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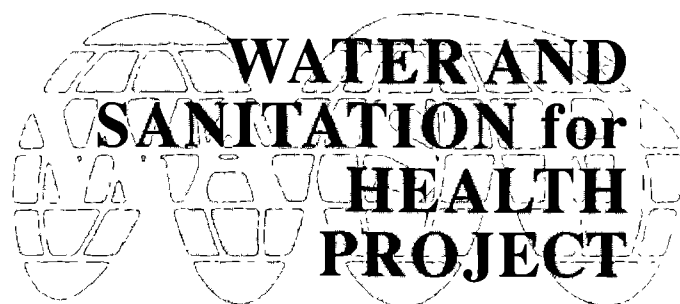
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R E P O R T

FINAL EVALUATION OF THE BOLIVIAN SAVINGS AND LOAN SYSTEM WATER AND SANITATION PROJECT

Field Report No. 315
September 1990

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CENTRO NACIONAL DE ESTUDIOS
DE CALIDAD DEL AGUA Y
SANEAMIENTO



Sponsored by the U.S. Agency for International Development
Operated by CDM and Associates

WASH Field Report No. 315

**FINAL EVALUATION
OF THE
BOLIVIAN SAVINGS AND LOAN SYSTEM
WATER AND SANITATION PROJECT**

Prepared for the USAID Mission to Bolivia
under WASH Task No. 152

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and
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September 1990

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ACRONYMS

BCB	<i>Banco Central de Bolivia</i> (Central Bank of Bolivia)
CACEN	<i>Caja Central de Ahorro y Préstamo para la Vivienda</i> (Central Housing Savings and Loan Bank)
CORPAGUAS	<i>Corporación de Agua Potable y Alcantarillado</i> (Water and Sewerage Corporation)
FONVI	<i>Fondo Nacional de Vivienda</i> (National Housing Fund)
GOB	Government of Bolivia
IAB	<i>Ingenio Azucarero de Bermejo</i> (Bermejo Sugar Mill)
IDB/BID	Inter-American Development Bank/ <i>Banco Inter-Americano de Desarrollo</i>
IMP	Implementation Master Plan
INSO	<i>Instituto Nacional de Salud Ocupacional</i> (National Institute for Vocational Health)
PAHO/OPS	Pan-American Health Organization/ <i>Organización Panamericana de la Salud</i>
PDA	<i>Plan de Acción</i> (Action Plan)
PP	Project Paper
SAMAPA	<i>Servicio Autónomo Municipal de Agua Potable y Alcantarillado</i> (La Paz) (La Paz Municipal Water and Sewerage Agency)
SEMAPA	<i>Servicios Municipales de Agua Potable y Alcantarillado</i> (Cochabamba) (Cochabamba Municipal Water and Sewerage Agency)
S&L	Savings and Loan System composed of CACEN and the <i>mutuales</i>
USAID	United States Agency for International Development
UNDP	United Nations Development Program
WHO/OMS	World Health Organization/ <i>Organización Mundial de la Salud</i>
WASH	Water and Sanitation for Health Project

EXECUTIVE SUMMARY

Background

This evaluation had two objectives: the first was to assist the Bolivia Mission of the U.S. Agency for International Development (USAID) in assessing the technical assistance and loan components of the Water and Sanitation Project; the second was to make recommendations with regard to future activities of this kind with the Bolivian savings and loan (S&L) system or with other financial institutions serving the needs of Bolivia's urban poor. The evaluation was also expected to provide useful information for a possible project of CARE.

The objective of the Water and Sanitation Project was to provide financial resources and technical assistance that would allow the Bolivian savings and loan system to diversify its portfolio and finance the installation of potable water and sanitation systems for low-income communities. Resources were disbursed from the Central Bank of Bolivia to the Caja Central de Ahorro y Préstamo para la Vivienda (CACEN), which channeled loan resources to the individual S&L associations.

Although the project was authorized in 1983, no disbursements were made until 1986 because the country's economic crisis curtailed lending by all Bolivian financial institutions. The first subproject, initiated in late 1985 and finished in September 1986, was to improve and expand the water supply system of Guayaramerín (Beni).

When the project ended in March 1989, it included five subprojects with a total of \$1,205,016 in loan funds. All of these subprojects are operating and provide water services to approximately 16,500 families in five of Bolivia's nine departments. The subprojects range from simple water connections to more complex systems serving large populations. Twelve different private or public entities participated in the design and implementation of the subprojects.

Conclusions and Recommendations

Although the subprojects have affected the beneficiaries positively, several deficiencies were found during the technical evaluation.

The model is replicable. It can be afforded by households and the communities have proved their capacity to manage water supply systems and to solve technical, financial, and operational problems. However, there are many aspects that must be improved before trying to replicate the model; some of these are mentioned below.

Subproject designs should comply with the national standards of the Ministerio de Urbanismo y Vivienda, *Normas de diseño para sistemas de agua potable* and *Normas de diseño para sistemas de alcantarillado*. In general, the subprojects should be designed so that they will provide sufficient and safe water. Furthermore, there should be coordination between water supply and sanitation so that wastewater disposal is properly accomplished.

"As-built" drawings should be produced for the subprojects so that operators have accurate information on subproject construction. The subprojects should be planned for easy maintenance, maintenance that can occur without interrupting service. Water sources should be protected.

In areas where no sewers are available, beneficiaries should be educated in proper methods of wastewater disposal. Wastewater pools can be avoided by providing seepage pits or piped drainage to natural streams. Proper sanitation should be included in water supply programs; pour-flush latrines are a perfect complement to piped water supply in a household.

All of these recommendations could be implemented either by having a special technical section in CACEN dedicated to the project or by having a specialized unit of the Corporación de Agua Potable y Alcantarillado (CORPAGUAS) or similar organization provide the technical expertise the subprojects need during planning, design, construction, and operation.

USAID should promote more loans to support private efforts to solve public needs, particularly those related to improvement of water and sanitation facilities. In the case of construction and/or operation of a water system, loans should be channeled through organizations representing the target population, capitalizing on the S&L system experiences.

CACEN's planning and control functions must be strengthened to obtain continuity of the project. If CACEN continues to be involved in projects of this type, it should—

- Establish a special unit to operate the program and provide technical and financial assistance to the *mutuales* and water supply cooperatives.
- Define in advance an implementation plan that includes objectives, goals, strategies, and a simple and flexible operational structure.
- Set a system for monitoring the program, based on the Implementation Plan.
- Establish clear criteria for project identification and selection through technical, financial, and economic studies carried on before the initiation of every subproject.

- Clearly define the roles and responsibilities of each institution involved before the beginning of every project.

USAID and CACEN should share with other international agencies in Bolivia (such as the United Nations Development Program, the World Health Organization, and the Inter-American Development Bank) the experience of the S&L system with the privately owned water facilities.

According to the agreement between USAID and the government of Bolivia, loan repayment will be due in 1995. This date should be extended for at least ten years to allow for other subprojects to be implemented, using the experience acquired during this pilot project and the monies CACEN receives as payments on the subprojects so far implemented. CACEN has already established a special account for relending these payments to similar projects in the future if the S&L system so desires.

Chapter 1

INTRODUCTION AND THE ENVIRONMENT

1.1 Evaluation Background and Methodology

1.1.1 Purpose

This evaluation had two objectives: the first was to assist the Bolivia Mission of the U.S. Agency for International Development (USAID) in assessing the technical assistance and loan components of the Water and Sanitation Project; the second was to make recommendations with regard to future activities of this kind with the Bolivian savings and loan (S&L) system or with other financial institutions serving the needs of Bolivia's urban poor. The evaluation was also expected to provide useful information for a possible project of CARE.

1.1.2 Scope of Work

Based on the Mission's Scope of Work, which is included in this report as Appendix A, the consultants prepared a detailed work plan that included the following tasks:

- Gathering data
- Evaluating subproject engineering
- Evaluating the project's financial and institutional aspects
- Determining beneficiary socioeconomic characteristics
- Evaluating expansion potential for financing this type of project
- Reviewing project compliance with development objectives outlined as project outputs in the Loan Agreement
- Proposing recommendations and guidelines for future project design and policy
- Preparing a draft report that presents evaluation findings and recommendations

1.1.3 Methodology

In preparation for the evaluation, a two-day planning meeting took place at the office of the Water and Sanitation for Health (WASH) Project to discuss evaluation objectives, define the report outline, and establish the work plan.

The evaluation methodology included the following components: meetings with USAID/Bolivia and CACEN staff, documents review, and field visits to four of the five project communities. The communities were selected based on accessibility, time constraints, and conditions in the country. (Appendices B and C detail persons contacted, communities visited, and reference documents reviewed.)

The engineering evaluation was conducted by interviewing USAID staff, engineering staff of each individual project, household users, cooperative officials, and S&L personnel; reviewing pertinent documents and drawings; and inspecting water and sanitation works in the field.

Interviews and document reviews took place April 26 to 28 in La Paz and field trips from April 30 to May 3 and from May 7 to 9. During each community visit, technical personnel of the S&L or the cooperative were present.

1.2 Project Description

The objective of the Water and Sanitation Project was to provide financial resources and technical assistance that would allow the Bolivian savings and loan system to diversify its portfolio and finance the installation of potable water and sanitation systems for low-income communities. Resources were disbursed from the Central Bank of Bolivia to the Caja Central de Ahorro y Préstamo para la Vivienda (CACEN), which channeled loan resources to the individual S&L associations. Although the project was authorized in 1983, no disbursements were made until 1986 because the country's economic crisis curtailed lending by all Bolivian financial institutions. The first subproject, initiated in late 1985 and finished in September 1986, was to improve and expand the water supply system of Guayaramerín (Beni).

