Household Strategies for Securing Clean Water
The Demand for Piped Water in Vietnam's Peri-Urban Settlements

James H. Spencer

Water Services and Market Reform: Small-Scale Providers, Alternative Sources, and the Demand for Low Quality

There is extensive theoretical and empirical literature on private outsourcing by the state to non-state actors in the water sector (Budds and McGranahan 2003; Fine 2002; Lobina and Hall 2000; Nickson 1996, 1998; Olmstead 2003; O'Riordan 2003; Peet 2003). Although useful for thinking about public-private partnerships at all levels, the research has tended to focus on large-scale systems. However, one must also consider the issue of scale, both geographic and organizational. As Bakker (2003) points out, private water providers range from small water vendors to multinational corporations, while state providers range from local water cooperatives to municipal and national corporations. In her point of view, both the complexity of the organization and its operational scale are central sources of variation in the alternative ways that water is provided.

If organizational and geographic scale are indeed central issues in the provision of clean water, then a better understanding of non-monopolistic actors—whether public, private, and/or community—in the water sector is critical for understanding viable alternatives. An examination of the empirical evidence on water service provision reveals few examples of such small-scale providers. What examples do exist suggest that small-scale piped water providers do likely play an important role in providing access to clean water (Crane 1994; Spencer 2007).

Better understanding of such forms of water provision might lead to relevant questions for policy makers currently considering finance mechanisms and cost-recovery schemes for improved water provision. Unlike previous work on water that focuses on natural monopolies, this study reveals the kinds of competitive pressures small-scale piped water providers may face from a resident-centered perspective. In doing so, it challenges an implicit assumption of high demand—as estimated by willingness to pay studies—demand for high-quality water in urban supply systems. Findings suggest that household demand for piped water exists, but not on a sufficient scale to obviate more traditional sources, even though it is surprisingly affordable when compared to what residents pay for natural sources. Findings also suggest that the main perceived advantage of the piped system is not for its hygienic quality, but for aesthetic characteristics such as taste, smell, and color. Scholars might continue to pursue research in situations where households are not limited in their ability to choose water sources of varying qualities.

Abstract

To date, there have been relatively few studies of small-scale providers of water in developing countries, though they are seen to be important players in peri-urban water supply systems. This paper uses the case of small-scale providers in Can Tho, Vietnam, to examine competition in local water markets, and how piped water compares with a range of lower-quality traditional sources. Although previous studies have usefully employed contingent valuation to estimate the demand for low quality, the evidence provided here estimates demand based on actual household choices regarding water of differing qualities and prices. Using an original household survey, the paper assesses the comparative advantages regarding costs, uses, and perceived advantages/challenges of each source. Findings suggest that household demand for piped water exists, but not on a sufficient scale to obviate more traditional sources, even though it is surprisingly affordable when compared to what residents pay for natural sources. Findings also suggest that the main perceived advantage of the piped system is not for its hygienic quality, but for aesthetic characteristics such as taste, smell, and color. Scholars might continue to pursue research in situations where households are not limited in their ability to choose water sources of varying qualities.

Keywords: empirical studies of planning theory, qualitative comparative analysis, communicative planning theory

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ificant turmoil, corruption, and management changes in much of Vietnam's industry (Gainsborough 1998).

Despite Doi Moi's reforms' significant positive impact on growth over the past decade, Vietnam remains a very poor country. According to World Bank indicators, Vietnam's average per capita income was $480 (US) in 2003, on par with Mongolia, Uzbekistan, Sudan, and Pakistan, and $10 below the average for sub-Saharan Africa (World Bank 2003)\(^1\), a characteristic often forgotten in the excitement of such an economically dynamic context (Arkadie and Mallon 2003; Stiglitz 2004). Under these conditions of continuing poverty, Vietnam has nevertheless experienced important positive trends that have increased its citizens' quality of life. From 1993 to 1998, general poverty was reduced from 58 percent to 37 percent; extreme poverty, i.e., food scarcity, was reduced from 25 percent to 15 percent.

Vietnam's gains during the 1990s came not only through improved incomes and management of the economy, but also through broader-based improvements in the quality of life. Despite its low Gross Domestic Product (GDP) figures, Vietnam scored an impressive 109 out of 175 nations in the Human Development Index (UNDP 2004), a broader-based measure that includes a wide range of public services including health, education, and clean water. Compared with the five countries with the closest GDP per capita incomes above and the five closest below, Vietnam performed well on human development compared to GDP. The difference in ranking between the two measures for Vietnam, twelve, was second only to Georgia, which scored a very high twenty-nine and twice as high as the next best, Bolivia, at six. Vietnam's relatively high scores on the Human Development Index are, in large part, due to impressive gains in public services, such as health and education.

