

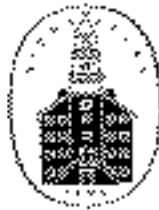
“Should We Bet On Private or Public Water Utilities In Cambodia?  
Evidence on Incentives and Performance from Seven Provincial Towns”

by

Mike Garn, Jonathan Isham, and Satu Kähkönen

June 2002

MIDDLEBURY COLLEGE ECONOMICS DISCUSSION PAPER NO. 02-19



DEPARTMENT OF ECONOMICS  
MIDDLEBURY COLLEGE  
MIDDLEBURY, VERMONT 05753

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***Should We Bet On Private or Public Water Utilities In Cambodia?  
Evidence on Incentives and Performance from Seven Provincial Towns***

Mike Garn  
World Bank

Jonathan Isham  
Middlebury College

Satu Kähkönen  
World Bank

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Abstract: Is public or private sector provision of water more likely to succeed in urban areas of Cambodia? Using quantitative and qualitative data from a range of surveys and technical assessments, this paper compares consumer satisfaction and technical performance of four private and four public utilities in Cambodia. The results indicate that households served by private utilities are significantly more satisfied with the piped water than customers of public utilities: the daily availability and quality of piped water is better, and service interruptions are less frequent. This has not happened by accident. Private utilities hire more educated staff whom they pay higher salaries; maintain their facilities on a more regular basis; and implement quality control programs more diligently. Private sector operators seem to face stronger incentives than public utilities to keep their customers satisfied. However, this improved service does not come for free and, consequently, does not yet reach all the available households. Households served by private utilities pay significantly more for piped water services, and some lower-income households that are not served by private utilities are partially limited by the high connection fees (as opposed to the regular monthly payments). Overall, while this recent effort to introduce private sector involvement in the water sector in Cambodia is encouraging, the full gains have not yet been realized. The commercial incentive for improved performance will likely be stronger if the privatization option used is a lease or concession arrangement; if there is more competition in the water market; and if the regulatory structure in Cambodia encourages commercial incentives to be more demand-responsive and cost conscious. Under these conditions, the private sector is a good bet.

Keywords: water supply, privatization, urban infrastructure, Cambodia.

JEL Codes: 017, Q31, R51.

## 1. Introduction<sup>1</sup>

Cambodia is actively seeking to develop water supply organizations that function well and, more broadly, a well-functioning water sector, as are other developing countries. It is possible to have well-functioning urban water companies managed and operated by either the public sector or the private sector. However, a key question to be answered is which choice offers Cambodia the best chance for significant improvement over the current arrangements.

As part of this process, Cambodia is experimenting with the introduction of the private sector in the management and operation of water supply organizations. In the past three years, water utilities in three provincial towns initiated the use of private sector operators. In the other 20 provincial towns in Cambodia, public utilities continue to be primarily responsible for the provision of water. In one of these, Kandal, a private company owns and operates part of the system.

Because this is so new in Cambodia, it is not known how well the private water utilities are performing and how well they are doing in comparison with the public utilities. Up to now no systematic performance assessments have been carried out, so the quantity and quality of the services they provide are not known. Nor is it known whether consumers are satisfied with the quality and quantity of services provided, which is a fundamental test of performance. Therefore, it is important to evaluate whether privatization of public utilities in these four towns has improved the delivery of water (increased the quantity and improved the quality of water consumed) in order to provide clues for future choices.

The objective of this paper is to assess and compare the performance and consumer satisfaction with services provided by the newer private companies and the more traditional public utilities. Specifically, the paper: (1) analyzes the level and quality of water services provided by private water companies and public utilities, and consumer reactions to these services; and (2) assesses whether there has been any significant change in the level and quality of water services provided as a result of private sector involvement.

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<sup>1</sup> This paper was prepared for the Public-Private Infrastructure Advisory Facility in the World Bank. We would like to thank Vijay Jagannathan for the opportunity to carry out the study. Also, thanks are due to the local team in Cambodia (M.S. Shivakumar, M. Kumbakumba, Chea Sarin, Han Phoumin, Ea Sophy, Nun Vanny, Meak Chhavannarey, and Venkatesh Sundararaman) that implemented the household and water utility surveys and carried out the technical assessments of water systems. We are also grateful to Ian McGuire of Middlebury College for his excellent research assistance.

## **2. Public vs. Private Provision of Urban Water: The General Case**

Private sector participation in water delivery is a relatively recent phenomenon in most developing countries. Up until 1990, almost all developing countries relied on government provision of water supply services (Silva, Tynan, Yilmaz 1999). However, in the past ten years, the disappointing performance of many (not all) public sector companies--as well as fiscal challenges--has encouraged many governments to look for alternative, more efficient ways of providing water services. Increasingly, they have turned to private sector solutions.

Although not open and shut, there is a strong case for encouraging more private sector involvement in the management and operation of urban water supply organizations. This case has three elements: (1) the dismal results of past attempts to substantially improve the performance of water supply and other organizations while retaining a preference for public sector management and operations (see, for example, World Bank 1995); (2) the growing evidence of the beneficial effect of private sector involvement where it has been tried; and (3) a persuasive explanation of these differing outcomes in terms of the relative incentive structures likely to face private and public sector organizations.

While it is not guaranteed, private sector participants generally face stronger incentives to be responsive to the demand for their services from users than do public sector participants. This is not because private sector participants are the “good” guys and public sector participants the “bad” guys. It is because, when the private sector is required to be responsible for normal commercial risks (as they should be), they depend much more than public sector participants on providing services that people want and for which they are willing to pay; and to control costs to increase net revenue. Public sector operators, who are generally less reliant on revenues from their customers to sustain their investments and operations and more reliant on government investments and operational budgets or grants, face weaker incentives to be responsive to demand. Put another way, public sector participants have to develop different strategies for resource allocation (how they utilize the money available to them) and for resource mobilization (how they raise the money available), while for the private sector operator, the two strategies are more nearly identical because of the ‘revenue from users’ requirement to sustain their investments. For the private sector operator, both strategies necessarily focus on users and their demand.

This outcome is contingent on the degree to which the private sector participant continues to be willing to assume the responsibility for future commercial risks. In turn, his willingness to do this is dependent on credible assurances that the government will not, in the future, make arbitrary decisions about pricing and additional assignment of responsibilities beyond those initially agreed between the operator and the government. The different options for private sector participation (service contracts, management contracts, BOTs, lease contracts, concessions, and outright sale of assets) differ considerably in the degree to which the private sector participant can be expected to take

and be responsible for commercial risks, and the degree to which credible government assurances require an explicit regulatory structure to be in place. The relevant positive incentive effects are likely to be strongest in the case of the last three options.

Although there are other incentive issues that could be discussed (see the next section), the most important requirement from the perspectives of this paper is that the private sector operator receives sufficient credible assurances from the government that the operator is willing to accept the commercial risks that are implicit in his future revenue projections. For then, the operator will have strong incentives to maintain a future revenue stream by being responsive to current and potential customers and, also, to control costs while doing so.

### **3. Private and Public Water Utilities in Cambodia: Specific Results**

In 1997 and 1998, water utilities in four out of 23 provincial towns in Cambodia—Banteay Meanchey, Kampong Speau, Takeo, and Kandal—began to use private sector operators.<sup>2</sup> In three of these towns—Banteay Meanchey, Kampong Speau, and Takeo—private sector companies are currently the sole network providers of water in the core area of the provincial town. By contrast, in Kandal, the private sector company operates the network outside the core area of the town, in Kien Svay. The core area of town is still taken care of by a public utility.<sup>3</sup>

The form of privatization varied across towns. In Banteay Meanchey, Kampong Speau, and Takeo, the Ministry of Industry, Mines, and Energy (MIME) granted private companies a three-year renewable license to supply water to residential consumers in the area. The renewal of these licenses depends on company's compliance with water quality and tariff stipulations. In addition, each of these private companies entered into a contract to transfer the assets of the water utility to the company for 23-40 years, after which all assets are to revert to the public sector. In Kien Svay, by contrast, no public assets were transferred to the private company. Instead, the private company entered into a built-own-operate (BOO) contract with MIME.

