MANAGEMENT AND OPERATIONAL PRACTICES OF MUNICIPAL AND REGIONAL WATER AND SEWERAGE COMPANIES IN LATIN AMERICA AND THE CARIBBEAN

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DISCUSSION PAPER

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MANAGEMENT AND OPERATIONAL PRACTICES
OF MUNICIPAL AND REGIONAL WATER AND SEWERAGE COMPANIES
IN LATIN AMERICA AND THE CARIBBEAN

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LAU Companies

ACUAVALLE  Valle del Cauca, Colombia
C.A.D.   Monterrey, Mexico
COPASA  Minas Gerais, Brazil
EMOS   Santiago, Chile
E.P.M.  Medellin, Colombia

SFU Companies

A.M.  Alicante, Spain
C.D.E.B.  París, France
Gestoras AGBAR  Spain
S.G.A.B.  Barcelona, Spain
Table of Contents

Summary and Recommendations .......................................................... 1

1. Background .................................................................................. 6

2. Overall Environment and Structure of Utilities ....................... 6

3. Practices to Emulate ...................................................................... 8

4. Monitoring Indicators ................................................................. 11

5. Operational Issues in Small Communities ............................... 15

6. An Agenda for Action ................................................................. 16

Tables

Table 1. General Information on Companies Analyzed .................. 21

Table 2. Operational and Technical Indicators ............................... 22

Table 3. Personnel Indicators ............................................................ 23

Table 4. Financial Indicators .............................................................. 24

Exhibits

Number 1. Multidivisional (MDF) and Functional (UF) Organizational Structures .................................................... 25

Number 2. Production Per Capita vs. Metering ............................... 26

Number 3. Unaccounted for Water (UFW) Reduction Programs ..... 26
1. Institutional weakness is one of the most important obstacles that stands in the way of the efficient provision of water and sewerage services in Latin America. To address this concern, the World Bank undertook a study to help identify and disseminate information about successful management and operational practices in well-run sector companies in the Latin American region. The study also quantifies, to the extent possible, operational indicators that can be used as benchmarks for other, less developed, sector agencies.

2. Sector companies in the region face a formidable task. To reach full service coverage by the end of the century they would have to serve some 522 million additional people, almost double the population now served, and invest at least US$92 billion (according to 1985 prices). Investment needs will almost certainly exceed this estimate or, alternatively, service levels will be substantially lower if sector management is not able to implement modern and efficient operational practices. Supervising government agencies and the political establishment in these countries share some of this responsibility, as they need to recognize the urgency of supporting these changes.

3. Sector organizations in the region face similar problems and constraints. Among the most important are: a) high inflation, b) low investment priority in a scarce capital resource scenario, c) rapid and uncontrolled urban population growth, d) a large proportion of low-income population to be served, e) politically appointed managers and controlled rates, f) instability of technical and managerial positions, and g) low salaries and an untrained labor force.

4. A selected group of companies in the region (LAU companies) has managed to be successful despite these problems and constraints: They all have reached service levels for water and sanitation that are substantially above the corresponding national averages, and they all operate at efficiency levels that are substantially higher than those of most sector companies in the region. LAU companies still have room for improvement in comparison to well-run companies in industrialized countries (SFU companies). The efficiency gaps that separate LAU companies from SFU companies are, however, narrower than those between them and most other sector companies in the region.

5. A sampling of well-run companies in Spain and France (SFU companies) demonstrates some substantial differences with the LAU companies' sample, inter alia: a) private capital plays an important role in both the financing and in the operation of SFU companies, b) LAU companies operate in cities or regions with population growth rates substantially above those in Europe, and c) the two regional companies in Latin America operate in
relatively dispersed geographic areas. A comparison of the organizational structure of LAU and SFU companies showed no significant differences.

Practices to Emulate

6. LAU companies have been able to develop responsive management teams and sound managerial and operational practices despite environmental constraints, even though they have not attained the same level of efficiency of many companies in the industrialized nations. The most salient, but not always quantifiable, aspects that help explain their good performance are:

   a. LAU companies have developed distinctive organizational cultures. Their managers are held in high esteem, and they in turn have been able to translate this trust into a mandate for company excellence.

   b. LAU companies offer, by far, more job stability in mid-management and professional positions. Therefore, institutional memory is preserved and long-term objectives are kept in focus.

   c. LAU companies' financial strength has been achieved by implementing reasonable rates that cover, at the very least, operational and maintenance requirements.

   d. LAU companies' relations with customers are of the highest priority. This not only provides feedback on operations but reinforces community trust in the company.

   e. Some LAU companies have, in addition, developed particular practices that deserve attention. Among them are the successful use of private contractors to increase staff productivity, the participation of private capital to finance and operate waste water reuse plants, and the development of an effective cost accounting system that allows better financial management. In addition, two companies have developed an organizational system that is responsive to the needs of small- and medium-size municipalities.