Along with rapid economic growth comes serious concerns, however, that the well-being of the poor is threatened by decreasing access to public services of all kinds (Arkadie and Mallon 2003: 232; Stiglitz 2004). Vietnam is now entering an accelerated urban transition. Ho Chi Minh City is a rapidly growing urban region, and its development includes an inter-
urban corridor to Can Tho in the heart of the Mekong Delta (Douglass et al. 1999). The Mekong Delta has also been an important reason for Vietnam's high national growth rates, in particular by providing a reliable and high quality supply of rice for export since 1993. The flip side of this urbanization, market reform, and economic growth, however, is that the region falls short on a number of the public services that have been essential to the country's improvements in the quality of life during the 1990s. One such service is basic water provision.

The National and Regional Context: Market Reform and Public Services in Vietnam

Two significant changes have occurred in Vietnam since 1990. First, the country began to implement its version of post-Soviet reform, Doi Moi, in earnest. Second, it made sign-
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The Development Paradox: Urbanization and Infrastructure Finance

Demand for water in the Mekong Delta is increasing, whether for existing intensive agriculture, recently expanding aquaculture, booming residential development, or for newly established commercial and industrial enterprises, bringing with it a major challenge to water management agencies.

The scale of this challenge is reflected in the Millennium Development Goals (MDG) indicators, which show major regional disparities in water and sanitation provision in Vietnam. Table 1 shows the MDG summary, poverty, and clean water indices by the eight Vietnamese socio-environmental regions. What is noticeable is that the Mekong Delta region, though in the middle of the distribution on the overall MDG index, and third overall but very close to the second-wealthiest
The Red River Delta, is second from the bottom for clean water and sanitation. Moreover, it differs sharply in water and sanitation quality from the other two densely populated and economically dynamic regions, the Red River Delta and the Northeast South regions, which contain Ha Noi and Ho Chi Minh City, respectively.

Figure 1 shows the provincial-level relationship between degree of urbanization—as measured by population density—and the MDG water index. As expected, the Mekong Delta provinces are low on the MDG axis even though some of the provinces are highly urban. For Vietnam in general, the more urbanized a province, the greater its access to clean water. What is interesting, however, is that when taken alone (as shown in Figure 2), the pattern for the Mekong provinces is an inverse one: The more urbanized the province, the worse its quality of water and sanitation. None of the seven other regions of Vietnam shows this kind of negative relationship between urbanization and water provision, reminding us that better services are not always a natural result of urban economic growth.

This stark contrast between the Mekong Delta and Vietnam’s other major regions is likely due to different histories, current development trajectories, and simple numeric spatial aggregation factors. Nevertheless, the relatively high economic growth rate and very low water and sanitation quality indicators for the Mekong Delta define a severe challenge for local and provincial officials in their work to provide the necessities of clean water and basic sanitation. Local officials have met this challenge with an innovative system for meeting future growth needs, and a better understanding of this system and its results has helped to fill the gap in the literature on non-corporate privatization of water services. The system may only be a temporary solution, as peri-urban areas begin to develop, before larger corporate and state providers displace them with more extensive systems (Spencer 2007, 2008). Equally likely, however, is that such temporary, small-scale efforts to provide clean water in urban areas become de facto mid- to long-term solutions (e.g., Crane 1994 for the case of Jakarta). In either case, the literature on such small-scale providers is thin.

The empirical focus of this paper is on the competitive pressures that this system of small-scale providers faces, as a window into the actual demand—as opposed to perceived or estimated—for high-quality household water. Although previous work has usefully estimated the demand for high-quality piped water by examining the poor’s willingness to pay for bottled water (World Bank 1994), or used contingent valuation techniques to estimate household demand (Whittington et al. 2002), this study examines a situation in which residents actually make the choice of whether or not to pay for higher-quality water. I examine water cost, types of use, and household

### Table 1. Regional Breakdown of Millenium Development Goals (MDG)\(^6\).

<table>
<thead>
<tr>
<th>MDG Summary Index(^7)</th>
<th>MDG Poverty Index</th>
<th>MDG Clean Water Index(^7)</th>
<th>Population</th>
<th>Population Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red River Delta</td>
<td>0.7081</td>
<td>0.6921</td>
<td>0.7364</td>
<td>14,799,691</td>
</tr>
<tr>
<td>Northeast</td>
<td>0.4879</td>
<td>0.3514</td>
<td>0.5972</td>
<td>10,860,804</td>
</tr>
<tr>
<td>Northwest</td>
<td>0.2517</td>
<td>0.1197</td>
<td>0.1623</td>
<td>2,226,372</td>
</tr>
<tr>
<td>North Central Coast</td>
<td>0.5064</td>
<td>0.2651</td>
<td>0.5535</td>
<td>10,007,699</td>
</tr>
<tr>
<td>South Central Coast</td>
<td>0.5066</td>
<td>0.5296</td>
<td>0.6372</td>
<td>6,528,081</td>
</tr>
<tr>
<td>Central Highlands</td>
<td>0.3652</td>
<td>0.2853</td>
<td>0.5481</td>
<td>3,061,901</td>
</tr>
<tr>
<td>Northeast South</td>
<td>0.6064</td>
<td>0.7889</td>
<td>0.8059</td>
<td>12,707,950</td>
</tr>
<tr>
<td>Mekong River Delta</td>
<td>0.4280</td>
<td>0.6680</td>
<td>0.1725</td>
<td>16,130,675</td>
</tr>
</tbody>
</table>

