Water Policy 8 (2006) 31–50

The viability of decentralized water and sanitation provision in developing countries: the case of Honduras

Glenn Pearce-Oroz

Sr Urban and Municipal Development Officer, Unit 2927, APO, AA 34022, USAID/Honduras.
Fax: 00 (504) 238-2812. E-mail: gpearceoroz@usaid.gov

Received 29 July 2004; accepted in revised form 7 February 2005

Abstract

The sustainable delivery of basic services continues to be an elusive goal for water and sanitation operators in developing countries. In Honduras, both centralized and decentralized providers of water and sanitation coexist simultaneously, providing an opportunity to compare the effectiveness of each approach amid similar constraints. This analysis uses ten variables that measure access, efficiency and sustainability, in comparing the experiences of 16 potable water systems in small- and medium-sized cities, operated by centralized and decentralized water authorities. While neither approach provides a single, integrated model of a best practice, overall the decentralized systems demonstrate better practices than their centralized counterparts. Decentralized potable water systems systematically outperform centralized ones in financial efficiency and in their ability to increase coverage of basic services over time. In large part, the decentralized systems' better practices have been motivated by institutional arrangements that promote political accountability to customers and provide incentives for sustainable management practices. Decentralized operators continue to face challenges, namely the need to apply economic principles in designing tariff regimes and implementing management practices to account for capital depreciation. Despite these challenges, however, this analysis demonstrates that decentralized systems are not only viable in developing countries, but also tend to provide better service than those systems operated by a centralized authority.

Keywords: Access; Accountability; Centralized operators; Decentralization; Financial efficiency; Management; Sanitation; Sustainability; Water

Introduction

The sustainable delivery of water and sanitation services is one of the more challenging issues in meeting basic needs in developing countries and a critical link in successfully achieving poverty reduction strategies. While central governments in many developing countries have assumed this responsibility, there has been an increasing recognition that decentralized provision of basic services is

doi: 10.2166/wp.2005.028

also a potential option. Whether or not decentralized operators can more effectively and efficiently provide these services than their centralized counterparts will depend to a large extent on the management capacity of local operators. As the following analysis indicates, even in low-income developing countries, decentralization strategies in the provision of basic services are viable.

Honduras provides an exceptional example of centralized and decentralized operators existing simultaneously, subject to the same economic, financial, regulatory and natural resource constraints. Because of the coexistence of centralized and decentralized potable water systems, management of water and sanitation in Honduras provides an intriguing test case for determining the benefits and limitations of each approach. The following analysis of 16 water supply and sanitation systems[1] in small- and medium-sized cities in Honduras will provide insight into the performance, sustainability and efficiency of centralized and decentralized providers over the past decade. These lessons, as well as an identification of areas where improvements are necessary, will provide input into the strengthening of municipal management of water and sanitation services as the provision of these services becomes decentralized in accordance with the October 2003, water and sanitation framework law (Ley Marco, 2003). Under this law the 31 remaining water systems still operated by the central government's *Servicio Autónomo Nacional de Acueductos y Alcantarillados* (SANAA) must be transferred to municipal operators within five years.

Specifically, the following comparative analysis will evaluate the performance of seven centralized and nine decentralized systems in three areas: (1) access (coverage and quality), (2) efficiency (production, commercial and financial) and (3) sustainability (decision-making, tariffs and subsidies and capital investment capacity). The mixed performance of both centralized and decentralized service providers notwithstanding, the results of this analysis suggest that local institutions are driving change in the water and sanitation sector. They are more efficient in the provision of basic services and the more likely of the two to achieve sustainability. Finally, this analysis and its recommendations for strengthening the local institutions aim to inform a larger debate regarding decentralized management capacity in the developing world. Challenges will continue, but specific measures can be taken to improve the sustainable delivery of a quality service.

An opportunity for sectoral reform: the framework law for water and sanitation

The passage of the framework law during the final months of 2003 is the most significant sectoral reform in Honduras in nearly 45 years and affects both operational and regulatory aspects of water and sanitation delivery. Since its creation in 1961, SANAA has been the single largest provider of water supply and operator of the largest urban water systems in the country[2]. During the 1990 s, a succession of legislative decrees provided for the transfer of six water systems to municipal authorities on a case by case basis. By 2003, 31 urban water supply services remained under SANAA's administrative control, 84 others were operated by decentralized providers, while the remaining estimated 177 water services of municipal seats[3] were municipally operated and/or technically assisted by SANAA. Now, the recently

[1] See the Appendix for a listing of the selected water and sanitation systems and their corresponding dimensions.

[2] Except for Tegucigalpa's sanitation system, SANAA never assumed the operation of sewerage systems nationwide as originally provided by law.

[3] Each municipality is made up of a municipal seat, which in the case of 115 municipalities include urban areas and rural villages within its municipal jurisdiction. Only a few municipalities have more than one urban area within their boundaries.

approved law legally mandates the transfer of the remaining 31 water supply systems under SANAA's authority (including Tegucigalpa's water and sanitation system) to municipal operators, while giving municipalities the responsibility to administer potable water services to their urban populations, either directly or through another decentralized provider.

This law also provides for the institutional disentanglement of policy and regulatory agencies. The previously existing institutional arrangements in Honduras were inefficient, complex and overlapping in the application of norms and regulations (República de Honduras, 2003): seven executive branch entities were able to make policies for the sector; five executive entities as well as each municipality established regulations and norms for the operation of systems; and regulatory oversight and control corresponded to four separate entities of the executive branch. In an effort to clarify the institutional framework, the water and sanitation law establishes one national council to coordinate policy making within the executive branch and a single independent regulatory agency responsible for economic and quality regulation.

The sector now faces an important transition period during which it must implement the reforms outlined in this legislation. In terms of the transfer of ownership and management of the 31 water systems, one of the immediate challenges becomes the negotiation of transfers between SANAA and the respective municipalities, without causing a disruption in service. In addition, the restructuring of SANAA, including severance payments to its personnel, represents a critical obstacle. Once these immediate challenges are resolved, the medium- and long-term challenges will involve the sustainable operation of these new systems, which can benefit from proven and existing strategies practiced by local service providers. The *de facto* decentralization of water supply and sanitation[4] that has existed simultaneously with the SANAA system over the past 43 years has stimulated some significant advances in the delivery of basic services. Despite difficulties, challenges and mixed results, positive examples exist from municipal management of water and sanitation as well as from autonomous local service providers. In both instances, local operators have pursued economies of scale by combining water and sanitation with the management of other municipal services, such as solid waste management and street cleaning. Despite the existing challenges, decentralized systems are better positioned than the SANAA operators to achieve efficient, sustainable provision of water supply and sanitation services in urban areas that are responsive to local needs.

