ASIAN DEVELOPMENT BANK **IES: REG 2002-17**

IMPACT EVALUATION STUDY

ON

WATER SUPPLY AND SANITATION PROJECTS

IN

SELECTED DEVELOPING MEMBER COUNTRIES

December 2002

ABBREVIATIONS

ADB	–	Asian Development Bank
DMC	–	developing member country
DSM	–	demand-side management
IES	–	impact evaluation study
m^3	–	cubic meter
NGO	–	nongovernment organization
NRW	–	nonrevenue water
O&M	–	operation and maintenance
PRC	–	People's Republic of China
RSDD	–	Regional and Sustainable Development Department
TA	–	technical assistance
WSC	–	water supply company
WSS	–	water supply and sanitation
UN-HABITAT	–	United Nations Human Settlements Programme

NOTE

In this report, "$" refers to US dollars.

Operations Evaluation Department, IE-69

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EXECUTIVE SUMMARY

Since its establishment in 1966, the Asian Development Bank (ADB) has devoted some $4.6 billion (close to 5% of its total lending) to the water supply and sanitation (WSS) sector, most of which has been for construction of water supply facilities. ADB has also provided technical assistance totaling about $84 million to prepare projects and strengthen local water service agencies. Despite this strong support, there are still an estimated 750 million people in Asia's rural areas and 100 million people in its urban areas that have no access to safe drinking water. Recognizing the magnitude of this challenge that is directly linked to its poverty reduction efforts, ADB formulated a comprehensive water policy in 2001.[1] The policy provides a framework for ADB's future operations in the WSS sector in pursuit of one of the Millenium Development Goals, namely to ensure environmental sustainability. One of the targets to achieve this goal is to halve by the year 2015, the proportion of people without sustainable access to safe water.

The rationale for this impact evaluation study (IES) emerged from recent evaluation reports on individual projects that identified several key issues affecting the sector. The objective of the IES is to evaluate the impacts of ADB lending and technical assistance for WSS projects. The IES assesses how improved water availability has affected various user groups, particularly the poor, and discusses (i) selected projects' physical, poverty, health and environmental, social and gender, financial and economic, and institutional and policy impacts; (ii) sector policies relating to water tariffs; (iii) institutional arrangements, including participation by beneficiaries, nongovernment organizations (NGOs), and the private sector; and (iv) lessons learned and best practices for addressing common problems in designing, implementing, and operating and maintaining WSS projects in the future.

An evaluation design matrix was applied in the IES to collect and analyze both primary and secondary data. Almost 1,000 domestic, commercial, and industrial water customers were surveyed. Case studies with field visits were undertaken for six WSS projects in urban and rural areas of People's Republic of China (PRC), Malaysia, Philippines, and Sri Lanka. Supplementary studies were carried out for India, Indonesia, and Viet Nam.

In addition to the quantitative data gathered during the surveys, success stories illustrating important components of the kind of enabling environment required to maximize project benefits for water customers and water providers were taken into account. Following survey completion and initial data analysis, stakeholder workshops were held in PRC, Malaysia, Philippines, and Sri Lanka. Through extensive small group discussions during these workshops with more than 200 stakeholder representatives (domestic, commercial, and industrial water customers; water providers; NGOs; and multilateral and bilateral funding agencies), the lessons learned and best practices were refined. Three workshops were also conducted for ADB staff to develop an integrated action plan for future ADB projects based on those lessons and best practices that could be replicated and scaled up.

The projects reviewed in the IES vary considerably in the type and scale of facilities constructed. All the ADB projects focused on water supply, with sanitation either not included or playing a secondary role. The project components also varied widely. They included (i) hand pumps and small gravity piped systems for villages in the Philippines, (ii) pumped pipe systems for small- and medium-sized towns in Sri Lanka and for medium towns and rural areas in Malaysia; and (iii) reservoirs and major pumped pipe systems for large cities in the PRC. Two

[1] ADB. 2001. *Water for All: The Water Policy of the Asian Development Bank*. Manila.

non-ADB projects in India were subjected to in-depth review, comprising water supply systems expeditiously commissioned through a turnkey contract and sanitation facilities efficiently operated by the community. NGOs took the lead in both these projects.

The projects reviewed have had the following main impacts:

(i) All of them have substantially increased the consumption of water by households. In PRC, Philippines, and Sri Lanka, many more households have access to an improved water supply than prior to project implementation, and some now have connections in their homes. The smaller impact in Malaysia has been attributable to starting from a higher base.

(ii) Satisfaction with improved water services varied considerably among both domestic and nondomestic water customers. The reasons for their satisfaction also varied considerably among survey respondents.

(iii) As sanitation received less attention than water supply in the projects reviewed, their impacts in this regard have been mixed and limited. In contrast, the NGO subprojects in Pune, India are outstanding examples of providing sustainable sanitation services through community mobilization, a distinct factor for their success.

(iv) Many of the households connected to water supply systems under the projects reviewed are poor. Although the projects have had a positive impact on the quantity and quality of water available to the poor, the level of impact could not be estimated because of lack of baseline data.

(v) A common goal of the projects has been to improve communities' health and living conditions by reducing the incidence of water related diseases. Important characteristics of improved water services are quantity, accessibility, reliability, and quality. The quantity, accessibility, and reliability were satisfactory to most users in the projects reviewed. While water quality was generally not an issue in the PRC and Sri Lanka, some beneficiaries in Malaysia and the Philippines perceived problems with quality, especially during the wet season.

(vi) The recent approach of involving prospective beneficiaries in planning, implementation, operation, maintenance, and cofinancing of small town and rural projects was largely not yet followed in the design of the projects reviewed. Similarly, the important roles and responsibilities of women in providing water, sanitation, and health support services for their families were not yet widely recognized. Not surprisingly, therefore, the level of customer involvement in planning and implementing these projects was much lower than in ongoing projects or those now being designed.

(vii) Households connected to a piped system are paying, on average, 1%–2% of their household income for water. The willingness to pay of households connected to piped systems is well established for each of the project areas reviewed. For households in villages still using hand pumps and standpipes, as in some of the Philippine projects, fewer than half would be willing to pay to connect to a piped supply. By contrast, in the PRC, people have accepted tariff increases and affordability does not appear to be an issue.

(viii) None of the water utilities reviewed has already achieved full cost recovery. Those most likely to achieve it in the near future are the two water supply companies in the PRC.

The key lessons learned and best practices identified by the IES are as follows:

(i) **Supporting cost recovery and financial sustainability.** The success stories from the PRC indicate that components and mechanisms that help water utilities meet the cost recovery targets increase the likelihood of long-term sustainability.

(ii) **Providing effective sanitation, hygiene, and health promotion programs.** The traditional emphasis on simply providing adequate quantities of good quality water is not enough. Carefully crafted sanitation, hygiene, and health promotion programs, such as the Society for the Promotion of Area Resource Center's model in India, are needed.

(iii) **Reducing nonrevenue water.** The PRC water supply companies demonstrate that low levels of nonrevenue water in the range of 20%–25% are feasible. Reducing nonrevenue water significantly from 60% to 30% or less is also possible, as demonstrated by the achievement in central Kedah, Malaysia. Leak detection is only one of many options. The caretaker approach, which ADB is currently developing, coupled with benchmarking the performance of water utilities, is a useful tool.

(iv) **Distributing drinking water.** Water for drinking need not be distributed only through a piped water supply. Potable water from water treatment plants may be delivered more effectively when it is distributed in bottles, either by the water supply company or by some scheme where both public and private sectors participate.

(v) **Using water demand side management (DSM).** An effective DSM program is an alternative to expanding supply, particularly in areas suffering from water shortages. With political support and appropriate awareness campaigns aimed at conservation by customers, DSM can succeed, as observed in Dalian in the PRC.

(vi) **Enhancing customers' roles in planning and implementation.** The greatest obstacle to successful participatory development is convincing institutional players that it is indeed possible. Success stories from Malaysia and the Philippines show that often just one committed person can lead the community participation process.

(vii) **Streamlining project management and administration.** Success stories of projects implemented by NGOs in India indicate that socially-oriented WSS projects should be implemented expeditiously, say within 24 months. Implementation delays erode customers' ownership of the project.

The action plan emerging from the IES aims to facilitate and accelerate the implementation of ADB's water policy. Called W A T E R, it comprises five categories of actions:

(i) **water (W):** providing 100% coverage for drinking water, including distribution in bottles;

(ii) **alternative sources (A):** protecting alternative water sources through education and revival of traditional practices;

(iii) **tap water (T):** reducing nonrevenue water, promoting tariff reform, and encouraging DSM for sustainable 24-hour piped water supply;

(iv) **environment (E):** providing 100% coverage for environmentally safe sanitation; and

(v) **river basins (R):** integrating water resources management, with participation by beneficiaries, and management at the river basin level.

Individual actions grouped into these five categories that have been supported by quantitative data from the surveys and corroborated by discussions with stakeholders, and that can be replicated and scaled up, are summarized in the table below.

Proposed W A T E R Action Plan

Action (Category)	Responsibility	Time Frame
Provide drinking water for all in Asian cities (W.1)	Water companies in DMCs with support from ADB and other external funding agencies, NGOs, and the private sector, under the auspices of the Water for Asian Cities Programme	2003–2008
Initiate health and hygiene awareness education in relation to safe drinking water (W.2)	Executing agencies, departments of health, and departments of education in DMCs, with support from ADB and other external funding agencies, under the auspices of the Water for Asian Cities Programme	2003–2005
Promote cost-effective water conservation replicating the success of Dalian in other DMCs (A.1)	ADB's regional departments, executing agencies, and the private sector, with support from RSDD; training by UN-HABITAT under the auspices of the Water for Asian Cities Programme	2003–2008
Harvest rainwater and protect boreholes and dug wells from contamination (A.2)	NGOs supported by ADB and UN-HABITAT, under the auspices of the Water for Asian Cities Programme	2003–2006
Launch initiatives for financially sustainable water supply utilities (T.1)	ADB's regional departments, with guidance from RSDD	2003–2006
Reduce nonrevenue water using the caretaker approach (T.2)	Private sector and executing agencies, with guidance from ADB's regional departments	2003–2008
Encourage community-oriented sanitation (E.1)	ADB's regional departments and local governments under the auspices of the Water for Asian Cities Programme	2003–2010
Promote integrated water resources management (R.1)	ADB's regional departments and executing agencies, with guidance from RSDD	2003–2010
Disseminate success stories at the Third World Water Forum (Others)	ADB's Operations Evaluation Department and RSDD, with support from ADB's Office of External Relations	2002–2003

ADB = Asian Development Bank, DMC = developing member country, NGO = nongovernment organization, RSDD = Regional Sustainable Development Department.

I. INTRODUCTION

A. Background

1. Policy and Assistance for Water Supply and Sanitation

1. Assistance in improving water supply and sanitation (WSS) in the developing member countries (DMCs) of the Asian Development Bank (ADB) has been an important part of its development agenda. The assistance has taken the form of financial and technical support for building the necessary infrastructure development, strengthening sector institutions, enhancing autonomy, and promoting cost recovery. Since its establishment in 1966, ADB has devoted some $4.6 billion (close to 5% of its total lending) to the sector. ADB has also provided technical assistance (TA) totaling about $84 million for project preparation and capacity building.

2. In recent years, the links between WSS projects and the social development objectives of reducing poverty and improving health have become increasingly evident. Poverty reduction has become the overarching goal in ADB's Long-Term Strategic Framework for the period 2001–2015. Robust, sustainable growth is essential for significant poverty reduction, and this growth requires building up physical and social infrastructure. Substantial investments are required in social services, including the provision of WSS services. ADB's new water policy[1] recognizes water as a socially vital economic good that needs careful management to sustain equitable economic growth and reduce poverty. ADB promotes a participatory approach to the conservation and protection of water resources and supports autonomy and accountability in service provision, private sector participation, and public-private partnerships. The policy emphasizes equitable access to water for the poor and the underserved.

2. Rationale for Evaluation

3. ADB's Regional and Sustainable Development Department (RSDD) and regional departments in operations proposed undertaking this impact evaluation study (IES) to help formulate investments in the sector and an agenda for policy dialogue with the DMCs. The proposal underscored the contribution that urban and rural WSS projects made to poverty reduction, both directly by providing safe water and indirectly by improving people's health and the environment. The rationale for the IES also emerged from recent operations evaluation reports that identified the following key issues affecting the sector:

(i) **Inadequate WSS coverage.** Despite the large investments supported by ADB and other external funding agencies, about 750 million people in rural areas and 100 million people in urban areas of Asia still lack access to safe drinking water. Similarly, hygienic sanitation is needed for 1.75 billion people in rural areas and 300 million people in urban areas. At the Johannesburg World Summit on Sustainable Development in August 2002, ADB and the United Nations Human Settlements Programme (UN-HABITAT) announced the joint Water for Asian Cities Programme, aimed at helping halve the number of people without access to safe drinking water or basic sanitation by 2015.[2]

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[1] ADB. 2001. *Water for All: The Water Policy of the Asian Development Bank*. Manila.

[2] The program will be supported by a $10 million grant, provided equally by each agency, and $500 million in loans from ADB for WSS over the next 5 years.

(ii) **High percentage of nonrevenue water (NRW).**[3] Although NRW has been reduced in some water supply systems, high NRW levels in the order of 40%–50% still persist in many DMCs.

(iii) **Poor financial performance of water companies.** Institutional and financial weaknesses of water companies hamper their operations and reduce their ability to sustain benefits from WSS projects.

(iv) **Suboptimal allocation of water sources.** Lack of policy in relation to the allocation of water sources among various users is a common problem in many DMCs.

(v) **Pollution of surface water and shallow groundwater sources.** Between 1995 and 2025 water pollution loads are expected to increase in Asia by up to 16 times for suspended solids, 17 times for total dissolved solids, and 18 times for biological pollution.

B. Purpose and Scope of Evaluation

4. The purpose of the IES is to identify lessons from the implementation of WSS projects supported by ADB and other external funding agencies that could assist in the formulation of sector investments and capacity building activities in the future.[4] In particular, the IES aims to (i) estimate the level of improvement in water availability for different user groups; (ii) assess the economic and social impact of improved water availability on different user groups, particularly the poor; (iii) assess sector policies relating to tariff structure and levels, supply alternatives, and institutional arrangements, including participation by beneficiaries and the private sector; and (iv) compile a set of recommendations based on best practices and solutions to common problems.

5. Based on reviews of various ADB documents, six WSS projects were used as case studies for the IES (Appendix 1). These projects are located in both urban and rural areas in four DMCs: People's Republic of China (PRC), Malaysia, Philippines, and Sri Lanka.[5] The status of the WSS sector varies in the four DMCs.[6] Concurrent with its relatively high economic growth during the last 20 years, the PRC has experienced rapid population growth in its cities, from 190 million in 1980 to 378 million in 2000. In that year, an estimated 94% of the PRC's urban population and 66% of its rural population had access to safe water, while the corresponding proportions with access to sanitation were 68% and 24%, respectively. In Malaysia, 96% of the urban population and 66% of the rural population had access to safe water in 1990. By 1999 the coverage had increased to 98% of the urban population and 90% of the rural population. While more than 90% of the urban population in the Philippines had access to safe water and to sanitation facilities in 2001, the corresponding figures for rural areas were about 80% and 70%, respectively. In Sri Lanka, 91% of the urban population and 80% of the rural population had access to safe water in 2000, while the percentages with access to sanitation were 91% and 83%, respectively.

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[3] NRW is the difference between water produced at treatment plants and water billed. It includes both technical (leakages) and non-technical (illegal connections, meter errors, incomplete billings, etc.) losses. In this IES, NRW is used as a generic term to describe these losses.

[4] The study team comprised K.E. Seetharam, Evaluation Specialist and Study Manager; Richard McGowan, Water Supply and Sanitation Specialist; Peter Mawson, Financial and Institutional Specialist; and social survey specialists from People's Republic of China, Malaysia, Philippines, and Sri Lanka, each supported by a group of enumerators.

[5] Appendix 2 lists all ADB's loans/TAs in the WSS sector in the four case study countries.

[6] ADB. 2002. *Water Indicators per Developing Member Country*. Available: http://www.adb.org/Water/Indicators/water_info_prc.pdf.

6. The projects selected for the case studies focused on water supply, with sanitation either not included or playing a secondary role. The projects varied considerably in the type and scale of facilities constructed, representing a cross-section of

(i) **user groups and institutional settings:** large urban systems run by national water utilities or provincial water companies, small rural systems run by community water user groups, and multiple family or single family point source systems;

(ii) **technology, level of service, and complexity:** large pumped pipe systems in cities, small- and medium-scale gravity piped systems in small towns, and hand pumps in rural communities; and

(iii) **operational and financial modalities:** facilities developed with little customer participation and low cost recovery, facilities built with some customer participation and partial cost recovery, and large municipal water utilities.

7. Appendix 3 summarizes salient features of the six projects reviewed in depth. In addition, two non-ADB projects in India implemented by nongovernment organizations (NGOs) as examples of sustainable provision of WSS services[7] and four relevant TAs in the PRC and Sri Lanka (Appendix 1) were reviewed. The IES has also drawn on the findings of more than 50 project performance audit reports and two earlier IESs on WSS projects in ADB's DMCs (Appendix 4).

C. Approach and Methodology

8. Based on the key issues identified in para. 3, an evaluation design matrix with more than 20 quantitative and qualitative indicators was developed (Appendix 5). The paucity of baseline information, especially in relation to social and economic impacts, made it difficult to assess without and before project scenarios. Targeted surveys, discussions with stakeholder groups, and expert opinions were used to obtain the best combination of quantitative and qualitative information on the various indicators as the basis for deriving significant conclusions.

9. The IES activities consisted of five main tasks: (i) preparatory work, including developing three survey questionnaires; (ii) field visits to the selected DMCs; (iii) completion of the survey questionnaires; (iv) follow-up field visits to the selected DMCs, including stakeholder workshops; and (v) preparation of the final report.

10. Based on the evaluation design matrix, the consultants prepared one survey questionnaire targeting domestic water users, a second questionnaire for commercial and industrial water users, and a third questionnaire for water suppliers (Supplementary Appendix A). The first questionnaire included questions on sanitation, health, and hygiene practices. The second covered water conservation practices and use of alternative sources of water. The water supplier questionnaire focused on institutional capacity, operation and maintenance (O&M), cost recovery, and financial sustainability. Local consultants were recruited to carry out the surveys. The three questionnaires were field tested in PRC, Philippines, and Sri Lanka, and modified as necessary. Overall, almost 1,000 questionnaires were completed.

[7] The $60 million Sri Sathya Sai Drinking Water Supply Project in Andhra Pradesh, implemented between 1993 and 1995; and the $4.2 million Community Sanitation Services Project in Pune, implemented between 1999 and 2001.

Table 1: Number of Questionnaires Completed in the Surveys

Category	PRC	Malaysia	Philippines	Sri Lanka[a]	India[b]	Total
Households	197	75	138	402[a]	105	917
Commercial and Industrial Users	18	25	6	6	1	56
Water Suppliers	2	1	7	4	1	15
Total	**217**	**101**	**151**	**412**	**107**	**988**

PRC = People's Republic of China.
[a] Includes 100 questionnaires completed for a World Bank-financed subproject of the Community Water Supply and Sanitation Project.
[b] Survey funded by UN-HABITAT and implemented by the Human Settlements Management Institute, New Delhi.

11. The IES team visited the case study countries in two phases to meet with resident mission staff, representatives from executing agencies and other concerned agencies, and private stakeholders. The team also held meetings with major sector players such as the World Bank, bilateral funding agencies, and local and international NGOs. The visits also included inspection of completed project facilities.

12. Data analysis provided the basis for the country reports (see Appendix 6 for report summaries and Supplementary Appendixes B to F for more detail). This was followed by an evaluation of a range of impacts (institutional, financial, economic, social and gender, poverty, health, and environmental), which enabled the IES team to develop a set of lessons learned and best practices.

D. Stakeholder Workshops

13. The country stakeholder workshops held during the second phase of the country visits provided useful insights into issues surrounding WSS projects. These workshops can be summarized as follows:

(i) **PRC.** The Beijing workshop had 15 participants from PRC agencies (the Ministry of Construction, the China Water Association, and the Dalian Water Supply Group), the World Bank, the United Nations Development Programme, the Japan Bank for International Cooperation, the Canadian International Development Agency, and ADB's PRC Resident Mission. The participants discussed a wide range of issues, for example, tariff reform, environmental degradation, subsidies for the poor, importance of social stability, population pressure, and growing demand for improved WSS services.

(ii) **Malaysia.** More than 40 participants from government agencies involved in public works and health and the private sector (water treatment plant operator), as well as beneficiary representatives, attended the workshop in Sungai Petani. Most expressed satisfaction with their WSS facilities, except for some water quality concerns. Other important topics were the deterioration of water sources, the high connection costs, and the successful efforts to raise public awareness about water, health and hygiene.