7. There are other areas in which European counterparts fare much better. European efforts in these areas should therefore be emulated by companies that strive for even higher efficiency. These include the following approaches:

   a. The government, the company's board of directors, and the company's management all have clear roles. The first regulates and sets clear norms, the second formulates strategic plans, and the latter operates and carries out company operations with a high degree of autonomy.
b. The private sector participates in company operations in order to foster independent decision making and to compel management to be more accountable for performance.

c. Management and operational systems use state-of-the-art technology.

d. The internal auditing department has been expanded to oversee and help to improve the operation and practices of the whole company.

Monitoring Indicators

8. Monitoring indicators should be interpreted with caution, as they seldom can fully describe or capture all the peculiarities and problems of a company. Nevertheless, they are useful as a management and evaluation tool and are of great help in setting realistic objectives to improve operations and to design plans and strategies to reach them.

9. Operational indicators include staff per 1,000 water connections or per 1,000 water plus sewerage connections, salary cost as a percentage of total operating costs (depreciation not included), and unaccounted for water (UFW). These indicators are described more fully below:

a. LAU companies show on average a ratio of 5.4 staff per 1,000 water connections or 3.0 per 1,000 water plus sewerage connections. These ratios imply a productivity level of at least double that of other companies in the region. SFU companies have a higher productivity level of 2.2 staff per 1,000 water connections as the result of extensive use of state-of-the-art technology and better trained staff.

b. Personnel costs are the most important cost element of a water and sewerage company. In LAU companies this ratio is under 40%, which compares favorably with most other sector companies in Latin America, where it often exceeds 50%. The same ratio in SFU companies is under 30%.

c. UFW, defined as the difference between metered production and consumption expressed as a ratio to metered production, is an elusive index because more often than not these volumes are not metered adequately. The average UFW for the LAU companies is 34%, in contrast to that of 40% to 60% of other companies in the region. In SFU companies this ratio is about 22%. The reduction of UFW is important not only as a conservation measure, but also because volumes of water thus saved replace or postpone the need for capital investments to develop new sources. A reliable assessment of UFW provides useful information in helping to improve the operation of the water distribution system. The experience of most companies in the region, on the other hand, also indicates that high values of UFW are often the result of
deficiencies in the commercial system and not of large leaks in pipes and losses in other appurtenances.

d. Financial Indicators. It is difficult to make a clear comparative analysis of company finances in different countries. Government regulations that affect financial management, exchange rates, and revaluation of assets vary widely and cloud the analysis. Nevertheless, certain good practices can be highlighted. Good management of current assets ensures that these assets are used effectively and are available in a timely manner. Good indicators include a low level of accounts receivable and an adequate level of cash on hand. Internal cash generation should be adequate to cover all operating and maintenance costs and debt service obligations as well as to contribute to the expansion of the system. The working ratio gives a good indication of the capacity of a company to satisfy its operating costs (a value greater than 1.0 is totally unacceptable). The basis for sound financial management is a good accounting and forecasting system that provides timely and reliable information.

Operational Issues in Small Communities

10. This study has documented the fact that important economies of scale exist in the operation of water and sewerage systems in the Latin American region and elsewhere. While average salaries rise with the size of the company, operational costs per connection decrease. Large municipal or regional companies, therefore, are able to attract more competent personnel, which in turn allows them to operate at a higher efficiency level to offset larger unit labor costs. Because personal income tends to decrease as the population of a community decreases, small communities find it difficult to pay for good managers and a critical mass of operational staff. Therefore, quality of service suffers. These problems are not exclusive to the region. Their solution has been provided in Latin America and in Spain by regional sector companies in charge of all phases of operation. These companies are also in a better position to capture some of the economies of scale available in the construction of large works that can be shared by several municipalities.

An Agenda for Action

11. Most good management practices and monitoring indicators identified here seem obvious and simple to implement. In practice, a concerted and sustained effort is needed to reach the high levels of effectiveness and efficiency associated with these companies. Organizational learning must tread a narrow path. A loose organizational structure helps to facilitate innovation and can lead to increased self-confidence and risk taking. Success, on the other hand, may lead to stagnation and a stifling of experimentation needed for future learning. Thus, in emulating LAU companies'
practices, other companies not only need to be creative and to adapt good practices to local conditions, but must also maintain a systematic and continuous effort to improve efficiency and effectiveness.

12. Any strategy to achieve effective management begins with a firm commitment to improve and an open mind to try new ideas that may run contrary to the ways things have been done in the past. Several paths have been followed to improve operations, and all have their merits and limitations. Among the most widely used are: a) twinning operations, which imply a horizontal cooperation between and transfer of experience from a well-run and an emerging company; b) targeting and bonus systems that focus on operating efficiency and on motivating management; and c) contract plans or negotiated agreements between governments acting as owners of a public enterprise and the managers of the enterprise itself.

13. Given the externalities and economies of scale in research and development, associations of utilities or central government organizations can be the focal point in documenting and disseminating successful management practices in their respective countries.