opinions of the strengths and limitations of each alternative water source available to residents. By explicitly comparing the use and costs of these various sources, I hope to increase knowledge about the competitive forces and demands for differentiated water types that may slow the adoption of small-scale water sources that cannot establish a citywide monopoly.

**Previous Findings on the System of Small-Scale Providers in Can Tho**

Can Tho is the Mekong Delta’s largest urban area, but has little publicly available local data. Moreover, because the system I describe below is a locally driven one developed through experimentation, there is little written about it, or similar efforts to incorporate local private capital into the provision of public infrastructure. The structure of this new system is described in depth elsewhere (Spencer 2008), and because it was approximately four years into implementation at the time of data collection, there has been sufficient time to assess early indicators on demonstrated—or actual—demand.

The first phase of the research involved three site visits and discussions with local officials, local university research staff, and residents of two newly urbanized wards in Can Tho. These sessions took place in June 2003, January 2004, and July 2005. In part, based on these site visits, the author developed a survey of 200 households, and worked with local partners to conduct further in-depth qualitative interviews with water company leadership, local level officials, and a variety of residents representing various water user-groups.

In general, Can Tho has adopted a localized privatization scheme that fits neither into the current model of corporate participation in water services, state-run systems, nor local community control and management of water resources. Instead, it is based on a complex system of local entrepreneurs working together with an entrepreneurial state-owned enterprise above them and entrepreneurial households beneath them. The municipal water company has financed private households to construct deep wells able to service any households within about 2,000 meters of the water station; the company allowed these entrepreneurial households to benefit from managing the water supply. This quasi-private model for water management is obviously not better or worse for local residents, and in particular the poor, but the structure of the system argues for a better understanding and evaluation of the multiple local forms that privatization might take in developing countries.

For my purposes here, one of the more interesting aspects of this potentially transitional water supply arrangement is that it presents, in conjunction with traditional sources, the case of a peri-urban, transitional settlement encompassing the full range of high- to low-quality water from which residents can select. The existence of such cases is important because there has been much-needed attention to the water needs of the poor, but what comparatively little analysis of their water supply demands exists suggests that the poor have a great demand for higher quality water that might be met through improved infrastructure. Citing a 1991 micro-level urban survey in Pakistan, India, and Turkey, the World Bank found that poor households paid a five-fold premium for clean, bottled water over those that had access to high-quality piped household water (World Bank 1994). More recently, Whittington et al. (2002) found that residents in Kathmandu, Nepal, were willing to pay much higher prices for improved household water services. From such findings, development banks have prompted efforts to include the urban poor in such networks of high-quality water service to reduce their dependence on expensive bottled water. The study presented here, however, suggests that the demand for such high-quality water amongst the poor may be limited to small quantities and does not justify payment for 24 hour-a-day service. Rather than conduct contingent valuation studies, such as Whittington et al. (2002), the current study examines actual water source choices in a peri-urban context in the Mekong Delta.

**Data and Methods: Sample Survey Protocol**

The sample included 200 respondents equally distributed from two urban wards in Can Tho City. The wards were selected based on their proximity to the central business district of Can Tho, and the fact that they had, within the past
three years, been redesignated from communes, a rural administrative unit, to wards, the same unit within officially designated urban areas.

Within these two wards, researchers recruited participant households through a random sampling procedure, using the official ward roster as the sampling frame. Thus, illegal migrants and residents are, theoretically, invisible to this sample. Respondents were interviewed up to one hour in a structured face-to-face format by research staff, and were compensated for their time. Participation was completely voluntarily, and respondents were informed of their rights as a research participant. Where possible, the self-identified head of the household was interviewed and provided information on household characteristics. If the household head was not available, then the next senior member of the household provided the household-level information. Survey interviews and coding were conducted entirely in Vietnamese by staff from the Southern Institute of Social Sciences (SISS) and translated into English by staff from the University of Hawai’i Globalization Research Center (GRC).

