PERFORMANCE INDICATORS FOR SELECTED WATER SUPPLY AND SANITATION UTILITIES IN ECUADOR

WASH Field Report No. 376
November 1992

Office of Housing and Urban Programs
Agency for International Development

Regional Housing and Urban Development Office
for South America, Quito, Ecuador

WATER AND SANITATION for HEALTH PROJECT

Sponsored by the U.S. Agency for International Development
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F I E L D R E P O R T

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Prepared for RHUDO/SA and USAID Mission to Ecuador
under WASH Task No. 168

by

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November 1992

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PREFACE

USAID/Ecuador and the Regional Housing and Urban Development Office for South America (RHUDO/SA) are pleased to share this study of performance indicators for water, wastewater, and combined water and wastewater utility companies in Ecuador. This study is an attempt, by RHUDO/SA, in its continuing technical assistance to local governments and utility companies in Ecuador, to provide better urban infrastructure services especially to low and moderate income families.

Previous studies have shown that low-income families are willing to pay for residential infrastructure services and that a feasible financial instrument is available to help residents finance domestic infrastructure connections. These studies, which examine the urban infrastructure issue from the demand side, are complemented by this study which examines the utilities supplying the services.

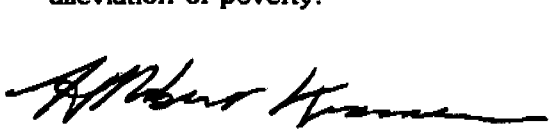
This study prepares profiles of 13 selected water and wastewater utilities in Ecuador to monitor, compare, and evaluate performance. The data is broken down into categories of service so that operational, personnel, and financial performance could be compared among Ecuadorian utilities and with utilities from throughout Latin America.

The results of the data will help the utility companies to develop a better understanding of the various aspects of their performance and show them how they can improve and monitor the provision of water and wastewater services.

Although the study made recommendations for each utility company individually, some general trends were also evident. First, increased metering would improve consumption information and reduce unaccounted for water, improving coverage to the service population. Secondly, all utilities should institute thorough studies of operations and manpower in order to bring about changes that will allow them to cover their operating expenses.

As Ecuador, and all of Latin America, urbanizes rapidly, infrastructure services entities need to provide more services more efficiently. We hope that this study will help these utility companies to serve a greater percentage of the Ecuadorian population in the best way possible.

A.I.D. hopes that this report will aid local governments, technical organizations, and other donor agencies in their analyses of and solutions to the challenges of urban growth and the alleviation of poverty.



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Acting Director
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William H. Yaeger
Director
USAID Regional Housing
and Urban Development Office for
South America

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ACRONYMS

Water Service Utilities

EMAPA-Loja	Empresa Municipal de Agua Potable y Alcantarillado de Loja
EMAP-Quito	Empresa Municipal de Agua Potable de Quito
EPAP-Guayas	Empresa Provincial de Agua Potable del Guayas

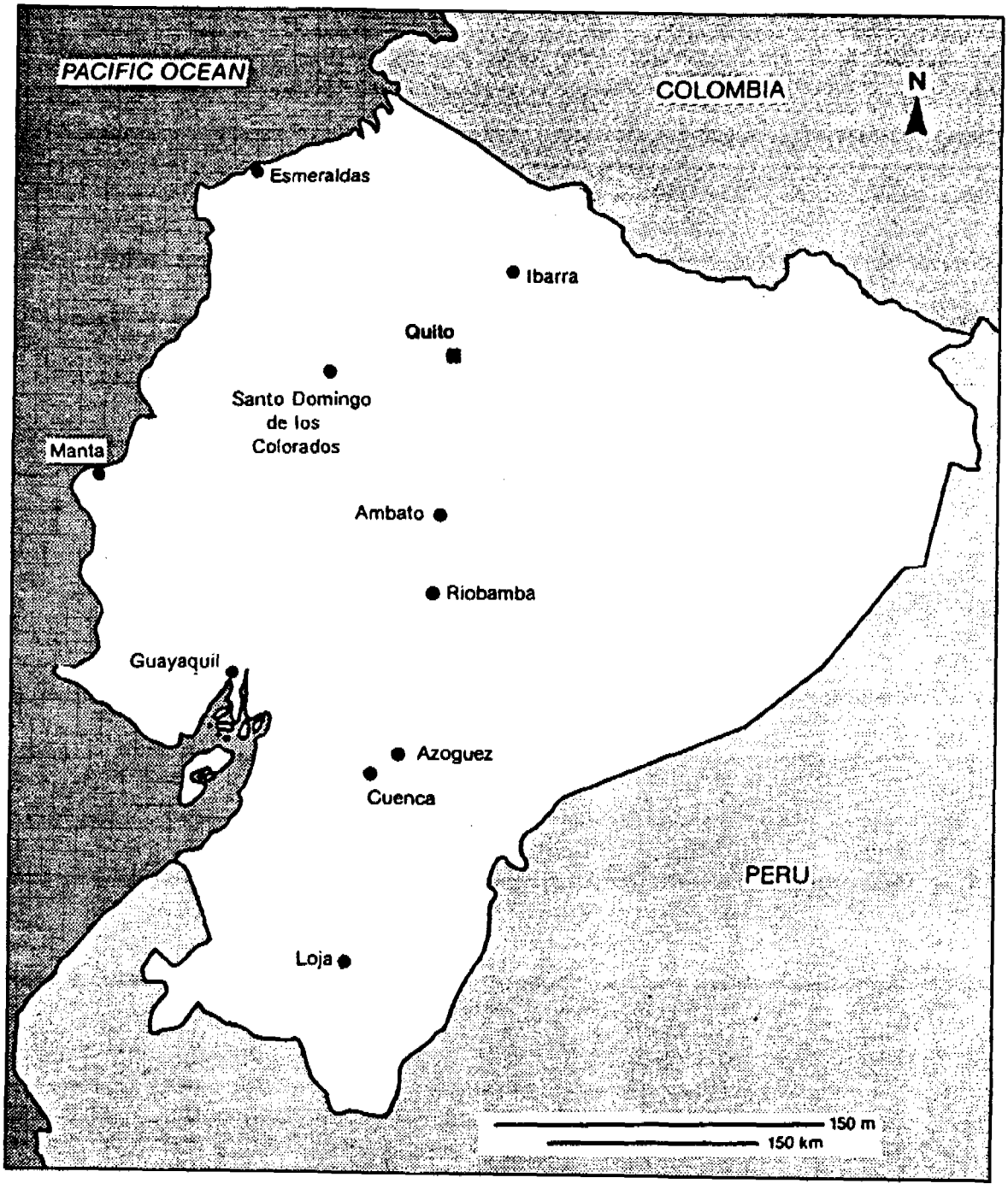
Sanitation Service Utilities

EMA-Quito	Empresa Municipal de Alcantarillado de Quito
EMA-Guayaquil	Empresa Municipal de Alcantarillado de Guayaquil

Combined Service Utilities

EMAPAL-Azogues	Empresa Municipal de Agua Potable y Alcantarillado de Azogues
EMAPAL-Ibarra	Empresa Municipal de Agua Potable y Alcantarillado de Ibarra
EMAPA-Sto. Domingo	Empresa Municipal de Agua Potable y Alcantarillado de Santo Domingo de los Colorados
DMAPA-Riobamba	Departamiento Municipal de Agua Potable y Alcantarillado de Riobamba
EMAPA-Ambato	Empresa Municipal de Agua Potable y Alcantarillado de Ambato
EMAPAM-Manta	Empresa Municipal de Agua Potable y Alcantarillado de Manta
EMAPYA-Esmeraldas	Empresa Municipal de Agua Potable y Alcantarillado de Esmeraldas
ETAPA-Cuenca	Empresa Pública Municipal de Teléfonos, Agua Potable y Alcantarillado de Cuenca

MAP


PACIFIC OCEAN
COLOMBIA
N
Esmeraldas
Ibarra
Quito
Santo Domingo
de los
Colorados
Manta
Ambato
Riobamba
Guayaquil
Azoguez
Cuenca
PERU
Loja
150 m
150 km

EXECUTIVE SUMMARY

The purpose of the study was to develop a set of performance indicators for 13 Ecuadoran utilities. A comprehensive questionnaire was designed to collect baseline data from which the performance indicators were calculated. The profiled utilities revealed a wide range of financial, technical, and personnel performance levels. The utilities covered in the survey included three that provided water services, two that provided wastewater services, and eight that provided both water and wastewater services. Only one of the utilities providing waste water services included treatment facilities. The majority of wastewater services referred to collection only.

Several utilities regard themselves as financially self-sufficient and present revenues in excess of costs to support this finding. Yet, the majority of the data on the utilities showed a fairly consistent pattern of government grants for capital projects and the probability of significant government subsidies for operating costs. Most of the reported data appeared to indicate that revenues from operations, i.e. water sales and connection fees, were not sufficient to cover operating costs. Furthermore, under "costs" and "revenues," the questionnaire provided an "other" category without requesting a description of these unspecified costs or revenues. Some utilities showed more than 30 percent of costs or revenues or both under this item, suggesting that such large sums for "revenues" included subsides from the central government.

The analysis revealed several weaknesses in the questionnaires and in the interpretation of the questions by the utilities. In addition, there were gaps in the data provided and cases where the information presented were in conflict. Lack of metering in a number of utilities raised doubts about the reliability of estimates for both water production and consumption. Estimates of the amounts of wastewater collected also frequently were questionable when compared with reported water use. Many utilities reported very high rates of bill collection in one part of the questionnaire and very high levels of accounts receivable in another.

Given these limitations on the data collected and analyzed, the principal objective of preparing for each utility a profile to serve as the beginning of a time-series database to be updated annually or as often as thought useful was realized. The 13 utility profiles are set out individually in an annex to the study and are designed as stand-alone documents to be used independently of each other.

The profiles covered current performance indicators for operational, financial and personnel activities. This "time-slice" approach allows for the collection of information for one year only. For example, no attempt was made to collect average data for several years that could have concealed a peak or trough in the single-year information. This is the first effort for most of these utilities, and they will undoubtedly make improvements to the survey as anomalies in the questionnaires are identified and resolved.

The study also provides a limited comparative analysis of data between the utilities and information drawn from published reports on a selection of performance indicators from Latin

American and European utilities. Given the limitations on the database used to make the comparative analysis, particular care is necessary in drawing conclusions from these results.

Chapter 1

INTRODUCTION

1.1 Purpose and Scope

The purpose of this study was to develop performance indicators for 13 selected water, wastewater, and combined water and wastewater utilities in Ecuador from data supplied by the utilities themselves. The performance indicators cover operational, financial, and personnel activities. Of the 13 utilities surveyed, three provide water services, two provide wastewater services, and eight provide both.

The principal objective was to prepare a profile of each utility to serve as the beginning of a time-series database to be updated annually or as often as thought useful. Salient features and trends would be identified and monitored and would be used to evaluate utility performance. The profiles are designed as stand-alone documents to be used independently of each other. They are presented in Annex A.

A second objective was to compare utilities within each category of service, to the extent possible. In addition to the information collected from the utilities, this comparative analysis drew on published reports of a selection of performance indicators from Latin America and Europe that provided benchmarks in interpreting the performance indicators presented.

1.2 Background and Methodology

The study proceeded in three phases: the development of questionnaires, the response to these questionnaires by the utilities, and the analysis of the resultant data. Separate questionnaires, with the functional differences between the utilities in mind, were developed for the water utilities, wastewater utilities, and utilities providing combined service. The questionnaires were designed to collect base data from which the performance indicators could be calculated, and no attempt was made to solicit indicators directly from the utilities. For example, they were not asked to estimate the percentage of unaccounted-for water.

Information was sought for the most recent year only, and no attempt was made to collect average data for several years that could have concealed a peak or trough in the single-year information. The data collected may or may not have represented an "average" year for each of the utilities. The questionnaires, written in English and translated into Spanish, are shown in Annex B.

The 13 utilities are listed in Table 1. The map (overleaf) shows their geographical location. The survey was organized by USAID/Quito and RHUDO/SA and undertaken by a local consultant with the assistance of ANEMAPA (The Association of Ecuadorian Water and Sewer Utilities). Data were collected over a six-week period between mid-November 1991 and the end of January 1992.

Table 1

WATER AND WASTEWATER UTILITIES PARTICIPATING IN THE STUDY

Utility	Service Provided	Service Area	Km^2	Population in Service Area
EMAPA-Loja	Water	Canton Loja	26	145,000
EMAP-Quito	Water	Canton Quito and Rural Areas	492	1,239,000
EPAP-Guayas	Water	Guayas Province	20,502	2,515,500
EMA-Quito	Wastewater	Canton Quito	188	1,300,000
EMA-Guayaquil	Wastewater	Guayaquil City and Rural Areas	236	1,570,400
EMAPAL-Azogues	Water	Canton Azogues	8	29,500
	Wastewater		8	24,000
EMAPA-Ibarra	Water	Canton Ibarra	22	94,600
	Wastewater		17	85,200
EMAPA-Sto. Domingo	Water Wastewater	City of Sto. Domingo	30	115,000
DMAPA-Riobamba	Water	City of Riobamba	25	120,000
	Wastewater		19	115,000
EMAPA-Ambato	Water	City of Ambato	14	125,000
	Wastewater		10	125,000
EMAPAM- Manta	Water	Canton Manta, Monte Cristi, and portion of Canton Sta. Ana	No Data	135,000
	Wastewater	Canton Manta	30	89,100
EMAPYA-Esmeraldas	Water	City of Esmeraldas	30	173,500
	Wastewater		18	173,500
ETAPA-Cuenca	Water Wastewater	Canton Cuenca and Rural Areas	3,129	331,000

The consultant convened a start-up meeting with senior representatives of the utilities and interviewed the manager of each utility in the course of the survey to ensure assistance in the data collection by securing nominated individuals in each utility to provide information. Annex C presents recommendations for improving the questionnaires for future surveys.

The analysis of the survey data and the preparation of this report were completed in Washington, DC. Supporting information from the World Bank's Infrastructure and Urban Development Department[1] was used to augment the comparative analysis.

1.3 Limitations

One of the original intentions was to correlate the quality of public health with the provision of water and/or wastewater services. Since most utilities provided very little information to permit this, the study was unable to develop public health indicators.

The analysis revealed several weaknesses in the questionnaires and in the interpretation of the questions by the utilities. In addition, there were gaps in the data provided and cases where the data were in conflict. Lack of metering raised doubts about the reliability of estimates for both water production and consumption. Estimates of the amounts of wastewater collected also frequently were questionable when compared with reported water use.

Several anomalies were apparent in the responses. Under "costs" and "revenues," the questionnaire provided an "other" category without requesting a description of what these "other" costs or revenues were. Some utilities showed more than 30 percent of costs or revenues or both under this head, suggesting that such large sums for "revenues" included subsidies from the central government.

The questionnaires called for data on interest payments but not on the repayment of principal. These payments may have been included in the "other" cost category in some cases. The lack of usable information on total debt repayments made it impossible to calculate some important indicators.

Many utilities reported very high rates of bill collection in one part of the questionnaire and very high levels of accounts receivable in another.

Several utilities regarded themselves as financially self-sufficient and presented revenues in excess of costs to support that assertion. Yet, the data showed a fairly consistent pattern of government grants for capital projects and the probability (perhaps hidden in the "other" category) of significant government subsidies for operating costs. Most of the reported data appeared to indicate that revenues from operations were not sufficient to cover operating costs.

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[1] "Management and Operational Practices of Municipal and Regional Water and Sewerage Companies in Latin America and the Caribbean," Infrastructure and Urban Development Department, The World Bank, Guillermo Yepes, January 1990.

These limitations must be kept in mind in reviewing the results of the study. This is a first effort for most of these utilities, and they will undoubtedly make improvements in subsequent years as these anomalies and questions are brought to their attention. Particular care must be taken in using the indicators to make comparisons.

1.4 Selection of Indicators

The performance indicators are arranged under the three areas of utility activities: operational, financial, and personnel. The least specific indicators were the most easily extracted from the respondents. As the indicators became more specific, fewer utilities were able to provide the base data. Table 2 lists possible indicators and their descriptions; not all of them were used in the study. Table 3 presents definitions of the financial terms used in developing the indicators.

1.5 Application of Indicators

The indicators should be used with circumspection to characterize a utility or group of utilities. Invariably the base data portray an incomplete picture of operations because they exclude contributing factors that are not readily quantifiable.

Furthermore, indicators can only be as good as the base data from which they are derived. Some of the problems with the data have already been described. Not all the indicators listed in Table 2 were applied to all 13 utilities. Aside from the fact that certain indicators are service specific, not all the utilities did or could provide the data required for the extraction of each indicator. In some cases where data were insufficient or questionable, estimates were made. In other cases, data were deemed too unreliable to use at all.

Table 2

SELECTED WATER AND WASTEWATER UTILITY PERFORMANCE INDICATORS

OPERATIONAL INDICATORS	Description
Total Population Density	Total Population in Service Area/Sq.Km. of Service Area
Coverage in Service Area	Population Served by Utility/Total Population in Service Area
Percent Metered Production	Metered Production/Total Production (m^3)
Water Production per Connection	Total Production (m^3/day)/Number of Water Connections
Unaccounted-for Water (UFW)	Total Production/Total Consumption (m^3)
Served Population Connected	Persons Served Directly by Pipeline/Total Population in Service Area
Percent of UFW	UFW/Total Production (m^3)
Percent Metered Connections	Metered Connections/Total Connections
Percent Metered Consumption	Metered Consumption/Total Consumption (m^3)
Consumption per Capita Served	Total Consumption (liters/day)/Population Served
Consumption per Water Connection	Total Consumption/Water Connections
Meters of Pipeline per Connection	Total Length (meters) of Distribution Piping/Total Number of Connections
Persons per Connection	Persons Served Directly by Pipeline/Total No. of Connections

PERSONNEL INDICATORS	Description
Employees per 1000 Connections	No. of Employees/1000 Connections
Employees per 1000 Persons Served	No. of Employees/1000 Population Served
Water Production per Employee	Water Production/No. of Employees
Wastewater Collection per Employee	Wastewater Collected/No. of Employees
Ratio of Pers. Costs to Oper. Costs	Personnel Costs/Operating Costs

HEALTH	Description
Infant Mortality	No. of Infant Deaths/1000 Live Births

FINANCIAL INDICATORS	Description
Oper. Rev. per Capita Served	Operating Revenue/Population Served
Oper. Rev. per m^3 Produced	Annual Oper. Rev./Water Production (m^3/year)
Total Revenue per Capita Served	Total Annual Revenue/Population Served
Operating Revenue per Connection	Annual Operating Revenue/No. of Connections
Total Revenue per Connection	Total Annual Revenue/No. of Connections
Ratio of Oper. Rev. to Total Prod.	Annual Oper. Rev./Total Water Production (m^3/day)
Oper. Rev. Billed per m^3 Water	Annual Oper. Rev./Billed Water Production (m^3/year)
Operating Costs[1] per Capita Served	Operating Costs/Population Served
Oper. Surplus (Loss) per Capita Served	(Oper. Rev.-Oper. Costs)/Population Served
Total Costs[2] per Capita Served	Total Costs/Population Served
Total Surplus (Loss) per Capita Served	(Total Revenues[3]-Total Cost)/Population Served
Operating Costs per Connection	Operating Costs/No. of Connections
Total Costs per Connection	Total Costs/No. of Connections
Operating Costs per m^3 Water Produced	Annual Oper. Costs/Total Water Production (m^3/year)
Operating Costs per m^3 Water Billed	Annual Operating Costs/Total Water Billed (m^3/year)
Debt Service[4] as percent of Oper. Revenues	Debt Service/Operating Revenues
Fixed Assets[5] per Capita Served	Fixed Assets/Population Served
Quick Ratio	Liquid Assets[6]/Current Liabilities[7]
Current Ratio	Current Assets[8]/Current Liabilities
Working Ratio	Operating Costs/Operating Revenue
Operating Ratio	Total Costs/Total Revenues
Cash Coverage of Total Costs(Days)	Cash Assets/(Total Costs/365)
Cash and Accounts Receivables[9] Coverage of Total Costs (Days)	Liquid Assets/(Total Costs/365)
Asset Turnover	Total Revenue/Total Assets[10]
Average Collection Period (Days)	Accts.Rec.Turnover/(Annual Billed Rev./365)

ENDNOTES FOR TABLE 2

1. Operating Costs = Sum of all costs expended for (1) materials, energy chemicals and parts, (2) contracts for services and repairs, (3) personnel, and (4) taxes. Operating costs do not include depreciation or the costs of capital construction projects, including debt service for such projects

2. Total Costs = Sum of operating costs, debt services, and any other costs not directly related to the utility's operations. Depreciation should be considered separately since it does not require a current expenditure

3. Total Revenues = Sum of operating revenues and income from grants, subsidies, or other sources not directly related to the provision of the utility's services

4. Debt Service = Payments of principal and interest on loans

5. Fixed Assets = Present value of the utility's physical assets

6. Liquid Assets = Sum of cash on hand and debts owed to the utility, including accounts receivable

7. Current Liabilities = Credit extended to the authority, including long- and short-term loans, and accounts payable

8. Current Assets = Liquid assets plus the value of inventory of parts and materials

9. Accounts Receivable = Money owed to the utility, usually for services billed but for which income has not yet been received

10. Total Assets = Sum of fixed assets, current assets, and work in progress*

* Work in Progress = Value of works under construction but not yet completed

Chapter 2

SUMMARY DESCRIPTIONS AND OVERVIEW OF THIRTEEN ECUADORIAN UTILITIES

2.1 Introduction

The 13 utilities in this study are located in different parts of the country, and the areas they serve range from a single town or city to an entire province. This chapter briefly describes each utility, and summarizes the findings that apply to the operational, financial, and personnel activities of all of them. Detailed information on each utility can be found in Annex A.

2.2 Description of Water Utilities

2.2.1 Empresa Municipal de Agua Potable y Alcantarillado de Loja (EMAPA-Loja)

The name does not clearly define EMAPA-Loja, as it is a utility providing only water service to the canton of Loja, an area of 26 km^2 with a population of 145,000. The service reaches 110,000 inhabitants, or 76 percent of the total population. EMAPA-Loja employs 134 full-time staff and produces an estimated 23,750 m^3 of water per day.

2.2.2 Empresa Municipal de Agua Potable de Quito (EMAP-Quito)

EMAP-Quito provides service to the canton of Quito and the surrounding rural regions, a total service area of 492 km^2. It reaches 1,067,700 inhabitants, or 86 percent of the total population of 1,239,000 in its service area. EMAP-Quito employs 1,881 full-time staff and produces an estimated 426,600 m^3 of water per day.

2.2.3 Empresa Provincial de Agua Potable del Guayas (EPAP-Guayas)

EPAP-Guayas provides service to Guayas province, an area of 20,500 km^2. It reaches 1,517,600 inhabitants in a total population of 2,515,500 in its service area, which represents 60 percent service coverage. EPAP-Guayas employs a full-time staff of 1,462 and produces an estimated 440,000 m^3 of water per day.

2.3 Description of Wastewater Utilities

2.3.1 Empresa Municipal de Alcantarillado de Quito (EMA-Quito)

EMA-Quito provides service to the canton of Quito, an area of 188 km^2 and a population of 1,300,000, and covers 1,000,000 inhabitants, or 77 percent of the total population. It employs a full-time staff of 357 and reportedly collects an estimated 18,000 m^3 of wastewater per day. (This volume appears to be very low, representing a per capita wastewater flow of only 26 lpcd for the 700,000 people said to be directly connected to the sewer system compared with the per capita water consumption of 220 lpcd reported by the Quito water utility.)

2.3.2 Empresa Municipal de Alcantarillado de Guayaquil (EMA-Guayaquil)

EMA-Guayaquil provides service to the city of Guayaquil and the surrounding rural regions, an area of 235 km^2 and a population of 1,570,400. It covers 1,050,000 inhabitants, or 67 percent of the total population. EMA-Guayaquil employs a full-time staff of 650 and collects an estimated 140,900 m^3 of wastewater per day.

2.4 Description of Combined Service Utilities

2.4.1 Empresa Municipal de Agua Potable y Alcantarillado de Azogues (EMAPAL-Azogues)

EMAPAL-Azogues provides service to the canton of Azogues over an area of 8 km^2, with a water service population of 29,500 and sanitation service population of 24,000. It achieves a water service coverage of 89 percent or 26,280 inhabitants, and sewer service coverage of 75 percent or 18,000 inhabitants. EMAPAL- Azogues employs a full-time staff of 56, produces an estimated 6,900 m^3 of water per day, and collects an estimated 4,000 m^3 of wastewater per day.

2.4.2 Empresa Municipal de Agua Potable y Alcantarillado de Ibarra (EMAPA-Ibarra)

EMAPA-Ibarra provides service to the canton of Ibarra, with areas of 22 km^2 and 17 km^2 for water and sewer service, respectively, with populations of 94,600 inhabitants in its water service area and 85,200 inhabitants in its sewer service area. The utility has a water service coverage of nearly 100 percent or 94,100 inhabitants, and sewer service coverage of 87 percent or 74,300 inhabitants. EMAPA-Ibarra employs a full-time staff of 144, produces 32,000 m^3 of water per day, and collects an estimated 27,200 m^3 of wastewater per day.

2.4.3 Empresa Municipal de Agua Potable y Alcantarillado de Santo Domingo de los Colorados (EMAPA-Sto. Domingo)

EMAPA-Sto. Domingo provides service to the city of Santo Domingo de los Colorados, with a service area of 30 km^2 and a population of 115,000. The utility has a water service coverage of 63 percent serving 72,600 inhabitants, and a sewer coverage of 42 percent or 48,200 inhabitants. EMAPA-Sto. Domingo employs a full-time staff of 92, produces an estimated 21,200 m^3 of water per day, and collects an estimated 16,900 m^3 of wastewater per day.

2.4.4 Departamiento Municipal de Agua Potable y Alcantarillado de Riobamba (DMAPA-Riobamba)

DMAPA-Riobamba provides service to the city of Riobamba, with a water service area of 25 km^2 and sewer service area of 19 km^2. The utility extends water service to 114,000 out of a total of 120,000 inhabitants, or a coverage of 95 percent. Sewer service is provided to 90,000 out of a total of 115,000 inhabitants, or a coverage of 78 percent. DMAPA-Riobamba employs a full-time staff of 80, produces an estimated 50,000 m^3 of water per day, and collects an estimated 17,500 m^3 of wastewater per day.

2.4.5 Empresa Municipal de Agua Potable y Alcantarillado de Ambato (EMAPA-Ambato)

EMAPA-Ambato provides service to the city of Ambato, with a service area of 14 km^2 and a population of 125,000. Water service reaches 109,000 inhabitants, or 87 percent coverage, and sewer service is extended to 76,300, or 61 percent coverage. EMAPA-Ambato employs a full-time staff of 285, produces an estimated of 50,500 m^3 of water per day, and collects an estimated 35,000 m^3 of wastewater per day.

2.4.6 Empresa Municipal de Agua Potable y Alcantarillado de Manta (EMAPAM-Manta)

EMAPAM-Manta provides water service to the cantons of Manta and Monte Cristi, and a portion of the canton of Santa Ana. The size of the service area was not indicated but it has a population of 135,000. Water service coverage is reported at 100 percent. Sewer service is provided to the canton of Manta only, with a service area of 30 km^2 and a population of 89,000. Coverage is extended to 59,100 inhabitants, or 66 percent of the population. EMAPAM-Manta employs a full-time staff of 218, produces an estimated 19,500 m^3 of water per day, and collects an estimated 5,000 m^3 of wastewater per day.

2.4.7 Empresa Municipal de Agua Potable y Alcantarillado de Esmeraldas (EMAPYA-Esmeraldas)

EMAPYA-Esmeraldas provides service to the city of Esmeraldas, with a service area of 30 km^2 and a population of 173,500. The utility extends water service to 104,000 inhabitants (60 percent coverage) and sewer service of 50,700 inhabitants (29 percent coverage). EMAPYA-Esmeraldas employs a full-time staff of 145, produces an estimated 12,000 m^3 of water per day, and collects an estimated 8,400 m^3 of wastewater per day.

2.4.8 Empresa Publica Municipal de Telefonos, Agua Potable y Alcantarillado de Cuenca (ETAPA-Cuenca)

ETAPA-Cuenca provides service to the canton of Cuenca and the surrounding rural regions, encompassing an area of 3,129 km^2 and a population of 331,000. The utility achieves a 73 percent coverage in water service and a 57 percent coverage in sewer service, extending service to 240,000 and 188,600 inhabitants, respectively. ETAPA-Cuenca produces an estimated 105,400 m^3 of water per day and collects an estimated 79,400 m^3 of wastewater per day. The number of full-time staff was not specified.

2.5 Overview of Survey Results

2.5.1 Operational Activities

Despite the diversity in the sizes of service areas, the populations served, and the level of services provided, the utilities surveyed share certain operational characteristics and also offer lessons from their diversity. The following are the study's principal operational findings:

- Service areas ranged from eight km^2 to 20,000 km^2 and populations covered from 29,000 to 2.5 million, with four covering more than 1 million, seven from 100,000 to 300,000, and two under 100,000.
- Eight of the 11 utilities providing water serve at least 70 percent of the people in their service area, and six serve over 85 percent. None serve less than 60 percent.
- As expected, coverage is much lower for the 10 utilities providing wastewater service. Only five serve at least 70 percent, and three serve less than 60 percent.
- The questionnaires did not ask, nor did the utilities provide, any information on how the reported quantities of wastewater collected and billed were determined. It is probable that these quantities are estimates rather than measurements of flow.
- Very few of the 11 utilities providing water service meter the water they produce. Ten of the 11 reported 66 percent or more of their connections were metered, four claimed 85-90 percent, and three claimed 100 percent. One said it had no meters.

The questionnaire did not ask for nor did the utilities provide any data on the percentage of meters functioning properly.

- Despite the apparent widespread metering of customers, most utilities reported that "total consumption" (block 13 on the questionnaire) was greater than "billed water production" (block 8). This suggests that the first amount is often an estimate based on assumed use per connection, while the second is a more accurate amount accounted for out of total production.

- Unaccounted-for water was a fairly serious problem for almost all utilities, ranging from about 25 percent to 60 percent, with a median of 35 percent. Lack of master metering of production sources and the likelihood of exaggerated estimated consumption lead to the conclusion that the actual figures may be even higher.

- Interestingly, the data for meters of pipeline per connection were reasonably uniform. Seven of the nine responding reported from eight to 12 meters per connection, one small utility reported five, and Guayas, which serves the entire province, reported 40 meters.

- Another fairly consistent response concerned the number of persons served per water connection. Excluding the high of 9.6 and the low of 4.5 reported by two of the 11 utilities, the figure ranged from 5.0 to 7.4, with an average of 6.4. Eight of the 11 utilities were within 20 percent of the average.

- Per capita water production and consumption varied widely. Production produced ranged from 115 lpcd to 460 lpcd, with four of the 11 utilities reporting over 400 lpcd and two under 200 lpcd. The median was 320 lpcd. Based on water billed to customers, per capita consumption ranged from 70 lpcd to 255 lpcd, with a median of 210 lpcd.

- Per capita wastewater flows were calculated from the reported amounts collected and the estimated population with sewer connections and ranged from 26 lpcd to over 400 lpcd. Of the 10 utilities providing wastewater service, seven reported collections equal to or greater than the per capita water consumption. Infiltration and storm water could account for part of this, but five reported flows 50 percent or more above water use. Excluding the one extremely low figure, five had flows from 85 lpcd to 220 lpcd, and four from 350 lpcd to 450 lpcd.

- Only one of the utilities providing wastewater service treats the wastewater collected.

2.5.2 Financial Activities

Not surprisingly, the financial picture was even more diverse, and the reported data contained more anomalies. In almost all cases it was difficult to determine the extent of government grants for capital works and subsidies for operating costs, and to interpret the information supplied. One example was the relatively large amounts for both revenues and costs shown

by several utilities in the "other" category. These deficiencies should be borne in mind in reviewing the following financial information about the utilities.

- Operating revenues are defined as income from the sale of services (water supplied, wastewater collected, fees for connections, and other service-related charges). Twelve utilities (one provided no financial data) reported operating revenues that ranged from 29 percent to 100 percent of total revenues. Three were above 90 percent, and two were 30 percent or below. The remaining seven ranged from 59 percent to 80 percent, with a median of 71 percent. There was no significant difference between those providing only water and those providing combined services, but the two large utilities providing only wastewater services averaged only 45 percent.

- Operating costs are defined as expenditures on materials, energy, chemicals and equipment, labor, contracts for services, and other outlays related to operations. Contracts for services were difficult to identify, and some of the reported contract costs were large enough to suggest that they covered construction costs. Where they could be identified, depreciation, construction, and debt service costs were excluded from operating costs.

- Excluding the highs and lows, operating revenues covered from 59 percent to 77 percent of operating costs, with a median of 75 percent. (The highs were 99 percent and 110 percent, the lows 23 percent and 38 percent). On the other hand, when comparing total revenues and total costs, the balance sheets improved considerably: the ratio of revenues to costs now ranged from a low of 65 percent to a high of 124 percent. Six of the utilities reported a surplus, and two reported reaching 95 percent of that goal.

- On average, the 12 utilities reported a modest surplus of total revenues over costs, but operating revenues covered only about 70 percent of these costs. The sources of the additional revenues were not identified, but the magnitude of these revenues appears to indicate that they were probably government subsidies. Ten utilities, in a self-assessment, admitted that they had not achieved the goal of financial self-sufficiency, and the total revenues of five of these exceeded their costs, which supports the assumption that most utilities are receiving operating subsidies, a fact confirmed in the assessment.

- The two utilities providing only wastewater service are in the large cities of Quito and Guyaquil. Both reported revenues in excess of total costs. However, based on data submitted, revenues from service amounted to only 30 percent for Quito and 59 percent for Guyaquil, suggesting that both are heavily subsidized.

- The data show considerable inconsistencies between collections for services billed and accounts receivable. The responses for rate of collection ranged from 50 percent to over 100 percent, with a median response of 85 percent. Accounts receivable, expressed as a percentage of operating revenues, ranged from less than 1 percent (4 days) to over 300 percent (over 1,000 days). Even discounting the two highest and

lowest responses, the data ranged from 20 percent (73 days) to 75 percent (274 days) for the 10 utilities. Further, the correlation between the two factors was poor. Several utilities reporting collection rates around 90 percent reported accounts receivable of over 70 percent of operating revenues. Conversely, the two utilities reporting less than 1 percent for accounts receivable showed collection rates of 60 percent to 70 percent. Few reported collection rates that seemed consistent with accounts receivable.

- Eight utilities provided data on estimated water consumption and operating costs and revenues, defined earlier, but the data did not always permit unambiguous determinations of these financial indicators. The value of operating revenues per m^3 of water consumed was judged to range from S21/m^3 to S165/m^3. The median was S43/m^3.

- For the same eight utilities, the value of operating costs per m^3 ranged from S49/m^3 to S226/m^3, with a median of S82/m^3. Only two of the eight had operating revenues adequate to meet operating costs. The others reported operating revenues that only covered from 23 percent to 78 percent of their costs, with a median (exclusive of the two who met their costs) of 64 percent.

2.5.3 Personnel Activities

One yardstick of operational efficiency is the number of employees per 1,000 connections. Utilities in developed countries typically have levels of about five because of high labor costs and the availability of expensive labor-saving equipment. At the other end of the spectrum, in countries that have low labor costs and less sophisticated equipment, levels may exceed 25. Comparisons are most valid among utilities in the same country or region.

- As noted earlier, the 13 utilities differ widely in size and type of services provided. Calculations were based on the number of full-time employees reported. Even if some of the utilities use contract employees to augment their staff, this was not considered a significant factor. For those utilities providing combined services, the total number of connections or accounts for both water and wastewater were used. These utilities reported water connections at a consistent level of 50 percent to 60 percent of the total.

- Utilities providing combined services should benefit from an economy of scale, and the number of employees per total connections (water and sewer) generally should be lower than for those providing only water or wastewater service.