14. An efficient and effective sector company cannot survive, much less provide effective and efficient service, if it is not able to recover its costs and contribute to system expansion. Governments should, therefore, devise mechanisms to overcome not only economic but political, social, and institutional barriers that influence the adoption and effective implementation of adequate rates.

15. The findings of this study strongly suggest that good management practices should be placed at the center stage of any company striving to reach high levels of effectiveness and efficiency. The examples of successful management practices documented in this study show that adequate operational efficiency and effectiveness can be attained by all utilities in the region.
1. **Background**

1.1 In 1988 five Latin American companies (referred to hereafter as LAU companies) were visited by World Bank consultants as part of a study to identify and disseminate information about the management and operational practices of well-run companies in the region. These companies were considered among the best run of those in the sector. To provide a broader frame of reference, a desk review of operating practices was made on selected Spanish and French water utilities (SFU companies). Performance and monitoring indicators for these and other U.S., Canadian, and Brazilian companies were also presented.

1.2 The success of the utilities in the sample taken was associated with organizational effectiveness and efficiency. Effectiveness refers to attaining public service goals and is measured according to the percentage of population served within the utility's area of jurisdiction. Efficiency refers to success in achieving organizational targets at a minimum cost. This is measured by the degree to which the organization optimizes its available resources. In some cases, an effective organization can be inefficient if it achieves its goals at a high cost (Israel 1989). Policy and institutional aspects of effectiveness and efficiency are intertwined. In both, however, the state plays a pivotal role in determining the policy environment in which an enterprise operates. Governments are also responsible for the social and physical infrastructure that underpins the activities of sector companies.

2. **Overall Environment and Structure of Utilities**

2.1 Sector companies in the region face similar problems and constraints. Most of these are related to the economic, political, and social environment of the country or region in which they operate. Among the most important are:

- High inflation.
- Difficult access to capital markets.
- Rapid and uncontrolled urban population growth.
- Significant proportion of low-income population to be served.
- Politically appointed managers and controlled rates.
- Instability of technical and managerial positions.
- Low salaries and an untrained labor force.

2.2 LAU companies have managed to be successful despite these problems and constraints. They have all reached service levels substantially above the corresponding national averages for water and sanitation services (Table 1), and they all operate at efficiency levels substantially higher than those of most sector companies in the region (Tables 2, 3, and 4). Although LAU companies still have room for improvement, when they are compared to well-run sector companies
in industrialized countries, the efficiency gaps that separate them from SFU companies are narrower than those between LAU companies and most other sector companies in the region.

2.3 LAU companies are all public enterprises (regional or municipal), and as such some of their decisions, particularly those related to budgets, rates, and investments, are controlled by line ministries and/or national and local government agencies. Three of them operate in large urban or metropolitan areas and two are regional companies that provide services to several small- and medium-size municipalities (Table 1). At the same time, LAU companies are located in areas characterized by above average per capita gross regional product, by a traditional entrepreneurial culture among the people, and by local institutions of high repute and level of academic standing.

2.4 Spanish and French companies studied demonstrated some substantial differences from the Latin American companies surveyed, inter alia:

a. Private capital plays an important role in both financing and operating European companies. Two of the companies studied are listed in the stock exchange and all have full operational autonomy. Despite their monopolistic position, however, they are subject to state and municipal controls, and their rates are regulated by clear financial policies that take into account parameters of operational efficiency.

b. LAU companies operate in cities or regions with population growth rates substantially higher than those in Europe. For the period 1985-87, for example, water and sewerage connections grew at annual rates of 6.7% and 5.3% respectively for LAU companies (Table 1). In contrast, one of the European companies had negative growth over the same period. This challenge is shared by almost all sector companies in Latin America. The implicit higher demand for services, when coupled in many cases with high service deficits, reinforces the need for an aggressive and consistent investment strategy for the sector to meet this challenge.

c. The two regional companies studied in the Latin American sample operate in relatively dispersed geographic areas. For example, COPASA serves a population of some 8 million over an area of 587,000 square kilometers (approximately the same area as the Iberic peninsula), and ACUAVALLE covers a mountainous area of 21,200 square kilometers.

2.5 No significant differences in organizational structure were observed among LAU companies when compared to SFU companies. No one organizational structure clearly emerges as the most efficient in the Latin American sample. SFU companies, however, have leaner organizations, meaning fewer employees and lower personnel costs in relation to overall operating costs. SFU companies operate in national economies with low inflation rates and have to contend with fewer controls by the public administration and with lower growth rates and corresponding lower capital investments.
AGBAR in Spain and EPM in Medellin, Colombia, emulate the organizational structure of large private corporations worldwide that follow standard multidivisional forms. These two companies organize tasks according to geographical markets, in the case of AGBAR, or sectors (water and sewerage, telephones, power) in the case of EPM. They also separate tactical from strategic decision making. The former is assigned to regional or sector heads and the latter to top managers who are supported by headquarters staff and an elaborate accounting system. The remaining utilities organize tasks according to a functional form that groups tasks according to their position in the organizational system (e.g., commercial or operations) and centralizes both tactical and strategic decisions. Exhibit 1 illustrates these two organizational structures.