In the sampled wards, residents generally used water from the small-scale piped system, household-dug wells of approximately 80 meters depth, natural river and canal sources, bottled water, and/or rainwater. Of these sources, only bottled water is considered ready to drink, while piped water and household well water require a minimal amount of boiling, though experts say it is safe to drink out of the tap. In this region, residents generally boil natural source water as well as treat it with alum (aluminum sulphate) to reduce solid matter. Previous analysis has found that households dependent on natural sources are poorer and do not connect to the new system at all, even though they are eligible at a modest cost. Moreover, distance from the distribution center was a stronger correlate for those not connecting, possibly because of the cost of piping and the limited technical ability to pump very long distances (Spencer 2007), suggesting some limitations in the project design.

In general, less than 12 percent of those in the sampled wards actually used the system. Only 17 percent of those within the pumping capacity range of the existing stations actually chose to connect to the system. Fully 83 percent of the sample preferred to continue using private well water and water taken directly from the river and canals treated with a small dose of alum. Households connecting to the new system came from the wealthier families, and 46 percent of the sample primarily dependant on river and canal water was significantly poorer than the others. Many of the other wealthier families that rely on private wells, however, also chose not to connect to the system (Spencer 2007). The finding that almost 85 percent of those eligible still use traditional systems—even though they have access to the new piped household water system and they come from both the highest and lowest strata of the community—reflects that the system has entered a competitive market rather than simply providing a needed service as a natural monopoly.

These previous findings provide an initial answer to the question of why residents choose to connect to the system or continue to use alternative sources. Cost explains the low connection rates for the poor, and sunk costs explain the low connection rates for those with household wells. While likely true, this study elaborates on these low usage rates by examining water use and residents’ assessments of the piped water as it compares with the various alternative sources. At present, there is not a clearly proven demand for piped water, as evidenced by less than 20 percent usage rate among both poor and wealthy residents. Thinking about piped water as less of a “basic need” than an extremely useful “product,” like other household needs, such as education, motorbikes, and agricultural inputs, can help to elaborate on low usage. Presently, there are surface and groundwater sources that at least 80 percent of residents feel comfortable enough continuing to use on some level. Such competitive pressures currently ensure that the small-scale providers managing the local water stations will have a difficult time recovering their costs.

A more-detailed description of the previous research shows that this system has established itself amongst a small minority of residents that are neither particularly rich nor poor, that migrants are disproportionately represented in those that choose to connect, and those further from the water stations are less likely to connect. Thus, the argument that financial burdens are the only, or even the primary, barrier to improved access to clean water is not clearly supported. This finding is consistent with the broad claim in the previous section that economic development will naturally lead to improved water services. Findings on project design, distance, and cost barriers to use are not new to the literature. But inconclusive results on these factors point toward a need to better understand the differences in how households use the various forms of water, and how these differences may inform management decisions targeted towards improving the alternatives available to residents of Can Tho for a variety of water qualities, rather than the promotion of a single water source and quality. In doing so, this study fills a gap in the literature on small-scale water providers by pointing out how the use of station water differs from the use of water secured from other sources, and how these differences may impact household connections to new water infrastructure. In particular, it addresses how they differ in amounts used, cost paid, types of usage, and what users like and do not like about the various kinds of water used. A better understanding of these differences and the dynamics of household-level strategizing, mixing of alternative water sources, and household perceptions of water sources will help planners move beyond simple “access to clean water” measures defined in the MDGs, to a more refined set of guidelines on the water demands of poor communities.
Cross-Use and Water Provision in Peri-Urban Can Tho

Cross Use, Consumption, and Cost

The first row of Table 2 restates proportions of households depending on each source of water as its primary supply during the dry season (Spencer 2007). Although these figures are useful in describing households’ primary sources of water, one of the main points of this paper is to describe the extent to which households rely simultaneously on multiple sources of water for domestic use.

As with formal and informal sector employment strategies (Owusu 2001), households patch together resources to fulfill daily water demands. The second row of Table 2 shows the extent to which this is the case, thus furthering the basic concept of primary source of water to an understanding of household strategies for securing water. The percentage point difference between the first and second rows provides information on the number of additional households that use each source for daily use, though it may not be the most used source. In particular, it is clear that rain, natural sources, and other—almost exclusively bottled—water sources play a very important role in supplementing piped and well water sources. Specifically, 20.5 percent of all households in the sample use rainwater as a secondary source of water during the dry season, a figure that jumps to 40.5 percent during the rainy season. Eleven percent of households not depending on natural sources as their main source depend on river or canal water to supplement other sources, a figure that does not vary by season. Bottled water (here identified as “other sources”) is a completely supplemental form used by about 27 percent of all households.

In addition to identifying the multiple sources used, Table 2 presents the average monthly consumption of each source during each of the main seasons. Thus, the three most common primary sources of water—piped water, private wells, and natural sources—are consumed at an average rate of 8.60 m³, 7.83 m³, and 6.84 m³ per month respectively. These figures indicate that, relative to volume, piped water is the most intensively used within households, followed by private well water and natural sources. This finding is not surprising, given the relative convenience of station water piped into each household compared to private well water that must be pumped and carried short distances and river/canal water that must be pumped or carried from the canal. Thus, the higher cost of piped water seems to outweigh the additional work associated with well water and natural sources for some households.