- Total number of employees ranged from 56 to 1,881, with a median of 180. The three utilities providing only water service had the highest levels, at 9.6, 12.0 and 12.5 per 1,000 connections. The two utilities providing only wastewater service had levels of 1.8 and 6.5 per 1,000 connections. The figure of 1.8/1,000, for EMA-Quito, is so low as to raise questions about the data provided, and probably should be disregarded.

Three of the combined utilities also had surprisingly low levels from 2.0 to 4.8/1,000. The median for the remaining combined utilities was 7.3, which appears more realistic.

- Calculations of personnel costs in millions of sucres (MS) per employee per year, based on the number of full-time employees reported by 11 utilities, showed the two highest levels of MS4.1 and MS4.5 for the Quito and Guayaquil wastewater utilities. This is not too surprising since labor costs are always higher in large cities, and frequently (but by no means always) higher for wastewater workers. For the six combined utilities in this comparison, costs ranged from MS1.1 to MS2.7, with an average of MS1.8.

- Results from the three utilities providing only water services were surprising. Loja, the smallest, showed the lowest figure for all eleven, MS1.0. Quito showed MS2.4, or slightly more than half the figure for the other large city utilities, and only marginally above the median for the combined utilities. Guayas, which serves an entire province, showed a figure of MS3.3.

Chapter 3

COMPARATIVE ANALYSIS

3.1 Introduction

In this comparative analysis of the 13 utilities, the main source of additional information is a World Bank report that contains operational data and indicators from well-run utilities in Latin America and Europe and compares five Latin American utilities (LAU) and four European utilities (EUR-U)[2]. The indicators from these utilities were included as averages in the comparative analysis of the 13 Ecuadorian utilities.

3.2 Analysis of Water Service Utilities

3.2.1 Operational Comparison

Table 3.1 lists the operational indicators used in the analysis.

EMAP-Quito is the most successful of the water utilities in coverage,[3] providing service to 86 percent of the population in its service area, compared with 76 percent by EMAPA-Loja and 60 percent by EPAP-Guayas. EMAP-Quito's coverage approaches that of the well-run LAU utilities at 92 percent. EPAP-Guayas's extensive service area, more than 40 times that of EMAP-Quito, could partly explain its poor showing.

High-density service areas would require less piping per service connection, as seen in the indicator for pipe length per connection. EPAP-Guayas, with the lowest population density, has the highest at 39.5 m of pipe per connection. EMAPA-Loja and EMAP-Quito, with pipe length per connection of 11.1 m and 11.0 m, respectively, compare well with the LAU average.

Unaccounted-for water (UFW) was generally higher than the LAU average of 34 percent with the exception of EMAPA-Loja, which, with the highest population density of 5,577 people/km^2, has the lowest figure for UFW at 30 percent. EPAP-Guayas, with the lowest population density of 123 people/km^2, has the highest UFW figure at 60 percent.

The production (m^3/connection/day) of the utilities is high, at 2.1 for EMAPA-Loja and 2.9 for both EMAP-Quito and EPAP-Guayas, compared with the LAU and EUR-U averages of 1.7 and 1.3 m^3, respectively. The consumption figures (m^3/connection/day) are also higher than the LAU and EUR-U averages.

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[2] See World Bank report, Guillermo Yepes, Jan. 1990, pp. 21-23.

[3] Utility water service coverage is the percentage of the total population in the service area that receives water service by direct connection or other unspecified means.

Metered connections for all three utilities are lower than the LAU average. These utilities, it must be remembered, are considered the most progressive in Latin America.

Table 3.1

OPERATIONAL INDICATORS FOR WATER SERVICE UTILITIES

UTILITY	EMPA-LOJA	EMAP-QUITO	EPAP-GUAYAS	AVG. LAU	AVG. EUR-U
POPULATION DENSITY	5,577	2,518	123	N/A[4]	N/A
COVERAGE IN SERVICE AREA	76%	86%	60%	92%	100%
PIPE LENGTH (M)/CONNECTION	11.1	11.0	39.5	9.9	N/A
PRODUCTION (M^3/CONN/DAY)[5]	2.1	2.9	2.9	1.7	1.3
UFW	30%	45%	61%	34%	17%
METERED CONNECTIONS	88%	66%	70%	93%	100%
CONSUMPTION (CONN) M^3/CONN/DAY)	1.49	1.57	1.12	1.06	1.04

[4] Indicators for the LAU and EUR-U not calculated in the WB report and indicators unavailable for the Ecuadorian utilities, because of insufficient data are denoted by N/A.

[5] The WB indicators on production, consumption, and unaccounted for water (UFW) are monthly figures divided by 30, to correspond to the daily figures used in this study.

3.2.2 Financial Comparison

The financial indicators derived for this analysis are shown in Table 3.2.

Total revenue, total cost, and total profit or loss for the three utilities reflect the best and the worst performance of the two large firms and a moderately good performance of the small firm. EMAP-Quito has the best results, appears to be the best managed, and may serve as a model for the others. EPAP-Guayas appears to be the least profitable and least efficient.

Comparing per capita operating revenues to operating cost, EMAP-Quito is profitable, EMAPA-Loja produces a moderate deficit, and EPAP-Guayas produces a severe deficit. The difference between water produced and billed for EMAP-Quito is 85 percent, for Guayas it is 205 percent.

The working and operating ratios for EMAP-QUITO are both in a satisfactory range below 1.0. For EPAP-Guayas, they are both well over 1.0, indicating cause for concern. For EMAPA-Loja, the operating ratio is below, but the working ratio is above, 1.0, showing the effect of non-operating revenue on the equation.

Balance sheet analysis shows a satisfactory picture for all three companies. Liquidity is satisfactory but the collection of accounts receivable needs to be improved. The relationship of fixed assets to the service coverage could not be determined. However, expansion of the physical plant is much larger at EMAP-Quito than at the others, and reflects a current commitment to improving the scope of its service.

3.2.3 Staffing Comparison

The most notable difference here is that EMAP-Quito and EPAP-Guayas, with 1,881 and 1,462 employees, respectively, dwarf EMAPA-Loja, with only 134 (Table 3.3).

Interestingly, the figures for full-time employees per 1,000 population served and for full-time employees per 1,000 connections are relatively close. Even more revealing is that EMAPA-Loja and EMAP-Quito have almost identical figures for employees per 1,000 connections. EPAP-Guayas appears to make the most efficient use of personnel until contract costs as a percentage of operating costs are considered. An accurate analysis of this utility is not possible without more information about the nature and purpose of its contract expenditures.

Table 3.2

FINANCIAL INDICATORS FOR WATER SERVICE UTILITIES

	EMAPA-LOJA	EMAP-QUITO	EPAP-GUAYAS
POPULATION SERVED (W)	110,000	1,067,742	1,517,559
PERCENTAGE SERVED (W)	76	86	60
FINANCIAL OPERATIONS			
TOTAL REVENUE PER CAPITA[1]	S 2,909[2]	S10,229	S 7,285
TOTAL COST PER CAPITA	S 2,882	S 8,274	S11,199
TOTAL PROFIT (LOSS) PER CAPITA	S 27	S 1,955	(S 3,914)
OPERATING REVENUE PER CAPITA	S 2,013	S 6,985	S 6,779
OPERATING COST PER CAPITA	S 2,882	S 6,366	S 9,286
OPER. PROFIT (LOSS) PER CAPITA	(S 869)	S 619	(S 2,507)
OPER. REVENUE/CONNECTION	S19,810	S49,764	S67,751
OPER. REVENUE/M^3 PRODUCED	S 25.5	S 47.9	S 64.0
OPER. REVENUE/M^3 BILLED	S 36.5	S 87.0	S 195.5
OPERATING COST/CONNECTION	S28,364	S45,354	S92,839
OPERATING COST/M^3 PRODUCED	36.6	S 43.6	S 87.7
OPERATING COST/M^3 BILLED	52.2	S 79.3	S 267.9
OPERATING RATIO	0.99	0.81	1.54
WORKING RATIO	1.43	0.95	1.62
BALANCE SHEET			
QUICK RATIO[3]	13.6	2.12	2.43
CURRENT RATIO[4]	18.5	3.22	10.21
CASH COVERAGE TOT. COST (days)	1.2	81	24
CASH + REC. COVERAGE (days)	173	307	117
ASSET TURNOVER[5]	0.81	N/A	0.24
A/C REC. TURNOVER	2.15	1.99	2.57
AVG. COLLECTION PERIOD (days)	170	183	142
WORK IN PROGRESS/TOT. POP.	S 841	S80,707	S 2,974
FIXED ASSETS/POP.SVD.	S 636	N/A	S 9,977

Table 3.3

STAFFING INDICATORS FOR WATER SERVICE UTILITIES

	EMAPA-LOJA	EMAP-QUITO	EPAP-GUAYAS
FULL-TIME EMPLOYEES	134	1,881	1,462
PART-TIME EMPLOYEES	0	0	0
EMPLOYEES PER 1,000 POP. SERVED	1.2	1.8	1.0
EMPLOYEES PER 1,000 CONNECTIONS	12	12.6	9.6
WATER PRODUCED PER EMPLOYEE (M^3/DAY)	177	227	301
WATER BILLED PER EMPLOYEE (M^3/DAY)	124	125	99
PERSONNEL COSTS/OPERATING COSTS	43.2%	67%	34%
CONTRACTOR COSTS/OPERATING COSTS	2.5%	N/A	48%

3.3 Analysis of Sanitation Service Utilities

3.3.1 Operational Comparison

Table 3.4 lists the and indicators used in the operational analysis of the sanitation service utilities. EMA-Guayaquil serves a slightly larger area and service population than EMA-Quito. Population densities of the two service areas are very close, EMA-quito with 6,922 people/km^2 and EMA-Guayaquil with 6,683 people/km^2. The two utilities serve population of nearly identical size, 1,000,000 and 1,050,000, respectively.

EMA-Quito is more successful in overall coverage, providing service to 77 percent of the population. However, EMA-Guayaquil does better than EMA-Quito in sewer service with coverage of 56 percent of total population.

The numbers and types of connections differs greatly. EMA-Quito has 200,000 connections, made up of 160,000 pipe connections, 16,000 truck accounts (septic tanks), and 24,000 other accounts. EMA-Guayaquil has only 100,182—all of which are considered pipe connections. (The utility did not submit data on other types of connections or accounts.) EMA-Quito serves 5 people, and EMA-Guayaquil 10.5 people, per connection.

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1 Per capita = per capita served
2 Amounts expressed in sucres
3 Cash + receivables/current liabilities
4 Current assets/current liabilities
5 Total revenue/total assets

The most significant difference between the two utilities is in the amount of sewage collected. EMA-Quito collects 18,016 m^3, or 0.09 m^3/connection, per day and EMA-Guayaquil collects 140,900 m^3 or 1.41 m^3/connection, per day.

EMA-Guayaquil is the only one of the utilities providing sanitation or combined service that treats sewage, subjecting 80 percent of what is collected to preliminary treatment by oxygenation and diffusion. The utility reports that a fraction of this 80 percent is subjected to further treatment. Three percent is taken through primary treatment; 3 percent through secondary treatment; and 14 percent through tertiary treatment as the final stage.

3.3.2 Financial Comparison

The financial statistics are set out in Table 3.5. Both utilities operate at a profit. Quito's profit margin of 17.7 percent is higher than Guayaquil's of 7.4 percent. Both, however, have operating deficits, Quito's at 163 percent of operating revenues being substantial. It reported total revenues of S3,289 million and operating revenues of S996 million, a gap that non-sewer-related income of S136 million does not begin to fill. Guayaquil's sewer sales revenues plus non-sewer-related revenues account for total revenues. Its operating deficit is 51 percent of operating revenues. The operating costs of both utilities are very much in line on the basis of population served.

Statistics relating to revenues and costs per connection are skewed because of a major system difference. Quito has 200,000 connections to service a population of 1,000,000, while Guayaquil has only 100,182 to service a population slightly larger. Quito's revenues per connection of S4,980 are about a third of Guayaquil's S17,867, and its costs per connection of S13,130 compared with Guayaquil's S27,131 also reflect this difference. Given the difference in configuration, comparative connection revenues and costs may not be significant.

The balance sheets of the two utilities do not offer a meaningful comparison. Guayaquil has S5,855 million in accounts receivable, about 70 percent more than total revenue, a figure that must include a capital transfer from government or some other non-operational source because it is too large to be only from sanitation service sales. The other anomaly is the low fixed asset figure of S252 million for Guayaquil compared with Quito's S4,256 million. Both utilities show work in progress, with Quito's at only about 20 percent of Guayaquil's S1,454 million.

3.3.3 Staffing Comparison

Table 3.6 sets out survey data on staffing. While the number of employees per 1,000 population served is nearly the same for both, the large difference in the number of employees per 1,000 connections suggests that different systems are used, with Quito employing a multiple of the number that Guayaquil employs. It might also indicate that Quito has a larger number of single-family connections than Guayaquil. Overall the data do not support meaningful comparisons.

Table 3.4

OPERATIONAL INDICATORS FOR SANITATION SERVICE UTILITIES

UTILITY	EMA-QUITO	EMA-GUAYAQUIL
POP. OF SERVICE AREA	1,300,000	1,570,396
SERVICE AREA (KM^2)	188	235
POPULATION DENSITY (POP/KM^2 SERVICE AREA)	6,922	6,683
POPULATION SERVED BY UTILITY:		
OVERALL SANITATION	1,000,000	1,050,000
SEWER SERVICE	700,000	871,500
SERVICE COVERAGE:		
OVERALL SANITATION	77%	67%
SEWER SERVICE	54%	56%
CONNECTIONS:		
PIPE CONN	160,000	100,182
TRUCK ACCOUNTS	16,000	
OTHER ACCOUNTS	24,000	
TOTAL CONN/ACCTS	200,000	100,182
POP.SERVED/CONN	5	10.5
SEWAGE COLLECTION:		
(M^3/DAY)	18,016	140,900
(M^3/CONN/DAY)	0.09	1.41
SEWAGE COLLECTED:		
INDUSTRIAL WASTE	12%	5%
SEWAGE TREATMENT	NOT TREATED	80% PRELIM. TREATMENT

Table 3.5

FINANCIAL INDICATORS FOR SANITATION SERVICE UTILITIES

SERVICE AREA	EMA-QUITO	EMA-GUAYAQUIL
POPULATION	1,300,000	1,570,396
POPULATION SVD. (S)	1,000,000	1,050,000
PERCENT SVD. (S)	77%	67%
OPERATIONS		
TOTAL REV./CAPITA SVD.	S 3,289	S 2,893
TOTAL COST/CAPITA SVD.	S 2,706	S 2,679
TOT. PROFIT (LOSS) P/C	S 583	S 214
OPER REV./CAPITA SVD.	S 996	S 1,705
OPER COST/CAPITA SVD	S 2,626	S 2,589
OPER PROFIT (LOSS) P/C	(S 1,630)	(S 884)
OPER REV./CONNECTION	S 4,980	S 17,867
OPER COST/CONNECTION	S 13,130	S 27,131
OPERATING RATIO	0.82	0.93
WORKING RATIO	2.72	1.52
BALANCE SHEET		
QUICK RATIO	0.96	11.6
CURRENT RATIO	1.09	11.7
CASH COV. TOT. COST (days)	59	42
CASH + REC. COV. TOT. COST (days)	87	802
ASSET TURNOVER	0.62	0.38
A/C REC. TURNOVER	15.8	0.52
AV. COLL. PERIOD (days)	23	702
WORK IN PROGRESS/TOT.POP.	S 219	S 926
FIXED ASSETS/POP.SVD.	S 4,256	S 240

Table 3.6

STAFFING INDICATORS FOR SANITATION SERVICES UTILITIES

	QUITO	GUAYAQUIL
FULL-TIME EMPLOYEES	357	650
PART-TIME EMPLOYEES	0	0
FULL-TIME PER 1,000 POP. SERVED	0.4	0.6
FULL-TIME PER 1,000 CONNECTIONS	1.8	6.5
PERSONNEL COSTS/OPERATING COSTS	61%	98%
CONTRACTOR COSTS/OPERATING COSTS	28%	1%

3.4 Analysis of Combined Service Utilities

3.4.1 Operational Comparison

Table 3.7 sets out the operational indicators used in this analysis.

In water service, EMAPA-Ibarra and EMAPAM-Manta appear to be the most successful, with a coverage of 100 percent of their service populations[6]. DMAPA-Riobamba, with a coverage of 95 percent, is the only combined utility that exceeds the LAU average. Two of the others, EMAPAL-Azogues and EMAPA-Ambato, are just below the LAU average with coverages of 89 percent and 87 percent, respectively. The utilities showing the lowest coverage are EMAPA-Sto. Domingo at 63 percent and EMAPYA-Esmeraldas at 60 percent.

EMAPA-Ibarra also performs well in sanitation service, with the highest coverage at 87 percent. Two others exceed the LAU average of 71 percent;—DMAPA-Riobamba at 78 percent and EMAPAL-Azogues at 75 percent. The utilities with the lowest water service coverage also have the poorest sanitation service coverage: EMAPA-Sto. Domingo at 42 percent and EMAPYA-Esmeraldas at only 29 percent.

The percentage of UFW varies across the range of utilities. EMAPA-Ibarra, DMAPA-Riobamba, and EMAPA-Ambato did not supply data on total consumption, from which

[6] Water service coverage is the percentage of the total population in the service area that receives water service by direct connection or some other unspecified means.

Table 3.7

OPERATIONAL INDICATORS FOR COMBINED SERVICE UTILITIES

UTILITY	EMAPAL-AZOGUES	EMAPA-IBARRA	EMAPA-STO. DOMINGO	DMAPA-RIOBAMBA	EMAPA-AMBATO	EMAPAM-MANTA	EMAPYA-ESMERALDAS	ETAPA-CUENCA	AVG LAU[7]	AVG EUR-U[7]
POPULATION DENSITY (POP/KM² SERVICE AREA)										
WATER	3,691	4,406	3,833	4,800	9,032	4,500	5,708	106	N/A	N/A
SANITATION	3,000	4,951	3,833	6,053	12,887	2,969	9,637	106	N/A	N/A
SERVICE COVERAGE:										
WATER	89%	100%	63%	95%	87%	100%	60%	73%	92%	100%
SEWER	75%	87%	42%	78%	61%	66%	29%	57%	71%	N/A
PIPE LENGTH (M)/WATER CONNECTION:	N/A	12.6	10.2	12.5	9.1	5.0	N/A	7.6	9.9	N/A
PRODUCTION (W)[8] (M³/CONN/DAY)	1.6	2.0	1.5	2.5	2.1	1.3	1.2	2.4	1.6	1.25
UFW	23%	25%	11%	50%	N/A	47%	0.0%	37%	34%	17%
UFW/CONN (M³/CONN/DAY)	0.37	0.49	0.16	1.25	2.02	0.60	0.0	0.88	0.54	0.21
METERED CONNECTIONS	95%	85%	N/A	88%	N/A	N/A	N/A	59%	93%	100%
CONSUMPTION:										
CONSUM (CAP) (M³/CAP/DAY)	0.20	N/A	0.26	N/A	N/A	0.11	0.18	0.28	N/A	N/A
CONSUM (CONN) (M³/CONN/DAY)	1.21	N/A	1.30	N/A	N/A	0.69	1.24	1.48	1.06	1.04
UNIT RESIDENTIAL WATER DEMAND	1.22	1.10	N/A	N/A	1.01	.049	0.62	1.49	N/A	N/A

[7] Indicators for the LAU and EUR-U not calculated in the WB report and indicators unavailable for the Ecuadorian utilities, because of insufficient data are denoted by N/A.

[8] The WB indicators on production, consumption, and unaccounted for water (UFW) are monthly figures divided by 30 to correspond to the daily figures used in this study.

UFW generally is calculated. For these, the billed water production was used as the basis for calculation. As EMAPA-Ambato indicated a very low billed production figure of 3.3 percent of total production, the utility will not be considered in the discussion of UFW. From the data on production and consumption (or billed production) from which UFW is calculated, EMAPYA-Esmeraldas has no UFW and EMAPA-Sto. Domingo has a figure of only 11 percent. These obviously are underestimates perhaps attributable to the means used to estimate production and consumption. EMAPYA-Esmeraldas indicated it has no metered production, and EMAPA-Sto. Domingo bases its consumption estimate on the total number of unmetered connections. Of the other utilities, EMAPAL-Azogues has the best performance with only 23 percent for UFW,[9] followed closely by EMAPA-Ibarra with 25 percent, both of which exceed the LAU average of 30 percent. It is interesting to note that these two are the smallest, in terms of population in service area, of the combined service utilities. DMAPA-Riobamba and EMAPA-Manta show the worst performances with UFW at around 50 percent.

The production[10] (m^3/connection/day) indicators of four of the utilities exceed the LAU average, with DMAPA-Riobamba reporting the highest figure of 2.5. The lowest of the four is EMAPA-Manta with a figure of 1.3. As with the water utilities, only a part of this production reaches the consumer, as reflected in consumption per connection. The rest is UFW.

Four of the utilities have higher consumption indicators than the LAU average, with ETAPA-Cuenca on top at 1.48 m^3/connection/day. EMAPA-Manta has the lowest at only 0.69 m^3/connection/day because of low production per connection and high UFW of 0.60 m^3/connection/day. EMAPA-Ibarra, DMAPA-Riobamba, and EMAPA-Ambato did not supply sufficient data to calculate consumption indicators. As with the water utilities, the relatively high consumption indicators here may make up for a lack in service coverage. The people who do not have water connections, and hence are not considered recipients of utility services, probably buy water from those that do. This observation is speculation as questionnaire data does not support the conclusion directly.

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[9] There is an important difference in the way percent UFW is calculated in this study and in the WB report. In this study, percent UFW is the difference between total production and total consumption divided by total production. In the WB report, it is the difference between metered water production and metered water sales divided by metered water production. The WASH study had to rely on insufficient data on metered production and a high percentage of unmetered consumption. Consequently, the WB figures are much more reliable.

[10] Since EMAPA-Ambato, EMAPA-Manta, and EMAPYA-Esmeraldas did not supply data on unmetered or total water connections, the number of metered water connections is used.

EMAPAL-Azogues has the highest figure for metered connections at 95 percent of total connections, exceeding the LAU average of 93 percent. The next best is DMAPA-Riobamba with 88 percent of connections that are metered. EMAPA-Sto. Domingo does not have metered connections. EMAPA-Ambato, EMAPA-Manta, and EMAPYA-Esmeraldas did not supply data on total connections.

3.4.2 Financial Comparison

Table 3.8 sets out the financial indicators for the combined utilities. Since the population served by water connections is larger than the population served by sanitation services, statistics relating to revenues and costs per capita are divided by the population served by water only. However, the total number of water and sewer connections are used to derive revenue or cost per connection.

Of the seven combined utilities that supplied financial data, only two earn a profit on total revenues. The most significant finding is that operating revenues are less than operating costs in every case.

The range of operating costs per m^3 of water produced is quite narrow, between S41 (Cuenca) and S91.5 (Esmeraldas). The mean is S61.9 and the median is S64.3. Azogues, the smallest utility, has a production cost slightly above the median (S64.5). Ambato, at the median cost of S64.3, serves 109,000 people. However, Manta, serving 135,000 people, has a production cost of S83.3, and Esmeraldas, serving population of 104,000, has the highest at S91.5. As mentioned earlier, Cuenca has the lowest production cost at S41.4 and is the largest utility.

Ambato bills only 3 percent of its water, so its costs per m^3 billed are irrelevant. Among the others, Sto. Domingo is the lowest at S58.8 and Esmeraldas is the highest at S156.9. The median is S76.35, to which Azogues and Cuenca are close.

In none of the cases do revenues per m^3 billed equal or exceed costs per m^3 billed. This consistency in operating losses prompts the conclusion that a review of tariffs is warranted, and that all the utilities can benefit from a study of their operating costs. Further, Ambato and Manta are the only utilities showing a profit on total revenues, explained by non-water/sewer-related income.

A comparative analysis of the balance sheets of the combined utilities does not yield much useful information because of the range of data presented and significant gaps and anomalies in them. Three of the utilities clearly have problems of liquidity in meeting liabilities, operating costs, or both Ambato, Esmeraldas, and, to a lesser degree, Manta will have difficulty meeting their payrolls. Azogues, Esmeraldas, and Cuenca need to improve the collection of accounts receivable.

The work in progress and fixed asset calculations are not very helpful. A spreadsheet comparison indicates that Ambato and Cuenca have important projects underway to expand

Table 3.8

FINANCIAL INDICATORS FOR COMBINED SERVICE UTILITIES

SERVICE AREA	AZOGUES	IBARRA	STO. DOMINGO	RIOBAMBA	AMBATO	MANTA	ESMER-ALDAS	CUENCA
POPULATION	29,528	94,600	115,000	120,000	125,000	135,000	173,470	331,028
POPULATION SERVED (W)	26,280	94,100	72,645	114,000	109,000	135,000	104,000	240,000
PERCENT SERVED (W)	89%	99%	63%	95%	87%	100%	60%	72%
PERCENT SERVED (S)	75%	87%	42%	78%	81%	66%	29%	57%
OPERATIONS								
TOTAL REV./CAPITA	S 4,701	S 5,207	S 4,487		S11,430	S 4,770	S3,070	S 3,883
TOTAL COST/CAPITA	S 6,772	S 5,504	S 4,694	N/A	S10,880	S 4,659	S3,903	S 7,129
TOT. PROFIT (LOSS)/CAPITAL	(S 2,071)	(S 297)	(S 207)		S 550	S 111	(S 833)	(S 3,246)
TOT OPER REV./CAPITA	S 4,587	S 3,772	S 3,604		S 8,083	S 4,336	S 894	S 3,883
TOT OPER COST/CAPITA	S 6,190	S 5,504	S 4,694	N/A	S10,880	S 4,395	S 3,861	S 6,633
OPER PROFIT (LOSS)/CAPITAL	(S 1,603)	(S 1,732)	(S 1,090)		(S 2,797)	(S 59)	(S 2,967)	(S 2,750)
TOT.OPER REV./CONNECTION (W&S)	S 15,727	S 11,866	S 10,837		S20,220	S22,271	S 5,505	S12,980
TOT. OPER REV./M^3 PRODUCED	S 47.7	S 30.4	S 33.8	N/A	S 47.7	S 82.2	S 21.3	S 24.2
TOT. OPER REV./M^3 BILLED	S 62.3	S 40.6	S 45.2		S 1,433	S 139.4	S 36.4	S 42.6
TOT. OPER COST/CONNECTION (W&S)	S 21,223	S 17,314	S 14,114		S26,025	S22,676	S23,754	S22,172
TOT. OPER COST/M^3 PRODUCED	S 64.5	S 44.4	S 44.1	N/A	S 64.3	S 83.3	S 91.5	S 41.4
TOT. OPER COST/M^3 BILLED	S 80.0	S 59.2	S 58.8		S 1,929	S 141.3	S 156.9	S 72.7
OPERATING RATIO	1.48	1.06	1.05	N/A	0.95	0.98	1.27	1.84
WORKING RATIO	1.35	1.46	1.30		1.35	1.08	4.37	1.74
BALANCE SHEET								
CASH COV. TOT. COST (days)	24	71	102	N/A	0.6	6	0.9	20
CASH+REC. COV. TOT. COST (days)	161	125	102		1.5	11	126	93
ASSET TURNOVER	0.47	N/A	1.4		0.3	7.2	0.46	0.26
A/C REC. TURNOVER	1.9	6.4	N/A	N/A	415	73.1	2.28	2.73
AV. COLL. PERIOD (days)	197	57	N/A		0.9	5	160	134
WORK IN PROGRESS/TOT.POP.	N/A	S 108	N/A	N/A	S 2,392	S 355	0	S 6,607
FIXED ASSETS/POP. SERVED	S 6,508	N/A	S 879		S37,302	S 44	S 2,596	S 2,167
QUICK RATIO	98.4	158	N/A	N/A	0.014	14.5	11.7	3.8
CURRENT RATIO	117.2	258	N/A		1.172	27.7	34.2	7.4

or improve service. Ibarra and Manta are working on smaller projects. Azogues, Santo Domingo de los Colorados, and Esmeraldas apparently are not engaged in capital formation. The fixed asset per capita ratio would be helpful if values were comparable. An old plant that has not been revalued carries a low sucre value. Compare the S44 per capita figure for Manta or the S879 figure for Sto. Domingo with S6,508 for Azogues or S37,302 for Ambato. These differences most likely indicate new capital rather than more sophisticated and more expensive technology. In future surveys, more precise data relating to physical plant would be helpful.

3.4.3 Staffing Comparison

Table 3.9 sets out the indicators used in the staffing comparison for the eight utilities, which serve populations ranging from 26,280 for Azogues to 240,000 for Cuenca. Cuenca did not provide personnel data.

The number of full-time employees ranges from 56 at Azogues to 285 at Ambato. Riobamba, with 20 part-time employees, or 20 percent of the workforce has the largest number of part-time employees; otherwise, part-time employment is not significant.

Riobamba is the most efficient, with 0.7 employees per 1,000 population served, which is close to the LAU average of .9, and 2.0 per 1,000 connections. However, the fact that this utility supplied no financial data raises some doubts about its personnel data. The range of employees per 1,000 population goes from Riobamba's 0.7 to 2.6 at Ambato, with a mean of 1.6, and per 1,000 connections from Riobamba's 2.0 to Esmeraldas' 8.6. The LAU average is 3.0 per 1,000 connections, and the mean for the Ecuadorian utilities is 5.9.

The ratio of personnel costs to operating costs ranges from 38 percent at Ibarra to 79 percent at Esmeraldas (Riobamba did not submit data). The LAU average is 39 percent. While possibly not significant because of the different purposes for which contract expenditures might be applied, contract expenditures range from 0 percent at Ambato and 1 percent at Esmeraldas to 57 percent at Cuenca. When contract help is used in place of full-time employees, expenditures should be included in the manpower utilization study for a more complete picture of the efficiency of the utility.

Table 3.9

STAFFING INDICATORS FOR COMBINED SERVICE UTILITIES

	AZOGUES	IBARRA	STO. DOMINGO	RIOBAMBA	AMBATA	MANTA	ESMERALDAS	CUENCA	LAU[7] AVERAGES
FULL-TIME EMPLOYEES	56	144	92	80	285	218	145	N/A	–
PART-TIME EMPLOYEES	0	0	1	20	3	2	0	N/A	–
EMPLOYEES PER 1,000 POP. SERVED	2.1	1.5	1.3	0.7	2.6	1.6	1.6	N/A	.9
EMPLOYEES PER 1,000 CONNECTIONS (W&S)	7.3	4.8	3.8	2.0	6.5	8.3	8.6	N/A	3.1
WATER PRODUCED PER EMPLOYEE (M^3/DAY)	123	222	230	625	177	89	53	N/A	N/A
WATER BILLED PER EMPLOYEE (M^3/DAY)	95	167	173	312	5.9	53	23	N/A	245
PERSONNEL COSTS/OPERATING COSTS	39%	38%	52%	N/A	65%	60%	79%	22%	39%
CONTRACTOR COSTS/OPERATING COSTS	21%	17%	13%	N/A	N/A	20%	1 %	57%	N/A

Chapter 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The study generated considerably more data than anticipated but was prepared with limited funding that precluded participation when the questionnaires were being completed by the utilities. This had two unfavorable effects. First, the weaknesses and ambiguities of the questionnaires evident during analysis could have been corrected with greater field participation by those conducting the study, and thus the results would have been less subject to possible error and misinterpretation. Secondly, is that the study was not able to go beyond the questionnaire to obtain additional information that could have made the results more useful to the participants.

Despite these problems, much useful baseline data were obtained from a representative cross-section of Ecudorian water and wastewater utilities. The results of the study should help the participating utilities to identify areas where they can improve their data collection and their performance.

Those interested in the performance of water and wastewater utilities in the developing world should find the results of the study of some value, whatever its shortcomings. Rather than focus on these shortcomings, it would be well to consider the study as the first step toward three objectives. The first is to give these utilities a better understanding of various aspects of their performance and show them how they themselves can improve and monitor that performance. The second is to benefit similar studies undertaken in other parts of the world. The third is to encourage the sponsor of this study, USAID/Quito, to refine it so it can be repeated with the hope of better results.

4.2 Recommendations

A few general observations are in order. It is suggested that the individual utility profiles (Annex A) on which the recommendations that follow are based should be carefully reviewed. They present detailed guidance for each utility. The study offers several ways to improve the questionnaires and the conduct of future studies of this type (Annex C) and recommends follow-up visits to each of the utilities to obtain their reactions and suggestions. A number of the recommendations overlap. None of them is based on the health data provided.

4.2.1 Water Utilities

- **Operational**
  - A more stringent control on UFW would postpone or obviate the necessity for developing additional water sources and treatment facilities to improve coverage of the service population.
  - Increased metering of connections would improve information on consumption rates and could also reduce UFW.
- **Financial**
  - The three utilities must reduce the percentage of unbilled water and the opportunity cost of this loss.
  - They all stand to benefit from increased metering of connections.
  - EMAPA-Loja must undertake a manpower utilization and cost study to improve operating efficiency.
  - EPAP-Guayas must undertake a similar study to improve its dismal performance, especially with respect to contractor performance, which represents 48 percent of operating costs, while staffing remains high.
- **Personnel**
  - All three should include manpower utilization studies as part of the overall studies recommended in the financial recommendations.
  - EPAP-Guayas should study the purpose, cost, and efficiency of its contracts.

4.2.2 Wastewater Utilities

- **Operational**

  The data supplied were insufficient for any recommendations.
- **Financial**
  - Both utilities must provide more thorough information on revenues. EMA-Quito must supply details to explain the difference between total revenues and sewer service sales. EMA-Guayaquil should analyze non-sewer-related income for stability over time.
  - EMA-Guayaquil should clarify the source and purpose of its large receivables.
  - EMA-Quito should provide more details about its large long-term debt, which appears to be larger than the total assets reported.

- **Personnel**
  - Both utilities should perform routine manpower utilization reviews.
  - EMA-Quito should examine the purpose and efficiency of work performed by outside contractors which represents 28 percent of operating costs.

4.2.3 Combined Service Utilities

- **Operational**
  - A more stringent control on UFW would postpone or obviate the necessity for developing additional water sources and treatment facilities to improve coverage of the service population.
  - Increased metering of connections would improve information on consumption rates and could also reduce UFW.
  - EMAPA-Sto. Domingo and EMAPYA-Esmeraldas should improve their methods for estimating production and consumption.
- **Financial**
  - All the utilities needs to reduce the percentage of UFW to increase the efficiency of revenue collection. This is especially true for EMAPA-Ambato.
  - All the utilities must review tariff schedules for water and sanitation services to increase operating revenue. EMAPYA-Esmeraldas and ETAPA-Cuenca are most in need of this.
  - All the utilities should institute a thorough study of operations to bring about changes that result in break-even or profit generation at the operating revenue/operating cost level.
  - EMAPA-Ambato, EMAPYA-Esmeraldas, and EMAPA-Manta need to improve their cash positions to meet operating costs and liabilities.
  - EMAPAL-Azogues, EMAPYA-Esmeraldas, and ETAPA-Cuenca need to improve their collection of accounts receivable.
- **Personnel**
  - A manpower utilization study is recommended for all the utilities.

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Appendix A

INDIVIDUAL UTILITY PROFILES

Appendix A presents summaries of the results obtained from completed questionnaires submitted by the 13 utilities included in the study. These profiles have been prepared as stand-alone documents to be provided to each utility for their use. The names of the participating utilities are presented in Table 1 of the report. The profiles profiles are intended to present the current status of each utility arrayed in three main areas: operational, financial, and staffing/personnel. Limited health statistics in the regions in which these utilities operate are also included.

The utilities are arranged in three functional categories based on services provided: three utilities provided water supply only; two utilities provided sanitation only; and eight utilities provided both water and sanitation services. Within these categories they are placed in order of the size of their service area populations, starting with the utility with the least service area population.

Each utility profile consists of the following sections:

- General Description
- Anomalies in Data (if present)
- Analysis
  - Operational Activities
  - Financial Activities
  - Personnel Activities
  - Health
- Recommendations
  - Operational
  - Financial
  - Personnel

■ Description

The description contains general information on the utility along with data from the survey that is not readily placed in tabular form, such as operational goals, investment sources, etc.