(iii) **Philippines.** More than 50 participants, including a broad mix of water customers and service providers, attended the workshop in Bacolod. Discussions focused on institutional O&M responsibilities, variable water quality and service levels, willingness to pay and affordability, and substantial needs for the rehabilitation

and expansion of facilities. Water users and suppliers felt that the urgent need to rehabilitate and expand facilities could not be met without external assistance.

(iv) **Sri Lanka.** This workshop in Colombo had more than 60 participants. Many were community members from ADB-financed subprojects, but institutional representatives from the Water Board, other external funding agencies, NGOs, and a World Bank-financed WSS subproject also attended. A primary concern raised in the discussions was the politicization of water project implementation, meaning political interference in subproject selection, tariffs, and extension of pipelines into hitherto unserved areas that reduced service to existing customers.

E. Report Finalization

14. This report is based on the findings from the surveys; responses from NGO and government representatives; and inputs from ADB experts and stakeholders, including poor beneficiaries. The draft was sent to pertinent ADB departments and to governments, and the comments received have been incorporated.

15. The main findings were presented at the Regional Consultation for the Water in Cities, held at ADB headquarters in Manila in October 2002 and attended mainly by representatives of the civil society. The main lessons, best practices, and recommended actions will be shared with decisionmakers such as mayors, regulators, and utility managers at the Osaka Day of the Third World Water Forum to be held in March 2003.

II. KEY IMPACTS OF CASE STUDY PROJECTS

16. This section presents the key impacts of the case study projects, using data from the surveys undertaken (see the summary in Appendix 7).

A. Physical Impacts

17. All the case study projects have significantly increased the availability of water and its consumption by households. The Dalian Water Supply Project in the PRC allowed domestic water use to more than double from around 40 liters per capita per day. The Kedah Water Supply Project in Malaysia increased treatment and distribution capacity to meet water requirements of the growing population and industry in the project area. More than half of households surveyed consume about 220 liters per capita per day. Similarly, the newly constructed piped systems in the Philippines have improved access to water and increased consumption for households connected to them. In Sri Lanka, the number of household connections has increased to more than 75% in all project towns, at the expense of standpipes. In the surveyed towns, average household water consumption is now almost 130 liters per capita per day.

18. Nondomestic consumers have also benefited from these projects and account for up to 57% of total demand in Dalian, about 30% in the Malaysian project, and 41% in the Sri Lankan urban subprojects. In Dalian, the Project has made just as much more water available for nondomestic consumers as for domestic consumers. The local government strongly encourages water conservation measures and requires large industrial and commercial consumers to adopt such measures. The Kedah Water Supply Project in Malaysia has achieved its objective of increasing the availability of water for nondomestic consumers in the new industrial estates. In the villages and small towns of the Philippine and Sri Lankan rural subprojects, the nondomestic

sector, while benefiting along with domestic users, is of less importance as a consumer of water.

19. Satisfaction with improved water services varied considerably among survey respondents in the four countries (Appendix 7, Table A7.1). The greatest dissatisfaction among households was in the PRC and Sri Lanka, where 59% and 70%, respectively, of respondents with in-house connections complained of insufficient water. In the Philippines, 30% of those using public taps had a similar complaint. Among respondents in Malaysia, 45% complained of poor water quality in the wet season, although quality was only a problem for 11% in the dry season (Appendix 7, Table A7.4). Hours of supply appear not to have been a major issue for domestic customers. In the PRC and Malaysia, the systems provide a 24-hour supply, while in the Philippines some, but not all, schemes do so, and others have regular operating hours. In Sri Lanka a 24-hour supply has yet to be achieved in most of the project towns.[8]

20. Sanitation did not receive the level of focus or funding that water did in the projects reviewed. Only the Second Water Supply and Sanitation Project in Sri Lanka had a specific sanitation component. This was mirrored by a general lack of interest in sanitation issues at stakeholder workshops except in Sri Lanka. One of the objectives of the project there was to construct 10,000 latrines in the 16 towns covered, but only 6,000 were completed.[9] Nevertheless, most of the households surveyed in the four countries do have toilets that they built by themselves or with support from other projects (Appendix 7, Table A7.2). The NGO subprojects in Pune, India are examples of providing sustainable sanitation services through community mobilization, a distinct factor for their success.[10]

B. Poverty Impacts

21. Survey household income data for each country indicated the proportion of poor households.[11] Many more poor households now have in-house connections or an improved water supply than prior to project implementation. In the Philippines, the new water supply systems in small towns and rural communities have had a positive impact on the quantity and quality of water available to all households, including the poor. In Sri Lanka, poor families are taking advantage of household connections and public standpipes are gradually being phased out in most project towns. In Malaysia, where rural coverage has increased as a result of the project and where 50% of surveyed rural households are below the poverty line, poor families have benefited. As no baseline data were available, the IES could not estimate in monetary terms by how much the projects have affected poor households.

22. The primary impacts of these projects for poorer households were likely to be the savings in time (but these vary considerably among locations), the cost of water (in the Philippines, respondents reported prices of P100 per cubic meter [m^3] or more before the projects compared with P13 per m^3 in the most expensive of the water districts included in the survey after the projects), and the incremental benefit of increased water consumption.

[8] Operational factors and increasing numbers of customers have restricted supply. Social impact surveys under TA 3587-SRI confirm that where the hours of supply are restricted most consumers have storage tanks.

[9] ADB. 2000. *Project Completion Report on the Second Water Supply and Sanitation Project in Sri Lanka*. Manila.

[10] The Society for the Promotion of Area Resource Centers and other NGOs have developed an innovative, community-based approach to solve the problem of sanitation. The scheme has highlighted people's willingness to pay user charges at the rate of $0.50 per household per month for sanitation.

[11] Poor households are defined as those living below the poverty line as defined for each country by the responsible government agency. The survey data are most complete for Malaysia and the Philippines. As the samples were relatively small, the results are only indicative.

Secondary impacts were on health and on small-scale economic activities, made possible partly by the time savings and the more readily available water. These changes are well illustrated by the Philippine surveys (Box 1). Subprojects have expanded employment options and incomes have increased. The quality of life has improved. A similar message is obtained from respondents' comments in Dalian, where the project has more than doubled the quantity of water available to households.

Box 1: Voices from the Philippines

"It is much better now that the water is right on our doorstep, not like before when we had to buy water at two pesos for 20 liters. Before when taking a bath we had to budget how much we will consume per bath per person. Now we don't need to worry about that."

"Now we can take care of our livestock and plants."

"I am happy, not like before when I had to wash clothes in the river. Now I can clean my house and use the toilet when I want. No need to carry water from the far away source."

"Time is saved and additional work can be done to earn income."

"Now I can take a bath every day and am away from diseases. The hand pump is free, while the water from the water district costs more, and comes irregularly."

"Life is easy, especially household chores, now that getting good quality water is easy. Our health and hygiene have improved. My children can take a bath any time they want."

C. Health Impacts

23. Surveyed households generally boil water before drinking it. The exception is the Philippines, where many households are supplied from tube wells and where only 12% of households boil water before drinking it. One alternative to boiling water is to use bottled drinking water, and in Dalian and Zhangjiakou[12] in the PRC, for example, the water supply company supplies bottled water in the local market. Many surveyed households purchase bottled water.

24. A common goal of all six projects was to improve community health and living conditions, reduce poverty, and increase economic growth, in part by reducing the incidence of water-related and waterborne diseases. Important characteristics of improved water services are quantity, accessibility, reliability, and quality. While most beneficiaries were satisfied with quantity, accessibility, and reliability, survey respondents in Malaysia, the Philippines, and Sri Lanka perceived water quality as a problem. In most places, water is tested regularly (though less regularly in some of the small schemes in the Philippines), although customers are generally unaware of whether or how often water quality is tested.

[12] The Zhangjiakou Water Supply Company received support for tariff reforms under TA 3250-PRC, one of the TAs reviewed.

25. Providing adequate amounts of clean, accessible, good-quality water alone will not ensure significant reductions in the incidence of waterborne and water-related diseases, especially in young children, who are the most vulnerable group. To obtain the maximum benefit from infrastructure investments in WSS, broadly based, customer-level health and hygiene education and awareness programs are needed. In the Pune sanitation project in India, the NGO's initiatives increased community understanding of the critical links between health and personal hygiene and sanitation practices (footnote 10). More recent ADB-financed projects typically include health promotion programs at the institutional, school, and individual family levels. Such programs were not included in the projects reviewed in this IES, but one good example was found in Dalian, though it was not directly associated with the ADB project there (Box 2).

Box 2: School Water Quality, Hygiene, and Environmental Awareness in the PRC

Until six years ago, the teachers and children in Taoyuan Elementary School in Dalian drew water from an open well located adjacent to a polluted river. The principal was concerned about the river contaminating the well, but the school had no other option. Given the dire water conditions before completion of the Dalian Water Supply Project, the new piped water dramatically improved health conditions for children in the school. They now have regular classes in health, sanitation, environmental awareness, and water conservation that teach them to be good stewards of their water resources. One day a week they refrain from washing the floors and windows, and they have stopped watering a grassy play area because it required too much water. Wet-towel dispensers in each classroom help reduce water consumption for hand washing while still maintaining personal hygiene. All schools celebrate the PRC's National Water Day on 22 March by focusing on environmental awareness themes.

26. Making quantitative assessments on the projects' health impacts based on the household surveys is difficult, mainly because of the lack of data on preproject situations. The current situation appears to be relatively good in most cases. In the month prior to the surveys waterborne and water-related diseases (excluding malaria) affected adults and children in 5% or fewer households in PRC, Philippines, and India (Appendix 7, Table A7.9).[13] The incidence was somewhat higher in Sri Lanka and highest in Malaysia, where 8% of adults and 12% of children were reported to have been ill.

27. Hand washing is a good indicator of hygiene practices. Chinese respondents set a good standard in this regard, perhaps reflecting programs of the type described in Box 2, with 93% reporting that they washed their hands with soap and water after using the toilet and 92% to do so before meals. Malaysian respondents reported similarly high levels. In the Philippines, the corresponding proportions were 81% and 77%, respectively. Schools in the surveyed area in Malaysia all had toilets, compared with less than 90% of schools in the Philippines and Sri Lanka, and only a third of schools in India. While the extent to which these practices arise directly from the projects in each area is not clear, a reasonably good standard has been established in most places, supported by the availability of water from project facilities.

[13] Significant reports of malaria only occurred in Malaysia and the Philippines. No obvious explanation exists for the relatively high incidence of malaria levels in Malaysia. Stakeholders at the workshop related it to the plantations.

D. Gender Impacts

28. Except the Second Islands Rural Water Supply Sector Project in the Philippines and the Second Water Supply and Sanitation Project in Sri Lanka, the projects reviewed had been designed as much as 10 or more years ago, before ADB's policies and procedures in relation to community involvement and gender roles were developed. The currently accepted approach for small town and rural projects of having prospective beneficiaries fully involved in planning, implementation, cofinancing of capital investments, and O&M was not yet part of the design. Similarly, women's roles and responsibilities in providing water, sanitation, and health support services for their families were not taken into account. Not surprisingly, therefore, the level of customer involvement in project planning and implementation was much lower than in current projects (Appendix 7, Table A7.5).

29. Where community water user organizations were established in the Philippines, women were involved in 79% of them as officers. In the other countries, there was no specific focus on encouraging women to become involved in system planning, implementation, and O&M (Appendix 7, Table A7.6). Survey questions about women's involvement in planning and construction suggested that women, and community members in general, played little role in either activity. Little training of any kind took place for women: fewer than 10% of respondents mentioned training in the Philippines (in O&M and community organization), and fewer than 20% in Sri Lanka. In the PRC and Malaysia, where systems are large and are built, operated, and maintained by water supply companies or government agencies, community participation and gender impact were negligible.

30. Despite the limited formal roles that communities in general, and women in particular, played in project planning and implementation, the projects did have significant positive impacts on women's lives as evidenced by their responses to survey questions. The main improvements especially mentioned in the Philippines by female respondents, who are usually responsible for collecting water and for family health and hygiene in rural communities, were related to quality of life, health, and economic impacts:

(i) being able to spend more time with their families;
(ii) having water of higher quality that is more accessible and is available more regularly;
(iii) not having to carry water from distant sources;
(iv) not having to worry about their own or their children's safety when fetching water from a distant source;
(v) children having more time playing, socializing, and studying by not having to spend so much time fetching water;
(vi) being able to wash their hands and bathe more frequently;
(vii) being able to keep their homes cleaner and on a more regular basis;
(viii) reducing the incidence of diarrhea;
(ix) reducing disease among children;
(x) having additional time to engage in income-generating activities, for instance, making and selling food, taking in laundry for hire, or dressmaking;
(xi) being able to water vegetables and livestock more easily; and
(xii) having piped water that is cheaper than water sold by private vendors.

E. Environmental Impacts

31. Since 1988, ADB requires that either an initial environmental examination or an environmental impact assessment be prepared for every project. The latter has to be carried out

for WSS projects only where significant environmental issues are identified in connection with their construction and O&M. However, this was not yet a requirement for three case study projects pre-dating this policy.[14] ADB also requires an environmental monitoring program during construction to ensure that any necessary mitigation measures are carried out.

32. The project in Dalian, coupled with the city's own sanitation, hygiene, environmental awareness, and water conservation programs, has generated positive environmental impacts such as improved management of human waste, enhanced awareness of health and hygiene, provision of storm water drainage, and improved management of the natural environment. Through a demand-side management (DSM) program for domestic, commercial, and industrial water users, the city of Dalian has achieved extensive greening by watering new and rehabilitated parks, numerous other green areas, and roadside gardens using recycled gray water. In Malaysia, the project was intended to increase the water supply in an area targeted for industrial development and urban growth, and mitigating potential environmental problems has been part of the overall urban planning for the area.

33. The projects in the Philippines and Sri Lanka have resulted in some adverse environmental impacts because of poor planning, inadequate facility design, inadequate community health training and awareness, or lack of proper environmental monitoring and follow-up actions. In the Philippines, poor drainage is a problem in many small gravity pipe systems and around hand pump sites. People are concerned about getting water, but not about how to dispose it once they have used it. Technical guidelines do not address proper drainage in subproject planning and community awareness building. Another issue noted in the Philippines is bacterial and nitrate contamination of water. Where latrines and wells are dug too close together, wells can be contaminated by human waste migrating from latrines.[15] In other locations, excessive water extraction at coastal sites has resulted in saltwater intrusion into the freshwater aquifer.[16] The WSS projects have encouraged people to move to the better or newly-served areas. In many communities in the Philippines, this migration has put increasing pressure not only on water, but also on other municipal resources, such as land, infrastructure, and social services.

34. In Sri Lanka water treatment plants discharge sludge, a potential environmental hazard, into rivers and ponds, although to date no significant adverse impact has been reported. In some subprojects under the Second Water Supply and Sanitation Project, environmental reviews were carried out, but mitigation measures did not fully address the problems encountered.

F. Institutional Performance and Cost Recovery

1. Implementation and Physical Performance

35. Except for Dalian in the PRC, completion of all the reviewed projects was delayed. The average delay was almost 20 months, compared with an average expected implementation period of 56 months. In the case of the project in Malaysia, the delay was 40 months. This may be contrasted with the expeditious implementation of the Sri Sathya Sai Drinking Water Supply

[14] The Kedah Water Supply Project in Malaysia, the Island Provinces Rural Water Supply Project in the Philippines, and the Water Supply Sector Project in Sri Lanka.
[15] Latrines were not part of ADB's First and Second Island Provinces Rural Water Supply Projects.
[16] ADB. 2000. *Project Performance Audit Report on the Second Island Provinces Rural Water Supply (Sector) Project in the Philippines*. Manila.

Project in India, which was implemented over a period of 18 months and constructed water supply systems for more than 1.25 million people in 731 villages.

36. The project facilities in Kedah are currently operating at about 85% of capacity. New projects are being planned and implemented to meet expanding demand. The subprojects surveyed in the Philippines and Sri Lanka were also producing at or close to capacity levels, and subproject managers all said that expansion was needed. The Dalian water supply system is currently operating at 65%–70% of capacity and the Zhangjiakou system at 60%–65%, due to the impact of water conservation measures and tariff reforms.

37. All water supply companies (WSCs) reported having programs for reducing NRW. The reductions have been most significant in Malaysia and Sri Lanka (Box 3).

Box 3: Project Experience with Nonrevenue Water

After completion of the Kedah Water Supply Project, an increase in NRW to 62% was experienced. The project completion report noted that this was probably due to higher pressure in old distribution lines, and that the original target to reduce NRW to 25% by 1990 was unrealistic. By 2000, the average NRW level in Kedah was reduced to 46%, and during the first seven months of 2002 to 32%. The major improvement was achieved through careful monitoring of metering and attention to leaks.

In Sri Lanka, the Second Water Supply and Sanitation Project sought to reduce NRW. This was partly achieved by improving metering and changing from standpipes to household connections, although standpipes, from which no revenue is collected, still remain in some places, and thus NRW is still high. Surveys for two schemes showed that in Weligama, NRW fell from 40% to 28%, and in Diyatalawa from 38% to 29%. Overall, NRW is estimated to have fallen from about 40% before the Project to 31% in 2000.

In the PRC, the Dalian and Zhangjiakou WSCs report a NRW level of 25% and 20%, respectively. The current level in Dalian is reportedly similar to that before project implementation of the project, which did not include any NRW targets, but the WSC aims at a reduction to 19%.

NRW is not monitored in the small rural water systems in the Philippines. Among the systems surveyed, the issue was only acknowledged as significant in Sagay City, where it was caused by leaks in the distribution pipeline. NRW was reduced from 45% to 34%, but is still of concern to system managers.

2. Financial Performance

38. ADB projects in the WSS sector generally emphasize full cost recovery to ensure the long-term viability of WSCs. The loan agreements of the projects reviewed contained covenants relating to cost recovery and financial performance. Except for the Dalian Water Supply Project in the PRC, compliance with the covenants was unsatisfactory (Appendix 7, Table A7.11).

39. In particular, the financial covenants for the Kedah Water Supply Project in Malaysia were not complied with. The project is operated as part of the statewide water supply system, and tariffs and other policies are set centrally for the whole state. Water tariffs in Kedah were last adjusted in 1993. Data for 1996 and 1999 show that operating costs were about 96% of revenues, suggesting that full cost recovery (including depreciation and debt servicing) had not

been achieved, and that water supply services continued to be subsidized from the state budget.

40. In the Philippines, where small water supply systems in rural communities were built, the intent was that O&M costs and a provision for depreciation would be recovered for each scheme. In many cases this has not happened, and in some of the smaller schemes no fees are collected, but users contribute to costs when repairs are needed. Many of these schemes depend on external sources of funds, such as local governments or politicians, when rehabilitation or system expansion is needed. The Sagay City water district, however, is a good example of sound management and an improving financial situation. The current tariff was established in 1997, and since then the district has been able to repay an inherited debt of P600,000. For the most recent financial year, the operating ratio was 0.88. The system supplies water for 18 hours a day and is increasing its coverage to reach 80% of households by 2003.

41. The water utilities that are most likely to achieve full cost recovery in the near future are the two WSCs reviewed in the PRC. The Zhangjiakou WSC, which benefited from one of the TAs for water supply tariff studies, has a schedule of tariff increases until 2006 that is intended to leave it debt free and recovering all costs. In 2001, the WSC had positive net income before interest and tax payments and an operating ratio of 0.86. The Dalian WSC is in compliance with ADB's loan covenants, and in 2001 had an operating ratio of 0.90 and a small positive net income before interest and tax payments. However, the WSC does not yet cover all debt servicing costs from its own resources, because tariffs have not increased as rapidly as expected (although a large increase took place in August 2001 that is not yet fully reflected in the financial results) and water sales have fluctuated, being lower in 2001 than in 1999.

42. In Sri Lanka the availability of financial information at the subproject level is limited. In the towns included in the IES surveys, revenues exceed expenditures on O&M, but the degree of full cost recovery achieved was uncertain. The second project was intended to provide a 24-hour supply, but the extent of O&M implemented has been insufficient to maintain this level of provision. Only 6 of the 27 towns included in an ADB-financed study[17] have a reliable 24-hour supply. The National Water Supply and Drainage Board spends insufficient amounts on O&M.

3. Water Conservation

43. Water conservation (or DSM) programs are becoming increasingly common in many parts of the world, especially in areas where water is scarce or where the cost of developing new sources of supply is high. Like reducing NRW, DSM reduces the amount of water that has to be produced and distributed, the requirements for wastewater treatment, and the energy required to distribute water throughout the system.