Access

One of the first challenges facing policy makers in developing countries is the lack of accurate sectoral information and indicators. In Honduras, although an integrated water and sanitation information system exists in the Ministry of Health, it is largely obsolete and lacks credibility (República de Honduras, 2003). SANAA provides data for its urban water supply systems, but no official repository of information exists for those systems outside of SANAA's control. In addition to its urban water supply services, SANAA monitors approximately 4,800 rural water supply systems through its regional offices. Apart from SANAA's monitoring and evaluation system, the only other database for urban decentralized water supply systems, which is limited in size, was compiled between 1994 and 2003 by the *Fundación para el Desarrollo Municipal* (FUNDEMUN) as part of the USAID Municipal Development Program.

[4] An estimated 84 urban water systems and all public sewerage systems except for Tegucigalpa's are managed locally.

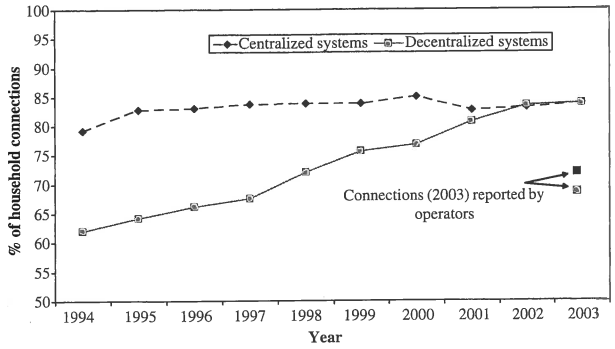

Fig. 1. Access (broadly defined) to urban water supply in selected cities. Source: FUNDEMUN/USAID basic services.

This database, however, is less complete than SANAA's monitoring system both in size (includes only 46 of the 298 municipalities in Honduras, some of which are SANAA systems) and scope (limited number of indicators collected). In the absence of any national accounting and information system[5], historical as well as current data are incomplete. Specific efforts by international organizations (Pan American Health Organization (PAHO), Inter-American Development Bank (IDB), UNICEF, USAID) coincide with the 2001 Census (INE, 2001) to provide similar, if not exact, estimates of access rates to water and sanitation on a national level for both urban and rural populations.

Nationally, access to water supply in urban areas has increased from a coverage of 85% in 1994 (ESIS, 1994) to 94% in 2002 (EPHPM, 2002)[6]. In contrast, according to these sources, access to public sanitation has improved slightly over the past ten years, increasing from 94% in 1994 (ESIS, 1994) to 95% in 2002 (EPHPM, 2002), with less than 55% connected to a sewer system (República de Honduras, 2003). Finally, domestic wastewater treatment lags far behind, with only a limited number of treatment facilities existing nationwide that cover a minimal percentage of the urban population.

Compounding the problem of accurate information, definitions of adequate access differ and do not always connote access to public water and sanitation systems. Census and international data suggest that access to water and sanitation solutions is far greater than the connections reported by individual systems. In Tela, for example, international indicators estimate that 86% of households have anadequate water supply (FUNDEMUN, 2003). The *División Municipal de Aguas de Tela* (DIMATELA), however, reports only 5,619 connections of a total of 7,637 homes for a total coverage by the public water system of 74%. The additional 12% coverage being reported can be attributed to private systems in middle and high income areas, improvised systems in peri-urban and low income areas as well as a broad definition of adequate access. No study has been reported to assess the quality, efficiency and sustainability of these alternative systems nor is it likely that smaller, alternative systems are systematically being monitored for compliance with economic and quality regulations.

Broad definitions of access to water and sanitation overestimate the percentage of households with access to public systems of water and sanitation. While public systems represent the majority of

[5] The Instituto Nacional de Estadísticas (INE), the entity now responsible for conducting permanent household surveys, was created in 2000.

[6] Access for urban populations outside of Tegucigalpa and San Pedro Sula in 2002 reached 85% (EPHPM, 2002) illustrating the importance of these two principal cities that represent 44% of the country's urban population.

connections, a percentage of access is provided through alternative systems and strategies. Figure 1 illustrates the ten-year trend in access to urban domestic water supply (broadly defined) for the 16 systems included in this study. For 2003, the percentage of household connections to public systems as reported by operators is also included, revealing a difference of between 10 and 14% of households that are covered by alternative methods and systems.

Even allowing for the differences between broad access to water supply and direct access to a public water system, the data for the 16 systems suggests markedly different trends between centralized and decentralized service providers over the past ten years. In cities served by centralized SANAA systems, 79% of households in 1994 had access to water supply (broadly defined) as compared to 62% of households in cities with decentralized systems. By 2003, however, coverage is nearly identical with 84% of households in both types of cities having access to water supply. While the access rate by centralized systems increased by only 5% over the past 10 years, the decentralized systems made significant progress in addressing unmet needs (22% increase). On the surface, this may suggest that decentralized systems have an advantage in financing capital investments over their centralized counterparts. However, no viable comparison can be made as both centralized and decentralized systems have depended almost exclusively on donor grants and financing for their major capital investments.

The difference in trends can be explained by the improved management capacity and political accountability in the decentralized systems over the past ten years. Starting in 1994, a number of technical assistance programs were launched to strengthen the management capacity of municipalities (all 16 cities included in this study are beneficiaries of this type of assistance). The increased management capacity by decentralized service providers has made them increasingly eligible for donor-funded infrastructure projects. At the same time, the effectiveness of local political leadership since 1994 has increased and can be attributed to the municipal reforms implemented in 1991. These reforms provided municipalities with greater management and legal instruments to administer basic services while simultaneous electoral reforms introduced mechanisms for directly electing local officials. In 1993, for the first time mayors were elected directly by voters rather than indirectly through party lists that included national as well as local candidates. This direct election has shifted the power and accountability structure significantly and made mayors and councils increasingly more responsive and accountable to local constituencies. As a result, local needs are prioritized and more aggressively pursued.