■ Anomalies in Data

Some information in the individual questionnaires was not readily understood and appeared incorrect or illogical. These anomalies may be due to a misunderstanding of a specific survey question, a data error, etc. While serious anomalies were not encountered in all of the utility surveys, the most significant ones are mentioned in this section as an explanation for specific

ambiguities that may be encountered in the utility data or indicators and to assist in future surveys.

- **Analysis**

The analysis and conclusions section constitutes the major portion of the profiles. This section is organized into the following subsections: Operational Issues, Financial Issues, Staffing/Personnel Issues, and Health. Within each of these subsections (with the exception of Health) specific data contained on the survey is presented. From this data, Performance Indicators are developed. The analysis and conclusions are based on the performance indicators. (See the definitions of performance indicators located in Table 2 in Chapter 1 of the main text.)

- **Recommendations**

Recommendations for each utility are organized into the same categories as for the Analysis and Conclusions section.

Outline of APPENDIX A: Individual Utility Profiles

Water Service Utilities:

Profile 1: EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE LOJA (EMAPA—LOJA)
Profile 2: EMPRESA MUNICIPAL DE AGUA POTABLE DE QUITO (EMAP—QUITO)
Profile 3: EMPRESA PROVINCIAL DE AGUA POTABLE DEL GUAYAS (EPAP—GUAYAS)

Sanitation Service Utilities:

Profile 4: EMPRESA MUNICIPAL DE ALCANTARILLADO (EMA—QUITO)
Profile 5: EMPRESA MUNICIPAL DE ALCANTARILLADO DE GUAYAQUIL (EMA—GUAYAQUIL)

Combined Service Utilities:

Profile 6: EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO (EMAPAL—AZOGUES)
Profile 7: EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE IBARRA (EMAPA—IBARRA)
Profile 8: EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE SANTO DOMINGO DE LOS COLORADOS (EMAPA—SD)
Profile 9: DEPARTAMENTO MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE RIOBAMBA (DMAPAR)
Profile 10: EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE AMBATO (EMAPA—AMBATO)
Profile 11: EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE MANTA (EMAPAM)
Profile 12: EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE ESMERALDAS (EMAPYA)
Profile 13: EMPRESA PUBLICA MUNICIPAL DE TELEFONOS, AGUA POTABLE Y ALCANTARILLADO DE CUENCA (ETAPA—CUENCA)

Each of the profiles consist of the following sections:

- Description
- Anomalies in Data (if present)
- Analysis and Conclusions
  - Operational Issues
  - Financial Issues
  - Personnel Issues
  - Health
- Recommendations
  - Operational
  - Financial
  - Personnel

PROFILE 1

EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE LOJA (EMAPA–LOJA)
Loja, Ecuador

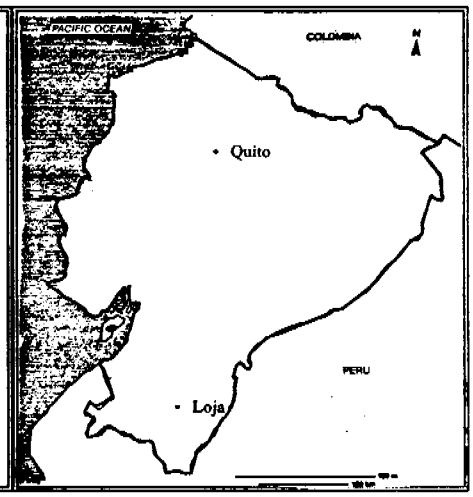
Services Offered: Water Supply

Population in Service Area: 145,000
Population Served: 110,000

Daily Water Production: 23,752 m^3
Daily Production Billed: 16,625 m^3

Full-time Staff: 134

Annual Revenue: 320,330,000 Sucres
Annual Costs: 316,650,000 Sucres (1990)



Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Agua Potable y Alcantarillado de Loja (EMAPA—LOJA) is located in Loja, a city in southern Ecuador approximately 650 kilometers south of Quito. The utility provides water to 110,000 people in Loja Canton. The total service area extends 26 square kilometers. See the box for additional base data.

EMAPA-LOJA recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EMAPA-LOJA can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMAPA—LOJA states that it reaches the operational goal of providing clean water. It currently works for, but does not attain, the goals of serving a specific geographical area, achieving financial autonomy, and meeting service targets in terms of population served and level of coverage.

- *Contracted Services*—EMAPA—LOJA contracts with other firms for 5 percent of billing and collections activities, as well as for additional unspecified services.
- *Investment Sources*—Forty percent of the funding for capital investments is self-financed; no other sources of investment funds were listed.
- *Billing*—EMAPA—LOJA has separate rates for different categories of customers, including residential and commercial/industrial customers. Charges per cubic meter increase as the volume of consumption increases. Approximately 86 percent of the billed sales are collected in each monthly billing period.
- *Health Data*—No health data was provided by utility.

Operational Activities

Population of Service Area	145,000
Population Served	110,000
Service Area (km^2)	26
Estimated Total Production (m^3/day)	23,752
Estimated Unaccounted for Water (UFW) (m^3/day)	7,126
Metered Production (m^3/day)	ND
Estimated Total Connections	11,176
Metered Residential Connections	ND
Total Metered Connections	9,791
Estimated Total Consumption (m^3/day)	16,626
Metered Residential Consumption (m^3/day)	10,900
Metered Consumption (m^3/day)	11,497

ND—No data was supplied on survey

Box 2

OPERATIONAL STATISTICS

- *Operational Analysis*—Lack of data on metered production probably indicates that production sources are not measured. While 88 percent of the connections are said to be metered, there are no data on how many of these are functioning or providing accurate readings. Accordingly, data on unaccounted-for-water and per capita water consumption can only be considered approximations.

  Metered connections represent 88 percent of the total connections yet account for only 69 percent of consumption. This seems to imply that unmetered connections use more water than metered ones. However, this could also mean that the meters are

Population Density (people/km^2 service area)	5,577
Percent Service Coverage	76
Percent UFW	30[1]
Percent Metered Connections/Total Connections	88
Percent Metered Consumption/Total Consumption	69

[1] Percent UFW (or unaccounted for water) is defined as total production less total consumption divided by total production.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

underrecording actual usage and that the utility is assigning relatively high amounts of consumption to unmetered accounts.

The utility reports that 97 percent of its served population receives water from piped connections, which is a relatively high level. The data do not shed light on how the 24 percent of the people in the service area not served by the utility receive their water. Since the service area is relatively small, this could mean that some of these people receive water from neighbors' connections (not a problem *if* such flows are metered and paid for) or from illegal connections.

Unaccounted-for-water at 30 percent is not an unreasonably high level, but, as noted earlier, the lack of meters on the production sources and doubts about the accuracy of consumption meters make this figure suspect. On the other hand, overall levels of per capita production and consumption of 216 and 155 lpcd are not indicative of unusual amounts of losses and waste.

The number of 9.6 persons per connection was the highest of all 13 utilities, and was 50 percent above the average of the others. The utility did not provide details on the number of meters by category of residential, commercial, or governmental/institutions, but residential connections or accounts were said to represent 83 percent of all accounts.

Financial Analysis

Lack of some data and vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

Total Overall Revenues	S320 million
Total Overall Costs	S317 million
Profit	S 3 million
Profit as Percent of Revenues	1
Operating Revenues	S221 million
Operating Revenues per Capita Served Population	S 2,013
Operating Revenues per Water Connection	S19,810
Operating Revenues per m^3 Produced	S 25.5
Operating Revenues per m^3 Billed	S 36.5
Total Cost	S317 million
Total Cost per Capita Served Population	S 2,882
Total Cost per Water Connection	S28,364
Operating Costs	S317 million
Operating Cost per m^3 Produced	S 36.6
Operating Cost per m^3 Billed	S 52.2
Operating Ratio (total cost/total revenue)	0.99
Working Ratio (operating cost/operating revenue)	1.43

Notes: Total Cost = Operating Costs

Box 4

FINANCIAL STATISTICS AND INDICATORS

At first glance, Loja has earned a surplus in 1990, with revenues slightly exceeding costs. However, 31 percent of these revenues are listed as sources other than those from the sale of water or fees for services. It is difficult to conceive of other sources of revenue of this magnitude except for subsidies from the central government. Until this revenue source is clarified, the financial picture remains clouded. In the data above, Operating Revenues were assumed to be those from sale of water and for connection charges and fees.

A similar problem arises in the cost data. A substantial 38 percent of total costs were listed as "other," with no further clarification. It is difficult to determine whether these are operating costs or related to debt repayment, for example. The utility lists nothing under long term liabilities. This could be an oversight or an indication that the central government is providing funds for its capital works programs.

Cash		S 1 million
Accounts Receivable		S 149 million
Inventory		S 54 million
Current Assets		S 204 million
Work in Progress		S 122 million
Fixed Assets		S 70 million
Total Assets		S 396 million
Current Liabilities		S 11 million
Total Liabilities and Capital		S 396 million
■ ■ ■		
Quick Ratio (cash + receivables/liabilities)		13.6
Current Ratio (current assets/current liabilities)		18.5
Cash Coverage of Total Costs		1.2 days
Cash + Receivables Coverage of Total Costs		173 days
Asset Turnover (total revenue/total assets)	0.81	
A/C Receivable Turnover		2.15
Average Collection Period		170 days

Box 5

BALANCE SHEET: STATISTICS AND INDICATORS

Loja reports that it collects 86 percent of the total revenues it bills each month, yet it also reports a year end amount of accounts receivable that represents 67 percent of its annual operating revenue. These facts appear to be contradictory.

The data show that the total cost of each cubic meter of water billed to customers was S52. While there are no specific data on unit charges for water, Loja provides up to 10 m^3 per month for S310 for residential users. That appears to indicate a base rate of S31 per m^3. Reported data for estimated total water consumption and total operating revenue from sale of water and fees yielded an average of S36 per m^3 or only 69 percent of the cost of that water.

The data clearly show that accounts receivable are much too high. In addition, anything that can be done to reduce unaccounted for water will benefit the financial health of the utility.

Personnel Activities

Full-time Employees	134
Part-time Employees	0
Employees per 1,000 Persons Served	1.2
Employees per 1,000 Connections	12
Water Produced per Employee	177 m^3/day
Water Billed per Employee	124 m^3/day
Personnel Costs/Operating Costs	43.2

Box 6

PERSONNEL STATISTICS AND INDICATORS

- *Personnel Analysis*—The utility has a full-time staff of 134 employees. This number represents 12.0 employees per 1,000 water connections, and 1.2 employees for each 1,000 population served. There is 0.92 employee for each 1,000 meters of water pipe in the system. Personnel cost is 43 percent of the total cost of the operation. The company does not make broad use of outside contractors.

  While staffing per 1,000 population served is at the low-end of the companies surveyed, the level of staff per connection appears high. The key indicator of interest is the number of employees per connection or account which was 12 for Loja. The World Bank[1] reported an average ratio of 5.4 for five large Latin American utilities, but also indicated that most water utilities in the region had ratios about twice that level. A 1992 WASH report[2] stated that the National Water Commission of Jamaica has a similar ratio of 11, while a ratio of 38 was considered acceptable for a Sri Lanka utility because of a large, low cost labor pool. The figure for Loja was in line with other water utilities in this study, but considerably higher than those of the other utilities.

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Canton Loja was 35.9 (deaths in the

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[1] "Management Operational Practices of Municipal and Regional Water and Sewerage Companies in Latin America and the Caribbean," The World Bank, Guillermo Yepes, January 1990.

[2] "Management Analysis and Privatization Options of the National Water Commission, Jamaica," WASH Field Report No. 361, April 1992.

first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989*, INEC, Quito, Ecuador).

Recommendations

- *Operational*

  1. Verify the quantities of water produced, preferably through the installation of master meters.

  2. Given the relatively small service area, consider programs to expand service to the 24 percent of the population not now served.

  3. Determine the number of metered connections in each service sector (data may be available but just were not reported).

- *Financial*

  1. Clarify the "other" costs so that a better determination can be made of what the utility's operating costs are. It is particularly important to note whether these are debt repayment costs.

  2. Determine the total long term obligations (loans) of the utility, and clarify whether most past capital expenditures have been provided by government subsidy. The records should be clear on these matters. In addition, determine the annual costs of servicing any debts the utility may have (interest and principal repayment).

  3. Identify the source(s) of the "other" revenue, particularly if this a government subsidy for operating costs. The current ambiguity means the difference between a financially solvent utility and one which is heavily subsidized.

  4. The current level of accounts receivable is too high and steps should be taken on a priority basis to reduce them.

  5. Reconcile the statement that 86 percent of billed revenue is collected with the fact that accounts receivable amount to 67 percent of operating revenues.

- *Personnel*

  1. Initiate the collection of information about personnel turnover by recording the number of employees at the start of each year who are no longer employed at the end of that year.

  2. Reconcile the data that indicate that the 88 percent of connections which are metered account for only 69 percent of the total amount of water estimated to be consumed. This infers that per capita consumption for those who are metered is only 122 lpcd, but it increases to 320 lpcd, or 2.6 times that amount for those served by unmetered connections.

PROFILE 2

EMPRESA MUNICIPAL DE AGUA POTABLE DE QUITO (EMAP)
Quito, Ecuador

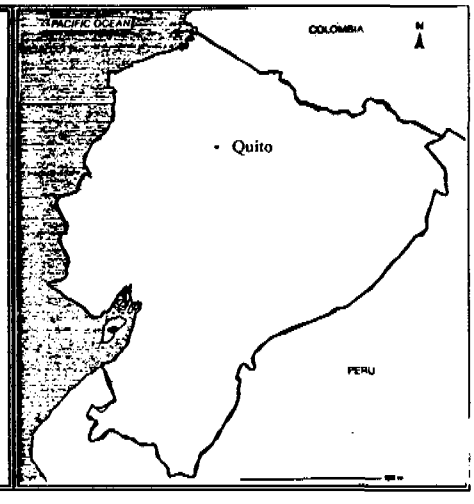
Services Offered: Water Supply

Population in Service Area: 1,238,967
Population Served: 1,067,742

Daily Water Production: 426,581 m^3
Daily Production Billed: 234,960 m^3

Full-time Staff: 1,881

Annual Revenue: 10,925,248,003
Annual Costs: 8,833,733,730 (sucres 1991)



Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Agua Potable (EMAP) is the primary water authority in Quito. The utility provides water to 1,067,742 people in the greater Quito region. The total service area extends over 490 square kilometers. See the box for additional base data.

EMAP recently completed an extensive questionnaire on its operational, financial, and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EMAP can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMAP states that it reaches the operational goals of serving a specific geographical area, improving health conditions, providing clean water, achieving financial autonomy, and meeting service targets in terms of population served and level of coverage.
- *Contracted Services*—EMAP contracts with other firms for 90 percent of its construction activities.

- *Investment Sources*—Seventy-three percent of the funding for capital investments is obtained through government transfers. An additional 15 percent is self-financed. The remainder is made available through external loans (11 percent) and private loans (1 percent).
- *Billing*—No information on the billing structure was provided. EMAP did report, however, that approximately 97 percent of the billed sales are collected in each monthly billing period.
- *Health Data*—No health data was provided by utility.

Operational Activities

Population of Service Area	1,238,967
Population Served	1,067,742
Service Area (km^2)	492
Estimated Total Production (m^3/day)	426,581
Unaccounted for Water (UFW) (m^3/day)	191,622
Metered Production (m^3/day)	77,259
Estimated Total Connections	149,867
Metered Residential Connections	93,569
Total Metered Connections	98,294
Estimated Total Consumption (m^3/day)	234,959
Metered Residential Consumption (m^3/day)	53,008
Total Metered Consumption (m^3/day)	62,537

Box 2

OPERATIONAL STATISTICS

- *Operational Analysis*—EMAP is a large water company serving the capital of the country. The population in the area served is estimated to be 1,238,967, and the population served 1,067,742, a service coverage of 86.1 percent in the 492 km^2 service area. The population density of the service area is 2,518 people per km^2.

  Data on metered production indicates that only 18 percent of the production sources and 66 percent of the connections are measured. There are no data on how many of the consumption meters are functioning or providing accurate readings. This, plus the relative paucity of production meters, leads to the conclusion that data on unaccounted-for-water and per capita water consumption can only be considered approximations.

Population Density (people/km^2 service area)	2,518
Percent Service Coverage	86
Percent Metered Production/Total Production	18
Percent UFW	45[1]
Percent Metered Connections/Total Connections	66
Percent Metered Consumption/Total Consumption	27
Unit Residential Water Demand (m^3/conn/day)	0.57[2]

[1] Percent UFW (unaccounted for water) is defined as total production less total consumption divided by total production.

[2] Unit demand is calculated by dividing metered residential consumption by the number of metered residential connections.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

Metered connections represent 66 percent of the total connections but account for only 27 percent of consumption. This seems to imply that unmetered connections use more water than metered ones but the gap is so great as to raise questions about how the unmetered consumption was estimated. Assuming the same average of 7.1 persons per connection, per capita consumption from metered connections was 90 lpcd and that from unmetered connections was 470 lpcd. That seems highly unlikely.

The utility reports that 100 percent of its served population receives water from piped connections, which is a very high level. The data do not shed light on how the 14 percent of the people in the service area not served by the utility receive their water.

The indicator of 11 meters of distribution piping per connection appears to be within the range of values in other Ecudorean water utilities.

Unaccounted-for-water is an unacceptably high 45 percent. Residential use accounts for 95 percent of the total connections, so water use is essentially residential as opposed to commercial or industrial. The level of 399 lpcd of water produced is quite high for essentially residential use and is supportive of the indicated high level of unaccounted for water.

It is difficult to understand why the 78 percent of commercial accounts that are metered are said to account for only 27 percent of the total commercial consumption. This situation would seem to call for the installation of meters on the remaining 22 percent of these accounts since they are said to be using 73 percent of all the water in this category.

Financial Activities

Salient financially-related statistics for the year 1991 follow:

Total Overall Revenues	S10,925 million
Total Overall Costs	S 8,834 million
Profit	S 2,091 million
Profit as Percent of Revenues	19.1
Operating Revenues	S 7,458
Operating Revenues per Capita Served Population	S 6,985
Operating Revenues per Water Connection	S49,764
Operating Revenues per m^3 Produced	S 47.9
Operating Revenues per m^3 Billed	S 87.0
Total Cost	S 8,834 million
Total Cost per Capita Served Population	S 8,274
Total Cost per Water Connection	S58,946
Operating Costs	S 6,797 million
Operating Cost per m^3 Produced	S 43.6
Operating Cost per m^3 Billed	S 79.3
Operating Ratio (total cost/total revenue)	0.81
Working Ratio (operating cost/operating revenue)	0.95

Box 4

FINANCIAL STATISTICS AND INDICATORS

- *Financial Analysis*—Lack of some data and vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  According to reported data, Quito earned a surplus in 1990, with revenues exceeding costs by 24 percent. However, 32 percent of these revenues are listed as sources other than those from the sale of water or fees for services. It is difficult to conceive of other sources of revenue of this magnitude except for subsidies from the central government. On the cost side, however, depreciation accounted for 20 percent of all costs. While this

Cash	S 1,954 million
Accounts Receivable	S 5,475 million
Inventory	S 4,685 million
Current Assets	S12,110 million
Work in Progress	S99,997 million
Fixed Assets	N/A
Total Assets	N/A
Liabilities	S31,599 million
Total Liabilities and Capital	N/A
■ ■ ■	
Quick Ratio (cash + receivables/liabilities)	2.12
Current Ratio (current assets/current liabilities)	3.22
Cash Coverage of Total Costs	81 days
Cash + Receivables Coverage of Total Costs	307 days
Asset Turnover (total revenue/total assets)	N/A
A/C Receivable Turnover	1.99
Average Collection Period	183 days

Box 5

BALANCE SHEET: STATISTICS AND INDICATORS

is a legitimate bookkeeping entry, it is not a true cost in terms of funds the utility had to pay during the year. On the other hand, Quito has outstanding loans of over S31,000 million, and while the costs reflect interest payments of S255 million, there is no indication of what may have been paid for principal repayment. Until these revenue and cost questions are clarified, the financial picture remains clouded.

In the indicators above, Operating Revenues were assumed to be those from sale of water and for connection charges and fees, and Operating Costs were assumed to be Personnel, Chemicals and Fuels, and costs listed in the "Other" category.

Under the heading of Investments in the questionnaire, Quito states that the central government has "transferred" funds (provided grants) for 73 percent of recent capital works programs, 15 percent was self-financed by EMAP-Quito and the remaining 12 percent was borrowed. Quito's total outstanding loans amount to S31,599 million. The stated interest payments of S255 million represents a rate of less than 1 percent per year, which certainly raises questions.

Quito reports that it collects 97 percent of the total revenues it bills each month, yet it also reports a year end amount of accounts receivable that represents 73 percent of its annual operating revenue. It is very difficult to reconcile these two factors.

The data show that the total cost of each cubic meter of water produced was S57. There are no data on unit charges for water, but operating revenue accounted for just S48 per m^3. Given the 45 percent level of unaccounted for water and the problem with collecting billed revenues, it appears that the unit cost of water is too low for financial viability.

The data clearly show that accounts receivable and unaccounted for water levels are much too high, and both must be significantly reduced in order to improve the financial health of the utility. With the central government providing 73 percent of the costs of capital works program and possibly an operating subsidy of about 32 percent of total revenues, Quito does not appear to be financially self-supporting as they indicate in their assessment of how they are meeting their goals.

Personnel Activities

Full-time Employees	1,881
Part-time Employees	0
Employees per 1,000 Persons Served	1.8
Employees per 1,000 Connections	12.6
Water Produced per Employee	227 m^3/day
Water Billed per Employee	125 m^3/day
Percent Personnel Costs/Operating Costs	67

Box 6

PERSONNEL STATISTICS AND INDICATORS

- *Personnel Analysis*—The key indicator of interest is the number of employees per connection or account which was 12.5 for Quito. The World Bank[3] reported an average ratio of 5.4 for five large Latin American utilities, but also indicated that most water utilities in the region had ratios about twice that level. This level was average for the three water utilities studied, but more than 50 percent higher than the median for all utilities in the study.

[3] "Management and Operational Practices of Municipal and Regional Water and Sewerage Companies in Latin America and the Caribbean", The World Bank, Guillermo Yepes, January 1990.

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Canton Quito was 40.2 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989,* INEC, Quito, Ecuador).

Recommendations

- *Operational*

  1. Verify the quantity of water produced, preferably through the installation of master meters, for the 82 percent of sources not now metered.
  2. Provide an indication of the percentage of the existing consumption meters that are not functioning effectively.
  3. Move quickly to install meters on the 22 percent of commercial connections that are not presently metered.
  4. Unaccounted for water in the order of 45 percent is unacceptably high and steps should be taken to reduce it.
  5. Verify that 100 percent of the served population is directly connected to the distribution system.
  6. Reconcile the data that indicate that the 66 percent of connections which are metered account for only 27 percent of the total amount of water estimated to be consumed. This infers that per capita consumption for those who are metered is only 90 lpcd, but it jumps to 470 lpcd, or five times that amount for those served by unmetered connections.

- *Financial*

  1. Identify the source of the "other" revenue that amounts to 32 percent of all revenue. Indicate whether this is a government subsidy for operating costs. If not, clarify the source(s) for these revenues.
  2. The current level of accounts receivable is too high and steps should be taken on a priority basis to reduce them.
  3. Clarify the "other" costs so that a better determination can be made of what the utility's operating costs are. It is particularly important to note whether these are debt repayment costs. In future, do not include depreciation as a cost for the purposes of comparing revenues against expended costs.

4. Determine the total costs for interest and repayment of principal for short and long term obligations (loans) of the utility. The cost of debt service is needed to develop several important financial indicators.

5. Make an estimate of the value of the utility's fixed assets.

6. Reconcile the statement that 97 percent of billed revenue is collected with the fact that accounts receivable amount to 73 percent of operating revenues.

- *Personnel*

1. Initiate the collection of information about personnel turnover by recording the number of employees at the start of each year who are no longer employed at the end of that year.

PROFILE 3

EMPRESA PROVINCIAL DE AGUA POTABLE DEL GUAYAS (EPAP–GUAYAS)
Guayas Province, Ecuador

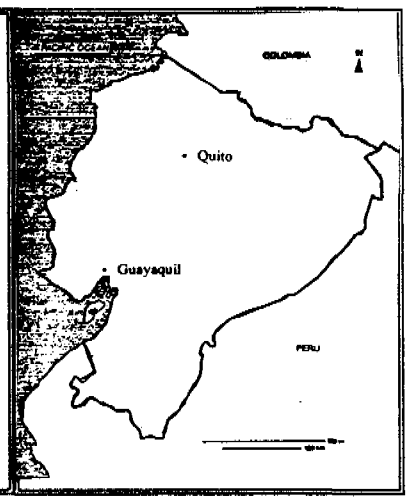
Services Offered: Water Supply

Population in Service Area: 2,515,546
Population Served: 1,517,559

Daily Water Production: 440,000 m^3
Daily Production Billed: 144,108 m^3

Full-time Staff: 1,462

Annual Revenue: 11,054,724,000 Sucres
Annual Costs: 16,994,752,000 Sucres (1990)



Box 1

GENERAL STATISTICS

General Description

The Empresa Provincial de Agua Potable del Guayas (EPAP—Guayas) is the water authority for Guayas Province, located on the central plane of Ecuador's Pacific Coast. Included in the region is Guayaquil, the country's most populous city. The utility provides water to over 1.5 million people in the province. The total service area extends over 20,500 square kilometers. See Box 1 for additional base data.

EPAP-Guayas recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EPAP-Guayas can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EPAP-Guayas states that it reaches the operational goal of providing clean water and meeting service targets in terms of population served and level of coverage. It currently works for, but does not attain, the goals of serving a specific geographical area, improving health conditions, and achieving financial autonomy.

- *Contracted Services*—EPAP—Guayas contracts with other firms for 100 percent of construction activities associated with the utility's "master plans." The utility also contracts for 80 percent of the installation of domestic connections and 70 percent of the studies it conducts.

- *Investment Sources*—Twenty percent of the funding for capital investments is obtained through government transfers, the remaining 80 percent is obtained through private loans.

- *Billing*—EPAP—Guayas has separate rates for different categories of customers, including residential and commercial. Approximately 73 percent of the billed sales are collected in each monthly billing period.

- *Health Data*—No health data was provided by utility.

Operational Activities

Population of Service Area	2,515,546
Population Served	1,517,559
Service Area (km^2)	20,502
Estimated Total Production (m^3/day)	440,000
Metered Production (m^3/day)	0.0
Estimated Total Connections	151,791
Metered Residential Connections	94,427
Total Metered Connections	106,268
Estimated Total Consumption (m^3/day)	170,506
Metered Residential Consumption (m^3/day)	87,086
Estimated Unaccounted for Water (UFW) (m^3/day)	269,494
Metered Consumption (m^3/day)	141,405

Box 2

OPERATIONAL STATISTICS

- *Operational Analysis*—EPAP—Guayas provides water to Ecuador's largest city, Guayaquil, and the remainder of Guayas province. The population of the Province is 2,515,546, and EPAP—Guayas serves an estimated 1,517,559 people, a coverage of 60 percent in the extensive service area of 20,502 km^2. The population density of the service area is 123 people per km^2.

  The total water production by EPAP is 440,000 m^3 per day. On the survey, EPAP supplied an unmetered production quantity of 440,000 m^3 per day which could indicate EPAP is unable to meter its production or simply did not supply the data. EPAP has UFW

Population Density (people/km^2 service area)	123
Percent Service Coverage	60
Percent UFW	61[1]
Percent Metered Connections/Total Connections	70
Percent Metered Consumption/Total Consumption	83
Unit Residential Demand (m^3/conn/day)	0.92[2]

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1 Percent UFW is defined as total production less total consumption divided by the total production.

2 Unit demand is calculated by dividing metered residential consumption by the number of metered residential connections.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

of 269,494 m^3 per day which is 61 percent of daily production. This is extremely high.

Total connections are 151,791. These are divided between 106,268 metered connections and 45,523 unmetered connections. The percentage of metered connections to total connections is 70 percent. Records show that total consumption of 170,506 m^3 per day, is split between 141,405 m^3 per day in metered consumption and 29,101 m^3 per day of unmetered consumption.

From the data received, the metered consumption is 83 percent of the total consumption while the metered connections make up only 70 percent of total connections. This could indicate that those with metered connections are the larger consumers on a per connection basis. However, this could also indicate that much of the consumption is by unregistered/unknown connections and the utility is assigning relatively high amounts of consumption to unmetered accounts. this would account for the high level of UFW.

The unit demand at metered residential connections is 0.92 m^3 per connection per day.

Financial Activities

Salient financially-related statistics for the year 1990 follow:

Total Overall Revenues	S11,055 million
Total Overall Costs	S16,995 million
Deficit	S 5,940 million
Deficit as Percent of Revenues	54
Operating Revenues	S10,284 million
Operating Revenue per Capita Served Population	S 6,779
Operating Revenues per Water Connection	S67,751
Operating Revenues per m^3 Produced	S 64.0
Operating Revenues per m^3 Billed	S 195.5
Total Cost	S16,995 million
Total Cost per Capita Served Population	S11,203
Total Cost per Water Connection	S111,956
Operating Costs	S14,092 million
Operating Cost per m^3 Produced	S 87.7
Operating Cost per m^3 Billed	S 267.9
Operating Ratio (total cost/total revenue)	1.54
Working Ratio (operating cost/operating revenue)	1.62

Box 4

FINANCIAL STATISTICS AND INDICATORS

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  None of the Guayas utility's water production is metered. Only 32.8 percent of its 440,000 m^3 per day production is billed. Unaccounted-for water, 269,494 m^3 per day, is 61.2 percent of total production. At a cost of S87.7 per m^3 produced, the expense represented in this situation is S8,626 million per year. The opportunity cost at S195.5 in revenues per m^3 billed is S19,195 million. The inefficiency and cost represented by these numbers is staggering.

  The size of both the overall deficit, S5,940 million representing 53.7 percent of revenues, and the operating deficit, S3,808 million representing 37 percent of operating revenues,

Cash	S 1,131 million
Accounts Receivable	S 4,298 million
Inventory	S17,392 million
Current Assets	S22,821 million
Work in Progress	S 7,481 million
Fixed Assets	S15,140 million
Total Assets	S45,442 million
Liabilities	S17,893 million
Total Liabilities and Capital	S45,442 million

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Quick Ratio (cash + receivables/liabilities)	2.4
Current Ratio (current assets/current liabilities)	10.2
Cash Coverage of Total Costs	24 days
Cash + Receivables Coverage of Total Costs	117 days
Asset Turnover (total revenue/total assets)	0.24
Assets Receivable Turnover	2.57
Average Collection Period	142 days

Box 5

BALANCE SHEET: STATISTICS AND INDICATORS

bring the sustainability of the entity into question. Clearly, something is wrong. Both the revenue and the cost sides of EPAP—Guayas, particularly the contracts into which the company has entered, deserve careful study immediately, and an existing or new management must take whatever steps are indicated to rectify the situation.

The financial condition of the company as indicated by the balance sheet is better than the operating picture. Liquidity to cover current liabilities and operational costs is adequate. However, long-term debt for plant and equipment is normally repaid from earnings which in this case are non-existent. While the amount of long-term debt is modest, EPAP—Guayas is not able to pay currently. The level of accounts receivable is high showing lagging collections. This function also should be improved.

Personnel Activities

Full-time Employees	1,462
Part-time Employees	0
Employees per 1,000 Persons Served	1.0
Employees per 1,000 Connections	9.6
Water Produced per Employee	301 m^3/day
Water Billed per Employee	99 m^3/day
Percent Personnel Costs/Operating Costs	34
Percent Contract Costs/Operating Costs	48

Box 6

PERSONNEL STATISTICS AND INDICATORS

- *Personnel Analysis*—Pure personnel indicators produce a fairly good picture of this utility. The employees per 1,000 population served and per 1,000 connections are notably lower than its sister utility in Quito. However, the financial condition and operating results of the two are vastly different (see Financial Analysis section).

  The primary difference is in outside contracting. Guayaquil contracts-out all construction activities and eighty percent of work related to new connections. Quito handles all connections in- house from the information obtained. Without a detailed breakdown of how contracting costs, 48 percent of operating costs, were applied in the year, accurate analysis is not possible.

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Guayas Province was 51.0 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989,* INEC, Quito, Ecuador).

Recommendations

- *Operational*—Efforts to reduce the unaccounted for water should be implemented. Possible steps are increasing the use of metered connections and identifying unregistered connections.
- *Financial*
  1. EPAP—Guayas requires remedial action as soon as possible. However, steps should be taken to enable the necessary actions to be placed within the context of a comprehensive plan.
  2. A study should be made of unaccounted-for water to improve efficiency and increase revenue producing water production.
  3. A thorough study of costs, particularly outstanding contracts (48 percent of operating costs) and personnel costs (34 percent), must be made and a cost reduction plan implemented.
- *Personnel*
  1. Obtain details on the application of contract expenditures related to new connections or minor construction.
  2. From the poor operating condition of the utility, a thorough study which includes a complete manpower utilization review is recommended.

PROFILE 4

EMPRESA MUNICIPAL DE ALCANTARILLADO (EMA)
Quito, Ecuador

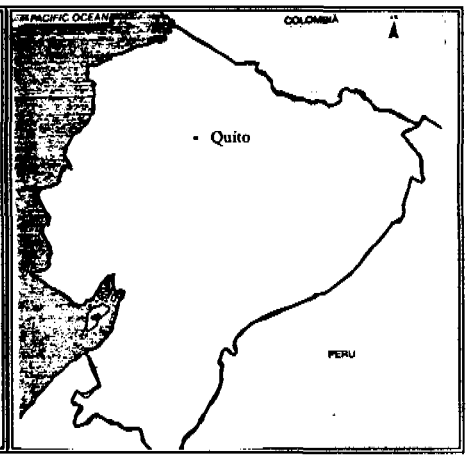
Services Offered: Sanitation Service

Population in Service Area: 1,300,000
Population Served: 1,000,000

Daily Wastewater Collection: 18,016 m^3

Full-time Staff: 357

Annual Revenue: 3,289,000,000 Sucres
Annual Costs: 2,706,410,000 Sucres (1991)



Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Alcantarillado (EMA) is the primary sewer authority in Quito. The utility provides sewer services to 1,000,000 people in the greater Quito region. The total service area extends over 187 square kilometers. See the box for additional base data.

EMA-Q recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EMA-Q can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMA states that it works for, but does not attain, the operational goals of serving a specific geographical area, improving health conditions, achieving financial autonomy, and meeting service targets in terms of level of coverage.
- *Contracted Services*—EMA contracts with other firms for 90 percent of its construction activities, 10 percent of the studies it conducts and 70 percent of its consulting services.

- *Investment Sources*—Thirty-seven percent of the funding for capital investments is obtained through government transfers. An additional 4 percent is self-financed. No other sources of investments were listed.
- *Billing*—No information on the billing structure was provided. The utility states that it receives 0.5 percent of the "impuesto predial," a type of government tax.
- *Health Data*—No health data was provided by utility.

Operational Activities

Population of Service Area	1,300,000
Population Served (overall sanitation)	1,000,000
Population Served (sewer service)	700,000
Service Area (km^2)	188
Estimated Sewage Collection (m^3/day)	18,016
Treatment	None treated
Pipe Connections	160,000
Truck Connections/Accounts	16,000
Other Connections/Accounts	24,000
Total Connections	200,000
Industrial Waste (percent of total collected)	12

Box 2

OPERATIONAL STATISTICS

Population Density (people/km^2 service area)	6,922
Percent Overall Sanitation Coverage	77
Percent Sewer Service Coverage	54

Box 3

OPERATIONAL PERFORMANCE INDICATORS

- *Operational Analysis*—EMA operates the sewage service for the capital city of Quito. It provides overall sanitation to a population estimated at 1,000,000 from an overall estimated population of 1,300,000 within the 188 km^2 service area (77 percent coverage).