In none of the four provincial towns, which now use private operators, were the conditions for privatization ideal to maximize positive institutional incentives. The privatization process was ad hoc and non-transparent (De Raet and Subbarao 1999). Private companies were not solicited through open and competitive bidding. In each town the process was triggered by unsolicited bids. In Banteay Meanchey, Kampong Speau and Takeo, individuals who submitted these bids were granted the license without competition. In Kandal, one of the two bidders was selected, but it is not known what criteria were used to select the winner.

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<sup>2</sup> Takeo is 75 kilometers south, Kampong Speau is about the same distance east, and Kandal to northwest of Phnom Penh. Banteay Meanchey is located in northern Cambodia.

<sup>3</sup> In each of these provincial towns, there also is a large number of private water vendors that serve households not connected to the network.

Further, there is currently no overall regulatory framework governing the operations of these private companies and existing regulation is deficient (De Raet and Subbarao 1999). For example, it is not clear how water tariffs will be revised and contractual disputes settled. The licenses and contracts for the companies are ambiguous, therefore, on some important issues that have an impact on incentives. The government is aware of this and is attempting to rectify the situation. Hopefully, they will do so in a way that takes into account the incentive effects of future government and regulatory actions on private operators to enhance the positive results. Nevertheless, in each of these provincial towns and with considerable residual uncertainty, private companies have been willing to make investments--sometimes substantial--to rehabilitate and expand water supply networks in their respective market areas.

The rest of the provincial towns in Cambodia are currently served by public water utilities. Most of these utilities were shut down during the Khmer Rouge regime and were reopened in the 1980s with seriously depleted facilities. Some of them have since been rehabilitated with support from different donor agencies, rather than private investment.

To compare the current performance of private and public water utilities, in addition to the four towns served by private companies (Banteay Meanchey, Kampong Speau, Takeo, Kandal), four provincial towns served by public utilities were selected for the study. These towns were selected randomly to avoid selection bias, and they are Kandal, Battambang, Kampong Chhang, and Svay Rieng.<sup>4</sup> Kandal appears in both lists because both private and public utilities serve the market area. The private portion is called Kien Svay in this paper. Table 1 summarizes the staffing, production capacity, coverage, and fees of the eight private and public water utilities included in the study.

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<sup>4</sup> Battambang is the second largest city of Cambodia, and located close to Thai border in the northwest corner of the country. Kampong Chhang is a port and fishing town on the Tonle Sap river in the middle of Cambodia. Finally, Svay Rieng is located in Southern Cambodia close to the Vietnam border.

<b>Table 1: Selected Production and Financial Characteristics of Eight Water Utilities in Cambodia</b>								
	<i>PUBLIC UTILITIES</i>				<i>PRIVATE UTILITIES</i>			
	<i>Battambang</i>	<i>Kampong Chhang</i>	<i>Kandal</i>	<i>Svay Rieng</i>	<i>Banteay Meanchey</i>	<i>Kampong Speau</i>	<i>Kien Svay</i>	<i>Takeo</i>
Population of town	139,964	41,703	58,264	21,205	98,848	41,478	58,264	39,186
Year established in current form	1993	1996	1979	1980	1998	1997	1998	1997
<b>Staffing:</b>								
Number of permanent staff	65	8	16	16	20	6	10	15
Number of temporary staff	0	0	0	0	6	8	0	N/A
Monthly salary of staff (Riels)	130,000	45,000	50,000	47,000	285,000	494,000	326,800	N/A
Monthly salary of operation and maintenance worker (Riels)	120,000	45,000	50,000	47,000	200,000	304,000	304,000	N/A
<b>Production Capacity:</b>								
Current production capacity (m <sup>3</sup> /day)	3750	960	780	400	3000	1500	1632	1300
Current production m <sup>3</sup> /day	2750*	200*	780	320	1200	560*	176	120
Capacity utilized (%)	73.33	20.83	100	80	40	37.33	10.78	9.23
<b>Coverage:</b>								
Total number of direct connections from utility:	1766	409	580	393	1500	1700	230	450
• Residential	1618	406	561	375	1423	1510	229	N/A
• Business	78	N/A	5	N/A	50	180	N/A	N/A
• Government	70	2	14	18	25	10	1	13
Percentage of households covered	6.33	5.28	5.47	9.13	7.74	19.93	2.24	6.21
<b>Subcontractors:</b>								
Number of sub-contractors to utility	4	0	3	0	0	0	0	0
Number of connections served by sub-contractors	2046	0	239	0	0	0	0	0
<b>Connection fees and tariffs:</b>								
Connection fee (Riels)	200,000	190,000-342,00	136,500-390,000	5,000-35,000 + materials	350,000	76,000	190,000	228,000
Water tariff (Riels/m <sup>3</sup> )	1400	1000	550	600	1300	1500	1400	N/A
<b>Notes:</b> * based on production meter reads. All salaries and fees in Cambodian Riels (3763 Riels/1 US\$) Some information on the utility in Takeo is missing since the manager of the utility declined to respond to a formal survey.								

## **A. Staffing**

Private utilities have a slightly smaller permanent staff than public utilities surveyed. While the size of permanent staff in private utilities varies from 6 to 20 (average 13), public utilities have 8 to 65 (average 26) permanent staff members on the payroll. To supplement the permanent staff, private utilities--unlike public utilities--do hire temporary workers. These workers typically assist with the maintenance and tariff collection in different localities.<sup>5</sup> All utilities reported to have some staff on the premises all times.

Utility managers' level of education also differs systematically across private and public utilities surveyed: managers of all private utilities have more formal schooling than do the managers of public utilities. Managers of private utilities have either high school or university education, whereas managers of public utilities have a secondary school background.

Private utilities pay their staff--including operations and maintenance (O&M) workers--much more than the public utilities surveyed. The average salaries for staff and O&M workers in private utilities are 368,600 and 269,333 Riels, respectively--in contrast to 68,000 and 65,500 Riels in public utilities.<sup>6</sup>

## **B. Production Capacity**

Most private water utilities reported lower capacity utilization rates than public utilities. The young age of private utilities and relatively dilapidated condition of public utilities may partially explain this result. All utilities, both private and public, reported to have increased their production capacity in the past two years.

## **C. Coverage**

However, neither public nor private utilities have so far reached many people in their market area. In each town, the percentage of households served by a water utility is low: the coverage of private water utilities varies from 2 to 20 percent of all households, whereas the coverage of public utilities ranges from 5 to 9 percent. As expected, the majority of connections served by private and public utilities are residential. Table 1 summarizes the number of residential, business, and government connections served by each utility.

In addition to direct connections, public utilities in Battambang and Kandal have *sub-contractors* that are authorized to resell water to other households. Specifically,

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<sup>5</sup> For example, in Kampong Speau, the utility has eight "block managers" who monitor the network and collect tariffs in their locality. As compensation, they are paid a percentage of the tariff collected. The overall network maintenance is the responsibility of permanent utility staff.