3. Practices to Emulate

3.1 LAU companies have been able to develop responsive management teams and sound managerial and operating practices despite environmental constraints, even though not all have attained the same levels of efficiency. Other sector companies in the region could benefit greatly if they were to emulate these practices. The most salient, but not always quantifiable, aspects that help explain their good performance are:

a. LAU companies have developed distinctive organizational cultures. Their managers are held in high esteem in their communities. Managers have been able to translate this trust into a mandate for the company to strive for excellence and to transmit and infuse their sense of pride and commitment to the rest of the staff. These companies have been able to attain a reasonable degree of institutional autonomy and thus have been able to resist or minimize pressure for radical shifts in policy or decisions that would damage the technical base of their organizations.

b. There is, by far, more job stability in mid-management and professional positions. The institutional memory of the company is thus preserved and long-term objectives are kept in focus. LAU companies allocate resources to training and keep abreast of sector developments outside their geographical area. Partly as a result of their sound personnel management, LAU companies exhibit high levels of productivity.

c. LAU companies' financial strength has been achieved by implementing reasonable rates to at least cover operating and maintenance requirements. Some are also able to contribute to their investments.

d. LAU companies are characterized by their customer-orientation. Relations with customers receive the highest priority. Customers are treated promptly and
courteously. This not only provides feedback on operations but reinforces community trust in the company. The function of the commercial department is seen not only as an extension of this public relations policy but also as the most critical link to the financial well-being of the company.

3.2. Some specific practices of LAU companies also deserve attention:

a. EMOS has the highest staff productivity among LAUs. This high productivity is maintained even when taking into account an imputed labor cost for contracted services. This is due to EMOS's successful use of private contractors in areas like meter reading and system maintenance, areas that are usually handled in other companies by their own staff.

b. C.A.D. took the lead in using private capital participation to build and operate a wastewater treatment plant and to sell treated effluents for use in industrial processes. Through this action, scarce water resources were preserved, environmental conditions improved, and industrial needs for water satisfied.

c. Both EPM and COPASA have developed effective cost accounting systems that support a successful financial planning and cost control strategy. Their good financial management is closely linked to a good cost accounting system that provides timely and reliable information.

d. COPASA and ACUAVALLE are regional companies that have developed an organization responsive to the needs of small- and medium-size municipalities in their jurisdiction. Municipalities are free to join these companies. Through educational and promotional campaigns these companies have also been able to promote the active involvement of communities in the construction and improvement of their water supply and sewerage systems.

e. To ensure a sustainable availability of water, most companies carry out watershed protection programs that focus on forest conservation and environmental monitoring and control. For instance, COPASA conducts water management programs in over 100,000 hectares throughout the state of Minas Gerais. There, COPASA has successfully reforested native species. Similarly, ACUAVALLE has coordinated the management of 17 river basins with other regional agencies.

f. Several LAU companies have actively promoted technical innovation. In an effort to reduce unaccounted for water, COPASA, along with other Brazilian companies, has induced manufacturing companies to design and produce small meters that are more sensitive and accurate to the low flow-rate
patterns of most domestic consumers. ACUAVALLE, in cooperation with a local university, has promoted the development and use of low-cost water treatment systems based on state-of-the-art, slow-rate sand filters.

3.3 In other areas of organization and operation, the European counterparts fare much better and therefore should be emulated by companies striving for even higher efficiency levels. These practices are as follows:

a. The government, the company's board of directors, and management have clear roles. The government regulates and sets clear norms, the board of directors formulates strategic plans, and management operates and carries out the utilities' operations with a high degree of autonomy.

b. The use of private capital in company operations fosters independent decision making and compels management to be more accountable for its performance. SFU companies' management control systems make decentralization work. Their operational decisions are assigned fully to the lowest possible management level. Decisions are made expeditiously and thoroughly.

c. Management information and operation systems make use of state-of-the-art technology. Computerized systems are used to maintain up-to-date information to monitor and optimize the use of resources.

d. The function of the internal auditing department has been expanded to oversee and help improve operations and practices of the whole company. Professional management-auditors ensure that procedures are up-to-date; function properly; and generate relevant, reliable, and timely information needed by management.

e. Companies emphasize accountability for their actions by providing their customers with such information as the costs of providing service, company plans, and results of technical and financial operations.
24. Monitoring Indicators

4.0 To the extent possible, operating indicators have been calculated for LAU companies and for selected sector enterprises in Europe, the United States, Canada, and Brazil. The monitoring indicators presented here should be interpreted with caution. None of these indicators can fully describe or capture all the peculiarities and problems that confront a given company. Nevertheless, they are useful as a management and evaluation tool and are of great help in setting up realistic objectives to improve operations and to design plans and strategies to reach them. Indicators are defined and quantified in Tables 1 through 4.