EMA-Quito provides sewer service coverage to 700,000 inhabitants in its service area, 54 percent sewer service coverage. The population density of the service area is 6,922 people per km^2.

EMA-Q services a total of 200,000 connections which is made up of: 160,000 piped connections; 16,000 truck connections or accounts; and 24,000 other connections or accounts. EMA-Q collects 18,016 m^3 of sewage per day, none of which is treated.

Financial Activities

Salient financially-related statistics for the year 1991 follow:

Total Revenues	S 3,289 million
Total Costs	S 2,706 million
Profit	S 583 million
Percent Profit as Percent of Revenues	18
Operating Revenues	S 996 million
Operating Revenue per Capita Served Population	S 996
Operating Revevues per Sewer Connection	S 4,980
Total Revenues per Connection	S16,445
Total Costs	S 2,706 million
Total Costs per Capita Served Population	S 2,706
Total Cost per Connection	S13,530
Operating Costs	S 2,626 million
Operating Cost per Capita Served Population	S 2,626
Operating Cost per Connection	S13,130
Operating Ratio (total cost/total revenue)	0.82
Working Ratio (operating cost/operating revenue)	2.72

Box 4

FINANCIAL STATISTICS AND INDICATORS

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

Cash	S 435 mil.
Accounts Receivable	S 207 mil.
Inventory	S 87 mil.
Current Assets	S 729 mil.
Work in Progress	S 285 mil.
Fixed Assets	S 4,256 mil.
Total Assets	S 5,270 mil.
Liabilities	S 6,905 mil.
Total Liabilities and Capital	N/A
■ ■ ■	
Quick Ratio (cash + receivables/liabilities)	0.96
Current Ratio (current assets/current liabilities)	1.09
Cash Coverage of Total Costs	59 days
Cash + Receivables Coverage of Total Costs	87 days
Asset Turnover (total revenue/total assets)	0.62
A/C Receivable Turnover (total revenues)	15.8
Average Collection Period	23 days
Receivables Turnover (operating revenues)	4.8
Average Collection Period (operating revenues)	76 days

Box 5

BALANCE SHEET: STATISTICS AND INDICATORS

To be able to make a meaningful operational assessment of EMA, one must have additional information regarding the nature of the non-sewer service related and other income which raises operating revenues of S996 million to total revenues of S3,289 million. Taking the operating figures alone, operating revenues S996 million versus

operating costs of S2,626 million results in an operating deficit of S1,630 million, or 163 percent of operating revenue. In the overall, the utility earns a satisfactory profit of S583

million, 18 percent on total revenues. However, the nature and stability of the unexplained revenue is crucial to the picture.

Similarly, the balance sheet analysis is clouded by the unexplained long-term liabilities figure which is larger than the total of current and fixed assets, including work in progress, as given in the survey. Since the balance sheet must balance, something is missing.

The liquidity situation compared with current liabilities $670 million is somewhat tight. However, cash and receivables coverage of operating costs is comfortable. The impact of the unexplained revenues mentioned above on the receivables average collection period is dramatic, as shown. Average collection versus operating revenues is 76 days compared with 23 days if all revenues are considered. This again highlights a need for more information.

Personnel Activities

Full-time Employees	357
Part-time Employees	0
m^3 Collected/Day/Employee	50.5
Employees per 1,000 Persons Served	0.4
Percent Employees per 1,000 Connections	1.8
Percent Personnel Costs/Operating Costs	61.2

Box 6

PERSONNEL STATISTICS AND INDICATORS

- *Personnel Analysis*—It is difficult to judge the efficiency of personnel from the information given. The fact that the utility is in reasonable financial condition presumes that management is operating in a satisfactory fashion. The gaps in the financial analysis, however, indicate caution on recommendations. A key indicator of interest is the number of employees per sewer connection. At 1.8 this seems a reasonable number.

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Canton Quito was 40.2 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989,* INEC, Quito, Ecuador).

Recommendations

- *Financial*

  If a meaningful analysis is desired, more information is needed concerning:

  1. The nature and composition of S2,293 million in revenues, the difference between total revenues and the S996 million in operating revenues.
  2. The composition and purpose of the S6,235 million in long-term debt which EMA reports in its questionnaire. This amount is larger than the total assets of the company as calculated.

PROFILE 5

EMPRESA MUNICIPAL DE ALCANTARILLADO DE GUAYAQUIL (EMA – GUAYAQUIL)
Guayaquil, Ecuador

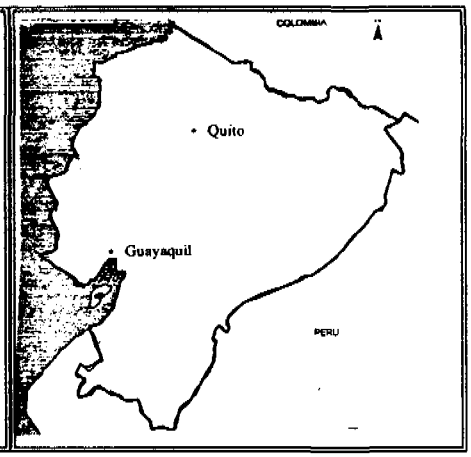
Services Offered: Sanitation Service

Population in Service Area: 1,570,396
Population Served: 1,050,000

Daily Wastewater Collection: 140,900 m^3

Full-time Staff: 650

Annual Revenue: 3,037,539,117 Sucres
Annual Costs: 2,839,584,746 Sucres (1990)



Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Alcantarillado de Guayaquil (EMA—Guayaquil) is the sewer authority for Guayaquil, Ecuador's most populous city, located on the Pacific Coast approximately 400 kilometers southwest of Quito. The utility provides sewer services to 1,050,000 people in the greater Guayaquil region. The total service area extends over 235 square kilometers. See Box 1 for additional base data.

EMA-Guayaquil recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EMA-Guayaquil can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMA—Guayaquil states that it reaches the operational goals of improving health conditions and meeting service targets in terms of level of coverage and population served. The company works for, but does not attain, the goals of serving a specific geographical area and achieving financial autonomy.

- *Contracted Services*—EMA—Guayaquil contracts with other firms for 80 percent of its billing and collection activities, 100 percent of its construction activities, 100 percent of the costs of maintaining its networks and 10 percent of the maintenance costs of its pumping stations and treatment facilities.
- *Investment Sources*—Eighty-eight percent of the funding for capital investments is obtained through foreign loans. An additional eleven percent is obtained through government loans, while one percent is self-financed.
- *Billing*—Billing for sewer services is based on water consumption. Rates range from 72 percent of billed water consumption for residential customers to 95 percent of billed water consumption for commercial customers. There is also an annual charge for storm drainage.
- *Health Data*—No health data was provided by utility.

Operational Activities

Population of Service Area	1,570,396
Population Served (overall sanitation)	1,050,000
Population Served (sewer service)	871,500
Service Area (km^2)	235
Estimated Sewage Collection (m^3/day)	140,900
Treatment:	
(treatment percent of total sewage collected)	
■ Preliminary Treatment	80
■ Primary Treatment	3
■ Secondary Treatment	3
■ Tertiary Treatment	14
Pipe Connections	182,000
Total Connections	182,000
Industrial Waste (percent of total collected)	5
Population Density (people/km^2 service area)	6,683
Percent Overall Sanitation Coverage	67
Percent Sewer Service Coverage	56

Box 2

OPERATIONAL STATISTICS AND INDICATORS

- *Operational Analysis*—EMA-Guayaquil provides sewer service to Ecuador's most populated city, Guayaquil. The utility provides overall sanitation service to a population of 1,050,000 within an overall area population of 1,570,396, a coverage of 67 percent, within a service area of 235 km^2. EMA-G provides sewer service coverage to 56 percent of the population. The population density of the service area is 6,683 people/km^2.

  EMA-Guayaquil is the only utility of the study that treats sewage. EMA-G collects 140,900 m^3 of sewage per day. Of this amount, 80 percent is subjected to preliminary treatment consisting of oxygenation and diffusion. Of this 80 percent of treated sewage, the following percentages indicate the additional treatment steps to which it is subjected: Primary—3 percent; Secondary—3 percent; Tertiary—14 percent. The percent of tertiary treatment is high.

  The utility services a total 182,000 sewerage connections, all of which are indicated as pipe connections. EMA-G did not supply data on other types of connections or accounts.

Financial Activities

Salient financially-related statistics for the year 1990 follow:

Total Overall Revenues	S 3,038 million
Total Overall Costs	S 2,813 million
Profit	S 225 million
Profit as Percent of Revenues	7.4
Operating Revenues	S 1,790 million
Operating Revenue per Capita Served Population	S 1,705
Operating Revenue per Connection	S17,867
Total Cost	S 2,813 million
Total Cost per Capita Served Population	S 2,679
Total Cost per Connection	S28,079
Operating Costs	S 2,718 million
Operating Cost per Capita Served Population	S 2,589
Operating Cost per Connection	
Operating Ratio (total cost/total revenue)	0.93
Working Ratio (operating cost/operating revenue)	1.52

Box 3

FINANCIAL STATISTICS AND REVENUE

Cash	S 326 million
Accounts Receivable	S 5,855 million
Inventory	S 62 million
Current Assets	S 6,243 million
Work in Progress	S 1,455 million
Fixed Assets	S 252 million
Total Assets	S 7,950 million
Liabilities	S 1,660 million
Total Liabilities and Capital	S 7,950 million
Quick Ratio (cash + receivables/liabilities)	11.6
Current Ratio (current assets/current liabilities)	11.7
Cash Coverage of Total Costs	42 days
Cash + Receivables Coverage of Total Costs	802 days
Asset Turnover (total revenue/total assets)	0.38
A/C Receivable Turnover	0.52
Average Collection Period	702 days

Box 4

STATISTICS AND INDICATORS

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  On an operating basis, EMA-Guayaquil shows a deficit of S928 million, or 52 percent of operating revenue. This compares with an overall profit of S225 million, or 4.5 percent of total revenues. There are S1,248 million in non-sewer related revenues which should be examined for source and stability before one can give a definitive opinion as to the quality of the assumed earnings.

  At the operating level, both per connection costs and per capita served costs exceed operating revenues per connection or per capita. These are key indicators, and management should strive to bring operating revenues in line, or reduce costs accordingly. Unless non-sewer related income can be counted upon indefinitely, the utility will find itself in difficulty.

  The balance sheet contains a large anomaly which must be explained to make a reasonable assessment of the utility's financial condition. The account receivable given in

the response most probably relates to much more than normal, operating accounts receivable. The sum of S5,855 million, which is a multiple of operating and even total revenues, most likely includes a sum such as a transfer payment due from government along with normal receivables. The source and purpose of receivables should be identified. Beyond this, normal liquidity and cash coverage of operating costs appears adequate.

Personnel Activities

Full-time Employees	650
Part-time Employees	0
Employees per 1,000 Persons Served	0.6
Employees per 1,000 Connections	6.5
m^3 Collected/Day/Employees	216.8
Percent Personnel Costs/Operating Costs	97.8

Box 5

PERSONNEL STATISTICS AND INDICATORS

- *Personnel Analysis*—Personnel indicators for a sewerage utility appear high. Further, we know from the financial analysis that the utility has a substantial operating deficit. Therefore, we conclude that a thorough manpower utilization survey is a necessary part of any overall study undertaken to improve performance.

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Canton Guayaquil was 52.3 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989,* INEC, Quito, Ecuador).

Recommendations

- *Financial*

  1. Information as to source and stability of non-sewer related revenues be obtained and studied.

  2. Information clarifying the source and purpose of accounts receivable be obtained.

  3. EMA-Guayaquil establish and execute a program designed to increase operating revenues, reduce operating costs, or both in an effort to reduce or eliminate the operating deficit.

- *Personnel*—We recommend that a thorough manpower utilization study be performed.

PROFILE 6

EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO (EMAPAL)
Azogues, Ecuador

Services Offered: Water and Sewer

Population in Service Area
Water: 29,528
Sewer: 24,000
Population Served
Water: 26,280
Sewer: 18,000

Daily Water Production: 6,912 m^3
Daily Production Billed: 5,303 m^3

Daily Wastewater Collection: 3,977 m^3

Full-time Staff: 56

Annual Revenue: 123,550,395 Sucres
Annual Costs: 177,961,216 Sucres (1991)

Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Agua Potable y Alcantarillado (EMAPAL) is located in Azogues, a town in south central Ecuador approximately 400 kilometers south of Quito. The utility provides water to 26,280 people and sewer services to 18,000 people in Azogues Canton, with a total service area extending some eight square kilometers. See Box 1 for additional base data.

EMAPAL recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of

EMAPAL can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Stated Operation*—EMAPAL states that it reaches the operational goals of serving a specific geographical area, improving health conditions, providing clean water and sewage collection. Among the goals which are not met are achieving financial autonomy, and reaching service targets in terms of population reached and level of coverage.
- *Contracted Services*—EMAPAL contracts 50 percent of its billing services to outside firms.
- *Investment Sources*—One hundred percent of the funds for capital investments is obtained through an agreement with the municipal government. No investments are attributed to other government transfers or loans, private loans, self-financing, or foreign loans or grants.
- *Billing*—EMAPAL has an incremental system based on water consumption, with separate rate scales for residential, commercial and industrial customers. Rates per cubic meter ascend for greater consumption volumes. Approximately 75 percent of the billed sales are collected in each monthly billing period. There are no separate charges for sewer services.
- *Health Data (provided by provincial health authority)*—Infant mortality: 1991—45.5 per 1,000 live births. Child mortality: 1991—19.1 per 1,000 inhabitants.
- *Anomolies*—The indicated area of the service regions is the same for water supply and sewer service yet the total indicated populations of the service area differs for the water supply service and sewer service.

Operational Activities

- *Operational Analysis*—EMAPAL provides both water and sewerage services and is by a wide margin the smallest in terms of both service area and population compared to the other 12 utilities in the utility survey.

  EMAPAL provides water service coverage to 26,280 and sewage service to 24,000 inhabitants in its service area of 8 km^2. The service coverage of total population in its service areas is 89 percent for water and 75 percent for sewer service. The population densities of the service areas are 3,691 people per km^2 for water and 3,000 people per km^2 for sewage.

  The total water production at EMAPAL is 6,912 m^3/day. There are no data on the metered production. It is not known whether EMAPAL is unable to meter its production or simply did not supply the data. EMAPAL has unaccounted for water (UFW) (calculated by subtracting water consumption from total production) of 1,609 m^3/day; this is 23

Population of Service Area (water)	29,528
Population of Service Area (sewer)	24,000
Population Served (water)	26,280
Population served (sewer)	18,000
Service Area (water and sewer) (km^2)	8
Estimated Total Water Production (m^3/day)	6,912
Unaccounted for Water (UFW) (m^3/day)	1,609
Estimated Total Water Connections	4,380
Total Metered Water Connections	4,145
Metered Residential Connections	3,705
Total Water Consumption (m^3/day)	5,303
Metered Residential Consumption (m^3/day)	4,516
Metered Consumption (m^3/day)	5,002
Estimated Sewage Collection (m^3/day)	3,977
Sewage Connections	3,285
Total Connections (W&S)	7,665

Box 2

OPERATIONAL STATISTICS

percent of the indicated production. UFW is low, but the lack of meters on production sources makes this figure suspect.

Total water connections number 4,380. These include 4,145 metered connections and 235 connections which are unmetered; this results in a metered/total connection percentage of 94.

Total consumption of 5,303 m^3/day is split between 5,002 m^3/day of metered consumption and 301 m^3/day of unmetered consumption. The metered connections which make up 94 percent of total connections. It appears that meter connections account for 94 percent of the total consumption. This indicates that the consumption is constant per connection regardless of whether the connection is metered or unmetered. The unit demand of metered residential connections is 1.22 m^3/conn/day.

- *Sewage collection and treatment*—EMAPAL services 3,285 sewage connections through which it collects 3,977 m^3 of sewage per day, none of which is treated.

Population Density (people/km^2 water service area)	3,691
Population Density (people/km^2 sewer service area)	3,000
Percent Service Coverage (water)	89
Percent Service Coverage (sewer)	75
Percent UFW	23.3[1]
Percent Metered Connections/Total Connections	94
Percent Metered Consumption/Total Consumption	94
Residential Unit Water Demand (m^3/connections/day)	1.22[2]

[1] Percent UFW (unaccounted for water) is defined as total production less total consumption divided by total production.

[2] Unit demand is calculated by dividing metered residential consumption by number of metered residential connections.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

Financial Activities

Salient financially related statistics for the year 1991 follow:

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  Water production of the Azogues utility is not metered. However, delivery is metered through 4,145 of 4,380 connections (94.6 percent metered). Of total production of 6,912 m^3 per day (2.52 million m^3/year), 5,303 m^3 of the production of 76.7 percent is billed. Unbilled production of 1,609 m^3/day (587,285 m^3/year), or 23.3 percent of total production, must have some deleterious effect on the operating performance of the utility and should be reduced to the extent possible.

  The 1991 operating deficit of S42.2 million, or 35 percent of revenues, is not healthy. A low tariff may contribute to this result. Revenues averaged S27,511 per connection per year (an average of S2,292 per month). This translates to US$1.77 revenue per

Cash	S11.9 million
Accounts Receivable	S66.8 million
Inventory	S15.1 million
Current Assets	S93.8 million
Plant and Equipment	S84.2 million
Total Assets	S265 million
Current Liabilities	0.8 million
Total Liabilities and Capital	S265 million
Quick Ratio (cash + receivables/liabilities)	98.4
Current Ratio (current assets/current liabilities)	117.2
Cash Coverage of Total Costs	24.4 days
Cash + Receivables Coverage of Total Costs	161.5 days
Asset Turnover (total receivables/total assets)	0.47
A/C Receivable Turnover	1.9
Average Collection Period	197 days

Box 5

BALANCE SHEET: STATISTICS AND INDICATORS

connection per month which is low by any standard. The average m^3 water usage per month per connection is 36.8. Therefore, the average revenue per m^3 at any given connection is S62.3, or US$0.048 per m^3. A review of the tariff schedule is indicated.

The balance sheet data offered indicates little growth activity. If this is the case, liquidity is marginally adequate so long as operating deficits are covered by the municipality. Collection efforts should be improved as a 203 day average collection period for water sales is excessive (the average collection period should be 30 to 60 days at most). Efforts by the company and its outside contractor to collect amounts owed in a timely fashion should be measured against this objective standard.

Personnel Activities

Full-time Employees	56
Part-time Employees	0
Employees per 1,000 Persons Served	2.1
Employees per 1,000 Connections	7.31
Water Produced per Employee	123 m^3/day
Water Billed per Employee	95 m^3/day
Percent Personnel Costs/Operating Costs	38.9

Box 6

PERSONNEL STATISTICS AND INDICATORS

- *Personnel Analysis*—While the complement of 56 full-time employees is the smallest among the combined water/sewer utilities studied, the ratio of 7.31 full-time employees per thousand water and sewer connections is the highest. The ratio of full-time staff per thousand population reached at 2.1 is the second highest. Staffing to length of pipe is not available. Given the information we have, two ratios indicate that the Azogues utility is inefficiently and slightly over-staffed.

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). Health data on the specific coverage area of this utility was not readily available from published sources.

Recommendations

- *Financial*

  The Azogues water and sewer utility should benefit from:

  1. A study and follow-up effort to reduce unaccounted-for water.
  2. Performance in collecting accounts receivable must be improved.

- *Operational*

  1. Verify the quantity of water produced, preferably through the installation of master meters.

- *Personnel*

  1. Azogues should study its staffing level to determine where cuts can be reasonably made to increase personnel efficiency.
  2. This study should be part of a work simplification study to determine how tasks can be handled more efficiently.

PROFILE 7

EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE IBARRA (EMAPA—IBARRA)
Ibarra, Ecuador

Services Offered: Water and Sewer

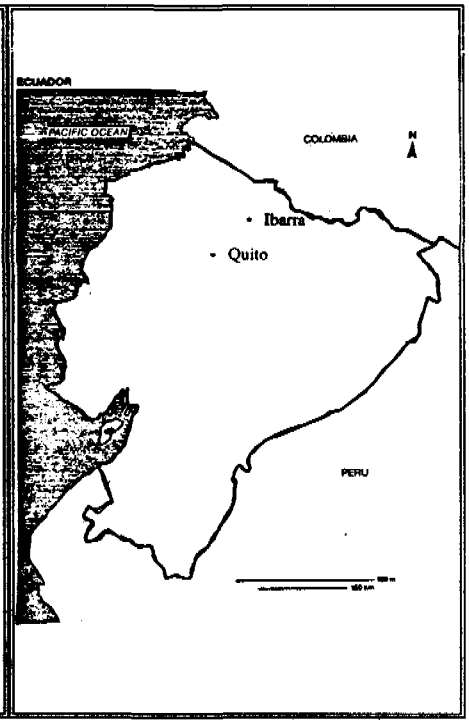
Population in Service Area
Water: 94,600
Sewer: 85,200
Population Served
Water: 94,100
Sewer: 74,320

Daily Water Production: 31,968 m^3
Daily Production Billed: 23,976 m^3

Daily Wastewater Collection: 27,173 m^3

Full-time Staff: 144

Annual Revenue: 490,000,000 Sucres
Annual Costs: 518,000,000 Sucres (1991)



Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Agua Potable y Alcantarillado de Ibarra (EMAPA—IBARRA) is located in Ibarra, a city in northern Ecuador approximately 115 kilometers northeast of Quito. The utility provides water to 94,100 people and sewer services to 74,320 people in Ibarra Canton, with a total service areas extending over 21 square kilometers for water and 17 square kilometers for sewage. See Box 1 for additional base data.

EMAPA-IBARRA recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EMAPA-IBARRA can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMAPA—IBARRA states that it reaches the operational goals of serving a specific geographical area, improving health conditions, providing clean water and sewage collection, achieving financial autonomy, and meeting service targets in terms of population reached and level of coverage.
- *Contracted Services*—EMAPA—IBARRA contracts 5 percent of its construction activities to outside firms. The utility also contracts out for 20 percent of the studies it conducts.
- *Investment Sources*—Sixteen percent of the funding for capital investments is self-financed. An additional forty-three percent is obtained through agreements with the municipal government and other organizations. No other sources of investment funds were listed.
- *Billing*—For water supply, EMAPA—IBARRA has an incremental billing system based on consumption, with separate rate scales for residential and commercial customers. Rates for sewer services also differ between residential and commercial customers, and are assessed based on fifty percent of the total water consumption. Approximately 90 percent of the billed sales are collected in each monthly billing period.
- *Health Data*—No health data was provided by utility.

Operational Activities

- *Operational Analysis*—EMAPA provides water service to 94,100 inhabitants which is 99 percent coverage of its water service area; the utility provides 74,320 inhabitants or 87 percent coverage for sewer. The population densities for its water service and sewer service area are 4,406 and 4,951 people/km^2 respectively.

  The total water production by EMAPA is 31,968 m^3/day. The metered production accounts for 100 percent of this production. EMAPA has UFW of 7,992 m^3/day which is 25 percent of total production. Total water connections, 16,168, consist of 13,760 metered connections and 2,408 connections which are unmetered. The metered connections make up 85 percent of total connections.

Population of Service Area (water)	94,600
Population of Service Area (sewer)	85,200
Population Served (water)	94,100
Population Served (sewer)	74,300
Service Area (water) (km^2)	21
Service Area (sewer) (km^2)	17
Total Water Production (m^3/day)	31,968
Estimated Unaccounted for Water (UFW) (m^3/day)	7,992
Metered Water Production (m^3/day)	31,968
Billed Water Production (m^3/day)	23,976
Estimated Total Water Connections	16,168
Metered Residential Connections	13,315
Total Metered Water Connections	13,760
Total Water Consumption (m^3/day)	ND
Metered Residential Consumption (m^3/day)	14,648
Metered Consumption (m^3/day)	16,972
Estimated Sewage Collection (m^3/day)	27,173
Sewage Connections	13,750
Total Connections (W+S)	29,918

ND = No data was submitted on survey

Box 2

OPERATIONAL STATISTICS

The metered consumption is 16,972 m^3/day. There is no data on total consumption. The lack of data on total consumption is surprising. Given that only 15 percent of connections are unmetered, some estimate of total consumption should be made by the utility given their knowledge of the types of unmetered connections, unless a majority of their connections are illegal. The lack of estimates of total consumption casts doubts on estimates of UFW. The unit demand at metered residential connections is 1.10 m^3/connection/day.

- *Sewage collection and treatment*—The utility services 13,750 sewage connections by which 27,173 m^3 of sewage is collected per day; none of the sewage is treated.

Population Density (people/km^2 water service area)	4,406
Population Density (people/km^2 sewer service area)	4,951
Percent Service Coverage (water)	99
Percent Service Coverage (sewer)	87
Percent Metered Production/Total Production	100
Percent UFW	25[1]
Percent Metered Connections/Total Connections	85
Percent Metered Consumption/Total Consumption	N/A
Unit Residential Demand (m^3/connections/day)	1.10[2]

[1] Percent UFW taken as total production less the billed production; rather than total production less total consumption as data on total consumption was not available.

[2] Unit demand is calculated by dividing metered residential consumption by number of metered residential connections.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

Financial Activities

Salient financially related statistics for the year 1991 follow:

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  The Ibarra utility water production is metered but only 23,976 m^3 per day, or 75 percent, of the production is billed. On the consumption side, 85.1 percent of the utilities 16,168 water connections are metered. Unbilled production is 7,992 m^3 per day, 25 percent of production, which amounts to 2.9 million m^3 per year. This has a negative impact on operating performance. Revenues received on billed production, S230 million, results in a price calculation of S26.3 per m^3 of water. On this basis, we can calculate the opportunity cost of the unbilled production at S76.7 million annually.

Total Overall Revenues	S490 million
Total Operating Costs	S518 million
Deficit	(S28 million)
Deficit as Percent of Revenues	5.7
Total Operating Revenue per Capita Served Population	S3,772
Total Operating Revenue per Connection	S11,866
Total Operating Revenues per m^3 Produced	S30.4
Total Operating Revenues per m^3 Billed	S40.6
Total Cost	S518 million
Total Cost per Capita Served Population	S5,504
Total Cost per Connection	S17,314
Total Operating Costs	S518 million
Total Operating Cost per m^3 Produced	S44.4
Total Operating Cost per m^3 Billed	S59.2
Operating Ratio (total cost/total revenues)	1.06
Working Ratio (operating cost/operating revenues)	1.46

Box 4

FINANCIAL STATISTICS AND INDICATORS

The calculated deficit of S28 million on overall revenues of S490 million, or 5.7 percent, is not worrisome. However, the operating deficit of S163 million, or 45.9 percent of revenues, gives cause for concern. This is the weakest statistic in what is otherwise a reasonable financial picture. Much depends on the stability and source of the S135 million in revenue not accounted for by either water or sewer service or connection fees.

The financial condition of the company is good in terms of its cash position and the collection of its receivables. Liquidity to meet operating costs (liabilities are inconsequential) is present with ample margin. The data does not contain information relating to fixed assets, so one cannot assess the status of plant and equipment nor the total size of the balance sheet. However, work relating to construction is partially contracted-out; during 1991, S88 million was spent on outside contracts, so one presumes that the plant is being expanded or modernized.

Cash	S 101 million
Accounts Receivable	S 77 million
Inventory	S 114 million
Current Assets	S 292 million
Work in Progress	S 10 million
Plant and Equipment	N/A
Total Assets	N/A
Current Liabilities	S 1 million
Total Liabilities and Capital	N/A
■ ■ ■	
Quick Ratio (cash + receivables/liabilities)	158
Current Ratio (current assets/current liabilities)	258
Cash Coverage of Total Costs	71 days
Cash + Receivables Coverage of Total Costs	125 days
Asset Turnover (total revenue/total assets)	N/A
A/C Receivable Turnover	6.4
Average Collection Period	57 days

Box 5

BALANCE SHEET: STATISTICS AND INDICATORS

Personnel Activities

- *Personnel Analysis*—EMAPA-IBARRA employs 144 full-time employees which is a ratio of 4.81 per thousand water and sewer connections. There are 1.4 employees per thousand meters of pipe, and 1.5 employees per thousand population (water) served. Personnel costs of S198 million are 38 percent of operating costs, among the lower of the combined utilities under study.

  While apparently not overstaffed, poor operating results indicate that both the revenue and the cost side of the operating deserve study. Therefore, the personnel situation should be examined to see if and where efficiencies can be made.

Full-time Staff	144
Part-time Staff	0
Employees per 1,000 Person Served	1.5
Employees per 1,000 Connections	4.81
Water Produced per Employee	222 m^3/day
Water Billed per Employee	167 m^3/day
Percent Personnel Costs/Operating Cost	38.2

Box 6

PERSONNEL STATISTICS AND INDICATORS

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). Health data on the specific coverage area of this utility was not readily available from published sources.

Recommendations

- *Operational*
  1. Verify the quantity of water consumed to obtain a better estimate of consumption, move to install more meters.
  2. Determine a course of action to reduce UFW.
- *Financial*
  1. Perform revenue and cost studies to reduce the operating deficit.
  2. Identify sources of revenue for investment funding. About 40 percent of funding for investment is unidentified.
- *Staffing/Personnel*
  1. Within an overall study of revenues and costs, study staffing to see if cost reductions can be made

PROFILE 8

EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE SANTO DOMINGO DE LOS COLORADOS (EMAPA–SD)

Santo Domingo de los Colorados, Ecuador

Services Offered: Water and Sewer

Population in Service Area
Water: 115,000
Sewer: 115,000

Population Served
Water: 72,645
Sewer: 48,160

Daily Water Production: 21,168 m^3
Daily Production Billed: 15,876 m^3

Daily Wastewater Collection: 16,934 m^3

Full-time Staff: 92

Annual Revenue: 326,086,000 sucres
Annual Costs: 340,921,000 sucres (1991)

Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Agua Potable y Alcantarillado de Santo Domingo de los Colorados (EMAPA—SD) is located in Santo Domingo de los Colorados, a city in north central Ecuador approximately 130 kilometers west of Quito. The utility provides water to 72,645 people and sewer services to 48,160 people in the city of Santo Domingo and surrounding areas within Pichincha province. The total service area for water supply and sewer extend approximately 30 square kilometers. See Box 1 for additional base data.

EMAPA-SD recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EMAPA-

SD can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMAPA—SD states that it reaches the operational goals of providing clean water and achieving fiscal autonomy. It currently works for, but does not attain the goals of serving a specific geographical area, improving health conditions, and meeting service targets in terms of population reached and level of coverage.
- *Contracted Services*—EMAPA—SD contracts with other firms for 100 percent of its billing and collections and 40 percent of its construction activities.
- *Investment Sources*—One hundred percent of the funding for capital investments is self-financed. No other sources of investment funds were listed.
- *Billing*—For water supply, EMAPA—SD has separate rate scales for residential/commercial, industrial, and public customers. Specific rates are determined by zone and type of service rather than volume of consumption. Rates for sewer services are assessed determined as a percentage of the total water bill. Approximately 75 percent of the billed sales are collected in each monthly billing period.
- *Health Data*—No health data was provided by utility.

Operational Activities

Population Density (people/km^2 water and sewer service areas)	3,833
Percent Service Coverage (water)	63
Percent Service Coverage (sewer)	42
Percent UFW	10.8[3]
Percent Metered Connections/Total Connections	N/A
Percent Unmetered Connections/Total Connections	100
Percent Metered Consumption/Total Consumption	N/A
Percent Unmetered Consumption/Total Consumption	100

[3] Percent UFW (unaccounted for water) is defined as total production less total consumption divided by total production.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

- *Operational Analysis*—The service areas and population are the same for water and sewer services preferred by EMAPA. In the 30 km^2 service area with a population of 115,000, 972,645 inhabitants or 63 percent have water service: 48,160 or 42 percent have sewer service.

Population of Service Area (water and sewer)	115,000
Population Served (water)	72,645
Population Served (sewer)	48,160
Service Area (water and sewer) (km^2)	30
Estimated Total Water Production (m^3/day)	21,168
Unaccounted for Water (UFW) (m^3/day)	2,279
Estimated Total Water Connections	14,529
Total Metered Water Connections	— [1]
Estimated Unmetered Water Connections	14,529
Total Water Consumption (m^3/day)	18,889[2]
Unmetered Consumption (m^3/day)	18,889[2]
Estimated Sewage Collection (m^3/day)	16,934
Sewer Connections	9,632
Total Connections (W+S)	24,161

[1] The questionnaire indicates the presence of 1000 installed meters in the city of Santo Domingo; however, these meters are not functioning. There are no other metered connections indicated in the system.

[2] The questionnaire indicated that the estimate for unmetered consumption (total consumption) is based on the number of connections.

Box 2

OPERATIONAL STATISTICS

The total water production by EMAPA-SD is 21,168 m^3/day, which is not metered. Based on the supplied production and consumption data, the UFW is 2,279 m^3/day which accounts for only 10.8 percent of total production. This is an absurdly low figure. The lack of meters on production sources and water connections makes this figure very suspect.

Total connections, 14,529, are all unmetered as the utility does not have functioning metered connections. However, the total consumption is estimated at 18,889 m^3/day.

- *Sewage collection and treatment*—EMAPA services 9,632 sewage connections by which 16,934 m^3 of sewage is collected per day; none of the sewage is treated.

Financial Activities

Salient financially related statistics for the year 1990 follow:

- *Financial Analysis*—EMAPA-SD operates its water service without metering at either the production or consumption ends. They estimate that 5,292 m^3 per day, or 25 percent of production, is unbilled. Revenues of S120 million on water sales alone calculate to a price of S20.7 per m^3 of billed water production. The 5,292 m^3 per day unbilled production results in lost revenues to EMAPA SD of S40 million.

Total Overall Revenues	S326 million
Total Operating Costs	S341 million
Deficit	S 15 million
Deficit as Percent of Revenues	4.6
Total Operating Revenue per Capita Served Population	S 3,604
Total Operating Revenue per Connection (W&S)	S10,837
Total Operating Revenues per m^3 Produced	S 33.8
Total Operating Revenues per m^3 Billed	S 45.2
Total Costs	S341 million
Total Costs per Capita Served Population	S 4,694
Total Costs per connection (W&S)	S14,114
Total Operating Costs	S341 million
Total Operating Costs per m^3 Produced	S 44.1
Total Operating Costs per m^3 Billed	S 58.8
Operating Ratio (total cost/total revenue)	1.05
Working Ratio (operating cost/operating revenue)	1.30

Box 4

FINANCIAL STATISTICS AND INDICATORS

The S15 million deficit of costs over revenues, 4.6 percent, indicates adequate pricing of services from the information available. The S326 million revenue flow is comprised of 43.4 percent connection fees, 36.9 percent water and sewer service sales, and 19.7 percent non-water/sewer revenues. There is an apparent opportunity to increase sales indicated by the relatively low level of penetration of the service area, 63 percent for water and 42 percent for sewer service respectively. IMAPA SD is not in an ideal position to take-on debt to expand its services due to operating losses, however growth is taking place as evidenced by the sizable connection fees shown. Increasing service coverage should be a high priority of the utility.

The financial condition of the balance sheet cannot be determined without information on accounts receivable. However, the cash position appears healthy in relation to both the stated liabilities and the level of operating costs (102 days coverage).

Cash	S 96 million
Accounts Receivable	N/A
Inventory	S 70 million
Current Assets	S166 million
Plant and Equipment	S 64 million
Total Assets	S230 million
Long-term Liabilities	S 3 million
Total Liabilities and Capital	S227 million
■ ■ ■	
Quick Ratio (cash + receivables/liabilities)	N/A
Current Ratio (current assets/current liabilities)	N/A
Cash Coverage of Total Costs	102 days
Cash + Receivables Coverage of Total Costs	102 days
Asset Turnover (total revenue/total assets)	1.42
A/C Receivable Turnover	N/A
Average Collection Period	N/A

Box 5

BALANCE SHEET: STATISTICS AND INDICATORS

Personnel Activities

- *Personnel Analysis*—EMAPA SD has 92 full-time employees and 1 part-time employee. There are 1.3 full-time employees per 1,000 population reached, and 3.81 employees for each 1,000 combined water and sewer connections. There are 1.6 full-time employees per each 1,000 meters of pipe installed. Personnel costs of S177 million are 52 percent of total operating costs.