Table 2.
Household Water Sources, Consumption, and Cost (n = 200).

<table>
<thead>
<tr>
<th>Water Supply</th>
<th>Water Supply Through Other Households’ Water Station</th>
<th>Private Well</th>
<th>Shared Well</th>
<th>Rain Water</th>
<th>Natural Sources (river, pond, canal)</th>
<th>Other Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of households using this source as primary source*</td>
<td>11.5</td>
<td>0</td>
<td>38.0</td>
<td>4.0</td>
<td>0.5</td>
<td>46.0</td>
</tr>
<tr>
<td>Percentage of households using this type of water (dry season)</td>
<td>12.0</td>
<td>0</td>
<td>37.5</td>
<td>5.5</td>
<td>21.0</td>
<td>57.0</td>
</tr>
<tr>
<td>Percentage of households using this type of water (rainy season)</td>
<td>12.0</td>
<td>0</td>
<td>38.0</td>
<td>4.5</td>
<td>50</td>
<td>57.0</td>
</tr>
<tr>
<td>Average Monthly consumption by water source (m³) (dry season)</td>
<td>8.60</td>
<td>0</td>
<td>7.83</td>
<td>5.25</td>
<td>2.38</td>
<td>6.84</td>
</tr>
<tr>
<td>Average Monthly consumption by water source (m³) (rainy season)</td>
<td>(3.38)</td>
<td>—</td>
<td>(5.80)</td>
<td>(2.33)</td>
<td>(2.89)</td>
<td>(5.59)</td>
</tr>
<tr>
<td>Average monthly cost of water source in rainy season (VND 000)</td>
<td>21.60</td>
<td>0</td>
<td>3.23</td>
<td>1.75</td>
<td>—</td>
<td>Cost of alum: 2.48</td>
</tr>
<tr>
<td>Average monthly cost of water source in dry season (VND 000)</td>
<td>22.71</td>
<td>(8.40)</td>
<td>—</td>
<td>(5.13)</td>
<td>(3.10)</td>
<td>—</td>
</tr>
<tr>
<td>Cost (1,000VND per m³)</td>
<td>2.51</td>
<td>—</td>
<td>0.413</td>
<td>0.333</td>
<td>—</td>
<td>3.34(without alum)</td>
</tr>
</tbody>
</table>

* James H. Spencer
This additional cost is not insignificant. The bottom row presents the average cost of a cubic meter of water from each source. Each month, the piped station water (during the rainy season) is roughly six times more expensive (VND2,510) than private well water (VND413). River and canal water is ostensibly free, except for the cost of treatment and any other additional expenses associated with gaining access and transporting it. Survey responses showed two major expenses associated with this source: alum for treatment, and a second catchall category of “additional costs,” comprising the cost of a motor and electricity to run it for pumping water to the house. Thus, the calculation of the cost of natural source water can be done in four ways: with the cost of alum included, with the cost of “additional costs” included, with both costs included, or with none of the additional costs included.4 As we will see in the following section, alum is used as a treatment for many sources of water when it is used for drinking or cooking. Thus, river and canal water may be very inexpensive to use if transported by hand, compared to the VND2,500 needed each month for station water. On the other hand, river and canal water (VND3,334) can be quite a bit more expensive to use than station water if a motor is used to pump it. Finally, Table 3 shows how water from the water station is used and how it is treated in preparation for each of those uses. Each source user group is comprised of all households using that source, whether or not it is the primary one.

Table 3 shows how water from the water station is used and how it is treated in preparation for each of those uses. The first row shows that it is used for all purposes except peripheral housecleaning needs and enterprise. Drinking, cooking, washing dishes, bathing, and laundry all showed use-rates at 85 percent or above, with some uses, such as cooking and bathing, being common to this water source for all households. Importantly, most households always boil this type of water before drinking or cooking with it, though a few choose to use alum. In part, this real or perceived need to treat even the piped water explains why many families are willing to spend as much on small amounts of bottled water per month as they are on large amounts of piped water. Similarly, almost no households bother to treat station water for washing dishes, bathing, or laundry. Thus, it is clear that the piped water is generally seen to be of good enough quality for any use not affecting human health through direct consumption.

