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How the Drudgery of Getting Water Shapes Women's Lives in Low-income Urban Communities

BEN CROW AND JAMIE MCPIKE

Global statistics suggest that people living in urban areas are more likely than those in rural areas to have access to "improved water sources". Women do most of the work of water collection in low-income urban areas, as they do in rural areas. In this review of the literature on access to water and women's work in low-income urban areas of the global south, we find that women's lives and income-generating opportunities in poor urban communities are profoundly shaped by their inadequate access to water. We identify the main modes of access to water and their possible influence on women's lives. Then, we examine descriptions of women's lives and the range of difficulties they face in collecting water (time of access, uncertainty and quality of supply, and costs). We describe some of the advantages (health, improved domestic work, livelihood opportunities, education, and gender relations) reported when communities gain access to safe water at the household level. We conclude that the global figures on improved access to water in urban areas focus only on the technology of access, overlooking social obstacles like the collection time and cost of access, and thus obscuring the wide-ranging social advantages of household water connections.

Keywords: gender, access to water, development, urban, sanitation, poverty, health, organizing

Slums, Water, and Gender Relations

Livelihoods and living conditions in low-income urban areas¹ have become an ever more pressing concern as the urban population of the world exceeds the rural (which occurred around 2005) and future population

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growth is concentrated in the urban areas of the developing world (Davis, 2004). In some ways, cities set people free from rural ties, provide more social options, and even offer the prospect of greater environmental sustainability. The realities of urban living for slum-dwellers and recent migrants, however, may provide little more than the hope of better lives. Lack of access to safe water is one of several constraints that make slum life grim, particularly for women and children who are the main collectors of water.

Global statistics on access to water suggest that urban populations have much better access to improved water sources than rural populations. According to the WHO/UNICEF Joint Monitoring Programme (JMP), in 2004, 92 percent of urban households had access to improved water sources compared to 70 percent of rural households. "Improved water source" is defined simply by the technical conditions of the water source (pumps, standpipes, boreholes, etc.); the social conditions of access and water quality are often omitted from this category, obscuring the realities of access to water in poor urban communities.

The article is based on a review of literature on access to safe water and gender relations in urban slums of the developing world. This review was undertaken as a complement to ongoing work on gender and water in rural areas of the global south (Crow, 2000; Crow and Sultana, 2002; Were, Swallow, and Roy, 2006). Some of the implications of water access and gender relations are emerging in rural areas. The story of gender and water in urban areas is, however, less apparent, and one thing this review highlights is that detailed accounts of women's lives in slums and their access to water are available for only a few cities worldwide, mostly in South Asia and Africa, and one or two from South America.

The question this article explores is: how do access to water and gender relations influence each other in low-income urban areas of the developing world? We think an understanding of this question will illuminate paths toward improved access to water, with its multiple health, livelihood and opportunity cost benefits particularly for women.

The article is organized into five sections after this first introductory section. Beginning with a brief discussion of capitalism and the history of infrastructure provision in cities, Section 2 identifies a typology of modes of access in urban areas, and sets in motion a discussion of the social dynamics of these modes and their implications for the gender division of labor and gender relations. Section 3 describes some general patterns of

women's lives in urban slums. Section 4 summarizes what is known about women's access to water in urban communities, and Section 5 describes the range of social benefits arising from household water connections. Section 6 is a summary of our conclusions.

Urban Modes of Access to Water

Before examining the pattern of slum women's lives and how they are shaped by water collection and other domestic duties, we describe characteristic patterns of urban water provision, sketch how they may have arisen, and identify the main modes of water access characteristic of cities in the developing world.

Capitalism and Infrastructure

The processes through which infrastructures arise have intimate connections with the immanent development of capitalism as well as the growth of public institutions. In the case of water supply infrastructure in the industrialized world, emerging 19th century capitalism needed industrial water supplies of reliable quantity and appropriate quality, avoidance of epidemic disease (amongst the labor force and the employers) and urban fire suppression. As Gandy (2002: p. 37) notes, "the modernization of nineteenth-century cities was not carried out in order to improve the conditions of the poor but to enhance the economic efficiency of urban space for capital investment". The institutions of municipal government and innovations in public finance were needed to generate a public infrastructure meeting the needs of private enterprise.

This infrastructure of household water and sanitation provision was replicated in colonial cities, but the largely post-colonial growth of those cities has far outpaced the capacity of utilities to extend pipe and revenue collection networks. A characteristic division of urban space has arisen. Areas where the rich and those in professional occupations live have household connections either from public mains or, less frequently, from private wells. In contrast, large squatter settlements, peri-urban areas, and poor urban communities, all of which for simplicity we will call 'slums', have arisen with little infrastructure. Few slum dwellers have household connections, and the majority receives their water from secondary sources like public standpipes, boreholes, water tankers, hand dug wells,

community wells, water carts, and natural sources like streams or rivers (Agarwal and Bapat, 2003; Collignon and Vezina, 2000; Sharma, 1999).

Differences in the histories of postcolonial cities may illuminate contrasts with industrial cities in the connection between capitalism and infrastructure. The dispersed pattern of settlement, rapid migration in the last 60 years, and the relatively slow growth of industry may be relevant (Crow, 2007).