  While not the lowest among the combined water/sewer utilities studied, EMAPA—SD holds the middle ground in its indicators. However, if it is to increase area coverage, it should do so while retaining or improving present personnel efficiency.

Full-time Employees	92
Part-time Employees	1
Employees per 1,000 Persons Served	1.3
Employees per 1,000 Connections	3.81
Water Produced per Employee	230 m^3/day
Water Billed per Employee	173 m^3/day
Personnel Costs/Operating Costs	52

Box 6

PERSONNEL STATISTICS AND INDICATORS

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Santo Domingo de los Colorados was 44.8 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989,* INEC, Quito, Ecuador).

Recommendations

- *Operational*—Based on the very low UFW percentage of total production of 10.8 percent the data supplied on production and consumption is suspect. Metering to estimate the consumption per connection for the different sectors should be introduced as soon as possible. The initial data could be used to develop a baseline which may allow for a more accurate estimate of consumption.
- *Financial*
  1. EMAPA-SD must create and implement an expansion plan to increase the coverage of its service area. This will include all technical and financial considerations.
  2. Clarify the position on the balance sheet of accounts receivable. The situation is confused as the utility appears to finance all capital assets though long-term liabilities appear low.
- *Personnel Issues*—That EMAPA—SD keep a personnel efficiency in mind as it undertakes its major study to increase area service coverage which is the primary unmet responsibility of the firm.

PROFILE 9

DEPARTAMENTO MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE RIOBAMBA (DMAPAR)
Riobamba, Ecuador

Services Offered: Water and Sewer

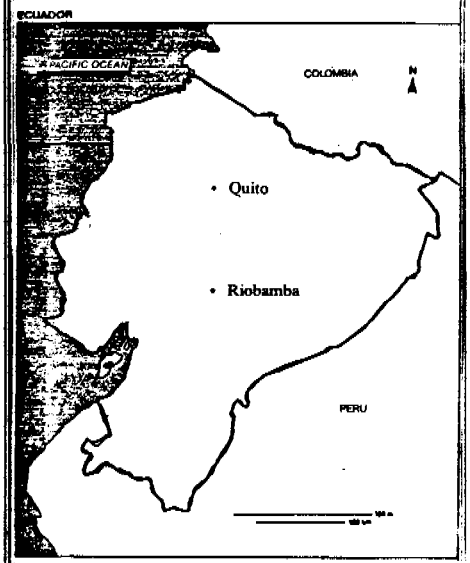
Population in Service Area
Water: 120,000
Sewer: 115,000
Population Served
Water: 114,000
Sewer: 90,000

Daily Water Production: 50,000 m^3
Daily Production Billed: 25,000 m^3

Daily Wastewater Collection: 17,500 m^3

Full-time Staff: 80

Annual Revenue: n/a
Annual Costs: n/a



Box 1

GENERAL STATISTICS

General Description

The Departamento Municipal de Agua Potable y Alcantarillado de Riobamba (DMAPAR) is located in Riobamba, a city in central Ecuador approximately 188 kilometers south of Quito. The utility provides water to 114,000 people and sewer services to 90,000 people in the Riobamba area. The total service area extends 25 square kilometers for water supply and 19 square kilometers for sewer. See Box 1 for additional base data.

DMAPAR recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of DMAPAR can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—DMAPAR states that it reaches the operational goals of serving a specific geographical area, improving health conditions, providing clean water, and meeting service targets in terms of population reached and level of coverage. The utility is working for, but has not achieved financial autonomy.
- *Contracted Services*—DMAPAR contracts with other firms for 80 percent of its construction activities, and 100 percent of the studies it conducts.
- *Investment Sources*—No data given.
- *Billing*—For water supply, DMAPAR has separate rate scales for various categories of customers, including residential, commercial, industrial, and institutional. Users pay a flat fee for an initial amount and additional fees for each cubic meter beyond that limit. For example, residential customers pay 320 sucres for the first 30 m^3 per month, and 3.5 sucres for each additional m^3. Rates for sewer services are one half of the total charge for water. Approximately 75 percent of the billed sales are collected in each monthly billing period.
- *Health Data*—No health data was provided by utility.
- *Anomalies*—The number of residential water connections seem inordinately low; the number of indicated commercial connections outnumber them.

Operational Activities

- *Operational Analysis*—The Riobamba Municipal Department of Water Supply and Sewerage is the only Municipal Department contacted in the study to supply data on their water supply and sewerage service separately.

  DMAPA provides water service coverage to 95 percent or 114,000 out of 120,000 of the inhabitants in its water service area of 25 km^2; the population density of this area is 4,800 people/km^2. The utility provides sewer service coverage to 78 percent or 90,000 out of 115,000 of the inhabitants of the 19 km^2 sewer service area; the population density is 6,053 people/km^2.

Population of Service Area (water)	120,000
Population of Service Area (sewer)	115,000
Population Served (water)	114,000
Population Served (sewer)	90,000
Service Area (water) (km^2)	25
Service Area (sewer) (km^2)	19
Total Water Production (m^3/day)	50,000
Estimated Unaccounted for Water (UFW) (m^3/day)	25,000
Metered Water Production (m^3/day)	50,000
Billed Water Production (m^3/day)	25,000
Estimated Total Water Connections	20,011
Metered Residential Water Connections	6,369
Metered Water Connections	17,612
Total Water Consumption (m^3/day)	ND
Metered Residential Consumption	ND
Metered Consumption (m^3/day)	ND
Estimated Sewage Collection (m^3/day)	17,500
Sewage Connections	20,000
Total Connections (W+S)	40,011

ND—No data was supplied on survey

Box 2

OPERATIONAL STATISTICS

The total water production, 50,000 m^3 day, is metered. The UFW for DMAPAR is 25,000 m^3/day or 50 percent of indicated production.

Total water connections, 20,011, consist of 17,612 metered connections and 2,399 connections which are not metered. The metered connections account for 88 percent of total connections. There was no consumption data supplied in the survey.

- *Sewage collection and treatment*—The municipal department services 20,000 sewage connections by which 17,500 m^3 of sewage is collected per day, none of the sewage is treated.

Population Density (people/km^2 water service area)	4,800
Population Density (people/km^2 sewer service area)	6,053
Percent Service Coverage (water)	95
Percent Service Coverage (sewer)	78
Percent Metered Production/Total Production	100
Percent UFW	50[1]
Percent Metered Connections/Total Connections	88
Percent Metered Consumption/Total Consumption	N/A

[1] Percent UFW taken as total production less the billed production; rather than total production less total consumption as data on total consumption was not available.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

Financial Activities

Financial details were not provided in the questionnaire and therefore, the preparation of a financial analysis is not possible.

Personnel Activities

Full-time Employees	80
Part-time Employees	20
Employees per 1,000 Persons Served	0.7
Employees per 1,000 Connections	2.0
Water Produced per Employee	625 m^3/day
Water Billed per Employee	312 m^3/day
Personnel Costs/Operating Costs	N/A

Box 4

PERSONNEL STATISTICS AND INDICATORS

- *Personnel Analysis*—From the indicators shown above, one can assume that DMAPAR is among the most, if not the most efficient combined water/sewer utility studied.

However, without financial data to confirm these findings, we can only state that DMAPAR has the best personnel/technical ratios in the group.

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). Health data on the specific coverage area of this utility was not readily available from published sources.

Recommendations

- *Operational*—The amount of unaccounted for water at 50 percent is high. Steps should be taken to reduce UFW. This may include better metering of both production and consumption. Knowledge of this may help pinpoint problems of water loss.
- *Financial issues*—No recommendations were possible on financial issues due to lack of data.
- *Personnel*—No recommendations—see personnel analysis above.

PROFILE 10

EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE AMBATO (EMAPA—AMBATO)
Ambato, Ecuador

Services Offered: Water and Sewer

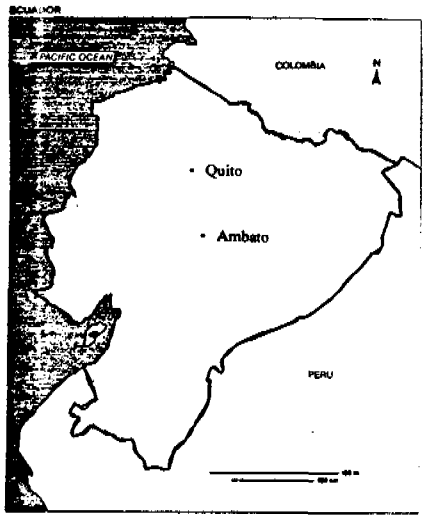
Population in Service Area
Water: 125,000
Sewer: 125,000
Population Served
Water: 109,000
Sewer: 76,300

Daily Water Production: 50,544 m^3
Daily Production Billed: 1,684 m^3

Daily Wastewater Collection: 35,000 m^3

Full-time Staff: 285

Annual Revenue: 1,255,836,238 Sucres
Annual Costs: 209,714,944 Sucres (1991)



Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Agua Potable y Alcantarillado de Ambato (EMAPA—AMBATO) is located in Ambato, a city in central Ecuador approximately 135 kilometers south of Quito. The utility provides water to 109,000 people and sewer services to 76,300 people with a total service areas extending over 13.5 square kilometers for water and 9.5 square kilometers for sewage. See Box 1 for additional base data.

EMAPA—AMBATO recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of

these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EMAPA—AMBATO can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMAPA—AMBATO states that it reaches the operational goal of providing clean water, while it is working for, but does not reach the goals of serving a specific geographical area, improving health conditions, achieving financial autonomy, and meeting service targets in terms of population reached and level of coverage.
- *Contracted Services*—EMAPA—AMBATO contracts 20 percent of its construction activities to outside firms. The utility also contracts for 20 percent of the studies it conducts.
- *Investment Sources*—Sixty-four percent of the funding for capital investments is self-financed. An additional 35 percent is obtained through government loans, and 1 percent is provided through direct government transfers.
- *Billing*—For water supply, EMAPA—AMBATO has an incremental billing system based on consumption, with separate rate scales for residential, commercial and industrial customers. Rates for sewer services are equivalent to the charges for water consumption.
- *Health Data*—No health data was provided by utility.
- *Anomalies*

  1. The service areas for water and sewer service are different yet the total indicated populations of the service area are the same.
  2. The indicated billed water production is only 3.3 percent of total indicated production. This percentage seems inordinately low in itself as well as compared to the other utilities.

Operational Activities

- *Operational Analysis*—EMAPA-A provides water service to 109,000 out of 125,000 inhabitants or 87 percent in its water service area of 13.8 km^2; it provides sewer service to 76,300 out of 125,000 inhabitants or 61 percent in the sewer service area of 9.7 km^2. The population densities in the water and sewer service areas are 9,032 and 12,887 respectively.

Population of Service Area (water)	125,000
Population of Service Area (sewer)	125,000
Population Served (sewer)	76,300
Population Served (water)	109,000
Service Area (water) (km^2)	13.8
Service Area (sewer) (km^2)	9.7
Estimated Total Production (m^3/day)	50,544
Metered Production (m^3/day)	ND
Total Water Connections	ND
Metered Residential Connections	19,771
Total Metered Water Connections	24,206
Total Water Consumption (m^3/day)	ND
Metered Residential Consumption (m^3/day)	20,049
Metered Consumption (m^3/day)	32,781
Estimated Sewage Collection (m^3/day)	35,000
Sewage Connections	19,365
Total Connections (W+S)	43,571[1]

ND—No data was provided in survey.

[1] As there is no data for total water connections, the number of metered water connections is used in calculations in place of total connections.

Box 2

OPERATIONAL STATISTICS

The total water produced by EMAPA-A is 50,544 m^3/day, however, the data provided in the survey on operational questions was insufficient to calculate several important indicators. For example, there is no data to determine whether total water produced is metered or unmetered production or a combination.

EMAPA services 24,206 metered connections and metered consumption is 32,781 m^3/day. The unti demand at metered residential connections is 1.01 m^3/connection/day. There is, however, no data on total number of connections, and there is no data on total consumption.

- *Sewage collection and treatment*—EMAPA services 19,365 sewage connections by which 35,000 m^3 of sewage is collected per day; none of the sewage is treated.

Population Density (people/km^2 water service area)	9,032
Population Density (people/km^2 sewer service area)	12,887
Percent Service Coverage (water)	87
Percent Service Coverage (sewer)	61
Percent UFW	— [2]
Metered Consumption/Total Consumption	N/A
Unit Residential Water Demand (m^3/conn/day)	1.01 [3]
Full-time Staff/1000 (W+S) Connections	6.5

[2] Percent UFW is not included as an indicator due to the absence of data on total consumption, and an unrealistically low quantity of billed water as indicated by the data.

[3] Unit demand is calculated by dividing metered residential consumption by number of metered residential connections.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

Financial Activities

Salient financially related statistics for the year 1991 follow:

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  In the overall, EMAPA Ambato reflects profitable operations. However, water and sewer operating revenues of S881 million related to costs, in effect the working ratio, reflects a deficit of S305 million, or 35 percent of revenues. Non-water or sewer related revenues of S365 million account for this difference between operating deficit and overall surplus.

  Ambato's small percentage of metered production, 3.3 percent, is an anomaly. At the consumption end, all water connections are metered. Calculations of metered production cost is irrelevant in the circumstance; however, we can arrive at a revenue of S73.6 per m^3 consumed versus a cost of S99.1 per m^3 consumed which describes the operating revenue/cost imbalance.

  The balance sheet is highly illiquid as reflected in the quick ratio and the cash coverage of total costs. Cash and accounts receivable do not give any cushion at all, on this particular day, and one must imagine that the utility will have to borrow from the municipality to cover the next payroll. On the other hand, inventory levels are high, even

Total Overall Revenues	S1,246 million
Total Overall Costs	S1,186 million
Profit	S 60 million
Profit as Percent of Revenues	4.8
Total Operating Revenue per Capita Served Population	S8,083
Total Operating Revenue per Connection (W&S)	S20,220
Total Operating Revenues per m^3 Produced	S 47.7
Total Costs	S1,186 million
Total Costs per Capita Served Population	S 10,880
Total Cost per Connection (W&S)	S 26,025
Total Operating Costs	S1,186 million
Total Operating Cost per m^3 Produced	S 64.3
Operating Ratio (total cost/total revenue)	0.95
Working Ratio (operating cost/operating revenue)	1.35

Box 4

FINANCIAL STATISTICS AND INDICATORS

exceeding work in progress. This could indicate that substantial cash purchases have been made to accommodate an expansion program since total liabilities are only 50 percent of inventory and work in progress combined.

The very small total of liquid assets, given the size of this utility, is puzzling, and leads one to suspect errors in completing the questionnaire.

Personnel Activities

- *Personnel Analysis*—Full-time staff at Ambato numbers 285; the utility also has 3 part-time employees. There are 6.54 employees per 1,000 connections, and 2.6 employees per 1,000 served population. There are 1.3 employees per 1,000 meters of water pipe. Personnel costs are 65 percent of total operating costs, high by comparison with most other utilities studied.

  There is little question that efficiencies can be made given this comparison with other combined utilities of similar size.

Cash	S 2 million
Accounts Receivable	S 3 million
Inventory	S 411 million
Current Assets	S 416 million
Work in Progress	S 299 million
Fixed Assets	S4,066 million
Total Assets	S4,781 million
Current Liabilities	S 355 million
Liabilities and Capital	S4,781 million
Quick Ratio (cash + receivables/liabilities)	0.014
Current Ratio (current assets/current liabilities)	1.172
Cash Coverage of Total Costs	0.6 days
Cash + Receivables Coverage of Total Costs	1.5 days
Asset Turnover (total revenue/total assets)	0.26
A/C Receivable Turnover	415
Average Collection Period	0.9 days

Box 5

BALANCE SHEET STATISTICS AND INDICATORS

Health

Health data is not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Canton Ambato was 58.2 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989,* INEC, Quito, Ecuador).

Recommendations

- *Operational*

  It would be difficult to draw conclusions from the data supplied. Data collection should be improved.

- *Financial*

  Likewise, the financial date may be suspect. However, management must introduce financial planning to assure adequate liquid assets to meet current obligations and operating costs.

Full-time Employees	285
Part-time Employees	3
Employees per 1,000 Persons Served[1]	2.6
Employees per 1,000 Connections[1]	6.5
Water Produced per Employee[1]	177 m^3/day
Water Billed per Employee[1]	5.9 m^3/day
Percent Personnel Costs/Operating Costs	65

[1] Full-time employees only

Box 6

PERSONNEL STATISTICS AND INDICATORS

- *Personnel*

  The Ambato utility must undertake a task analysis and work simplification study to determine where personnel efficiencies can be effected. This study should be performed by a contracted, not by in-house staff.

PROFILE 11

EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE MANTA (EMAPAM)

Manta, Ecuador

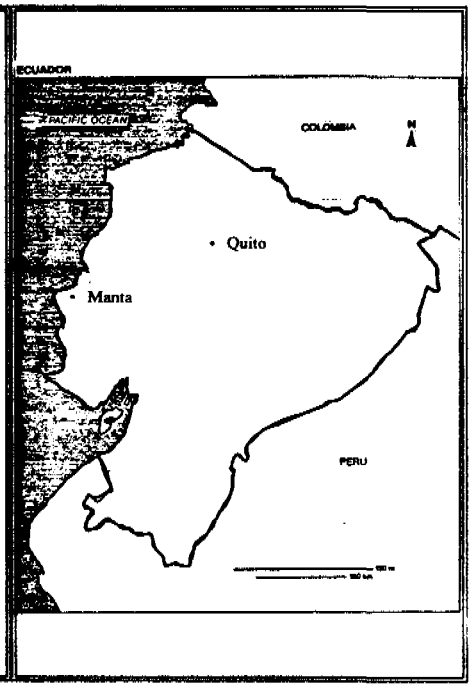
Services Offered: Water and Sewer
Population in Service Area
Water: 135,000
Sewer: 89,076
Population Served
Water: 135,000
Sewer: 59,073

Daily Water Production: 19,500 m^3
Daily Production Billed: 11,500 m^3

Daily Wastewater Collection: 5,000 m^3

Full-time Staff: 218

Annual Revenue: 644,217,106 sucres
Annual Costs: 629,457,036 sucres (1991 sucres)



Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Agua Potable y Alcantarillado de Manta (EMAPAM) is located in Manta, a city on the Pacific Coast of Ecuador approximately 390 kilometers southwest of Quito. The utility provides water to 135,000 people and sewer services to 59,073 people in the city of Manta and surrounding areas. The total service area for water supply and sewer extend approximately 30 square kilometers. See the box for additional base data.

EMAPAM recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of -

EMAPAM can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMAPAM states that it reaches the operational goals of improving health conditions, providing clean water and meeting service targets in terms of population reached and level of coverage. It currently works for, but does not attain the goals of serving a specific geographical area and achieving financial autonomy.
- *Contracted Services*—EMAPAM contracts with other firms for 80 percent of its operations and maintenance costs, 100 percent of its construction activities, and 100 percent of the studies it conducts.
- *Investment Sources*—90 percent of the funding for capital investments is self-financed, and 10 percent is obtained through private loans.
- *Billing*—For water supply, EMAPAM has separate rates for residential, commercial and industrial customers. Charges are based on a flat amount for each cubic meter of water within each customer category. Charges for sewer services are equal to 25 percent of the water bill in each of the categories. Approximately 50 percent of the billed sales are collected in each monthly billing period.
- *Health Data*—No health data was provided.

Operational Activities

- *Operational Analysis*—EMAPAM provides water service to 100 percent of the inhabitants and sewer service to 66 percent in each service area; this is 135,000 people in an unspecified water service area and 59,073 people in a sewer service area of 30 km^2. The population density in its sewer service area is 2,969 people/km^2.

  The total water production by EMAPAM is 19,500 m^3/day, however, the data provided in the survey on operational questions was insufficient to calculate several important indicators. For example, there is no data to determine whether total water produced is metered or unmetered production or a combination of both. The estimated UFW is 9,082 m^3/day which is 47 percent of daily production.

  EMAPAM services 15,147 metered connections, however, there is no data on total number of connections. Total consumption, 10,418 m^3/day, consists of 9,834 m^3/day of metered consumption and 583 m^3/day of unmetered consumption.

  The metered consumption accounts for 94 percent of total consumption.

  The unit demand at metered residential connections is 0.49 m^3/connection/day.

- *Sewage collection and treatment*—EMAPAM services 11,120 sewage connections by which 5,000 m^3 of sewage is collected per day; none of the sewage is treated.

Population of Service Area (water)	135,000
Population of Service Area (sewer)	89,073
Population Served (water)	135,000
Population served (sewer)	59,073
Service Area (water)	ND
Service Area (sewerage) (km^2)	30
Estimated Total Water Production (m^3/day)	19,500
Metered Water Production (m^3/day)	ND
Total Water Connections	ND
Metered Residential Connections	13,579
Metered Water Connections	15,147
Estimated Total Water Consumption (m^3/day)	10,418
Metered Residential Consumption (m^3/day)	6,667
Total Metered Consumption (m^3/day)	9,834
Estimated Unaccounted for Water (UFW) (m^3/day)	9,082
Estimated Sewage Collection (m^3/day)	5,000
Sewage Connections	11,120
Total Connections (W+S)	26,267[1]

ND—No data was submitted on questionnaire

[1] As there is no data for total water connections, the number of metered water connections are used in calculations in place of total connections.

Box 2

OPERATIONAL STATISTICS

Population Density (people/km^2 water service area)	N/A
Population Density (people/km^2 sewer service area)	2,969
Percent Service Coverage (water)	100
Percent Service Coverage (sewer)	66
Percent UFW	47[2]
Metered Consumption/Total Consumption	94
Unit Residential Water Demand (m^3/connection/day)	0.49[3]
Full-time Staff/1000 (W+S) Connections	8.3[1]

[1] As there is no data for total water connections, the number of metered water connections are used in calculations in place of total connections.

[2] UFW is defined as total production less total consumption divided by total production.

[3] Unit demand is calculated by dividing metered residential consumption by metered residential connections.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

Financial Activities

Salient financially related statistics for the year 1991 follow.

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  It is unclear if the Manta utility's water production is metered or not. Of daily production of 19,500 m^3, 59 percent, or 11,500 m^3 is billed. This leaves 41 percent, or 2.9 million m^3 per year, unbilled. Data indicates that all connections are metered at the consumption end. Sales revenues received on billed production of 4.2 million m^3 per year indicates a price of S122 per m^3. The opportunity cost of the 41 percent in unbilled water is substantial at these price levels.

Total Overall Revenues	S644 million
Total Overall Costs	S629 million
Profit	S 15 million
Profit as Percent of Revenues	2.3
Total Operating Revenues	S585 million
Total Operating Revenue per Capita Served Population	S4,336
Total Operating Revenue per Connection (W&S)	S22,271
Total Operating Revenues per m^3 Produced	S 82.2
Total Operating Revenues per m^3 Billed	S139.4
Total Costs	S629 million
Total Cost per Capita Served Population	S4,659
Total Cost per Connection (W&S)	S23,946
Total Operating Costs	S593 million
Total Operating Cost per m^3 Produced	S 83.3
Total Operating Cost per m^3 Billed	S141.3
Operating Ratio (total cost/total revenue)	0.98
Working Ratio (operating cost/operating revenues)	1.08

Box 4

FINANCIAL STATISTICS AND INDICATORS

Overall, Manta enjoyed a S15 million profit in 1991 as a result of S59 million in non-water or sewer revenues. In operating terms, costs exceeded revenues by S8 million, or 1.4 percent. Interest payments were S36 million, the difference between operating costs and total costs. Notwithstanding staffing which appears excessive in comparison with other utilities, performance is marginally acceptable; however, there does not appear to be sufficient profit to meet debt service from what one can tell.

The balance sheet reflects a tight liquidity situation for the size of the utility. Cash and accounts receivable are low compared with operating costs; it appears the company would be unable to meet a S13 million bi-weekly payroll if one were due currently. The re-creation of Manta's balance sheet is not possible due to the low value which can be assumed to represent work in progress and equipment compared with the current value of long-term debt representing, one assumes, work in progress and equipment purchases which have not yet been included in the books as fixed assets.

Cash	S 11 million
Accounts Receivable	S 8 million
Inventory	S 17 million
Current Assets	S 36 million
Work in Progress	S 48 million
Fixed Assets (without revaluation)	S 6 million
Total Assets	S 90 million
■ ■ ■	
Total Liabilities	S185 million
Quick Ratio (cash + receivables/liabilities)	14.5
Current Ratio (current assets/current liabilities)	27.7
Cash Coverage of Total Costs	6 days
Cash + Receivable Coverage of Total Costs	11 days
Asset Turnover (total revenue/total assets)	7.2
A/C Receivable Turnover	73.1
Average Collection Period	5 days

Box 5

BALANCE SHEET STATISTICS AND INDICATORS

Personnel Analysis

Manta employs 218 full-time staff and 2 part-time. This calculates to 8.3 full-time employees per 1,000 water and sewer connections, and 1.6 per 1,000 population served. There are 2.9 full-time employees per 1,000 meters of pipe in the water system. Personnel cost is S358 million, 60.4 percent of operating costs or 56.9 percent of total costs. These personnel-related indexes are among the highest for the combination water/sewer utilities covered by the survey. They are particularly high considering that, according to their response to the questionnaire, 80 percent of operations and maintenance activities are contracted out. Contract costs account for a further 20 percent of operating costs.

Full-time Employees	218
Part-time Employees	2
Employees per 1,000 Persons Served	1.6
Employees per 1,000 Connections	8.3
Water Produced per Employee	89 m^3/day
Water Billed per Employee	53 m^3/day
Percent Personnel Costs/Operating Costs	60

Box 6

PERSONNEL STATISTICS AND INDICATORS

Health

Health data are not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Canton Manta was 24.5 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989*, INEC, Quito, Ecuador).

Recommendations

- *Operational*

  1. The unaccounted for water is almost half of the water production, however there were significant data gaps. This has a negative impact in the level of service that EMAPAM is able to provide. Improving the maintenance of the waterlines and/or confirming water consumption amounts could reduce the UFW.

- *Financial*

  1. Data in general were insufficient to make full recommendations.
  2. Reduce level of unbilled water to increase revenues.
  3. Introduce improved financial management to increase liquidity and enhance ability to meet obligations.
  4. The creation of an overall financial plan would improve management's ability to move the utility forward.

- *Personnel*

  1. Serious study should be given Manta's staffing situation.
  2. In order to rationalize the high personnel and contracing costs incurred and to define which responsibilities are to be in-house and contracted out, a review of the entire utility should be undertaken immediately.

PROFILE 12

EMPRESA MUNICIPAL DE AGUA POTABLE Y ALCANTARILLADO DE ESMERALDAS (EMAPYA)

Esmeraldas, Ecuador

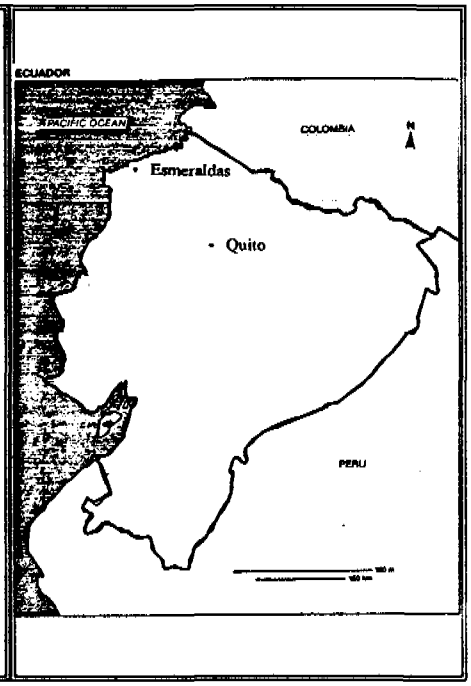
Services Offered: Water and Sewer
Population in Service Area
Water: 173,470
Sewer: 173,470
Population Served
Water: 104,000
Sewer: 50,709

Daily Water Production: 12,000 m^3
Daily Production Billed: 7,000 m^3

Daily Wastewater Collection: 8,400 m^3

Full-time Staff: 145

Annual Revenue: 319,335,000 sucres
Annual Costs: 405,790,707 sucres (1991 sucres)



Box 1

GENERAL STATISTICS

General Description

The Empresa Municipal de Agua Potable y Alcantarillado de Esmeraldas (EMAPYA) is located in Esmeraldas, a city on the northern Pacific Coast of Ecuador approximately 318 kilometers northwest of Quito. The utility provides water to 104,000 people and sewer services to 50,709 people in the city of Esmeraldas and surrounding areas. The total service areas extend 30 square kilometers for water supply and 18 square kilometers for sewer services. See the Box 1 for additional base data.

EMAPYA recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of performance indicators which can serve as a baseline against which future activities of EMAPYA can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—EMAPYA states that it reaches the operational goals of serving a specific geographical area, providing clean water, and meeting service targets in terms of population reached. It currently works for, but does not attain, the goals of improving health conditions, achieving financial autonomy, and meeting service targets in terms of level of coverage.
- *Contracted Services*—EMAPYA contracts with other firms for 30 percent of billing and collections activities.
- *Investment Sources*—Sixty percent of the funding for capital investments is self-financed; 39 percent is obtained through occasional transfers from the central government, and an additional 1 percent is obtained through private loans.
- *Billing*—For water supply, EMAPYA has separate rates for residential, commercial, industrial, and "official" customers, based on total consumption. Charges for sewer services are equal to 25 percent of the water bill in each of the categories. Approximately 60 percent of the billed sales are collected in each monthly billing period.
- *Health Data*—No health data was provided by utility.
- *Anomalies*—The populations of the water and sewer service areas are the same, yet the indicated areas of service are different.

Operational Activities

- *Operational Analysis*—The service areas for water and sewer service are 30 km^2 and 18 km^2 respectively. The utility provides water service to 104,000 or 60 percent of the total population of 173,470; the population density of the water service area is 5,782 people/km^2. EMAPYA provides 29 percent or 50,709 inhabitants out of 173,470 with sewer service; the population density of the sewer service area is 9,637 people/km^2.

Population of service area (water and sewer)	173,470
Population Served (water)	104,000
Population served (sewer)	50,709
Service Area (water) (km^2)	30
Service Area (sewer) (km^2)	18
Estimated Total Production (m^3/day)	12,000
Metered Production (m^3/day)	N/A
Estimated total Water Connections	ND
Total Metered Water Connections	9,659
Metered Residential Connections	7,561
Estimated Total Water Consumption (m^3/day)	12,000
Metered Residential Consumption (m^3/day)	4,694
Metered Consumption (m^3/day)	7,013
Estimated Sewage Collection (m^3/day)	8,400
Sewage Connections	7,244
Total Connections (W+S)	16,903[1]

ND—No data was submitted on questionnaire

[1] As there is no data for total water connections, the number of metered water connections are used in calculations in place of total connections.

Box 2

OPERATIONAL STATISTICS

The indicated total water production, 12,000 m^3/day, is unmetered. The unaccounted for water (total production—total consumption) is 0.0 based on indicated production and consumption data. Total consumption is given as 12,000 m^3/day (equal to production). The metered consumption is 7,013 m^3/day; there is no data for unmetered consumption. The metered consumption accounts for 58 percent of the total consumption. Unit demand at metered residential connections is 0.62 m^3/connection/day. Clearly the lack of metered production makes the calculation of several indicators suspect. EMAPYA services 9,659 metered connections. There is no data on total number of connections.

- *Sewage collection and treatment*—EMAPYA services 7,244 sewage connections by which 8,400 m^3 of sewage is collected per day; none of the sewage is treated.

Population Density (people/km^2 water service Area)	5,782
Population Density (people/km^2 sewer service Area)	9,637
Percent Service Coverage (water)	60
Percent Service Coverage (water)	29
Percent Metered Production/Total Production	N/A
Percent UFW	0.0[3]
Percent Metered Connections/Total Connections	N/A
Percent Metered Consumption/Total Consumption	58
Unit Residential Water Demand (m^3/connections/day)	0.62[2]

[2] Unit demand is calculated by dividing metered residential consumption by metered residential connections.

[3] Percent UFW is defined as total production less total consumption divided by total production.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

Financial Activities

Salient financially related statistics for the year 1991 follow.

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  Esmeraldas production of water is entirely unmetered. Billed production of 7,000 m^3 per day is 58 percent of their 12,000 m^3 per day total production. The opportunity cost in unbilled production at S36.4 per m^3 is S66.4 million over a year. According to the questionnaire, all connections are metered, so the consumption end is well controlled.

  The overall deficit of Esmeraldas' operations is S87 million, or 27 percent of revenues. As there are an unexplained S227 million of non-water/sewer revenues, the operating figures are tragic. The operating deficit is S313 million, 336 percent of operating revenues. One must believe that the non-operating revenue figure is in some way related to operations.

Total Overall Revenues	S319 million
Total Overall Costs	S406 million
Deficit	S 87 million
Deficit as Percent of Revenues	27
Total Operating Revenues	S 93 million
Total Operating Revenue per Capita Served Population	S894
Total Operating Revenue per Connection (W&S)	S5,505
Total Operating Revenues per m^3 Produced	S 21.3
Total Operating Revenues per m^3 Billed	S 36.4
Total Cost	S 406 million
Total Cost per Capita Served Population	S3,903
Total Cost per Connection (W+S)	S24,019
Total Operating Costs	S 401 million
Total Operating Cost per m^3 Produced	S 91.5
Total Operating Cost per m^3 Billed	S156.9
Operating Ratio (total cost/total revenue)	1.27
Working Ratio (operating cost/operating revenue)	4.37

Box 4

FINANCIAL STATISTICS AND INDICATORS

As described, the company cannot produce the resources internally to carry stable operations and service debt to permit growth. The utility does claim to finance 60 percent of funding for capital investments. It is clear there is an error in the data as collected.

The utility's balance sheet shows a shortage of cash with respect to operating cost requirements as the major problem. Current liabilities will be repaid from the collection of accounts receivable and are not a problem. However, there is no long-term debt, no work in process, apparently no expansion of facilities taking place at this time. Service coverage of 60 percent in water delivery and 29 percent in sewer service cannot be improved until the company is capitalized and put its operations on a near profitable or profitable basis.

Cash	S 1 million
Accounts Receivable	S 140 million
Inventory	S 270 million
Current Assets	S 411 million
Fixed Assets	S 270 million
Total Assets	S 681 million
Current Liabilities	S 12 million
Total Liabilities and Capital	S 681 million
■ ■ ■	
Quick Ratio (cash + receivables/liabilities)	11.7
Current Ratio (current assests/current liabilities)	34.2
Cash Coverage of Total Costs	0.9 days
Cash + Receivables Coverage of Total Costs	126 days
Asset Turnover (total revenues/total assets)	0.46
A/C Receivable Turnover	2.28
Average Collection Period	160 days

Box 5

BALANCE SHEET STATISTICS AND INDICATORS

Personnel Activities

- *Personnel Analysis*—Esmeraldas operates with 145 full-time staff, a ratio of 8.6 per 1,000 connections and 1.4 for each 1,000 of the population served. The ratio of employees per 1,000 meters of water pipe installed cannot be calculated. Personnel costs of S317 million are 78 percent of total costs and 79.1 percent of operating costs. These are the highest among the combined water/sewer utilities providing information to the survey.

  The financial analysis section of this report advises that Esmeraldas receive a thorough review. The utility is unable to provide adequate service due to its inability to finance an expansion program. The staffing situation should be given a thorough review as a part of this study.

Full-time Employees	145
Part-time Employees	0
Employees per 1,000 Persons Served	1.6
Employees per 1,000 Connections	8.6
Water Produced per Employee	53 m^3/day
Water Billed per Employee	23 m^3/day
Percent Personnel Costs/Operating Costs	79

Box 6

PERSONNEL STATISTICS AND INDICATORS

Health

Health data are not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Canton Esmeraldas was 69.5 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989,* INEC, Quito, Ecuador).