Unlike water supply, and with the noted exception of Tegucigalpa, urban sanitation services are operated at the local level throughout the country. While in 1994 cities with centralized water supply services and a decentralized sanitation service ("centralized/decentralized") had fewer household connections to public sewerage systems than cities with decentralized water systems ("decentralized/decentralized"), the difference was not as pronounced as with access to water. However, while "decentralized/decentralized" systems maintained constant levels of urban sanitation coverage, "centralized/decentralized" services achieved more substantial increases in coverage over the past decade. These contrasting trends need to be interpreted jointly with water coverage and may reflect a zero sum gain in management and financial capacity during the first years of the decade. One plausible explanation supported by the data suggests that local managers of decentralized water systems focused on increasing access to water during the initial years, which is almost always a priority over sanitation and may not have been able to dedicate as many financial and political resources to improvements in their sanitation infrastructure. Therefore, coverage of urban sanitation services remained constant until 2002 and 2003 when coverage increased slightly. Similarly, in cities where water supply is provided by a central authority and increasing access to water is also the responsibility of that authority, the

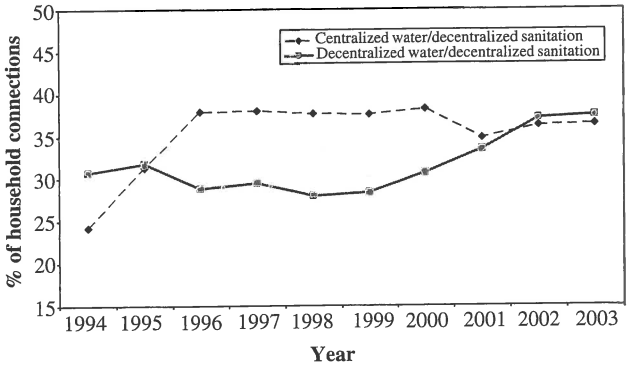

Fig. 2. Access to urban domestic sanitation. Source: FUNDEMUN/USAID basic services.

decentralized sanitation provider is able to focus more directly on increasing connections to the sewerage system or providing other safe sanitation alternatives such as latrines in less densely populated areas. As a result, the "centralized/decentralized" systems have demonstrated more dynamism in increasing sanitation coverage over the past ten years.

Finally, the limited sanitation coverage of approximately 37% of urban households in both "centralized/decentralized" and "decentralized/decentralized" cities in 2003 (see Figure 2) reflects the financial burden represented by more costly construction of sewer lines and sewerage systems compared with the typically less costly water distribution system. Much of the increased access over the ten-year period can be attributed to increased household connections to existing sewer lines since major increases in coverage beyond the easily reached neighborhoods require significant financing that is, for the most part, inaccessible to local operators.

Quality of service: rationing and treatment

Quantitative indicators that measure access to urban domestic water supply also have the potential of masking the quality of service being provided to homes. Despite high coverage rates, the quality of water and sanitation services throughout the country continues to be deficient and is one of the major reasons that diarrhea and intestinal illnesses are the second leading cause of infant mortality and the leading cause of child mortality in urban areas, registering rates three times as high as other Latin American countries (ENESF, 2001)[7]. In terms of uninterrupted access to water, most households receive rationed service and some go more than one day without service, even if they are connected to the public network. With few exceptions, such as in Tela and Tocoa, access to a 24-hour water supply does not exist for customers in the 16 systems surveyed. Widespread intermittent or irregular service provision has forced the urban population to adopt a variety of storage and accumulation strategies. Given this reality, a more realistic parameter for measuring acceptable domestic water supply is daily service with a minimum of 12 hours combined with hygienic storage. Provision every other day or too few hours per day makes

[7] In Honduras, infant mortality reached 34 per 1,000 live births in 2001. By comparison, Costa Rica infant mortality reached 10 per 1,000 in 2000, Chile 10 per 1,000 in 1999 and Colombia 13 per 1,000 in 1998 (Pan American Health Organization, 2001).

Table 1. Rationing and treatment of water supply.

	No treatment	Filter and chlorine	Treatment plant
No rationing		**Tocoa**	**Tela**
Moderate rationing	**Villanueva**	**Catacamas**	**Choluteca** *El Progreso* *Juticalpa*
Heavy rationing	**Choloma**	**Olanchito**	**Santa Rosa** *Danlí*

Key: decentralized systems in **bold**, centralized systems in *italics*.

domestic water use difficult even with catchment and storage strategies and promotes waste by households during the times they receive water.

Whereas the lack of 24-hour water supply is fairly consistent throughout the country, treatment of water supply is more uneven. In Honduras, an estimated 88% of water sources are superficial, requiring some degree of treatment (República de Honduras, 2003). However, the combination of political pressures for providing greater access to water supply and a lack of enforcement of quality standards results in a low priority for the treatment of public water supply. The enforcement of standards, incumbent upon the Health Ministry, is not systematic over time or throughout the country and focuses its sporadic efforts on SANAA operated systems. Certain systems, such as Juticalpa, have treatment plants, but treated water is not provided to all its customers. Although tariffs guided by economic principles should include treatment costs, the lack of a demand-driven approach in defining *ex-ante* the financial responsibilities, combined with the absence of economic principles in tariff setting also work against a more systematic approach in the treatment of water supply.

Table 1 categorizes selected centralized and decentralized service providers based on rationing and treatment of domestic water supply. The systems are classified from the most deficient category in the bottom left-hand corner—those that have both heavy rationing and no treatment—to the most effective category in the upper right-hand corner—those that provide 24-hour service of treated water. None of the systems provide uniform quality to all customers nor can they be considered as delivering a high quality service. Different areas typically receive different levels of rationing or different types of treatment depending on their location and the origin of their source. Even in Tela, the system categorized as having the best practice, service is uneven, with deficiencies in treatment and rationing to some neighborhoods. For the purposes of this comparison, each system is classified based on the service being provided to the majority of its customers.

As noted in Table 1, centralized systems more consistently provide treated water to households. This reflects in part the monitoring mechanisms that are reported systematically to SANAA's central office and a more uniform approach implemented by trained water experts. Decentralized systems, on the other hand, have been confronting lower access rates over the past ten years and have focused more attention on expanding coverage rather than providing treatment. In the absence of effective enforcement, water quality is not controlled or improved systematically. Ideally, future indicators and measurements will go beyond the existence of treatment mechanisms to include the quality of water being delivered.

Efficiency

The efficient operation and maintenance of water and sanitation systems on the one hand and the simultaneous pursuit of universal, safe access to these basic services on the other, are often incompatible for systems confronted by a large percentage of low-income customers. In Honduras, services face additional constraints caused by poorly performing financial markets that offer few financing mechanisms at high interest rates and a lack of credible enforcement mechanisms to deal with delinquent customers. Even with the benefit of a coherent policy framework, economically viable tariff regimes and a functioning regulatory entity, an enabling environment can still be hampered by a weak national economy, a predominantly low-income customer base and poorly functioning financial markets.

Because of the lack of historical data, the operational performance of the 16 systems included in this analysis is limited to one year, 2002. The preliminary conclusions of this analysis should be interpreted with the caveat that one year's performance may be exceptionally positive or negative and not as representative as a multi-year measure. The lack of available historical data again suggests the need for greater efforts in systematic data collection and performance monitoring.