44. Water conservation has been addressed only in the PRC among the projects reviewed (Box 4). In addition to technical measures, tariffs have been used for demand management. In north China, where populations are large and water is scarce, water producers and consumers are under pressure to conserve water. The Zhangjiakou and Dalian WSCs have successfully used tariff increases to help promote water conservation (para. 49). The increases have been large—up to 190% over a 4-year period—and their acceptability and impact have been aided by a shared sense of the need to control consumption. However, WSCs have little incentive to

[17] Coffey MPW Pty. Ltd. 2002. *Review of 27 ADB-Assisted Water Supply Schemes: 1986–2000*. Report prepared under TA 3587-SRI: *Secondary Towns Water Supply and Sanitation Project*.

save water if water resources are abundant and exceed current demand, as in the case in Kedah.

Box 4: Dalian's Experience with Demand-Side Management

Dalian is a dry area with limited water resources. Even with the new project, end users and officials of the local government and WSC realized the importance of taking additional measures to ensure continuing access to water. Thus, the preparatory TA report for the Dalian Water Supply Project recommended that specific water saving measures should be adopted parallel to project implementation, namely: (i) public awareness campaign for water savings; (ii) increased water recycling rate and the reuse of treated wastewater; (iii) adoption of some official management measures to promote the rate of recycling and reuse of treated wastewater; and (iv) drastically raising water tariff together with penalty payment for exceeding the specified quotas.

The promising water conservation program that resulted incorporates technical, financial, public awareness, and regulatory measures. Specific technical measures include recycling gray water, carrying out water audits, substituting seawater for freshwater for some processes, and using flow restrictors and low-flow toilets. To complement this, subsidies have been introduced for DSM technologies and hardware, and water audits and punitive tariff rates are applied to consumption exceeding specified water quotas for both domestic and nondomestic consumers. Public awareness programs for schools, commerce, and industry are implemented and awards are given for successful DSM programs.

From the regulatory side, recycling measures are mandated for certain classes of consumers and DSM standards are widely disseminated among nondomestic customers. The impact of this program is seen in the high level of awareness of water issues among consumers, the widespread use of recycled water for parks and gardens, and the impact of the water tariff on consumption by individual consumers and overall sales.

4. Willingness to Pay

45. The surveys checked whether domestic and nondomestic customers saw the tariffs charged by WSCs as affordable and within the range of what they were willing to pay for water. Households connected to a piped system were paying, on average, 1%–2% of their income for water (Appendix 7, Table A7.7), an amount that was affordable for most of them. In the Philippines, households in rural communities with simple supply systems are paying much less than this for water.

46. The willingness of households already connected to piped systems to pay for water is well established in each of the project areas reviewed, but for those in villages still using hand pumps and standpipes, as in some of the Philippine subprojects, fewer than half would be willing to pay to connect to a piped supply. These people are cautious about incurring the costs that would be involved. By contrast, in the PRC, where domestic tariff rates have increased by 126% in Zhangjiakou and 92% in Dalian since the beginning of 1998, increases appear to have been well accepted by the population and affordability does not appear to be an issue, although in Zhangjiakou, a cash rebate equivalent to consumption of up to 5 m^3/month is paid twice yearly to certified poor households. In Sri Lanka, tariff rates are currently low for small consumers (Appendix 7, Table A7.10). Even poor households are now willing and able to pay for in-house connections.

47. Households are more willing to pay to connect to a water system if they do not have to bear all costs up-front. In large towns and cities in the PRC and Malaysia, the issue of connection costs hardly arises, because the connection comes with the house or apartment and alternative water sources are not available. Connection costs posed problems in rural areas. In the Philippines, the number of surveyed households currently without in-house connections that were willing to pay for a connection increased by about a third if installment payments were an option.

48. Nondomestic consumption is an important component of total consumption in most projects with the exception of the small-scale supply systems in the Philippines and some rural subprojects in Sri Lanka. Nondomestic consumers invariably pay higher rates than domestic consumers (Appendix 7, Table A7.8). They subsidize domestic consumers in most water supply schemes.

49. Increased tariff rates in the projects reviewed have generally exerted downward pressure on nondomestic consumption. In PRC, nondomestic consumption has clearly fallen in response to price rises. In Dalian and Zhangjiakou, where nondomestic tariff rates have risen by 110% to 150% in Dalian and by 180% to 190% in Zhangjiakou since the beginning of 1998, industrial consumers surveyed have, on average, reduced consumption by 30%, implying a high price elasticity. Consumption by one large industrial user in Zhangjiakou has fallen by 45%.

G. Policy Impacts

50. The two TAs in the PRC addressed the issue of tariff reform (Appendix 1). The first resulted in the National Guidelines on Water Tariffs. The second helped implement the guidelines in several pilot cities by establishing local rules and regulations for tariff reform. Under the new arrangements, WSCs and municipal governments no longer set water tariffs on an ad hoc basis, but according to a set of rules. Thus, even though the reform concerns increasing the price of water to facilitate the financial viability and sustainability of water utilities, the essence of the process is institutional.

51. Although the tariff reform recommended by the first TA was not fully implemented by the Dalian WSC, tariffs have been raised significantly in recent years with the objective of moving toward full cost recovery and repayment of outstanding debt, ahead of schedule if possible. Three cities were selected under the second TA as pilots for tariff reform, namely, Chengdu, Fuzhou, and Zhangjiakou. The reform at Zhangjiakou has been the most successful so far (Box 5).

Box 5: Tariff Reform in Zhangjiakou

Zhangjiakou has been a successful pilot case for tariff reform. Prior to the implementation of tariff reform, the Zhangjiakou WSC had excess capacity and debts of about CNY100 million that it was having difficulty servicing. A new treatment facility had been constructed to meet demand that did not materialize. Because of industrial restructuring during the 1990s, total demand was declining as old industries closed and new ones started. Following its tariff reform, the WSC expects to be debt free by 2006.

Tariff reform involves putting local regulations in place that simplify and increase the transparency of the administrative and approval procedures for tariff adjustments by rationalizing the financial basis for estimating tariff requirements and increasing water prices to levels that ensure the WSC's financial viability and sustainability. The deputy prime minister cited the success of tariff reform in Zhangjiakou as a model for other cities to emulate, and the State Council endorsed the implementation of tariff reform in accordance with the National Guidelines on Water Tariffs. Reform is not an easy process, and an enabling environment must be present for it to succeed. In Zhangjiakou, the urgent need to improve the financial situation, the need for water conservation, and the presence of a dynamic deputy mayor who supported the process and was instrumental in getting the local government and other agencies to accept it all contributed to the success of the tariff reform.

52. All four DMCs exhibited a trend toward corporatizing or privatizing WSCs. This included the adoption of commercial accounting systems, the improvement of management systems, and the delivery of better quality service. The WSCs in Dalian and Zhangjiakou are, in effect, already corporatized with respect to most of their operations. The water supply project in Dalian and the tariff reform process in Zhangjiakou have strongly supported this trend.

53. Consistent with the recommendations of ADB's postevaluation, Kedah's water supply system is now corporatized.[18] However, Kedah is one of the Malaysian states that has yet to completely privatize its water supply system, in line with the government policy that favors privatization of this function. To date, Kedah has only privatized some of its water production. The Kedah Public Works Department still continues to manage 20% of the state's water supply, although privatization started in 1993. The Kedah Public Works Department office in Sungai Petani envisages to contract out all maintenance works by 2003.

54. Several subprojects in the second project in Sri Lanka faced water rights problems, as there was no mechanism to resolve differences between water user groups during periodic droughts. Significant steps in developing policy on water rights were taken based on recommendations of ADB TAs.[19] The Government adopted an action plan for comprehensive water resources management in 1995, and later established the Water Resources Council and a secretariat to support it. Additionally, it developed an action plan that covered national water policy, water legislation and regulation, institutional development, river basin planning, information systems, and public consultation. Building on this, a recent ADB-financed project[20] supports establishment of the National Water Resource Authority to help manage the country's water resources. As most conflicts about water use are social disputes, with different water user

[18] ADB. 1996. *Project Performance Audit Report on the Kedah Water Supply Project*. Manila.
[19] TA 1918-SRI: *Institutional Assessment for Comprehensive Water Development*, for $188,000, approved on 30 July 1993, and TA 2422-SRI: *Institutional Strengthening for Comprehensive Water Resource Management*, for $1,570,000, approved on 12 October 1995.
[20] Loan 1757-SRI: *Water Resources Management*, for $19.7 million, approved on 19 September 2000.

groups competing for the same limited resource, this project is expected to have a significant positive social impact.

III. KEY ISSUES FOR CONSIDERATION

A. Cost Recovery and Financial Sustainability

55. In recent years, ADB has increasingly emphasized the importance of cost recovery in water supply projects and the financial viability of WSCs. Only full cost recovery will ensure WSCs' ability to supply customers over the long term, and the most reliable way to achieve this is for water users to compensate WSCs directly. Most loan agreements include financial covenants intended to encourage progress toward full cost recovery and WSCs' financial independence, but the projects frequently do not include components to help achieve these objectives. The WSCs' ability to increase tariffs and achieve full cost recovery depends on local circumstances.[21] Willingness to charge comes from a wish to stop burdening local government finances with excessive subsidies and to address the constraints of the local water resource situation. The Dalian and Zhangjiakou WSCs have relatively high levels of debt, but both have been increasing water tariffs substantially and moving toward full cost recovery.[22]

56. Cost recovery for water supply projects tends to focus on increasing WSCs' revenues to cover specific costs (O&M, depreciation, and so on) or to meet financial ratio targets such as the debt-service ratio. This approach ignores two points, first, whether the costs that are being covered are adequate to sustain the water supply system,[23] and second, whether operating costs are too high, perhaps because excess staff are on the payroll or levels of NRW are high.[24] Therefore when considering cost recovery, project designs should take into account both the revenues and costs, as well as technical issues relating to the adequacy of O&M procedures and practices.

B. Nonrevenue Water

57. The experiences of the projects reviewed with regard to NRW are varied (Box 3). NRW has obvious implications for WSC finances, especially if unchecked, as it represents lost revenue. It can be reduced through such measures as improving maintenance, and metering, and reducing leaks and thefts. As revenue is a function of volume sold and price, the water tariff is one of the factors affecting how much effort should be put into reducing NRW. Assuming demand for the water exists, the revenues gained from water saved can be reinvested to cover the costs of reducing NRW. Where the tariff is low, the cost per unit reduction in NRW may be significant compared with the revenues gained. In the projects reviewed, except in the small

[21] In Kedah, the facilities provided by the project were only part of a statewide water supply system operated by the Public Works Department, with a single tariff for the whole state. The operation of the water supply system is subsidized from the state budget and there is little political will to increase the tariff.

[22] Their respective municipal governments own the WSCs that have several factors in common, including operating in situations where water is in short supply and where people recognize that it must be properly managed to ensure and protect supply, and where management is strong and competent. There is political support for full cost recovery in the municipal governments.

[23] For example, stakeholder workshop participants have suggested that in Sri Lanka, while revenues collected exceed O&M expenditures, the amounts spent on O&M are insufficient to sustain the water supply systems over the longer term.

[24] Excess staff was an issue for the two WSCs in the PRC. Both have partially solved the problem by using some of the excess staff to run subsidiary companies such as hotels and restaurants.

towns in Sri Lanka, a NRW reduction cost of \$0.10 per m^3 of additional water sold would still be worthwhile.[25]

C. Targeted Subsidies for Poor Households

58. Delivering low-cost water to poor households was either a stated or implied objective of the projects reviewed. Two main approaches to achieving this objective were observed, either of which may be applicable in future projects. The focus should be on selecting the most effective method for the particular conditions. The most common is a block tariff system as used in Sri Lanka, with low volumetric rates for low consumption levels of, e.g., 20 m^3/month or less. However, the tariff in Sri Lanka has fixed and volumetric components, so even though volumetric rates are low for consumption below 20 m^3/month, the average per unit cost for small volumes is relatively high (Appendix 7, Table A7.10). Thus, a household that consumes 5 m^3/month pays the same average cost as one that consumes 27 m^3/month, with the average cost of all volumes in between being lower. If an objective is to deliver low-cost water to households consuming small amounts, many of which will be poor households, the tariff should be structured so that this is actually achieved. An alternative approach is used in Zhangjiakou in the PRC, where low-income households receive a cash rebate equivalent to 5 m^3/month. Households with incomes below a specified level and the unemployed pay their water bills in the usual way and receive the cash rebate twice a year. Households receiving this rebate must be certified by a workers' organization or other accredited organization as having an income below the defined level. The tariff in Zhangjiakou is a flat rate per unit volume charge that has increased rapidly in recent years. The rebate was introduced as part of the tariff reform. This approach is an effective way to deliver low-cost water to poor households, but incurs administrative costs, because an approved agency must certify qualifying households. In addition, some deserving households may miss out if they are unable to obtain the necessary certificate. While not specifically a subsidy, allowing consumers to pay for connection costs in installments may also facilitate access to clean water for the poor (para. 47).

D. Sanitation, Hygiene Behavior, and Community Health

59. While governments have targets for increasing sanitation coverage, sanitation improvements in many DMCs typically lag well behind improvements in water supply. This is typically attributable to rather limited willingness to pay for improved sanitation resulting from a widespread lack of awareness of the critical link between improved sanitation and hygiene behavior, and family and community health. Overlapping institutional responsibilities often exacerbate this problem. While the Ministry of Public Works or Construction is typically responsible for water supply, sanitation and hygiene education typically fall under the purview of the Ministry of Health. Water supply usually receives a far greater share of resources than sanitation. Hygiene education components generally receive insufficient attention.

60. To realize the health benefits of improved sanitation and hygiene behavior, health promotion activities are required to increase individual and community awareness of sanitation, hygiene, and health linkages. As developing good hygiene habits among children is easier than changing the hygiene habits of adults, creating demand for improved sanitation facilities is often most successful when carried out through health and hygiene awareness programs at the elementary school level (Box 2), as also observed in the Water Education for African Cities

[25] This is lower than the average tariffs for Zhangjiakou and Dalian in 2001 at \$0.19/m^3 and \$0.22/m^3, respectively. In Sagay City in the Philippines, the average tariff is around \$0.20/m^3, and in central Kedah in Malaysia, it is about \$0.24/m^3. For the small systems in Sri Lanka, the tariff is closer to \$0.05/m^3 or \$0.06/m^3, but it is higher in Colombo, where commercial and industrial consumers provide a significant proportion of total revenue.

Programme implemented by UN-HABITAT.[26] When school health and hygiene programs succeed, children often become their parents' teachers. Public awareness programs can also be used to explain the need for water tariff increases and the importance of the WSCs' financial viability to ensure sustainable operations.

61. The role of women in taking care of their families' health, and therefore being responsible for sanitation and hygiene behavior, needs to be acknowledged. Women need to be involved in the design and management of sanitation facilities and the associated public awareness and hygiene education programs. Successful examples of this involvement exist that can provide a blueprint for future project design.[27]

E. Community Participation

62. The survey data show little community involvement in project planning, design, construction, or O&M. This is largely because the projects reviewed were designed before ADB adopted participatory approaches to design and implementation. Postevaluation showed that part of the reason for the limited success of the second project in the Philippines was the lack of community participation.[28]

63. Enhanced community participation in decision-making and project development activities tends to increase the likelihood of project sustainability. In addition, people who actively participate in construction are much more likely to be able to operate, maintain, and repair facilities when this is required. This is true, for example, for community-level facilities in the Philippines. The IES developed a model to confirm these findings (Appendix 8 and Supplementary Appendix D). For the larger and more complex facilities in the PRC and Malaysia, trained professional service providers are required to manage, operate, and maintain the facilities. However, this need not obviate consultation with water customers on such matters as system management, level of service, expansion planning, and periodic tariff revisions.

F. Good Governance and Effective Project Management

64. Good governance is one of the key elements of ADB's poverty reduction strategy.[29] Sound management, stakeholder participation, transparency, and accountability are important components that help strengthen good governance. Projects assessed in this IES fell short in some or all of these elements. In the Philippines and Sri Lanka, protracted domestic procurement procedures and decision-making processes have been a reason why ADB projects have not provided the level of benefits to participating communities that they might otherwise have done. The impact of these procedures and processes is broad and far reaching, and ADB should help streamline them and make them more transparent so as to minimize negative

[26] UN-HABITAT. 2002. *Water Education for African Cities*. Nairobi.

[27] Loan 1755-NEP: *Small Towns Water Supply and Sanitation Sector Project*, for $35 million, approved on 12 September 2000, and TA 2376-VIE: *Community Environmental Health Improvements for the Provincial Towns*, for $500,000, approved on 17 August 1995.

[28] ADB. 2000. *Project Performance Audit Report on the Second Island Provinces Rural Water Supply (Sector) Project in the Philippines*. Manila. The IES surveys confirmed that community members had a small role in decisions on technology choice, level of service, cost, or institutional responsibilities.

[29] ADB. 1999. *Fighting Poverty in Asia and the Pacific: The Poverty Reduction Strategy of the Asian Development Bank*. Manila.

impacts on project implementation.[30] Corruption can undermine projects significantly, sometimes irreparably.[31] To change corrupt practices requires strong and focused political will.

65. This situation can largely be avoided when beneficiary communities are actively involved in the planning and constructing of WSS facilities. Informed citizens are often the most motivated quality control monitors. They do not need to be technically well qualified to assess the quality and appropriateness for the simpler types of water systems commonly built in rural communities. Project design can also incorporate the involvement of qualified and committed local and international NGOs to help mobilize and empower communities to participate in monitoring and evaluation.

66. Time-consuming project administration and procurement procedures and complex project design and policy requirements can be major sources of delay in project implementation. Complex, and sometimes conflicting, ADB and government regulations impair the efficiency of project administration and procurement. The channeling of funds and domestic decision-making mechanisms for moving funds from their initial repository in the Ministry of Finance to the field level for community mobilization and construction can be slow as observed in the Philippine subprojects. Delays in construction projects are often not construction delays as such, but rather delays in making funds available so that construction can proceed.

67. Effective and efficient project management depends strongly on the capacity and capability of each component of the institutional framework. Projects reviewed in the IES reflect the traditional approach of having a single government agency act as the executing agency essentially responsible for all project activities.[32] While this simplified framework facilitates coordination for ADB, the Sri Lankan surveys show that a single institution seldom has the required depth and breadth of capacity and capabilities to carry out all the required tasks.[33]

68. Many countries are increasingly accepting that the role of government agencies should be quality assurance and facilitation rather than implementation. While ADB has established policies to enhance the roles of the private sector and NGOs in implementation of WSS projects, their services remain largely underutilized. More effective utilization of the capabilities of NGOs and the private sector can help streamline implementation, but the ADB projects reviewed did not use this approach. Many participants in the stakeholder workshops observed that more reliance on the private sector and NGOs would result in projects having a greater and broader impact and enhancing benefits for consumers.

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[30] These impacts may include increasing the cost of facilities and undermining quality control, increasing O&M and repair costs because of lower-quality initial construction, reducing the quality of services through inappropriate design and poor construction, and undermining stakeholders' confidence and decreasing their willingness to pay.

[31] ADB. 2001. *Progress in the Fight Against Corruption in Asia and the Pacific*. Manila.

[32] In the projects reviewed, line agencies responsible for water development were the implementing agencies in Malaysia, Philippines, and Sri Lanka. Such agencies have limited capacity for managing activities other than construction, and sometimes even construction. In particular, they have limited capability to carry out such project components as promoting health and hygiene, mobilizing and training communities, managing NGOs providing services to the project, and coordinating with local or municipal governments during project planning and implementation. Moreover, in WSS projects involving multiple agencies, implementing agencies often compete rather than cooperate.

[33] The sanitation and health promotion programs in the second project in Sri Lanka were partly successful. The executing agency focused on delivering water services rather than on community mobilization and health promotion.

IV. CONCLUSIONS AND RECOMMENDATIONS

A. Lessons Learned and Best Practices

69. Numerous lessons learned and best practices were compiled during this IES. The following paragraphs discuss the most important of them.

1. Supporting Cost Recovery and Financial Sustainability

70. New WSS projects usually include requirements to raise tariffs and generate revenues to recover costs and meet defined financial targets. Components aimed at helping WSCs meet these targets are included less often. Rationalizing or raising tariffs may often require difficult institutional changes and the reasons for increasing tariffs may need to be fully explained to water consumers and producers as well as to politicians. Support for implementing these processes, as in the two tariff study TAs in the PRC, would increase the likelihood of WSCs meeting financial targets and achieving long-term sustainability.

2. Ensuring Effective Sanitation, Hygiene, and Health Promotion Programs

71. ADB needs to give serious attention of implementing effective sanitation, hygiene, and health promotion programs in its WSS projects. The traditional emphasis on simply providing adequate quantities of good quality water is not enough to achieve the full benefits of improved individual and community health. Carefully crafted sanitation, hygiene, and health promotion programs, such as the Society for the Promotion of Area Resource Center's projects in India, are needed for project beneficiaries to become much more aware of the critical links between water, sanitation, hygiene behavior, and health.