<sup>6</sup> As shown in the table, three of the four public utilities pay their staff no more than 50,000 Riels per month -- the equivalent of \$13 per month.

these sub-contractors have been given permission to extend the piped network beyond their individual connections to other households in the area and charge a fixed tariff for the water sold. In Battambang, the utility currently has three subcontractors and the utility in Kandal has three. The number of connections served by subcontractors has increased rapidly in Battambang. Currently, subcontractors in that town serve a larger number of residential connections (2046) than the utility itself does (1618). Interestingly, all subcontractors in Kandal and at least some in Battambang are employees of the water utility.<sup>7</sup>

#### ***D. Connection Fees and Tariffs***

All private utilities, unlike public utilities surveyed, charge a fixed connection fee from their customers. These fees are listed in Table 1 and range from 76,000 Riels to 350,000 Riels.<sup>8</sup> They cover all labor charges, cost of piping materials, the water meter, and other connection expenses. All private utilities, except the utility in Kampong Speau, require their customers to pay the fee in lump sum.

The method of setting the connection fee varies across public utilities surveyed. The connection fee for utilities in Kampong Chhang and Kandal depends on the distance of the customer from the network. Accordingly, their fees range from 136,500 to 390,000 Riels, include all connection costs, and are to be paid in lump sum. In Battambang, the utility charges a fixed, all-inclusive fee of 200,000 Riels for new connections. Unlike other public utilities, it provides its customers an option to pay the fee in installments. Finally, in Svay Rieng, unlike in any other utility surveyed, customers who want a connection need to purchase the water meter, piping and other materials, and obtain all the needed permits and clearances themselves. They pay to the utility only for the labor charges related to connection, which vary between 5,000 and 35,000 Riels depending on the distance from the network.

Private utilities charge higher tariffs for water consumed than do public utilities surveyed. Both private and public utilities charge their customers a uniform tariff per a cubic meter of water consumed. This tariff is the same for residential, business, and government connections. In private utilities, the tariff varies from 1300 to 1500 Riels/m<sup>3</sup>. In public utilities surveyed, it ranges between 550 and 1400 Riels/m<sup>3</sup>. All utilities, except the utility in Svay Rieng, have metered all their connections and bill customers on a monthly basis based on meter readings. Currently, no utility charges its customers a minimum monthly fee.

Unlike the utility in Kandal, the utility in Battambang charges its subcontractors a different—lower—tariff. While its other customers with direct connections are charged 1400 Riels/m<sup>3</sup> of water, subcontractors pay for water 1375 Riels/m<sup>3</sup>. These subcontractors in turn are allowed to charge their customers up to 2000 Riels/m<sup>3</sup> of water

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<sup>7</sup> It is not clear what criteria were used to select subcontractors in Battambang and whether all subcontractors are employees of the utility.

<sup>8</sup> The exchange rate at the time of data collection was 1 USD=3900 Riels.

delivered. By contrast, in Kandal, subcontractors are permitted to charge 550-1200 Riels/m<sup>3</sup> for the water.

To assess the performance of these private and public utilities as well as household satisfaction with the water services they provide, a range of primary data was collected from all eight provincial towns. First, in each town a sample of households was surveyed and asked to assess the quality of water services. Second, the managers of eight utilities were interviewed and technical performance of each utility independently assessed by a water engineer. The next sections describe the results of these exercises.

#### **4. Household Assessment of Performance of Water Utilities**

In each town a sample of households served by the water utility was surveyed to gauge the level of user satisfaction with services and to get users' perception of other aspects of service delivery. In each town, 50 randomly selected households that were served by either *public* (Battambang, Kandal, Kampong Chhang and Svay Rieng) or *private* (Banteay Meanchey, Kien Svay, Kampong Speau, Takeo) utilities were surveyed. In addition, for the two public utilities that have subcontractors (Battambang and Kandal), 25 and 26 randomly selected households served by these *sub-contractors* were surveyed, respectively.

The results of these household assessments of satisfaction, water quality, water availability, reliability of service, frequency of service breakdowns and maintenance, cost of service, and service-orientation of utilities were somewhat mixed across the different categories and the different utilities. However, overall the user responses were favorable to the private utilities on most categories. The next sections review the major findings and provide disaggregated information on the results by individual towns.

##### **A. Customer Satisfaction**

Households served by private utilities are more satisfied with the quality of piped water than households served by either public utilities or subcontractors. Table 2 summarizes the results on household satisfaction for each category of utilities (public, subcontractor, private). It shows that 82 percent of households served by private utilities reported satisfaction with the quality of piped water, while only 56 and 45 percent of households served by public utilities or subcontractors, respectively, are satisfied with the service.

**Table 2: Customer Satisfaction: Satisfaction with Water Services**

	Public				
	Average Public	Battambang	Kandal	Kompong Chhnang	Svay Rieng
Satisfied with quality of water	0.56	0.44 (0.50)	0.32 (0.47)	0.84 (0.37)	0.64 (0.48)
Satisfied with water service	0.93	0.90 (0.30)	0.98 (0.14)	0.86 (0.35)	0.96 (0.20)
	Sub-contractor				
	Average Contract	Battambang	Kandal		
Satisfied with quality of water	0.45	0.46 (0.51)	0.44 (0.51)		
Satisfied with water service	0.92	0.85 (0.37)	1.00 (0.00)		
	Average Private		Private		
		Bantey Meanchey	Kien Svay	Kompong Speu	Takeo
Satisfied with quality of water	0.82	0.82 (0.38)	1.00 (0.00)	0.70 (0.46)	0.76 (0.43)
Satisfied with water service	0.93	0.96 (0.20)	1.00 (0.00)	0.82 (0.39)	0.92 (0.27)

Notes: Means and (standard deviations) for water service variables.

Assessing household satisfaction across different categories of water utilities while controlling for town-level characteristics confirms that customer satisfaction with the quality of water is increasing with private sector involvement. The town of Kandal, that has a public and private water utility (Kien Svay) and subcontractors, provides an opportunity to compare these three types of delivery modes with varying degree of private sector involvement, while controlling for town-level characteristics. As Table 2 reveals, in Kandal, household satisfaction with the quality of water is steadily increasing as private sector involvement intensifies: 32, 44, and 100 percent of households served by public utilities, subcontractors, and private utilities, respectively, are satisfied with the quality of water.

Satisfaction with water quality, however, varies within each category of utilities. Among private utilities, the share of households satisfied with water quality ranges from 70 to 100 percent. The utility in Kien Svay reaps the highest household satisfaction scores: all households served by the utility reported satisfaction with water quality. Among public utilities, the share of households satisfied with the quality of water varies between 32 and 84 percent. The utility in Kampong Chhang stands out in that category. It has the second highest level of household satisfaction with water quality across all utilities surveyed: over 80 percent of households served are satisfied with water quality.

Surprisingly, household satisfaction with the piped water service *overall* does not vary across public and private water utilities. As can be seen from Table 2, over 90 percent of households served by private utilities, public utilities, or subcontractors

reported to be satisfied with the service they get. According to the Cambodian survey team, Cambodians' reluctance to express dissatisfaction may partly explain this result. Also, it may reflect the lack of awareness of alternatives.

What is behind these differences in consumer satisfaction? Household assessments of water quality, availability, frequency of breakdowns and maintenance, cost of service, and service-orientation of different utilities can help to answer this question.

### ***B. Water Quality***

Household assessment of piped water quality mirrors the results on household satisfaction. Each household surveyed was asked to evaluate various attributes of piped water, such as its clarity and overall quality. The main results of this assessment are reported in Table 3.