4.1 Operational Indicators

4.01 Unit of Service. This index is important for further comparisons with other indices. A distinction must be made between a service connection and a service account. The first implies the physical pipe connection to the building from the water supply or sewerage network system. The second is often associated with a bill for services rendered. Both can include service to one or more housing units. Wide variations, therefore, can be expected in the index of persons served by a service connection and service account, particularly when large apartment buildings are considered.

4.02 Staff per 1,000 connections. This index can be calculated as total staff per 1,000 water connections or per 1,000 water plus sewerage connections. The latter is probably more significant as it encompasses both services; the former tends to disfavor companies that provide both services (sewerage companies are rare, at least in Latin America).

4.03 The average ratio of employees per 1,000 water connections in LAU companies is 4.7 (3.0 per 1,000 water plus sewerage connections). This ratio implies a staff productivity of at least double that of other regional companies (10 to 20 per 1,000 water connections). Staff productivity for water only in the sample of European, American, and Canadian companies is 2.2, 2.9, and 2.0 per 1,000 respectively. (Information on sewerage connections was not readily available for these companies.) This higher productivity is the result not only of more extensive use of state-of-the-art technology but also of better trained staff.

4.04 Salary Costs. A complementary index to the staff per connections ratio is the ratio of total salary costs to total operating costs (before depreciation). Personnel costs are one of the most important, if not the most important, cost element of a water and sanitation company. In LAU companies the average ratio is under 40%, which compares favorably with most other Latin American sector companies, where it often exceeds 50%. The same ratio for the SFU companies is under 30%.
These staff productivity indices are highly relevant to the financial standing of a company. Most sector institutions in the region would benefit greatly by increasing staff efficiency and thus liberating resources to improve operations and maintenance and to contribute to the expansion of services.

Unaccounted for Water. Unaccounted for water (UFW) is defined as:

\[
UFW = \frac{\text{Metered Net Water Production to Distribution System} - \text{Water Metered Sales}}{\text{Metered Net Water Production to Distribution System}}
\]

This is a very elusive index because more often than not production and consumption volumes are not metered adequately. Therefore, large errors in unaccounted for water estimates are possible, particularly in consumption. For this reason, this index loses significance, particularly as the relative number of unmetered connections increases.

The average UFW for the visited companies is 34%, which contrasts to that of 40% to 60% for other companies in the region. It is, however, higher than figures reported for the sample of SFU companies (22%) and of U.S. companies (13%). Canadian companies report an average of 12% UFW coupled with a metering coverage of 73%, which points to definitional problems referred to earlier.

There are three main components of UFW: a) metering errors, b) leaks and losses in pipes and other water handling facilities, and c) unauthorized use. Leaks and losses are often referred to as technical losses. Based on the experience of some LAU companies, leaks and losses account for 15% to 20% of UFW (including fire fighting and street cleaning). Metering losses account for 15% to 20% (2% to 5% in macrometering and 12% to 15% in micrometering). UFW due to unregistered and illegal connections represents between 5% to 10%. If the lessons learned by SFU companies were used by American and Canadian companies, technical and metering losses could be reduced to less than 20% and unauthorized uses to close to 0. Technical losses indicate water that cannot be consumed, while nontechnical losses indicate the sum of the consumption and billing losses or, in other words, consumption that is not paid for (Bayer 1988).

The reduction of UFW is important not only as a conservation measure but as a measure need to help replace or postpone the need for capital investment to develop additional water resources. For example, a reduction of UFW from 45% to 25% in a municipality growing at 3% per year would postpone investments in new production facilities by about eight years. Metering of consumption has a similar effect in reducing consumption and therefore production needs. Reduction in production volumes also reduces pumping and chemical costs. Exhibit 2 illustrates the effect on per capita consumption due to water metering. Finally, a reliable assessment of UFW provides significant information to improve the operation of the water distribution system.
4.10 UFW reduction programs need to be persistent and systematic over time to show results. Brazil's successful experience has shown that reduction of one to two percentage points per year is also possible. Exhibit 3 presents data on UFW reduction programs carried out by two Brazilian utilities. The experience of most water supply companies in the region also indicates that high values of UFW are often the result of deficiencies in the commercial system and not of high leaks in pipes and losses in other appurtenances in the distribution system. These deficiencies are related to outdated cadaster information; inadequate accounting for users; and inadequate meter reading, selection of metering technology, and maintenance practices.

4.2 Financial Indicators

4.20 This study has shown that it is very difficult to make a clear comparative analysis of company finances in different countries. Even without significant variations in accounting procedures, and with the benefit of a full analysis of investment strategies, most specific values for financial ratios would be open to question. For these reasons, we have not attempted a detailed comparative financial analysis from which a comprehensive set of financial ratios and practices can be recommended.