3. Reducing Nonrevenue Water

72. Every ADB-financed WSS project with subprojects serving more than 5,000 people should require the development and implementation of a program of specific and feasible activities (technical, financial, managerial, and social) to reduce NRW. Simply saying that this should be done is not enough. Project preparation documents should specify a program of feasible and cost-effective tasks, tailored to the situation at hand, that have a high likelihood of reducing NRW to "reasonable" levels of about 25%–30%, or lower if the situation permits. Leak detection is only one of many options that should be considered. The caretaker approach,[34] currently under development by ADB, is a useful tool to apply coupled with benchmarking the performance of water utilities.

4. Supplying Drinking Water

73. As drinking water requirements account to 2–3 liters per capita per day, they do not have to be met only through a piped water supply. Potable water from water treatment plants, as well as smaller quantities from shallow groundwater, may be better delivered when distributed in bottles, either by the WSC or through public-private partnership. Most tropical areas of DMCs

[34] This approach is applicable to urban areas and proposes to assign staff of the WSC at the community level (perhaps for every 500 or 1,000 connections) with responsibility for operational matters within the community. This may include overseeing general operation of the network in the area, reading meters, identifying leaks in the distribution system, helping customers identify leaks inside the home, and undertaking other customer relations matters.

are endowed with sufficient annual rainfall for shallow groundwater to be the most accessible and sustainable source of potable water. The key problem is the pollution of this groundwater because of inadequate sanitation practices. This problem cannot be overcome by extending piped water supply alone, which requires greater investment.

5. Considering Water Demand-Side Management

74. An effective DSM program is a simple and cost-effective alternative to supply expansion, particularly in water-scarce areas. DSM succeeds with political support and appropriate campaigns to promote customer awareness of the need for conservation, as observed in Dalian. Particularly in water-scarce areas, all ADB-financed medium- to large-scale WSS projects should include a DSM program of achievable and cost-effective actions, appropriate to the situation, to develop demand-side alternatives to supply-side expansion of system capacity. The program's activities should be prioritized according to their net impact in terms of the amount of water potentially saved and according to their cost-effectiveness in decreasing cost per unit of water saved. Project preparatory TA documents should address the full range of tasks needed to design and implement a DSM program, including technical assessments and recommended actions, financial (for instance, water tariff structure) and economic assessments, customer conservation awareness campaigns, and political support requirements.

6. Enhancing Customers' Roles in Planning and Implementation

75. Stakeholders' roles in planning, implementing, and operating water supply systems have been limited in the projects reviewed in the IES. Perhaps the greatest obstacle to successful participatory development is convincing institutional players that it is indeed possible. Maximizing stakeholder involvement in project decision-making and implementation goes against the institutional culture in some DMCs. Success stories from Malaysia and the Philippines show that often just one committed person can lead the way and achieve customer participation. Consistent with ADB policies that specify the importance of such participation, project designs should make a more concerted effort to realize this objective.

7. Streamlining Project Management and Administration

76. Most WSS projects experience significant delays in implementation. These delays result from an interplay among institutional, design, policy, and administrative factors that include institutional and capacity constraints commonly encountered in DMCs, overly complex project designs, proliferation of policy requirements of both external funding agencies and recipients, administrative procedures that are not always well understood, and cumbersome domestic procurement procedures and decision-making processes. Insufficient attention by ADB to project management and monitoring causes slow loan disbursements, adversely affecting project implementation and performance. In turn, this can lead to increased project overhead costs and customer dissatisfaction. ADB should consider how best to address this complex but important set of issues. Success stories from NGO-implemented projects in India point to innovative approaches, such as turnkey contracts, that ADB might consider as elements in a more streamlined approach to project management for expeditiously implementing WSS projects.

B. Action Plan

77. An integrated and comprehensive action plan has emerged from the IES. Three workshops were conducted for ADB staff to develop this action plan from those lessons and best practices that could be replicated and scaled up in future ADB projects. The action plan is consistent with the Water for Asian Cities Programme that builds on UN-HABITAT's experience in urban water governance and capacity building in other regions, as well as ADB's operational experience, and aims to accelerate the operationalization of ADB's Water Policy. Called W A T E R, it comprises five categories of actions:

(i) **water (W):** providing 100% coverage for drinking water, including distribution in bottles;
(ii) **alternative source (A):** protecting alternative sources of water through education and revival of traditional practices;
(iii) **tap water (T):** reducing NRW, promoting tariff reform, and encouraging DSM for sustainable 24-hour piped-water supply;
(iv) **environment (E):** providing 100% coverage for environmentally safe sanitation; and
(v) **river basins (R):** integrating water resources management, with participation of beneficiaries, and management at the river basin level.

1. W.1 Provide Drinking Water for All in Asian Cities

78. Bottled drinking water is prevalent in many DMCs, especially in urban areas. Yet only a few WSCs in DMCs actually bottle their water for distribution. The experience of WSCs in the PRC and Indonesia confirms that bottling water is a financially viable business, because the selling price of bottled water from private companies is about 1,000 times that of the cost of water produced by WSCs.

79. With support from ADB and other external funding agencies, and under the auspices of the Water for Asian Cities Programme, WSCs in DMCs should be encouraged to distribute drinking water in bottles and sell drinking water from their water treatment plants in bulk to bottling companies.[35] This action can be implemented between 2003 and 2008.

2. W.2 Initiate Health and Hygiene Awareness Education in Relation to Safe Drinking Water

80. Providing adequate amounts of clean, accessible, good quality water will not by itself necessarily ensure significant reductions in the incidence of water-related diseases, especially in young children, who are the most vulnerable group. The numerous anecdotal examples in this IES indicate that the intended health impacts of WSS projects are fully achieved only in the presence of wide awareness of the benefits of health and hygiene among the beneficiaries. To obtain the maximum benefit from WSS investments, broadly based health and hygiene education and awareness programs are needed at the customer level to increase community understanding of the critical links between health, personal hygiene, and sanitation practices. In the absence of such awareness, the benefits are either not achieved or are at best underachieved. The simple chore of washing hands with soap, especially before meals and after using the toilet, can make a big difference in achieving the health impacts if people, especially children, practice it. The program developed by UN-HABITAT for water education in

[35] The water sold or bottled before it is distributed in pipes also helps the companies reduce the level of NRW and obtain additional revenues.

schools in Asian cities, following that for water education in African cities, is highly relevant in this context.

81. Executing agencies, departments of health, and departments of education in DMCs should implement this action with support from UN-HABITAT, ADB, and other external funding agencies under the auspices of the Water for Asian Cities Programme between 2003 and 2005.

3. A.1 Promote Cost-Effective Water Conservation

82. Water conservation (or DSM) programs are becoming increasingly common in many parts of the world, especially in water-scarce areas. Like reducing NRW, they have the advantages of reducing the amount of water that has to be produced and distributed, the requirements for wastewater treatment, and the energy required to distribute water throughout the system. Strategic use of water conservation can extend the value and life of infrastructure assets used for both water supply and wastewater treatment. The success of the water conservation program in Dalian, which incorporates technical, financial, public awareness, and regulatory measures, is replicable in many cities in the PRC and other DMCs. The training programs for utilities under the Water for Asian Cities Programme could accelerate the pace of action in this regard.

83. ADB's regional departments and executing agencies should implement this action between 2003 and 2008 with support from ADB's RSDD and training by UN-HABITAT under the auspices of the Water for Asian Cities Programme.

4. A.2 Harvest Rain Water and Protect Boreholes and Dug Wells from Contamination

84. Water cannot be produced; it can only be harvested. Yet the most common source–rainwater–is not harvested in many urban and rural areas. Rainwater is generally pure and can be easily collected and stored without contamination. The related investments are modest and can be supported by community-oriented initiatives. Raw water from other sources, such as boreholes and dug wells, often suffers from contamination from nearby septic tanks, which are either located or constructed and operated without much precaution. This contamination is remediable once the source of pollution has been reconstructed or moved, which is cheaper than exploiting new sources of water. The best practice examples from the projects implemented by NGOs in many DMCs can be replicated.[36]

85. NGOs should be encouraged to implement these initiatives with support from ADB and UN-HABITAT under the auspices of the Water for Asian Cities Programme during 2003–2006.

5. T.1 Launch Initiatives for Financially Sustainable Water Supply Companies

86. Full cost recovery is essential for long-term sustainability. Both loan covenants and specific project components are required to achieve this objective and remove subsidies. It is important to optimize costs by providing adequate allocations for O&M and, at the same time, reducing waste caused by excessive staffing and NRW levels. The success stories from Zhangjiakou, Sagay City, and Dalian are replicable elsewhere. Assistance such as the tariff study TAs in the PRC, should be considered for other DMCs.

[36] At the Regional Consultation Workshop held in Manila in October 2002, an NGO based in India, presented successful projects that harvest rainwater in a cost-effective manner.

87. ADB's regional departments should implement these measures during 2003–2006 with the guidance of ADB's RSDD.

6. T.2 Reduce Nonrevenue Water Using the Caretaker Approach

88. The Zhangjiakou and the Dalian WSCs managed to reduce NRW to 25%–30%. In many other DMCs, NRW levels are still above 30% and a major scope for improvement exists. NRW can be reduced through such measures as improving maintenance, upgrading metering, and reducing leaks. Revenues gained from the water saved should cover the costs of reducing NRW. As revenue is a function of volume sold and price, the water tariff is one of the factors affecting how much effort should be put into reducing NRW. Where tariffs are low attempting to reduce NRW may not be worthwhile.

89. ADB's RSDD is developing the caretaker approach (footnote 34) to help WSCs reduce NRW. Regional departments and executing agencies should implement this approach during 2003–2008.

7. E.1 Encourage Community-Oriented Sanitation

90. While governments have targets for increasing sanitation coverage, actual achievements are still very low. As noted earlier, overlapping institutional responsibilities often exacerbate this problem. Sanitation and hygiene education components should be allocated a greater share of resources in future projects. The Society for the Promotion of Area Resource Center's model could be replicated in as many DMCs as possible.

91. ADB's regional departments and local governments should implement this action under the auspices of the Water for Asian Cities Programme during 2003–2010.

8. R.1 Promote Integrated Water Resources Management

92. As the demand for water grows, the pressure on limited water sources has intensified in many DMCs. Often the more readily accessible water sources have already been used, and more distant or lower-quality water sources must be tapped. This increases the costs of water transmission and treatment. Competition for increasingly limited water raises complex legal, environmental, and ethical problems among water user groups. Especially in rural areas, where agriculture is the largest user of water, water rights controversies may supplant limited financial resources as the most important constraint to providing improved water supply services. An integrated approach to managing water resources as that developed in Sri Lanka can meet the increasing needs of all water users.

93. ADB's regional departments and executing agencies should replicate such an approach in other DMCs with guidance from ADB's RSDD during 2003–2010.

9. Other: Disseminate Success Stories at the Third World Water Forum

94. ADB should disseminate the IES findings at the Third World Water Forum to be held in Japan in March 2003 and at related regional and international workshops. ADB should conduct seminars and prepare video footage and PowerPoint slides on success stories and lessons from the IES for a wide audience, including nontechnical people and schoolchildren.

95. ADB's Operations Evaluation Department and RSDD are already implementing this action with support from the Office of External Relations during 2002–2003.

CASE STUDY PROJECTS

Loan/ TA No.	Project Title	Approved Amount ($'000)	Type	Funding	Approval Date	Completion Date	Other Reports
People's Republic of China							
1313	Dalian Water Supply	160,000	Loan	OCR	20-Sep-94	Apr-99	PCR
2773	Water Supply Tariff Study	169	ADTA	ADB	24-Mar-97	Jun-99	TCR
3250	Water Supply Tariff Study II	950	ADTA	ADB	03-Sep-99	Active	
Malaysia							
652	Kedah Water Supply Project	24,500	Loan	OCR	15-Nov-83	Oct-91	PCR, PPAR
Philippines							
812	Island Provinces Rural Water Supply Sector	24,000	Loan	OCR	04-Dec-86	Dec-92	PCR, PPAR
1052	Second Islands Provinces Rural Water Supply	24,000	Loan	ADF	20-Nov-90	Feb-96	PCR, PPAR
Sri Lanka							
817	Water Supply Sector	30,000	Loan	ADF	11-Dec-86	Jun-95	PCR
1235	Second Water Supply and Sanitation	40,000	Loan	ADF	17-Jun-93	Mar-99	PCR
1486	Financial Accounting and Reporting Assistance to the National Water Supply and Drainage Board	100	ADTA	ADB	27-Feb-91	Mar-94[a]	[b]
1900	Management Strengthening of the National Water Supply and Drainage Board	550	ADTA	Norway	17-Jun-93	Jul-97	[c]

ADB =Asian Development Bank, ADF = Asian Development Fund, ADTA = advisory technical assistance, OCR = ordinary capital resources, PCR = project completion report, PPAR = project performance audit report, TCR = technical assistance completion report.

[a] Financial completion.

[b] No TCR.

[c] The ADTA was attached to Loan 1235-SRI. The TCR was part of the PCR for the loan.

ADB ASSISTANCE IN THE WATER SUPPLY AND SANITATION SECTOR IN THE SELECTED COUNTRIES

Loan/ TA	Project/Technical Assistance	Type	Amount ($'000)	Funding	Approval Date
People's Republic of China					
1313	Dalian Water Supply	Loan	160,000	OCR	20-Sep-94
1490	Anhui Environmental Improvement Project for Municipal Wastewater Treatment	Loan	28,000	OCR	26-Nov-96
1544	Zhejiang-Shanxi Water Supply Project (Phase I)	Loan	100,000	OCR	24-Sep-97
1636	Fuzhou Water Supply and Wastewater Treatment	Loan	102,000	OCR	30-Sep-98
1692	Suzhou Creek Rehabilitation	Loan	300,000	OCR	29-Jun-99
1797	Tianjin Wastewater Treatment and Water Resources	Loan	130,000	OCR	11-Dec-00
1145	Beijing Tianjin Water Resources Study	ADT	550	JSF	17-Apr-89
1681	Beijing Region Water Resources Management	ADTA	256	ADB	30-Mar-92
1835	Haihe Basin Environmental Management and Planning Study	ADTA	1,240	JSF	31-Dec-92
1852	Dalian Water Supply	PPTA	100	ADB	10-Mar-93
2187	Anhui Municipal Wastewater Treatment	PPTA	283	JSF	19-Oct-94
2504	Seminar on Build-Operate-Transfer in the Water Supply Sector	ADTA	100	ADB	22-Dec-95
2511	Zhejiang-Shanxi Water Conservancy	PPTA	1,000	JSF	26-Dec-95
2726	Water Qaulity Management Planning for Suzhou Creek	ADTA	600	JSF	23-Dec-96
2751	Capacity Building of Wastewater Treatment Operations in Anhui Province	ADTA	400	Denmark	27-Jan-97
2770	Fuzhou Water Supply and Wastewater Treatment	PPTA	598	Denmark	14-Mar-97
2773	Water Supply Tariff Study	ADTA	600	ADB	24-Mar-97
2804	Build-Operate-Transfer (BOT) Chengdu Water Supply	ADTA	600	ADB	02-Jun-97
2726	Water Quality Management Planning for Suzhou Creek (Supplementary)	ADTA	400	JSF	13-Feb-98
3049	Zhejiang-Shanxi Water Supply (Phase II)	PPTA	540	JSF	21-Jul-98
3095	Hai River Basin Wastewater Management and Pollution Control	ADTA	570	JSF	10-Nov-98
3211	Improving Environmental Management in Suzhou Creek	ADTA	840	ADB	29-Jun-99
3215	Helongjiang Water Supply	PPTA	1,000	JSF	01-Jul-99
3216	Tianjin Wastewater Treatment and Water Resources Protection	PPTA	800	JSF	02-Jul-99
3250	Water Tariff Study II	ADTA	950	ADB	03-Sep-99
3488	Hebei Province Wastewater Treatment	PPTA	850	JSF	30-Aug-00
3571	Harbin Water Supply	PPTA	720	JSF	12-Dec-00
3638	Wuhan Wastewater Treatment	PPTA	500	France	19-Mar-01
3749	National Guidelines for Urban Wastewater Tariffs and Management	ADTA	700	ADB	25-Oct-01
3638	Wuhan Wastewater Treatment (Supplementary)	PPTA	199	France	01-Mar-02
3863	Mudanjiang Water Supply	PPTA	150	ADB	15-May-02
Malaysia					
0004	Penang Water Supply	Loan	7,200	OCR	19-Sep-68
0041	Malacca Water Supply	Loan	5,000	OCR	12-Nov-70
0107	Greater Ipoh Water Supply	Loan	6,100	OCR	09-Nov-72
0145	Kuching-Sibu Water Supply	Loan	6,460	OCR	30-Oct-73
0283	Johore and Kelantan Water Supply	Loan	15,000	OCR	23-Nov-76
0316	Sabah Water Supply	Loan	15,300	OCR	08-Nov-77
0364	Johor, Perak, and Trengganu Water Supply	Loan	31,740	OCR	07-Nov-78
0500	Rural Water Supply Master Plan	Loan	2,810	OCR	19-Dec-80
0652	Kedah Water Supply	Loan	24,500	OCR	15-Nov-83
1197	Rehabilitation and Upgrading of Water Supply Systems Sector	Loan	105,000	OCR	26-Nov-92

Loan/ TA	Project/Technical Assistance	Type	Amount ($'000)	Funding	Approval Date
0211	Sandakan Water Supply	PPTA	150	ADB	08-Nov-77
0390	Rural Water Supply Master Plan	PPTA	150	ADB	19-Dec-80
0677	Water Supply and Sanitation Sector Profile	PPTA	75	ADB	25-Apr-85
0769	Second Sabah Water Supply	PPTA	150	ADB	21-May-86
0959	Coastal Villages Environmental Improvement	PPTA	195	ADB	04-Mar-88
1603	Rehabilitation and Upgrading of Water Supply Systems	PPTA	597	France	18-Nov-91
2055	Impact Evaluation Study of the Water Supply and Sanitation Sector	ADTA	100	ADB	05-Jan-94
Philippines					
0190	Manila Water Supply	Loan	51,300	OCR	28-Aug-74
0251	Provincial Cities Water Supply	Loan	16,800	OCR	16-Dec-75
0351	Second Manila Water Supply	Loan	49,000	OCR	07-Sep-78
0457	Manila Sewerage	Loan	42,800	OCR	24-Jun-80
0545	Water Supply Sector	Loan	46,000	OCR	25-Nov-81
0645	Manila Water Supply Rehabilitation	Loan	39,300	OCR	27-Oct-83
0812	Island Provinces Rural Water Supply Sector	Loan	24,000	OCR	04-Dec-86
0947	Second Manila Water Supply Rehabilitation	Loan	26,400	OCR	24-Jan-89
0986	Angat Water Supply Optimization	Loan	130,000	OCR	14-Nov-89
1052	Second Islands Provinces Rural Water Supply	Loan	24,000	ADF	20-Nov-90
1056	Metropolitan Cebu Water Supply	Loan	16,000	ADF	29-Nov-90
1057	Metropolitan Cebu Water Supply	Loan	6,000	OCR	29-Nov-90
1150	Manila South Water Distribution	Loan	31,400	OCR	19-Dec-91
1217	Umiray-Angat Transbasin Technical Assistance	Loan	2,600	OCR	22-Dec-92
1269	Municipal Water Supply	Loan	43,200	OCR	25-Nov-93
1379	Umiray-Angat Transbasin	Loan	92,000	OCR	21-Sep-95
1440	Rural Water Supply and Sanitation Sector	Loan	18,500	OCR	04-Jun-96
1441	Rural Water Supply and Sanitation Sector	Loan	18,500	ADF	04-Jun-96
1472	Small Towns Water Supply Sector	Loan	50,000	OCR	30-Sep-96
0072	Laguna de Bay Water Resources Development Study	PPT	1,284	UNDP	08-Aug-72
0087	Manila Water Supply	PPT	49	ADB	05-May-73
0433	Bulacan Bulk Water Supply Scheme	PPT	150	ADB	25-Nov-81
0737	Island Provinces Water Supply Sector	PPT	75	ADB	26-Dec-85
0779	Water Supply and Sanitation	ADT	50	ADB	20-Jun-86
1039	Angat Water Supply Optimization	PPT	100	ADB	21-Sep-88
1057	Manila Metropolitan Region Environmental Improvement Study	ADT	551	Switzerlan	08-Nov-88
1219	Angat Water Supply Optimization	ADT	300	ADB	10-Nov-89
1268	Cebu Water Supply - Phase II	PPTA	670	JSF	29-Jan-90
1270	Umiray-Angat Transbasin Study	PPTA	1,267	JSF	19-Feb-90
1422	Training System for Rural Water Supply Personnel	ADTA	130	ADB	20-Nov-90
1423	Second Manila Sewerage	PPTA	250	ADB	23-Nov-90
1513	Manila North-East Water Supply	PPTA	1,283	France	07-May-91
1268	Cebu Water Supply - Phase II (Supplementary)	PPTA	53	ADB	24-Jul-91
1845	Second Provincial Towns Water Supply	PPTA	100	ADB	25-Jan-93
1513	Manila North-East Water Supply (Supplementary)	PPTA	48	France	23-Jul-93
1995	Institutional Strengthening of Local Water Utilities Administration and Water Districts	ADTA	590	JSF	25-Nov-93

Loan/ TA	Project/Technical Assistance	Type	Amount ($'000)	Funding	Approval Date
2089	Socioeconomic Survey and Evaluation of the Island Provinces Rural Water Supply Sector	ADTA	100	ADB	12-May-94
2254	Metropolitan Waterworks and Sewerage System Operational Strengthening Study	ADTA	600	ADB	24-Dec-94
2263	Metropolitan Waterworks and Sewerage System Water Supply Improvement Study	PPTA	582	JSF	27-Dec-94
2272	Small Towns Water Supply and Sanitation Sector	PPTA	100	ADB	27-Dec-94
2401	Metropolitan Waterworks and Sewerage System Privatization Support	ADTA	582	ADB	21-Sep-95
2417	Water Resources Management (Angat Reservoir)	ADTA	100	ADB	06-Oct-95
2803	Pasig River Environmental Management and Rehabilitation	PPTA	800	JSF	29-May-97
2916	Water Supply and Sanitation Sector Plan Study	ADTA	600	ADB	24-Nov-97
3703	Capacity Building for the Regulatory Office of the Metropolitan Waterworks and Sewerage System	ADTA	800	JSF	08-Aug-01
3848	Metro Manila Solid Waste Management	ADTA	1,250	JSF	18-Mar-02
Sri Lanka					
0817	Water Supply Sector	Loan	30,000	ADF	11-Dec-86
1235	Second Water Supply and Sanitation	Loan	40,000	ADF	17-Jun-93
1575	Third Water Supply and Sanitation (Sector)	Loan	75,000	ADF	06-Nov-97
1757	Water Resources Management	Loan	19,700	ADF	19-Sep-00
0744	Water Supply Rehabilitation	PPT	75	ADB	29-Jan-86
1150	Rural Water Supply and Sanitation Sector Development Planning	ADT	600	JSF	26-Apr-89
1486	Financial Accounting and Reporting Assistance to the National Water Supply and Drainage Board	ADTA	100	ADB	27-Feb-91
1584	Second Water Supply Sector	PPT	250	Finland	25-Oct-91
1900	Management Strengthening of the National Water Supply and Drainage Board	ADTA	552	Norway	17-Jun-93
2609	Rural Water Supply and Sanitation Sector	PPT	600	JSF	17-Jul-96
3434	Accounting Review of the National Water Supply and Drainage Board	ADT	100	ADB	10-May-00
3587	Secondary Towns Water Supply and Sanitation	PPTA	1,000	JSF	15-Dec-00

ADB = Asian Development Bank, ADF = Asian Development Fund, ADTA = advisory technical assistance, JSF = Japan Special Fund, OCR = ordinary capital resources, PPTA = project preparatory technical assistance.