Volume billed versus volume produced

At the heart of efficiency measurements is the ability of water service providers to account for the production and delivery of water supply. While leakage and unaccounted water will never be eliminated altogether, management mechanisms to quantify production and identify losses can be introduced. A billing-to-production ratio comparing the volume billed over the volume produced provides one effective indicator to determine the extent of losses that each water supply system must subsidize. In terms of this measurement, decentralized service providers in Honduras are unable to determine basic levels of production accurately. None of the nine decentralized systems included in this analysis possess macro-metering of well or surface production and therefore can only indirectly estimate the amount of water being produced for distribution. The consumption side is equally as deficient with no micro-meters existing for domestic customers of the decentralized systems[8]. To determine patterns of consumption, the decentralized operator must rely on estimates based on global consumption patterns and standards, usually $35\,m^3$ per household per month or 60 gallons per person per day. As metered residential consumption in centralized systems demonstrates, water usage in low-income households in Honduras is well below the standard $35\,m^3$. However, where unmetered households receiving rationed access and implementing storage strategies are concerned, the same estimate may be less than the true consumption rate. Subsequently, on a month-to-month basis, these decentralized providers have no ability to gauge accurately the volume that is being delivered to customers and no control mechanisms in place to provide incentives for efficient use of water.

The SANAA systems monitor more accurately their production of water and have incorporated production measurements as a standard indicator and management tool. Although production is measured, the centralized systems are only slightly better equipped than their decentralized counterparts to monitor consumption. Of the 52,138 domestic connections to SANAA systems represented in this

[8] Only DIMATELA reported metered the domestic consumption of exactly one commercial customer.

Table 2. Billing to production ratio for selected systems, 2002.

System	Ratio	Cubic meters billed annually	Cubic meters produced annually
Comayagua	0.59	4,746,613.00	8,053,666.00
Danlí	1.34	2,221,399.00	1,654,373.00
La Esperanza/Intibucá	0.25	909,466.00	3,659,840.00
Juticalpa	0.49	1,333,034.00	2,724,744.00
La Paz	0.93	1,476,597.00	1,591,560.00
Siguatepeque	1.05	2,815,345.00	2,688,989.00
Average	0.77	2,250,409.00	3,395,528.67

Source: SANAA, 2003; SANAA, 2002.

sample, only an estimated 4,677 micro-meters are installed, all other domestic consumption is unmetered and estimated based on the standard consumption rate of 35 m^3 per connection per month. As indicated by the billing-to-production ratios of SANAA systems included in Table 2, unaccounted water in 2002 for these six systems is estimated at 1.1 million m^3, or 34% of production. This loss should be considered a conservative estimate and could well be higher owing to the predominance of unmetered connections as well as the absence of economic incentives that promote non-wasteful use of water by customers.

Billing versus collection

The tariff-collection capacity of water service providers helps measure the commercial efficiency of the business operation. In terms of billing systems, decentralized service providers in Honduras have a distinct advantage over their centralized counterpart. Because most decentralized billing systems are able to access other municipal billing records and even integrate or cross-reference their customers with other municipal databases, decentralized operators are able to identify and track customers more accurately. In addition, greater economies of scale in billing administration are achieved by including water, sewerage, solid waste and street cleaning tariffs and fees in the same bill. Greater leverage can also be utilized in terms of tracking and negotiating payment of arrears.

Contrary to the recent *Análisis Sectorial de Agua y Saneamiento* (República de Honduras, 2003), one of the most complete assessments of the water and sanitation sector in Honduras, most if not all decentralized providers in the 50 largest urban centers maintain separate accounts for budgets associated with water and sanitation service provision. All nine decentralized systems included in this study manage separate accounts for their municipal services and can easily identify operating costs, revenues by source, arrear payments and capital expenditures. A comparison of 2002 funds accountability statements in four decentralized systems indicates that the least effective in collecting tariffs for that year was Catacamas (42% of the amount targeted for billing), with the other three collecting at higher rates (Villanueva 67%, Santa Rosa 97% and Olanchito 154%)[9].

[9] The surplus generated by tariff collection in Olanchito can be attributed to underestimated billing targets. Nevertheless, it reflects an important high rate of collection.

In contrast, the centralized system manages its billing administration regionally. Each regional office tracks and delivers statements to customers in five to eight local water systems within its region, without the benefit of combining its bill with other bills for payment to generate economies of scale. Disaggregated financial data was not available for the SANAA systems to determine the percentage of tariffs collected of those billed in 2002.

Working ratio (WR)

Finally, the working ratio (WR) provides a parameter to determine the financial efficiency of a service provider by comparing annual operating costs (excluding depreciation and interest payments) and operating revenues (tariffs, connection fees, arrears). Alone, the WR will not guarantee service delivery, but this parameter helps identify systems functioning without operational deficits. The WRs for the 16 systems in 2002 are summarized in Figure 3 and illustrate a noticeable difference between centralized and decentralized service providers.

In 2002, all decentralized systems included in this study had separate budget lines or accounts clearly identifying operating costs and revenues of water provision. This accounting practice facilitates the calculation of the WR for each system and more importantly provides a financial management tool for planners, politicians and managers. Because of separate accounts for water and sanitation systems, decentralized managers and their boards of directors can easily monitor income and outlays to control operating costs and, at minimum, ensure that they do not exceed operating revenues.

In addition to these financial management tools for tracking costs and revenues, locally managed systems have strong built-in political incentives for maintaining broad fiscal discipline. Simply stated, local services operate within a more closed or limited financial system than their centralized counterparts with fewer opportunities available to subsidize inefficiencies or cost overruns. The lack of opportunities to cover cost overruns creates pressure on managers to operate services within their revenue ceilings or