4.21 Nevertheless, certain practices related to financial management can be highlighted. Ratios and definitions as well as limitations in their interpretation are presented in Table 4.

a. Current assets. Adequate management of these assets is vital to ensure that financial resources are used effectively and are available in a timely manner. Indicators of good management practices include a low level of accounts receivable and an adequate level of cash on hand to pay all operational expenses and to pay contractors and suppliers.

The quick and current ratios of LAU companies indicate that they apply very conservative policies to the management of their liquid assets. A more "profit oriented" management approach would result in these assets being invested in short-term financial instruments to obtain an extra financial return on them.

A high level of accounts receivable (more than about two to three months) is indicative of problems in the commercial system (billing and collection), of an insufficient effort in collections, and of inadequate policies in dealing with overdue accounts (including low or no penalties for late payment). The importance of keeping this ratio as low as possible is particularly relevant in situations of high inflation.
The low level of accounts receivable in most LAU companies is indicative of a good commercial system and of adequate collection practices. Most of these companies have strict policies to impose financial penalties and even disconnection from service for late payment.

b. Cash Generation. Internally generated funds should be adequate to cover all operating and maintenance costs and debt service obligations and to contribute to the expansion of the system.

The working ratio gives a good indication of the capacity of a company to satisfy its operating costs (before depreciation) from its operating revenues. A value greater than 0.8 is already troublesome and a value greater than 1.0 totally unacceptable.

An analysis of LAU companies' working ratios (Table 4) shows that LAU companies generate adequate operational revenues to cover all cash operating costs. It is not surprising then to observe that these companies provide adequate operation and maintenance of their assets. In addition, through gains in operating efficiency, costs have been contained. Thus, most of these companies are generating funds to contribute to their expansion plans.

4.22 As depicted by LAU companies’ experiences, a precondition for good financial management is a cost accounting and financial forecasting system that provides timely and reliable information. As a guideline, income and loss statements should be available no more than one to two weeks after the end of the month. Information on the cash situation should be available daily, and financial forecasting should be updated monthly. Cash flow position and forecasting, including accounts receivable and payable, should be updated regularly.
5. Operational Issues in Small Communities

5.1 An analysis of operating indicators of 36 regional and municipal water and sewerage companies in Brazil for 1984 provides a useful insight into the problems associated with the operation of small systems. This analysis indicates that there are important economies of scale in the operation of water and sewerage systems. A similar conclusion is reached when examining the operational data of the sample of Latin American, European, American, and Canadian companies. The main variables analyzed were:

<table>
<thead>
<tr>
<th>Company Size Range</th>
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</thead>
<tbody>
<tr>
<td>(000 water connections)</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Staff per 1000 water connect.</td>
</tr>
<tr>
<td>Staff per 1000 wat. con. index</td>
</tr>
<tr>
<td>Average salary/staff index</td>
</tr>
<tr>
<td>Operating cost/connec. index</td>
</tr>
</tbody>
</table>

5.2 COPASA serves as a good example in identifying the implications of these findings. In 1984 COPASA was responsible for the operation of water and sewerage systems in 314 and 19 municipalities respectively. The population served in an average municipality was 17,700 (3,100 water connections). If these municipalities were to operate their water systems independently, the above data would indicate that they would require 77% more staff as compared to COPASA, and their aggregate operating costs would exceed those of COPASA by 59%.

5.3 It is also of interest to note that the average salary per employee rises with the size of the company, while total operating costs per connection decrease. Data from American and Canadian companies as well as for LAU companies show a similar trend. Large companies are able, through larger salaries, to attract more competent personnel, which in turn allows them to operate at a higher efficiency and offset larger unit labor costs.

5.4 Per capita income tends to decrease as the population of a community decreases. Small communities, therefore, can hardly afford to pay for good managers and a critical mass of operational staff needed to ensure an adequate water and sewerage service. These problems are not exclusive to the region. The same conclusion holds true for small towns and services in other countries. The solution to the problem of providing good services in small municipalities has been provided in Latin America and Spain by regional sector companies (privately owned in Spain) that are in charge of all phases of operation, from planning to operations and maintenance.

5.5 In Latin America there is overwhelming evidence that water and sewerage services in municipalities with populations of less than about 150,000 (less than 20,000 to 30,000 water connections) can be provided with
services more efficiently and at lower cost if they are managed and operated by independent regional companies. Regional companies are also in a better position to capture some of the economies of scale present in the construction of large works (water intakes, water and sewerage treatment plants, etc.) that can be shared by several municipalities.

6. An Agenda for Action

33. Most of the good management practices and monitoring indices identified seem obvious and simple to implement. In practice, a concerted and sustained effort is required to reach the high levels of effectiveness and efficiency associated with these companies. Most water supply and sewerage utilities in the region would greatly benefit if they could emulate the experience of the LAU group of companies.