COMPARISON OF THE CASE STUDY PROJECTS[1]

Item	Dalian Water Supply, PRC	Kedah Water Supply, Malaysia
A. Project Objectives		
1. Increased Access to Safe Water	• Enable 24-hour water supply to residences. • Provide additional water to meet priority needs.	• Expand the water supply by 68,000 m^3/day to meet the projected demand for water of about 90 percent of the population in the area (250,000 people) by 1995.
2. Health Improvement	• Improve public health.	
3. Economic and Social Improvement	• Increase employment and upgrade living standards.	
4. Policy Reform	• Ensure that the new water supply facilities are financially self-sustaining.	
B. Project Components		
1. Water Supply	• Construct northern and southern conveyor systems. • Expand and rehabilitate the Pulandian water supply system and the Jinshitan water supply system.	• Expand river intake works, treatment plant, and pumping system with a capacity of 68,000 m^3/day. • Construct five service reservoirs with a total capacity of 45,000 m^3. • Supply and lay 55 kilometers of pipes.
2. Tariffs	• Review tariffs. PCR reported improvements in financial management.	
3. Demand-Side Management	• Introduce policy changes aimed at providing market-based initiatives and encouraging conservation.	
4. NRW Reduction		• Identify causes of NRW, formulating measures to reduce NRW, and implement leakage control programs.
C. Salient Features		
1. Implementing Agencies	• The Dalian Water Supply Company and the Dalian Yinbi Northern Water Supply Company implemented original subprojects. • The Pulandian Water Supply Company and the Jinshitan Water Supply Company implemented the additional subprojects.	• The Public Works Department of the State of Kedah was the Executing Agency.
2. Target Beneficiaries	• People living in the Dalian service area, residents of Pulandian and Jinshitan, and industries and business establishments.	• At appraisal the Project was expected to serve three industrial estates: Tikam Batu, Bakar Arang, and Kulim. The needs of the Kulim Estate were met from another upgraded water treatment plant located at Kulim and funded by the Government. The facilities provided under the Project also supply a new industrial estate, the Ria Jaya Industrial Estate.

[1] Compiled information available in RRPs, PCRs, and PPARs.

Item	Dalian Water Supply, PRC	Kedah Water Supply, Malaysia
D. Indicators of Impacts		
1. Physical Impacts Increased Access for Domestic, Commercial, and Industrial Users	• Increased and more reliable supply of water has benefited 2.3 million people. • Pipes now contain clean water flowing all day.	• Production achieved as planned and is sufficient to meet demand. The population served by the metered connections is estimated at about 308,000, which is about 95 percent of the total population in the area served by the Project.
2. Poverty Impacts a. Time Savings b. Cost Savings c. Economic Opportunities	• Resettled households have rebuilt their houses with new materials and improved standards. • Resettled households have new economic opportunities open to them.	• Reduction in time and energy spent fetching water from alternative sources. • Facilities provided by the Project served to supplement private investment in residents, offices, and industrial estates so that the Sungai Petani area has become the fastest growing area in Malaysia.
3. Health Impacts a. Reduction in Waterborne and Water-Related Diseases b. Hygiene Awareness	• Key officials indicated that the incidence of water-related diseases has declined as a result of the improved supply of water.	• Improved water quality, significant increase in flush toilet facilities and septic disposal.
4. Environmental Impacts a. Pollution of Groundwater b. Wastewater Disposal	• Increased wastewater generated.	• Minor soil erosion occurred during construction, but the effect was minimal and temporary.
5. Gender a. Proportion of Women Beneficiaries b. Participation by Women		• Benefits to women include reduced time and energy spent on fetching water from alternative sources.
6. Institutional/Policy a. Demand-Side Management b. Tariffs by Consumer Groups c. Cost Recovery d. NRW Measures e. Subsidy/Cross-Subsidy	• The Dalian Water Supply Company has increased water tariffs to support full cost recovery. • Water tariffs have been increased to more sustainable levels and subsidies in the sector have been reduced.	• The required accounting system to be installed was not complied with. • Tariffs were increased significantly after the completion of the Project but not enough to cover O&M costs. • The requirement to reduce NRW was not met and actually increased following Project completion. • The high level of NRW and the lower than expected water tariff level have reduced the financial return.
7. Performance of the utility a. Utilization of Capacity of Facilities b. O&M c. Staffing d. Water Quality Testing	• Project facilities have been operating and have been maintained. The O&M has been sufficient. Tariffs have been found sufficient to cover O&M costs. If the tariff increases continue to be implemented, the target to phase out the government subsidies to all water companies by 2006 will likely materialize.	• Project facilities have been operating at about 85% of capacity and are being operated as part of the statewide water supply system. Tariffs are set centrally for the whole state. Cost recovery had not been achieved and water supply services continue to be subsidized from the state budget.

Item	Island Provinces Rural Water Supply Sector, Philippines	Second Island Provinces Rural Water Supply, Philippines
A. Project Objectives		
1. Increased Access to Safe Water	• Provide safe water to rural communities.	• Provide safe and easily accessible drinking water to about 180 rural municipalities in the same 15 island provinces targeted under the first project.
2. Health Improvement	• The objective of improved public health was not quantified at appraisal.	
B. Project Components		
1. Water Supply	• Provide and rehabilitate 6,930 point sources and providing the necessary equipment and support services.	• Construct shallow and deep wells and develop springs; rehabilitating some point source systems.
2. Capacity Building	• Upgrade technical skills of staff of the Department of Public Works and Highways and of the Rural Waterworks Development Corporation.	
3. Tariffs	• The beneficiaries were to pay water charges that were to cover the O&M costs, including minor repairs and depreciation of pumps.	
C. Salient Features		
1. Implementing Agencies	• The Department of Public Works and Highways was the Executing Agency, with the Rural Waterworks Development Corporation providing institutional development assistance.	• Department of Public Works and Highways
2. Target Beneficiaries	• Target beneficiaries were rural communities in island provinces.	• Target beneficiaries were rural communities in island provinces.
D. Indicators on Impacts		
1. Physical Impacts Increased Access for Domestic, Commercial, and Industrial Users	• At the time of the PPAR one fourth of the facilities were either no longer in operation or did not produce potable water.	• The OEM found that the operational performance of the facilities was not fully satisfactory and water quality was poor. • Where the facilities were operating, the beneficiaries could obtain water more conveniently.
2. Poverty impact a. Time Savings b. Cost Savings c. Economic Opportunities	• Poverty incidence did not decline. However, the OEM believed that the living conditions of the beneficiaries, who were mostly poor, had improved because of the Project. • The time for fetching water decreased by half; however, instead of using the time saved for income-producing activities it was used to fetch more water by doubling the number of trips.	• Socioeconomic benefits were realized only in spring development facilities because the time savings were substantial in these cases. This translated into more productivity and income for the beneficiaries.

Item	Island Provinces Rural Water Supply Sector, Philippines	Second Island Provinces Rural Water Supply, Philippines
3. Health Impacts a. Reduction In Waterborne and Water-Related Diseases b. Hygiene Awareness	• No firm conclusions were reached about the reduction in morbidity.	• Community members enjoyed health benefits from facilities with good water quality.
4. Environmental Impact a. Pollution of Groundwater b. Salt Water Intrusion c. Wastewater Disposal	• Runoff water near wells and standpipes frequently contaminated by washing, laundering, and animal droppings because drainage around point sources was often inadequate. • Overall discharge of wastewater has increased in relation to the quantity of water being used; however, the environmental impact appears to be minimal in the rural setting.	• Shallow groundwater was polluted by septic tanks that affected water quality. • Some facilities went dry during the dry season possibly because of overabstraction beyond the natural replenishment rate underground. There were also cases where the barangay waterworks and sanitation associations overabstracted water beyond the natural replenishment rate of groundwater and abstracted brackish waters, and eventually the facility was abandoned.
5. Gender a. Proportion of Women Beneficiaries b. Participation by Women	• Women benefited the most from the provision of accessible, convenient, and potable water as they are the major users of water at home and do the fetching. • Some women have emerged as leaders of the water association.	
6. Institutional/Policy a. Demand- Side Management b. Tariffs by Consumer Groups c. Cost Recovery	• Tariff rates are low and are estimated to be below the cost of maintaining the facilities in operating condition. • The PPAR estimated that cost recovery remained insufficient.	• Tariffs were arbitrarily fixed and not based on investment. In some cases no regular tariff collection took place and collection was done only when the facility broke down.
7. Performance of the utility a. Utilization of Capacity of Facilities b. Operation And Maintenance c. Staffing d. Water Quality Testing	• No water quality monitoring or treatment took place. • The OEM believed that O&M had been neglected at a number of point sources. • The PPAR considered that the Project's objectives of developing sustainable institutional and indigenous capability in system management were not met.	• The OEM found that the Project had contributed marginally to improving the institutional capabilities of the *barangay* (neighborhood) waterworks and sanitation associations. They did not operate efficiently, did not collect tariffs regularly, did not handle major repairs of shallow pumps, and did not have adequate training or skills to manage systems that included public standpipes and private taps. • Financial performance of the *barangay* (neighborhood) waterworks and sanitation associations was poor.

Item	Water Supply Sector, Sri Lanka	Second Water Supply and Sanitation, Sri Lanka
A. Project Objectives		
1. Increased Access to Safe Water	• Provide adequate, safe, and reliable water supply to an estimated 800,000 people. • Rehabilitate 30-40 existing urban water supply schemes serving populations ranging from 5,000 to 100,000.	• Provide safe and reliable water supply and sanitation services at affordable prices for 440,000 people in 16 towns in the central and western regions.
2. Health Improvement		• Raise public awareness of hygiene, water conservation, and water pollution control issues throughout the country.
3. Policy Reform		• Help National Water Supply and Drainage Board improve its operational efficiency and financial viability. • Reduce NRW in Greater Colombo.
B. Project Components		
1. Water Supply	• Rehabilitate and upgrade existing water supply and transmission facilities.	• Repair/expand production and distribution systems. • Rehabilitate water treatment plants. • Lay additional pipelines.
2. Sanitation		• Construct about 6,127 latrines.
3. Education/Awareness		• Provide training in community participation and hygiene education. • Launch nationwide public awareness campaign for hygiene education and water pollution control.
4. Capacity Building	• Provide training in public health engineering, leakage control and NRW reduction, water supply accounting, public health, public awareness, project planning.	• Provide training to National Water Supply and Drainage Board and local authorities' staff and instruction in O&M, water resources management, construction supervision, and management information systems.
5. Demand-Side Management		• Launch nationwide campaign on water conservation.
6. NRW Reduction		• Repair visible leaks, install and replace pipes, and register and map all connections.
C. Salient Features		
1. Implementing Agencies	• NWSDB	• NWSDB
2. Target Beneficiaries	• Around 800,000 people in various part of the country	• Low income people in 16 project towns
D. Indicators on Impacts		
1. Physical Impacts Increased Access for Domestic, Commercial, and Industrial Users	• The PCR estimated that more than 400,000 people benefited from the Project. • The population served by in-house connections increased by 44% (at the time of the PCR) and water was supplied 24 hours a day.	• In 16 project towns 270,000 people benefited from the water supply subprojects. • At the time of the PCR water was available 24 hours per day in 8 towns, between 12 and 24 hours in 5 towns, and for less than 12 hours in 3 towns. • 20,000 people benefited from the rural water supply and sanitation pilot project in Monaragala district.

Item	Water Supply Sector, Sri Lanka	Second Water Supply and Sanitation, Sri Lanka
2. Poverty Impact a. Time Savings b. Cost Savings c. Economic Opportunities		• Around 30,000 people benefited from new and repaired latrines. • Sanitary facilities were improved in 18 schools in Monaragala district.
3. Health Impacts a. Reduction in Water Borne/Related Diseases b. Hygiene Awareness	• Public awareness and hygiene education were enhanced by programs in schools relevant to the subprojects. • The PCR reported less diarrhea among children.	• At the time of the PCR the risk of major water-related diseases was reduced.
4. Environmental Impact		• No serious adverse environmental impact.
5. Gender a. Proportion of Women Beneficiaries b. Participation by Women	• The PCR reported that women spent less time and energy collecting water.	• The Project eased women's carrying burden by providing piped water to their homes, thereby enabling them to organize their daily activities more productively.
6. Institutional/Policy a. Demand-Side Management b. Tariffs by Consumer Groups c. Cost Recovery d. NRW Measures e. Subsidy/Cross Subsidy	• Public awareness campaigns emphasizing the need to reduce personal consumption were carried out and consumer associations and standpipe consumer societies were set up.	• Collection of water charges became more efficient after the introduction of a computerized billing system and a disconnection policy for late payments. • The percentage of NRW in Greater Colombo decreased to 39.4% in 1999 from 50% to –60% percent at appraisal. • Tariff increases were effective in decreasing water demand by high-consumption households, but not enough to substantially reduce overall water demand.
7. Performance of the Utility Utilization of Capacity of Facilities	• Revenues and tariffs cover all O&M. • The NWSDB was financially viable at the time of the PCR.	• Tariff revisions during the later stages of project implementation made NWSDB financially viable. • At the time of PCR, NWSDB had been meeting all O&M costs and debt service liabilities for its aggregate revenue. • PCR reports NWSDB's success in reducing NRW.

m^3 = cubic meter, NRW = nonrevenue water, NWSDB = National Water Supply and Drainage Board, O&M = operation and maintenance, OEM = Operations Evaluation Mission, PCR = project completion report, PRC = People's Republic of China, PPAR = project performance audit report, RRP = report and recommendation of the President.

PROJECT PERFORMANCE AUDIT REPORTS AND IMPACT EVALUATION STUDIES IN THE WATER SUPPLY AND SANITATION SECTOR

Loan No.	Country	Rating[a]	Project	Circulatio Date
Project Performance Audit Reports				
0057	Singapore	GS	Water Supply Project	Dec-76
0004	Malaysia	GS	Penang Water Supply Project	Dec-76
0064	Republic of Korea	GS	Seoul Water Supply Project	Jan-80
0093	Hongkong, China	PS	Sea Water Desalting Porject	Apr-80
0107	Malaysia	GS	Greater Ipoh Water Supply Project	Oct-81
0145	Malaysia	GS	Kuching-Sibu Water Supply Project	Mar-82
0095	Republic of Korea	GS	Busan-Daegu Water Supply Project	Aug-82
0262	Singapore	GS	Second Water Supply Project	Apr-83
0137	Thailand	PS	Bangkok Water Supply Project	Apr-83
0183[SF]	Lao, PDR	PS	Vientiane Water Supply Project	Oct-83
0119	Republic of Korea	GS	Metropolitan Water Intake Project	Dec-83
0234	Hongkong, China	GS	Sha Tin Sewage Treatment Project	Feb-84
0398	Republic of Korea	GS	Second Busan Water Supply Project	Jun-84
0278[SF]/0346[SF]	Papua New Guinea	GS/PS	First and Second Water Supply	Jun-84
0251	Philippines	GS	Provincial Cities Water Supply Project	Nov-84
0416	Singapore	GS	Bedok Sewage Treatment Plant Expansion	May-86
0316	Malaysia	PS	Sabah Water Supply Project	Jul-86
0478[SF]	Solomon Islands	PS	Honiara Water Supply Project	Sep-87
0336	Republic of Korea	PS	Regional Water Supply Project	Sep-87
0283	Malaysia	GS	Johore and Kelantan Water Supply Project	Sep-87
0364	Malaysia	PS	Johor, Perak, and Trengganu Water Supply	Sep-87
0195[SF]/ 0401	Indonesia	PS	Bandung Water Supply Project	Dec-87
0443	Thailand	GS	Second Bangkok Water Supply	Dec-88
0539	Republic of Korea	GS	Provincial Cities Water Supply	Dec-88
0190/0351	Philippines	GS	Manila Water Supply Project	Nov-89
0735	Thailand	GS	Third Bangkok Water Supply Project	Dec-91
0139[SF]/0140	Viet Nam	PS	Saigon Water Distribution Project	Jan-92
0493	Indonesia	PS	Small Towns Water Supply Sector Project	Dec-92
0584[SF]	Myanmar	GS	Mandalay Water Supply Project	Oct-93
0547	Indonesia	PS	Semarang Water Supply Project	Mar-94
0812	Philippines	PS	Island Provinces Rural Water Supply Sector	May-95
0571[SF]	Bangladesh	PS	District Towns Water Supply Project	Nov-95
0652	Malaysia	S	Kedah Water Supply Project	Jun-96
0331[SF]	Pakistan	US	Faisalabad Water Supply, Sewerage, and Drainage Project	Jun-96
0645/0947	Philippines	US	Manila Water Supply Rehabilitation Project and Second Manila Water Supply Rehabilitation	Apr-97
0263[SF]	Pakistan	PS	Hyderabad Water Supply and Sewerage Project	Nov-97
0719[SF]	Nepal	PS	Rural Water Supply Sector Project	Dec-97
1052[SF]	Philippines	PS	Second Island Provinces Water Supply Sector Project	Dec-99
1122[SF]	Lao PDR	PS	Southern Provincial Towns Water Supply Project	Dec-00
1001[SF]/1002	Pakistan	PS	Karachi Sewerage Project	Nov-01
1069	Indonesia	S	Second IKK Water Supply Sector Project	Dec-01

GS = generally successful, HS = highly successful, PS = partly successful, S = successful, US = unsuccessful.

[a] Ratings of projects in project performance audit reports circulated after 1995 were retrofitted to ratings adopted in 2000.