Overall, the piped station water serves a wide variety of uses within the household that prioritize some aspect of human health and hygiene. Private well water shows similar, but slightly lower, rates of use for those health-related aspects of household management (Table 4). This source, however, may be slightly more versatile, due to its relatively cheap cost, including a higher proportion of households using it for other forms of housecleaning. Slightly more than 80 percent of households use well water for drinking, and almost all use it for washing dishes, bathing, and laundry (96 percent, 97.3 percent, and 97.4 percent, respectively). Although these rates are similar to those for piped water, residents seem to feel a

### Table 3.

<table>
<thead>
<tr>
<th>Uses Of the Water Station Water (n = 24)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percent of households</strong></td>
</tr>
<tr>
<td>Drinking</td>
</tr>
<tr>
<td>87.5%</td>
</tr>
<tr>
<td><strong># Always boil</strong></td>
</tr>
<tr>
<td>(21)</td>
</tr>
<tr>
<td><strong># Usually boil</strong></td>
</tr>
<tr>
<td>(1)</td>
</tr>
<tr>
<td><strong># Occasionally boil</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td><strong># Never treat</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td><strong>Percent that don’t use this source for this use</strong></td>
</tr>
<tr>
<td>12.5%</td>
</tr>
</tbody>
</table>

Quality, Treatment, and Use

Water used for domestic purposes cannot easily be lumped into a single commodity of equal value for all uses. For this reason, even poor residents may be willing to pay relatively high prices for drinking water, but not for water used to wash clothes, for example. This kind of household water triage complicates the scale and scope of the market for which the station water source competes with other sources in Can Tho. Tables 3-5 break the three main sources of water down by use category, and the degree to which each is treated before use. Each source user group is comprised of all households using that source, whether or not it is the primary one.
greater need to clean this source of water than piped water for all purposes. All households boil it before drinking, as opposed to 75 percent for those drinking piped water, and almost all of them (85 percent) additionally treat it with alum prior to drinking it. No households drinking piped water reported treating it with alum.

The only other major difference between piped and well water is that residents use well water for other household cleaning purposes at higher rates than station water (68 percent as opposed to 41.7 percent).

The third major source of water used in Can Tho is that from natural sources: rivers, canals, and ponds. Table 5 shows that a significantly lower proportion of households use river or canal water for drinking, that most of them (about 93 percent) always boil it, and that most of them (about 94.3 percent) treat it with alum. Thus, most river and canal water needs to be cleaned by both boiling and alum treatment. Similarly, somewhat fewer households use this source for cooking, and when they do, they always treat it with alum.

Finally, rainwater and bottled water serve as supplements to other drinking water sources. A total of 76.2 percent of those sampled used rainwater for drinking, 30.9 percent used it for cooking, and in both cases, the water was boiled only before it was consumed. Bottled water (categorized as “other” in the survey) was exclusively used for drinking and never treated with alum or boiled.

### Table 4. Uses Of the Private Well Water (n = 75)

<table>
<thead>
<tr>
<th>Source Used</th>
<th>Drinking</th>
<th>Cooking</th>
<th>Washing Dishes</th>
<th>Bathing</th>
<th>Laundry</th>
<th>Other Housecleaning</th>
<th>Enterprise</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of households using source for</td>
<td>81.3%</td>
<td>93.3%</td>
<td>96.0%</td>
<td>97.3%</td>
<td>97.4%</td>
<td>68.0%</td>
<td>21.3%</td>
<td>9.3%</td>
</tr>
<tr>
<td># Always boil</td>
<td>(61)</td>
<td>(70)</td>
<td>(72)</td>
<td>(73)</td>
<td>(74)</td>
<td>(51)</td>
<td>(16)</td>
<td>(7)</td>
</tr>
<tr>
<td># Usually boil</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td># Occasionally boil</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td># Never treat</td>
<td>(52)</td>
<td>(62)</td>
<td>(33)</td>
<td>(30)</td>
<td>(29)</td>
<td>(15)</td>
<td>(3)</td>
<td>0</td>
</tr>
<tr>
<td>Percent don’t use this source this use</td>
<td>18.7%</td>
<td>6.7%</td>
<td>4.0%</td>
<td>2.7%</td>
<td>1.3%</td>
<td>32.0%</td>
<td>78.7%</td>
<td>90.7%</td>
</tr>
<tr>
<td>(14)</td>
<td>(5)</td>
<td>(3)</td>
<td>(2)</td>
<td>(1)</td>
<td>(24)</td>
<td>(59)</td>
<td>(68)</td>
<td></td>
</tr>
</tbody>
</table>

Household Assessments of Water Sources

The analysis thus far has examined consumption, cost, and use, pointing toward how differences across water sources based on these characteristics may help to explain why the new system has relatively low usage rates. Specifically, it has suggested some of the possible lack of comparative advantages of the system relative to private wells and natural sources. Although this examination of behavior is useful as a direct measure of relative advantages and disadvantages of each source, it cannot assess users’ self-reported perceptions, which may be as, or more, indicative of whether households will switch to the new system once they are presented with the alternative. Therefore, Table 6 reports the perceived advantages and disadvantages of each water source, as a way to help explain low usage of the system and the nature of competition in the local water market.