When the project ended in March 1989, it included five subprojects with a total of \$1,205,016 in loan funds. All of the subprojects are operating and provide water services to approximately 16,500 families in five of Bolivia's nine departments. The subprojects include three water supply and distribution systems (Guayaramerín, San Juan-San Pablo, and Bermejo), one subproject for making water and sewer connections to existing systems (El Kenko), and one that improves water distribution by constructing individual household storage tanks (Cobija). No latrines were constructed, although the Project Paper (PP) indicated that pit latrines and pour-flush toilets would be included in the project. Twelve different private or public entities participated in the design and implementation activities of the subprojects.

1.3 The S&L System

1.3.1 Institutional Framework

The S&L system, created by Decree-Law 07585 of 1966, is controlled by the Superintendencia de Bancos. The system is composed of private-sector institutions run on a nonprofit basis: CACEN and the *Asociaciones mutuales de Ahorro y Préstamo para la Vivienda*. CACEN promotes and regulates the use of funds for the S&L system. The *asociaciones mutuales* are the system's operational branches; each is owned by its depositors and operates independently.

CACEN has a five-member board, which includes the Minister of Finance and four directors elected by the *mutuales*. The bank has a long record of efficient management; since its creation 24 years ago, it has never defaulted a loan. According to an evaluation performed by the PADCO in 1988, CACEN faces some obstacles:

- CACEN's multiple functions
- Orientation to the use of external funds as opposed to raising capital from other sources
- Difficult working relationship between CACEN and the two larger *mutuales* of La Paz
- Lack of long-term deposits (difficult for S&Ls to make long-term housing loans)
- Unclear financial viability of some smaller S&Ls

1.3.2 Impact of Inflation

During the past decade, the S&L system suffered the effects of Bolivia's economic situation, particularly the inflationary process that began in 1982 and peaked in 1985. In 1982, the system was authorized to readjust its assets and liabilities according to the devaluation of that year. However, the system's external debt was not de-dollarized, which generated very negative effects and threatened the very existence of the S&L system.

Although the *mutuales* revalued assets and liabilities according to the full devaluation (76 percent), it was lower than the inflation rate (124 percent) and much lower than the parallel market devaluation (321 percent). On the other hand, because of the borrowers' limited

capacity to pay, S&Ls could not increase interest rates above the inflation rate to recover future exchange losses.

In 1982, the system's foreign debt was still dollarized, increasing local value with each devaluation. On the other hand, with the elimination of the value clause, deposits became a small fraction of liabilities. Asset value decreased with each devaluation, and with no equivalent liability decrease, the system experienced a progressive decapitalization.

Between 1982 and 1985, the official exchange rate (partially reflecting inflation) suffered the following changes in relation to the U.S. dollar:

February 5, 1982:	44 pesos
November 3, 1982:	200 pesos
November 17, 1983:	510 pesos
April 12, 1984:	2,100 pesos
August 17, 1984:	5,000 pesos
November 22, 1984:	9,000 pesos
February 8, 1985:	50,000 pesos
May 16, 1985:	75,000 pesos
August 30, 1985:	1,100,000 pesos

The hyperinflation of 1984-85 had devastating effects on the S&L system, depleting its loan portfolio and reducing deposits to almost nil. In 1984, the system had to reduce personnel to 60 percent because it could not pay salaries.

After Paz-Estenssoro took office in August 1985, radical changes in economic policies led to an almost complete control of inflation, as can be seen in the following exchange rates between 1985 and 1989:

September 30, 1985:	1.075 bolivianos (1,075,000 pesos)
October 31, 1985:	1.12 bolivianos (1,120,000 pesos)
November 30, 1985:	1.493 bolivianos (1,493,000 pesos)
December 31, 1985:	1.692 bolivianos (1,692,000 pesos)
December 31, 1986:	1.923 bolivianos (1,923,000 pesos)
December 31, 1987:	2.21 bolivianos (2,210,000 pesos)
December 31, 1988:	2.47 bolivianos (2,470,000 pesos)
December 31, 1989:	2.97 bolivianos (2,970,000 pesos)

The new economic program did not solve all the S&L problems; the system's foreign currency debt still remained, for example. But the foundations were set for the system to achieve financial viability. Besides inflation control, other policies affected the S&L system:

- Exchange rate stabilization
- Elimination of interest rate controls
- Indexation through dollar maintenance of value clauses
- Diversification of loan portfolio, increasing short-term loans
- Increased market share in deposits by S&L system
- Expansion of loan portfolio.

In July 1987 the government of Bolivia (GOB) absorbed the S&L dollarized debt, equivalent to US \$31.2 million. As a consequence, most S&L *mutuales* changed their net worth from negative to positive (see Table 1 in Chapter 4, which shows S&L balance sheets and income statements).

Chapter 2

PROJECT PLANNING AND IMPLEMENTATION

2.1 Overview and Objectives

The Project Paper presents a comprehensive project description, including purpose, goals, resources to be provided, and overall implementation plan. The project's main purpose is to enhance the capability of the Bolivian savings and loan system to meet the water and sanitation requirements of Bolivia's poor. Target markets were those without adequate water supplies, such as peri-urban areas and rural areas. No activity was envisioned in areas with adequate water systems except in a few peri-urban communities that may desire and could afford connections to the city sewer pipes.

According to the Loan and Grant Agreement of September 30, 1983, the project's objectives were these:

- To diversify the S&L *mutuales*' short-term loan portfolio
- To increase S&L capacity to address water and sanitation needs of low-income households in Bolivia
- To financially and technically strengthen the S&L system as part of the Bolivian private sector
- To create a mechanism that combines municipal public agencies with the dynamic private sector to improve the quality of life.

2.2 Target Populations

The target populations were to meet several conditions:

- Family income below 70 percent of the total national average
- Villages with populations above 500
- Easily accessible villages and towns
- No inner cities or mining towns

Five target markets were identified:

- Major cities
- Minor cities
- Villages of 1,000 to 2,000 inhabitants
- Villages of 500 to 1,000 inhabitants
- Localities scheduled to receive project subsidies from other sources

2.3 Implementation and Institutional Aspects

As described in the PP, the agreement between the GOB acting through the Banco Central de Bolivia (BCB) and the United States acting through the Agency for International Development called for the U.S. to lend Bolivia an amount not to exceed US \$2,000,000. These funds would provide the Bolivian savings and loan system with financial resources and technical assistance to diversify its portfolio and finance the installation of potable water and sanitation systems for low-income communities and individuals. The resources would be disbursed from the BCB through CACEN to the individual savings and loan associations. The associations were to lend the funds to cooperatives and individuals for water and sanitation purposes. Although the project was authorized in 1983, no disbursements were made until 1986 because the country's economic crisis from 1983 to 1986 curtailed lending by all Bolivian financial institutions during that period. USAID also was to make a grant of US \$250,000 to CACEN to provide technical assistance and pay for project operating expenses.

The main institutions linked to the project were the following:

- USAID/Bolivia as the financing agency
- Central Bank of Bolivia
- CACEN, responsible for project implementation, including financial and administrative functions
- Savings and loan associations affiliated with CACEN, responsible for the project's operational aspects

Corporación de Agua Potable y Alcantarillado (CORPAGUAS) and the local water authorities (SAMAPA-La Paz, SEMAPA-Cochabamba, etc.) were expected to help finance and maintain the water systems.

2.4 Financial Conditions

The assumptions on which the PP was based were those prevailing in 1982 and 1983, before hyperinflation and the consequent New Economic Policy. The exchange rate was supposed to increase about 20 percent yearly in the first three years and then decrease to 10 percent per year between 1987 and 1995.

Interest rates between BCB and CACEN were consequently fixed at 16 percent. S&L *mutuales* would receive funds from CACEN at 20 percent which, blended with their own funds, they would lend to borrowers at "the highest market rate permitted by law." Loans to consumers were for five years.

Financial statements of CACEN and the *mutuales* were projected using these assumptions, and the project was expected to be highly profitable. Net profit for CACEN would increase from 1 percent to 40 percent and for the *mutuales* from 53 percent in 1984 to 72 percent in 1995. Return on equity would be 14 percent for the *mutuales* and 18 percent for CACEN.

Not only would the project be profitable but also, with positive cash flows after the second year, repayments of principal and interest could easily be done on the basis of their cash flows. When the A.I.D. loan was paid off after five years, the *mutuales* would retain the earnings and continue operations in the same line of business. CACEN's line of credit would come from A.I.D. (\$2 million) and from the S&L's own funds. The project was to become fully operational in two years and from then on to sustain the project with the reflow of loans. Over the project's 12-year life, loans to 50,000 households would amount to over \$6 million and the S&L system would have established itself in a new line of business complementary to its housing-related loans.

2.5 Implementation Master Plan

Among the conditions for the first disbursement, the Loan Agreement required development of an Implementation Master Plan (IMP) which CACEN prepared in May 1987, almost four years after the Loan Agreement was signed and one year after the Guayaramerín project was finished. The plan, which outlined the methodology to implement the project and subprojects, included these major components:

- Subproject identification
- Requirements to obtain loans
- Procedures to give loans
- Procedures for goods and services procurement
- Institutional relationships between CACEN and the Bolivian agencies responsible for water supply and wastewater disposal
- Credit systems
- Technical assistance
- Training

The IMP defined the first five projects to be financed: San Juan-San Pablo (Cochabamba), Bermejo (Tarija), El Kenko (La Paz), and individual loans in Santa Cruz and in Trinidad (Beni), leaving the door open for other projects to be identified later. While this implementation plan provided the blueprint for executing the project, each subproject followed its own development path.

The IMP established the requisites to be fulfilled by potential credit subjects, which could be individuals, cooperatives, or other private institutions. The plan also defined the procedures to follow for access to credit at all levels: loan subject-*mutual*, *mutual*-CACEN, and CACEN-USAID. Buying and bidding procedures for goods and services acquisition were also established by the IMP.