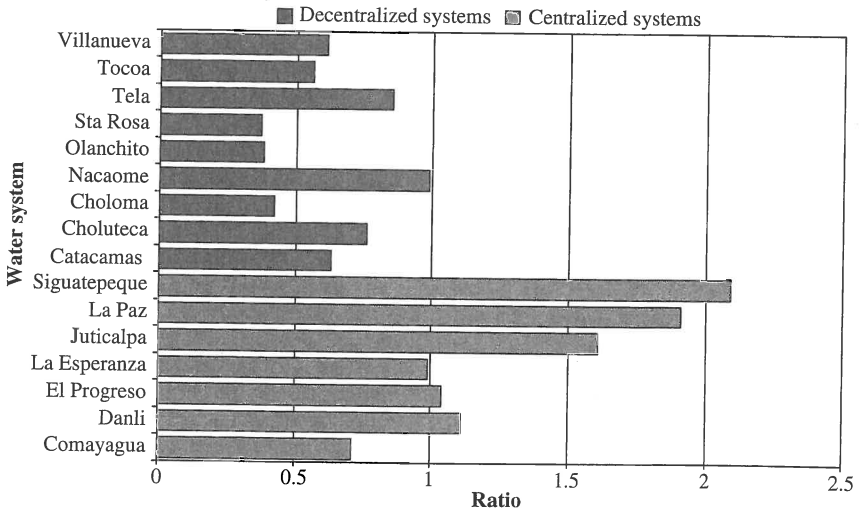

Fig. 3. Working ratio (water supply). Source: 2002 budgetary information compiled from water systems.

face the difficult decision of subsidizing overruns from local income destined for other services. In either case, accountability is focused at the local level and directly on locally elected officials. For example, if the water system's deficit is covered by funds budgeted for teachers' salaries or street maintenance, locally elected officials will still be held accountable for diminished service provision. In 2002, none of the nine decentralized service providers operated with a deficit and several maintained a WR well below one indicating sound financial management. In addition, these rates are competitive with some other systems worldwide such as Seoul (0.75), São Paulo (0.49) and Manila (0.52) (TWUWS, 1996), demonstrating successful financial management of decentralized services even in a low-income developing country such as Honduras. In large part, this should be attributed to clarity in the management of financial accounts as well as a strong political incentive of accountability to constituents.

The financial management of centralized systems operates according to different incentives. The regional management structure of SANAA promotes the efficiency of the entire region over the efficiency of local systems and does not provide incentives for fiscal discipline of individual systems. Regional managers target the financial efficiency of the aggregated systems rather than each system separately. Any deficits sustained in one water system can be balanced out by surpluses from another within the same region as part of a strategy to subsidize low performers and poorer customers in certain parts of the country with higher performers and wealthier customers in other parts of the country. If receipts from tariffs or debt collection are low in a particular system, there is little incentive to improve the efficiency of that particular system when other systems within the region are producing financial surpluses. Similarly, if an entire region is performing poorly, it can receive additional income transfers from other regions via the central office.

In contrast to the direct accountability of locally elected officials, accountability is not focused or easily identifiable in the centralized system. If SANAA cost overruns are subsidized at the expense of other national services, the responsibility is shared by Congress and the executive branch. This more open financial system and multiple layers of financial decision making dilute political accountability. As a result, very few centrally managed systems operate without deficits. The WR for the centralized systems in Figure 3 demonstrates the levels of financial inefficiency reached in 2002, where only two of the seven systems included in this analysis had their operating costs covered by their operating revenues.

Sustainability

Both centralized and decentralized service providers are ill-equipped for sustainability. At the most fundamental level, neither type of operator implements management tools guided by coherent principles of sustainable service delivery. The SANAA systems, for example, monitor production and financial indicators, but have other institutional mechanisms counteracting potentially solid and sustainable management practices. Regional managers can track inefficient local systems, for example, but do not have an incentive to address the problem until the entire region is experiencing difficulties or deficits. The experience of decentralized water systems is more heterogeneous and many operators have incorporated management mechanisms or decision-making structures that are sound, but none provide complete models for long-term operation and maintenance, expansion, cost recovery and capital investment capacity.

As discussed in the previous section, most decentralized systems are geared toward short-term financial efficiency and maintain an acceptable working ratio. But short-term efficiency does not guarantee long-term sustainability. The recent sectoral reforms, the new regulatory agency and the decentralization of all water systems provide an opportunity to correct unsustainable practices and reorient locally managed systems to adopt principles that promote sustainable provision of water and sanitation. A comparative analysis of centralized and decentralized service providers' decision-making structures, tariff regimes and capital investment capacities, indicates where some of the challenges to a more sustainable approach to water and sanitation management can be found.

Corporate decision making

In order for water and sanitation services to adopt and maintain sustainable practices, service providers must have (1) a decision-making structure made up of appropriate personnel, (2) institutional incentives to address the requirements of sustainable service provision and (3) the ability to be responsive to local contexts, needs and preferences.

In comparing centralized and decentralized service providers, both have only partially successful formulas for management and decision making. The SANAA system has the technical and professional capacity (i.e. appropriate personnel), but lacks the institutional incentives for promoting sustainable processes as well as an accountable decision-making structure. Conversely, decentralized systems tend to have more coherent incentive structures to promote sustainable processes and are more accountable to customers, but lack a critical mass of appropriate technical and professional personnel.

In terms of being responsive to local contexts and needs, the decentralized providers have an advantage over centralized service providers. For decentralized providers, corporate and operational decisions are made by local actors accountable to local constituencies. When these services are provided by the municipality, ultimate authority rests with the locally elected mayor and city council. In the case of semi-autonomous local authorities, ultimate authority rests with a board of directors made up of representatives from the city council as well as citizen or customer representatives elected at membership assemblies. In both cases, the decision-making structure provides direct access for input by local actors and users, allowing for greater accountability to take place. In addition, decision makers for decentralized systems are in a better position than their centralized counterpart to coordinate with other relevant local decision makers, such as real estate developers, other service providers, agricultural cooperatives and the municipality.

Critical to their accountability and responsiveness, these local boards possess the authority to approve annual budgets and establish their own tariff regimes. For this reason it is necessary that the boards understand the economic principles behind tariff setting, have access to accurate data regarding consumption and the impact of subsidies and receive appropriate technical advice and guidance. Despite sound institutional arrangements at the local level, the lack of technical preparation and experience by local decision makers and managers is a weakness of nearly all decentralized service providers.

An inverted set of strengths and weaknesses holds true for the centralized operators. Decision making within the SANAA system is much more complex, with several layers of decision makers responding to incentive structures at a regional or national level. The most basic operational decisions are taken by the local SANAA manager of each water system. However, most maintenance decisions, especially those requiring budgetary outlays, are taken at the regional level by the regional manager who may have between five and ten water systems under his charge. Strategic and corporate decisions, such as capital

investments, improvements over US$550 and budget allocations are taken by the SANAA's central office in Tegucigalpa. Other financial decisions, such as annual budget formulations are conducted by the Ministry of Finance, in coordination with SANAA, while Congress retains approval authority over SANAA finances as part of the national budgeting process. Finally, an autonomous national commission is responsible for establishing tariffs for every SANAA-operated system in the country. This decision-making scheme does not automatically preclude responsiveness to local problems and needs. However, it neither provides a structural mechanism for encouraging local inputs in the decision-making process nor incentives for accountability.