34. However, emulating good practices requires more than just knowing what to shoot for. First, there is the problem of applying what is valid for a given company operating in a political and economic microclimate to a company in which conditions may be different, even from those conditions in which nearby "model" LAU companies operate. Second, even though organizations can learn and adapt, several problems must be overcome to emulate good practices. Real situations are filled with risks and opportunities, and usually managers must see a coincidence of opportunity and payoff before they can run the risk of change. Organizational learning must tread a narrow path. On one side, a less structured organization facilitates innovation and, where successful, can lead to increased self-confidence and risk-taking. On the other side, success can be the enemy of experimentation, as it may lead to stability in routines, and this in turn to stagnation and a stifling of experimentation needed for future learning. Thus, in emulating LAU companies' practices, companies not only need to be creative and to adapt good practices to local conditions, but also to maintain a systematic and continuous effort to improve efficiency and effectiveness.

35. Several strategies have been used by public sector companies to achieve effective management. They all start with a firm commitment to improve and an open mind to trying new ideas that may run contrary to the way things have been done in the past. To improve effectiveness (percentages of population served) and efficiency, utilities should set specific and attainable goals and unequivocal priorities along with measurable indicators to monitor progress.

36. Several paths have been followed to improve operations. All have their merits and limitations. Companies and governments may therefore need to assess a mix of alternatives. Among the most widely used are twinning operations, targeting and bonus systems, and contract plans.

a. Twinning operations imply an horizontal cooperation between, and transfer of experience from, a well-run and an emerging company (Cooper 1987). Recent examples
of cooperation have been those undertaken between local utilities within a country, as in Brazil or Colombia; internationally between organizations and consultant firms with utilities in Jamaica and Ecuador; and between utilities from different countries, for example, between Brazil with Uruguay and Argentina and the United States and Costa Rica.

b. **Targeting and bonus systems.** Some authorities have established targeting and bonus systems to improve the efficiency of state-owned enterprises, and such approaches also can be applied to sector companies. The focus is on operating efficiency, not financial returns, and on motivating management. Care should be taken, however, to set efficiency objectives that do not include variables over which managers have no control (Shirley 1989). Several mechanisms have been suggested to strengthen the effectiveness of these incentive systems, including rewarding managers who reduce operating losses as well as those who increase profits, allocating bonuses on an individual basis, and increasing managerial autonomy.

c. **Contract Plans.** France and some developing countries have implemented mechanisms to improve performance of public enterprises based on contract plans (CP). CPs are negotiated performance agreements between governments acting as owners of a public enterprise and the managers of the enterprise itself (Nellis 1988). CPs help to clarify goals, increase managerial autonomy, and open a dialogue between management and the state. CPs seem to work best with firms that operate commercially and already have an acceptable level of management and sound financial and reporting procedures.

37. Given the externalities of economies of scale in research and development, associations of utilities or central government organizations can be the focal point to document and disseminate successful managerial practices in their respective countries. These agencies should perform periodic studies to help overcome the endemic weakness of most of their institutions. Areas deserving further attention include organizational decision making, investment strategies, and cost-effective local technologies.

38. An efficient and effective sector company cannot survive, much less provide an effective and efficient service, if it is not able to cover its costs and contribute to system expansion. Governments should devise mechanisms to overcome economic, political, social, and institutional barriers that influence the adoption and effective implementation of adequate rates. Regulators should set specific goals, establish clear "rules of the game," and clarify mutual obligations
between the state and the utilities. Latin American governments can learn from the U.S. experience, in which the government has created strong public utility commissions (PUCs). PUCs approve tariff requests and also look at the efficiency of the companies they regulate, including reviewing demand forecasts and expansion programs, and also responding to customers' complaints.

39. Sector companies should assess the potential for improvement offered by privatization of the management of operations. The prevalent path followed by most European countries has been to contract the operation for the supply of services through management contracts between municipalities and private companies. The involvement of the private sector in some operational areas is also worth a closer look.

40. The findings of this study strongly suggest that good management practices should be placed at the center stage of any company striving to reach high levels of effectiveness and efficiency. Examples of successful management practices documented in this study show that adequate operational efficiency and effectiveness levels can be attained by utilities in the region. The study also raises a number of questions that remain to be answered. They include inter alia an assessment of mechanisms to improve management and operational practices of utilities operating in the same or different latitudes, subcontracting and procurement practices, and investment strategies that improve a utility's effectiveness and efficiency.
NOTES

1. This paper was prepared by Guillermo Yepes (LATIE) with the assistance of Ernesto Sanchez-Triana. The document is based, in part, on a report and data gather for the World Bank by AGBAR, which is a private corporation that operates water, sewerage, and other municipal services in Spain.

2. The Latin American companies examined were COPASA of Minas Gerais, Brazil; ACUAVALLE of Valle del Cauca; and E.P.M. of Medellin, Colombia; EMOS of Santiago, Chile; and C.A.D. of Monterrey, Mexico. The Bank would like to thank these companies for their cooperation in providing this information and for the useful comments of their officers during interviews.