2.6 Community Participation and Organization

The PP does not include community participation and organization; however, the project's master plan includes a methodology for initiating subprojects that includes community participation requirements. According to the plan, at least 75 percent of a subproject area's residents should be able to pay for the capital costs and operation and maintenance of the subproject and willing to participate in it.

In addition, the subproject promoters (local S&Ls) were to help organize a committee, cooperative, or other beneficiary organization for the subproject that would help with communal work, materials gathering, trench excavation, and other activities to lower the subproject cost. Furthermore, the community organization was to contract with the

construction company for construction of the works. These activities were mostly for the water supply projects.

2.7 Health Aspects

A project goal was to provide sufficient, safe water and sanitation to poor communities in peri-urban and rural areas, in order to improve health conditions in these communities. This goal was to be achieved entirely as a result of subproject implementation, and no further attempt was made to link the project with other health improvement actions such as training and education.

2.8 Training and Technical Assistance

No training was included in the PP, although the implementation plan included a training program for S&L staff to explain project goals and teach promotional activities related to the project. The Implementation Plan implied that the communities would operate and maintain their systems by hiring trained technicians.

The project included a grant of US \$250,000 for technical assistance, which was to include seven months of technical assistance on training, planning, and control, plus two years of technical assistance to include IMP design, financial planning, subproject control, monitoring, procurement, and field coordination and oversight of subproject activities.

Chapter 3

TECHNICAL EVALUATION

3.1 Overview

Under the Water and Sanitation Project, five subprojects were implemented: three were water supply projects, one supported construction of household water storage tanks, and one financed water and sewer connections for individual households. Guayaramerín (Beni), San Juan-San Pablo (Cochabamba), and Bermejo (Tarija) were large, complex water supply projects that required substantial planning, organization, and implementation efforts. Cobija in Pando (storage tanks) and El Kenko in La Paz (household water and sewer connections) involved simple engineering. A detailed evaluation of Guayaramerín, San Juan-San Pablo, and Bermejo follows.

3.2 Guayaramerín Subproject

3.2.1 Project Description

Guayaramerín, in the department of Beni, sits upon the shores of the Mamoré River, the boundary between Bolivia and Brazil. It is a town of about 20,000 people, whose water supply system was built in 1973 for a population of 16,000. System capacity was exceeded by 1980, and the Cooperativa de Agua Potable de Guayaramerín, operator of the system, wanted to enlarge and improve the system to meet the demand. The subproject was designed with technical assistance from CACEN and included the following components:

- Second infiltration gallery at the intake works
- Third pump and motor
- Second (2,900 m long, 10 in. diameter) forcemain
- Additional water distribution mains (21.5 Km) ranging from 2 to 8 inches in diameter
- Water meters and household water connections

The subproject was constructed under CACEN's technical direction, with local labor and pipe and equipment imported from Brazil. The project financed the acquisition of the pipe, only; local funds covered other costs. Subproject capital cost was approximately US \$304,000,

which included a US \$233,000 loan financed by the project and the equivalent of US \$71,000 in local contributions.

3.2.2 General System Performance

The system performs well. According to the users there is sufficient, safe water all the time.

3.2.3 Water Source Selection

The water source is the stream called Las Arenas. The source, selected prior to this subproject, is of good quality, although measures need to be taken to protect it. The stream should be fenced for a certain length upstream from the intake to avoid the intrusion of humans and animals. These precautions should be taken even though the water is drawn from the stream through two filter galleries at both sides of the stream and is chlorinated at the pumping station.

Other measures should also be taken: buying as much land surrounding the stream as possible; educating the farmers to avoid loss of soil and erosion, which cause siltation of the stream above the intake; and general public education on the importance of protecting the water source.

3.2.4 Design and Construction Procedures

CORPAGUAS carried out the original design using its own standards. CACEN hired an engineer to design the improvements, using the original CORPAGUAS design as a basis. The only important design problem detected during the field visit was the lack of a bypass to deviate the stream in order to clean the filter galleries. This bypass is being planned for construction during the next expansion.

Subproject construction was carried out locally under the supervision of the cooperative technical personnel and the CACEN engineer. The beneficiaries and members of the armed forces and other skilled and unskilled workers supplied the labor. Pipe was bought from Brazil (Braslit) after an international bidding process.

The quality of the construction observed was good; the quality of the concrete work and other visible parts of the construction was more than acceptable. Water meters were installed above the surface of the ground in anticipation of future sidewalk construction.

3.2.5 Design and Construction Standards

The subproject was planned based on the earlier CORPAGUAS design for the initial phase of the system. The Ministerio de Urbanismo y Vivienda has standards of design for water supply and wastewater disposal that are used by CORPAGUAS, one of its agencies. These concise standards, *Normas de diseño para sistemas de agua potable*, are used by most organizations carrying out water and wastewater projects in Bolivia.

The subproject was designed to serve 46,000 people (the expected population of the year 2006) with a daily per-capita consumption of 180 liters. Piping was designed for a maximum pressure of 10 kg/cm². The system includes an elevated (15 m) storage tank to regulate pressure and supply peak demands.

3.2.6 Water Quality

The Instituto Nacional de Salud Ocupacional (INSO) analyzed the water quality of the source; results were within the requirements for human consumption set by the World Health Organization (WHO). Because the source can be contaminated bacteriologically, the water is chlorinated at the pumping station. Chlorine residual is tested at different points of the distribution system to maintain a minimum residual of 0.2 parts per million (ppm) using a portable tester. Water quality of the source may deteriorate in the future because of siltation and erosion from agricultural activities near the stream. Heavier maintenance of the infiltration galleries will be needed unless measures are taken to protect the source.

3.2.7 System Operation and Maintenance

The system is operated and maintained by the cooperative's technical staff, which includes the chief operator, two machinists, eight plumbers, and a watchman. At the time of the field inspection, one of the three pumps was being overhauled. However, this pump is a spare and its being down does not affect system operation. The only serious maintenance problem occurs when siltation requires the filtration galleries to be cleaned. To accomplish this, the entire stream must pass through a diversion channel, and water service is interrupted.

In 1989, operating expenses for the system were about 26,000 Bolivian pesos and the average cost of 1 m³ of water was 0.64 Bolivian pesos.

3.2.8 Project Impact on Beneficiaries

The subproject has produced a very positive impact on the beneficiaries by providing safe and sufficient water. However, because the cooperative does not presently operate the

wastewater disposal system, some potential problems exist. Although the municipality is constructing and expanding the sewer system, many households have no access. As a result, these households dispose of wastewater improperly, in most cases on the ground. The consequent dirty water pools provide a perfect breeding ground for mosquitoes in an area known to have endemic malaria. This problem could be resolved by undertaking a public education campaign on proper wastewater disposal. If the cooperative eventually becomes responsible for the sewer system, it may be able to deal with this problem more effectively than the municipality by coordinating water-supply projects with sewerage and/or public-education efforts relating to this issue.

As a first measure, the cooperative should instruct beneficiaries on methods of proper wastewater disposal such as providing drainage by constructing leaching fields or seepage pits for wastewater disposal or, where this is not feasible, providing piped drainage to the nearest drainage ditch.

Another issue of concern is the lack of coordination between water supply and proper excreta disposal. Although this is not presently the cooperative's responsibility, proper excreta disposal should be an integral part of any project geared toward improving beneficiary health. To its members without sewerage, the cooperative could provide technical assistance on the proper siting and construction of latrines and could finance their construction. A logical choice would be the pour-flush latrine because of the availability of water through the subproject.

3.3 San Juan-San Pablo Subproject

3.3.1 Project Description

The San Juan-San Pablo subproject was planned by Servicios Municipales de Agua Potable y Alcantarillado (SEMAPA) in order to provide water to a small section in the northern part of Cochabamba. The area, which includes the barrios of El Mirador, Petrolero, La Promotora, Villa Moscú, Lomas de Aranjuez, Alto Tupuraya, and others, has a total population of about 6,000 (1,000 families). The subproject included the following components:

- Improvements to the intake works and the conduit from the San Juan-San Pablo reservoirs to the new treatment plant
- Treatment plant including a grit chamber, sand filters, and storage tanks
- Transmission mains (6 inch and 4 inch) to the barrios

- 14 km of water distribution mains ranging from 3 to 6 inches in diameter
- Installation of water meters and household water connections.

The subproject was constructed under the technical direction of CACEN using local labor. The pipe was imported from Brazil. The project financed about 71 percent of the construction and the other costs were financed with local funds. The subproject capital cost was approximately \$497,000, which included a \$355,000 loan financed by the project and \$142,000 in local contribution.

3.3.2 General System Performance

For the last three years the city of Cochabamba has endured a severe drought and water is being rationed to all sections of the city; the subproject is no exception. As a result, water is available only part-time even though the subproject was expected to supply twice as many people as presently served. The water is not chlorinated continuously because the plant has no chlorine feeder; consequently, the water is unsafe to drink without boiling. With the above limitations, the system seems to be performing relatively well.

3.3.3 Water Source Selection

The reservoirs of San Juan-San Pablo, high in the mountains north of the service area, serve as the water source. The source, selected during SEMAPA's feasibility study, is of good quality. Although the feasibility study indicated that the source had a safe yield of 10 l/s, SEMAPA indicated that the two reservoirs are now empty and that they are pumping from the Wara-Wara reservoir to the transmission conduit in order to provide at least some water to the subproject beneficiaries. In addition, it appears that although SEMAPA owns the reservoirs, some farmers claim to have water rights to the source waters. As a result, even under these severe drought conditions, about one-quarter of the flow is being diverted from the treatment plant.