Recommendations

- *Operational*—It is evident that the estimate of total consumption was based on total production (or vice versa). In order to effectively analyze the performance of the utility the survey data collection should be clarified.
- *Financial*—If the financial data collected is indicative of operations and not in error, then the operations of EMAPYA are such that an outside team of specialists should perform a top-to-bottom analysis of Esmeraldas' operations. The utility appears moribund with an important percentage of the service area unattended. The operations are in serious deficit, and a full restructuring of the utility appears to be in order.
- *Personnel*—The staffing situation should receive a thorough analysis as a part of the overall study of the utility which is recommended in the Financial Analysis section of this report.

PROFILE 13

EMPRESA PUBLICA MUNICIPAL DE TELEFONOS, AGUA POTABLE Y ALCANTARILLADO DE CUENCA (ETAPA)

Cuenca, Ecuador

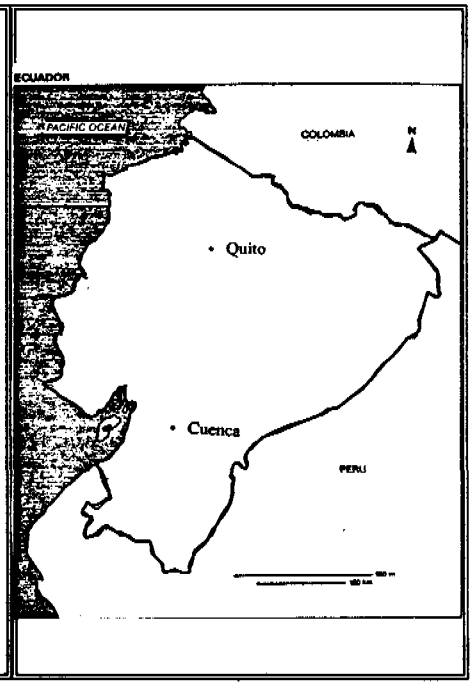
Services Offered: Water, Sewer, Telephones
Population in Service Area
Water: 331,028
Sewerage: 331,028
Population Served
Water: 240,000
Sewerage: 188,600

Daily Water Production: 105,400 m^3
Daily Production Billed: 60,000 m^3

Daily Wastewater Collection: 79,400 m^3

Full-time Staff: no response

Annual Revenue: 932,346,510
Annual Costs: 1,711,304,693 (1990 sucres)



Box 1

GENERAL STATISTICS

General Description

The Empresa Publica Municipal de Teléfonos, Agua Potable y Alcantarillado de Cuenca (ETAPA) is located in Cuenca, a city in south central Ecuador approximately 440 kilometers south of Quito. The utility provides water to 240,000 people and sewer services to 188,600 people in Cuenca and the surrounding region, with a total service area extending over 3100 square kilometers. See the Box 1 for additional base data.

ETAPA recently completed an extensive questionnaire on its operational, financial and personnel activities for the period 1990-1991. Data on these activities and an analysis of these data are presented in the following sections. The analysis includes the development of

performance indicators which can serve as a baseline against which future activities of -ETAPA can be measured. The Profile concludes with some recommendations for improvements for the utility to consider.

- *Operational Goals*—ETAPA states that it reaches the operational goals of improving health conditions, providing clean water and meeting service targets in terms of population reached and level of coverage. It currently works for, but does not attain the goals of serving a specific geographical area, and achieving financial autonomy.
- *Contracted Services*—ETAPA contracts 90 percent of its billing services, 90 percent of its construction activities and 90 percent of its studies to outside firms.
- *Investment Sources*—Thirty-five percent of the funds for capital investments are self-financed. Thirty-two percent is obtained through government transfers, while an additional thirty-one percent is obtained through government loans. The final 2 percent is generated through an agreement with the municipal government.
- *Billing*—For water supply, ETAPA has a rate system based on water consumption, with separate rate scales for categories including residential and industrial customers. Rates per cubic meter ascend for greater consumption volumes. Approximately 96 percent of the billed sales are collected in each monthly billing period for water supply and 73 percent for sewer services. Billing for sewer services is equal to fifty percent of the water bill.
- *Health Data*—No health data was provided by utility.

Operational Activities

- *Operational Analysis*—The service area of ETAPA is 3,129 km^2 for both water and sewer services. The population density in their service area is 106 people/km^2. Water service is provided to 240,000 or 73 percent of the population service area population of 331,028; sewer service is provided to 188,600 inhabitants or 57 percent of the service area.

  The total water production by ETAPA is 105,400 m^3/day; 83,900 m^3/day or 80 percent of total production is metered. The UFW is for 37 percent of total production or 39,200 m^3/day.

  The total water connections are 44,600 and consist of 26,280 metered connections and 18,320 unmetered connections; metered connections account for 59 percent of total connections. Total consumption of 66,200 m^3/day is comprised of 45,700 m^3/day of metered consumption and 20,500 m^3/day of unmetered consumption.

Population of Service Area (water and sewer)	331,028
Population Served (water)	240,000
Population Served (sewer)	188,600
Service Area (water and sewer) (km^2)	3,129
Estimated Total Production (m^3/day)	105,400
Unaccounted for Water (UFW) (m^3/day)	39,200
Metered Production (m^3/day)	83,900
Estimated Total Water Connections	44,600
Metered Residential Connections	24,900
Total Metered Water Connections	26,280
Estimated Total Water Consumption (m^3/day)	66,200
Metered Residential Consumption (m^3/day)	37,000
Metered Consumption (m^3/day)	45,700
Estimated Sewage Collection (m^3/day)	79,400
Sewage Connections	27,200
Total Connections (W+S)	71,800

Box 2

OPERATIONAL STATISTICS

Population Density (people/km^2 water and sewerage service area)	106
Percent Service Coverage (water)	73
Percent Service Coverage (sewer)	57
Percent Metered Production/Total Production	80
Percent UFW	37[1]
Percent Metered Connections/Total Connections	59
Percent Metered consumption/Total Consumption	69
Unit Residential Water Demand (m^3/conn/day)	1.49[2]

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1 Percent UFW is defined as total production less total consumption divided by total production.

2 Unit demand is calculated by dividing metered residential consumption by number of metered residential connections.

Box 3

OPERATIONAL PERFORMANCE INDICATORS

From the data received, the metered consumption is 69 percent of the total consumption while the metered connections make up only 59 percent of total connections. This could indicate that those with metered connections are the larger consumers on a per connection basis. It could also show that much of the consumption is by unregistered/unknown connections; information on this consumption may not be included in the data. This would account for some of the 37 percent percent of water production that is unaccounted for. The unit demand at metered residential connections is 1.49 m^3/connection/day.

- *Sewage collection and treatment*—ETAPA services 27,200 sewage connections by which 79,400 m^3 of sewage is collected per day, none of the sewage is treated.

Financial Activities

Salient financially related statistics for the year 1990 follow:

- *Financial Analysis*—Lack of some data, vagueness of data reported, either because of interpretation by the utility or lack of specificity in the questionnaire, make it difficult to determine some indicators and reduce the credibility of others. The following paragraphs illustrate some of these problems.

  Cuenca, the largest of the combined water and sewer utilities studied, produces 105,400 m^3 of water daily, 79.6 percent of which is metered. At the consumption end, 58.9 percent of the 44,600 water connections are metered. With an operating cost of S41.4 per m^3 produced and operating revenues of S42.6 per m^3 billed, one can see that unaccounted for water (39,200 m^3/day) is costly. The additional revenues of S609 million would make a substantial difference in prospects for the company.

  The calculated deficit of S779 million, a deficit representing 84 percent of revenues, is not sustainable. Aside from opportunities lost through unaccounted-for water mentioned above, a review of tariffs is indicated along with the preparation of a cost-reduction plan. Furthermore, the un-served population of an estimated 91,000 people represents a substantial market in and of itself. If a meaningful portion of unaccounted-for water is reaching this population through un-metered standpipes, or through a secondary market, a study may show that individual un-served consumers may benefit if the utility were able to expand and formalize its service to this community.

Total Overall Revenues	S 932 million
Total Overall Costs	S 1,711 million
Deficit	S 779 million
Deficit as Percent of Revenues	84
Total Operating Revenues per Capita Served Population	S3,883
Total Operating Revenues per Connection (W&S)	S12,980
Total Operating Revenues per m^3 produced	S24.2
Total Operating Revenues per m^3 billed	S42.6
Total Cost	S 1,711 million
Total Cost per Capita Served Population	S 7,129
Total Cost per Connection (W&S)	S23,830
Total Operating Costs	S 1,592 million
Total Operating Cost per m^3 Produced	S 41.4
Total Operating Cost per m^3 Billed	S 72.7
Operating Ratio (total cost/total revenues)	1.84
Working Ratio (operating cost/operating revenues)	1.74

Box 4

FINANCIAL STATISTICS AND INDICATORS

Cash	S 93 million
Accounts Receivable	S 341 million
Inventory	S 413 million
Current Assets	S 847 million
Work in Progress	S 2187 million
Fixed Assets	S 520 million
Total Assets	S 3554 million
Current Liabilities	S 114 million
Total Liabilities and Capital	S 3554 million
■ ■ ■	
Quick Ratio (cash + receivables/liabilities)	3.8
Current Ratio (current assets/current liabilities)	7.4
Cash Coverage of Total Costs	20 days
Cash + Receivables Coverage of Total Costs	93 days
Asset Turnover (total revenue/total assets)	0.26
A/C Receivable Turnover	2.73
Average Collection Period	134 days

Box 5

BALANCE SHEET STATISTICS AND INDICATORS

Liquidity is marginally adequate according to this analysis. The collection of accounts receivable at 134 days should be improved upon. The project in progress at S1,573 million does not reflect itself in the liabilities side of the balance sheet. It is hopefully being financed by government transfer as the utility's resources are insufficient to finance the project otherwise.

Personnel Activities

Personnel data was omitted from the questionnaire.

- *Personnel Analysis*—No information was provided regarding the staffing of the Cuenca utility. However, personnel costs are given as S345 million which is 20 percent of total costs and 22 percent of operating costs. While precise details are not available, ETAPA

shows outside contract costs for water and sewer totalling S915 million. This equates to 53 percent of total costs and 57 percent of operating costs and shows a substantial reliance on contracting-out as a management cost-saving strategy.

Health

Health data are not routinely collected by this utility. The following was obtained through secondary sources. Enteritis and other diarrheal diseases were the primary causes of infant mortality in Ecuador in 1989, occurring at a rate of 7.19 per 1,000 live births nationally (WHO). In that year, the overall infant mortality rate in Canton Cuenca was 42.4 (deaths in the first year of life per 1,000 live births, based on data in *Anuario de Estadisticas Vitales; Nacimientos y Defunciones—1989*, INEC, Quito, Ecuador).

Recommendations

- *Operational*

  1. Unaccounted for water at 37 percent is high and steps should be taken to reduce it.
  2. Provide an indication of the percentage of meters that are not working; verify unregistered or unknown connections.

- *Financial*

  1. The Cuenca utility must have a thorough technical and financial study performed by outside experts to effect a reduction in the operating deficit.
  2. Clarification of the balance sheet should be obtained.

- *Personnel*

  To conform with the recommendations in the Financial Analysis portion of this report, obtaining and analyzing personnel data are essential.

Appendix B

RECOMMENDATIONS FOR FUTURE SURVEYS

Recommendations on the Implementation of Future Surveys

- Surveys should be undertaken periodically and preferably annually. To assist in making comparisaons, data from each of the utilities should be for the same year.
- Appropriate and timely presurvey arrangements should be made to facilitate the data collection process.
- Sufficient time should be allocated to a local consultant to assist the utilities in collecting their data to ensure consistent responses from the utilities.
- Efforts should be made to increase the number of utilities participating in the survey as it would broaden the data base and provide a more reliable determination of what constitutes norms for many of the indicators.
- Consider extending the survey to include utilities from surrounding countries. This would not only benefit utilities in those countries but extend the data basis to the region.
- Questionnaires should be revised to include additional information and to clarify those questions that have been misunderstood or are ambiguous. The utilities which participated in the survey also should be asked for their suggestions for improvement in the questionnaires.

Recommendations on the Questionnaires

During the period of analysis a number of problems were recognized in terms of gaps in the questions asked and possible misinterpretaion of the questions as stated. This led to the preparation of a list of recommendations on how the questionnaire could be revised to obtain more accurate and useful data. The survey consultant who worked in the data collection phase of the process and the consultants who performed the operational,financial, and personnel analyses of the data contributed to thes recommendations.

The preliminary recommendations are summarized below in the order in which the relevant topics appear in the questionnaire. "General Comments" identify content areas which could be added or modified, while "Revisions" address specific wording or format changes. A final section labeled "Additional Recommendations" discusses general issues affecting both financial and operational data collection. After the questionnaire is revised, it should be tested on a small sample before being implemented on a large scale.

Section I: Introductory Questions

General Comments

The survey question on terrain should be more specific as it has a significant impact on the operation/maintenance/expansion costs of the utility.

What is the terrain over the majority of service area? Include a listing of the following terrain types which can be circled: flat, hilly, very hilly, mountainous

Service Sector

The industrial sector should be included as a service sector in the questionnaires as opposed to including is as part of the commercial sector.

Revisions

Question 3.C. *Solid Waste*

The translation of solid waste would be more appropriate as "desechos solidos" rather than "desperdicios solidos".

Section II: (i) General Information

Revisions

Question 3. *Population Reached by Utility*

This question is so vague that it encourages such different interpretations by the utilities that it makes analysis difficult. Is it supposed to indicate the number of people that are served by the utility by means other than direct connections, or is it simply the difference between the total population of the service area and the population reached by the utility? There is also some difference in the questions asked in parts B and C pertaining to level of sanitation technologies employed. This should be standardized between the surveys.

This section could be reworded to clearly indicate the desired information, for example:
The second question could read:
How many of the above are served by served directly by pipe connections?
The third question (sewerage and combined utilities) could read:
How many of the remainder are served by the utility with septic tanks or other improved systems?
The third question (water utilities) could read:
How many of the remainder are served by the utility by means other than direct connections or improved systems?

Section II: (ii) Technical Information

General Comments

Connections:

The questions relating to type of connection were unclear to the coordinators who completed the questionnaire. This is likely the result of terminology which is not used among Ecuadoran utilities relative to the definition of water connections.

The number of connections could be defined as number of accounts or customers: One way to clarify what is meant is to give an example of an apartment building (which would be one account or connection if there is only one meter, or several accounts if each apartment has its own meter) This would be better than asking the individual utilities to define connections.

How are the number of unmetered connections determined? Are thay actual accounts or just estimated?

Unaccounted For Water (UFW):

Consultants performing both the financial and technical analyses emphasized the importance of determining UFW as a performance indicator. They therefore stressed

the need to obtain complete and accurate data on total production and consumption. Included should be a description of how unmetered consumption is estimated. Most respondents gave different numbers for the question about the percentage of produced water that was billed and another question about the amount of water consumption. Presumably they should be the same. The questionnaires should be adjusted to eliminate this conflict and ensure that the utilities know exactly what is being asked.

Sewage:

Additional questions could be included on sewage to obtain a better understanding of the utilities operation, such as:

- Does sewage collected include stormwater?
- What is the estimated percentage of the sewage collected that is stormwater?
- What is point of discharge of untreated sewage? river, ocean, lake etc, where is it going?
- What portion of sewage is used, agriculture?
- How is the quantity of sewage collected estimated?

Revisions

II,A,7 & II,C,7: *Production*

The section on production could be rewritten as follows:

Production:

- is production metered?
- quantity of metered production?
- quantity of unmetered production?
- How is unmetered production estimated?
- Quantity of total production?

II,B,9 & II,C,17: *Sewage Treatment*

This item could be misunderstood and does not account for a preliminary treatment step, such as screening. Possible rewording is as follows:

1. What percentage of total sewage collected is treated?
2. What percentage of total *treated* sewage has preliminary treatment as the only treatment process (describe process)?
3. What percentage of total *treated* sewage has primary treatment as final stage (definition)?
4. What percentage of total *treated* sewage has secondary treatment as final stage (definition)?
5. What percentage of total *treated* sewage has tertiary treatment as final stage (definition)?

Percentages in 2 through 5 should add to 100% of 1. These could also be left as volumes of total sewage and the ratios could be calculated from this raw data.

II,B,10 & II,C,18: *Collection Techniques*

It would be more appropriate to list the "Average percentage of yearly collections" as opposed to "Fraction of daily total collections" as collection by truck may only occur at certain times of the year.

II,B,11 and II,C,19: *Collection Accounts*
These could or do refer to houses. It may be easier to understand if "house" is included with "connections or accounts."

Section II: (iv) Financial Information

General Comments

1. Include a question on the amount of long-term debt due within the next year to be able to determine an ability to service debt.
2. Include specific questions on direct government transfers, how much they are and how they are accounted for, ie., if booked directly to capital or assigned "other income."
3. Request more information regarding other income (non-water and/or sewer).

Revisions

II,A, B, & C.iv.a: *Revenues*

There should be an added blank for "total other revenues" as there could be cases where the questions on specific revenue sources do not include all sources.

II,A, B, & C.iv.b: *Costs*

The cost questions should be set in order to easily calculate operating costs. i.e. depreciation and interest should be last.

II.A, B, & C.iv.c: *Assets/Liabilities*

They should be separated in the survey. Liquid assets should be first followed by the other assets. Liabilities should follow. There should be a question on total other liabilities.

II.A ,B, & C.iv.e: *Investment*

This question should call for amounts rather than percentages.

Section II: (v) Billing

II. A, B, & C.v: *Billing*

The questions on billing and tariff structure should conform to the answers submitted by the utilities with enough space for them to include their billing structure. A rate per sector format would supply more information.

Section III: Health Information

Data on health conditions is not collected by water and sewer utilities, and the health section of the questionnaire was generally not completed. The limited information presented in the utility profiles was collected from readily available secondary sources. More detailed health statistics are available and could be researched. This survey, however, is not the most appropriate instrument for collecting information on health.

Additional Recommendations

When the survey was implemented, it was found that the sources for much of the general and technical data provided were studies undertaken by the utilities. Some of these were quite recent while others were much older. Financial information comes from still different sources and must therefore be properly indexed. The questionnaire requests that all data be applicable to a single year. This should be emphasized during implementation of the survey, even though it may mean using older data. Because data from the utilities will reflect varying years, comparative analysis becomes less significant.
At the end of the questionnaire, a space should be provided for the name and signature of the individual who coordinated completion of the questionnaire.

Appendix C

UTILITY SURVEY

To The Respondent:

Thank you for taking the time to answer our survey. This survey is designed to collect data on the financial and managerial performance of your utility. This is part of a project sponsored by U.S.A.I.D. - Ecuador who is interested in understanding more about the performance of firms like yours.

The project has two basic parts, the first is the survey which you see in front of you. This survey is the first of an annual series which will be distributed and collected each year. The second part is a report which will be written to summarize the responses that you and other firms give to our questions.

The information on this survey will form the beginning of a file of data on your utility, as well as at least eight other utilities in your general region of Latin America. You will be receiving the results of this survey which we hope will give you a better look at your own performance as well as that of the other firms in your region.

The survey comes in three sections; here are some basic instructions.

Section One - Introductory Questions

This first section has some simple introductory questions such as the name of your facility, your location, what services you provide, etc.

* Everyone should answer these general questions

* Pay close attention to the instructions at the bottom of page one. You need answer only the part of the survey that covers your type of utility.

If you are only a water utility, answer part A) of section two alone.

If you are only a sewage utility, answer part B) of section two alone.

If you provide both water and sewage services, then answer part C) of section two alone.

Section Two - Questionnaire parts A, B, and C

Section Two is the main body of the questionnaire which contains all of the important questions about your operations. As noted above, you only need answer one of the three parts in section two. Things to pay attention to:

* Try to give data for the most current full year available.

* If you cannot answer the question, just leave a blank space.

* Try to give data from the same year throughout the entire survey. If this is not possible for some items, give the most current data you have and make a note which year it is from.

* If your utility is composed of several different plants, please give us the totals from your combined operations.

* If you are answering for a combined water and sewage utility, there are questions in Part C) which ask you to divide your costs, personnel, and assets between these two activities. If it is not possible for you to do this, then just fill in the "water" box for each question with the total.

* If your answer does not fit in the space given, write it on the back or on a separate sheet firmly stapled to the packet.

Section Three - Detachable Health Questionnaire

This third section is a detachable sheet which includes questions about general health conditions in your area.

- If you have reliable answers to these questions readily available, please fill in the blanks and send the form back with the rest of the survey.

- If you do <u>not</u> have reliable answers to these questions readily available, please detach the form and forward it to the local health authority who may be able to answer these questions. Have them fill in the answers and send it directly back to the address printed on the front of the sheet. Stress that the figures be given for the same year and region as the data from the water utility if possible.

- Please fill in the top two blanks with your utility's name and the year which your data is from.

This is the first time this particluar survey has been distributed. We would value highly all comments and criticisms that you have on this survey format. At the end of section II) space has been provided for you to respond directly about the survey.

Section I - Introductory Questions

1	Name of Authority	Give the full name and address of the facility or facilities represented here.						
2	Name of Service Region	Give the name of the city or region under jurisdiction of the Authority.						
3	Services Provided	Which services does the Authority provide?	Yes	No	Do you charge separately for this service? Yes	Do you charge separately for this service? No	Do you account separately for this service in your financial statements? Yes	Do you account separately for this service in your financial statements? No
		A) Water						
		B) Sewage						
		C) Solid Waste						
		D) Electricity						
		E) Gas						
		F) Telephone						
		G) Other (specify)						

Refer to the first part of question three to follow the instructions below.

If you answer YES to A) and NO to B)	GO TO: PART A: WATER FACILITY
If you answer NO to A) and YES to B)	GO TO: PART B: SEWAGE FACILITY
If you answer YES to A) and YES to B)	GO TO: PART C: COMBINED FACILITY
If you answer NO to A) and NO to B)	DO NOT FILL OUT THIS SURVEY

Section II - Part A: WATER UTILITY

) **GENERAL INFORMATION:**

For all of the following questions it is important that the information come from the same year. If it is for some reason impossible to do this for some data please note the year that the data comes from in the margin of the survey.

HE DATA GIVEN ON THIS SURVEY ARE FOR THE YEAR:_____

1	'Square area of Service Region	How large an area must the Authority serve with water? Give approximate area in square kilometers.	
2	Population of Service Region	Give the most recent estimate of the population of your service area (as defined on page one of this survey).	
		In which year was this estimate made?	
3	Population Reached by Water Authority	Give an estimate of the total number of people served by the Authority.	
		How many of these are served directly by connections?	
		How many are served by other means?	

			Yes	No
4	Source of Water			
		Do you purchase water from an outside supplier?		
		Do you own your own treatment facility?		
		If you purchase water, what percentage of total output is purchased water?		

					Are these goals regularly reached?	
5	Operating Targets	What are the operating goals set by the authority?	Yes	No	Yes	No
		To serve a certain geographical area				
		To improve health conditions				
		To provide clean water				
		To achieve financial autonomy				
		To serve a certain number of people				
		To achieve a targeted coverage level				
		Other (Specify)				

6	Contracted Services	Does the authority contract parts of its service to outside firms?	Yes	No	If yes, what percentage?
		Billing and Collections			
		Operations and Maintenance			

Section II - Part A: WATER UTILITY

) GENERAL INFORMATION: (continued)

6	continued		Yes	No	If yes, what percentage?
		Construction			
		Other: (specify)			
		Other: (specify)			

Section II - Part A: WATER UTILITY

i) **TECHNICAL INFORMATION:**

For all of the below figures seasonal amounts may vary widely. If this is true, use annual figures and divide by 365 to get daily averages and note that you have done this.

7	Metered Net Production	Give the average total water production delivered into the distribution network by the utility in m3/day. Combine metered and estimated unmetered production to get the total.	Metered	
			Unmetered	
			Total	
8	Billed Water Production	Of the total production above, give the total amount of water which is billed for -in m3/day.		
9	Total Length of Distribution Network.	Estimate the total length of distribution network piping, not including connection piping - in meters.		

10	Disinfection		Yes	No
		Does your water come pretreated from a supplier?		
		Do you disinfect your own water?		
		What fraction of total output is disinfected?		
		What fraction of total output is filtered?		
		How many days per year is disinfection done?		

11	Connection Type	How do you define water connections?	Yes	No
		Actual service connections to the network.		
		Billing accounts not necessarily related to physical service connections.		
		Other (please describe)		

12	Connection Information	For each of the following user classifications, give the total number of water connections as well as the number of connections which have meters (As of the end of the reported year.) **BUSINESS** - Include all forms of business enterprise which have water connections. (industry, stores, etc.) **RESIDENTIAL** - Include homeowners as well as rental dwellings. **GOVERNMENT AND INSTITUTIONS** - Include local, state, and national government users as well as schools.

Section II - Part A: WATER UTILITY

i) TECHNICAL INFORMATION (continued):

12	continued	BUSINESS	Number of Connections	
			Connections Metered	
		RESIDENTIAL	Number of Connections	
			Connections metered	
		GOVERNMENT AND INSTITUTIONS	Number of Connections	
			Connections metered	
		OTHER	Number of Connections	
			Connections metered	
		TOTAL	Number of Connections	
			Connections metered	

13 *Consumption*

Metered Consumption - give the amount of water consumed by all metered connections in each sub-group. (M3/day)*

Unmetered Consumption - estimate the amount consumed by all unmetered connections in each sub-group. (M3/day)*

Total Consumption - give the total of all water consumed by each sub-group including metered and unmetered connections. (M3/day)*

*(If your figures are for a different period give these and make a note)

BUSINESS	Metered Consumption	
	Unmetered Consumption	
	Total Consumption	
RESIDENTIAL	Metered Consumption	
	Unmetered Consumption	
	Total Consumption	
GOVERNMENT AND INSTITUTIONS	Metered Consumption	
	Unmetered Consumption	
	Total Consumption	

Section II - Part A: WATER UTILITY

ii) **TECHNICAL INFORMATION (continued):**

13	continued	OTHER	Metered Consumption	
			Unmetered Consumption	
			Total Consumption	
		TOTAL	Metered Consumption	
			Unmetered consumption	
			Total Consumption	

iii) **STAFFING:**

14	Full-time Staff	Give the annual total of all persons working within the utility, including: management, services, and all other full-time employees. Do not include part-time non-construction workers.	
15	Part-time Staff	Give the annual number of workers hired for part-time non-construction work. Do not include workers from outside contractors.	
16	Staff Turnover	Give the number of staff employee positions which became vacant during the year.	

iv) **FINANCIAL:**

iv) a) Income Statement: **Revenues**

17	Connection Fees Etc.	Annual total for all flat-rate charges including connection fees, maintenance charges, service charges etc.	
18	Annual Sales of Water	Annual total for all water sales not including the above flat-rate charges.	
19	Non-Water Revenue	Total revenue from operations and assets not associated with the sale of water.	
20	Total Revenue	Total of all revenues to the Water Authority for the year stated above.	
21	Collection Rate	Give the percentage of the total billed water sales collected per billing period.	

Section II - Part A: WATER UTILITY

v) b) Income Statement: Costs

22	Total Material and Equipment Costs.	Cost of all chemicals, fuels, and other materials.	
23	Total Personnel Costs	Include all salaries and wage payments for the year, and the cash value of all benefits such as insurance and pensions.	
24	Depreciation	Give total depreciation on the value of all fixed assets in place at the end of the year.	
25	Total Interest Payments	Calculate the total of all interest payments, both short-term and long-term, made during the year.	
26	Total Tax Bill	Give the total of tax payments to all local, state, and national governments made during the year.	
27	Total Contract Costs	Give the total of all payments made to contractors for work accomplished on behalf of the Authority during the year.	
28	Total Other Costs	Include all items not stated above.	
29	Total Costs	Include all items from above.	

v) c) From the balance sheet: Current Assets and Liabilities

30	Cash Assets	Value of all money held as cash or in bank accounts. (by year end)	
31	Credit Extended to Authority	Value of all short-term obligations with a lending period less than one year. (by year end)	
32	Debts Owed to Authority	Value of all accounts receivable. (by year end)	
33	Stocks	Value of all stocks of materials and non-capital equipment. (by year end)	
34	Work in Progress	Give the value of all unfinished projects. Include for example unfinished construction projects. (by year end)	

Section II - Part A: WATER UTILITY

iv) d) From the balance sheet: Long Term Assets and Liabilities

35	Long Term Liabilities	Total value of all credit extended to Authority for a a period of more than one year. (by year end)			
36	Gross Asset Value	Give the total value of existing stocks of assets. (by year end)			
		Is this calculation net of depreciation?	Yes	No	
	Please describe which method you use for this valuation. (historical cost, current cost, replacement cost, etc.)				

iv) e) Investment

37	Investment Finance	Give the percentage of total new investments at the Authority financed by each of the following sources.	Approximate Percentage
		Government Transfers	
		Government Loans	
		Private Loans	
		Self Finance	
		Foreign Loans	
		Foreign Donor Grants	
		Other (Specify)	

v) BILLING

38	Billing Period	How long is your billing period (one month, one quarter, one year, etc.)	

Section II - Part A: WATER UTILITY

BILLING (continued)

39	Tariff Structure	Which of the following types of charge structures does your facility use?		
		A) Flat charge not based on consumption volume.	Yes	No
		If yes, what is the amount of this charge? (enter 0 if no charge)		
		B) Constant rate per cubic meter consumed.	Yes	No
		If yes, what is this rate?		
		C) Ascending rates per cubic meter for greater consumption volumes.	Yes	No
		If yes, what is the minimum rate?		
		For what volume is the minimum rate charged?		
		What is the maximum rate?		
		For what volume is the maximum rate charged?		
		D) Descending rates per cubic meter for greater consumption volumes.	Yes	No
		If yes, what is the minimum rate?		
		For what volume is the minimum rate charged?		
		What is the maximum rate?		
		For what volume is the maximum rate charged?		

Section II - Part A: WATER UTILITY

) **BILLING (continued)**

39	continued	E) Varying rates per cubic meter depending on type of consumer.	Yes	No
		If yes, what is the minimum rate?		
		Please define the group for whom this rate applies.		
		What is the maximum rate?		
		Please define the group for whom this rate applies?		
	If you answered yes to more than one of the above please explain briefly.			

UESTIONS OR COMMENTS? Please write them here.

Section II - Part B: SEWAGE UTILITY

) **GENERAL INFORMATION:**

For all of the following questions it is important that the information come from the same year. If it is for some reason impossible to do this for some data please note the year that the data comes from in the margin of the survey.

IE DATA GIVEN ON THIS SURVEY ARE FOR THE YEAR:_____

1	Square area of Service Region	How large an area must the Authority serve with sewage collection and disposal? Give the approximate area in square kilometers.	
2	Population of Service Region	Give the most recent estimate of the population of your service area.(area as defined in the introductory questions of this survey)	
		In which year was this estimate made?	
3	Population Reached by Sewage Authority	Give an estimate of the total number of people served by the Authority.	
		What percentage of the above total are served directly by pipe collections?	
		What percentage of the total are served by septic tanks or other improved systems?	
		What percentage of the total are served by unimproved systems such as latrines or less modern systems?	

		What are the operating goals set by the authority?	Yes	No	Are these goals regularly reached? Yes	No
4	Operating Targets	To serve a certain geographical area				
		To improve health conditions				
		To provide sewage collection				
		To achieve financial autonomy				
		To serve a certain number of people				
		To achieve a targeted coverage level				
		Other (Specify)				

		Does the authority contract parts of its service to outside firms?	Yes	No	If yes, what percentage?
5	Contracted Services	Billing and Collections			
		Operations and Maintenance			

Section II - Part B: SEWAGE UTILITY

GENERAL INFORMATION: (continued)

			Yes	No	If yes, what percentage?
5	continued	Construction			
		Other: (specify)			
		Other: (specify)			

Section II - Part B: SEWAGE UTILITY

i) TECHNICAL INFORMATION:

For all of the below figures seasonal amounts may vary widely. If this is the case, use annual figures and divide by 365 to get daily averages and make a note that you have done this.

6	Total Sewage Collection	Give the estimated total cubic meters of raw sewage collected by the authority per day.	
7	Billed Sewage Collection	Of the total collection above, give the fraction which is billed for.	
8	Industrial Waste Collection	Of the total collection above, give the fraction which is industrial waste.	
9	Treatment	What fraction of total sewage collections is treated?	
		What fraction of total sewage treatment is primary? (treated by sedimentation)	
		What fraction of total sewage treatment is secondary? (treated by biological means)	
		What fraction of total sewage treatment is tertiary? (removal of chemical waste etc)	

10	Collection Techniques	Name the techniques by which sewage is most commonly collected by your authority.	Fraction of daily total collections.
	1	Piped Collection System	
	2	Truck Collection System - Septic Tanks etc.	
	3	Other (specify)	
11	Collection Accounts	Of the above techniques, how many connections or accounts do you have for each type?	Number of Connections or accounts.
	1	Piped Collection System	
	2	Truck Collection System	
	3	Other (specify)	

Section II - Part B: SEWAGE UTILITY

ii) STAFFING:

12	Total Full-time Staff	Give the annual total of all persons working within the utility, including: management, services, and all other full-time employees. Do not include part-time non-construction workers.	
13	Part-time Staff	Give the annual number of workers hired for part-time non-construction work. Do not include workers from outside contractors.	
14	Staff Turnover	Give the number of staff employee positions which became vacant during the year.	

v) FINANCIAL:

v) a) Income Statement: Revenues

15	Annual Sales of Collection Services	Annual total sales for sewage collection services.	
16	Non-Sewage Revenue	Total revenue from operations and assets not associated with the sale of sewage collections.	
17	Total Revenue	Total of all revenues to the Sewage Authority for the year stated above.	
18	Collection Rate	Give the percentage of the total billed water sales collected per billing period.	

v) b) Income Statement: Costs

19	Total Material and Equipment Costs.	Cost of all chemicals, fuels, and other materials.	
20	Total Personnel Costs	Include all salaries and wage payments for the year, and the cash value of all benefits such as insurance and pensions.	
21	Depreciation	Give total depreciation on the value of all fixed assets in place at the end of the year.	
22	Total Interest Payments	Calculate the total of all interest payments, both short-term and long-term, made during the year.	
23	Total Tax Bill	Give the total of tax payments to all local, state, and national governments made during the year.	

Section II - Part B: SEWAGE UTILITY

v) b) Income Statement: Costs (continued)

24	Total Contract Costs	Give the total of all payments made to contractors for work accomplished on behalf of the Authority during the year.	
25	Total Other Costs	Include all items not stated above.	
26	Total Costs	Include all items from above.	

v) c) From the balance sheet: Current Assets and Liabilities

27	Cash Assets	Value of all money held as cash or in bank accounts. (by year end)	
28	Credit Extended to Authority	Value of all short-term obligations with a lending period less than one year. (by year end)	
29	Debts Owed to Authority	Value of all accounts receivable. (by year end)	
30	Stocks	Value of all stocks of materials and non-capital equipment. (by year end)	
31	Work in Progress	Give the value of all unfinished projects. Include for example unfinished construction projects. (by year end)	

v) d) From the balance sheet: Long Term Assets and Liabilities

32	Long Term Liabilities	Total value of all credit extended to Authority for a a period of more than one year. (by year end)			
33	Gross Asset Value	Give the total value of existing stocks of assets. (by year end)			
		Is this calculation net of depreciation?	Yes	No	
	Please describe which method you use for this valuation. (historical cost, current cost, replacement cost, etc.)				

Section II - Part B: SEWAGE UTILITY

iv) e) Investment

34	Investment Finance	Give the percentage of total new investments at the Authority financed by each of the following sources.	Approximate Percentage
		Government Transfers	
		Government Loans	
		Private Loans	
		Self Finance	
		Foreign Loans	
		Foreign Donor Grants	
		Other (Specify)	

v) **BILLING**

35	Billing Period	How long is your billing period (one month, one quarter, one year, etc.)		
36	Tariff Structure	Which of the following types of user charge structures does your facility use?		
		A) Flat charge not based on collection volume.	Yes	No
		If yes, what is the amount of this charge? (enter 0 if no charge)		
		B) Constant rate per cubic meter collected.	Yes	No
		If yes, what is this rate?		
		For what volume is the maximum rate charged?		
		C) Varying rates per cubic meter depending on type of consumer.	Yes	No
		If yes, what is the minimum rate?		
		Please define the group for whom this rate applies.		