Loan No.	Country	Project	Circulatio Date
Impact Evaluation Studies			
0137/0443/0735	Thailand	Bank Operations in the Water Supply Subsector in Bangkok[b]	Feb-92
0004/0107/0145/0283/ 0316/0364	Malaysia	An Impact Evaluation Study of Bank Operations in the Water supply and Sanitation Sector in	Dec-94
195/271/400/401/493/547/550/ 629/731/768/919/983/984/1069/ 1077/1078/1158	Indonesia	Impact Evaluation Study of Bank Assistance in the Water Supply and Sanitation Sector in Indonesia	Oct-99

[b] In the preparation of this Impact Evaluation Study, the findings of this Report on Thailand were not specifically drawn or

EVALUATION DESIGN MATRIX

Issues	Questions	Information Required	Information Source	Data Collection Method	Analysis
Impact of WSS projects	• Did the projects improve access to safe water? • Did the projects improve people's health and the environment? • Did the projects benefit the poor?	• Quantity and quality of water provided by the projects • Quality of water from vendors, hand pumps, dug wells (outside the projects) • Trends in number of cases of water-related diseases • Number of poor beneficiaries versus the total number of beneficiaries	• Reports from water utilities • Laboratory test results of samples • Interviews with water utilities and local operators • Reports from local health centers • Beneficiary impact surveys	• Surveys, collection of secondary data, stakeholder workshops, consultations with experts	• Statistical analysis of quantitative data on impacts • Expert opinions on qualitative impacts
Inadequate coverage for water supply and sanitation	• Does the chosen technical option provide the desired level and quality of service to beneficiaries? • Do technical options reflect the site's physical constraints and opportunities? • Were systems built as designed?	• Community satisfaction with project facilities and services • Technical audit of facilities' design and construction • Coverage of new facilities and number of households benefiting from facilities • Extent to which the demand-supply gap for water and sanitation has been reduced	• WUGs and representative sample of community members • Appraisal reports on WSS system components • Engineering design documents	• On-site technical assessment of technology choice and suitability of facilities for providing desired level of service	• Comparison of project targets and government targets with actual achievements
High percentage of NRW	• How was NRW before the project? • What are the major causes of NRW? • Are communities willing to participate in activities to reduce NRW?	• NRW levels before and after the project/technical assistance • Willingness of community members to participate in WSS management and activities that will guard against NRW losses	• Community members • ADB project preparation documents • WUG and water companies' records	• Interviews and review of records	• Estimation of funds needed to achieve NRW reduction targets and the impact of financial sustainability
Poor financial performance of water companies	• Are communities willing and able to cofinance construction at the agreed on levels of cash and in-kind contributions?	• Monthly household income levels • Water users' willingness to pay • Technical and cost feasibility studies • Community agreement to collect and provide cash and in-kind contributions as and when required	• Community members • WUG accounts and meeting minutes • Detailed engineering designs and cost estimates • System O&M management and financing plan	• Socioeconomic survey using representative samples • Structured community interviews on household income and expenses • On-site review of WUG books and accounts	• Comparison of willingness to pay with current and projected tariffs • Evaluation of the financial efficiency of the water companies

Issues	Questions	Information Required	Information Source	Data Collection Method	Analysis
	• Are water tariffs adequate for full O&M cost recovery and within a reasonable percentage (no more than 5%) of monthly household incomes? • Are chosen technical options the most cost-effective choice for providing the desired level of service? • Were community contributions in place before construction began?	• Plans for collecting and managing water user fees after construction • Willingness of community members to participate in WSS management or to hire people who will do so		• Technical assessment of detailed engineering designs, cost estimates, and feasibility of O&M plan • Review of technical options	
Suboptimal allocation of water sources	• To what extent did various users of WSS participate in planning facilities • Did communities get the facilities they wanted and were willing to pay for? • Are policy, legal, and institutional frameworks for establishing transferable water rights through markets in place? Was the community consulted?	• Roles of community and other institutional stakeholders in planning and decisionmaking processes • Level of community satisfaction with overall results of planning process • Extent to which communities and project implementing agencies understand and agree on their respective responsibilities and capabilities for carrying out all required tasks	• ADB project documents • Various segments of the community	• Community visits • Interviews with various groups and individuals • Interviews with nongovernment organizations and local government staff involved in planning and implementation	• Analysis of alternative solutions for water sharing

Issues	Questions	Information Required	Information Source	Data Collection Method	Analysis
Pollution of surface water and shallow groundwater sources	• Are water quality standards met? • Are drainage and overflow facilities adequate? • Have suitable sanitation facilities been built and are they being regularly used? • What is the level of community health, hygiene, and environmental awareness?	• Water quality data at source and points of use • Existence and suitability of drainage and wastewater treatment/disposal facilities • Number of public (school) and private (family) latrines that are regularly used and maintained • Level of community environmental awareness and environmental health conditions • Community and individual family solid waste management practices • Household-level wastewater and sewage disposal practices	• Water quality monitoring reports • Standards for drainage and wastewater disposal facilities • Community members and schoolteachers about level of environmental awareness and practices	• Interviews with various groups and individuals • Site visits	• Estimation of impact of hygiene practices on health, especially children • Estimation of impact of groundwater pollution on shallow wells • Estimation of health impacts of the pollution of groundwater

ADB = Asian Development Bank, NRW = nonrevenue water, O&M = operation and maintenance, WSS = water supply and sanitation, WUG = water users' group.

SUMMARIES OF COUNTRY REPORTS

1. These summaries present only the distinct findings in each country report. Selected data on indicators are summarized in Appendix 7 for comparison. The detailed data tables, and discussion on topics covered in the surveys and stakeholder workshops are presented in the Supplementary Appendixes.

A. People's Republic of China[1]

1. Background

2. The Dalian Water Supply Project and the implementation of water tariff reforms in Zhangjiakou, while quite different interventions, have both had significant impacts on water supply. Zhangjiakou water supply company (WSC) has been a successful pilot case for implementing tariff reform in the context of the ADB TA, Water Tariff Reform II. The WSC has achieved changes in the level of the tariff with consequent impacts on consumption by consumers and the finances of the WSC. The surveys focused on the beneficiaries in Dalian.

3. Dalian, a city of about 2.6 million inhabitants, has seen a significant increase in supply as well as in the price that consumers must pay for water. The project expanded the capacity of the city's water supply system, and as a result domestic consumption has increased from about 40 liters per capita per day to some 85 liters per capita per day. Supplies to industry and commerce have also increased, and extensive water conservation and recycling programs have been introduced.

2. Domestic Consumers

4. The household surveys revealed that prior to the implementation of the project domestic consumption was extremely low. Public taps were common, and water was only available at limited times. Following project implementation almost all urban households have in-house connections and average water consumption has doubled. Furthermore, the water conservation and recycling programs implemented in association with the project have facilitated the development of more than 50 parks and green areas in the city, thereby improving the city living environment.

5. The project affected health primarily through making more and safer water available. Many respondents indicated that washing was now easier and that they were able to keep toilets, latrines, and their houses in general cleaner than previously. Although sanitation was not part of the project, Government campaigns have ensured a high level of hygiene awareness. Hand washing is usual, and more than 90% of respondents wash their hands with soap and water after using the toilet.

6. Although the level of satisfaction with water supply facilities is generally good, some residents are still dissatisfied with the quantity of water available, because supply is intermittent in some areas. This was the most common reason those with household connections gave for being less than satisfied. City dwellers were generally satisfied with the quality of the water, although some rural respondents were less satisfied with the quality of water during the wet season. There were also complaints of discolored water in the city, probably indicating corrosion of the distribution pipes.

[1] The survey findings are presented in Supplementary Appendix B. The questionnaires were translated into Chinese for the surveys and the domestic consultant translated selected responses from Chinese to English.

7. Community participation in the design and implementation of the project was limited. However, the tariff setting process provides for presenting tariff proposals at a public meeting that must approve the proposals. Implementation of the project has been associated with rapid and significant increases in water tariffs. Since 1998 the water tariff has increased by 92% for domestic consumers. While noting that water costs much more than before, respondents recognized not only that the supply of water is now greater and more reliable, but also that water at the new prices is affordable because incomes are rising.

8. Dalian is one of the three largest ports in the People's Republic of China and has a solid commercial and industrial base, but the lack of freshwater had become a bottleneck to further development of the city and the port. Since the project began operating in 1997, the water supply conditions in Dalian have greatly improved, which has facilitated sustained rapid growth of the local economy. This in turn has had a positive impact on incomes and living conditions in the city and the surrounding areas.

3. Nondomestic Consumers

9. The project has also benefited commercial and industrial consumers in terms of improved water availability and quality. Tariff increases in both cities have also affected these consumers. Since 1998 the tariff increases for nondomestic consumers have been 110% to 150%. Nevertheless, these consumers expressed a high level of satisfaction with the reliability of the water supply systems and, generally, with the quality of the water provided.

10. While commercial consumers such as hotels, restaurants, and government offices may find that reducing consumption is difficult as prices increase, industrial consumers are often able to respond to prices by reducing consumption, either by adjusting their processes to use less water or by recycling water. In both Dalian and Zhangjiakou the industrial consumers surveyed have reduced their average monthly consumption by around 30% since 1998. These consumers are well aware of the cost of water and the need to control costs by keeping consumption under control.

B. Malaysia[2]

1. Overall Impact of the Project

11. The Kedah Water Supply Project has significantly raised the capacity of the water treatment plant at Pinang Tunggal and enabled the Kedah State Government to reach out to both domestic and nondomestic consumers, especially the industrial firms located in the Bakar Arang and Tikam Batu industrial estates. Production of water in Kedah has been increasing steadily since 1985. Current daily production in central Kedah, where the project is located, is now 185,000 cubic meters, which is about 18% of total daily production in the state. The Pinang Tunggal plant is currently running at 85% of its capacity.

12. The main direct benefit from the project is increased accessibility to potable water in the project area. All industrial and commercial consumers have access to piped water. This is important for the industries, as most require access to a regular supply of water and need a large amount of water to sustain production. Without access to piped water 24 hours a day such industries which provide much needed job opportunities, could not operate in Sungai Petani.

[2] The survey findings are presented in Supplementary Appendix C.

13. Domestic connections have also risen. Coverage in urban areas is now 100% in Kedah, including Sungai Petani and Bedong in the project area. Within the project area the percentage of coverage in rural areas is also extensive: at least 95%. The project was targeted to reach at least 300,000 people by 1996. The population in the area has increased to above 350,000, comprising about 75,000 households. The district waterworks engineer estimates that the current total number of connections in the project area has risen to 85,000, almost quadruple the 23,000 connections in 1983, at the time of project appraisal.

14. Most consumers who benefit from coverage have expressed their satisfaction with the regular flow of water from the water supply system.[3] This is significant, because it endorses the quality of technical standards maintained during project implementation and the project's sustainability in the medium- to long-term through consistent management of operation and maintenance (O&M) (the project is now in its 12th year of operations). Similarly, most domestic consumers are also satisfied with the water quality. The reasons for dissatisfaction of some are mainly turbidity and color.[4] The color and turbidity are attributed to the corrosion of old water pipes that were not replaced or rehabilitated, as they were not part of the project components. Funds for replacement and rehabilitation are not readily available.

2. Direct Impacts

15. Potable water is now easily accessible to all members of the household. Piped connections from the project are now located within house compounds and are extended into kitchens, bathrooms, and toilets for those who use a cistern flush system. With the availability of piped water, household members do not spend time carrying water from a main source or from any other alternative sources such as wells into the house for such domestic chores as cooking, washing, and bathing.

16. Such easy access has especially helped the women in the community, as they are usually the ones who carry out most of the daily chores: cooking, cleaning, and washing and bathing the children. In most households the mother is a role model in teaching her children good hygiene practices, and having piped water makes providing a cleaner environment for the family easier.

17. Access to piped water has also contributed toward better hygiene practices among households in general. The survey results show that all domestic consumers bathe daily, most do their laundry daily, and all wash their hands frequently and, more important, with soap after certain chores that could cause contamination leading to waterborne illness. As a result the incidence of waterborne diseases in the area is low. More significant, the incidence of such diseases as dysentery, cholera, and diarrhea is low in the rural areas, especially among children.

[3] Although the majority is satisfied, a third did express some degree of dissatisfaction. Most of those who are unhappy with their water supply are from the rural areas and the main cause of their dissatisfaction is their household connections. When asked, many expressed dissatisfaction with water pressure and quality.

[4] However, at the stakeholder workshop, the Kedah Public Works Department (Water) and the representative from the private firm engaged to produce water for Kedah assured the meeting that pollution of the river Muda, the source of intake for the project, is not an issue. Although pollution occurs at the upper reaches of the river, this is dissipated by the time the water reaches the intake point. In addition, water quality is checked daily by the water producer and by the Government on a monthly basis, although not all consumers are aware of this.

3. Indirect Impacts

18. In the project area the availability of toilet facilities linked to piped water is quite high. In the urban areas 90% of the houses have toilets with a cistern flush system. In the rural areas the percentage is lower at 61%, but rises to 70% if the 9% who have pour flush systems with water seals is included. Overall, the level of sanitation facilities is relatively good in both urban and rural areas. The system has also been extended to all schools in the community, whether in urban or rural areas. Moreover, the availability of piped water connections have allowed people in the project area to enjoy a quality of life better than with before the project, when coverage was limited to those in the urban areas.

19. People's wealth and income have improved considerably, especially those in the urban areas. They have good quality houses that have a higher resale value than before, in some cases as high as RM250,000. In addition, 70% percent of the urban households own cars and have telecommunications. In general, they are better off than the rural households. A possible explanation for this is that members of the urban households are more likely to work in the industrial estates for which the project supplies water. At least 9% of them work in the industrial sector, compared with only 6% of the rural households. Also a higher proportion of urban residents have secondary and postsecondary education, which gives them access to better paying jobs than rural households.

20. The benefits of improved water supply cover both the upper- and lower-income groups, but the impact is more positive for the higher-income groups in the urban areas. In terms of the cost of water, the survey findings show that both groups incur average monthly water bills of about the same amount with more or less similar consumption levels. When compared against their income levels, the proportion of income allocated to water expenditure is higher for the rural households that have lower incomes.

21. The stakeholder workshop, held at the Tupah water treatment plant, brought together four major stakeholders in water supply, distribution, and consumption. The major player, the Kedah Public Works Department (PWD), was well represented, as was the State Department of Health. Not only was the district health office from Kuala Muda in the project area represented, but the surrounding districts also sent representatives to the workshop. Their presence reflected the Ministry of Health's concern about the availability of potable water. The Kedah PWD has privatized water production (para. 26). The private company, now responsible for producing more than 80% of the state's water, also participated actively in the discussions.

22. The presence of the consumers, especially rural consumers, at the workshop was a surprise.[5] Community participation in planning water projects in the country has been negligible. Despite their growing participation in economic activity as workers in factories and in business, women do not, as a rule, participate in this sort of activity. However, the stakeholder workshop underscored the importance of community participation in the project. The participation of the Kedah PWD, together with household members represented largely by women, many from rural areas, at the workshop enabled positive interaction between the WSC, the water producer, and the water consumer.

23. During the workshop, rural households voiced that they were paying more for water every month than urban households. In addition, rural households complained that they seem to pay more for installation of water connections. The Kedah PWD responded by noting that the

[5] Participants admitted that the Malaysian public tends to be apathetic about such issues and interest, if any, was expected to be on the part of the more educated urban households.

cost of connections to urban houses is absorbed into building costs when such houses are built, whereas in most rural areas households have to install and pay for their own connections. Costs vary between RM400 and RM700 for each installation. In addition, households have to pay a deposit equivalent to two months of water bills.

24. Aside from this, the flow of information and interaction between the water provider in general and consumers, both domestic and nondomestic, is poor. Knowledge about changes in tariffs, about the role of the water provider, and even about the role of consumers is poor. Consumers lack awareness of the significance of water and of water management and conservation. The Kedah PWD is more concerned with managing and maintaining the water supply system and less concerned about developing a relationship with its customers. This is not a weakness of the WSC, as its traditional role has always been to focus on the system's technical aspects and ensure that it is functioning. Customer relations are not a mandatory activity. Yet public relations are now becoming important for government agencies like the Kedah PWD, not only to provide the public with information, but also to gain their cooperation and support. In this particular case the personality and professionalism of the district engineer—that is, his ability to work closely with other stakeholders; his concern about water provision and nonrevenue water losses; and his ability to reach out to consumers, especially to poor rural households—have helped to create a more responsive environment for sustaining the project's benefits. This may change with a change of personnel in the Central Kedah water zone. To ensure that this environment is further improved establishing a framework that supports and sustains interaction and sharing of information among project stakeholders may be necessary.

25. Workshop participants made suggestions on how to create public awareness of the significant role water plays in society, but stakeholders did not consider that awareness of water use was important and the topic did not generate interest. Nevertheless, such awareness is vital for protecting the country's water resources. In response to this the district waterworks engineer suggested that he could conduct an open house at treatment plants to help create awareness, and he responded positively to a suggestion from the State Health Department to reach out to school children in the form of school visits and briefings. School representatives also reacted positively to this suggestion. This reflects a first step toward greater interaction and sharing of knowledge that should create greater awareness among children, and through them will reach their parents and families.

26. Kedah is one of the Malaysian states that has yet to completely privatize its water provision in line with Government policy that favors privatization of this function. Currently Kedah has only privatized some of its water production. The Kedah PWD still continues to manage the production of 20% of the state's water, although privatization started in 1993. Earlier Asian Development Bank (ADB) missions found the performance of the private firm to be acceptable and indicated that privatization could help the Government establish a full commercial accounting system for the project and for any other forthcoming projects of this nature. The working arrangement between the Kedah PWD and the private firm is smooth as reflected in the working relationship between the district waterworks engineer and private firm's representatives. This could form a strong basis for the eventual move toward complete privatization of the water supply in the state.

C. Philippines[6]

1. Coverage of the Survey

27. The domestic consultants surveyed successful water supply projects in three provinces—Guimaras, Negros Occidental, and Negros Oriental—to identify best practices for future ADB-funded projects. The survey team visited 19 ADB-funded projects,[7] as well as one NGO-funded project. Representatives of 138 households, 6 commercial water customers, 8 *barangay* (neighborhood) water and sanitation associations (BWSAs), six water districts, and 1 commercial water bottler (Guimaras Water) were interviewed as part of the survey.

2. Spring Water

28. Spring water is a common water source usually located on elevated land and distributed by gravity flow. In most cases surveyed, it did not require a mechanical or electrical pump and was available at the ground surface level with little or no digging required. Springs were the least expensive of the different types of water systems surveyed. During the dry season, however, spring water sources sometimes dried up. This could be remedied by building a large overhead reservoir tank to store water. An electric pump would be required to fill the tank. In addition, during the rainy season the water could become turbid from the soil runoff caused by rain. This could be remedied by building a concrete platform around the spring water source to protect it from such runoff.

3. Underground Water

29. Where surface spring water is not available, underground water is the next best alternative. The advantage of underground water is its abundance even during the dry season. The major disadvantage of a pumped underground water system is power consumption, plus an electric pump or a diesel generator would be required, adding to the capital and recurring costs and maintenance expenses. In addition, a ground-level or overhead reservoir tank is also necessary. In the facilities surveyed, almost all such reservoir tanks were too small for the growing village population, resulting in a continual shortage of water. Water pumps were also easily overworked running up to 12 hours per day, and therefore broke down from time to time, and most communities could not afford a spare pump. In at least two communities, multiple overhead reservoir tanks with an adequate storage capacity were constructed, allowing the pump to be shut off after enough water had been accumulated.

30. One item project planners did not consider was the replacement costs of electrical or mechanical pumps and overhead reservoir tanks. Such systems should collect enough tariffs to cover not only O&M, but also the costs of repairing or replacing pumps or reservoir tanks as necessary.

4. Hand Pumps

31. The hand pump was the most basic facility and was built to cater to 10 to 30 households. In general, water from a hand pump system is free of charge. In successful projects the users collect a small amount of money among themselves to fund repairs as needed. Hand pumps

[6] The survey findings are presented in Supplementary Appendix D.

[7] The projects were part of Loan OCR 1986–1992 (ADB. 1986. *Island Provinces Rural Water Supply Sector Project.* Manila); or Loan ADF 1990–1996 (ADB. 1990. *Second Island Provinces Rural Water Supply Sector Project.* Manila).

were widely used in the three provinces surveyed,[8] and users were generally happy with them. Hand pumps are most suitable for low-income groups who cannot afford to pay even a minimal regular tariff.

5. Water and Health

32. While one goal of the projects was to improve communities' health and living conditions by providing potable water, the household survey indicated a lack of awareness of the links between safe water and sanitation facilities and health. Almost none of the households reported ever receiving any health education or information about the importance of water for health. Most respondents were unaware of the importance of treating drinking water and even fewer knew about the need to test for potability regularly. Few were curious about or willing to understand the significance of clean, safe water. When asked about health hazards related to poor quality water, few could identify whether any particular health condition was due to unsafe water.

6. Sanitation

33. The sewerage and sanitation systems needed improvement at most of the sites. Most households rely on on-site systems to treat and dispose of waste. Households are generally unaware of the importance of a proper drainage system, and many communities have received no pertinent training or information. Most people either burn their waste or dump it in the surrounding area and wait for somebody to collect it. In some areas solid waste is not collected for more than a week.

7. Role of Women

34. Most female respondents mentioned that they were not consulted at the design stage of the project even though they are the main users of water in their household. However, a number of the BWSAs were either headed by women or had a majority of women officers.