3.3.4 Design and Construction Procedures

SEMAPA carried out the subproject design using Bolivian design standards. The only significant design problem detected during the field visit was the lack of a chlorinator to dispense chlorine to the water for disinfection. This piece of equipment was to have been added to the plant as a change order during construction, but this never occurred. At the present time, the operator reportedly adds 1/2 kg of calcium hypochlorite manually to the effluent filter chamber once a day.

A local company did the construction, supervised by the technical personnel of the *mutual* and the CACEN engineer. The contractor bought pipe from Brazil.

The quality of the construction observed was good; the quality of the concrete work and other visible parts of the construction was also good. Water meters were installed in more than 70 percent of the house connections.

3.3.5 Design and Construction Standards

SEMAPA planned the subproject based on the design standards of the Ministerio de Urbanismo y Vivienda. The subproject was designed for an expected population of about 6,000 and a per-capita consumption of 150 liters per day. Piping was designed for a minimum pressure of 1.5 kg/cm². The system includes storage tanks to regulate pressure and supply peak demands.

3.3.6 Water Quality

During the feasibility study the quality of the source was analyzed, and the results indicated the water would need to be filtered to meet WHO standards for human consumption. Because the source can be contaminated bacteriologically, the water should be chlorinated continuously. Chlorine residual should be checked with a portable tester at different points of the distribution system to maintain a minimum residual of 0.2 ppm.

3.3.7 System Operation and Maintenance

The system is operated and maintained by SEMAPA's technical staff, which includes two operators assigned to the plant. There are no maintenance problems at the present time, although the manual chlorination method is inefficient and should be replaced with a chlorinator. The average cost of 1 m³ of water was 0.53 Bolivian pesos.

3.3.8 Project Impact on the Beneficiaries

By providing water, the subproject has produced a positive impact on the beneficiaries. However, the current drought prevents them from receiving continuous service. In addition, because the water is manually chlorinated, it is not guaranteed to be safe. The beneficiaries are trying to negotiate lower tariffs with SEMAPA because they also have to pay the subproject costs, which they consider inequitable.

3.4 Bermejo Subproject

3.4.1 Project Description

Bermejo is located on the shores of the Bermejo River, the boundary between Bolivia and Argentina. This city of 20,000 is in the department of Tarija. Bermejo's water supply system consisted of a pumping station that pumped water from the river to a treatment plant for chlorination, sedimentation, and filtration. That system was very unreliable because of a deficient electrical supply and water turbidity during the summer months. To solve these problems CORPAGUAS designed the subproject in 1984, with the following components:

- A new water source at Quebrada 9 with a new dam, intake, and filter bed
- A new sedimentation tank
- A new transmission main (9 km long, 10 inch diameter, PVC)
- A new regulating tank

The subproject was constructed under CACEN's technical direction, using local labor. Pipe was imported from Brazil. The project financed the pipe and some other materials, while other costs were financed with local funds. Capital cost was approximately \$747,000, which included a \$502,000 loan financed by the project and \$245,000 in local contributions.

3.4.2 General System Performance

The system performs well at present. According to the users, there is sufficient water all the time; however, there is no assurance about the potability of the water because it is not being chlorinated. This problem will no doubt be resolved once the chlorination system is on line and the cooperative acquires a portable chlorine tester.

3.4.3 Water Source Selection

The water source is the stream called *Quebrada 9*, which was selected to replace the poorer-quality Bermejo River. The new source is of good quality, although measures need to be taken to protect it. For example, the stream should be fenced for a certain length above the intake to avoid contamination by humans and animals. These precautions should be taken even though the water is drawn from the stream through a filter bed at the intake works and then further treated. Other measures should include buying as much land surrounding the

stream as possible; educating the farmers to avoid loss of soil and erosion, which produce siltation of the stream above the intake; and general public education on the importance of protecting the water source.

3.4.4 Design and Construction Procedures

CORPAGUAS designed the subproject using Bolivian design standards. Some design problems were detected during the field visit:

- There is no sluice gate to allow drainage of the impoundment at the intake to clean it of debris and silt now accumulating there.
- There are no provisions for cleaning the filter bed.
- PVC pipe is used in the exposed pipe bridges of the transmission main. These bridges present continual leakage problems due to deflection, expansion, and contraction from temperature changes. These pipe sections will most likely fail in the near future, interrupting service. Pipe bridges should be replaced with steel welded pipe connected to PVC pipe with expansion (Dresser) couplings.

Construction was carried out under a force account by the cooperative with local labor under the supervision of cooperative technical personnel and the CACEN engineer. Pipe was bought from Brazil (Brasilit) after an international bidding process.

Construction quality was generally good, as were the concrete work and other visible parts, with the notable exception of the pipe bridges which will need to be replaced soon. Also, it appeared that where the transmission main required bends and fittings were unavailable, the PVC pipe was bent by heat. Wherever this procedure was used, the pipe is also likely to fail and will need to be replaced in the future.

3.4.5 Design and Construction Standards

CORPAGUAS designed the subproject using the *Normas de diseño para sistemas de agua potable*. The system includes several storage tanks to regulate pressure and supply peak demands. Transmission pipe includes a vent and several drainage valves. The subproject was designed to serve 37,000 people (the expected population for the year 2009) with a daily per-capita consumption of 160 liters.

3.4.6 Water Quality

The water quality of the source was not analyzed. Because the source is remote and high it appears to be of good quality; however, the water should be analyzed as soon as possible and the results compared with the WHO standards for human consumption. Because the source can be contaminated bacteriologically, the water should be chlorinated. Chlorine residual should be checked with a portable tester at different points of the distribution system to maintain a minimum residual of 0.2 ppm.

Water quality may deteriorate in the future because of siltation and erosion from agricultural activities near the stream. As noted, heavier maintenance of the intake works and filtration bed will be required unless measures are taken to protect the source.

3.4.7 System Operation and Maintenance

The system is operated and maintained by the cooperative's technical staff, which includes the chief operator, two assistants, seven plumbers, two watchmen, and a laborer. At the time of the field inspection the chlorination system was not operating but was expected to be in operation soon. WHO is providing the cooperative with a chlorine tester to help determine the dosage.

In 1989, system operating expenses were about 78,800 Bolivian pesos, and the average cost of 1 m³ of water was 0.37 Bolivian pesos.

The most serious maintenance problem occurs when deflection and movement cause the pipe bridges to fail; then service has to be interrupted to replace the pipe. In those circumstances the old pumping station on the Bermejo River has to be reactivated to provide water to the beneficiaries. Unfortunately, the quality of the river water is not good.

3.4.8 Project Impact on the Beneficiaries

The subproject has produced a positive impact on the beneficiaries by providing better-quality water and a sufficient supply. However, because the water is not presently being chlorinated, water quality is not guaranteed.

Household services are not presently metered, which leads to waste and to inequities in beneficiary costs. This situation has produced problems for the cooperative, with some beneficiaries refusing to pay for the service. The cooperative should undertake a program to install water meters.

3.5 Cobija and El Kenko Subprojects

These subprojects included simple engineering solutions for household elevated water storage tanks in Cobija (Pando), and water and sewer systems and connections in El Kenko (La Paz). The Cobija subproject was directed to individuals, who were given loans of up to US \$1,500 to construct elevated storage tanks that would allow them to have water all day. The El Kenko subproject included water and sewer house connections, and bathrooms in houses built by the *mutual* during the construction of the El Kenko III development. These facilities were constructed in accordance with existing building codes.

3.6 Conclusions of the Technical Assessment

Although the subprojects have produced a positive effect on the beneficiaries, several deficiencies were found during the technical evaluation.

In general, the subprojects should be designed in such a way that they will provide safe water and enough of it. They should be planned for easy maintenance that does not require service interruptions. Furthermore, there should be coordination between water supply and sanitation so that wastewater disposal is properly accomplished. Water sources should be protected, and education and training on the importance of protecting the sources should be provided. Accurate "as-built" drawings should be produced for the subprojects so that the operators have dependable information.

Chapter 4

FINANCIAL AND INSTITUTIONAL EVALUATION

This chapter covers four topics: first, a brief overview of the project's institutional organization; second, an overview of the financial structure of the S&L *mutuales*; third, the financial management analysis of subprojects, exploring the replicability of a privately oriented model of public utilities; and fourth, cost recovery and affordability. The balance sheet, income statement, and financial ratios for the *mutuales* and CACEN are listed in Appendix D. Table 1 gives an overview of the three major subprojects. Late payments in Bermejo and Guayaramerín are analyzed in Table 2. Both Tables are at the end of this chapter.

4.1 Project Operational Structure

The planned organizational structure and the loan funds transactions were presented in the Project Paper. The actual structure turned out to be slightly different; in most cases the community was represented by cooperatives, instead of funds going directly to the individual households. The cooperatives negotiated directly with contractors and suppliers, eliminating the need for CACEN to become involved with inventory management.

The original purpose of the project was to provide the Bolivian savings and loan system with the financial resources and technical assistance to diversify its portfolio which was depleted as a result of the hyperinflation that took place in the early 1980's. Although interest rates were lower than originally proposed: USAID to Banco Central, 8 percent; Banco Central to CACEN, 9 percent; CACEN to *mutuales*, 10.5 percent; and *mutuales* to cooperatives or individuals, 16 percent, there seem to be too many intermediaries from the source of funds (USAID) to the final beneficiaries. This increases the cost of funds and leads to more controls than necessary, making implementation of the subprojects less attractive to the beneficiaries.

Although the auditing function seems to be carried on in an acceptable way, there has been a noticeable lack of attention to how the planned inputs, outputs, objectives, procedures, and impacts are being accomplished. Such monitoring by CACEN and the S&L *mutuales* could have helped detect problems early on, thus preventing them from becoming more serious and also permitting adjustments to the initial plans.