Section II - Part B: SEWAGE UTILITY

) **BILLING (continued)**

36	C) continued	What is the maximum rate?			
		Please define the group for whom this rate applies.			
		D) Varying Flat Charges		Yes	No
		If yes, what is the minimum charge?			
		Please define the group for whom this rate applies.			
		What is the maximum charge?			
		Please define the group for whom this rate applies.			
	If you answered yes to more than one of the above please explain briefly.				

UESTIONS OR COMMENTS? Please write them here.

Section II - Part C: COMBINED UTILITY

) **GENERAL INFORMATION:**

For all of the following questions it is important that the information come from the same year. If it is for some reason impossible to do this for some data please note the year that the data comes from in the margin of the survey.

HE DATA GIVEN ON THIS SURVEY ARE FOR THE YEAR: _____

1	Square Area of Service Region	How large an area must the Authority serve with water and sewage disposal? Give approximate square area in kilometers.	Water	
			Sewage	
2	Population of Service Region	Give the most recent estimate of the population of your service area (as defined on page one of this survey).	Water	
			Sewage	
		In which year was this estimate made?		
3	Population Reached by Services	Give an estimate of the total number of people served by the Utility.	Water	
			Sewage	
		How many are served directly by connections?	Water	
			Sewage	
		How many are served by other means?	Water	
			Sewage	

			Yes	No
4	Source of Water	Do you purchase water from an outside supplier?		
		Do you own your own treatment facility?		
		If you purchase water, what percentage of total output is purchased water?		

			What are the operating goals set by the authority?		Are these goals regularly reached?	
			Yes	No	Yes	No
5	Operating Targets	To serve a certain geographical area				
		To improve health conditions				
		To provide clean water				
		To provide sewage collection				
		To achieve financial autonomy				
		To serve a certain number of people				
		To achieve a targeted coverage level				
		Other (Specify)				

Section II - Part C: COMBINED UTILITY

) GENERAL INFORMATION: (continued)

6	Contracted Services	Does the authority contract parts of its service to outside firms?	Yes	No	If yes, what percentage?
		Billing and Collections			
		Operations and Maintenance			
		Construction			
		Other: (specify)			
		Other: (specify)			

Section II - Part C: COMBINED UTILITY

ii) a) <u>TECHNICAL INFORMATION: WATER SERVICE</u>

For all of the below figures seasonal amounts may vary widely. If this is true, use annual figures and divide by 365 to get daily averages and note that you did this.

7	Metered Net Production	Give the average total water production delivered into the distribution network by the utility in m3/day. Combine metered and estimated unmetered production to get the total.	Metered	
			Unmetered	
			Total	
8	Billed Water Production	Of the total production above, give the total amount of water which is billed for -in m3/day.		
9	Total Length of Distribution Network.	Estimate the total length of distribution network piping, not including connection piping - in meters.		
10	Disinfection		Yes	No
		Does your water come pretreated from a supplier?		
		Do you disinfect your own water?		
		What fraction of total output is disinfected?		
		What fraction of total output is filtered?		
		How many days per year is disinfection done?		
11	Connection Type	How do you define water connections?	Yes	No
		Actual service connections to the network.		
		Billing accounts not necessarily related to physical service connections.		
		Other (please describe)		
12	Connection Information	For each of the following user classifications, give the total number of water connections as well as the number of connections which have meters (As of the end of the reported year.) BUSINESS - Include <u>all</u> forms of business enterprise which have water connections. (industry, stores, etc.) RESIDENTIAL - Include homeowners as well as rental dwellings. GOVERNMENT AND INSTITUTIONS - Include local, state, and national government users as well as schools.		

Section II - Part C: COMBINED UTILITY

i) a) TECHNICAL INFORMATION: WATER SERVICE (continued)

12	continued	BUSINESS	Number of Connections	
			Connections Metered	
		RESIDENTIAL	Number of Connections	
			Connections metered	
		GOVERNMENT AND INSTITUTIONS	Number of Connections	
			Connections metered	
		OTHER	Number of Connections	
			Connections metered	
		TOTAL	Number of Connections	
			Connections metered	
13	Consumption	Metered Consumption - give the amount of water consumed by all metered connections in each sub-group. (M3/day)* Unmetered Consumption - estimate the amount consumed by all unmetered connections in each sub-group. (M3/day)* Total Consumption - give the total of all water consumed by each sub-group including metered and unmetered connections. (M3/day)* *(If your figures are for a different period give these and make a note)		
		BUSINESS	Metered Consumption	
			Unmetered Consumption	
			Total Consumption	
		RESIDENTIAL	Metered Consumption	
			Unmetered Consumption	
			Total Consumption	
		GOVERNMENT AND INSTITUTIONS	Metered Consumption	
			Unmetered Consumption	
			Total Consumption	

Section II – Part C: COMBINED UTILITY

i) a) TECHNICAL INFORMATION: WATER SERVICE (continued)

13	continued	OTHER	Metered Consumption	
			Unmetered Consumption	
			Total Consumption	
		TOTAL	Metered Consumption	
			Unmetered consumption	
			Total Consumption	

i) b) TECHNICAL INFORMATION: SEWAGE SERVICE

14	Total Sewage Collection	Give the estimated total cubic meters of raw sewage collected by the authority per day.		
15	Billed Sewage Collection	Of the total collection above, give the fraction which is billed for.		
16	Industrial Waste Collection	Of the total collection above, give the fraction which is industrial waste.		
17	Treatment	What fraction of total sewage collections is treated?		
		What fraction of total sewage treatment is primary? (treated by sedimentation)		
		What fraction of total sewage treatment is secondary? (treated by biological means)		
		What fraction of total sewage treatment is tertiary? (removal of chemical waste etc)		
18	Collection Techniques	Name the techniques by which sewage is most commonly collected by your authority.		Fraction of daily total collections.
	1	Piped Collection System		
	2	Truck Collection System - Septic Tanks etc.		
	3	Other (specify)		

Section II – Part C: COMBINED UTILITY

i) b) **TECHNICAL INFORMATION: SEWAGE SERVICE**

19	Collection Accounts	Of the above techniques, how many connections or accounts do you have for each type?	Number of Connections or accounts.
	1	Piped Collection System	
	2	Truck Collection System	
	3	Other (specify)	

ii) **STAFFING:**

If you do not have separate staff rosters for your sewage and water functions, just enter the totals under "Water".

20	Total Full-Time Staff	Give the annual total of all persons working within the utility, including: management, services, and all other full-time employees. Do not include part-time non-construction workers.	Water	
			Sewage	
21	Total Part-Time Staff	Give the annual number of workers hired for part-time non-construction work. Do not include workers from outside contractors.	Water	
			Sewage	
22	Staff Turnover	Give the number of staff employee positions which became vacant during the year.	Water	
			Sewage	

Section II – Part C: COMBINED UTILITY

v) FINANCIAL:

If you break your financial data down between sub-divisions such as water and sewage functions, we have provided the space for you to enter this information separately. If you do not have this type of information, just enter the totals in the boxes marked "Water".

v) a) Income Statement: Revenues

23	Connection Charges Etc.	Annual total for all flat-rate charges including connection fees, maintenance charges, service charges etc.	Water	
			Sewage	
24	Annual Sales of Water and Sewage Service	Annual total for all sales of water and sewage services not including the above flat-rate charges.	Water	
			Sewage	
25	Non-Water/ Sewage Revenue	Total revenue from operations and assets not associated with the sale of water or sewage services.	Water	
			Sewage	
26	Total Revenue	Total of all revenues to the Water Authority for the year stated above.	Water	
			Sewage	

v) b) Income Statement: Costs

27	Total Material and Equipment Costs	Cost of all chemicals, fuels, and other materials.	Water	
			Sewage	
28	Total Personnel Costs	Include all salaries and wage payments for the year, and the cash value of all benefits such as insurance and pensions.	Water	
			Sewage	

Section II - Part C: COMBINED UTILITY

v) b) Income Statement: Costs (continued)

29	Depreciation	Give total depreciation on the value of all fixed assets in place at the end of the year.	Water	
			Sewage	
30	Total Interest Payments	Calculate the total of all interest payments, both short-term and long-term, made during the year.	Water	
			Sewage	
31	Total Tax Bill	Give the total of tax payments to all local, state, and national governments made during the year.	Water	
			Sewage	
32	Total Contract Costs	Give the total of all payments made to contractors for work accomplished on behalf of the Authority during the year.	Water	
			Sewage	
33	Total Other Costs	Include all items not stated above.	Water	
			Sewage	
34	Total Costs	Include all items from above.	Water	
			Sewage	

Section II - Part C: COMBINED UTILITY

c) From the balance sheet: Current Assets and Liabilities

35	Cash Assets	Value of all money held as cash or in bank accounts. (by year end)	Water	
			Sewage	
36	Credit Extended To Utility	Value of all short-term obligations with a lending period less than one year. (by year end)	Water	
			Sewage	
37	Debts Owed To Utility	Value of all accounts receivable. (by year end)	Water	
			Sewage	
38	Stocks	Value of all stocks of materials and non-capital equipment. (by year end)	Water	
			Sewage	
39	Work in Progress	Give the value of all unfinished projects. Include for example unfinished construction projects. (by year end)	Water	
			Sewage	

d) From the balance sheet: Long Term Assets and Liabilities

40	Long Term Liabilities	Total value of all credit extended to Authority for a a period of more than one year. (by year end)	Water	
			Sewage	

Section II - Part C: COMBINED UTILITY

d) From the balance sheet: Long Term Assets and Liabilities (continued)

41	Gross Asset Value	Give the total value of existing stocks of assets. (by year end)			Water	
		Is this calculation net of depreciation?	Yes	No	Sewage	
		Please describe which method you use for this valuation. (historical cost, current cost, replacement cost, etc.)				

e) Investment

42	Investment Finance	Give the percentage of total new investments at the Authority financed by each of the following sources.	Approximate Percentage
		Government Transfers	
		Government Loans	
		Private Loans	
		Self Finance	
		Foreign Loans	
		Foreign Donor Grants	
		Other (Specify)	

BILLING:

43	Billing Period	How long is your billing period (one month, one quarter, one year, etc.)			
44	Bill Collection	Give the percentage of the total billed sales collected per billing period.	Water		
			Sewage		

Section II - Part C: COMBINED UTILITY

BILLING: (continued)

45	Water Tariff Structure	Which of the following types of charge structures does your facility use?		
		A) Flat charge not based on consumption volume.	Yes	No
		If yes, what is the amount of this charge? (enter 0 if no charge)		
		B) Constant rate per cubic meter consumed.	Yes	No
		If yes, what is this rate?		
		C) Ascending rates per cubic meter for greater consumption volumes.	Yes	No
		If yes, what is the minimum rate?		
		For what volume is the minimum rate charged?		
		What is the maximum rate?		
		For what volume is the maximum rate charged?		
		D) Descending rates per cubic meter for greater consumption volumes.	Yes	No
		If yes, what is the minimum rate?		
		For what volume is the minimum rate charged?		
		What is the maximum rate?		
		For what volume is the maximum rate charged?		

Section II - Part C: COMBINED UTILITY

BILLING: (continued)

45	continued	E) Varying rates per cubic meter depending on type of consumer.	Yes	No
		If yes, what is the minimum rate?		
		Please define the group whom this rate applies.		
		What is the maximum rate?		
		Please define the group whom this rate applies.		
	If you answered yes to more than one of the above please explain briefly.			
46	Sewage Tariff Structure	Which of the following types of user charge structures does your facility use?		
		A) Flat charge not based on collection volume.	Yes	No
		If yes, what is the amount of this charge? (enter 0 if no charge)		
		B) Constant rate per cubic meter collected.	Yes	No
		If yes, what is this rate?		
		For what volume is the maximum rate charged?		
		C) Varying rates per cubic meter depending on type of consumer.	Yes	No
		If yes, what is the minimum rate?		
		Please define the group for whom this rate applies.		

Section II - Part C: COMBINED UTILITY

BILLING (continued)

6	C) continued	What is the maximum rate?		
		Please define the group for whom this rate applies.		
		D) Varying Flat Charges	Yes	No
		If yes, what is the minimum charge?		
		Please define the group for whom this rate applies.		
		What is the maximum charge?		
		Please define the group for whom this rate applies.		
	If you answered yes to more than one of the above please explain briefly.			

ESTIONS OR COMMENTS? Please write them here.

Section III - HEALTH CONDITIONS

. form was forwarded by (name of utility):_____

:a given by utility for year:_____

:ase return this form to the following address:

NERAL:

	Responding Authority	Give the full name and address of the Authority responding to these health questions.	
2	Name of Region	Give the name of the city or region covered by the data given below.	

ALTH: THE DATA GIVEN HERE ARE FROM THE YEAR:_____

1	Infant Mortality	Number of infant deaths per thousand inhabitants.	
2	Child Mortality	Number of child deaths per thousand inhabitants.	
3	Cases of Child Diarrhea	Number of cases of diarrhea per child per year.	
4	Mortality due to Diarrheal Disease	Number of cases per year.	
5	Life Expectancy	Number of years.	
6	Are there any other water-related diseases for which You have statistics?	Yes / No	
	If yes, please give them.		

Cities or regions of study: / Services preferred:	Loja Water Supply	Quito Water Supply	Guayas Water Supply	Quito Sewerage	Guayaquil Sewerage	Azogues W.S.S.	Ibarra W.S.S.	Sto Dom W.S.S.	Riobamba W.S.S.	Ambato W.S.S.	Manta W.S.S.	Esmeraldas W.S.S.	Cuenca W.S.S.T.
Area of Service (km2):													
Water Supply	28.00	492.00	20,502.00			6.00	21.47	30.00	25.00	13.84 b		30.00	3,129.00
Sewerage				167.80	235.00	6.00	17.21	30.00	19.00	9.70	30.00	18.00	3,129.00
Population information:													
P. Serv. Area water	146,000	1,238,967	2,515,546			29,528	94,600	115,000	120,000	125,000	136,000	173,470	331,028
P. Serv Area Sewerage				1,300,000	1,570,396	24,000	85,200	115,000	115,000	125,000	69,073	173,470	331,028
P. reached, water	110,000	1,067,742	1,517,569			26,280	94,100	72,645	114,000	109,000	135,000	104,000	240,000
P. reached, sewerage				1,000,000	1,050,000	18,000	74,300	48,160	90,000	76,300	69,073	50,709	186,600
P. Directly served, (water)	107,000	1,067,742	1,116,592			26,280	94,100	72,645	114,000	109,000	90,882	67,615	240,000
P. Directly served, (sewerage)				700,000	871,500	18,000	74,300	48,160	90,000	76,300	59,073	50,709	186,600
P. served/other means (water)	3,000 b		400,967			b	5,000	10,000 b		16,000	44,118	36,387	91,000
P. served/other means (unknown)				n/a	n/a	B	3,000 b		b	b	30,000	b	34,400
P. served/other means (imp. san.)				100,000	178,500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P. served/other means (unimp. san.)				200,000		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Year of Pop. estimate	1991	1991	1990	1991	1990	1991 b		1990	1991	1991	1991	1991	1990
% P. reached, water: L	75.9	86.2	60.3			89.0	99.5	63.2	95.0	87.2	100.0	60.0	72.5
% P. reached, overall sanitation: L				76.9	66.9	75.0	87.2	41.9	78.3	61.0	100.0	29.2	57.0
% P. reached, improved sanitation (Direct conn + impr. san): L				61.5	66.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
%P. reached, sewer service: L				53.8	55.5	75.0	87.2	41.9	78.3	61.0	86.3	29.2	57.0
%P. reached, uninproved san.: L				15.4	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service area density:													
Pop. of serv. area/serv. area (w)	5,577	2,518	123			3,691	4,406	3,833	4,800	9,032	4,500	5,782	108
Pop. of serv. area/serv. area (s)				6,922	6,683	3,000	4,951	3,833	6,053	12,867	2,969	9,637	108
Net Water Production (m3/day):													
Metered Production	b	77,259.1	0.0			b	31,968.0	b	50,000.0	b	b	b	83,900.0
Unmetered Production	b	349,322.4	440,000.0			6,912.0	b	21,168.0	b	b	b	12,000.0	21,500.0
Total Production	23,752.0	426,581.5	440,000.0			6,912.0	31,968.0	21,168.0	50,000.0	50,544.0	19,500.0	12,000.0	105,400.0
Total Production (m3/yr): L	8.67E+06	1.56E+08	1.61E+08			2.52E+06	1.17E+07	7.73E+06	1.83E+07	1.84E+07	7.12E+06	4.38E+06	3.85E+07
% M.P./T.P.: L	0.0 *1	18.1 N/A				N/A	100.0	N/A	100.0	0.0 *1	0.0 *1	N/A	79.8
% Unmet. Prod./Tot. prod.: L	0.0	81.9	100.0			100.0	N/A	100.0	N/A	0.0	0.0	100.0	20.4
Billed Production (m3/day)	16,625.8	234,959.6	144,108.0			5,303.0	23,976.0	15,876.0	25,000.0	1,894.0	11,500.0	7,000.0	60,000.0
Billed Production (m3/yr): L	6.07E+06	8.58E+07	5.26E+07			1.94E+06	8.75E+06	5.79E+06	9.13E+06	6.15E+06	4.20E+06	2.56E+06	2.19E+07
Unbilled prod. (m3/day): L	7,126.2	191,621.9	295,892.0			1,609.0	7,992.0	5,292.0	25,000.0	48,860.0	8,000.0	5,000.0	45,400.0
% Billed prod./total prod.: L	70.0	55.1	32.8			76.7	75.0	75.0	50.0	3.3 *A	59.0	58.3	56.9
Tot. prod/tot. pop. reached: L (m3/1000 people/d or liter/person/d)	215.93	399.52	289.94			263.01	339.72	291.39	438.60	463.71	144.44	115.38	439.17
Tot. prod/tot. pop. of serv. area:L (m3/1000 people/d or liter/person/d)	163.81	344.30	174.91			234.06	337.93	184.07	416.67	404.36	144.44	69.18	316.40
Length of piping (m)	124,000.0	1,650,000.0	6,000,000.0			b	203,100.0	148,000.0	250,000.0	219,747.0	75,000.0	b	340,000.0
Production (daily)/pipe length: L	0.19	0.26	0.07			N/A	0.16	0.14	0.20	0.23	0.26	N/A	0.31
Water connections:													
# Conn, Business	1,718	5,082	12,829			456	386	107	11,783	b	b	b	1,700
# Metered Conn, B.	b	3,980	11,626			420	386	0	10,387	4,288	1,467	2,019	1,300
# Conn, Residential	9,243	142,156	138,697			3,899	15,664	14,413	7,233 *B	b	b	b	32,800
# Metered Conn, R	b	93,999	94,427			3,705	13,315	0	6,389	19,771	13,579	7,561	24,900
# Conn, Gov. and Institutions	179	2,629	265			25	118	9	995	b	b	b	100
# Metered Conn, GI	b	745	215			20	59	0	876	147	101	79	80
# Conn, Other	36 b		0			b	b	b	b	b	b	b	10,000
# Metered Conn, O	b b		0			b	b	b	b	0	b	b	b
Tot. Met. Connections	9,791 *C	98,294	106,268			4,145	13,760	No metered conn.	17,612	24,206	15,147	9,659	0.0 26,280
Total Water Connections	11,176	149,867	151,791			4,380	16,168	14,529	20,011	24,206 *2	15,147 *2	9,659 *2	44,600
Tot. Unmet. connections: L	1,385	51,573	45,523			235	2,408	14,529	2,399	# Unm con unknow	# Unm con unknow	# Unm con unknow	18,320
	*C	78.3	90.6			92.1	100.0	No metered conn.	86.0				76.5
% Met. conn./tot. conn. R: L		66.8	68.1			95.0	85.0		86.1				75.9
% Met. conn./tot. conn. GI: L		28.3	81.1			80.0	50.0		86.0				80.0
% Met. conn./tot. conn. O: L	N/A	N/A				N/A	N/A	N/A					
% Tot. met. conn./tot. conn.: L	87.6	66.6	70.0			94.6	85.1		86.0	100.0 *2	100.0 *2	100.0 *2	58.9
% Tot. unmet. conn./tot. conn.: L	12.4	34.4	30.0			5.4	14.9	100.0	12.0	# Unm con unknow	# Unm con unknow	# Unm con unknow	41.1
Pipe length/tot. conn. (m): L	11.1	11.0	39.5			N/A	12.6	10.2	12.5	9.1	5.0 N/A		7.6
Production (daily)/water conn.: L	2.13	2.85	2.90			1.58	1.98	1.46	2.50	2.09 *2	1.29 *2	1.24 *2	2.36
WATER CONSUMPTION (m3/day):									No consump. data				
Met. Consumption, B	3,968.73	7,962.20	51,181.00			483.00	1,771.23	b	b	11,358.00	3,167.00	1,912.00	7,100.00
Unmet Con. B	b	22,009.57	3,115.00			38.00	b	b	b	b	b	b	2,200.00
Tot Con, B	b	29,971.77	54,296.00			521.00	b	140.00	b	b	3,167.00	b	9,300.00
Met. Consumption, R	10,900.03	53,007.79	87,086.00			4,516.00	14,648.31	b	b	20,049.00	6,667.00	4,694.00	37,000.00
Unmet Con, R	b	136,444.92	25,828.00			262.15	b	b	b	b	84.00	b	11,700.00
Tot Con, R	b	189,452.71	112,914.00			4,778.15	b	18,737.00	b	b	6,751.00	b	48,700.00
Met. Consumption, GI	1,412.50	1,596.65	3,138.00			3.00	562.30	b	b	1,374.00	b	407.00	1,600.00
Unmet Con, GI	b	13,988.09	158.00			0.85	b	b	b	b	500.00	b	400.00
Tot Con, GI	b	15,534.74	3,296.00			3.85	b	12.00	b	b	500.00	b	2,000.00
Met. Consumption, O	354.46 b	b				b	b	b	b	0.00	b	b	b

Cities or regions of study:	Loja	Quito	Guayas	Quito	Guayaquil	Azogues	Ibarra	Sto Dom	Riobamba	Ambato	Manta	Esmeraldas	Cuenca
Services preferred:	Water Supply	Water Supply	Water Supply	Sewerage	Sewerage	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.T.
Unmet Con, O	b	b	b			b	b	b	b	b	b	b	6,200.00
Tot Con, O	b	b	b			b	b	b	b	b	b	b	6,200.00
Tot. Metered Cons.	11,497.03	62,536.64	141,405.00			5,002.00	16,971.84 b	b		32,781.00	9,834.00	7,013.00	45,700.00
Tot. Unmet. Cons.	5,128.80	172,422.58	29,101.00			301.00 b		18,889.00 b	b		584.00	4,987.00	20,500.00
Total Consumption	16,625.83	234,959.22	170,506.00			5,303.00 b		18,889.00 b	b		10,418.00	12,000.00	66,200.00
% Met Con/Tot Con, B: L		°C 26.57	94.26			92.71		*3 No metered conn.	No consump. data	*3	100.00	*3	76.34
% Met Con/Tot Con, R: L		27.98	77.13			94.51					99.76		75.98
% Met Con/Tot Con, GI: L		10.08	95.21			77.92					0.00		80.00
% Met Con/Tot Con, O: L	N/A	N/A				N/A					N/A		0.00
% Tot. metered cons./Tot cons.: L	69.2	26.6	82.9			94.3					94.4	58.4	69.0
% Total unmeter cons./Tot cons.: L	30.8	73.4	17.1			5.7		100.0			5.6	41.6	31.0
Unaccounted water (UFW) (m3/day): L	7,128.17	191,622.28	289,494.00			1,609.00	7,992.00 *4	2,279.00	25,000.00 *4	48,880.00 *4	9,082.00	0.00 *D	39,200.00
(Total Prod-Total Consumption)													
% Unaccounted/Tot. prod.: L	30.0	44.9	61.2			23.3	25.0	10.8		96.7	46.6	0.0	37.2
Non-revenue water (m3/day): L	7,128.17	191,621.90	295,892.00			1,609.00	7,992.00	5,292.00	25,000.00	48,880.00	8,000.00	5,000.00	45,400.00
(Total production-billed production)													
% Non-rev/Tot. production: L	30.0	44.9	67.2			23.3	25.0	25.0	50.0	96.7	41.0	41.7	43.1
Total cons. (daily)/pipe length: L	0.13	0.14	0.03			N/A	0.00 *3	0.13	N/A	0.00 *3	0.14	N/A	0.19
Meter cons. (daily)/pipe length: L	0.09	0.04	0.02			N/A	0.08	0.00	N/A	0.15	0.13	N/A	0.13
Total cons. (daily)/water conn.: L	1.49	1.57	1.12			1.21	0.00 *3	1.30	0.00 *3	0.00 *3	0.69	1.24	1.48
UFW/tot. water connections: L	0.64	1.28	1.78			0.37	0.49	0.16	1.25	2.02 *2	0.80 *2	0.00 *2	0.88
UFW/pipe length: L	0.06	0.12	0.04			N/A	0.04	0.02	0.10	0.22	0.12	N/A	0.12
Metered consump/metered conn: L	1.17	0.64	1.33			1.21	1.23	ERR	0.00	1.35	0.65	0.73	1.74
Unmetered consump/unmetered conn: L	3.70	3.34	0.64			1.28	0.00	1.30	0.00	ERR	ERR	ERR	1.12
Resid. Cons (daily)/res. conn.: L	0.00	1.39	0.81			1.23	0.00	1.30	0.00	ERR	ERR	ERR	1.48
Resid. Cons/pop. in serv. area: L	0.00	0.18	0.10			0.18	0.00	0.26	0.00	0.00	0.07	0.00	0.20
met.res.cons/met.res.conn.: L	ERR	0.57	0.92			1.22	1.10	ERR	0.00	1.01	0.49	0.62	1.49
Consumption/pop. reached (w): L	0.16	0.22	0.15			0.20	0.00	0.26	0.00	0.00	0.11	0.18	0.28
SEWERAGE:													
Total Sewage Col. (m3/day)				18,016.00	140,900.00	3,977.00	27,173.00	16,934.00	17,500.00	35,000.00	5,000.00	8,400.00	79,400.00
Total Sewage Col. (m3/yr): L				6.58E+06	5.14E+07	1.45E+06	9.92E+06	6.18E+06	6.39E+06	1.28E+07	1.83E+06	3.07E+06	2.90E+07
% billed of tot. collected				0.00 b		b	66%	66%	50%	130% *E	50%	100%	60%
% of Sewage is Indus. waste				12%	5%	b	2%	0%	b	5 %	15%	10%	3-4%
Treatment:						b							
% of total vol that is treated				NONE TREATED	60%	b	NONE TREATED	NONE TREATED	NONE TREATED	NONE TREATED	NONE TREATED	NONE TREATED	NONE TREATEI
% of treated that is primary					3%	b							
% of treated that is secondary					3%	b							
% of treated that is tertiary					14%	b							
Collection Techniques:													
% Piped collection				80%	83%	100%	90%	100 %	100 %	100 %	90%	75%	70%
% Truck collection				8%	17%		6%				10%	b	8%
% Other collection system				12%	0.00		4%	5%			3%	b	22%
Collection Accounts:													
Pipe: # of sewage connections				160,000	100,182	3,285	13,750	9,632	20,000	19,385	9,845	7,244	27,200
Truck: # of sew. accounts or houses				16,000 b		b	b		b	b	980 b	b	b
Other: # of sewage accounts				24,000 b		b	b		b	b	295 b	b	b
Total Conn. or accounts (sewage): L				200,000	100,182	3,285	13,750	9,632	20,000	19,385	11,120	7,244	27,200
Combined conn. (water + sewage): L	11,176	149,867	151,791	200,000	100,182	7,685	29,918	24,161	40,011	43,571 *5	26,287 *5	16,903 *5	71,809
# of tot. conn./1000 pop reached: L	101.6	140.4	100.0	200.0	96.4	291.7	317.9	332.6	351.0	399.7	194.6	162.5	298.2
Sewage coll/water prod: L						0.58	0.85	0.80	0.35	0.69	0.26	0.70	0.76
Sewage coll/tot. water cons: L						0.75	ERR *3	0.90	ERR *3	ERR *3	0.48	0.70	1.20
PERSONNEL:													
Full time staff (water only)	134	1,881	1,462										
Full time staff (sewage only)				357	650								
Full time staff (combined)						56	144	92	80	285	218	145 b	
Part time staff (water only)													
Part time staff (sewerage only)													
Part time staff (combined)								1	20	3	2		
F.T. Staff/1000 water conn.: L	12.0	12.6	9.6									N/A	
F.T. Staff/1000 sewage conn.: L				1.8	6.5							N/A	
F.T. Staff/1000 comb (wat/sew) conn.: L						7.31	4.81	3.81	2.00	6.54 *5	8.30 *5	8.58 *5	N/A
F.T. Staff/1000 pop. reached: L	1.2	1.8	1.0	0.4	0.6	2.1	1.5	1.3	0.7	2.5	1.8	1.4	N/A
Water Prod (daily)/F.T. Staff: L	177.25	226.78	300.96			123.43	222.00	230.09	625.00	177.35	89.45	82.76	N/A
Water billed (daily)/F.T. Staff: L	124.07	124.91	98.57			94.70	169.50	172.57	312.50	5.91	52.75	46.28	N/A
Sewage coll. (daily)/F.T. Staff: L				50.46	216.77	71.02	186.70	184.07	218.75	122.81	22.94	57.93	N/A
REVENUES:													
Connection fees (water)	5.381E+07	1.132E+09	6.138E+08							1.261E+08			7.405E+07
Connection fees (sewage)				*7	*7					1.939E+07			1.808E+07
Connection fees (combined)						6.238E+07 b		1.419E+08			4.277E+07	2.019E+06	
Annual sales (water)	1.879E+08	6.328E+09	9.670E+09				2.300E+08			4.578E+08	5.116E+08	9.088E+07	5.339E+08
Annual sales (sewerage service)				9.980E+06	1.790E+09		1.250E+08			2.775E+08	3.099E+07	3.730E+05	3.084E+08
Annual sale (combined service)						5.817E+07		1.200E+08					
Non-water or sewerage revenues	9.893E+07	3.467E+09	7.706E+08	1.380E+08	1.248E+09	2.997E+06	1.350E+08	6.424E+07		3.652E+08	5.880E+07	2.269E+06 b	
Total revenue (water service)	3.203E+08	1.099E+10	1.106E+10							9.488E+08	6.132E+08		6.079E+08
Total revenue (sewerage service)				3.299E+09 *F	3.038E+09					2.973E+08	3.099E+07		3.244E+08

Cities or regions of study:	Loja	Quito	Guayas	Quito	Guayaquil	Azogues	Ibarra	Sto Dom	Riobamba	Ambato	Manta	Esmeraldas	Cuenca
Services proferred:	Water Supply	Water Supply	Water Supply	Sewerage	Sewerage	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.T.
Total revenue (combined service)						1.236E+06	4.900E+06	3.261E+06 *G				3.193E+06	
Overall total revenue: L	3.203E+06	1.093E+10	1.105E+10	3.259E+09	3.038E+09	1.236E+06	4.900E+06	3.261E+06		1.246E+09	6.442E+06	3.193E+06	9.323E+08
Op. Rev. Water (Con fee + sales): L	2.214E+06	7.458E+09	1.028E+10				2.300E+06			5.838E+06	5.544E+06 *6	9.270E+07 *6	6.079E+08
Op. Rev. Sew. (Con fee + sales): L				9.960E+06	1.790E+09		1.250E+06			2.969E+06	3.099E+07 *6	3.730E+06 *6	3.244E+08
Op. rev. Comb. (con fee + sale): L						1.206E+06		2.616E+06					
Total Operating Revenue: L	2.214E+06	7.458E+09	1.028E+10	9.960E+06	1.790E+09	1.206E+06	3.550E+06	2.616E+06		8.807E+06	5.854E+06	9.307E+07	9.323E+08
Water sales/met. conn. : L	17,147.89	84,368.29	90,999.23	N/A	N/A		16,715.12			18,908.21	33,778.86	9,388.34	20,315.64
Oper. revenue water/met. conn.: L	22,613.11	75,875.24	96,775.08	N/A	N/A		16,715.12			24,117.37	36,902.29	9,597.37	23,133.24
Water sales/connection: L	15,022.82	42,210.98	63,706.03	N/A	N/A		14,225.63			18,908.21 *2	33,778.86 *2	9,388.34 *2	11,970.74
Oper. rev. (w)/pop. served: L	2,012.77	6,984.91	8,776.79	998.00	1,704.77	4,587.27	3,772.58	3,804.43		8,079.61	4,336.36	894.94	3,884.78
Oper. revenue water/conn.: L	19,810.76	49,764.66	67,751.67	N/A	N/A		14,225.63			24,117.37 *2	36,902.29 *2	9,597.37 *2	13,630.98
Sewerage service sales/conn: L				4,980.00	17,867.58		9,090.91			14,330.20	2,787.20	51.49	11,264.11
Op. Rev. Sew./conn.: L				4,980.00	17,867.58		9,090.91			15,331.38	2,787.20 *6	51.49 *6	11,926.65
Combined service sale/t. conn.: L						7,569.38	11,665.77	4,966.32		16,872.42 *5	20,858.70 *5	5,386.91 *5	11,703.05
Op. rev. comb./tot. conn.: L						15,727.78	11,665.77	10,837.47		20,212.46 *5	22,286.85 *5	5,506.36 *5	12,965.33
Tot. rev. (water service)/conn.: L	28,662.31	72,899.82	72,826.59							39,185.48 *2	40,484.81 *2		13,630.98
Tot. rev. (sew. service)/conn.: L				16,445.00	30,320.21					15,353.09	2,787.20		11,926.65
Tot. rev. (comb. service)/conn.: L						16,118.77	16,378.10	13,496.36		28,593.24 *5	24,525.72 *5	18,892.21 *5	12,965.33
Tot. Rev./Pop. served: L	2,912.09	10,232.10	7,284.54	3,289.00	2,892.89	4,701.31	5,207.23	4,486.76		11,429.69	4,771.98	3,070.53	3,884.78
Oper. rev. (water)/m3 bill prod: L	36.48	86.96	195.52	N/A	N/A	62.28 *8	26.28	45.19 *8		949.77 *A	132.08 *6	36.28 *6	27.76
Oper. rev. (water)/m3 tot. prod: L	25.54	47.90	64.04	N/A	N/A	47.78 *8	19.71	33.89 *8		31.64	77.89 *6	21.16 *6	15.80
Oper. rev. (sew)/m3 sewage coll.: L	N/A	N/A	N/A	161.46	34.81	0.00 *8	12.60	0.00 *8		23.24	16.98 *6	0.12 *6	11.19
Col. rate (water service)	86%	97%	73%			90%	75%		70%		80%	95%	
Col. rate (sewerage service)				93.47%	84.89%	90%	75%		130%		80%	73%	
Col. rate (combined service)						75%	60%		50%				
COSTS:													
Operating Costs:													
Total Material and Equipment:													
Water	5.055E+07	1.388E+09	1.979E+09							1.788E+08			1.686E+08
Sewerage				1.092E+08	3.418E+07					4.650E+07			3.787E+07
Combined						2.105E+07	2.320E+06	3.652E+07			6.722E+07	1.627E+07	
Total Personnel:													
Water	1.366E+06	4.549E+09	4.866E+09							6.979E+06			3.042E+06
Sewerage				1.806E+09	2.858E+09					7.524E+07			4.108E+07
Combined						6.331E+07	1.980E+06	1.786E+06			3.561E+06	3.173E+06	
Total contract costs:													
Water	8.025E+06	b	6.783E+09							6.933E+07			6.943E+06
Sewerage				7.308E+08	2.588E+07					8.756E+07			2.203E+06
Combined						3.359E+07	8.800E+07	4.500E+07			1.210E+06	5.100E+06	
Total tax bill:													
Water	b	b	0.000E+00										0.000E+00
Sewerage				1.600E+06	b								0.000E+00
Combined						9.067E+05	b	b		2.220E+07 *H	2.557E+06	b	
Total other costs:													
Water	1.215E+06	8.611E+06	4.643E+06										1.144E+06
Sewerage				2.124E+07	0.000E+00								1.139E+07
Combined						4.362E+07	b	8.292E+07		b	4.447E+07	6.259E+07	
Oper. costs (water): L	3.167E+06	6.797E+09	1.409E+10							9.883E+06 *H			1.281E+09
Oper. costs (sewerage): L				2.626E+09	2.716E+09					2.093E+06			3.107E+06
Oper. costs (combined): L						1.627E+06 *9	5.180E+06 *9	3.409E+06 *9			5.934E+06 *9	4.015E+06 *9	
Subtotal I (tot. oper. costs): L	3.167E+06	6.797E+09	1.409E+10	2.626E+09	2.716E+09	1.627E+06	5.180E+06	3.409E+06		1.198E+09	5.934E+06	4.015E+06	1.592E+09
Total interest payments:													
Water	b	2.550E+06	2.544E+09										2.415E+07
Sewerage				8.000E+07	b								2.540E+06
Combined						0.000E+00	b	b		1.060E+07	3.606E+07	4.282E+06	
Subtotal II: L	3.167E+06	7.052E+09	1.664E+10	2.706E+09	2.716E+09	1.627E+06	5.180E+06	3.409E+06		1.208E+09	6.295E+06	4.058E+06	1.619E+09
Depreciation:													
Water	b	1.781E+09	3.590E+06										8.198E+07
Sewerage				b	9.417E+07								1.102E+07
Combined						1.529E+07	b	b	b	b	b		
Total costs:													
Water	3.167E+06	8.834E+09	1.699E+10							9.969E+06			1.387E+09
Sewerage				2.706E+09	2.813E+09					2.093E+06			3.242E+06
Combined						1.780E+06	5.180E+06	3.409E+06			6.295E+06	4.058E+06	
Overall total costs: L	3.167E+06	8.834E+09	1.699E+10	2.706E+09	2.813E+09	1.780E+06	5.180E+06	3.409E+06		1.208E+09	6.295E+06	4.058E+06	1.711E+09
Op. costs (w)/met. wat. conn.: L	32,340.93	89,152.88	132,606.09	N/A	N/A	39,246.33	37,645.35 *9	No metered conn.		49,475.52	39,175.69 *9	41,570.41 *9	60,578.98
Op. costs (w)/tot. water conn.: L	28,333.04	45,355.64	92,838.15	N/A	N/A	37,140.65	32,038.59 *9	23,464.86		49,475.52 *2	39,175.69 *2	41,570.41 *2	35,695.42
Op. costs (w)/pipe length: L	2,553.63	4,119.58	2,348.67	N/A	N/A	N/A	2,550.47 *9	2,303.52		5,449.92	7,911.92 *9	N/A	4,682.40
Oper. costs/pop. served: L	2,878.64	6,366.06	9,285.96	2,626.41	2,586.97	6,190.11	5,504.78	4,692.97		10,987.20	4,396.51	3,860.85	6,633.40
T. oper. costs/total (W&S) conn: L	N/A	N/A	N/A	13,132.05	27,134.78	21,223.23	17,313.99	14,110.38		27,486.27 *5	22,590.86 *5	23,754.87 *5	22,172.92
Tot costs/total conn: L	28,333.04	58,943.82	111,961.53	13,532.05	28,074.75	23,217.36	17,313.99	14,110.38		27,729.56	23,963.80	24,007.02	23,834.33
Tot. costs/pop. served: L	2,878.64	8,273.28	11,198.74	2,706.41	2,678.65	6,771.74	5,504.78	4,692.97		11,084.46	4,662.64	3,901.83	7,130.44
Oper. costs (w)/m3 water prod.: L	36.52	43.86	87.75	N/A	N/A	64.48 *9	44.39 *9	44.12 *9		53.57 *H	89.37 *9	91.67 *9	39.31
Op. costs (w)/m3 bill wat prod.: L	52.18	79.28	267.91	N/A	N/A	84.04 *9	59.19 *9	58.83 *9		1,807.85 *A	141.37 *9	157.15 *9	58.51
Op. costs (s)/m3 sewage coll.: L				399.40	52.86	0.00 *9	0.00 *9	0.00 *9		16.39	0.00 *9	0.00 *9	10.72