In general, there are two main possible advantages of piped water: the convenience and consistency of having water pumped directly into the house, and high quality, hygienic water. Users’ perceptions on these hypothesized advantages show an ambivalence that explains the low connection rates. First, there is a high level of concern among piped water users with intermittency. Of the “top-3” challenges associated with piped water, roughly half (48.15 percent) noted the service was intermittent. Wells can be intermittent on occasion, and natural sources of water in this region are almost never intermittent. However, the most important finding here is that the only other challenge associated with any source showing this level of consensus is the 49.62 percent of challenges associated with the “quality” of natural water sources. Such high convergences of concern suggest that piped water managers might have a potential market among natural source users if they are able to provide consistent service of quality water. This potential market, however, is constrained by perceptions of convenience. Of all the systems, convenience is least often cited among piped water users (29.51 percent) when compared to all other groups. This finding is particularly problematic for water station managers, because 60.12 percent of natural water source users cited convenience as a main advantage.

The second possible advantage of the piped system is improved water quality. As with the convenience advantage, the piped water system has some perceived obstacles to overcome. First, users of private wells are more satisfied with the hygienic quality—at roughly 50 percent—than both piped water users and rain water users. For these two user groups, only about one third of the cited advantages had to do with hygiene. On the other hand, water quality is defined not only by hygiene. Taste, smell, and color are all parts of how residents assess water quality. On this more “aesthetic” measure, piped water fares noticeably better. Only 11.11 percent of piped water users cited “quality” as a main challenge in their
water supply, while 26.19 percent of well users and 49.62 percent of natural source users did. These findings strongly suggest that the main advantage of the piped system lies in its provision of water that tastes, smells, and looks good. This finding suggests that arguments for the new-piped system based on health and hygiene may not be the most effective, but that appeals to taste may stand on a stronger footing.

**Concluding Remarks: Understanding Strategies for Water Use**

This paper informs a larger debate on small-scale providers and clean water provision in the peri-urban settlements of developing countries. Four years after its creation, this new system for securing clean water has not taken over the market, but has established a small, and growing, presence. Based on an original sample of n = 200, it is clear that about 12 percent of households had connected to the water stations, and for almost all of these households, it served as the primary source. However, fully 37.5 percent continued to use private wells and about 57 percent continued to use natural sources such as river and canal waters. Moreover, a significant number of households supplemented their piped or private well water sources with additional water from rainfall—especially in the rainy season—and canal water. Households used between 9 and 10 cubic meters of piped, well, and canal water—the three main sources used in Can Tho—per month. The piped source was the most intensively used of the three in both the wet and dry seasons.

Differences in the cost of these sources, however, were significant. Piped water costs about VND2,510 per cubic meter,
over five times as much as the private well water, suggesting that the recurring costs of the new system are comparatively quite high. Compared to water from the rivers and canals, the survey surprisingly showed ambiguous results. Although it is ostensibly free to access natural sources like river and canal water, respondents reported very high “additional costs” each month associated with pumping water from natural sources. When these costs are included in the analysis, water from natural sources actually becomes more expensive, at VND3,340, than piped water. This finding suggests that in addition to quality, high relative costs of water pumping may also push residents toward the new system in the future, at least for those far from the natural sources.

Even beyond the comparative cost of piped water, one of the main advantages of paying for water from the station is in how much it needs to be purified. Although most station users felt that they needed to boil this kind of water for drinking and cooking, they do not need to treat it additionally with alum for purification. This is not true for the private well water, for which users generally boil and treat with alum. On the other hand, the private well water is used in a slightly wider variety of household tasks. Finally, despite being generally free, river and canal water requires much work in its preparation, being both boiled and treated with alum for drinking and cooking, and being treated with alum alone for almost all of its domestic uses.

Overall, these findings suggest that the new system does effectively provide cleaner and more convenient water to a small, but significant, portion of Can Tho’s population. Why, then, are there relatively low rates of use? First, the system is relatively new and limited in its technical coverage. Data from the users’ assessments, however, additionally suggest a general perception that wells are the most hygienic, the natural sources the most convenient, and household piped water intermittent. These assessments from the water user groups also suggest that the two main alternatives, private wells and river/canal water, will be hard for this new system to displace among current residents for other reasons. In particular, private well water is seen by respondents to be of almost as high quality as the piped alternative, and used for the same basic purposes. The only major difference is that the well water must be treated with alum. If this cost is included in the average cost per cubic meter of well water, then it is still less than half the cost of piped water. Water from the canals and rivers may actually be an easier share of the market for the piped system to displace. An assessment of water users’ perceptions does suggest that the main comparative advantage of the system may be in the aspects of quality having to do with taste, smell, and appearance.