4.2 S&L Mutuales

4.2.1 Planning and Budgeting

CACEN has prepared an Action Plan (PDA) that defines the S&L system's objectives, goals, and strategies for 1989-93. In order to reach the established goals, the PDA defines strategies to achieve profitability, savings attraction, portfolio increase, personnel training, relations with the financial system, and relations with the community.

Because of the effects of hyperinflation, the S&L system was decapitalized and not until 1987 could the *mutuales* show a positive figure for equity, as the Bolivian government had assumed the system's foreign debt that year.

4.2.2 USAID Loans and Lending Activity

The relative importance of the USAID loan varies depending on the *mutual*: in March 1990, excluding Pando, these funds comprised 17 to 33 percent of all USAID loans through CACEN to these *mutuales*. On the other hand, they represented between 2.5 and 10.7 percent of all assets. The main impact of USAID loans has been in the small *mutuales* that serve mainly populations of self-employed workers and have no access to loans from the Fondo Nacional de Vivienda (FONVI). In Tarija and La Frontera *mutuales*, the combined USAID loans represent 69 percent and 78 percent of all loans.

4.2.3 Financial Structure

In the last five years the current ratio of the *mutuales* has been between 1.63 and 2.20, which can be considered a satisfactory relationship of current assets and liabilities. The quick assets ratio is around 0.40 and improving. The inventory seems to be larger than necessary for the *mutuales*' normal operation and increased dramatically in 1989.

4.2.4 Liquidity

The liquidity ratio has values of more than 50 percent in the last three years, very high for housing financial intermediaries. The reason seems to be the lasting effects of the economic crisis of 1985, which leads to a preference for liquid assets in order to protect the *mutuales* and savers from an eventual repetition of the 1985 situation.

4.2.5 Profitability

The *mutuales'* profitability has increased consistently since 1985, when it was negative, to reach 18 percent in 1989. Net income, negative since 1984, became positive in 1988 and 1989. This trend will probably continue in the near future barring unforeseen events.

The PDA 1989-93 proposes to increase the portfolio of diversified loans up to 30 percent of the total and to maximize the use of FONVI, PL480, and 511-HG-007 resources. It also establishes 7 percent as the maximum of late payments in relation to the total portfolio. In order to maximize profitability, the PDA recommends a more efficient use of the productive assets.

4.3 Subproject Financial Management

4.3.1 Overview

Of the five subprojects financed through the project loan, the most important were Guayaramerín, Bermejo, and San Juan-San Pablo, which were visited during the first two weeks of the consultancy. Guayaramerín and Bermejo subprojects are operated by cooperatives that are responsible to the *mutuales* La Frontera and Tarija for the loans. Table 1 synthesizes the basic data of the three subprojects.

4.3.2 Debt Management

Bermejo is three months behind schedule in its payments to the *mutual* Tarija. This is related to the situation of late payments illustrated in Table 2. The Bermejo cooperative should pay more attention to the effects of low tariffs and late payments on its capacity to manage debt. The Guayaramerín cooperative as well as the beneficiaries of the San Juan-San Pablo subproject are paying the *mutuales* on time.

In its financial accounting, Bermejo's provision for depreciation of fixed assets is very low, perhaps hiding a situation in which it is not covering capital costs with revenues. Although there is the feeling among users that tariffs are too high, the opportunity cost of water from other sources is many times higher than the current cost of water sold by the cooperative. The Bermejo cooperative has been unable to establish higher fees after the completion of the infrastructure works, in part because this matter became an issue during the 1989 presidential election. It is expected that this matter will be eventually resolved.

4.3.3 Bill Collection and Tariff Setting

The beneficiaries of the San Juan-San Pablo project are reluctant to pay SEMAPA's tariffs on the grounds that they were promised special treatment for having financed the subproject investments. *Mutual La Promotora* is trying to reconcile the opposing points of view, but SEMAPA maintains the position that they sell water and should therefore charge all users the same.

Guayaramerín has a fixed charge of 6 bolivianos for the first 10 cubic meters and 0.68 bolivianos for each additional cubic meter. Tariff collection is very effective, and as of April 1990 only 7 percent were late payers and only about 1 percent had owed for three months.

Bermejo tariffs were very low until December 1989 and did not cover costs. This year the rates were raised to an average of 10.60 bolivianos per user, but the increase was not approved by the municipality until April. The cooperative had made no efforts to collect the bills of January, February, and March, which is reflected in the very high percentage of late payers.

Bermejo cooperative tariffs are still low and its net income is around zero. On the other hand, water is used inefficiently due to the lack of meters. In Guayaramerín average consumption per household is 19 cubic meters, while in Bermejo it is 29. Average prices per cubic meter are 0.64 and 0.37 bolivianos, respectively.

4.3.4 Cash Management

Being nonprofit institutions, cooperatives are less profit-oriented than private enterprises. Nevertheless, co-ops must understand the value of money in terms of time and must develop the attitude and capability to collect tariffs on time and recover arrears, to invest surplus funds in interest-bearing instruments, and to hold just the necessary inventory of supplies. The Guayaramerín *mutual* is operating well within these parameters; it is trying to fully utilize the water distribution network by attracting new affiliates to the cooperative and giving special treatment to the poorest households.

4.4 Cost Recovery and Affordability

4.4.1 The Target Group and Beneficiaries

According to the project paper, the target group consisted of localities where the median family income was below the 70th percentile, yet high enough that families could afford the system cost. In 1988, according to the Household Permanent Survey (*Encuesta Permanente*

de Hogares), the structure of monthly family income by deciles was as follows, in U.S. dollars:

Decile 1: below 42.9	Decile 6: 128.8 - 154.5
Decile 2: 42.9 - 64.4	Decile 7: 154.5 - 201.7
Decile 3: 64.4 - 85.8	Decile 8: 201.7 - 257.5
Decile 4: 85.8 - 103.0	Decile 9: 257.5 - 394.8
Decile 5: 103.0 - 128.8	Decile 10: more than 394.8

At that time, the 70th percentile was US \$201.70, about 630 current bolivianos. Although there was no statistical information about household income in the three localities under analysis, some rough figures for the mean family income were estimated. Bermejo is within the target group, but Guayaramerín is slightly over it with 815 bolivianos. The average income of the individual beneficiaries of the San Juan-San Pablo subproject is well above the 630 limit; if the beneficiaries are "grouped," like the ones living in Lomas de Aranjuez, the average income will increase to much higher levels. Many of the present beneficiaries of the San Juan-San Pablo subproject are not the original families which had incomes in the range stipulated by the Project Paper. As a result of the project and the availability of water service, property values soared. This resulted in the sale of many properties to people in higher income brackets. This is an important phenomenon which should be taken into account during the identification and appraisal of future projects where land values could be subject to speculation as services and infrastructure are provided.

In conclusion, the Bermejo project and probably Guayaramerín are within the target group as defined in the PP. Most of the San Juan-San Pablo beneficiaries are above the 70th percentile.

4.4.2 Affordability

The subprojects must collect expected revenues from the consumers. Guayaramerín presents no problems in this aspect. Bermejo, as noted, allowed the number of late payers to increase substantially in the first quarter of 1990. The cooperative authorities are confident that now, with the new tariffs approved, the bills will be collected and the percentage of late payers will return to normal levels.

The proportion of monthly income spent on water falls within reasonable limits: Bermejo—1.85 percent, Guayaramerín—1.49 percent, and San Juan-San Pablo—1.60 percent. A proportion of less than 5 percent is considered acceptable in many cases and less than 3 percent in any circumstance. Therefore, the beneficiaries can afford all three subprojects.

4.4.3 Cost Recovery

Water revenues collected by the Bermejo and Guayaramerin cooperatives combined with a contribution from the Bermejo Sugar Mill barely cover the expenses, including depreciation (high in Guayaramerin) and interest (high in Bermejo). Projected net income is 285 bolivianos per month in Bermejo and 9,823 bolivianos in Guayaramerin.

4.4.4 Subsidies

There are no subsidies as such in the tariff structure applied in Guayaramerin and in the fixed tariffs of Bermejo. But the Bermejo cooperative receives a contribution from the Bermejo Sugar Mill (which could be considered a subsidy) that allows the cooperative to have a positive net income.

4.4.5 Project Duration

According to the agreement between USAID and the government of Bolivia, loan repayment will be due in 1995. This date should be extended for at least ten years to allow for other subprojects to be implemented, using the experience acquired during this pilot project and the monies CACEN receives as payments on the subprojects so far implemented. CACEN already has established a special account for relending these monies if the S&Ls have projects which can be financed.

4.5 Conclusions of the Financial-Institutional Assessment

- The financial situation of the S&L system is improving after the breakdown suffered as a consequence of the 1984 deindexation, but it has not yet regained the total confidence of savers.
- The relative importance of USAID loans is much greater in smaller towns, particularly in very distant border towns where self-employment is predominant, thus reducing the demand for FONVI-financed projects.
- When the government has not solved the problem of water supply, many communities have undertaken the responsibility of financing the required investments and of managing the water supply system once it is operating. This has been the case in Guayaramerin, Bermejo, Cobija, and San Juan-San Pablo in Cochabamba.

- The subprojects' operational efficiency has been better when the communities have been formally organized into cooperatives. Individual loans are effective only when the problem can be solved at the individual level, such as with the tanks for Cobija households. In the case of construction and/or operation of a water system, loans should be channeled through a cooperative or other organization that represents the target population.
- Coordination between the beneficiaries, organized or not, and municipal institutions has not been as smooth as it should be. In the Cochabamba subproject, SEMAPA and the beneficiaries have deep differences about tariff-setting.
- Project beneficiaries' average income is higher than originally proposed but, with the exception of the San Juan-San Pablo subproject, they are within the target group.
- In the water supply systems promoted and managed by the communities, coverage does not extend to all residents. The reasons are either technical difficulties in extending the water network to distant neighborhoods or the poorest households' inability to pay installation fees, including water meters.
- The model is replicable; it can be afforded by households and the communities have proved their capacity to manage water supply systems and to solve technical, financial, and operational problems. However, there are many aspects that must be improved before trying to replicate the model; some of these are mentioned in the following chapter.
- The project should be extended ten years to allow for other subprojects to be implemented through this loan program.

