

F. Conclusions and Recommendations

16. Based on the review of documents and field visit interviews, the evaluation team concluded:

- (i) No independent monitor was appointed by International Red Cross (IRC) and ADB to monitor the resettlement process.
- (ii) Households from Toul Sen and Boeng Trabek canals were (a) relocated before the approval of the resettlement action plan, (b) not compensated enough to build new dwellings for resettled households, and (c) not made fully aware of their entitlements and the resettlement policy.
- (iii) Affected families were not given a choice in the selection of the resettlement site.
- (iv) The resettlement site offered few job opportunities, and people still need to leave the site and go to Phnom Penh for jobs.
- (v) MPP effectively implemented the resettlement process.
- (vi) Relocated families are living in a better environment than where they used to live along the canals and the pumping station.

17. Based on the findings and lessons learned, the evaluation team made six recommendations to guide future resettlement plans:

- (i) Resettlement plans should be prepared before implementation and relocation with the participation of relevant stakeholders, and they should adhere to ADB involuntary resettlement policies.
- (ii) IRC and ADB should appoint independent monitors to monitor the resettlement implementation, and report to relevant stakeholders.
- (iii) Affected families should be given a choice of relocation sites.
- (iv) The main criteria for relocation site selection should be livelihood opportunities, including the availability of jobs.
- (v) Residents should be trained for any new jobs not familiar to them.
- (vi) Social infrastructure should be developed that responds to the needs of affected families.

PROJECT RATING

Table A11.1: Assessment of Project Performance at Completion

Criteria	Rating	Assessment
Relevance	Highly Relevant	The Project was in line with the Government's policy and the Asian Development Bank's country operational strategy at appraisal.
Efficacy	Highly Efficacious	The Project was constructed generally as appraised. The changes during implementation enhanced the relevance and efficacy of the Project.
Efficiency	Highly Efficient	The financial internal rate of return of the Project was 7.8%, higher than appraisal estimates and WACC. The economic internal rates of return were 19.9% for the water supply component and 18.7% for the drainage component—both higher than the EOCC.
Sustainability	Likely	Project facilities were completed generally in accordance with the required specifications, and are considered to be good quality. The Phnom Penh Water Supply Authority has shown strong capacity to appropriately operate and maintain the project facilities. The budget requested for operation and maintenance of the drainage system has been allocated in full. The capacity of the DPWT to manage the drainage system needs to be strengthened.
Institutional Development and Other Impacts	Highly Substantial	A 1996 sub-decree granted operational autonomy to PPWSA. Tariff structure and levels were adjusted to allow full recovery of the costs of PPWSA operations. The technical and financial performances of the PPWSA improved dramatically. The institutional and management capacities of the drainage and sewerage division, DPWT also were strengthened. Community awareness of, and participation in, solid waste management and other neighborhood environmental improvement activities improved. No significant negative social and environmental impacts were noted.

DPWT - Department of Public Works and Transport, MPP, EOCC – Economic Opportunity Costs of Capital, PPWSA - Phnom Penh Water Supply Authority, WACC – Weighted Average Costs of Capital.

Source: Asian Development Bank estimates.

Table A11.2: Project Rating

Criteria	Rating		Weight	Score
	(A)		(%) (B)	(A x B)
A. Project Outcome				
1. Relevance	Highly Relevant	3	20	0.6
2. Efficacy	Highly Efficacious	3	25	0.75
3. Efficiency	Highly Efficient	3	20	0.6
B. Sustainability	Likely	2	20	0.4
C. Environmental, Social, and Institutional Development	Highly Substantial	3	15	0.45
Overall Project Rating	Highly Successful			2.8

The rating was made following the Asian Development Bank's *Guidelines for the Preparation of Project Performance Audit Reports* (2000).

Source: Asian Development Bank estimates.