8. Institutional Issues

35. A number of institutional and governance issues arose during the stakeholder workshop that involved communities, the private sector, and local governments.

a. Who Should Own and Manage the Water Facility?

36. Ideally, project designers should consult end-users before and during construction of the water facility (whether the facility will be new, expanded, or improved) to develop a sense of ownership among stakeholders, even if they do not physically manage the system. The most successful projects in the field survey were those that allowed the entire community to participate in and contribute ideas right from the start.

37. In the larger towns water districts, government entities regulated by the Local Water Utility Authority, which is the national Government regulator, manage the water systems. At the

[8] In the *Second Island Provinces Rural Water Supply Sector Project* funded by ADB, of the total of 4,143 water systems constructed more than 50% were shallow wells (level 1 hand pumps) with another 30% being deep wells (level 2 or 3). These rural systems are technically defined in the Philippines as level 1 systems consisting of point source systems with public standpipes and no household connections. In urban areas, level 2 and level 3 systems are used. Level 2 systems have a mix of public standpipes and household connections. For level 3 systems, all or most of the households are connected to piped systems.

barangay level BWSAs or elected *barangay* officials normally manage the water systems. What organization actually manages the water system may not matter, but what does matter is that the community periodically elects members of the water committee to ensure accountability in the management of the system. The committee must be progressive in terms of raising the necessary funds to maintain the system and involving the community in its maintenance.

38. For extremely small systems, strong arguments favor having the local government unit responsible for maintaining the community water system for a number of reasons. The disadvantage, however, manifests itself in cases where politicians use the water system as a private resource for themselves and their cronies, thereby undermining the facility's viability and the quality of service and possibly having a negative effect on system management.

b. What Should Be the Legal Status of the Land on which the Water System Stands?

39. By law, the land on which the water system is built must be public land or land legally donated to the local government for public use. In planning water systems clarifying and legalizing land ownership before constructing a water supply and sanitation (WSS) project is crucial to avoid the possibility of conflict in the future and the water project being hijacked by the private landowner. In the case of the Guimaras Water, bottling company, the community is now hard pressed to challenge the legality of the company's ownership of the publicly-funded water system in the absence of any proof that is acceptable in a court of law.

c. Who Should Plan, Design, and Supervise Construction or Expansion of the Facility?

40. In ADB-funded projects, the Government's Department of Public Works and Highways takes on the multiple roles of executing agency, contractor, financier, and technical expert. Department staff consult community leaders and solicit a donation of land from the community, or for spring development requests the landowner's permission to use the source. Facility expansion is usually undertaken only when a crisis point has been reached.

41. Most subprojects visited during the field survey urgently needed expansion. At the time of construction the pipes and reservoir tanks used were small, based on immediate needs, with no provision made for demographic expansion. However, the inevitable population increase has increased the demand for water, resulting in water shortages. WSS project designs should take likely population growth into account. Ideally, a water system should be able to meet a community's needs for 10 years before requiring large-scale expansion.

d. How Should Water System Operations be Financed?

42. Water districts are eligible for developmental loans from the Local Water Utility Authority for developing, constructing, and expanding water systems. For O&M, however, water districts are expected to generate funds by collecting tariffs. Smaller systems managed by BWSAs do not have similar loan facilities available to them and rarely charge any tariff or charge only a nominal amount.

43. Most of the systems that need to be expanded because of the increase in population do not have sufficient funds from tariff collections to fund any kind of major repair, much less expansion. System repair or expansion generally requires external funding from the local government unit, the national Government, or an external agency, which places local systems at the mercy of politicians or fund availability.

44. Thus WSS projects should incorporate financial management training of local water associations to help them set up the proper financial and accounting systems that would allow them to maintain their systems over the long term.

e. Who Should Regulate Tariffs and How Should Tariffs be Determined?

45. For level 1 and 2 water systems, the water tariff is normally a fixed amount. In most Level 1 and 2 cases surveyed the tariffs set were so low that the systems could not build up reserves to finance expansion or renovation of the water system when it was required. For larger towns with water districts the Local Water Utility Authority regulates a more formal tariff based on metered water. To set or raise tariffs water districts must inform consumers formally and hold public hearings to address objections.

46. Users showed a willingness to pay for water, but not for poor service. Thus reliable service can lead to regular payment of higher water tariffs that could lead to better maintenance of the system and expansion when needed. Projects should be designed to avoid this cycle of poor service, dissatisfaction, poor payment, and deterioration.

f. Who Should Regulate Water Quality?

47. Regulators require water districts to test water quality regularly. Of the water systems surveyed Guimaras Water, whose bottled water was subject to a quarterly test as required by law, carried out the most rigorous tests.

48. For rural water systems water quality is only checked at the beginning of a project to determine the potability of the water from that particular source. Once built the water systems that were surveyed, whether managed by a BWSA or a water district, were seldom tested. In a few cases respondents said the water quality had been tested after a member of the community had got sick and water was suspected as the cause of the sickness. Thus overall, water quality testing takes place only rarely. Enforcement of regulations could help impose regular water quality testing. Informing communities about test results would also increase community awareness about health and sanitation issues.

g. Who Should Audit BWSA and Water District Accounts?

49. All BWSAs elect an internal auditor; however, this position is often occupied by a person who is neither an accountant nor has any accounting experience or training. In addition, *barangay*-level bookkeepers also double as bill collectors. Of the 20 BWSAs surveyed only 5 appeared to have proper bank accounts or books, and the remainder kept customer records in a logbook.

50. Water districts tend to keep records more systematically because of Local Water Utility Authority regulations. BWSAs' independence from both a national regulator and the local government unit or *barangay* council will make their lack of professionalism in relation to financial accounts a perennial problem. Given the size of many BWSAs formal audits would not be particularly helpful and are not recommended, although accountability measures must be put in place**.**

9. Elements of a Successful Water Supply Systems

51. Many of the water supply systems surveyed showed deficiencies that might have been remedied if the community had been formally organized to help with planning at the project identification stage. The organization of BWSAs or some other formal community organization at the earliest stages would help channel community input into the following:

(i) determining the type of facility required;
(ii) ascertaining the required level of sophistication of the proposed water system;[9]
(iii) establishing willingness to pay for an improved facility;
(iv) providing information about the community's population and health;
(v) articulating community expectations and willingness to participate in training programs; and
(vi) providing information about environmental considerations, for example, saltwater intrusion or contamination of the water basin by wastewater.

D. Sri Lanka[10]

52. ADB assisted the National Water Supply and Drainage Board to rehabilitate 27 water supply schemes under the First and Second WSS Projects, a third ADB project is ongoing in six districts supplying water and sanitation facilities to rural areas, and a fourth project is in the preparatory stage. Three small towns were selected for the IES. These were Awissawella, which was funded under Loan 1235-SRI(SF), the Second WSS Project, for the western region; the town of Diyatalawa, funded under the same loan for the central region; and Weligama, funded under Loan 817-SRI(SF), the First WSS Project, for the southern Region.

53. A comprehensive questionnaire comprising more than 115 questions was administered to 100 households in each location and to a few commercial users. In all three towns the households consisted of rich, middle–income, and poor households. The survey coordinator and six enumerators collected qualitative data by means of observations and interviews with community participants and with staff of the National Water Supply and Drainage Board in the three study locations. This summary primarily reflects the qualitative data generated by the survey.

54. The National Water Supply and Drainage Board buildings in all three towns were in good condition: old buildings had been refurbished and new ones had been built under the project. The intake had been improved, with booster pumps and PVC piping used to infill distribution in all three areas. In all three locations' treatment plants have been refurbished or new ones have been constructed, and these were quite impressive.

55. Under this project many poorer households in all three towns received household connections. Thus the poor have gained significantly in terms of time and cost savings and also gained a health benefit through the increased use of water. Women have benefited through easier access to safe water, of which they are the main users, as have children.

56. The current number of household connections is more than what was originally planned for the schemes, while the number of standpipes is now diminishing, and in most locations they had been abandoned. In Weligama the fishing communities suggested that standpipes would be

[9] In some *barangays* surveyed people did not want in-house connections for a variety of reasons and preferred level 1 and 2 water systems. The two most common reasons they gave were that they might not be able to afford level 3 systems and that level 1 and 2 systems provided for community interaction and socialization that individual household connections did not necessarily provide.

[10] The survey findings are presented in Supplementary Appendix E.

more useful than direct connections, saying that more people would benefit from these. The town is currently short of water during the mornings, and water from dug wells could not be used for drinking because of its salinity. In Diyatalawa the communities were generally positive about the household connections, as they had faced much hardship earlier because fetching water in their hilly location was difficult. The poorer women had gained time that they could now devote to other, sometime income-generating activities. In the commercial area of Awissawella, including the bus stand and marketplace, consumers use water supplied from a single standpipe. This water is used mainly for cleaning purposes; however, the drainage system is inefficient, leading to stagnant water and resultant breeding of flies and mosquitoes.

57. Consumers in all three towns were not pleased with the hours of supply. Most households, especially the poor, who could not afford to build storage tanks, faced difficulties because of inadequate supply. However, most people had alternative sources of water, such as dug wells, lined wells, springs, and rivers. Some harvested rainwater.

58. The treatment capacity seemed adequate, as a large percentage of those interviewed stated that they were satisfied with the quality of the water they received. Thus safe drinking water was provided to an average of 90% of the populations of these towns. Most people stated that they did not even boil the water from the taps as they considered this water to be safe for consumption, while some families only boiled water for their babies. In all three towns the poorer households used other sources of water for laundry and bathing, while the wealthier households used tap water for nondomestic use such as watering plants.

59. With regard to community participation in the different phases of the project, respondents did not recall any water committees or any participation by women in discussions or decision-making. The communities also considered O&M to be the responsibility of the Government. Government officials clarified that their responsibility extended to the household meter, but beyond that the responsibility was the households'. A clear lack of commitment and ownership was apparent on the part of the community resulting from a lack of awareness and limited participation during the project planning and decision-making stages.

60. The projects did not have a health or hygiene education component. One town officer said that this was the responsibility of the propaganda unit of the head office, as they were not geared for such assignments because of staff shortages. Most households believe that hygiene education and training is the mother's, or in some cases the grandmother's, responsibility. In Awissawella many wealthier and middle-class households had two toilets, a cistern type inside the house and a water sealed type outside. In Diyatalawa most of the poorer households had pit latrines. Most of those interviewed in all three locations said they bathed every day or every other day. In Weligama the fishermen still use the beach, for bathing and as a toilet, both because of traditional attitudes and because of the shortage of water for washing. Diyatalawa also a serious problem with wastewater management and drainage.

1. Conclusions

61. The main conclusions are summarized below:

(i) Household connections had been given to a large number of the poorer households in the three towns. The poor living in these towns have gained significantly in terms of time and cost savings and health benefits resulting from increased use of water.
(ii) Women have substantially benefited through easier access to safe water.
(iii) Children have also benefited from direct water connections.

(iv) The lack of awareness among poor community has resulted in the misuse of water.
(v) Community participation and user involvement in decisionmaking, planning, and implementation and during O&M was inadequate to improve ownership and project sustainability.
(vi) Women did not participate in project activities.

2. Recommendations

62. The stakeholder workshop participants suggested the National Water Supply and Drainage Board to consider the following recommendations:

(i) Involve beneficiaries at all stages of a project to improve ownership and service delivery. Projects should educate, encourage, and employ beneficiaries. Showing people that water is a basic human need is important.
(ii) Improve water pressure to provide a 24-hour supply, especially to higher elevations.
(iii) Increase awareness among poor communities to avoid misuse of water. Implement hygiene and sanitation education.
(iv) Implement socially-oriented rural water supply projects expeditiously.
(v) Examine the possibility of joint project implementation by local governments, nongovernment organizations (NGOs), and community-based organizations. Encourage private sector participation, initially in distribution, billing, and collection.

E. India[11]

63. The IES reviewed the Sri Sathya Sai Drinking Water Supply Project in Anantapur and one sanitation project in Pune, both in India. These two non-ADB projects were implemented expeditiously with the innovative participation of NGOs and private sector. The fieldwork covered 105 households and the different institutions involved in conceiving, planning, designing, and implementing the water supply project and eight sanitation subprojects.[12] The surveys were funded by UN-HABITAT and were carried out by the Human Settlements Management Institute, India.

1. Sri Sathya Sai Drinking Water Supply Project[13]

64. Some of the project's special features include the NGO's, Sri Sathya Sai Central Trust's (the trust's), leadership and other trust members, who helped change public policy by entrusting project implementation in relation to capital works as well as subsequent project O&M for 3 to 5 years to a private company. The project's sustainability has been further ensured through an institutional framework and decision-making processes that assign clear roles and responsibilities to the various entities involved and to Anantapur's collector and district magistrate. Another special feature of the project was the extent of community involvement in project planning and implementation.

[11] The survey findings are presented in Supplementary Appendix F.
[12] They used the questionnaires developed in the IES. Local researchers/enumerators were also involved in the fieldwork.
[13] This project was chosen an example of substantial achievement in improving people's living environment, particularly of the poor and the disadvantaged in Anantapur district, and provides an interesting example of community empowerment through extension of a safe water supply. It was also a good example of coordination by various entities, including the Sathya Sai Central Trust, an NGO; the Panchayati Raj (village level administration) Departm ent of the State Government of Andhra Pradesh; and Larsen and Toubro, Ltd., a private company.

a. Scale of Operation

65. The project has supplied safe drinking water to 1.25 million people in 731 villages, or 70% of all the villages in the district. The trust provided two types of facilities, namely:

(i) Protected water supply schemes using borewells for 279 villages where surface water was not available. These are mostly maintained by the individual *gram panchayats* (village councils) and by the trust.

(ii) Comprehensive protected water supply schemes making use of surface water by means of balancing reservoirs, infiltration wells, and summer storage tanks for 452 villages. Villagers obtain their water from as many as 1,700 public standpipes.

b. Low Costs and Expeditious Turnkey Implementation

66. Larsen and Toubro worked around the clock to complete the project. No tendering took place and Larsen and Toubro executed the project at cost without making a profit.

67. Project cost was initially estimated at Rs700 million, mainly for the borewells and de-flouridation plants. For the trust, the benefit to the people was far more important than the cost. The project was redesigned to include the comprehensive protected water supply scheme. Final costs were estimated at Rs3,000 million, totally funded by the trust.

68. The project was announced in November 1993. Construction started immediately and the major facilities were fully operational by May 1995 serving 20 villages immediately. Within the next 6 months, i.e., by November 1995, the ground water supply system through borewells for 279 villages was completed. The rest of the project for 432 villages using surface water facility was completed by November 1996. No cost or time overruns were incurred on the redesigned scope, compared with the likely outcome had this been a Government project.

c. Sustainable Operation and Maintenance

69. Following project completion the government of Andhra Pradesh set up the Sri Sathya Sai Water Supply Project Board for O&M of the water supply to 438 villages covered by comprehensive protected water supply systems. The remaining schemes are administered by a variety of entities, including municipalities and beneficiaries. The costs of O&M are currently split 70:30 between the government of Andhra Pradesh and the Sri Sathya Sai Water Supply Project Board.

d. Government Involvement

70. The state government's commitment to the project contributed significantly to the project's success. This support included

(i) exempting the trust from paying sales taxes on materials purchased,

(ii) providing government land free of charge as the project facilities were ultimately transferred to the state government, and

(iii) providing electricity for installation and maintenance free of charge.

e. Tariff Structures and Project Sustainability

71. No water tariffs are collected. To date spare parts already available from Larsen and Toubro are being used. In addition, the board has been purchasing chemicals and spares at

discounted prices. Thus O&M has been satisfactory. In the case of borewells *gram panchayats* are to cover the costs of O&M.

f. Replicability

72. The trust and the Andhra Pradesh government have extended the project in 1998 to two districts of Medak and Mehboobnagar in the state, covering 320 villages. The replication in other situations must take into account two key factors: the NGO's grant contribution of capital costs, and the innovative implementing and O&M arrangements.

g. Lessons Identified

73. The following are the key lessons from this survey:

(i) Enlisting the cooperation of a variety of different entities, including an NGO, a state government, a private company, and the public, ensured a successful water supply project.

(ii) Avoiding government interference in project execution significantly saved both time and costs.

(iii) Having excellent project specifications and using quality materials to provide an affordable and reliable solution to cater to minimum needs for the next 30 years is a great achievement.

(iv) Creating an environment of assurance and encouragement with comprehensive arrangements in place for funding and meeting contingencies, plus enthusiastic public involvement, contributed to the project's success.

(v) Constituting an autonomous board for O&M following project completion that operates at cost, along with the involvement of the executing agency in O&M at cost, was a unique feature of the project.

(vi) Bringing significant improvements to people's health and quality of life was made possible by providing safe drinking water.

2. Community-Oriented Sanitation in Pune[14]

74. The Pune Municipal Corporation (PMC) has been constructing community toilet blocks in slums for more than 30 years. However, the number of blocks built was small far below the demand for toilets. Moreover, costs were high because of the expensive designs and involvement of contractors. Finally, in the absence of community involvement during the project preparation and implementation, existing toilet blocks were abused, became dilapidated and municipal conservancy staff could not maintain them. As a result, people had to suffer the indignity of having to defecate in the open and the incidence of diseases like diarrhea was higher in slum areas. The surrounding environment was polluted, leading to the spread of other diseases.

75. For the first time in 1999, the Municipal Commissioner wanted to tackle the issues effectively. First, he took up the program at a citywide scale and managed to reach 500,000 people out of a slum population of 600,000. Second, he invited bids only from NGOs so that community participation in construction, design and maintenance would be ensured. The final partners in the program included the local authority, PMC, and the Society for the Promotion of Area Resource Center, the lead NGO, and seven other NGOs. Third, he brought down costs

[14] The discussion is based on a desk review of available reports and the survey of eight subprojects. Reference: "Slum Sanitation in Pune–Sundar Burra", published in Good Urban Governance Campaign–India Launch, Govt. of India and UN-HABITAT (2001). See also: http://www.unhabitat.org/campaigns/governance/docs_pubs.asp.

significantly by laying down the condition that the 8 NGOs that were chosen could not bid higher than the estimated cost.[15] The total project cost was $4.2 million, equivalent to about $25 per family. Fourth, he personally reviewed in weekly meetings the implementation of the program of building about 3,500 toilet seats within two years and this helped energize all PMC staff as also remove obstacles.

76. The role of PMC that has taken an initiative and provided the basic framework for implementing the scheme is worth recording. What stands out in the program is the willingness on part of PMC to involve the community through NGOs and letting them take their own decisions in matters of planning, design and maintenance of the toilets. In limiting its role to providing finances, PMC has been the first such corporation in India to adapt itself to a new role of the State as a facilitator of development instead of relying on the straitjacket approach of centralized planning. The program is now a success story that could be replicated in other cities. Having made a tangible impact on the urban poor in Pune, it has all the characteristics of a good practice in terms of partnerships, sustainability, replicability, scalability and empowerment of communities.

77. An independent survey by Human Settlements Management Institute, India covered eight case study toilets, each toilet block with 30-40 seats serving about 125 adults and children, operated by caretakers providing a 24-hour service. The survey has provided an insight into how a community based approach to the problem of sanitation along with participatory planning and execution can work wonders in a moribund system. The survey concludes that the Pune Toilet has demonstrated an innovative solution to tackle the seemingly intractable problem of public health and sanitation. The expeditious implementation of the project and the maintenance of the toilet blocks by the community with the guidance of NGOs are the highlights of this achievement. There were no time and cost overruns in the project and the project provided a citywide solution to the problem of sanitation. It has also confirmed that people are willing to pay user charges at the rate of $0.50 per month per family for sanitation and these services would not be a burden on the exchequer anymore. The survey records that the program has opened a possibility for a paradigm shift in sanitation infrastructure development.

78. This experiment in Pune has attracted many visitors from other Indian cities, governments in other countries, and international agencies. The Pune experiment led to the acceptance of this model in Mumbai on a large scale as well as in other cities. The Government of India has based its new program for universal sanitation in India[16] on the principles of the Pune program, confirming the replication of this approach.

[15] This could be achieved due to the non-profit approach of NGOs as compared to contractors.

[16] "Nirmal Bharat Abhiyan"–a National City Sanitation Project–is an integral sub-component of Valmiki Ambedkar Awas Yojana, a centrally sponsored scheme launched in 2001–2002 by the Prime Minister of India. Twenty per cent of the costs of the scheme will be used for the sanitation/toilet facility, comprising a Rs2,000 million loan from Housing and Urban Development Corporation and a Rs2,000 million Government subsidy. The state governments/local bodies supplement this amount with additional investments. The average cost for a community toilet block has been estimated at Rs40,000. Each toilet block will be maintained by a group from among the slum dwellers who will make a monthly contribution of about Rs20 per family.