**Table 3: Performance of Water Systems: Water Quality**

Description	Public				
	Average public household	Battambang	Kandal	Kompong Chhnang	Svay Rieng
Very good or good quality	0.27	0.22 (0.42)	0.14 (0.35)	0.36 (0.48)	0.36 (0.48)
Very bad or bad quality	0.27	0.28 (0.45)	0.12 (0.33)	0.30 (0.46)	0.38 (0.49)
Clear water	0.65	0.44 (0.50)	0.62 (0.49)	0.80 (0.40)	0.72 (0.45)
Don't drink the water	0.22	0.26 (0.44)	0.46 (0.50)	0.06 (0.24)	0.08 (0.27)
Description	Sub-contract			Private	
	Average subcontract household	Battambang	Kandal	Kompong Speu	Takeo
Very good or good quality	0.12	0.12 (0.33)	0.32 (0.48)	0.28 (0.45)	0.38 (0.49)
Very bad or bad quality	0.15	0.15 (0.37)	0.04 (0.20)	0.20 (0.40)	0.00 (0.00)
Clear water	0.38	0.38 (0.50)	0.88 (0.33)	0.54 (0.50)	0.92 (0.27)
Don't drink the water	0.27	0.27 (0.45)	0.16 (0.37)	0.00 (0.00)	0.22 (0.42)

Notes: Means and (standard deviations) for project design variables.

See text for descriptions of variables.

A larger share of households served by private than by public utilities judged the quality of piped water to be good. As Table 3 indicates, 49 percent of households served by private utilities, and only 27 percent of households served public utilities, said that the water quality is either good or very good. Further, 27 percent of households with connections from public utilities and only seven percent of households served by private utilities reported the piped water to be of bad or very bad quality. 84 percent of

households served by private and 65 percent of households served by public utilities considered the piped water clear.

The case of Kandal, which can be used to compare the performance of private and public utilities and subcontractors while controlling for town-level characteristics, provides further support to the result that private sector participation tends to lead to the delivery of better quality water. While only 14 percent of households served by the public utility in Kandal assessed the quality of piped water to be good or very good; 32 percent of households served by sub-contractors and 80 percent of households served by private utilities—the highest share of customers across all utilities--rated the quality of piped water high.

The quality of piped water was not, however, judged to be equally high across all private utilities. Household evaluation of the quality of piped water was significantly worse in Kampong Speau than in other towns served by private utilities. Only 28 percent of households served by the utility considered the quality of water to be good, while 20 percent of households stated that the quality of piped water is bad or very bad. This result is consistent with low household satisfaction, discussed in the previous section.

### ***C. Water Availability***

Differences in the availability of piped water to households also help to explain the differences in household satisfaction with water services. Piped water availability is measured here in two ways: whether it is available to households every day; and by the number of hours per day it is typically available.

As Table 4 indicates, the piped water availability is higher in households served by private utilities than in households served by public utilities. 76 percent of households served by private utilities, but only 57 percent of households served by public utilities, have piped water available every day. While households served by private utilities have water available from the system on average for 21 hours per day, households served by public utilities get piped water on average only for about six hours per day.

Comparison of households served by public utilities with those served by their sub-contractors reveals that even sub-contracting modestly improves water delivery by increasing the hours piped water is available. On average, households served by sub-contractors have piped water available for two hours more per day than households served by public utilities.

Assessing piped water availability to households while controlling for town-level characteristics confirms these results: private sector participation improves water availability. In Kandal, households served by public utilities have water available for 5.5 hours per day; those served by sub-contractors about 8 hours per day; and those served by the private utility in Kien Svay 24 hours per day. The percentage of households reporting water to be available every day is following a similar pattern.

Private sector participation, however, by no means ensures water availability 24 hours per day. As Table 4 indicates, the performance of private utilities in this respect varies. Specifically, the performance of the utility in Kampong Speau again significantly differs from the performance of other private utilities. While all other private utilities provide a 24-hour service to households, the utility in Kampong Speau delivers piped water only 13 hours per day.

**Table 4: Performance of Water Systems: Water Availability and Use**

Description	Average public household	<u>Public</u>			
		Battambang	Kandal	Kompong Chhnang	Svay Rieng
Hours of water availability in wet season	6.1	8.2 (1.08)	6.1 (3.56)	5.5 (2.22)	4.5 (5.87)
Piped water available every day	0.57	0.82 (0.39)	0.66 (0.48)	0.16 (0.37)	0.62 (0.49)
Water availability has increased over the last two years	0.22	0.10 (0.30)	0.26 (0.44)	0.12 (0.33)	0.38 (0.49)
Household consumes more water now than two years ago	0.41	0.26 (0.44)	0.26 (0.44)	0.48 (0.50)	0.62 (0.49)
Description	Average subcontract household	<u>Sub-contract</u>			
		Battambang	Kandal		
Hours of water availability in wet season	8.3	8.3 (0.96)	11.2 (3.68)		
Piped water available every day	0.75	0.81 (0.40)	0.68 (0.48)		
Water availability has increased over the last two years.	0.08	0.08 (0.27)	0.16 (0.37)		
Household consumes more water now than two years ago.	0.31	0.31 (0.47)	0.40 (0.50)		
Description	Average private household	<u>Private</u>			
		Bantey Meanchey	Kien Svay	Kompong Speu	Takeo
Hours of water availability in wet season	21.3	24.0 (0.00)	24.0 (0.00)	13.4 (4.51)	23.9 (0.59)
Piped water available every day	0.76	0.58 (0.49)	0.90 (0.30)	0.72 (0.45)	0.84 (0.37)
Water availability has increased over the last two years.	0.05	0.02 (0.14)	0.00 (0.00)	0.14 (0.35)	0.04 (0.20)
Household consumes more water now than two years ago.	0.38	0.34 (0.47)	0.00 (0.00)	0.50 (0.51)	0.66 (0.48)

Notes: Means and (standard deviations) for project design variables.  
See text for descriptions of variables.

Though public utilities' daily hours of operation are shorter than private utilities' hours of operation, public utilities have improved their water delivery over the past two years. On average, 22 percent of households served by public utilities stated that the daily availability of piped water has improved over the past two years. This is not

surprising, given that public utilities were partly destroyed during the Khmer Rouge regime, and, therefore, in a bad condition when they were re-opened.

#### ***D. Service Breakdowns and Maintenance***

The results of the household survey reveal that private water utilities provide a slightly more reliable service than public utilities. Reliable service refers here to water being available every day and when the customer expects it. 81 percent of households served by private and 78 percent served by public utilities judged their water supply as reliable.

Households served by public utilities experience more service interruptions than households served by private utilities or subcontractors, as reported in Table 5. While 13 percent of households served by public utilities reported that, in the past three months, the service had been stopped for a day or more, only six percent of households served by private utilities or subcontractors acknowledged having similar interruptions of service. Sixteen percent of households served by private utilities, compared to seven percent of households served by public utilities, however, said that there are more service breakdowns now than two years ago. This is not surprising, given that many of the private utilities have been in operation for only a couple of years.

The results from the water utility surveys also suggest that the public utilities receive more complaints from customers. Only one (Kien Svay) of the three private utilities reported that they had received a single complaint in the previous month. All four of the public utilities received at least one complaint--the average number of complaints being three.<sup>9</sup>

Further, a slightly larger share of households served by private utilities or subcontractors than by public utilities consider the piped network to be well maintained. Ninety, 94, and 85 percent of households served by private utilities, subcontractors, and public utilities, respectively, said the network is well maintained. While 42 percent of households with connections from public utilities stated that there are currently leaking pipes in town, 35 and 37 percent of households served by private and subcontractor, respectively, said the same.

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<sup>9</sup> The number of reported monthly complaints in the four public utilities are one (Kandal), five (Battambang), three (Kampong Chhang) and three (Svay Rieng).