Urban Modes of Access to Water

To begin to understand the relation between access to water and gender, it is useful to describe the social conditions characteristic of different urban modes of access to water. We have identified five modes of access, described in Table 1. These modes, which seek to encapsulate both technical and social conditions, involve varying levels of infrastructure provision: (i) the household tap or connection, requires the highest level of provision, (ii) a community standpipe, (iii) purchase from a water vendor, (iv) purchase from a community-based organization (CBO) kiosk, all require a more modest pipe network, down to (v) collection from a natural source, requiring little infrastructure.

Figure 1 provides, for 10 African cities, a rough estimate of the percentage of households getting water through two of these modes (household connections and standpipes) and a residual estimate of the remaining modes (vendors, kiosks and natural sources). Piped connections vary from just under 30 percent of households to just over 70 percent. Standpipe access covers between 40 percent of households and one percent or less. In Ouagadougou, Bamako, Nouakchott, and Dakar, more than 10 percent of households obtain their water from standpipes. Those 'not served by city water' are never less than about 13 percent, and for six cities (Cotonou, Conakry, Bamako, Nouakchott, Kampala, and Dar es Salaam) the figure never exceeds 50 percent.

It is probably a reliable assumption that rich and middle class households are concentrated in the 30–70 percent of households with piped connections, and virtually all the poor are contained in the remaining 30–70 percent.

Each of these modes of access has specific historical dynamics, association to accumulation, spatial patterns, and social, economic, and political relationships. Delineating these historical, social, and spatial

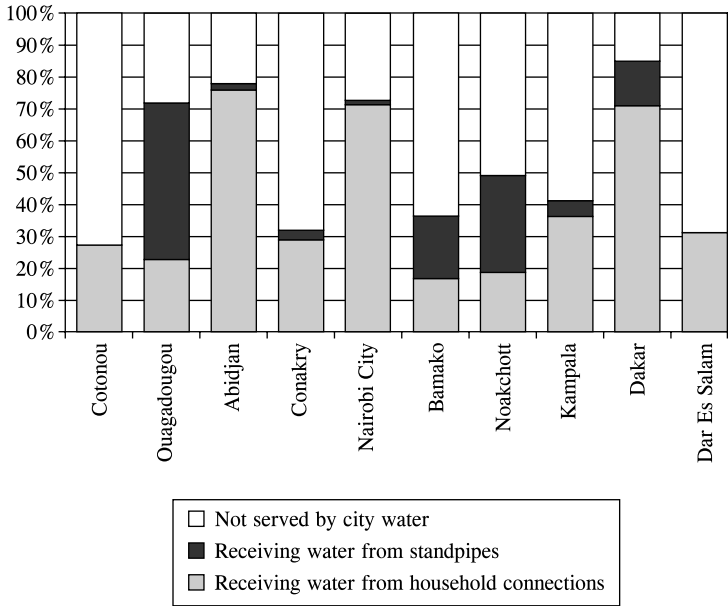
Table 1
*Urban Modes of Access to Water**

<i>Mode</i>	<i>Agents, Chain</i>	<i>Prior Process & Investment</i>	<i>Property Rights</i>	<i>Characteristic Transactions</i>
Household tap	Relations with municipality, engineers, bill collectors, inspectors	Municipal investment in household water pipe network	Clear land ownership (resident or landlord)	Distribution and payment of water bills
Direct access stand-pipe	Municipality	Municipal investment	Public land	Lines, turn taking
Vendor operated stand-pipe	Municipality, operator	Municipal and vendor	Public land, right to sell	Payment to vendor
Purchase from vendor or water tanker	Vendor, cartel, municipality	Relation vendor, cartel, municipality	Connection to city supply; own borehole	Payments to vendor and others
Purchase from CBO kiosk	CBO vendor, municipality, regulator	Modus operandi with municipality	Rights to kiosk and tank land	Payment to kiosk
Collect from natural source	Collector, vendor	Establishment of access and use rights	Use rights	Dipping a container into a pond or river

Source: Allen, Davila and Hoffman (2006, Table 2) list additional community water supply practices: rainwater harvesting, water theft, gifts/purchase from neighbors, clandestine connections, own wells, community organized piped networks.

Notes: *CBO—community based organization (that is, indigenous, local NGO).

Figure 1
*Percentage of Households Served by Public Water Networks
 in 10 Cities in Africa*



Source: Collignon and Vezina, 2000: p. 18.

patterns is beyond the scope of this article. Since, nonetheless, this bundle of patterns, dynamics, and relationships may illuminate the characteristic ways in which conditions of water access circumscribe, or possibly liberate, the lives and livelihoods of men and women, we provide some brief description in the next section.

Gender and Modes of Access to Water

The characteristics of these different modes of access have implications for those who do the labor of collecting water. In poor urban communities, it is women and/or children who do this work.

Clearly, piped water delivered to the homestead or house provides the highest level of infrastructure and service provision and the greatest potential to liberate those allocated the drudgery of collecting water.