IMPACT OF WATER SUPPLY AND SANITATION PROJECTS

1. The case study projects comprised four Asian Development Bank (ADB) projects, one each in the People's Republic of China and Malaysia and two each in the Philippines and Sri Lanka. In the Philippines, the water supply systems included in the survey come from both projects. In Sri Lanka, of the three towns included in the survey, Weligama was part of the First Water Supply Sector Project and Avisawella and Diyatalawa were included in the Second Water Supply and Sanitation Project. For the purposes of processing the household survey data, sites from each project have not been treated separately.

2. The three questionnaires (Supplementary Appendix A) included over 115 questions that cover a variety of indicators listed in Appendix 5. Almost 1,000 questionnaires were completed (main text, Table 1). Tables A7.1 to A7.9 summarize key data from the household surveys. They include results from the survey carried out in India in the project area of the Anantapur Drinking Water Supply Project (survey funded by UN-HABITAT) for comparison with the results from the ADB projects. Questionnaires were not used for the Pune sanitation project. Tables A7.10 and A7.11 discuss tariffs financial covenants for ADB projects. The detailed data of the case study projects are in country reports (Supplementary Appendixes B-F).

Table A7.1: Domestic Water Supply Facilities and Consumer Satisfaction
(%)

Item	PRC	Malaysia	Philippines	Sri Lanka	India
Most Common Water Source[a]					
Household Connection	72	97	37	76	1
Tubewell and Hand Pump	31	0	17	1	6
Public Tap	6	0	14	3	93
Spring	2	0	8	2	0
Dug Well	1	3	8	4	0
Users Satisfied with Household Connection[b]	41	76	70	30	100
Most Common Reason for Dissatisfaction with Household Connection	Water quantity	Water quality	Water quantity	Water quantity	—

— = not available, PRC = People's Republic of China.
[a] Rural respondents in the PRC in particular use more than one water source.
[b] Of those with household connections.

Table A7.2: Domestic Sanitation Facilities and Their Use

(%)

Item	PRC	Malaysia	Philippines	Sri Lanka	India
Households with Toilets	98	100	82	>81	18
Most Common Toilet Types					
Pour Flush	4	9	88	76	63
Cistern Flush	61	61	7	14	5
Pit or Ventilated Pit Latrine	32	23	0	9	32
Other	3	7	5	1	0
Homes Where All Adults Use Toilet	95	99	73	—	16
Homes Where All Children Use Toilet	48	70	53	—	5

— = not available, PRC = People's Republic of China.
Note: Some Sri Lanka households have more than one toilet.

Table A7.3: Household Poverty Status

Item	PRC	Malaysia	Philippines	Sri Lanka	India
Sample Size	197	75	120[a]	402	105
Poverty Line (/person/year)	—	RM1,330	P13,823	—	Rs3,930
Percentage Below the Poverty Line[b]	—	48	68	—	50
Percentage Owning House	80	88	93	91[c]	93
Average Number of Durables Per Household	—	7.3	3.4	3.2	—
Percentage of Households With Durables	>95	—	34	>63	74

— = not available, PRC = People's Republic of China.
[a] Excludes missing and outlying values.
[b] Based on estimated per capita household income.
[c] Based on 332 responses.
Source of poverty line data: Philippines: National Statistical Coordination Board; Malaysia: Government of Malaysia; India: Planning Commission.

Table A7.4: Domestic Customer Perceptions of Water Quality

(%)

Water Quality	PRC		Malaysia		Philippines		Sri Lanka		India	
	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season
Generally Dissatisfied	25	11	45	11	12	9	60	38	0	0
Common Complaints [a]	Wet Season		Wet Season		Wet Season		Wet Season		Wet Season	
Bad Smell	43		12		0		4		—	
Bad Taste	37		10		0		20		—	
Dirty	54		21		13		15		—	
Bad Color	54		25		13		40		—	
Floating Particles	31		14		0		6		—	
Settled Particles	43		15		6		7		—	
Frequency of Water Quality Tests by Households										
Never	31		93		43		93		7	
Once	1		7		27		1		0	
Once a month	67		0		0		0		93	
Don't Know	1		0		30		6		0	

— = not available, PRC = People's Republic of China.
[a] Percentage of those dissatisfied with water quality.

Table A7.5: Customer Involvement in Project Planning and Implementation

(%)

Kinds of Involvement	PRC	Malaysia	Philippines	Sri Lanka	India
Knowledge During Planning of					
Purpose of Project	13	3	30	19	67
Kind of WSS Facilities	1	0	10	7	3
Customer Responsibilities	0	0	9	1	0
Were Told Nothing About Project	0	7	15	5	13
Don't Know	86	90	46	68	17
Responsibility for WSS Construction					
Outside Contractor (not from area)	36	11	30	6	100
Local Contractor	0	23	1	2	0
Skilled Laborers from Area	43	0	30	30	0
Unskilled Laborers from Area	1	0	13	7	0
Don't Know	20	66	27	55	0

PRC = People's Republic of China, WSS = water supply and sanitation.

Table A7.6: Water User Committees and Their Responsibilities

(%)

Water User Committees	PRC	Malaysia	Philippines	Sri Lanka	India
Existence of WUC					
Yes	1	0	17	4	0
No	45	100	61	24	100
Don't Know	54	0	22	72	0
WUC with at Least 1 Female Officer[a]	0	0	79	0	0
Common Responsibilities of WUC[b]					
Carrying Out Water System O&M	—	0	46	16	0
Collecting Water User Fees	—	0	30	6	0
Deciding Who Gets Connections	—	0	13	1	0
Monitoring Water Quality	—	0	11	9	0

— = not available, O&M = operation and maintenance, PRC = People's Republic of China, WUC = water user committee.

[a] Total number of respondents saying that they have officers in the WUC is 28. The percentage of those who said that at least some of those officers are women is indicated in the table.

[b] Where there is one.

Table A7.7: Affordability of Water Tariffs

Item	PRC (yuan)	Malaysia (ringgit)	Philippines[a] (peso)	Sri Lanka (rupee)	India (rupee)
Average Monthly Income	2,782	1,187	7,438	25,263	3,012
Affordability					
1% of Income	28	12	74	253	30
5% of Income	139	59	372	1,263	151
Average Monthly Water Bill[b]	11[c]	21	78	954[d]	0
Connection Cost	0	690	1,418	10,687	0

PRC = People's Republic of China.

[a] Excludes households with no stated income.

[b] Only households with piped connections.

[c] Excludes 2 households with very large consumption levels.

[d] If the 9% of households with large bills are excluded, the average is Rs167.

Table A7.8: Nondomestic Consumers

Item	PRC (yuan)	Malaysia (ringgit)	Philippines (peso)	Sri Lanka (rupee)	India (rupee)
Tariff Ratio[a]	1.4–2.2	2–4	2	0.9–33	—
Average Consumption (m^3/month)	43,000	1,412	—	2,600	—
Average Water Bill (per month)	12,890	470	—	1,025	—

— = not available, m^3 = cubic meter, PRC = People's Republic of China.
[a] Indicative ratio of nondomestic to domestic tariff. The figures for Sri Lanka exclude fixed cost.

Table A7.9: Hygiene Practices and Health Indicators

(%)

Item	PRC	Malaysia	Philippines	Sri Lanka	India
Hand Washing after Toilet Use[a]					
With Soap and Water	93	88	81	68	32
With Water Only	6	12	9	13	68
Hand Washing before Meals with Soap and Water	92	83	77	60	19
Water-Borne/Water-Related Diseases[b]					
Adults	3	8	5	7	0
Children	3	12	5	8	4

m^3 = cubic meter, PRC = People's Republic of China.
[a] Percentage of respondent households.
[b] Percentage of households reporting in the last month except for Malaysia, for which the percentage of adult and child populations.

Table A7.10: Average Water Tariffs
($/m^3)

Item	Zhongjiakou, PRC	Dalian, PRC	Kedah, Malaysia	Sagay City, Philippines[a]	NWSDB. Sri Lanka
Domestic tariffs					
Up to 8 m^3/month	0.14	0.28	0.11	0.21	0.08
8-20 m^3/month	0.14	0.84	0.11	0.21	0.08
Above 20 m^3/month	0.14	0.97	0.13	0.22	0.15
Commercial tariff	0.52	0.61	0.32	0.37	0.45
Industrial tariff	0.26	0.39	0.32	0.42	0.45

m^3 = cubic meter, NWSDB = National Water Supply and Drainage Board, PRC = People's Republic of China.
[a] Sagay City is selected as an example of a water district in the Philippines.
Note: The minimum monthly amounts charged and subsidies for poor domestic consumers are not presented here. Commercial and industrial rates are indicative. Dalian has water quotas that are set for each enterprise; Kedah has higher rates for consumption over 10,000 m^3/month; Sagay City sets commercial and industrial rates at 1.75 and 2 times residential rates, respectively; NWSDB rates include a monthly fixed sum of about $0.75/month for all users that for commercial and industrial enterprises is less than the cost of 2 m^3.

Table A7.11: Status of Financial Covenants

	Loan Covenants Specified				
Item	O&M	Debt Service	Depreciation	Financial Ratios	Compliance
Dalian Water Supply Project, People's Republic of China	Yes	Tariffs to cover debt service requirements or depreciation expense whichever is higher		Debt service	Complied
Kedah Water Supply Project, Malaysia	Yes	Tariffs to cover debt service requirements or depreciation expense whichever is higher + 20% of capital expenditure program		—	Not complied
Second Islands Water Supply and Sanitation Project, Philippines	Yes	No	Yes	—	Partial
Water Supply Sector Project, Sri Lanka	Yes	—	—	Operating ratio	Partial
Second Water Supply and Sanitation Project, Sri Lanka	Yes	Tariffs to cover debt service requirements or depreciation expense whichever is higher		—	Partial

— = not specified as a covenant, O&M = operation and maintenance.

SUSTAINABILITY OF COMMUNITY-LEVEL WATER SYSTEMS

A. A Simple Model

1. What is the measure of success for a water project funded by the Asian Development Bank (ADB) or by any external funding agency? Is success measured by the project attaining certain goals and purposes as outlined in the logical framework? Is it about water systems still being of use to communities 10 or more years after construction? Or should a different test be applied?

2. Any water project begins with an articulated demand or need for potable water for a variety of purposes. For many rural communities similar to the ones served by ADB's First and Second Islands Water Supply and Sanitation Projects (Loans 812-PHI and 1052-PHI), the original source of water was a natural source located some distance away or an existing water system that provided poor quality water. By engineering standards, a "better" water system was one that provided access to potable and safe water (quality) that was reliable and of adequate quantity to serve the entire community. The water systems surveyed were thus successful water systems by this definition.

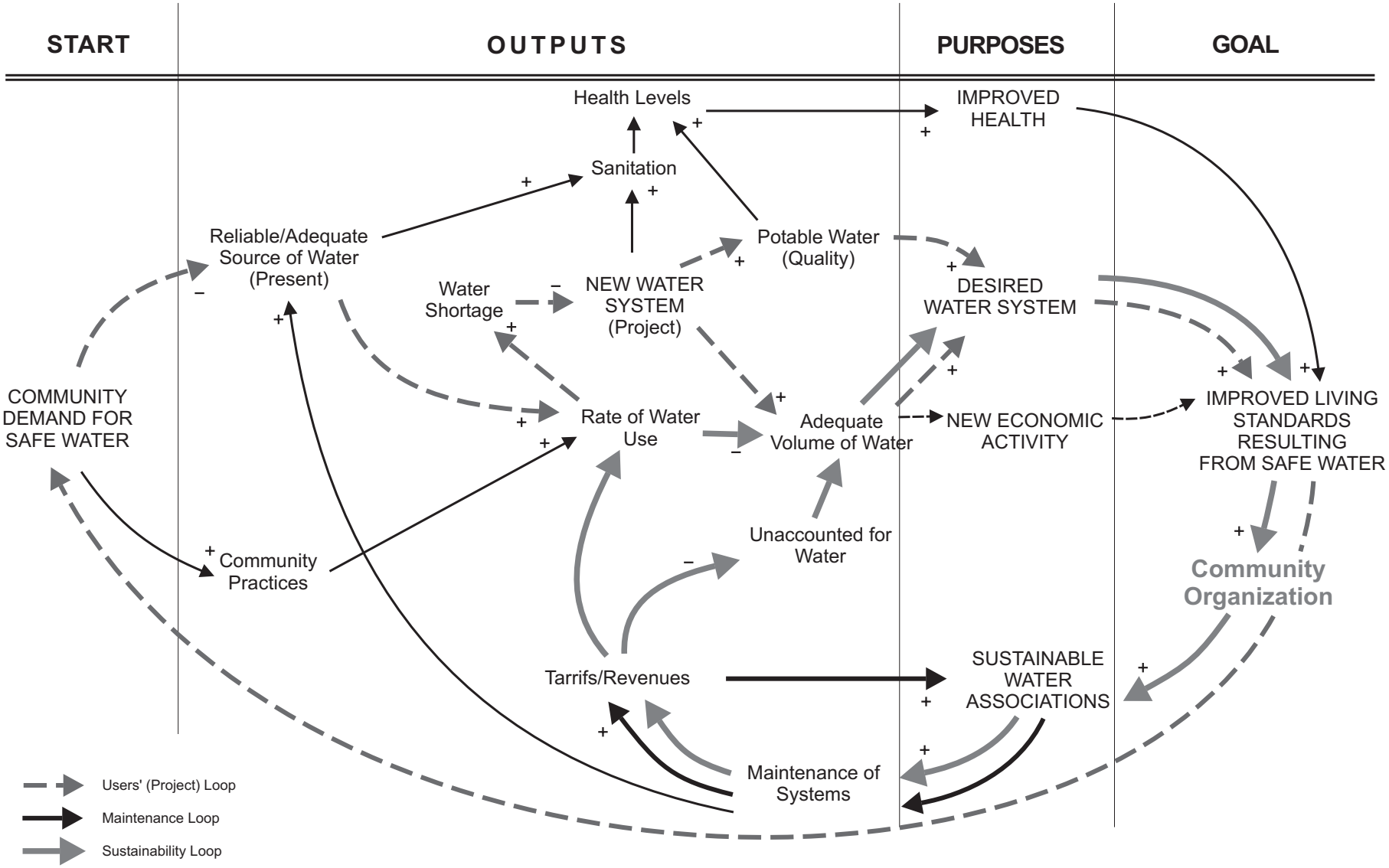
3. This impact evaluation study (IES) supports this view for the most part. Yet if a test for sustainability were to be applied looking at water systems that were continually maintained, repaired, and even expanded as demographic needs grew, many of the systems are short-term solutions with long-term shortcomings.

4. In analyzing the data from the survey results and reviewing the best practices of successful systems, the IES identified that real test of a system's success came at some "moment of truth"—at the point of repair, rehabilitation, or expansion—and the criterion of success was an answer to the question: Is there local capacity to address repair or expansion needs as these arise? Furthermore, this local capacity reflects whether or not the community can maximize its water assets and derive the other related benefits as outlined in the project logical framework, that is, improved health and new economic activity.

5. In the course of the IES, a model was created to explain what made certain water systems "better" than others even though most would be termed successful from an engineering point of view (see Figure A8.1).[1] The model used a list extension outline used in system dynamics[2] in drawing the causal loop diagrams to better relate this model to the project logical framework used by ADB, particularly in relation to (a) goal, (b) purposes, and (c) outputs.

[1] The model was prepared by J.M. Luz, associate professor, Asian Institute of Management, Philippines.
[2] For a discussion on system dynamics, see Jay W. Forrester's link at http://sysdyn.mit.edu/people/jay-forrester.html.

Figure A8.1. Model of a Community - Level Water System



Notes:
1. The signs indicate the direction of relationship between two inputs or (outputs).
2. A + sign indicates a direct relationship.
3. A - sign indicates an inverse relationship.

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6. The goal of community-based water systems in the Philippine case study projects is improved living standards resulting from safe water. This in turn reflects the community demand for safe water for a variety of purposes.

7. Similarly, the project logical framework has identified four purposes: improved health, desired water system, new economic activity, and sustainable water associations or organizations. These in turn were linked to a number of program outputs, including health levels, sanitation, potable water, adequate volumes of water, and systems for maintaining water supply.

8. The causal loop diagram in the model demonstrates cause and effect from the moment a community articulates a demand for safe water to the provision of a water system that can improve living standards. In the first instance, a community with access to a natural source of water looks at the resource as a right, pays no tariff for its use, and provides no limits to the rate of water use so long as the resource is adequate. When a shortage of water or water-related sickness arises, a community may articulate demand for a new water source, and at this point it might be included in the national government's agenda for safe water.

9. The provision of an engineered water system leads to the four criteria of water project success, namely: (i) accessibility to the water source by the community, which is assumed to be superior or more accessible than the traditional source; (ii) adequacy in terms of the volume of water produced; (iii) potability of the water produced; and (iv) reliability of the system to produce water continuously. This in turn is related to the Project's final outputs to fulfill its purposes and the final goal as stated earlier.

10. Maintenance of the system is also a stated output to be carried out by sustainable water associations,[3] which are supposed to charge tariffs to derive the revenue needed for maintenance, repair, and expansion. The track records of such associations are spotty for *barangay* systems (in half the communities surveyed they were either not functioning or had ceased to exist). For water districts, most still operate, although their level of sustainability from a financial point of view is of major concern for many of them.

11. The model for the community-level water projects clearly presents two critical causal loops: (a) the users' (or project) loop, and (b) the maintenance loop. The users' loop approximates the manner whereby such water projects are planned. Communities use water primarily based on their perception of what is available and on community practices. When shortages occur or when the traditional source presents certain problems (for example, causing sickness, suffering from salt intrusion, or smelling foul), a new water system project leads to desired ends as a response to a community's demand. The maintenance loop focuses on water associations formed during the water project process that are tasked with maintaining the system by charging adequate water tariffs.

[3] Water districts for large-scale systems with majority household connections; *barangay* (neighborhood) water and sanitation associations for small community-level systems.

12. The loops together reflect the project logical framework. The loops also explain why at the moment of truth few communities are able to repair, much less expand, their systems.[4] Both the users' loop and the maintenance loop were linked in these systems that were sustainable. The model also confirmed that the demand-supply equation of the users' loop must be connected dynamically to the maintenance loop for sustainable systems.

13. The successful community-level systems were distinct by the presence of community organization (or leadership). Such organization was different from the sustainable water association that was to be formed by the project. These community organizations had the following characteristics:

(i) They were "larger" than the water associations in that they covered other community interests of which water was only one (though a major interest as far as the community was concerned). These organizations were thus multipurpose in nature.

(ii) In some cases the community organization was the *barangay* council or government. This direct intersection of water association and *barangay* council provided a logical fit, though the issue of politics could be problematic in the future.

(iii) They usually predated the water association, making them a more natural extension of the community than the association formed by the project.

(iv) In some cases no community organization existed as such, but rather a community leader whose attributes carried the project and sustained it as a champion would a cause.

B. Implications for Planning

14. Such a model supports what development managers have learned over the past decade:[5] community preparation and organization matter. A number of ideas might be salient in designing, planning, and implementing such community-level projects. First, community inputs are important, but must be organized and must reflect community interests. At the earliest stages of planning, planners would be wise to identify an existing community organization that is sufficiently broadly based and involve it in determining the type of water system to be built. Second, where such an organization exists, this could perhaps become the water association. Where no such organization exists planners might look for strong *barangay* councils to take the lead, and where such organizations do not exist, perhaps they might be able to find a strong informal leader to champion the project and be the anchor for community involvement. Unless a strong community organization exists, building sustainable water systems at the community level will be difficult.

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[4] An example is the Plaridel Water System in Moises Padilla, Negros Occidental, Philippines, which started out as a level 1 system, later expanded to a level 2 public tap arrangement, and still later grew to level 3 with household connections. All this was driven by local community initiative, even though resource mobilization was undertaken to cover the large capital costs involved. These rural systems are technically defined in the Philippines as level 1 systems consisting of point source systems with public standpipes and no household connections. In urban areas, level 2 and level 3 systems are used. Level 2 systems have a mix of public standpipes and household connections. For level 3 systems, all or most of the households are connected to piped systems.

[5] At the various internal meetings held at ADB, much was said about the fact that the water system projects were evaluated at a time when little was done in relation to community preparation and organization and when the delivery of such projects tended to be engineering-driven. Much has changed since that time to correct this oversight.

C. A Closing Note

15. Multipurpose community organizations can function as community-level water associations. *Barangays* are best served by such multipurpose associations. However, when water systems become large and serve thousands of customers through household connections, such multipurpose associations lack the necessary focus to manage more complex systems. In such cases, more professionally run, single-purpose water districts are required, because managers require different skills and the larger and more complex financial transactions call for greater accountability.

16. Nevertheless, the system dynamics model still holds, though “community organization” gives way to “community accountability,” which serves as a proxy for democracy (for example, election of officers in the water district), accountability (for instance, annual reporting), and transparency (for example, open operations). In short, while leadership and organization are critical for community-level water systems, leadership and governance are important for water districts.