3. The Spanish and French utilities surveyed as a basis for comparison were S.C.A.B. of Barcelona; A.M. of Alicante; and Gestoras AGBAR (from Spain); and Compagnie Des Eaux de la Banlieue (C.D.E.B.) of Paris (from France).

4. E.P.M. of Medellin provides power generation and distribution and telephone services in addition to water and sewerage services. COPASA is a regional company that provides services to more than 310 municipalities.

5. The information for monitoring indicators was provided by LAU companies when they were visited by consultants preparing this report.

6. Modern operational practices followed in Medellin and in SFU companies require each housing unit in an apartment or condominium system to have a metered connection. Brazil has developed a methodology for maintaining records on both indices, serviced connection and serviced account.

7. Four factors make comparison difficult: a) government policies and regulations that affect financial management and therefore financial results, b) rate of exchange policies, c) accounting procedures to deal with variation in exchange rates and with inflation; and d) consistency in the revaluation of fixed assets.

8. The selection of Brazilian companies (26 state regional and 10 municipal in the state of Minas Gerais) for this calculation was based on the accessibility and consistency of data.

9. The index has been normalized. The value of the respective index for a utility with 100,000 water connections (equivalent to a serviced population of about 600,000) has been taken as the unit.

10. ACUAVALLE (1987) estimates this threshold population at 200,000 inhabitants.

11. Care should be taken not to infer that a large and centralized federal or national organization would be an optimal solution. Experience during the 1960s and 1970s in Argentina, Colombia, Mexico, and other large countries indicates that the expansion of this type of central sector agency stretched its managerial capacity to the point where service inefficiencies were readily observable. In the 1980s this led to the disbandment of most of these organizations.
REFERENCES


### TABLE No. 1.
MANAGEMENT AND OPERATIONAL PRACTICES
MUNICIPAL AND REGIONAL WATER AND SEWERAGE COMPANIES
GENERAL INFORMATION ON COMPANIES ANALYZED
(1987)
--- Water Supply ----------------- -------- Sewerage -------

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<th>Serviced Population (000)</th>
<th>House Connec (000)</th>
<th>Popul per House</th>
<th>Service Level %</th>
<th>Serviced Popul. (000)</th>
<th>House Conn. (000)</th>
<th>Service Level %</th>
<th>Growth / Water %/ Yr.</th>
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/a --- Data not available or not applicable
/d Remaining 13% are serviced by the municipality.
/e Yearly growth for period 1985-1987
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<th>Consumption M3/Month/Conn</th>
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<th>Micro Metering %</th>
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TABLE No. 2.
MANAGEMENT AND OPERATIONAL PRACTICES
MUNICIPAL AND REGIONAL WATER & SEWERAGE COMPANIES
TECHNICAL INDICATORS 1987
**TABLE No. 3.**
MANAGEMENT AND OPERATIONAL PRACTICES
MUNICIPAL AND REGIONAL WATER & SEWERAGE COMPANIES
PERSONNEL INDICATORS 1987

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<th>Company</th>
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<th>Population Served</th>
<th>Employees/ 1000 Water Connections</th>
<th>Total connections (Water + Sewerage)</th>
<th>Cubic Meters Billed/ Employee (1000 m³/year)</th>
<th>Personnel Costs/ Operating Costs (%)</th>
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**EUROPE**

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**Canada**

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¹/ Own staff (1622) plus equivalent number of positions (1006) due to contracted services.
²/ CABES (1984) Saneamiento Basico Do Brazil 1984
**TABLE No. 4.**
MANAGEMENT AND OPERATIONAL PRACTICES
MUNICIPAL AND REGIONAL WATER & SEWERAGE COMPANIES
FINANCIAL INDICATORS 1987

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<th>Working</th>
<th>Profit</th>
<th>Accounts Rec. (months)</th>
<th>Operating Revenue US $/m³ Sold</th>
<th>Fixed Assets US$/con²</th>
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**EUROPE**

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<th>Deb/Equity</th>
<th>Operating Margin (%)</th>
<th>Working</th>
<th>Profit</th>
<th>Accounts Rec. (months)</th>
<th>Operating Revenue US $/m³ Sold</th>
<th>Fixed Assets US$/con²</th>
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<tr>
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<td>68/32</td>
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<td>Average</td>
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1 Inflation Adjustments not included
2 Water and sewerage connections
3 Water and sewerage only
4 Total company
EXHIBIT 1

Multidivisional and Functional Organizational Structures

Functional
ACUAVALLE

Multidivisional
AGBAR

Diagram of organizational structures for ACUAVALLE and AGBAR.
**EXHIBIT 2**
PRODUCTION PER CAPITA VS. METERING
Gallons Per Capita Per Day (GPD)

**EXHIBIT 3**
Unaccounted For Water Reduction Programs

Source: Data from SABESP 1977-1981