**Table 5: Performance of Public and Private Water Systems:  
Service Breakdowns/Failures and Maintenance**

	Public				
	Average public household	Battambang	Kandal	Kompong Chhnang	Svay Rieng
Reliable piped water	0.78	0.78 (0.42)	0.96 (0.20)	0.46 (0.50)	0.92 (0.27)
Any water stoppage	0.13	0.04 (0.20)	0.04 (0.20)	0.34 (0.48)	0.08 (0.27)
More service breakdowns	0.07	0.06 (0.24)	0.00 (0.00)	0.18 (0.39)	0.02 (0.14)
Leaking pipes in town	0.42	0.32 (0.47)	0.40 (0.49)	0.50 (0.51)	0.46 (0.50)
Network well maintained	0.85	0.78 (0.42)	0.86 (0.35)	0.84 (0.37)	0.90 (0.30)
Sub-contractor					
	Average contractor household	Battambang	Kandal		
Reliable piped water	0.88	0.88 (0.33)	0.88 (0.33)		
Any water stoppage	0.06	0.12 (0.33)	0.00 (0.00)		
More service breakdowns	0.04	0.08 (0.27)	0.00 (0.00)		
Leaking pipes in town	0.37	0.38 (0.50)	0.36 (0.49)		
Network well maintained.	0.94	0.92 (0.27)	0.96 (0.20)		
Private					
	Average private household	Bantey Meanchey	Kien Svay	Kompong Speu	Takeo
Reliable piped water	0.81	0.90 (0.30)	0.98 (0.14)	0.52 (0.50)	0.84 (0.37)
Any water stoppage	0.06	0.06 (0.24)	0.00 (0.00)	0.08 (0.27)	0.10 (0.30)
More service breakdowns	0.16	0.04 (0.20)	0.00 (0.00)	0.46 (0.50)	0.14 (0.35)
Leaking pipes in town	0.35	0.66 (0.47)	0.04 (0.20)	0.50 (0.51)	0.18 (0.39)
Network well maintained	0.90	0.98 (0.14)	0.98 (0.14)	0.66 (0.48)	0.96 (0.20)

Notes: means and (standard deviations) for project design variables.

See text for descriptions of variables.

These results belie a fairly large variation in household assessments within each category of utilities. Among public utilities, the utility in Kampong Chhang, that is rated high on the quality of water, has the worst record of service reliability and frequency of service breakdowns. Thirty-four percent of its customers reported that the service had been stopped to their house for a day or more in the past three months, and a half of respondents said that there are leaking pipes in town. Among private utilities, the utility in Kampong Speau is again an outlier: households served by the utility experience more often service breakdowns than households served by other private utilities. As a result, household assessment of the service reliability is significantly lower in Kampong Speau than in other towns.

### *E. Cost of Service*

The results of the household survey confirm that private utilities charge on average a higher connection fee from customers than public utilities. While households surveyed paid on average 219,684 Riels to private utilities for a connection, the average cost of connection from a public utility was 186,926 Riels. This can be seen from Table 6. The connection fees households reported to have paid matched approximately utilities' stipulated fees listed in Table 1, except in the case of utilities in Kampong Chhang and Kampong Speau. In Kampong Chhang, the average connection fee households reported to have been paid was lower than the fee currently imposed by the utility (168,319 Riels compared to 190,00-342,000 Riels). By contrast, in Kampong Speau, the average fee households reported to have paid to the utility was significantly higher than the fee posted by the utility (113,334 Riels compared to 76,000 Riels). Interestingly, while almost all households served by other private utilities reported to have received a receipt for their payment, only 72 percent of households served by the utility in Kampong Speau had obtained one. According to Cambodians, payments made without receipts often do not enter into the official records of the utility. Overall, the results indicate that private utilities have more often issued receipts than public ones.

**Table 6: Cost of Water Service**

	Average		Public		
	Public Household	Battambang	Kandal	Kompong Chhnang	Svay Rieng
Connection fee (Riels)	186,926	203,042 (146,559)	312,460 (142,498)	168,319 (90,622)	63,884 (73,864)
Received receipt for connection	0.80	0.69 (0.47)	0.75 (0.44)	0.83 (0.38)	0.92 (0.27)
Number of days to get connection	6.9	15.3 (43.5)	2.5 (2.5)	7.6 (10.0)	2.1 (1.6)
Amount of last monthly bill (Riels)	13,818	26,806 (26034)	10,318 (4191)	10,390 (8795)	7,759 (5370)
Unit tariff (Riels per cubic meter)	888	1,402 (14)	550 (0)	1,000 (0)	601 (7)
Cubic meters consumed	15.6	19.1	18.8	10.4	12.9
<u>Sub-contractor</u>					
	Average Contract				
	Household	Battambang	Kandal		
Connection fee (Riels)	159,990	159,990 (44,098)	510,360 (1,099,514)		
Received receipt for connection	0.83	0.83 (0.39)	0.72 (0.46)		
Number of days to get connection	2.2	2.2 (1.9)	4.1 (6.2)		
Amount of last monthly bill (Riels)	17,308	17,308 (11,907)	11,721 (4,280)		
Unit tariff (Riels per cubic meter)	1,400	1,823 (163)	784 (229)		
Cubic meters consumed	12.4	9.5	15.0		
<u>Private</u>					
	Average Private		Kien Svay		
	Household	Bantey Meanchey		Kompong Speu	Takeo
Connection fee (Riels)	219,684	343,200 (18,455)	194,200 (14,581)	113,334 (60,198)	228,000 (7,677)
Received receipt for connection	0.92	1.00 (0.00)	1.00 (0.00)	0.72 (0.46)	0.98 (0.14)
Number of days to get connection	2.2	1.4 (1.0)	1.9 (2.1)	3.1 (3.9)	2.2 (2.5)
Amount of last monthly bill (Riels)	20,894	18,704 (13,793)	20,553 (6,776)	21,305 (42,724)	23,012 (21,332)
Unit tariff (Riels per cubic meter)	1,489	1,312 (59)	1,400 (0)	1,503 (229)	1,739 (323)
Cubic meters consumed	14.0	14.3	14.7	14.2	13.2

Notes: Means and (standard deviations) for water service variables.

All fees in Cambodian Riels (3763 Riels/1 US\$)

Further, private utilities provide connections faster than public utilities. According to results, it takes from one to three days to get a connection from a private utility. By contrast, getting a connection from a public utility can take from two to fifteen days, the average time being about seven days.

The results of the household survey also confirm that the unit tariff of water tends to be higher in private than in public utilities. The average unit tariff charged by private utilities is 1,489 Riels, while the average unit tariff charged by public utilities is 888 Riels. The unit tariffs households reported to pay were consistent with tariffs posted by utilities. The average unit tariff households served by subcontractors pay is 1,400 Riels. The unit tariffs charged by subcontractors in Battambang and Kandal are within the authorized range.

### ***F. Service-orientation***

Finally, to evaluate service-orientation of utilities, households were asked a series of questions about the responsiveness of utility staff. Among other things, it was inquired whether they can contact the utility and get assistance if they have inquiries about the service or billing; whether they have ever had a problem with billing; and whether the staff of the utility takes customer complaints and inquiries seriously and attempts to improve the service. To cross-check these results, all the utilities were also asked a series of questions about their own perception of the customer service that they deliver.

As results in Table 7 indicate, the household assessments of utility service-orientation do not vary in any systematic pattern across different categories of utilities. Staffs of public and private utilities are viewed to be equally responsive. Almost all households said that they can contact the utility if they have inquiries about the service or billing. About a half of households served by public and a half of households served by private utilities considered the utility staff to take customers' complaints and inquiries seriously. Only five percent of households served by public and four percent of households served by private utilities had had a problem with billing.

This result is surprising. Given the incentives faced by private utilities (discussed in section 2), one would expect household perception of service-orientation differ across private and public utilities. In fact, the results from the water utility surveys also suggest that the public utilities--at least by their own assessments--are as responsive as private utilities. All reporting public and private utilities alike respond that they have some staff dedicated to customer services, that they encourage customers to report problems, and that they responded to all complaints that they received last month.<sup>10</sup>

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<sup>10</sup> Although, as noted above, the public utilities tended to receive more complaints every month.