Table 1

Basic Data for Major Subprojects

	BERMEJO COOPERATIVE	GUAYARAMERIN COOPERATIVE	S.JUAN-S.PABLO COCHABAMBA
CURRENT POPULATION	20,000	24,000	360,000
TARGET POPULATION	37,000	46,000	6,000
AVERAGE MONTHLY INCOME (BS.)	573	815	908
PERSONS PER HOUSEHOLD	6.0	6.0	6.0
WATER CONNECTIONS CURRENT	2,200	2,985	414
POPULATION SERVED	13,200	17,910	2,484
PERCENTAGE SERVED	66.00%	74.63%	41.40%
WATER CONNECTIONS EXPECTED	2,674	4,500	1,000
CONSUMPT. PER CONNECTION (M ³ /MONTH)	29	19	27
VOLUME PRODUCED (000 M ³ /MONTH)	74	67	16
% UNACCOUNTED FOR (EST.)	15.00%	15.00%	32.00%
VOLUME SOLD (000 M ³ /MONTH)	63	57	11
LTS/PERSON/DAY	160	180	150
PRICE: BASIC CHARGE (BS.)	NO RATE	6.00	NO RATE
PRICE: ADDITIONAL M ³ (BS.)	NO RATE	0.68	NO RATE
PRICE: AVERAGE PER MONTH (BS.)	10.60	12.18	14.50
INSTALLATION COST (BS)	60.00	372.00	2476.28
AVERAGE PRICE PER M ³	0.37	0.64	0.54
OPPORT COST (M ³ ALTERNAT. SOURCE)	50.00	21.67	
WATER REVENUES	23,320	36,372	6,003
OTHER OPERATION REVENUES	577	14,435	
TOTAL OPERATION REVENUE	23,897	50,807	
EXPENSES:			
PERSONNEL & TRANSPORTATION	8,659	13,262	
CHEMICALS, MATERIALS & POWER	2,012	13,394	
ADMINISTRATIVE	1,614	5,611	
DEPRECIATION	130	8,684	
TOTAL EXPENSES	12,414	40,951	
NET OPERATING INCOME	11,483	9,856	
CONTRIBUTION FROM IAB	9,360	0	
LESS INTEREST	20,558	34	
NET INCOME	285	9,823	
ASSETS IN OPERATION (000 BS.)	1,842	2,427	
RATE OF RETURN	0.62%	0.41%	
OPERATING RATIO	0.	0.81	

Table 2

Late Payments—Bermejo and Guayaramerin

LATE PAYMENTS - BERMEJO (*)

	NUMBER	%	AMOUNT DUE (PESOS)
USERS ON APRIL 30	2674	100.00%	26740
OWE MARCH ONLY	72	2.69%	576
OWE FEBRUARY AND MARCH	30	1.12%	480
OWE JAN, FEB & MARCH	690	25.80%	16560
OWE 4 MONTHS AND MORE	625	23.37%	21875
TOTAL LATE PAYERS	1417	52.99%	39491
MORE THAN 2 MONTH LATE PAYERS	1345	50.30%	38915

(*) LATE PAYMENTS ARE VERY LARGE IN THE PERIOD ANALYZED BECAUSE TARIFFS WERE INCREASED BEGINNING JAN.90 AND THE COOPERATIVE DID NOT COLLECT BILLS WAITING FOR THE NEW TARIFFS APPROVAL WHICH OCCURRED IN LATE MARCH.

LATE PAYMENTS - GUAYARAMERIN

	NUMBER	%	AMOUNT DUE (PESOS)
USERS ON APRIL 30	2985	100.00%	36357
OWE MARCH ONLY	686	25.65%	8355
OWE FEBRUARY AND MARCH	90	3.37%	2192
OWE JAN, FEB & MARCH	10	0.37%	365
TOTAL LATE PAYERS	786	29.39%	10913
MORE THAN 2 MONTH LATE PAYERS	100	3.74%	2558

Chapter 5

RECOMMENDATIONS

5.1 Introduction

Recommendations are presented in two major groups: technical engineering recommendations and financial and institutional recommendations.

5.2 Technical Engineering Recommendations

Specific recommendations based on the findings discussed in Chapter 3 are intended to address deficiencies and ensure serviceability.

- Subprojects should be designed in accordance with the national standards of the Ministerio de Urbanismo y Vivienda: *Normas de diseño para sistemas de agua potable*, and *Normas de diseño para sistemas de alcantarillado*.
- Before designing the systems, staff should make field checks of the subproject area topography.
- As-built drawings should be produced for each community system by marking the original plans with changes made during construction.
- Feasibility studies should investigate all existing uses of the water source, such as water rights for irrigation and other uses. These other uses will diminish the safe yield available for water supply.
- Only approved fittings should be used for bends in the piping systems.
- Piping materials should be carefully matched to the specific field conditions and uses. PVC pipe is unsuitable for installations such as pipe bridges that are subject to great temperature changes; steel pipe is a more suitable material for these applications.
- All of the above recommendations could be implemented either by having a special technical section in CACEN dedicated to the project or by having a specialized unit of CORPAGUAS or similar organization provide the technical expertise the subprojects need during planning, design, construction, and operation.

- Water sources should be analyzed chemically, physically, and bacteriologically during the feasibility stage to determine their fitness.
- Surface water supplies should be chlorinated to guarantee their potability.
- Intake works should be built in such a way that they can be cleaned without interrupting service.
- After construction, the system operators should be given as-built drawings of the system.
- Where no sewers are available, beneficiaries should be educated on the proper methods of wastewater disposal. Wastewater pools can be avoided by providing seepage pits or piped drainage to natural streams.
- Proper sanitation should be included in water supply programs. Pour-flush latrines are a perfect complement to piped water in a household.
- Beneficiaries and operators should be educated on the need to protect surface water sources by acquiring land surrounding these sources and by adopting agricultural methods that avoid loss of soil and siltation of the source.

5.3 Financial and Institutional Recommendations

Specific recommendations based on the findings in Chapter 4 are given below.

- Extend project for 10 more years (to 2005) to allow for other subprojects to be implemented through this loan program.
- Promote more programs and loans to support private efforts to solve public needs, particularly those that improve water and sanitation facilities.
- Define in advance an implementation plan that includes general objectives, quantitative goals, strategies, and a simple and flexible operational structure. The implementation plan should be the basis of comparison for the monitoring and the end-of-project evaluation.

- Establish clear criteria for project identification and selection. Prefeasibility technical, financial, and economic studies should be carried out before the initiation of every project.
- Share with other international agencies in Bolivia (such as the United Nations Development Program, WHO, and the Inter-American Development Bank) the experience of the S&L system with the privately-owned water facilities.
- Before the beginning of every project, clearly define the roles and responsibilities of each participating institution. This is of crucial importance in the case of water authorities and local governments.
- Increase the amount and quality of technical assistance that CACEN provides to the *mutuales* and water supply cooperatives.
- Reduce liquidity of the *mutuales* by increasing the loan portfolio and reducing cash and bank deposits.
- Improve cooperatives' debt and cash management and bill collection through a program of CACEN technical assistance.
- Establish guidelines for cooperatives to design efficient and equitable tariff structures under the assumption that water meter use should be generalized.
- If a new project of the same type is planned, the situation of the poorest households who cannot pay installation fees should be taken into account and appropriate mechanisms designed.

PHOTOGRAPHS

SAN JUAN-SAN PABLO SUBPROJECT (Cochabamba)

(Photos 1-3)



PHOTO 1. Water Treatment Plant

PHOTO 2. Wealthy
Barrio of Beneficiaries



PHOTO 3. Poor Barrio of Beneficiaries



GUAYARAMERIN SUBPROJECT

(Photos 4-6)

PHOTO 4. House Tap and Shower.
Note poor drainage on the floor.



PHOTO 5.
New Intake
Filtration
Gallery

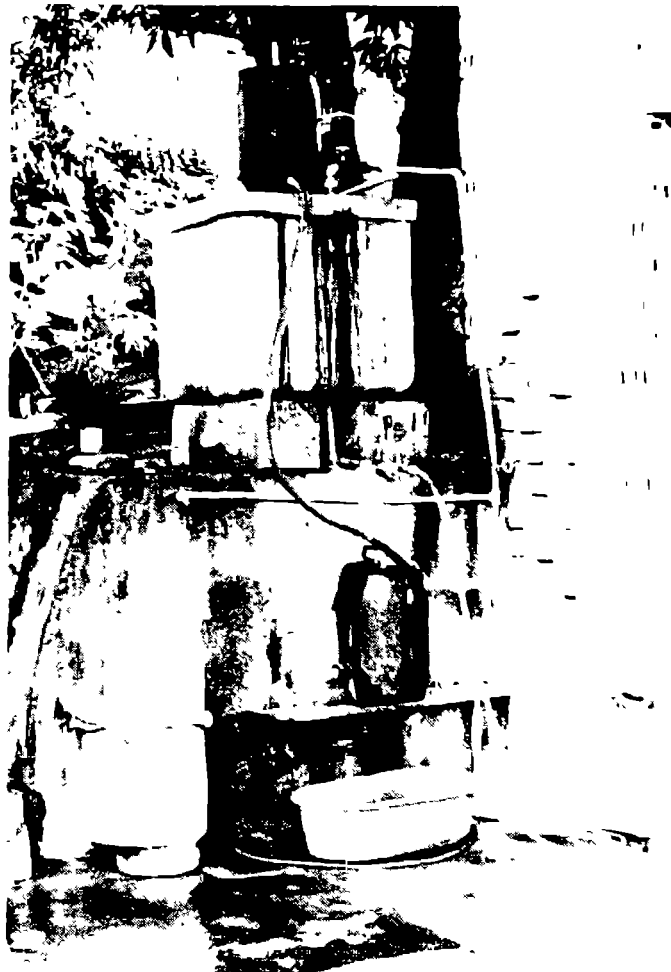


PHOTO 6. Chlorination System.