Unlike the decentralized service providers, SANAA has developed a critical mass of technical and professional staff who are familiar with the requirements for maintaining sustainable systems. Structural incentives within the SANAA system and political intervention in the decision-making process, however, severely compromise the ability of managers and technicians to implement these sustainable practices.

Tariff regimes and subsidies

According to the service providers, the tariff regimes of all 16 systems have been calculated to cover operation and maintenance costs while at the same time attempting to provide subsidies to low-income consumers. These tariffs represent a fraction of the full supply cost, because they do not include capital charges or depreciation and an even smaller fraction of the full economic cost of water. As a result, these tariffs create obstacles for a system's long-term financial sustainability, operation, maintenance and infrastructure replacement. To become sustainable, tariffs should reflect the full cost of water, including full supply cost, opportunity cost, economic externalities and environmental externalities (Rogers *et al.*, 1998). However, none of the 16 systems have accounting systems in place to estimate these disaggregated costs.

In terms of subsidies, no explicit policy exists in Honduras (República de Honduras, 2003). Any attempted subsidy policy would be complicated by the fact that an accurate socio-economic data collection system to identify eligible recipients would have to be created and maintained. In the absence of both current socio-economic data as well as metering of consumption, proxies based on property value and/or household surveys are utilized to estimate relative consumption levels of different income groups. A higher property value is used as a proxy for customers that consume more water on a monthly basis. The owners of these properties are charged a higher monthly tariff for water than owners of properties with lower values. However, as the following benchmark tariff analysis demonstrates, tariffs have not been established according to economic principles and poorer customers are consistently paying more per cubic meter of water than other income groups.

A final constraint on tariff setting practices among these systems is the lack of annual adjustments to account for inflation that, according to World Bank estimates (2003), has averaged between 10 and 15% annually over the past ten years. The lack of automatic annual adjustments further erodes the ability of managers to design tariff regimes based on the full economic costs of service delivery.

A benchmark tariff[10] was calculated to estimate the operation and maintenance cost of delivering a cubic meter of water for 15 of the 16 water systems included in this study (see Table 3). The benchmark tariff for delivery of a cubic meter of water is then compared to the existing tariff regimes in each of the

[10] The benchmark tariff methodology used in this analysis is adapted from Walker *et al.*, 2000. Because of a lack of data, the calculation of the benchmark tariff could not include either full supply costs or full economic costs of a cubic meter of water.

Table 3. Benchmark tariff vs. existing tariff for selected systems, 2002.

	Existing tariff (Honduran Lempiras)			
	Benchmark tariff (Lempiras)	Low (% of households)	Middle (% of households)	High (% of households)
Choloma	0.54	2.70 (33%)	1.39 (67%)	–
Choluteca	0.99	2.40 (16%)	1.89 (51%)	1.65 (34%)
Comayagua[a]	1.74		2.21 (100%)	
Danlí	1.85	2.88 (19%)	**1.55 (80%)**	4.09 (1%)
Siguatepeque	2.63		**0.89 (100%)**	
Catacamas	1.04	1.68 (87%)	1.23 (11%)	**0.73 (1%)**
Juticalpa	4.62	**2.82 (87%)**	**0.71 (13%)**	5.82 (0%)
Villanueva	2.38	3.60 (97%)	2.52 (2%)	2.89 (0%)
Tocoa	0.43	0.72 (55%)	0.49 (36%)	**0.41 (9%)**
Tela	0.73	1.80 (42%)	1.13 (46%)	1.60 (12%)
Santa Rosa	0.73	2.85 (49%)	2.02 (26%)	1.11 (25%)
Olanchito	0.34	0.63 (48%)	0.52 (38%)	0.63 (15%)
La Esperanza/Intibucá	1.32		**0.95 (100%)**	
La Paz	2.00		**0.89 (100%)**	
Nacaome	1.30	3.00 (89%)	2.20 (11%)	1.81 (1%)

Source: tariff data, individual systems, 2003.
[a] Specific existing tariffs were not available for the centralized systems of Comayagua, Siguatepeque, La Esperanza and La Paz.

selected systems. Tariff regimes for these systems are divided into low, middle and high-income categories[11]. Since nearly all consumption goes unmetered and in order to differentiate between different income groups, the calculated benchmarks include estimated consumption levels based on metered consumption patterns available in Honduras[12]. Those tariffs that fall below the benchmark reflect a subsidized price for water service, while those tariffs that are above the benchmark indicate a presence of surplus charges. It is worth reiterating that each benchmark tariff is artificially low and would be much higher once capital depreciation, opportunity costs and economic externalities are included. Likewise, a higher benchmark would reveal a higher percentage of users receiving subsidies.

As noted by the figures in bold in Table 3, relatively few tariffs fall below their respective benchmarks and can be considered subsidized. Three of the centralized systems providing subsidized tariffs (Siguatepeque, La Esperanza and La Paz) do not have disaggregated tariff data available, although it is likely that middle and high income groups are also receiving a subsidy, such as for the case of Juticalpa and Danlí. In practice, because most of these connections are unmetered, greater subsidies for all income groups are achieved owing to waste; that is, households are likely to consume above the monthly volume indicated by locally metered standards. This tariff analysis also depicts regressive tariff regimes for all 15 systems. Except for Danlí and Juticalpa, all low income tariffs are higher than the middle and high income tariffs for the delivery of a cubic meter of water

[11] Other tariffs exist, but are applied only minimally.

[12] Consumption patterns per income group were estimated using existing data of metered consumption of 2,877 households at low, middle and high income levels in El Progreso and applied globally as an estimated consumption pattern for users in other systems without micro-meters. This data suggests that poor households actually consume on average 16.66 m^3 per month, while households in the middle income groups consume 39.69 m^3 and upper income groups 96.92 m^3 per month.

and two decentralized systems have subsidized rates for the highest income groups. Finally, because of the difficulty in targeting low income users, compounded by not having the benefit of metered consumption, the application of the tariff regimes does not accurately identify customers according to their income groups. Especially when using proxies based on property value, a flawed property assessment system can lead to artificially low tariff assignments such as the case of economically prosperous cities such as Villanueva where 97% of households are being charged the minimum tariff.