**Table 7: Service Orientation of Water Utilities**

	Public				
	Average Public	Battambang	Kandal	Kompong Chhnang	Svay Rieng
Staff is responsive to complaints and inquiries	0.52	0.56 (0.50)	0.44 (0.50)	0.52 (0.50)	0.56 (0.50)
Have had billing problem	0.05	0.08 (0.27)	0.02 (0.14)	0.00 (0.00)	0.08 (0.27)
Operation has improved in last two years	0.55	0.66 (0.48)	0.54 (0.50)	0.26 (0.44)	0.72 (0.45)
	Sub-contractor				
	Average Contract	Battambang	Kandal		
Staff is responsive to complaints and inquiries	0.61	0.62 (0.50)	0.60 (0.50)		
Have had billing problem	0.10	0.19 (0.40)	0.00 (0.00)		
Operation has improved in last two years	0.51	0.54 (0.51)	0.48 (0.51)		
	Average Private	Private			
		Bantey Meanchey	Kien Svay	Kompong Speu	Takeo
Staff is responsive to complaints and inquiries	0.47	0.50 (0.50)	0.42 (0.50)	0.42 (0.50)	0.52 (0.50)
Have had billing problem	0.04	0.08 (0.27)	0.00 (0.00)	0.04 (0.20)	0.02 (0.14)
Operation has improved in last two years	0.31	0.30 (0.46)	0.10 (0.30)	0.60 (1.59)	0.24 (0.43)

Notes: Means and (standard deviations) for water service variables.

More than half of households (55 percent) connected to a piped networked managed by a public utility held that the operation of the utility had improved in the past two years. Only one-third of households served by private utilities said the same. The lower initial level of public utilities may again explain this result.

In summary, the household assessment of private utilities is more favorable than the assessment of public utilities. In particular, the percentage of households which reported satisfaction with the quality of water, thought the water to be good or very good, had water available every day for more hours a day, thought the water was more reliable, had fewer stoppages, believed the network to be well maintained, and got a connection quicker were higher with private operators than with public operators. In addition, fewer of those served by private operators thought they got very bad or bad water and fewer did not drink the water.

Surprisingly, 93 out of 100 households said they were satisfied with the services regardless of which type of system provided them—public or private. This could be a general reluctance to express dissatisfaction or lack of awareness of alternatives. Two

categories suggest a need for caution. First, users judged public utilities to be slightly more responsive to complaints and inquiries than private utilities. This may be partly due to the absence of competition in these early experiments with private sector operators and the incomplete set of institutional incentives. Second, private operators charged more for connection and monthly bills tended to be higher than those of their public counterparts. While this could reflect accurately what is needed to sustain and nourish investment, it remains a concern in Cambodia given very low rates of coverage of the population given the finding that the vast majority of those unconnected expressed an interest in getting a piped connection.

Are these results consistent with the technical assessment of utilities? The next section will explore this question.

## **5. Technical Assessment of Performance of Water Utilities**

To get an independent assessment of the technical performance of the eight utilities, a water engineer evaluated the performance and maintenance of facilities in each town. Performance indicators used included the condition and daily operation of facilities; frequency of major breakdowns; frequency of maintenance; and implementation of water quality control programs.

### ***A. Facility Performance***

The results of the technical assessment confirmed that the daily hours of operation are significantly higher among private than public utilities. Table 8, which summarizes the condition and daily operation of facilities, shows that all private utilities, except the utility in Kampong Speau, distribute piped water 24 hours a day. This is consistent with household reports discussed in the previous section. The distribution system of public utilities, by contrast, operates between 8 and 12 hours a day, according to the technical assessment. These hours of operation are, however, inconsistent with household reports, which indicate that households served by public utilities have water available only 4-8 hours per day.

Further, the results indicate that the frequency of major breakdowns is less common in private than public utilities. Among private utilities, the utility in Kampong Speau is reported to have a major breakdown in its source works once in every six months, and the distribution system in the utility in Banteay Meanchey is reported to break down approximately once a year. Among public utilities, the utilities in Kandal and Svay Rieng have most problems. The treatment facilities of the Kandal utility were out of service at the time of the survey due to a major breakdown. Also, the distribution system of the utility fails about once in six months. The utility in Svay Rieng has no water treatment facilities, and, like the utility in Kandal, it has major problems with its distribution system twice a year.

The percentage of non-working connection is zero or negligible in all but one utility. About ten percent of connections served by the public utility in Kampong Chhang are out of service.

Finally, meters and pumps used by public utilities are significantly older in public than in private utilities. The age of meters varies from three to 15 years and the age of pumps from three to seven in public utilities, whereas private utilities have meters and pumps that are one or two years old.

**Table 8: Technical Assessment of Water Utilities: Facility Performance**

		Public			
		Battambang	Kandal	Kompong Chhnang	Svay Rieng
Pump Stations	Number of stations	2	2	2	1
	Condition	Functioning with problems	Functioning without problems	Functioning without problems	Functioning without problems
	Daily operation (hours per day)	10	.	8	5
	Frequency of Major Breakdowns	Never	Never	Never	Never
Source Works	Condition	Functioning with problems	Functioning without problems	Functioning without problems	Functioning without problems
	Daily operation (hours per day)	10	12	8	5
	Frequency of Major Breakdowns	Once in lifetime	Never	Never	Never
Transmission	Condition	Functioning without problems	Functioning without problems	Functioning without problems	Functioning without problems
	Daily operation (hours per day)	10	12	8	5
	Frequency of Major Breakdowns	Never	Never	Never	Never
Treatment	Condition	Functioning	Out of service	Functioning	No treatment present
	Daily operation (hours per day)	10	Out of service	8	No treatment present
	Frequency of Major Breakdowns	Never	Out of service	Never	No treatment present
Storage	Condition	Functioning without problems	Functioning without problems	Functioning without problems	Functioning without problems
	Daily operation (hours)	10	12	4	3
	Frequency of Major Breakdowns	Never	Never	Never	Never
Distribution	Condition	Functioning	Functioning	Functioning	Functioning
	Daily operation (hours per day)	10	12	8	8
	Frequency of Major Breakdowns	Never	Once in six months	Never	Once in six months
Connections	Percentage of non-working	0.0%	0.9%	9.8%	0.0%
Age (years)	Pumps	7	4	3	5
	Meters	7	15	3	5

**Table 8: Technical Assessment of Water Utilities: Facility Performance (continued)**

		Private			
		Bantey Meanchey	Kien Svay	Kompong Speu	Takeo
Pump Stations	Condition	Functioning without problems	Functioning without problems	Functioning without problems	Functioning without problems
	Daily operation (hours per day)	18	2	10	4
	Frequency of Major Breakdowns	Never	Never	Never	.
Source Works	Condition	Functioning without problems	Functioning without problems	Functioning with problems	Functioning without problems
	Daily operation (hours per day)	18	2	10	4
	Frequency of Major Breakdowns	Never	Never	Once in six months	Once in six months
Transmission	Condition	Functioning without problems	Functioning without problems	Functioning without problems	Functioning with problems
	Daily operation (hours per day)	18	2	10	4
	Frequency of Major Breakdowns	Never	Never	Never	Never
Treatment	Condition	Functioning without problems	Functioning without problems	Functioning with problems	Functioning without problems
	Daily operation (hours per day)	18	2	.	4
	Frequency of Major Breakdowns	Never	Never	Never	Never
Storage	Condition	Functioning without problems	Functioning without problems	Functioning without problems	Functioning without problems
	Daily operation (hours per day)	24	24	15	24
	Frequency of Major Breakdowns	Never	Never	Never	Never
Distribution	Condition	Functioning without problems	Functioning without problems	Functioning without problems	Functioning without problems
	Daily operation (hours per day)	24	24	15	24
	Frequency of Major Breakdowns	Once a year	Never	Never	Never
Connections	Percentage of non-working	0%	0%	1%	.
Age (years)	Pumps	2	1	2	2
	Meters	2	1	2	2

## B. Maintenance

The results of technical assessment reveal that private utilities maintain their facilities better than public utilities. As can be seen from Table 9, public utilities maintain their facilities (pump stations, source works, transmission, treatment, storage, distribution) only when there is a crisis and action has to be taken. As an exception, the utility in Svay Rieng maintains its distribution system--but not its other facilities--on a weekly basis. This is in stark contrast to the maintenance practices of private utilities. All private utilities carry out regular maintenance of all their facilities on a weekly or monthly basis as a preventive measure.