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Some of the improvements associated with this mode of access are described in Section 5. A 24-hour household connection provides the quantity and quality of water enabling water collection work to be minimized and livelihood opportunities maximized.

Household connections imply large municipal investments based on substantial industrial accumulation and the recognition by the city that all residents, including those in low-income areas, are citizens with standing in the city. In the very rapidly growing cities of Asia and Africa, the investment required to pipe new settlement areas may be a formidable obstacle to household connections.

In low-income urban areas, the municipal standpipe is a more common form of provision. Standpipes are often open directly to the consumer. In some cities, notably in Africa, vendor operators (or standpipe managers) sell water from the standpipes (Collignon and Vezina, 2000). In both cases, this mode is generally associated with a significantly higher investment of labor by the user, walking to and from the standpipe, waiting in line, and dealing with uncertainty if the water supply is erratic, as it is in many areas. The quality of water may be high, in accord with municipal treatment standards, but often the combination of low pressure, illicit pipe connections, and lack of sanitation leads to contamination from human waste. As a result, there may be both illness and substantial additional labor for boiling the water. This mode of water access, like household connections, requires collective investment in a network of pipes, water capture, storage, and treatment facilities.

Understanding of independent small-scale vendors of water in African cities was greatly expanded by the set of multi-year research studies, funded by international agencies and reported by Collignon and Vezina (2000). In principle, water purchased at the front door, and in adequate quantities, could provide a decent level of service. The work required by household members may be minimal. They identify 11 different types of independent water providers in African cities, including resellers of home water, operators of city standpipe, hand-carters, donkey or horse-carters, water truckers, well operators, and small network operators.

These forms of enterprise, often with low entry costs, might be expanded to provide a flexible response to expanding urban areas. There is, however, a form of collective action that has been little studied, that is, the water cartel.² In most of the low-income areas of Nairobi, and probably in many other cities as well, water and sometimes electricity supply is

regulated by what amounts to a parallel, if usually illegal, state, the water cartel. Agarwal and Bapat (2003) and Sekhar, Nair, and Reddy (2005) described somewhat similar circumstances in Mumbai and Bangalore respectively. The scale and operations of water cartels deserve further research and a separate article. Cartels cast a shadow over optimism about the ready expansion of small-scale vendors who may be operating in the context of a set of institutions (organized crime or a parallel state?) of unknown tractability.

Kiosks sell water and generally have an operator who takes the money and helps fill consumer's containers. This mode is preferable to the directly accessed standpipe because the supply is predictable and the quality consistent. The labor of collecting water remains the same as for a standpipe, but without the time queuing. Both labor and cost will limit the amount of water that can be obtained by a household. Experience of water supply from kiosks operated by community-based organizations (CBO) is not well documented. Debomy (2000) reported a study of kiosks in Arusha, Tanzania organized by the municipality and local government. In this city, the expansion of household connections, and poor location of kiosks, undermine their utility.

Natural water sources include rivers, lakes, ponds, seeps, and springs. Quantities may be seasonally variable, the quality of water is likely to be poor and the labor of water collection will be substantial for all but those close to this source.

To fully understand how these modes of access affect women's lives, we now turn to descriptions of the daily pattern of women's lives in poor urban communities.

Women's Lives in Poor Urban Communities

Women in slums manage daily productive and reproductive tasks in an effort to fulfill the double burden of domestic work and income provision. Over a span of roughly a decade, multiple authors provide descriptions of the everyday lives of slum women. Huq-Hussain (1995) discusses the importance of women's economic contributions to slum households in Dhaka. Salway, Rahman, and Jesmin (2003), also researching in Dhaka, and Bose (1999), researching in Calcutta, both described the limited productive opportunities available to slum women and the barriers to entry that slum women face when trying to find work. Mitra (2005) showed

how women's economic opportunities are affected by their everyday reproductive work in India, while Bennett (1995) linked the reproductive activity of collecting water to the productive opportunities available to women living in slums in Mexico.

Female Income Contributions to the Slum Household

For many slum households, female wage contributions are vital to the economic stability of the household. In a large and carefully designed study of livelihoods in Dhaka slums, Pryer, Rogers, Normand, and Rahman (2002) used cluster analysis to identify four livelihood clusters; self-employed, dependent self-employed, casual unskilled and female head units, and casual skilled. She concludes that women's incomes in each of the clusters were only slightly less than those of men. Bose (1999: p. 5) described women's incomes in the slums of Calcutta as 'crucial for the basic survival of their households'. Huq-Hussain (1995) also studying Dhaka, found few households relied solely on the income provided by the head-of-household. Female incomes accounted for one quarter to one half of the household income in many slum households (World Bank, 1990 cited in Huq-Hussain, 1995). Of the male-headed slum households surveyed in another study in Dhaka, the portion of households that reported using female income contributions during a one month period was nearly one half, while the contribution of female wages in female-headed households was obviously much larger. Much of the work completed by men and women living in slums is self-employed work, or daily wage labor work (Salway et al., 2003). Most of this work is in the informal sector, and men and women depend on social networks to find this work.