Cities or regions of study:	Loja	Quito	Guayas	Quito	Guayaquil	Azogues	Ibarra	Sto Dom	Riobamba	Ambato	Manta	Esmeraldas	Cuenca
Services preferred:	Water Supply	Water Supply	Water Supply	Sewerage	Sewerage	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.T.
Personnel cost/T. operating cost: L	0.43	0.67	0.35	0.61	0.98	0.39	0.38	0.52		0.65	0.60	0.79	0.22
% of Contract Costs/Oper Costs: L	2.53	0.00	48.13	27.82	0.95	20.65	16.99	13.20		14.77	20.40	1.27	57.45
Tot. Personnel cost/water conn.: L	12,223.07	30,350.90	32,057.24	N/A	N/A	14,454.69	12,246.41	12,153.76		31,940.26	23,643.22	32,846.66	7,741.55
Tot. Personnel cost/pipe length: L	1,101.85	2,756.73	811.00	N/A	N/A	N/A	974.89	1,193.12		3,516.35	4,774.98	N/A	1,015.51
Tot. cost/T op rev: L	1.43	1.18	1.65	2.72	1.57	1.46	1.46	1.30		1.37	1.08	4.36	1.84
Work ratio (op cost+int/op rev): L	1.43	0.95	1.62	2.72	1.52	1.35	1.46	1.30		1.37	1.08	4.36	1.74
Oper. ratio (Tot cost/tot rev): L	0.99	0.81	1.54	0.82	0.98	1.44	1.06	1.05		0.97	0.98	1.27	1.84
Debt Service (100*int/op. rev): L	N/A	3.42	24.73 %	8.03 %	N/A	N/A	N/A	N/A		1.20 %	6.16 %	4.58 %	2.86
Profit													
(overall rev.- overall cost): L	3.68E+06	2.09E+09	-5.94E+09	5.83E+08	2.25E+08	-6.44E+07	-2.80E+07	-1.48E+07		3.76E+07	1.48E+07	-8.65E+07	-7.79E+06
Profit as % of Rev.: L	1.15	19.14	-53.73	17.71	7.41	-44.04	-5.71	-4.55		3.02	2.29	-27.07	-83.55
Oper def. (oper rev-opercost): L	-9.52E+07	6.61E+08	-3.81E+09	-1.63E+09	-9.28E+08	-4.21E+07	-1.63E+08	-7.91E+07		-3.17E+08	-7.99E+06	-3.08E+08	-6.80E+08
Oper def as % of op. rev: L	-43.02	8.86	-37.03	-163.70	-61.87	-34.94	-45.92	-30.20		-35.99	-1.36	-331.41	-70.75
Tot Profit (loss) P/C: L	33.45	1,958.82	(3,914.20)	582.59	214.24	(2,070.43)	(297.56)	(204.21)		346.23	109.33	(831.30)	(3,245.66)
Oper. Profit (loss) P/C: L	(865.86)	616.65	(2,509.23)	(1,630.41)	(884.20)	(1,602.84)	(1,732.20)	(1,088.54)		(2,907.59)	(69.15)	(2,985.91)	(2,749.62)
ASSETS/LIABILITIES:													
Curr. assets/liabilities (from balance sheet)													
Cash Assets	1.040E+06	1.954E+09	1.131E+09	4.354E+08	3.261E+08	1.195E+07	1.010E+08	9.575E+07		1.625E+06	1.115E+07	8.442E+05	9.279E+07
Debts owed to auth. (Accts. Rec.):													
Water	1.490E+08	5.475E+09	4.298E+09										1.806E+08
Sewerage				2.069E+08	5.855E+09								1.599E+08
Combined						6.685E+07	7.707E+07	b		2.592E+06	7.812E+06	1.402E+06	
Subtotal I (Liquid Assets): L	1.500E+08	7.429E+09	5.429E+09	6.423E+08	6.181E+09	7.880E+07	1.781E+08	9.575E+07		4.217E+06	1.897E+07	1.410E+08	4.334E+08
Stocks (Inventory):	5.363E+07	4.695E+09	1.739E+10	9.876E+07	6.246E+07	1.514E+07	1.138E+08	7.021E+07		4.114E+06	1.730E+07	2.695E+06	4.132E+08
Subtotal II (Current Assets): L	2.037E+08	1.211E+10	2.282E+10	7.291E+08	6.243E+09	9.394E+07	2.918E+08	1.680E+08		4.156E+06	3.627E+07	4.105E+06	8.466E+08
Work in progress:													
Water	1.215E+08	1.000E+11	7.481E+09										1.573E+09
Sewerage				2.849E+08	1.455E+09								6.144E+08
Combined						b	9.625E+06	b		2.986E+06	4.815E+07	b	
Cred Ext'd to auth (Curr. Liab.):	1.081E+07	3.510E+09	2.238E+09	6.705E+08	5.342E+08	7.777E+05	1.129E+06	b		3.563E+06	1.325E+06	1.246E+07	1.140E+08
Quick Ratio: L	13.88	2.12	2.43	0.96	11.57	101.32	157.72	N/A		0.01	14.31	11.31	3.80
Current ratio: L	18.84	3.45	10.21	1.09	11.69	120.80	258.48	N/A		1.17	27.37	32.94	7.42
% Cash assets/tot. curr. assets: L	0.51	16.13	4.96	59.72	5.22	12.72	34.61	57.69		0.39	30.75	0.21	10.96
Cash cov. of Total Costs: L	1.20	80.73	24.29	59.72	42.32	24.50	71.17	102.51		0.49	6.47	0.76	19.79
Cash + Rec. cov. of Total Costs: L	172.95	306.97	116.59	86.63	802.10	161.82	125.47	102.51		1.27	11.00	128.84	92.43
Work in Progress/tot. pop: L	838.07	80,709.82	2,973.77	219.05	926.30	N/A	101.74	N/A		2,386.71	356.67	N/A	6,607.16
Fixed Assets/Pop. served: L	639.91	N/A	9,976.70	4,255.99	240.07	6,508.03	0.00	879.25		37,307.31	47.22	2,591.47	2,166.82
Long term assets/liabilities:													
Long term liabilities	b	2.809E+10	1.566E+10	6.235E+09	1.126E+09	b	b	2.500E+06		2.401E+06	1.850E+06	b	1.707E+06
Total Liabilities: L		3.160E+10	1.789E+10	6.905E+09	1.660E+09					5.954E+06	1.863E+06		2.847E+06
Gross asset values (Fixed Assets):													
Water	7.039E+07	b	1.514E+10										3.467E+08
Sewerage				4.258E+09	2.521E+08								1.733E+06
Combined						1.710E+06	b	6.387E+07		4.068E+09	6.374E+06	2.695E+06	
Total Assets: L	3.958E+08	1.121E+11	4.544E+10	5.270E+09	7.950E+09	2.650E+06	3.015E+06	2.298E+08		4.781E+09	9.079E+07	6.800E+06	3.584E+09
Asset turnover (T Rev./T Ass.): L	0.81	0.10	0.24	0.82	0.38	0.47	1.63	1.42		0.25	7.10	0.47	0.26
Accts. Receivable Turnover: L	2.15	2.00	2.57	15.90	0.52	1.85	6.36	ERR		480.56	82.47	2.28	2.74
Average Collection period: L	169.78	182.92	141.90	22.96	709.51	197.50	57.41	ERR		0.76	4.43	160.21	133.33
G. Asset value w/ depreciation	b	b	yes	no	yes	no	b	no		no	no	no	no
Method of valuation	Historic	b	Historic	No depreciation	Historic	Historic	b	Historic		Historic	Historic	Historic	Historic
G. Asset value/Tot connections: L	6,298.32	N/A	99,743.91	21,279.95	2,516.20	22,313.24	N/A	2,643.64		93,330.36 *5	242.98 *5	16,944.65 *5	7,242.86
Area of Service (km2):													
Water Supply	26.00	492.00	20,502.00			8.00	21.47	30.00	25.00	13.84	b	30.00	3,129.00
Sewerage				187.80	235.00	8.00	17.21	30.00	19.00	9.70	30.00	16.00	3,129.00
Population information:													
P. Serv. Area water	145,000	1,238,987	2,515,546			29,526	94,600	115,000	120,000	125,000	135,000	173,470	331,028
P. Serv Area Sewerage				1,300,000	1,570,396	24,000	85,200	115,000	115,000	125,000	89,073	173,470	331,028
P. reached, water	110,000	1,067,742	1,517,559			26,280	94,100	72,645	114,000	109,000	135,000	104,000	240,000
P. reached, sewerage				1,000,000	1,060,000	18,000	74,300	46,160	90,000	76,300	89,073	50,709	188,600
P. Directly served, (water)	107,000	1,067,742	1,116,592			26,280	94,100	72,645	114,000	109,000	90,882	67,615	240,000
P. Directly served, (sewerage)				700,000	871,500	18,000	74,300	46,160	90,000	76,300	89,073	50,709	188,600
P. served/other means (water)	3,000	b	400,967			b	5,000	10,000	b	16,050	44,118	36,387	91,000
P. served/other means (unknown)				n/a	n/a	B	3,000	b	b		30,000	b	34,400
P. served/other means (imp. san.)				100,000	178,500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P. served/other means (unimp. san.)				200,000		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Year of Pop. estimate	1991	1991	1990	1991	1990	1991	b	1990	1991	1991	1991	1991	1990
% P. reached, water: L	75.9	86.2	60.3			89.0	99.5	63.2	95.0	87.2	100.0	60.0	72.5
% P. reached, overall sanitation: L				76.9	66.9	75.0	87.2	41.9	78.3	61.0	100.0	29.2	57.0
% P. reached, improved sanitation (Direct conn + impr. san): L				61.5	66.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
%P. reached, sewer service: L				53.8	66.5	75.0	87.2	41.9	78.3	61.0	66.3	29.2	57.0

Cities or regions of study:	Loja	Quito	Guayas	Quito	Guayaquil	Azogues	Ibarra	Sto Dom	Riobamba	Ambato	Manta	Esmeraldas	Cuenca
Services preferred:	Water Supply	Water Supply	Water Supply	Sewerage	Sewerage	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.T.
%P. reached, unimproved san.: L				15.4	0.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service area density:													
Pop. of serv. area/serv. area (w)	6,577	2,518	123			3,691	4,406	3,833	4,800	9,032	4,500	5,782	106
Pop. of serv. area/serv. area (s)				6,922	6,683	3,000	4,951	3,833	6,053	12,667	2,969	9,637	106
WATER PRODUCTION:													
Metered Production (m3/day)	b	77,299.1	0.0			b	31,968.0	b	50,000.0	b	b	b	68,900.0
Unmetered Production (m3/day)	b	349,322.4	440,000.0			6,912.0	b	21,168.0	b	b	b	12,000.0	21,900.0
Total Production (m3/day)	23,752.0	426,581.5	440,000.0			6,912.0	31,968.0	21,168.0	50,000.0	60,544.0	19,500.0	12,000.0	105,400.0
Total Production (m3/yr): L	8.67E+06	1.56E+08	1.61E+08			2.52E+06	1.17E+07	7.73E+06	1.83E+07	1.84E+07	7.12E+06	4.38E+06	3.85E+07
Billed Production (m3/day)	16,625.8	234,969.6	144,108.0			5,303.0	23,976.0	15,876.0	25,000.0	1,684.0	11,500.0	7,000.0	80,000.0
% M.P./T.P.: L	0.0 *1	18.1 N/A				N/A	100.0 N/A		100.0	0.0 *1	0.0 *1 N/A		79.6
% Unmet. Prod./Tot. prod.: L	0.0	81.9	100.0			100.0 N/A		100.0 N/A		0.0	0.0	100.0	20.4
Unaccounted water (m3/day): L	7,126.17	191,622.28	280,494.00			1,609.00	7,992.00 *4	2,279.00	25,000.00 *4	48,860.00 *4	9,082.00	0.00 *D	39,200.00
(Total Prod-Total Consumption)													
% Unaccounted/Tot. prod.: L	30.0	44.9	61.2			23.3	25.0	10.8		96.7	46.6	0.0	37.2
Tot. prod/tot. pop. reached: L	215.93	399.52	289.94			263.01	339.72	291.39	436.80	463.71	144.44	115.36	439.17
(m3/1000 people/d or lltes/pers/d)													
Tot. prod/tot. pop. of serv. area:L	163.81	344.30	174.91			234.06	337.93	184.07	416.67	404.35	144.44	69.16	318.40
(m3/1000 people/d or lltes/pers/d)													
Production (daily)/water conn.: L	2.13	2.85	2.90			1.58	1.98	1.46	2.50	2.00 *2	1.29 *2	1.24 *2	2.36
UFW/tot. water connections: L	0.64	1.28	1.78			0.37	0.49	0.16	1.25	2.02 *2	0.60 *2	0.00 *2	0.88
CONNECTIONS:													
Tot. Met. Connections	9,791 *C	98,294	106,268			4,145	13,760	No metered conn.	17,612	24,206	15,147	9,669	28,280
Total Water Connections	11,176	149,867	151,791			4,380	16,168	14,529	20,011	24,206 *2	15,147 *2	9,669 *2	44,600
Tot. Unmet. connections: L	1,385	51,573	45,523			235	2,408	14,529	2,399	# Unm con unknow# Unm con unknow# Unm con unknow			16,320
% Tot. met. conn./tot. conn.: L	87.6	65.6	70.0			94.6	85.1		88.0	100.0 *2	100.0 *2	100.0 *2	58.9
% Tot. unmet. conn./tot. conn.: L	12.4	34.4	30.0			5.4	14.9	100.0	12.0	# Unm con unknow# Unm con unknow# Unm con unknow			41.1
Pipe: # of sewage connections				180,000	100,182	3,265	13,750	9,632	20,000	19,385	9,845	7,244	27,200
Truck: # of sew. accounts or houses				16,000 b		b	b		b	b	980 b	b	
Other: # of sewage accounts				24,000 b		b	b		b	b	295 b	b	
Total Conn. or accounts (sewage): L				200,000	100,182	3,265	13,750	9,632	20,000	19,385	11,120	7,244	27,200
Combined conn. (water + sewage): L	11,176	149,867	151,791	200,000	100,182	7,665	29,918	24,161	40,011	43,571 *5	26,267 *5	16,903 *5	71,800
# Metered Conn, R	b	98,569	94,427			3,705	13,315	0	6,389	19,771	13,579	7,561	24,900
CONSUMPTION:													
Tot. Metered Cons.	11,497.03	62,536.64	141,405.00			5,002.00	16,971.84 b		b	32,781.00	9,834.00	7,013.00	45,700.00
Tot. Unmet. Cons.	5,128.80	172,422.58	29,101.00			301.00 b		18,869.00	b	b	584.00	4,987.00	20,500.00
Total Consumption	16,625.83	234,959.22	170,506.00			5,303.00 b		18,869.00	b	b	10,418.00	12,000.00	66,200.00
% Tot. meter cons./Tot cons.: L	69.2	26.6	82.9			94.3					94.4	58.4	69.0
% Total unmeter cons./Tot cons.: L	30.8	73.4	17.1			5.7		100.0			5.6	41.6	31.0
Metered consump/metered conn: L	1.17	0.64	1.33			1.21	1.23	ERR	0.00	1.36	0.65	0.73	1.74
Unmetered consump/unmetered conn: L	3.70	3.34	0.64			1.28	0.00	1.30	0.00	ERR	ERR	ERR	1.12
Resid. Cons (daily)/res. conn.: L	0.00	1.33	0.81			1.23	0.00	1.30	0.00	ERR	ERR	ERR	1.48
Met. Consumption, R	10,900.03	53,097.79	87,086.00			4,516.00	14,848.31 b		b	30,049.00	8,667.00	4,694.00	37,000.00
met.res.cons/met.res.conn.: L	ERR	0.57	0.92			1.22	1.10	ERR	0.00	1.01	0.49	0.62	1.49
Resid. Cons/pop. in serv. area: L	0.00	0.18	0.10			0.18	0.00	0.26	0.00	0.00	0.07	0.00	0.20
Consumption/pop. reached (w): L	0.16	0.22	0.15			0.20	0.00	0.26	0.00	0.00	0.11	0.18	0.28
Total cons. (daily)/water conn.: L	1.49	1.57	1.12			1.21	0.00 *3	1.30	0.00 *3	0.00 *3	0.69	1.24	1.48
PERSONNEL:													
Full time staff (water only)	134	1,861	1,462										
Full time staff (sewage only)				357	650								
Full time staff (combined)						56	144	92	80	285	218	145 b	
Part time staff (water only)													
Part time staff (sewerage only)													
Part time staff (combined)								1	20	3	2		
F.T. Staff/1000 water conn.: L	12.0	12.6	9.6										
F.T. Staff/1000 sewage conn.: L				1.8	6.5								
F.T. Staff/1000 comb (wat&sew) conn.: L						7.31	4.61	3.81	2.00	6.54 *5	8.30 *5	6.56 *5 N/A	
F.T. Staff/1000 pop. reached: L	1.2	1.8	1.0	0.4	0.6	2.1	1.5	1.3	0.7	2.6	1.6	1.4 N/A	
Water Prod (daily)/F.T. Staff: L	177.25	228.76	300.96			123.43	222.00	230.09	625.00	177.35	89.45	82.76 N/A	
Water billed (daily)/F.T. Staff: L	124.07	124.91	98.57			94.70	166.50	172.57	312.50	5.91	52.75	46.28 N/A	
Sewage coll. (daily)/F.T. Staff: L				50.46	216.77	71.02	188.70	184.07	218.75	122.81	22.94	57.93 N/A	
SEWERAGE:													
Total Sewage Col. (m3/day)				18,016.00	140,900.00	3,977.00	27,173.00	16,934.00	17,500.00	36,000.00	5,000.00	8,400.00	79,400.00
Total Sewage Col. (m3/yr): L				6.58E+06	5.14E+07	1.45E+06	9.92E+06	6.18E+06	6.39E+06	1.28E+07	1.83E+06	3.07E+06	2.90E+07
Sewage coll/water prod: L						0.58	0.85	0.80	0.35	0.89	0.26	0.70	0.75
Sewage coll/tot. water cons: L						0.75	ERR *3	0.90	ERR *3	ERR *3	0.46	0.70	1.20
DATA AND INDICATORS USED IN FINANCIAL ANALYSIS:													
REVENUES:													
Overall total revenue: L	3.203E+08	1.093E+10	1.105E+10	3.289E+09	3.038E+09	1.236E+08	4.900E+08	3.261E+08		1.246E+09	6.442E+08	3.193E+08	9.323E+08
Op. Rev. Water (Con fee + sales): L	2.214E+08	7.468E+09	1.028E+10				2.300E+08			5.838E+08	5.544E+08 *6	9.270E+07 *6	6.079E+08
Op. Rev. Sew. (Con fee + sales): L				9.960E+08	1.790E+09		1.250E+08			2.969E+08	3.099E+07 *6	3.730E+05 *6	3.244E+08
Op. rev. Comb. (con fee + sale): L						1.206E+08		2.618E+08					
Total Operating Revenue: L	2.214E+08	7.468E+09	1.028E+10	9.960E+08	1.790E+09	1.206E+08	3.550E+08	2.618E+08		8.807E+08	5.854E+08	9.307E+07	9.323E+08
Water sales/met. conn. : L	17,147.89	64,358.29	90,999.23 N/A		N/A		16,715.12			18,906.21	33,778.86	9,398.34	20,315.84
Oper. revenue water/met. conn.: L	22,613.11	75,875.24	98,775.08 N/A		N/A		16,715.12			24,117.37	38,602.29	9,597.37	23,133.24
Water sales/connection: L	15,022.82	42,210.98	63,708.03 N/A		N/A		14,225.83			18,906.21 *2	33,778.86 *2	9,398.34 *2	11,970.74
Oper. rev. (w)/pop. served: L	2,012.77	6,964.91	8,776.73	998.00	1,704.77	4,567.27	3,772.58	3,604.43		8,079.61	4,336.36	864.94	3,884.78
Oper. revenue water/conn.: L	19,810.76	49,764.86	67,751.67 N/A		N/A		14,225.83			24,117.37 *2	38,602.29 *2	9,597.37 *2	13,630.98
Sewerage service sales/conn: L				4,980.00	17,867.58		9,090.91			14,330.20	2,787.20	51.49	11,264.11
Op. Rev. Sew./conn.: L				4,980.00	17,867.58		9,090.91			15,331.38	2,787.20 *6	51.49 *6	11,926.55
Combined service sale/t. conn.: L						7,589.38	11,865.77	4,965.32		16,872.42 *5	20,659.70 *5	5,388.91 *5	11,703.05

Cities or regions of study:	Loja	Quito	Guayas	Quito	Guayaquil	Azogues	Ibarra	Sto Dom	Riobamba	Ambato	Manta	Esmeraldas	Cuenca
Services preferred:	Water Supply	Water Supply	Water Supply	Sewerage	Sewerage	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.	W.S.S.T.
Op. rev. comb./tot. conn.: L						15,727.78	11,866.77	10,837.47		20,212.46 *5	22,286.85 *5	5,506.36 *5	12,986.33
Tot. rev. (water service)/conn.: L	28,662.31	72,899.62	72,828.59							39,186.48 *2	40,484.81 *2		13,630.98
Tot. rev. (sew. service)/conn.: L				16,445.00	30,320.21					15,353.09	2,767.20		11,928.85
Tot. rev. (comb. service)/conn.: L						16,118.77	16,378.10	13,496.38		28,593.24 *5	24,525.72 *5	15,892.21 *5	12,986.33
Tot. Rev./Pop. served: L	2,912.09	10,232.10	7,284.54	3,289.00	2,892.89	4,701.31	5,207.23	4,488.76		11,429.69	4,771.98	3,070.53	3,884.78
Oper. rev. (water)/m3 bill prod: L	36.48	86.96	196.52	N/A	N/A	62.28 *8	26.29	45.19 *8		949.77 *A	132.08 *6	38.28 *6	27.76
Oper. rev. (water)/m3 tot. prod: L	25.54	47.90	64.04	N/A	N/A	47.78 *8	19.71	33.89 *8		31.64	77.80 *6	21.16 *6	15.80
Oper. rev. (sew)/m3 sewage coll.: L	N/A	N/A	N/A	151.46	34.81	0.00 *8	12.60	0.00 *8		23.24	16.98 *6	0.12 *6	11.19
COSTS:													
Overall total costs: L	3.167E+08	8.834E+09	1.699E+10	2.706E+09	2.813E+09	1.780E+08	5.180E+08	3.409E+08		1.208E+09	6.295E+08	4.058E+08	1.711E+09
Oper. costs (water): L	3.167E+08	6.797E+09	1.409E+10							9.883E+08 *H			1.281E+09
Oper. costs (sewerage): L				2.626E+09	2.718E+09					2.098E+08			3.107E+08
Oper. costs (combined): L						1.627E+08 *9	5.180E+08 *9	3.409E+08 *9			5.934E+08 *9	4.015E+08 *9	
Subtotal I (tot. oper. costs): L	3.167E+08	6.797E+09	1.409E+10	2.626E+09	2.718E+09	1.627E+08	5.180E+08	3.409E+08		1.198E+09	5.934E+08	4.015E+08	1.592E+09
Op. costs (w)/met. wat. conn.: L	32,340.93	69,152.88	132,606.09	N/A	N/A	39,246.33	37,645.35 *9	No metered conn.		49,475.52	39,175.89 *9	41,570.41 *9	60,578.98
Op. costs (w)/tot. water conn.: L	28,333.04	45,355.64	92,838.15	N/A	N/A	37,140.55	32,038.59 *9	23,464.86		49,475.52 *2	39,175.89 *2	41,570.41 *2	35,695.42
Op. costs (w)/pipe length: L	2,553.63	4,119.58	2,348.67	N/A	N/A	N/A	2,550.47 *9	2,303.52		5,449.92	7,911.92 *9	N/A	4,682.40
T. oper. costs/total (W&S) connr: L	N/A	N/A	N/A	13,132.05	27,134.78	21,223.23	17,313.99	14,110.38		27,486.27 *5	22,590.86 *5	23,764.87 *5	22,172.92
Oper. costs/pop. served: L	2,878.64	6,366.06	9,285.96	2,626.41	2,586.97	6,190.11	5,504.78	4,692.97		10,967.20	4,395.51	3,860.85	6,833.40
Tot costs/total conn: L	28,333.04	58,943.82	111,961.53	13,532.05	28,074.75	23,217.36	17,313.99	14,110.38		27,729.58	23,963.80	24,007.02	23,834.33
Tot. costs/pop. served: L	2,878.64	8,273.28	11,198.74	2,706.41	2,678.65	6,771.74	5,504.78	4,692.97		11,084.48	4,662.64	3,901.83	7,130.44
Oper. costs (w)/m3 water prod.: L	36.52	43.66	87.75	N/A	N/A	64.48 *9	44.39 *9	44.12 *9		53.57 *H	83.37 *9	91.67 *9	33.91
Op. costs (w)/m3 bill wat prod.: L	52.18	79.26	267.91	N/A	N/A	84.04 *9	59.19 *9	58.83 *9		1,607.85 *A	141.37 *9	157.15 *9	58.51
Op. costs (s)/m3 sewage coll.: L				399.40	52.86	0.00 *8	0.00 *9	0.00 *9		16.39	0.00 *9	0.00 *9	10.72
Personnel cost/T. operating cost: L	0.43	0.67	0.35	0.61	0.98	0.39	0.38	0.52		0.65	0.80	0.79	0.22
Tot. Personnel cost/water conn.: L	12,223.07	30,360.90	32,057.24	N/A	N/A	14,454.89	12,246.41	12,153.76		31,940.26	23,643.22	32,846.66	7,741.56
Tot. Personnel cost/pipe length: L	1,101.65	2,786.73	811.00	N/A	N/A	N/A	974.89	1,198.12		3,516.35	4,774.98	N/A	1,015.51
% of Contract Costs/Oper Costs: L	2.53	0.00	48.13	27.82	0.95	20.65	16.99	13.20		14.77	20.40	1.27	57.45
Tot. cost/T op rev: L	1.43	1.18	1.65	2.72	1.57	1.46	1.46	1.30		1.37	1.08	4.36	1.84
Debt Service (100*int/op. rev): L	N/A	3.42	24.73 %	8.03 %	N/A	N/A	N/A	N/A		1.20 %	6.16 %	4.58 %	2.86
Profit													
(overall rev.- overall cost): L	3.66E+08	2.09E+09	-6.94E+09	5.89E+08	2.25E+08	-5.44E+07	-2.80E+07	-1.48E+07		3.76E+07	1.48E+07	-6.65E+07	-7.79E+08
Profit as % of Rev.: L	1.15	19.14	-53.73	17.71	7.41	-44.04	-5.71	-4.55		3.02	2.29	-27.07	-83.55
Oper def. (oper rev-opercost): L	-9.52E+07	6.61E+08	-3.81E+09	-1.63E+09	-9.29E+08	-4.21E+07	-1.53E+08	-7.91E+07		-3.17E+08	-7.99E+08	-3.09E+08	-6.80E+08
Oper def as % of op. rev: L	-43.02	8.86	-37.03	-169.70	-51.57	-34.94	-46.92	-30.20		-35.99	-1.36	-331.41	-70.75
Tot Profit (loss) P/C: L	33.45	1,956.82	(3,914.20)	582.59	214.24	(2,070.43)	(297.56)	(204.21)		548.92	109.33	(631.30)	(3,245.66)
Oper. Profit (loss) P/C: L	(665.86)	618.85	(2,509.23)	(1,630.41)	(884.20)	(1,602.84)	(1,732.20)	(1,088.54)		(2,967.59)	(59.19)	(2,965.91)	(2,748.62)
ASSETS/LIABILITIES:													
Cash Assets	1.040E+06	1.954E+09	1.131E+09	4.354E+08	3.261E+08	1.196E+07	1.010E+08	9.575E+07		1.625E+08	1.115E+07	8.442E+05	9.279E+07
Debts owed to auth. (Accts. Rec.):													
Water	1.490E+08	5.475E+09	4.296E+09										1.808E+08
Sewerage				2.089E+08	5.855E+09								1.599E+08
Combined						6.685E+07	7.707E+07	b		2.592E+08	7.812E+06	1.402E+08	
Subtotal I (Liquid Assets): L	1.500E+08	7.429E+09	5.429E+09	6.423E+08	6.181E+09	7.880E+07	1.781E+08	9.575E+07		4.217E+08	1.897E+07	1.410E+08	4.334E+08
Stocks (Inventory):	5.363E+07	4.695E+09	1.739E+10	8.676E+07	6.246E+07	1.514E+07	1.139E+08	7.021E+07		4.114E+08	1.730E+07	2.695E+08	4.132E+08
Subtotal II (Current Assets): L	2.037E+08	1.211E+10	2.282E+10	7.291E+08	6.249E+09	9.394E+07	2.918E+08	1.680E+08		4.156E+08	3.627E+07	4.105E+08	8.466E+08
Work in progress:													
Water	1.215E+08	1.000E+11	7.481E+09										1.573E+09
Sewerage				2.849E+08	1.465E+09								6.144E+08
Combined						b	9.625E+06	b		2.986E+08	4.815E+07	b	
Gross asset values (Fixed Assets):													
Water	7.039E+07	b	1.514E+10										3.467E+08
Sewerage				4.256E+09	2.521E+09								1.733E+08
Combined						1.710E+08	b	6.357E+07		4.066E+09	6.374E+08	2.695E+08	
Total Assets: L	3.956E+08	1.121E+11	4.544E+10	5.270E+09	7.950E+09	2.650E+08	3.015E+08	2.296E+08		4.781E+09	9.079E+07	6.800E+08	3.554E+09
Cred Ext'd to auth (Curr. Liab.):	1.081E+07	3.510E+09	2.236E+09	6.705E+08	5.342E+08	7.777E+05	1.129E+06	b		3.553E+08	1.325E+06	1.246E+07	1.140E+08
Long term liabilities	b	2.809E+10	1.586E+10	6.235E+09	1.126E+09	b	b	2.800E+06		2.401E+08	1.850E+08	b	1.707E+08
Total Liabilities: L		3.190E+10	1.789E+10	6.905E+09	1.680E+09					5.954E+08	1.963E+08		2.847E+08
Quick Ratio: L	13.86	2.12	2.43	0.96	11.57	101.32	157.72	N/A		0.01	14.31	11.31	3.80
Current ratio: L	18.84	3.45	10.21	1.09	11.69	120.80	258.48	N/A		1.17	27.37	32.94	7.42
Cash cov. of Total Costs: L	1.20	80.73	24.29	58.72	42.32	24.50	71.17	102.51		0.50	6.47	0.76	19.79
Cash + Rec. cov. of Total Costs: L	172.96	306.97	116.59	88.63	802.10	161.82	125.47	102.51		1.30	11.00	128.84	92.43
Asset turnover (T Rev./T Ass.): L	0.81	0.10	0.24	0.62	0.38	0.47	1.63	1.42		0.25	7.10	0.47	0.25
Accts. Receivable Turnover: L	2.15	2.00	2.57	15.90	0.52	1.85	6.36	ERR		480.56	82.47	2.29	2.74
Average Collection period: L	169.78	182.92	141.90	22.96	703.51	197.50	57.41	ERR		0.76	4.43	160.21	133.33
Oper. ratio (Tot cost/tot rev): L	0.99	0.81	1.54	0.82	0.93	1.44	1.06	1.05		0.97	0.98	1.27	1.84
Work ratio (op cost+int/op rev): L	1.43	0.95	1.62	2.72	1.52	1.36	1.46	1.30		1.37	1.08	4.36	1.74
Work in Progress/tot. pop: L	838.07	80,709.82	2,973.77	219.05	926.30	N/A	101.74	N/A		2,388.71	366.67	N/A	6,607.16
Fixed Assets/Pop. served: L	639.91	N/A	9,976.70	4,255.99	240.07	6,508.03	0.00	979.25		37,307.31	47.22	2,991.47	2,166.82