**Table 9: Technical Assessment of Water Utilities: Maintenance**

		<u>Public</u>			
		Battambang	Kandal	Kompong Chhnang	Svay Rieng
Frequency of Regular Maintenance	Pump Stations	Never	Never	Never	Never
	Source works	Never	Never	Never	Never
	Transmission	Never	Never	Never	Never
	Treatment	Never	Never	Never	Never
	Storage	Never	Never	Never	Never
	Distribution	Never	Never	Never	Weekly
Implementation of water quality control programs	Chlorine in water	Yes	No	Yes	Yes
	Regularly cleans filters	No	.	No	(No filter)
		<u>Private</u>			
		Bantey Meanchey	Kien Svay	Kompong Speu	Takeo
Frequency of Regular Maintenance	Pump Stations	Monthly	Weekly	Monthly	Monthly
	Source works	Weekly	Weekly	Monthly	Weekly
	Transmission	Weekly	Weekly	Weekly	Weekly
	Treatment	Weekly	Weekly	Weekly	Weekly
	Storage	Weekly	Weekly	.	.
	Distribution	Weekly	Weekly	Weekly	Weekly
Implementation of water quality control programs	Chlorine in water	Yes	Yes	Yes	Yes
	Regularly cleans filters	Yes	Yes	Yes	Yes

Private utilities also implement water control programs more diligently than public utilities. All utilities, except the public utility in Kandal, put chlorine in water regularly. However, only private utilities clean filters on a regular basis. The public

utilities in Battambang and Kampong Chhang clean filters only when there is an overflow. The public utility in Svay Rieng has no filters since it has no water treatment facilities, and the utility in Kandal does nothing to filters since its treatment facilities are out of operation.

### ***C. Financial Performance***

Almost all residential customers, regardless of whether they are served by private or public utilities, pay their bills within 30 days. As Table 10 shows, 90 percent of more of residential customers in each town, except in Battambang, pay their water bills on time. This is remarkable given that two of the three private utilities that responded to this survey never cut off service for non-payment, as opposed to one of the four public utilities.<sup>11</sup>

Five of the six utilities that agreed to share information about their revenues and expenditures had made a profit last year. The exception, Kampong Chhang, essentially covered all expenses. Further, one of the two private utilities, Kampong Speau, has a very high profit margin (201 percent of expenditures). All the other utilities have a profit margin from -2 percent (Kampong Chhang) to 16 percent (Banteay Meanchey) of expenditures.

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<sup>11</sup> All of these utilities also provide waters services to a small number of offices of governmental agencies; these customers range from less than one percent to 4.6 percent of the utilities' total direct connections. Two of the public utilities (Kampong Speau and Kandal) and two of the private utilities (Battambang and Kampong Chhang) report that these public customers are more than 90 days late in paying their water bills.

**Table 10: Technical Assessment of Water Utilities: Financial Performance**

	Public				
	Battambang	Kandal	Kampong Chhang	Svay Rieng	
What percentage of residential customers has paid bill within 30 days?		85	98	95	100
In practice, after what period of time is service cut-off for non-payment?		40	90	never	20
Tariff revenues	694,121,152	40,522,000	30,761,400	24,321,800	
Other revenues	7,780,000	-	2,296,500	-	
Total revenue	701,901,152	40,522,000	33,057,900	24,321,800	
Total expenditures	615,355,328	35,400,000	33,780,640	22,851,200	
<i>Profits</i>	<i>86,545,824</i>	<i>5,122,000</i>	<i>-722,740</i>	<i>1,470,600</i>	
	14%	14%	-2%	6%	
	Private				
	Banteay Meanchey	Kampong Speau	Kien Svay	Takeo	
What percentage of residential customers has paid bill within 30 days?	90	100	.	100	
In practice, after what period of time is service cut-off for non-payment?	never	30	.	never	
Tariff revenues	339,365,280	302,400,000	.	4,815,400	
Other revenues	182,958,064	60,800,000	.	27,702,000	
Total revenue	522,323,344	363,200,000	.	-	
Total expenditures	451,813,728	120,840,000	.	.	
<i>Profits</i>	<i>70,509,616</i>	<i>242,360,000</i>	.	.	
	16%	201%	.	.	

Notes: All revenues and tariffs in Cambodian Riels (3763 Riels/1 US\$)

In sum, the results of the technical assessment indicate that private utilities perform better than public utilities. To ensure continued operation and performance, private companies, unlike public utilities, maintain their facilities on a regular basis. Public companies, by contrast, tend to carry out maintenance work only as a response to crisis. Financially, private and public utilities have relatively similar performance.

## 6. Access to Water Services

What kind of households (in terms of the level of income and education) do these private and public utilities serve? The motivation for addressing this question is straightforward: given the low coverage of utilities, is there evidence that the poor, because of lack of interest or lack of resources, have not been able to afford either public

services or the better performing (and more expensive) private services? If so, what are the implied policy implications?

Table 11 establishes that households with higher incomes and more household wealth are significantly more likely to be connected to a piped service -- and that this difference is further attenuated in towns served exclusively by private utilities. First, columns (1) and (4) of Table 11 show that the estimated income and expenditures of all connected households (798,457 and 758,356 Riels) are more than twice the respective figures for all unconnected households (313,742 and 329,678 Riels). This is consistent with the results of an independent assessment of household income levels based on the survey team's observations of the characteristics of the household. Eighty six percent of all connected households were assessed to be middle or high income, as opposed to 22 percent of all unconnected households. As one would expect, given the positive correlation between income and education, unconnected household also have lower levels of education than connected households: thirty five percent of the heads of all unconnected households report that they have no primary education, in contrast to 18 percent of all connected households.

Second, columns (3) and (7) of Table 11 show that the estimated income and expenditures of connected households served by private utilities (881,226 and 791,077 Riels) are about three times the respective figures for all unconnected households in towns with private utilities (278,365 and 293,626 Riels). This even greater difference between the wealth and income of connected and unconnected households in these towns is also found in the comparisons of the assessment of household income levels (85 percent middle or high income versus 16 percent middle or high income) and education levels (17 percent of connected households have no primary education versus 37 percent of unconnected households.)<sup>12</sup>

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<sup>12</sup> Since Kandal has both public and private utilities, the demographics for the unconnected households in this town are reported separately, in column 6 of Table 11.