The Process of Finding Work and Types of Work

In order to find work, those living in slums often rely on social contacts like family members, neighbors, or word of mouth. As a result of this close networking, slum women living in the same settlements tend to be concentrated in similar types of work and often work in the same localities. Mitra (2005: p. 295) described how:

... such contact based job searching ends up in providing jobs only in the close neighborhoods of their residence, as the early settlers who

help their friends, members of the same caste groups and co-villagers in providing information on job and space to settle down are usually engaged in similar activities in the vicinity.

This “contact based job searching” can be limiting. First, it can limit women’s choices of productive opportunities mostly to jobs near the slum, ones that traditionally are informal and lowly remunerated (Mitra, 2005). Second, for women who have limited social networks (i.e., recent migrants or female-heads of household who find it difficult to establish networks based on social norms of being married—men establish many contacts for women), their ability to find productive work can be delayed until the right contact is found (Huq-Hussain, 1995).

It is common for slum women’s employment to be “concentrated in poorly remunerated, low or unskilled, gender-segregated work in the informal sector” (Bose, 1999: p. 10). Bose (1999), Salway et al. (2003) and Mitra (2005) found that many female slum dwellers engage in selling and manufacturing, domestic service work, and petty piece-rate work. Slum women are also found working as domestic servants and factory workers, with a small percentage being self-employed.

Now we turn to another important factor that restricts women’s employment choices, the need to balance daily reproductive and productive duties.

The Management of Productive and Reproductive Duties

A large number of women must manage household duties while also working during the day. In her study of slums in Bangladesh, Pryer (2003) found that 60 to 82 percent of working women, and 74 to 94 percent of non-working women, carried out a range of daily domestic tasks, including cooking, cleaning, childcare, and collecting water, every day.

Household duties restrict many women to part-time work, which tends to be either in-home or in close proximity to the home. Anand and Tiwari (2006), studying working localities and transportation for slum dwellers in Delhi, describe how women tend to work close to their homes due to their “limited mobility and limited access to transport facilities” as well as their responsibility to complete reproductive duties throughout the day. They found that “75 percent of the women work within a 5-km radius [of their homes]” and 100 percent work within one hour travel time from their homes (Anand and Tiwari, 2006: p. 72–73).

In addition, women “preferred to be engaged in occupations where the nature of the work was more or less an extension of the work they carried out as housewives. Such occupations allowed them to carry out their economic work along with their domestic work” (Desphande, 2001 as cited in Mitra, 2005: p. 293). Salway et al. (2003) and Mitra (2005) indicated that it is common for slum women to accept lower paying jobs that are close to their homes so that they may go home intermittently to complete reproductive tasks. Bose (1999: p. 11) described the typical day of a slum woman in Calcutta as one that “consists of short segments of productive work sandwiched between reproductive work rather than a continuous segment of wage-work”. These segmented jobs are generally low-paying, part-time positions in the informal sector.

One pivotal reproductive activity that affects productive opportunities is the daily collection of water. Inadequate water sources often make this task time-consuming, unpredictable, and difficult to balance with the other tasks of the day. As Bennett (1995: p. 82–3) noted, “water is a primary element of a housewife’s daily work. The water services her neighborhood receives are a crucial determinant of her working conditions”. Blackden and Wodon (2006) also made tangible how lack of infrastructure affects productive opportunities through their valuable study of gender and “time poverty”. They note that:

“Time poverty has long been recognized as a constraint to development in Sub-Saharan Africa, with women working especially long hours due in part to a lack of access to basic infrastructure services such as water and electricity” (ibid.: p. 91). “Time poverty and income poverty reinforce one another” (ibid.: p. 4), forcing women to make nearly impossible choices with significant implications for the households to which they belong. Because women often receive little help in the daily collection of water, daily challenges to obtain water have significant impacts on women’s lives within the household and their opportunities outside the household (Pryer, 2003). We turn now to a description of how women get access to water in urban slums.

Water in Slums

In this section, we review the water crisis in urban slums, with a particular focus on women’s role in the collection of water. UNDP (2006) provides a description of the global crisis in access to water and sanitation.

A dozen authors discuss access to water in contemporary slums. Agarwal and Bapat (2003), researching in Pune and Mumbai, and Sharma (1999), also researching in Mumbai, provided a comprehensive look at the water problems for male and female slum dwellers. Their studies provide first hand accounts of how poor water services in urban areas impact the lives of slum dwellers. Collignon and Vezina (2000) described the gap in access to water for the wealthy and poor living in 10 major African cities. Kjellen (2006) provided a detailed overview of water provision in Dar es Salaam, Tanzania. Swaminathan (1995) reviews the problems associated with obtaining water for poor slum dwellers in India. Calaguas and Roaf (2001) and Hardoy and Satterthwaite (1995) all discussed the political and environmental issues associated with the provision of water to urban slums through their comprehensive, multi-country studies. While all the previous authors touch on how urban water problems impact women, Ebam Etta (1999) and Oruwari (1999), both researching in Nigeria, and Buor (2003) in Ghana provided a more detailed approach to looking at how poor services directly impact women's time and incomes.

Problems Obtaining Water from Public Sources

Public water sources, most prominently the municipal standpipe, are included in global water access statistics (WHO/World Bank Joint Monitoring Program) as improved water sources. In practice, there are several problems with this type of source.