BERMEJO SUBPROJECT



PHOTO 7. Intake Dam. Note log hanging on crest.



PHOTO 8. PVC Pipe Bridge. Note deflection at the center of the span.



PHOTO 9. Water Intake Works. Note debris and silt in the intake basin.

APPENDIX A

Scope of Work

FINAL EVALUATION OF THE BOLIVIAN SAVINGS AND LOAN SYSTEM WATER AND SANITATION PROJECT

Purpose of the Evaluation

The purpose of the evaluation is to assist the Mission to assess the achievements of both the technical assistance and loan components of the Water and Sanitation Project and to make recommendations with regard to future activities of this kind with the Bolivian Savings and Loan System or any other financial institution catering to the needs of urban poor families in Bolivia. The evaluation will also provide useful information for a possible water and sanitation project to be implemented by CARE.

Background

The purpose of the Project was to provide the Bolivian Savings and Loan System with financial resources and technical assistance to diversify its portfolio and to finance the installation of potable water and sanitation systems for low income communities. Resources were disbursed from the Central Bank of Bolivia to the Caja Central de Ahorro y Préstamo para la Vivienda (CACEN), which channeled loan resources to the individual S&L Associations. Although the Project was authorized in 1983, no disbursements were made under the Project in 1984 and 1985 because of the economic crisis prevalent in the country and the curtailment of lending operations of all Bolivian financial institutions. The first sub-project financed under the Project was for water supply in Guayaramerín, which was initiated in late 1985 and finished in September 1986.

On March 31, 1989, when the Project was completed, it consisted of five sub-projects with a total of \$1,205,016 in loan funds. All of the sub-projects are in operation and are providing water services to approximately 16,500 families. The geographic distribution of the sub-projects covers five of the nine departments of Bolivia. They consist of simple water connections to more complex water systems serving large populations. Twelve different private or public entities participated in the design and implementation activities of the sub-projects.

Statement of Work

The consultants will gather and review reports and records on the referenced Project, interview Mission personnel, CACEN and S&L staff, municipal officials and community leaders and families in the areas of the five sub-projects financed under the Project. The consultants shall focus on the following issues regarding past activities.

1. The process of sub-project identification (planning, field investigation and source selection), feasibility analysis, (criteria and standards), engineering design and drawing

preparation, quality of construction and construction supervision, system performance, water quality, operation and maintenance and environmental concerns to determine the capacity within the Savings and Loan System for financing and managing water and sanitation projects.

2. The financial viability of these projects both from the perspective of the capacity to pay for services of communities and municipalities, and from the perspective of the financial viability of the participating S&Ls. Both capital replacement and operation & maintenance costs should be included.
3. The target population: What are the socio-economic characteristics of the families in the communities which have benefitted from the sub-projects?
4. The potential for expanding the financing of water and sanitation projects by the private sector and recommendations on how to modify and improve the current process.
5. Review the Project's compliance with the development objectives outlined as project outputs in the Loan Agreement.

Also, based on the findings of the investigations, the evaluating team shall recommend guidelines for future project design and policy. The following key evaluation questions have been identified:

a. Implementation/Institutional Arrangements

If the water projects are to be replicated on a larger scale, it is important to come up with a reasonably simple, straight-forward process for packaging the projects and for carrying out the construction. Have the procedures followed to date in the Mission-funded projects met this test? Can they be simplified or made more expeditious? Are the Savings and Loan Associations the right institutions to serve as packagers/promoters? What are the option- municipalities, PVO's, private contractors?

b. Financing

What was the experience with regard to the affordability of the water projects? What income groups were served? What was the experience with the financing and debt recovery? What levels of savings were the families able to establish and maintain? How about collections/arrears? Are the terms of the loans - interest and principal (amortization), percent financed and time frame - something to be reconsidered? How did the S&L deal with capital costs (depreciation) and inflation.

c. Potential Demand

What inferences can the consultants draw on additional demand for similar projects? Can lower-income groups be served?

Composition of Evaluation Team and Qualifications

The evaluation will consist of an engineer and a financial analyst. The engineer will be experienced with small water and sanitation projects in Latin America and have prior experience with evaluations and A.I.D. The financial analyst will be experienced with water and sanitation projects in Latin America and with the financing of said projects.

Recommended Consultants

The recommended consultants are:

**Fernando Requena, team leader and engineer, CDM Boston
Julian Velasco, financial analyst, independent consultant**

Relationship and Responsibilities

The consultants will work under the direct supervision of USAID/Bolivia, in coordination with RHUDO/SA and the PRE/Housing office in Washington. The official contact at the mission in Bolivia is Dino Siervo (Tels: 365384 and 354703). The consultants have relations with the Government of Bolivia only as arranged by the Mission.

Reports

Before departing Bolivia, the consultants will prepare a draft report in English, of approximately 30 pages (excluding annexes) with an executive summary of 3-4 pages and shall make a presentation of the findings of the evaluation to the Mission.

Special Requirements

Physical Fitness:

For short-term technical assistance, the following applies:

The altitude of La Paz (13,400 feet above sea level) can have a deleterious effect on the health of persons with pre-existing medical problems and/or respiratory infections. Individuals with hypertension, diabetes, angina pectoris, coronary heart disease, asthma, emphysema, chronic bronchitis, or any history of heart attack, heart disease, or lung disease, should have a thorough evaluation by their physician prior to traveling to La Paz. Persons with any respiratory infection, such as cold, bronchitis, or pneumonia should delay travel to La Paz until they have fully recovered.

USAID/Bolivia requires a doctor's statement declaring that incoming short-term personnel are not afflicted by any of the above pre-existing medical problems. If such problems exist, a full physical exam is required prior to departure for Bolivia.

Adjustment to the altitude usually requires only a few days. Personnel should, if at all possible, limit their physical activity for the first 36-48 hours after arrival in La Paz.

Infectious hepatitis, amoebic dysentery, bacillary dysentery, giardiasis, rabies and typhoid are endemic in Bolivia. Yellow fever and malaria are present in tropical areas of Bolivia. The usual sanitary precautions concerning food and water should be observed and all immunizations should be up-to-date prior to arrival in country. Yellow fever vaccine is recommended for all personnel traveling to tropical areas. Rabies pre-exposure prophylaxis (not the low-dose intradermal injections) is recommended for all personnel who plan to spend considerable time outdoors on foot. The Embassy Health Unit can advise personnel traveling to tropical areas concerning malaria prophylaxis on a case-by-case basis. The precautions and need for medications are determined by the duration of travel, the extent of exposure, and drug allergy history.

Schedule

Team Planning at WOC:	April 23 and 24, 1990
Travel to Bolivia:	April 25
Begin work in Bolivia:	April 26
Last work day in Bolivia:	May 23, 1990

Comments on Scope of Work

A series of meetings were carried out to review the scope of work and outline prepared by the consulting team for the project's final evaluation. The results of the review indicated that the general scope of work was satisfactory. These observations were made in reference to the scope of work:

- Impacts of the Project on the Communities and institutions should be included in the report.
- Project replicability should be determined.
- Project implementation should be reviewed to determine effectiveness of subproject promotion, community participation, and the role of CACEN.
- Four subprojects could be visited; Cobija was too remote given the amount of time available and the uncertainty of transportation.
- A preliminary draft of the report should be available May 18, 1990 for Mission review.

Also, at these meetings information was gathered about all aspects of the project and subprojects.

APPENDIX B

People Interviewed

USAID/Bolivia Mission Staff

Dino Siervo, Project Officer

David L. Jessee, Economist (PRE)

César Castellón P., Chief, Engineering Division

Matthew Chaney, Engineer

CACEN Staff

Ernesto Wende, President

Antonio Reyes, Manager for Housing and Urban Services

José Claire, Auditor

Eduardo Frias, General Manager

Other Persons Contacted

Luis Linares, IDB Engineering Specialist

Mario Salzman, UN Resident Representative in Bolivia

Armando Pinell, BCB Advisor

Lucio Vicario, Project Director, UNDP Habitat

Roberto Jordan Mealla, Subdirector, Fondo Nacional de Desarrollo

Richard Mallon, Harvard Institute for International Development, Planning Ministry Advisor

Liliana Salvatierra, Accountant *mutual* Cobja

San Juan-San Pablo Subproject (April 28-May 2, 1990)

Agustín López Videla, General Manager, *mutual* La Promotora

Agustín Zelaya, Administrative Manager, *mutual* La Promotora

Jaime Cors, Chief Technical Section, *mutual* La Promotora and a subproject beneficiary

Armando Escalera, Resident Engineer of the subproject

Gustavo Méndez T., Planning Director, SEMAPA

Guayaramerín (May 2-3, 1990)

Hugo Baya, Manager, *mutual* de la Frontera

Wilfredo Coca, Accountant, de la Frontera

Arcelia Moreno de Arce, Manager, Guayaramerín Cooperative

Oswaldo Cabral, Treasurer, Guayaramerín Cooperative

Tomás Flores, Technical Manager, Guayaramerín Cooperative

Carlos Cuéllar Guardia, Secretary, Guayaramerín Cooperative

Teresa de Arévalo, Accountant, Guayaramerín Cooperative

Tarija-Bermejo (May 7-9, 1990)