Previous findings from Can Tho (Spencer 2007), however, show that these users are significantly poorer than those on the new system. If the actual costs of consuming river and canal water are found to be higher than station water, then why do those using natural sources choose not to switch to the new system? This finding supports the other conclusion from Can Tho (Spencer 2007)—that barriers to service go beyond the cost burden for the poor. Do awareness, social exclusion, and/or technical access drive these decisions for poor households? Further study of why the poor are systematically not served by the system might also explore cultural issues affecting households’ slowness in familiarizing themselves with a new system, as well as how having multiple sources can help the poor, in an unstable social and economic environment, balance over-dependence on any single source.

Vietnam is currently undergoing a major social and economic transition that has three primary components: market reforms, urbanization, and increasing demands for public service amenities. These three components have combined to create a development paradox that has many state institutions scrambling to create and reorient traditional structures of governance to meet these demands in areas that are urbanizing quickly. The literature on institutions and urban service provision, however, provides scant evidence to suggest how such urbanization may play out in a context of rapid population growth where infrastructure currently does not exist—a characteristic of peri-urban areas. Many studies focus on the privatization of public services and the outcomes this institutional change has on the poor, assuming that these services are natural monopolies. These studies, however, overlook that in rapidly transitioning urban areas, multiple water sources may facilitate competition within the market—as opposed to for the market—and maintain viable economizing choices for the poor.

Local officials in Can Tho, Vietnam, have responded in a creative way to market reforms by creating a quasi-private distribution system that competes with household wells and natural sources. These other, long-standing sources of water are not so easily pushed aside because there remains sufficient demand for lower quality water. In particular, those on private wells and households that secure water from the abundant rivers and canals mostly choose not to connect with the new system, likely because they would prefer to buy limited amounts of bottled water, when necessary, and invest in alternative mechanisms for household improvement, such as education or transportation. Because of the persistence of these alternative sources, the small-scale providers of the new service must act in an entrepreneurial way rather than simply as a natural monopoly. This case suggests that the demand for high-quality water services may not be sufficient to support large-scale systems in peri-urban areas, because multiple sources of varying quality may best serve the poorest residents. Future research projects, therefore, might provide further evidence of households patch together various high-, medium-, and low-quality sources as strategies to economize.

Over time, however, the pressure for all households to shift towards using piped water seems inevitable. As the
Mekong River becomes increasingly polluted with agricultural runoff, industrial waste, and aquaculture effluent, the cost of treating and purifying natural sources and private well water will increase, leaving only a single option for residents. Thus, the current policy issue is how the managers of the new system can ensure that there is equitable financial and technical access to the new system so that everyone will have the opportunity to connect at a reasonable cost before the alternatives narrow to zero. In large part, this requires a gradual build-out and construction of the system before other sources become irreparably contaminated. Additionally, planners must develop a mechanism for replacing the lower quality, lower-cost water sources, so that residents might effectively purchase water based on ultimate use and needs, rather than simply purchase the highest-cost alternative.

The case suggests that the literature might benefit from a more complex understanding of the nature of water demand, particularly the demand for “bad” water that is priced accordingly. As is increasingly recognized in more industrialized countries, it makes little sense to flush toilets with drinkable water.

Notes

1. The UNDP uses a different system for estimating GDP in calculating its Human Development Index. The UNDP GDP per capita figure was $2,070 for 2001, a much higher figure than $480. In either case, though, the measure is comparable to low-income Central Asia and sub-Saharan Africa (GDP per capita of $1,831). I use the World Bank method for calculating the measure of average income relative to other countries, however, because it uses the Atlas method to adjust for short-term fluctuations in exchange rates that can distort annual measures of GDP figures.

2. The local partners, Vien Khoa Hoc Xa Hoi (Southern Institute of Social Sciences) of Ho Chi Minh City, field-tested the original survey instrument, collected the final surveys, and conducted the in-depth interviews.

3. Although there are certainly a number of “illegal” residents in the sampled wards, they do not face the same water source choices as legal residents. Because they lack official registration, they would be ineligible to connect to the piped system and therefore not be helpful in understanding resident preferences of alternative sources.

4. One limitation of the study is its inability to estimate opportunity costs. In particular, the cost of—usually women’s time—carrying water from source to home (e.g., Whittington, Mu, and Roche 1990; Ray 2007) can be high. As there are numerous natural sources throughout the Mekong Delta, however, I felt that in this particular case the opportunity cost for carrying water would be relatively small.

5. Satisfaction with natural sources is likely because much of this water is directly pumped into homes rather than carried by hand.

6. Provincial indicators weighted by population.

7. Provincial indicators weighted by population.

8. Data from this row have been previously published in Spencer (2007).

9. Number of cases falling within each category listed in parentheses.

10. Number of cases falling within each category listed in parentheses.

11. Number of cases falling within each category listed in parentheses.

12. Each respondent provided up to three answers for “advantages” and three for “challenges.” Thus, the comparisons here are of the number of responses, not the number of households. For the person responsible items, the comparisons are of households.

References