One significant problem is that the number of users at each public source is usually very large and results in long queues for the water collectors. The number of users for various public water sources in slums of Mumbai and Pune vary greatly, but are generally quite large. One woman describes how "each tap has at least 25 people queuing" (Agarwal and Bapat, 2003: p. 77), while another recounts how "now we have one tap used by 35 families" (Agarwal and Bapat, 2003: p. 85). In other slums surrounding these cities, a small number of standpipes and water sources can be shared between 700 and 900 families (2003: p. 78, 86). These crowded conditions create long queues at public sources that can cause fights over water. For many women living in slums in Port Harcourt, Nigeria queuing for water was a major complaint, followed by distance, cost, contamination, and irregularities of supply (Oruwari, 1999).

A photo in the *New York Times* (29–30 September 2006) exemplifies the problems associated with fierce competition to get water. Here, women living in a slum in New Delhi are unsure when their next shipment of water will come. This uncertainty, combined with long queues, leads to fights over the water source (Fremson, 2006). One slum woman living in Mumbai says “there are always fights for water, particularly if women try to jump the queue” (Agarwal and Bapat, 2003: p. 74). Another woman describes how “even sisters used to fight for water” because the queue for the water would be so long (ibid.: p. 79).

In addition to long queues for water, public water sources often have inadequate water pressure. Agarwal and Bapat (2003) find many first-hand accounts of public water sources with inadequate water pressure. One woman describes how “the pressure is so low that the water does not flow if we have the pipe raised even one foot above the ground” (ibid.: p. 75). Water sources that flow into slums are often at the end of a long pipe that has been tapped into many times over; “because this is such a long pipeline, the water pressure is very low toward the end of the line” (ibid.: p. 78). Water pressure in pipes may be reduced by large numbers of illegal connections (Kjellen, 2006).

Contaminated water sources are common in poor urban areas. Open sewage and inadequate disposal of waste contaminates many of the sources that slum households rely upon (Buor, 2003; Calaguas and Roaf, 2001). Hardoy and Satterthwaite (1995: p. 150) in their comprehensive study of urban slums of the global south found that “hundreds of millions of urban dwellers have no alternative but to use contaminated water—or at least water whose quality is not guaranteed”. Even slums that are considered “well-provided for” are found to have main wells containing water that is “not fit to drink” (Swaminathan, 1995: p. 137). One slum woman from Mumbai says, “they promised us good water. We waited for one year. The water in the tap can’t be used for drinking. Even the color is bad. We have to go a long distance to get good water” (Agarwal and Bapat, 2003: p. 79). In addition to contamination at the water source, poor storage, collection, and transportation of water can increase the risks of contaminating initially clean water sources (Swaminathan, 1995). Even when water is safe, uncertainty may lead households to boil or otherwise treat water, increasing the overall time invested in water collection.

Time Spent in Collecting Water

Unpredictable times for water dispersal, distant water collection sites, and crowded public sources, resulting in long queues at the water site, all affect the time it takes to obtain water. Buor (2003: p. 91) found that, on average, women in slums of Ghana spend 2.5 hours a day collecting water during “periods of scarcity” and 0.76 hours a day collecting water during “regular flows”. A significant number of women actually spent four or more hours collecting water (Buor, 2003). In slums of India, the findings are similar. Sharma (1999) found examples of women who spend anywhere from two hours (collecting water from a dripping pipe) to four hours (the total time spent waiting in line plus the time spent retrieving water) collecting their daily water supplies.

The time spent collecting water is not only the physical act of retrieving the water, but also the time spent waiting in line and the time spent actually getting to and from the water source. Sharma (*ibid.*: p. 5) found that women in slums of Mumbai have to “wake up each day at 4:30 a.m. to be ready to fill water from the community stand posts where water comes for around four hours starting at 5:30 a.m.”. For some women, getting up at early hours is the only way to ensure that they will get water for the day; “we only get [water] if we get up at 4 a.m”. Swaminathan (1995: p. 137) describes examples of women in Mumbai who get up as early as three or four in the morning and “spend the next few hours collecting water for the daily needs of their family”. If there is no direct source available in the immediate area, women will travel long distances to the nearest source. One woman had to travel 15 to 20 minutes per trip to get to her water source (Sharma, 1999). Another looked for an alternative source that was a 25-minute walk (1999). The time spent getting to the water source may not seem very long for one trip, but it can add up when multiple trips are made throughout the day.

The time spent collecting water is also affected by the inconsistency of the water sources. As described above, for many women living in slums, it is important to maintain a spot in the queue in order to get their water. However, many women describe how this act is often in vain because water is available at random times making it difficult to predict when the water will come.

Our turn for filling up the water can come at any time of day or night. If a woman has to go out to work, her neighbour may help by filling the water for her. The day before yesterday, my turn came at four in the morning. I was able to fill only a small quantity of water because I had to leave to go to work. (Agarwal and Bapat, 2003: p. 82)

In many slums “there are no fixed timings at which the water is supplied”, making it extremely difficult for women to manage their daily activities (*ibid.*: p. 76). Productive opportunities are put on hold in order to collect water, unless the woman can find help to complete this daily task.