Jaime Colodro, Manager, *mutual* Tarija

Julian Cuéllar, Administrative Director, *mutual* Tarija

Rubén Romero Molina, President, Bermejo Cooperative

René Acha, Accountant, Bermejo Cooperative

David Notta, Treasurer, Bermejo Cooperative

Ivar Veizaga, Technical Manager, Bermejo Cooperative

APPENDIX C

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APPENDIX D

Balance Sheet and Income Statement for S&L *Mutuales* and CACEN

SAVINGS & LOAN MUTUALES - BALANCE SHEET (US\$)

SUBTOTALS	1984	1985	1986	1987	1988	1989
11 CASH	1,159,182	1,261,157	3,001,382	5,349,539	15,434,505	20,528,307
12 PORTFOLIO	351,307	705,673	5,777,996	16,308,760	29,590,725	54,267,616
13 INVENTORY	11,952,529	12,173,903	7,960,032	8,417,228	11,701,158	22,388,822
14 FIXED ASSETS	1,268,472	2,392,553	1,656,251	2,033,757	2,368,963	2,632,247
1 TOTAL ASSETS	14,731,490	16,533,286	18,395,661	32,109,284	59,095,351	99,816,993
21 SHORT TERM DEBTS	2,658,491	6,431,877	10,267,657	13,439,344	32,477,707	51,442,782
22 LONG TERM LOANS	23,607,492	34,389,545	26,367,729	5,781,837	13,362,682	32,863,442
23 COMMISSION RESERVE	274,756	124,012	201,176	311,660	355,036	472,431
24 RETAINED EARNINGS	871,447	1,053	6,869	80	0	10,427
2 TOTAL LIABILITIES	27,412,186	40,946,488	36,843,431	19,532,922	46,195,425	84,789,082
3 EQUITY	(12,680,696)	(24,413,201)	(18,447,770)	12,576,362	12,899,926	15,027,910

SAVINGS & LOAN MUTUALES - INCOME STATEMENT (US\$)

SUBTOTALS	1984	1985	1986	1987	1988	1989
41 INTEREST EARNED	1,395,927	1,346,808	2,476,458	3,807,811	6,737,422	10,860,494
42 EARNED COMMISSIONS	16,453	35,980	353,471	840,461	554,132	279,902
43 OTHER INCOMES	250,958	397,967	822,758	1,177,340	490,532	1,092,515
4 TOTAL INCOME	1,663,338	1,780,756	3,652,687	5,825,613	7,782,086	12,232,911
51 INTERESTS PAID	2,167,488	4,204,883	3,478,715	3,633,988	3,976,136	5,912,985
52 ADMIN. EXPENSES+ADJUSTMENT	80,199	1,045,616	1,278,120	2,393,788	3,442,772	4,096,825
5 TOTAL EXPENSES	2,247,687	5,250,499	4,756,835	6,027,776	7,418,908	10,009,810
6 NET INCOME	(584,349)	(3,469,743)	(1,104,148)	(202,164)	363,178	2,223,101

SOURCE: CAJA CENTRAL DE A&P

SAVINGS & LOAN MUTUALES - FINANCIAL RATIOS

FINANCIAL RATIOS	1984	1985	1986	1987	1988	1989
1 NET INCOME/TOTAL INCOME	-35.13%	-194.85%	-30.23%	-3.47%	4.67%	18.17%
2 NET INCOME/EQUITY (%)	4.61%	14.21%	5.99%	-1.61%	2.82%	14.79%
3 LIQUID. RATIO (CASH/LT DEBT)	0.05	0.04	0.11	0.93	1.16	0.62
4 LONG TERM DEBT/EQUITY RATIO	-1.86	-1.41	-1.43	0.46	1.04	2.19
5 LOANS AS % OF ASSETS	178.30%	246.90%	199.15%	59.86%	77.57%	84.46%
6 CURRENT RATIO	5.06	2.20	1.63	2.24	1.75	1.89
7 QUICK ASSETS RATIO	0.44	0.20	0.29	0.40	0.48	0.40
8 NET INCOME AS % OF ASSET	-3.97%	-20.99%	-6.00%	-0.63%	0.61%	2.23%

CAJA CENTRAL (CACEN) - BALANCE SHEET (US\$)

SUBTOTALS	1984	1985	1986	1987	1988	1989
1 CASH BALANCE	258,587	135,386	516,472	565,044	2,915,555	2,420,085
12 PORTFOLIO	24,924,224	28,167,441	32,557,771	5,054,732	12,167,634	30,360,033
13 INVENTORY	94,310	249,116	266,833	286,044	292,362	2,423,147
14 FIXED ASSETS	544,577	278,403	312,895	416,714	379,706	334,786
1 TOTAL ASSETS	25,821,697	28,830,346	33,653,971	6,322,533	15,755,257	35,538,051
21 SHORT TERM DEBTS	1,750,293	3,502,177	5,405,304	208,060	1,349,931	2,840,989
22 LONG TERM LOANS	23,813,914	24,729,545	26,599,245	4,489,346	12,923,438	31,171,775
23 COMMISSION RESERVE	111,040	38,341	129,029	43,189	78,170	90,625
24 RETAINED EARNINGS	0	0	0	0	0	68,877
2 TOTAL LIABILITIES	25,675,247	28,270,063	32,133,578	4,740,594	14,351,539	34,172,266
3 EQUITY	146,450	560,283	1,520,393	1,581,939	1,403,718	1,365,786

CAJA CENTRAL (CACEN) - INCOME STATEMENT (US\$)

SUBTOTALS	1984	1985	1986	1987	1988	1989
41 INTEREST EARNED	1,851,054	2,421,384	2,583,623	1,641,735	748,582	1,773,176
42 EARNED COMMISSIONS	2,358	2,106	31,079	69,751	51,452	36,391
43 OTHER INCOMES	29,603	7,356	156	77,765	69,049	146,567
4 TOTAL INCOME	1,883,015	2,430,846	2,614,858	1,789,250	869,083	1,956,134
51 INTERESTS PAID	1,815,243	1,974,922	1,942,406	1,331,693	321,940	1,316,681
52 ADMIN. EXPENSES+ADJUSTMENT	198,787	455,466	594,064	428,974	634,886	677,385
5 TOTAL EXPENSES	2,014,030	2,430,388	2,536,470	1,760,667	956,825	1,994,067
6 NET INCOME	(131,015)	458	78,388	28,583	(87,743)	(37,932)

SOURCE. CAJA CENTRAL DE A&P

CAJA CENTRAL (CACEN) - FINANCIAL RATIOS

SUBTOTALS	1984	1985	1986	1987	1988	1989
1 NET INCOME/TOTAL INCOME	-6.96%	0.02%	3.00%	1.60%	-10.10%	-1.94%
2 NET INCOME/EQUITY (%)	-89.46%	0.08%	5.16%	1.81%	-6.25%	-2.78%
3 LIQUID. RATIO (CASH/LT DEBT)	0.01	0.01	0.02	0.13	0.23	0.08
4 LONG TERM DEBT/EQUITY RATIO	162.61	44.14	17.49	2.84	9.21	22.82
5 LOANS AS % OF ASSETS	99.00%	97.92%	95.10%	74.30%	90.59%	95.71%
6 CURRENT RATIO	14.44	8.15	6.17	28.39	11.39	12.39
7 QUICK ASSETS RATIO	0.16	0.04	0.10	2.72	2.16	0.85
8 NET INCOME AS % OF ASSET	-0.51%	0.00%	0.23%	0.45%	-0.56%	-0.11%

3

Camp Dresser & McKee International Inc.
Associates in Rural Development, Inc.
International Science and Technology Institute
Research Triangle Institute
University Research Corporation
Training Resources Group
University of North Carolina at Chapel Hill

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THE WASH PROJECT

With the launching of the United Nations International Drinking Water Supply and Sanitation Decade in 1979, the United States Agency for International Development (A.I.D.) decided to augment and streamline its technical assistance capability in water and sanitation and, in 1980, funded the Water and Sanitation for Health Project (WASH). The funding mechanism was a multi-year, multi-million dollar contract, secured through competitive bidding. The first WASH contract was awarded to a consortium of organizations headed by Camp Dresser & McKee International Inc. (CDM), an international consulting firm specializing in environmental engineering services. Through two other bid proceedings since then, CDM has continued as the prime contractor.

Working under the close direction of A.I.D.'s Bureau for Science and Technology, Office of Health, the WASH Project provides technical assistance to A.I.D. missions or bureaus, other U.S. agencies (such as the Peace Corps), host governments, and non-governmental organizations to provide a wide range of technical assistance that includes the design, implementation, and evaluation of water and sanitation projects, to troubleshoot on-going projects, and to assist in disaster relief operations. WASH technical assistance is multi-disciplinary, drawing on experts in public health, training, financing, epidemiology, anthropology, management, engineering, community organization, environmental protection, and other subspecialties.

The WASH Information Center serves as a clearinghouse in water and sanitation, providing networking on guinea worm disease, rainwater harvesting, and peri-urban issues as well as technical information backstopping for most WASH assignments.

The WASH Project issues about thirty or forty reports a year. *WASH Field Reports* relate to specific assignments in specific countries; they articulate the findings of the consultancy. The more widely applicable *Technical Reports* consist of guidelines or "how-to" manuals on topics such as pump selection, detailed training workshop designs, and state-of-the-art information on finance, community organization, and many other topics of vital interest to the water and sanitation sector. In addition, WASH occasionally publishes special reports to synthesize the lessons it has learned from its wide field experience.

For more information about the WASH Project or to request a WASH report, contact the WASH Operations Center at the above address.