Capital investment capacity

Another important element to consider when evaluating the sustainability of systems is the operators' ability to plan for future expansions, replace obsolete components and repair or improve the existing system. Unfortunately, master planning as well as capital investment planning for basic services in Honduras is virtually non-existent. None of the 16 systems reviewed for this analysis maintain updated master plans of how their systems will increase capacity and coverage to keep up with the population growth rates. While nearly all operators are cognizant of the importance of a master plan/capital investment plan as a management tool, institutional weaknesses of the operators and the macro-economic context within which they function work against this practice. The basic tools for developing a capital investment plan are missing as a result of accounting systems that are not organized to quantify and track capital depreciation and inventory. Without a system to manage these costs, it is difficult to identify and program investments, most of which occur only after systems either are no longer functioning or are destroyed as occurred following Hurricane Mitch in 1998.

A second limitation to capital investment capacity is the lack of financing available for water and sanitation infrastructure. Whereas decentralized systems have more diverse sources for financing infrastructure at their disposal than SANAA, the funds appropriated to SANAA in the national budget are potentially greater. In practice, however, neither decentralized nor centralized systems have made significant investments on their own to improve infrastructure requirements of their systems, relying heavily on grants from donor countries.

For municipal systems, the options available for financing capital investments range from tariff revenues, municipal bond issues, loans from commercial banks and targeted assessments for capital improvements. In practice, tariff revenues generate sufficient funds for only modest improvements and investments and municipal bond issues, while legally permitted, are not viable because no municipal bond market exists. Likewise, the rates charged on loans from commercial banks are prohibitive for many systems and targeted assessments for capital improvements have had limited successes because they require specialized capacity by municipal governments for their design and implementation.

For SANAA systems, revenues generated from tariff collection, bond issues and central government transfers are the main potential sources for capital investment. However, the budget deficit maintained by SANAA, as well as a restricted national budget, does not make either of these two options viable sources of large investments. Bond issues, while legally permitted, have not been utilized to finance infrastructure.

As a result, a heavy reliance exists on donor funding to resolve infrastructure needs in water and sanitation. Because the systems are not required to pay for the infrastructure costs, depreciation or replacement costs are often not included in the tariff structure with the tacit assumption that at the end of the useful life of capital, donors will again be available to contribute to financing these capital costs.

Very little has been accomplished in leveraging donor funds to make structural changes in the way the sector operates and in introducing enabling factors that are necessary for domestically generated long-term financing. The sectoral reforms that have recently been passed are one of the few examples of successfully conditioning a multilateral loan (IDB's US$26 million Potable Water and Sanitation Investment Program) to improvements in the institutional and policy framework.

Conclusions

The analysis of the 16 systems selected for this study is aimed at contributing to the still growing understanding of the operational realities of decentralized water and sanitation systems in the developing world. Understanding the challenges faced by decentralized service providers is necessary in order to better guide their long-term sustainability as well as the more general decentralization process.

Currently, none of the 16 systems can be considered efficient, sustainable providers of water supply and sanitation services in urban areas with universal coverage and responsiveness to local needs. Instead, each incorporate management practices or institutional frameworks that partially contribute to the efficient and sustainable provision of services. Table 4 summarizes the performance of centralized and decentralized systems when compared by access, efficiency and sustainability criteria. For three of the ten variables (rationing, tariff regime and subsidies) the performance among systems is similar. For others, such as subsidies, the findings of this analysis are mixed and suggest that centralized systems are offering more

Table 4. Comparative summary.

Criteria	Centralized service provider	Decentralized service provider
Access		
Coverage (water supply)	Increase of 5% (broadly defined) over ten years	**Increase of 22% (broadly defined) over ten years**
Rationing	Commonplace	Commonplace
Quality	**Treatment plants**	Mixed treatment
Efficiency		
Production (billing to production)	**Metering of production, loss of 34%**	No metering of production
Commercial (billing to collection)	No data available	**Ave. 90% collection rate**
Financial (working ratio)	Inefficient, most systems > 1	**Efficient, all systems < 1**
Sustainability		
Corporate decision-making	Multiple layers, diffuse accountability	**Concentrated, direct accountability**
Tariff regime	Regressive, not according to economic principles	Regressive, not according to economic principles
Subsidies	6 of 10 tariffs reported subsidized, only partially targeted to low-income households	2 of 26 tariffs reported subsidized, targeted to high-income households
Capital investment capacity	Limited sources available, dependence on donor assistance	**Multiple sources available, dependence on donor assistance**

Key: Sections in bold denote better practice.

subsidized rates, but that these are not necessarily targeted to low-income customers. The two variables where centralized systems reflect a better practice are operational in nature: metering of production and operation of treatment plants. In contrast, the five variables where decentralized systems provide better practices focus on business operations (commercial and financial efficiency), institutional arrangements (corporate decision-making and capital investment capacity) and the trend in improving access to services.

The water and sanitation sector in Honduras is in the midst of a structural transition that will culminate with decentralized operators throughout the country. The challenges facing the Honduran case are not unlike those being confronted by other developing countries that have initiated decentralization processes. To its benefit, Honduras has already experimented with *de facto* decentralization of urban potable water systems. Policy makers both in Honduras and other developing countries should draw on the accumulated experiences of existing decentralized operators in order to determine what works and where improvements must be introduced. The following lessons contribute to an understanding of where more efforts need to be directed if decentralized systems are expected to become efficient and sustainable providers of water and sanitation services:

1. *Alternative systems and strategies*. Not all urban households are connected to a public water system; as many as 15% of households must rely on alternative systems and strategies for their water supply needs. A better understanding is needed of how these alternative systems work, why these populations choose these systems if connection to a public network is available and how the alternative systems relate or become annexed by the public service provider.
2. *Storage and accumulation strategies*. Because the operational realities require storage and accumulation strategies by an important number of households, decentralized systems should address this widespread practice with programs that help eliminate or minimize wasteful water use and promote effective hygienic storage techniques.
3. *Metered production and consumption*. SANAA systems monitor the water produced for their systems but are at an equal disadvantage with decentralized systems regarding metered consumption. A highly unpopular measure from the customer's perspective, the introduction of meters (both for production and consumption) needs to be pursued in decentralized systems. Leveraging donor investment to make meter installation coincide with capital investment should be systematically implemented.
4. *Capacity building for decision makers and strengthened corporate management*. The proliferation of decision-making bodies among the decentralized (or soon-to-be decentralized) systems in Honduras will require capacity building for political leaders and boards of directors. These decision-making entities are well placed to remain accountable and responsive to local interests, but need the benefit of increased knowledge and understanding of the requirements for the efficient and sustainable delivery of basic services. To be effective, the increased knowledge of decision makers should also be accompanied by efforts to strengthen the corporate management capacity of local service providers. A targeted effort in improving all management components of the local provider is needed to improve the quality and reliability of service delivery.
5. *Economic principles in tariff setting*. None of the tariff regimes reviewed as part of this analysis reflect the incorporation of economic principles. The resulting tariffs are regressive across income groups without a clear targeting of subsidies. Tariff regimes also lack any systematic incorporation of capital depreciation. Decentralized systems need to review their methodologies for establishing tariffs and include the full economic cost of water.