Costs of Water

For slum dwellers, the cost of water may be a significant portion of their daily income. One slum woman in Mumbai describes how “most of the people who live here are daily wage laborers. They are paid around 100 rupees a day. Out of this, they have to spend 20 to 50 rupees just for water” (*ibid.*: p. 82). In one study of 10 major African cities, Collignon and Vezina (2000: p. 20) found that the “demand is high for the purchase of water in small quantities (10 to 200 liters). Most low-income earners do not work in salaried positions and the irregularity of their earnings means that they are managing their money on a day-to-day basis”. Because of this day-to-day or “piece rate” method of purchasing water the poor are susceptible to fluctuations in costs depending on scarcity, demand, and the prices chosen by vendors (Sharma, 1999). These prices are usually high, causing the poor to pay anywhere from “5–2500 percent more per liter of water than what a consumer connected to main supplies would pay” (Calaguas and Roaf, 2001: p. 1). Cairncross (1990: p. 51) also found that in Peru, “the poor often obtain water from private vendors and can pay 20–30 times the cost per litre paid by the richer groups with piped supplies”.

When adding up the costs that the urban poor spend on water, there are other, less obvious costs to keep the supply of water flowing. It is common for slum dwellers to pay bribes for their water and to have money extorted from them to keep their supplies. As noted earlier in Section 2,

water cartels have arisen, in the absence of state provision, in some low-income areas. This funding of this set of illegal activities parallel to state agencies takes the form of extortion and bribes.

Agarwal and Bapat (2003) documented the account of one slum woman in Mumbai. She describes how thugs control the water connection used by her community, and how “if we complain to the councilor of the area, he says that he is unable to do anything since we are living illegally on the land” (Agarwal and Bapat, 2003: p. 82). One study in Bangalore finds similar reports of bribes and extortion of slum dwellers. Slum dwellers from two different slums in Bangalore report high incidences of bribes and extortion. These bribes were paid for a variety of reasons, and were generally paid once a month (Sekhar et al., 2005). It is also common for those in control of the water to demand more money after a period of time. Sharma (1999: p. 4) describes one woman’s experiences; “for the last two years, we are all getting water from the fire hydrant in Water Gully. ... We used to pay rupees 10 per month, now it’s more because the officer wants more money”. These small costs paid for water, in addition to the day-to-day costs many slum dwellers already pay, add up and can be another frustrating barrier to obtaining water.

In a variety of studies, the high costs of water adversely affect slum-dwelling women. In her study of low-income areas in Lagos, Florence Ebam Etta (1999) found that although women’s incomes are less than men’s, women spend a larger portion of their incomes on water, and this is true for both single and married women. Women also responded that none of their husbands give them money for water because it is seen as socially unacceptable to do so. One woman describes how “women do not get, do not expect, and do not ask for money for water” (Ebam Etta, 1999: p. 42). Calaguas and Roaf (2001) also found that women in slums spend a greater portion of their incomes than men on household expenditures, water included. Oruwari (1999: p. 27) likewise found that women in Port Harcourt are in charge of the housekeeping allowance. Socialized norms dictating women as the main collectors of water also dictate their economic role in providing this amenity.

Women Organizing for Improved Access to Water

We have not undertaken a comprehensive review of the literature on women’s organizing over water. Since most accounts of improvements in

access come from changes brought by women's collective action, however, we preface this section on the outcomes of access to water with one indicator suggesting that women's protests for water are surprisingly large and widespread, and a brief description of some important studies.

Despite women's widespread lack of political voice, there is considerable evidence of women's organizing around water. Searches (in 1999 and 2007) of the Associated Press data base of news photos reveals massive women's demonstrations demanding access to safe water in Patna and Mumbai, India in 1998, Dhaka, Bangladesh in 1999 and 2006, Basra, Iraq in 2003, Bolivia (several cities) in 2000 and 2005 and Nicaragua 2005.

Bennett (1995) in a classic study of an extraordinary era of protest in the city of Monterrey, Mexico argued that water provides opportunity for women to organize across class lines. James et al. (2002) and Panda (2007) described large-scale organizing by rural women around access to water in Gujarat, India, and suggested that time saved from water collection can be used to increase women's cash incomes. Andujar (2005) described the dramatic social improvements brought by women organizing for water and sanitation in a shantytown in Buenos Aires, Argentina. Were, Roy, and Swallow (2008) described the consequences for women's work of community organized household connections in rural Kenya.

Consequences of Successful Organizing for Access to Water

The health benefits of access to water are relatively well known (Clasen and Cairncross, 2004; Cutler and Miller, 2005; Esrey, Potash, Roberts, and Shiff, 1991; Macassa, Antonio, and Bo, 2006). Table 2 summarizes multiple studies on reduction in diarrheal disease arising from improvements in water and sanitation.

Recent findings show that, in addition to health benefits, access to water may bring the potential for wide social improvements (Andujar, 2005), increased income generation (James et al., 2002; Panda, 2007), and increased quality of domestic work (Were, Roy, and Swallow, 2008). Increased educational opportunities for women and girls also result from time saved previously used for collecting water.