**Table 11: Access to water services, household demographics**

	Connected households			All households	Unconnected households		
	All households	Served by public utilities	Served by private utilities		In towns with public utilities	In town with public and private utilities	In towns with private utilities
<b>Income and wealth</b>							
Monthly income (Riels)	798,457	734,082	881,226	313,742	311,865	369,131	278,365
Monthly expenditures (Riels)	758,356	730,980	791,077	329,678	351,918	354,387	293,626
Low-income	0.13	0.13	0.13	0.78	0.72	0.79	0.81
Middle- income	0.60	0.62	0.57	0.21	0.26	0.21	0.15
High-income	0.26	0.24	0.28	0.01	0.01	0.00	0.01
Have electricity	0.98	0.99	0.97	0.87	0.87	0.98	0.79
Own a color television	0.90	0.92	0.89	0.63	0.65	0.81	0.49
Own a car	0.18	0.17	0.18	0.09	0.12	0.10	0.07
Own a house	0.94	0.93	0.97	0.97	0.97	0.96	0.98
<b><u>Level of Schooling</u></b>							
No schooling	0.18	0.19	0.17	0.30	0.35	0.13	0.37
Primary only	0.25	0.24	0.27	0.21	0.19	0.28	0.18
Secondary	0.33	0.33	0.33	0.31	0.29	0.41	0.26
High school	0.17	0.19	0.15	0.13	0.10	0.15	0.13
Post-high school	0.06	0.04	0.08	0.02	0.05	0.01	0.01
Sample size	451	251	200	375	125	100	150

Notes: share of connected and unconnected households, respectively, with listed characteristics.

See text for description of characteristics.

Incomes and expenditures in Cambodian Riels (3763 Riels/1 US\$)

Do the results in Table 11 imply that low income households simply can not afford a piped connection--particularly in the towns with the more expensive private services? As detailed in Table 12, the majority of unconnected households interviewed report that they would be interested in getting a piped connection. While 41 percent of unconnected households on average report that they are satisfied with their current service (with a range of 14 percent in Takeo to 62 percent in Kampong Chhang), 86 percent note that they would be interested in getting a piped connection. Given this level of interest among unconnected households, what are the constraints to getting such a connection?

Utilities' limited service area and high connection fees are the two most common reasons for households not having piped connections. On the supply side, a relatively large share of households (forty two percent) states that the utility does not serve their area (with a range of 12 percent in Kampong Speau and Battambang to sixty percent in Takeo). On the demand side, 35 percent state that the connection fee is too high (with a range of 17 percent in Svay Rieng to 52 percent in Kampong Speau), while very few (eight percent) state that the monthly tariff is too expensive.

In particular, connection fees, not the level of monthly water tariffs, constrain the access of the poor to water services. Using the independent assessments of household income levels, 37 percent of low-income unconnected households report that the connection fee is too high, in contrast to 29 percent of middle- and high-income unconnected households. By contrast, there is no (statistically significant) difference between these types of households in their response about the monthly tariff: 8.3 percent of low-income unconnected households report that the monthly tariff is too high, in contrast to 9.1 percent of middle- and high-income unconnected households. Taken together, these results suggest that the poor are willing to pay for piped water, but in many cases are unwilling (or unable) to pay, for the cost of getting connected.

**Table 12: Assessment of alternative water services: unconnected characteristics**

	In towns with public utilities			In town with public and private utilities	In towns with private utilities			
	Average household	Battambang	Kampong Chhang	Svay Rieng	Kandal	Banteay Meanchey	Kampong Speau	Takeo
<u>Evaluation of current water source</u>								
Satisfied with current water source	0.41 (0.49)	0.28 (0.46)	0.62 (0.49)	0.56 (0.50)	0.46 (0.50)	0.30 (0.46)	0.38 (0.49)	0.14 (0.35)
Interested in getting a piped connection	0.86 (0.35)	0.96 (0.20)	0.78 (0.42)	0.82 (0.39)	0.84 (0.37)	0.86 (0.35)	0.94 (0.24)	0.90 (0.31)
Why are you not connected? Utility doesn't serve area	0.42 (0.49)	0.12 (0.33)	0.54 (0.50)	0.36 (0.48)	0.48 (0.50)	0.48 (0.50)	0.12 (0.33)	0.60 (0.49)
Alternative water source	0.55 (0.50)	0.16 (0.37)	0.50 (0.51)	0.54 (0.50)	0.68 (0.47)	0.56 (0.50)	0.54 (0.50)	0.56 (0.50)
Connection fee is too high	0.35 (0.48)	0.40 (0.50)	0.33 (0.48)	0.17 (0.38)	0.41 (0.49)	0.30 (0.46)	0.52 (0.54)	0.28 (0.45)
Monthly tariff is too expensive	0.08 (0.28)	0.00 (0.00)	0.11 (0.31)	0.00 (0.00)	0.06 (0.24)	0.02 (0.14)	0.28 (0.45)	0.08 (0.27)
Notes: Means and (standard deviations) for water variables. See text for variable description								

This implies that if utilities want to expand their coverage and the scale of operations, they need make connections more affordable. This does not necessarily mean that connection fees need to be reduced. The first step to expand access might instead be to provide households an option to spread the financial burden of a connection over longer period of time by allowing them to pay the connection fee in installments.

## 7. Conclusions

This paper has compared the performance and consumer satisfaction with water services provided by four private companies and four public utilities in Cambodia. The comparison was based on results of a survey of households served by these utilities and on results of a technical assessment of each water system carried out by a water engineer.

The results indicate that households served private utilities are significantly more satisfied with the piped water than customers of public utilities. The daily availability and quality of piped water is better in households served by private than by public utilities. Also, customers of private utilities experience fewer service interruptions. This has not happened by accident. Private utilities hire more educated staff whom they pay higher salaries; maintain their facilities more regularly; and implement water quality control programs more diligently. Private sector operators seem to face stronger incentives than public utilities to keep their customers satisfied.

However, according to results, this improved service does not come for free. Households served by private utilities pay for the piped water service significantly more than customers of public utilities. The connection fees as well as unit tariffs charged by private utilities are higher than fees and tariffs of public utilities. Some lower-income households that are not served by private utilities are partially limited by the high connection fees (as opposed to the regular monthly payments).

Overall, this paper indicates that the bold effort of a few towns and private sector participants to introduce private sector involvement in the water sector is encouraging in many ways. But the full gains, which are possible, have not yet been realized. Earlier, it was stressed why the commercial incentive for positive net revenue from operations tends to lead the private entrepreneur to be responsive to the demand for services from actual and potential future customers and to economize on costs while doing so. This commercial incentive is likely to be stronger if the privatization option used is a lease or concession arrangement, rather than a service or management contract, since the operator in the former cases has access to the revenue stream over a number of years, rather than a fixed fee which is normal in service and management contracts. It pays the operator to increase net revenue (revenues in excess of costs) in the former cases. In this regard, BOT (build, own, and transfer) arrangements are a mixed bag. Usually, BOTs are for only part of the system, for example, source works to increase capacity of the system. Since, in this case, the private operator is not responsible for distribution, the operator will normally require a 'take or pay' contract (a guarantee that a minimum amount will be purchased regardless of the amount sold by the distributor). This clearly relieves the

BOT operator of the incentive to be demand responsive in the choice of investments, although not of the desirability of controlling costs.

The set of commercial incentives facing utilities would clearly be made stronger if there was competition for the market. As the paper indicates, the initial private sector initiatives in Cambodia have not had this feature. Consequently, the commercial incentives to be demand-responsive and to control costs have not been as strong as would be desirable. This is particularly true in the water sector because of the relatively high capital costs and longevity of assets. Private operators normally require, even with full control of the revenue stream, fairly extensive periods to recover investment costs.

This paper shows that private sector operators have been willing to come forth and that commercial incentives, however much weakened by uncertainty about the direction and scope of future regulation of the sector, are working to improve the water supply situation. The study also shows that in the current situation there is not a completely clear-cut case for the superiority of the private sector over the public sector in all respects. This is to be expected. Nevertheless, if the regulatory structure, which the Government of Cambodia intends to put into place, encourages the commercial incentives to be more demand-responsive and cost conscious, and, further, reinforces the market incentives of competition, rather than leaving the private sector operators open to arbitrary government action, the private sector is a good bet.

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