6. *Subsidy policy*. The initial steps in developing subsidy policies must be taken. Decentralized systems need to begin with a review of their methodologies for targeting income groups and consider systematic surveys to collect socio-economic data that will serve as inputs for water tariffs and other social benefits.
7. *Capital maintenance planning*. An important part of sustainable practices is the ability to monitor, repair and replace capital infrastructure. None of the systems included in this study have the organizational capacity or accounting classifications needed to keep track of depreciation, inventory and replacement costs. Capital maintenance planning and expenditures need to be introduced as common practice.
8. *Performance indicators*. Even though they are not always utilized as an input in the decision-making process, SANAA regional managers collect specific operational and management indicators. None of the decentralized systems have adopted this systematic approach to performance monitoring. A minimal set of operational, financial and water quality performance indicators needs to be identified and incorporated into the decision-making process of decentralized operators.
9. *Financial markets*. Dependency on donor assistance will continue as long as the financial markets remain weak and do not provide competitive instruments for financing infrastructure. A long-term effort needs to be coordinated by the government, international assistance and the banking sector to identify the possibilities for increasing financial products to meet the demand for infrastructure investment.
10. *Central government commitment*. In addition to the measures taken at the local level by decentralized providers, the central government must also continue its commitment to the sector. For these reforms to be successful, the central government must quickly assume its responsibility for all administrative costs associated with the transferring of potable water systems and lay the groundwork for the new institutional relationships outlines in the law. A sound SANAA restructuring plan must be designed and carried out with consistent support by the government.
11. *Policy coordination among donors*. In countries such as Honduras where donor funds play an important role in filling the demand for capital infrastructure, policy coordination to guide grant funds are needed. The sector-wide approach (SWAP) being promoted by the IDB and other donors is one promising mechanism for this type of coordination.

Acknowledgements

An earlier version of this paper was presented at the Urban Research Symposium organized by the World Bank in Washington, DC (December, 2003). The opinions expressed herein are the author's and do not necessarily reflect the opinions of the United States Agency for International Development.

References

ENESF (2001). *Encuesta Nacional de Epidemiología y Salud Familiar (ENESF) 2001*. Secretaría de Salud, Tegucigalpa.
EPHPM (2002). *Encuesta Permanente de Hogares de Propósitos Múltiples (EPHPM), Septiembre 2002*. INE, Tegucigalpa.
ESIS (1994). *Encuesta sobre indicadores socio-económicos (ESIS)*. ADAI-USAID, Tegucigalpa.
Fundación para el Desarrollo Municipal (FUNDEMUN) (2003). *Basic Services Indicators, 1994–2003*. USAID, Tegucigalpa, (unpublished).
Instituto Nacional de Estadísticas (INE) (2001). *Censo Nacional de Población y Vivienda, 2001*. INE, Tegucigalpa.

Ley Marco del Sector de Agua Potable y Saneamiento (2003). *Decreto N. 118-2003*. La Gaceta Oficial, Tegucigalpa.
Pan American Health Organization (2001). *Basic Country Health Profiles for the Americas, Updated 2001*. http://www.paho.org/English/SHA/profiles.htm.
República de Honduras (2003). *Análisis del Sector Agua Potable y Saneamiento*. República de Honduras, Tegucigalpa.
Rogers, P., Bhatia, R. & Huber, A. (1998). *Water as a Social and Economic Good: How to Put the Principle into Practice*. Background Paper No. 2 Global Water Partnership/SIDA Technical Advisory Committee (TAC), Stockholm.
SANAA (2002). *Información Básica de Acueductos Regionales (La Esperanza, Siguatepeque, Comayagua, La Paz)*. SANAA, División Centro Occidente, Siguatepeque, Año 2002.
SANAA (2003). *Evaluación plan operativo anual a diciembre del 2002 de las regionales*. Documento No. 244. SANAA, Tegucigalpa.
TWUWS (1996). *Water and Wastewater Utilities Indicators*, 2nd Edition. The World Bank, Washington DC.
Walker, I., Ordoñez, F., Serrano, P. & Halpern, J. (2000). *Pricing, Subsidies and the Poor: Demand for Improved Water Services in Central America*. The World Bank Policy Research Working Paper 2468, Washington.
World Bank (2003). *Honduras-at-a-glance*. http//www.worldbank.org/data.

Appendix. Selected water and sanitation systems[a]

Table 5. Appendix

City	Population (2001)[b]	No. of homes[c]	No. of water connec.[d]	% coverage[e]	No. of sewerage connec.[f]	% coverage[g]
Choloma	**126,402**	**31,174**	**17,887**	**57**	**8,453**	**27**
El Progreso	94,797	22,499	19,714	88	13,201	59
Choluteca	**76,135**	**18,069**	**9,383**	**52**	**2,927**	**16**
Comayagua	60,078	12,961	9,475	73	5,390	42
Danlí	47,310	9,656	6,179	64	n.d.	n.d.
Siguatepeque	42,853	10,138	5,573	55	n.d.	n.d.
Catacamas	**35,995**	**6,960**	**4,221**	**61**	**1,429**	**21**
Juticalpa	33,698	6,999	6,302	90	n.d.	n.d.
Villanueva	**32,022**	**7,820**	**7,604**	**97**	**3,370**	**43**
Tocoa	**30,716**	**6,965**	4,459	**64**	**237**	**3**
Tela	**29,247**	**7,637**	**5,619**	**74**	**2,270**	**30**
Santa Rosa	**28,292**	**6,610**	**3,930**	**59**	**3,227**	**49**
Olanchito	**25,040**	**6,320**	**5,044**	**80**	**2,785**	**44**
La Esperanza/Intibucá[h]	18,277	3,645	1,978	54	n.d.	n.d.
La Paz	16,947	3,401	2,917	86	2,717	80
Nacaome	**14,701**	**3,339**	**2,470**	**74**	**336**	**10**

[a] Rows in bold denote decentralized water systems.
[b] 2001 Census, urban population of municipal seat.
[c] 2001 Census, urban homes.
[d] Connections to the public water system reported by operator for August-October, 2003.
[e] Percentage of homes connected: C/B
[f] Connections to the public sewerage system reported by operator for period August-October, 2003.
[g] Percentage of homes connected: E/B
[h] The cities of La Esperanza and Intibucá share a common water system. Population data is combined.
n.d. – no data.