Andujar (2005) provided a fascinating account of how, in 1990, a group of women neighbors in Villa Jardin, a Buenos Aires shantytown, organized and successfully fought for domestic water and sewage networks

Table 2
Health Impacts from Improvements in Water and Sanitation
Provision—Based on Review of Studies

<i>Water and Sanitation Improvement</i>	<i>Median Reduction in Diarrheal Morbidity Percent</i>			
	<i>1985 Review</i>	<i>1991 Review</i>		<i>2003 Review</i>
		<i>Overall</i>	<i>Rigorous*</i>	
Improved water quality	22	17	15	42
Improved excreta disposal	22	22	36	—
Improved availability of water	25	27	20	—
Improved quality and quantity of water	37	16	17	—
Improvements in both water and sanitation	—	33	33	—
Hygiene	—	33	33	—

Sources: Clasen and Cairncross (2004); Esrey et al. (1991).
 Deemed methodologically rigorous by Esrey et al. (1991).

for their community. They brought together a collaboration between the water company (Aguas Argentinas), local government, a local bank and a construction company. After their successful battle for improved water access, family relations, children's education and activities were greatly improved, and the amount of time women spent waiting for water decreased. The women's struggle for water and sanitation "prompted their passage from the domestic to the public space... women's social practices provided democratic forms of organization and participation that contributed to the visibilization and empowerment of the organizations that they generated" (ibid.: p. 1).

Detailed accounts of women's lives changing as a result of social organizing around water also come from rural areas. Two studies (James et al., 2002; Panda, 2007) of large scale organizing in rural Gujarat, India report that access to water freed women's time for income-generating activities. Beginning in 1995, the Self Employed Women's Association (SEWA) organized 200,000 women in 500 villages of Gujarat in a "women, water and work campaign".

Table 3 (Panda, 2007) shows changes in time women devoted to different activities before and after gaining access to water, in this case from roof rainwater harvesting tanks. In these villages, improved water access allowed women to spend less time on collecting water (2.4 hours)

Table 3
*Women's Time Profiles Before and After Access to
 Water in Rural Gujarat, India (Monsoon Season)**

<i>Activity</i>	<i>Before</i>	<i>After</i>	<i>Difference</i>
Sleep	7.0	7.6	0.6
Household work	5.2	4.6	-0.6
Fetching water	3.2	0.8	-2.4
Social activities	2.0	2.0	0
Income generation	6.6	9.0	2.4
Total	24	24	

Source: Panda (2007: p. 23).

Note: *Study based on focus group discussions in six villages.

and household work (0.6 hours), and used that time mostly for income generation (2.4 hours) and more sleep (0.6 hours).

In their earlier article assessing the same “women, water and work campaign” in rural Gujarat, James et al. (2002: 205) argue that ‘when water supply improvements are coupled with opportunity to create income through micro-enterprises, time released from water collection is converted into income earned’.

Were, Roy, and Swallow (2008) report a detailed study of a village in western Kenya where a community organization, with significant input from women, brought piped water to most households. Table 4 shows changes in the quantities of water women use for different activities. Big increases in water use are recorded for washing clothes, bathing, kitchen garden irrigation, tea seedling irrigation (for sale), washing utensils and for livestock consumption.

The data in Table 4 suggest, and this is confirmed in the detailed interviews reported in Were et al. (2006), that both time savings and the quantity of water use are important. The combination of time saved from water collection and increased quantities of water available allow not only increased income generation (tea seedlings, livestock), with much of the increase going to women, but also improvements in crucial domestic tasks. The authors conclude:

Households with improved water access report time savings, improved health, cleaner clothes, increased production of tea seedlings, milk and vegetables, with the net result of significant increases in income controlled by women. This case study thus provides solid support for

Table 4
Average Daily Water Consumption for Households with and without Piped Water*

<i>Household Use of Water</i>	<i>Average Liters Used Per Day (Households with Piped Water)</i>	<i>Average Liters Used Per Day (Households without Piped Water)</i>	<i>Average Higher Consumption in Households with Piped Water</i>	<i>Percent Higher Consumption in Households with Piped Water</i>
Livestock consumption	94.0	64.4	29.6	46
Kitchen garden irrigation	45.7	15.7	29.9	190
Bathing	41.8	15.1	26.8	178
Washing clothes	37.8	3.6	34.2	937
Tea seedlings irrigation	37.0	22.4	14.6	65
Washing utensils	32.8	20.6	12.2	59
Cooking	26.7	21.2	5.5	26
Human consumption	15.8	15.1	0.8	5
Resurfacing floor	2.6	3.4	-0.8	-24
Total	334.2	181.4	152.8	84

Source: Were et al. (2006: Table 6).

Note: *Calculations based on household surveys of 30 women using water from protected and piped sources and 39 women using water from unprotected springs.

the proposition that access to small amounts of water beyond domestic needs can lead to substantial improvements in welfare, especially for women (Were et al., 2006: conclusion).

This section described evidence of women's protest in several cities for better access to water, and the range of favorable outcomes arising when that access is gained. Lower illness rates, significant changes in women's and children's lives, new livelihood possibilities and improvements in the quality and quantity of work maintaining the family and home, are all generated by improvements in access to water.

Conclusions—Modes of Water Access and Gender Relations

Women's lives and livelihoods in urban slums are shaped by inadequate access to water. It is common for women in slums to queue for long periods, compete with numerous others, get up before dawn, prepare for uncertainty of supply and quality, and pay significant proportions of their income for water. This limits the employment opportunities they can take and imposes a whole range of disadvantages upon them and their households. Where safe and sufficient water supply has been accomplished through women's organizing, the benefits have been wide-ranging and significant.

Global statistics on access to water overlook these social circumstances. Most of the low-income urban areas described in this article are classified as having access to "improved water sources". Data on "improved water sources," collected by WHO and UNICEF and routinely reproduced in the reports of international agencies and elsewhere, focus on the technical conditions and ignore the labor, time, cost and uncertainties of collection. These are the social circumstances that shape women's lives in low-income urban areas.

With the idea of *mode of access to water*, we have combined the social and technical conditions of access. We identify five modes of access to water common in poor urban areas: a household connection, a standpipe, purchase from a vendor, purchase from a CBO kiosk, and collection from a natural source. These modes have characteristic histories and social relations. Some assume public action, others private commerce. Several

modes may be used by the same household for various water needs. Each mode may also have implications for women's lives and livelihoods, and for the relations between women and men. Each mode of access may be amenable to a range of innovation and of public action.

The household connection is often seen as the "holy grail"²³ of water supply. We described in Section 5 how this highly distributed access may open otherwise unattainable social possibilities in schools and households. Not least, a household connection will free many women from the demanding and sometimes unpredictable burdens of access imposed by other modes. A household connection is the level of access characteristic of urban areas in industrialized countries and older urban areas, populated by the better-off, in developing countries. It requires dense pipe networks and effective revenue collection. Nonetheless, both social action and technical innovation could make household connections more attainable.

Social action could raise access to water and sanitation to the level of what De Swaan (1988) calls a public need. Raising the priority of access in public discourse could facilitate connections between rich and poor, the growth of enabling institutions, and the mobilization of public and private finance needed for new pipe networks.

Access to water through a public standpipe is differentiated between those areas and countries where vendor operators mediate access and those where user access is direct. The literature we have consulted on Asian cities seems mostly to describe direct consumer use of a standpipe, without a vendor or operator. Collignon and Vezina (2000) imply that, by contrast, all standpipes in the 10 African cities they studied have vendor operators, some of whom make household deliveries. They suggest that in these circumstances standpipes can provide effective supply, even in times of drought.

The literature we have reviewed raises the set of issues described in Section 4: long lines, low pressure, contamination, uncertain times of supply, and potential for conflict. The public standpipe is possibly preferred by municipalities because it is relatively cheap, and it circumvents the problems of household land tenure and of gaining access to build dense pipe networks in crowded urban spaces. The inclusion of this mode in the WHO/UNICEF Joint Monitoring Program's category of 'improved water access' enables municipalities to generate statistics that suggest that more progress has been made than is experienced by those getting the water.

The experience of buying water from water vendors, also called independent water providers, is, with the exception of Collignon and Vezina (2000), poorly documented. We do not know to what extent it liberates women's water collection time and provides water in adequate quantity and quality. It is possible that this is a mode of access that can be self-funding and readily scalable. The publications of international institutions (for example, Collignon and Vezina, 2000) sometimes portray vendors as a private sector panacea for improving water access. The diversity of relationships involved in water vending, the unknown extent of water cartels, and other forms of state-like organization, as well as the absence of research about the consumers' experience of water supply, suggests that more research is required into water vending.

Kiosks run by community-based organizations may provide a more reliable water supply than public standpipes, but users may have to walk similar distances to obtain water. This form of provision may also lack the flexibility of well-established, small-scale commercial providers.

There is evidence of women's organizing around water in several cities of South Asia, the West Asia and Latin America. Where communities and women's groups have been able to achieve household piped connections there have been profound changes in the lives of women and children. The substantial time, costs and uncertainties of collecting water from a standpipe or vendor, can be largely eliminated. That and the increased availability of water make possible new lives and livelihoods.

To facilitate these desirable outcomes we need research particularly on two questions. Firstly, where and with what outcomes are women's and community organizations able to work with water utilities to expand water access? Secondly, what forms of social institution, including water cartels and water vendors, mediate access to water in the low-income areas of different African, Asian and Latin American cities?

NOTES

1. There is no consensus on how best to describe low-income urban areas. We use the terms slums, informal settlements, poor urban housing and/or communities, low-income areas, and peri-urban settlements more or less interchangeably. UN HABITAT defines a slum as an area where households lack one or more of the following 'durable housing, sufficient living area, access to improved water, access to sanitation, secure tenure' (UN HABITAT, 2006: p.19).

2. Interview with Edmond Odaba, Project Officer, Kenya Water for Health (KWAHO) on 15 August 2009.
3. Personal communication, Jeff Albert, the Principal of Aquaya (2008).

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